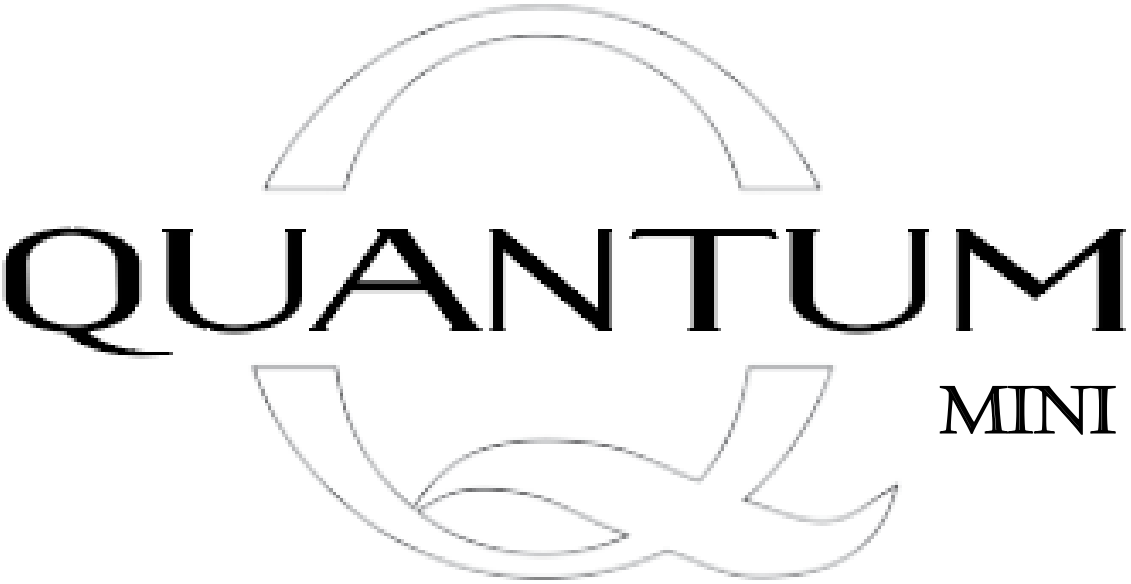
BobsCNC

Unleash Your Creativity



Assembly Manual

Rev 1.01

Welcome to the Family.

We're excited that you purchased the Quantum MINI CNC Router Kit from BobsCNC, and we know you're just as excited to put it together. This manual gives you step by step instructions to ensure your success in assembling the Quantum MINI and provides all the information you need to get your machine up and running.

Before beginning the assembly, take all the time you need to completely review the manual. It's good to be familiar with the entire assembly process before diving in. Be sure to check out the recommended tools you'll need for the assembly.

Welcome to the BobsCNC family. It's time to… *Unleash Your Creativity!*

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BobsCNC Quantum Specifications

The assembled footprint:

Length: 38" (965 mm)

Width: 40" (1016 mm)

Height: 22" (559 mm)

Assembled Weight: 35 lbs.

Cutting Area:

X: 16" (407 mm)

Y: 16" (407 mm)

Z: 3.8" (98 mm)

Safety is always the First Priority. Always wear proper protective equipment and use "safety sense" when assembling and operating your Quantum Series CNC Router.

Information/Warning Boxes

	CAUTION Indicates a possible risk of injury that can result from failure to follow this instruction
	WARNING Indicates the possible damage to the machine, its components, the work piece, or injury that can result from failure to follow this warning.
	DANGER Indicates a serious risk of bodily harm, injury and death. This is a serious warning and should not be ignored. Any work must be carried out with extreme caution.
	TIPs Contains helpful information, shortcuts, and hints to simplify assembly and make machine operation easier and safer.

Safety Precautions and Warnings

BobsCNC Routers have a 110 v. Power Supply and use bits that spin at 30,000 rpm with cutting edges that are sharp and hazardous. The operator must understand the potential hazards and is responsible to take appropriate safety precautions before operating the Router.

- Only use extension cords rated for 20 amps plugged into a dedicated outlet.
- Inspect the machine before every use for maintenance issues: loose fasteners, belts, etc.
- Do not operate the machine with dull or damaged router bits.
- Always unplug machine after each use and when cleaning the router or changing router bits.
- Remove rings, bracelets, watches, necklaces before using the machine.
- Wear snug fitting clothing and/or roll up long sleeves to prevent snagging.
- Use appropriate personal protective equipment (PPE) when operating machine including safety glasses and hearing protection.
- Keep hands, hair, and clothing away from the moving parts of the machine.
- Do not operate the machine when under the influence of alcohol or prescription medications.
- Make certain the workpiece is clamped securely in place before starting the machine.
- Never leave the machine running unattended.
- Children must be supervised by adults when operating the machine.
- Do not operate the machine in the presence of flammable materials.
- Keep floors clean, dry, and free of debris to eliminate slip and/or trip hazards.
- Have a suitably rated fire extinguisher on hand when the machine is in operation.

Getting Started

Required Tools:

To Assemble the Quantum CNC Kit

Metric Socket Set
#1, #2 and #3 Phillips Screw Drivers
Needle Nose Pliers
Set of Metric Allen Wrenches
Pliers
Utility Knife
Clear Nail Polish or Locktite™
Scissors
Blue Painter's
Tape

To Operate the BobsCNC Quantum CNC Router, you need will need:

Computer with control software for GRBL.
Materials for Projects.
1/4" Shaft Router bits.

Recommended for the electronic setup include:

Multimeter to correctly connect the Power Supply and to set the current for the Stepper Motors (a great tool for general electronic trouble shooting).

Assembly Recommendations:

Use a large, flat, clean work surface for assembling your Quantum Mini.

All Screws (unless noted) should be installed snug, then rotated 1-2 ½ turns.

Apply LOCTITE™ or clear fingernail polish to all M4 X 16 mm Machine Screw that are used to secure plywood pieces. Machine Screws that are secured with Lock Nuts do not need LOCTITE™.

Light sanding of the wood components may be performed if desired.

Painting or applying stain with a clear coat will provide extra protection to the wood components.

Clean the rails with acetone to remove rust preventative and apply a light coat of PTFE (Teflon®) lubricant.

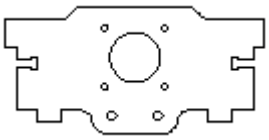
We recommend using strips of 1-inch blue painters' tape behind the T-Slots to help hold the Nuts in place during assembly.

Lock Nuts are never used to secure components that have T-Slots. They are only used to mount components where the Nut is not held in a T-Slot.

CAUTION This kit contains numerous small components that pose a choking risk for small children and pets. Keep kit pieces in a secure location out of the reach of small children and pets.

Belt Drive

Wood Components (Included with Kit)

Part #	Description	Qty	Photo
QR2	XY Stepper Motor Mount	3	

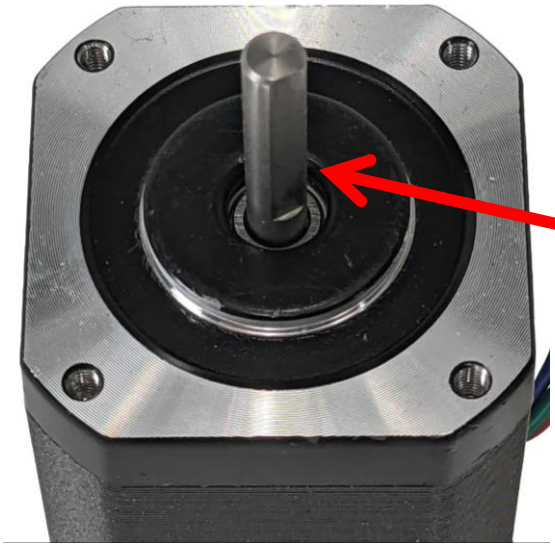
Required Hardware

Part #	Description	Qty	Photo
H86	Flanged Bearing F635Z	12	
H48	M5 x 30 Machine Screw	6	
H49	M5 Lock Nut	6	
H50	Idler Fender Washer	18	
H89	Small Black Washer	12	
H84	GT2 Pulleys	3	
H37	M3 x 10	12	
H88	M3 Washer	12	
CB11	Stepper Motor	3	

Illustrated Step by Step Instructions

Step 1 Preparing the Stepper Motors for Mounting

Step 1a Align one of the Set Screws of the GT2 Pulley (H84) to the flat surface of the Stepper Motor (CB11) Shaft. Snug the Set Screw so that it engages the shaft but still allows the Drive Pulley to slide down the shaft.

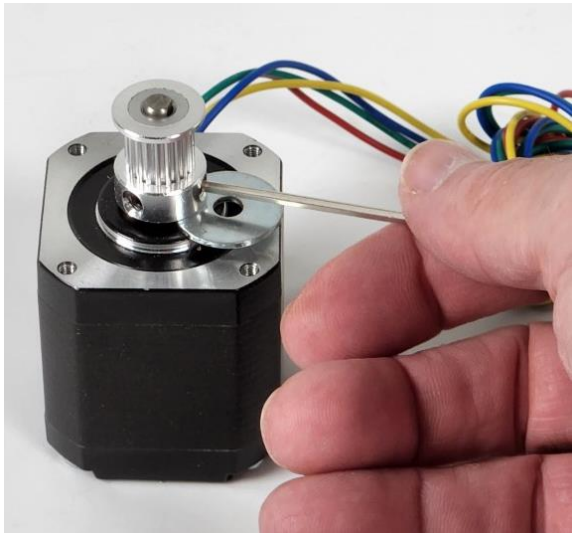


Flat Surface of Shaft

Set Screw

Step 1b Use an Idler Fender Washer (H50) as a shim and gently slide the Drive Pully down to the surface of the Washer.

Fully tighten the Set Screw against the flat. Tighten the second Set Screw. Remove the Idler Fender Washer. The gap between the bottom of the Drive Pulley and the Stepper Motor housing will be approx. 1.25mm. Repeat for all three Stepper Motors.

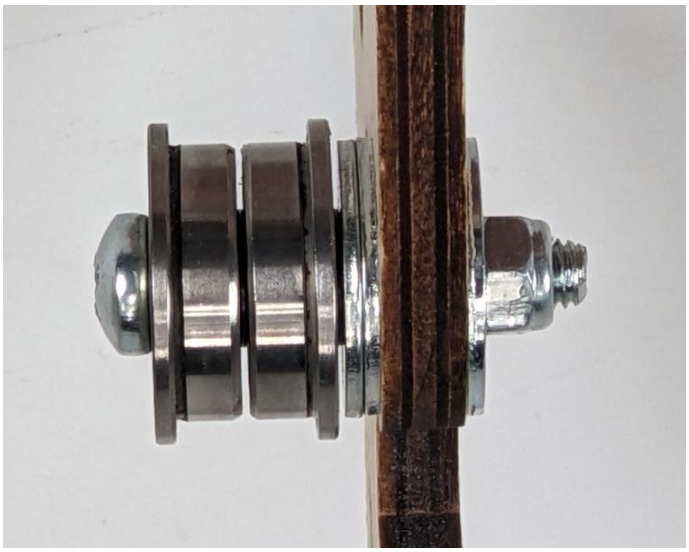


Step 2 Mounting the Stepper Motors

Step 2a Build four Idler Bearing Assemblies using one (H48) M5 x 30 Machine Screw, two (H86) Flanged Bearings, and two (H50) Idler Fender Washers in the sequence shown below.

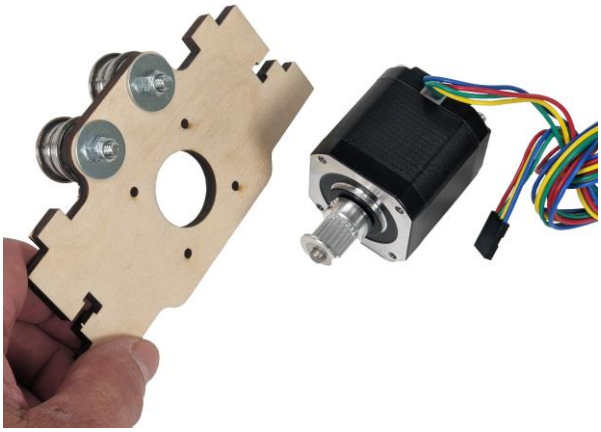
Be sure the head of the Machine Screw fits against the Bearing flange and the other is mounted so that both flanges are oriented outboard from each other.

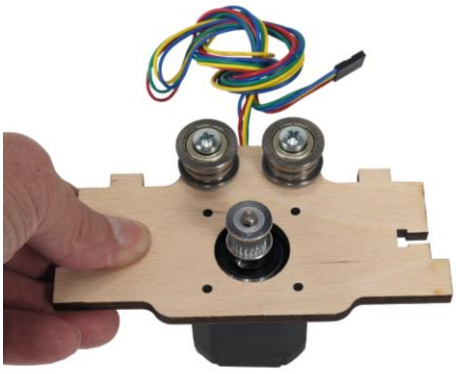
Step 2b Insert the threaded shaft of Bearing Assembly though the XY Stepper Motor Mount (QR2) and secure with a M5 Lock Nut (H49).



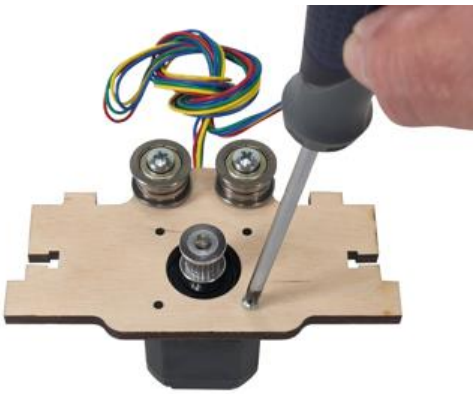
Repeat to install the remaining Idler Assembly.

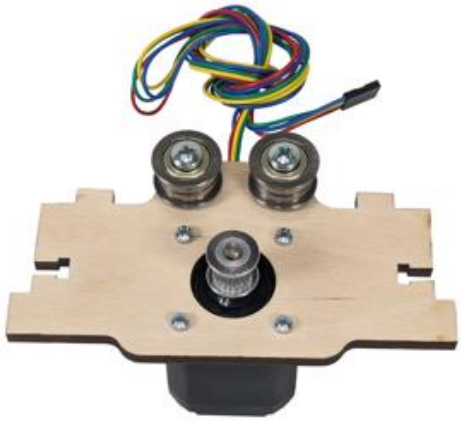
Step 2c Align the mounting holes of the Stepper Motor with holes in the X, Y Stepper Motor Assemblies.



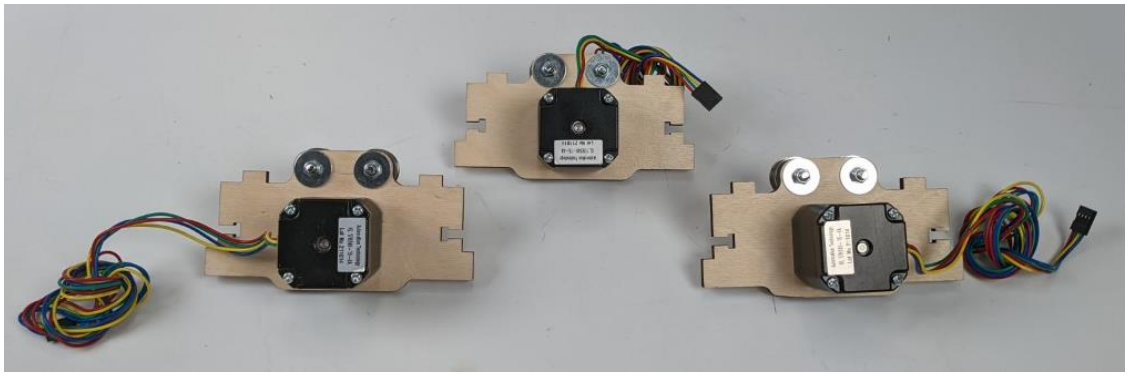


Secure the Stepper Motor to the Stepper Motor mount with four M3 x 10 Machine Screws (H37) with M3 Washers (H88).

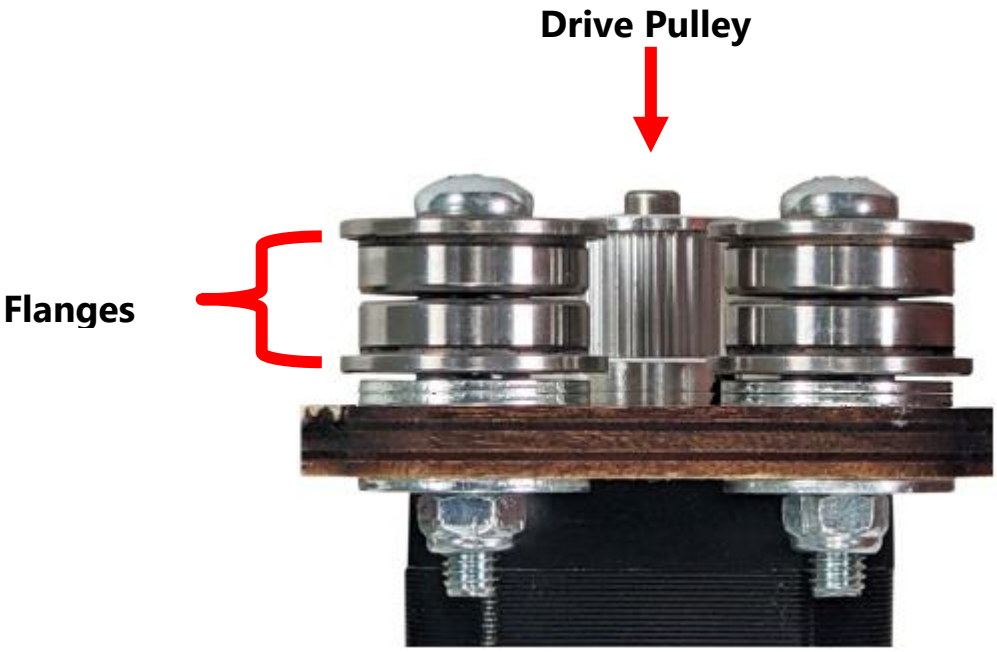




NOTE: When viewed from the back, the Stepper Motor wires of each Motor are oriented in three directions. The wires of the Y Stepper Motor are centered between the Flanged Bearing and run upward. The wires of the X1 and X2 Stepper Motor wires run one to the left, the other to the right as shown below.

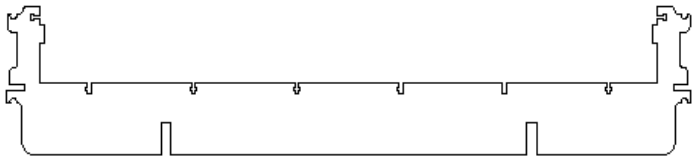
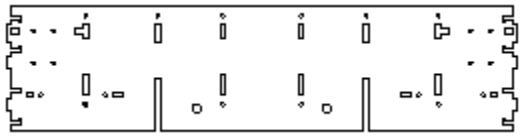
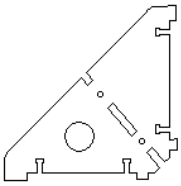
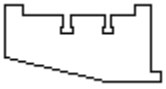


NOTE: When properly installed, the flanges of the Flanged Bearings will frame the teeth of the Drive Pulley (see below).



X Frame Instructions

Required Wood Components

Part #	Description	Qty	Photo
QX1M	Rail Support	8	
QX4M	Frame Mid Support	2	
QX5M	Frame Side Support	2	
QX6M	Frame End Support	2	
QX8	Frame Corner Support	4	
QX11	Belt Support	4	

Required Hardware

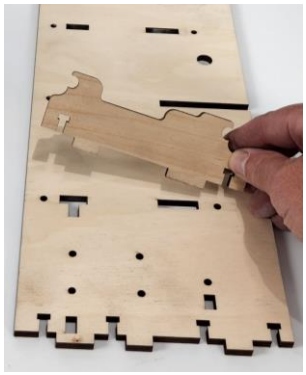
Part #	Description	Qty	Photo
H14	M4 x 16 Machine Screw	60	
H15	M4 Nut	60	

Illustrated Step by Step Instructions

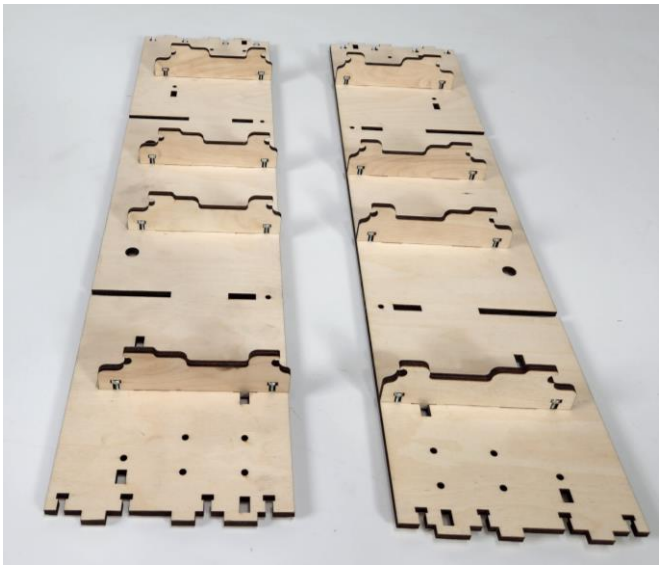
Step 1 Build the Side Assemblies.

IMPORTANT: The long, open slots in the Frame Side Support (QX5M) are oriented toward the bottom of the X Frame Assembly.

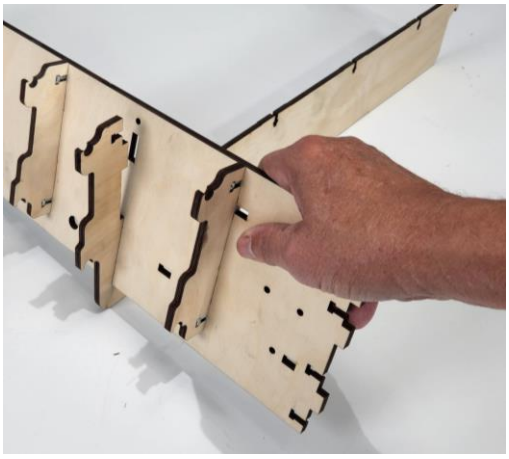
Step 1a Insert the tabs of four Rail Support (QX1M) in the slots of the Frame Side Support (QX5M) and secure each with two M4 x 16 Machine Screws (H14) and Nuts (H15).

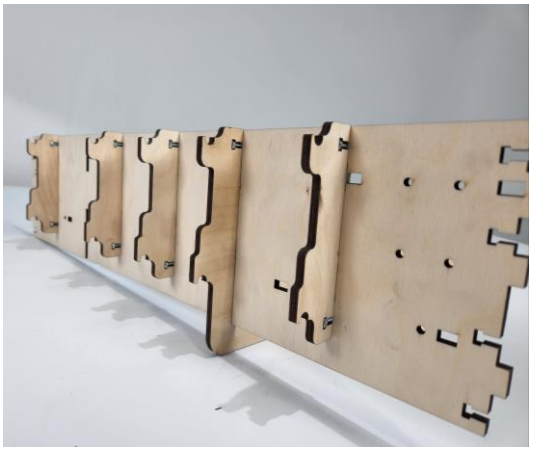


Step 1b Repeat to complete the other Side Frame Support



Step 2 Slide the open slot of the Frame Side over the Outer Frame Mid Support (QX4M). Insert the tabs of the Outer Frame Mid Support into the upper slot of the Frame Side Support and secure with one M4 X 16 Machine Screw and Nut as shown.

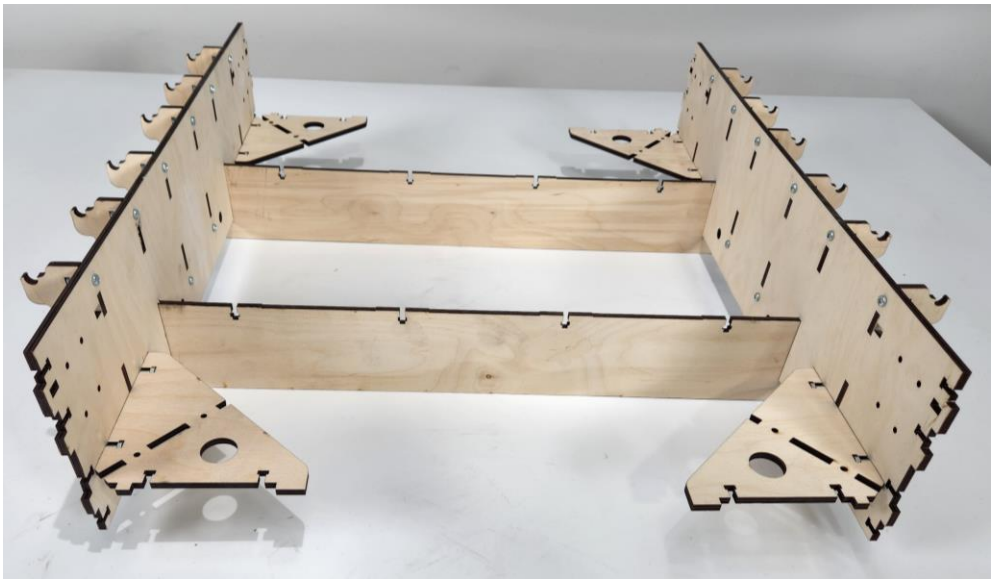




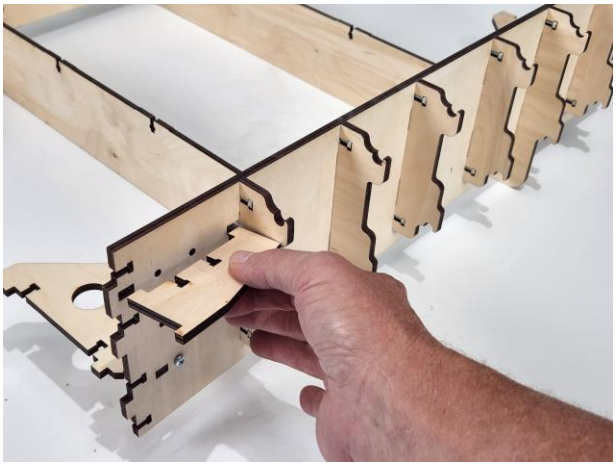
Step 2a Repeat the steps to install the second Outer Frame Mid Support as shown.

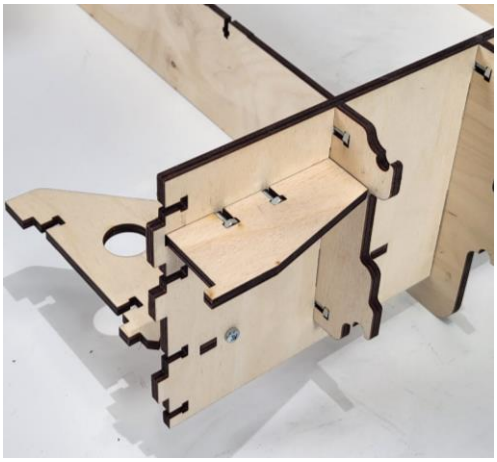
Step 2b Repeat the steps to install the other Frame Side Support to the two Outer Frame Mid Supports on the other side.

Step 3 Align the tabs of the four Frame Corner Supports (QX8) with the slots of the Frame Side Support and secure each with two M4 X 16 Machine Screws and Nuts. Make sure the hole in the Frame Corner Support is oriented toward the end of the X Frame as shown.

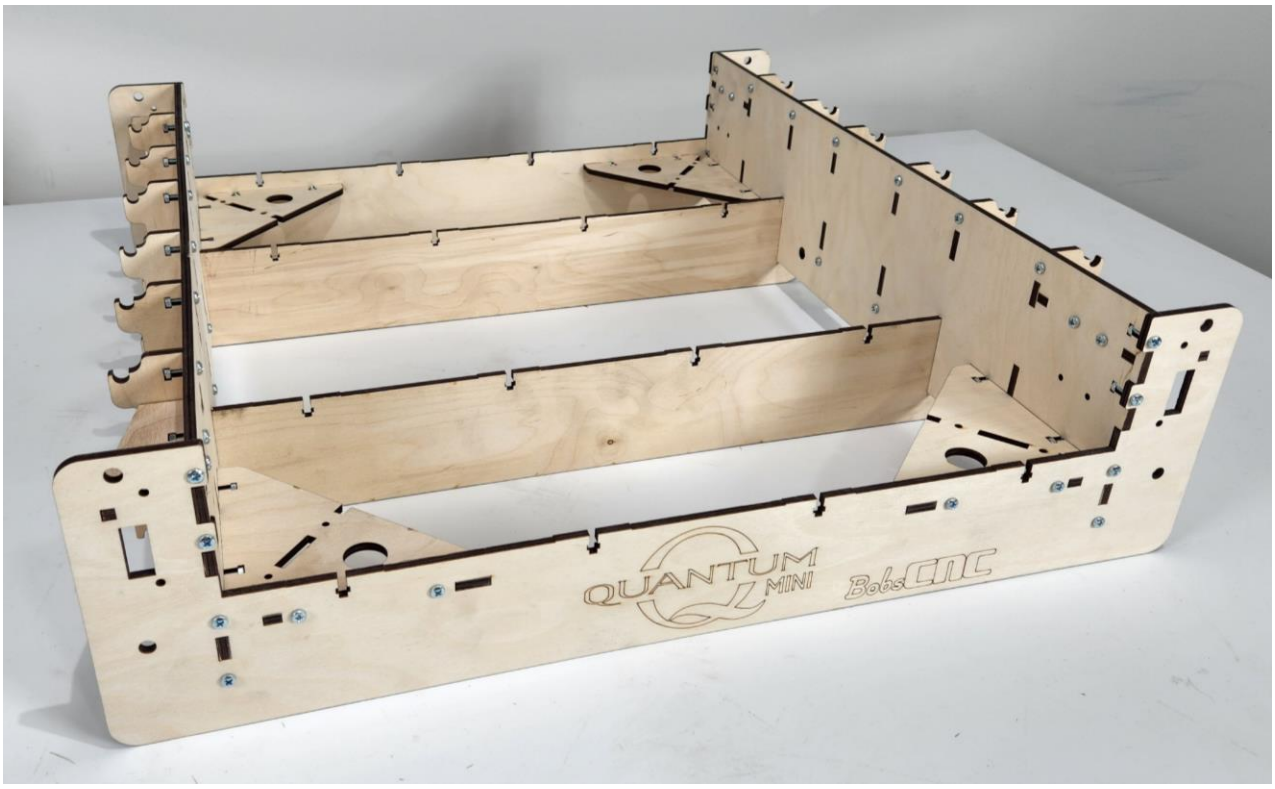


Step 4 Insert the tabs of the each of the Belt Support (QX11) into the slots located at each end of the X Assembly and secure with two M4 x 16 Machine Screws and Nuts for each.



