HP Dual-port 4x Fabric Adapter User Guide

September 2005 (Fourth Edition)
Part Number 377704-004

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Regulatory Notices

Regulatory Model Number

For the purpose of regulatory compliance certifications and identification, this product has been assigned a unique regulatory model number. The regulatory model number can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always refer to this regulatory model number. The regulatory model number is not the marketing name or model number of the product.

Federal Communications Commission Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit that is different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

Declaration of Conformity for Products marked with the FCC Logo, United States Only

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.

For questions regarding your product, contact us by mail or telephone:

Hewlett-Packard Company
P. O. Box 692000, Mail Stop 530113
Houston, Texas 77269-2000
1-800-HP-INVENT (1-800-474-6836)
(For continuous quality improvement, calls may be recorded or monitored.)

For questions regarding this FCC declaration, contact us by mail or telephone:
Hewlett-Packard Company
P. O. Box 692000, Mail Stop 510101
Houston, Texas 77269-2000
1-281-514-3333

To identify this product, refer to the part, series, or model number found on the product.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user's authority to operate the equipment.

Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

Canadian Notice (Avis Canadien)

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada

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European Union Regulatory Notice

This product complies with the following EU Directives:

- •Low Voltage Directive 73/23/EEC
- •EMC Directive 89/336/EEC

Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) which are listed on the EU Declaration of Conformity issued by Hewlett-Packard for this product or product family.

This compliance is indicated by the following conformity marking placed on the product:

This marking is valid for non-Telecom products and EU harmonized Telecom products (e.g. Bluetooth).

XXXX*

This marking is valid for EU non-harmonized Telecom products .
*Notified body number (used only if applicable - refer to the product label)

Japanese Notice

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の
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取扱説明書に従って正しい取り扱いをして下さい。

Korean Notice

B급 기기 (가정용 정보통신기기)

이 기기는 가정용으로 전자파적합등록을 한 기기로서
주거지역에서는 물론 모든지역에서 사용할 수 있습니다.

BSMI Notice

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能
會造成射頻干擾，在這種情況下，使用者會被要求採
取某些適當的對策。

Electrostatic Discharge

Preventing Electrostatic Damage

A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage when setting up the system or handling parts:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Handle parts by edges only.
- Avoid contact between the parts and clothing (for example, a wool sweater) . Wrist straps only protect parts of the body from ESD voltages.
- Do not wear jewelry.
- Always be properly grounded when touching a static-sensitive component or assembly.

Grounding Methods To Prevent Electrostatic Damage

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm ± 10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an authorized reseller install the part.

For more information on static electricity, or assistance with product installation, contact your authorized reseller.

Contact Information

Table ii-1: Customer Contact Information

For the name of your nearest authorized HP reseller:	In the United States, refer to the HP US service locator webpage. In other locations, refer to the HP website.

Table ii-1: Customer Contact Information

For HP technical support:	In the United States and Canada, call 1-800-HP-INVENT (1-800-474-6836). This service is available 24 hours a day, 7 days a week. For continuous quality improvement, calls may be recorded or monitored. Outside the United States and Canada, refer to www.hp.com

1

About the Host Channel Adapter

The following sections appear in this chapter:

- "Introduction" on page 1
- "HP Dual-port 4x Fabric Adapters" on page 1
- "About the HCA Host-Side Drivers" on page 2
- "Check the HP Support website at http://support.hp.com for the latest list of supported kernels and system architectures." on page 3

Introduction

The host channel adapter (HCA) serves as the interface that connects your commodity hosts to the IB™ network. Hosts can support one or two HCAs, depending on host type.

HP Dual-port 4x Fabric Adapters

This document describes the following HCAs:

- HP NC570C PCI-X Dual-port 4x Fabric Adapter
- HP NC571C PCI Express Dual-port 4x Fabric Adapter

Both HCAs provide 4x InfiniBand (IB) copper connectors that provide 10Gbps connections per port in each direction (20 Gbps aggregate bandwidth). Each HCA and associated protocol drivers are designed to run in conjunction with IB switches. The HP Dual-port 4x Fabric Adapters feature a full suite of upper-layer protocols and APIs.

