

Wiring Diagram and Instructions

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Further References and introduction

Each page references new wire unless clearly stated otherwise. The size of the wire and the length will be listed. There are several sizes. The larger the size of the wire the smaller the AWG number, therefore 18AWG wire is smaller than 10AWG. There are also several different voltages being transferred by their respective wires. To help in identifying the voltage being transferred there will either be a label on the picture or a mention in the pages description. Some of the voltages are deadly others are simply harmful, so **DO NOT PLUG IN THE EXTENSION CORD UNTIL THE END AFTER A THOROUGH REVIEW OF ALL THE STEPS, ENSURING THAT EVERYTHING IS WIRED PROPERLY.**

As you go through the steps it will be best to read the entire page. Then cut all the wires to length. Then add to connection ends to all the wires.

Then finally connect the wires to where they should go. In order to create some organization we will be using sections of the wire loom to bunch several wires together. Use the wire looms wherever possible. To use the wire loom cut to desired length and then heat up the ends to avoid fraying.

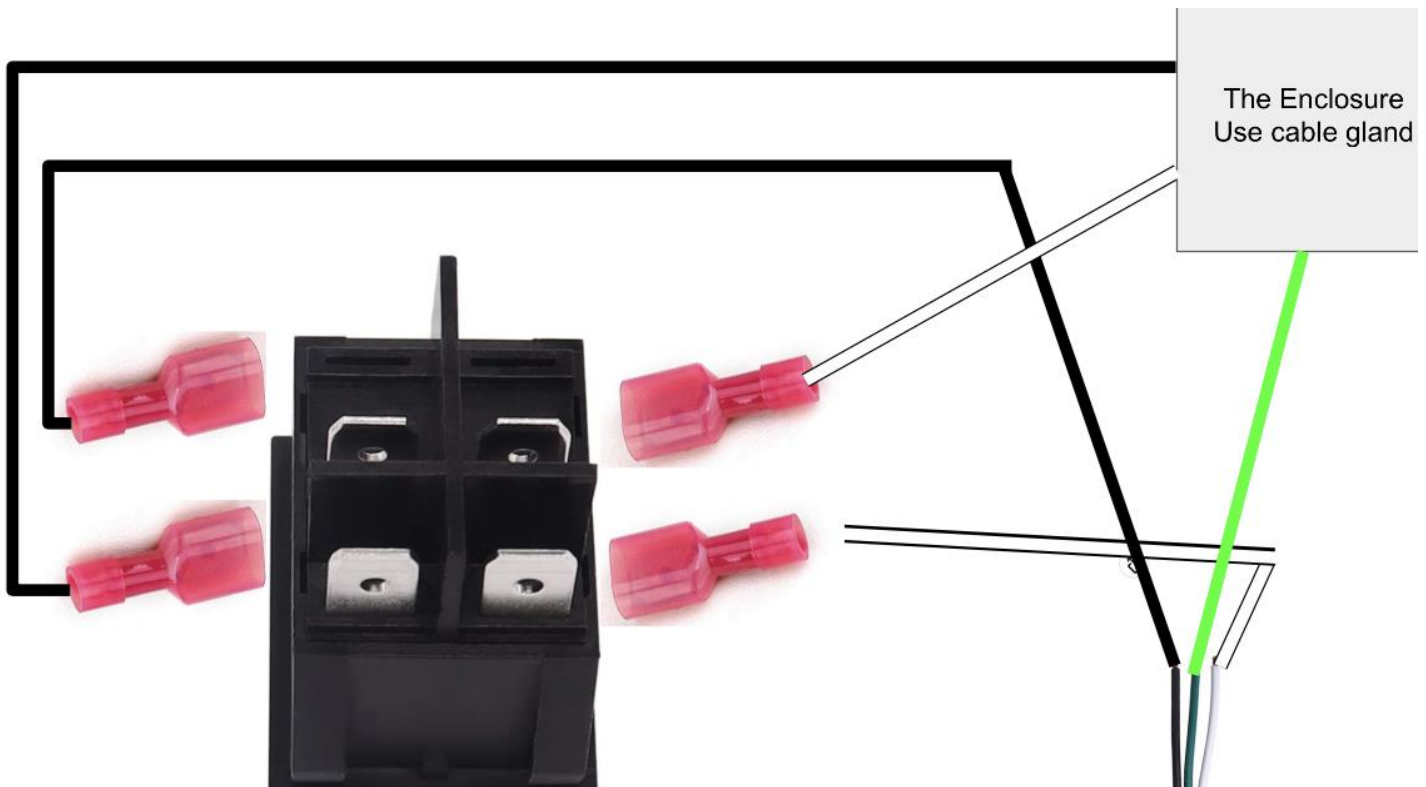
The tools needed within these steps are as followed: fillips head screw driver, flat head screw driver, wire snips, wire strippers, wire crimpers, a lighter or heat gun, soldering fixture, soldering iron, soldering flux, and soldering wire.

The soldering section of these steps can be a stopping point if soldering is not a strong suit. Soldering is difficult and very important. If you go forward with the soldering section remember that the iron I HOT.

Therefore set it down keeping that in mind, wear heat protectant gloves, and use the fixture to ensure best quality and protection. When soldering make sure the wires go to the right pins. If they do not things can be fried.

Step 1

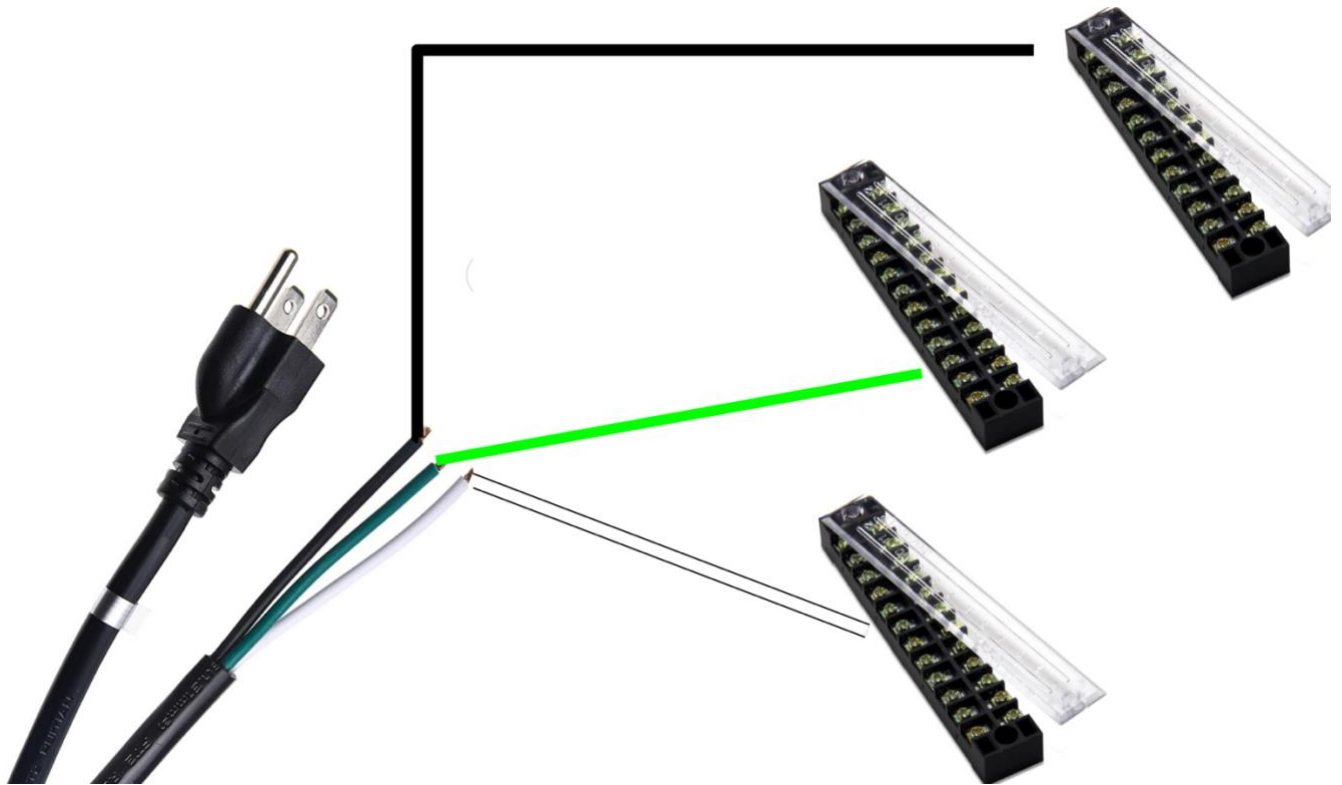
To start of we are going to wire the power switch. The power switch starts outside of the box. We are going to use the extension cord and it's wire. To start cut the extension cord back 6 feet, then cut that into two sections; one two foot part an then one four foot part. Set aside the four foot part and we will be using the two foot section. Then expose the wires and trim them on each side.



