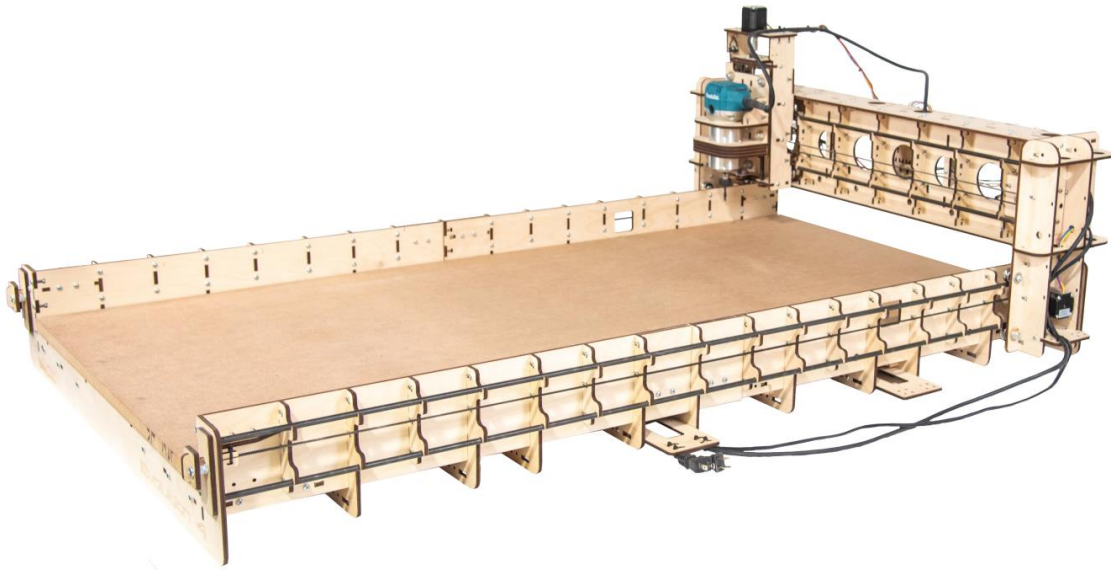


**BobsCNC**  
Unleash Your Creativity



# Evolution 4 Extension Kit

## Assembly Instructions

Rev. 1.3

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# EVOLUTION 4 with Extension

## Specifications

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### **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)

Components needed to complete the kit:




1. Four pieces of 5/16" stress proof steel rods 56-7/8" long
2. 1x2 pine batten strips
3. If you have old one-piece spoilboard (two pieces at 17" and eight pieces at 28")
4. If you have newer T-Slot spoilboard (one piece at 17" and six pieces at 28")
5. 3/4" wood screws to mount the batten strips

6. 1-1/4" wood screws to mount the spoilboard
7. 3/4" spoilboard cut to 28-1/2" by 57- 1/2"

**Safety is the First Priority. Always wear proper protective equipment and use "safety sense" when assembling and operating your Evolution 4 CNC Router.**

## Information/Warning Boxes

---

	<b>CAUTION</b> Indicates a possible risk of injury that can result from failure to follow this instruction
	<b>WARNING</b> Indicates the possible damage to the machine, its components, the work piece, or injury that can result from failure to follow this warning.
	<b>DANGER</b> 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 machine when under the influence of alcohol or prescription medication.
- Make certain 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:

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Use a large, flat, clean work surface for assembling your EVOLUTION 4.

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.

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.

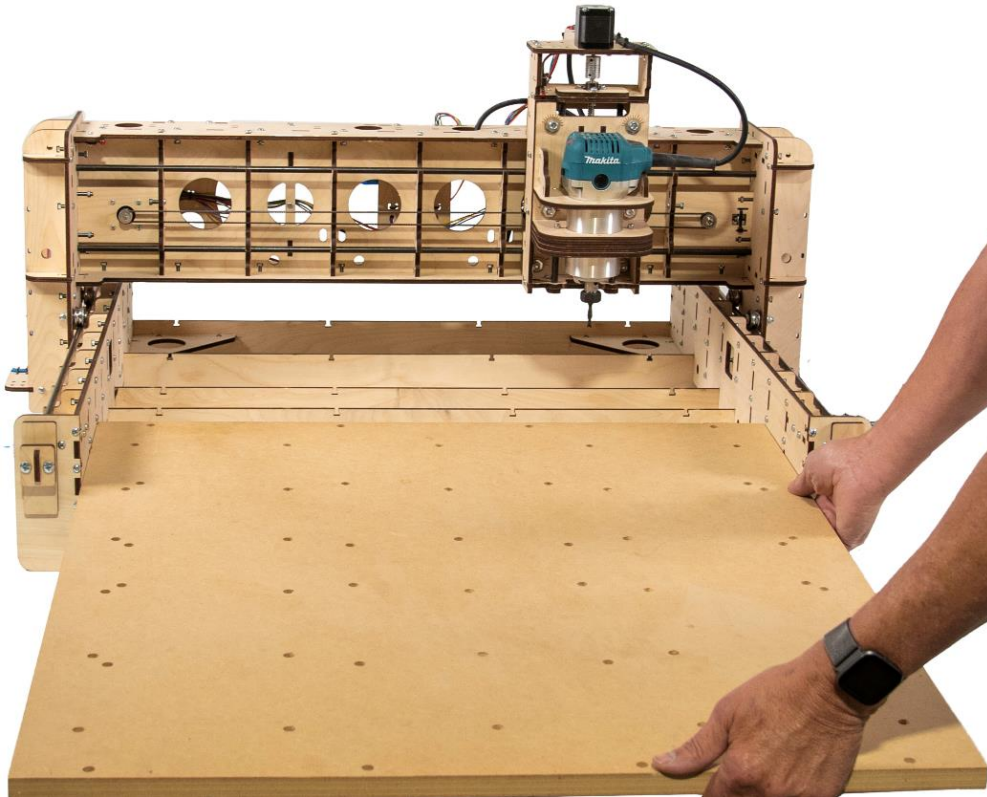
# Removing Components:

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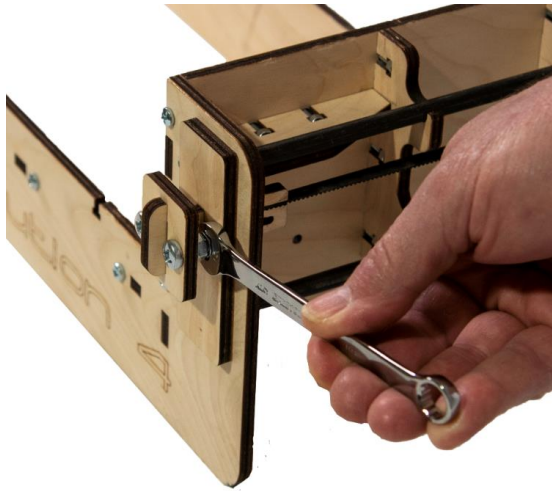
## Illustrated Step by Step Instructions

Before you can add the extension kit 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.



