

REVOLUTION 642

Rotating Axis CNC Router

Assembly Manual

Rev. 1.23

Welcome to the Family!

We're excited that you purchased the new Revolution 642 CNC Router Kit from BobsCNC. This manual was written to give you step-by-step instructions to ensure your success in assembling the Revolution CNC Router and provides all the information you need to get your machine up and running.

Before beginning the assembly, take time 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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REVOLUTION Specifications

Laser cut 6mm Baltic Birch Frame components.

Fully Engineered Frame with rigid Box and Beam Gantry.

Fully supported 5/16-inch stress proof steel Rails with SG20U Bearings.

GT2 Belt Drive on X and A axes.

Chuck Mounting Plate

2 mm pitch, 4 start Acme Threaded Rod on Z axis.

Home Switches on X and Z axes

Accuracy 0.002 to 0.004 inch.

The assembled footprint:

Length: 62.5" (1588 mm)

Width: 16.0" (406 mm)

Height: 24.0" (610 mm)

Assembled Weight: 40 lbs.

Cutting Area:

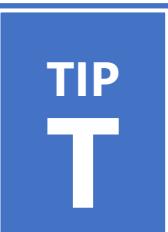
X: 42.0" (1067 mm)

Z: 3.8" (98 mm)

A: 6.4" (165 mm) diameter

Safety must be your First Priority. Always wear proper protective equipment and use "safety sense" when assembling and operating your Revolution 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

The Revolution Rotating Axis CNC Router has a 110vac Power Supply and uses bits that spin up to 30,000 rpm with cutting edges that are sharp and hazardous. The operator must understand the potential hazards and is responsible for taking 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:

A pair of long nose pliers and/or forceps.

Diagonal Cutters or sharp knife to trim nylon ties.

Calipers or measuring tape to measure part placement.

Small standard screwdriver to connect electronics.

Phillips screwdrivers to mount Home Switches and Stepper Motors.

220 grit sandpaper to remove laser marks on wood pieces (if desired).

LOCTITE 242™ thread lock (fingernail polish can be used as a substitute).

Set of Metric Sockets and SAE Wrenches.

Set of Metric and SAE Long Reach Allen Wrenches.

To Operate the REVOLUTION Rotating Axis Router, you will need:

Computer with control software for GRBL.

Materials for Projects.

1/4" Shaft Router bits.

Assembly Recommendations:

Use a large, flat, clean work surface for assembling your REVOLUTION 642.

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

Apply LOCTITE 242™ to all M4 Machine Screws that are used to secure plywood pieces except for the 4 screws that clamp the router in the final assembly.

Light sanding may be required to remove any marks made by the laser.

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

You may wish to use strips of 1-inch blue painters' tape behind the T-Slots to help hold the M4 Nuts in place during assembly. A telescoping magnetic pickup tool can also be a handy way of placing and holding small 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.

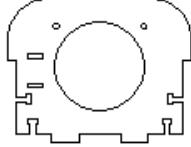


CAUTION This kit contains numerous small components that pose a choking risk for small children and pets. Keep kit pieces in a secure location out of the reach of small children and pets.

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	
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Required Hardware

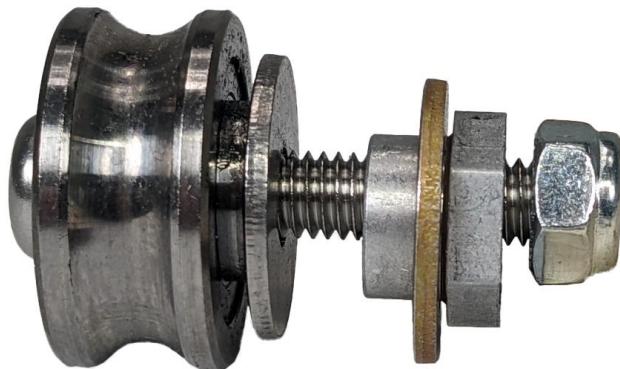
Part #	Description	Qty	Photo
H95	M6 x 35 Machine Screws	4	
H18	M6 Locknuts	4	
H40	Eccentric Spacer	4	
H41	Eccentric Washer	4	
H42	Bearing Fender Washer	4	
H44	SG20U Bearing	4	
ZD12	ACME Nut Assembly	1	
H97	M5 X18 Machine Screw	2	
H49	M5 Lock Nut	2	

H14	M4 x 16 Machine Screw	20	
H15	M4 Nut	20	
H48	M5 x 30 Machine Screw	1	
H93	M5 Square Nut	1	
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 SG20U Bearing Assemblies.

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



TIP
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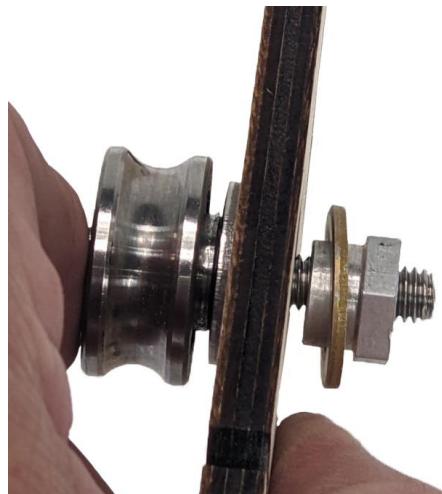
When inserting the Bearing Assembly through the Back Frame (QZ1), make sure the Hub of the SG20U Bearing faces the Bearing Washer which is pressed against the wood.



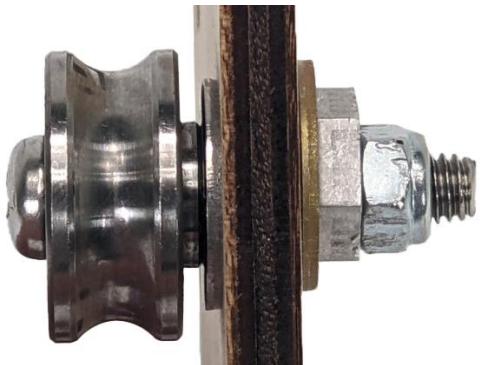
Step 1a Insert the Bearing Assemblies through the mounting holes in the Back Frame (QZ1) with the Bearing Fender Washer (H42) against the wood and the Hub against the Bearing Fender Washer as shown below.



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.



Step 1c Secure the Bearing Assembly in place with an M6 Lock Nut (H18) on each of the four Assemblies.

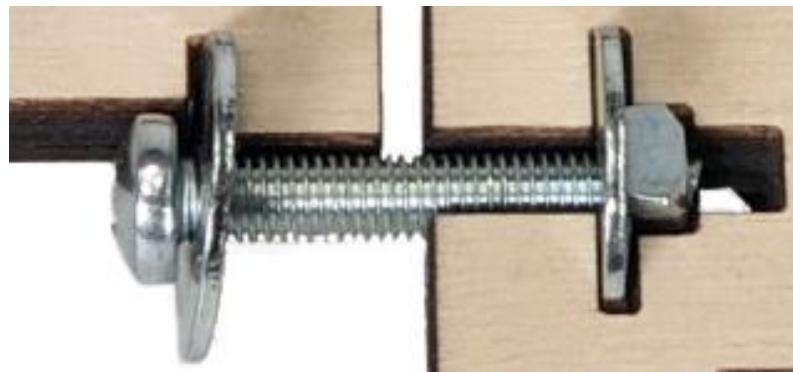
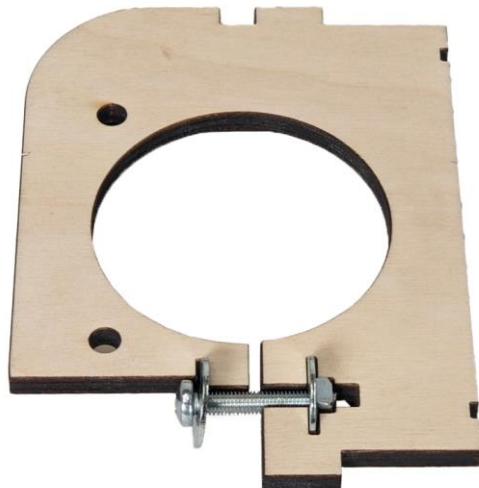


Step 2 Building the Router Mount.

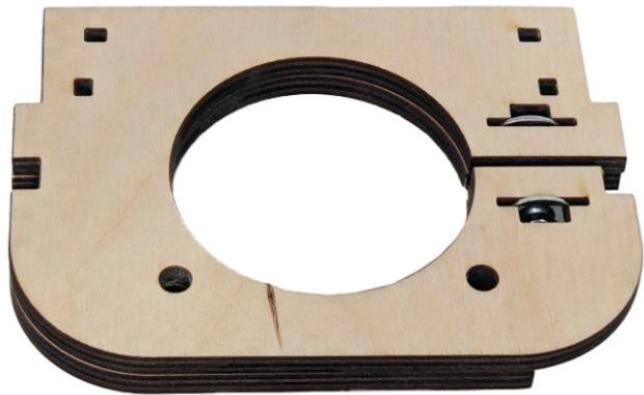
Step 2a Slide the two Idler Fender Washers (H50) onto the M5 x 30 Machine Screw (H48) and secure with the M5 Square Nut (H93).



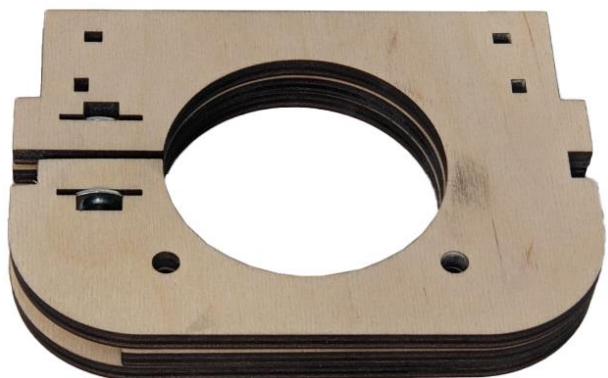
Step 2b Place the Screw, Nut and Washer Assembly into the Inner Spindle Mount (QZ5). Be sure the Square Nut and Washers are nested into their slots, as shown.



Step 2c Position the Mid Spindle Mount (QZ6) over the Inner Spindle Mount (QZ5), the Screw, Nut and Washer Assembly as shown.



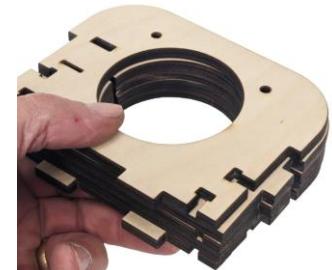
Step 2d Making sure the Screw, Nut and Washer Assembly stay in place, carefully turn the Spindle Mount Assembly over and cover with the second Mid Spindle Mount (QZ6) as shown.



Step 2e Position 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.

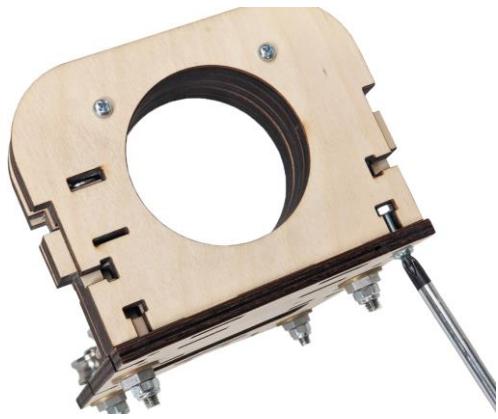




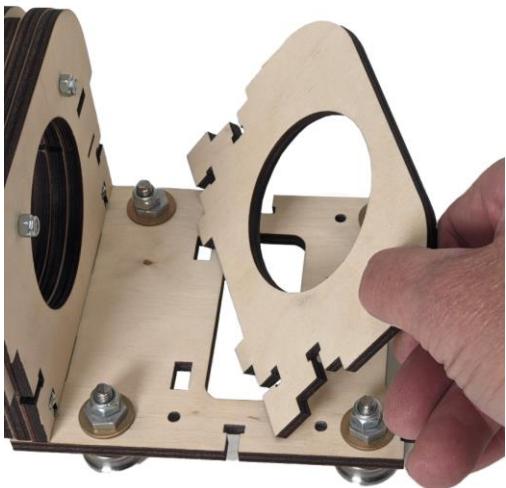
The Assembly stack can be oriented so that the slot for securing the Router is located on either the left or right side with the curved front corners facing you.

Step 2g Align the tabs of the stack with the slots in the Back Plate Assembly and secure with four M4 x16 Machine Screws and Nuts. You may find it helpful to set the two M4 Nuts in the top before fully seating the tabs.

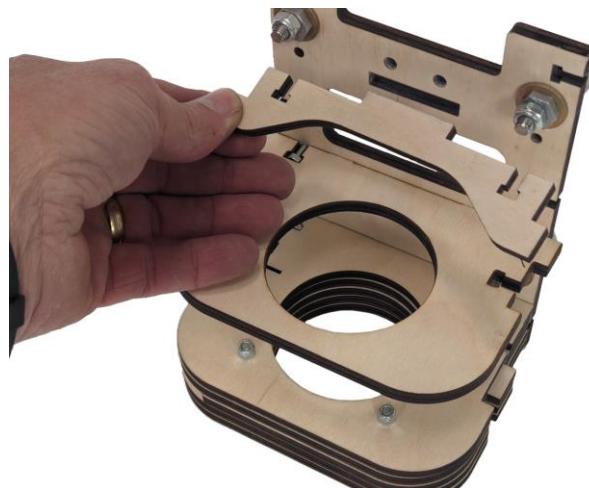




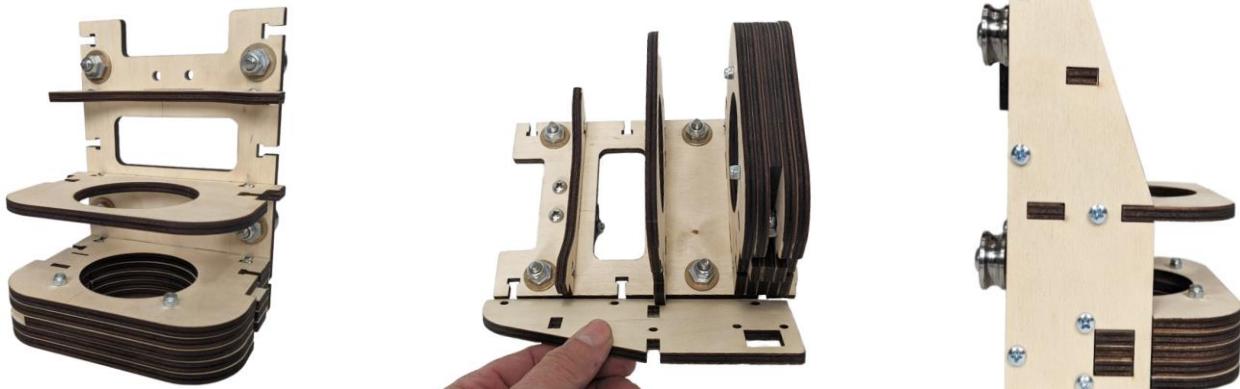
Step 2h Align the tabs of the Top Spindle Mount (QZ4) with the slots in the Back Plate Assembly and secure with two M4 x 16 Machine Screws and Nuts as shown.



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. Note: Make sure the nylon washer at the top of the Lock Nut is visible after inserting as shown.



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.



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



Left Side



Right Side

Belt Drive

Wood Components (Included with Kit)

Part #	Description	Qty	Photo
QR2	X Stepper Motor Mount	1	

Required Hardware

Part #	Description	Qty	Photo
H86	Flanged Bearing F635Z	4	
H48	M5 x 30 Machine Screw	2	
H49	M5 Lock Nut	2	
H50	Idler Fender Washer	6	
H89	Small Black Washer	4	
H84	GT2 Pulley Long	1	
H37	M3 x 10	4	
H88	M3 Washer	4	

CB11	Stepper Motor	1	
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NOTE: There are two different size GT2 Pulleys, Long and Short. The long Pulley is used for the X-Axis Drive.



Illustrated Step by Step Instructions

Step 1 Preparing the X Stepper Motor for Mounting

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



Step 1b Use an Idler Fender Washer (H50) as a shim and gently slide the Long 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 Long Drive Pulley and the Stepper Motor housing will be approx. 1.25mm.



Step 2 Building and Mounting the Idlers

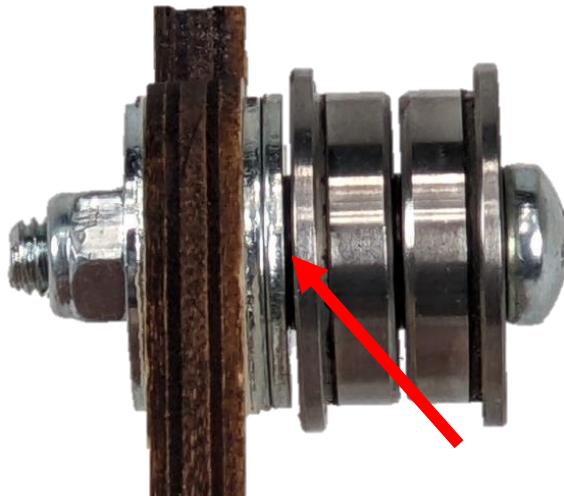
Step 2a Build two Idler Bearing Assemblies using one M5 x 30 Machine Screw (H48), two Flanged Bearings (H86), two Small Black Washers (H89) and two Idler Fender Washers (H50) in the sequence shown below.



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

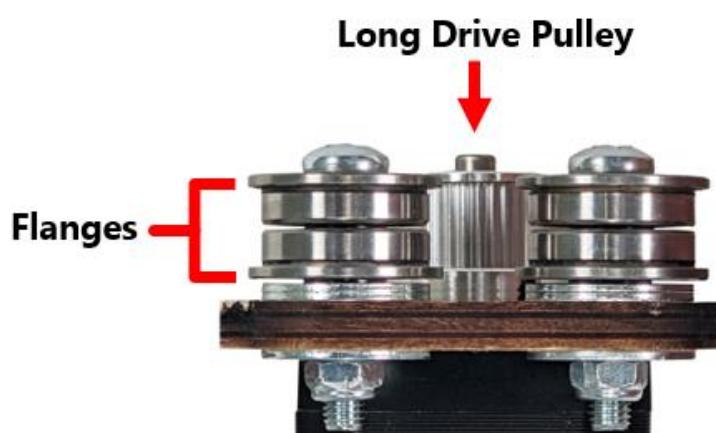
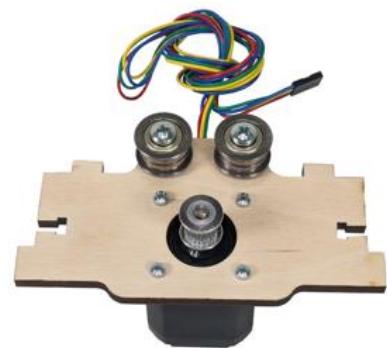
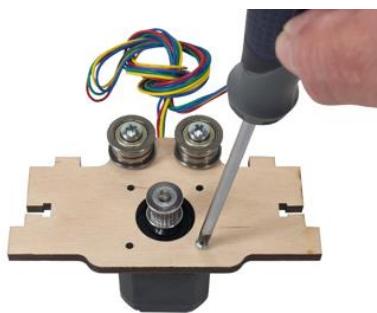
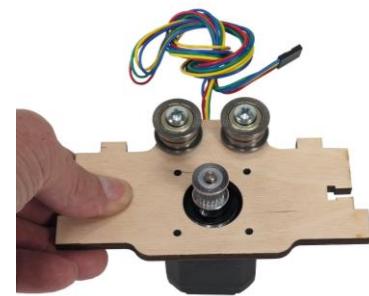
Step 2b Insert the threaded shaft of the Bearing Assembly through the X Stepper Motor Mount (XR2) and secure with a M5 Lock Nut (H49).





NOTE: There must be two Fender Idler Washers on the Bearing side.

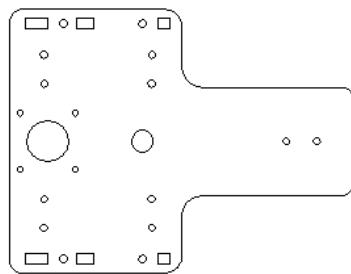
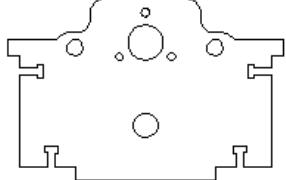
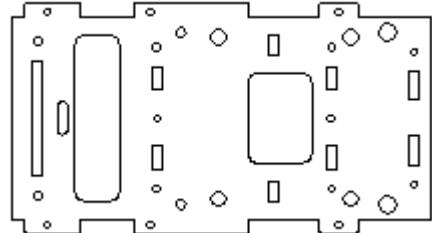
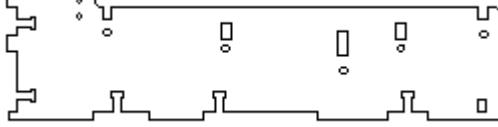
Step 2c Align the mounting holes of the Stepper Motor with holes in the Stepper Motor Assemblies. Secure the Stepper Motor to the Stepper Motor Mount with four M3 x 10 Machine Screws (H37) with M3 Washer(H88).

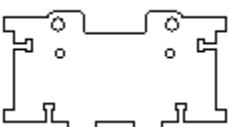
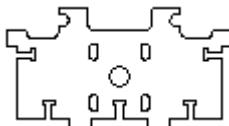


Verify the Alignment of the Drive Pulley and the Bearing as shown.

X Carriage Assembly and Z Assembly

Required Wood Components

Part #	Description	Qty	Photo
XR1	Z Stepper Motor Mount	1	 A rectangular wood component with a central circular hole and several smaller holes around it, designed to hold a stepper motor.
XR2	Carriage Top Support	1	 A trapezoidal wood component with two circular holes and a central slot, used for the top support of the carriage.
XR3	Bearing Retainer Plate	1	 A small, semi-circular wood component used to retain bearings.
XR4	Carriage Frame	1	 A large rectangular wood component with multiple holes and slots for mounting the carriage frame.
XR5	Carriage Side Support	2	 A long, narrow wood component with a central slot and four circular holes, used for side support.

XR6	Z Rail Stop	1	
XR7	Carriage Bottom Support	1	
XR8	Outer Rail Support	2	

Required Hardware

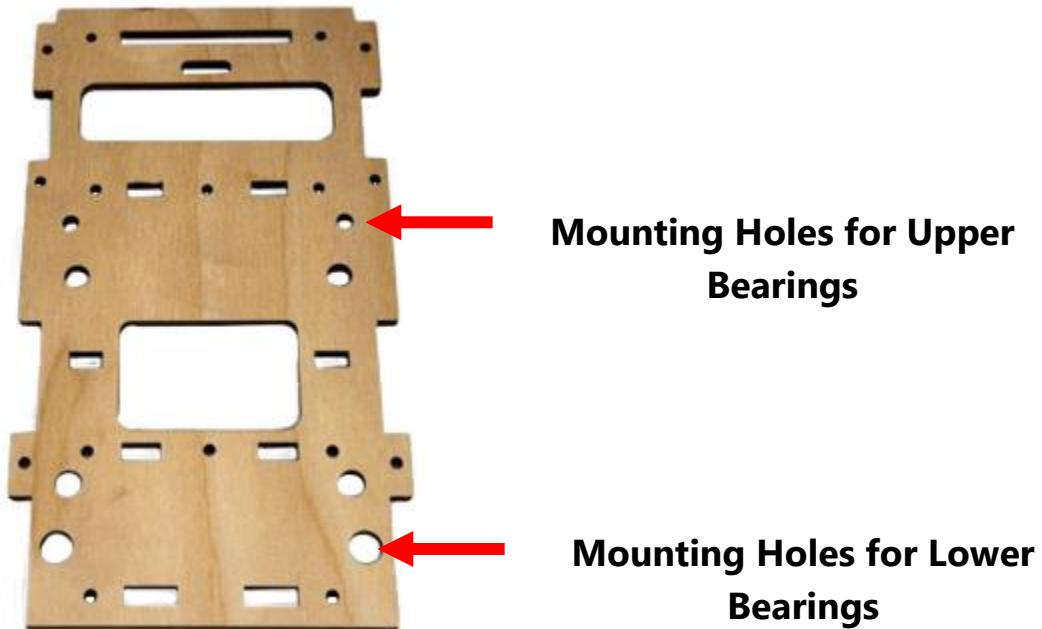
Part #	Description	Qty	Photo
H95	M6 x 35 Machine Screws	4	
H18	M6 Locknuts	4	
H40	Eccentric Spacer	2	
H41	Eccentric Washer	2	
H42	Bearing Fender Washer	6	
H44	SG20U Bearing	4	
H57	Bearing Retainer Washer	3	
H98	M4 x 20	5	

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	1/4 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

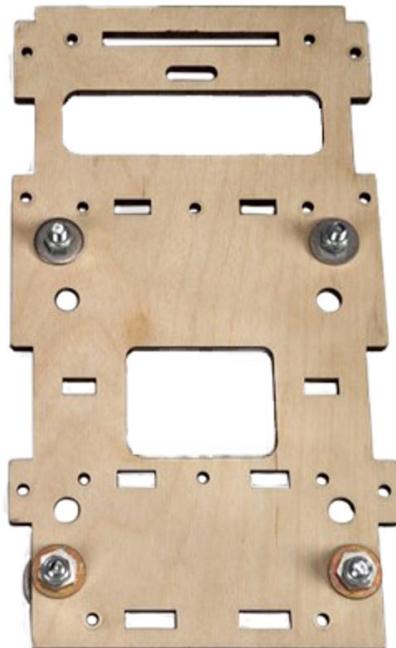


Step 1a

Install the two Upper SG20U Bearing Assemblies for the Carriage Frame (XR4). The assembly order for the Upper Bearing: M6 x 35 Machine Screw (H95), SG20U Bearing(H44) with hub facing toward the Bearing Washer, Bearing Fender 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 X 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, Bearing Fender Washer (H42), Plywood, Eccentric Washer (H41), Eccentric Spacer (H40) secured with a M6 Lock Nut (H18).