Supported Protocols

- IPoIB - Internet Protocol over IB. Refer to "IPoIB" on page 2.

- SRP - SCSI RDMA Protocol. Refer to "SRP" on page 2.
- SDP - Socket Direct Protocol. Refer to "SDP" on page 2.
- uDAPL - User Direct Access Programming Library. Refer to "uDAPL" on page 3.
- MPI - Message Passing Interface. Refer to "MPI" on page 3.

HCA Package Contents

Inspect all items for shipping damage. If anything appears to be damaged, or if you encounter problems when installing or configuring your system, contact a customer service representative.

The HP Dual-port 4x Fabric Adapters ship with the following components:

- One HP Dual-port 4x Fabric Adapter
- *HP Dual-port 4x Fabric Adapter Quick Setup Instructions*
- Limited Warranty and Material Limitations Documentation

About the HCA Host-Side Drivers

HP Dual-port 4x Fabric Adapters provide a full suite of upper-layer protocols, including IpoIB, SDP, SRP, MPI, and uDAPL. For configuration details, refer to the *Host-Side Drivers User Guide*.

IPoIB

The IPoIB protocol passes IP traffic over the IB network. Both SDP and uADAPL rely on IPoIB to resolve IP addresses.

To configure IPoIB, you assign an UP address and subnet mask to each IP port. IPoIB automatically adds IB interface names to the IP network configuration. To configure IPoIB, refer to the *Host-Side Drivers User Guide*.

NOTE: IPoIB supports port-to-port failover on the HCA ports.

SRP

SRP runs small computer system interface (SCSI) commands across remote direct memory access (RDMA)-capable networks so IB hosts can communicate with Fibre Channel (FC) storage devices. This protocol assigns devices and mounts file systems so that hosts can access the data on those file systems. The SRP driver is installed as part of the driver package and loads automatically when the host reboots. This protocol requires a Server Switch with an FC gateway to connect the host to FC storage.

SRP requires no host-side configuration. In conjunction with a Server Switch, SRP disguises IB-attached hosts as FC-attached hosts. The Topology Transparency feature lets FC storage communicate seamlessly with IB-attached hosts (known as SRP hosts).

NOTE: SRP supports port-to-port failover on the HCA daughter card.

SDP

Sockets direct protocol (SDP) enables sockets-based applications to take advantage of the enhanced performance featurs provided by IB. It provides a high-performance, zero-copy data transfer protocol for stream-socket networking over an IB fabric. You can configure the driver to automatically transfer TCP to SDP based on source IP, destination, or application name. For configuration instructions, refer

to the *Host-Side Drivers User Guide*. SDP achieves lower latency and higher bandwidth than IPoIB running sockets-based applications.

uDAPL

The User Direct Access Programming Library (uDAPL) defines a set of APIs that leverages IB's RDMA capabilities. uDAPL is installed transparently with the driver library. Your application must explicitly support uDAPL. This library requires no manual configuration. However, if your application supports uDAPL, it may require additional configuration changes. Please refer to your application documentation for more information.

MPI

MPI is a library specification for message-passing. MPI is available on the HP Support website at http://support.hp.com. The MPI implementation lets you use either external HCA port and supports Opteron 64-bit operation. For configuration instructions, refer to the *Host-Side Drivers User Guide*.

Linux Kernels

Check the HP Support website at http://support.hp.com for the latest list of supported kernels and system architectures.

