

REVOLUTION

Rotating Axis CNC Router

Assembly Manual

Rev. 2.6

Welcome to the Family!

We're excited that you purchased the Revolution 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 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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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.

Longworth Self Centering Chuck

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: 43.8" (1113 mm)

Width: 13.2" (335 mm)

Height: 24.0" (610 mm)

Assembled Weight: 30 lbs.

Cutting Area:

X: 24" (610 mm)

Z: 3.3" (85 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 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:

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 need 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.

All Screws (unless noted) should be installed snug, then rotated 1-2 1/2 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 Nuts in place during assembly. A telescoping magnetic pickup tool can also be a handy way of placing and holding small Nuts during assembly.

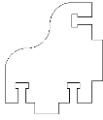
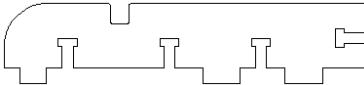
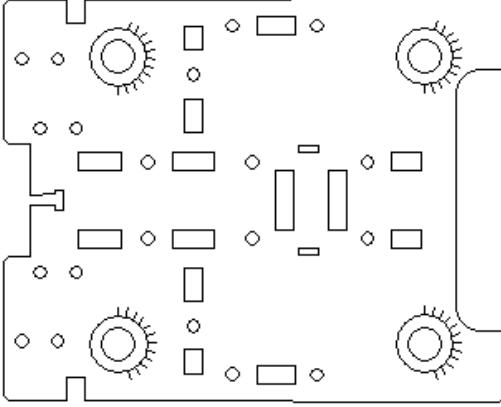
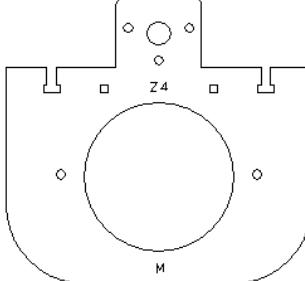
Lock Nuts are never used to secure components that have T-Slots. They are only used to mount components where the Nut is not held in a T-Slot.

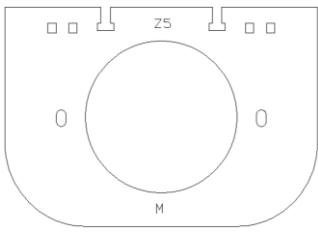
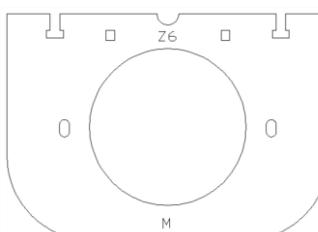
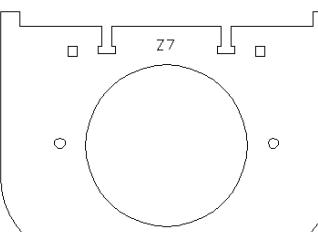
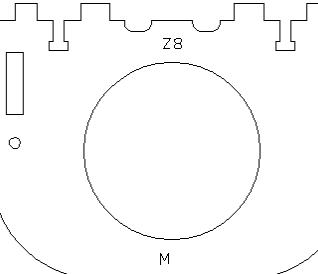


CAUTION This kit contains numerous small components that pose a choking risk for small children and pets. Keep kit pieces in a secure location out of the reach of small children and pets.

Z Spindle Mount Assembly:

Required Wood Components

Z1	Z Frame Mount Support	2	
Z2	Z Frame Support	2	
Z3	Z Frame	1	
Z4	Z Spindle Bottom Mount	1	

Z5	Z Spindle Interlock Bottom	1	
Z6	Z Spindle Interlock Top	1	
Z7	Z Spindle Top Mount	1	
Z8	Z Spindle Support	1	

Required Hardware

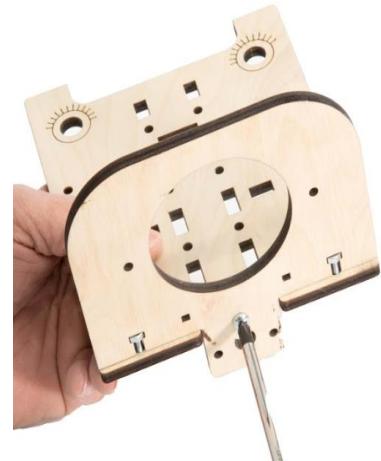
Part #	Description	Qty	Photo
ZD2	Acme Block Nut	1	
H31	8" Zip Tie	1	
H39	M6 x 30 Machine Screws	4	
H18	M6 Locknuts	4	
H40	Eccentric Spacer	4	
H41	Eccentric Washer	4	
H42	Bearing Fender Washer	4	
H44	SG20U Bearings	4	
H38	M4 x 30 Machine Screws	2	
H14	M4 x 16 Screws	25	
H15	M4 Nuts	25	
H47	M4 Lock Nuts	2	

Illustrated Step by Step Instructions

The Z Carriage Assembly holds the Router securely in a carriage that travels up and down the Z-axis on a set of Rails. These first steps will show you how to build the Spindle (Router) Mount.

NOTE: The Z Frame has alignment marks that are used to snug the SG20U Bearings to the Rails and later to tram the Router. When assembling the Z Carriage, it is important that the adjustment marks face toward the Spindle Mount as shown in the following photos.

- Step 1** Attach Spindle Bottom Mount (Z4) to the Z Frame (Z3) with three M4 x 16 Machine Screws and Nuts as shown.



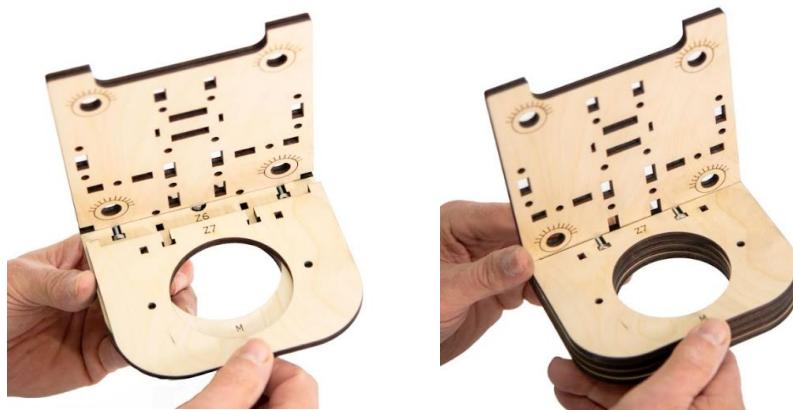
Step 2 Loosely attach Spindle Interlock Bottom (Z5) to the Z Frame Assembly with two M4 x 16 Machine Screws and Nuts as shown. Do not tighten the Machine Screws and Nuts or use LOCTITE. They will be tightened in a later step after the Router has been mounted.



Step 3 Loosely attach the Spindle Interlock Top (Z6) to the Z Frame Assembly with two M4 x 16 Machine Screws and Nuts as shown. Do not tighten the Machine Screws and Nuts or use LOCTITE. They will be tightened in a later step after the Router has been mounted.



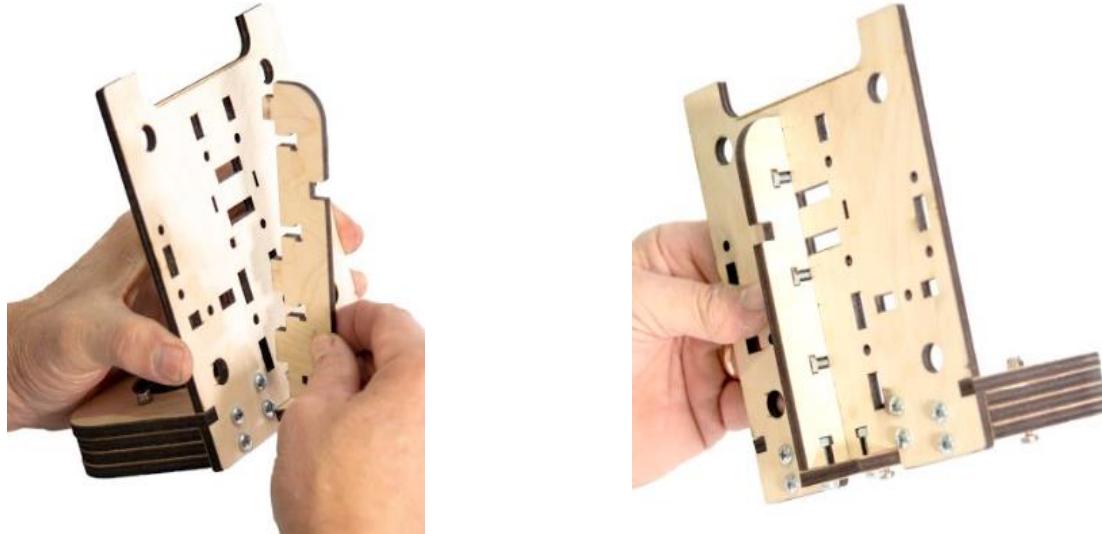
Step 4 Attach Spindle Top (Z7) to the Z Frame Assembly with two M4 x 16 Machine Screws and Nuts as shown. Do not tighten the Machine Screws and Nuts at this stage. They will be tightened in a later step after the Router has been mounted. The Interlock Bottom and Top must be able to move slightly from front to back, this allowance will make installing the Router easier. You only need to make sure that the machine Screws and Nuts are engaged to keep the Screws from falling out.



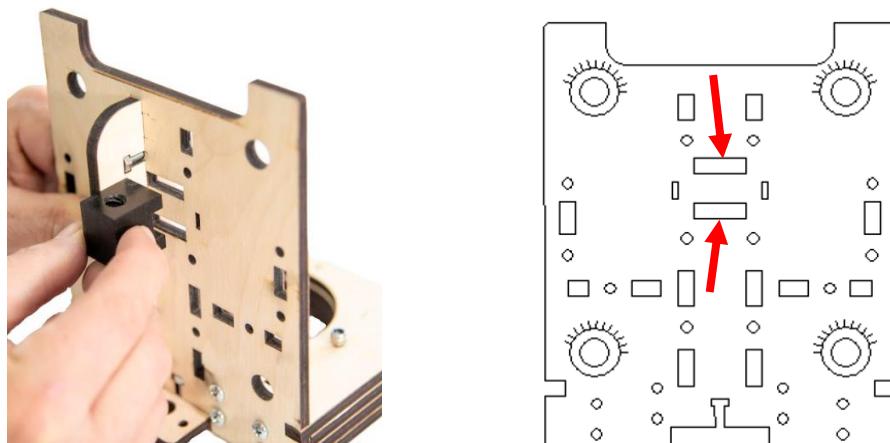
Step 5 Loosely secure the Spindle Bottom Supports together with two M4 x 30 Machine Screws and Locknuts as shown. Do not fully tighten the nuts.



Step 6 Attach the Z Frame Support (Z2) to the Spindle Assembly with four M4 x 16 Machine Screws and Nuts as shown.



Step 7 Fit the tabs on the Acme Block Nut into the slots on the back side of the Frame Assembly as shown. The ACME Block Nut tabs are designed to be a snug fit. If the ACME Block Nut fit is too tight, use sandpaper with block or a file to sand the outer faces of the rectangular slots, as shown, with the red arrows below until the Block fits snugly into the slots.



- Step 8** Attach the second Frame Support (Z2) to the Spindle Top Plate Assembly with four M4 x 16 Machine Screws and Nuts as shown. Be careful to keep the Acme Block Nut securely in place.



- Step 9** Wrap an 8" Zip Tie around the Frame Supports as shown. Make sure the Zip Tie Lock is positioned on the Router side of the Assembly.



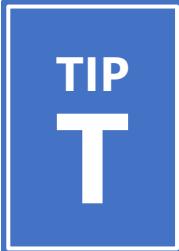
TIP

Test fit the Router in the Support Assembly as shown. This will help align the interlocking center pieces prior to final assembly and tightening. Remove the Router after dry fitting is completed.

Video Link: <https://www.youtube.com/watch?v=SkQ55V6ymEs&t=69s>



Step 10 Attach four SG20U Bearing Assemblies to the Z Frame. Loosely tighten the Nuts. These will be adjusted and tightened at a later step.



When putting the Bearing Assembly together, make sure the hub on the Bearing faces the wood. **IMPORTANT:** The Screw must be oriented so that the Nut is visible when looking at the back of the carriage (see photo below).



**NOTE: Bearing Assembly Order with Eccentric Adjustment
Spacer: M6 X 30 Machine Screw Head, Bearing (with hub facing toward the Bearing Washer), Bearing Washer, Eccentric Washer, Eccentric Adjustment Spacer, M6 Locknut.**

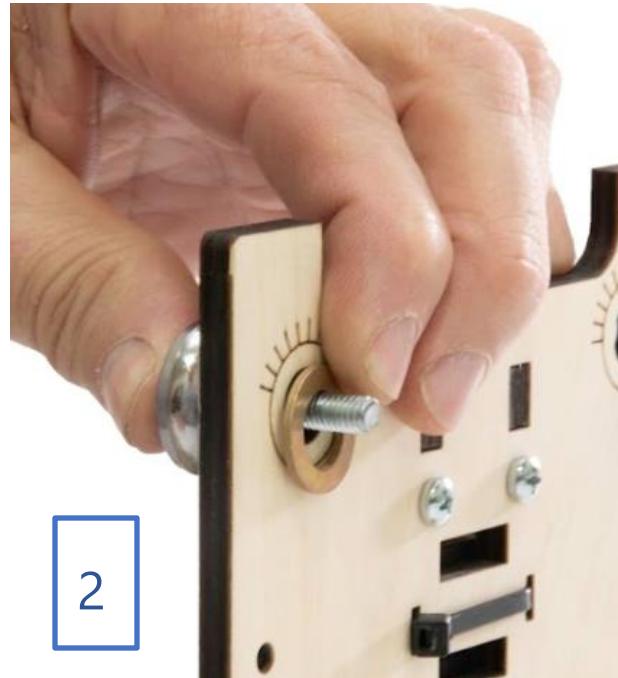


TIP

Prior to putting the Bearing Assembly together mark the point of the inboard edge of the Eccentric Adjustment Spacer using a permanent marker as shown below. This mark will help orient the Nut for tramping.



**Mark this
inboard point**



Step 11 Attach the two (Z1) Frame Mount Supports to the (Z8) Spindle Support and secure with two M4 x 16 Machine Screws and Nuts.



Step 12 Attach the Spindle Support Assembly to the Z-Frame Assembly with six M4 x 16 Machine Screws and Nuts as shown.

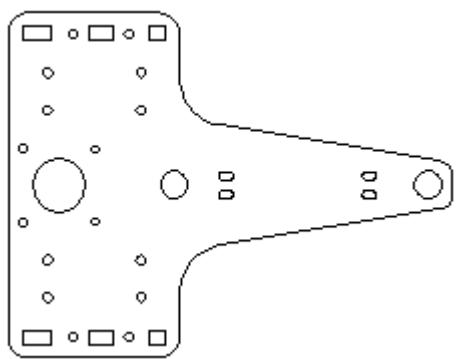
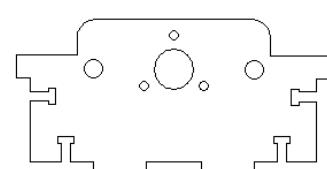
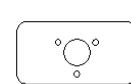
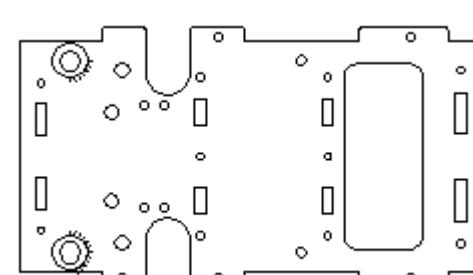
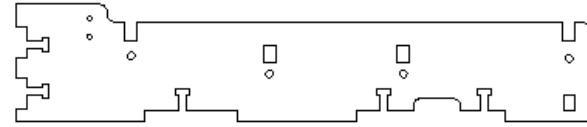


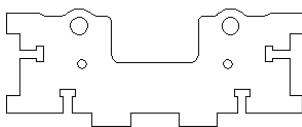
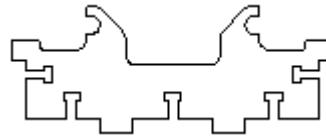
The finished Z Assembly should look like this:



X Carriage Assembly

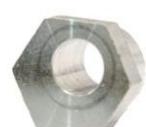
Required Wood Components

Part #	Description	Qty	Photo
XR1	Z Stepper Motor Mount	1	
XR2	Rail Top Support	1	
XR3	Bearing Retainer Plate	1	
XR4	Carriage Frame	1	
XR5	Y Carriage Side Support	2	
XR6	Belt Retainer	1	

XR7	Z Rail Stop	1	
XR8	Carriage Bottom Support	1	
XR9	Rail Support	2	

Required Hardware

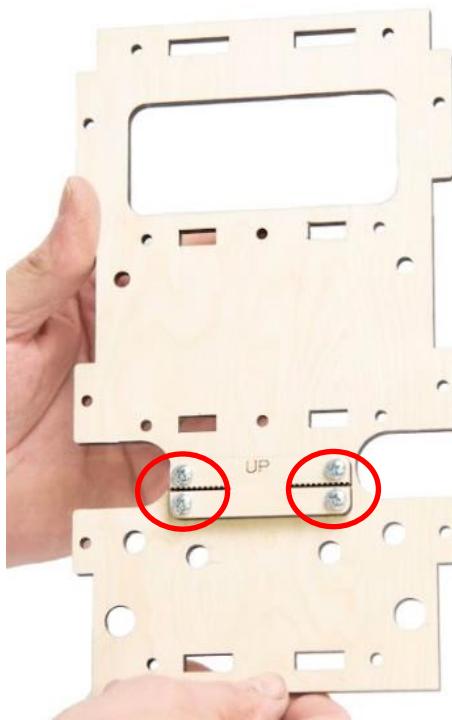
Part #	Description	Qty	Photo
H57	Bearing Retainer Washer	3	
CB11	Stepper Motor	1	
ZD5	Aluminum Coupler	1	
H44	SG20U Bearing	4	

ZD1	ACME Rod	1	
H66	Small Shim Washer	2	
H39	M6 x 30 Machine Screw	4	
H18	M6 Locknut	4	
H40	Eccentric Spacer	2	
H41	Eccentric Washer	2	
H42	Bearing Fender Washer	6	
H47	M4 Lock Nut	9	
H14	M4 x 16 Machine Screw	37	
H15	M4 Nut	28	
ZD3	626-2RS Bearing	1	
ZD4	6mm Split Locking Collar	1	
HR1	Stress Proof Steel Z-Rail	2	

H27	M2.5 x 16 Machine Screw	2	
H43	M2.5 Lock Nut	2	
CB13	Home Switch	1	
H37	M3 x 10 Machine Screw	4	
H26	Small Zip Ties	2	

Illustrated Step by Step Instructions

Step 1 Attach the Belt Retainer (XR6) to the front side of the Y Carriage Frame (XR4) and secure with four M4 x 16 Machine Screws and Lock Nuts as shown below. Make sure the 'UP' mark is visible and oriented toward the top of the Y Carriage Frame (NOTE: The Eccentric Bearing adjustment marks are on the opposite side of the X Carriage Frame as shown).



Step 2 Attach the SG20U Bearing Assembly.

2a Attach and tighten the two upper SG20U Bearing Assemblies to the Y Carriage Assembly as shown.

NOTE: The assembly order for the Upper Bearing: Machine Screw, SG20U Bearing (with hub facing toward the Bearing Washer), Bearing Washer, Plywood, Bearing Washer secured with a Lock Nut.



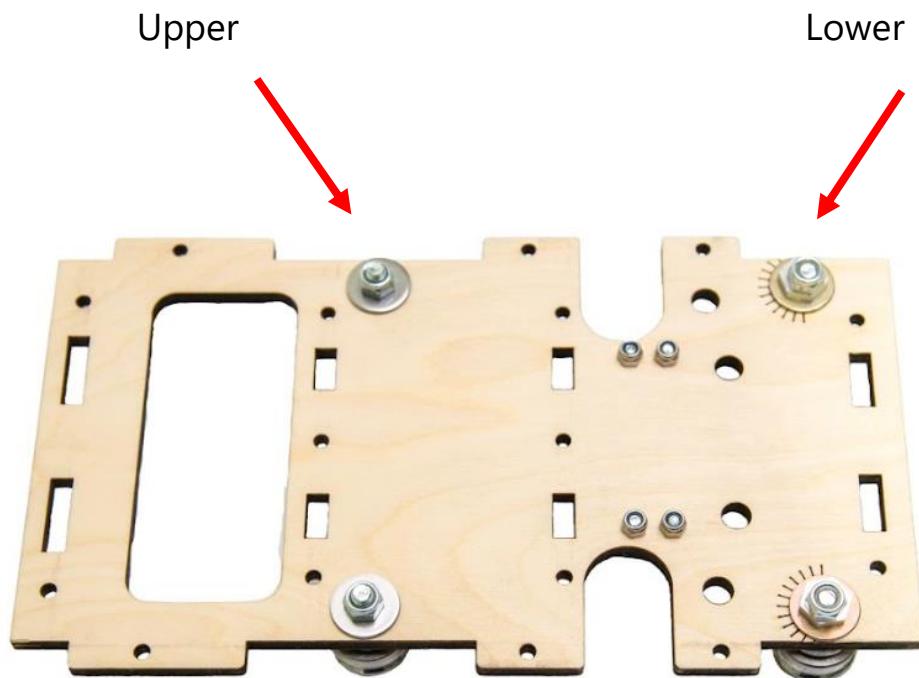
Upper Bearing Assembly

- 2b** Attach the two lower SG20U Bearing Assemblies to the X Carriage Assembly as shown. These will be tightened in a later step.

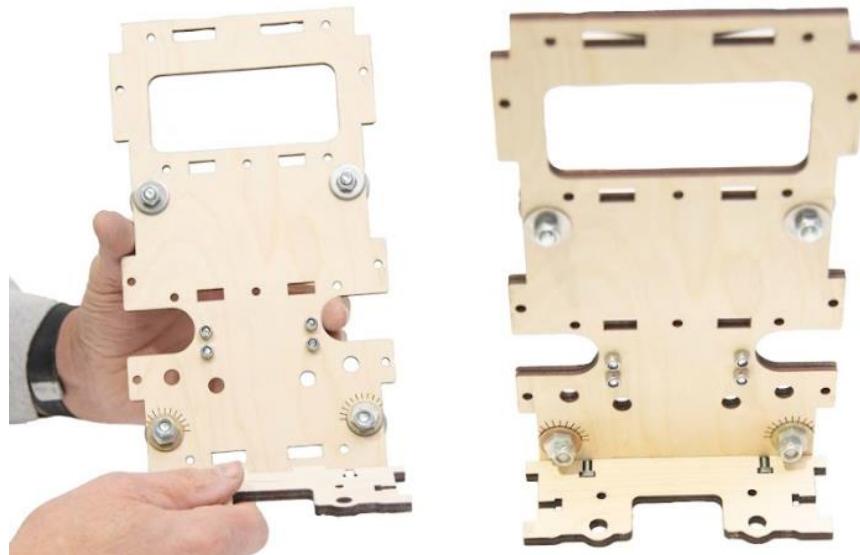
NOTE: The assembly order for the Lower Bearing: Machine Screw, SG20U Bearing (hub facing toward the Bearing Washer), Bearing Washer, Plywood, Eccentric Washer, Eccentric Spacer, secured with a Lock Nut.



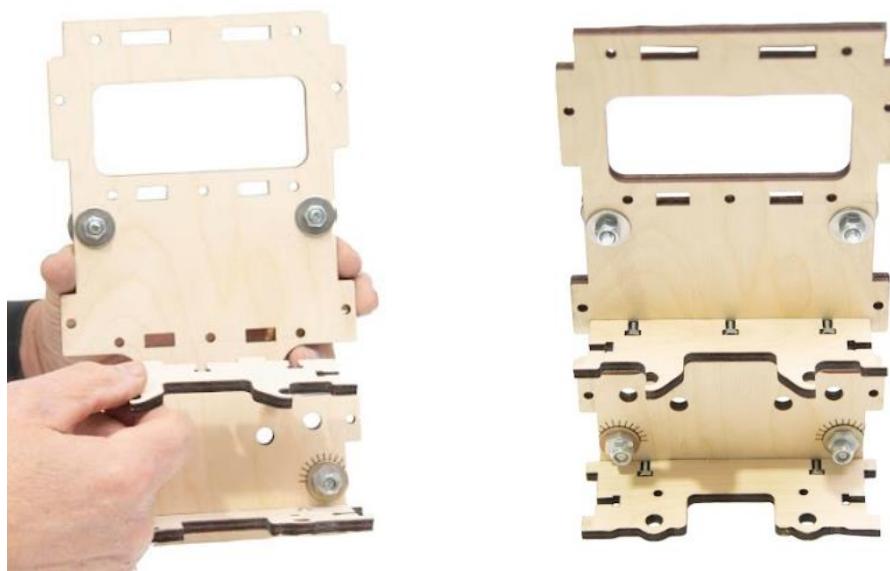
Lower Bearing Assembly with Eccentric Spacer



Step 3 Attach the Carriage Bottom support (XR8) to the X Frame Assembly with two M4 x 16 Machine Screws and Nuts as shown.



Step 4 Attach one Rail Support (XR9) to the X Frame Assembly with three M4 x 16 Machine Screws and Nuts as shown



Step 5 Attach the second Rail Support (XR9) to the X Frame Assembly with three M4 x 16 Machine Screws and Nuts as shown.



Step 6 Attach the Rail Top Support (XR2) to the X Frame Assembly with two M4 x 16 Machine Screws and Nuts as shown.



- Step 7** Attach the Z Rail Stop (XR7) to the X Frame Assembly with two M4 x 16 Machine Screws and Lock Nuts as shown.



- Step 8** Attach one X Carriage Side Support (X5) to the Y Frame Assembly with seven M4 x 16 Machine Screws and Nuts as shown.



- Step 9** Repeat for the other side. Attach one X Carriage Side Support (X5) to the Y Frame Assembly with seven M4 x 16 Machine Screws and Nuts as shown.



