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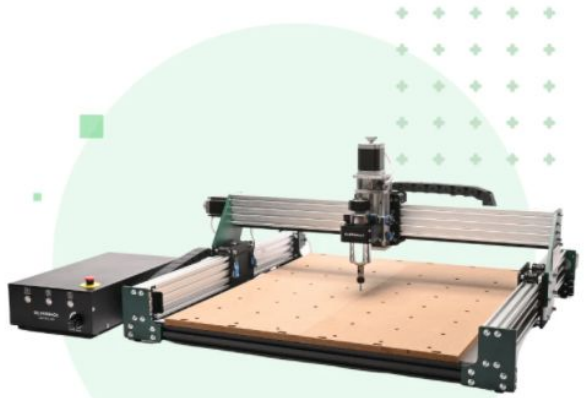
YORA SILVERBACK BENCHTOP CNC ROUTER 6060

USER MANUAL

Version 1.3 • April, 2022



Purpose

This Manual is intended for assembly of the Yora SilverBack 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 1/3

- ➔ 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 2/3

- ➔ 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 3/3

- ➔ 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 SilverBack 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 SilverBack 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.

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Part 1 Packing List 1/12

Small Box			
Item	Size	Picture	Quantity
SilverBack Controller			1

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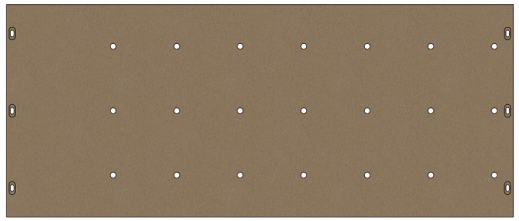
Part 1 Packing List 2/12

Layer 1			
Item	Size	Picture	Quantity
MDF Spoilboard			2
Front/Rear Frame Rail	20x40 Aluminum Extrusion		2

Part 1 Packing List 3/12

Layer 2			
Item	Size	Picture	Quantity
Spindle Motor			1
Spindle Motor Sleeve			1
Drag Chain Bracket	Large Bracket		1

Part 1 Packing List 4/12

Layer 2 - continued			
Item	Size	Picture	Quantity
Drag Chain Bracket	Small Bracket		2
Laser Adapter Sleeve			1
Drag Chain Support Rail			1

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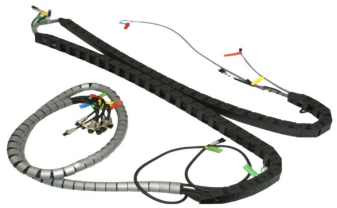
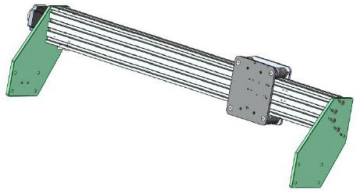
Part 1 Packing List 5/12

Layer 2 - continued			
Item	Size	Picture	Quantity
Drag Chain/Wire Harness Assembly			1
X Axis Assembly			1
Spoilboard Support Kit			3x Support Rails 12x Corner Brackets 24x M5 T-Nuts 24x M5*8 Screws

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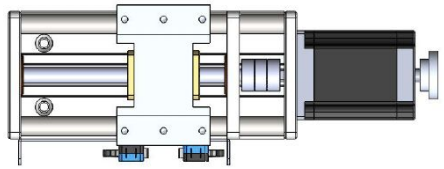
Part 1 Packing List 6/12

Layer 3			
Item	Size	Picture	Quantity
Z Axis Assembly			1
Y Axis Assemblies	Y1 - Left Y2 - Right		1+1
Spindle Mount			1

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Part 1 Packing List 7/12

Hardware Box			
Item	Size	Picture	Quantity
Socket Head Cap Screws	M4 x 8mm		3
	M5 x 6mm		7
	M5 x 14mm		14
	M5 x 20mm		29

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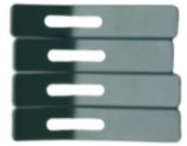
Part 1 Packing List 8/12

Hardware Box - continued			
Item	Size	Picture	Quantity
Countersunk Socket Head Cap Screws	M5 x 25mm		4
	M4 x 6mm		9
Square Nut	M5		3
Flat Washer	M5		25
Spring Lock Washer	M5		25

Part 1 Packing List 9/12

Hardware Box - continued			
Item	Size	Picture	Quantity
Hold-down Clamps			4
Clamp Thumbscrews	M5 including wing nuts and washers		4
Wrenches	13mm x 15mm		1
	14mm x 17mm		1
Z Probe Assembly	20mm		1

Part 1 Packing List 10/12

Hardware Box - continued			
Item	Size	Picture	Quantity
Hex Key	2mm, 2.5mm, 3mm, 4mm		1 of each
Power Cable			1
USB Cable			1
Name Plate	Personalizable		1

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Part 1 Packing List 11/12

Hardware Box - continued			
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

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Part 1 Packing List 12/12

Optional Accessories & Upgrades - Not included		
Yora Laser Module 	Yora SilverBack 6060 Aluminum Spoilboard 	Yora Essential Bits 
Yora Makita 1.25HP Router 	Yora SilverBack 6060 Expansion Kit (100x100cm) 	Yora CNC V-Groove Bits (With ER11 Spring Collets) 
Yora SilverBack 2-in-1 Dust Shoe 	Yora SilverBack 100x100cm Aluminum Spoilboard 	Yora CNC Diamond Drag Engraving Bit (90 Degree) 
Yora SilverBack 6060 MDF Spoilboard (For Replacement) 	Yora 6 Inch Stainless Steel Digital Caliper | mm/in/f Conversion 	1/4" bits and more!

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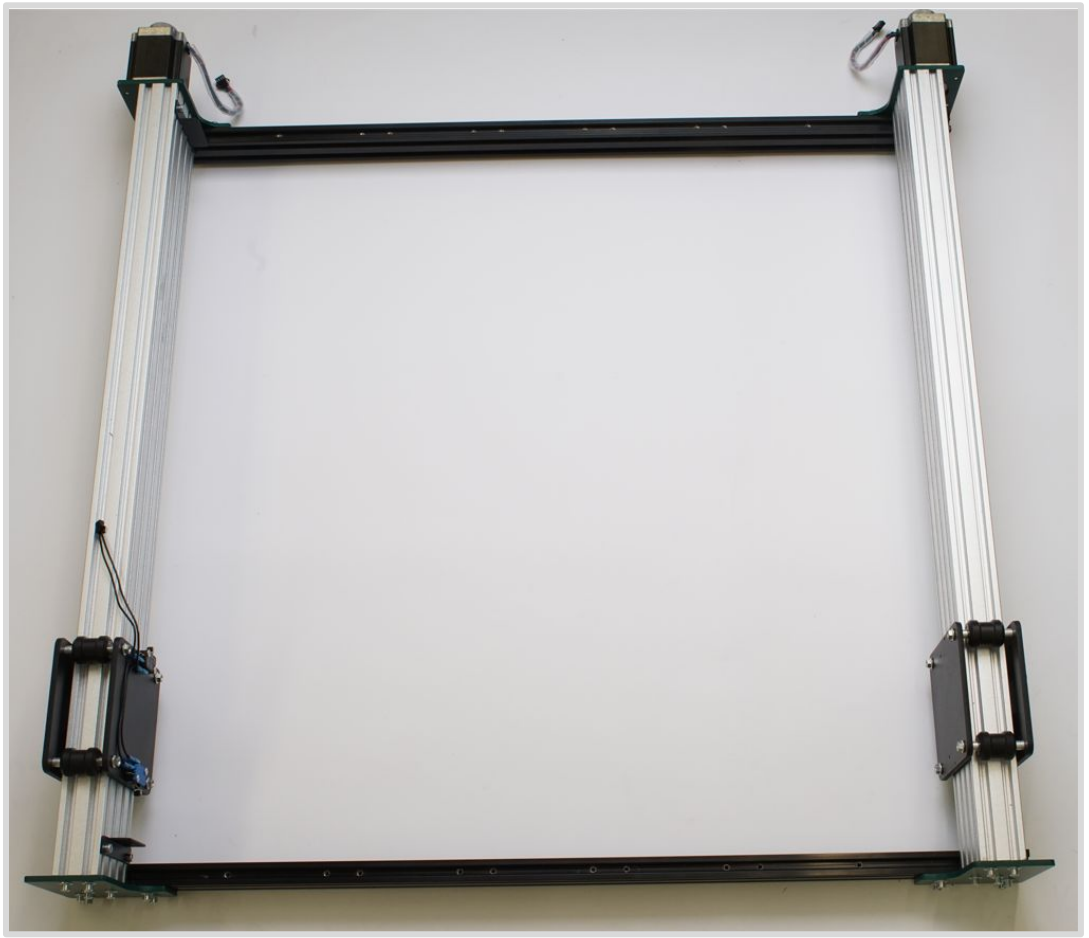
Part 2 Mechanical Assembly

Step 1 - Assemble Main Frame 1/4

Parts Required:

- ➔ 16 M5 x 20mm Screws
- ➔ 16 M5 Flat Washers
- ➔ 16 M5 Split Lock Washers
- ➔ 2 Front/Rear Frame Rails
- ➔ 2 Y Axis Assemblies



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Part 2 Mechanical Assembly

Step 1 - Assemble Main Frame 2/4

- ➔ Ensure Y1 Axis is on left
- ➔ Ensure Y2 Axis is on right
- ➔ Position Y Axes with lead screws to the OUTSIDE of the frame

Using 4x M5 x 20mm screws, Split Lock Washers, and Flat Washers at each corner, attach the Front and Rear Rails to the Y Axis end brackets.

NOTE - Do NOT tighten these screws yet.

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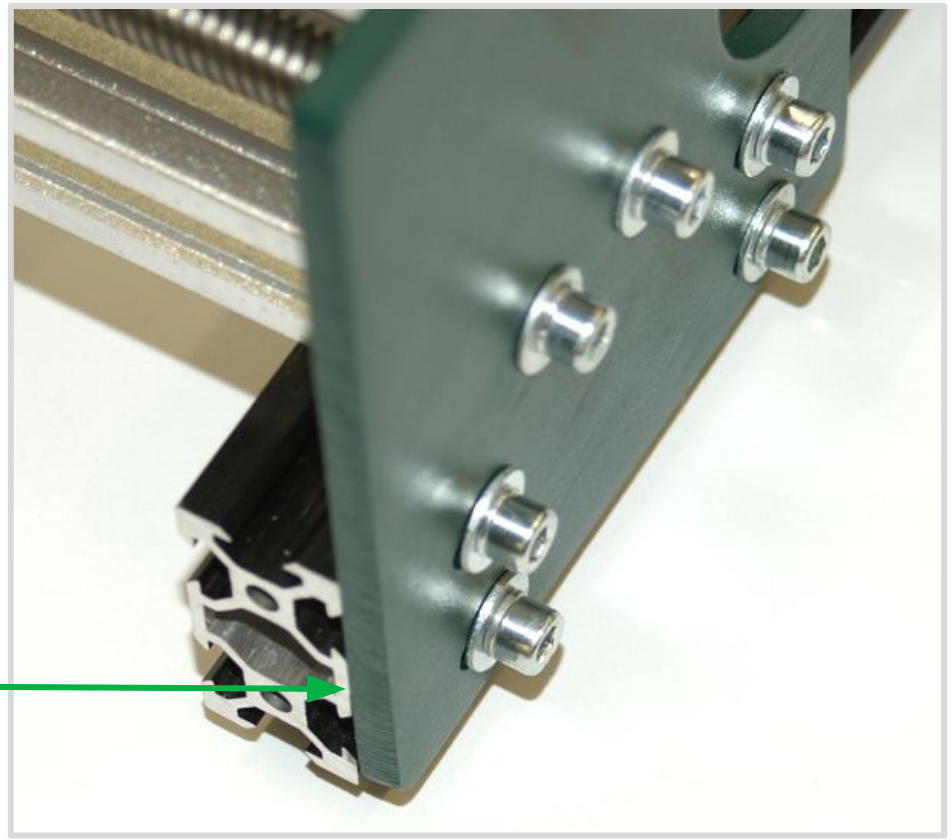
Part 2 Mechanical Assembly

Step 1 - Assemble Main Frame 3/4

- ➔ Ensure that the Front and Rear Rail ends are even with the outer edge of the Y Axis end brackets
- ➔ Tighten all 16 of the M5 x 20 screws



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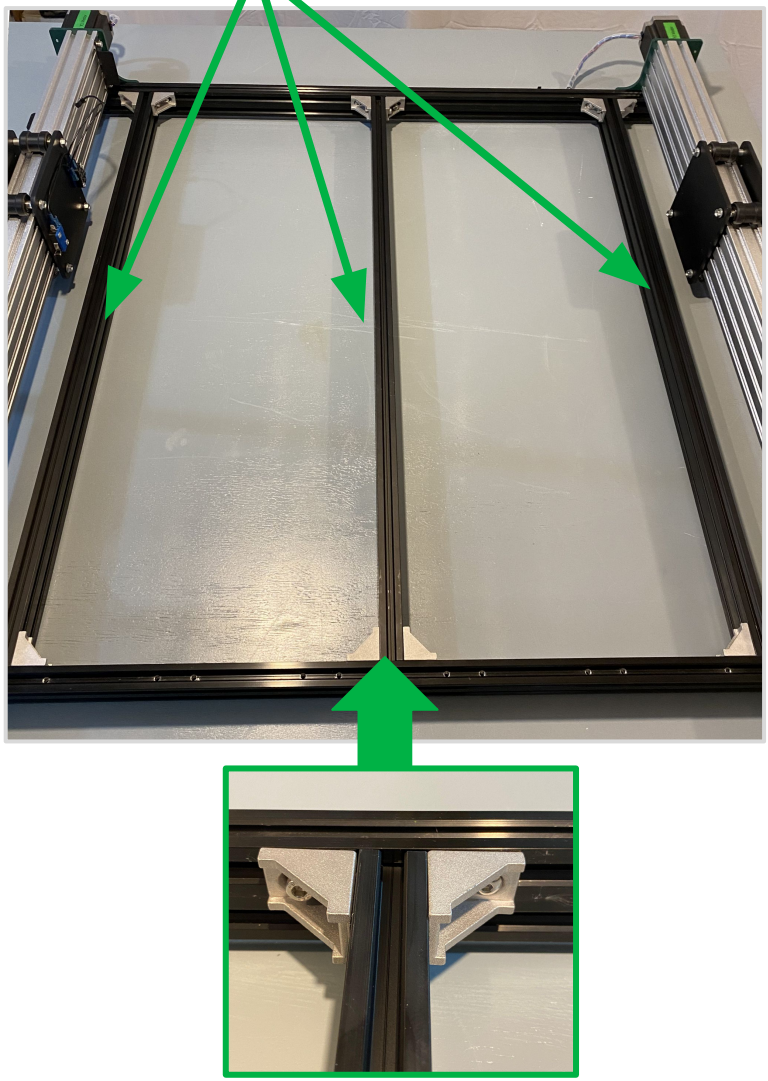
Part 2 Mechanical Assembly

Step 1 - Assemble Main Frame 4/4 (Spoil Board Supports)

- ➔ Place the 3x support rails inside the frame as shown in the picture
- ➔ Using: 24x M5*8mm screws, 24x T-Nuts and 12x corner brackets, install 2 corner brackets at each end of the braces.



NOTE:

- Center support is dead center of the frame
- Left and right supports are 1 ½ inches from the outer frame

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Part 2 Mechanical Assembly

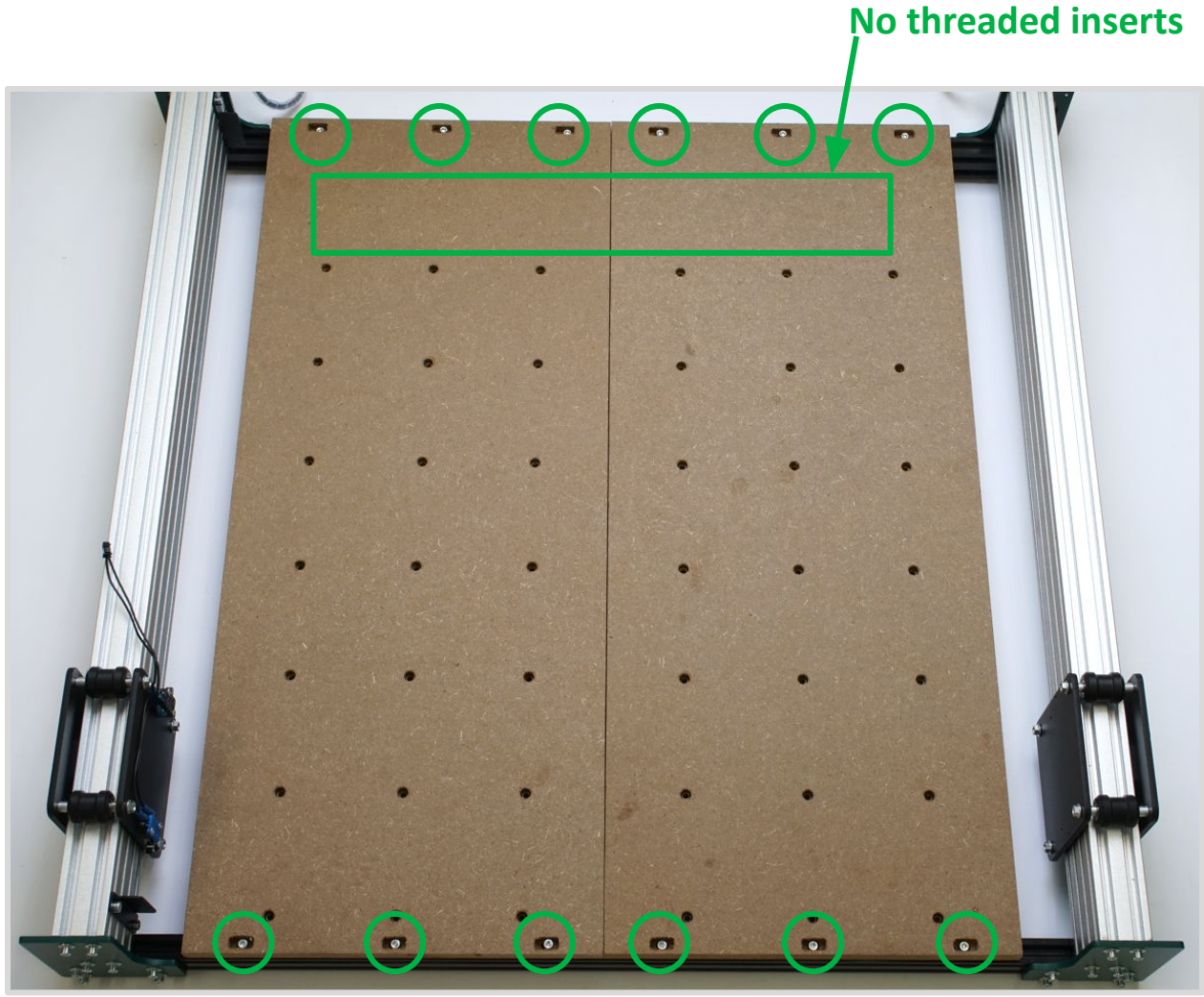
Step 2 - Assemble Spoil Board (60x60cm)

Parts Required:

- ➔ 12 M5 x 20mm Screws
- ➔ 2 Spoil Board Halves

Install Spoil Board, securing to Front and Rear rails.