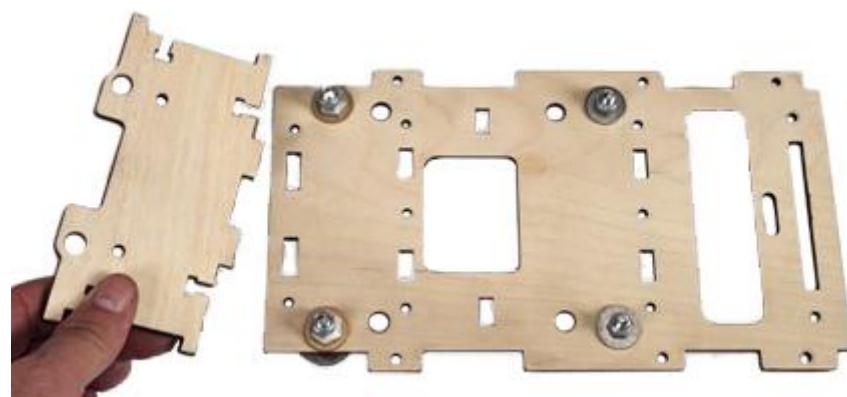
Carriage Frame Front



Carriage Frame Rear

Step 2 Building the X Carriage Assembly

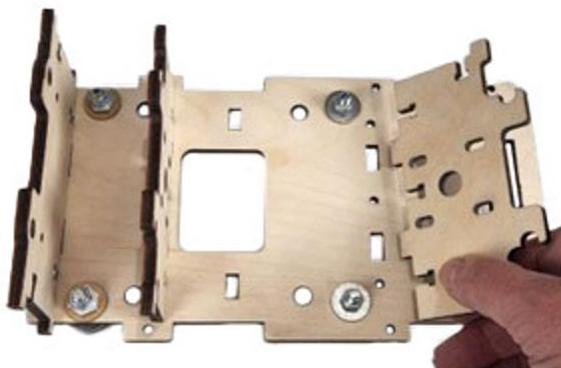
Step 2a With the Bearings facing down, align the tabs of the Carriage Bottom Support (XR7) with the slots at the bottom of the Carriage Assembly and secure with two M4 x 16 Machine Screws and Nuts.



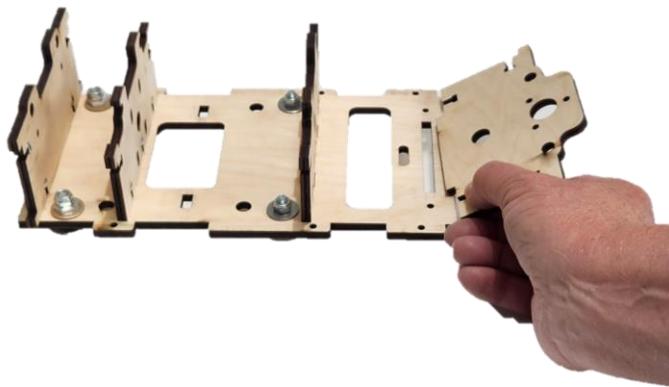
Step 2b Align the tabs of the Outer Rail Support (XR8) with the slots located below the opening in the X Carriage Assembly and secure with three M4 x 16 Machine Screws and Nuts.



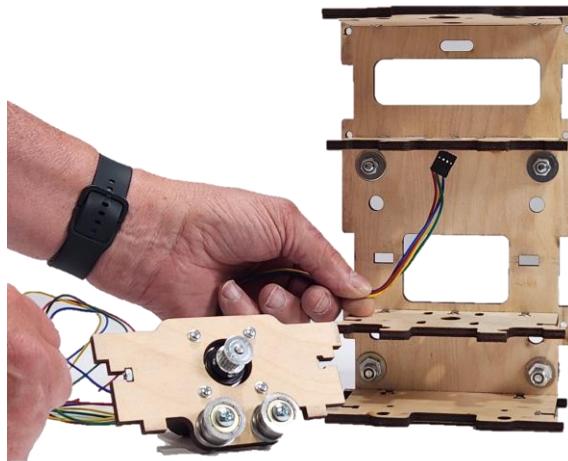
Step 2c Align the tabs of the remaining Outer Rail Support (XR8) with the next set of slots above in the X Carriage Assembly and secure with three M4 x 16 Machine Screws and Nuts.



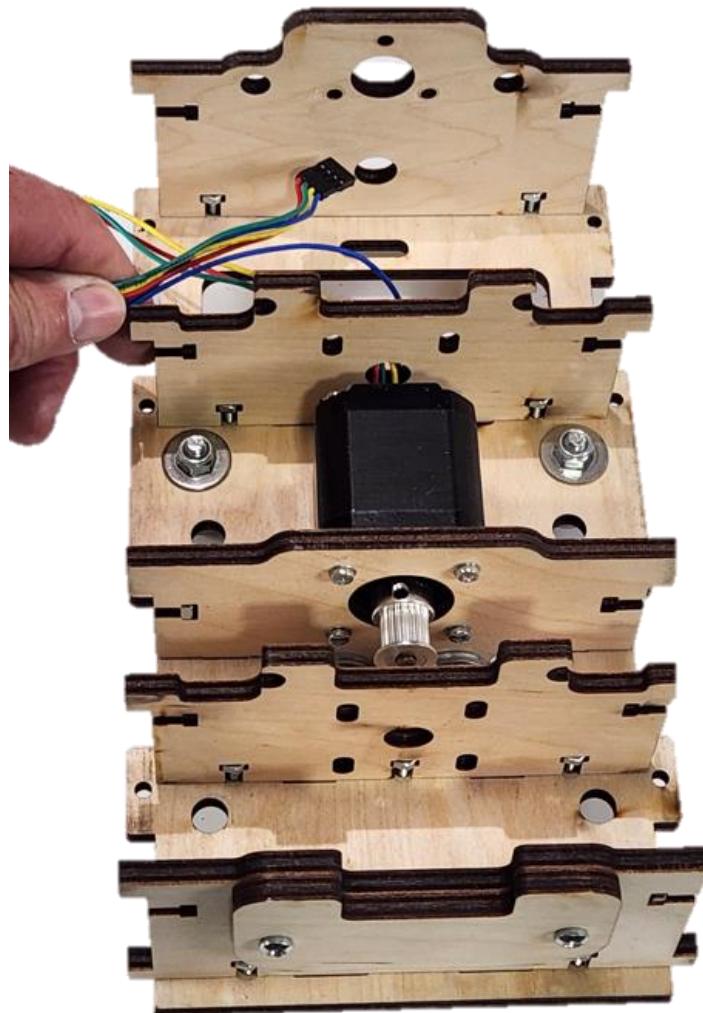
Step 2d Slide the narrow tongue of the Carriage Top Support (XR2) through the long narrow slot at the top of the X Carriage Assembly as shown. Secure with two M4 x 16 Machine Screws and Nuts.



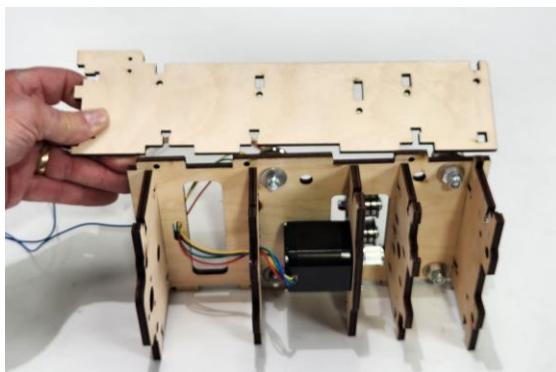
- Step 2e** Carefully thread the Dupont Connector of the X Stepper Motor wires through the upper Outer Rail Support, as shown.



Step 2f Align the tabs of the X Stepper Motor Assembly with the corresponding slots in the Carriage Frame Assembly and set in place. Thread the wire through the X Carriage Top Support.



Step 2G Align the tabs and slots of the Carriage Side Support (XR5) with the X Carriage Frame Assembly and secure with eight M4 x 16 Machine Screws and Nuts. Repeat, attaching the other Carriage Side Support.



Step 2H Attach the Z Rail Stop (XR6) to the bottom of the X Carriage Frame Assembly and secure with two M4 x 20 Machine Screws (H98) and Lock Nuts (H47).

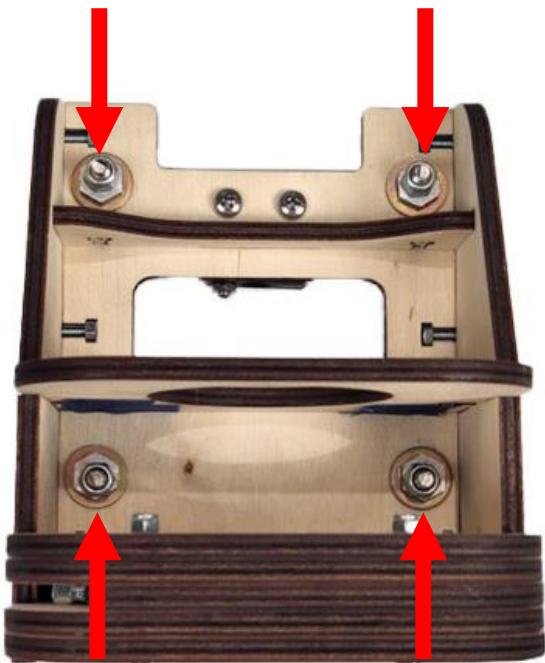


Step 3 Attach the Z Frame Assembly to the X Carriage Frame Assembly



This closeup view shows the Locknut tightened against the Eccentric 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.

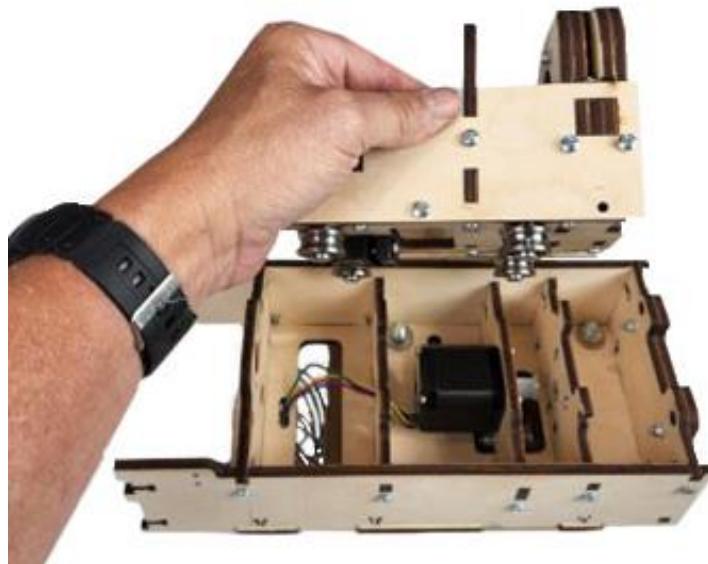
Step 3a With the Locknut firmly snugged against the face of the Eccentric Spacer, use a 13mm socket to turn just the Eccentric Spacer as shown.



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 Frame onto the X Carriage Assembly as shown.



Step 3c Carefully slide the Z Rail (H54) through the hole in Carriage Top Support (XR2), through both Outer Rail Supports (XR8) until it is seated at the bottom of the X Carriage Assembly.



Top View



Bottom View



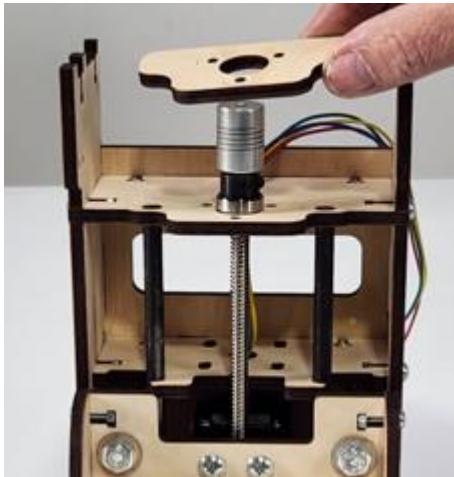
Step 4 Installing the Acme Screw.

Step 4a Thread the Acme Rod Assembly through the hole located at the front of the Carriage Top Support (XR2) and into the Acme Nut. Rotate the Acme Screw through the Acme Nut until the bearing touches the Carriage Top Support. Then turn the Acme Screw just until the Z Assembly begins to rise up the Rail.



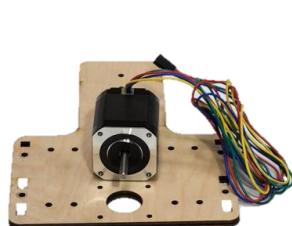
Step 4b

Place the Bearing Retainer Plate (XR3) over the ACME Screw Assembly and secure with three M4 x 20 (H98) Machine Screws and Bearing Retainer Washers (H57), and M4 Locknuts (H47).



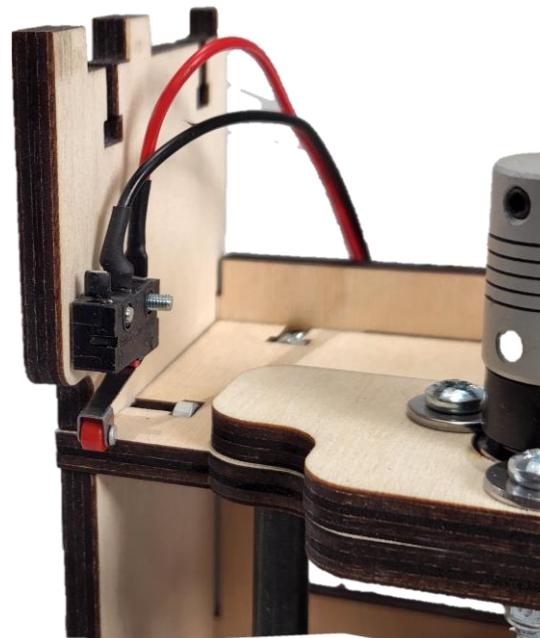
The Bearing Retainer Plate (XR3) is designed so that the Bearing Retainer Washers cover the Bearing race to hold it in place.

Step 5 Fasten the Z Axis Stepper Motor to the Carriage Top Support (XR2) using four M3 X 10 Machine Screws (H37) and Washers(H88).



Step 6 Installing the Z Home Switch.

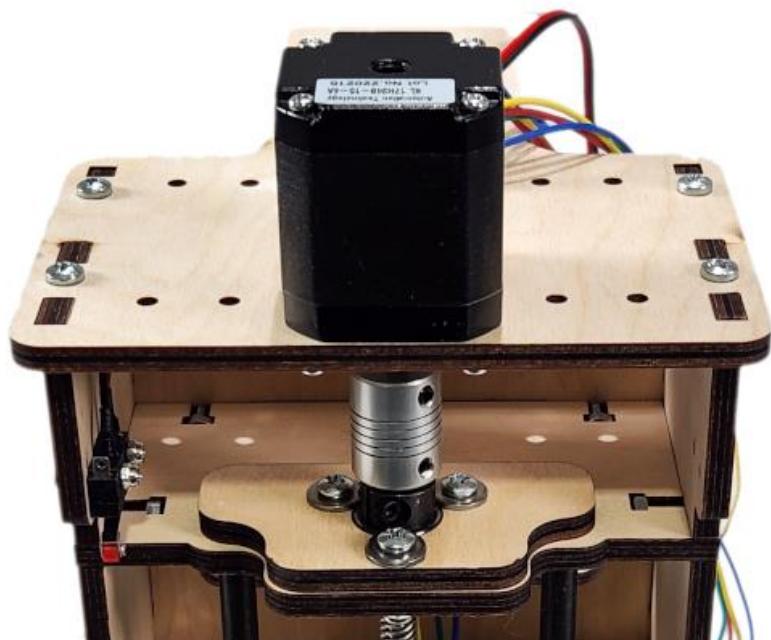
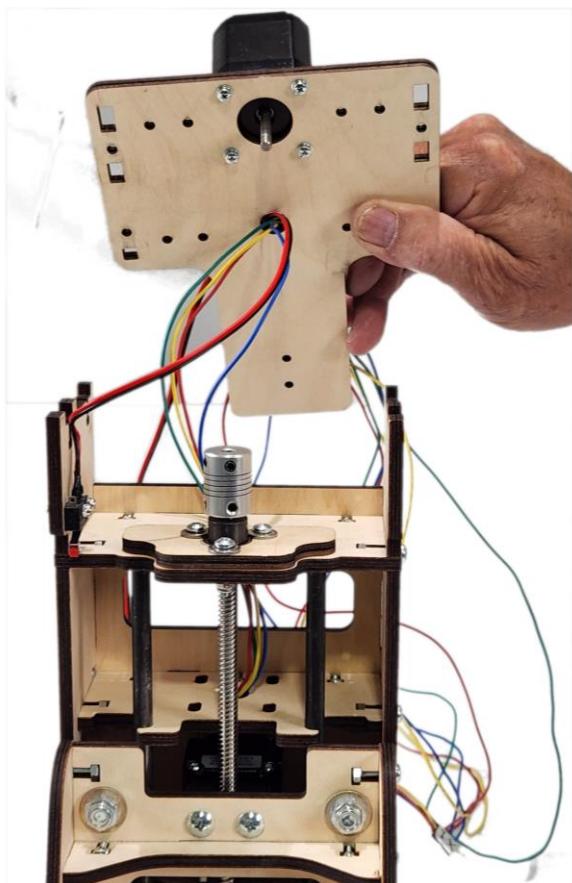
Step 6a Align the Home Switch Arm pointing down as shown. Secure Home Switch with two M2.5 X 16 Machine Screws (H27) and Locking Nuts (H43). Install the Screws so that the heads are outside the Carriage Side Support with Lock Nuts against the switch housing. Do not over tighten.



Step 7 Attaching the Carriage Top Support (XR2).

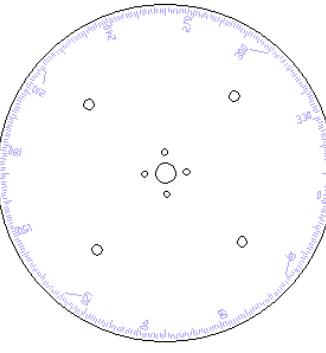
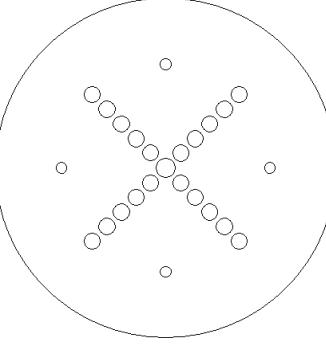
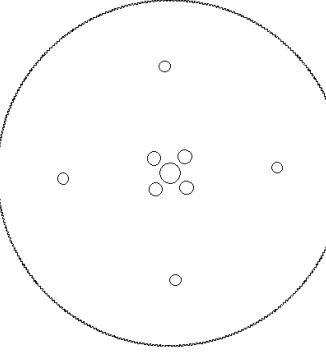
Step 7a While aligning the tabs of the Carriage Frame Assembly with the slots in the Z Stepper Motor Mount, make sure that the flat of the Stepper Motor shaft lines up with a Set Screw in the Helical Coupler.

Secure the Carriage Top Support to the Assembly with 4 M4 X 16 Machine Screws and Nuts.



Chuck Assembly:

Required Wood Components

L1	Inner Chuck Plate	1	
L2	Outer Chuck Plate	1	
L3	Chuck Pulley Plate	1	

Required Hardware

H47	M4 Lock Nut	4	
H14	M4x16 Machine Screw	4	
H71	12mm Chuck Shaft	1	
H70	12mm Chuck Flange	1	
H95	M6 x 35 Machine Screws	4	
H60	M6 Nut	4	
H66	1/4 Shim Washer	8	

Illustrated Step by Step Instructions

- Step 1** Attach the 12mm Chuck Flange(H70) to the Inner Chuck Plate (L4) using four M4 x 16 Screws with Locking Nuts.

NOTE: Before attaching the Flange, insert the two Set Screws in the Flange body. Make sure they do not protrude into the center to allow the insertion of the 12mm Chuck Shaft in a later step.



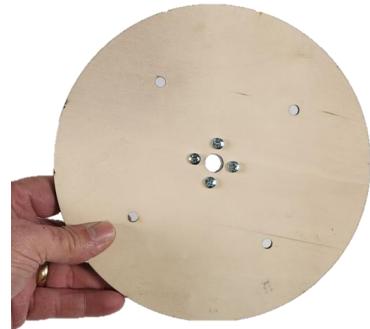
Align the holes of the 12 mm Chuck Flange with the screw holes in the Inner Chuck Plate (L1) and secure with four M4 x 16 Screws and Lock Nuts as shown.

Insert the Screws through the back of the Inner Chuck Plate so that the threaded end passes through the Flange and can be secured with the Lock Nuts as shown.

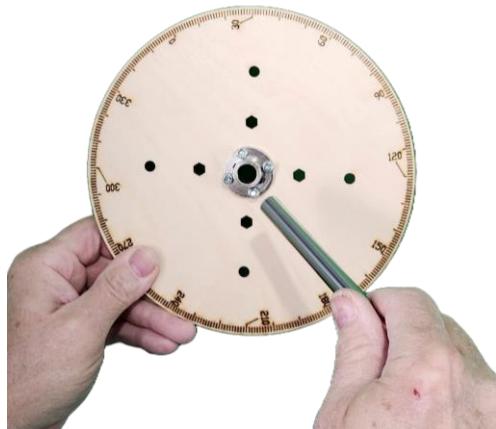
Front View



Back View



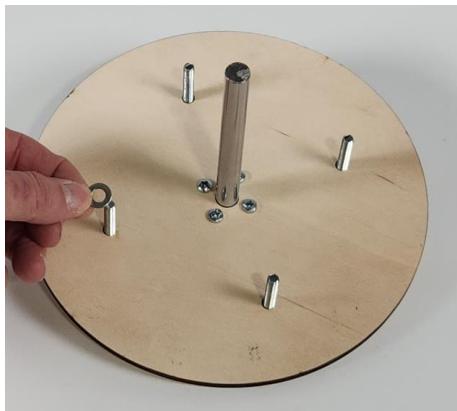
- Step 2** Insert the 12mm Chuck Shaft(H71) through the Chuck Plate Flange as shown below.



Step 3 Insert four M6 x 35 Machine Screws(H95) through the Chuck Plate as shown. Cover the Screw heads with Painter's Tape to temporarily hold them in place.



Step 4 Slide a Shim Washer(H66) over each of the four threaded bolts.



- Step 5** Align the Chuck Pully Plate(L3) over each of the four threaded bolts and center shaft and slide in place.



- Step 6** Install a Shim Washer over each of the four threaded Screws.



Step 7 Align the Outer Chuck Plate(L2) slide over the Screws and 12mm Chuck Shaft. Secure assembly with four M6 Nuts(H60) and tighten.



- Step 8** Temporarily slide a Chuck Face Plate (L4) over the completed Assembly. With the plate resting on the ends of the exposed Screws, slide the shaft back through the Chuck Flange until the end of the shaft is flush with the surface of the Workpiece Attachment. Tighten the Chuck Flange Set Screws.



Tail Stock Assembly:

Required Wood Components

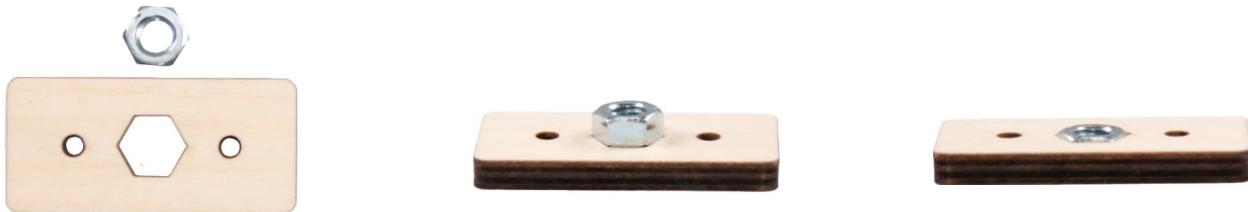
TS1	Tail Stock Side Plate	2	
TS2	Tail Stock Top Plate	1	
TS3	Tail Stock Bottom Plate	1	
TS4	Tail Stock Top Brace	1	
TS5	Tail Stock Bottom Brace	1	
TS6	Tail Stock Guide	2	
TS7	Tail Stock Tensioner	1	
TS8	Tail Stock Nut Retainer	1	

Required Hardware

Part #	Description	Qty	Photo
H77	5/16 x 3 Hex Cap Screw	1	
H5	5/16 Nut	1	
H14	M4 x 16 Machine Screw	14	
H15	M4 Nut	12	
H69	12mm Pillow Block Bearing	2	
H78	12mm Live Center	1	
H73	M6x20 Socket-head Screw	4	
H18	M6 Locknut	4	
H47	M4 Lock Nut	2	

Illustrated Step by Step Instructions

Step 1 Securely set a 5/16 Nut in the hex shaped hole in the Tail Stock Nut Retainer (TS8). It will be necessary to use a hammer, mallet, or handpress to press fit the Nut into the Retainer.