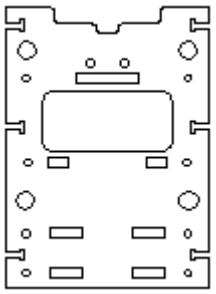
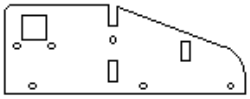
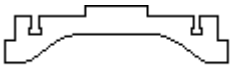
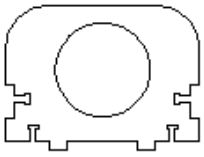
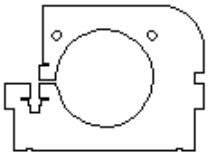
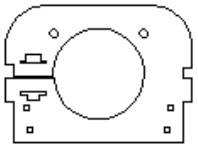
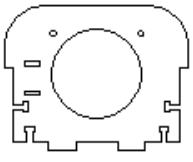


Step 5 Align the tabs of the X Frame Assembly into the slots of the Frame End Support (QX6M) and secure with twelve M4 X 16 Machine Screws and Nuts for each end as shown.



Z Spindle Mount Assembly:

Required Wood Components

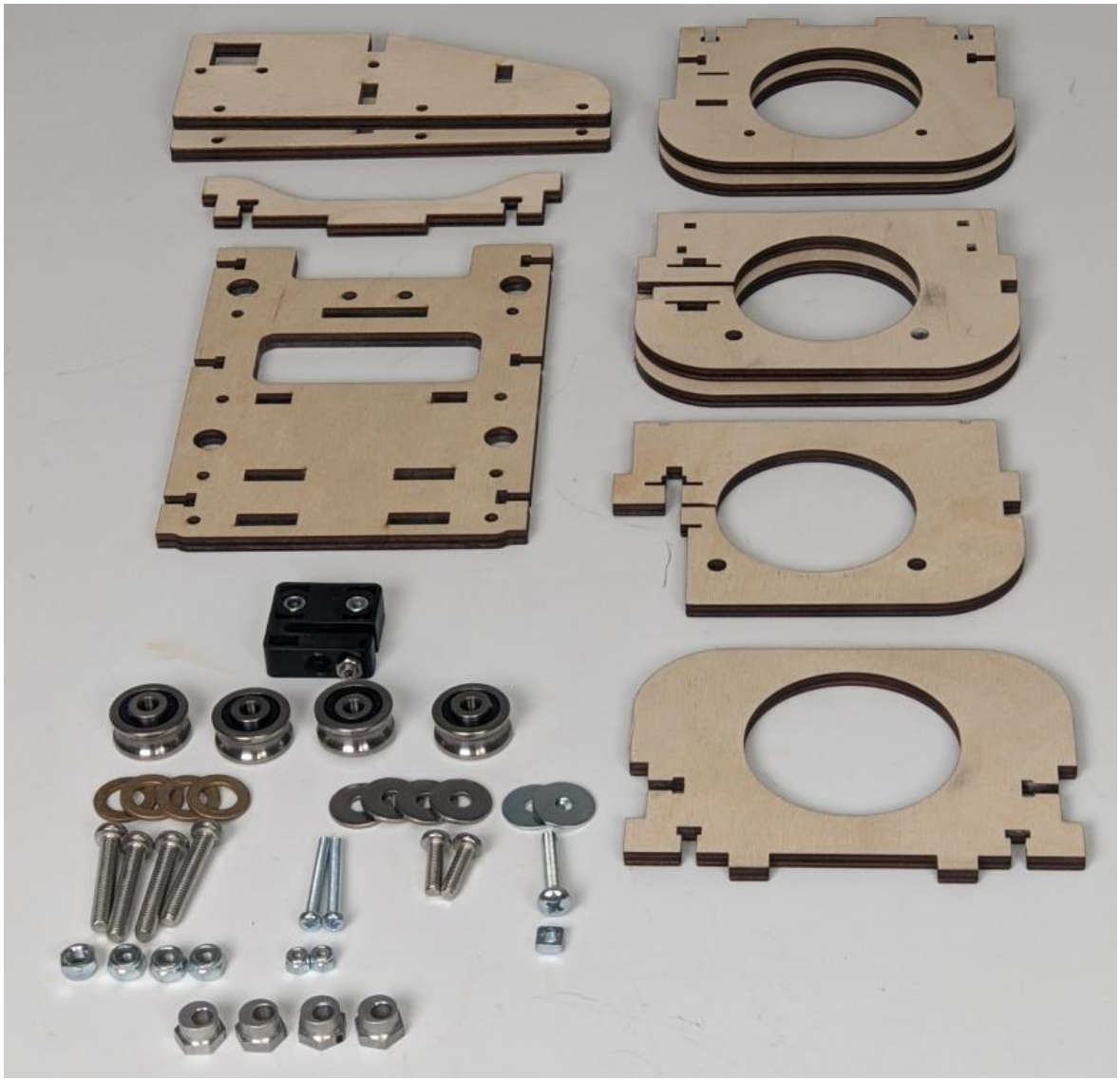
Part #	Description	Qty	Photo
QZ1	Back Frame	1	
QZ2	Side Support	2	
QZ3	Top Brace	1	
QZ4	Top Spindle Mount	1	
QZ5	Inner Spindle Mount	1	
QZ6	Mid Spindle Mount	2	
QZ7	Outer Spindle Mount	2	

Required Hardware

Part #	Description	Qty	Photo
H95	M6 x 35 Machine Screws	4	
H18	M6 Locknuts	4	
H40	Eccentric Spacer	4	
H41	Eccentric Washer	4	
H42	Bearing Fender Washer	4	
H44	SG20U	4	
ZD12	ACME Nut Assembly	1	
H97	M5 X18	2	
H49	M5 Lock Nut	2	
H14	M4 x 16 Machine Screw	20	
H15	M4 Nut	20	
H48	M5 x 30 Machine Screw	1	
H93	M5 Square Nut	2	

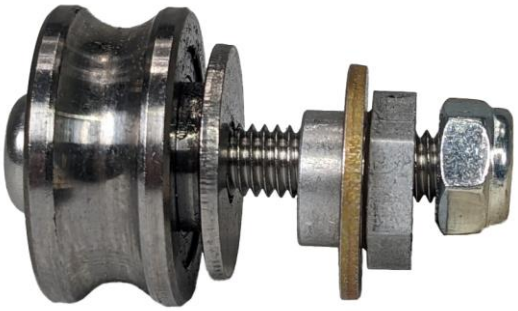
H50	Idler Fender Washer	2	
H85	M4 x 35 Machine Screw	2	
H47	M4 lock Nut	2	

Illustrated Step by Step Instructions



Step 1 Building the G20U Bearing Assemblies.

NOTE: the Bearing Assembly Order: M6 x 35 Machine Screw (H95), SG20U Bearing(H44) with hub facing toward the Bearing Fender Washer (H42), Eccentric Washer (H41), Eccentric Spacer (H40), M6 Locknut (H18).

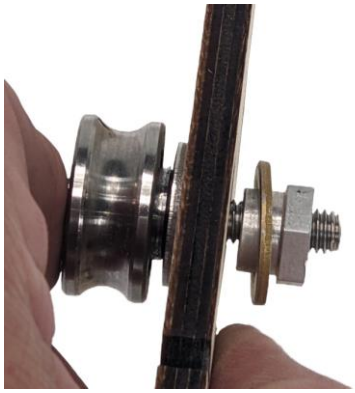


TIP	When inserting the Bearing Assembly through the Back Frame (QZ1) make sure the Hub of the G20U Bearing faces the Bearing Fender Washer which is pressed against the wood.

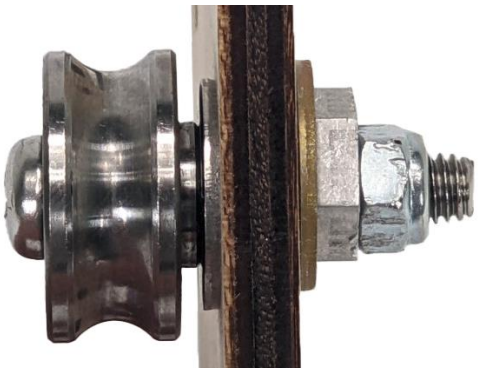
HUB

Step 1a Insert the bearing Assemblies through the mounting holes in the Back Frame (QZ1) with the Bearing Fender Washer (H42) against the wood and the Hub against the Bearing Fender Washer as shown.

Step 1b Slide the Eccentric Washer (H41) over the Eccentric Spacer (H40) inserting the shaft of the M6 X 35 Machine Screw (H95)through the Eccentric Spacer as shown.

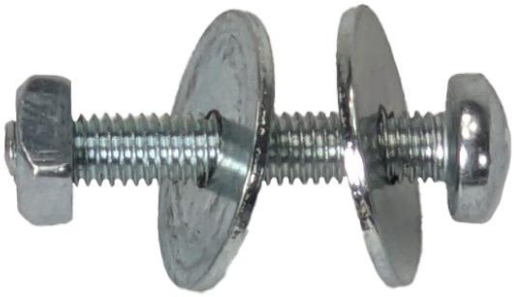


Secure the Bearing Assembly in place with an M6 Lock Nut (H18) on each of the four Assemblies

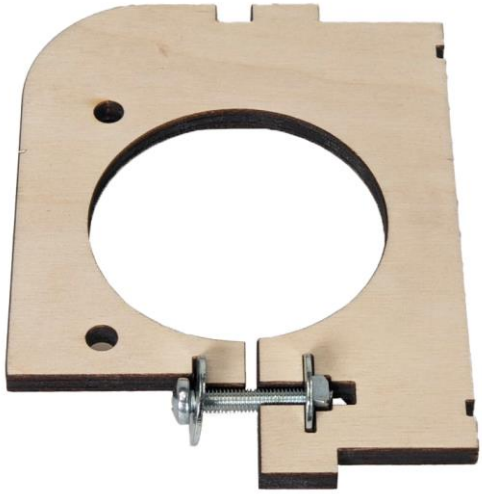


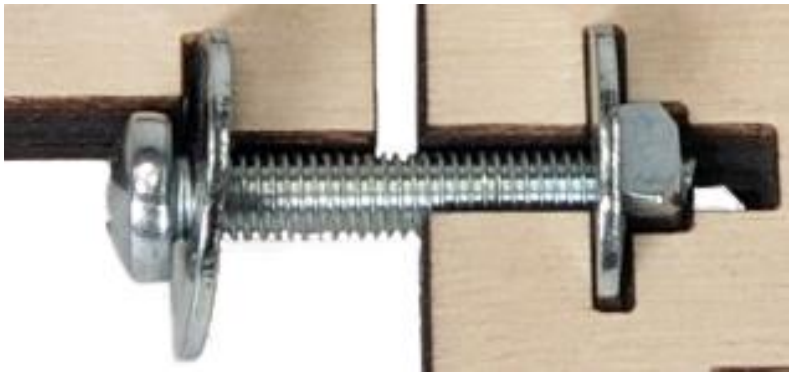
Step 2 Building the Router Mount.

Step 2a Slide the two Idler Fender Washers (H50) onto the M5 X 30 Machine Screw (H48) and secure with the M5 Square Nut (H93).

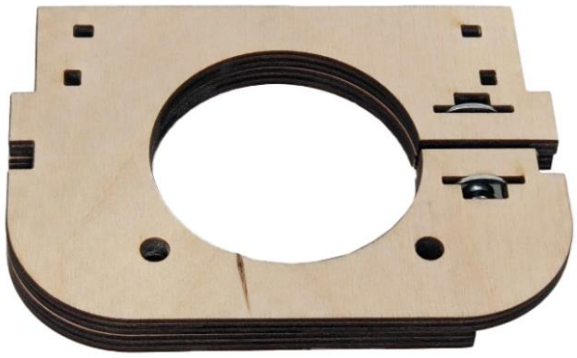


Step 2b Place the Screw, Nut and Washer Assembly into the Inner Spindle Mount (QZ5). Be sure the Square Nut and Washers are nested into their slots, as shown.

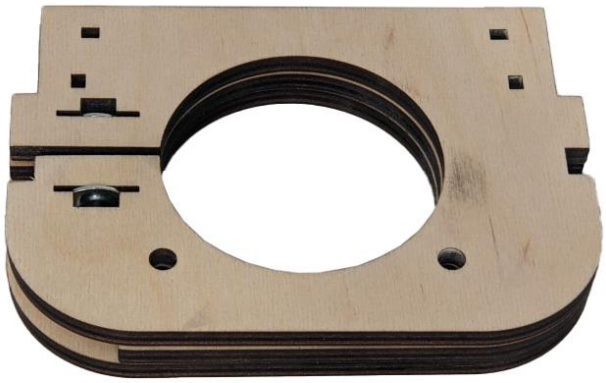




Step 2c Position the Mid Spindle Mount (QZ6) over the Inner Spindle Mount and the Screw, Nut and Washer Assembly, as shown.

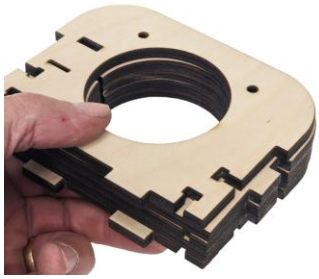


Step 2d Making sure the Screw, Nut and Washer Assembly stay in place, carefully turn the Spindle Mount Assembly over and cover with the second Mid Spindle Mount (QZ6) as shown.



Step 2e Install the two Outer Spindle Mounts (QZ7) on the top and bottom of the Router Mount Assembly.

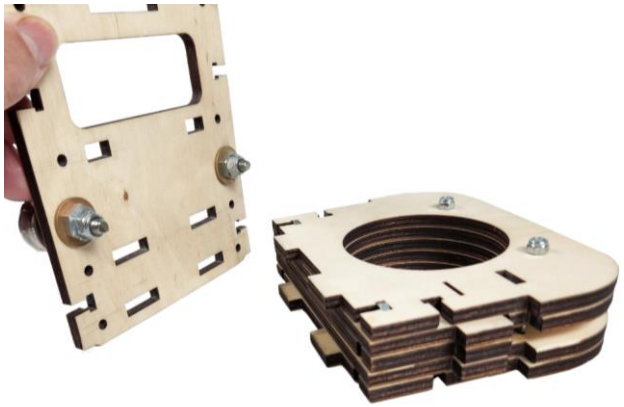
Step 2f While holding the Assembly stack together, insert two M4 x 35 Machine Screws (H85) through the bottom of the Assembly and secure with two M4 Lock Nuts (H47) as shown.

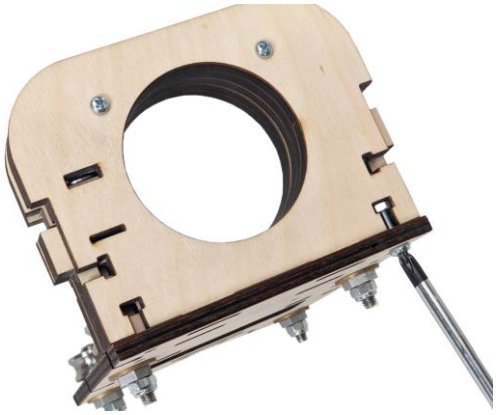


Adjustment Slot

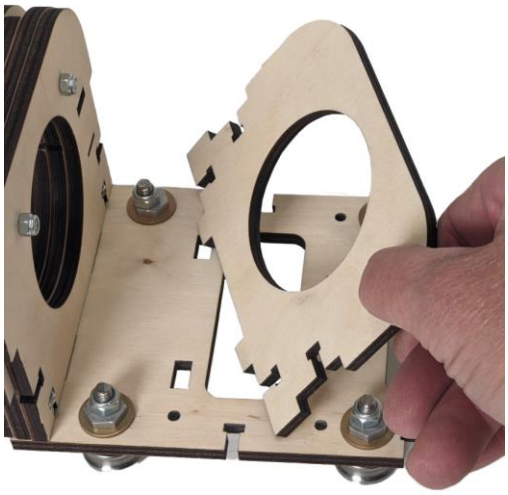
The Assembly stack can be oriented so that the slot for securing the Router is located on either the left or right side with the curved front corners facing you.

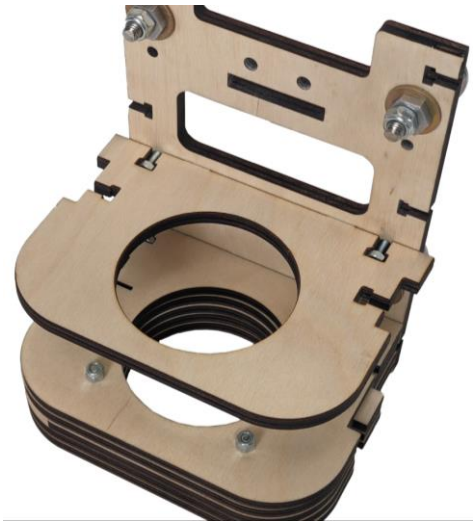
Step 2g Align the tabs of the stack with the slots in the Back Plate Assembly and secure with four M4 x 16 Machine Screws and Nuts. You may find it helpful to set the two M4 Nuts in the top before fully seating the tabs.



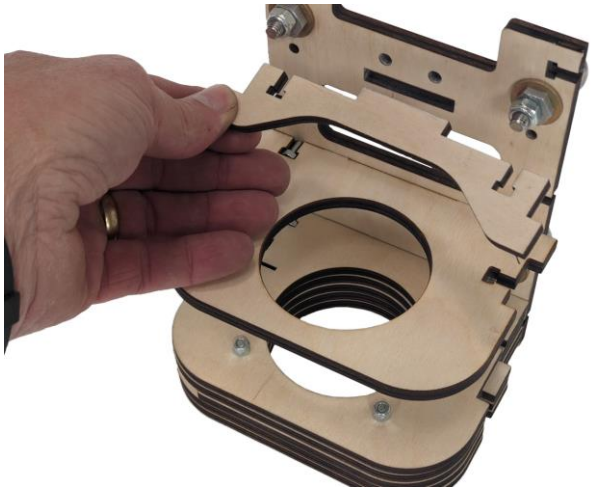


Step 2h Align the tabs of the Top Spindle Mount (QZ4) with the slots in the Back Plate Assembly and secure with two M4 Machine Screws X 16 and Nuts as shown.

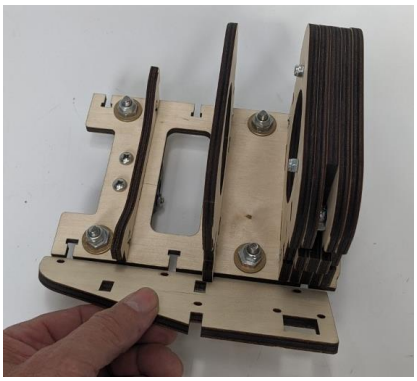




Step 2i Align the tabs of the Top Brace (QZ3) with the slots in the Back Plate Assembly and secure with two M4 X 16 Machine Screws and Nuts as shown

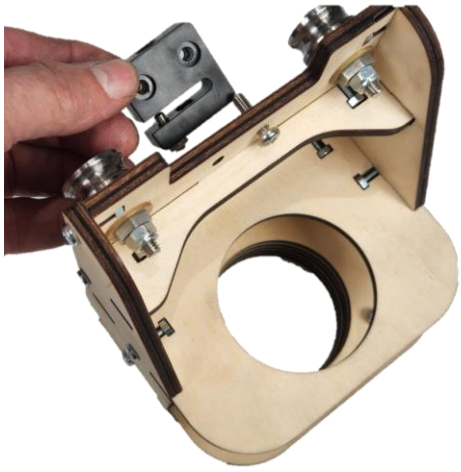


Step 2j Align the tabs of the Router Mount Assembly with the slots in the Side Support (QZ2) and secure with six M4 x 16 Machine Screws and Nuts. Repeat to install the other Side Support.



Step 2k Prepare the ACME Nut Assembly (ZD12) by inserting two M5 Lock Nuts (H49) in the ACME Block. Make sure the nylon washer on the top of the Lock Nut is visible after inserting.

Step 2l Insert two M5 x 18 Machine Screws (H97) through the Router Mount Assembly as shown and secure the ACME Nut Assembly in place as shown.



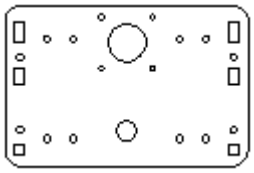
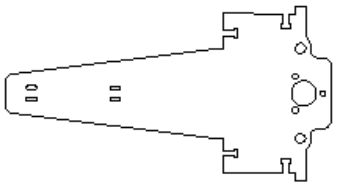
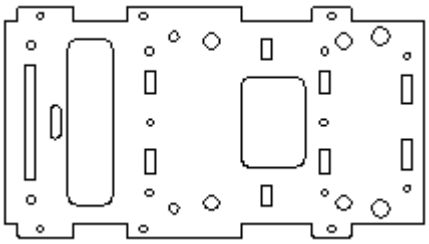
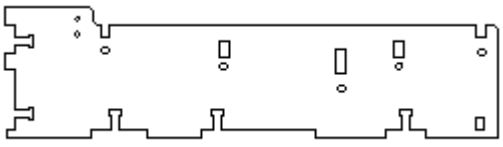
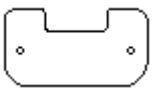
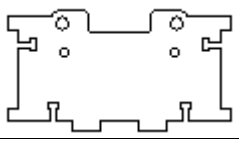
The slot in the ACME Nut must be oriented on the bottom as shown.

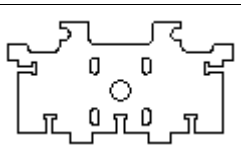
Left Side

Right Side

Y Carriage Assembly and Z Assembly

Required Wood Components

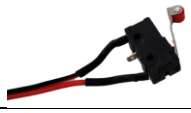
Part #	Description	Qty	Photo
QY1	Z Stepper Motor Mount	1	
QY2	Carriage Top Support	1	
QY3	Bearing Retainer Plate	1	
QY4	Carriage Frame	1	
QY5	Carriage Side Support	2	
QY6	Z Rail Stop	1	
QY7	Outer Rail Support	1	

QY8		2	

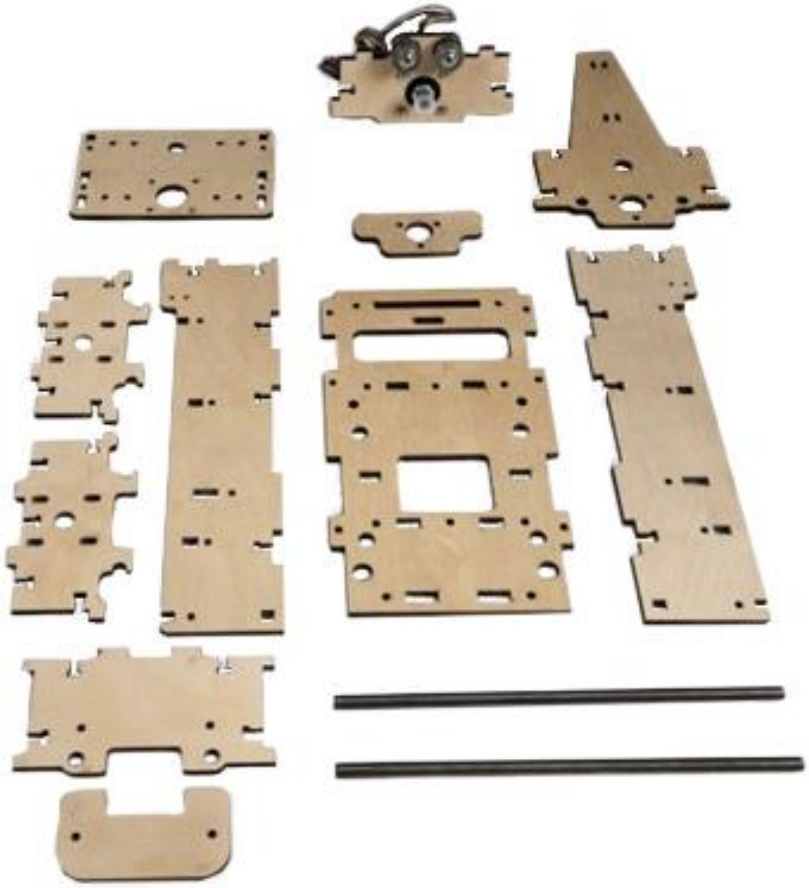
Required Hardware

Part #	Description	Qty	Photo
H95	M6 x 35 Machine Screws	4	
H18	M6 Locknuts	4	
H40	Eccentric Spacer	2	
H41	Eccentric Washer	2	
H42	Bearing Fender Washer	6	
H44	SG20U Bearing	4	
H57	Bearing Retainer Washer	3	
H98	M4 x 20	5	
H47	M4 Lock Nut	5	

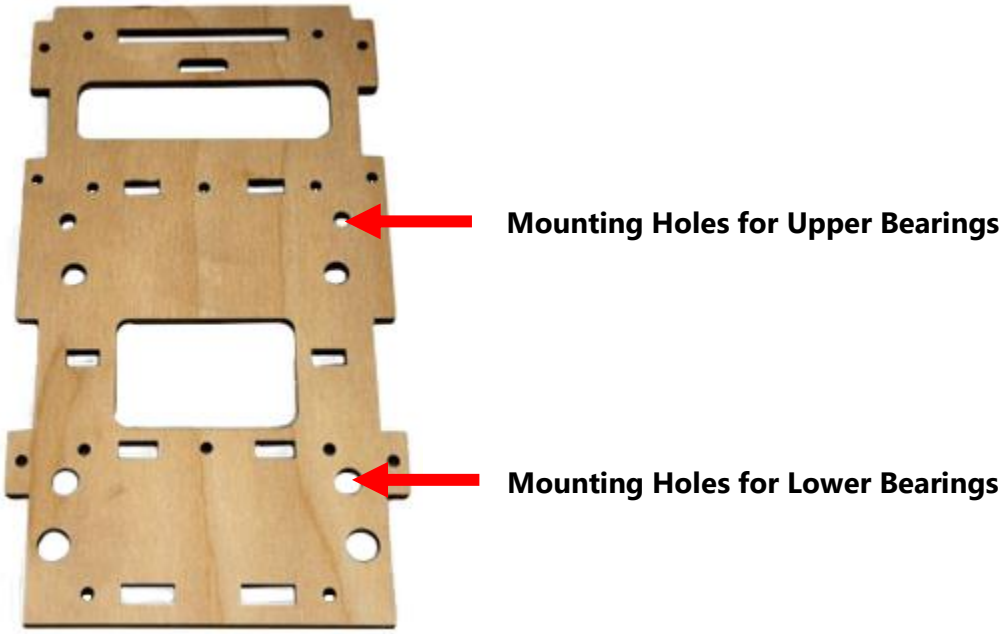
CB11	Stepper Motor	1	
H37	M3 x 10 Machine Screw	4	
H88	M3 washer	4	
ZD5	Aluminum Helical Coupler	1	
ZD3	626-2RS Bearing	1	
ZD4	6mm Split Locking Collar	1	
ZD1	ACME Screw	1	
H66	¼ inch Shim Washer	2	
H15	M4 Nut	30	
H14	M4 x 16 Machine Screw	30	
H54	Stress Proof Steel Z-Rail	2	

CB19	Home Switch	1	
H27	M2.5 x 16 Machine Screw	2	
H43	M2.5 Lock Nut	2	

Illustrated Step by Step Instructions



Step 1 Installing the Upper and Lower Bearings

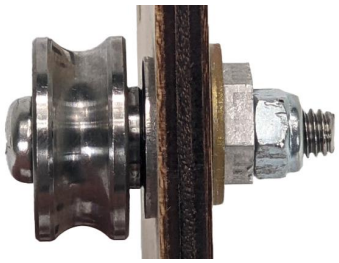


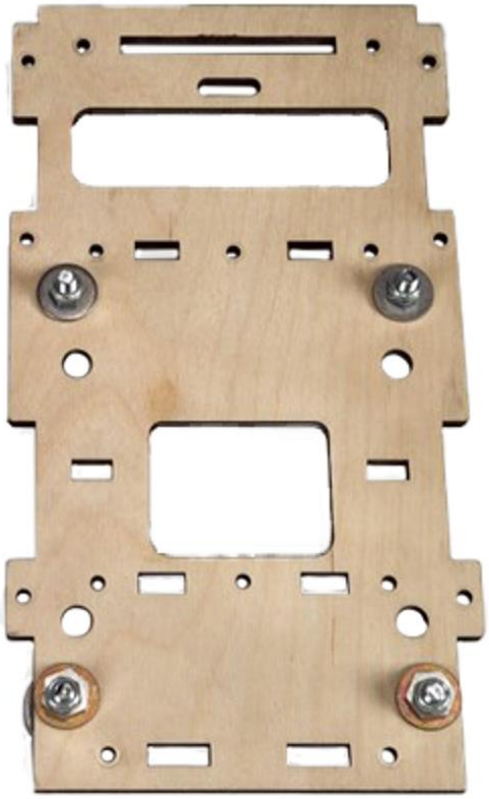
Step 1a

Install the two Upper SG20U Bearing Assemblies for the Carriage Frame (QY4). The assembly order for the Upper Bearing: M6 x 35 Machine Screw (H95), SG20U Bearing(H44) with hub facing toward the Bearing Washer (H42), Plywood, Bearing Fender Washer (H42) secured with a M6 Lock Nut (H18) as shown.

