

# USB 3 vs. USB 2 vs. eSATA

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**TuCS** COMPUTER  
**Son**  
SOCIETY

**TMUG**  
TUCSON  
MACINTOSH  
USERS GROUP

# Web Location for Presentations:

<http://aztcs.org>

Click on “Meeting Notes”

# SUMMARY

- "eSATA" is 2 to 3 times faster relative to "USB 2" ("Test 5" versus "Test 4")
- "USB 3" is 2 to 3 times faster relative to "USB 2" ("Test 2" versus "Test 4")
- "USB 3" is a little bit faster than "eSATA" ("Test 2" versus "Test 5")

# ADDITIONAL FINDINGS

- When you attach a "USB 3" device to a "USB 2" port, the device will work fine but you will get "USB 2" data transfer speeds ("Test 3" versus "Test 4").
- When you attach a "USB 2" device to a "USB 3" port, the device will be a little bit faster relative to a connection to a "USB 2" port ("Test 6" versus "Test 4").
- A "USB 3 to PCIe" adapter will run slightly faster when inserted into a "PCIe x16" slot relative to a "PCIe x1" slot ("Test 2" versus "Test 1")

# TOPICS

- USB TERMINOLOGY AND BASICS
- “eSATA” TERMINOLOGY AND BASICS
- GENERAL AVAILABILITY OF "USB 3"
- MORE INFORMATION ON "USB 3"
- CONFIGURATION OF A "USB 2" CABLE
- CONFIGURATION OF A "USB 3" CABLE

# TOPICS (continued)

- POSSIBLE CONFIGURATIONS OF "USB 2" AND "USB 3" PERIPHERALS
- FORWARD COMPATIBILITY OF "USB 2" CABLES AT BOTH THE COMPUTER END AND THE EQUIPMENT END

# TOPICS (continued)

- FORWARD COMPATIBILITY OF "USB 2" PORTS AT THE COMPUTER END
- BACKWARD INCOMPATIBILITY OF "USB" 3 CABLES AT THE EQUIPMENT END
- BACKWARD COMPATIBILITY OF "USB 3" PORTS AT THE COMPUTER END

# **TOPICS (continued)**

- **OPTIONAL "USB 3 MICRO B" AT THE EQUIPMENT END**
- **POSSIBLE PROBLEMS WITH "USB 3"**
- **METHODOLOGY FOR COMPARING DATA SPEEDS OF "USB 2", "USB 3", AND "eSATA" DEVICES**

# TOPICS (continued)

- FREE "CRYSTALDISKMARK" SOFTWARE FOR BENCHMARKING HARD DRIVES
- RAW TEST RESULTS
- ANALYSIS OF TEST RESULTS
- ACTIVE EXTENSIONS FOR "USB 2" AND "USB 3" CABLES

# USB TERMINOLOGY AND BASICS

- Standards organization: USB-IF = "USB Implementors Forum  
See <http://www.usb.org>
- USB specifications:  
USB 1.0, USB 1.1, USB 2.0, and  
USB 3.0
- All USB specifications are available for free at  
<http://www.usb.org/developers/docs/>

# USB TERMINOLOGY..(continued)

- USB data rates:  
Low-Speed, Full-Speed,  
High-Speed, and Super Speed
- Physical configuration:  
"USB 2" is a 4-wire/4-pin technology.  
"USB 3" is a 9-wire/9-pin technology.

# USB TERMINOLOGY..(continued)

- 16.4 feet (5 meter) limitation for "USB 2" cables
- 9.8 feet (3 meter) limitation for "USB 3" cables will generate a tremendous demand for active "USB 3" extension cables
- See

<http://www.techrepublic.com/blog/10things/10-things-you-should-know-about-usb-20-and-30/1265>

# eSATA TERMINOLOGY AND BASICS

- “eSATA” is a 7-wire/7-pin technology.
- Maximum cable length of 6 1/2 feet (2 meters).
- See [http://en.wikipedia.org/wiki/Serial\\_ATA](http://en.wikipedia.org/wiki/Serial_ATA)
- eSATA and SATA have the same number of wires/pins and their signal formats are the same.

# eSATA TERMINOLOGY..(continued)

- Not available at "Best Buy" stores.
- Briefly available at "Best Buy" stores about 5 years ago
- Available at specialized computer stores and online retailers such as Newegg.com
- Reference:  
[http://en.wikipedia.org/wiki/List\\_of\\_device\\_bandwidths](http://en.wikipedia.org/wiki/List_of_device_bandwidths)

# **GENERAL AVAILABILITY OF “USB 3”**

Amherst "Best Buy" advertisement  
effective October 22, 2011, page 31:

# GENERAL AVAILABILITY OF “USB 3” (continued)

## EXTERNAL STORAGE



**1.5TB** FreeAgent® | GoFlex™  
USB 3.0/2.0 Portable Hard Drive  
SKU: 1305576 Reg. Price '149.99

SAVE \$30

**119<sup>99</sup>**  
After Savings

**1TB** FreeAgent® | GoFlex™ USB  
3.0/2.0 Portable Hard Drive  
SKU: 1305503 Reg. Price '109.99

SAVE \$20

**89<sup>99</sup>**  
After Savings

**500GB** FreeAgent® | GoFlex™  
USB 3.0/2.0 Portable Hard Drive  
SKU: 1305063 Reg. Price '79.99

SAVE \$20

**59<sup>99</sup>**  
After Savings



**4TB** FreeAgent® | GoFlex™ USB  
3.0/2.0 External Hard Drive  
SKU: 3551503 Reg. Price '219.99

SAVE \$20

**199<sup>99</sup>**  
After Savings

**3TB** FreeAgent® | GoFlex™ USB  
3.0/2.0 External Hard Drive  
SKU: 3551442 Reg. Price '159.99

SAVE \$30

**129<sup>99</sup>**  
After Savings

**2TB** FreeAgent® | GoFlex™ USB  
3.0/2.0 External Hard Drive  
SKU: 3550901 Reg. Price '119.99

SAVE \$30

**89<sup>99</sup>**  
After Savings

# GENERAL AVAILABILITY OF “USB 3” (continued)



**750GB My Passport™ Essential™**  
**SE USB 3.0/2.0 Hard Drive**

SKU: 1250646 – Black, 1261411 – Red Reg. Price \$99.99 Each

**SAVE \$30**  
**69<sup>99</sup>** Each  
After Savings

## GENERAL AVAILABILITY OF “USB 3” (continued)

Note that "USB 3" is called  
"USB 3.0/2.0" in all "Best Buy" ads.

See

[http://bestbuy.shoplocal.com/bestbuy/  
default.aspx?action=entryflash&adref  
=&citystatezip=14228](http://bestbuy.shoplocal.com/bestbuy/default.aspx?action=entryflash&adref=&citystatezip=14228)

# MORE INFORMATION ON “USB 3”

There is a nominal, best case, marketing-provided 10-fold increase in maximum attainable data transfer speed for "USB 3" relative to "USB 2":

5 Gigabits per second maximum data transfer speed for "USB 3".

480 Megabits per second maximum data transfer speed for "USB 2".

## **MORE INFORMATION ON “USB 3” (continued)**

However, these nominal data transfer rates are just a "speed limit" and our empirical tests show that these values are not achievable for real hard drives in real hard drive enclosures at the present time.

# CONFIGURATION OF A “USB 2” CABLE

PC SIDE SIDE:

"USB 2" "A" PLUG/CONNECTOR

---4 CONDUCTORS OF WIRE---

EQUIPMENT SIDE:

"USB 2" "B" PLUG/CONNECTOR

See

[http://pinouts.ru/Slots/USB\\_pinout.shtml](http://pinouts.ru/Slots/USB_pinout.shtml)

<http://en.wikipedia.org/wiki/USB>

# CONFIGURATION OF A "USB 3" CABLE

PC SIDE SIDE:

"USB 3" "A" PLUG/CONNECTOR

---9 CONDUCTORS OF WIRE---

EQUIPMENT SIDE:

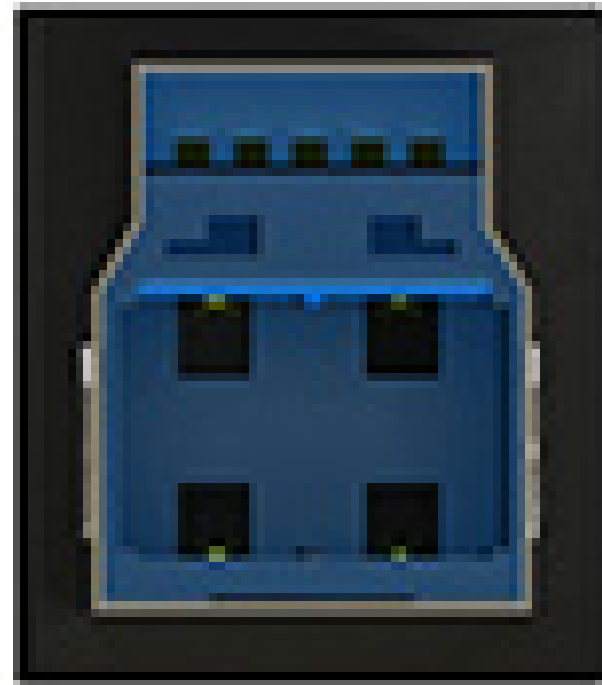
"USB 3" "B" PLUG/CONNECTOR

See

[http://www.addonics.com/emerging\\_technologies/usb3\\_tutorial.asp](http://www.addonics.com/emerging_technologies/usb3_tutorial.asp)

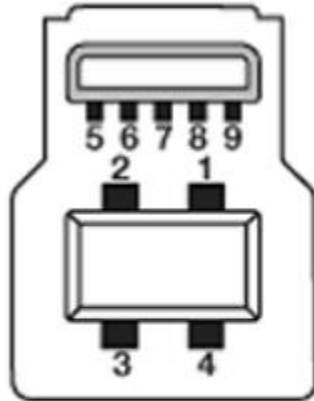
[http://en.wikipedia.org/wiki/USB\\_3.0](http://en.wikipedia.org/wiki/USB_3.0)

# CONFIGURATION OF A “USB 3” “B” CONNECTOR



# PINOUT OF A “USB 3” “B” CONNECTOR

## USB 3.0 Type B

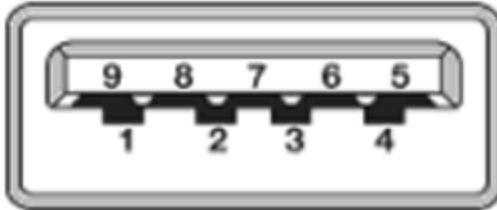


Mating face of USB 3.0  
type B female

PIN	SIGNAL	PIN	SIGNAL
1	VBUS	6	StdA_SSTX+
2	-Data	7	GND_DRAIN
3	+Data	8	StdA_SSRX-
4	GND	9	StdA_SSRX+
5	StdA_SSTX-		

# PINOUT OF A “USB 3” “A” CONNECTOR

## USB 3.0 Type A



Mating face of USB 3.0  
type A female

PIN	SIGNAL	PIN	SIGNAL
1	VBUS	6	StdA_SSRX+
2	-Data	7	GND_DRAIN
3	+Data	8	StdA_SSTX-
4	GND	9	StdA_SSTX+
5	StdA_SSRX-		

## USB 3.0 Type B

<http://gadgetcircuits.com/usb-pinout>

# CONFIGURATIONS OF USB PERIPHERALS

**PC SIDE**

**EQUIPMENT SIDE**

"USB 2" PORT-----"USB 2" CABLE-----"USB 2" PORT

"USB 3" PORT-----"USB 3" CABLE-----"USB 3" PORT  
(= PURE "USB 3")

"USB 2" PORT-----"USB 3 CABLE"-----"USB 3" PORT

"USB 3" PORT-----"USB 2" CABLE-----"USB 2" PORT

"USB 3" PORT-----"USB 2" CABLE-----"USB 3" PORT

## **FORWARD COMPATIBILITY OF "USB 2" CABLES AT BOTH THE COMPUTER END AND THE EQUIPMENT END**

- “USB 2” cables are forward compatible at both the "A" computer end and the "B" equipment end
- When you use a “USB 2” cable to attach to a “USB 3” computer jack, you get “USB 2” speeds
- In order to get “USB 3” speeds, the jack at the computer end, the cable, and the jack at the equipment end all have to be "USB 3"

# FORWARD COMPATIBILITY OF "USB 2" CABLES AT BOTH THE COMPUTER END AND THE EQUIPMENT END (continued)

- "jacks" = "ports"
- You can use a "USB 2" cable to attach a "USB 3" device to a "USB 2" or "USB 3" port in a computer.
- You can use a "USB 2" cable to attach a "USB 2" device to a "USB 3" jack in a computer.

# FORWARD COMPATIBILITY OF "USB 2" PORTS AT THE COMPUTER END

“USB 2” ports at the computer end are forward compatible:

- A “USB 2” port at the computer end will accept a “USB 3” “A” plug at the computer end.
- You will get “USB 2” speeds if you do this.

# BACKWARD COMPATIBILITY OF "USB 3" PORTS AT THE COMPUTER END

A "USB 3" port at the computer end will accept a "USB 2" cable's "A" connector.

## **BACKWARD INCOMPATIBILITY OF "USB" 3 CABLES AT THE EQUIPMENT END**

“USB 3” cables are not backward compatible at the (“B”) equipment end:  
You cannot use a “USB 3” cable’s “B” plug to attach to a “USB 2” port at the equipment end.

# **BACKWARD COMPATIBILITY OF “USB 3” PORTS AT THE EQUIPMENT END**

A “USB 3” port at the equipment end will accept the “B” plug of a “USB 3” cable.

# OPTIONAL "USB 3 MICRO B" AT THE EQUIPMENT END

See

[http://en.wikipedia.org/wiki/File:USB\\_3.0\\_Micro\\_B\\_plug.PNG](http://en.wikipedia.org/wiki/File:USB_3.0_Micro_B_plug.PNG)

and

<http://www.cablestogo.com/resources/usb.asp>

# OPTIONAL "USB 3 MICRO B" AT THE EQUIPMENT END



# OPTIONAL "USB 3 MICRO B" AT THE EQUIPMENT END

## USB 3.0 Micro-B



Mating face of USB 3.0 type A female

PIN	SIGNAL	PIN	SIGNAL
1	VBUS	6	MicB_SSTX-
2	-Data	7	MicB-SSTX+
3	+Data	8	GND_DRAIN
4	ID	9	MicB_SSRX-
	GND	10	MicB_SSRX+

USB3.0 Pinout Diagram - USB Pinout

# KINGWIN "ATK-35U3-BK" "USB 3" HARD DRIVE ENCLOSURE

Available at "Computer Renaissance" stores and online at "NewEgg.com":

Price: \$60.

See

[http://kingwin.com/products/cate/enclosures/atk\\_35u3\\_bk.asp](http://kingwin.com/products/cate/enclosures/atk_35u3_bk.asp)

Since they do not have a fan, I always run this model with the external cover removed so that more air flows around the actual hard drive.

# KINGWIN "ATK-35U3-BK" "USB 3" HARD DRIVE ENCLOSURE (continued)

Model#: ATK-35U3-BK

## ■ FEATURES

- External Enclosure For SATA Hard Drive
- Up to 4.8 Gbps Data Transfer Rate In USB 3.0
- Aluminum Case
- Support Hot Plug & Play
- Elegant Blue LED For Power / HDD Activity
- RoHS Compliant

## ■ SPECIFICATIONS

- H.D.D. Support: 3.5" SATA
- Interface: SATA to USB 3.0
- Dimension: 5" W x 8 1/2" L x 1 1/4" H
- Support OS: Windows 98SE/ME/2000/XP/Vista/7  
Mac OS 10 x & Above



# KINGWIN "ATK-35U3-BK" "USB 3" HARD DRIVE ENCLOSURE (continued)



# "KOUTECH" "USB 3" "PCI-E" ADAPTER

Model: IO-PEU230

Mfr.: Koutech

Price: \$40

Available at "SWS Electronics & Computers".

See

[http://www.koutech.com/proddetail.asp?line\\_number=465](http://www.koutech.com/proddetail.asp?line_number=465)

# "KOUTECH" "USB 3" "PCI-E" ADAPTER (continued)

**SuperSpeed USB 3.0**  
PCI Express/ExpressCard Host Controller

PEU230 53983  
2-PORT USB 3.0 PCIE CONTROLLER

- 2-Port 5Gbps SuperSpeed USB 3.0 PCI Express / ExpressCard Host Controller<sup>1</sup>
- Supports Windows XP/Server 2003/ Vista/Server 2008/7<sup>2</sup>

IO-PEU230 IO-PEU231

IO-ECU230

\*Products may vary in appearance from photo

# "KOUTECH" "USB 3" "PCI-E" ADAPTER (continued)

## IO-PEU230

- Fully compliant with one-lane (x1) PCI Express 2.0 specification
- Two (2) external 5Gbps SuperSpeed USB 3.0 ports
- SuperSpeed USB 3.0 offers 10 times performance increase over Hi-Speed USB 2.0<sup>1</sup>
- Up to 5Gbps maximum transfer rate<sup>1</sup>
- SuperSpeed USB 3.0 is backwards compatible with USB 1.0/1.1/2.0 devices
- Built-in with 15-pin SATA power connector for added power source to better support power hungry bus-powered devices
- Fully Plug-N-Play compatible
- Supports Windows XP/Server 2003/ Vista/Server 2008/7<sup>2</sup>
- Supports both 32-bit & 64-bit OSes
- For PC with minimum 512MB of RAM, 1GHz or faster CPU, and one (1) available PCI Express 1.x or 2.x slot

# **METHODOLOGY FOR COMPARING DATA SPEEDS OF "USB 2", "USB 3", AND "eSATA" DEVICES**

The same 1-Terabyte Seagate  
"Barracuda" ST31000528AS" SATA hard  
drive was used for all tests.