Ensure that when you crimp the wires they have a tight connection. Do not allow any exposed wires. Also, remember that you do not plug in the extension cord until the very end. Feed as much as possible through to the enclosure. Reference the wire in the enclosure for the next step

Step 2

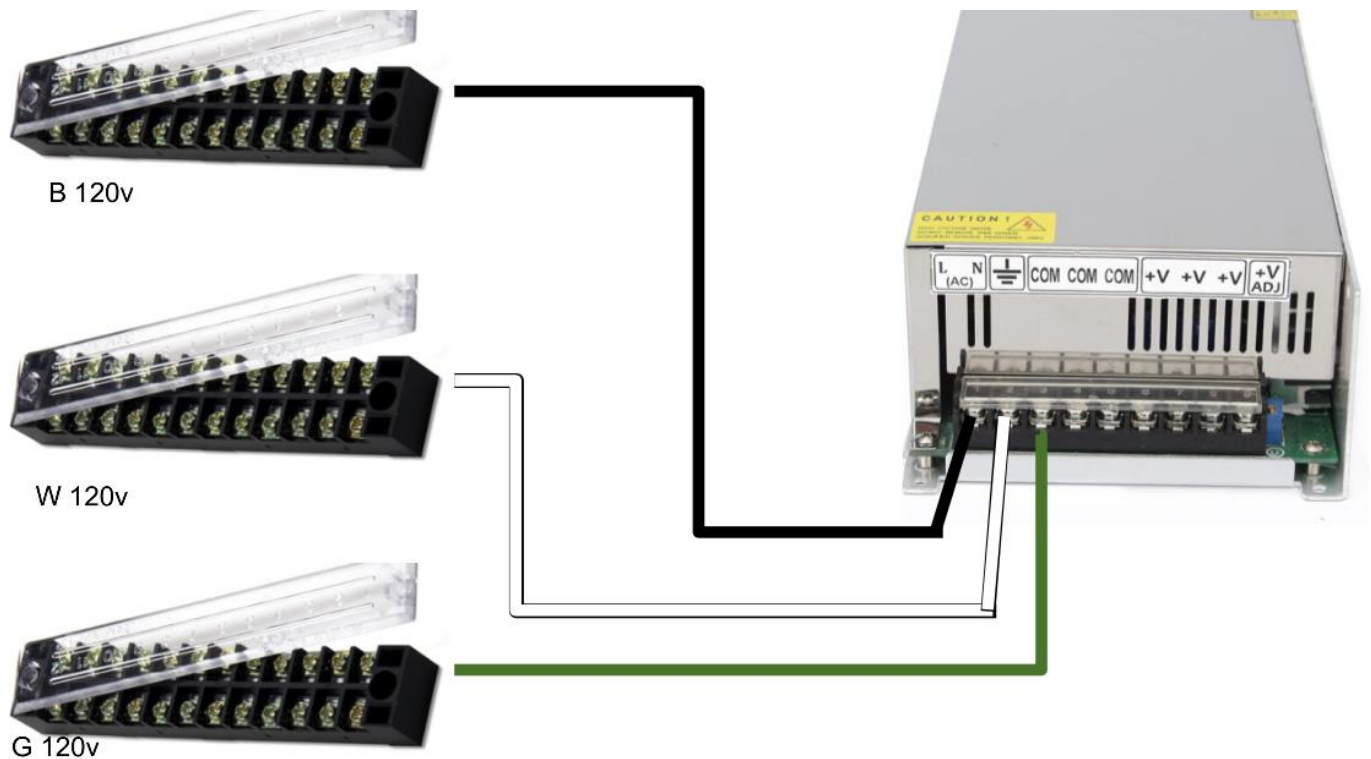
Black, green, and white. The black wire is the live wire, the green wire is the ground wire, and the white wire is the neutral wire. Utilize a Cable Gland to feed the wire through the electrical enclosure. Connecting each separate cord to its own terminal strip as pictured.



These terminal strips will only be used to power the power supplies. **DO NOT USE THEM TO POWER ANYTHING ELSE.** In order to distinguish they will be represented with the first letter of the color coming into them and 120v under the color.

Step 3

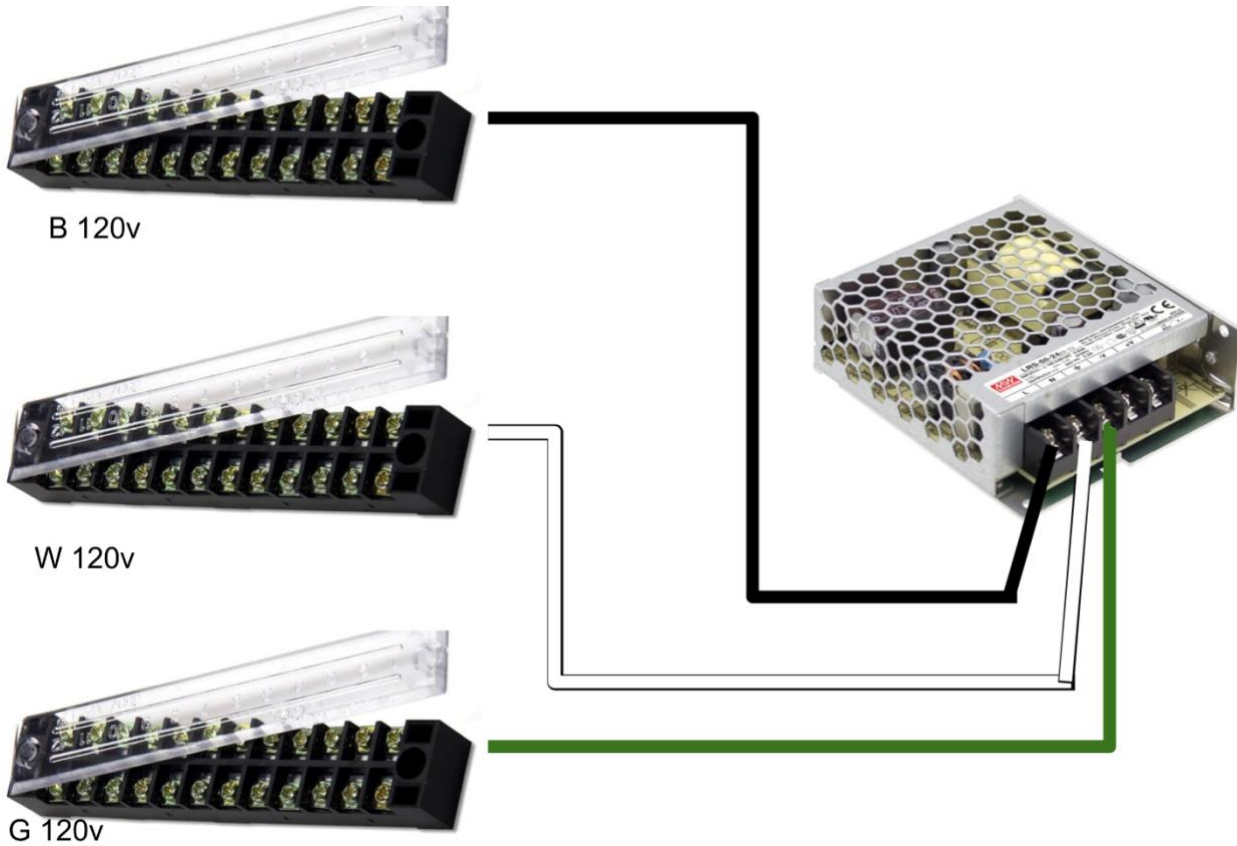
As mentioned above the terminals for the 120v extension cord will be used to power the power supplies. There are two power supplies so only 2 wires will come out of the terminals. We will be using 10AWG wire for these connections. This comes from the extension cord.



