



YORA CNC CARVING MACHINE 3018-PRO

USER MANUAL

Version 1.3 • May, 2020



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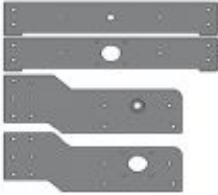






Part 6: Best Practices For Assembly & Setup

Part 7: Terminology







Part 1 Packing List_{1/4}

Name	Size	Picture	Qty
Aluminum Profile	20*40*290mm		2
	20*20*360mm		2
	300*180mm		1
Guide Rail (X Axis)	Ø10*360mm		2
Guide Rail (Y Axis)	Ø10*290mm		2
Lead Screw	T8(365mm)		1
	T8(295mm)		1

Part 1 Packing List_{2/4}

Name	Size	Picture	Qty
Phenolic Resin Plate	Bakelite-A Bakelite-B Bakelite-C Bakelite-D		4
Steppmotor			2
Spindle & ER11			1
X-Z Axis Assembly			1
Slider			4
Nut Seat			1
Milling Cutter			10

Part 1 Packing List_{3/4}

Name	Size	Picture	Qty
4P Motor Line			3
Spindle Motor Line			1
24V Power Supply			1
Control Board & Fan & Case			1
USB Cable			1
Plate Clamp			4

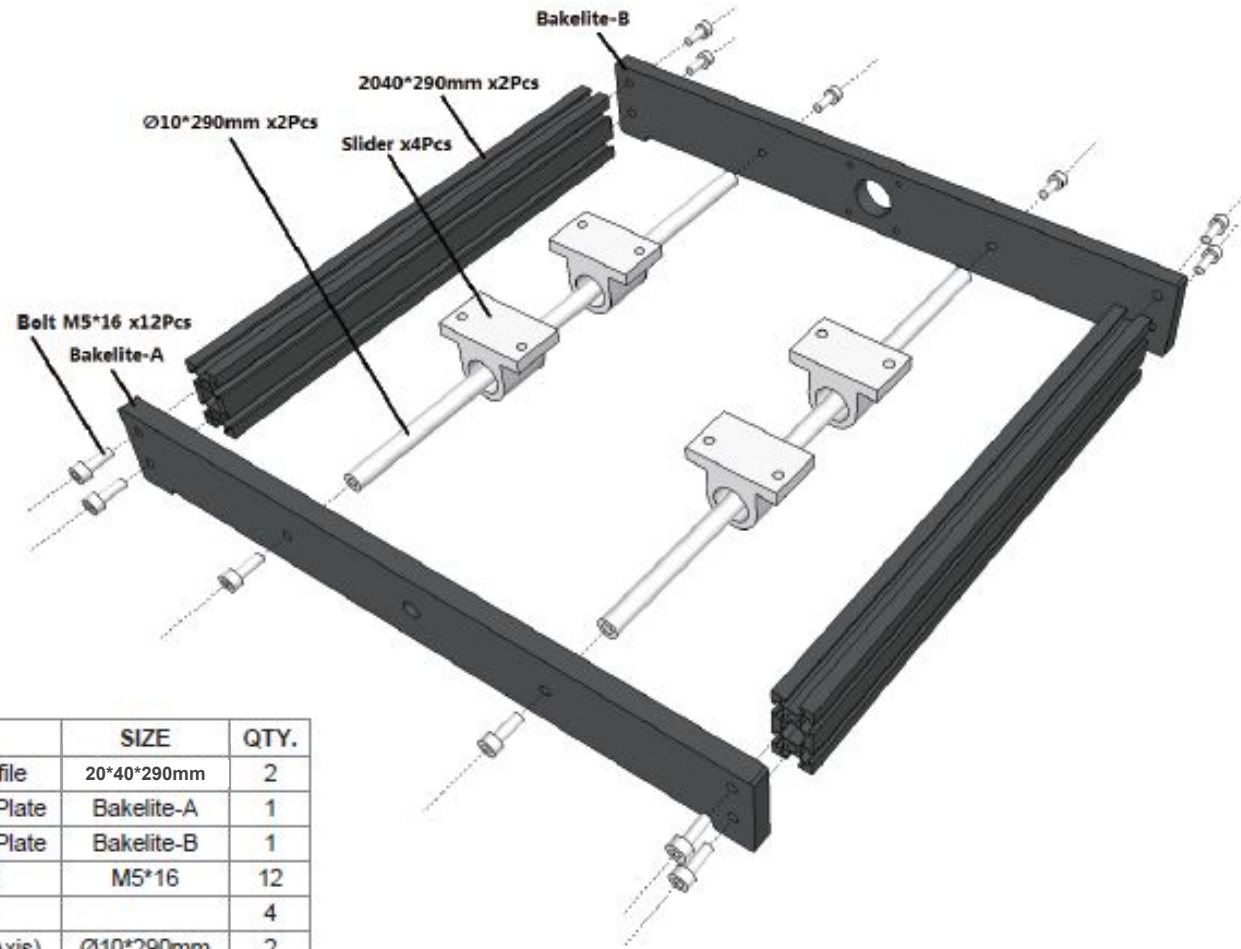
Part 1 Packing List_{4/4}

Name	Size	Picture	Qty
Winding Tube			1.5M
CD			1
Allen Wrench	1.5mm,2.0mm,2.5mm, 3.0mm,4.0mm		5
Bolt	M5*10		4
	M5*16		43
	M3*14		8
Copper Nut			2
Nut 20M5	20*M5		16
Nut 30M5	30*M5		10
Spring			2
Coupling & Set Screw			2

Part 2 Mechanical Installation

Step 1

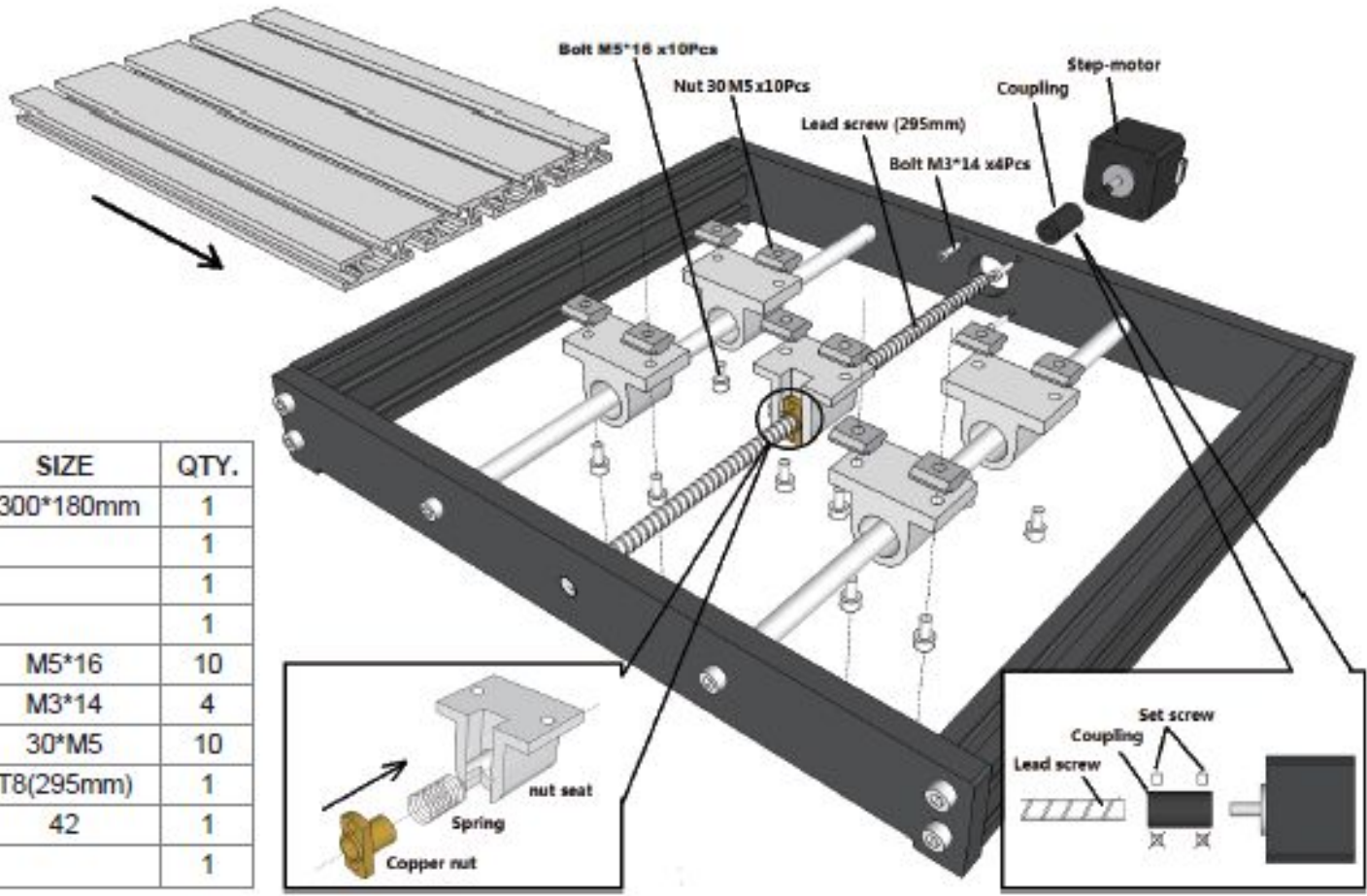
→ Bakelite-A, Bakelite-B & Base Installation



	NO.	NAME	SIZE	QTY.
Prepare materials	1	Aluminum Profile	20*40*290mm	2
	2	Phenolic Resin Plate	Bakelite-A	1
	3	Phenolic Resin Plate	Bakelite-B	1
	4	Bolt M5*16	M5*16	12
	5	Slider		4
	6	Guide Rail (Y Axis)	Ø10*290mm	2

