

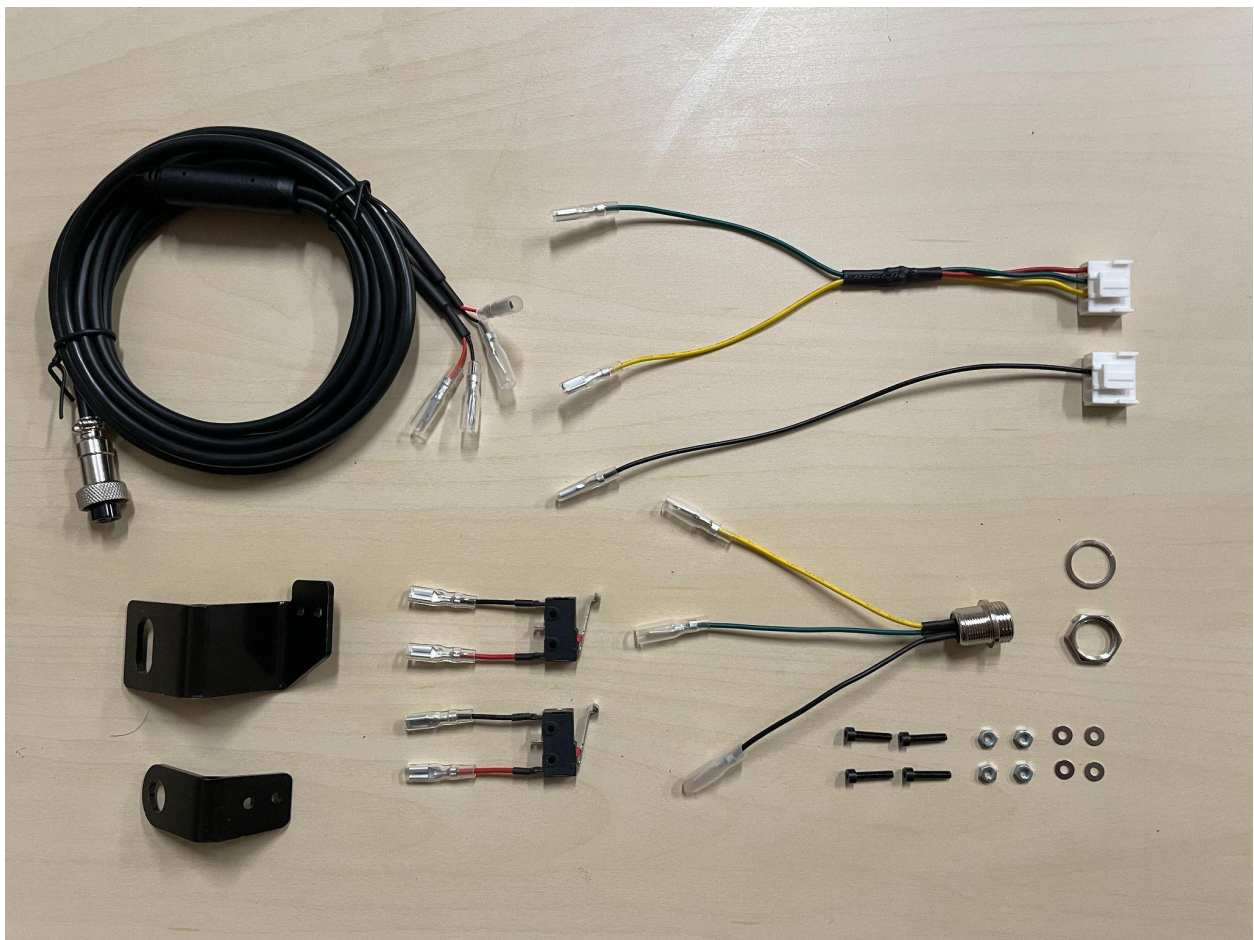
LANGMUIR SYSTEMS

LIMIT SWITCH KIT

ASSEMBLY INSTRUCTIONS FOR CROSSFIRE & CROSSFIRE PRO

What's Included

Your limit switch kit will include the parts shown in the picture below:



Electronics Enclosure Modifications

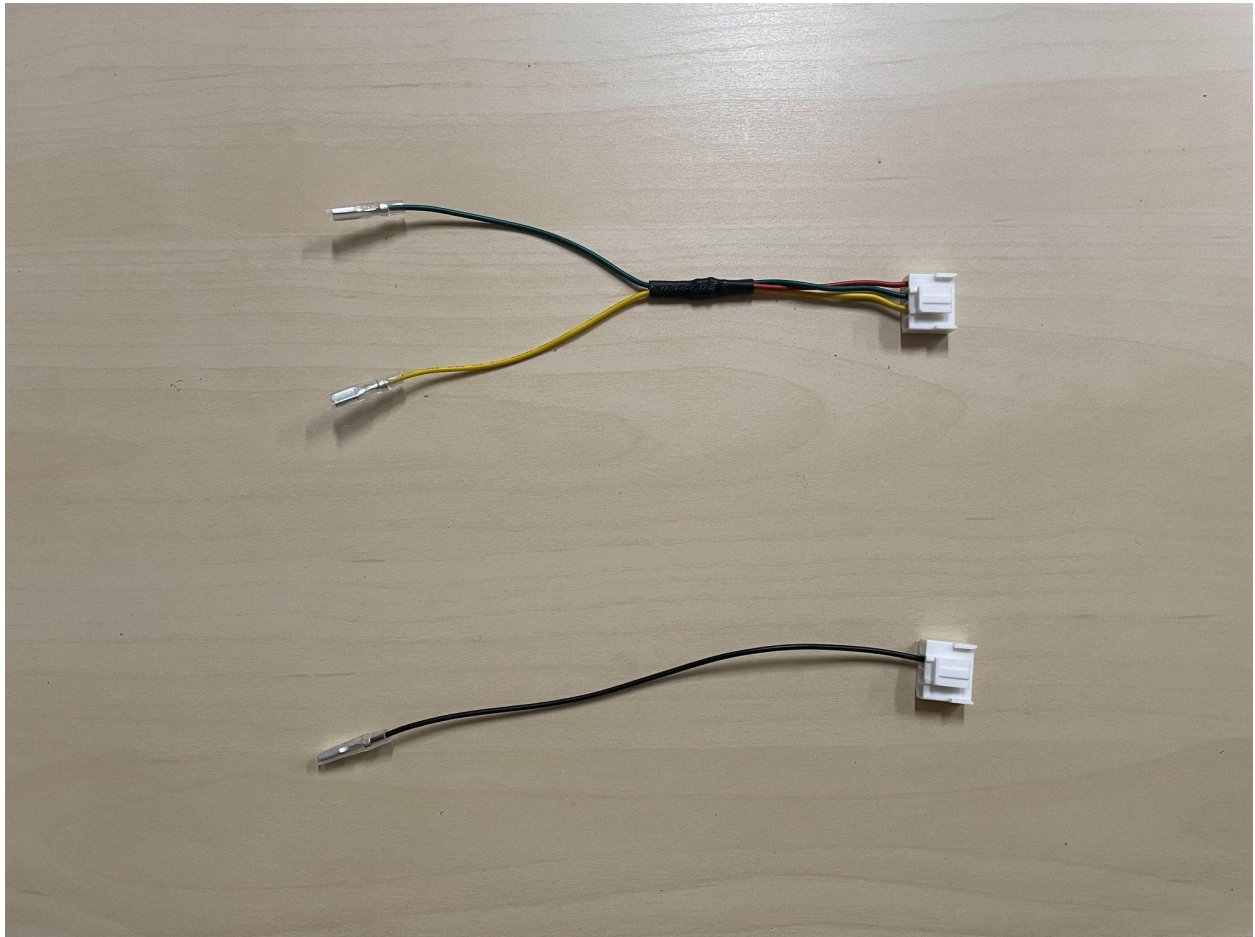
Before installing the limit switches onto the machine, we will first utilize the EXP port slot of the electronics enclosure and the unused pins of the motion control board. We recommend dismounting your electronics enclosure from the leg tube of the machine and placing it on its

backside during this procedure. **HIGH VOLTAGE WARNING: Please ensure that your electronics enclosure is turned off, and that the 110V power cable and USB cable are disconnected.**

Motion Control Board Pins

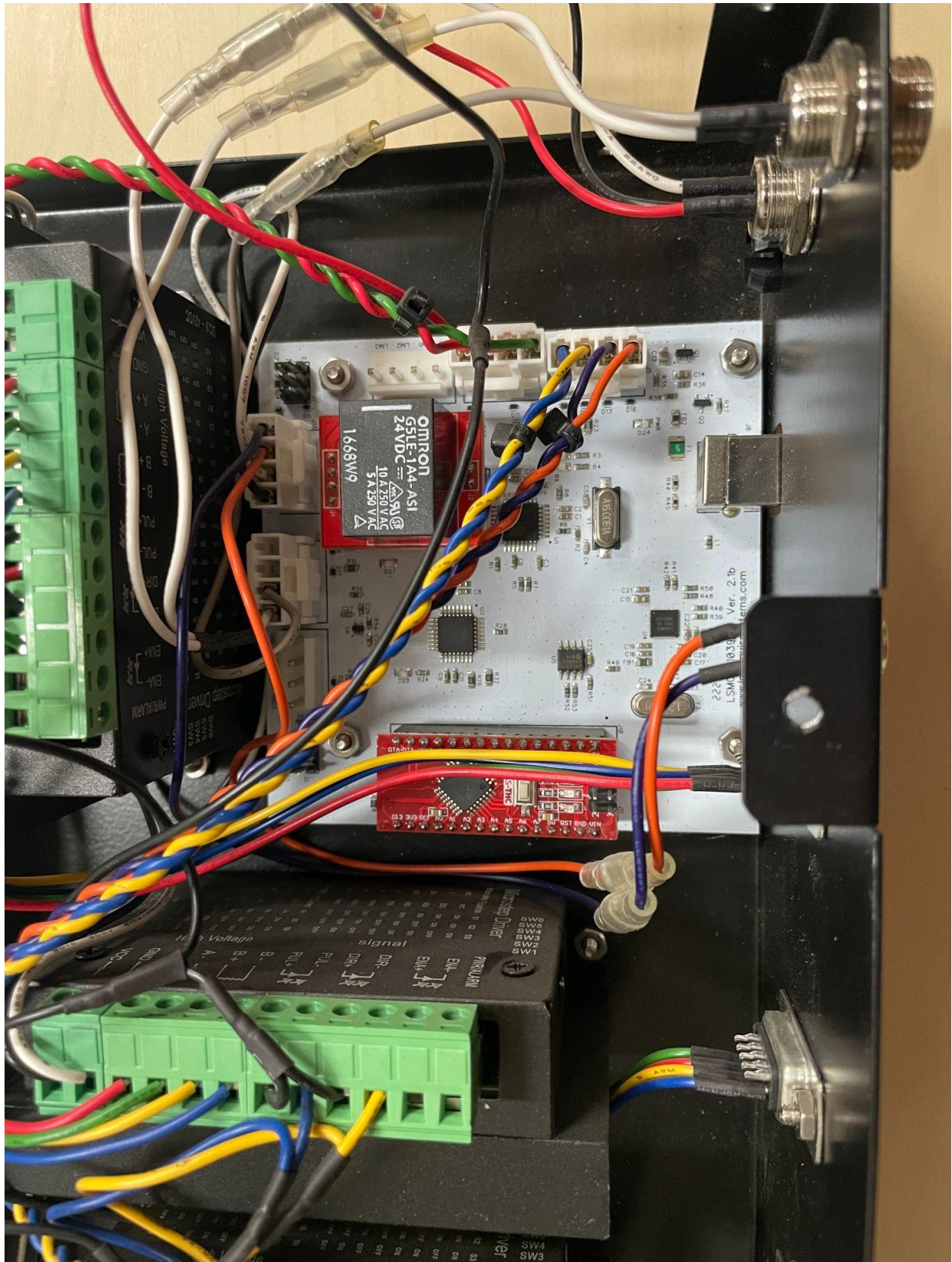
Setup

Identify the two wiring harnesses that were included in your limit switch kit. Note that one of them is color-coded with a black wire, and the other is color-coded with a yellow wire and a green wire (with a red wire for ground).



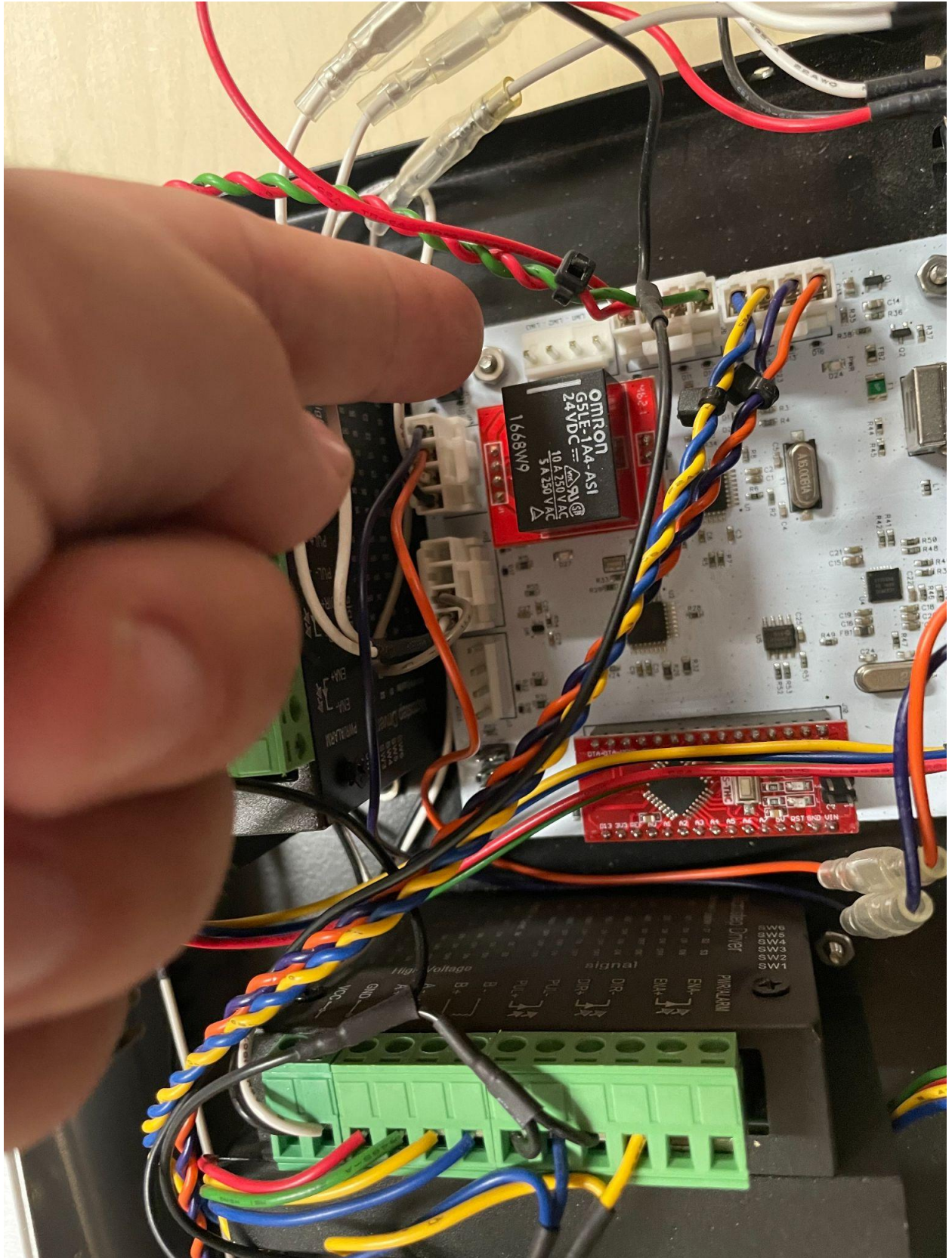
Unscrew the hex head sheet metal screws and remove the lid from the electronics enclosure and identify the motion control board. Take note of the two unused 4 pin connectors in the

top left corner and the bottom left corner of the motion control board.