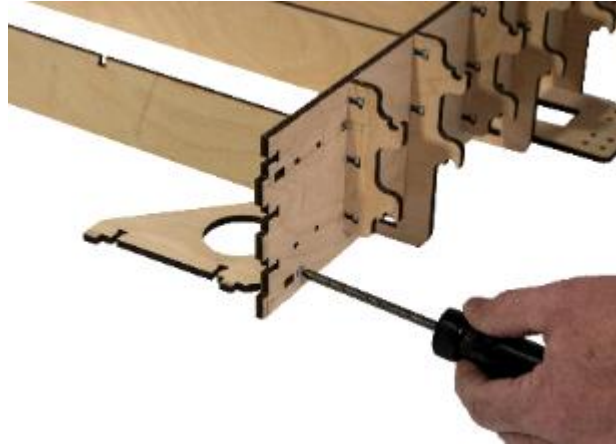
**Step 3** Remove front Frame End Support and set aside for later assembly.



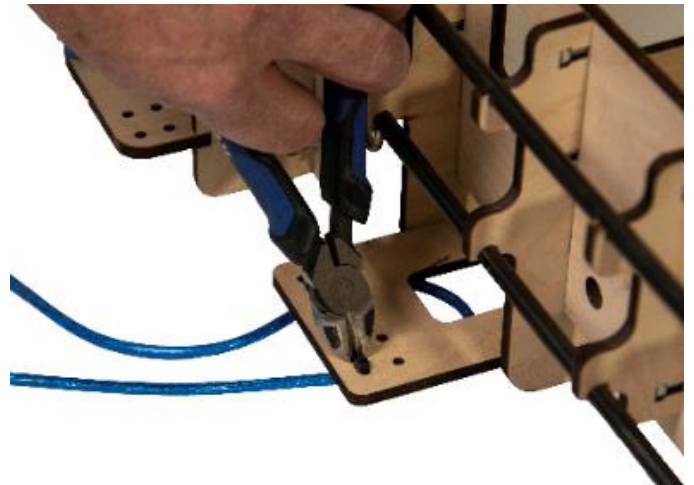
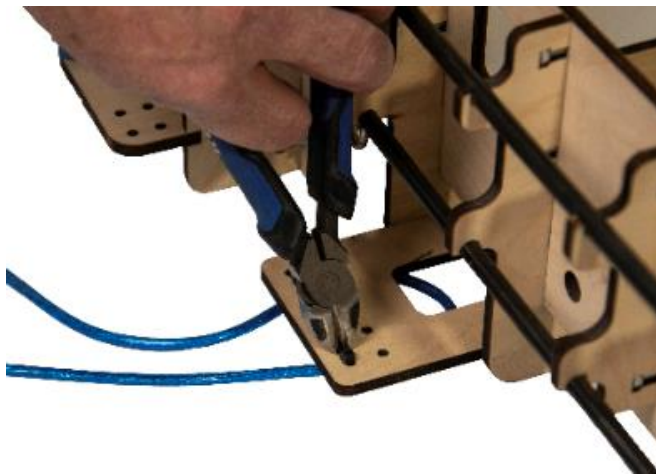
**Step 4** Remove both sides of the front Frame Corner Supports and set aside for later assembly.



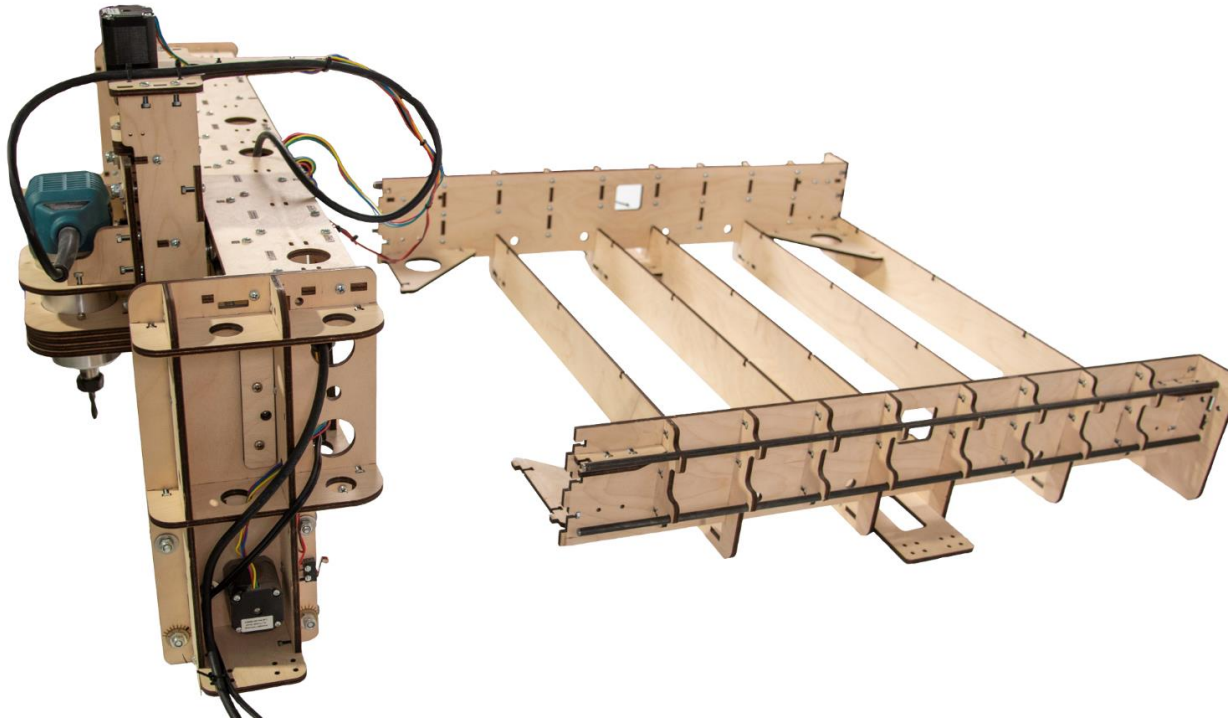
**Step 5** Remove both sides of the Frame Corner Braces and set aside for later assembly.



