MAKE YOU OWN EXTERNAL USB HARD **DRIVES AND AND SSDs** by Francis Chao







Web location for this presentation:

http://aztcs.apcug.org Click on "Meeting Notes"

SUMMARY

The USB external hard drives, USB external hard drive enclosures, and external SSD enclosures that are available at retail have terrible reliability. You can buy good parts to "grow your own" external USB hard drives and external USB enclosures.

TOPICS Ports in a SATA Hard drive or a 2.5-in SATA SSD

- USB Adapters For Various Types of Drives
- Photos of a Do-It-Yourself "USB 3.0" Hard Drive or Enclosure
- Parts Needed for Building Your Own External Hard Drives and Enclosures

PORTS IN A SATA HARD DRIVE OR 3.5-IN. SATA SSD:

Any 3.5-in. SATA hard drive, 2.5-in. SATA hard drive, or 2.5-in. SATA solid state drive (SSD) will have the following standardized configuration consisting of a SATA power port and a SATA data port:

PORTS IN A SATA HARD DRIVE OR SATA SSD (continued):

Here is how the two ports look on an "internal" 3.5-in. hard drive:



PORTS IN A SATA HARD DRIVE OR SATA SSD (continued):

The SATA data port is the smaller port on the right:



PORTS IN A SATA HARD DRIVE OR SSD (continued):

The SATA power jack is the larger port on the left:



PORTS IN A SATA HARD DRIVE OR SSD (continued):

Here is how the two ports look on a 2.5-in. hard drive or a 2.5-in SATA Solid State Drive:



PORTS IN A SATA HARD DRIVE OR SSD (continued):

To connect a SATA hard drive or 3.5-inch SATA SSD to a computer, you have to make two connections: a connection to the SATA data port and

a connection to the SATA power port.

USB ADAPTERS FOR THE VARIOUS TYPES OF DRIVES

- Powered USB adapters for spinning 3.5inch hard drives, spinning 2.5-inch hard drives, 2.5-inch SATA SSDs, and and internal DVD/CD/Blu-ray drives
- Unpowered USB adapters for spinning 2.5inch hard drives and 2.5-inch SATA SSDs
- Unpowered USB enclosures, extenders, and coolers for SATA M.2 SSDs
- Unpowered USSB enclosures, extenders,

POWERED USB DRIVE ADAPTERS

Powered USB drive adapters are versatile since they can connect spinning 3.5-inch hard drives, spinning 2.5-inch hard drives, 2.5inch SATA SSDs, and internal DVD/CD/Blu-ray drives

POWERED USB DRIVE ADAPTERS (continued) https://www.amazon.com/Tripp-

- <u>https://www.amazon.com/Tripp-</u>
 <u>Lite-SuperSpeed-Adapter-U338-</u>
 <u>06N/dp/B01N0VKR6L/</u>
- This model of USB drive adapter is very versatile: In some situations, it can even be used to attach to a hard drive that is mounted inside a computer case.



Tripp Lite USB 3.0 SuperSpeed to SATA/IDE Adapter w/Built-in USB Cable 2.5in / 3.5in / 5.25in Hard Drives (U338-06N) Visit the Tripp Lite Store 4.5 228 ratings

-14% \$**32**82

Typical price: \$38.24 🔒

With Amazon Business, you would have saved \$306.28 in the last year. Create a free account a save up to 10% today.

Not aliaible for Amazon Drime, Available with

POWERED USB DRIVE ADAPTERS (continued)

- <u>https://www.amazon.com/AGPtek-</u>
 <u>Drive-Adapter-Converter-</u>
 <u>External/dp/B00BIE996S/ref=sr 1 13</u>
 <u>?crid=1FYL6HB5UUKCI</u>
 - This model of USB drive adapter is also very versatile but it only runs a USB 2.0 speeds



Roll over image to zoom in

\$**16**⁹⁹

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UNPOWERED USB ADAPTERS FOR SPINNING 2.5-INCH HARD DRIVES AND 2.5-INCH SATA SSDS

 Unpowered USB drive adapters are usually less expensive than powered USB drive adapters but they cannot be used with 3.5-inch hard drives

UNPOWERED USB ADAPTERS FOR SPINNING 2.5-INCH HARD DRIVES AND 2.5-INCH SATA SSDS (continued)

- <u>https://www.amazon.com/StarTech-</u> <u>com-USB-SATA-Adapter-</u> <u>USB31CSAT3CB/dp/B0133F30R8/</u>
 - This unpowered USB drive adapter has a USB-C plug:





StarTech.com USB C to SATA Adapter -External Hard Drive Connector for 2.5" SATA Drives - SATA SSD / HDD to USB C Cable (USB31CSAT3CB) Black