Completed X Carriage Assembly



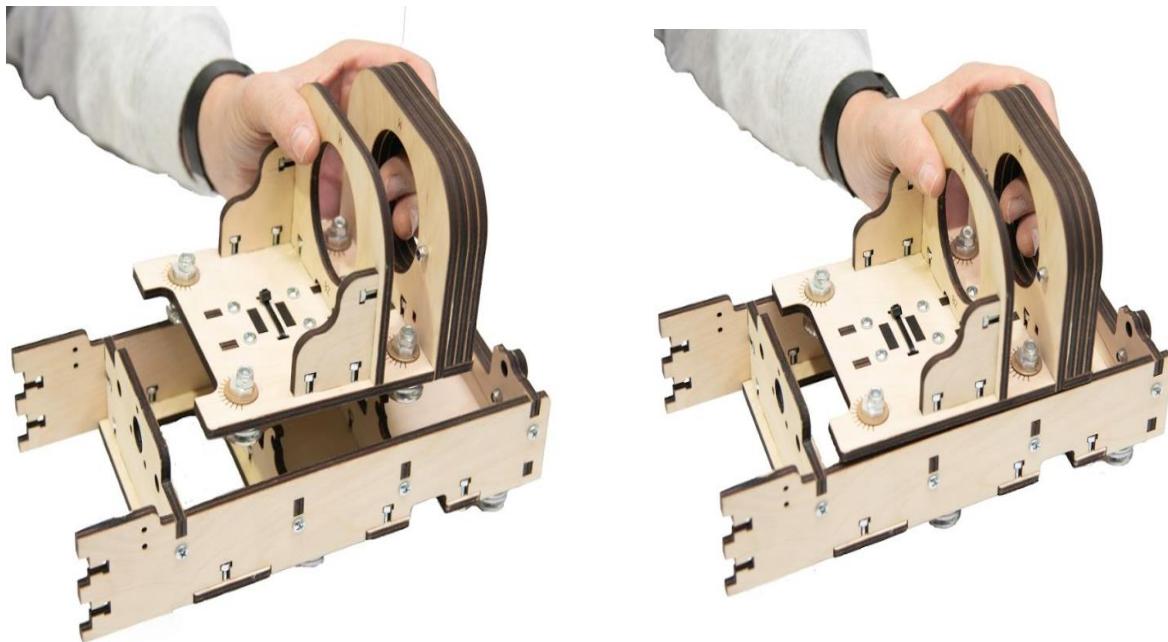
X and Z Carriage Assembly

Illustrated Step by Step Instructions



WARNING Prior to installing the Lower Rails, adjust the Eccentric Spacers so that the lower Bearing Assemblies are at their outboard position.

- Step 1** Lay the X Carriage Assembly with the Bearings facing down. Fit the Z Carriage Assembly into the X Carriage Assembly as shown.

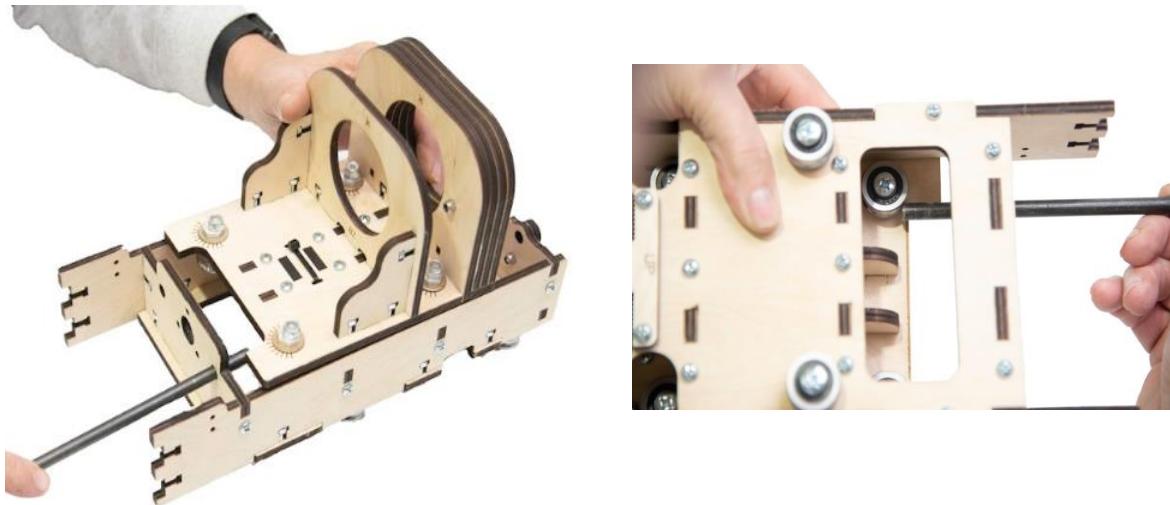


TIP

Rotate each Rail as you guide them through each of the components. This will help them to slide smoothly into place.

Step 2

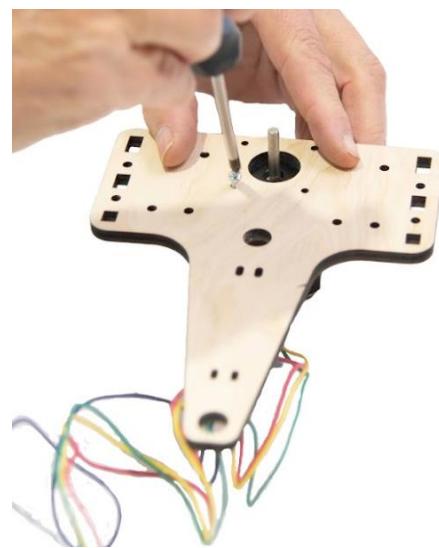
Hold the Assemblies together and carefully insert a Short Rail through the Upper Rail Support, threading it behind the upper SG20U Bearing as shown. Gently thread the Rod through the Rail Support and behind the lower SG20U Bearing, through the second Rail Support, finally seating the Rod into the Lower Rail Support and Rail Stop Assembly



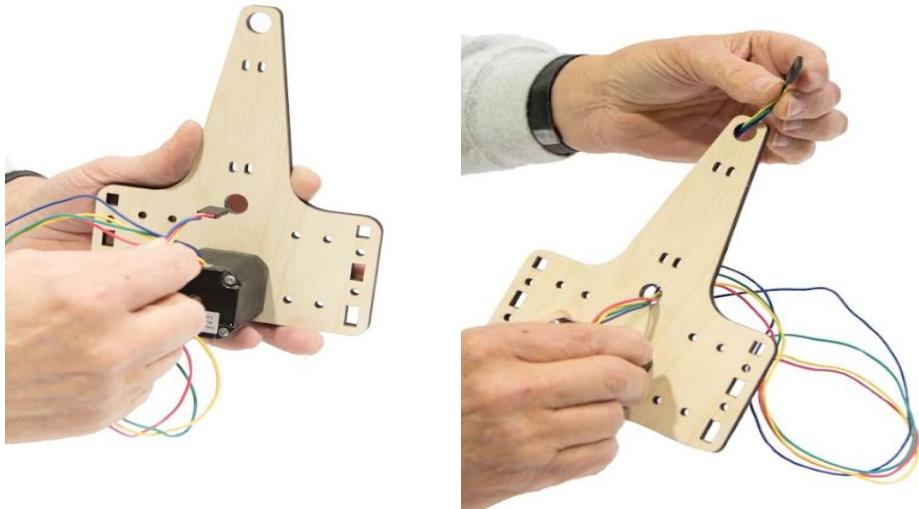
Step 3 Repeat to install the second Rail. The finished Assembly should look like this.



Step 4 Attach the Stepper Motor to the Z Stepper Motor Mount (XR1) using four M3 x 10 Machine Screws. Note: The Stepper Motor wires are facing towards the protrusion.



Step 5 Thread the Stepper Motor wiring harness through the Motor Mount as shown.



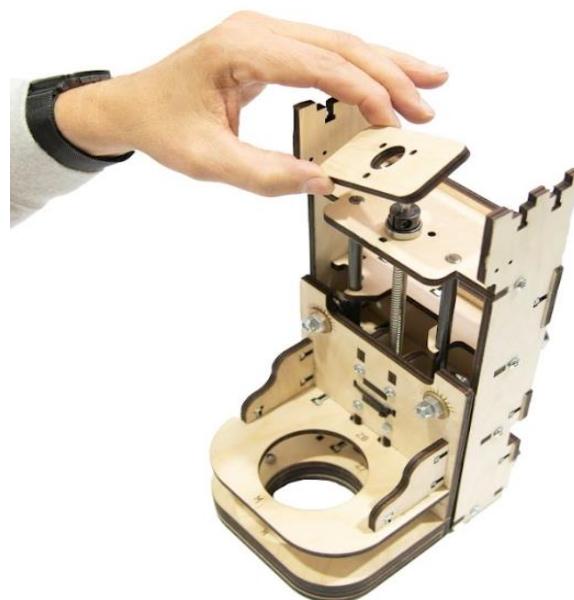
Step 6 Slide the 626-2RS Bearing onto the shaft of the ACME Rod. Next, insert 2 Shim Washers and secure in place with the 6mm Split Locking Collar by holding the Locking Collar tightly against the Bearing, then tighten the Set Screw as shown.



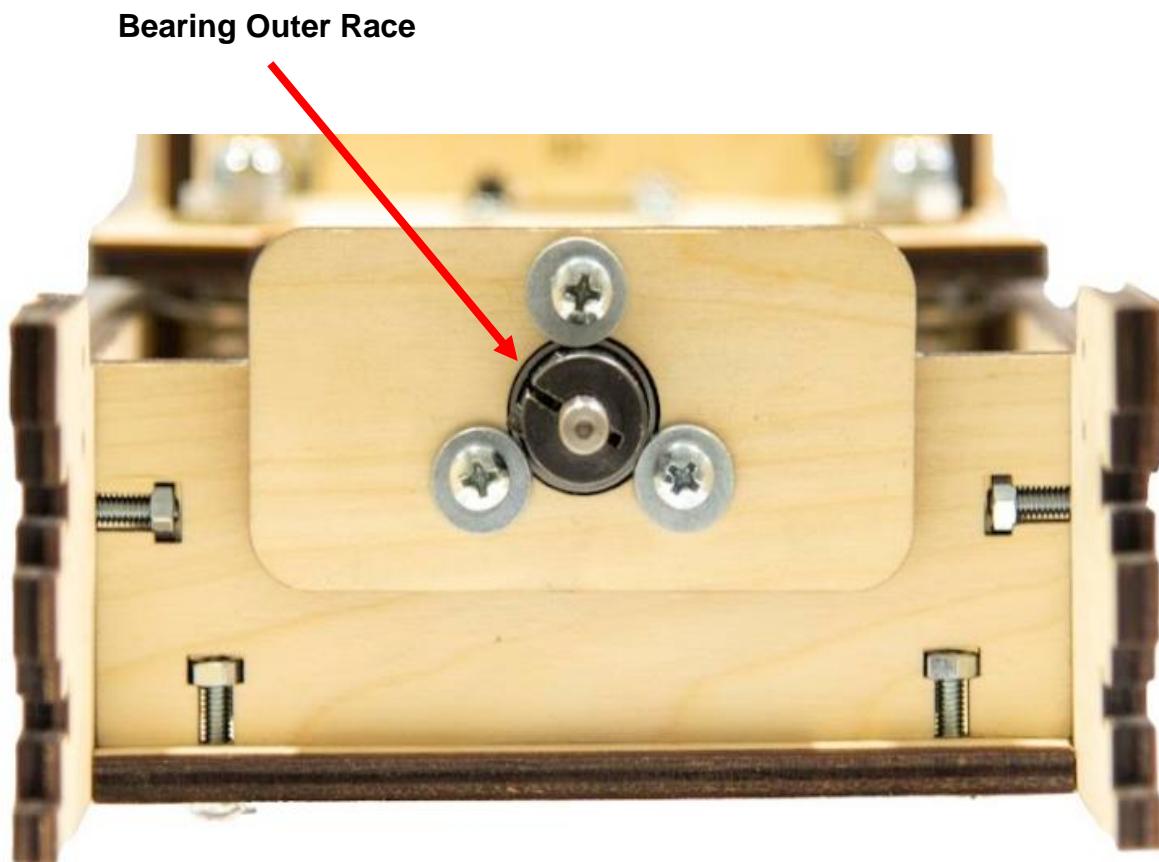
- Step 7** Insert the ACME Rod through the hole in the Rail Top Support and thread into the ACME Block Nut as shown.



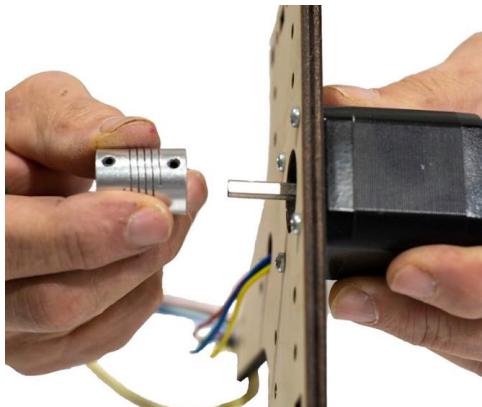
- Step 8** Place the Bearing Retainer Plate (XR3) over the Bearing and secure in place with three M4 x 16 Machine Screws, Bearing Retainer Washers and Lock Nuts.



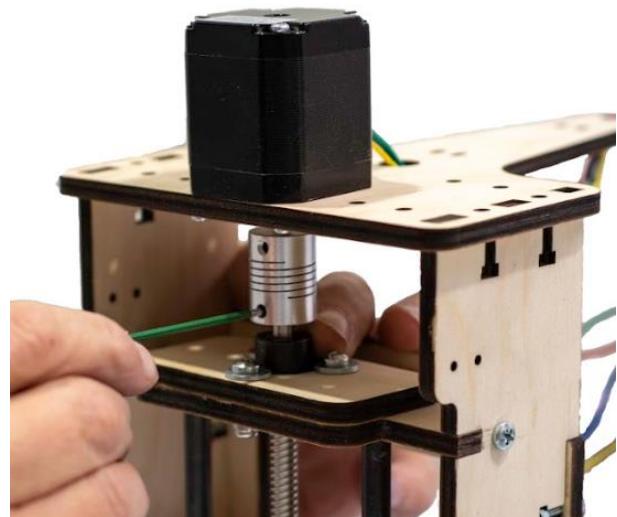
NOTE: Washers must be placed so that they cover the Outer Bearing Race to secure it in place as shown. Once installed, spin the ACME Rod to confirm the Washers do not interfere with the rotation of the Locking Nut.



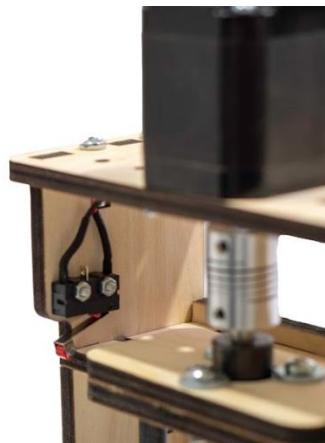
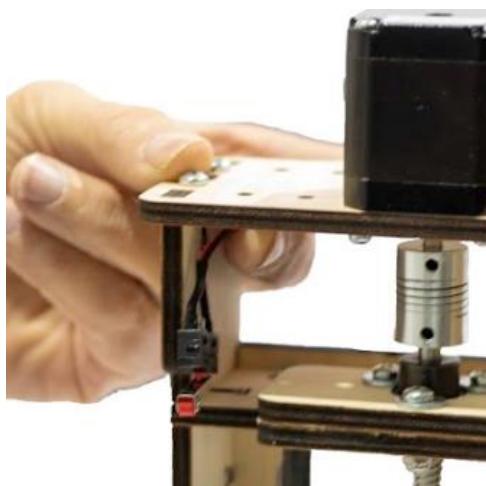
Step 9 Slide the Aluminum Coupler over the shaft of the Stepper Motor. Make sure the Set Screw fits against the flat of the Stepper Motor Shaft. Gently snug the Set Screw to keep it from rotating off the flat but loose enough so that it can slide up and down.



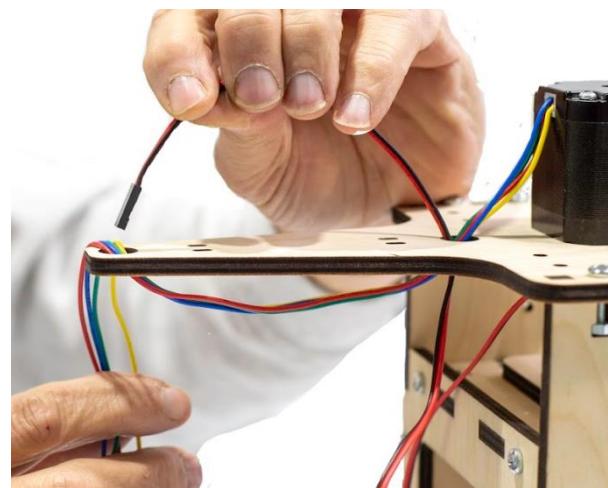
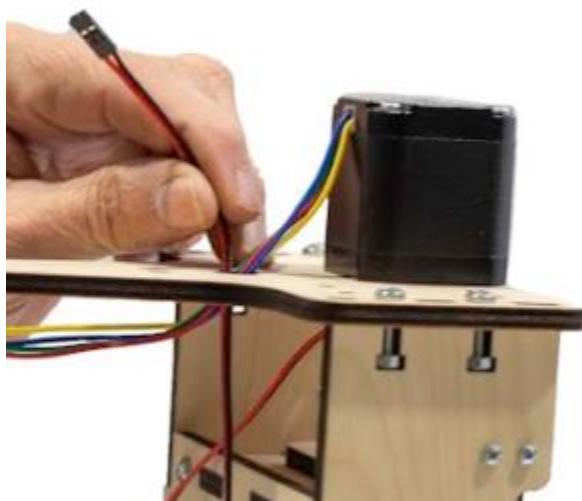
Step 10 Slide the Aluminum Coupler so that it is centered top and bottom between the Locking Collar and bottom of the Z Stepper Motor Mount and tighten the upper and lower Set Screws. Secure the Z Motor Mount to the tabs of the Y Carriage Assembly using four M4 x 16 Machine Screws and Nuts.



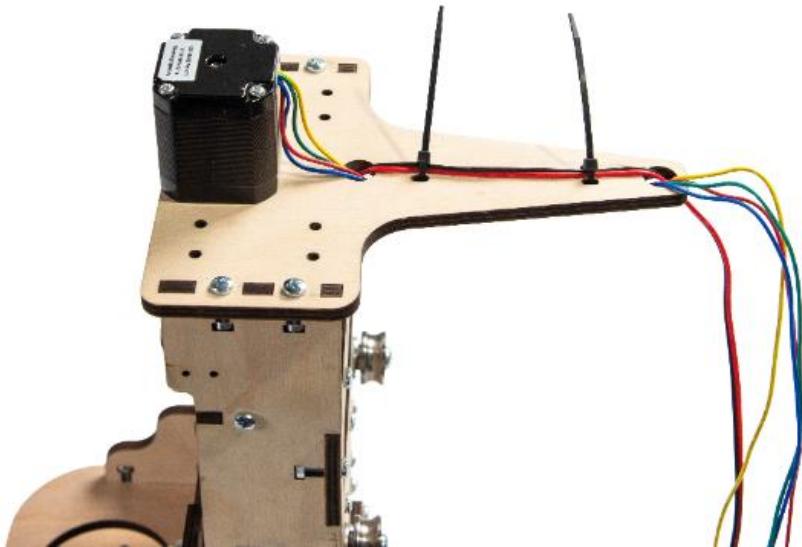
Step 11 Attach the Z Carriage Home Switch in the upper left inside corner of the X-Carriage Assembly using two M 2.5 x 16 Machine Screws and Lock Nuts as shown. [Note: Do not overtighten the Screws].



Step 12 Route the Home Switch Wires as shown below.

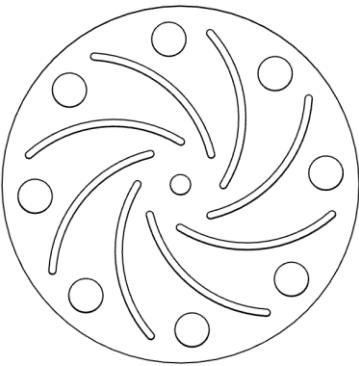
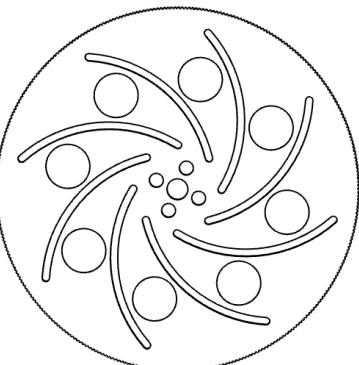
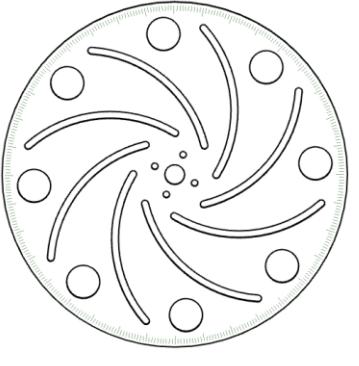


Step 13 Secure the Z Axis Stepper Motor and Home Switch wires with two Zip Ties to the Stepper Motor Mount as shown.



Chuck Assembly:

Required Wood Components

L2	Outer Chuck Plate	1	
L3	Chuck Pulley	1	
L4	Inner Chuck Plate	1	

Required Hardware

H47	M4 Lock Nut	12	
H74	M4x40 Hex Cap Screw	8	
H57	Bearing Retainer Washer	16	
H72	Chuck Gripper	8	
H14	M4x16 Machine Screw	4	
H71	12mm Chuck Shaft	1	
H70	12mm Chuck Flange	1	
H76	Round Foam Tabs	8	

Illustrated Step by Step Instructions

Step 1 Attach the 12mm Chuck Flange 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. 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 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. Do not tighten these until step 4.



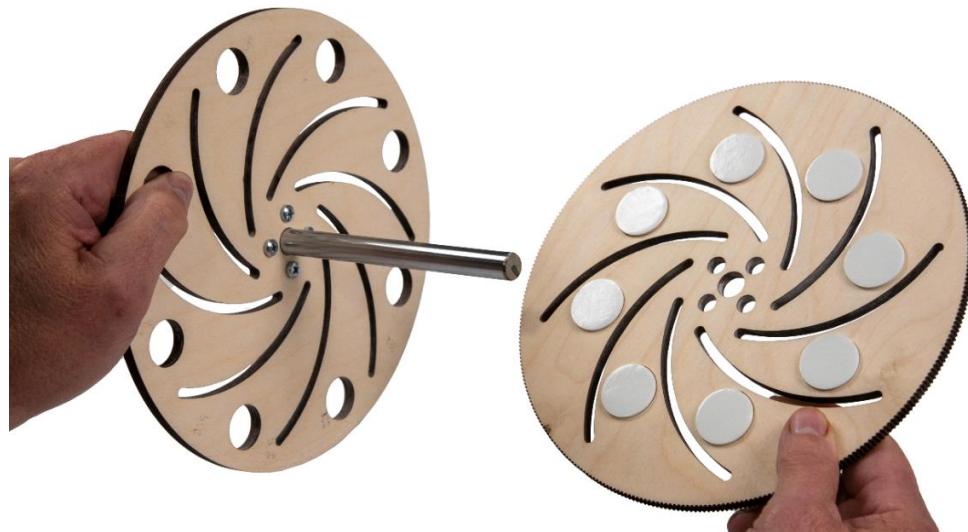
Step 2 Insert the 12mm Chuck Shaft through the back of the Inner Chuck Plate Assembly for alignment as shown.



Step 3 Remove the paper covering one side of the eight Round Foam Pads and carefully adhere them to the circular marks located on the Chuck Pulley (L3).

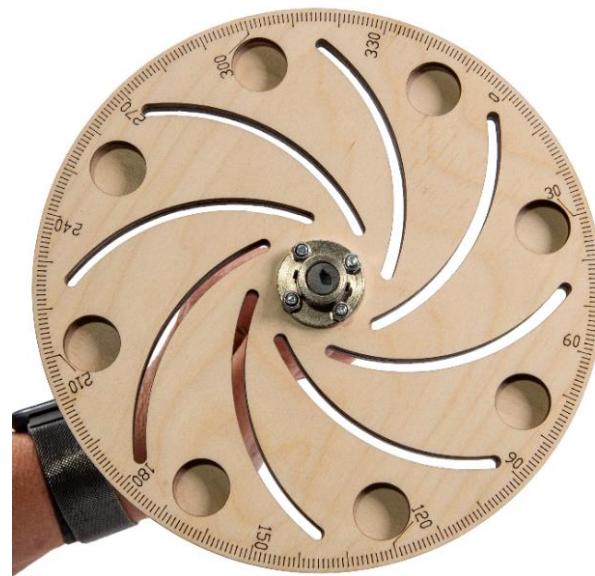


Step 4 Remove the paper covering on the remaining side of the eight Round Foam Pads Orient the side with the exposed Pads to face the back of the Inner Chuck Plate Assembly. Slip the Chuck Pulley (L3) over the 12 mm Chuck Shaft. Slide the Plates together being careful to keep the helical cutouts of the Chuck Pulley and those on the Inner Chuck Plate perfectly aligned. Then press the discs firmly together as shown.

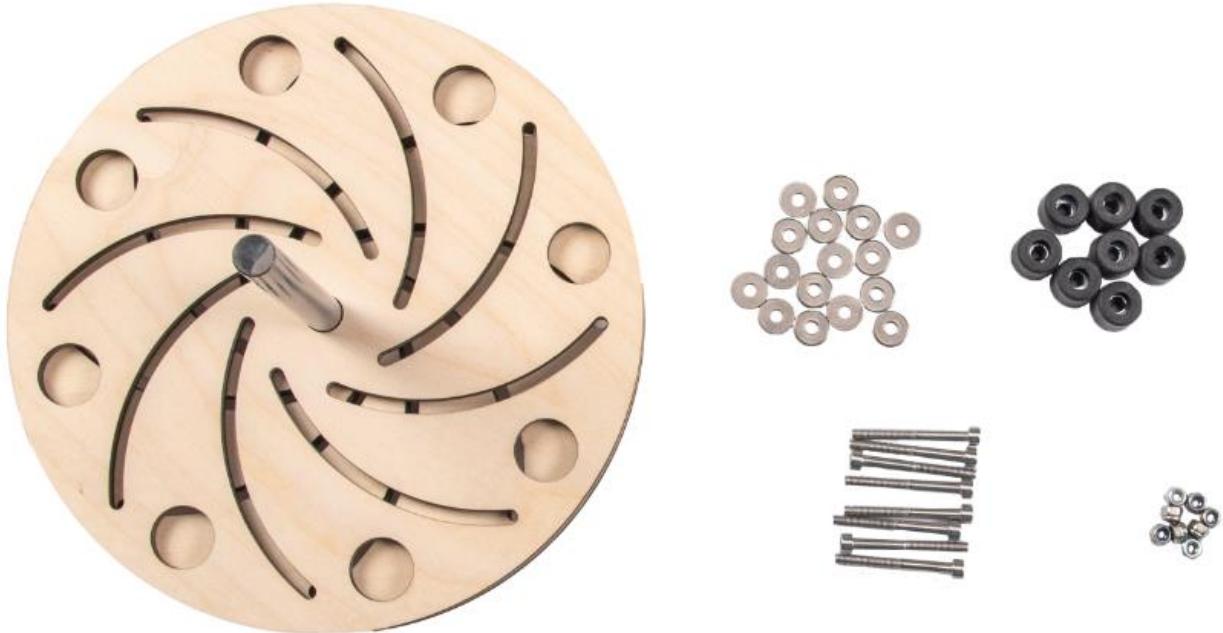


View from the flange side showing the alignment of the helical cutouts for both the Inner Chuck Plate(L4) and the Chuck Pulley (L3).

