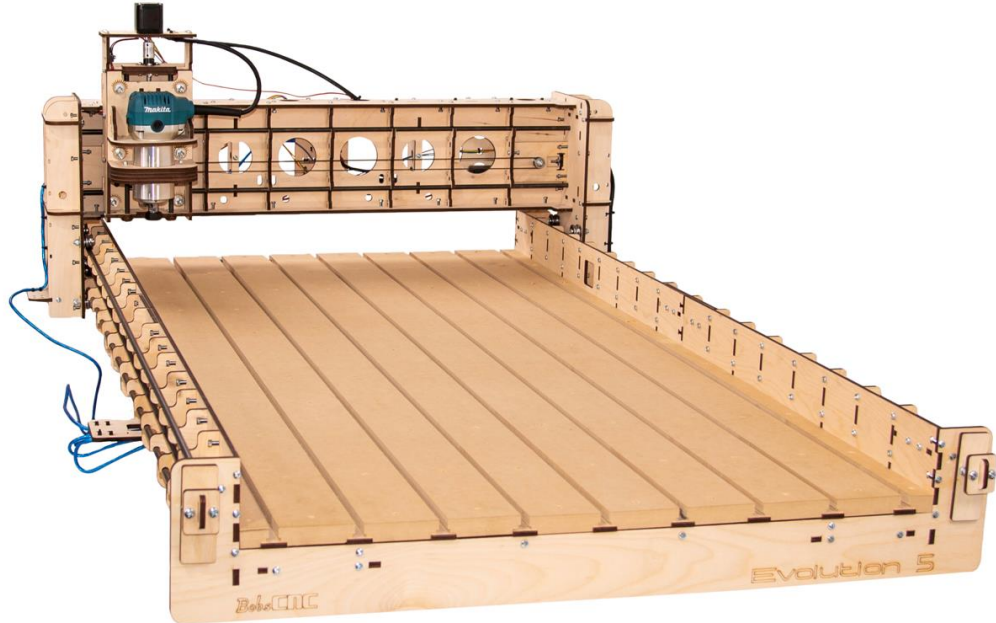


BobsCNC
Unleash Your Creativity



Evolution 4 Upgrade Kit

Converts the Evolution 4 CNC Router
into an Evolution 5 CNC Router

Assembly Instructions

Rev. 1.9

Contents

EVOLUTION 4 Upgrade Specifications.....	2
Information/Warning Boxes.....	3
Safety Precautions and Warnings.....	4
Getting Started.....	5
Required Tools:.....	5
Assembly Recommendations:	5
Removing Components:.....	7
Illustrated Step by Step Instructions	7
X Frame Extension Assembly	12
Wood Components	12
Hardware	13
Illustrated Step by Step Instructions	14
Final Assembly.....	21
Illustrated Step by Step Instructions	21
T-Slot Spoilboard	39
Wood Components	39
Required Hardware.....	39
Illustrated Step by Step Instructions	40
Updating Firmware.....	49
Evolution 4 Extension Firmware Value Change.....	49
Appendix (\$130=1283)	50
Evolution 4 Firmware Values.....	50

EVOLUTION 4 Upgrade Specifications

The Assembled Footprint:

Length: 58.7" (1490 mm)

Width: 39" (994 mm)

Height: 20.9" (530 mm)

Assembled Weight:

48 lbs.

Cutting Area:

X: 50.5" (1283 mm)

Y: 24" (610 mm)

Z: 3.3" (85 mm)

Safety is the First Priority. Always wear proper protective equipment and use "safety sense" when assembling and operating your Evolution 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

Evolution Series CNC Routers have a 110 v. power supply and use bits that spin at 28,000 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.

Diagonal Cutters or sharp knife to trim nylon ties.

Calipers or measuring tape to measure part placement.

#3 Phillips screwdriver to build the main components.

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 Allen Wrenches.

Assembly Recommendations:

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

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

Apply LOCTITE to all M4 X 16 mm Machine Screw that are used to secure plywood pieces except for the 4 screws that clamp the router in step 10 of 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.

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

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



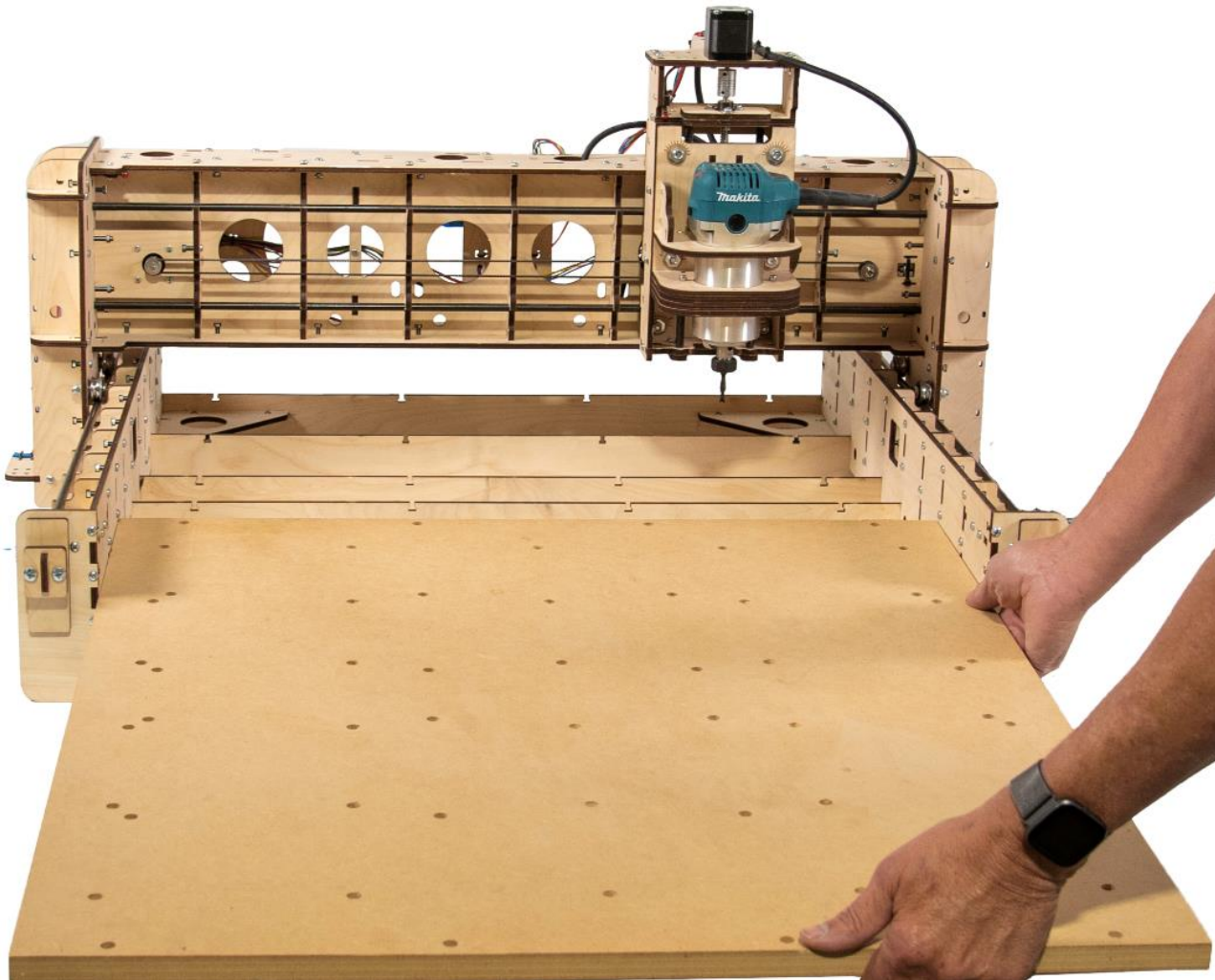
CAUTION This kit contains numerous small components that pose a choking risk for small children and pets. Keep kit pieces in a secure location out of the reach of small children and pets.

Removing Components:

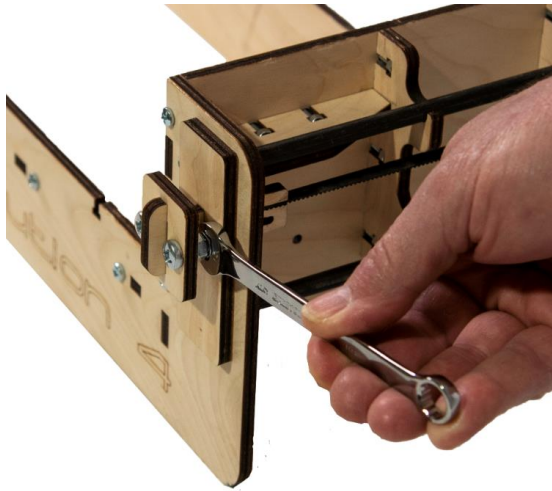
Illustrated Step by Step Instructions

Before you can upgrade your Evolution 4 you will need to remove several components.

Step 1 Remove and discard Spoilboard.



Step 2 Remove and discard Belts by first loosening the Belt Tensioner.



Be sure to keep the Belt Retainers.



Step 3 Remove front Frame End Support and discard.



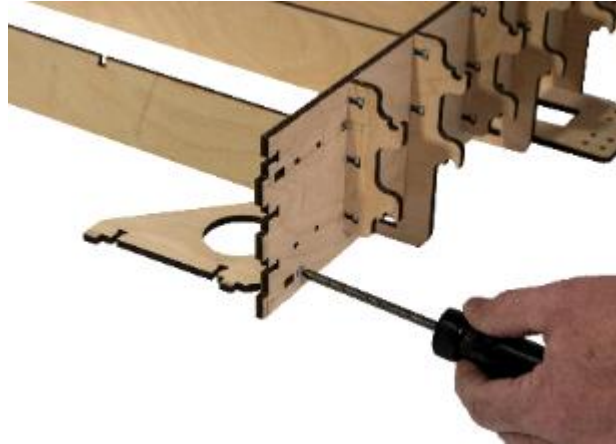
Step 4 Remove both sides of the front Frame Corner Supports and set aside. They will be reinstalled with the new Evolution 5 End Support.



