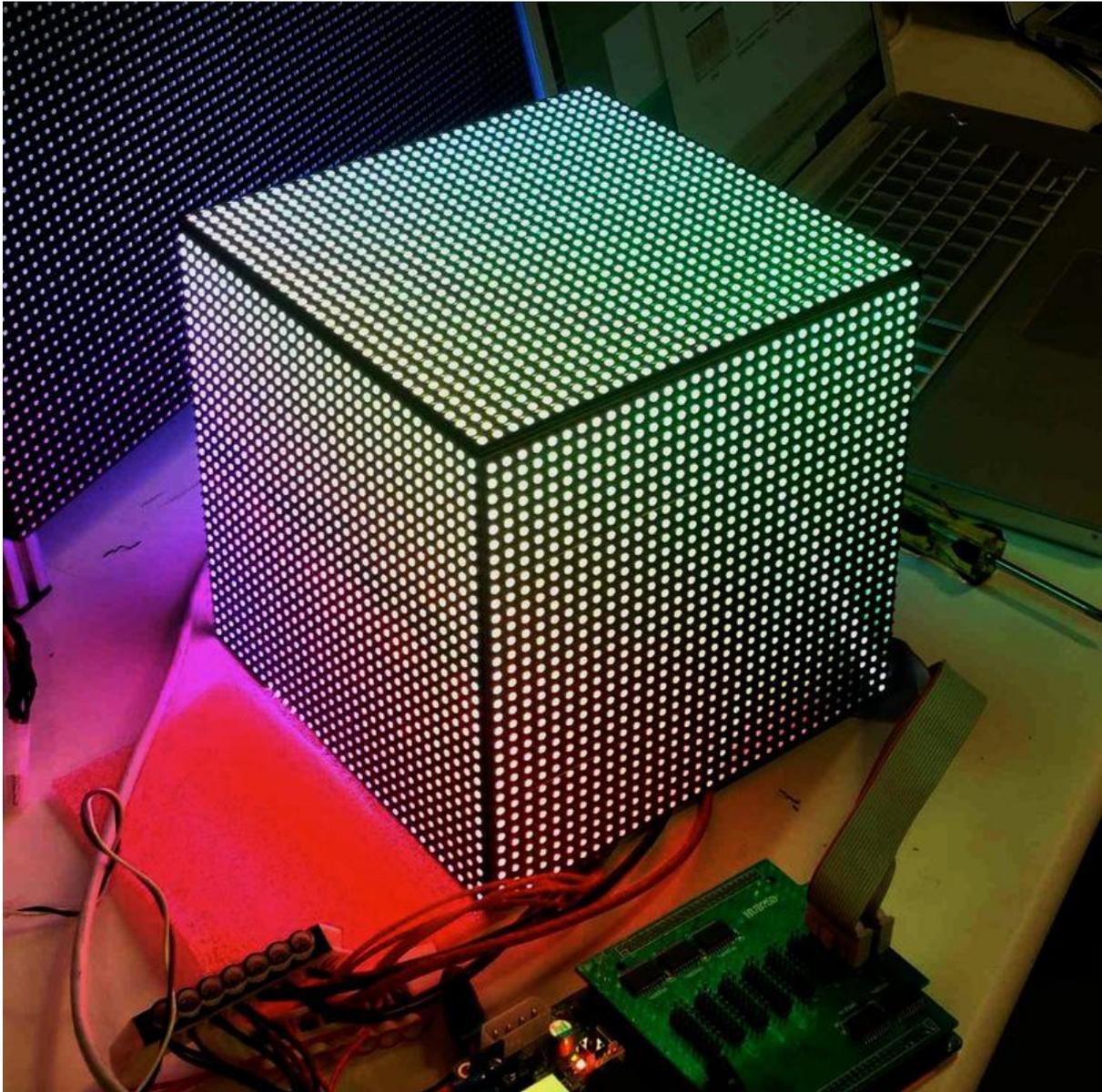




DIY LED Video Cube

Created by James DeVito



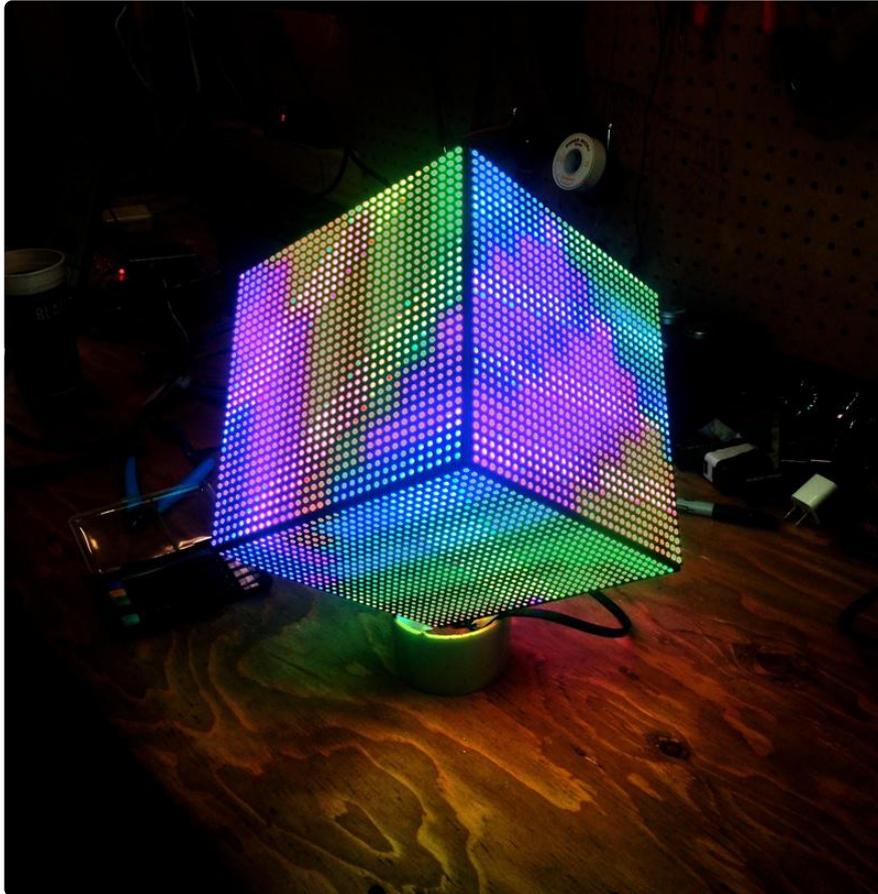
<https://learn.adafruit.com/diy-led-video-cube>

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Overview



After finishing the [LED Video Wall \(\)](#), I wanted to take advantage of the fact that each panel is modular and can be arranged in nearly any way imaginable. I present to you, the Adafruit Video Cube! Each side has 1024 LEDs, for a grand total of 6144 LEDs-- it's super bright in every direction!



It works nearly identical to the LED Video Wall in that the video decoder boards do all the hard work - All you need is a DVI/ HDMI/Displayport output with the proper cable, a good 5V power supply and a little wiring time. The driver supports up to 1024x800 displays. Once programmed and configured you can use any video source!

