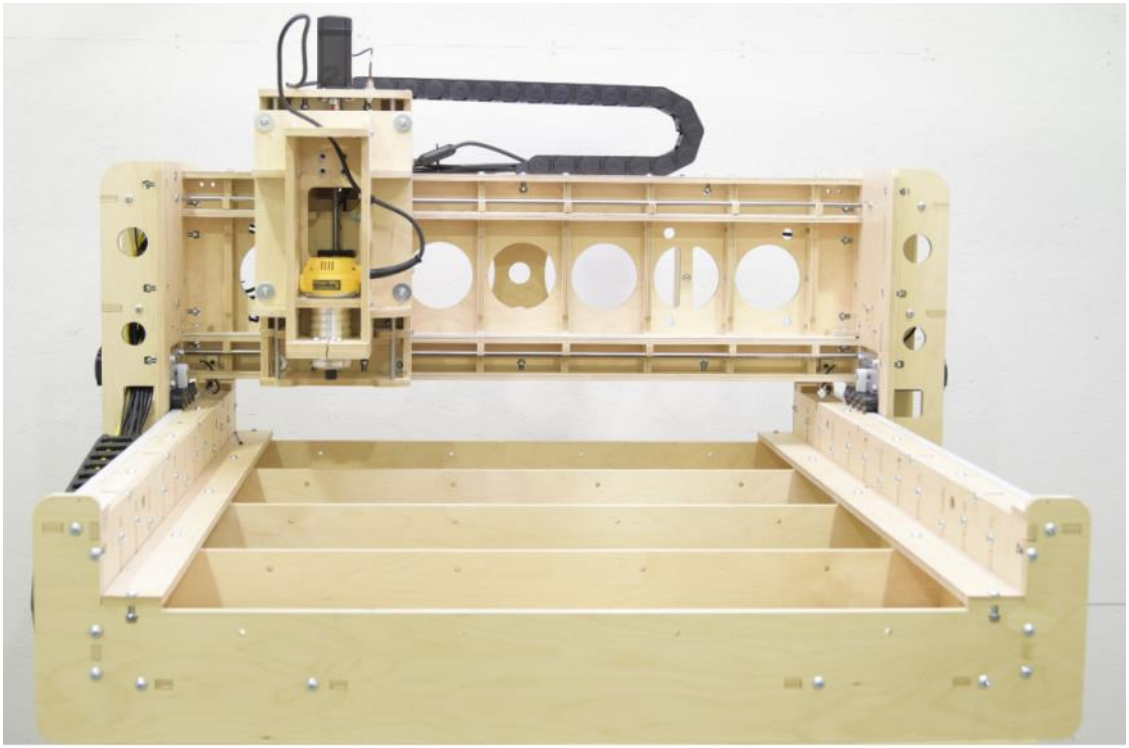
BobsCNC

Unleash Your Creativity

KL133

Mechanical System

MANUAL 5 of 8



Version 2.2

Table of Contents

Mechanical Systems Hardware ····· 3-4

Safety Information and Hints ····· 5

Installing the Static Bell Everman Belts ····· 6-9

Installing the X1 & X2 Servo Motors ····· 10-11

Installing the Y Servo Motor to the Y Carriage ····· 12-15

Installing the Z Servo Motor to the Ball Screw Assembly ····· 16-17

Installing the X1 & X2 Dynamic Bell Everman Belts ····· 18-21

Installing the Y Carriage on the Gantry ····· 22-23

Installing the Y Bell Everman Dynamic Belt ····· 24-26

Preparing the Drag Chain ····· 27-29

Attaching the Cable Drag Chains ····· 30-32

Cable Routing of the Servo Motor Wires/Cables ····· 33-43

Preparing for the Home Switch Installation ····· 44

Installing the Z Home Switch ····· 45-46

Installing the Y Home Switch ····· 47

Installing the X Home Switches ····· 49-51

Securing, Trimming, and Managing the Excess Wire ····· 52

Tightening the Bell Everman Dynamic Belts ····· 53-57

Attaching the Z Assembly ····· 58-59

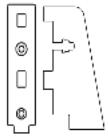
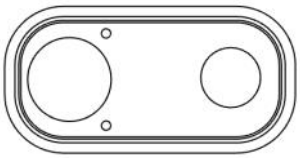
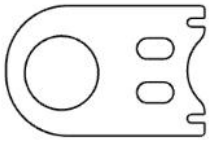
Routing the Extension Cord and Attaching the Router ····· 60-62

Wire Management ····· 63-64

Assembling and Mounting the Vacuum Brush Shoe ····· 65-67

Mechanical System Hardware Components

Part #	Description	Qty	Photo
H24	**Tape (roll)**	**1**	
H8	**T5 Timing Belt Roll (10M)**	**1**	
	10-24 x 3/4 Hex Head Screws	8	
	M5 Washer	12	
	M5x30 Socket Head Bolt	4	
	5/16 x 1 Hex Head Bolt	**1**	
H3	**5/16 x 1 1/4 Machine Screw**	**6**	
H5	**5/16 Lock Nuts**	**30**	
H6	**Large Zip Ties**	**6**	
	20’ Extension Cord		
	DeWalt 611 Router	1	
	Drag Chain	2	

Part #	Description	Qty	Photo
H24	Adjustment Tool	1	
	Vacuum Shoe	1	
	Vacuum Shoe Retainer		

Safety Information and Hints.

DANGER Indicates a serious risk of bodily harm, possible injury and death. This warning box is to be taken seriously. Any work must be carried out with extreme caution.

CAUTION Indicates a possible risk of injury that can result from failure to follow this warning.

WARNING Indicates the possible damage to the machine, it's components, or the work piece that can result from the failure to follow this warning.

Hints will provide needed information, shortcuts, and insights that will make assembly and machine operation easier and safer.

Please review each assembly manual before beginning to assemble the KL7 SERIES CNC Router.

Installing the Static Bell Everman Belts

HINT	**The Bell Everman Drive system requires two belts on each axis, one Static the other Dynamic. The Static Belt is attached to the Belt Support. The Dynamic Belt is routed through the Bell Everman Drive. The teeth of the Dynamic Belt are meshed into the teeth of the Static Belt beneath the Idler Pulleys and driven by the Dynamic Belt as its teeth are engaged by the Timing Pulley.**

Step 1

Clean the Belt Support surfaces using denatured alcohol and a clean paper towel or lint-free cloth as shown.

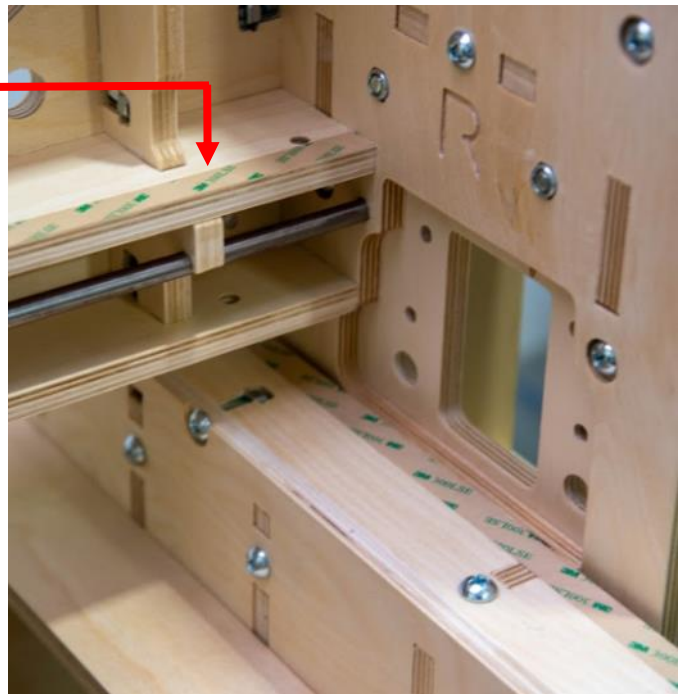
NOTE: The 3M double sided tape supplied with your kit was specifically designed to adhere to a polyurethane surface. Before proceeding, make sure you applied two coats of polyurethane to all the wood components.

Step 2

Expose 3 to 4 inches of 3M double sided tape. Beginning at one end of the Belt Support, carefully position the tape. The edge of the tape must be placed along the outside edge as shown. The tape will be placed from one end to the other and cover the length of the Belt Support.

NOTE: You will have to roll the gantry past the tape you have applied to finish the entire Belt Support Surface.

Repeat the process to install the tape on the Gantry Belt Support.



After applying the tape, press it firmly onto the wood surface, being careful not to remove the paper cover from the tape.

Step 3

Measure a length of belt approx. 1/8” shorter than the Belt Support. Using snips, cut the belt to length.

Step 4

Clean any oil, dust and dirt from the back of the belt with denatured alcohol and a lint-free rag.

Step 5

Peel back a few inches of the paper protective layer and carefully position the belt so its edge is flush to the edge of the Belt Support as shown.

Working from one end to the other, carefully position the Belt along the edge of the Belt Support.

After the belt is set firmly, press it into the tape for maximum adhesion. Repeat for the remaining 2 belts.

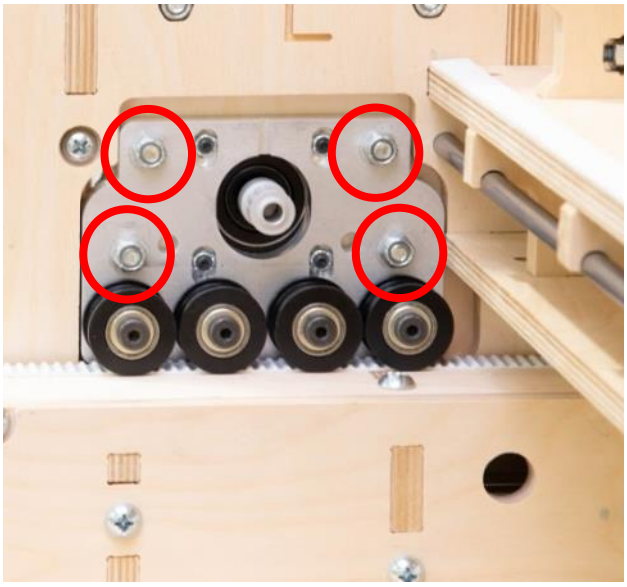
Installing the X1 and X2 Servo Motors

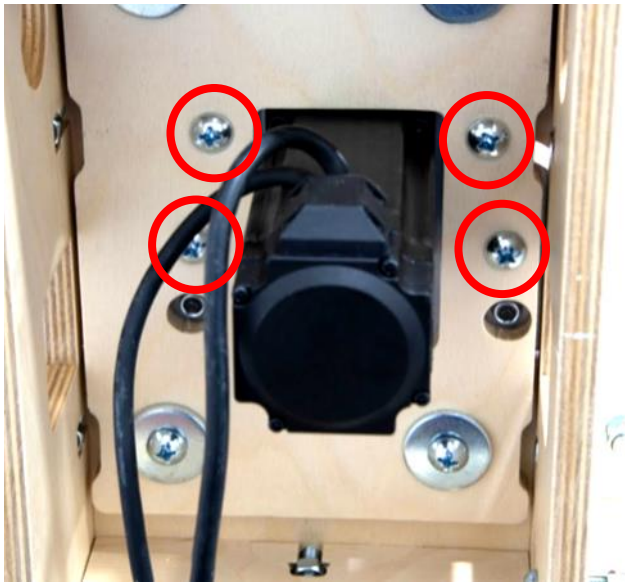
Step 1

Thread the Servo Motor and Encoder Wires through the Left side of the Gantry as shown

Step 2

Secure the Bell Everman assembly in place with four 1 1/4 Machine Screws and Lock Nuts as shown.





Step 3

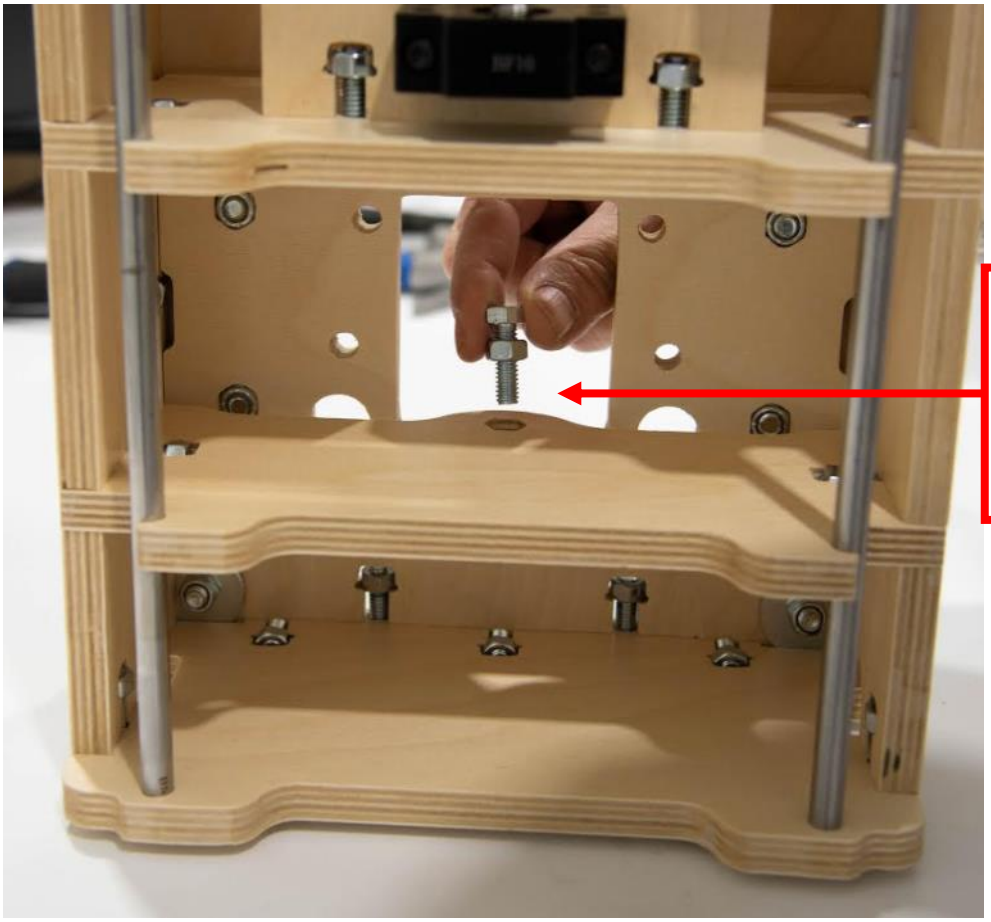
Remember Wire Management. Bundle the Servo Motor and Encoder wires together. Secure with Zip Ties as shown. Repeat procedure to install the X2 Servo Motor on the right side.

Installing the Y Servo Motor to the Y Carriage

Step 1

Thread a 5/16 Nut on to the 5/16-18 x 1 Hex Head Bolt as shown and insert it in the Rail Support as shown.

