



## YORAHOME CROSSRIVER BENCHTOP CNC ROUTER 6060

### USER MANUAL

Version 1.0 • December 2023



# Purpose

This Manual is intended for assembly of the YoraHome CrossRiver Benchtop CNC Router. This manual is designed to cover the basic functionality of the machine and software, and may not address every aspect or option present.

Before beginning assembly, we recommend conducting an inventory using the Packing List to ensure all components are present. NOTE - there may be extra hardware included; this is normal, in case items get dropped or lost.

Please read these instructions carefully before assembling your machine to prevent possible damage to your machine.



# Safety<sup>1/3</sup>

- Read and understand the entire user manual before attempting assembly or operation
- Do not use the CNC router for other than its intended use. If used for other purposes, YoraHome disclaims any real or implied warranty and holds itself harmless from any injury that may result from that use.
- Always wear approved safety glasses/face shield while using CNC router machine. Everyday eyeglasses only have impact resistant lenses, they are not safety glasses
- Before operating CNC router, remove tie, rings, watches and other jewelry, and roll sleeves up past the elbows.
- Do not wear loose clothing. Confine long hair. Non-slip footwear or anti-skid floor strips are recommended. Do not wear gloves.
- Wear ear protectors (plugs or muffs) during extended periods of operation. Do not operate CNC router while tired or under the influence of drugs, alcohol or any medication.

# Safety<sup>2/3</sup>

- Make certain the switch is in the OFF position before connecting CNC router machine to the power supply
- Make all machine adjustments or maintenance with CNC router unplugged from the power source.
- Give your work undivided attention. Looking around, carrying on a conversation and “horseplay” are careless acts that can result in serious injury.
- Use the right tool at the correct speed and feed rate. Do not force a tool or attachment to do a job for which it was not designed. The right tool will do the job better and more safely.
- Do not touch a bit immediately after use, it will be hot and may cause skin burns.
- Never leave CNC router running unattended. Turn the power off and do not leave CNC router until it comes to a complete stop.
- Remove loose items and unnecessary work pieces from the area before starting CNC router.

# Safety<sup>3/3</sup>

- Always secure workpiece to spoil board using clamps or double-sided tape. Never hold workpiece down by hand while operating.
- Make sure workpiece is free from nails or other foreign objects.
- After installing a bit, make sure collet is securely tightened. An unsecured bit may fly loose from the collet and cause injury.
- The CrossRiver CNC router is intended for carving and cutting wood, acrylics, plastics and soft metal, etc. Do not use it to cut hard metals.
- Be within reach of the Emergency Stop or pause button when the machine is in operation. In the event of an emergency, or if there are any conditions that may result in injury to yourself or others, the CrossRiver is equipped with an Emergency Stop button on top of the Controller. When pressed, this button will latch in the Stop position. To reset, twist the red knob clockwise.



# Contents

Part 1: Packing List

Part 2: Mechanical Assembly

Part 3: Software Installation

Part 4: Machine Setup

Part 5: Recommended Settings

Part 6: Best Practices



Part 7: Terminology

Part 8: Default GRBL Settings

# Part 1 Packing List<sub>1/10</sub>

Box 1 of 4 - Gantry		
Item	Picture	Quantity
X Axis Gantry Assembly		1
Front Frame Rail		1
Rear Frame Rail		1
Bed Support Rail Kit		1 (3 piece kit)

## Part 1 Packing List<sub>2/10</sub>


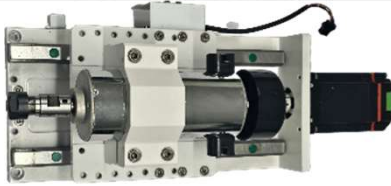


Box 2 of 4 - Y Axis		
Item	Picture	Quantity
Right Y Axis Assembly		1
Left Y Axis Assembly (includes wiring harness)		1







## Part 1 Packing List<sub>3/10</sub>

Box 3 of 4 - Hybrid Spoilboard		
Item	Picture	Quantity
Hybrid Spoilboard Panel		8
Drag Chain Support Rail		1





## Part 1 Packing List<sub>4/10</sub>

Box 4 of 4 - Z Axis, Controller, Accessories		
Item	Picture	Quantity
CrossRiver Controller		1
Z Axis Assembly (with 500W Spindle)		1
X Axis Proximity Switch Housing		1
Alternate Mounts		3 piece kit (65mm, 69mm, 80mm)


## Part 1 Packing List<sub>5/10</sub>

Box 4 of 4 - Z Axis, Controller, Accessories		
Item	Picture	Quantity
Laser Mounting Plate (with mounting screws)		1
Cable Cover		1
Power Cord		1
Z Probe Assembly		1

## Part 1 Packing List<sub>6/10</sub>

Box 4 of 4 - Z Axis, Controller, Accessories		
Item	Picture	Quantity
Clamp Kit (Set of 4)		1
Name Plate		1
USB Cable		1
ER11 Collet - 1/4 inch		1

## Part 1 Packing List<sub>7/10</sub>

Box 4 of 4 - Z Axis, Controller, Accessories			
Item	Size	Picture	Quantity
Shank Blue Corn Milling Bits	0.8/1.0/1.2/1.4/1.6/1.8/2.0/2.2/ 2.4/3.17 mm		1 pack of 10
Engraving Bits	30 deg bit, 0.1mm cutting tip		1 pack of 10
Chip Brush			1

## Part 1 Packing List<sub>8/10</sub>

Box 4 of 4 - Z Axis, Controller, Accessories			
Item	Size	Picture	Quantity
Socket Head Cap Screws	M5 x 6mm		2
	M5 x 12mm		12
	M5 x 16mm		34
	M5 x 30mm		12

## Part 1 Packing List<sub>9/10</sub>

Box 4 of 4 - Z Axis, Controller, Accessories			
Item	Size	Picture	Quantity
Countersunk Socket Head Cap Screws	M3 x 6mm		4
	M4 x 3mm		4
	M5 x 16mm		20
Flat Washer	M5		12
Spring Lock Washer	M5		12

## Part 1 Packing List<sub>10/10</sub>

Box 4 of 4 - Z Axis, Controller, Accessories			
Item	Size	Picture	Quantity
Pan Head Screws	M4 x 6mm		27
Hex Key	2mm, 2.5mm, 3mm, 4mm		1 of each
Wrenches	13mm x 15mm		1
	14mm x 17mm		1
Offline Controller			1

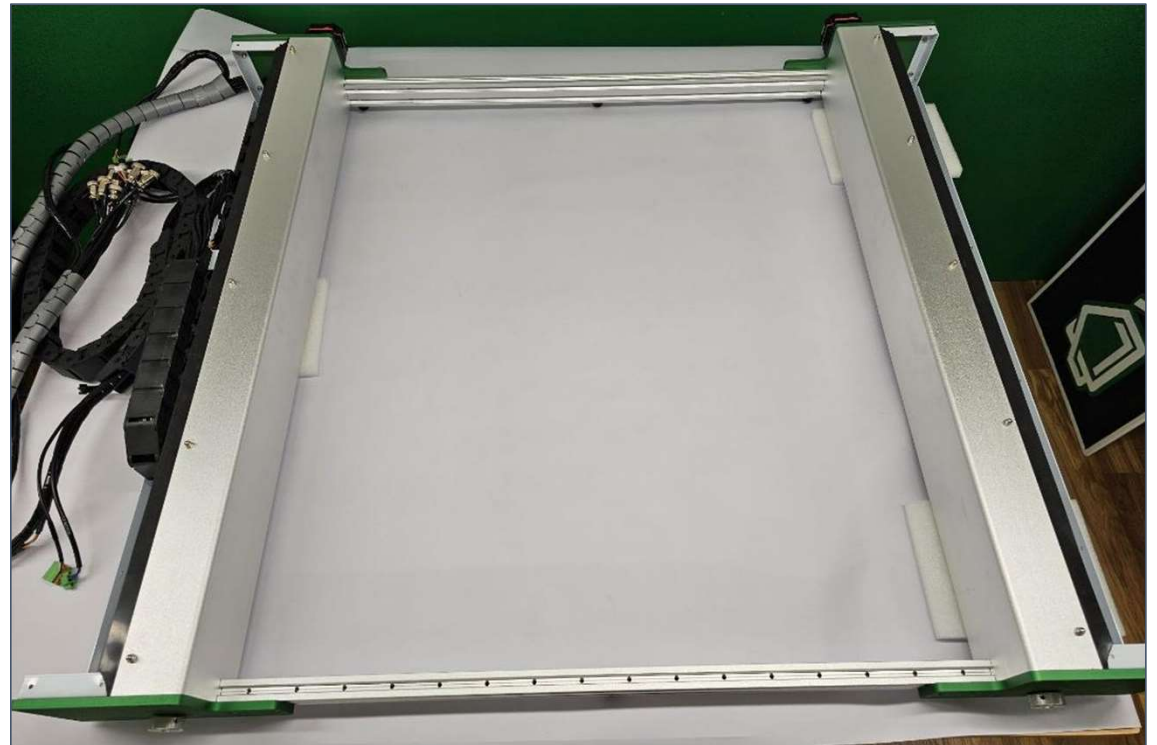


## Part 2 Mechanical Assembly

### Step 1 - Assemble Main Frame 1/5

Parts Required:

- 16 M5 x 16mm Countersunk Screws
- Left Y Axis Assembly
- Right Y Axis Assembly
- Front Rail
- Rear Frame Rail



## Part 2 Mechanical Assembly

### Step 1 - Assemble Main Frame 2/5

Using the foam inserts from the shipping box to elevate them, position the Left and Right Y axis on the work surface as shown.

This will allow clearance for installing the Frame Rails and Bed Support Rails.

(NOTE: Photos show axis covers removed; this does not need to be done yet, and will be addressed in a later step.)

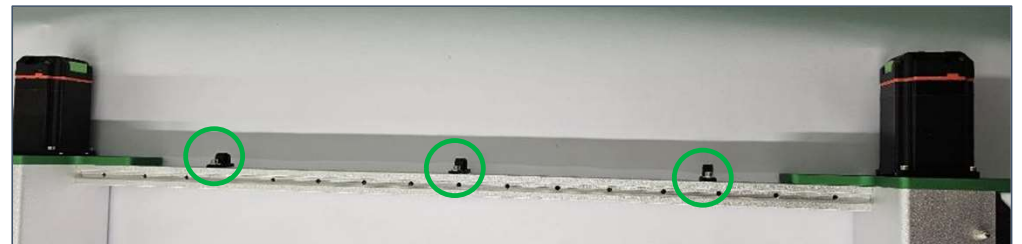


## Part 2 Mechanical Assembly

### Step 1 - Assemble Main Frame <sup>3/5</sup>

- Position the Front and Rear Frame Rails between the Y Axes
- Ensure the Rear Frame Rail is positioned with the cable management clips to the rear of the machine

Rear Frame Rail



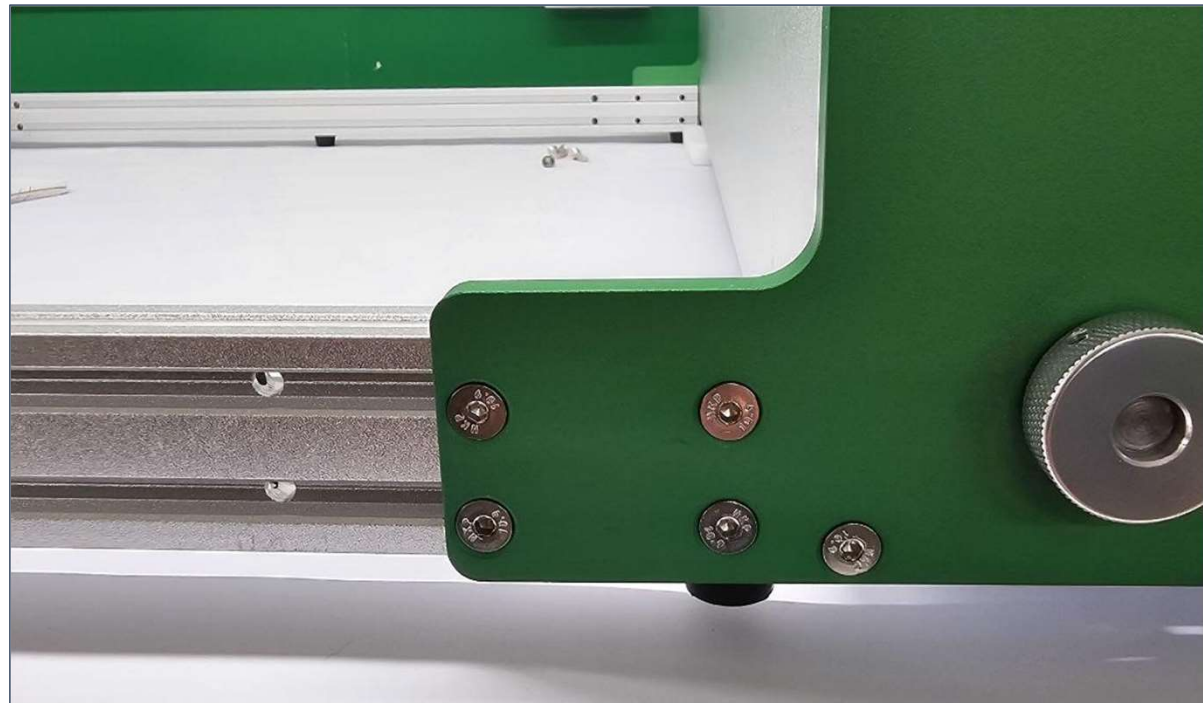
Front Frame Rail

## Part 2 Mechanical Assembly

### Step 1 - Assemble Main Frame 4/5

Using 4 of the M5 x 16mm Countersunk Screws at each corner, attach the Front and Rear Frame Rails to the Y Axes.

HINT - Start all the screws by hand before tightening them to prevent binding.