Part 2 Mechanical Installation

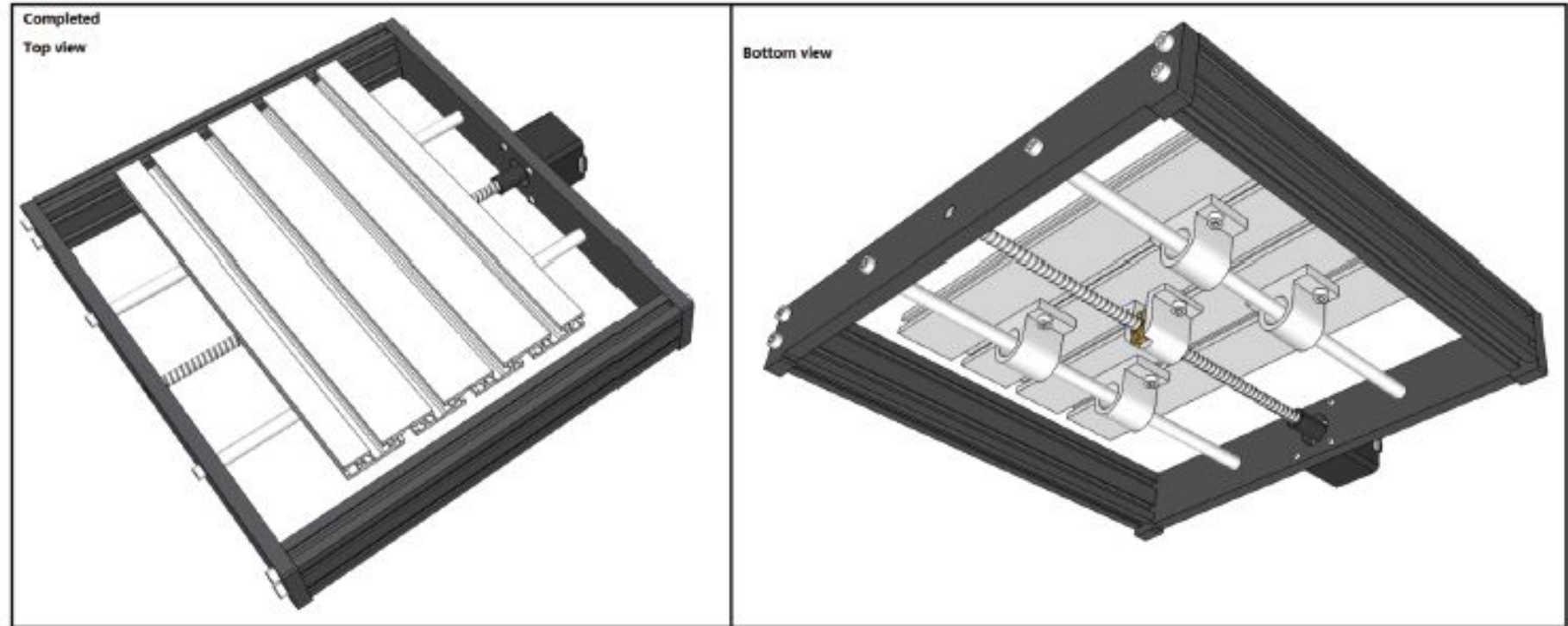
Step 2 → Table Installation



Prepare materials	NO.	NAME	SIZE	QTY.
	1	Aluminum Profile	300*180mm	1
	2	Copper Nut		1
	3	Spring		1
	4	Nut Seat		1
	5	Bolt	M5*16	10
	6	Bolt	M3*14	4
	7	Nut 30M5	30*M5	10
	8	Lead Screw	T8(295mm)	1
	9	Stepmotor	42	1
10	Coupling & Set Screw		1	

Part 2 Mechanical Installation

Completed

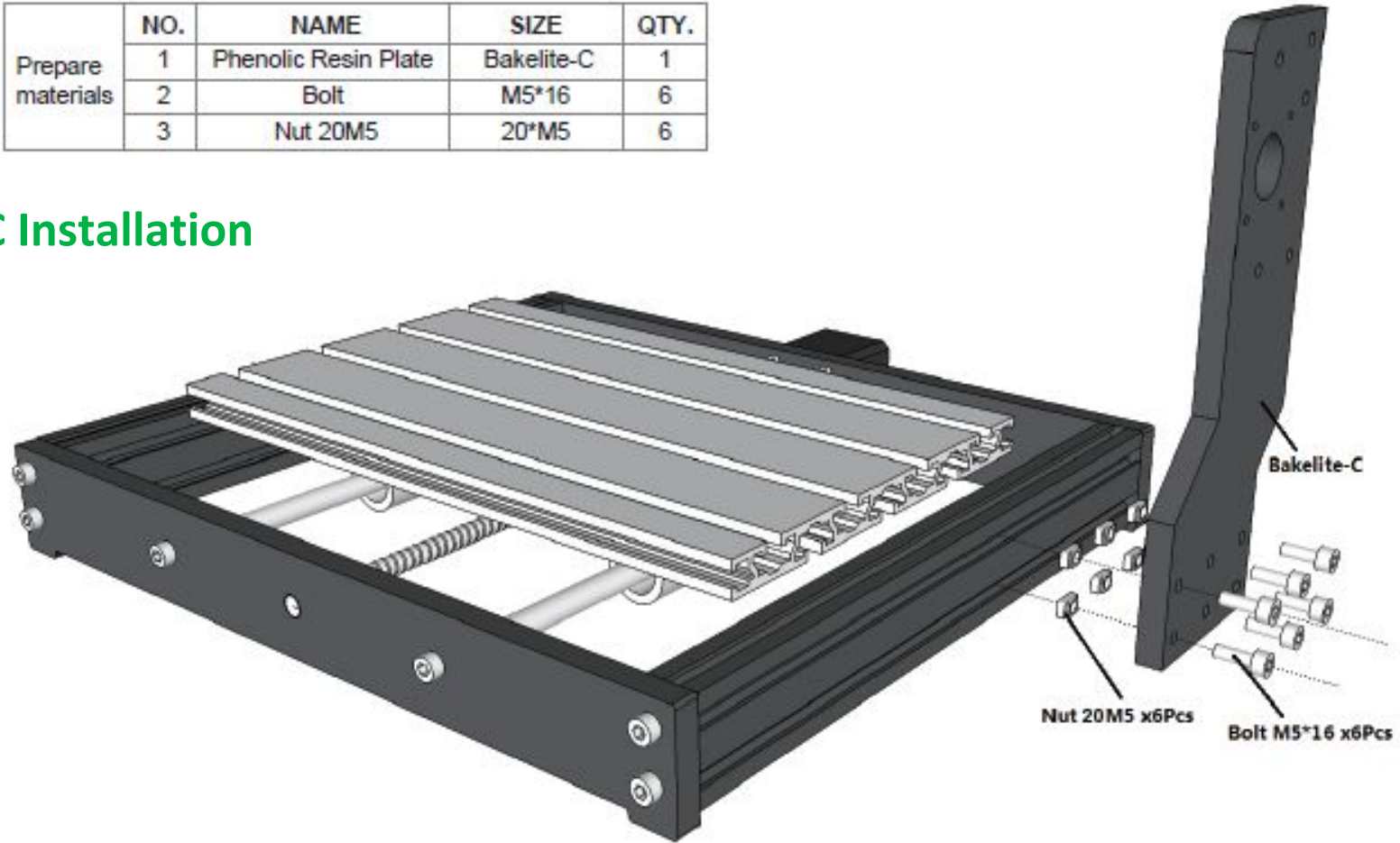


Part 2 Mechanical Installation

	NO.	NAME	SIZE	QTY.
Prepare materials	1	Phenolic Resin Plate	Bakelite-C	1
	2	Bolt	M5*16	6
	3	Nut 20M5	20*M5	6