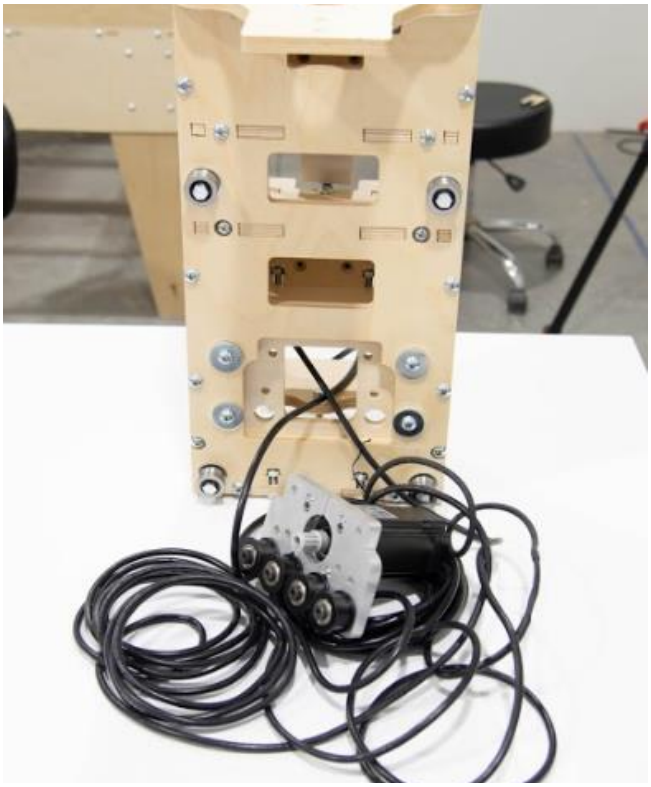
NOTE: This bolt will be used to tighten the Y axis belt in a later step.

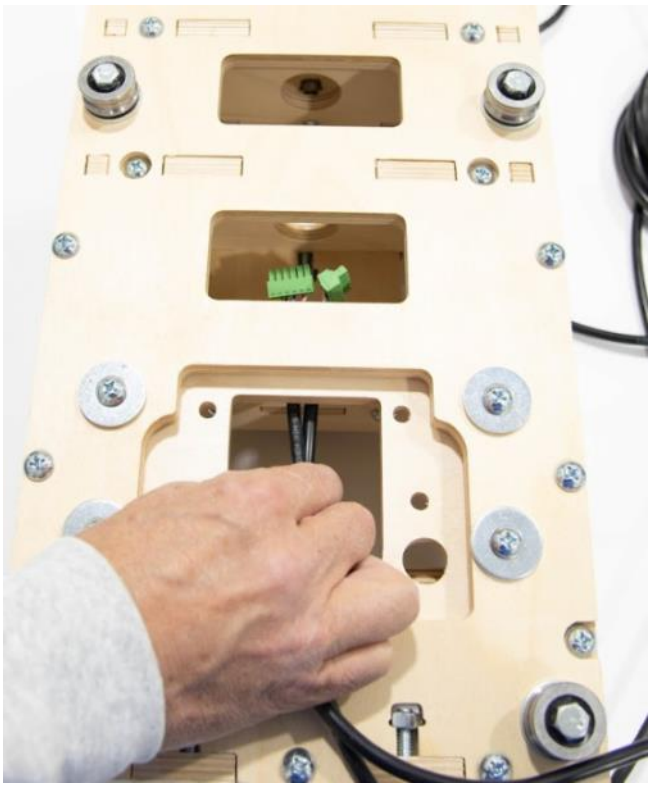


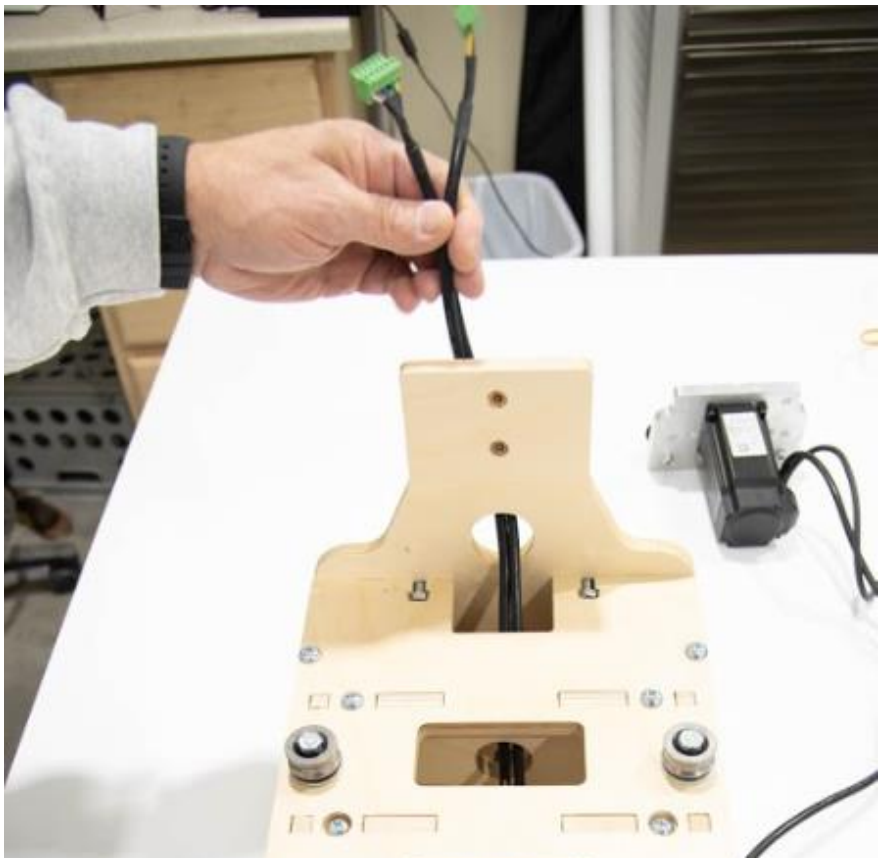
The bolt and nut must be positioned on the top of the support.

Step 2

Route the Servo Motor and Controller cable through the back of the Y Carriage Assembly as shown.

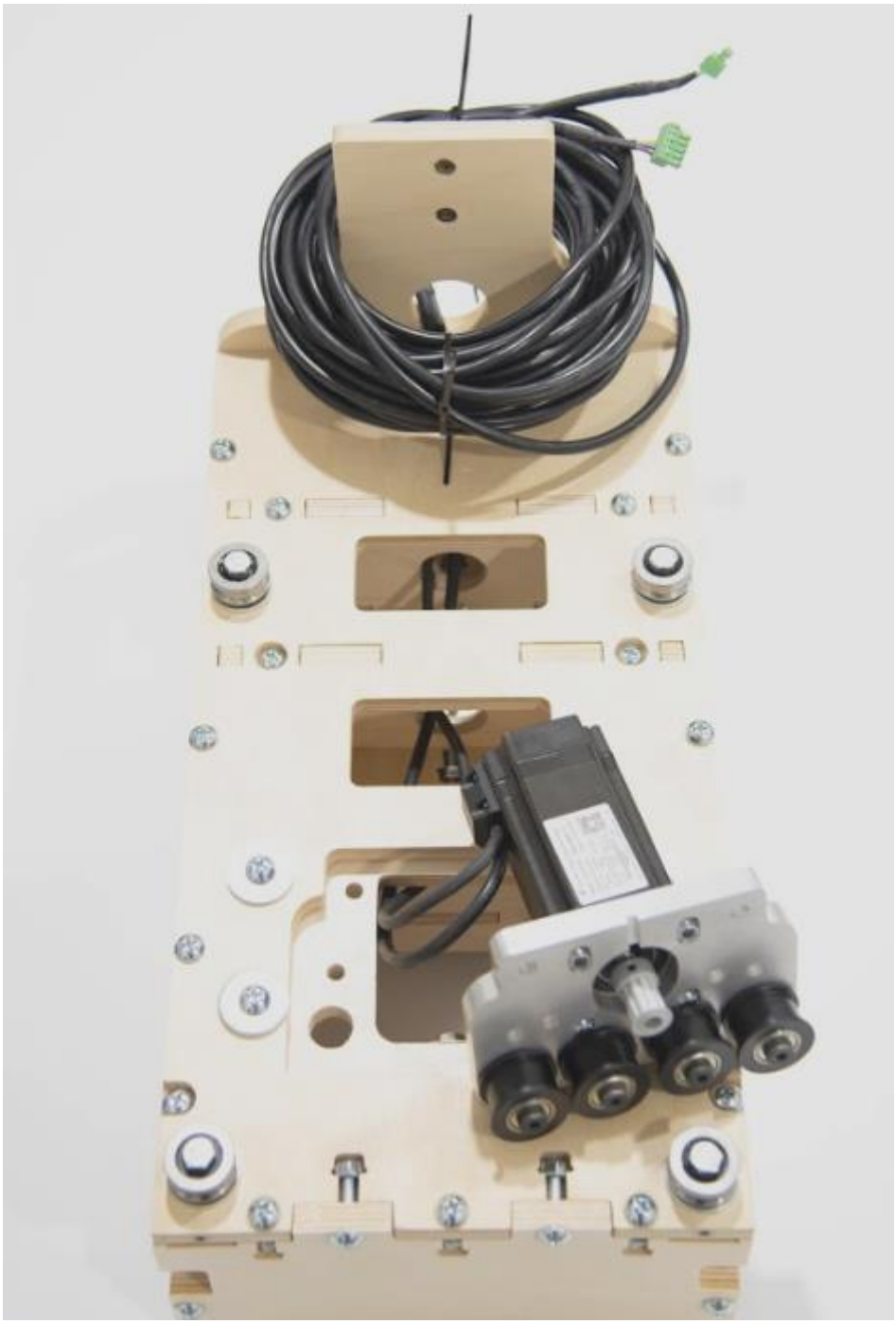






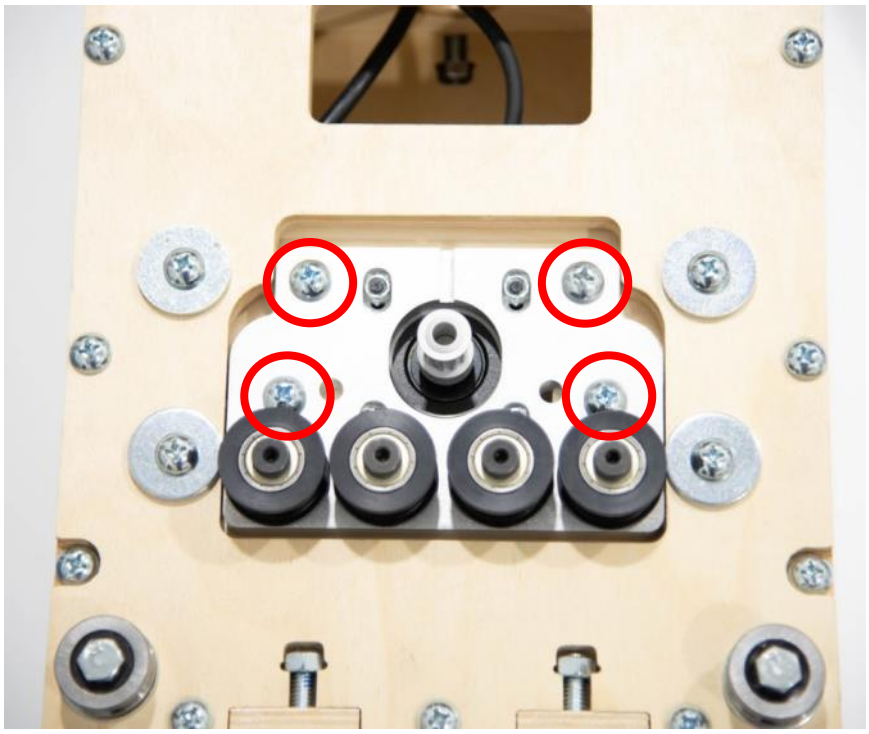
Step 3

After carefully pulling all the cables through the Y Carriage, loop the excess wire and secure it with two zip ties. Hang it over the back of the Carriage Mount Top.



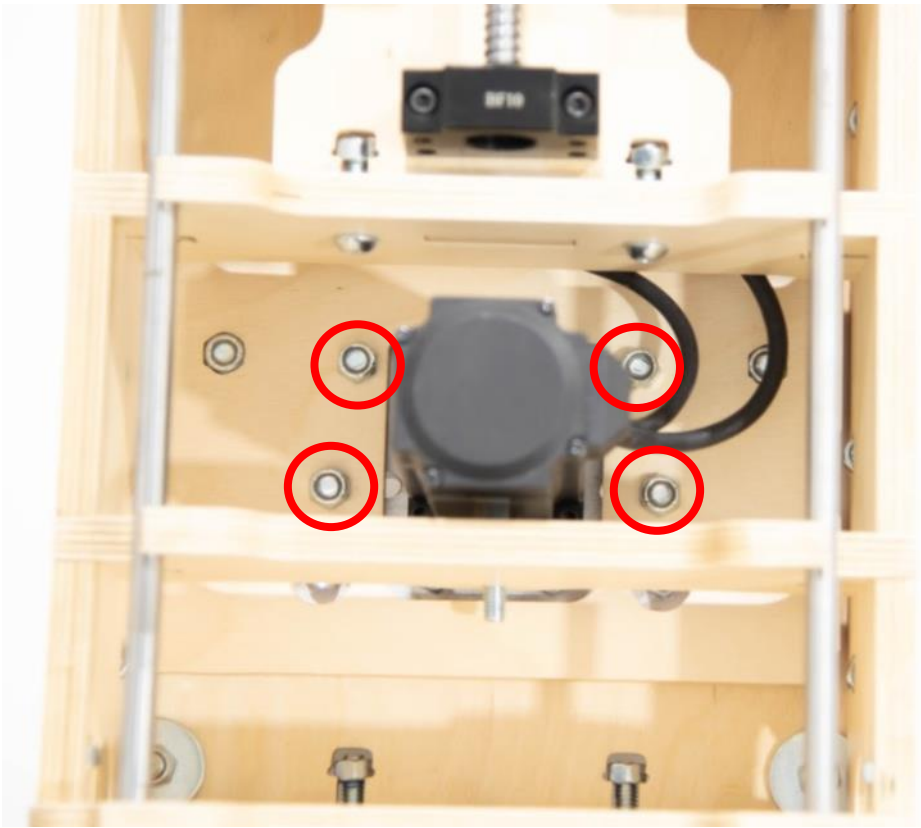
Step 4

Set the Servo Motor and Bell Everman Assembly onto the Adjustment Plate and secure with four 5/16 x 1 1/4 Machine Screws and lock nuts circled in red.



