PCIe x16 Gen3 Cable Adapter

SKU: OSS-PCIe-HIB68-x16

OSS
ONE STOP SYSTEMS

Table of Contents

Preface

Advisories

Five types of advisories are used throughout this manual to provide helpful information, or to alert you to the potential for hardware damage or personal injury.

NOTE

Used to amplify or explain a comment related to procedural steps or text.

IMPORTANT

Used to indicate an important piece of information or special "tip" to help you

CAUTION

Used to indicate and prevent the following procedure or step from causing damage to the equipment.

WARNING

Used to indicate and prevent the following step from causing injury.

DANGER or STOP

Used to indicate and prevent the following step from causing serious injury or significant data loss

Disclaimer: We have attempted to identify most situations that may pose a danger, warning, or caution condition in this manual. However, the company does not claim to have covered all situations that might require the use of a Caution, Warning, or Danger indicator.

Safety Instructions

Always use caution when servicing any electrical component. Before handling the expansion chassis, read the following instructions and safety guidelines to prevent damage to the product and to ensure your own personal safety. Refer to the "Advisories" section for advisory conventions used in this manual, including the distinction between Danger, Warning, Caution, Important, and Note.

- Always use caution when handling/operating the computer. Only qualified, experienced, authorized electronics personnel should access the interior of the computer and expansion chassis per UL and IEC 60950-1
- The power supplies produce high voltages and energy hazards, which can cause bodily harm.
- Use extreme caution when installing or removing components. Refer to the installation instructions in this manual for precautions and procedures. If you have any questions, please contact Technical Support.

WARNING
Never modify or remove the radio frequency interference shielding from your workstation or expansion unit. To do so may cause your installation to produce emissions that could interfere with other electronic equipment in the area of your system.

When Working Inside a Computer

1. Before taking covers off a computer, perform the following steps:
2. Turn off the computer and any peripheral devices.
3. Disconnect the computer and peripheral power cords from their AC outlets or inlets in order to prevent electric shock or system board damage.

In addition, take note of these safety guidelines when appropriate:

- To help avoid possible damage to systems boards, wait five seconds after turning off the computer before removing a component, removing a system board, or disconnecting a peripheral device from the computer.
- When you disconnect a cable, pull on its connector or on its strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs. If you are disconnecting this type of cable, press in on the locking tabs before disconnecting the cable. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before connecting a cable, make sure both connectors are correctly oriented and aligned.

CAUTION
Do not attempt to service the system yourself except as explained in this manual. Follow installation instructions closely.

Protecting Against Electrostatic Discharge

Electrostatic Discharge (ESD) Warning
Electrostatic Discharge (ESD) is the enemy of semiconductor devices. You should always take precautions to eliminate any electrostatic charge from your body and clothing before touching any semiconductor device or card by using an electrostatic wrist strap and/or rubber mat.

Static electricity can harm system boards. Perform service at an ESD workstation and follow proper ESD procedures to reduce the risk of damage to components. We strongly encourage you to follow proper ESD procedures, which can include wrist straps and smocks, when servicing equipment.

You can also take the following steps to prevent damage from electrostatic discharge (ESD):

- When unpacking a static-sensitive component from its shipping carton, do not remove the component's anti-static packaging material until you are ready to install the component in a computer. Just before unwrapping the anti-static packaging, be sure you are at an ESD workstation or are grounded.

- When transporting a sensitive component, first place it in an anti-static container or packaging.

- Handle all sensitive components at an ESD workstation. If possible, use anti-static floor pads and workbench pads.

- Handle components and boards with care. Do not touch the components or contacts on a board. Hold a board by its edges or by its metal mounting bracket.

1   Introduction

PCIe x16 Gen 3 switch-based host interface board with PCIe quad SFF-8644 cable connectors as used in the PCI Express External Cabling specification can be configured as x16, two x8 or four x4 cable ports. The cable adapter operates in host or target mode with a Dipswitch setting change.

1.1   Specifications

Item	Description
Form Factor	PCIe 3.0 x16 half-height, half-length
Dimensions	5.85 x 2.34" (14.85 x 5.94 cm) at 0.063" (1.6mm) thickness
Bandwidth	128Gb/s
Connectors	• PCIe x16 card edge connector • Quad SFF-8644 connectors on the bracket • Compliant to PCI-SIG PCI Express External Cable Specification 3.0
Bracket	Standard and low profile brackets available Two LEDs on bracket • Upstream link status • Downstream link status
PCIe Switch	Broadcom PEX8733 • 8.0GT/s 32-Lane PCI Express Gen 3 Switch • DMA Controller • SSC Isolation
Switch Latency	150ns
Cable Types	Supports the following cable types: • PCIe 3.0 CMI copper cables • SFF-8644 copper cables • SFF-8644 fiber cables up to 100m
Cable Connection Modes	One x16 host connection via edge card to: • One x16 cable connection • Up to two x8 cable connections • Up to three x8x4x4 cable connections • Up to four x4 cable connections
Power	17W max • 1.5A @3.3V • 900mA @12V • 250mA @ 3.3V aux
Operating Temperature	0˚C to +50˚C
Storage Temperature	-40˚C to 85˚C
Operating Humidity	10% to 90% relative humidity non-condensing
Storage Humidity	5% to 95% relative humidity non-condensing
Agency Compliance	Designed to meet the following agency standards: • FCC - Part 15 Class A, 47CFR; Canada ICES-003, issue 4, Class A; Japan: VCCI, Class A; CE Emissions 2004-108EC • UL/IEC 60950-1; Canada: CSA C22.2 No. 60950-1; Argentina: IEC60950-z; IEC 60950-1 (CB Certificate and CB Test Report) • CE Mark (EN55022 Class A, EN60950-1, EN55024, EN61000-3-2, EN61000-3-3) • CISPR 22, CISPR 24, Class A: Australia/New Zealand AS/NZS CISPR 22, ClassA • RoHS 6 of 6 compliance (Directive 2002/95/EC)

1.2   Part Numbers

Part Numbers	Description
OSS-PCIe-HIB68-x16	HIB68-x16 Host Configuration with Full-height bracket
OSS-PCIe-HIB68-x16-Half	HIB68-x16 Host Configuration with Half-height bracket
OSS-PCIe-HIB68-x16-T	HIB68-x16 Target configuration with Full-height bracket
OSS-PCIe-HIB68-x16-T-Half	HIB68-x16 Target configuration with Half-height bracket

1.3   Parts of HIB68-x16
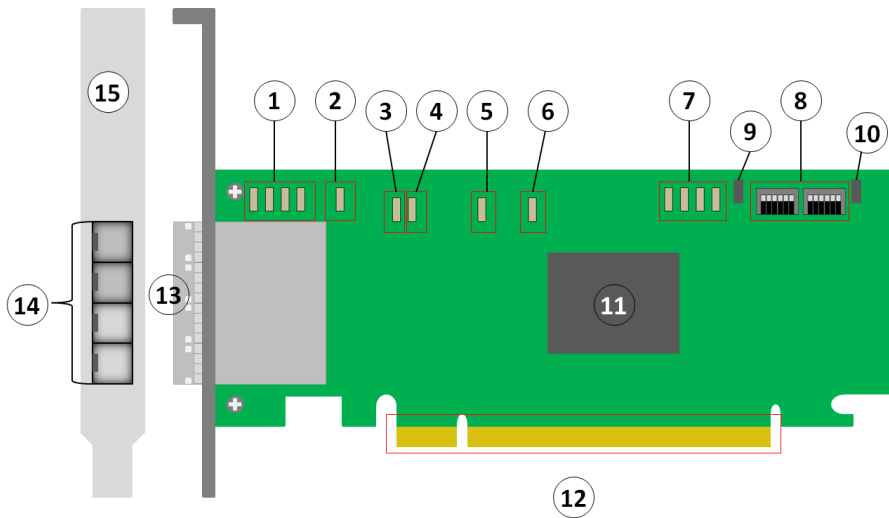
	Description	
#1	LED CHO, CH1, CH2 & CH3 are the Cable LINK LEDs	
#2	3.3AUX power	
#3	D2, CE is the link LED to the card edge	
#4	D3, PWR LED: This is the power LED. It blinks signifying that the FPGA processor is running	
#5	CR3, ERR LED: Red LED, usually shines when PEX device is stuck in reset. Will see it blink when PERST#s signals are sent from the host.	
#6	This is CRC error LED, which is permanently turned OFF until FPGA implements CRC	

#7	The last four are status LEDs used for debugging FPGA code.	
#8	SW1 and SW2: Dipswitch setting for Host and Target card	
#9 & #10	JP1 and JP2 are not ACTIVE	
#11	PCIe switch (under the HeatSink)	
#12	PCIe Card Edge connector (x16)	
#13 & #14	SFF-8644 connector	
#15	Standard PCIe Bracket	

1.3.1 x4 cable Ports

There are **four x4 cable ports** available on the HIB card. The ports are not labeled. The photos below will serve as reference guide in identifying the port numbers on the HIB card.

Before connecting a single x4 PCIe SFF-8644 cable (or when utilizing a single-cable configuration) it is very imperative to know where port #0 is on the HIB card. Prior to installing the HIB card, make sure to mark where port #0 is on the bracket. Once the card is installed in a horizontal position in a host server PCIe x16 slot of a motherboard, it is very difficult and confusing to locate the port #0 on the back of the HIB card.

- A single cable (when utilizing One-Cable Configuration) must be inserted into port #0 on both HIB cards (Host and Target) all the time.
- When using two x4 SFF-86644 cables, the 1st cable must be connected to port #0 of the Host and Target card.
  - The 2nd cable must be inserted to port #1 on both Host and Target card. Inserting the cables in a wrong port can cause connectivity issues.
- For more information on supported cable configurations go to Chapter 3 and Chapter 10.

Below are photos of the HIB cards in a different position when plugged into a PCIe slot. This will serve as a guide in determining where the port #0 is on the HIB card. NOTE: The location of the PCIe slot on the board dictates the position on how the HIB card will be installed.

HIB card seated flat (horizontal position)

Target-to-Host **or** Host-to-Target

Port #0 Port #0

SFF-8644 cable

Target-to-Host **or** Host-to-Target

Port #0 Port #0

SFF-8644 cable

Target-to-Host **or** Host-to-Target

Port #0 Port #0

SFF-8644 cable

Target-to-Host **or** Host-to-Target

Port #0

SFF-8644 cable
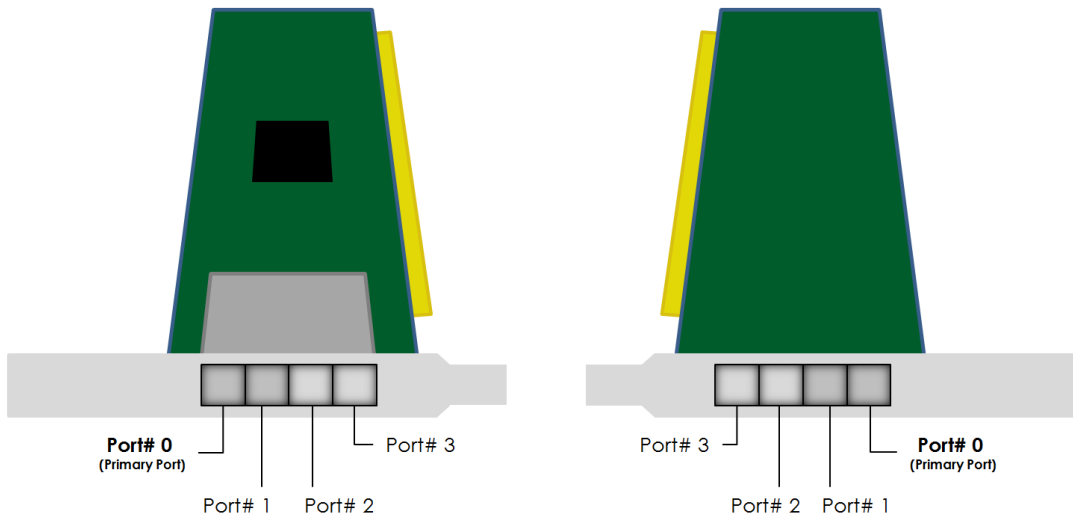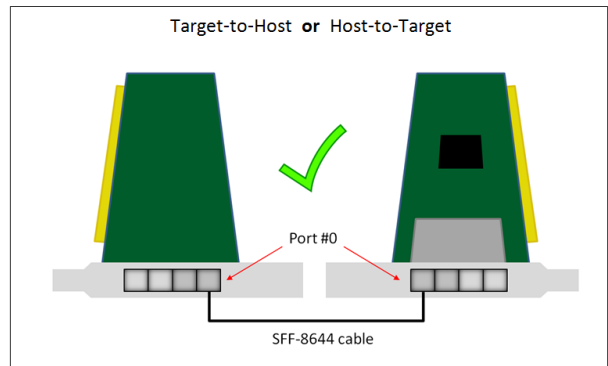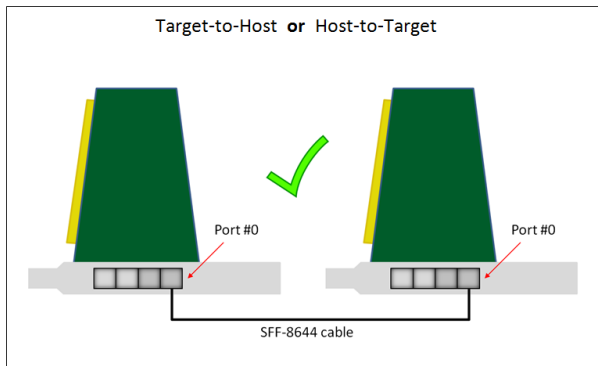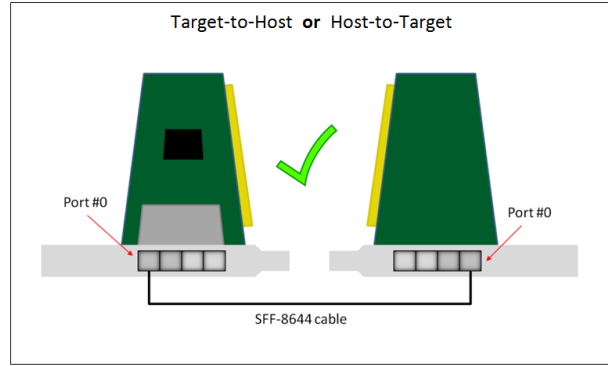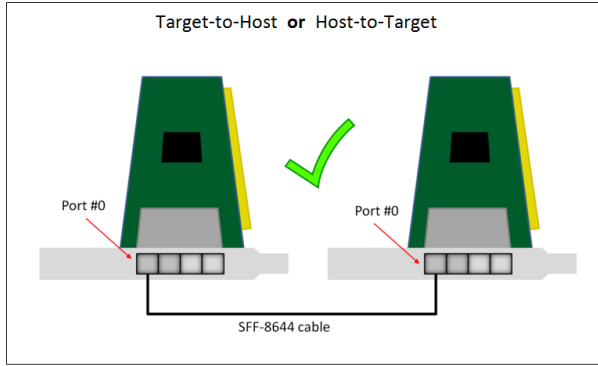
HIB card seated in a vertical position

Target-to-Host **or** Host-to-Target

Port #0 Port #0

SFF-8644 cable
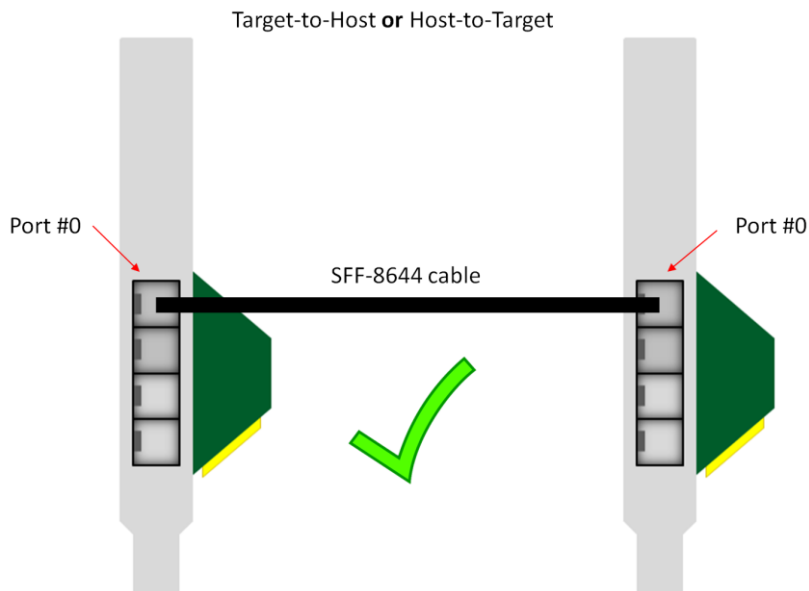
The "Port #0" is located on the top side of the bracket, opposite of the card edge connector.