Utilize the proper crimping technique and connector. As well as ensuring that a generous amount of heat shrink is used. Green goes to the funny shape (ground), white to neutral, and black to live

Step 4

We are going to wire the 12v power supply the same way we wired the 36v power supply



Utilize the proper crimping technique and connector. As well as ensuring that a generous amount of heat shrink is used. Green goes to the funny shape (ground), white to neutral, and black to live

Step 5

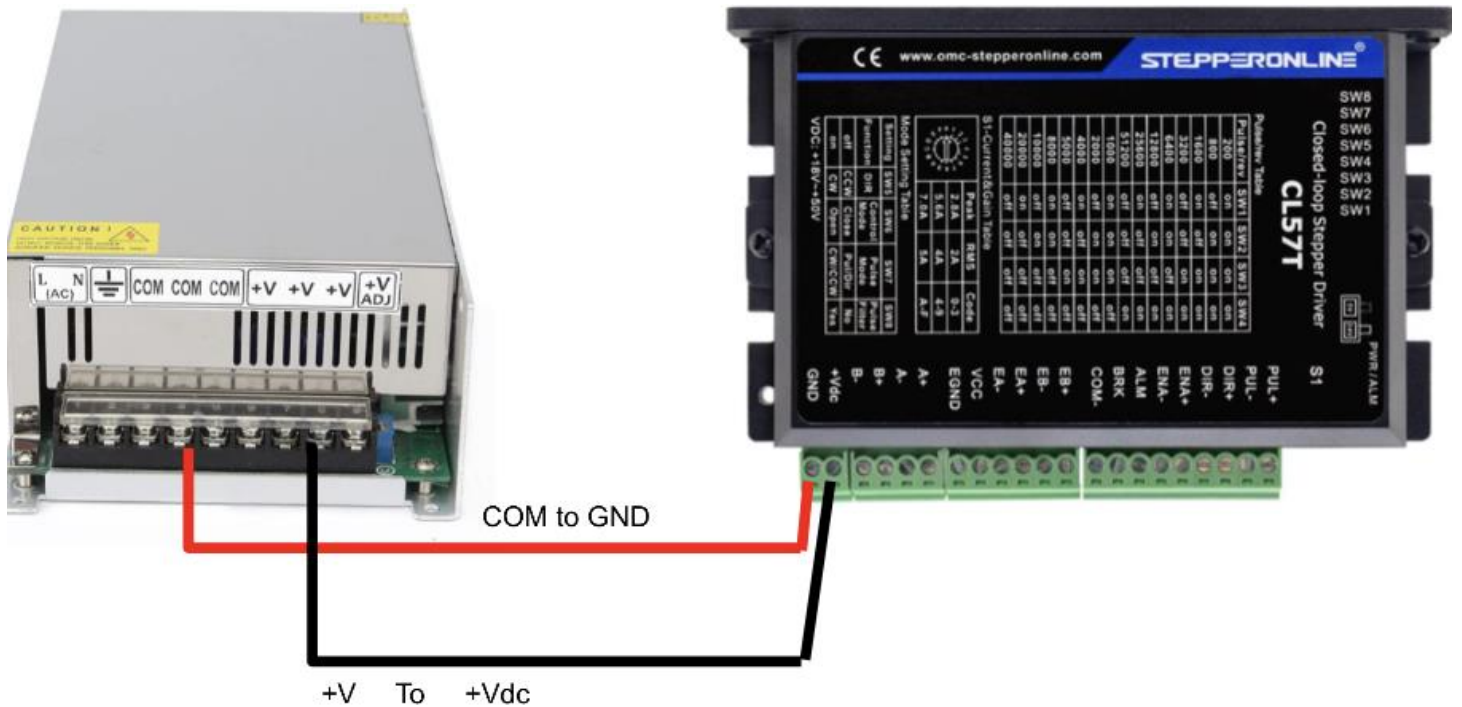
We are now going to do the last step with the 120v wire. We are simply going to take a small section of the green 10 AWG wire and connect it to the box at the pictured area and the green terminal. This will ground the box, protecting it from outside electronic noise.



This is the last of the work done with the 120v section. The only more interaction we will have with this section is adding more wire for grounding.

Step 6

Now we are going to wire the stepper drivers to give them power. We will be using the 18 gauge wire and utilizing the wire ferrule along with some heat shrink. Ensure the connection is firm, strong, and safe. All the stepper drivers will be wired from the 36v power supply.

