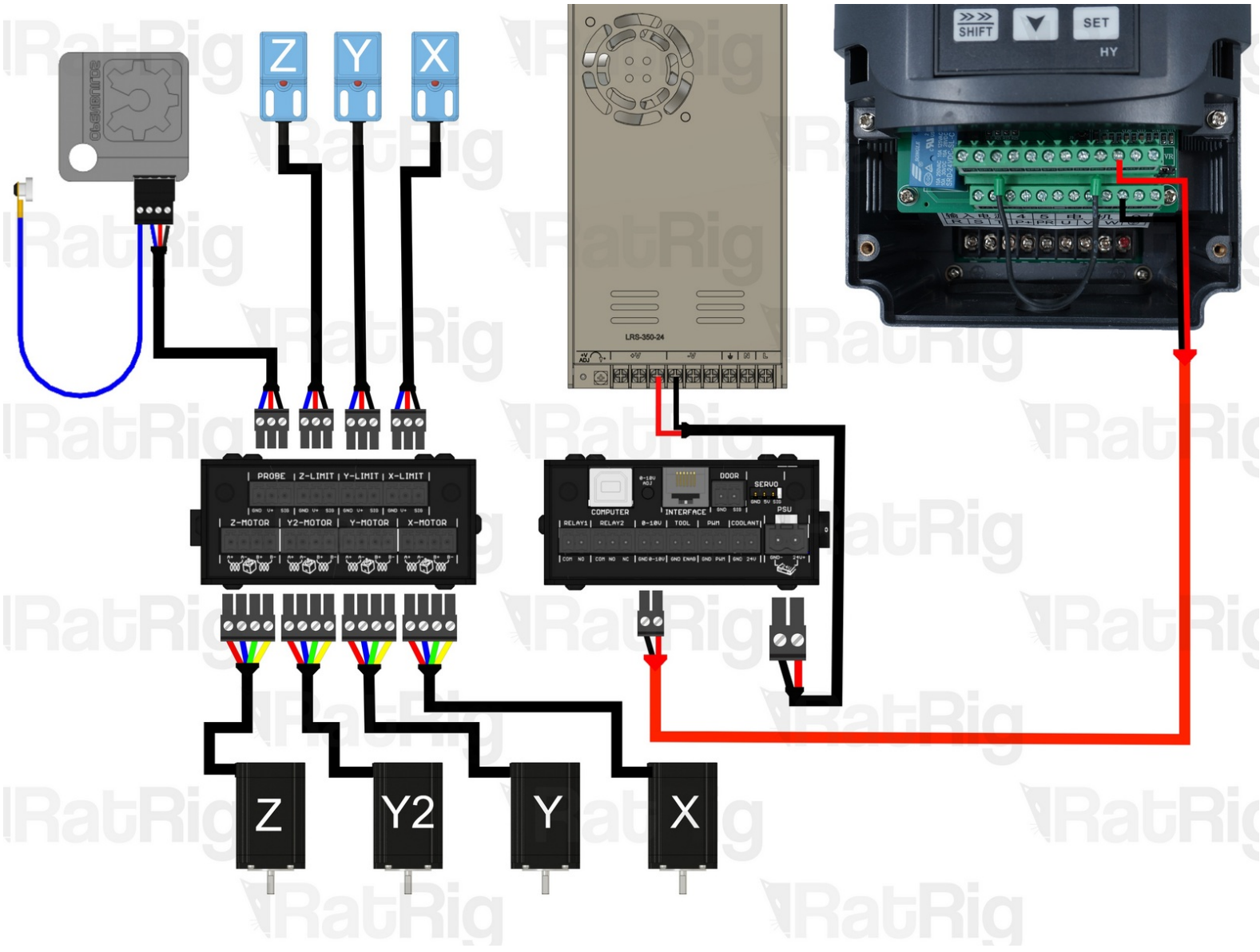
Rat Rig

06. Wiring Guide - Standard kit - BETA

Written By: Rat Rig

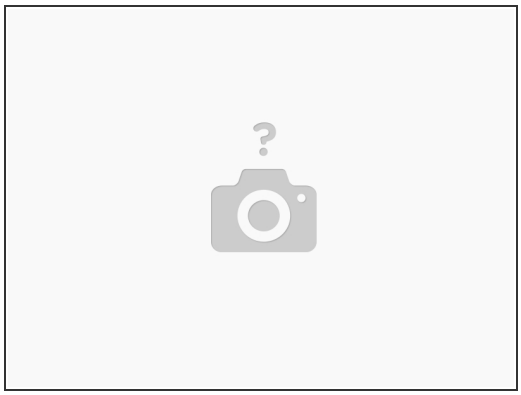


INTRODUCTION

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 standard 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.

