BOSSLASER™

FM SERIES

USER MANUAL

CLASS IV Laser Machine

V2

BOSSLASER™

Fiber Marking User Manual

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Introduction

Welcome to the Boss Laser Family!

We are very excited to have you as one of our valued customers. It is recommended that you print out this manual to save time in the future and be sure to keep it close to your machine or computer, so you can have easy access while you design files or operate the machine.

This manual will walk you through the uncrating process, understanding the software and give a couple example test files to get you comfortable with your new equipment.

Test Files	
Page Number	**Example**
29	Running your first test file. “Hello World” Text and Hatch
58	Chuck Test File – Rotary Mark
35	Barcodes

Please be sure to read the manual in its entirety prior to operating the machine, this will ensure a better understanding of the machine and how it works. We understand that there can be a learning curve like with any new piece of machinery but, with some effort and patience you will be running your new laser with confidence and speed in no time!

If you do have any questions while reading the manual or setting up your machine, feel free to give us a call at 1-888-652-1555 or email techsupport@bosslaser.com and a member of our technical support team would be happy to answer your questions.

Our Mission Statement:

“Boss Laser strives to honor God by positively impacting its clients, employees, and community by providing products and services with Integrity, Honesty, and Value.”

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Warranty Disclaimer

Thank you for your interest in the products and services of Boss Laser.

This Limited Warranty applies to the laser machines and parts purchased from Boss Laser.

This Limited Warranty covers any defects in material or workmanship under normal use during the Warranty Period. ***This does NOT include labor and/or on-site Tech. Support.***

During the Warranty Period, BOSSLASER will repair or replace, at no charge, products or parts of a product that proves defective because of improper material or workmanship, under normal use and maintenance.

BOSSLASER will repair the product at no charge, using new replacement parts.

The Warranty Period for the Laser Equipment will begin on the day of arrival and will be covered for the length of time listed on your original machine invoice. If you have questions about your warranty, contact your Sales Representative or Technical Support.

The machine and any warranty replacement parts will be covered for the length of your warranty listed on your original invoice. The only exception to this warranty is the optical lens, which have a 30-day warranty from the date of arrival.

This Limited Warranty does not cover any problem that is caused by:
Conditions, malfunctions or damage not resulting from defects in material or workmanship (ex. modifications done to the machine)

Any modifications without written consent from Tech. Support, will void your machine's warranty.

To obtain warranty service, you must first contact Tech Support (888.652.1555 or TechSupport@bosslaser.com) to determine the problem and the most appropriate solution for you.

Definitions of Procedures

The BOSSLASER FM Series laser system is a machine that uses a fiber laser for engraving absorptive materials.

Operation

Operational procedures includes an introduction to the main interface of the marking software, EZCad 2, creating a text file, assigning power settings, positioning the file onto the material, and how to properly turn off your machine. In addition to the marking software, more advanced functions, which includes but not limited to, creating barcodes, QR codes and variable text features (ex. serial numbering).

Maintenance

Maintenance includes routine cleaning of the worktable surface as well as the lens being used (located on the scan head). These procedures are performed with the machine off.

Service

Service includes initial installation of USB Drivers & rotary installation & functions. Procedures during service may require the machine to be turned on. BOSSLASER recommends that only trained service personnel complete service or repairs.

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Users Manual for FM Series

SECTION 1: SAFETY

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Safety Precautions

- The BOSSLASER FM Series Laser Systems are a Class 4 laser product, as defined in International Standard IEC 60825-1.

- The BOSSLASER FM Series model family complies with 21 CFR 1040.10 and 1040.11, the Federal Performance Standards for Light-Emitting Products, except for deviations pursuant to Laser Notice No. 50, dated May 8, 2019. The Center for Devices and Radiological Health, of the US FDA, issued Laser Notice No. 50 to permit manufacturers to classify and manufacture their products in accordance with the International Standard.

- During normal operation, the output of the embedded laser is not contained. Proper personal protective equipment (PPE) is required.

- The visible output beam of the Laser Diode Pointer (Red Dot Pointer) is accessible to the operator. While this device employs the same technology as the familiar laser pen-pointers, like them it is potentially hazardous if its beam is directed into the eye.

- We have made every effort to make the Laser Diode Pointer (Red Dot Pointer) as safe as possible. Its beam path is located well inside the cabinet, and under normal operation, no hazardous levels of laser radiation can escape. The 2nd Red Dot Pointer (external) is located near the scan head of the machine, the main purpose is for finding the correct focal depth per lens configuration.

- The standard reference for laser safety is the American Standard for the Safe Use of Lasers, Z136.1-2000, developed by the American National Standards Institute (ANSI). This reference is the basis for many of the federal regulations for laser and laser system manufacturers, and for the Occupational Safety and Health Administration (OSHA) laser safety guidelines. It contains detailed information concerning proper installation and use of laser systems.

- While the ANSI standard itself does not have the force of law, its recommendations, including warning signage, training, and the designation of a laser safety officer, may be compulsory under local workplace regulations when operating laser systems above Class I. It is the operator's responsibility to ensure that the installation and operation of the BOSSLASER FM Series Laser System is performed in accordance with all applicable laws.

- Copies of ANSI Standard Z136.1-2000 are available from:

Laser Institute of America
12424 Research Parkway, Suite 125
Orlando, FL 32826
(407) 380-1553

Safety Precautions

- Before using the machine, any and all operators are required to read this manual carefully and adhere to the operating requirements & specifications. Anyone who has not read this manual should abstain from using the laser machinery, as it can cause harm to the machinery, the operator, and any bystanders.

