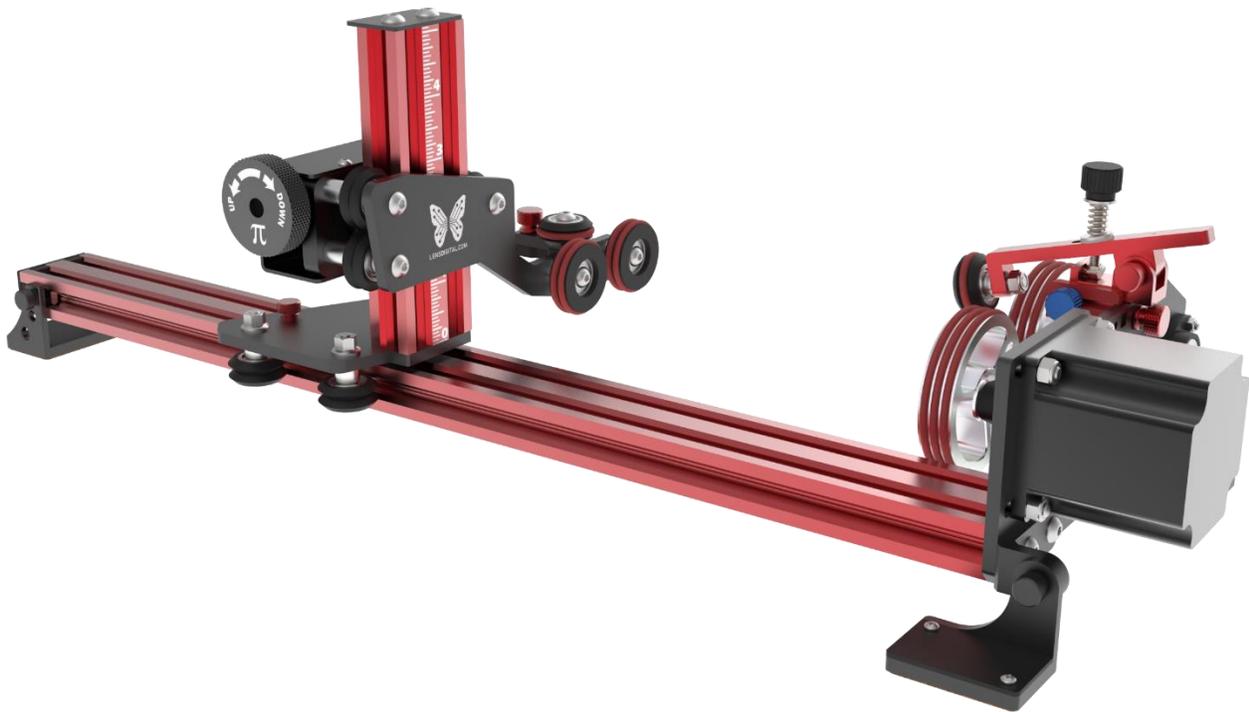


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# PIBURN LASER ROTARY ATTACHMENT V4.0

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## User Manual



Updated: July 7, 2023 ( get latest version at: <http://piburn.info/manual> )

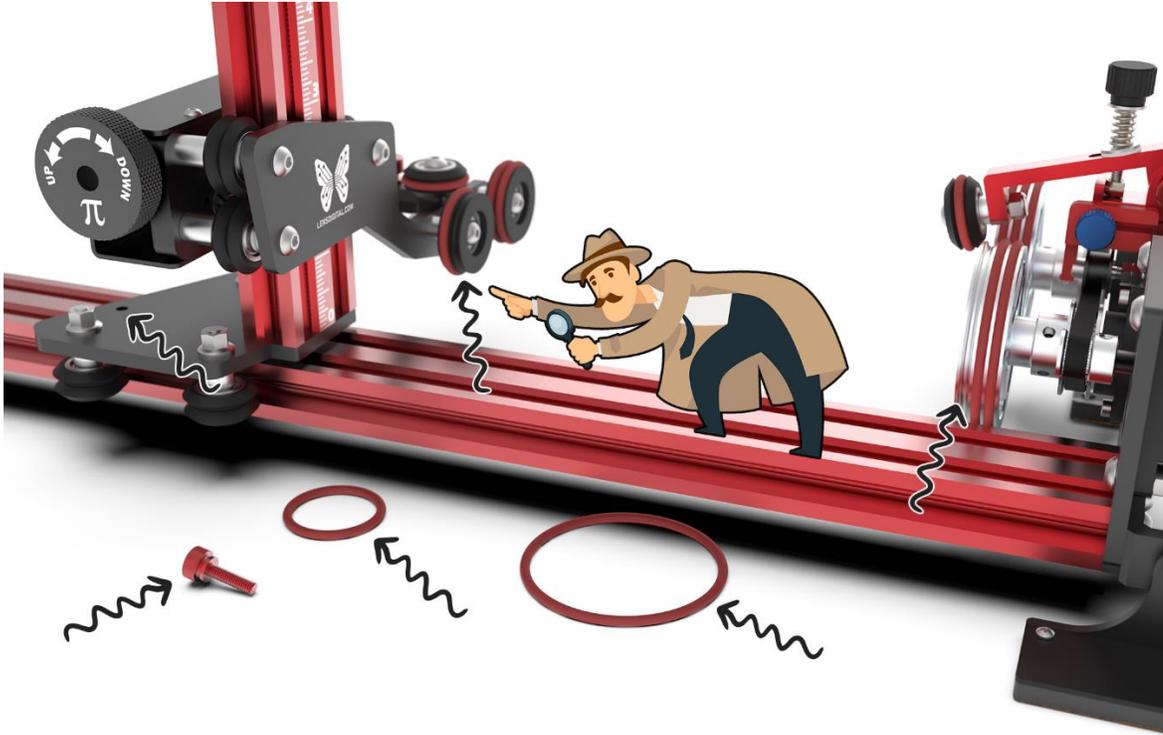
Note: PiBurn is a rotary attachment for laser cutters engravers that allows you to engrave cylindrical objects.

It's meant to temporary replace your Y-Axis and will work with most Ruida type controllers.

*Note: Due to constant improvements to the design your PiBurn might look slightly different from the one pictured in this guide.*

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## What's new in 4.0

In version 4.0 PiBurn has undergone some incremental changes. PiBurn 3.0 was a huge improvement over previous version and it's still to this day an amazing and versatile rotary. It wasn't easy but we managed to make some improvements and released this new version 4.0 (patent pending):

- An improved self-locking lift mechanism for even better precision. We eliminated need for stopper thumb screw as now tailstock piece stays in its last position automatically. It won't drop or lower under engraving object's weight!
- Lower profile! The lift handle is now on the side, not on the top of the vertical tower, so you don't have to worry about crashes
- Now, the back wheels move even LOWER to allow for oversized objects and odd-shaped wine glasses
- We now have an engraved ruler on the back rail for extreme repeatability and quick setup
- Even sturdier design
- New styling and color scheme. This is the hottest looking rotary on the market!

# Main Diagram



Figure 1. Front View

1. Headboard
2. Front Rollers/Wheels
3. Clamp
4. Motor Pulley
5. Magnetic Front Foot
6. Footboard
7. Clamp Lock Screw
8. V-Wheels
9. Eccentric Spacer
10. Carriage
11. Vertical V-slot rail
12. Horizontal V-slot rail
13. Magnetic Back Foot
14. Carriage Lock Thumbscrew
15. Vertical Adjustment Hand Wheel
16. Back End-stop Wheel
17. Back End-Stop Lock thumb screw
18. Back End-Stop platform
19. V-slot rail cap

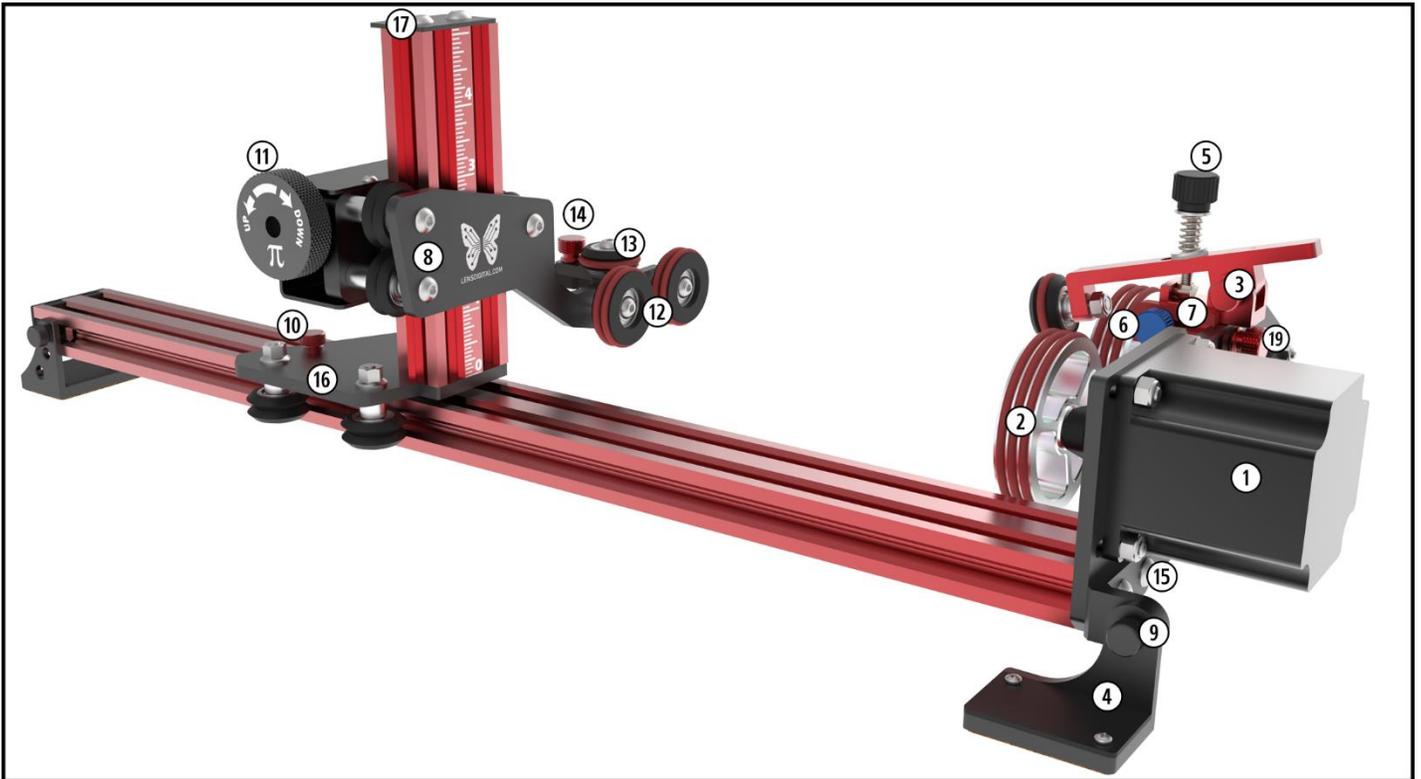


Figure 2. Back View

- |   |   |
|---|---|
| <b>1.</b> Motor (on Headboard)                    | <b>11.</b> Vertical Adjustment Hand Wheel         |
| <b>2.</b> Front Rollers/Wheels                    | <b>12.</b> Back Rollers/Wheels                    |
| <b>3.</b> Clamp                                   | <b>13.</b> Back End-stop Wheel                    |
| <b>4.</b> Magnetic front foot                     | <b>14.</b> Back End-Stop Lock thumb screw         |
| <b>5.</b> Clamp Tension Screw                     | <b>15.</b> Headboard Attachment/Adjustment screws |
| <b>6.</b> Front end-stop lock screw               | <b>16.</b> Carriage                               |
| <b>7.</b> Front end-stop                          | <b>17.</b> Top Plate                              |
| <b>8.</b> Footboard                               | <b>19.</b> Clamp Attachment Thumb Screw           |
| <b>9.</b> Mag Foot lock thumb screw               |   |
| <b>10.</b> Horizontal Adjustment lock thumb screw |   |

