Rat Rig

08. Wiring Guide - Advanced kit - BETA

Written By: Rat Rig

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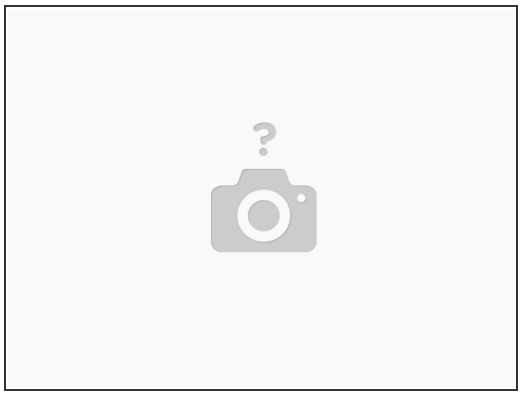
INTRODUCTION

This guide is a beta version, if you have any suggestions please leave them in the comments below.

This guide is meant to assist you during the electronics assembly of the StrongHold PRO advanced kit. Never plug or unplug any components while the CNC machine is powered on, this will lead to damaged components and even safety hazards. Avoid bending the cables into tight corners as you can damage them. If you do not feel confident with a certain step, ask someone experienced to assist you. Any mistakes during this assembly will permanently damage the components. The guide contains a lot of warnings meant to keep you alert and ensure a successful build!

Step 1 — StrongHold PRO Size VS Cable length



Our CNC kits do not come with a pre-designated location for mounting electronic components, affording a greater degree of versatility in customization to accommodate your particular Rig. These kits include both 3-wire and 4-wire cables, which you will need to cut to the appropriate length as the assembly progresses.

Do not pre-cut any cables as the guide will instruct you on when and where to make necessary cuts, preventing any cables from being trimmed too short.

It is advised to practice crimping and soldering before the wiring assembly. Bad crimps or soldering jobs are the most common faults in electronics malfunctions. Never plug or unplug any components while the machine is powered on, this will lead to damaged components and even safety hazards.

Avoid bending the cables into tight corners as you can damage them. If you do not feel confident with a certain step, ask someone experienced to assist you. Any mistakes during this assembly will permanently damage the components. The guide contains a lot of warnings meant to keep you alert and ensure a successful build!

Step 2 — Mains Power

⚠ The mains power of the circuit must be done by a professional. Mains electricity can kill or severely injure people and cause damage to property.

This must be the final stage in any electronic wiring process, as it requires the completion and thorough verification of the entire circuit.

Step 3 — Set up - Power Supplies

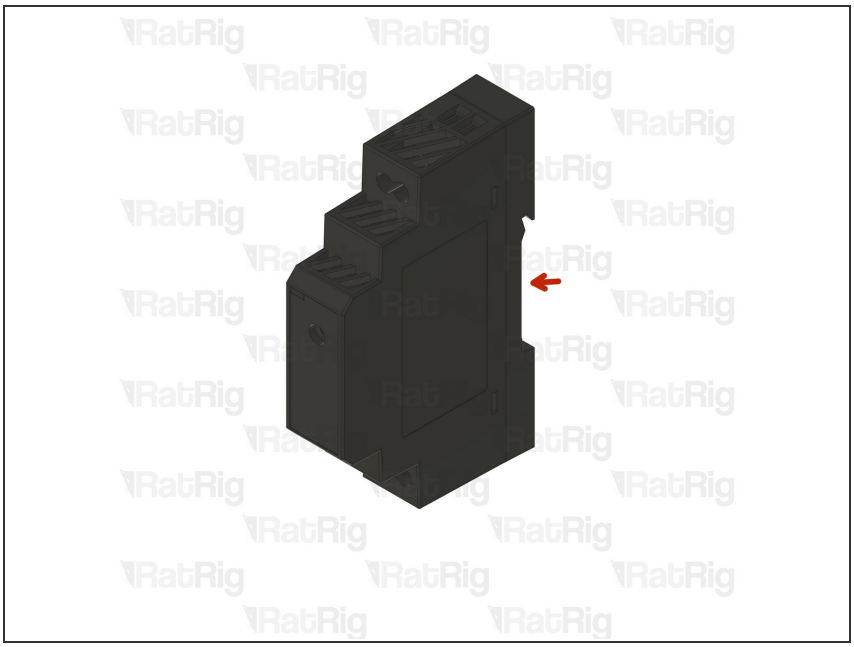
The 48V and 24V power supplies are identical, this step is the same for both.

- On the right side of the power supply there is a switch.
- This switch needs to be set to the mains voltage in your country. Either 115V (most common in the USA / Canada), or 230V.

⚠ Setting this to the incorrect input voltage may destroy the power supply and anything connected to it.

⚠ Keep in mind that milling is a very messy job and debris may fly into the power supply. This could cause it to fail or catch fire! Please be aware!

Step 4 — Set up - 5V power supply

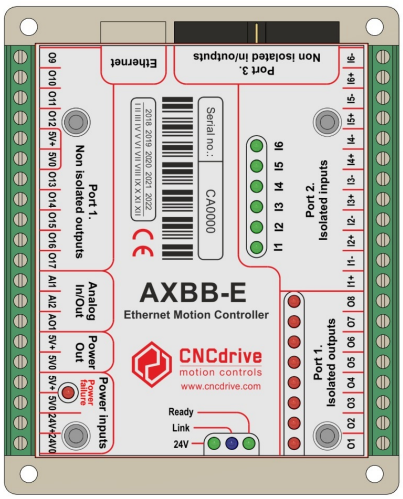


Mount the 5V power supply on the desired location, Rat Rig advises you to install it close to the 48V and 24V power supplies.

- The provided 5V power supply is designed for compatibility with the din rail mounting style, thus potentially necessitating the use of an adapter.

Keep in mind that milling is a very messy job and debris may fly into the power supply. This could cause it to fail or catch fire! Please be aware!

Step 5 — Set up - AXBB-E CNC controller



Install the AXBB-E in your preferred location, ensuring that all cables can comfortably reach their destinations without being subjected to undue stretching.

⚠ Throughout the remainder of the guide, please give careful consideration to the provided images, as they indicate the specific side of the AXBB where the connections should be installed.

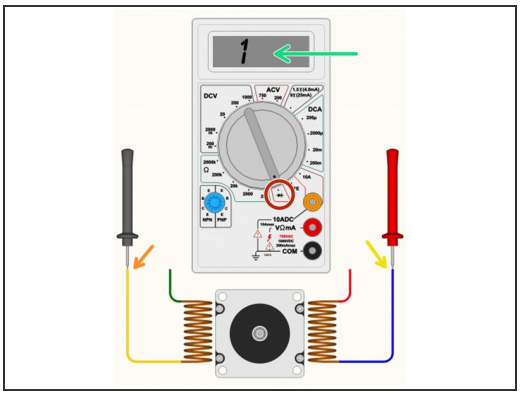
⚠ Keep in mind that milling is a very messy job and debris may fly into the AXBB. This could cause it to fail or catch fire! Please be aware!

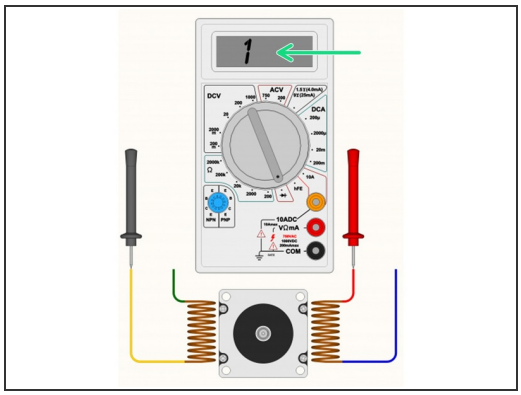
Step 6 — Mount the VFD

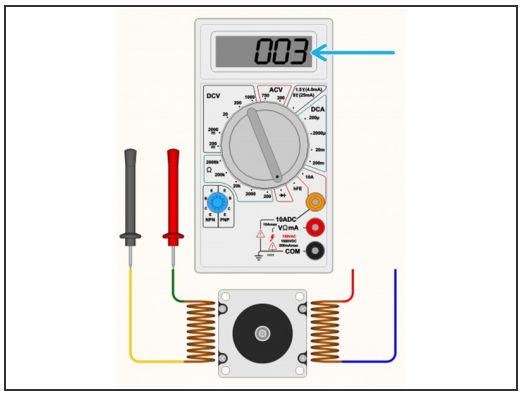
Install the VFD in your preferred location, ensuring that all cables can comfortably reach their destinations without being subjected to undue stretching.