**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.



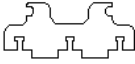
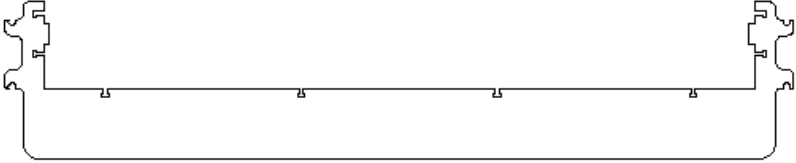
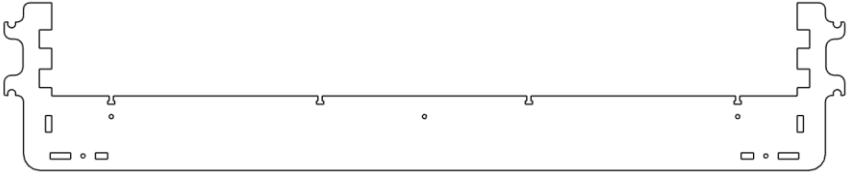
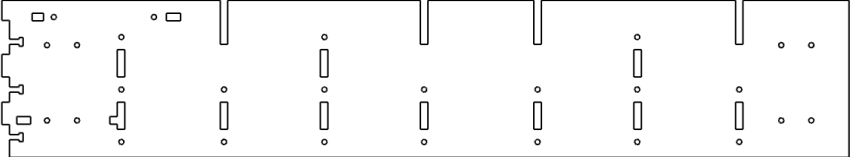
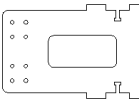
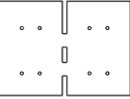
**Step 8** Remove the four X Rails and discard.



# X Axis Extension Assembling

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## 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	
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	

## Illustrated Step by Step Instructions

**Step 1** Align the slots in EX12 Coupling Plates to the tabs in the EX4 Extension Frame Mid Support at both ends and press in place.





## Step 2

While holding the Coupling Plates in place, position the Extension Mid Frame Support at the open end of the Evolution X Frame Assembly. Make sure the Coupling Plates are aligned to the outside of the Frame Side Support as shown.

Align the slots in the Coupling Plates to the tabs in the Frame Side Support and secure each side with four M4 x 16 Screws and Lock Nuts.

**NOTE: Make sure the Screw heads are mounted on the outside of the Frame Assembly as shown.**



**Step 3**

Align the tabs of three X1 Rail Supports to slots of the EX5 Extension Frame Side Supports and secure each with three M4 16 Screws and Nuts.



