User Manual

SKU: OSS-PCIe-HIB38-x4

Table of Contents

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, OSS 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 OSS 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.

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. OSS strongly encourages 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   Hardware Requirements

1. OSS-HIB38-x4 card as Host
2. OSS-HIB38-x4 card as Target
3. Ipass Cable x4 (OSS-PCIe-CBL-x4), qty:1
4. Gen3 x8 PCIe slot (computer motherboard)
5. SFF-8644 cables (qty 2). Cable connectors are keyed so that you cannot insert them incorrectly.

1.1   Host card Configuration

For Host mode: Set the dipswitch SW3 #1 to OFF position
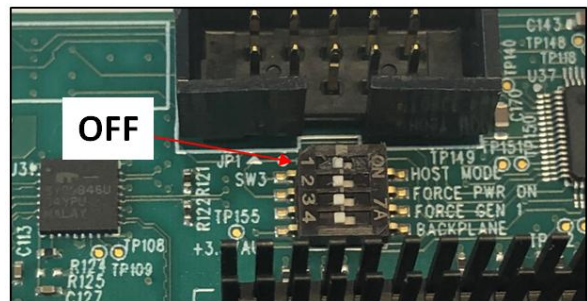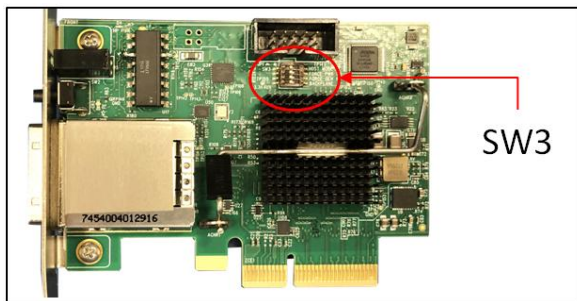
1.2   Target card Configuration
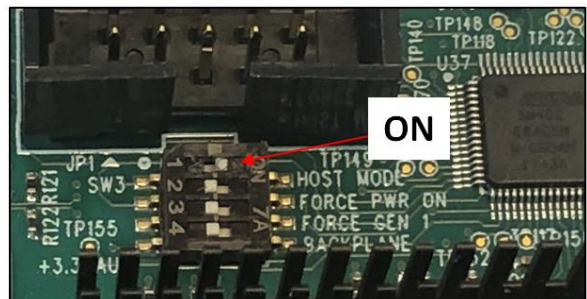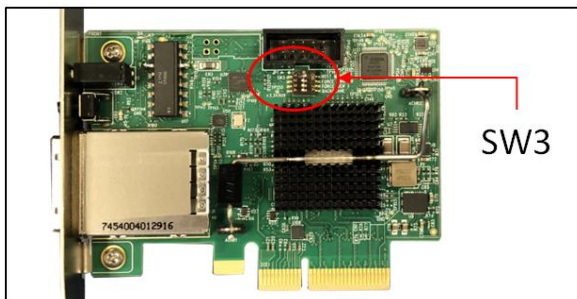
For target mode: Set the dipswitch SW3 to ON

2   Hardware Installation

The following steps will guide you through the installation of your OSS Expansion System.

2.1   Tools Required for Installation

To complete the installation of the OSS product you will need a Phillips-head screwdriver and ESD wrist strap to prevent electrostatic discharge.

2.2   Installation-Procedures Overview

Below is the concise version on how to set up the ExpressBox 3400.

1.   Set the Dipswitch for each adapter card
2.   Install the host adapter card
3.   Install the target card
4.   Connect Cable
5.   Install 3rd party PCIe card
6.   Connect power to expansion system.
    a.   Attach Power Cord
7.   Power on Computer
8.   Hardware Check
9.   Verify Installation (via Operating System)

NOTE
It is highly recommended to install any 3rd party PCI-E cards / High Power PCIe cards after you have verified and tested that the OSS expansion chassis is functional.

When installing 3rd Party PCIe cards, start with one card first just to see if there are any software and / or hardware issues or incompatibility problems that may occur. This way you can troubleshoot the problem more easily and efficiently. If everything works well and there are no configuration issues, you can proceed with the installation of the remaining 3rd party PCIe cards. Always refer to or read "3rd party manufacturer installation guide" for further instructions.