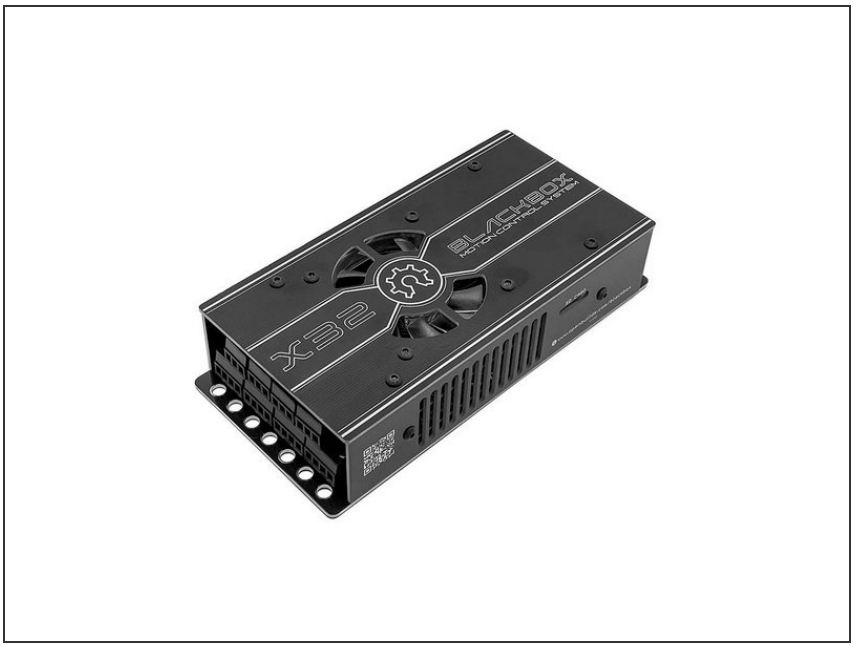
Step 3 — Set up - Power Supply

- 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 the BlackBox X32



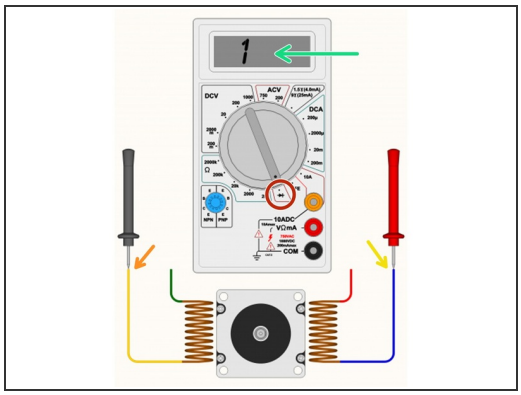
Install the BlackBox X32 in your preferred location, ensuring that all cables can comfortably reach their destinations without being subjected to undue stretching.

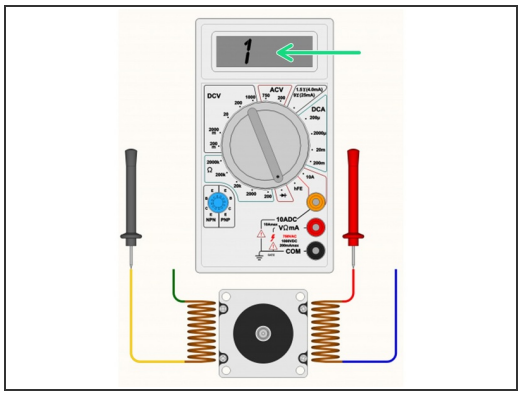
Going forward, when installing a component into the BlackBox x32, please make sure to use the appropriate connector for that particular socket.

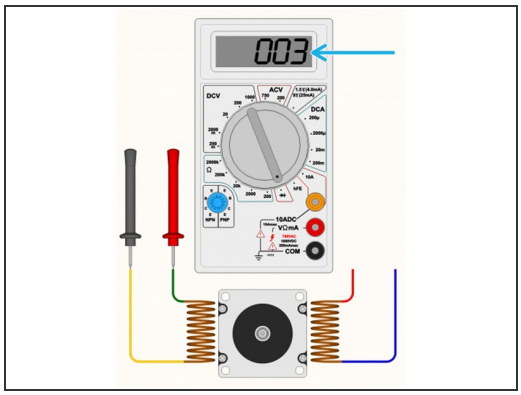
Throughout the remainder of the guide, please give careful consideration to the provided images, as they indicate the specific side of the BlackBox X32 where the connections should be installed.

Keep in mind that milling is a very messy job and debris may fly into the BlackBox X32. This could cause it to fail or catch fire! Please be aware!

Step 5 — Identifying stepper motor coil wires (with a multimeter)





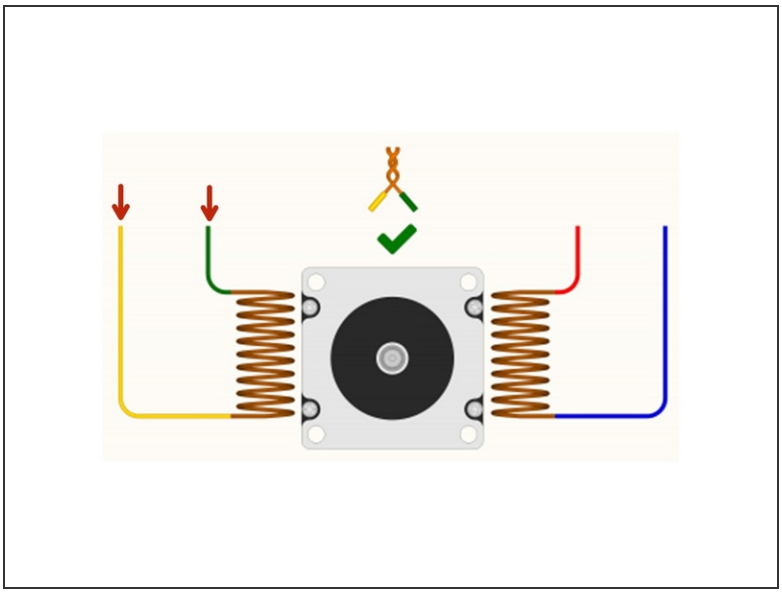


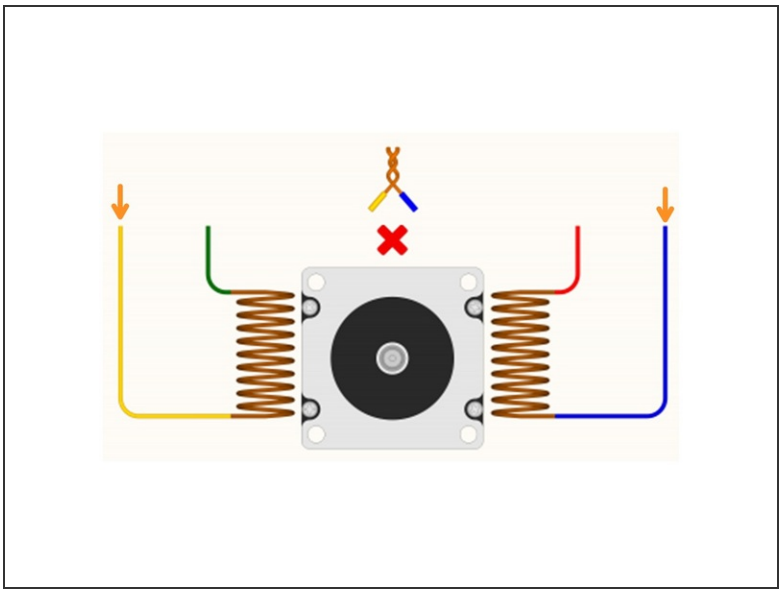
This procedure can be found on the OpenBuilds Documentation, for further information click here.