# Dimensions

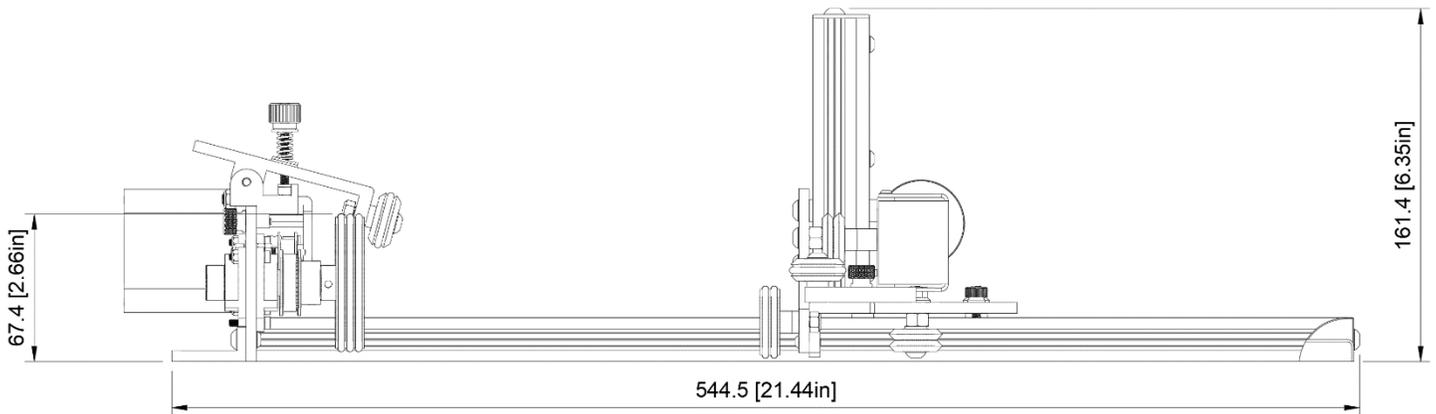


Figure 3 Standard Version Length Dimensions

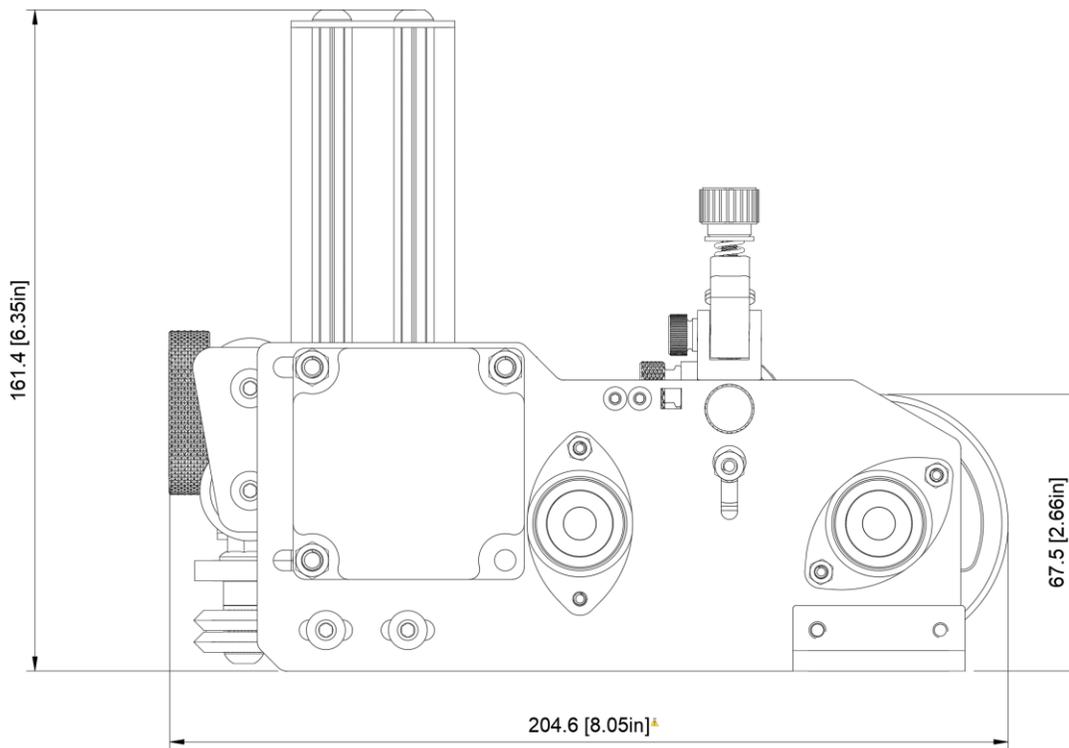


Figure 4. Dimensions from Front/Back

*Technical Drawings above show PiBurn 4.0 with “simple” feet. Magnetic Feet upgrade adds about 20mm (0.79 in) to the rotary height, but they can be folded and removed when needed.*

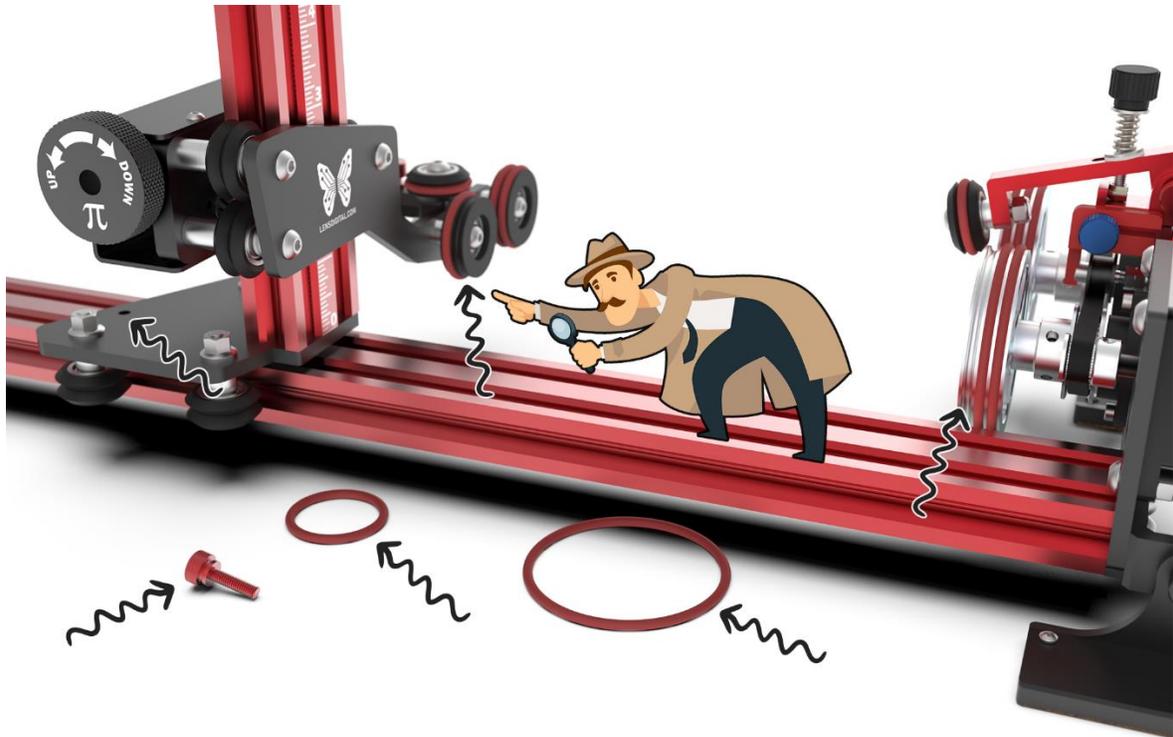
PiBurn comes in two lengths to accommodate different laser bed sizes.

Total length of Standard PiBurn is 563 mm (22.17 in), and a “MINI” (i.e. for Boss LS-1416) is 397 mm (15.61 in).

*Main V-slot rail can be cut to desired size on various saws.*

Maximum height of PiBurn is 162 mm (6.35 inches) with “simple” low profile feet. Distance from bottom of the floor to top of front wheels is 67.5mm (2.66 in).

## Before Using your PiBurn: Check for the Loose Items!



We triple check that everything is installed before packaging your PiBurn, however due to the nature of expanding foam packaging it's very common for red silicone O-rings to slip off the wheels, especially when you remove PiBurn from the box.

So, first thing you should do is look at two large front wheels and two smaller back wheels/rollers. Front wheels should have 3 large O-rings on each one and back wheels should have two smaller O-rings on each one. If you see one or more missing, immediately check inside box, packaging and in the area where you unpacked your PiBurn. It is less common, but occasionally Big Red stopper (size M4x12mm) Thumb Screw can also fall out due to extreme vibrations during shipping (especially for international destinations). Also check for "back stopper with wheel". If you don't see it attached, it's either fell off during shipping or was included separate in bubble bag that has flyer and various tools.



## Chapter I: Installation

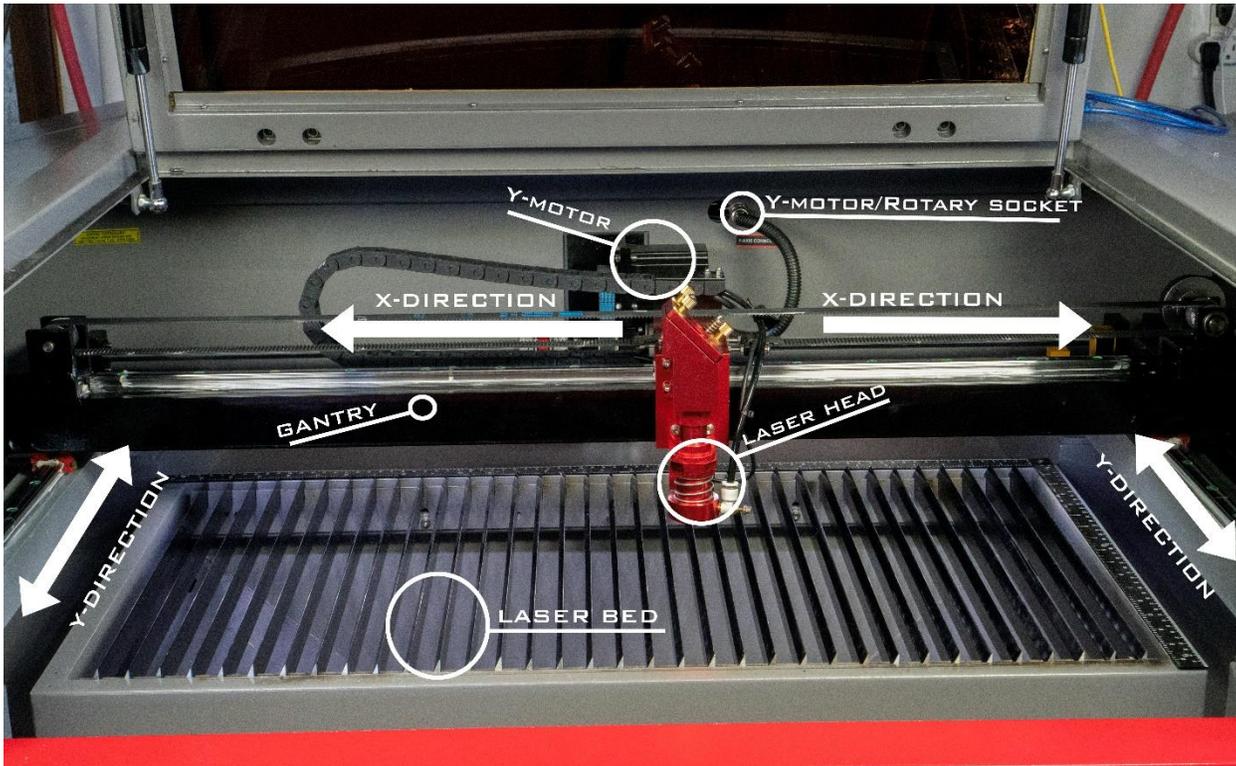


Figure 5. Laser Overview

### Plug in PiBurn to your machine

NOTE: Different laser machines have different ways of connecting rotary attachment. Some (i.e. Boss Lasers made after 2020, Aeon Mira/Nova, Thunder laser) have dedicated rotary port and either manual switch or automatic relay to enable it. In machines that don't have dedicated rotary port (i.e. Boss Laser made before 2020, OMTech and other generic), usually you will unplug your Y axis motor and plug in rotary instead.

### *For Machines without dedicated Rotary Port:*

1. Locate Y-Axis plug. This is where your Y-motor is plugged in. Usually it's located in the "work chamber" and easily accessible once you lift main machine cover. On Boss Laser machines plug is located towards back



Figure 6. Y-Axis Connector

2. Lower your bed so PiBurn can easily fit under laser nozzle
3. We also recommend that you move your laser head to the top right corner (or whenever your normal homing position is) via control panel arrows and save position (i.e. "Origin" button on control panel) before turning machine off. It's safer this way because laser head tends to move very fast to the position it was in last before machine was powered down. It can injure or surprise you when it does that.
4. Finally power down machine.

### *For Machines with Dedicated Rotary Port:*

1. Power on your laser and let it auto home.
2. Locate Rotary port (note on some machines (i.e. Aeon Mira) you might have to lower z table to gain access to this port and plug in Rotary)
3. If your laser machine have Rotary switch, switch it to the rotary position.

## Install PiBurn

(see note for Thunder Laser)

1. When physically placing PiBurn insides laser you have 3 options:
  - a. Place it On top of Honeycomb Table
  - b. Place it on the "knife blades"
  - c. Place it directly on laser floor

If you have enough headroom space you can place PiBurn directly on the honeycomb table. For PiBurn with Magnetic Feet, it's best to use honeycomb made out of ferrous metal (i.e. NOT aluminum). However if you have aluminum table magnetic feet will still provide added benefit due to their cork pads.

You can also place PiBurn directly on its feet on top of your knife blades or honeycomb table. If you have magnetic feet and folded them for extra space or if your blades are too wide to accommodate magnetic feet size, you will need to place it on some flat piece of material like plywood or acrylic. PiBurn with simple feet can be also screwed into wooden surface for extra stability and you can even cut exact size plywood piece that can be placed against edge of your laser machine, thus giving exact alignment to the laser gantry.

When engraving larger objects, and if your laser machine allows, you can remove knife blades place rotary directly on

the laser bed. If your laser bed has sloping walls, you can adjust angle of magnetic feet and attach it to those walls. Please clean your walls first so feet have more grip.

2. Plug in your rotary as described above.
3. Carefully arrange wire, PiBurn and supporting platform so it doesn't interfere with laser bed going up or down. We don't want wire to get pinched between moving parts.
4. Turn on your machine (if it wasn't on already).

### *Homing Machine with Rotary Attachment*

When you turn on your laser it needs to go perform a "homing" sequence, so it knows where it's start position is. This usually involves moving of the gantry and laser head into top right (or left on same machines) corner until it reaches end-stop limit switch. Then laser will move a little away from the limit switch and then back. Upon completion of the homing sequence laser head and gantry will want to move rapidly to the last know position where it was when you turned off the laser.