Visit the StarTech Store

Amazon's Choice

in SATA Cables by StarTech

-27% \$**23**99

List Price: \$32.99 🔒

UNPOWERED USB ENCLOSURE FOR SATA M.2 SSDS

- The older M.2 SSDs are SATA SSDs.
 The newer, current M.2 SSDs are NVMe SSDs.
 - Here is a USB enclosure for the older SATA M.2 SSDs:

https://www.amazon.com/SSK-

Aluminum-Enclosure-External-

Based/dp/B07MKCG5ZG/



SSK Aluminum USB 3.2 Gen 1 to M.2 SATA NGFF SSD Enclosure Adapter, External SATA Based M.2 Solid State Drive Enclosure Reader (for M.2 SATA SSD only) Visit the SSK Store

\$1199

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UNPOWERED USB ENCLOSURE FOR NVMe M.2 SSDS

 The older M.2 SSDs are SATA SSDs.
 The newer, current M.2 SSDs are NVMe SSDs.

Here is a USB enclosure for the newer NVMe M.2 SSDs:

https://www.amazon.com/gp/product /B08GR2NJT2/ref=ppx yo dt b searc h asin title?ie=UTF8&psc=1



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LENTION USB C & A to NVMe M.2 SSD Enclosure, USB 3.1 Gen 2 M Key, B&M Key Hard **Drive Adapter, Supports** M.2 SSD Size 2280/2260/2242/2230 , Compatible Mac OS, Windows, Chrome OS, More(CB-C9s, Space Gray) Visit the LENTION Store 4.1 ★★★★☆ × 30 ratings

^{\$2699}

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FAN COOLER FOR A M.2 SSD

If you are going run a SATA M.2 SSD or an NVMe SSD in a USB enclosure for an extended length of time (to attempt to recover data files), it is best to install fan cooler to keep the M.2 SSD from overheating. If you install a fan cooler for an M.2 SSD, you will also need a power supply and a "Molex"-to-pulse width 28

FAN COOLER FOR A M.2 SSD (continued)

Here is a good fan cooler for a SATA M.2 SSD or an NVMe M.2 SSD: https://www.amazon.com/gp/product/B

<u>096WTJMQ4/ref=ppx yo dt b search a</u> sin title?ie=UTF8&psc=1

29



Titanium Micro TMHSFM3 Nitro M.2 NVME 2280 Heatsink Dual Cooler with 30mm PWM Fan

Visit the Titanium Micro Store 4.2 $\Rightarrow \Rightarrow \Rightarrow \Rightarrow \Rightarrow \Rightarrow 37$ ratings

-6% \$**28**99

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List Price: \$30.99 🔒

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FAN COOLER FOR A M.2 SSD (continued)

 Here is a good "Molex to Pulse Width Modulation" adapter for powering up a fan cooler for a SATA M.2 SSD or a SATA NVME SSD:

https://www.amazon.com/gp/product /B07VS6MSC9/ref=ppx_yo_dt_b_sear

ch asin title?ie=UTF8&psc=1

Siyu Xinyi 4-Pin Molex to4 x 3 Pin / 4 Pin PMW 12V PC Case Fan Power Adapter Cable, 3-Pin or 4-Pin (PWM Connector) to Molex Computer Cooler Cooling Fan Splitter Y Power (Large 4P to 3P Cable) Brand: SiyuXinyi 4.7 22 ratings

\$**7**88

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FAN COOLER FOR A M.2 SSD (continued)

- Here is a good power supply for powering up a fan cooler for a M.2 SSD
- <u>https://www.amazon.com/gp/product</u> /B084JG4619/ref=ppx yo dt b searc
 <u>h asin title?ie=UTF8&psc=1</u>



Coolerguys 12V Fan Power Supply, Length: 5ft, Input Power: 100-240vAC, Output Power: 12vDC Volts, Multi-Functional, Highly Compatible Visit the coolerguys Store 4.6 569 ratings

\$**7**⁹⁹

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within 30 days of receipt 🐱

Brand Cool

Coolerguys

Commentiale Developed Commentary

SATA power plug from SATA-to-USB 3 adapter or from computer's power supply

To molex-to-SATA power converter cable

To molex jack of hard drive cooler



FAN COOLER FOR 3.5-IN. HARD DRIVES

- <u>https://www.amazon.com/Evercool-</u> <u>Wheel-Cooler-Silver-HD-CW-</u> <u>SR/dp/B07FDW4BNX/</u>
- These coolers help keep a 3.5-in. hard drive from getting too hot when a USB adapter is used, since a hard drive that connects by means of a USB drive adapter usually ends up outside of the fans of a computer 37



Evercool Cool Wheel 3.5" Hard Drive Cooler Silver Cover Red Fan HD-CW-SR Brand: Evercool

^{\$12°°}

Eligible for Return, Refund or Replacement within 30 days of receipt ~

Brand	Evercool
Voltage	12 Volts
Noise Level	23 dB
Material	Aluminum,Silver

Report incorrect product information.

