

7-Port USB Hub for Raspberry Pi

User Manual

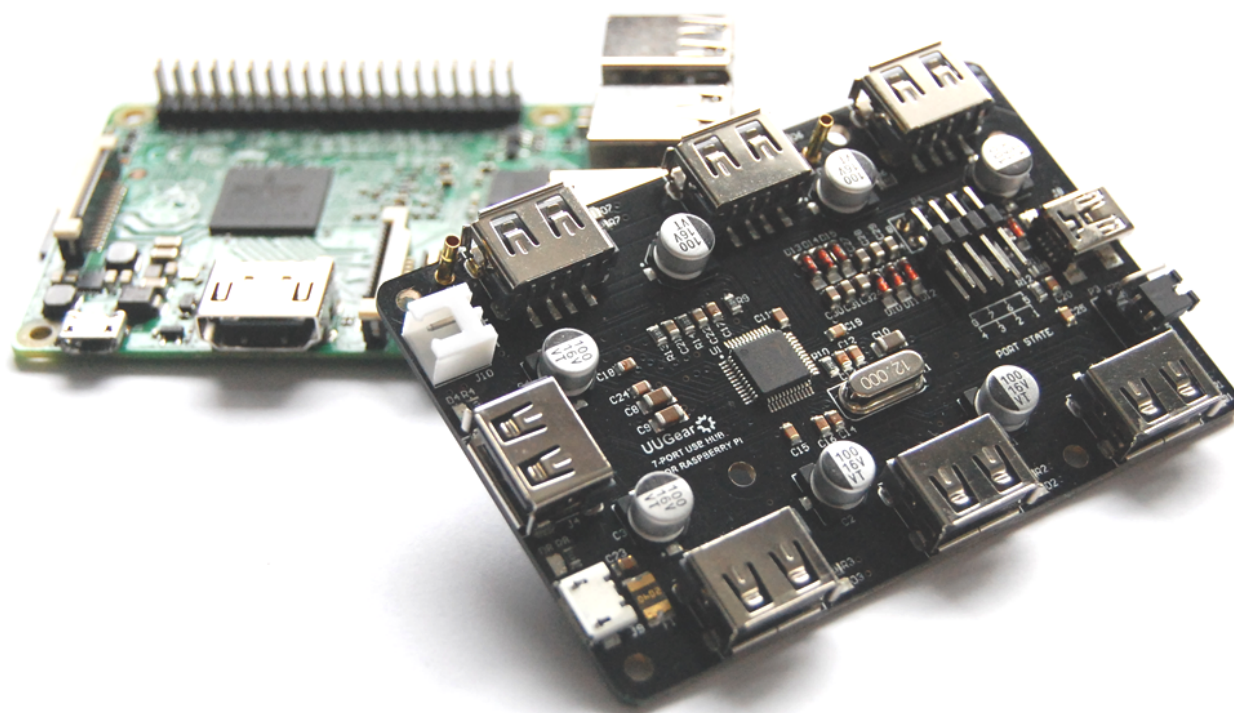


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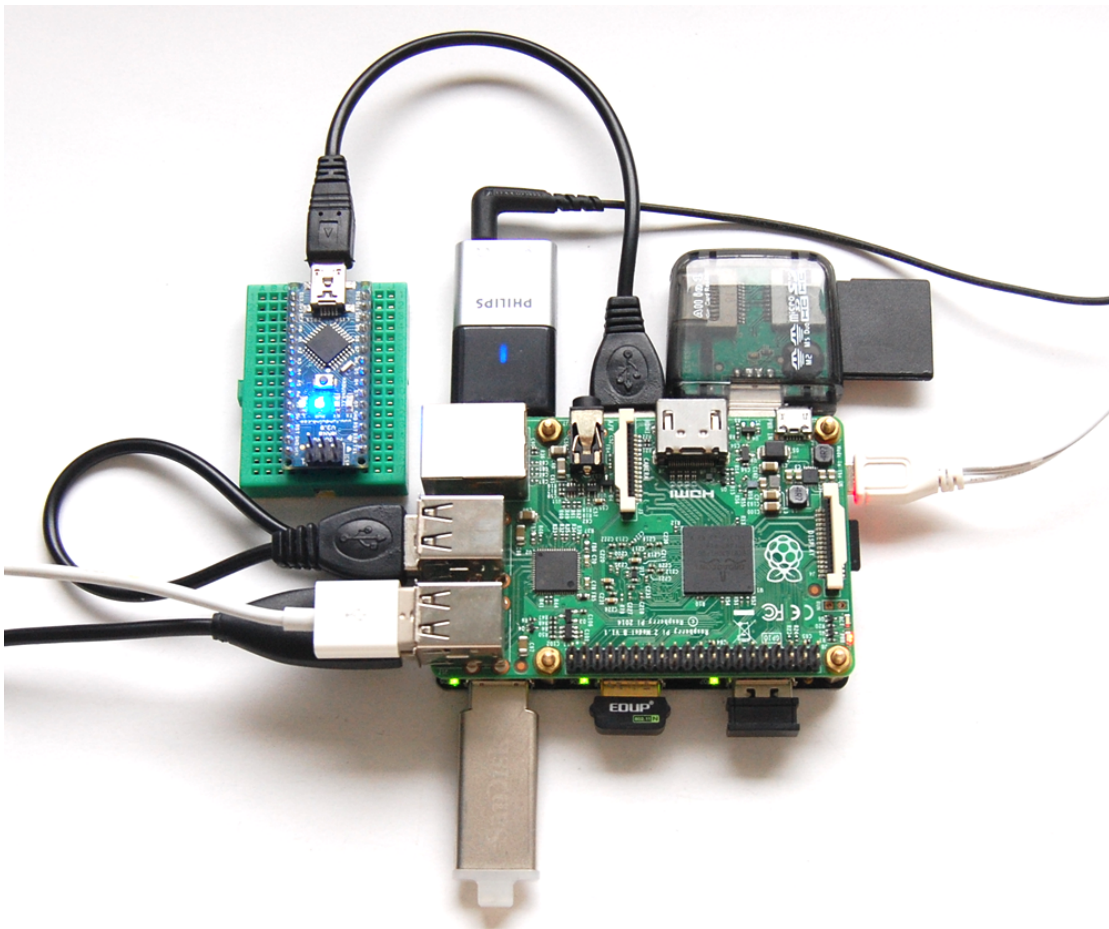
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Product Overview

This is a 7-Port USB hub designed for Raspberry Pi. It extends one USB port on Raspberry Pi to 7 usable USB ports, which allows you to connect much more USB devices to your Raspberry Pi.

This USB hub is compatible with all versions of Raspberry Pi, including the old A/B model, A+/B+ model, compute module (with development kit), Raspberry Pi 2 (B model) and Raspberry Pi Zero.

The board size of this USB hub is the same with Raspberry Pi B+ or Raspberry Pi 2 (B model). The old Raspberry Pi A and B model also have the same size, except that they don't have those rounded corners. This USB hub has 6 mounting holes at correct positions and could be mounted under any Raspberry Pi model except the compute module.



Both Raspberry Pi B+ and Raspberry Pi 2 (B model) have 4 USB ports on board, which are usually enough if you are using these two models of Raspberry Pi. However, sometimes you may still need more USB ports. Below are some USB devices you may

want to connect to your Raspberry Pi:

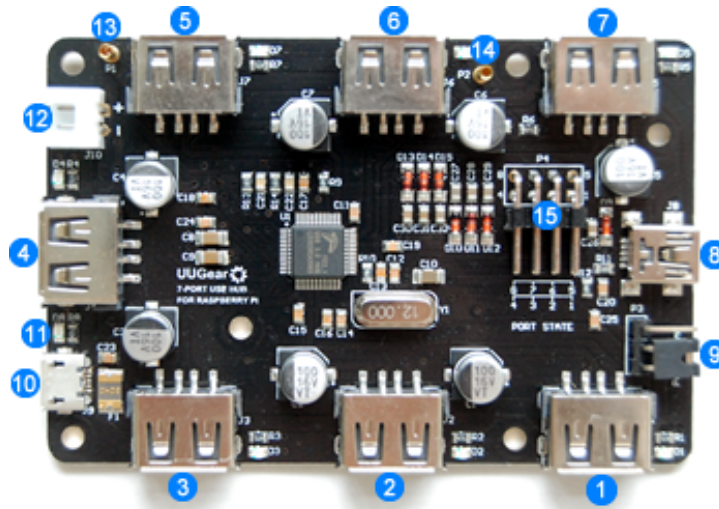
			
Keyboard	Mouse	Wi-Fi Dongle	3G Dongle
			
Flash Drive	Portable Hard Disk	USB Audio Card	SD Card Reader
			
Bluetooth Adapter	Arduino Board	USB Logic Analyzer	USB Camera

Of course you may not want to connect all of them at a time. The point is that sometimes you may need more than 4 USB ports. As for the A/B/A+/Zero model and the compute module with development kit, they have only one or two USB ports and undoubtedly need a USB hub in the major of cases.

For different models of Raspberry Pi, this USB hub uses different approaches to (optionally) back-power the Raspberry Pi, which significantly simplifies your wiring and allows you to power both the USB hub and Raspberry Pi with only one power supply.

There are also 7 digital output pins on board, which can tell whether a USB port is in used. These output pins are in 3.3V level and can be directly connected to Raspberry Pi's GPIO pin, or connected to an external microcontroller.