- This laser machine is a Class IV laser machine, laser radiation is a possibility. Failing to follow the proper safety precautions has the potential to cause the following:
    - Materials within the machine and the surrounding areas to catch on fire.
    - When certain materials are processed by a laser machine, those materials can generate or produce toxic or hazardous gas when processed by a laser machine (see Laser Safe Materials section).
    - Direct exposure to laser radiation, causing harm to the human body.

- To ensure you are prepared for any possible accidents or emergencies, it is recommended to adhere to the following safety measures:
    - Have a CO2/ABC fire extinguisher on hand and near by to minimize damage to the machine and the surrounding environment incase of a fire.
    - Avoid stacking flammable or explosive objects on or near the machine.
    - Ensure good ventilation within the area while running the laser machine.
    - Only allow qualified personnel to operate the laser machine at all times, each person who enters the area should have general safety laser knowledge and any person who operates the machine should read this manual first.

- This laser machine uses electricity, having the potential increase the risk of electrical shock. Do not disassemble the machine without prior approval from Technical Support, otherwise warranty may be voided. Ensure all sources of power are removed for Service and Maintenance.

- Prior to the operation of the laser machine, all covers, doors, hoods, and safety mechanisms should be in place.

- During machine operation, the operator must be present to observe the working status of the machine, the machine cannot be left unattended. In case of an abnormality or an emergency it is important for the operator to react quickly and safely. In case of an emergency, utilize the emergency stop button, disconnect the machine from power immediately and take precautionary measures to inspect the machine prior to returning to normal use.

- To minimize the chance of accidents and emergencies, turn off the laser machine and disconnect any power cords prior to leaving the machine unattended.

- Do not place any reflective materials or objects in the machine, reflective material can cause the laser beam to deflect, causing damage to the machine.

- The ideal environment for your machine is a dry environment, free of interference from pollution, vibration, high voltage, or strong magnets. The laser machine should be in an ambient temperature of 39° - 104° Fahrenheit (5° - 40° Celsius) with humidity ranges of 5%-95% with no dew.

- The operating voltage of this machine should be AC 110V 60Hz.

Fire & Hazardous Materials

⚠ **WARNING**: This machine uses high heat to engrave and etch material. At no point should the machine be left unsupervised while it is in use. Leaving the machine unattended while in use can result in a fire and substantial damage to the machine and the building it resides in. Any damage caused by fire that is not due to defects in workmanship or the machine itself will NOT be covered by the BOSS LASER, LLC Limited Warranty.

⚠ **Hazardous Materials**: Any and all materials considered hazardous to the health of the machine, the health of the individuals operating the machine and the individuals surrounding the machine while in use are **NOT** recommended to etch or engrave. These materials can produce toxic fumes or cause the machine to not function properly and need replacement parts.

Materials that should **NOT** be etched or engraved:

- ⃠ PVC Compounds - Fumes produced by Polyvinyl Chlorine can cause irritation to eyes, skin and the respiratory tract. This material should not be exposed to elevated temperatures.

- ⃠ Vinyl - Fumes produced by Vinyl that has Chlorine can cause irritation to eyes, skin and the respiratory tract. This material should not be exposed to elevated temperatures.

Helpful Hint:
Majority of materials have a “Safety Data Sheet” or SDS, these can tell you whether materials are safe or not and whether they can be exposed to high heat. Any material containing chlorine is not safe to your laser or any individuals near the fumes. If you are still unsure about the material and its properties, give us a call and we would be happy to try and identify the safety of the material and whether it can be lasered or not.

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Laser Safety & Policies

First and foremost, **BE CAREFUL**. Laser machines are a powerful tool and the proper precautions should be taken, just as if you were working with any other high-powered tool or machinery. These machines are designed to engrave with highly focused heat energy and can be dangerous. You should never leave your machine unattended while it is in operation and do not let an inexperienced or unfamiliar person operate your machine at any time.

Avoid any direct exposure and do not stare at the laser beam while the machine is operating. Notice and understand all the warning labels located on your machine.

The following safety measures must be strictly enforced and be abided by to ensure the safety of the machine and the individual operating it. BossLaser, LLC shall not be held responsible for any damages or injuries resulting from improper use or dismantling of the laser machine.

- **NEVER** operate laser machinery unless you have been properly trained.
- **ALWAYS** wear industry approved protective eyewear (preferably wraparound goggles) when operating the laser. Your fiber laser comes with one pair of laser safety goggles. It is recommended operators have a spare set and at least one set of goggles for each operator using the equipment.
- **NEVER** set anything on top of the laser and/or on the worktable while not in use.
- **NEVER** leave the laser unattended while it is running. This will ensure that you are able to see or hear any abnormalities / potential hazards.
- **ALWAYS** maintain the machine's environment free of heavy pollution, such as strong magnetic electrical interference.
- **NEVER** use unapproved or unsafe materials, such as Polyvinyl Chloride (PVC) or any materials that emit noxious gases. These gases can cause harm to your central nervous system.
- **NEVER** operate the laser near flammable or explosive substances.
- **NEVER** dismantle the laser machine unless instructed by a BOSSLASER Technician, this can disrupt the laser and its high voltage/pressure parts. This can cause harm or injury.

⚠ In Case of a Fire:

1. Press the EMERGENCY STOP button located on the panel with the power switch.
2. Quickly blow out the flame(s), a CO_2* fire extinguisher for serious flames.

* Halon can also be used on the laser systems.