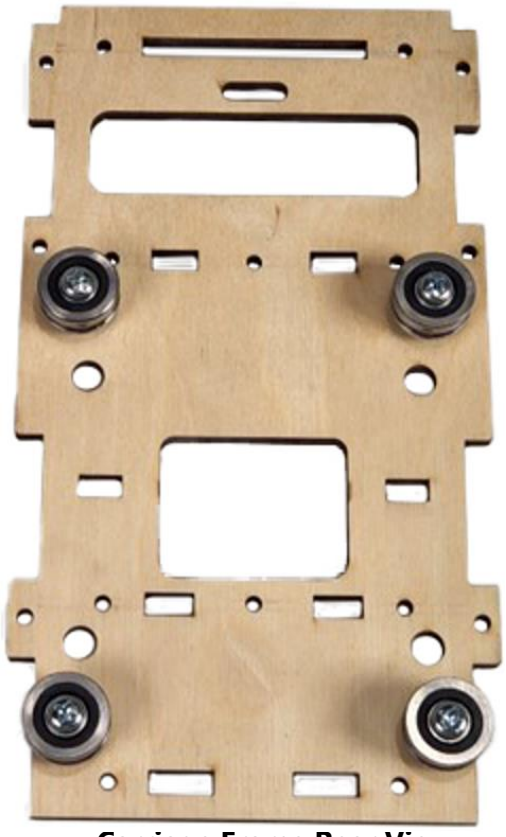
Step 1b

Install the two lower SG20U Bearings for the Y Carriage Assembly as shown. The assembly order for the Lower Bearings: M6 x 35 Machine Screw (H95), SG20U Bearing (H44) hub facing toward the Bearing Fender Washer (H42), Plywood, Eccentric Washer (H41), Eccentric Spacer (H40) secured with a M6 Lock Nut (H18).





Carriage Frame Front View



Carriage Frame Rear View

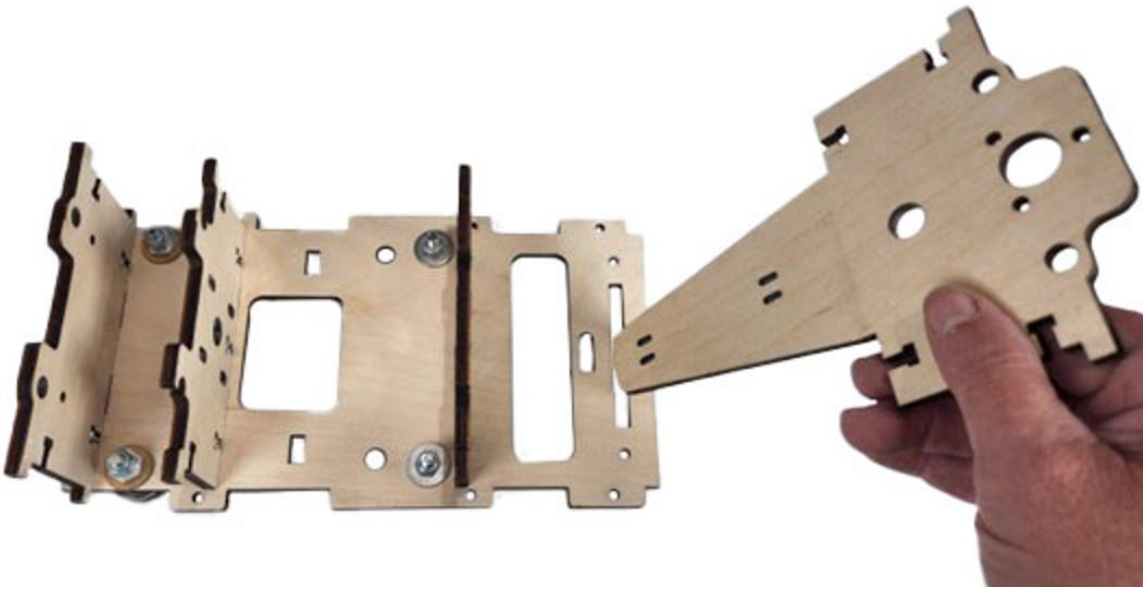
Step 2 Building the Y Carriage Assembly

Step 2a With the Bearings facing down, align the tabs of the Carriage Bottom Support (QY7) with the slots at the bottom of the Carriage Frame (QY4) and secure with two M4 x 16 Machine Screws and Nuts.

Step 2b Align the tabs of the Outer Rail Support (QY8) with the slots located below the opening in the Carriage Frame Assembly and secure with three M4 x 16 Machine Screws and Nuts.

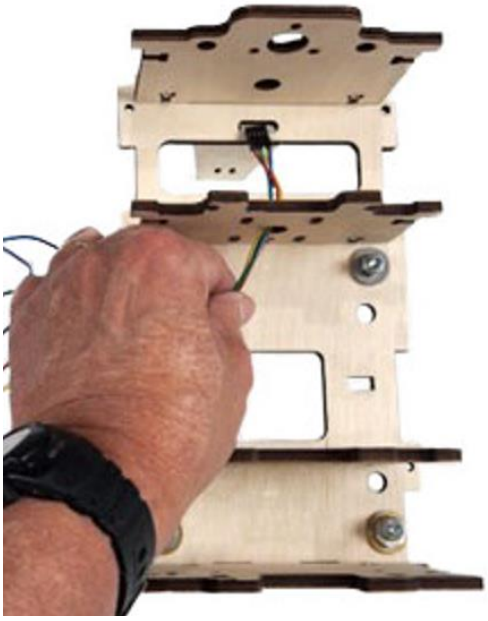
Step 2c Align the tabs of the remaining Outer Rail Support (QY8) with the next set of slots above in the Carriage Frame Assembly and secure with three M4 x 16 Machine Screws and Nuts.

Step 2d Slide the narrow tongue of the Carriage Top Support (QY2) through the long narrow slot at the top of the Carriage Frame Assembly, as shown. Secure with two M4 x 16 Machine Screws and Nuts.

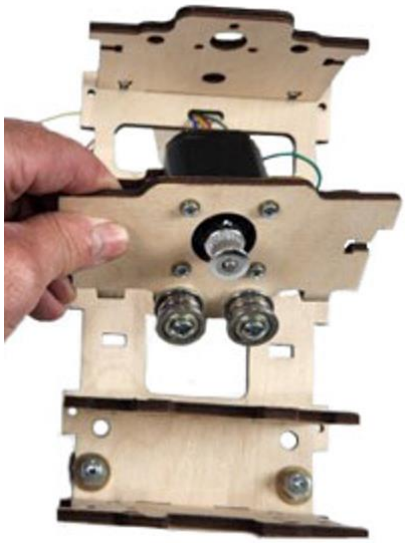


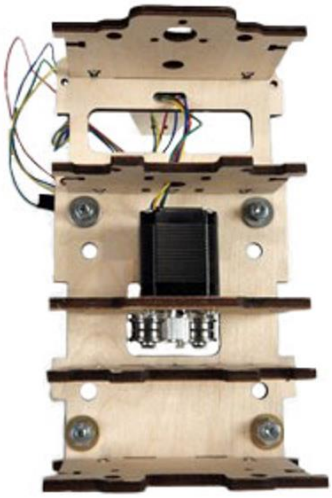
Step 2e Carefully thread the Dupont Connector and the Stepper Motors wires of the Z Stepper Motor Mount Assembly through the upper Outer Rail Support.

Continue threading the wires through the rectangular slot just beneath the Carriage Top Support.

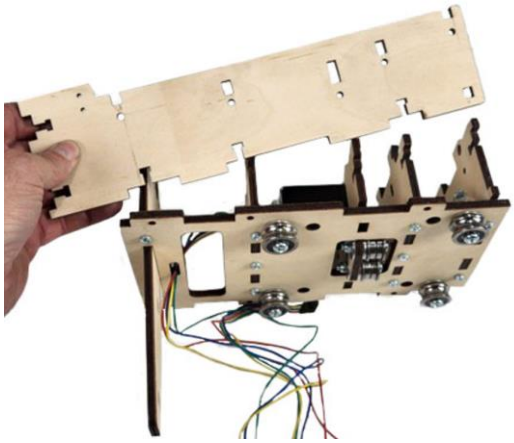


Step 2f With most of the wire threaded through the Y Carriage Assembly, align the tabs of the Z Stepper Motor Assembly with the corresponding slots in the Carriage Frame Assembly.





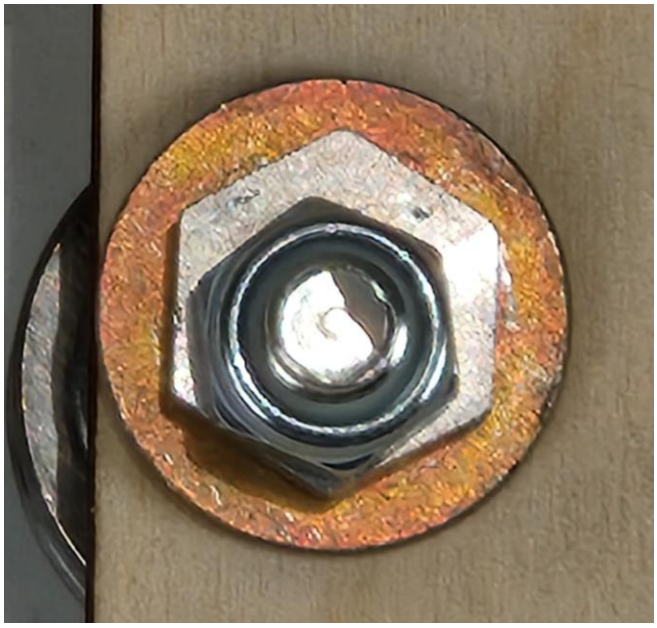
Step 2g Align the tabs and slots of the Carriage Side Support (QY5) with the Y Carriage Frame Assembly and secure eight M4 x 16 Machine Screws and Nuts.



Repeat to attach the other Carriage Side Support.

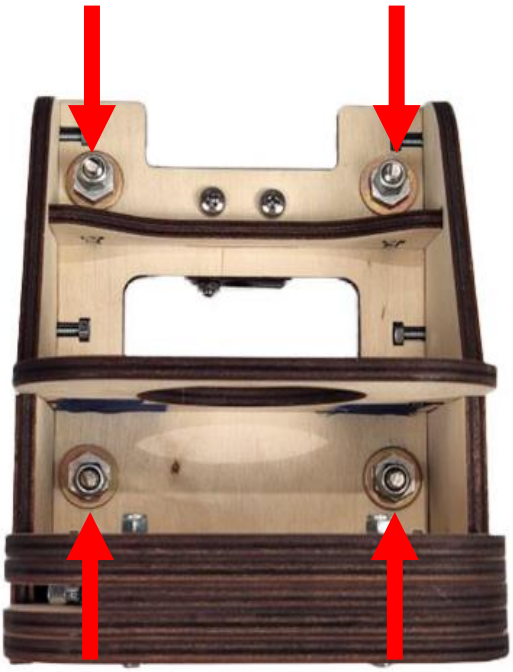
Step 2h Attach the Z Rail Stop (QY6) to the bottom of the Y Carriage Frame Assembly and secure with two M4 x 20 Machine Screws (H98) and Lock Nuts (H47).

Step 3 Attaching the Z Carriage to the Y Carriage Frame Assembly



This closeup view shows the Locknut tightened against the Eccentic Spacer. Note the space between the faces of the locknut and those of the Eccentric Spacer. This will indicate the position of the SG20U Bearing and the Rail.

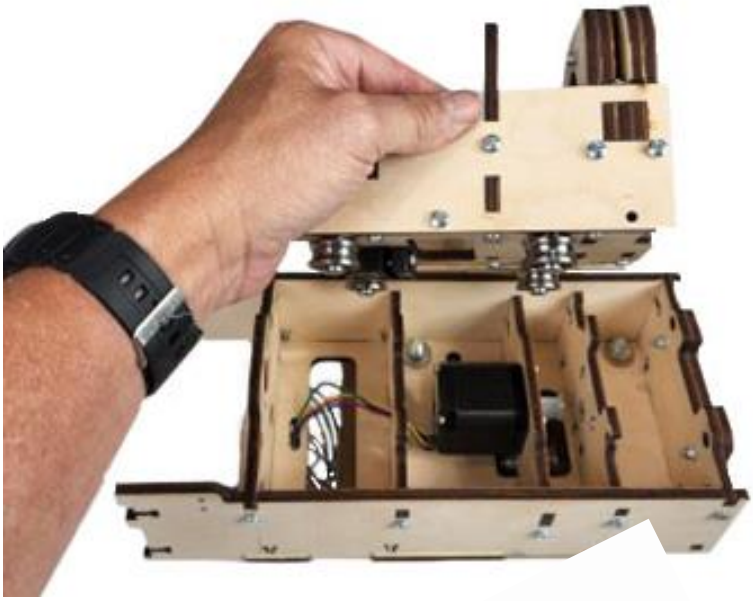
Step 3a With the Locknut firmly snugged against the face of the Eccentric Spacer use a 13mm socket to turn just the Eccentric Spacer as shown below.



IMPORTANT

Make sure the points on the wide edge of the Eccentric Spacers of the upper Bearings are pointing down and the wide point of the lower Eccentric Spacers are pointing up as shown.

Step 3b Carefully set the Z Carriage Assembly onto the Y Carriage Assembly as shown.



Step 3c Carefully slide the Z Rail (H54) through the hole in Carriage Top Support (QY2), through both Outer Rail Supports (QY8) and past the Bearings until it is seated at the bottom of the Y Carriage Assembly.

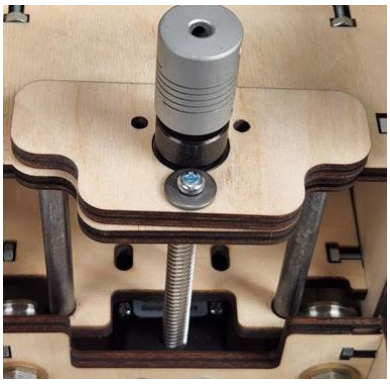
Top View

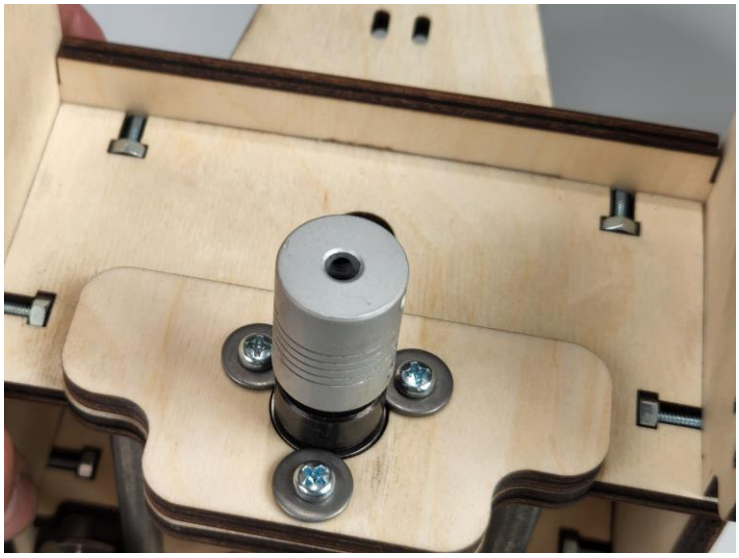
Bottom View

Step 4 Installing the Acme Screw.

Step 4a Thread the Acme Rod Assembly through the hole located at the front of the Carriage Top Support (QY2) and into the Acme Nut. Rotate the Acme Screw through the Acme Nut until the bearing touches the Carriage Top Support. Then turn Acme Screw just until Z Carriage begins to rise up the Rail.

Step 4b Place the Bearing Retainer Plate (QY3) over the ACME Screw Assembly and secure with three M4 x 20 (H98) Machine Screws and Bearing Retainer Washers (H57), and M4 Locknuts (H47).

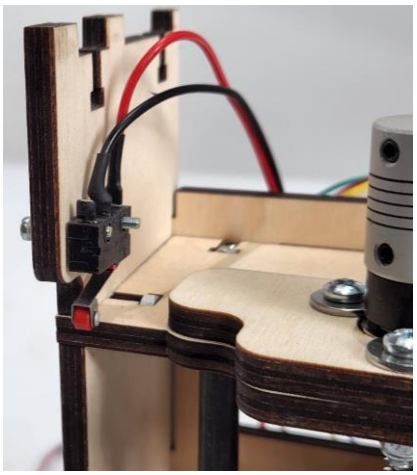




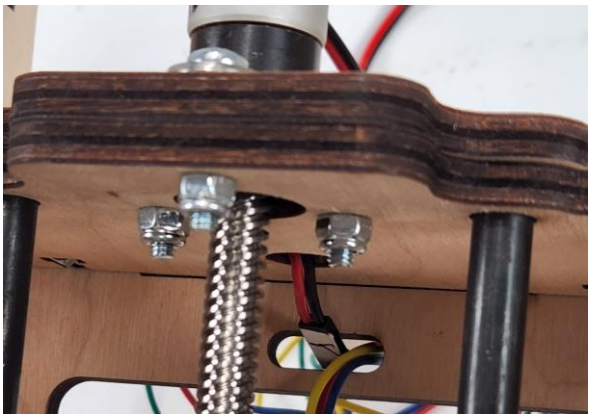
The Bearing Retainer Plate (QY3) is designed so that the Bearing Retainer Washers cover the Bearing race to hold it in place.

Step 5 Installing the Z Home Switch.

Step 5a Align Home Switch Arm down as shown. Secure Home Switch with two M2.5 X 16 Machine Screws (H27) and Locking Nuts (H43). Install the Screws so that the heads are outside the Carriage Side Support with Lock Nuts against the switch housing. Do not over tighten.

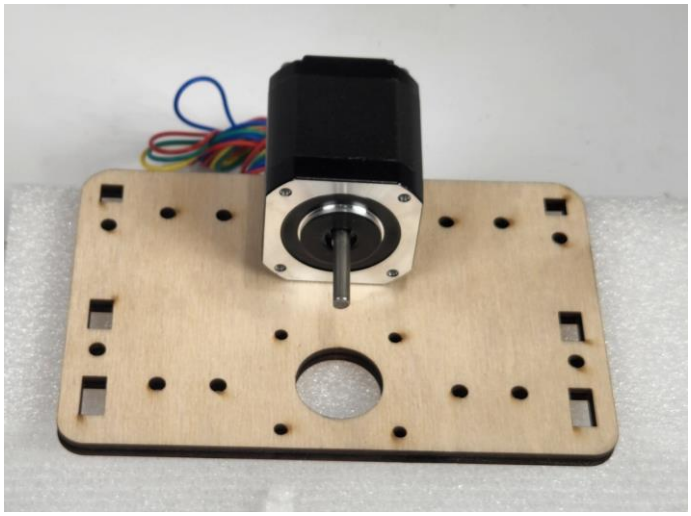


Step 5b Route the Home Switch wire down through the access hole and through the elongated hole in the Carriage Frame as shown.

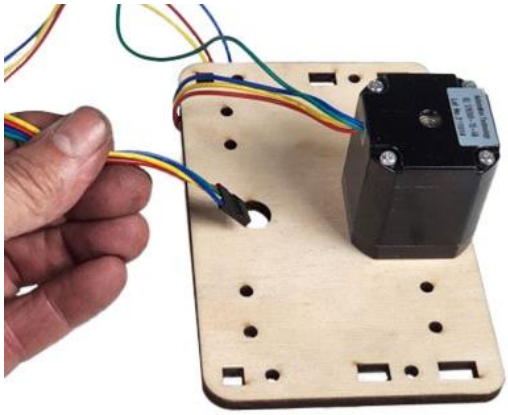


Step 6 Installing the Z Stepper Motor.

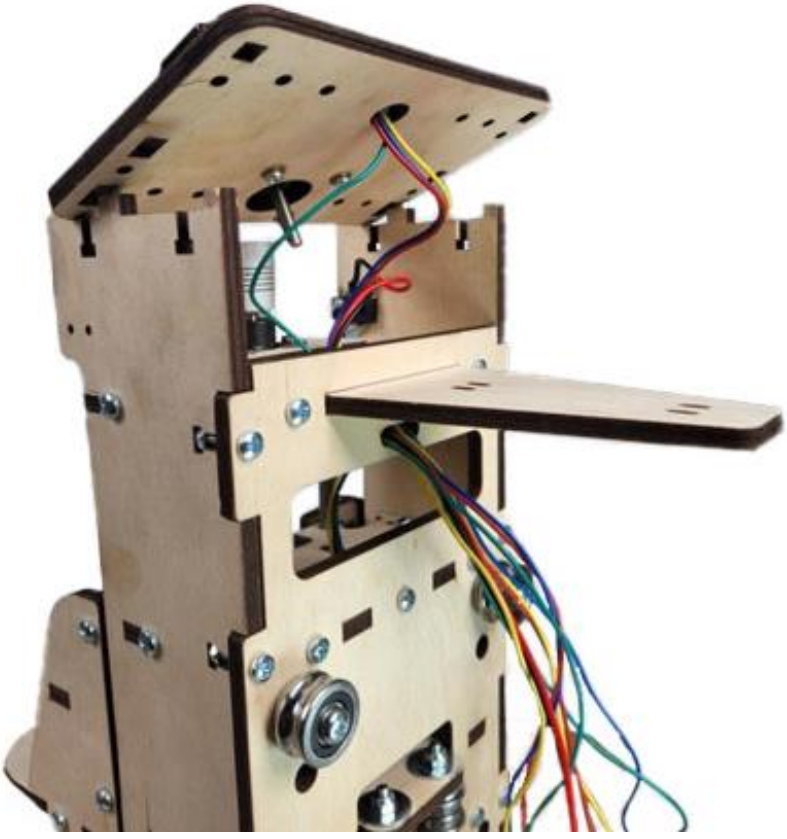
Step 6a Mount the Z Stepper Motor through the large hole in the (QY1) Z Stepper Motor Mount. Secure four M3 x 10 Machine Screws (H37) with M3 Washers (H88).



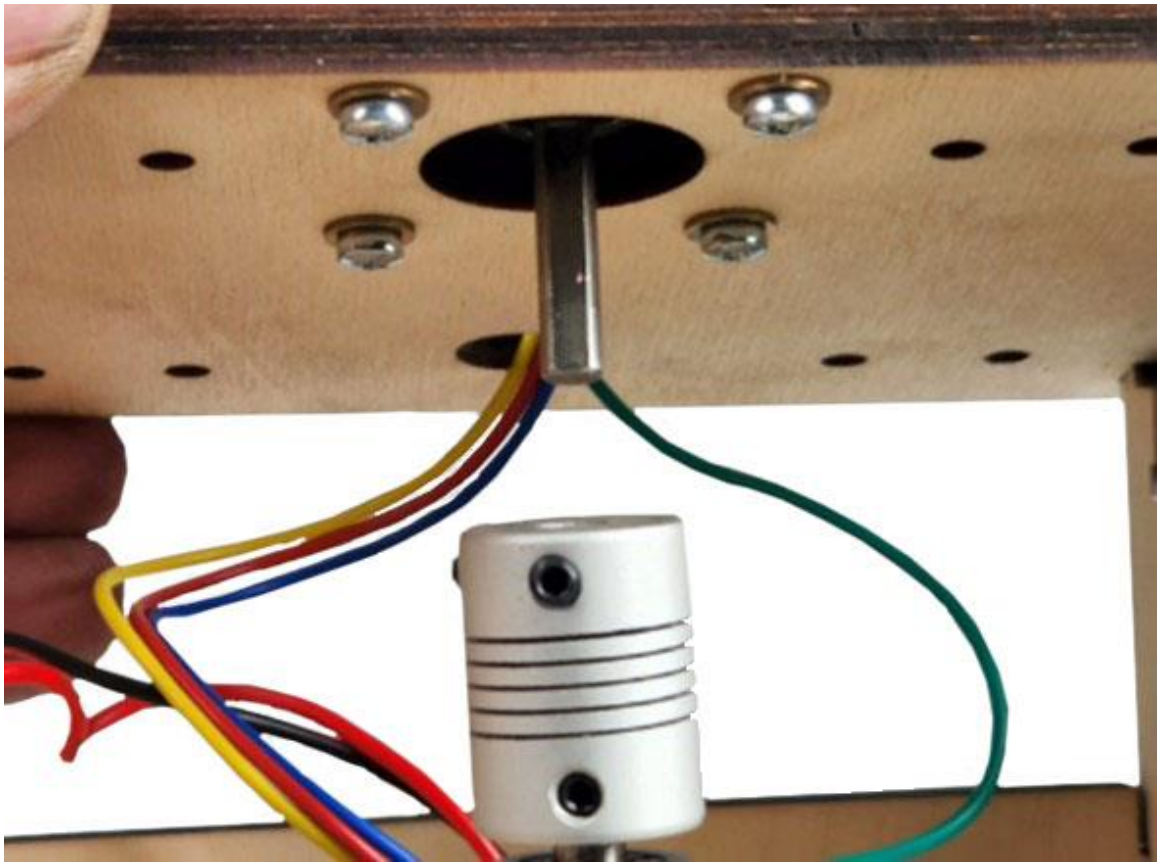
Step 6b Route the Z Stepper Motor wire through the small hole at the back of the Mount as shown.



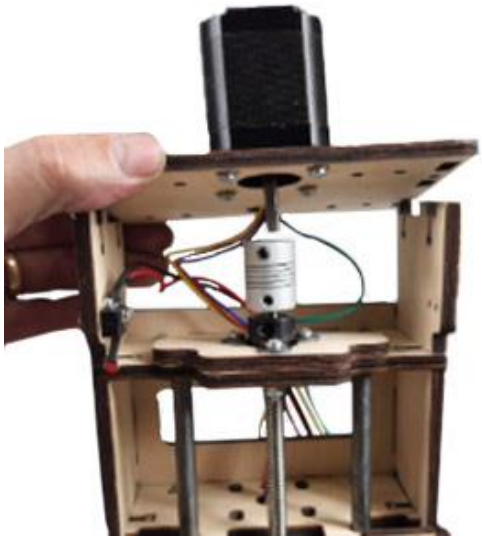
Continue routing the wires through the Carriage Top Support (QY2) and the small rectangular hole in the Carriage Frame (QY4) beneath the Carriage Top Support as shown.

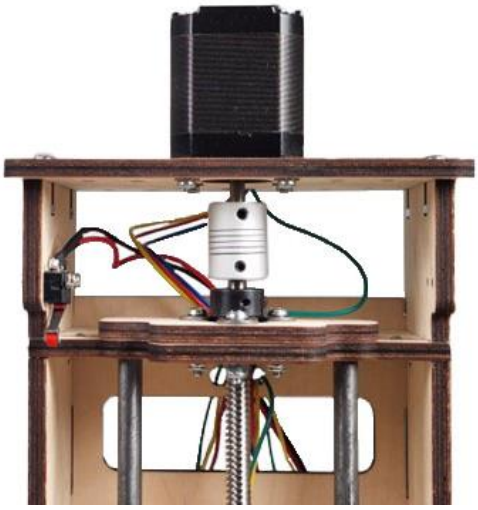


Step 6c Before aligning the tabs of the Carriage Frame Assembly with the slots in the Z Stepper Motor Mount, make sure that the flat of the Stepper Motor shaft lines up with a Set Screw in the Helical Coupler as shown.

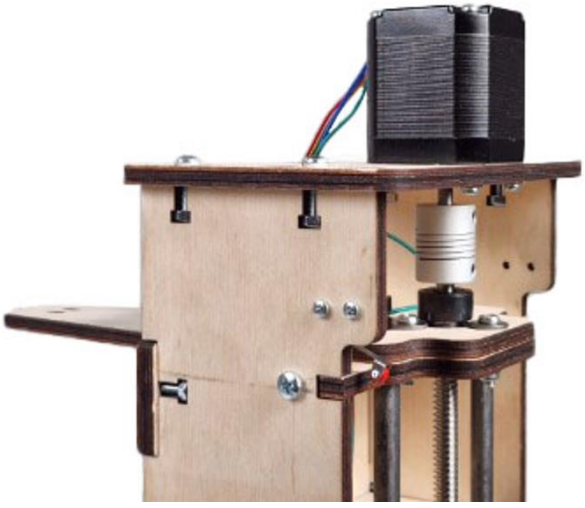


Step 6d Carefully slide the Stepper Motor Shaft into the Helical Coupler. Then fit the tabs of the Carriage Frame Assembly into the slots in the Z Stepper Motor Mount and secure with four M4 x 16 Machine Screws and Nuts.



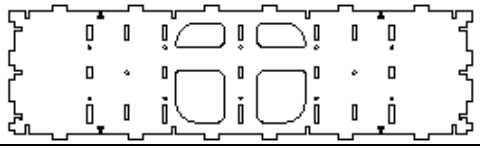
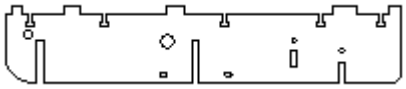
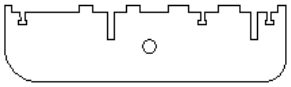
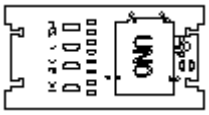
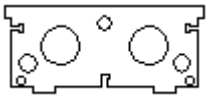
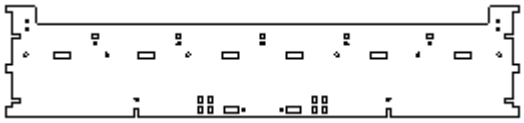
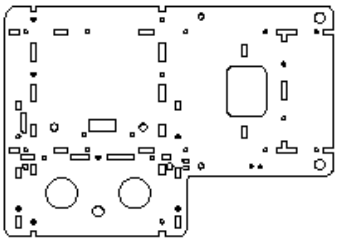


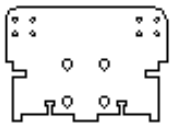
Step 6e Carefully tighten both set screws on the Helical Coupler against the Stepper Motor shaft.