Step 2 Attach the Tail Stock Nut Retainer Assembly to the Tail Stock Bottom Plate (TS3) and secure with two M4 x 16 Screws and M4 Lock Nuts.



Step 3 Attach a Pillow Block Bearing to the Tail Stock Side Plate (TS1).



A Pillow Block Bearing is designed to allow the bearing to swivel within the block making it self-centering. After sliding the 12mm Shaft through the first Bearing, the second Bearing can be rotated within its Block as needed to pass a shaft through two Bearings.



Place the 12mm Pillow Lock Bearing through the hole in the Tail Stock Plate (TS1) and secure with two M6 x 20 Socket-head Screws with M6 Lock Nuts.

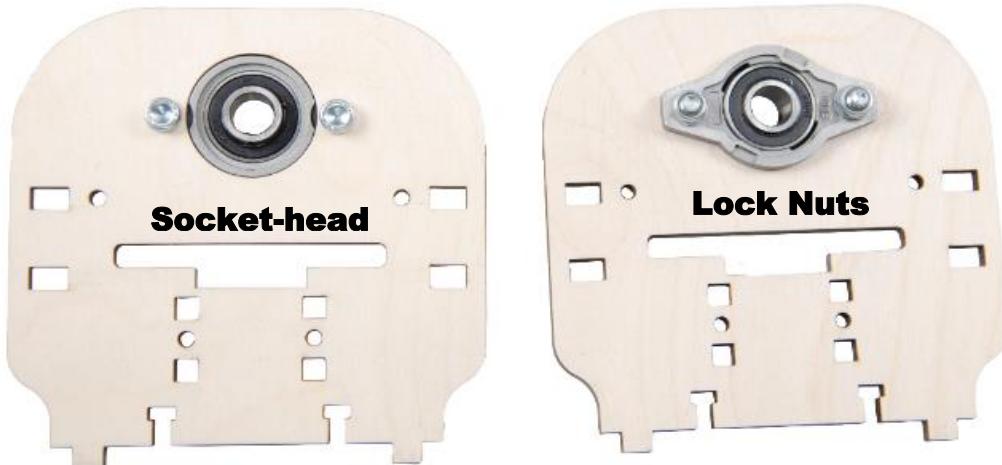


Holding the 12 mm Pillow Block Bearing in place turn the Tail Stock Side Plate over and insert the Socket-head Screws so that the Screw head rests against the wood.



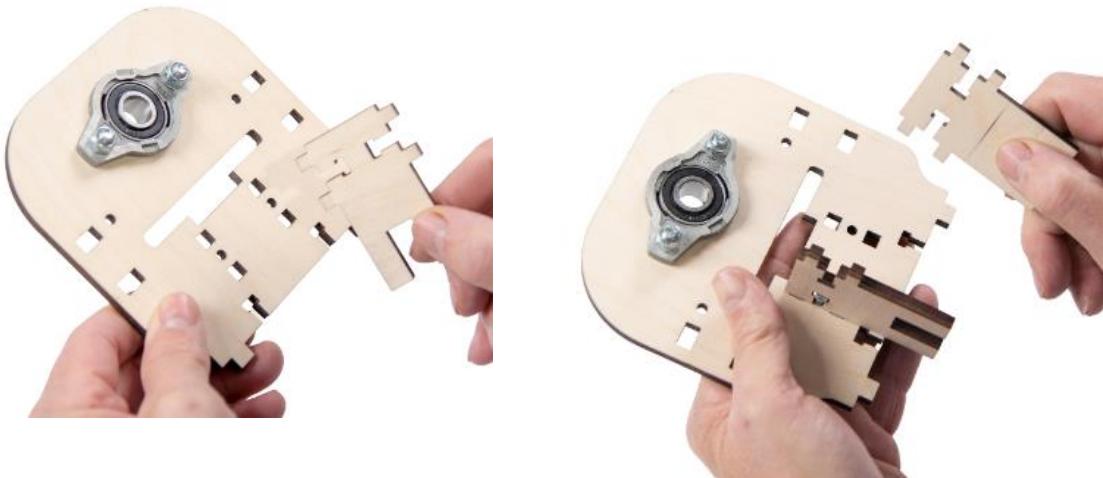
Do not tighten completely until the live center is in place. This will aid in alignment of the Pillow Block Bearings with the Live Center in a later step.

Step 4 Repeat the assembly for the remaining Tail Stock Side Plate (TS1)

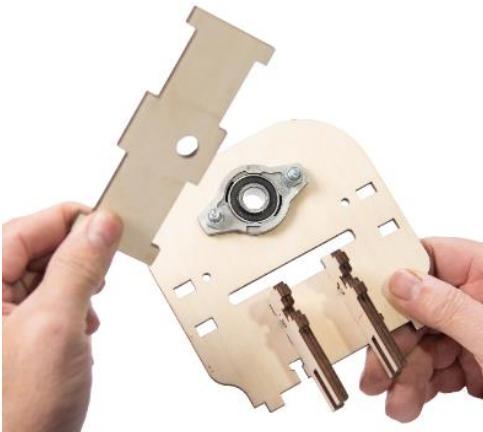


Step 5 Build the Tail Stock Tensioning Assembly

5a Attach the two Tail Stock Guides (TS6) to the Tail Stock Side Plate Assembly and secure with two M4 x 16 Screws and Nuts.



- 5b** Insert the tab of Tail Stock Bottom Brace (TS5) into the slot in the Tail Stock Assembly.



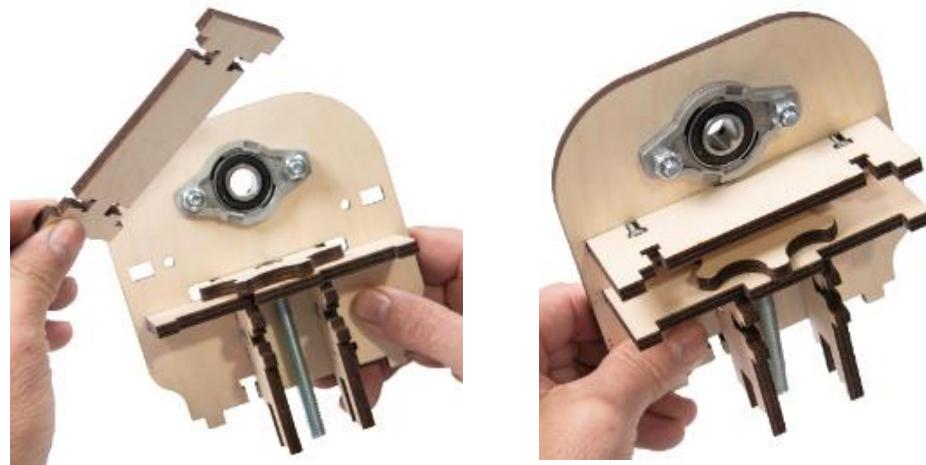
- 5c** Insert the Tail Stock Tensioner (TS7) into the slot in the Tail Stock Assembly, centering the hex shaped hole with the hole in top of the Brace as shown.



- 5d** Insert the 5/16 x 3" Hex Cap Screw into the hex shaped hole.



- 5e** Insert the tabs of the Tail Stock Top Brace (TS4) into corresponding slots in the Tail Stock Assembly and secure with two M4 x 16 Screws and Nuts.



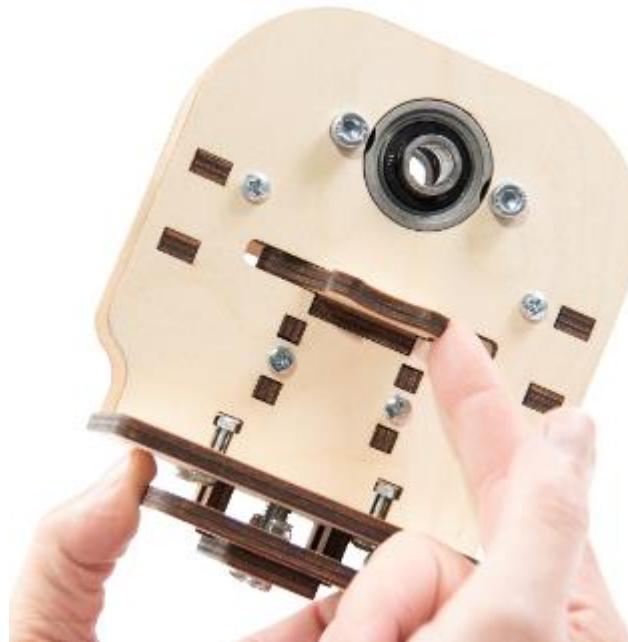
5f Align the tabs with the slots in the second Tail Stock Side Plate Assembly and secure them together with four M4 x 16 Screws and Nuts. Rotate the Tail Stock Assembly to align the tabs of the Tail Stock guides with the slots of the Tail Stock Top Plate (TS2). Align the hole in the Tail Stock Top Plate to allow the 3" Screw to pass through. Secure with four M4 x 16 Screws and Nuts.



5h Place the Tail Stock Guides through the Tail Stock Bottom Plate Assembly and insert so that the end of the 3" Screw can be threaded into the 5/16" nut.



Use the sprocket shape of the Tail Stock Tensioner to tighten the Bottom Plate Assembly and complete the Tail Stock Tensioning Assembly. The Tail Stock Bottom Plate Assembly will be removed and reinstalled in a later step.



Step 6

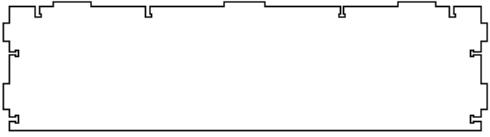
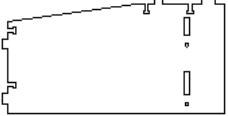
Insert the 12mm Live Center into the Chuck on the opposite side of where the Tail Stock Tensioner (TS7) protrudes out the furthest, as shown. Tighten the Set Screws to secure the Live Center.



Base Assembly:

Required Wood Components

Part #	Description	Qty	Photo
BA1	Base Frame	1	
BA2	Base Tail Stock Guide	1	
BA3	Front Base Support	1	
BA4	Rear Base Support	1	
BA5	Base Brace	12	
BA6	Base Corner Bracket	2	

BA7	Back Brace	1	
BA8	Side Brace	2	

Required Hardware

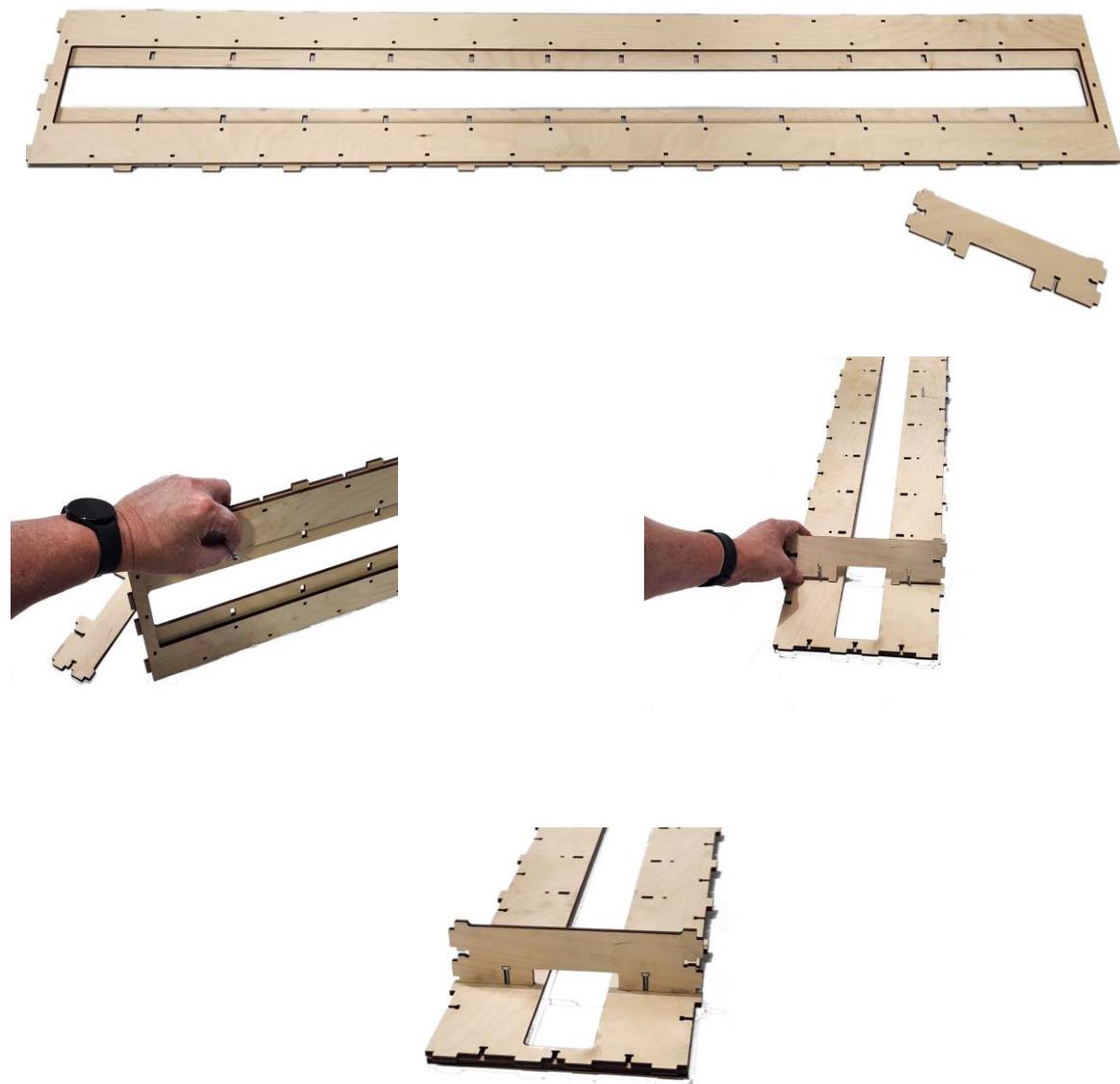
Part #	Description	Qty	Photo
H38	M4 x 30 Machine Screws	24	
H14	M4 x 16 Screws	64	
H15	M4 Nuts	88	

Illustrated Step by Step Instructions

- Step 1** Lay the Base Tail Stock Guide (BA2) on the Base Frame (BA1) as shown.



Step 2 Holding the two pieces together with the Base Tail Stock Guide on the bottom, insert the tabs of a Base Brace (BA5) into the slots of the Base Frame (BA1) and loosely secure with two M4 x 30 Machine Screws and Nuts (twenty-four total). Repeat with the remaining eleven Base Braces (BA5). **Note: Do not fully tighten the Screws and Nuts. This will be done in a later step.**



Bottom View



Top View

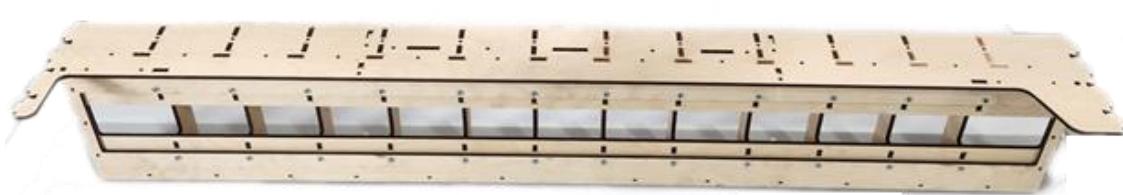


Step 3

Attach the Rear Base Support (BA4) to the Base Assembly using twenty-four of the M4 x 16 Machine Screws. Align the slots of the Rear Base Support Assembly to the tabs of the Base Assembly as shown.



When installing the Rear Base Support, the narrow leg of the Support must be positioned to the left as shown below.



- Step 4** Repeat the process to attach the Front Base Support (BA3) to the Base Assembly using Twenty-four M4 x 16 Screws and Nuts.

Note: The Rear Base Support is unmarked. The *BobsCNC* and the *Revolution* logos are clearly visible on the Front Base Support.

Note: After both sides are attached, securely tighten the M4 x 30 Machine Screws and Nuts.



Front View



Rear View

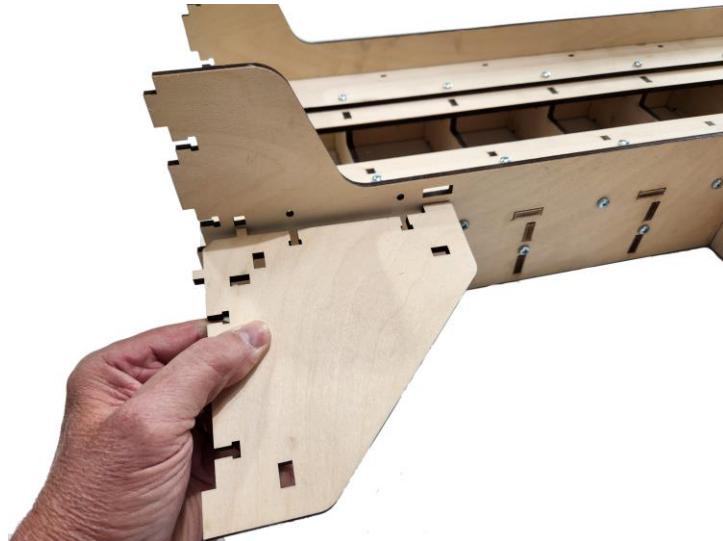
Step 5 Assemble the Back Brace Assembly. Secure the two Side Braces (BA8) to the bottom of the Back Brace (BA7) and secure with four M4 x16 Machine Screws and Nuts.



Step 6 Attach the Back Brace Assembly to the Base Assembly by aligning the inserting the tabs of the Back Brace into the slots in the back side of the Base Assembly as shown. Secure the sides pieces to the bottom of the Back Brace and secure with eight M4 x16 Machine Screws and Nuts.



Step 7 Attach the Base Corner Brackets (BA6) to both ends of the Base Assembly and secure with two M4 X 16 Machine Screws and Nuts each as shown.



Gantry Assembly

Required Wood Components

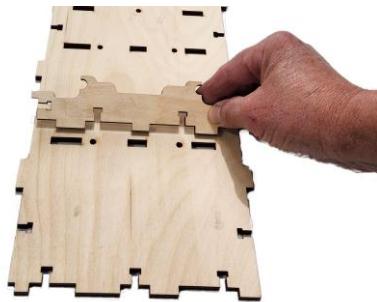
GR1	Gantry Frame	1	
GR4	X Rail Support	11	
GR5	Controller Mount	1	
GR7	Gantry Back Brace	4	
GR8	Gantry Back Support	2	
GR9	Gantry Top/Bottom Brace	2	

Required Hardware

Part #	Description	Qty	Photo
H14	M4 x 16 Machine Screws	92	
H15	M4 Nuts	92	

Illustrated Step by Step Instructions

- Step 1** Align and insert the tabs of the eleven X Rail Supports (GR4) into the slots in the Gantry Frame(GR1) and secure with two M4 x 16 Machine Screws and Nuts each.



Finished Assembly will look like this.

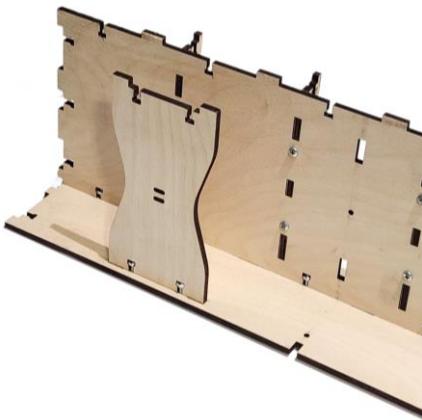


Step 2 Align and insert the tabs of the Gantry Frame Assembly into the slots in the Gantry Bottom Brace (GR9) and secure with twenty-three M4 x 16 Machine Screws and Nuts as shown.

Note the laser markings designate the top and bottom pieces for GR9 pieces.



Step 3 Align and insert the tabs of the two Gantry Back Supports (GR8) into the slots at either end of the Gantry Frame Assembly and secure with two M4 x 16 Machine Screws and Nuts for each Support.



Left Side



Center

- Step 4** Align and insert the tabs of the Controller Mount (GR5) into the slots at the right end of the Gantry Frame Assembly facing you and secure with two M4 x 16 Machine Screws and Nuts.



- Step 6** Align and insert the tabs of the Gantry Frame Assembly into the slots of the Gantry Top Brace (GR9).

Note the laser markings designate the top and bottom pieces for GR9 pieces.



Step 7 Turn the Assembly face down. Align and insert the tabs of the four Gantry Back Braces (GR7) into the slots of the Gantry Frame Assembly. There are four notches in each of the Top and Bottom Braces to receive each Back Brace. Secure with three M4 x 16 Machine Screws and Nuts in each.



Finished assembly shown below.



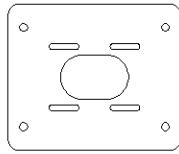
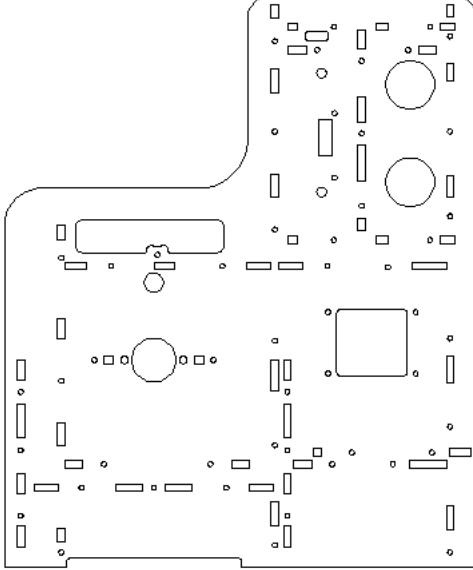
Front View.

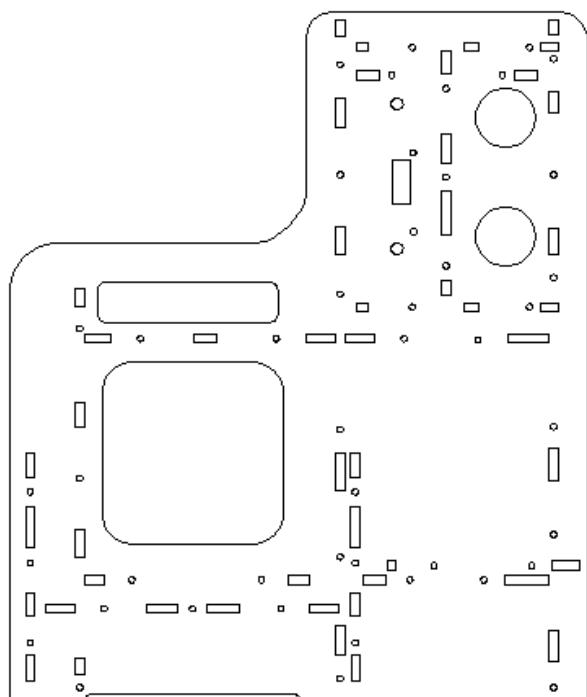
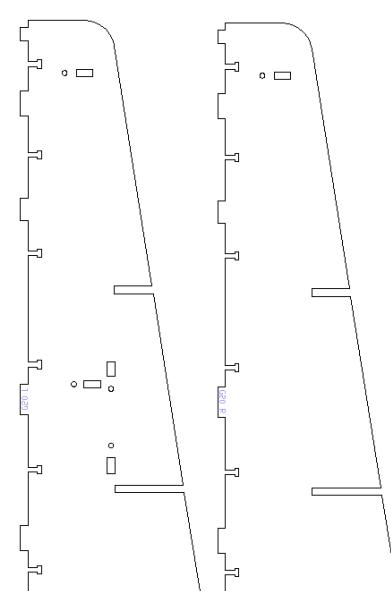


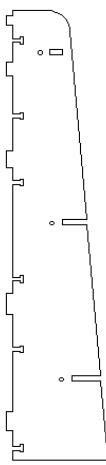
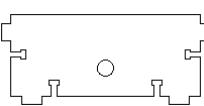
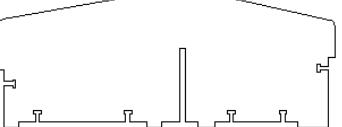
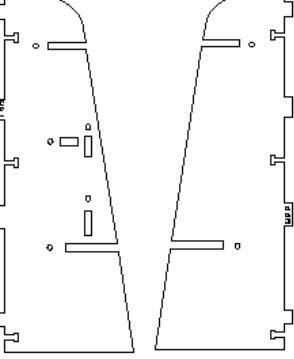
Rear View.