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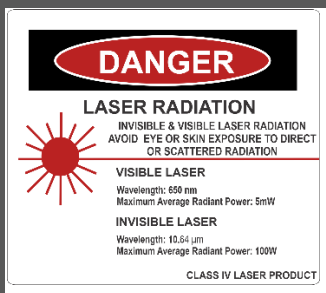
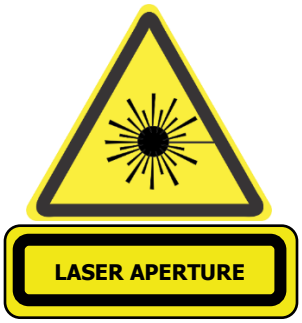
Important Safety Labels

These warning labels can be found all around your machine, it is important that you pay attention to these warning labels and adhere to them. These labels are put in place for the safety of the machine and the operator. If these warnings are not followed, it could cause serious damage to the machine and possible injuries to the operator.

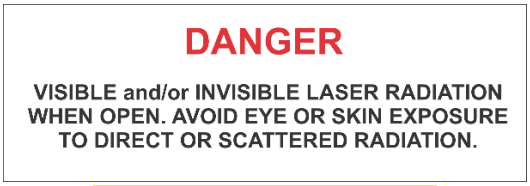
FM Warning Labels



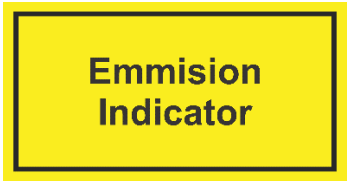
This label can be found on the top surface of the machine, near the control panel. The fiber laser will be initiated from the fiber source to the housing, through the scan head and onto the material on the worktable.



Located on the scan head where the focusing beam is being emitted.



Located on the body of the machine near the non-interlock openings.



Located on the top surface of the machine, near the control panel. Indicates when the laser is being emitted.

Located on the top surface of the machine, near the control panel. Used to power the machine on and off and provides unauthorized access with the use of a key.

Located under the E-Stop button, part of the control panel. When initiated, the system/machine will shut down immediately.

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SECTION 2: GETTING STARTED

Accessing Our Manuals

How to Access the Manuals:

On the USB

1. Your FM Series Machine will come with a USB that contains the software and a few of our manuals. The first step is to plug in the USB that accompanied the machine.
2. Next, there should be two folders within the USB, a “Factory” folder and “Lens Config ___ x___” folder. The user will choose the correct file based off the lens size they are working with.
3. The “Lens Config” folder will contain the screenshots of the factory parameters from the initial setup from the Boss Facility and a digital version of this manual.

On Our Website

1. Go to BossLaser.com
2. There will be a banner of drop-down menus located towards the top of the page, hover over the menu labeled “Support”.
3. After you hover over the menu labeled “Support” scale down the drop-down list until you reach “Downloads”. Now, hover over the “Downloads” option.
4. There should now be three subcategories labeled “Manuals”, “Software” and “Resources”. Select the “Manuals” option to view all manuals.

There will be manuals for almost all of our machines located on this page. Make sure you are downloading the proper manuals for the FM Series Machine.

Unpacking & Setting Up Your Machine

Your new laser will be delivered in a large wooden crate. Please be sure to have the necessary tools on hand when unpacking the crate, we recommend a hammer and a pry bar, as well as some type of metal cutter or tin snips that will allow you to remove the bands from the crate. Our crates will have pallet feet, this allows for a forklift or pallet jack to be used so you can move the crate with ease.

While majority of our machines arrive safe and sound, we urge you to inspect the crate upon delivery to ensure that no damage has occurred while in transit. Damage can include pierced wood, smashed sides, or an open portion of the crate, If there seems to be any damage to the crate, take pictures prior to removing the bands. If no damage is visible on the outside, proceed to the opening of the crate. If there is damage to the crate, contact your sales representative and send them pictures so we can report that damage to the carrier. The machine is insured for its full value while in transit and if it is damaged to the point of needing parts or replacement, the carriers are very good at covering those costs. **Damage must be reported within 24 hours of delivery.**

It is recommended that the bands be cut first then carefully use a crowbar to remove the lid of the crate. All of our crates are secured by 2” staples, so use caution when prying up the lid. Be careful not to use any part of the plywood interior as a focal point for the pry bar, stay on the outside framing to ensure that you will not pierce the plywood and damage the machine. Once you have the lid of the crate off, take out any smaller loose boxes that contain accessories. These boxes have a tendency to fall out if the crate walls were to be taken off first. After those smaller boxes have been removed, move onto the removal of the front panel, two side panels and then the back panel. Save these crate panels in the event that you ever need to move the machine to a different location.

Setting Up the Laser for the First Time

- Make sure to remove any foam or padding from inside or outside of the machine.
- Depending on what options you had purchased with your laser, those accessories will be found in the main crate with the laser. Inspect them for possible shipping damages.
- If you think anything is missing from your machine or crate, please contact your sales representative.
- Start removing items from the toolbox to be assembled with the machine.

Unpacking & Setting Up Your Machine (Continued)

Your new laser system will have a toolbox that contains everything for you to set up and operate your new system. Depending on the machine you've ordered will determine what is in toolbox you will find:

Power Cord – **Comes attached to FMD and not found in the toolbox.**

This is the main power input cable that goes from the wall to the "General Power" of your machine (110VAC)

Allen Wrenches

In the event something needs to be tightened after shipping; these are provided for convenience.