Front view

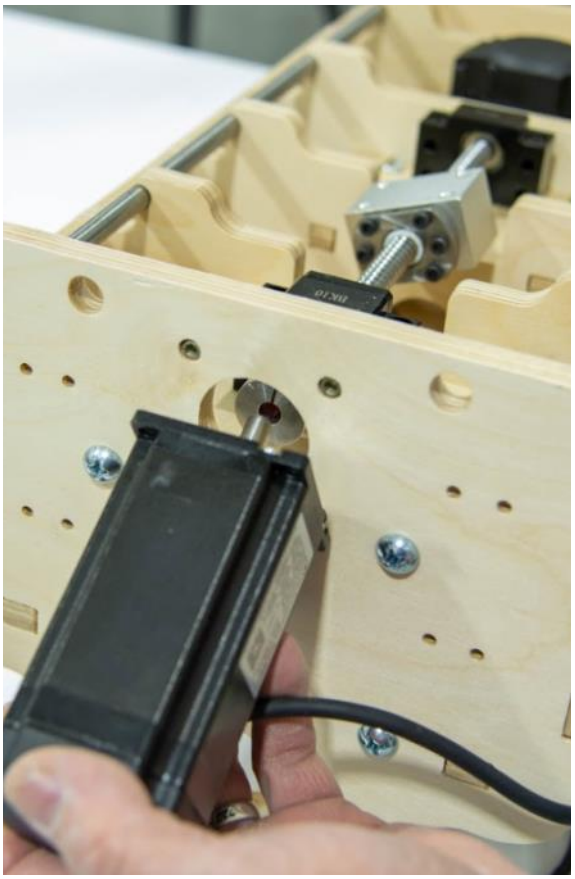
Back view

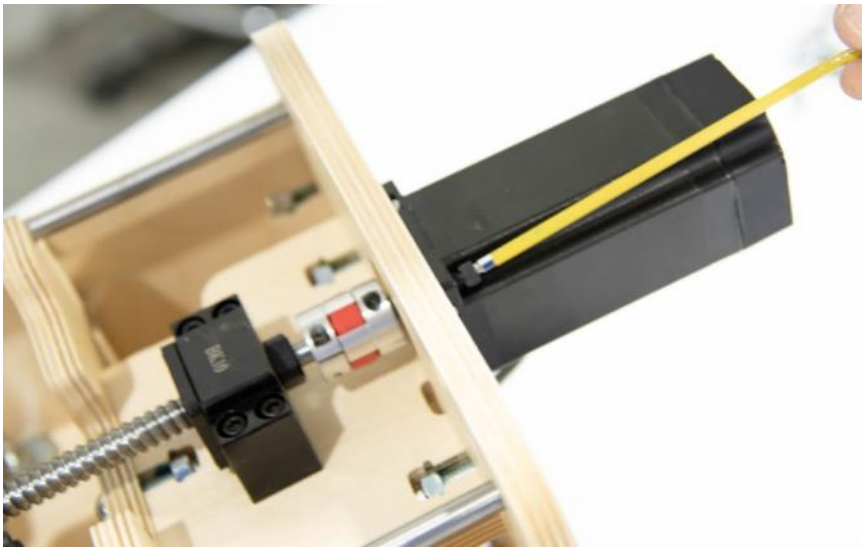


Installing the Z Servo Motor to the Ball Screw Assembly

Step 1

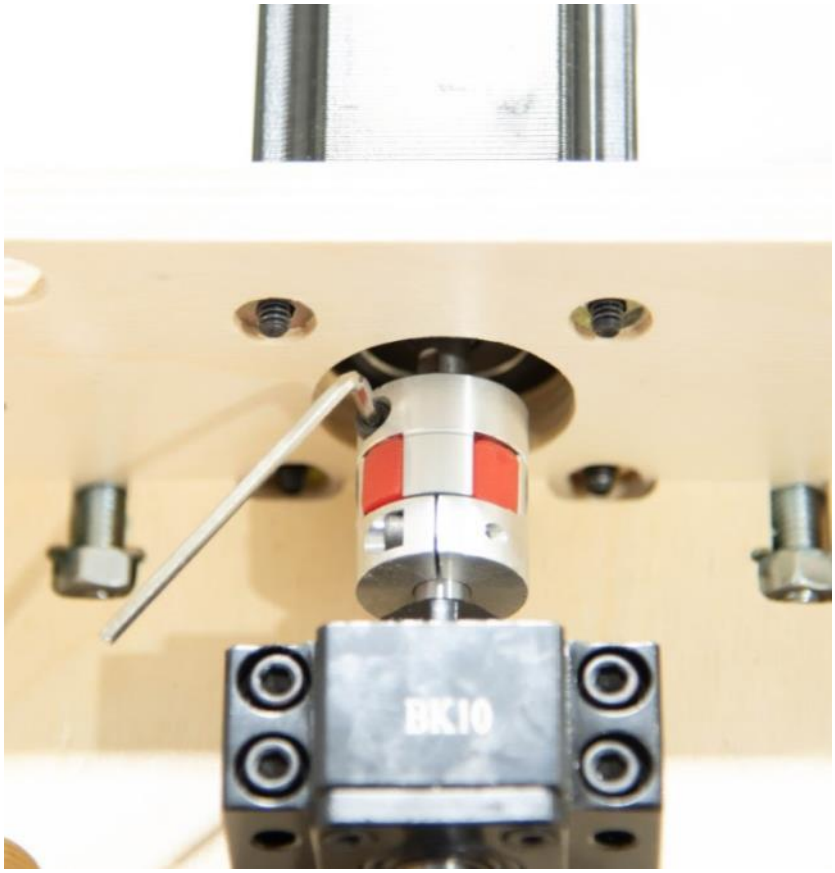
Align the Servo Motor shaft with the opening in the Spider Coupler as shown. Secure the Servo Motor with four 10-24 x 3/4 Socket Head Bolts.





Step 2

Tighten Spider Coupler to the shaft using an Allen Wrench as shown.



NOTE: Remember Wire Management. Bundle the excess wire and secure with two zip ties and loop the wire over the Servo Motor (as shown).

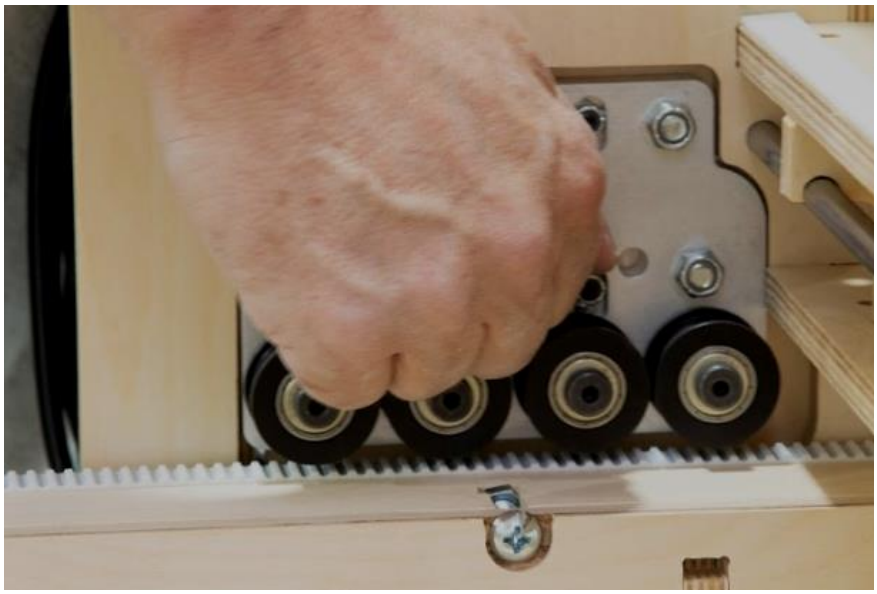
Installing the X Dynamic Bell Everman Belts

Step 1

At the back left of the X1 axis, align and mesh the ends of the belts together. Secure with the a X9 Belt Holder and one 5/16 x 1 1/4 Machine Screw and Nut as shown.

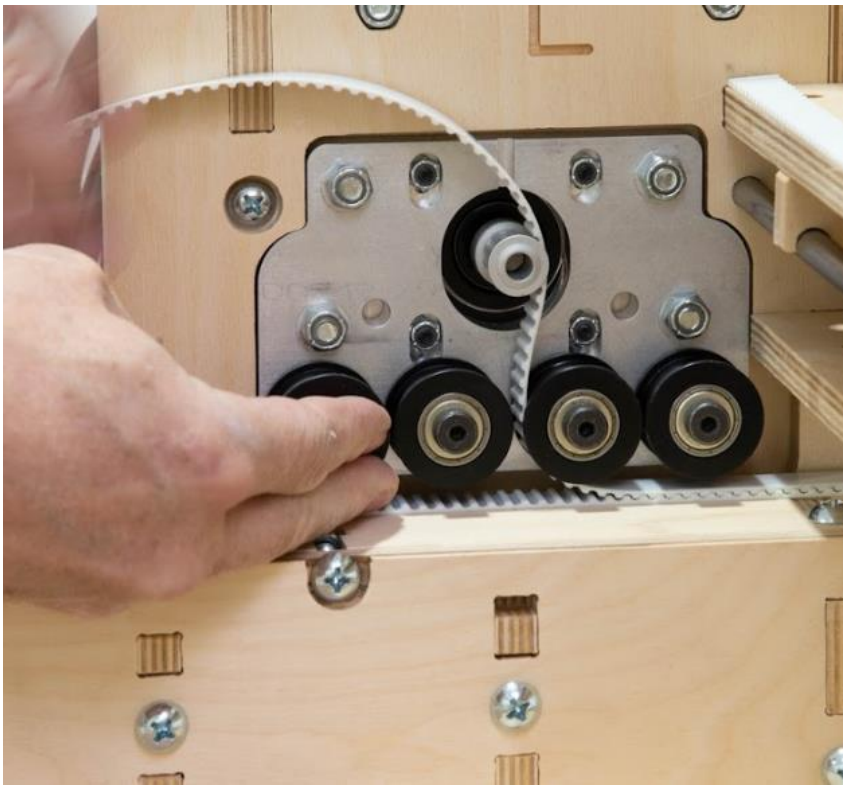
Step 2

Pull the Bell Everman Assembly up so that there is a gap between the Idler Pulleys and the Static belt.



Step 3

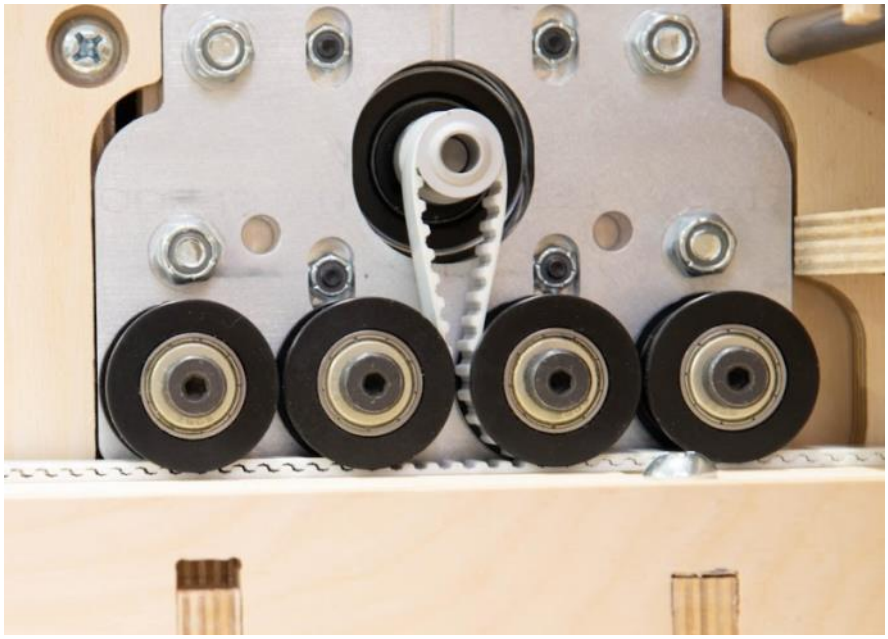
Slip the Dynamic Belt beneath the two back Idler Pulleys.



Step 4

Loop the Dynamic Belt over the Timing Pulley and then route it beneath the two front Idler Pulleys.

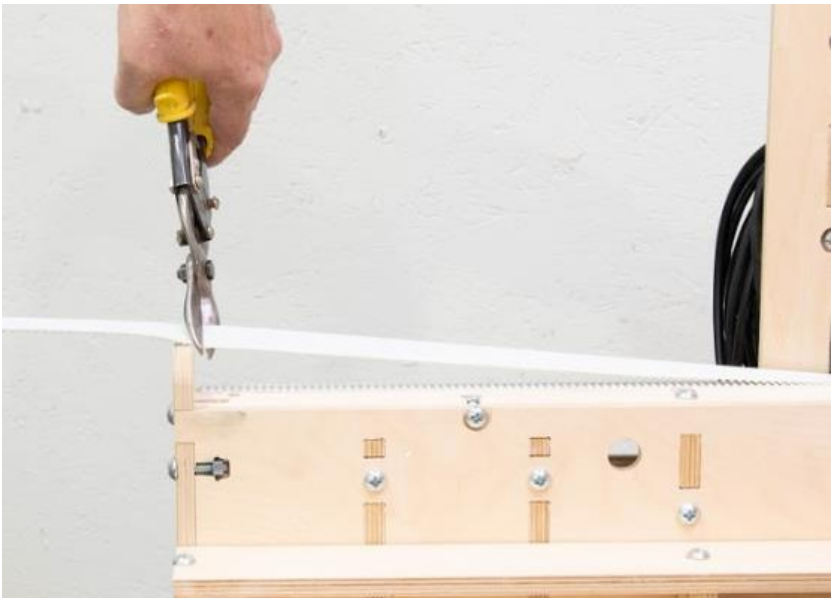
Remove excess slack from the Belt Pully and Push the Bell Everman Assembly down so that the belt is meshed as shown.



The belt will not be tight at this step in the process. The belts will be tightened in a later step.

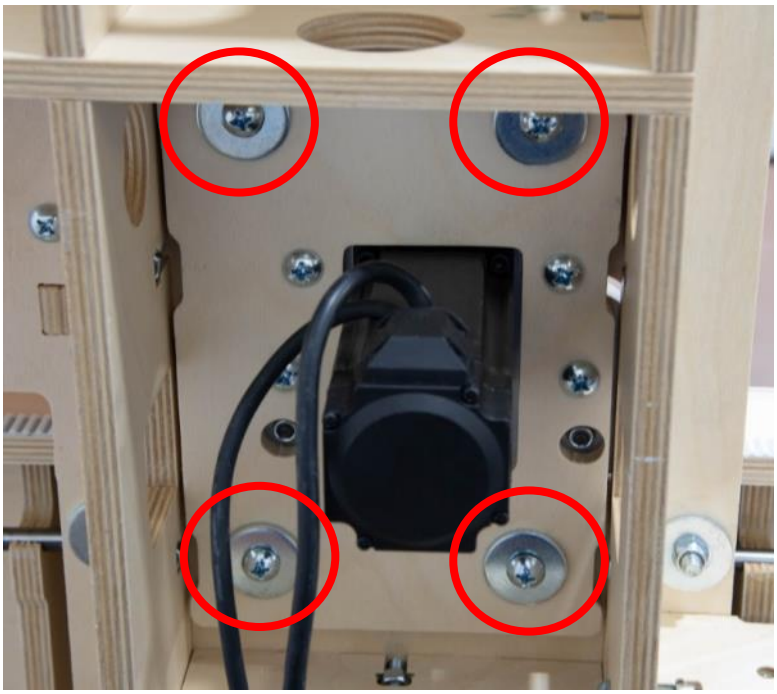
Step 5

Trim the belt to length and secure with a X9 Belt Holder and one 5/16 x 1 1/4 Machine Screw and Nut.



Step 6

Tighten the four screws holding the Bell Everman Assembly in place making certain the belts are meshed.



Step 7

Repeat above steps to install the X2 Dynamic Belt.

Installing the Y Carriage on the Gantry

Step 1

Hang the two upper bearings on the upper Y rail on the Gantry as shown.

Step 2

Raise the lower bearings against the lower rail by adjusting the set screw in the bottom of the Y Carriage. Tighten in place with the 2mm Allen Wrench. The bearings should only roll as the carriage assembly moves.

Step 3

Tighten the four 5/16 Nuts to secure the SG25U Bearings.

Installing the Y Bell Everman Dynamic Belt

Step 1

At the back left side of the Gantry, align and mesh the ends of the belts together. Secure with a G15 Belt Holder and one 5/16 x 1 1/4 Machine Screw and Nut as shown.