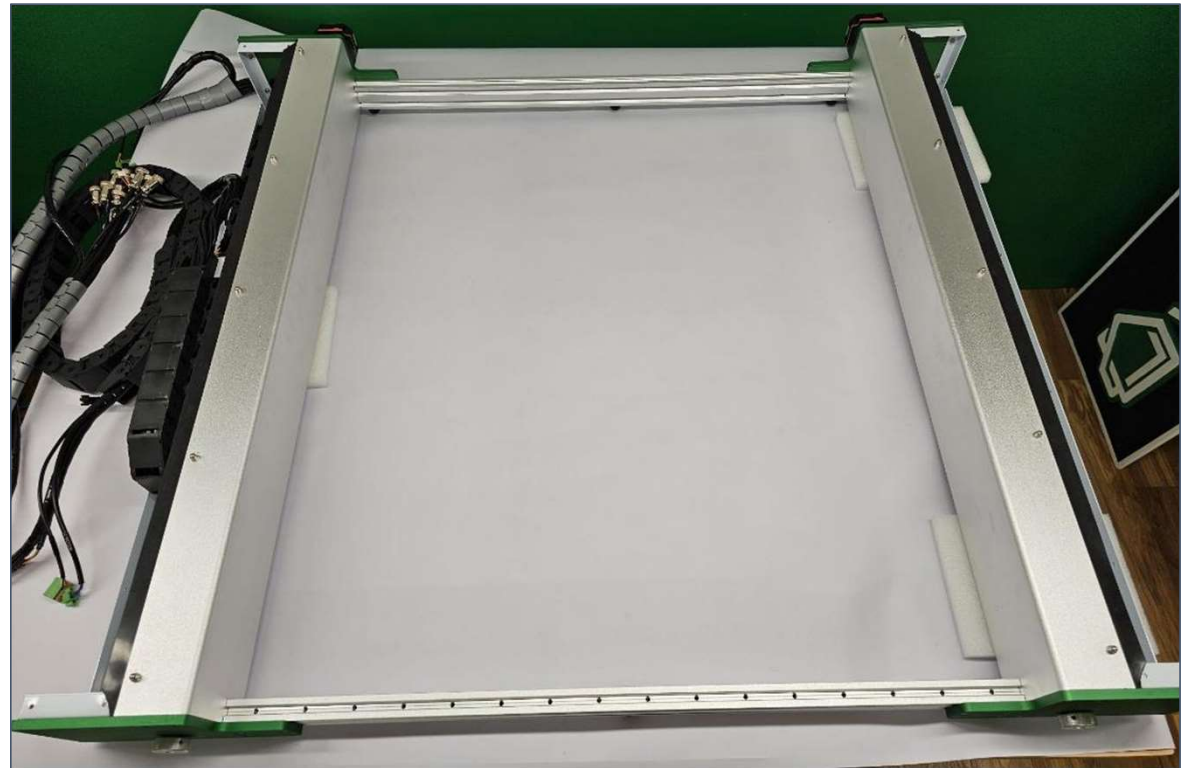
## Part 2 Mechanical Assembly

### Step 1 - Assemble Main Frame

5/5

Your machine should now look similar to this picture, with the Front and Rear Frame Rails secured to the Y Axes.

Note the foam spacers used to raise the Y Axes temporarily.



## Part 2 Mechanical Assembly

### Step 2 - Assemble Bed Support Rails

1/4

Parts Required:

- 12 M5 x 30mm Socket Head Screws
- 12 M5 Lock Washers
- 12 M5 Flat Washers
- Bed Support Rails (3 pcs as shown)





## Part 2 Mechanical Assembly

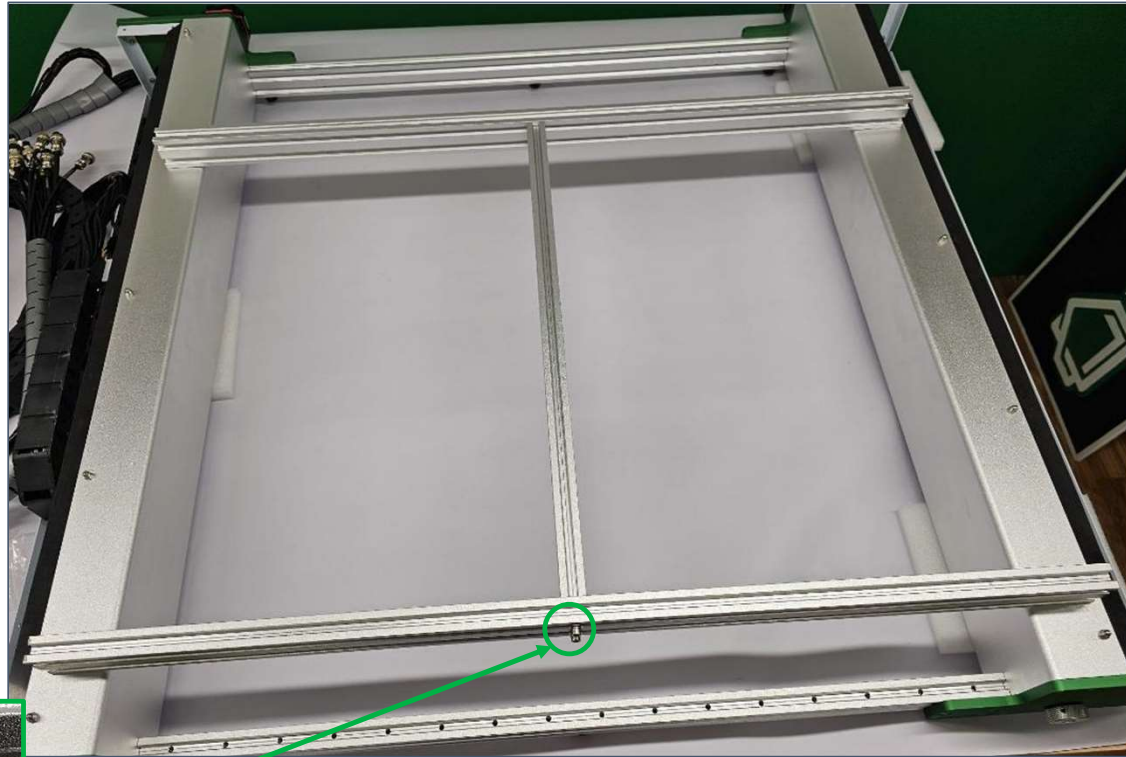
### Step 2 - Assemble Bed Support Rails

2/4

Lay the longer Bed Support Rails across the machine as shown.

Place the shorter Bed Support Rail in between the longer rails, perpendicular to the longer rails.

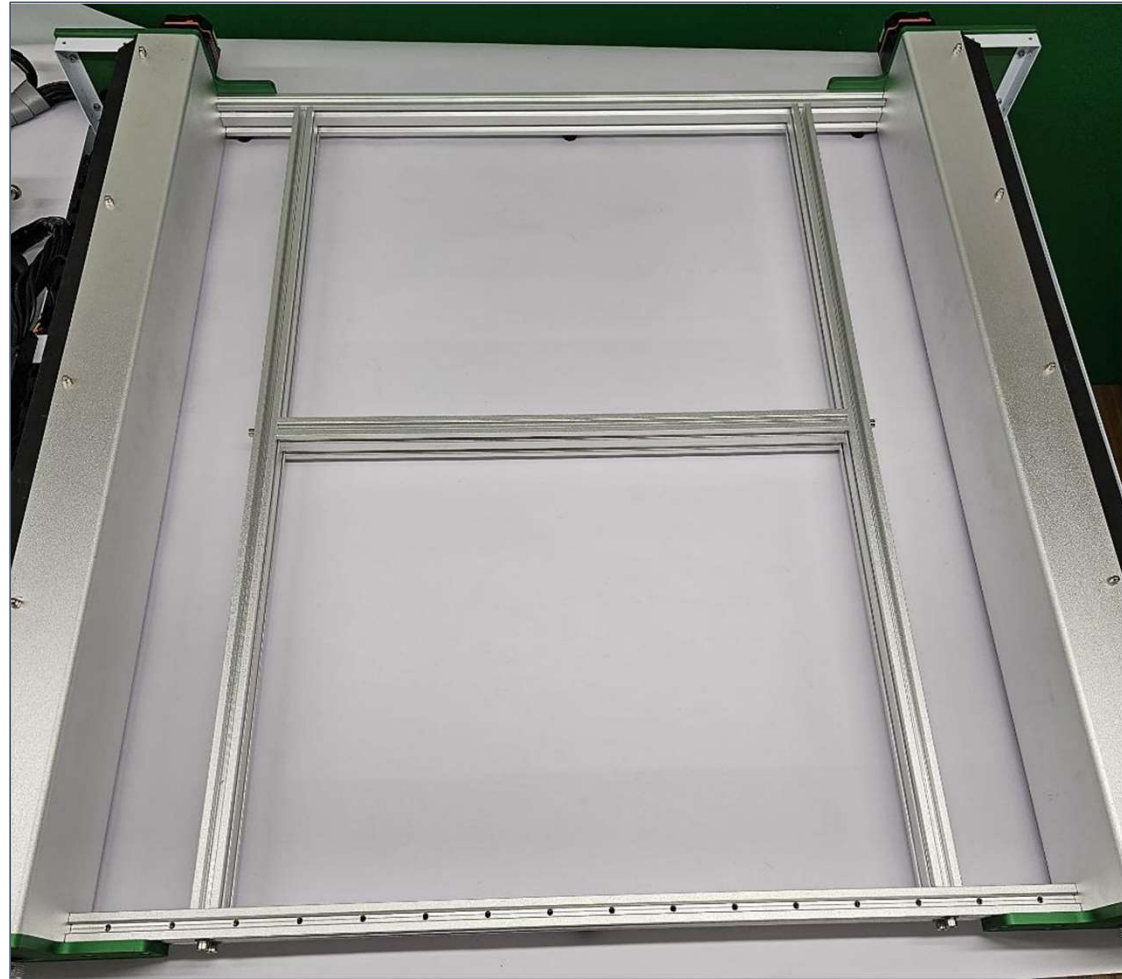
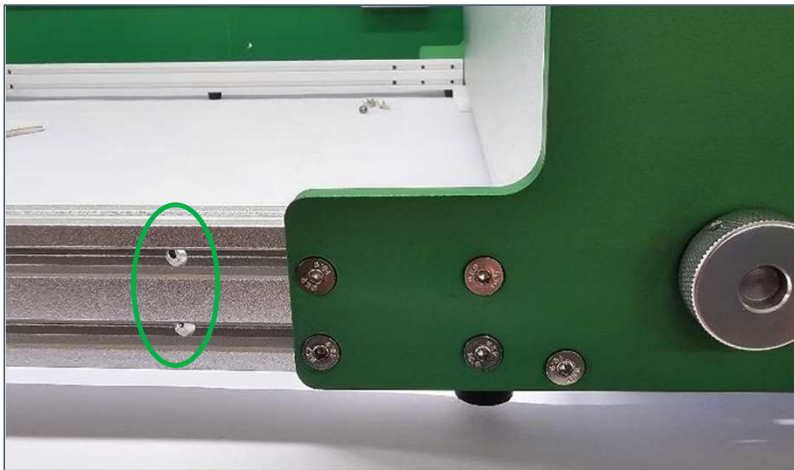
Using 4 of the M5 x 30mm Socket Head screws, 4 M5 Flat Washers, and 4 M5 Lock Washers; connect the Bed Support Rails in an “H” shape.



## Part 2 Mechanical Assembly

### Step 2 - Assemble Bed Support Rails 3/4

Rotate the assembled Bed Support Rails 90 degrees, and slide the assembly between the Front and Rear Frame Rails; aligning them with the screw holes in the Frame Rails.





## Part 2 Mechanical Assembly

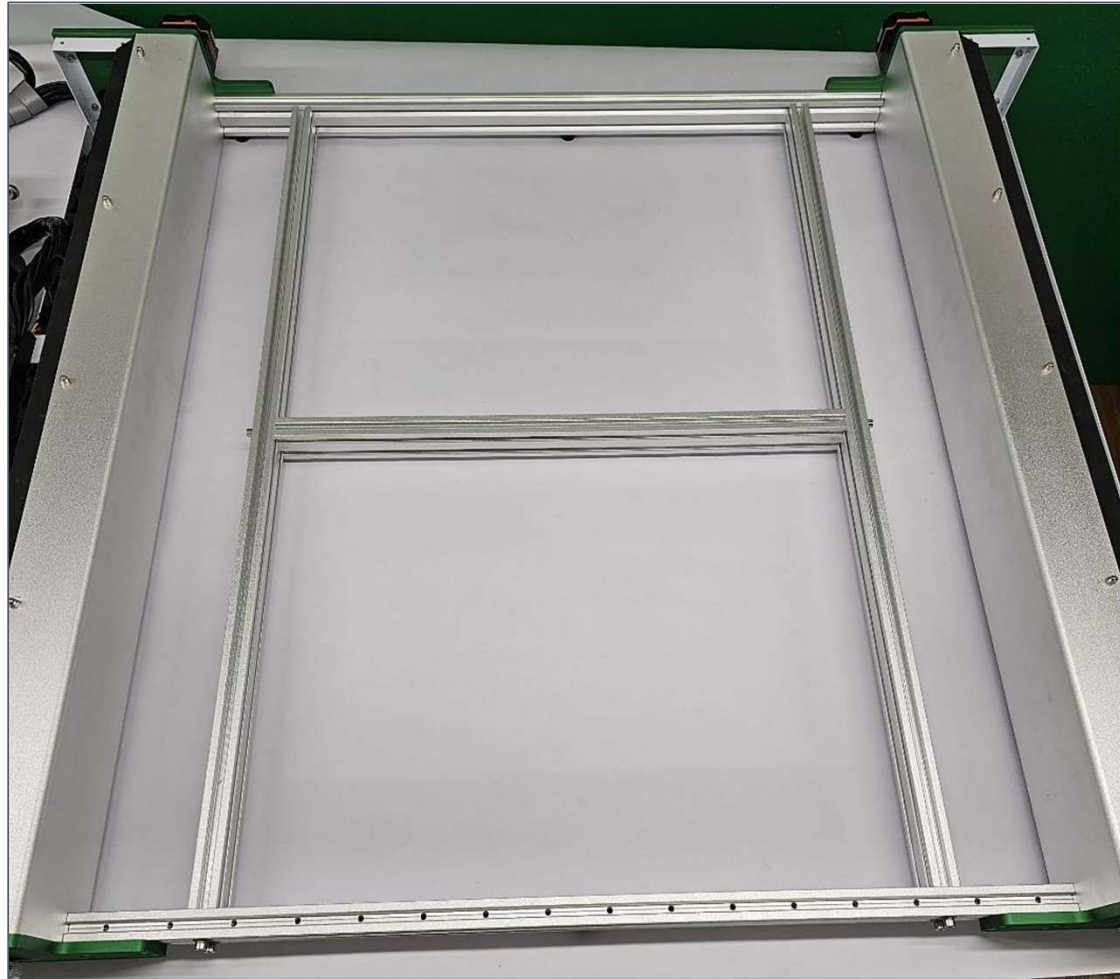
### Step 2 - Assemble Bed Support Rails

4/4

Using 8 of the M5 x 30mm Socket Head screws, 8 M5 Flat Washers, and 8 M5 Lock Washers; connect the Bed Support Rails to the Front and Rear Frame Rails, as shown in the previous image.