x



**Step 4** Attach the Frame Corner Supports and secure with two M4 x 16 Screws and Nuts for each piece.



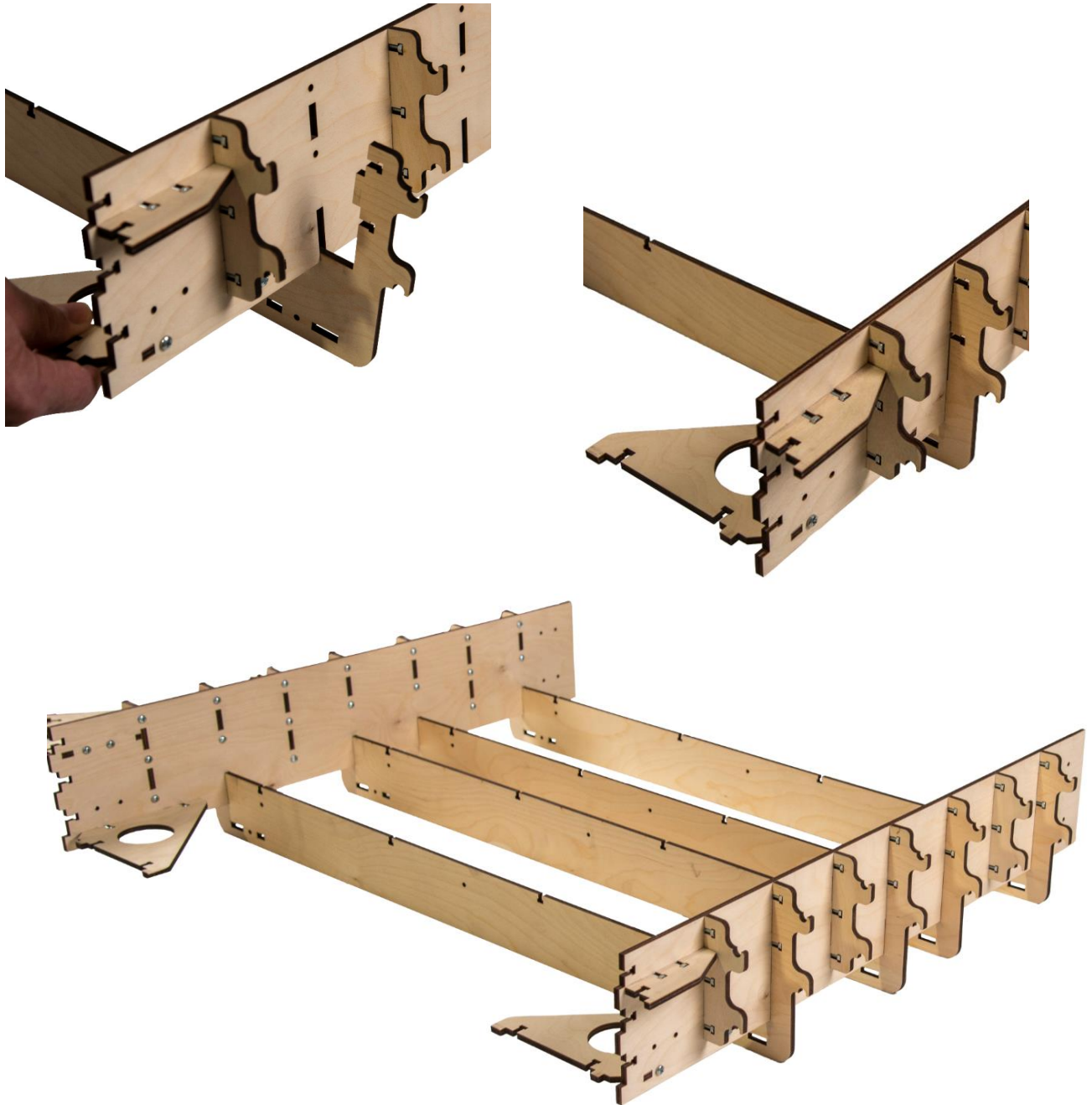
**Step 5**

Attach the Frame Corner Braces and secure to the Extension Frame Side with two M4 x 16 Screws and Nuts for each Brace.



## Step 6

Align the tabs of the X4 Frame Mid Supports with the slots in the Extension Frame Side Supports and secure with two M4 x 16 Screws and Nuts on each side. Repeat for the remaining 3 of the Frame Mid Supports.



**Step 7**

Align the tabs of the X7 Wire Harness Supports with the slots in the Extension Frame Side Supports and secure with one M4 x 16 Screw and Nut each side.



# Connecting the X Axis Extension

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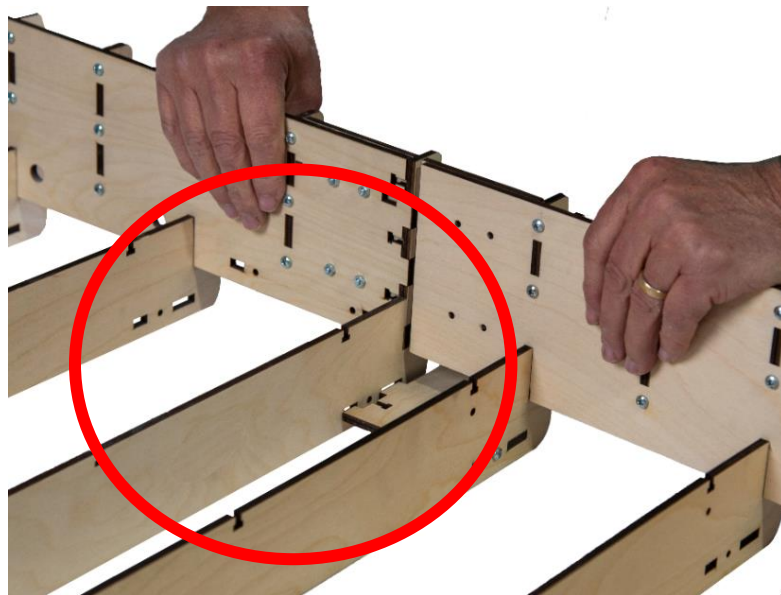
## Illustrated Step by Step Instructions

- Step 1** Attach the Extension Assembly to the Evolution X Frame. Make sure the Coupling Plates are oriented to the outside of the X Frame Extension Side Supports as shown.



**Step 2** While aligning the components, make sure the tabs of the Wire Harness fit into the adjoining slots of the X Frame Mid Support. Secure the Coupling Plate with four M4 x 16 Screws and Locking Nuts and the Wire Harness Support with one M4 x 16 Screw and Nut. Repeat for the other side.

**Note: Use a straight edge across the top of both extensions to ensure that both halves are in line and the X Frame is straight.**

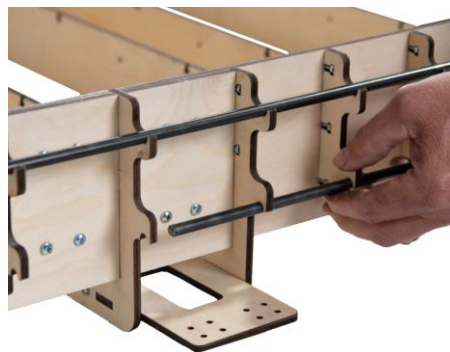
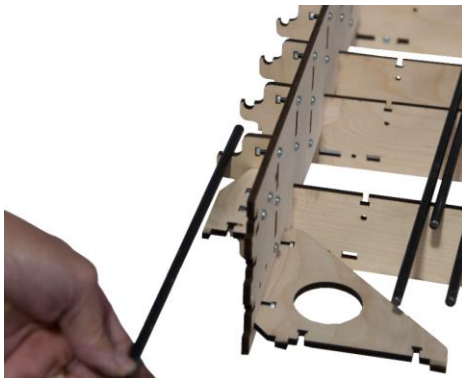




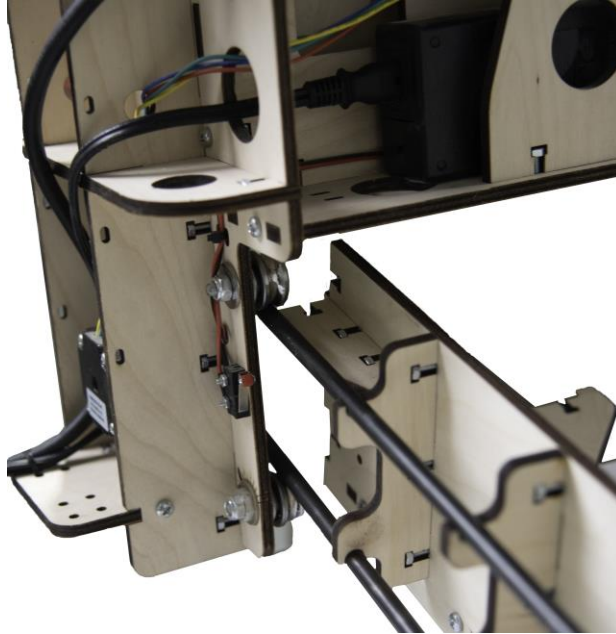
### Step 3

The kit requires 4 each of 5/16" Stress Proof rods that will be cut to 56 7/8" in length (rods are not included). The rod ends should be filed or sanded to remove the burrs. Insert each of the 4 rails starting from one end while moving through each support.