Tighten M4 x 16 Screws and Lock Nuts.



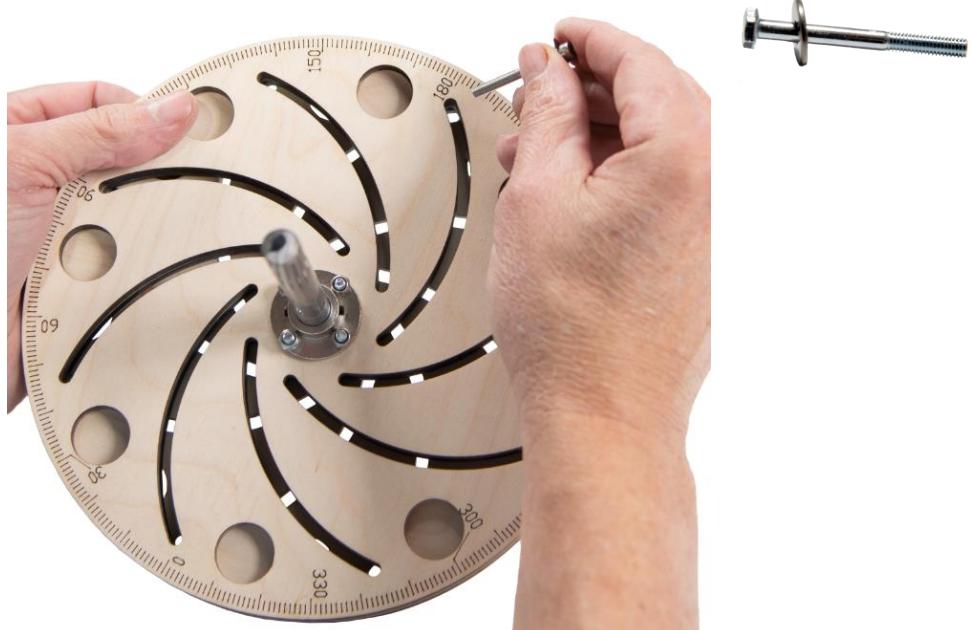
Step 5 Attach the Chuck Grippers and Outer Chuck Plate (L2) to the Chuck Assembly.



5a Align the Outer Chuck Plate (L2) with the Chuck Assembly so the helical cutouts intersect as shown below and slide the Outer Chuck Plate (L2) onto the 12mm Chuck Shaft.



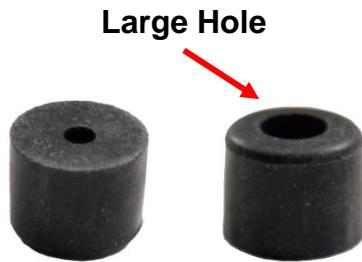
- 5b** After placing a Bearing Retainer Washer on to the shaft of the M4 x 40 Hex Cap Screw, slide the Screw through the intersection of the helical grooves as shown below.



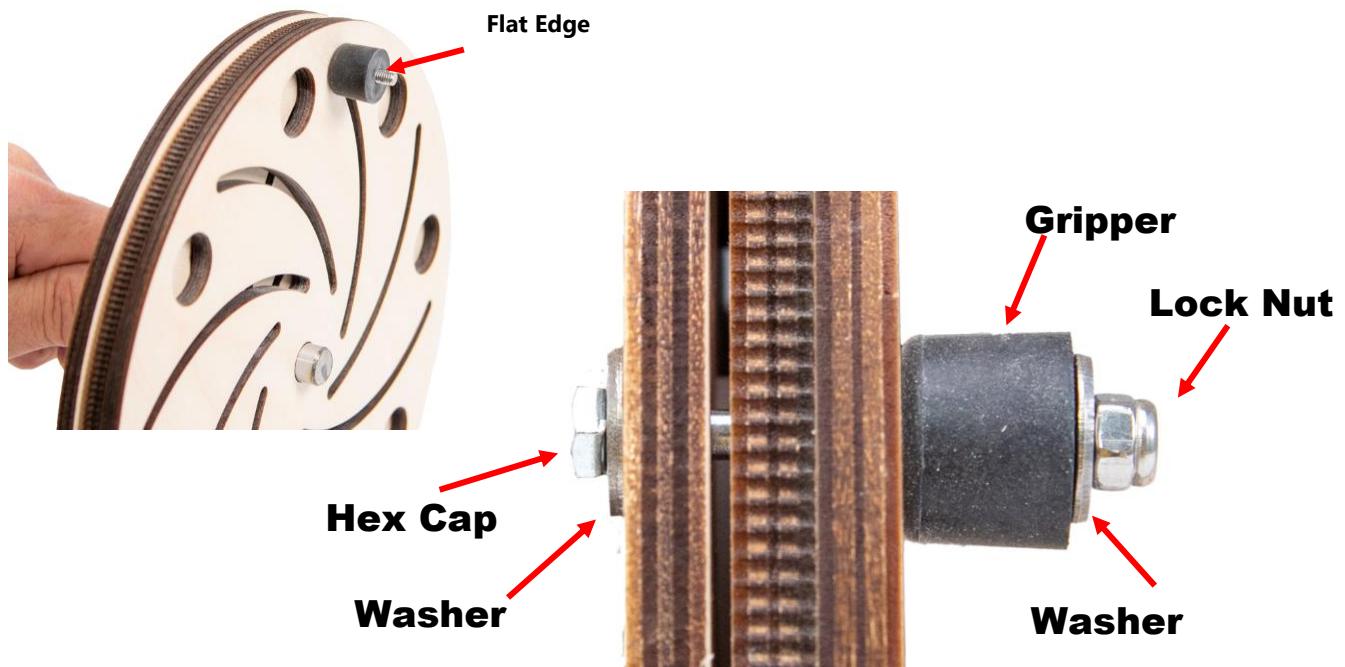
TIP

The Chuck is designed to allow the two Chuck Plates to counter rotate. As the Plates rotate, the Grippers are guided along the helical cutouts either inward toward the shaft or outward to secure or release a workpiece. If the Lock Nuts securing the Grippers are too tight the Plates will not slide against each other.

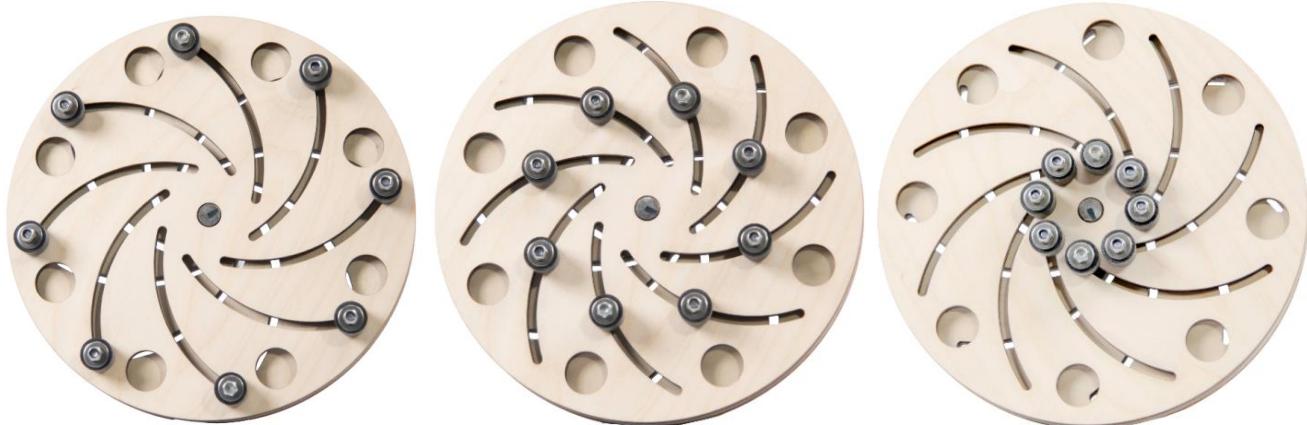
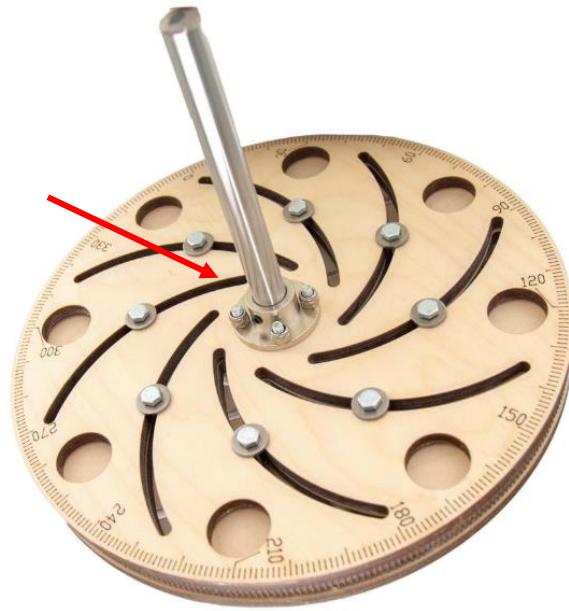
NOTE: Each Chuck Gripper must be properly oriented to the surface of the Inner Plate. The end with the larger opening and rounded edge must be installed facing the wood. The end with the small hole will be covered with the Bearing Retainer Washer.



- 5c** Slide the Chuck Gripper over the screw threads on the Chuck Assembly with the rounded shoulder against the wood and secure with a Bearing Retainer Washer and Lock Nut as shown. Once the threads of the screw engage the nylon insert in the Lock Nut, the screw should be snugged $\frac{1}{4}$ turn. Repeat to install the remaining Chuck Gripper Assemblies.



- 5d** With the shaft end flush with the front chuck surface, secure the chuck flange 4 machine screws.



The Completed Assembly

Tail Stock Assembly:

Required Wood Components

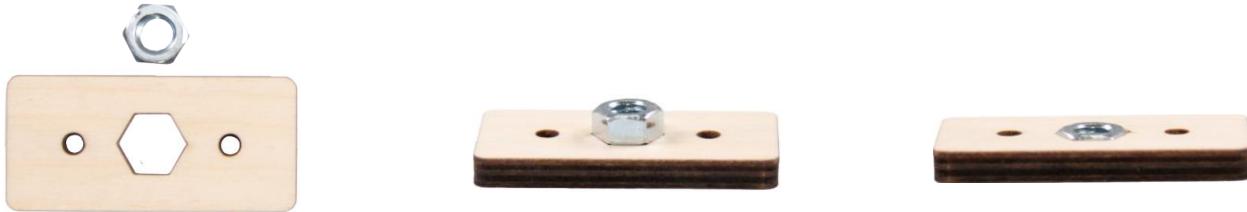
TS1	Tail Stock Side Plate	2	
TS2	Tail Stock Top Plate	1	
TS3	Tail Stock Bottom Plate	1	
TS4	Tail Stock Top Brace	1	
TS5	Tail Stock Bottom Brace	1	
TS6	Tail Stock Guide	2	
TS7	Tail Stock Tensioner	1	
TS8	Tail Stock Nut Retainer	1	

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, hard 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.

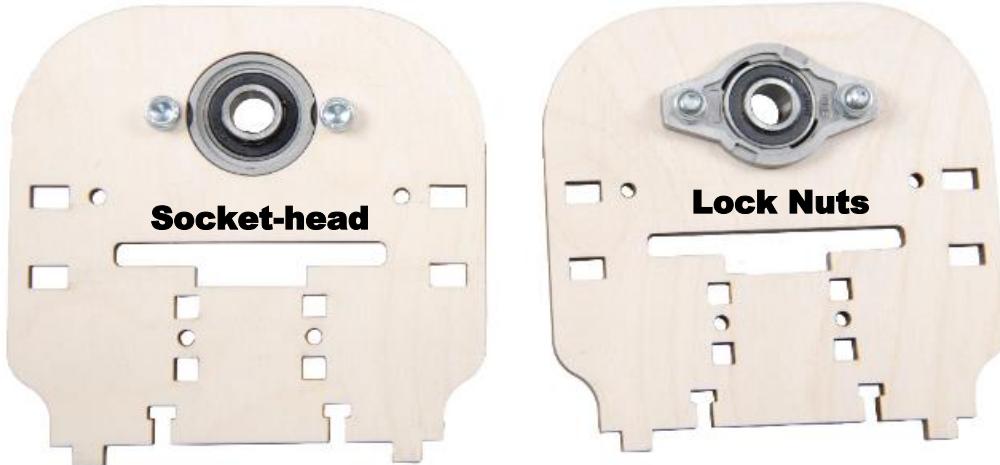


Holding the 12 mm Pillow Block Bearing in place turn the Tail Stock Side Plate over and insert the Socket-head Screws so that the Screw head rests against the wood.



Do not tighten completely until the live center in place. This will aid in alignment of the pillow block bearings with the live center in a later step.

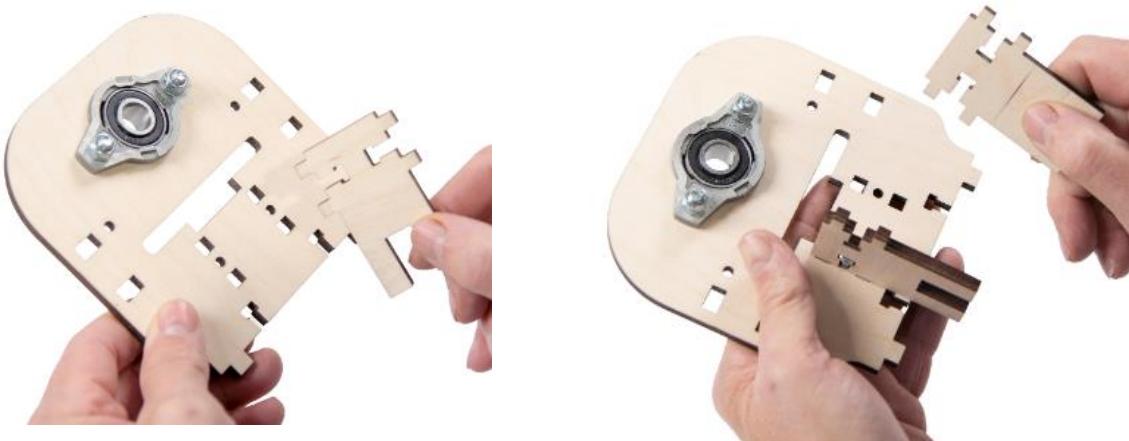
Step 4 Repeat the assembly for the remaining Tail Stock Side Plate (TS1)



The Completed Assembly

Step 5 Building 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.



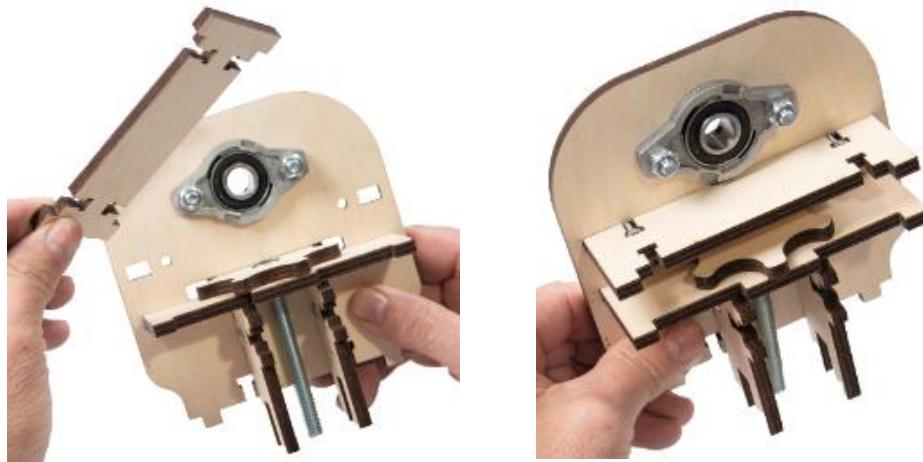
- 5d** Insert the 5/16 x 3" Hex Cap Screw into the hex shaped hole.



Holding the bolt in place with a piece of tape will aid in assemble in a later step.



- 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.



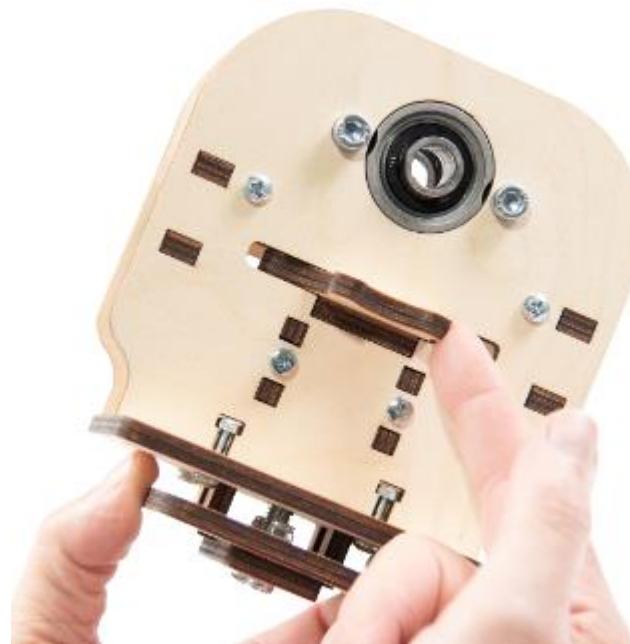
- 5g** Rotate the Tail Stock Assembly to align the tabs of the Tail Stock guides with the slots of the Tail Stock Top Plate (TS2). Align the hole in the Tail Stock Top Plate to allow the 3" Screw to pass through. Secure with four M4 x 16 Screws and Nuts.



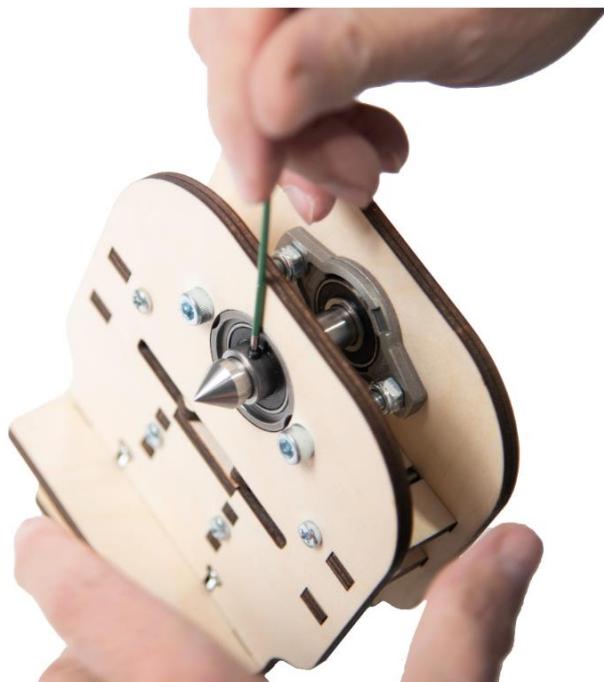
- 5h** Place the Tail Stock Guides through the Tail Stock Bottom Plate Assembly and insert so that the end of the 3" Screw can be threaded into the 5/16" nut.



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	8	
BA6	Base Corner Bracket	2	

Required Hardware

Part #	Description	Qty	Photo
H38	M4 x 30 Machine Screws	16	
H14	M4 x 16 Screws	36	
H15	M4 Nuts	52	

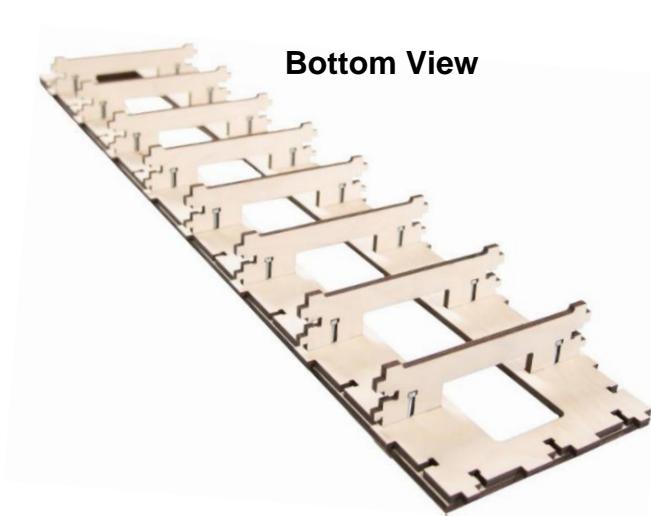
Illustrated Step by Step Instructions

- 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. Repeat with the remaining seven Base Braces (BA5). **Note: Do not fully tighten the Screws and Nuts. This will be done in a later step.**

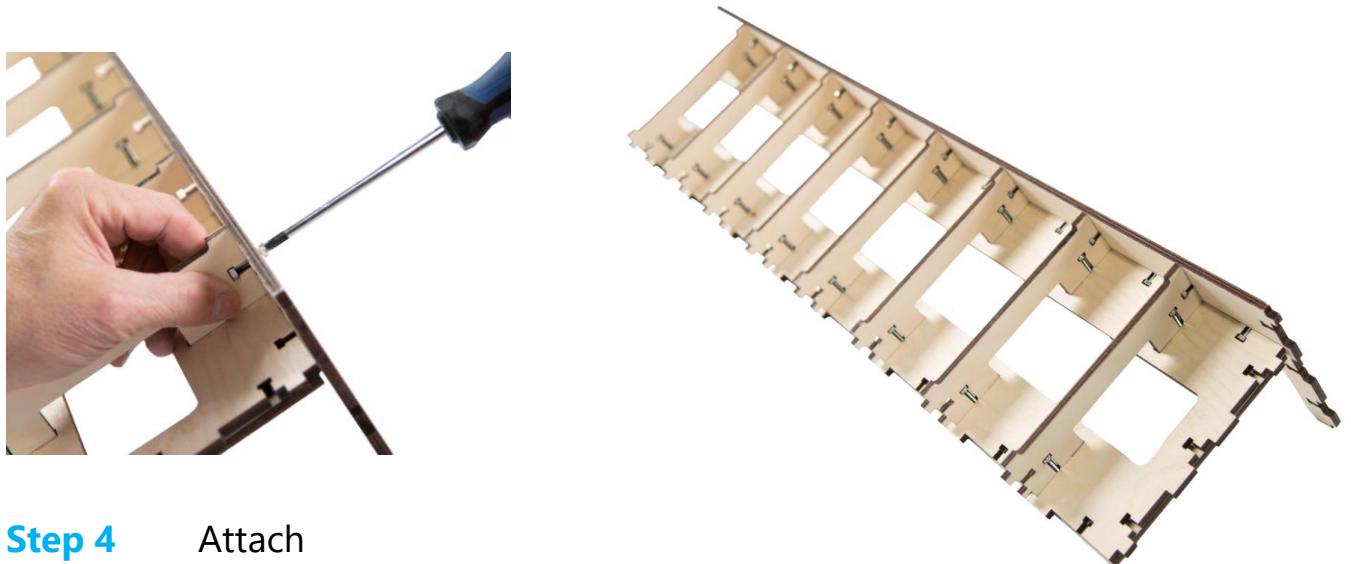


Bottom View



Top View

Step 3 Attach the Front Brace Support (B3) to the Base Assembly using sixteen M4x 16 Screws and Nuts.



Step 4 Attach
the Rear Base Support
(B4) to the Base Assembly using sixteen M4 x 16 Screws and
Nuts.

**Note: When Both Sides are attached, fully tighten the M4 x 30 Screws
and Nuts**





Both Sides Attached Bottom View



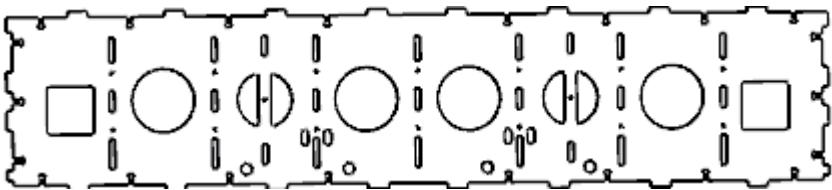
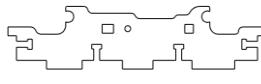
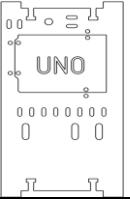
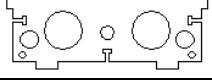
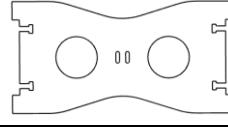
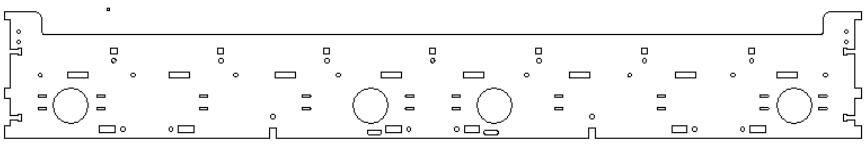
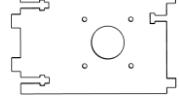
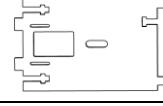
Both Sides Attached Front View

Step 5 Attach the two (B6) Base Corner Brackets to the Base Assembly using two M4 x 16 Screws and Nuts for each.



