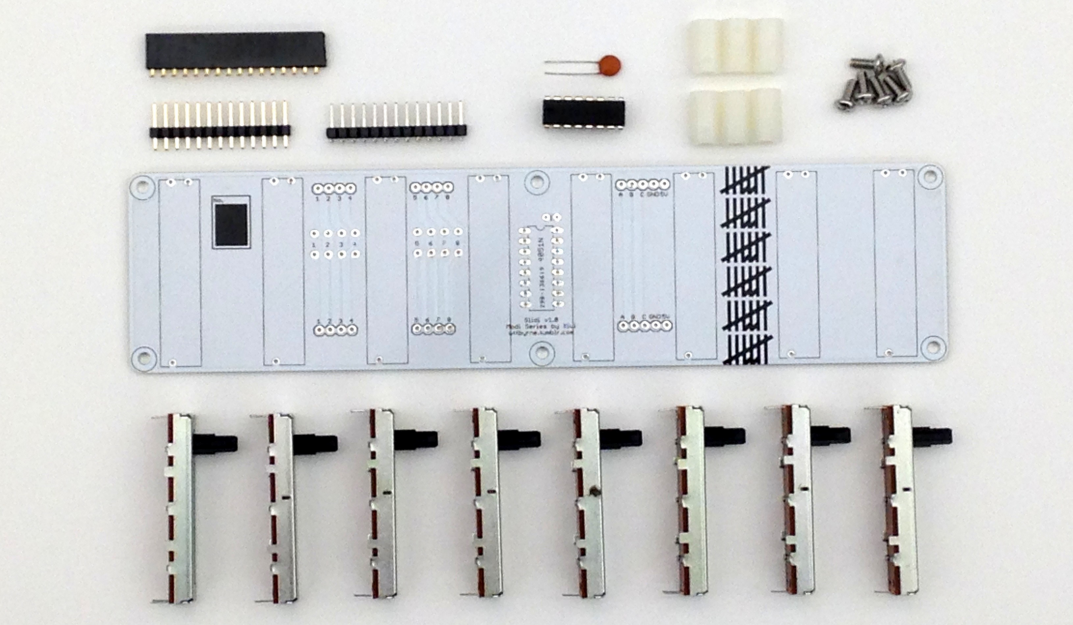
SLIDI Assembly Instructions

Product Page -
GitHub Repository - https://github.com/brendan-byrne/Modi

To assemble this kit you should have introductory knowledge of electronic components and soldering. At the very least, you will need a soldering iron, solder, wire strippers, and flush/angle cutters. Having some solder wick on hand just in case of accidents never hurts either.

For questions, concerns, or problems related to kits from the MODI Controller series please contact, Brendan Byrne, at xiwicontact@gmail.com.

NOTE: Occasionally, the PCBs in the following images will vary from your PCB. There are three other units from the MODI series that share functionally identical elements. Do not distress!



Kit Contents

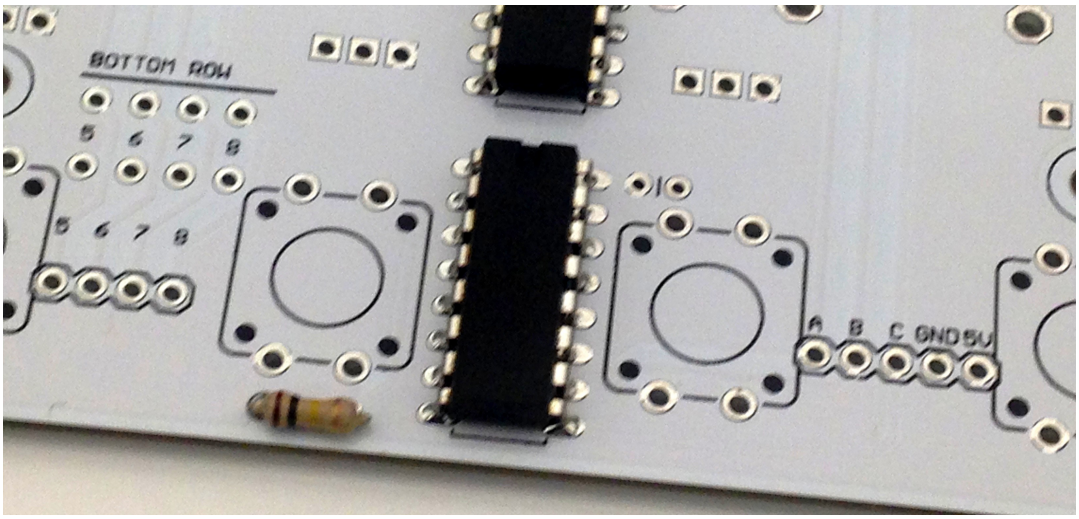
1 – Slidi PCB
1 – 4051 Multiplexer ICs
1 - .1uF Capacitors
8 – Slide Potentiometers
8 – Slide Knobs
1 - Male Straight Pin Header
1 - Male Right Angle Pin Header
1 - Female Pin Header
6 - ¼” Standoffs
6 - 4-40 Screws

PCB Population

Resistors

Hybri uses one resistor. It is positioned directly beneath the button to the left of the *BOTTOM* 4051. On the Pushi PCB, another resistor must be soldered at the top of the PCB. You will find that the spacing of these holes is off a little bit. I apologize for this and plan to fix it in the next iteration of the board. Fortunately, it will in no way effect the functionality of the unit.

SAVE BOTH SNIPPED LEADS OF THE RESISTOR! They will be used later.



This image shows the 4051's already soldered in place.

Next , solder the 4051 chips into place. This kit does not include IC sockets due to a height conflict when fitting the board to an enclosure. If you have a 16-pin socket available, you can use it if you like.

You can do it!

If you are worried about soldering an IC, watch a YouTube “how to solder” video and follow the instructions. I recommend this one from Curios Inventor and at times reference it myself http://youtu.be/I_NU2ruzyc4.