Sizes included:

2.5 mm 3 mm 4 mm 5 mm 6 mm

Ruler – **Not included in FMD**

This is also for your convenience to measure parts or lens height towards the piece of material

A pair of Fiber Laser Safety Glasses (λ = 1064 nm)

These are mandatory for your safety when operating your laser system

Foot Pedal

This is used as another way to start the file. This is usually used in a production/manufacturing environment when the operator feeds the machine new parts without making any software changes

USB Manual/Software with Backup Parameters

The USB flash drive contains all the manuals and resources necessary for you to operate this laser as well as backup parameters in the event of a software crash.

Remote Interlock

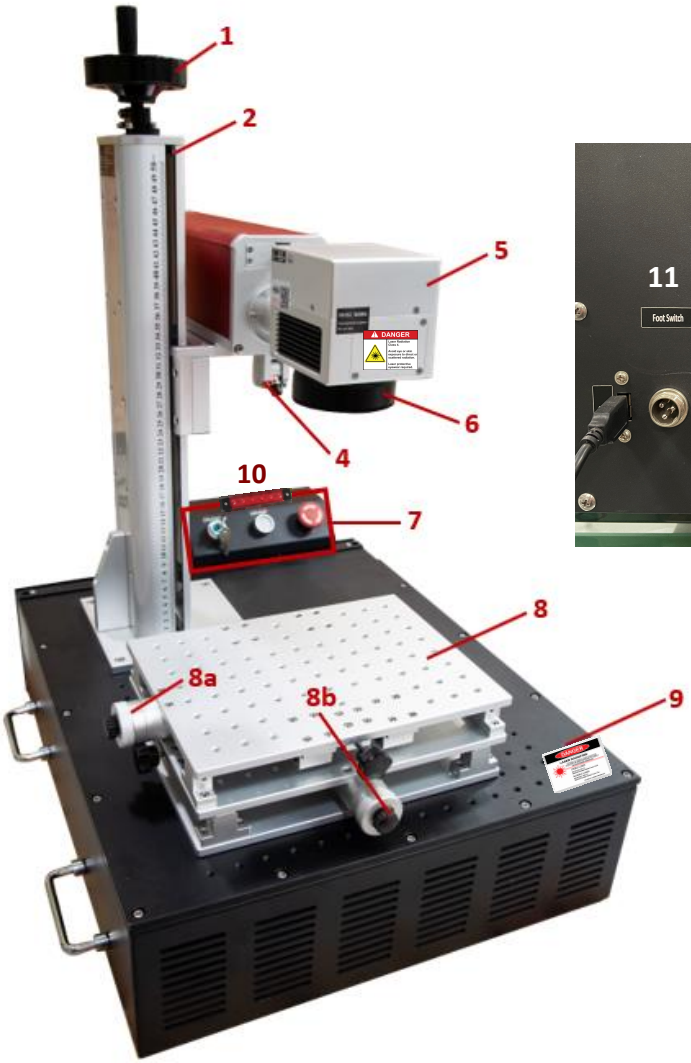
The machine incorporates a remote interlock connector for the end user to have the option of implementing a remote interlock with the included In-Use Connector. The included Remote Interlock Not In-Use Jumper will be used if the end user does not desire to use a remote interlock. An optional Remote E-Stop is also included with the machine to be used as a remote interlock, if desired.

Remote Interlock
In-Use Connector

Remote Interlock Not
In-Use Connector
(Jumper Plug)

Optional Remote E-Stop

FM-Desktop



FMD Machine Components

1. Z Axis Column Handle
2. Z Axis Column
3. n/a
4. External Red Dot Pointer
5. Scan Head
6. Lens
7. Control Panel (expanded below)
8. Adjustable Worktable **(optional)**
   a. X Axis Adjusting Knobs
   b. Y Axis Adjusting Knobs
9. Worktable
10. Emission Indicator
11. Foot Switch
12. Rotary Connector
13. Remote Interlock Connector

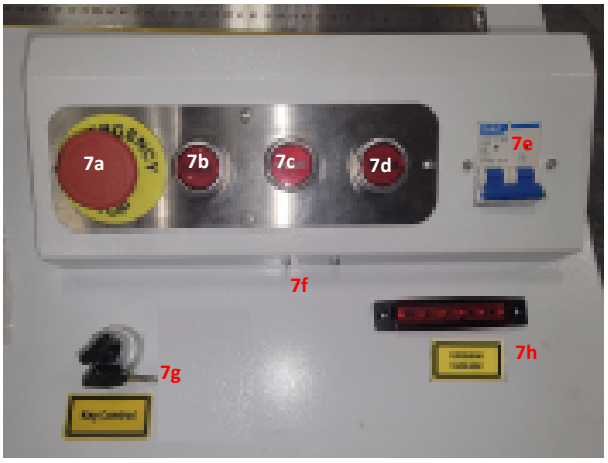
Important Switches

7. Control Panel
   a. ON/OFF Key Switch
   b. ON/OFF Fiber Laser Power
   c. ON/OFF Emergency Switch

FM-Station

FMS Machine Components

1. Z Axis Column Handle
2. Z Axis Column
3. Monitor
4. External Red Dot Pointer / Focus
5. Scan Head
6. Lens
7. Control Panel
8. Adjustable Worktable
   a. X Axis Adjusting Knobs
   b. Y Axis Adjusting Knobs
9. Keyboard and Mouse Tray
10. Computer Tower
11. Leveling Feet
12. Foot Pedal
13. Remote Interlock Connector



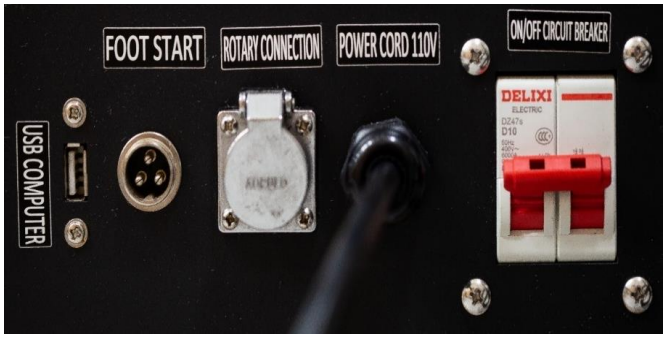
Important Switches

7. Control Panel
   a. Emergency Button
   b. Scan Head Power
   c. On/Off Laser Power
   d. On/Off Rotary Attachment Power
   e. Circuit Breaker
   f. Computer USB Port
   g. Key Control
   h. Emission Indicator

Turning on your FMD Laser

Now that you are familiar with the overall terminology, we will walk you through on turning on and running your first file.