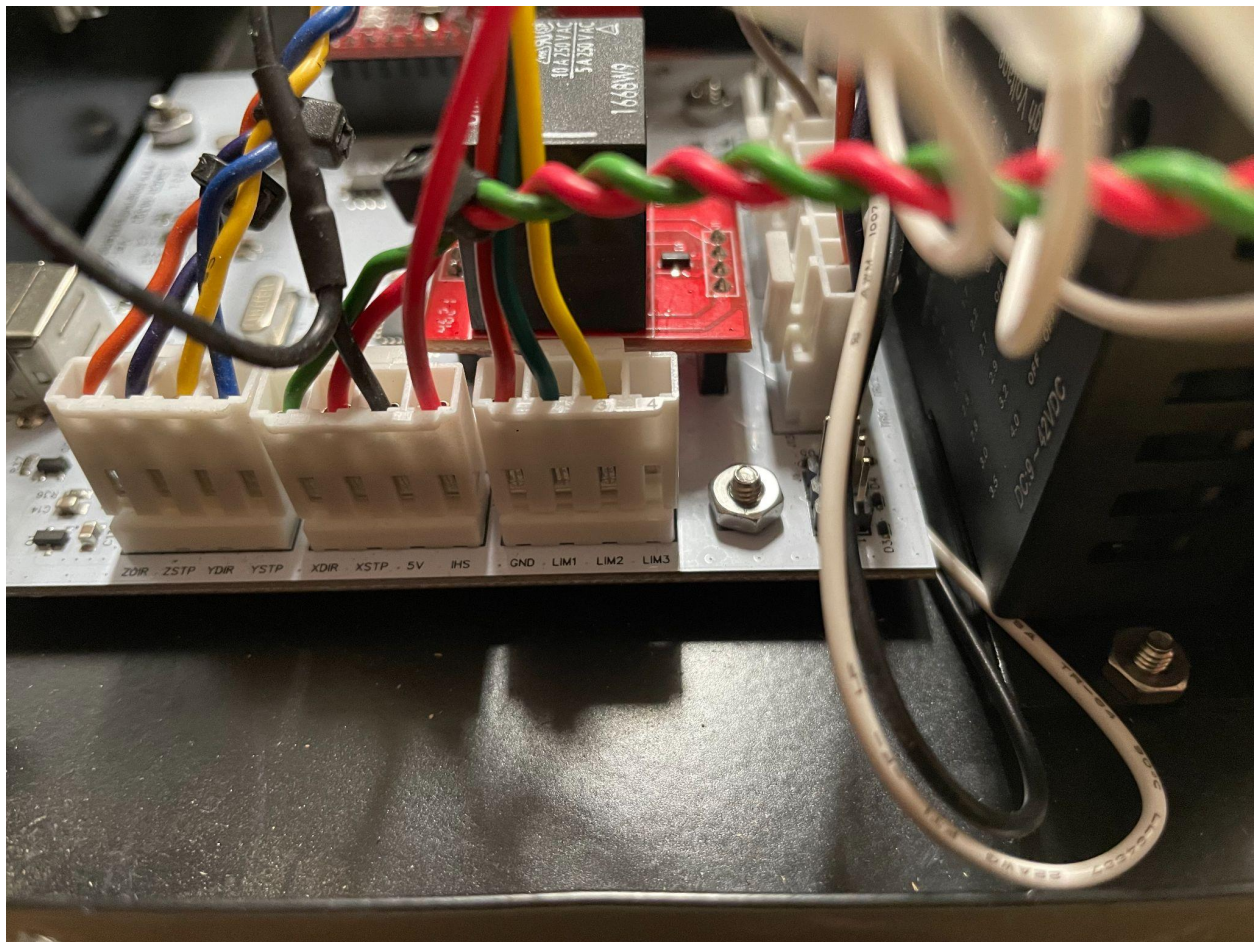


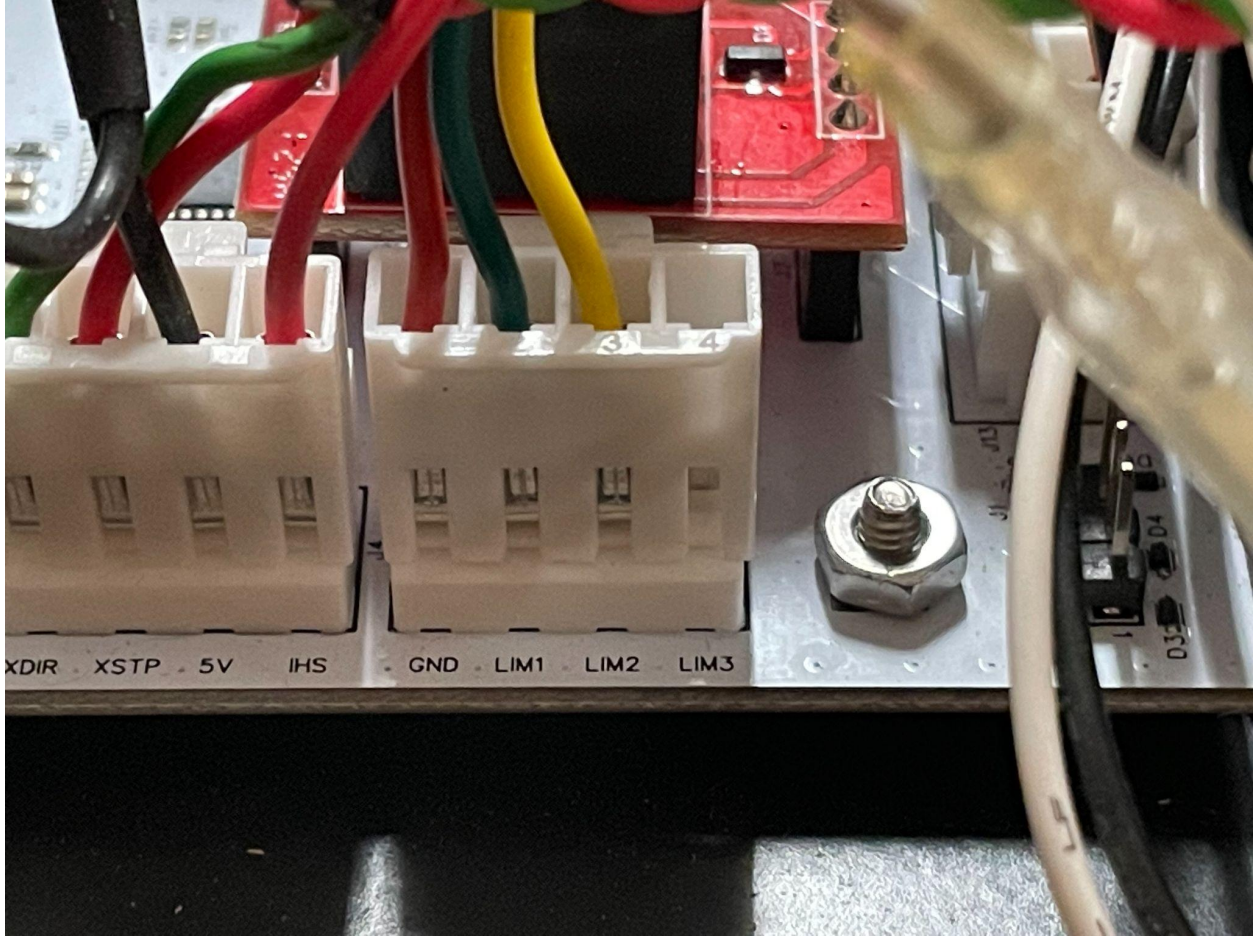
GND/LIM1/LIM2 - Connector

The green, yellow, and red wiring harness will connect to the unused motion control board pins in the top left corner of the motion control board.



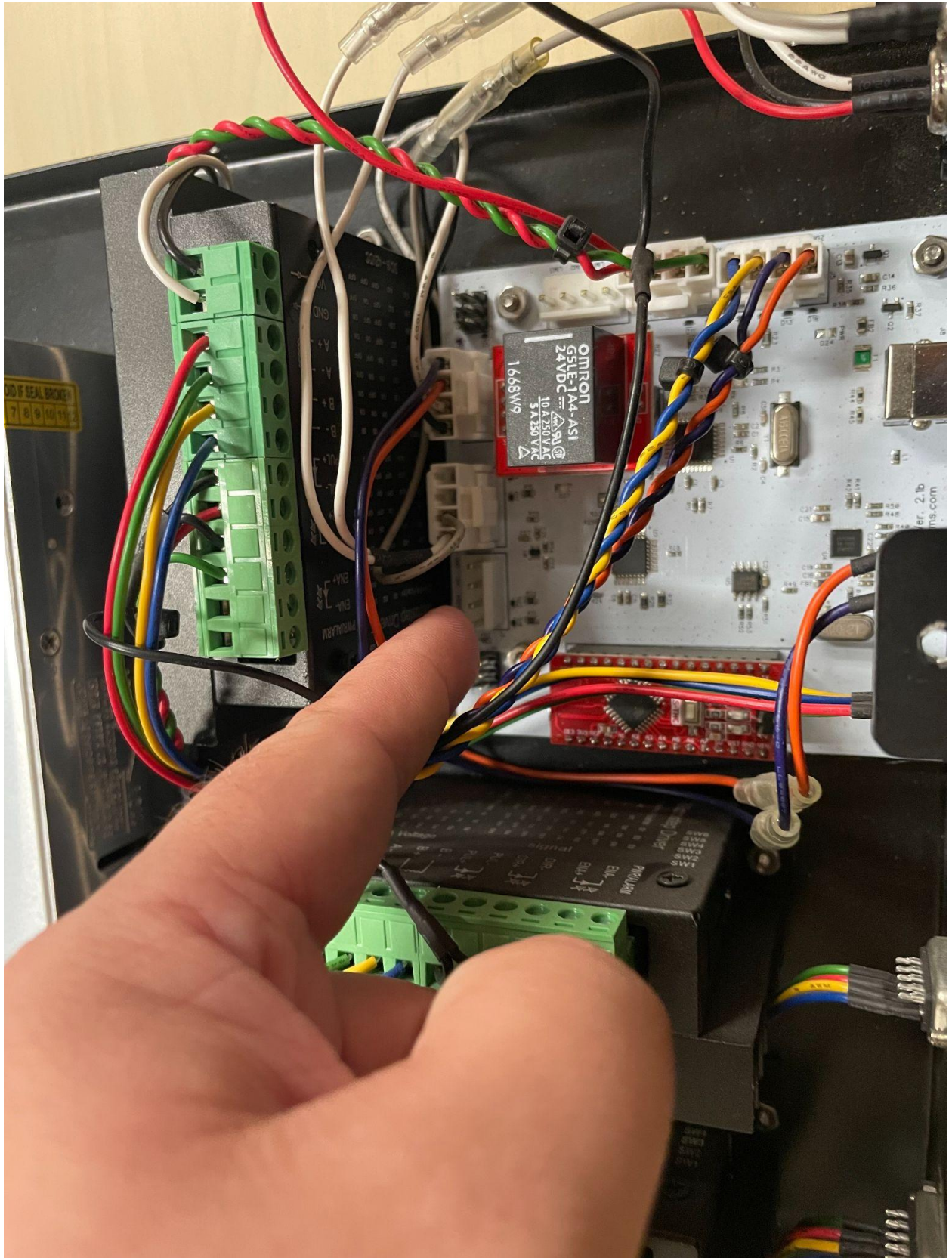
Connect the wiring harness in such a way that the motion control board position labeled GND lines up to the red wire, LIM1 lines up to the green wire, and LIM2 lines up to the yellow wire. Push the connector in firmly to click it into the mating board connector.



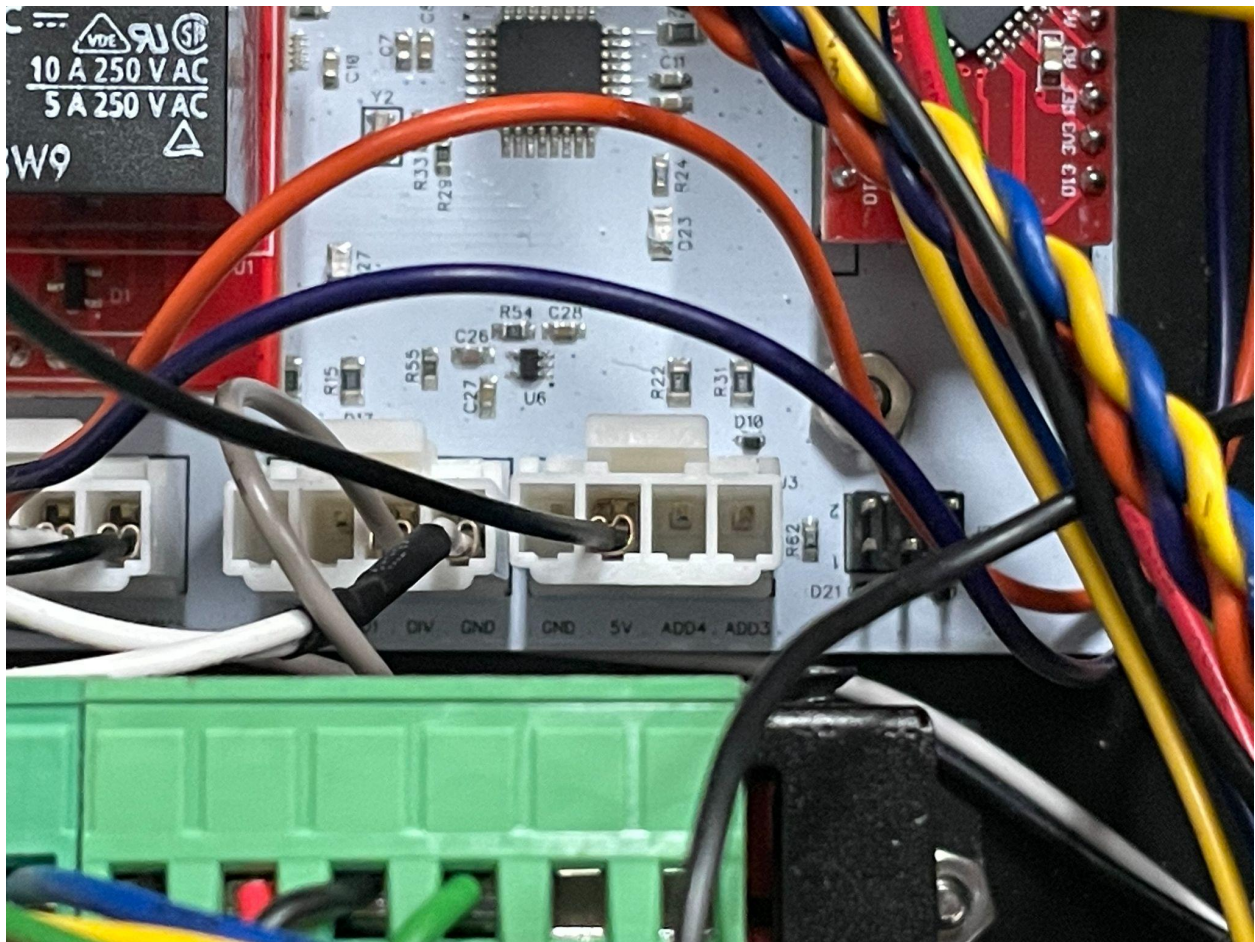


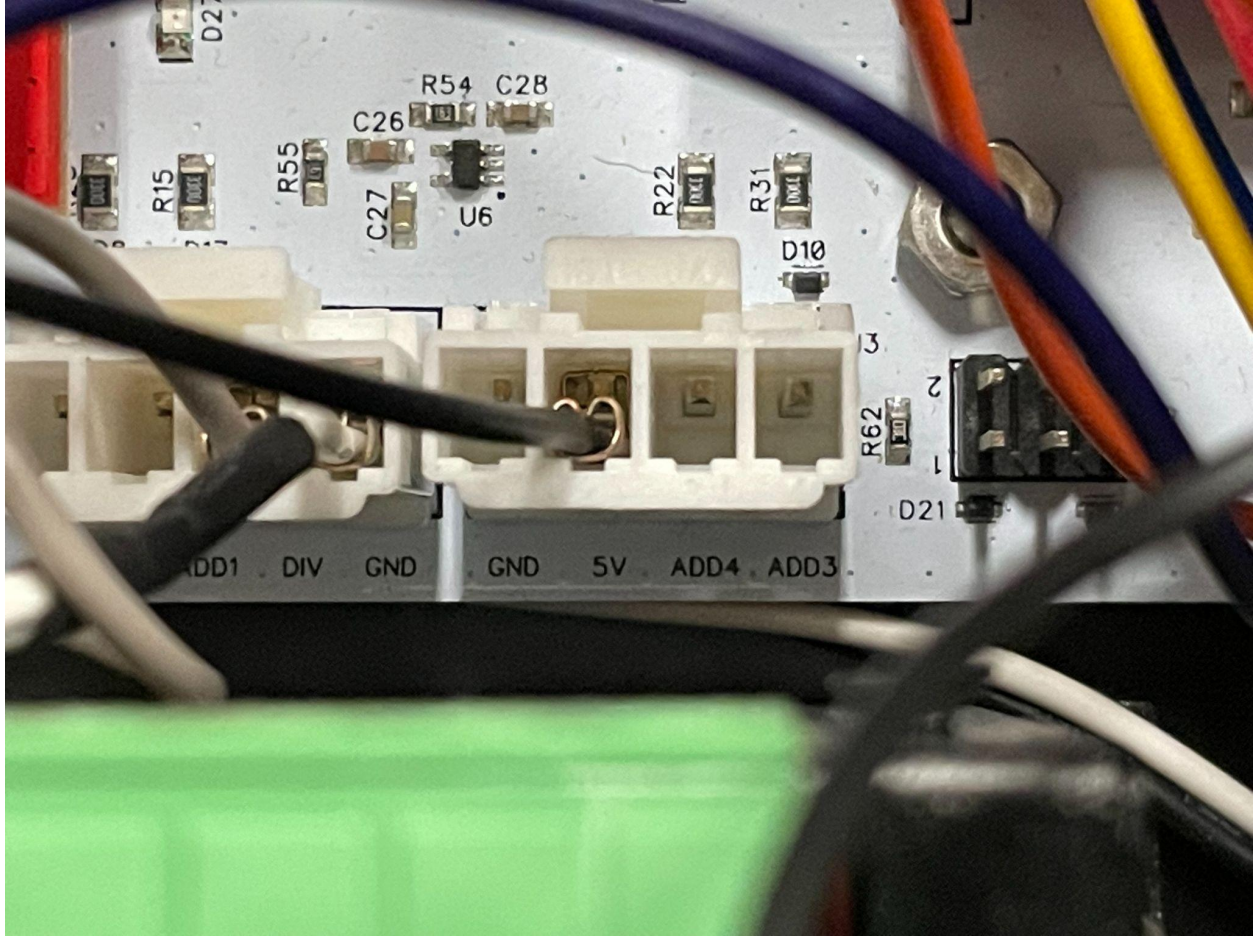
5V - Connector

The black wiring harness will connect to the unused motion control board pins in the bottom left corner of the motion control board.



Connect the wiring harness in such a way that the motion control board position labeled 5v lines up to the black wire as shown. Firmly seat the connector into the mating connector on the board until it clicks in place.