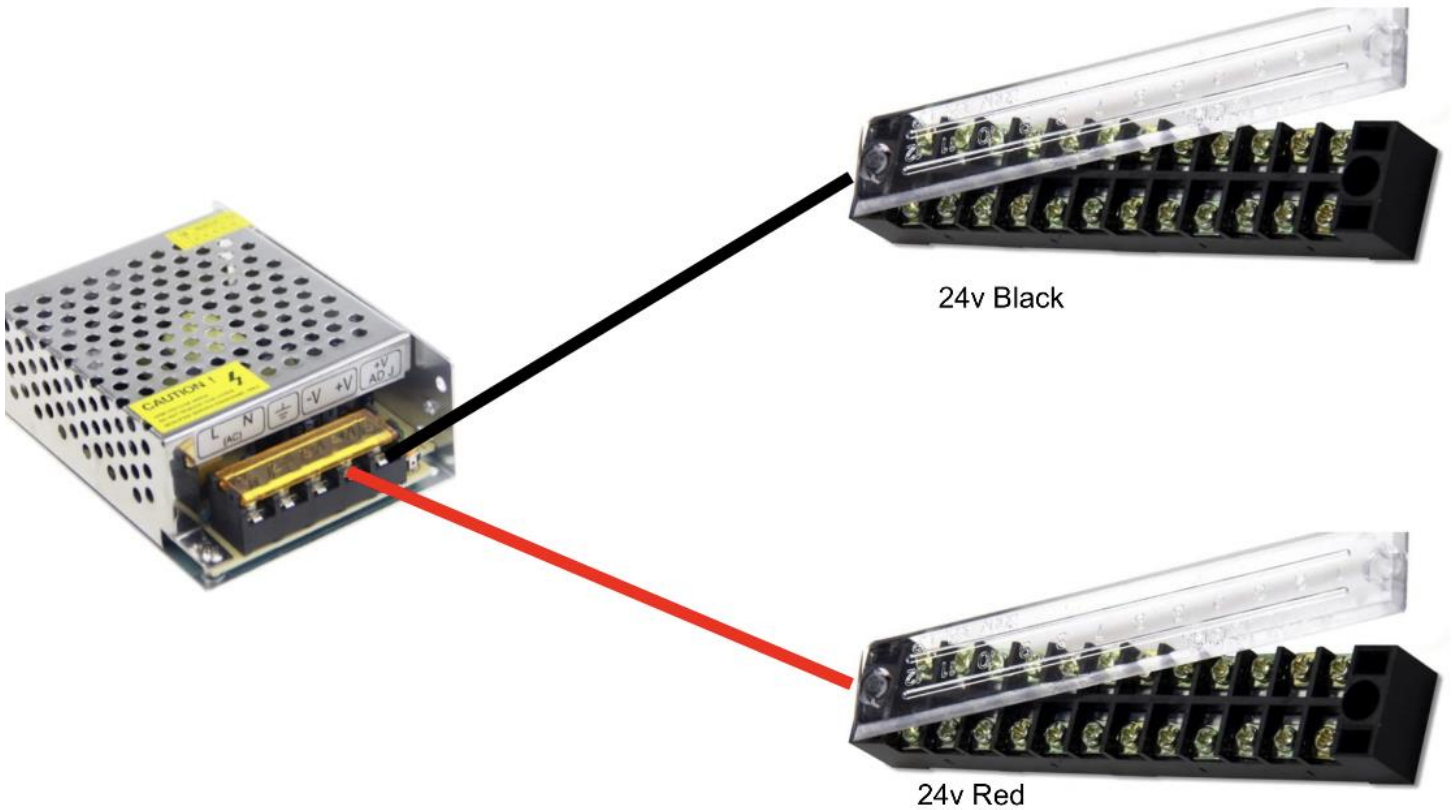


When going from the power supply utilize the connection piece shown on the left, then use the piece shown on the right to connect it to the driver. WIRE ALL DRIVERS THIS WAY.



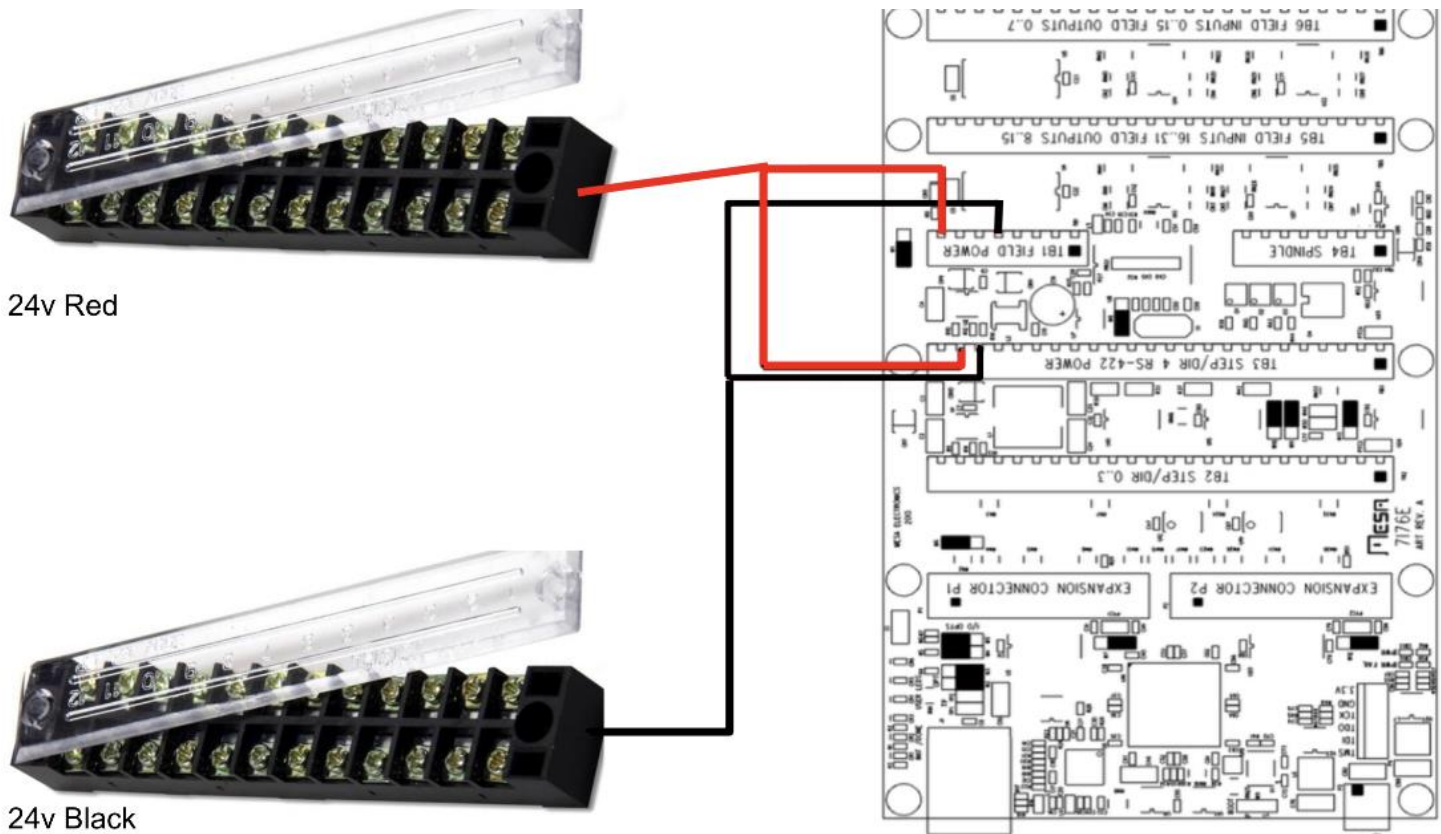
Step 7

We will now be setting up several terminal strips from the 24v power supply that will be used later with the proximity sensors in step ### and the next step for the Mesa power. Ensure that we are using the correct power supply and that the connections are very tight.