2.3 Set Dipswitch for each Adapter card

For TARGET card set the SW3#1 to ON position. For HOST card set the SW3#1 to OFF position

2.4 Install Host Adapter card

Install the Host adapter card in x16, x8 or x4 PCIe slot in the host computer.

2.5 Install Target Adapter card

Install the Target adapter card in the designated Upstream slot of the expansion board. Do not install the Target card in the downstream slot, the card only works in the Upstream slot.

2.6 Connect Cable

Connect the x4 Ipass cable to the Host card and connect the other end of the cable to the Target card. Make sure the cable is locked-in the cable port of both Target and Host cards.
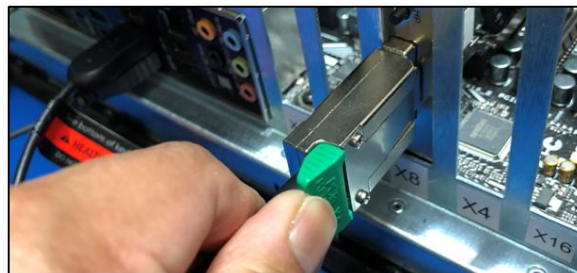
2.7 Install 3rd Party PCIe card

Plug in your PCIe card. Use any available downstream PCIE slots on the expansion board.

Make sure that all cards are fully seated in their PCIe card slots. When correctly seated, there will be a firm resistance when you pull up gently on the card. To keep the cards in place, secure them in the enclosure with their retaining screws.   After securing the cards verify that they do not touch each other.

2.7.1 Aux Power Connectors

Some PCIe cards require extra power. The power supply should provide the extra power connectors / adapters. Some power supplies have three 4-pin Molex AUX power connectors that can be used for providing extra power to cards and two (6+2 pin) PCIe connectors for GPUs.

2.7.2 High Power PCIe card installation

High Power PCIe cards, also known as High End PCIe cards, such as GPUs and other similar type of card requires additional power (or AUX Power) to operate. High power PCIe cards or GPUs that requires auxiliary power should come with power adapter cables.

 There are three 4-pin Molex AUX power connectors and two (6+2 pin) PCIe connectors from the power supply that can be used to provide power to your GPUs or High Power PCIe cards.

2.7 Plug-in Power to Expansion unit

Connect power to expansion system by attaching the power cord to the power supply. Use standard ATX power supply.

- Upon connecting power to the expansion board, TARGET card LEDs "POWER"(D1) and CBL will illuminate as solid green.

2.8   Power ON Host computer

Apply power to the Host computer. Host card LED "POWER" (D1) will illuminate as solid green.
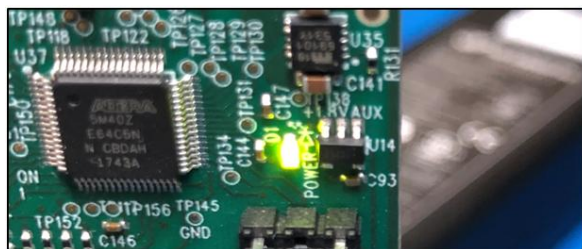
2.9   Hardware Check

Check the bracket LED on both Host and Target cards..

- Target and Host card LEDs: CBL and CE LEDs are illuminated as solid green. The "CE" LED could be ON as solid green or blinking, depending on the LINK (i.e Gen1 or Gen2).
- CBL LED when ON it indicates that the cable is recognized.
- On the Host card: HP_PWR LED (D4) = ON as solid blue

HP_Power LED
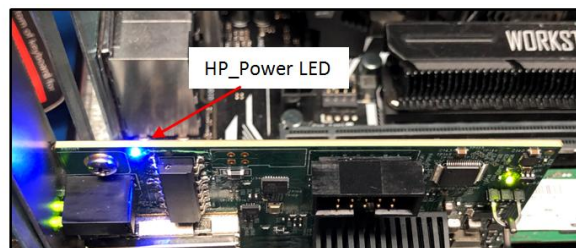
3   Other Technical Information