Follow this step if you have access to a multimeter, otherwise skip to Step 5.

- 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 6 — Identifying stepper motor coil wires (without a multimeter)



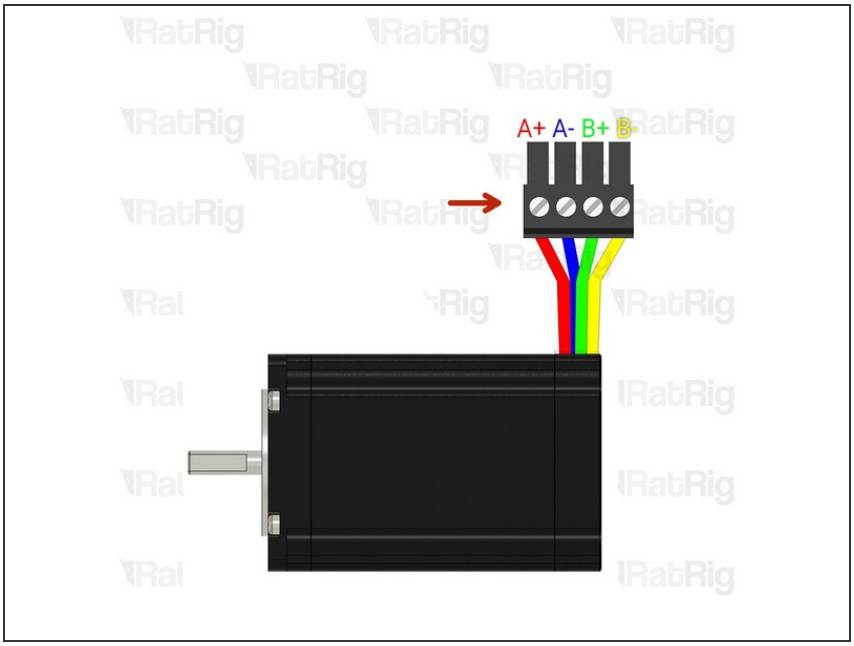


This procedure can be found on the OpenBuilds Documentation, for further information click here.

- 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 7.
- 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 7 — Identifying stepper motor coil wires - Insert the Xtension connector



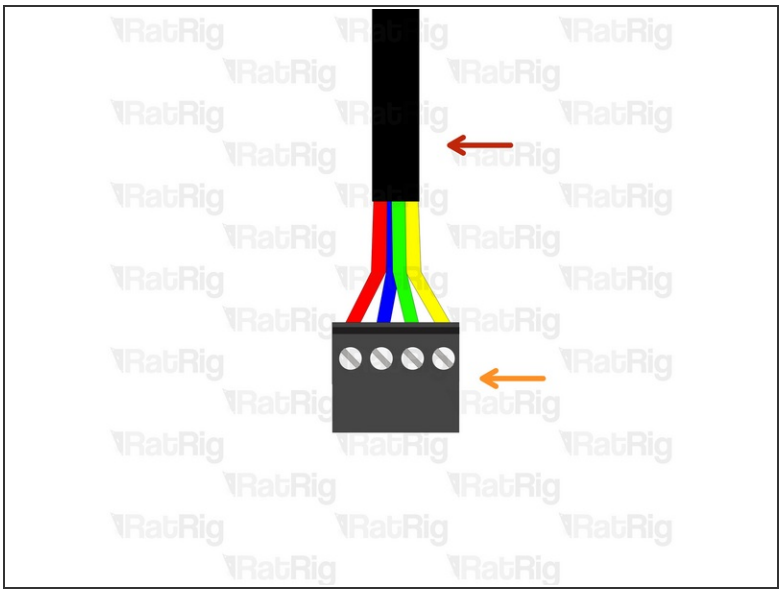
- Xtension Connector - 4 Pin

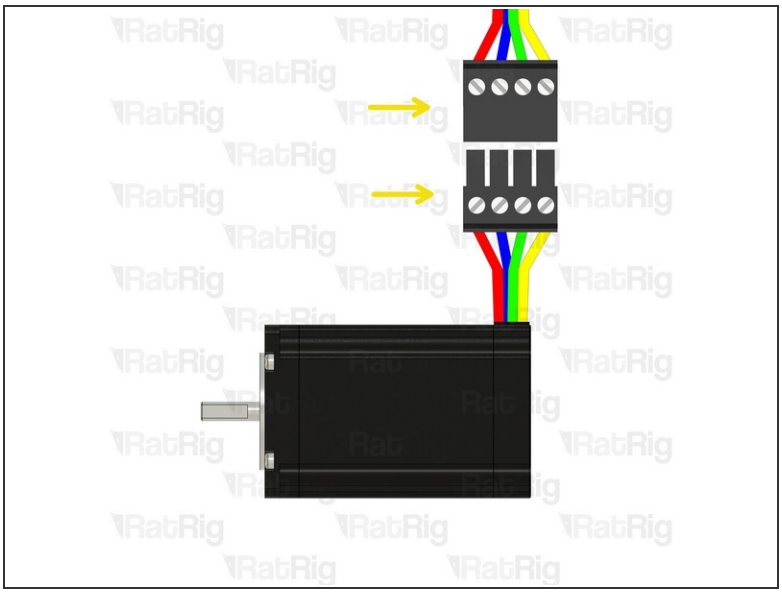
Insert an Xtension connector (male) onto the stepper wires. The previously identified coil pairs must be next to each other. They are now designated as A pair and B pair. The + and - don't really matter at this point as long as the coil ends are toghether.