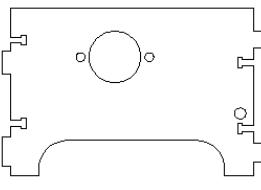
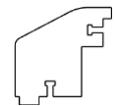
Attaching the Base and Gantry Assembly

Required Wood Components

Part #	Description	Qty	Photo
GR2	A-Axis Stepper Motor Mount	1	
GR3	A-Axis Stepper Motor Spacer	2	
GR17	Left Gantry Side	1	
L8	Dial Indicator	1	

GR18	Right Gantry Side	1	
GR20L GR20R	Gantry Mid Vertical Support	2	

GR21	Gantry Back Vertical Support	2	
GR14	Gantry Top Brace	2	
GR15	Gantry Mid Brace	2	
GR16	Gantry Bottom Brace	2	
GR19L GR19R	Gantry Front Vertical Support	2	 L R

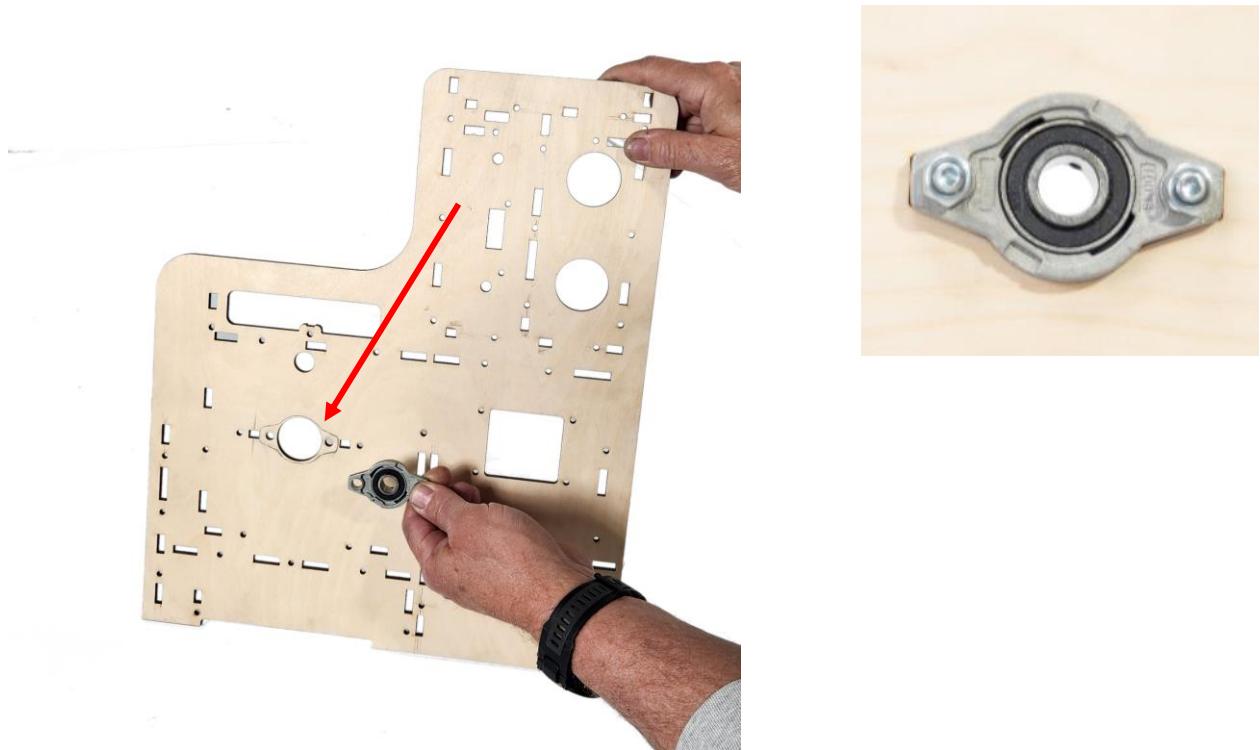
L5	Chuck Support	1	
L6	Front Chuck Brace	1	
L7	Rear Chuck Brace	1	

Required Hardware

Part #	Description	Qty	Photo
H14	M4 x 16 Machine Screws	111	
H15	M4 Nut	111	
H85	M4 x 35 Machine Screw	4	
H47	M4 lock Nut	4	
H69	12mm Pillow Block Bearing	2	
H73	M6x20 Socket-head Screw	4	
M18	M6 Lock Nut	4	

Illustrated Step by Step Instructions

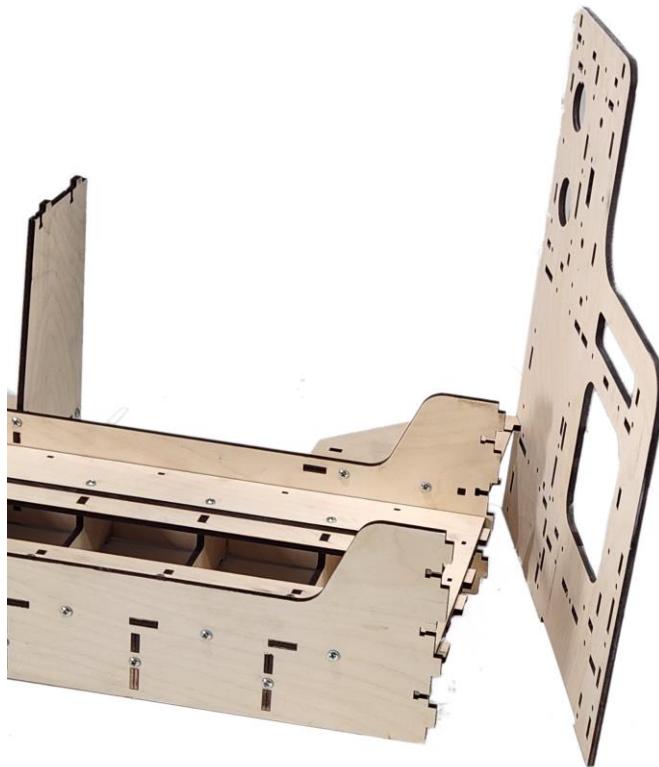
- Step 1** Attach a 12mm Pillow Block Bearing(H69) to the Left Gantry Side (GR17) and secure with two M6 x 20 Socket Head Screws(H73) and Lock Nuts(M18). Align the Pillow Block Bearing with the laser markings on the Gantry Side (below left). Turn the Gantry Side over and insert the two Socket Head Screws and secure with M6 Lock Nuts (below right).



Step 2 Align and insert the tabs of the Gantry Frame Assembly into the slots of the left Gantry Side Assembly and secure with eleven M4 x 16 Machine Screws and Nuts.



Step 3 Align and insert the tabs of the Gantry Frame Assembly into the slots of the Right Gantry Side (GR18) and secure with eleven M4 x 16 Machine Screws and Nuts.



Step 4 Align and insert the tabs of the Gantry Frame Assembly into the slots of the Gantry Sides and middle Brace then secure with eighteen M4 x 16 Machine Screws and Nuts. Photos below show both Gantry Sides attached to the Gantry and Base Assemblies.

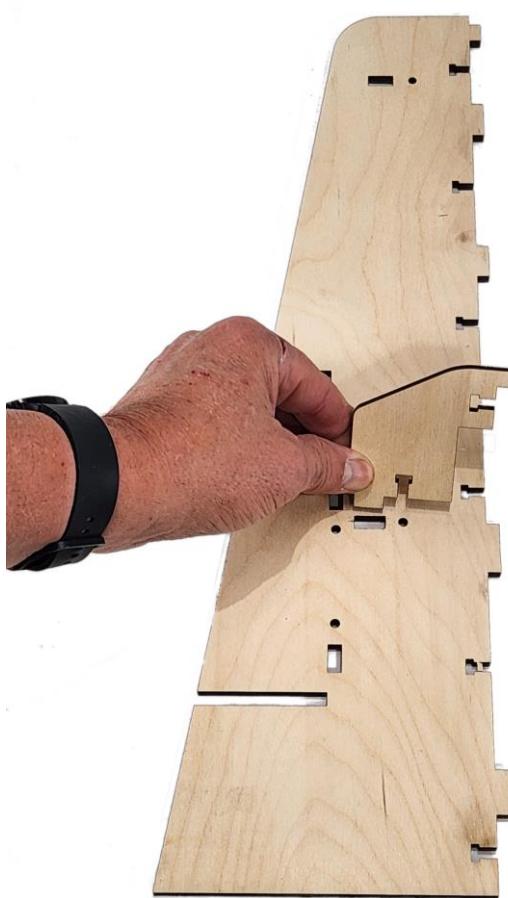
Front View



Rear View



Step 5 Attaching the Left Side Assembly Components.

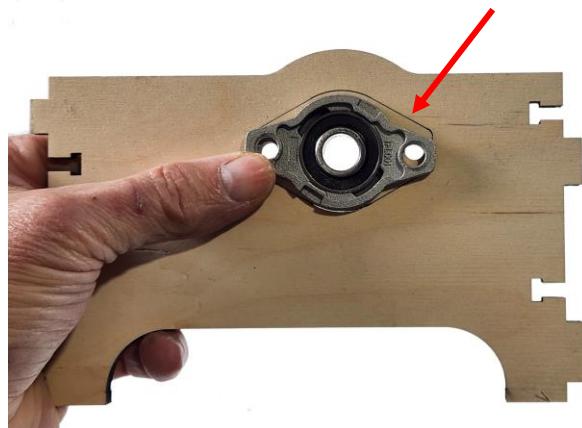


5a Attach the Rear Chuck Brace (L7) to the Gantry Mid Vertical Support (GR20L) and secure with one M4 x 16 Screw and Nut.

5b Attach the Front Chuck Brace (L6) to the Gantry Front Vertical Support (GR19L) and secure with one M4 x 16 Screw and Nut.



5c Insert a 12mm Pillow Block Bearing(H69) to the Chuck Support(L5) and secure with two M6 x 20 Socket-head Screws and Lock Nuts. Note that the hub side of the Bearing is set so that it extends through the opening. The Screws are placed so that the Nuts are exposed on the side with the laser engraved outline, as shown.



- 5d** Attach the Gantry Mid Support Assembly and Chuck Support Assembly together with two M4 x 16 Screws and Nuts.



- 5e** Connect the Gantry Mid Support Assembly to the Gantry Front Support Assembly and secure with two M4 x 16 Screws with Nuts.



- 5f** Connect the Gantry Top Brace (GR14) to the Gantry Back Vertical Support (GR21) and secure with one M4 x 16 Screw and Nut.



- 5g** Connect the Gantry Top Brace (GR14) and the Gantry Back Vertical Support (GR21) as shown and secure with one M4 x 16 Screw and Nut.



- 5h** Insert the tabs of the Gantry Top Brace (GR14) into the corresponding slots in the Assembly and secure with one M4 x 16 Screws and Nuts.



- 5i** Align the tabs on the Side Support Assembly with the slots on the Left Side of the Revolution Assembly and secure with nineteen M4 x 16 Screws and Nuts.



- 5j** Insert the tabs of the Gantry Mid Brace (GR16) into the corresponding slots in the Assembly and secure with six M4 x 16 Screws and Nuts.



- 5k** Insert the tabs of the Gantry Mid Brace (GR15) into the corresponding slots in the Assembly and secure with six M4 x 16 Screws and Nuts.



- 5i** Insert Dial Indicator (L8) into the corresponding slot in the Assembly and secure with one M4 x 16 Screw and Nut.



Step 6 Attach the Gantry Right Side Assembly Components.

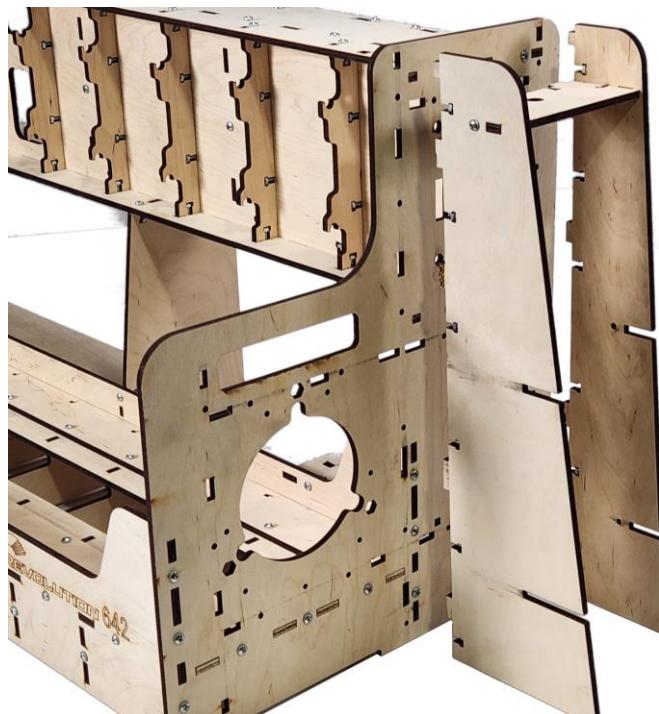
- 6a** Insert the tab of the Gantry Top Brace (GR14) into the Gantry Mid Vertical Support (GR20R) and secure with one M4 x 16 Screw and Nut.



- 6b** Insert the tab of the Gantry Top Brace (GR14) into the slot of the Gantry Mid Vertical Support (GR21) and secure with one M4 x 16 Screw and Nut.



- 6c** Align the tabs of the Right-Side Vertical Assembly to the slots of the Right-Side Assembly and secure with fourteen M4 x 16 Screws and Nuts.



- 6d** Align the tabs of the Gantry Front Vertical Support (GR19R) to the slots of the Gantry Right Side Assembly and secure with three M4 x 16 Screws and Nuts.



- 6e** Insert the Gantry Bottom Brace (GR16) into the slots of the attached vertical supports and secure with six M4 x 16 Screws and Nuts.



- 6f** Insert the Gantry Mid Brace (GR15) into the slots of the attached vertical supports and secure with six M4 x 16 Screws and Nuts.



- Step 7** Attach the A-Axis Stepper Motor Mount Assembly to the right side of the Base and Gantry Assembly.

- 7a** Insert four M4 x 30 Machine Screws(H38) through the A-Axis Stepper Motor Mount (GR2) and lay the piece with the screw heads on the bottom as shown.



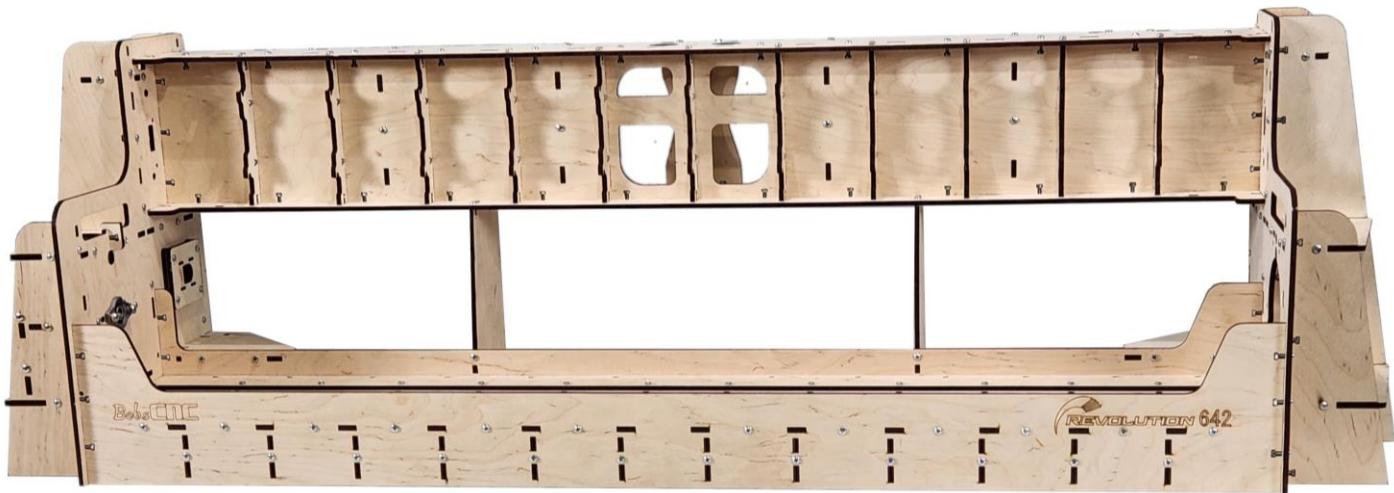
- 7b** Lay the two A-Axis Stepper Motor Spacers (GR3) over the Mount with the Screws through the two holes in each spacer as shown.



- 7c** Insert four M4 x 30 Machine Screws in the Stepper Mount Assembly through the holes in the left side of the Gantry and secure with four M4 Lock Nuts.



Finished Front

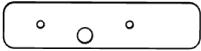
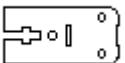
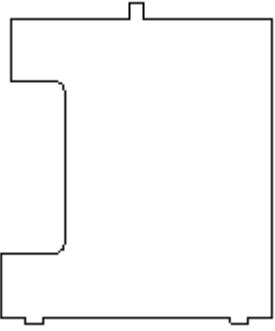
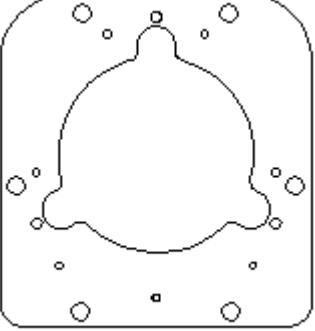
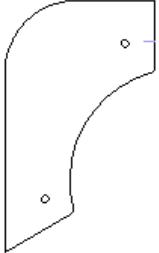


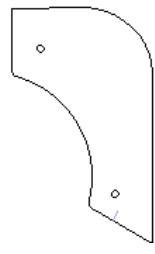
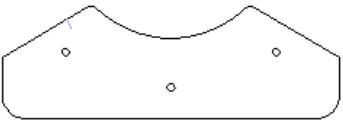
Finished Back



Final Assembly

Required Wood Components

Part #	Description	Qt y	Photo
GR6	X Rail Stop	2	
QR3	Belt Retainer	4	
L9	Belt Guard	1	
RP1	Pass Through Frame	2	
RP2	Pass Through Left Guide	1	

RP3	Pass Through Right Guide	1	
RP4	Pass Through Bottom Guide	1	
RP5	Short Bearing ARM	3	
RP6	Medium Bearing ARM	3	
RP7	Long Bearing ARM	3	

Required Hardware

Part #	Description	Qty	Photo
H26	Small Zip Ties	30	
H83	GT2 Open Loop Belt	1	
H68	GT2 Closed Loop Belt	1	
H102	Stress Proof Steel X Rail	2	

H38	M4 x 30 Machine Screw	7	
H47	M4 lock Nut	15	
H98	M4 x 20 Machine Screw	4	
H14	M4 x 16 Machine Screws	10	
H15	M4 Nuts	6	
H48	M5 x 30 Machine Screw	2	
H93	M5 Square Nut	2	
H50	Idler Fender Washer	2	
H27	M2.5 x 16 Machine Screw	2	
H43	M2.5 Lock Nut	2	
CB19	Home Switch	1	
CB23	Wire Extension Kit	1	

CB12	Power Supply with cord	1	
CB16	UNO Controller	1	
SD4	Drag Chain 18x25 mm	1	
CB 14	USB Cable		
H55	GT2 Pulley Short	1	
H37	M3 x 10 Machine Screw	4	
H88	M3 Washer	4	
H95	M6 x 35 Machine Screws	12	

ZD3	626-2RS Bearing	9	
H61	Hardened Washer	30	
H18	M6 Locknuts	9	
H60	M6 Nut	3	
R2	Makita Router	1	

Installing the Chuck Assembly

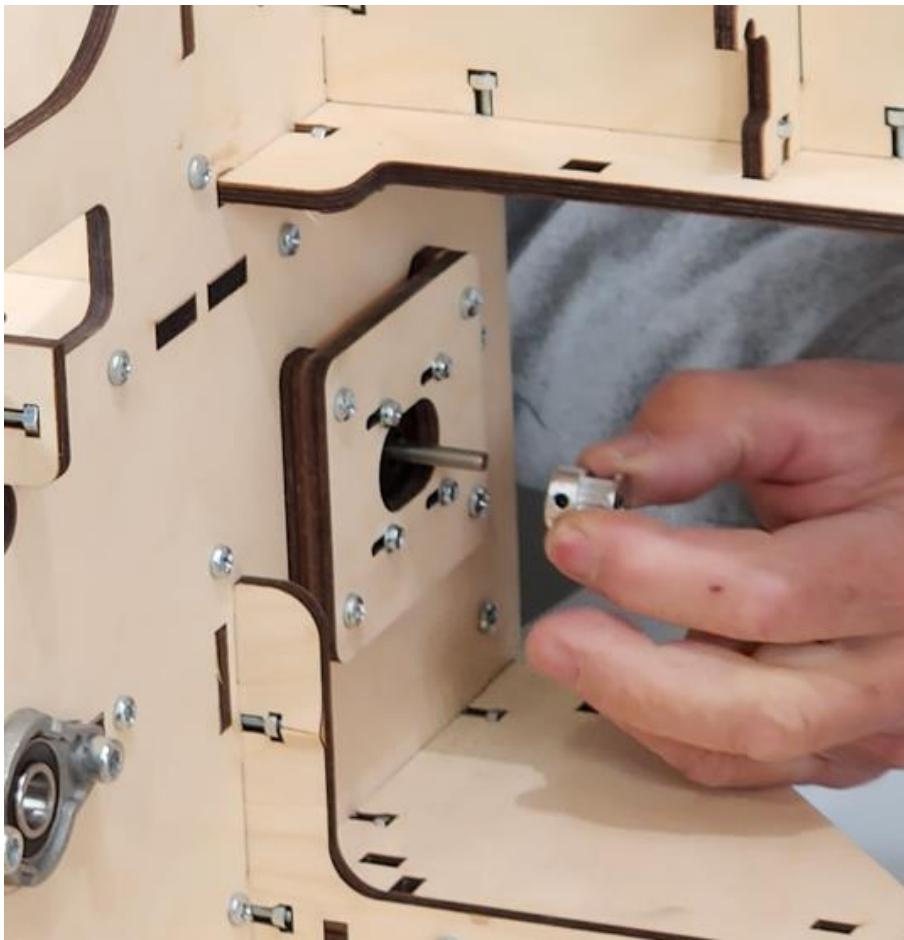
- Step 1** Attach the A-Axis Stepper Motor by sliding the shaft through the Stepper Motor Mount Assembly on the left side of the Assembly. Be sure that the Stepper Motor wires are oriented at the top of the motor as shown.



Align the holes in the Stepper Motor Plate with the slotted holes of the Mount and secure with four M3 X 10 Machine Screws(H37) and M3 Washers(H88). Do not fully tighten the Machine Screws at this time.

- Step 2** Mount the Short Pulley (H55) on to the shaft of the A-Axis Stepper Motor as shown. Do not tighten the Set Screws at this time. **Notice the difference between the two Drive Pulleys.**





A Pillow Block Bearing is designed to allow the Bearing to swivel within the block making it self-centering. After sliding the 12mm Shaft through the first Bearing, the second Bearing can be rotated within its Block as needed to pass a shaft though both Bearings.



Step 3

Insert

the 12 mm shaft of the Chuck Assembly through both Pillow Blocks.



Inboard View



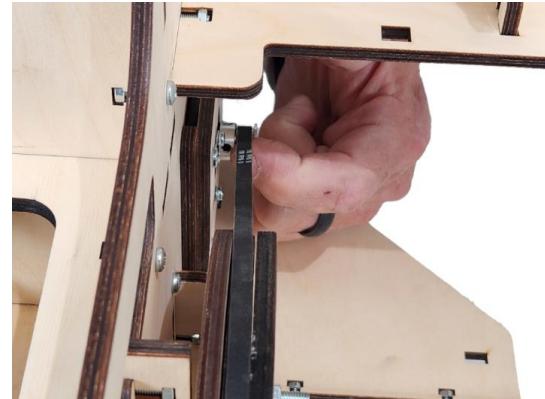
Outboard View

Step 4

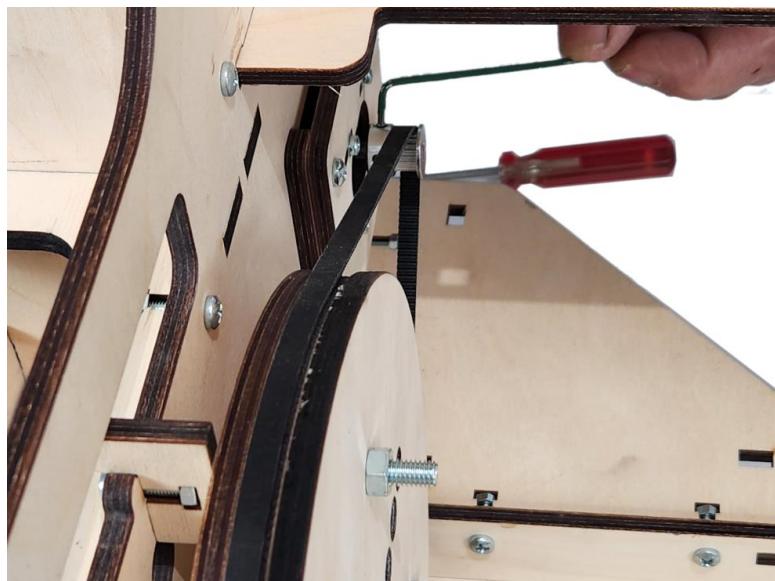
Align the Chuck Pulley Plate and the Short Drive Pulley on the A-Axis Stepper motor.