After all fasteners are securely tightened; carefully lift each side of the machine frame and remove the foam used to elevate the Y axes.

Watch for “pinch points”!



## Part 2 Mechanical Assembly

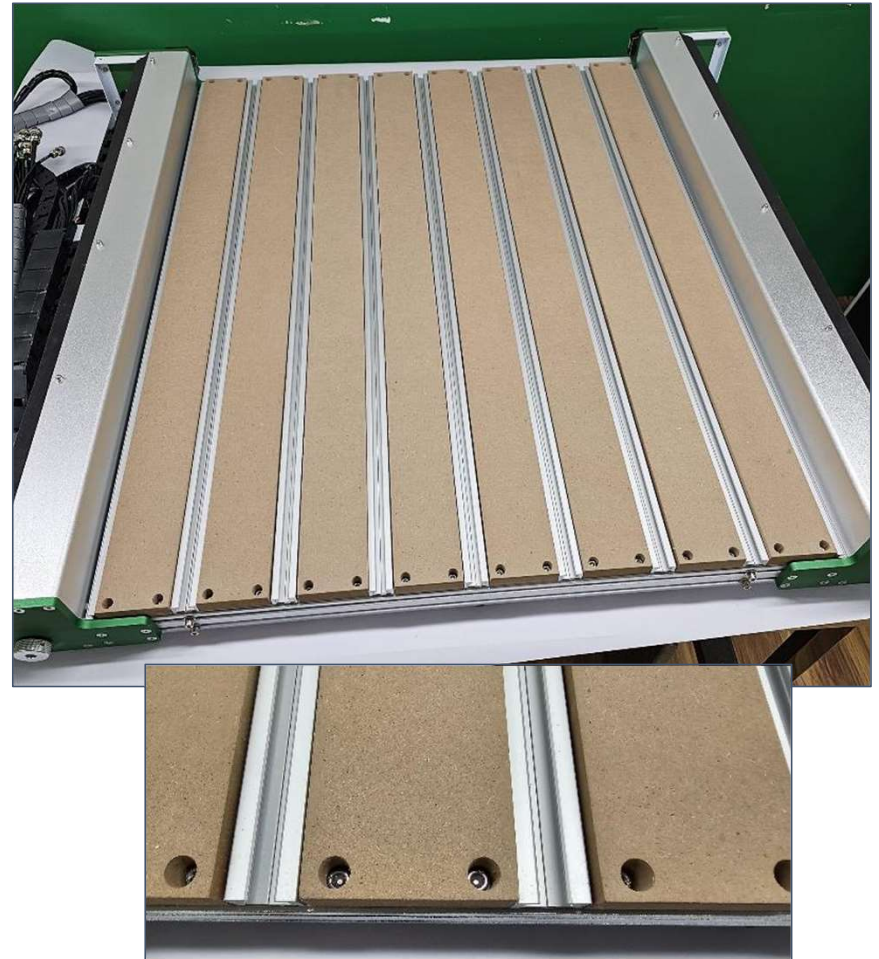
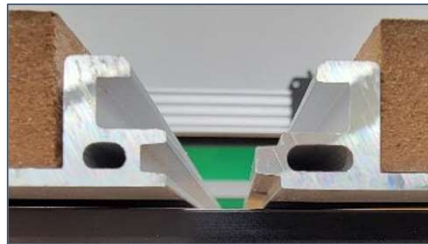
### Step 3 - Assemble Hybrid Spoil Board

Parts Required:

- 32 M5 x 16mm Screws
- 8 Spoil Board Panels

Install Spoil Board Panels, securing to Front and Rear rails.

Ensure that the panels are positioned in a manner that the tongue/groove edges can interlock, as shown below.



## Part 2 Mechanical Assembly

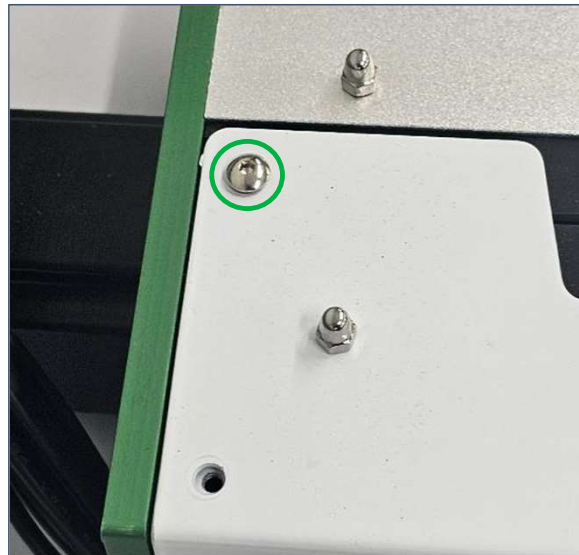
### Step 4 - Prepare for X Axis Installation <sup>1/2</sup>

The Y Axis Covers are temporarily installed using 2 screws at the factory for shipping; these covers must be removed for X Axis installation.

Remove the screws holding each cover in place, and set the covers in a safe location.

These screws will be reused for installation in a later step.

Rear Of Machine



Front Of Machine





## Part 2 Mechanical Assembly

### Step 4 - Prepare for X Axis Installation 2/2

The carriages on the Y Axes are positioned at the factory; approximately 12 inches from the rear housing plate.

Verify that both carriages are the same distance from the rear housing plate - the exact measurement is not critical, but they need to both be the same distance to facilitate X Axis installation.

Left Y Axis



Right Y Axis



## Part 2 Mechanical Assembly

### Step 5 - Install X Axis Gantry 1/4

Parts Required:

- 8 M5 x 12mm Screws
- X Axis Gantry

Ensure all cables are positioned in a manner that they will not interfere with installation of the X Axis; positioning as shown will allow for installation.



## Part 2 Mechanical Assembly

### Step 5 - Install X Axis Gantry 2/4

NOTE: This step may require 2 people.

Carefully lift the X Axis into place, aligning the side plates with the Y Axis carriages.

Ensure that the rubber seals are bent “upwards” to allow for smooth travel, as shown in the following images.

The X Axis Gantry is balanced and will stay in place for any slight adjustments.





## Part 2 Mechanical Assembly

### Step 5 - Install X Axis Gantry <sup>3/4</sup>

Using the 8 M5 x 12mm Socket Head Screws, attach the X Axis Gantry Side Plates to the carriages on the Y Axes.

It may be necessary to make slight adjustments to the carriage positions, using the manual knobs at the front of the machine.

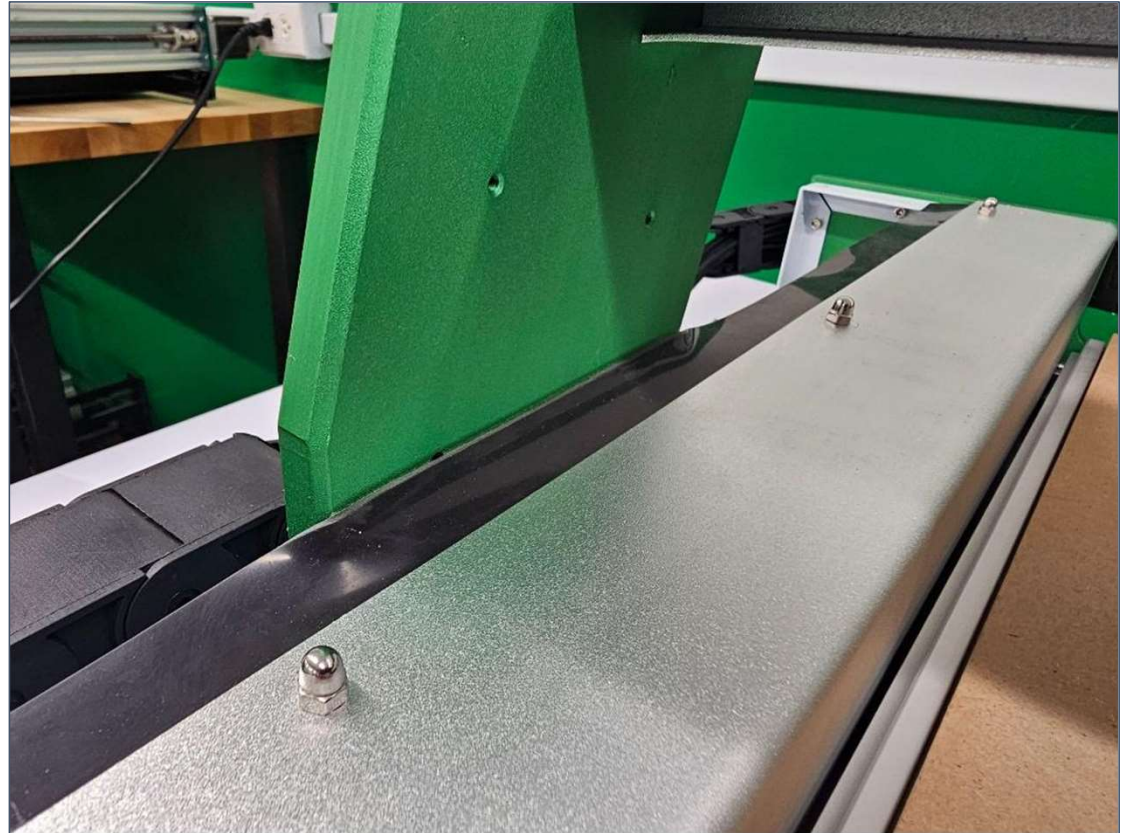
It is not necessary to remove the drag chain on the Left Y Axis; there is enough clearance to access the screws.



## Part 2 Mechanical Assembly

### Step 5 - Install X Axis Gantry 4/4

Verify that the rubber seal is positioned properly along the X Axis Gantry side plates; reposition the seal if necessary.





## Part 2 Mechanical Assembly

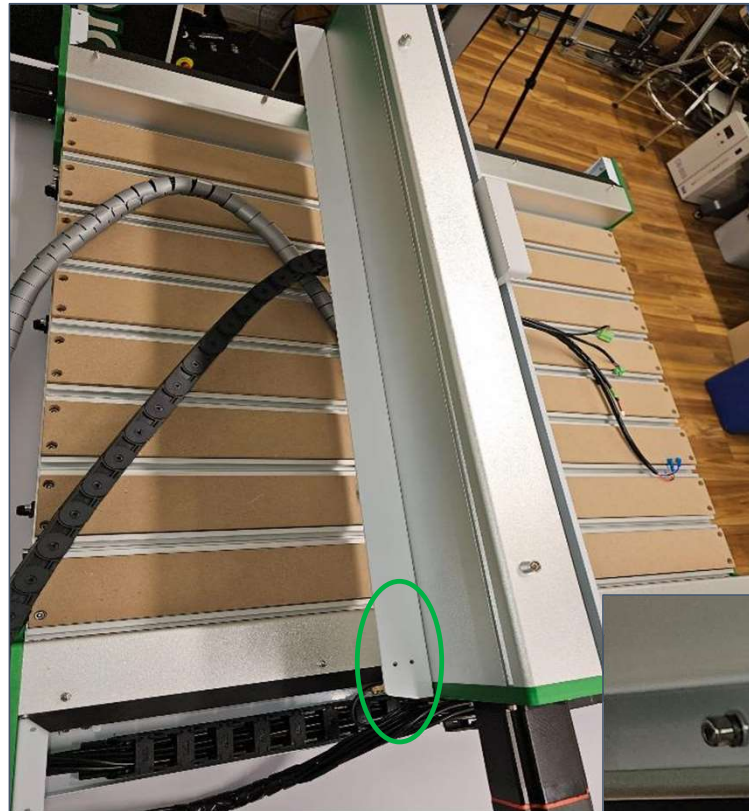
### Step 6 - Install Drag Chain Support Rail

The fasteners for the Drag Chain Support Rail are pre-installed.

Ensure the fasteners are loose, to allow the t-slot nuts to rotate.

Position the Drag Chain Support Rail in the slot at the back of the X Axis Gantry, with the two screw holes closest to the Left Y Axis.

Center the rail on the X Axis, and tighten the 3 screws to secure it in place.