In many laser machines when you plug in rotary you are disabling Y gantry motor, so it won't be able to reach limit switch. In case like that you will need to move gantry by hand to simulate normal homing sequence. But sometimes you can't move gantry because its motor is still under power. In that case you should only plug in rotary after machine finished homing sequence.

To home gantry by hand, push whole gantry all the way back to trigger Y-axis limit switch.



Figure 7. Pushing Gantry

- You'll notice that rollers on the PiBurn will start rotating to the opposite direction after you reach limit switch. That's because laser wants to move gantry back a little.
- Pull gantry towards yourself just a bit so it disengages limit switch and finally push it all the way back again.

At this point you manually finished performing initialization process that machine usually does automatically when Y-axis plugged int and it should all be set to continue with software setup part.

#### **Note for Thunder Laser Owners:**

**You will not be able to move your gantry by hand, because Y motor is always powered on. Thus, you need to position gantry using arrow keys above rotary.**

## Chapter II: Main Software Settings

To correctly configure your PiBurn with laser machine you will need to determine 2 settings.

First setting is “**Diameter (mm)**”. This one is easy; it’s always going to around **62-63 mm** no matter what object your engraving. Diameter refers to diameter of the front rollers of the PiBurn.

Second setting “**Steps Per Rotation** (a.k.a. **Circle Pulse**”) is a little bit trickier. This number tells your laser machine how many pulses/steps it needs to send to rotary’s motor to perform full 360-degree rotation. Or in practical terms it controls how far your engraving object is rotated. If you set this number incorrectly your engravings will be either squished or elongated. This number depends on the how your laser engraver was setup at factory.

Known “Steps Per Rotation” Values:

For Boss Laser LS/HP-1630s, 2436s & 3655s value is: **12,500**

Boss Laser LS1420/1416 value is: **6,000 (sometimes 8,000)**

AEON Mira 7/9 and Nova value is: **25,000**

Thunder Laser Nova: **8,000**

OMTech: **5,000 (some 12,500)**

For all others, it must be determined by looking at Stepper Driver DIP switches, as described below. **DO NOT CHANGE DIP SWITCH POSITION!** Only note them.

### **WARNING!**

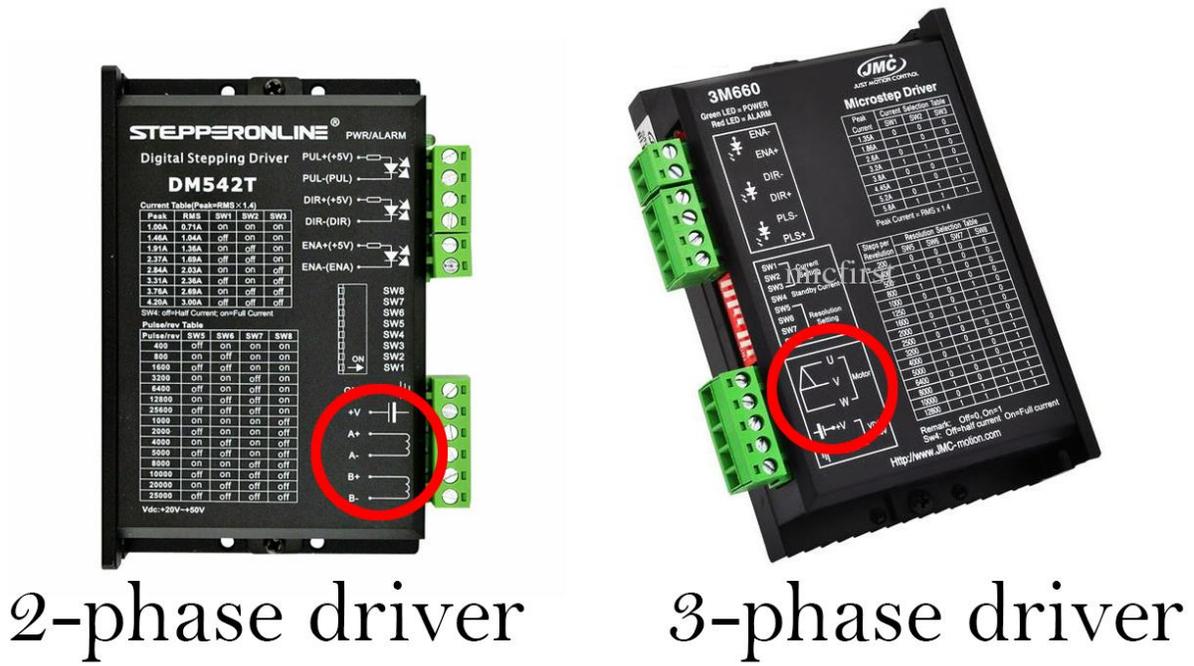
Your machine must be completely powered off, unplugged and discharged because you will have to go inside electronics compartment to visually inspect some switch settings.

1. Open door that leads you to the internal electronics compartment. On Boss 1630 series it’s located in the back of the machine.



Figure 8. Door to electronics

2. Locate Stepper Motor Driver that controls your Y motor. Stepper Driver looks similar one on the picture below.



2-phase driver

3-phase driver

Figure 9

3. There will be 2 or 3 of them inside your machine. One for X motor, one of Y motor and one for Z axis (if your machine equipped with motorized table). Y and X drivers should be identical to each other.

Here's what it looks like inside Boss Laser LS-1630 machine (notice drivers are labeled):

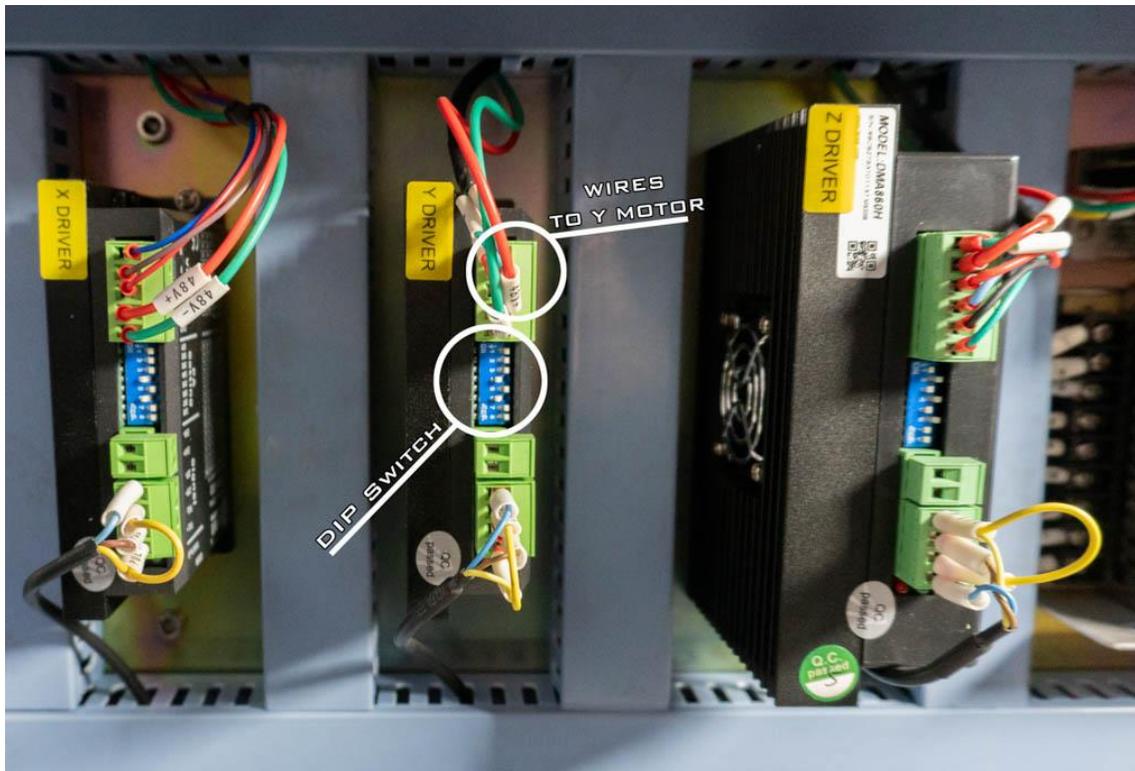


Figure 10. Stepper Drivers inside Boss Laser

4. If yours are not labeled try tracing wires from the plug where your motor was plugged in (and where we now connected PiBurn rotary).

5. Write down (or take photo) of:
  - a. **Make and Model Number** of the you **Stepper Driver**
  - b. Position of **“DIP” switches**. These are tiny switches on the back of the motor driver that can be flipped up or down. There’s about 6-8 of them. Please refer to *Figure 8. Stepper Drivers inside Boss Laser*
6. Find out to how many **“Pulse/Rev”** (Pulses per Revolution) is your Y driver set to.  
 Position of **DIP switches** determines **“Pulse/Rev”** setting.  
 Many stepper drivers will have **“Pulse/Rev”** table printed on them (see *Figure 9. Close look at stepper driver*). If yours doesn’t, search online and download manual for your stepper driver model. In the manual find **“Pulse/Rev”** table.  
 Let’s look at example below:

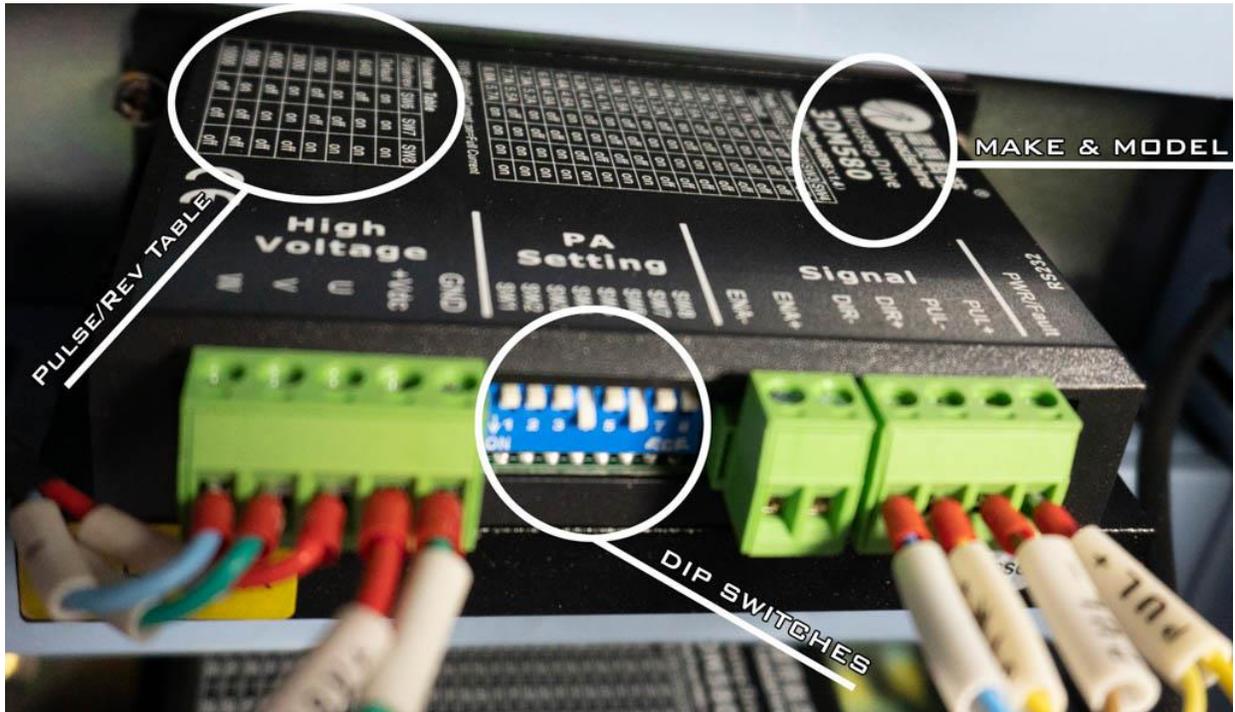


Figure 11. Close look at stepper driver

There are 8 **DIP switches** on this driver SW1 - SW8. Switches 4 (SW4) and 6 (SW6) are turned on (flipped down) while rest are off (flipped up).

This driver happens to have **Pulse/Rev** Table printed on it so we don’t really need to know its manufacturer and model (no need to look at the manual).

Table refers only to SW6, SW7 and SW8 positions. In our case **SW6** is **ON**, **SW7** and **SW8** are **OFF**.

This combination shows that our **Pulse/rev** value is **5000**. That’s the one you need to know for next step.

7. To find **“Steps Per Rotation”** setting take **“Pulse/Rev”** value (from previous step) and **multiply by 2.5** (that’s the gear ratio of PiBurn if you are curious).

For example if your **Pulse/Rev = 5000**, your **Steps Per Rotation** will be:  $5000 * 2.5 = 12,500$

## Chapter III: Configuring Software

Now that we know Diameter and Steps Per Rotation values let's use RDWorks or LightBurn to configure your laser to use PiBurn.