4a Loop the GT2 Drive Belt(H68) around the Chuck Pulley Plate and the A-Axis Drive Pulley.

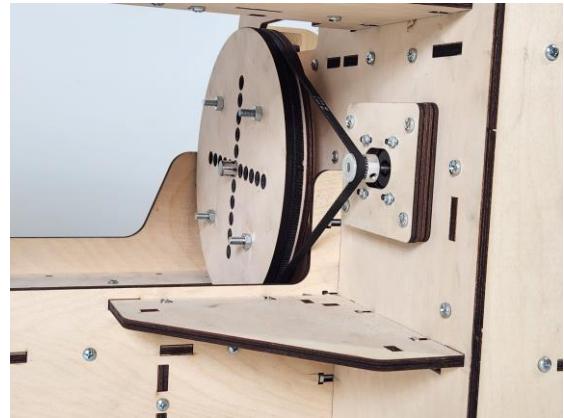
Gently pull the A-Axis Short Drive Pulley back to remove any slack in the Belt, then tighten the A-Axis Stepper Motor in place.



- 4b** Gently push the A-Axis Stepper Motor Drive Pulley toward the Mount until the Belt is parallel to the Gantry Side and tighten in place. Make sure one of the Set Screws tightens against the flat of the Stepper Motor Shaft.



4c Tighten the M3 x 10 Stepper Motor Screws.



4d Tighten the two Set Screws on the inboard and outboard Pillow Block against the 12mm Shaft.



Inboard



Outboard

Step 5 Install the Belt Guard (L9) by aligning the tabs on the Plate with the slot in the bottom of the Gantry. Slide the tab up into the slot and allow the two tabs at the bottom of the plate to drop into the two slots in the Back Corner Brace.



Installing the Tail Stock

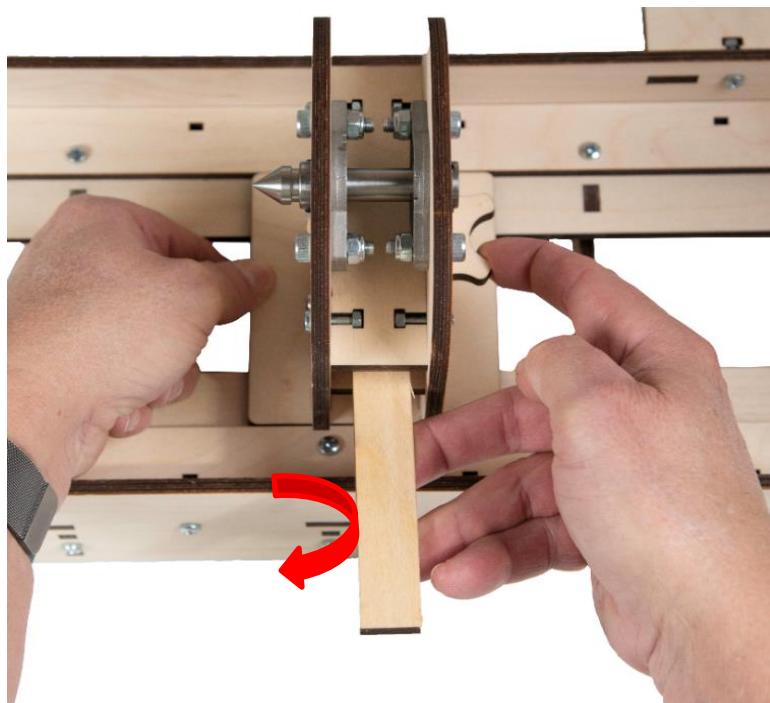
- Step 1** Insert the Tail Stock Bottom Plate Assembly into the Base Assembly and position the Plate so it can move from end to end beneath the Base Frame. **NOTE: The Nut Assembly is oriented toward the right end of the Base.**



Position the Nut so that it rests on a Base Brace.

- Step 2** Align the tabs of the Tail Stock Guide and the threaded shaft of the Screw into the Bottom Plate.





In the photo above a $\frac{1}{4}$ " thick piece of shim stock was inserted into the Live Center Assembly with one end positioned over the hex head of the 3" Screw. The shim was lifted to hold the hex head down. At the same time, the Tail Stock Top Plate and Bottom Plate are gently squeezed together to enable the end of the bolt to engage the Nut while the Tail Stock Tensioner was turned in a clockwise direction to tighten the Nut.

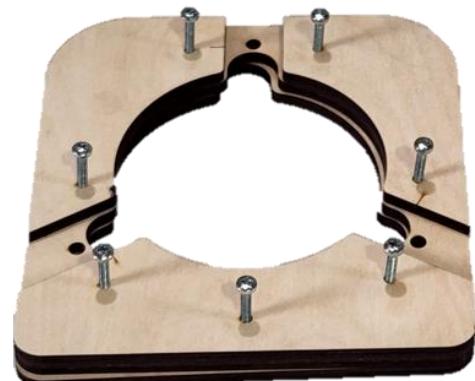
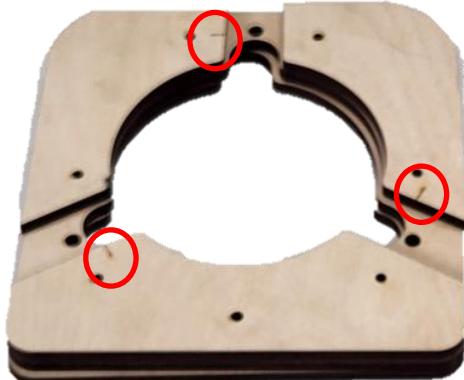
Installing the Pass-Through Rest.



- Step 1** Stack the two Pass Through Frames (RP1) on top of each other



Place the Pass Through Guides (RP2, 3, and 4) on the Pass Through Assembly as shown below. Make sure that the laser line is showing on each piece. Insert seven M4 X 30(H38) Machine Screws into the holes as shown. The seven M4 Lock Nuts will be attached later.



- Step 2** Orient the Pass-Thru Rest to the right Gantry Side and align the Machine Screws to the mounting holes and secure with the seven M4 Locknuts(H47).



- Step 3** Assemble the three Long Bearing ARM. Each set Long, Medium, and Short contains three equal length Bearing Arms. The instructions illustrate a long set. Each set will be assembled the same way.



Step 3a Assemble the three Large Bearing Arms in the following sequence.



The Bearing assembly consists of a M6 x 35 Machine Screw(H95), Hardened Washer(H61), Pass-Thru Arm(RP5,RP6, RP7), Hardened Washer, 626-2RS Bearing(ZD3), Hardened Washer, and M6 Locknut (H18).



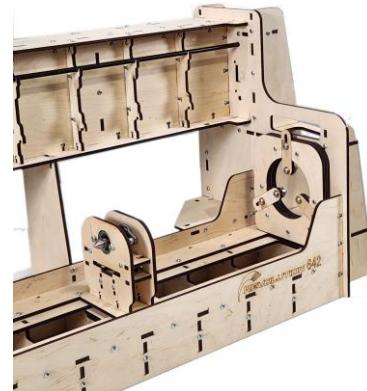
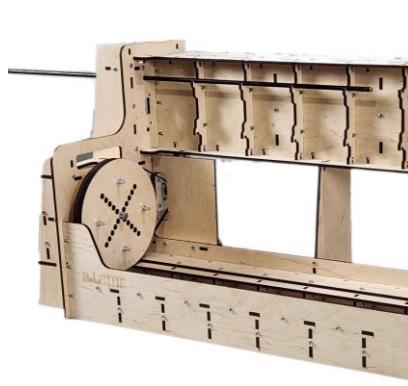
Step 3b Attach the three Large Pass-Thru Guides to the Pass-Thru Assembly by first inserting the M6 Nut(H60) in the Pocket of the Assembly. Holding the Nut in place insert a M6 x 35 Machine Screw(H95) and Hardened Washer(H61) through the hole in the Arm Assembly. Make sure the Bearing is pointing toward the center of the Pass-Thru opening. Orient the gauge markings on each so they are visible from the front of the machine.



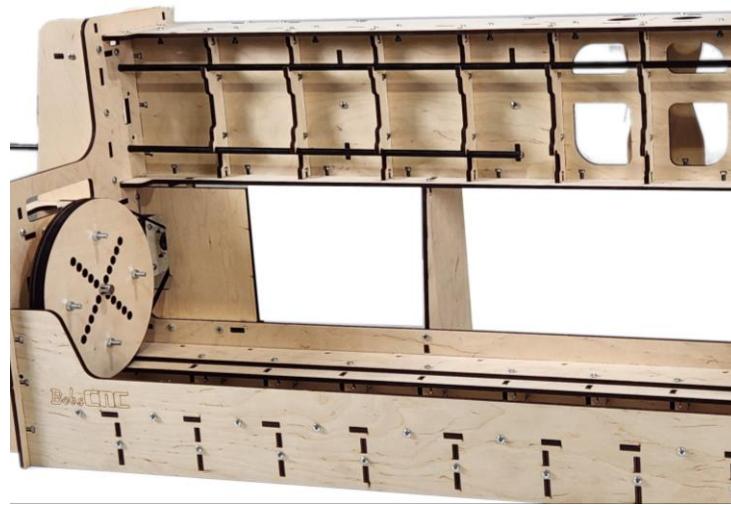
Installing the XZ Assembly

Step 1 Attach the X Carriage to the Gantry Assembly.

Step 1a Insert the upper Rail(H52) through the Gantry Side Assembly. Rotate the Rail as it passes through the Gantry Rail Supports and is fully seated in the opposite Gantry Side Assembly.



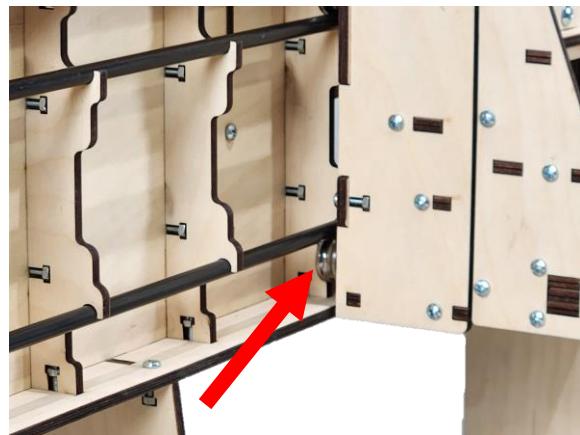
Step 1b Insert the lower Rail(H52) through the Gantry Side Assembly, partially across the Rail Supports.



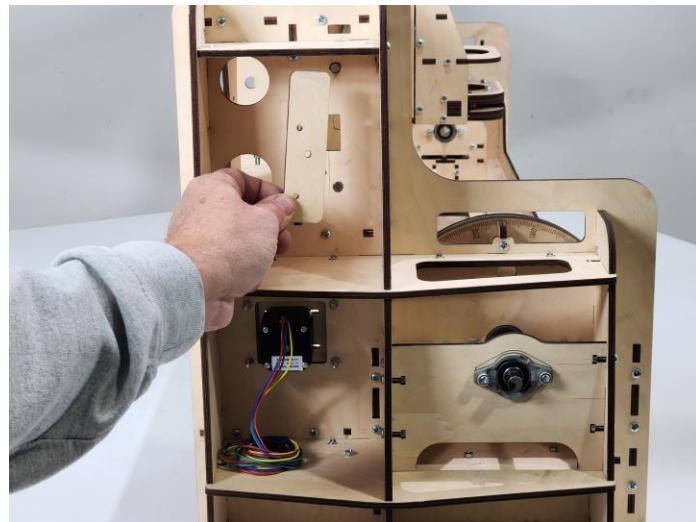
Step 1c Hang the upper SG20U Bearings of the X Carriage Assembly on the Upper Rail.



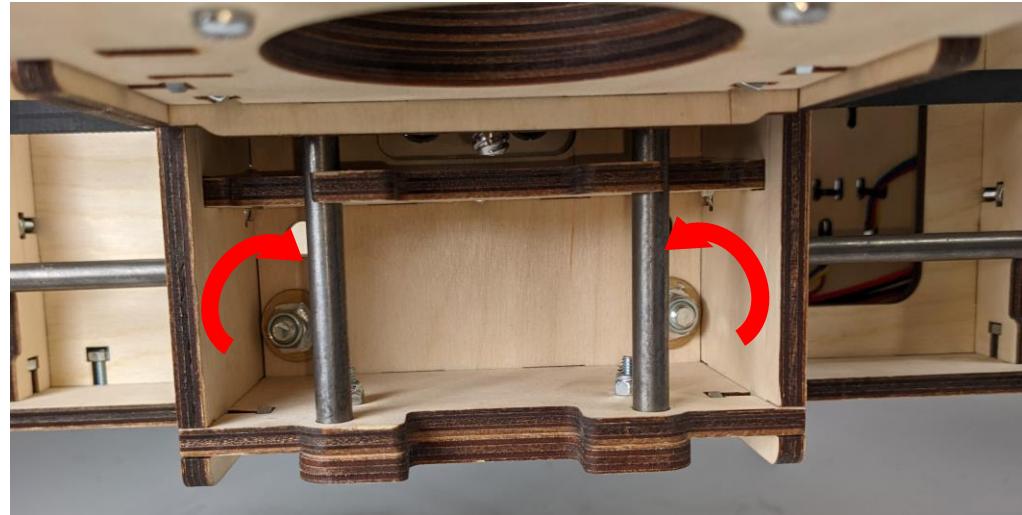
Step 1d Finish threading the Rail across the top of both of the lower SG20U Bearings on the X Carriage Assembly through the remaining Rail Supports and seat the Rail in the opposite Gantry Side Assembly.



Step 1e Secure the Upper and Lower Rail by attaching a X Rail Stop (GR6) at each end of the Gantry Assembly with two M4 X 20 Machine Screws(H98) and M4 Locknuts(H47) for each.

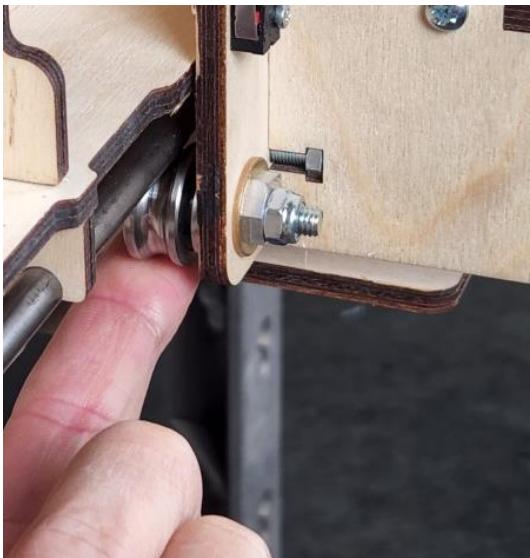


Step 1f Adjust the Eccentric Spacers until the SG20U Bearings are snug against the Rails.



Rotate Clockwise

Rotate Counter-Clockwise



The SG20U 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 X Carriage Assembly should move as you roll the Bearing. Make sure the X Carriage rides smoothly along the full length of the Rails. Adjust as required.

Installing the X Belt



There are four X Belt retainers (QR3) used for the GT2 9mm Belt Assembly.

Step 1 Attaching the GT2 9mm Belt.

Step 1a Prepare the Belt by cutting the GT2 9mm Belt(H83) **53 inches** long for the X axis.

- Step 1b** With the teeth of the GT2 Belt facing down, thread one end of the GT2 Belt through the rectangular slot in a Belt Retainer.



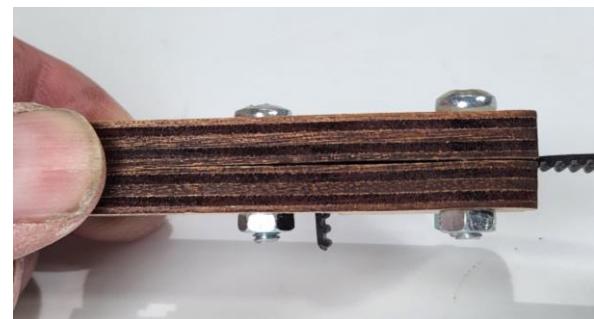
- Step 1c** Cover the Belt with the teeth still facing down with the second Belt Retainer.



Step 1d Sandwich the GT2 Belt between the two Belt Retainers and bolt them together with three M4 x 16 Machine Screws(H14) and Nuts(H15).



After installing the first Screw and Nut, it is possible to adjust the amount of GT2 belt installed through the bottom of the clamp by gently pulling the GT2 belt until only two or three of the teeth are visible. Then, insert the remaining two M4 x 16 Machine Screws and Nuts.



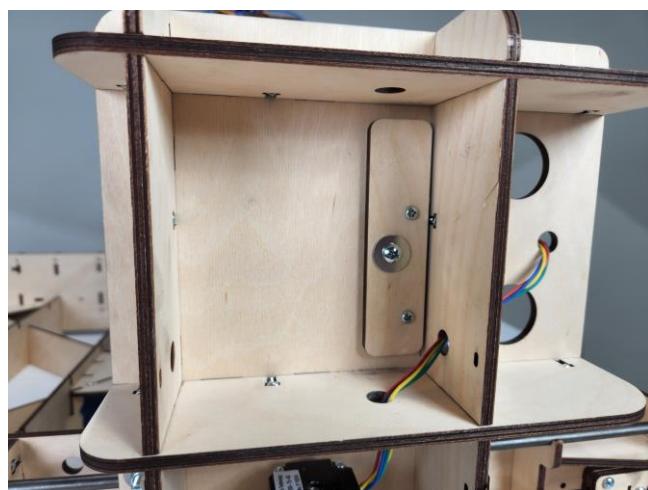
When properly installed and tight, there shouldn't be a visible gap between the two Belt Retainers.

Step 2e Stretch the Belt Assembly out and measure the distance between the two notched ends in the Belt Retainers. The distance should be 49.25 inches.



Step 3 Installing the X Axis GT2 Belt Assembly.

Step 3a Insert a M5 x 30 Machine Screw(H48) with Idler Fender Washer (H50), through the Rail Stop and thread a M5 Square Nut(H93) on the exposed threads. Repeat for other Gantry Side Assembly.



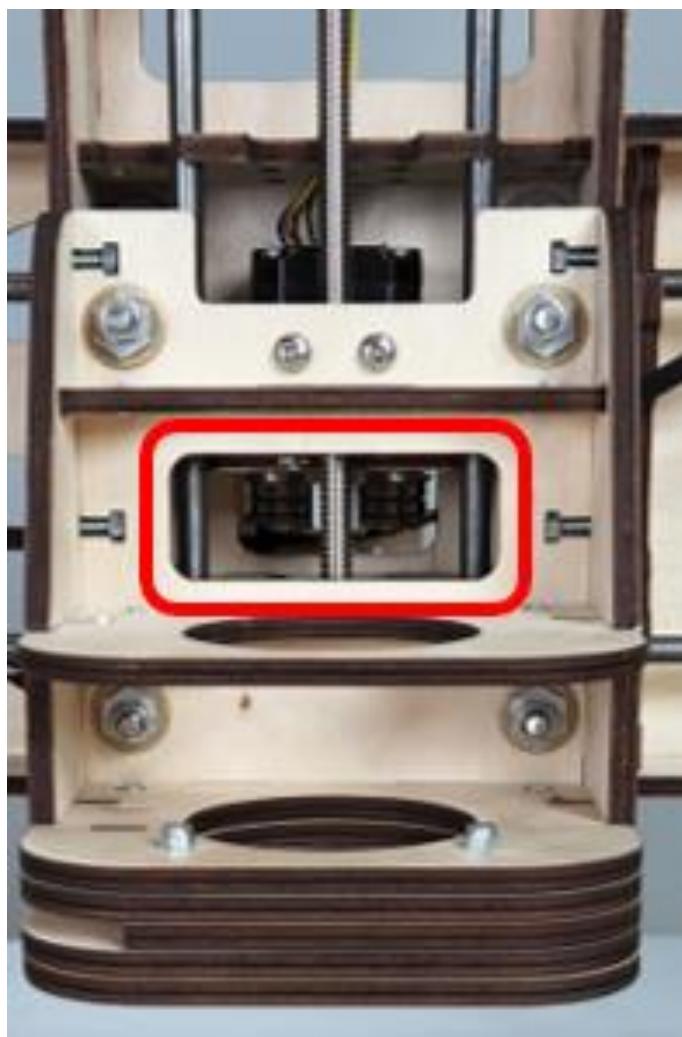
Step 3b Slip the Belt Retainer Assembly end over the exposed thread so that the Square Nut is seated in the cutout in the Belt Retainer Assembly. Be sure the smooth side of the GT2 Belt is visible with the teeth oriented toward the Gantry Assembly.



Step 3c Temporarily place the Belt Retainer Assembly through the large opening in the Gantry Assembly as shown.



Step 3d Slide the X Carriage Assembly past the Belt Retainer Assembly. Position the X Carriage Assembly so that it is immediately in front of one of the large openings in the Gantry Frame. Align the rectangular opening in the Z Frame Assembly with the opening in the Gantry Frame by manually turning the Helical Coupler at the top of the Y Carriage Assembly to lower the Z Frame Assembly.



Step 3e Position the GT2 Belt so that it runs across the two Idler Pulleys.

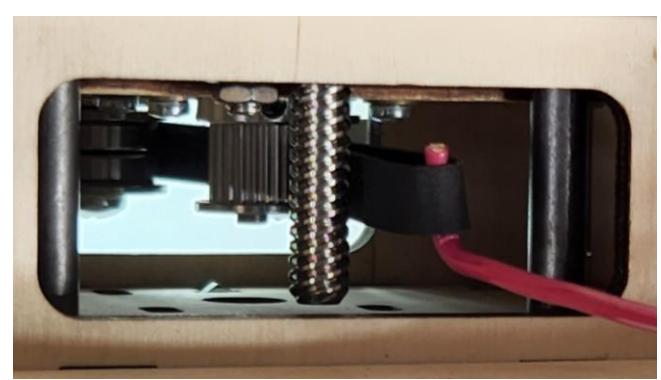
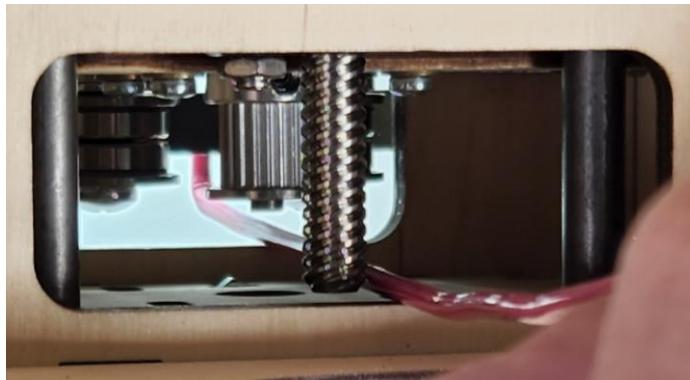


Back View

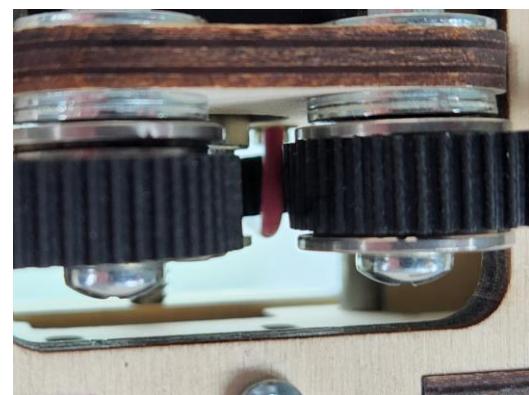


Front View

Step 3f 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 Frame Assembly and hook the wire over the GT2 Belt as shown. Pull the GT2 Belt between the Idler Bearings and create a loop while keeping tension on the GT2 Belt so it doesn't slip off the Idler Bearings.

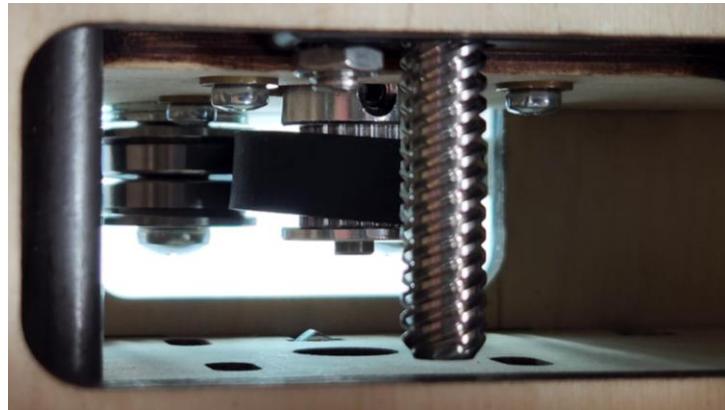


Front View



Back View

Step 3g Loop the GT2 Belt over the GT2 Pulley.
Hold the X Carriage Assembly in place
and pull the GT2 Belt snug.