Software Used:

64-bit version of "Portable Edition" of  
"CrystalDiskMark 3" freeware

# FREE "CRYSTALDISKMARK" SOFTWARE FOR BENCHMARKING HARD DRIVES

Use the 64-bit "Portable Edition" of "CrystalDiskMark" since it is malware-free.

Do not install the non-portable version of CrystalDiskMark since it installs the "OpenCandy" adware engine into your "Windows" computer.

# FREE "CRYSTALDISKMARK" SOFTWARE FOR BENCHMARKING HARD DRIVES (continued)

64-bit version of "Portable Edition" of "CrystalDiskMark 3" is freeware from

<http://crystalmark.info/download/index-e.html>

or

[http://sourceforge.jp/projects/crystaldiskmark/downloads/46482/CrystalDiskMark3\\_0\\_1b.zip/](http://sourceforge.jp/projects/crystaldiskmark/downloads/46482/CrystalDiskMark3_0_1b.zip/)

# FREE "CRYSTALDISKMARK" SOFTWARE FOR BENCHMARKING HARD DRIVES (continued)

The tech support department of the Acronis company uses CrystalDiskMark as a standardized test for their customers to run.

See

<http://kb.acronis.com/content/19463>

# FREE "CRYSTALDISKMARK" SOFTWARE FOR BENCHMARKING HARD DRIVES (continued)

For more information about  
"CrystalDiskMark", see

[http://forum.notebookreview.com/solid-  
state-drives-ssds-flash-storage/574195-  
crystaldiskmark-3-0-installs-adware-  
opencandy.html](http://forum.notebookreview.com/solid-state-drives-ssds-flash-storage/574195-crystaldiskmark-3-0-installs-adware-opencandy.html)

# FREE "CRYSTALDISKMARK" SOFTWARE FOR BENCHMARKING HARD DRIVES (continued)

and

[http://en.sourceforge.jp/ticket/browse.php?group\\_id=4402&tid=24811](http://en.sourceforge.jp/ticket/browse.php?group_id=4402&tid=24811)

and

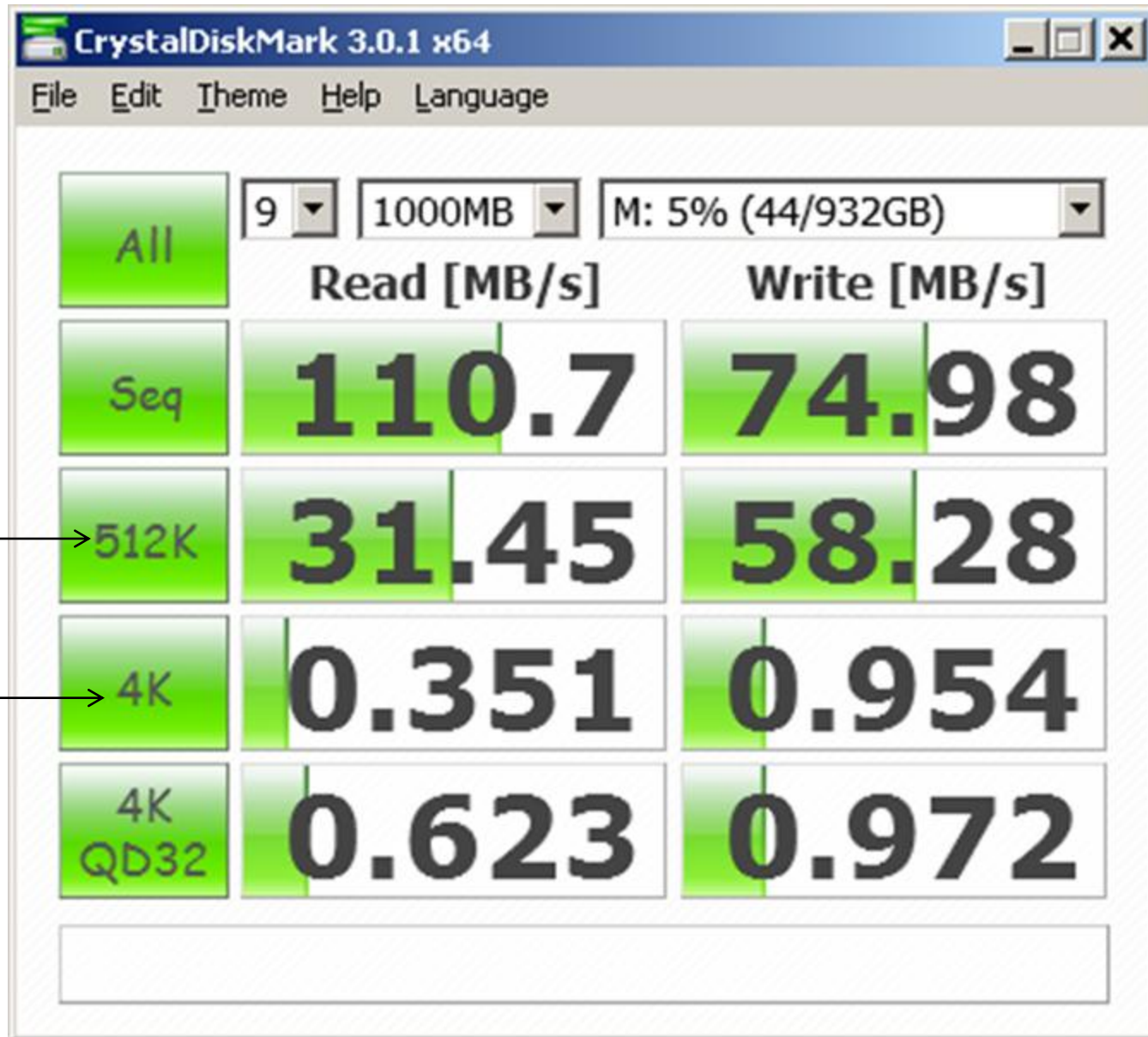
<http://www.microsoft.com/security/portal/Threat/Encyclopedia/Entry.aspx?Name=Adware%3AWin32%2FOpenCandy>

# BLOCKS VERSUS DATA PACKETS IN USB COMMUNICATIONS

Your application software program or your operating system sends "USB Request Blocks" to the USB controller. The USB controller converts this block of data into "data packets" to send out on the USB cable.

The numerical values in the buttons of the CrystalDiskMark window refer to "blocks", not packet size. Many Web sites and blogs erroneously refer to these numbers as "packet sizes".

# BLOCKS VERSUS DATA PACKETS IN USB COMMUNICATIONS (continued)



# BLOCKS VERSUS DATA PACKETS IN USB COMMUNICATIONS (continued)

See

[http://www.tech-pro.net/intro\\_usb.html](http://www.tech-pro.net/intro_usb.html)

and

<http://vusb-analyzer.sourceforge.net/tutorial.html>

# MORE ABOUT "CRYSTALDISKMARK"

See

<http://crystalmark.info/software/CrystalDiskMark/index-e.html>

and

<http://crystalmark.info/software/CrystalDiskMark/manual-en/MainWindow.html>

and

<http://www.rarst.net/software/crystaldiskmark/>

# **MORE ABOUT "CRYSTALDISKMARK" (continued)**

and

<http://www.sevenforums.com/performance-maintenance/133430-what-crystal-disk-mark-statistic-telling.html>

and

<http://sqlserverperformance.wordpress.com/2011/04/27/a-sql-server-hardware-nugget-a-day-day-27/>

and

<http://crystaldiskmark.blogspot.com/>

# MORE ABOUT "CRYSTALDISKMARK" (continued)

and

<http://www.tomshardware.com/charts/2011-micro-sdhc-charts/CrystalDiskMark-3.0-x64,2751.html>