1. Make sure your PiBurn is installed and plugged-in inside your laser engraver.
2. Turn on Laser machine and manually home-in Y axis
3. Connect your machine to the computer running RDWorks or Lightburn. Use either USB cable or network connection.
4. If you are using RDWorks (or LaserWorks which is same software)
  - a. Navigate to **User** tab and press "**Read**" button. If you don't see Read/Write buttons, resize window (drag border) down until it appears

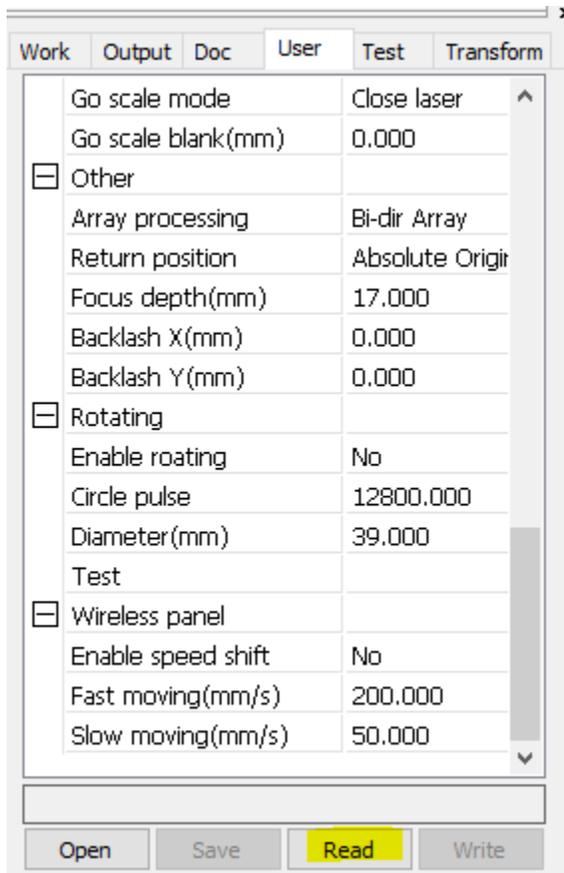


Figure 12

- b. Scroll down until you see "**Rotating**" section (note in newer versions of RDWorks, **User** tab is separated into 3 sections. If you don't see "**Rotating**" option, click on "**Other**" radio button on top).
- c. Change "**Enable Rotating**" to "**Yes**"
- d. Enter "**Circle Pulse**" (a.k.a. **Steps Per Rotation**) value you determined from previous chapter.
- e. Enter "**Diameter(mm)**" to be **63**
- f. Click "**Write**" button

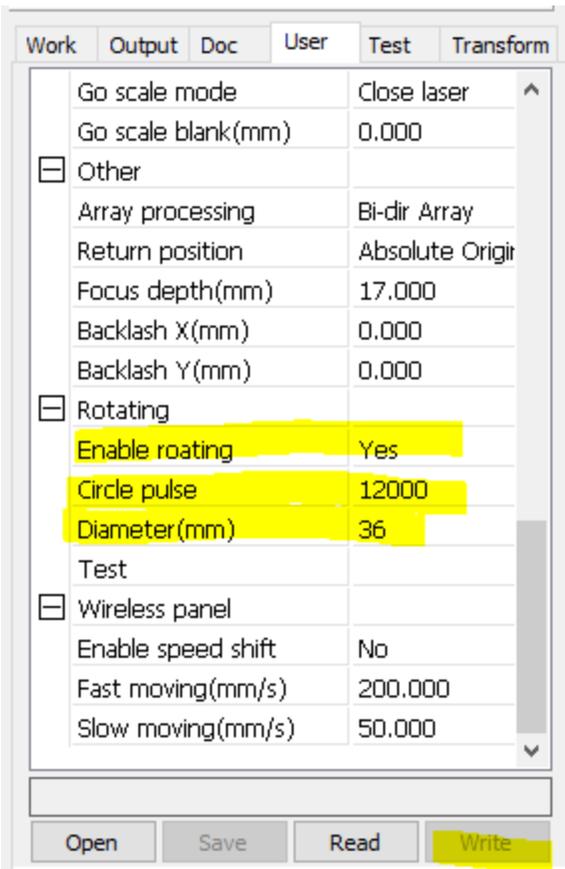


Figure 13

5. If you are using Lightburn, start it and go to “Tools” menu and select “Rotary Setup”
  - a. Change Rotary Type to “Roller”
  - b. Click on “Enable Rotary” switch to make it green.
  - c. Rotary Axes should be set to “Y axis” (for Thunder it will be “A Axis”)
  - d. Change “Steps Per Rotation” to a value you determined from previous chapter
  - e. Set “Roller Diameter” to 62 or 63 mm (due to slight variations in rubber O-rings this value might differ for your specific rotary by about a millimeter).
  - f. Disregard “Object Diameter” and “Circumference” values, they do not affect anything

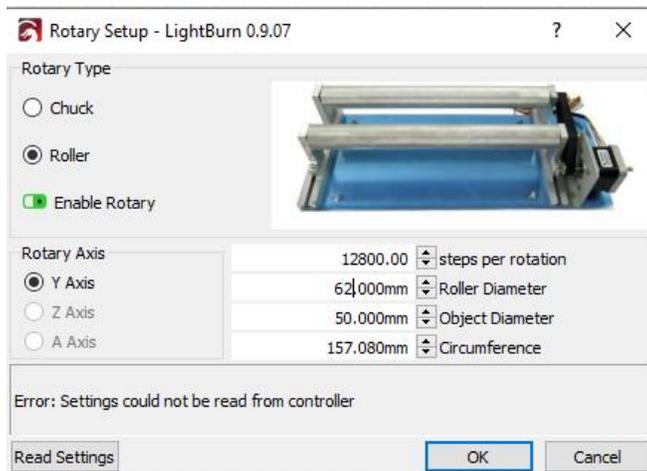


Figure 14. Lightburn Rotary Setup

## 6. Lower idle and acceleration speed.

While this is not absolutely required, we strongly suggest your lower and acceleration speeds when using rotary attachment. That's the speed at which head moves between cut movements. When cutting or engraving flat materials you might have noticed that laser moves at the speed that you entered when it's firing, but when it's done with cutting/engraving it will move very fast to starting position. Rotary attachment is not meant to be rotated this fast and might cause object that you are engraving to fly off it after engraving is done or when doing "frame" operation.

**To access parameters in Lightroom Open "Machine Settings "from "Edit" menu.** In RDWorks these can be found under "User" Tab.

That's why it's highly recommended to lower this value when using rotary. Please do write down default values first, so you can change back them when not using rotary. You can backup all the default settings by hitting Read button and then **Save** Button and store this file on your computer.

Change following values:

- a. Set "Idle Speed(mm/s)" to 30
- b. Set "Idle Acc(mm/s<sup>2</sup>)" to 30
- c. Set "Min Acc(mm/s<sup>2</sup>)" to 20
- d. Set "Max Acc(mm/s<sup>2</sup>)" to 30.

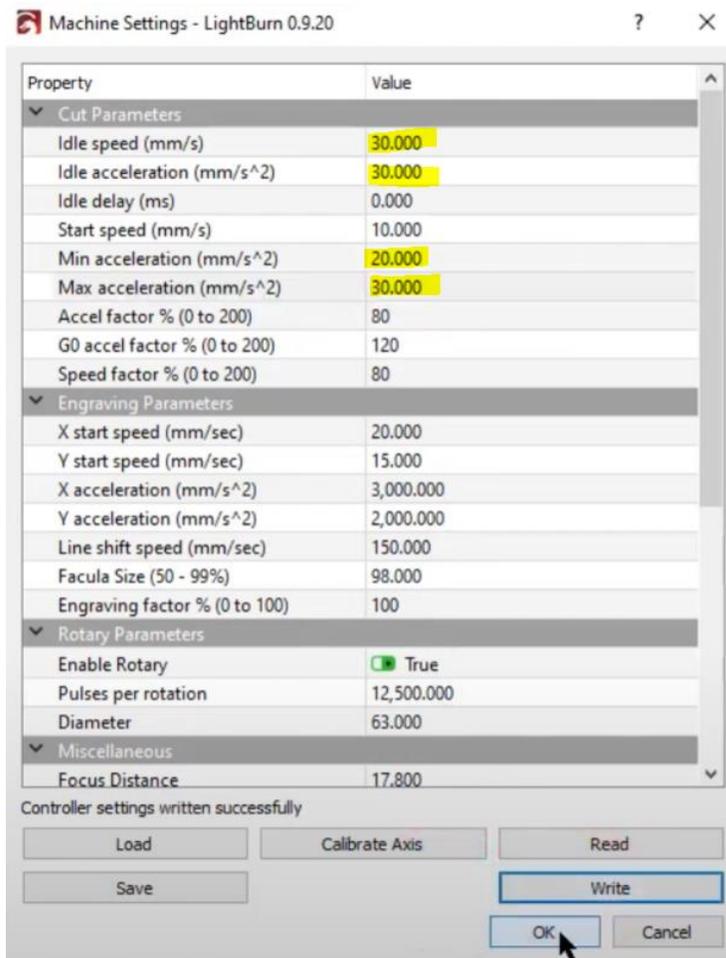
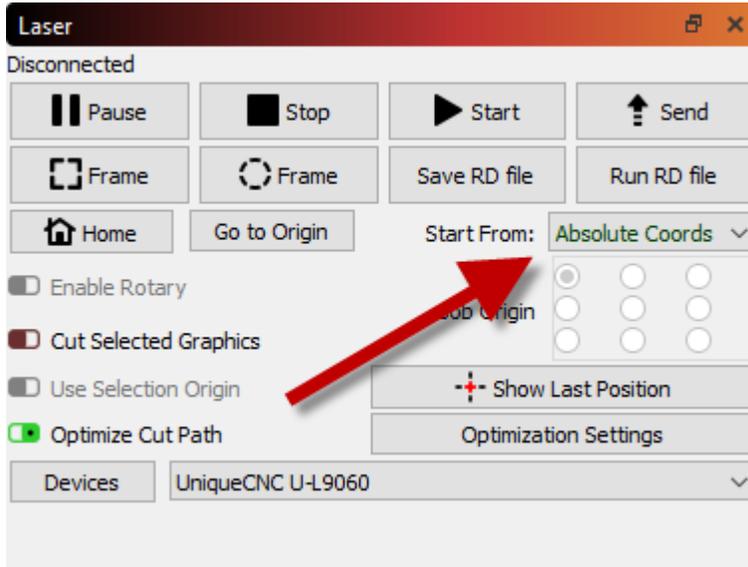


Figure 15. Speed Settings

These are just suggested values, and you might have to adjust them according to your machine.

7. Special Note about Thunder laser. Thunder Lasers use custom firmware for their controller. In order for PiBurn rotary to work with these machines, you have to change Origin in Lightburn to anything OTHER THAN “**Absolute Coordinates**”. This is very important! With Absolute Coordinates selected Y gantry will move instead of Rotary turning.



## Chapter IV: Fine Tuning and Testing

Now we can finally start some testing! If your laser has beam combiner built in (i.e. red pointer laser dot) you don't even need to fire actual laser until you tuned in correct setting!

Find a cylindrical object you want to test.

Actual tumbler would be a good choice. Wrap some masking or painter's tape across it's top, since you'll be using marker or pencil to write on it.

**Note:** We will be working in **metric** scale, but feel free to convert to **imperial** if your Laser software is set to that.

Mark short horizontal line at starting position anywhere near the top of the object. Cut piece of string 100 mm long, put one end of it near mark you made, wrap it around cylinder and mark another short horizontal line where string ends.

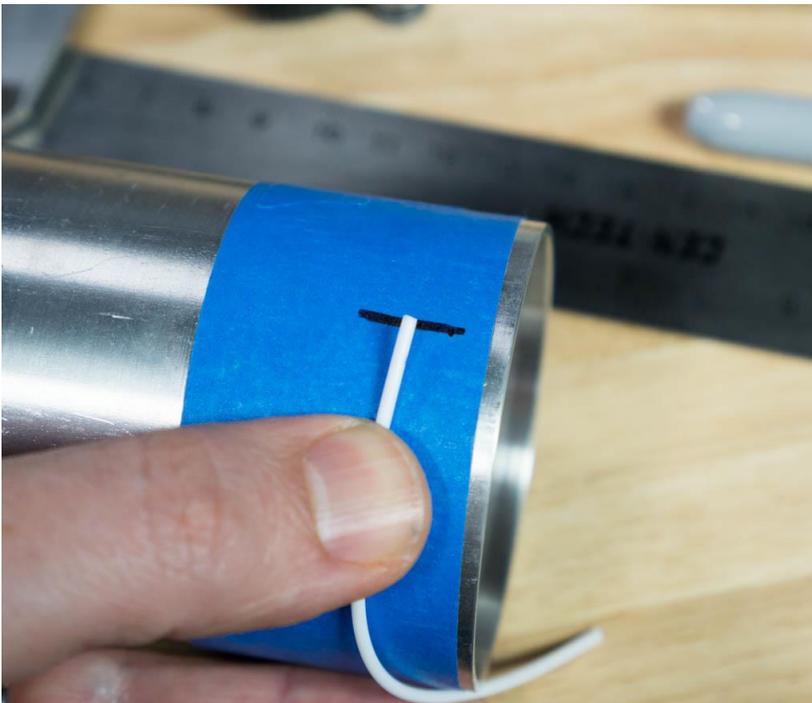
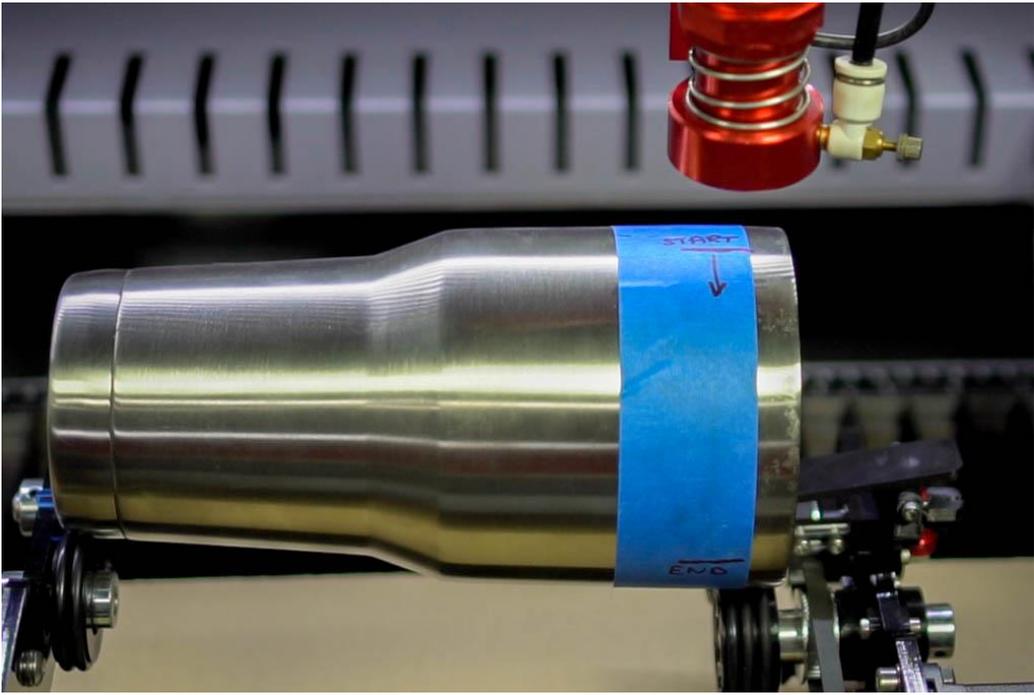


Figure 16. Mark distance with string

You should have exactly **100 mm** between start and end lines.