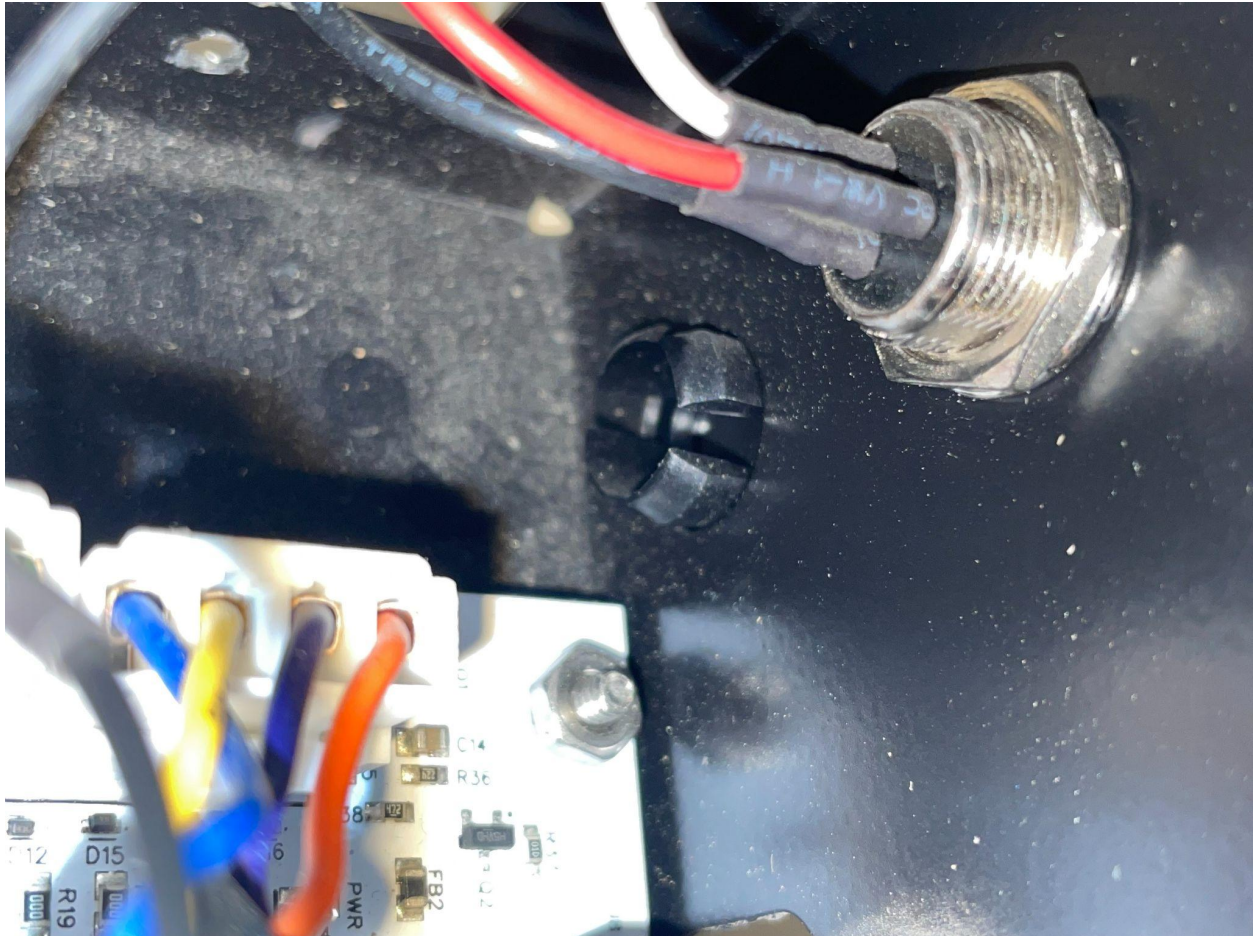


Install EXP Port

Note that the EXP port slot of the electronics enclosure is blocked by a plastic stopper.



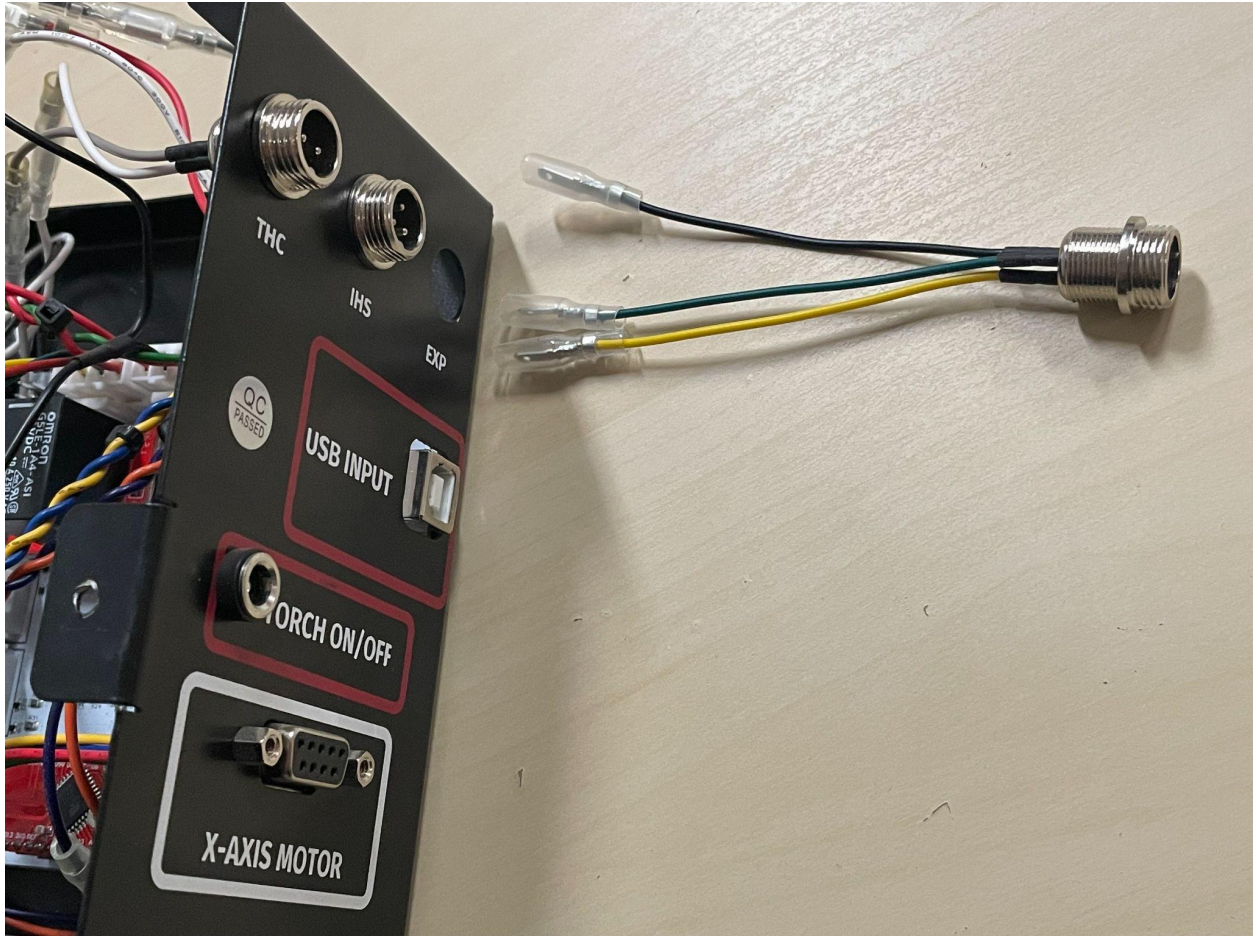
Inside of the electronics enclosure, squeeze the teeth of the plastic stopper blocking the EXP port slot.



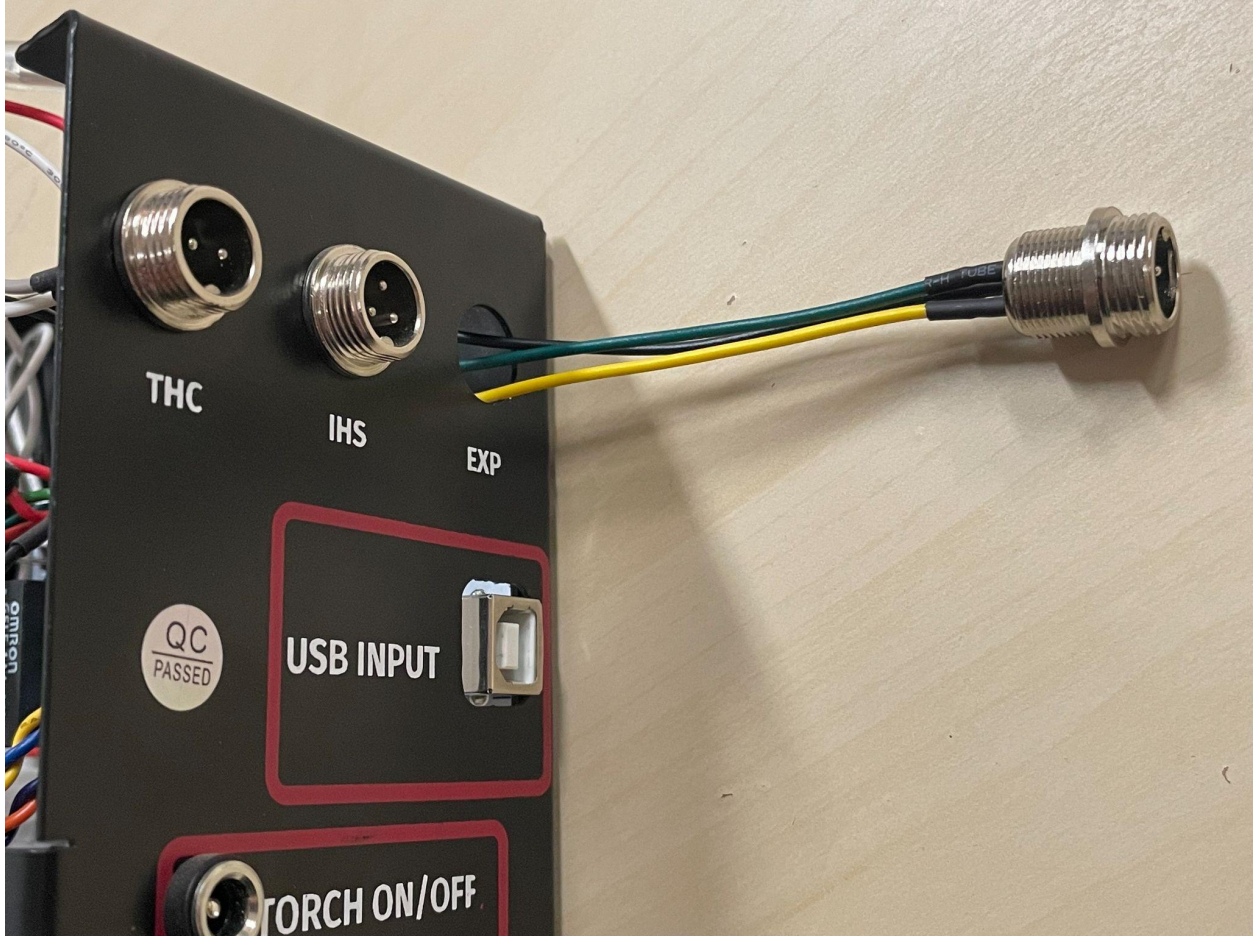
The plastic stopper should pop out of its position easily, allowing space to install the LIM port included with the limit switch kit into the EXP slot.



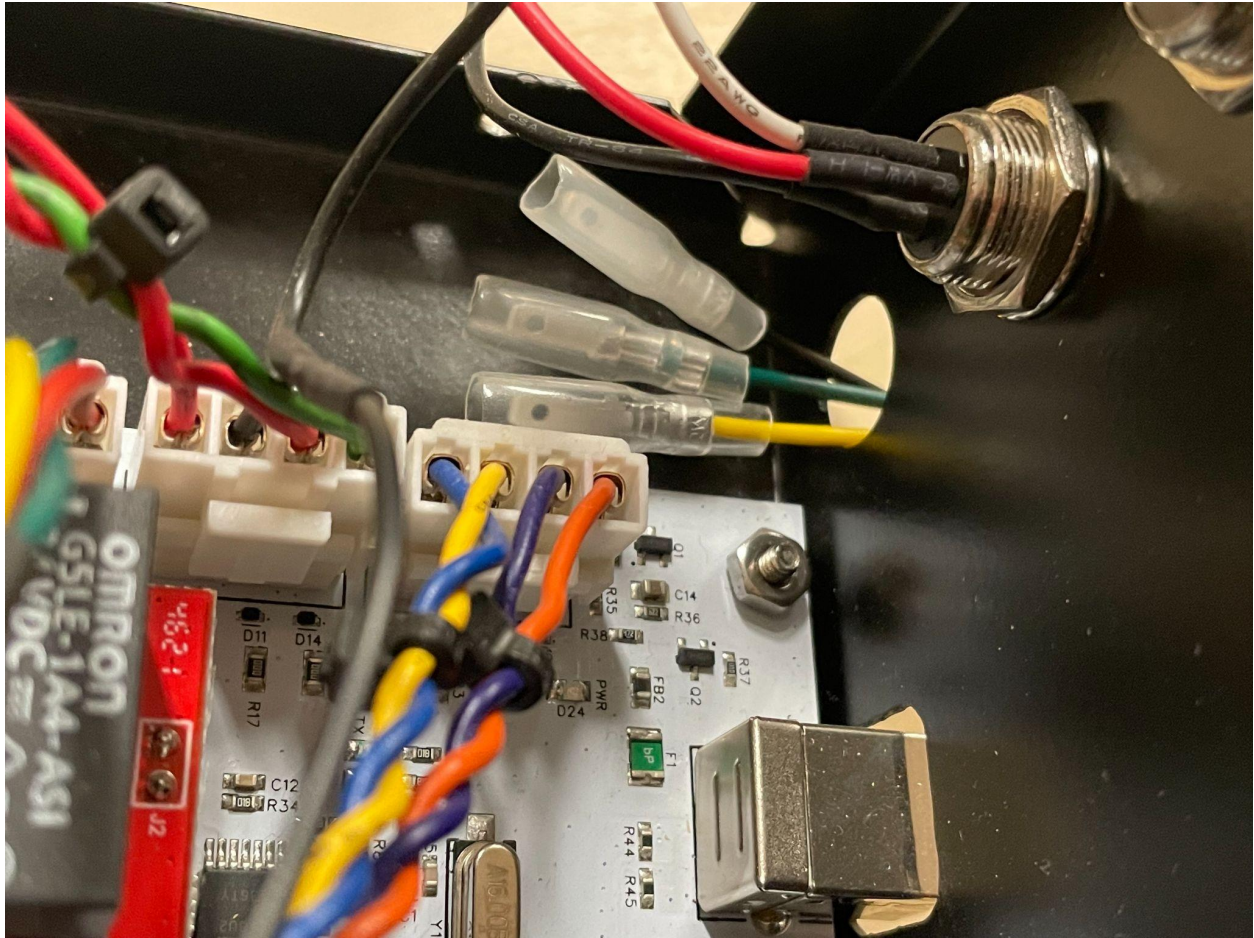
Identify the LIM port that was included with the limit switch kit. Note that its blade connectors are attached to wires that are color-coded yellow, green, and black.



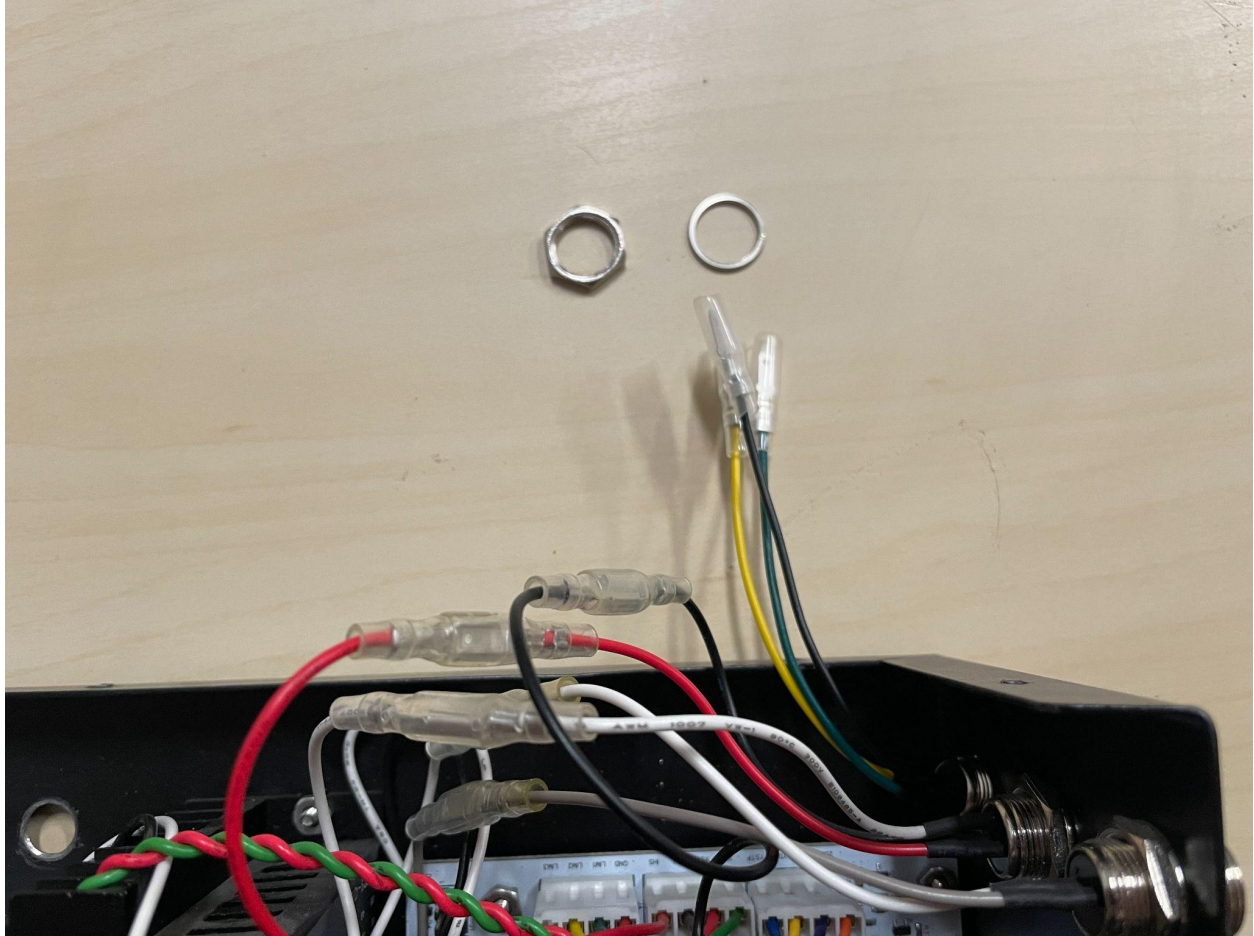
Insert the blade connectors of the LIM port into the EXP port slot.