⚠ Keep in mind that milling is a very messy job and debris may fly into the VFD. This could cause it to fail or catch fire! Please be aware!

Step 7 — Identifying stepper motor coil wires (with a multimeter)





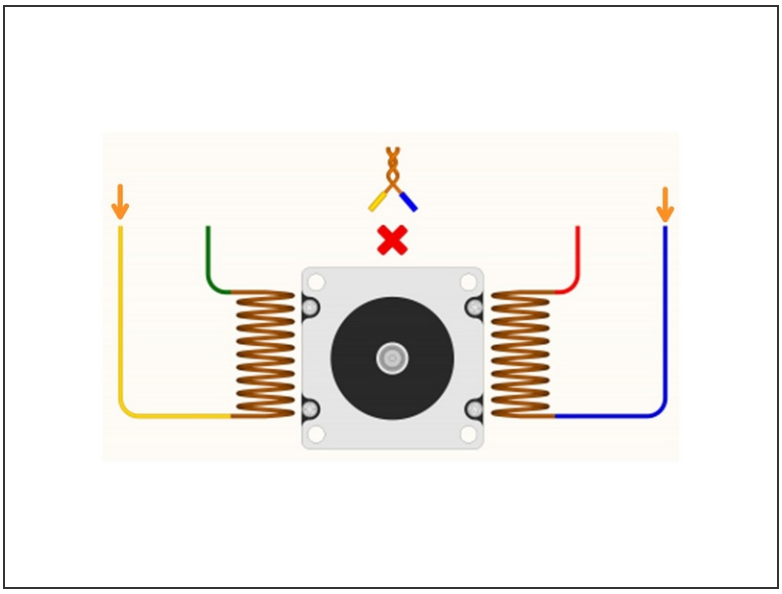


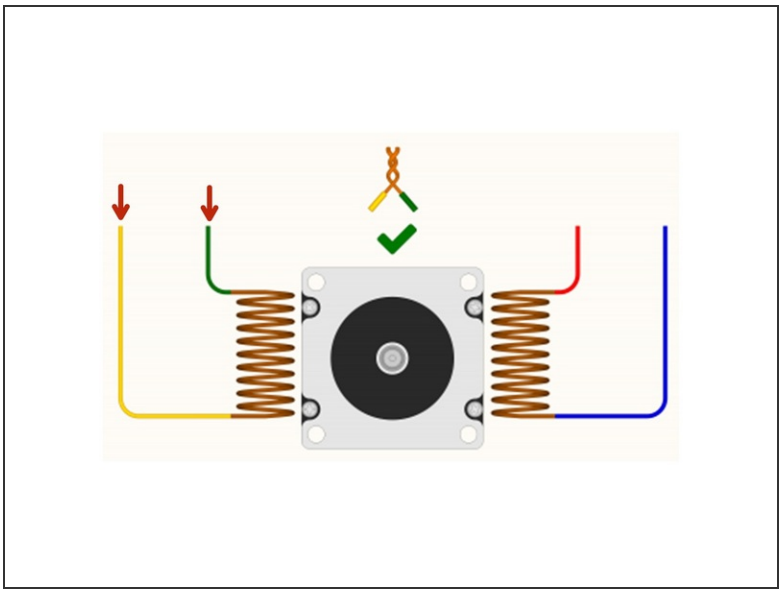
This procedure can be found on the OpenBuilds Documentation, for further information click here.

Follow this step if you have access to a multimeter, otherwise skip to Step 8.

- Set your multimeter to Continuity / Diode Test mode.
- Start with any random wire, and touch that to the Black/Negative probe on your multimeter.
- Select any remaining wire and touch it with the Red/Positive probe of your multimeter:
- If the multimeter shows [1 or 0L] it means “no connection” - indicating we did not find a coil between these two wires. Some multimeters also “beep” when it does find a connection, so if there is no beep noise, it also could indicate the coil is not between these two wires.
- If you see a reading on the multimeter. The actual number does not matter too much, it's more important that it has some low value reading, and that the multimeter no longer displays [1] on the display. Some multimeters may “beep” when you have continuity between the wires (circuit completed by the coil in between).
- Segment off these two wires and label them as belonging to a coil. It's important to not lose track of the coil pairs.

Step 8 — Identifying stepper motor coil wires (without a multimeter)



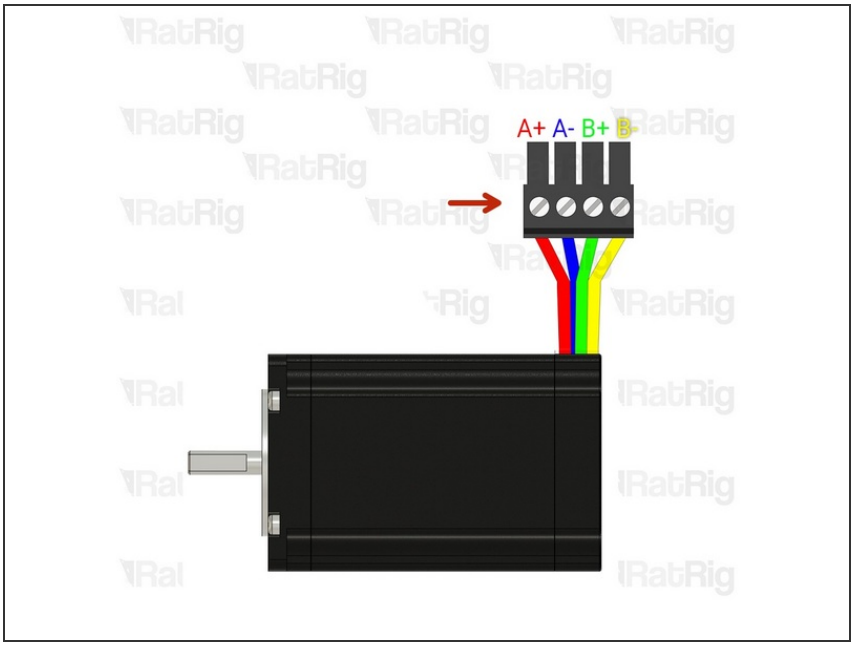


This procedure can be found on the OpenBuilds Documentation, for further information click here.

- Follow this step if you don't have access to a multimeter. If you already identified all coil pairs in the previous step, please proceed to step 9.
- If the two wires you joined together belong to the same coil, the shaft will become significantly harder to turn by hand.
- If that shaft still spins easily, you have not identified a coil yet, and you must try a different combination of wires.

If you join together two wires that do result in the motor presenting resistance against turning, you can label these two wires as belonging to the same coil.