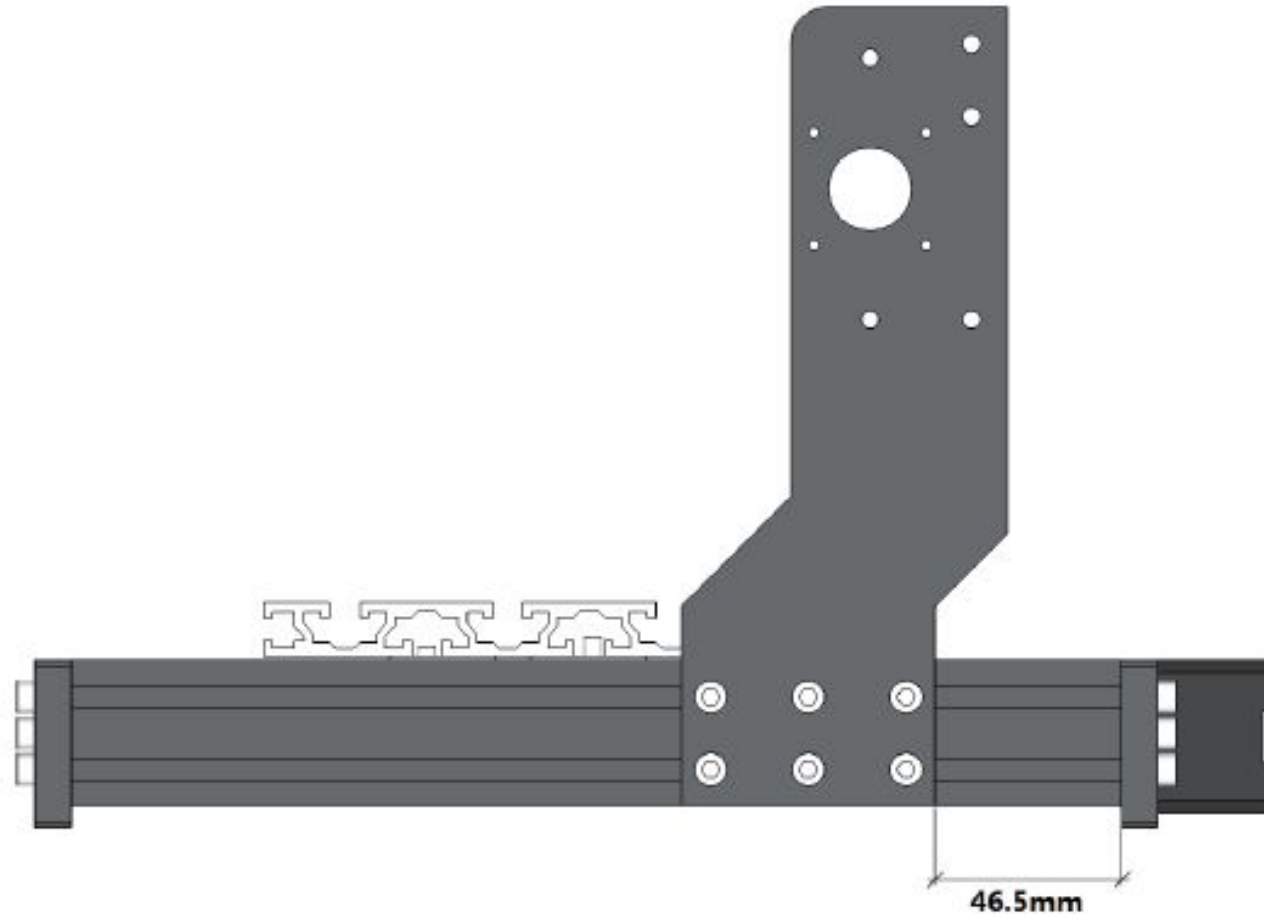
Step 3

→ Bakelite-C Installation



Part 2 Mechanical Installation

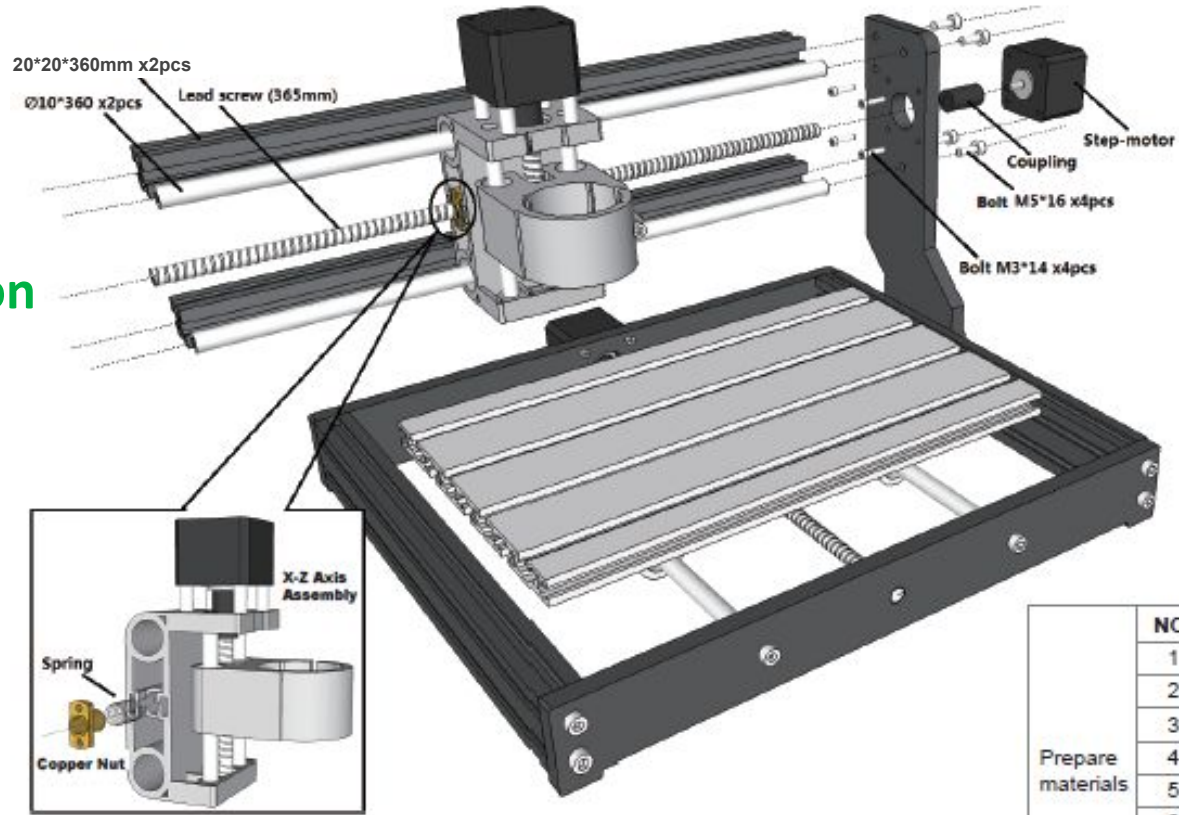
Completed



Don't have a metric ruler? See second last page of this manual for a helpful tool!

Part 2 Mechanical Installation

Step 4 → X-Z Axis Installation

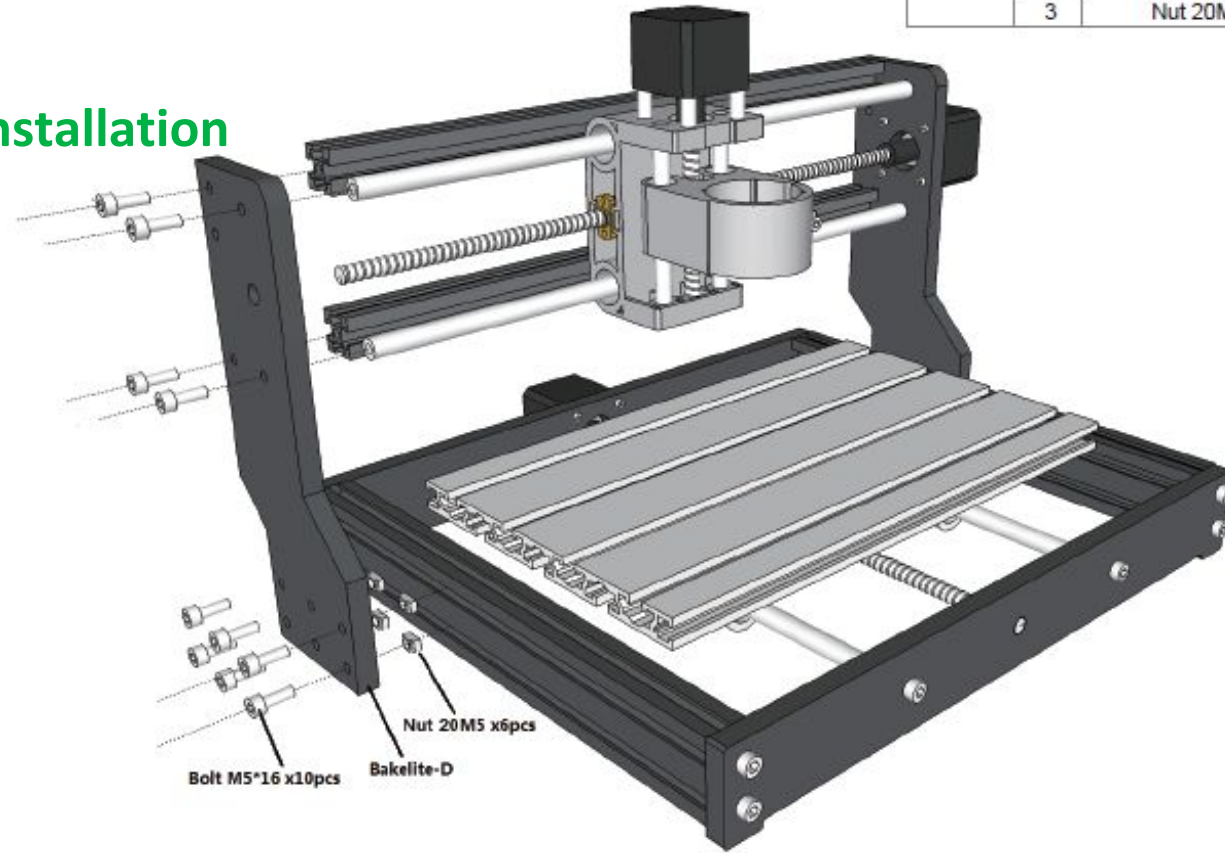


	NO.	NAME	SIZE	QTY.
Prepare materials	1	X-Z Axis Assembly		1
	2	Copper Nut		1
	3	Spring		1
	4	Aluminum Profile	20*20*360mm	2
	5	Guide Rail (X Axis)	Ø10*360mm	2
	6	Lead Screw	T8(365mm)	1
	7	Coupling & Set Screw		1
	8	Bolt	M5*16	4
	9	Bolt	M3*14	4

Part 2 Mechanical Installation

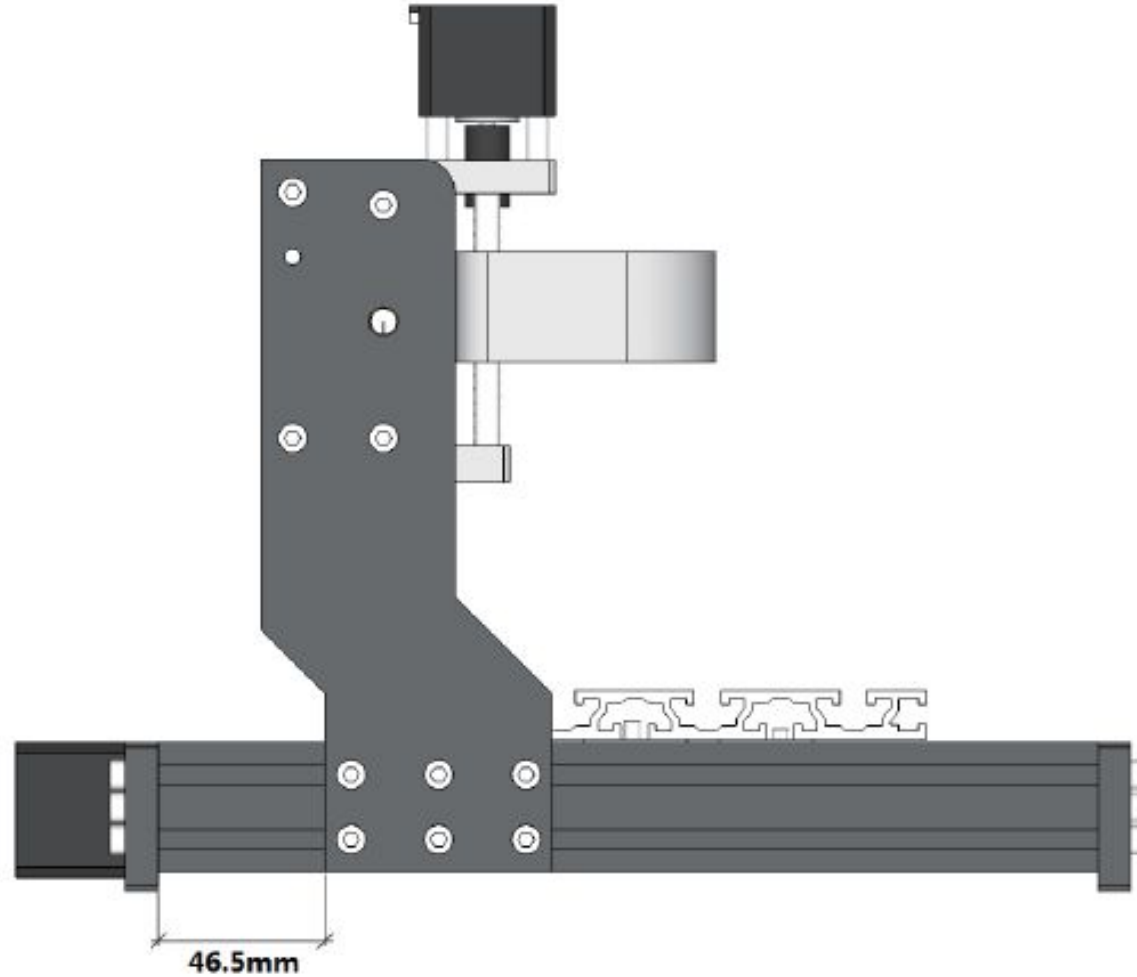
	NO.	NAME	SIZE	QTY.
Prepare materials	1	Phenolic Resin Plate	Bakelite-D	1
	2	Bolt M5*16	M5*16	10
	3	Nut 20M5	20*M5	6