The figure below shows how the USB hub looks like:

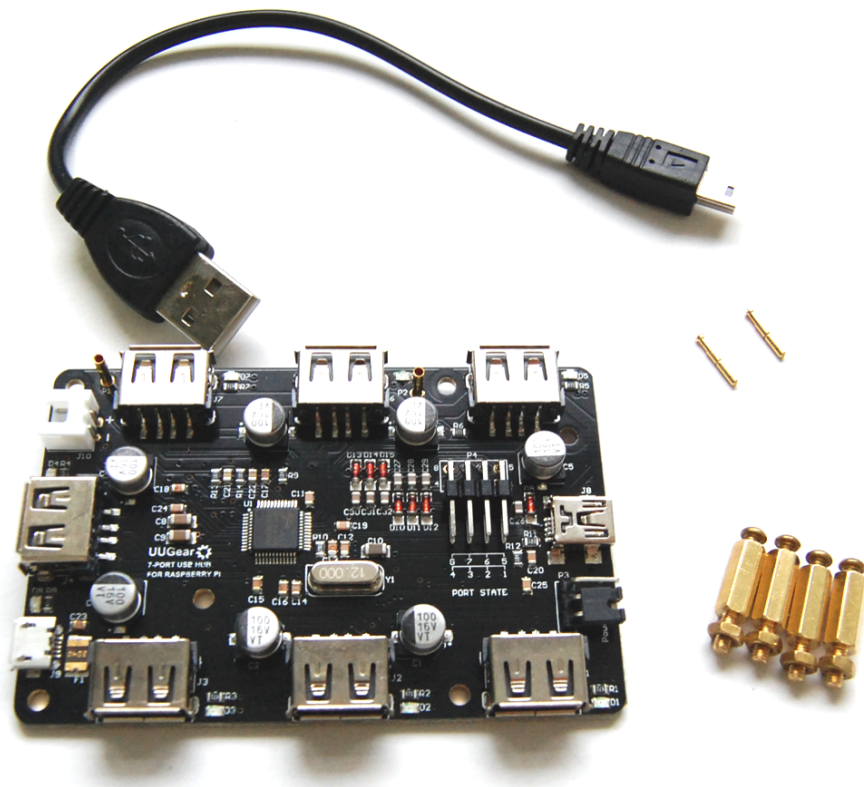


- 1~7) Downstream USB port with green LED as activity indicator
- 8) Upstream USB port
- 9) Power link jumper
- 10) Micro-USB DC 5V power in
- 11) Red LED as power indicator
- 12) Alternative DC 5V power in
- 13) Pogo pin holder (+5V)
- 14) Pogo pin holder (GND)
- 15) 4x2 header for digital output pins (port state)

Package Content

Each package of this USB hub contains:

- 7-port USB hub board x 1
- USB to mini USB cable x 1
- Crown head pogo pin x 2
- M2.5 x 10+6mm Copper Standoff x 4
- M2.5 screws x 4
- M2.5 nuts x 4



Specifications

Dimension:	85mm x 56mm x 10mm
Weight	29g (net weight without any accessory)
Standards	USB Specification Revision 2.0 and 1.1 compatibility Multiple Transaction Translator (MTT)
Data Speed	USB v1.1: 12 Mbps USB v2.0: 480 Mbps
USB Ports	Upstream: 1 (mini-USB) Downstream: 7
LED Indicators	Power: 1 (red) Port Activity: 7 (green)
Power Mode	Bus-Power / Self-Power
Output Voltage	DC 5V
Output Current	Bus-Power: maximum 500mA for all ports Self-Power: maximum 2A for all ports
Static Current	4mA
Operating Temperature	0°C~70°C
Storage Temperature	-20°C~60°C
Humidity	0~80%RH, no condensing

About Back-Power (Back Feeding Power)

Back-power (or back feeding power) here means the USB hub provides electronic power to Raspberry Pi. This can only (optionally) happen when the USB hub gets power supply connected (works in self-power mode). The advantage of back-power is that you only need one power supply to power both the USB hub and Raspberry Pi.

Some people may not like back-power, but it works without problem unless you connect two power supplies and let them fight with each other. So if you choose back-powering, make sure you only connect one power supply to the USB hub, and do not connect any power supply to the micro USB port on Raspberry Pi.

Some models of Raspberry Pi allow back-powering via the USB port, but some do not. There are two pogo pins in the package and they could be used to back-power Raspberry Pi via the 40-pin GPIO header, when back-powering via USB is not supported by Raspberry Pi.

About Powering Mode

A USB hub could be powered by the USB bus (bus-power mode), or be powered by the power supply (self-power mode). Bus-power mode is simpler as it does not need to have external power supply, but it has quite limited ability to power the devices on the USB hub. When you are trying to power more devices with higher current, it is recommended to use the self-power mode.

This USB hub supports both bus-power mode and self-power mode.

Bus-Power Mode

If you only connect USB devices that consume very small current to the USB hub, you can consider using the bus-power mode. Just make sure the jumper is at “power link” position (which is the default setting) and do not connect power supply to the USB hub.

When you use a USB - miniUSB cable to connect a USB port on Raspberry Pi and the upstream USB port on the USB hub, the USB hub will be powered too (taking power from the USB bus). In this case, the USB hub is working in bus-power mode, and the maximum output current for all ports are 500mA, according to the USB standard.

Remarks: If you are using the first revision of Raspberry Pi A/B, each USB port on it has a 140mA polyfuse, which will reduce the maximum output current to about 100mA. In this case, it is strongly recommended to use the self-power mode instead.

Self-Power Mode

If you connect the power supply to the micro USB port (power in) on the USB hub, the USB hub will work in self-power mode, or say it becomes a powered USB hub. In this case the maximum output current for all USB ports are 2,000mA.

If the USB hub is also back-powering your Raspberry Pi, the current consumed by Raspberry Pi is also taken into account. For example, if Raspberry Pi consumes 260mA, then the maximum output current for all USB ports will become 1,740mA.

About MTT and STT

A USB hub may have two possible ways for organizing Transaction Translators (TTs). A USB hub could have one TT for all downstream ports that have USB devices attached (which is called Single Transaction Translator, STT), or the USB hub could have one TT for each downstream port (which is called Multiple Transaction Translator, MTT) .

For Single Transaction Translator (STT), connecting one USB 1.1 device to the hub will force all ports to process data with USB 1.1 standard, thus slowing down all USB devices on the same USB hub. While for Multiple Transaction Translator (MTT), each downstream port has its own transaction translator to provide the best USB performance no matter what class of USB device is connected.

So MTT is better than STT, if the higher price is acceptable.

This USB hub has Multiple Transaction Translator (MTT).

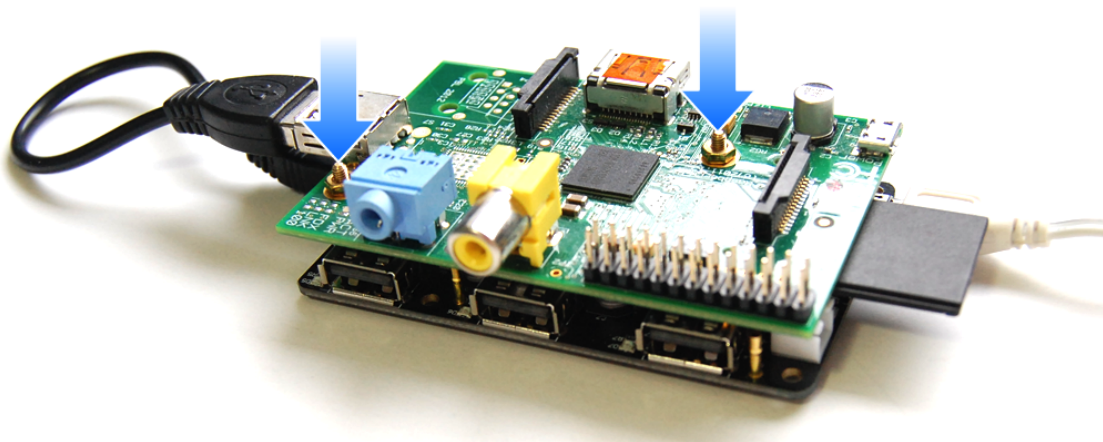
Usage Guide

This USB hub can work with all models of Raspberry Pi. However, the mounting and wiring may be different for various models. Please read the sections below for details.

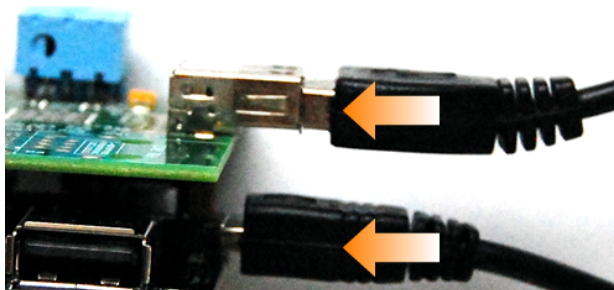
Raspberry Pi Model A and B

The old models of Raspberry Pi (A and B model) only have two mounting holes, so we only need two sets of copper standoff, screw and nut to mount the USB hub under it. The pogo pins should not be used in this case.