NOTE - One end of the Spoil Board has NO threaded inserts; this end should be towards the REAR of the machine (closest to the Y Axis motors), as shown.



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Part 2 Mechanical Assembly (This section is only for SilverBack 1x1M Owners)

Step 2 - Assemble Spoil Board (1x1m)

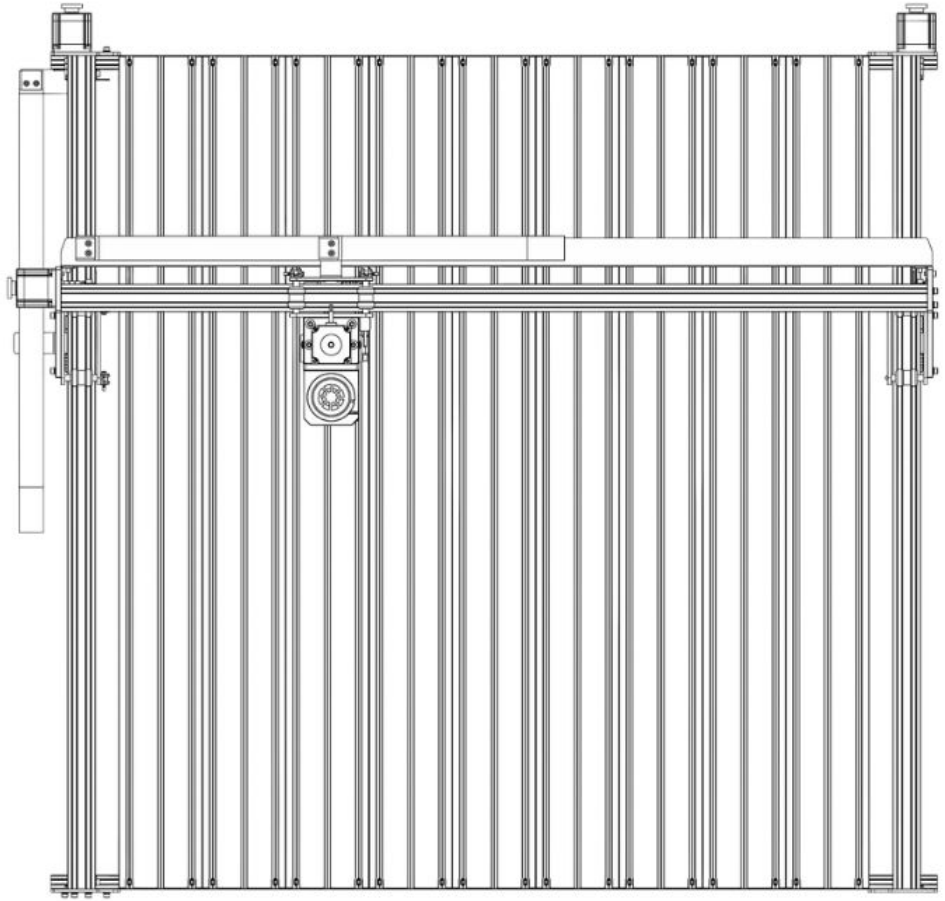
Parts Required:

- ➔ 9x Aluminum T-Slot Base
- ➔ 36x M5 x 16mm Screws

No MDF spoilboard or support rails for SilverBack 1x1M Owners. The 1x1m aluminum bed included in the package is strong enough to hold the material and prevent any flexing.

Just install the aluminum bed, securing front and rear with the screws.

Everything else (apart from longer 1x1m aluminum extrusions) is the same with the 6060.



[Link to the YoraHome SilverBack Benchtop CNC 1x1M|39x39” (For 1x1M Owners)]

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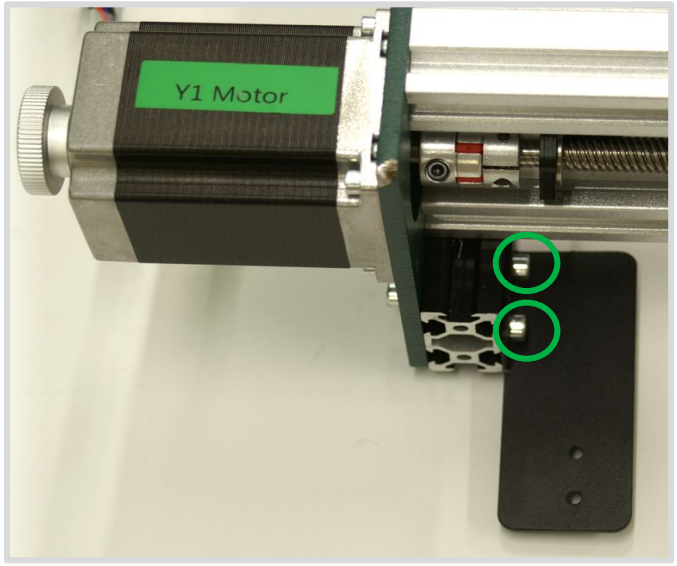
Part 2 Mechanical Assembly

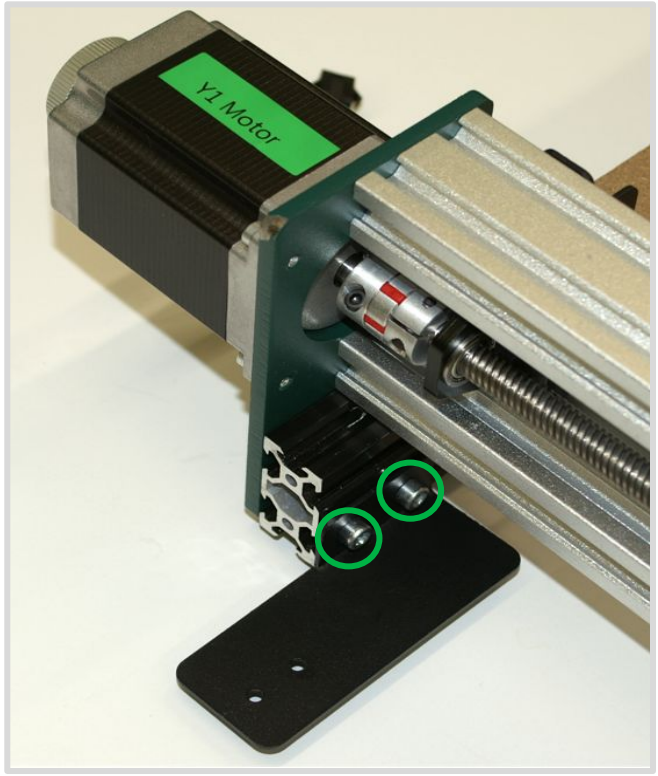
Step 3 - Install Drag Chain Bracket

Parts Required:

- ➔ 2 M5 x 6mm Screws
- ➔ 2 Square Nuts
- ➔ Large Drag Chain Bracket

Install the Large Drag Chain Bracket to the left end of the Rear Frame Rail, just in front of the Y1 motor, as shown.





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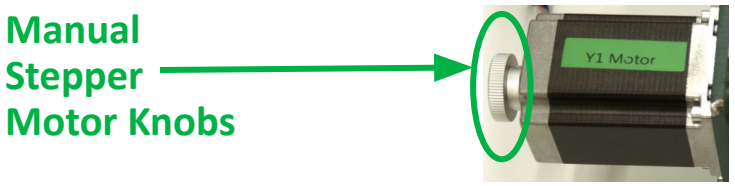
Part 2 Mechanical Assembly

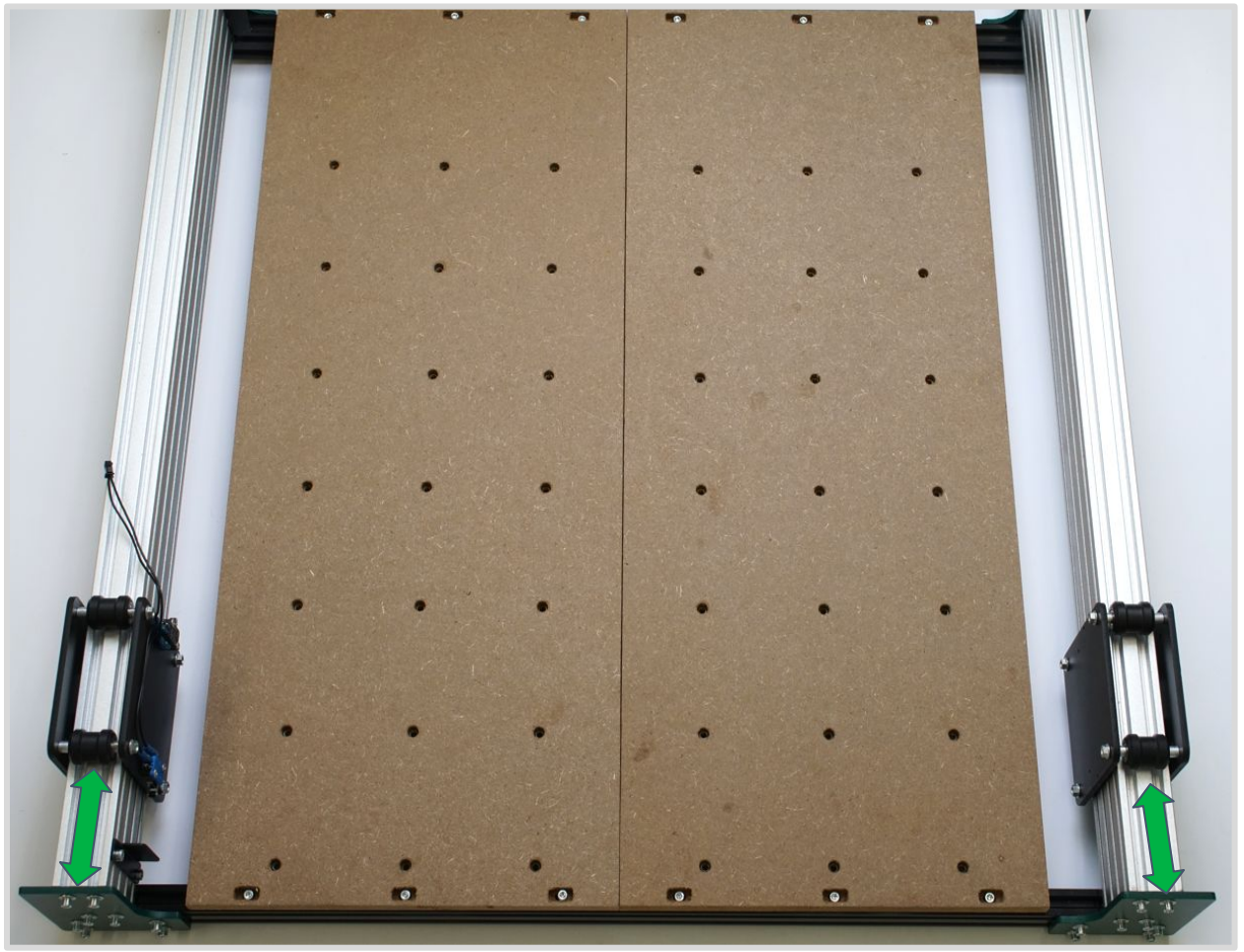
Step 4 - Align Y Axis Gantry Plates

No Parts Required.

Using the manual knobs on the end of the Y Axis Motors, move the Gantry Plates to the middle of the machine, as shown.

A specific measurement is not needed, but they do need to be the same distance.





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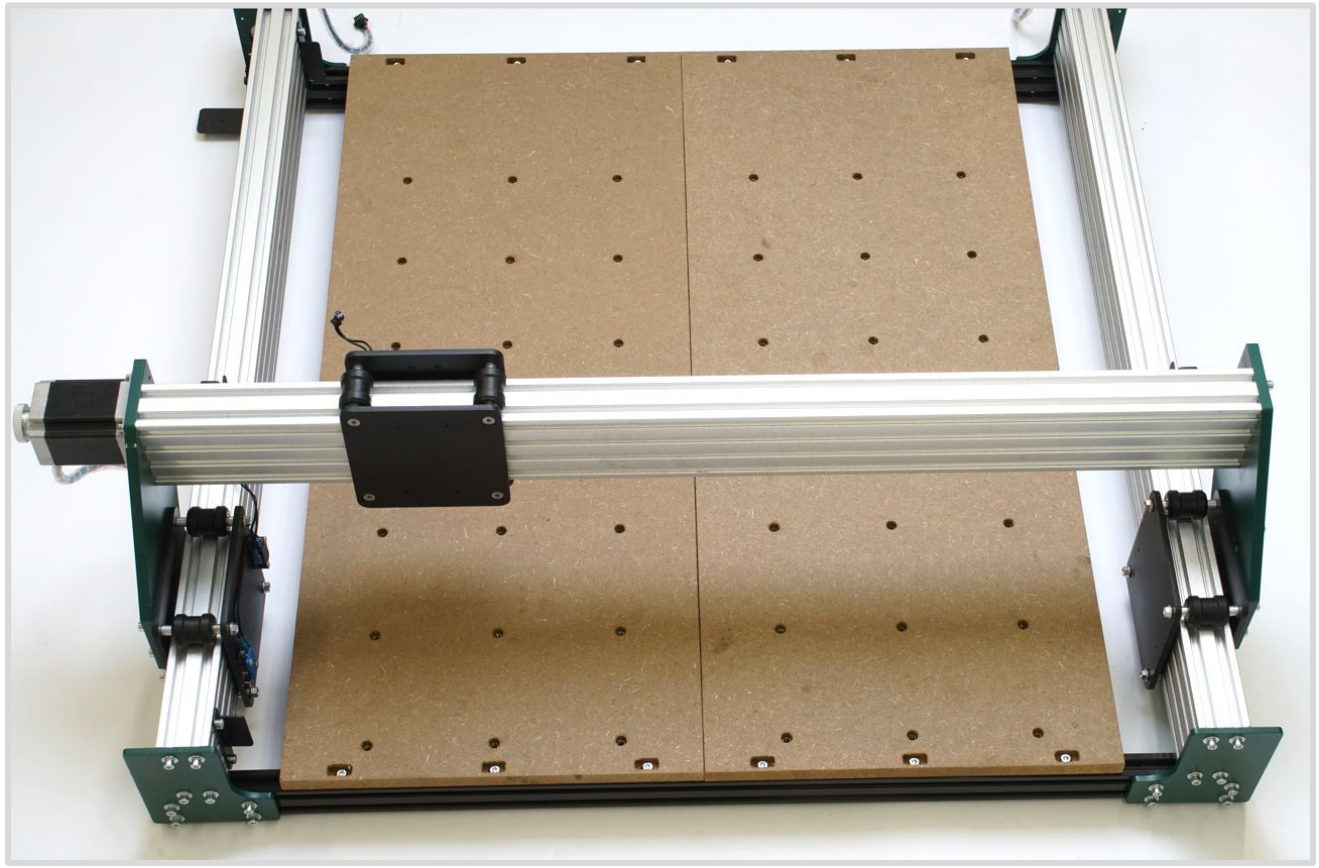
Part 2 Mechanical Assembly

Step 5 - Assemble X Axis to Frame 1/2

Parts Required:

- ➔ 8 M5 x 14mm Screws
- ➔ 8 M5 Flat Washers
- ➔ 8 M5 Split Lock Washers
- ➔ X Axis Assembly



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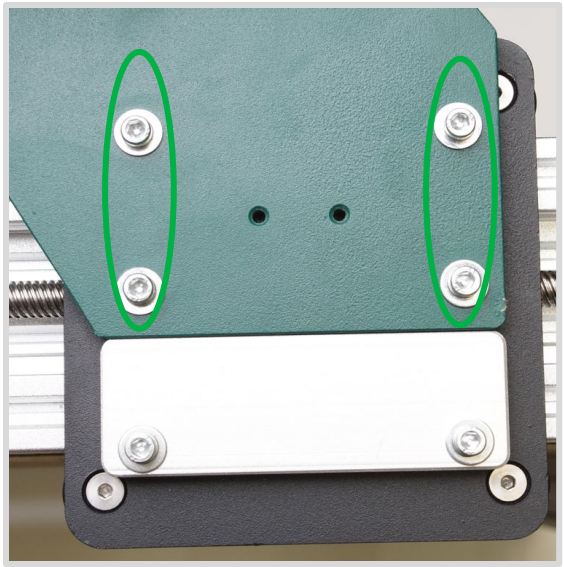
Part 2 Mechanical Assembly

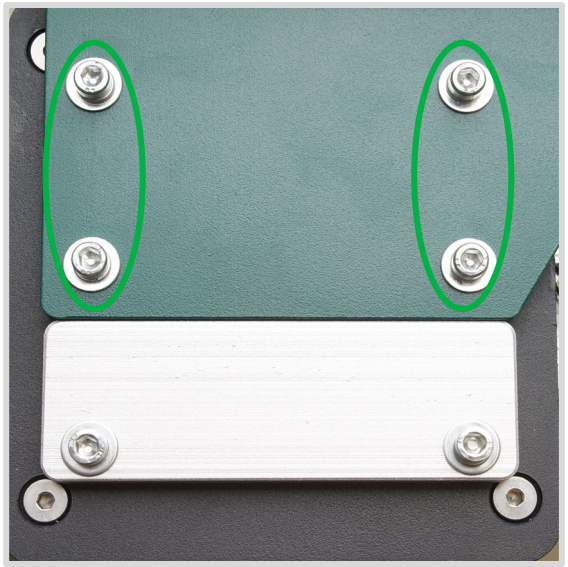
Step 5 - Assemble X Axis to Frame 2/2

- ➔ Ensure X Axis Motor is on left
- ➔ Position X Axis with lead screw to the REAR of the frame

Using 4x M5 x 14mm screws, Split Lock Washers, and Flat Washers at each end, attach the X Axis Assembly to the Y Axis gantry plates

NOTE - If any additional movement of the Y Axis is needed after this Step, ensure that BOTH Y Axis Motors are adjusted simultaneously.





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Part 2 Mechanical Assembly

Step 6 - Attach Y Axis Drag Chain Bracket

Parts Required:

- ➔ 2 M4 x 8mm Screws
- ➔ 1 Small Drag Chain Bracket

Attach the Small Drag Chain Bracket to the left side X Axis plate, as shown.

Ensure the “platform” of the bracket is on top.

