A USER MANUAL
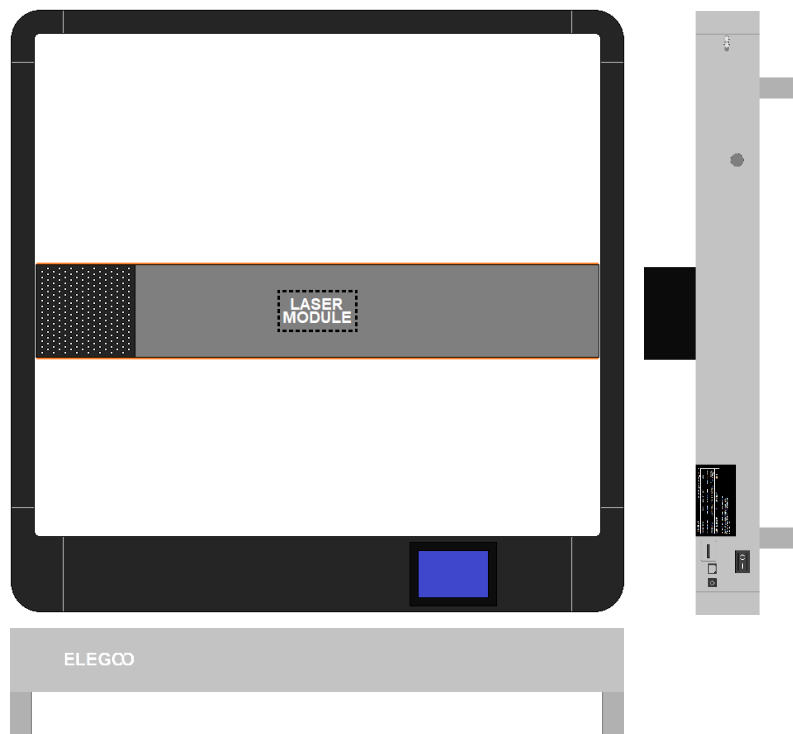## for the
BASIC OPERATION
of the
ELEGOO PHECDA
LASER DEVICE
(for 10-watt and 20-watt versions)

Written by E. M. Southard, Jr.

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The sole purpose of this manual is to introduce the reader to some of the basics for operating a 10w or 20w Elegoo Phecda laser machine.

This document will not cover the use of laser software, such as LaserGRBL or LightBurn. There are numerous videos on the internet that cover the use of these two programs, as well as other laser control programs. (Although, if the demand is great enough, I may create a separate manual covering the basics of the free LaserGRBL software and how to use it when connected to an Elegoo product.)

IMPORTANT NOTICE:

**Since a laser device is inherently dangerous,
please-please-please follow ALL of the safety recommendations
and warnings packaged with your Elegoo Phecda laser device.
Use your Laser Goggles like your sight depends on it…
because your sight DOES depend on it!
Also, be sure that anyone who is within eyesight
of the machine are also protected by Laser Goggles.
Do not let pets or animals anywhere near an operating laser,
as they can easily be harmed, as well.**

TABLE of CONTENTS

In this manual, we'll use the term "carving" as a generic term for both etching AND cutting. ("Etching" is where an image is etched onto a surface. "Cutting" is where the material is cut completely through).

Elegoo's Phecda can commands to carve via one of three methods:
- a TF card (also called a micro-SD card), or
- an Elegoo app on your phone (via a WiFi connection), or
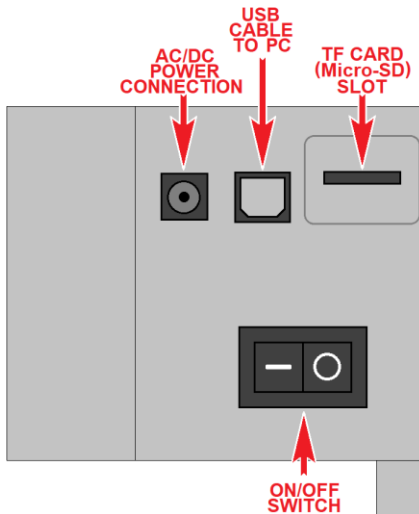- a USB cable connected directly to a computer which is running laser control software.

For our example, we'll use method #1 (TF card) and a carving file (with extension ".nc"). There may be a few .nc files preloaded onto your card… but if not, you can download a carving file of a 70mm wide image of the Elegoo logo (filename "**ELEGOO-70mm-logo.nc**") (also check www.elegoo.com):
https://www.dropbox.com/scl/fi/shmm5shi2si06p5fj5jqj/ELEGOO-70mm-logo.nc?rlkey=pp2hd119otg0kktqt1uyk0xxf&dl=0

Note: Common image files (like .png, bmp, & .jpg) must 1st be processed by software. Three processed file types that **can** be used are ".nc", ".gc", and ".gcode". LaserGRBL can output .nc files; LightBurn can output .gc files; Image-to-gcode software can output .gcode files.

Once we've located an ".nc" file to engrave, be sure to place it into the root directory of your TF card (do not tuck it away into a folder… otherwise, the laser device will not be able to see the file).

SAFETY 1ST: It's mandatory that we protect our eyes from laser light. Even a reflection can be harmful. This is **THE** time to put on our Laser Goggles; once they're in place, we can proceed. When not in use, keep them on top of the blue control screen, so that we won't forget to put them on.

YOUR EYES ARE PRICELSS.
WEAR YOUR LASER GOGGLES
TO PROTECT THEM.

USB CABLE TO PC
AC/DC POWER CONNECTION
TF CARD (Micro-SD) SLOT

ELEGOO		Shenzhen Elegoo Technology Co., Ltd	
MACHINE MODEL	PHECDA	MACHINE POWER	55W
ENGRAVING AREA	400*400mm	RATED VOLTAGE	100V~240V 50/60Hz
MACHINE SIZE	673*660*190mm	PRINTING PRINCIPLE	Laser engraving and cutting
LASER HEAD POWER	10W	NET WEIGHT	6.5KG

Tel: (86) 0755-21005141 Web: www.elegoo.com
Add:No.30 Dahe Industrial Park, Guancheng Community, Guanhu Street, Longhua District, Shenzhen, China

ON/OFF SWITCH

After assembling the Phecda (as per the user manual & assembly video), take a look at the front end of the right side of the machine. You should see the AC/DC power connection, the USB cable connection, the TF card slot, and the On/Off switch (as shown). Be sure the power switch is Off. Next, insert the TF card into its slot; be sure the TF card label is facing downward and that it is carefully inserted into the center of the slot. There is a small gap above and below the slot that you will want to avoid when inserting the TF card. (**Important**: To protect the TF card, **only** insert or remove the card with the power OFF.)
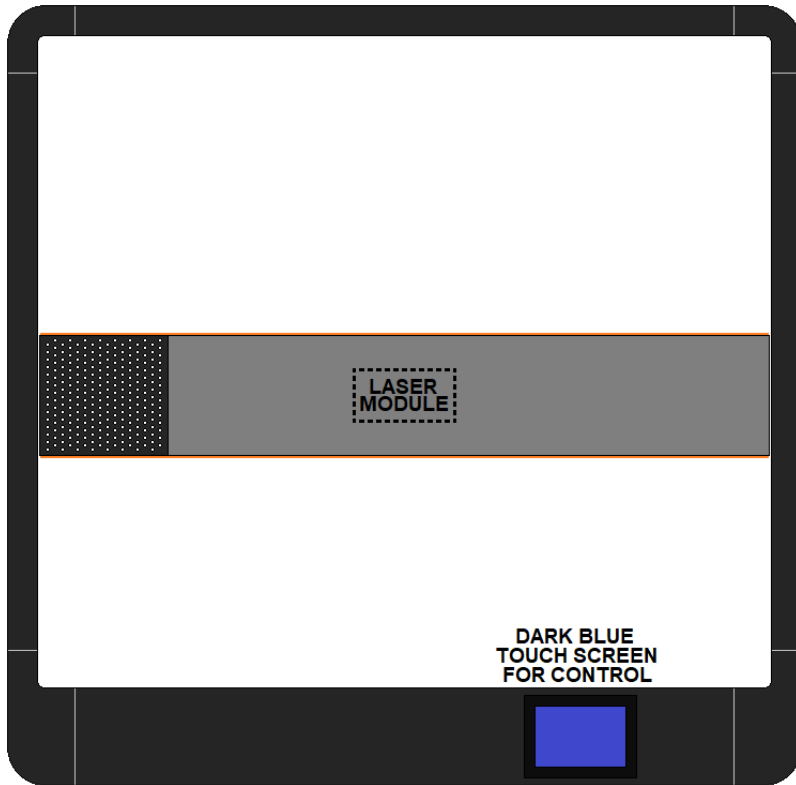
Again, be sure you're wearing your Laser Goggles. Next, turn on the power switch; the machine should power up in about 3 seconds. When viewed from above, we should see a blue screen illuminate (located in the lower, right corner of the frame).

