



USB to Eurorack Power Supply

Created by Liz Clark



<https://learn.adafruit.com/usb-to-eurorack-power-supply>

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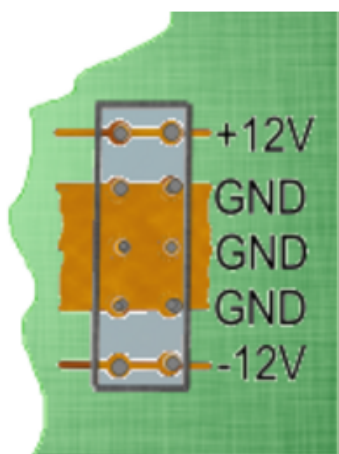
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Overview



When the [TPS65131 Split Power Supply breakout](http://adafruit.it/6280) (<http://adafruit.it/6280>) was added to the shop, I thought one thing: Eurorack! Eurorack synthesizers use +12V and -12V for their power input. This can be tricky to accomplish with the usual DIY tools at our disposal, thus this project: a simple 5V USB to standard 10-pin Eurorack power supply. Perfect for quickly testing a module or using a module outside of a usual rack setup. Since all modules have different power requirements, its recommended to only power one module at a time with this project.



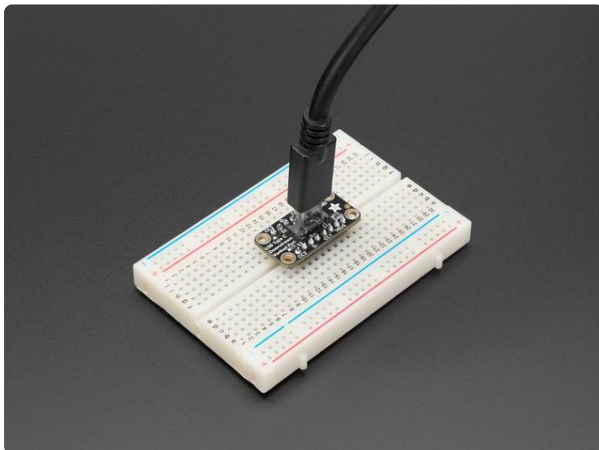
[Most Eurorack modules](https://adafruit.it/1agw) (<https://adafruit.it/1agw>) have adopted a standard 10-pin power input, with two -12V pins on one end and two +12V pins on the other. The center six pins are connected to ground. The -12V side is usually marked by a line on the PCB silkscreen and corresponds with the red stripe on the power cable. This is the pinout replicated in this project. Always check the pinouts and specifications of your gear before plugging them into new power supplies.

Always check the pinouts and specifications of your gear before plugging them into new power supplies.



A toggle switch is connected to the EN (enable) pin on the TPS65131 breakout and lets you turn the power supply on or off. The lid for the 3D printed enclosure has an embossed line to denote the -12V rail on the 2x5 pin header.

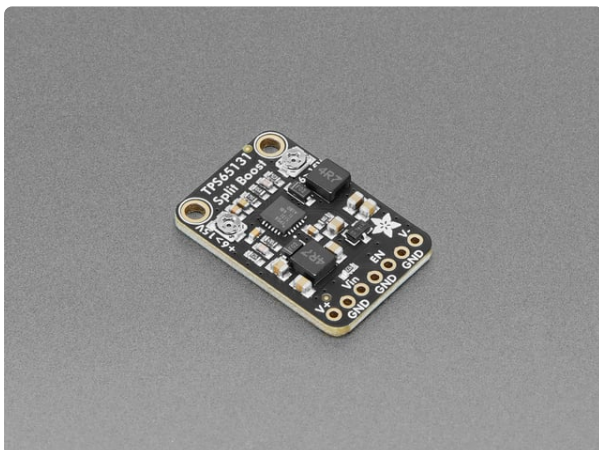
Parts



[Adafruit USB Type C Vertical Breakout - Downstream Connection](https://www.adafruit.com/product/5993)

Throw out all those Mini and Micro B USB cables you have in a plastic bin; the next generation of USB connectors is here with USB C! You will start to see these...

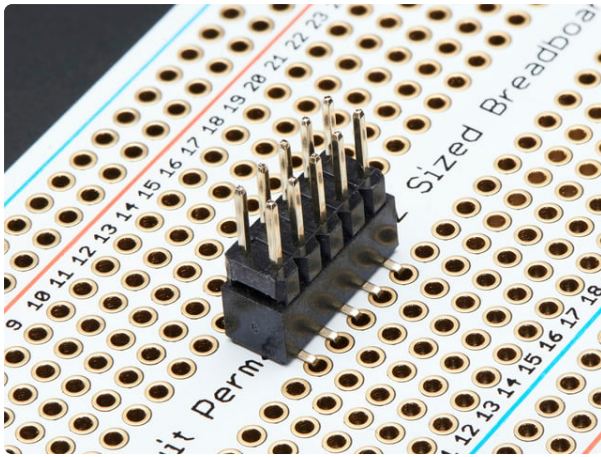
<https://www.adafruit.com/product/5993>



[Adafruit TPS65131 Split Power Supply Boost Converter](https://www.adafruit.com/product/6280)

Need those tricky split-rail voltages for your vintage electronics? The Adafruit TPS65131 Split Rail Boost Converter generates both positive and negative voltage rails...

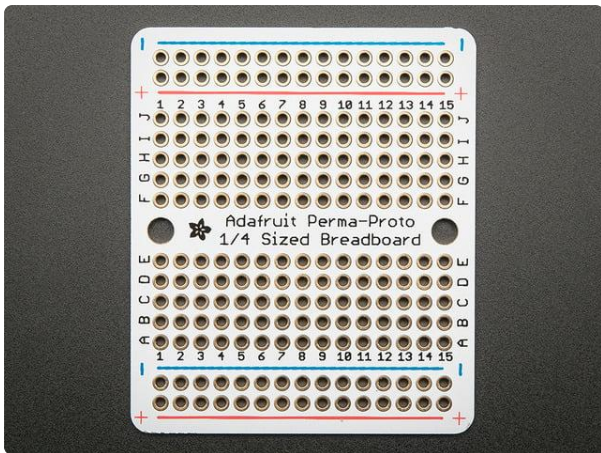
<https://www.adafruit.com/product/6280>



IDC Breakout Helper - 2x5 (10 pin)

This little 2x5 (10 pin - 0.1 spaced) IDC Breadboard Helper is great in conjunction with any of our

<https://www.adafruit.com/product/2102>



Adafuit Perma-Proto Quarter-sized Breadboard PCB - Single

Customers have asked us to carry basic perf-board, but we never liked the look of most basic perf: it's always crummy quality, with pads that flake off and no labeling. Then we...