4051 ICs – Various Approaches

1: Gravity and Balance

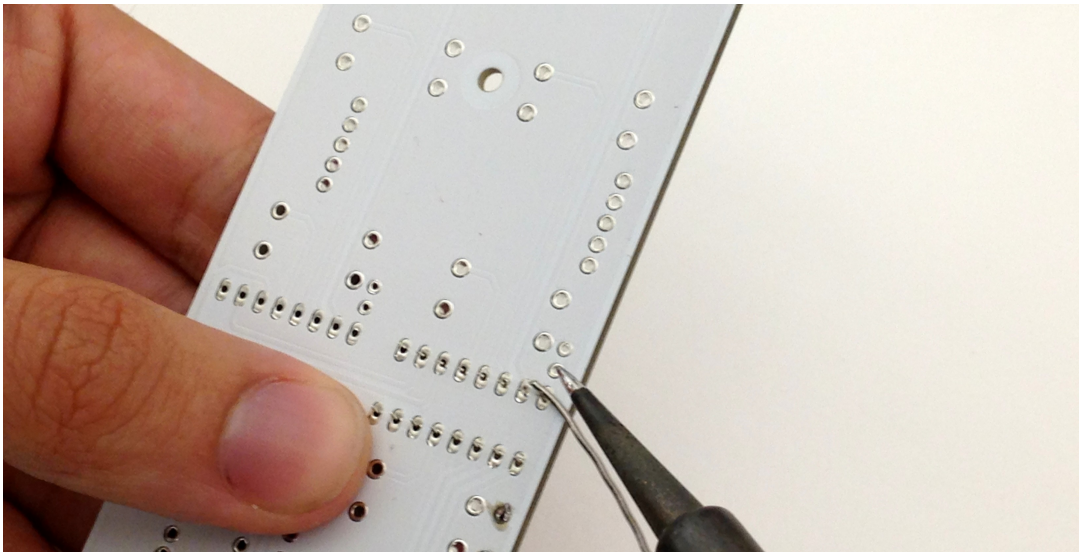
There are a few ways you can go about soldering the chip into place. The first way is easiest. Set the 4051 into the PCB correctly. The notch is clearly indicated. Flip the board over and let the weight of the board keep the IC in place. You may want to apply pressure to the board on either side of the IC's pivot point so that it doesn't move around too much.

2: Hold and Tack

The other way involves holding the IC in place with your index finger. Press and hold the chip in place.

Pull some solder out from its coil and let it float in the general location the board will be. Position the soon-to-be-soldered point on the PCB next to your solder. Make sure the solder extends a few millimeters past the joint. Apply the iron and watch the solder curl back and melt into the joint.

If you are using loose solder, you can also use helping hands. This is a good way to have it hover in place.



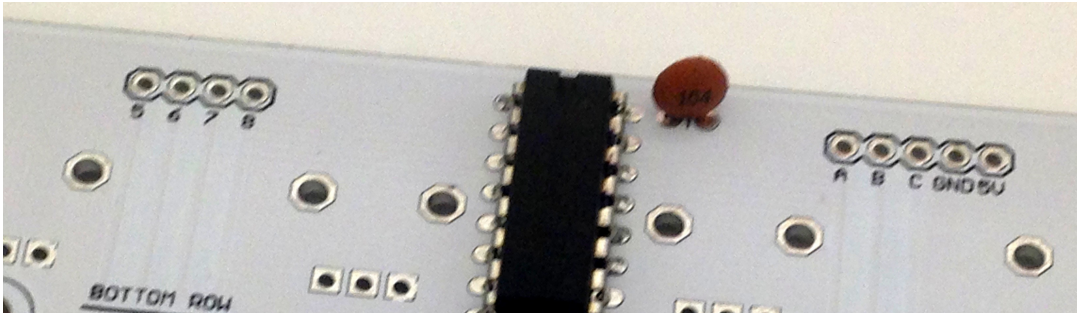
This is a technique I use all the time. Good to learn.

It can be tricky at first, but you'll quickly get the hang of it.

3: Flux Pen Alternative
If you have a flux pen on hand, apply some flux to the joint and apply an iron pre-loaded with solder to the joint. Be sure to clean the board when completely done assembling. Certain kinds of flux can be corrosive to the PCB.

Solder All the Pins
Regardless of what method you choose, be sure you have soldered the rest of the pins into place.

Capacitors
Place each capacitor directly to the top-right pin of each 4051, bend the leads, snip, and solder. All boards except SLIDI use two capacitors.



Modular Selection Pins

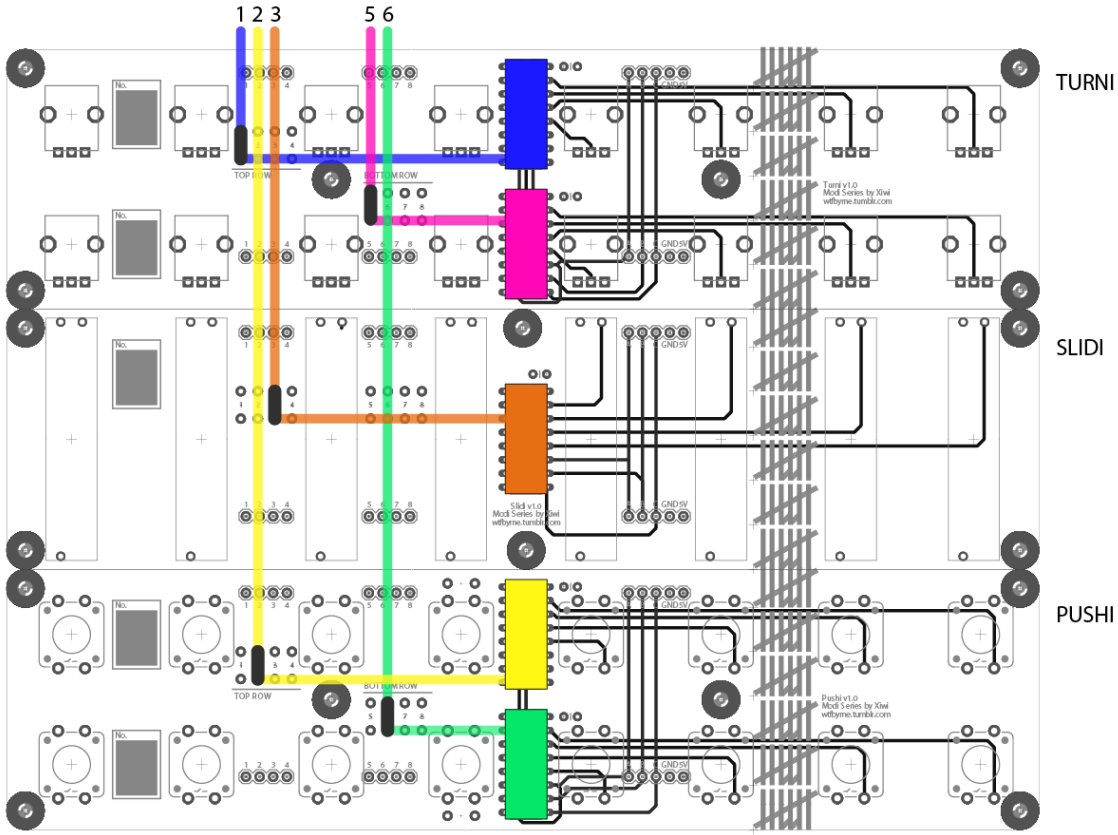
Next, we will solder the modular connection bridge into place. These points allow you to chose what MODI signal path the IC will send potentiometer or button signals on. This translates directly to what pins you connect your microcontroller to on a breadboard.