**Note: rotating the rod gently will ease installation.**



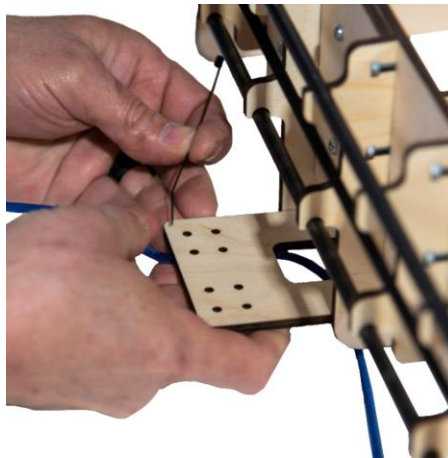
**Step 4** Carefully reinstall the Gantry Assembly.



**Step 5** Reinstall the Frame End Support and secure with twelve M4 x 16 Screws and Nuts.



**Step 6** Secure the USB Cable to the underside of the Wire Harness with Zip Ties as shown.

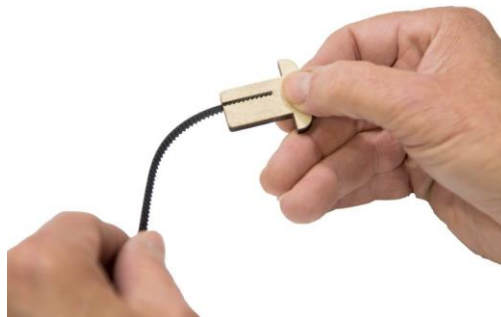


- Step 7** Secure the Power Cords to the underside of the Wire Harness with Zip Ties as shown.

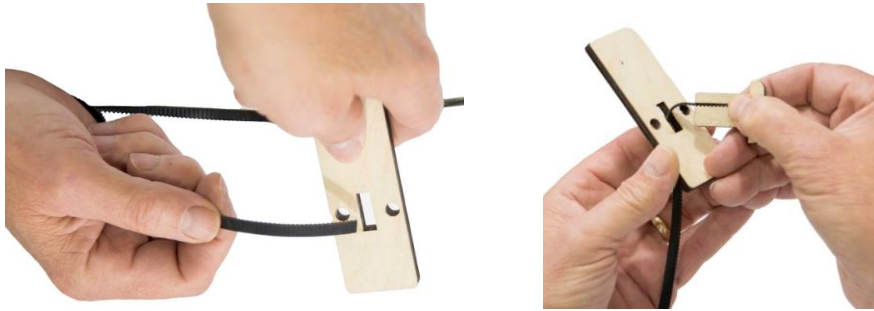


- Step 8** Installing the longer X GT2 Belts.

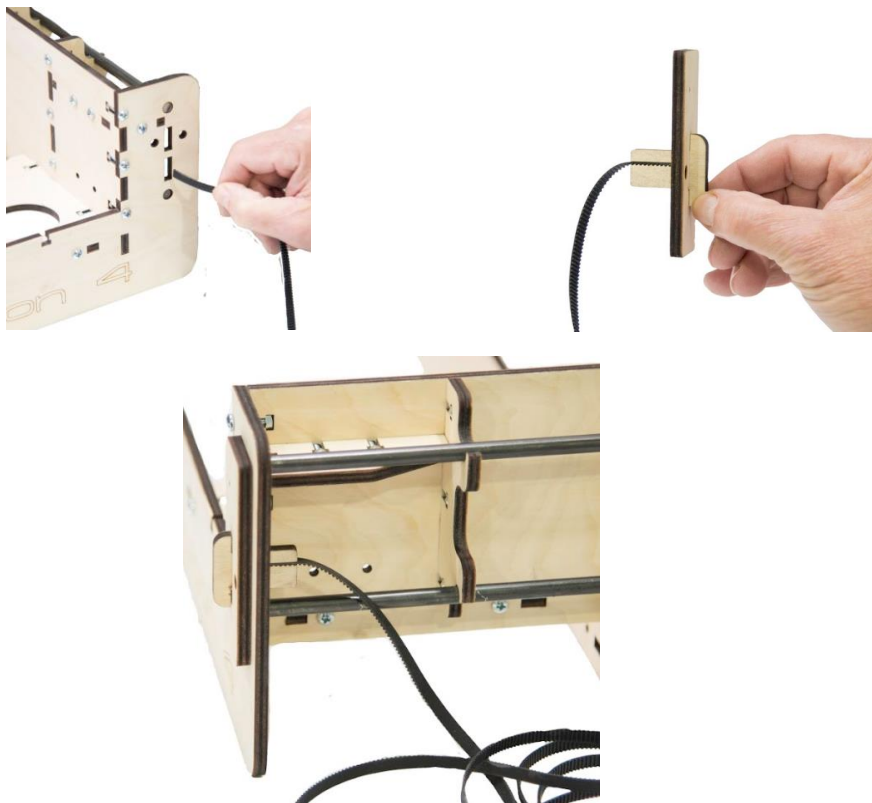
- 8a** Cut two of the GT2 Belts to a length of **60 7/8** inches.
- 8b** Insert one end of the Belt into the X9 Short Belt Retainer.



- 8c** Next, thread the free end of the GT2 Belt through the Rail Stop (X3). NOTE: In the photo, the Rail Stop has been rotated so that the slot is oriented toward the bottom of the Rail Stop. Pull the belt through and insert the Short Belt Retainer through the Rail Stop as shown.



- 8d** Insert the free end of the Belt through the lower slot of the X Frame Assembly and pull the Belt through.