Gantry Assembly

Required Wood Components

GR1	Gantry Frame	1	
GR4	X Rail Support	7	
GR5	Controller Mount	1	
GR7	Back Brace	2	
GR8	Gantry Back Support	2	
GR9	Gantry Top/Bottom Brace	2	
GR11	X Stepper Motor Mount	1	
GR12	X Belt Idler Mount	1	

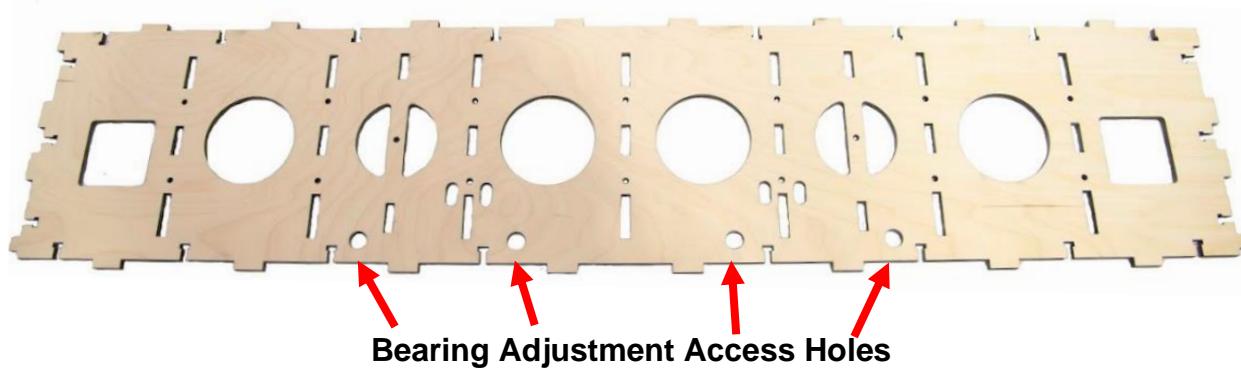
GR13	X Belt Tensioner	1	
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Required Hardware

Part #	Description	Qty	Photo
H14	M4 x 16 Machine Screws	64	
H15	M4 Nuts	65	
H31	Large 8" Zip Ties	1	
H48	M5 x 30 Machine Screw	2	
H64	M5 Nut	2	
H49	M5 Lock Nuts	2	
H50	Idler Fender Washer	4	
H51	Flanged Bearing F625Z	4	
H57	Bearing Retainer Washers	1	

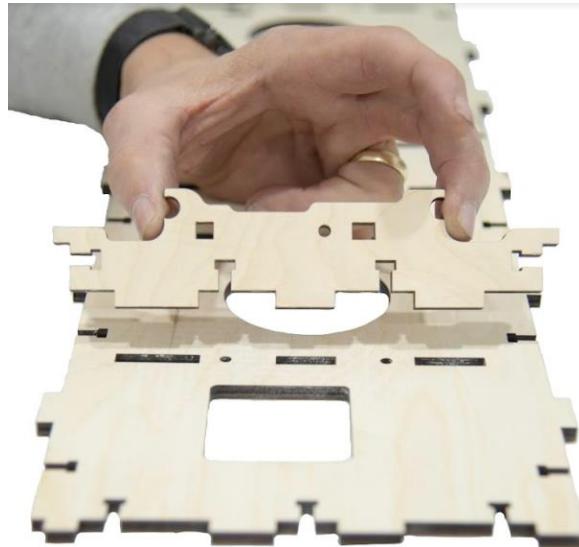
TIP

Prior to putting the Gantry Assembly together, note that the four $\frac{1}{2}$ " (12mm) holes at the bottom of the Gantry Frame (GR1) must be oriented on the bottom of the Gantry Assembly. They provide access to adjust the X Carriage Bearings needed in a later step.

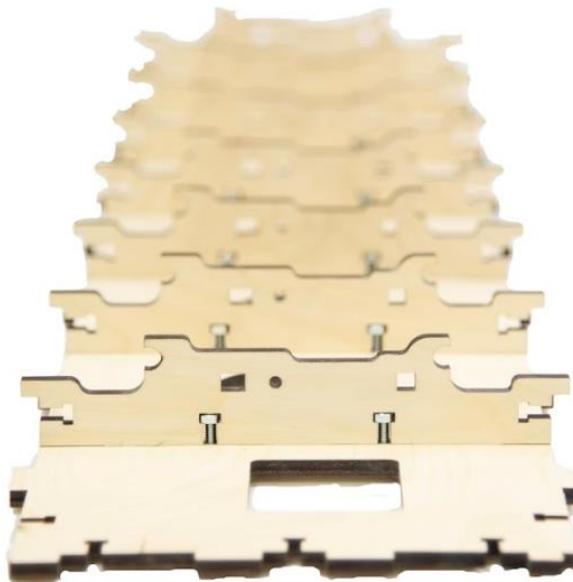


Illustrated Step by Step Instructions

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



Finished Assembly should 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 fifteen M4 x 16 Machine Screws and Nuts as shown.



- Step 3** Align and insert the tabs of the Gantry Back Support (GR8) into the slots of the Gantry Frame Assembly and secure with two M4 x 16 Machine Screws and Nuts. Repeat at the opposite end of the Gantry as shown.

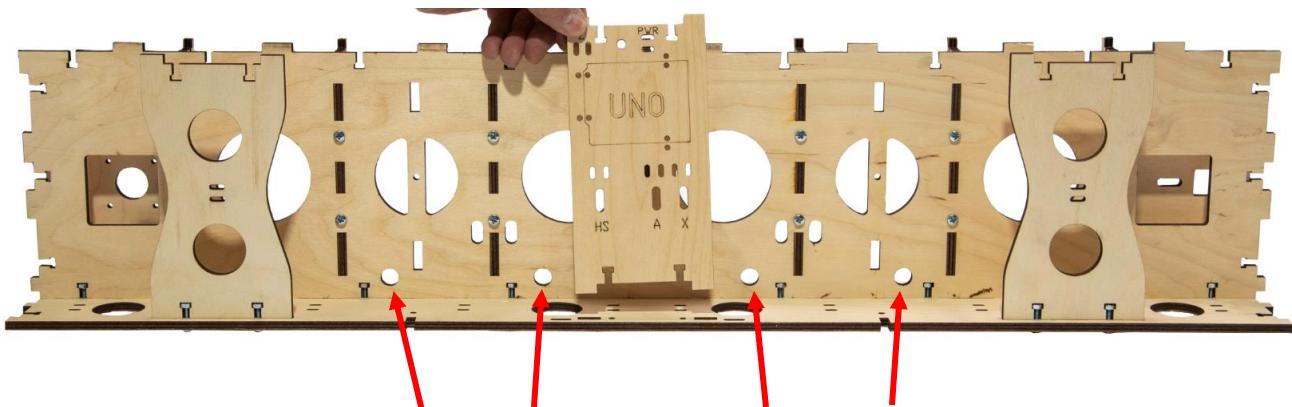


Left Side Back



Right Side Back

Step 4 Align and insert the tabs of the Controller Mount (GR5) into the slots of the Gantry Frame Assembly and secure with two M4 x 16 Machine Screws and Nuts as shown.



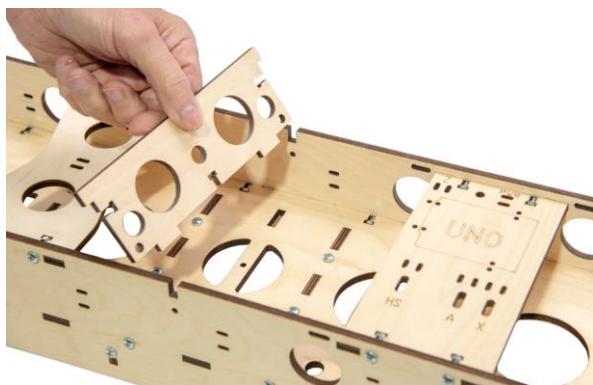
These small holes must be positioned at the bottom to properly install the Controller Mount (GR5).



- Step 5** Align and insert the tabs of the Gantry Frame Assembly into the slots of the Gantry Top Brace (GR9) and secure with twenty-one M4 x 16 Machine Screws and Nuts as shown.



- Step 6** Align and insert the tabs of the Back Brace (GR7) into the slots of the Gantry Frame Assembly and secure with three M4 x 16 Machine Screws and Nuts as shown. Repeat to install the second Brace.



Step 7 Build two Idler Bearing Sub-Assemblies.

- 7a** Slide two F625Z Flanged Bearings on a M5 x 30 Machine Screw as shown. NOTE: install the flanges of the Bearings so that each flange is oriented to the outside from the other as shown.



- 7b** Thread a M5 Nut onto the Machine Screw, snug against the Bearings as shown.



- 7c** Slide an Idler Fender Washer onto the Machine Screw against the M5 Nut.



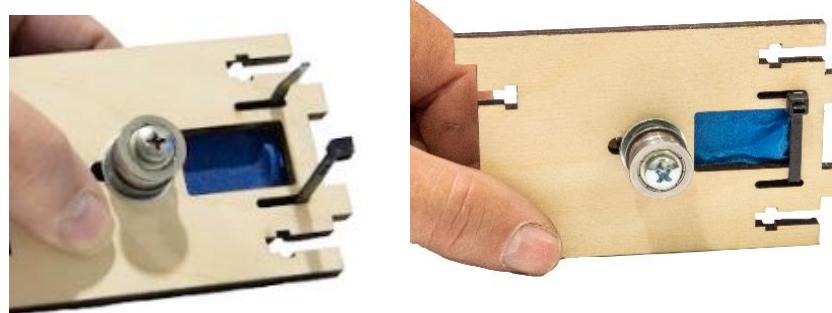
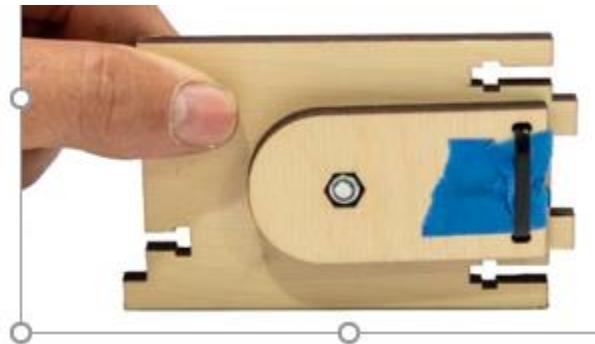
- 7d** Insert the Bearing Assembly through X Belt Idler Mount (GR12) and snug with an Idler Fender Washer and M5 Lock Nut as shown below. The idler should able to slide with in the slot.



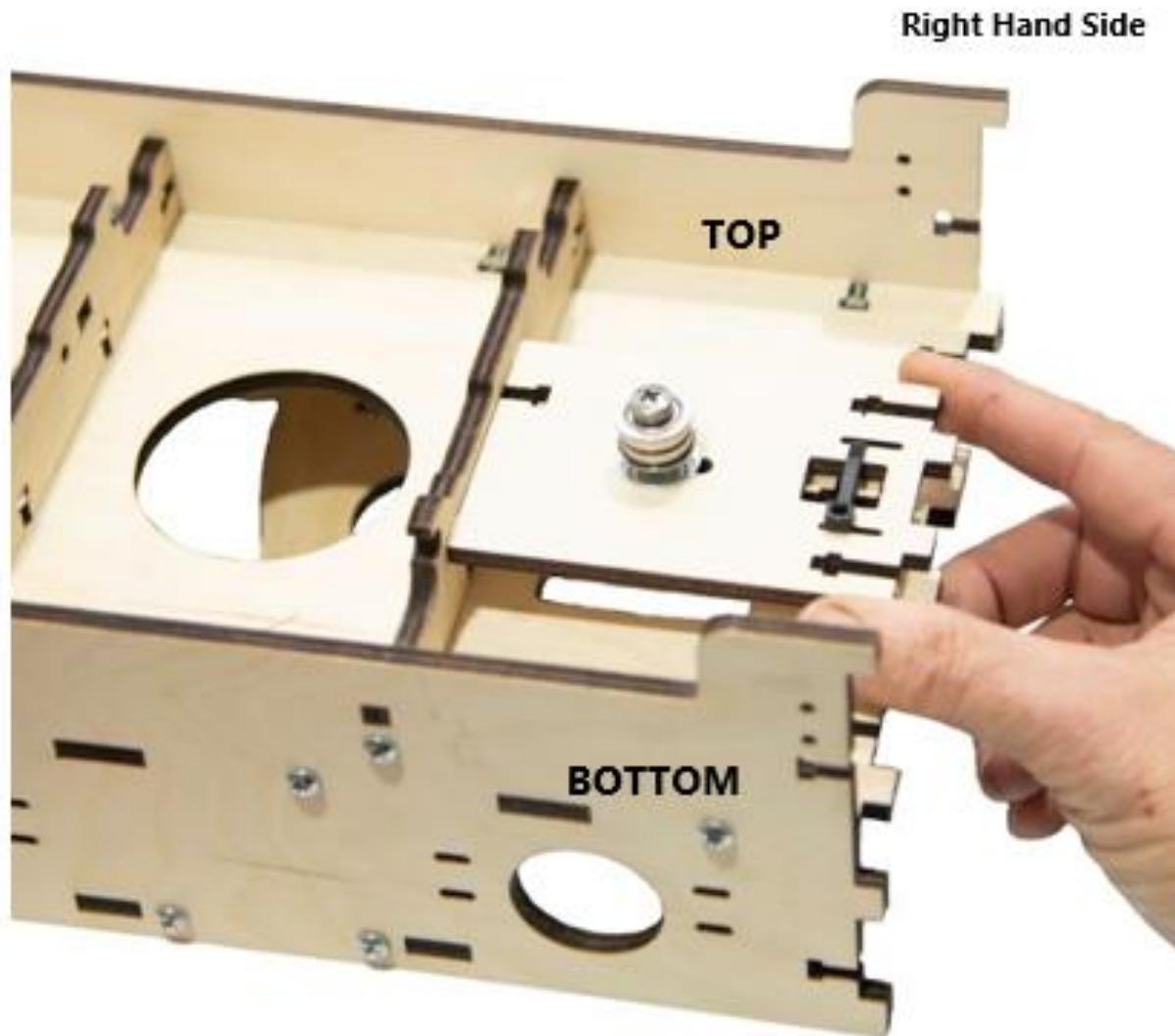
- 7e** Place a 1 ½" strip of painter tape on one side of the Y Belt Adjuster. Insert a M4 Nut and a Bearing Retainer Washer in the appropriate slots and cover with another length of tape.



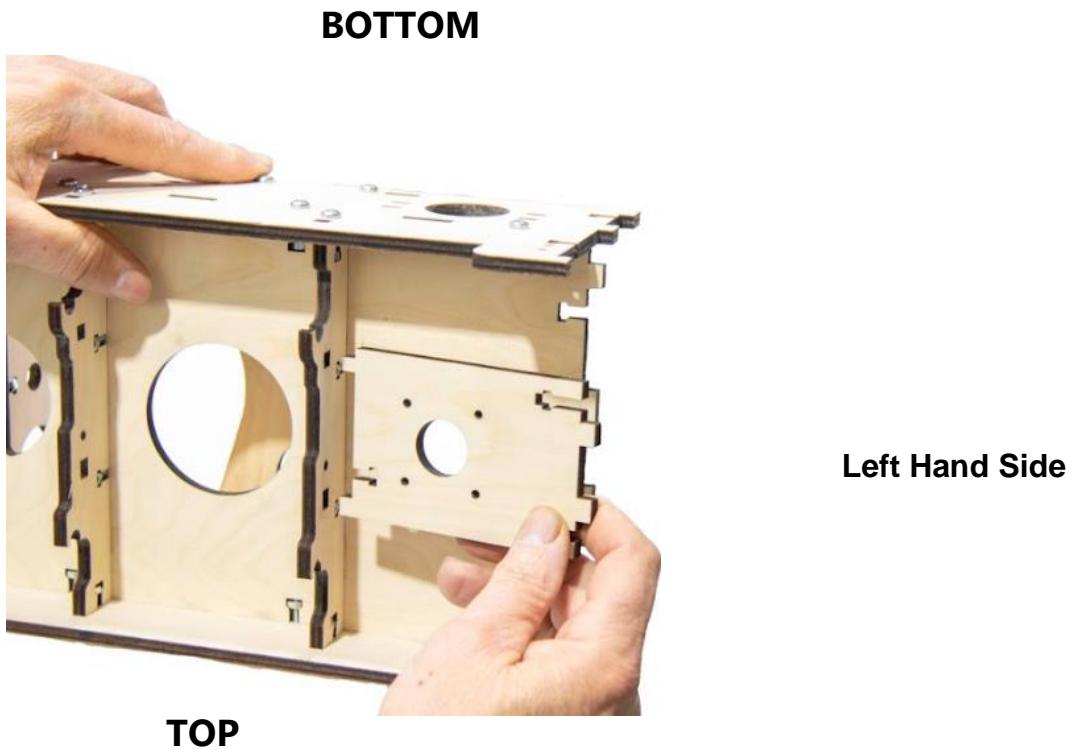
- 7f** Insert the M5 Lock Nut into the hex shaped hole in the X Belt Adjuster (GR13). Secure in place by threading an 8-inch Zip Tie through the slots as shown. NOTE: The Idler Support Assembly should slide up and down the X Belt Adjuster while keeping the Lock Nut secure.



Step 8 Align the Idler Adjustment Assembly into the slots of the Gantry Frame Assembly as shown. Secure the Adjustment Assembly in place with one M4 x 16 Machine Screw and Nut. In the photo below, the Bearing Adjustment Access Holes are oriented to the top to simplify installation.

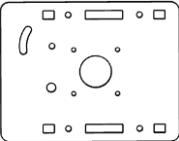
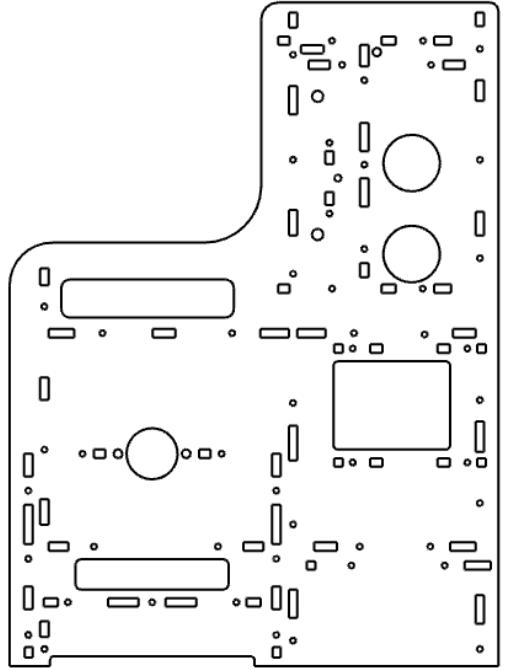
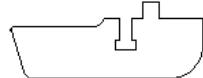


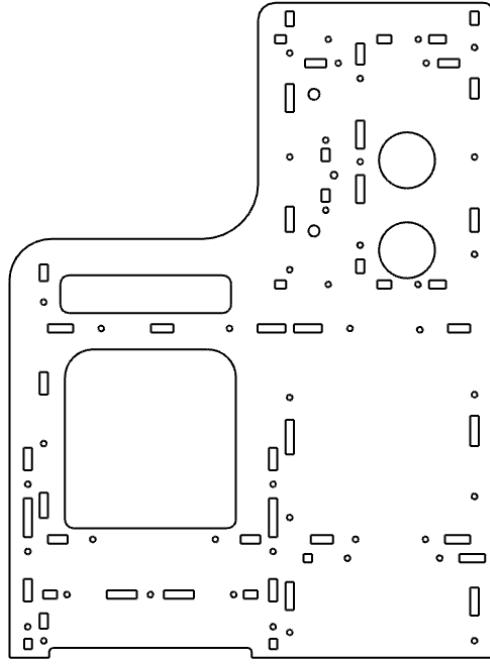
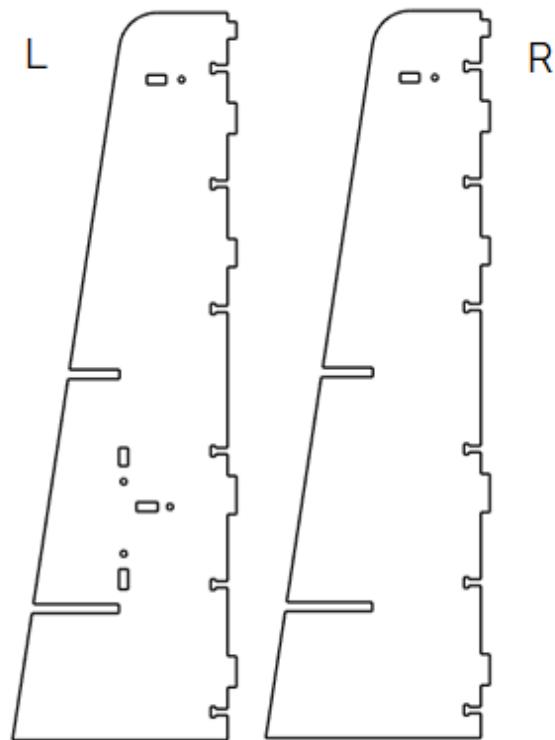
Step 9 Align and insert the tabs of the X Stepper Motor Mount (GR11) into the slots of Gantry Frame Assembly and secure with one M4 x 16 Machine Screw and Nut. In the photo below, the Bearing Adjustment Access Holes are oriented to the bottom to simplify installation.

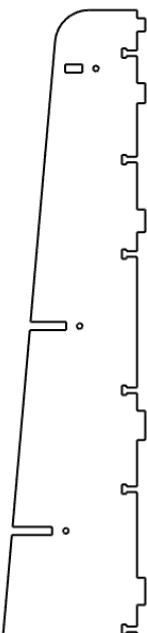
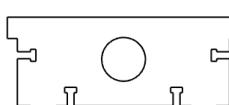
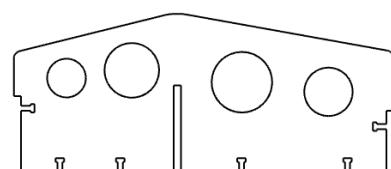


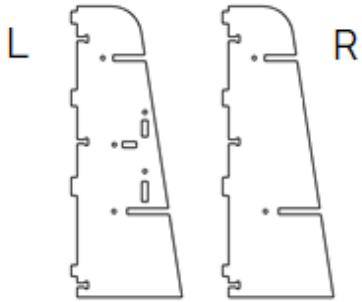
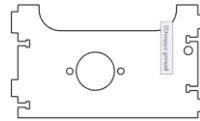
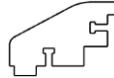
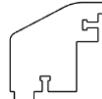
Attaching the Base and Gantry Assembly

Required Wood Components

Part #	Description	Qty	Photo
GR2	A-Axis Stepper Motor Mount	1	
GR3	A-Axis Stepper Motor Support	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	
GR10	A-Axis Belt Tensioner	1	
GR14	Gantry Top Brace	2	
GR15	Gantry Mid Brace	2	
GR16	Gantry Bottom Brace	2	

GR19L GR19R	Gantry Front Vertical Support	2	
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	119	
H15	M4 Nut	119	
H42	Bearing Fender Washer	1	
H69	12mm Pillow Block Bearing	2	
H73	M6x20 Socket-head Screw	5	

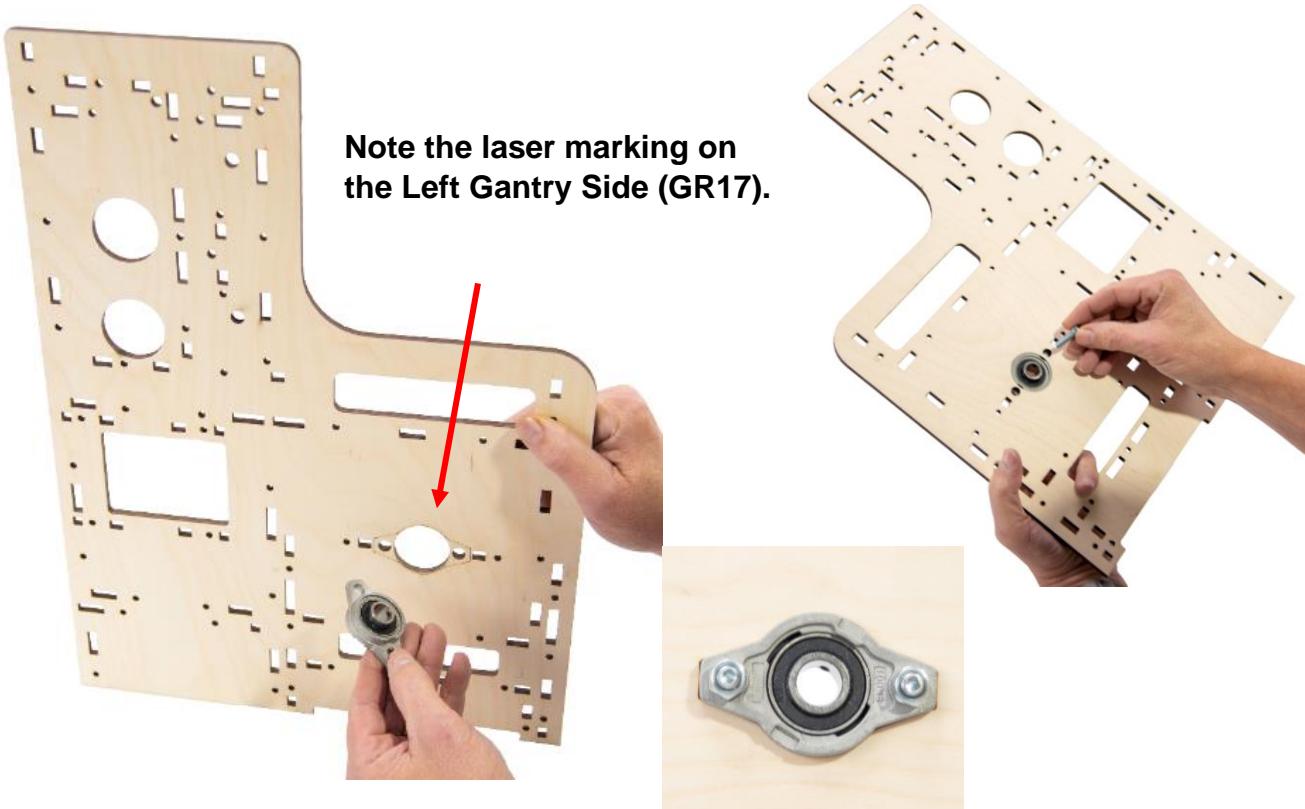
M18	M6 Lock Nut	5	
H9	1/4 - 20 X 2" Screw	1	
H45	1/4 - 20 Wing Nut	1	
H10	1/4 - 20 Nut	1	
H75	3/4 Spacer	1	

Illustrated Step by Step Instructions

TIP
T

**Do not tighten completely until the live center in place.
This will aid in alignment of the pillow block bearings
with the Chuck Shaft in a later step.**

- Step 1** Attach a 12mm Pillow Block Bearing to the Left Gantry Side (GR17) and secure with two M6 x 20 Socket Head Screws and Locking Nuts.

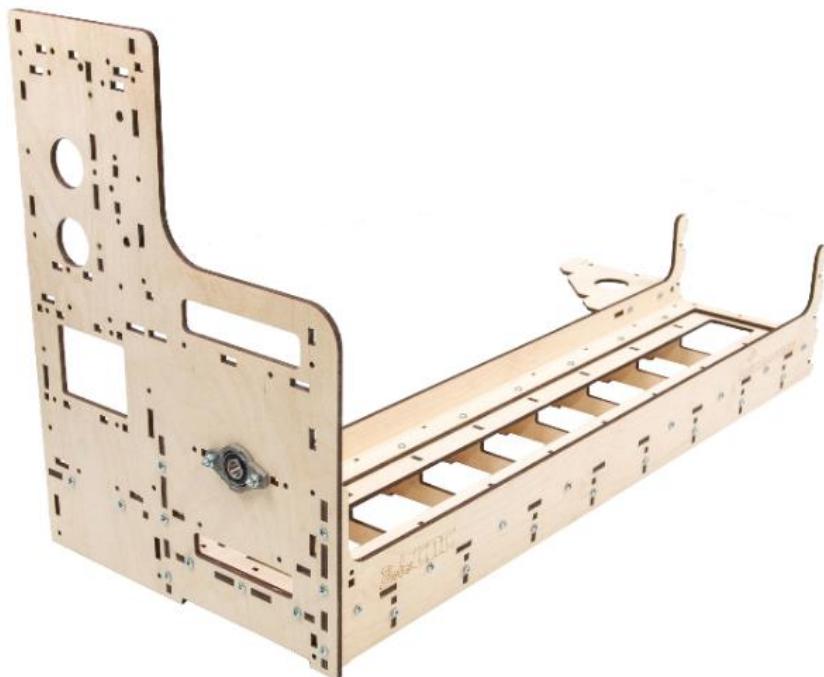


- Step 2** Align and insert the tabs of the Gantry Frame Assembly into the slots of the left Gantry Side Assembly and secure with eleven M4 x 16 Machine Screws and Nuts.