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 8 — Prepare the Z stepper motor cable



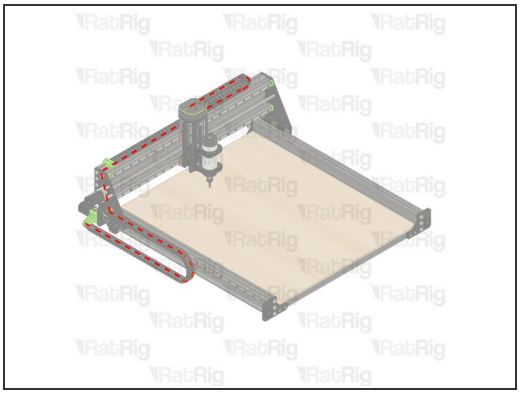


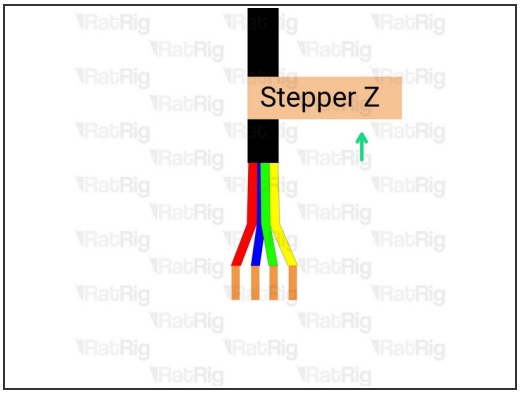
Prepare the 4 wire cable for the Z stepper motor.

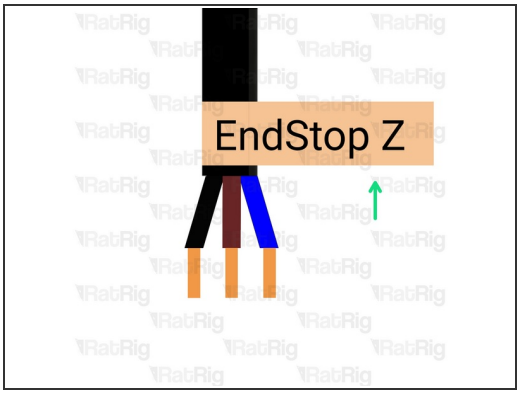
- 4 Wire cable
- Insert an Xtension (female) connector on to the cable end.
- Connect the extension to the stepper motor.
- Make sure to follow the wire colour scheme to preserve the motor coil pairs.

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

Step 9 — Route the Z axis cables







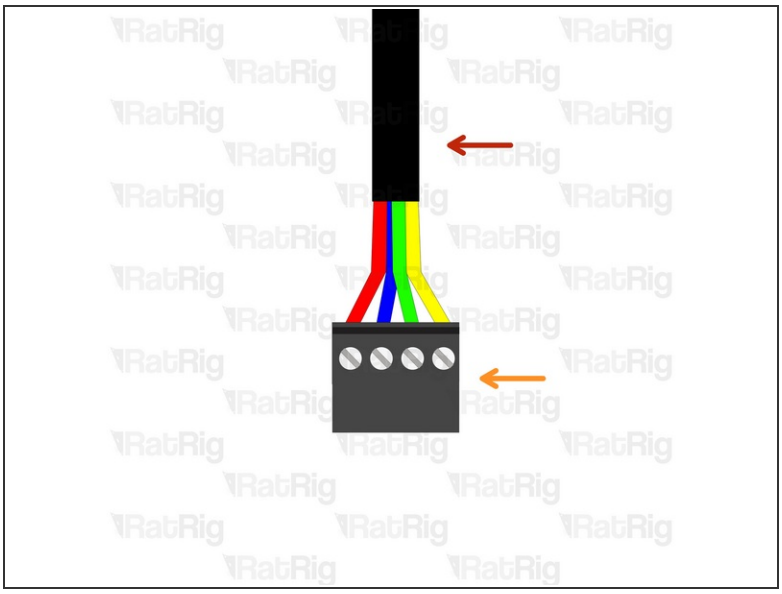
- Route the endstop, Z-stepper and spindle cables as shown in the picture.

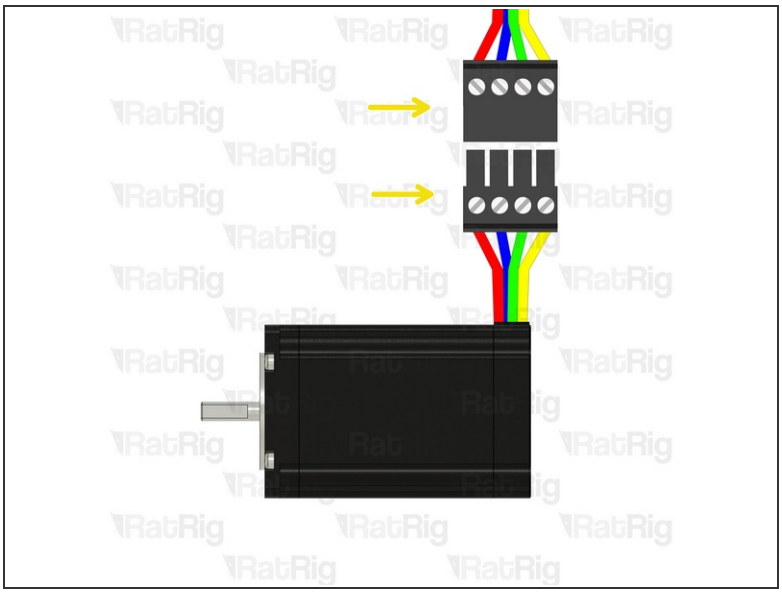
⚠ Carefully insert them inside the drag chain and make sure the cables don't get pinched or twisted.

- 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 5. Make sure to respect the colour order.