<https://www.adafruit.com/product/1608>



Silicone Cover Stranded-Core Wire - 30AWG in Various Colors

Silicone-sheathing wire is super-flexible and soft, and its also strong! Able to handle up to 200°C and up to 600V, it will do when PVC covered wire wimps out. We like this wire...

<https://www.adafruit.com/product/2051>



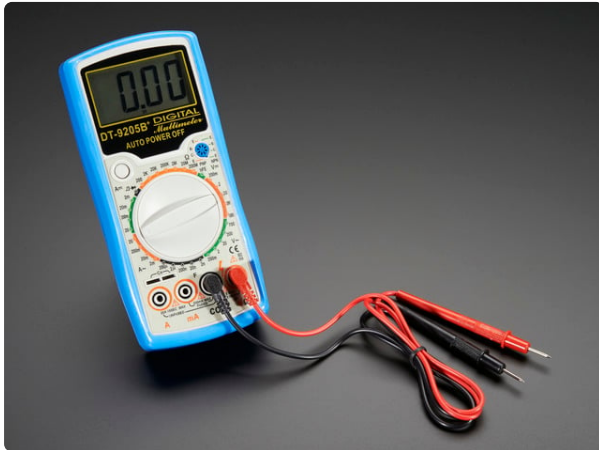
Black Nylon Machine Screw and Stand-off Set – M2.5 Thread

Totalling 380 pieces, this M2.5 Screw Set is a must-have for your workstation. You'll have enough screws, nuts, and hex standoffs to fuel your maker...

<https://www.adafruit.com/product/3299>

Tools

You'll need these tools to adjust and measure the voltage for the TPS65131 Power Supply.



Digital Multimeter - Model 9205B+

This massive multimeter has everything but the kitchen sink included. It's a great addition to any workbench or toolbox. It's low cost, simple to use, and has a big clear...

<https://www.adafruit.com/product/2034>

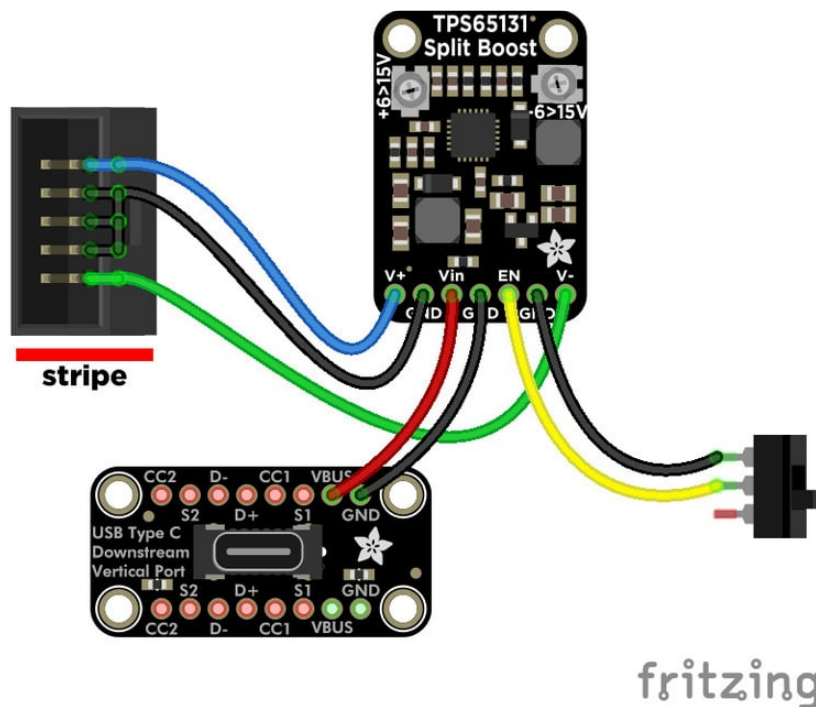


Precision screwdriver set (6 pieces)

Break seals! Void warranties! With this handy screwdriver set at your hands, all hardware you touch will open up and reveal their secret innards. This set contains 6...

<https://www.adafruit.com/product/424>

Circuit Diagram

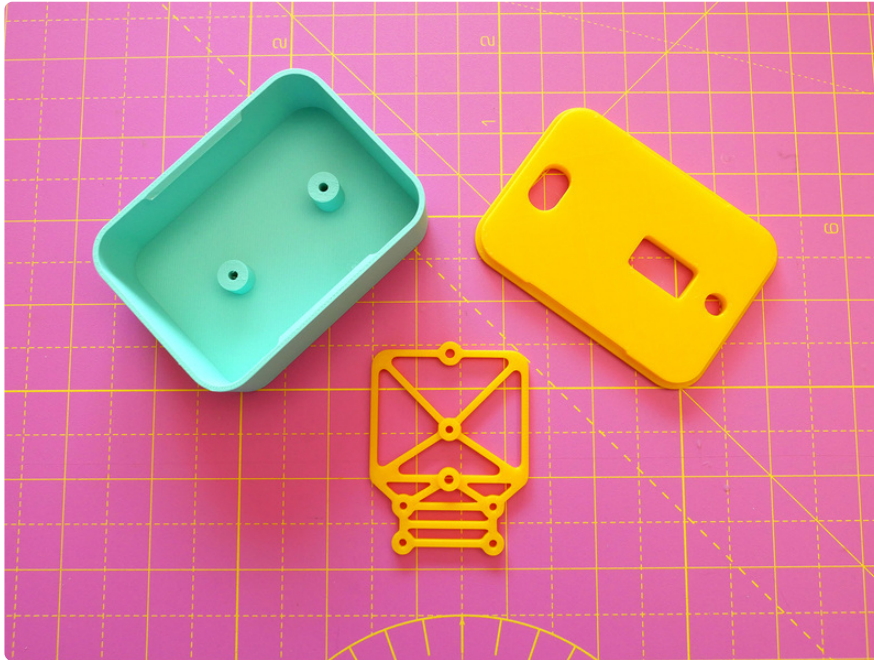


- USB VBUS to boost Vin (red wire)
- USB GND to boost GND (black wire)
- Boost V+ to IDC pins 9 and 10 (blue wire)
- Boost V- to IDC pins 1 and 2 (green wire)
- Boost GND to IDC pins 3, 4, 5, 6, 7 and 8 (black wire)
- Boost EN to switch center pin (yellow wire)
- Boost GND to switch left pin (black wire)

A stripe, usually a white stripe on the PCB silkscreen and a red wire on the ribbon cable, is used to denote the -12V rail in Eurorack modules. This is usually to the left of the notched key on the IDC connector. Some modules may vary though, so always double check before applying power to any of your gear.

Always double check the power pinout on your gear before applying power.