On the left side of the PCB there are a few numbers and solder points. Numbers 1-4 indicate what paths the top IC will transmit on and numbers 5-8 represent possible channels for the bottom IC. If you are working with the SLIDI module then 1-8 represent possible paths for that PCB's single 4051. These numbers do not affect the code of your microcontroller. They have been placed to assist you in planning your system electronically.

If you plan to use more than one MODI module than **BE SURE NOT TO USE THE SAME SIGNAL PATH TWICE**. If you've made this mistake, you will receive messages from two banks of controllers. This will problem will reveal itself when it comes time to program the device.

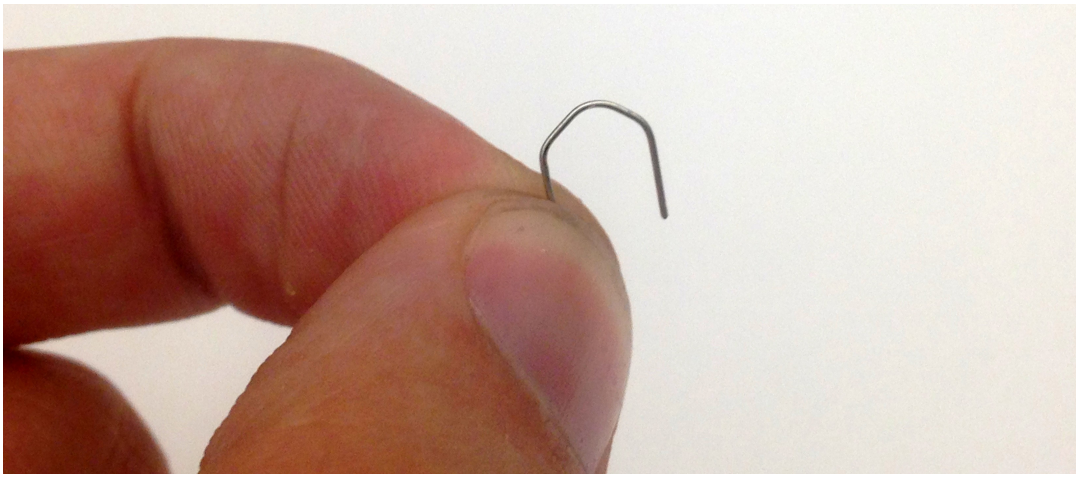
Visualizing Path Selection

The image below is an example of a MODI system composed of three separate modules. The five colors indicate signal paths. The elongated grey ovals in the selection area indicate solder connections. This unit supports 5 4051 multiplexers and 40 analog readings.

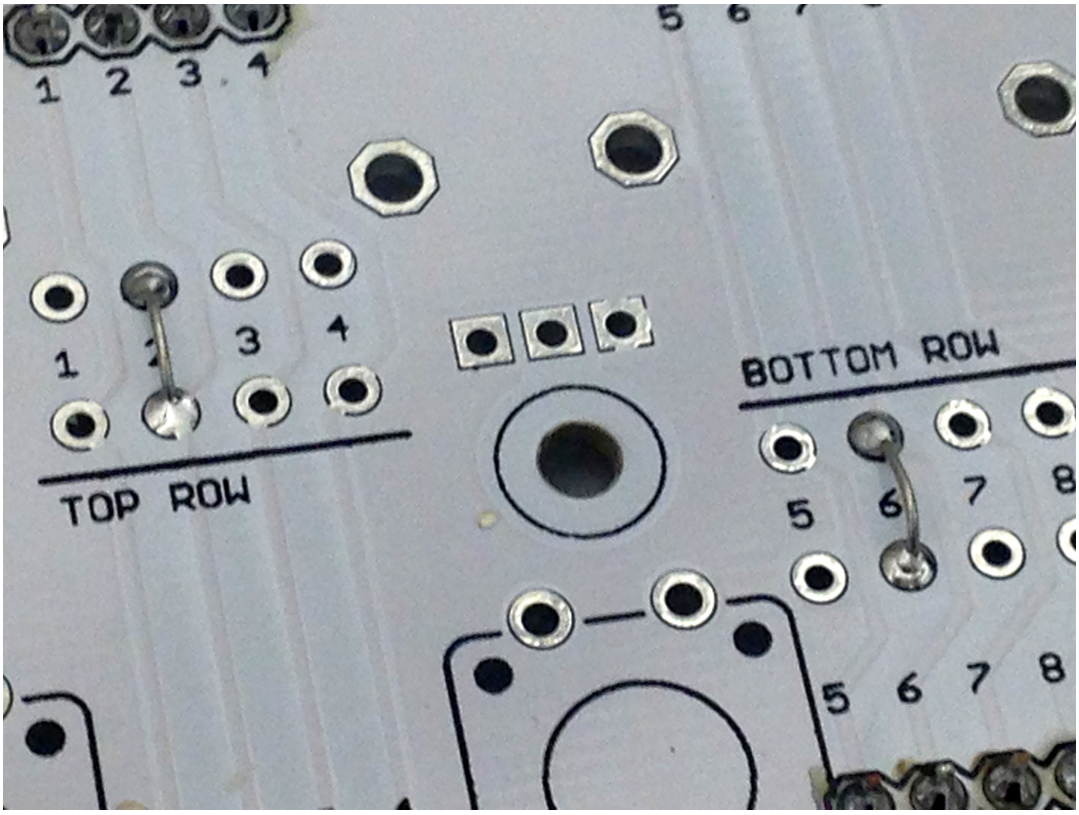


Making a Selection

Remember the leads you saved from the resistor? Bend those leads into the shape seen below. They don't have to be perfect. These will be inserted into the numbered slots, so use them as a rough gauge for shaping the wire.