Open **RDWorks** or LightBurn and create a square shape or just a vertical line.  
Make sure that little “padlock” icon is “unlocked”.  
Change square’s width to about 10 mm and length to 100 mm (exactly).

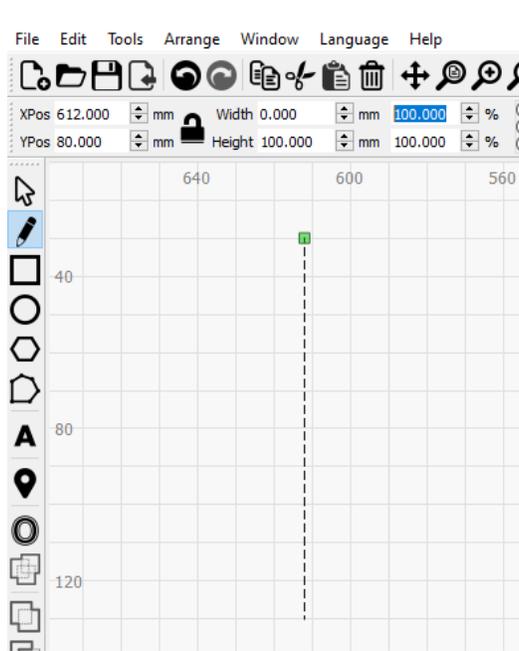
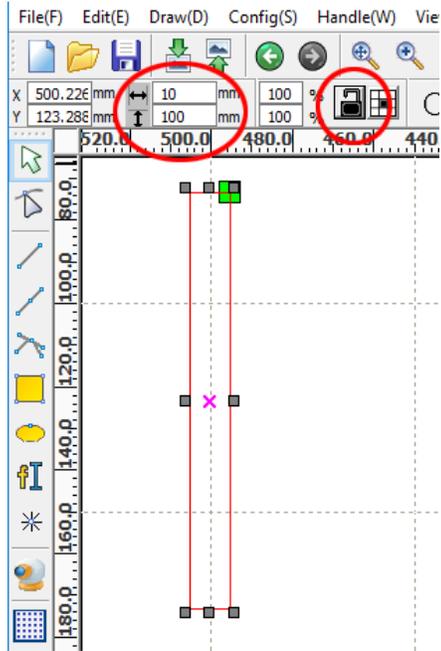


Figure 17. Shape in RDWorks

Figure 18. Create shape in Lightburn

In layer settings change power to 1% (we don’t want laser to fire), and speed to 20mm/sec. Upload this file to your laser machine, let’s name it “square”.

At laser machine's control panel change default speed to 20mm/sec (press "Speed" button).

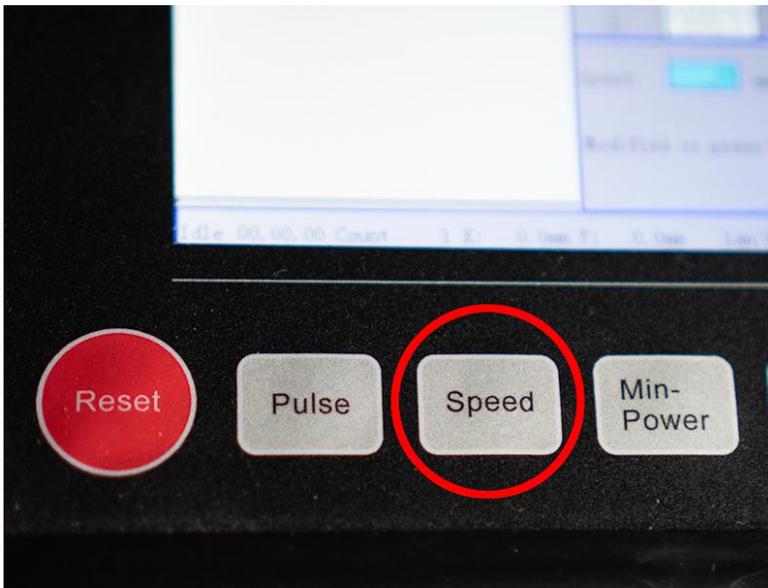


Figure 19. Speed Button

Insert your test object into PiBurn, adjust rollers for correct length and height and use clamp.

*See Chapter V: Basic Operation if you unsure how to do this.*

Move Y gantry by hand until it's directly above PiBurn. Move laser head in X direction using left/right arrows on control panel to position it above first mark. You might need to rotate object using up/down arrows on control panel. Hit "Origin" button.

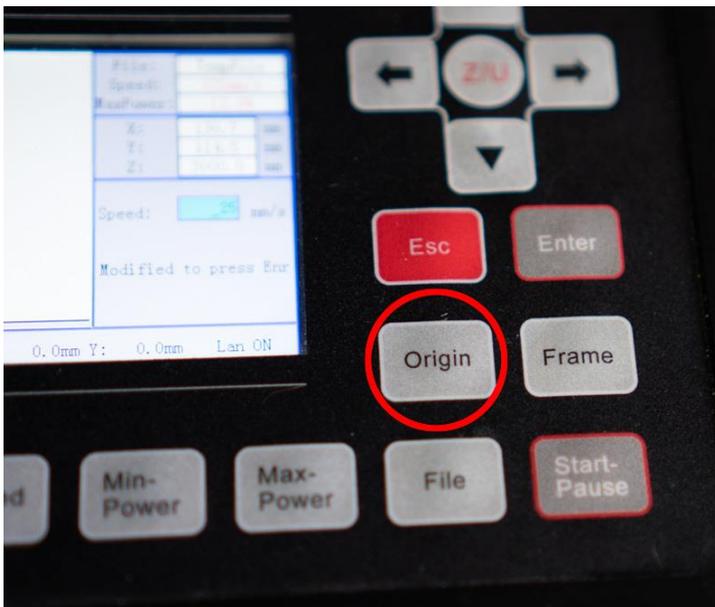


Figure 20. Origin Button

Move laser bed up or down to approximate focal distance. Doesn't really matter as long as you can see laser dot on the object clearly.

Load "square" file and press "Frame" button.

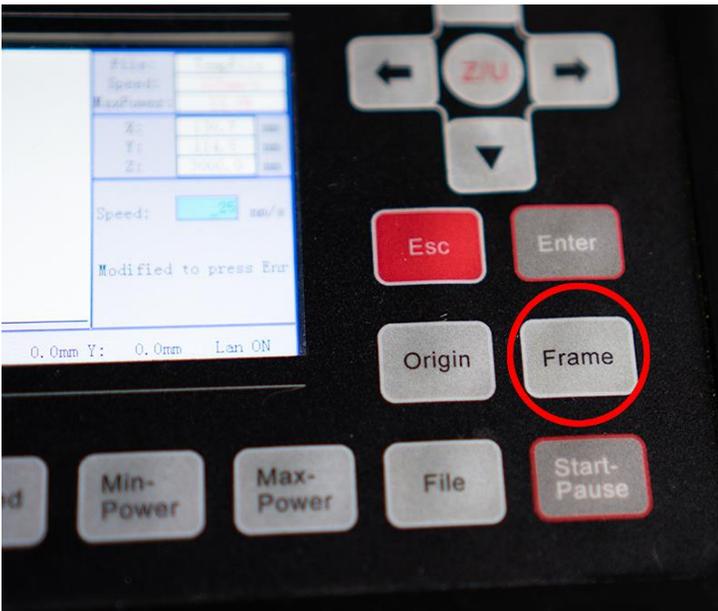


Figure 21. Frame Button

PiBurn will rotate object in one direction, and then back. Note up to which point it stopped before returning to original position. If it went right up to the second mark, you are all set! Otherwise follow these steps:

1. If laser didn't reach end mark you will need to decrease "**diameter (mm)**" number. Increase it depending on how short it stopped to the mark. Follow guide in "Chapter III: Configuring Software" to adjust this value. No need to turn off or restart machine between these changes.
2. If laser went past end mark, you'll need to increase "**diameter (mm)**" number.
3. Finally save new setting and try "**Frame**" again.
4. Adjust again as needed until it stops right at the end mark.

TIP: You can also adjust "**Steps Per Rotation**" value instead of **diameter**, which might give you finer adjustment

What if your machine doesn't have red "pointer" laser (beam combiner)? In this case you will need to actually burn in the line on the object. Adjust power of the line layer to the minimal at which your laser will fire. You only want to see where it ends up...

# Chapter V: Basic Operations

Assuming that you already setup your machine to work with PiBurn and connected rotary attachment here are basic operation guides.

*Note: Due to constant improvements to the design your PiBurn might look slightly different from the one pictured below.*

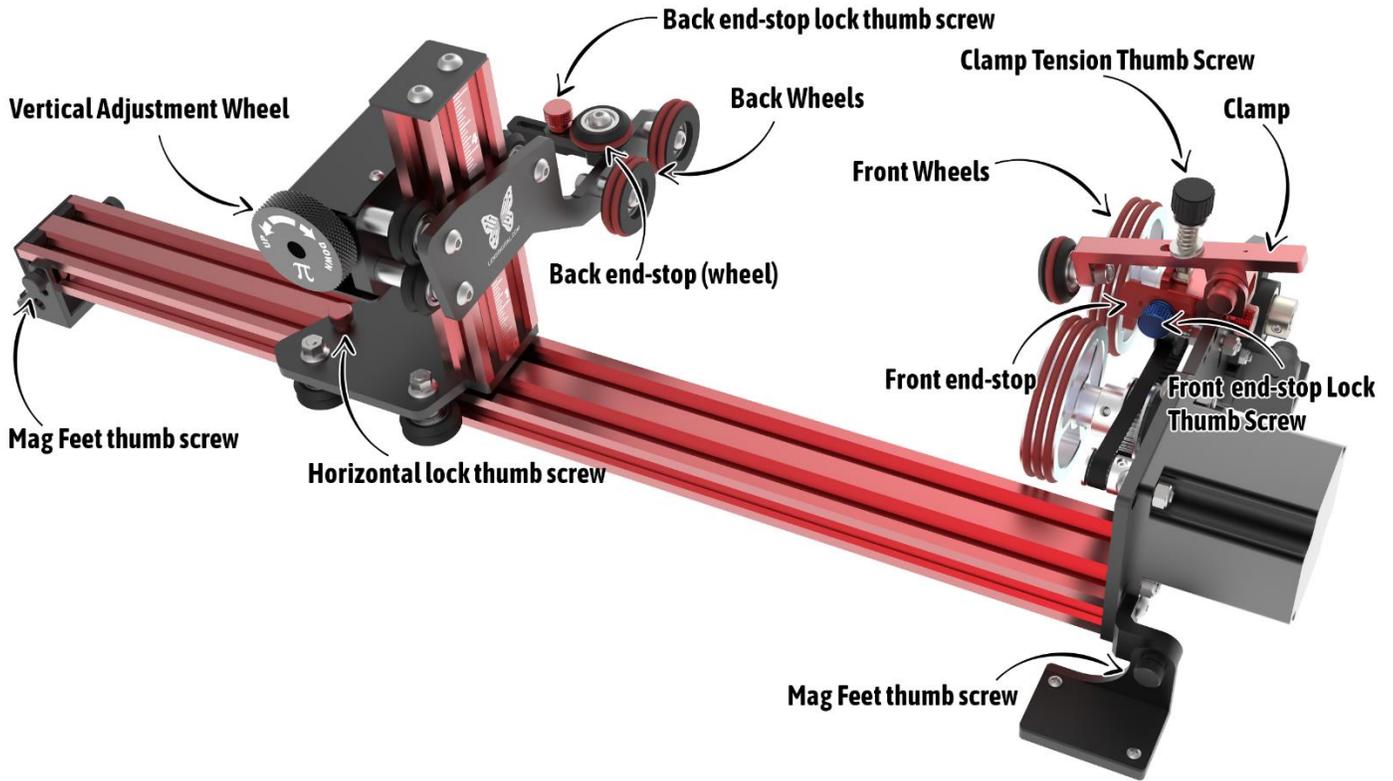


Figure 22. Rotary Overview

## Loading/Unloading object

1. Remove lid from the object so you can fit clamp inside it. If it's impossible to use clamp, remove clamp arm and set aside (*see Clamp Operation*)
2. Loosen-up horizontal lock thumb screw so back wheels carriage can slide back and forth freely.
3. Loosen-up Back end-stop lock screw and move back end-stop wheel out of way.