## Part 2 Mechanical Assembly

### Step 7 - Secure Drag Chain to Support Rail

Parts Required:

→ 2 M4 x 3mm Countersunk Screws

Lay the Drag Chain on the Support Rail, and secure the end bracket to the Support Rail with 2 M4 x 3mm Countersunk Screws

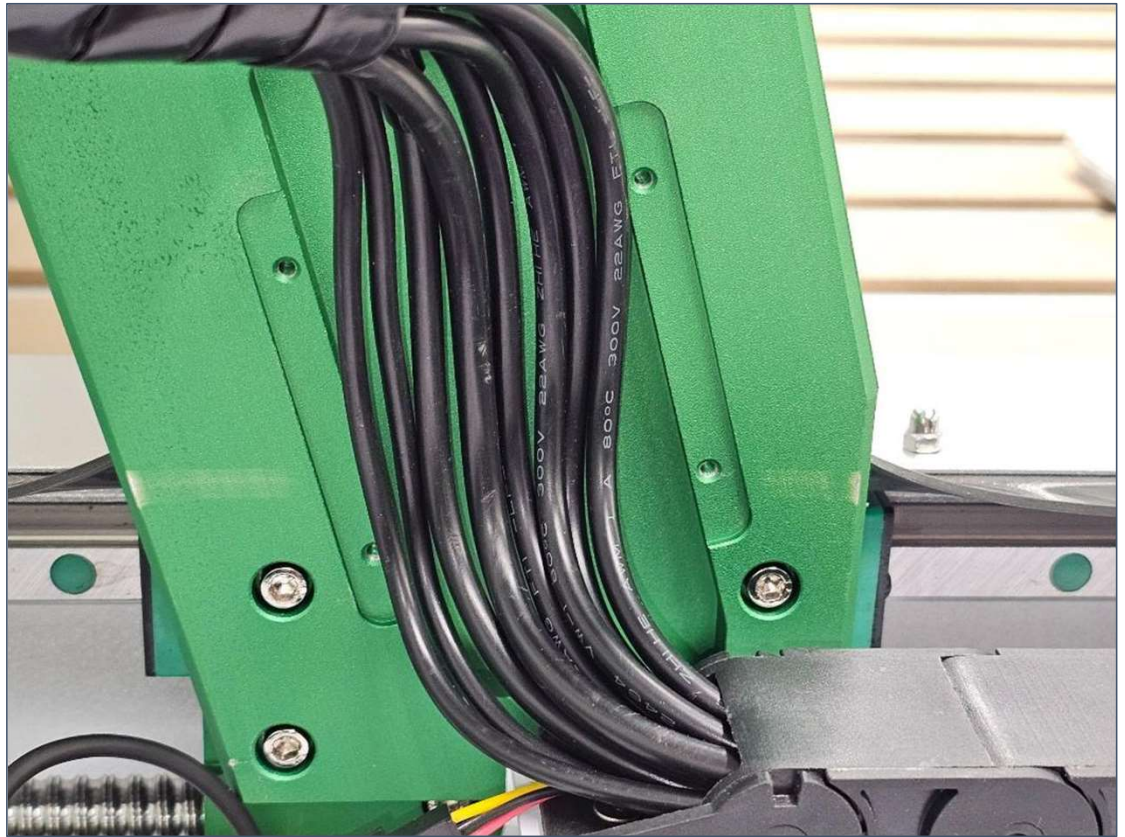


## Part 2 Mechanical Assembly

### Step 8 - Install Cable Cover <sup>1/2</sup>

On left side of the X Axis Gantry, arrange all the cables so that they will lay side-by-side in the recess in the side plate.

Order of cables is not important; but they must be able to lay flat to prevent damage.





## Part 2 Mechanical Assembly

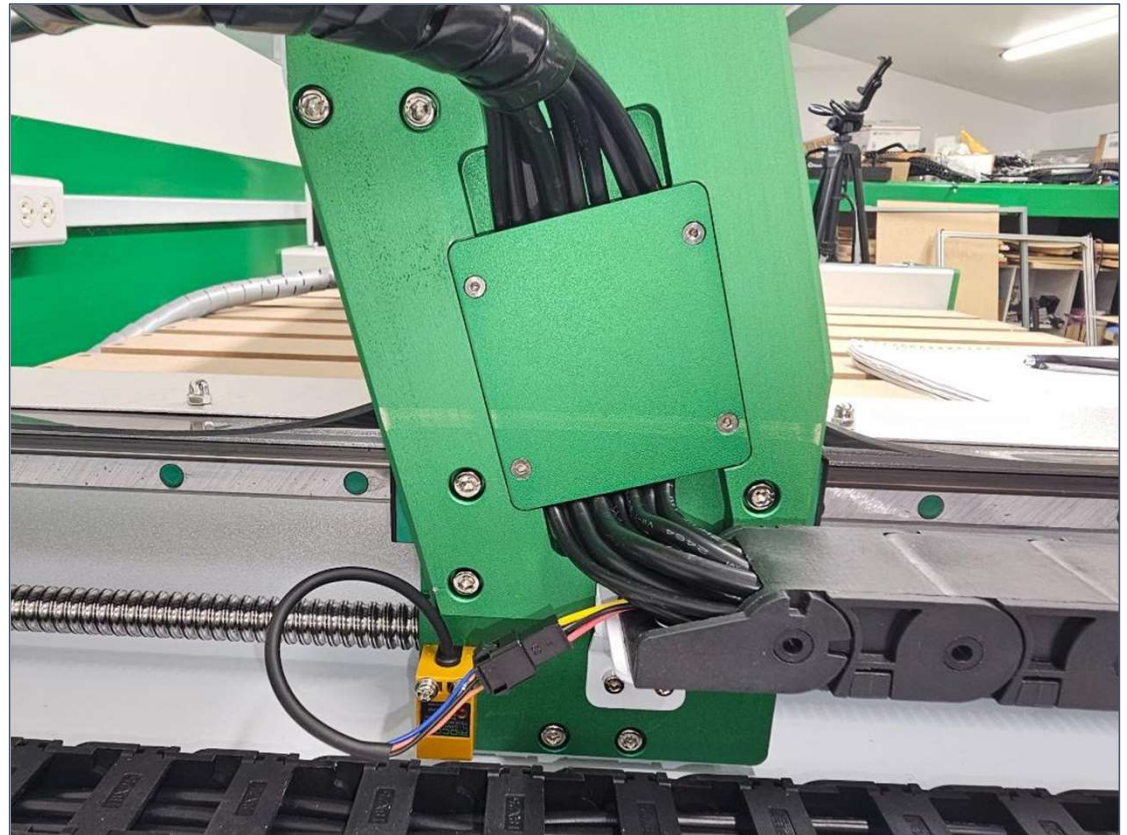
### Step 8 - Install Cable Cover 2/2

Parts Required:

- 4 M3 x 6mm Screws
- Cable Cover Plate

Position the Cable Cover Plate over the cables, and attach with 4 M3 x 6mm Countersunk Screws.

Ensure no wires are pinched or damaged in the recess.



## Part 2 Mechanical Assembly

### Step 9 - Install Y Axis Covers

Parts Required:

- 24 M4 x 6mm Panhead Screws
- Y Axis Covers

Reinstall the Y Axis Covers; ensuring that all fasteners are secure, and the rubber seal is positioned up where it meets the X Axis Gantry side plates.



## Part 2 Mechanical Assembly

### Verification Time!

At this point, your machine should appear as shown in this image.





## Part 2 Mechanical Assembly

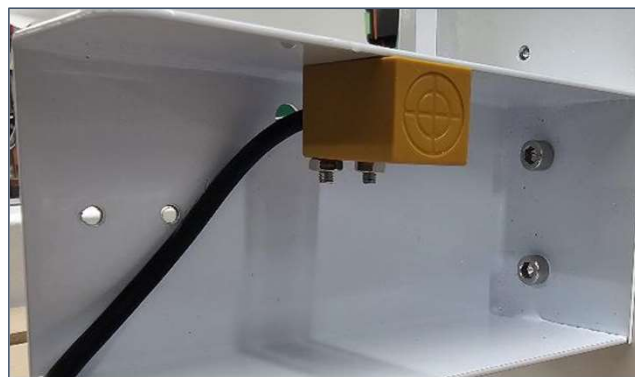
### Step 10 - Prepare Z Axis for Installation

Parts Required:

- 2 M5 x 6mm Screws
- Z Axis Assembly
- X Axis Proximity Switch Housing

Attach the X Axis Proximity Switch Housing to the rear of the Z Axis Assembly as shown.

The “Open” side of the housing should face downward.



## Part 2 Mechanical Assembly

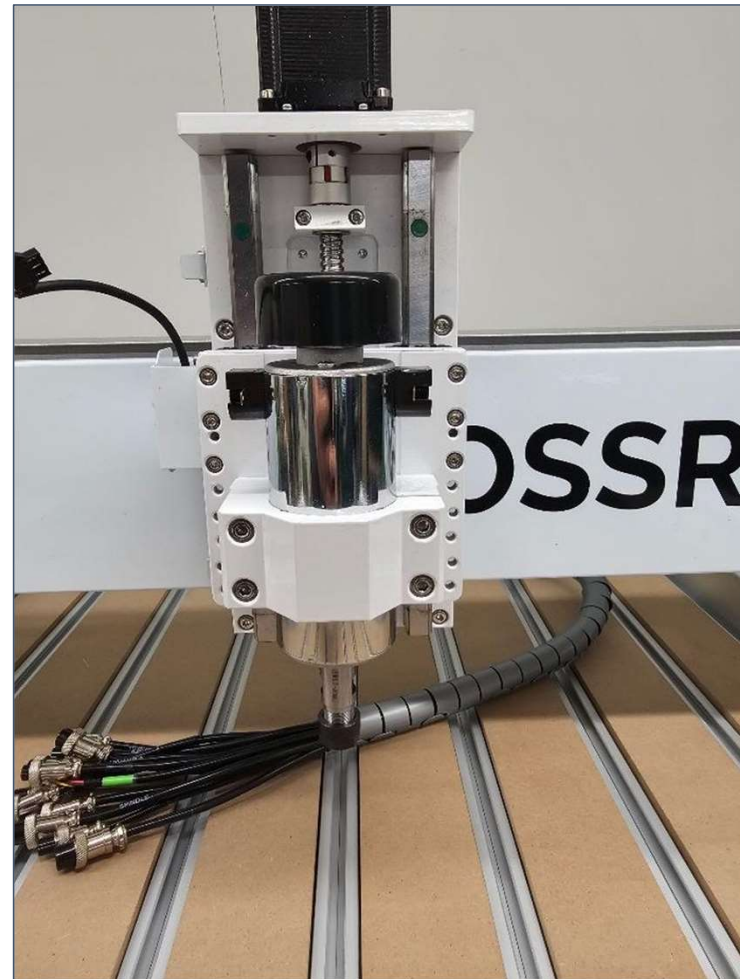
### Step 11 - Install Z Axis Assembly

Parts Required:

- 4 M5 x 12mm Screws
- Z Axis Assembly

Install the Z Axis Assembly to the X Axis carriage using 4 M5 x 12mm screws.

The Proximity Switch Housing on the rear of the Z Axis will assist in holding up the Z Axis during this step.





## Part 2 Mechanical Assembly

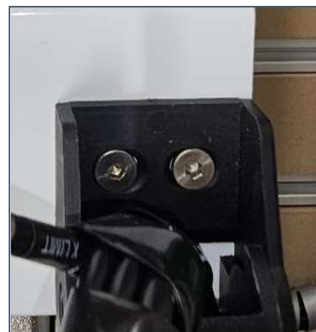
### Step 12 - Secure Drag Chain to Z Axis

Parts Required:

→ 2 M4 x 3mm Countersunk Screws

Bring the end of the Drag Chain to the rear of the Z Axis.

Secure the Drag Chain to the top of the Proximity Switch Housing using 2 M4 x 3mm Countersunk Screws, as shown.



## Part 2 Mechanical Assembly

### Step 13 - Wiring Harness Connections

1/9

Connect Wiring Harness as shown in the following images; please note that a small flat screwdriver will be needed for installation of the stepper motor power supply wiring connectors.

Shown here:

X Axis Proximity Switch Connection - rear of Z Axis Assembly



## Part 2 Mechanical Assembly

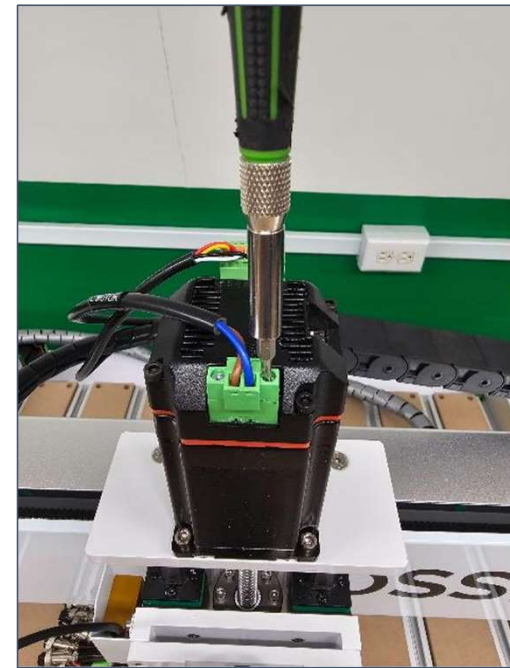
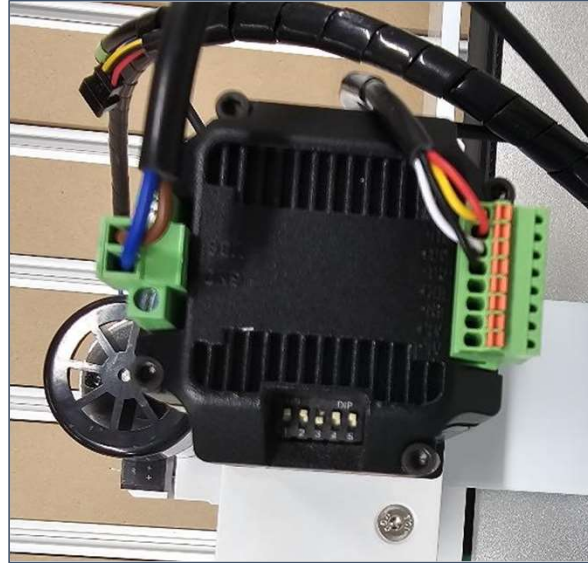
### Step 13 - Wiring Harness Connections

2/9

Connect Wiring Harness as shown in the following images; please note that a small flat screwdriver will be needed for installation of the stepper motor power supply wiring connectors.

