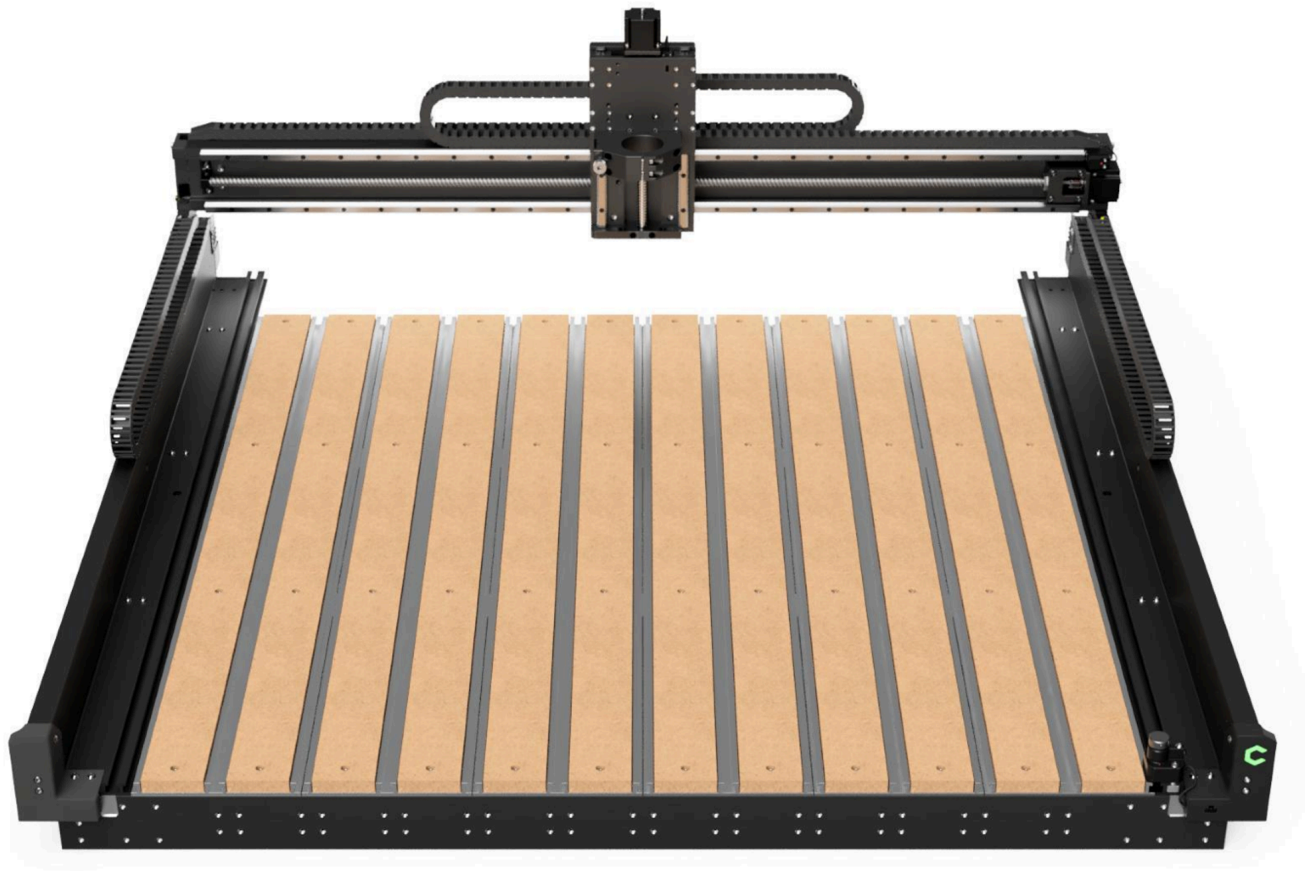


Shapeoko 5.1 Pro Assembly Manual

2025-12-15



Before You Start



Visit the Shapeoko 5.1 Pro Getting Started page to check for updates to this manual

<https://my.carbide3d.com/gettingstarted/shapeoko51pro/>



Watch a quick video overview of the assembly process

<https://qr.carbide3d.com/unboxing/s5>

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1. Welcome and Congratulations

The Shapeoko 5.1 Pro is a high-performance CNC router that comes with everything you need to accurately cut wood, plastic, and aluminum, so you can turn your workbench into a business.

At up to 4 feet in width, Shapeoko 5.1 Pro is bigger than ever, so you can take on larger jobs or nest more parts together and run the machine longer. It's not just a CNC router, it's a complete system of hardware, software, accessories, and training, built and supported in the USA.

1.1 Assembly Notes

- The use of power tools is not recommended for assembly. Use hand tools only.
- Some steps rely on non-tightened fasteners. Do not tighten fasteners beyond finger-tight until instructed.
- Your Shapeoko 5.1 Pro gantry is powered by stepper motors. When the power is off, moving the motors by hand will cause them to generate electricity. **IMPORTANT:** When moving the gantry by hand, go slowly. The power generated by the stepper motors will feel like bumps. If the red LED on the controller lights up when moving the stepper motors, it's important to slow down because you are pushing electricity back through the board, which could damage the controller.

1.2 Technical Support

Have questions? Need help? We have a fully-staffed support team waiting to help if you run into any trouble while assembling your Shapeoko 5.1 Pro. Just email us at support@carbide3d.com.

Your Shapeoko 5.1 Pro Kit is **hand-packed and inspected** before shipping. If you discover that any hardware is missing during assembly, check the **extra hardware bag** included in the **Open First** box.

If a part is not in the extra hardware bag, or if any component was damaged in transit, contact support@carbide3d.com for a replacement.

2. Unpacking

The **Shapeoko 5.1 Pro Kit** ships in **three separate boxes**.

- Shipping Box 1: Y-Axis, Z-Axis, Machine Accessories, Assembly Hardware and Components
- Shipping Box 2: Gantry Assembly, Hybrid Table
- Shipping Box 3: Baseframe

The sections below list the contents of each shipping box. Tables are provided to help you verify that all parts are included.

2.1 Shipping Box 1: Inventory Overview

Box 1 contains several smaller boxes and multiple large pre-assembled components.

The smaller boxes are labeled and contain grouped hardware and sub-assemblies, while the large assemblies are packaged directly in custom foam inserts for protection during shipping.

Inside Box 1 you will find:

Sub-Boxes

- HDZ Box
- S5 Electronics Box

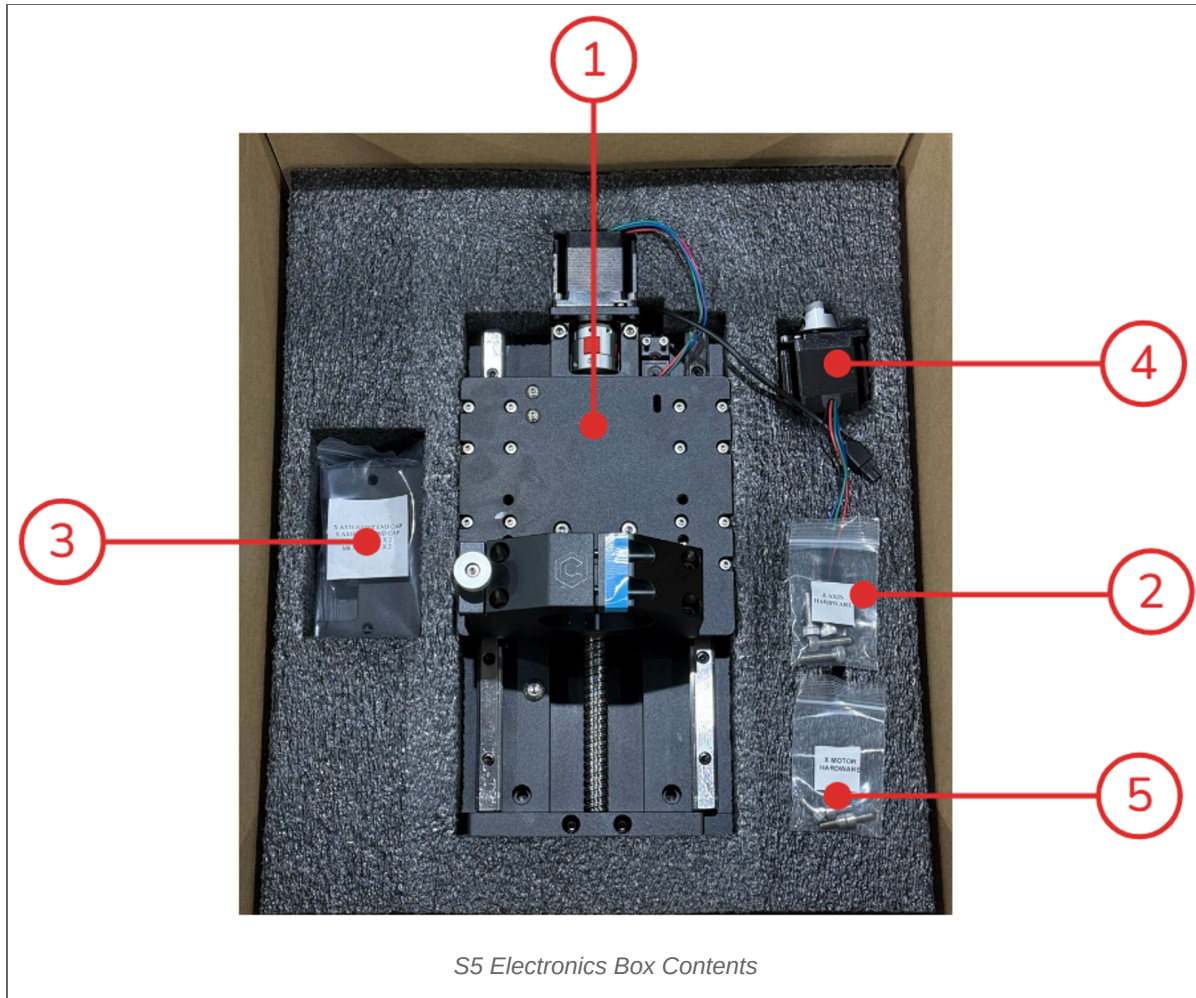
Large Components (packed in custom foam)

- Y-Left Assembly
- Y-Right Assembly
- Cable Track

Each sub-box and assembly is detailed in the following sections, including part inventories and verification tables.

If you ordered accessories such as a **VFD Spindle Kit**, **cutters** or most other items from our store, those will also be included inside **Shipping Box 1**.

HDZ Box Contents



Item	Label	Description
1	HDZ Assembly	Pre-assembled and tested Z-Axis (HDZ) assembly
2	HDZ Hardware	M6 × 20 mm screws × 2
3	Gantry End Caps	Gantry End Caps and Hardware
4	Stepper Motor	Gantry Stepper Motor (X-Axis)
5	Stepper Hardware	M5 × 10 mm screws × 4

S5 Electronics Box Contents



Item	Type	Label	Description
1	Single	Sweepy 65	Dust boot for 65 mm spindle and router
2	Sub	Open First	Tools and essential items required for initial assembly
3	Sub	Wiring Harness	Wiring and cable management components
4	Single	S5 Controller	Shapeoko 5 motion controller
5	Sub	Final Assembly	Components needed to complete final setup
6	Sub	S5 BitSetter	Automatic tool length probe

7	Single	S5 Power Pendant	E-Stop and Feed Hold control pendant
8	Sub	Baseframe and Hybrid Table Hardware	Hardware for hybrid table and base frame assembly

Open First Box	Item	Quantity
	Spare Limit Switch	1
	Extra Hardware Bag	1
	Toolkit	1
	Cable Management Clips	1
	#201 End Mill	1
	Permanent Marker	1
	Workholding Kit	1
	Quick Draw Accessory	1
	S5 Maintenance Kit	1
	Gantry Shift Extensions	1

Wiring Harness Box	Item	Quantity
	Main Wiring Harness	1
	Front Plate Extension	1
	Spindle Drag Chains	2

Final Assembly Box	Item	Quantity
	Y Drag Chain Brackets and Hardware	1
	Power Cord	1
	Power Pendant Cable	1

	Grounding Block and Hardware	1
	Wire Keepers	1
	USB Cable	1
	Drag Chain Hardware	1

Shapeoko 5 BitSetter Box	Item	Quantity
	BitSetter Assembly	1
	BitSetter Cable	1
	M6 × 25 mm Socket Head Cap Screws	2
	Teez-Nutz	2

Baseframe and Hybrid Hardware Box	Item	Quantity
	M6 × 12 mm Flat Head Screws	96
	M6 × 20 mm Socket Head Screws	48
	M6 x 16mm Button Head Screws	16

2.2 Shipping Box 2: Inventory Overview

Item	Description	Qty
Gantry Harness Box	X-Axis Wiring Harness	1
X-Axis Gantry Assembly	Assembled S5 Gantry	1
Hybrid Table Extrusions	Extruded aluminum pieces with pre-drilled holes	6
MDF Strips	MDF to be used as a wasteboard	12

NOTE: **Shapeoko 5.1 Pro 2x2** only requires three (3) Hybrid Table Extrusions and six (6) MDF Strips.

2.3 Shipping Box 3: Inventory Overview

Item	Description	Qty
Front / Rear Baseframe Member	Powder Coated Extrusion (black)	2
Middle Baseframe Member	Extrusion (silver)	2

NOTE: **Shapeoko 5.1 Pro 2x2** and **Shapeoko 5.1 4x2** only requires three (3) baseframe members. Two (2) Painted and One (1) silver.

3. Baseframe and Gantry Assembly

Items Required	Qty
Y-Right Assembly	1
Y-Axis Assembly Hardware: M6×16mm Button Head Cap Screws	16
Cable Track	1
Baseframe Members (4x4 Size)	4
Baseframe Members (4x2 and 2x2 Size)	3
Y-Left Assembly	1
Tool Bag	1
X-Axis Gantry Assembly	1

NOTE: Only the **Shapeoko 5.1 Pro 4x4** size requires four (4) baseframe members. The **Shapeoko 5.1 Pro 4x2** and **Shapeoko 5.1 Pro 2x2** sizes use three (3) baseframe members.

3.1 Unpack Shipping Box 1

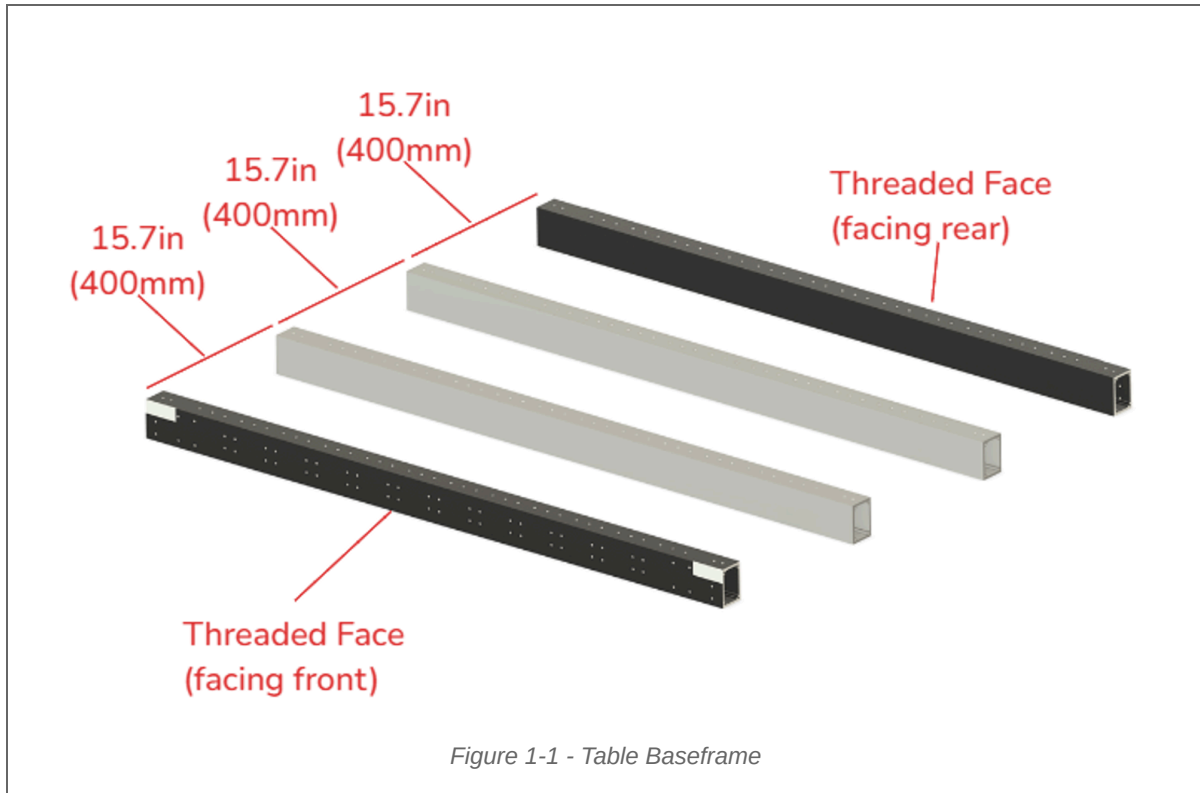
1. Remove box labeled **S5 Electronics Box**
2. Remove the bag containing the tool kit from the box labeled **Open First**.
3. Also remove the Box labeled **Baseframe and Hybrid Table Hardware** from the **Open First** box.
4. Now, Locate the Box Labeled HDZ, and set aside along with hte **S5 Electronics Box**. Those will be used later in the assembly process.

3.2 Position Baseframe

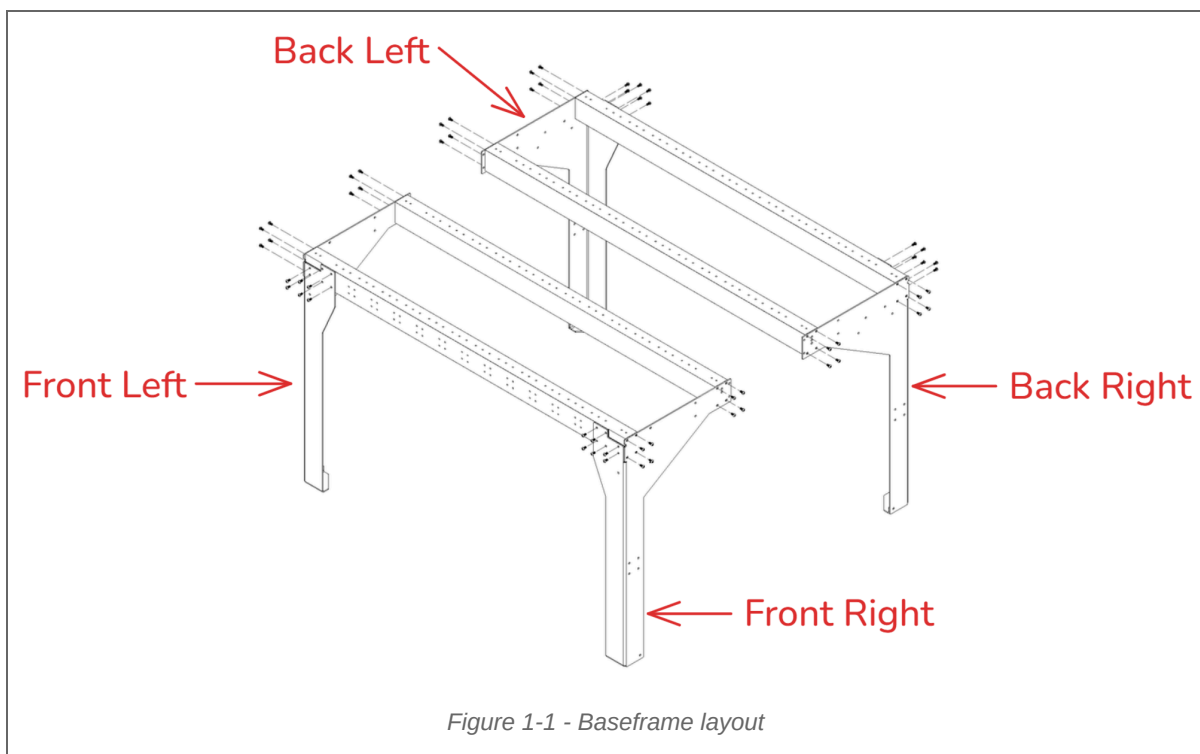
If you have the table legs, skips to the next section titled **Installing Table Legs**

1. Open **Shipping Box 3** and remove the four (4) baseframe members.
2. Position the four (4) baseframe members horizontally across your table approximately 15.7 inches (400 mm) apart, center to center. See Figure 1-1.
3. The black baseframe pieces are the front and rear members
4. Ensure the threaded face of the black extrusion is facing the front of the machine on the front, and the rear of the machine on the rear.