2

Installing the Host Channel Adapter

This chapter provides the following information:

- "Installation Overview" on page 5
- "Selecting the Host Connector" on page 5
- "Installing an HCA in a PCI-X or PCI Express Connector" on page 8
- "Connecting the InfiniBand Cables" on page 9
- "Installing HCA Host-Side Drivers" on page 11

Installation Overview

The following steps are required when performing the HCA installation procedure:

- "Selecting the Host Connector" on page 5
- "Installing an HCA in a PCI-X or PCI Express Connector" on page 8
- Installing the Host-Side Drivers (refer to the *Host-Side Drivers User Guide* for installation instructions)

Selecting the Host Connector

The following types of connectors are supported:

- "Selecting PCI-X Connector(s)" on page 5
- "Selecting PCI-Express Connector(s)" on page 7

Selecting PCI-X Connector(s)

The HCA requires that specific PCI-X slots be used. When determining which PCI-X slot to use, inspect the server chassis and consider the following:

- Speed of the slot
- Other devices on the bus
- Cooling
- Physical stability of the installation
- PCI-X frequency configuration
- Dual HCA installation requirements

Speed of the Slot

- Locate the 133MHz PCI-X (64-bit, 3.3V) or 100MHz PCI-X (64-bit, 3.3V) slots. 5V slots are not supported.
- A conventional PCI 64-bit connector is not recommended as the first option, but is supported.
- Systems with 66 MHz PCI-X connectors are supported but not recommended.

Other Devices on the Bus

- It is recommended that you select a connector that is the only one on that particular PCI-X bus. This is most often the case for the 133MHz connectors.
- Use the mother board (server) documentation in order to get a block diagram of all the available PCI-X buses. This will help you determine which connectors belong to which bus. If this is not obvious from the documentation you may need to contact the server vendor technical support.
- If there are two connectors (or more) on the same PCI-X bus, make sure to remove all other devices from this bus. It is highly undesirable to have another device on the same PCI-X bus, as performance will most likely be affected. However, if performance is not a concern and the frequency of the PCI-X bus is 100MHz, it is permissible to have two devices (for example, an IB HCA and GE NIC) on the same bus.
- If the bus is 133MHz, it is mandatory that you remove any other devices so that the IB HCA is the only device on that bus.

Cooling

- Most HCAs have totally passive cooling, which means there are no extra fans installed on the board.
- It is mandatory that you arrange for suitable airflow to go around the HCA head sink. This may mean choosing PCI-X slots that do not place the HCA too close to another card.
- In addition, some server chassis vendors provide extra fan assemblies, and you should make sure to have them installed.

Physical Stability of the Installation

When selecting the PCI-X slot, consider whether the HCA(s) can be installed in such a way that they are absolutely secure. It is possible to stress the HCA connectors while arranging the cables. A poorly secured HCA could also damage the PCI-X connector mechanically.

Dual HCA Installation Requirements

- For dual HCA installation in a single host, it is required to have two completely isolated PCI-X buses to avoid any performance degradation.
- If the host has only one PCI-X 100 or 133MHz bus (regardless of the number of connectors), then this mother board should not be used for a dual HCA installation.
- It is acceptable to have one of the PCI-X slots operate at 133MHz and the other at 100MHz. However, the best case is to have two 133MHz individual connectors on two completely isolated PCI-X buses.
- Systems with 66 MHz PCI-X connectors are supported but not recommended.

Selecting PCI-Express Connector(s)

The HCA requires that specific PCI-Express slots be used. When determining which slot to use, inspect the server chassis and consider the following:

- type of connector (x4, x8, or x16)
- cooling
- physical stability of the installation

Type of PCI-E Connector

PCI-Express x8, x16 and x4 connectors can be used to install an HCA. PCI-Express x1 connectors should not be used, even if it is possible mechanically.

Using an x8 Connector for the HCA

The HCA will be utilized at the maximum bandwidth when plugged into an x8 connector. If bandwidth is an important issue, you should use the server documentation to verify that the connector is actually x8, and is supported by the BIOS as x8. This is important because some servers use x8 connectors for x4.

Using an x16 Connector for the HCA

The HCA will be utilized at the maximum bandwidth when plugged into an x16 PCI-E connector.

NOTE: The x16 PCI-E connector on some mother boards is only x16 in one direction; the other direction could be x1 or x4. This asymmetrical configuration is not suitable for the IB HCA, and should be avoided.

Using an x4 Connector for the HCA

- The HCA will be utilized at half the bandwidth when plugged into an x4 connector.
- If you are installing a single HCA in a system with dual PCI-E connectors of x8 and x4, it is important to differentiate the connectors and use the x8 PCI-E connector for maximum bandwidth. However, it is acceptable to use the second x4 PCI-E connector for second IB HCA, provided bandwidth is not an issue.