Shown here:

Z Axis Stepper Motor Connections -  
top of Z Axis Assembly



## Part 2 Mechanical Assembly

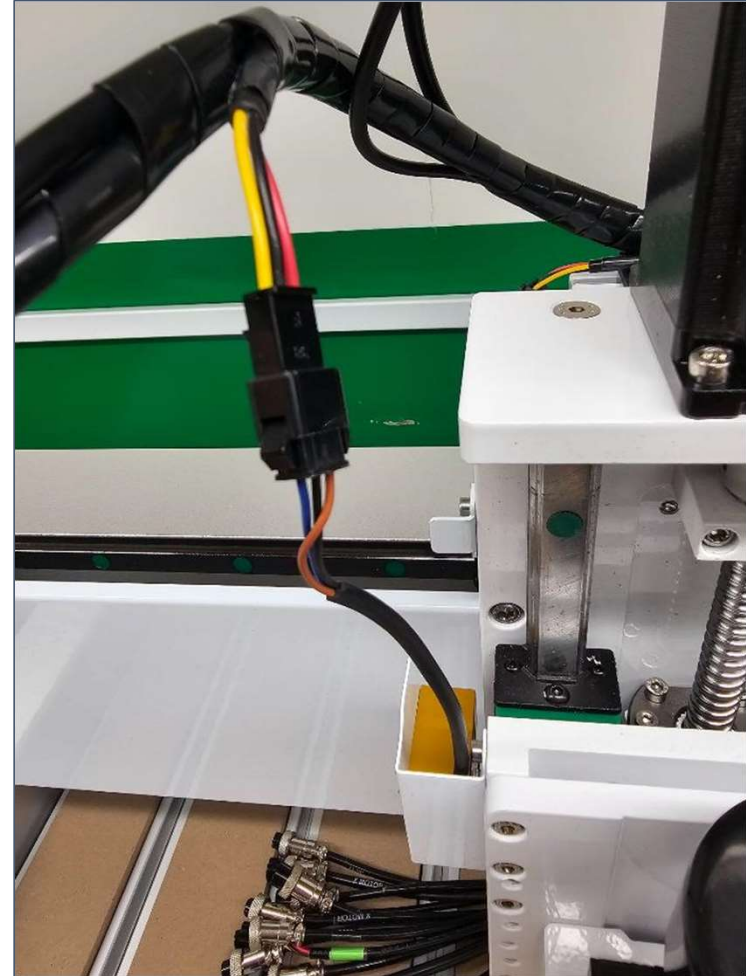
### Step 13 - Wiring Harness Connections

3/9

Connect Wiring Harness as shown in the following images; please note that a small flat screwdriver will be needed for installation of the stepper motor power supply wiring connectors.

Shown here:

Z Axis Proximity Switch Connection - front of Z Axis Assembly





## Part 2 Mechanical Assembly

### Step 13 - Wiring Harness Connections

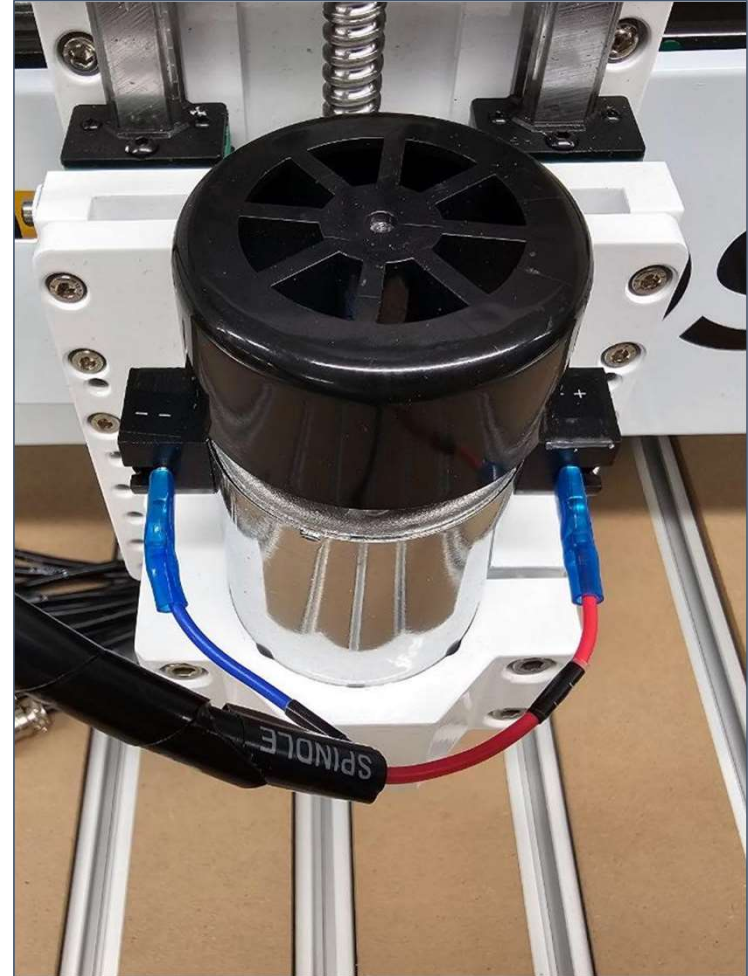
4/9

Connect Wiring Harness as shown in the following images; please note that a small flat screwdriver will be needed for installation of the stepper motor power supply wiring connectors.

Shown here:

Spindle Motor Connection - front of Z Axis Assembly

Note polarity of positive and negative wires!



## Part 2 Mechanical Assembly

### Step 13 - Wiring Harness Connections

5/9

Connect Wiring Harness as shown in the following images; please note that a small flat screwdriver will be needed for installation of the stepper motor power supply wiring connectors.

Shown here:

X Axis Stepper Motor Connections -  
Left Side of X Axis Assembly



## Part 2 Mechanical Assembly

### Step 13 - Wiring Harness Connections

6/9

Connect Wiring Harness as shown in the following images; please note that a small flat screwdriver will be needed for installation of the stepper motor power supply wiring connectors.

Shown here:

Left Y Axis Stepper Motor Connections  
- rear of Left Y Axis Assembly



## Part 2 Mechanical Assembly

### Step 13 - Wiring Harness Connections

7/9

Connect Wiring Harness as shown in the following images; please note that a small flat screwdriver will be needed for installation of the stepper motor power supply wiring connectors.

Shown here:

Right Y Axis Stepper Motor  
Connections - rear of Right Y Axis  
Assembly





## Part 2 Mechanical Assembly

### Step 13 - Wiring Harness Connections

8/9

Connect Wiring Harness as shown in the following images; please note that a small flat screwdriver will be needed for installation of the stepper motor power supply wiring connectors.

Shown here:

Cable to Right Y Axis Stepper Motor placed in cable clips on Rear Frame Rail.



## Part 2 Mechanical Assembly

### Step 13 - Wiring Harness Connections

9/9

Connect Wiring Harness as shown in the following images; please note that a small flat screwdriver will be needed for installation of the stepper motor power supply wiring connectors.

Shown here:

X Axis Proximity Switch Connection - rear of Z Axis Assembly



## Part 2 Mechanical Assembly

### Step 14 - Wiring Harness Controller Connections

Connect Wiring Harness to the Controller as shown.

All cables are labeled; verify connections are made to the matching cable.

Secure connections using the screw rings.

NOTE - 24V AUX port is for future expansion, and is not used at this time.

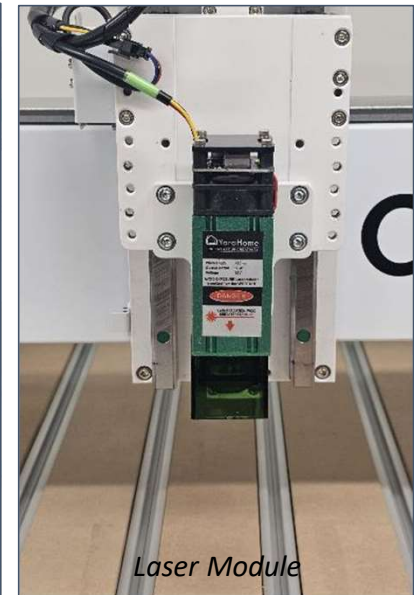


## Part 2 Mechanical Assembly

### Optional Accessories Mounting<sup>1/5</sup>

The CrossRiver can work with these accessories:

- Makita Router
- Dewalt Router
- 1.5K/2.2KW Water-Cooled Spindle
- Laser Module
- 4th Axis (Coming soon)





## Part 2 Mechanical Assembly

### Optional Makita Router Mounting<sup>2/5</sup>

#### Parts Required

- Makita Router
- 80mm Holder
- 65mm Mount

Remove the Spindle Mount.

Attach 80mm Holder as shown.

Insert 65mm Mount Adapter (align gap in adapter with gap in the 80mm Holder).

Tighten thumbscrew to hold Makita Router Motor firmly in place.

Route power cord safely to prevent damage from moving parts.

Note: Dewalt routers can also be used using the 69mm mount included in the package.



## Part 2 Mechanical Assembly

### Optional Water-Cooled Spindle Mounting<sup>3/5</sup>

#### Parts Required

- Water-Cooled Spindle (1.5-2.2kw)
- 80mm Holder

Remove the Spindle Mount.

Attach 80mm Holder as shown.

Insert Water Cooled Spindle, adjusting height as desired.

Tighten thumbscrew to hold Spindle Motor firmly in place.

Please refer to the appropriate manual for the Water Cooled Spindle Kit for further instructions on accessory installation and operation.





## Part 2 Mechanical Assembly

### Optional Laser Module Mounting<sup>4/5</sup>

To utilize the laser engraving functionality of the CrossRiver, the laser module and plate will need to be installed in place of the Spindle Holder.

#### Parts Required

- Laser Plate
- Laser Module

Remove the Spindle Mount.

Attach Laser Module to the Laser Plate using the M3 mounting screws.

Attach Laser Plate to the Z Axis using the supplied screws.



## Part 2 Mechanical Assembly

### Optional Laser Module Mounting<sup>5/5</sup>

The user needs to change the controller configuration, in particular the \$32 setting will need to be set to a “1” to enable proper laser operation.

Please note that the default \$30 value of the controller should be 1000 - this means that the S-MAX value for laser engraving will need to be the same settings of 1000 to equal 100% power to the laser module.

The laser module cable connects to the rear of the Controller, and the Laser/Spindle Selector Switch will also need to be set to “Laser”.

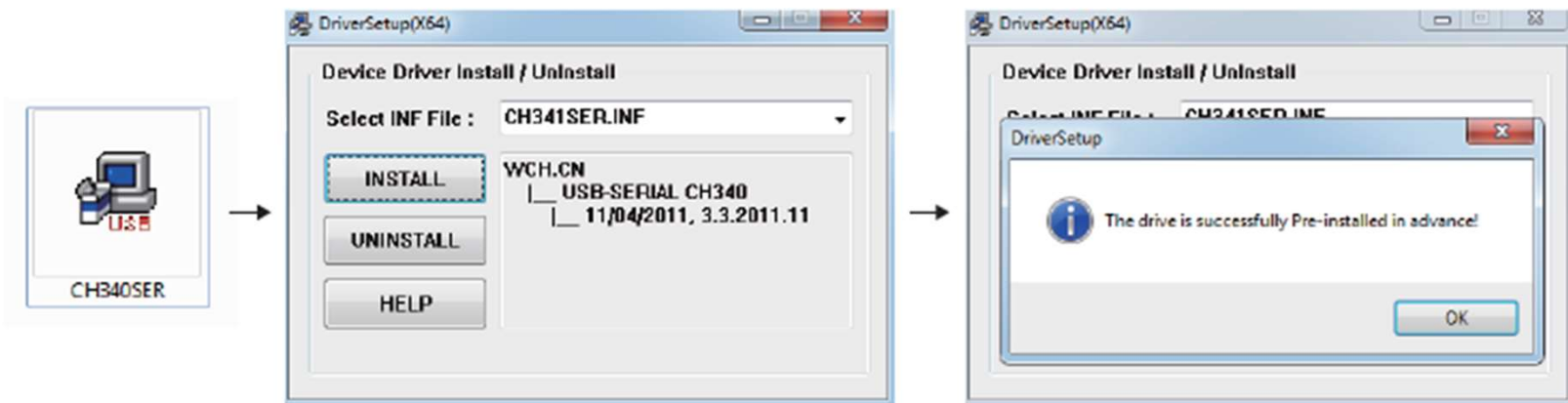


## Part 3 Software Installation

### Step 1 - Install the machine's driver (CH340SER)

If not available on the USB drive, you may download it here: <https://bit.ly/3gFOhVG>

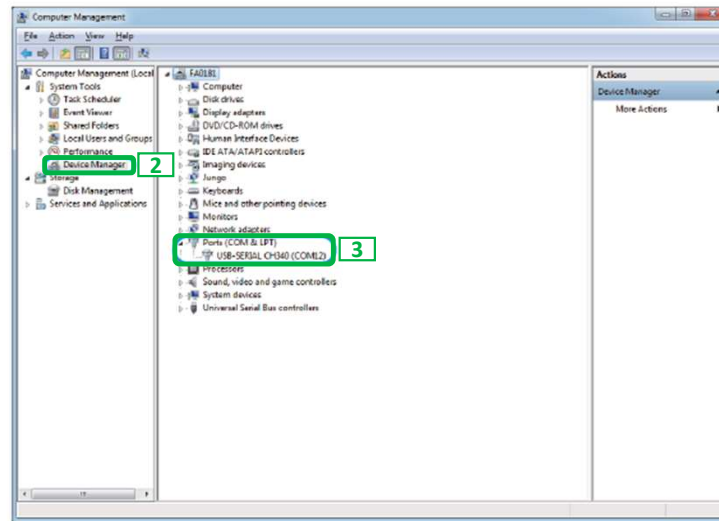
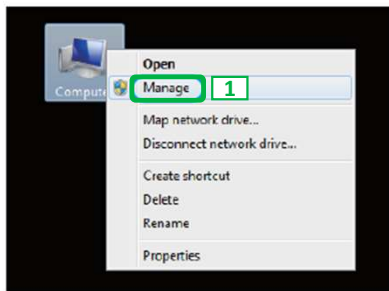
NOTE FOR MAC USERS: If your Mac is running Mojave OS or higher, do NOT install the driver, as the OS has native support for the CH340. If you are running Sierra or High Sierra, please contact YoraHome Technical Support for additional guidance.



# Part 3 Software Installation

## Step 2 - Determine your machine's COM port (Windows computers)

- **Windows XP:** Right click on *My Computer*, select *Manage*, then *Device Manager*.
- **Windows 7:** Click on *Start* on the taskbar, right click on *Computer*, select *Manage*, then *Device Manager*.
- **Windows 10:** In the search box on the taskbar, type *Device Manager*, then select it from the menu.