3D Printing



You can 3D print all of the parts for this project. There is a mounting plate, box lid and box with mounting holes and cutouts for the components.

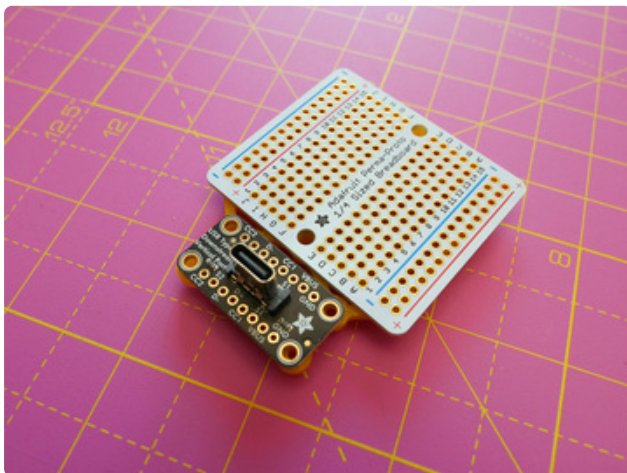
The STL files can be downloaded directly here or from Printables.

[USB_to_Euroack_STLs.zip](#)

<https://adafru.it/1agx>

[Printables Download](#)

<https://adafru.it/1agy>

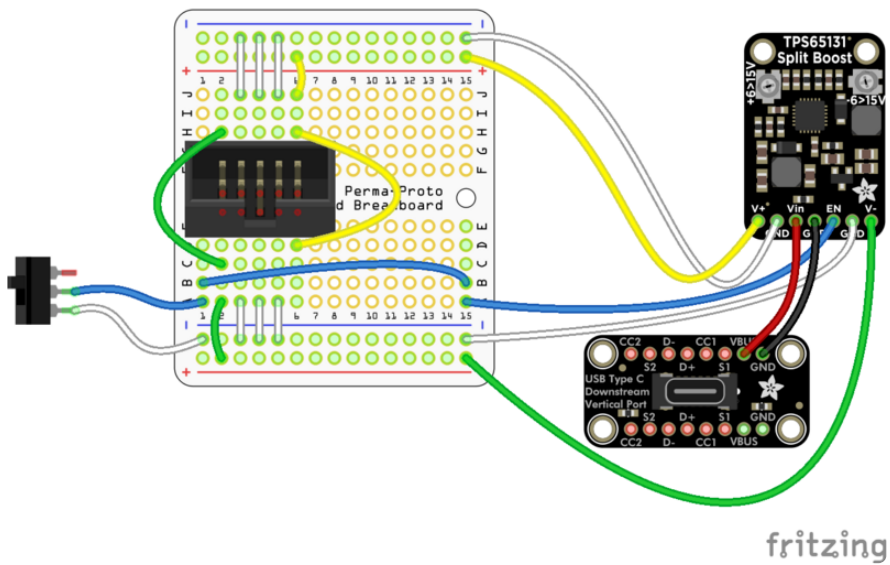


The mounting plate has holes for all of the components.

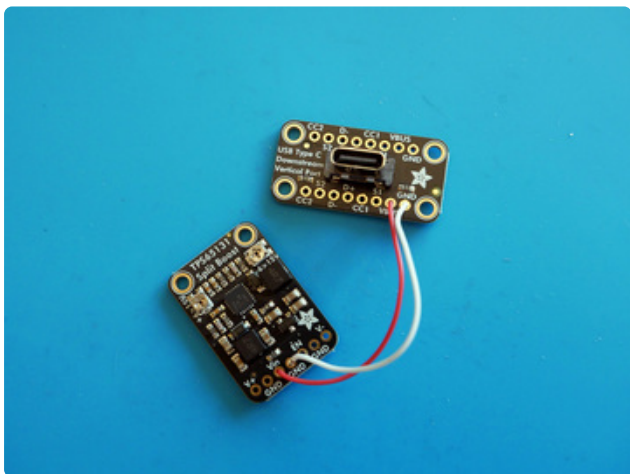


The lid has cutouts for the USB C port, switch and IDC power cable. There is an embossed notch to the left of the power cable slot to denote the -12V rail.

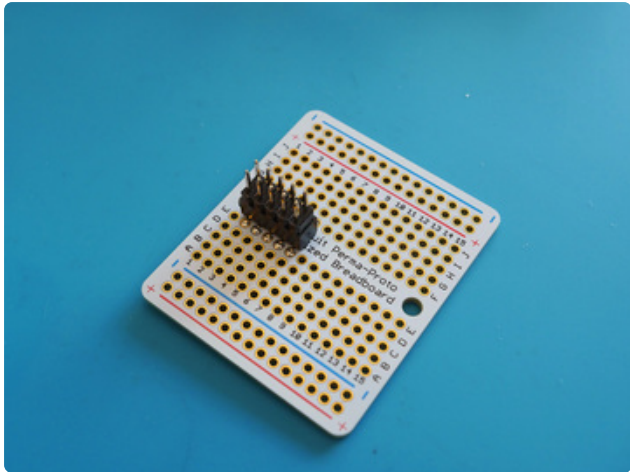
Wiring



Main Components

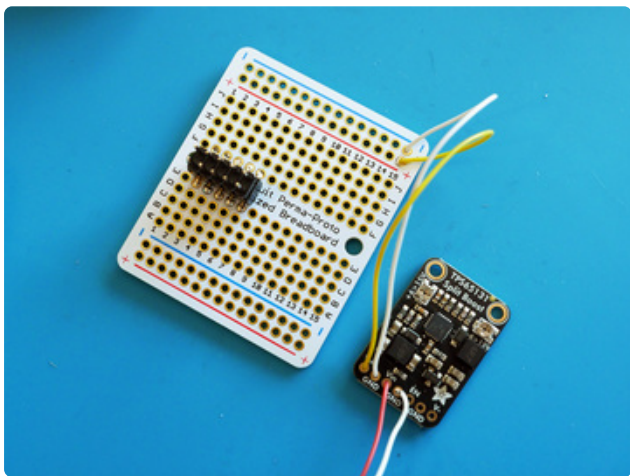


Solder a wire from USB VBUS to boost Vin (red wire). Solder a second wire from USB GND to boost GND (white wire).



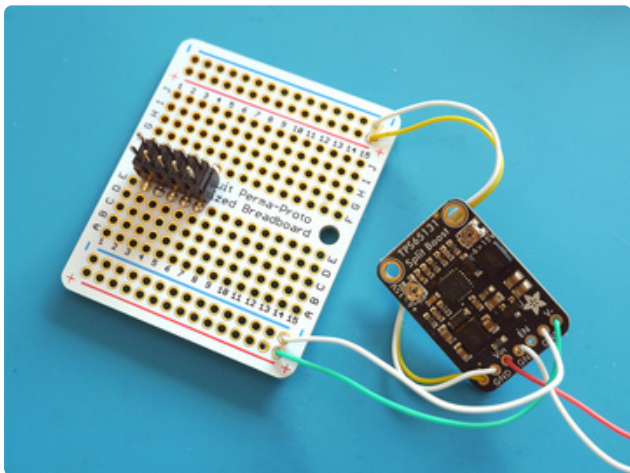
Solder the 2x5 header to the perma-proto board. The first row should be on row 2; one row away from the mounting hole.