LED Indicators   Dipswitches

Port# 0
(Primary Port)

Port# 1

Port# 2

Port# 3

Card Edge Connector

Port# 0
(Primary Port)

Port# 1

Port# 2

Port# 3
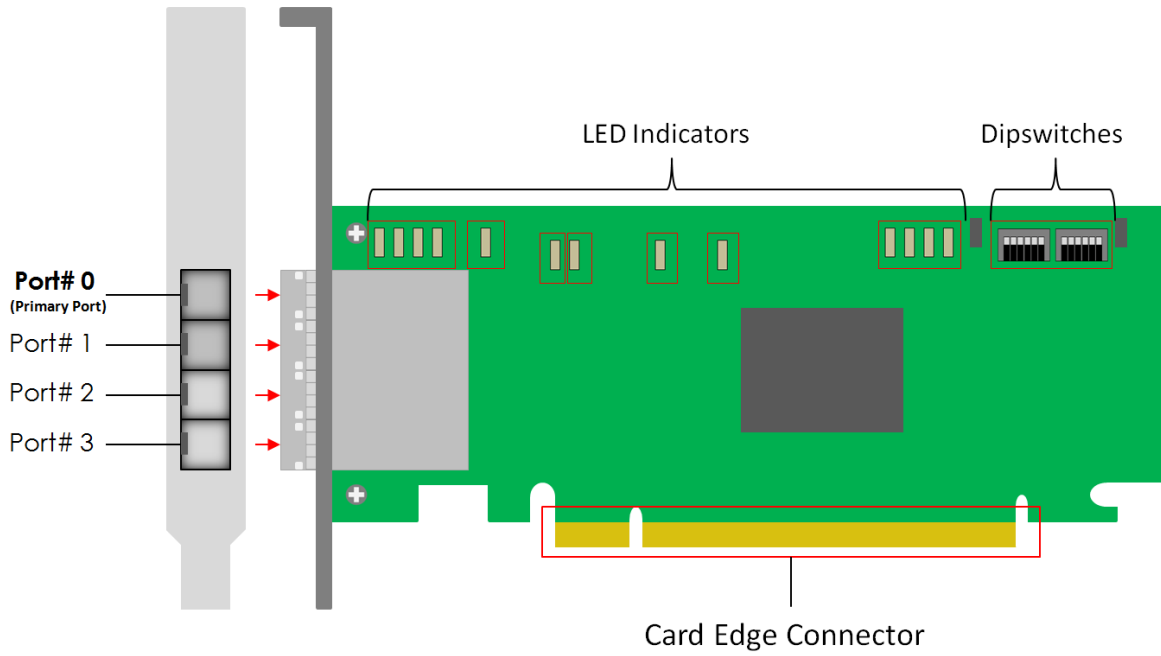
Photos below are example of single-cable configuration plugged in to the wrong HIB card ports. Avoid this type of cable connectivity installation errors.

Target-to-Host **or** Host-to-Target

SFF-8644 cable

Port #3   Port #3

Target-to-Host **or** Host-to-Target

Port #0

SFF-8644 cable

Port #3

Target-to-Host **or** Host-to-Target

Port #2   Port #2

SFF-8644 cable

Target-to-Host **or** Host-to-Target

Port #1   Port #1

SFF-8644 cable

Target-to-Host **or** Host-to-Target

Port #2

SFF-8644 cable

Port #3

Target-to-Host **or** Host-to-Target

Port #0

Port #2   SFF-8644 cable
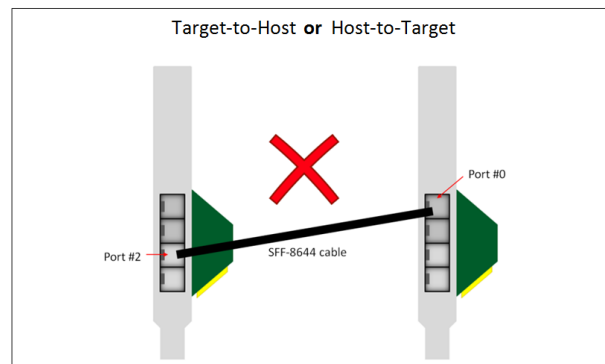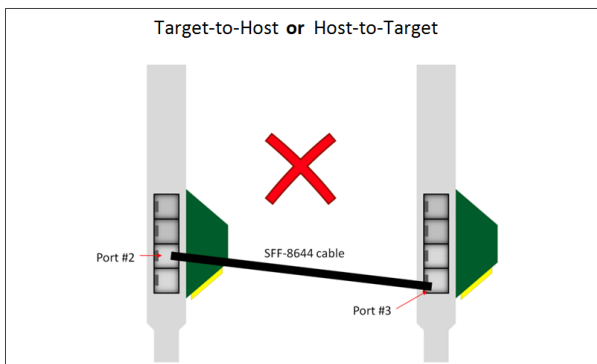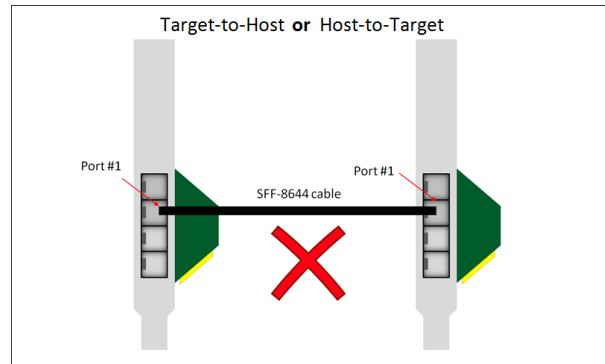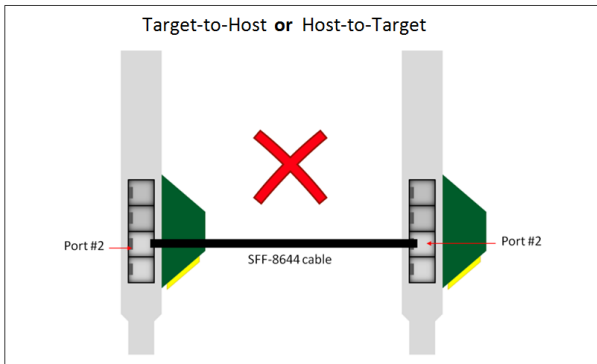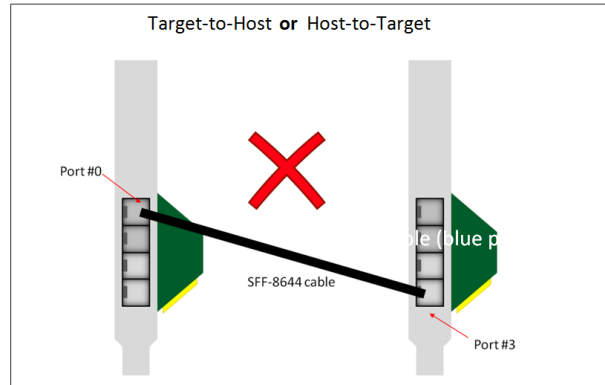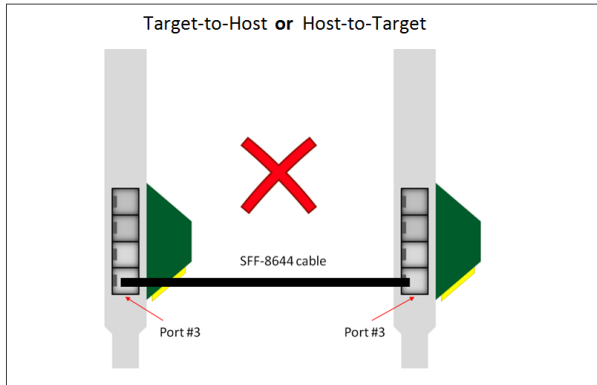
1.3.2 Pin out assignment of the SFF-8644 ports

SFF-8644 PCB Connectors
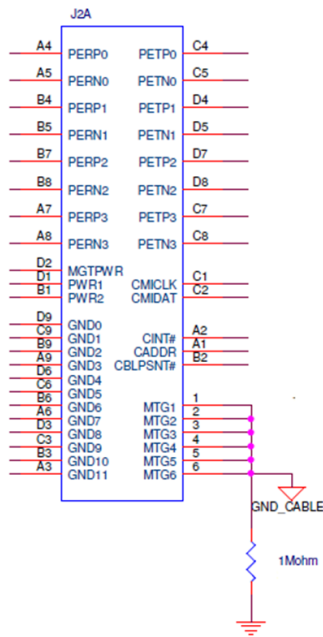
Connector 0
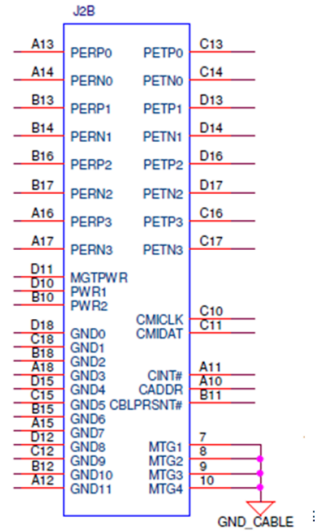
Connector 1
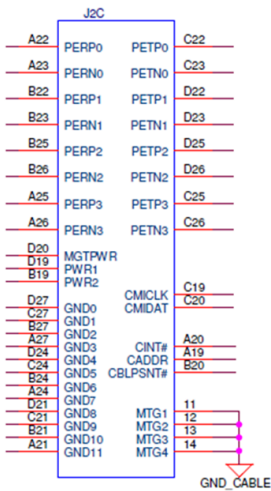
Connector 2
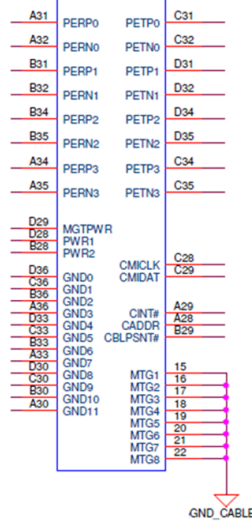
Connector 3

1.3.2   Signal Descriptions

PETpN/PETnN: PCI Express Transmitter pairs, labeled where N is the Lane number (starting with 0); "p" is the true signal while "n" is the complement signal.

PERpN/PERnN: PCI Express Receiver pairs, labeled where N is the Lane number (starting with 0); "p" is the true signal while "n" is the complement signal

PWR: Power provisioning to the connector backshell is provided to allow for signal conditioning components within the cable assembly. A wire must not be provided within the cable. 345

MGTPWR: Power supplied to the connector backshell for cable management components that are needed while the link is not active. This needs to be active if the Subsystem has power. A wire must not be provided within the cable.

CBLPRSNT#: Cable present detect, an active-low signal pulled-down by the Free-Side when it is inserted into the Fixed-Side Connector. A wire must not be provided within the cable. 350

CADDR: This signal is used to configure the Upstream cable management device address. A wire must not be provided within the cable.

CINT#: This signal is asserted by the cable assembly to indicate a need for service via the Cable Management Interface controller. A wire must not be provided within the cable.

CMISDA: Management interface data line. Used for both initial link setup and sideband 355 messages when used with proper cables.

CMISCL: Management interface clock line. Used for both initial link setup and sideband messages when used with proper cables

CMICLK: same as CMISCL

CMIDAT: same as CMISDA

GND (Ground): Shield for differential pairs

1.4   Features

1.4.1   Host Interface Board

PCI Express SFF-8644 solution for computer manufacturers. The HIB is provided with either a standard or low profile PCIe bracket type and has the following features:

- PCI Express interface that is compatible with the PCI Express Specification, revision 3.0.
- PCI Express 3.0 compliance x16 host and target interfaces.
- Compatibility with the PCIe Low Profile standards and PCIe CEM standard.
- PCI Express transmission and reception data rate of 8 Gb/s in each direction, yielding a total bandwidth of 128 Gb/s for each full-duplex.
- Simplified cabling with a point-to-point, serial architecture.
- PCI Express 3.0 Cable Specification compliance including support for CMI.

1.4.2   SFF-8644 Features

The following are the PCIe features supported by the HIB:

- Four SFF-8644, x4 external (high-density) connectors.
- Capability of running with either 4, 8 or 16 serial lanes for connection to other SFF-8644 devices.
- 8 Gb/s SFF-8644 target interface supporting 5-Gb/s Gen 2 and 2.5-Gb/s Gen 1 PCIe link rates Support for cable bifurcation for multiple connections through separate physical target HIBs and through a single host HIBs.
- Support for x16, x8x8, x8x4x4 and x4x4x4x4 host configurations with manual or automatic cable detection.
- Support for the easy addition of SFF-8644 interfaces to any computer, workstation, or server with a PCI Express bus.

2   Hardware Installation

The following steps will guide you through the installation of your HIB68-x16 card.

CAUTION

Before touching anything inside the enclosure, move to an ESD station and follow proper ESD procedures. Failure to do so may result in electrostatic discharge, damaging the computer or its components. For more information, see "Protecting Against Electrostatic Discharge" in the Preface.

2.1   Hardware & System Requirements

1.   Gen3 x16 PCIe slot (computer motherboard)
2.   Gen3 x16 expansion board (using OSS or Magma Expansion backplane)
3.   A server-host type computer / server motherboard. Do not use a desktop-host or a compact PC motherboard
     a.   It is highly recommended to use a server type motherboatd, the specific reason is that when server system power plug is inserted, it creates AUX power before the unit is turned on. The FPGA that is on the 502 needs this AUX power to properly operate the CMI sequencing. Most regular PCs do not have AUX power powered separately. It is generally turned on at the same time as the main 3.3V so the FPGA is not initialized properly and CMI does not work.
4.   SFF-8644 cables (qty 4 or qty 2). Cable connectors are keyed so that you cannot insert them incorrectly.
     a.   PCIe 3.0 SFF-8644 Cable (Green Cable) or
     b.   Standard SFF-8644 (Blue Cable)

2.1.1   PCIe Slot & Motherboard Requirement

 Use a server-computer type motherboard that has a Gen3 x16 PCIe slot in order for the card to operate to its max performance. The card is recommended to be installed in a x16 connector. HIB68-x16 card supports PCIe Gen1, Gen2 and Gen3 speeds and x2, x4, x8 and x16 link-widths.

2.1.2   Host / Target Configuration

The HIB68-x16 card can be used as either a host adapter or target adapter by configuration of the DIP switches to its proper settings.
The DIP switches are located on the upper edge of the board labeled as SW1 and SW2, which can be found close to the upper edge of the board. The Dip switches can be set to operate in specific bifurcation mode, two x4 links, two x8 links and four x4 links

2.1.3   SFF-8644 x4 Cable

Gen 3 and Gen 4 PCI Express (PCIe) share the same cable with SAS for high speed signaling up to 4m in length. This passive copper cable mates to the SFF-8644 connectors on the HIB6xx family of OSS host interface boards and includes the CMI (cable management interface) and serialized EEPROMs in the cable backshell.

- Available in up to 4m lengths
- Allows transfers to and from the host up to 6GB/s
- Mates to HIB6xx family host interface boards
- Single or multiple cables can form larger PCIe links
  - x4 (1 cable)
  - x8 (2 cables)
  - x16 (4 cables)

You can use two available cables . The standard SAS SFF-8644 cables (blue) and the PCIe CMI cables (with green tab) are shown below. When using a set of HIB68x16 (Target and Host) boards it is recommend that you use the GREEN SFF-8644 cable (CMI cable).
- Using the HIB68-x16 as Target only and connecting to a third-party SAS controller card or directly into a fixed SAS connector of a computer motherboard, use the BLUE SFF-8644 cable.