The 1st screen image we'll see is called the "Home" screen, as shown below. Note that this is a pressure sensitive screen, so the controls can be selected by gently pressing it. This Home Screen has four buttons: **Adjustment, Control, Carving, & Tool.**

HOME SCREEN

X 0.00 Y 0.00 S 100

Adjustment   Control
Carving   Tool

The illustration below demonstrates that when we press any of the four "Home" screen buttons, we'll be rewarded with a new screen. Now to be clear, we could successfully carve our first file using only the Carving Screen, but the other three screens have valid uses that we'll want to learn about. For the remainder of this manual, we'll discuss each of these four buttons within four separate sections:

Section #1… the Adjustment Screen,
Section #2… the Carving Screen,
Section #3… the Control Screen, and
Section #4… the Tool Screen.

ADJUSTMENT SCREEN

‹ Back

10%   1%   0.5%

HOME SCREEN

X 0.00 Y 0.00 S 100

Adjustment   Control
Carving   Tool

CONTROL SCREEN

‹ Back

1mm
Low Speed

Y+
X- X/Y +X
-Y

Unlock   Set origin

CARVING SCREEN

‹ Back

Aircraft.nc   nc
Spacecraft.nc   nc
Test_File.nc   nc

‹   ›

TOOL SCREEN

i   EN
Info   Wifi   Language

Fire   Tilt   Back
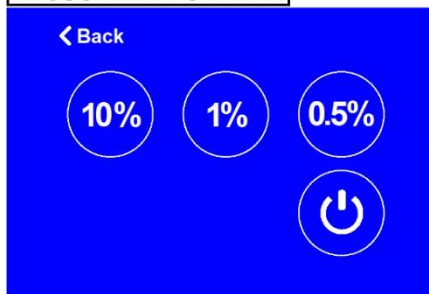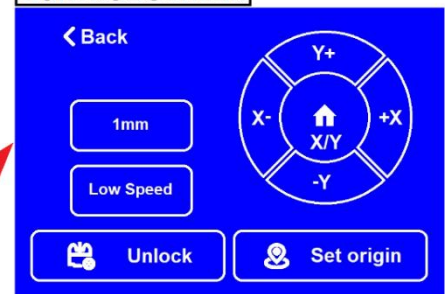
Now is an excellent time to adjust the height of the laser over the workpiece. When we set this height, we're actually setting the focus of the beam; therefore, it is very important to make this adjustment. Since our laser came packaged with sample materials, let's use the thin plywood board for this example. Here are the steps to setting the laser's focus onto a wooden board.

1. Remove the magnetically-attached orange cover plate from the frontside of the X-axis bar that contains the Laser Module; this will allow easy access to the Laser Module.

2. Place the sample plywood piece directly beneath the laser.

3. While supporting the Laser Module with your left hand, use your right hand to loosen the pair of set screws that hold the Laser Module in place. Do not lower the Laser Module just yet.

4. While still supporting the Laser Module with your left hand, lower the Focal Positioning Bar (located to the right side of the Laser Module) by rotating it to the fully downward position … and then slowly lower the Laser Module down until this metal "kickstand" rests on the workpiece. This is the correct height to focus the laser onto the workpiece.

5. Now, tighten the pair of set screws, but be careful not to over tighten these screws… just be sure that they're firm enough to fully secure the Laser Module's weight and to maintain the height.
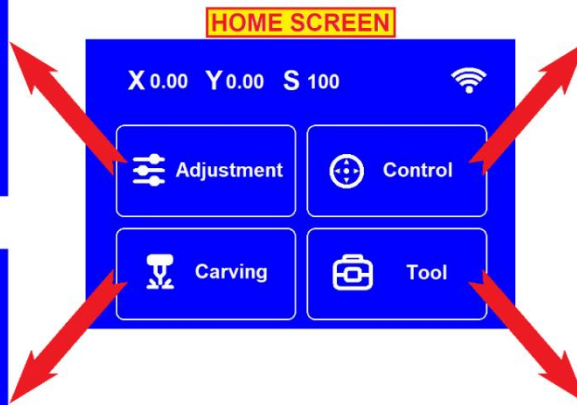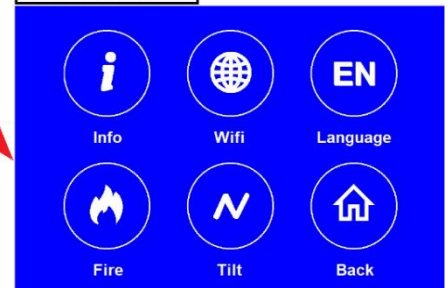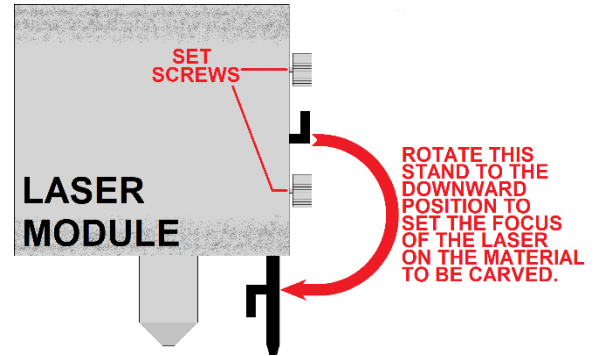
6. NEXT, rotate the Focal Positioning Bar back up into the stored position, away from the workpiece. Once it is in the fully up position, magnetism will hold it in place.

7. Magnetically reattach the orange cover plate back onto the X-axis bar. And we're done!

LASER MODULE

SET SCREWS

ROTATE THIS STAND TO THE DOWNWARD POSITION TO SET THE FOCUS OF THE LASER ON THE MATERIAL TO BE CARVED.

*IMPORTANT NOTE:

**Since each workpiece may have a different thickness,
you will need to make this height adjustment for each workpiece you work with.
This is a crucial adjustment to correctly focus the laser for whatever is being carved.
Otherwise, the laser will be out of focus,
and the beam's strength will be weakened and blurry.**

SECTION #1	⚏ Adjustment	# HOW TO USE THE ADJUSTMENT SCREEN

When the Adjustment button is pressed on the Home Screen, it changes to the Adjustment Screen (shown to the right).

ADJUSTMENT SCREEN

‹ Back

10%   1%   0.5%

⏻

This screen is used to turn on the laser and to temporarily project a beam onto the workpiece. Once a beam is projected, we can see exactly where it's located with respect to the workpiece.

When any one of the top three buttons is pressed, the laser turns on with the percentage of power shown on the button.
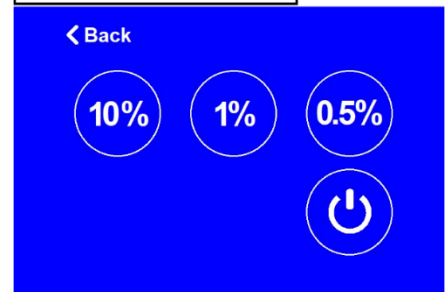
Therefore,
if we're using the 10-watt Phecda laser,
- the 10% button provides about 1 watt of power,
- the 1% button provides about 0.1 watts of power, and
- the 0.5% button provides about 0.05 watts of power…

if we're using the 20-watt Phecda laser,
- the 10% button provides about 2 watts of power,
- the 1% button provides about 0.2 watts of power, and
- the 0.5% button provides about 0.1 watts of power.

YOUR EYES ARE PRICELSS. WEAR YOUR LASER GOGGLES TO PROTECT THEM.

If the laser is turned on by one of the three percentage buttons, then we should also be able to turn it off, when necessary - right? Well of course, and this can be done by pressing the power button located in the lower, right-hand side of the screen.