3.1   Dipswitch Setting (SW3)
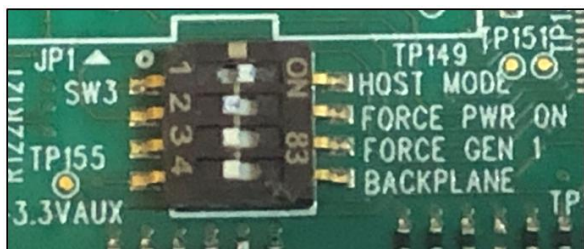
Dipswitch	Setting	Description
SW1	OFF	Host Mode: card is installed in the host computer
	ON	Target Mode: card is installed in the OSS expansion board in a Upstream PCIe slot
SW2	OFF	Target Power Enabled by Host (Default)
	ON	Target Enabled Regardless of Host
SW3	OFF	Automatic Speed Negotiation (Default)
	ON	Force PCIe 1.1 Speed
SW4	OFF	Backplane Type: OSS Backplane
	ON	Backplane Type: Magma

3.2   Bracket LEDS

Dipswitch	Description
CE	Card Edge Link Status
CBL	Cable Link Status
ATN	Hot Plug Attention

4   FAQ's

Question#1
When cable link status toggles also *Hot Plug Attention LED* and *Hot Plug Power LED* go out and do not turn on again. I would like to know when these LEDs go out.

Answer:
The two blue Hot Plug LEDs are controlled by register bits in BRCM switch device and are controlled by host software.

Question#2
What does pressing HP button make? What is interrupts presence status?

Answer:
All this does is set a bit in a BRCM switch register and creates an interrupt to host if host software configures switch for that purpose. Should have no effect on board operation.

Question# 3
Can you please describe the meaning and active position of each dipswitch ?

Answer:
SW3-2 (FORCE PWR ON): This only applies when 492 board in used as target device. When ON, forces power to turn onto the backplane when AC is connected to backplane power supply.

SW3-3 (FORCE GEN1) : Forces the switch to link at lower link speeds

SW3-4 (BACKPLANE) : Used in target mode only. When using Magma produced backplanes, this must be ON. OSS backplanes must be OFF.

Question#4
Is the card compatible with devices that run over PCIe Gen2 x4?

Answer:
 Yes, this card version was able to link to Gen 2 x4 , but there are design issues that may hampering proper operation .

Question#5
Which LED are lighting when the cable and cards are working?

Answer:
The CE or the CBL. The CE LED shows the link to the host, The CBL LED shows the connection to the target .

Question#6
What is the function of the black button next to the LEDs and connector?.

Answer:
The black button is part of the hot plug feature of the board. When appropriate software is loaded in the host, the button signals to host that the user want to power down the target so the target board can be replace. NOTE: We do not know a source for this software. So for now all it does is set a bit in the PLX that would be sensed by the software.

Question#7
Do you have any other recommended checks or diagnostics to test?

Answer:
You can use the PEX Design Editor software to verify the links **

5   How to Get More Help

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

5.1   Contacting Technical Support

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

1. Exact and correct OSS 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
6. Your full name and contact number(s).

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: www.OSS.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.

5.2   Returning Merchandise to OSS

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. **OSS will return any product that is not accompanied by an RMA number.** Please note that OSS 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 OSS product. However, if you return a product to OSS 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. OSS 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.

5.3   Online Support Resources

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

 Here are the links:

Support Portal:

https://www.onestopsystems.com/support-0

 Here is another important site that provides Knowledgebase Articles such as troubleshooting methods, compatibility, FAQ, documentation, and product technical information.

- Support / Product Knowledgebase / FAQ: https://www.onestopsystems.com/knowledge-center
- Manuals / Documents

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, here is the link:

- Submit Technical Support

If you need to send a unit for repair or diagnostic evaluation, fill out our RMA (Return Material Authorization) online request form.

- RMA Information and RMA Request

6   Appendix A   Compliance

FCC

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE
The assembler of a personal computer system may be required to test the system and/or make necessary modifications if a system is found to cause harmful interferences or to be noncompliant with the appropriate standards for its intended use.