In the tree, expand *Ports (COM & LPT)*. Your machine will be identified by the USB Serial Port (COMX), where the "X" represents the COM number, for example COM3.

If there are multiple USB serial ports, right click on each one and check the manufacturer, the machine's should be "CH340".

**Note - Machine must be connected to your computer in order for a COM port to be assigned.**

## Part 3 Software Installation

### Step 3 - Log into Easel

We recommend that our customers use a web application called **Easel**, which is developed by Inventables for their X-carve machines.

It works great with the the CrossRiver too. It is free (the pro version is not really needed), powerful and easy to use to design and carve your projects.

Go to [easel.inventables.com](https://easel.inventables.com) and click on the blue **Sign in through Inventables** button.



Easel is the all-in-one software solution for 3D carving machines.

Designed by [Inventables](#), Easel is the easiest way to get started in the world of 3D carving.

**Sign in through Inventables**



## Part 3 Software Installation

### Step 4 - Create your account in Easel

- Click on the “Create New Account” option
- Enter your personal information
- When you are done, click on the orange **Start Free Trial** button

NOTE - Inventables defaults all new accounts to a free 30-day trial of Easel Pro. At the end of that trial, you can continue with a paid Pro subscription, or revert to a FREE Easel account.



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The Easel logo, consisting of the word "EASEL" in blue capital letters, with a stylized blue icon of a computer monitor and a chair between the 'A' and 'S'.

Returning Users

Create New Account

Email:

Full Name:

Password:

☐ I consent to the inventables [PRIVACY POLICY](#)

☐ I consent to the inventables [TERMS OF USE](#)

☐ I'm not a robot

The reCAPTCHA logo, featuring a blue circular arrow icon and the text "reCAPTCHA Privacy - Terms".

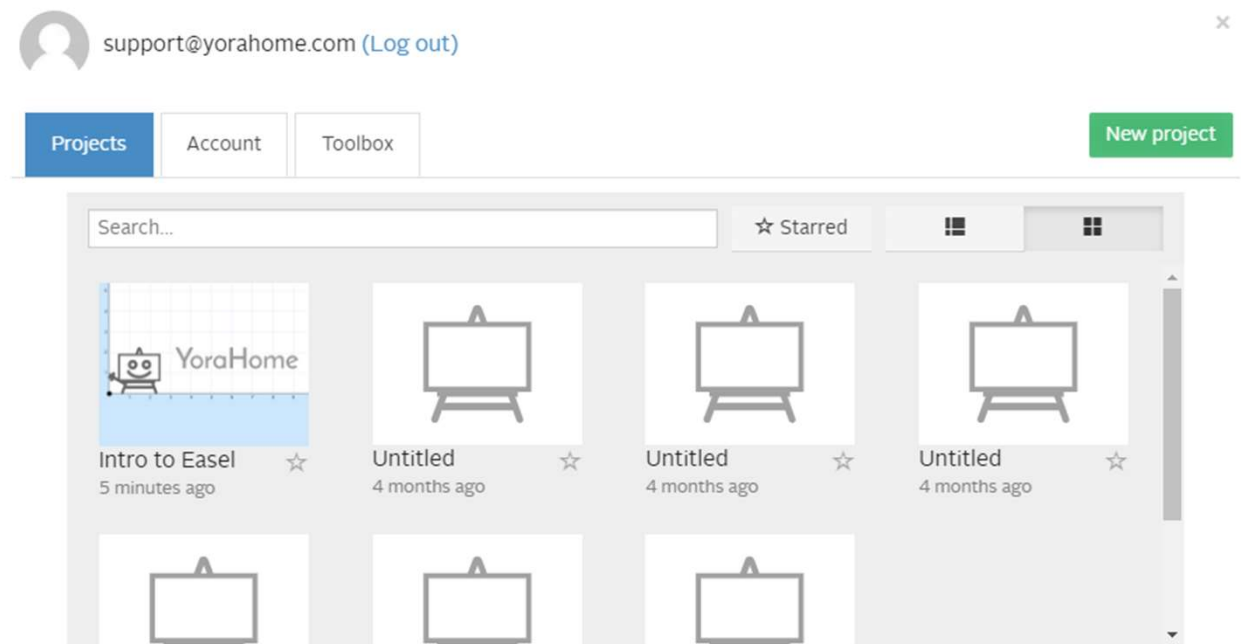
Start Free Trial

---

## Part 4 Machine Setup

### Step 1 - Your first project in Easel!

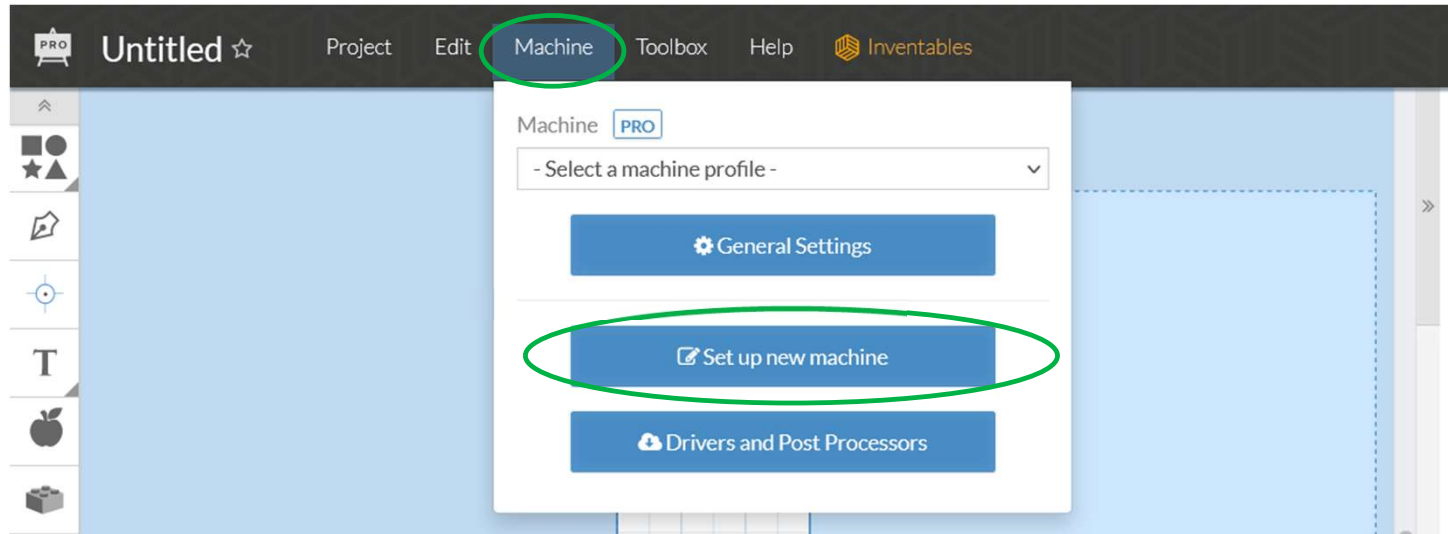
Create a new project by selecting one document in the Projects tab (it can be “Intro to Easel” or any “Untitled”)



## Part 4 Machine Setup

### Step 2 - Set up New Machine

Click on the “Machine” menu, and select the blue “Set up new machine” button.

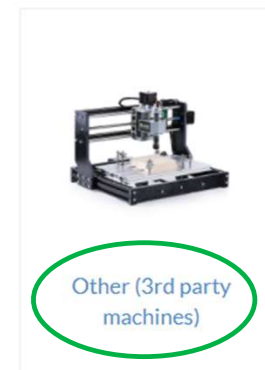
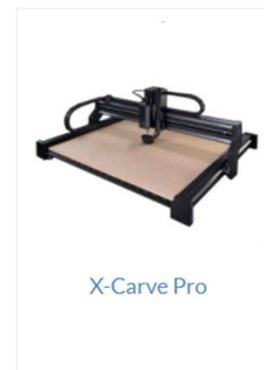
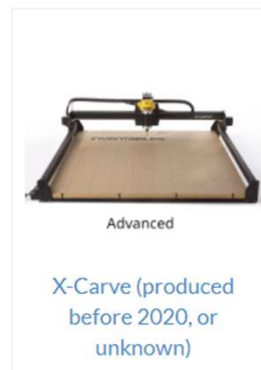


## Part 4 Machine Setup

### Step 3 - Choose your machine

On the Choose your machine type screen, select the “Other (3rd Party Machines)” option.

Choose your machine type:



## Part 4 Machine Setup

### Step 4 - Easel driver (Windows):

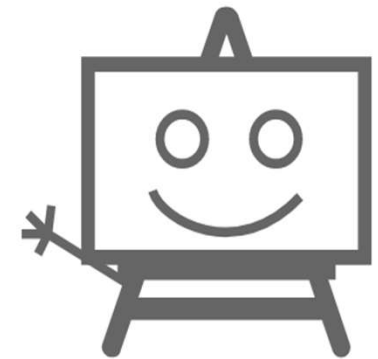
You will be automatically prompted to download and install Easel driver if it is not already installed; whether you're on a Mac or a Windows computer. This driver will allow Easel to talk to the USB port on your computer. If the window below doesn't open, you can access the driver version here: [http://easel.inventables.com/sender\\_versions](http://easel.inventables.com/sender_versions)

W1. Click the green Download for Windows button, the Easel driver will automatically download to your computer. Most downloads are saved to the Downloads folder.

#### Install the Easel Driver

Before you start carving with Easel, we'll make sure everything is set up correctly.

But first, you'll need to install the Easel Driver. This is a small program that lets Easel connect to your machine.



Download for Windows

[Download for Mac](#)

[Download for Linux](#)



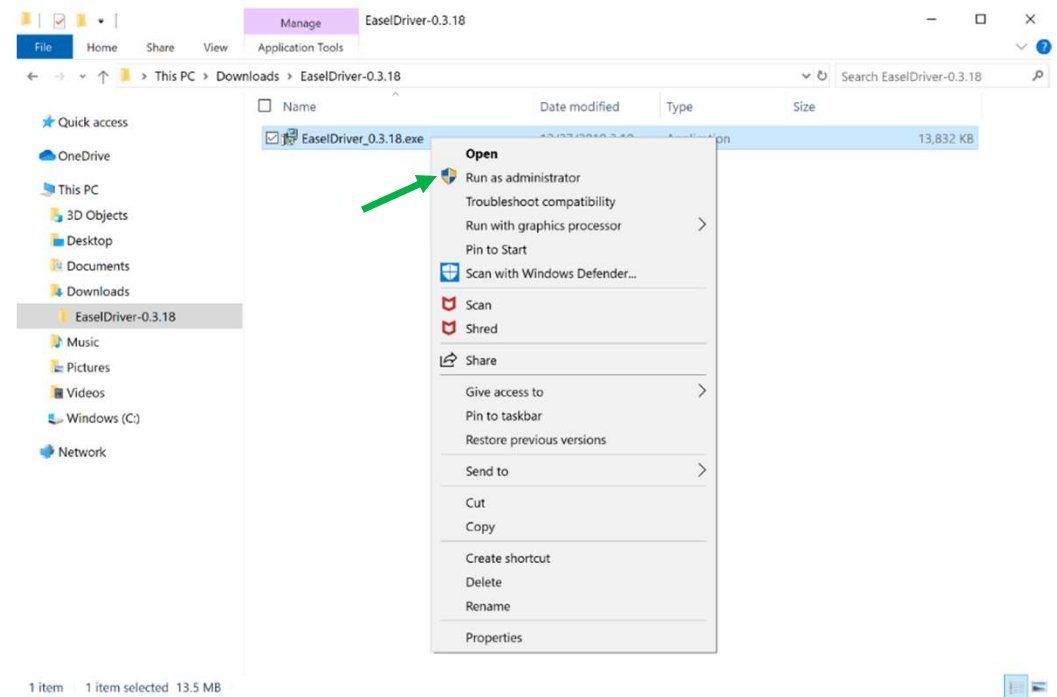
## Part 4 Machine Setup

### Step 5 - Install Easel driver (Windows)

W2. Go to your Downloads folder, open the download and you should see the Easel Driver File (**EaselDriver-0.#.##.exe**).

W3. Then, right-click on it, select "Run as administrator" and follow the installation prompt. Follow the Installer instructions to complete the installation. You may need to refresh your browser and, in some cases, restart your computer.

**Important:** Windows 10 security settings may pop up to confirm if you want to install the driver. You will need to click "More Info" and select "Run Anyway" to proceed with the installation.



## Part 4 Machine Setup

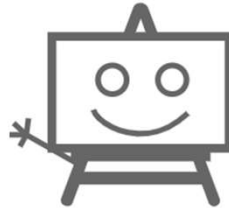
### Step 6 - Download and Install Easel driver (MacOS)

M1. Click the green [Download for Mac](#) button. Easel driver will automatically download to your computer. You may also see the download at the bottom of your browser.

Congratulations on assembling your X-Carve!

Before you start carving with Easel, we'll make sure everything is set up correctly.

But first, you'll need to install the Easel Driver. This is a small program that lets Easel connect to your machine.



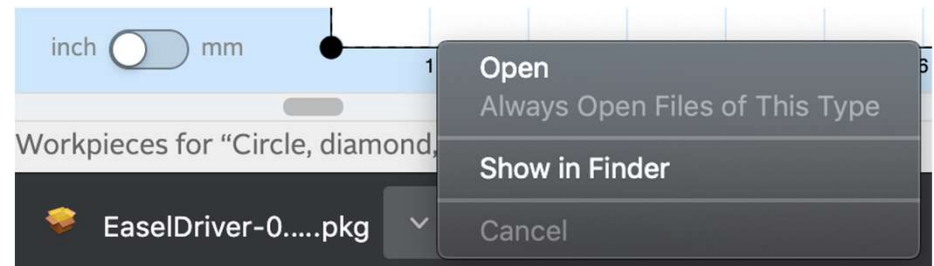
Download for Mac

[Download for Windows](#)

[Download for Linux](#)



M2. Click the downloaded file ([EaselDriver-0.###.pkg](#) file) and open it to run the installer. Follow the Installer instructions to complete the installation. You may need to refresh your browser and, in some cases, restart your computer.



## Part 4 Machine Setup

### Step 7 - Enter your machine details

Choose the options as shown in the picture.