- Put largest/heaviest part of the object on front wheels (clamp it if possible) and holding back side of it in the air slide carriage until it's positioned correctly. Front of the cup/glass should slightly touch front-end stop.



Figure 23

- Start turning hand wheel so back part of rotary (footboard) goes up or down until most of the object's surface is parallel to the frame.



Figure 24

You can use small level to check.

6. Change machine's "framing" speed to 10-25mm/s

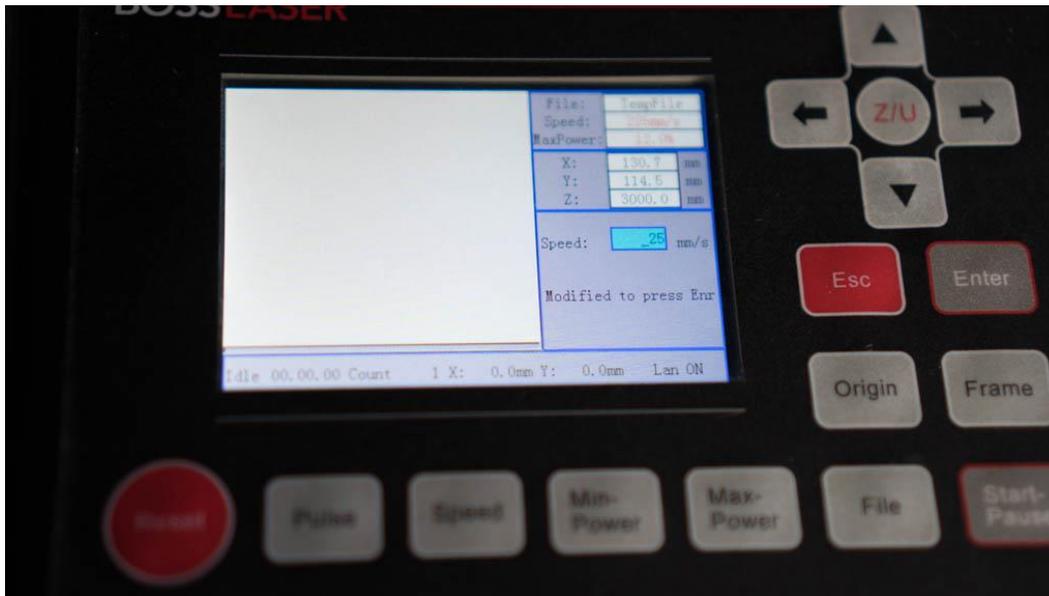


Figure 25. Speed

7. Using up/down arrows on control panel rotate object slightly to make sure it's sitting correctly.

## Clamp Operation

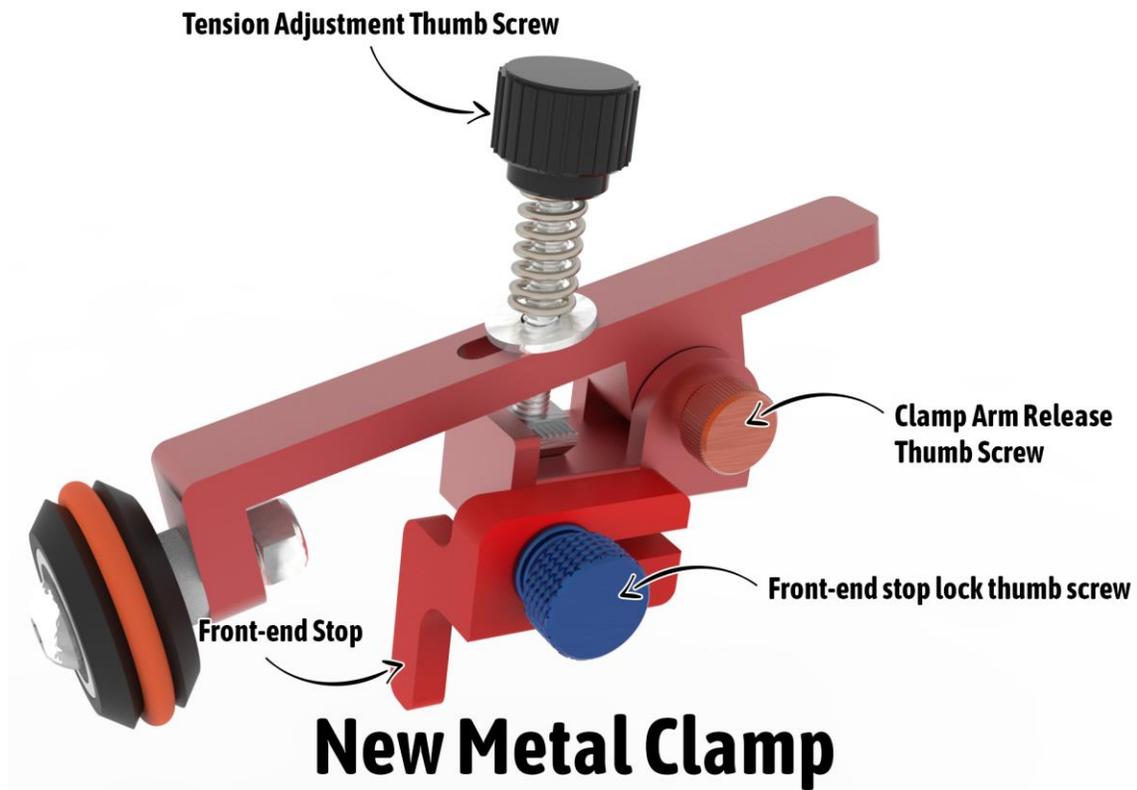


Figure 26. New Design Metal Clamp

Clamp spring provides sufficient pressure for most object, however when more clamping power is needed, please use Tensions Adjustment Thumb Screw (Locking Screw on old plastic clamp) to increase clamping force on the object.

Front-end stop works with back-end stop and serves two tasks. One is to prevent the object from “walking” or moving forward or back when rotating. Second task is spacing mug with handles, by keeping mug at the correct distance so it’s handle doesn’t hit front wheels. In most cases you’ll want to keep your front end-stopper retracted all way back, but when spacing mugs with handles, you need to extend it until it keeps handle free of wheels. To extend or retract front-end stop, loosen up its lock screw and move end-stop in desired location. When done tighten thumb screw to lock it in place.

In most cases clamp will be placed inside engravable object such as tumbler or glass. However, in some cases, like when engraving bottles, you will want widest part of the bottle to be on the front rollers and clamp won’t open wide enough to

accommodate these. In this case, you need to remove clamp arm or whole clamp.

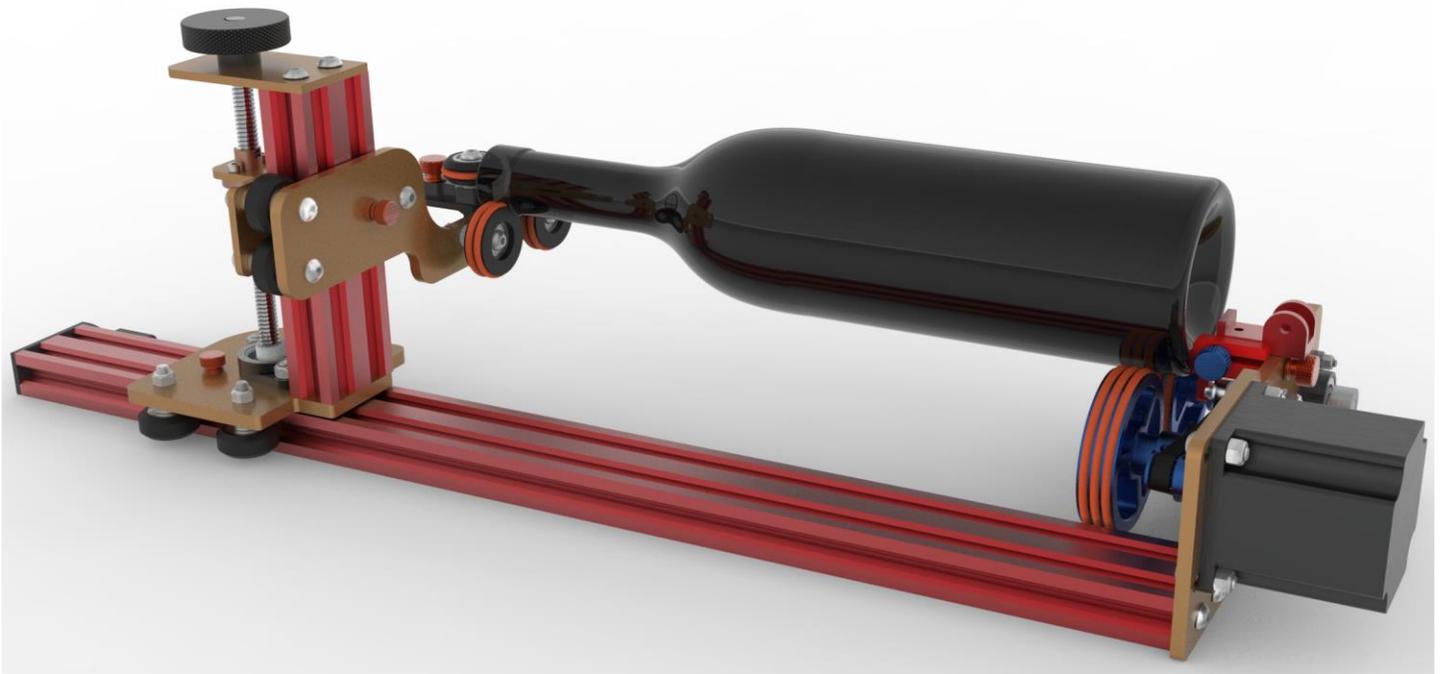
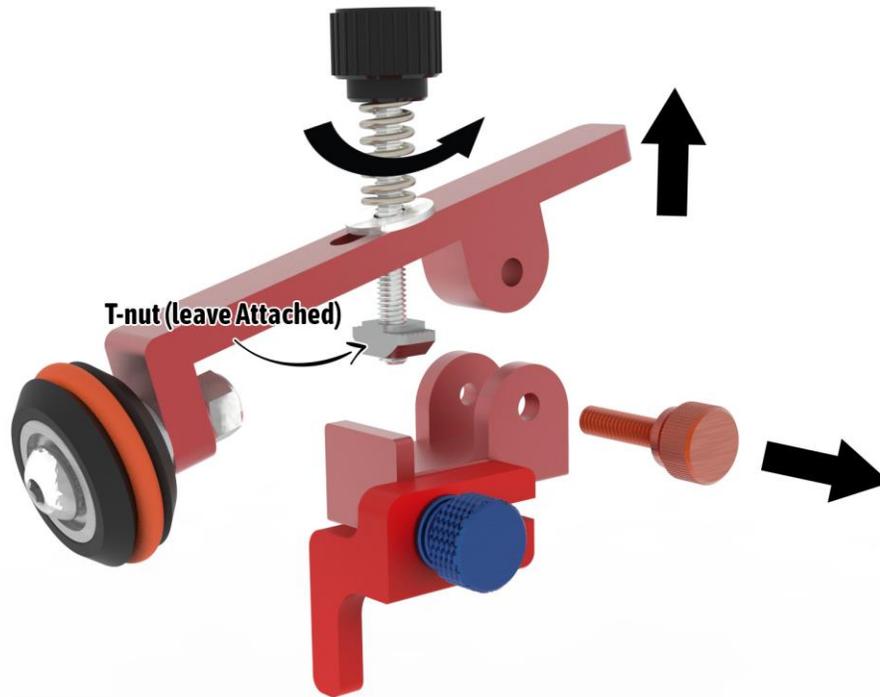


Figure 27. Bottle placement

Our new metal clamp doesn't have to be removed completely; you can just remove clamp arm. In fact, we don't recommend removing clamp because you will lose front-end stopper.