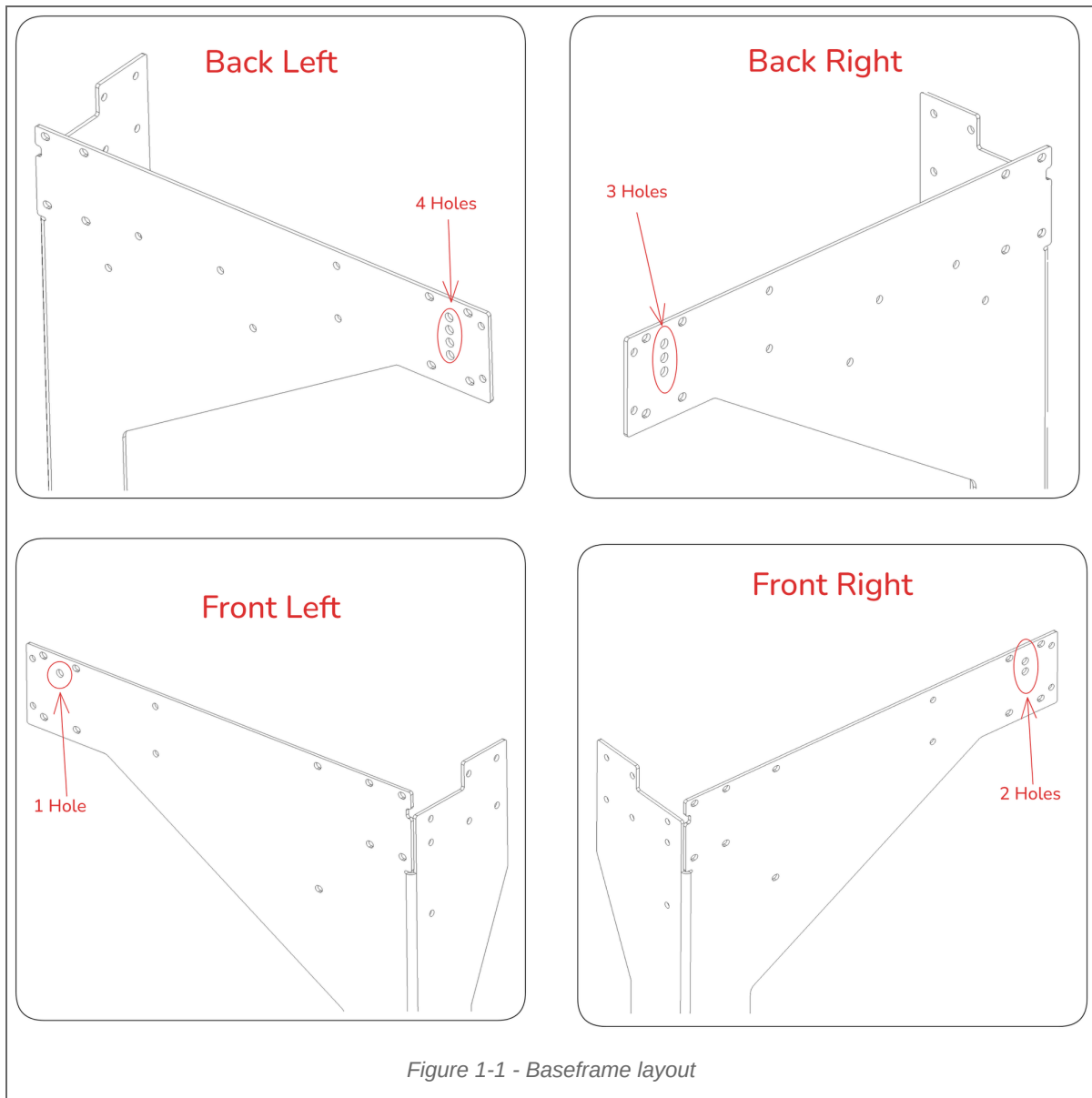
Baseframe members of the same color are identical and can be used interchangeably. Either of the black baseframe members can be used as the front or the back of the machine, either silver baseframe member can be a middle section.



3.3 Installing Table Legs



1. Open **Shipping Box 3** and remove the four (4) baseframe members.
2. Open **Table Leg Box** and remove four (4) table legs and mounting hardware (set aside *controller and vfd mounting hardware*)
3. Using the Diagram Below, identify the four types of table legs: Front Right, Front Left, Back Right, Back Left.



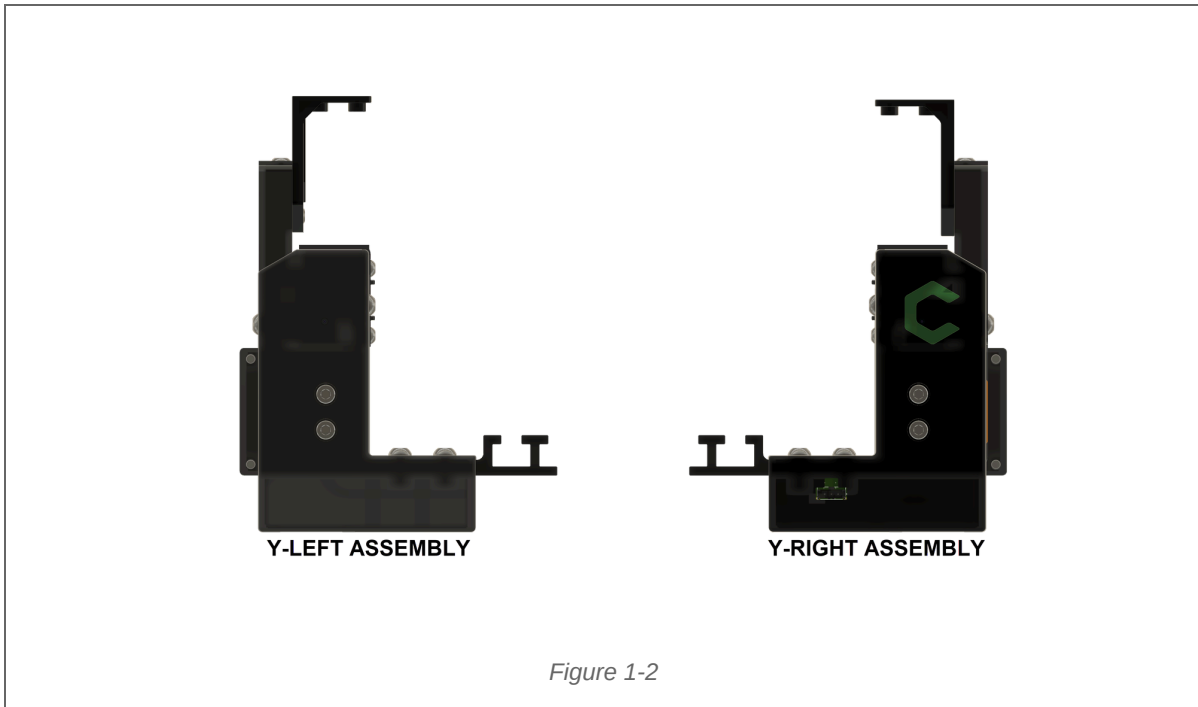
This can also be done by setting the baseframes on a workbench upside down, flipping the legs upside down and attaching the legs to the baseframe members as shown in Figure-1-0

1. Using the included Mounting Hardware, attach each leg as shown in Figure-1-0.
2. Attach Front Right and Front Left Table legs to Front Baseframe and Middle Baseframe members
3. Attach Back Right and Back Left Table legs to Back Baseframe and Middle Baseframe members
4. Use two hybrid table extrusions to temporarily stand up and attach the Front and Rear Table Sections

The assembly process is now the same regardless of if you have the table leg kit or not.

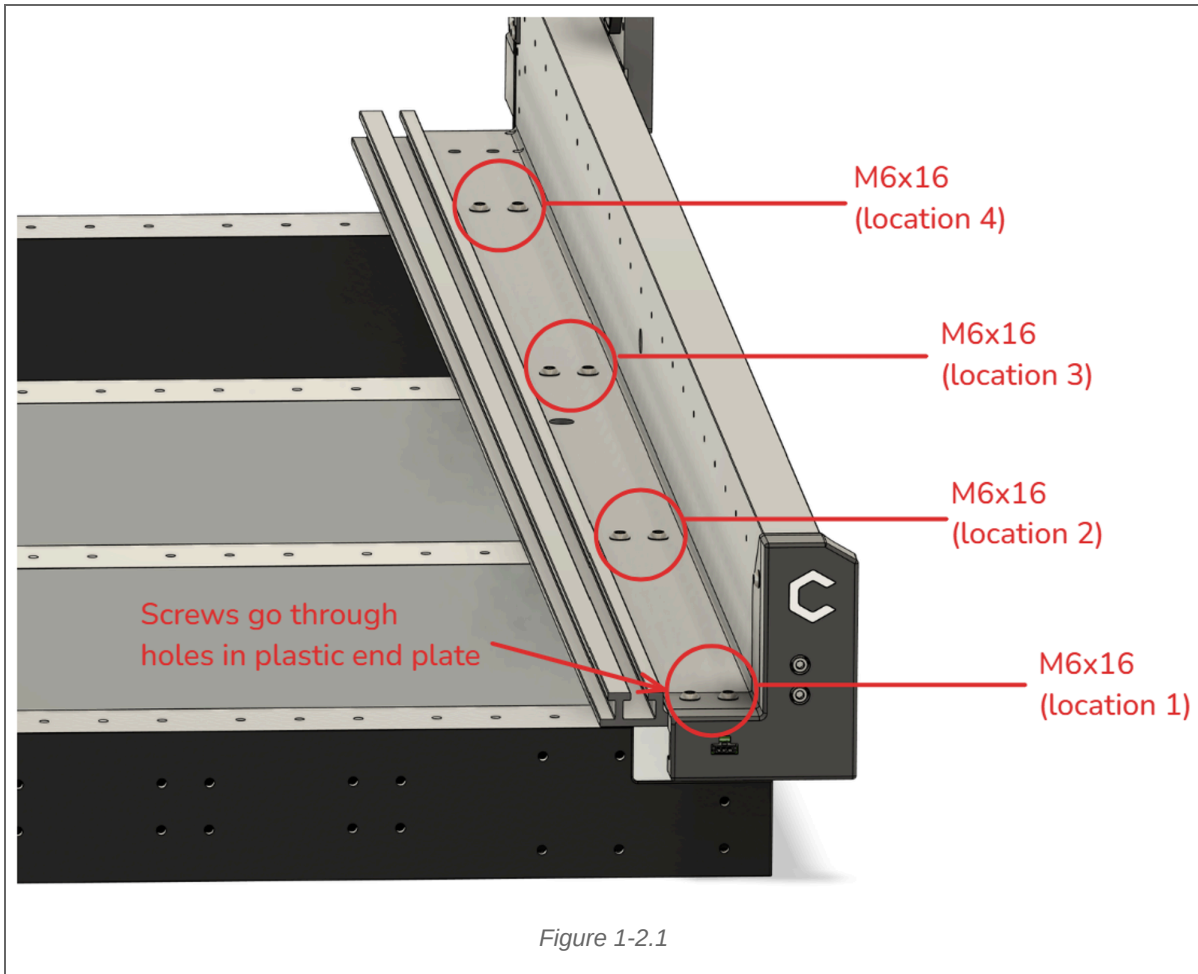
3.4 Install Y-Right Assembly

WARNING: This step is much easier with two people. The Y-assembly is heavy and unevenly weighted, and will easily tip over if set upright before attaching it to the baseframe.



1. Remove the **Y-Right Assembly** from its protective foam in Shipping Box 1. The Y-Right has a Carbide 3D logo on the front plate. See Fig 1-2 for reference.
2. Set the **Y-Right Assembly** on the right side of the baseframe. See Fig. 1-2.1.
3. Align the front edge of the Y-Right Assembly with the front edge of the first baseframe member.
4. Align with the outside set of screw holes in each baseframe member.
5. Remove eight (8) M6x16mm BHCS from the **Baseframe Hardware** bag.
6. Use a 4mm hex key and eight (8) M6x16mm BHCS to attach the Y-assembly. See Fig. 1-2.1. Snug the screws but don't fully tighten.
 - Y-Right assembly is attached in four (4) locations.
 - At location 1, insert the BHCS through the holes in the end cap.

NOTE: Don't worry about squaring the baseframe yet, we'll do that after installing the gantry.



3.5 Install Y-Left Assembly

WARNING: This step is much easier with two people. The Y-assembly is heavy, awkwardly weighted and will easily tip over if set upright before attaching it to the baseframe.

1. Remove the **Y-Left Assembly** from its protective foam in Shipping Box 1. Y-Left has a blank front plate, see Fig 1-2 for reference.
2. Set the **Y-Left Assembly** on the left side of the baseframe. See Fig. 1-3.
3. Align the front edge of the Y-Left Assembly with the front edge of the first baseframe member.
4. Align with the last set of screw holes in each baseframe member.
5. Use a 4mm hex key and eight (8) M6×16mm BHCS to attach the assembly. See Fig. 1-3. Snug the screws but don't fully tighten.
 - Y-Left assembly is attached in four (4) locations.
 - At location 1, insert the BHCS through the holes in the end cap.

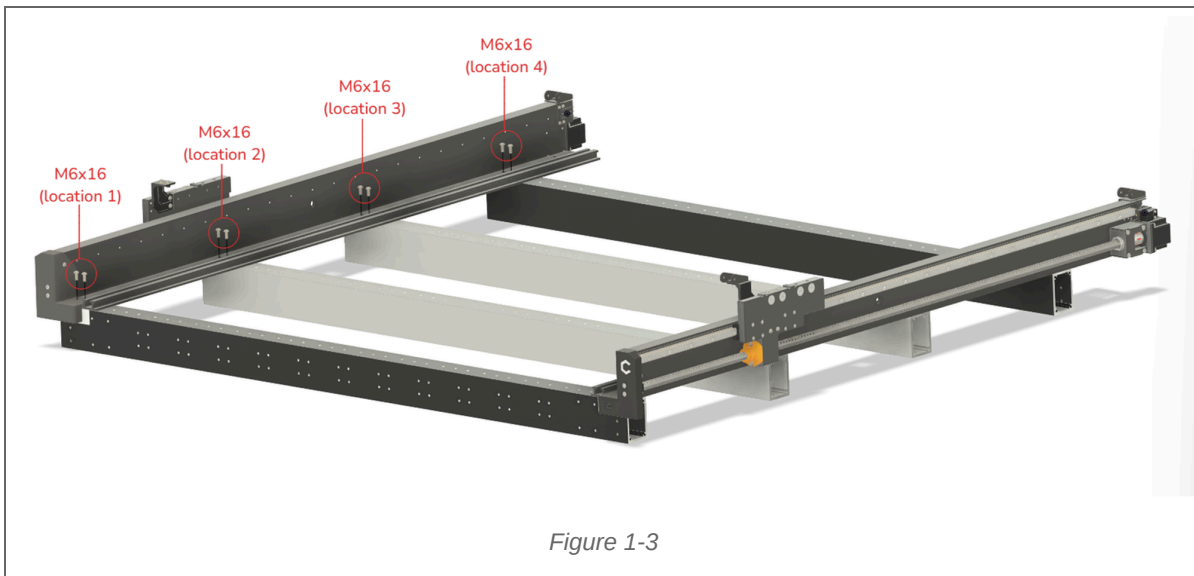


Figure 1-3

TIP: Each location of the baseframe holes on the Y-Left assembly is slotted. When attaching the gantry, remember you can slide the entire Y-Left Assembly inward/outward 2mm to align the gantry with the cross dowels.

3.6 Install the Cable Track

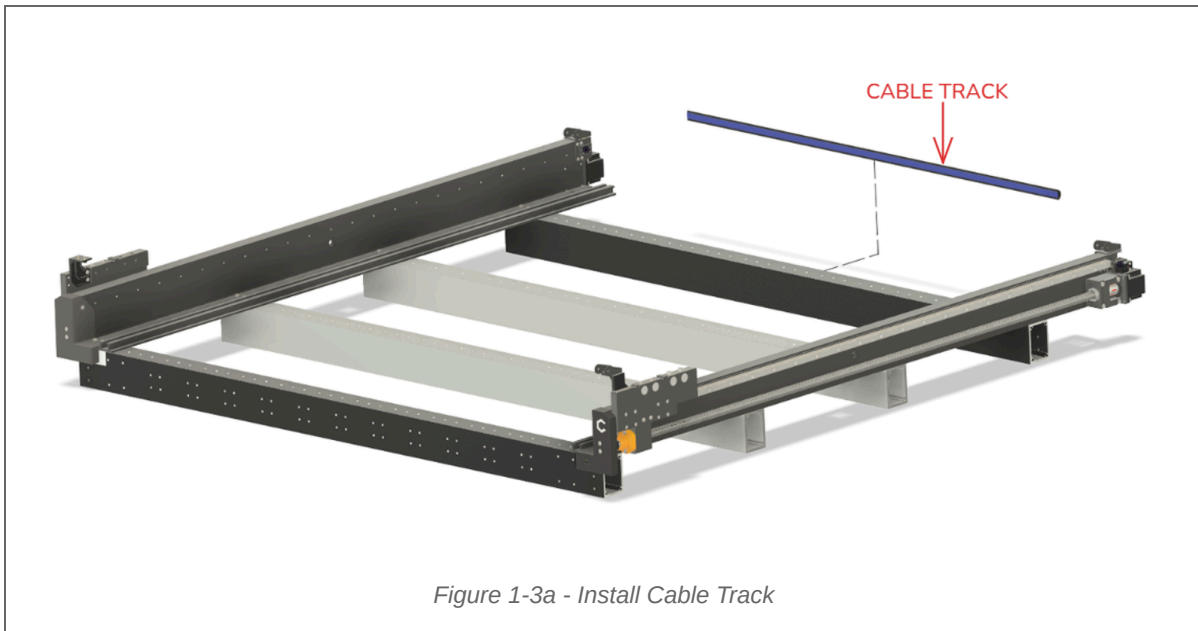


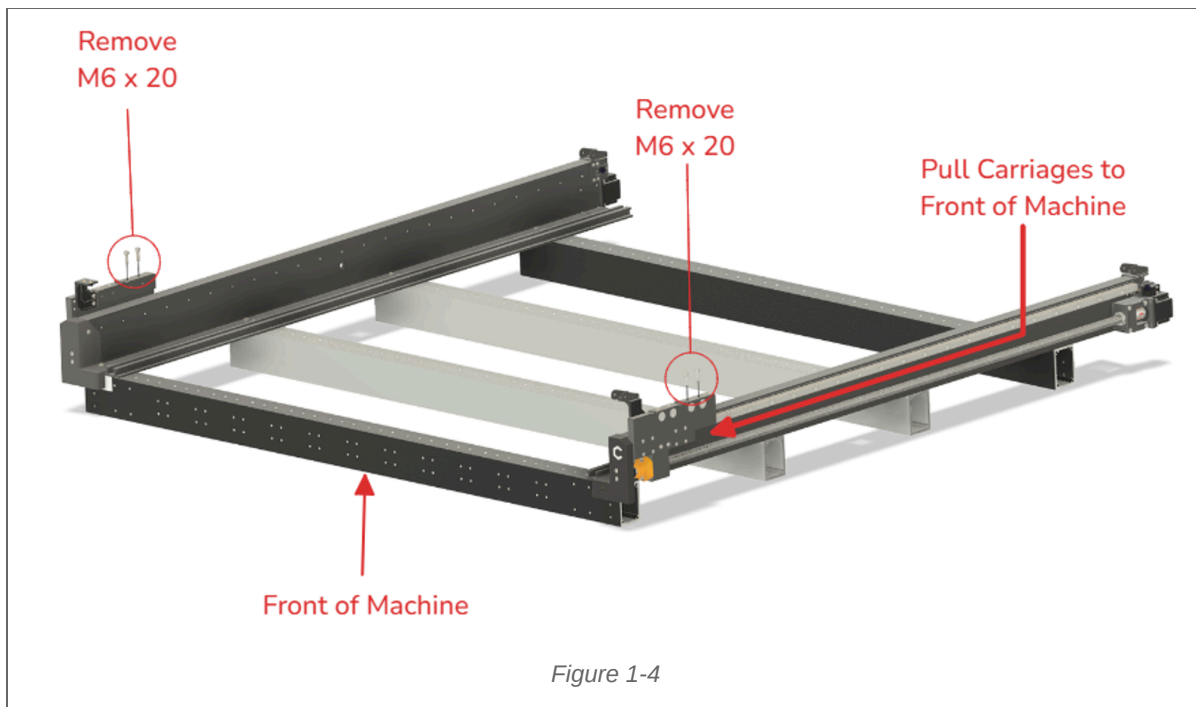
Figure 1-3a - Install Cable Track

1. Remove the adhesive cable track from **Shipping Box 1**.
2. Install the **Cable Track** on the last baseframe member at the back of the machine.
3. Remove the clear protective coating.
4. Remove the blue adhesive cover.
5. Position with the opening facing up.
6. Align the cable track to the bottom edge of the baseframe.
7. Center the cable track between the two Y-Axis assemblies, there will be about 4 inches (100 mm) on either side.
8. From one side, press firmly as you run your hand over the entire length of the track.

3.7 Prepare for Gantry Install

1. Pull the **Y-Right Carriage** to the front of the machine. See Fig. 1-4.
2. Pull the **Y-Left Carriage** to the front of the machine.
3. Use a 5mm hex key to remove the two (2) M6×20mm SHCS from the rear position of the Y-Right and Y-Left carriages.

NOTE: Keep the M6×20mm SHCS close by. You will need them to install the gantry.



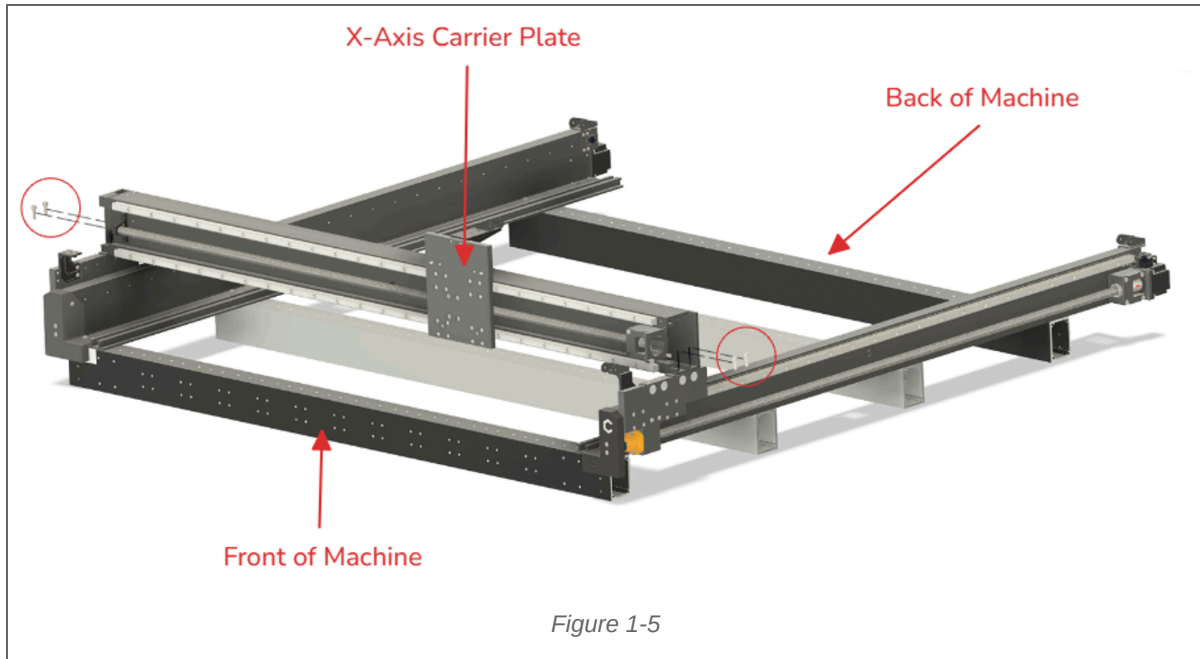
3.8 Open Shipping Box 2

1. Open Shipping Box 2. This box contains:

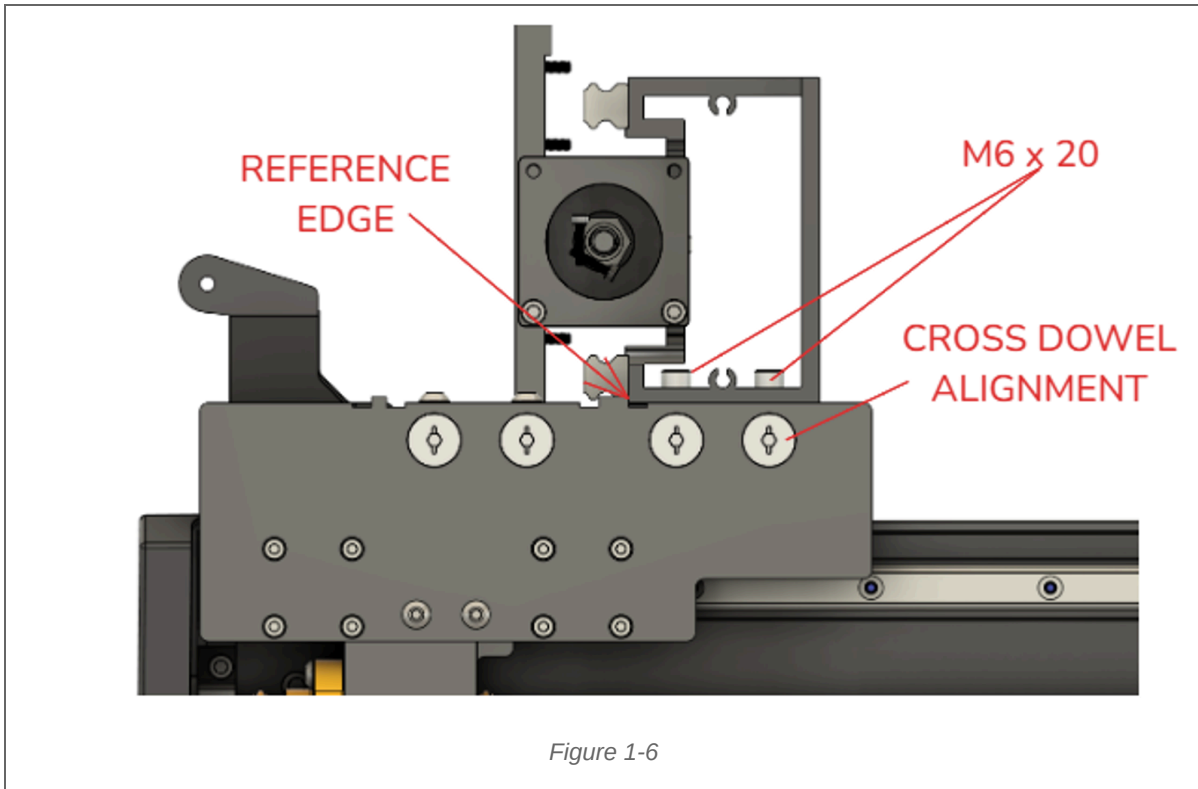
- Gantry Assembly (note that the X-Axis drag chain is pre-installed on the gantry).
- Hybrid Table (Aluminum extrusions and MDF Strips).