Step 5
→ Bakelite D Installation



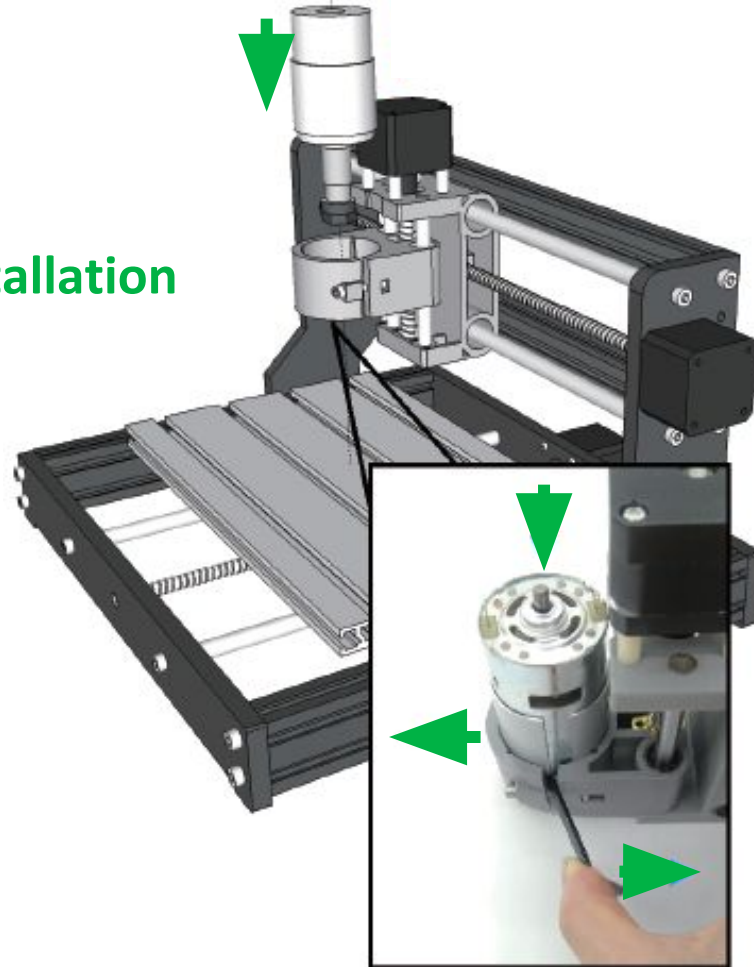
Part 2 Mechanical Installation

Completed

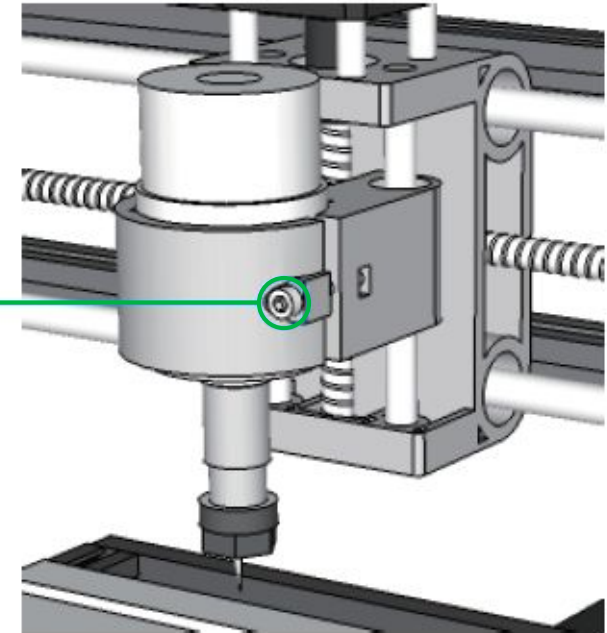


Part 2 Mechanical Installation

Step 6
→ Spindle Installation



Caution

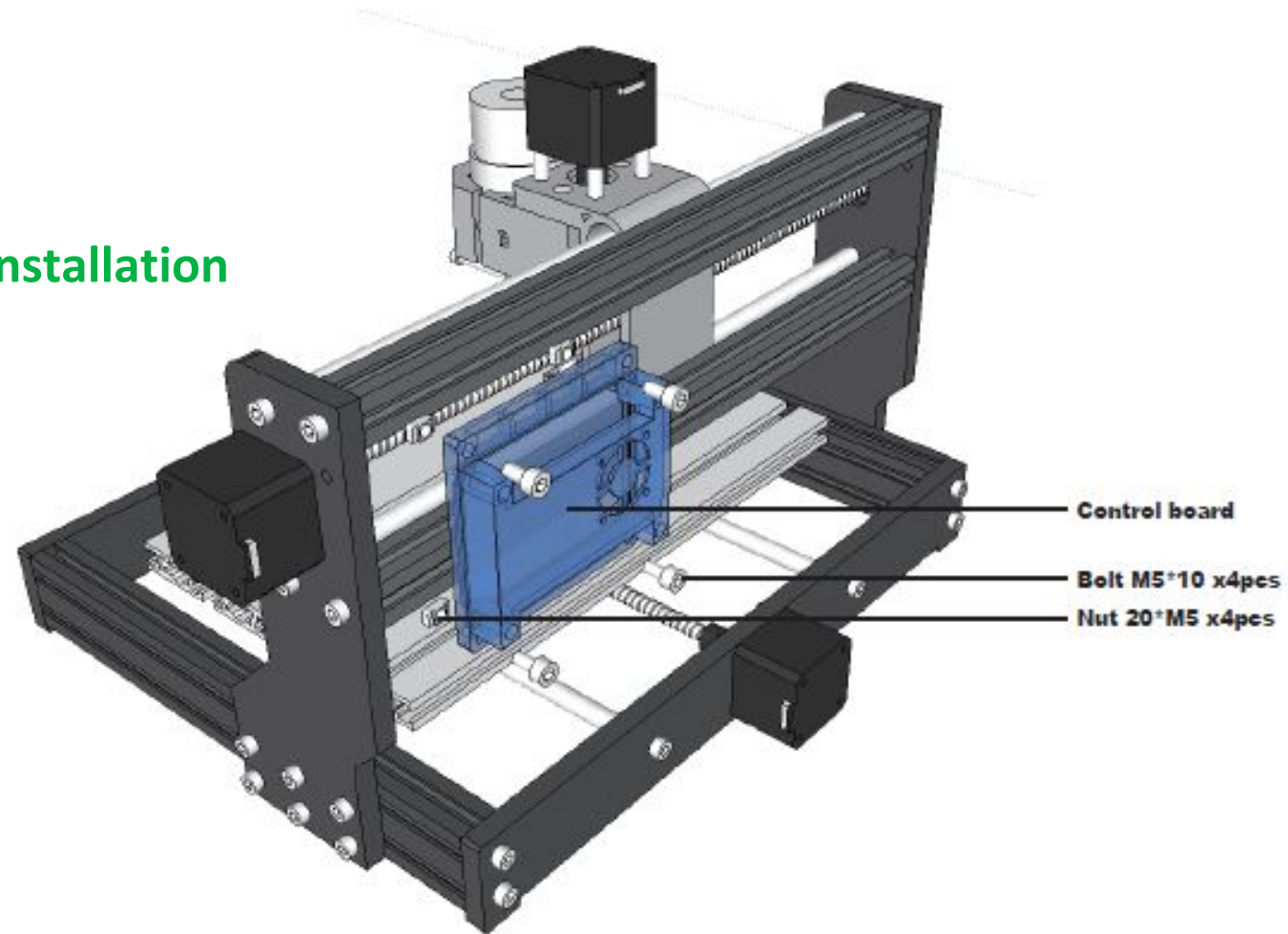


Tighten the M4 bolt without using excessive force to prevent plastic damage

Part 2 Mechanical Installation

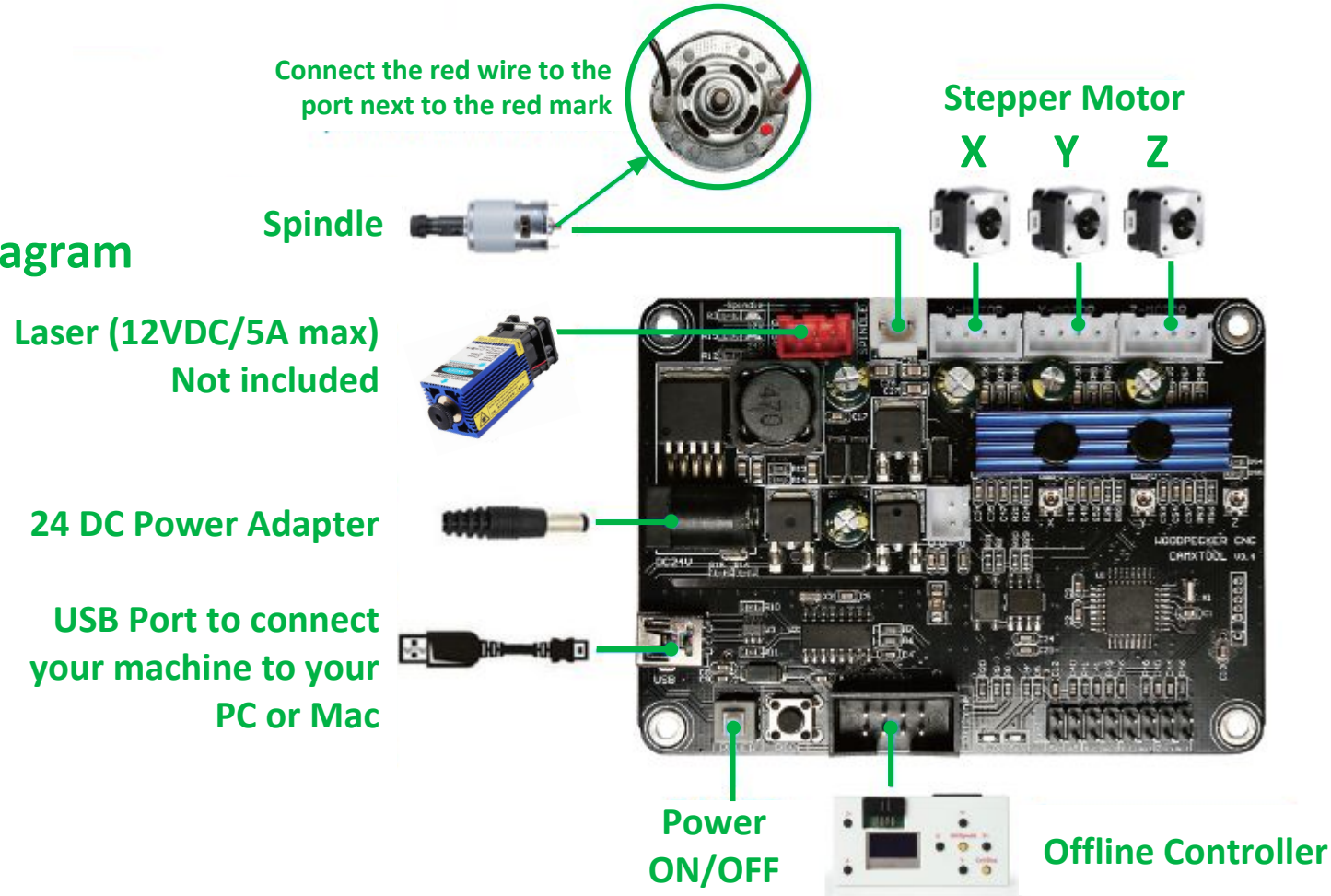
Step 7

→ Control Board Installation



Part 2 Mechanical Installation

Step 8 → Wiring diagram

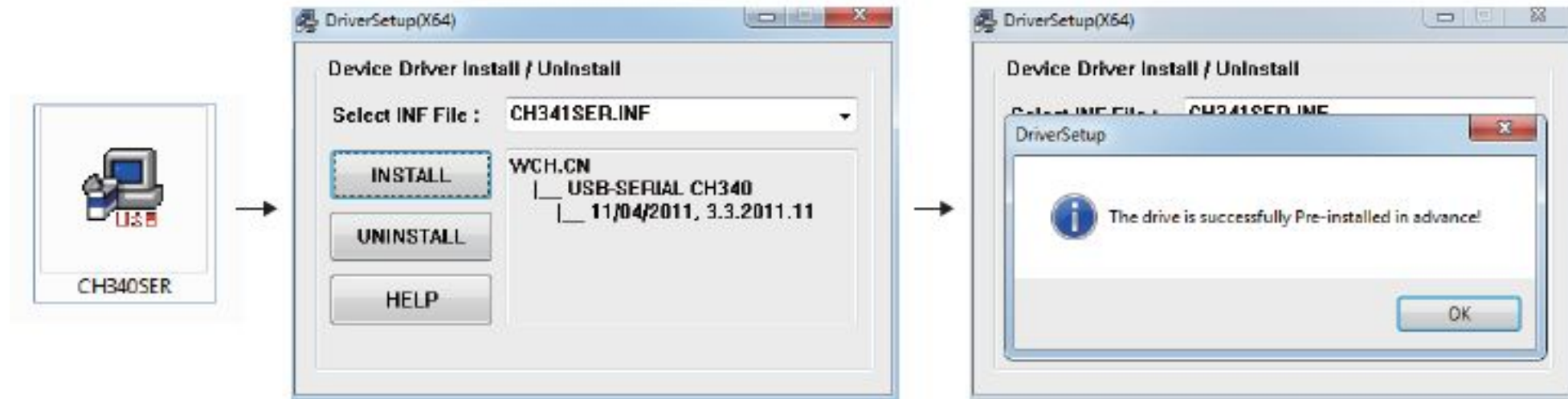


NOTE:
Do not use the Offline Controller and USB connection at the same time – damage may result!