Step 9 — Identifying stepper motor coil wires - Insert the Xtension connector



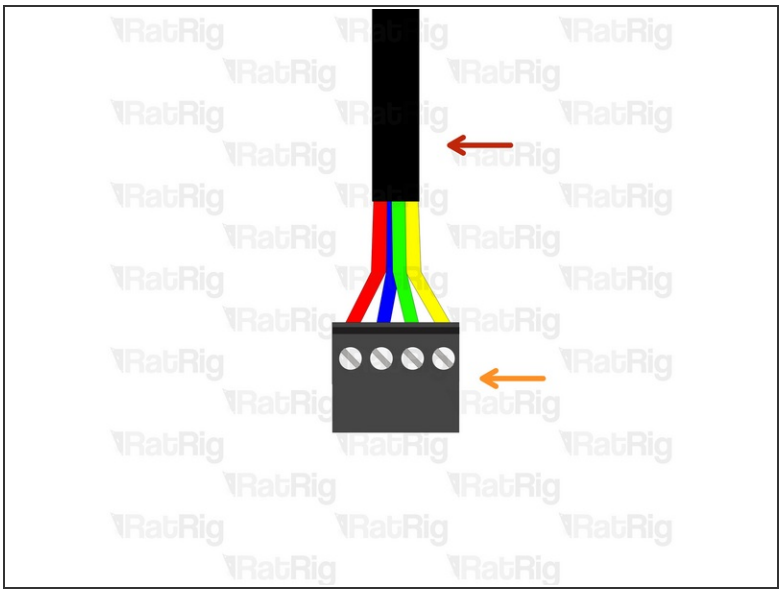
- Xtension Connector - 4 Pin

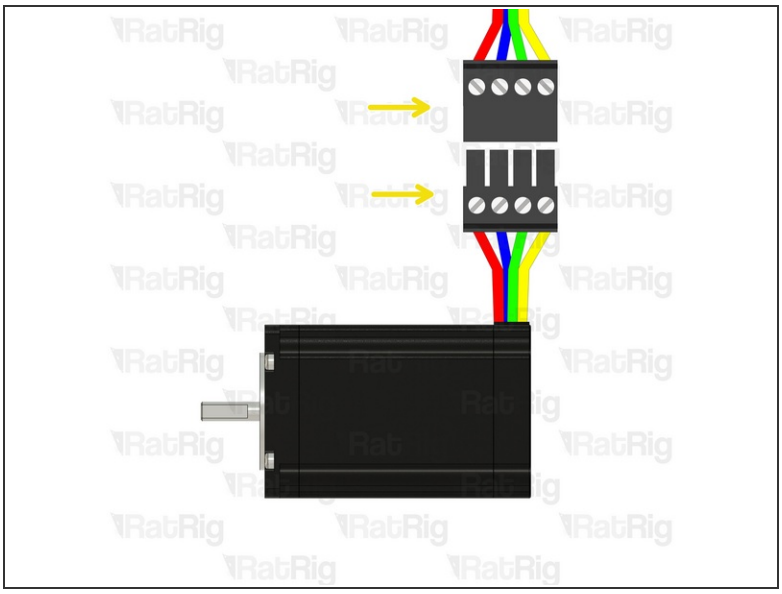
Insert an Xtension connector (male) onto the stepper wires. The previously identified coil pairs must be next to each other. They are now designated as A pair and B pair. The + and - don't really matter at this point as long as the coil ends are toghether.

Your stepper wire colours might be different, please proceed with the correct coil pairs for your set-up.

Repeat the coil identification step and this step for the remaining stepper motors.

Step 10 — Prepare the Z stepper motor cable



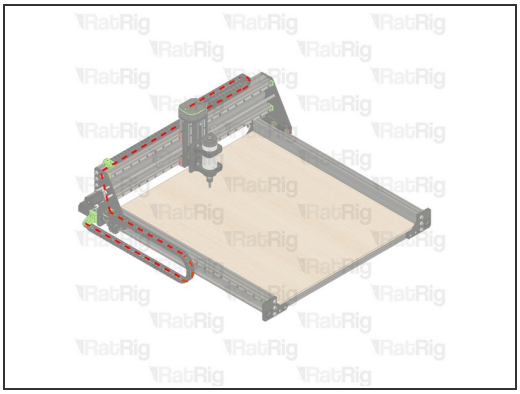


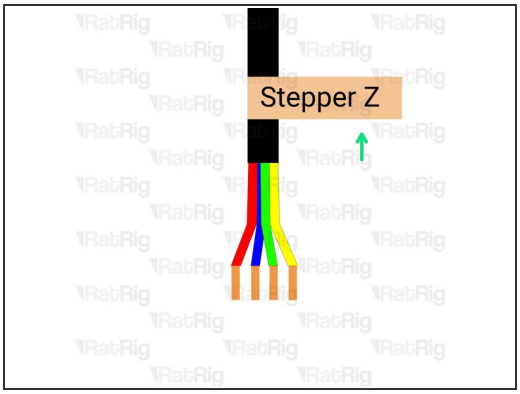
Prepare the 4 wire cable for the Z stepper motor.

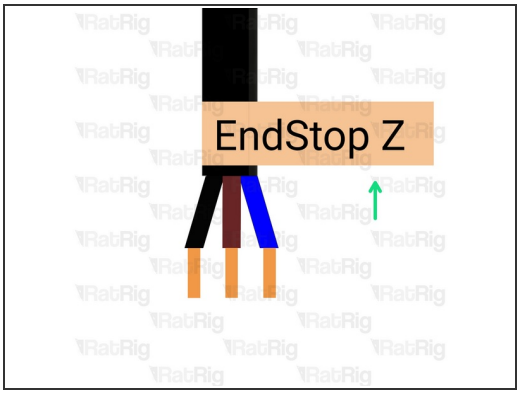
- 4 Wire cable
- Insert an Xtension (female) connector on to the cable end.
- Connect the extension to the stepper motor.
- Make sure to follow the wire colour scheme to preserve the motor coil pairs.

Should the integrity of the motor coil pairs not be maintained, the motor will experience impaired operational functionality.

Step 11 — Route the Z axis cables







- Route the endstop, Z-stepper and spindle cables as shown in the picture.

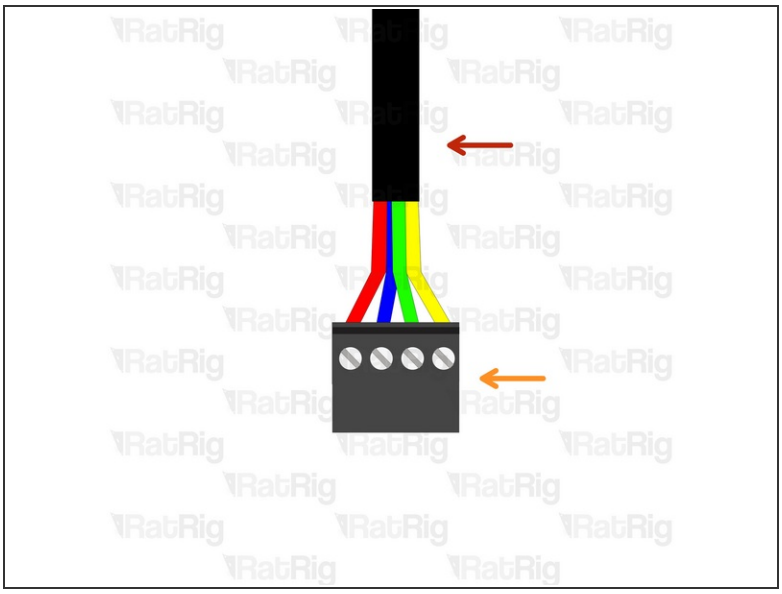
The Z endstop wire passes thouth a dedicated hole on the aluminium plate, be aware of the Z movement while wiring it. Make sure the cable doesn't get damaged or streched.

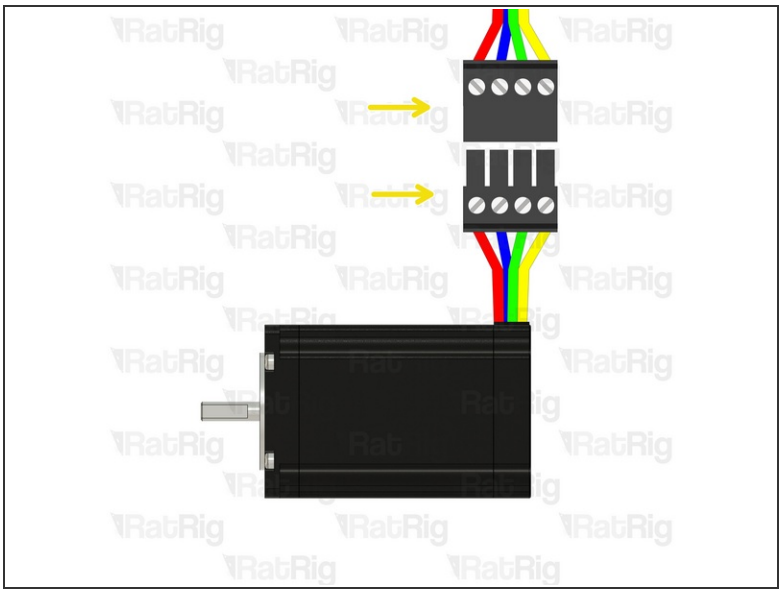
Carefully insert them inside the drag chain and make sure the cables don't get pinched or twisted.

- Route the cables to the location where you desire to have the electronics components.
- Cut the cables to the final length, double check if the cable has the appropriate length before cutting.
- Label the cable at the end, with a piece of duct tape for example.

If the endstop cable is too short, use the provided 3-wire cable and extend it following the same procedure as for the stepper motor in Step 10. Make sure to respect the colour order.