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Part 2 Mechanical Assembly

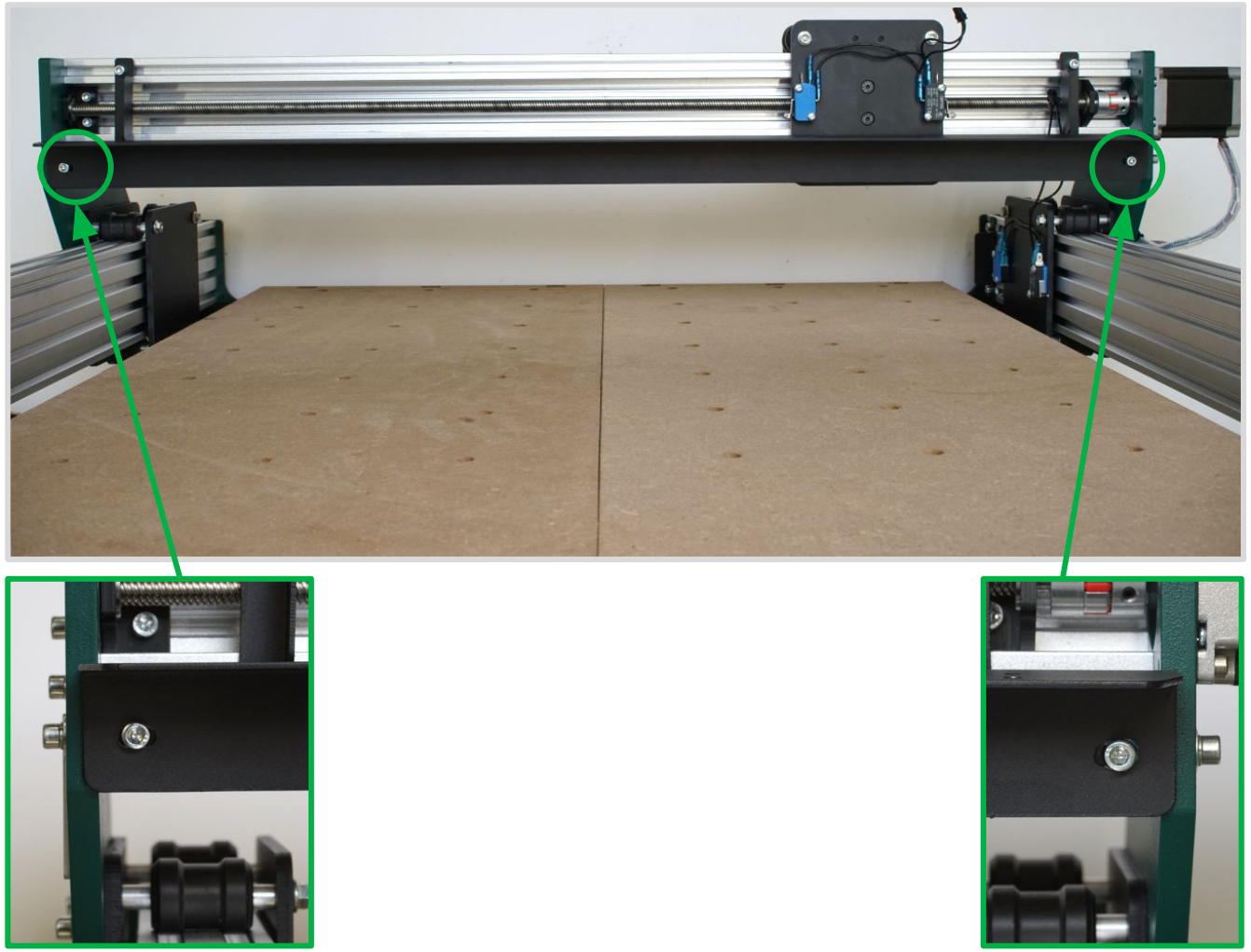
Step 7 - Attach X Axis Drag Chain Support Rail

Parts Required:

- ➔ 2 M5 x 6mm Screws
- ➔ Drag Chain Support Rail

Attach the Drag Chain Support Rail to the rear of the X Axis Assembly, as shown.

Ensure the “platform” of the Support Rail is on top.



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Part 2 Mechanical Assembly

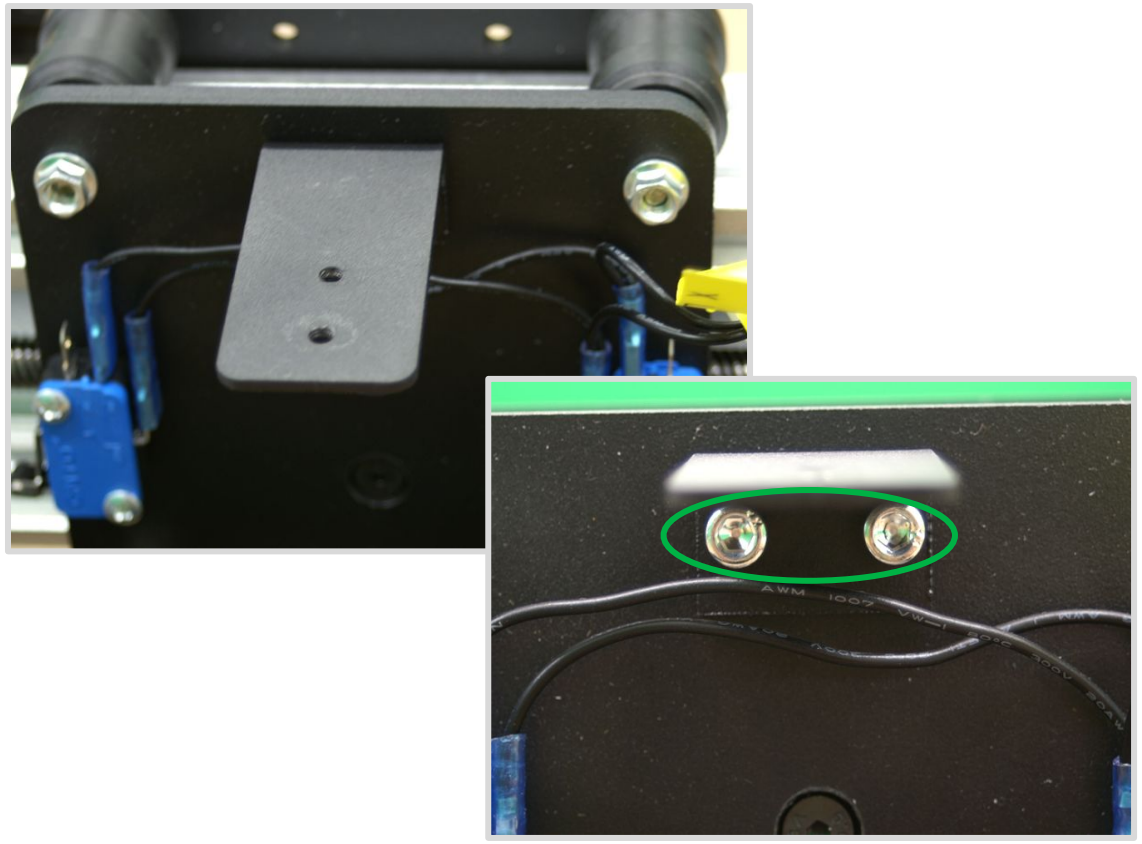
Step 8 - Attach X Axis Drag Chain Bracket

Parts Required:

- ➔ 2 M5 x 6mm Screws
- ➔ 1 Small Drag Chain Bracket

Attach the Small Drag Chain Bracket to the rear of the X Axis gantry, as shown. Use caution, so the limit switch wiring does not get caught between the Drag Chain Bracket and X Axis gantry plate.

Ensure the “platform” of the bracket is on top.



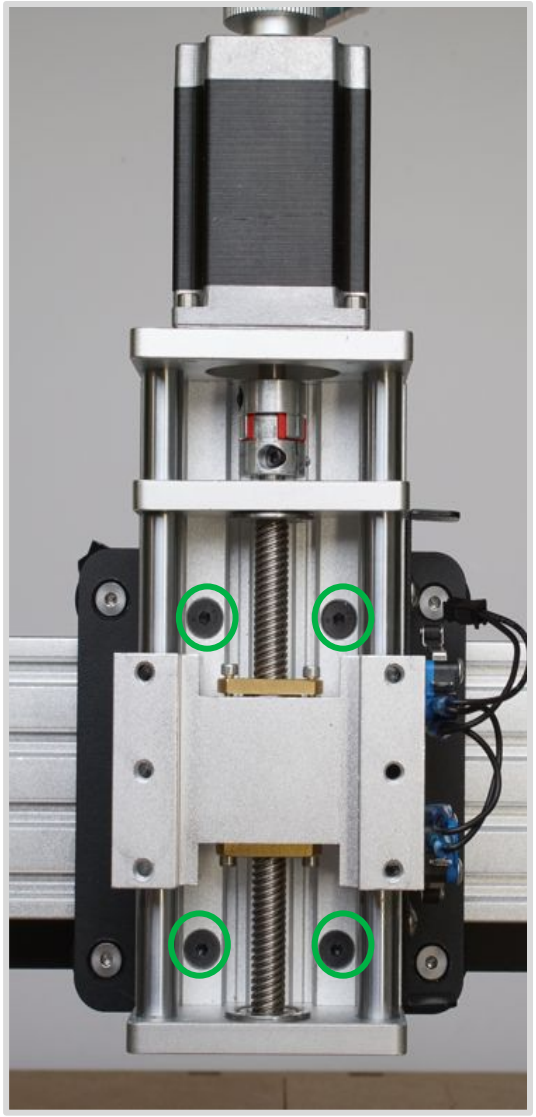
Part 2 Mechanical Assembly

Step 9 - Attach Z Axis Assembly

Parts Required:

- ➔ 4 Countersunk M5 x 25mm Screws
- ➔ Z Axis Assembly

Attach the Z Axis Assembly to the front of the X Axis gantry, as shown. It may be necessary to adjust the position of the Z Axis to access the screws.



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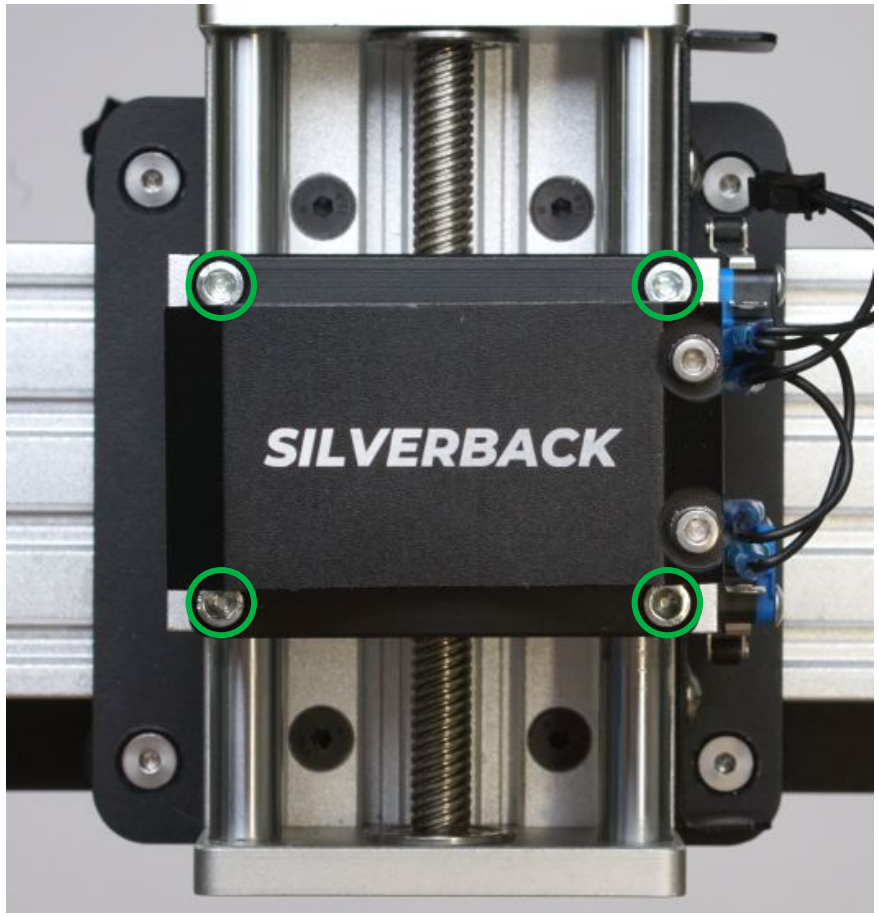
Part 2 Mechanical Assembly

Step 10 - Attach Spindle Holder

Parts Required:

- 4 M5 x 14mm Screws
- Spindle Holder

Attach the Spindle Holder to the front of the Z Axis assembly, as shown.



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Part 2 Mechanical Assembly

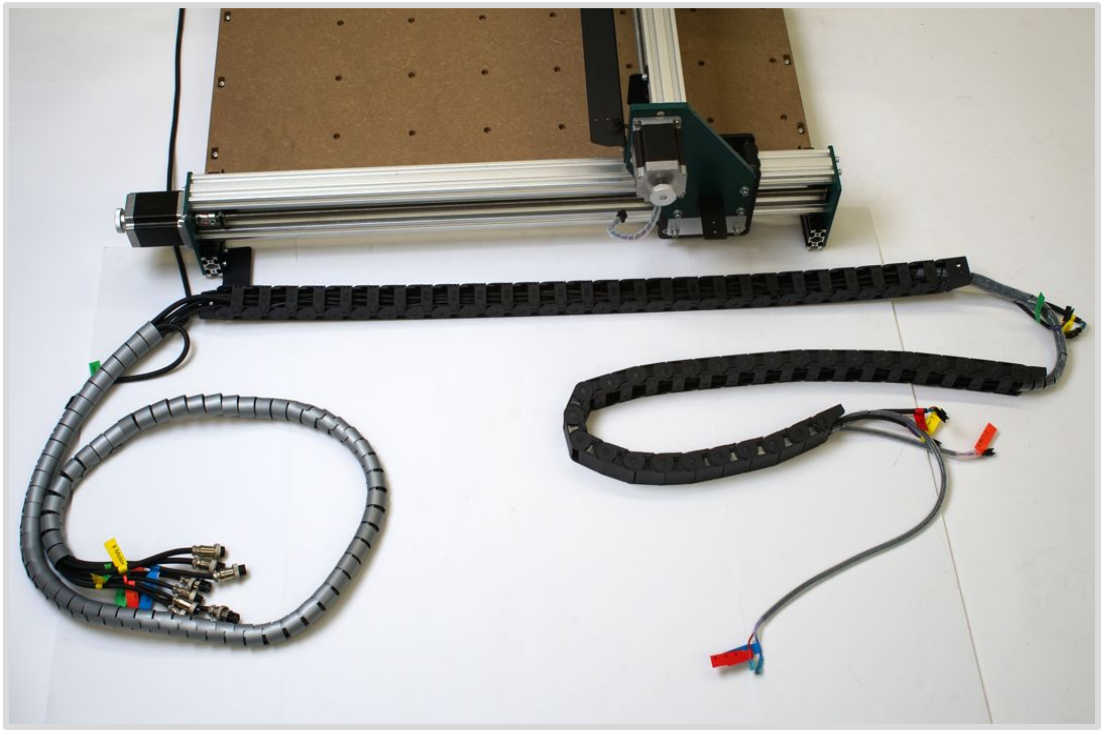
Step 11 - Install Drag Chain/Wire Harness 1/6

Parts Required:

- 8 Countersunk M4 x 6mm Screws
- Drag Chain/Wire Harness Assembly

Lay out the Drag Chain/Wire Harness Assembly on the left side of the machine, as shown.

The grey sheathed segment goes to the rear of the machine.



Part 2 Mechanical Assembly

Step 11 - Install Drag Chain/Wire Harness 2/6

Using 2 of the Countersunk M4 x 6mm Screws, attach the end of the Drag Chain to the Large Drag Chain Bracket at left rear of the machine.

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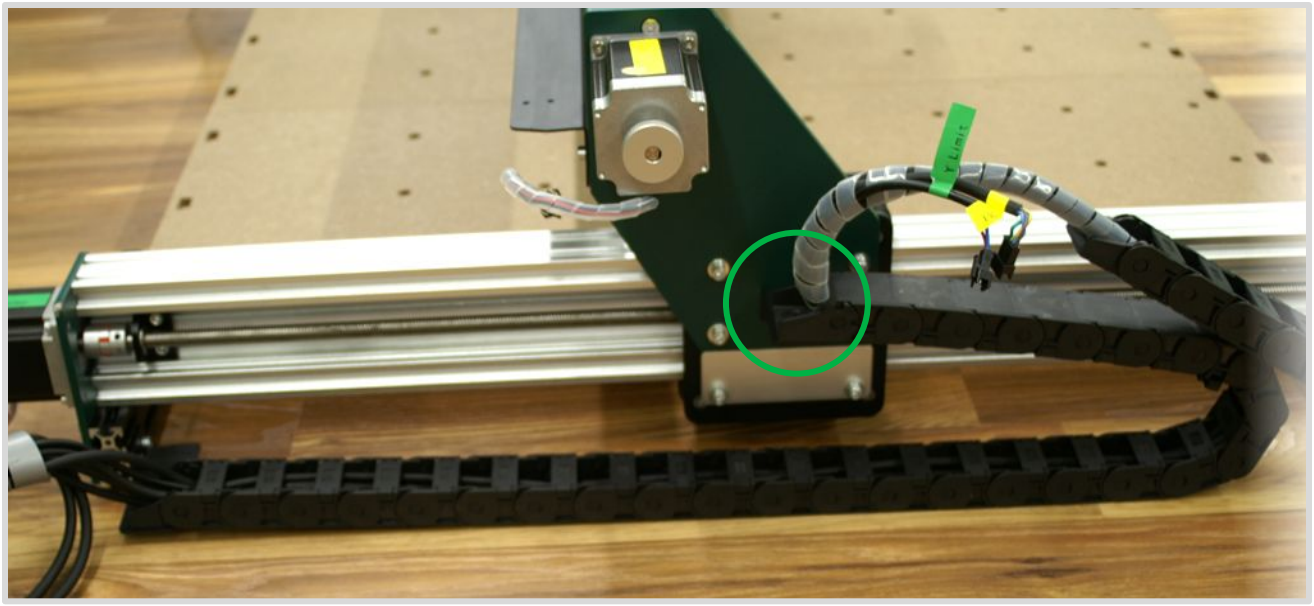
Part 2 Mechanical Assembly

Step 11 - Install Drag Chain/Wire Harness 3/6

Fold the Y Axis Drag Chain towards the rear of the machine as shown.