**Note:** Slide the Gantry Assembly in front of the square access hole. 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>

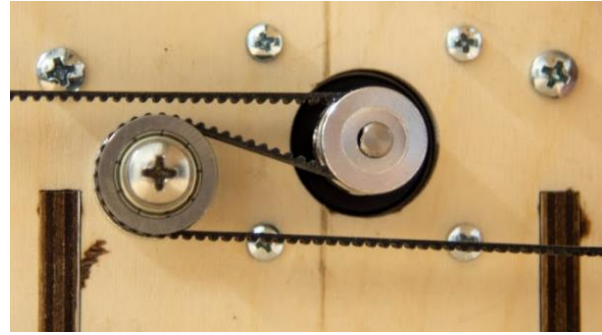


The following photos illustrate the proper path for routing the Belt. The photos were taken before the Gantry was installed on the X Frame for Illustration purposes only! The Gantry Assembly must be installed on the X Frame Assembly before attempting to install the Belts.

**8e** Route the Belt with teeth facing down beneath, over and then around the Idler Pulley. Note the teeth on the belt are facing outboard.



- 8f** 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.**

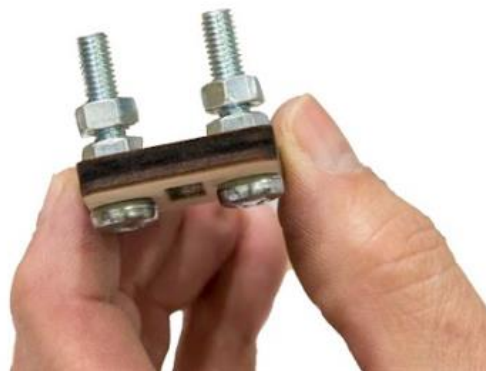
- 8g** Repeat for the other X Belt.

**Step 9**    Securing the X1 and X2 Belts

- 9a**    Insert two M6 x 30 Machine Screws through the Belt Adjustment Plate (X11) and secure with a M6 Nut.



- 9b**    Add one M6 Nut to each Machine Screw as shown.



- 9c**    Insert the Long Belt Retainer (X10) through the Belt Adjusting Plate into the Rail Stop (X3) as shown.





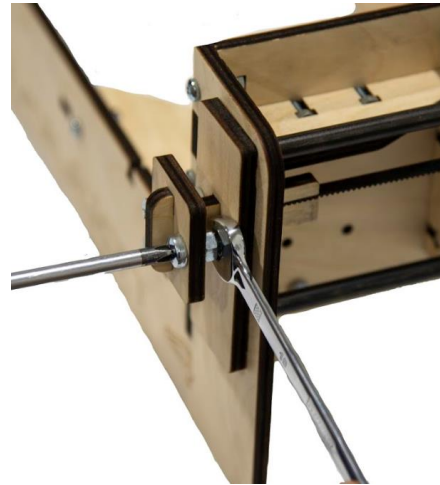
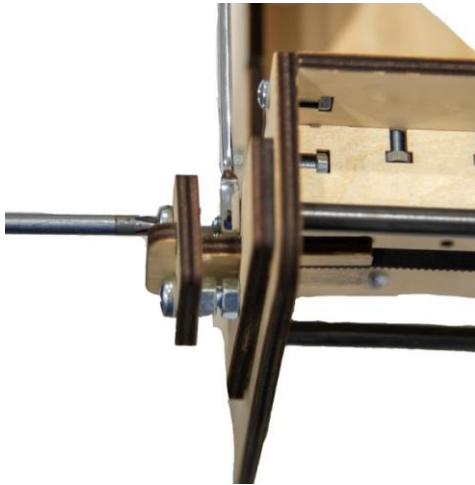
- 9d** Insert the Belt Tightening Assembly into the upper slot of the X Assembly as shown.



- 9e** Insert the end of the Belt into the Belt Retainer. Be sure to seat the Belt completely in the Retainer as shown.



**Step 10** 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.



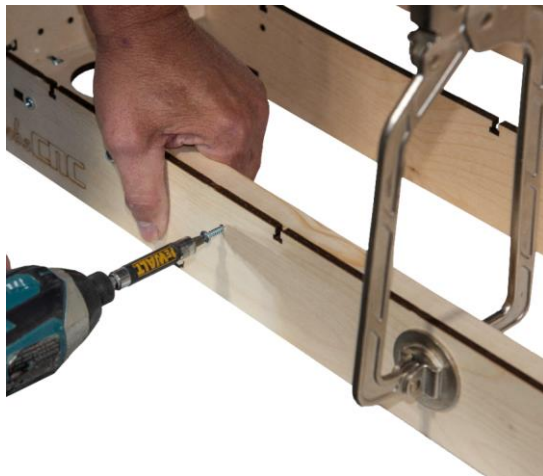
# Adding a Spoilboard

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## Evolution 4 with one-piece spoilboard

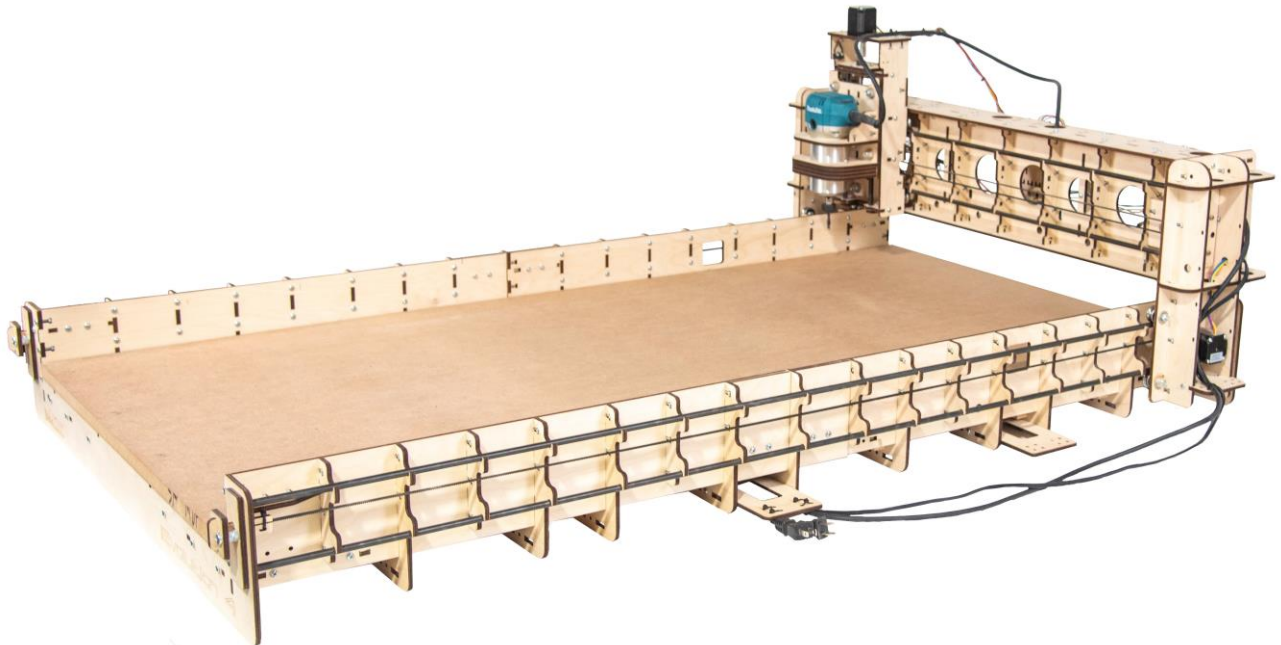
**Step 1** Cut two 17-inch and eight 28-inch pieces of 1 x 2 stock (not included). These will serve as battens that you can screw into to secure your spoilboard. Align the pieces so that their top edge is approx. 1/16-inch below the top edge of the Frame Supports as shown.