Step 12 — Prepare the X stepper motor cable



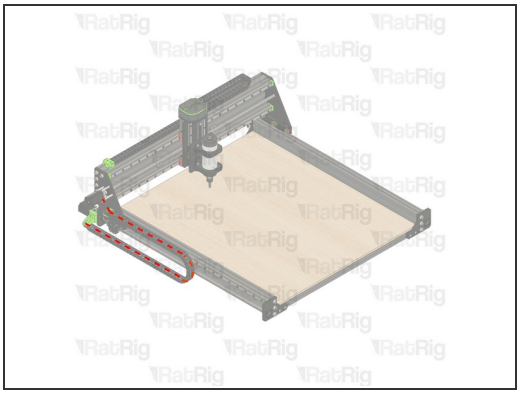


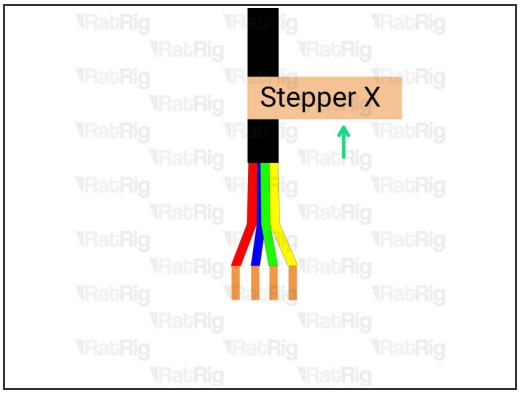
Prepare the 4 wire cable for the X stepper motor.

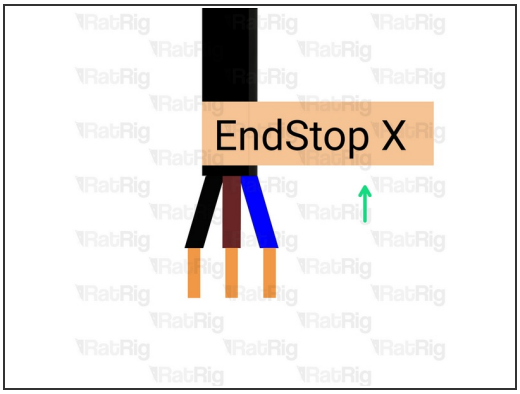
- 4 Wire cable
- Insert an Xtension (female) connector on the cable end.
- Connect the extension to the stepper motor.
- Make sure to follow the wire colour scheme to preserve the motor coil pairs.

Should the integrity of the motor coil pairs not be maintained, the motor will experience impaired operational functionality.

Step 13 — Route the X axis cables







- Route the endstop, and X-stepper cables as shown in the picture.

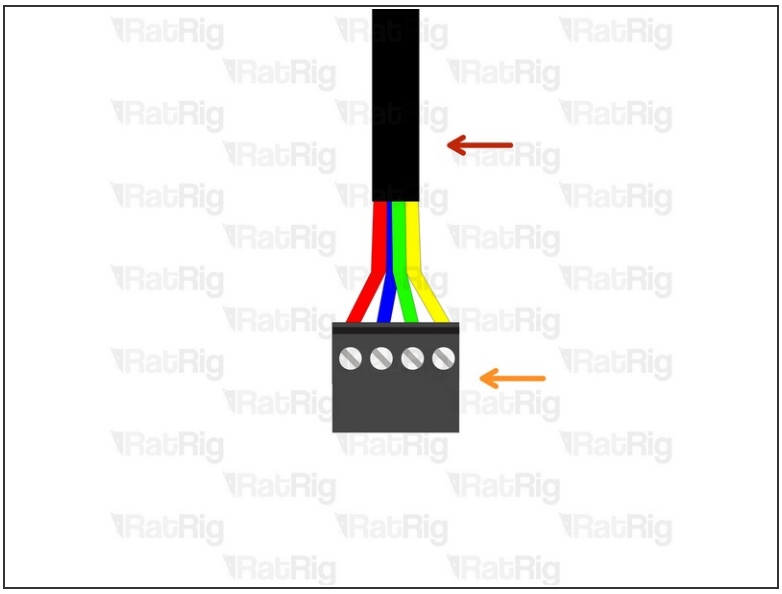
The X endstop cable must be inserted thourgh the dedicated hole on the alumminium plate.

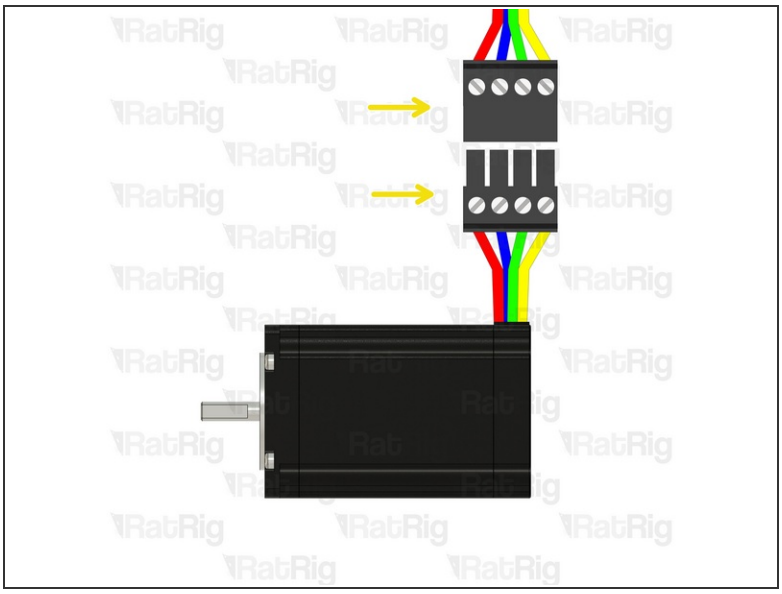
Carefully insert them inside the drag chain and make sure the cables don't get pinched or twisted.

- Route the cables to the location where you desire to have the electronics components.
- Cut the cables to the final length, double check if the cable has the appropriate length before cutting.
- Label the cable at the end, with a piece of duct tape for example.

If the endstop cable is too short, use the provided 3-wire cable and extend it following the same procedure as for the stepper motor in Step 12. Make sure to respect the colour order.

Step 14 — Prepare the Y stepper motor cable



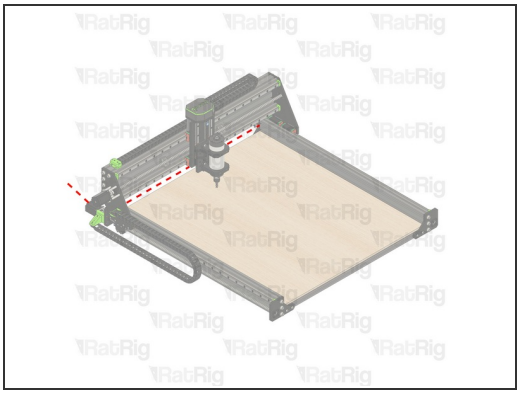


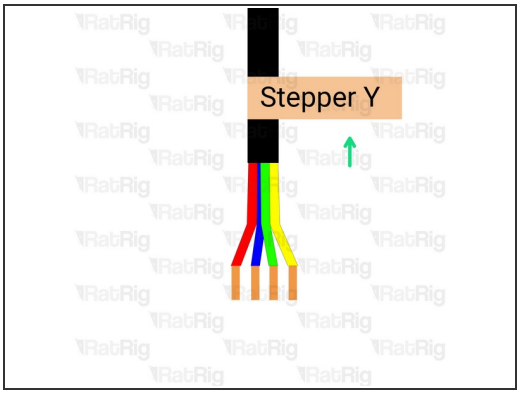
Prepare the 4 wire cable for the Y stepper motor.

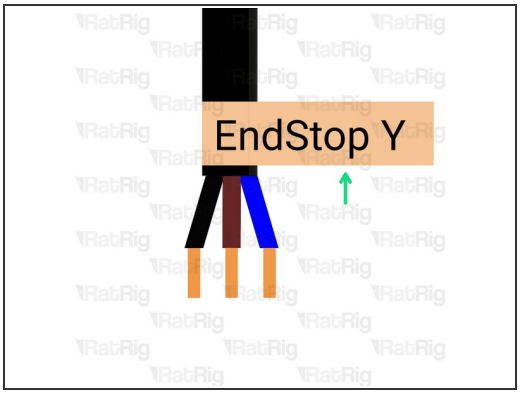
- 4 Wire cable
- Insert an Xtension (female) connector on the cable end.
- Connect the extension to the stepper motor.
- Make sure to follow the wire colour scheme to preserve the motor coil pairs.

Should the integrity of the motor coil pairs not be maintained, the motor will experience impaired operational functionality.