PCIe Gen3 CMI cable (green plastic tab)	SFF-8644 cable (blue plastic tab)

Using the blue cable

To use the blue cables, the TARGET card needs to be turned on (full power) prior to the host turning on. This can be achieved by sliding the FORCE-PWRON switch on the TARGET card to ON. This will then allow the FPGA to generate a PERST# for the target switch and the backplane switch as soon as the AC power is plugged in.

2.2   Installation-Procedures Overview

Below is the concise version on how to set up the HIB68-x16 card.

1. Select your Configuration (Chapter 3)
    - Standard configuration is x16, using all four link cables. Go to Chapter 3 for more details on different supported configurations.

2. Set the Dipswitch for Target or Host cards (Chapter 4)
    - Host card>> SW1: #5=ON | SW2: #1=ON;#2=ON
    - Target card>> SW #1=ON; #2=ON | SW2 ALL OFF
    - Go to Chapter 4 for further details on target and host card dipswitch settings.

3. Install HIB68-x16 cards (Chapter 5)
    - Plug in Target card in a designated x16 upstream slot on the expansion board. Go to Chapter 5 for more information.
    - Plug in the host card in a x16 Gen3 slot on the computer motherboard

4. Connect SFF-8644 or PCIe Gen3 cables (Chapter 6)
    - Using x16 configuration: Plug in all four link cables. Go to chapter 6 for details and illustrations.

5. Power UP the systems: Expansion system and Host computer (Chapter 7)
    - If you are using the standard SFF-8644 cable (with blue plastic tab), you need to manually turn ON the expansion system.
    - When using a Magma brand expansion unit, press the power button manually to turn it ON.
    - When using an OSS brand expansion unit, there is no power button. The OSS expansion is powered ON remotely when the host computer is turned ON.
    - Go to Chapter 7 for steps / methods on how to power up the systems properly.

6. Hardware Check (Chapter 8)

7. Identify HIB Device (Chapter 12)

- Do not plug in the link cables while the both systems (Host and expansion) are ON.
    - Make sure both systems are   completely turned OFF and no AUX power are connected / attached.
- Do not plug in the link cables while the expansion unit is ON and the Host computer is OFF or vice versa.
- Do not disconnect link cable(s) and reconnect it while both systems (Host and expansion) are ON.
- Do not plug in the Target card in a downstream PCIe slot on the expansion board.
    - Do not plug in the target card in a host computer.
    - Do not plug in the host card in an expansion board.

3   Select your Configuration

There are 9 supported user / case configurations. Each configuration differs from one another in terms of cable type, quantity of cable(s) and type of expansion board to use.

The three standard configurations are the x16, x8 and x4. These three configurations are commonly used with a single HIB Target card connecting to a single HIB Host card.

3.1   Supported User / Case Configurations

3.1.1   One Expansion Chassis

- x16 Configuration:
    - Four SFF-8644 cables or PCIe Gen3 CMI cables.
    - Single HIB adapter card as host.
    - One Target card installed in either OSS or Magma based Gen3 expansion board.

- x8 Configuration:
    - Two SFF-8644 cables of PCIe Gen3 CMI cables
    - Single HIB adapter card as host.
    - One Target card installed in either OSS or Magma based Gen3 expansion board

- x4 Configuration:
    - One SFF-8644 cable or PCIe Gen3 CMI cable.
    - Single HIB adapter card as host.
    - One Target card installed in either OSS or Magma based Gen3 expansion board.

3.1.2   Two Expansion Chassis

- x8, x8
- x4, x4
- x8 X4

3.1.3   Three Expansion Chassis

- x8, x4, x4
- x4, x4, x4

3.1.4   Four Expansion Chassis

- x4, x4, x4, x4

3.2   Diagrams

x16 Configuration
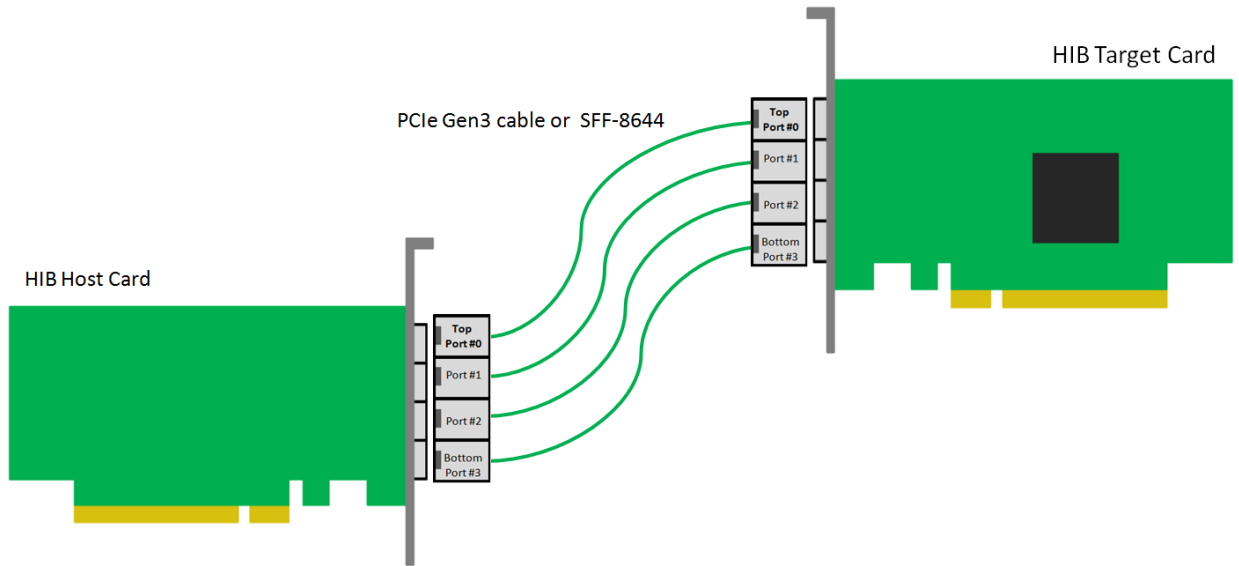
x8 Configuration

x4 Configuration

HIB Target Card

PCIe Gen3 cable or SFF-8644

| Top Port #0 |
| Port #1 |
| Port #2 |
| Bottom Port #3 |

HIB Host Card

| Top Port #0 |
| Port #1 |
| Port #2 |
| Bottom Port #3 |

x8, x8 Configuration

HIB Target Card #1

| Top Port #0 |
| Port #1 |
| Port #2 |
| Bottom Port #3 |

HIB Host Card

| Top Port #0 |
| Port #1 |
| Port #2 |
| Bottom Port #3 |

PCIe Gen3 or SFF-8644 cables

HIB Target Card #2

| Top Port #0 |
| Port #1 |
| Port #2 |
| Bottom Port #3 |

x4, x4 Configuration

HIB Host Card

PCIe Gen3 or SFF-8644 cables

HIB Target Card #1

HIB Target Card #2

x4, x4, x4, x4 Configuration

HIB Host Card

PCIe Gen3 or SFF-8644 cables

HIB Target Card #1

HIB Target Card #2

HIB Target Card #3

HIB Target Card #4

x4, x4, x4 Configuration

x8, x4, x4 Configuration

X8, x4 Configuration

HIB Target Card #1

HIB Host Card

Top
Port #0

Port #1

Port #2

Bottom
Port #3

Top
Port #0

Port #1

Port #2

Bottom
Port #3

PCIe Gen3 or SFF-8644 cables

HIB Target Card #2

Top
Port #0

Port #1

Port #2

Bottom
Port #3
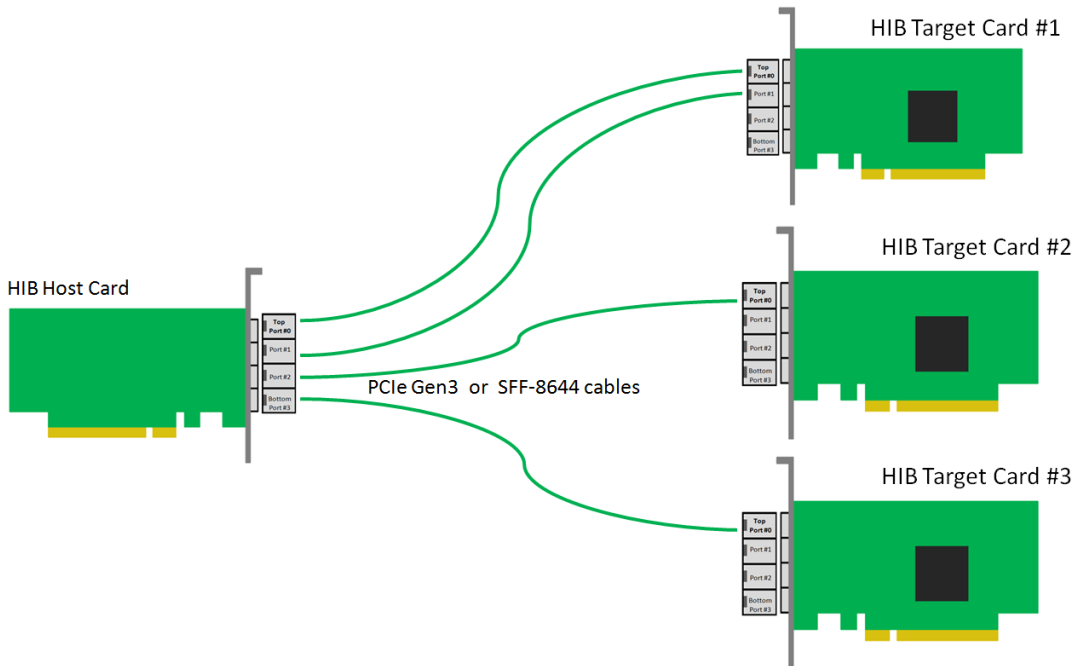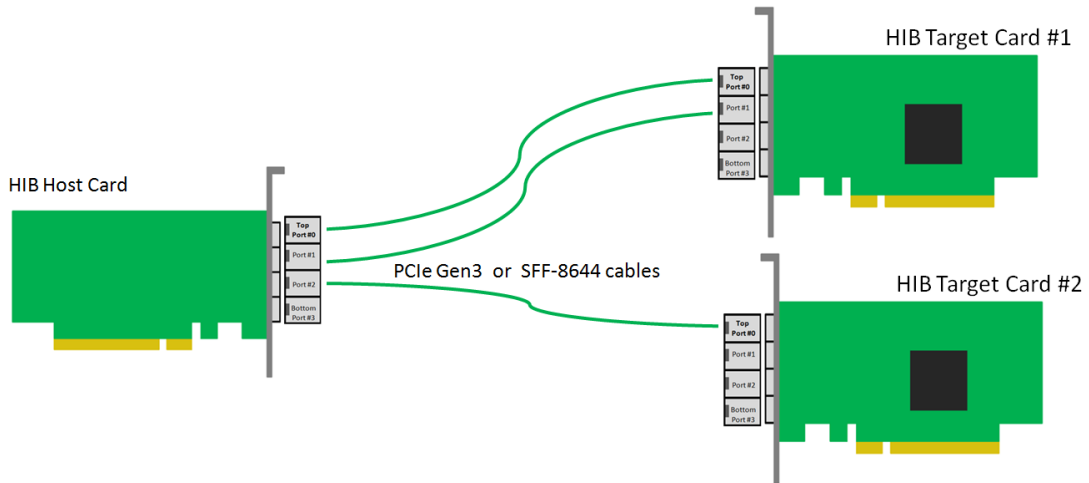
4   Configure the Dipswitches

It is imperative to set the dipswitches on the host and target cards prior to installation and operation.   HIB cards that are not properly configured will render the entire systems inoperable.

Important

- Unpack the box containing the HIB in a static-free environment and inspect it for damage.
- Attach an antistatic wrist strap and remove the HIB from its protective bag.
- Set the HIB dipswitch setting to Host and / or Target (described later)

4.1   Dipswitch settings for HIB68-x16 card

- When using the HIB68x16 card as HOST, set SW1 and SW2 to OFF positions. This is the recommended setting for implementing "Auto Negotiation".
- When setting up a bifurcation configuration the Host card dipswitches must be set to "Manual Negotiation".

SW1

SW2

| RSVD |
| ON=MANUAL CONFIGURE OFF=AUTO CONFIGURE |
| ON=MAGMA BACKPLANE OFF=OSS BACKPLANE |
| RSVD |
| ON=FORCE POWER ON OFF=AUTO POWER ON |

MANUAL MODE	SW2-1	SW2-2
x16	ON	ON
x8x8	ON	OFF
x8x4x4	OFF	ON
x4x4x4x4	OFF	OFF

| RSVD |

| ON = TARGET MODE OFF=HOSTMODE |
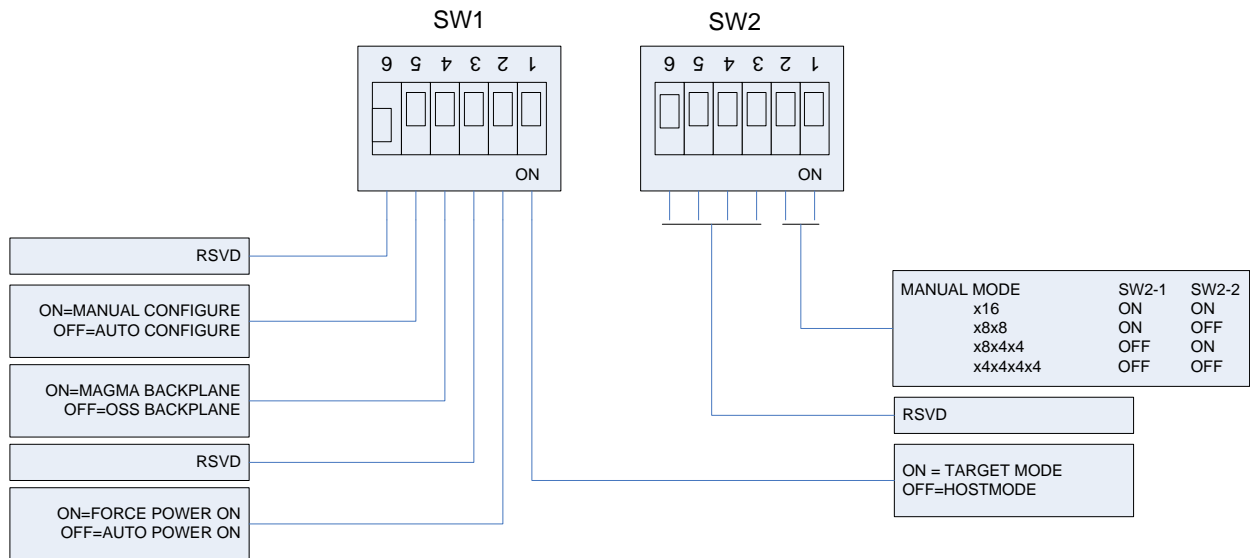
4.3 Dipswitch settings for HOST MODE – AUTO NEGOTIATION

Host Mode- Auto Negotiation: All dipswitches are set to OFF
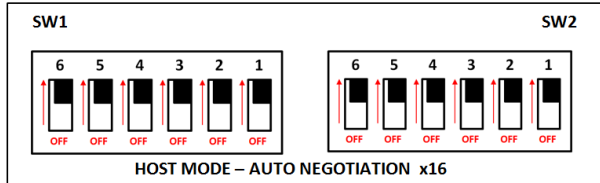
4.4 Dipswitch settings for HOST MODE – MANUAL NEGOTIATION