Attach the two 17-inch pieces at either 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 2** Cut a piece of  $\frac{3}{4}$ " MDF for the spoilboard, (not included) 28- $\frac{1}{2}$ " wide and 57- $\frac{1}{2}$ " long. Make sure the location of your battens is marked and easily visible.

Attach the spoilboard to the battens. Countersink screws at least  $\frac{1}{4}$ " below the surface of the spoilboard. If you plan on surfacing your spoilboard make sure to add the amount you remove from the surface to the depth of the countersink.

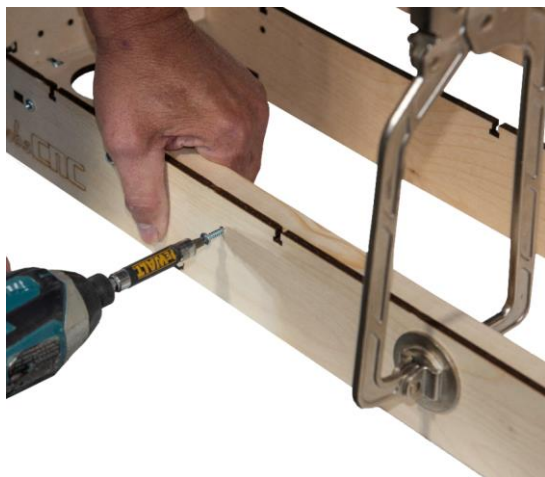


## Evolution 4 with T-Slot spoilboard

If your machine had the T-Slot spoilboard, then you will only need to attach battens to the newly added extension.

**Step 1** Cut one 17-inch and six 28-inch 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.

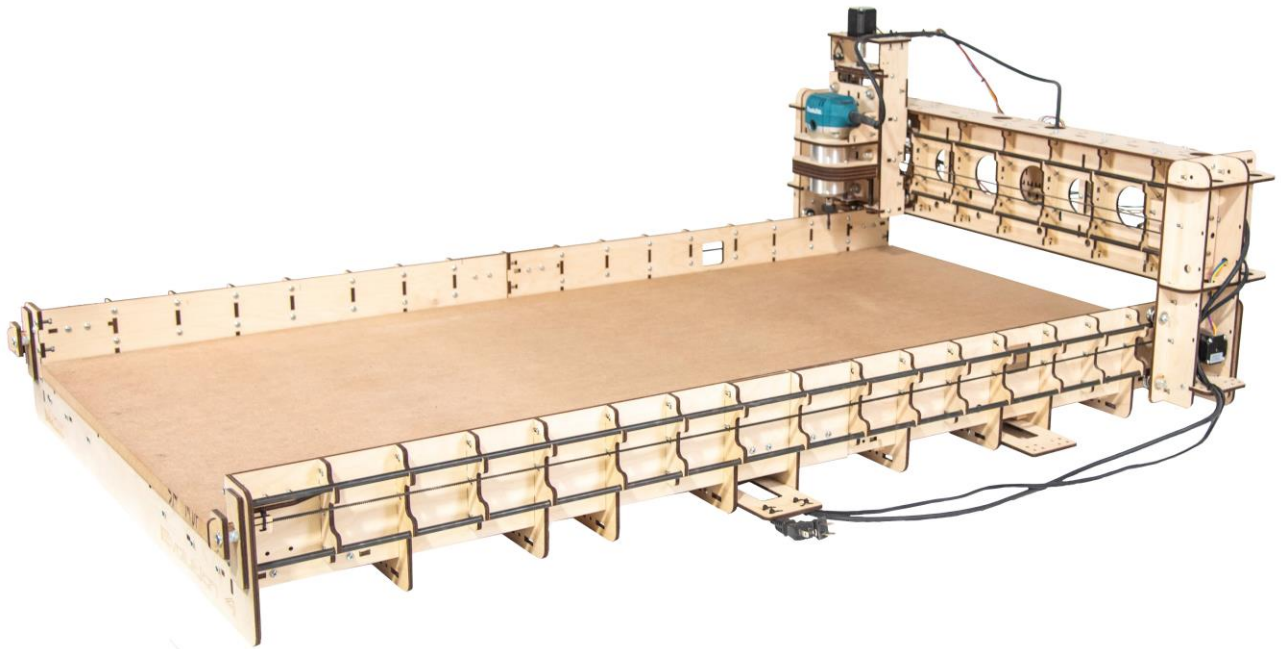
Attach the 17-inch piece to the end of the extension between the Corner Supports and attach with 3/4" wood screws (not included). Space and attach the 28-inch pieces for the interior Frame Supports.



## Step 2

Cut a piece of  $\frac{3}{4}$ " MDF for the spoilboard, (not included) 28- $\frac{1}{2}$ " wide and 57- $\frac{1}{2}$ " long. Make sure the location of your battens is marked and easily visible.