The back of your machine will look like one of these two set ups.



Step 1: Plug the power cord into a 110v (AC) outlet.

Step 2: To turn on the machine, you will need to do it in a specific sequence:

1. Flip the Circuit Breaker to the up position or turn the red switch to the on position.
2. Turn the Emergency Switch up; Follow the arrow indicators
3. Turn the key to the ON position
4. Press down on the Laser On/Off button. It should light up white when ON.
5. Remove the Lens Cap from the Scan Head to prepare for the following steps on running your job
6. Lastly, plug the USB Cable to the unit (labeled USB Computer) and into your PC

Powering the machine down

Powering the machine down in these specific steps is important. You must follow the sequence otherwise you will run the risk of your machine not functioning properly and hard resetting. If your machine does this, you will need to contact the Tech Support team for assistance.

1. Put back the Lens Cap onto the Lens.
2. Turn off the Laser On/Off button
   2a. On the FMS Only – Power down the computer before cutting the power to the machine.
3. Press down the Emergency Switch
4. Turn the key to the OFF position
5. Flip down the Circuit Breaker

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Turning on your FMS Laser

Very similar to powering on the FMD machine follow these steps below and you'll be running your first file in no time!

1. Flip the **Circuit Breaker** to the up position
2. Turn the **Emergency Switch** up; Follow the arrow indicators
3. Press down on the **Scan Head** button. It should light up green when ON.
4. Press down on the **Laser On/Off** button. It should light up green when ON.
    a. Note: The **Rotary Attachment** button is the same, however, it does NOT light up green.
5. Turn on the **PC** & **Monitor**
    a. Depending on your PC, it may have a door that you must open to access a switch with a white dot. Flip this switch by pressing on the white dot to turn on the PC. Wait for a green LED light to turn on to show that the PC is getting power
6. Lastly, remove the **Lens Cap** from the **Scan Head** to prepare for the following steps on running your job

Step 3. Launching EzCad2. The shortcut icon should be located on the desktop.

Double Click on the icon to start up the program.

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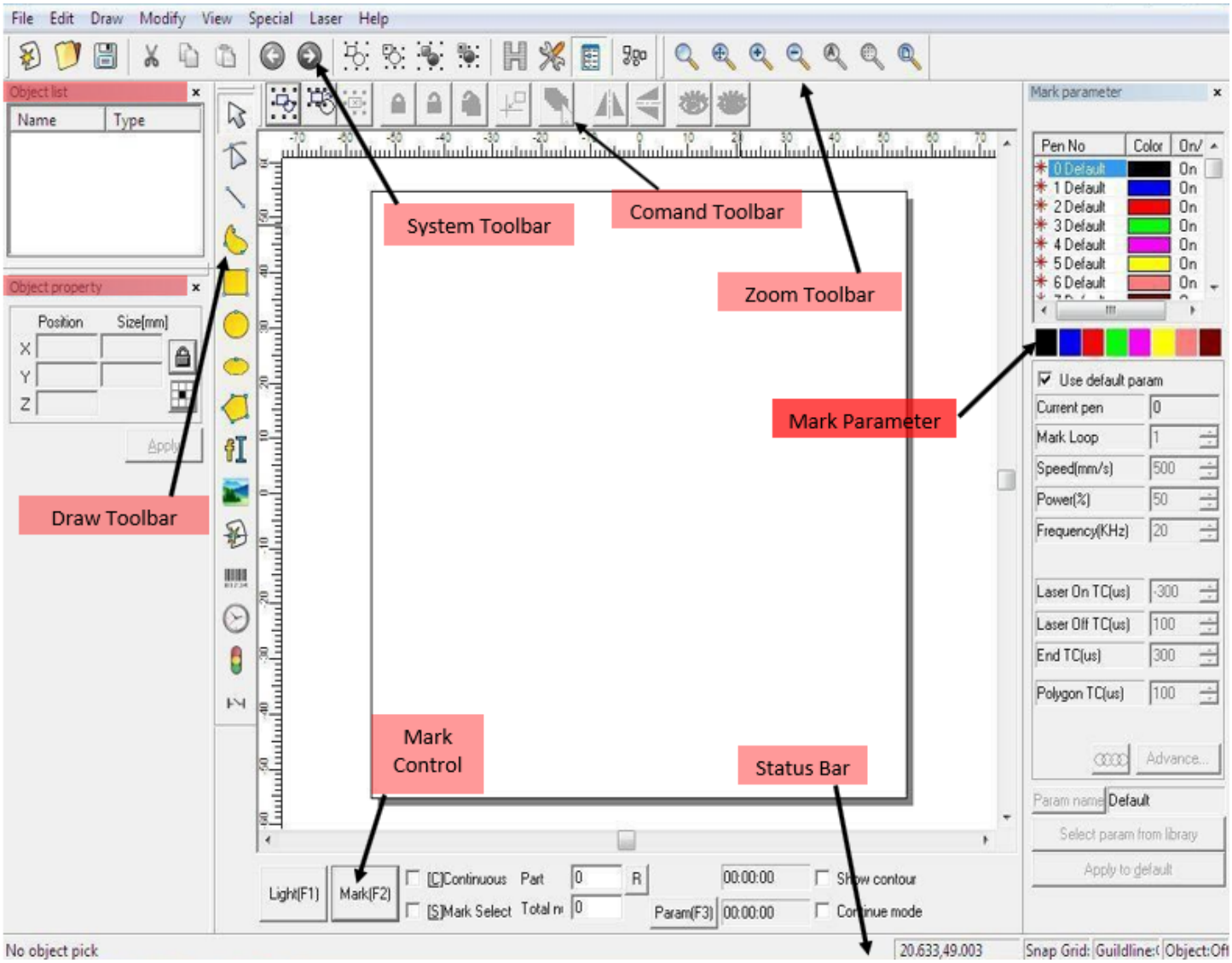
SECTION 3: OPERATION