Part 3 Software Installation

Step 1

→ Install the machine's driver (CH340SER). Download it online [here](#).

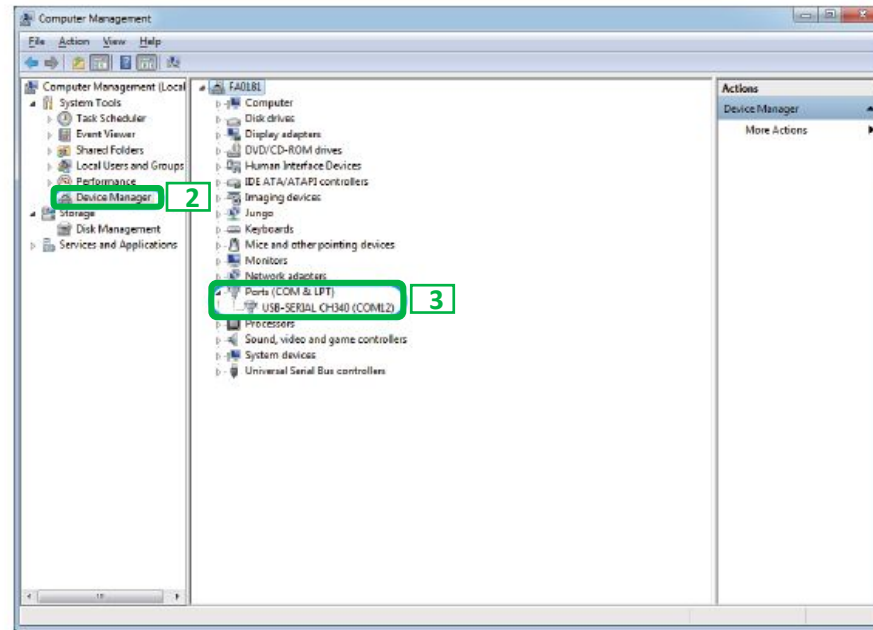
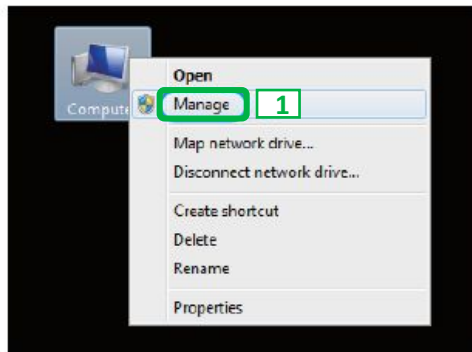


Part 3 Software Installation

Step 2

→ Determine your machine's COM port

- **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".

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 3018 CNC machines 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.

The logo for Easel, featuring the word "EASEL" in a blue, sans-serif font. The letter "A" is replaced by a blue icon of a presentation board or easel.

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 radio button « I am a new customer »
- Enter your personal information (see an example in this picture)
- When you are done, click on the orange Continue button

MY ACCOUNT

- I am a returning customer
 I am a new customer

Email


support@yorahome.com

Full Name

YoraHome

Choose a Password

.....

 I'm not a robot



reCAPTCHA

- I consent to the Inventables [PRIVACY POLICY](#)
 I consent to the Inventables [TERMS OF USE](#)

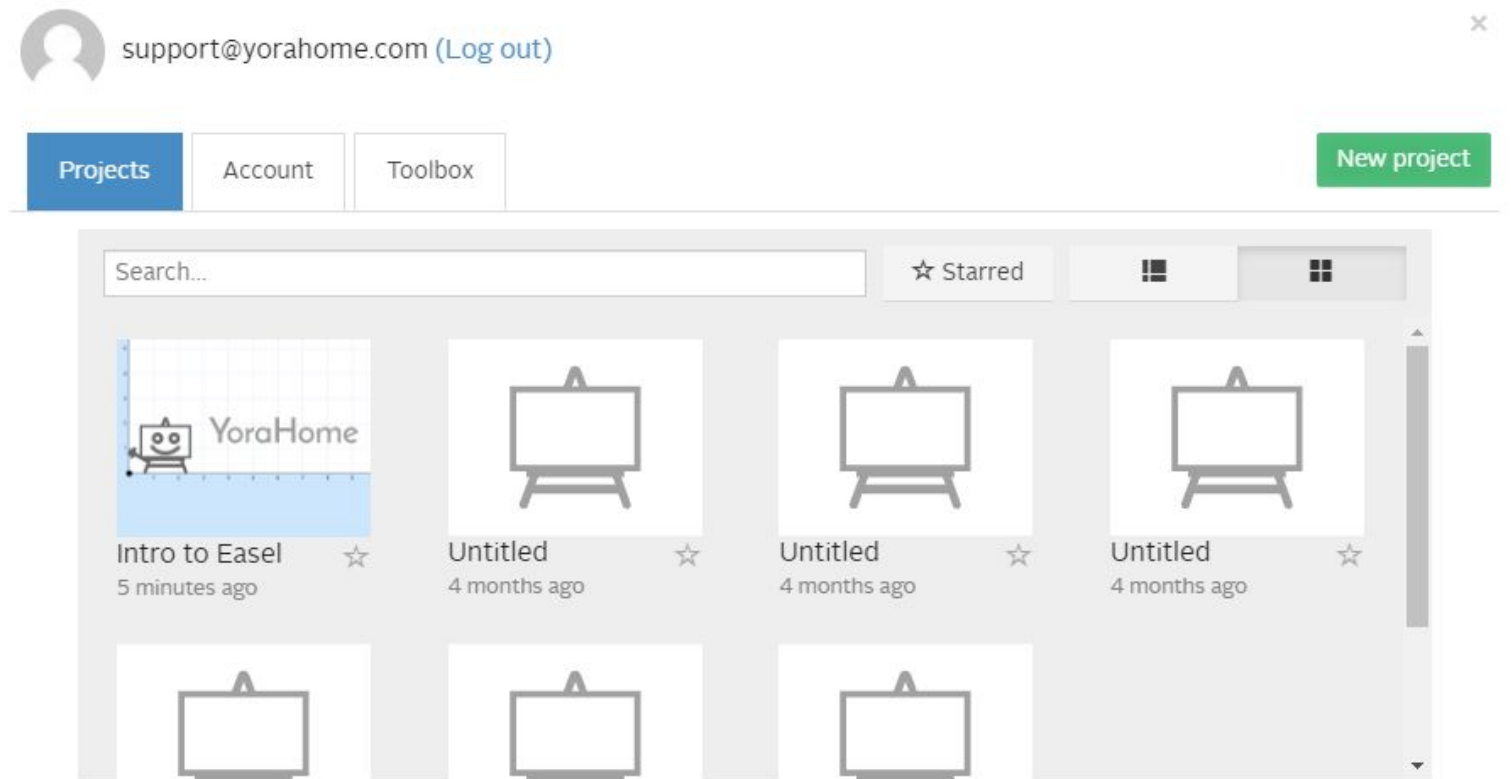
CONTINUE

Part 4 Machine Setup

Step 1

→ Your first project in Easel!

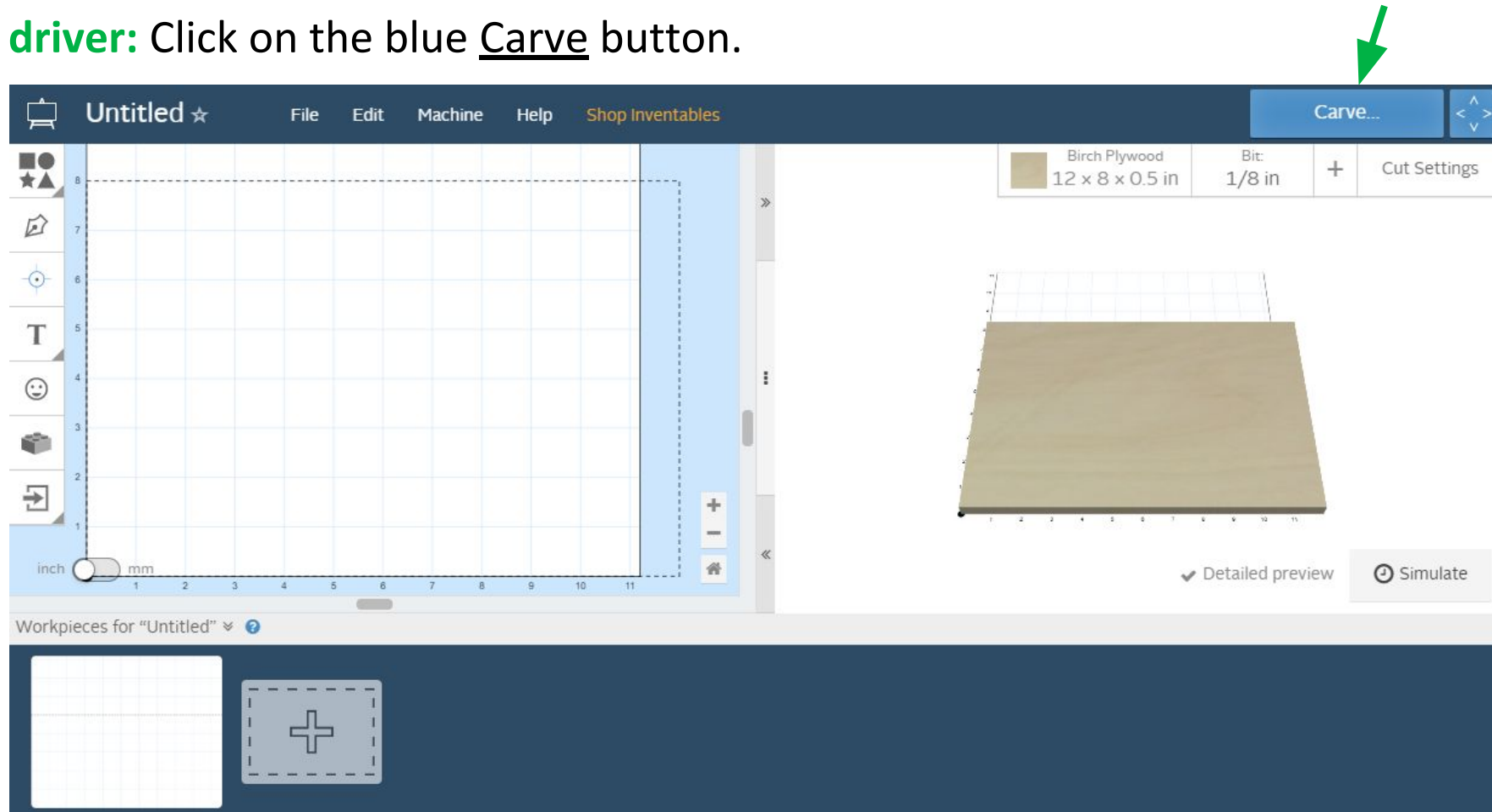
Create a new project by selecting one document in the Projects tab (it can be “Intro to Easel” or any “Untitled”)



Part 4 Machine Setup

Step 2

→ **Easel driver:** Click on the blue Carve button.