Step 2

Route the Dynamic Belt beneath the two back Idler Pulleys with the Bell Everman assembly in the upward position.

Viewed From Behind Through the Gantry

Step 3

Loop the belt over the Timing Pulley and under the two front Idler Pulleys as shown.

Step 4

Remove excess slack from the Belt Pully and Push the Bell Everman Assembly down so that the belt is meshed. Tighten the 4 Machine Screws as shown.

The belt will not be tight at this step in the process. The belts will be tightened in a later step.

Step 5

Trim the belt to length.

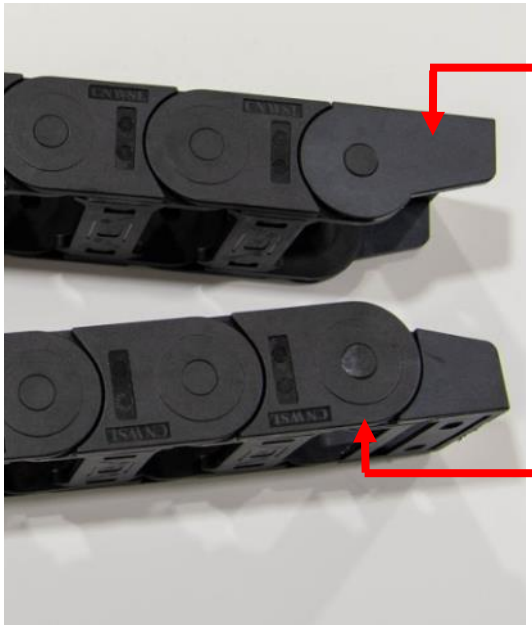
Step 6

Secure with a G15 Belt Holder and one 5/16 x 1 1/4 Machine Screw and Nut.

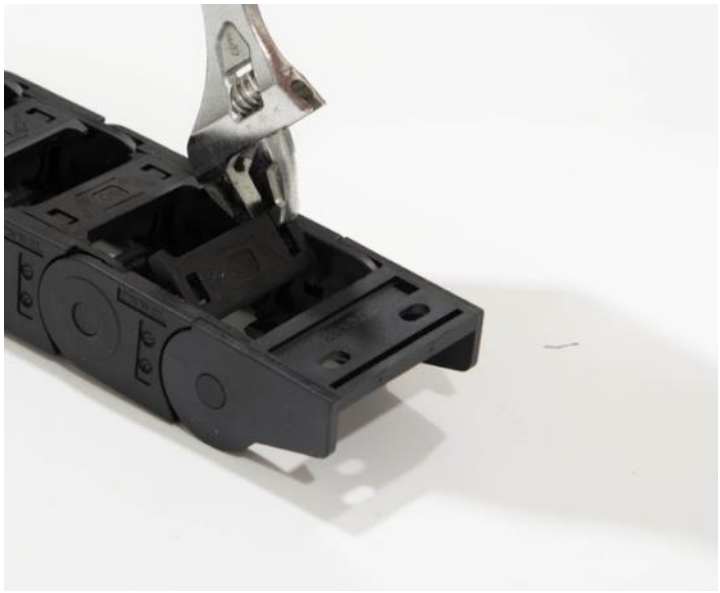
Preparing the Drag Chain.

Step 1

Lay out the Drag Chain on its side. Notice the end cap of the end links. One end cap fits within the adjoining link. The other end cap fits around the outside of the adjoining link.



Turn the end cap on its back and remove the connecting tab as shown.



Disconnect and remove the end link. Turn it over and reconnect to the adjoining link as shown.

NOTE: Proper orientation of the Drag Chain ends.

Attaching the Cable Drag Chains

Step 1

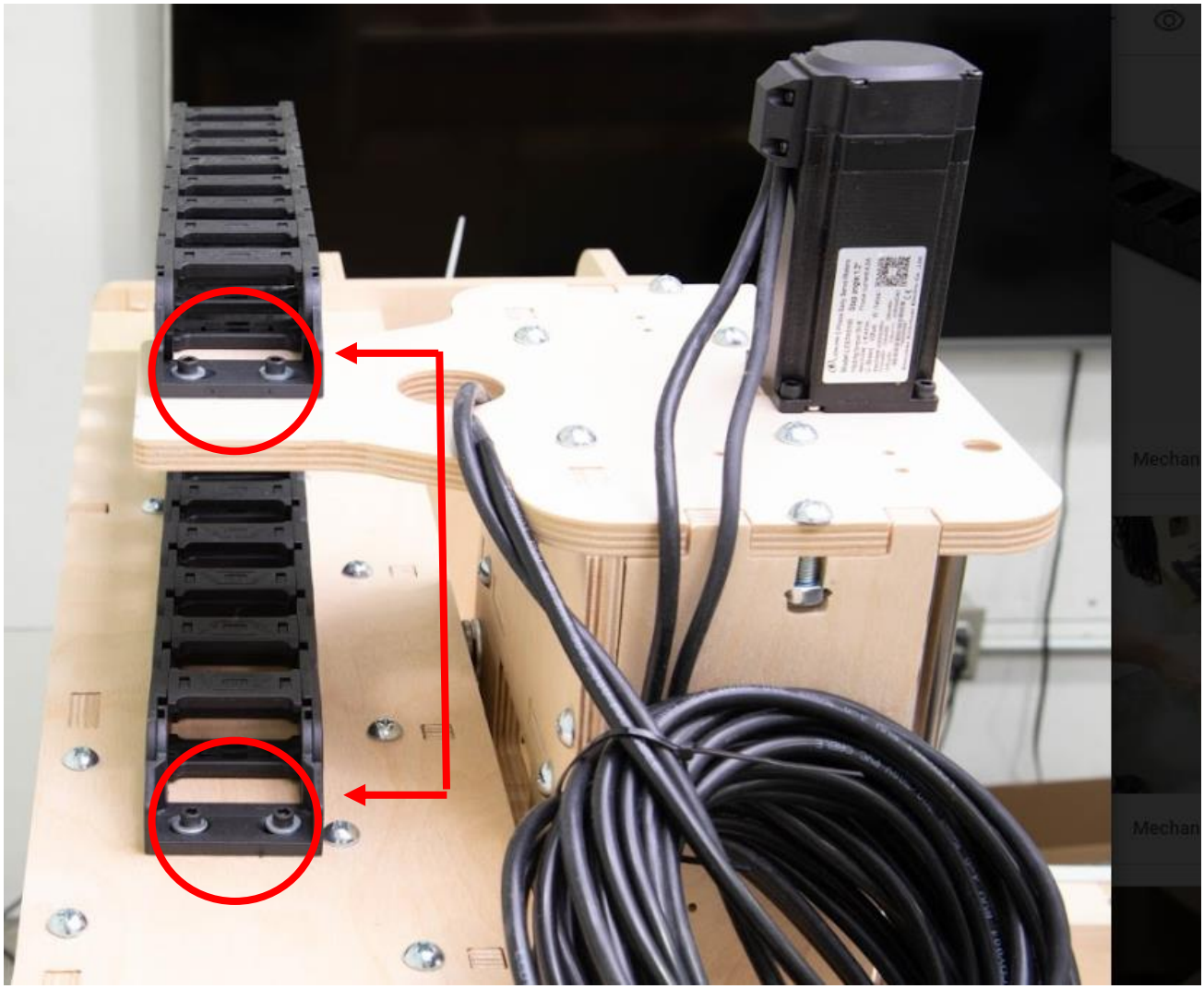
Attach the Left Side Drag Chain to the G8 Drag Chain Mount on the Left Side of the Gantry Assembly using two 10-24 x 3/4 “ Socket Head Bolts and M5 Washers as shown.

Step 2

Attach the other end of the Drag Chain to the X4 Drag Chain Support using two 10-24 x 3/4 Socket Head Bolts and M5 Washers as shown.

Step 3

Attach the Y Axis Drag Chain to the Y1 Carriage Top Mount and the G10 Gantry Top Support using four 10-24 x 3/4 Socket Head Bolts and M5 Washers as shown.



Finished View Top Left

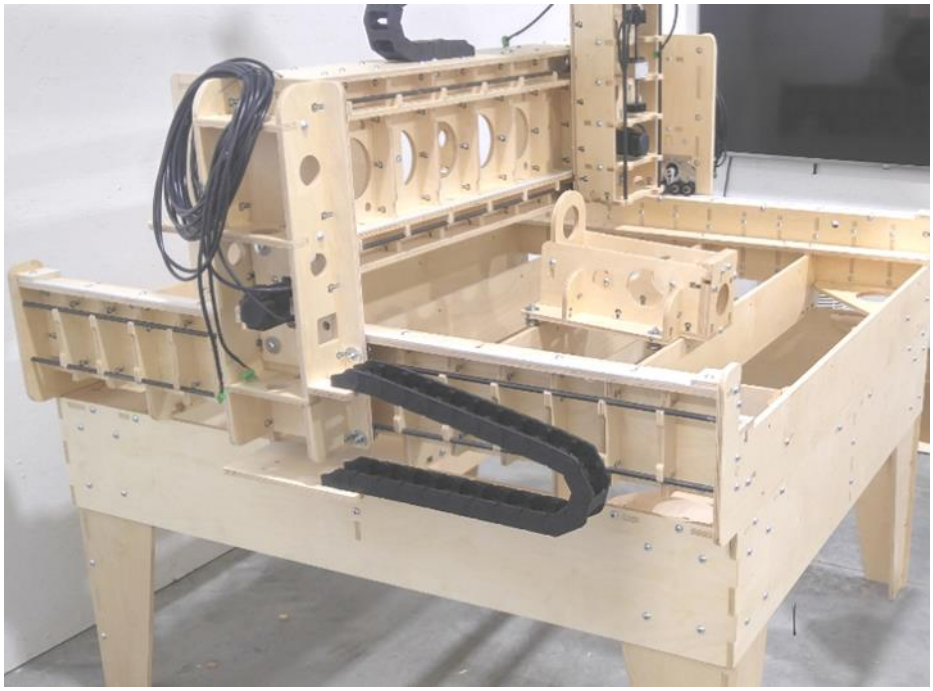
Finished View from Front

Cable Routing of the Servo Motor Cables

Preparing the Drag Chain for Wire Routing

Step 1

Slide the Gantry half way along the X axis as shown.



Step 2

Use a crescent wrench for leverage and GENTLY remove the upper connecting tabs on the Drag Chain as shown to the point where the chain loops back. Only remove the upper tabs.

Keep the tabs in a safe place for reinstallation later.

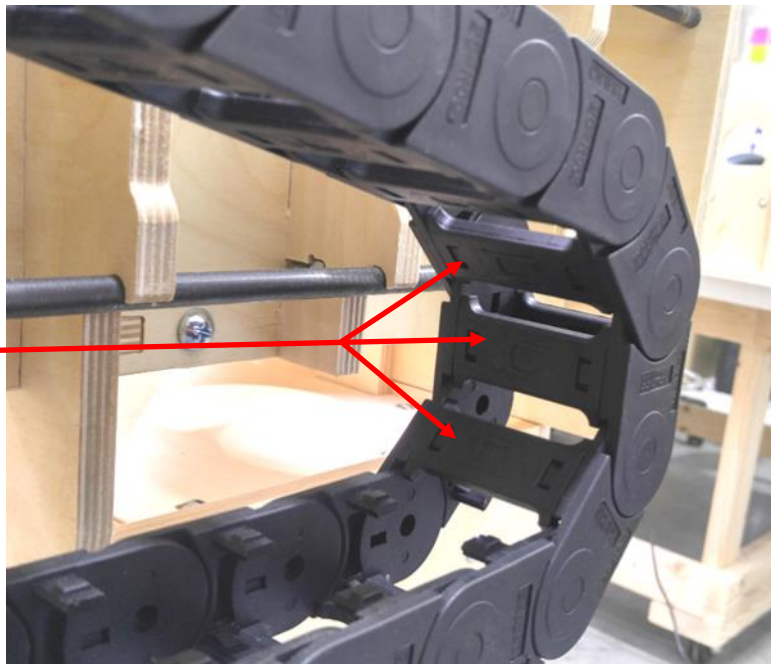
HINT	**When removing the connecting tabs DO NOT remove the upper and lower tabs of a single link or the drag link will separate.**

Step 3

Remove the upper tabs until you reach the bend

Leave one tab on the front of the bend.

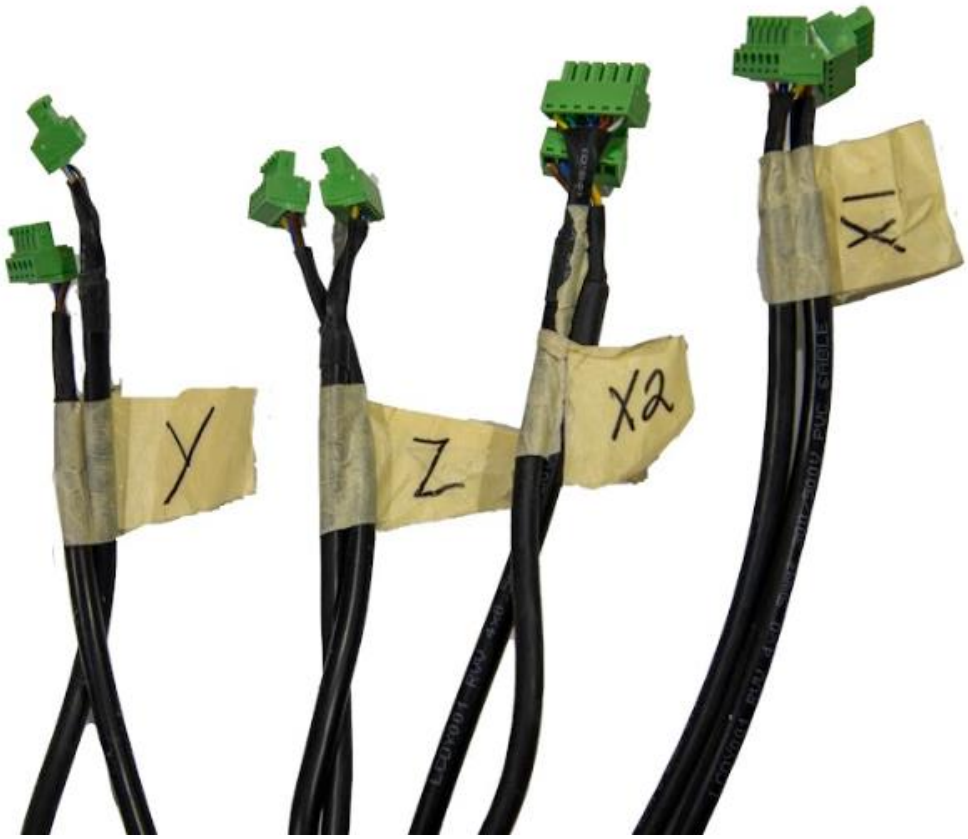
Leave three tabs on the back of the bend.



Step 2

Carefully label the Servo Motor and Encoder Cables for each of the axes (X1, X2, Y, and Z). The Encoder Connector has five pins, the Servo Motor Connector has six.

Tape the cables of each axis pair together and label as shown.