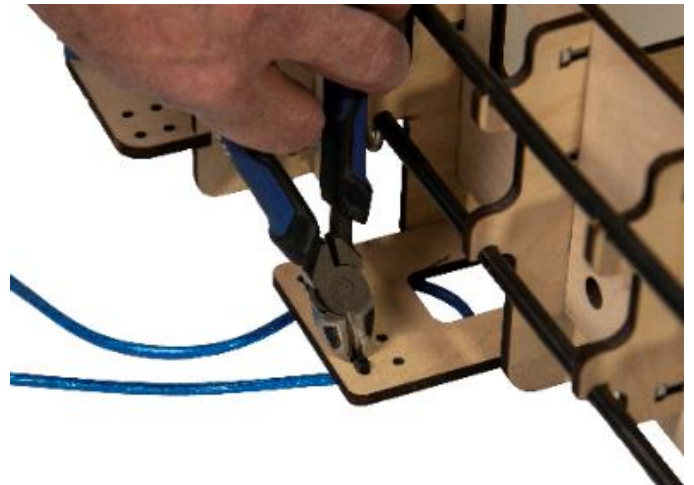
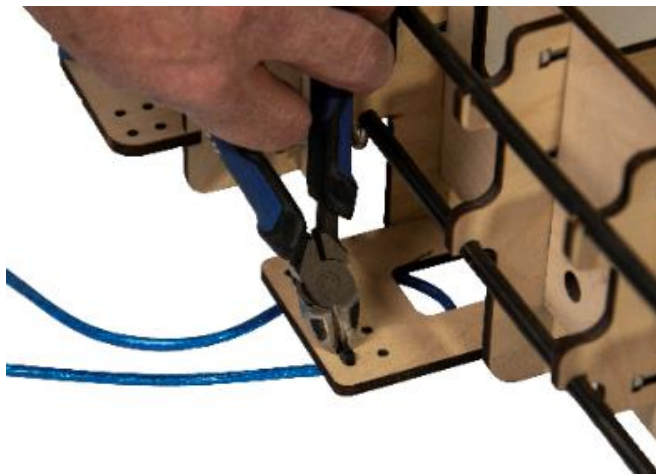
Step 5 Remove both sides of the Frame Corner Braces and set aside to be used in the Front Assembly.



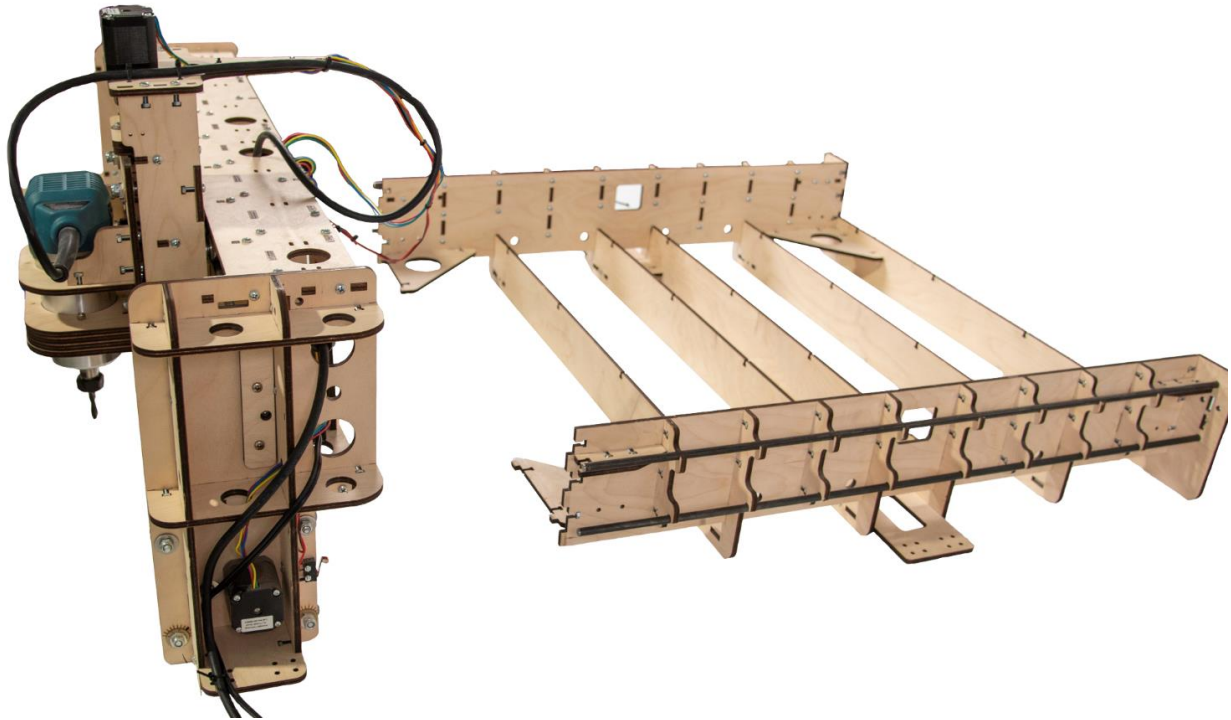
Save these parts



Step 6 Clip and remove the Zip Ties that secure the USB Cable and Power Cords to the Wire Harness Supports.



Step 7 Slide Gantry Assembly off the Rails and carefully set it aside.

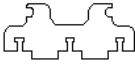
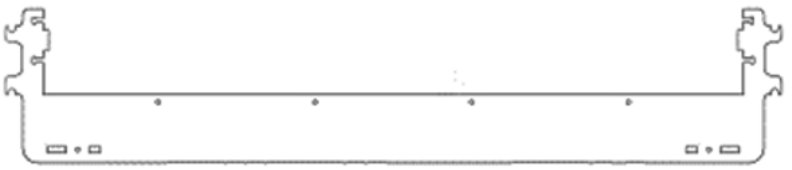
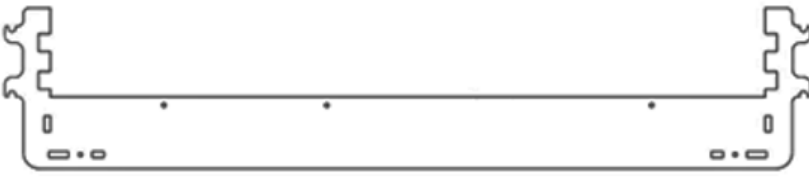
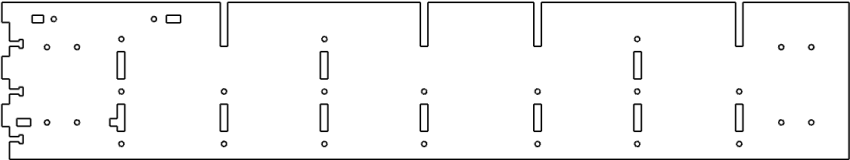

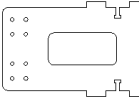
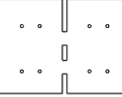


Step 8 Remove the four X Rails and discard. The X frame will form the Rear Assembly.





X Frame Extension Assembly

Wood Components

Part #	Description	Qty	Photo
X1	Rail Support	6	
X4	Frame Mid Support	4	
EX4	Extension Frame Mid Support	1	
EX5	Extension Frame Side Support	2	
X6	Frame End Support	2	
X7	Wire Harness Support	2	
EX12	Coupling Plate	2	

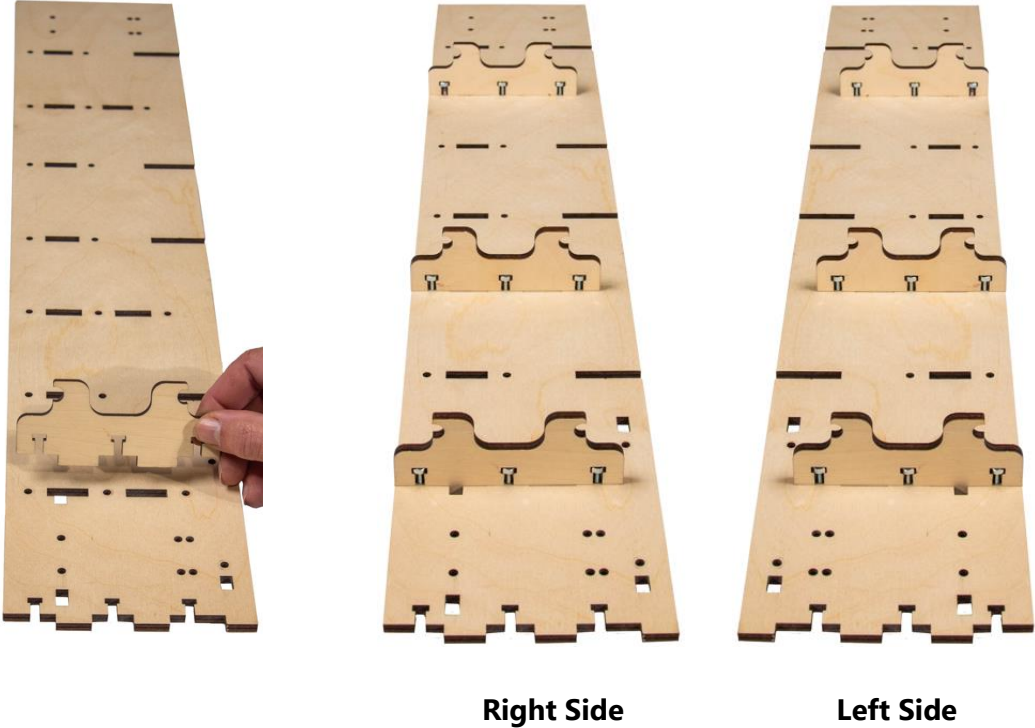
Hardware

Part #	Description	Qty	Photo
H14	M4 x 16 Machine Screw	74	
H15	M4 Nut	58	
H47	M4 Locknut	16	
H56	GT2 Belts	2	
H82	Stress Proof Steel X Rail	4	

Illustrated Step by Step Instructions

Step 1 The X Frame consists of a front and rear Assembly. To build the Front Assembly:

Align the tabs of the Rail Supports (X1) into the slots in the Extension Frame Side Support (EX5). Secure with three M4 x 16 Machine Screws and Nuts for each Rail Support as shown. Repeat for both Frame Side Supports Front.