3.9 Install Gantry Assembly

WARNING: This step is much easier with two people. The X-Axis gantry assembly is heavy and can easily tip over. If the gantry tips over, the mating face on the bottom edge could be irreparably damaged, which will prevent the gantry from attaching properly to the Y-Axis assemblies.



1. Lift the **Gantry Assembly** from the box and set it onto the rear position of the Y-Axis carriage plates, over the now-empty screw holes. See Fig. 1-5.
2. Ensure that the large X-Axis carrier plate faces the front of the machine.
3. Hold the gantry firmly in place as you complete the steps on the following page.
4. From the right side of the machine, push the gantry toward the front of the machine until it engages with the reference edge on the top of the Y-Right carriage plate. See Fig. 1-6.



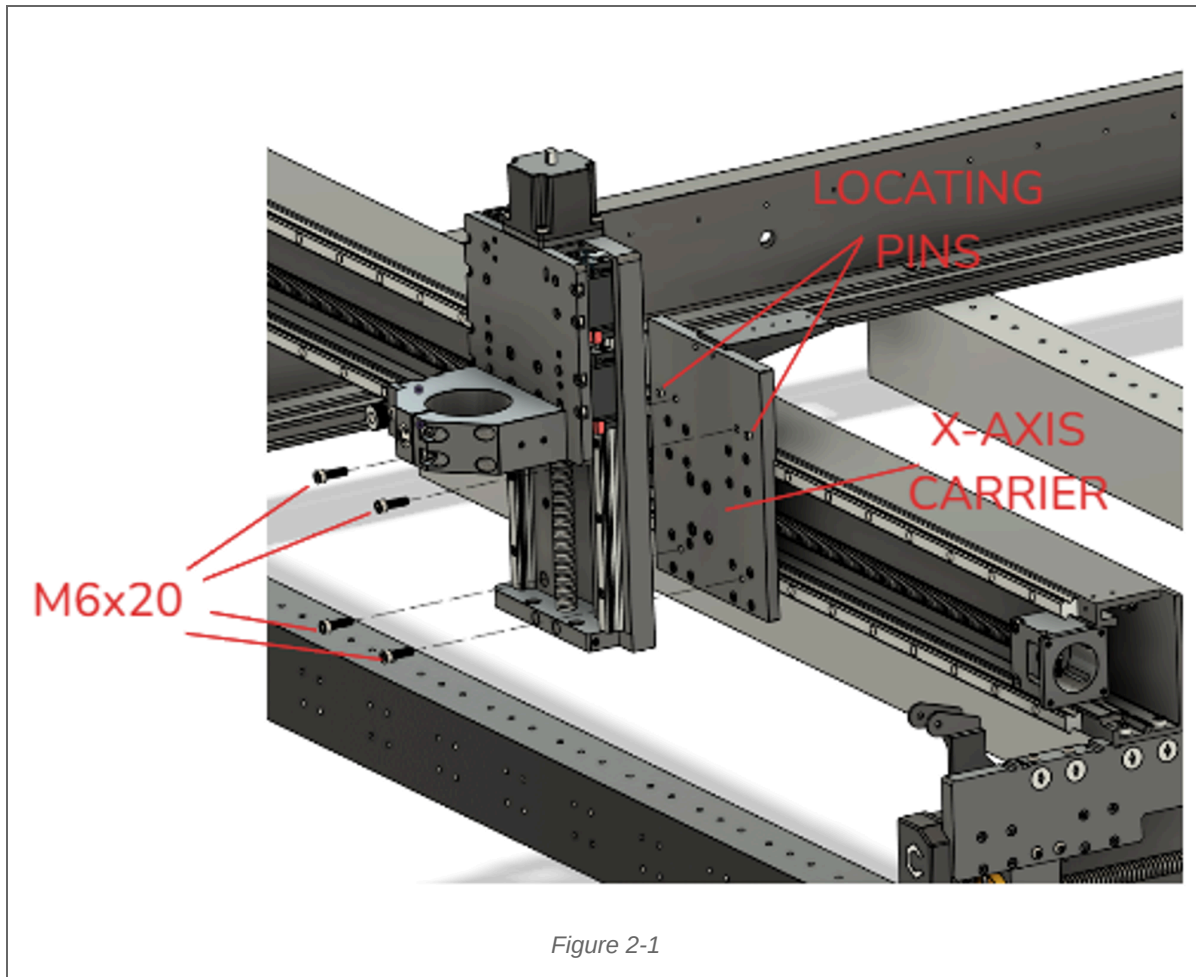
5. Orient the **Cross Dowels** so that the reference line on the face of each is vertical. See Fig. 1-6.
6. Use a 5mm hex key to loosely re-insert the two (2) M6×20mm SHCS to attach the gantry to the Y-Right Assembly. See Fig. 1-7.
7. From the left side of the machine, push the gantry forward until it engages with the reference edge on the top of the Y-Right carriage plate.
8. Orient the **Cross Dowels** so that the reference line on the face of each is vertical. See Fig. 1-7.
9. Use a 5mm hex key to loosely re-insert the two (2) M6×20mm SHCS to attach the gantry.
10. Ensure that both Y-carriage plates are still in the furthest forward position.
11. Keep pressure on the gantry to keep it engaged with the reference edge on each carriage as you fully tighten all four (4) M6×20mm SHCS.

3.10 Square the Machine

1. Check that the **Y-Right Carriage** and the **Y-Left Carriage** are still pushed to the front of the machine.
2. Starting on the right side, use a 4mm hex key to fully tighten the first pair of M6×16mm BHCS to secure the Y-Right assembly to the first baseframe member.
3. Moving to the left side, use a 4mm hex key to fully tighten the first pair of M6×16mm BHCS.
4. Push the gantry back to the second baseframe member and fully tighten the pair of screws on the right side, then on the left side.
5. Push the gantry back to the third baseframe member and tighten the screws on the right, then on the left.
6. Push the gantry all of the way to the back of the machine until it hits the Y-motor mounts and tighten the screws on the right, then on the left.

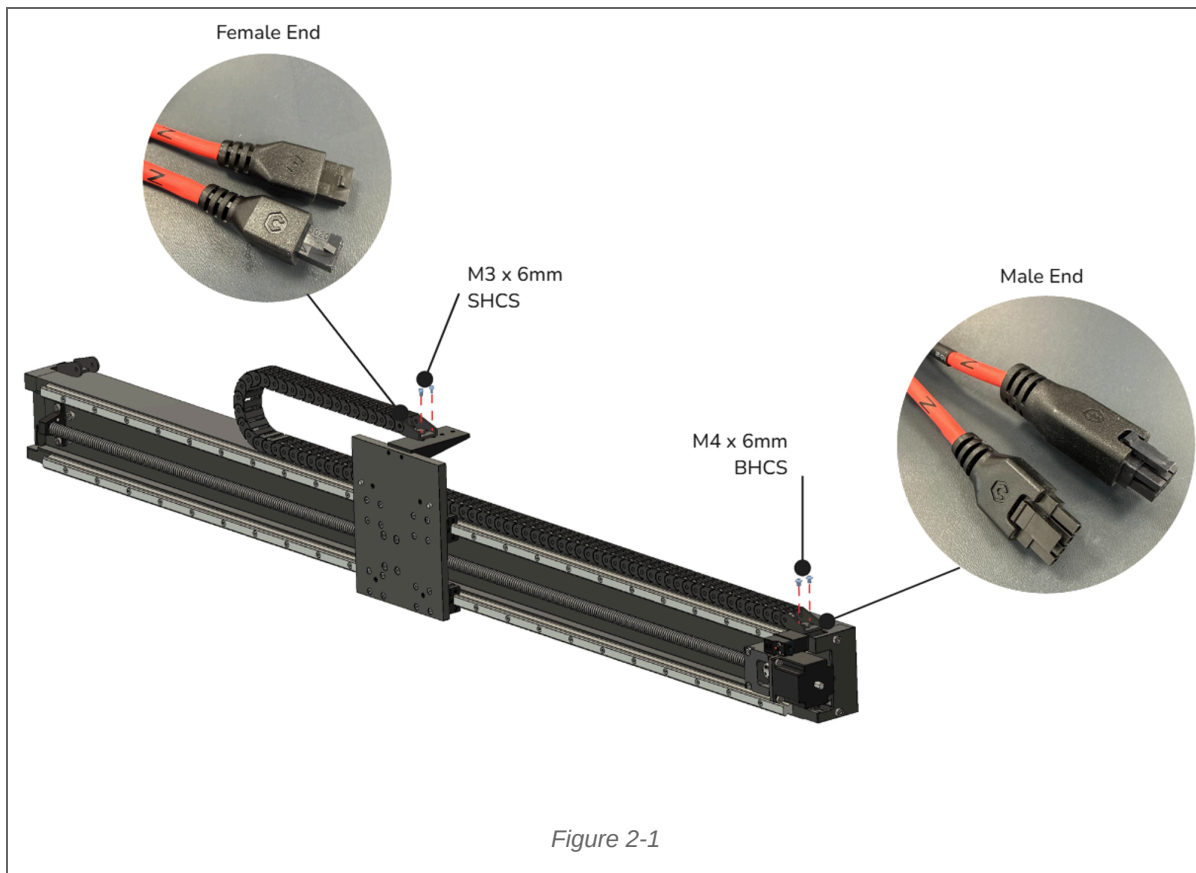
4. Install the HDZ (Z-Axis)

Items Required	Qty
HDZ (Z-Axis)	1
HDZ Hardware: M6×20mm Socket Head Cap Screws	4
X-Motor Hardware: M5×10mm Socket Head Cap Screws	4
X-Axis Stepper Motor	1



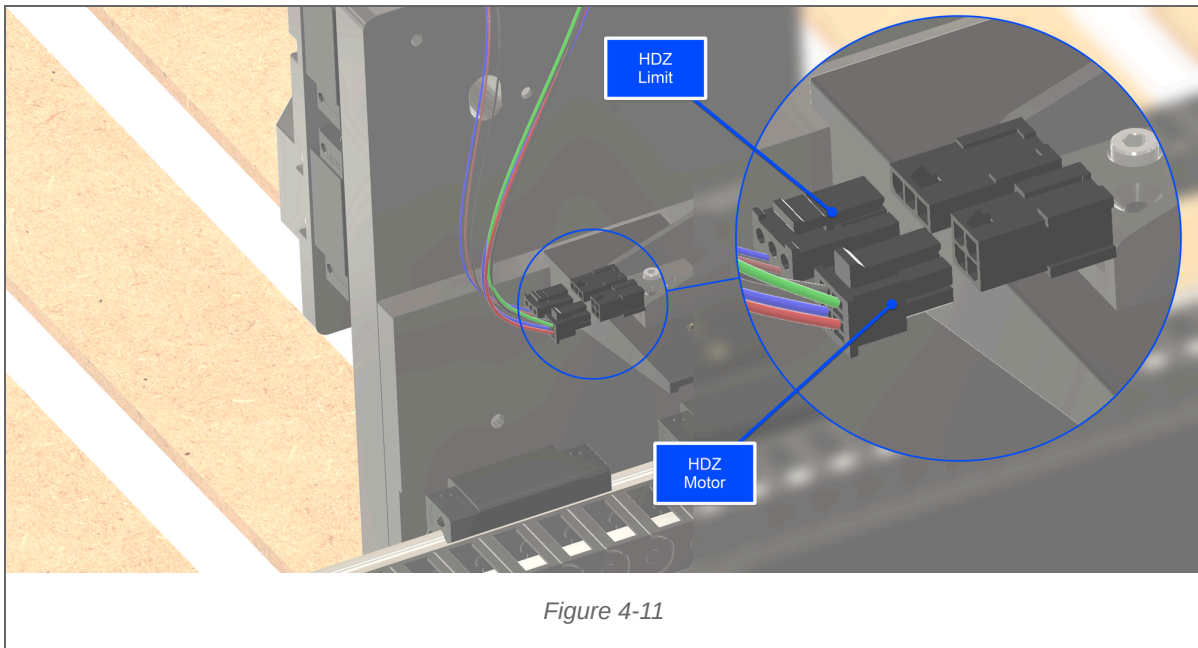
1. Open the **HDZ Box** and remove the assembled HDZ (Z-Axis Assembly), HDZ hardware, X-Axis stepper motor, X-Axis stepper motor hardware.
2. Set the Y-Left and Y-Right end caps and hardware aside. You will not need them until step 4 and step 5.
3. Align the HDZ with the two (2) short locating pins on the front of the X-Axis carrier plate and push it onto the carrier plate. See Fig. 2-1.
 - Z-Axis stepper motor on top.
 - The HDZ slides onto the two (2) locating pins. Note that it may not slide completely onto the pins until the four SHCS are fully tightened.
4. Hold the HDZ in place as you loosely insert four (4) M6×20mm SHCS. See Fig. 2-1. **Do not let go of the HDZ until at least two (2) of the SHCS are installed.**
5. Use a 5mm hex key to fully tighten the SHCS and secure the HDZ to the carrier plate.

4.1 Install the Gantry Drag Chain



1. Open the Gantry Harness Box from Shipping Box 2
2. Using 3mm Hex Key attach drag chain bracket with M5 x 10mm BHCS to back of X-Carrier Plate
3. Using M3 x 6mm SHCS, attach female end of Gantry Harness to Drag Chain Bracket
4. Using M4 x 6mm BHCS, attach male end of Gantry Harness to top of Gantry Tube

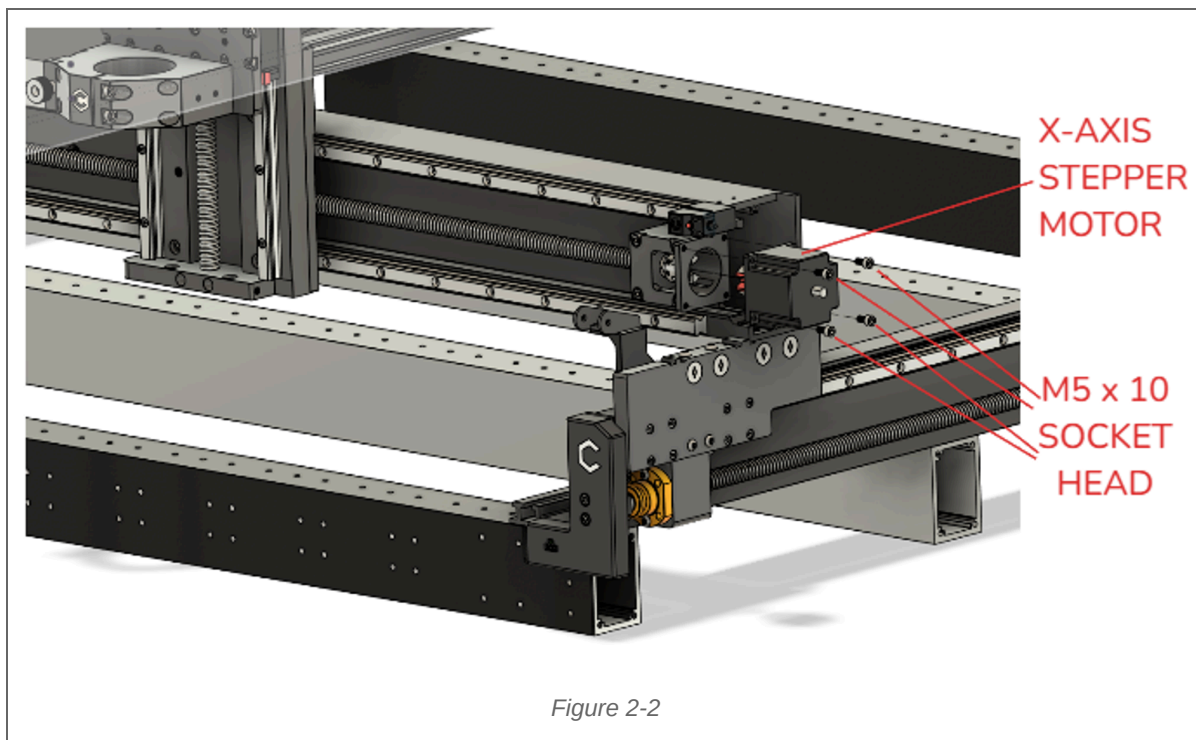
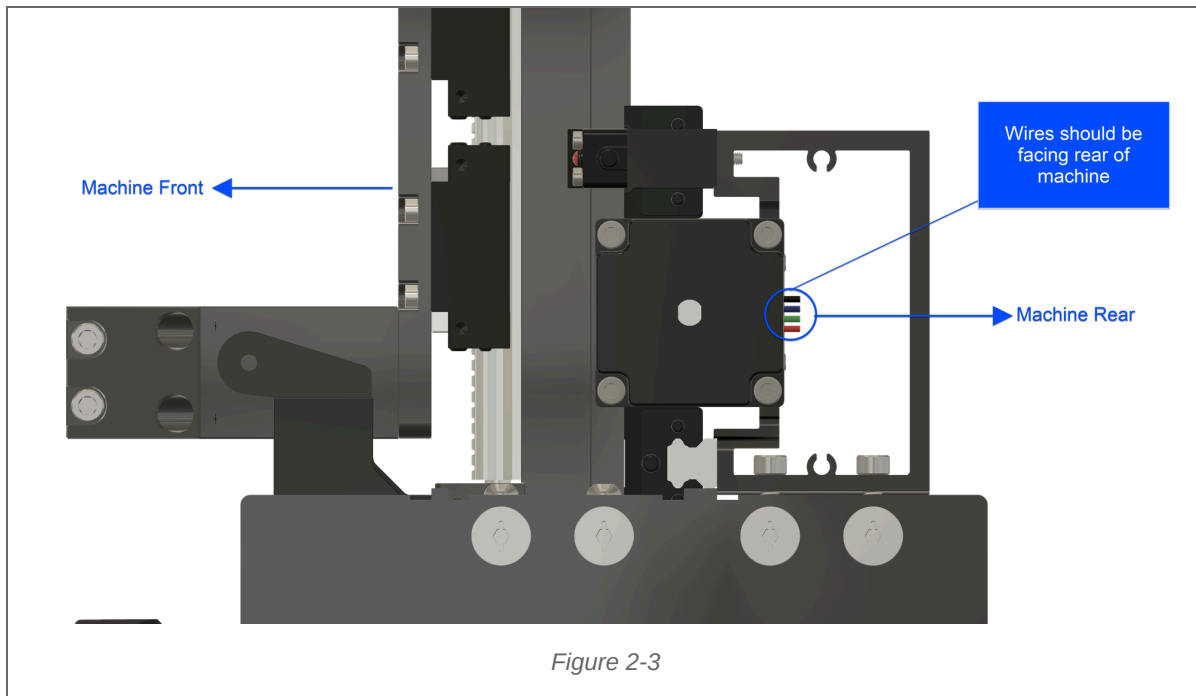
4.2 Connect Z-Axis Cables



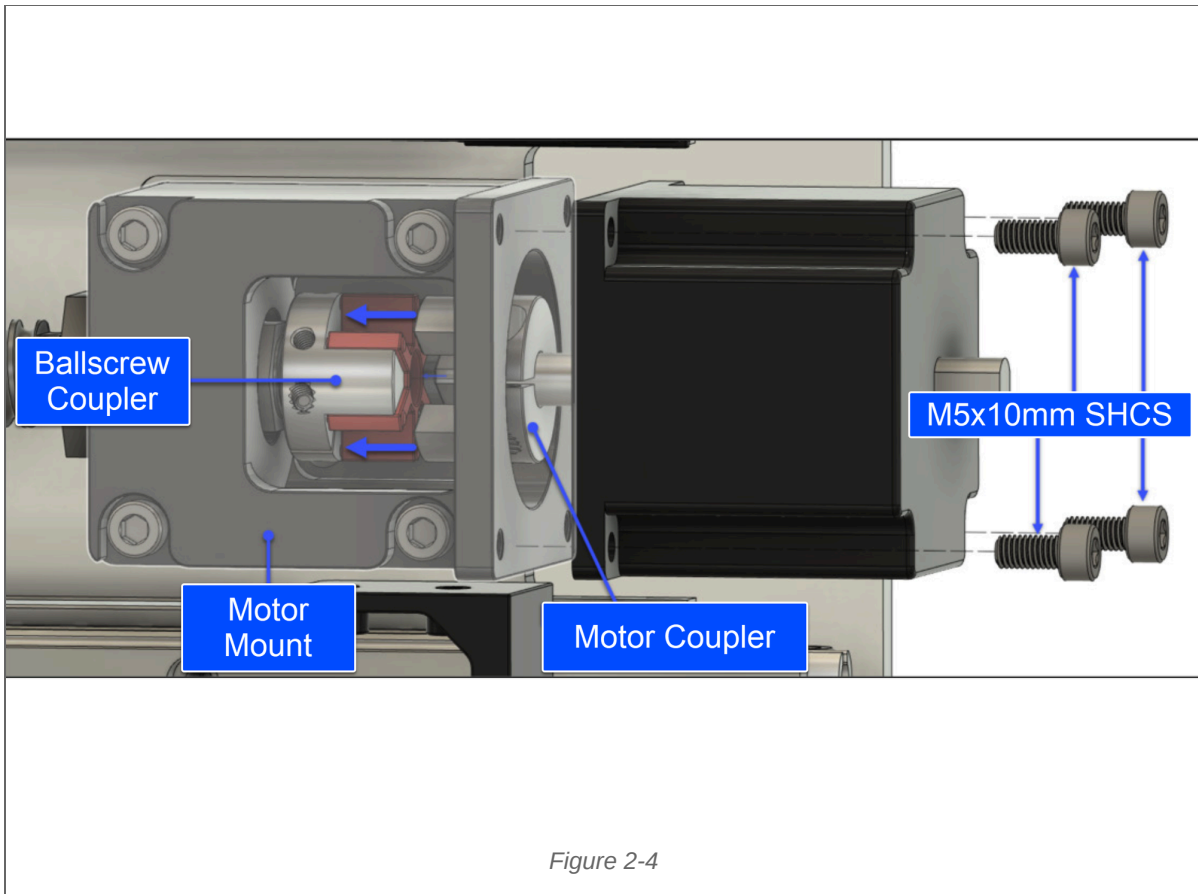
1. At the back of the HDZ, connect the Z-Axis motor and Z-Axis limit switch cables to Gantry Harness.
See Fig. 4-11.