We are working with Inventables to add the CrossRiver. In the interim, selecting the SilverBack machine will allow for proper operation of the machine.

If you have purchased the optional dust shoe with your machine, check the box.

Then, click on the blue **Confirm settings** button.



### Enter your machine details

Select the settings that match your machine. Click [here](#) for Shapeoko (1 or 2).

Make	<input type="text" value="YoraHome"/>
Model	<input type="text" value="Yora SilverBack Benchtop CNC 6060"/>
Dust shoe	<input checked="" type="checkbox"/>

You must use the correct settings for your machine to run correctly.

Confirm settings

(You can always change them later.)

## Part 4 Machine Setup

### Step 8 - Test your wiring

When the machine successfully connects, you'll be presented with a set of controls for jogging your machine. Try jogging the machine using the directional arrows.

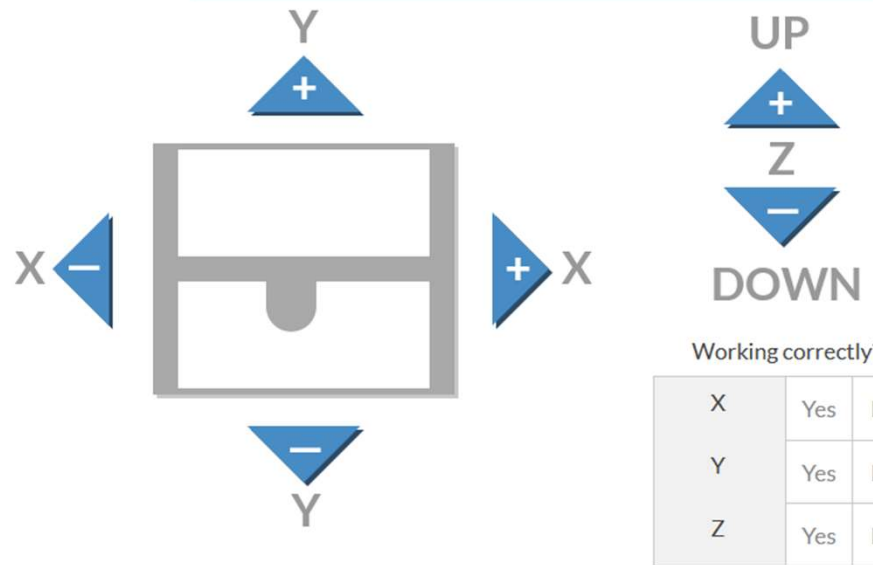
If everything is wired correctly you should get proper motion on each axis. If so, press on the Yes buttons for the X, Y and Z axis.

If you press No, it will swap the directions and fix the issue for you.

### Test your wiring

Now we'll test that your motors are wired correctly. Test each axis using the controls and confirm that each axis moves correctly. We'll troubleshoot any axes that aren't working in the next step.

If you have homing switches, be careful jogging your machine. The switches are currently disabled and can easily be crushed.



Continue

## Part 4 Machine Setup

### Step 9 - Limit switch setup

After you confirm your limit switches and Homing settings, you'll be prompted to enable or disable homing. Since the CrossRiver is equipped with proximity switches, select the "Yes, enable homing" option then click "Start homing sequence", the machine will go through a homing sequence to verify the limit switches.

***Ensure there is nothing in the way of any axes movement during this process.***

#### Homing switch setup

Does your machine have homing switches?

Yes, enable homing

No, disable homing

#### Test the homing switches

Starting the homing sequence should move your machine towards the homing switches. Press "Stop" immediately if the axes move the wrong direction or continue to move after hitting the limits.

Start homing sequence



## Part 4 Machine Setup

### Step 10 - Z-Probe setup

The CrossRiver does have a Z-Probe. Click on the blue “Yes” button.

Do you have a Z-Probe?



Yes No

## Part 4 Machine Setup

### Step 11 - Z-Probe configuration

Follow the prompts on the screen to confirm operation of the Z-Probe. Connect the clip to the collet of the spindle, and touch the probe plate to the collet.

The indicator will turn green when contact is made.

Before continuing past this step, click on the “Advanced Settings” option to set the Z-Probe parameters.



### Setting up your Z-Probe

Plug the leads into the carriage



Attach the clip to the collet

Clip is attached

Touch the touch plate to the collet



Not available

Advanced Settings

Continue

(To continue, make contact with the probe)

## Part 4 Machine Setup

### Step 12 - Z-Probe Advanced Settings

Ensure the Touch plate thickness is set to 19.99 mm. (You may need to select the “mm” option at the top of the screen.

All other options can be left at default.

Click on the “Continue” button.



### Setting up your Touch Plate

Select Units ☐ in ☒ mm

Touch plate thickness

Probe rate

Retract height

Maximum probing distance

(Sends the below gcode. Ensure leads are plugged in, clip is attached, and touch plate is under bit)

```
G21
G91
G38.2 Z-78.74 F127
G10 L20 P0 Z19.99
G91 G21 G0 Z6.35
```

☐ No contact

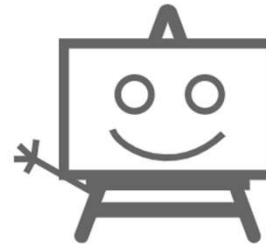
## Part 4 Machine Setup

### Step 13 - Finish Screen

After setting up your machine, you will need to make a few more changes before you can run a test carve. Click on “Finish” and then you should be prompted to start a new project. Just click New Project and continue to the next Step.

That's it! You're ready to carve!

Hooray! You finished setting up your machine!



Run the test carve

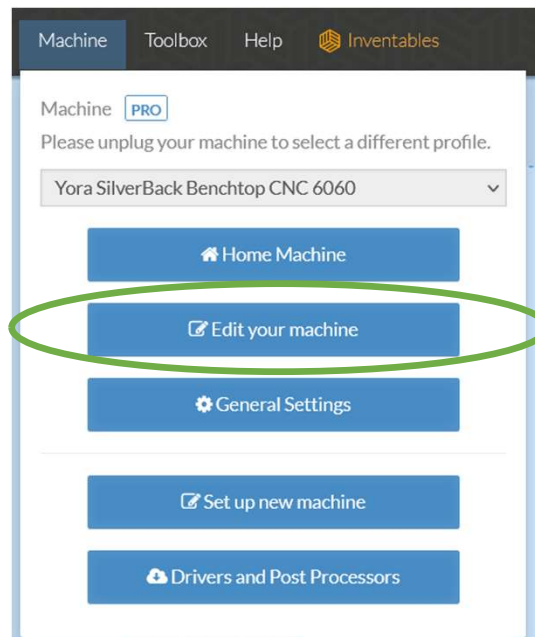
Finish



## Part 4 Machine Setup

### Step 14 - Verify Machine Settings 1/2

After you started a new project click on “Machine” at the top menu then click “Edit your machine”.





## Part 4 Machine Setup

### Step 14 - Verify Machine Settings 2/2

Confirm the following settings:

1. Work Area X: 23.622 in
  2. Work Area Y: 23.622 in
- 
1. Spindle Controlled By: Hardware
- 
1. Spindle: Other

If you have purchased the optional dust shoe with our CrossRiver, make sure the box is checked.  
Z Probe will be checked if it was previously setup.

Click Save and you are ready for your test carve.



Machine Settings

×

Name

Yora SilverBack Benchtop CNC 6o6o

Machine

Yora SilverBack Benchtop CNC 6o6o

Serial Number

Work Area

X

23.622 in

Y

23.622 in

Spindle Controlled by

Hardware

▼

Spindle

Other

▼

Default Spindle Speed (RPM)

12000

Accessories

☐ Dust Shoe

☐ Z Probe

☐ Coolant

Uninstall this machine

Cancel

Save

# Part 5 Recommended Settings - Router



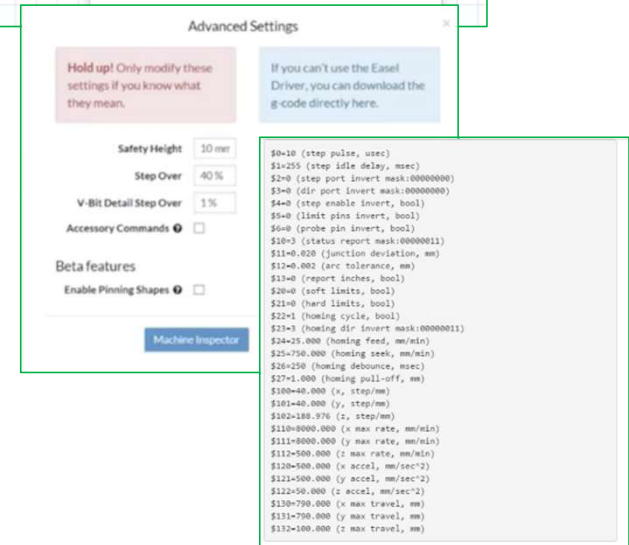
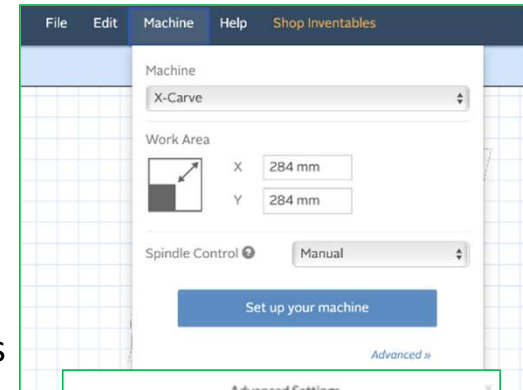
## Key GRBL Settings

### Intro

The CrossRiver motherboard has a series of settings on it that allow your machine to work correctly. We typically recommend that the end user not alter these settings, except as directed by Technical Support.

Go to Easel » Advanced » Machine » Machine Inspector » Settings. This will display all the Grbl settings values from the router. Copy these into a text editor and save the file somewhere as a baseline. No matter how much you may mess up the settings, you will always have a previous set to go back to.

You will see a list of \$xx=yy lines where xx is the setting number and yy is the current value. To change a value send the command of \$xx=zz in the console, where xx is the setting number and zz the new value. These will be permanently stored on the motherboard so they only need to be changed once.



## Part 5 Recommended Settings - Router



### Key GRBL Settings

#### \$3 - Direction port invert mask <sup>1/2</sup>

If an axis is moving in the wrong direction, you need to change one of the settings, namely \$3, the direction port invert mask to be precise.

This is very easy to do. But before doing that:

- Check the connections from the stepper motors and make sure they are plugged into the correct X, Y and Z axis connections on the router board.
- Check that the axis is not binding by turning the screw by hand (disconnect the coupler first).
- Check that the grub screw on the coupler connecting the threaded rod to the stepper motor are tight and the coupler is not slipping.
- Swap the connection for the stepper motor into the router motherboard for that axis with another one. If it now moves (remember it is now a different axis) and the other one doesn't then it is likely to be a motherboard failure. Or possibly a faulty cable, so swap the cable with a working one just to be sure.

If your connections are fine along with your cables, stepper motors and board, then you need to change your \$3 value stored in the motherboard.

## Part 5 Recommended Settings - Router



### Key GRBL Settings

#### \$3 - Direction port invert mask <sup>2/2</sup>

Use the following table: Select the row for your current \$3 value, go across to the column for the axis to change and the value there is your new \$3 value. This only allows you to change one axis at a time. If you need to change more than one, make multiple passes through the process.

Examples:

- Current \$3 value is 2 and the X axis needs inverting: Select the 2 row and the X column, the new \$3 value is 6.
- Current \$3 value is 3, and the Y and Z axes need inverting: To invert the Y axis, select the 3 row and the Y column, the new \$3 value is 1. To invert the Z axis, select the 1 row and the Z column, the new \$3 value is 0.

<u>Current \$3 Value</u>	<u>New \$3 Value</u>		
	<u>Invert X</u>	<u>Invert Y</u>	<u>Invert Z</u>
0	4	2	1
1	5	3	0
2	6	0	3
3	7	1	2
4	0	6	5
5	1	7	4
6	2	4	7
7	3	5	6

In Easel, type \$3=x in the console command box where x is the revised number and hit enter to send it to the route motherboard. Everything should now be moving in the correct direction. If you changed any settings, make a note in your file containing your original settings just in case.

## Part 5 Recommended Settings - Router



### Key GRBL Settings

#### **\$100,\$101,\$102 - [X,Y,Z] steps/mm**

These parameters controlled the distance travelled by each axis. These values are the number of microsteps required to move the spindle on each axis by 1mm. \$100 sets the X axis, \$101 the Y axis, and \$102 the Z axis. These should all be set to the values listed in the Default Settings Table at the end of the manual.

#### **\$30 and \$31 – Max and Min Spindle Speed (RPM)**

This sets the spindle speed range between 0.0% and 100%. Since the CrossRiver has an external speed control, these values should not require adjustment.

#### **\$32 – Laser Mode**

This is a Boolean value or on/off. 1 is on (laser connected) and 0 is off (spindle connected). If you don't have a Laser module then just leave this set to 0. If you do wish to use the optional laser module, you will need to set Laser Mode on (1) when using the laser module.



## Part 5 Recommended Settings - Router



### Key GRBL Settings

#### **\$110, \$111 and \$112 – [X,Y,Z] Max rate, mm/min**

Set in mm/min, these set the maximum rate each axis can move. Whenever Grbl plans a move, it checks whether or not the move causes any one of these individual axes to exceed their max rate. If so, it'll slow down the motion to ensure none of the axes exceed their max rate limits. This means that each axis has its own independent speed, which is extremely useful for limiting the typically slower Z-axis. Leave them at \$110=5000, \$111=5000 and \$112=5000.