Using 2 of the Countersunk M4 x 6mm Screws, attach the end of the Drag Chain to the Small Drag Chain Bracket at left side of the X Axis Assembly

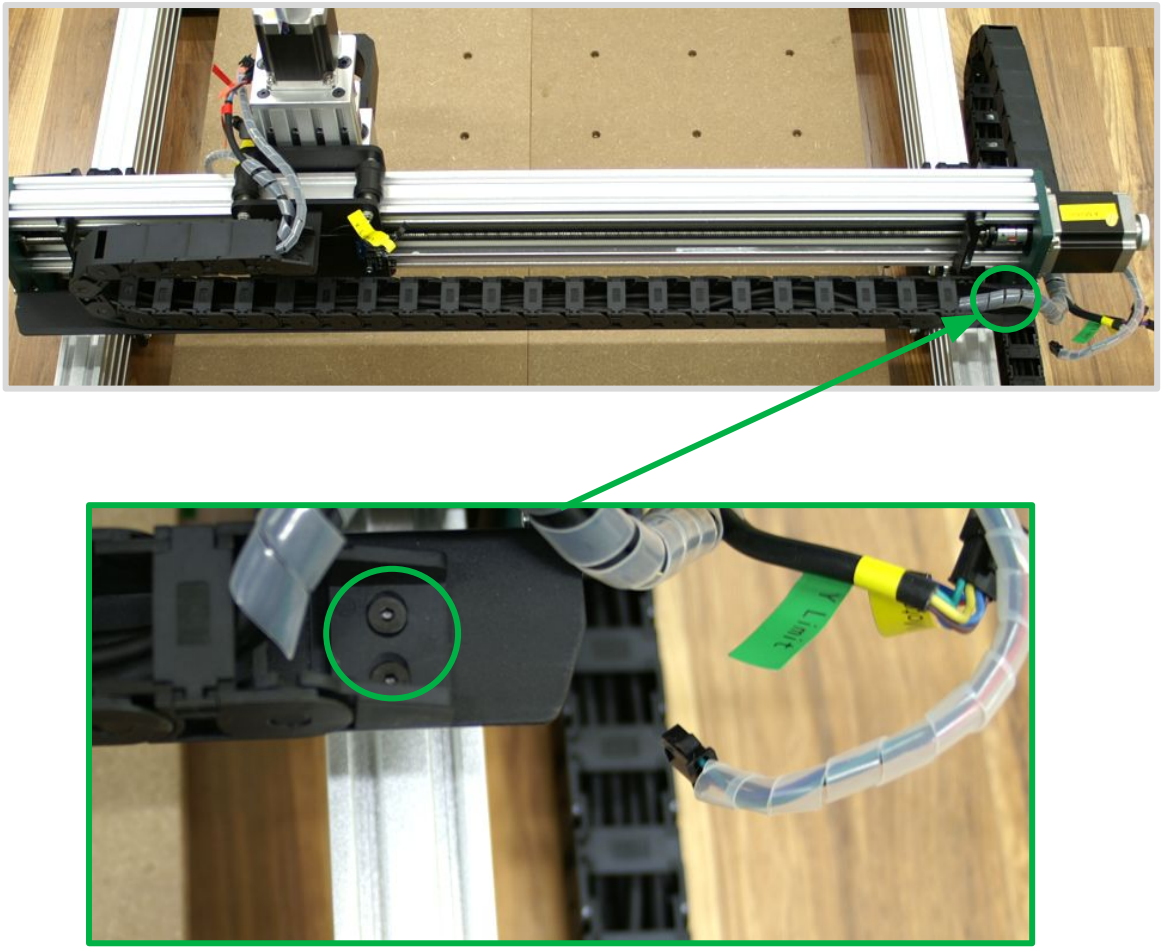


Part 2 Mechanical Assembly

Step 11 - Install Drag Chain/Wire Harness 4/6

Carefully move the X Axis Drag Chain segment to the rear side of the X Axis Assembly, and lay it on the Drag Chain Support Rail.

Using 2 of the Countersunk M4 x 6mm Screws, attach the end of the Drag Chain to the Drag Chain Support Rail at left side of the X Axis Assembly



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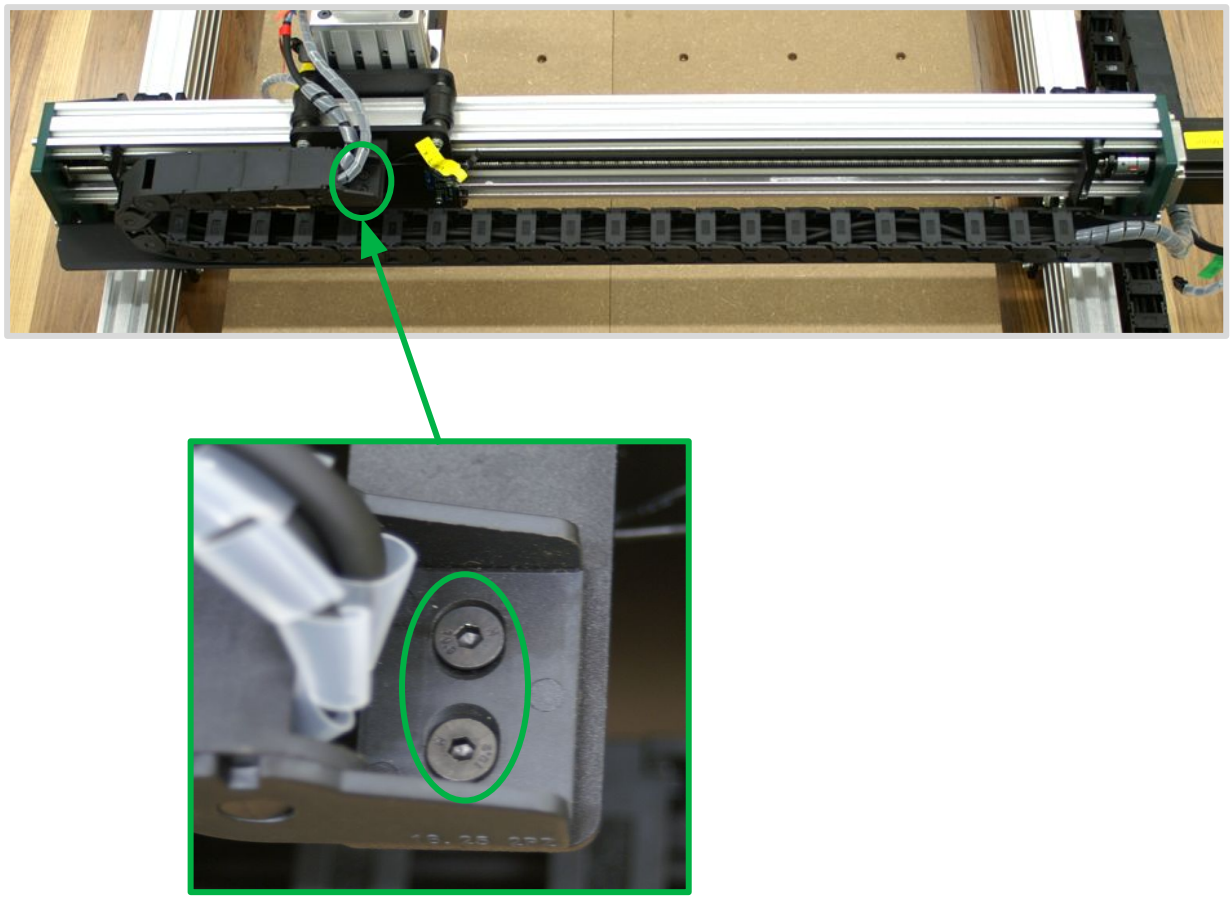
Part 2 Mechanical Assembly

Step 11 - Install Drag Chain/Wire Harness 5/6

Fold the X Axis Drag Chain towards the Z Axis Assembly as shown.

Using 2 of the Countersunk M4 x 6mm Screws, attach the end of the Drag Chain to the Small Drag Chain Bracket at rear gantry plate of the X Axis Assembly.



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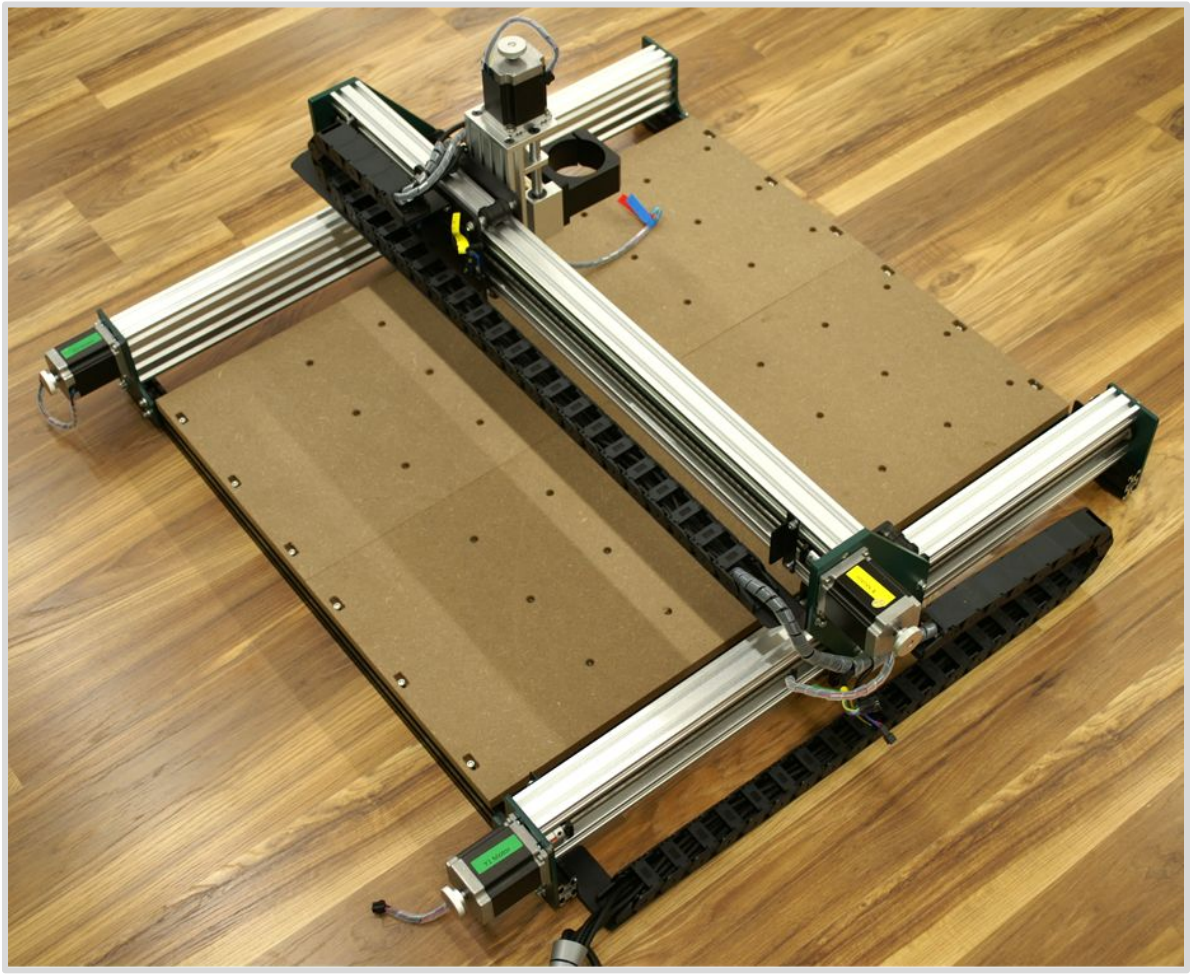
Part 2 Mechanical Assembly

Step 11 - Install Drag Chain/Wire Harness 6/6

Your machine should appear as shown.

All wiring connections are labeled; connections are as shown on the following pages.



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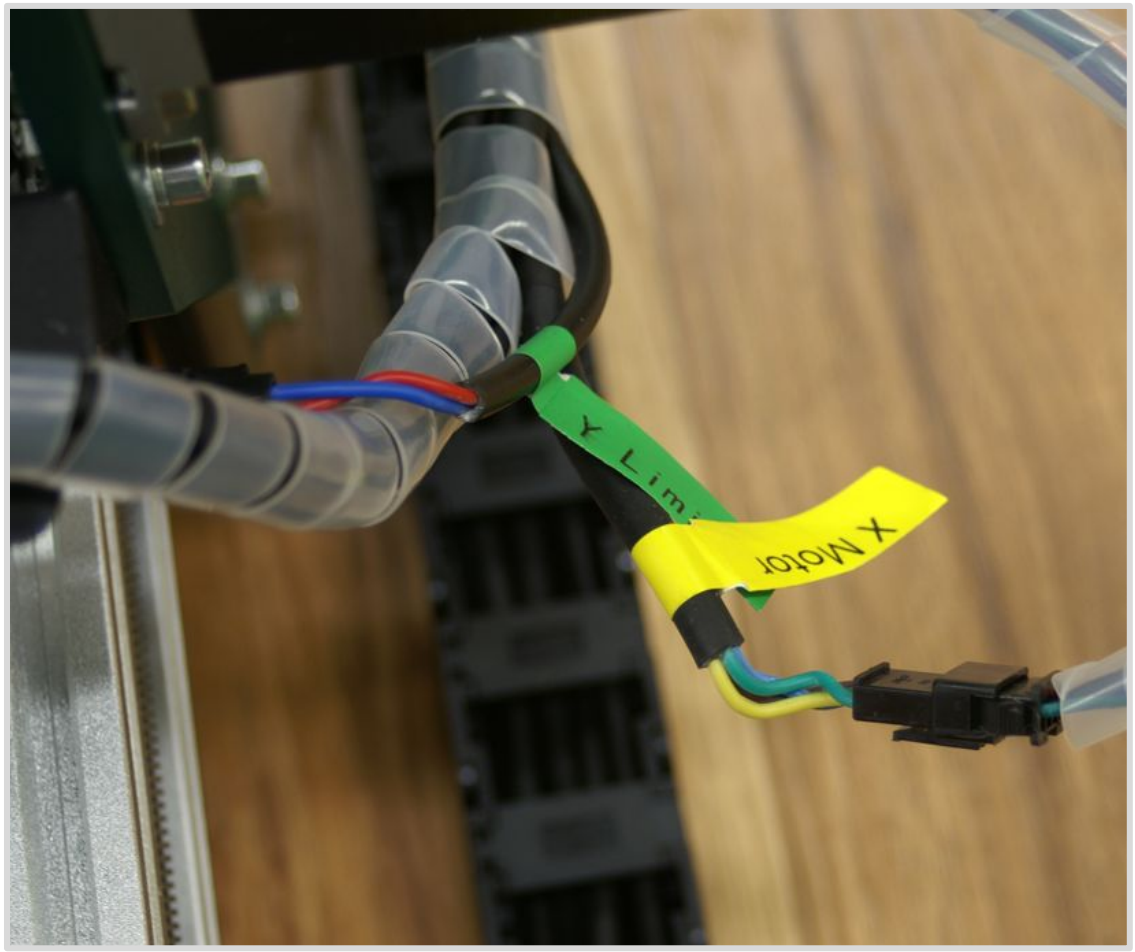
Part 2 Mechanical Assembly

Step 12 - Install Wiring Connections 1/5

Left end of X Axis Assembly:
- X Motor
- Y Limit

NOTE - Ensure Y Limit wiring is clear of rollers on Y Axis



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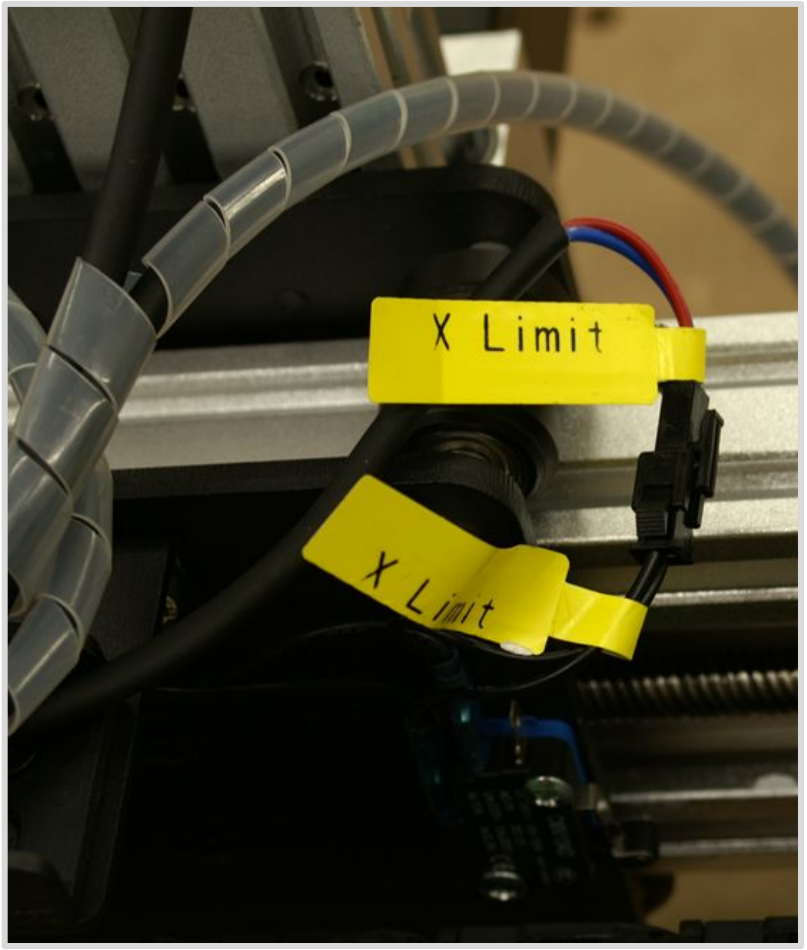
Part 2 Mechanical Assembly

Step 12 - Install Wiring Connections 2/5

Rear of X Axis Assembly:

- X Limit



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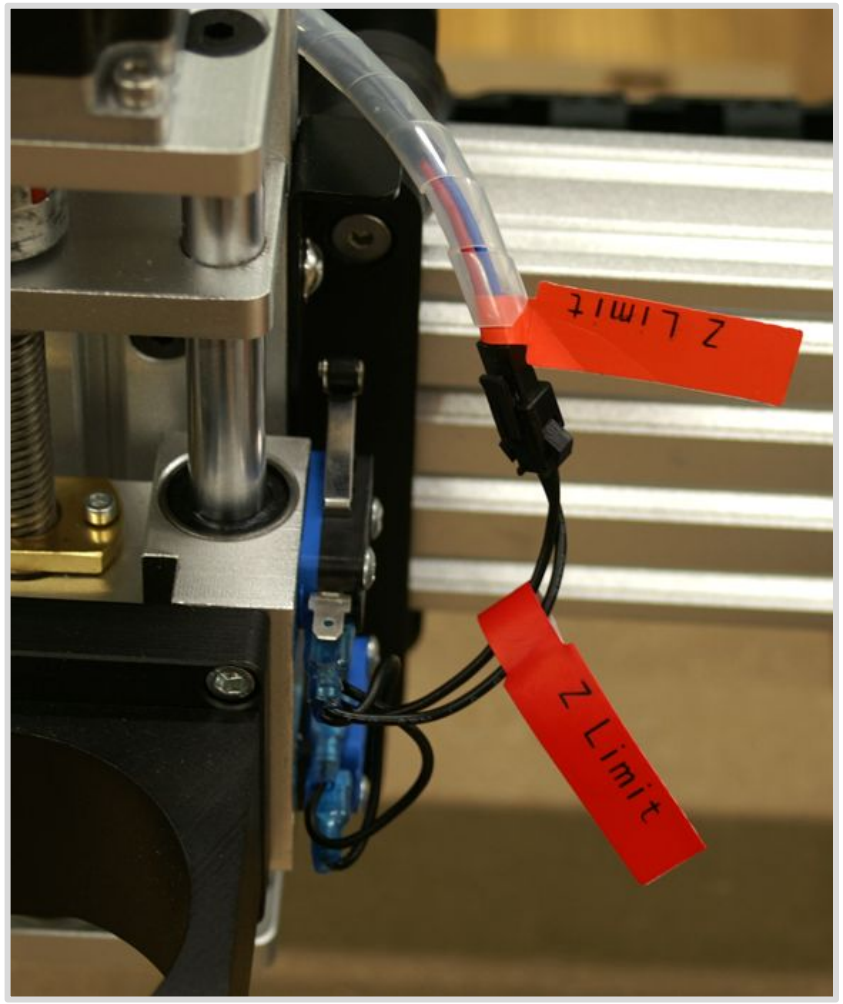
Part 2 Mechanical Assembly