Cooling

- Most HCAs have totally passive cooling, which means there are no extra fans installed on the board.
- It is mandatory that you arrange for suitable airflow to go around the HCA head sink. This may mean choosing slots that do not place the HCA too close to another card.

In addition, some server chassis vendors provide extra fan assemblies, and you should make sure to have them installed.

Physical Stability of the Installation

When selecting the PCI Express slot, consider whether the HCA(s) can be installed in such a way that they are absolutely secure. It is possible to stress the HCA connectors while arranging the cables. A poorly secured HCA could also damage the PCI-E connector mechanically.

Warnings

When installing the HCA in the server, observe the following:

- To avoid the risk of personal injury or damage to the equipment, consult the User's Documentation provided with your equipment before attempting the installation.

- Many computers are capable of producing energy levels that are considered hazardous. Users should not remove enclosures nor should they bypass the interlocks provided to protect one from these hazardous conditions.
- Installation of this HCA should be performed by individuals who are both qualified in the servicing of computer equipment, and trained in the hazards associated with products capable of producing hazardous energy levels.
- To reduce the risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

Installing an HCA in a PCI-X or PCI Express Connector

The HCA comes preconfigured. You do not have to set any jumpers or connectors. To install the HCA:

1. Note the Global Unique ID (GUID) numbers from the hardware. You will need this number when performing configurations.

   Optionally, you can run **vstat** or **vstat -v** (a utility that is available after host driver installation) to view the Global ID (GID). The GUID is the last 8-bytes of the GID.

   The GUID will look something like this: 00:05:ad:00:00:00:02:40
2. Log on to the host system as the root user.
3. Power down the host system.
4. Disconnect the power cable.

   NOTE: This is an important step, as serious damage could be caused by the standby power accidently being powered on during the HCA installation.
5. Ground yourself appropriately to the host chassis.
6. Remove the host-system cover to access the PCI slots.
7. Insert the HCA into the appropriate slot, if you have not already done so. Refer to "Selecting the Host Connector" on page 5.
8. Screw the HCA to the host mounting-rail.
9. Replace the host-system access cover.
10. Power-up the host system.
11. Install the host drivers as described on "Installing HCA Host-Side Drivers" on page 11.
12. Connect the IB cables, as described in "Connecting the InfiniBand Cables" on page 9.

Connecting the InfiniBand Cables

To connect the IB host to the IB switch, standard 4x IB cables are required. IB cables can be used to connect any two IB devices, whether switch or host.

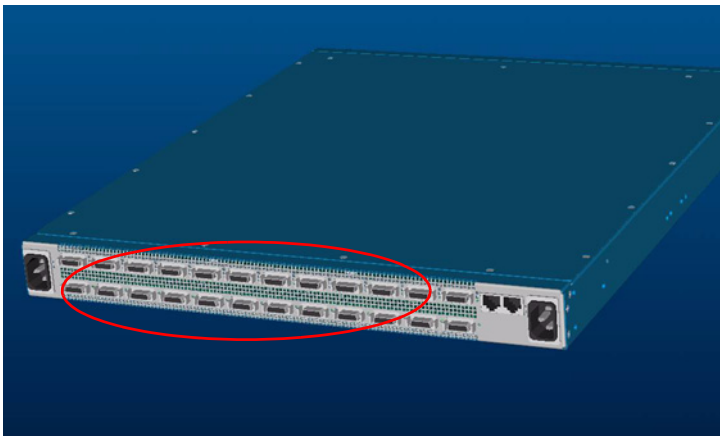

Figure 2-1: Example of IB Ports

1. Plug IB cables from the host to the IB switch.
   a. To plug in an IB cable, push the connector into the interface until you hear/feel a click.