Part 4 Machine Setup

Step 3

→ **Easel driver (Windows):** You will be automatically prompted to download and install Easel driver; 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 [here](#).

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 carve, you'll need to install the Easel Driver, a small program that allows the browser to communicate with your X-Carve.

No need to worry about configuration—just run the installer and you'll be ready to carve.

Technical note: The Easel Driver will connect with Carvey, and Grbl versions 0.8c or newer.

Already installed the Easel Driver? [View troubleshooting info.](#)

[Download for Windows](#)

[Download for Mac](#)

[Download for Linux](#)

Part 4 Machine Setup

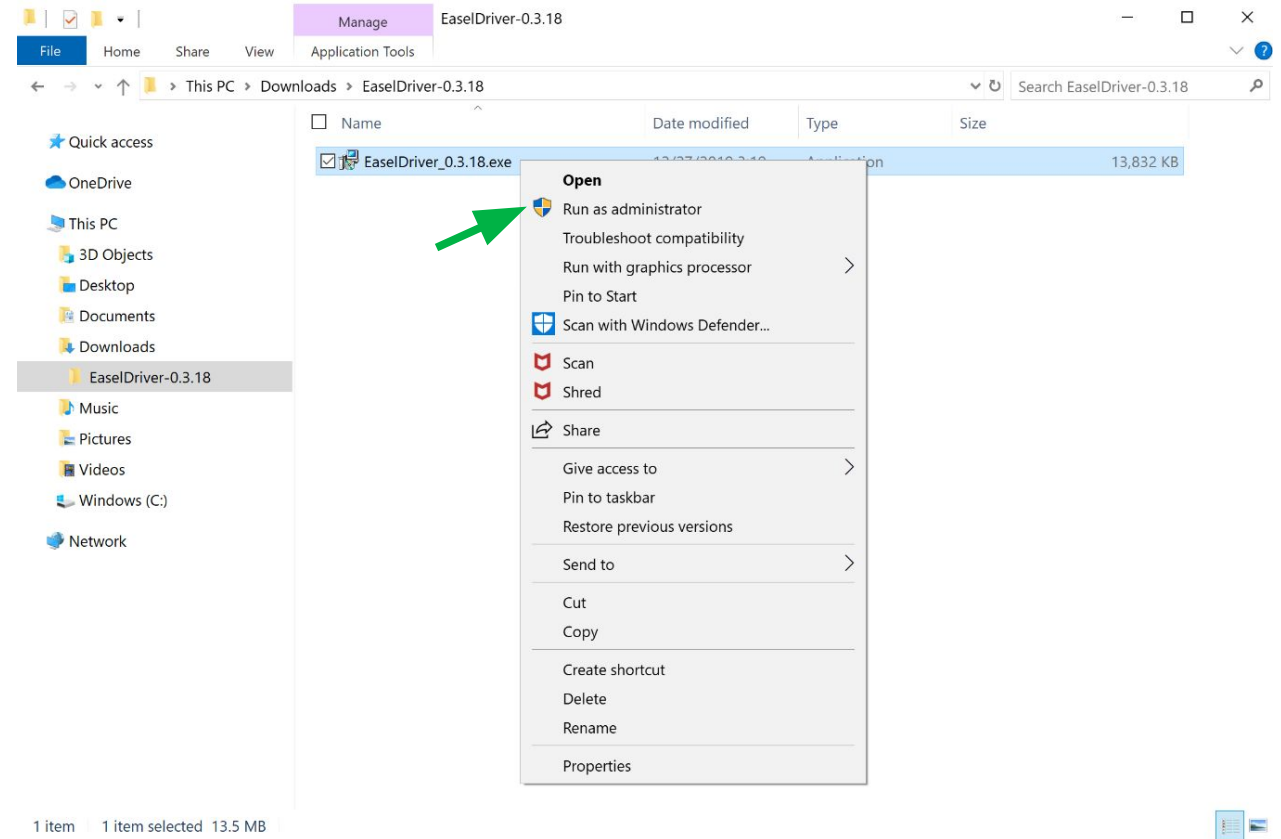
Step 4

→ Install Easel driver (Windows)

W2. Go to your Downloads folder, open the download and you should see the file EaselDriver-0.3.18.exe.

W3. Then, right-click the EaselDriver 0.3.18.exe, 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 5

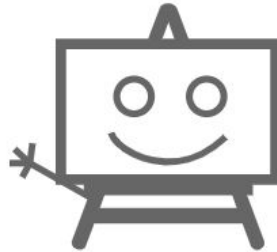
→ Download and Install Easel driver (MacOS)

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.

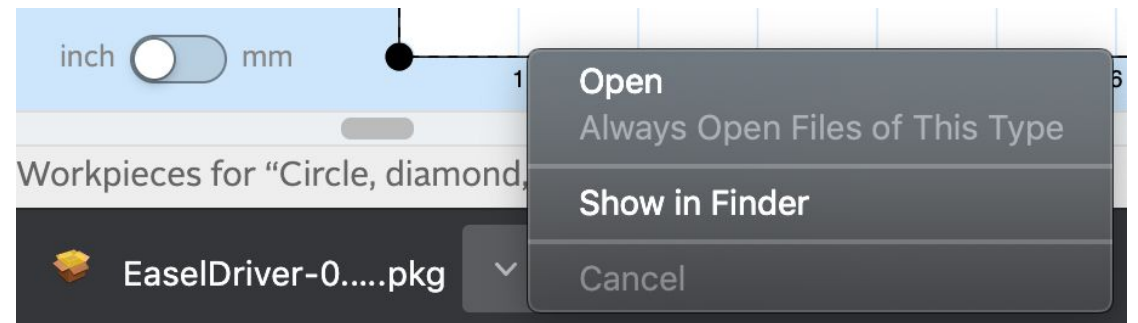


Download for Mac

Download for Windows

Download for Linux

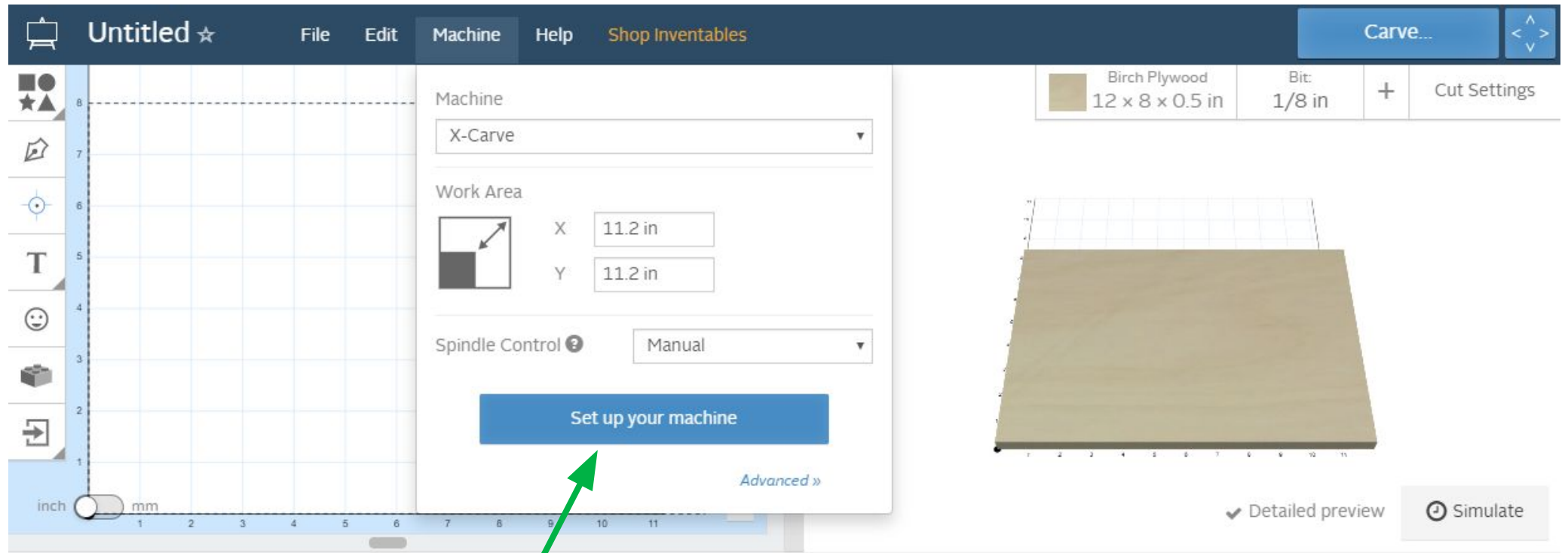
M2. Click the EaselDriver-0.3.18.pkg file and open it to run the installer. Follow the Installer instructions to complete the installation. You may need to refresh your browser and, in some cases, restart your computer.



Part 4 Machine Setup

Step 6

→ **Set up your machine:** Now that Easel driver is installed, you need to setup your machine. On the menu bar, click on Machine and then click on the blue Set up your machine button.



Part 4 Machine Setup

Step 7

→ **Enter your machine settings:** Use the ones shown in the picture below. You can use either Other (grbl) or X-carve in the machine type. Enter the other settings as shown below. No dust shoe with our 3018, so don't check the box. Then, click on the blue Confirm settings button.

Enter your machine details

Select the settings that match your machine.