Step 8

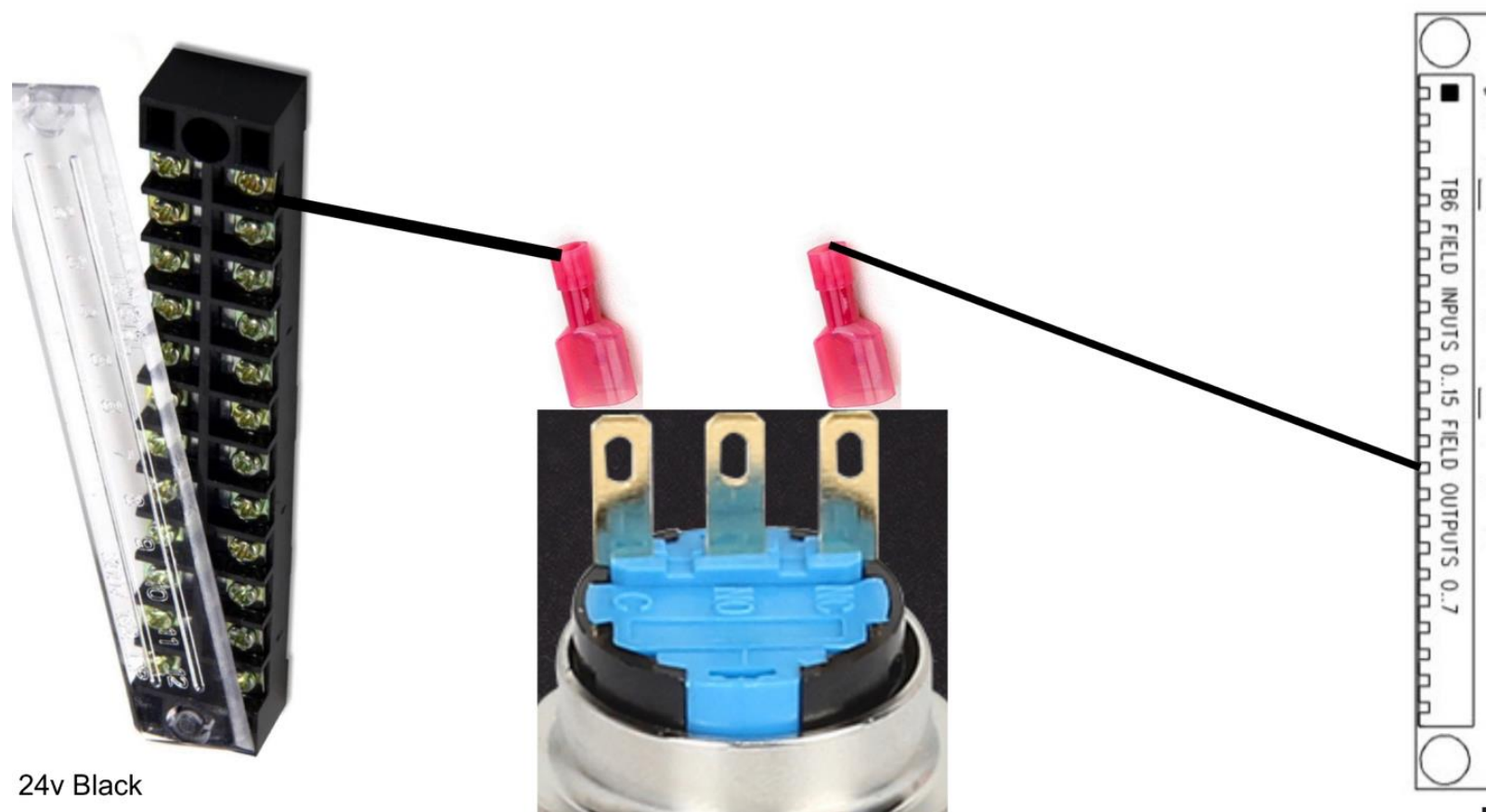
Now we are going to wire power to the Mesa 7i76e board, we are also simultaneously going to set up the field power. For this step we are going to be using the 24v power supplies terminals we just set up last step with 18 AWG wire. Both ends of these wires should be stripped, crimped with a ferrule, and secured with heat shrink



TAKE PARTICULAR NOTE OF WHAT EXACT SPOT EACH WIRE GOES TO. There are two spots being wired by one wire according to the picture. Though each spot will have its own wire. Therefore there are four wires in this step.

Step 9

We are going to now wire the E-Stop. We are going to use the same terminals as we did in the last step, the 24v terminal. There are several areas on the E-Stop to wire up to. We will be using the normally closed side (NC). This means that power is running through the E-Stop until it's pushed. Therefore the machine will run unless the E-Stop is pushed. The E-Stop is outside of the box so we will have to use a cable gland to lead the wire out of the box then another to lead it into the outside box. We will also use the cable loom around this wire as more wires will be going outside the box like these.



Note that these are wires to TB6. That is the last section on the Mesa board. Also take particular note of what exact spot the wires going to for the mesa board.

Section 2

We have passed the section where we are wiring power to things. All the major components have power and all the power supplies are set up to be wires to further when needed. The next steps will be very specific as to what wire goes to what, not that all the wires specific positions aren't important, though it's more so that these wires are closer together in smaller receptacles so it could be easy to mistake their actual placement. In this section we will not be doing step, as many of the steps are repeated several times with lengthy processes. Therefore we will be addressing a singular component and how to properly wire it entirely.

We will be soldering in these sections. If you don't feel comfortable soldering then do not continue. The next page will show what we will be soldering. For each soldered connection ensure that the wire is very well soldered, not bridging to any other section, covered with heat shrink, and at the right pin! The fixture should help in ensuring that you don't get burn and it's easier to solder.

There will be a table at the end explaining every spot on the Mesa boards outputs and inputs. If need be then reference that for either wiring (may not be useful), for programming, and for placement on the box.

This is when wires may get messy, so when possible use wire loom and keep the wires as short as possible while keeping them out of the way

Reference page for following instruction

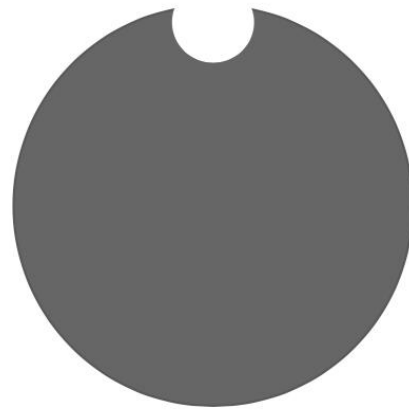


4

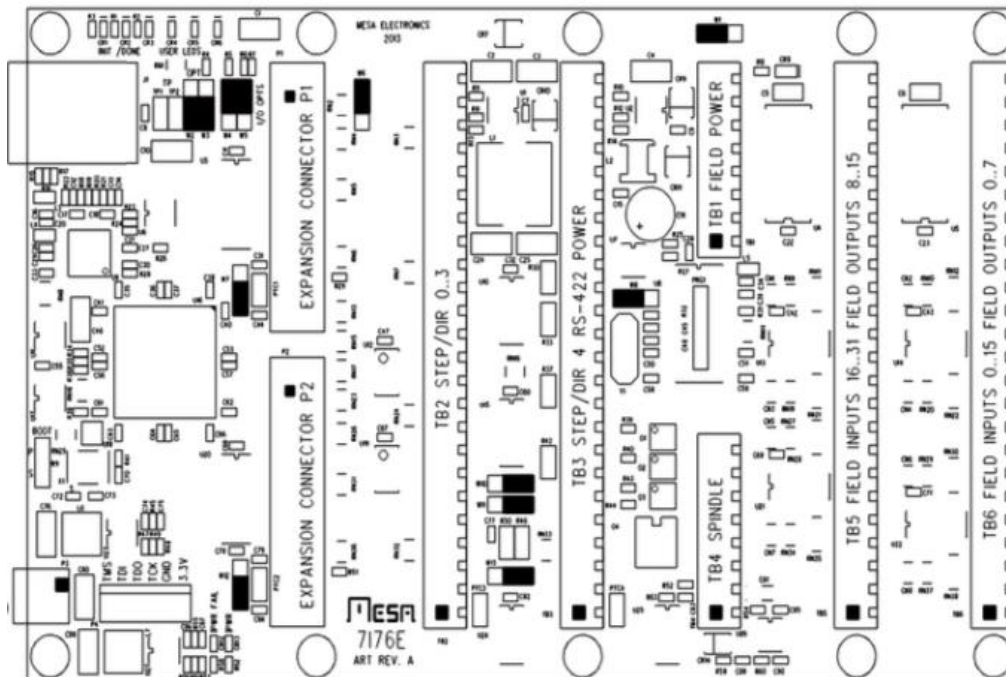
1

3

2



These things are difficult to solder. For some tips try to follow these steps. Have your wires cut and ready at the side, put the piece in the fixture, add a good amount of flux to the metal pieces, heat up the metal area, add solder to the metal, then set the wire up overtop the metal, add flux to the wire, then heat up the wire, add flux if needed, let it cool, then do the others the same way, once it's all cooled clean it up, then give a generous amount of heat shrink to each, covering everything exposed.