Step 2

Align the tabs of two Frame Corner Supports (previously removed) into the lower slots of the Frame Side Assembly and secure with two M4 x 16 Machine Screws and Nuts as shown. Repeat to complete the second Frame Side Assembly.



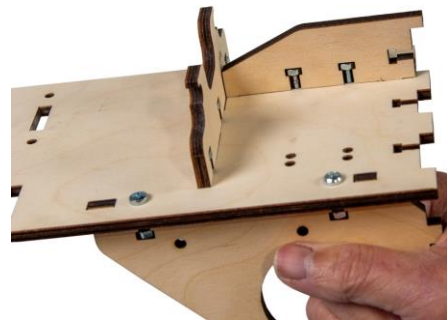
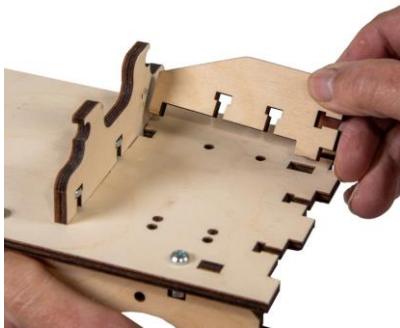
Right Side



Left Side

Step 3

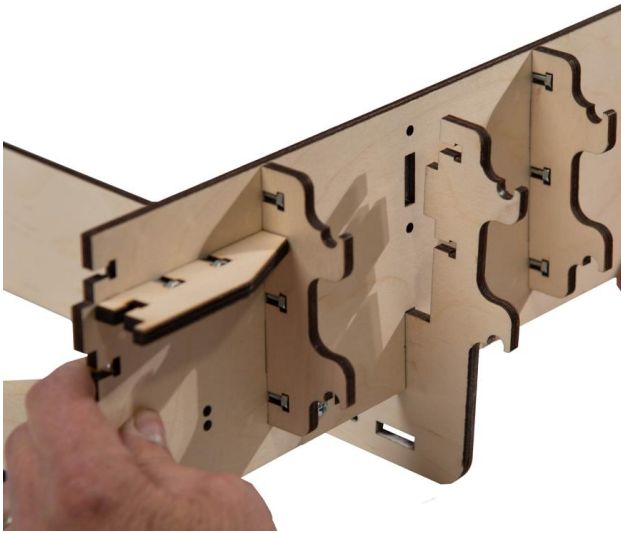
Align the tabs of the four Frame Corner Braces (previously removed) into upper slots of the Frame Side Assembly on the outside and secure with two M4 x 16 Machine Screws and Nuts as shown. Repeat on the remaining Frame Side Assembly.



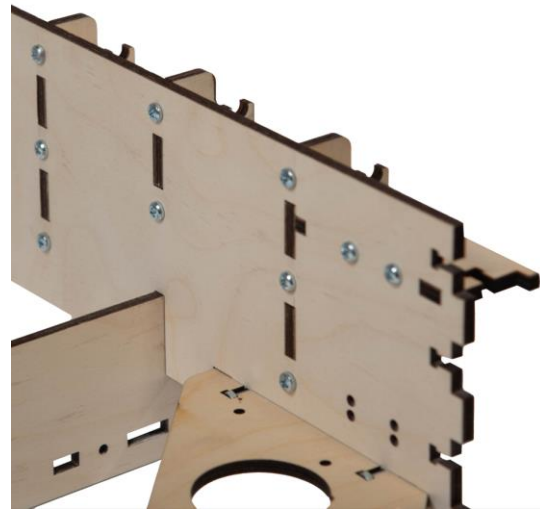


Completed Front Side Assemblies

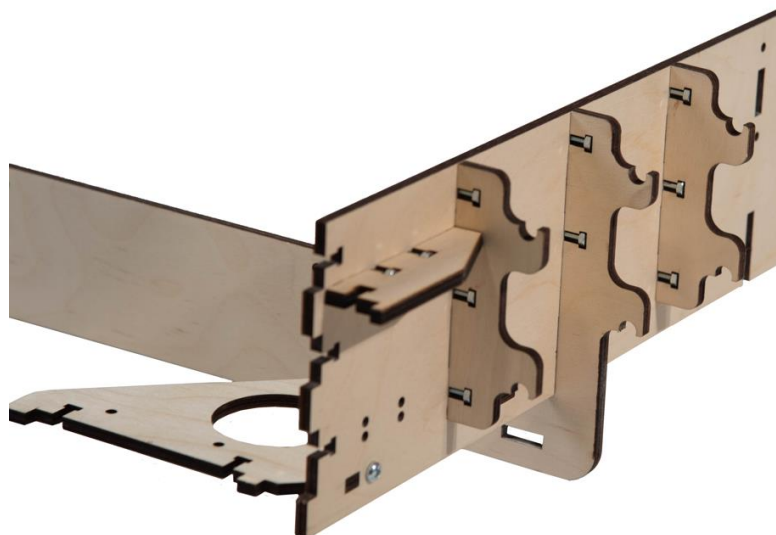
Step 4 Align the slots in one of the Frame Side Assemblies with the tabs in the Frame Mid Support(X4) as shown and secure with two M4 x 16 Screws and Nuts.



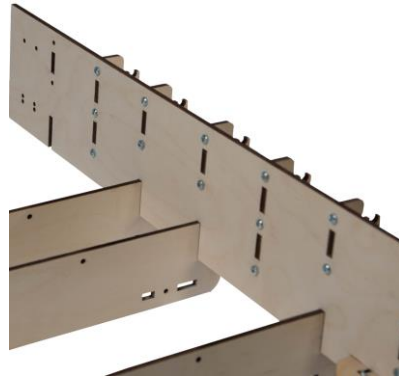
Outside View



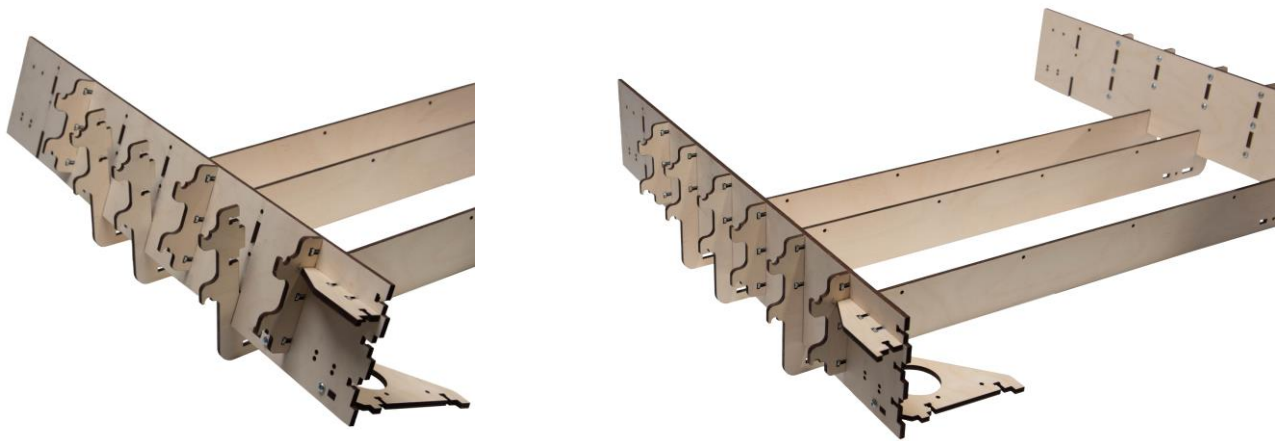
Inside View



Step 5 Repeat the process until three Frame Mid Supports have been installed and secured.

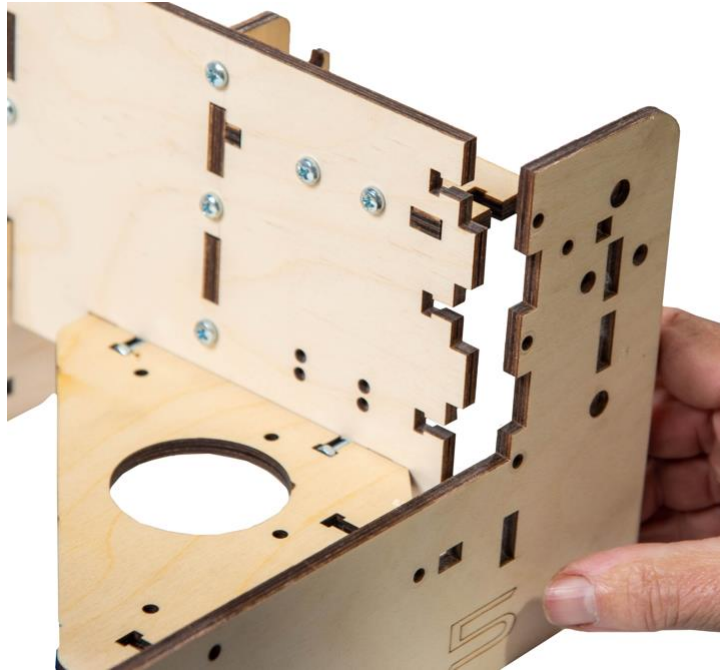


Step 6 Repeat this procedure to install the remaining Side Support Assembly.