Main Interface Introduction

Launching EzCad 2:

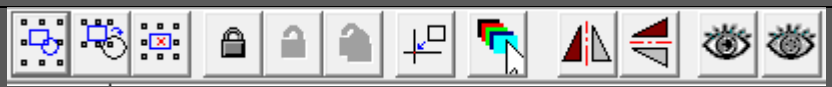
Locate the folder **BOSSLASER Ezcad2.14.7 FMD GEN V**.

Each folder will correspond to each "Field Size" setup (110, 200, and 300). Drag and drop these folders onto your Desktop. To launch Ezcad2, double click onto the folder that corresponds to your Field Size setup, and double click on the **EzCad2 icon**. This is what the software looks like when fully launched.

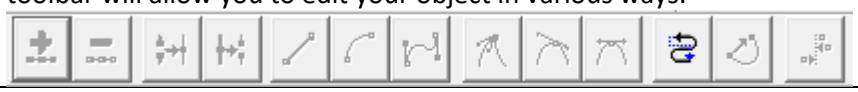


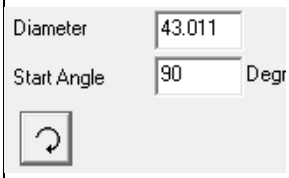
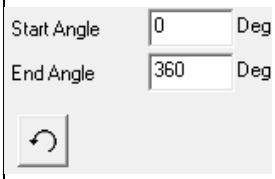
System Toolbar		
Toolbar Icon	**Keyboard Short Cut**	**Description**
	Ctrl + N	**New Document:** Open a new document, if needed. Please note, like most programs if current document is not saved when this button is pressed the software will prompt you to save your work before opening a new document.
	Ctrl + O	**Open Document:** Open a document previously saved. If current document is not saved when this button is selected, then the software will prompt you to save your work before opening a new project.

System Toolbar		
		
Toolbar Icon	**Keyboard Short Cut**	**Description**
	Ctrl + S	**Save Document:** Save your current job as an .ezd or Ezcad file. Once saved that file can be opened again using the “Open Project” button.
	Ctrl + X	**Cut:** When an item within your design is selected this button allows you to cut the item out of the project and paste the item into another location.
	Ctrl + C	**Copy:** When an item within your design is selected this button allows you to copy that item to be pasted in another location of your file.
	Ctrl + V	**Paste:** Select an item as cut or copied, and then paste it to a desired location within your project.
	Ctrl + Z	**Undo:** Undo a previous action made while working on your file.
	Ctrl + Y	**Redo:** Redo an action that was undone while working on your file.
	Ctrl + L	**Combine:** Select two or more items within your file and combine them to create a single item.
	Ctrl + K	**Uncombine:** Uncombine two or more items that were combined previously within the file.
	Ctrl + G	**Group:** Group one or more items together within your file.
	Ctrl + U	**Ungroup:** Ungroup two or more items that were grouped previously within your file.
	Ctrl + H	**Hatch:** Select to highlight a vector item within your file and then hatch it. This creates a series of vector lines within the vector design to be etched. The various hatch features are explained in detail on page 20. **Note:** The object to be hatched must be a closed curve. If multiple objects are to be hatched, they cannot intersect.
	N/A	**System Parameter:** Open to refer to your software parameters. From here you can adjust the display, language, workspace, etc. Once selected a menu will appear. The various System Parameter features are explained in detail on page 62. **Note:** You can also get to System Parameters by selecting File > System Parameter
	N/A	**S/H Object List Bar:** Show or hide the object list function on the left side of the screen.
	N/A	**Resort:** Adjust the marking order the laser will perform when marking.

Command Toolbar	
	
Toolbar Icon	**Description**
	**Select all:** Select all objects present within the workspace.