This is not a beginner project! It is strongly recommended to start out with our [LED Video Wall](#) () before embarking on this adventure! Because so much has to fit inside the cube, it requires some modifications that could potentially damage the hardware if you are not careful and patient! There's also a lot of wiring and power management. We don't sell all the components required so you may need to spend some time getting all the parts you need. Building the cube can take a few weekends and requires care and patience. Here at Adafruit we love this kind of thing, and we have documented the process as best as possible but there's not a lot of documentation out there about these systems so even though we got our cube working nicely we do not offer any kind of consulting or assistance beyond our forum tech support. This is

not a project for a mission-critical, outdoor, mobile or other LED display or for use beyond hobbyist hacking!

Parts List

You will need a lot of stuff to build this cube! Here is a list of what we used - it might be incomplete, we'll correct as we find mistakes!

- [32x32 RGB LED panels \(http://adafru.it/1484\)](http://adafru.it/1484) - not all LED panels are going to work - LED panels come with certain pin and LED configurations. You can build a cube of any size really, but for this cube we used 6 panels, 1 per side.
- [LED video wall sender/receiver set with IDC adapter plate from Adafruit - they come preprogrammed for this tutorial. \(http://adafru.it/1453\)](http://adafru.it/1453)
- You will also need 16-pin IDC connector and thick 5V power cables for the above. Our panels come with them. Make sure you have 6
- 2 Long 16-pin IDC cables. This is to connect from the board to the first row of panels, for this design you'll need 2. Make yourself or [buy from a cable assembler \(\)](#).
- [Oval T-nuts \(http://adafru.it/1158\)](http://adafru.it/1158), one bag
- 1/16 nylon spacer that will fit M4 screws - get a bag of 20
- 1/2" (12mm) M4 screw - get a bag of 20
- [Slotted aluminum extrusion \(http://adafru.it/1221\)](http://adafru.it/1221) - One 2' long piece, to be cut for the frame.
- [Double Corner Brace \(http://adafru.it/1259\)](http://adafru.it/1259) - Three pieces
- [M4 10mm screws \(http://adafru.it/1159\)](http://adafru.it/1159) and [slim T-nuts \(http://adafru.it/1157\)](http://adafru.it/1157) - one pack each
- 5V power supply with at least 20A output, 30A is better. A big ATX power supply can do this and is available at many computer supply shops
- [ATX power adapter cables can be useful if you're using an ATX supply \(http://adafru.it/425\)](http://adafru.it/425). Cut the yellow wire out so you don't accidentally send 12V into your panels
- [Power Distribution Bus \(http://adafru.it/737\)](http://adafru.it/737) - two of these to distribute power within the cube.
- 12 AWG stranded core wire - red and black, one foot should do the trick.
- Ring terminals that will fit 12 AWG - these may or may not be used depending on the panel power plugs
- Heat shrink
- 5V 1A power supply with 2.5mm jack. This is not a standard size jack, [but we used our compact switching adapter with multiple jacks and it works. Just make sure you use 2.5mm with center positive and select 4.5V on the adapter. \(http://adafru.it/1448\)](#)

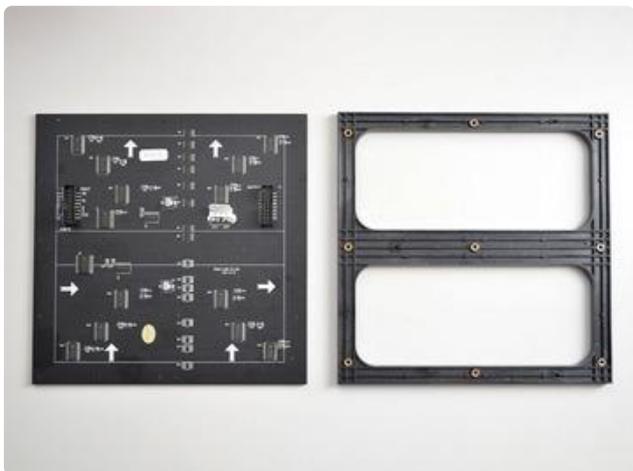
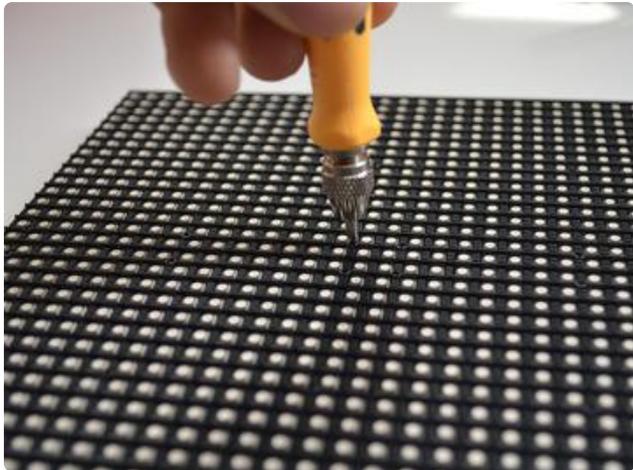
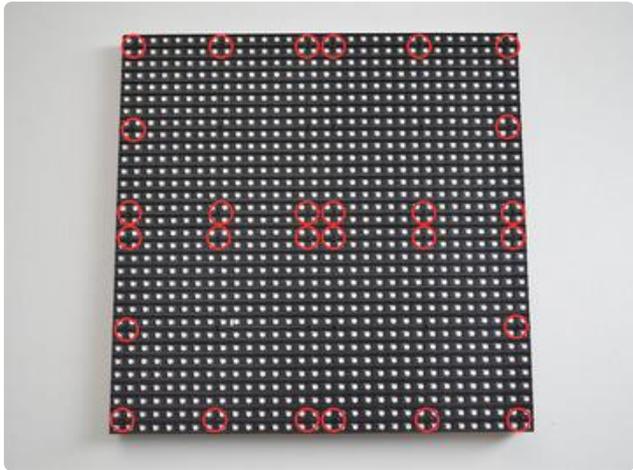
- Ethernet cable - we used up to 100 ft long cable with success, any Cat5 cable ought to work. [We have up to 10ft long in the shop \(http://adafru.it/730\)](http://adafru.it/730)
- Access to a computer with Windows XP/7 if you want to run the configuration software - the config software only needs to be run if you want to change around the display configuration
- Access to a laser cutter and acrylic, though can be substituted.

Also, a variety of tools! Hacksaw, Allen wrenches, drill, heat gun for heatshrink, wire cutters & strippers, etc.

LED Panel Prep

Back of the 32x32 RGB LED panel, frame intact.