Step 7

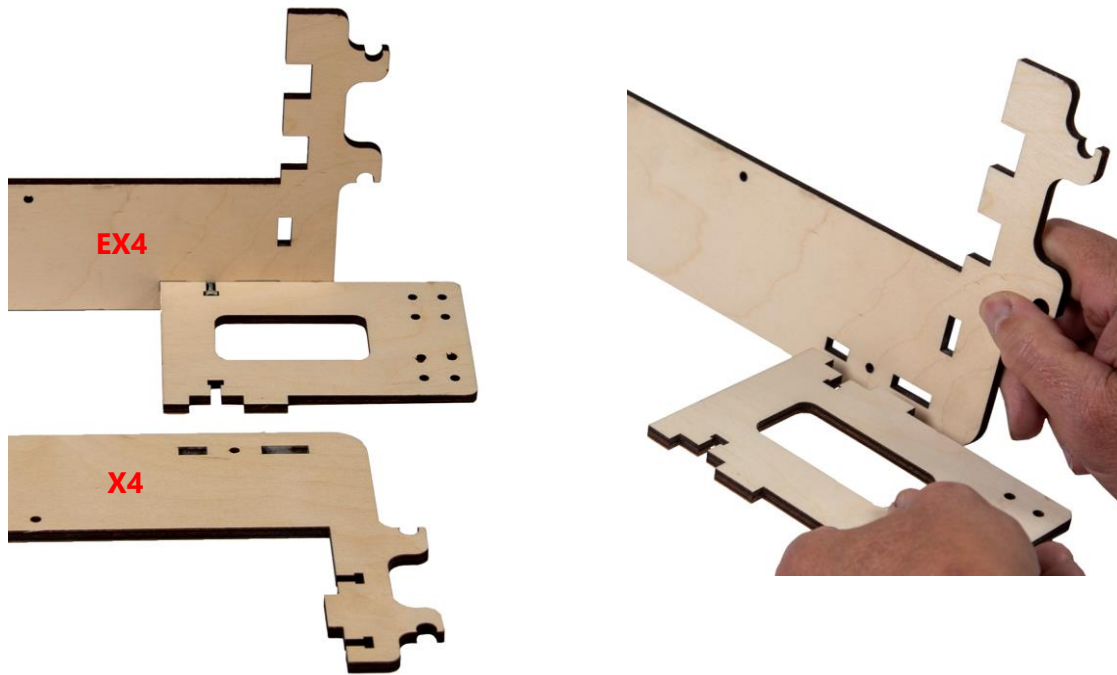
Align the slots in the X6 Frame End Support with the tabs in the Front X Frame Assembly and secure each side with six M4 x 16 Screws and Nuts.



**Completed Front X Frame
Assembly**

Step 8

Using the Extension Frame Mid Support (EX4), align the tabs of the Wire Harness Support (X7) with the slots and secure with two M4 x 16 Machine Screws and Nuts for each end as shown. Align and mount the Frame Mid Support (X4) to the Mid Frame Assembly.



Repeat to install the remaining Wire Harness Support (X7)

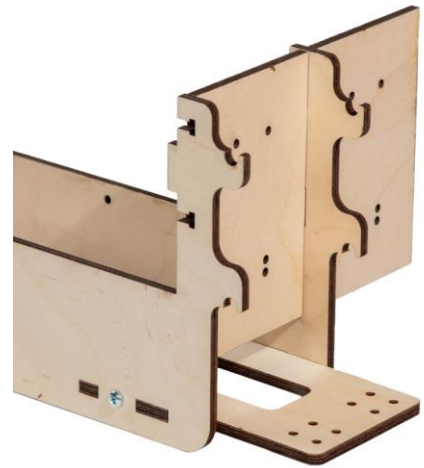
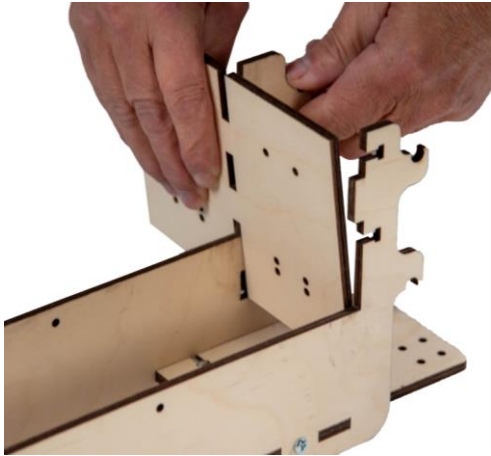


Completed Mid Frame Assembly

Final Assembly

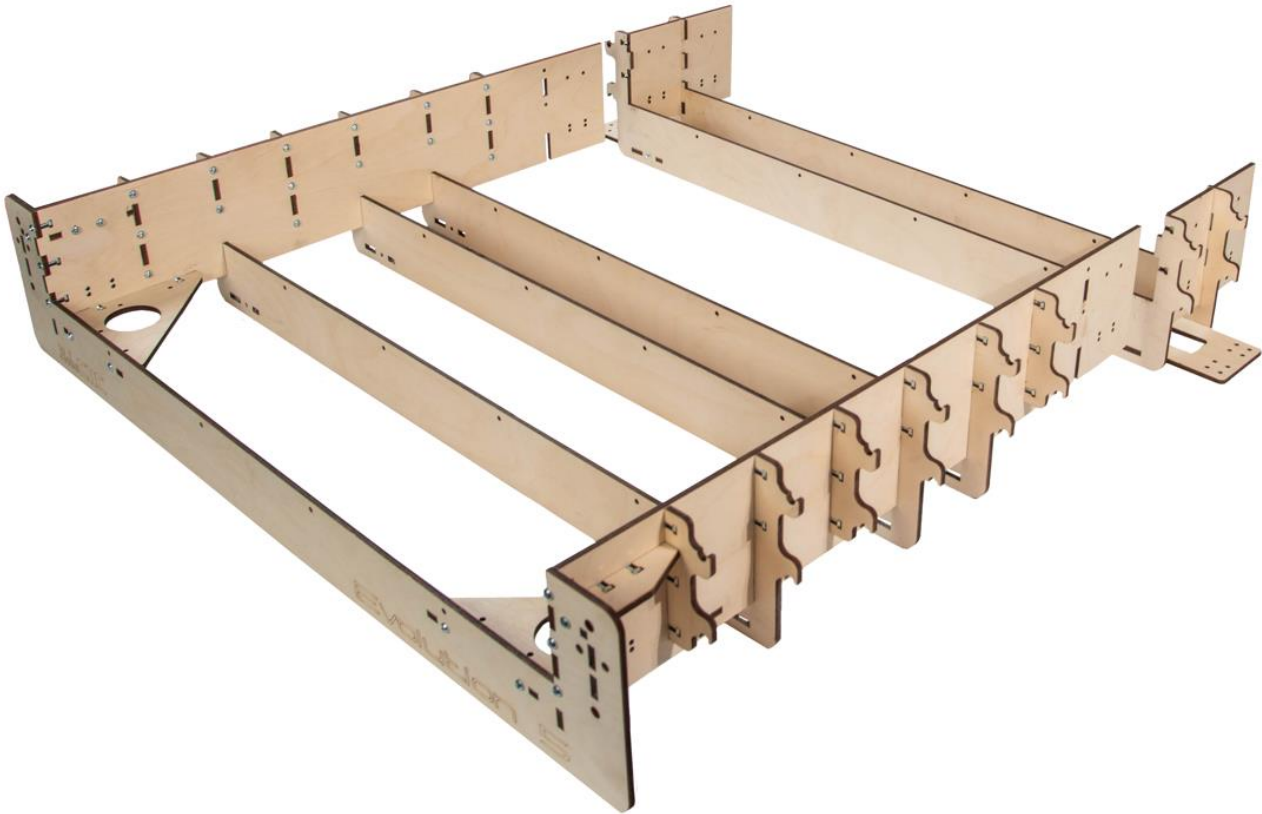
Illustrated Step by Step Instructions

- Step 1** Align the tabs of the Mid Frame Assembly into the slots of the Coupling Plate (EX12) (one for each Side of the Mid Frame Assembly) and press them together as shown.



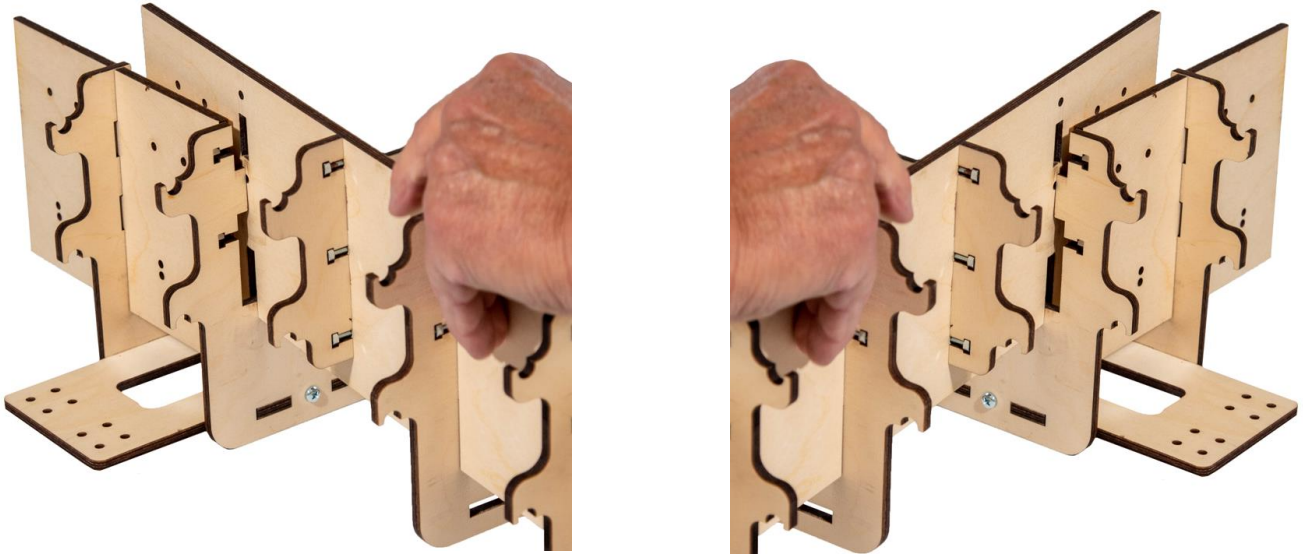
Step 2

Align the mounting holes of the Coupling Plates(EX12) with the holes in the Front X Frame Assembly. The ends of the Front X Frame Assembly will fit between the Coupling Plates.