Voltage and Ground Rails



Solder a wire from the boost V+ to the top power (+) rail on the perma-proto (yellow wire). This will be the +12VDC rail.

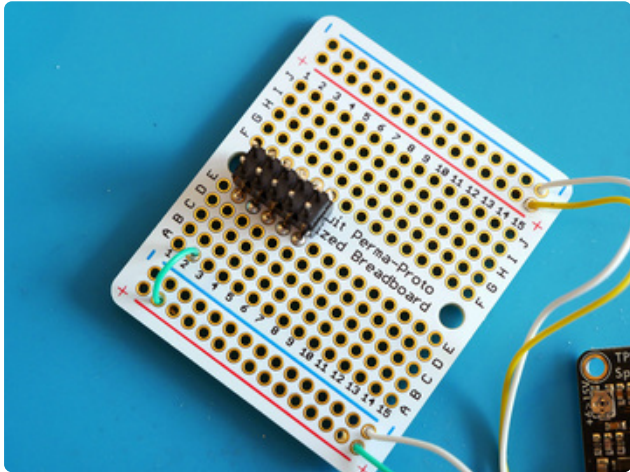
Solder a wire from the boost GND to the top ground (-) rail on the perma-proto (white wire).



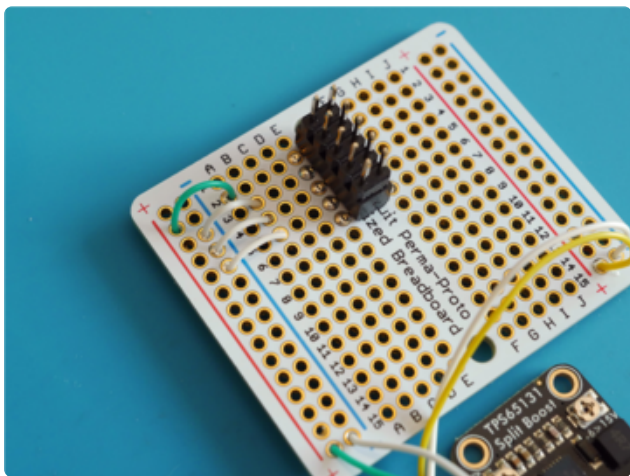
Solder a wire from the boost V- to the bottom power (+) rail on the perma-proto (green wire). This will be the -12VDC rail.

Solder a wire from the boost GND to the bottom ground (-) rail on the perma-proto (white wire).

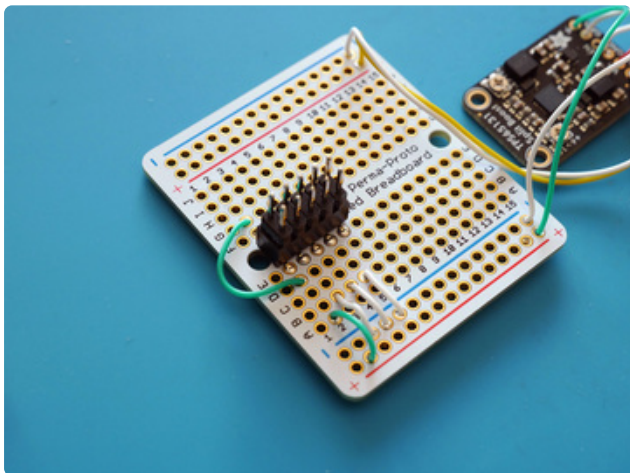
Negative Voltage Line



Solder a small wire from the bottom negative power rail to the first row on the header (green wire).

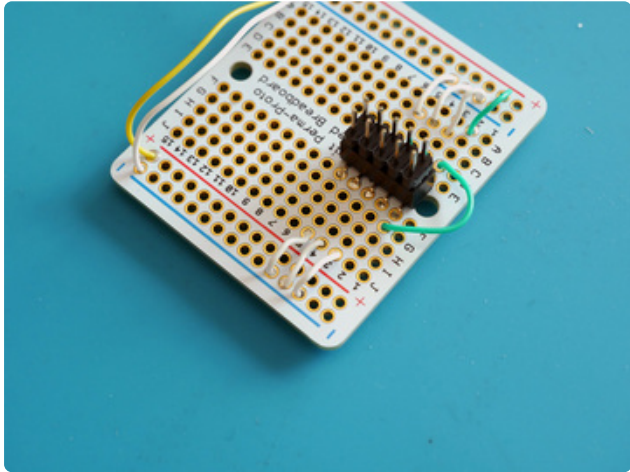


Solder three small wires from the bottom ground rail to the second, third and fourth rows on the header (white wires).

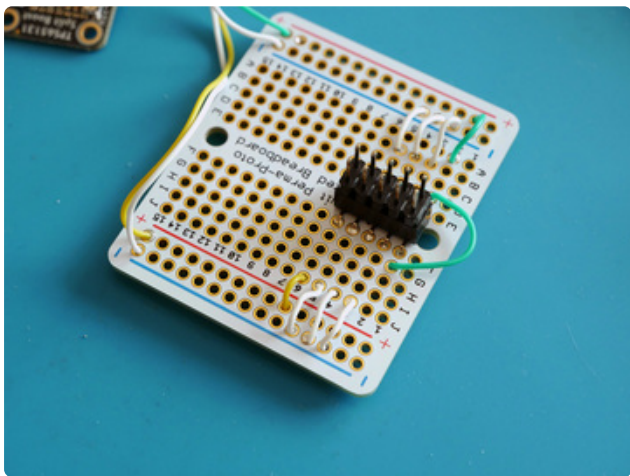


Solder a short wire to connect pins 1 and 2 on the header to the negative voltage line (green wire).

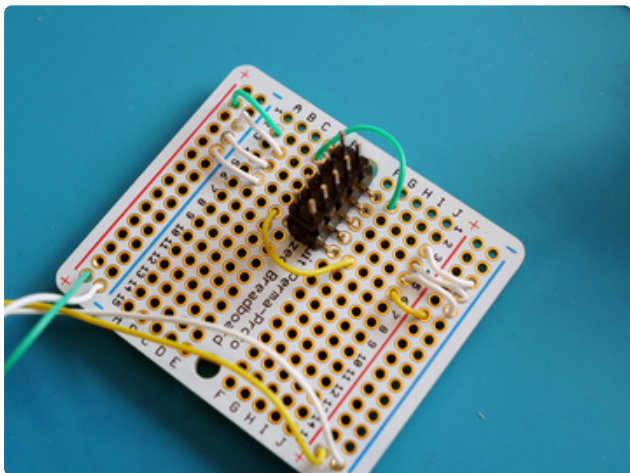
Positive Voltage Line



Solder three small wires from the top ground rail to the second, third and fourth rows on the header (white wires).