You can check all the defined GRBL settings and what they mean using the link below:

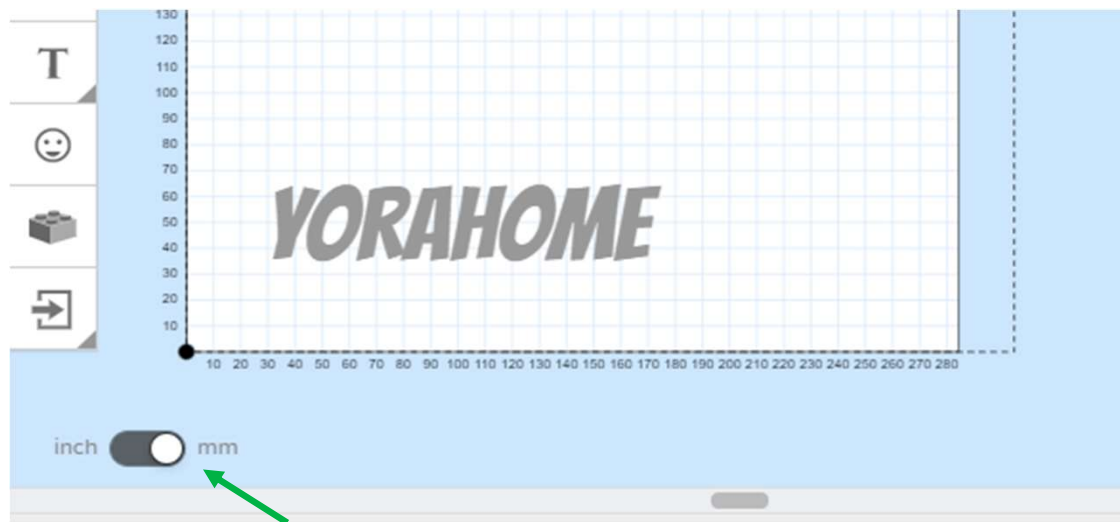
<https://github.com/gnea/grbl/wiki/Grbl-v1.1-Configuration>

Note – changing GRBL settings beyond those mentioned above is not recommended by YoraHome, and is done at your own risk.

## Part 5 Recommended Settings - Easel

### Metric system settings in Easel

We recommend that our customers use the mm (metric) settings for better readings and precision, especially in the CNC world.



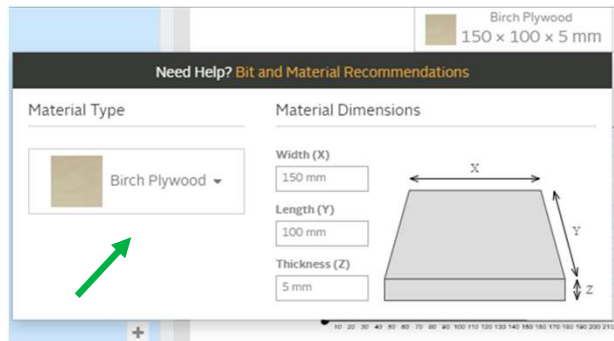
## Part 5 Recommended Settings - Easel

### Material type and Dimensions

1. Find the piece of wood or material you want to carve



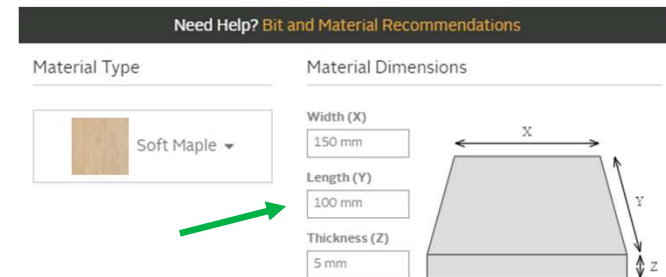
2. Select the material type in Easel



3. Take the measurements (Length, Width, Depth) of your material



4. Enter the Material Dimensions in Easel



## Part 5 Recommended Settings - Easel








### Bit settings

5. Clamp your material down on your machine's table.



6. Insert your bit into your ER11. Specify the type of End Mills you inserted using Other in Easel for any of the bits you have. (This will allow you not to have to purchase the Easel Pro Version)

If you don't know the width or diameter of the bits you bought from YoraHome, check the product page description of the bits in our [Router Bits](#) category.

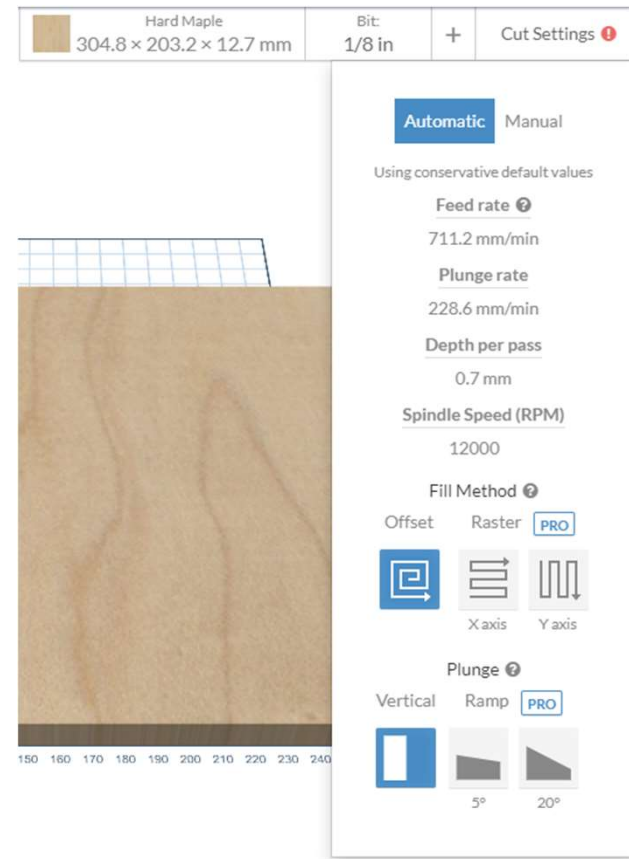
End Mills		
Type	Size	
Straight cut ? 	1/8 in	
	1/32 in	
Upcut ? 	1/16 in	
	1/8 in	
	Other	Width <input type="text" value="0.1"/> in mm

## Part 5 Recommended Settings - Easel

### Cut settings

Selecting the material type in Easel allows the software to calculate cut settings. Preliminary testing has shown that these Automatic settings are a good starting point for most users.

The user will need to adjust settings based on their personal experience and how the machine is operating. For smaller diameter bits, speeds WILL need to be drastically reduced to prevent bit breakage.





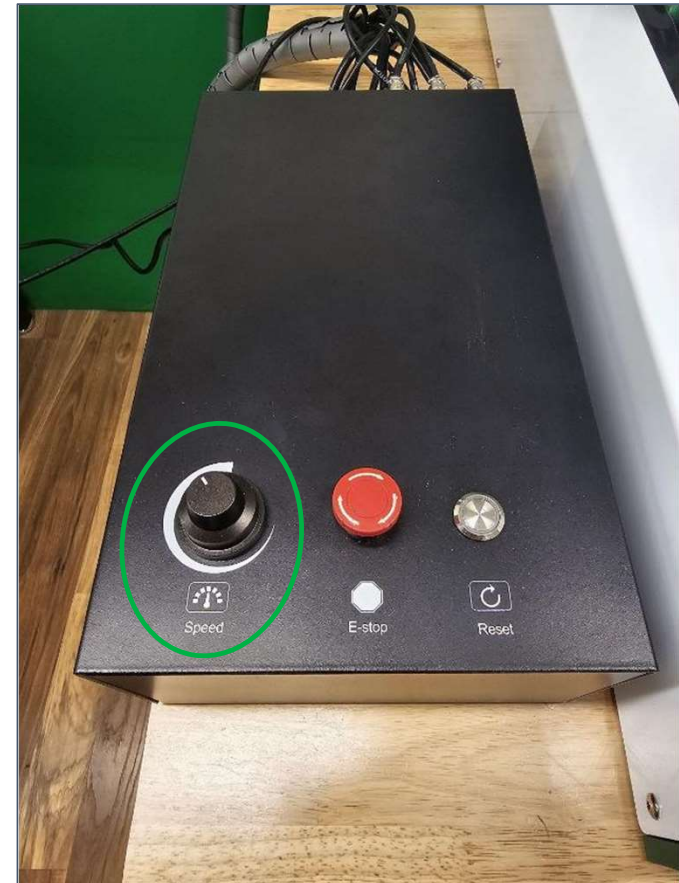
## Part 5 Recommended Settings - Easel

### Cut settings - Spindle Speed

When using the 500W Spindle Motor, spindle speed is controlled by the user, not the Controller.

The Controller will turn the Spindle Motor On/Off.

Speed is controlled using the adjustment knob on the top of the Controller.



## Part 6 Best Practices For Assembly & Setup

### Quick Guide

1. Ensure everything is **wired and powered correctly** per the manufacturer guidelines.
2. Ensure your axes **move freely** and don't obviously bind. If you can't easily tell, try removing your steppers and check if they run under no load.
3. Ensure your stepper motors and axes linear mechanisms are all tight and secure. Small set screws on drivetrain components becoming loose is a very common problem. Re-tighten and try applying some non-permanent thread locker (**Loctite blue**) if it continually loosens.
4. For more difficult issues, try the process of elimination to quickly **isolate the problem**. Start by disconnecting everything from the Arduino (controller board). Test if Grbl is operating ok by itself. Then, add one thing at a time and test.
5. If your steppers are powered and making a grinding noise when trying to move, try **lowering the '\$' acceleration and max rate settings**. This sound is a sign that your steppers are losing steps and not able to keep up due to too much torque load or going too fast.
6. Next, you need to make sure your machine is moving in the correct directions according to a Cartesian(XYZ) coordinate frame. Check all axes. If an axis is not moving correctly, **alter the \$3 direction port mask setting to invert the direction**. Just keep in mind that motions are relative to the tool. So on a typical CNC gantry router, the tool will move rather than the fixed table. If the x-axis is aligned positive to the right, a positive motion command will move the tool to the right. Whereas, a moving table with a fixed tool will move the table to the left for the same command, because the tool is moving to the right relative to the table.
7. Finally, tune your settings to get close to your desired or max performance. Start by ensuring your **\$100,\$101, and \$102 axes step/mm** settings are correct for your setup.

## Part 7 Terminology<sup>1/2</sup>

**CNC (Computer Numerical Control):** A CNC machine is a motorized platform controlled by a computer according to specific input instructions.

**Units (mm or inches):** It is imperative that the units match. If you tell your software to work in inches and the router works in mm, you are going to get very bad or compressed results.

**G-code:** G-code stands for “Geometric Code”. It is a programming language for CNC that instructs machines where and how to move. Most machines speak a different “dialect” of g-code, so the codes vary depending on type, make, and model.

**Controller or Motherboard:** This is the brain of your CNC working with an Arduino microprocessor. This is the bit of electronics that controls everything: stepper motors (axis movements), spindle motor (cutting speeds), laser (power settings), jogging, G-code commands received via USB or an offline controller, etc.

**Grbl :** This is the software which runs on the motherboard. It takes the G-code and translates it into the movements and speeds needed to cut a line for example.

**Closed-Loop Stepper motor:** A motor that is told to turn in small steps like turn clockwise  $1.7^{\circ}$  as opposed to a normal motor that will continue to rotate as long as the power is supplied. Each step of the motor will turn the threaded rod which will move the the axes connected to it. Closed-Loop motors use an encoder to ensure the motor is turning the desired amount, to help eliminate “lost steps”

**Spindle Motor:** This is the big electric motor which holds the cutting bit.

**Stock:** Whatever you are trying to engrave, cut or carve.

**Bed:** This is the flat MDF plywood or aluminium bed which holds the stock with slots in it to allow clamps to hold the stock down.

## Part 7 Terminology<sup>2/2</sup>

**ER11:** This is the piece that fits onto the end of the spindle and holds the bit.

**Collet:** The piece inside the tool holder (ER11) which as it is tightened into a tapered hole contracts around the bit so holding it.

**Bit (or Tool):** The sharp blade which rotates and cuts bits out of the stock.

**Shank:** The part that goes into the collet of the tool holder.

**Flute:** A cutting edge at the end of the bit.

**Limit Switches or End Stops:** Switches which trigger at the limits of movement for each axis. During the operation, they will stop the router from trying to move past its physical limits by generating an alarm.

**Toolpath:** The path that the tool is moved along in order to do the job. Your software will provide a toolpath simulation so you can see on your computer what is going to happen before you send it to the router.

**Passes:** This is the number of times you tell the router to retrace the same path. If you want to cut a groove or pocket in a piece of wood 5mm deep you are not going to do it in one single, go down 5mm then cut! If the wood is very soft and the bit is very sharp, maybe, but you take the risk of overloading the router, wearing out or breaking the bit by trying to make it do too much work in one go. You can get around this by telling Easel to make multiple passes cutting out a little each time. As a general rule, the less material you take out the better the finish quality but the longer it takes.

## Part 8 Default GRBL Settings

\$0=10 (Step pulse time)	\$27=3.000 (Homing switch pull-off distance)
\$1=255 (Step idle delay)	\$30=1000 (Maximum spindle speed)
\$2=0 (Step pulse invert)	\$31=0 (Minimum spindle speed)
\$3=1 (Step direction invert)	\$32=0 (Laser-mode enable)
\$4=0 (Invert step enable pin)	\$100=320.000 (X-axis travel resolution)
\$5=0 (Invert limit pins)	\$101=320.000 (Y-axis travel resolution)
\$6=0 (Invert probe pin)	\$102=400.000 (Z-axis travel resolution)
\$10=3 (Status report options)	\$110=5000.000 (X-axis maximum rate)
\$11=0.010 (Junction deviation)	\$111=5000.000 (Y-axis maximum rate)
\$12=0.002 (Arc tolerance)	\$112=5000.000 (Z-axis maximum rate)
\$13=0 (Report in inches)	\$120=300.000 (X-axis acceleration)
\$20=0 (Soft limits enable)	\$121=300.000 (Y-axis acceleration)
\$21=1 (Hard limits enable)	\$122=300.000 (Z-axis acceleration)
\$22=1 (Homing cycle enable)	\$130=600.000 (X-axis maximum travel)
\$23=3 (Homing direction invert)	\$131=600.000 (Y-axis maximum travel)
\$24=100.000 (Homing locate feed rate)	\$132=130.000 (Z-axis maximum travel)
\$25=1000.000 (Homing search seek rate)	
\$26=250 (Homing switch debounce delay)	



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<https://My.YoraHome.com>



<https://Facebook.com/groups/YoraHome.CNC>