4.3 Install X-Axis Stepper Motor

1. Locate the X-motor in the HDZ box.
2. Orient the X-motor with the motor coupler facing toward the mount. See Fig. 2-2.
3. Ensure that the motor wires face the rear of the machine. See Fig. 2-3.
4. Rotate the motor shaft until the motor coupler is lined up with the ball-screw coupler inside the mount.



5. Press the couplers together until fully seated and the motor is flush with the motor mount. See Fig. 2-4.
6. Use a 4mm hex key and four (4) M5×10mm SHCS to secure the X-motor to the motor mount. Fully tighten.



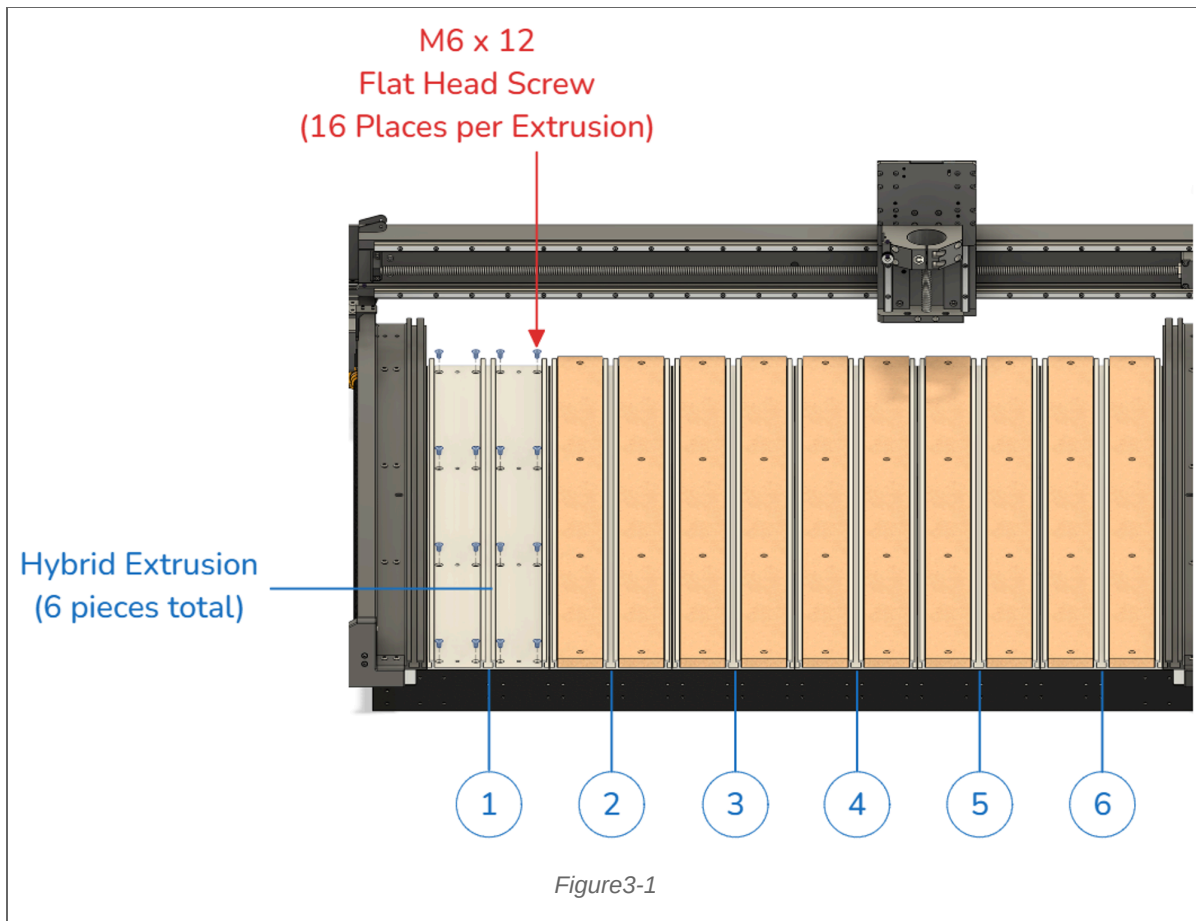
WARNING: Do not adjust the coupler. Each ballscrew and motor assembly is pre-assembled according to very specific standards, manually adjusting the coupler could negatively affect the performance of your machine.

5. Hybrid Table

WARNING: Do not use power tools to build the Hybrid Table. It is very easy to apply too much torque and strip threads or cross-thread a screw.

Items Required	Qty (4x4)	Qty (4x2)	Qty (2x2)
Hybrid Table Extrusions	6	6	3
M6x10 Flat Head Screws	96	72	36
MDF Strip	12	12	6
M6x20 Socket Head Cap Screws	48	36	18

5.1 Install Extrusions



1. Locate the **Hybrid Table Extrusions** and **MDF Strips** from **Shipping Box 2** (the MDF Strips are nested inside the extrusions)
2. Lay the twelve (6) aluminum Hybrid Table Extrusions across the baseframe, right to left. (Only six (3) extrusions are required for the 2x2 machine.)
3. Use a 4mm hex key and eight (8) M6×10mm FHS to **loosely** attach each extrusion. Insert the screws from front to back. See Fig. 3-1.
4. Fully tighten all screws to secure the **Hybrid Table Extrusions**.

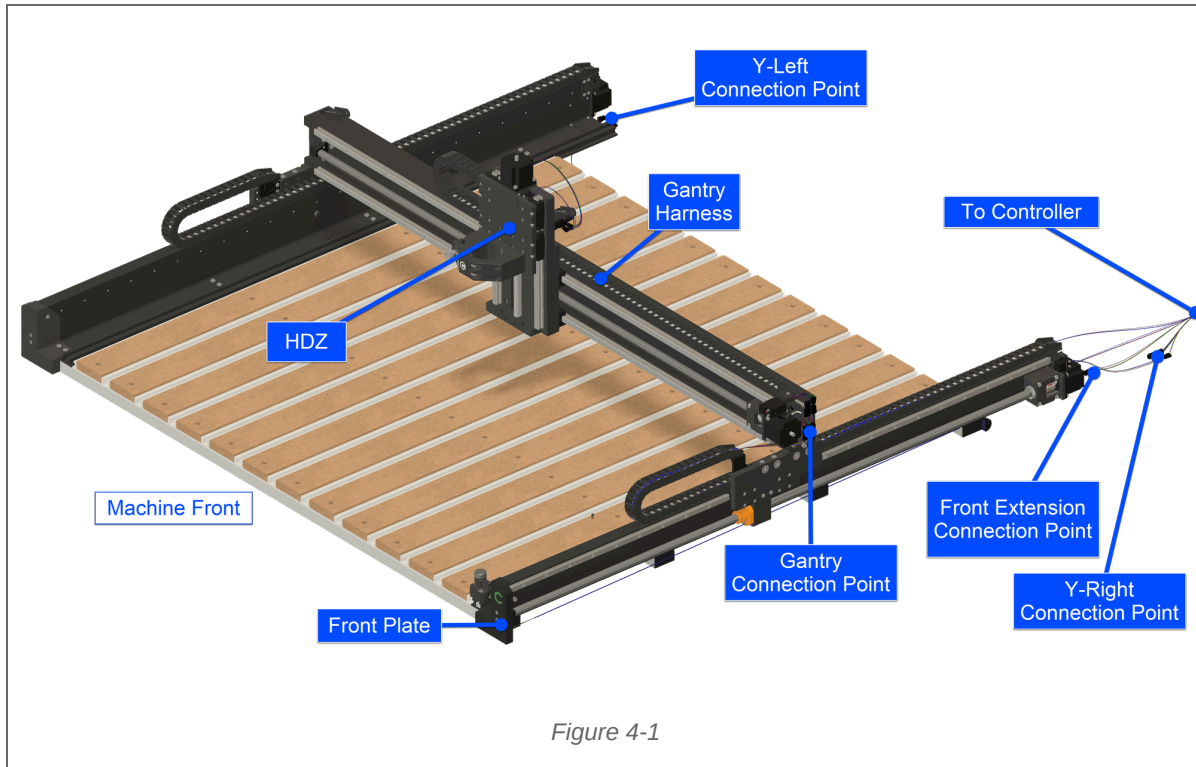
5.2 Install MDF Strips



1. Position the twelve (12) **MDF Strips** inside the Hybrid Table Extrusions. See Fig. 3-2.
2. Use a 5mm hex key and four (4) M6×20mm SHCS to **loosely** attach each MDF Strip. Insert the screws from front to back.
3. Fully tighten all screws to secure the **MDF Strips**.

6. Wiring Harness

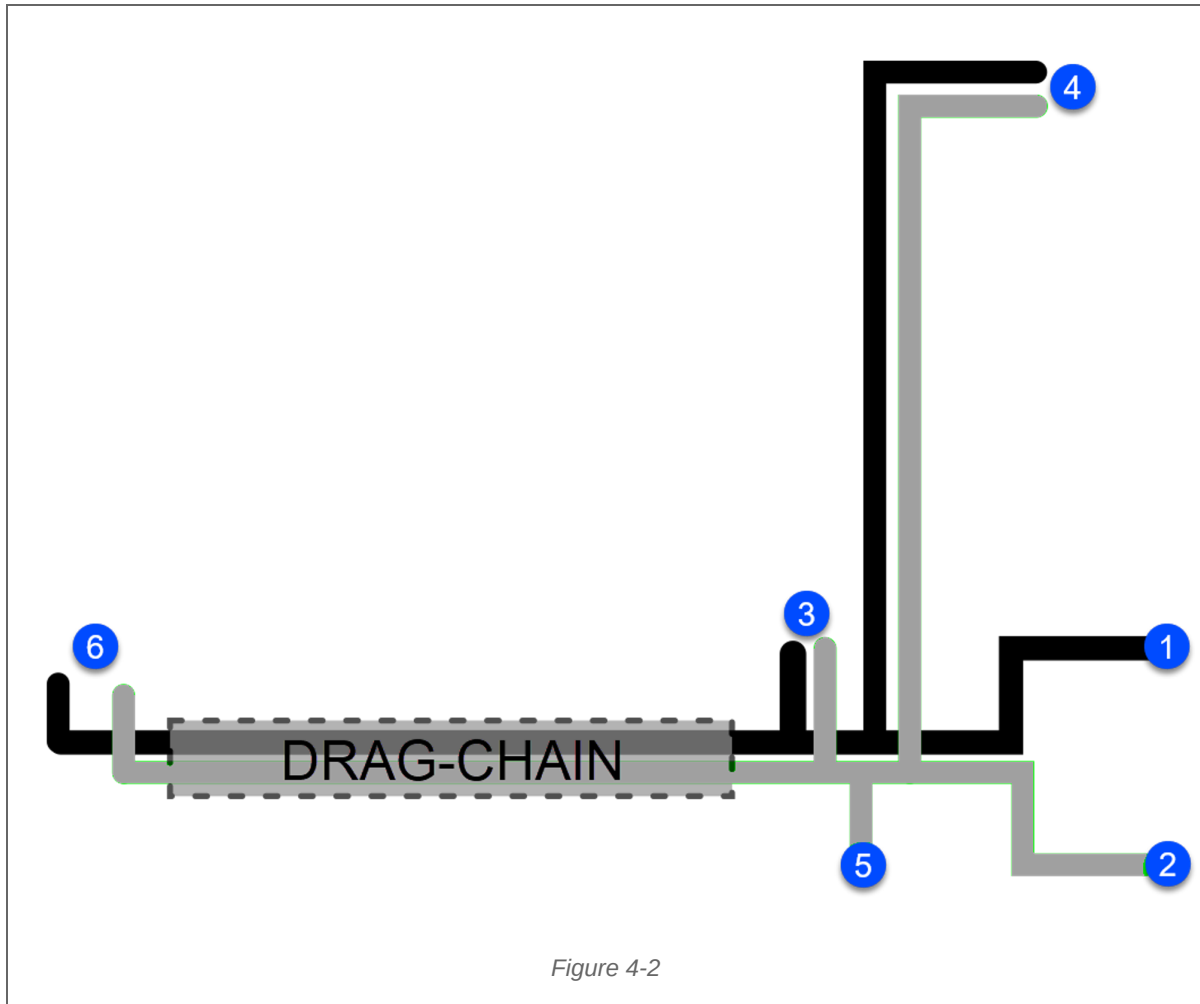
The Shapeoko 5.1 Pro wiring has been fully tested before shipping and is expected to be plug-and-play during the assembly process.



Looking closer at the wiring harness you will find two (2) separate harnesses bundled together:

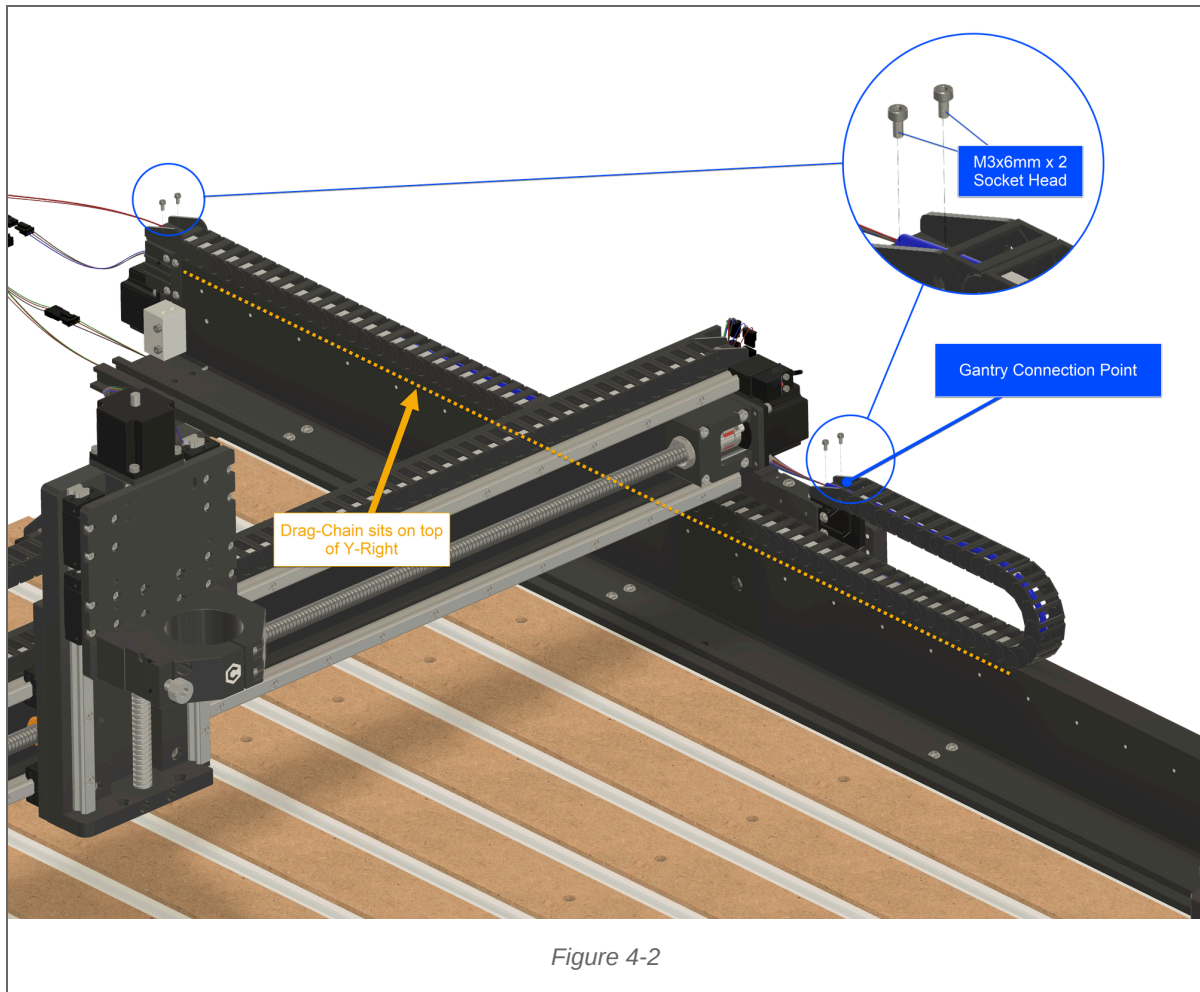
1. The larger harness controls the motors and LED.
2. The smaller harness controls the limit switches and grounding.

The harness has several branches, each branch controls a different segment of your machine. All branches are shown in **Fig. 4-2** and a detailed description of each branch's connection points can be found in the table below:



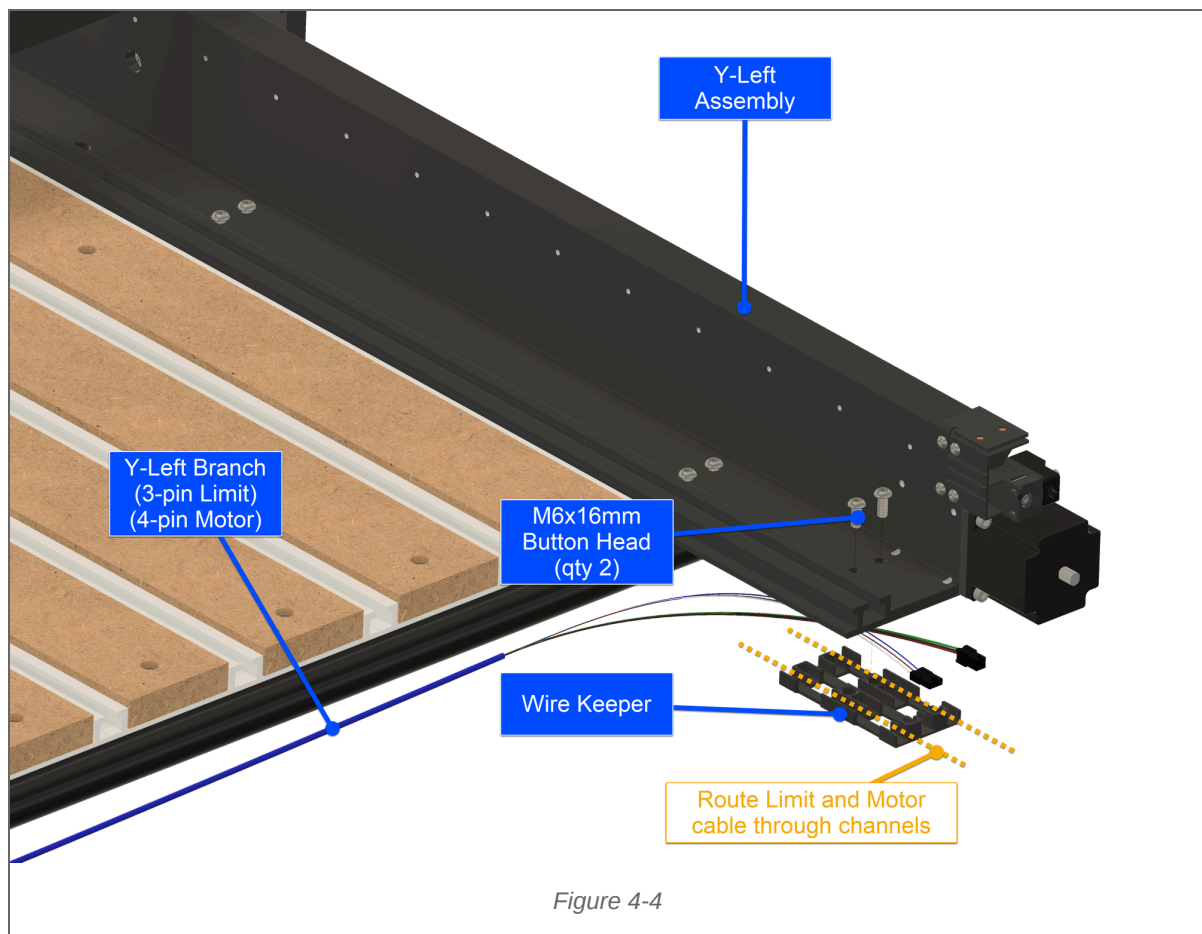
Item	Name	Connectors	Connects To:
1	Motor Harness	1	Connects to Controller
2	Limit Harness	1	Connects to Controller
3	Y-Right Connection Point	2	Y-Right Motor, Y-Right Limit
4	Y-Left Connection Point	2	Y-Left Motor, Y-Left Limit
5	Front Plate Connection Point	1	Front Plate Extension
6	Gantry Connection Point	6	X Motor, Z Motor, LED, X Limit, Z-Limit, GND

6.1 Install Wiring Harness



1. Remove the wiring harness and drag chain hardware bag from the **Wiring Harness Box** (found inside the main S5 Electronics Box).
2. Unroll and lay the wiring harness on the baseframe running parallel with the **Y-Right** assembly.
3. Lift the drag chain, slide it under the gantry, and place it on top of the Y-Right assembly.
4. Curl the **Gantry Connection Point** of the wiring harness up so that it rests on the carrier plate bracket. See Fig. 4-2.
5. Use a 2.5mm hex key and two (2) M3×6mm SHCS to secure the drag chain at both ends. Fully tighten. See Fig. 4-2.
6. Put the drag chain hardware bag, with the remaining screws, back in the Wiring Harness Box. You'll need them when we install the router drag chains in Step 5.