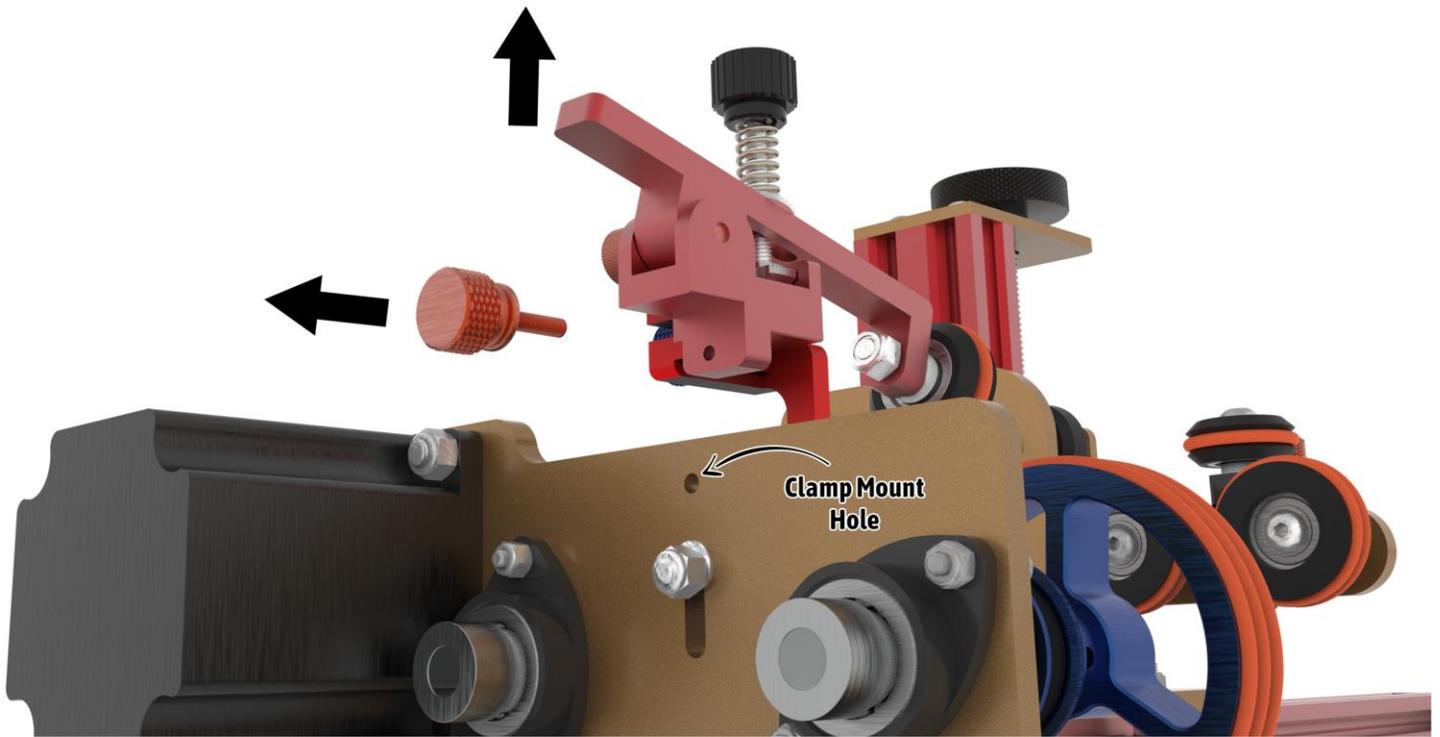
To remove clamp arm, first unscrew black tension thumb screw on top until it is no longer inside clamp base (leave small t-nut on the screw as it prevents spring and other parts of the clamp from flying away). Now just unscrew M4 thumb screw on the side that holds arm to the base. Arm will easily come off.

# Clamp Arm Disassembly



Re-assemble clamp in reverse order. Be careful with T-nut, don't move it too high up the long thumb screw. You should have just a little bit of thumb screw exposed under t-nut so it will thread into clamp base. T-nut will remain in same spot when you screwing-in black long thumb screw.

If you need to remove whole clamp, all you have to do is just unscrew M3 thumb screw that's holding clamp to the headboard.



## Focusing and Beam Alignment

You'll always want to align your Y axis to be in the middle of the PiBurn. Easiest way to do this is to position Y gantry by hand above PiBurn and move laser head from control panel left or right until it's above middle line of the clamp.

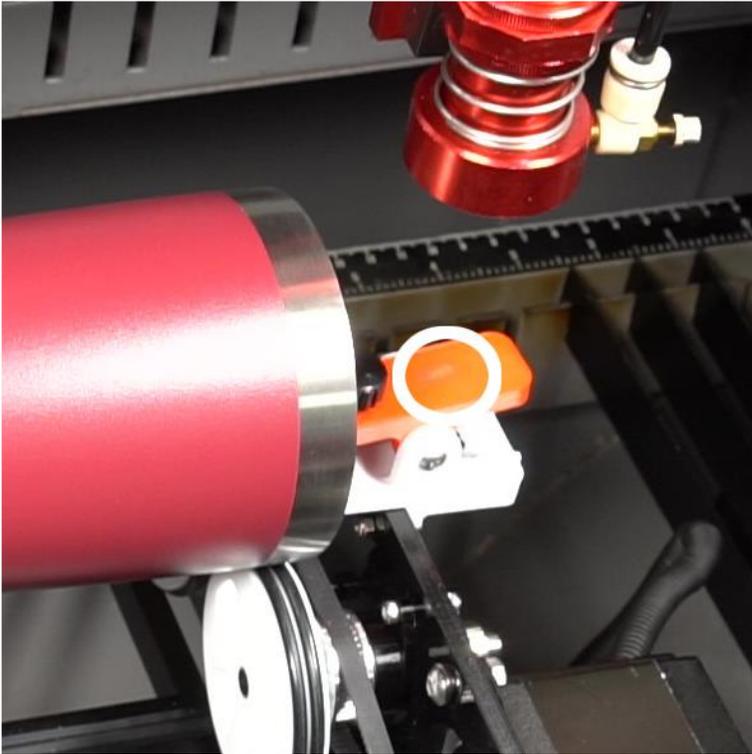


Figure 28. Center Alignment (front side)

Then move laser head until it's directly over middle of the red thumb screw holding back stopper

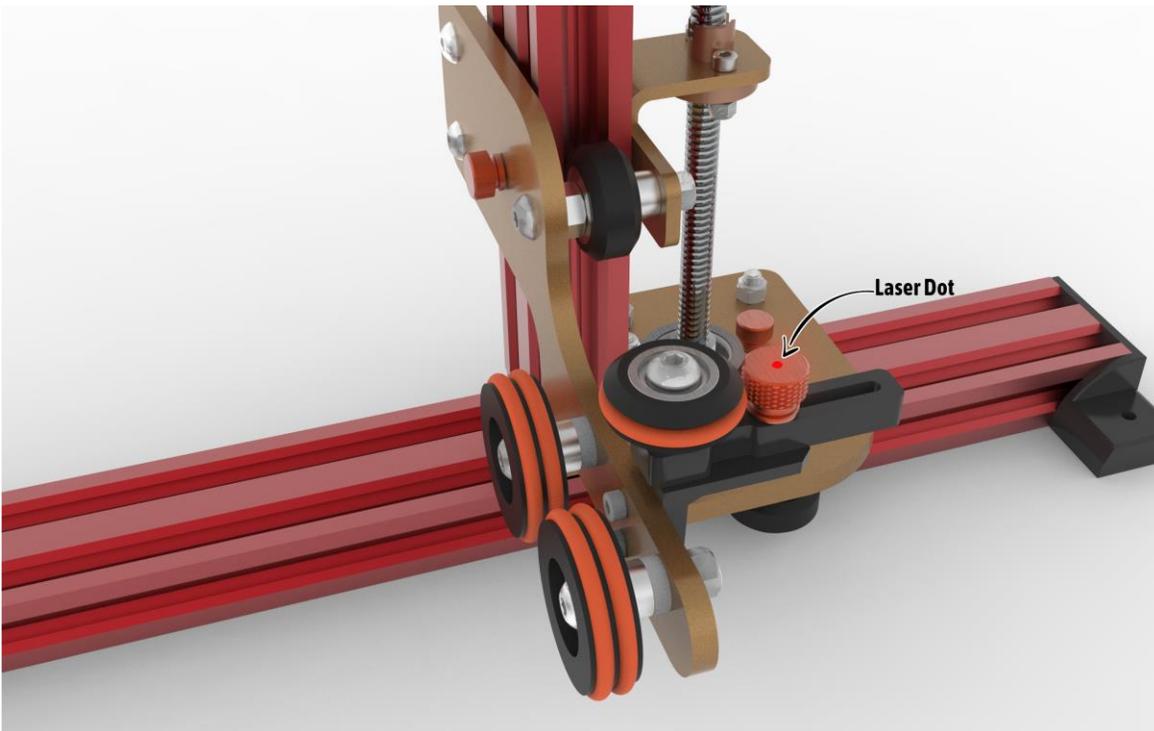


Figure 29. Center Alignment (back side)

If your laser has auto-focus you can use it as normal, just try focusing over **front** area of the object closest to the motor. Rear part of PiBurn is not as rigid and will bend down slightly as laser head is pressing on top. Make sure you ready to hit emergency stop button too.

*We've seen some users reporting malfunctioning autofocus bending stainless steel tumblers, and it could definitely break PiBurn. We never had this happened in our own tests, but better if you are aware.*

## Chapter VI: Usage Guides and Suggestions

### Always remember #1 Rule: BE SAFE!

Do not operate your laser machine with cover opened, but if you must always wear protective goggles and never place your hand in the path of laser beam. Infrared Laser is invisible, and it hurts a lot when it touches you.

### Rule #2 is: Rotate SLOW!

Laser engraver/cutter machines are meant to move fast when not firing to save operator time. This includes movements to cutting position, framing, or moving back to start position at the end of engraving.

Rotary attachment is not designed to move this quickly! If it spins rapidly, any object on it will fly off and break (i.e. glass) in the worst case, or shift and slip in the best.

So, before you start, set your machine's default movement speed to about **20 mm/s** or lower. This can be done via control panel's "**Speed**" button. This setting doesn't affect lasering operations, only manual movements and "**Framing**" function (when you hit "**Frame**" button).

Lower your idle speed and acceleration as well. This function is performed via machine Settings in Lightburn and described in detail in Chapter III.

### Y coordinates position

Rotary replaces Y axis of the laser machine, and it doesn't have limit as it rotates forever. Unfortunately, machine doesn't know that. It will not let you rotate past specific point because it will hit physical limit of your machine's bed. This can cause machine refusing to engrave and giving a "Slope" Error.

Let's say that your machine maximum cutting area in Y direction is 400 mm. You have engraving that's 100 mm wide. While positioning and rotating your tumbler your Y=350 mm mark (this can be seen on control panel's LCD screen). When trying to engrave from this point, you will get a "Slope" error because machine can't engrave at position above 400 mm ( $350+100=450$ ).

That's really easy to fix.

1. Hold UP arrow key on control panel, until machine shows Y close to 0 mm.
2. Disengage clamp and rotate your tumbler by hand until it's at roughly starting position you want
3. You can fine tune its position now using UP/Down arrow keys as long as you don't go too far (i.e. above 300 mm limit as in our example).
4. Hit "Origin" Button to save this as start position.

### Slipping/Jumping Off

Some very light objects might not have enough weight to stay on rollers despite front clamp. If you see object slipping from back rollers, try adding some weight to it. Place a small bag of rice or sand inside object to add weight to it.

# Sizing and Aligning your Artwork

## Aligning

Cool thing about PiBurn rotary is that its stepper motor is installed on the outside of the headboard. This means you don't have to invert your image or rotate PiBurn in "unnatural" position.

Your artwork will engrave just like you see it on the screen. Meaning in most cases you'll just want to rotate it by -90 degrees because your bottle or tumbler is laying on its side inside rotary. Of course, if you want it to be engraved sideways you don't need to rotate artwork.

Here's example:

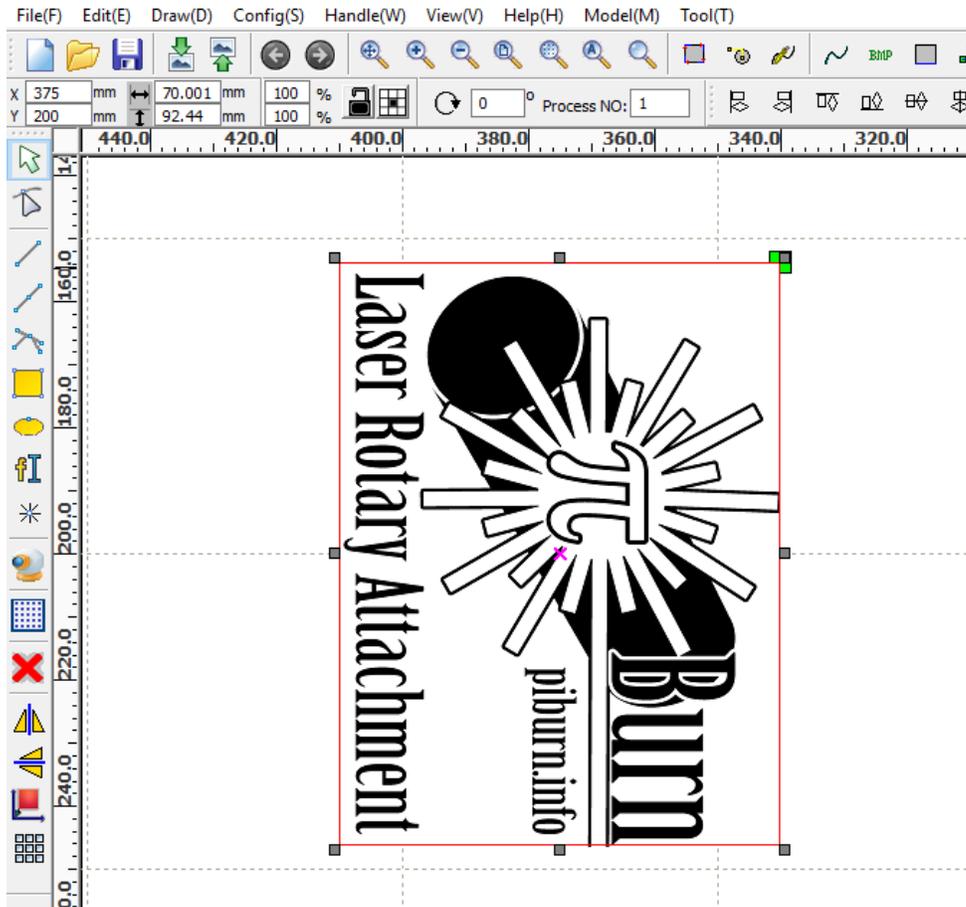


Figure 30. Image Alignment

And Resulting Engraving:



Figure 31. Result of Engraving

## Sizing Artwork

Measure the object you trying to engrave. You'll need to know length of the area you want to engrave (X direction) and width (Y direction). Length is easy, but to find out width you'll need to calculate circumference of the service. Easiest way is to measure object's diameter and multiply by number Pi (3.14). You see why we named our rotary PiBurn? 😊

For example, you have tumbler that's has diameter of 6 inches (152 mm) at its widest point. And its length is 10 inches (254 mm). Maximum size of the artwork you'll be able to engrave is 152x254mm. But do leave some room for margins.