Industry Canada

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numériqué de la classe A est conformé à la norme NMB-003 du Canada

CE

The product(s) described in this manual complies with all applicable European Union (CE) directives. OSS will not retest or recertify systems or components that have been reconfigured by customers

7   Appendix B   PCI Express General Information

7.1   What is PCIe / PCIE

Peripheral Component Interconnect Express (PCIe or PCI-E) PCI-Express is a standard developed to allow expansion cards to be plugged into a computer and communicates to the rest of the computer and other peripheral devices. It replaces the older PCI, PCI-X and AGP bus standards

PCI Express is a serial connection that operates more like a network than a bus. Instead of one bus that handles data from multiple sources. PCI-Express uses a switched topology, it controls several point-to-point serial connections. in which all cards can communicate at the same time with the host.

PCIe provides lower latency and higher data transfer rates than parallel busses such as PCI and PCI-X

PCI-Express also uses the concept of lanes, you can tell how many lanes a slot uses by its length. http://i.imgur.com/JxN1FDm.jpg. The more lanes the more bandwidth it provides.

7.2   How PCI Express Works

A PCI Express* (PCIe*) 'link' comprises from one to 32 lanes. Links are expressed as x1, x2, x4, x8, x16, etc. The link is negotiated and configured on power up. More lanes deliver faster transfer rates; most graphics adapters use at least 16 lanes in today's PCs. The clock is embedded in the data stream, allowing excellent frequency scaling for scalable performance

7.3   What is Lane

Data transfer is carried by two signal pairs, two wires for transmitting and two wires for receiving. Each set of signal is called a "lanes", and each lane is capable of sending and receiving 8-bit data packets simultaneously between two packets. You can have one, two, four, eight, sixteen or 32 lanes in a single PCIe slot (x1, x2, x4, x8, x16, x32).   Lane's counts are written with an "x" prefix (for example "x8" represents an eight-lane card or slot. The x16 is the largest size in common use. The lane count of a PCIe card or the PCIe slot is a determining factor its performance.

7.4 PCI Express Links and Lanes
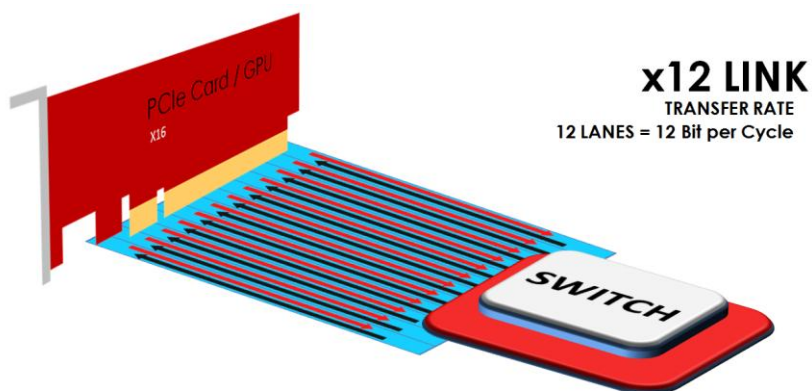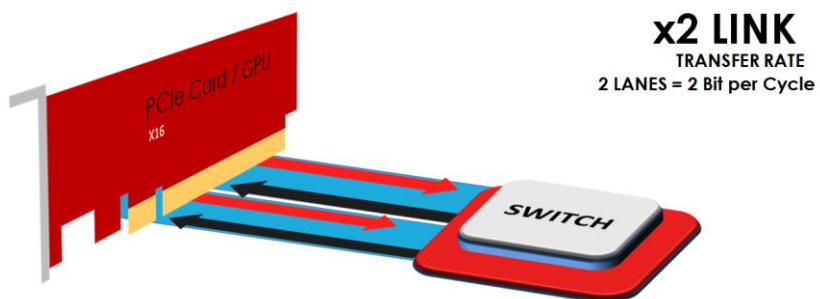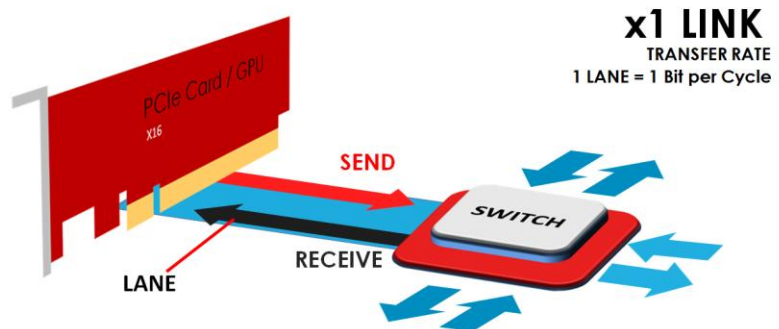
When computer starts up, the BIOS detects and enumerates all devices that are plugged into the CPU-motherboard. It then identifies the links between the devices and creating a map of where the traffic will go and negotiating the width of each link.