6.2 Install YL Wire Keeper

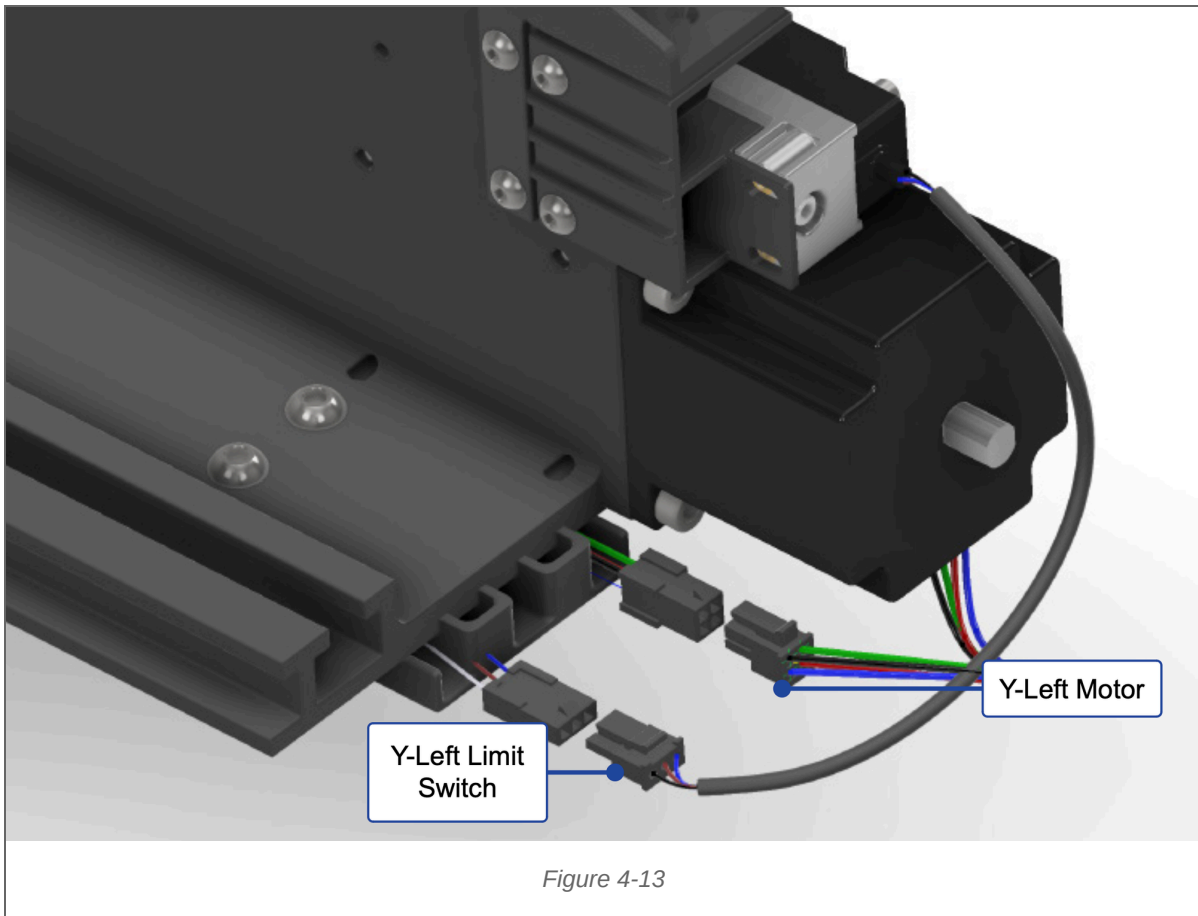


NOTE: The wire keepers provide a route to keep your cables protected and maintain their position below the Y-Axis assemblies

1. Move to the back of the machine.
2. Locate the long Y-Left wiring bundle extending from the wiring harness (the long bundle *NOT* inside the drag chain).
3. Using a Wire Keeper from the **Wiring Harness Box**
4. Place the wire keeper under the Y-Left assembly. See Fig. 4-4.
5. Route the Motor and Limit cables inside the channels on the wire keeper.
6. Align the screw holes in the wire keeper with those in the assembly.
7. Use a 4mm hex key and two (2) M6×16mm BHCS to attach the wire keeper to the Y-Left assembly. Fully tighten. See Fig. 4-4.

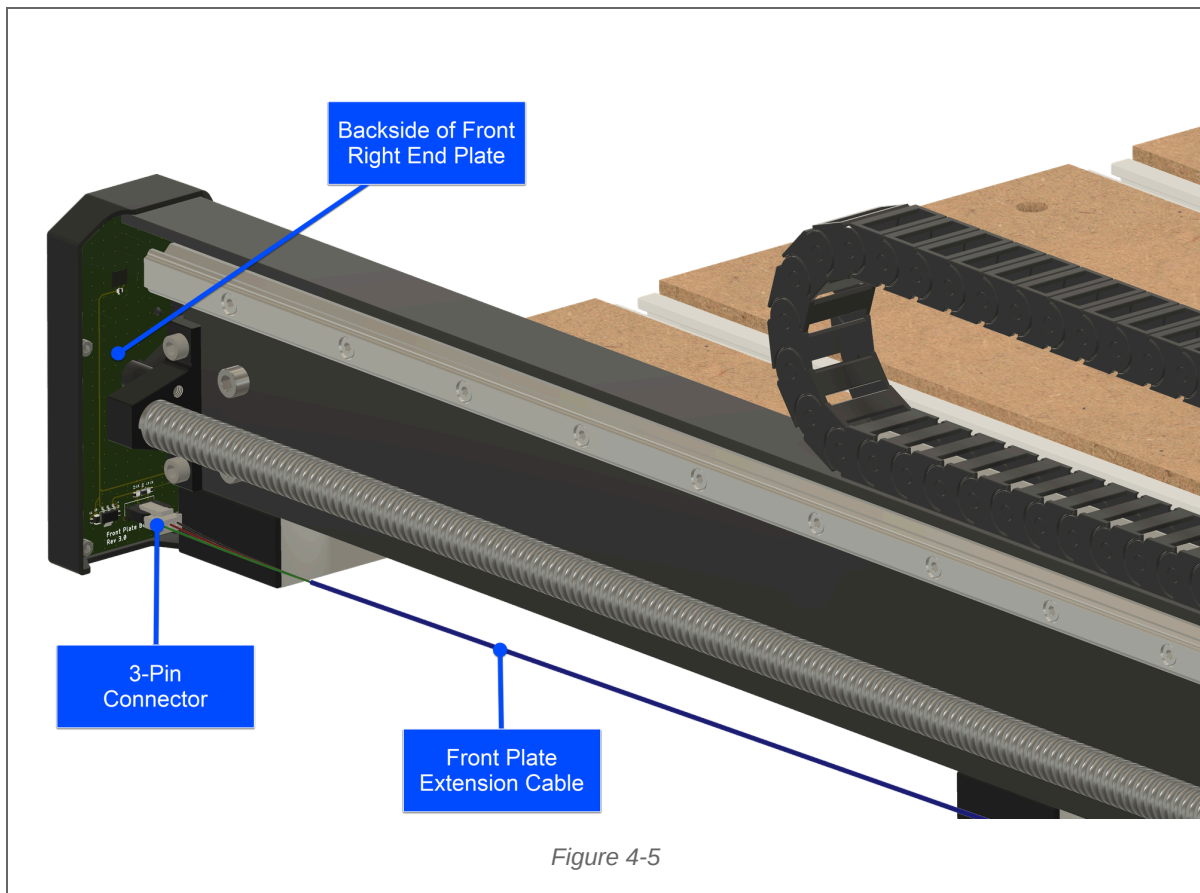
NOTE: When securing the wire keepers, make sure all cables are seated in channels and will not be pinched/crushed when keepers are tightened

6.3 Connect Y-Left Motor and Limit Cables



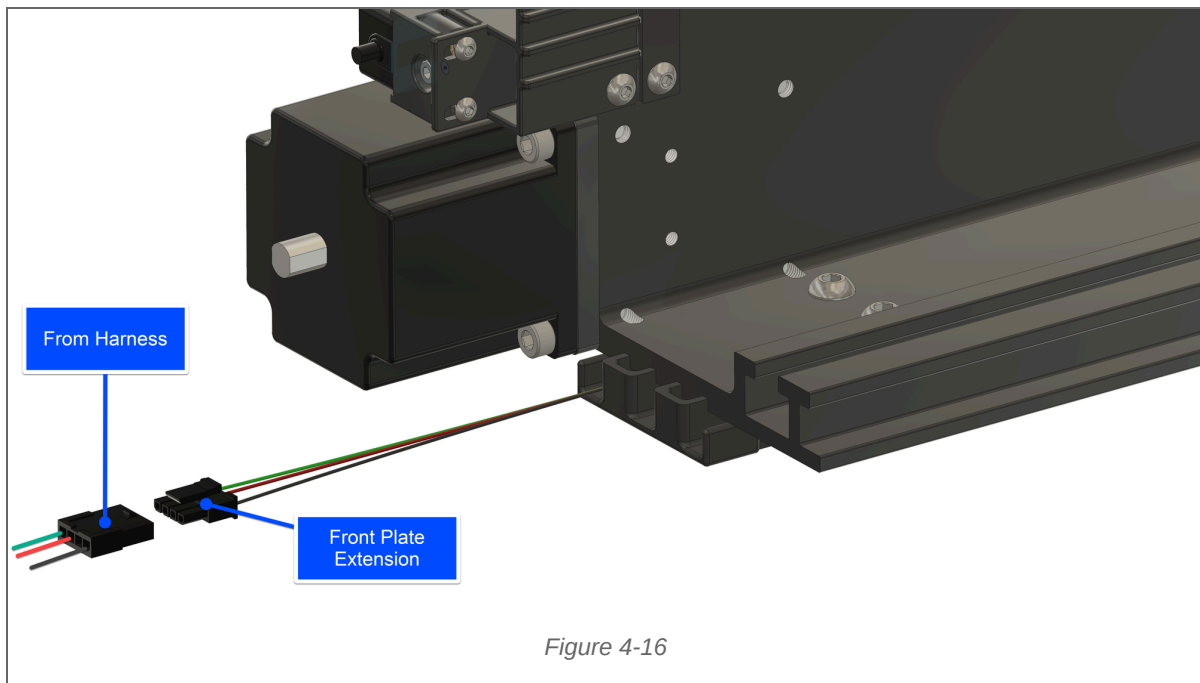
1. Locate the two (2) connectors, 4-pin Y-Left-motor and 3-pin Y-Left-limit switch, exiting from the Y-Left wire keeper.
2. Connect the Y-Left stepper motor. See Fig. 4-13.
3. Connect the Y-Left limit switch. See Fig. 4-13.

6.4 Connect Front Plate



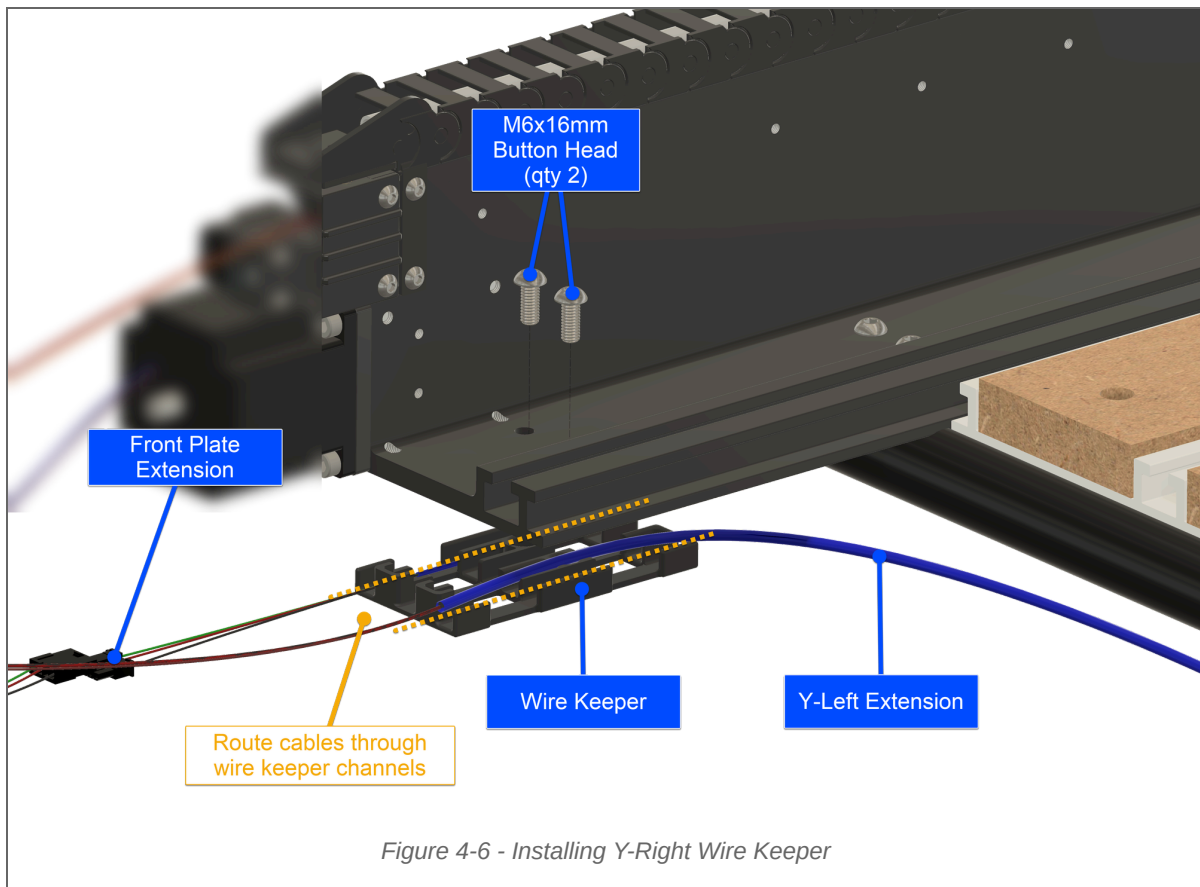
1. Locate the front plate extension cable (3-pin to 4-pin) in the Wiring Harness box.
2. Plug the cable's 3-pin connector into the 3-pin outlet on the back side of the front plate. See Fig. 4-5.
3. Moving towards the back of the machine, snap each wire clip over the cable.
4. Direct the end of the cable past the final baseframe member and under the end of the Y-Right assembly.

Connect Front Plate to Harness



1. Locate the single-row 4-pin connector coming from the Harness
2. Plug the Front Plate extension into the 4-pin connector.

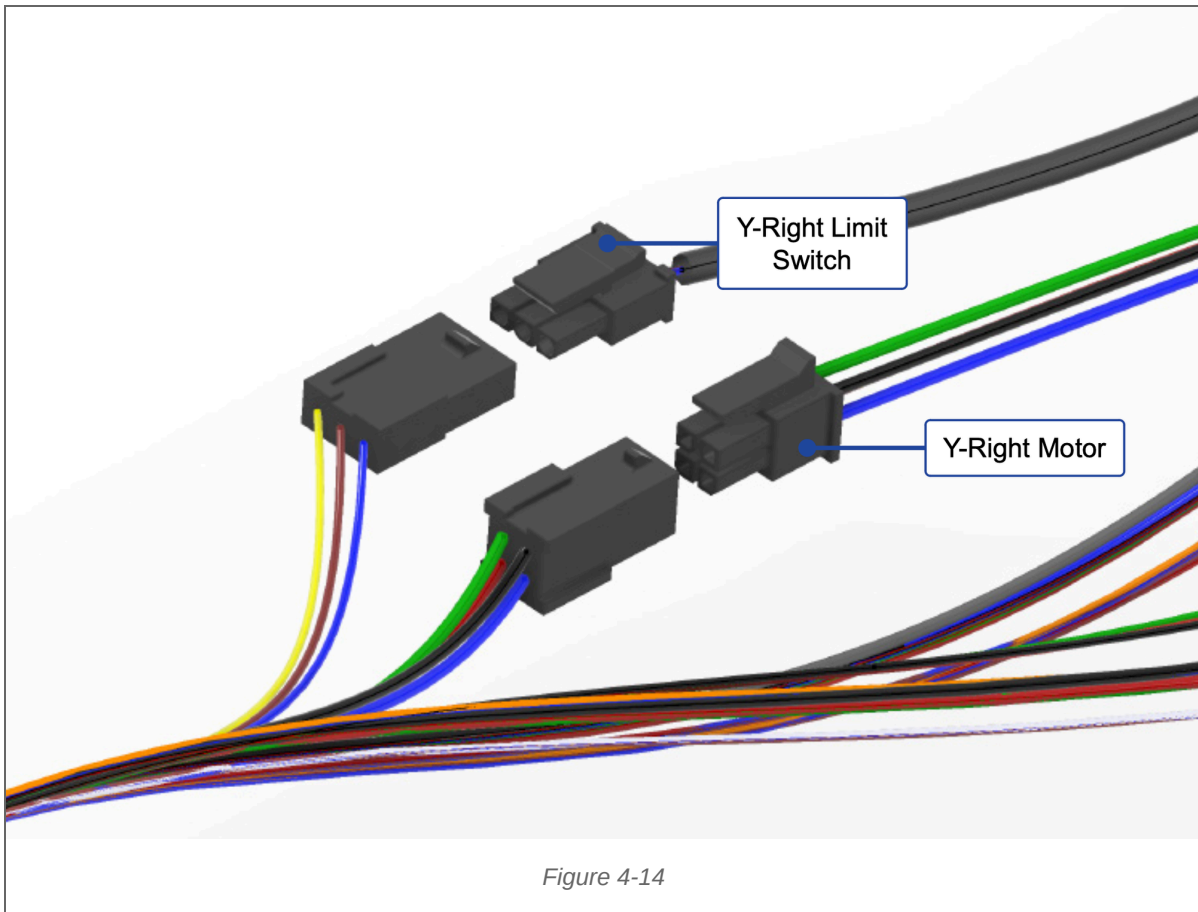
6.5 Install YR Wire Keeper



1. Use the other Wire Keeper from the *Wiring Harness Box** and Fig. 4-6 and Fig. 4-16 as a reference.
2. Set the **Front Plate Extension** cable into the Wire Keeper.
3. Set the Y-Left cables into the Wire Keeper.
4. Place the wire keeper under the Y-Left assembly.
5. Align the screw holes in the wire keeper with those in the assembly.
6. Use a 4mm hex key and two (2) M6×16mm BHCS to attach the wire keeper to the Y-Right assembly.
Fully tighten.

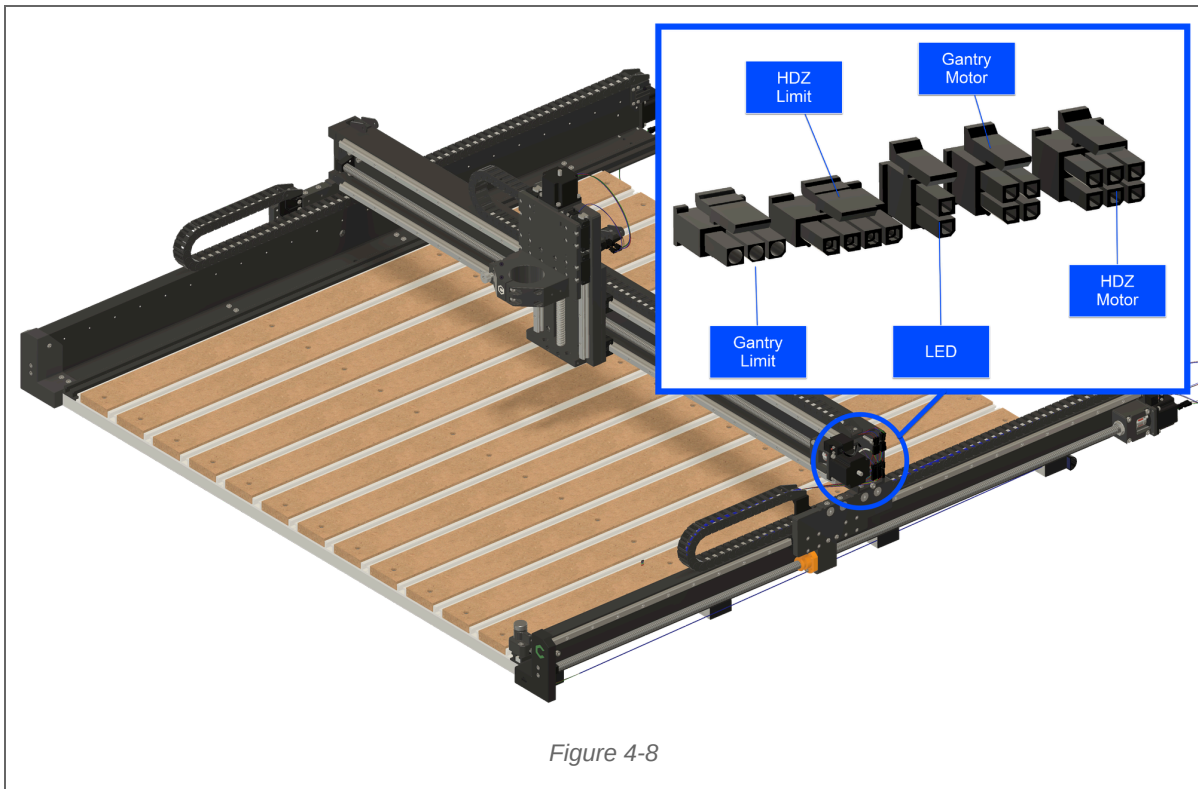
NOTE: When securing the wire keepers, make sure all cables are seated in channels and will not be pinched/crushed when keepers are tightened.