The mounting is very straightforward, just put the USB hub under Raspberry Pi and place the copper standoffs between the USB hub and Raspberry Pi (align to the mounting holes), and tighten the two ends of standoff with screw and nut. Our suggestion is to put the screws at the bottom of the USB hub and put the nuts on the top surface of the Raspberry Pi board.

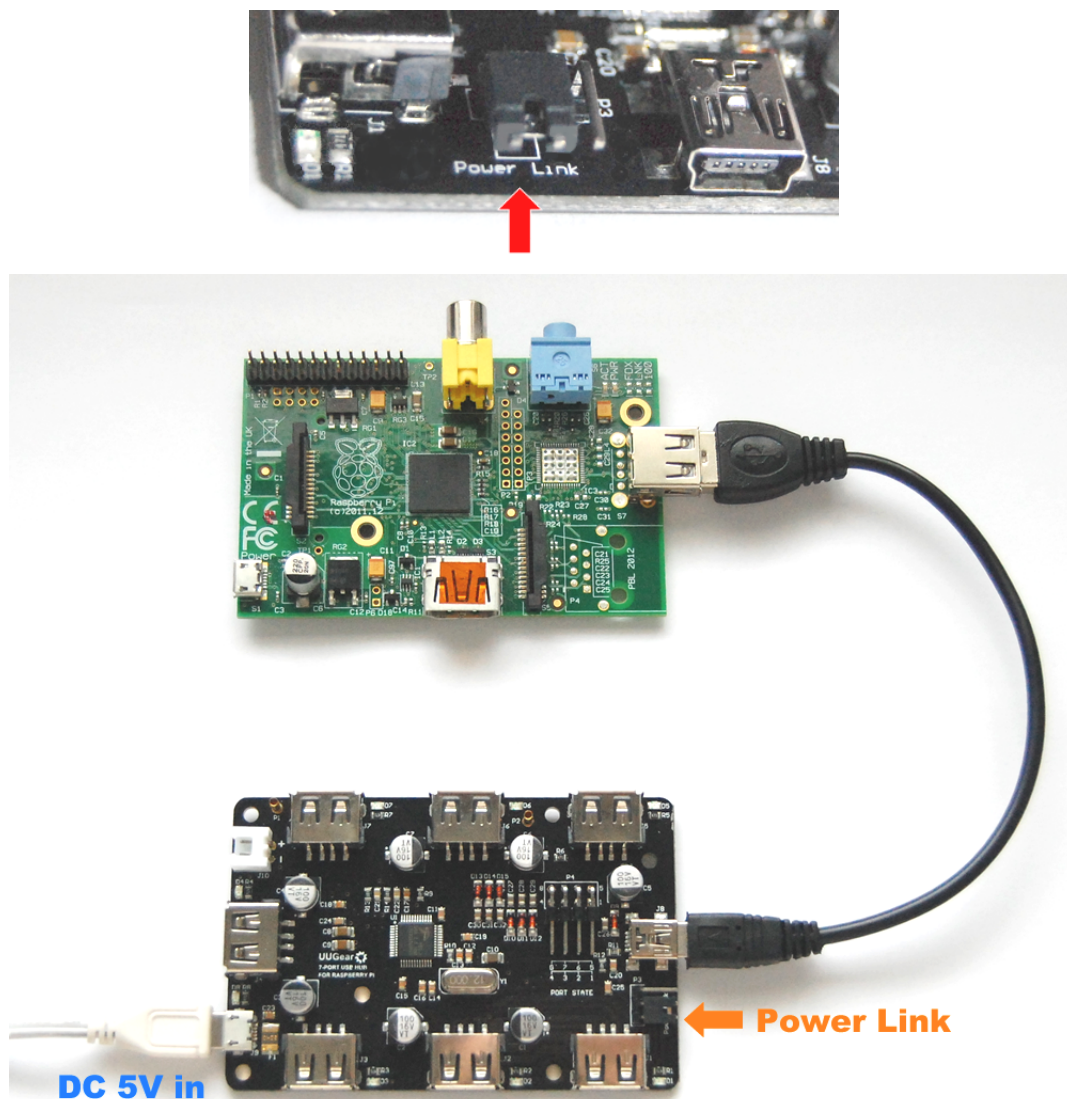


Use the USB - mini USB cable to connect the USB port on Raspberry Pi and the mini USB port on the USB hub and then it will be ready to work.

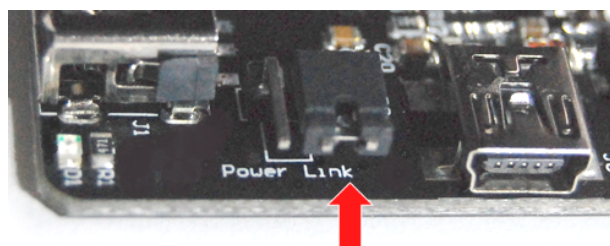


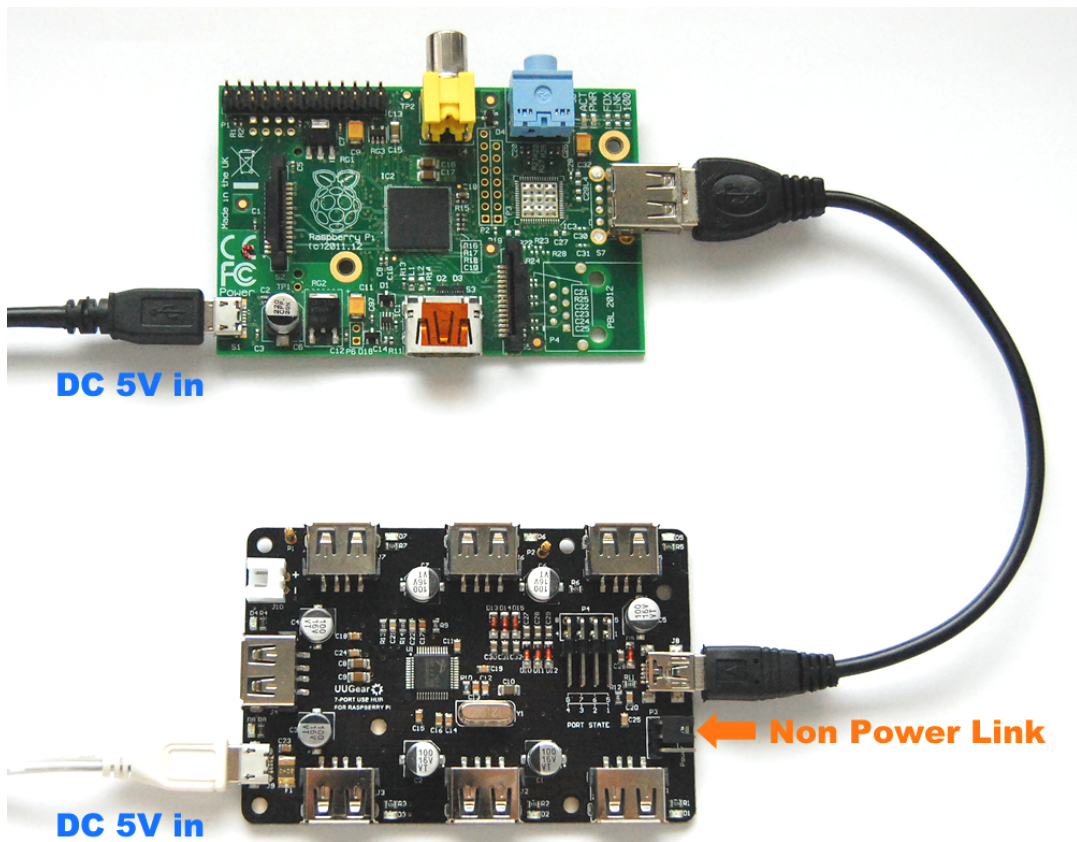
By default the jumper is at the “power link” position, and it can back-power your Raspberry Pi. When the power supply is connected to the USB hub, you will see your Raspberry Pi is getting powered too. This allows you to use only one power supply to

power both the USB hub and your Raspberry Pi.



If you don't want the back-powering, you can disable it by putting the jumper on another side. By doing so, you will need two power supplies, one for the USB hub and the other one for your Raspberry Pi.