Step 15 — Route the Y axis cables







- Route the endstop, Y-steppers cables as shown in the picture.

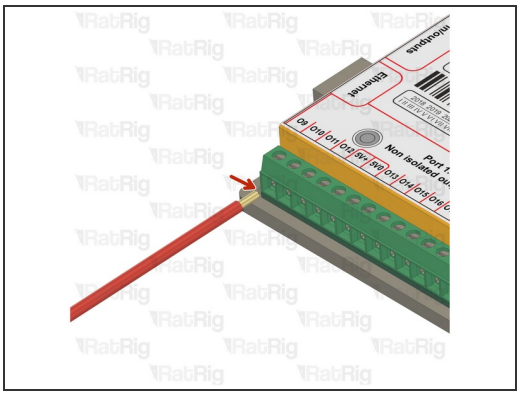
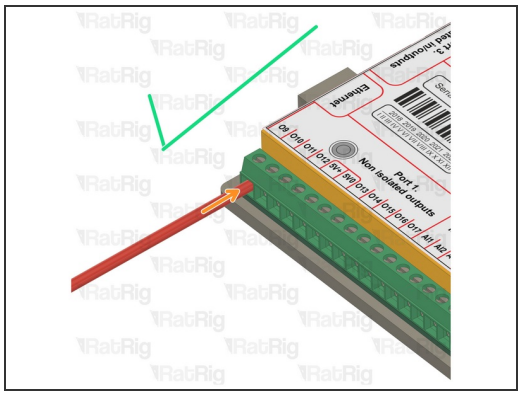
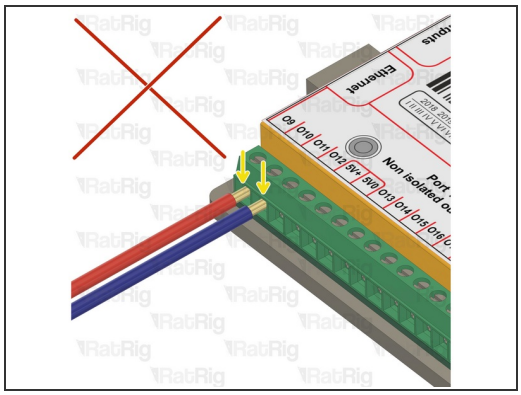
⚠ Carefully insert them inside the drag chain and make sure the cables don't get pinched or twisted.

- Route the cables to the location where you desire to have the electronics components.
- Cut the cables to the final length, double check if the cable has the appropriate length before cutting.
- Label the cable at the end, with a piece of duct tape for example.

If the endstop cable is too short, use the provided 3-wire cable and extend it following the same procedure as for the stepper motor in Step 14. Make sure to respect the colour order.

Repeat Step 14 and Step 15 for the second Y axis stepper motor.

Step 16 — Ensure a proper connection to the controller.

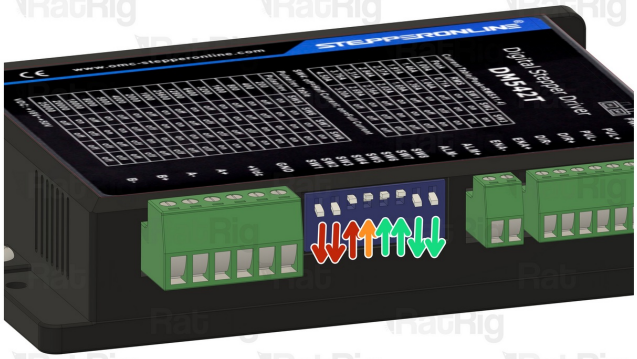




- When inserting a copper wire, ensure it is inserted completely to the point where no copper is visible.
- Only the insulation should be on the exterior of the controller board.
- Exposed copper can lead to damaged components, component failures, and fire hazards, as it may result in a short circuit.

Always push the cable in as far as possible, and tighten the set screw while ensuring the cable is firmly in place.

Always ensure proper connection when connecting wires, even on the power supplies, drivers and VFD.

Step 17 — Prepare the stepper motor drivers - Part 1



The DM542T stepper drivers allow current and micro-stepping control, resulting in a vast range of configurations.

Adjust the switches on the drivers for each stepper motor

- Depressing switches 1 and 2 while simultaneously elevating switch 3 establishes a current of 2.69 amperes, marginally below the rated current for the stepper motors. This configuration is designed to enhance performance and extend the operational lifespan of the components.
- The upwards positioning of switch 4 ensures that only half of the designated current is provided to the stepper motors when they are at a standstill, thus preventing the potential for overheating in both the stepper motors and the associated drivers.

- Elevating Switches 5 and 6 simultaneously with the downward orientation of Switches 7 and 8 configures the pulse/revolution rate to 1600, in conjunction with the ball screws, this specific arrangement ensures that the axis traverses a distance of 1mm for each full revolution accomplished by the stepper motor, with the exception of the Z axis.

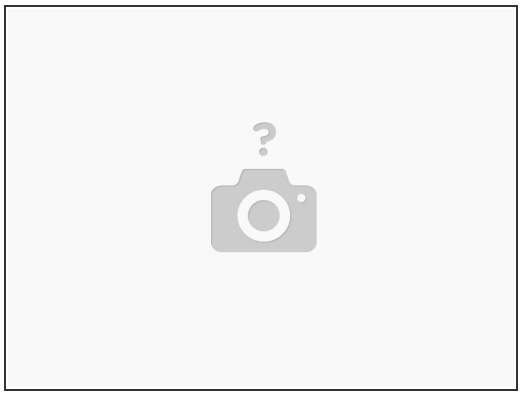
ⓘ Repeat for the other DM542T stepper drivers

Step 18 — Prepare all the stepper motor drivers - Part 2

- There is a small switch on top of the DM542T stepper driver, ensure it is set to 5V as the AXBB signal is 5V.

ⓘ Repeat for the other DM542T stepper drivers

Step 19 — Stepper driver power

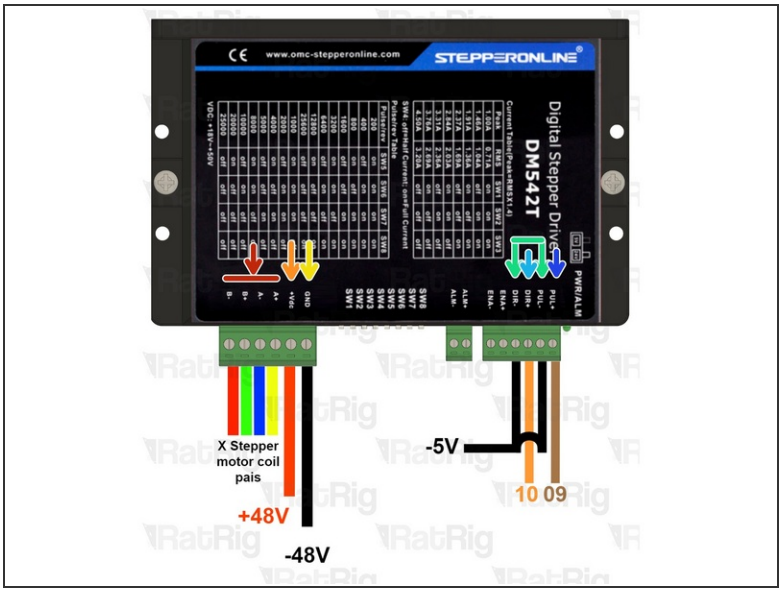


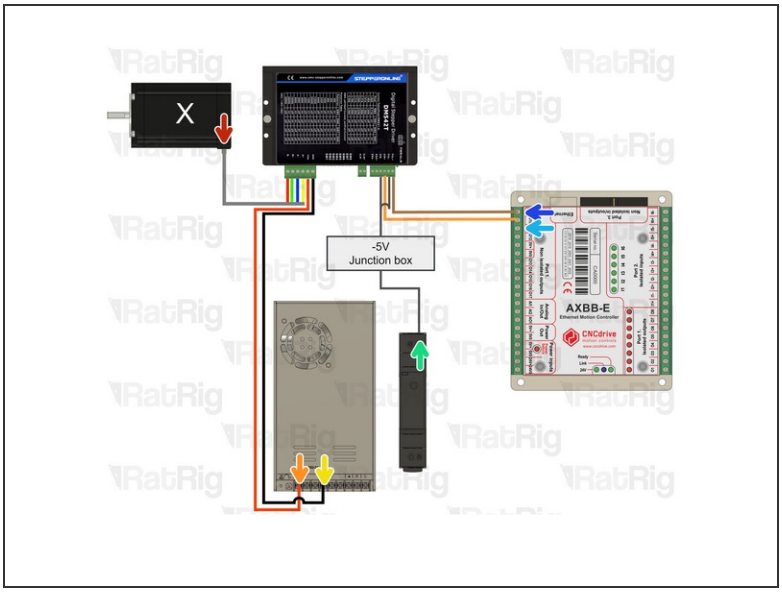
The StrongHold PRO advanced kit has two 48V Power supplies, which need to be divided between the stepper drivers.