4.4.1 x16 Configuration: Host Mode – Manual Negotiation
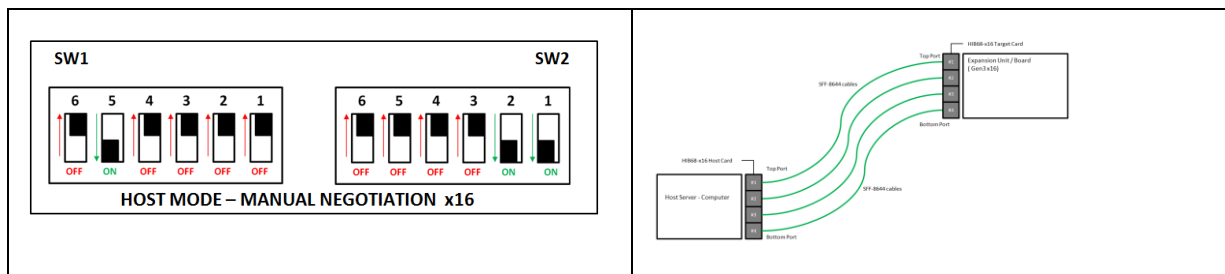
4.4.2 x8 Configuration: Host Mode – Manual Negotiation
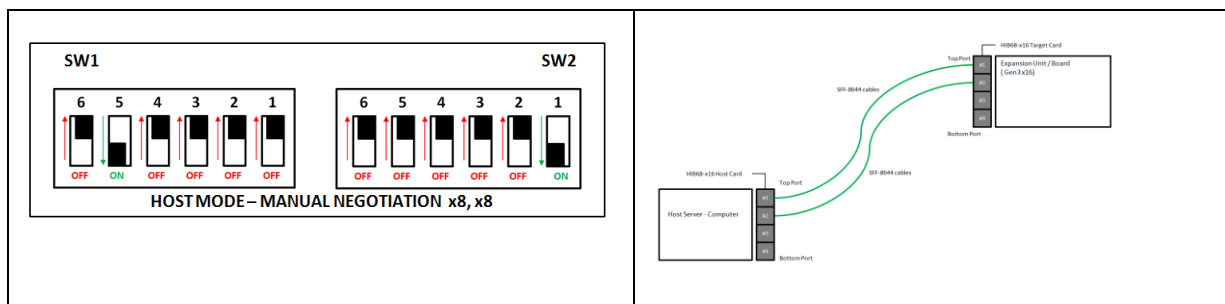
4.4.3   x4 Configuration: Host Mode – Manual Negotiation
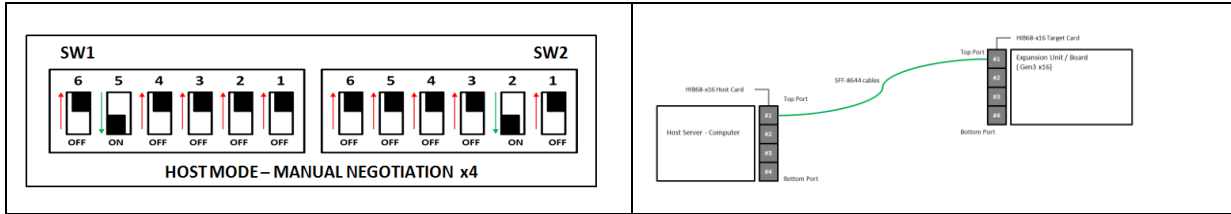
4.4.4   x8, x8 Configuration: Host Mode – Manual Negotiation
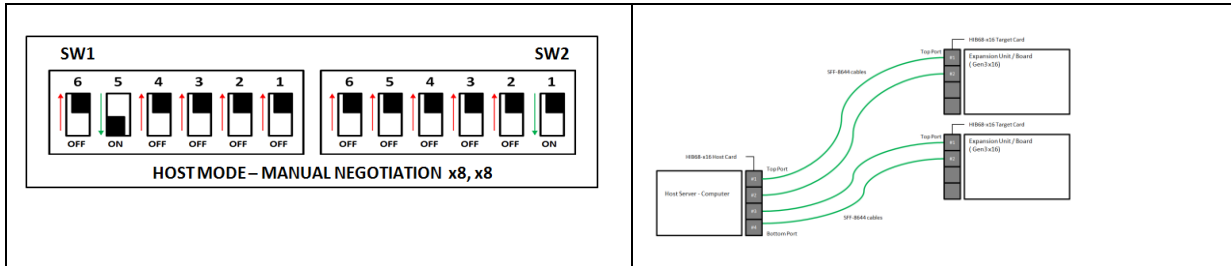
4.4.5   x4, x4 Configuration: Host Mode – Manual Negotiation
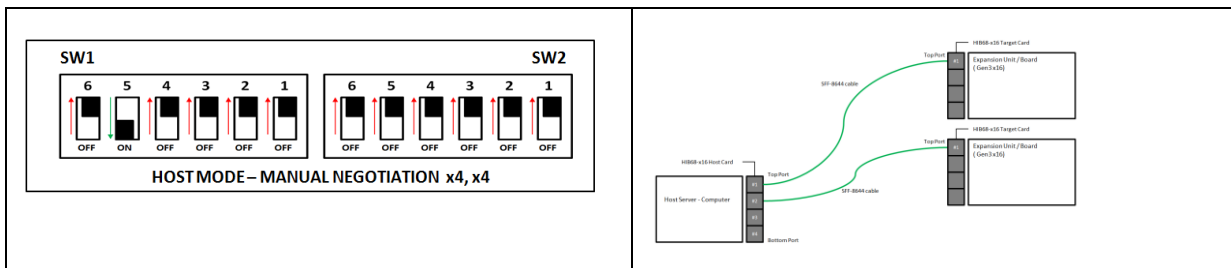
4.4.6   x8, x4 Configuration: Host Mode – Manual Negotiation
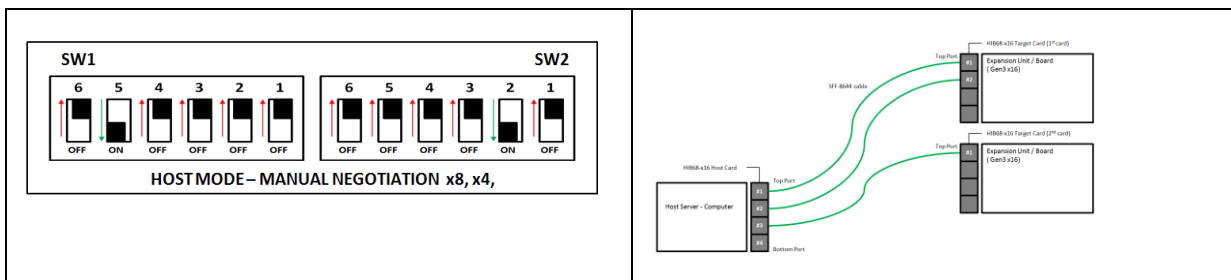
4.4.7   x8, x4, x4 Configuration: Host Mode – Manual Negotiation
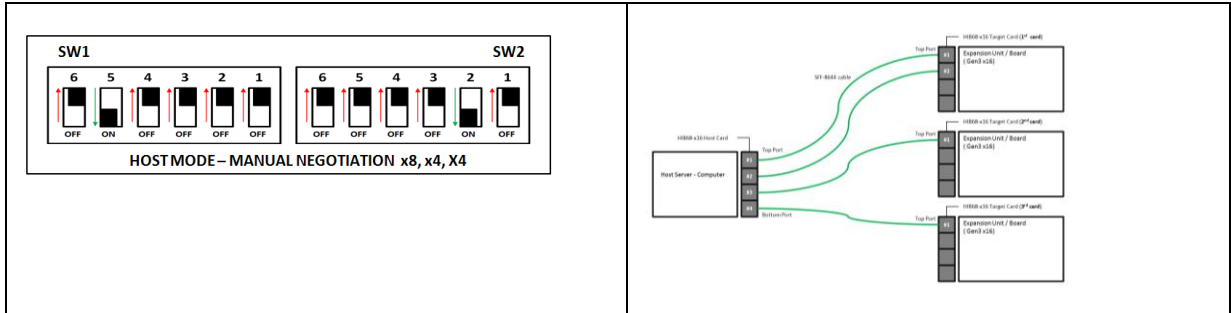
4.4.8   x4, x4, x4 Configuration: Host Mode – Manual Negotiation
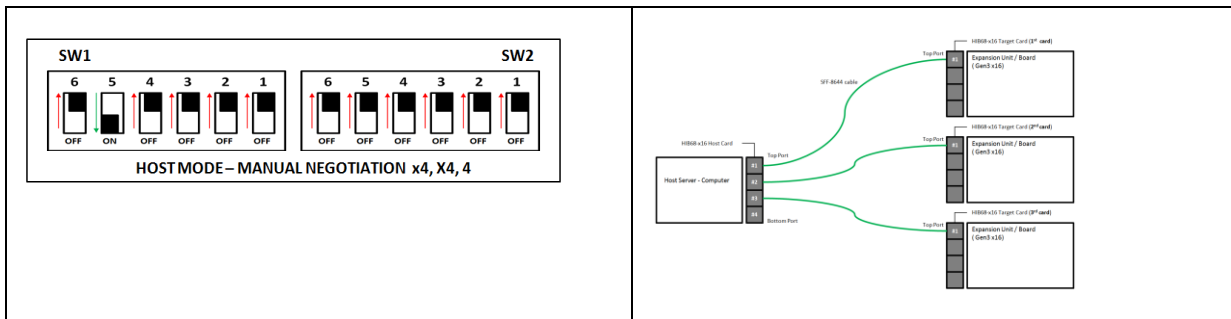
4.4.9   x4, x4, x4, x4 Configuration: Host Mode – Manual Negotiation
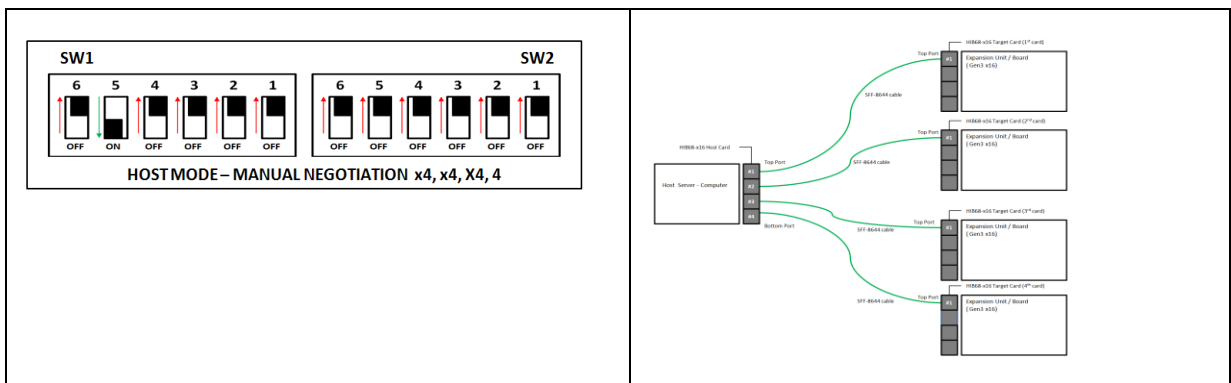
4.5   Dipswitch settings for HIB68-x16 as Target

4.5.1   OSS based Expansion board

When using an OSS based backplane / OSS Expansion system, set the HIB Target card SW1 and SW2 using the settings below.

Important

- SW1>> #1=ON, #2= OFF, #3= OFF, #4= OFF, #5 = OFF
- SW2>> #1= OFF, #2= OFF, #3= OFF, #4= OFF, #5= OFF, #6 = OFF
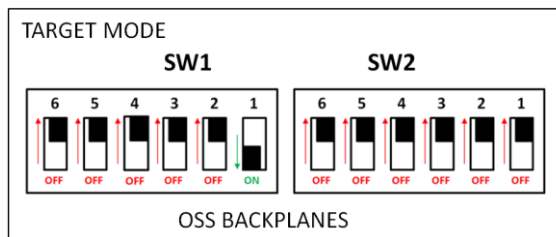
4.5.2   Magma based Expansion board

When using a Magma based expansion board / Magma expansion system, set the Target Card to the following.

Important

- SW1>> #1=ON, #2=OFF, #3=OFF, #4=ON, #5=OFF
- SW2>> #1= OFF, #2= OFF, #3= OFF, #4= OFF, #5= OFF, #6 = OFF
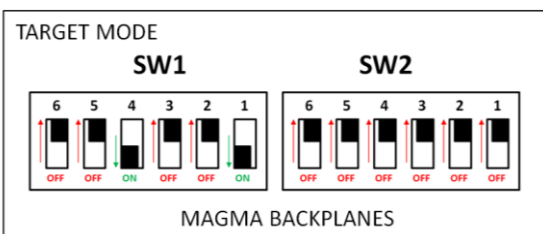
5   HIB card Installation

5.1   Host card Installation

Plug in the host card directly into a x16 Gen 3 slot of computer motherboard. Align the HIB to the PCIe slot and press down carefully until firmly seated into the slot. Secure the HIB to the card guide slot with retaining screw.

PCIe x16 slot
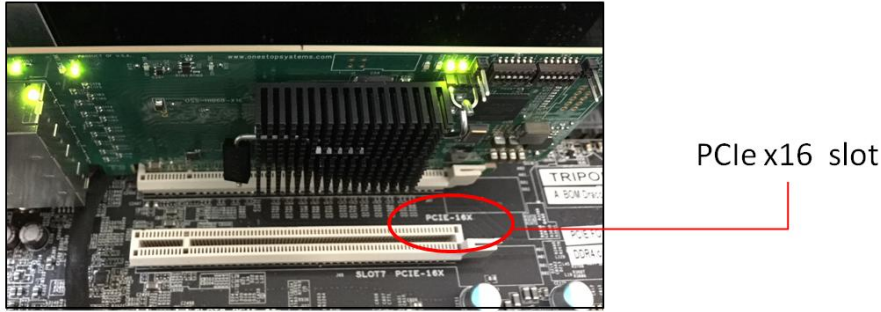
5.2   Target Card Installation

Plug the HIB68-x16 card to a x16 Gen 3 slot. Use the UPSTREAM PCIe slot on the backplane.

Position the HIB over the target slot and ensure that the notch in the connector on the board aligns with the notch in the connector of the PCIe card.

- Press down on the card until it is completely seated in the slot.
- Secure the card to the chassis back panel using the retaining screw.

When using an EB3600 expansion unit (with two expansion boards in the enclosure), install the 1st target card in SLOT 0 on the SIDE A of the expansion board and install the 2nd target card in SLOT 5 on the SIDE B of the expansion board. See photos below.
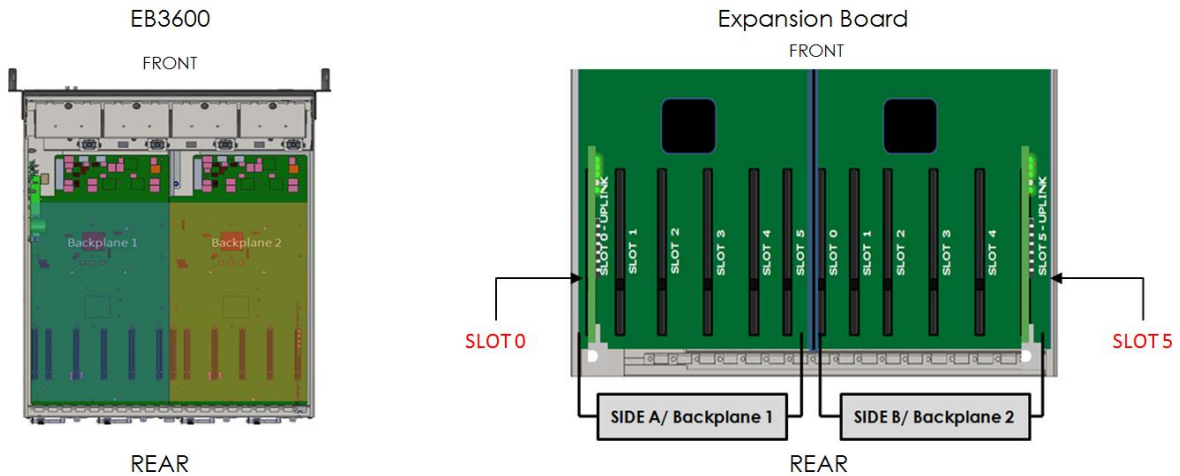
6   Cable Installation

6.1   What cable to use?

There are two available cables that you can use when using the HIB68x16 card. The standard SFF-8644 cable (with blue plastic tab) and the PCIe Gen3 cable with CMI (Command Management Interface) cable (with green plastic tab). See photos below.