Left Side



In this photo, the Base was set on end to make it easier to align the tabs in the Base Assembly with the Left Side of the Frame Assembly.



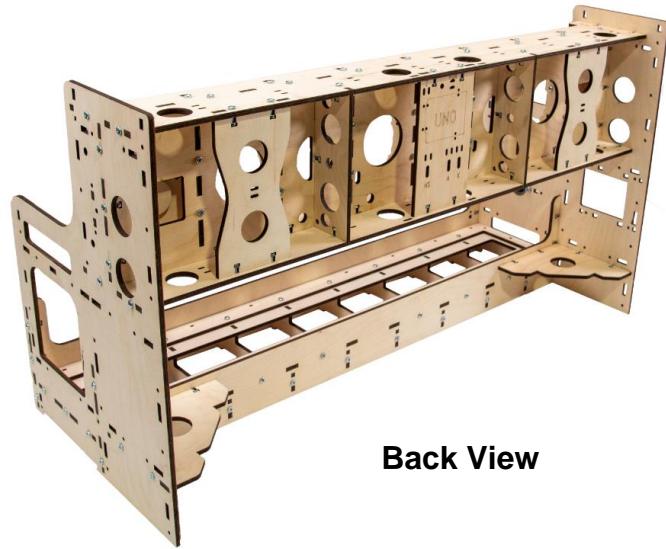
Step 3 Align and insert the tabs of the Gantry Frame Assembly into the slots of the Right Gantry Side Assembly and secure with eleven M4 x 16 Machine Screws and Nuts.



Step 4 Align and insert the tabs of the Gantry Frame Assembly and base into the slots of the Right Gantry Side (GR18) and secure with eighteen M4 x 16 Machine Screws and Nuts. Photos below show both sides attached to the Gantry and Base Assemblies.



Front View



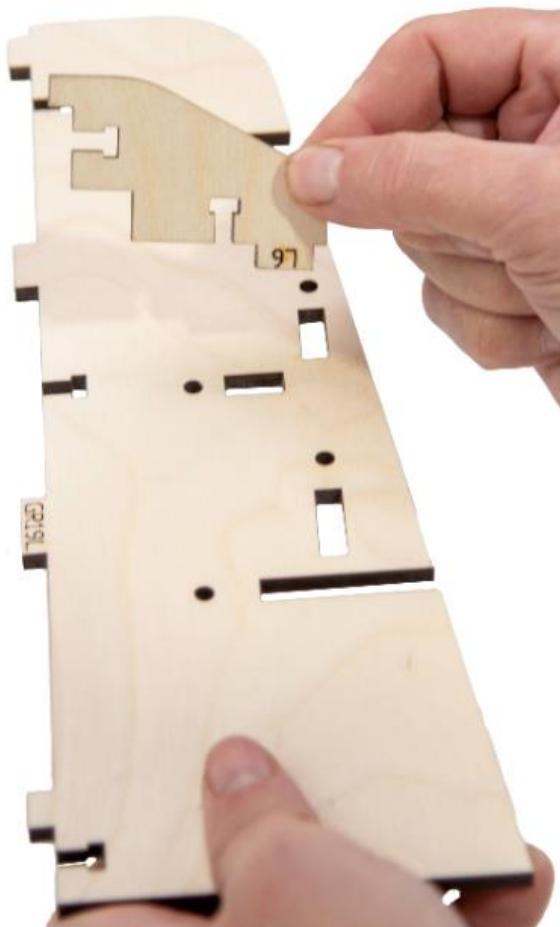
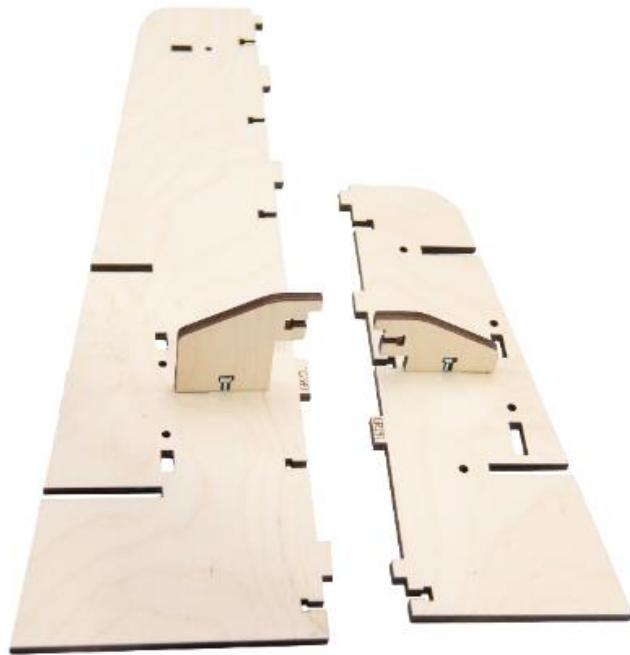
Back View

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 16Screw and Nut.

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



5c Insert a 12mm Pillow Block Bearing to the (L5) Chuck Support 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.



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



- 5g** Connect the Front, Mid and Back components as shown and secure with one M4 x 16 Screw and Nut.



- 5h** 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.



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



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



Completed Left Side



Step 6 Attach the Gantry Right Side Assembly Components.

- 6a** Insert the tab of the (GR14) Gantry Top Brace into the (GR20R) Gantry Mid Vertical Support 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 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.



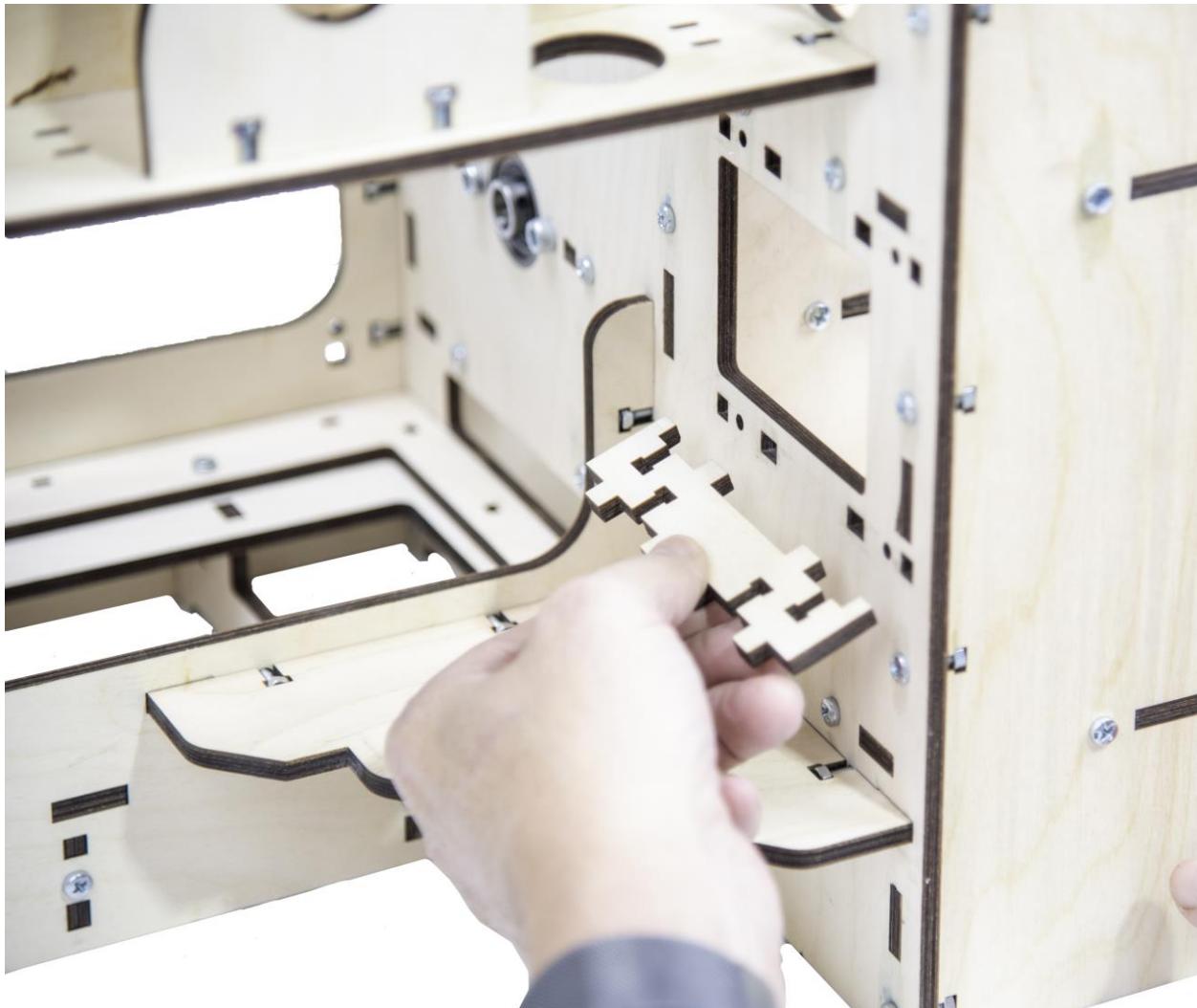
- 6f** Insert the Gantry Mid Brace (GR15) into the slots of the attached vertical supports and secure with six M4 x 16 Screws and Nuts.

Completed Right Side



Step 7 Attach A-Axis Stepper Motor Support

- 7a** Insert the tabs of the A Axis Stepper Motor Support (GR3) into the Left Frame Assembly slots and secure with two M4 x 16 Screws and Nuts.



Left Side, Rear View of Revolution

- 7b** Repeat for the remaining A-Axis Stepper Motor Mount (GR3) and secure with two M4 x 16 Screws and Nuts as shown.



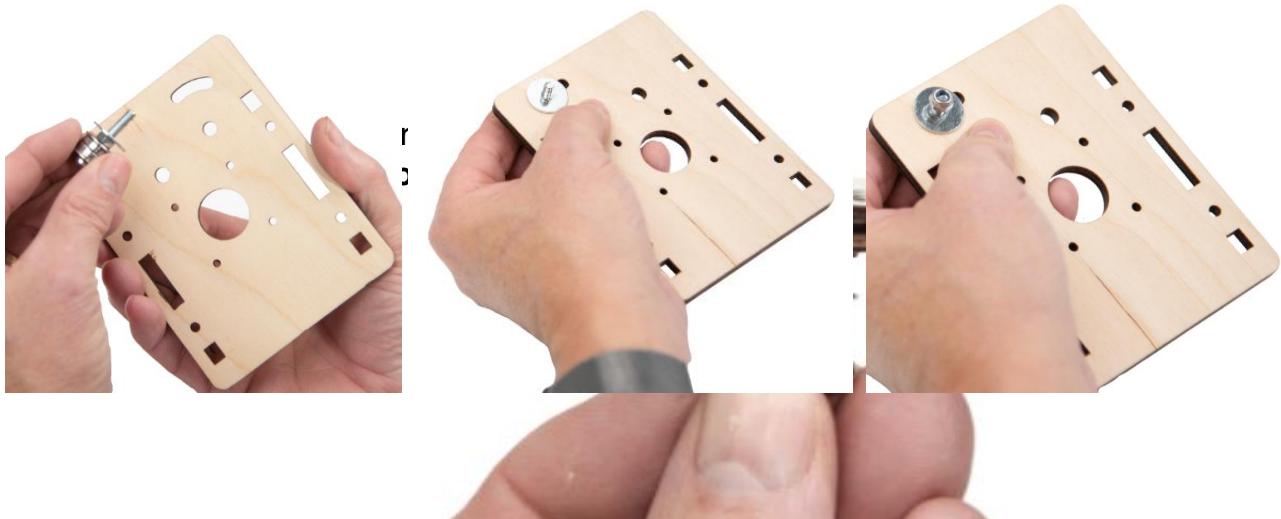
**Top and Bottom A-Axis
Stepper Motor Supports
Installed**

Step 8 Assemble the A-Axis Stepper Motor Mount

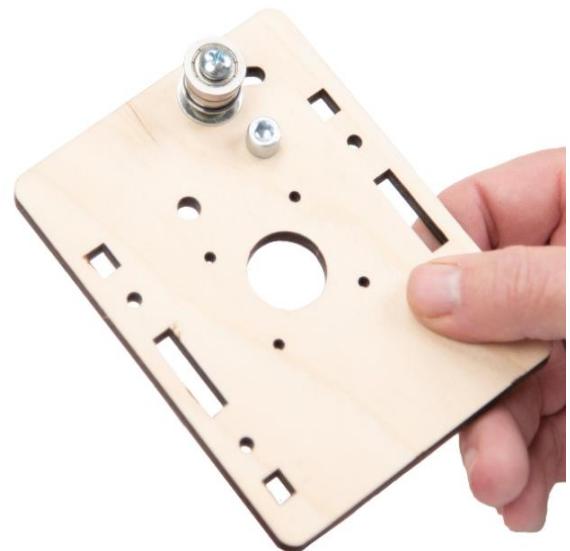
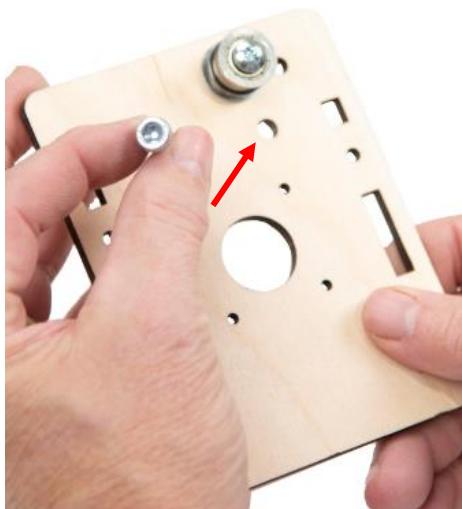
- 8a** Using the remaining previously built Idler Bearing Assembly (see pages 76-77)



insert the Idler Bearing Assembly, with an Idler Fender Washer, into the A-Axis Stepper Motor Mount (GR2), install a Idler Fender Washer and secure with a M5 Lock Nut.



- 8c** Insert a M6 x 20 Socket-head Screw through the hole below the Bearing as shown. The idler should be able to slide within the slotted hole.



Hold the Socket-head
Screw in place and turn
the Motor Mount over as
shown to place a Bearing
Fender Washer over the
Screw.





Insert the A-Axis Belt Tensioner (GR10) as shown.

Note: The hex shaped hole in the Tensioner is designed to fit over the Idler Assembly Lock Nut

Secure the Belt Tensioner (GR10) with a M6 Lock Nut.

The idler should be able to slide within the slotted hole.



8d Insert the $\frac{1}{4}$ - 20 X 2-inch Screw as shown.



8e Place the $\frac{3}{4}$ " Spacer on the Screw and snug in place with a $\frac{1}{4}$ -20 Nut.



- Step 9** Align the slots of the A-Axis Stepper Motor Mount Assembly with the tabs of the Stepper Motor Support and secure with four M4 x 16 Screws and Nuts.



- Step 10** Insert the Dial Indicator(L8) on the Front Left of the Frame Assembly and secure with one M4 x 16 Screw as shown.



TIP

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.



Step 11 Slide the 12mm Stainless Steel Shaft of the Chuck Assembly through the two mounted Pillow Block Bearings.

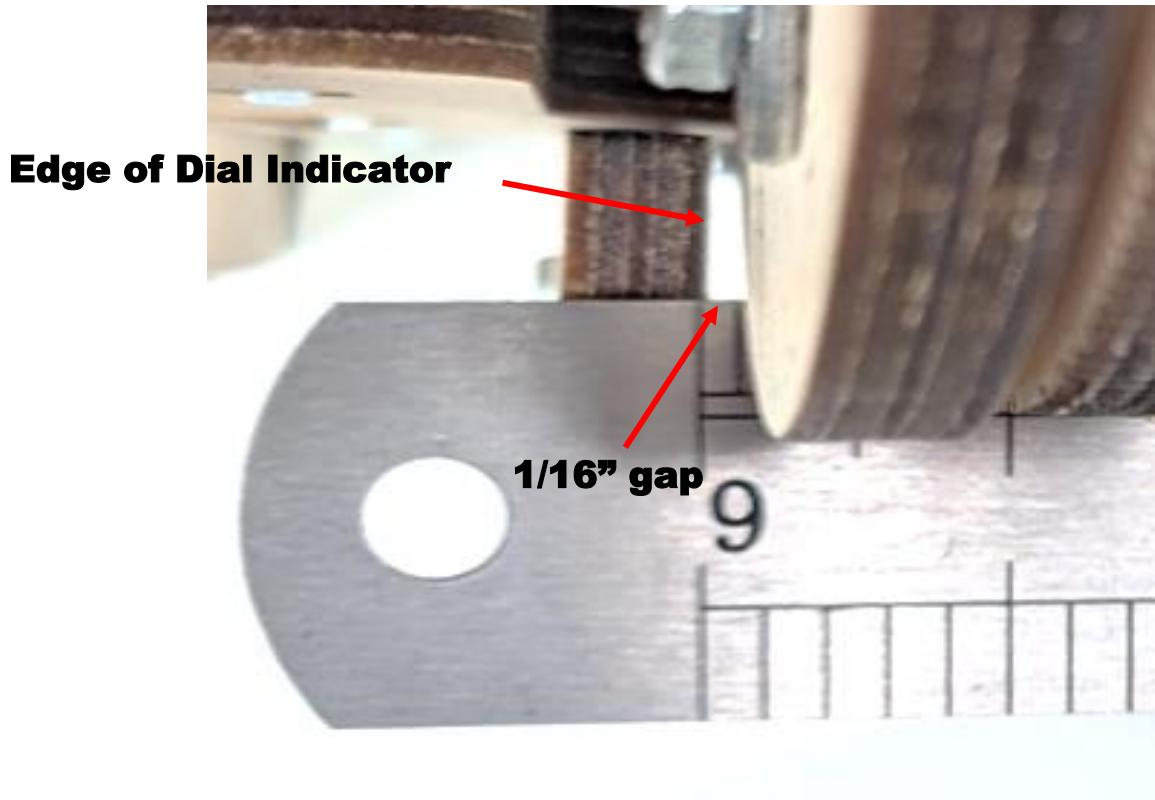


Inside View



Outside View

Step 12 Adjust the Chuck Assembly so there is a 1/16" gap between the Inner Chuck Plate and the Dial Indicator (L8) and tighten the two Set Screws on each Pillow Block Bearing and the Set Screws on the Chuck Flange.

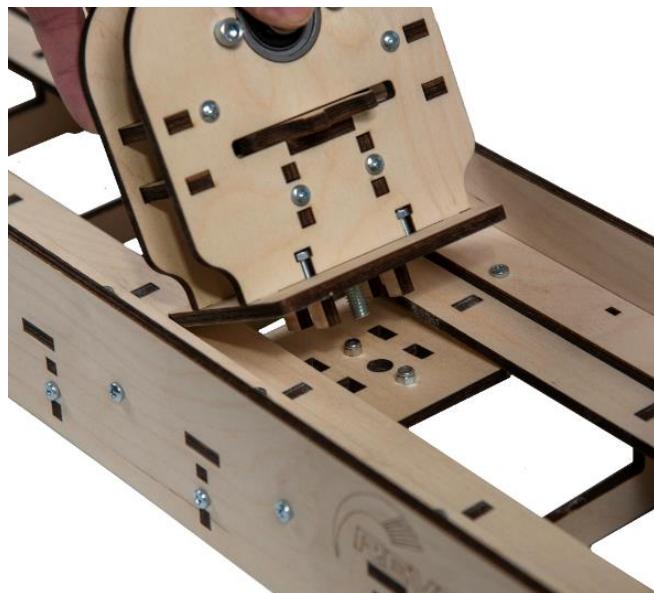


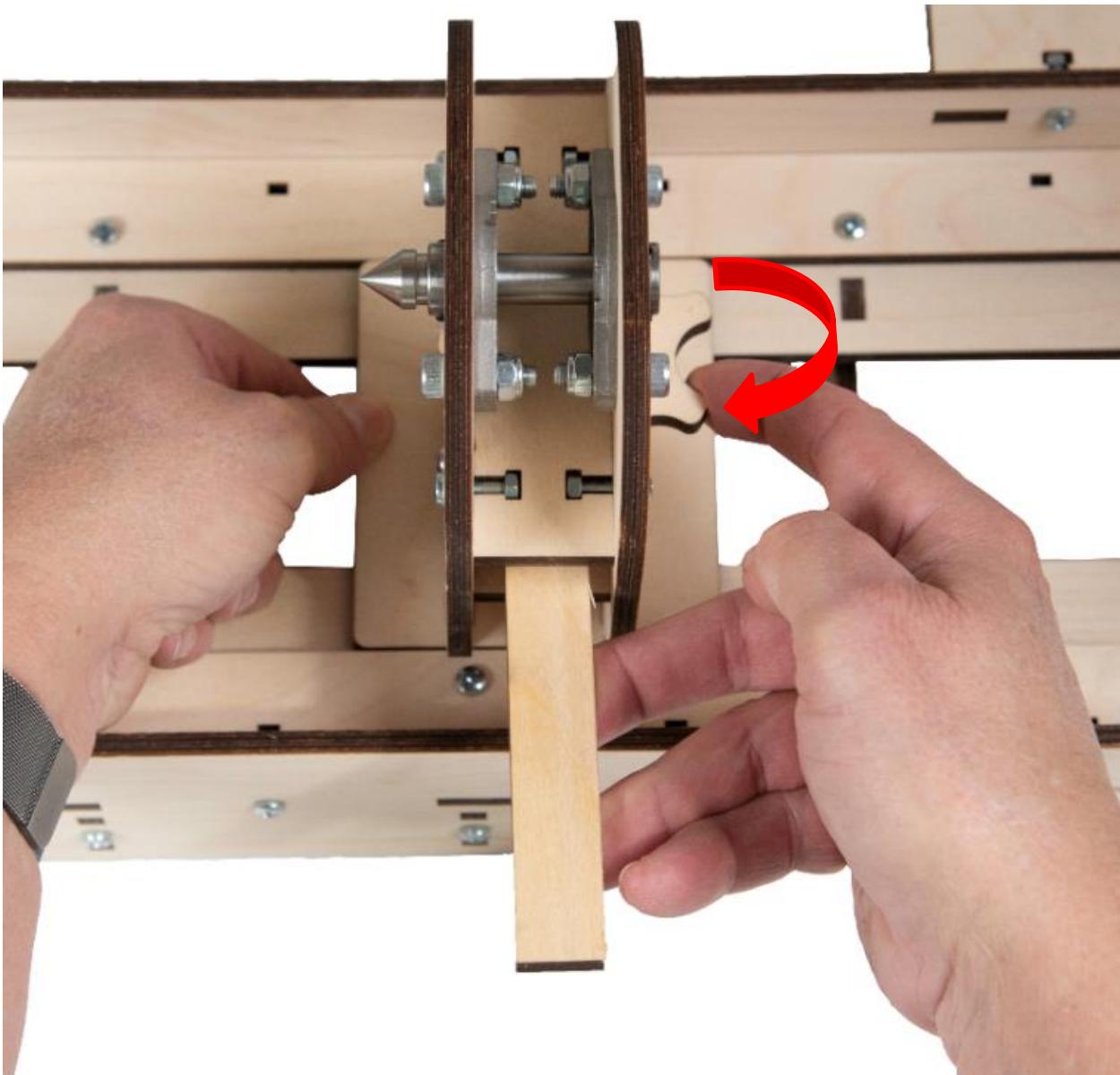
Step 13 Insert the Tail Stock Bottom Plate Assembly into the Base Assembly and position the Plate so that it can move from end to end beneath the Base Frame. **NOTE: The Nut Assembly is oriented toward the right end of the Base.**



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

Step 14 Align the tabs of the Tail Stock Guide and the threaded shaft of the Screw into the Bottom Plate.

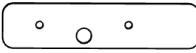
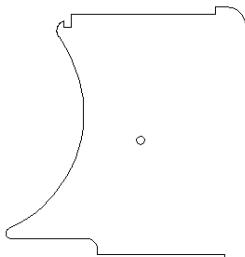




In the photo above a $\frac{1}{4}$ " thick piece of shim stock was inserted into the Live Center Assembly with one end positioned over the hex head of the 3" Screw. The shim was lifted to hold the hex head down. At the same time, the Tail Stock Top Plate and Bottom Plate are gently squeezed together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

Final Assembly

Required Wood Components

GR6	X Rail Stop	2	
GA1	21mm Pulley Gauge	1	
L1	Belt Guard	1	

Required Hardware

Part #	Description	Qty	Photo
H26	Small Zip Ties	30	
H56	GT2 Open Loop Belt	1	
H68	GT2 Closed Loop Belt	1	
H52	Stress Proof Steel X Rail	2	
H37	M3 x 10 Machine Screw	8	

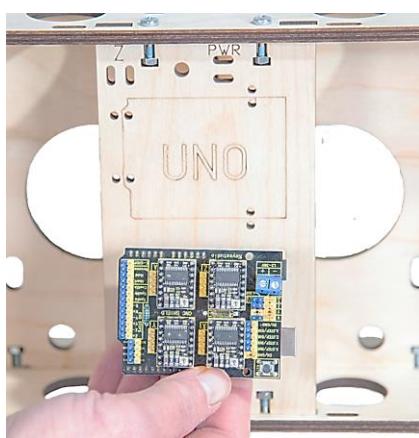
H38	M4 x 30 Machine Screw	5	
H45	1/4" x 20 Wing Nut	1	
H15	M4 Nut	4	
H27	M2.5 x 16 Machine Screw	2	
H43	M2.5 Lock Nut	2	
CB13	Home Switch	1	
CB12	Power Supply with cord	1	
CB16	UNO Controller	1	
H55	GT2 Pulley	2	
CB11	Stepper Motor	2	

Installing the Controller, and the X Axis Home Switch

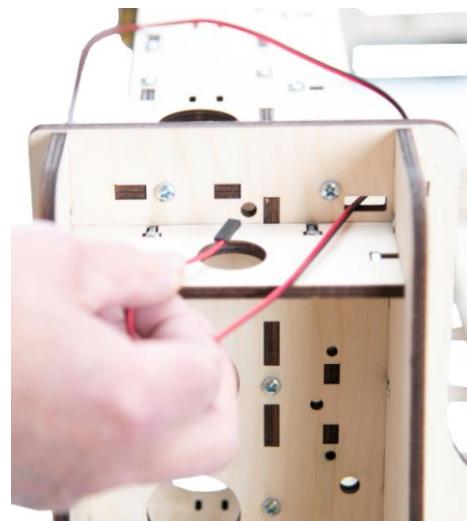
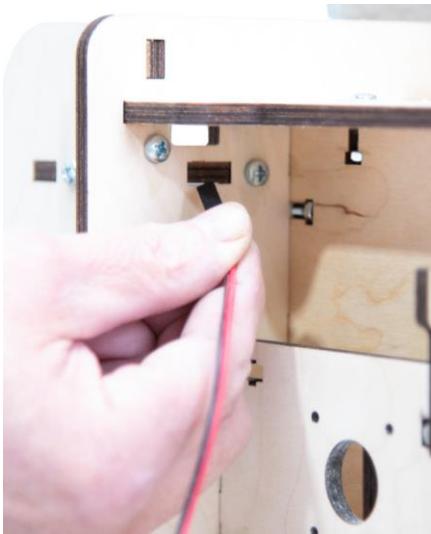


Home Switches are simple contact switches. They can create a transient voltage spike when opened or closed. Stepper Motors also generate electrical interference which can cause the Controller to act as if a Home Switch has been depressed. Most controller programs have a “switch debounce” routine that 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.