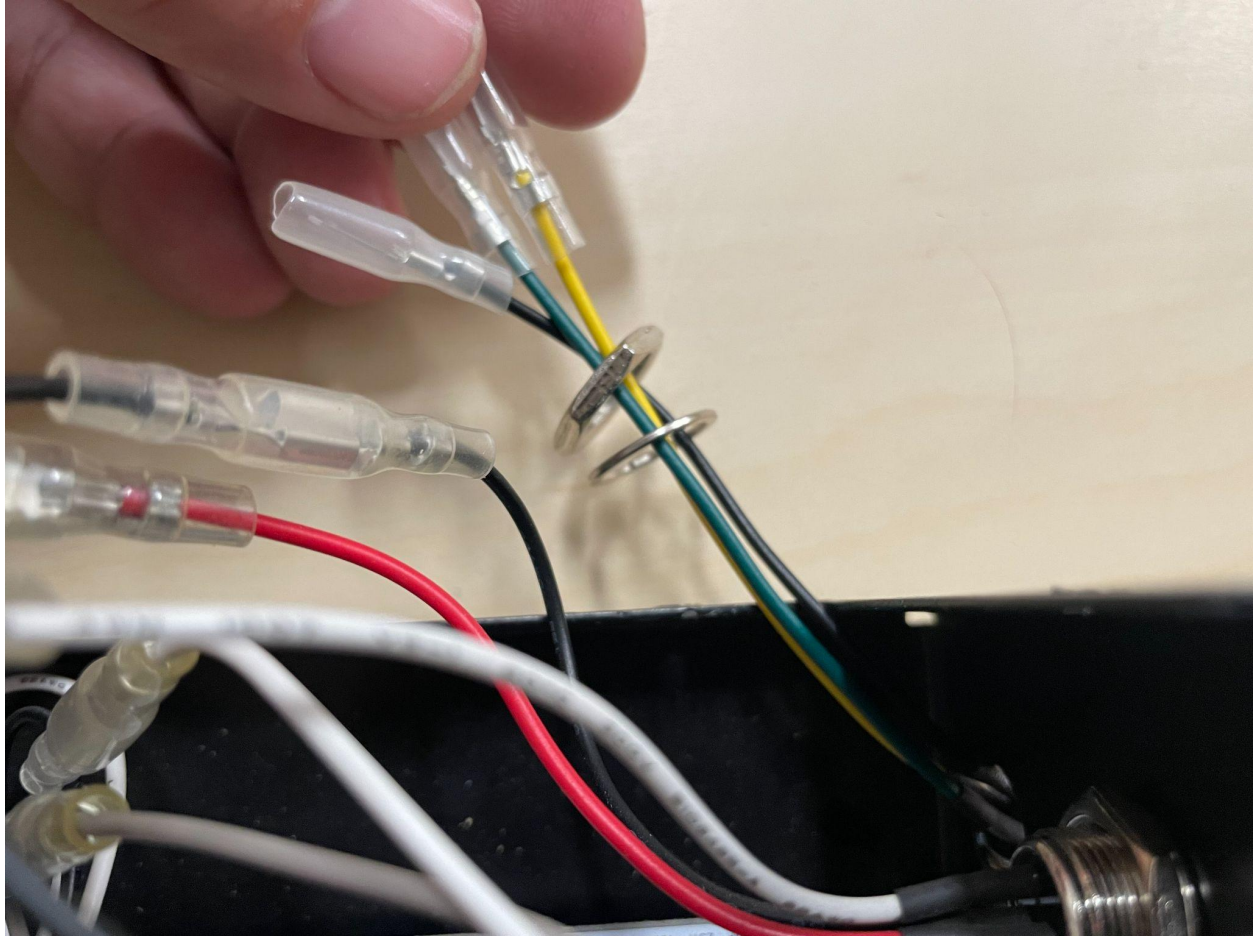
From the inside of the electronics enclosure, pull the blade connectors of the LIM port through the EXP port slot.



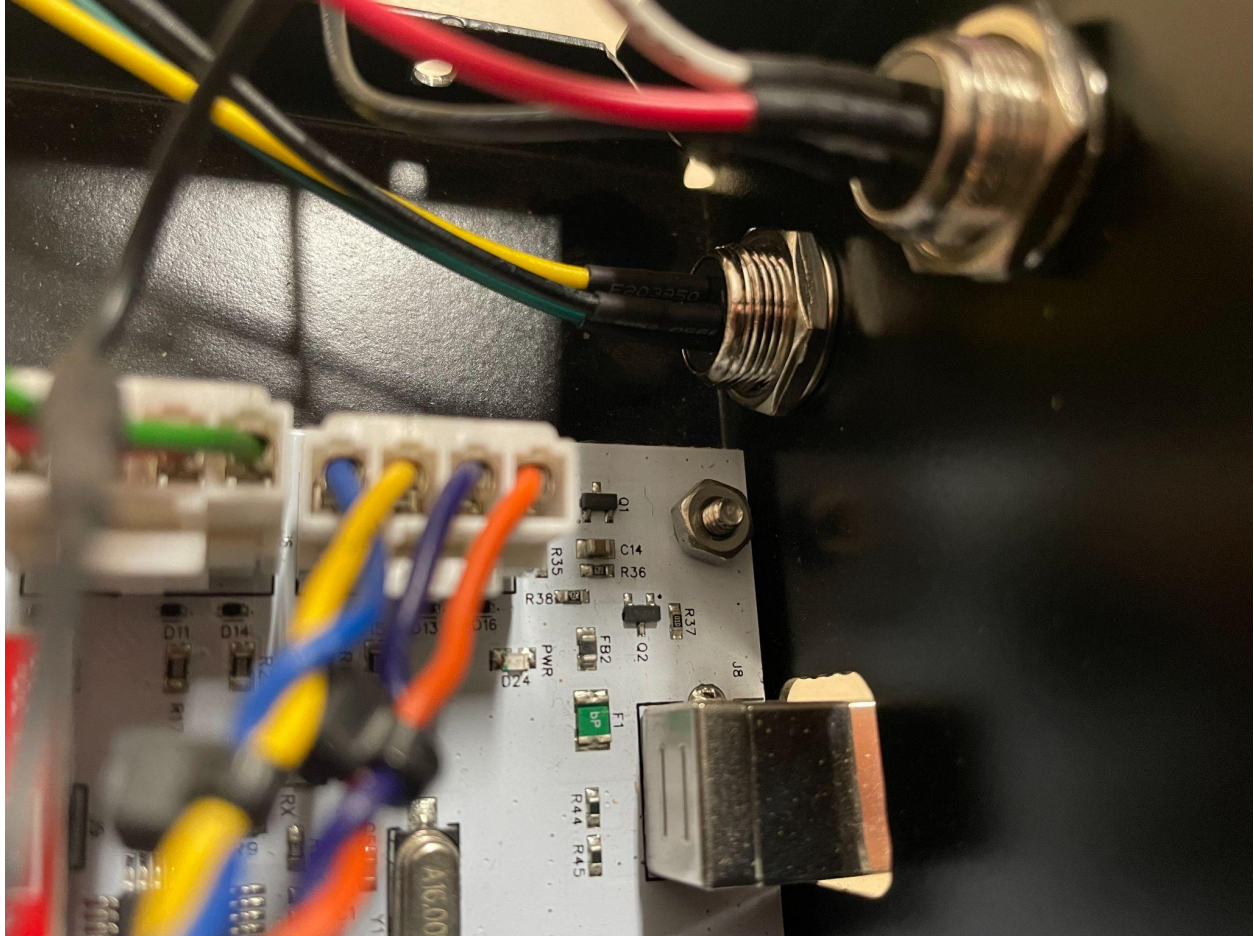
Identify the washer and ring nut that were included in the limit switch kit.



First, put the washer onto the blade connector wires. Then, put the ring nut onto the blade connector wires.



Thread the ring nut onto the backside of the LIM port until it is almost fully tightened.

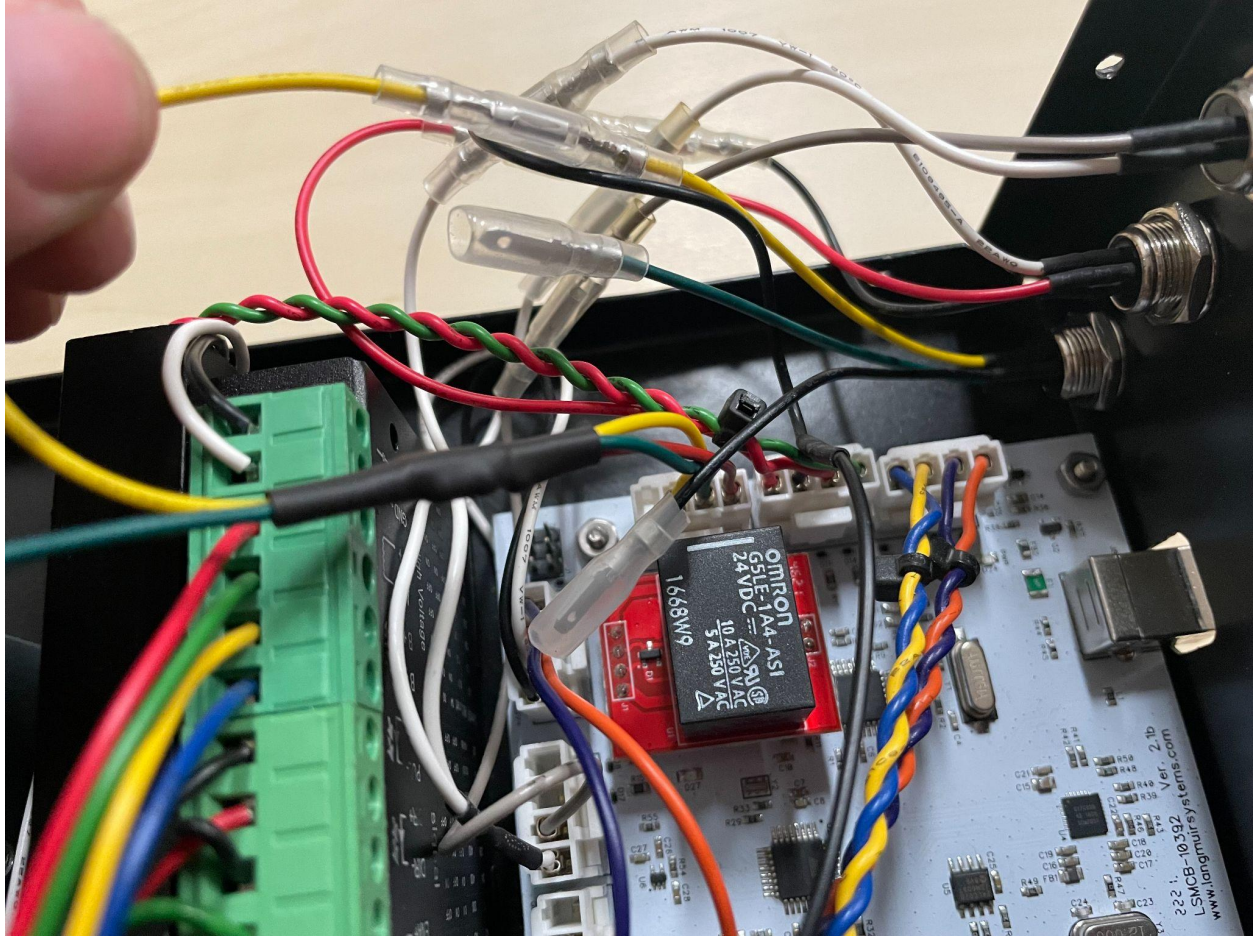


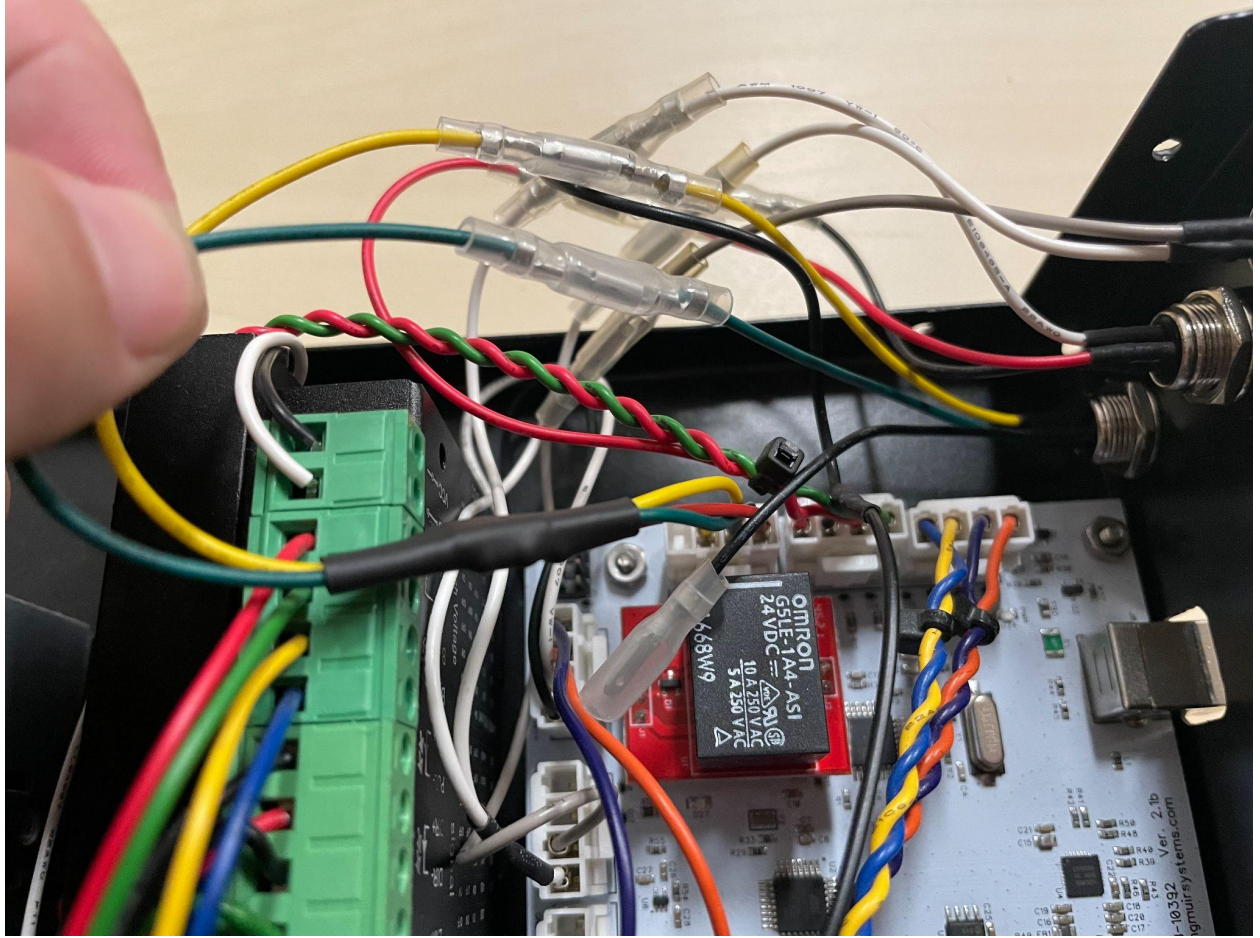
On the outside of the electronics enclosure, rotate the LIM port until it is in the desired position, then fully tighten the ring nut on the inside of the electronics enclosure to secure it in place.

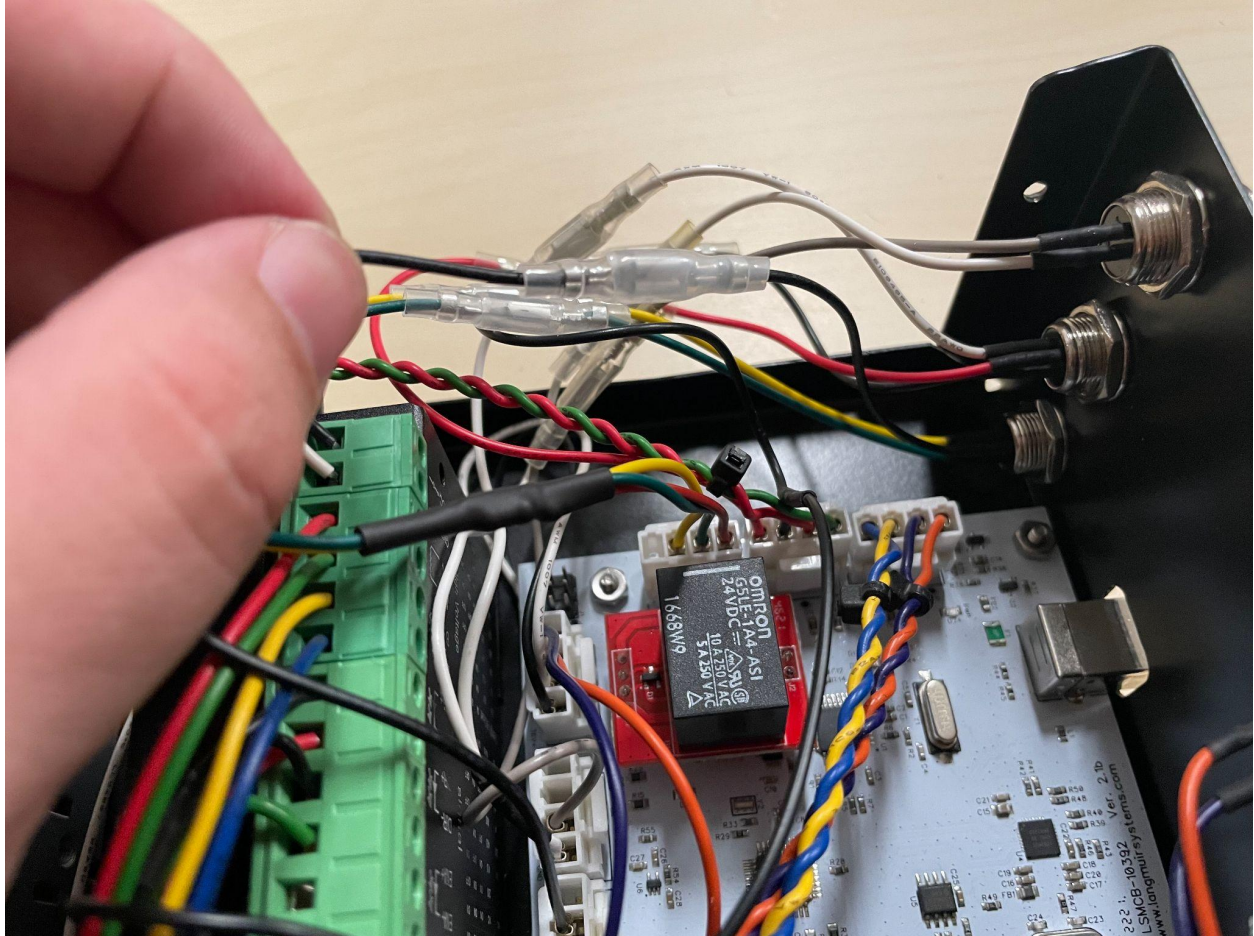


Connect LIM Port to Motion Control Board

The final step is to connect the LIM port's blade connectors to the matching color-coded blade connectors on the wiring harnesses that were connected to the motion control board in the previous step.