Machine type	Other (grbl) ▼
Motion Controller	Arduino & gShield ▼
Rail size	500mm x 500mm ▼
Lead screw	M8 threaded rod (discontinued Sept 2016) ▼
Spindle	Other ▼
Max RPM	9000
Dust shoe	<input type="checkbox"/>

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

Confirm settings

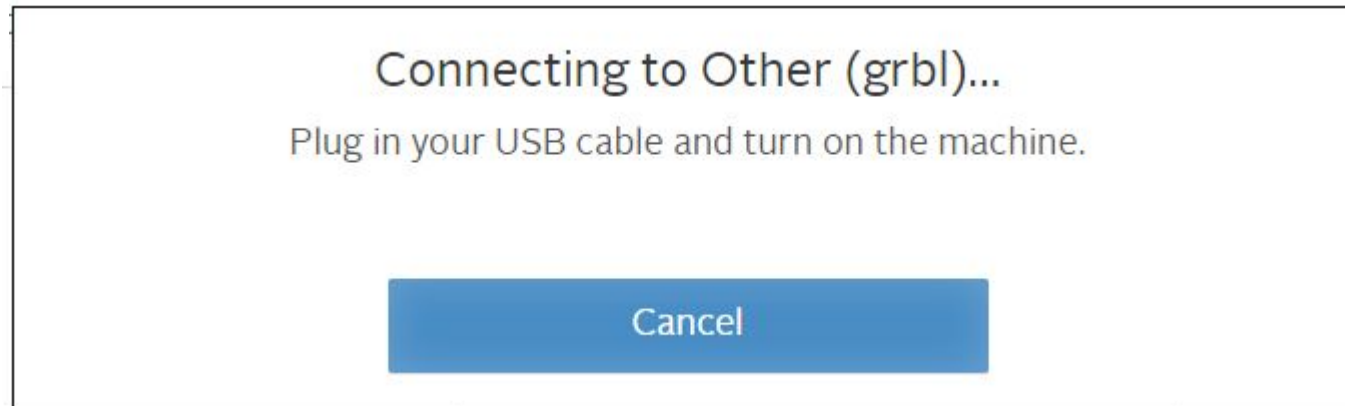
Part 3 Machine Setup

Step 8

→ **Connect your 3018 to your computer**

1. Plug in your power cord
2. Plug in your USB cable into your computer
3. Turn on your 3018

Easel will automatically connect to your 3018.



Part 4 Machine Setup

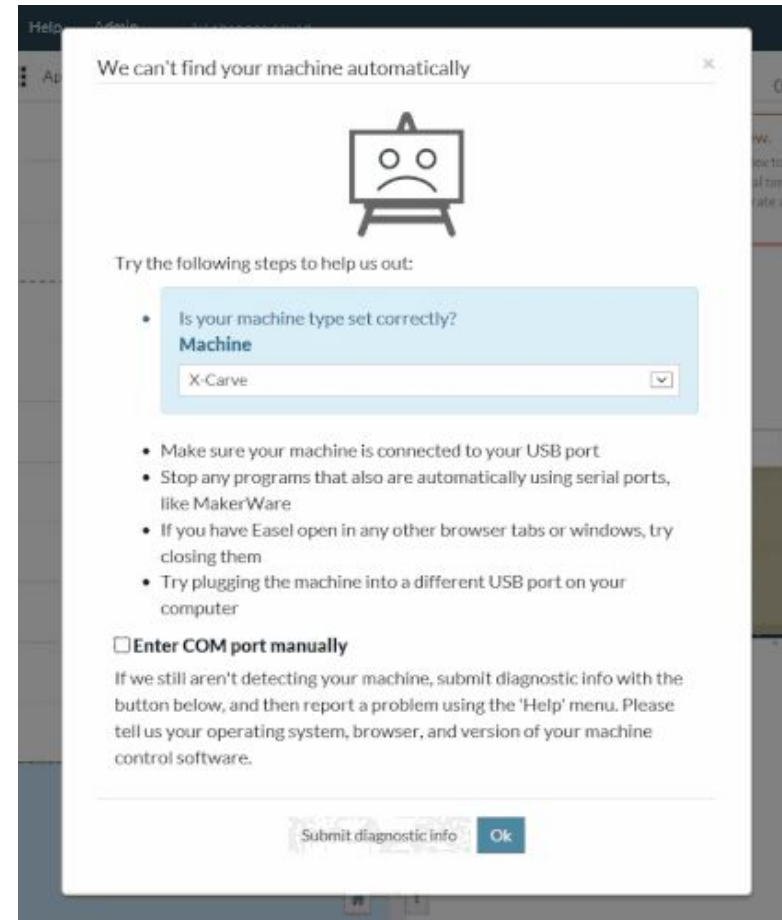
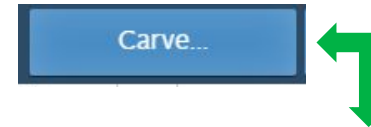
Step 9

→ Enter your COM port if needed

If Easel is unable to find your 3018 automatically:

1. Click on the blue “Carve” button in Easel
2. In the "Easel can't find your machine" window that pops up, check the "Enter COM port manually" box and then enter the port number from the Device Manager. (Check Part 3> Step 2 on how to find your port number)

COM ports change from time to time, so you may have to do this again if you turn off or unplug your machine.



Part 4 Machine Setup

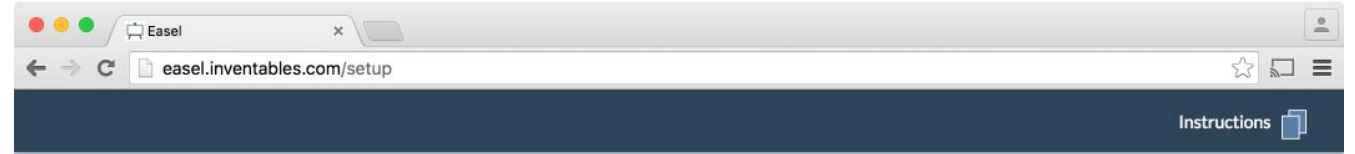
Step 10

→ 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.

		Working correctly?	
X	 	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Y	 	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Z	 	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Continue

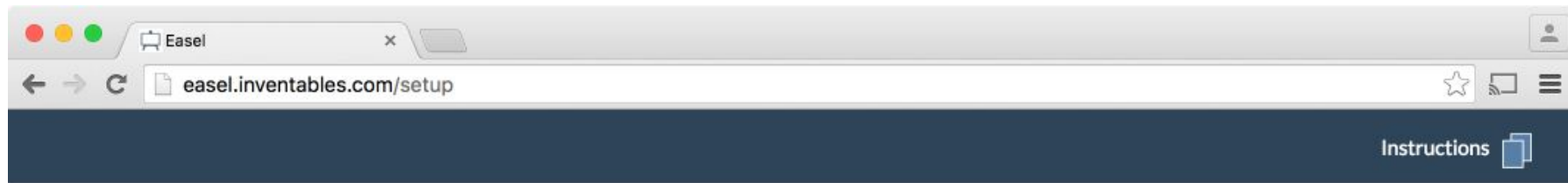
Important Reminder:

The Y axis movement is in reference to the spindle position on the workspace. Clicking the UP button will move the work table *towards* the user; the DOWN button will move the work table *away* from the user.

Part 4 Machine Setup

Step 11

→ **Set your spindle settings:** The 3018 does not have a manual spindle. So, select 'Automatic' for your spindle control preference.



Spindle settings

Should Easel control your spindle automatically or would you prefer to turn it on and off manually?

Spindle control preference

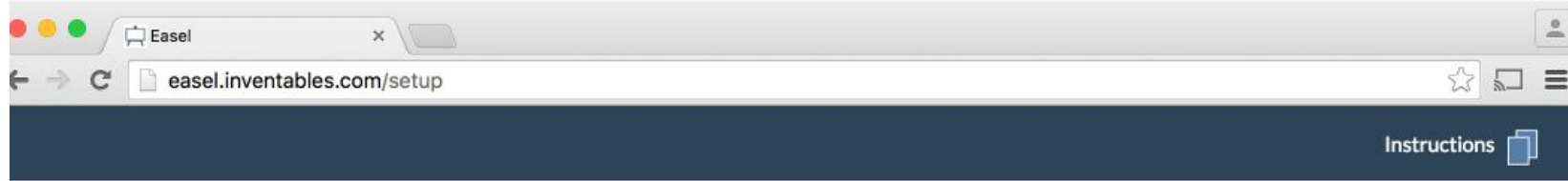
Automatic

Save spindle preference

Part 4 Machine Setup

Step 12

→ **No limit switch setup:** After you confirm your spindle setting, you'll be prompted to enable or disable homing. Our 3018 does not come with limit switches. Click on the blue No, disable homing button.



Limit switch setup

Does your machine have limit switches?

Yes, enable homing

No, disable homing

Part 4 Machine Setup

Step 13

→ **No Z-Probe:** Our 3018 does not a Z-Probe. Click on the red No button.

Do you have a Z-Probe?



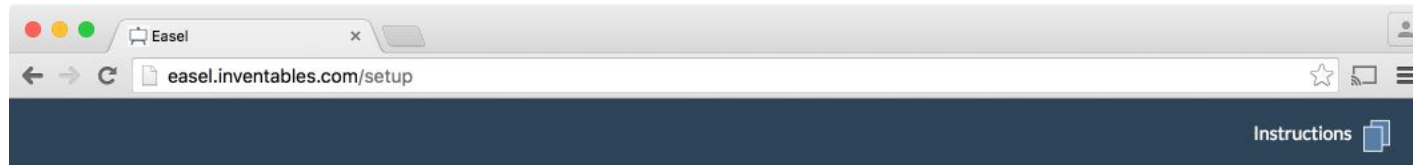
Yes

No

Part 4 Machine Setup

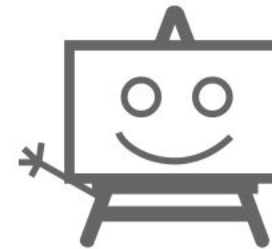
Step 14

→ **Run the test carve:** After setting your machine, you can run a test carve to ensure that the machine is operating properly. Clicking on the green button here will take you to the test carve project itself.



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

Hooray! You finished setting up your machine!



Run the test carve

Part 5 Recommended Settings - Router



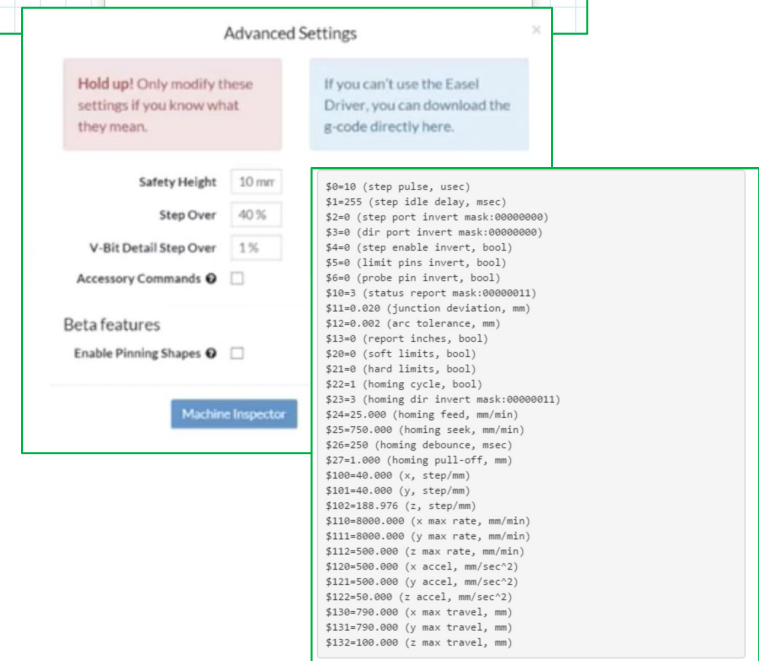
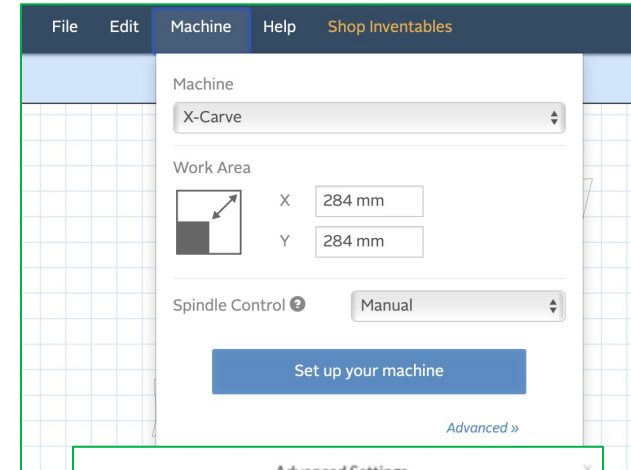
Key GRBL Settings

Intro

The 3018 motherboard has a series of settings on it that allow your machine to work correctly. Some may be wrong (which shouldn't be the case), so you may have to adjust them to take a full advantage of your machine.