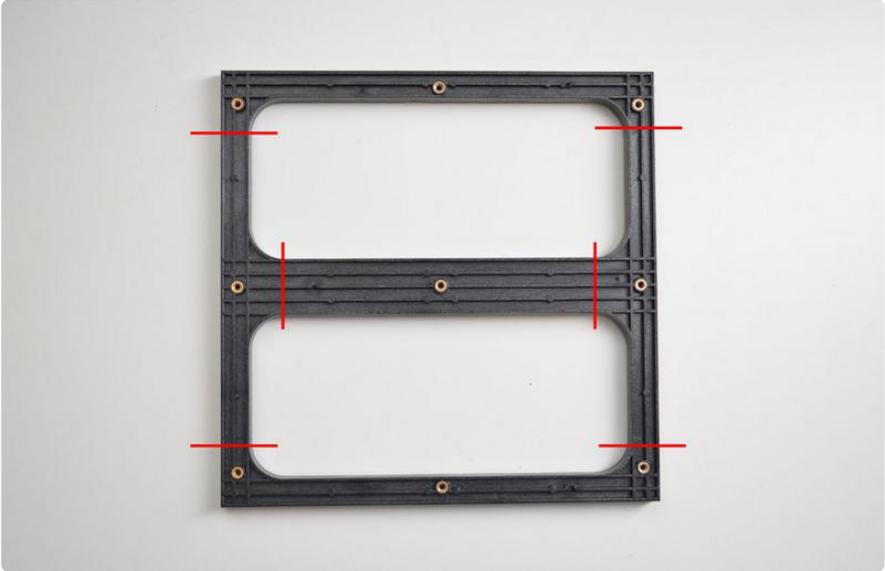


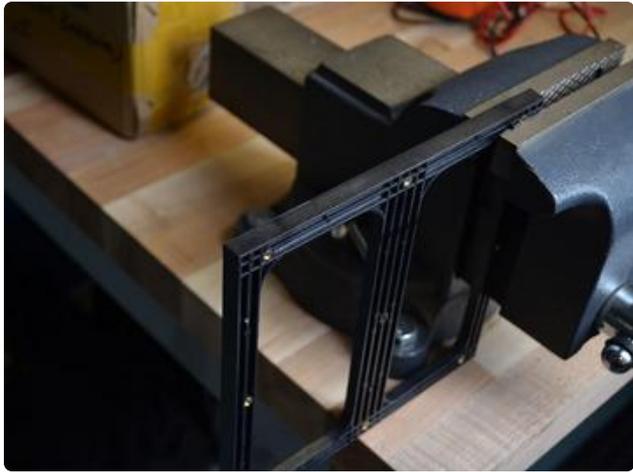


In order to get each panel connected and flush at right angles, some modifications need to be made to the rear plastic frame. If you look closely at the front of the panel you'll see tiny phillips screws that are holding it together. Carefully remove the ones that are holding the back frame on (indicated in the picture). Leave the others - they are to hold the front screen to the circuit board.

You'll need to remove the frame on 4 of 6 panels. Save them though, they'll be used again in the next step. Also make sure to hold on to the screws.

Mark two of the frames along each of the red lines in the picture below.

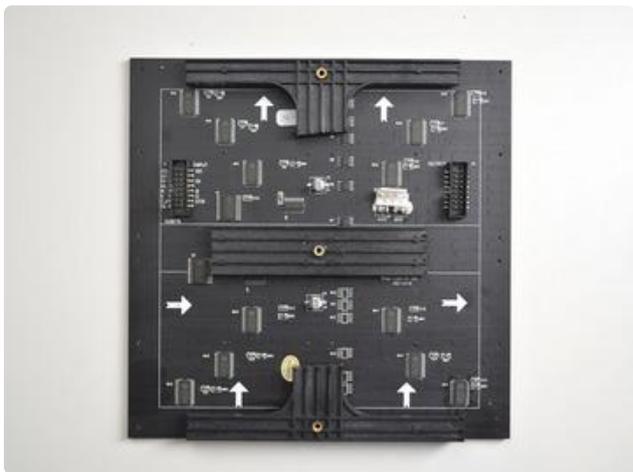




Using a vice to hold it steady, cut the frame at each mark with a hacksaw.

You only need to cut 2 of the 4 frames, but keep the extras as a backup.

You'll wind up with 5 pieces, but you can recycle the left and right-most pieces from the picture below, they will not be used.



Place the newly cut pieces of frame on the back as shown. Even though they aren't all placed where they used to be, the screw holes will line up. Screw them in and repeat this for one more panel.



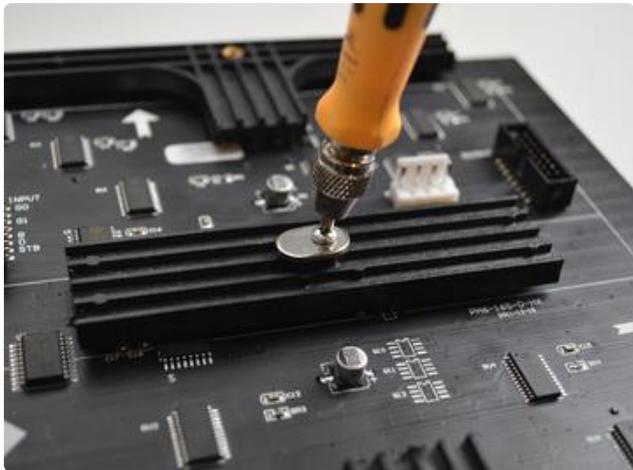
The completed cube will consist of 2 of these modified panels, 2 normal panels, and 2 with the frames completely removed.



To hold the cube together, we'll be building an aluminum extrusion frame around the inside perimeter.

A 4-40 1/2" zinc screw, oval T-nut and 1/16" nylon spacer provides just enough room for the extrusion to slide on nice and snug. I didn't have any 1/16" on hand so I cut down a 3/16" nylon spacer using diagonal cutters.

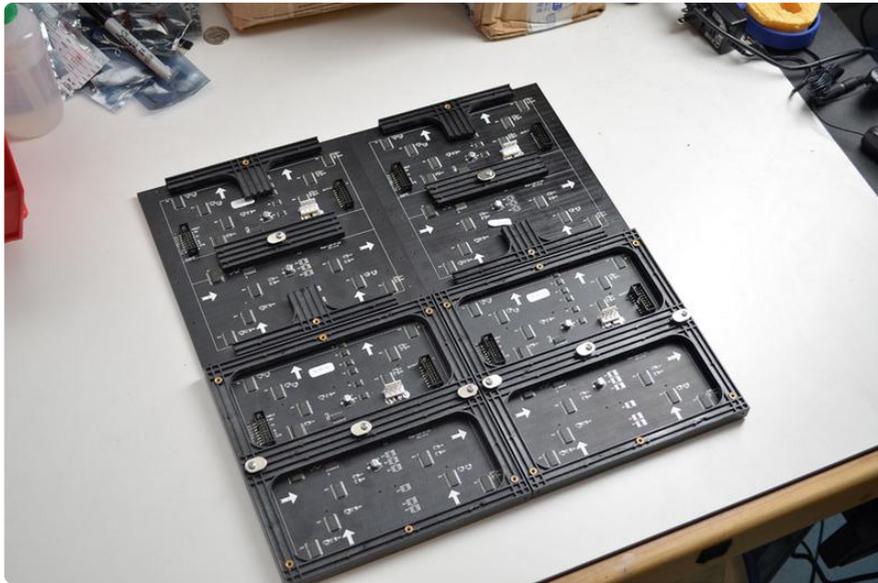
Prepare 8 of these.



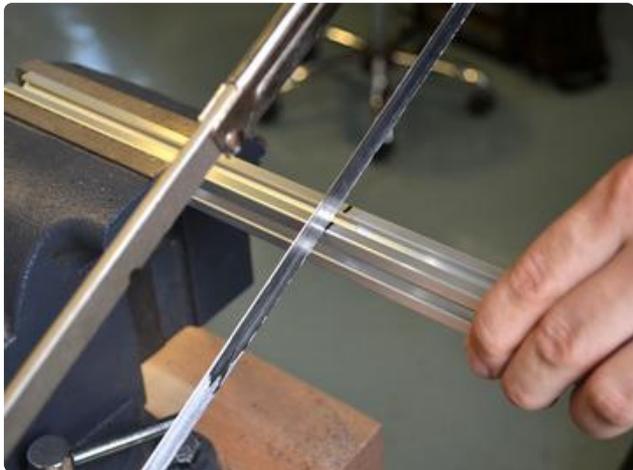
Both modified panels get one screw, and the other 2 untouched ones get three screws down the center.