6.6 Connect Y-Right Motor and Limit Cables



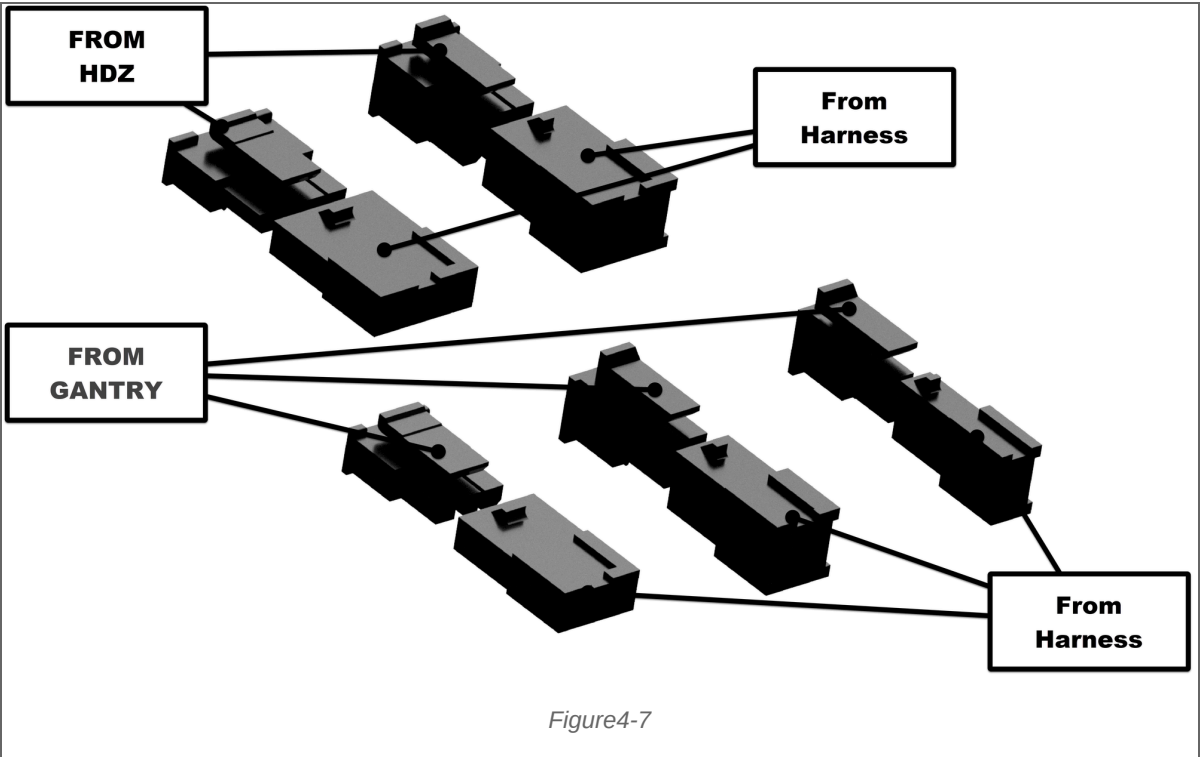
1. Move to the right side of the machine.
2. Locate the two (2) Y-Right cables (one 4-pin and one 3-pin) exiting the wiring harness trunk.
3. Connect the Y-Right stepper motor. See Fig. 4-14.
4. Connect the Y-Right limit switch. See Fig. 4-14.

6.7 Connect Gantry



NOTE: The Harness Gantry Connection Point Consists of five (5) connectors, detailed in Fig. 4-8 and described in the table below. Each of these connectors is polarized and will only connect one way. Be sure the connectors are properly oriented with the locking tabs aligned before plugging them in. **Do not force a connection.**

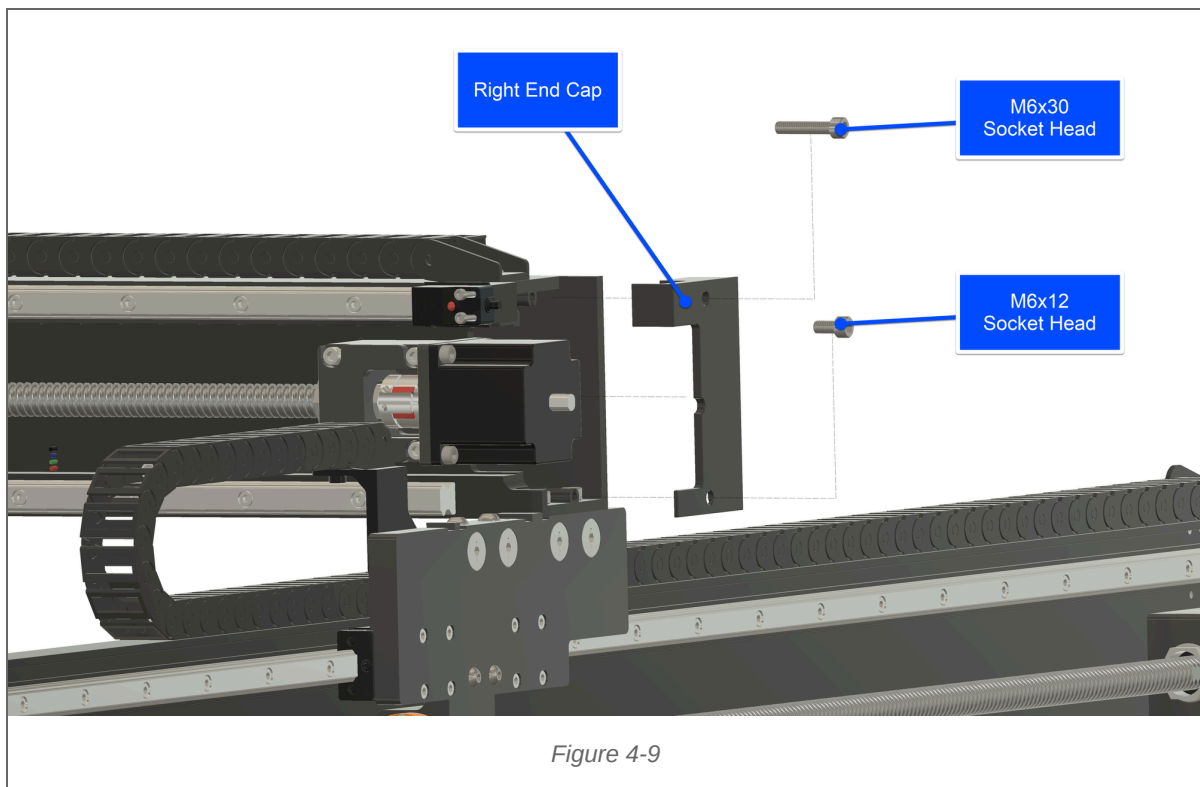
Item	Description	Connector Type
HDZ Limit	Connects to HDZ Limit Extension from HDZ	1x4
HDZ Motor	Connects to HDZ Motor Extension from HDZ	2x3
Gantry Motor	Connects to Gantry Motor	2x2
Gantry Limit	Connects to Gantry Limit	1x3
LED	Connects to LED Strip	2x1



1. Move to the right side of the machine so you have clear access to the end of the gantry and the harness installed in the previous step.
2. Connect the gantry LED to the Harness using the 2-pin connector.
3. Connect the Gantry Motor to the Harness using the 4-pin dual-row connector.
4. Connect the Gantry Limit to the Harness using the 3-pin connector.
5. Connect the HDZ Motor to the Harness using the 6-pin connector.
6. Connect the HDZ Limit to the harness using the 4-pin single-row connector.

NOTE: Carefully tuck all five (5) of the cables you just connected into the open end of the gantry. Ensure the cables are not pinched or bent at extreme angles.

6.8 Install Y-Right End Cap



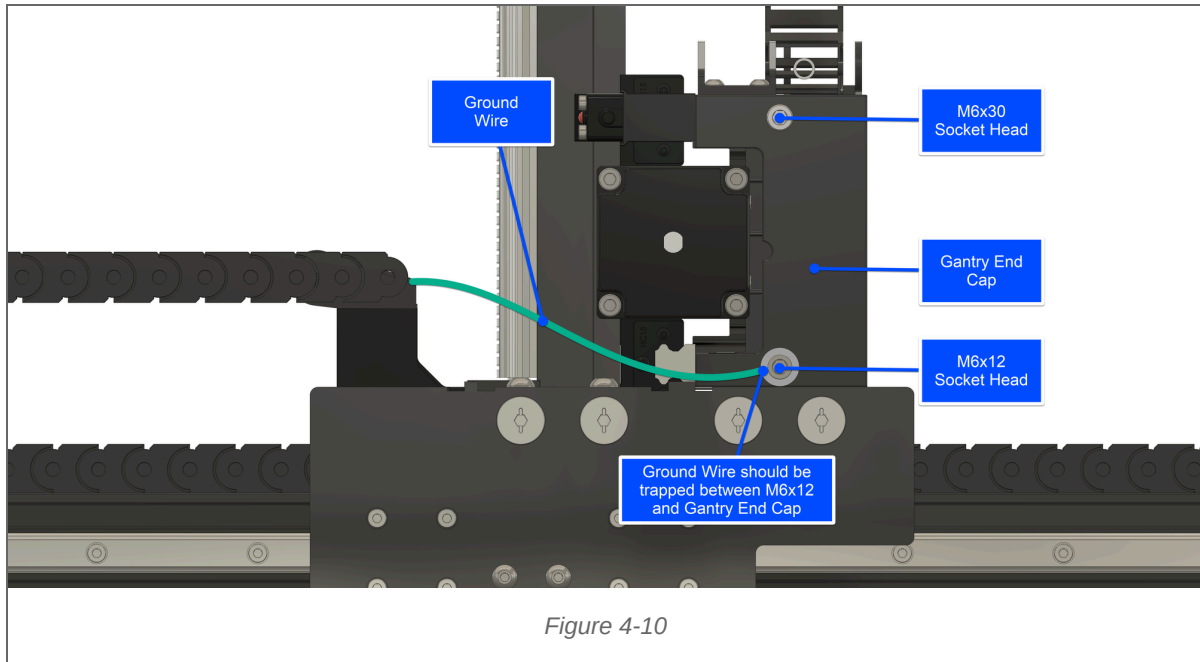
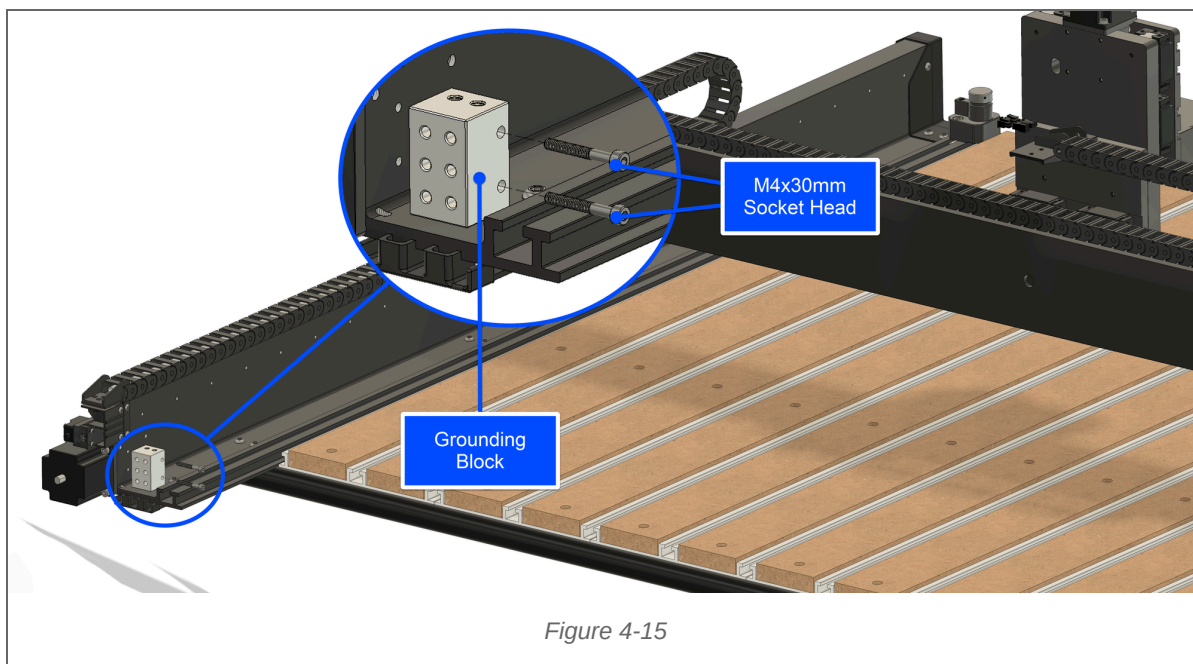


Figure 4-10

1. Gather the Right End Cap and hardware (one M6×30mm and one M6×12mm SHCS).
 2. Make sure the gantry wiring is tucked into the cavity in the Gantry.
 3. Place the Right End Cap on the End of the Gantry. See Fig. 4-9.
 4. Use a 5mm hex key to insert one (1) M6×30mm SHCS through the top screw hole.
 5. Locate the green and yellow grounding wire exiting the wiring harness at the Gantry.
 6. Place the loop at the end of the grounding wire onto the end of the M6×12mm SHCS. See Fig. 4-10.
 7. Use a 5mm hex key to insert the M6×12mm SHCS through the bottom screw hole in the end cap.
- See Figs. 4-9 and Fig. 4-10.

6.9 Install Grounding Block



1. Locate the grounding block and its hardware in the Grounding Block bag.
2. Position the grounding block on the inside of the Y-Right assembly, at the rear. See Fig. 4-15.
3. Rotate the grounding block so the six (6) non-threaded holes face the rear and the two (2) threaded holes face up.
4. Use a 3mm hex key and two (2) M4×30mm BHCS to attach the grounding block to the inside of the Y-Right assembly. See Fig. 4-15.
5. Locate the green and yellow cable with the banana plug exiting the wiring harness.
6. Insert the banana plug into any of the six (6) non-threaded holes on the rear face of the grounding block.

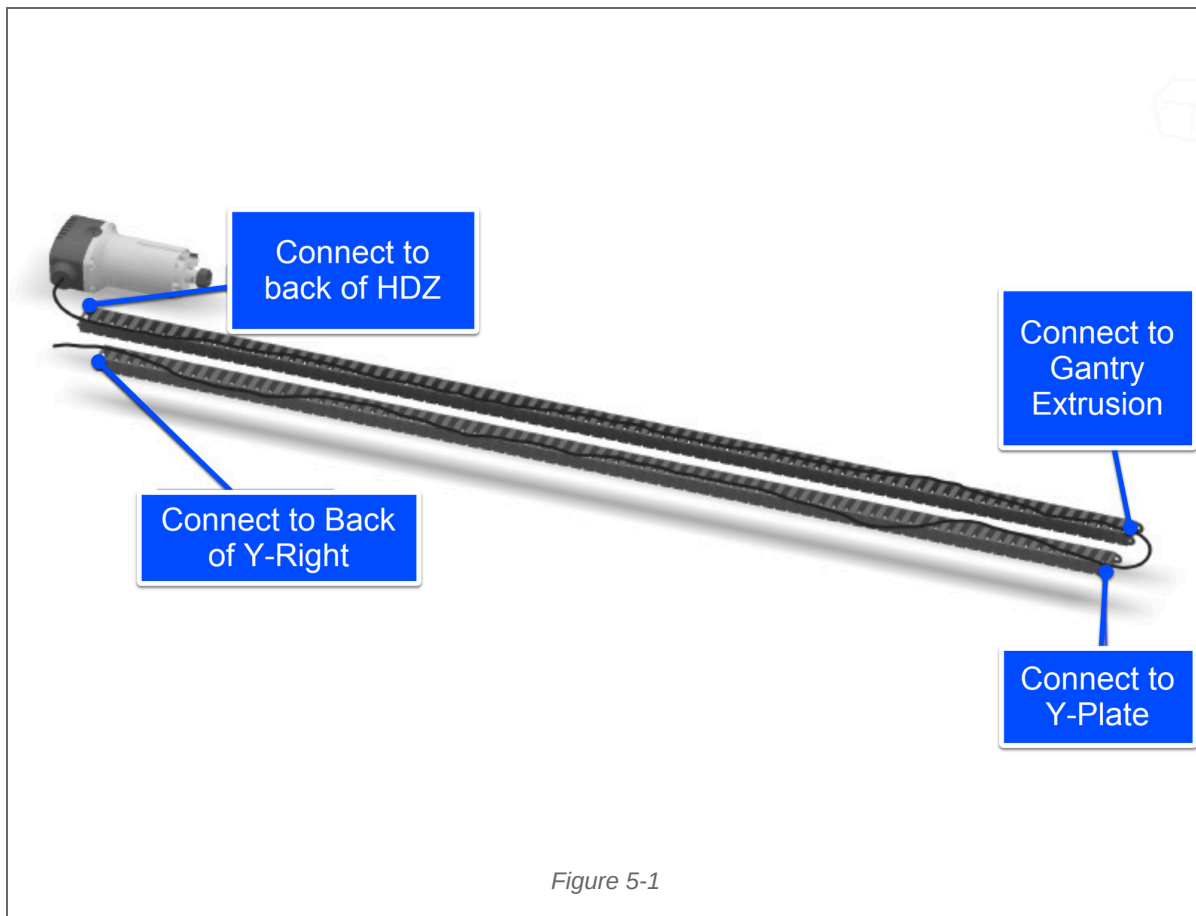
7. VFD / Router

Items Required	Qty
X- and Y-Axis Router Drag Chains	2
Router / Spindle (Optional Purchase)	1
Drag Chain Hardware: M3×6mm SHCS (6); M4×6mm BHCS (2)	1
Y-Left End Cap	1
Top End Cap Hardware: M6×30mm Socket Head Cap Screw	1
Bottom End Cap Hardware: M6×12mm Socket Head Cap Screw	1

7.1 Preparing the Router Drag Chains

1. Locate the two (2) empty router drag chains in the **Wiring Harness Box**.
2. Lay the drag chains flat, hinge-side up, side by side on the baseframe. See Fig. 5-1.
3. Use a large hex key or long flathead screwdriver to pry open the link hinges on both drag chains.
4. Use a flathead screwdriver to pry the head link and tail link off each drag chain and set them aside.

7.2 Insert Power Cable



1. Place the router at the end of one drag chain.
2. Lay the router power cable in the drag chain and close the first and last links to hold the cable in place.
3. Lay the power cable into the other drag chain
4. Close the first and last links of the other chain to hold the cable in place.
5. Snap closed the remaining links in both drag chains.
6. Snap the head and tail links back onto both drag chains.

NOTE: When installing the drag chains, if a head or tail link is upside down, simply pry it off with a small screwdriver and reattach it, flat side to the rail.

7.3 Install the Drag Chains

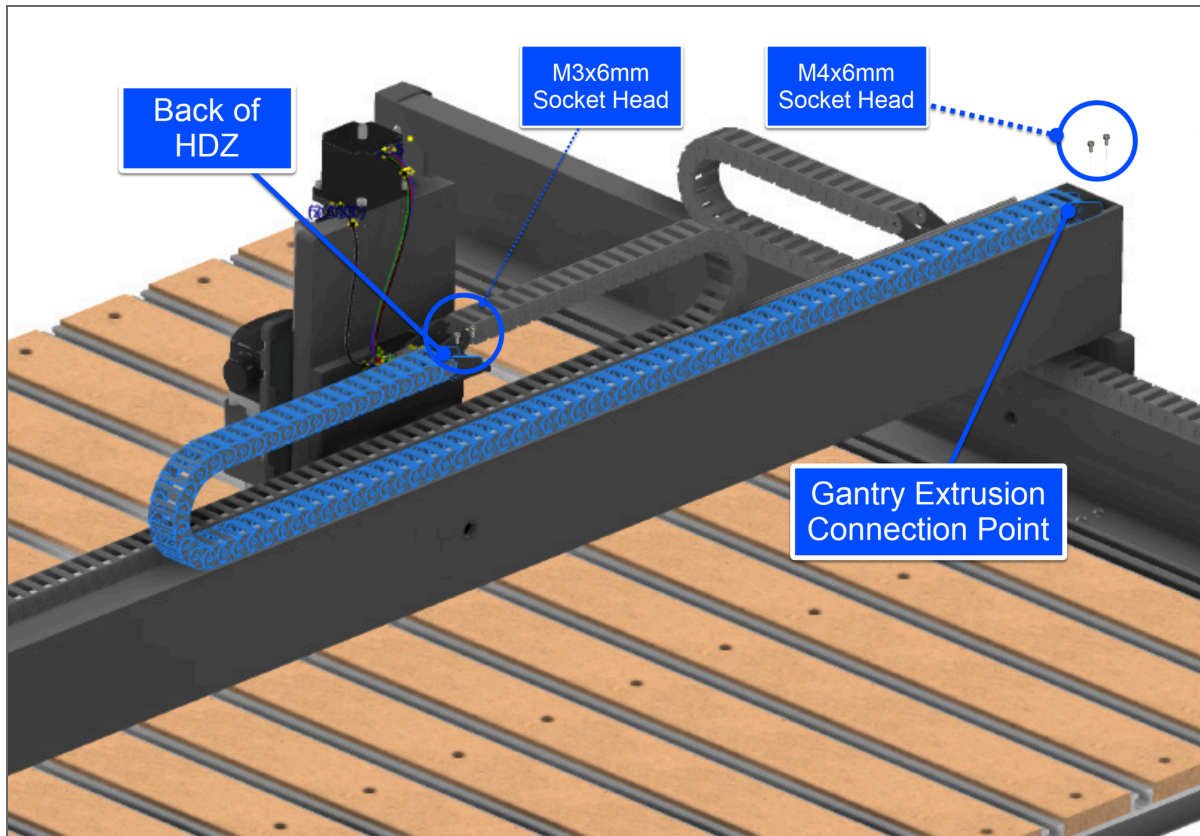
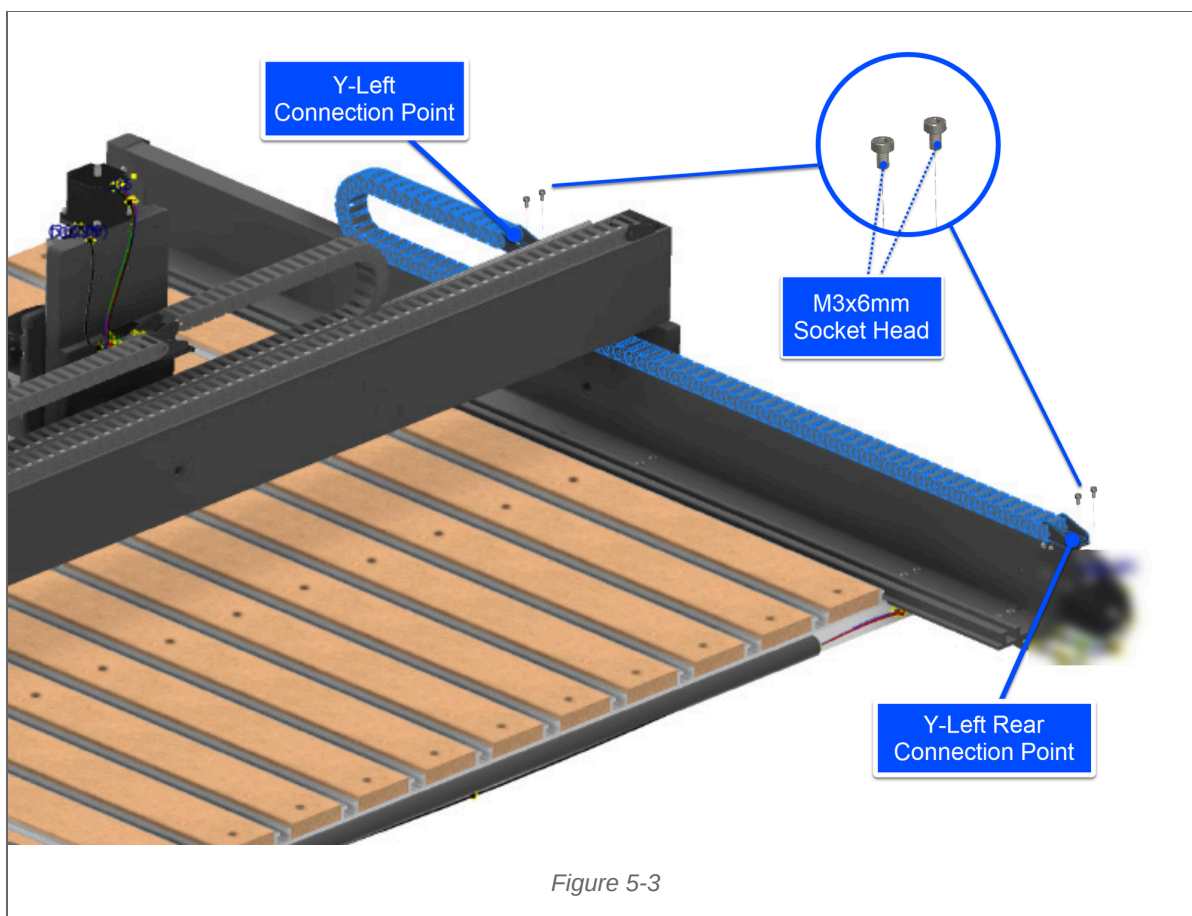