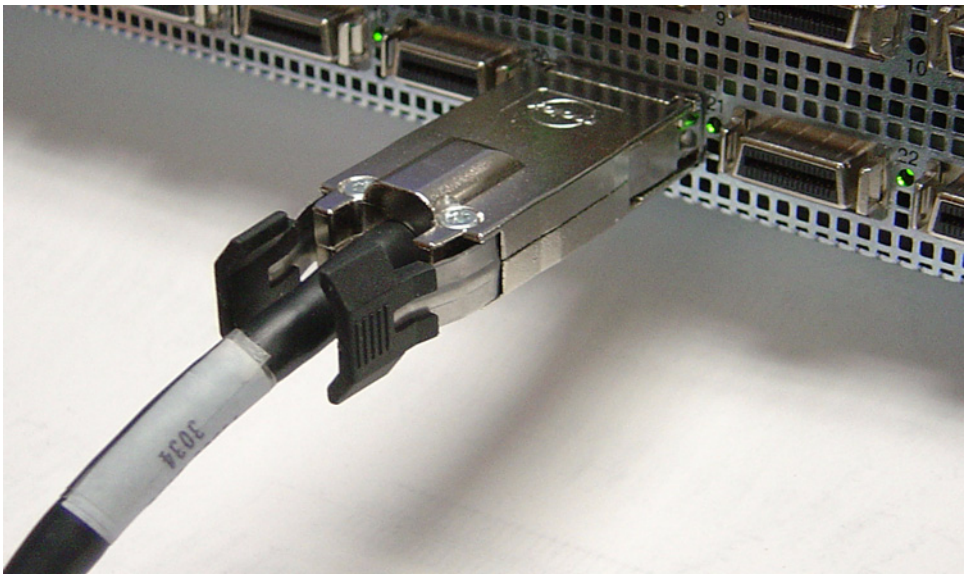

Figure 2-2: Fully Installed IB Cable with Pinch Connector

NOTE: If your host does not provide an ample amount of free space around a given IB port, double-check that your IB cable connector engages fully. Wiggle your connector back and forth to be sure that both sides of the connector have locked firmly into place.

b. To remove a cable with a pinch connector, pinch both sides of the back of the connector and pull the connector away from the port.

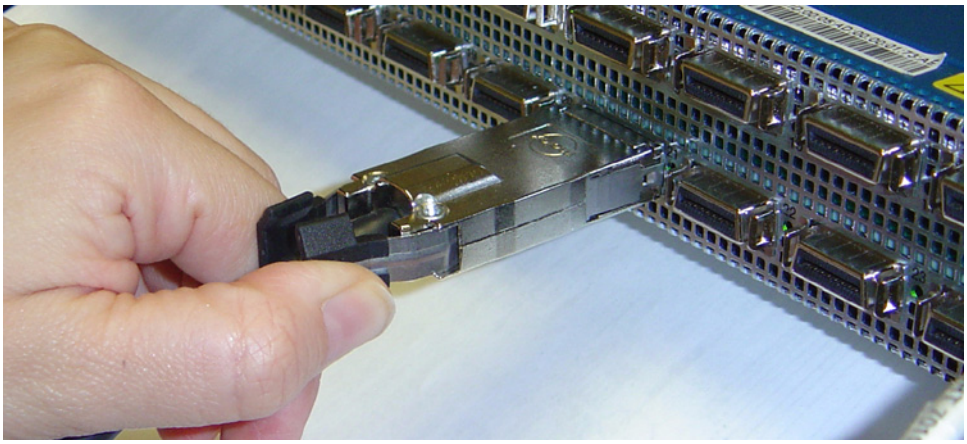

Figure 2-3: Removing a Pinch Connector

c. To remove a cable with a pull connector, grasp the connector with one hand and push it *toward* the port, then pull the latch away from the port with your other hand and gently wiggle the connector away from the port.