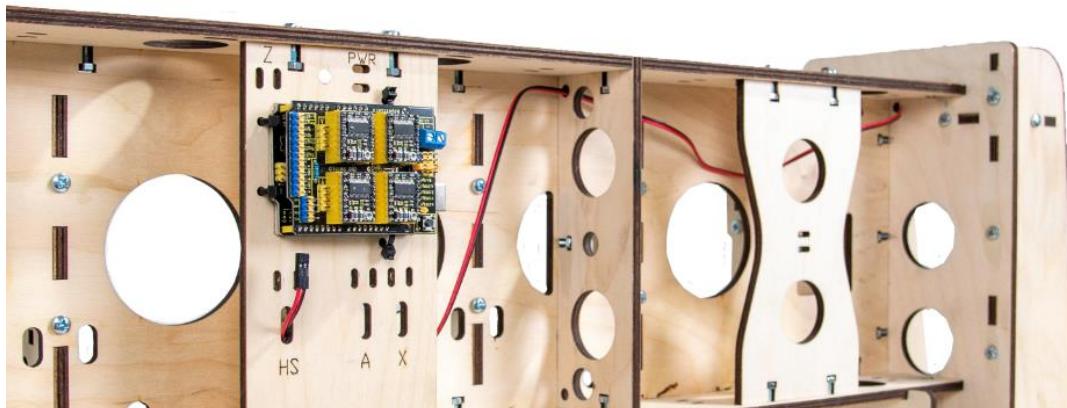
- Step 1** Install the UNO Controller to the Controller Mount on the Gantry Assembly using four Zip Ties as shown. NOTE: when threading the Zip Ties through the attachment holes, do not tighten until all four Zip Ties are installed. Do not over-tighten. Once installed, clip the loose ends of the Zip Ties.



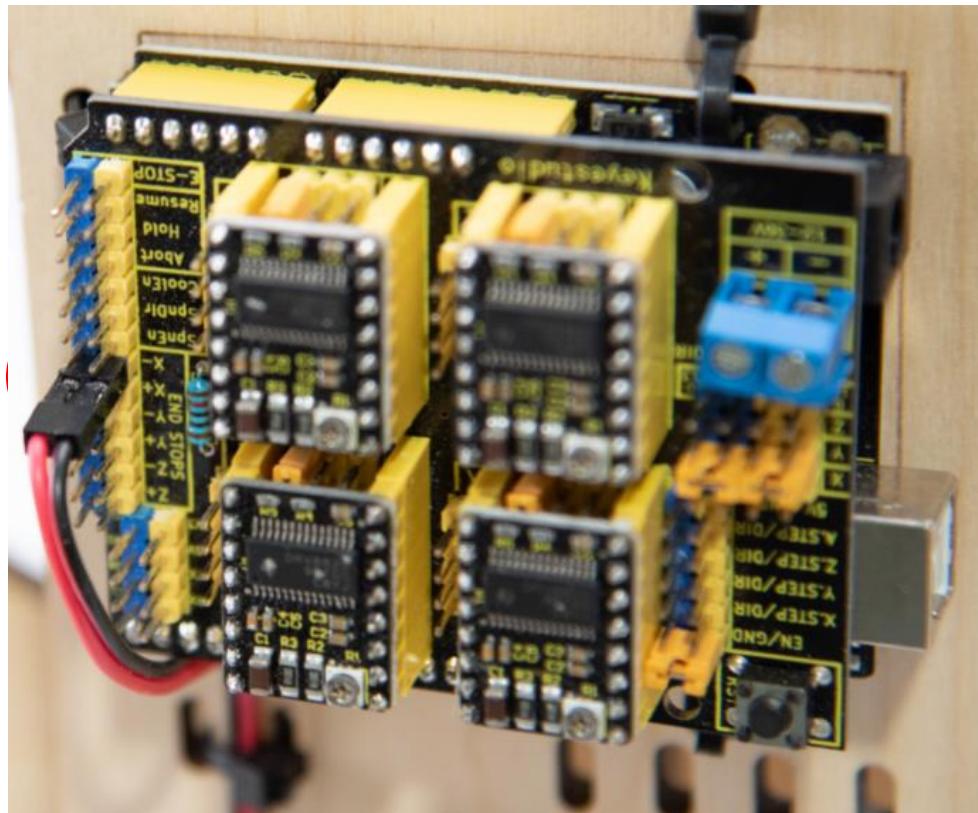
Step 2 Before Attaching the X Axis Home Switch to the Gantry, carefully thread the DuPont connector through the square access hole located in the upper left corner of the Gantry Assembly as shown below.



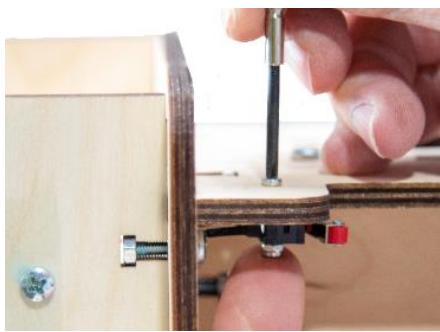
Thread the Home Switch Wire through the access hole in the top of the Side Assembly, across the interior of the Gantry and through the access hole in the top of the Gantry Back Brace. Finish by routing the female end through the back of the Controller Mount and through the hole marked "HS" as shown



Connect the 2 pin DuPont connector to the X- pin on the Arduino Controller as shown circled below.



- Step 3** Attach the X Axis Home Switch to the underside in upper left corner of the Gantry Assembly as shown and secure with M2.5x10 Machine Screws and Lock Nuts.



Installing the X and A Axes Stepper Motors:

Step 1 Use the 21mm Belt Pulley Gauge (GA1) to install the Belt Pulley on both Stepper Motors. Make sure the legs of the Gauge are set flat on the Motor Housing as shown.

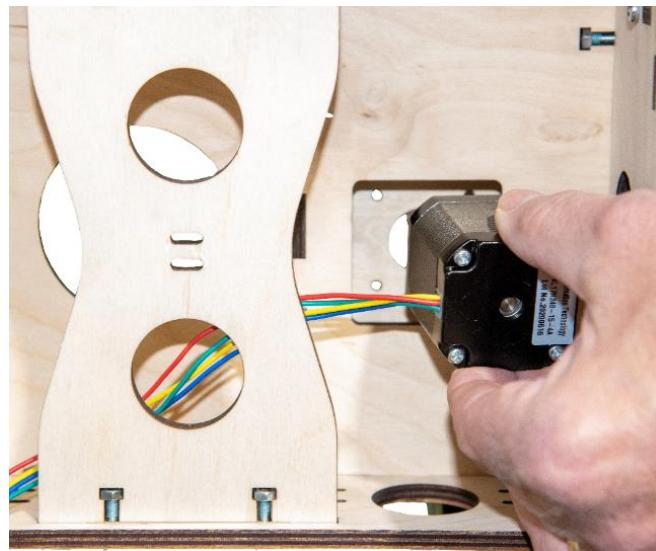


Insert the Pulley onto the Motor shaft. Snug one of the Set Screws against the flat on the shaft and lift the top flange of the Pulley against the top of the gauge opening as shown. Securely tighten the two Set Screws using Locktite 242™.

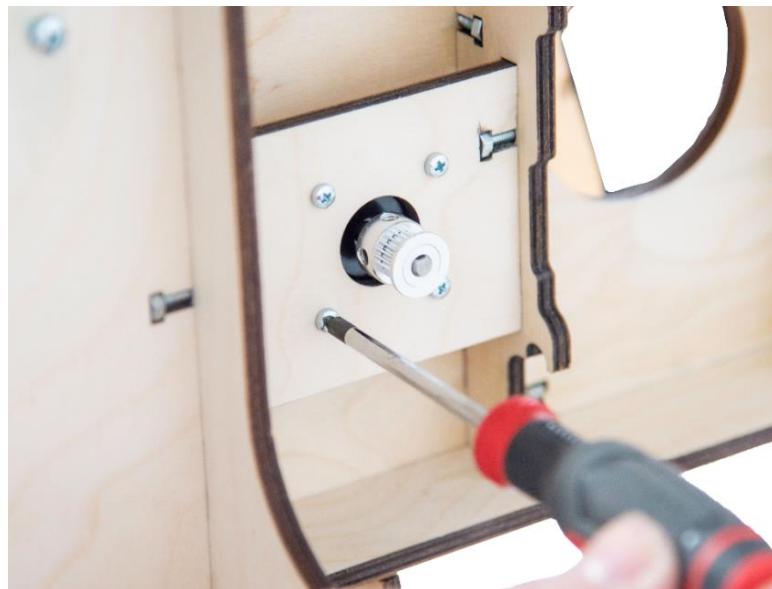


Step 2

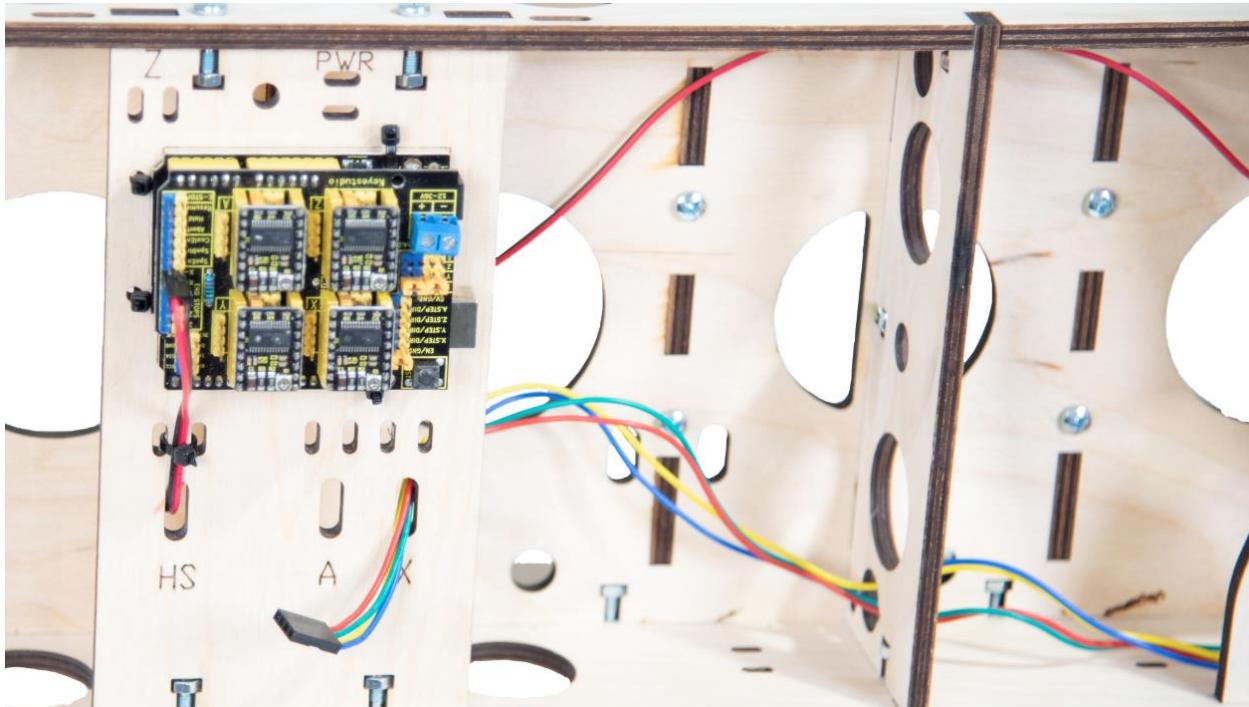
Position the X Axis Stepper Motor through the rectangular opening in the left end of the Gantry Assembly. Make sure to the wires are oriented to the left side of the Motor toward the controller mount.



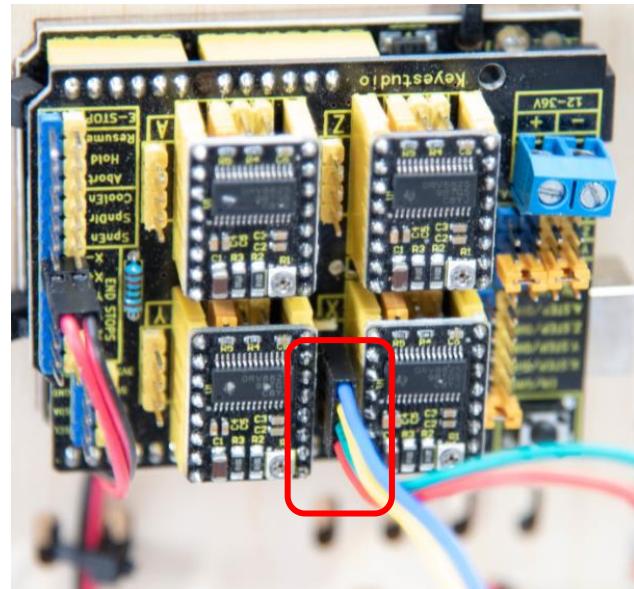
Secure the Motor in place with four M3x10 Machine Screws.



Route the wire across the bottom of the Gantry Assembly through small hole in the bottom of the Gantry Back Brace and through the X Slot in the Controller Support as shown,



- Step 3** Connect the 4 pin Dupont connector to the X Driver on the Controller as shown.
Note: All Stepper Motor connections to the Controller are made with the Blue Wire on top.



- Step 4** Position the A Axis Stepper Motor through the rectangular opening of the Left Side Assembly.



Note: The Stepper Motor is oriented so that the wires are at the top to make it easy to route the wires up through the Side Assembly.

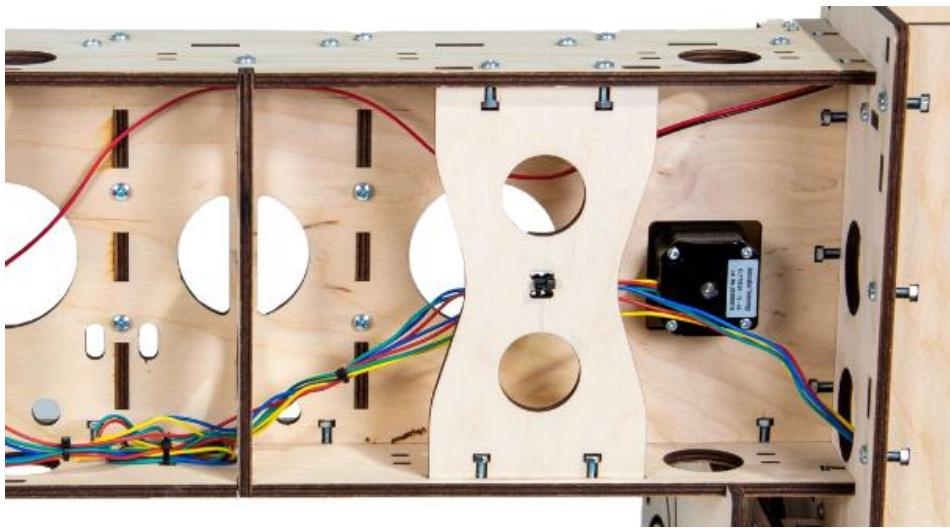
With the Belt Pulley protruding through the hole, secure the Stepper Motor with four M3 x 10 Machine Screws.



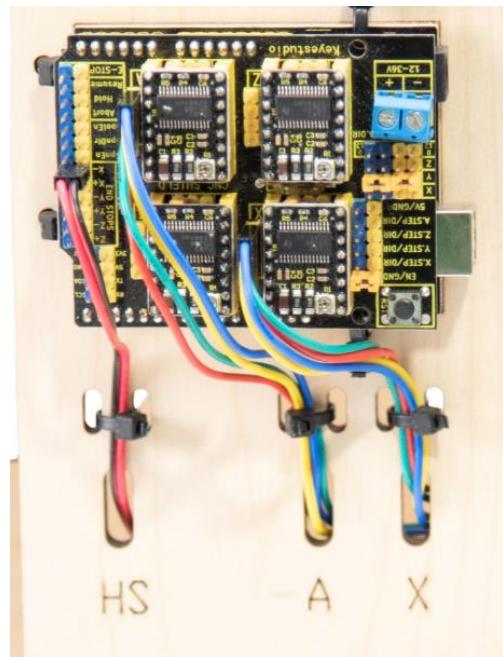
Step 5 Route the A Axis Stepper Motor wires up and through the Side Assembly and across the Gantry as shown.



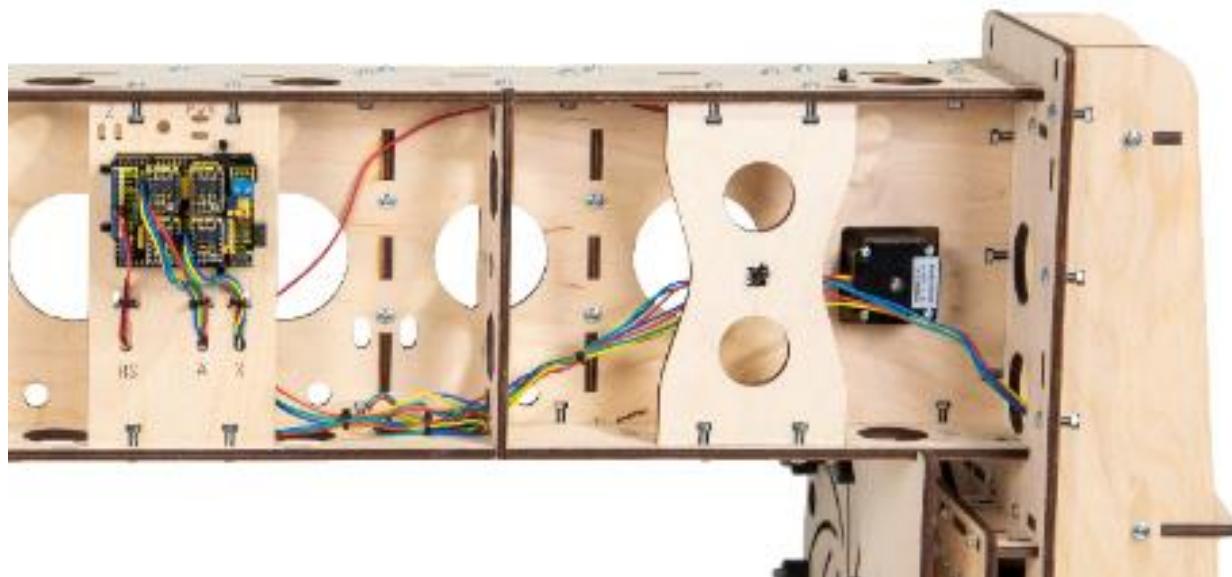
Secure the A and X Axes Stepper Motor wires together with Zip Ties, routing the A Axis wires through the hole in the bottom of the Gantry brace.



Step 6 Route the A Axis connector through the A opening in the Controller mount and connect the 4 pin Dupont Connector onto the pins of the A Axis Driver as shown.



Step 7 Secure the bundled wires together with Zip Ties every four inches and secure the bundled wires to the Gantry Assembly as shown.

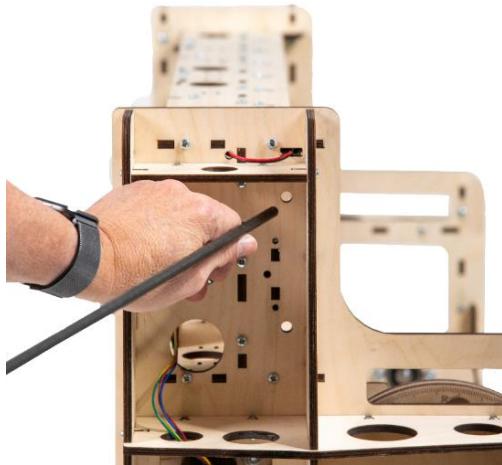


Installing the ZX Assembly



Rotate each Rail as you guide them through each of the components. This will help them to slide smoothly into place.

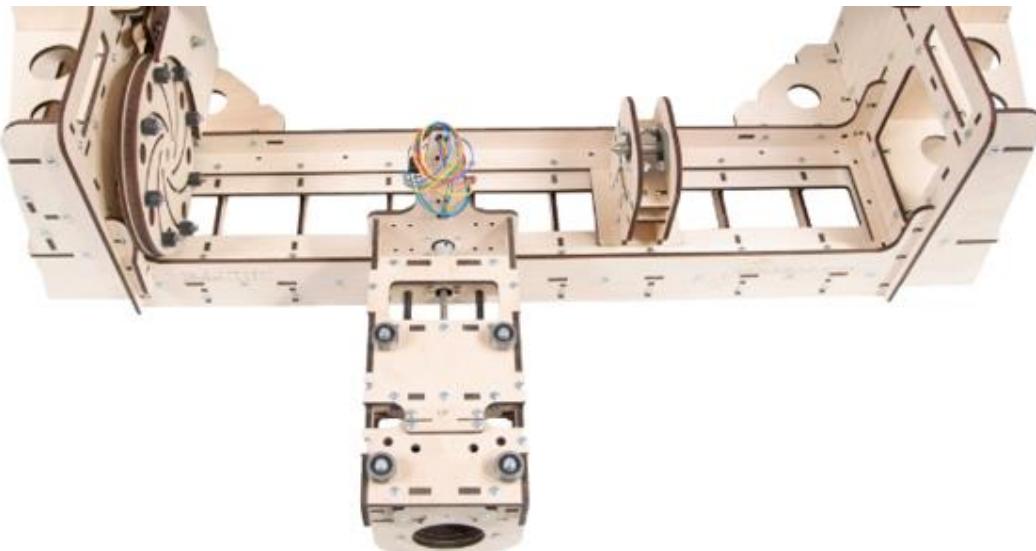
- Step 1** Insert the upper X Axis Rail through the top hole in the Left Side panel.



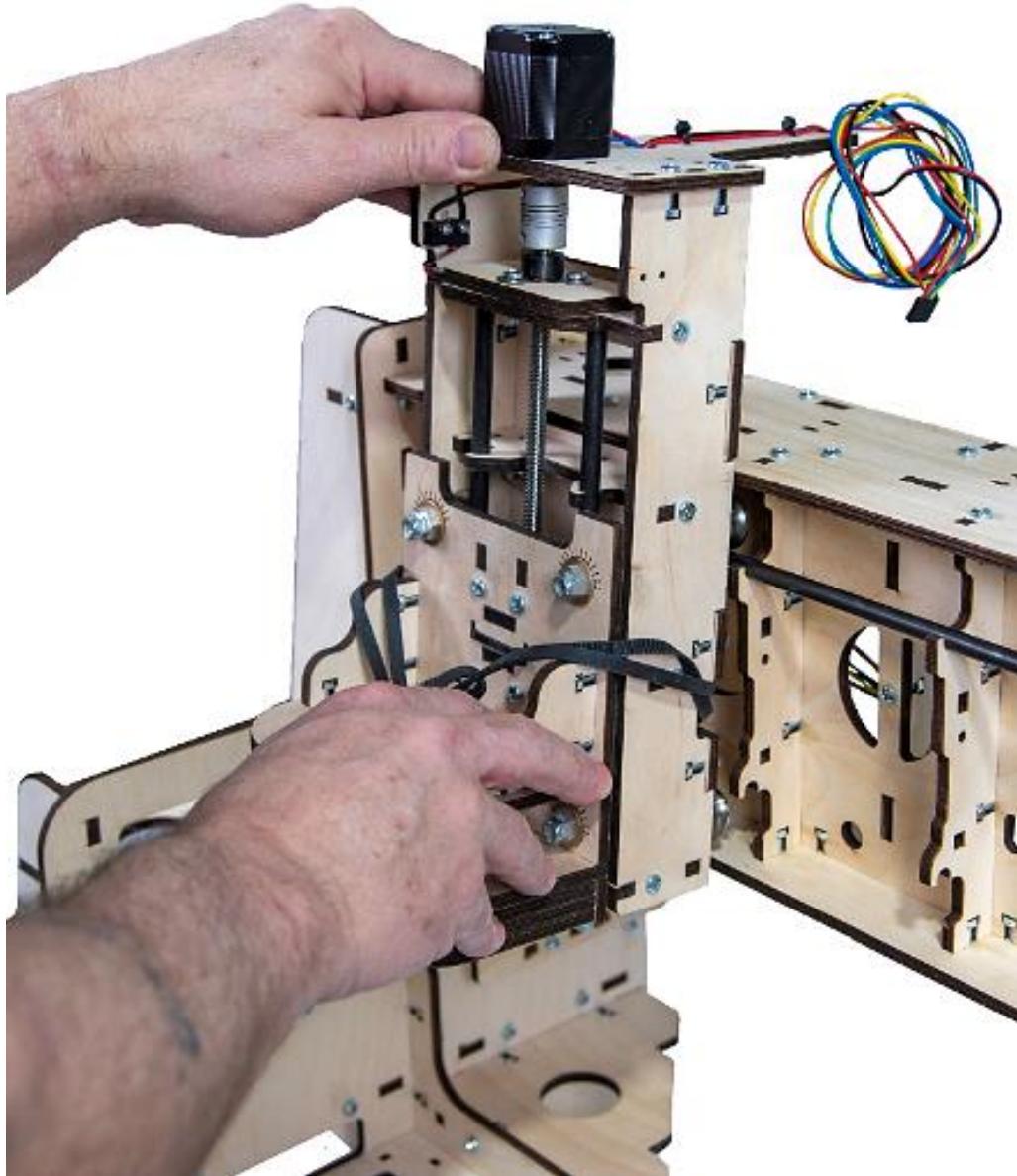
Carefully guide the X Rail through the Rail supports, across the Gantry and into the top hole in the Right-Side Panel.