Step 10 — Prepare the X stepper motor cable



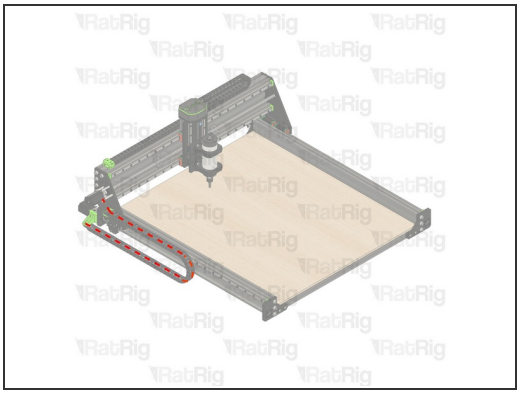


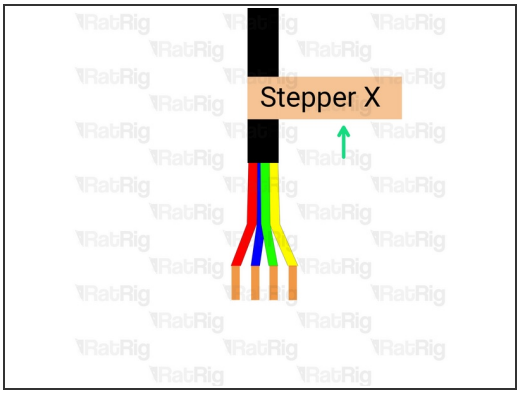
Prepare the 4 wire cable for the X stepper motor.

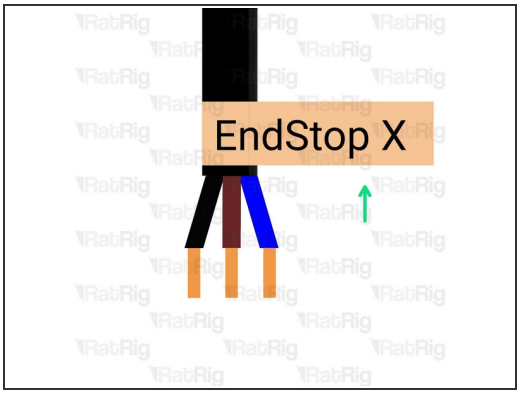
- 4 Wire cable
- Insert an Xtension (female) connector on the cable end.
- Connect the extension to the stepper motor.
- Make sure to follow the wire colour scheme to preserve the motor coil pairs.

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

Step 11 — Route the X axis cables







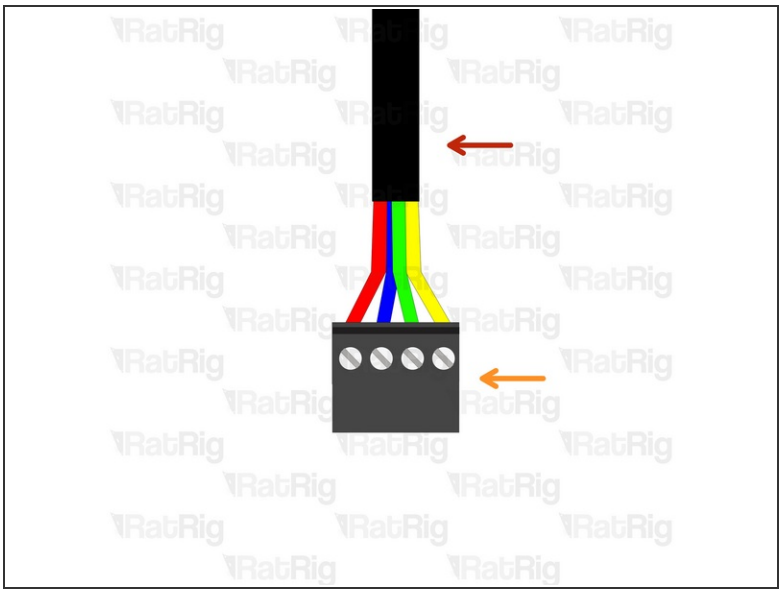
- Route the endstop, and X-stepper cables as shown in the picture.

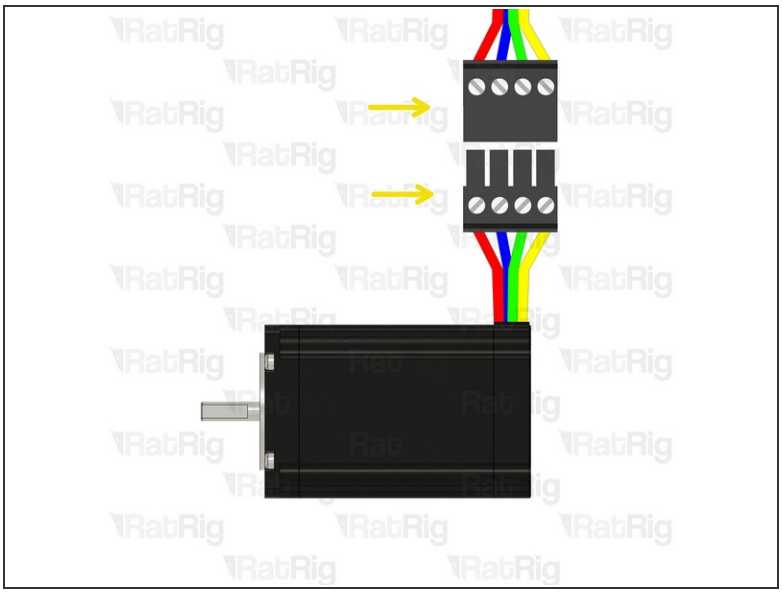
⚠ Carefully insert them inside the drag chain and make sure the cables don't get pinched or twisted.

- 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 5. Make sure to respect the colour order.

Step 12 — Prepare the Y stepper motor cable



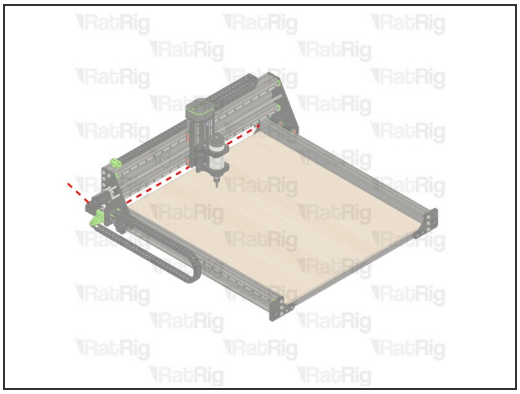


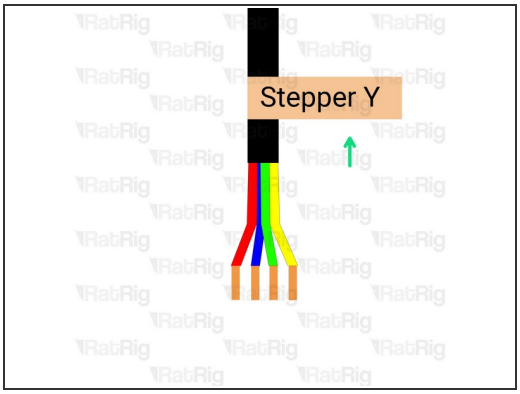
Prepare the 4 wire cable for the Y stepper motor.