Gantry Assembly

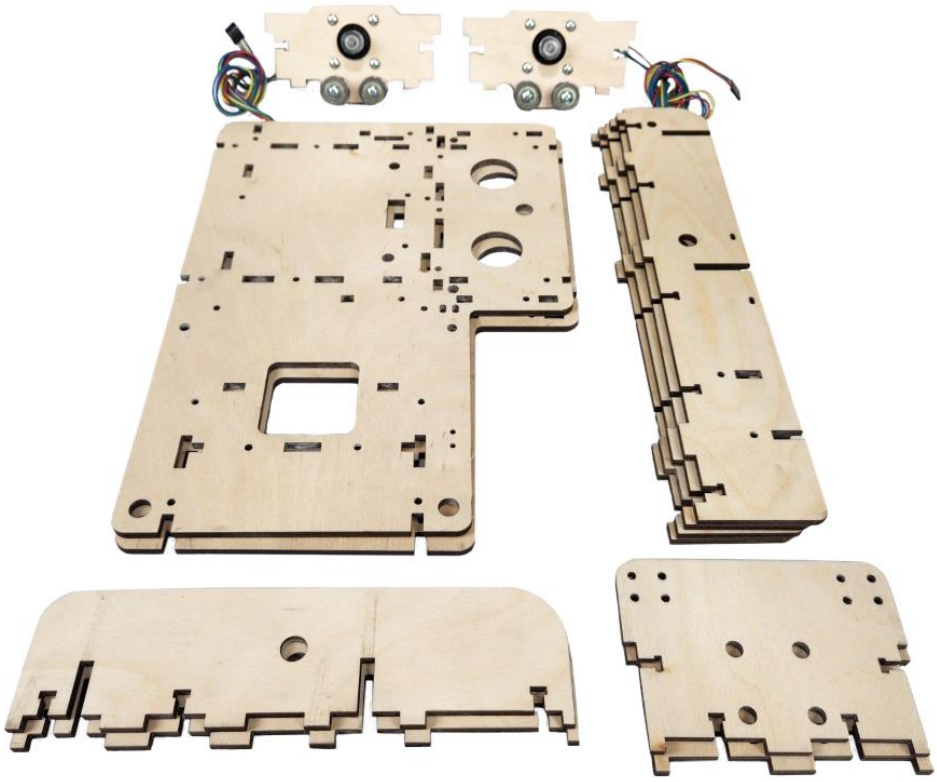
Required Wood Components

Part #	Description	Qty	Photo
QG1M	Gantry Frame	1	
QG2	Gantry Side Support	4	
QG3	Gantry Cross brace	4	
QG4	Y Rail Support	5	
QG5	Controller Mount	1	
QG6	Gantry Back Brace	2	
QG8M	Gantry Top/Bottom Brace	2	
QG9	Gantry Side	2	

QG10	Gantry Lower Side Brace	2	

Required Hardware

Part #	Description	Qty	Photo
H95	M6 X 35 Machine Screws	8	
H18	M6 Lock Nut	8	
H40	Eccentric Spacer	4	
H41	Eccentric Washer	4	
H42	Bearing Fender Washer	12	
H44	SG20U Bearing	8	
H14	M4 x 16 Machine Screws	100	
H15	M4 Nut	100	
CB19	Home Switch	3	
H27	M2.5 x 16 Machine Screw	6	
H43	M2.5 Lock Nut	6	
H53	Stress Proof Steel XY-Rail (24.75”)	4	

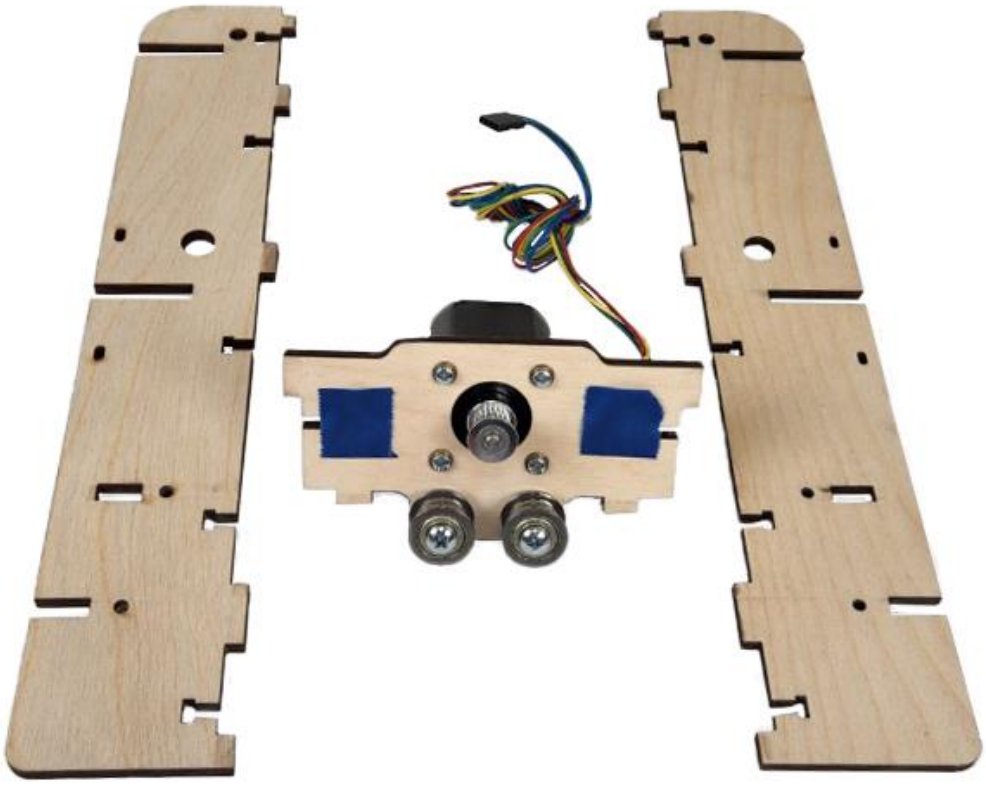


Step 1 Building the Gantry Side Assemblies.

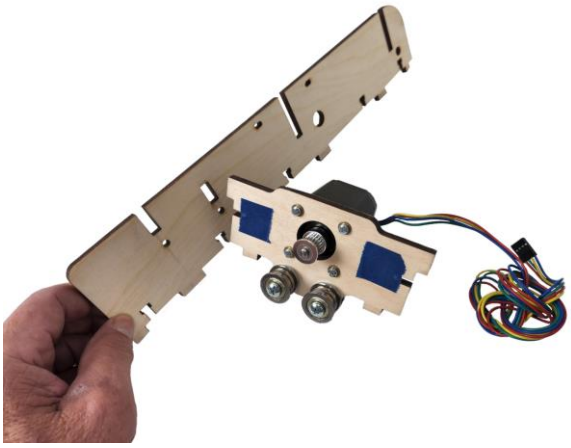
NOTE: The two Side Assemblies will mirror each other when completed. Prior to assembly, orient the parts of the side you are building as shown.

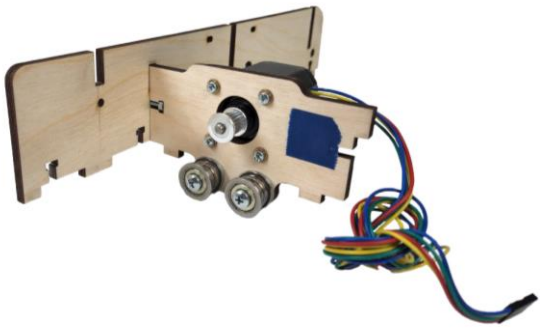
Step 1a Lay out two Gantry Side Supports (QG2) and a completed Stepper Motor Mount Assembly. Be sure that with the Bearings resting on the table as shown to ensure the Stepper Motor Wires are oriented in the correct direction as shown.

Install two M4 Nuts and use small pieces of tape to cover the T-slots on the bottom of the Stepper Motor Mount Assembly.

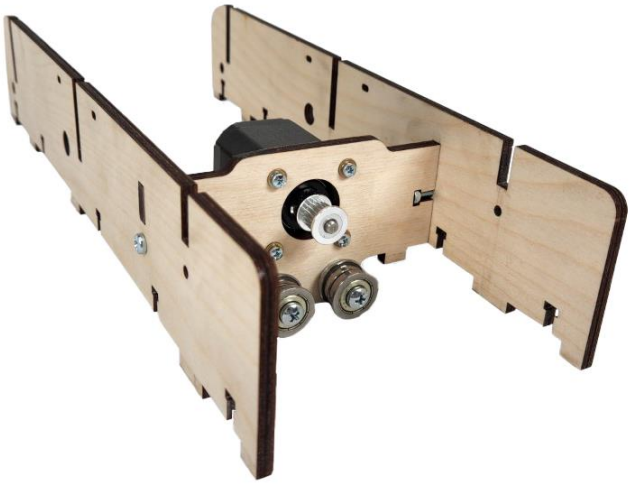


Step 1b Align the tabs of the Stepper Motor Mount Assembly with the slots in the Gantry Side Support (QG2) and secure with one M4 x 16 Machine Screw.

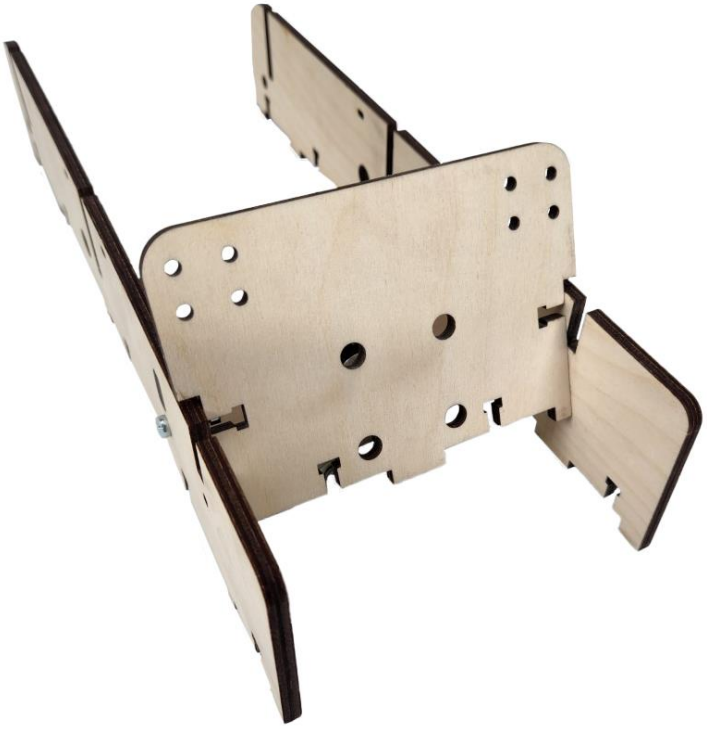




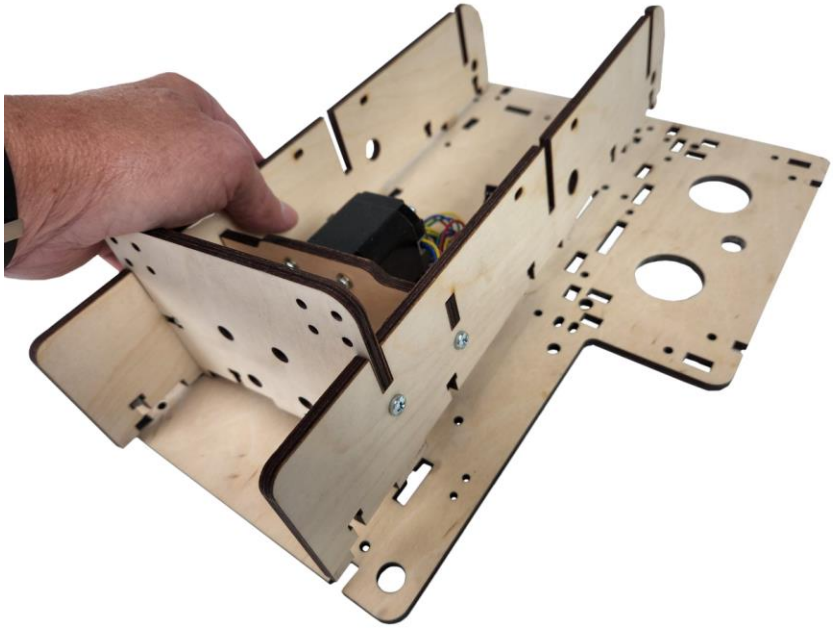
Repeat to install the other Gantry Side Support. Remove the tape after tightening.

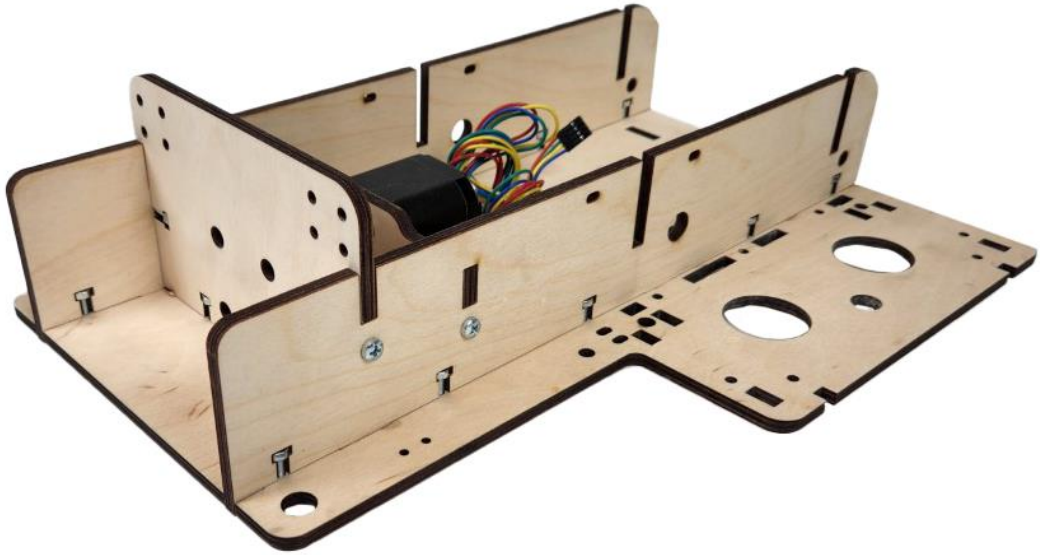


Step 1c Align the tabs of the Gantry Lower Side Brace (QG10) and slide it into the slots in the Assembly as shown.

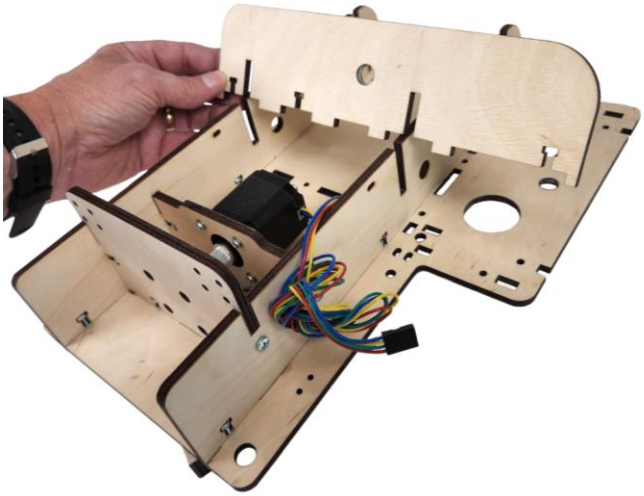


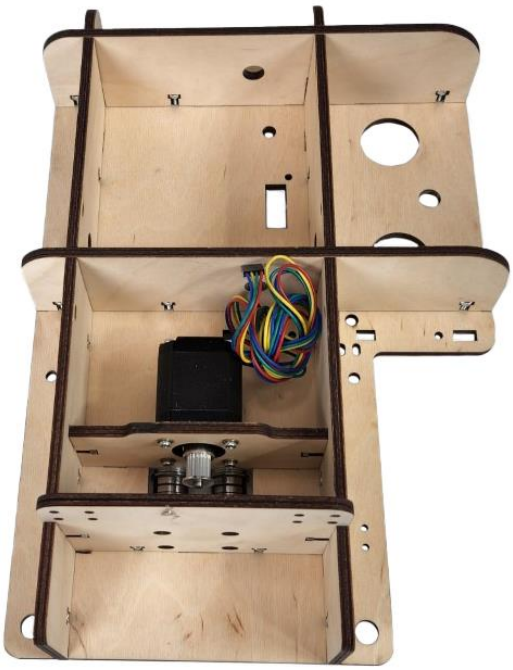
Step 1d Carefully align the tabs of the Support Assembly and slide them into the slots in the Gantry Side (QG9). Secure with twelve M4 x 16 Machine Screws and Nuts.





Step 1e Align the slots of the two Gantry Cross Braces (QG3) with the slots in the Assembly. Carefully insert the tabs in the corresponding slots and secure each with three M4 x 16 Machine Screws and Nuts.



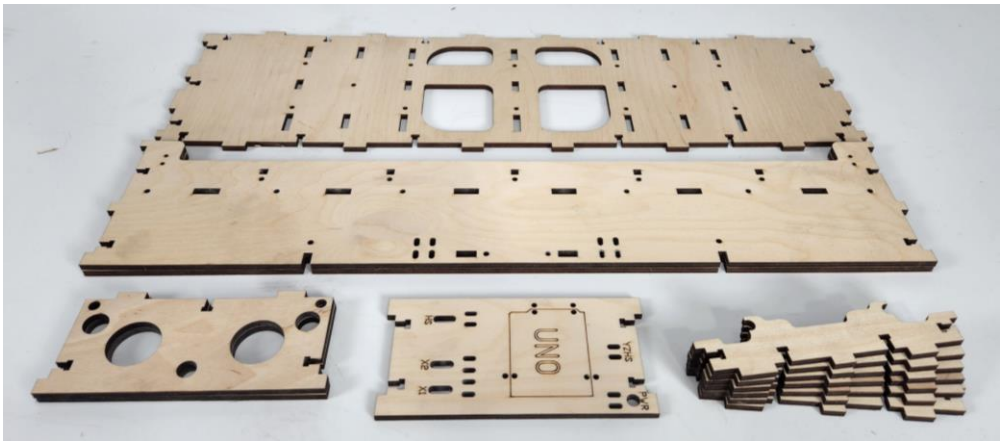


Repeat these steps to complete the other Gantry Side Support Assembly.

Finished Gantry Side Assemblies

Each completed Assembly is a mirrored copy of the other. It is essential that the Stepper Motor wires are oriented as shown.

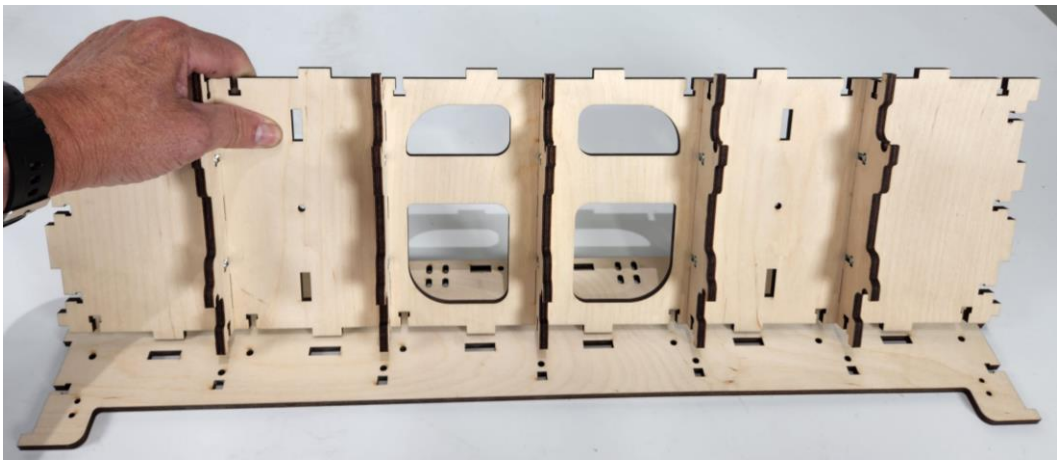
Step 2 Building the Gantry Back Assembly.



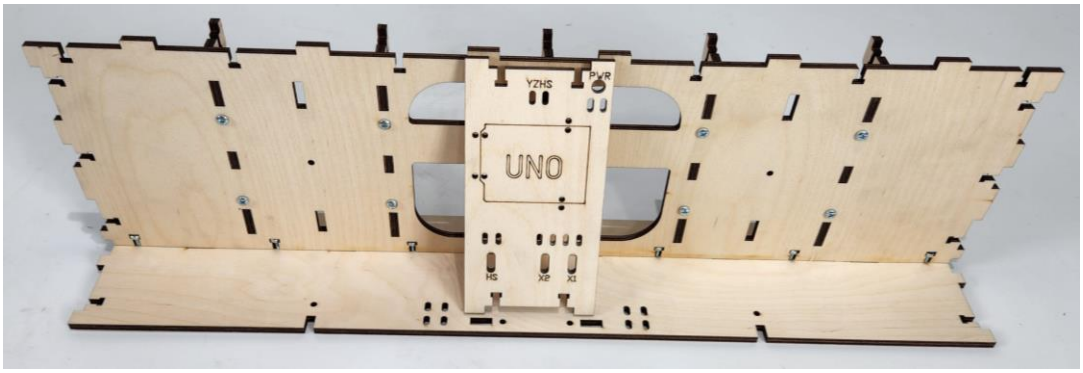
IMPORTANT: The two smaller rectangular cutouts in the Gantry Frame (QG1M) indicate the top of the Gantry Frame.

Step 2a Attach the five Y Rail Supports (QG4) to the Gantry Frame (QG1M) and secure each with two M4 X 16 Machine Screws and Nuts as shown.

Step 2b Align the tabs and slots of the Gantry Bottom Brace (QG8M) with the Gantry Frame Assembly. Secure with eleven M4 x 16 Machine Screws and Nuts.

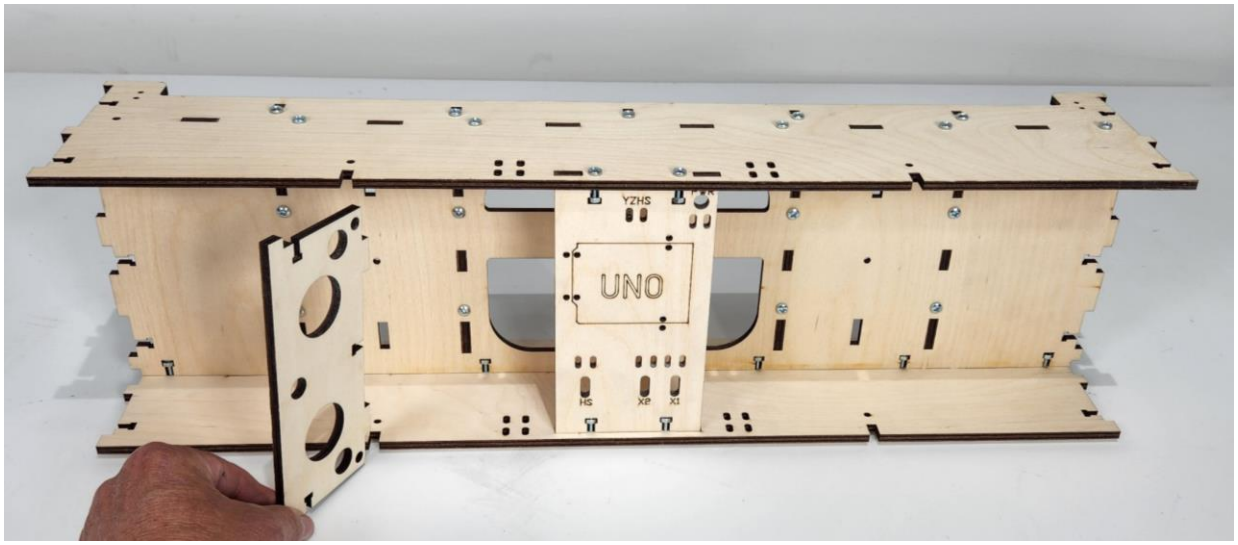


Step 2c Insert the tabs of the Controller Mount (QG5) into the slots in the Gantry Assembly as shown below. Secure each with two M4 x 16 Machine Screws and Nuts.



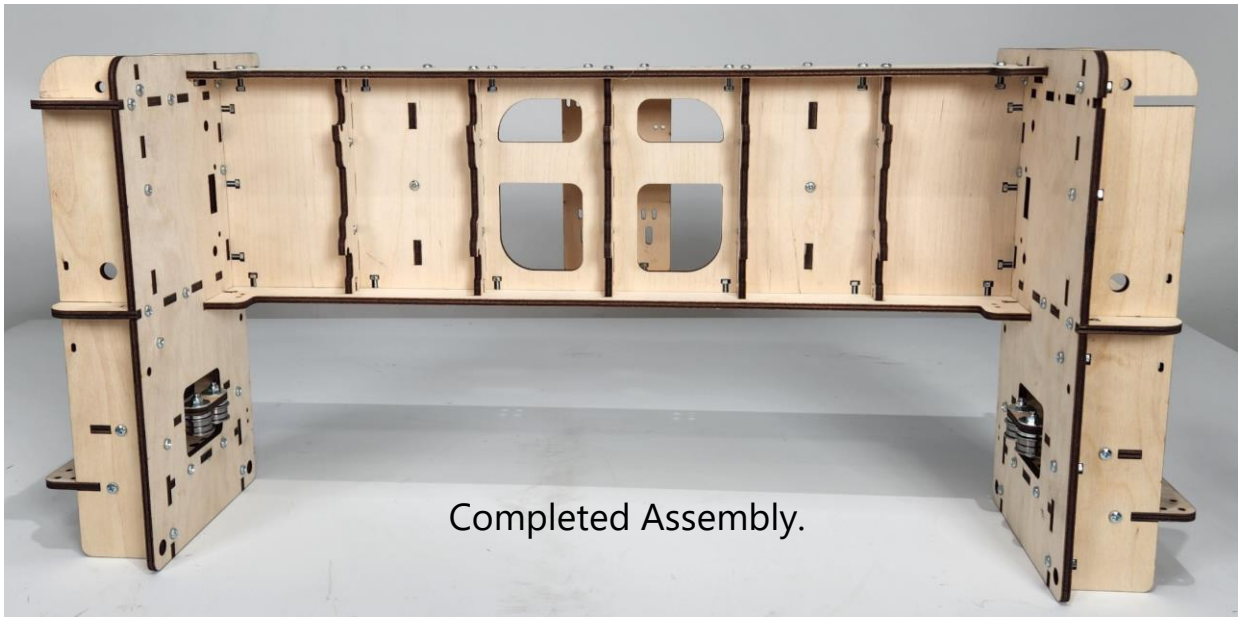
Step 2d Align the tabs of the Back Frame Assembly with the slots in the Gantry Top Brace (QG8) and Controller Mount (QG5). Carefully fit the top in place and secure with twenty-three M4 x 16 Machine Screws and Nuts as shown.

Step 2e Align and insert the tabs of the two Gantry Back Braces (QG6) into the slots of the Gantry Frame Assembly and secure each with three M4 x 16 Machine Screws and Nuts as shown. Repeat to install both braces.



Step 2f Align and fit the tabs of the Gantry Assembly into the slots of the left Gantry Side Assembly and secure with seven M4 x 16 Machine Screws and Nuts.

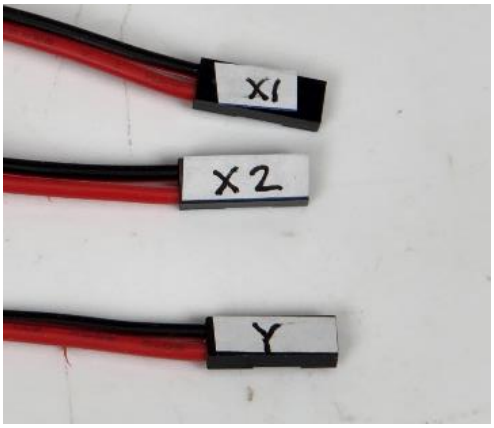
Repeat for the right side



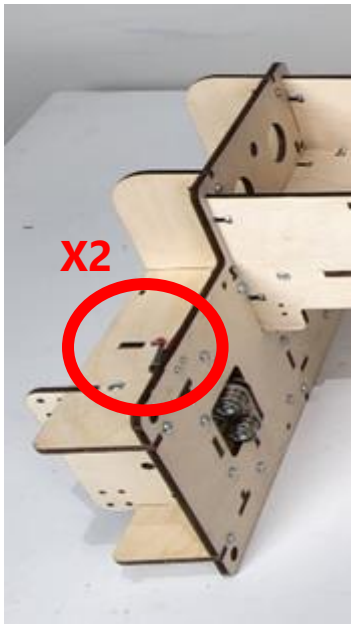
Completed Assembly.

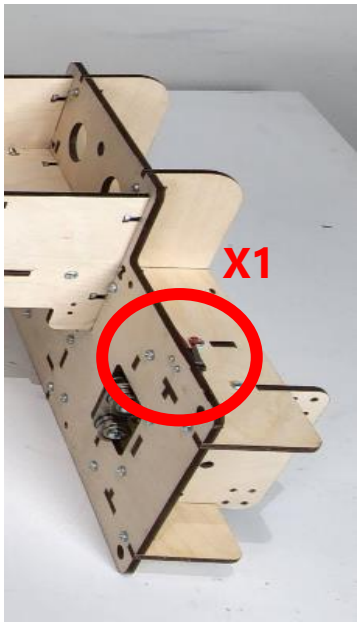
Step 3 Attaching the X1, X2, and Y Home Switches.

Step 3a Take the three Home Switches (CB13) and label the DuPont Connectors “X1”, “X2” and “Y”.

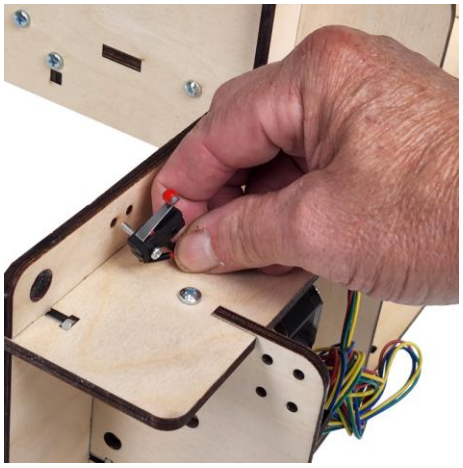


With the Gantry Assembly lying as shown, attach the X1 and X2 Home Switches.