PCIe Gen3 CMI cable (green plastic tab)

SFF-8644 cable (blue plastic tab)
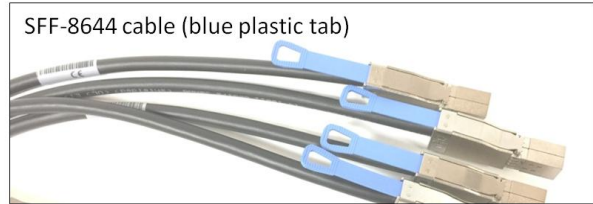
Installing and removing cables should be done with both host and expansion system completely powered OFF. Avoid mixing different types of SAS SFF-8644 (i.e CMI and NON CMI cables). Use the same cable port (i.e port 1 through 4) on both host and target for each individual cable, to ensure that the cards properly link up as x16, x8, or x4. Make sure each cable is properly and firmly secured to the connector.

Using the SAS SFF-8644 cable (with BLUE plastic tab)

To use the standard cable (with blue tab), the TARGET card needs to be turned ON (full power) prior to the host turning on. This can be achieved by sliding the FORCE-PWRON switch (SW1 #2) on the TARGET card to ON position. This will then allow the FPGA to generate a PERST for the target switch and the backplane switch as soon as the AC power is plugged in.

When using the Target card on OSS backplane + using the standard SFF-8644 (with blue plastic tab) cables. Use the following dipswitch settings.

Target Card Switch Settings:
OSS based Expansion Board + SFF-8644 cables (Blue Tab)

SFF-8644 cable (blue plastic tab)
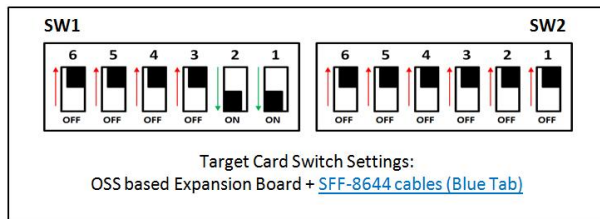
When using the Target card on MAGMA backplane + using the standard SFF-8644 (with blue plastic tab) cables. Use the following dipswitch settings.

Target Card Switch Settings:
Magma based Expansion Board + SFF-8644 cables (Blue Tab)

SFF-8644 cable (blue plastic tab)
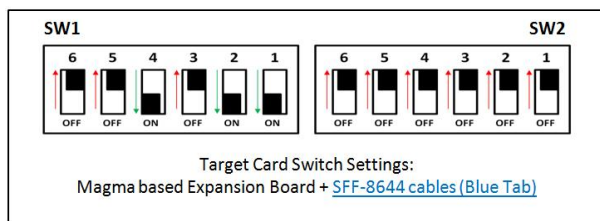
Using the PCIe Gen3 cable with CMI (Command Management Interface) support (with Green plastic tab)

- When using the Target HIB68-x16 card with OSS based expansion board or Magma based expansion plus using the **PCIe Gen3 cable with CMI** cable you need to slide the FORCE-PWRON switch (SW1 #2) on the TARGET card to **OFF** position.

Note Use the Target card Dipswitch settings below when using OSS based expansion board + PCIe cables with CMI support (with green plastic tab).

SW1   SW2

Target Card Switch Settings:
OSS based Expansion Board + PCIe cables (CMI/Green Tab)

PCIe Gen3 CMI cable (green plastic tab)
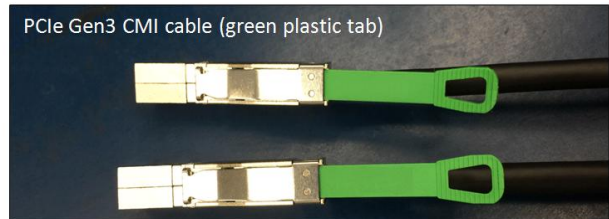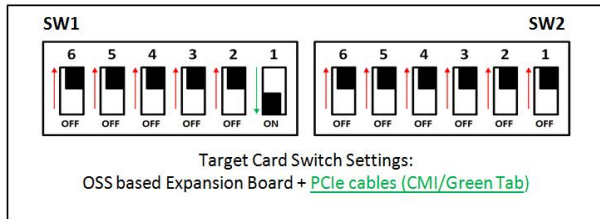
Note Use the Target card Dipswitch settings below when using Magma based expansion board + PCIe cables with CMI support (with green plastic tab).

SW1   SW2

Target Card Switch Settings:
Magma based Expansion Board + PCIe cables (CMI/Green Tab)

PCIe Gen3 CMI cable (green plastic tab)
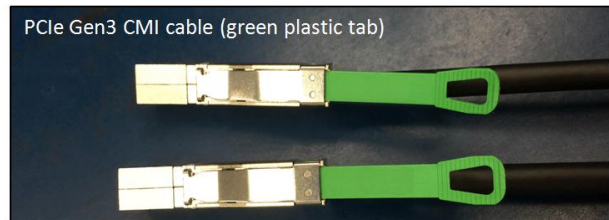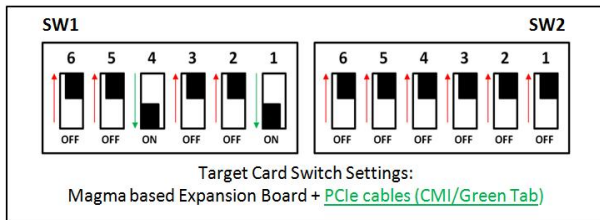
6.2   Connecting the cables

Connect all SFF8644 Cables to the cards (on both target and host cards). Do not leave cables connected only to one board. This will cause the board not to operate properly. For more details on proper installation of cables, go to Chapter 9 "Supported Configurations".

6.2.1   Inserting the cable

Attach the cable by aligning the keyed slot with the connector key ridge on the slot cover, insert the cable connector into the cable shell on the board until the connector teeth snap securely into the holes in the cable shell.
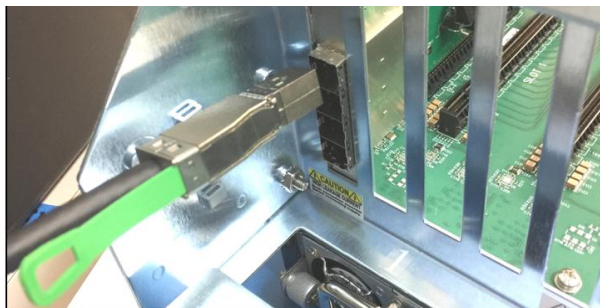
6.2.2   Removing the cable

▪   Pull back the green / blue thumb tab to release metal pins while slowly pulling the cable out.
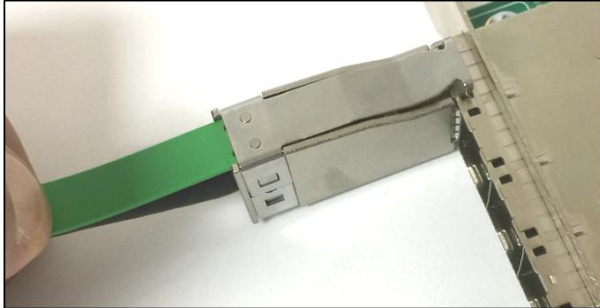
6.3   Proper Placement of cables

For details on which port to plug in the cable in accordance to the configuration you are using, go to Configurations & Cable Installations

Using Four cables
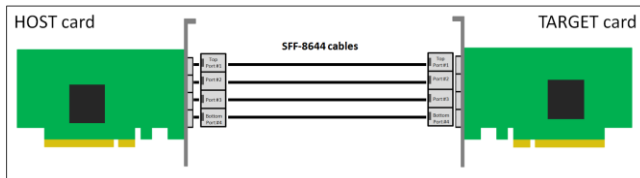
Using Two cables
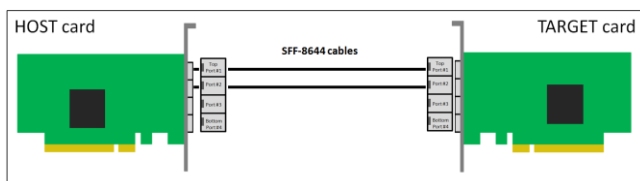
Using One cable
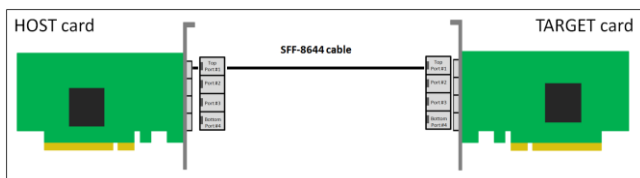
6.4   Using Fiber Optic cables

You can use fiber optic cables (15 meter and 100 meter) with the HIB68-x16 cards (both host and target).

- The HIB68-16 card requires a different EEPROM when using the Fiber Optic cable.
- The HIB68-x16 cards (host and target) have standard EEPROM that works with the PCIe 3.0 CMI cables and SFF-8644 copper cables.
- You need to upgrade the EEPROM on the target and host cards in order for the "fiber optic cables" to work.
- Su**upported configuration: x16 (with four cables)**
- **The 502 cards (host and target) that are programmed for fiberoptic active cable will NOT work on copper cable.**
- **It is strongly recommended to use the fiberoptic active cables that are tested by OSS.** There are different brands of fiberoptic active cable or active optical cable that do not work well with OSS HIB68-x16 cards.
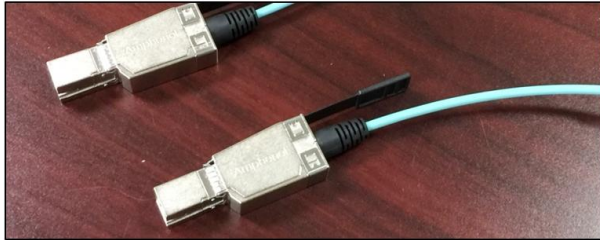
Make sure to connect all four cables correctly to host and target cards
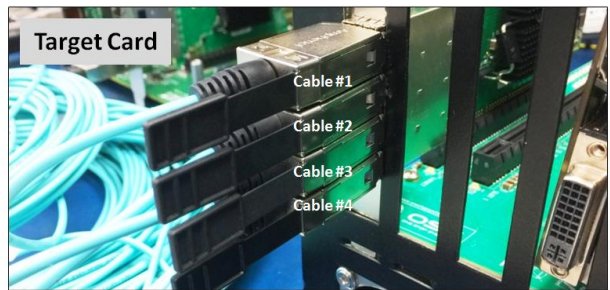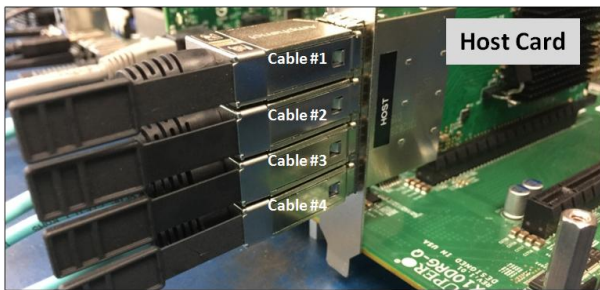
Set the dipswitch settings accordingly on both Host and Target cards.

Switch Definitions

	OFF	ON
SW1-1	Host Mode	Target Mode
SW1-2	Power enabled by Host	Power is always enabled
SW1-3	EEPROM WP OFF	EEPROM WP ON
SW1-4	Using OSS Backplane	Using Magma Backplane
SW1-5	Auto Configuration Negotiation	Use SW2 for Manual Configuration

	SW2-1	SW1-2
	PC1	PCO
Manual x16	ON	ON
Manual x8x8	ON	OFF
Manual x8x4x4	OFF	ON
Manual x4x4x4x4	OFF	OFF

Host card dipswitch setting: SW1: #5=ON | SW2: #1=ON; #2=ON
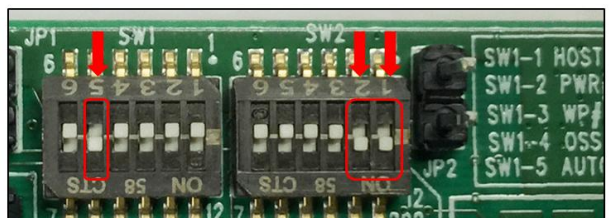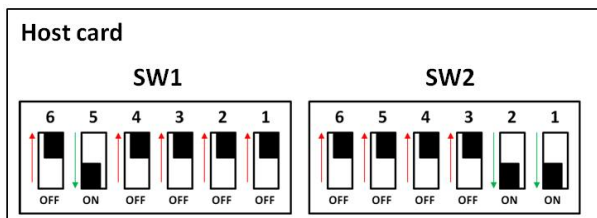
Target card & OSS Backplane

When using the OSS backplane, follow these settings: SW1: #1=ON; #2=ON | SW2: All OFF
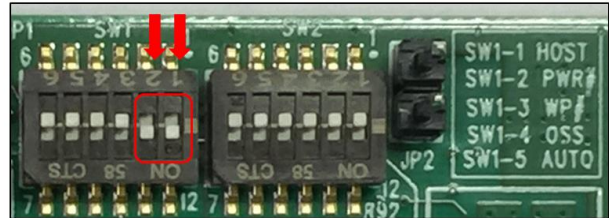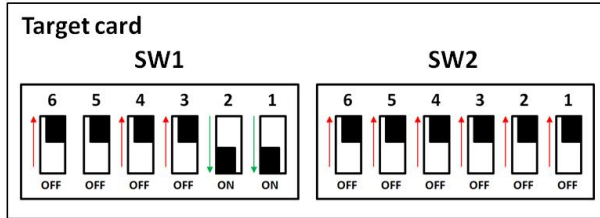
For more information on the HIB68-x16 card go to https://www.onestopsystems.com/product/pcie-x16-gen3-cable-adapter

Target Card & Magma Backplane

If you are using a Magma based expansion board or backplane, you need to configure the target card dipswitch using the settings below.
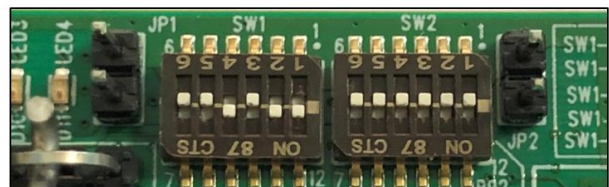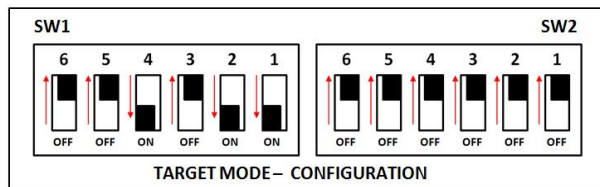
Power ON procedures. Make sure to follow thee steps below according to order. When using a fiber active optical cable or PCIe cable with the HIB68-X16 cards (both host and target cards) it is imperical to follow these Power ON procedures accordingly.

1. Disconnect all power from the target board / backplane. Set the board to force power ON
2. Disconnect power from the host
3. Wait for few seconds until all power are completely dissipated.
4. Plug-in the power to the target board first or the expansion unit.
5. Plug-in the power to the host computer
6. Turn ON the expansion unit or the expansion board.
7. Turn ON the host computer.
8. Upon powering ON the host computer, the host and target cards will link up.

Failure to follow the above steps will result to no link between host card and target card.

7   Power Up The System

1. Plug-in the AUX power to the expansion unit (connect power to the power supplies).

2. Plug-in the AUX power to the host-server computer (connect power to the power supplies).

3. On the expansion unit, flip the power supply switch to ON position.
    a.   The expansion unit is set to standby mode.

4. If you are using the standard SFF-8644 cable (with blue plastic tab), you need to manually turn ON the expansion system.
    a.   When using a Magma brand expansion unit, press the power button manually to turn it ON.
    b.   When using an OSS brand expansion unit, there is no power button. The OSS expansion is powered ON remotely when the host computer is turned ON.
    c.   If you are using the PCIe 3.0 CMI cable (with green plastic tab), skip STEP4 and go to STEP 45

5. Turn ON the host-server computer.
    a.   On the host computer, flip the power supply switch to ON position. The server is set to standby mode
    b.   Turn ON the server by pressing the main power button. Host computer powers UP and turns ON the expansion unit.
    c.   The HIB68-x16 Host card will send a remote power ON signal via link cable to the HIB68-x16 Target card triggering the OSS expansion system to power UP.