Proximity sensors

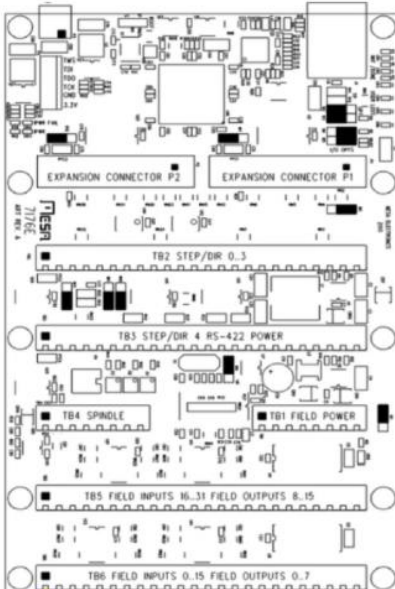
We are going to set up the box to have all the appropriate proximity sensors. There are 8 proximity sensors. All of the sensors will have the same wiring style and the same exact pin soldering position.

Pin 1 – Black

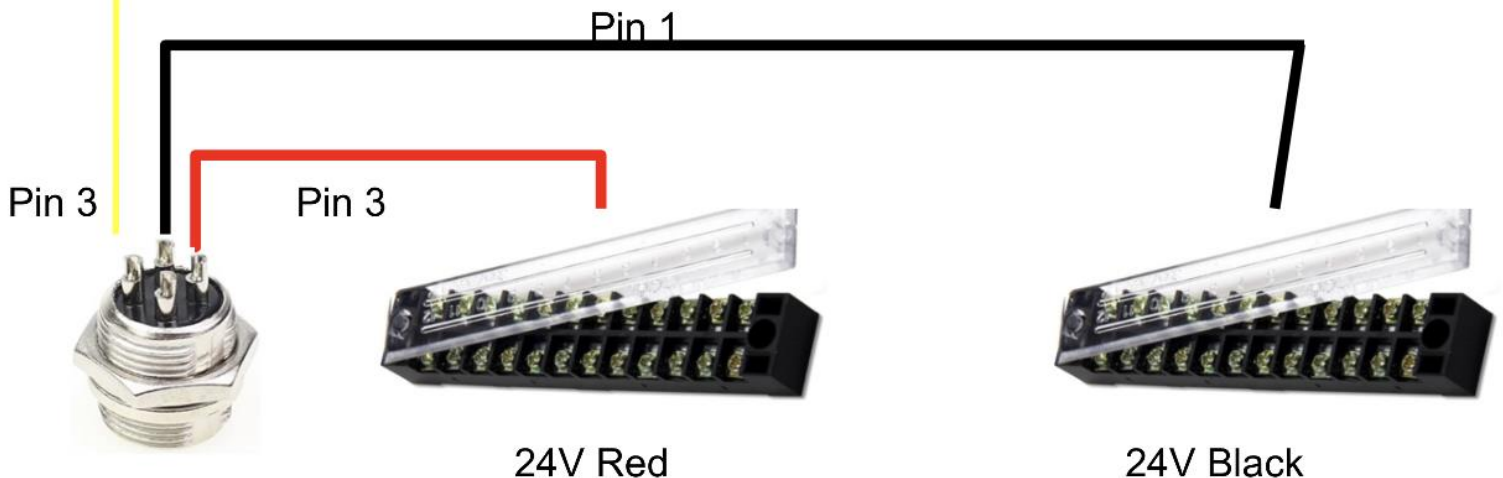
Pin 2 – Red

Pin 3 – Yellow

We were going to be using the terminals already set up with the 24v power supply. Use the following spot on the Mesa board for each different sensor. Therefore there should be only one wire per spot.



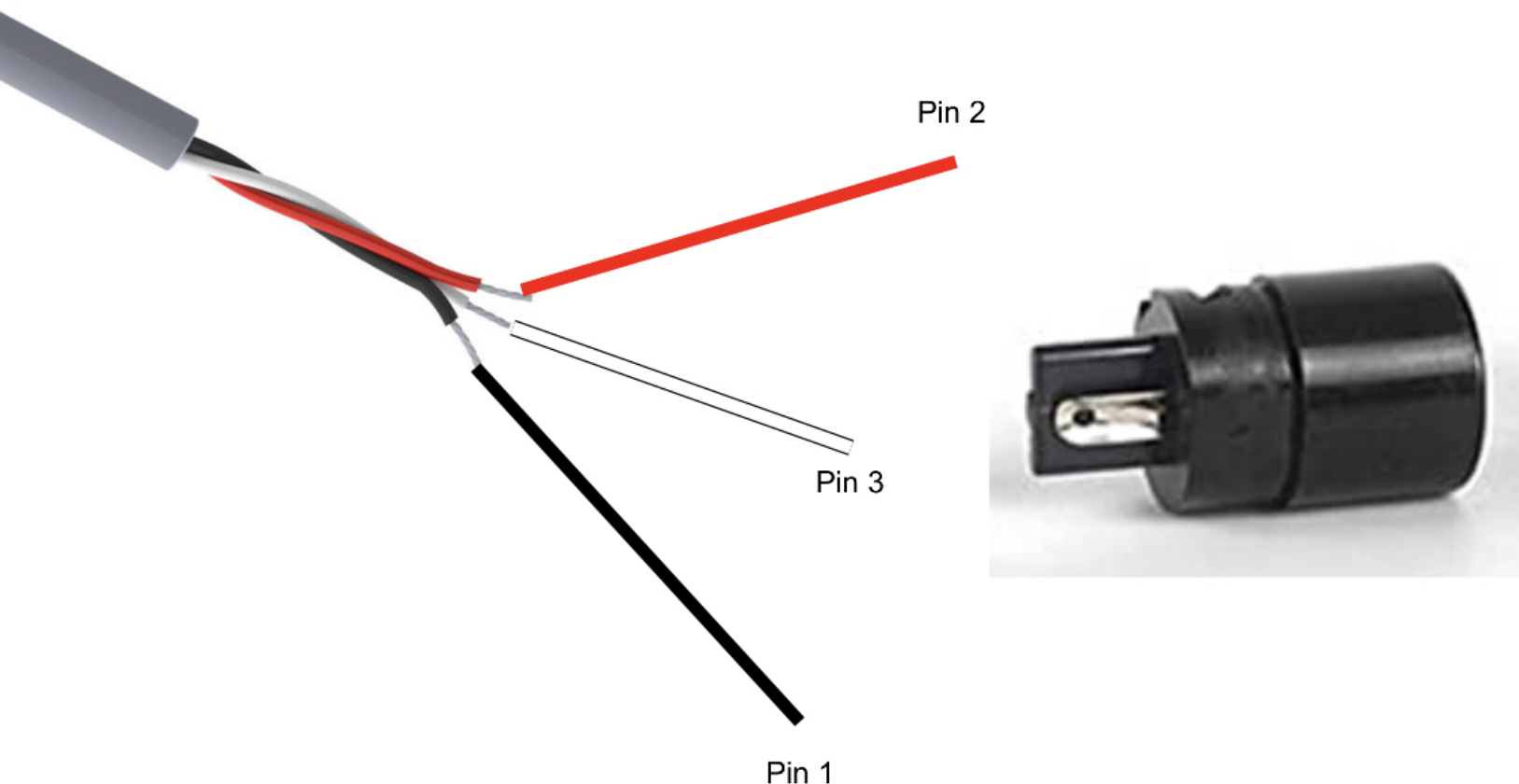
TB6 Field inputs	
0	X Minimum + Home
1	X Maximum
2	Y Minimum + Home
3	Y Maximum
4	Y2 Minimum + Home
5	Y2 Maximum
6	Z Maximum + Home
7	
8	
9	
10	
11	
12	
13	
14	



We are going to continue along the theme of proximity sensors because there are more things to be soldered with them. We have to set up the actual sensors and the wires coming from them so it can be plugged into the box.