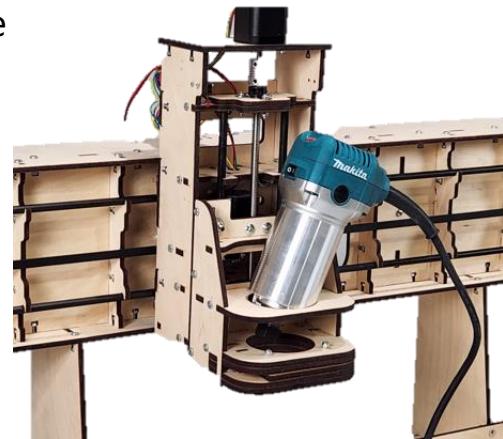


Step 3h Slip the Belt Retainer Assembly end over
the exposed thread so that the Square
Nut is seated in the cutout in the Belt
Retainer Assembly and tighten the GT2
Belt to remove any slack. **Do not over
tighten and stretch the belt.**



Installing the Router

- Step 1** Slip the Makita Router (R2) into the Router Mount.



- Step 2** Snug the Makita 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.



Installing the Drag Chain and Extending Stepper Motor and Home Switch Wires.



Home Switches are simple contact switches. They can create a transient voltage spike when opened or closed. Stepper Motors also generate electrical interference which can cause the Controller to act as if a Home Switch has been depressed. Most controller programs have a “switch debounce” routine that ignores these spikes and only validates a signal if it is held for a few milliseconds. The best way to minimize electrical interference is careful wire routing. Please follow the wire routing instructions in the manual.

Step 1 Extending the X and Z Axis

Stepper Motor Wires.

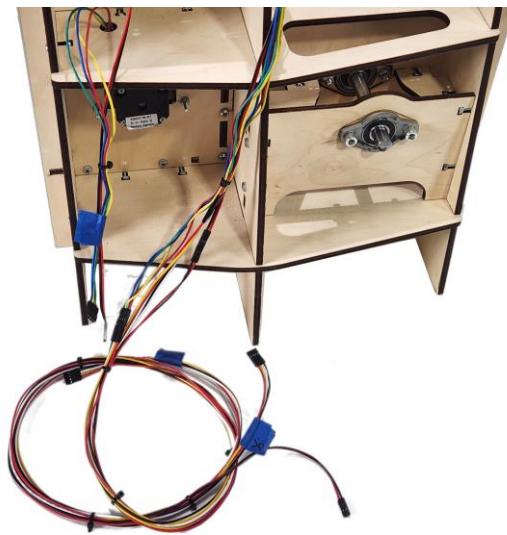
Step 1a Connect a Four Wire Extension(CB23) to the X and Z Axis Stepper Motor wires making sure the connections are Red to Red, Green to White, Yellow to Yellow, and Blue to Blue as shown.



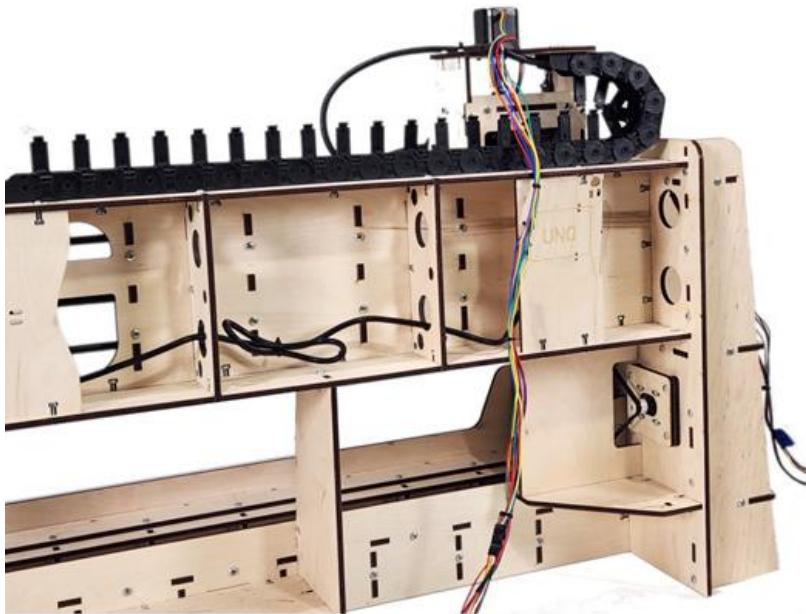
Step 1b Connect the Two-Wire Extension (CB23) to the Z Home Switch Wires, making sure the connections are Red to Red and Black to Black.



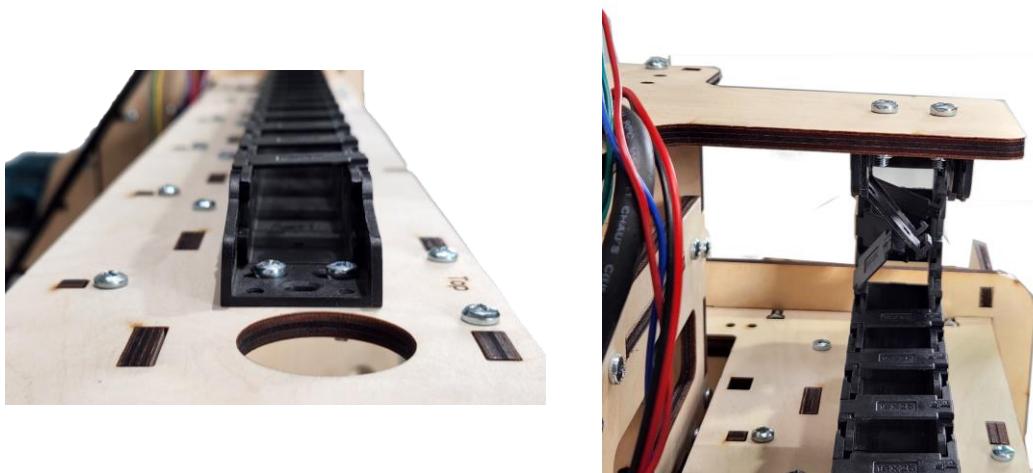
Step 2 Bundle the extended X and Z Axis Stepper Motor Wires and the Z Home Switch Wire together with Zip Ties every 6 inches. Do the same with the A Stepper Motor and Home Switch wires.



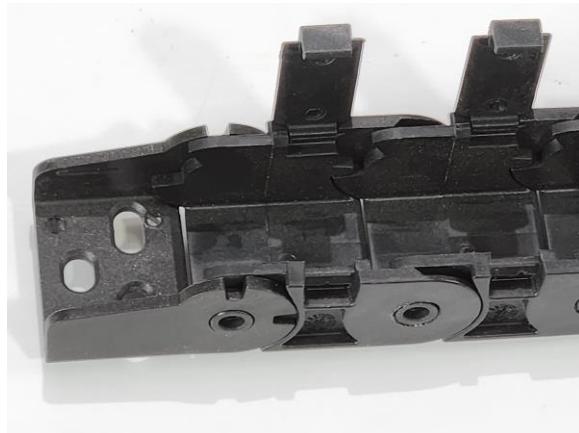
- Step 3** Facing the back of the Gantry, slide the X carriage to the right. Unroll the Drag Chain across the top of the Gantry.



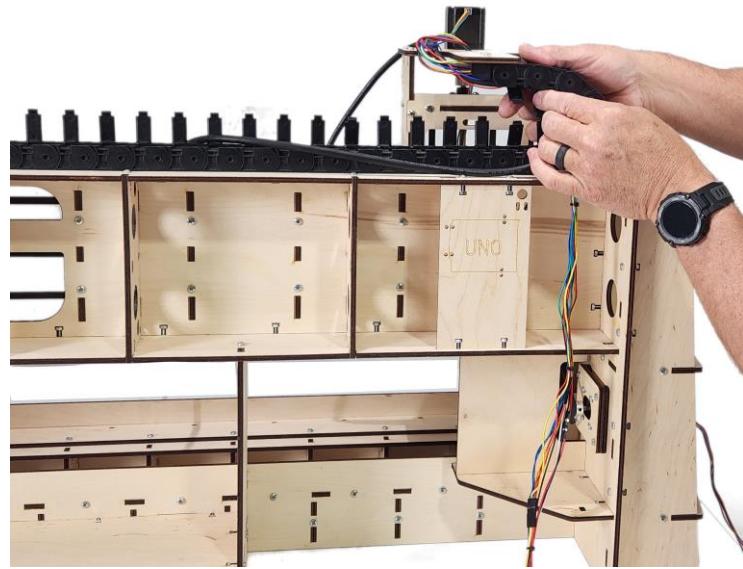
Attach one of the end links to the top of the Gantry using two M4 X 16(H14) Machine Screws and Lock Nuts(H47) as shown. Attach the other end to the underside of the Carriage Top Support using two M4 X 16 Machine Screws and Lock Nuts as shown.

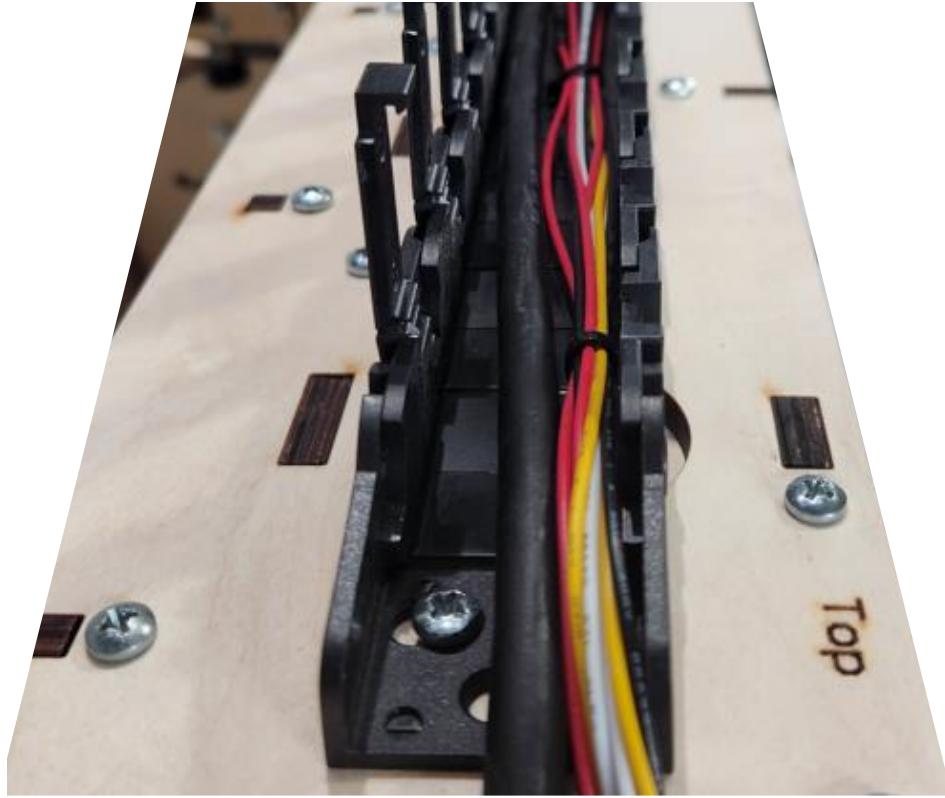


The links have hinged connectors that must be opened to install the wires.

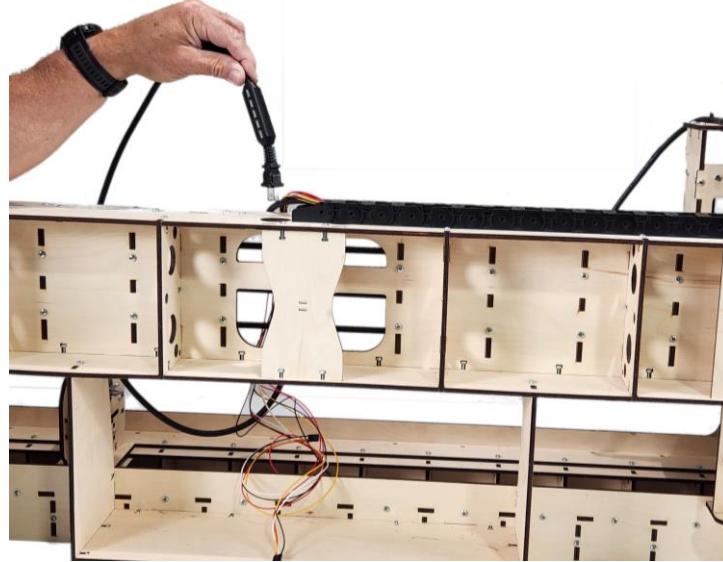


- Step 4** Open all the hinged connectors and route the Router Cord, the X and Z Stepper Motor Wires and Z Home Switch Wire around the loop and along the Drag Chain. Keep the Router Cord on one side of the Drag Chain and the other wires on the other side to minimize electrical interference.





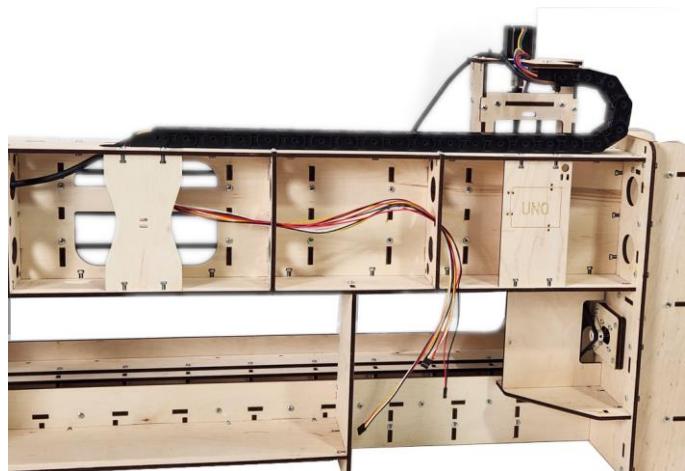
- Step 5** Take the Router Plug and thread it though the large hole next to the end of the Drag Chain.



Continue threading the Cord through the top holes in the Gantry Supports and out through the lower hold in the Gantry Side as shown.

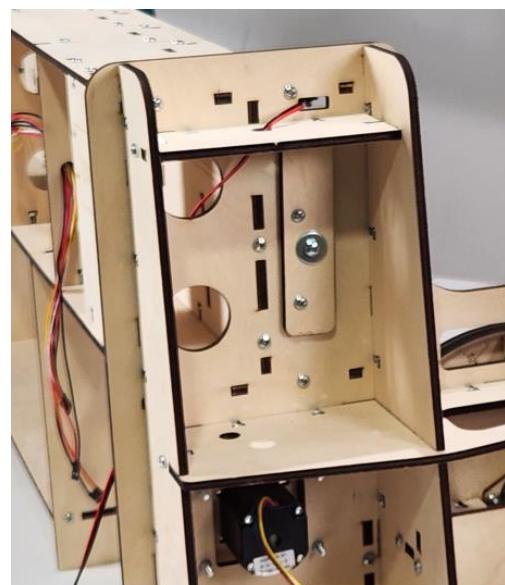
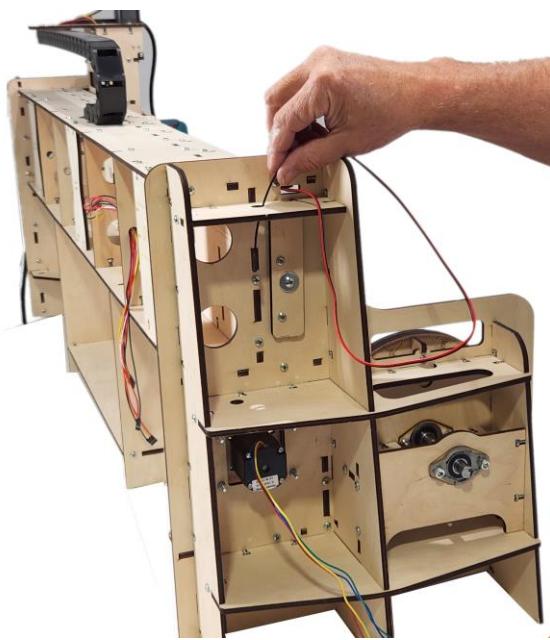
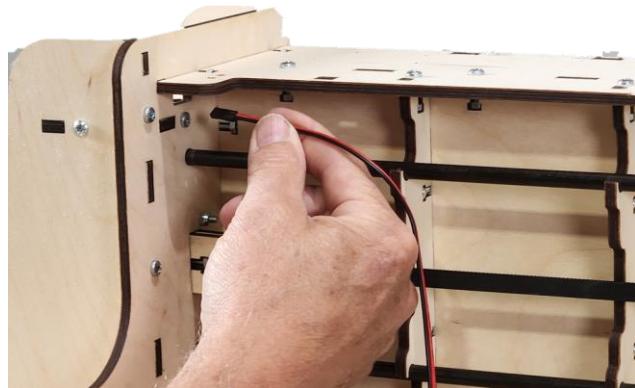


- Step 6** Take the bundled X and Z Stepper Motor wires and the Z Home Switch Wires and thread them though the large hole next to the end of the Drag Chain routing them toward the Controller then behind the Gantry Back Support, through small holes in both Back Braces as shown below.



Step 7 Attach the X Home Switch by threading its connector through the rectangular hole in the Left Gantry Side. Continue

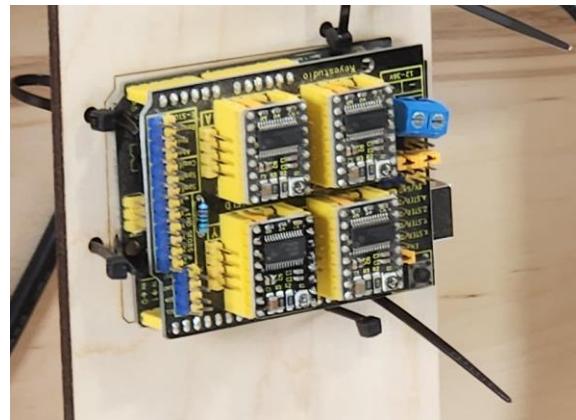
threading the wires through the small hole in the Gantry Top Brace and the large upper hole in the Gantry side to the Controller.



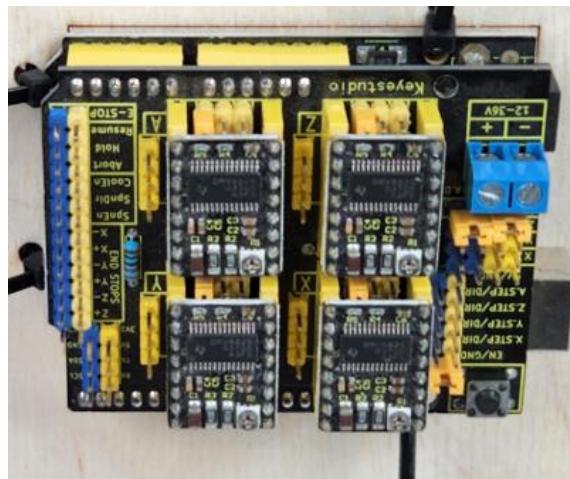
Attaching the Controller

Step 1 Attach the Controller (CB16) to the Controller Support.

Step 1a Use four small Zip Ties to attach the Controller (CB16) to the Controller Support, as shown.



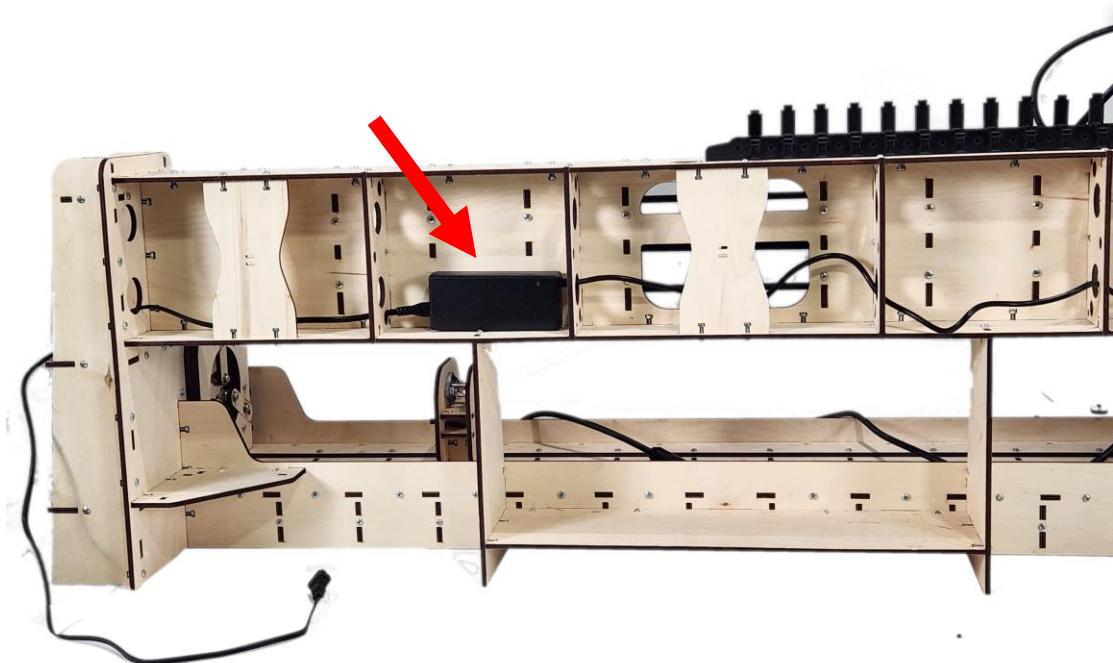
Step 1b Gently tighten the Small Zip Ties and then carefully trim the ends with scissors.



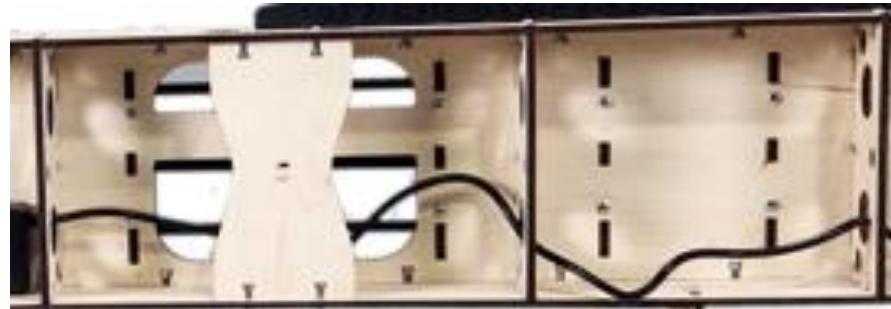
Installing the Power Supply



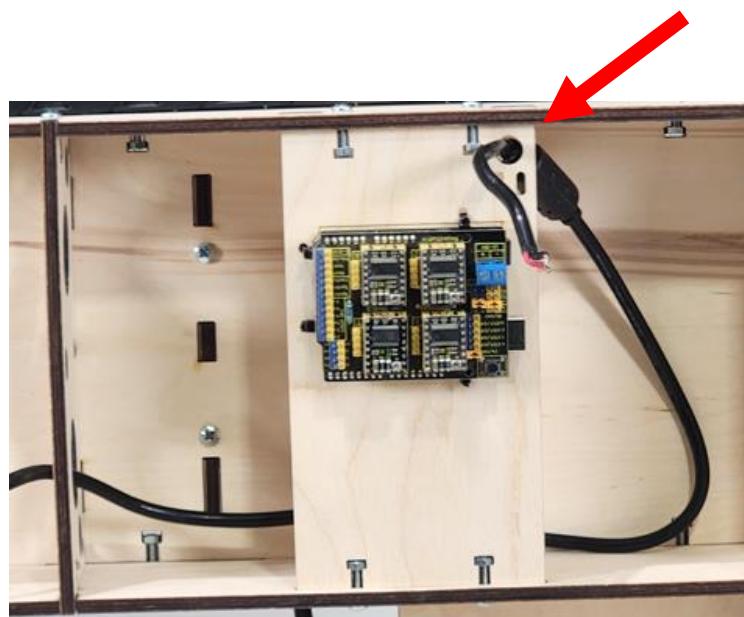
- Step 1** Place the Power Supply (CB12) in the second bay from the left as shown. Thread the plug end behind the Gantry Back Support and through the large hole in the Gantry Back Brace as shown.



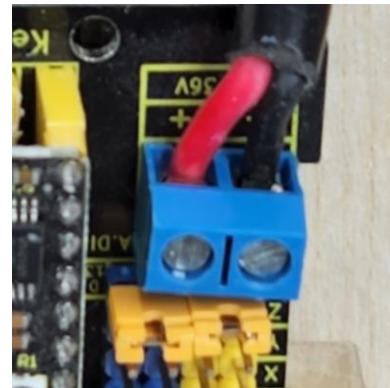
Step 2 Thread the Power Supply cord behind the Gantry Back Support and through the large hole in the Gantry Back Brace and behind the Controller Support.



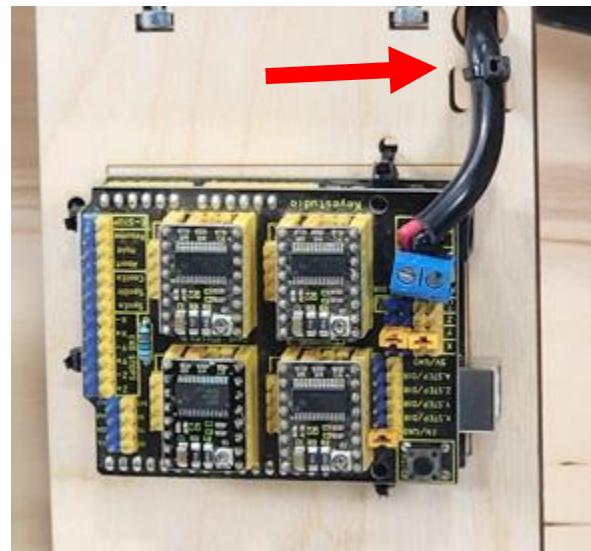
Step 3 Thread the exposed Power cord end through the hole in the upper left corner of the Controller Support.