Make sure the HIB cards are firmly and correctly seated in the PCIe slot before powering UP the system!

- If no link, shutdown both systems.

- Disconnect all the link cables and reseat the target and host cards and reconnect all cables.

- Make sure all cables are plugged in to their appropriate cable ports.

- Check Dipswitch settings on both cards are set correctly.

- Repeat the "power up systems" from the very beginning.

8   Hardware Check

After powering UP the expansion and host systems, check the hardware LEDs on the target and host adapter cards. The adapter card has a built-in LED indicators to help you to determine or troubleshoot if your target system is linking up correctly with the host system. To check your hardware if it is linking up correctly and showing the correct LEDs, go to section HIB card LED indicators for different case configuration.

Below is an example of LED indicators for x16, x8 and x4 Configurations for both Target and Host cards that are linked together using a PCIe Gen3 CMI cables (green plastic tab).

HIB Target card
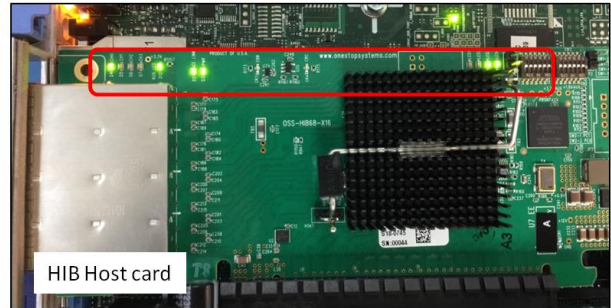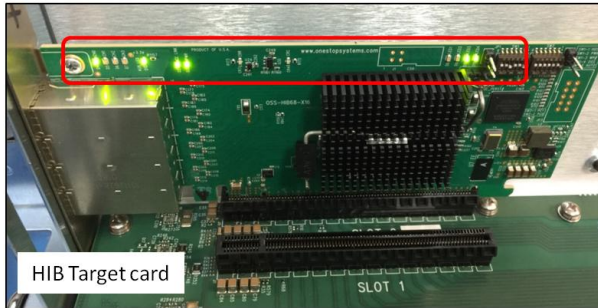
HIB Host card

Below is an example of x4,x4,x4,x4 Configuration LED indicators. It shows the Host card with all linked LEDs CHO, CHI, CH2 and CH3 illuminated.

HIB Target card

HIB Host card
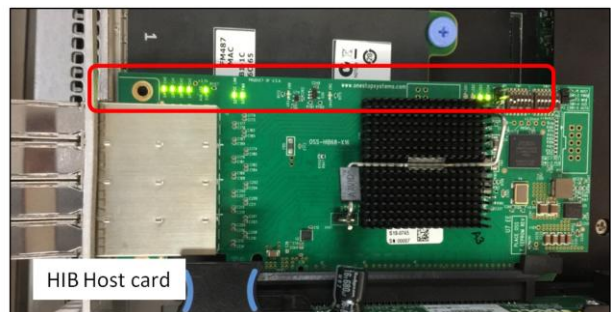
Below is an example of NO LINK (CHO not illuminated) on the Target card but it has power. The Target card is unable to link up with the Host.

HIB Target card
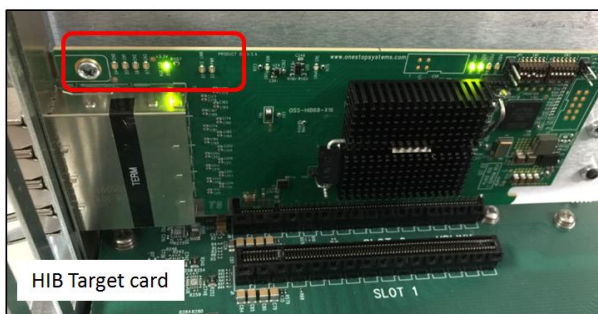
9   HIB68-x16 LED Indicators

The following tables are HIB card LED indicators for different case configurations. The supported case configurations below are tested with OSS and Magma based expansion boards with PCIe Gen3 CMI cable (with green plastic tab) and standard SFF-8644 cable (blue plastic tab).

In a normal and working condition, a properly linked HIB Host and Target card will illuminate the correct LEDs. Use the table below as reference guide in checking the appropriate LEDs on the HIB Host and Target cards.

9.1   x16 Configuration

	Host LEDs			Target LEDS	
1	CH0	ON or blinking		CH0	ON or blinking
2	AUX LED /+3.3V	ON		AUX LED /+3.3V	ON
3	CE LINK	ON		CE LINK	ON
4	PWR	ON		PWR	ON
5	LED3	ON		LED3	ON
6	LED4	ON		L LED3	ON
					OFF: When using the standard SFF-866 cable (with blue tab)

9.2   x8 Configuration

	Host LEDs			Target LEDS	
1	CH0	ON or blinking		CH0	ON or blinking
2	AUX LED /+3.3V	ON		AUX LED /+3.3V	ON
3	CE LINK	ON		CE LINK	ON
4	PWR	ON		PWR	ON
5	LED3	ON		LED3	ON
6	LED4	ON		LED4	ON
					OFF: When using the standard SFF-866 cable (with blue tab)

9.3   x4 configuration

	Host LEDs			Target LEDS	
1	CH0	ON or blinking		CH0	ON or blinking
2	AUX LED /+3.3V	ON		AUX LED /+3.3V	ON
3	CE LINK	ON		CE LINK	ON
4	PWR	ON		PWR	ON
5	LED3	ON		LED3	ON
6	LED4	ON		LED4	ON
					OFF: When using the standard SFF-866 cable (with blue tab)

9.4   x8, x8 configuration

	Host LEDs			Target LEDS	
1	CH0, CH1	ON or blinking		CH0	ON or blinking
2	AUX LED /+3.3V	ON		AUX LED /+3.3V	ON
3	CE LINK	ON		CE LINK	ON
4	PWR	ON		PWR	ON
5	LED3	ON		LED3	ON
6	LED4	ON		LED4	ON
					OFF: When using the standard SFF-866 cable (with blue tab)

9.5   x4, x4 configuration

	Host LEDs			Target LEDS	
1	CH2, CH3	ON or blinking		CH0	ON or blinking
2	AUX LED /+3.3V	ON		AUX LED /+3.3V	ON
3	CE LINK	ON		CE LINK	ON
4	PWR	ON		PWR	ON
5	LED3	ON		LED3	ON
6	LED4	ON		LED4	ON
					OFF: When using the standard SFF-866 cable (with blue tab)

9.6   x4, x4, x4, x4 configuration

	Host LEDs			Target LEDS	
1	CH0, CHI, CH2, CH3	ON or blinking		CH0	ON or blinking
2	AUX LED /+3.3V	ON		AUX LED /+3.3V	ON
3	CE LINK	ON		CE LINK	ON
4	PWR	ON		PWR	ON
5	LED3	ON		LED3	ON
6	LED4			LED4	ON
					OFF: When using the standard SFF-866 cable (with blue tab)

9.7   x4, x4, x4 configuration

	Host LEDs			Target LEDS	
1	CHI, CH2, CH3	ON or blinking		CH0	ON or blinking
2	AUX LED /+3.3V	ON		AUX LED /+3.3V	ON
3	CE LINK	ON		CE LINK	ON
4	PWR	ON		PWR	ON
5	LED3	ON		LED3	ON
6	LED4	ON		LED4	ON
					OFF: When using the standard SFF-866 cable (with blue tab)

9.8   x8, x4, x4 configuration

	Host LEDs			Target LEDS	
1	CH0, CH1, CH2	ON or blinking		CH0	ON or blinking
2	AUX LED /+3.3V	ON		AUX LED /+3.3V	ON
3	CE LINK	ON		CE LINK	ON
4	PWR	ON		PWR	ON
5	LED3	ON		LED3	ON
6	LED4	ON		LED4	ON
					OFF: When using the standard SFF-866 cable (with blue tab)

9.9   x8, x4 configuration

	Host LEDs			Target LEDS	
1	CH0, CH1	ON or blinking		CH0	ON or blinking
2	AUX LED /+3.3V	ON		AUX LED /+3.3V	ON
3	CE LINK	ON		CE LINK	ON
4	PWR	ON		PWR	ON
5	LED3	ON		LED3	ON
6	LED4			LED4	ON
					OFF: When using the standard SFF-866 cable (with blue tab)

10 Case Configurations & Cable Installations

10.1 x16 Configuration

- One Expansion board with 1 HIB68-x16 card set to TARGET mode.
- Single host-server computer with 1 HIB68-x16 card set as HOST.
- Using four SFF-8644 cables connecting to a single HOST to a single TARGET .

- Connect the 1st cable to the top port of the Target card and the other end to the top port of the Host card.

- Connect the 2nd cable to the 2nd port of the Target card and the other end to the 2nd port of the Host card.

- Connect the 3rd cable to the 3rd port of the Target card and the other end to the 3rd port of the Host card.

- Connect the 4th cable to the bottom port of the Target card and the other end to the bottom port of the Host card.

10.2 x8 Configuration

- One Expansion board with 1 HIB68-x16 card set to TARGET mode.
- Single host-server computer with 1 HIB68-x16 card set to HOST mode.
- Using two SFF-8644 cables connecting to a single HIB68-x16 HOST card and to a single HIB68-x16 TARGET card.

- Connect the 1st cable to the top port of the Target card and the other end to the top port of the Host card.

- Connect the 2nd cable to the 2nd port of the Target card and the other end to the 2nd port of the Host card.
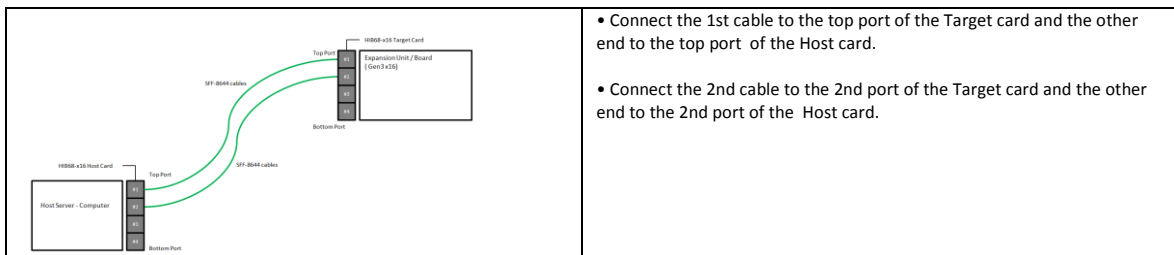
10.3 x4 Configuration

- One Expansion board with 1 HIB68-x16 card set to TARGET mode.
- Single host-server computer with 1 HIB68-x16 card set to HOST mode.
- Using one SFF-8644 cable connecting to a single HIB68-x16 HOST card and to a single HIB68-x16 TARGET card.

- Connect a single cable to the top port of the Target card and the other end to the top port of the Host card.
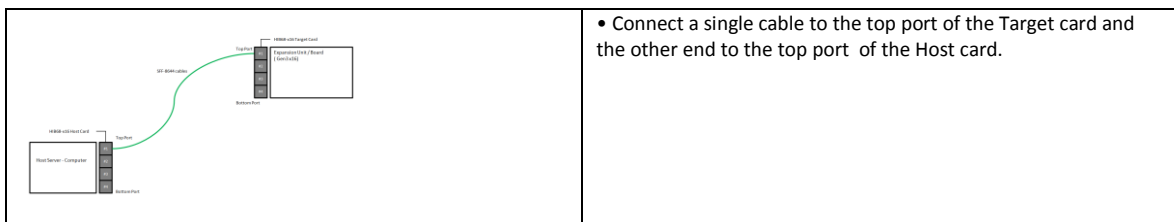
10.4   x4, x4, x4, x4 Configuration

- Single host-server computer with 1 HIB68-x16 card set to HOST mode.
- One SFF-8644 cable per TARGET card.
- All 4 SFF-8644 cables are connected to a single Host card.

• Connect the 1st cable to the top port of the 1st Target card and the other end to the top port of the Host card.

• Connect the 2nd cable to the top port of the 2nd Target card and the other end to the 2nd port of the Host card.

• Connect the 3rd cable to the top port of the 3rd Target card and the other end to the 3rd port of the Host card.

• Connect the 4th cable to the top port of the 4th Target card and the other end to the bottom port of the Host card.

10.5   x8, x8 Configuration

- Two Expansion boards. Each expansion board has 1 HIB68-x16 card set to TARGET mode.
- Single host-server computer with 1 HIB68-x16 card set as HOST.
- Two SFF-8644 cables per TARGET card.
- Two Targets connected to a single Host .

• Connect the 1st cable to the top port of the 1st Target card and the other end to the top port of the Host card.

• Connect the 2nd cable to the 2nd port of the 1st Target card and the other end to the 2nd port of the Host card.

• Connect the 3rd cable to the top port of the 2nd Target card and the other end to the 3rd port of the Host card.

• Connect the 4th cable to the 2nd port of the 2nd Target card and the other end to the bottom port of the Host card.

10.6   x4, x4 Configuration

- Single host-server computer with 1 HIB68-x16 card set as HOST.
- One SFF-8644 cable per TARGET card.
- Two Targets connected to a single Host card.

• Connect the 1st cable to the top port of the 1st Target card and the other end to the top port of the Host card.

• Connect the 2nd cable to the top port of the 2nd Target card and the other end to the 2nd port of the Host card.

10.7   x8, x4 Configuration

- Two Expansion boards. Each expansion board has 1 HIB68-x16 card set as TARGET.
- Single host-server computer with 1 HIB68-x16 card set as HOST.
- Two SFF-8644 cables for the 1st   target card. One SFF-8644 cable for the 2nd target card.

• Connect the 1st cable to the top port of the 1st Target card and the other end to the top port of the Host card.

• Connect the 2nd cable to the 2nd port of the 1st Target card and the other end to the 2nd port of the Host card.

• Connect the 3rd cable to the top port of the 2nd Target card and the other end to the 3rd port of the Host card.

10.8   x4, x4, x4 Configuration

- Three Expansion boards. Each expansion board has 1 HIB68-x16 card set as TARGET.
- Single host-server computer with 1 HIB68-x16 card set as HOST.
- One SFF-8644 cable for each target card.

• Connect the 1st cable to the top port of the 1st Target card and the other end to the top port of the Host card.

• Connect the 2nd cable to the top port of the 2nd Target card and the other end to the 2nd port of the Host card.

• Connect the 3rd cable to the top port of the 3rd Target card and the other end to the 3rd port of the Host card.

10.9   x8, x4, x4 Configuration

- Three Expansion boards. Each expansion board has 1 HIB68-x16 card set as TARGET.
- Single host-server computer with 1 HIB68-x16 card set as HOST.
- Two SFF-8644 cables for the 1st target card.
- One SFF-8644 cable for the 2nd target card.
- One SFF-8644 cable for the 3rd target card.

• Connect the 1st cable to the top port of the 1st Target card and the other end to the top port of the Host card.

• Connect the 2nd cable to the 2nd port of the 1st Target card and the other end to the 2nd port of the Host card.

• Connect the 3rd cable to the top port of the 2nd Target card and the other end to the 3rd port of the Host card.