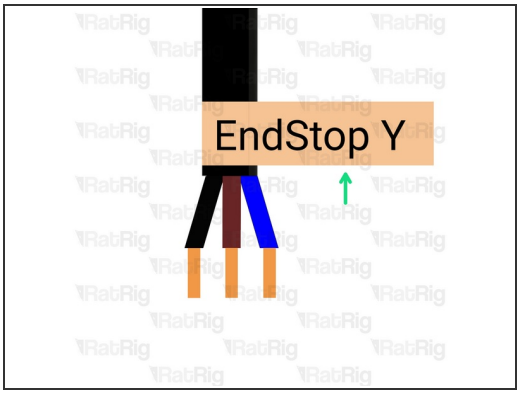
- 4 Wire cable
- Insert an Xtension (female) connector on the cable end.
- Connect the extension to the stepper motor.
- Make sure to follow the wire colour scheme to preserve the motor coil pairs.

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

Step 13 — Route the Y axis cables







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

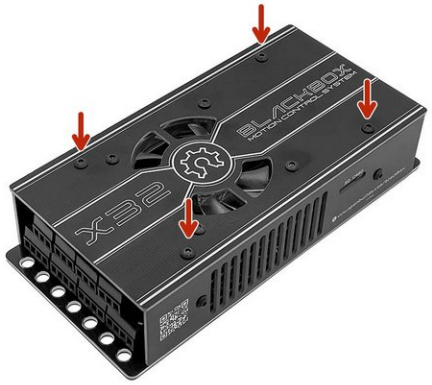
⚠ Carefully insert them inside the drag chain and make sure the cables don't get pinched or twisted.

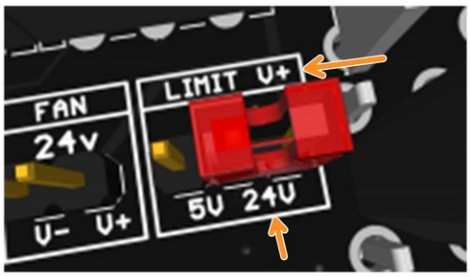
- Route the cables to the location where you desire to have the electronics components.
- Cut the cables to the final length, double check if the cable has the appropriate length before cutting.
- Label the cable at the end, with a piece of duct tape for example.

Repeat Step 9 and Step 10 for the second Y axis stepper motor.

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 5. Make sure to respect the colour order.

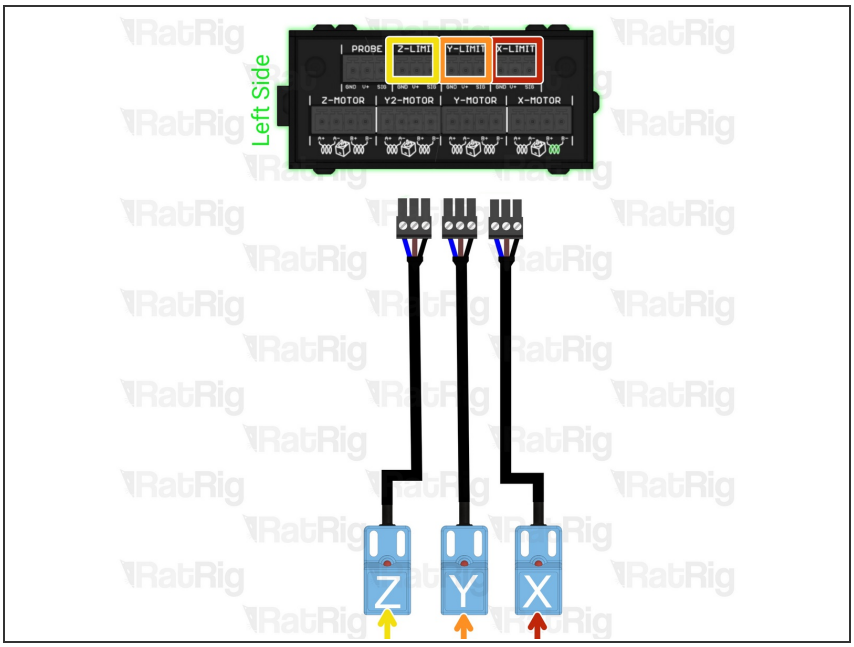
Step 14 — Prepare the controller for the inductive endstops





- Remove the top cover of the controller.
- Inside you will find a jumper with the "Limit V+" label, make sure it's set to 24V as the inductive endstops require more power than regular mechanical endstops.