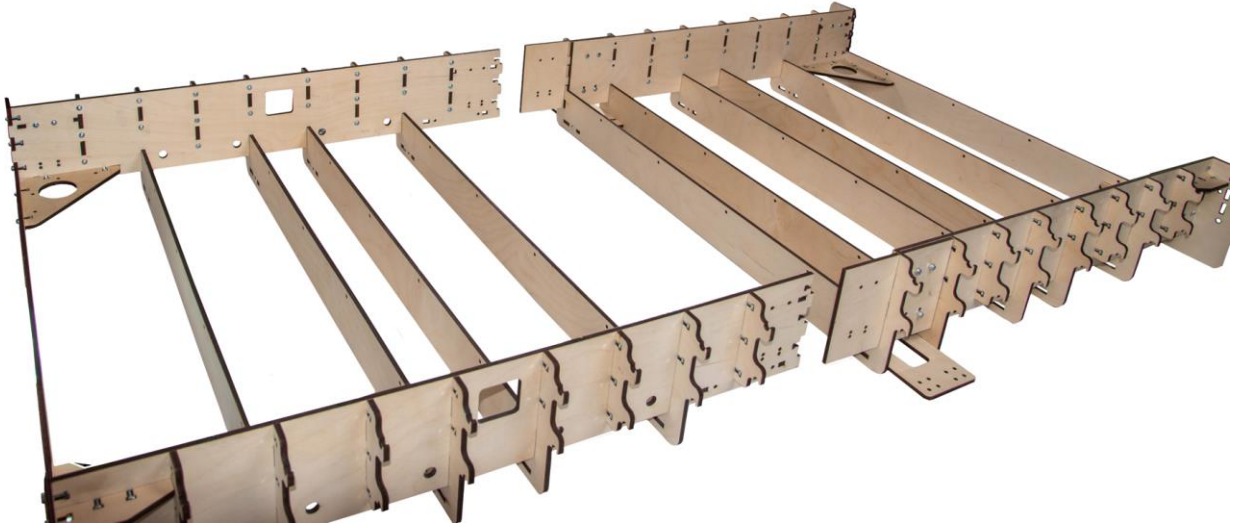


Step 3

Insert the tabs of the Frame Mid Support (X4) into the slots of the Front X Frame Assembly and secure with four M4 x 16 Machine Screws and Locking Nuts for each side as shown.



Step 4 Align the unused mounting holes of the Coupling Plate with the holes in the Rear X Frame Assembly.



The ends of the Rear X Frame Assembly will fit between the Coupling Plates. Secure each side with four M4 X 16 Screws and Lock Nuts.



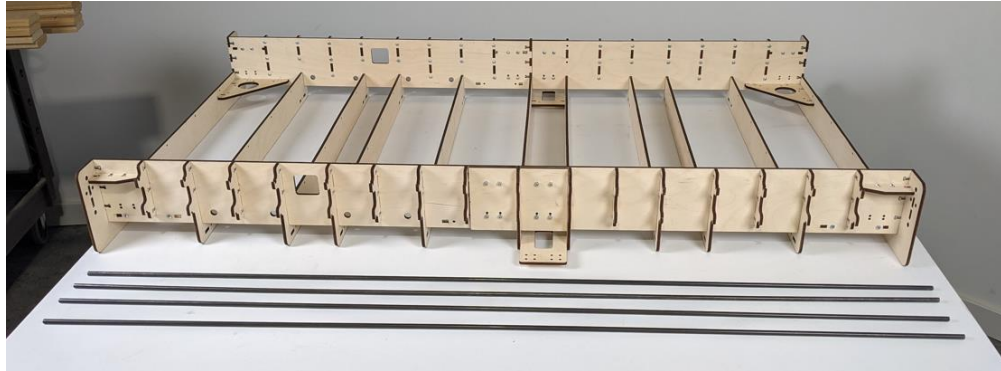
IMPORTANT NOTE: Before tightening the Lock Nuts, hold a straight edge across the top each side. Make sure the top edges of the entire X Frame Assembly are flat when tightening.



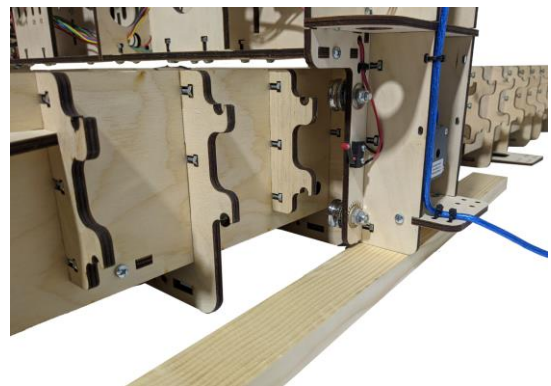
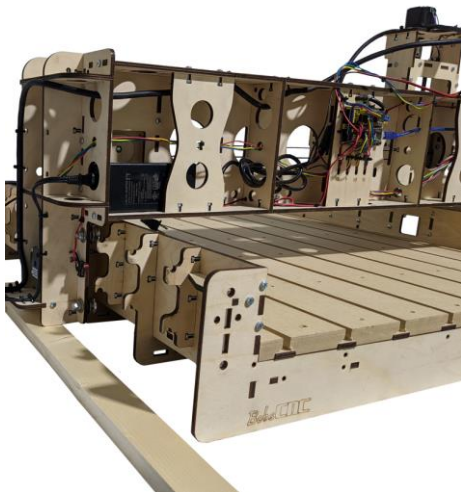
Completed Frame Assembly

Step 5 Insert each of the 4 X Rails starting from one end while moving through each support.

Note: rotating the rod gently will ease installation.



Step 6 Carefully reinstall the Gantry Assembly. In the photos below the Gantry is resting on a piece of $\frac{3}{4}$ " scrap to help hold the bearings up before installing the new Rails.



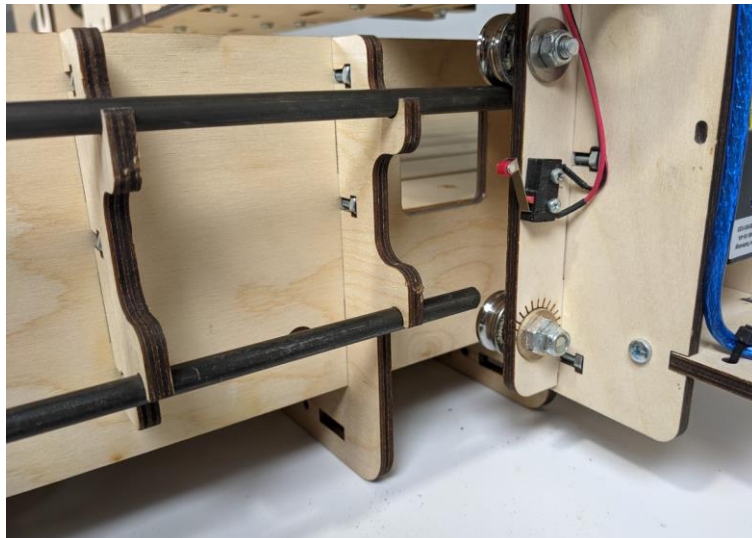
Step 7

Carefully install the two X Rails through the X Frame Assembly Support and the Rail Supports. Lift one side of the Gantry to allow the Rail to pass beneath the upper bearing.

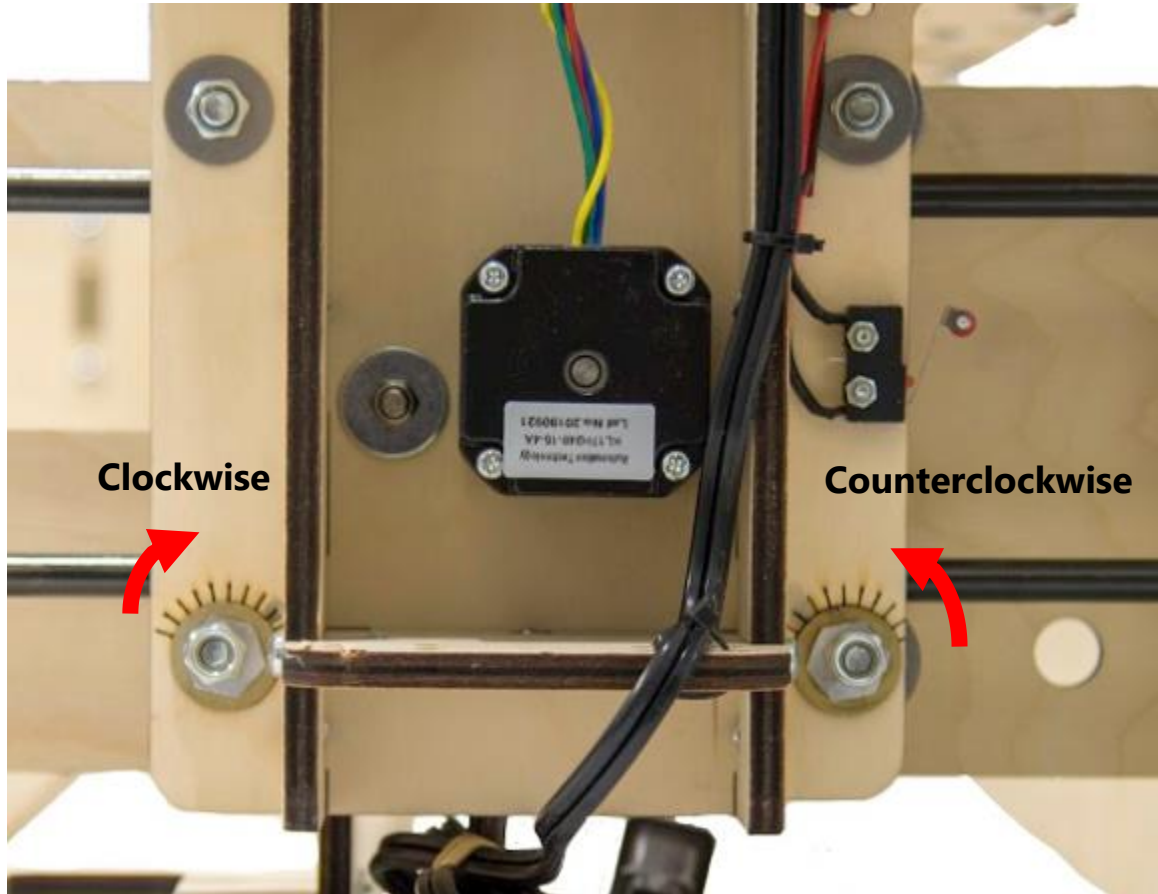


Step 8

Carefully install the lower Rails through the X Frame Assembly and the Rail Supports threading the rail to pass over the lower bearing. Repeat to install Rails on other side.