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 ^{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.

<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 the same. Because of the standard components that tend to be used, the likely values on a 3018 are going to probably be 800 or 1600. If they are not all the same, then the first step is to send \$101/2/3=800/1600 commands to make them all the same. Now that they are all the same, we suggest a quick visual check by jogging all the axes by 10mm and making sure the distance travelled looks like 10mm.

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

This sets the spindle speed for the maximum 5V PWM pin output. For example, if you want to set 10000rpm at 5V, program \$30=10000. For 255rpm at 5V, program \$30=255. If a program tries to set a higher spindle RPM greater than the \$30 max spindle speed, Grbl will just output the max 5V, since it can't go any faster. It seems to be roughly 8,500 RPM not under load! So we recommend setting \$30=9000 and \$31=0.

\$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, we strongly recommend setting 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=1000, \$111=1000 and \$112=600.

\$13 - Report inches, boolean

Grbl has a real-time positioning reporting feature to provide a user feedback on where the machine is exactly at that time, as well as, parameters for coordinate offsets and probing. By default, it is set to report in mm, but by sending a \$13=1 command, you send this boolean flag to true and these reporting features will now report in inches. \$13=0 to set back to mm. We want to work in mm. So leave \$13 at 0.

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

Step 1

→ **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

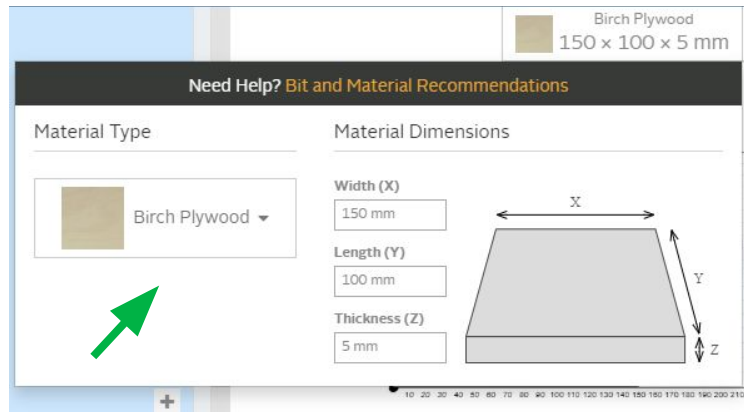
Step 2

→ Material type and Dimensions

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



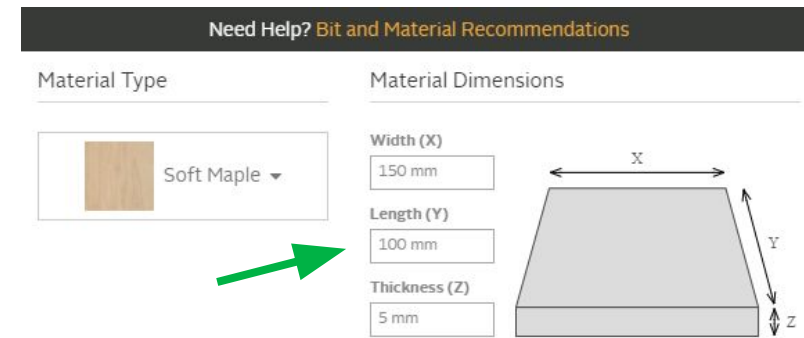
2. Select the material type in Easel



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



4. Enter the Material Dimensions in Easel



Part 5 Recommended Settings - Easel

Step 3




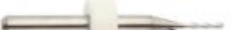






→ Bit settings

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"/>	<input type="button" value="in"/> <input type="button" value="mm"/>

Part 5 Recommended Settings - Easel

Step 4

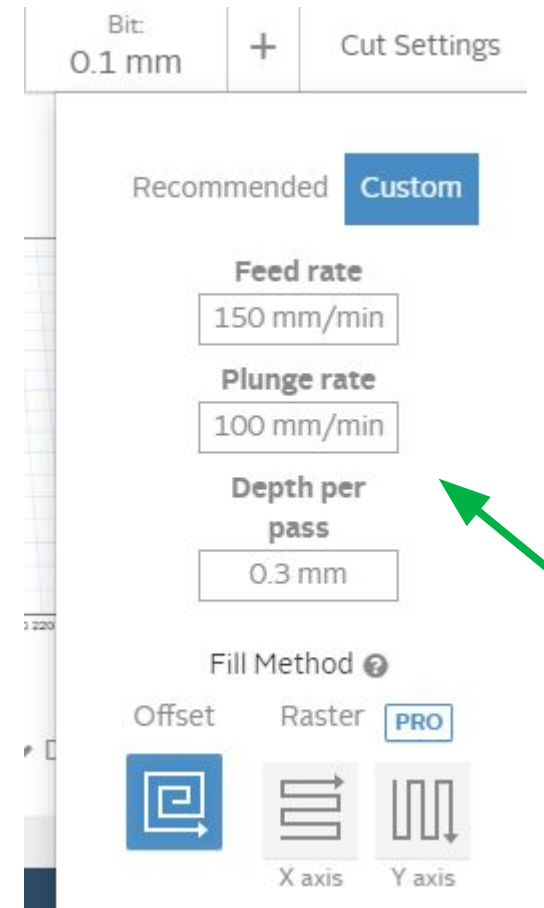
→ Cut settings

7. Use the cut settings we recommend below. This will allow your machine to last longer.

Feed rate (How fast the machine will move the bit through the material when cutting and is critical to get it right for leaving a good quality cut edge): **150 mm/min**

Plunge rate (How fast the bit is driven down into the material when starting a cut. If you make it plunge too fast, it will easily damage the tip of the cutter): **100 mm/min**

Depth per pass (The depth the bit is going into the material per pass or toolpath): **0.2 - 0.4mm**



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 to **low the '\$' acceleration and max rate settings**. This sound is a sign that your steppers are losing steps and not able to keep up due 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

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 3018 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.

Grb1 : 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 aluminium bit which holds the stock with slots in it to allow clamps to hold the stock down.

Part 7 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.

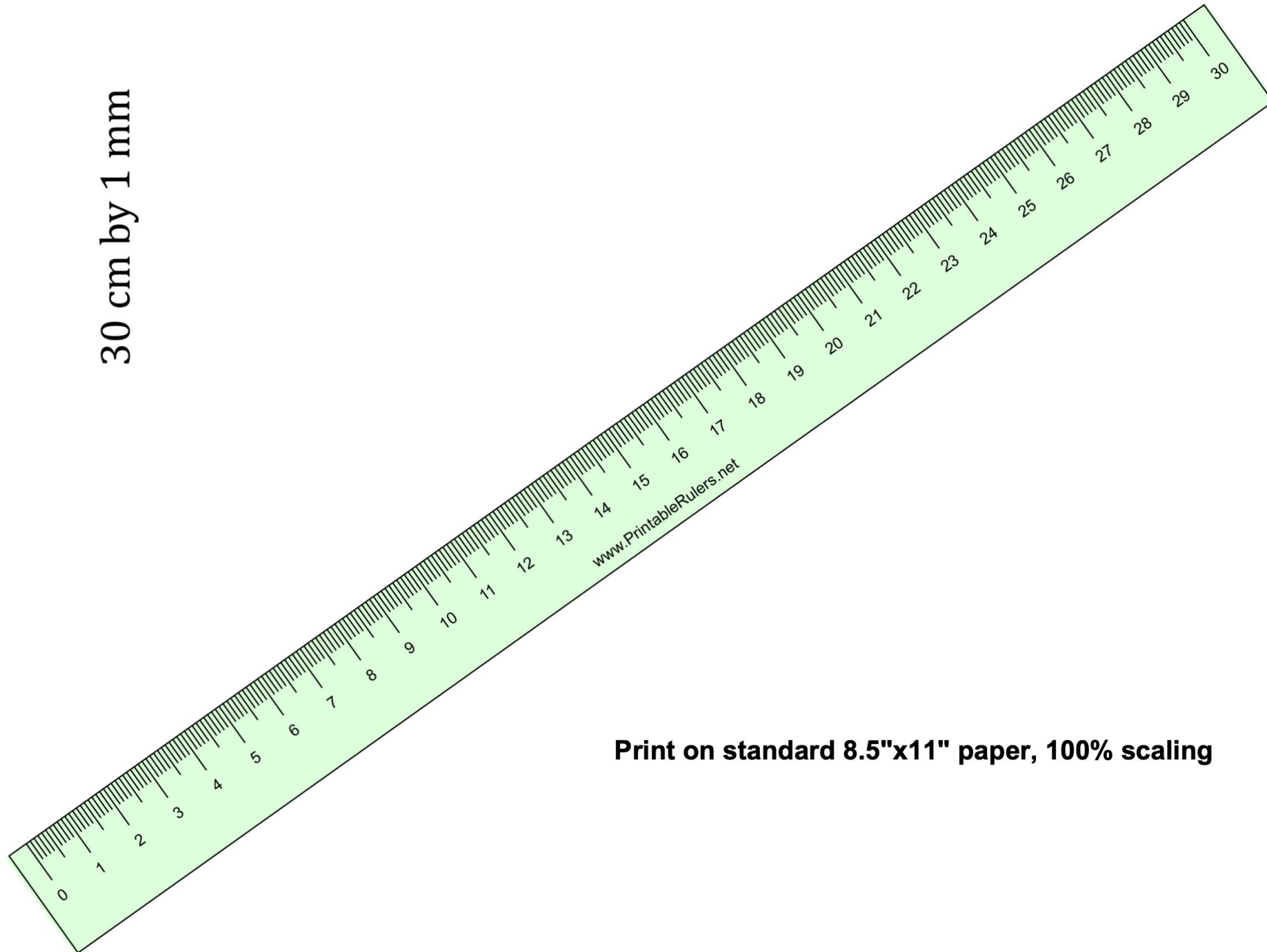
Flute: A cutting edge at the end of the bit.

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. Not included in the 3018.

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 round this by telling your 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.

30 cm by 1 mm



Print on standard 8.5"x11" paper, 100% scaling



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