Step 12 - Install Wiring Connections 3/5

Front of Z Axis Assembly:

- Z Limit
- Z Motor (connection not shown)

NOTE - Ensure all wiring is clear of rollers on X Axis



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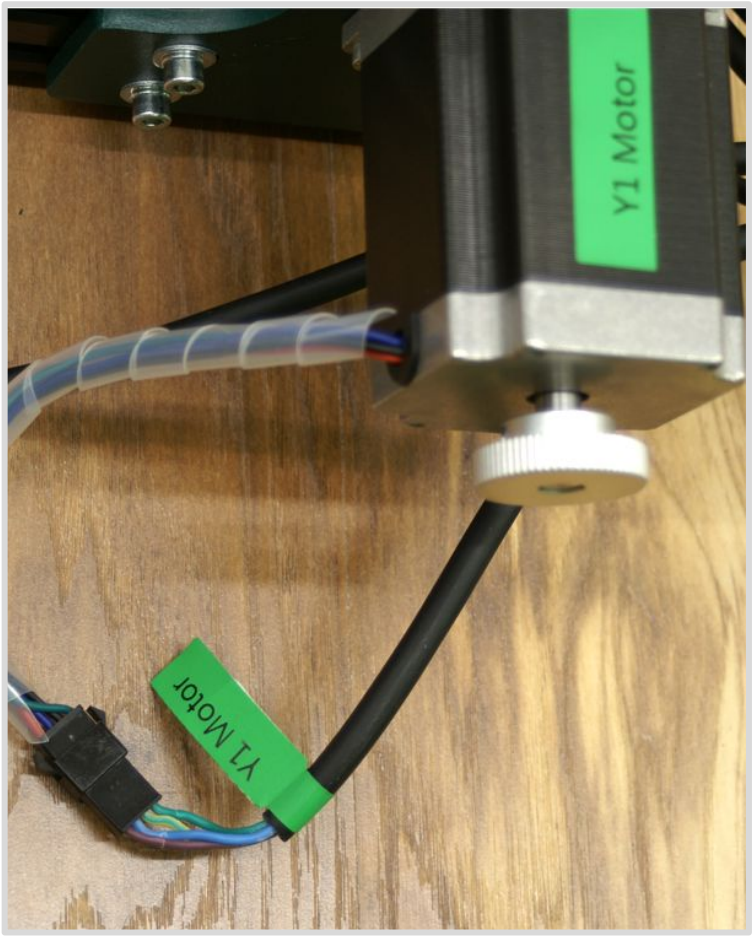
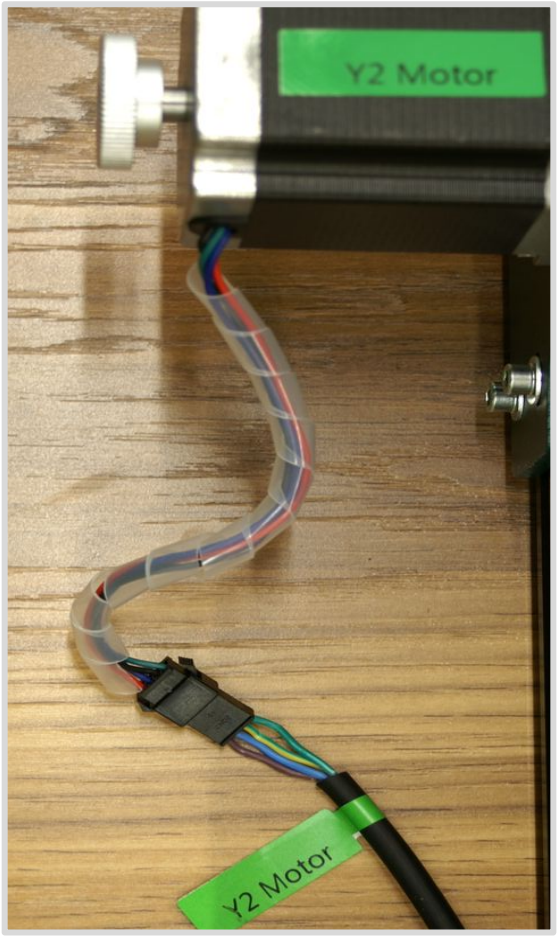
Part 2 Mechanical Assembly

Step 12 - Install Wiring Connections 4/5

Rear of machine:

- Y1 Motor (left side)
- Y2 Motor (right side)





YoraHome

Part 2 Mechanical Assembly

Step 12 - Install Wiring Connections 5/5

Rear of controller:
- Axis Motors
- Spindle
- Limit Switches

All connections are indexed for proper insertion.

Ensure the Laser/Spindle switch is in the “Spindle” position.

Plug in power cord and turn power switch on.

YoraHome

Part 2 Mechanical Assembly

Step 13 - Install Nameplate

The included nameplate can be personalized by you - making sure everyone knows this is YOUR machine.

The nameplate can be attached to the X Axis end plate by removing the protective paper from the adhesive backing.

NOTE - If you would like to use the SilverBack to engrave this nameplate, do not adhere it to the machine at this time.

Part 2 Mechanical Assembly

Step 14 - Accessory Installation

The SilverBack holder can accommodate 3 accessories:

1. Yora 400W Spindle with ER11 chuck (included with the SilverBack)
2. Yora Makita RT0701C Router (available separately): https://yorahome.com/products/yora-makita-1-25hp-router
3. Yora Diode Laser Modules (available separately): https://yorahome.com/products/yora-laser-module

YoraHome

Part 2 Mechanical Assembly

Step 14 - Accessory Installation (Yora 400W Spindle Motor)

Parts Required
- ➔ Spindle Motor
- ➔ Spindle Motor Sleeve

Insert Spindle Motor Sleeve into the Spindle Mount.
Insert Spindle Motor into Spindle Motor Sleeve.

Tighten Spindle Mount clamping screws to hold Spindle Motor firmly in place.
NOTE: Alternating between the two screws about one half turn at a time is best so you don't over tighten or strip the threads.

Connect wiring harness to color-coded terminals.

YoraHome

Part 2 Mechanical Assembly

Step 14 - Accessory Installation (Yora Makita Router)

Part Required

➔ Makita Router Motor

Remove any Adapter Sleeves from the Spindle Mount.
Insert Makita Router Motor into Spindle Mount.

Tighten Spindle Mount clamping screws to hold Makita Router Motor firmly in place.
NOTE: Alternating between the two screws about one half turn at a time is best so you don't over tighten or strip the threads.

Route power cord safely to prevent damage from moving parts.

YoraHome

Part 2 Mechanical Assembly

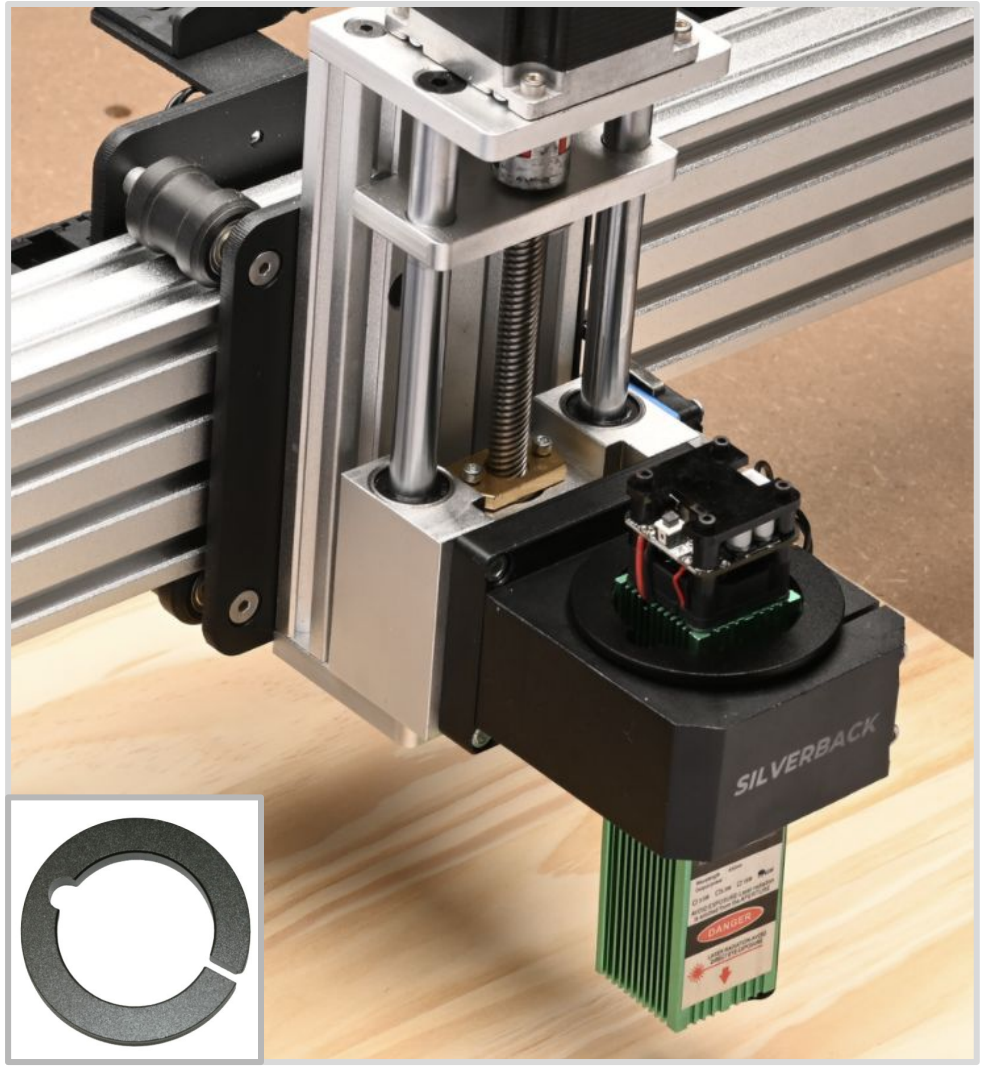
Step 14 - Accessory Installation (Yora Laser Module)

Parts Required
- Laser Module
- Laser Adapter Sleeve
- Laser Module Cable (included with Laser Module)

Insert Laser Adapter Sleeve into the Spindle Mount.

Insert Laser Module into Laser Adapter Sleeve.

Tighten Spindle Mount clamping screws to hold Laser Module firmly in place.
NOTE: Alternating between the two screws about one half turn at a time is best so you don't over tighten or strip the threads.



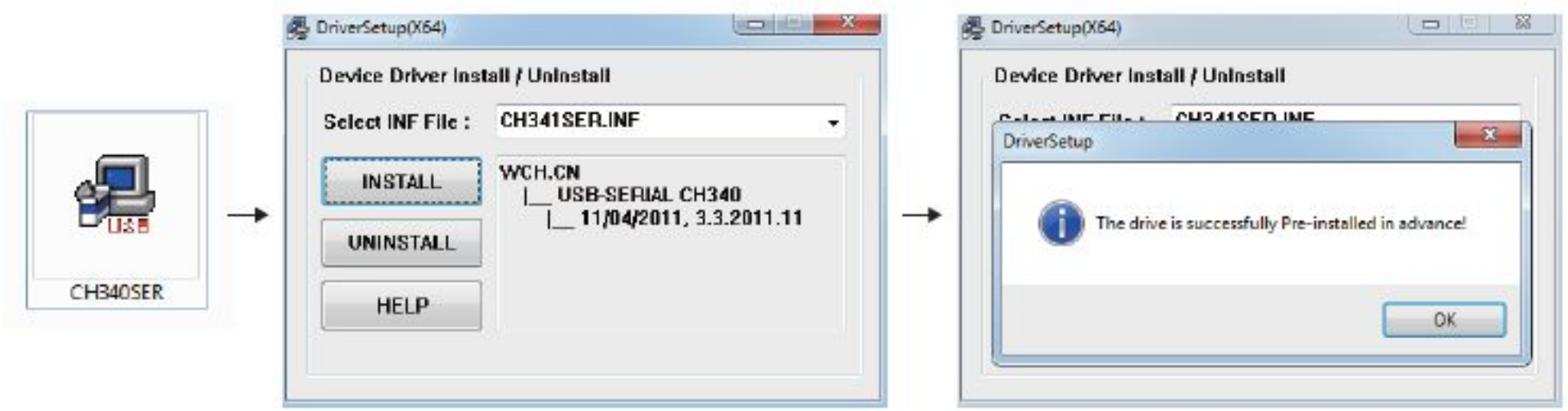
YoraHome

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.

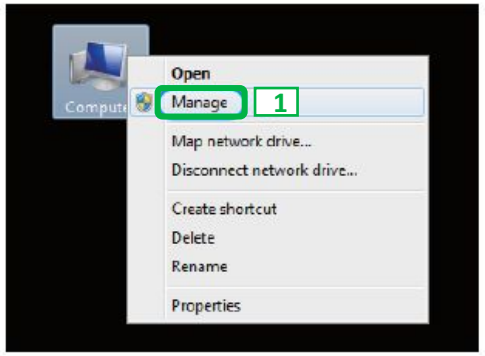


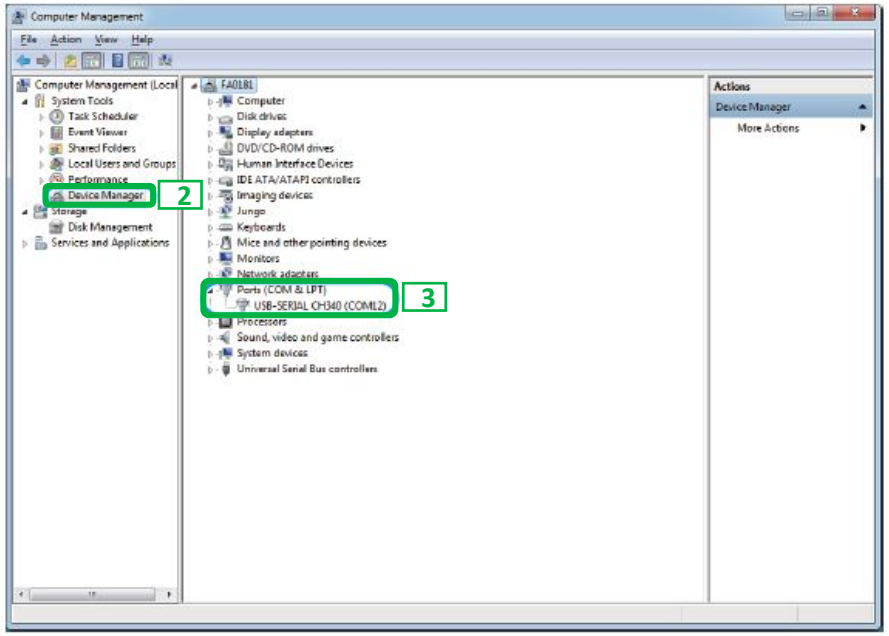
YoraHome

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.

YoraHome

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 SilverBack 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 and click on the blue **Sign in through Inventables** button.

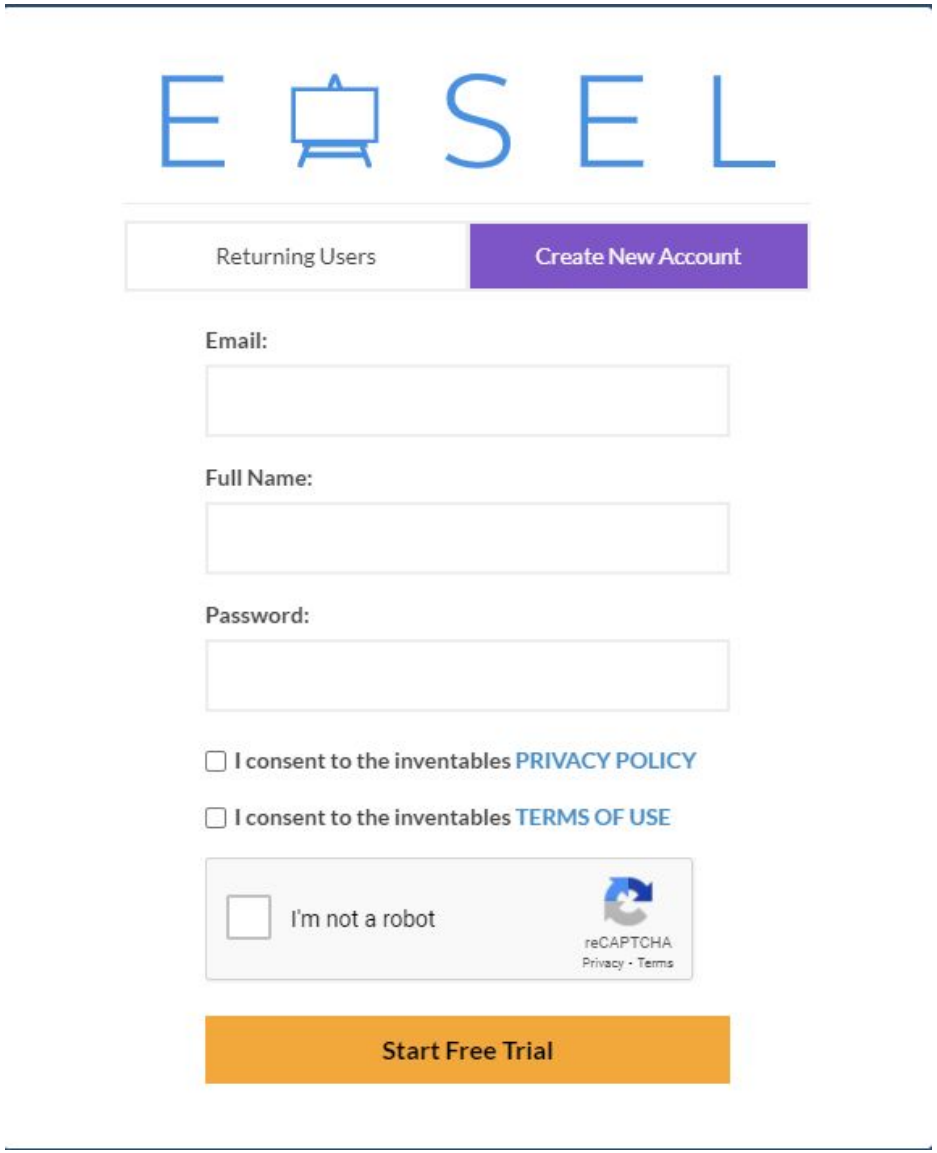
YoraHome

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.