Your electronics enclosure is now ready to use limit switches, and can be installed back onto the leg tube of your CrossFire machine.

Limit Switches

Tools Needed:

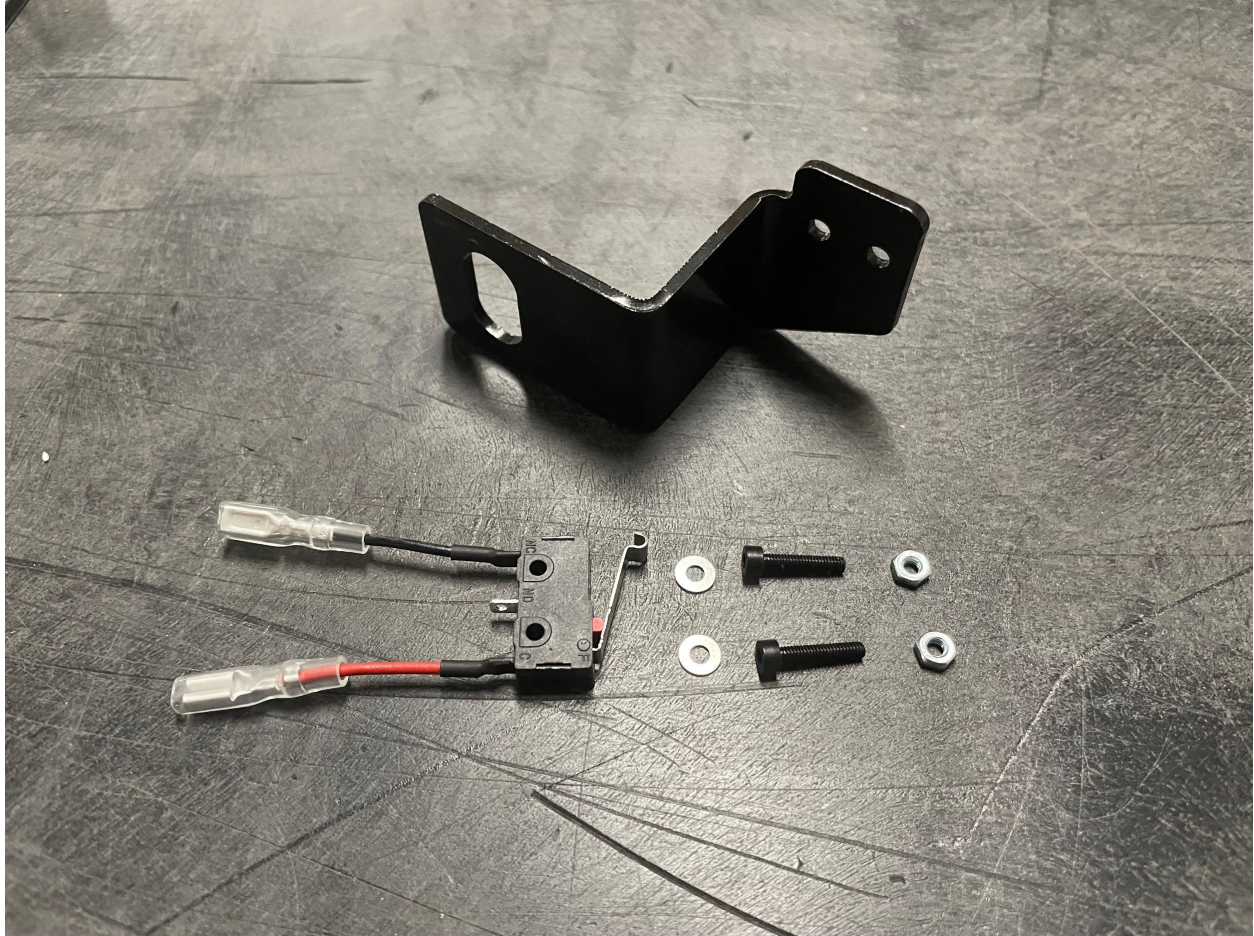
- 5/64" Allen wrench
- 5mm socket wrench
- 9/16" box wrench (x2)

Assemble Limit Switches

Identify the X-axis limit switch mounting bracket, one of the limit switches, and the hardware that will mount the limit switch to the X-axis bracket.



Identify the Y-axis limit switch mounting bracket, one of the limit switches, and the hardware that will mount the limit switch to the Y-axis bracket.



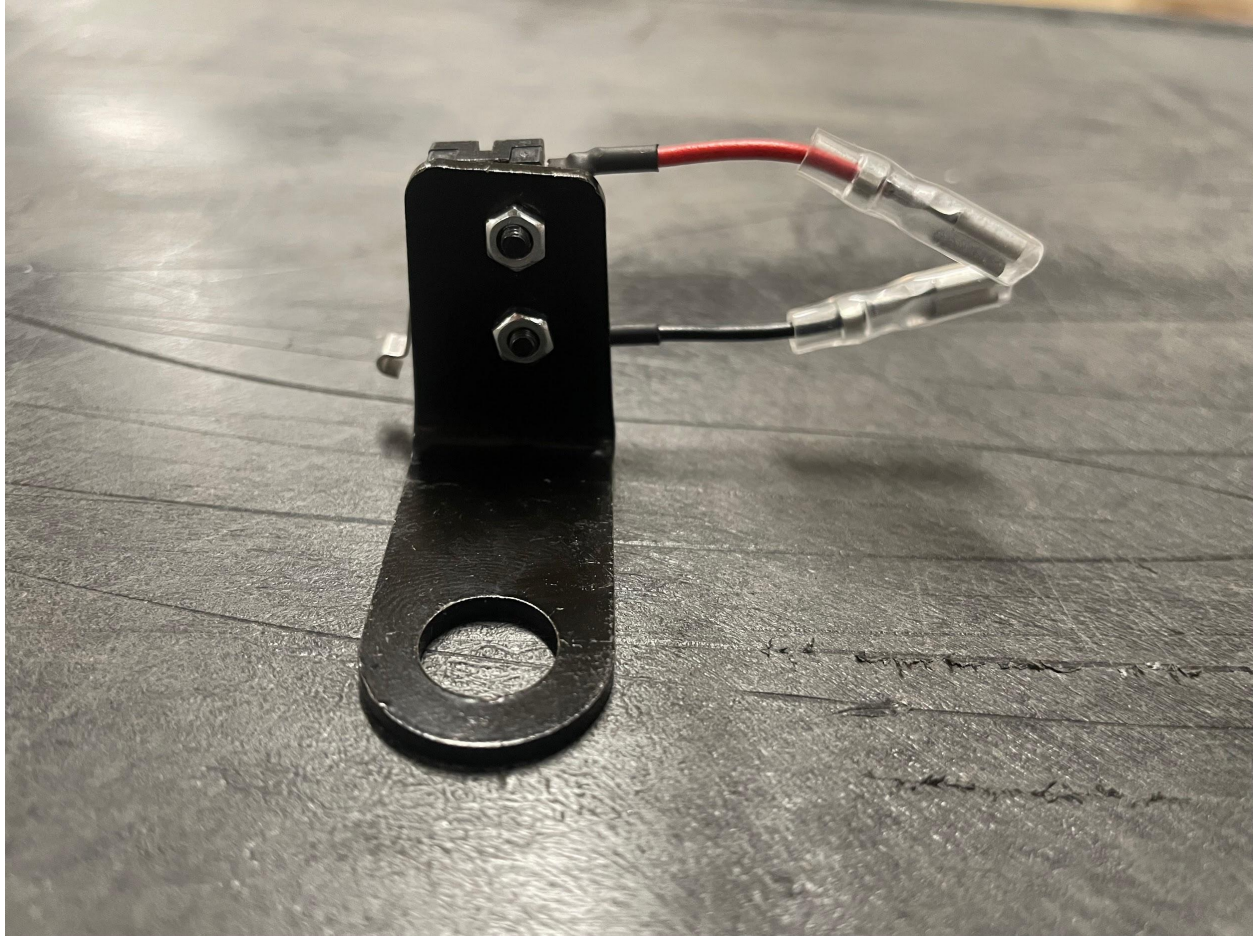
Orient the limit switches as shown below, and pass the bolts through the mounting holes on each switch. The washers will go in between the limit switches and the mounting brackets.



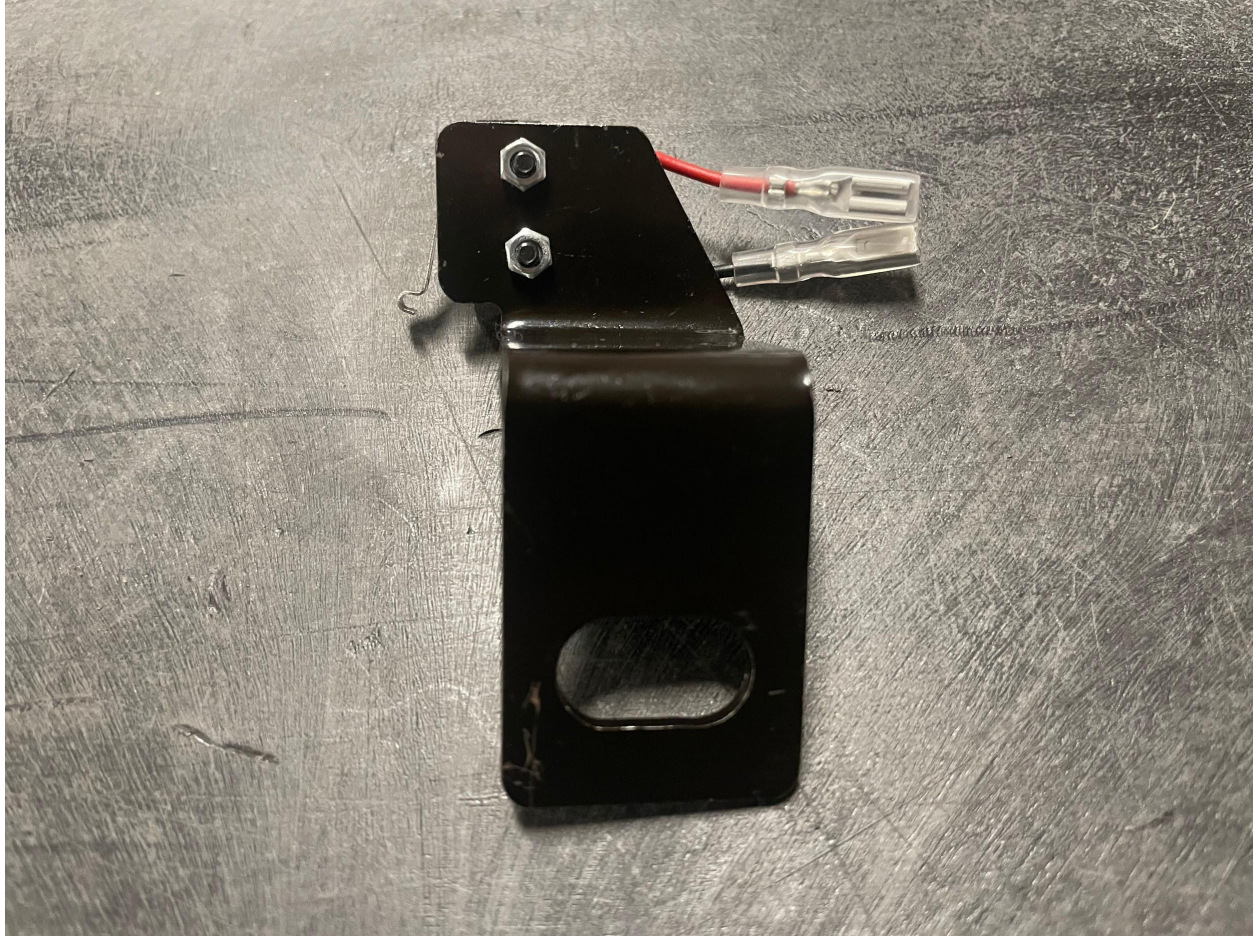
Use the included nuts to firmly mount the switches to the brackets, using a 5/64" Allen wrench and a 5mm socket wrench.



This is what the completed X-axis limit switch assembly should look like.



This is what the completed Y-axis limit switch assembly should look like.



X-axis Limit Switch Installation

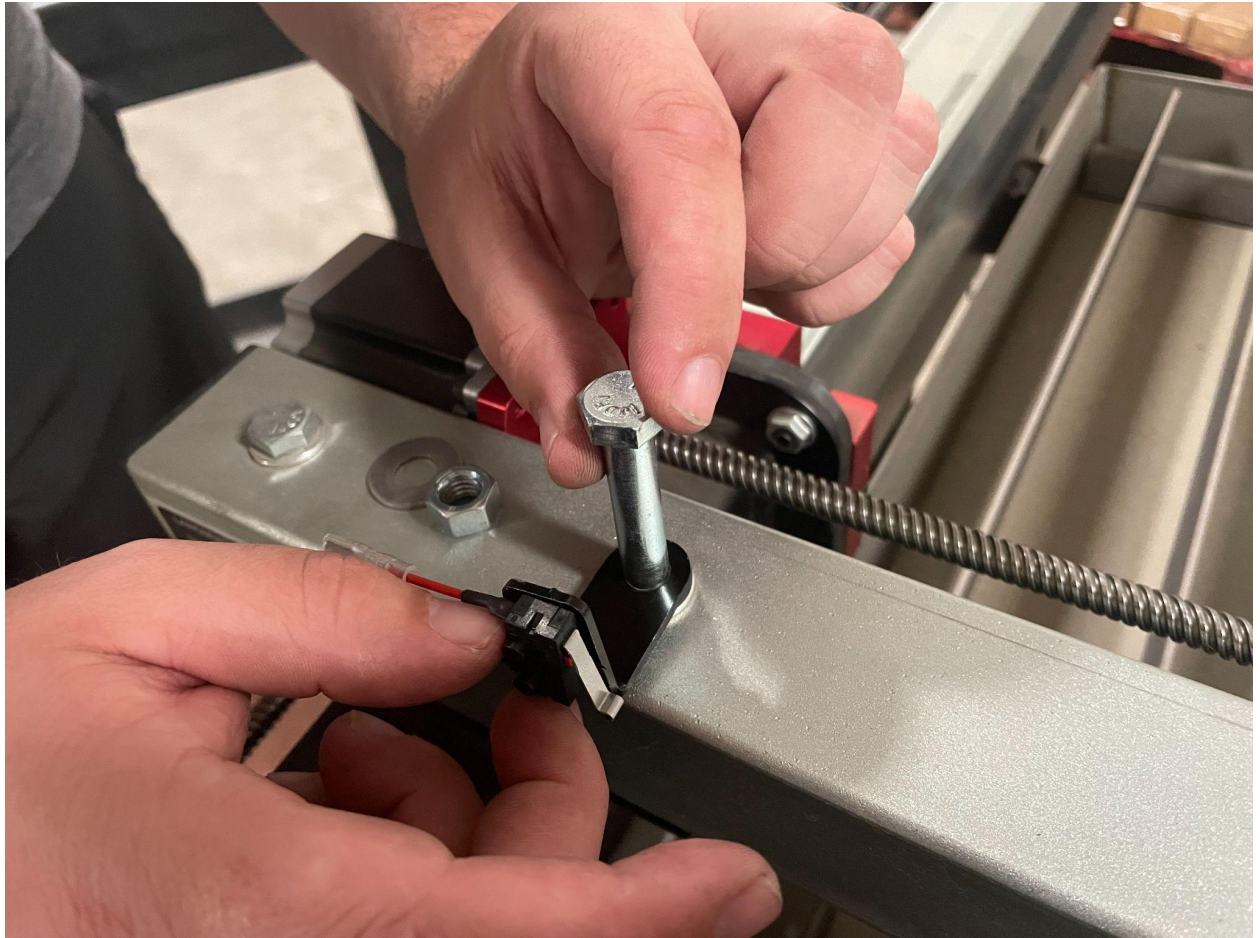
Use two 9/16" box wrenches to uninstall the bolt shown in the image below that mounts the X-axis gantry tube to the Y-axis carriage. (*Note: if installing the limit switch onto a 2x2 CrossFire machine, take care not to bump into the cantilevered end of the X-axis gantry tube while this bolt is uninstalled. Doing so could put the X-axis out of square with the Y-axis.*)



The X-axis limit switch bracket will mount in between the tube spacer and bolt pictured below.