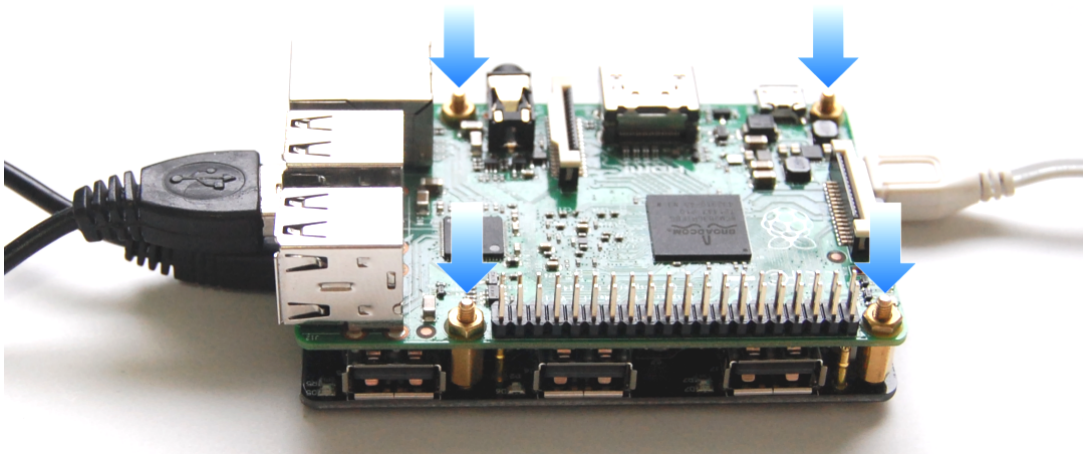




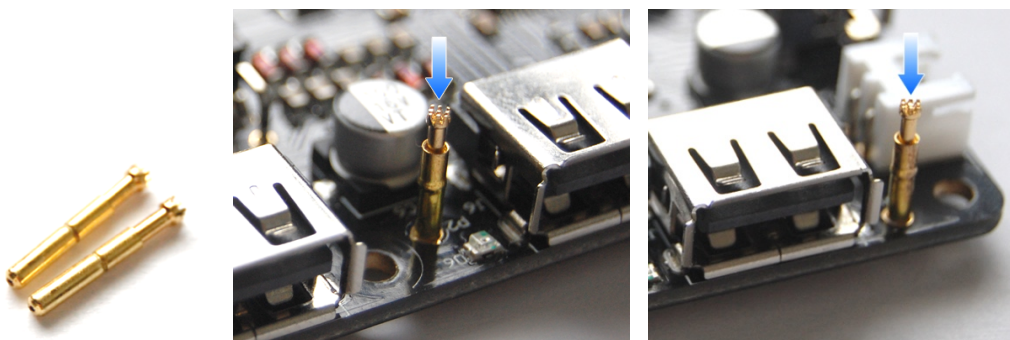
Raspberry Pi B+ and Raspberry Pi 2 (B Model)

Raspberry Pi B+ and Raspberry Pi 2 (B model) have four mounting holes on board, so we can use four sets of copper standoff, screw and nut to mount the USB hub under it. The pogo pins will be used if you want the USB hub to back-power your Raspberry Pi.

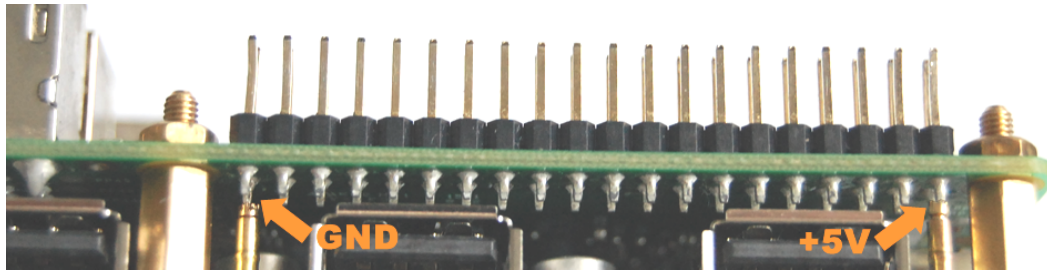
After putting the USB hub under Raspberry Pi, you can place the copper standoffs between the USB hub and Raspberry Pi (align to the 4 mounting holes). After tightening the two ends of each standoff with screw and nut, the USB hub is mounted under your Raspberry Pi firmly. Our suggestion is to put the screws at the bottom of the USB hub and put the nuts on the top surface of the Raspberry Pi board, you can reverse it though.



Raspberry Pi B+ and Raspberry Pi 2 (B model) do not support back-powering via USB port. If you still want the USB hub to back-power your Raspberry Pi, you need to make use of the two pogo pins in the package, as shown below:



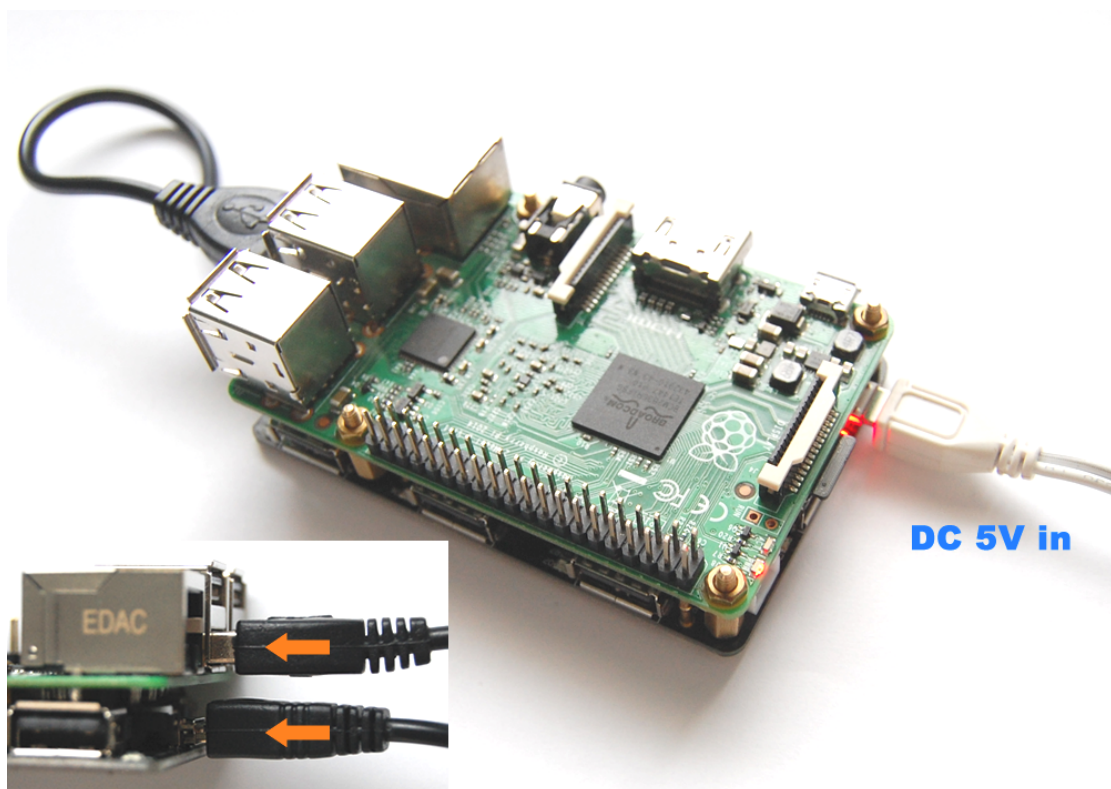
There are two pogo pin holders on the USB hub board. Gently put the pogo pin into the holder and press it to the bottom. The crown head of the pogo pin should be on top and it will contact to the +5V and GND pins in the 40-pin header, when you mount the USB hub under your Raspberry Pi.



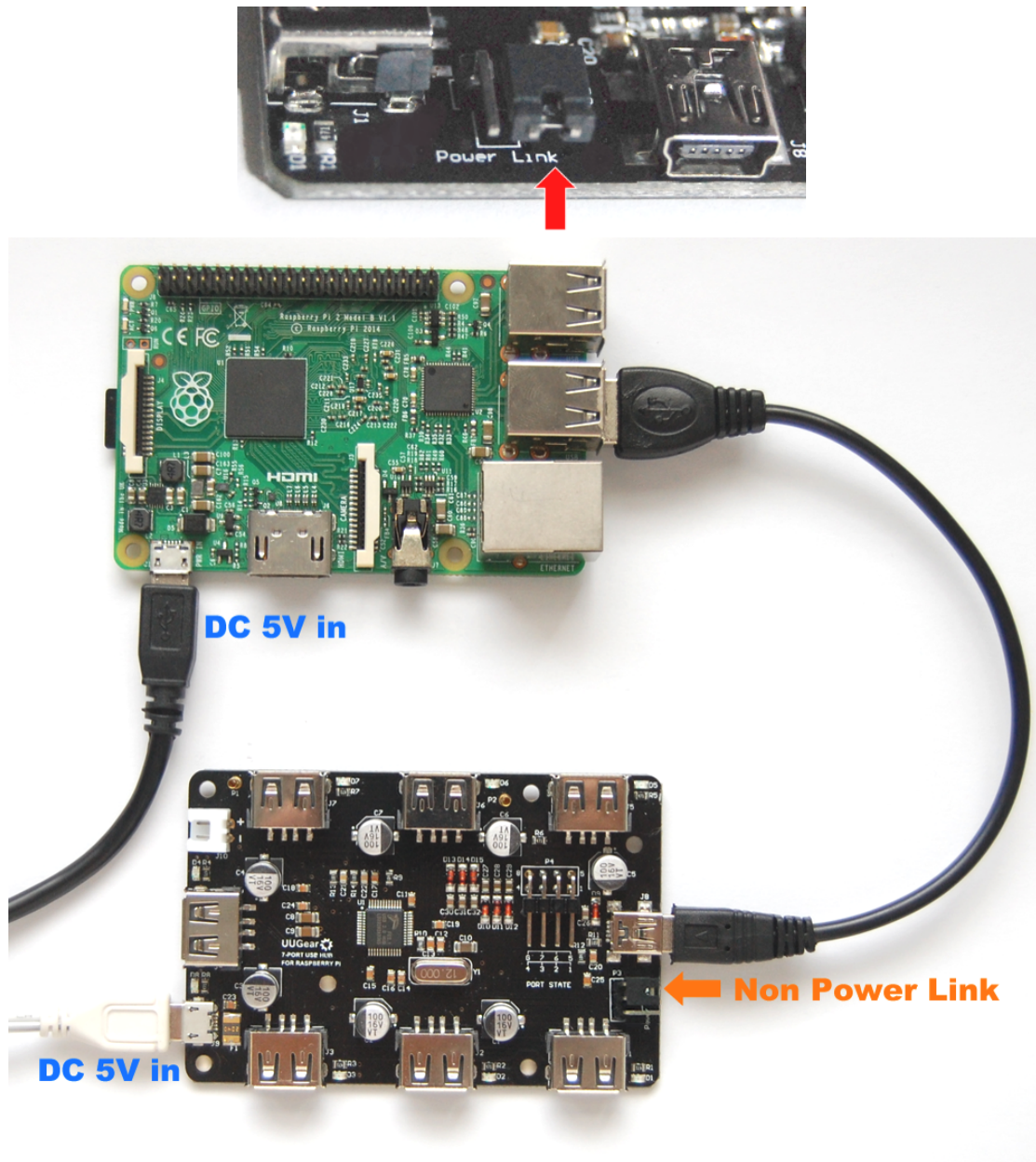
Make sure the pogo pin on the right contacts with the most right-top pin (+5V) and the pogo pin on the left contacts with the most left-bottom pin (GND). Thus when you power the USB hub, it will also power your Raspberry Pi.