The wire already existing on the sensor should be about 6ft with exposed wires on the end. We will not connect them yet because we are not sure how long exactly the wires should be. Though for future reference the wires from the sensors correspond with these colors on going to the box. Black to white, blue to red, brown to black.

We are going to cut an 11 foot section of the 3 core 18Gauge grey wire (not the individual wires) then we are going to solder the other side of the aviation connector. Pin 3 is white, pin 2 is red, pin one is black.

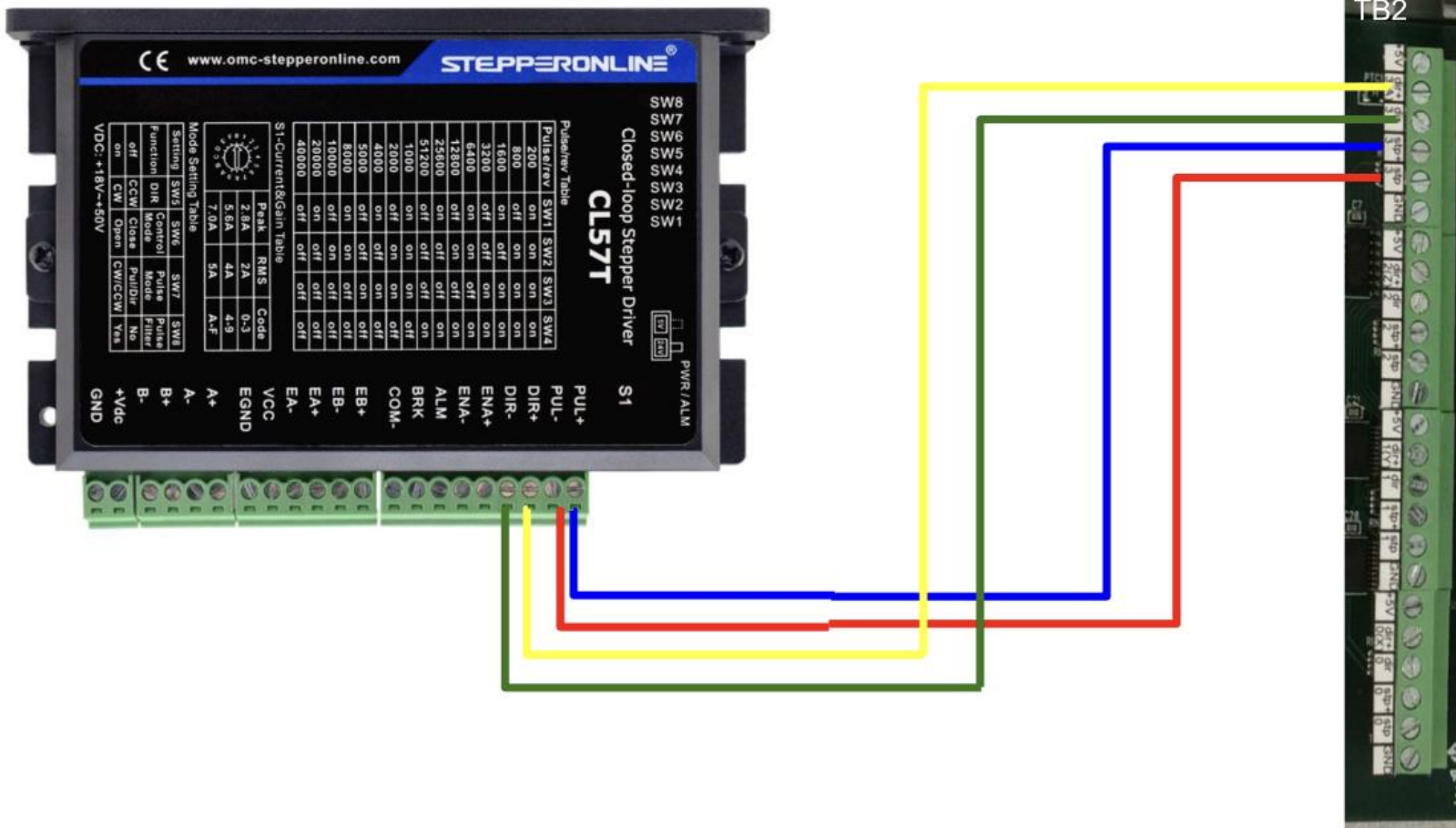


Lastly, once the sensors are in place we can then cut the wire to its proper length and solder the ends together. Make sure heat shrink and wire loom are in place before soldering.

Stepper Motor Drivers

Wiring the stepper motor drivers will be a bit difficult. These will use the aviation connectors that already come with and on the motors cord. We will not re-solder the aviation connectors on the soldered end. We will instead split the cable in the middle if need be and extend the wire there. Though we will be soldering the wires in the box to the other end of the aviation connectors. There are four drivers, one is different. Though it should be wired the same except for the second aviation connector.

First we will wire the driver to the Mesa board.



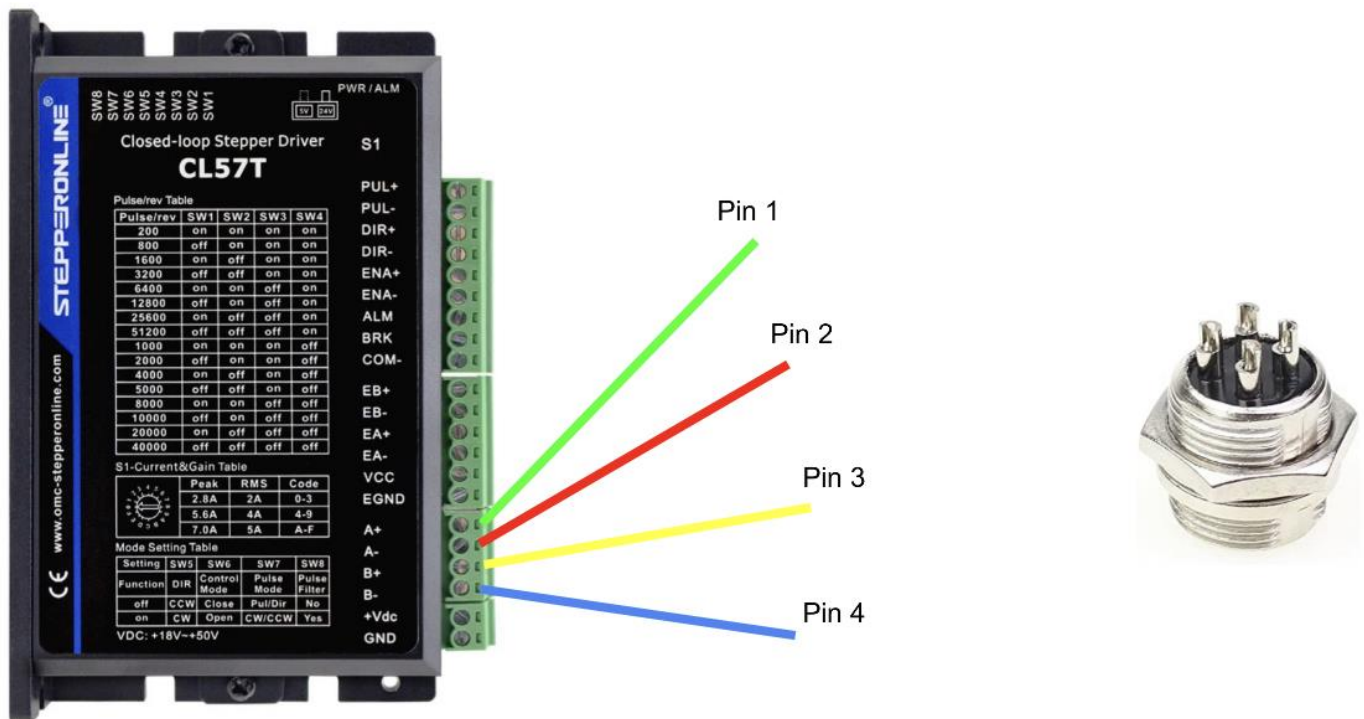
Do this for all of the drivers, though move to the next section on the Mesa for each one. Let me explain. The entire strip you see of connecting areas is for the motors. There are six connection spots for each motor. So wire one this way, then move to the next section of six.