Obviously, the higher the power, the brighter the beam… and the easier it will be to see the beam's location on the workpiece. But it's important to know that for many materials, 1 or 2 watts of power is more than enough to immediately start carving the material. Therefore, it may be smarter to start with the lowest power (the 0.5% button) and only go up in power if it is necessary to locate the beam. For example, a brightly lit room may require more power. But with a little bit of practice, you'll be able to quickly determine beam location with just the 0.5% or 1% setting.

* Something worth knowing…
Later we'll instruct the machine to trace out a rectangular maneuver over the area that is to be carved. For instance, if the overall image to be etched is 5mm wide and 10mm tall, then the machine will move a dim laser beam across the workpiece (in a rectangular fashion) that is 5mm X 10mm in size. This movement will help us to know where the laser will be carving on our workpiece. This is called "Marking the perimeter". Although it will not really carve the workpiece, it will give us a good visual indication of where the actual carving may soon take place. The amount of power it will use for this maneuver can be selected with this Adjustment Screen. By the way, after the "Marking the perimeter" has completed its course, the laser beam will automatically turn off… and then will await your next command.

SECTION #2	🔬 Carving	# HOW TO USE THE CARVING SCREENS

When the Carving button is selected from the Home Screen, it changes to the Carving Screen (shown to the right).

CARVING SCREEN

‹ Back

Aircraft.nc   nc

Spacecraft.nc   nc

Test_File.nc   nc

‹   ›

YOUR EYES ARE PRICELSS.
WEAR YOUR LASER GOGGLES
TO PROTECT THEM.

This screen is where the magic really happens, because with just a few more button presses, the Phecda will start delivering an etching or cutting laser beam to our workpiece. For that very reason, this is a good time to again remind you to be wearing those ever-important Laser Goggles!
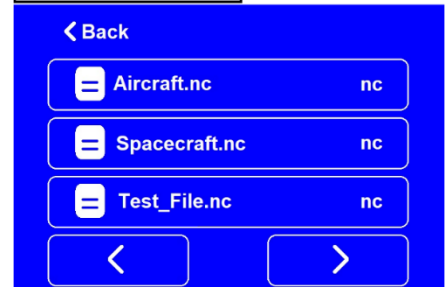
Early on, we talked about a carving file with the extension ".nc". Let's talk some more about that.

QUESTION: What is an ".nc" file (also known as a "Numerical Control" file)?

ANSWER: When an image file is put through some special laser "slicing" software (i.e., LaserGRBL), the user must provide the answers to a few questions, so that the program will understand exactly what we are trying to achieve. For example, it'll need to know information like:

- How many lines of laser carving to carve per millimeter?
- How much laser power to apply?
- How fast to move the laser beam from side to side?
- (And there are other questions, as well.)

Once all of the questions are answered, the program can then create an ".nc" file for you. This file will contain a series of commands that tells the Laser device exactly how to carve your project.

As also mentioned in the introduction, our ".nc" files need to be in the root directory of the TF card that Elegoo provided; they must not be placed into any folders. Once the TF card is loaded with our ".nc" files, and it has been carefully inserted into the slot on the Phecda machine, then we should be able to see a list of these files on the Carving Screen. If we don't see their names here, then the screen will be blank (except for the "Back" button in the upper left corner).

By the way, if we have 4 or more ".nc" files on the TF card, then left & right arrow buttons are provided at the bottom of the screen. Since only 3 filenames can be seen at a time, these arrow buttons allow us to quickly skip through the list to see any additional files. For our example, I've added more files to the TF card, which allows us to see the left & right arrow buttons.

Let us select the "Aircraft.nc" file by pressing its name. The screen will then change to the Carving Screen #2, as shown to the right. Note the name of the chosen carving file is at the top of the screen.

CARVING SCREEN #2

‹ Back   Aircraft.nc

Plane Mode   Rotation Mode   Y+

Low Speed   X-   X+

1MM   Y-

⬚ Mark the perimeter   ⦿ Position   🔬 Carving

By the way, please do not let all of the buttons on this screen intimidate you. The function of each button is fairly straightforward and easy to understand; we will discuss them one at a time…

Plane Mode | **Rotation Mode**
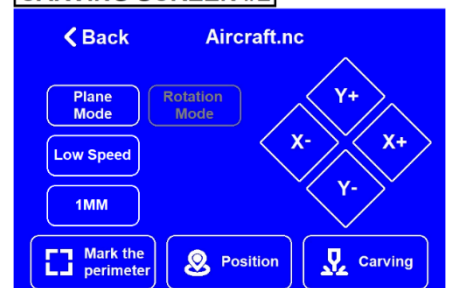
The first thing we need to do, is to select one of two buttons at the top of the screen… and this choice will be based on whether we're working on a flat or a curved surface.

In our example, we're going to etch onto a flat plywood surface, so we'll select the "Plane Mode" button. By far, this is the most commonly used setting.

If we have the optional rotary device, and if it is plugged into our Phecda, then we can use the "Rotation Mode" button and etch onto the rounded sides of a cup, mug, tumbler, or drinking glass.

Y+ **X-** **X+** **Y-**
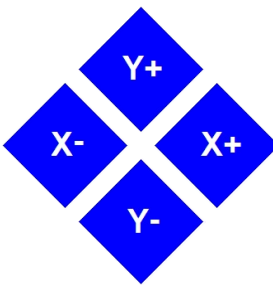
The next thing to look at on the Carving Screen #2 are the four diamond-shaped "directional" buttons. When we press any one of these buttons, the Laser Module will "jog" or move in that direction.

Shown to the right is an overhead view of the Phecda device; note the blue control screen in the lower right corner. The red arrows around the Laser Module show the direction that these directional buttons will move (or "jog") the Laser Module towards, when pressed.

Low Speed ➡ **Mid Speed** ➡ **High Speed**
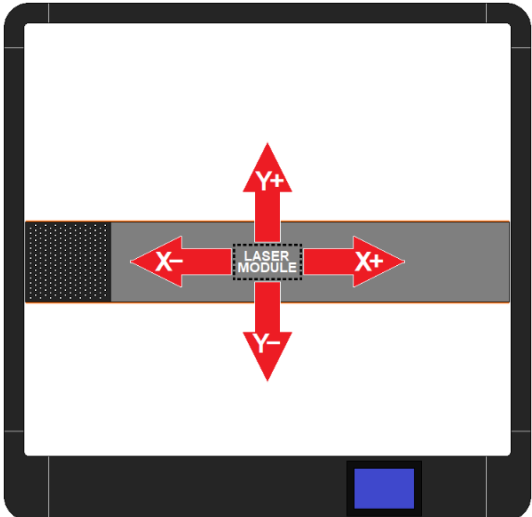
Additionally, Elegoo provides us the nice option to change *how fast* the Laser Module will move with each press of a directional button. For this purpose, there's a button on the screen that'll read as either "Low Speed" or "Mid Speed" or "High Speed". Each time we press this button, it will change to a different speed… low, mid, or high.

1MM ➡ **5MM** ➡ **10MM**

Elegoo also provides the option to change *how far* the Laser Module will move with each press of a directional button. For this purpose, there's a button on the screen that'll read either as "1mm" or "5mm" or "10mm". Each time we press this button, it will change to a different distance… 1mm, 5mm, or 10mm.

Thus, before we even start to use any of the directional buttons, we can set **how fast** and **how far** each jog will be when we press a directional button. In other words:
   If we have it set to "High Speed" and "10mm", the movement of the Laser Module will be fairly quick.
    If we have it set to "Low Speed" and "1mm", the movement of the Laser Module will be quite slow.

But now the obvious question: Why would we want to move the Laser Module around like this?

To answer that question, we need to first talk about setting a "Home" for the Laser Module. Home is the name given to some location that we will specify within Phecda's metal framework. And once that Home position is declared, then the Home position will be the lower left-hand corner of the image we're about to carve. By the way, we can set Home to ANY place we want to within about a 400mm X 400mm area. In this exercise, I suggest that we set Home close to the middle of Phecda's work area.

For example, let's use the directional buttons to move the Laser Module to a spot near the center of Phecda's frame. Once the module is there, then we'll tell Phecda "this is the new Home for our lasering project". To do that, we'll just press the "Position"

button. And now, when the laser starts its job of carving the aircraft image, it will be performed above and to the right of the Home position.

THIS SPOT WOULD BE OUR HOME AND THE IMAGE WILL BE CARVED ABOVE AND TO THE RIGHT OF HOME.