## Uneven Surfaces

For best quality engraving distance from laser's head to the object must be same on thru the whole area. This is because laser beam is smallest and has highest power at lens' focal distance.

Unfortunately, that's not always possible with curved glasses, cups, etc. Try averaging focal distance by focusing on the area that's between highest and lower point. Engraving should still come out great!

If height difference is too much, design your artwork to be engraved in sections if possible, or simply size it so doesn't cover too large of the area lengthwise.

## Bottle Objects or Help my image is getting stretched!

The most common issue we are seeing people reporting is their engraving is being stretched on the bottle like objects (i.e. large diameter body and smaller diameter neck). This happens because smaller diameter part of the object rotates less compared to the rest of the object. So, if neck of the bottle turned  $\frac{1}{2}$  of the way, rest of the bottle might have turned  $\frac{3}{4}$  of the way at the same time. When you set your steps per rotation and roller diameter, these settings ONLY affect part that's directly on the big drive wheels! So if you want to engrave neck of the bottle it will come out correctly. However now you have to take into account difference of the diameters. There are 3 choices you can take to address this problem:

1. Remove clamp arm and simply flip bottle around! No need to mess with settings, and usually uniform objects like that engrave fine without clamp.

2. Temporary adjust steps per rotation or roller diameter settings. You will have to find correct settings experimentally (we recommend doing 100mm test as described in this manual). Just don't forget to change settings back when you want to engrave normally shaped object.
3. Finally, you can just resize your artwork, "squishing" it's height until it comes out ok in the engraving.

It's important to keep in mind that some bottle tumblers have threads on the neck. These will force bottle to move back of forward on the rotary pushing it against front or back stopper so hard that it will prevent it from rotating correctly and skipping. For this you can laser cut an adapter that will go on your threaded neck and make it smooth. As a bonus if you make adapter same diameter as main body of the bottle then you won't have to worry about diameter differences!

## Switching to regular laser operations

After you done with PiBurn rotary, don't forget to disable rotary function, or you will not be able to engrave/cut materials! In LightBurn you can go to Rotary setup and switch off enable rotary. But you'll also want to change acceleration values back. Best way to do this is it have two configuration files saved somewhere. One for Rotary and one for Flat work. Just load one you want via machine settings and write it to the controller memory.

# Chapter VII: Maintenance and Alignment

There's very little maintenance needed to keep PiBurn in top shape.

## O-rings

If you are using metal marking sprays like Laserbond 100 or Cermark, some of the compound will be transferred to rubber O-rings. You can wipe off O-rings with paper towel and alcohol to make sure they are providing good traction to the engraving objects. O-rings can be easily removed and cleaned when needed. Please make sure when you put them back you don't twist them to keep rotation even and smooth. Spare O-rings can be purchased at our store when needed.

## Belt

Transmission belt might lose tension with time.

Best way to check for correct belt tension is to power off or unplug your rotary (so motor turns freely), grab big wheel closes to the motor and try rotating it by hand. If it engages second big wheel your belt tension is good. If wheel skips belt teeth then you'll need to increase belt tension.

Tension can be adjusted in two ways.

Best way adjusts belt tensioner/idler pulley located above two front rollers by loosening M4 nut and moving idler up (or down).

Some tension can be also achieved by moving stepper motor. Loosen 4 M5 screws holding stepper motor to the headboard and slide motor until belt has sufficient tension to grip pulleys. When finished tighten up M5 screws to secure motor. Don't tighten too much or you might crack plastic frame.

## V-Slots and Roller Wheels

From time to time wipe clean V-slots of aluminum extrusion beams and V-wheels that travel in them. If carriage feels lose you can adjust wheel tension by slightly turning eccentric nut on v-wheel. There are 3 wheels on each axis of motion, one on one

side and two on the other. Single v-wheel that's opposite from the other 2 is the one that has eccentric nut. Turning it makes wheel move closer to or further from v-slot extrusion beam.

## Roller Alignment

You can check front to back roller alignment by moving carriage with back rollers as close as possible to the front rollers. Lower footboard with roller wheels so you can see those wheels edges. Remove the clamp and looking from the front of rotary and slightly above (as shown on picture below) make sure that both back rollers are equally spaced in relation to larger front wheels.



Figure 32. Alignment (point of view)

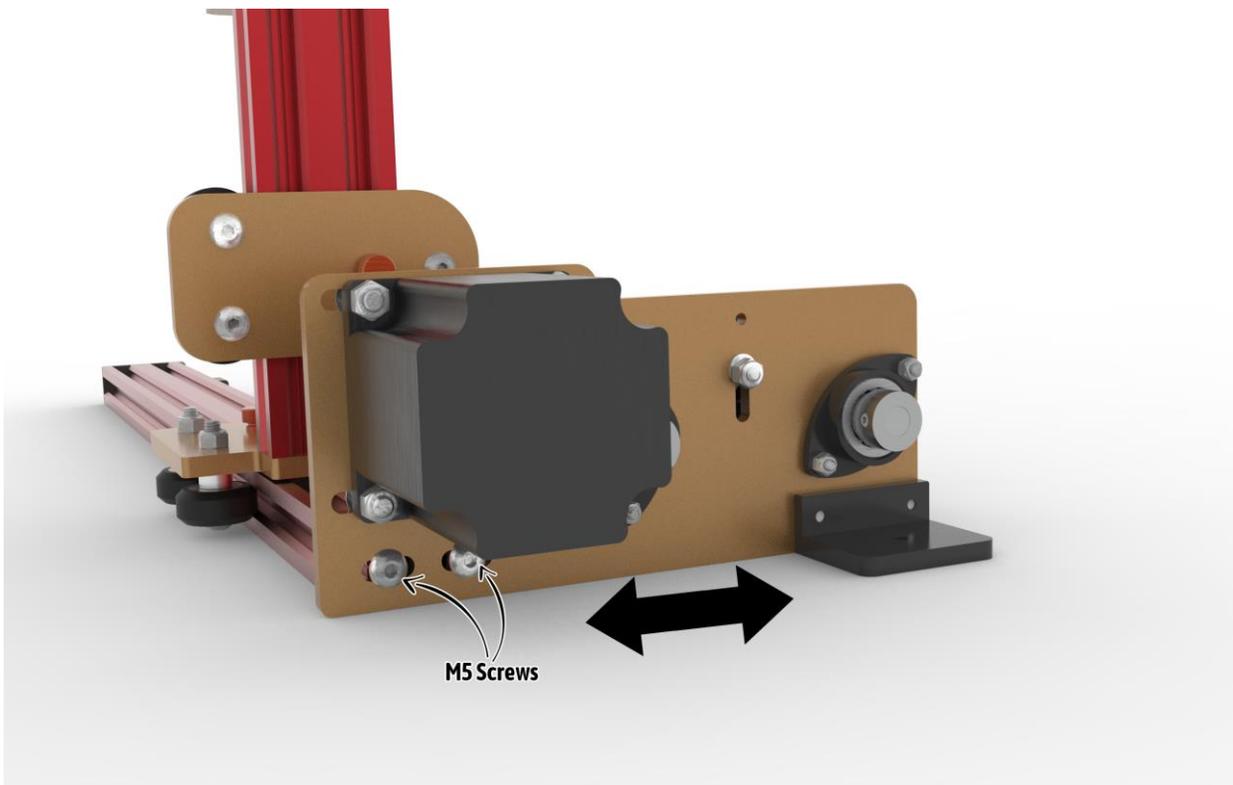


Figure 33. Headboard Screws

Then start tightening M5 screws. Keep checking wheel alignment, as tightening screws might shift the headboard a little. Repeat adjustment if needed and then fully tighten both M5 screws.

## Appendix A: Note on Thunder Laser Motor (Servo) Switches



Figure 34. Servo Motor Switches

PiBurn for Thunder Lasers uses a special “closed loop hybrid stepper motor”. We will refer to it as a servo motor (even though it’s not a truly servo) in the manual. These motors have 6 DIP switches on the back. We shipped these with Switch #1,#3 and #5 in the Up (ON) position. Switches 1-4 control default steps per rotation, please don’t change them or you will have to figure out new settings for your laser controller.

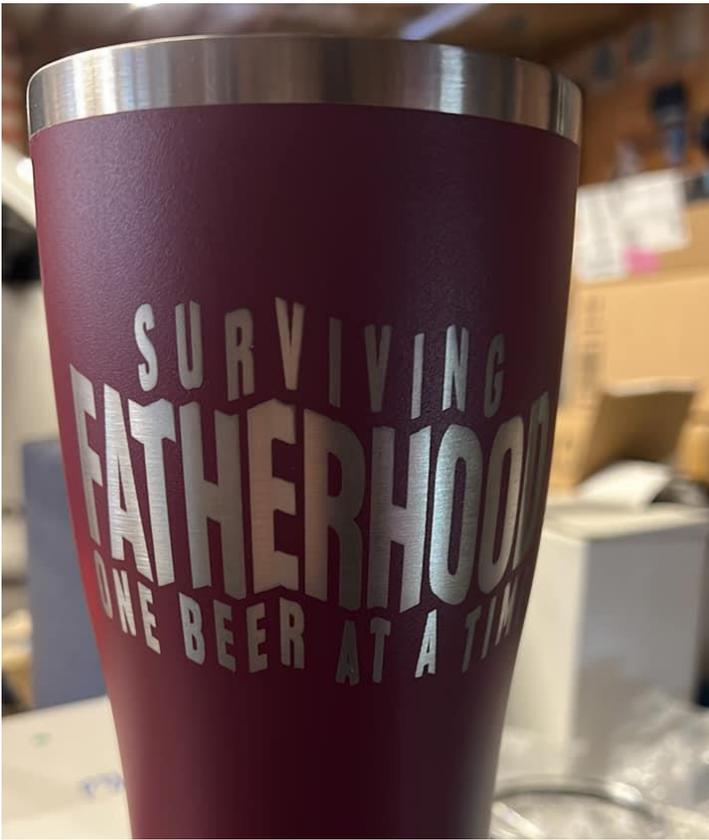
However Switch #5 controls motor rotation direction. It’s up to end user how he wants to place rotary inside laser. Most place it with motor facing left side of the laser and for this placement we recommend Switch 5 to be ON. However if you decide to rotate your rotary 180 degrees you’ll want to flip this switch to on or your engraving might come out “mirrored”.

So simply said, if your engraving is mirrored just flip switch Number 5 (i.e. UP if it’s down, or Down if it was UP).

Never turn on switch #6, as it will place motor into test mode and it will just spinning on it’s own until switch is turned off.

## Appendix B: Know Issues and Solutions

Text comes out extremely wavy when it supposed to be straight



This happens mostly with OMTech machines due to incorrect setting, but super easy to fix!

In Lightburn go Edit --> Machine Settings. Save the current settings to a file. Under Vender Settings, X Axis Settings, toggle PWM Rising Edge Valid setting. If it's on turn it off, if its off turn it on. Write the settings.

Machine Settings

Property	Value
Return Position	Origin
▼ Vendor Settings	
Homing Speed (mm/sec)	80.000
Laser 1 Output Signal	Low
Laser 2 Output Signal	Low
Water Protect Enable,Laser 1	<input checked="" type="checkbox"/> True
Water Protect Enable,Laser 2	<input type="checkbox"/> False
Enable air-assist output	<input type="checkbox"/> False
Enable door open protect	<input checked="" type="checkbox"/> True
▼ X Axis Settings	
Enable Homing	<input checked="" type="checkbox"/> True
Limit Trigger	<input type="checkbox"/> False
Invert Keypad Direction	<input checked="" type="checkbox"/> True
PWM Rising Edge Valid	<input type="checkbox"/> False
Limiter Polarity	<input type="checkbox"/> False
Direction Polarity	<input checked="" type="checkbox"/> True
Step length (um)	30.022450
Max speed (mm/sec)	500.000
Jumpoff speed (mm/s^2)	40.000
Max acceleration (mm/s^2)	15,000.000
Max travel (mm)	600.000000
Keypad jumpoff speed (mm/sec)	15.000
Keypad acceleration (mm/s^2)	4,500.000
E-Stop acceleration (mm/s^2)	30,000.000
Home offset (mm)	0.000

Controller settings read successfully

Save to File    Calibrate Axis    Read

Load from File    Load from Backup    Write

Cancel    **OK**

Save to File if you are loading settings from a file

At very beginning or the end engraving is squished, or small part cut off.

Cause:

This usually is a sign that either motor pulley or Belt is loose. When this happens engraving starts before wheels start turning, picking up pulley's or belt's slack.

Solution:

Check pulley on motor's axel with our hand and see if it's loose. If it is tighten two small set screws holding it.

You can check belt tension by unplugging rotary first, and then grabbing big wheel that's closer to the motor and start turning it with your hand. It should transmit rotation to the second wheel that's further away. But if your wheel turns and doesn't engage the belt, it means it lost tension. To tighten belt's tension, release tensioner pully that's pressing on the belt, lower it a little until there's some tension (you don't need much, don't overdo it) and while holding it down, tighten the pulley's screw and nut.

## Repair and Warranty

Due to its modular design, PiBurn is very easy to repair if any of its parts breaks. There are no rivets or hidden latches, almost everything can be taken apart in few minutes with Allen hex key and pliers. If you need a part to be replaced, please reach out to us via [Contact Us](#) page on our website.

PiBurn is covered by a 1-year limited warranty. In simple terms if anything breaks during normal use, we'll fix or replace it.