As each power supply is rated for 350W, Rat Rig recommends 2 stepper drivers per power supply.

- The X and Z stepper drivers will be connected to one power supply.
- The Y and Y2 stepper drivers will be connected to the other power supply.

Step 20 — Connect the X Stepper driver

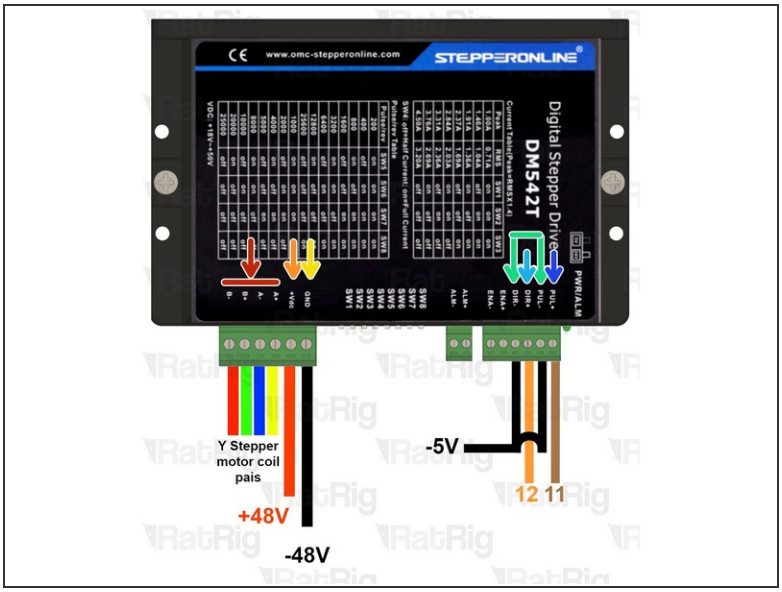


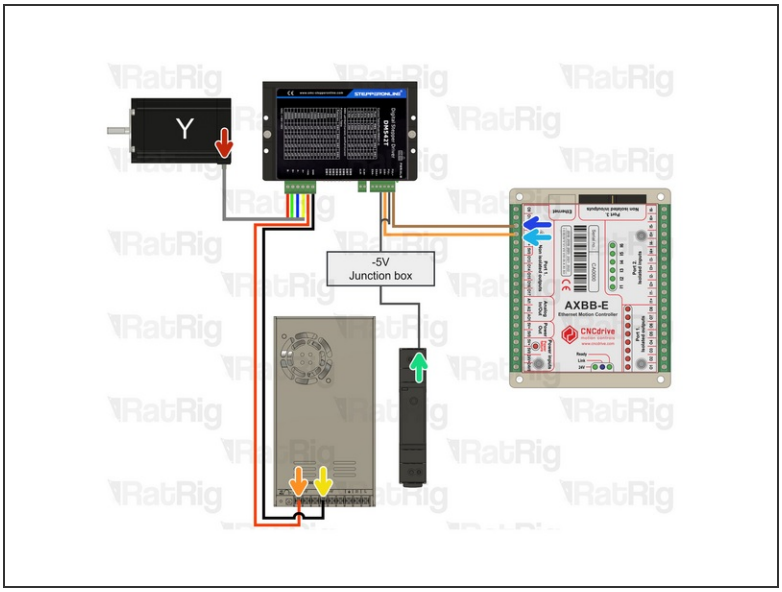


The drivers have labels on each port, please follow carefully:

- Connect the stepper motor wires to the designated terminals A+, A-, B+, and B-, while ensuring the correct pairing of coil pairs A and B.
- Connect the VCC terminal to the positive terminal on the 48V power supply
- Connect the GND terminal to the negative terminal on the 48V power supply
- Connect the PUL- and DIR- terminals to the negative terminal on the -5V power supply
- Connect the DIR+ terminal to the number 10 terminal on the AXBB-E controller.
- Connect the PUL+ terminal to the number 09 terminal on the AXBB-E controller.

Step 21 — Connect the Y Stepper driver





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- Connect the stepper motor wires to the designated terminals A+, A-, B+, and B-, while ensuring the correct pairing of coil pairs A and B.
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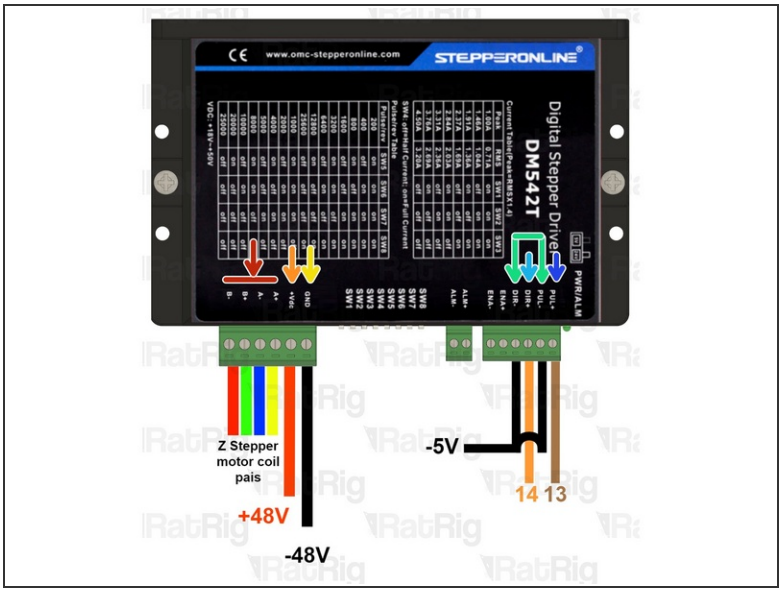
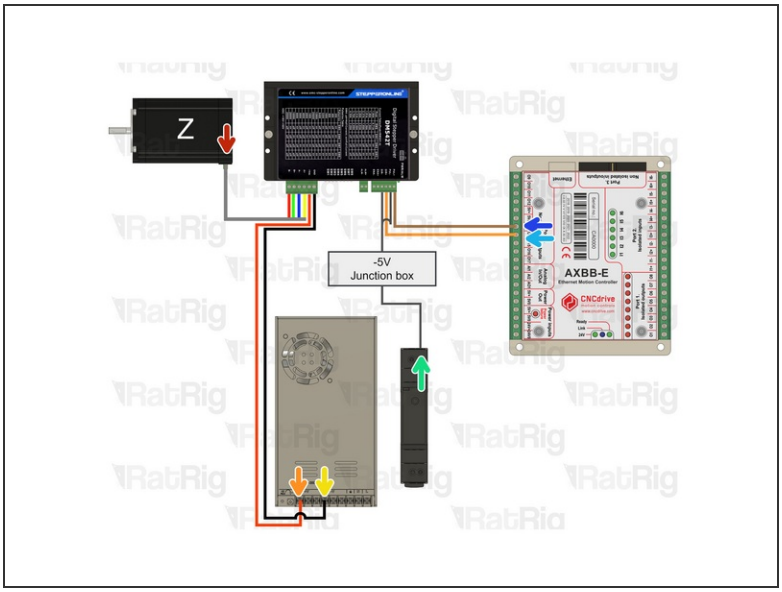
- Connect the GND terminal to the negative terminal on the 48V power supply
- Connect the PUL- and DIR- terminals to the negative terminal on the -5V power supply
- Connect the DIR+ terminal to the number 12 terminal on the AXBB-E controller.
- Connect the PUL+ terminal to the number 11 terminal on the AXBB-E controller.