Step 9 Adjusting the Eccentric Spacers

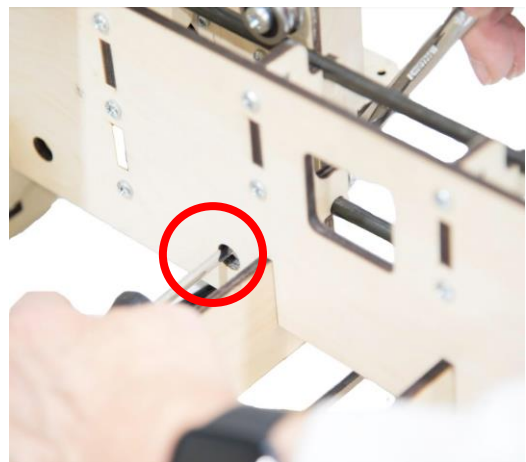


NOTE: To raise the SG20U Bearing against the Rail on the Left Side, use a 13mm wrench or socket to rotate the Eccentric Adjustment Spacer clockwise. To raise the Bearing on the Right Side, rotate the Eccentric Adjustment Spacer counterclockwise.

Raise the left lower Bearing to the corresponding mark. Using your fingers try to turn the left lower Bearing. The Bearing should only move if the Gantry moves. Once the Bearings are snug against the Rail, tighten the Locknut with a 10mm wrench and Phillips Head screwdriver as shown.



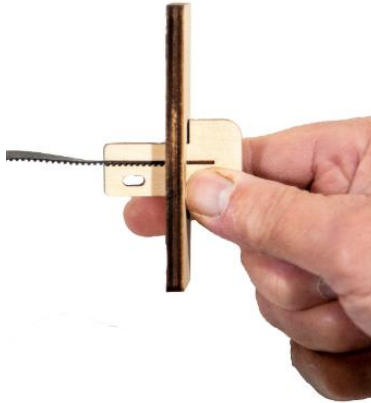
NOTE: There are access holes located at the bottom of the Sides of the X Frame to help you tighten the Bearings.



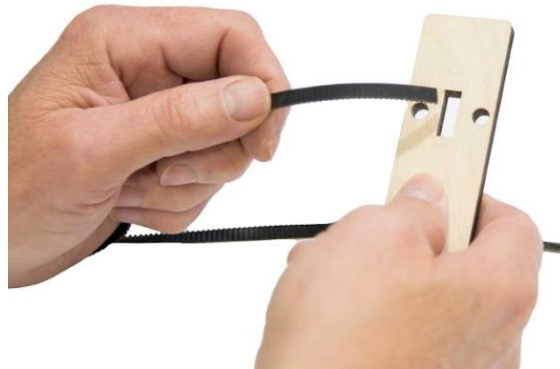
Step 10 Installing the X GT2 Belts.

10a Cut two of the GT2 Belts to a length of **60 7/8** inches.

10b Insert one end of the Belt into the Short Belt Retainer (previously removed).

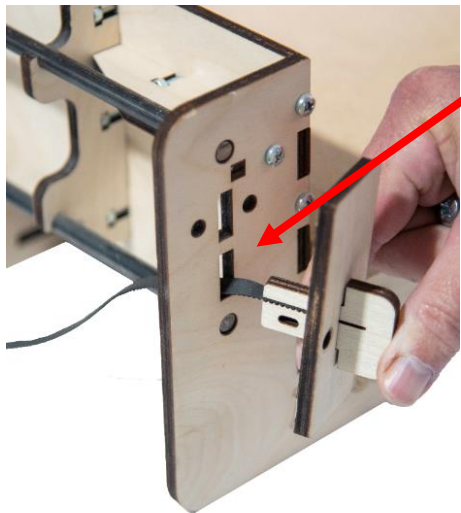


10c Next, thread the free end of the GT2 Belt through the Rail Stop (previously removed).

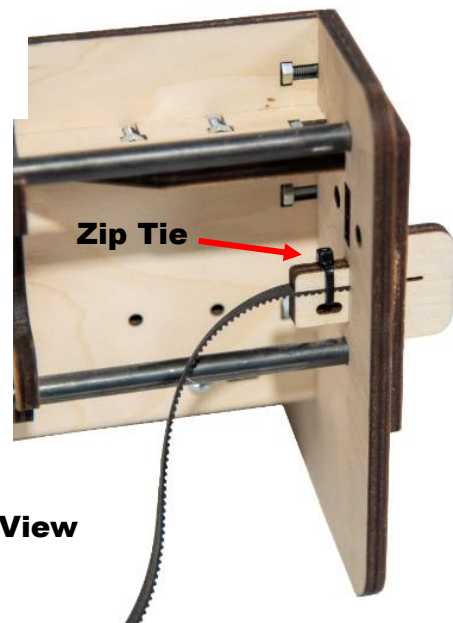


10d Insert the Belt Retainer and Belt into and through the Rail Stop. Then insert the Assembly into the bottom slot at the back of the X Frame Assembly.

NOTE: Using a Zip Tie, snug the belt in the Retainer. Make sure the square lock of the Zip Tie is located on the top of the Belt Retainer.



Be sure to insert in the lower slot at the rear of the machine.



Right Side Rear View

10e Route the free end of the Belt through the Gantry.



Note: Slide the Gantry Assembly in front of the square access hole in the X Frame. This opening provides the access you need to loop the Belt around the Idler and Flange Bearings. We suggest that you watch the short video demonstrating how to correctly route and install the Belts around the Flange and Idler Bearings. <https://youtu.be/SAz9UjGeOa0>



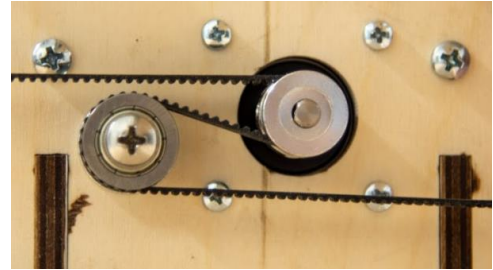


The following photos illustrate the proper path for routing the Belt. The photos were taken before the Gantry was installed on the X Frame for Illustration purposes only! The Gantry Assembly must be installed on the X Frame Assembly before attempting to install the Belts.

- 10f** Route the Belt with teeth facing down beneath, over and then around the Idler Pulley. Note the teeth on the belt are facing outboard.



10g Loop the Belt over the Belt Pulley so that the Belt teeth engage the teeth of Pulley.



**Finished Belt Routing
viewed through the
access port.**

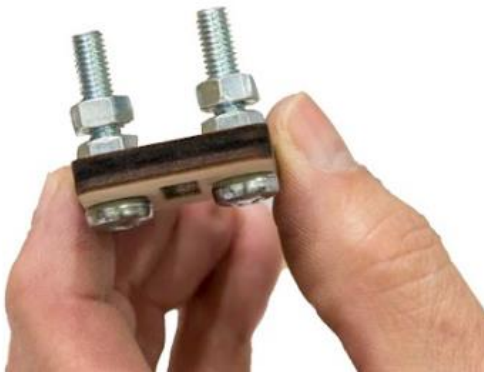
10h Repeat to install the other X Belt.

Step 11 Securing the X1 and X2 Belts

11a Insert two M6 x 30 Machine Screws through the Belt Adjustment Plate (previously removed) and secure with a M6 Nut.



11b Add one M6 Nut to each Machine Screw as shown.

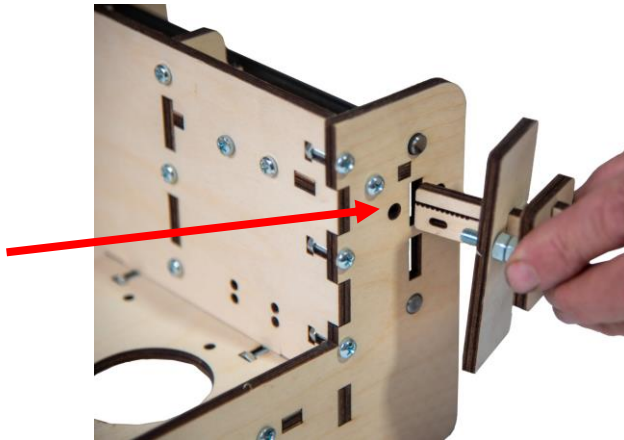


11c Insert the Long Belt Retainer (previously removed) through the Belt Adjusting Plate into the Rail Stop (previously removed) as shown.