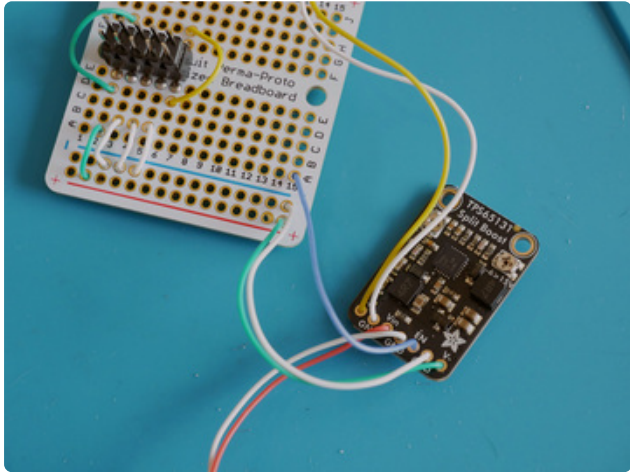


Solder a small wire from the top positive power rail to the last row on the header (yellow wire).

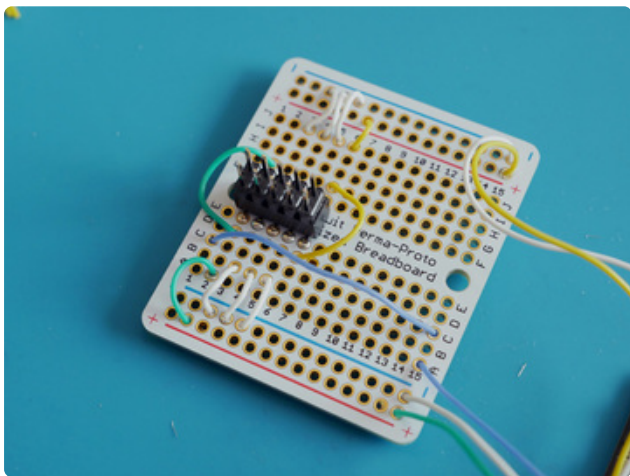


Solder a short wire to connect pins 9 and 10 on the header to the positive voltage line (yellow wire).

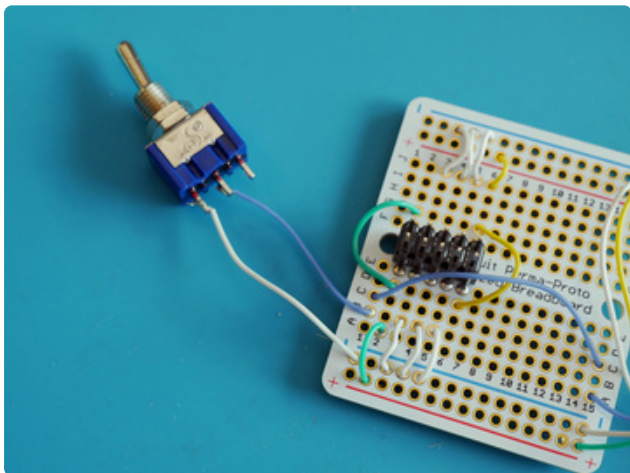
Enable Switch



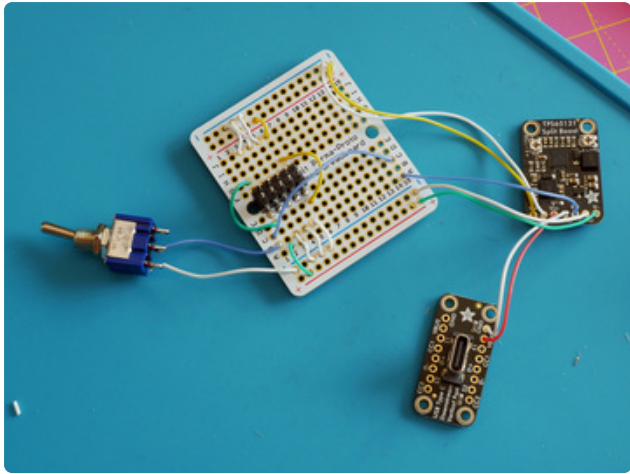
Solder a wire from the EN pin on the boost to the closest row on the perma-proto (blue wire).



Solder a wire from the EN row to the other side of the perma-proto board (blue wire).



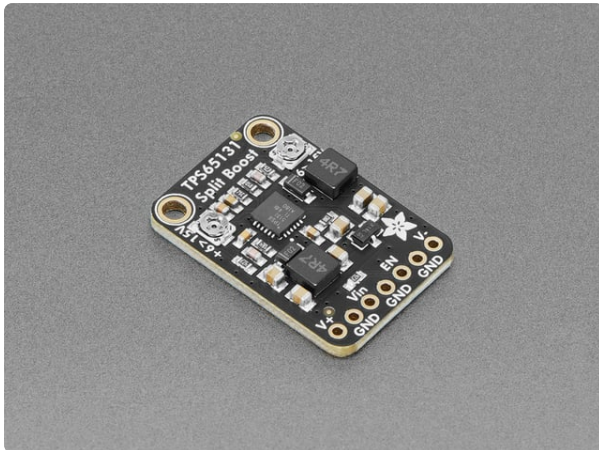
Solder a wire from the middle pin on the toggle switch to the EN row (blue wire). Solder a wire from the bottom pin on the toggle switch to the bottom GND row (white wire).



That completes the wiring!

Tune to +12V and -12V

Before you put your newly soldered circuit into the enclosure, you'll want to dial in the negative and positive voltages on the breakout to +12V and -12V. There is a page with more details about this process in the guide for the [TPS65131 breakout \(https://adafruit.it/1agz\)](https://adafruit.it/1agz).