Step 22 — Connect the Z Stepper driver

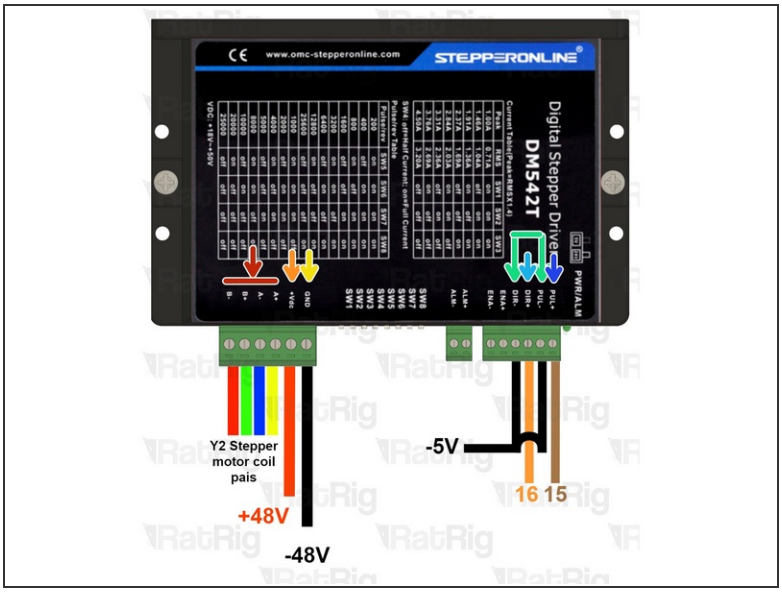


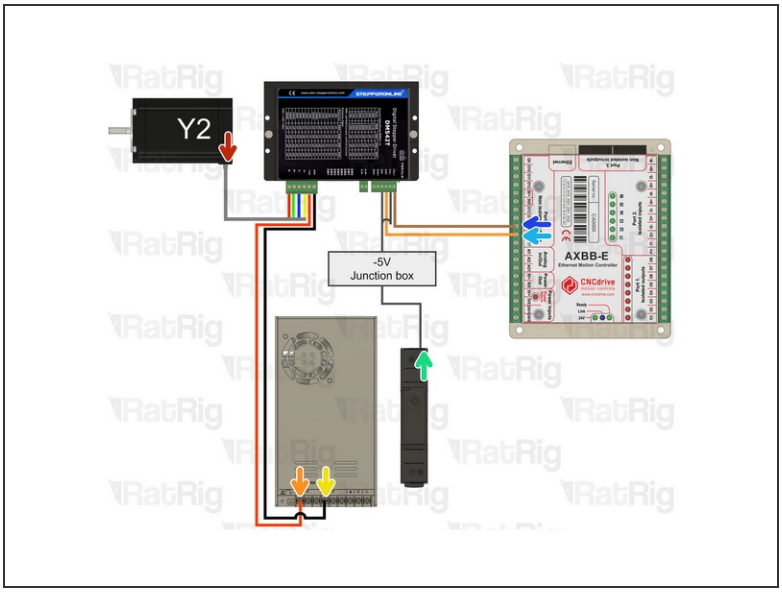


The drivers have labels on each port, please follow carefully:

- Connect the stepper motor wires to the designated terminals A+, A-, B+, and B-, while ensuring the correct pairing of coil pairs A and B.
- Connect the VCC terminal to the positive terminal on the 48V power supply
- Connect the GND terminal to the negative terminal on the 48V power supply
- Connect the PUL- and DIR- terminals to the negative terminal on the -5V power supply
- Connect the DIR+ terminal to the number 14 terminal on the AXBB-E controller.
- Connect the PUL+ terminal to the 13 number terminal on the AXBB-E controller.

Step 23 — Connect the Y2 Stepper driver

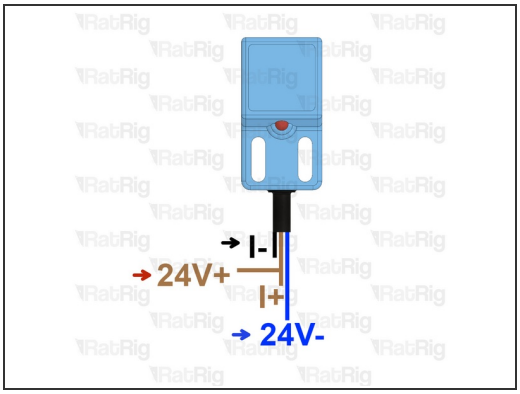


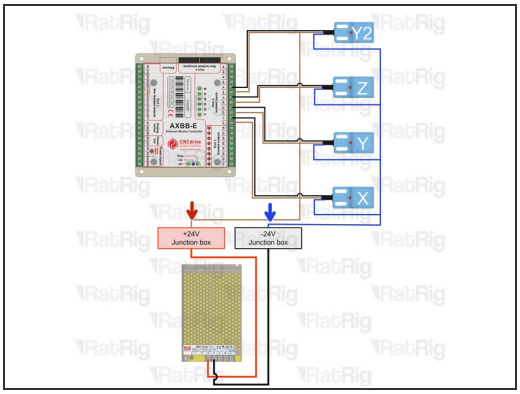


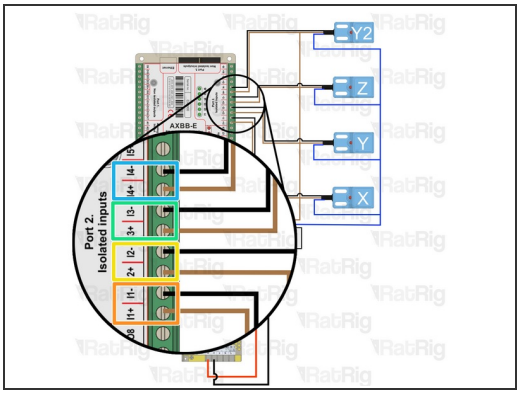
The drivers have labels on each port, please follow carefully:

- Connect the stepper motor wires to the designated terminals A+, A-, B+, and B-, while ensuring the correct pairing of coil pairs A and B.
- Connect the VCC terminal to the positive terminal on the 48V power supply
- Connect the GND terminal to the negative terminal on the 48V power supply
- Connect the PUL- and DIR- terminals to the negative terminal on the -5V power supply
- Connect the DIR+ terminal to the number 16 terminal on the AXBB-E controller.
- Connect the PUL+ terminal to the number 15 terminal on the AXBB-E controller.

Step 24 — Connect the Endstops





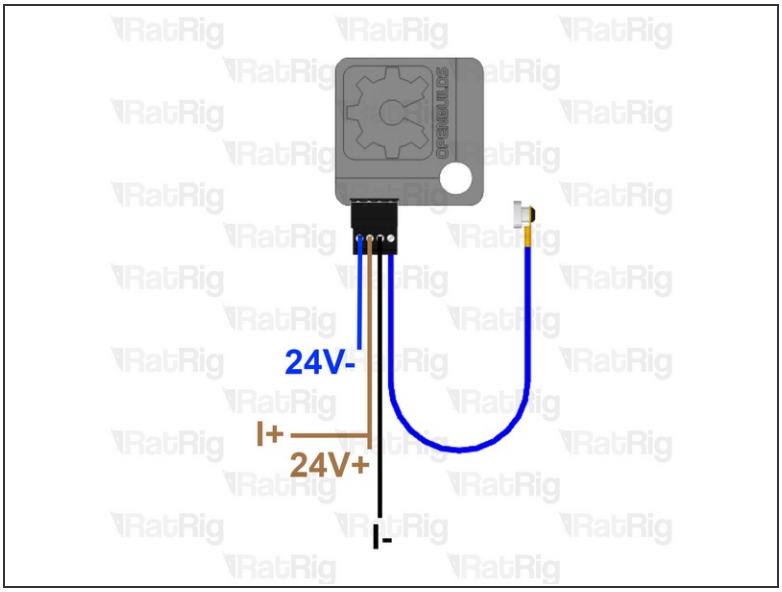


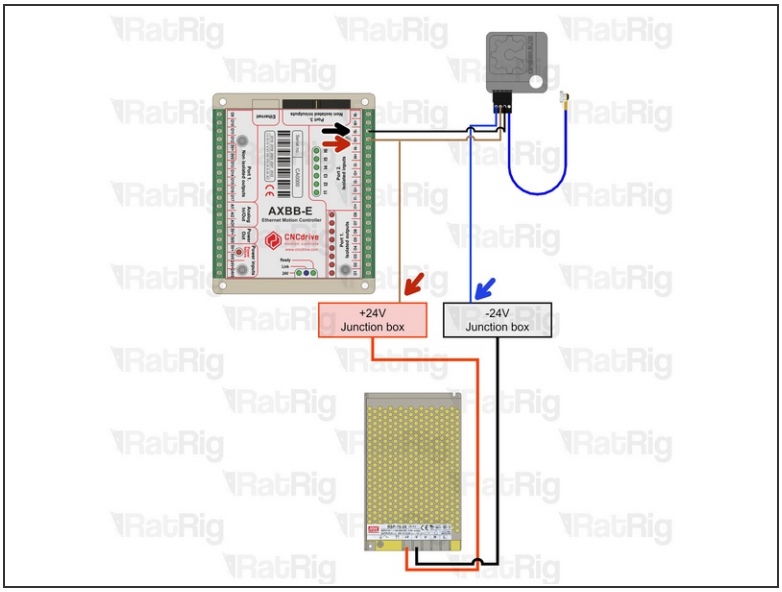
The endstops have three wires, if your colours are different, please check the supplier datasheet.