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.

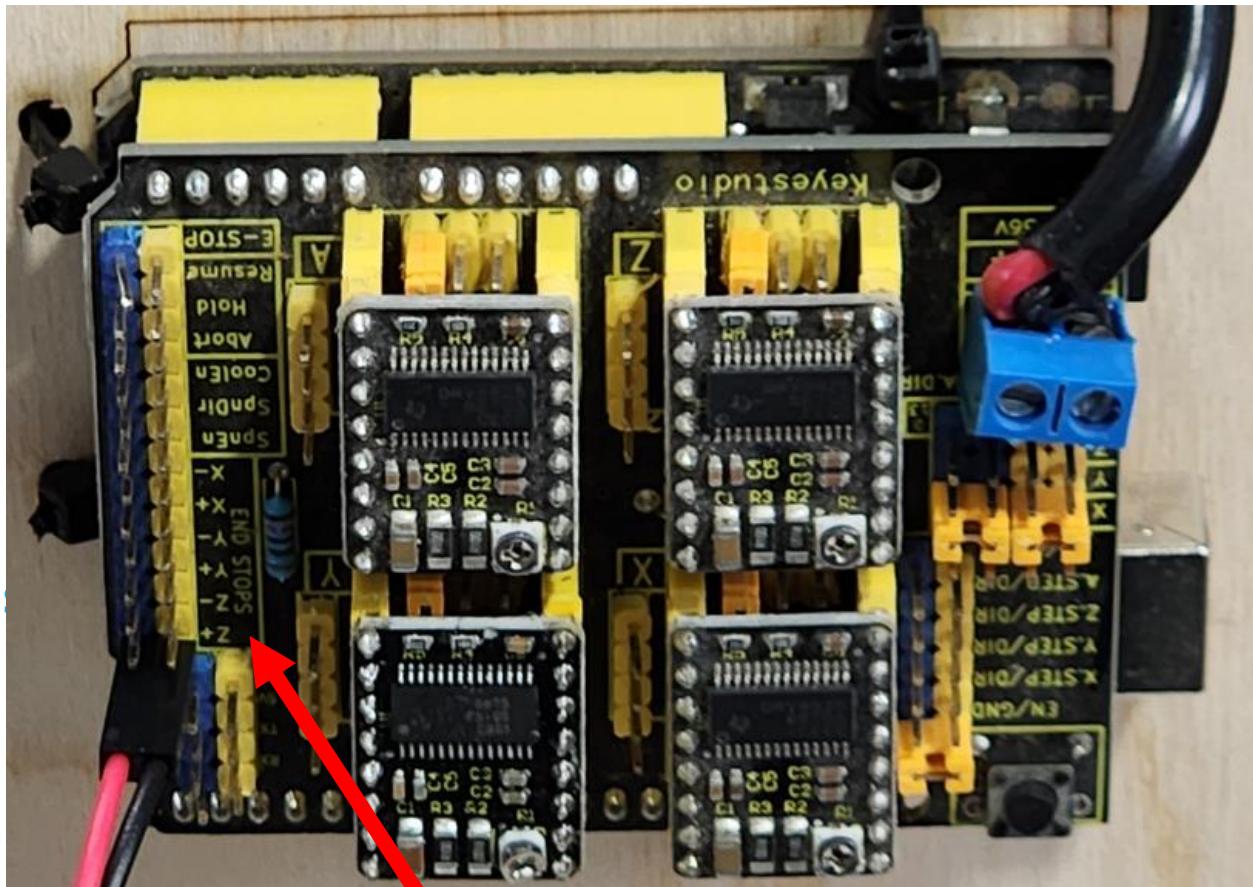


Step 4 Secure the Power cord wire to the Controller Support with a small Zip Tie.

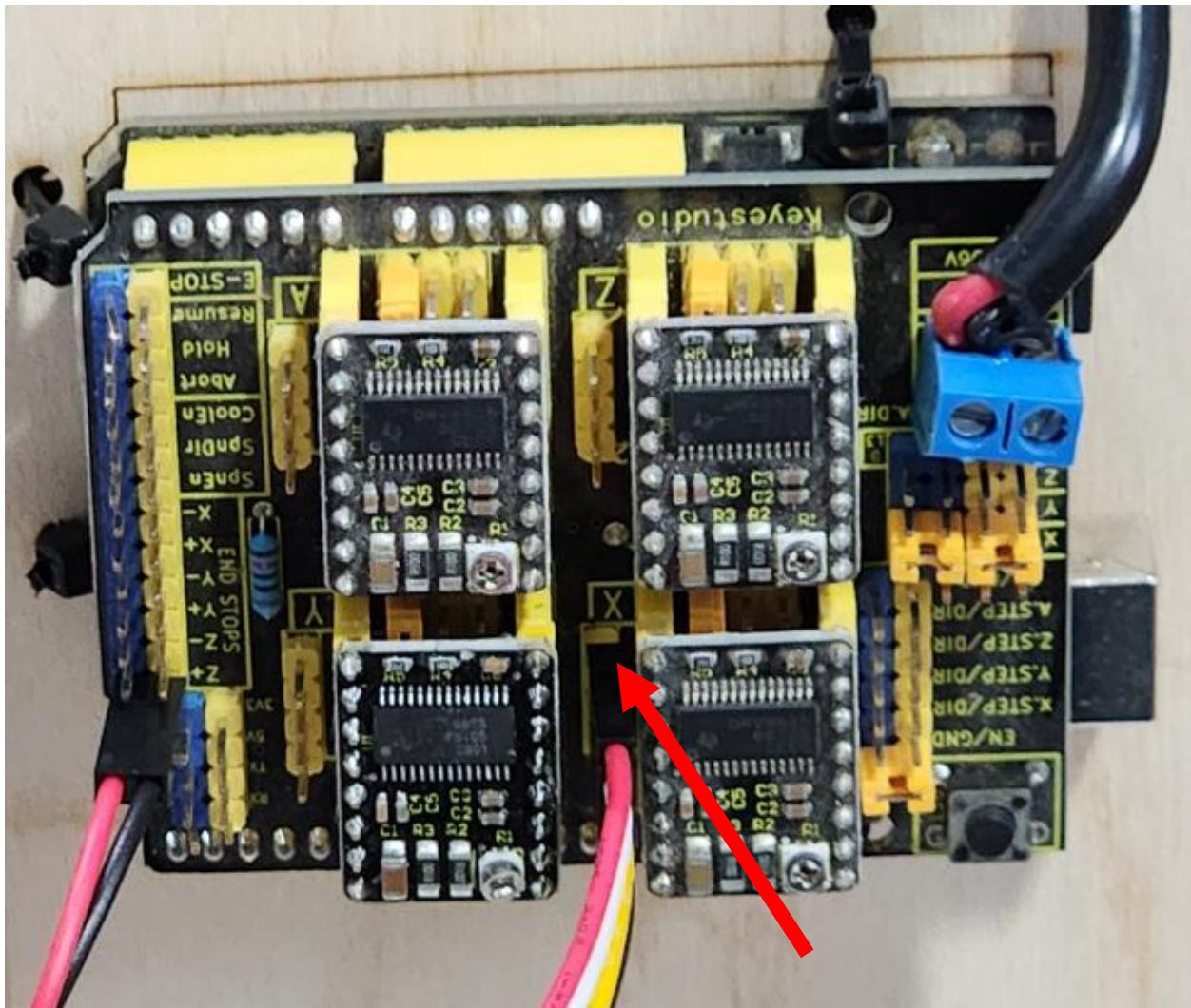


Wiring the Controller

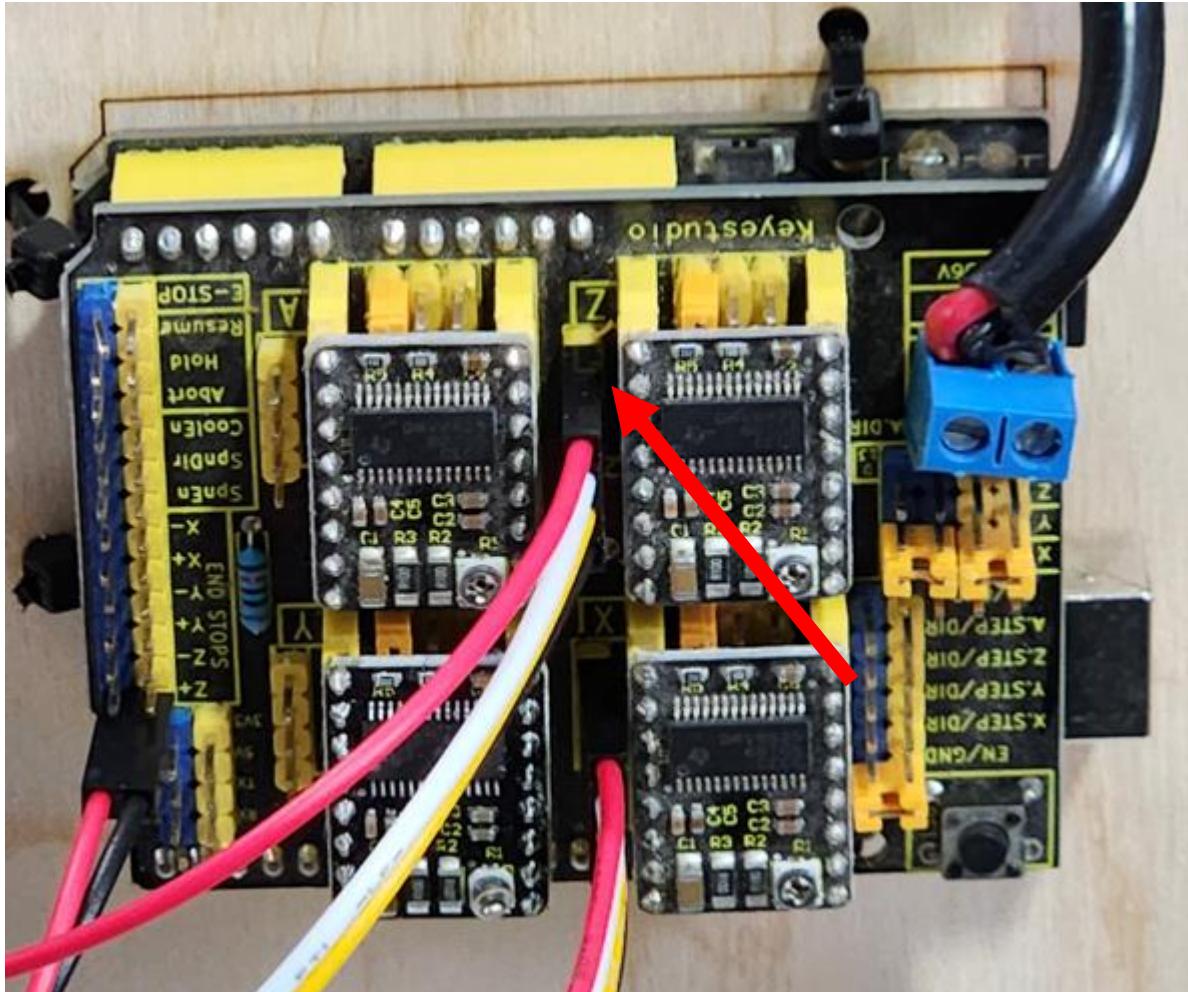
Step 1 Connect the Z Home Switch wire to the "Z+" Pins on the Controller. **NOTE: Polarity doesn't matter.**



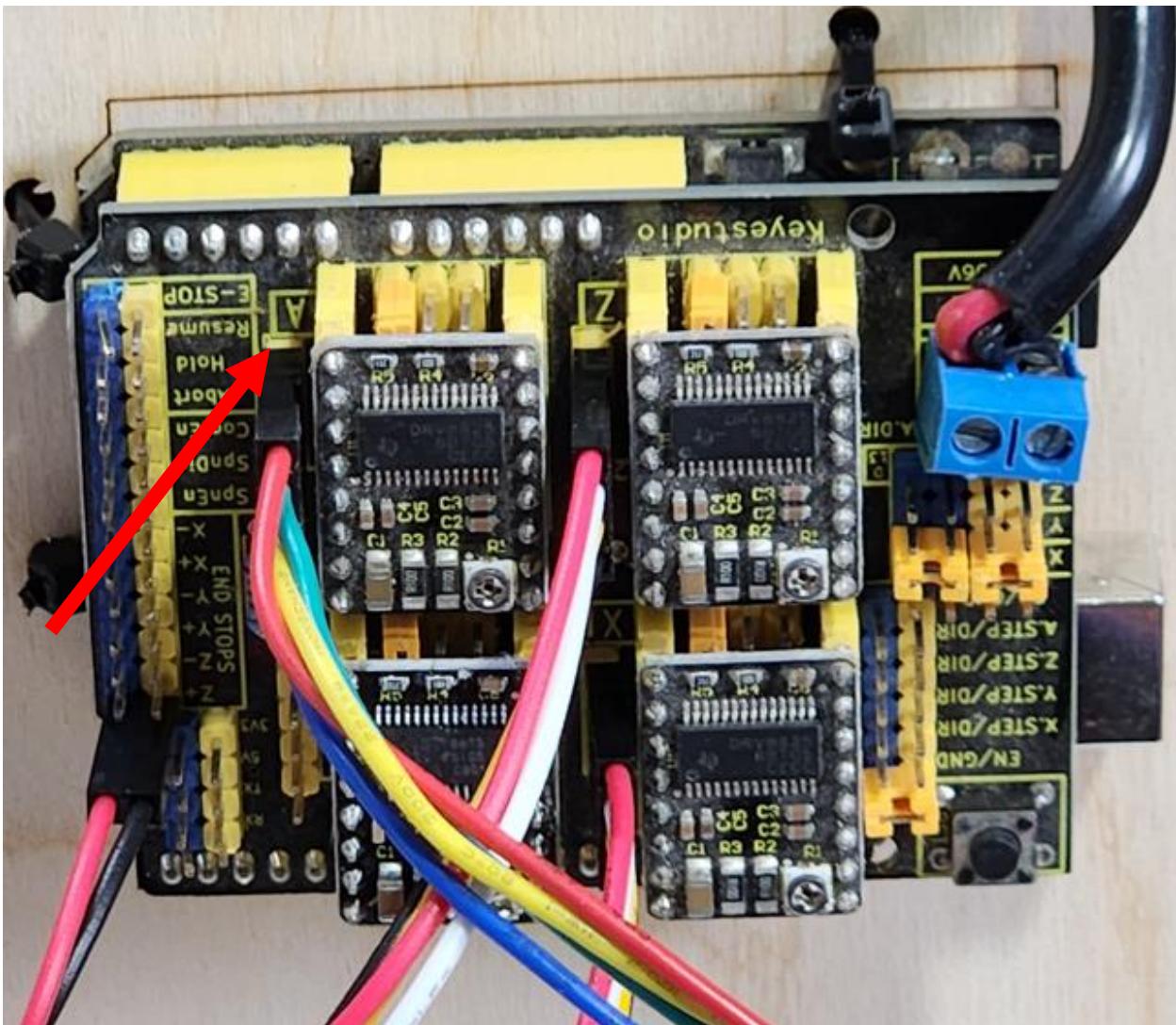
Step 2 Connect the X Stepper Motor Wires to the X Driver on the Controller. Make sure the red wire is on the top.



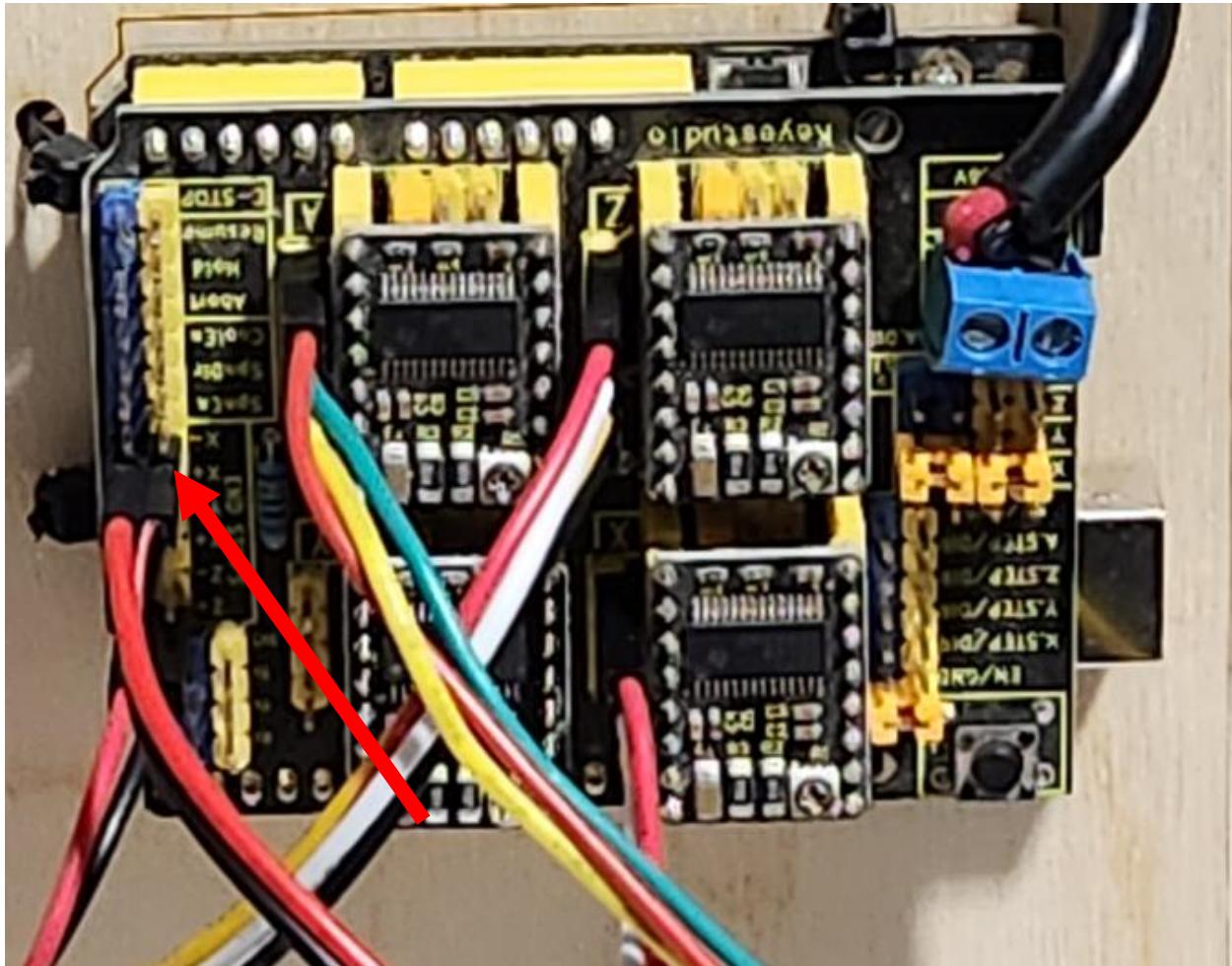
Step 3 Connect the Z Stepper Motor Wires to the X Driver on the Controller. Make sure the red wire is on the top.



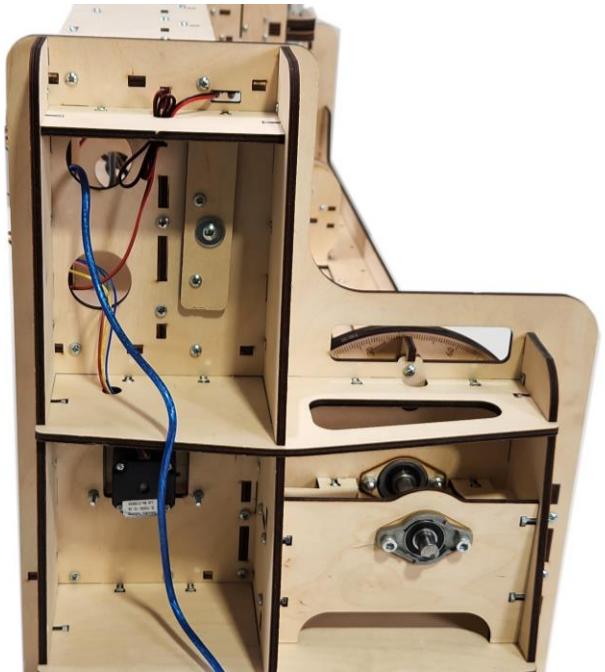
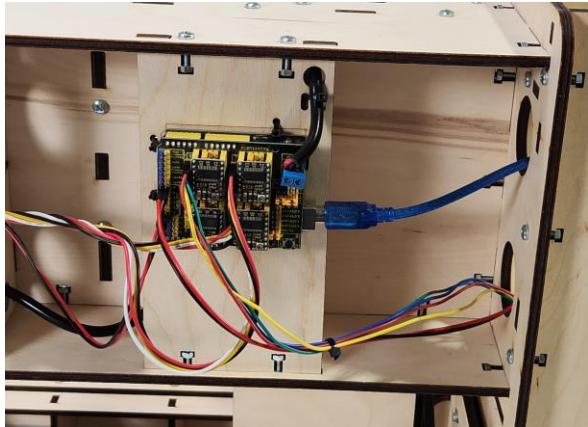
Step 4 Connect the A Stepper Motor Wires to the A Driver on the Controller. Make sure the red wire is on the top.



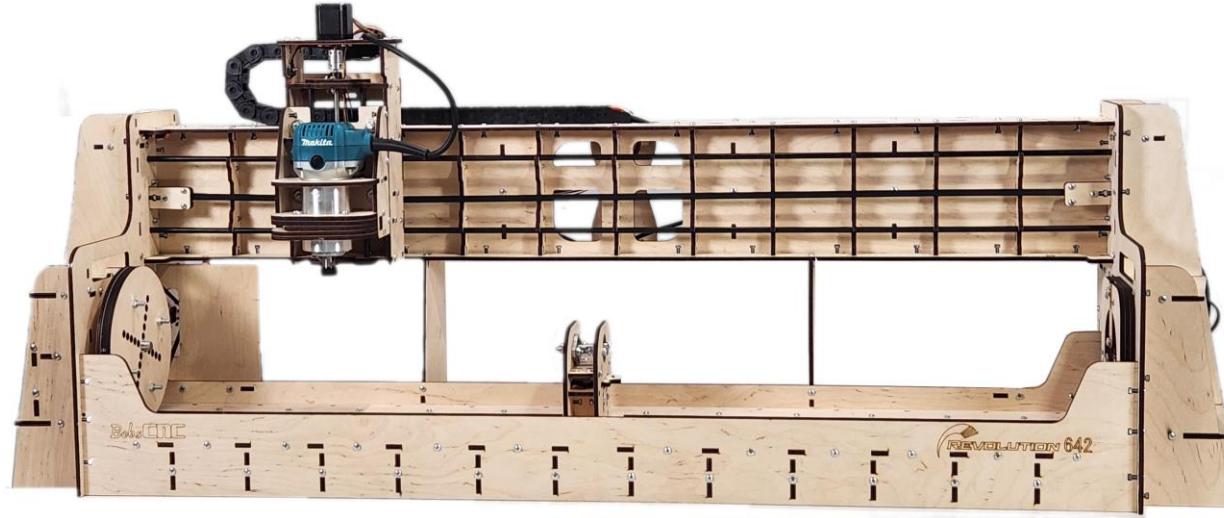
Step 5 Connect the X Home Switch Wires to the X- Pins on the Controller.



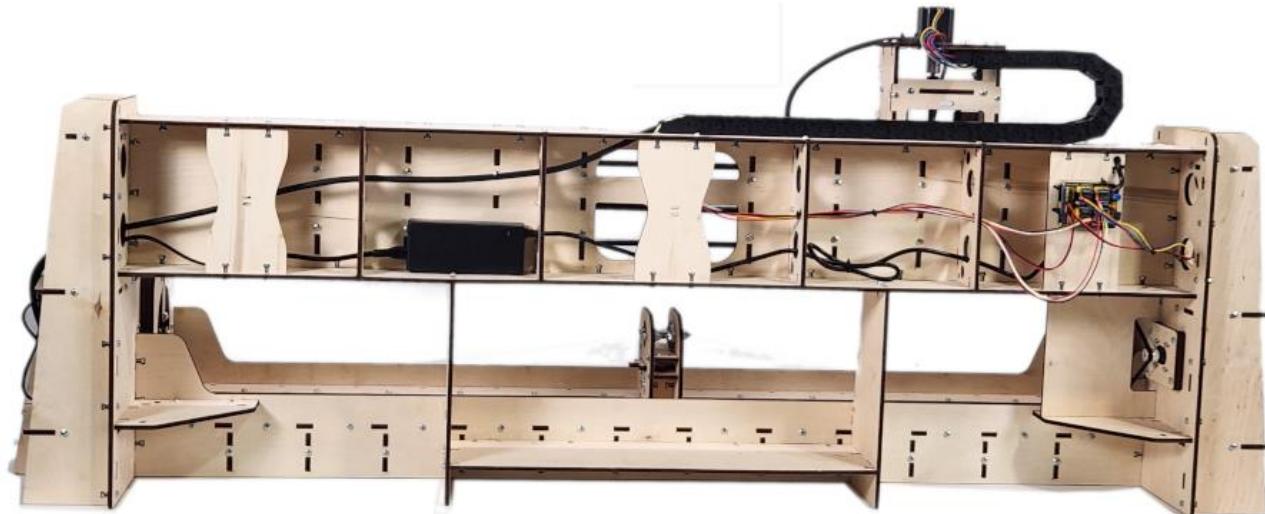
- Step 5** Connect the USB cord to the controller. Thread the cord through the hole at the top of the Gantry Side.