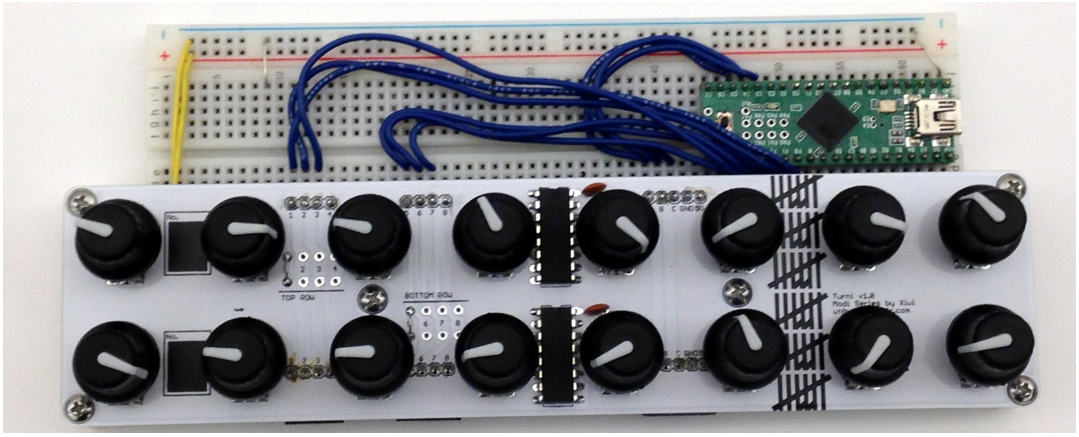
Insert the leads into the path you'd like to send on. *Use one for the top row and one for the bottom row*. In the example below, you'll see that the top multiplexer will send its signal on path 2 and the bottom will send on path 6. Each of these paths is associated with a pin of the pin header that we will be adding next.



The top row is using path 2 and the bottom is using path 6. These paths should not be reused by other MODI PCBs.

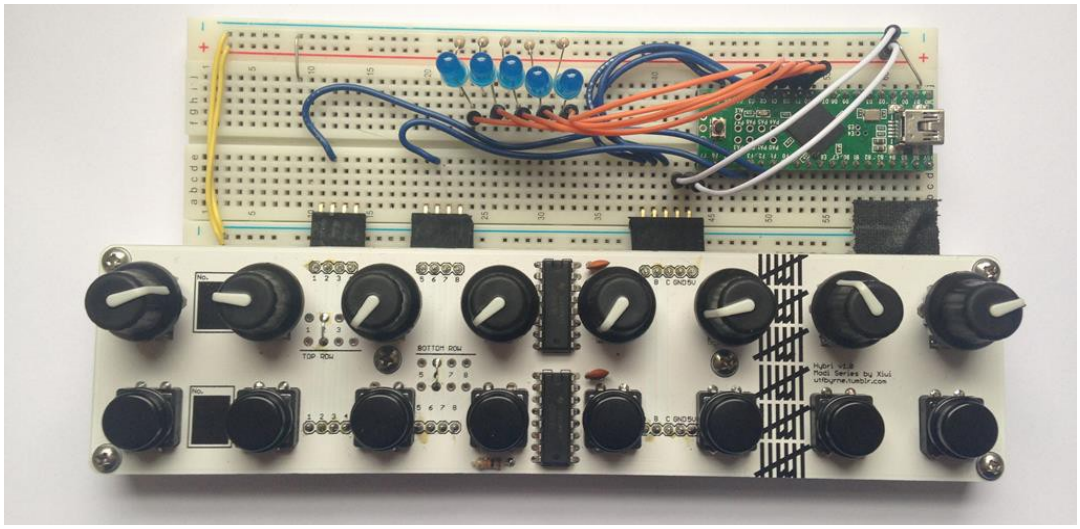
Top Male Pin Header
You will have to decide whether you want to use the male *straight* or *right angle* pin header. Both sets are included in the kit.

Straight:
Choose this option if you want to plug your MODI PCB directly into a breadboard. Works best for whatever module is at the top of your system or if you plan to use just one MODI board.



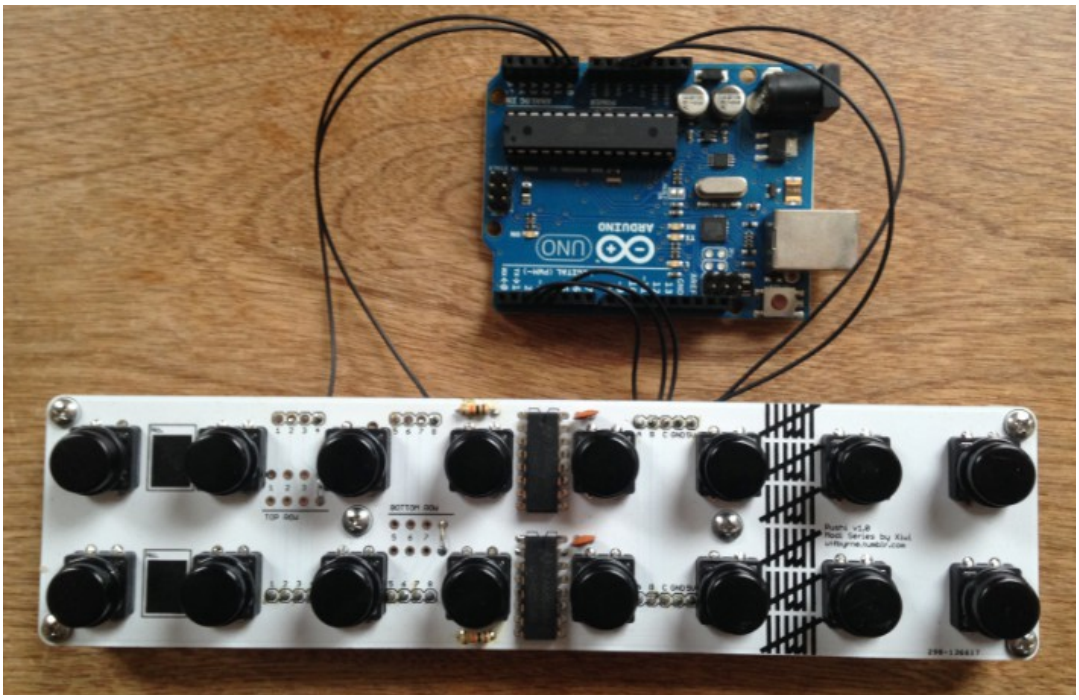
Straight pin header plugs directly into breadboard. Turni board shown here.

Right Angle:
Choose this option if your module will be daisy-chained and located beneath another module. Keep in mind that you can still connect a MODI unit with *right angle* pin header to a breadboard (see image below). If you have female pin header of your own or you don't plan to use the female pin header that came with the kit, you can plug them directly into the breadboard.