Info

Position success

Confirm
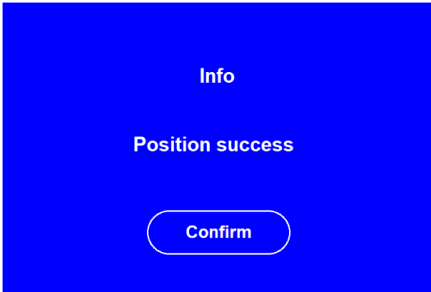
By the way, once the Position button is pressed, Phecda will tell us that Home has been successfully created with the screen shown to the left. (Sometimes Home is referred to as the "Origin", but I prefer "Home".)

Keep in mind that we can set the location of "Home" anywhere within the frame, but generally speaking, we may want to set Home towards the lower, left-hand corner of Phecda's frame for larger carvings.

But why is that? *Because generally speaking, we will prefer to have the largest amount of space for the laser to move around in, when it starts carving… especially for large images.*
But why is that? *Because we want to make sure that the Laser Module does not bump against the upper frame rail or the right-side frame rail when carving. And if we keep to the lower, right of the framework, then we will minimize the chance of the Laser Module bumping into a frame.*

Of course, there may be times when we have a large work piece, and we'll **NEED** to etch or cut something small in the upper area, or to the right side. In this case, we may end up setting "Home" well away from the lower, left-hand corner. But no matter where we set "Home", we need to know in advance how wide and how tall the carving will be and whether "Home" is set to a location that will prevent the Laser Module from bumping into a frame rail.

Before we commit to a laser carving, there's another step we'll take to know what area the Laser Module needs to move around in… and to see if our plywood material is where it needs to be. We do this by pressing the "Mark the perimeter" button. Remember? We talked about this concept several pages ago, and this is what the button

looks like. Press it and watch how the Laser Module moves around in a rectangular fashion… showing us the most

THE LASER WILL TAKE A TRIP AROUND AN IMAGINARY BOX THAT HUGS THE IMAGE TO BE CARVED. IT WILL START AT HOME, AND THEN GO CLOCKWISE AROUND THE BOX UNTIL IT RETURNS BACK TO HOME…

extreme positions that it will need during our upcoming carving session. *(Please note: the larger and more complex the image to be carved, the longer it will take for the motion to occur… as it has to review ALL of the code before it can "draw" the imaginary box around our image.)*

Info

Mark the perimeter success
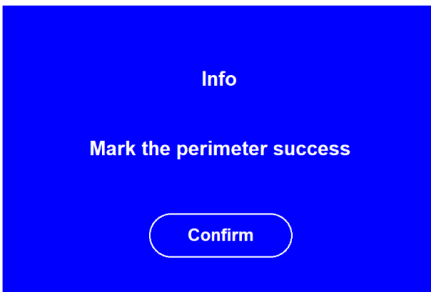
Confirm

Once the laser has completed its rectangular trip (showing us what area it is going to use), then this screen will tell us that the perimeter has been "marked". Just press the Confirm button to return back to the Carving Screen #2.

And now we're ready for the big moment: to tell Phecda to start carving on our material. Find the "Carving" button in the lower right-hand corner of the screen… and press it.

But wait… the Phecda device will actually give us a chance to cancel our command to start carving with this screen (shown to the left).

So, if you've changed your mind, then just press the "Cancel" button… but if you are committed to carve, then press the "Carving" button instead… and the laser will immediately turn on and it will start moving very quickly and accurately around the workpiece with the laser beaming sweeping back and forth over our material.

While the laser is carving, the blue screen will change to what's shown to the right. Note that the screen has an upper and lower section.

The upper section allows us to pause or even stop the process… and if we choose to pause the carving, then it allows us to change power and speed settings! The lower section tells us where we're currently at in the carving process. It gives the percentage of work currently completed and it reports on how much relative laser power and speed is being used right now… and the current position of the laser.
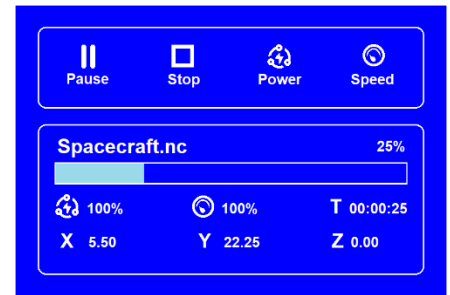
Let's look more closely at the upper section of this screen. As previously mentioned, we can press the "Pause" button and the laser will immediately pause and stop moving around. Furthermore, the "Pause" button label is changed to the word "Start"… and if we press the new "Start" button, then the laser will pick up where it left off, and continue the carving process. Why would you want to do that? Well, here's one reason: We should never leave an active laser unattended. So, if you need to leave the machine for a few minutes, you can just pause it and come back later to finish it.

The "Stop" button is different from the "Pause" button, in that it completely STOPS the process. Which means that it cannot pick back up where it left off. So, this is the same thing as completely aborting the carving process. For this reason, it will ask us if we really want to stop carving or not.

But there's another reason why we might choose to "Pause" the carving. When paused, the Phecda allows us to alter the laser's power and the laser's speed… and then to complete the job with the new settings! So, how can we make these changes to laser power and speed? Glad you asked…

It is easy. Once it is paused, just press the "Power" button. This screen will appear. Note that the power's set to 100; this does NOT mean that the laser is generating a full 10 watts of power (assuming that we're using the 10w Phecda laser). Instead, it means that it's currently set for 100% of whatever power the "Aircraft.nc" file called for. So, if the file said to use 5 watts of laser power, then 100% represents 5 watts of power. We can raise or lower the percentage of power by pressing the "+" or "-" buttons. Therefore, if we double the power by raising it to 200%, our laser power will now be bumped up to 10 watts. Please know that the most it can be increased is 200% of the original power the ".nc" file called for.
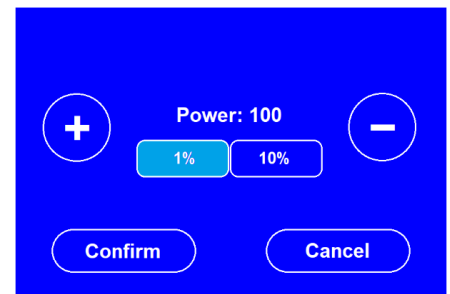
Also, please notice the 2 buttons below the Power value. If we press the 1% button, then the "+" or "-" buttons will only raise or lower the value by 1% for each time one is pressed. If we press the 10% button, then the "+" or "-" buttons will raise or lower the value by 10% for each time one is pressed. Once we have the power where we want it, press the "Confirm" button (or press the "Cancel" button to undo our changes).

If we press the "Speed" button, then this screen will appear. Note that the speed is set to 100; this does NOT mean that the laser is moving at the top possible speed. Instead, it means that it is currently set for 100% of whatever speed the "Aircraft.nc" file called for. So, if the file originally called for a speed of 10,000mm/min (millimeters per minute), then 100% represents 10,000mm/min. We can raise or lower the percentage of speed by pressing the "+" or "-" buttons. Therefore, if we double the speed by raising it to 200%, our laser can now move at 20,000mm/min. Please know that 200% of the original speed is the most it can be increased to.
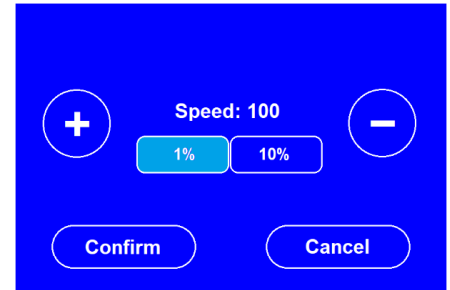
Also, note the two buttons below the Speed value. Like before, if you press the 1% button, then the "+" or "-" buttons will only raise or lower the value by 1% for each time one is pressed. But if you press the 10% button, then the "+" or "-" buttons will raise or lower the value by 10% for each time one is pressed. Once we have the speed where we want it, then just press the "Confirm" button (or press the "Cancel" button to undo our changes).

At this point, if we want to continue the carving with our modified speed and power settings, then we can just press the "Start" button, and it will pick up where it left off… but this time, it will use the newly modified settings for the remainder of the carving!

SECTION #3	⊕ Control	# HOW TO USE THE CONTROL SCREEN

When the Control button is pressed on the Home Screen, it changes to the Control Screen (shown to the right).