Remarks: don't let the pogo pin touches any other pin in the header, or it might damage your Raspberry Pi!

Use the USB - mini USB cable to connect a USB port on Raspberry Pi and the mini USB port on the USB hub, then it will be ready to work.

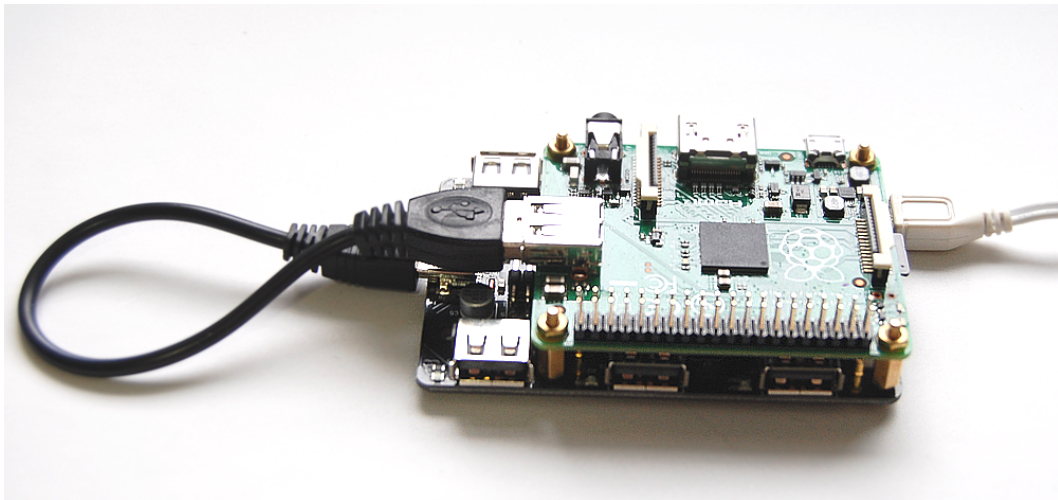


If you don't want to use the back-powering, just take out the pogo pin from its holder. After doing so, you will need two power supplies, one for the USB hub and the other for Raspberry Pi. Also the jumper should be placed to the opposite side against "power link".

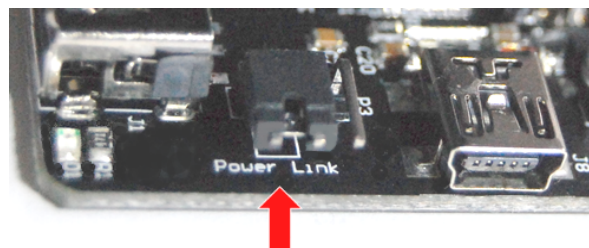


Raspberry Pi A+

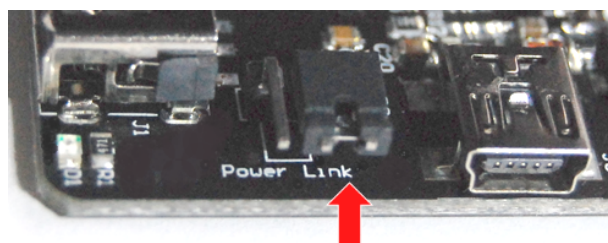
Raspberry Pi A+ has the same mounting holes with B+ model, so the process to mount the USB hub under it will be quite similar. The board of Raspberry A+ is shorter, but it wouldn't be a problem.

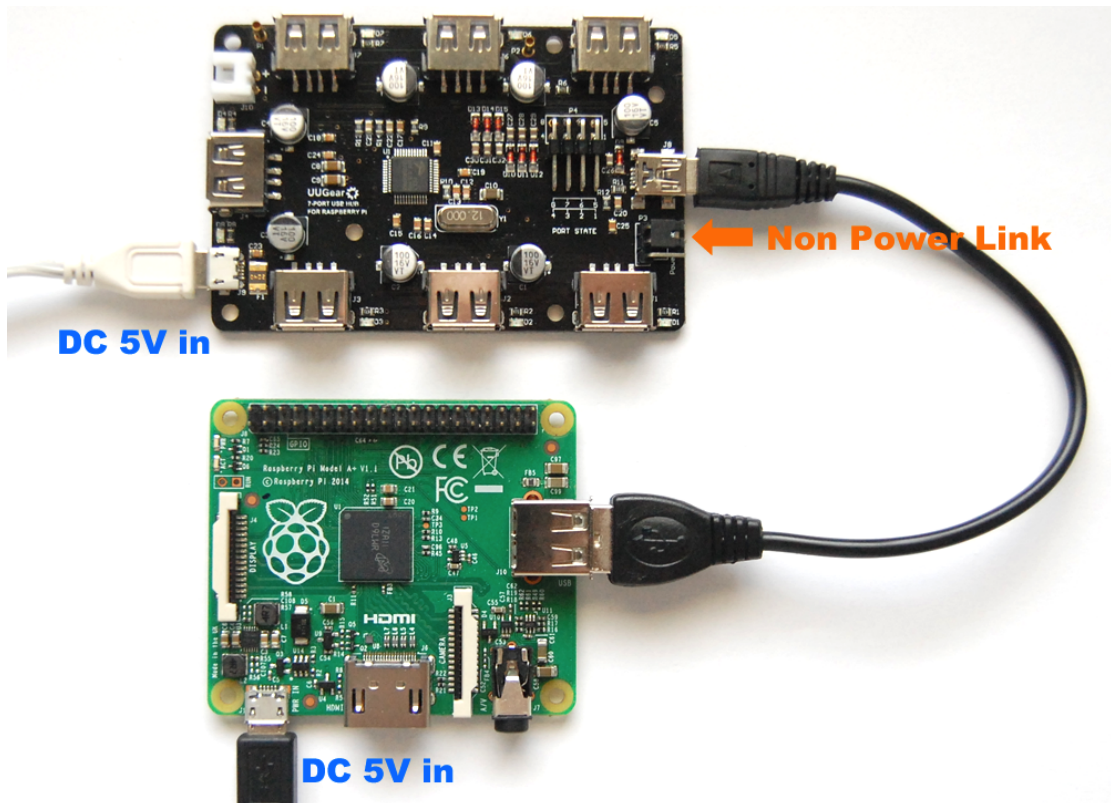


Different than the B+ model, Raspberry Pi A+ supports back-powering via USB port. So it is not necessary to use those pogo pins for back-powering. Just make sure to place the jumper to “power link” position and only connect a power supply to the USB hub, then Raspberry Pi A+ can be back-powered by the USB hub.



If you don't want the back-powering, just put the jumper to the other side and connect two power supplies to USB hub and Raspberry Pi accordingly.



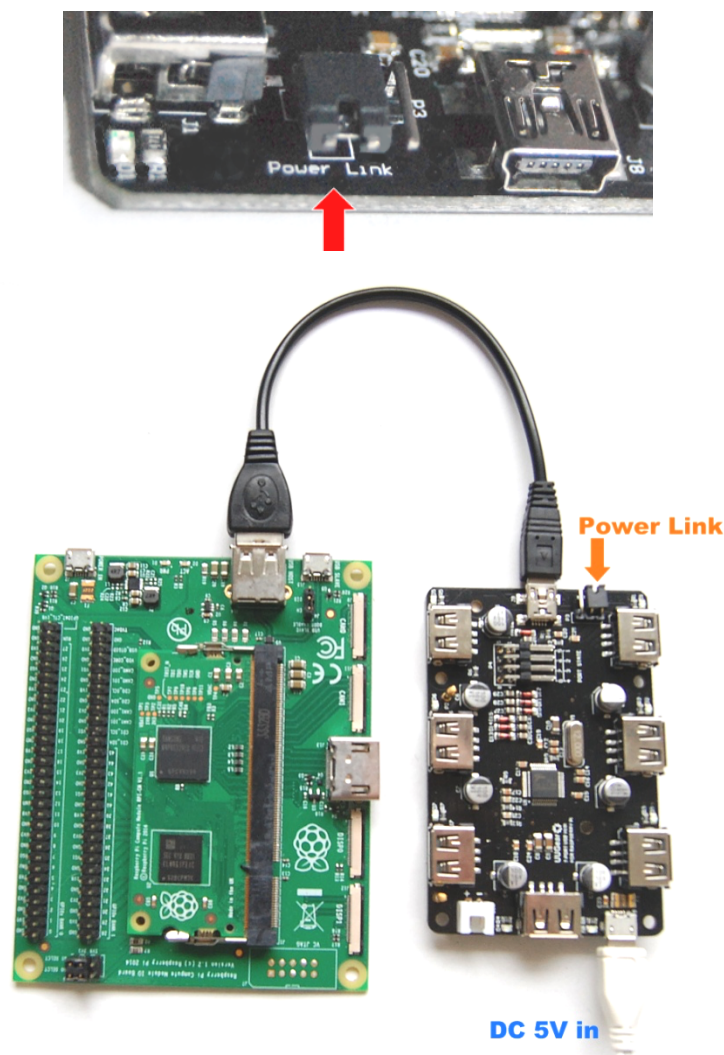


Raspberry Pi Compute Module (with Development Kit)