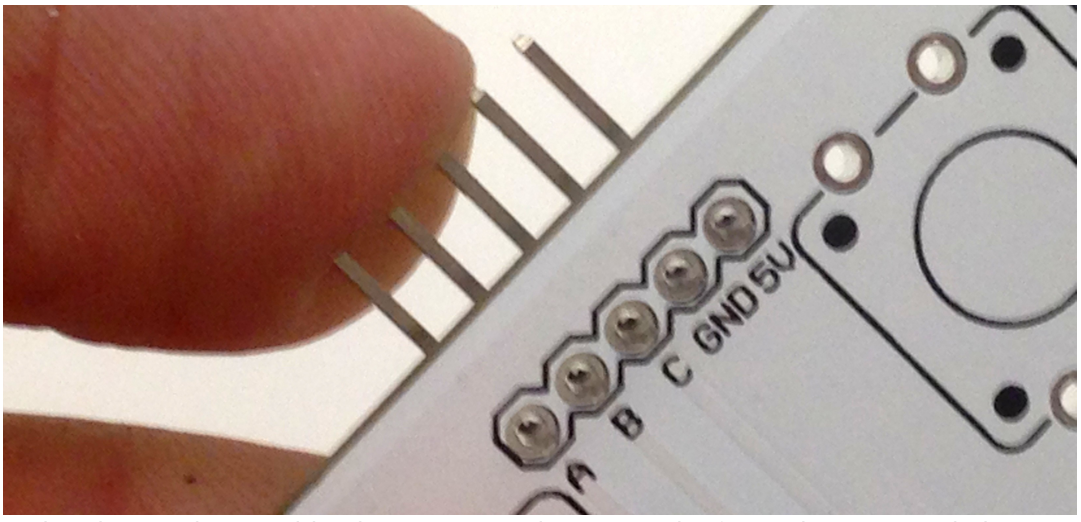
This is a good example of how integrating your controller into a breadboard allows you to build interfaces on the fly to suit your evolving needs. Here, I am utilizing the breadboard to visualize MIDI input messages using a few LEDs. Hyrbi board shown here.

Wired Connectors:
If you are planning to create an enclosure for your system, consider mounting your microcontroller underneath the Modi PCBs. In this case, using a wire connection will be the best approach. It also works well for directly connecting to an Arduino.



MODI PCB wired directly to an Arduino. Pushi board shown here.

Soldering Pin Header:
Regardless of what pin header type you use, you will still need to solder it in place. The connectors that come with the kit must be broken into sets to match the PCB. First, snip the male pin header. Create sections of 5, 4, and 4. The best tool to make these sections is the flush cutter. There are a few spare pins, but do your best to cut without destroying any pins.



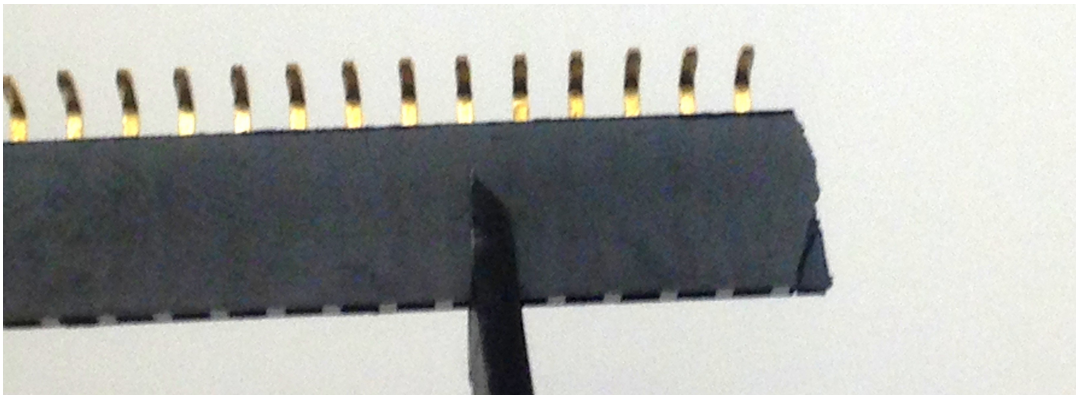
In this photo, I plan to solder the 5V pin into place. My index finger does not touch this pin.

DO NOT TOUCH THE PIN YOU ARE SOLDERING! YOU WILL BURN YOUSELF!

Make sure the pin header goes in straight and flush with the board. The holes allow for some wiggle room, so after you've soldered one pin, it won't be too difficult to heat that joint back up and readjust the header. Applying pressure with your index finger pushes the pin header into a straight position.

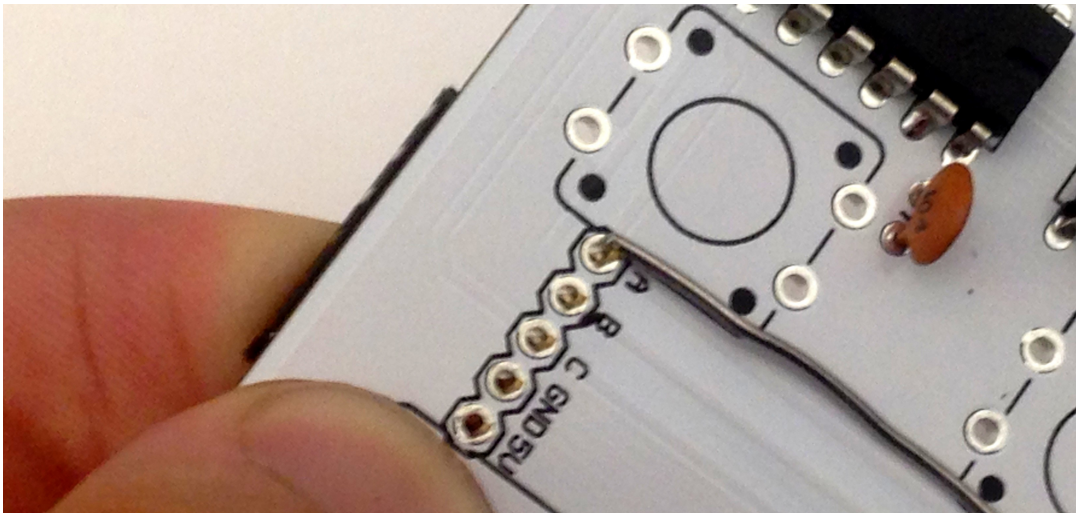
Bottom Female Pin Header
If you intend to use only one module, then you can skip this portion of assembly. Otherwise, this is the key component in linking MODI boards together.

First, snip the female pin header into sections of 5, 4, and 4 pin sets. When you cut female pin header you must take into consideration that one pin will be destroyed. Center your flush cutters on the sacrificial pin.