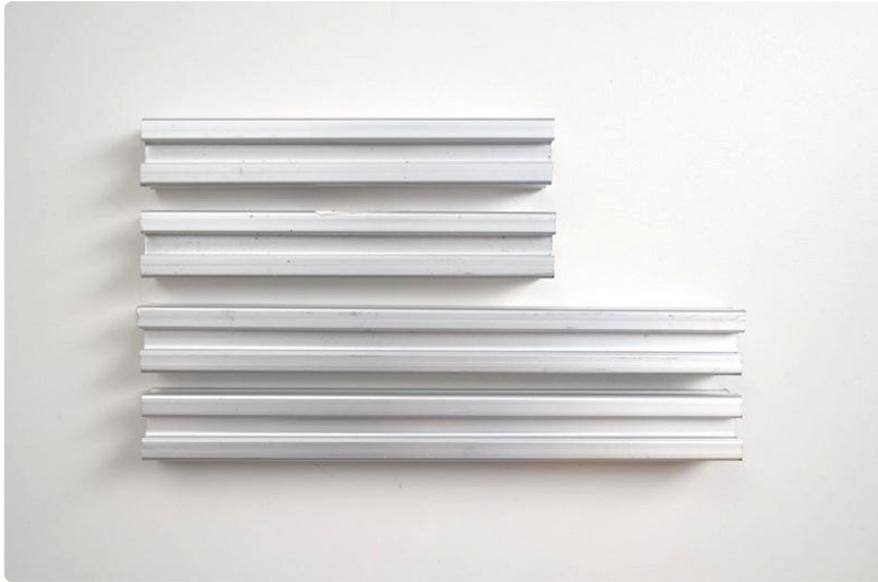
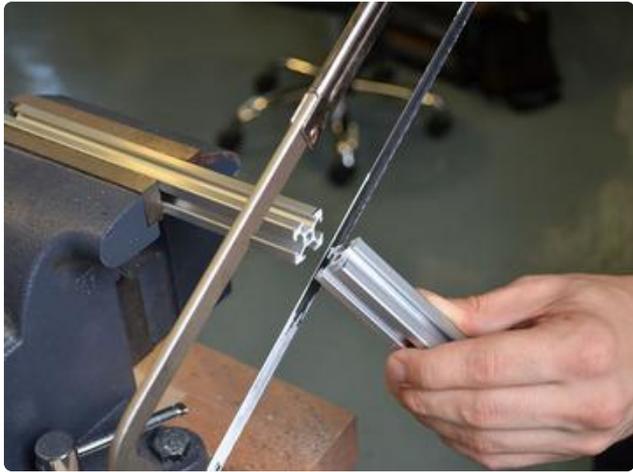
When all panels are prepared it will look like this. These 4 will make up the horizontal sides. The top and bottom 'frameless' panels are not pictured. They will be attached last.

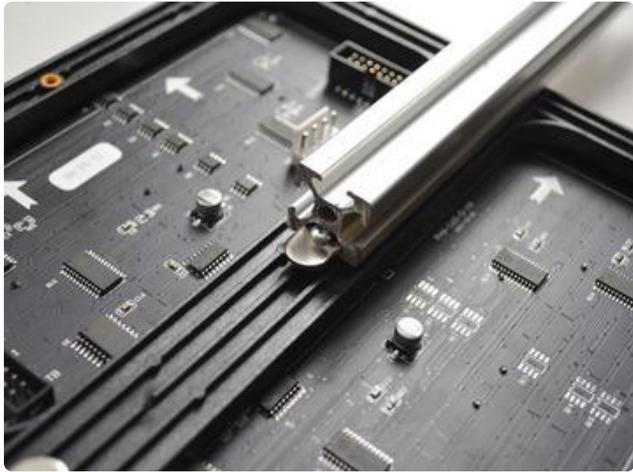


Aluminum Frame



For the aluminum frame, mark two pieces for 4.75" and two for 6.75". Hold with a vice and cut with a hacksaw.



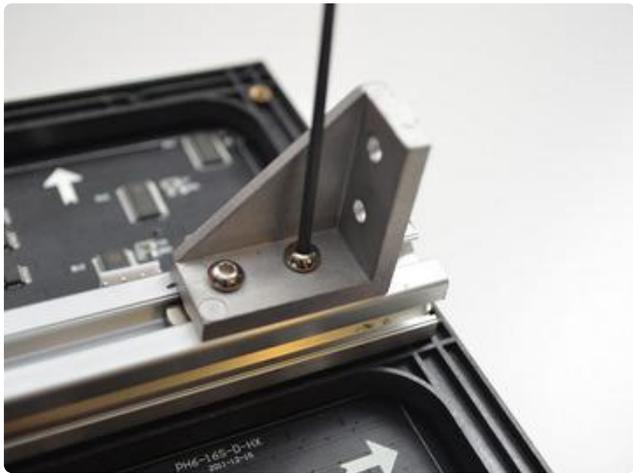


Slide the 6.75" extrusion onto the unmodified panels. Do the same with the 4.75" extrusions onto the cut panels.





Using M4 screws, oval T-nuts and double corner braces, connect two panels at a right angle. The two alike panels should be opposite each other in order to fit flush.



Make sure the horizontal data flow arrows are all pointing in the same direction and vertical orientation arrows are pointing up. Now is the time to check. If these panels aren't aligned properly you will have to disassemble the entire frame to correct it.

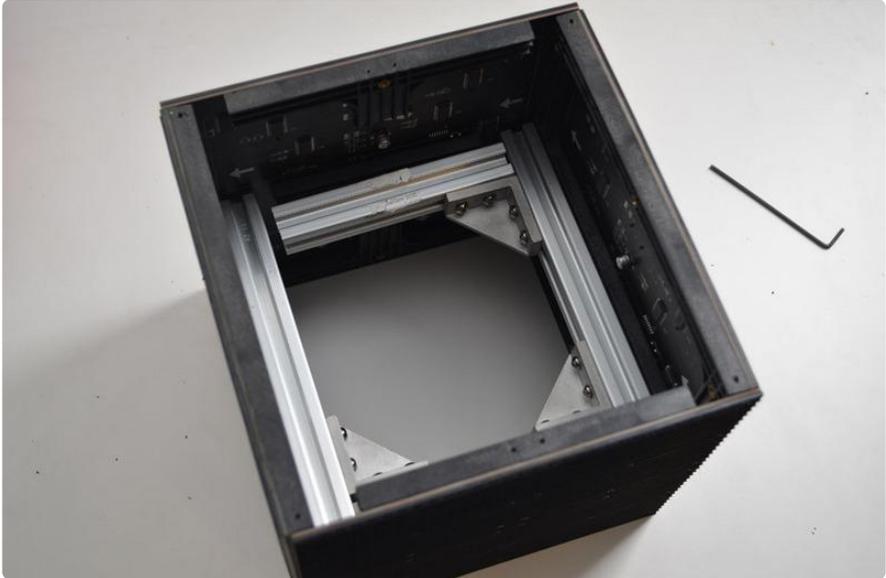


Loosely screw in the corner brace onto one side before placing the next. Make sure the corners are flush and tighten the screws once everything is aligned properly.