7.5   Form Factor

There are several different physical connections, each of which can function electrically as a slot with a lower number of lanes and can accommodate a physically smaller cards. A physical PCIe x16 slot can accommodate a x1, x2, x4, x8 or x16 card, and can run a x16 card @ x16, x8, x4 or x1. Some slots are open-ended sockets to permit physically longer cards and negotiate the best available electrical and logical connections.

7.5.1   PCI Express Sample Connectors
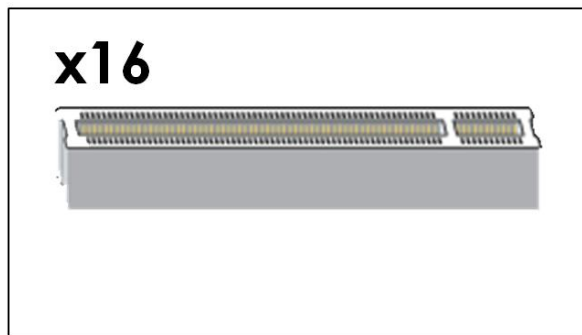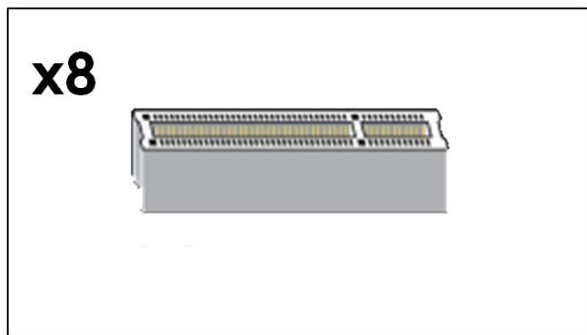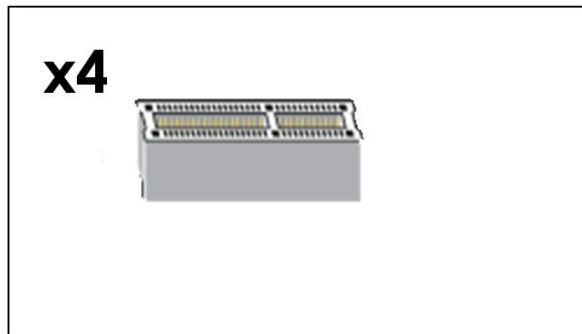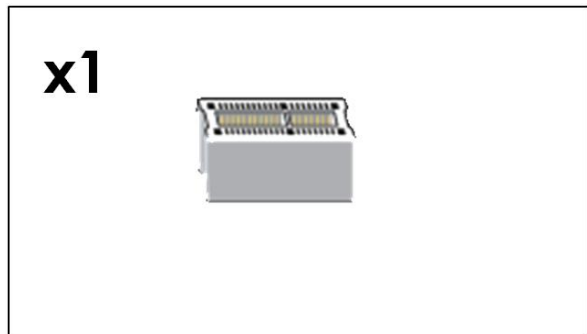
The number of lanes actually connected to a to a slot may also be less than the number supported by the physical slot size. An example is a x16 lot that runs at x4, which will accept any x1, x2, x4, x8 or x16 card, but only provides four lanes. Its specification may read as "x16 (x4 mode)" while "xsize" @ xspeed" notation ("x16 @ x4") is also common. The advantage is that such slots can accommodate a larger range of PCI Express cards without requiring motherboard hardware to support the full transfer rate.