Now we are going to wire the first aviation connector on the motors. This connector is already wired to one end of the motor wire so we will be soldering to the other end. There will be four wires.

Motor	A+	A-	B+	B-
Wire	GRN	RED	YEL	BLU

These correspond to the sections we will be widening them to on the drivers. Green will go to pin 1, red pin 2, yellow pin 3, and blue pin 4



SW8 SW7 SW6 SW5 SW4 SW3 SW2 SW1 PWR / ALM

Closed-loop Stepper Driver S1

CL57T

Pulse/rev Table

Pulse/rev	SW1	SW2	SW3	SW4
200	on	on	on	on
800	off	on	on	on
1600	on	off	on	on
3200	off	off	on	on
6400	on	on	off	on
12800	off	on	off	on
25600	on	off	off	on
51200	off	off	off	on
1000	on	on	on	off
2000	off	on	on	off
4000	on	off	on	off
5000	off	off	on	off
8000	on	on	off	off
10000	off	on	off	off
20000	on	off	off	off
40000	off	off	off	off

S1-Current&Gain Table

Peak	RMS	Code
2.8A	2A	0-3
5.6A	4A	4-9
7.0A	5A	A-F

Mode Setting Table

Setting	SW5	SW6	SW7	SW8
Function	DIR	Control Mode	Pulse Mode	Pulse Filter
off	CCW	Close	Pul/Dir	No
on	CW	Open	CW/CCW	Yes

VDC: +18V~+50V

PUL+
PUL-
DIR+
DIR-
ENA+
ENA-
ALM
BRK
COM-
EB+
EB-
EA+
EA-
VCC
EGND
A+
A-
B+
B-
+Vdc
GND

Now we are going to wire up the encoder side of driver to the motors.

The wires from the motors with the encoder have a connection on them that is not an aviation connector. There are only three of these, the fourth motor does not have an encoder nor does the driver have the encoder section. Therefore just do this step on the three.

Remove the wires from the connector on the motor end. We are going to use the 6 pin connectors for this step. Solder them this way.

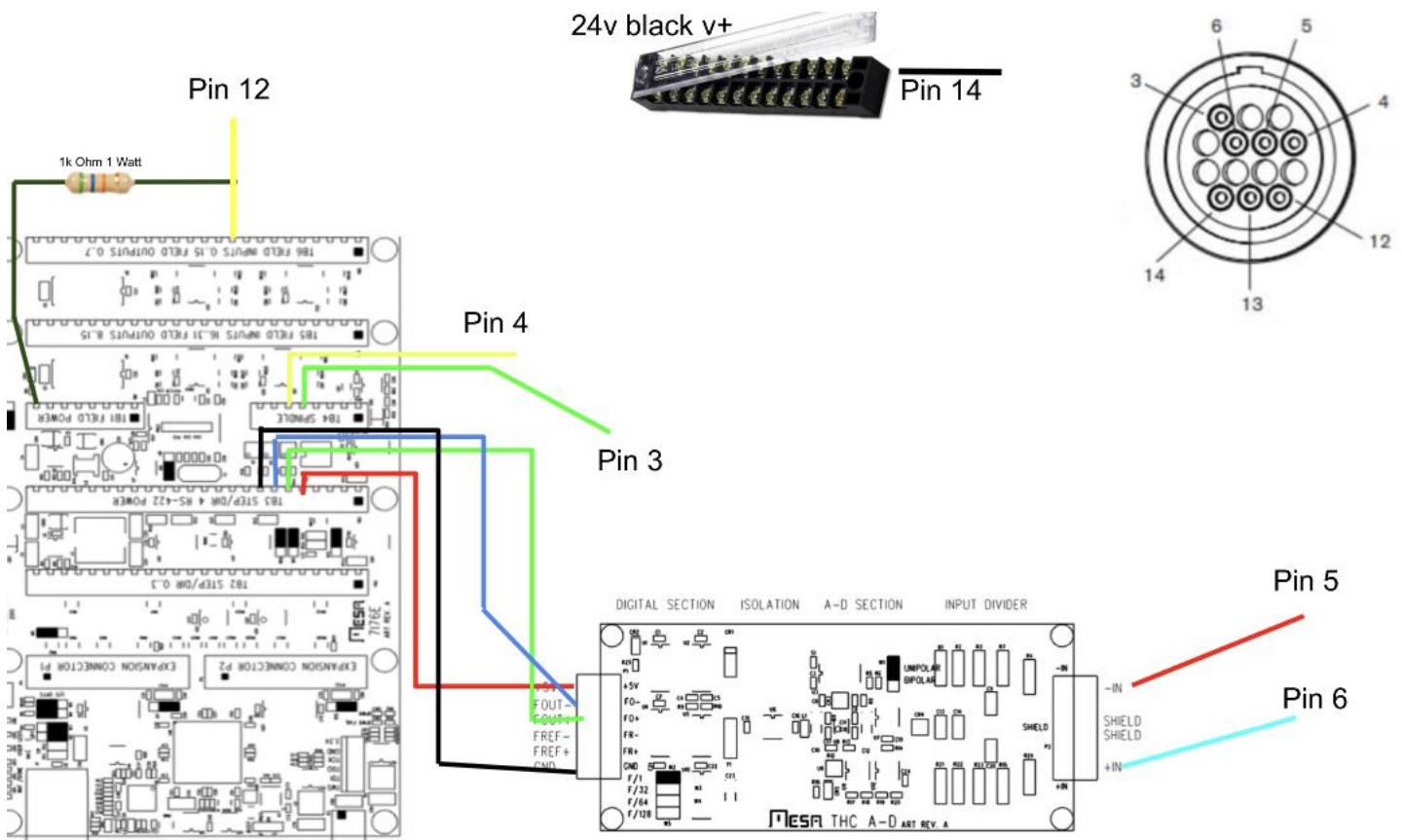


Yellow - Pin 1
Green - Pin 2
Red - Pin 3
Blue - Pin 4
White - Pin 5
Black - Pin 6



THCAD-10

There is one last thing to wire up and then we will be finished. This is the Mesa THCAD-10 board. This is the torch height control. The wiring may be a bit confusing though there's no soldering. Though we will be using the voltage meter to determine what wire goes to what pin. Since there are several wires of the same color. Take the wire that looks like the one picture bellow, cut it so it's only 4 feet long. Then determine the wire you need to wire up by sticking one end of the voltage meter in a pin, and then to each wire. When it reads a number then that's the wire for that pin! Wire things this way.



Before wiring use a cable gland to feed the wire into the box.

WE ARE DONE!

Everything is wired and done now! Go back through these steps with a voltage meter to make sure things are perfect. If they are then great! It's ready to be added to the table!

Use the following pages as reference for wiring correction or assurance and for programming.