CONTROL SCREEN

The first thing we should notice about this screen is that there are some similarities to the Carving Screen #2 (from the previous section). And this is for a good reason: this screen will also allow us to move the Laser Module around, and to set the location that we'll specify as "Home". In fact, that's its only job in life!
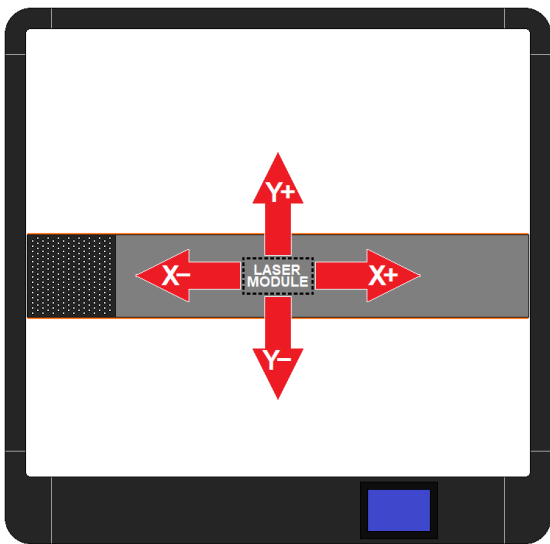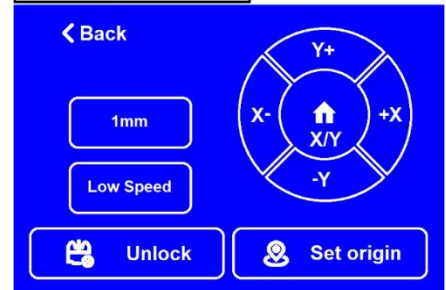
Just like before, we can press any of the X or Y buttons to move the Laser Module to a desired position. And again, the view above the Phecda (figure to the left) shows the direction each button will move the Laser Module in.

After the desired location is achieved, simply press the "Set origin" button to select it as the new "Home" position.

By the way, if you have already set up the location of Home… but later, you move it away from the Home position… then it's possible to quickly bring it back to Home position. This can be done by simply pressing the "Home X/Y" button (located in the middle of the X and Y directional buttons). Nice and convenient.

Also, just like we saw with the Carving Screen #2, we can change the distance and the speed for each time any of the X or Y buttons are pressed. Just press the distance or speed button; each time you press it, its value will change to one of the three possible values.

1MM → 5MM → 10MM

Low Speed → Mid Speed → High Speed

Currently, the button labeled "Unlock" is disabled. If this changes, we'll update the manual, accordingly.

Important: We don't have to use this screen to set Home, if it's already been set by Carving Screen #2. This screen allows us to change Home, without having the Carving button nearby. Also, once Home is set, don't manually (by hand) move the laser module, as the Home position will be corrupted.

And here's a tip: When you first turn on the machine… wherever the Laser Module is located, THAT is the new and current Home position. Of course, afterwards, you can use the X and Y buttons on either screen and use a Position or Set Origin button to change Home to the new position. But otherwise, the Phecda device will consider the position at turn-on as the new Home location.
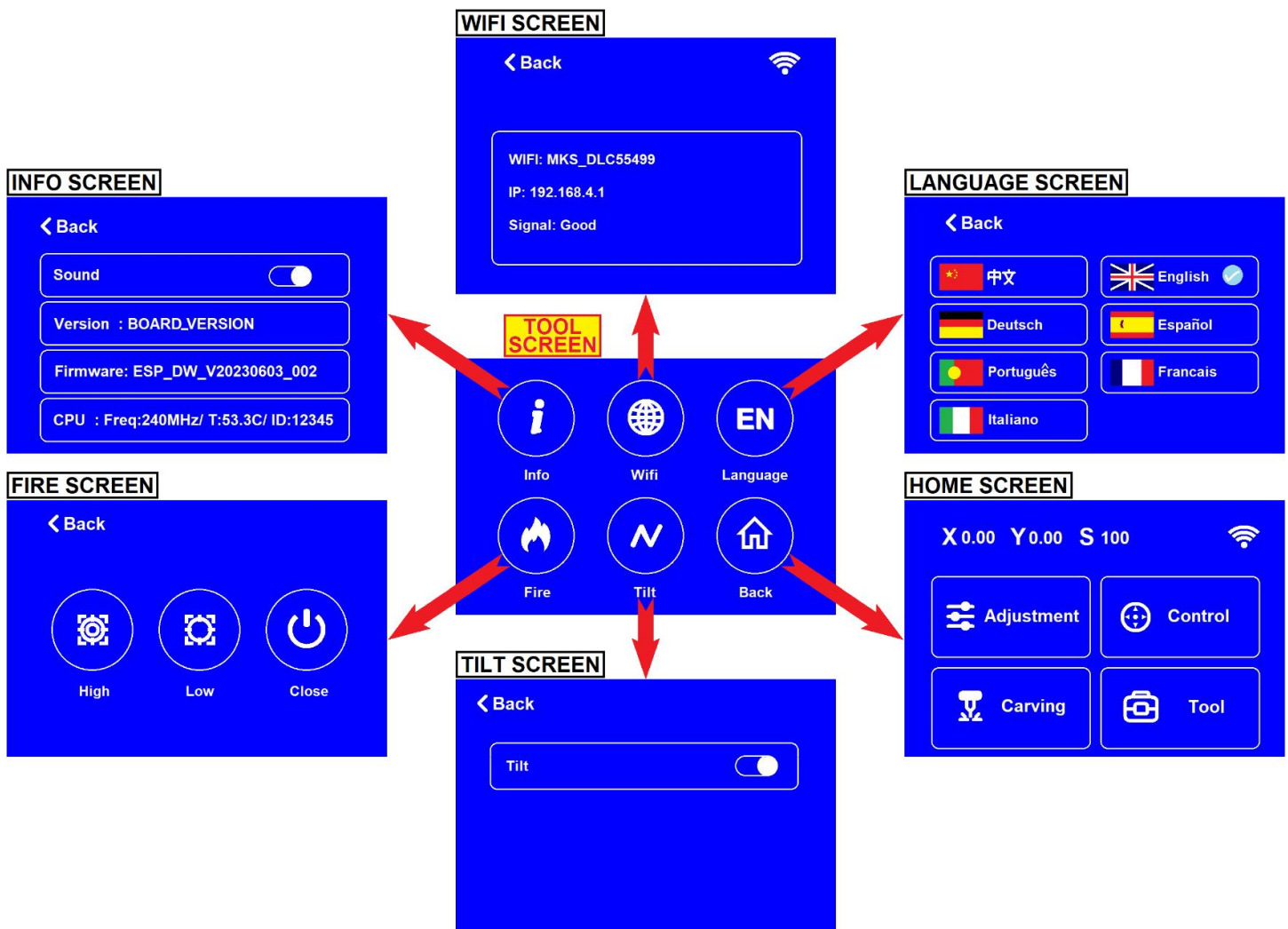
SECTION #4	🧰 Tool	HOW TO USE THE TOOL SCREEN

TOOL SCREEN

When the Tool button is pressed on the Home Screen,
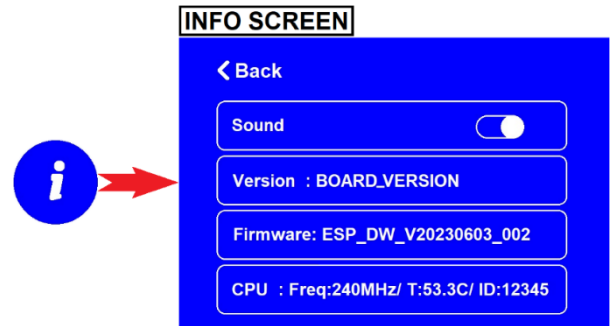it changes to the Tool Screen (shown to the right).

This Tool Screen consists of 6 different round buttons. Each button can take us to a different screen,
as the image below illustrates. In the pages that follow, we'll discuss the purpose of each screen.