FAN COOLER FOR A 3.5-IN. HARD DRIVE: (continued)

• If you use a Y-splitter cable and a SATA powerto-Molex adapter cable to split the power side of a "SATA-to-USB 3" adapter so that it provides power to both the hard drive cooler and the hard drive, you sometimes end up with a intermittent hard drive. When this happens, you might have provide a separate "SATA-to-USB 3" adapter to power the hard drive cooler.

PARTS LIST FOR A DO-IT-YOURSELF "USB 3.0" HARD DRIVE OR HARD DRIVE ENCLOSURE

- Powered or non-powered SATA-to-USB 2.0 adapter
- Given Search Fan assembly
- □Surge strip or power outlet cord
- Assorted Cable ties

PHOTOS OF A DO-IT-YOURSELF "USB 3.0" HARD DRIVE OR ENCLOSURE

• Here are 4 photos of a do-it-yourself "USB 3.0" hard drive that I built:









ATTACHING AN INTERNAL HARD DRIVE OR AN SSD TO YOUR COMPUTER WITH A SATA DATA CABLE AND A SATA **POWER CABLE** To connect an internal hard drive or a SATA-type SSD to your computer as cheaply as possible, you can use SATA data cables and/or SATA power extension cables instead of USB enclosures/adapters: 46

ATTACHING AN INTERNAL HARD DRIVE OR AN SSD TO YOUR COMPUTER WITH A SATA DATA CABLE AND A SATA **POWER CABLE (continued)** Be sure to power down your

computer before you make these two connections.

ATTACHING AN INTERNAL HARD DRIVE OR AN SSD TO YOUR COMPUTER WITH A SATA DATA CABLE AND A SATA POWER CABLE (continued)

Then you will probably will have to fiddle with the BIOS or UEFI of the computer in order to get the motherboard to recognize the drive. ATTACHING AN INTERNAL HARD DRIVE **OR AN SSD TO YOUR COMPUTER WITH** A SATA DATA CABLE AND A SATA **POWER CABLE (continued)** For SATA hard drives and SSDs, the plugs at the end of SATA power and SATA data cables are "female" and the corresponding receptacle ports on the SATA hard drives and SSDs are "male". 49

ATTACHING AN INTERNAL HARD DRIVE OR AN SSD TO YOUR COMPUTER WITH A SATA DATA CABLE AND A SATA **POWER CABLE (continued)** Here is a good quality 40-inch SATA data cable that you can use to connect a SATA port on a motherboard to the SATA data port of 3.5-in. hard drive, a 2.5-in. hard drive, or a SATA-type SSD 50



Roll over image to zoom in

Micro Connectors F03-152 SATA III (6Gb) Data Cable Straight, 1 Meter Visit the MICRO CONNECTORS Store

\$**10**⁶⁰

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Color: Red



Size: 40" (STRAIGHT)

ATTACHING AN INTERNAL HARD DRIVE OR AN SSD TO YOUR COMPUTER WITH A SATA DATA CABLE AND A SATA POWER CABLE (continued)

https://www.amazon.com/dp/B000G G1QEW/ref=twister B07P44DNQ1?th =1 ATTACHING AN INTERNAL HARD DRIVE OR AN SSD TO YOUR COMPUTER WITH A SATA DATA CABLE AND A SATA **POWER CABLE (continued)** Here is a good SATA power extension cable that you can use to connect a SATA power pigtail cable on the power suppy of the computer to the SATA data port of 3.5-in. hard drive, a 2.5-in. hard drive, or a SATA-type SSQ



Roll over image to zoom in

CRJ SATA Power Extension Cable with High Density Black Sleeving 24" Length (1-Pack)

Visit the CRJ Electronics Store ★★★★★ 245 ratings | 4 answered questions

Lowest price in 30 days

-11% \$**7**99

Was: \$8.99 🚹

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FREE Returns ~

Get a \$100 Amazon Gift Card instantly upon approval for the Amazon Prime Rewards Visa Card. No annual fee.

Size: 1-Pack

1-Pack	2-Pack
Brand	CRJ Electronics
Connector Type	Sata 15-pin Male Power Connector
Color	Black
Connector Gender	Male-to-Female

ATTACHING AN INTERNAL HARD DRIVE OR AN SSD TO YOUR COMPUTER WITH A SATA DATA CABLE AND A SATA **POWER CABLE (continued)** https://www.amazon.com/CRJ-Power-**Extension-Density-**Sleeving/dp/B0711M91D4/ref=sr 1 23?cri d=17K8W7N1ODPTQ&keywords=sata%2Bp ower%2Bcable&qid=1675481118&sprefix=s ata%2Bpower%2Bcable%2Caps%2C165&sr= 8-23&th=1 55

THREE WAYS TO ATTACH AN INTERNAL HARD DRIVE TO A "WINDOWS.." COMPUTER: • Method 0:

- USB hard drive enclosure
- Method 1: SATA data cable and SATA power cable
- Method 2: USB to SATA adapter