Step 2 Cut the GT2 Open Loop Belt to 56 1/2 inches. Lay the Y Carriage Assembly on the Base Assembly and insert the ends of the X Axis Belt into the Belt Retainer, making certain the Belt is not twisted.

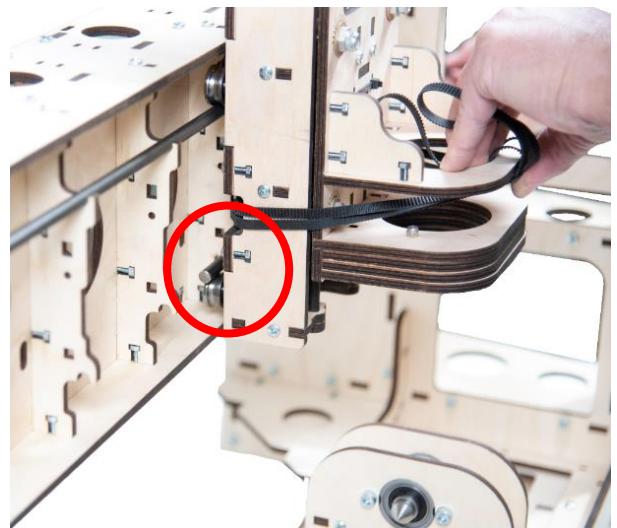


- 2a** Carefully loop the Belt around the X Carriage Assembly, making sure the ends remain secure in the X Belt Retainer. Then hang the upper Bearings of the X Carriage Assembly onto the upper X Rail as shown, being careful to keep the Belt between the upper and lower Bearings.





With the Belt out of the way, insert the lower X Rail through the Gantry Side, through the lower Rail Supports, over the top of the lower SG20U Bearings, and across into the opposite Gantry Side.



- 2b** Attach the Rail Stops to each end of the Gantry Side using two M4 x 30 Machine Screws and Nuts for each side as shown.



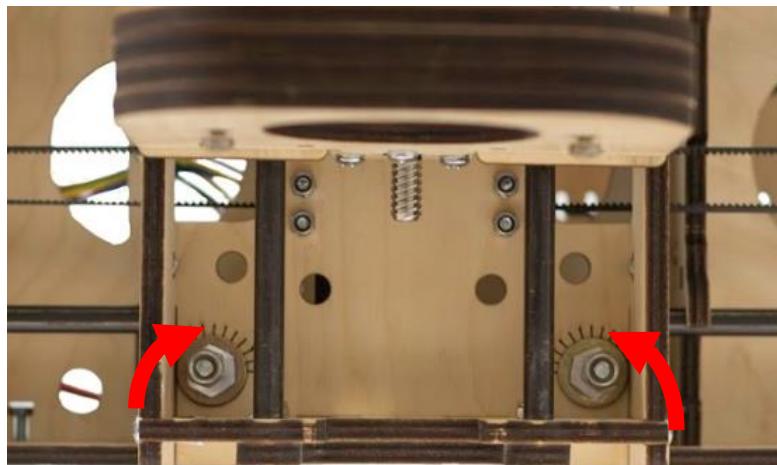
- 2c** Loop the G2 Belt over the Idler Pulley at the right end of the Gantry as shown. Make sure the Belt is not twisted and that the Belt teeth are oriented as shown.



- 2d** Loop the other end of the Belt over the Belt Pulley as shown. Make sure the teeth in the Belt engage the teeth of the Belt Pulley.



- Step 3** Adjust the X Carriage Eccentric Spacers equally on both sides using the alignment marks to tighten Bearings against the Rail as shown.



Clockwise

Counterclockwise

- 3a** Align the access hole in the Gantry with the Bearing Screw. Using a 10mm socket and a Phillips Screwdriver, tighten the Lock Nuts to secure the 4 Bearing positions.

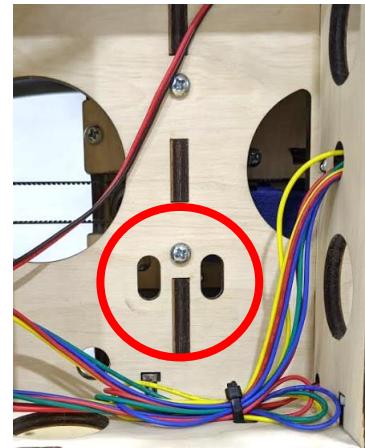


Step 1 Installing the Makita RT0701C Router.

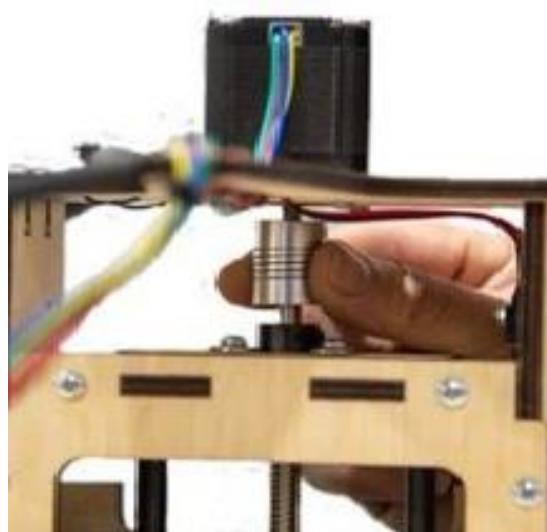
- 1a** Insert the Router into the Holder and with downward pressure, gently twist the Router body until it is fully seated in place in the Holder.



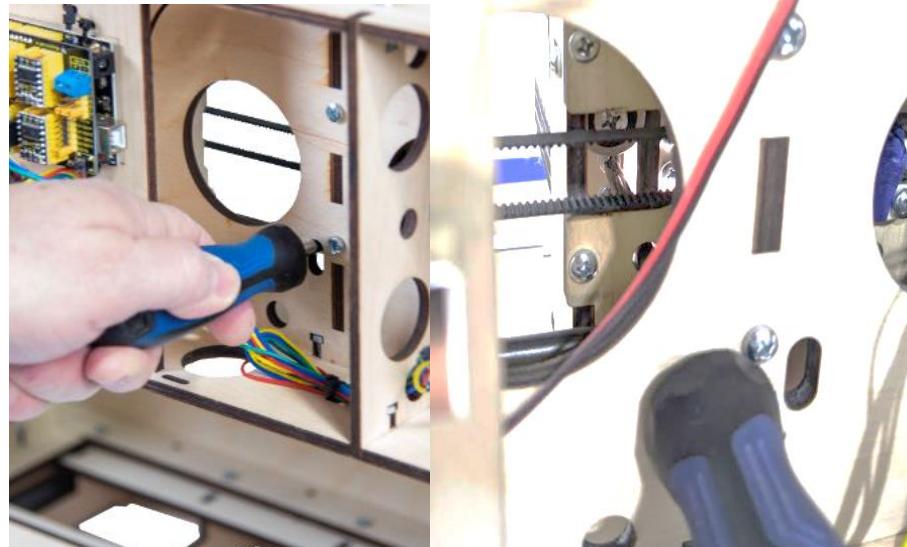
- 1b** The inner 4 screws will need to be tightened to clamp the router into the Z Mount. First, align each Screw with one of the elongated access holes in the back of the Gantry.



Note: To align the access hole with the Phillips head Screws, it may be necessary to raise or lower the Z Carriage. This can be done by manually rotating the Aluminum Coupler at the top of the Z-Axis as shown.



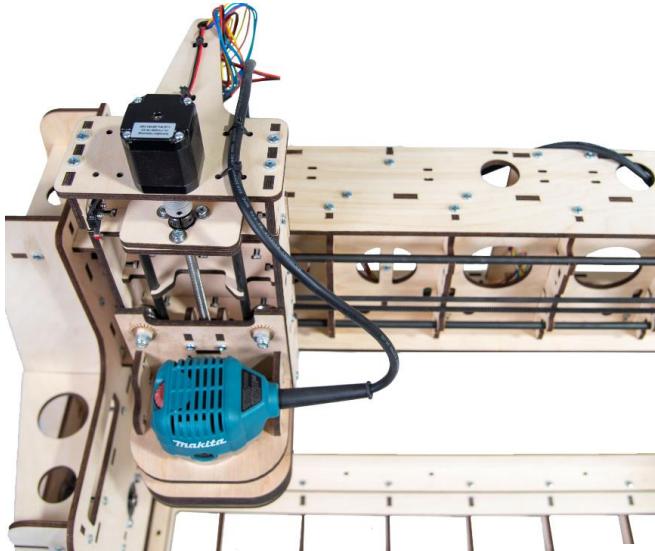
- 1c** With the Gantry and X Carriage aligned correctly, tighten the four Screws in the Router Z Mount.



- 1d** Tighten the 2 M4 X 30 Machine Screws and Lock Nuts to clamp the lower Router Mount.



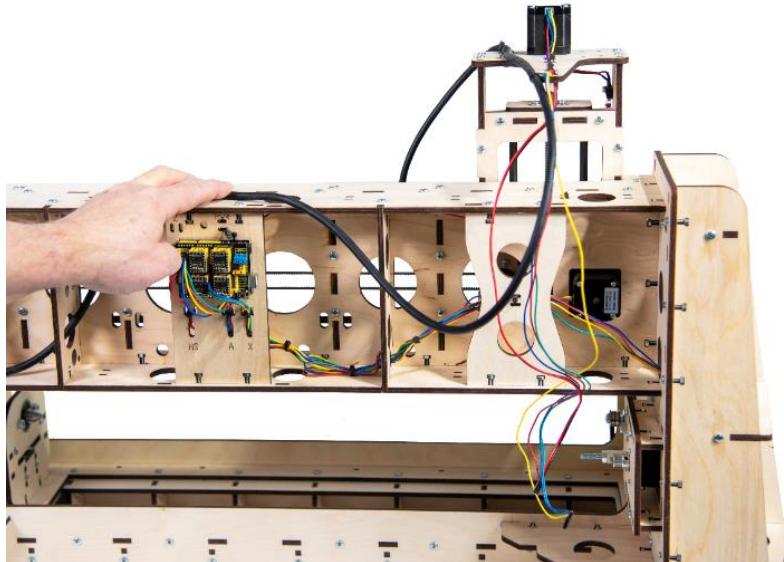
- 1e** Lower the Z Router Assembly as low as possible. Secure the Router Cord to the X Carriage and Gantry. Use Zip Ties to secure the Router Power Cord as shown. Be careful to route the Cord without putting stress on the stress relief as shown.



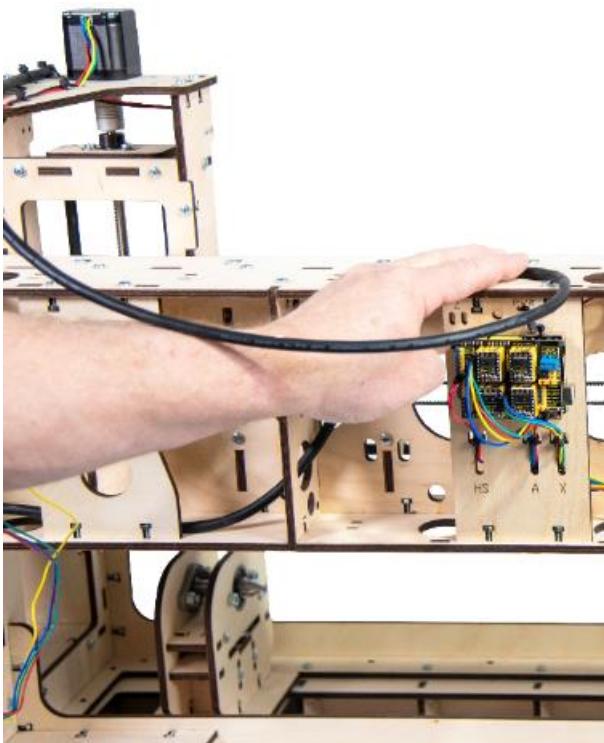
- 1f** Route the plug down and through the access hole on the right side of the Gantry Back Side as shown, then through the side access hole.



- 1g** Facing the back of the Gantry, slide the X Carriage all the way to the right. Allow enough slack in the cord so the X Carriage can travel from the right side of the Gantry to the left without binding as shown.

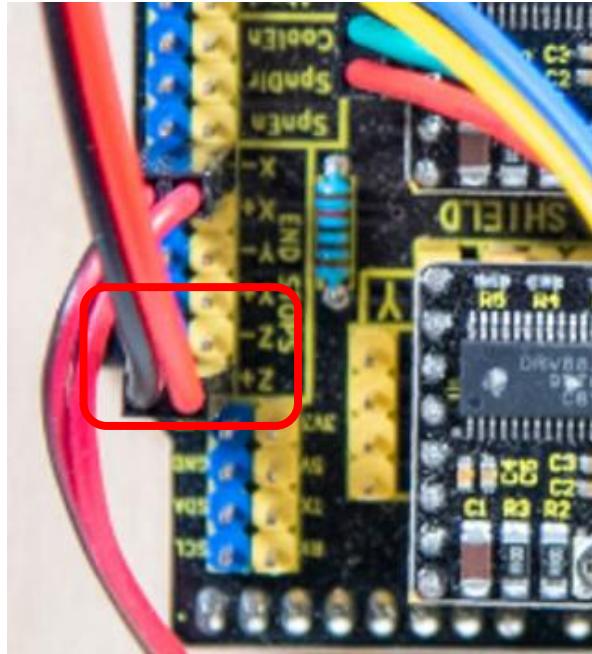


**Cord length estimated
from the right side.**

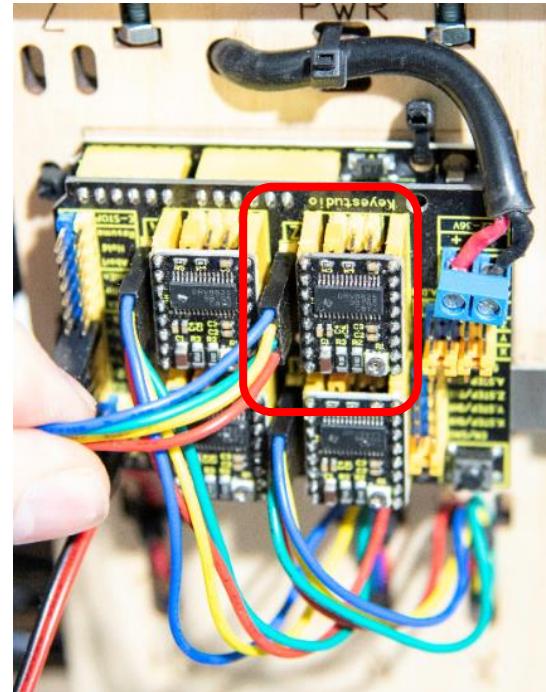


**Cord length estimated
from the left side.**

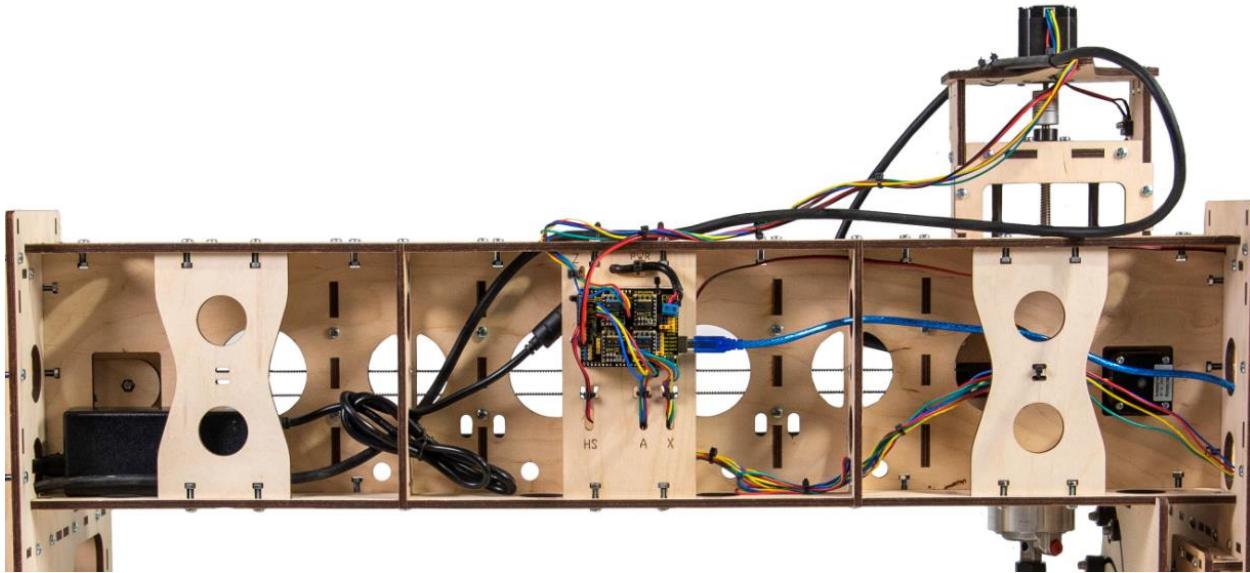
1h Connect the Z Axis Home Switch wire to the Z+ terminal.



11 Connect the Z Axis Stepper Motor wire to the Z+ terminal.



- 1i** Final Wire Management. Zip Tie the Power Cord to the top of the Gantry as shown.



Step 2 Tighten the X Belt

- 2a** Insert the M4 x 30 Machine Screw through the large hole in the X Rail Stop as shown. Thread the Screw into the Nut of the Y Adjuster Assembly. Verify that both ends of the belt are still completely inserted in the holder, then tighten the Belt by turning the Screw clockwise.



- 2b** Tighten the Screw on the Idler Pulley to secure Belt Tensioner as shown.

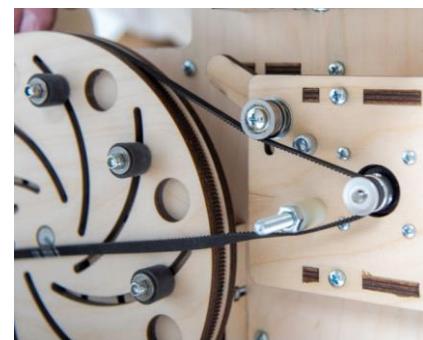


Step 3 Installing and tightening the GT2 Closed Loop A Belt.

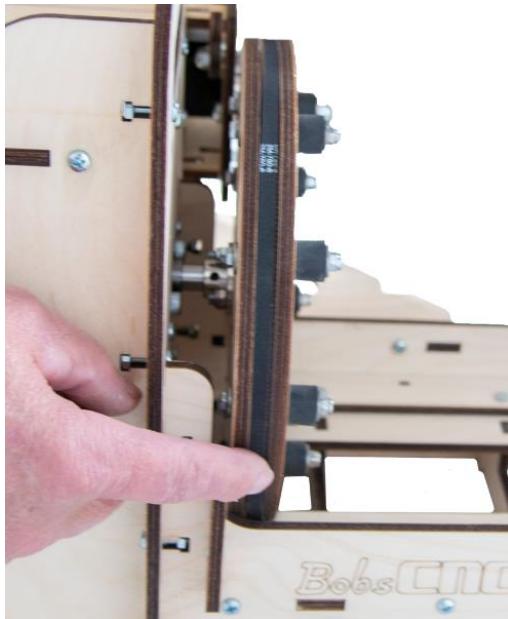
- 3a** Loop the belt around the Idler Pulley as shown.



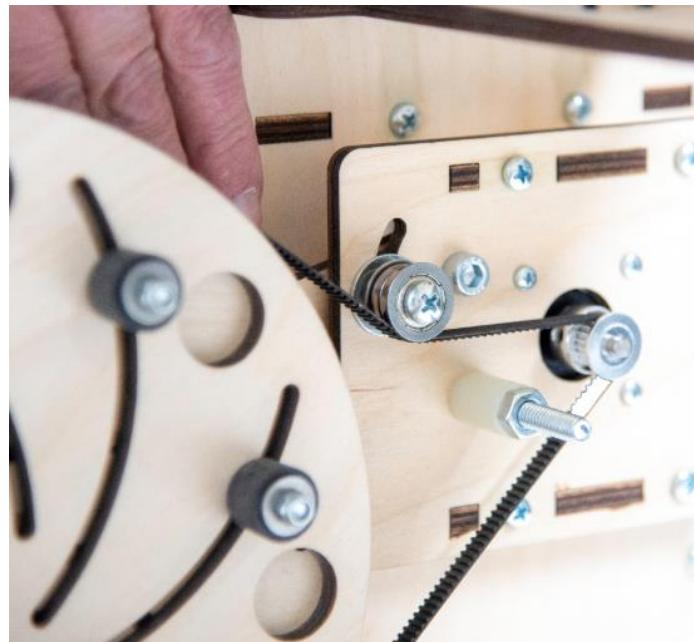
- 3b** Loop the belt beneath the Idler bearing and over the top of the Chuck Pulley as shown.



- 3c** Rotate the Chuck Assembly so that the Belt is surrounds the Pulley.



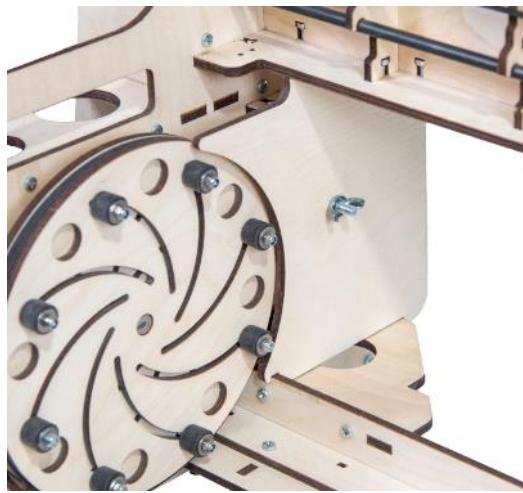
- 3d** Tighten the Belt by pushing the A Axis Belt Tensioner down which lowers the Idler Pulley down against the Belt as shown.



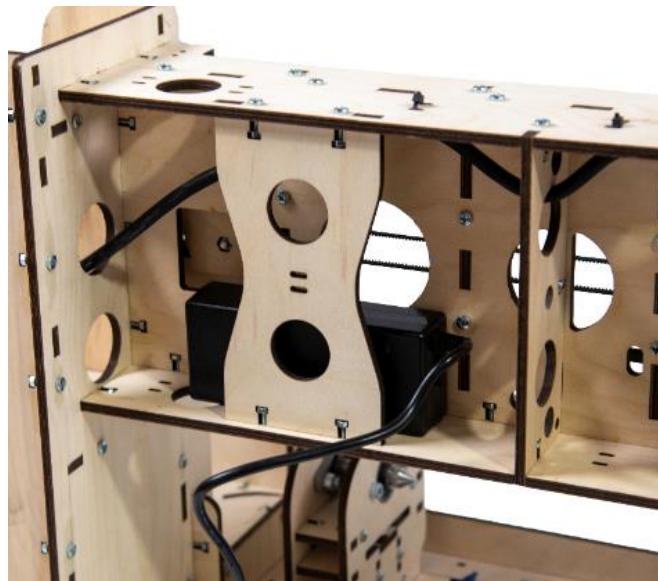
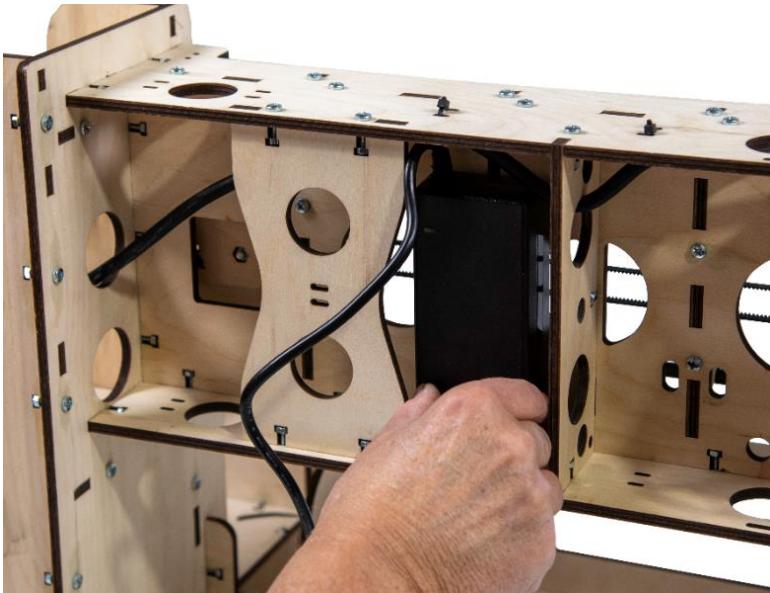
- 3e** Use a Phillips screwdriver to tighten the Idler Pulley in place.



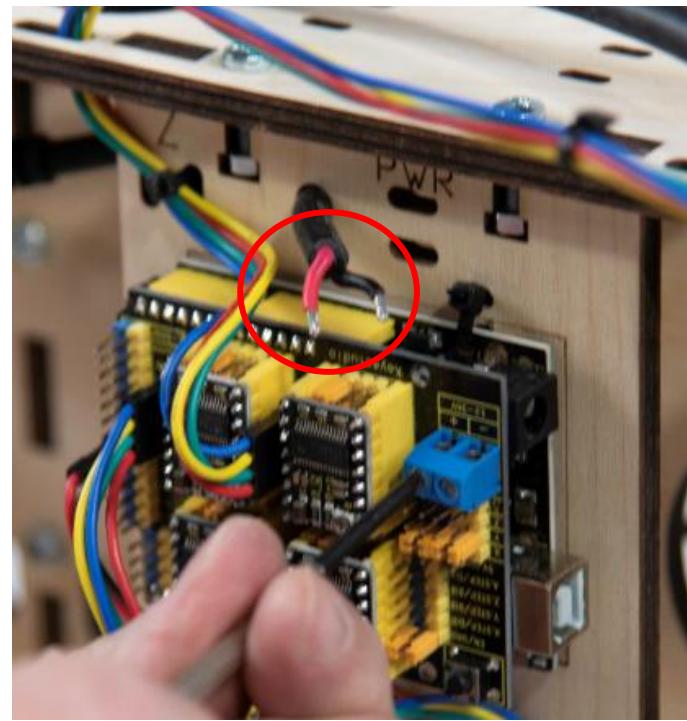
Step 4 Install the Belt Guard (L1) and secure with $\frac{1}{4}$ " x 20 Wingnut.