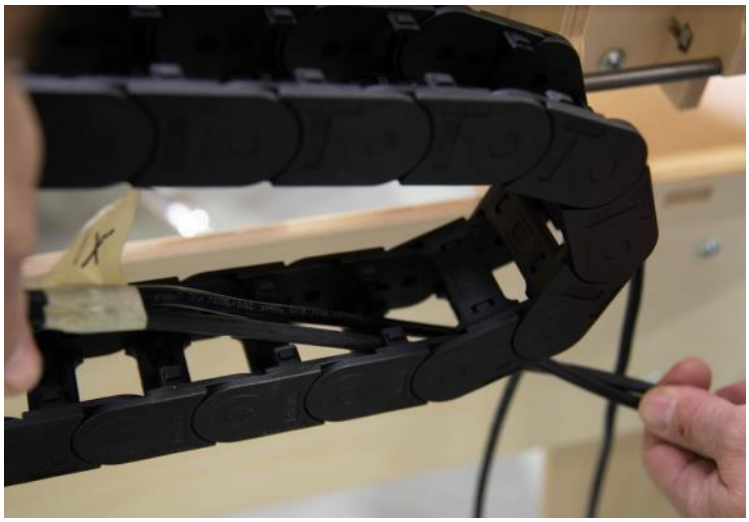


Each set of cables will need to be routed neatly through the structure and Drag Chain(s). The end result should not have any cables kinked or rubbing against any sharp corners.

Step 3

Route the left side X1 Servo Motor and Encoder Cables through the square access hole to the right of the X1 Servo Motor.

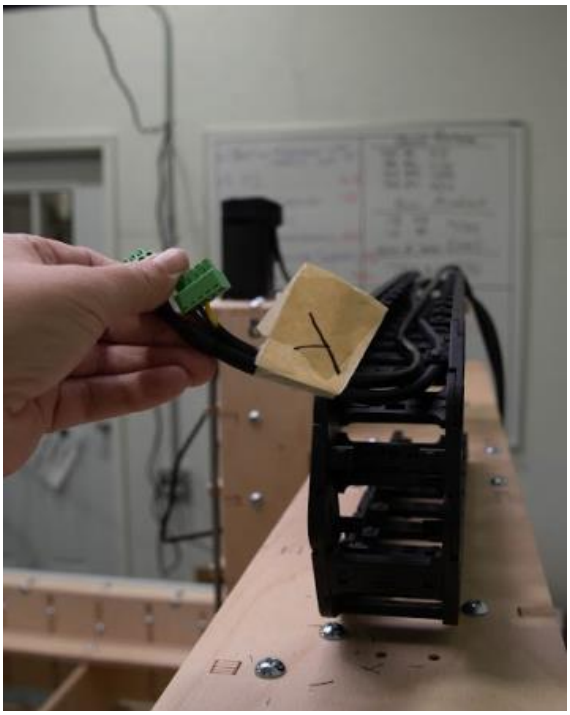
Route the cables through the Drag Chain so that they run past the Drag Chain Mount.

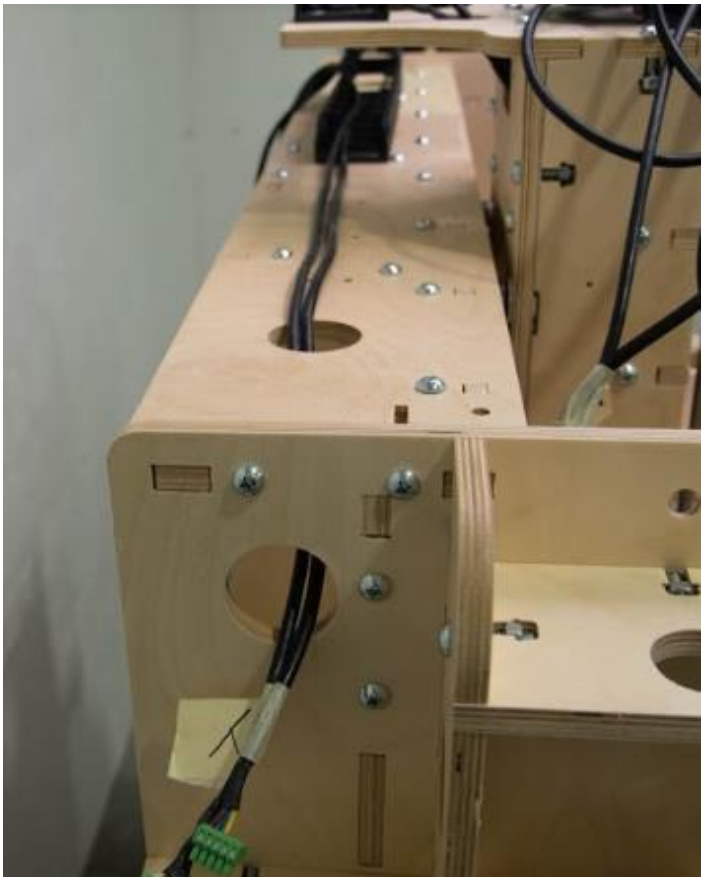


There will be excess cables once they are routed through the Drag Chain. Be sure to protect the cables and connectors from damage.

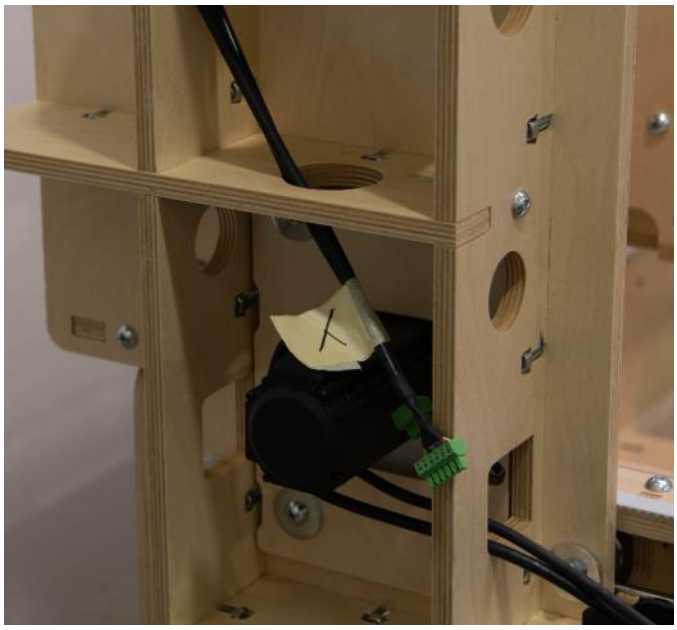
Step 4

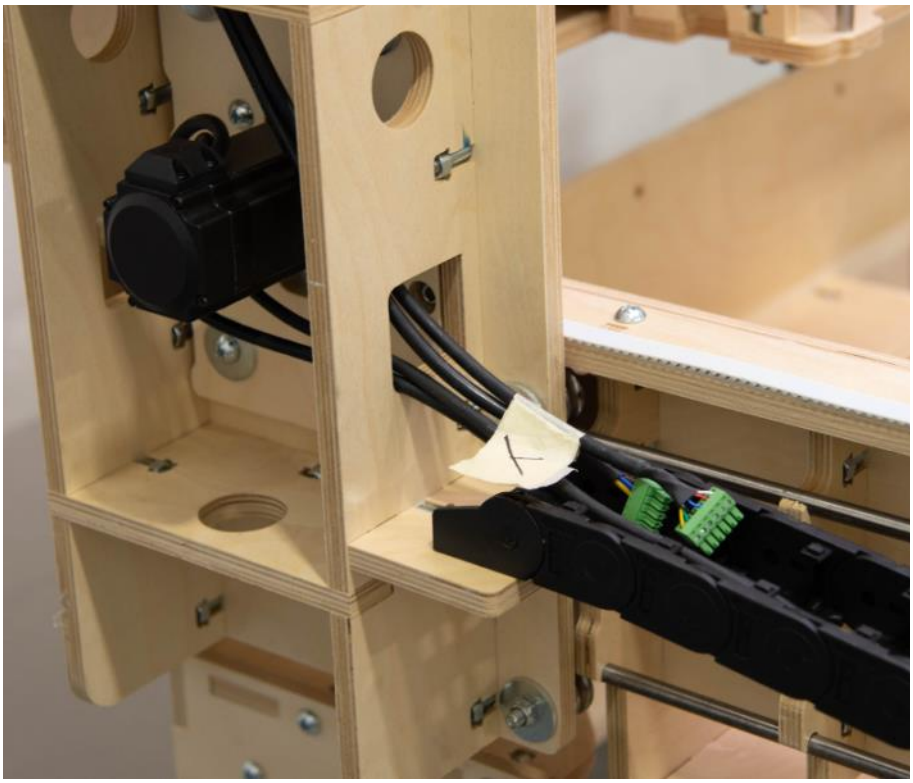
Route the Y Servo Motor and Encoder Cables across the Y1 Carriage Mount Top and into the Y/Z Drag Chain as shown.





Continue routing the cables through the Left Gantry Side and Drag Chain as shown.





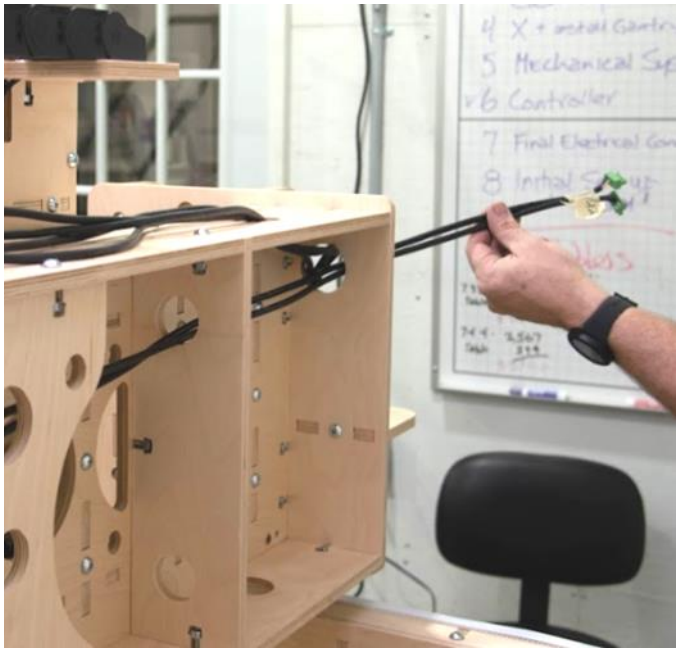
Continue routing the cables through the entire Left Gantry Side and Drag Chain. There will be excess cables once they are routed. Be sure to protect the cables and connectors from damage.

Step 5

Repeat for the Z Servo Motor and Encoder Cable routing following the Y Servo Motor and Encoder Cable routing path.

Step 6

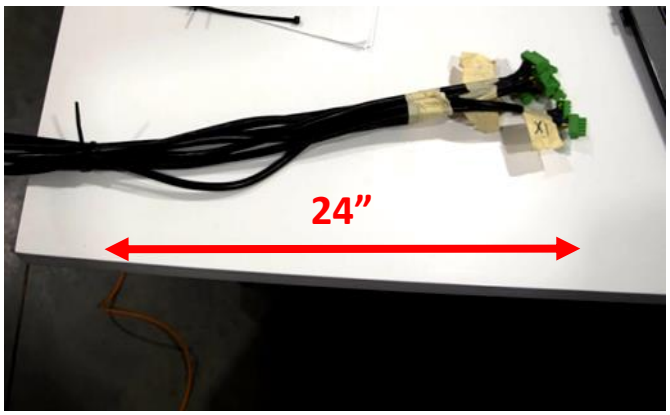
Route the X2 Servo Motor and Encoder Cables up and through the Right Gantry Side and across the back of the Gantry Assembly, through the Left Side Gantry Assembly and into the Drag Chain as shown.

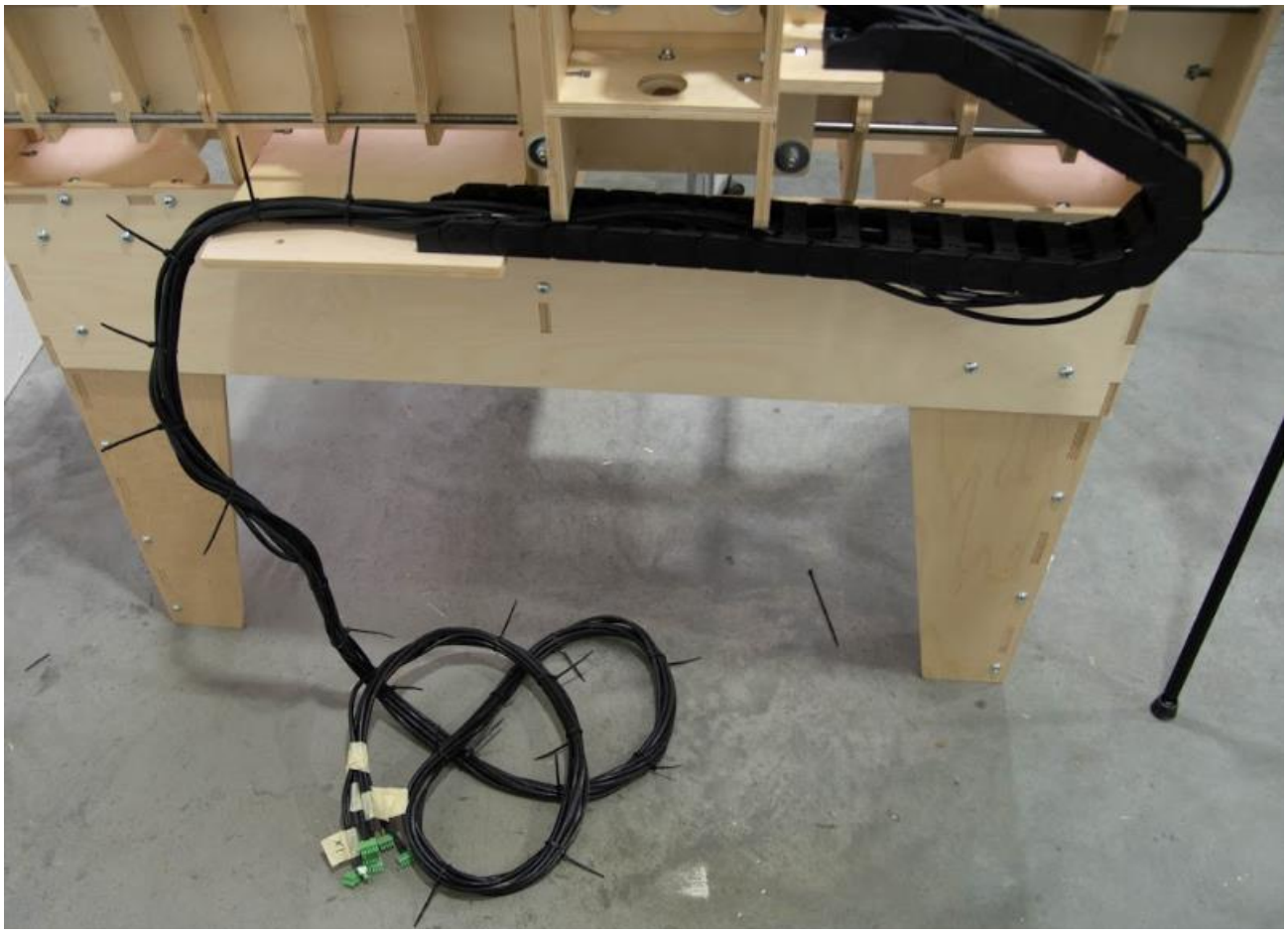


Continue routing the cables through the entire Left Gantry Side and Drag Chain. There will be excess cables once they are routed. Be sure to protect the cables and connectors from damage.