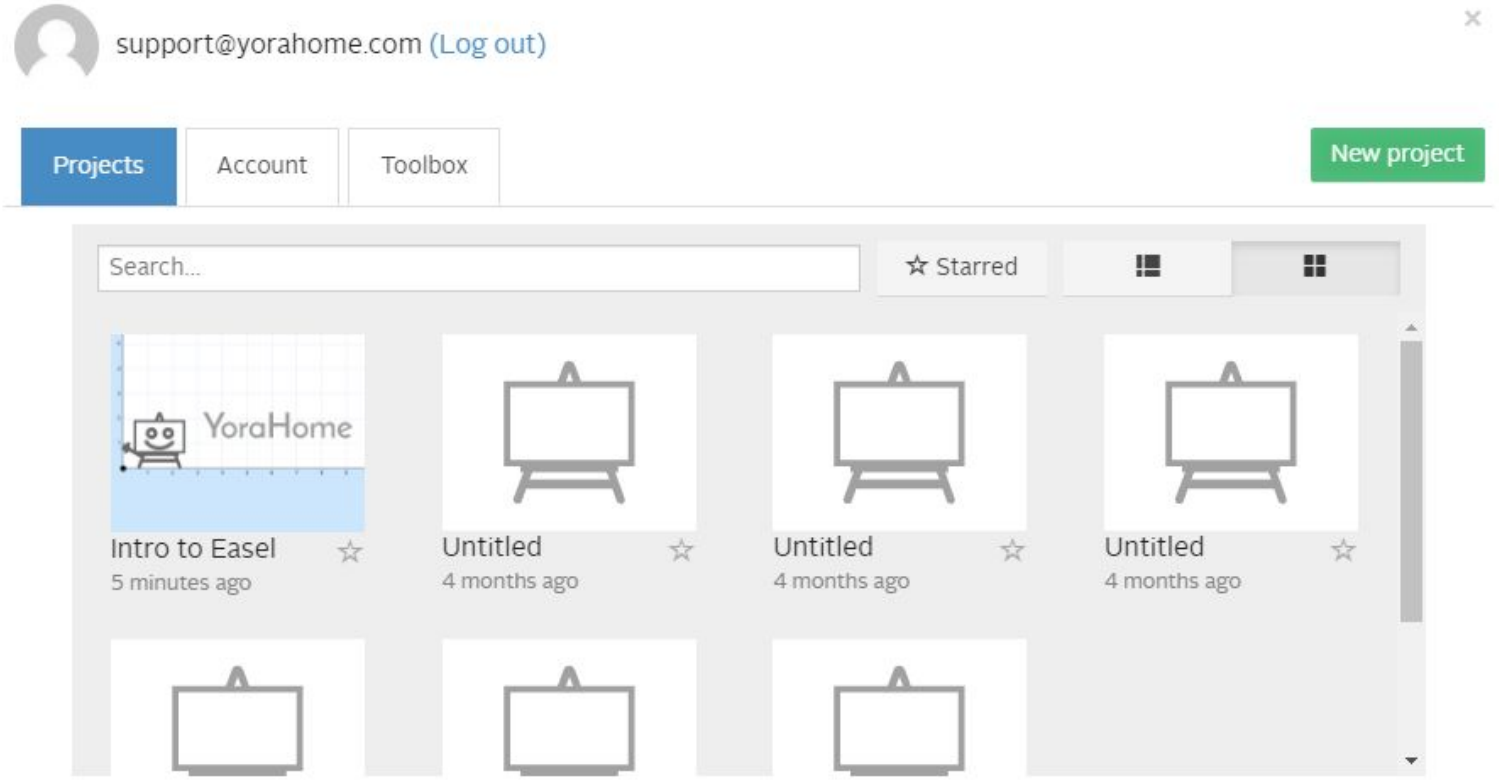


YoraHome

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”)

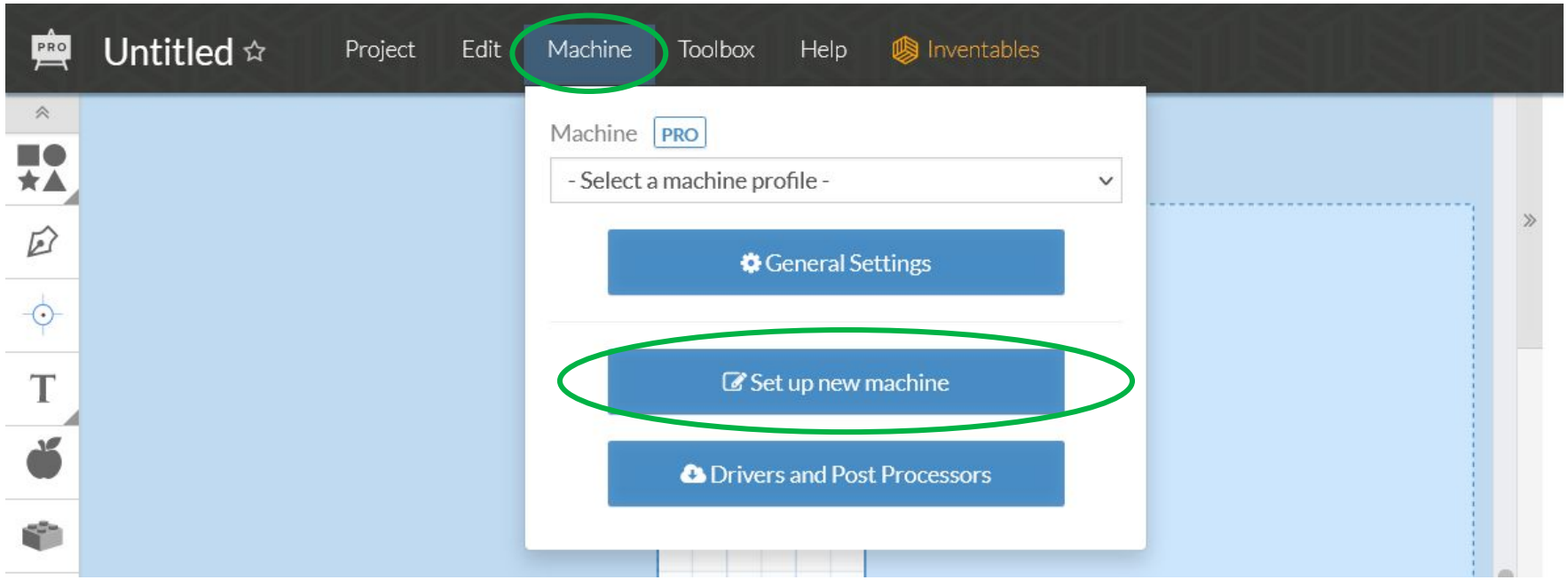


YoraHome

Part 4 Machine Setup

Step 2 - Set up New Machine

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

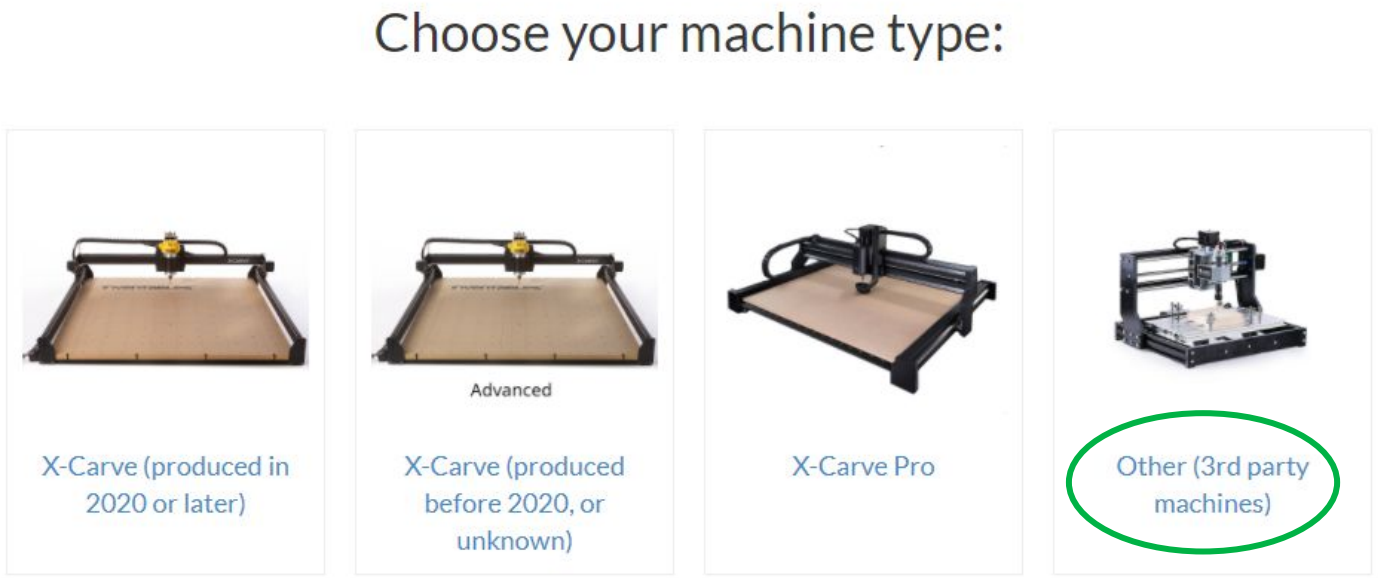


YoraHome

Part 4 Machine Setup

Step 3 - Choose your machine

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



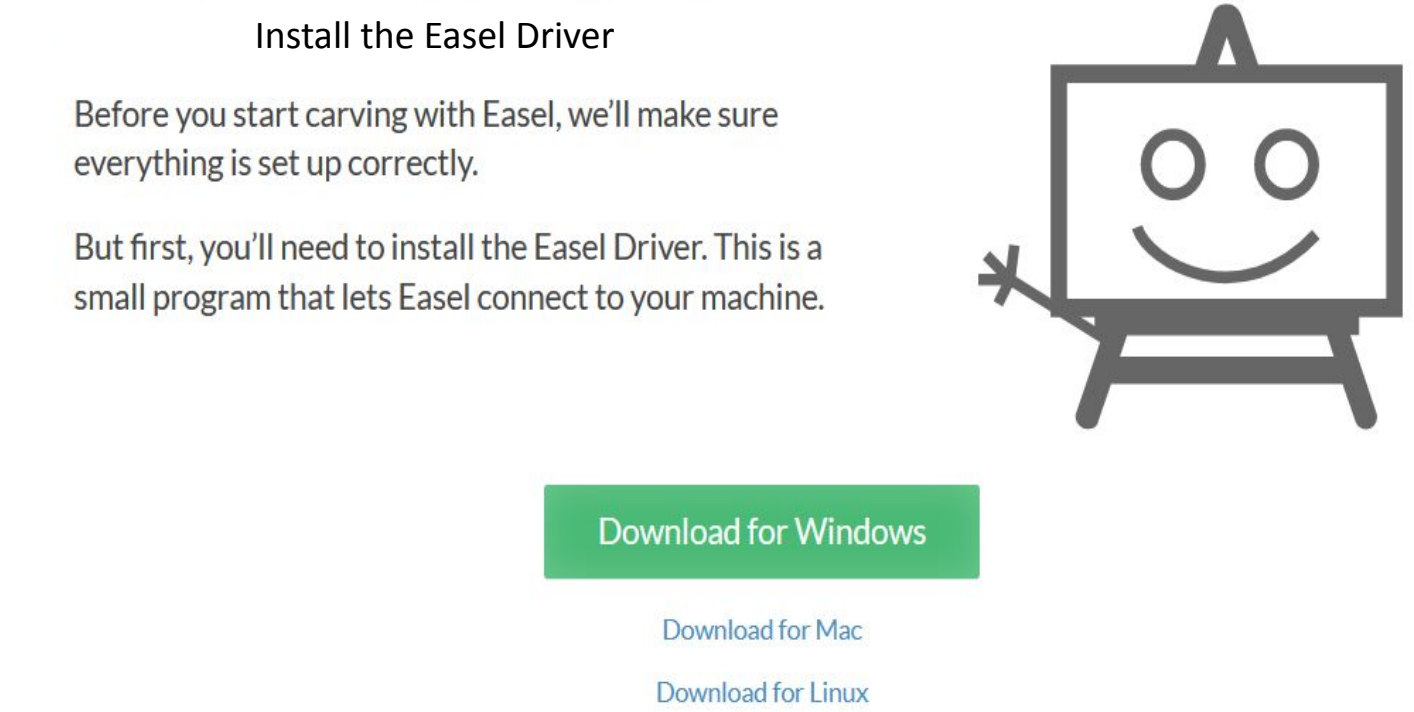
YoraHome

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

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.



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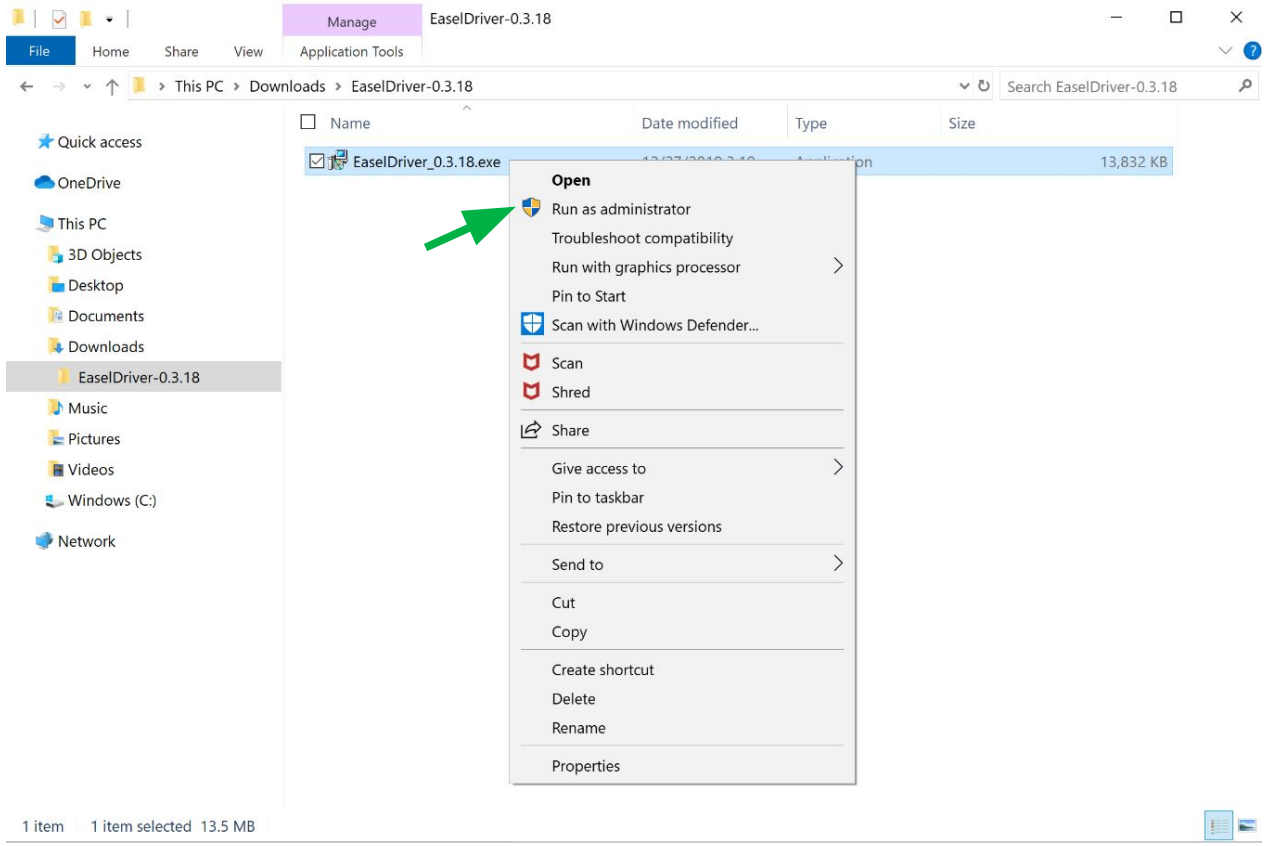
Part 4 Machine Setup

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.

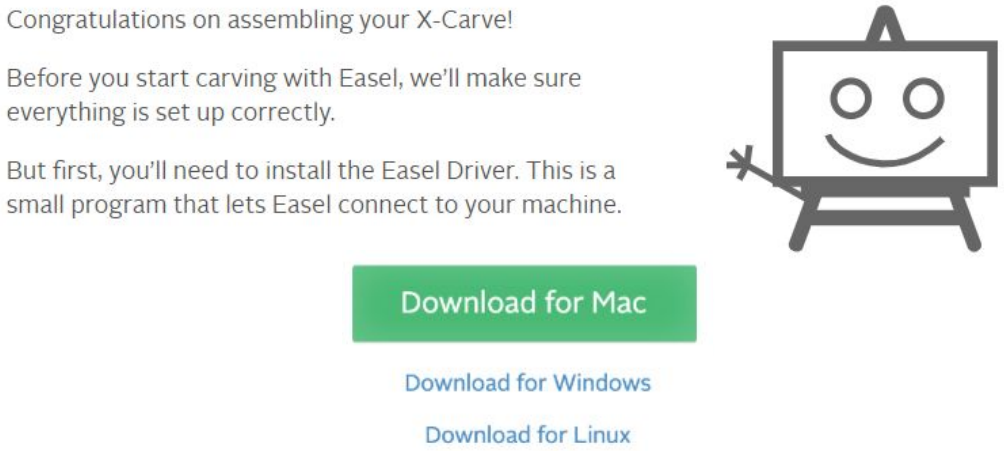


YoraHome

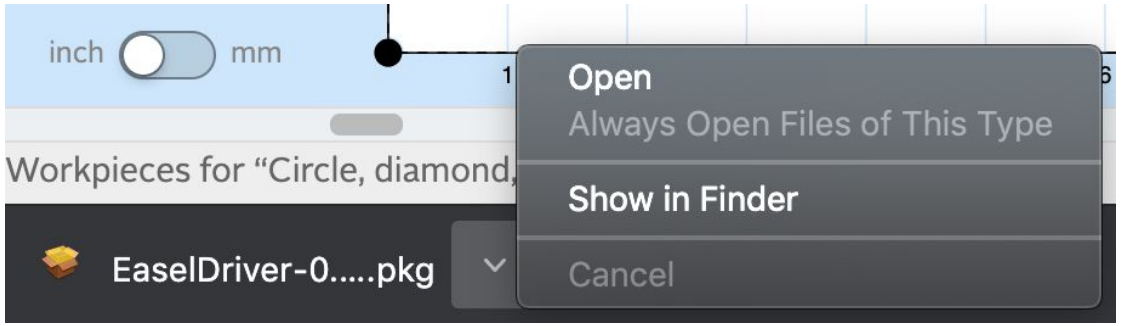
Part 4 Machine Setup

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.



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.