Adafruit TPS65131 Split Power Supply Boost Converter

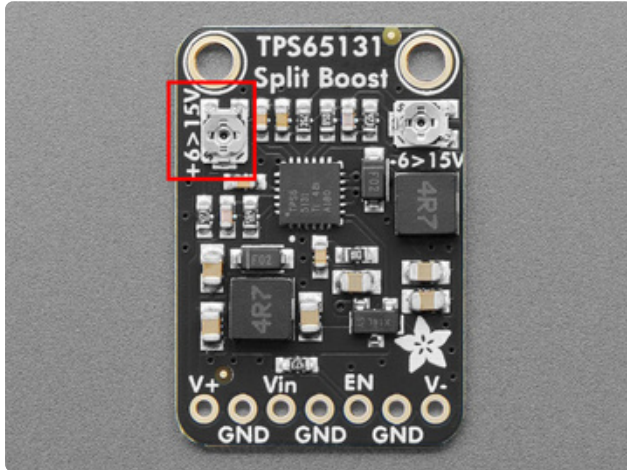
By Liz Clark

[Use](#)

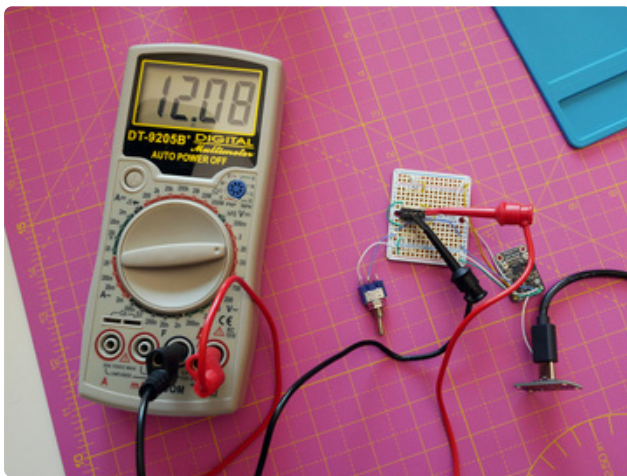
<https://learn.adafruit.com/adafruit-tps65131-split-power-supply-boost-converter/use>

You'll need to power up the project with a 5V USB power supply before trying to adjust the output from the breakout.

Positive Voltage

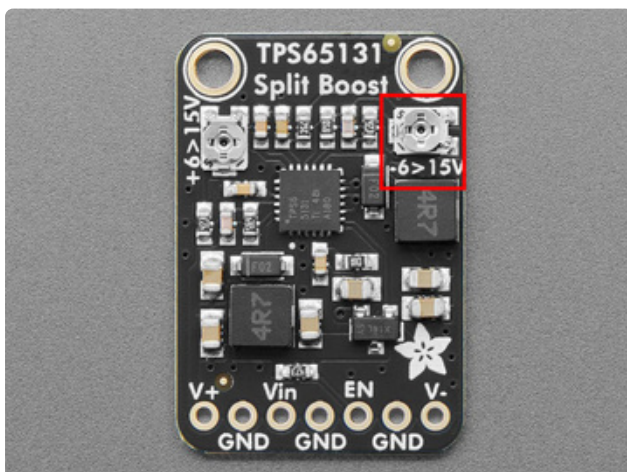


You'll turn the positive voltage trim pot, located on the left side of the board, with a smaller screwdriver to dial in the correct positive voltage output.

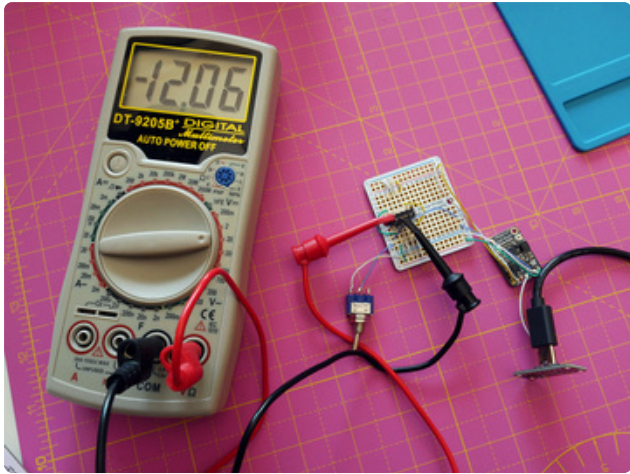


Set your multimeter to DC voltage mode. Connect the ground probe to one of the ground pins on the header. Connect the volts probe to one of the positive voltage pins on the header. Use a small screwdriver to turn the positive voltage trim pot on the left side of the breakout to dial in +12V.

Negative Voltage



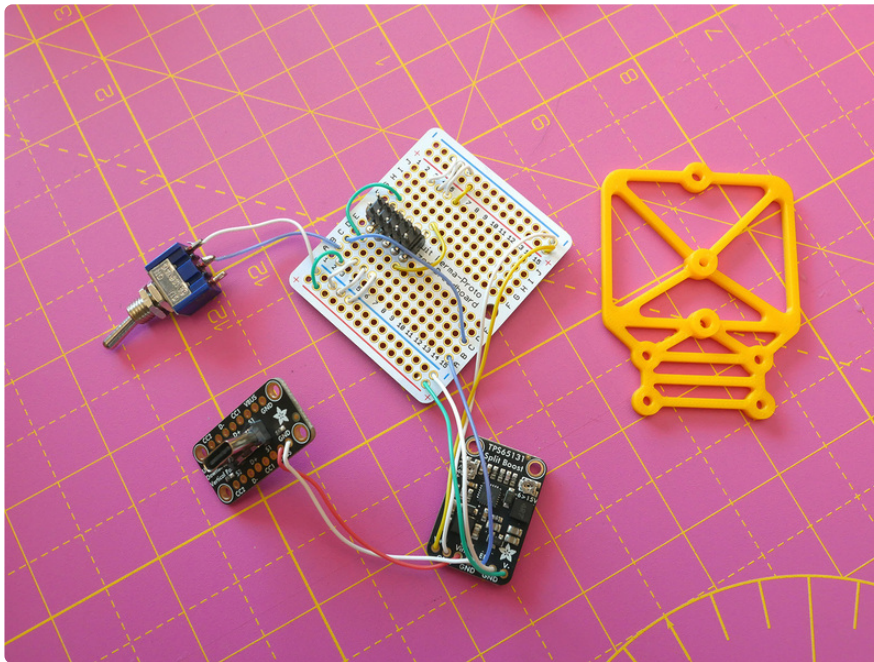
You'll turn the negative voltage trim pot, located on the right side of the board, with a smaller screwdriver to dial in the correct negative voltage output.