Figure 5-2

1. Lift the drag chains and router and move them to the front of the machine.
2. Insert the router/spindle as far as it will go into the spindle mount on the front of the HDZ.
3. Lift the spindle drag chain over the HDZ and set it on top of the gantry. See Fig. 5-2.
4. Lift the Y-Axis (shorter) drag chain and set it onto the Y-Left assembly (it slides under the gantry).
See Fig. 5-3.
5. Use a 2.5mm hex key and two (2) M3×6mm SHCS to secure the drag chain to the bracket on the back of the HDZ. Fully tighten.
6. Use a 2.5mm hex key and two (2) M4×6mm BHCS to secure the drag chain to the end of the gantry.
Fully tighten.
7. Use a 2.5mm hex key and two (2) M3×6mm SHCS to secure the drag chain to the Y-Left carriage.
Fully tighten.
8. Use a 2.5mm hex key and two (2) M3×6mm SHCS to secure the Y-Axis drag chain tail to the Y-Left assembly. Fully tighten.

7.4 Secure Router & Cable

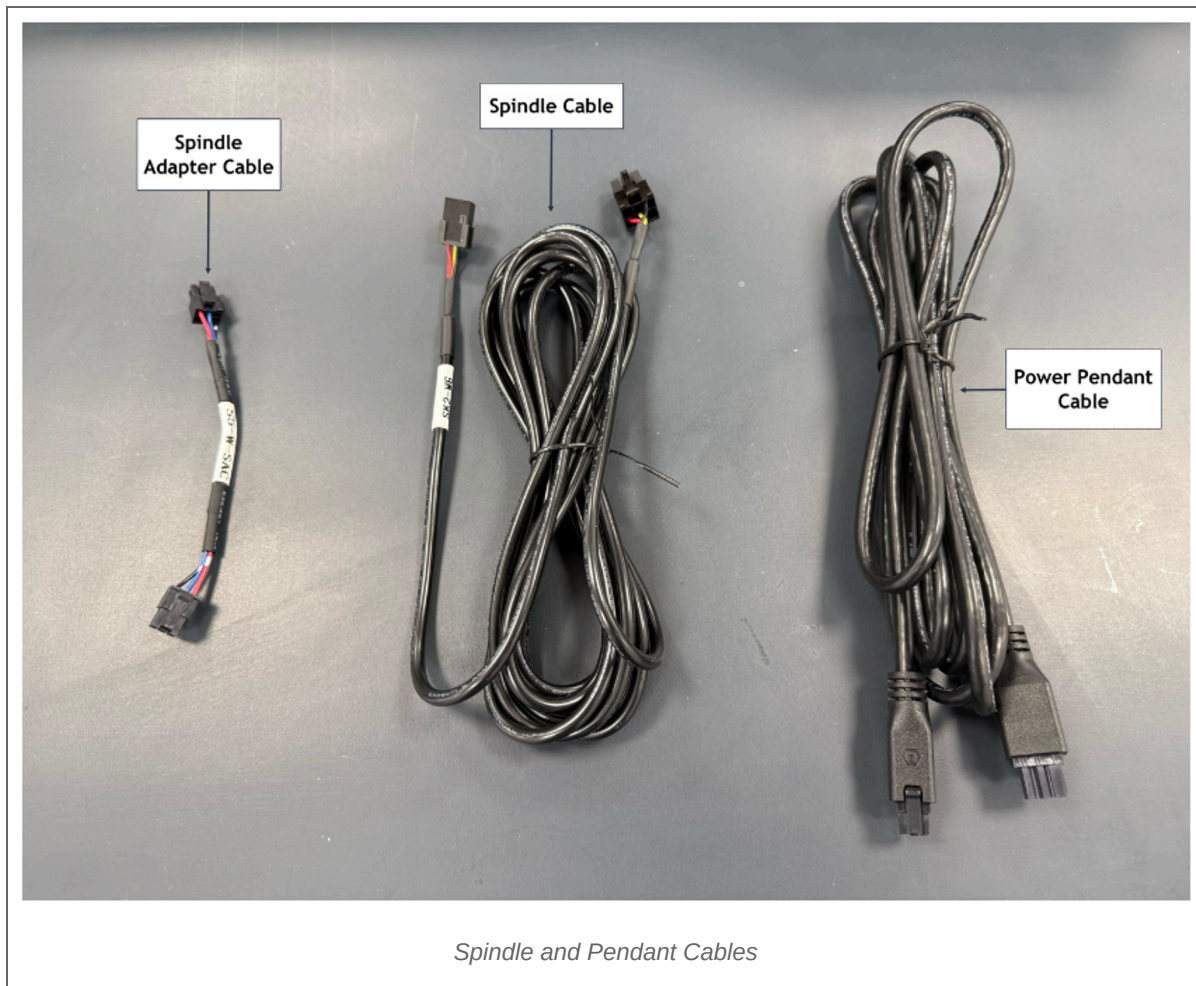


1. Orient the router in the spindle mount so that the power cable extends toward Y-Left.
2. Use a 5mm hex key to tighten the four (4) M6 screws, securing the router in the spindle mount.
3. Push the HDZ down to the bottom of travel.
4. Use a zip tie to secure the router power cable to the head end of the X-Axis router drag chain.
5. Use a zip tie to secure the router power cable to the tail end of the X-Axis router drag chain.

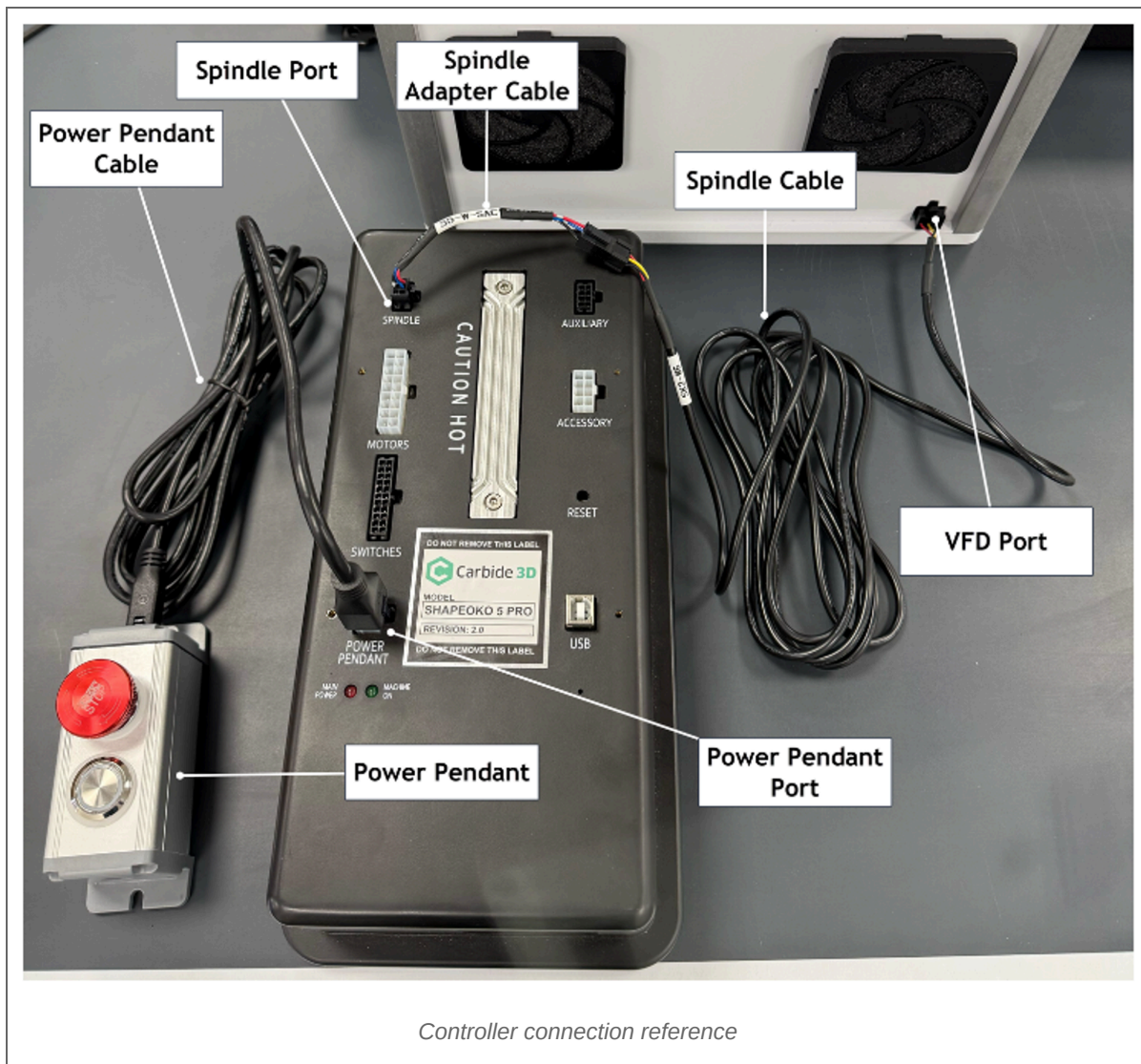
NOTE: Make sure there is enough power cable slack to allow the HDZ to move freely and to prevent binding during travel.

7.5 Install the VFD (optional)

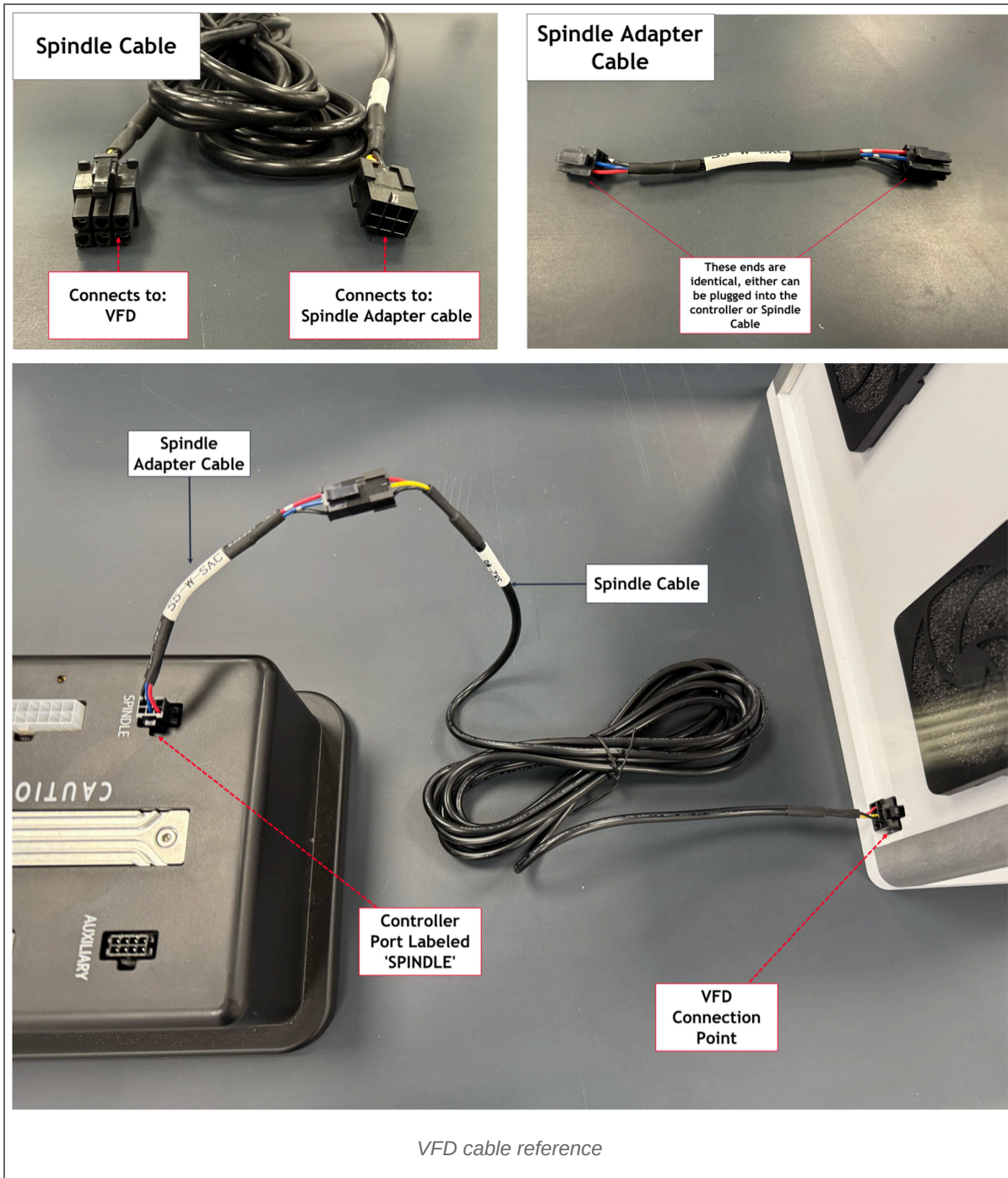
The Shapeoko 5 with VFD ships with 3 cables that all serve a unique and specific purpose. For the machine to function correctly, these cables must be plugged into the intended components and the correct controller ports.



Connection Overview

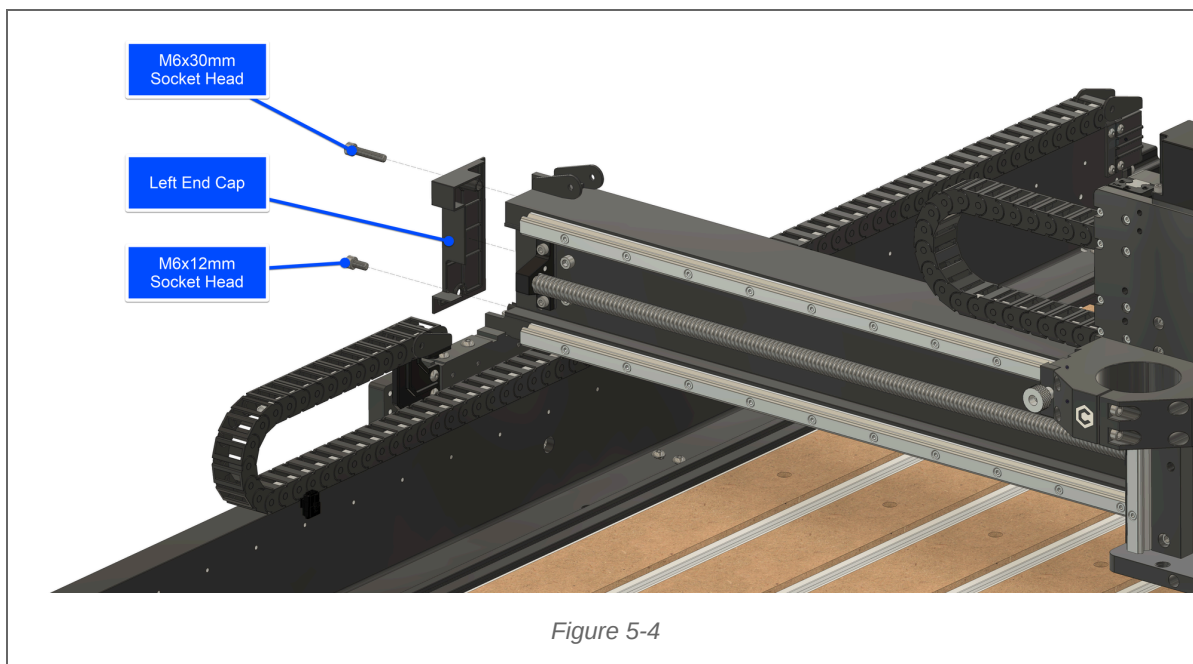


- **Spindle Adapter Cable:** Plugs directly into the Controller SPINDLE port
- **Spindle Cable:** Plugs into Spindle Adapter cable and VFD Port
- **Power Pendant Cable:** Plugs directly into the Power Pendant and the Controller POWER PENDANT port.



1. Plug one end of the Spindle Adapter Cable into the controller port labeled SPINDLE.
2. Plug the other end of the Spindle Adapter Cable into the female end of the Spindle Cable.
3. Plug the Male End of the Spindle Cable into the VFD connection point.

7.6 Install Y-Left End Cap



1. Gather the Y-Left End Cap and Hardware (one M6×30mm SHCS and one M6×12mm SHCS).
2. Route the router power cable down over the edge of the gantry.
3. Place the end cap over the Y-Left end of the gantry and the power cable.
4. Ensure that the long straight edge goes to the back.
5. Use a 5mm hex key to insert one (1) M6×30mm SHCS through the top screw hole and one (1) M6×12mm SHCS through the bottom screw hole.

8. Controller and Bitsetter

Items Required	Qty
Controller	1
Power Pendant	1
Power Pendant Extension Cable (6-pin Male to 6-pin Male)	1
3-Prong Controller Power Cable	1
USB Cable	1
BitSetter	1
BitSetter Hardware: M6×30mm (2) and Teez Nuts (2)	1
BitSetter Extension Cable (3-pin Male to 3-pin Male)	1

8.1 Connect the Controller

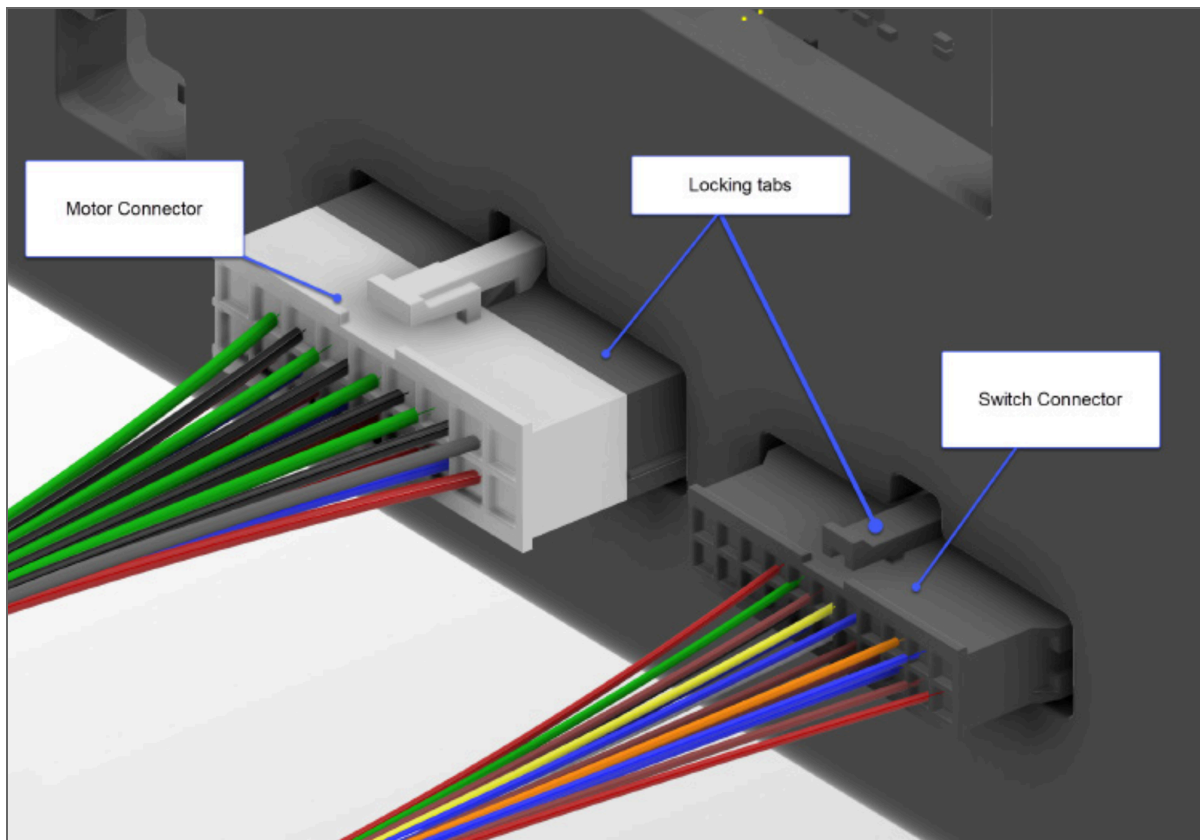
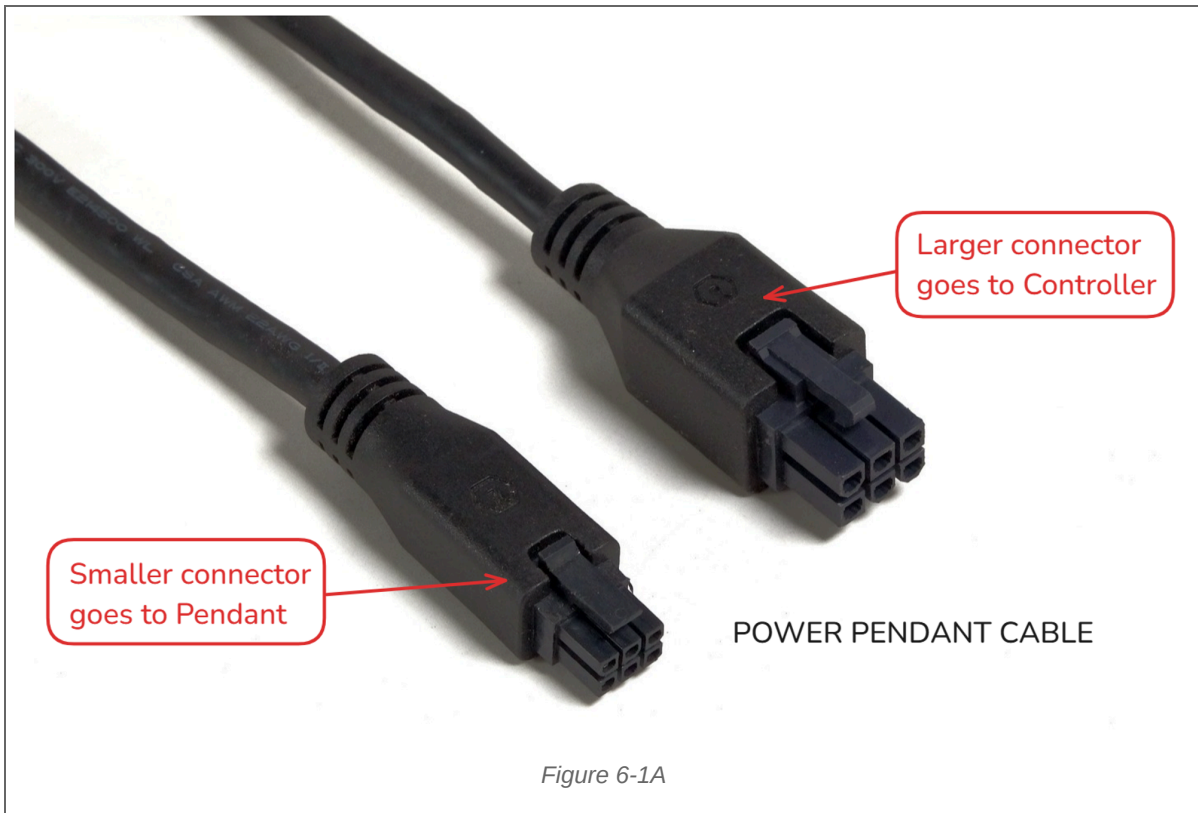