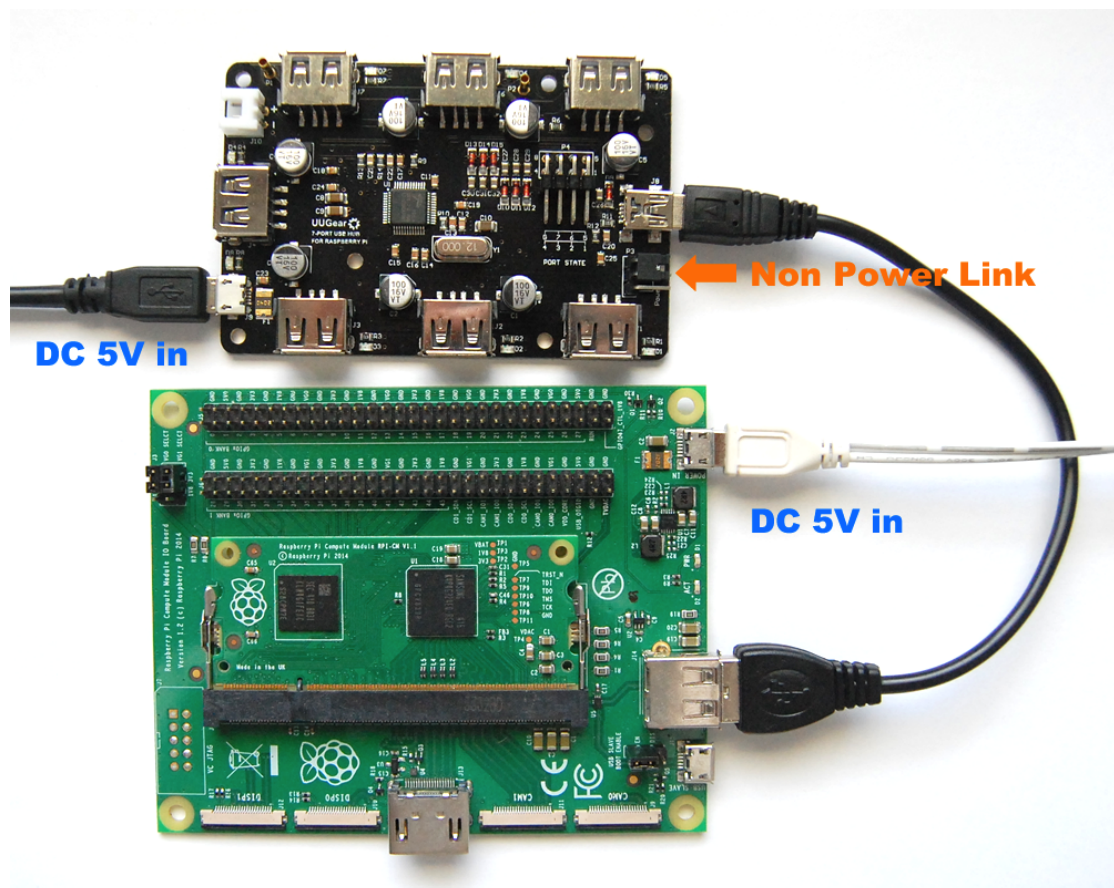
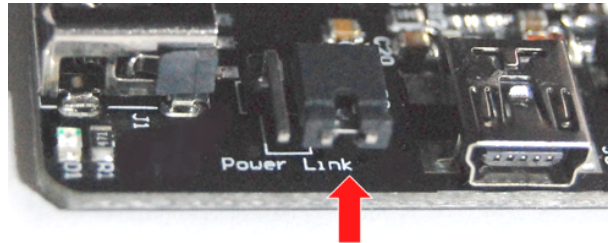
The Raspberry Pi compute module is supposed to be inserted into another product and it doesn't have any USB port on its board. However if you are developing a product that uses Raspberry Pi compute module, you should also have a development kit, which allows you to plug the compute module on a development board and access the USB port on it.

Although not a common situation, if you need more than one USB port from the development board, this USB hub can still help. The mounting holes on the development board are different than those on other Raspberry Pi models, so you could not (firmly) mount the USB hub over or under it. But still you can use the USB hub once you connect it to the board.

The development board supports back-powering via the host USB port, so you can just put the jumper to "power link" position and connect power supply to the USB hub.



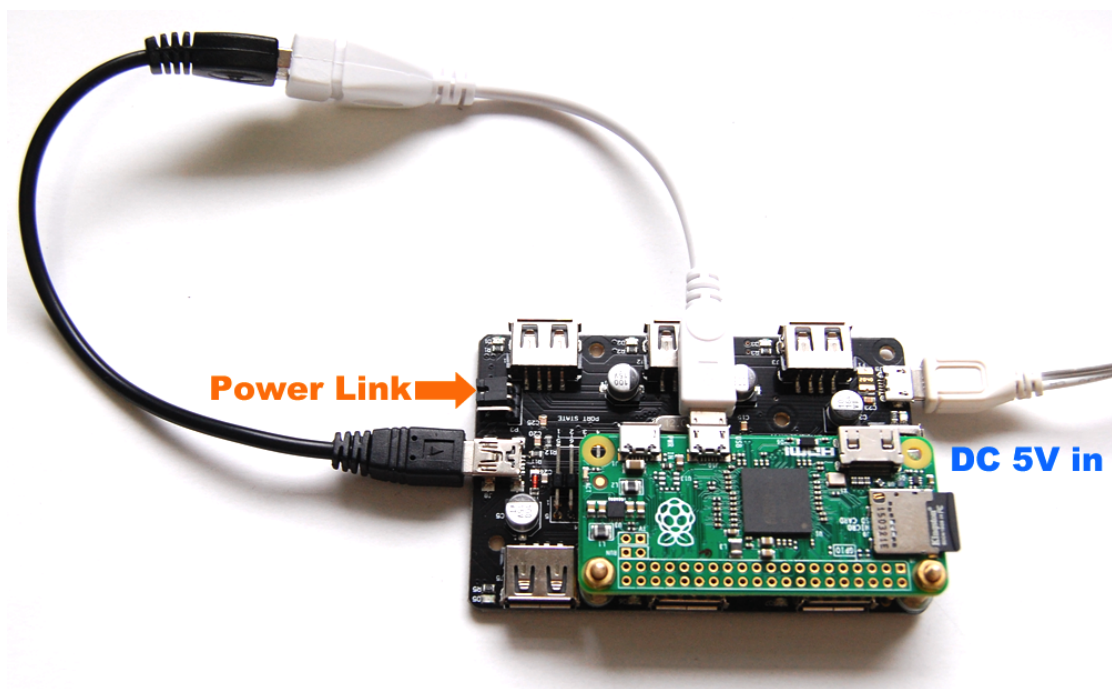
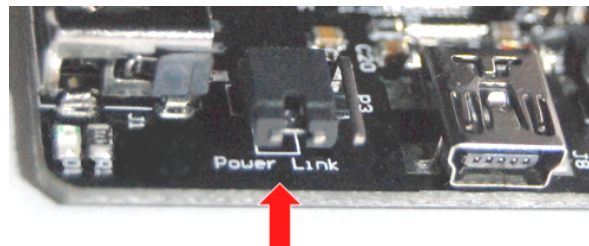
If you don't want the back-powering, just put the jumper to the other side and connect two power supplies to USB hub and the development board accordingly.