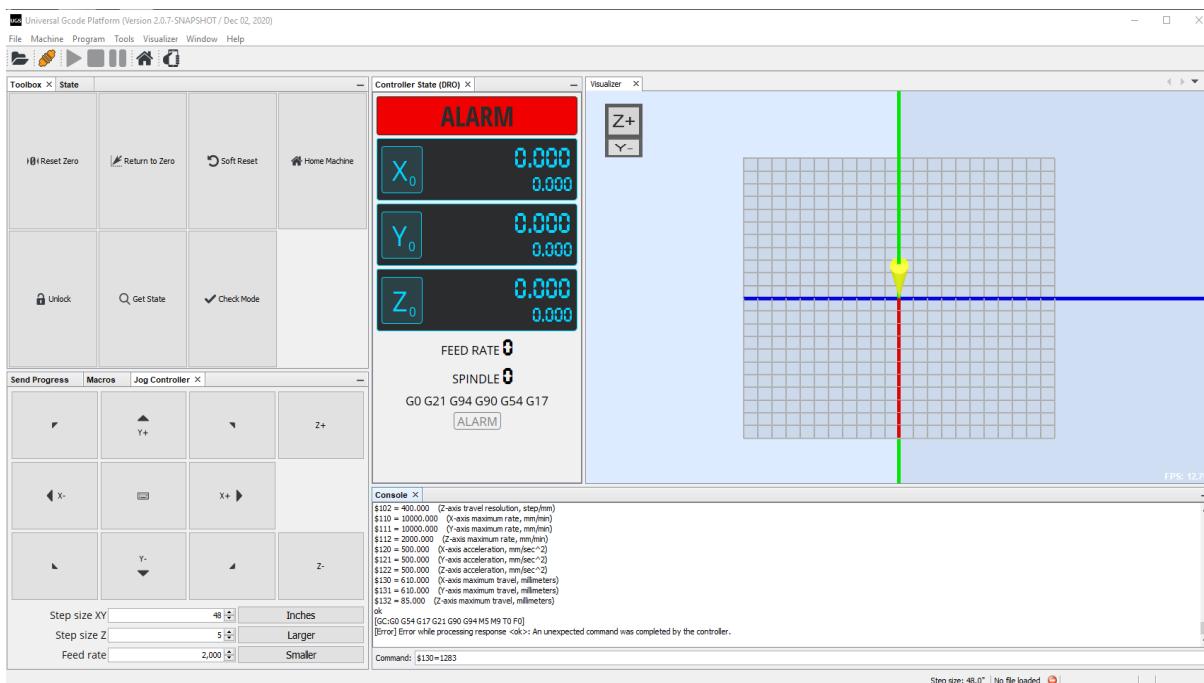
Attach the spoilboard to the battens. Countersink screws at least  $\frac{1}{4}$ " below the surface of the spoilboard. If you plan on surfacing your spoilboard make sure to add the amount you remove from the surface to the depth of the countersink.



# Updating Firmware

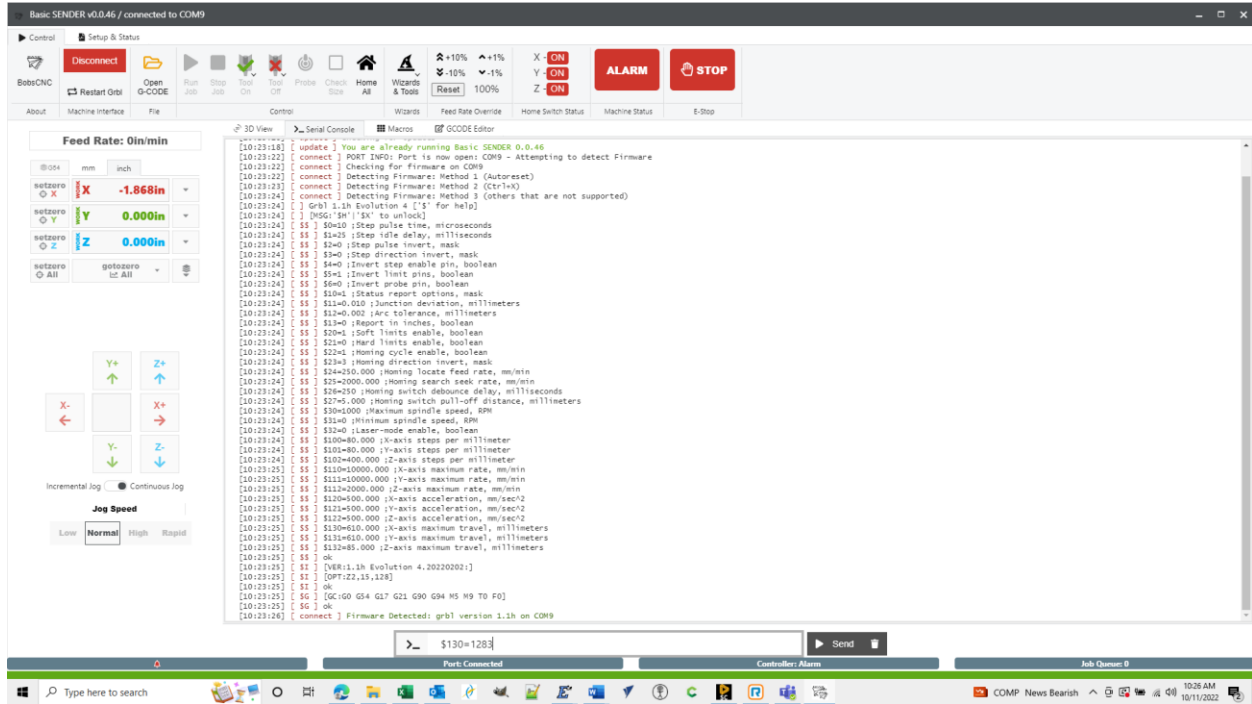
## UGS Platform

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



# Basic Sender

Connect the CNC to the USB and connect to the machine in Basic Sender. Type in \$130=1283 in the command textbox of the Serial Console window 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)

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## 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 <sup>2</sup> )
\$121	500	(Y-axis acceleration, mm/sec <sup>2</sup> )
\$122	500	(Z-axis acceleration, mm/sec <sup>2</sup> )
\$130	1283	(X-axis maximum travel, millimeters)
\$131	610	(Y-axis maximum travel, millimeters)
\$132	85	(Z-axis maximum travel, millimeters)