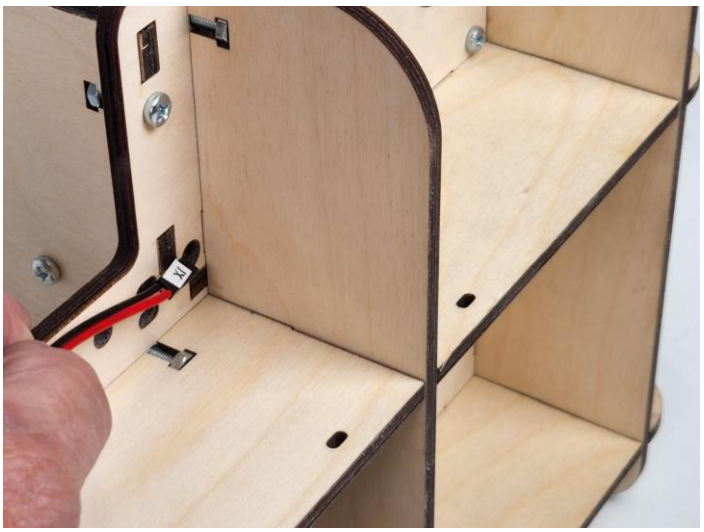




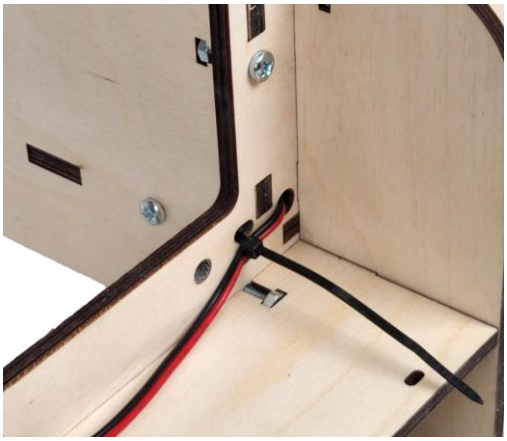
Attach each Home Switch with two M 2.5 X 16 Machine Screws (H27) and M2.5 Lock Nuts (H43). Orient the Screw Head so that it tightens against the Switch housing.

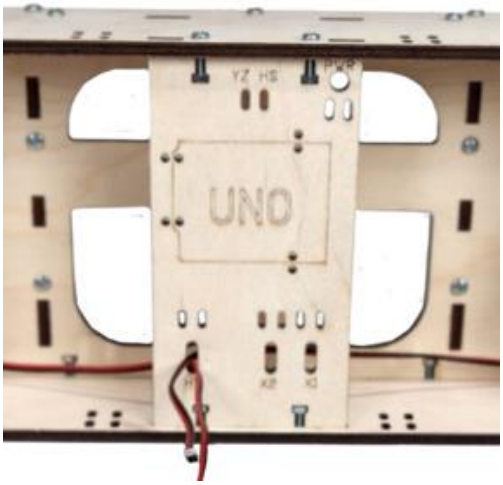


Route the X1 Home Switch wire from the Mount up and through the hole in the Side Assembly, across the Gantry and through the Controller Mount as shown



Secure wires with a Zip Tie. Trim excess material after securing. Route the Home Switch wire across the Gantry and through the Controller Mount as shown.

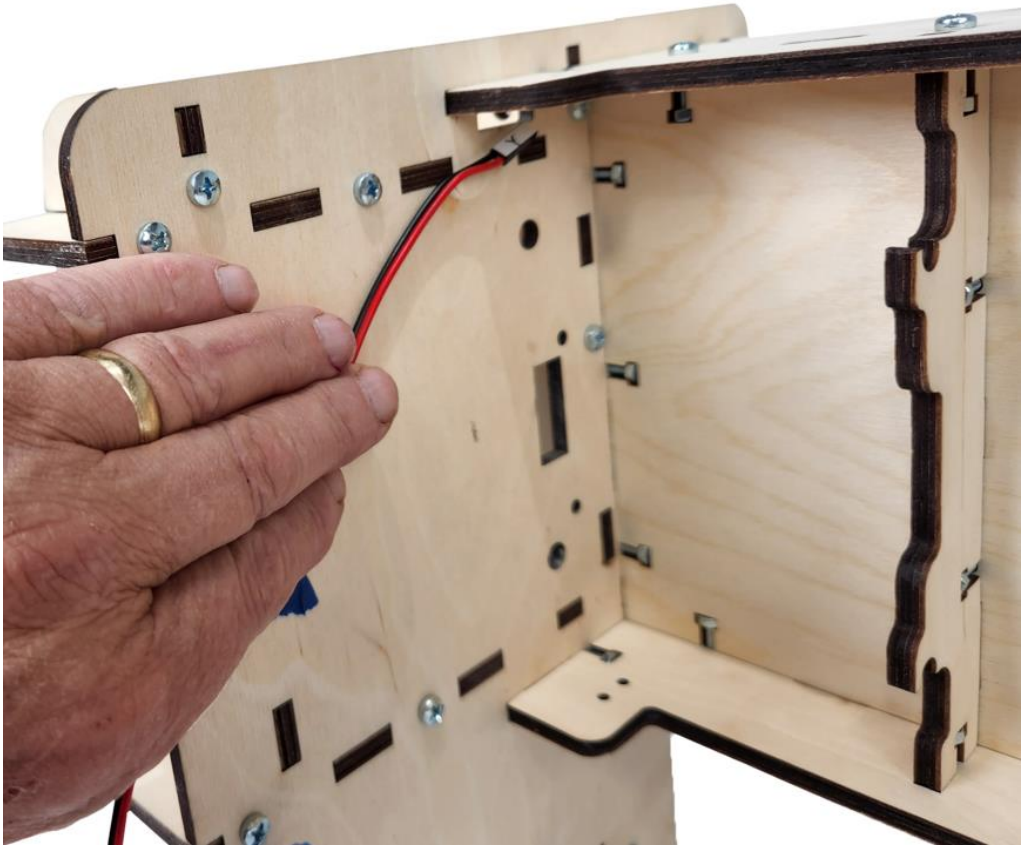




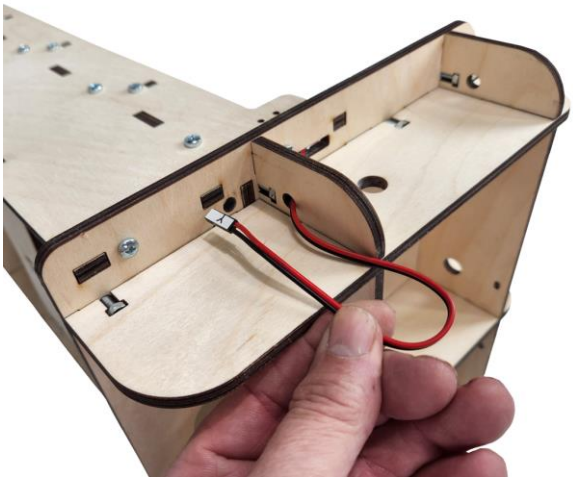
Follow the same procedure to install X2 Home Switch.

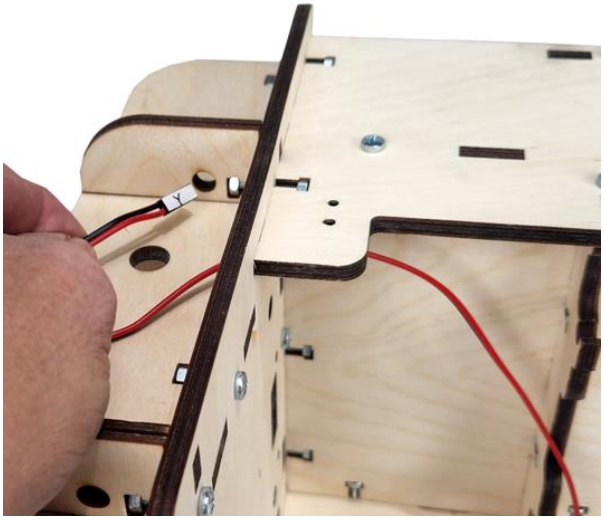
Step 3b Before installing the “Y” Home Switch route the Home Switch wire through the rectangular opening in the upper front left corner as shown.

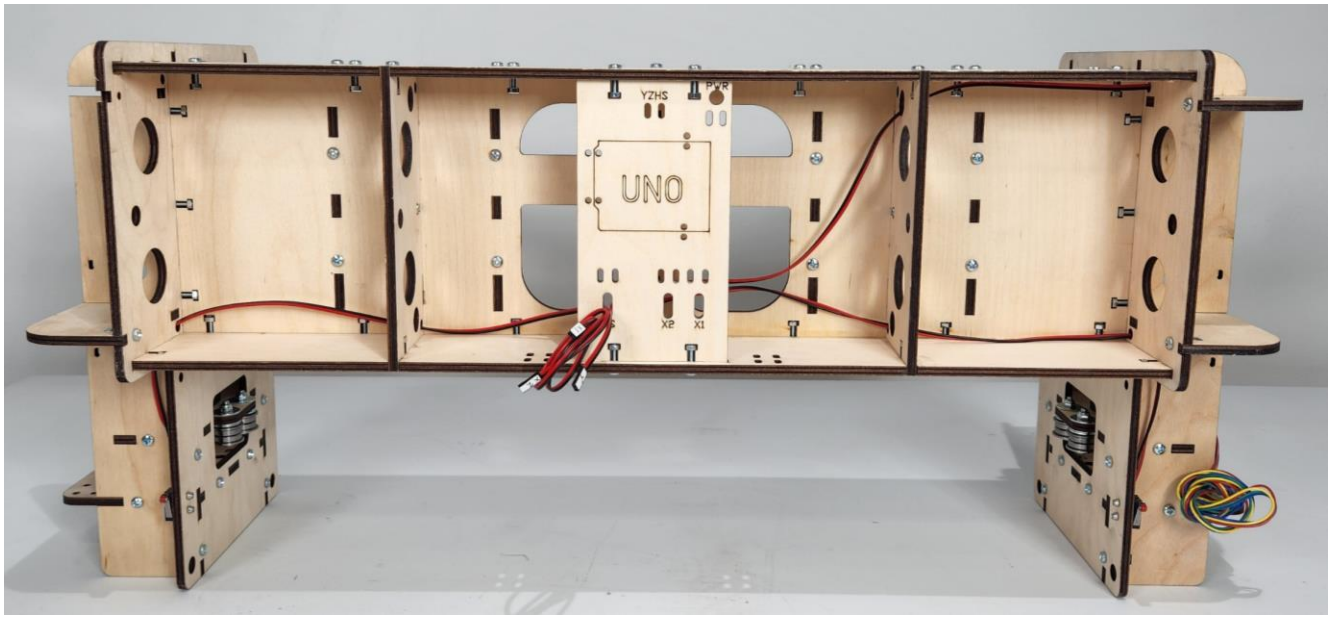
Run the wire through the small hole in the top of the Side Assembly and through the Gantry Side Support.



Run the wire back though the top of the Gantry Side Support and then through the small hole, then through the second-round hole so that the wire connector is on the inside of the Gantry and through the “HS” opening in the Controller Support as shown.





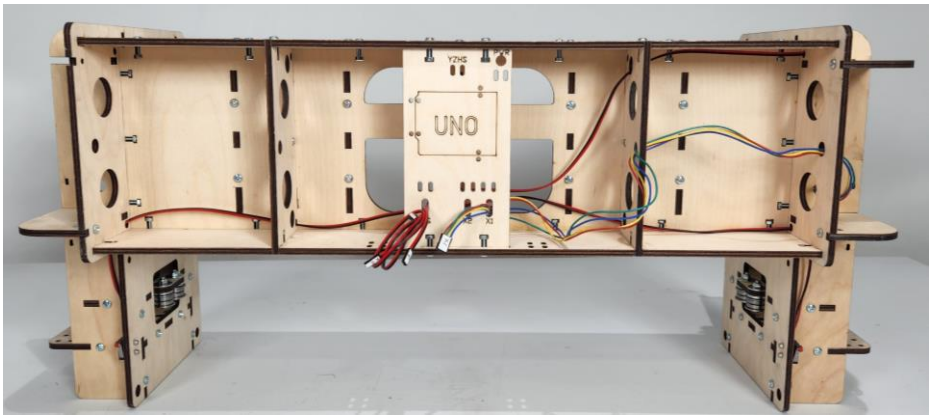


Step 3c Install the “Y” Home Switch beneath the Gantry Top Brace and secure with two M2.5 X16 Machine Screws and Lock Nuts.

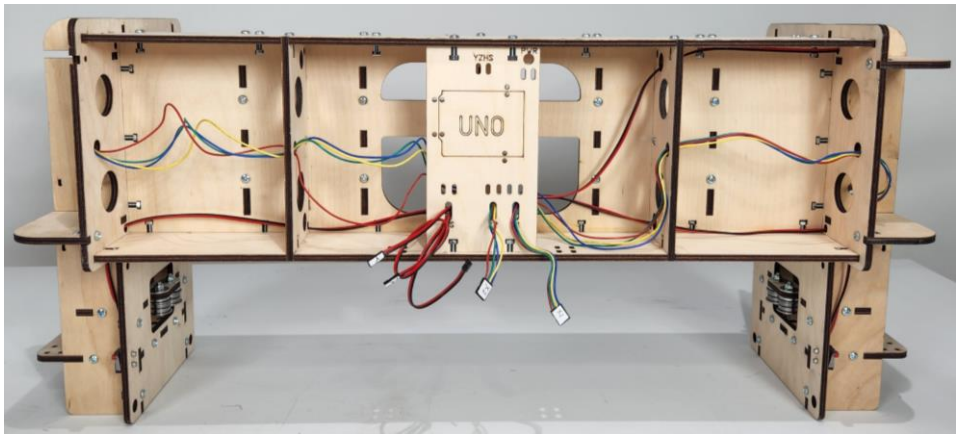
Step 4 Routing the X1 and X2 Stepper Motor Wire to the Controller Support.

Step 4a Take the DuPont Connector for the X1 Stepper Motor (right side when view from the back) and run it up and through the hole in the upper Gantry Cross Brace then through the hole in the Gantry Side Assembly as shown.

Continue routing the Dupont Connector and X1 Stepper Motor wires across the inside of the Gantry and through the Gantry Back Brace. After running the connector and wire though the X1 opening at the bottom of the Controller Mount.

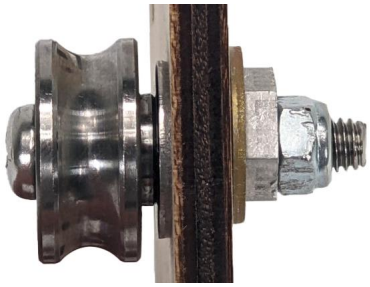


Step 4b Repeat the process to route the X2 Stepper Wires.

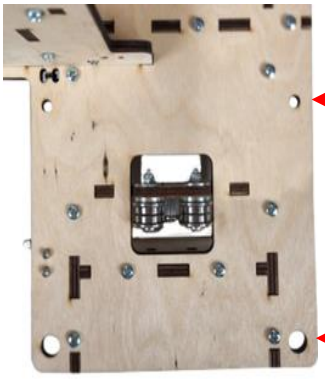


Step 5 Install the two Upper SG20U Bearing Assemblies for the Gantry Side Frame Assembly. The assembly order for the Upper Bearing Mounts: M6 x 35 Machine Screw (H95), SG20U Bearing (H44) (with hub facing toward the Bearing Washer), (H42) Bearing Fender Washer (H42), Plywood, Bearing Fender Washer (H42) secured with a M6 Lock Nut (H18) as shown.

Step 6 Install the two lower SG20U Bearings for the Gantry Assembly as shown. The assembly order for the Lower Bearings: M6 x 35 Machine Screw (H95), SG20U Bearing (H44) hub facing toward the Bearing Fender Washer, Bearing Fender Washer (H42), Plywood, Eccentric Washer (H41), Eccentric Spacer (H40) secured with a M6 Lock Nut (H18).

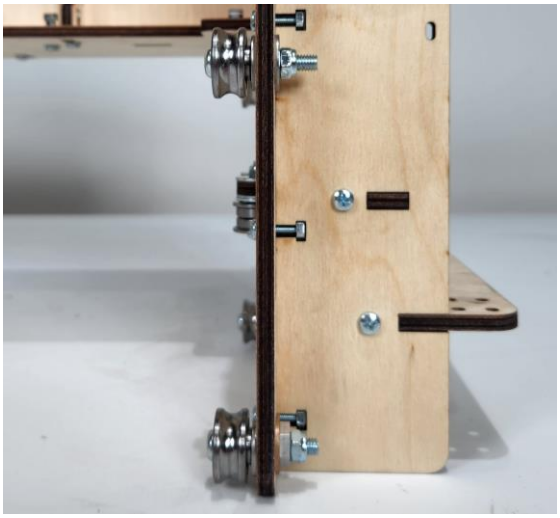


Step 7 Attach the upper and lower SG20U Bearing Assemblies to each of the Gantry Side Assemblies.



UPPER BEARINGS

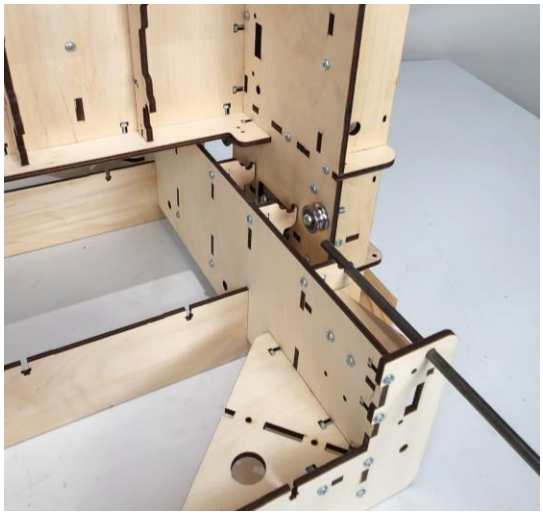
LOWER BEARINGS (With Eccentric Spacers)



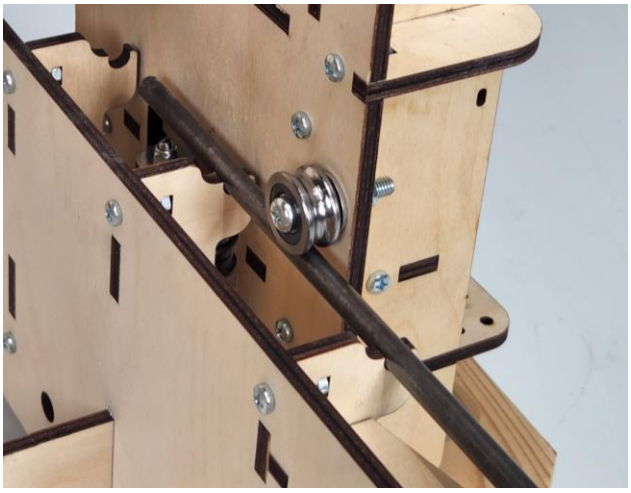
Step 8 Attach the Gantry Assembly to the X Frame Assembly.

Step 8a Carefully align the Gantry Sides with the Rail Supports in the X Frame Assembly. Make sure the X1 and X2 Stepper Motor Idlers slide between the Rail Supports as shown. Notice that the Idler Bearings of the X1 Stepper Motor fit between the rail supports.

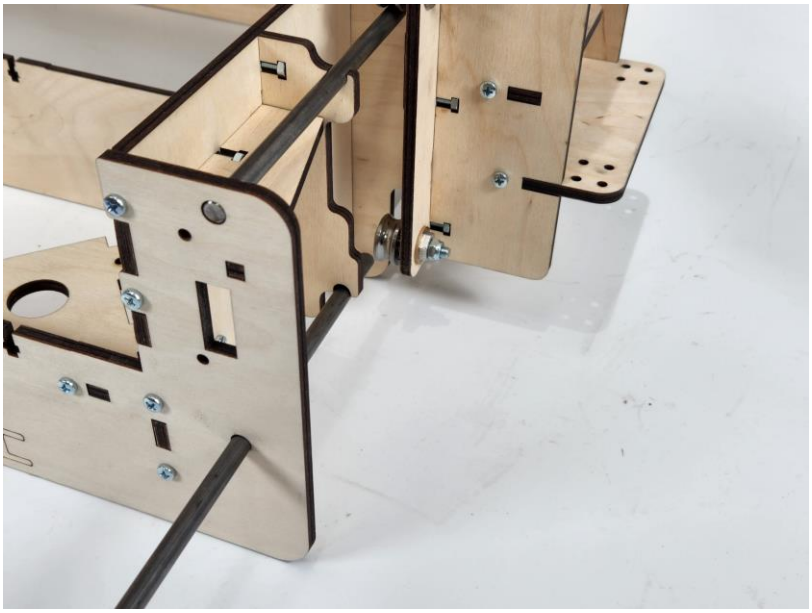
Step 8b Insert the Rail into and through the upper access hole in the Frame End Support and the Rail supports so that the Upper Bearing rest on the rails. Continue inserting the Rail until it is fully nested in the rear Frame Support.



Lift the Gantry Side so that the rail slides beneath both top bearings. Insert the Rail completely so that the ends of the Rail are seated flush in the Front and Back End Supports

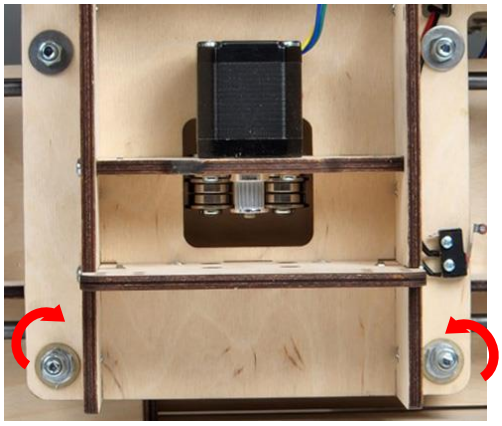


Step 8c Insert the Rail into and through the lower access hole in the Frame End Support and across the Rail supports and the top of the lower Eccentric Bearing as shown.



Step 9 Adjust the Eccentric Spacers until the Bearings are snug against the rails

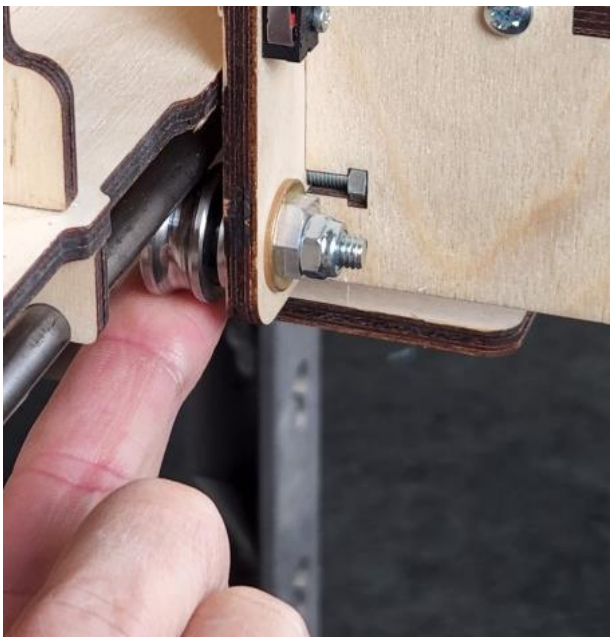
Rotate Clockwise



Rotate Counter-Clockwise

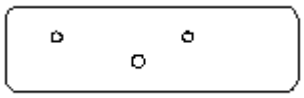
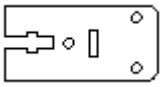
When adjusted, the position of the right and left Eccentric Spacer should mirror each other.

The Bearing should be snug against the rail. Use your finger to roll the bearing. It should not spin in place. When the bearing is properly adjusted against the rail the entire Carriage Assembly should move as you roll the bearing. Make sure the Carriage rides smoothly along the full length of the rails. Adjust as required.



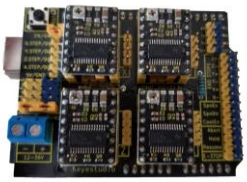
Final Assembly

Required Wood Components

Part #	Description	Qty	Photo
QR1	XY Rail Stop	6	
QR3	XY Belt Retainer	12	

Required Hardware

Part #	Description	Qty	Photo
H53	Stress Proof Steel XY-Rail (24.75”)	2	
H14	M4 x 16 Machine Screw	18	
H98	M4 x 20 Machine Screw	12	
H47	M4 lock Nut	12	
H15	M4 Nut	18	
H48	M5 x 30 Machine Screw	6	
H93	M5 Square Nut	6	

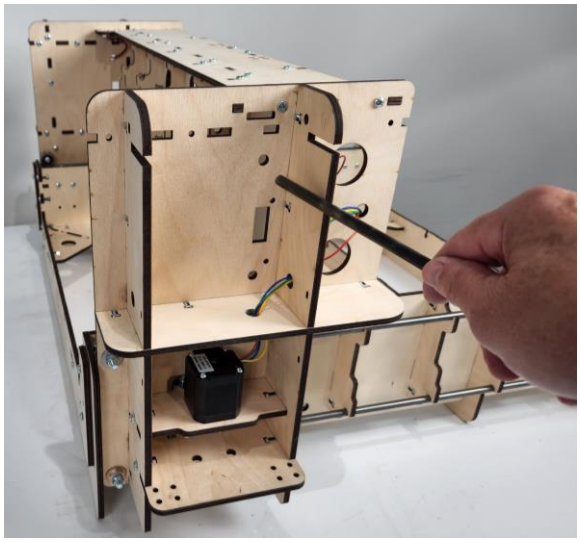
H50	Idler Fender Washer	6	
R2	Makita Router	1	
H83	GT2 – 9mm Belt	3	
CB12	Power Supply with Cord	1	
H26	Small Zip Tie	30	
CB16	Controller	1	

Step 1 Attach the four XY Rail Stops (QR1) on the front and back Frame End Supports and secure each with two M4 x 20 Machine Screws and Lock Nuts as shown.

Make sure the hole located between the Machine Screws in the Rail Stop is clearly visible through the rectangular opening in the Frame End Support

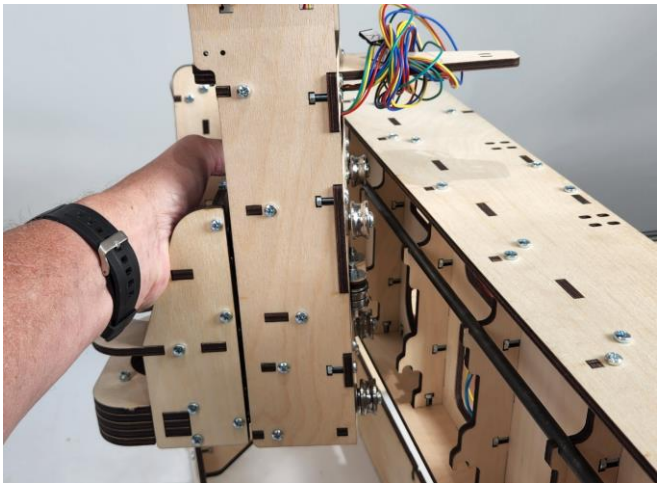
Step 2 Attaching the Y Carriage to the Gantry Assembly.

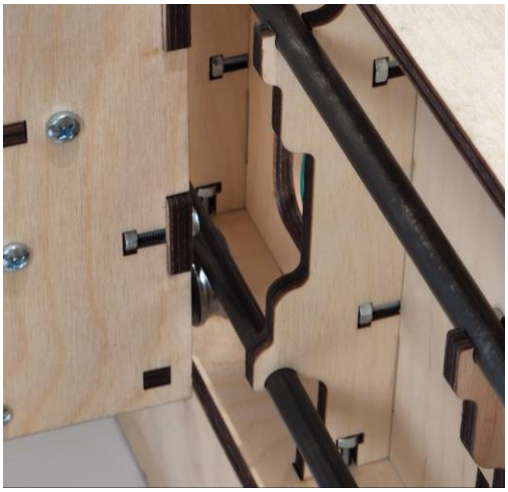
Step 2a Insert the upper Rail (H53) through the Gantry Side. Rotate the Rail as it passes through Gantry Rail Supports and is fully seated in the opposite Gantry Side



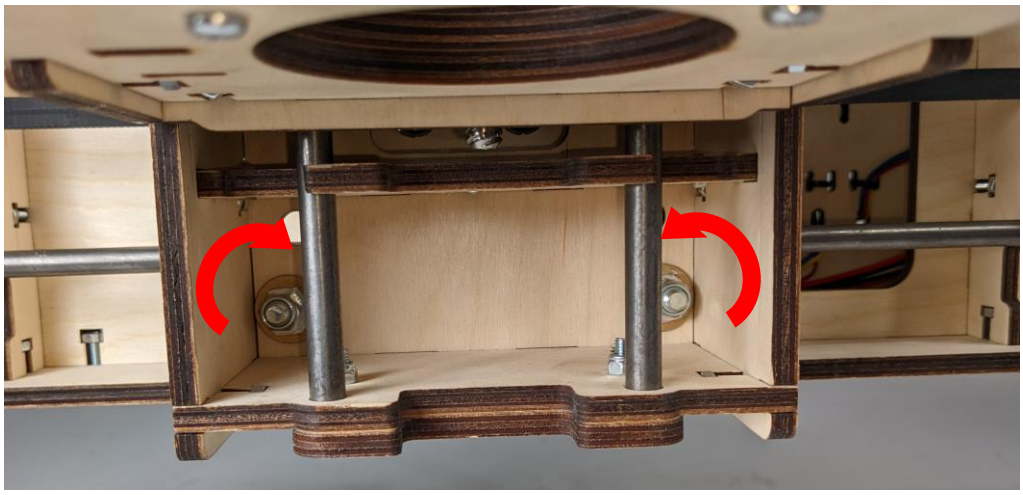
Step 2b Insert the lower Rail through the Gantry side, across the Rail Supports but only partially across the Gantry.

Step 2c Hang the upper Bearings of the Y Carriage on the Upper Rail. Then finish threading the lower Rail across both Lower Bearings, until it is fully seated in the opposite Gantry side.