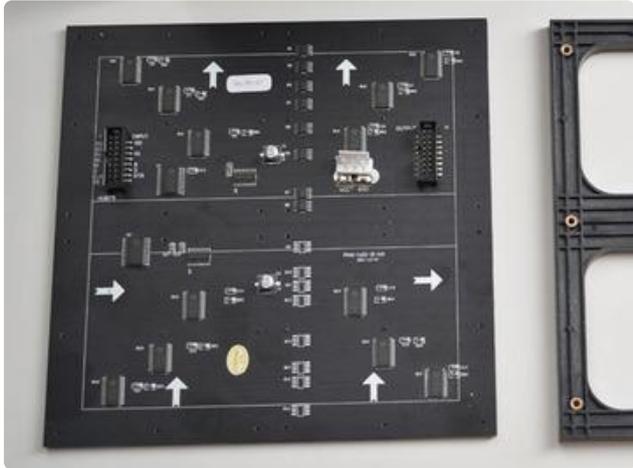
Repeat this for 3 corners. In order to fit the receiver card, there's no room for the 4th as we'll see in the next steps.



The complete frame!



Preparing the Top and Bottom



Line up the bare panel so it is sitting squarely on top of the cube's sides. The screw holes are symmetrical around the perimeter, so at this point the orientation doesn't matter. Attaching the top and bottom panels will be one of the last steps after all wiring is complete.



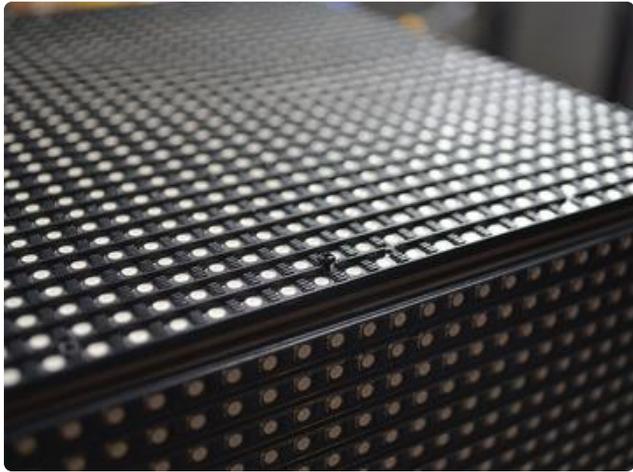
Take the small phillips screws and hold it steady while screwing them in around the perimeter. You'll need to drill pilot holes so screw just enough to make a mark as a guide. I used a 1.51mm bit.

The drilling will create a lot of plastic debris, so it is best to do this before mounting more components inside.



Repeat this for the other side. Do not attach the panels yet.

Make sure the holes line up and move on to the next step!



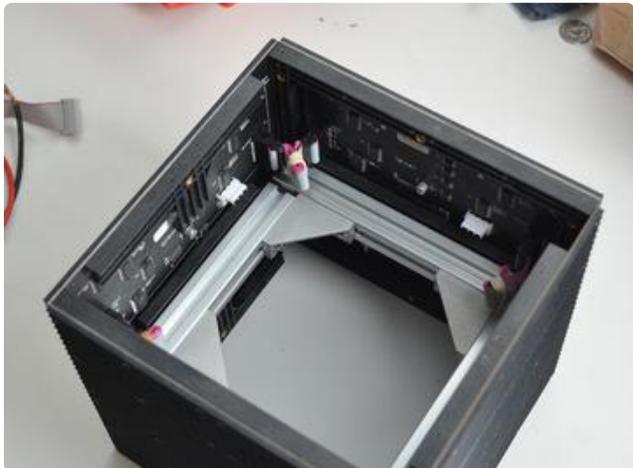
Wiring Data & Power



The 4 horizontal sides of the cube will be linked together to create one row of video data.



Fold the ribbon cable over and use a rubber band to keep it tidy and short. Use 3 of these to run data from the output to the input of each adjacent panel.



Leave the input of the panel where there is no aluminum corner brace so it will be a short run to where the receiver card is mounted.

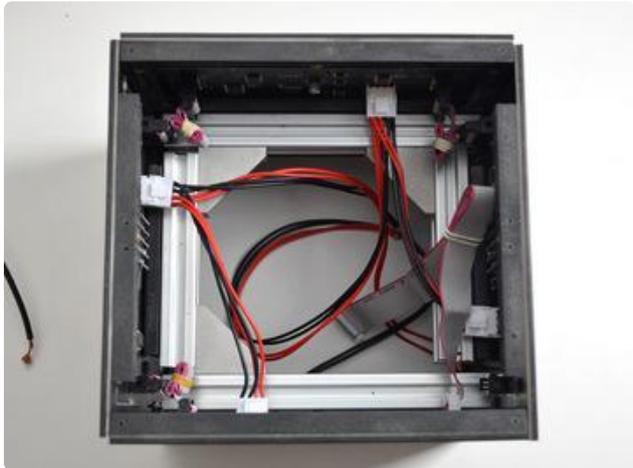


The panels also come with power Y cables. Use two of these to power the 4 panels. Make sure to keep the proper polarity when plugging in the connectors.





Shorten the longer IDC cable to an appropriate length if needed and connect it to the input of the first panel in the chain.



Mounting the Receiver

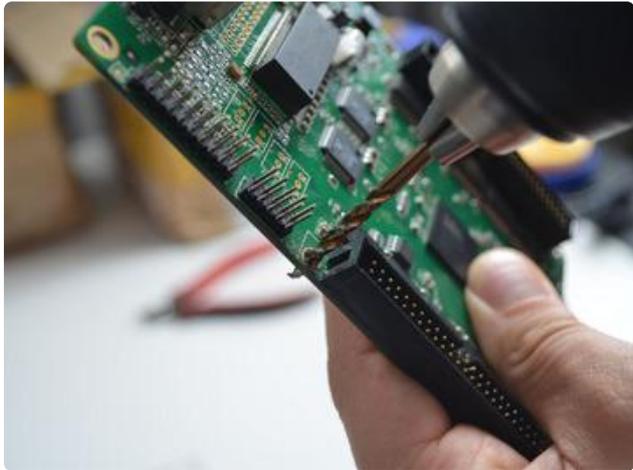


The receiver card will be mounted to the aluminum frame using slim T-nuts & 10mm M4 screws. I laser cut a plate for for stability and insulation. If you don't have access

to a laser cutter, you could get away with using spacers, but I wouldn't recommend it as it can be flimsy.

Download the mounting plate CAD files

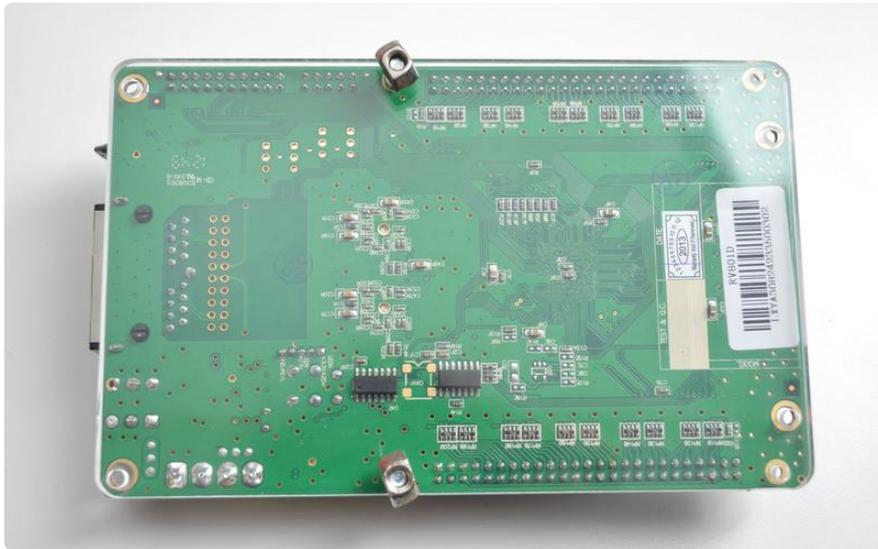
This step requires boring out larger mounting holes on the receiver card to fit the M4 screws. Proceed carefully!!! We cannot be responsible if you break it!