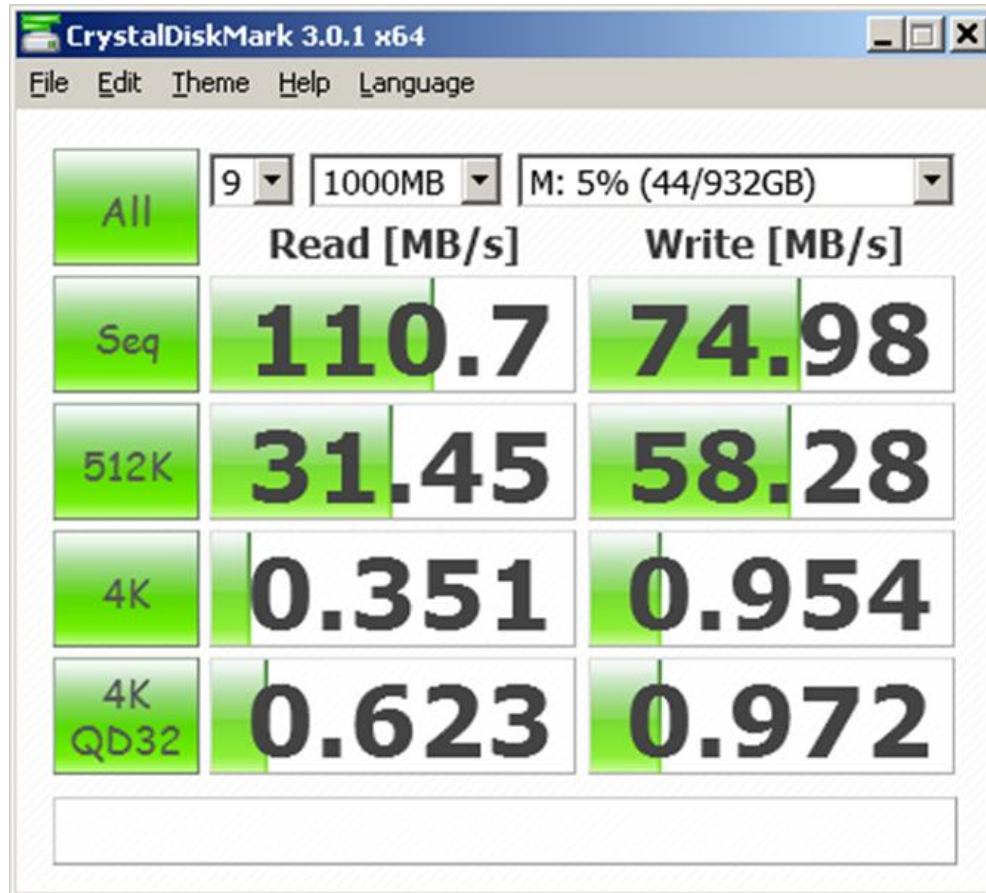
and

<http://www.blogtechnika.com/crystaldiskmark-is-affective-hard-drive-benchmarking-tool>

# RAW TEST RESULTS

TEST 1:

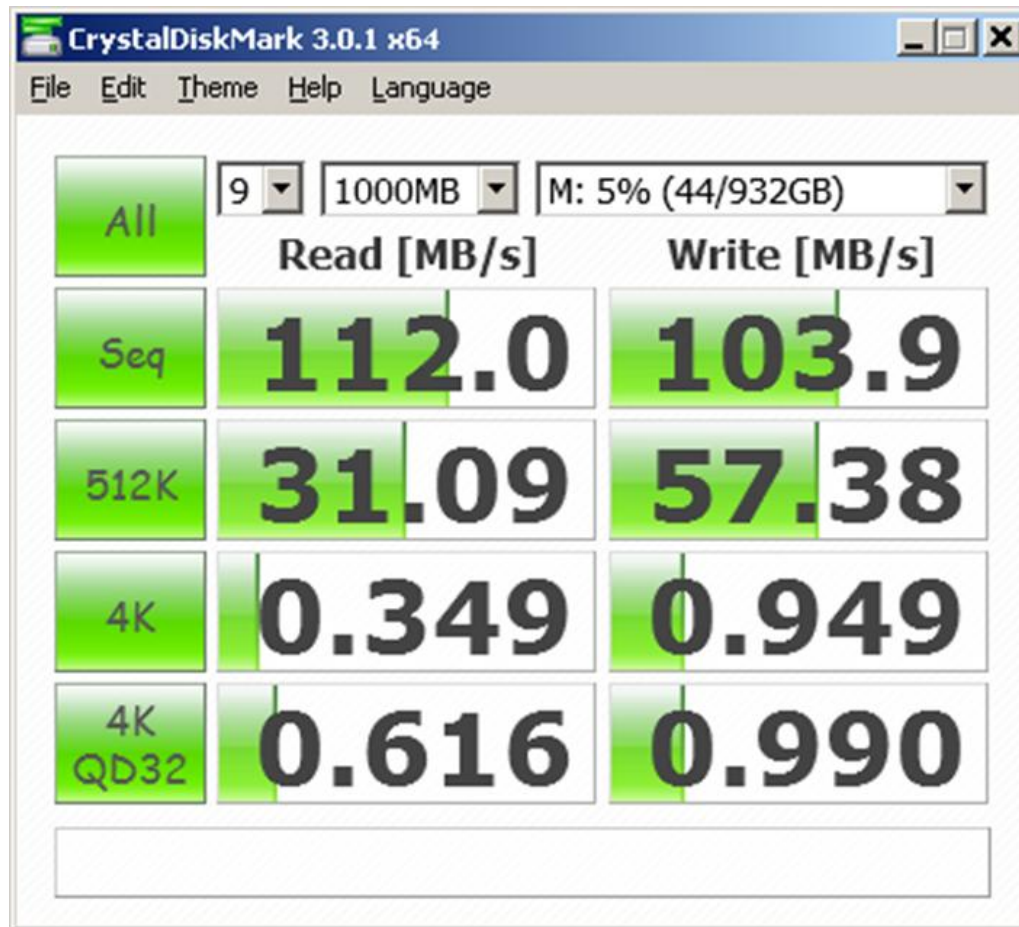
"Kingwin" "USB 3" external hard drive box attached to a "USB 3" jack in a PCIe expansion controller inserted into a "PCIe version x1" expansion slot:



# RAW TEST RESULTS (continued)

TEST 2:

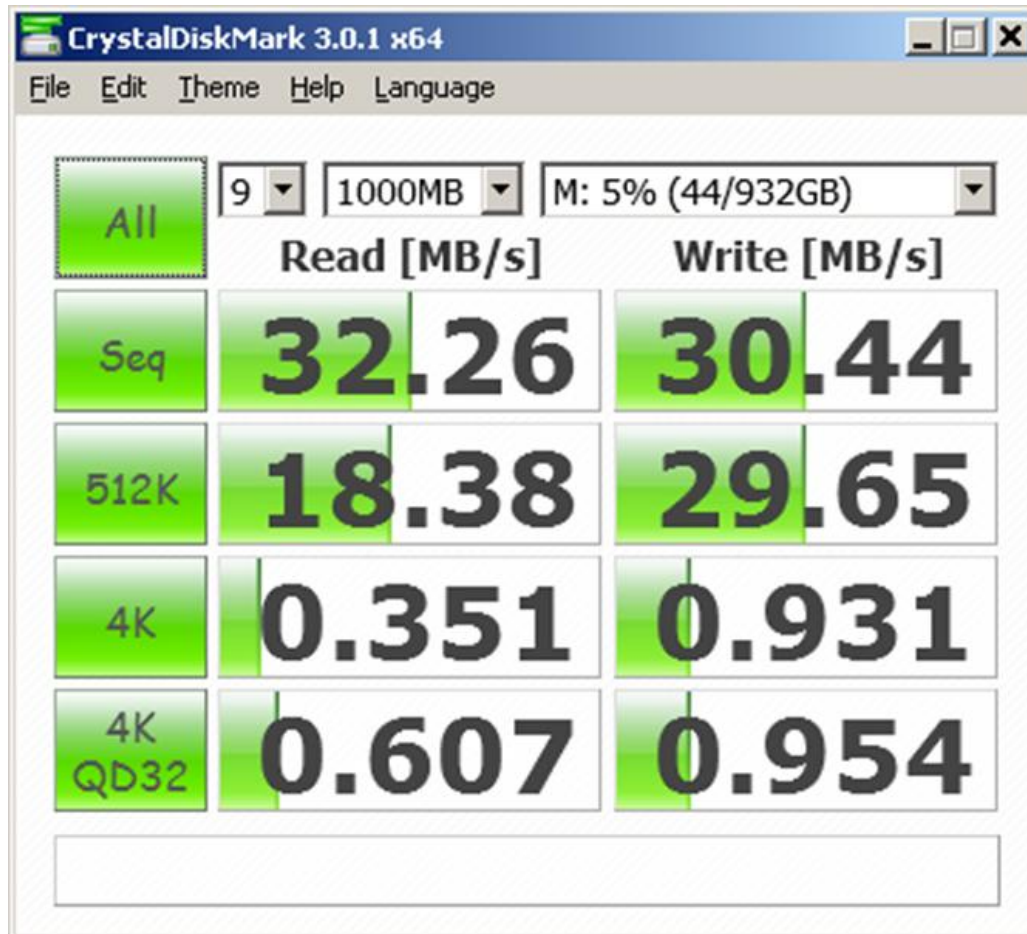
"Kingwin" "USB 3" external hard drive box attached to a "USB 3" jack in a PCIe expansion controller inserted into a "PCIe version x16" expansion slot:



# RAW TEST RESULTS (continued)

## TEST 3:

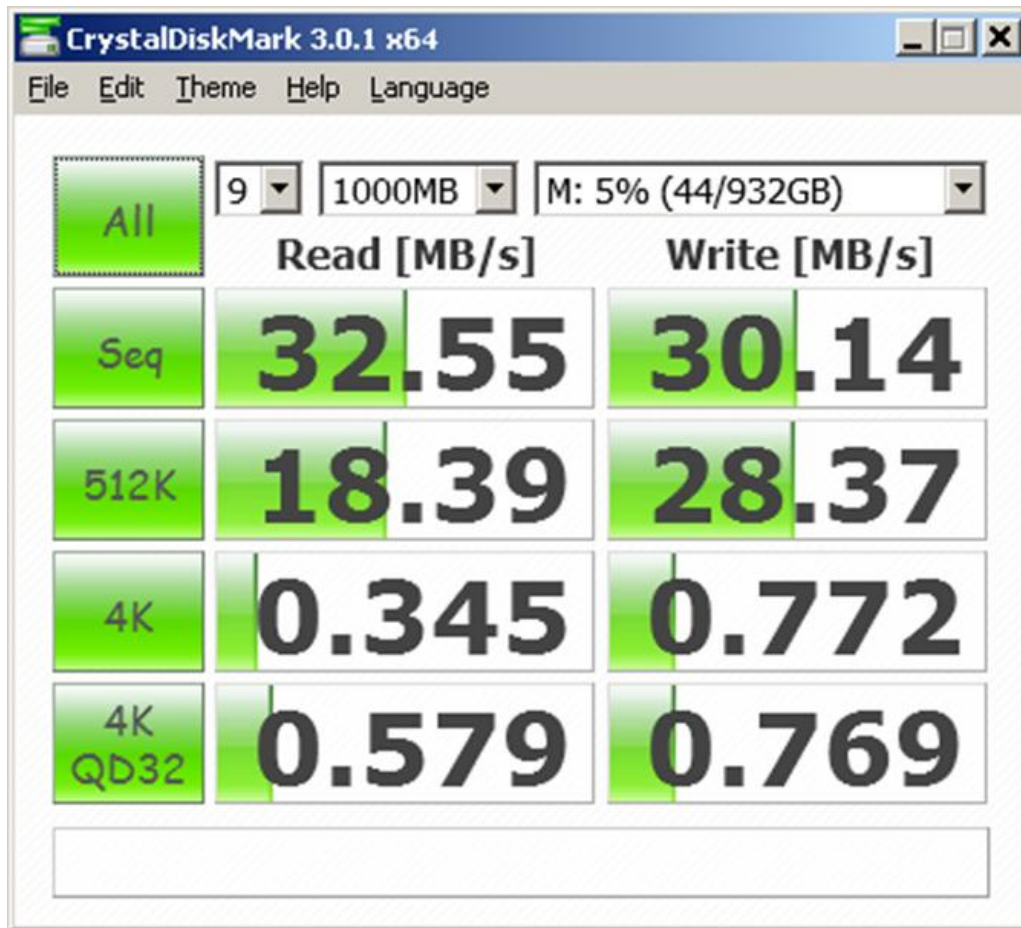
Kingwin "USB 3" external hard drive box attached to legacy "USB 2" port (that is integral to a HP Pegatron motherboard)



# RAW TEST RESULTS (continued)

TEST 4:

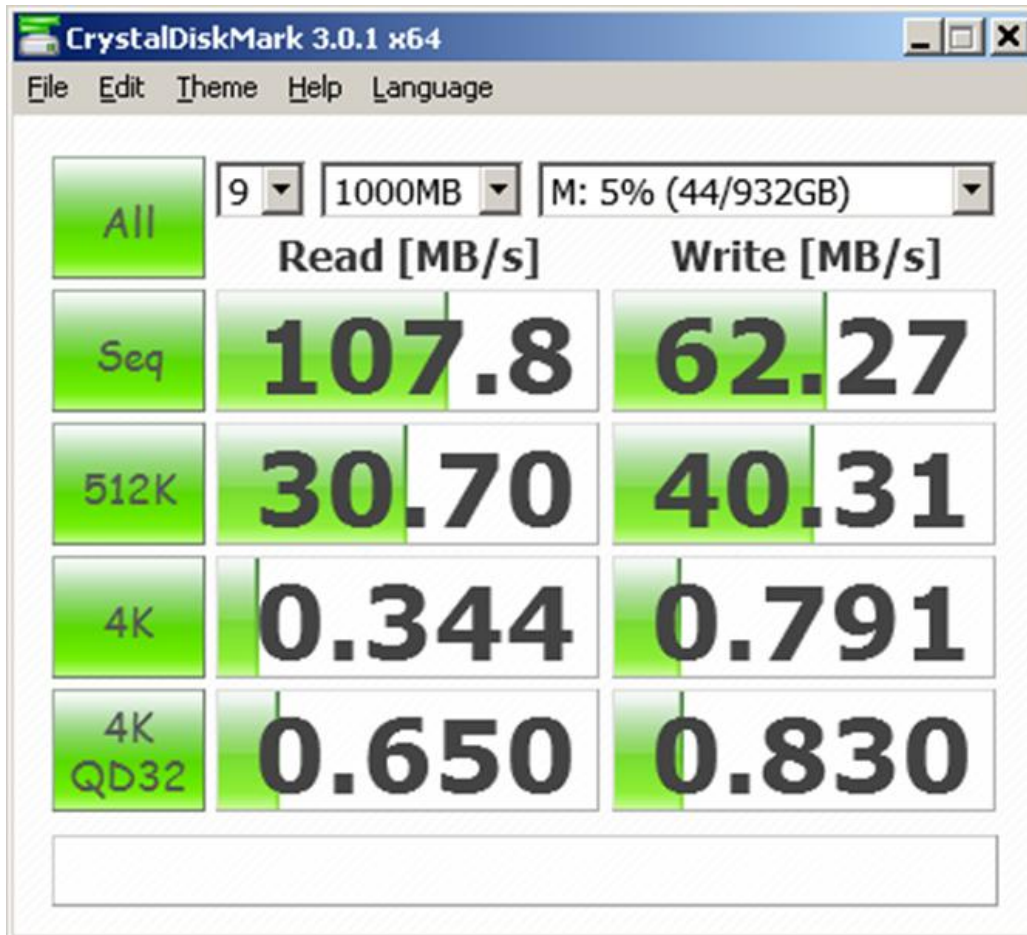
"Addonics" eSATA/USB 2 external hard drive box attached to a legacy "USB 2" port (that is integral to a HP Pegatron motherboard)



# RAW TEST RESULTS (continued)

TEST 5:

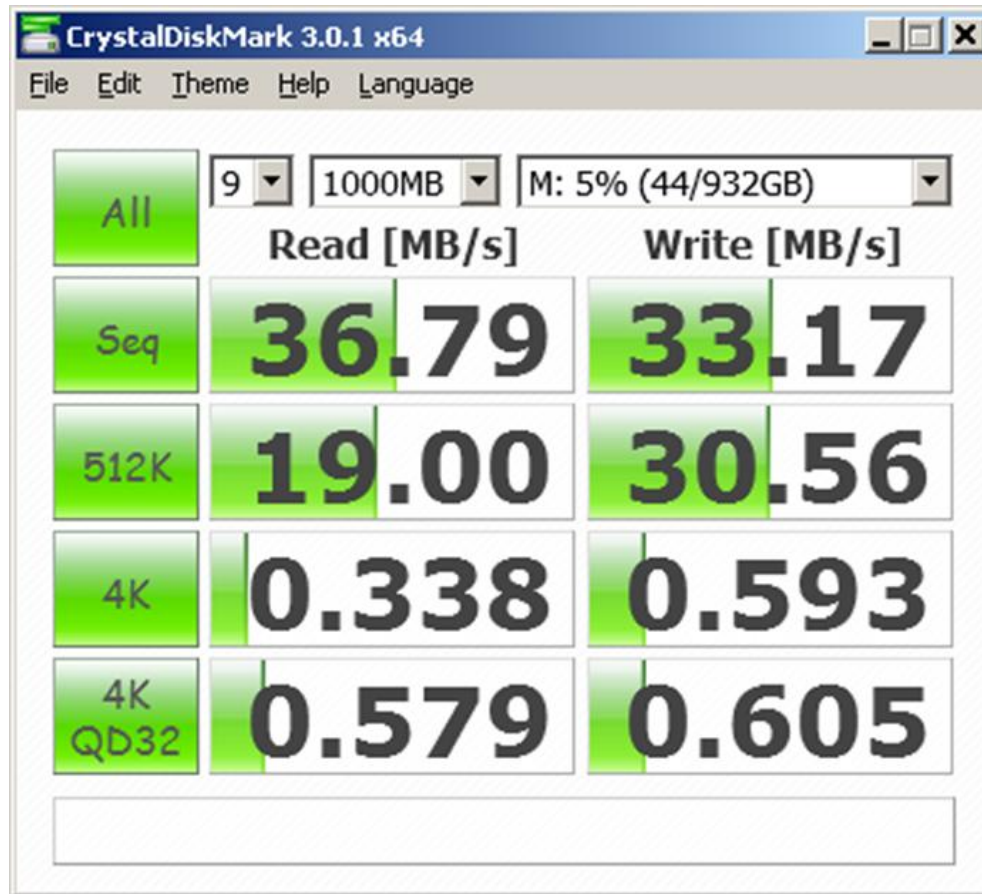
"Addonics" eSATA/USB 2 external hard drive box attached to an eSATA port that is integral to a HP Pegatron motherboard)



# RAW TEST RESULTS (continued)

TEST 6:

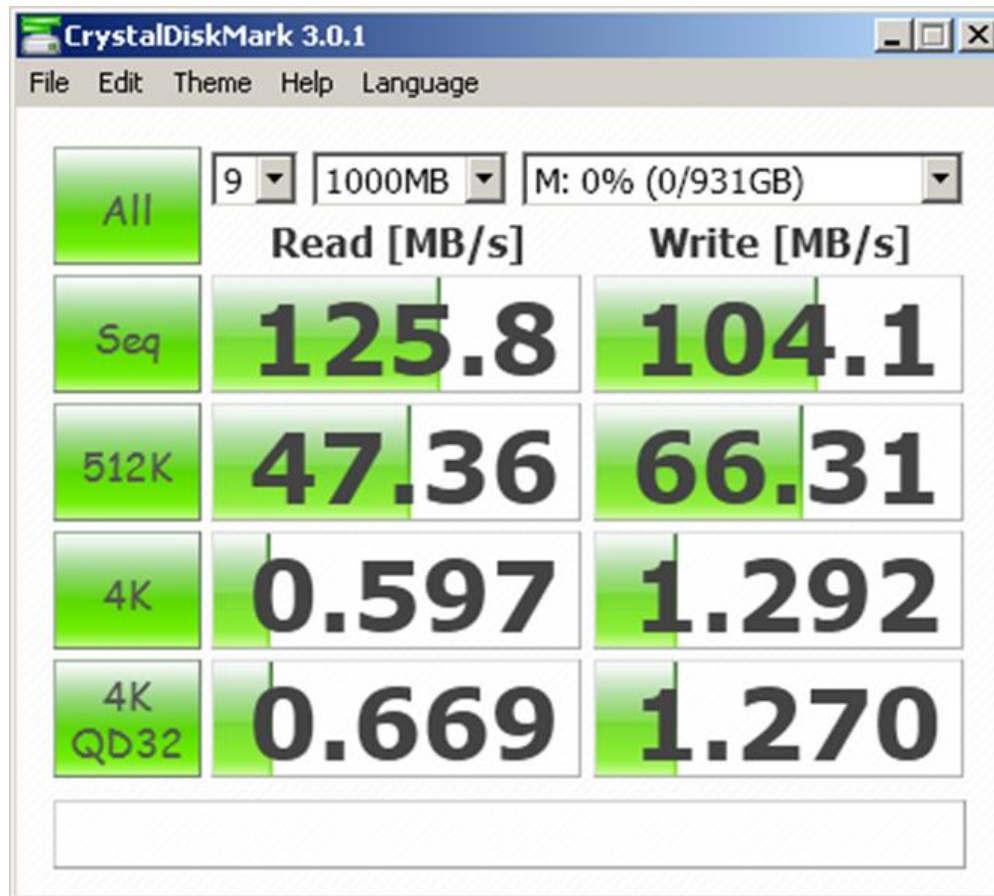
"Addonics" eSATA/USB 2 external hard drive box attached to a "USB 3" jack in a PCIe expansion controller inserted into a "PCIe version x16" expansion slot:



# RAW TEST RESULTS (continued)

## TEST 7:

"Addonics" eSATA/USB 3 external hard drive box attached to a USB 3 port that is integral to a HP DV7 laptop motherboard.

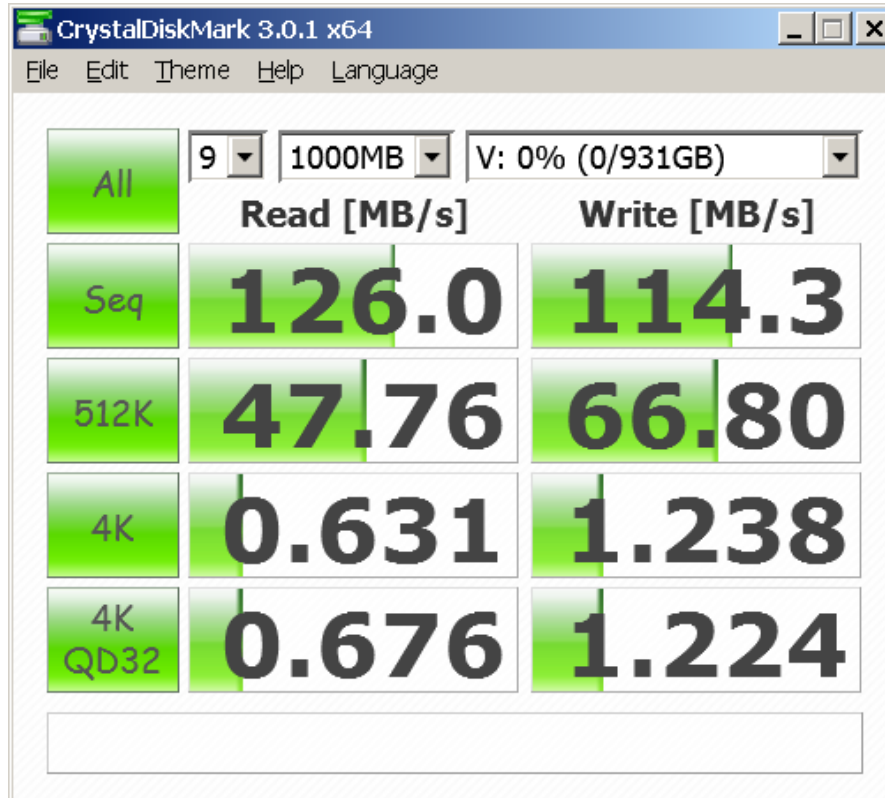


# RAW TEST RESULTS (continued)

TEST 8:

"Addonics" eSATA/USB 3 external hard drive box attached to a "USB 3" jack in a PCIe expansion controller inserted into a "PCIe version x16" expansion slot:

(This was our best test result. This test was not used in any of the conclusions which follow since this device arrived late during our tests.)



## RAW TEST RESULTS (continued)

Our “Test 8” results are similar to a comparable test that was performed by the “Addonics” company which is described at

[http://www.addonics.com/emerging\\_technologies/usb3\\_tutorial.asp](http://www.addonics.com/emerging_technologies/usb3_tutorial.asp)

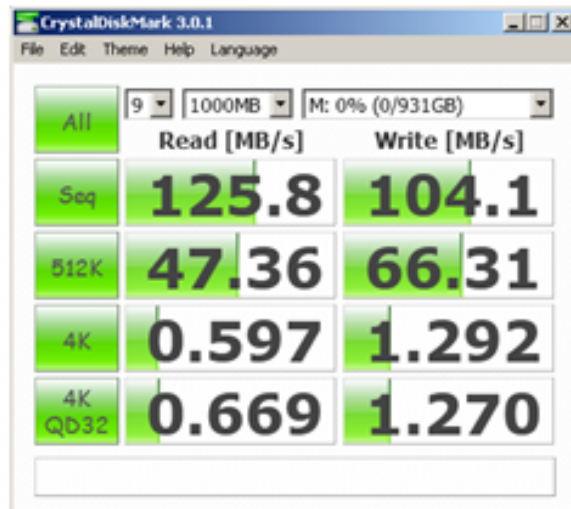
However, they used the 2.2 version of CrystalDiskMark while we used the 3.0 version of CrystalDiskMark.