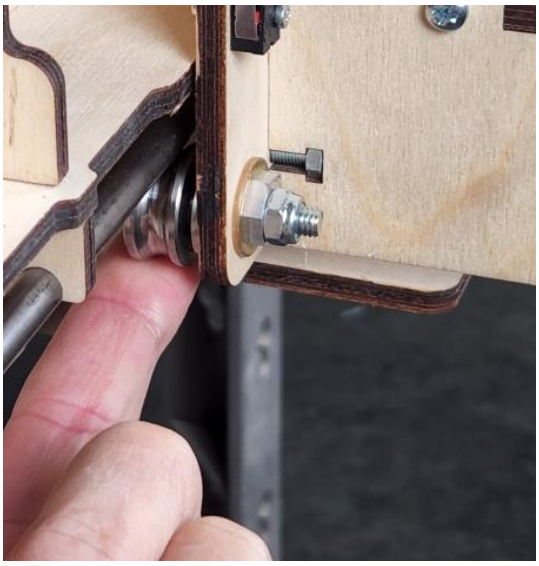




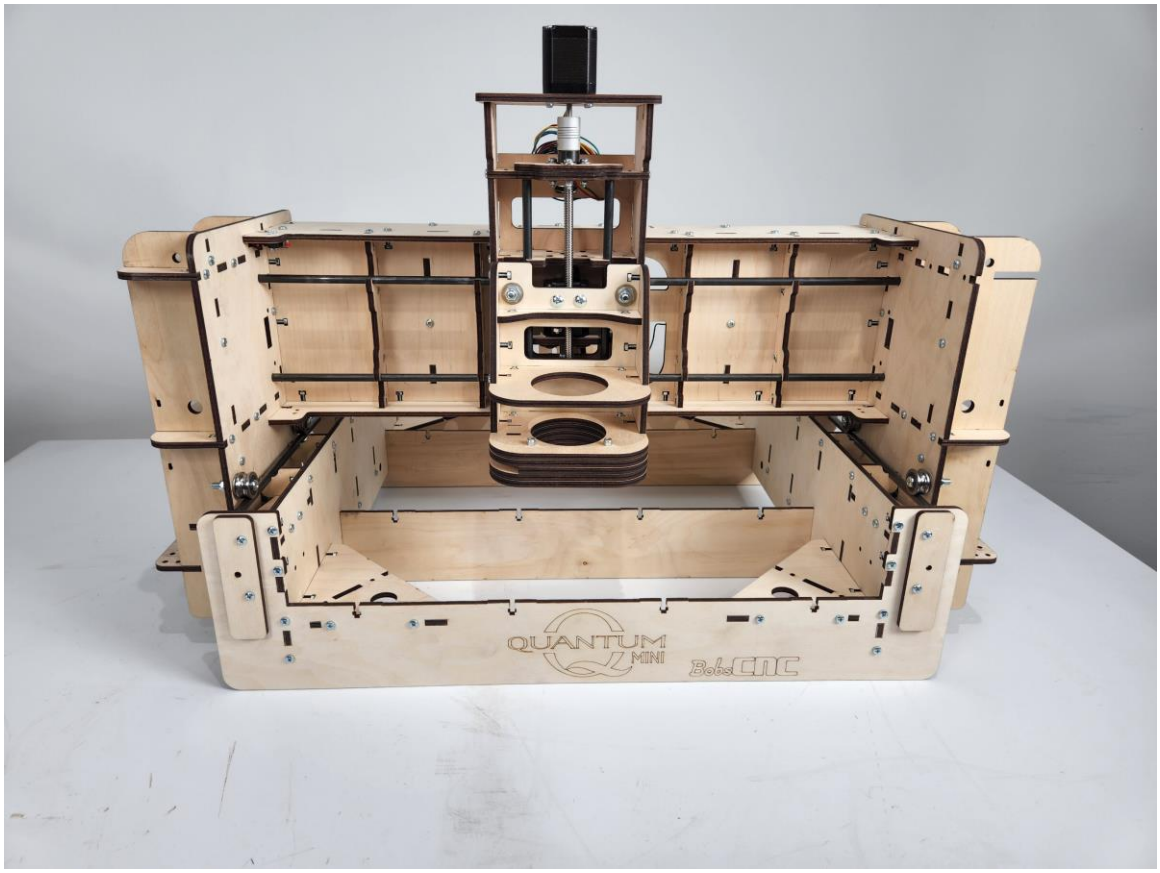
Step 2d Adjust the Eccentric Spacers until the Bearings are snug against the rails



Rotate Clockwise **Rotate Counter-Clockwise**



The Bearing should be snug against the rail. Use your finger to roll the bearing. It should not spin in place. When the bearing is properly adjusted against the rail the entire Carriage Assembly should move as you roll the bearing. Make sure the Carriage rides smoothly along the full length of the rails. Adjust as required.


QUANTUM
MINI
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There are four XY Belt retainers (QR3) used for each of the three sets of the GT2 9mm Belt Assemblies

Step 3 Attaching the GT2 9mm Drive Belts.

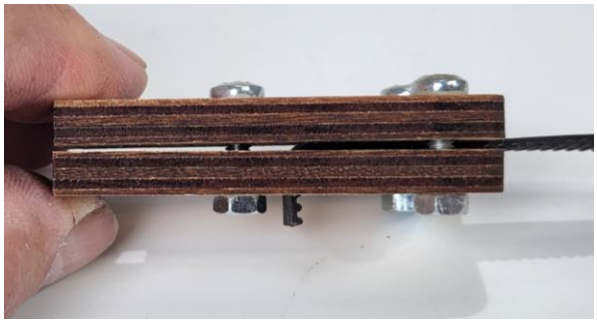
Step 3a Cut three lengths of the GT2 9mm Belt 27 inches long.

Step 3b With the teeth of the Belt facing down, thread one end of the 9mm Belt through the rectangular slot in a XY Belt Retainer (QR3).

Step 3c Cover the Belt with the teeth still facing down with the second Belt Retainer, as shown.

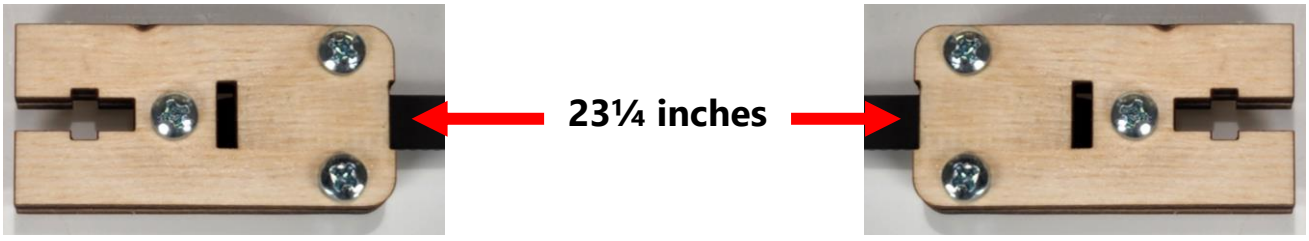
Step 3d Sandwich the Belt between the two Belt Retainers and bolt them together with three M4 x 16 Machine Screws and Nuts.

After installing the first Screw and Nut, it is possible to adjust the amount of Belt installed through the bottom of the clamp by gently pulling the Belt until only two or three of the teeth are visible. Then insert the remaining two M4 x 16 Machine Screws and Nuts.



When properly installed and tight, there shouldn't be a visible gap between the two Belt Retainers.

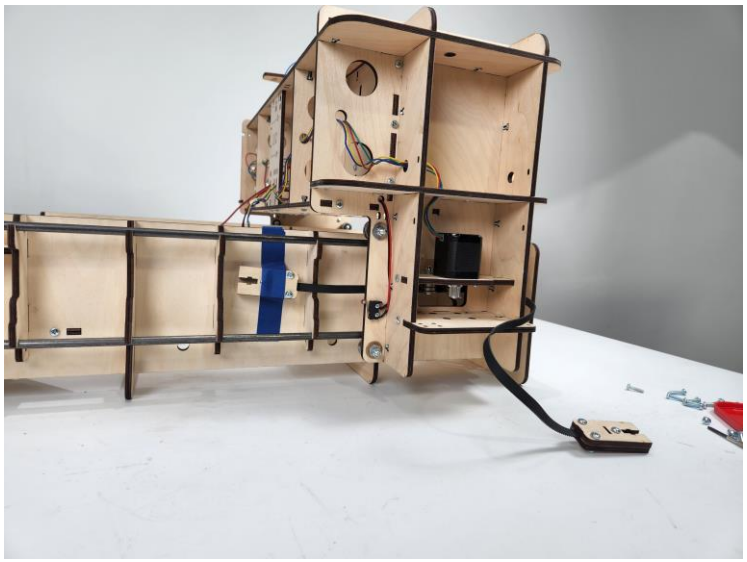
Step 3e Stretch the Belt Assembly out and measure the distance between the two notched ends in the Belt Retainers. The distance must be 23¼ inches.



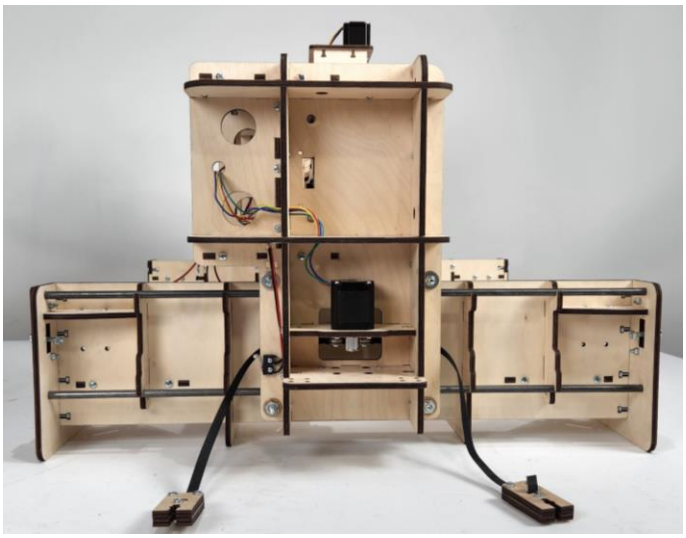
Simply loosen the M4 x 16 Machine Screws and Nuts and gently adjust the belt to the correct length.

Step 3f Insert a M5 x 30 Machine Screw (H48) with a M5 Washer through each of the Rail Stops mounted on the front and rear Frame End Supports. Then thread a square M5 Nut (H93) on the exposed threads.

Step 3g Slide the Gantry to one end of the X Frame. Using a strip of Blue Painter's Tape, temporarily attach one of the Belt Retainers behind the rails with the smooth side of the Belt visible as shown

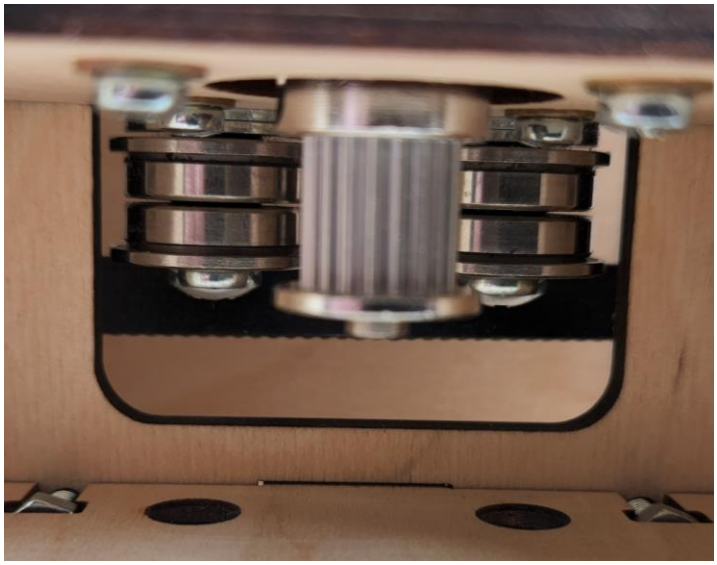


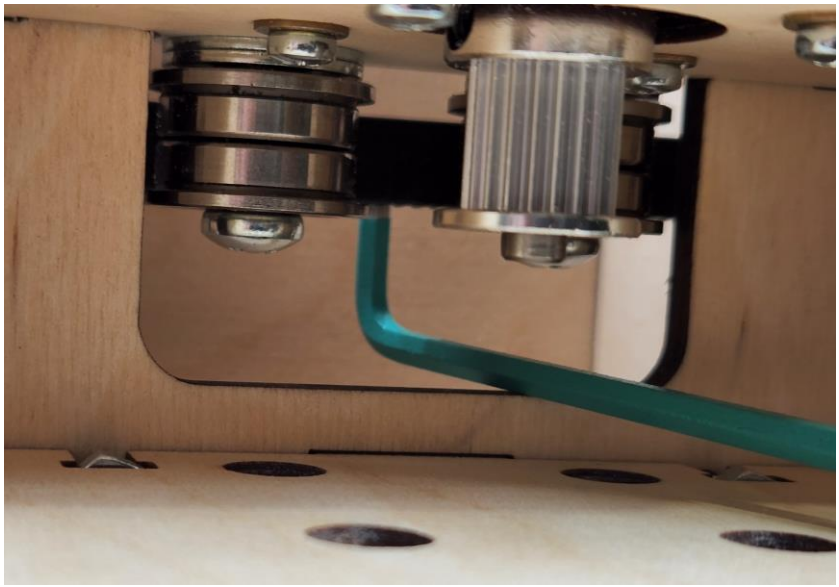
Step 3h Slide the Gantry past the Belt Retainer and position the Belt across the Idler Pulleys.



Step 3i Attach a Belt Retainer to the Frame Support end onto the M5 square nut.

Step 3j Pull the slack belt tight and notice its location behind the GT2 Pulley and the Idler Pulleys. Gently position the Belt behind the Idler Pulleys. Using a long L-end wrench or a stiff piece of wire (e.g., AWG 12 solid core copper wire), bend a small hook into one end of the wire.) slip the L-end behind the Belt and pull it between the Idler Pulleys and create a loop.





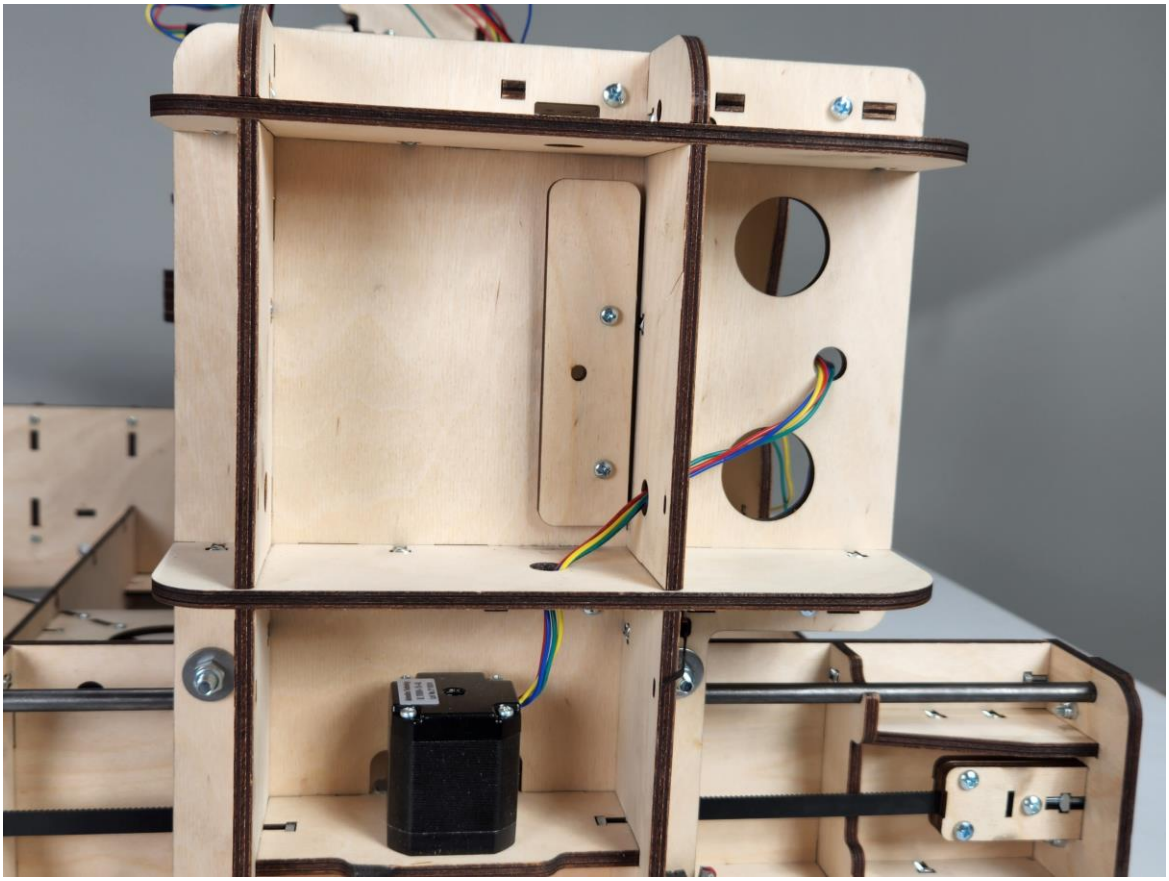
Slide the loop in the Belt over the GT2 Pulley keeping tension on the Belts so they will not slip off the Idler Pulleys

Step 3k Attach a Belt Retainer to the Frame Support end onto the M5 Square Nut.

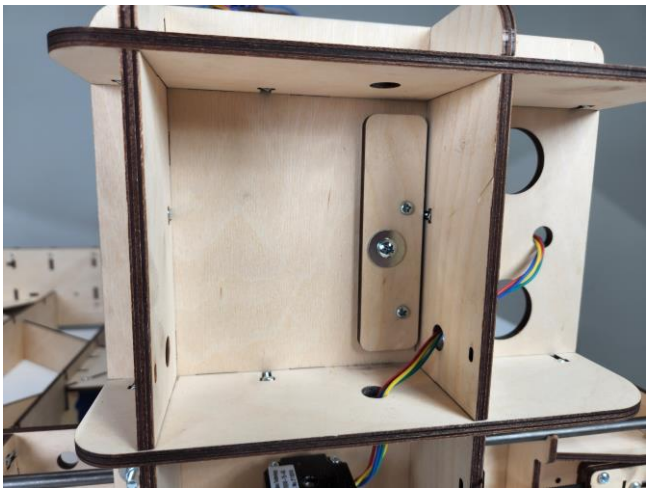
Step 4 Repeat these same steps to install the X2 Belt on the other side of the Gantry.

Step 5 Installing the Y Axis Belt.

Step 5a Install the Y Rail Stops (QR1) and secure with two M4 x 20 Machine Screws and Lock Nuts for each side of the Gantry.

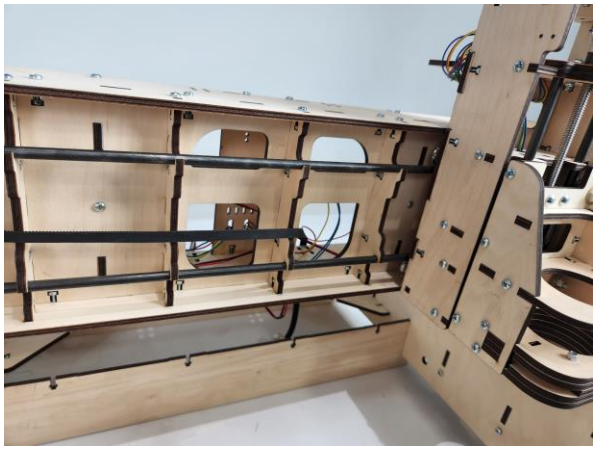


Step 5b Insert a M5 x 30 Machine Screw with Washer, through the Y Rail Stop and thread a M5 Square Nut on the exposed threads. Repeat for other Gantry Side.

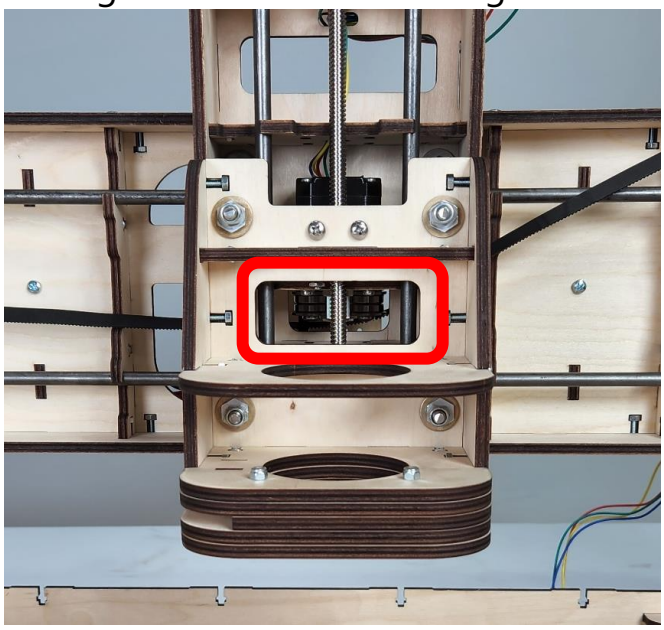


Step 5c Slip the Belt Retainer end over the exposed thread so that the Nut is seated in the cutout in the Retainer. Be sure the smooth side of the Belt is visible with the teeth oriented toward the Gantry Frame.

Step 5d Temporarily place the Belt Retainer through the large opening in the Gantry Frame as shown below.

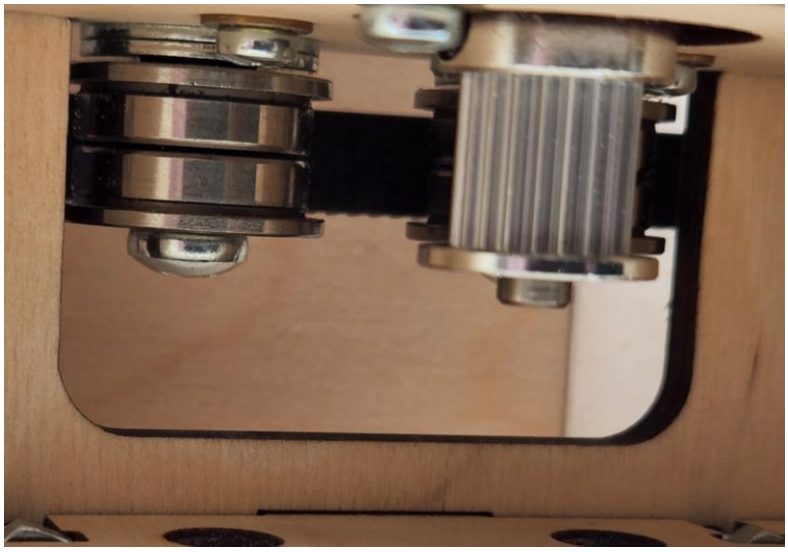


Step 5e Slide the Y Carriage past the Belt Retainer. Position the Y Carriage so that it is immediately in front of one of the large openings in the Gantry Frame. Align the rectangular opening in the Z Carriage with the opening in the Gantry Frame by manually turning the Helical Coupler at the top of the Y Carriage to lower the Z Carriage.



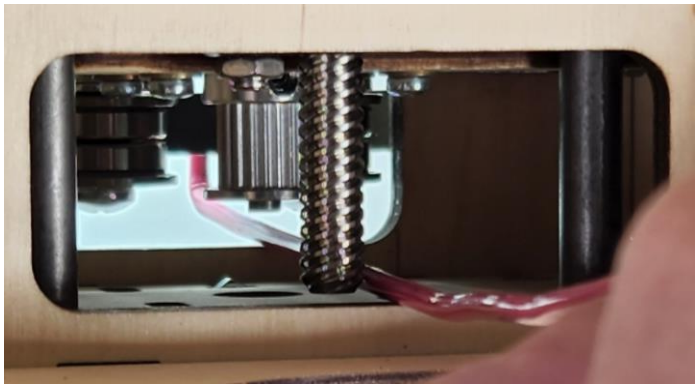
Step 5f Position the Belt so that it runs across the two Idler Pulleys

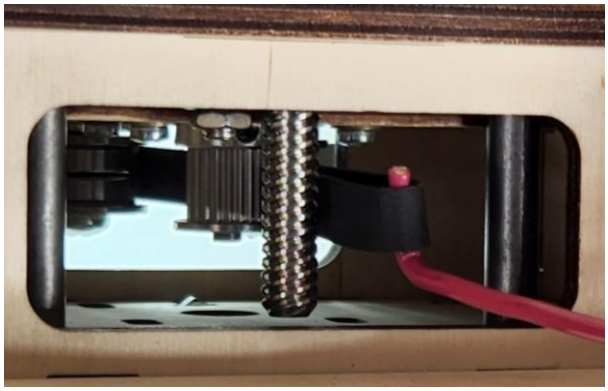
Back View



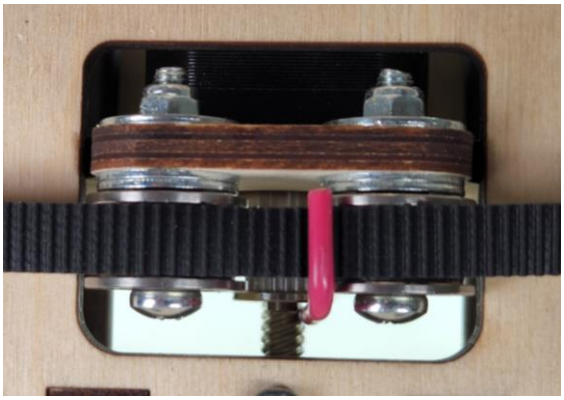
Front View

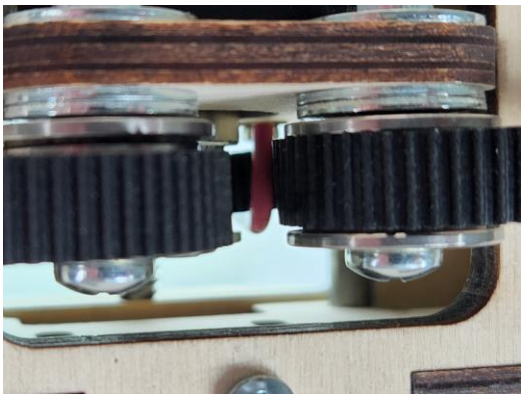
Step 5g Using a long Allen Wrench or a stiff piece of wire (e.g., AWG 12 solid core copper wire), bend a small hook into one end of the wire. Carefully insert the hook through the front of the Z Assembly and hook the wire over the Belt as shown. Pull the Belt between the Idler Bearings and create a loop of Belt Material Be sure to keep tension one the belt so it doesn't slip off the Idler Bearings





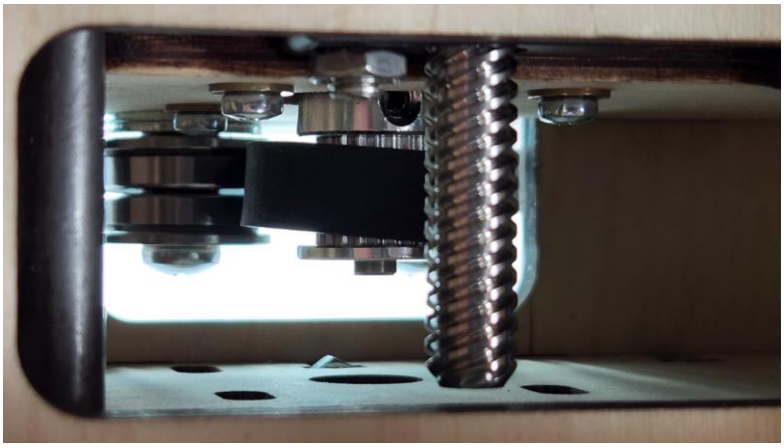
Front View



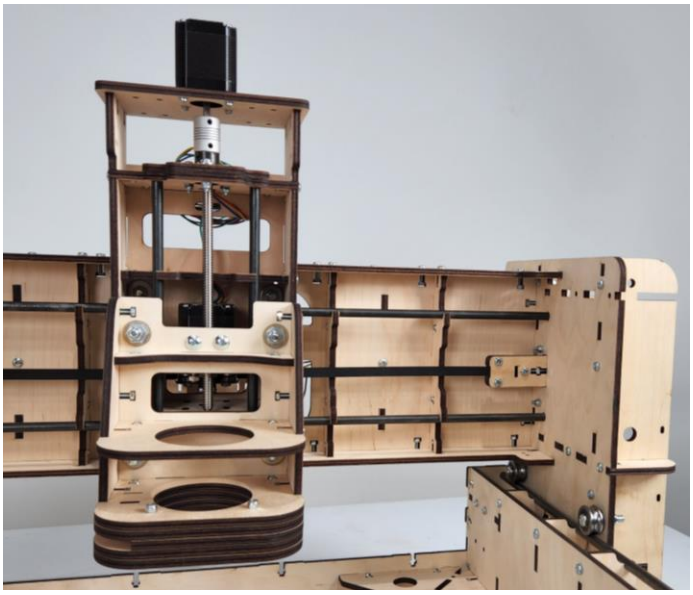


Back View

Step 5h Loop the Belt over the GT2 Pulley. Hold the Y carriage in place and pull the Belt snug.