WIFI SCREEN

< Back

WIFI: MKS_DLC55499

IP: 192.168.4.1

Signal: Good

INFO SCREEN

< Back

Sound

Version : BOARD_VERSION

Firmware: ESP_DW_V20230603_002

CPU : Freq:240MHz/ T:53.3C/ ID:12345

LANGUAGE SCREEN

< Back

中文   English ✓

Deutsch   Español

Português Francais

Italiano

TOOL SCREEN

i   ⊕   EN
Info   Wifi   Language

♨   N   ⌂
Fire   Tilt   Back

FIRE SCREEN

< Back

⊙   ⊡   ⏻
High   Low   Close

HOME SCREEN

X 0.00   Y 0.00   S 100

Adjustment   Control

Carving   Tool

TILT SCREEN

< Back

Tilt

11

If we select the Info button,
then we are given this Info screen.
The screen will provide some technical information:
- the electronic control board used,
- the firmware currently installed, and
- some Central Processor Unit specifications.

It also has a sliding button to turn sound on/off.

INFO SCREEN

‹ Back

Sound

Version : BOARD_VERSION

Firmware: ESP_DW_V20230603_002

CPU : Freq:240MHz/ T:53.3C/ ID:12345

If we select the WiFi button,
then we are given this WiFi Screen.
It provides some basic WiFi information:
- the device WiFi name,
- the device IP address, and
- current signal strength.

This information can be used by the
Elegoo Phone app to operate this device.
The password for Phecda's WiFi signal is "12345678".

WIFI SCREEN

‹ Back

WIFI: MKS_DLC55499

IP: 192.168.4.1

Signal: Good
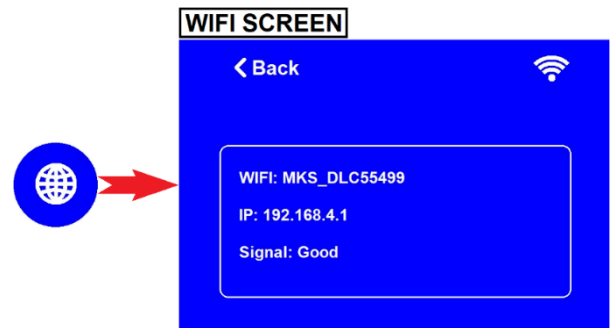
If we select the EN button,
then we are given this Language Screen.
It provides a choice of 7 different languages.
A checkmark is used to denote which language
is currently selected by you, the user.
Once a language has been selected, all
screens will use the chosen language.

LANGUAGE SCREEN

‹ Back

中文   English ✓

Deutsch   Español
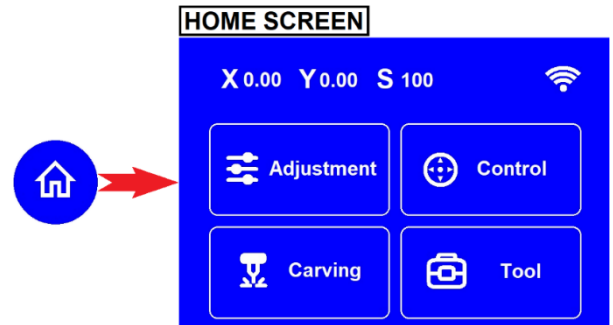
Português   Francais

Italiano
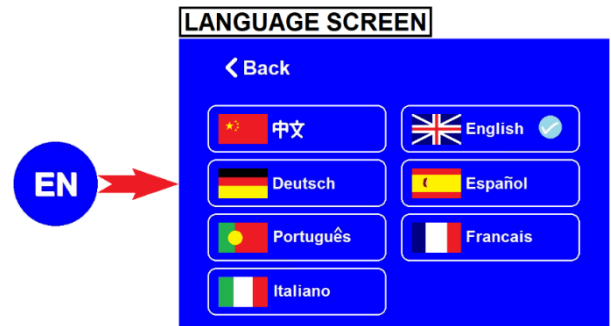
If we select the Fire button,
then we are given this Fire Screen.
Phecda has a sensor to detect a fire.
This screen can be used to select the sensor
Sensitivity (or to turn the sensor completely off).
If a fire is detected, the laser job will be aborted.
It is suggested that we use the highest sensitivity,
whenever possible, for the sake of safety.

FIRE SCREEN

‹ Back

High   Low   Close
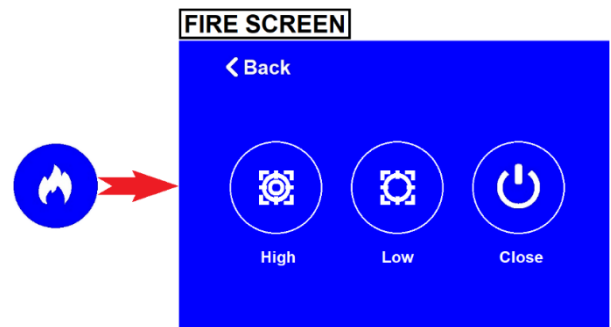
If we select the Tilt button,
then we are given this Tilt Screen.
Phecda has a sensor to detect if the
device has been tilted more than 30 degrees.
If so, then the laser job is immediately aborted.
The sliding button on this screen can
be used to turn this feature on or off.
It is suggested that we turn this
sensor on, whenever possible.

TILT SCREEN

‹ Back

Tilt
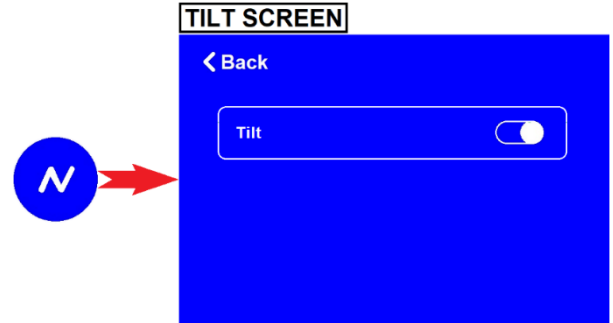
If we select the Home button,
then we are taken back to the Home Screen…
the same Home Screen that we started out
with when the device was first powered up.

HOME SCREEN

X 0.00 Y 0.00 S 100

Adjustment   Control

Carving   Tool

SECTION #5	**F.A.Q.**	**FREQUENTLY ASKED QUESTIONS**

#	QUESTION:	ANSWER:
1	Are lasers harmful to humans or pets?	If all safety precautions are carefully observed, lasers can be safely operated. Ignoring safety procedures during laser operation is inherently dangerous. Protective laser goggles are included with the Phecda laser machine and they MUST be worn during operation to protect your eyes from harm. **The laser beam must NEVER be observed by anyone who is not properly wearing laser goggles.** Animals must be kept away from the machine during operation, as they too can be harmed by the laser light.
2	What kind of goggles should I use?	Eye protection is provided by laser goggles that are designed to block laser wavelengths of approximately 455nm. Additional laser goggles can be purchased to protect your friends and family members.
3	What materials can the PHECDA laser engrave?	Phecda can engrave bamboo and different types of wood. You can also engrave metals with various coatings (like stainless steel) and anodized aluminum. It is important that the metal is thoroughly cleaned and doesn't have any chemicals on the surface; **PLEASE NOTE: Some cleaning or surface chemicals can be dangerous when heated by a laser. Also, be aware that some materials are dangerous to laser (for example, leather can produce chlorine gas which is both corrosive/damaging to the machine and VERY toxic to you. Always be aware of what is safe or not safe to laser and act accordingly. Additionally, know that it's crucial to have good ventilation during machine operation.**

4	What is the maximum cutting depth?	The laser's ability to cut through boards varies depending on the type of wood. But as a baseline, Phecda has been tested with basswood board. Here are the results:
		     For the 10-watt Phecda, maximum cutting depth is about 8mm (with multiple passes).
		     For the 20-watt Phecda, maximum cutting depth is about 14mm.(with multiple passes).

5	What compatible laser software does Elegoo recommend for the Phecda laser machines?	1. LaserGRBL (https://lasergrbl.com/download/) is a popular program that is currently free of charge. It works fairly well with both Phecda machines. LaserGRBL can be used with popular computer operating systems (Windows, Mac OS, and Linux) and can import many file formats (such as nc, cnc, tap, gcode, ngc, bmp, png, jpg, gif, svg, and lps). 2. Lightburn (https://lightburnsoftware.com/pages/trial-version-try-before-you-buy) is a very popular and feature-rich program that also works well with Phecda machines. At the time of this writing, it could be downloaded for a 30-day free trial, after which there is a one-time cost for unrestricted use. LightBurn can also be used with popular computer operating systems (Windows, Mac OS, and Linux). A large number of file formats are supported, as well. LightBurn can be configured to have different engraving speeds and different power levels for multiple components of an imaged being carved; this one feature alone could make it worth considering for your use.