# ANALYSIS OF TEST RESULTS

**"USB 3" is 2 to 3 times faster relative to "USB 2"**

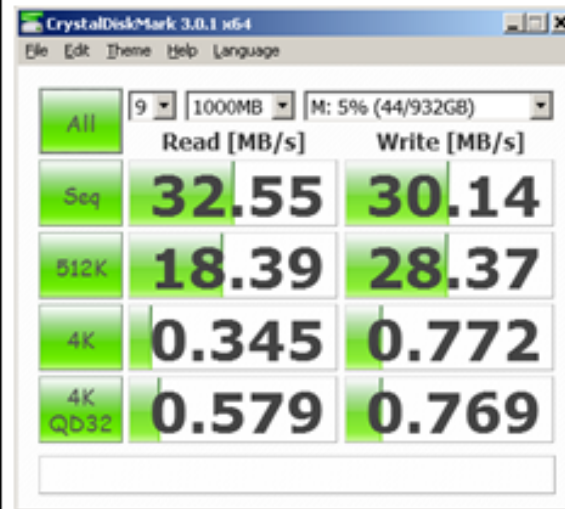
TEST 7:

**"Addonics" "USB 3"** external hard drive box attached to an on-board "USB 3" port that is integral to a HP DV7 laptop motherboard:



TEST 4:

**"Addonics" eSATA/USB 2** external hard drive box attached to a legacy "USB 2" integral port that is integral to a HP Pegatron motherboard:



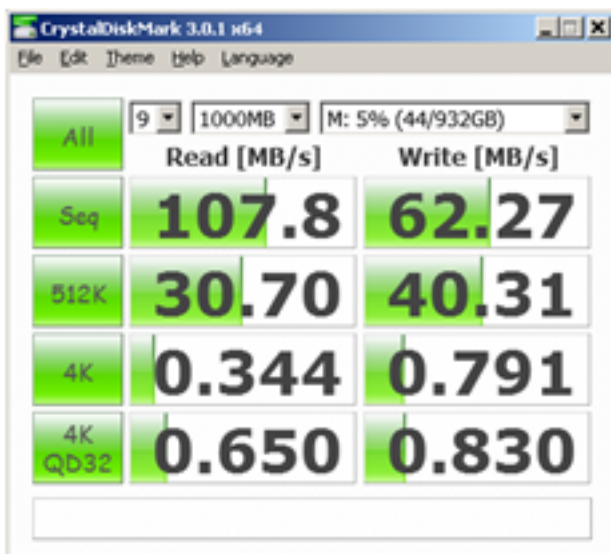
Despite what the marketing folks and their fancy ads tell you, 10X is actually about 2 1/2 X for "USB 3" relative to "USB 2".

# ANALYSIS OF TEST RESULTS (continued)

"eSATA" is a 2 to 3 times faster than **"USB 2"**

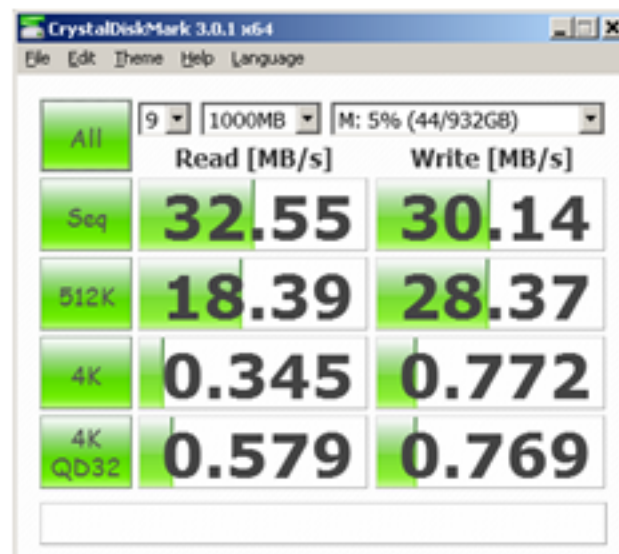
TEST 5:

"Addonics" eSATA/USB 2 external hard drive box attached to an eSATA port that is integral to a HP Pegatron motherboard)



TEST 4:

"Addonics" eSATA/USB 2 external hard drive box attached to a legacy **"USB 2"** integral port that is integral to a HP Pegatron motherboard:

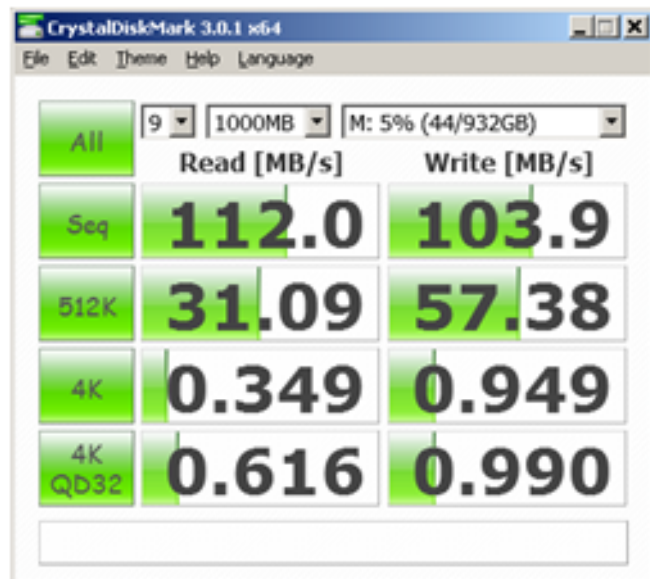


# ANALYSIS OF TEST RESULTS (continued)

**"USB 3" is a little bit faster than "eSATA"**

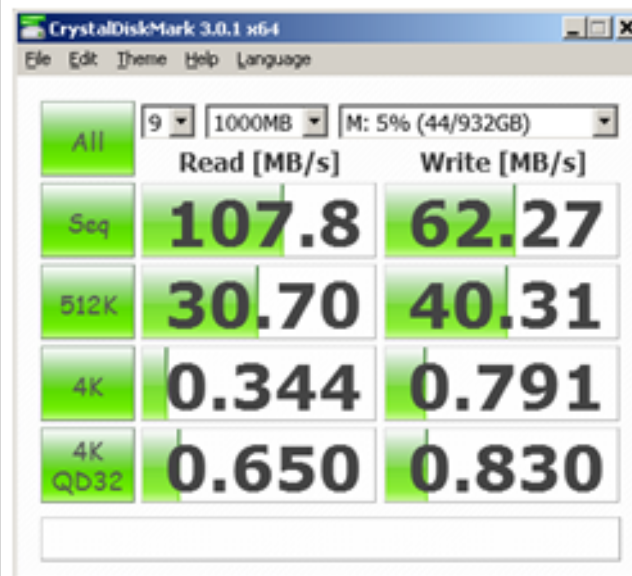
TEST 2:

**"Kingwin" "USB 3"** external hard drive box attached to a **"USB 3"** port in a **PCIe** expansion controller inserted into a **"PCIe version x16"** expansion slot:



TEST 5:

**"Addonics" eSATA/USB 2** external hard drive box attached to an **eSATA** port that is integral to a HP **Pegatron** motherboard in an HP desktop computer):

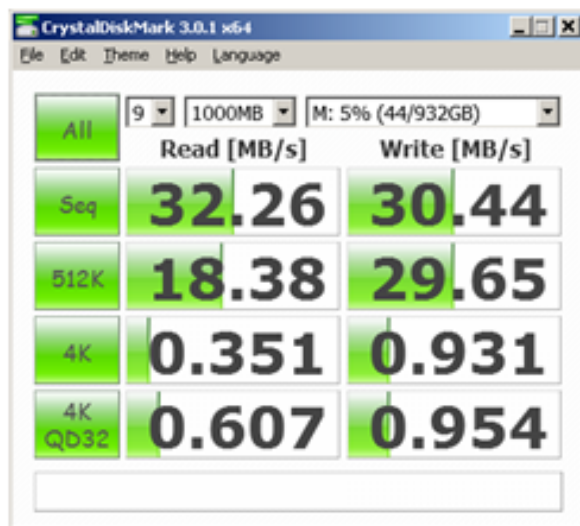


# ANALYSIS OF TEST RESULTS (continued)

When you attach a **"USB 3"** device to a **"USB 2"** port, the device will work fine but you will get **"USB 2"** data transfer speeds