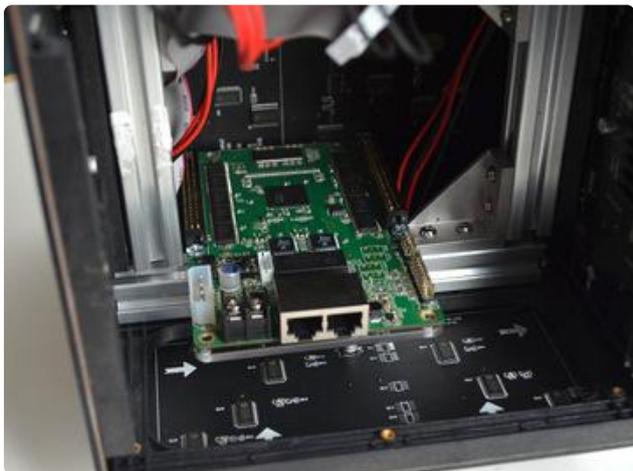
To fit the M4 screws, use a drill to bore larger holes into the left and right center screw holes.



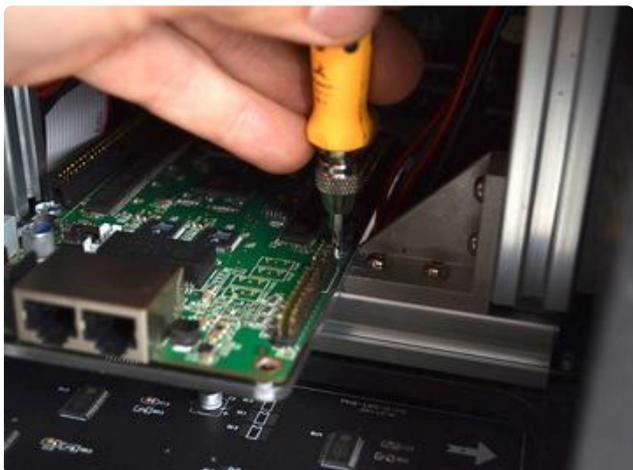
Gradually increase the size of the bit until the screw will fit through. I used a 9/64 bit. Very slowly run the drill through the middle two mounting holes.

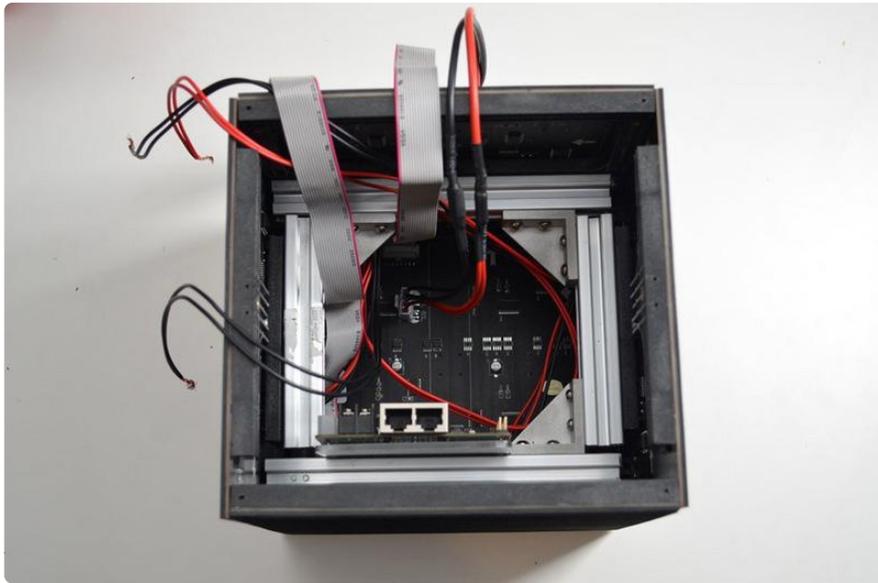


Leave the slim T-nut so it is just barely on the tip of the screw. You have to mount it this way because it is such a tight squeeze and would be very difficult to slide & align the nut in the extrusion's rail.



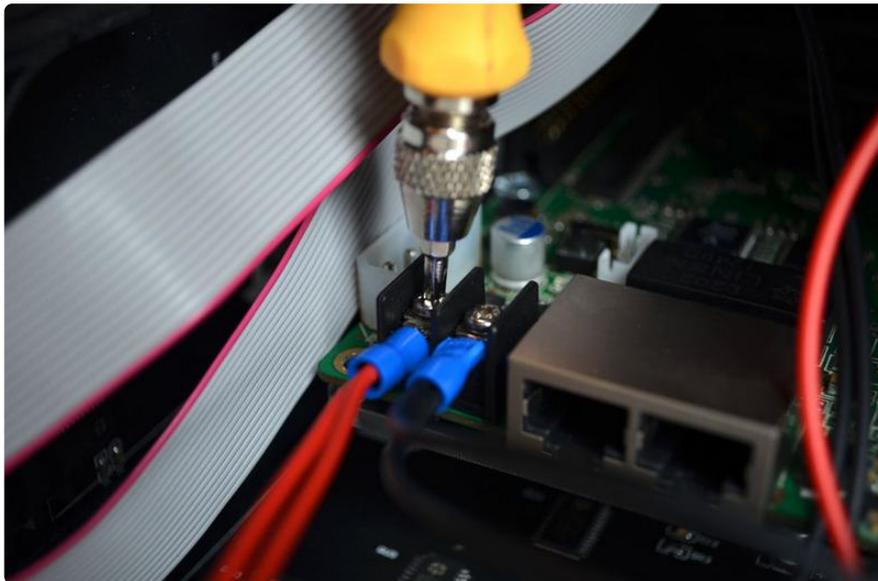
Mount the receiver card assembly so the ethernet jacks are pointing towards the bottom of the cube. The T-nuts should fit in the grooves. Tighten the screws to lock it in.