#	QUESTION:	ANSWER:
6	Are there instructions for connecting my Phecda to LightBurn software?	Yes; please visit this link: https://drive.google.com/file/d/12hKRjRT4w_neHDYDaZRFhkWe1HDYul9o/view
7	Does the Phecda laser machine require cleaning / maintenance? What are the procedures? How often should they be performed?	Yes, cleaning and maintenance will be needed. The maintenance interval will depend on frequency and intensity of use. Fortunately, inspection and maintenance are fairly simple; recommended after every 15 days for moderate use, but under heavy use, maintenance should be performed more often. Look for residual dust and debris buildup on the X and Y-axis tracks, laser module fans, filter fan, and the laser module's window mirror. You should find the following videos helpful when performing inspections, adjustments, and cleaning: **How to clean laser module's cooling fans:** https://youtu.be/1RyVqR9rDd4 **How to clean dust collection turbo fan:** https://www.youtube.com/watch?v=qVLwxzyevgY **How to check belts for proper tension:** https://www.youtube.com/watch?v=scB1BSkx18c **How to clean laser module's window mirror:** https://youtu.be/FTx0ewFpCPw **Additional helpful videos can be found at:** https://www.youtube.com/@ElegooOfficial/search?query=phecda ***** IMPORTANT NOTE:** During laser operation, smoke and debris are generated which will eventually coat the window mirror. Air assist does help to slow this process down, but it cannot fully eliminate it. Therefore, when enough debris coats the window mirror, the laser will not be able to fully penetrate it; this will then heat up the debris on the window mirror. **When this happens, the window mirror can crack due to the intense heat generated by the laser.** Therefore, cleaning the window mirror is an important part of maintenance for any laser machine. Inspect regularly, until you get a good feel for when it should be scheduled. Also, be aware that some types of materials will emit more debris than other types of materials; get to know what to expect from each type of material you may work with.
8	What is the filter cartridge's expected lifespan?	For typical usage, we recommend that you inspect the filter ever week or so, and replace the filter every 1-2 months. Under heavy use, the filter will need to be replaced more often. Please keep in mind that the filter must be fresh enough to allow air to freely flow through it. Again, be aware that some materials create more debris than others.

#	QUESTION:	ANSWER:
9	Why doesn't the machine recognize my TF card? Why doesn't the machine recognize the files on my TF card?	The TF card may not "appear" to function correctly due to one of the following causes: 1. Please note that the machine cannot carve unprocessed image files (such as png, jpg, bmp, and others)… but it **can** recognize processed image files with the extensions of ".nc", ".gc" and ".gcode": LaserGRBL typically can output ".nc" files. LightBurn typically can output ".gc" files. Image-to-gcode converter software can output ".gcode" files. Note that once a carving file has been created, it must be placed into the root directory of the TF card; these files must NOT be stored within any folders on your TF card; this is because the machine cannot navigate through folders on the TF card. 2. It is possible that the TF card has been formatted incorrectly or has been corrupted. Ensure that the card has been successfully formatted using the FAT32 format, before placing your files onto the card. 3. **IMPORTANT NOTE:** The Phecda's power must be OFF when inserting or removing the TF card. Do not insert or withdraw the TF card while the machine is powered up, otherwise the card may be damaged, or the TF card's file structure may be damaged.
10	There are no sample carving files on the TF card.	Currently, we do not provide carving files on the TF card provided with your machine (in other words, you will not find any files with the ".nc" extension - from the factory). A few simple image files are provided, but they must be processed by LaserGRBL or Lightburn to etch or cut your material. In the near future, sample .nc files will be available on the Elegoo website. But for now, I have posted a sample .nc file on the DropBox.com website: https://www.dropbox.com/scl/fi/shmm5shi2si06p5fj5jqj/ELEGOO-70mm-logo.nc?rlkey=pp2hd119otg0kktqt1uyk0xxf&dl=0
11	What diameters and lengths can I engrave when using Elegoo's Rotary attachment?	The rotary attachment can engrave a cylinder with a diameter of 5mm to 250mm. The cylinder being etched can extend past the end of the rotary attachment, because there's no baffle to block it. But this doesn't mean any length is possible. Since a very long cylinder will have one end that's not supported, the weight of the cylinder becomes a problem. Too long of a cylinder will topple or shift during use; a maximum cylinder length of 340mm is suggested. It's recommended that your machine be updated with the latest firmware to ensure that the device can accurately engrave your cylinder. An older version of the firmware could possibly result in a distorted image during the carving process. Here are some instructions as to how to upload the latest firmware to your machine: https://drive.google.com/drive/folders/1x585JY70PonsQkAu45AvQLq2CVEtmaod?usp=sharing You may also watch this video… https://www.youtube.com/watch?v=ho15mrY3RME

#	QUESTION:	ANSWER:
12	How is the Rotary Attachment installed? Are there any precautions to observe?	1. Load the carving file onto the TF card. Then slide it into the card slot on the Phecda. Be sure to select the rotation mode on the Phecda's screen, prior to engraving. 2. You'll need to unplug the motor cable for the Y-axis. Next, plug the Rotary Attachment's motor cable into the Y1 or Y2 connection. Note that the origin (home) of the machine will be in the lower left corner. Here's a link to a video that shows how to install the Rotary Attachment: https://www.youtube.com/watch?v=shPJ6X2Ys-k 3. Be sure to use the "Mark the Perimeter" button from the Phecda screen. When pressed, the cylinder should initially rotate towards the front of the machine, then move to the right, then rotate towards the back of the machine, then back to the left (back to home position). If it initially rolls in the wrong direction, it's likely that the Rotary attachment needs to be rotated 180 degrees, so that it will roll in the correct direction beneath the laser module. 4. Note that the cylinder's surface needs to be smooth & flat. For example, a mug should be the same diameter, from top to bottom. If the object's sides are angled, then it will likely shift to the left (or to the right) during operation, causing the image to be distorted. Also, be aware that a handle (or any other protrusions) may cause problems with the rotary attachment.
13	What should I know about the Tilt Detection alarm?	When the laser module is working, Phecda automatically monitors the angle of the machine with respect to a level surface. If this angle becomes greater than 30 degrees, the machine will consider this to be a hazardous situation and will do the following: the Tilt Detection Alarm will be triggered (providing a beeping sound), the laser module and beam will immediately be stopped, and the control screen will display a Tilt Alarm Error.
14	Can the Phecda machine be operated outdoors, in direct sunlight?	There are two answers to this... yes and no. Let me explain: 1. No, because when the Phecda's operated in direct sunlight, the flame detection module may be triggered - which will cause the laser to shut down. But outdoor usage does provide excellent ventilation for any fumes that may be generated; for this reason, please read on. 2. Yes, but the flame detection module may need to be turned off. This can be accomplished through the touch control screen. If you decide to turn flame detection off for outdoor use, then please exercise caution and practice additional safety. The machine should be monitored at all times (regardless of whether flame detection is on or off). Be certain to have the alarm turned back on, when the Phecda is returned to indoor use. **3. Whether operated inside or out, be certain that nobody's able to view the laser without laser goggles. Also, remember that animals can be harmed by the laser, as well.**
15	Can the Phecda laser create colors on stainless steel material?	The Research & Development Test Engineer for Elegoo has tested the 10-watt and the 20-watt Phecda lasers for their effectiveness in producing colors on stainless steel. While both lasers can etch stainless steel, the 20-watt laser produces much better results in providing color to the metal surface. Also, please be aware that if the stainless-steel is very thin, the intense heat may very well cause the piece to deform... which would negatively affect the engraving result. Keep this in mind when selecting the laser's power and the laser's speed.