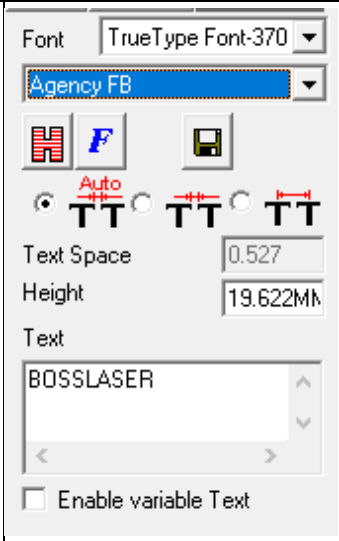
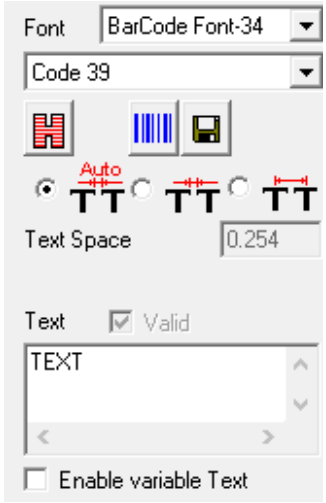
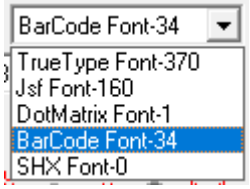
Command Toolbar	
	
Toolbar Icon	**Description**
	**Select/deselect all:** Select all objects as well as deselect all objects within the workspace.
	**Delete all:** Delete whatever object(s) are selected within the workspace.
	**Lock object:** Lock a selected object and prevent it from being adjusted.
	**Unlock object:** Unlock a previously locked object within the workspace.
	**Unlock/deselect object:** Unlock and deselect a previously locked object within the workspace.
	**Put to origin:** Selected object or objects will be set to origin within the workspace. The origin can be adjusted in The system parameters menu or in the object properties menu. **Pro Tip:** Keyboard shortcut press the letter “C”
	**Pick by pen:** Select object by their pen color. If you have an object or objects set to a specific color and you Would like that object(s) selected you can select this button and choose the pen you are looking to Select and press ok.
	**Vertical mirror:** Mirror the selected object in the x axis.
	**Horizontal mirror:** Mirror the selected object in the y axis.
	**Show object:** Show selected hidden object(s).
	**Hide object:** Hide selected object(s).

Draw Toolbar	
	
Note: When the tool is in the “pressed-down” state on this toolbar it indicates that the tool is currently being utilized.	
Toolbar Icon	**Description**
	**Select Tool** Select objects as well as other options within the software. You can use your mouse to select objects within the workspace.
	**Edit Node Tool** Edit nodes within selected objects. When an object is selected in the workspace there will be nodes that appear around the object. You can identify nodes as hollow squares, the largest being the start point of the curve. **Note:** When this tool is selected a Node editing toolbar will appear. The different functions within this toolbar will allow you to edit your object in various ways. 
	**Draw Line Tool** Draw a single line or create an object out of line segments.

Draw Toolbar	
	
Note: When the tool is in the "pressed-down" state on this toolbar it indicates that the tool is currently being utilized.	
Toolbar Icon	**Description**
	**Draw Curve Tool** Create a free curve by selecting this icon and click and dragging on the workspace.
	**Rectangle Tool** Draw a rectangle by left clicking in the work area and dragging to the right. **Pro Tip:** You will be able to draw a square by left clicking on the work area while holding the "ctrl" key in unison while dragging to the right to create the size square desired. **Pro Tip:** Selecting the box for All Corner Round will make all corners the same angle when you enter a specific value. After drawing a rectangle, refer to the object properties toolbar. The option for rounding corners by a specific degree is available. Be sure to select Apply if you make any changes.
	**Circle Tool** Draw a circle by left clicking the workspace and dragging to the right until you reach the desired size of the circle. By using this tool, you will be able to create perfectly round circles. When you draw and select the circle the object properties menu options change to show the circle's size information.  **Diameter:** Diameter of the circle **Start Angle:** Degree of the angle of that start point and the center of the circle. **The Arrow Icon:** is indicating the direction of the circle. It can be changed from Counterclockwise to Clockwise.
	**Ellipse Tool** Very similar to the Circle Tool, but this option allows you to draw ovals if desired. Draw by left clicking in the workspace and dragging to the right until you reach the desired size of the ellipse. When you draw and select the ellipse the following toolbar will appear under the Object Properties:  **Start Angle:** The angle between the start point and center point of the ellipse. **End Angle:** The angle between the end point and the center of the ellipse. **The Arrow Icon:** is indicating the direction of the circle. It can be changed from Counterclockwise to Clockwise. **Pro Tip**: While drawing the ellipse hold down the Ctrl button on your keyboard to draw a circle. One less menu option to learn and completely user preference should both or only one be used.
	**Polygon Tool** Create a series of different shapes that have more than 2 sides by left clicking the workspace and dragging to the right until you reach the desired size off the shape. Once object is drawn or selected the shape can be customized in under the Object Properties menu:  **Edge Num:** Allows you to enter the number of points you would like on your object. **The Polygon or Star Button:** Allows you to alter the shape from polygon to star. **Pro Tip:** While drawing the polygon hold down the Ctrl button on your keyboard to draw a symmetrical object.