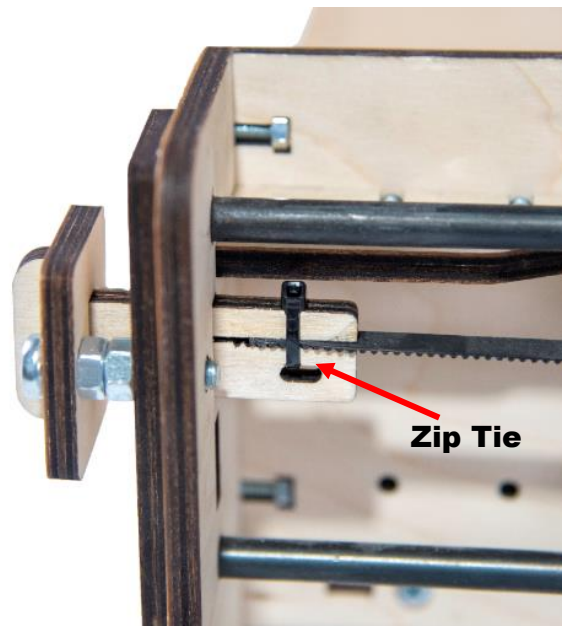


- 11d** Insert the Belt Tightening Assembly into the upper slot of the X Assembly as shown.

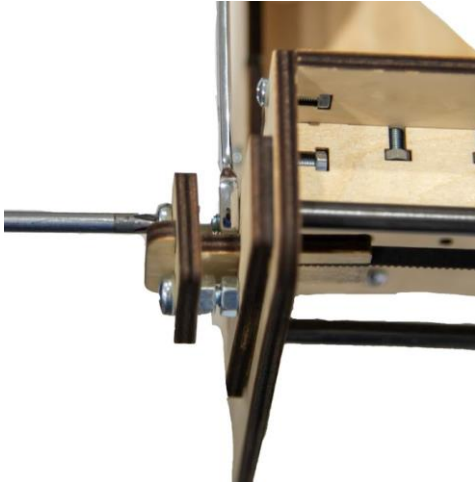
At the front of the machine be sure to insert in the upper slot.



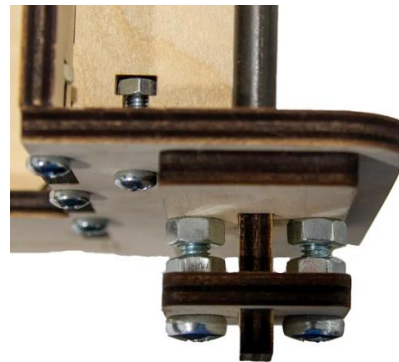
- 11e** Insert the end of the Belt into the Belt Retainer. Be sure to seat the Belt completely in the Retainer as shown and secure with a Zip Tie.



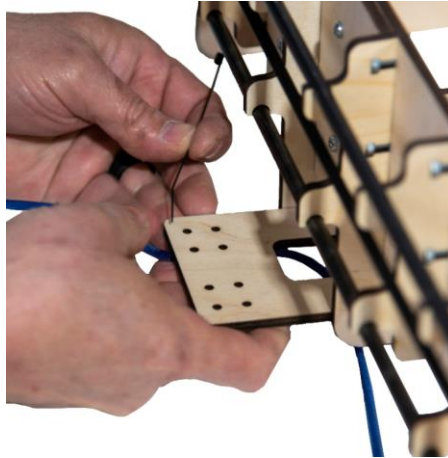
Step 12 Tighten the X1 and X2 Belts. Make sure the Nut closest to the Belt Adjusting Plate is tight. Using a 10mm wrench, hold the adjustment Nut and turn the machine screw to tighten the Belt. Be sure to adjust both Screws the same amount until the Belt is tight.



Repeat these steps to tighten the X2 Belt.



Step 13 Secure the USB Cable to the underside of the Wire Harness with Zip Ties as shown.







Step 14 Secure the Power Cords to the underside of the Wire Harness with Zip Ties as shown.






T-Slot Spoilboard

Wood Components

Part #	Description	Qty	Photo
SB1	Fastening Strip	11	 A long, thin, light-colored strip with four small, dark, rectangular markings spaced evenly along its length.
SB3	T-Slot Small Board	2	 A long, thin, light-colored board with a series of small, dark, circular holes spaced evenly along its length.
SB4	T-Slot Large Board	8	 A long, thin, light-colored board with a series of small, dark, circular holes spaced evenly along its length, similar to SB3 but longer.
SB7	Spacer Strips (set)	9	 A set of two long, thin, light-colored strips with a wavy, zig-zag pattern along one edge.

Required Hardware

Part #	Description	Qty	Photo
H9	1.25" Woodscrews	110	 A single, dark-colored wood screw with a sharp point and a wide, flat head.
H14	M4 X 16 Machine Screws	44	 A single, silver-colored machine screw with a hexagonal head and a threaded shaft.
H80	M4 Square Nuts	44	 A single, dark-colored square nut with a central hole.

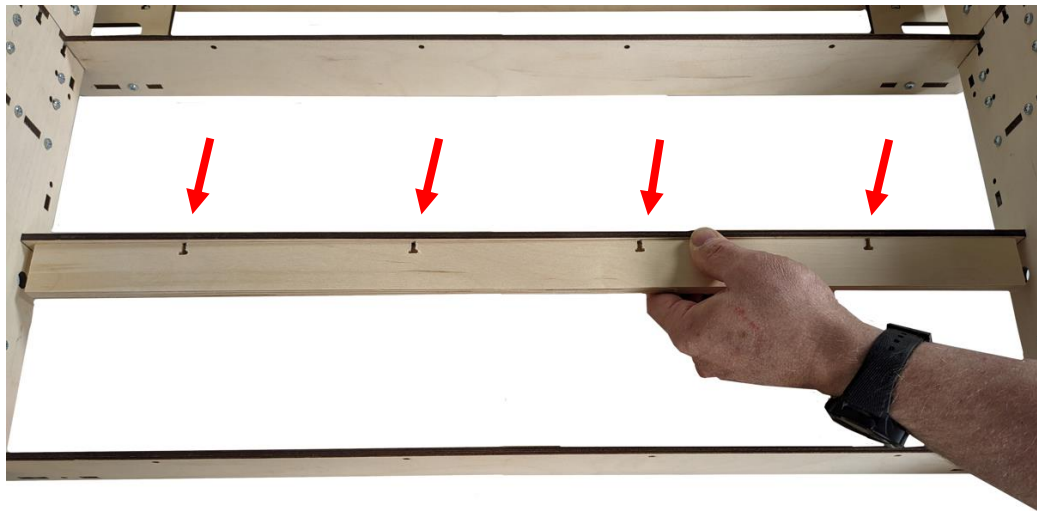


The Mid Frame and End Supports of the old version Evolution 4 does not have predrilled holes for attaching Mounting Strips. Mounting strips can be made using five 1"x 2" furring strips.

Illustrated Step by Step Instructions

Step 1

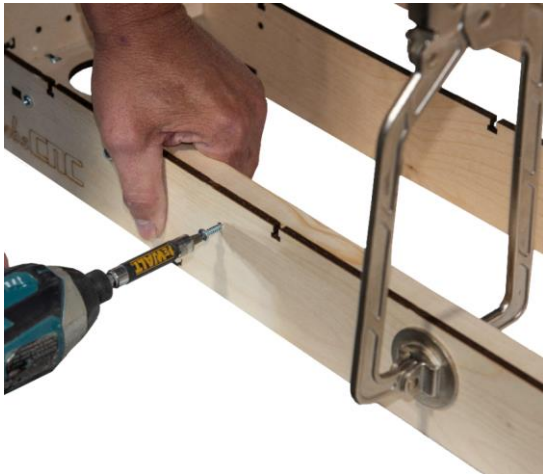
NOTE: For newer kits, skip this Step and Step 2 For the old version use a new Fastening Strip(SB1) as a template to mark the location of mounting holes. The holes should be centered 5/16" from the top edge of the Frame Mid and End Supports. Use new components as a reference. Drill with a 1/8" bit.



Step 2

NOTE: For newer kits, skip Step 1 and this Step. Cut one 17-inch and four 28-inch long pieces of 1 x 2 stock (not included). These will serve as battens that you can screw into to secure your spoilboard. Align the pieces so that their top edge is approx. 1/16-inch below the top edge of the Frame Supports as shown.

Attach the one 17-inch pieces at end between the Corner Supports and attach with 3/4" wood screws (not included). Space and attach the 28-inch pieces for the interior Frame Supports.



Step 3 **NOTE: For newer kits, start this Step** Insert four M4 Square Nuts into each of the T-Slots in the SB1 Fastening Strip.



Step 4 Lay a T Slot Small Board (SB3) on the X Frame Assembly with the cut mark facing up. The position of the predrilled holes (circled below) in the strip will indicate the side on which the Fastening Strips (SB1) will be mounted.



Step 5

Carefully align the T-Slots in the Fastening Strips with the mounting holes in the Rail Supports and secure with four M4 x 16 Screws. Make sure the Fastening Strip is mounted on the inside of the X Frame Front.

Before tightening, make sure the Fastening Strips are mounted so that the X Frame Supports are approximately 1/16" proud. This will allow the T-Slot Boards to fastened flush against each of the frame supports



Step 6

Repeat to install the next fastening strip until all eleven strips are installed.



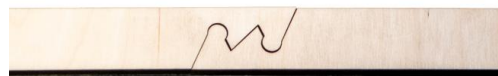
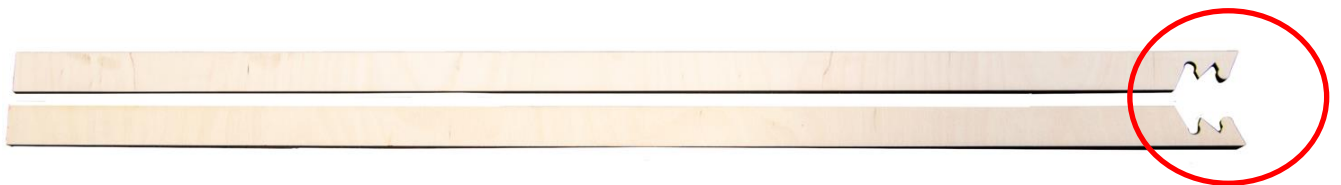
Step 7

Before installing the Spoilboard, it is important to make sure the X Frame is square. The simplest way to do this is to measure diagonally from one corner of the cutting area to the other. If the measurements are exactly the same, the X-Frame is square. If not, gently rack the Frame until the measurements are equal.