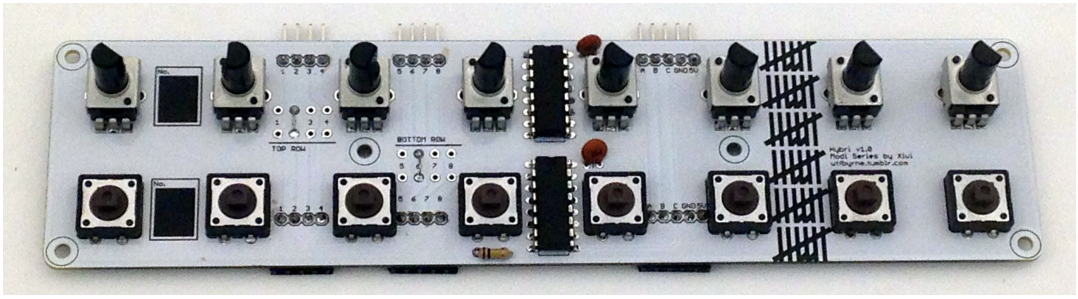
In this image I am cutting to create a section of 5 pins. Note that my flush cutters are located directly upon the 6th pin from the right, which will be destroyed.

Solder the female connectors into place. Try to keep them flush. The hovering solder trick described in the 4051 IC section works well here.

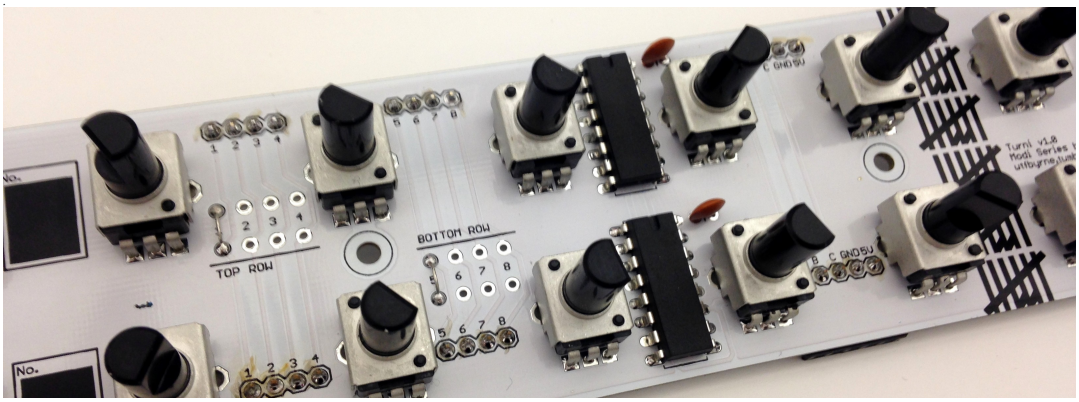


I am about to solder pin A into position. My solder is floating using some helping hands. All I need to do is apply the the soldering iron.

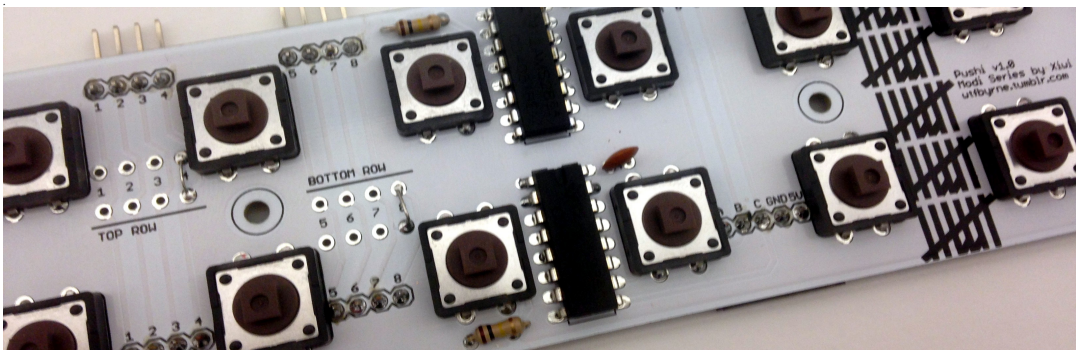
Potentiometers and Buttons:
Place each one into the PCB and solder the pins on the bottom side of the board. For the potentiometers it is only important to solder the three pins. Soldering the clips is entirely optional. I prefer to not solder them. Take a moment to check your board against the images below. Now is the time to fix mistakes if you see any.



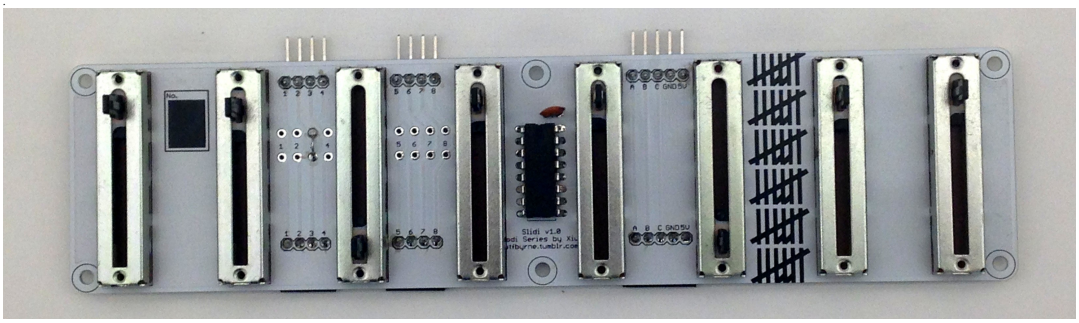
HYBRI – *Signal Paths 2 + 6 with Right Angle Connectors*



TURNI – *Signal Paths 1 + 5 with Straight Connectors*



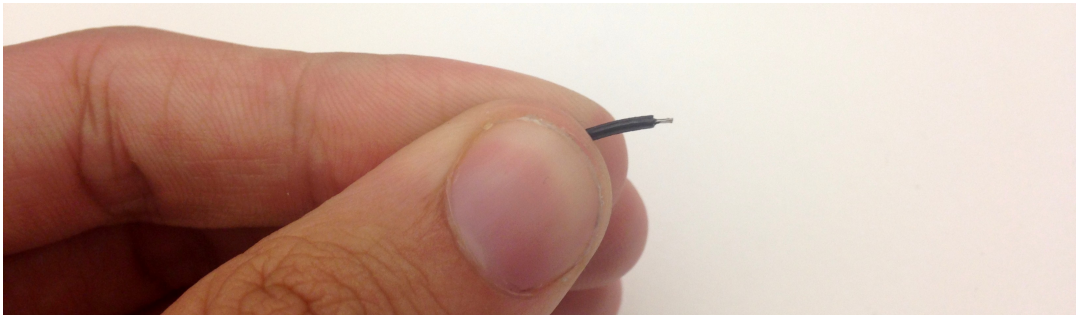
PUSHI – *Signal Paths 4 + 8 with Right Angle Connectors*