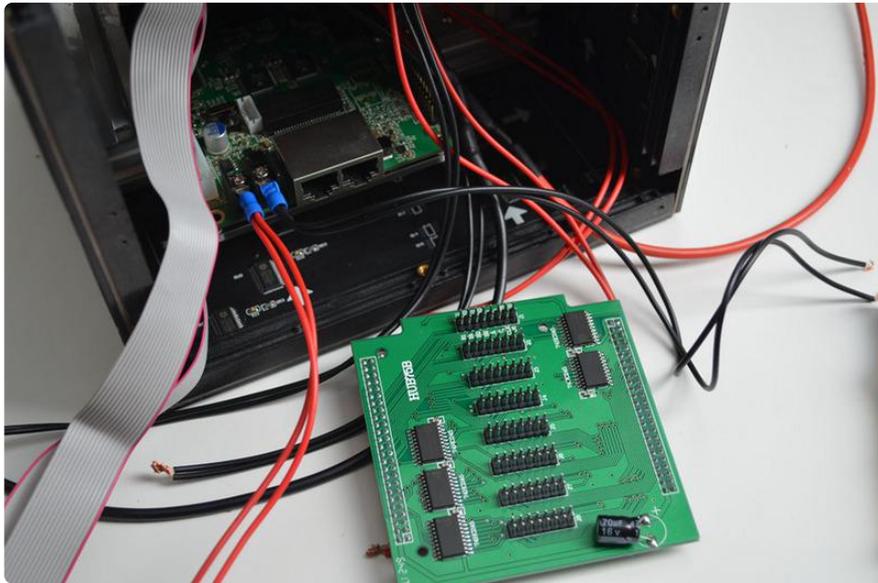




Wiring the Receiver

Use two power cables with ring terminals to supply 5VDC to the receiver card.





You'll be plugging 3 IDC cables into the receiver card IDC cape. The red side of the ribbon goes opposite the 'J' labels.

J1 -> Top Panel

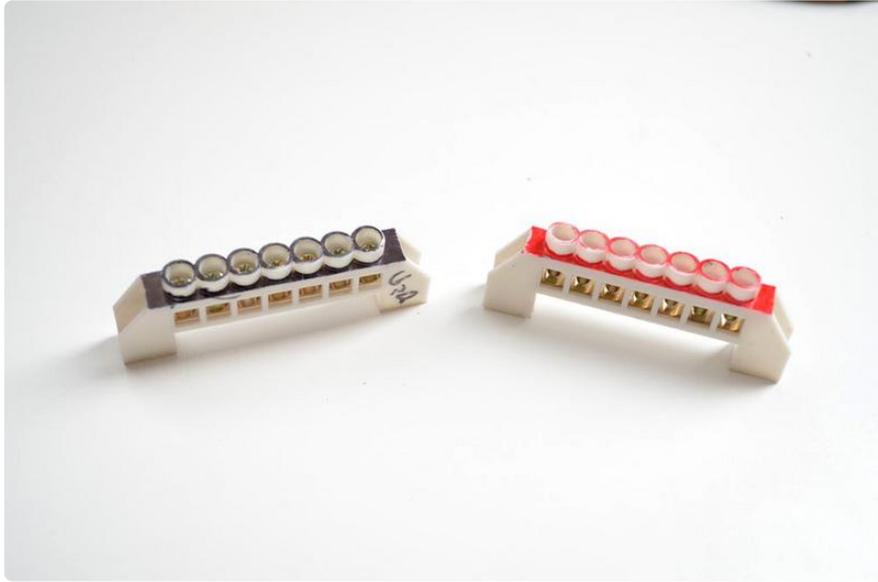
J2 -> Input of the 4 panel chain

J3 -> Bottom Panel

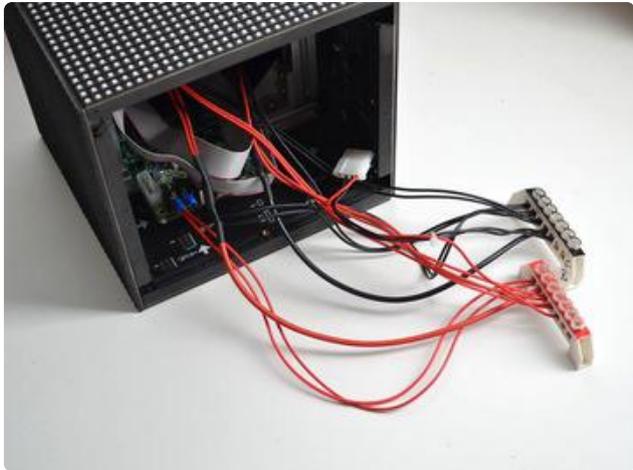
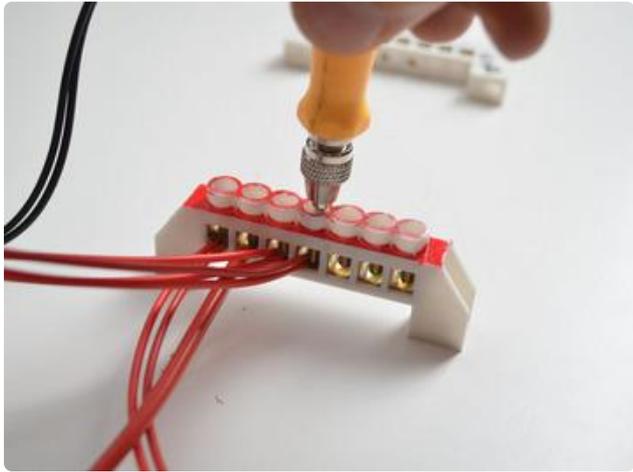
Once all IDC connections are made, plug the cape into the receiver with the electrolytic capacitor towards the ethernet jacks. It's very easy to plug this in backwards :)

The top and bottom panels can still be off at this point but connect all data and power cables.

Power Bus Distribution



These power distribution busses are convenient because we can mount them directly to the top of the rails keeping them out of the way. To be extra certain, use a black and red sharpie to clearly indicate which is power and which is ground.



Screw all the 5V lines into the red bus and Ground lines to the black bus. Also, use an ATX molex plug for power input. You may have to strip and twist the ends in order to get them to fit. In total there should be 6 of 7 terminal spots used:

- 4 pairs powering the panels
- 1 pair powering the receiver
- 1 pair as ATX power input



Place the slim T-nuts into the extrusion as shown and use M4 screws to mount the busses on the rail.



Double check for any bare wires - be extra careful not to short anything.

Before we seal it up we'll verify that all the hardware is working properly in the next step.

Preparing the Sender Card

[This setup is identical to the LED Video Wall tutorial \(\)](#)

Go read it then come back when done!

LED Studio Software Configuration

[Use the setup from the LED Video Wall tutorial, but load the receiver with the AdaCube.RCG file below. \(\)](#)

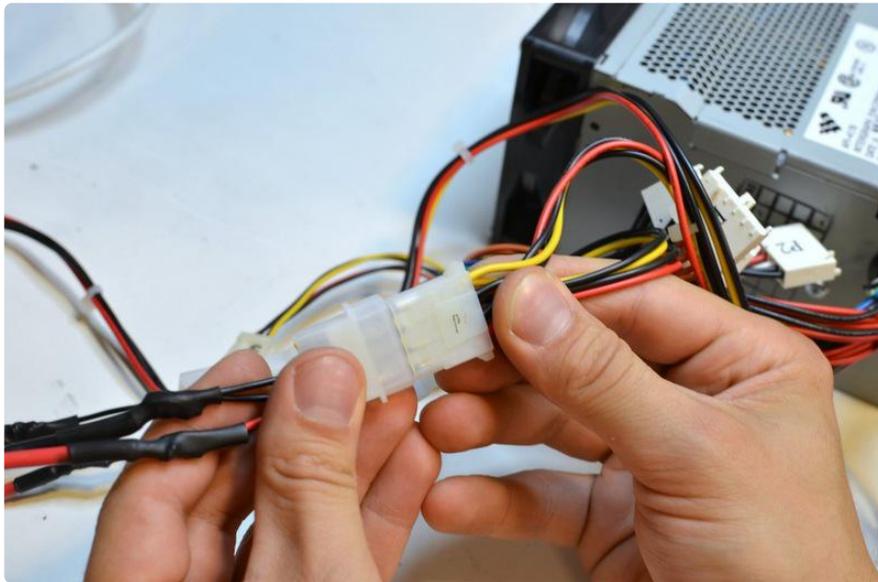
AdaCube.RCG

Verifying & Finishing the Cube

Connect the CAT5 cable from the sender's 'U' output to the receiver card's 'A' input.