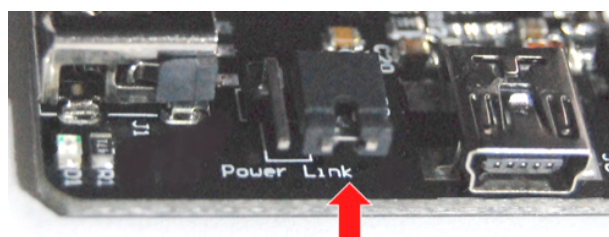
Raspberry Pi Zero

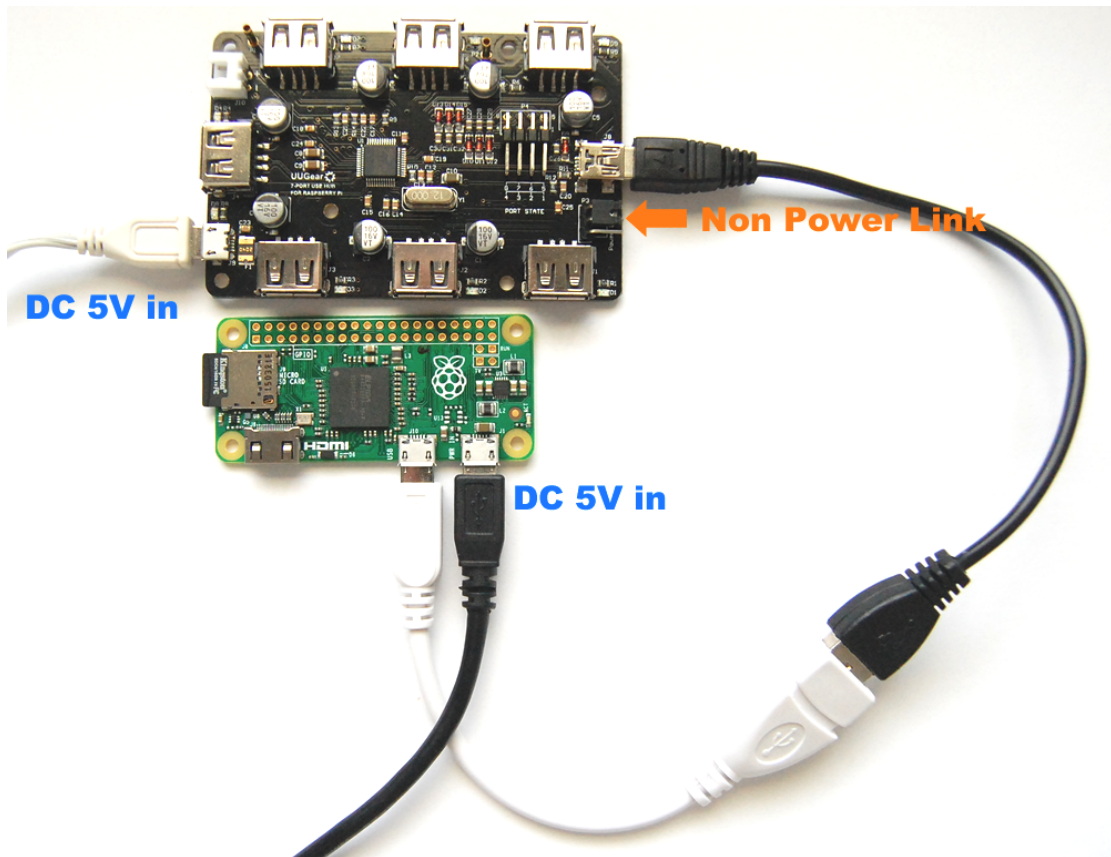
Raspberry Pi Zero has 4 mounting holes, but only two of them could be used to mount the USB hub under it.

Raspberry Pi Zero supports back-powering via the data USB port, so you can just put the jumper to “Power Link” position and connect power supply to the USB hub. To connect the upstream USB port to Raspberry Pi Zero’s data USB port, you will need a USB - OTG adapter (not included in the package).



If you don't want the back-powering, just put the jumper to the other side and connect two power supplies to USB hub and Raspberry Pi Zero accordingly.

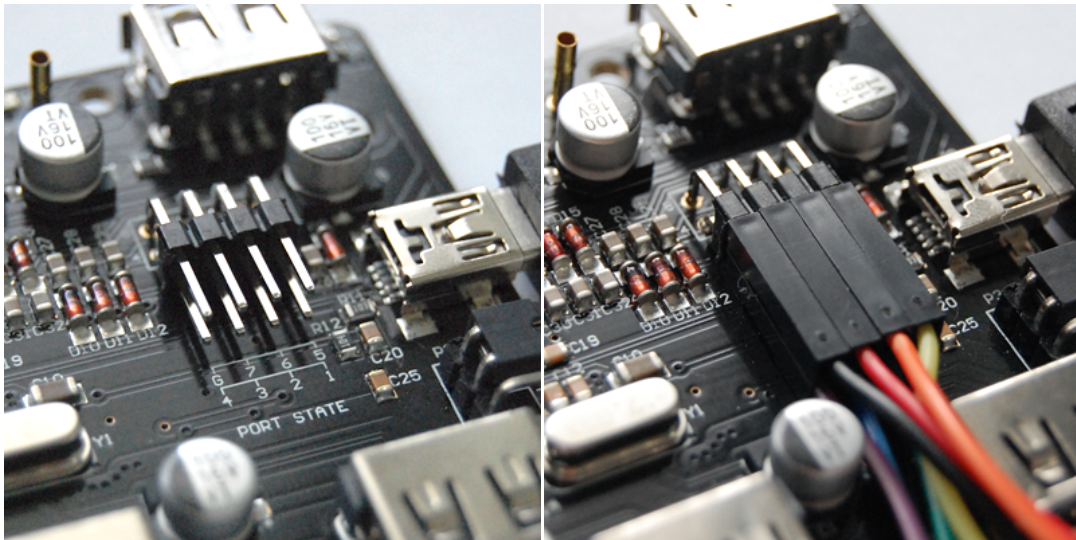




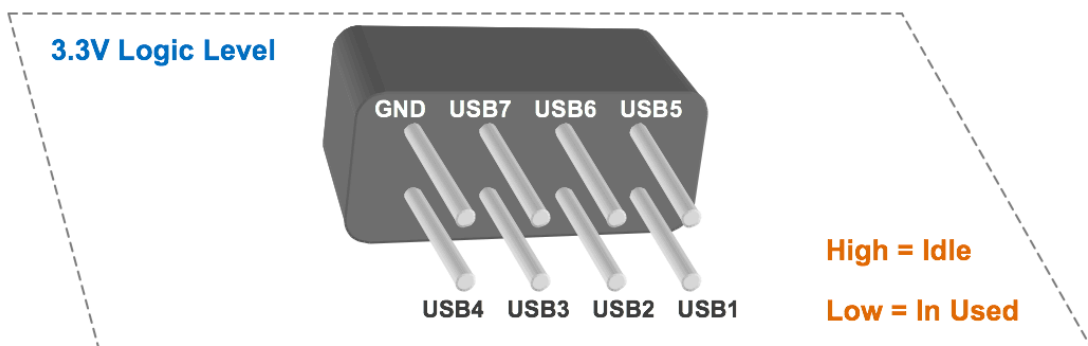
Monitoring USB Port Usage

There is a 4x2 header on the USB hub board, which has label “Port State”. This header contains 7 digital output pins and a GND pin. The output pins are in 3.3V level and can directly connect to Raspberry Pi’s GPIO pins. By monitoring the voltage level of these output pins, your program knows the status of the 7 USB ports, and can tell which USB port has a USB device newly plugged to or unplugged from.

You will need some DuPont wires (not included in the package) to connect the digital output pins and Raspberry Pi’s GPIO pins. If you want to use external MCU to monitor the port state, the GND pin should be connected to the ground of external MCU too.

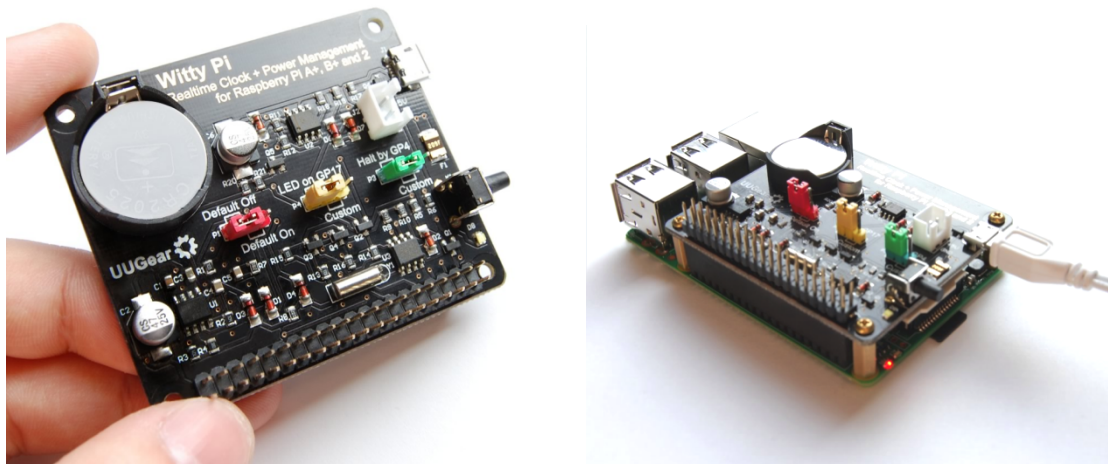


The figure below shows the layout of the pin header. The output pin is in HIGH voltage level when the corresponding USB port is not used. If you plug a USB device on a USB port, its port activity LED (green) will light up and its digital output pin will turn to LOW voltage level.