• Connect the 4th cable to the top port of the 3rd Target card and the other end to the bottom port of the Host card.
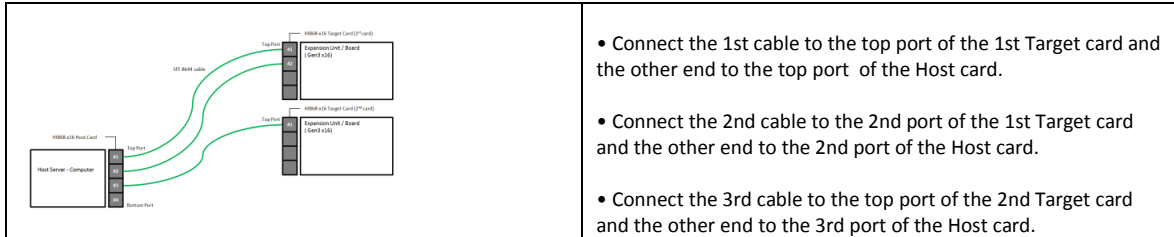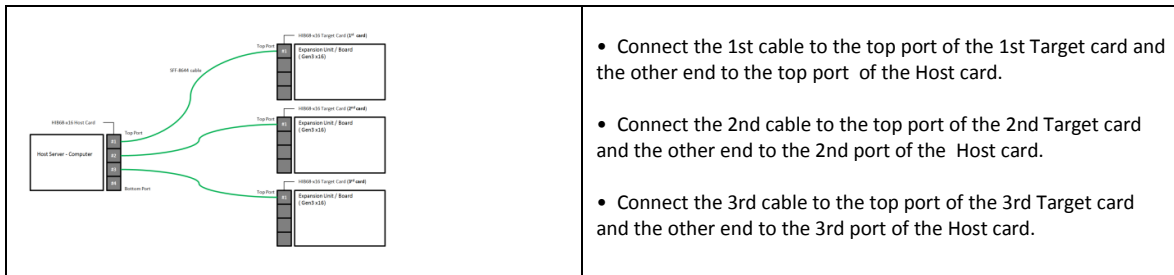
11   Configurations and Dipswitch Settings Table

1.   Configuration: x16

Diagram	Qty of Expansion board	Qty of Cables	Expansion Board	Type of Cable	Host DIP switch setting		Target DIP switch setting
					Manual Negotiation	Auto Negotiation	
	1	4	Magma based board	PCIe 3.0 CMI (green tab)	SW1: #5 =ON; Rest are OFF SW2: #1, #2=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1,#4 =ON; Rest are OFF SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: #1, #2=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1, #2, #4 =ON; Rest are OFF SW2: All OFF
			OSS based board	PCIe 3.0 CMI (green tab)	SW1: #5=ON; Rest are OFF SW2: #1, #2=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1 =ON SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: #1, #2=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1, #2 =ON; Rest are OFF SW2: All OFF

2.   Configuration: x8

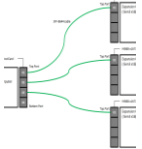| Diagram	Qty of Expansion board	Qty of Cables	Expansion Board	Type of Cable	Host DIP switch setting		Target DIP switch setting
					Manual Negotiation	Auto Negotiation	
	1	2	Magma based board	PCIe 3.0 CMI (green tab)	SW1: #5 =ON; Rest are OFF SW2: #1=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1,#4 =ON; Rest are OFF SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW1:#1=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1, #2, #4 =ON; Rest are OFF SW2: All OFF
			OSS based board	PCIe 3.0 CMI (green tab)	SW1: #5=ON; Rest are OFF SW2: #1=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1 =ON SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: #1=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1, #2 =ON; Rest are OFF SW2: All OFF

3.   Configuration: x4

Diagram	Qty of Expansion board	Qty of Cables	Expansion Board	Type of Cable	Host DIP switch setting		Target DIP switch setting
					Manual Negotiation	Auto Negotiation	
	1	1	Magma based board	PCIe 3.0 CMI (green tab)	SW1: #5 =ON; Rest are OFF SW2: All OFF	SW1: All OFF SW2: All OFF	SW1: #1,#4 =ON; Rest are OFF SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: All OFF	SW1: All OFF SW2: All OFF	SW1: #1, #2, #4 =ON; Rest are OFF SW2: All OFF
			OSS based board	PCIe 3.0 CMI (green tab)	SW1: #5=ON; Rest are OFF SW2: All OFF	SW1: All OFF SW2: All OFF	SW1: #1 =ON SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: All OFF	SW1: All OFF SW2: All OFF	SW1: #1, #2 =ON; Rest are OFF SW2: All OFF

4.   Configuration: x8, x8

Diagram	Qty of Expansion board	Qty of Cables	Expansion Board	Type of Cable	Host DIP switch setting		Target DIP switch setting
					Manual Negotiation	Auto Negotiation	
	2	4	Magma based board	PCIe 3.0 CMI (green tab)	SW1: #5 =ON; Rest are OFF SW2: #1=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1,#4 =ON; Rest are OFF SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: #1 = ON; Rest are OFF	Not Supported	SW1: #1, #2, #4 =ON; Rest are OFF SW2: All OFF
			OSS based board	PCIe 3.0 CMI (green tab)	SW1: #5=ON; Rest are OFF SW2: #1=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1 =ON SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: #1 = ON; Rest are OFF	Not Supported	SW1: #1, #2 =ON; Rest are OFF SW2: All OFF

5. Configuration: x4, x4

Diagram	Qty of Expansion board	Qty of Cables	Expansion Board Model	Type of Cable	Host DIP switch setting		Target DIP switch setting
					Manual Negotiation	Auto Negotiation	
	2	2	Magma based board	PCIe 3.0 CMI (green tab)	SW1: #5 =ON; Rest are OFF SW2: All OFF	SW1: All OFF SW2: All OFF	SW1: #1,#4 =ON; Rest are OFF SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: # 2= ON; Rest are OFF	Not Supported	SW1: #1, #2, #4 =ON; Rest are OFF SW2: All OFF
			OSS based board	PCIe 3.0 CMI (green tab)	SW1: #5=ON; Rest are OFF SW2: All OFF	SW1: All OFF SW2: All OFF	SW1: #1 =ON SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: # 2= ON; Rest are OFF	Not Supported	SW1: #1, #2 =ON; Rest are OFF SW2: All OFF

6. Configuration: x8, x4

Diagram	Qty of Expansion board	Qty of Cables	Expansion Board Model	Type of Cable	Host DIP switch setting		Target DIP switch setting
					Manual Negotiation	Auto Negotiation	
	2	3	Magma based board	PCIe 3.0 CMI (green tab)	SW1: #5 =ON; Rest are OFF SW2: #2=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1,#4 =ON; Rest are OFF SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: #2=ON	Not Supported	SW1: #1, #2, #4 =ON; Rest are OFF SW2: All OFF
			OSS based board	PCIe 3.0 CMI (green tab)	SW1: #5=ON; Rest are OFF SW2: #2=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1 =ON SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: #2=ON	Not Supported	SW1: #1, #2 =ON; Rest are OFF SW2: All OFF

7. Configuration: x8, x4, x4

Diagram	Qty of Expansion board	Qty of Cables	Expansion Board Model	Type of Cable	Host DIP switch setting		Target DIP switch setting
					Manual Negotiation	Auto Negotiation	
	3	3	Magma based board	PCIe 3.0 CMI (green tab)	SW1: #5 =ON; Rest are OFF SW2: #2=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1,#4 =ON; Rest are OFF SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: #2=ON	Not Supported	SW1: #1, #2, #4 =ON; Rest are OFF SW2: All OFF
			OSS based board	PCIe 3.0 CMI (green tab)	SW1: #5=ON; Rest are OFF SW2: #2=ON; Rest are OFF	SW1: All OFF SW2: All OFF	SW1: #1 =ON SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: #2=ON	Not Supported	SW1: #1, #2 =ON; Rest are OFF SW2: All OFF

8. Configuration: x4, x4, x4

Diagram	Qty of Expansion board	Qty of Cables	Expansion Board Model	Type of Cable	Host DIP switch setting		Target DIP switch setting
					Manual Negotiation	Auto Negotiation	
	3	3	Magma based board	PCIe 3.0 CMI (green tab)	SW1: #5 =ON; Rest are OFF SW2: All OFF	SW1: All OFF SW2: All OFF	SW1: #1,#4 =ON; Rest are OFF SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: All OFF	Not Supported	SW1: #1, #2, #4 =ON; Rest are OFF SW2: All OFF
			OSS based board	PCIe 3.0 CMI (green tab)	SW1: #5=ON; Rest are OFF SW2: All OFF	SW1: All OFF SW2: All OFF	SW1: #1 =ON SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: All OFF	Not Supported	SW1: #1, #2 =ON; Rest are OFF SW2: All OFF

9. Configuration: x4, x4, x4, x4

Description	Qty of Expansion board	Qty of Cables	Expansion Board Model	Type of Cable	Host DIP switch setting		Target DIP switch setting
					Manual Negotiation	Auto Negotiation	
	4	4	Magma based board	PCIe 3.0 CMI (green tab)	SW1: #5 =ON; Rest are OFF SW2: All OFF	SW1: All OFF SW2: All OFF	SW1: #1,#4 =ON; Rest are OFF SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: All OFF	Not Supported	SW1: #1, #2, #4 =ON; Rest are OFF SW2: All OFF
			OSS based board	PCIe 3.0 CMI (green tab)	SW1: #5=ON; Rest are OFF SW2: All OFF	SW1: All OFF SW2: All OFF	SW1: #1 =ON SW2: All OFF
				SAS SFF-8644 (blue tab)	SW1: #2,#5=ON; Rest are OFF SW2: All OFF	Not Supported	SW1: #1, #2 =ON; Rest are OFF SW2: All OFF

12   Identify HIB Device

12.1   Linux OS

In Linux, you can check the HIB card if it detected or not. On the terminal window, type the command

#lspci | grep "Device 8733"

```
[root@localhost oss]# lspci  -vvv | grep "Device 8733"
04:00.0 PCI bridge: PLX Technology, Inc. Device 8733 (rev ca) (prog-if 00 [Normal decode])
05:08.0 PCI bridge: PLX Technology, Inc. Device 8733 (rev ca) (prog-if 00 [Normal decode])
        Capabilities: [a4] Subsystem: PLX Technology, Inc. Device 8733
06:00.0 PCI bridge: PLX Technology, Inc. Device 8733 (rev ca) (prog-if 00 [Normal decode])
        Capabilities: [a4] Subsystem: PLX Technology, Inc. Device 8733
07:00.0 PCI bridge: PLX Technology, Inc. Device 8733 (rev ca) (prog-if 00 [Normal decode])
[root@localhost oss]#
```

To check the port and their corresponding speed and link width, type lspci –d 105b:8733 –vvv | grep LnkCap

```
            ACSCap: SrcValid+ TransBlk+ ReqRedir+ CmpltRedir+ UpstreamFwd+ EgressCtrl+ DirectTrans+
            ACSCtl: SrcValid- TransBlk- ReqRedir- CmpltRedir- UpstreamFwd- EgressCtrl- DirectTrans-
        Capabilities: [b70 v1] Vendor Specific Information: ID=0001 Rev=0 Len=010 <?>
        Kernel driver in use: pcieport

[root@localhost oss]# lspci -d 10b5:8733  -vvv | grep LnkCap
            LnkCap: Port #0, Speed 8GT/s, Width x16, ASPM L1, Exit Latency L0s <4us, L1 <4us
            LnkCap: Port #8, Speed 8GT/s, Width x16, ASPM L1, Exit Latency L0s <4us, L1 <4us
            LnkCap: Port #8, Speed 8GT/s, Width x16, ASPM L1, Exit Latency L0s <4us, L1 <4us
            LnkCap: Port #0, Speed 8GT/s, Width x16, ASPM L1, Exit Latency L0s <4us, L1 <4us
[root@localhost oss]#
```

To check the speed and link witdh, type "lspci –d 10b5:8733 –vvv | grep 'LnkSta'

```
File   Edit   View   Bookmarks   Settings   Help
[root@localhost oss]# lspci -d 10b5:8733 -vvv | grep 'LnkSta'
            LnkSta: Speed 8GT/s, Width x8, TrErr- Train- SlotClk- DLActive- BWMgmt- ABWMgmt-
            LnkSta2: Current De-emphasis Level: -6dB, EqualizationComplete+, EqualizationPhase1+
            LnkSta: Speed 8GT/s, Width x16, TrErr- Train- SlotClk- DLActive+ BWMgmt+ ABWMgmt-
            LnkSta2: Current De-emphasis Level: -6dB, EqualizationComplete+, EqualizationPhase1+
            LnkSta: Speed 8GT/s, Width x16, TrErr- Train- SlotClk- DLActive- BWMgmt- ABWMgmt-
            LnkSta2: Current De-emphasis Level: -6dB, EqualizationComplete+, EqualizationPhase1+
            LnkSta: Speed 8GT/s, Width x16, TrErr- Train- SlotClk- DLActive+ BWMgmt+ ABWMgmt-
            LnkSta2: Current De-emphasis Level: -6dB, EqualizationComplete+, EqualizationPhase1+
[root@localhost oss]#
```

To check for the slot# and port# of the Downstream or Upstream port, type lspci –s XX:XX.X -vvv | grep 'Slot\|port'.

```
File   Edit   View   Bookmarks   Settings   Help
[root@localhost oss]# lspci  -s 04:00.0 -vvv | grep 'Slot\|Port'
       Capabilities: [68] Express (v2) Upstream Port, MSI 00
                     ExtTag- AttnBtn- AttnInd- PwrInd- RBE+ SlotPowerLimit 25.000W
             LnkCap: Port #0, Speed 8GT/s, Width x16, ASPM L1, Exit Latency L0s <4us, L1 <4us
             LnkSta: Speed 8GT/s, Width x8, TrErr- Train- SlotClk- DLActive- BWMgmt- ABWMgmt-
             VC0:    Caps:   PATOffset=03 MaxTimeSlots=1 RejSnoopTrans-
                     Port Arbitration Table <?>
             VC1:    Caps:   PATOffset=00 MaxTimeSlots=1 RejSnoopTrans-
```

```
07:00.0 PCI bridge: PLX Technology, Inc. Device 8733 (rev ca) (prog-if 00 [Normal decode])
[root@localhost oss]# lspci  -s 05:08.0 -vvv | grep 'Slot\|Port'
       Capabilities: [68] Express (v2) Downstream Port (Slot+), MSI 00
             LnkCap: Port #8, Speed 8GT/s, Width x16, ASPM L1, Exit Latency L0s <4us, L1 <4us
             LnkSta: Speed 8GT/s, Width x16, TrErr- Train- SlotClk- DLActive+ BWMgmt+ ABWMgmt-
                     Slot #72, PowerLimit 25.000W; Interlock- NoCompl-
             VC0:    Caps:   PATOffset=03 MaxTimeSlots=1 RejSnoopTrans-
                     Port Arbitration Table <?>
             VC1:    Caps:   PATOffset=00 MaxTimeSlots=1 RejSnoopTrans-
[root@localhost oss]# ▮
```

12.2 Windows 10 / Windows Server OS

Verify hardware device in Windows Operating System. As your Windows computer starts up, you will see a small message box pop-up in the lower-right corner of the screen to alert you that Windows has found new hardware.

To verify a successful installation on Windows, find the '**My Computer**' icon and "right-click" on it. Then select '*Manage*' from the pop-up menu. Next, click on '*Device Manager*' in the leftmost Computer Management window. Finally, click on the *View Menu* and select *View Devices by Connection.*

When everything is functioning correctly, your Windows Device Manager should look something like the screenshot below. You will see multiple PCI Express standard Upstream Switch Ports and PCI Express standard Downstream Switch Ports. The number of Downstream Switch Ports will vary depending on the number of PCIe slots available on expansion board.

12.2.1 One Target card to One Host card

One expansion board is attached to one specific host computer. Applicable to x4-x8 and x16 case configurations.