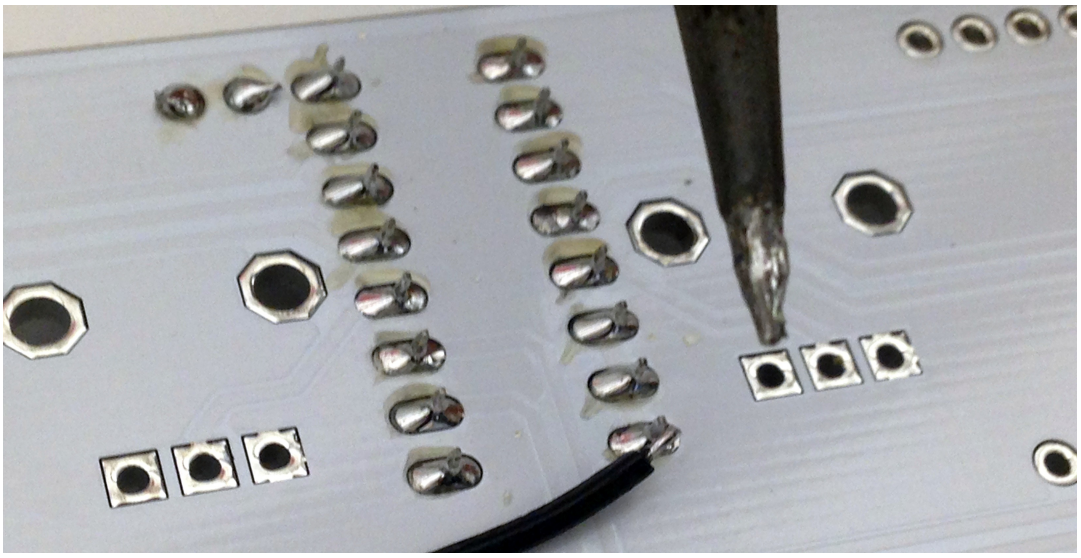
SLIDE – *Signal Path 3 with Right Angle Connectors*

HYBRI Boards Only: A Quick Fix

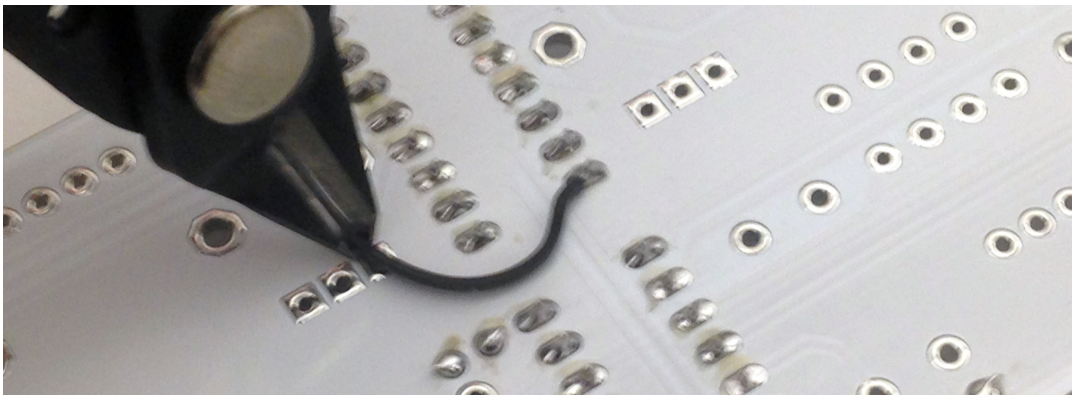
Take the thin blue wire, strip some of insulation away, and add a small bit of solder to the exposed wire. Try to make your wire resemble the one pictured below. Trimming down the exposed wire is a good technique for sizing.



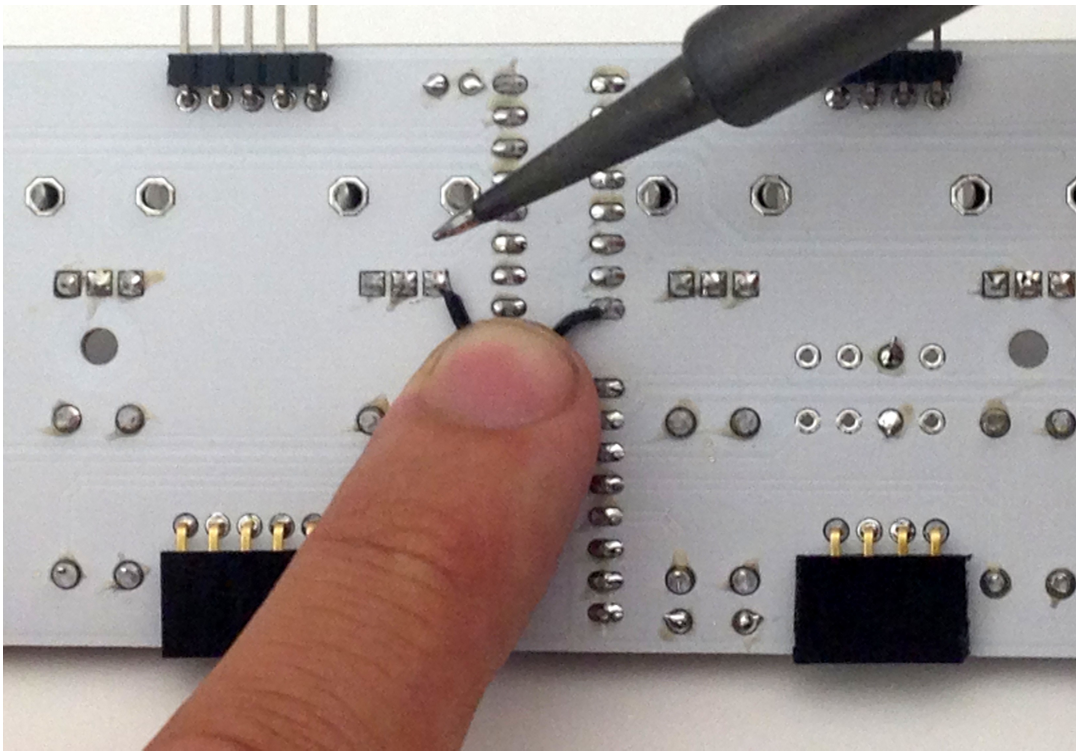
Next, look at the bottom of the PCB. Place the end of the wire so that it is touching the bottom right pin of the top 4051 IC. Hold it in place and apply your soldering iron.