7.6   Bandwidth

There are several different versions of PCIe interface with different bandwidth limitations. CPU motherboards have PCIe slots of different physical sizes, lanes and different PCIe generations.

A single PCIe 1.0 lane can carry up to 2.5 Gigatransfers per second (GTs) in each direction simultaneously. For PCIe 2.0, that increases to 5GT/s, and a single PCIe 3.0 lane can carry 8GT/s.

Gigatransfers per second are the same thing as gigabits per second, but they include the bits that are lost as a result of interface overhead. All PCI Express versions lose some of their theoretical maximum throughput to the physical overhead associated with electronic transmission.

PCIe 1 and 2.0 use 8b/10b encoding, the upshot of which is that 8 bits of data cost 10 bits to transmit, so they lose 20 percent of their theoretical bandwidth to overhead. After overhead, the maximum per lane data rate of PCIe 1.0 is eighty percent of 2.5GT/s, which gives 2gigabits per second or 250MB/s (8bits to a byte). The PCIe interface is bidirectional, so that is 250MB/s in each direction per lane. PCIe 2.0 doubles the per-lane throughput to 5GT/s, which gives 500MB/s of actual data transfer per lane.

PCIe 3.0 is twice the speed of PCIe 2.0, having a per lane throughput that is only 60 percent more than PCIe 2.0's 5GT/s. PCIe 3.0 use more efficient encoding scheme called 128b/130b, so the overhead is much less, only 1.54 percent. This means that a single PCIe 3.0 lane, at 8GT/s, can send 985B/s.

A PCIe 3.0 x4 connection (3.94GB/s) should have nearly the same bandwidth as PCIe 1.1 x16 or PCIe 2.0 x8 (both 4GB/s)

For example, two PCIe 3.0 GPUs running at x8 each on a PCIe 3.0 motherboard should have almost the same bandwidth as two PCIe 2.0 GPUs running at x16

The lower number of PCIe lanes available determines the speed or performance of your connection. This means if your motherboard or PCIe card is limited to a PCIe 1.0 or 2.0 connections, you are basically stuck using a slower interface.

7.7   Operation Mode

The PCI Express connection is based on the number of "lanes" availability, which is a single-bit, full-duplex, high-speed serial communication. Lanes can be grouped to increase bandwidth. For example, when two devices use four lanes for their connection, they are considered an "x4" connection and will be able to achieve four times more bandwidth than a single connection, i.e., a single lane. Photo below illustrates two connected devices using two lanes, i.e., an "x2" connection. Although in theory any number from one to 32 lanes can be grouped, the most common numbers are x4, x8, and x16.
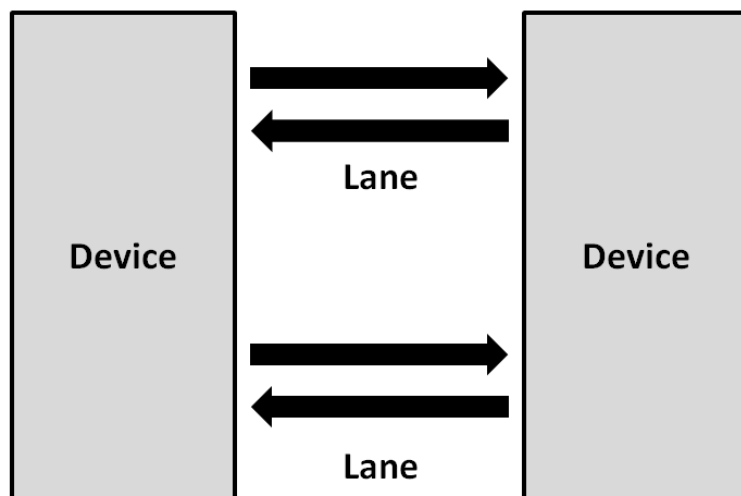
7.7.1   PCI Express Performance Table