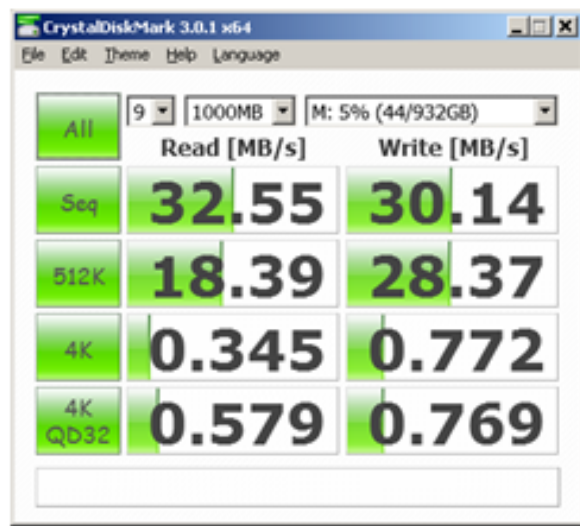
TEST 3:

Kingwin **"USB 3"** external hard drive box attached to legacy **"USB 2"** port (that is integral to a HP Pegatron motherboard in an HP desktop computer)



TEST 4:

Addonics **eSATA/USB 2** external hard drive box attached to a legacy **"USB 2"** port (that is integral to a HP Pegatron motherboard in an HP desktop computer)

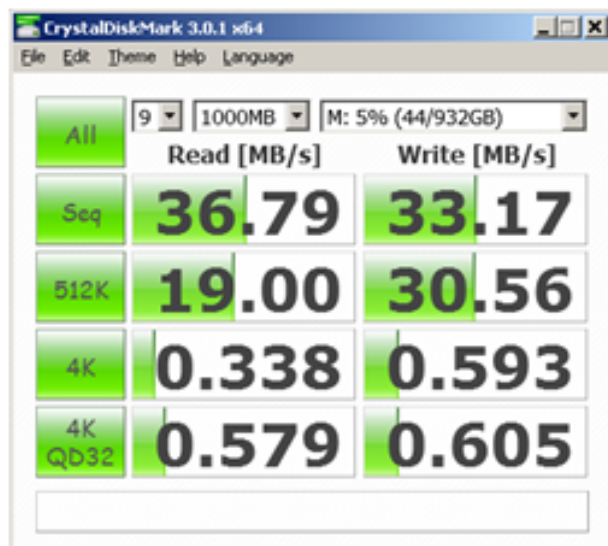


# ANALYSIS OF TEST RESULTS (continued)

When you attach a **"USB 2"** device to a **"USB 3"** port, the device will be a little bit faster relative to a connection to a **"USB 2"** port

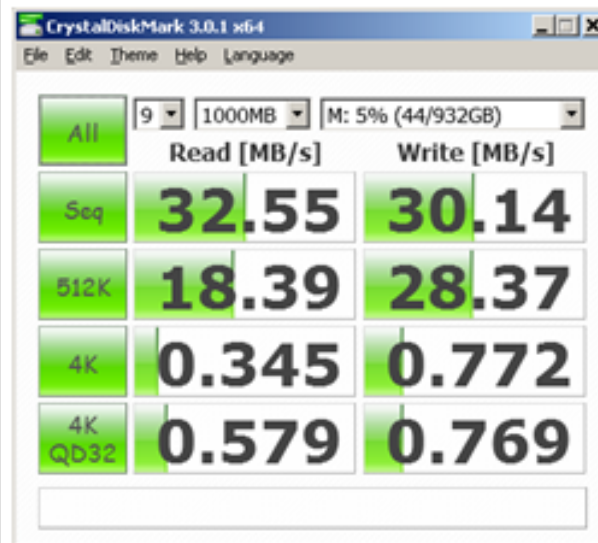
TEST 6:

"Addonics" eSATA/USB 2 external hard drive box attached to a **"USB 3"** jack in a PCIe expansion controller inserted into a PCIe version x16 expansion slot:



TEST 4:

"Addonics" eSATA/USB 2 external hard drive box attached to a legacy **"USB 2"** port (that is integral to a HP Pegatron motherboard in an HP desktop computer)

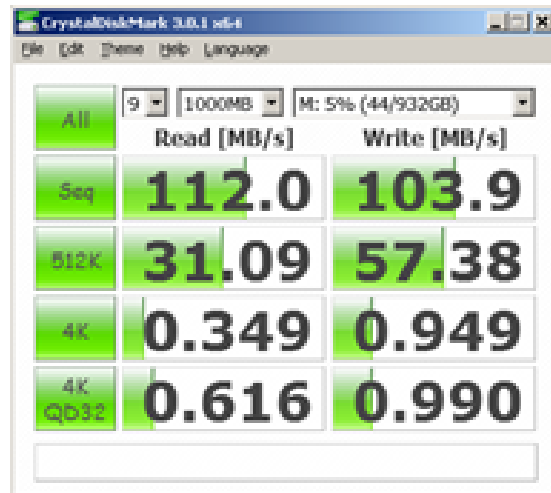


# ANALYSIS OF TEST RESULTS (continued)

A "USB 3 to PCIe" adapter will run slightly faster when inserted into a "PCIe x16" slot relative to a "PCIe x1" slot

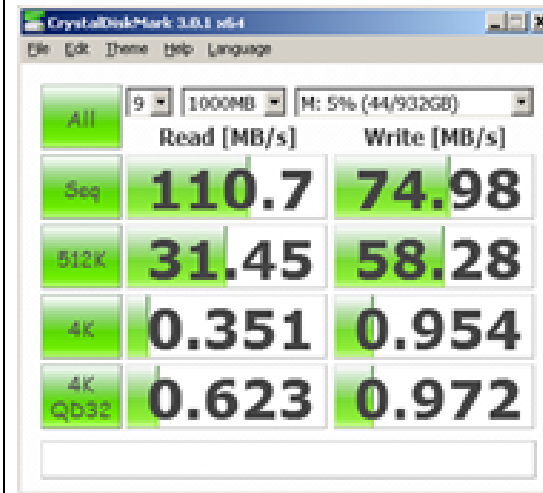
## TEST 2:

"Kingwin" "USB 3" external hard drive box attached to a "USB 3" jack in a PCIe expansion controller inserted into a "PCIe version x16" expansion slot in an HP desktop computer:



## TEST 1:

"Kingwin" "USB 3" external hard drive box attached to a "USB 3" jack in a PCIe expansion controller inserted into a "PCIe version x1" expansion slot in an HP desktop computer:



Read the fine print in the installation instructions that are packaged with any USB 3 adapters that you buy. All of the PCIe "USB 3" adapters (that we have installed) recommend the use of a "PCIe version x16" expansion slot instead of a "PCIe version x1" expansion slot.

# ACTIVE EXTENSIONS FOR "USB 2" AND "USB 3" CABLES

"Cascading" of USB hubs up to 5 "levels" is casually-mentioned once at the USB.org Web site at

[http://www.usb.org/developers/whitepapers/usb\\_20t.pdf](http://www.usb.org/developers/whitepapers/usb_20t.pdf)

"Cascading" is not a part of the official "USB 2" or "USB 3" specifications at the usb.org Web site.

# **ACTIVE EXTENSIONS FOR "USB 2" AND "USB 3" CABLES (continued)**

We have never successfully cascaded USB hubs beyond 2 levels.

(No active extensions exist for eSATA cables.)

16.4 feet (5 meter) limitation for "USB 2" cables.

The 9.8 feet (3 meter) limitation for "USB 3" cables will generate a tremendous demand for active USB 3 extension cables.

# "USB 2" Active Extension Cables

Most have fine print on the package that states that up to five 5-meter active extension cables can be chained together for a maximum of 80 feet.

Monoprice USB2-RP-16 is available at SWS for about \$19.

See the technical specs for more information.

# "USB 3" Active Extension Cables

"USB 3" Active Extension Cables:  
(Not available at "SWS" yet.  
Only available online.)

Cablemax 16-foot Active USB 3.0 Extension  
See also CableMax's description

Gearmo 65-ft. USB Extension

Manhattan Products USB Extension

# "USB 3" HUBS

The Koutech HU430 is sometimes available at SWS Electronics for about \$43