#	QUESTION:	ANSWER:
16	What are the exterior dimensions of the Phecda machines? What are the dimensions from within (between) the fixed feet?	If you are considering an enclosure for the Phecda, then it would be good to know the exterior dimensions (as viewed from above). Also, you may want to allow additional room for air assist and the power supply. The exterior sides of the Phecda machines measure: ~658mm from front to back (along the Y-axis), and ~673mm from side to side (along the X-axis). When placing a workpiece beneath the laser module, then it would be good to know the free space between the fixed feet: ~486mm from front to back (along the Y-axis), and ~623mm from side to side (alone the X-axis). The general working dimensions of the laser is a spacious 400mm by 400mm.
17	What is the Phecda's "Laser Safety Level"?	Phecda's laser safety level is a number 4. Direct or scattered laser exposure to your eyes or skin MUST be avoided at all times. A proper laser enclosure is effective at reducing accidental exposure to blue laser light.
18	What is the focal length of the Phecda laser head?	Focal length of the 10-watt laser head is 35±1mm; the laser spot size is 0.06mm*0.06mm. Focal length of the 20-watt laser head is 40±1mm; the laser spot size is 0.07mm*0.13mm.
19	Can a 10-watt Phecda be upgraded to a 20-watt machine?	Yes, you can purchase a 20-watt laser head from our store and replace the 10-watt laser head. You will also need to replace the power adapter; this is because the two laser heads have different power requirements: *The 10-watt laser requires a power supply that can deliver in excess of 45-watts at 24V. *The 20-watt laser requires a power supply that can deliver in excess of 85-watts at 24V.
20	Why is the carved image "mirrored" (or backward) from the image in my LightBurn software?	Within the LightBurn software, navigate through the menus... from "Edit" to "Device Settings", and then check the setting for "Device Origin". This setting controls the orientation of how the image will be carved by the laser. The Origin should be at the bottom left; if this is not the case, the carved image may be mirrored or upside down.

#	QUESTION:	ANSWER:
21	Sometimes the laser module collides with outside rails when "Marking the perimeter" or when carving. Why is this?	Before carving, the Home position needs to be carefully set (as discussed in this manual). Generally, it is best to set Home to the lower left corner of the device. You will need to know the overall dimensions of the image to be carved (width x height). If either dimension exceeds the 400mm x 400mm working area, or if Home is too far to the right, or if Home is too far up... then when the "Mark the Perimeter" button is pressed, the Laser Module may collide with a rail. If this is a possibility, then be ready to immediately switch off the power (to reduce wear to the belts). Next, make the image smaller... or after restarting the machine, move the Home location closer to the lower left corner. Always "Mark the Perimeter" prior to a carving. Installing Limit Switches is an additional option. See the next question for information about the use of limit switches.
22	Can limit switches be installed?	Yes, limit switches can be installed/wired into the Phecda (which will help prevent the laser module from colliding into the rails). If you have access to a 3D printer, you can print the parts needed to mount the switches. For more information on how this is done, go to this link: https://drive.google.com/file/d/1yi4ShWTMjzRfEqAqGbmHIygIfB69qbw2/view?usp=drive_link
23	What is a "focusing mirror"? What is a "window mirror"? Can the window mirror be replaced?	Both the 10-watt and the 20-watt Phecda lasers have a "focusing mirror" and a "window mirror" mounted within the lower side of the laser module. Both are about 10mm wide. The purpose of the focusing mirror is to focus the laser down to a small dot to allow for accurate carving, and to maximize the power being delivered to the workpiece. If it is too close or too far away, the beam will go out of focus, and performance will suffer. The focusing mirror works in conjunction with the laser module's height above the workpiece. The laser module's black Focal Positioning Bar is used to set the module to the correct height. The use of this "kickstand" is discussed in this manual. After the laser beam leaves the focusing mirror, it then travels through a window mirror. The primary purpose of the window mirror is to protect the focusing mirror from debris thrown up during the carving process. It is important that this window mirror be kept clean. Buildup on this window can cause the laser to be concentrated on it, and not on the workpiece; this will heat up the window mirror and can destroy it. The window mirror is mounted onto the copper-color cylindrical protrusion beneath the laser module. Please note that if Air-Assist is attached, this part will be concealed by the air-assist's shroud. When cleaning, the shroud can be removed by loosening its retaining screw. As mentioned earlier, the window mirror will need to be cleaned from time to time. Please see this link for more information: https://youtu.be/FTx0ewFpCPw Also, please know that replacement window mirrors can be purchased at this link: https://www.elegoo.com/products/window-mirror-for-elegoo-phecda

#	QUESTION:	ANSWER:
24	While using LaserGRBL, how can I accurately specify the location of my carved image?	If you're using LaserGRBL and you have opted to use the image's center point for the origin, then perform the following steps: 1. Mark the center point on the material. 2. Divide the height of the image by 2, and mark that distance directly below the center point. 3. Divide the width of the image by 2, and mark that distance to the left of the lower mark. 4. When the material is placed within the laser's rails, make the third mark the Home location. 5. As always, use the "Mark the Perimeter" button to ensure the image will be carved in the correct location and will not bump into a rail.
25	When using LightBurn, how can I accurately specify the location of my carved image?	If you're using LightBurn, lightly mark the center of the item. To find the center, consider marking crisscrossing lines over the material: the 1st line from the top right corner to the lower left corner, the 2nd line from the top left corner to the lower right corner. The place where they intersect will be the center. LightBurn has 9 positions to choose for the "Job Origin"; click the center option. With the laser set to very low power, jog the laser to the center spot. Once centered, make this location the "Origin" for LightBurn. The carving can now be started. For more information and illustrations on this procedure, visit the link: https://drive.google.com/file/d/1Rc_aLzAOqyVu9UKUDMukAHKPw-3TLglZ/view?usp=sharing
26	Is the laser operation "continuous" or "pulsed mode"?	The output of the Phecda lasers is pulsed mode.
27	How can I modify the unit of speed used by LightBurn software?	Left-click the "Edit" button on the toolbar, then left click the "Settings" option. About half way down, you should see a section for modifying "Units / Grids". Look for the column of options labeled as "Better for diode" (because the Phecda is a diode-based laser). You should see these three options available: mm / min Inches / min Inches / mm/min Just left-click the option that is most convenient for you.
28	Where can I find the terms of Warranty for the Phecda Lasers?	For product warranty information, please visit this link: https://www.elegoo.com/pages/refund-policy

ELEGOO PHECDA 10W ENGRAVER/CUTTER					
Operation	**Material Type**	**Thickness**	**Power (%)**	**Speed (mm/min)**	**Pass**
ENGRAVING	Nylon cloth	-	8	2000	1
	Release paper/Silicone paper	-	25	15000	1
	Kraft paper	-	40	12000	1
	Anodized aluminum	-	40	6000	1
	Soft magnetic board	-	50	15000	1
	Orange translucent acrylic	-	55	5400	1
	A4 paper	-	60	9000	1
	Cork slice	-	70	15000	1
	Medium Density Fiberboard	-	80	12000	1
	Coated metal	-	80	12000	1
	Epoxy board	-	80	1800	1
	Bamboo slice	-	80	9000	1
	Balsa wood	-	85	12000	1
	Fraxinus Mandshurica board	-	90	3000	1
	Basswood board	-	95	12000	1
	Stainless steel	-	100	2000	1
	Poplar board	3 mm	80	6000	1
	Bamboo Board	5 mm	65	6000	1
CUTTING	Kraft paper	0.18 mm	50	1800	1
	A4 paper	0.10 mm	50	1200	1
	Basswood board	3 mm	55	180	1
	Poplar board	3 mm	80	300	1
	Balsa wood	3 mm	80	600	1
	Med. Density Fiberboard	3 mm	60	180	3
	Foam board	4.50 mm	75	600	1
	Basswood board	4 mm	80	180	1
	PS foam board/KT board	5.40 mm	100	180	1
	EVA	5 mm	50	480	1
	Basswood board	5 mm	80	120	1
	Bamboo Board	5 mm	100	300	5
	Basswood board	6 mm	80	120	2

ELEGOO PHECDA 20W ENGRAVER/CUTTER					
Operation	Material Type	Thickness	Power (%)	Speed (mm/min)	Pass
ENGRAVING	Nylon cloth	-	7	1600	1
	Anodized aluminum	-	25	6000	1
	Kraft paper	-	40	18000	1
	Stainless steel	-	50	2000	1
	Med. Density Fiberboard	-	55	12000	1
	Basswood board	-	65	12000	1
	Bamboo Board	5 mm	70	12000	1
CUTTING	Kraft paper	0.18 mm	30	1800	1
	Basswood board	10 mm	100	120	2
	Peach board	3 mm	55	360	1
	Basswood board	3 mm	55	300	1
	MeD. Density Fiberboard	3 mm	100	300	1
	EVA	5 mm	25	480	1
	Bamboo Board	5 mm	90	180	1

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