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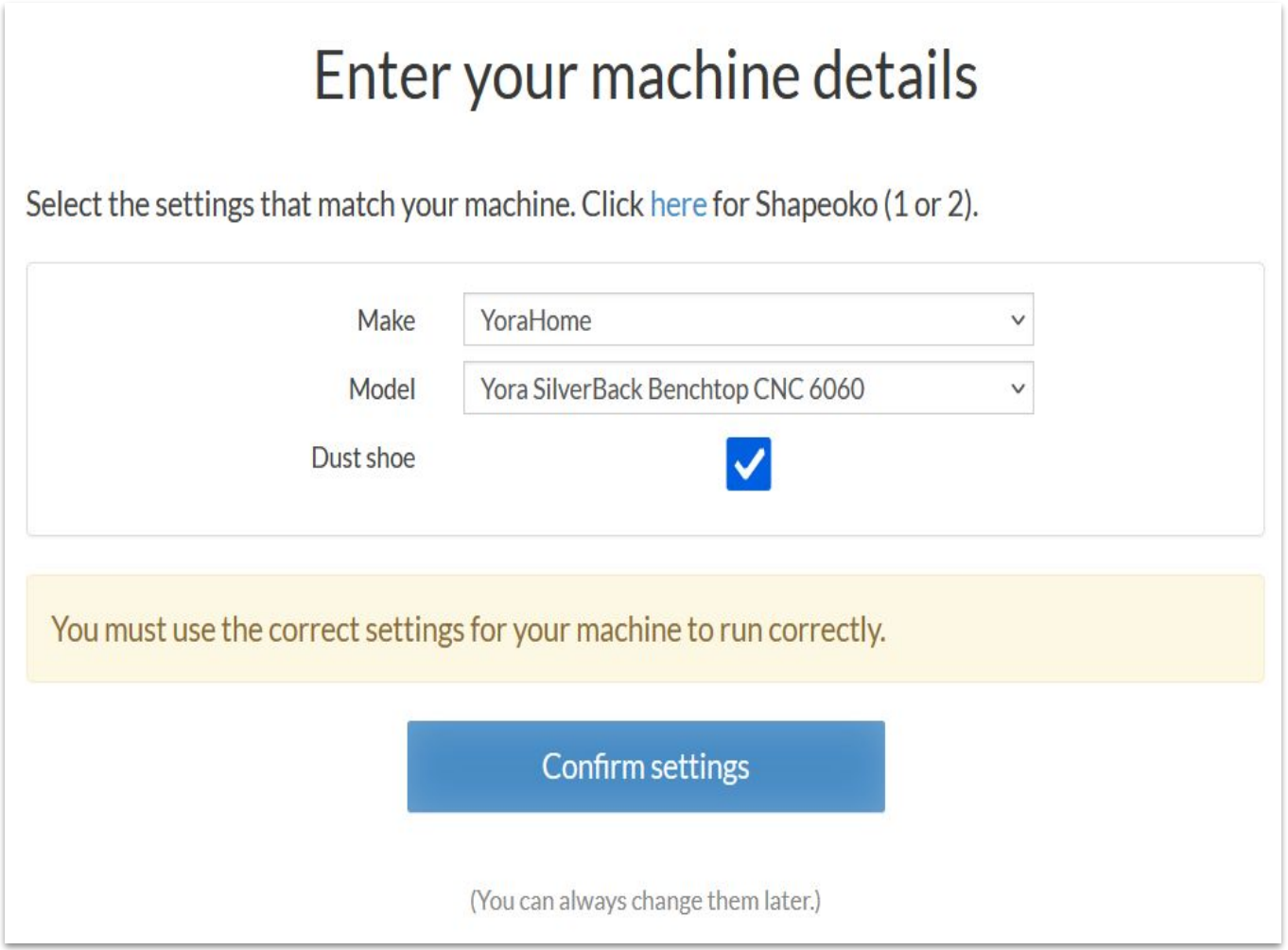
Part 4 Machine Setup

Step 7 - Enter your machine details

Choose the options as shown in the picture.

If you have purchased the optional dust shoe with our SilverBack, check the box.

Then, click on the blue Confirm settings button.



YoraHome

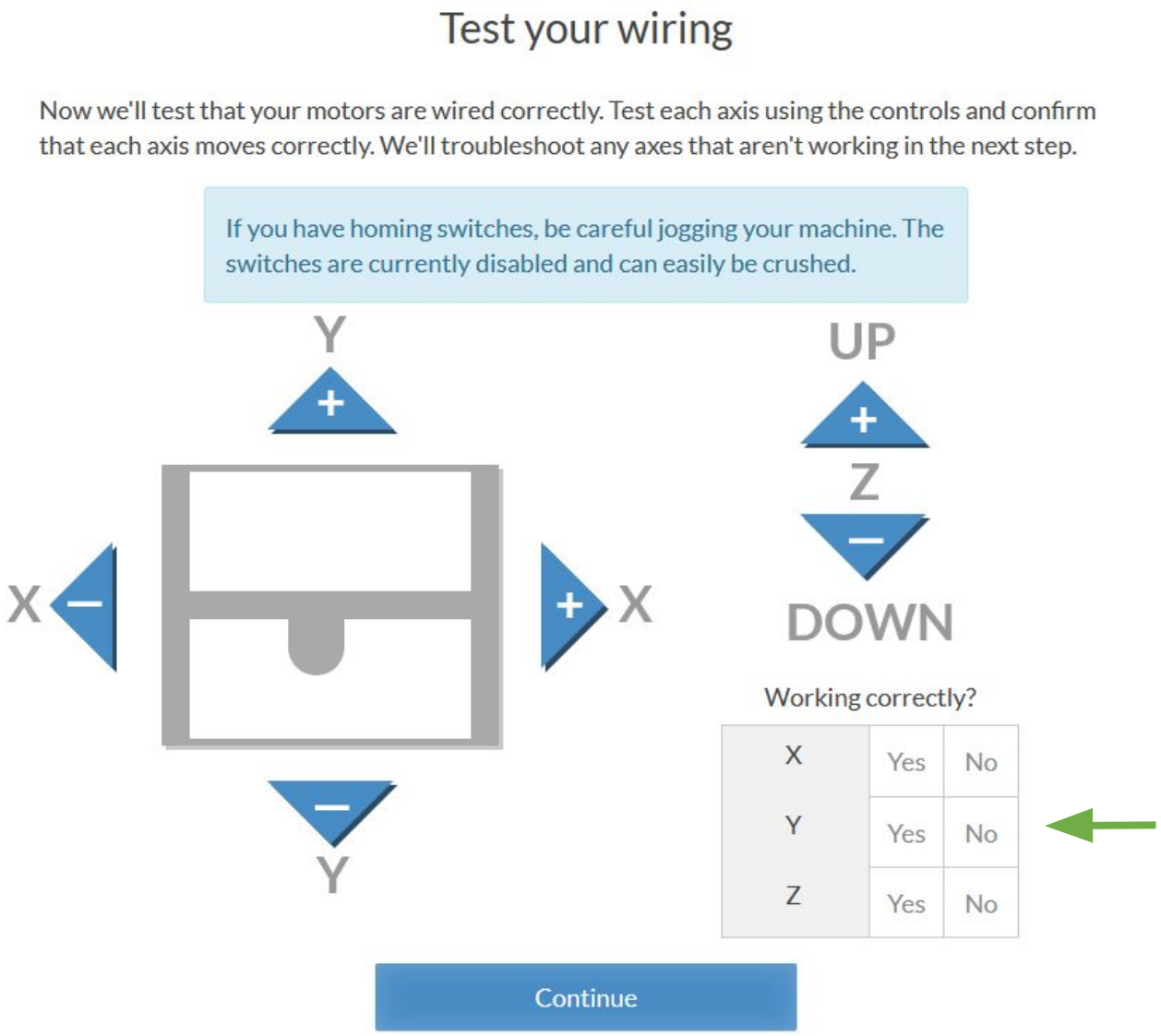
Part 4 Machine Setup

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.



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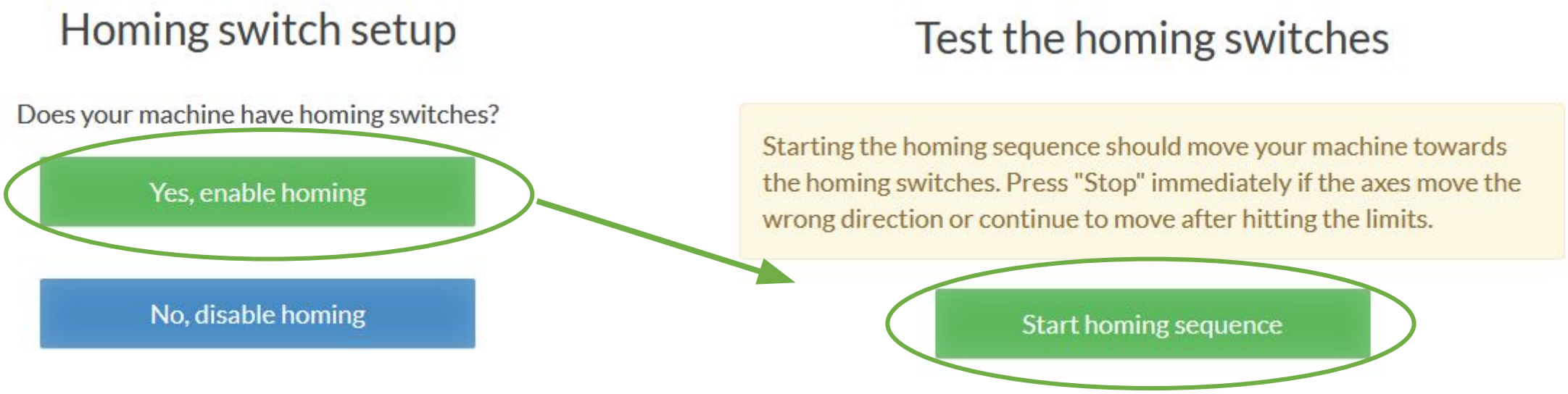
Part 4 Machine Setup

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 SilverBack is equipped with limit 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.



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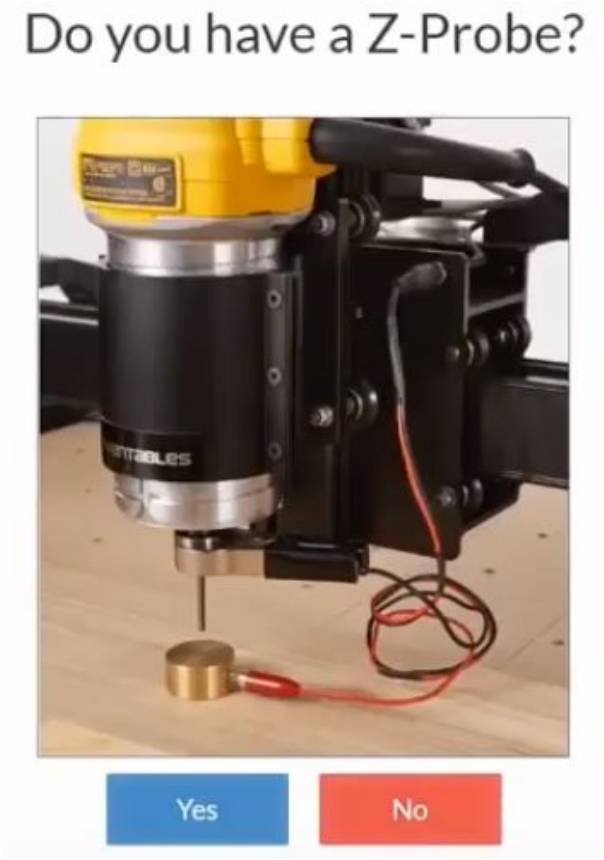
Part 4 Machine Setup

Step 10 - Z-Probe setup

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



YoraHome

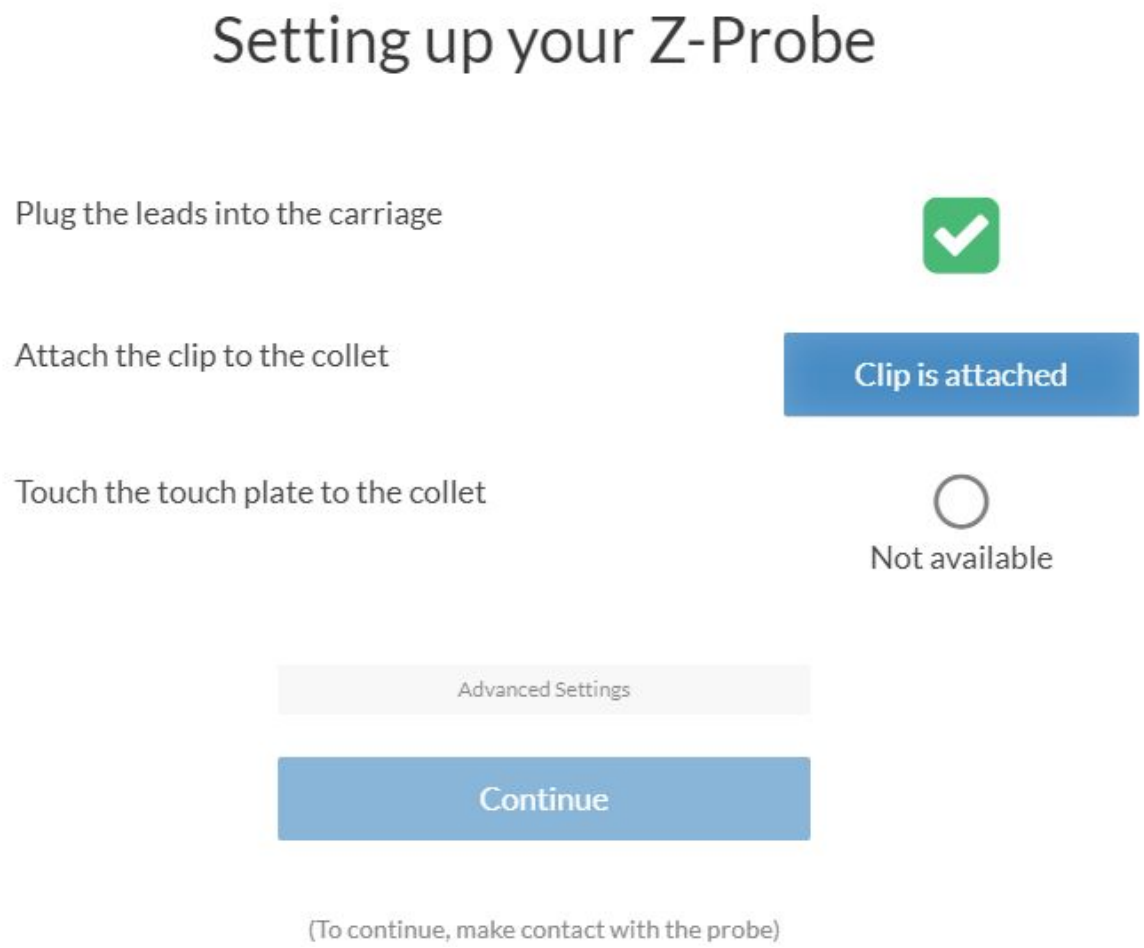
Part 4 Machine Setup

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.



YoraHome

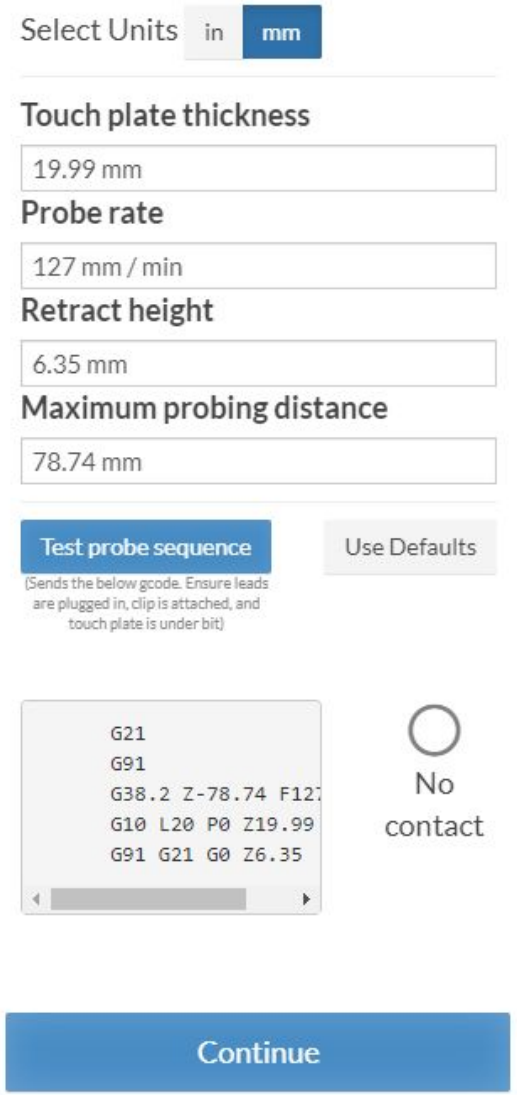
Part 4 Machine Setup

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.



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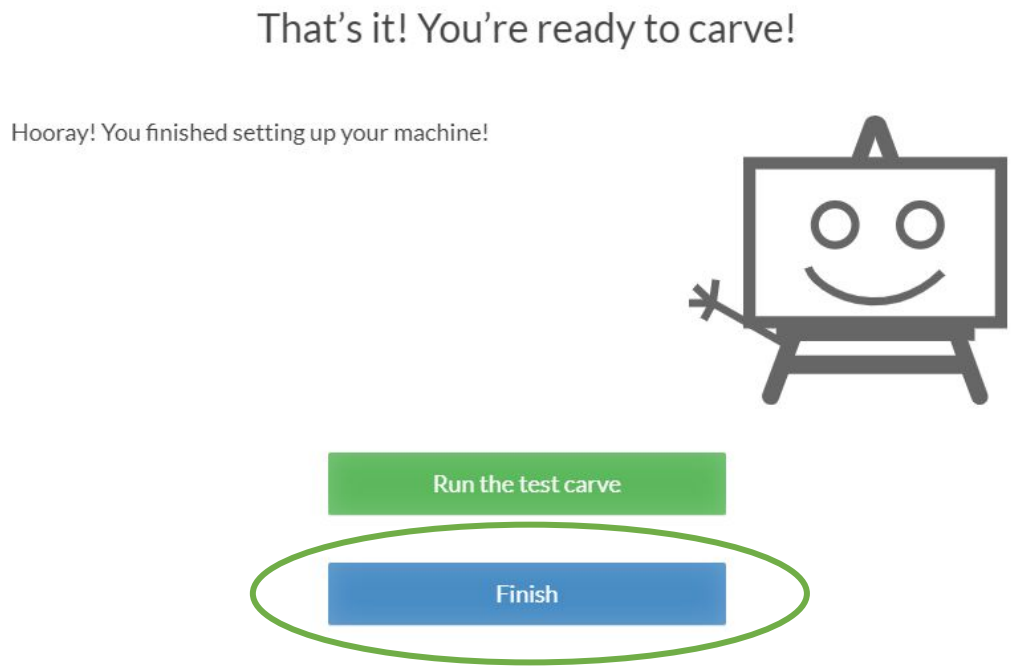
Part 4 Machine Setup

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.