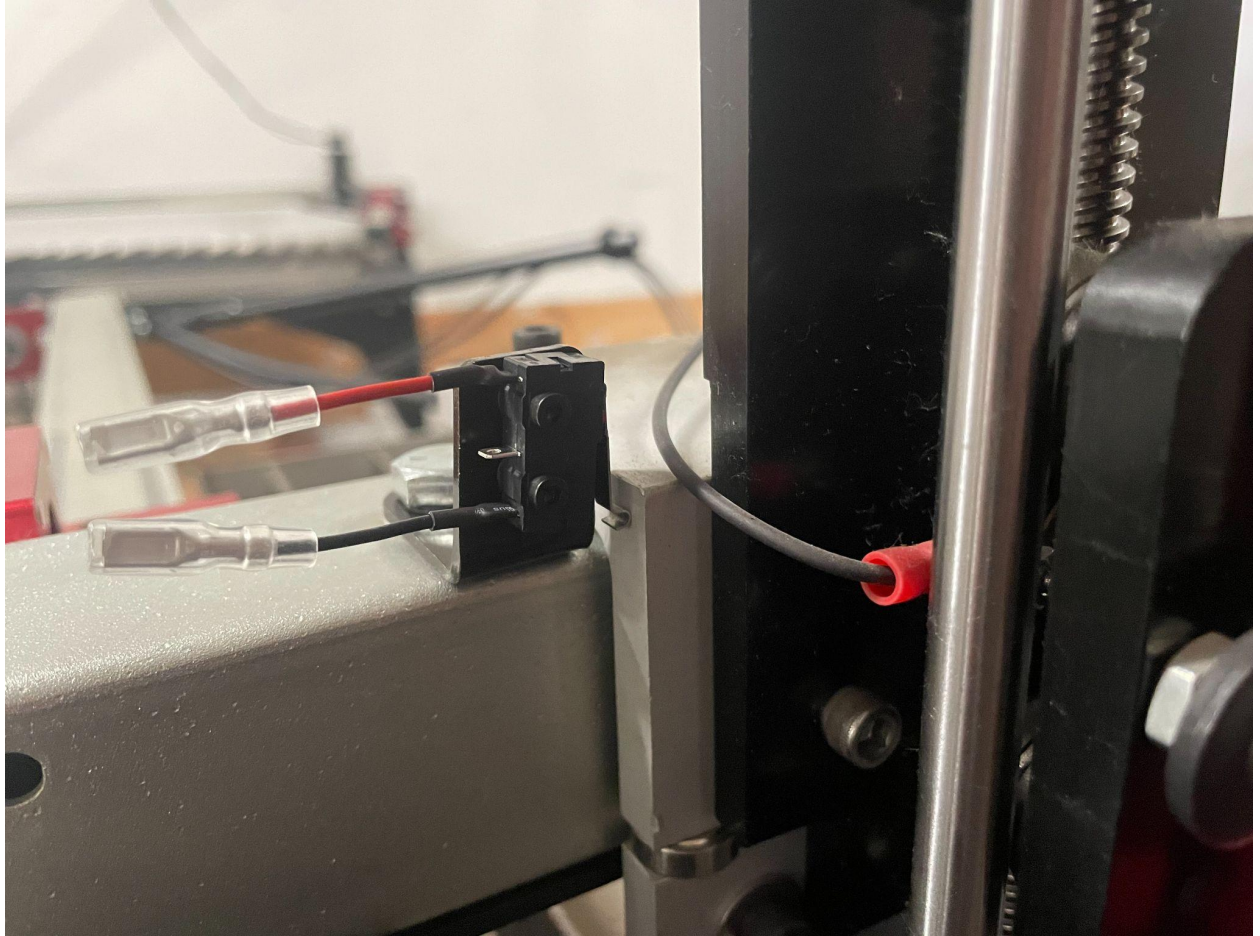


Line up the mounting hole of the X-axis limit switch bracket with the hole of the tube spacer, then pass the bolt through the set of holes.

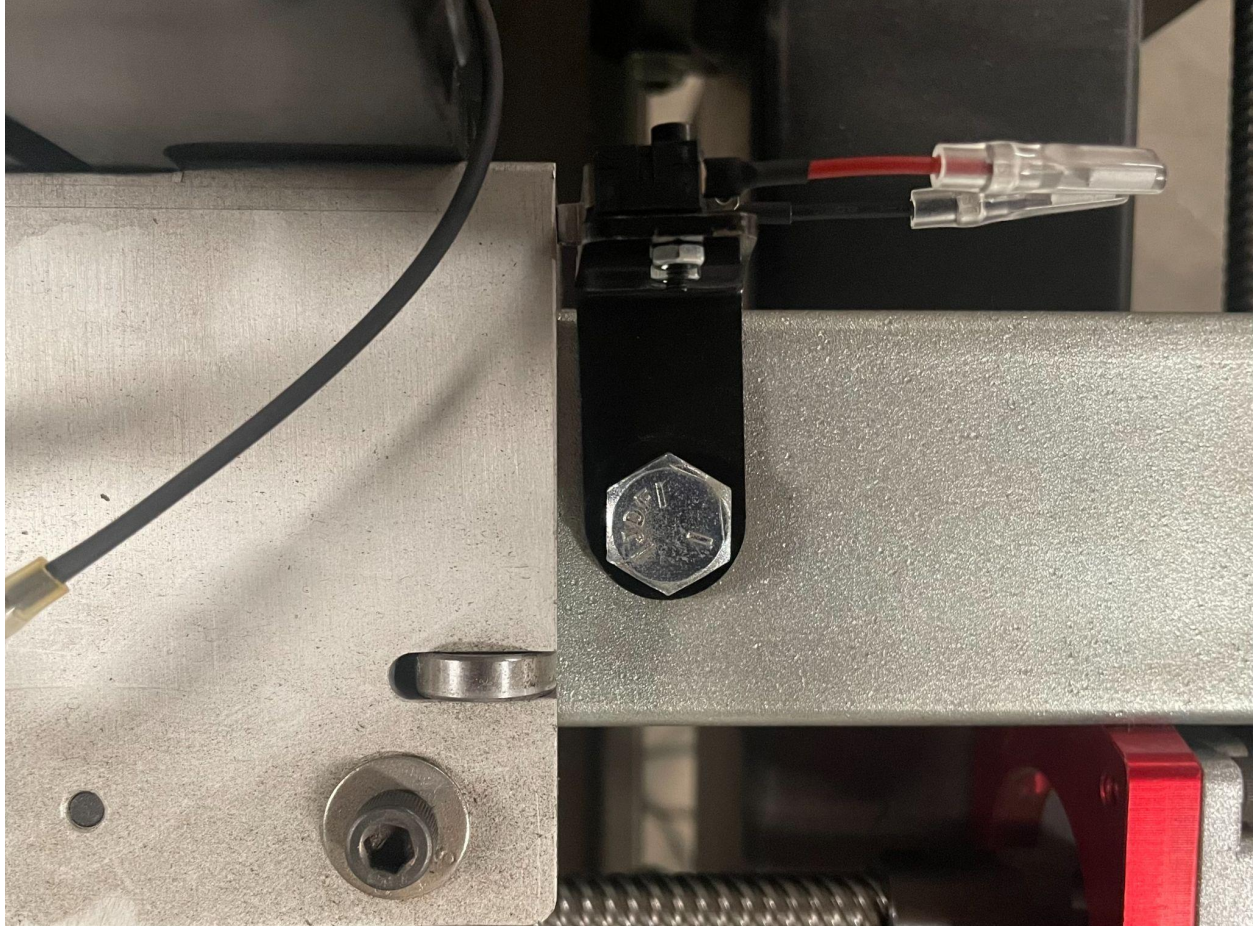




Ensure that the X-axis carriage interfaces with the limit switch before hitting the head of the bolt, as shown in the images below. Rotate the limit switch bracket around the bolt if necessary.





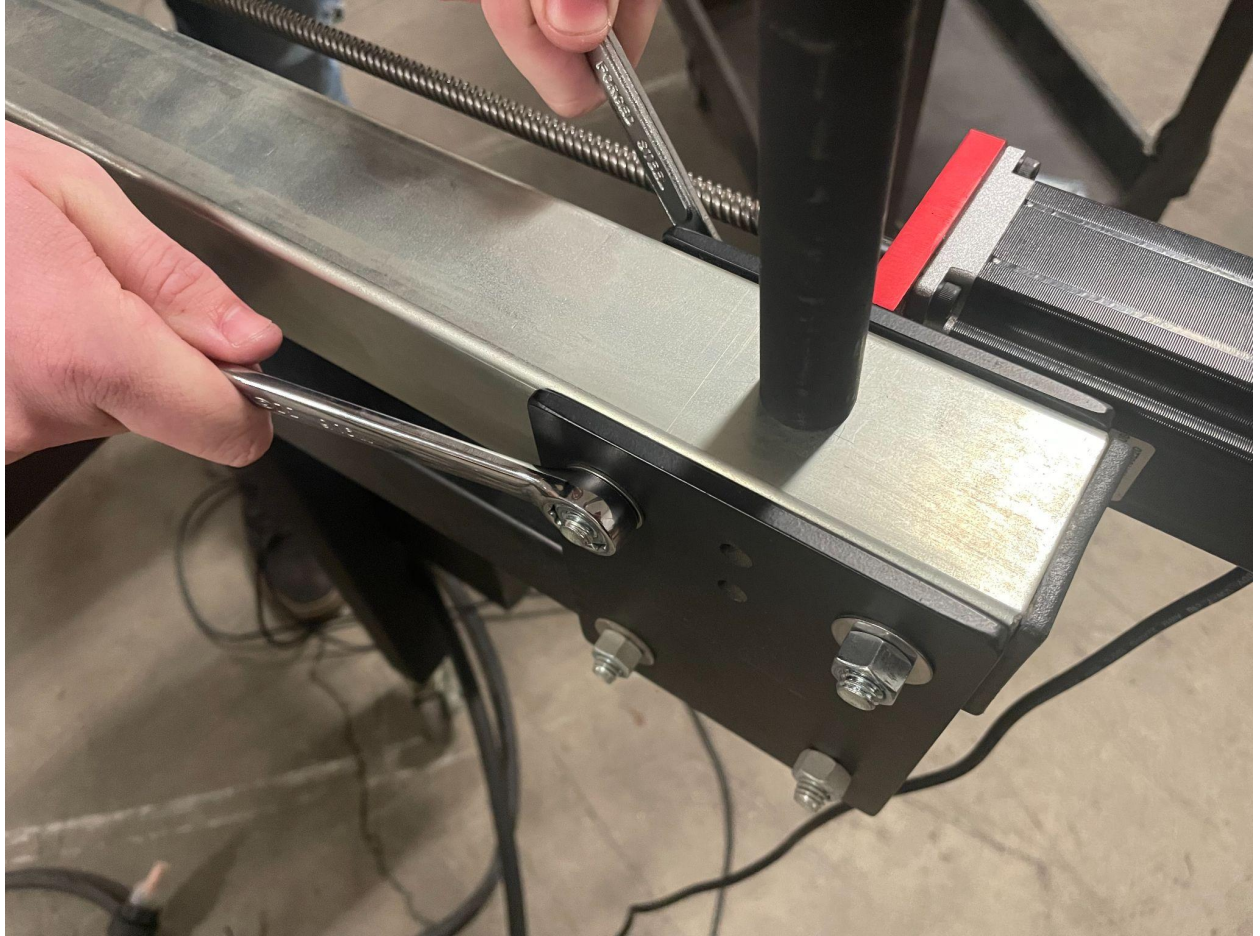


Once you are satisfied with the position of the X-axis limit switch, tighten the bolt and nut using two 9/16" box wrenches.



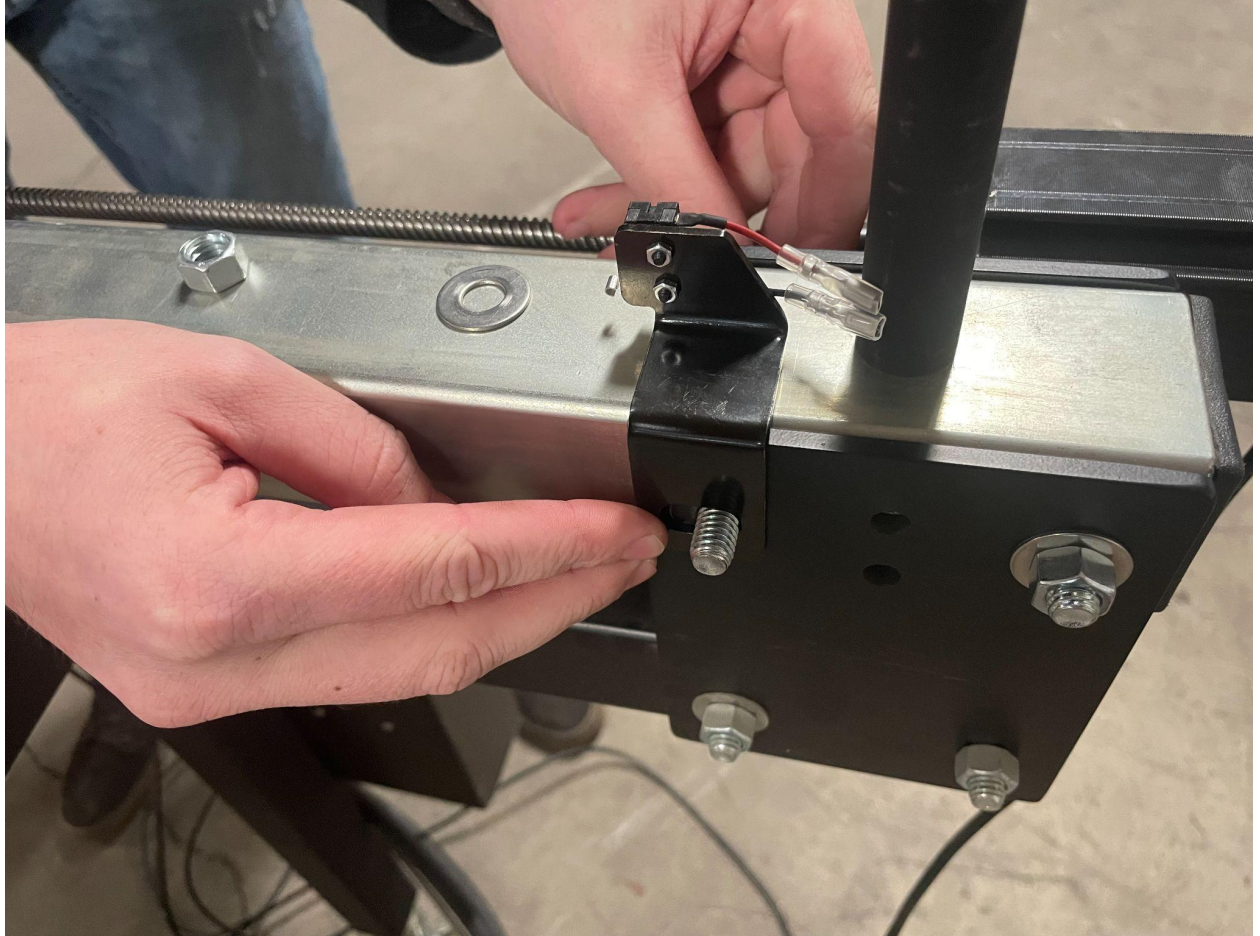
Y-axis Limit Switch Installation

Use two 9/16" box wrenches to remove the nut and washer from the bolt pictured below. These are the stanchion plates located closest to the electronics enclosure.

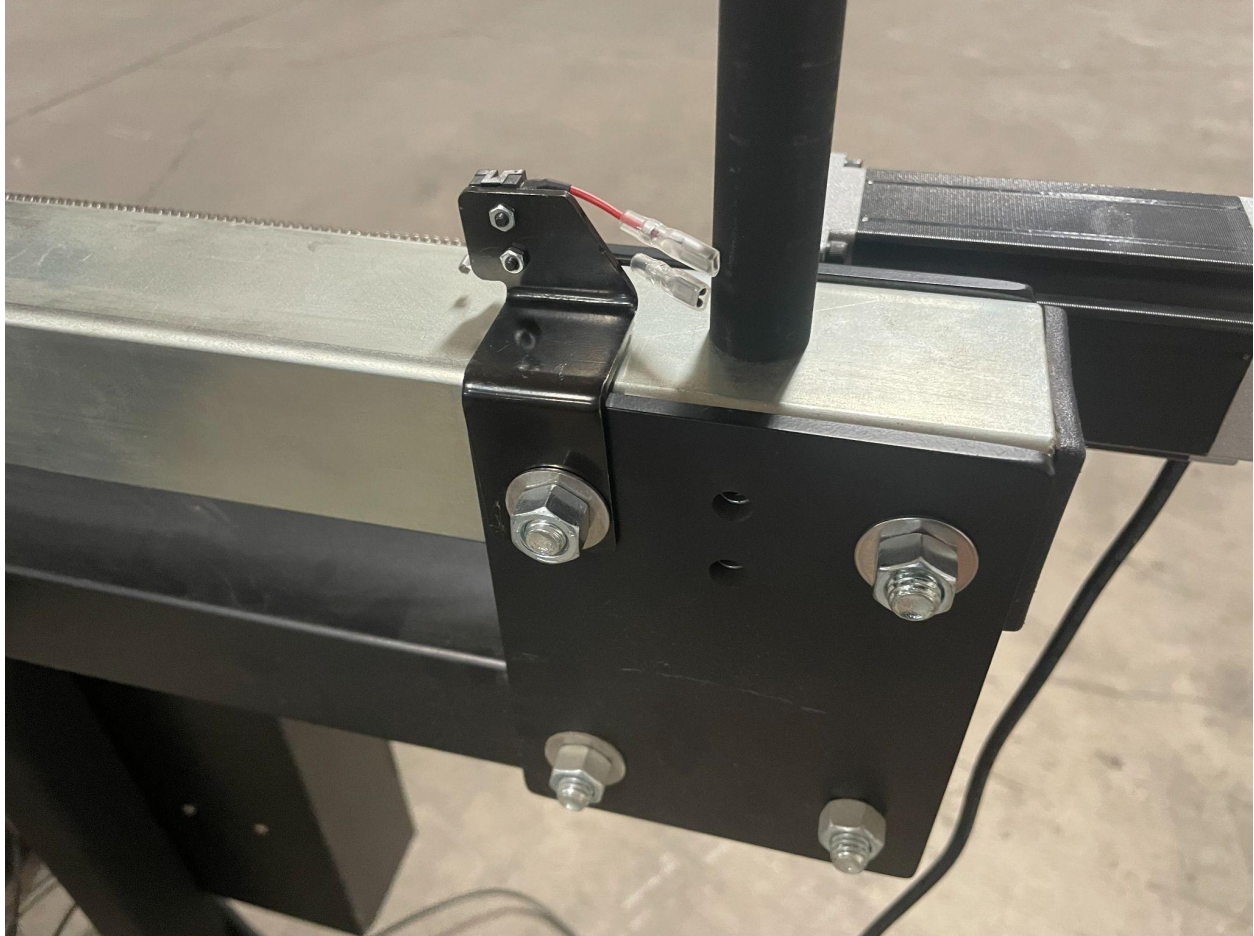




Pass the Y-axis limit switch bracket onto the bolt.



Reinstall the washer and nut, leaving them finger tight for now.



The Y-axis limit switch bracket has a significant amount of play compared to the X-axis limit switch mounting bracket installed in a previous step. Ensure that the bearing block of the Y-axis carriage interfaces with the switch before the bearings contact the stanchion plates.

Once you are satisfied with the position of the Y-axis limit switch, tighten the bolt and nut using two 9/16" box wrenches.