Make sure the wire is soldered properly by giving it a good hard tug. If it passes the test, you can now trim it to size. Shape the wire so that it looks similar to the picture below. Snip it at about the same spot. It is better for the wire to be too long than too short, so play it safe.



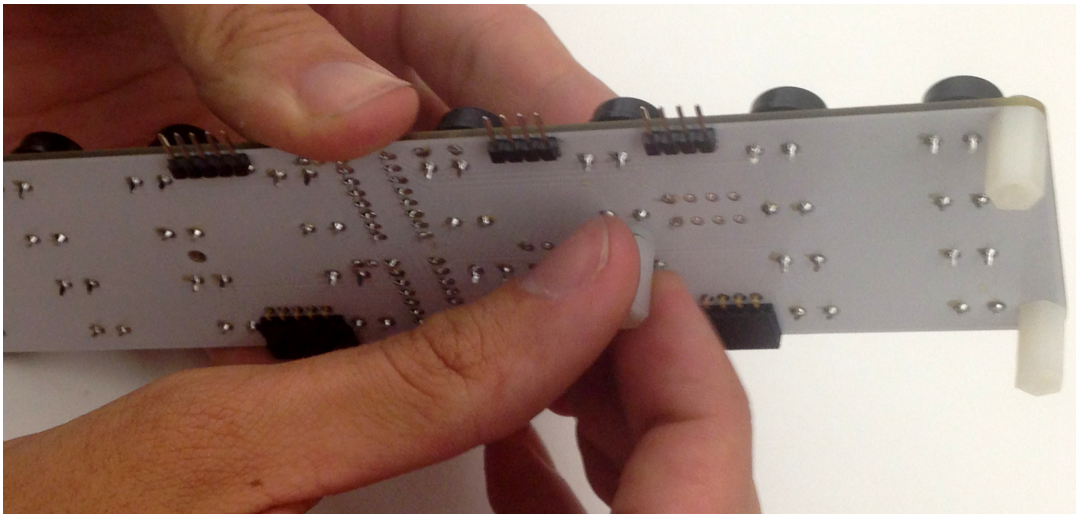
Finally, strip the other end of the wire and apply some solder to it. This process is called tinning. Move this end of the wire to the potentiometer pin indicated in the photo. Apply your soldering iron to make the connection.



This image demonstrates very clearly what our jumper wire accomplish.

Standoffs and Screws

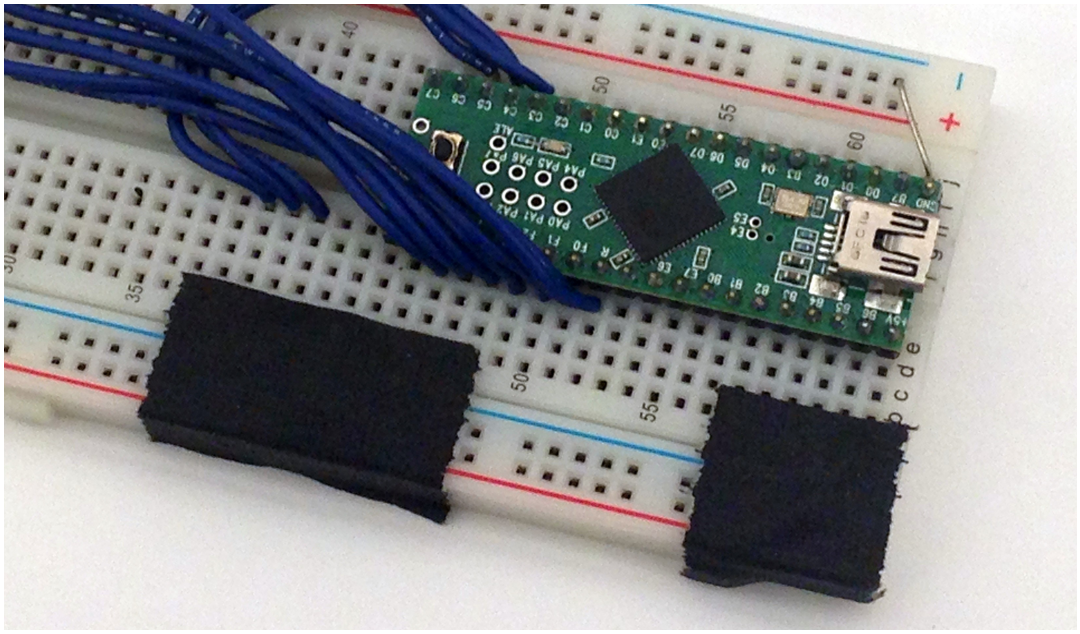
This is the easiest and final part of assembling your MODI kit. Take one screw and place it through any of the mounting hole slots of the PCB. Hold the screw in place using one of your hands. With the other, grab a plastic standoff. Rotate the standoff clockwise to quickly screw it firmly into place. Repeat this process for the other mounting holes.



Breadboard Wiring

Now it is time to connect your MODI board to your Arduino/Teensy. If you used the straight angle pin header, I'd highly recommend connecting your jumper wires prior to inserting the PCB into the breadboard.

Also, if you are using exposed metal jumpers to connect to the ground or 5V buses of your breadboard *THESE MIGHT MAKE CONTACT WITH THE BOTTOM OF THE MODI PCB CAUSING A SHORT CIRCUIT.* A quick trick to resolving this problem is to either use wire jumps to the other buses or use an insulator to cover the metal jumps as I did in the picture below.



Connections

- The 5V pin must be connected to your microcontroller's 5V power.
- The GND must also be connected to your microcontroller's GND.
- The A, B, and C pins can be connected to any pin that supports digital output. Pulldown resistors are not necessary. I recommend using sequential pins and keeping alpha-numerical order. This will keep your code clean and logical.
- The 1, 2, 3, 4, 5, 6, 7, and 8 pins are dependent on the following criteria:
    - Are they connected at all? In the case of my example board used in this instruction set, only pins 2 and 6 are in use.
    - Are your signals digital or analog? Buttons can be connected to digital or analog inputs, but the rotary potentiometers and the slide potentiometers must go to analog inputs.

Programming

Modi comes packaged with an easy-to-use library with built in smoothing functionality. This is extremely useful for quickly prototyping controller systems with precision readings.

Look to the examples found at the GitHub repository.