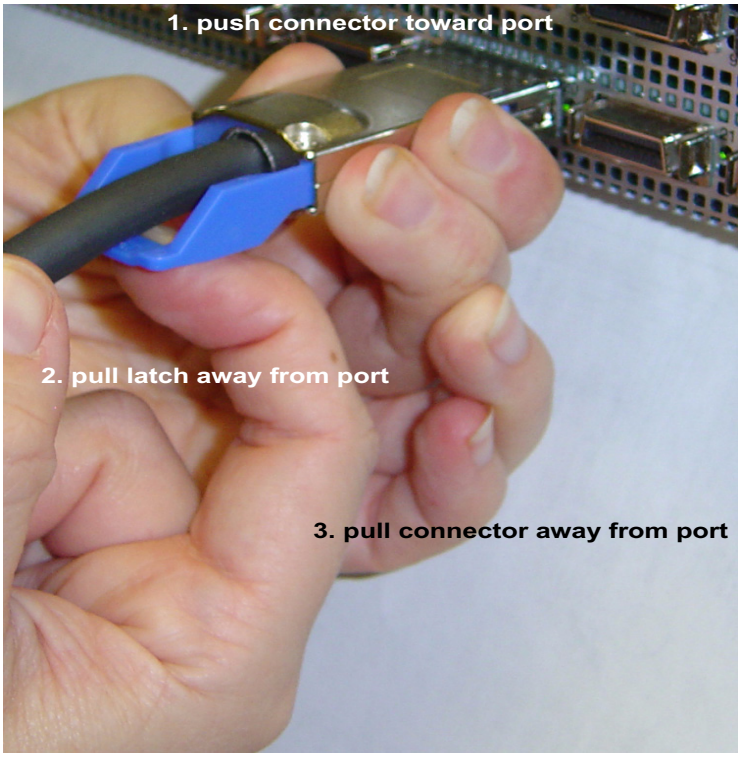

Figure 2-4: Removing a Pull Connector

Installing HCA Host-Side Drivers

After you physically install the HCA, install the appropriate host-side drivers. For instructions, refer to the *Host-Side Drivers User Guide* for your appropriate platform (Linux or Windows).

3

Troubleshooting the HCA Installation

The following are a list of things you can check if the HCA does not operate appropriately.

- "Interpreting HCA LEDs" on page 13
- "Checking the InfiniBand Cable" on page 14
- "Checking the InfiniBand Network Interfaces" on page 14
- "Running the HCA Self-Test" on page 15

Interpreting HCA LEDs

There are two types of LEDs on the HCA card:

- The top yellow LED indicates a logical link has taken place.
- The bottom green LED indicates a physical link has occurred.

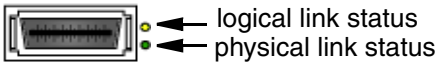

Figure 3-1: The HCA LEDs

Table 3-1: Interpreting the LEDs

LED	Indication
Top LED	**Off** indicates there is no logical link detected. If this LED is Off, but the bottom LED is On, then a logical link error has occurred. This indicates that the subnet manager has not done a sweep.

Table 3-1: Interpreting the LEDs

LED	Indication
Top LED	**On** indicates a logical link is detected. A logical link is established when the subnet manager makes a sweep. A logical link must be established if you are to use the port.
Bottom LED	**Off** indicates that no physical link is detected. A physical link requires that the drivers on the attached IB host have been installed and are running.
Bottom LED	**On** indicates that a physical link is detected.

Checking the InfiniBand Cable

- Make sure an IB cable is connected to a port on the HCA and a port on the IB switch card. HP recommends that you tug slightly on the cable to verify that is tightly connected as poorly connected IB cables can cause errors that are difficult to detect.
- If you are running the EM, click the Refresh button and note if the corresponding IB port on the EM turns green. If it's green, you have a physical connection and a logical link.
- Check the port LEDs on the HCA. The bottom LED should be green.
- Check the port LEDs on the IB switch. One should turn green, indicating a physical connection is established.
- Note the port designations next to the HCA ports.

With one HCA installed in the host, Port 1 is assigned the ib0 network interface. Port 2 is assigned the ib1 network interface. If they are not correctly connected, reconnect them.

Checking the InfiniBand Network Interfaces

Check for IB network interfaces using the **ifconfig -a** command. You should see interfaces that begin with ib (in other words, ib0, ib1).