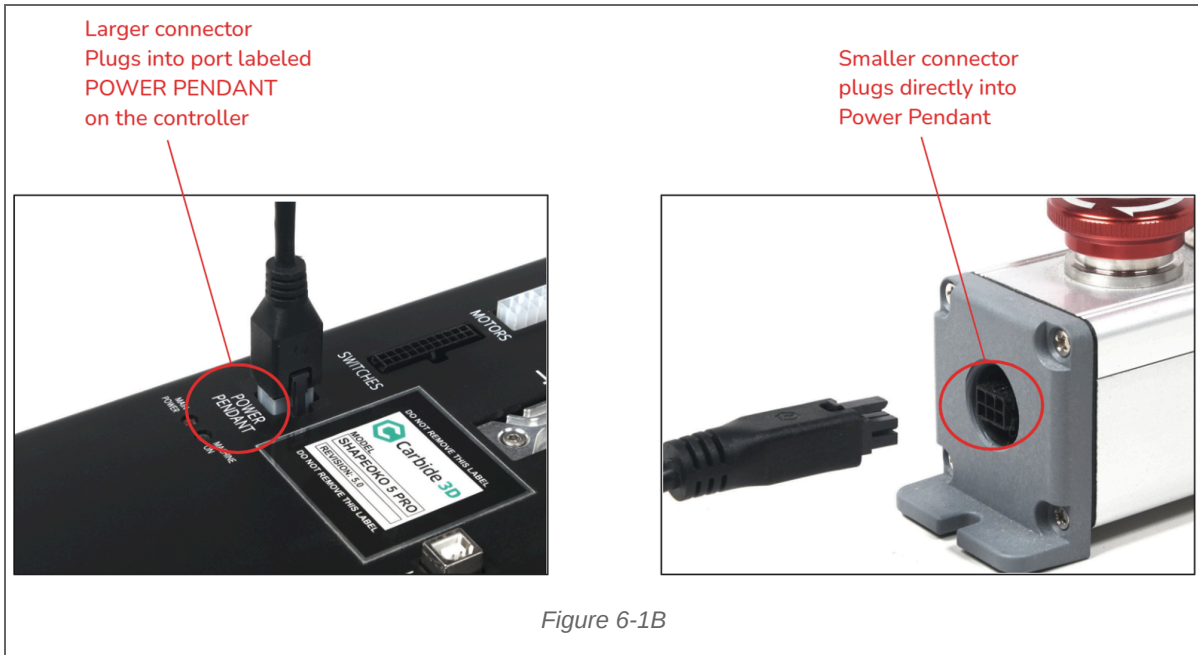
Figure 6-1

1. Locate the Controller box, Power Pendant box, and USB cable in the S5 Electronics Box.
2. Plug the 18-pin motor wiring bundle connector into the larger 18-pin **"MOTORS"** port on the controller. See Fig. 6-1.
3. Plug the 22-pin limit switch wiring bundle connector into the smaller 22-pin **"SWITCHES"** port on the controller. See Fig. 6-1.

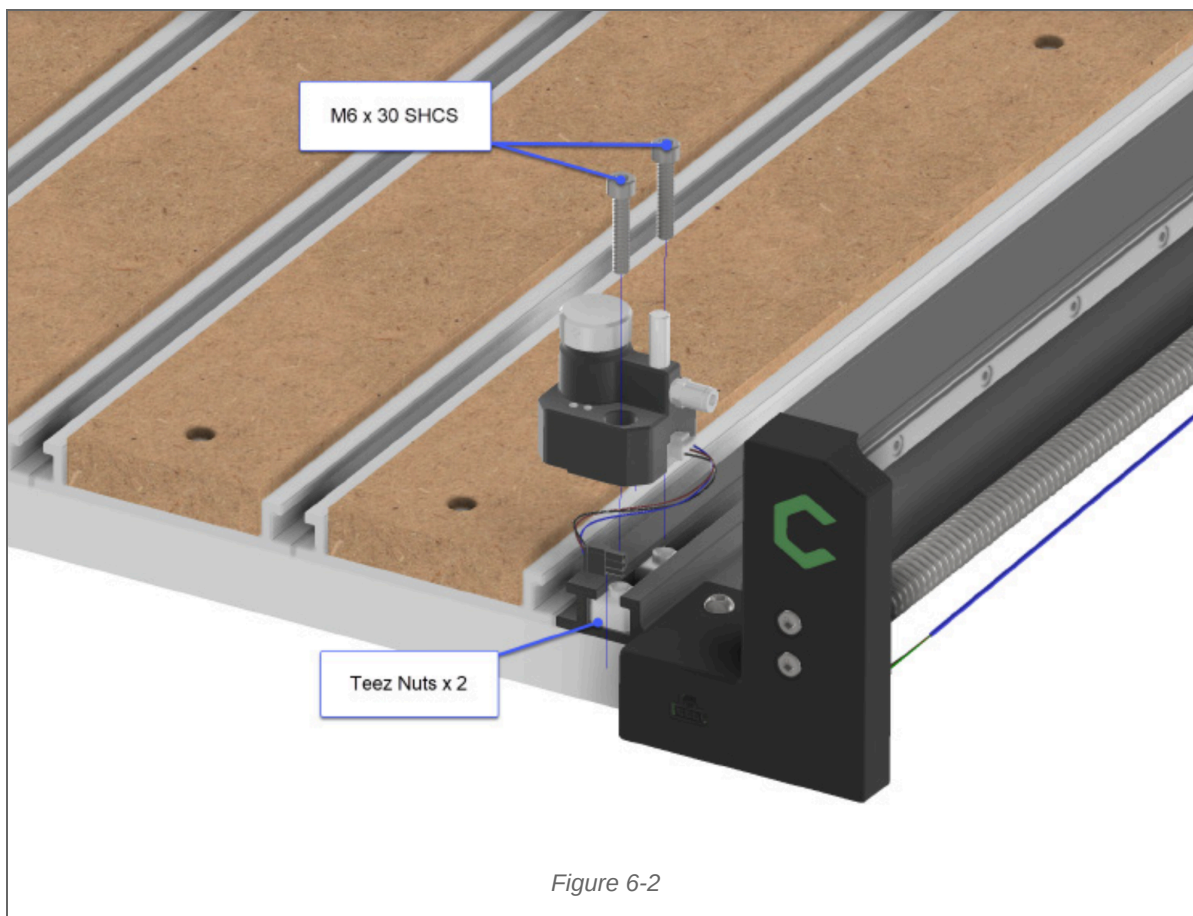
8.2 Connect the Power Pendant



1. Plug the larger 6-pin end of the power pendant cable into the port labeled **"POWER PENDANT"** on the controller.
2. Plug the smaller 6-pin end of the power pendant cable into the power pendant. Be sure to align the locking tabs for proper orientation.

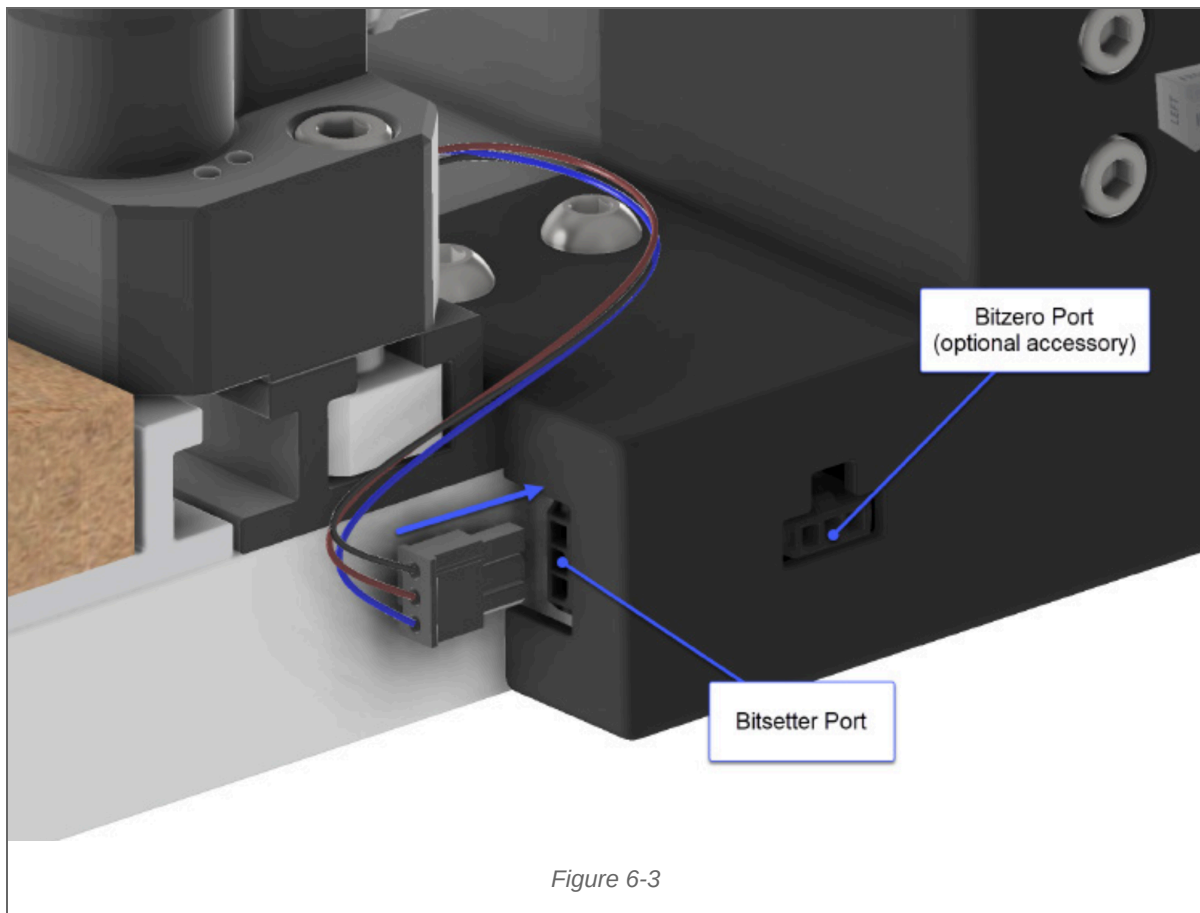


8.3 Install the BitSetter



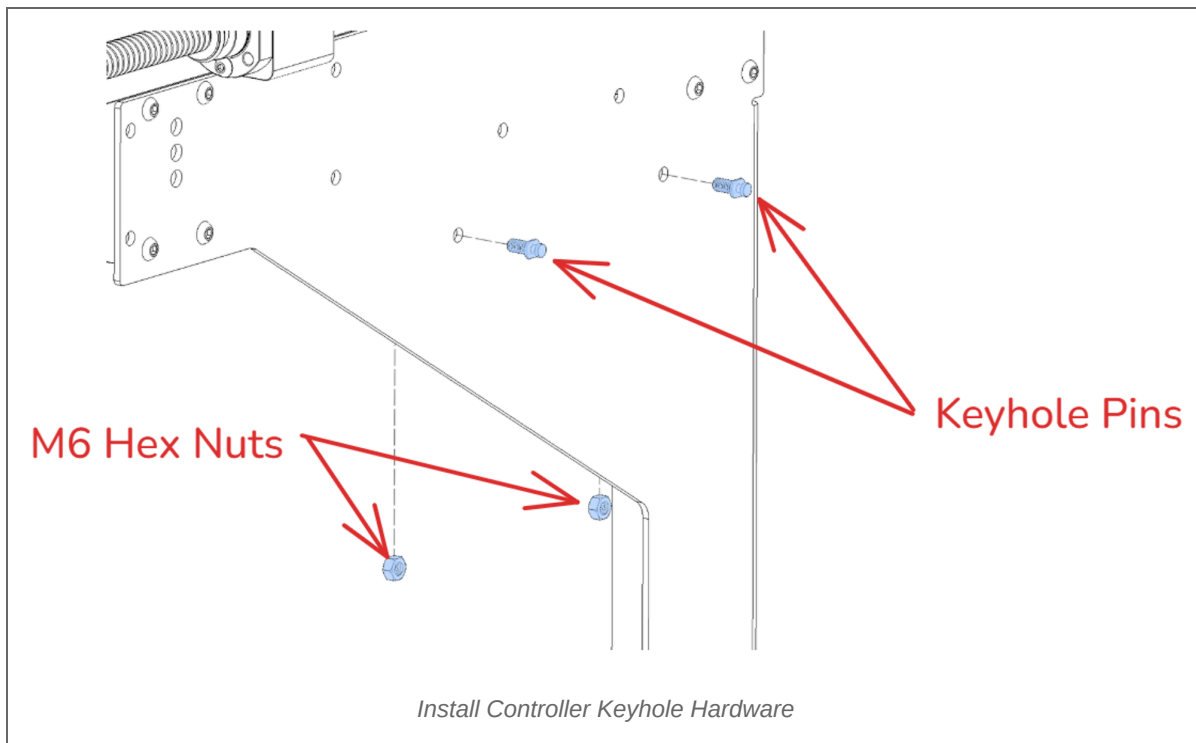
1. Locate the **BitSetter Box** in the S5 Electronics Box.
2. Slide the two (2) Teez Nuts into the T-track slot integrated into the Y-Right assembly. See Fig. 6-2.
3. Position the BitSetter over the Teez Nuts with the 3-pin port on the base facing to the right.
4. Use a 5mm hex key to loosely insert two (2) M6×30mm SHCS through the top of the BitSetter and into the Teez Nuts. See Fig. 6-3.
5. Slide the BitSetter close to the front edge of the baseframe. Fully tighten the SHCS.

Connect the Bitsetter

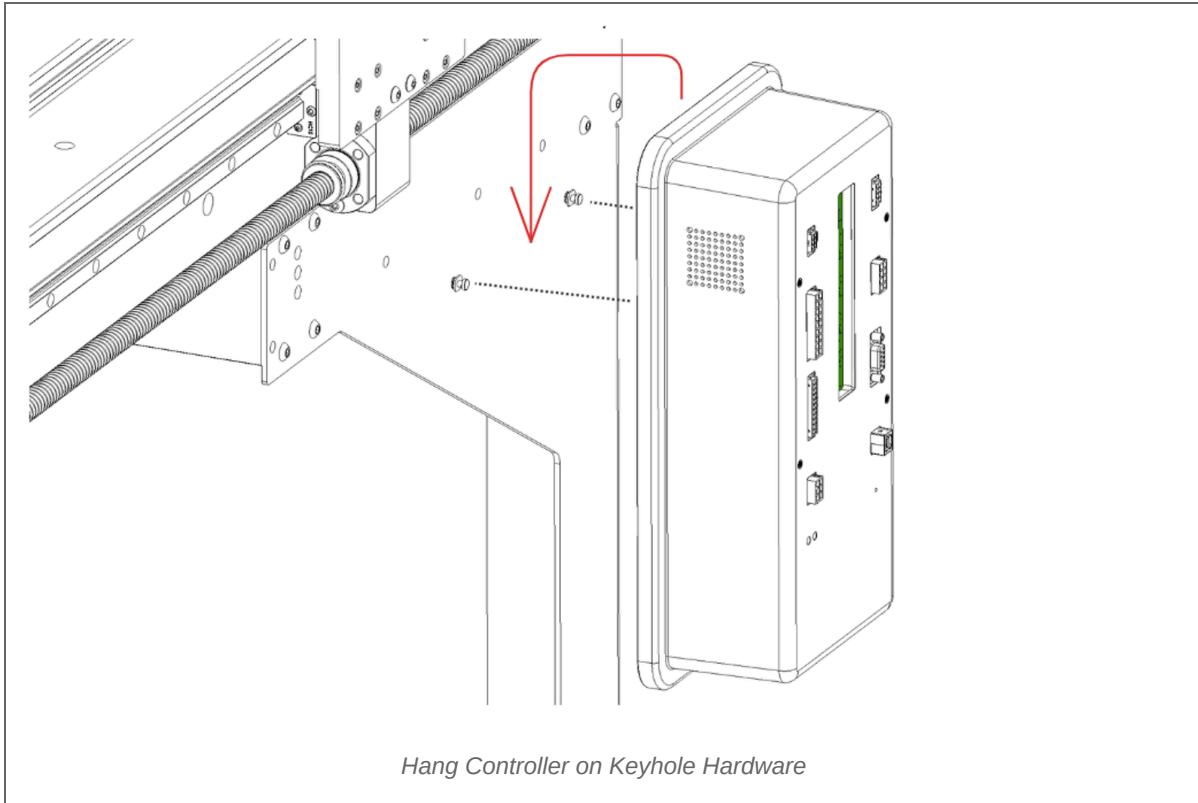


1. Plug the short 3-pin BitSetter extension cable into the 3-pin port on the inside edge of the front-right endplate. See figs. 6-2 and 6-3.
2. Plug the other end of the 3-pin extension cable into the 3-pin port on the BitSetter. See Fig. 6-3.

8.4 Hang the Controller (Optional with Leg Kit)



1. Locate the Controller and VFD Mounting Hardware from the Leg Kit
2. Using the Keyhole pins and an M6 Hex Nut, attach keyhole hardware to Back Right Table Leg.
3. Locate Keyhole slots on bottom of Controller
4. Align with keyhole hardware
5. Push Controller onto keyhole pins
6. Push controller towards the ground to engage keyhole slot



Hang Controller on Keyhole Hardware

8.5 Connect The Computer

1. Plug the USB cable into the port on the controller labeled **“USB”**.
2. Plug the 3-prong power cable into the power jack on the side of the controller.

8.6 Tidy Up

1. Locate the zip ties and self-adhesive cable ties in the Open Me First Box.
2. Use a self-adhesive cable tie and a zip tie to tidy the Y-Left cables at the back of the machine.
3. If needed, readjust the reusable velcro strapping attached to the wiring harness trunk to tidy the wiring harness cables.

Congratulations, the Shapeoko 5.1 Pro assembly is complete!

IMPORTANT: Before homing your machine, you MUST update your machine configuration settings. See the Shapeoko 5.1 Pro Getting Started Guide for detailed instructions.

<https://my.carbide3d.com/docs/shapeoko-setup/>

9. Where to go next

9.1 Machine Configuration

For the latest instructions on how to configure your machine, see the <https://my.carbide3d.com/docs/shapeoko-setup/>.

9.2 Training

Access training videos, design resources, and more at my.carbide3d.com.

Your Shapeoko 5.1 Pro comes with four 30-minute 1-on-1 training sessions with a Carbide 3D expert via video chat that can be used in the first year of ownership. To schedule your training sessions, visit <https://carbide3d.com/schedule/>.

9.3 Support and Warranty

Technical Support

Have questions? Need help? We have a fully-staffed support team waiting to help if you run into any trouble while assembling your Shapeoko 5.1 Pro. Just email us at support@carbide3d.com.

One-Year Warranty

Your Shapeoko 5.1 Pro comes with a one-year warranty against defects. If you have any problems, we'll take care of them. See the full warranty at <https://carbide3d.com/policy/warranty>.

60-Day, "Mistakes Are on Us" Guarantee

We want you to jump into your new Shapeoko CNC router without any fear of damaging anything so our warranty includes the following benefit: for the first 60 days that you own your Shapeoko, we'll replace any Carbide 3D-branded item that's damaged, even if it's your fault. Details about what's covered can be found at <https://carbide3d.com/policy/mistakes/>.

9.4 Changes

- 11/1/2025 - Update for Shapeoko 5.1 Pro
- 1/1/2024 - Initial release of this manual in a new format.
- 1/18/2024 - Make naming conventions more consistent. Remove extra steps where possible.

9.5 Contact Us

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