Completed Views



Front View



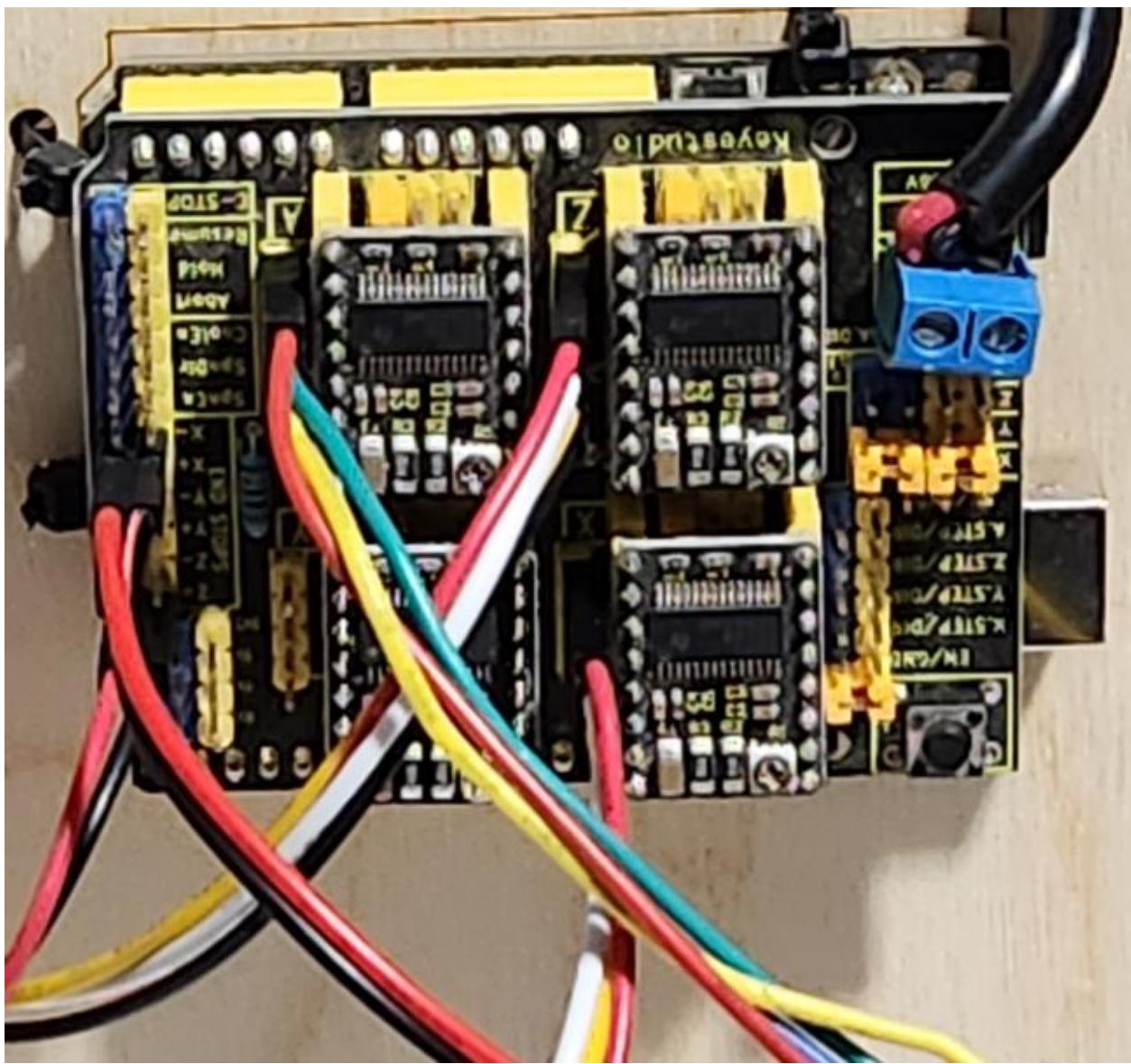
Back View



Left Side



Right Side

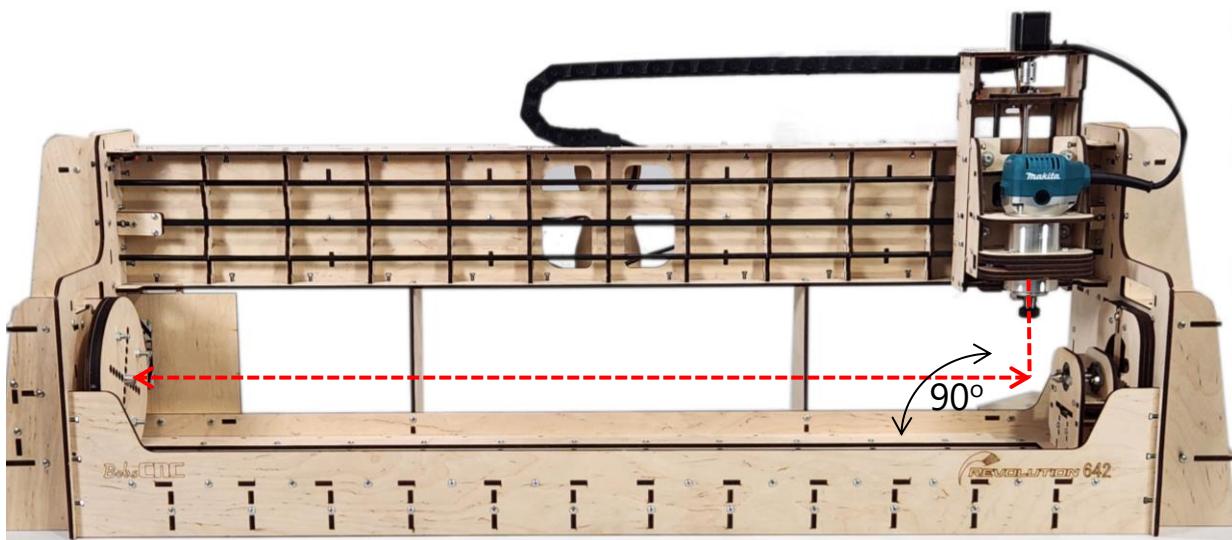


Controller Wiring

Tramming

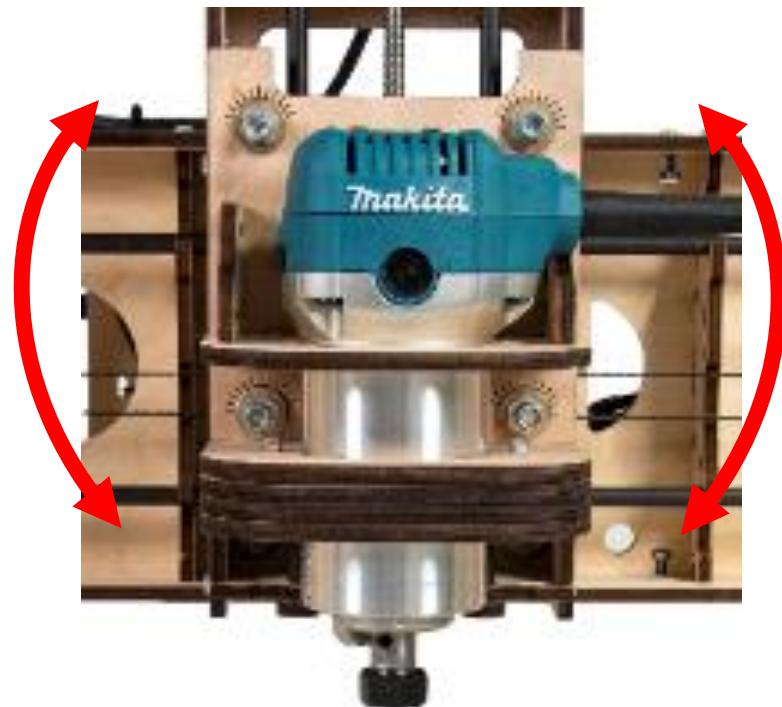
Tramming is the process of adjusting the CNC Spindle (Router) so that it is perpendicular to the material being cut. The goal with a rotating axis is to ensure that the Router bit is perpendicular to the horizontal line that extends from the center of the Live Center though the center of the Chuck as illustrated below.

If the Spindle is not perpendicular, the Revolution can be trammed on the X Axis by adjusting the four Eccentric Adjustment Spacers on the Z Carriage.

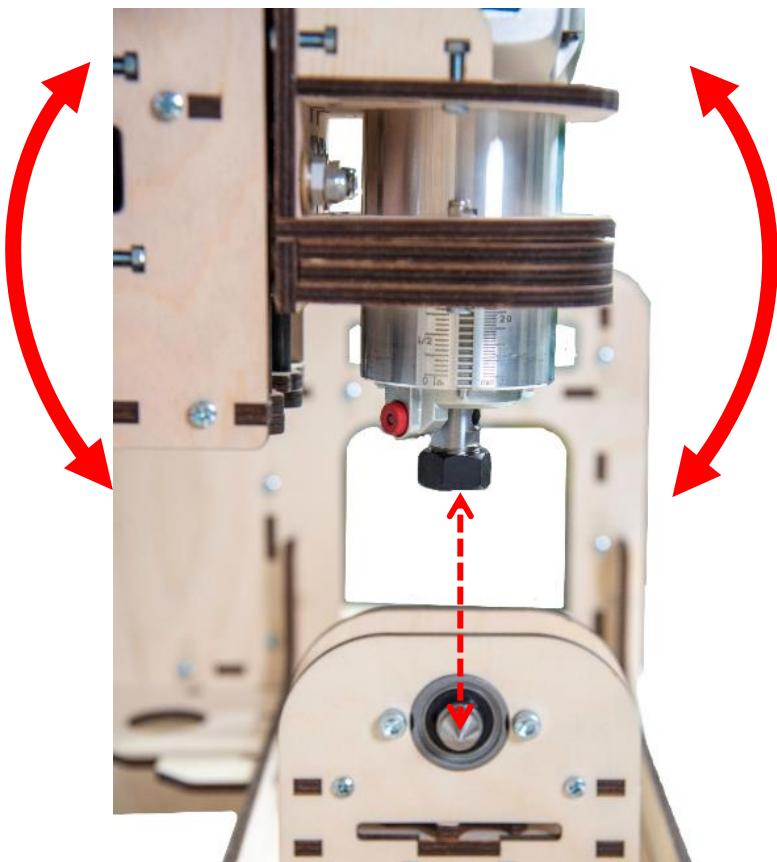


Eccentric Spacers on the left side should be rotated clockwise so that the SG20U is snug up against the Rail.

Eccentric Spacers on the right side should be rotated counterclockwise so that the SG20U is snug up against the Rail.



The Spindle (Router) can be trammed on the A Axis by placing shims behind the SG20U Bearing Fender Washer on the X carriage. Placing the shim on the top will tilt the axis clockwise. Placing the shim on the bottom will tilt the axis counterclockwise. **NOTE: Shims must be placed on the X-axis Assembly.**

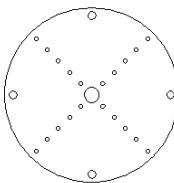


The center of the router bit must be aligned vertically to the point on the Live Center.

The shim placement is always on the top or bottom sets of the X Carriage and placed in between the SG20U and Bearing Fender Washer.

Machine Set-Up

Wood Components (Included with Kit)

Part #	Description	Qty	Photo
L4	Chuck Face Plate	5	
ZG1	Z Gauge	3	



To mount a stock, first find and mark the center point of both ends by marking diagonal lines from corner to corner.

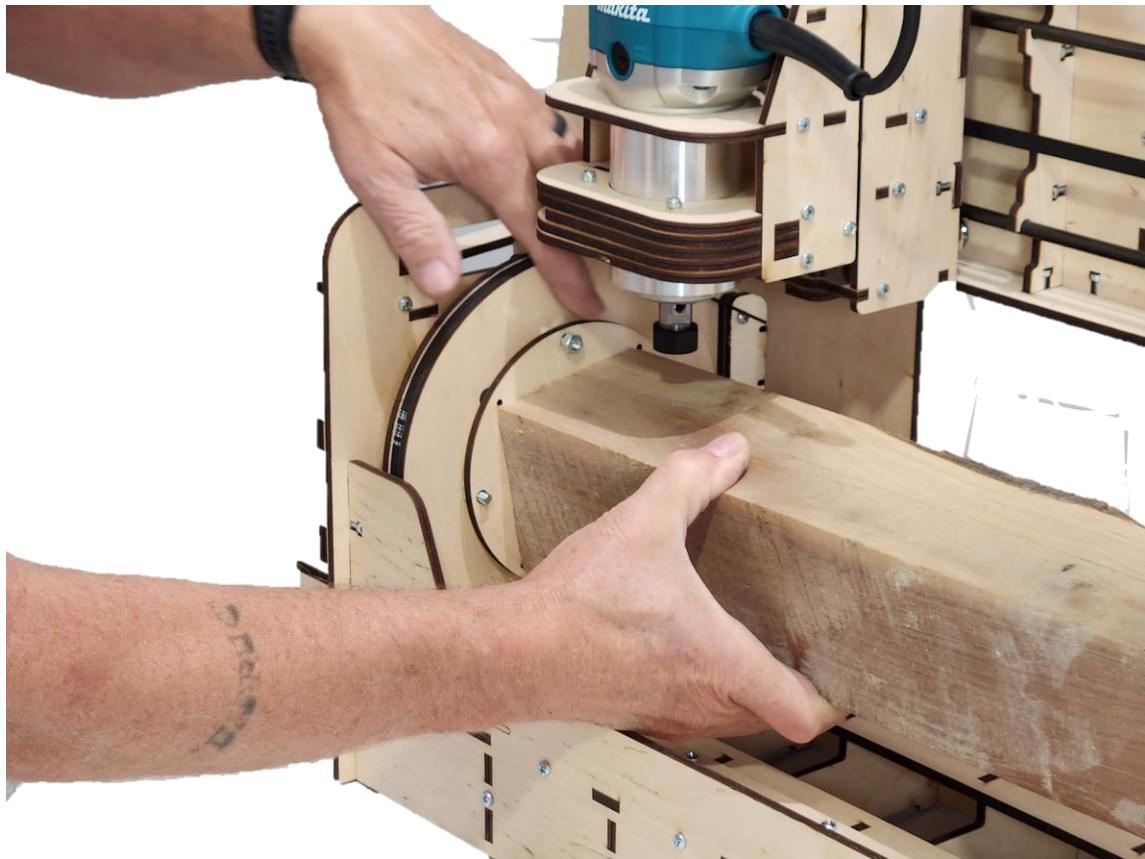


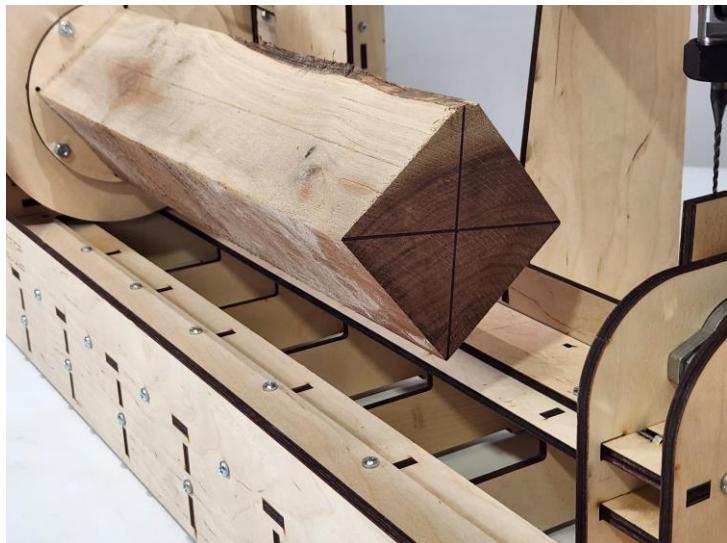
Align the center hole of the Chuck Face Plate (L4) over the center marked on the stock.

Secure the Face Plate to the stock using four wood screws.



Align the four holes in the Mounting Plate with the four threaded studs on the Chuck and secure with four M6 nuts and tighten.

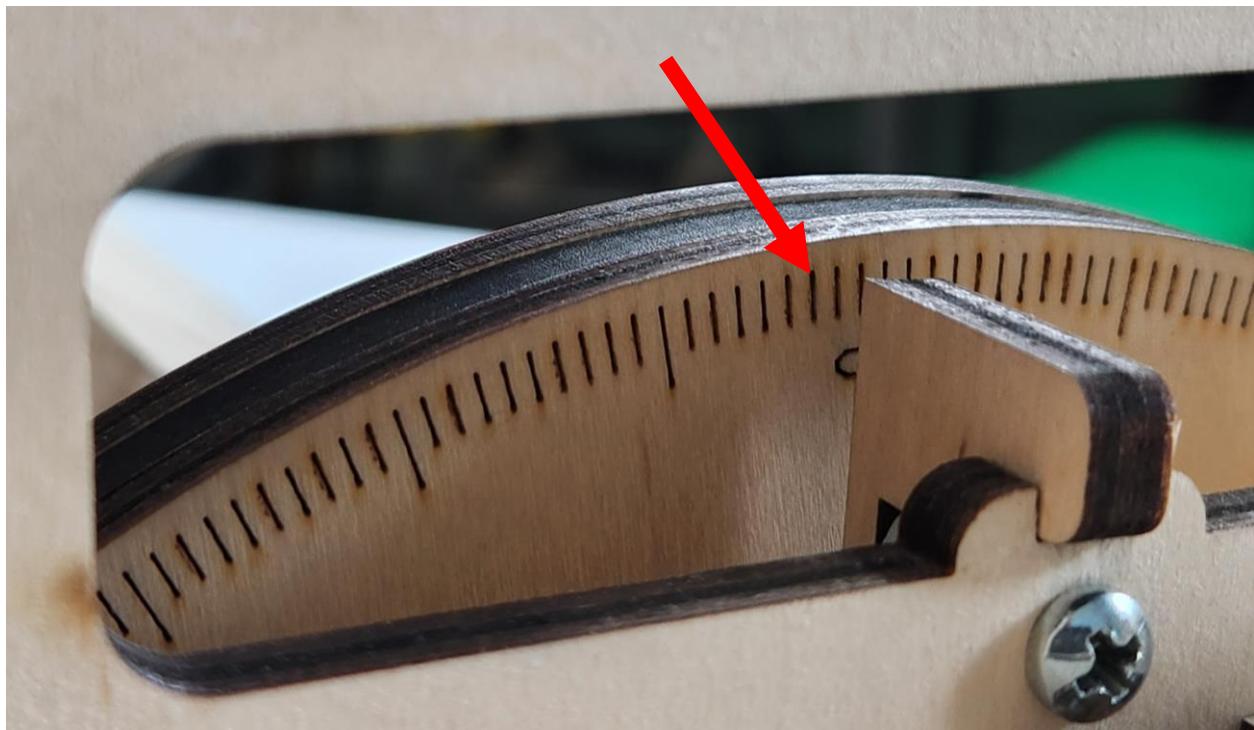




After the workpiece is mounted, align the point of the Live Center to the center point of the stock. Push the point of the Live Center into the end of the stock and tighten the Stock Tensioner to hold the Tail Stock in place.



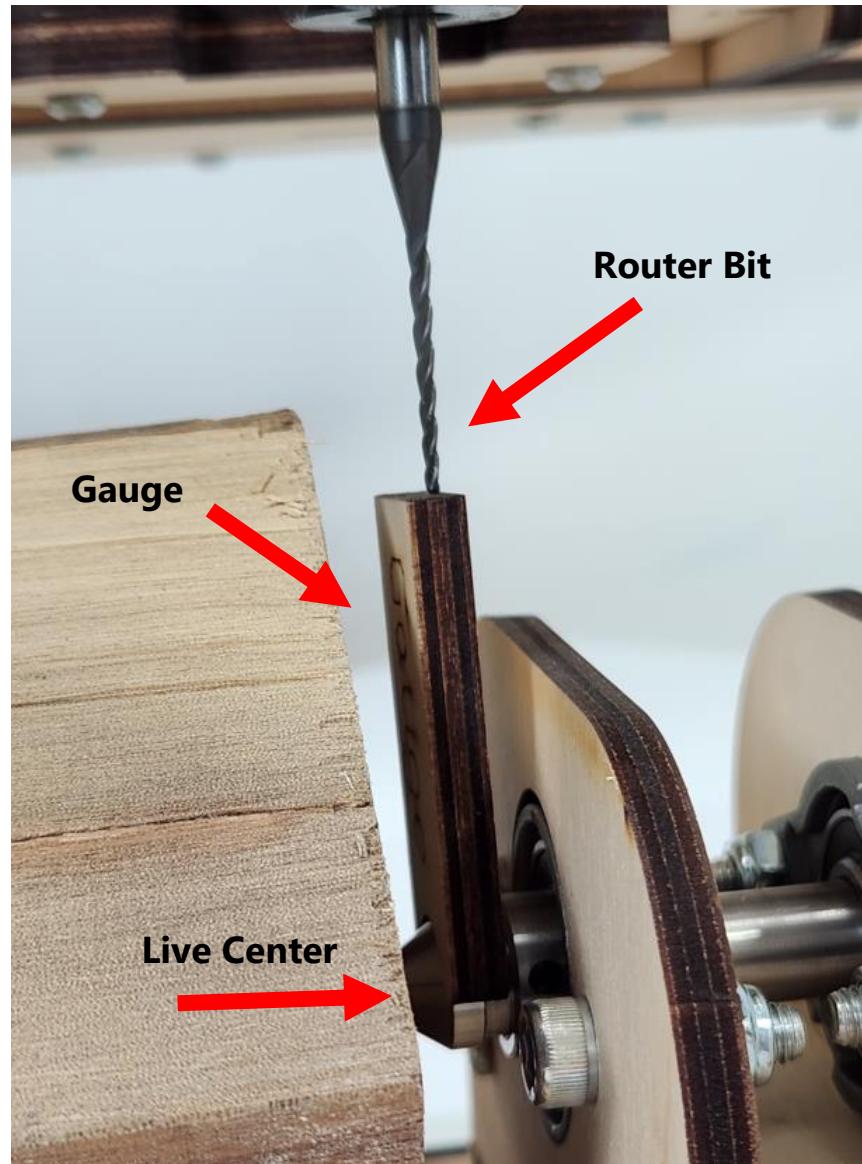
Rotate the Stock until the 0-mark on the Chuck Plate lines up with the Dial Indicator as shown. Then set the A Axis to zero.



Note: The A-axis does not have a Home Switch and is set for reference only. Setting this axis zero point will allow you to return to a known A-axis position.

G54	mm	inch
setzero X	WORK X	0.000in
setzero Z	WORK Z	2.000in
setzero A	WORK A	0.00°
setzero All	gotozero All	

Set the Z-Zero using Z Gauge. After the Tail Stock has been locked in place, slide the Gauge between the Bit and the Live Center so that the radius rests on the outer surface of the Live Center, as shown.



Slowly lower the Router Bit until it touches the top of the Gauge. This is the Z- Zero location, however the zero is offset. Set the DRO in the Sender to 50.8 mm or 2.0 inches by typing the number into the Z DRO textbox and pressing the **shift + enter** keys.



Next, move the X axis to the zero point of the Gcode file and zero the X axis



Using the Pass-Thru. The Pass-Thru lets us machine round stock that is longer than 42 inches. Depending on the diameter of the stock, use either the small, medium or large arms to support the material. Make sure all three arms are of the same length and are on the same alignment mark.



Congratulations!

You Have Completed the Assembly of Your Revolution.

Please review our Software Setup Guide for Software installation and setup and our Getting Started guide to help with your first project.

[Revolution 642 Manuals and Documentation –
BobsCNC](#)

Appendix

Revolution 642 Washer Dimensions

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
H61	Hardened Washer	0.260	0.577	0.051	0.080
H66	1/4 Shim Washer	0.256	0.500	0.028	0.035
H88	M3 Washer	0.125	0.276	0.017	0.021

Revolution 642 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	1	(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	1	(homing dir invert mask:00000001)

\$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	144	(a, step/mm)
\$102	400	(z, step/mm)
\$110	10000	(x max rate, mm/min)
\$111	10000	(a max rate, mm/min)
\$112	2000	(z max rate, mm/min)
\$120	500	(X-axis acceleration, mm/sec^2)
\$121	500	(A-axis acceleration, mm/sec^2)
\$122	500	(Z-axis acceleration, mm/sec^2)
\$130	1067	(X-axis maximum travel, millimeters)
\$131	3600	(A-axis maximum travel, millimeters)
\$132	98	(Z-axis maximum travel, millimeters)