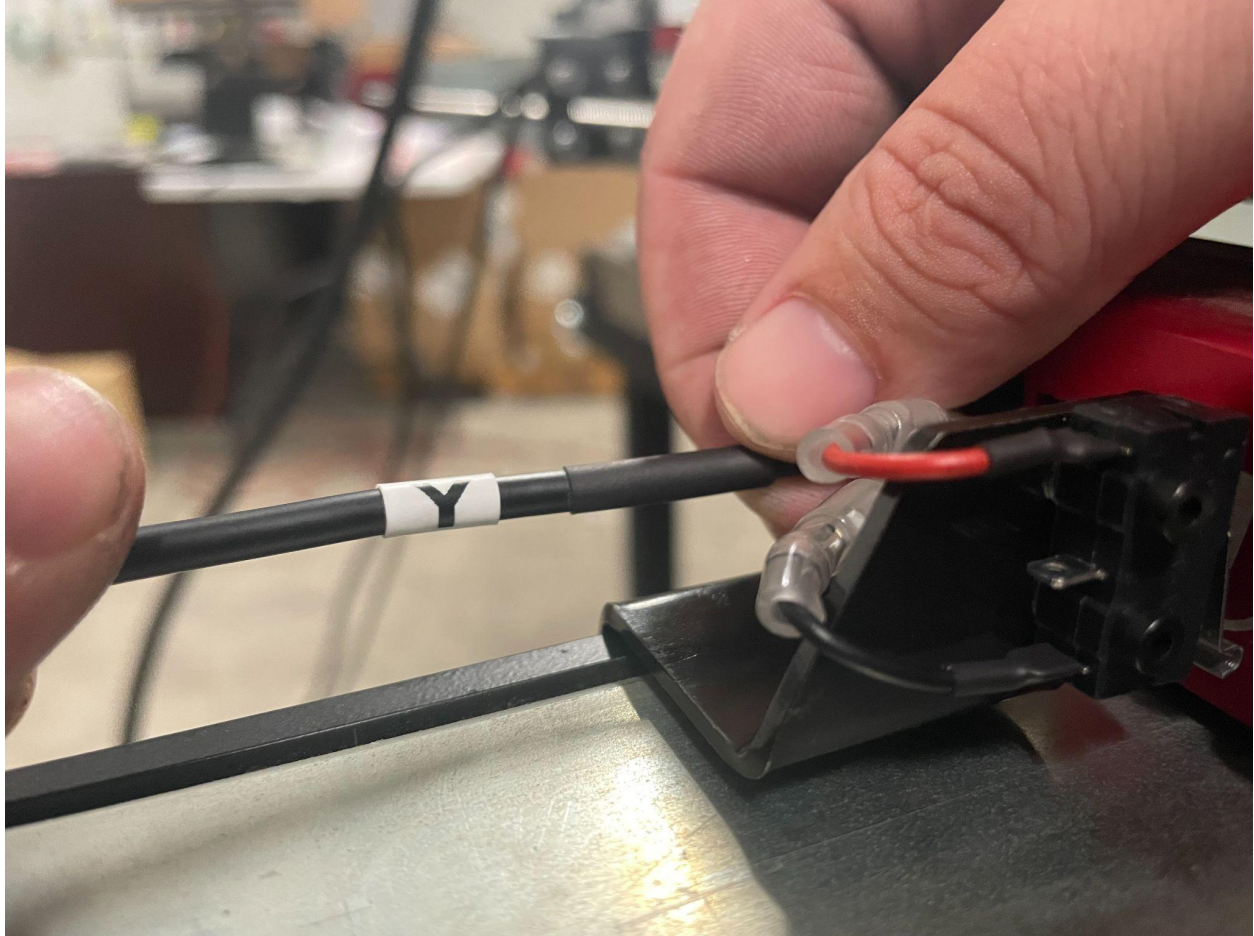


Your limit switches are now installed onto your machine, and are ready to be connected to the LIM port of your electronics enclosure using the LIM cable.

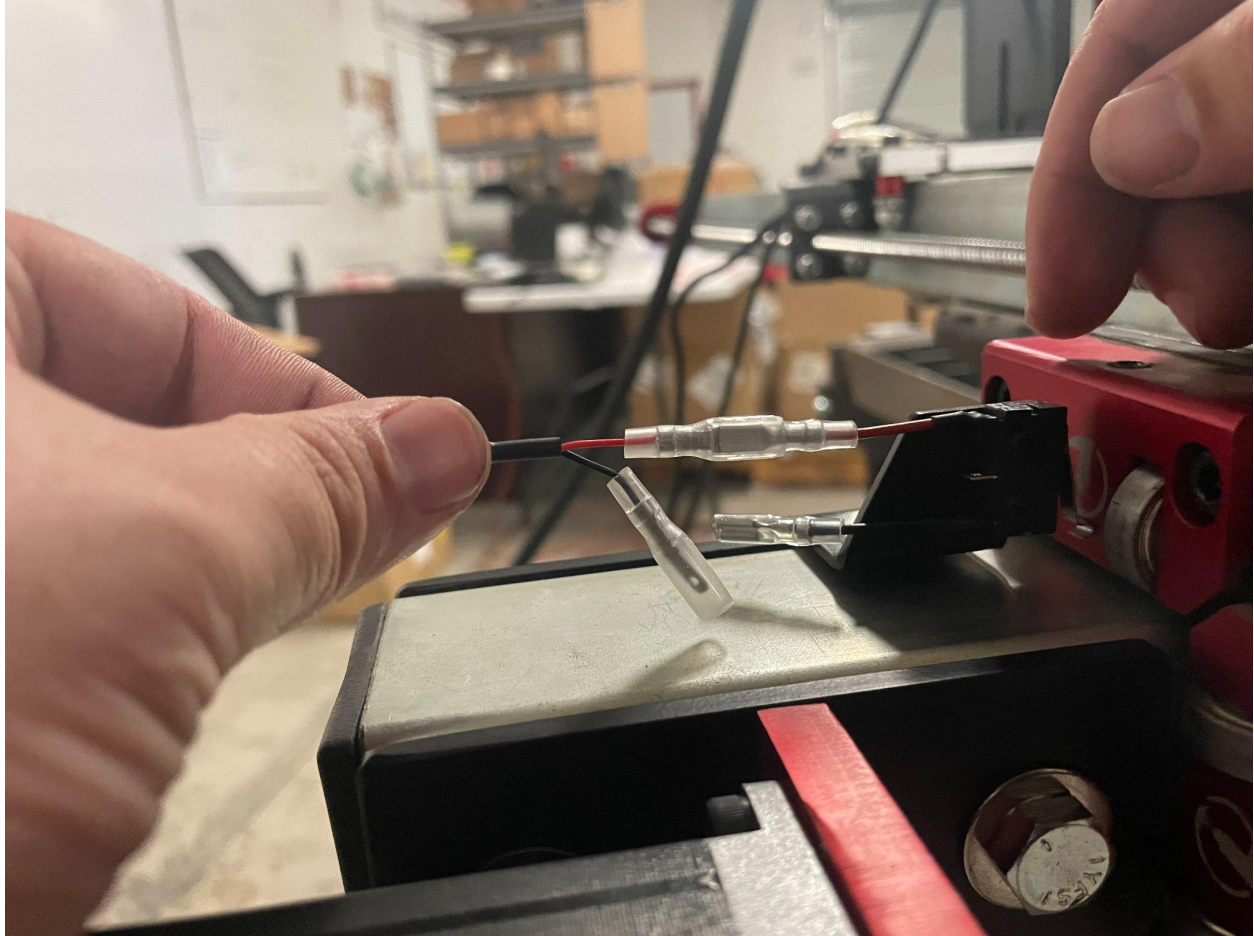
LIM Cable Connection

The final step before moving onto FireControl is connecting the limit switches to the electronics enclosure using the LIM cable. Note that the longer lead of the LIM cable is labeled X-axis, and the shorter lead of the LIM cable is labeled Y-axis.





The blade connectors of the limit switches and the blade connectors of the LIM cable leads are color-coded red and black. Ensure that you match red with red and black with black.





Connect the other end of the LIM cable to the LIM port that is installed in the EXP slot of the electronics enclosure.



Finally, use the included zip ties to pair each LIM cable lead to its associated motor cable for cable management.



Your limit switches are now ready to use in FireControl.

FireControl Configuration

Use of Limit Switches requires updating to Machine Control Firmware version 1.3LS.

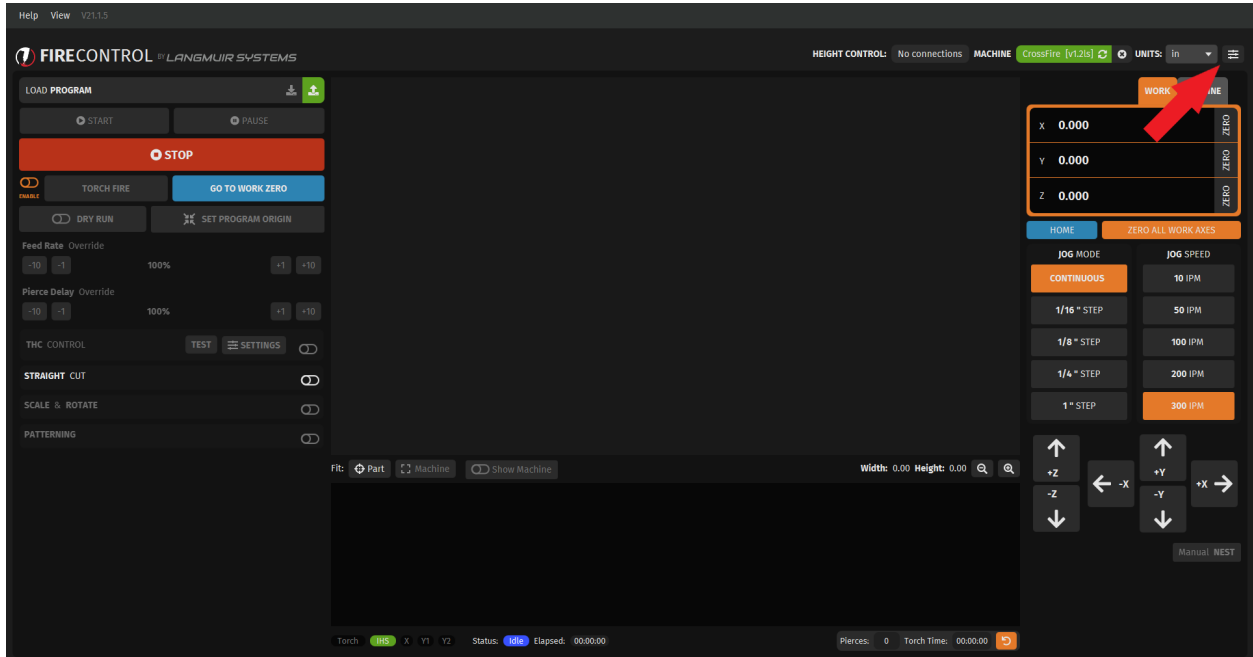
To update, connect to the internet and boot up FireControl with the machine connected. If you are not running the latest 1.3LS firmware, you will see a yellow machine Update available button in the upper right corner of the FireControl screen.

Click this to update your firmware.

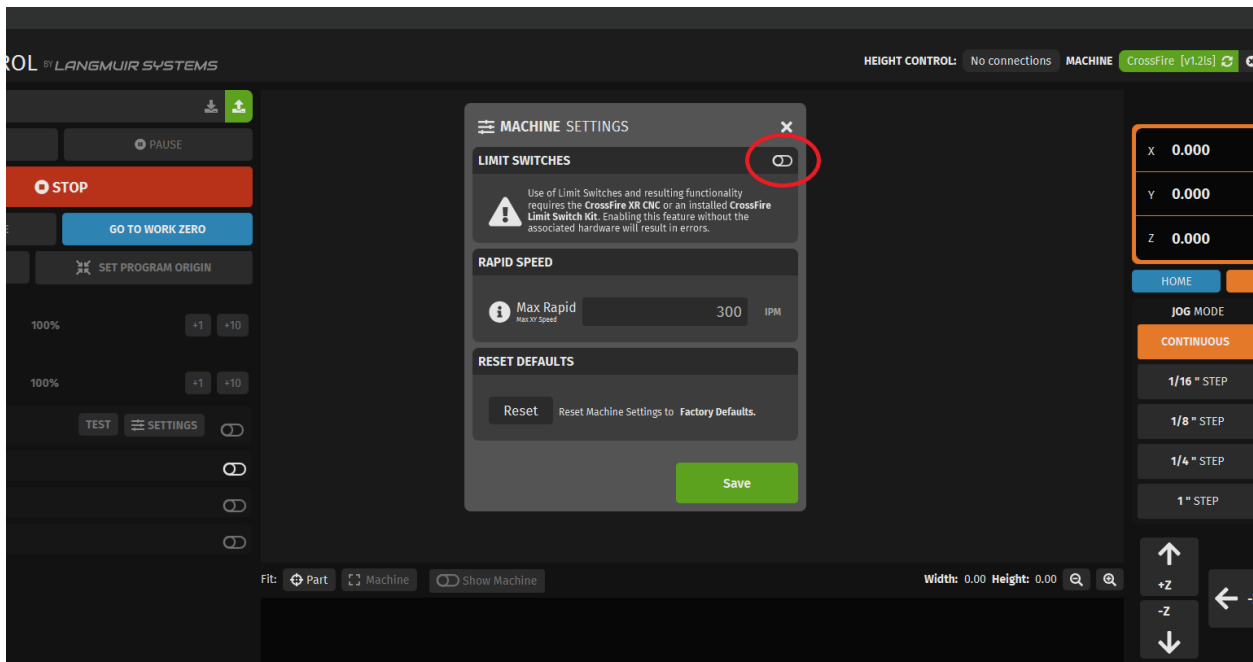
Note: This Firmware update contains only updates related to limit switch functionality.

Enabling Limit Switches

First, limit switch functionality will need to be enabled in FireControl. To do so, click on the “Machine Settings” icon in the top-right corner of the window.



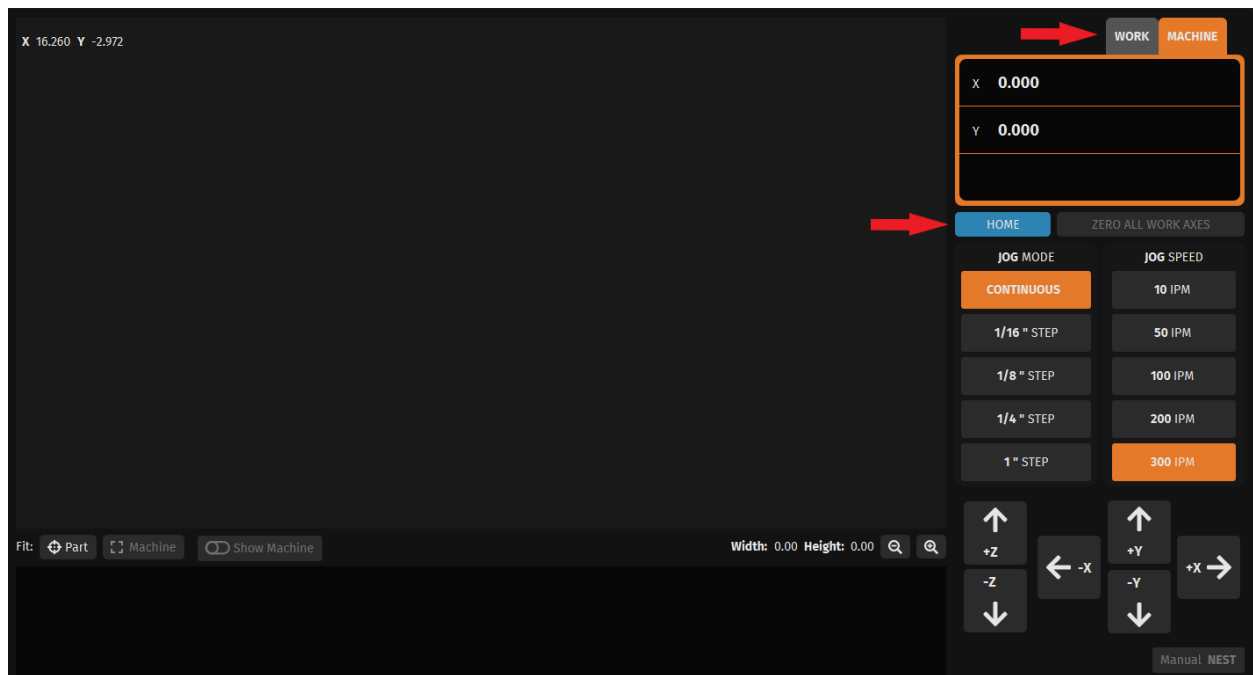
In the Machine Settings popup, click the slider toggle “LIMIT SWITCHES” button. Toggling this slider will expand the window with more options; ignore these for now and press “Save”.