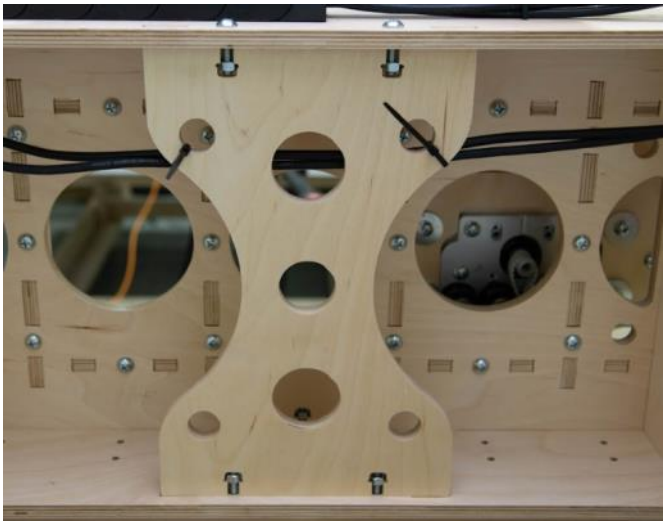
Step 7

Gather all the Servo Motor and Encoder Cables. Starting from the connectors measure back 24 inches and bundle the Cables together with a Zip Tie. Then every 4 to 6 inches add a Zip Tie until the Cables enter the Drag Chain.

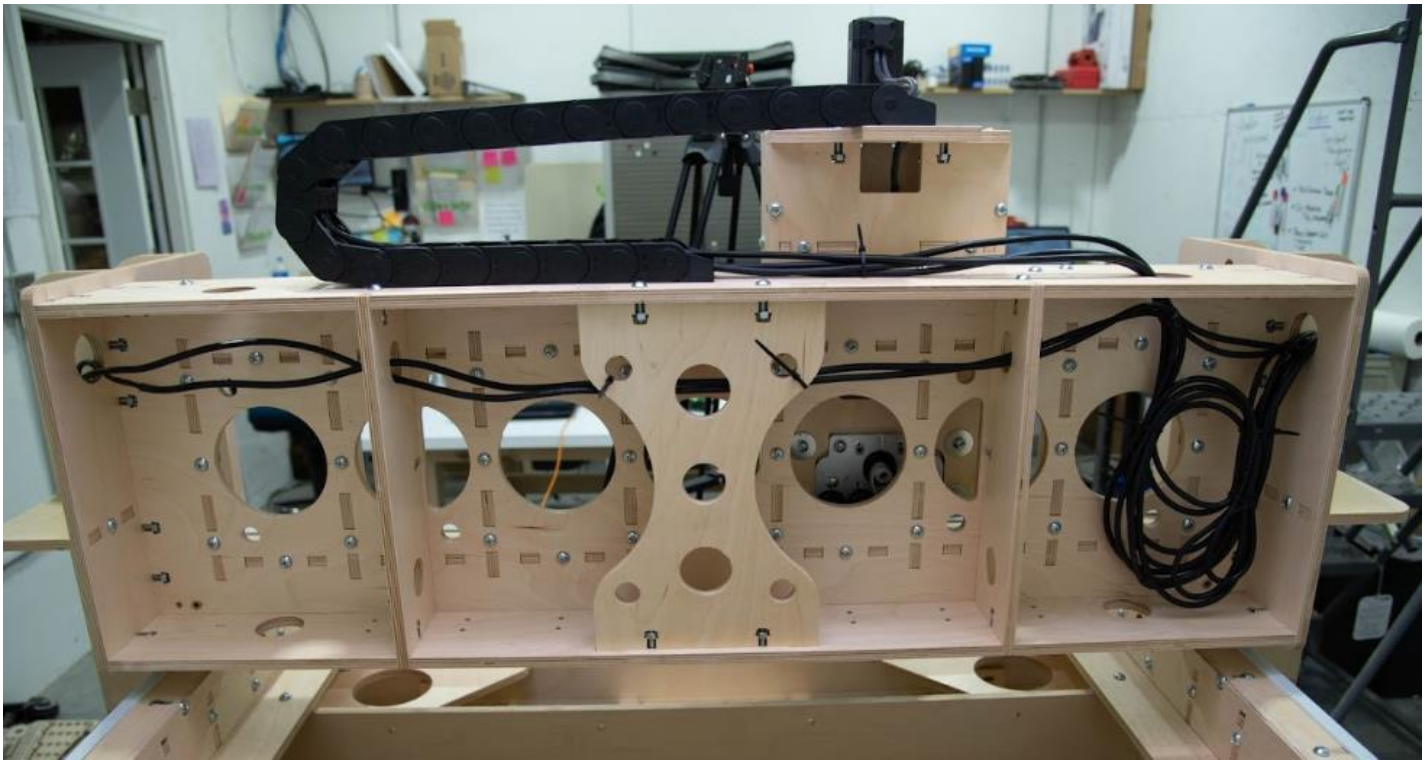




Carefully pull all the excess cables back through and the Drag Chain and the left side of the Gantry then organize and Zip Tie the excess Cables as shown.



Wire routing and management for the back of the Gantry Assembly



Preparing for the Home Switch Installation

WARNING **Keep the Home Switch cables separate from the Servo Motor and Encoder Cables as much as possible to minimize electronic interference (noise) which can adversely affect machine performance.**

Step 1

Separate and label the Home Switch cables, X1, X2, Y, and Z

Step 2

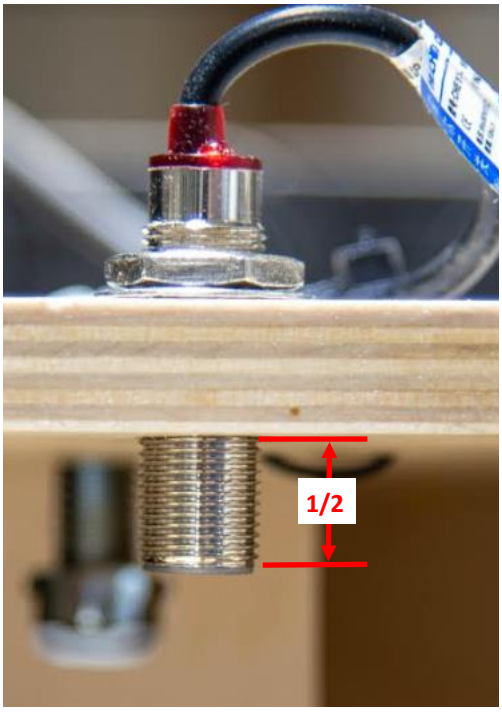
Remove the Nut and one of the Lock Washers from the all 4 of the Home Switches.

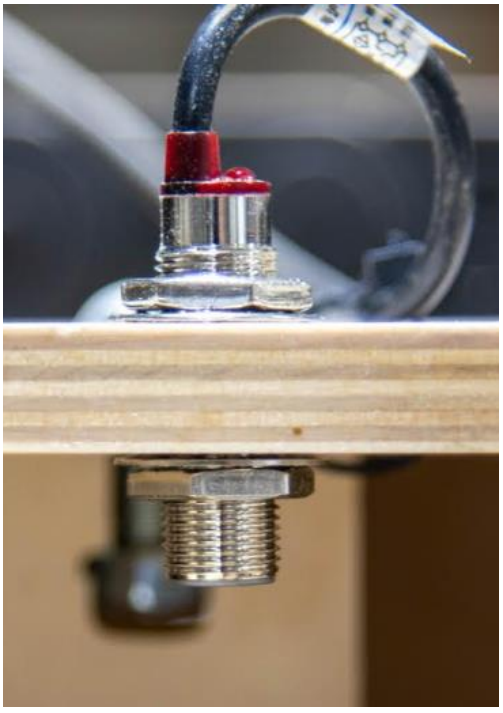
Installing the Z Home Switch

Step 1

Slip the Z Home Switch threaded body through Home Switch mount as shown. The hardware should be arranged: Upper Nut, Lock Washer, Plywood, Lock Washer, Lower Nut. Snug in place as shown.

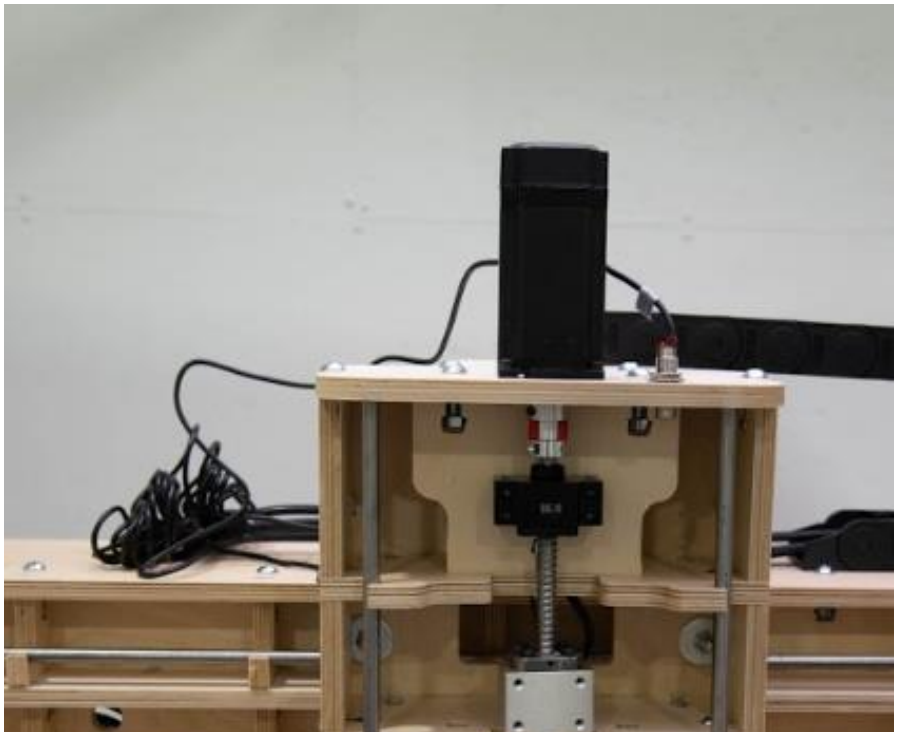
HINT	**Place the home switch so that the end of the barrel measures at least 1/2 inch from the Home Switch Mount surface.** **NOTE: The mounting distance can be adjusted once the CNC is ready for operation. This will be done to maximize the amount of travel on the Z axis.**

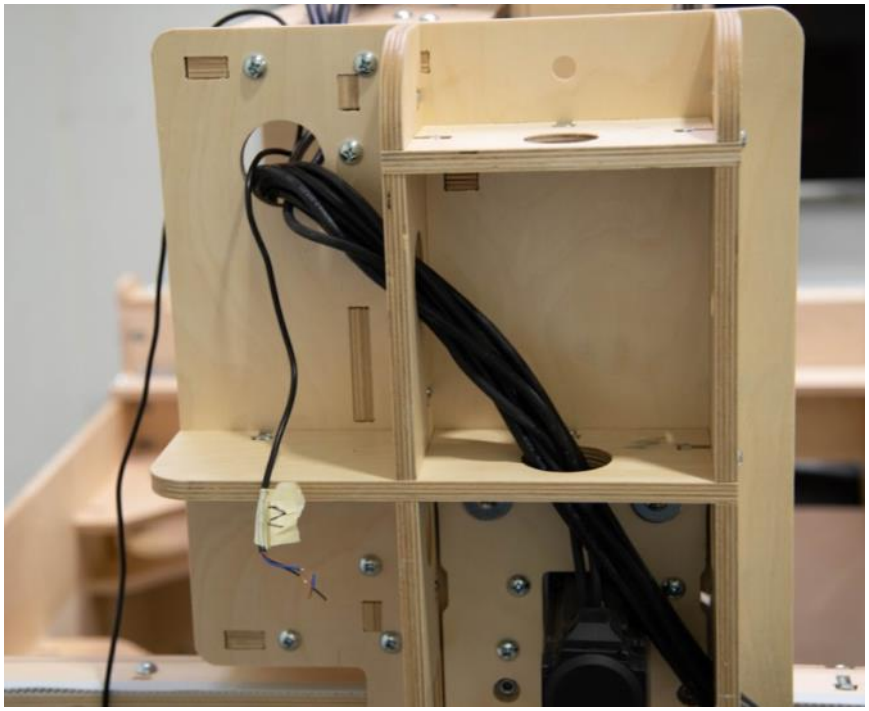




Step 2

Route the Z Home Switch into the Y Drag chain and through the upper access hole in the Left Gantry Side as shown. Finish by routing the Z Home Switch Wire through the X Drag Chain.





Installing the Y Home Switch

Step 1

Place the threaded body through the Y Home Switch Mounting hole. Secure with the Nut and Lock Washer.

HINT	**Place the home switch so that the end of the barrel measures at least 1/4 inch from the Home Switch Mount surface.** **NOTE: The mounting distance can be adjusted once the CNC is ready for operation. This will be done to maximize the amount of travel on the Y axis.**

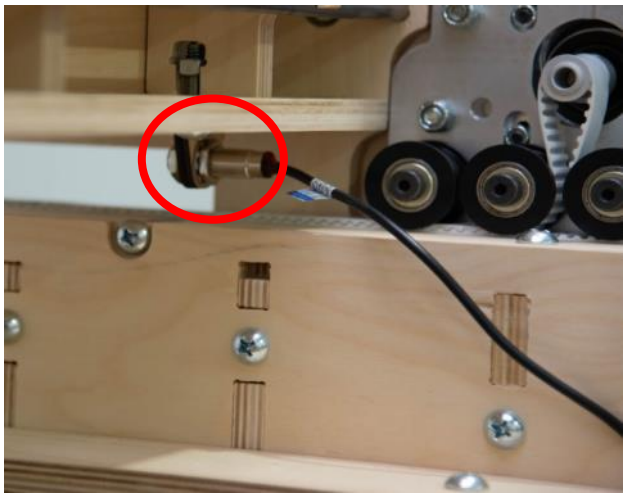
Step 2

Finish by routing the Y Home Switch wire down and through the Drag Chain.

Installing the X Home Switches

Step 1

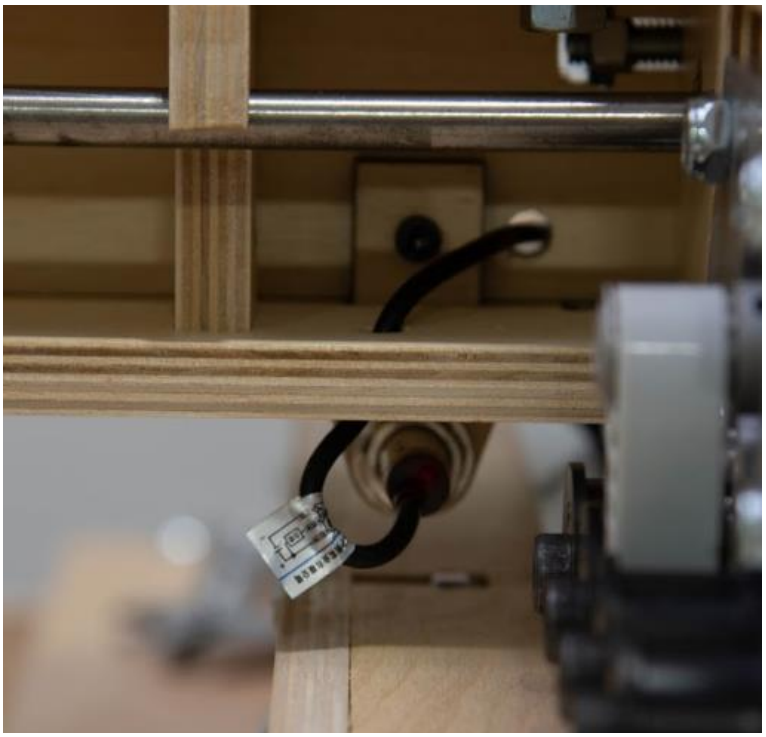
Install the threaded body of the X2 Home Switch into X2 Home Switch Mount as shown.