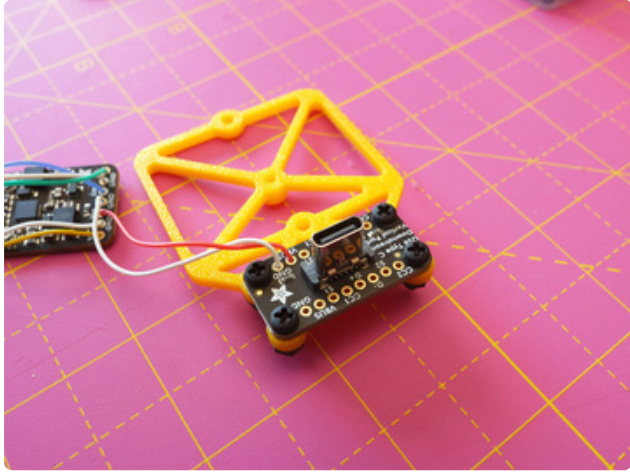
Set your multimeter to DC voltage mode. Connect the ground probe to one of the ground pins on the header. Connect the volts probe to one of the negative voltage pins on the header. Use a small screwdriver to turn the negative voltage trim pot on the right side of the breakout to dial in -12V.

Once your voltages are dialed in, you can move on to the final assembly.

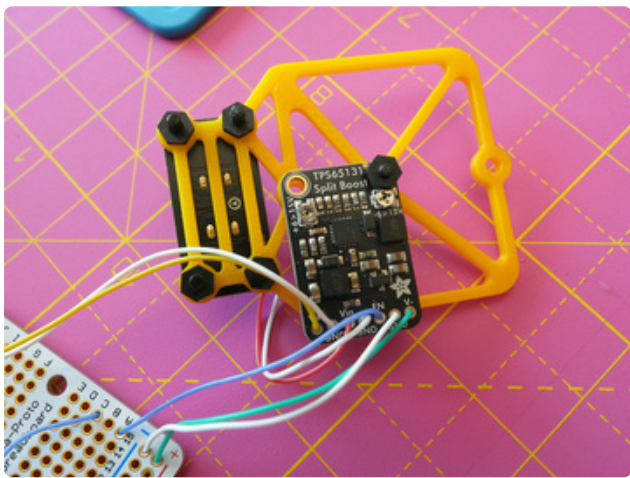
Assembly



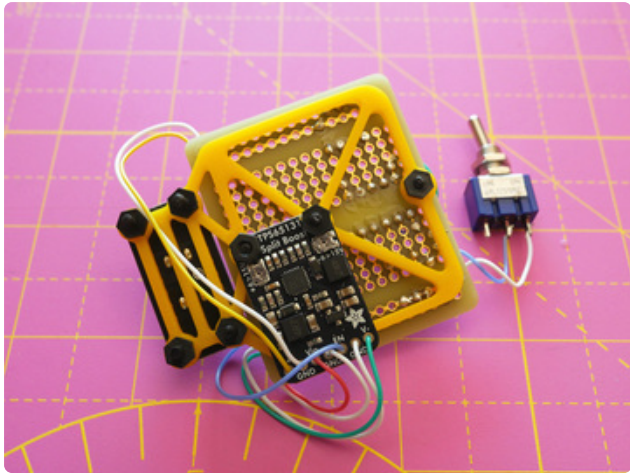
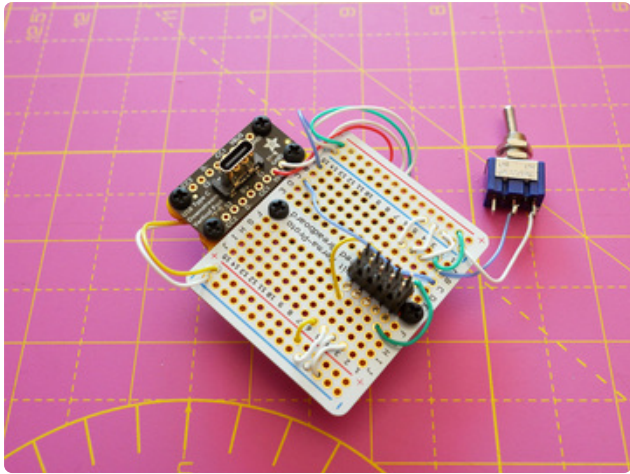
Mount Components



Attach the USB breakout to the mount with four M2.5 screws and nuts.

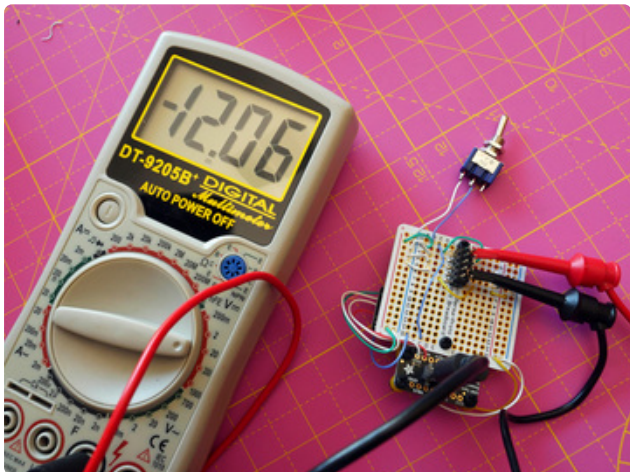


Turn the mount over. Attach the right mounting hole of the boost breakout to the center mounting hole of the mount with an M2.5 screw and nut.



Flip the mount back upright. Attach the perma proto board to the two remaining mounting holes with M2.5 screws and nuts. The second mounting hole for the boost breakout should be secured with the screw closest to the USB breakout.

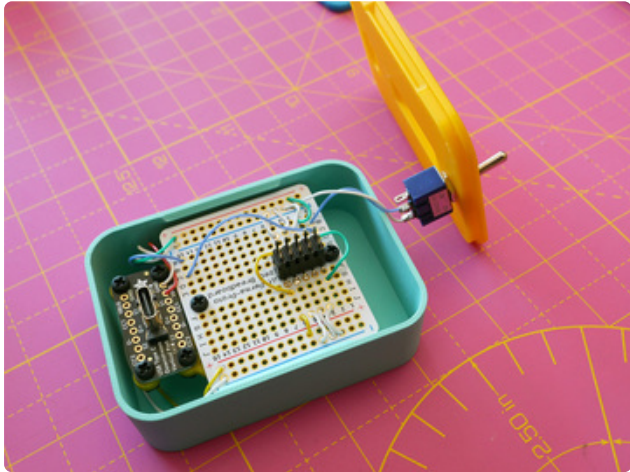
Check Voltage Outputs



Now would be a great time to double check that your voltage readings on the breakout are still accurate before closing up the enclosure. You should read -12V on the negative rail and +12V on the positive rail.

If you skipped the [Tune to +12V and -12V page](https://adafruit.it/1agA) (<https://adafruit.it/1agA>), please go back to it.