Step 15 — Connect the endstops to the controller



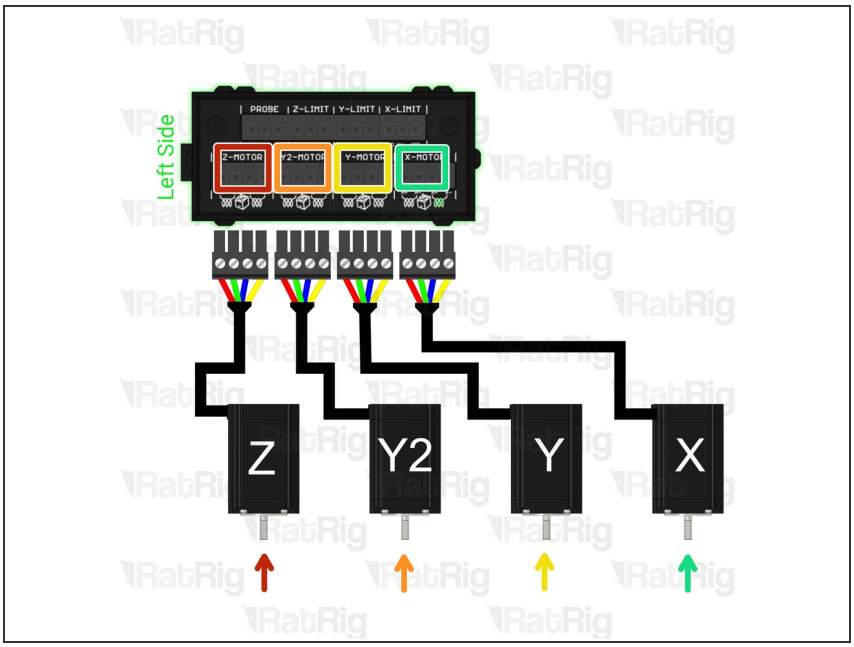
- The X endstop must be inserted on the X endstop socket.
- The Y endstop must be inserted on the Y endstop socket.
- The Z endstop must be inserted on the Z endstop socket.

The wire colours must match the controller's input:

- Black - Signal
- Brown - V+
- Blue - GND

If you are utilizing different endstops, refer to the supplier datasheet for the wire input specifications.

Step 16 — Connect the steppers to the controller

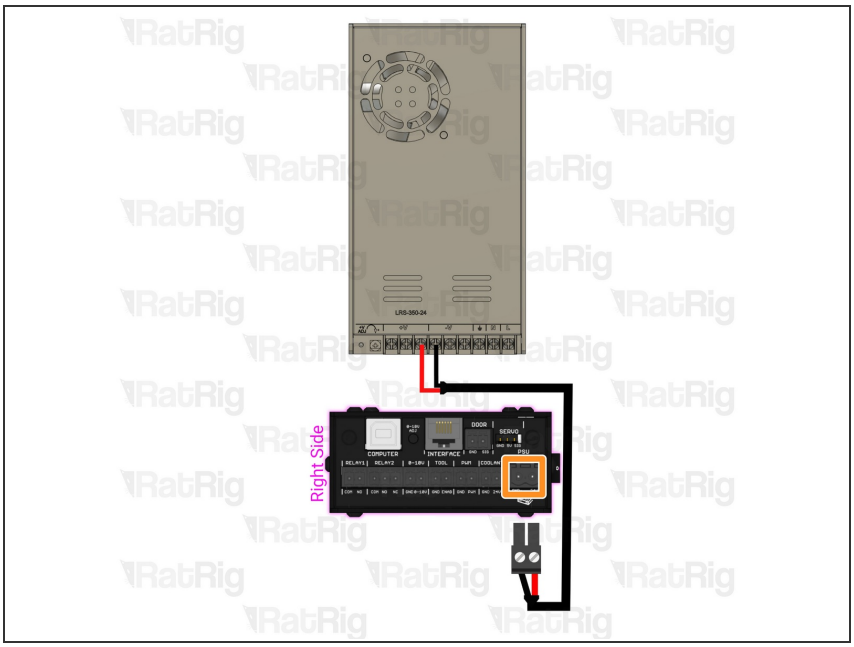


Insert the stepper motors connectors on the designated slots:

- The Z stepper motor must be inserted on the Z stepper motor socket.
- The Y2 stepper motor must be inserted on the Y2 stepper motor socket.
- The Y stepper motor must be inserted on the Y stepper motor socket.
- The X stepper motor must be inserted on the X stepper motor socket.

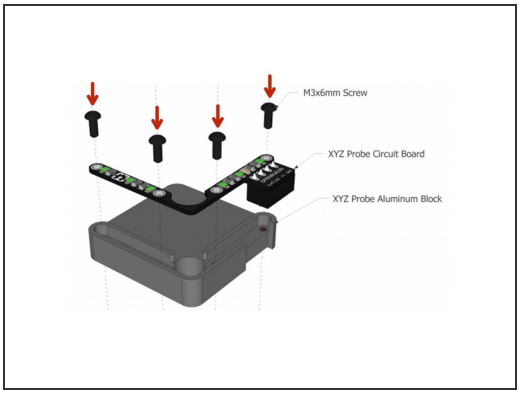
If the extension was added while keeping the pairs of stepper motor coils intact, they should be labeled as coil A and coil B. If you notice that the stepper motors are not moving or producing unusual sounds when powered on, please double-check the coil pairs.

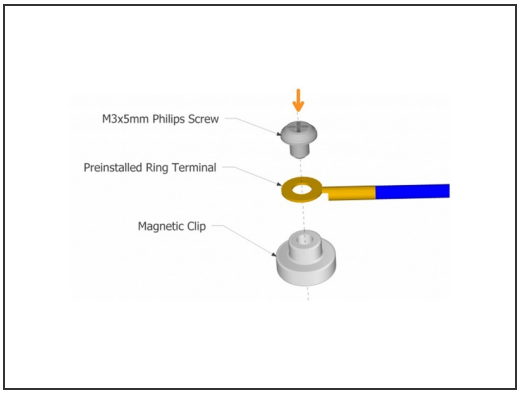
Step 17 — Connect the power supply

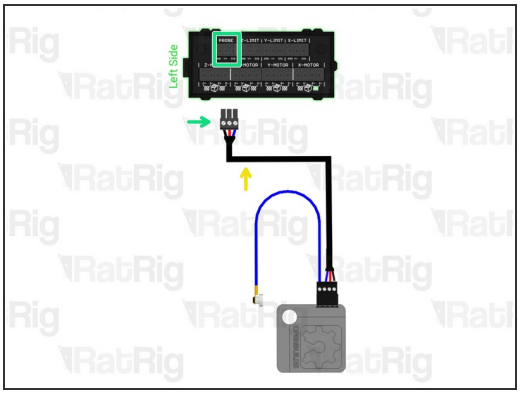


- Install the PSU in your desired location.
- Prepare a 2-wire cable, long enough to connect the power supply to the Blackbox X32.
- Using the provided connector with the Blackbox X32, connect the power supply to the Blackbox X32.
  - Connect the red wire to the V+ terminal on the power supply
  - Connect the black wire to the V- terminalon the power supply