Finding Soft Limits

With limit switches enabled, the Machine Coordinate tab is now available. Machine coordinates differ from traditional work coordinates; while work coordinates measure steps

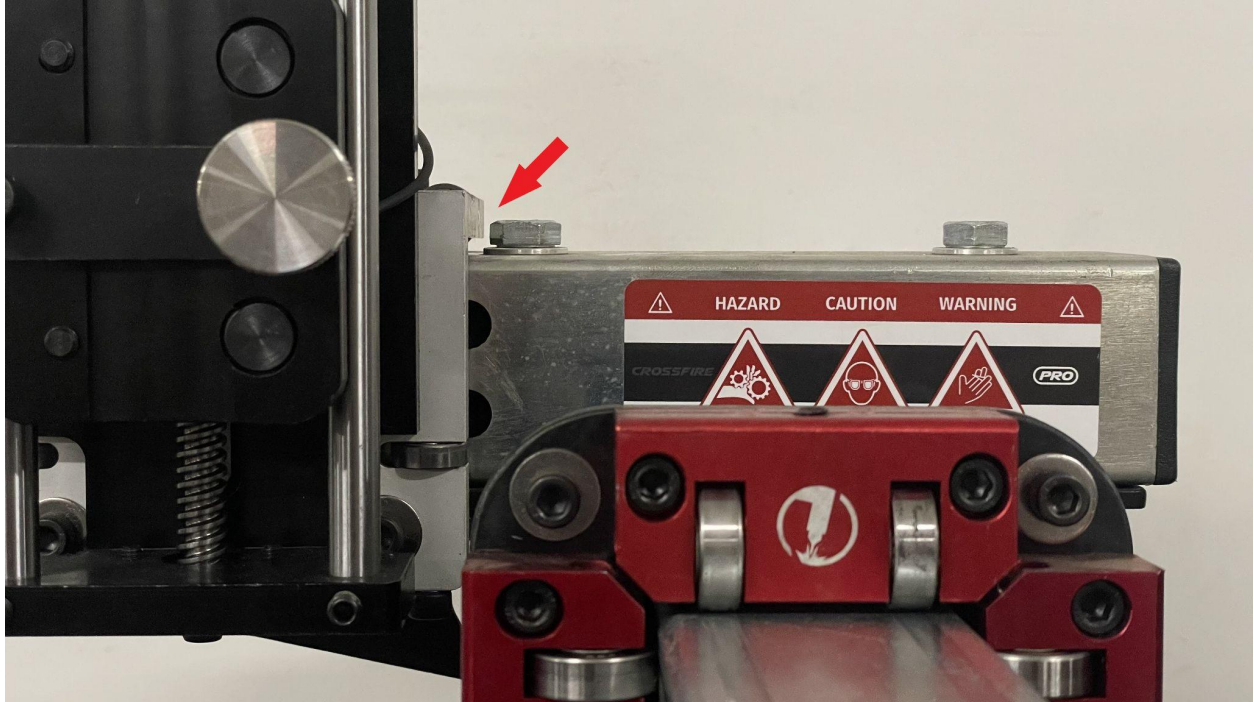
from the user-set work zero, machine coordinates measure steps from the machine's home. You can command the homing process to begin by pressing the blue "HOME" button under the digital read-out (DRO).



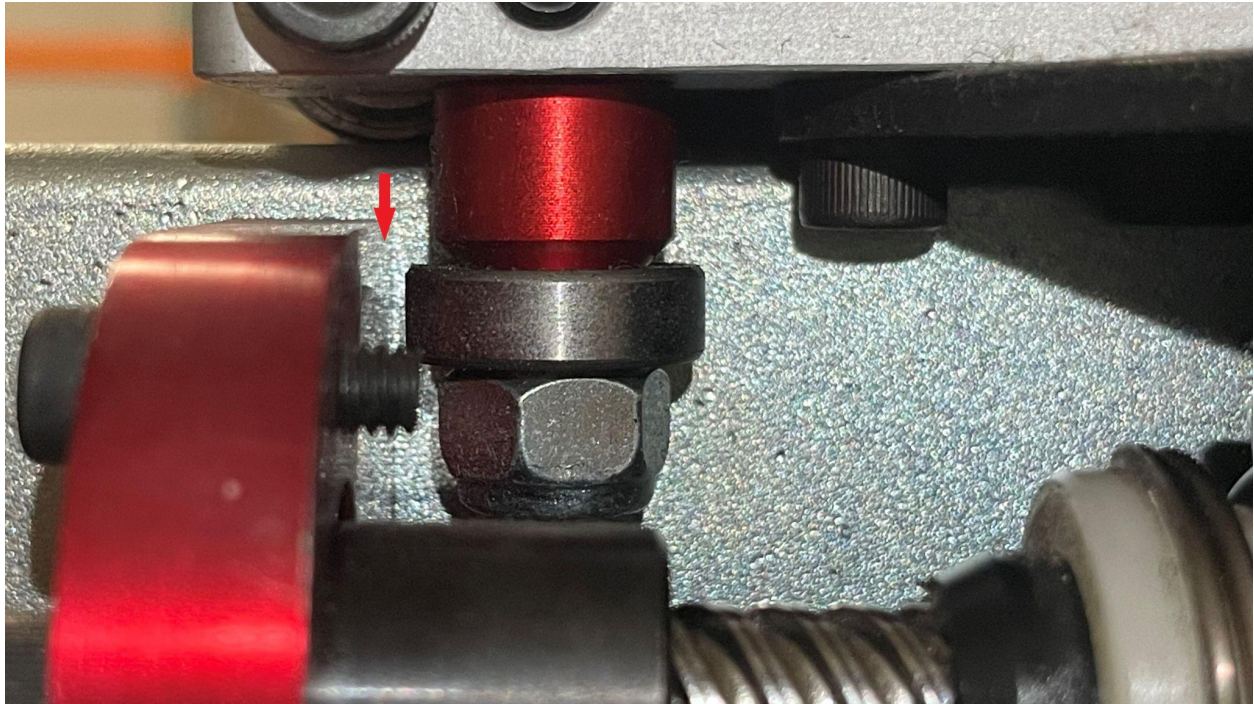
After the machine is homed, the DRO should read 0.000 for both X & Y. We'll be using the machine coordinate read-out to find the appropriate soft limits to set for your machine.

Manually jog the X-axis towards the end of travel; as you get close, toggle the jog mode to 1/16" step. The goal is to get the machine as close to the end of travel as possible without crashing.

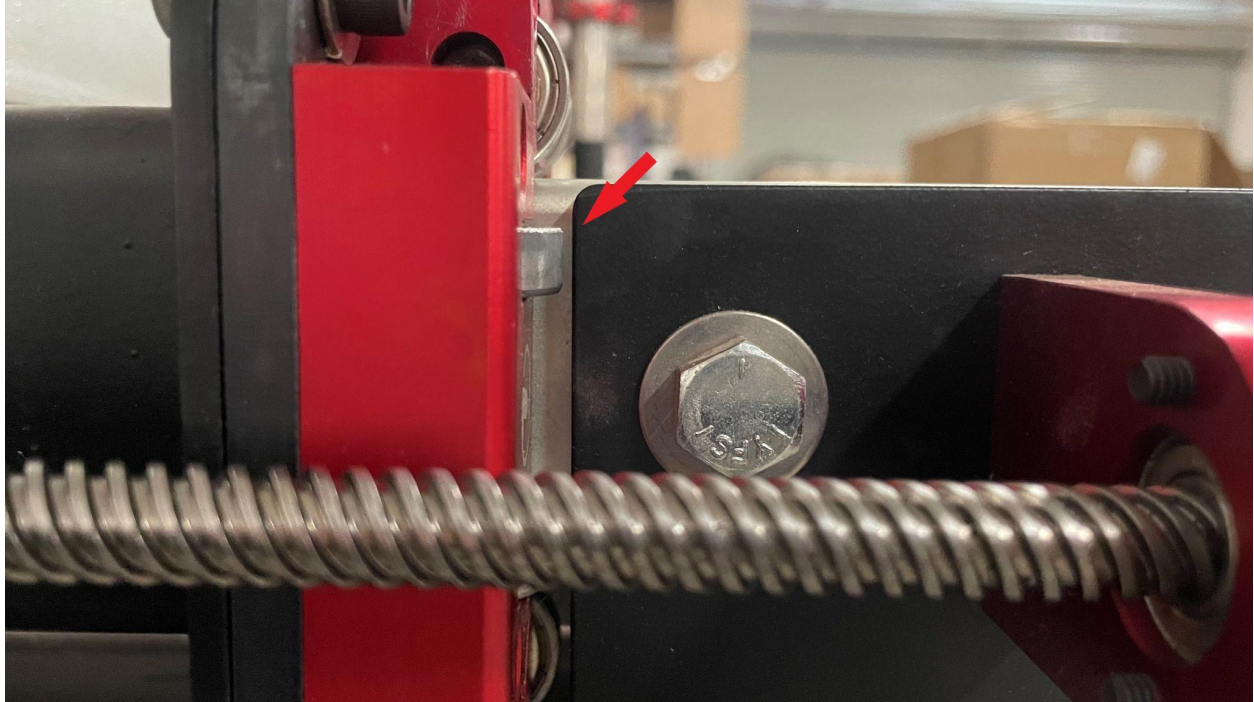
For the CrossFire PRO, get the X-axis Carriage Assembly as close to the bolt head near the end of the gantry tube as possible:



For the CrossFire, get the X-axis Carriage Assembly as close to the X-axis Bearing Mount as possible:



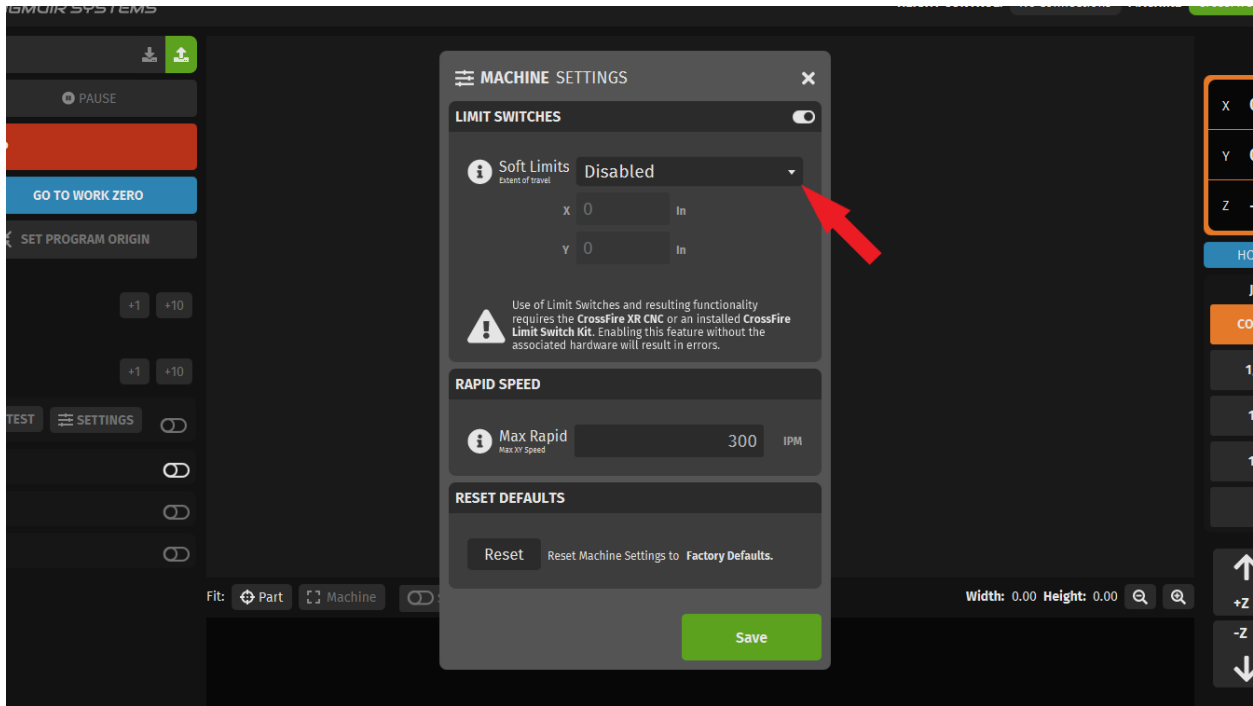
The same process is utilized to find the Y-axis soft limit. For **both the CrossFire and CrossFire PRO**, get the bearings of the Y-axis carriage as close to the stanchion plates as possible.



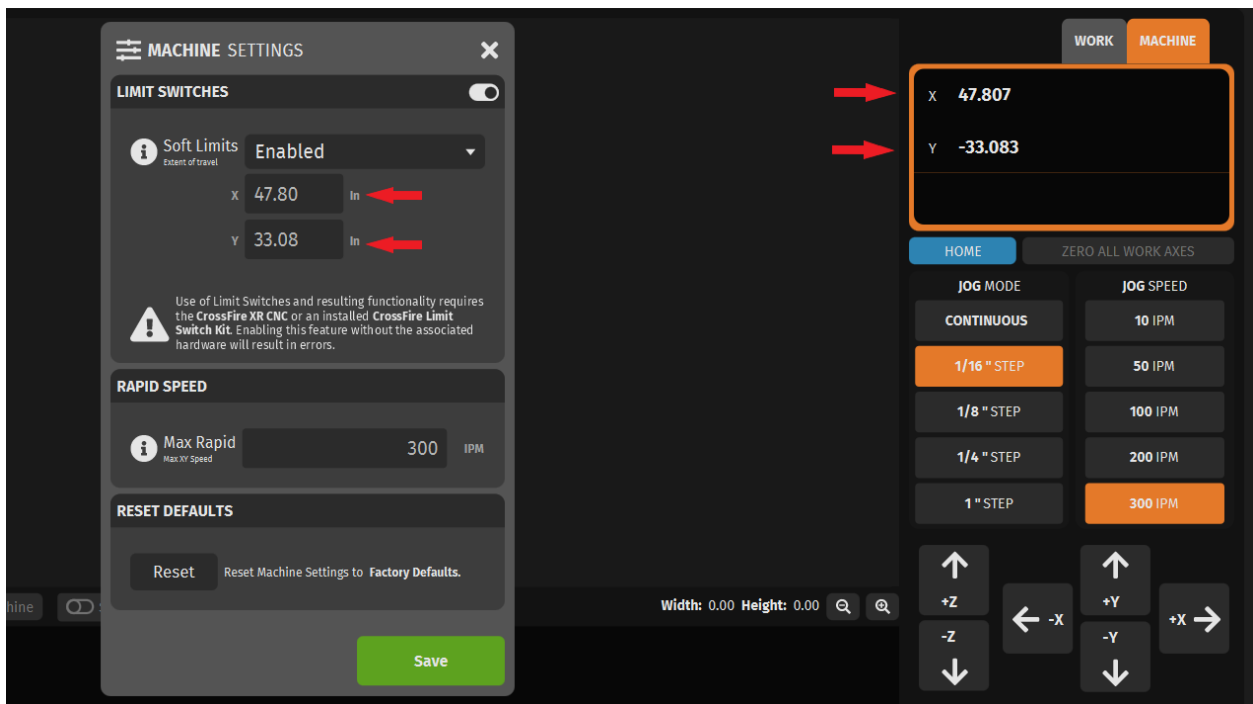
At this point, the Machine Coordinate DRO should be displaying nonzero X and Y values. Take note of these, as they will be set as the soft limits.

Configuring Soft Limits

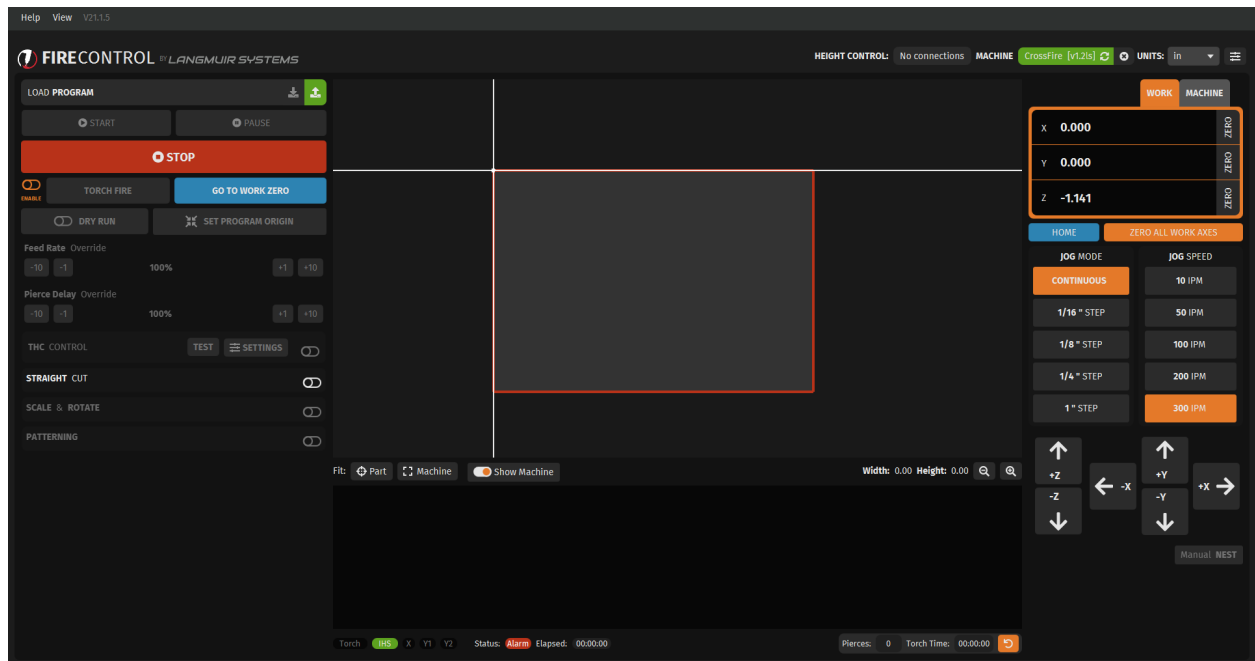
Returning to the Machine Settings window, open the “Soft Limits” drop down list and select “Enabled”.



Use the X and Y values you found previously to set the soft limits. While the machine coordinate DRO will measure & display thousandths of an inch (0.001”), soft limits must be entered to the nearest hundredth of an inch (0.01”). Make sure to **round down** to avoid setting a soft limit that is too high. For this example, we used 47.80” for X and 33.08” for Y. Furthermore, the DRO will display the Y position as a negative value, but it **should be entered as a positive value** when setting the Y-axis soft limit.



Press “Save” to set the soft limits. With soft limits set, you will now see an outline of the machine’s travel area in FireControl’s Program Toolpath Visualizer.



Troubleshooting

I hit a hard limit, and FireControl won’t allow me to jog away from it.

If you hit a hard limit, you will need to jog the opposite direction a few times. Another option is to power off the CNC electronics enclosure and turn the lead screw by hand until the limit switch is back in its neutral position.

The soft limits are reducing my travel area.

The Y-axis limit switch bracket has a notable amount of play relative to where the bearings actually would come into contact with the stanchion plates. If your cut area is significantly reduced in the Y-axis, you might have installed the Y-axis bracket too far away from the stanchion plates. Loosen the nut where the Y-axis bracket mounts, and reposition the bracket in such a way that the Y-axis carriage interfaces the switch just before the bearings would contact the stanchion plates.

In **FireControl 21.1.5**, you will set your own custom soft limits. Try to set these to be as close as possible to the travel limit at the end of each axis that is opposite the hard stops.

In **FireControl 22+**, there are preset soft limits for each machine: CrossFire, CrossFire PRO, and CrossFire XR. The preset soft limits are very conservative estimates to account for slight variances in frame squareness. The presets can be overridden by using 'customize' instead of the preset.