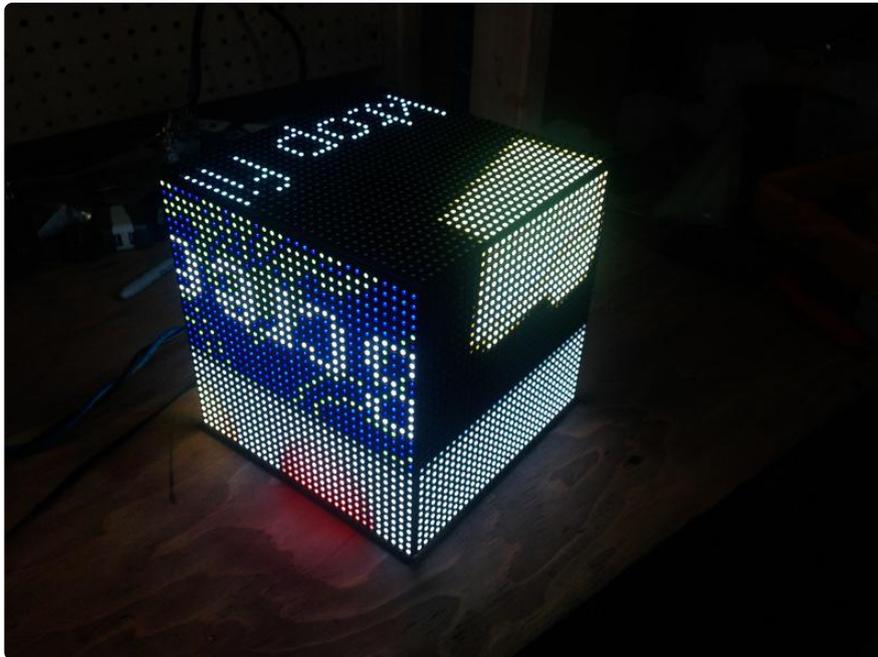
Connect power to the cube power busses with the ATX supply.

Before turning the power supply on, make sure all power is wired correctly. Seriously! This is 30A of 5V power, so you really really want to make sure its wired correctly.



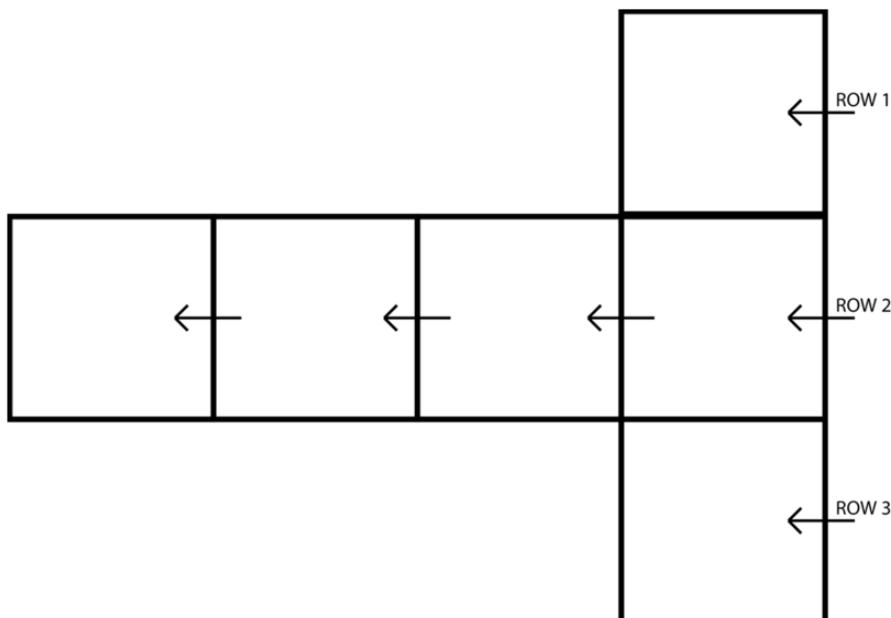
Once everything is powered on, your computer should detect an external display. Adafruit receivers/senders are pre-programmed for the 16x32 RGB LED panels, [so make sure you configure them with the files from this tutorial \(\)](#). If you can 'mirror' your display that is easiest to debug.

If all is working properly you should see something like this!



Once everything is verified working, turn off the power supply and screw in the top and bottom panels using the pilot holes from earlier. In order to have the image displayed on the cube mirror the diagram below, the bottom panel's vertical arrows should be pointing to the bottom of the first input in the horizontal chain, and the arrows on that pointing to the 'bottom' of the top panel. Essentially creating a seamless 3 panel side, just folded onto itself.

The data flow for the LED panels works the same way as the Video Wall, just with the rows folded in on each other. The 6 sided cube mirrors from 3 rows on the video input, when unfolded it looks like this:

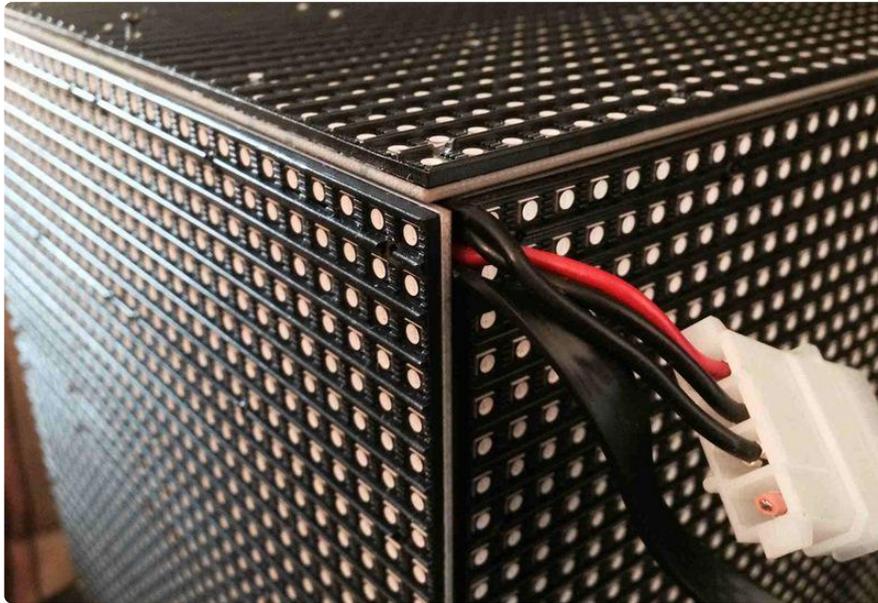


If you want to start playing around with tiling images, check out the ZIP below, with Processing code and example images that look good on the flattened, 6-sided video

cube

Cube_Image_Drop.zip

When screwing in the bottom side, leave off one corner and feed the power and data cable through the seam. The panels will flex enough to let them through.



Video!