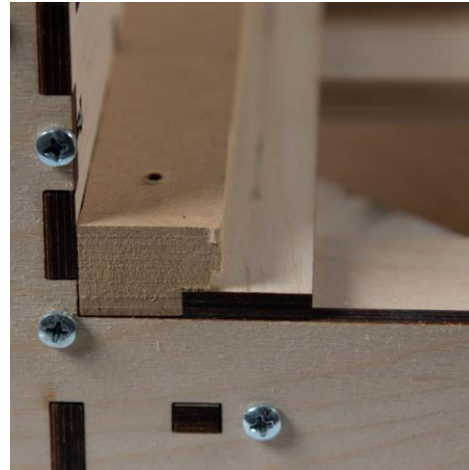
Step 8

Join two Spacer Strips(SB7) together using the scarf joint ends.



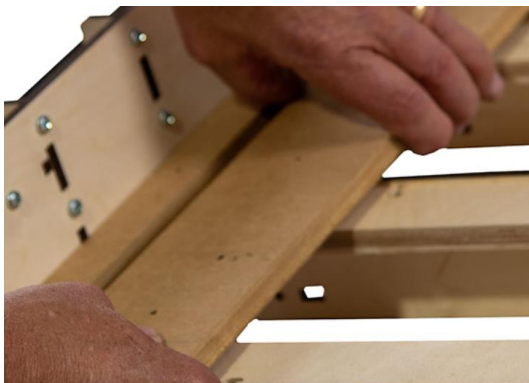
Step 9

Install the T-Slot Small Board (SB3) along the left side of the X Frame Assembly with the notch facing down as shown. Next, install the Spacer Strip Assembly so that it lies beneath the bottom notch of the T-Slot Board.



Step 10

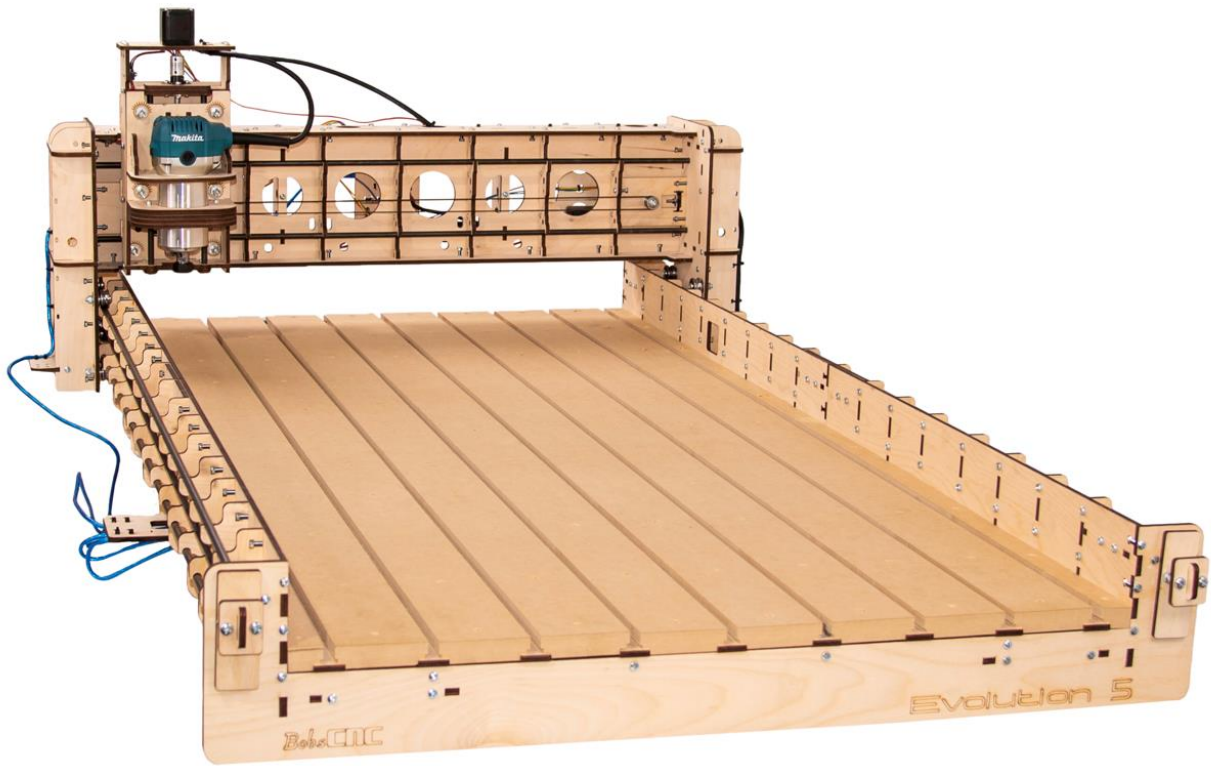
Repeat, using T-Slot Large Board (SB4), making sure the notch is fully seated on top of the Spacer Strip. Repeat the procedure to install the remaining Spacer Strips and T-Slot Boards. The remaining T Slot Small Board(SB3) is installed to the right side. Make sure the T Slot Boards and Spacer Strips are lying flat on the X Frame Assembly Cross Members.



Step 11 Make sure the T Slot Small Boards are tight against each side. Then using the 1¼ inch Wood Screws, secure the Spoilboard to the X-Frame Assembly. We recommend counter sinking the wood screws approx. 3/16" below the surface of the T-Slot Boards.

NOTE: Make sure the T Slot Small Boards are tight against each side. Then using the 1¼ inch Wood Screws, secure the Spoilboard to the X-Frame Assembly. We recommend counter sinking the cabinet screws approx. 3/16" below the surface of the T-Slot Boards. Insert the first wood screw in the middle hole of the MDF, then insert the remaining wood screws working from the center to the front, then center to back.



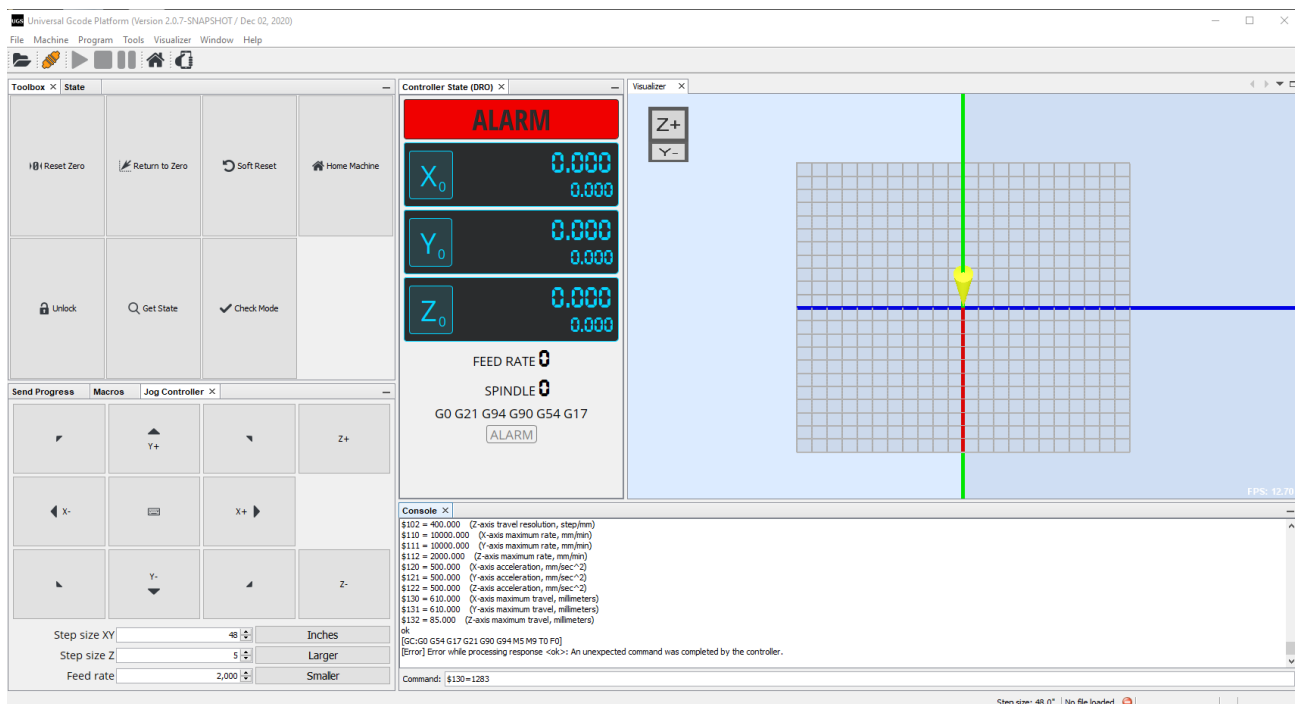


Finished View

Updating Firmware

Evolution 4 Extension Firmware Value Change

Connect the CNC to the USB and connect to UGS Platform. Type in $\$130=1283$ in the command textbox of the console window of UGS and press the enter key. This will change the soft limit for the X axis to the new value of 1283mm (50.5")



Appendix (\$130=1283)

Evolution 4 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	3	(homing dir invert mask:00000011)
\$24	250	(homing feed, mm/min)
\$25	2000	(homing seek, mm/min)
\$26	250	(homing debounce, msec)
\$27	5	(homing pull-off, mm)
\$30	1000	Maximum spindle speed, RPM
\$31	0	Minimum spindle speed, RPM
\$32	0	Laser-mode enable, boolean
\$100	80	(x, step/mm)
\$101	80	(y, step/mm)
\$102	400	(z, step/mm)
\$110	10000	(x max rate, mm/min)

\$111	10000	(y max rate, mm/min)
\$112	2000	(z max rate, mm/min)
\$120	500	(X-axis acceleration, mm/sec ²)
\$121	500	(Y-axis acceleration, mm/sec ²)
\$122	500	(Z-axis acceleration, mm/sec ²)
\$130	1283	(X-axis maximum travel, millimeters)
\$131	610	(Y-axis maximum travel, millimeters)
\$132	85	(Z-axis maximum travel, millimeters)