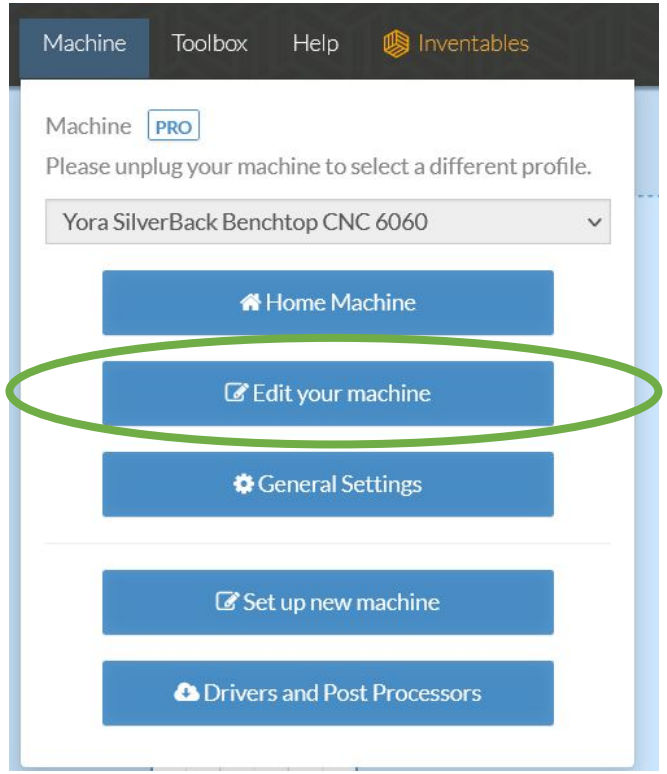


YoraHome

Part 4 Machine Setup

Step 14 - Edit Machine Settings 1/2

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



YoraHome

Part 4 Machine Setup

Step 14 - Edit Machine Settings 2/2

Next make the following changes:

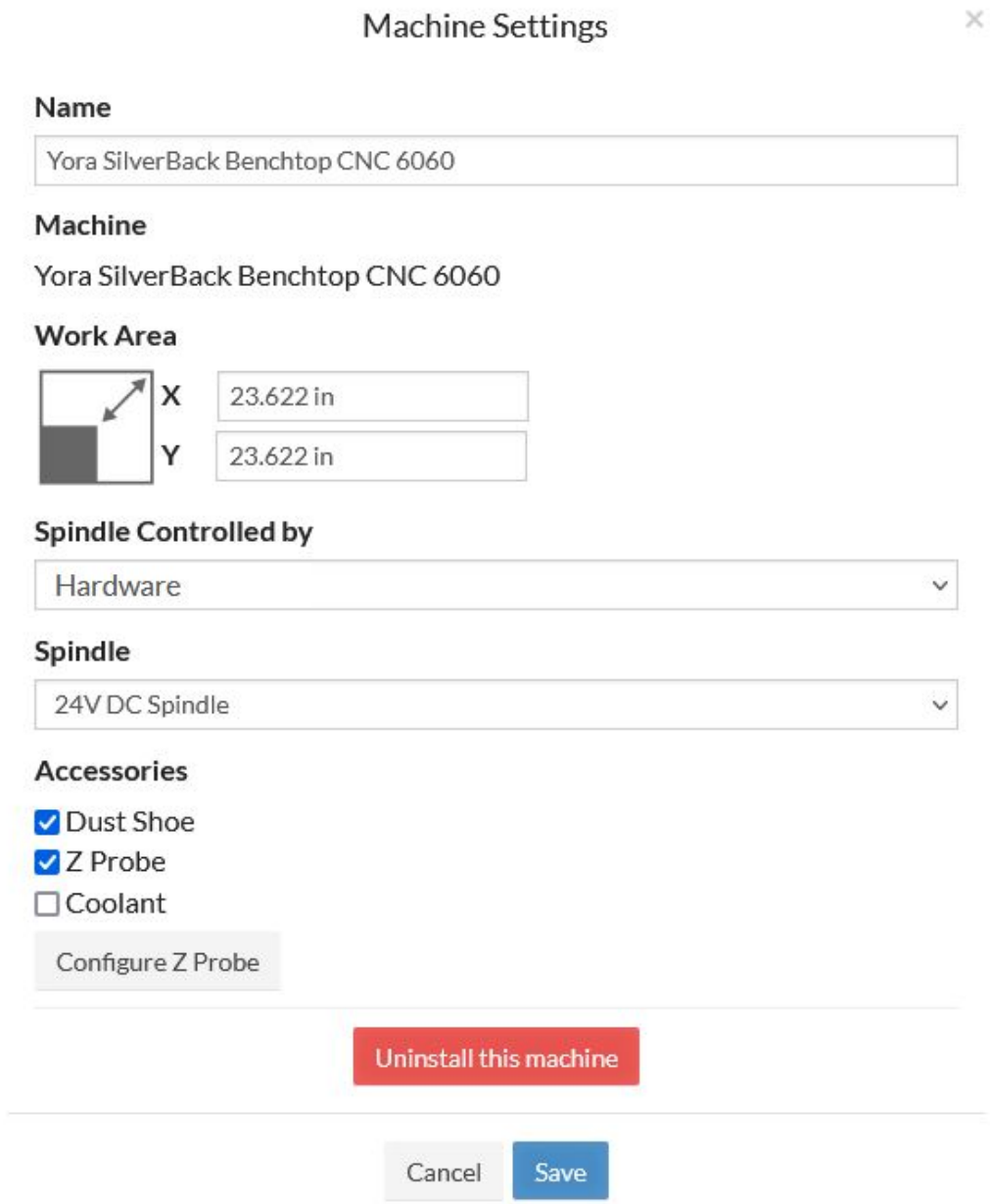
1. Work Area X: 23.622 in
2. Work Area Y: 23.622 in

3. Spindle Controlled By: Hardware

4. Spindle: 24V DC or Makita

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

Click Save and you are ready for your test carve.



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Part 5 Recommended Settings - Router

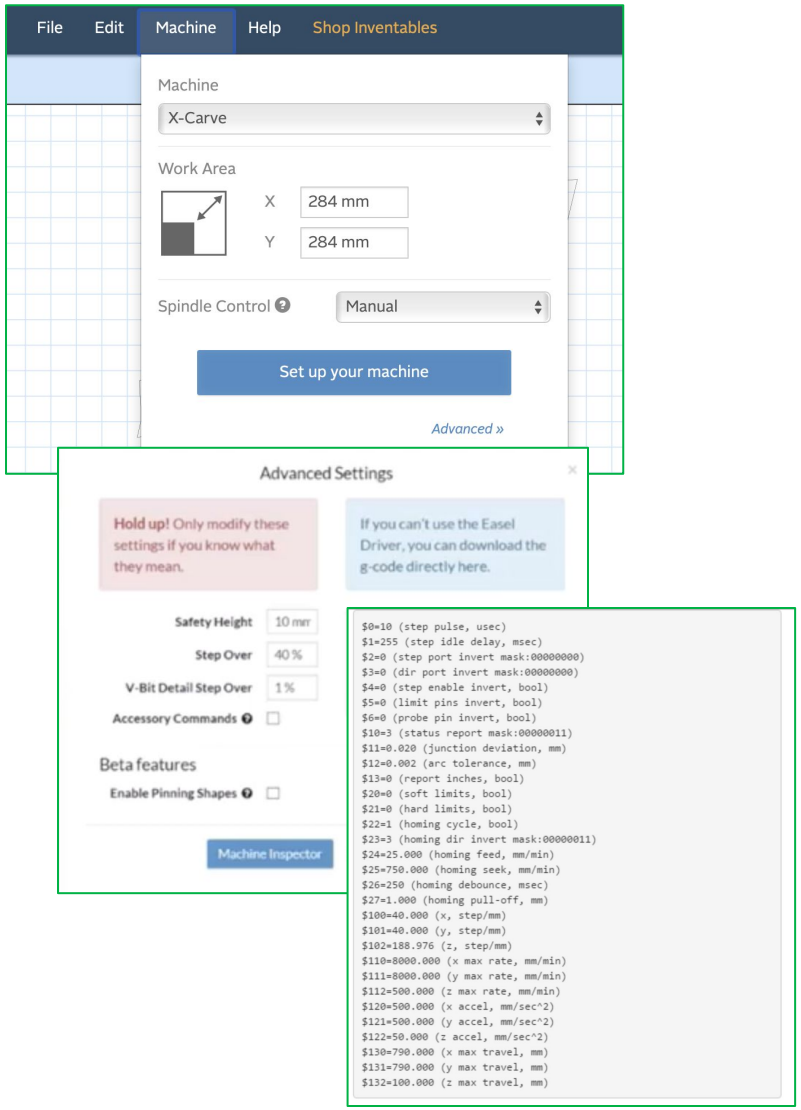
Key GRBL Settings

Intro

The SilverBack 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.



YoraHome

Part 5 Recommended Settings - Router

Key GRBL Settings

$3 - Direction port invert mask 1/2

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 2/2

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.

	New $3 Value		
Current $3 Value	Invert X	Invert Y	Invert Z
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.

YoraHome

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 the same - default value for the SilverBack is 200.

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

This sets the spindle speed range between 0.0% and 100%. Since the SilverBack 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=2000, $111=2000 and $112=2000.

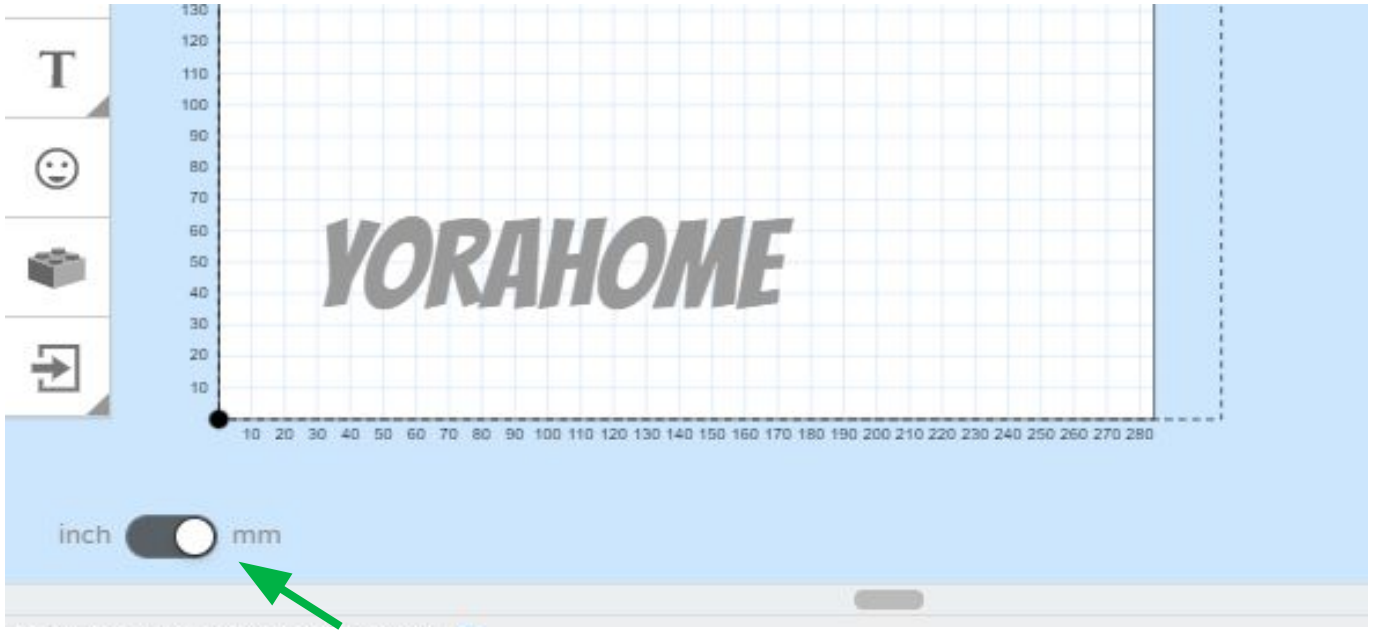
You can check all the defined GRBL settings and what they mean using the link below:
https://github.com/gnea/grbl/wiki/Grbl-v1.1-Configuration

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.



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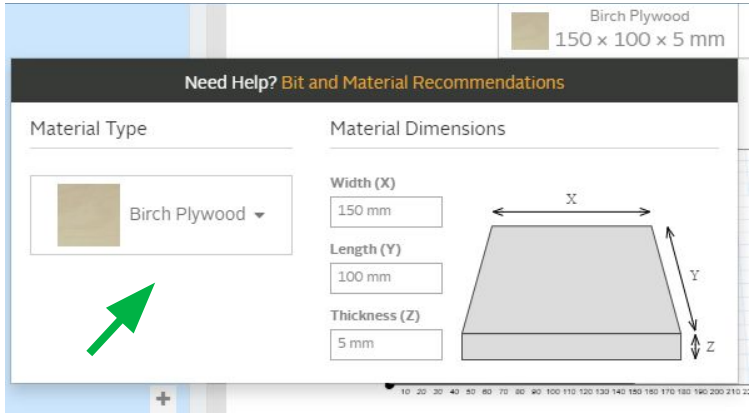
Part 5 Recommended Settings - Easel

Material type and Dimensions

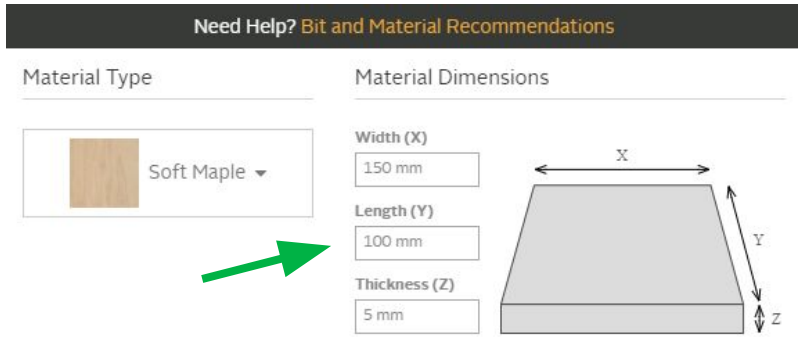
1. Find the piece of wood or material you want to carve

2. Select the material type in Easel



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

4. Enter the Material Dimensions in Easel



YoraHome

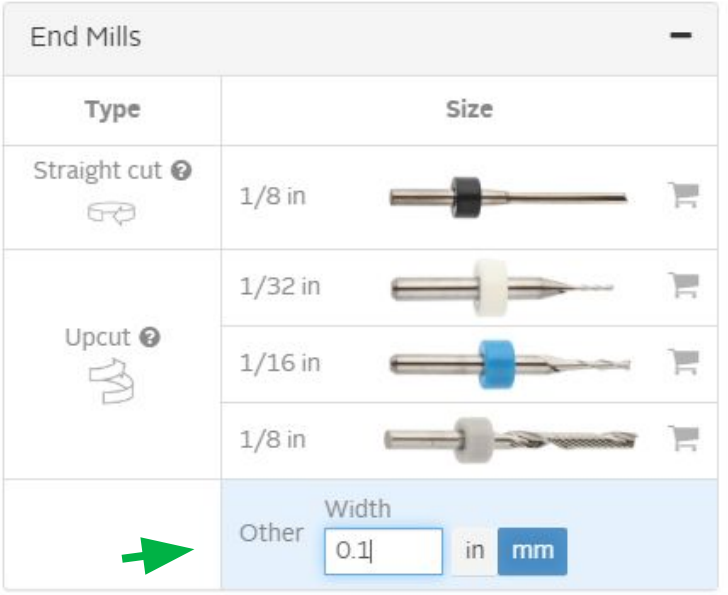
Part 5 Recommended Settings - Easel

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.



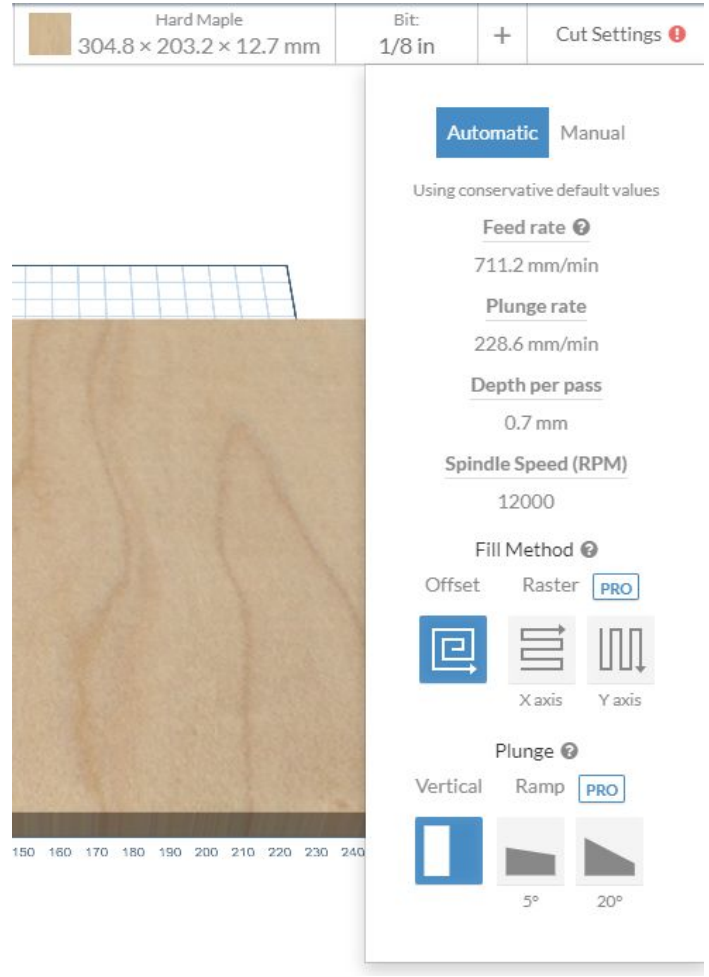
YoraHome

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.



YoraHome

Part 5 Recommended Settings - Easel

Cut settings - Spindle Speed

When using the 400W 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 front of the Controller.

YoraHome

Part 6 Optional Laser Installation

Laser Engraving with your SilverBack

To utilize the laser engraving functionality of the SilverBack, the Yora Laser Module will need to be installed in the Spindle Mount, as described in Part 2.

The user will also need 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”.

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Part 7 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 8 Terminology

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.

Stepper motor: A motor that is told to turn in small steps like turn clockwise 1.7˚ 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.

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 8 Terminology

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 9 Default GRBL Settings

$0=10 (Step pulse time)
$1=255 (Step idle delay)
$2=0 (Step pulse invert)
$3=0 (Step direction invert)
$4=0 (Invert step enable pin)
$5=0 (Invert limit pins)
$6=0 (Invert probe pin)
$10=115 (Status report options)
$11=0.010 (Junction deviation)
$12=0.002 (Arc tolerance)
$13=0 (Report in inches)
$20=0 (Soft limits enable)
$21=1 (Hard limits enable)
$22=0 (Homing cycle enable)
$23=3 (Homing direction invert)
$24=150.000 (Homing locate feed rate)
$25=1000.000 (Homing search seek rate)
$26=250 (Homing switch debounce delay)
$27=3.000 (Homing switch pull-off distance)
$30=1000 (Maximum spindle speed)
$31=0 (Minimum spindle speed)
$32=0 (Laser-mode enable)
$100=200.000 (X-axis travel resolution)
$101=200.000 (Y-axis travel resolution)
$102=160.000 (Z-axis travel resolution)
$110=2000.000 (X-axis maximum rate)
$111=2000.000 (Y-axis maximum rate)
$112=2000.000 (Z-axis maximum rate)
$120=300.000 (X-axis acceleration)
$121=300.000 (Y-axis acceleration)
$122=300.000 (Z-axis acceleration)
$130=600.000 (X-axis maximum travel)
$131=600.000 (Y-axis maximum travel)
$132=55.000 (Z-axis maximum travel)

Note (For 1x1M Machines):
$130=1000.000 (X-axis maximum travel)
$131=1000.000 (Y-axis maximum travel)

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