12.2.2   Two Target cards to One Host card

Two expansion boards are linked to one host computer. Applicable to x4-x4, x8-x4, and x8-x8 configurations.
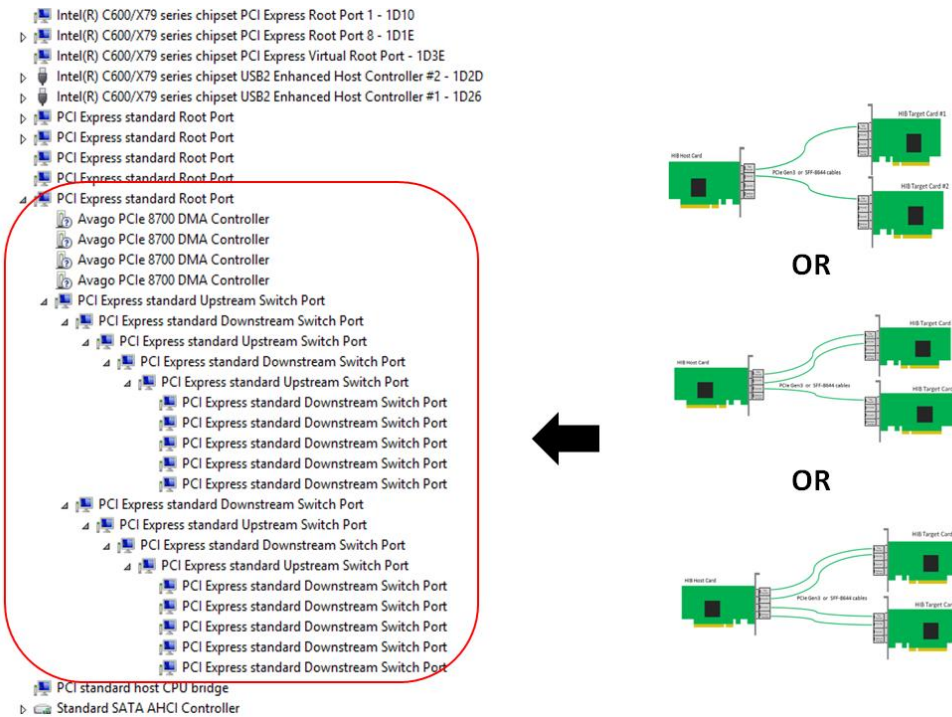
12.2.3   Three Target cards to One Host card

Three expansion boards are linked to one host computer. Applicable to x4-x4-x4, and x8-4-x4 configurations.

OR

12.2.4   Four Target cards to One Host card

Four expansion boards are linked to one host computer. Applicable to x4-x4-x4-x4 configuration.

13   FAQs and Troubleshooting

1.   Question:

Will the new 502-card support remote power UP (side band signal). Will automatically powers UP when the host computer is TURNED ON?

Answer:

- If the system is using OSS host and target cards then the Cable Management Interface (CMI) will turn the power on to the target and backplane.
- It will also work other company's boards if they are CMI compliant.
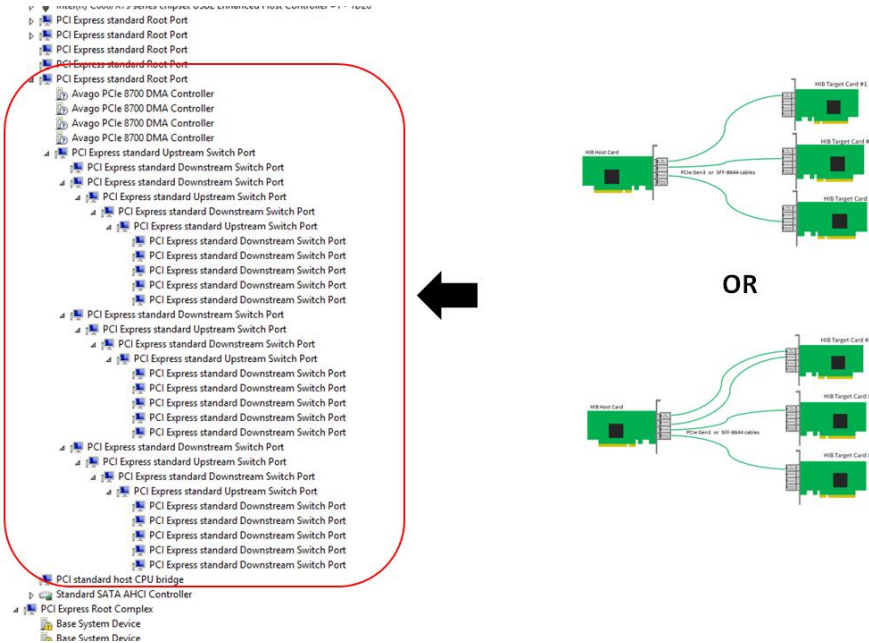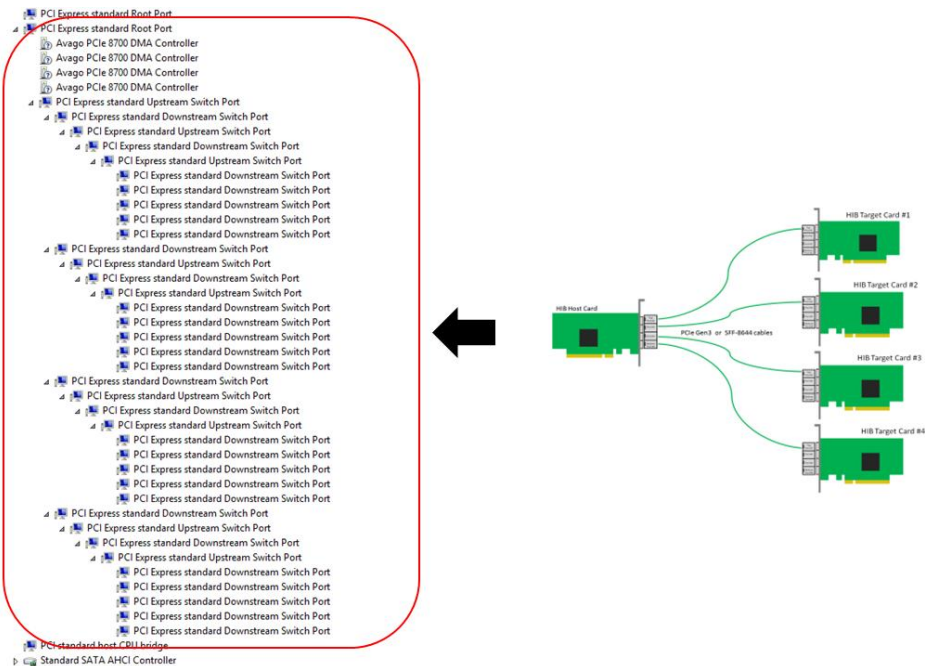- If non CMI-compliant host or target cards are used then it will not power up the target/backplane.

2.   Question:

Can you plug in the OSS target cards (502-card) in any non OSS backplane?

ANSWER:

No, the 502 and OSS/Magna backplanes use a reserved connection on the PCI connector to turn on the backplane. Non-OSS backplanes can be used but they must power on their board in a separate manner.

3.   Question:

What are the requirements for the 502 card to work in any non-oss backplane?

ANSWER:

The only requirement is that the non-OSS backplane be able to power on the backplane and target 502 card independent of host. It follows PCISIG specs.

4.   Question:

if I have an OSS backplane, can I plug in the 502 card in the downstream port if it is set as HOST (by setting the switch).

Will the 502 cards work as HOST to HOST configuration?

ANSWER:

No, host to host configuration not allowed

5.   Question:

 I am using a Magma based expansion board and the HIB target card is not powering ON, what should I do?

ANSWER:

Slide the SW1 #2 and #4 to ON position.

6.   Question:

 Is there a particular dipswitch settings on the target and host cards when using the SFF-8644 cables (blue plastic tab)?

ANSWER:

- For HIB host card: Set the SW1 #2 (Force-PWRON) to ON.
- Target card: set the SW1 #2 (Force-PWRON) to ON

To use the blue cables, the host expansion needs to be turned on (full power) prior to the host turning on. This can be achieved by sliding the FORCE-PWRON switch on the TARGET board to ON. This will then allow the FPGA to generate a PERST for the target switch and the backplane switch as soon as the AC power is plugged in.

7.   Question:

Can I use a desktop computer?

ANSWER:

Make sure you are using a server. You need to use a server-type host NOT a desktop-type host. When using desktop-type host: it turns on aux and main power at same time and the host 502 card will not initialize properly.

8. Question:

When using a Magma based expansion board (i.e EB3600-10 expansion system), the red LED on the HIB card comes ON, why?

ANSWER:

On the EB3600, the REMOTE ON signal is connected to a pull down. This affects the power on methodology on the HIB card. Generally, the REMOTE_ON# signal is pulled UP on the backplane (EB3600 in this case) and the target HIB brings it low to turn on the expansion chassis. Because of this the main power to the EB3600 automatically turns on when the AC is plugged in and the target 502 board PEX device has not been reset yet (over CMI). This causes a red light on the target HIB. When the host computer AUX and main power are turned on, then the reset messages are sent to the target HIB clearing out the red ERROR LED condition.

9. Question:

Why is the REMOTE power ON does not work when on Magma based expansion system (i.e EB3600)

ANSWER:

The EB3600 defaults to POWER ON. The only thing the 502 board can do is turned it OFF. If the POWER_ON signal from the FPGA actually drives a high signal, then it should turn off the EB3600. If the FPGA just does not drive it (Hi-Z) then the EB3600 will stay on.

10. Question:

How do I know if the system is linking up at Gen2 or Gen3?

ANSWER:

LINK LED will be solid for GEN 3. LINK LED will blink for GEN2 (I think 2Hz) or GEN1 will blink faster.

11. Question:

Will the 502 Target card works when connected to a 3rd party HIB SAS controller card in the host server?

Will the following configurations work?

- Magma E3600 expansion board <----502 Target card ---> SFF8644 cable ---> third party mini SAS controller card ---> Host Server

- Magma EB3600 expansion board<----502 Target card ---> SFF8644 cable ---> built mini SAS controller card on the Host Server motherboard.

ANSWER:

They should work if the 3rd party HIB devices are implemented as host devices and it follows PCI-SIG pinouts. This should work as long as the FORCE_PWRON switch is ON at the OSS 502 target card .

12. Question:

Can you connect 4 host servers to one target 502 card (expansion system)?

ANSWER:

No, this will not work. Yes can only connect one host card to 4 target cards.

13. Question:

Can I plug-in a single SFF-8644 cable or PCIe Gen3 cable to any ports on the HIB target and host cards?

ANSWER:

When using a single cable you must use the top port connector.

14. Question:

Is the SFF-8644 cable (with blue plastic tab), a passive copper cable?

ANSWER:

The SPF-8644 cables with blue tabs have active EEPROMs inside the cable.

15. Question:

Is the "Gen3 PCIe cable with CMI support" a passive copper cable too, or what type of cable?

ANSWER:

It is the same as the blue tabbed ones but it has two extra connections for I2C between the boards that permit CMI communication.

16. Questions:

Does the 502 card (HIB68-x16) support transparent bridging ?

ANSWER:

> The 502 board does support transparent bridging. But it does not support NT mode (None Transparent).

17. Question:

Do 502 cards (HIB68-x16) support Host clock isolation. Automatic support for host running CFC or SSC mode?

ANSWER:

> Supports host SSC or CFC.

18. Question:

What will be the device ID number for the 502 card (to verify if it is detected or not in the OS)?

ANSWER:

> It will be detected and will show a 8733 device.

19. Question:

Is there an LED indicator on the 502 CARD that will tell you if your link is at x4, x8 and x16?

ANSWER:

> No, it will only tell how many links are connected.

20. Question:

Which LED that will tell you how many cables / links are connected

ANSWER:

> It depends on the cable connection configuration.

- If using 4 cables for a x16 connection you will get 1 light = Which LED is lit on the 502 CARD? CH0 (left most)
- If using 4 cables for two x8 connections you will get 2 lights = Which LED is lit the 502 CARD? CH0 and CH1
- If using 4 cables for x8x4x4 connection you will get 3 lights = Which LED is lit the 502 CARD? CH0 CH1 and CH2
- If using 4 cables for x4x4x4x4 connection you will get 4 lights = Which LED is lit the 502 CARD? CH0-3
- If using 3 cables for x8x4 connection you get 2 lights= Which LED is lit the 502 CARD? CH0 CH1
- If using 3 cables for x4x4x4 connection you get 3 lights = Which LED is the 502 CARD? CH0 CH1 CH2
- If using 2 cables for x8 connection you get 1 light= Which LED is lit the 502 CARD? CH0
- If using 2 cables for x4x4 connection you get 2 lights = Which LED is lit the 502 CARD? CH0 CH1
- If using 1 cable for x4 connection you get 1 light = Which LED is lit the 502 CARD? CH0

21. Question:

I a using a Dolphin host card and connecting to a OSS 502 TARGET CARD.

Does this OSS card expects the Clock signal coming from the Host to the Target mode over the PCIe Gen cable connector?

ANSWER:

> If the Dolphin card does not support CMI, then the FORCE_PWR on switch must be set to ON in the target card.
> Clock does not cross over the PCIe Cable 3.0 interface. The target does not expect it from the host. The OSS 502 target generates its known clock.

22. Question:

What is the scheme for HIB68-x16 (502) card?

Can you select between spread spectrum/ no spread spectrum / common / separate clocks?

ANSWER:

> The clocking scheme on the two HIB cards is two separate constant frequency clocks. The versions of the HIB boards do not support SSC isolation from the host server. SSC must be disabled in the host server BIOS.

23. Question:

Can I bifurcate the cables to multiple targets? What settings do I must implement?

ANSWER:

- Have Target board in FORCE PWR ON mode SW1-2 is on
- Have Host board in FORCE PWR ON mode (this forces WAKE# signal at host) SW1-2 is on
- Operate cable configuration ONLY in manual mode. SW1-5 is on

14   Software Installation

No software or driver is required for the HIB68-x16 card.

15   How to Get More Help

You can visit the Technical Support FAQ pages on the Internet at https://www.onestopsystems.com/support

15.1   Contacting Technical Support

Our support department can be reached by phone at 1 (760) 745-9883. Support is available Monday through Friday, 8:00 AM to 5:00 PM PT. When contacting Technical Support make sure to include the following information:

1. Exact and correct serial #
2. Service Ticket or Case # (if you already submitted an online request)
3. Computer Type & Model: Operating System
4. Make & Model of PCI/PCIe cards: Application
5. Problem description

When submitting an online technical support request always provide a valid working e-mail address, phone number, shipping address and proper contact name. Check your e-mail for an automated response containing the case # and updates. You can also visit our web site at: https://www.onestopsystems.com/support for a quick response, use the Technical Support and RMA Request Form available in the Support Section of the website. Simply complete the form with all required information. Please make sure that your problem description is sufficiently detailed to help us understand your problem.

Shipping or Transporting of Expansion Unit with PCI / PCIe cards
Any PCIe cards in **should be removed** (or not to be installed) prior to shipment to avoid or prevent possible damage. Note: Expansion board and PCIe / PCI cards that arrive damaged in shipment will not be covered under warranty.

15.2   Returning Merchandise

If factory service is required, a Service Representative will give you a Return Merchandise Authorization (RMA) number. Put this number and your return address on the shipping label when you return the item(s) for service. Please note that One Stop Systems WILL NOT accept COD packages, so be sure to return the product freight and duties-paid. Ship the well-packaged product to the address below:

> Attention:RMA # _____, One Stop Systems
> 2235 Enterprise Street, #110
> Escondido, CA 92029
> USA

It is not required, though highly recommended, that you keep the packaging from the original shipment of your product. However, if you return a product for warranty repair/ replacement or take advantage of the 30-day money back guarantee, you will need to package the product in a manner similar to the manner in which it was received from our plant. We cannot be responsible for any physical damage to the product or component pieces of the product (such as the host or expansion interfaces for the expansion chassis) that are damaged due to inadequate packing. Physical damage sustained in such a situation will be repaired at the owner's expense in accordance with Out of Warranty Procedures. Please, protect your investment, a bit more padding in a good box will go a long way to insuring the device is returned to use in the same condition you shipped it in. Please call for an RMA number first.

15.3   Online Support Resources

As a product user and customer, listed below are our Online Support Resources

https://www.onestopsystems.com/support provides Knowledgebase Articles such as troubleshooting methods, compatibility, FAQ, documentation, and product technical information.

If you need technical support, product assistance or have a technical inquiry we encourage you to submit it on-line using our Technical Support Form. If you need to send a unit for repair or diagnostic evaluation, fill out our RMA (Return Material Authorization) online request form.
- https://www.onestopsystems.com/support

2235 Enterprise Street, Suite#110, Escondido CA 92029

Toll-Free : +1(800)285-8900 US • Main: +1 (760) 745-9883 • Fax: +1 (760) 745-9824

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