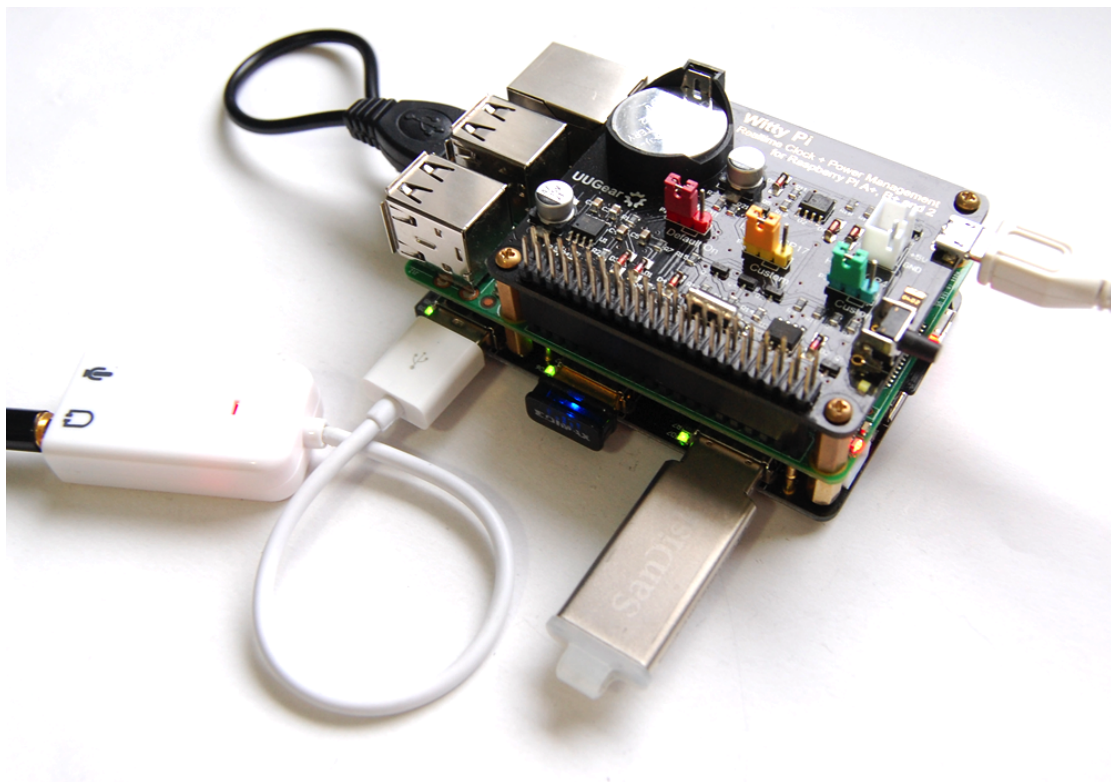


Integrates with Witty Pi

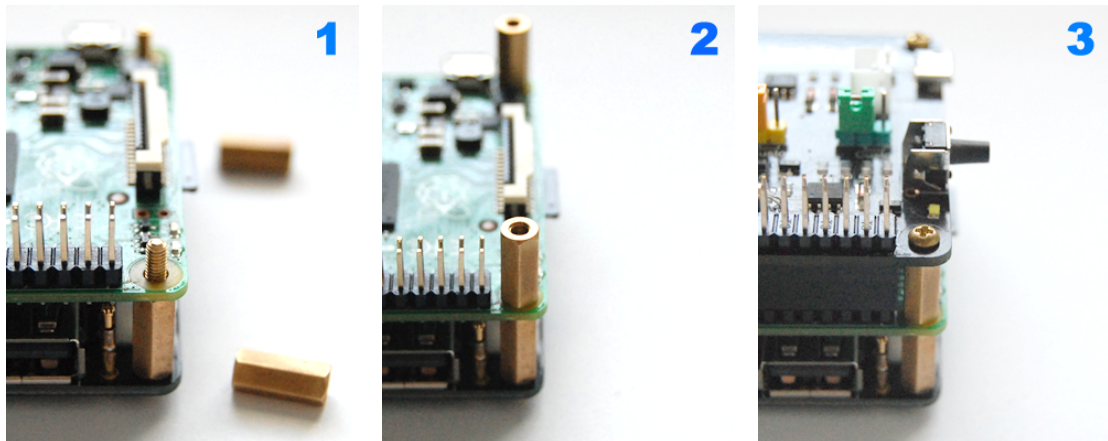
Witty Pi is another UUGear product, which is a small extension board that can add realtime clock and power management to Raspberry Pi. It can be mounted above Raspberry Pi by connecting to the 40-pin GPIO header.



Since this USB hub can be mounted under Raspberry Pi, it has no conflict with Witty Pi. Instead it can be easily integrated into the Witty Pi + Raspberry Pi combination and become a nice sandwich structure.

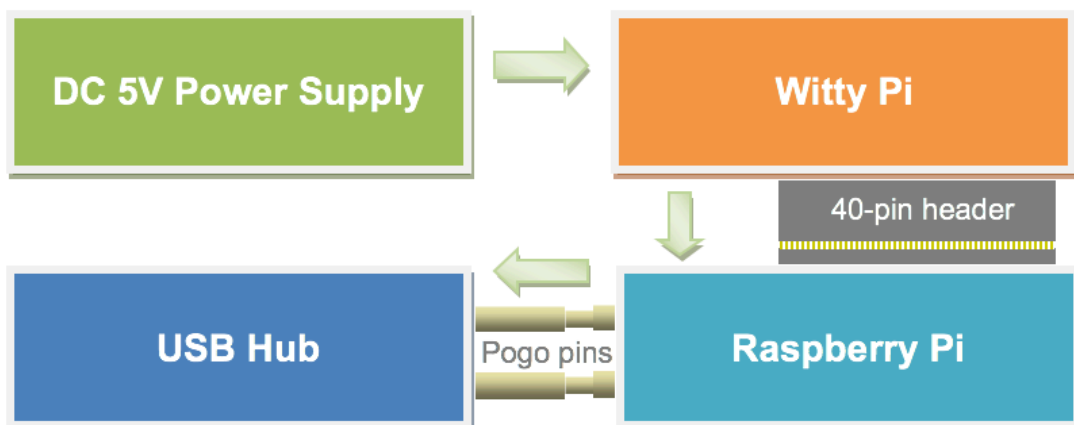


The integration is quite simple, just mount Witty Pi over Raspberry Pi and mount the USB hub under Raspberry Pi, you can do either part first. The Witty Pi comes with 4 female-female standoffs, while the USB hub comes with 4 female-male standoffs, thus they could be connected together and has Raspberry Pi board in the middle.



Since Witty Pi is the power manager, it should be the only one that gets connected to the power supply.

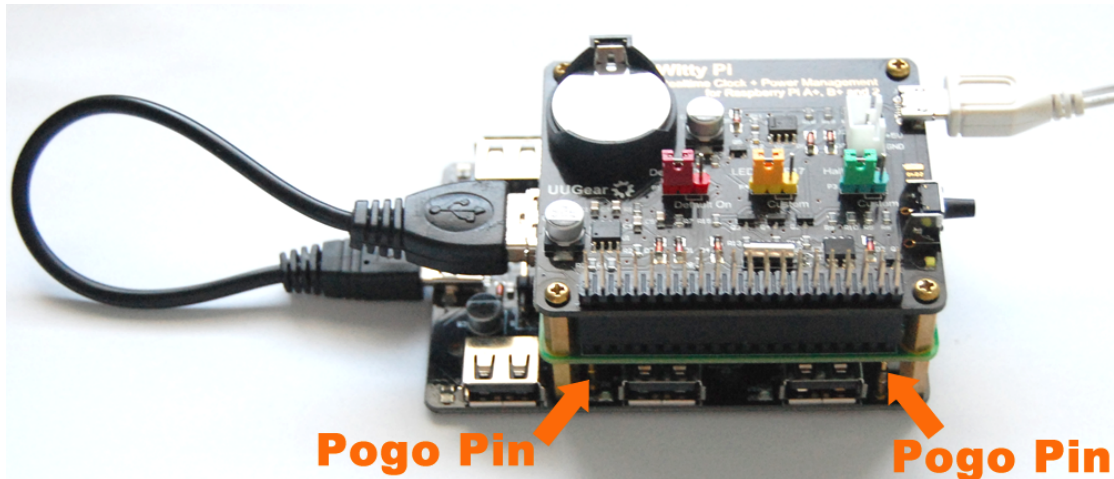
For Raspberry Pi A+, B+ and Raspberry Pi 2 (B model), you can put the two pogo pins in place, so they connect the +5V and GND between the USB hub and Raspberry Pi. This is the same setup for back-powering Raspberry Pi when power supply is connected to the USB hub. However, the purpose is different in this scenario. The power supply will be connected to Witty Pi only, and the pogo pins will take power from the Raspberry Pi's GPIO pin header, and power the USB hub.



With this setup, the USB hub will work in self-power mode, which maximizes the output current of all USB ports.

Raspberry Pi A+ doesn't need to use the pogo pins for back-powering Raspberry Pi, but the situation changes when integrating with Witty Pi. The pogo pins will also be

used to make sure the USB hub can work in self-power mode, otherwise the USB hub can only pull power via the upstream USB port, which can only provided very limited current.



For Raspberry Pi A, B and compute module with development kit, Witty Pi could not be mounted on them because of the incompatible GPIO pin header. Also they could not use the pogo pins to power the USB hub, so the USB hub can only work in bus-power mode. Having all these factors considered, it doesn't worth the effect to put them together.

If you are using Raspberry Pi Zero, and have soldered the 40-pin header on it, then you can also integrate it with Witty Pi and USB hub. Just use the pogo pins to power the USB hub, like we did on model A+, B+ and 2B.