PCI Express Version	Line Code	Transfer Rate	Throughput				
			x1	x2	x4	x8	x16
1.0 (Gen 1)	8b/10b	2.5 GTs	250 MB/s	500 MB/s	1.0 GB/s	2.0 GB/s	4.0 GB/s
2.0 (Gen 2)	8b/10b	5.0 GTs	500 MB/s	1.0 GB/s	2.0 GB/s	4.0 GB/s	8.0 GB/s
3.0 (Gen 3)	128b/130b	8.0 GTs	984.6 MB/s	1.97 GB/s	3.94 GB/s	7.88 GB/s	15.8 GB/s
4.0 (Gen 4)	128b/130b	16.0 GTs	1969 MB/s	3.94 GB/s	7.88 GB/s	15.75 GB/s	31.5 GB/s
5.0 (Gen 5)	128b/130b	32.0 GTs	3938 MB/s	7.88 GB/s	15.75 GB/s	31.51 GB/s	63.0 GB/s

8b/10b encoding

8b/10b encoding is a telecommunications line code in which each eight-bit data byte is converted to a 10-bit transmission character. PCI Express 1.0 and 2.0 use the 8b/10b encoding system (which is the same encoding used by Fast Ethernet, i.e., 100 Mbps, networks)

8b/10b encoding was invented by IBM and is used in transmitting data on enterprise system connections, gigabit Ethernet and over fiber channel. This encoding supports continuous transmission with a balanced number of zeros and ones in the code stream. 8b/10b can also detect single-bit transmission errors.

To convert a figure given in bits per second (bps) to bytes per second (B/s) you need to divide it by eight, since a byte is a group of eight bits. However, because of the 8b/10b encoding, we need to make this division by 10 rather than eight. This is the reason why, with a clock of 2.5 GHz and 5 GHz, the x1 bandwidth of these connections are 250 MB/s and 500 MB/s, respectively, and not 312.5 MB/s and 625 MB/s. The two extra bits added are called "overhead," and they "eat" 20% of the channel bandwidth.

128b/130b encoding

PCI Express 3.0 uses a different encoding system, called 128b/130b. As you can deduce, this encoding system transmits each 128 bits of data as a 130-bit number, which offers a far lower overhead. To transmit 128 bits of data, PCI Express 3.0 needs only two extra bits, while with the previous revisions, 32 extra bits are needed (two for every eight bits). Because of this lower overhead requirement, PCI Express 3.0 can achieve double the PCI Express 2.0 bandwidth with a clock rate of 8 GHz instead of 10 GHz.

7.8   Power

All sizes of x4 and x8 PCIe cards are allowed to a maximum power consumption of 25 Watt. All x1 cards consumed 10 Watts. A full -height cards is considered as "high-power" and consume 25 Watts. All x16 card are initially 25 Watts but may increase their power after configuration and can use up to o75 Watt (3.3v x 3A + 12 v x 5.5a). Per PCIe specification, it demands that the higher-power configuration be used for graphics cards only, while card of other purposes are to remain a 25 Watts.

PCIe cards requiring more than 75 Watts have added power connectors.

To accommodate graphics cards needing more than 75 watts, the **PCI-SIG (Special Interest Group)** introduced two standards for supplying additional power to a video card via additional graphics power connectors:

- **PCI Express x16 Graphics 150 W-ATX Specification**—Published in October 2004, this standard defines a six-pin (2x3) auxiliary power connector capable of delivering an additional 75 W to a graphics card directly from the power supply, for a total of 150 W to the card.
- **PCI Express 225 W/300 W High Power Card Electromechanical Specification**—Published in March 2008, this standard defines an eight-pin (2x4) auxiliary power connector capable of supplying an additional 150 W of power, for a total of either 225 watts (75+150) or 300 watts (75+150+75) of available power.

Cards requiring even more power can use multiple connectors.

Graphics Card Auxiliary Power Connector Configurations	
Maximum Power Draw	**Auxiliary Power Connector Configuration**
75 Watts	None
150 Watts	One six-pin connector
225 Watts	Two six-pin connectors*
300 Watts	One eight-pin connector + one six-pin connector
375 Watts	Two eight-pin connectors
450 Watts	Two eight-pin connectors + one six-pin connector

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