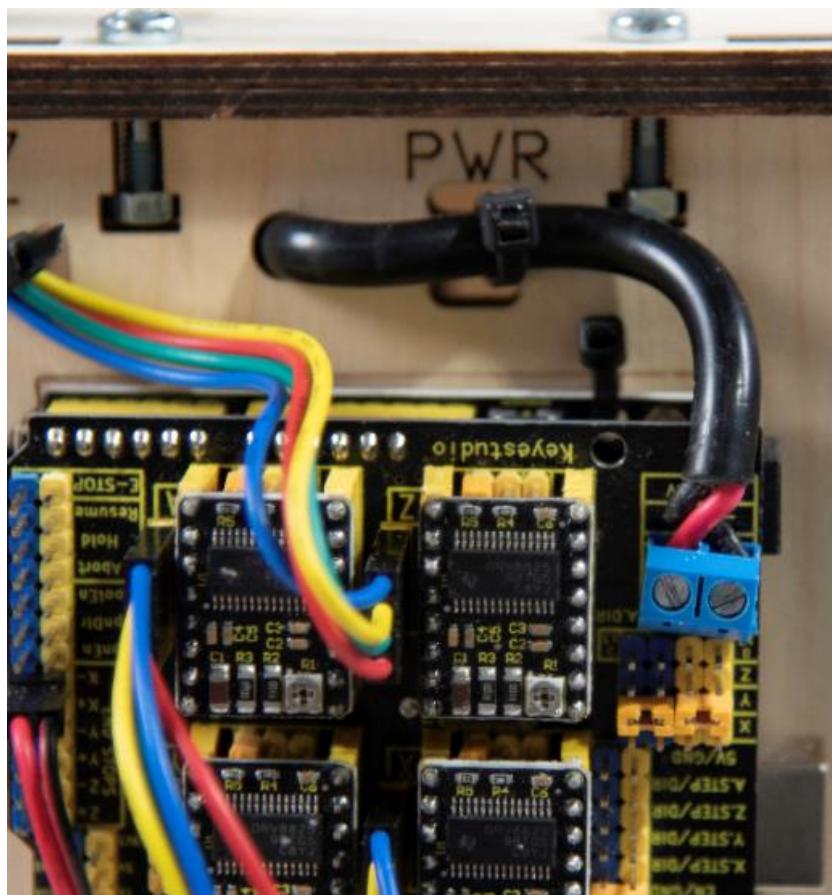
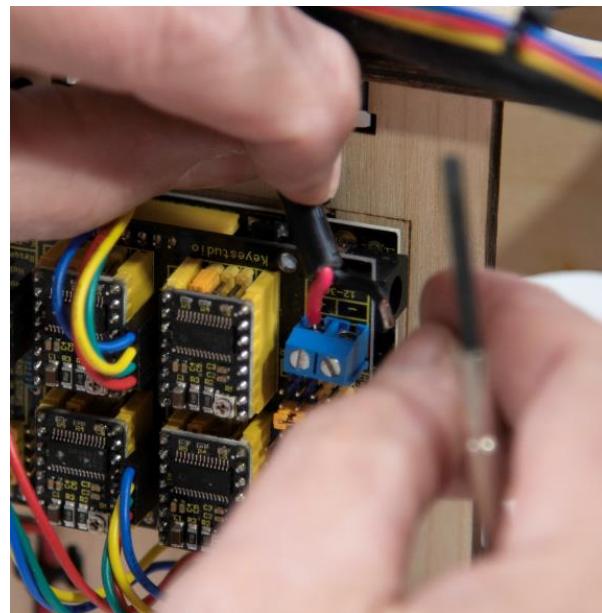
Step 5 Install the Power Supply on the end in the back right side of the Gantry and then lay it horizontally behind the Gantry Back Support as shown.



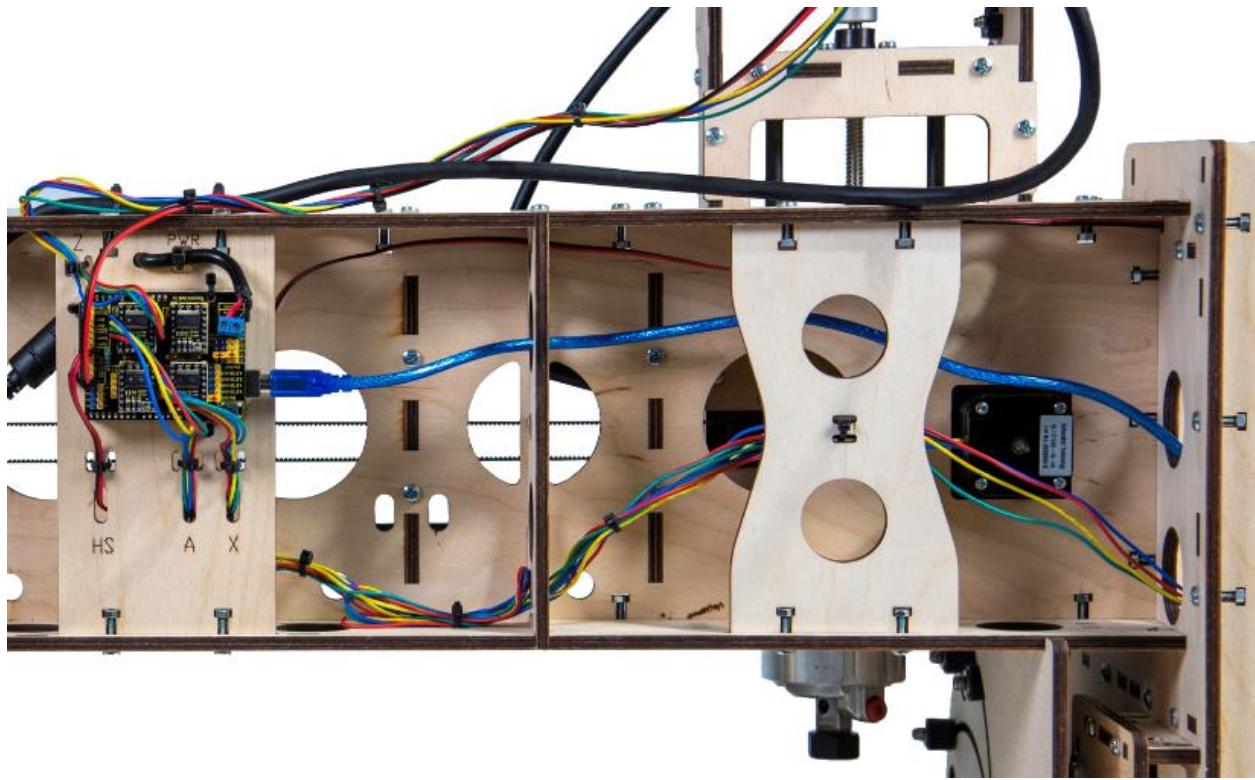
Step 5a Route the Power Cord through the lower hole in the Back Brace, then behind the Controller Mount and through the PWR access hole.



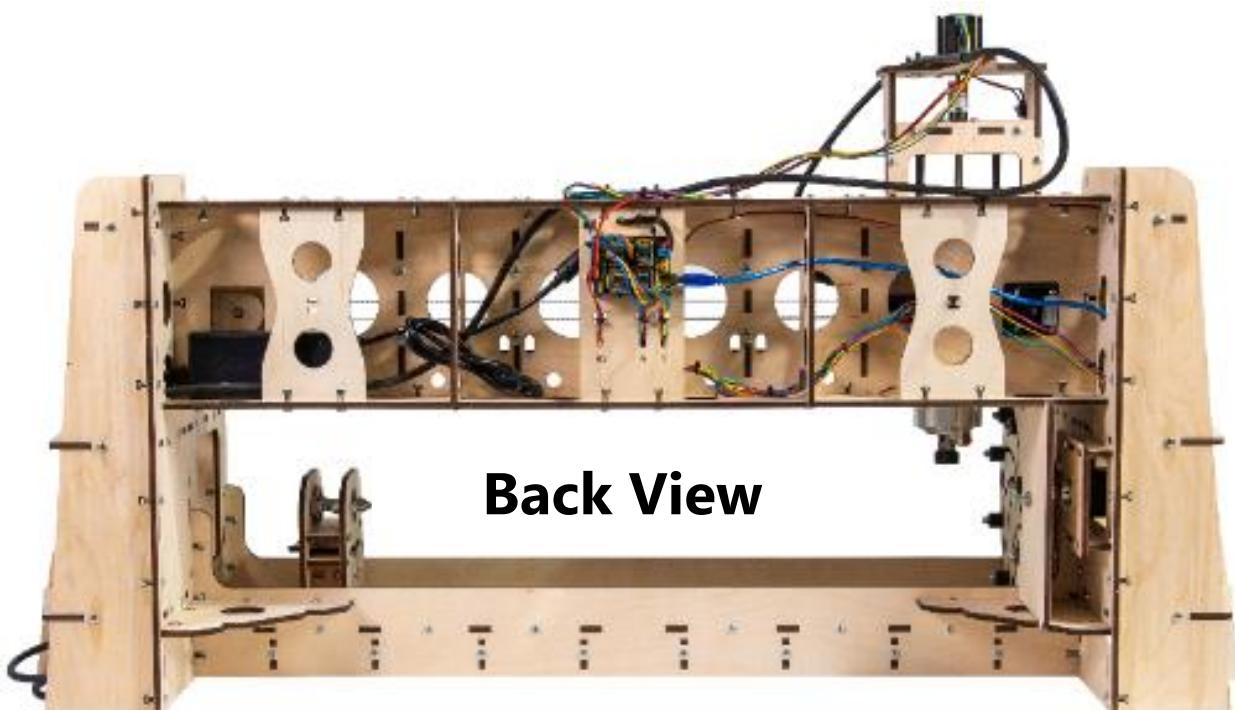
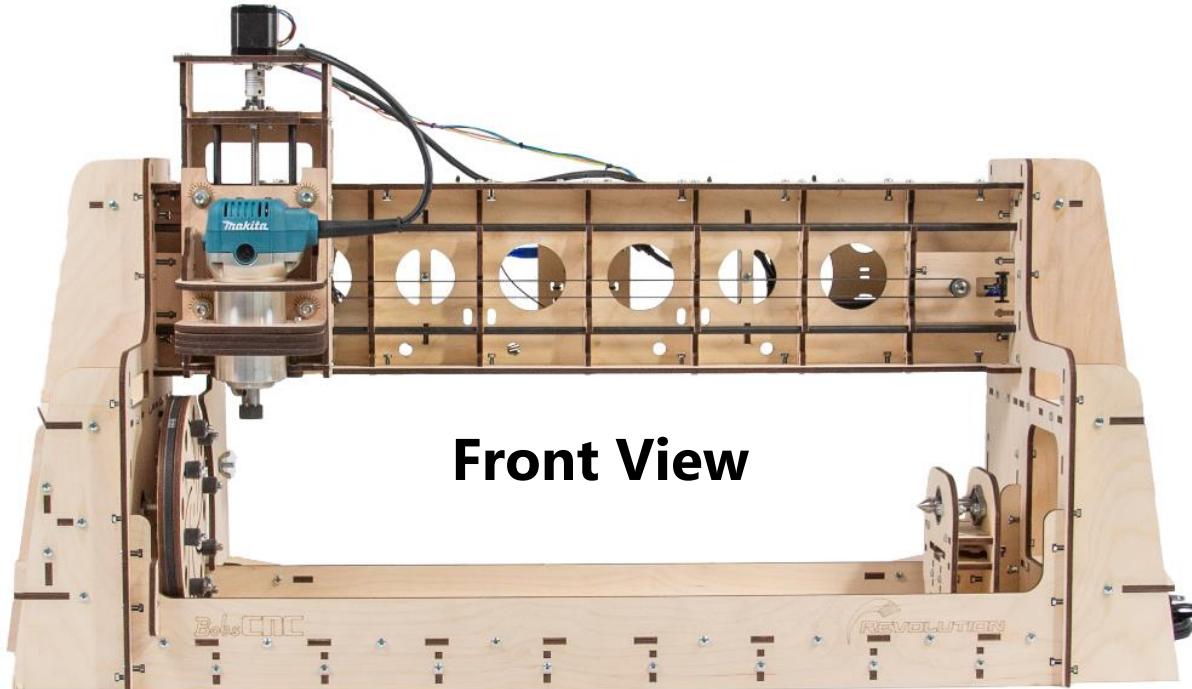
Step 5b Loosen the + and - screws in the blue terminal on the UNO Controller. Insert the exposed end of the Red Wire into the + side of the terminal and securely tighten in place. Repeat to install the Black wire in the - side of the terminal. Finish by securing the power wire in place with Zip Ties.

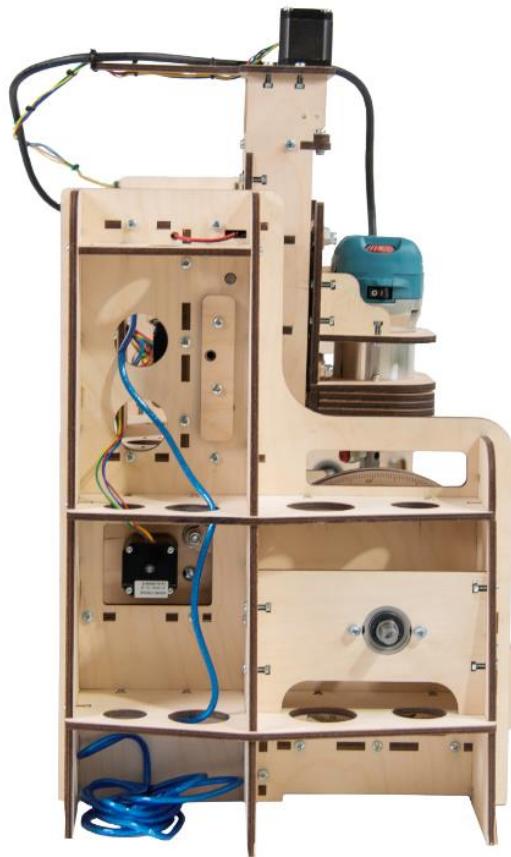


Step 6 Route the USB Cord up and through the left Gantry side, through the Gantry Assembly and connect it to the Uno Controller as shown.

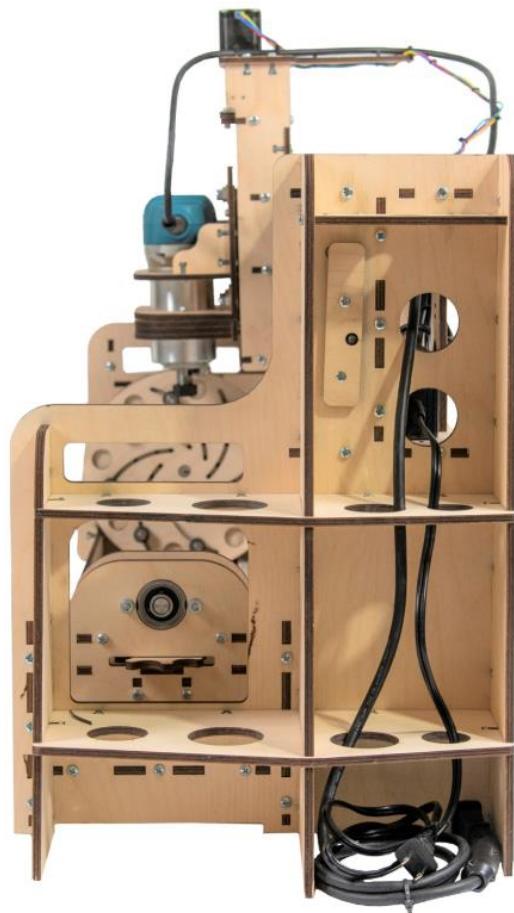


Completed Views

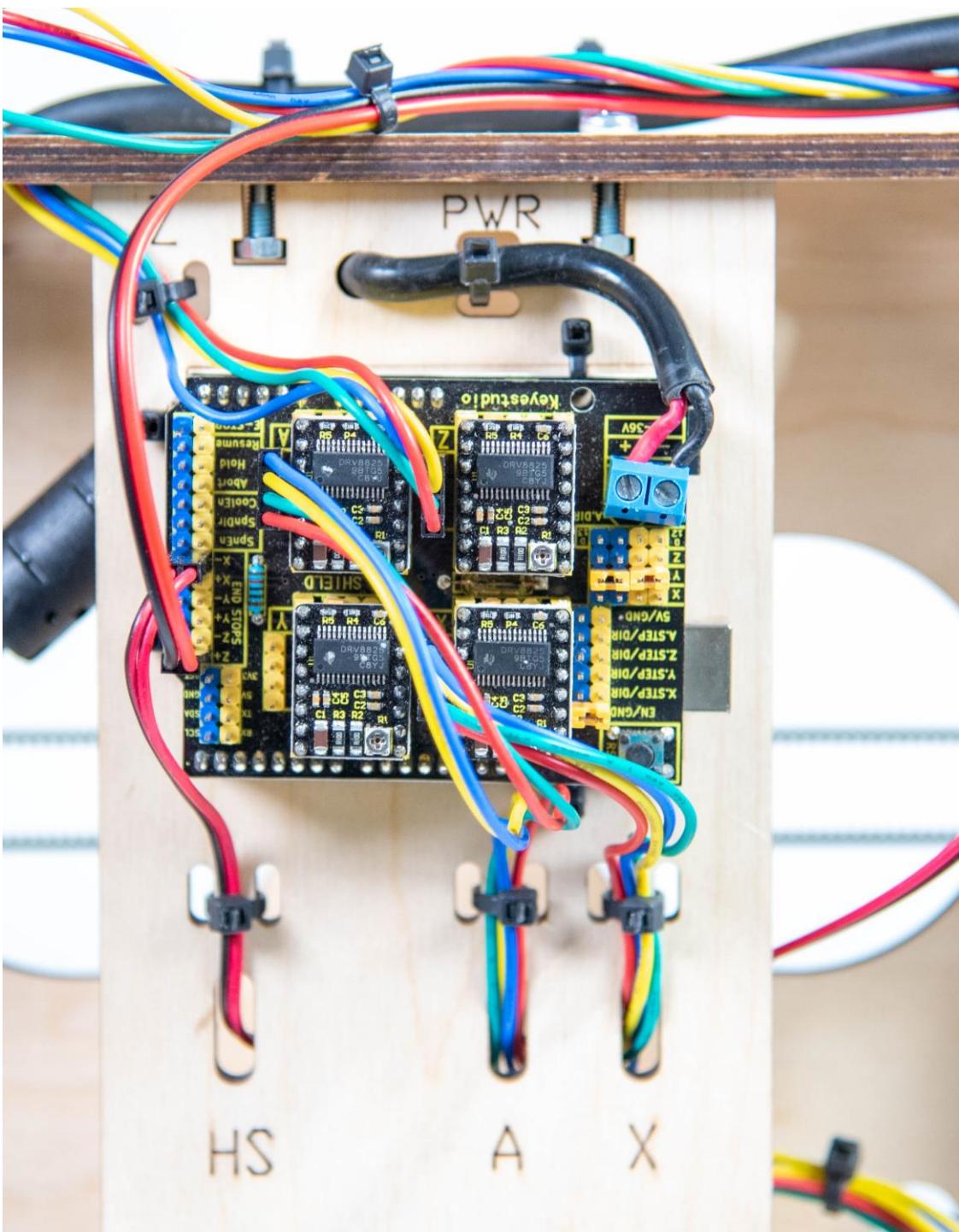




Left Side



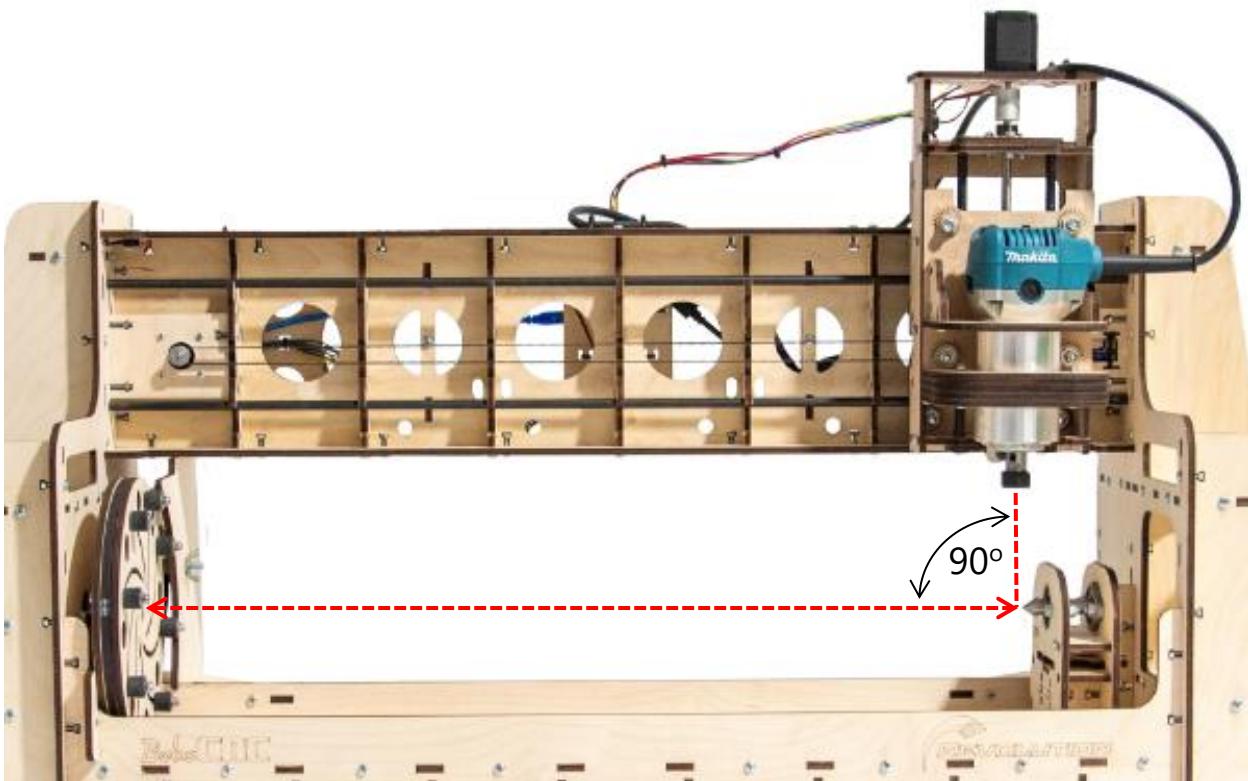
Right Side



Properly Wired Controller

Tramming

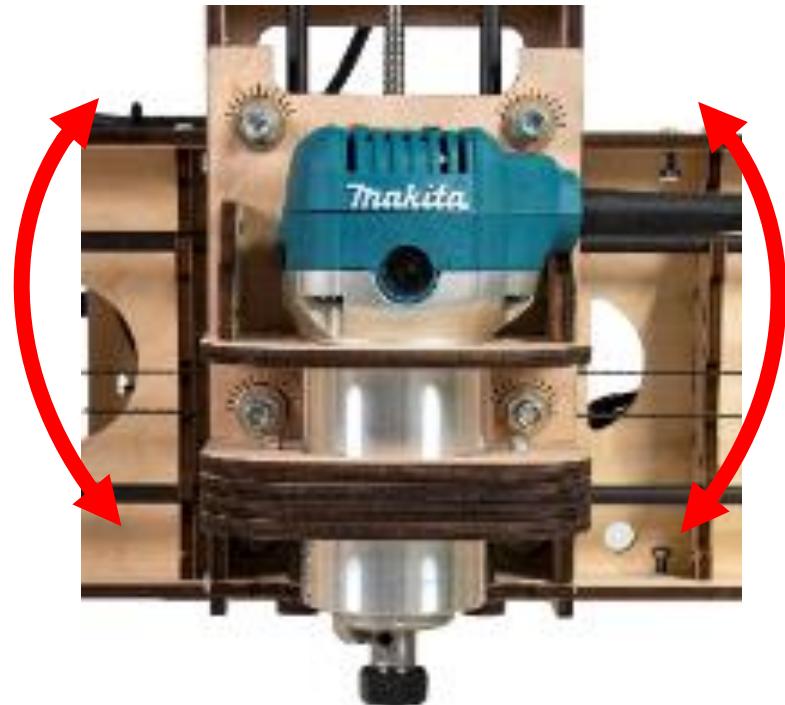
Tramming is the process of adjusting the CNC Spindle (Router) so that it is perpendicular to the material being cut. The goal with a rotating axis is to ensure that the Router bit is perpendicular to the horizontal line that extends from the center of the Live Center though the center of the Chuck as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



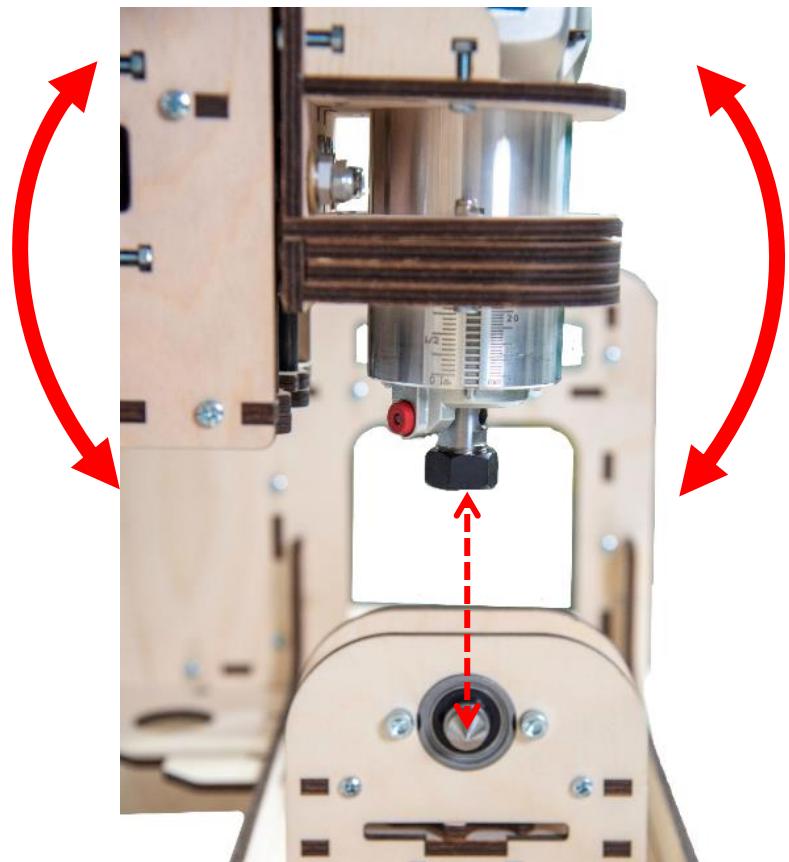
If the Spindle is not perpendicular, the Revolution can be trammed on the X Axis by adjusting the four Eccentric Adjustment Spacers on the Z Carriage.

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. Placing the shim on the top will tilt the axis clockwise. Placing the shim on the bottom will tilt the axis counterclockwise.



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.

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 Manuals and Documentation – BobsCNC](#)

Appendix

Revolution 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
H66	1/4 Shim Washer	0.256	0.500	0.028	0.035

Revolution 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	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	610	(X-axis maximum travel, millimeters)
\$131	3600	(A-axis maximum travel, millimeters)
\$132	85	(Z-axis maximum travel, millimeters)