Enclosure

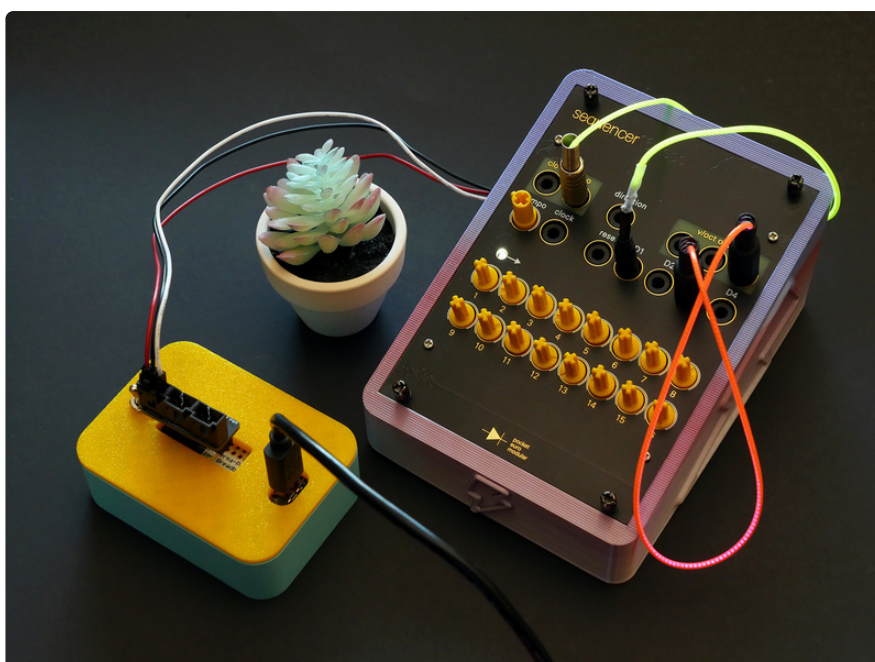


Insert the assembled mounting plate into the enclosure box. The screws will notch into the mounts in the bottom of the box. Attach the toggle switch to the opening in the lid.

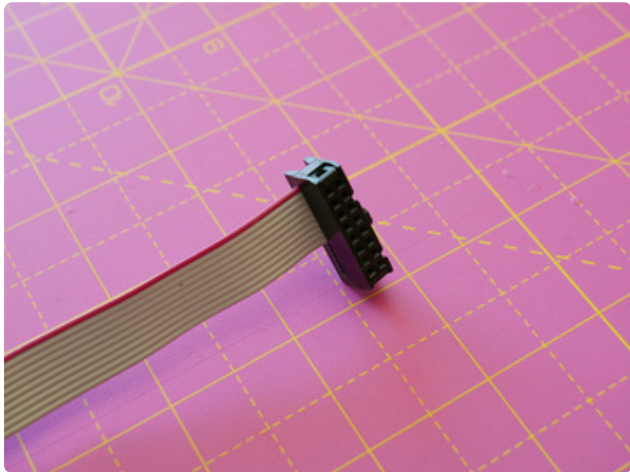


Close up the box with the lid. You'll notice an embossed line to the left of the negative rail on the 2x5 header. This denotes the negative rail for Eurorack module. Now you're ready to use the power supply.

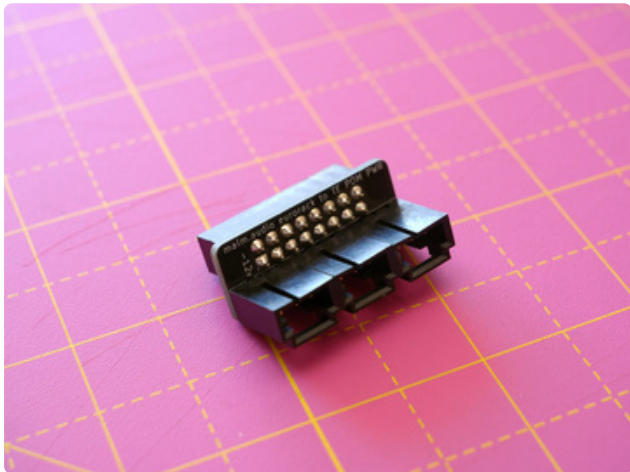
Use



Now you're ready to use the power supply with a module. You'll plug in your module's power cable into the 2x5 header on the power supply.



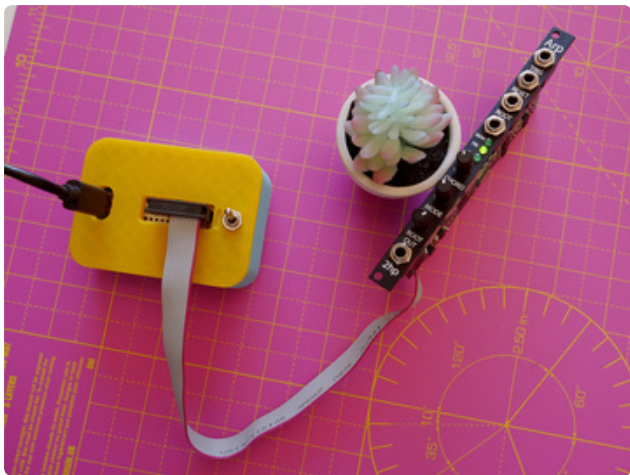
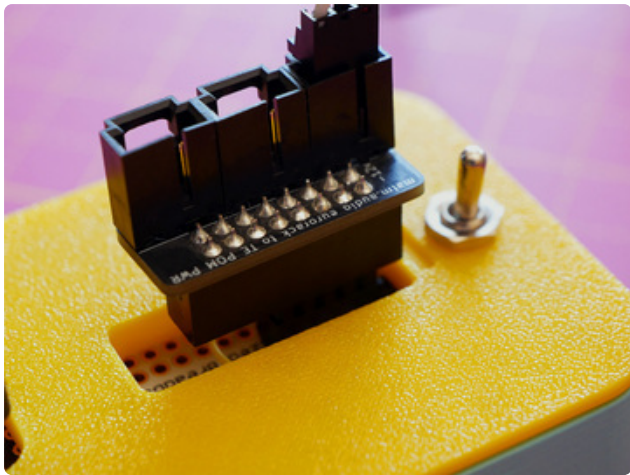
Eurorack IDC power cables usually have a red stripe on one side that denotes the -12V rail.



There are also IDC connector adapters for gear that don't use standard power connections. This adapter converts [Teenage Engineering Pocket Operator Modular 3-pin connectors \(https://adafru.it/1agB\)](https://adafru.it/1agB) to a Eurorack power connector.



Plug your IDC power cable into the power supply, making sure that the -12V lines are matched. There an embossed line on the 3D printed lid to help as a reminder for the -12V location.



Connect a 5V USB power supply to the USB C plug. The TPS65131 accepts 3 to 5.5V as an input voltage, so any [5V USB power supply \(http://adafru.it/5801\)](http://adafru.it/5801) will work. Switch on the power supply and you're ready to use your module.