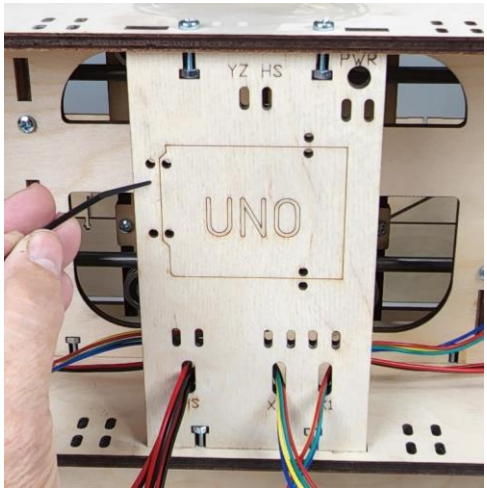


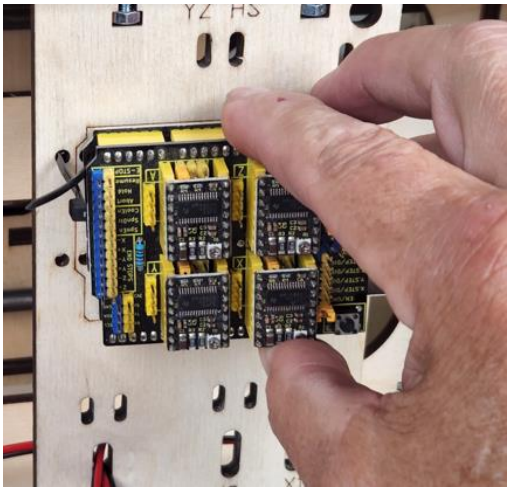
Step 5i Slip the Belt Retainer end over the exposed thread so that the Nut is seated in the cutout in the Belt Retainer and tighten the Belt to remove any slackness.

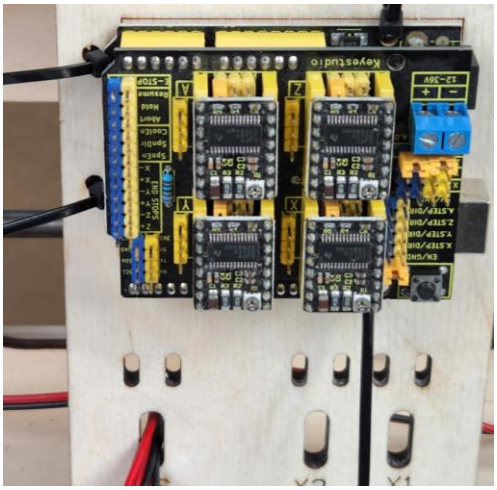


Step 6 Attaching the Controller to the Controller Support.

Step 6a Use four small Zip Ties to attach the Controller to the Controller Support.



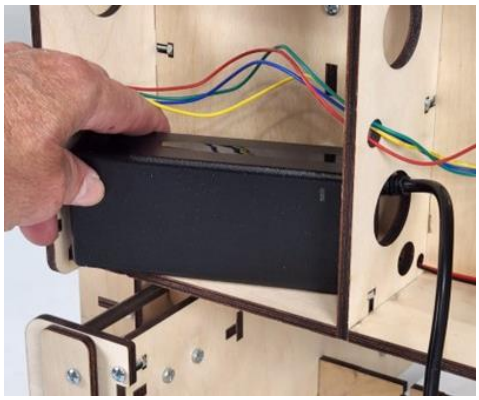




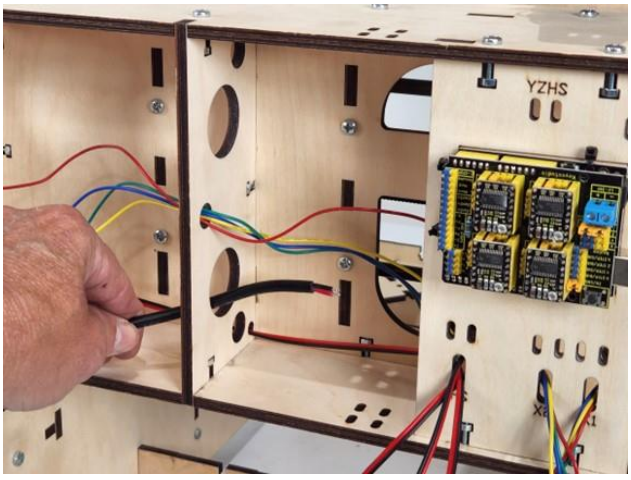
Step 6b Gently tighten the Zip Ties and then carefully trim the ends with a scissors.

Step 7 Attaching the Power Supply.

Step 7a Thread the power supply cord behind the Gantry Back Support and through the large hole in the Gantry Back Brace as shown.

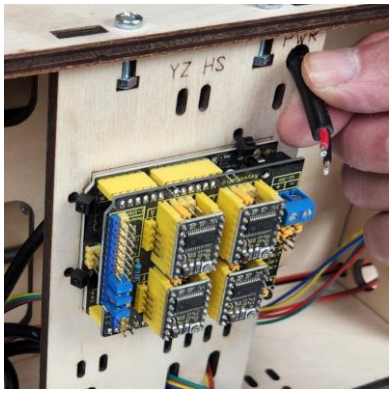


Step 7b Continue threading the Power Supply cord behind the Gantry Back Support and through the large hole in the Gantry Back Brace and past the Controller Support as shown.

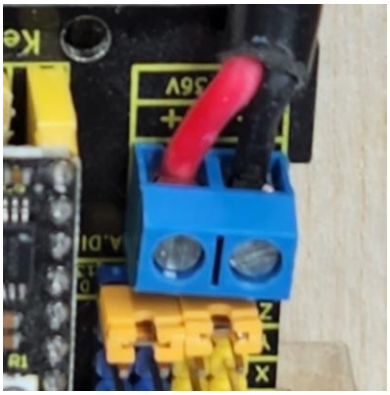


Step 7c Bundle the excess power cord and secure with a small Zip Tie.

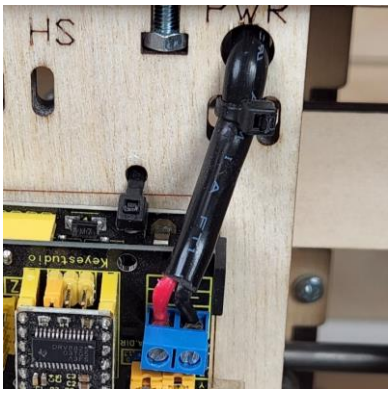
Step 7d Thread the exposed power cord end through the "PWR" hole in the Controller Support.



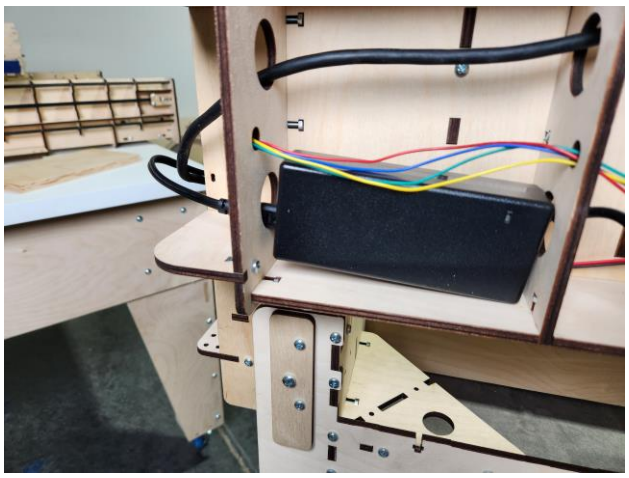
Step 7e **IMPORTANT** When connecting the Power Supply to the Controller, make sure the red wire is connected to the (+) positive terminal and the black wire is connected to the (-) terminal.



Step 7f Secure the power cord wire to the Controller Support with a small Zip Tie.



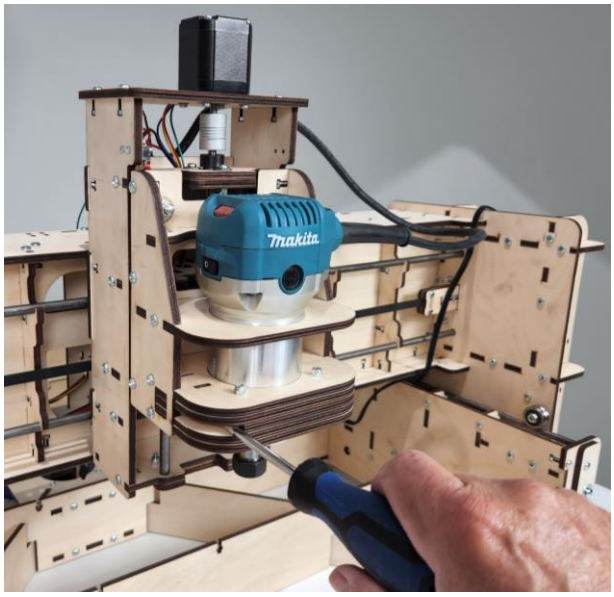
Step 7g Plug the power cord into the Power Supply.



Step 8 Installing the Makita Router.

Step 8a Slip the Makita Router into the Router Mount.

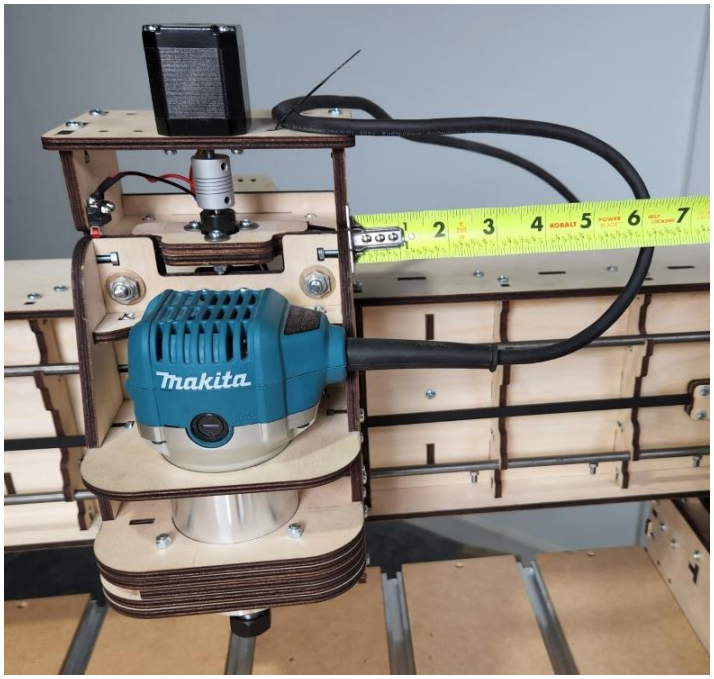
Step 8b Snug Router in place by tightening the Router Mount Clamp. Then tighten the two M4 x 35 Screws and Locknuts at the front of the Router Clamp



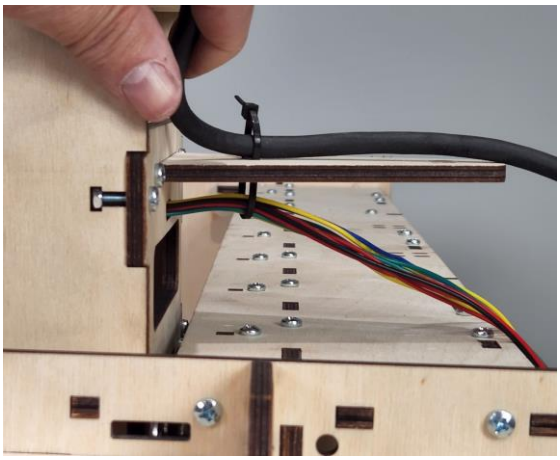
Step 9 Wire Management.

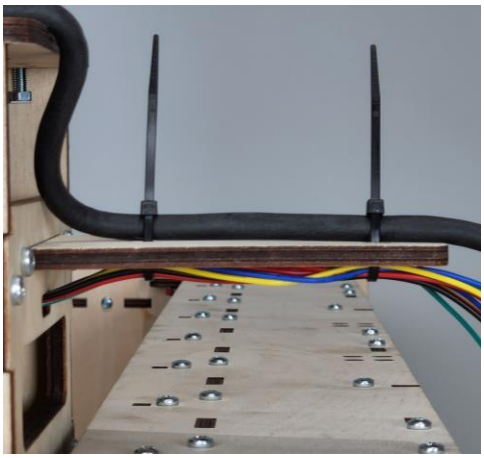
WARNING **In order to reduce electrical noise which can interfere with the proper operation of the Stepper Motors and Controller it is required that all the wiring and securing of loose wires be performed as illustrated in the manual. Failure to do so may result in poor machine performance.**

Step 9a Make a loop of cord approximately six inches long from the Router to the midpoint of the loop. This allows the router to move up and down the Z Axis without stress to the cord.

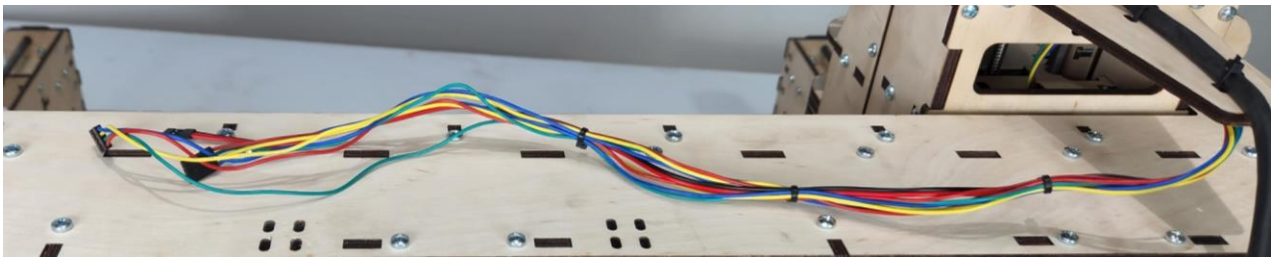


Step 9b Secure the Router cord and the Y Home Switch, Y Stepper Motor and Z Stepper Motor wires across the Carriage Top Support.

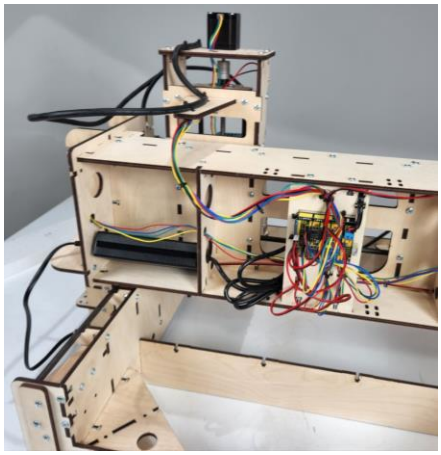


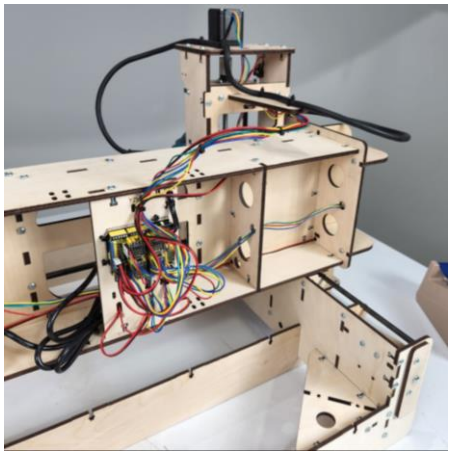


Step 9c Continue bundling the Stepper Motor and Home Switch wires together with small Zip ties spaced 4 to 5 inches apart

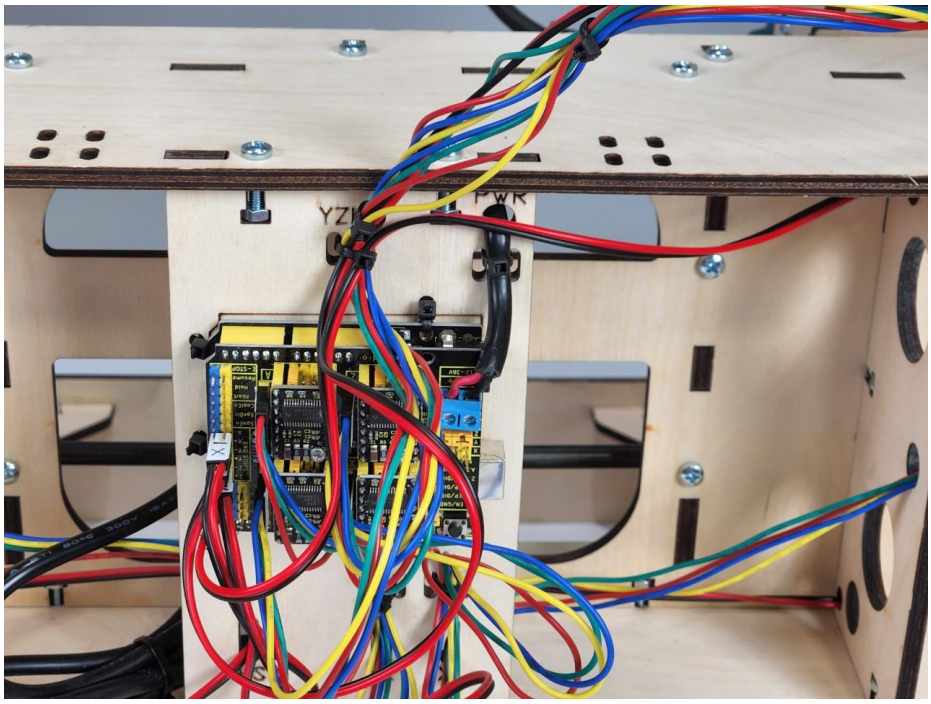


Bundle enough wire so that when the harness is attached to the Controller Mount, the Y Carriage can travel back and forth across the Gantry without pulling on the wires.

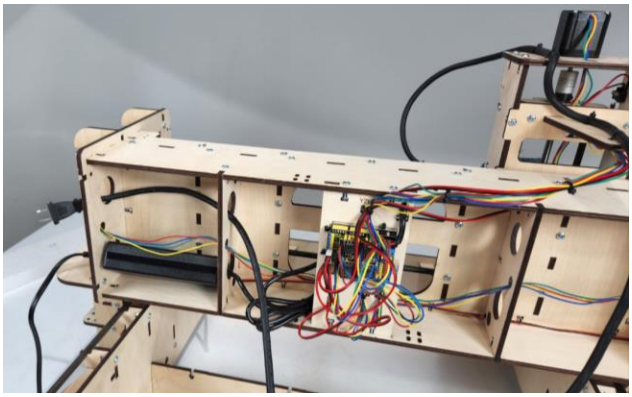




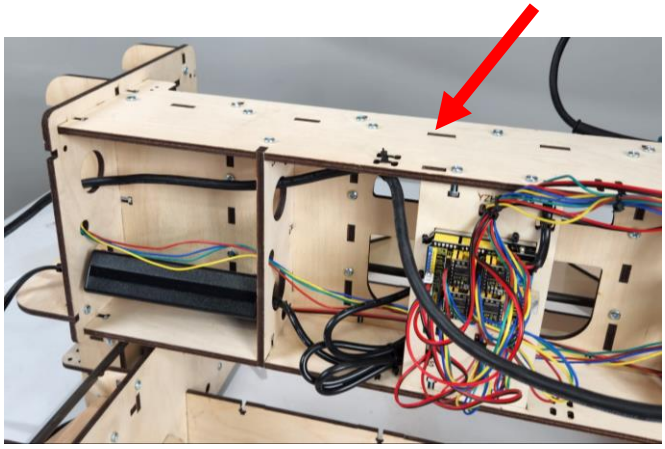
Secure the wires to the Controller Mount with a Zip Tie to the “YZ HS” mounting holes



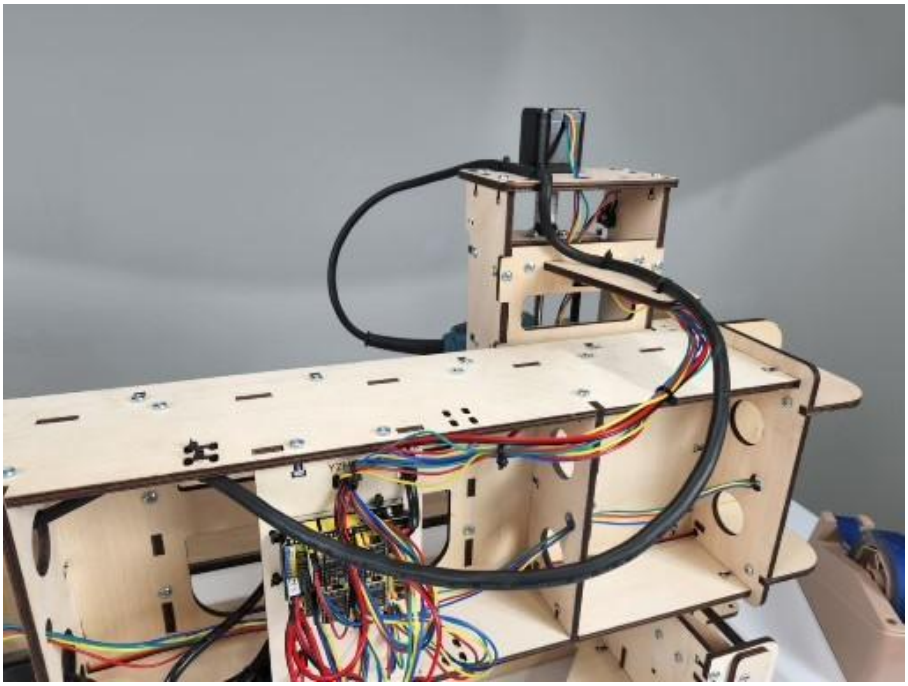
Step 9d Route the Router cord through the Gantry Back Brace and Gantry Side as shown.

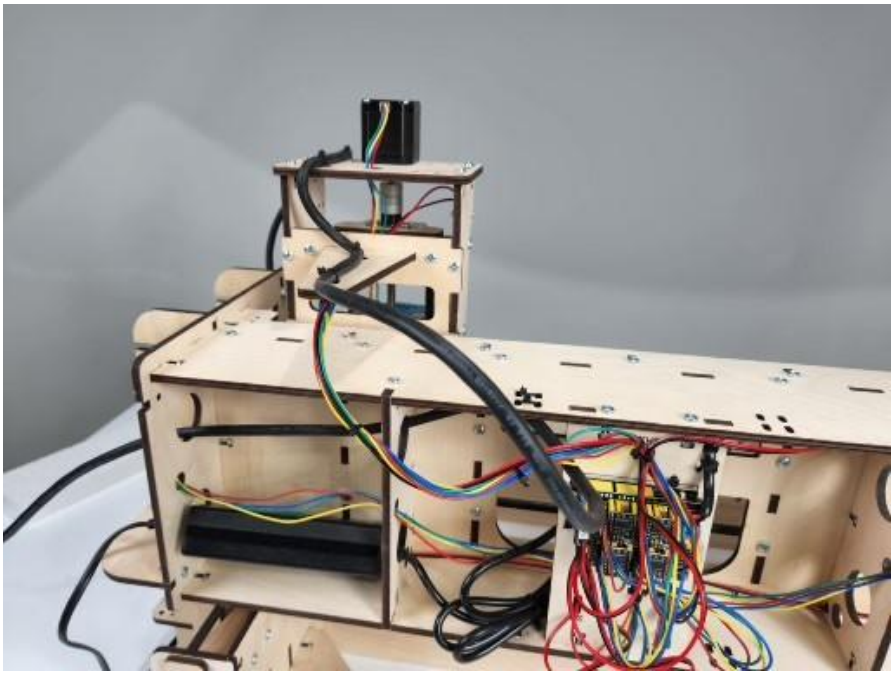


Step 9e Secure the Router cord at the two elongated holes in the top of the Gantry Top Brace located just to the left of the Controller.

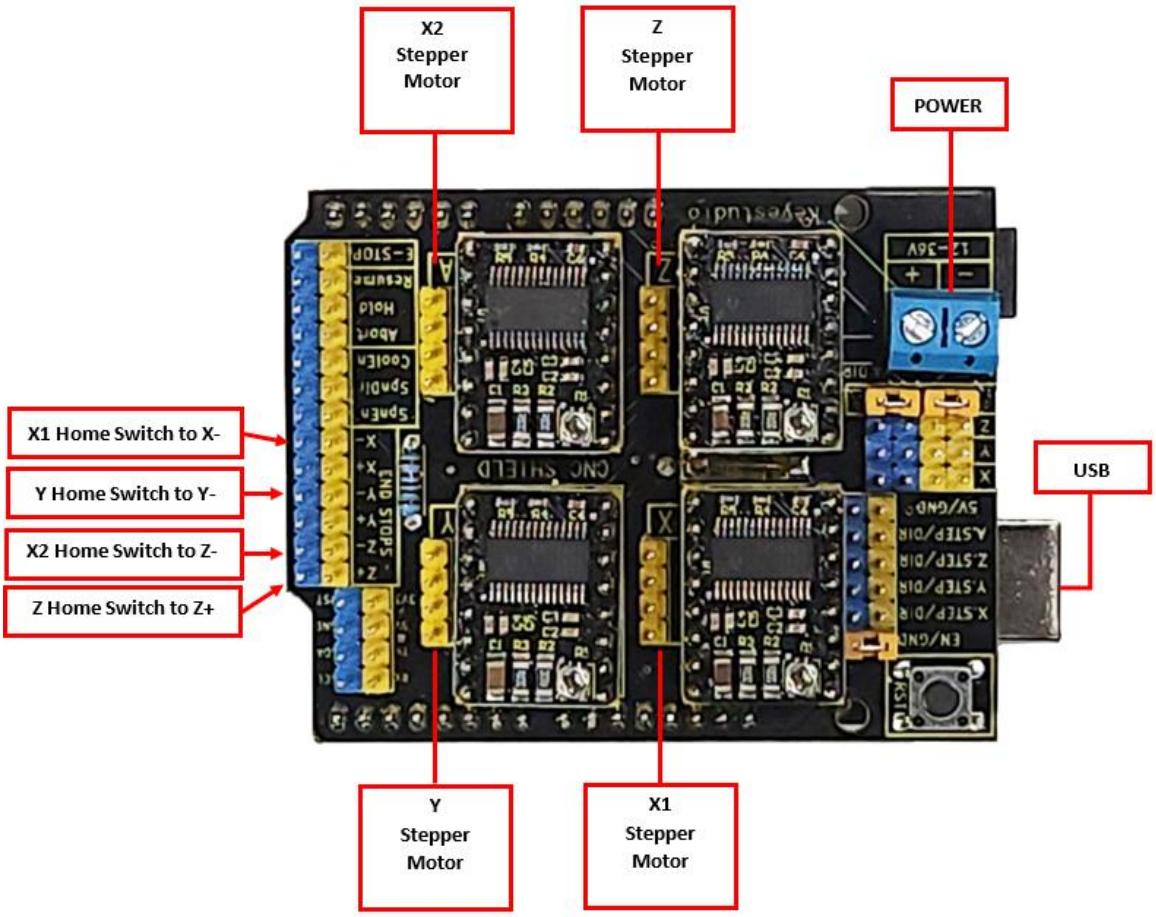


Leave enough cord to allow the Y Carriage to travel back and forth across the Gantry without pulling on the Router cord and so that it will not interfere with the Stepper and Home Switch wires.



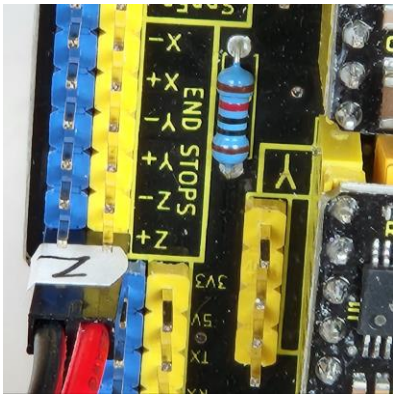


Step 10 Connecting the Home Switches to the Controller.

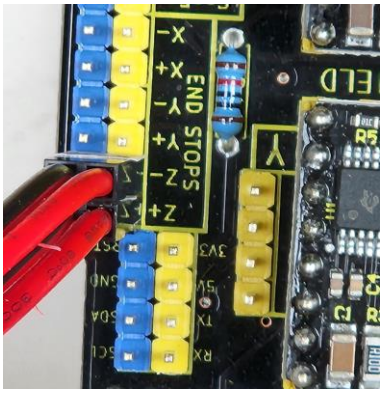


IMPORTANT. The Controller is mounted so that the PIN Designations are upside down. It is very important to be certain the Dupont Connectors at the ende of the wires cover the proper pins on the controller. Use the diagram below for reference

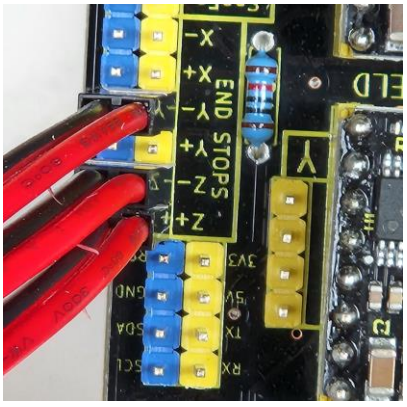
Step 10a Connect the Z Home Switch to the Z+ plug on the Controller.



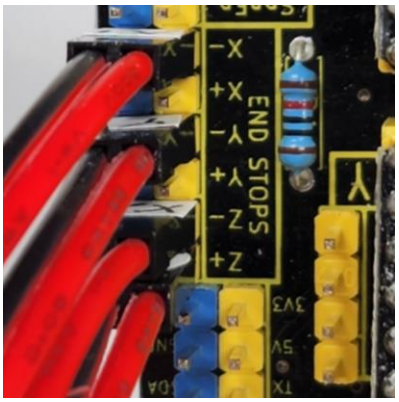
Step 10b Connect the X2 Home Switch to the Z- plug on the Controller.



Step 10c Connect the Y Home Switch to the Y- plug on the Controller.



Step 10d Connect the X1 Home Switch to the X- plug on the Controller

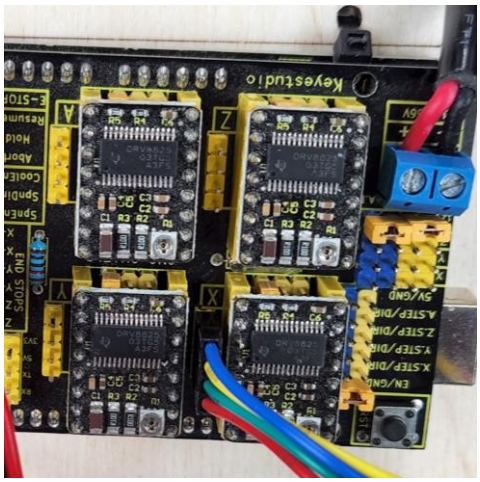


Side View of Home Switch Connections

Step 11 Connecting the Stepper Motors to the Controller.