- Black - signal I-
- Brown - 24 V+ and I+ terminals
- Blue - 24V-

- Connect the X endstop to the I1+ and I1- terminals.
- Connect the Y endstop to the I2+ and I2- terminals.
- Connect the Z endstop to the I3+ and I3- terminals.
- Connect the Y2 endstop to the I4+ and I4- terminals.

Step 25 — Connect the probe



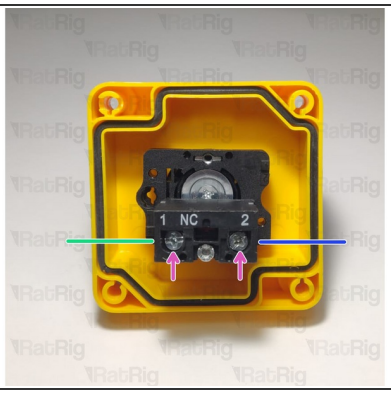


The probe has three wires, if your colours are different, please check the supplier datasheet.

If you are using a XYZ probe from OpenBuilds, the connector on the probe has

- Blue - 24V- (GND)
- Brown - 24V+ and I+ terminals.
- Black (signal wire)- I- terminal

Step 26 — Prepare the Emergency button



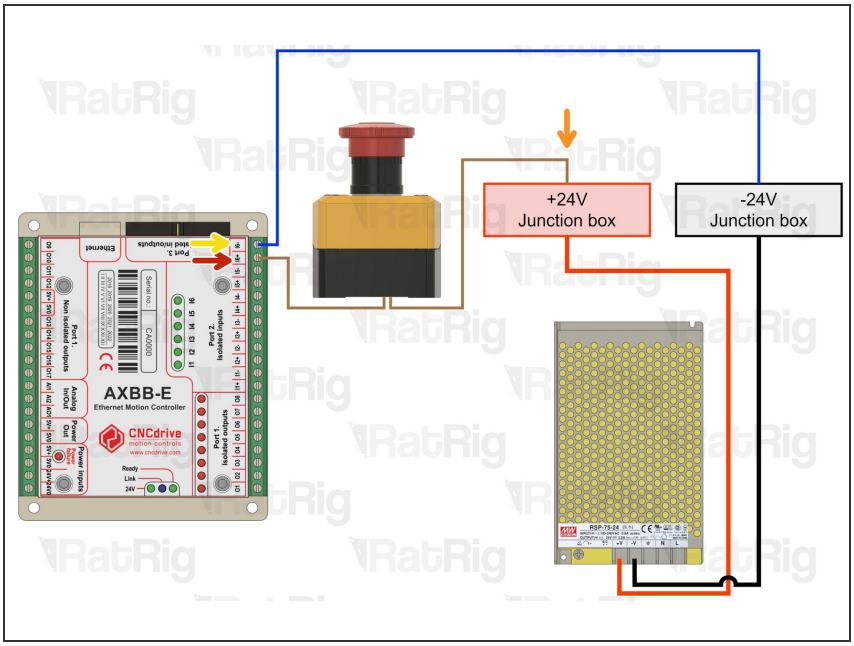
- Open the emergency button by removing the four screws
- Open a hole on the emergency button body, either by snapping a removable disk or drilling a hole

Prepare two wires. These must be long enough to connect the button to the AXBB and place the emergency button on your desired location.

- Insert one wire on one side
  - Tighten the screw to hold it in place
- Insert another wire to the other side
  - Tighten the screw to hold it in place

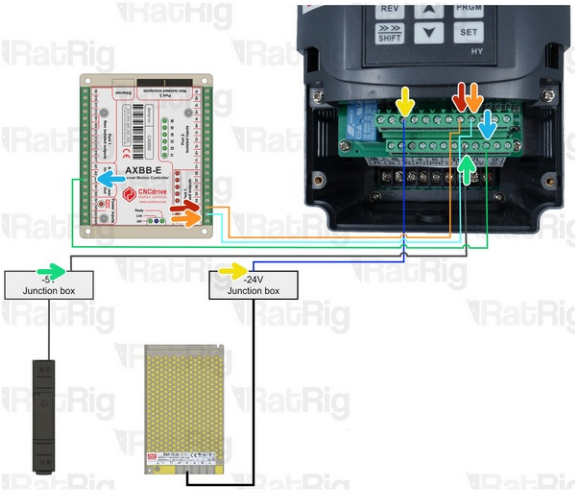
Make sure to feed the wires through the hole made previously and close the emergency button with the four screws.

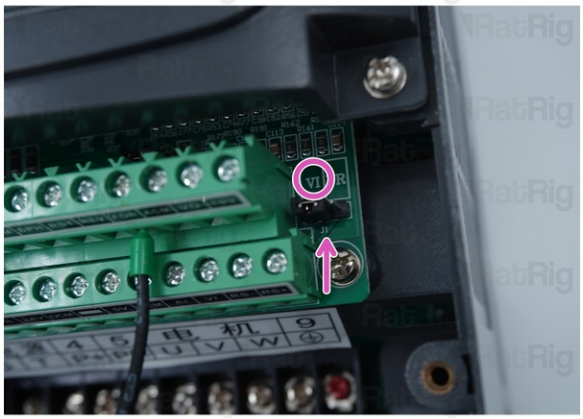
Step 27 — Connnect the Emergency button



- Connect one wire from the emergency button to the I6+ terminal on the AXBB-E
- Connect the other wire from the emergency button to the +24V junction box
- Connect a wire from the I6- terminal on the AXBB-E, to the -24V junction box

Step 28 — Connect the VFD





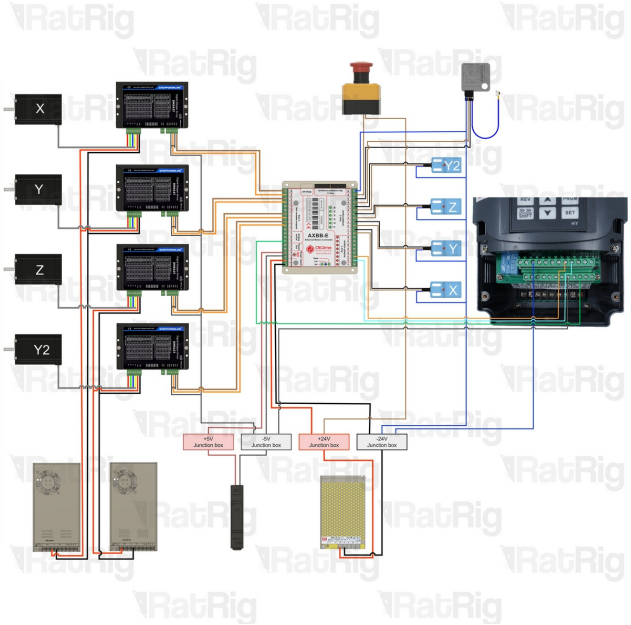
Open the VFD front cover by removing the two screws on the front

Establish the following connections:

- Connect AXBB-E Port 1, Pin 3, to the terminal marked REV on the VFD
- Connect AXBB-E Port 1, Pin 2, to the terminal marked FOR on the VFD
- Connect a wire from the -24V junction box, to the terminal marked DCM on the VFD
- Connect a wire from the -5V junction box, to the terminal marked ACM on the VFD
- Connect AXBB-E Port A01 to the terminal marked Vi on the VFD

- Check that the marked jumper is set to VI on the VFD. Change its position if it is not set correctly.

Step 29 — Check all connections



Check all the cables. The connections must look like the picture. Take your time to ensure all steps are correct before powering the machine on, any mistakes may cause component malfunction or failure.