HINT	**Place the home switch so that the end of the barrel measures at least 1/2 inch from the Home Switch Mount surface.** **NOTE: The mounting distance can be adjusted once the CNC is ready for operation. This will be done to maximize the amount of travel and the gantry is square with the X axis.**

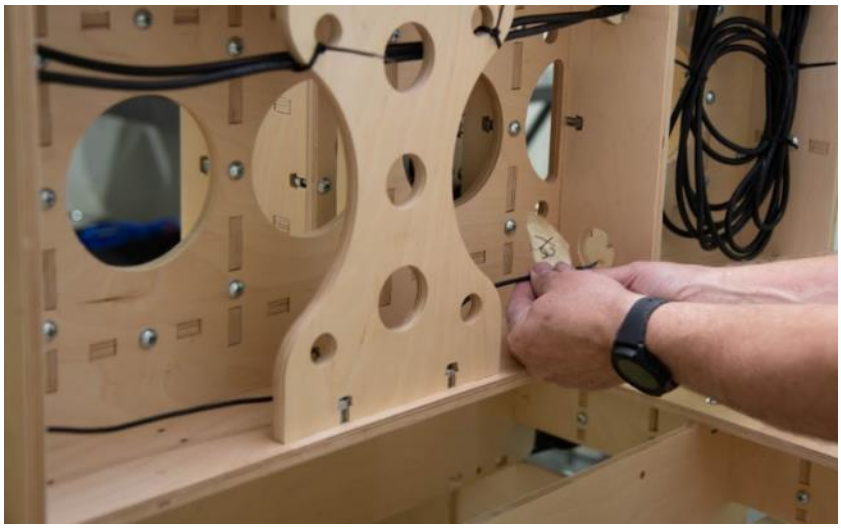
Step 2

Route the X2 Switch Wire up through the Gantry Bottom Support and out the back as shown.



Step 3

Route the X2 Switch Wire through the Gantry Frame and along the bottom of the Gantry Assembly as shown.

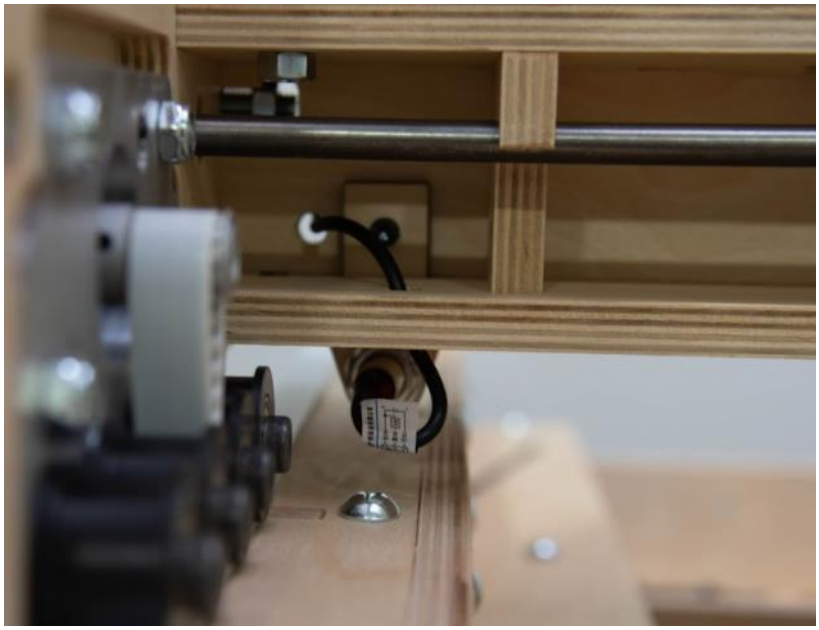


Step 4

Route the X2 Home Switch Wire up through the Left Gantry Side into and through the Drag Chain as shown.

Step 5

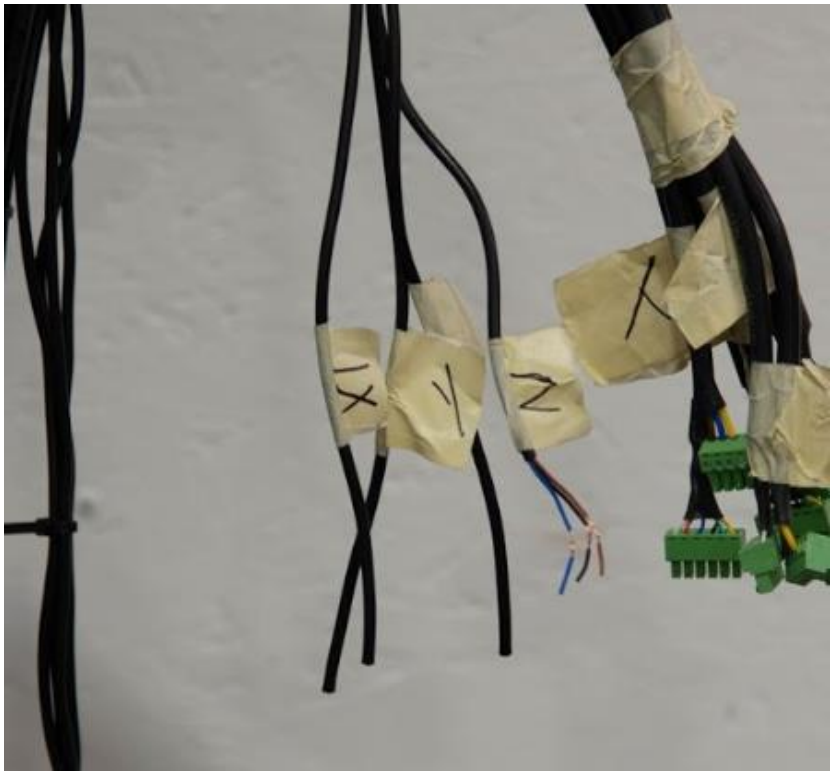
Follow the same process to install the X1 Home Switch



Securing, Trimming, and Managing the Excess Wires

Step 1

Trim Home Switch wires to the same length as the Servo Motor and Encoder Cables. Once trimmed, bundle the X1, X2, Y and Z Home Switch Wires together with Zip Ties placed 6 inches apart.



Be careful to protect the connectors from damage. The connections to the Controller will be completed in a later step.

Tightening the Bell Everman Dynamic Belts

WARNING **Do not overtighten the Dynamic belt. The Dynamic belt should be tightened to remove any slack between the timing and idler pulleys and ensure that the mesh has contact resulting in minimal backlash.**

Step 1

To tighten the Y belt, use a 1/2” open ended wrench to raise the bolt head. Raising the bolt head will force the Y Servo Motor upward and tighten the belt.

Step 2

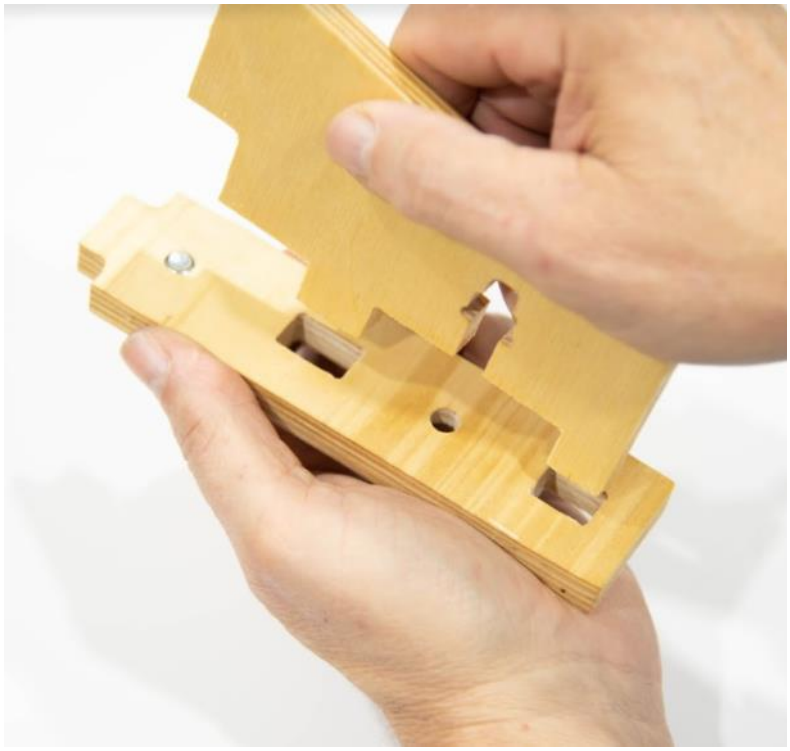
Once the belt has been tightened, then tighten the four Y Servo Motor mounting screws as shown.

Step 3

Loosen the 5/16” Hex Bolt so that it no longer touches the Y Servo Motor.

Step 4 Assemble the X Servo Belt Tension Tool.

Insert a 5/16 Nut and the 5/16 x 1 Hex Head Bolt as shown.

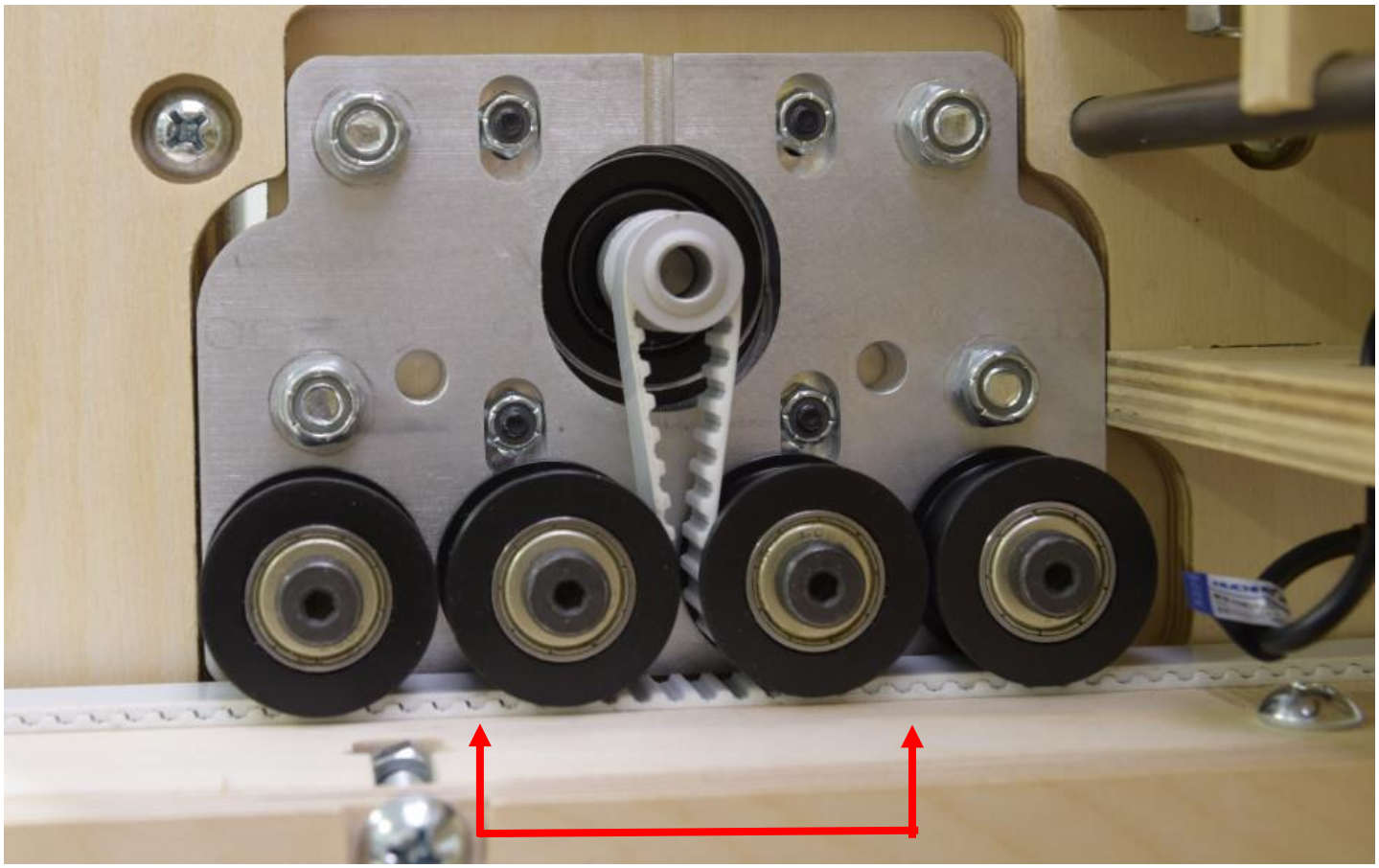


Position the tool parts and secure with 5/16 x 1 1/4 Machine Screw and Nut as shown.

Step 5

Insert the Belt Tensioning Tool beneath the X1 Stepper Motor and raise the head of the bolt until it touches the Motor Assembly.

Using a 1/2” open end wrench gently adjust the bolt up against the motor housing until the belt is properly tightened. Remove the slack between the Timing and Idler Pulleys. Repeat process for the X2 Stepper Motor.

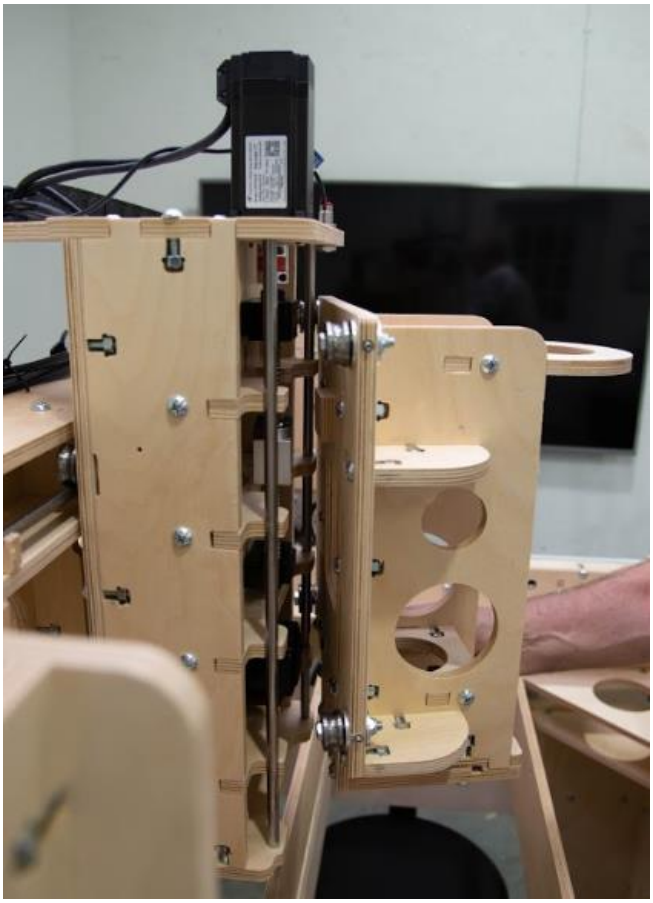


Properly tightened belt with teeth fully engaged.