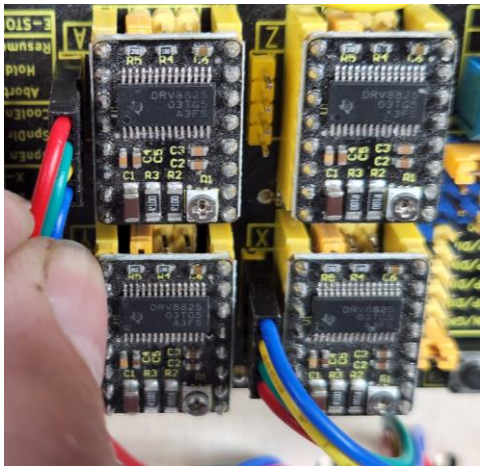
Step 11a

Connect the X1 Stepper Motor to the pins of the “X” driver on the Controller. Make sure the blue wire is at the top.

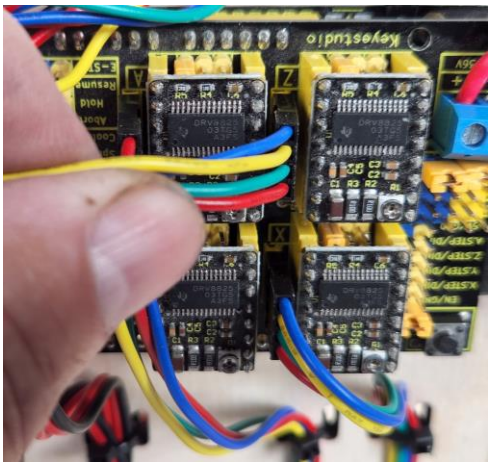


Step 11b

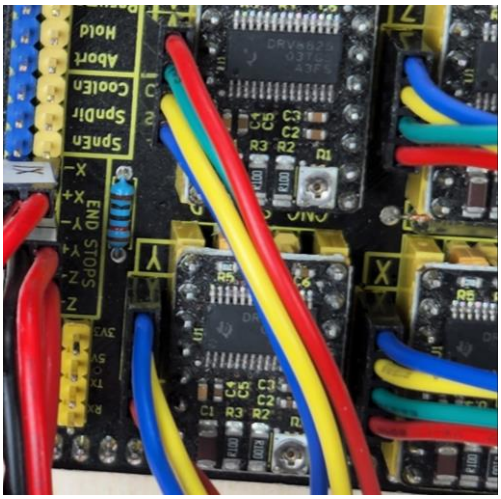
Connect the X2 Stepper Motor to the pins of the “A” driver on the Controller. Make sure the red wire is at the top.

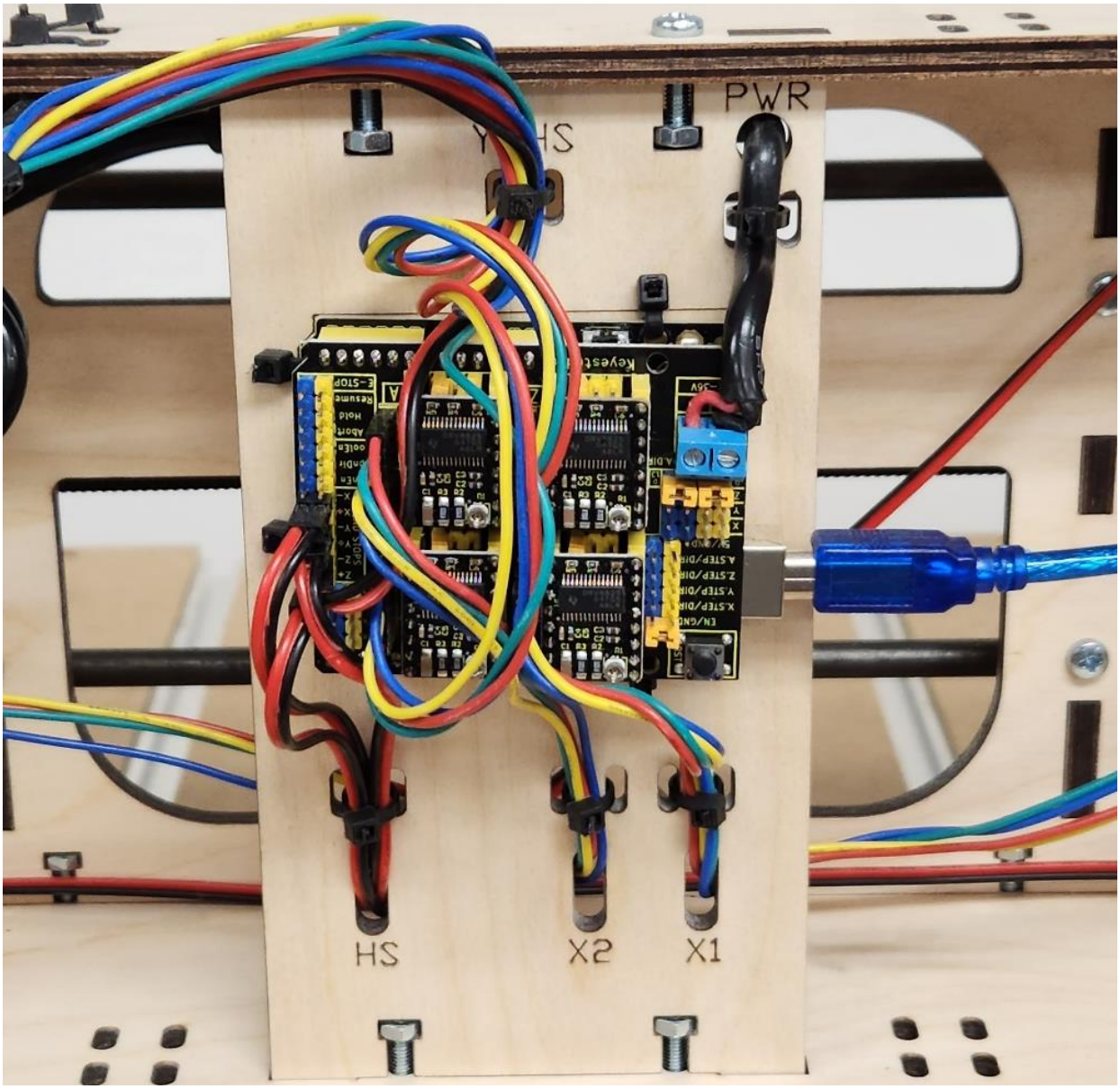


Step 11c Connect the Z Stepper Motor to the pins of the “Z” driver on the Controller. Make sure the blue wire is at the top.



Step 11d Connect the Y Stepper Motor to the pins of the “Y” driver on the Controller. Make sure the blue wire is at the top.

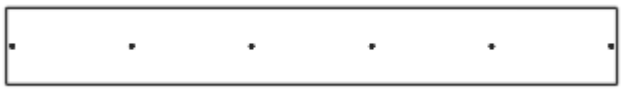




View of wire routing

T-Slot Spoilboard

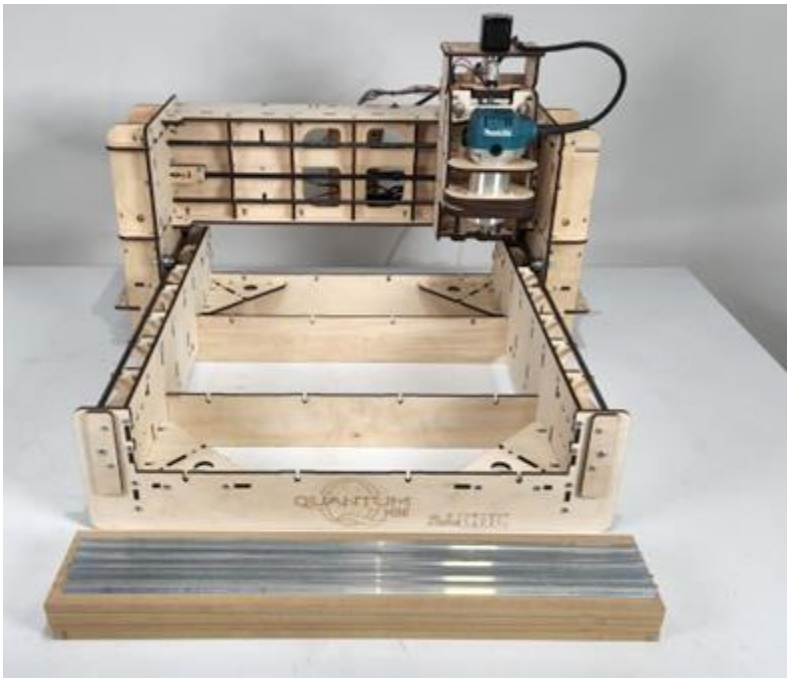
Wood Components

Part #	Description	Qty	Photo
QSB24	MDF Section	6	

Required Hardware

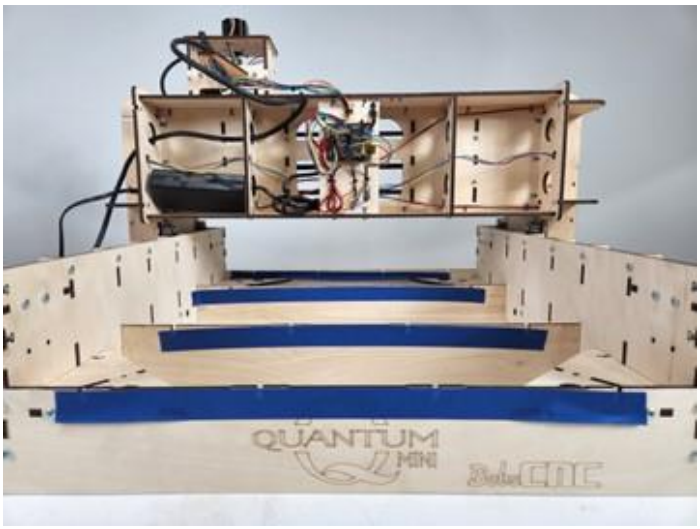
Part #	Description	Qty	Photo
H14	M4 X 16 Machine Screws	16	
H15	M4 Nut	16	
SBT24	Aluminum T-slot	5	

Illustrated Step by Step Instructions

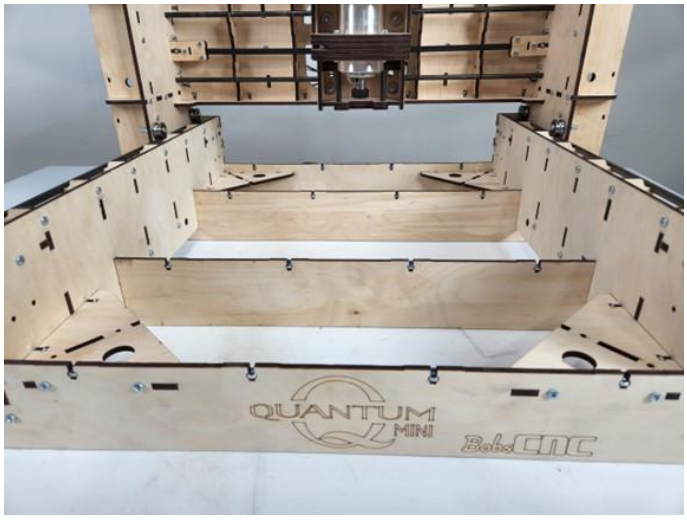


Step 1 Attaching the Spoilboard to the X Frame Assembly. The MDF Sections will overhang the front and back end supports ⅛ inch. The Aluminum T-Slots will fit flush to the front and back end supports

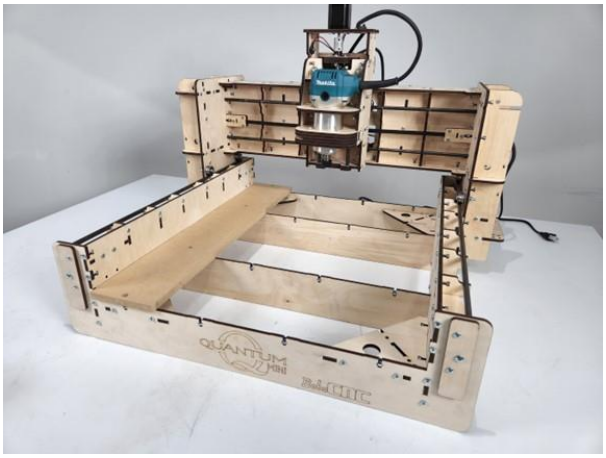
Step 1a Cover the T-slots with blue painter's tape to hold the M4 Nuts in place during the installation process.



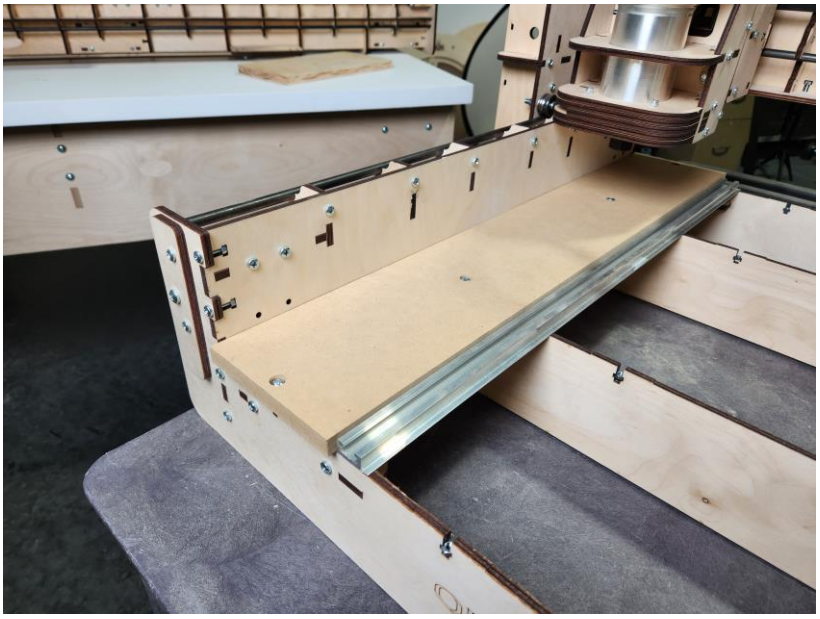
Step 1b Fill the T-slots with sixteen M4 Nuts.



Step 2 Lay the first MDF Section against the left side of the X Frame Assembly as shown. Make sure the countersunk openings are facing up. Align the holes with the installed M4 nuts beneath. The Machine Screws that hold the Sections will be installed later.

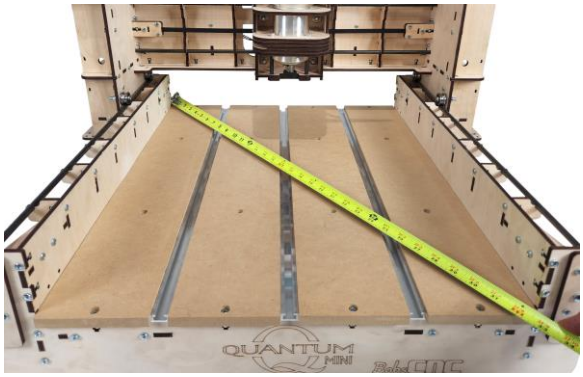


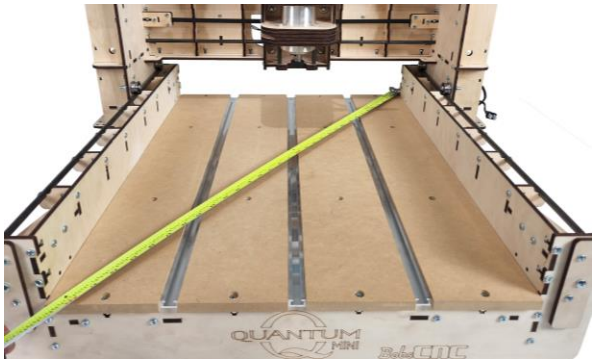
Step 3 Lift the MDF Section and set the flange of the Aluminum T-Slot so that the MDF covers it completely. Align the front and back end of the Aluminum T-Slot flush with the front and back-end panels as shown.



Step 4 Repeat to install the remaining Sections and Aluminum T-slot extrusions.

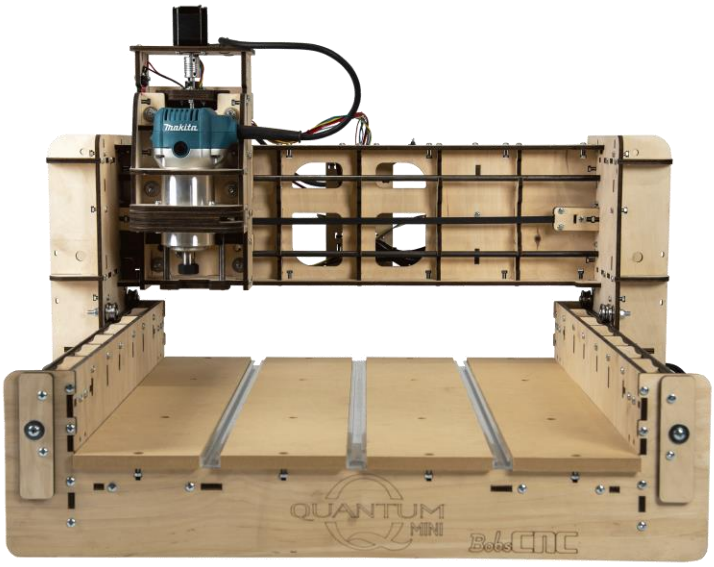
Step 5 Snug the thirty-six M4 x 16 Machine Screws into the M4 Nuts but do not fully tighten them. Measure the Spoilboard diagonally from corner.

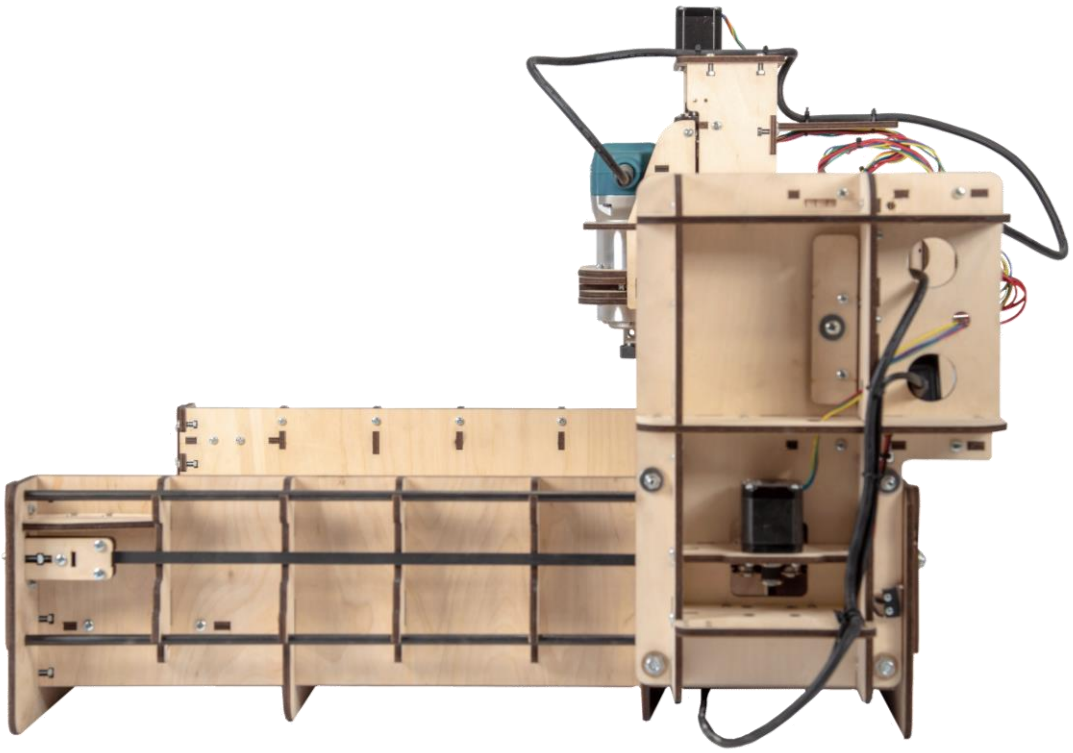


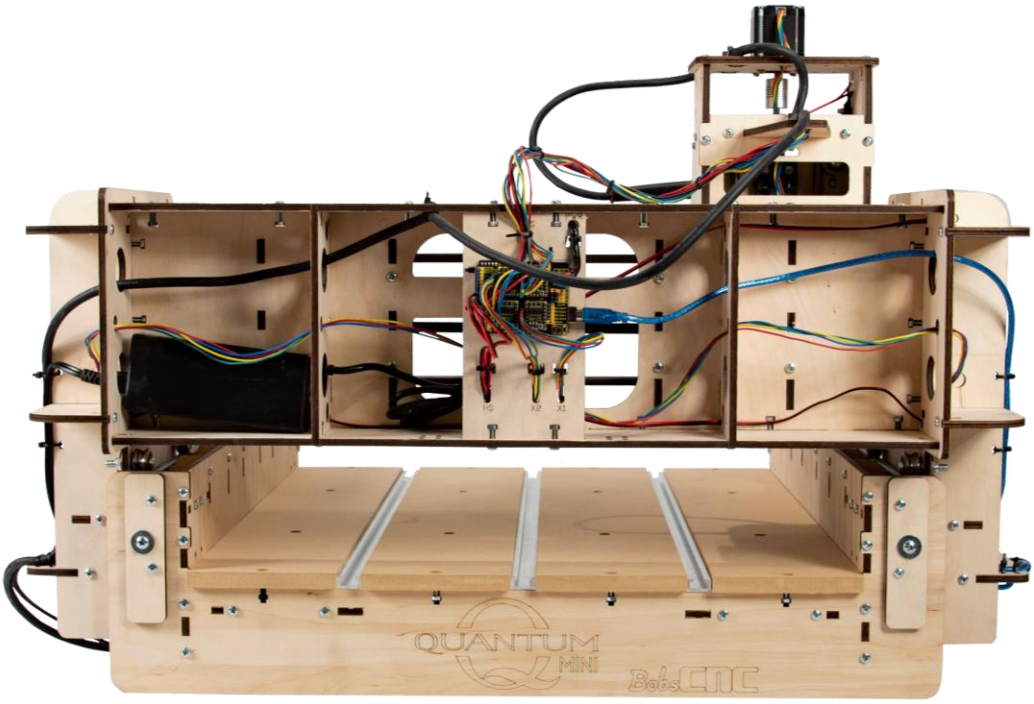


When both measurements match, the spoilboard is square and the Machine Screws can be securely tightened.

Completed Views



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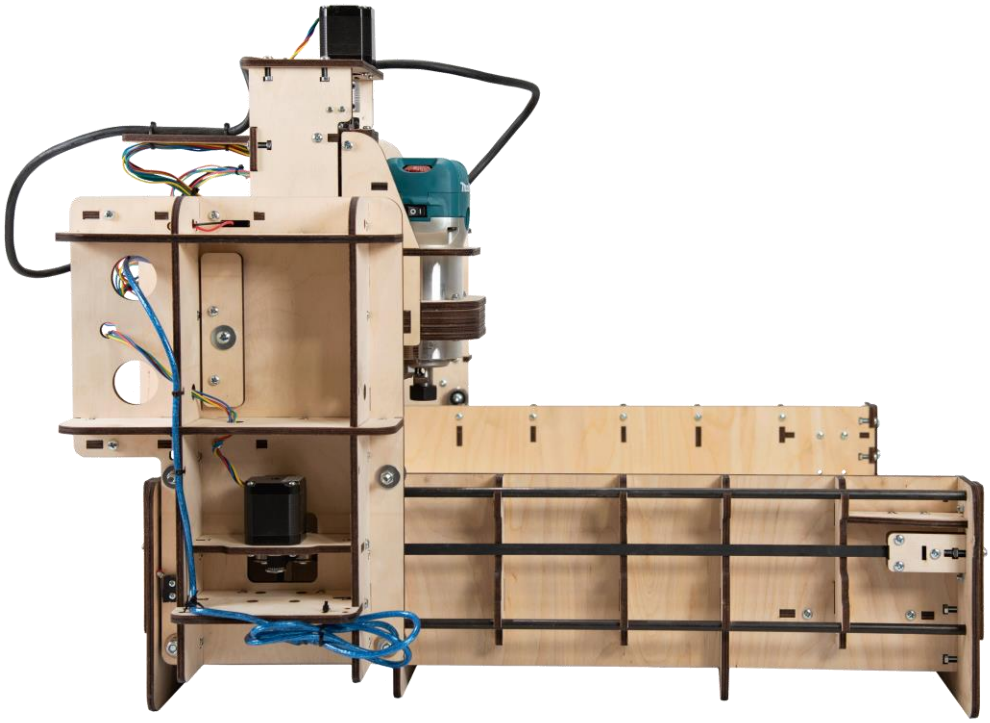
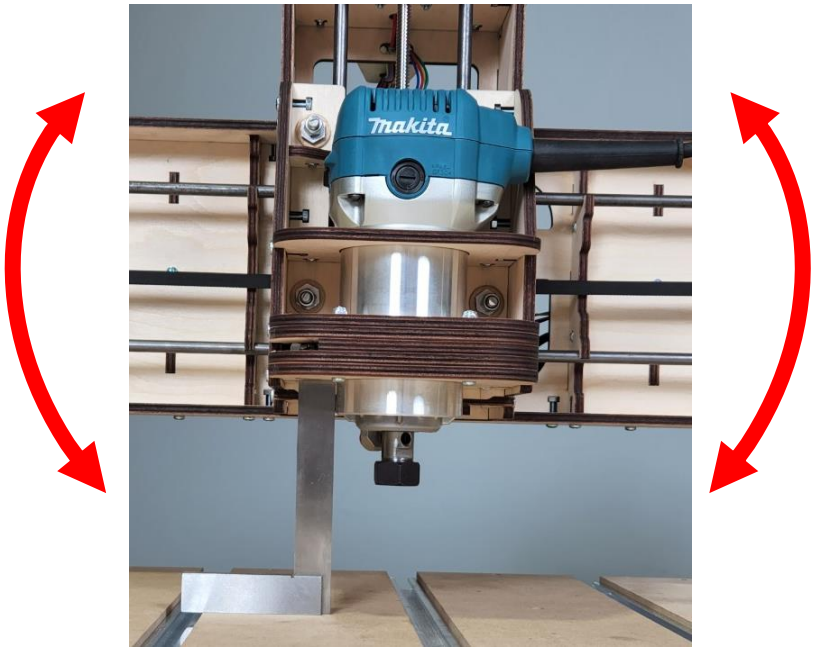


Tramming

Tramming is the process of adjusting a CNC Spindle (Router) so it is perpendicular to the spoilboard. The simplest method to do this is to use a square as shown. If the Spindle is not perpendicular, the Evolution Series CNC Routers can be trammed on the X axis by adjusting the four Eccentric Spacers on the Z Carriage.



The Spindle (Router) can be trammed on the Y axis by placing shims behind the SG20U Bearing Fender Washer on the upper or lower Y Assembly. Placing the shim on the top will tilt the axis clockwise. Placing the shim on the bottom will tilt the axis counterclockwise.

Clamping System

Wood Components (Included with Kit)

Part #	Description	Qty	Photo
A1 A2	Clamp (long) Clamp (short)	4 4	

Required Hardware

Part #	Description	Qty	Photo
H9 H45 H62	1/4- 20, 2” Screws, Wingnuts, and T-Nuts	8 ea.	

A

BobsCNC supplies wooden clamps that are secured to the spoilboard in conjunction with ¼ x 20 2″ Screws and Wingnuts (H9). The T-Nuts slide into the aluminum T-Slots and can be tightened within the slot. The Wingnuts tighten the wooden clamps against the workpiece to hold it in position during the cutting process.

Congratulations! You Just Completed the Assembly of Your BobsCNC Quantum CNC Router, Mini.

Please use the link where to download our Basic CAM and Basic SENDER

Basic Software Suite

Appendix

Firmware Values

Key	Value	Description
$0	10	(step pulse, usec)
$1	25	(step idle delay, msec)
$2	0	(step port invert mask:00000000)
$3	0	(dir port invert mask:00000000)
$4	0	(step enable invert, bool)
$5	0	(limit pins invert, bool)
$6	0	(probe pin invert, bool)
$10	1	(status report mask:00000011)
$11	0.01	(junction deviation, mm)
$12	0.002	(arc tolerance, mm)
$13	0	(report inches, bool)
$20	1	(soft limits, bool)
$21	0	(hard limits, bool)
$22	1	(homing cycle, bool)
$23	3	(homing dir invert mask:00000011)
$24	250	(homing feed, mm/min)
$25	2000	(homing seek, mm/min)
$26	250	(homing debounce, msec)
$27	5	(homing pull-off, mm)
$30	1000	Maximum spindle speed, RPM
$31	0	Minimum spindle speed, RPM
$32	0	Laser-mode enable, boolean
$100	80	(x, step/mm)
$101	80	(y, step/mm)
$102	400	(z, step/mm)

$110	10000	(x max rate, mm/min)
$111	10000	(y max rate, mm/min)
$112	2000	(z max rate, mm/min)
$120	500	(X-axis acceleration, mm/sec^2)
$121	500	(Y-axis acceleration, mm/sec^2)
$122	500	(Z-axis acceleration, mm/sec^2)
$130	407	(X-axis maximum travel, millimeters)
$131	407	(Y-axis maximum travel, millimeters)
$132	98	(Z-axis maximum travel, millimeters)

Quantum Washer Size Table

Part number	Description	ID	OD	Thickness (min)	Thickness (max)
H41	Eccentric Washer	0.453	0.750	0.059	0.063
H42	Bearing Fender Washer	0.250	0.750	0.060	0.090
H50	Idler Fender Washer	0.203	0.750	0.043	0.051
H57	Bearing Retainer Washer	0.172	0.050	0.050	0.080
H66	¼ inch Shim Washer	0.256	0.500	0.028	0.035
H88	M3 Washer	0.125	0.312	0.025	0.040
H89	Small Black Washer	0.078	0.188	0.016	0.025