Use the **`ifconfig -a`** command to display IB interfaces. If there are no ib0 and ib1 interfaces, you may create them automatically or manually. To create them automatically each time the server reboots, change the directory. The directory may be /etc/sysconfig/network-scripts.

Create one script per HCA port you wish to use (in other words, ifcfg-ib0, ifcfg-ib1). (You may copy another ifcfg file, modify the DEVICE and IPADDR lines, then save it as either ifcfg-ib0 or ifcfg-ib1.)

To create it manually each time after booting the server, enter:

Syntax:

```
ifconfig ib# addr netmask mask
```

- **ib**# is the HCA network interface getting the IP address. This may be either ib0 or ib1.
- *addr* is the IP address to assign the network interface.
- **netmask** is a mandatory keyword.
- *mask* is the netmask for the IP address.

Running the HCA Self-Test

The HCA Self-test verifies the state of the HCA component, the state of each port on the HCA, as well as the connectivity to the fabric.

1. Log into the IB-enabled host.
2. Run the **hca_self_test**.

Example

```
[root@1750]# /usr/local/topspin/sbin/hca_self_test
```

Figure 3-2: Running the HCA Self-Test

Example

```
---- Performing InfiniBand HCA Self Test ----
Number of HCAs Detected ................ 1
PCI Device Check ....................... PASS
Host Driver Version .................... rhel3-2.4.21-4.ELsmp-2.0.0-530
Host Driver RPM Check .................. PASS
HCA Type of HCA #0 ..................... Cougar
HCA Firmware on HCA #0 ................. v3.01.0000
HCA Firmware Check on HCA #0 ........... PASS
Host Driver Initialization ............. PASS
Number of HCA Ports Active ............. 1
Port State of Port #0 on HCA #0 ........ UP
Port State of Port #1 on HCA #0 ........ DOWN
Error Counter Check .................... PASS
Kernel Syslog Check .................... PASS
------------------ DONE ---------------------
```

Figure 3-3: HCA Self-Test with Port Error

3. View the output of the HCA Self-test. In the example shown in Figure 3-3, port #1 of the HCA is not properly connected.
4. View another example of the HCA Self-test. In the example shown in Figure 3-4, both ports on the HCA appear to be disconnected, or are not connected properly.

   The following errors appear:

   - Port State of Port #0 on HCA #0 is Down
   - Error Counters Failure

Example

```
[root@1750]# /usr/local/topspin/sbin/hca_self_test
---- Performing InfiniBand HCA Self Test ----
Number of HCAs Detected ............... 1
PCI Device Check ...................... PASS
Host Driver Version ................... rhel3-2.4.21-4.ELsmp-2.0.0-530
Host Driver RPM Check ................. PASS
HCA Type of HCA #0 .................... Cougar
HCA Firmware on HCA #0 ................ v3.01.0000
HCA Firmware Check on HCA #0 .......... PASS
Host Driver Initialization ............ PASS
Number of HCA Ports Active ............ 0
Port State of Port #0 on HCA #0 ........ DOWN
Port State of Port #1 on HCA #0 ........ DOWN
Error Counter Check ................... FAIL
    REASON: found errors in the following counters
      Errors in /proc/topspin/core/ca1/port1/counters
        Symbol error counter:                        29
Kernel Syslog Check ................... PASS
```

Figure 3-4: HCA Self-Test with Errors on Two Ports

5. To locate further information about an error counter failure, execute **counters** on a specific port.

Example

```
[root@1750]# cat /proc/topspin/core/ca1/port1/counters
Symbol error counter:                        29
Link error recovery counter:                  0
Link downed counter:                          1
Port receive errors:                          0
Port receive remote physical errors:          0
Port receive switch relay errors:             0
Port transmit discards:                       2
Port transmit constrain errors:               0
Port receive constrain errors:                0
Local link integrity errors:                  0
Excessive buffer overrun errors:              0
VL15 dropped:                                 0
Port transmit data:                     1133136
Port receive data:                      1099008
Port transmit packets:                    15738
Port receive packets:                     15264
```

Figure 3-5: Example of Error Counter Output