Step 18 — Assemble and connect the probe



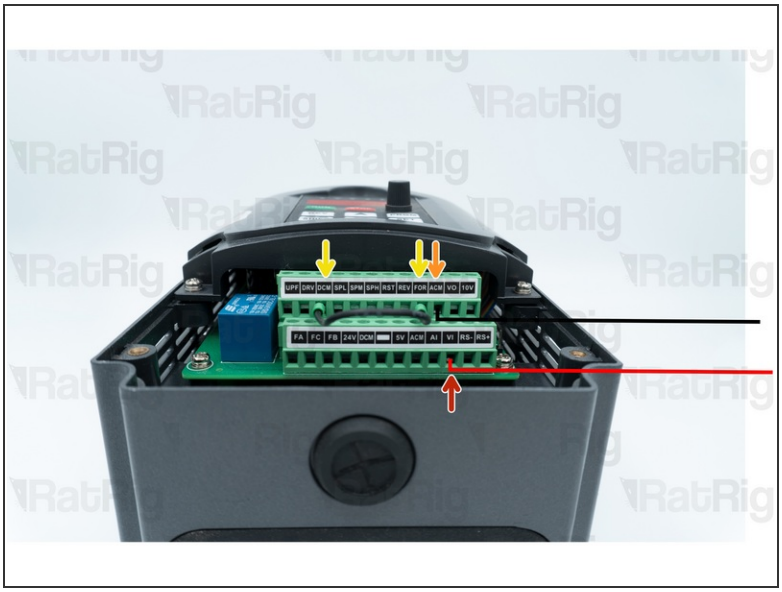


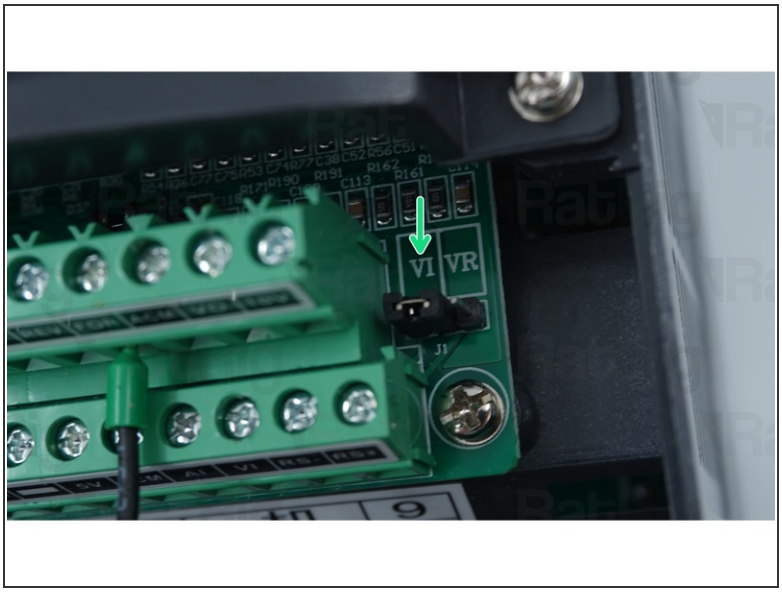


- Assemble the XYZ probe, for more information please check the Openbuilds XYZ Probe documentation
- Assemble the probe magnet as the image suggests.
- Prepare a 3 wire cable. It should be long enough to reach from the controller to any position in the machine work area.
- Using the connector provided with the controller, plug it in to the socket labelled as "probe".

ⓘ For further information on wiring the probe please check the Openbuilds XYZ Probe documentation

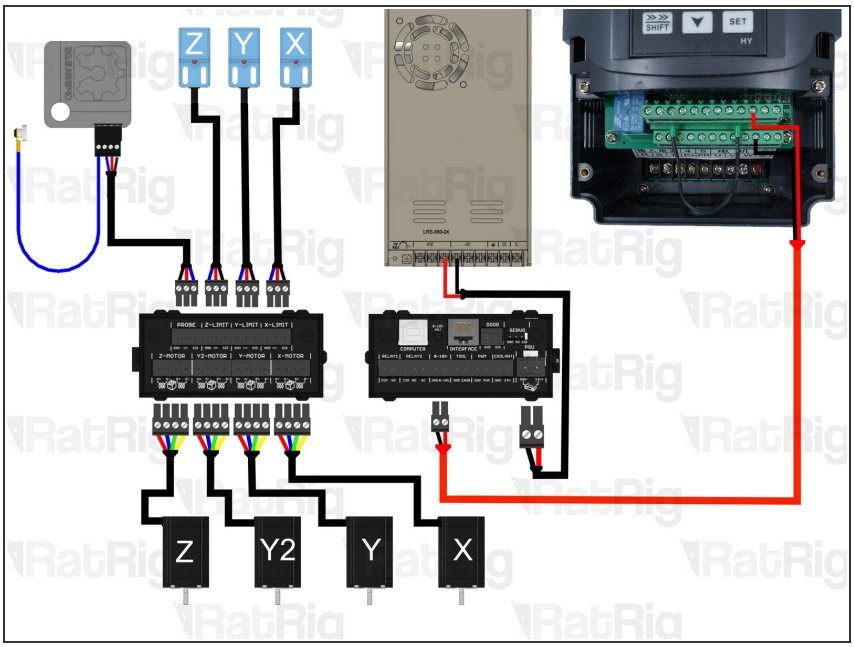
Step 19 — Connect the VFD





- Insert a wire on the VI socket and make sure it's long enough to reach the BlackBox X32.
- Insert a wire on the ACM socket and make sure it's long enough to reach the BlackBox X32.
- A Jumper must be placed between DCM and FOR, usually it's already in place out of the box.
- Ensure the jumper on the right of the VFD is set to VI, allowing the BlackBox X32 to control the spindle speed.

Step 20 — Wiring scheme



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.