Attaching the Z Assembly

Step 1

Attach the Z Assembly by holding one side of the bearings against the rod and rotating the Assembly into position as shown.



Step 2

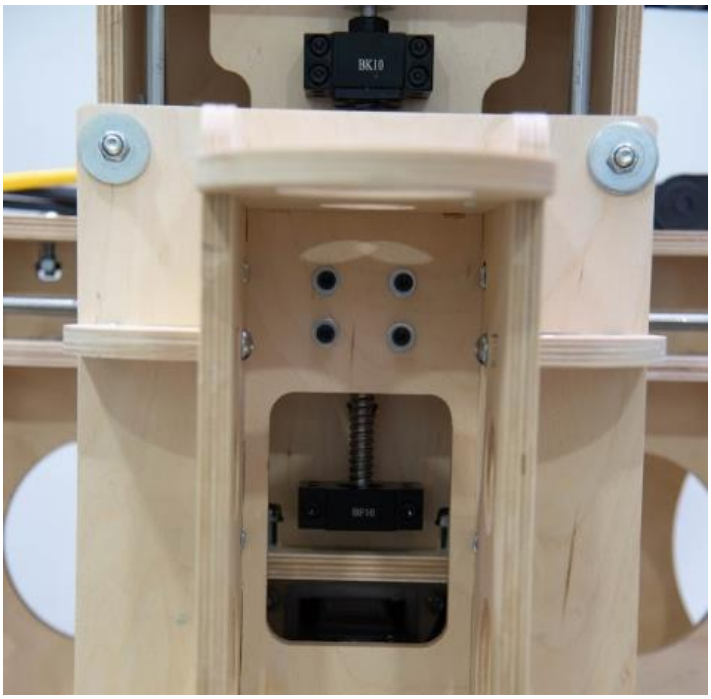
Screw the 8-32 Inserts inward to push the bearings snug up against the rails as shown.

Step 3

Slide the Z Assembly and align the four mounting holes with the Ball Screw Nut Housing

Step 4

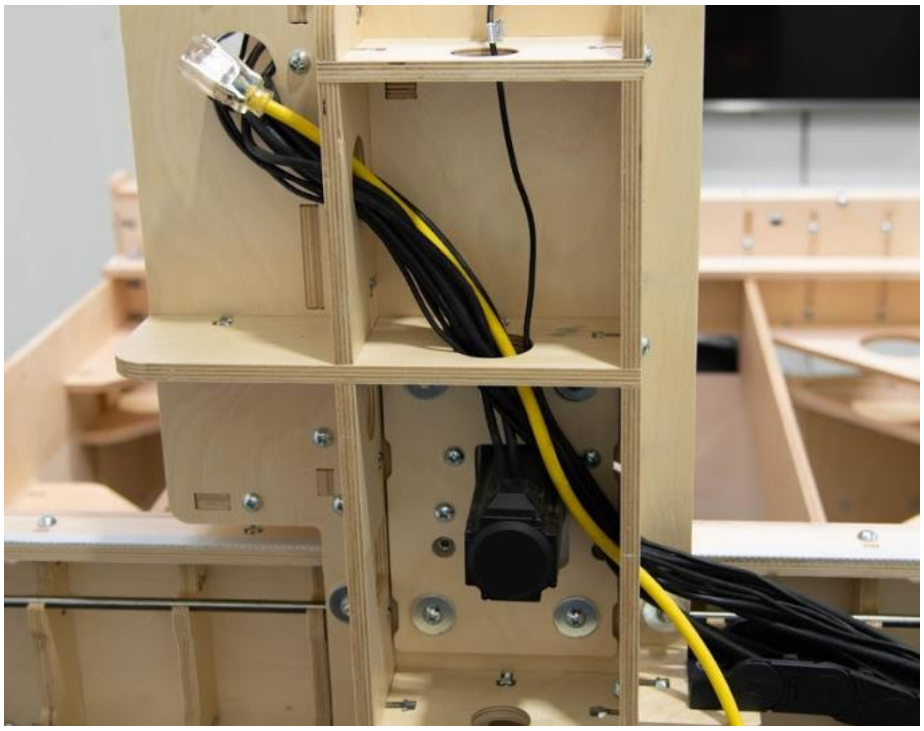
Tighten the Z Assembly to the Ball Screw Nut Housing using four M4 X 30 Socket Head Screws and M 5 Washers as shown.

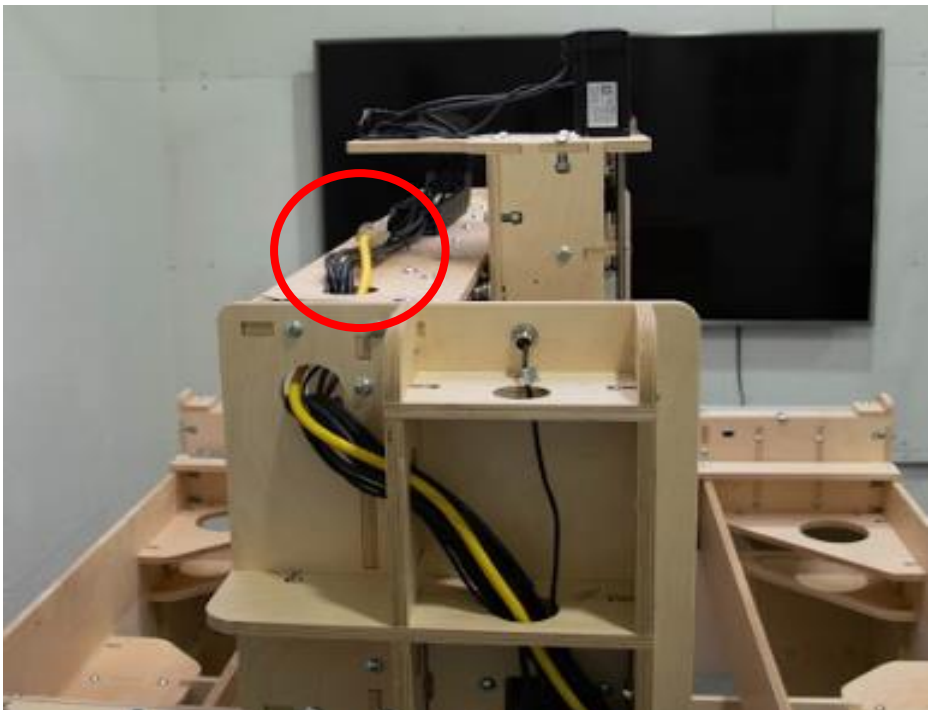


Routing the Extension Cord and Attaching the Spindle

Step 1

Route the Extension cord through the Left Side Gantry Frame Assembly and Drag Chain.

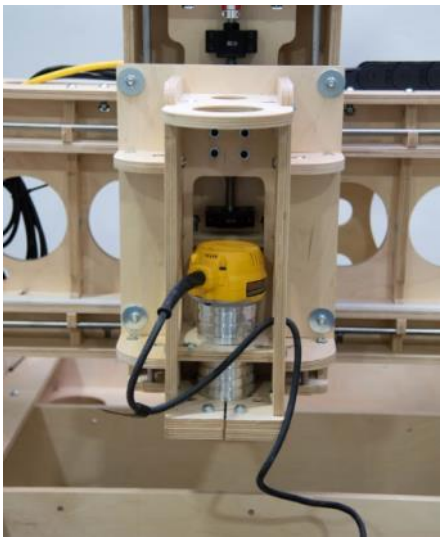




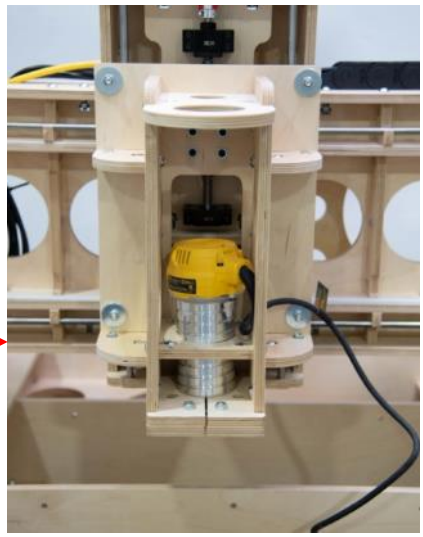
The female end of the Extension cord should be positioned at the entrance of the Y Drag Chain as shown.

Step 2

Insert the Spindle mid way through the mount and rotate as the cord is gently pulled through the access hole in the Z Assembly as shown.

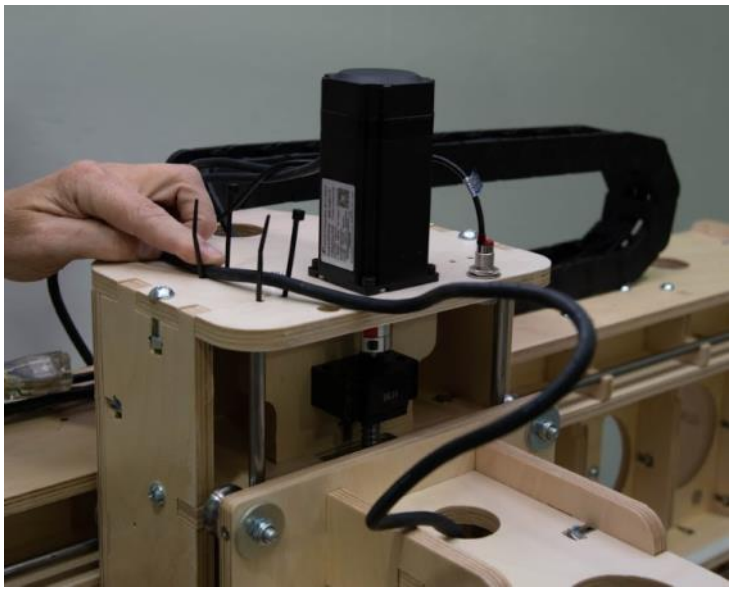


Gently turn the router as you feed the strain relief and power cord through the access hole. →



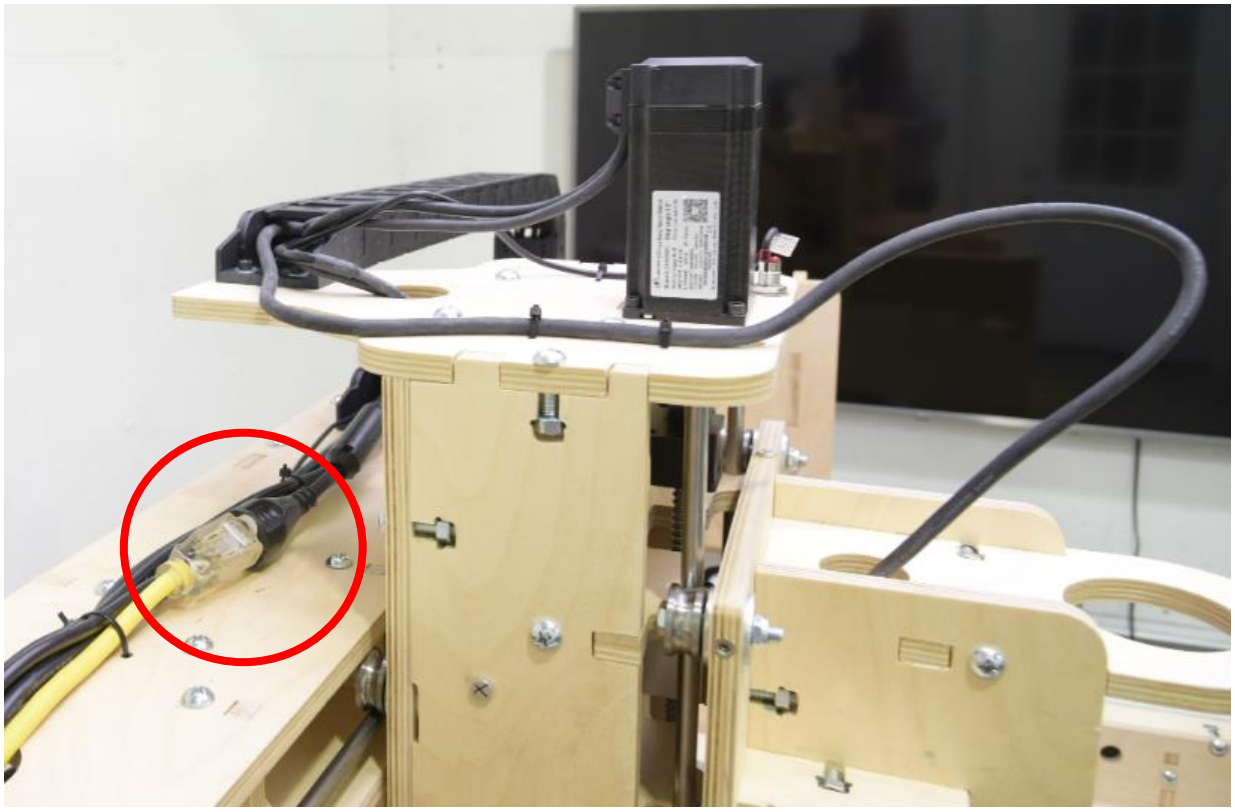
Step 3

Route the Spindle Cord through the Z Assembly and mount it with Zip Ties leaving excess for Z axis motion.



Step 4

Plug the Router into the Extension Cord as shown.

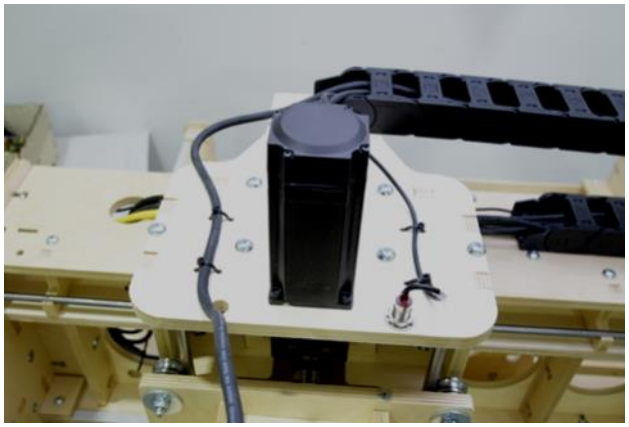


Wire Management

Step 1

Re-install the Drag Chain Clips for Both Drag Chains. Be careful not to damage any of the Cables.

Cable Management Pictures



NOTE: Bundle the Cables together and secure to the frame components to eliminate excess movement and prolong the life of the wiring components.

Assembling and Mounting the Vacuum Brush Shoe

Step 1

Install two 1/4-20 Inserts into the Shoe Plate as shown.

Step 2

Using a slotted screw driver insert the 2” Brush material securely into the groove of the Shoe Plate until the brush completely surrounds the plate and trim to length.

NOTE: You may have to sand the inside channel to widen.

Step 2

Thread a 1/4-20 Nut onto both bolts until the bottom of nut is approximately 9/16” from the bottom of each bolt. Then thread the bolts assembly into the threaded inserts as shown.

9/16”

Step 3

Insert the Brush assembly around the Router body with the Bolts fitting up and through the access holes in the Router base plate as shown.

Step 4

Lock the Brush Shoe Assembly in place by inserting the Shoe Retainer as shown.