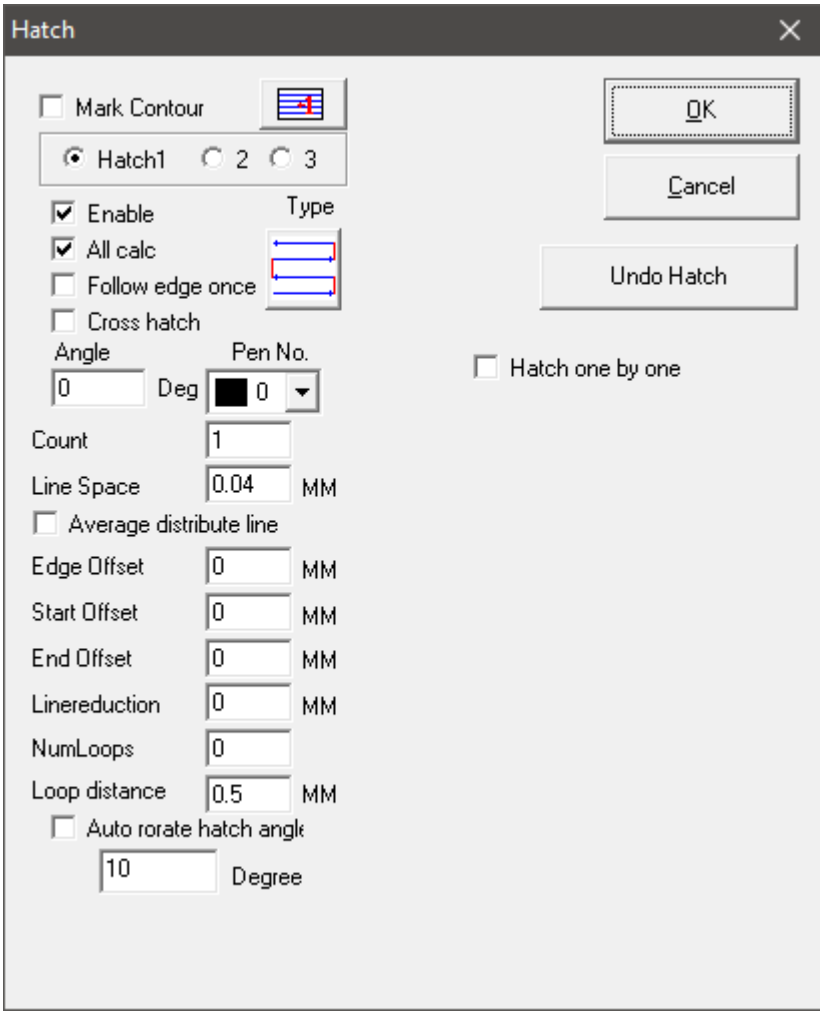
Draw Toolbar

Note: When the tool is in the "pressed-down" state on this toolbar it indicates that the tool is currently being utilized.

Toolbar Icon	Description
fI	 **Text Tool** To use this function within the workspace, select the text icon and left click once on the workspace. When you've created and selected the text within the work area various changes can be made under the Object Properties menu. **Font Character Properties:** Users may change the list by selecting one of the different lists from the drop-down menu. **Font:** All the fonts available from the selected list will appear in the drop-down menu for various options. **Note:** SHX Font-0 are specific preloaded fonts from the software different from the usual TrueType Fonts loaded from your computer. **Hatch:** Hatch the text files after they are created using the hatch features. **F:** Opens the font properties window. In this menu text alignment, bold, italic, and many other options for editing the appearance of the text is available. **Text Spacing:** by default, is set to auto. **Circle Text:** features will be covered on page: 28 ☐ **Enable Variable Text:** Used for barcodes, serial numbers and other sequences.
	Bitmap Tool This tool will allow you to import a bitmap file previously saved onto your computer. You can also access bitmaps via the draw menu or importing them via the File menu. **Note:** The current supported graphic files are bmp, jpeg, jpg, gif, tga, png, tiff, and tif. Additional Bitmap Tool features will be covered on page: 36 **Pro Tips:** **Show preview:** when box is checked, users can preview the design before they import the image. **Put to center:** when checked, the image will be imported to the center of the workspace.
	Vector Tool This tool will allow you to import a premade vector design into the workspace. You can also import vector images within the Draw Menu as well as the File Menu. **Note:** the following vector file formats: DXF, SVG, PLT, DST Additional Vector Tool features will be covered on page: 39
	Barcode Tool This tool will allow operators to create barcodes out of text. To use the tool, select the correct icon and then click once on the workspace. Once you create the barcode and select it the following toolbar will appear under Object Properties:  **Barcode Text Function:** Users may specify the barcode font as one of the five font types as shown:  When users select a type of barcode, a list of available barcodes within that font group will appear as BarCode Font in the drop-down menu. **Note**: Additional bar code features will be covered on page: 29

Draw Toolbar	
	
Note: When the tool is in the "pressed-down" state on this toolbar it indicates that the tool is currently being utilized.	
Toolbar Icon	**Description**
The next three icons on the Draw Toolbar are typically used for integrating automation systems. These features are likely only useful to a very small group of individuals. The features are explained below but are not currently supported by BOSSLASER or the current design of FM model machines. If you feel you could benefit from these features, contact sales and discuss your custom machine options.	
	**Time-Lapse Tool** This tool will allow the user to set a specific time delay for a specific marking process. When the time lapse is selected the Object Properties will display an area that will allow the user to enter a wait time. **Wait Time** is measured in milliseconds and tells the system to wait before it begins to mark the selected image.
	**Input Port Tool** This tool allows users to control the input signal for a specific marking process. When the Input Port Tool is selected the Object Properties will display **I/O Control Condition**. **I/O Control Condition** are settings that control the pause feature for the software. The software will pause until the input signal is the same as the I/O control condition. **Note:** If **Message** is checked, then the software will supply a message to the user that can be customized stating instructions.
	**Output Port Tool** This tool allows users to control the output signal for a specific marking process. Once selected the Object Properties will allow you to customize Set Output.  Icon indicates that the system will export a high-level voltage signal when the operation is taking place at the current output port.  Icon indicates that the system will export a low-level voltage signal when the operation is taking place at the Current output port.  Icon indicates that the system will export a fixed level.  Icon indicates that the system will export a pulse.

Hatch Menu Features



1. **Mark Contour**: whether to show and mark the current object's contour or not

means when selected, mark hatch line first then mark contour

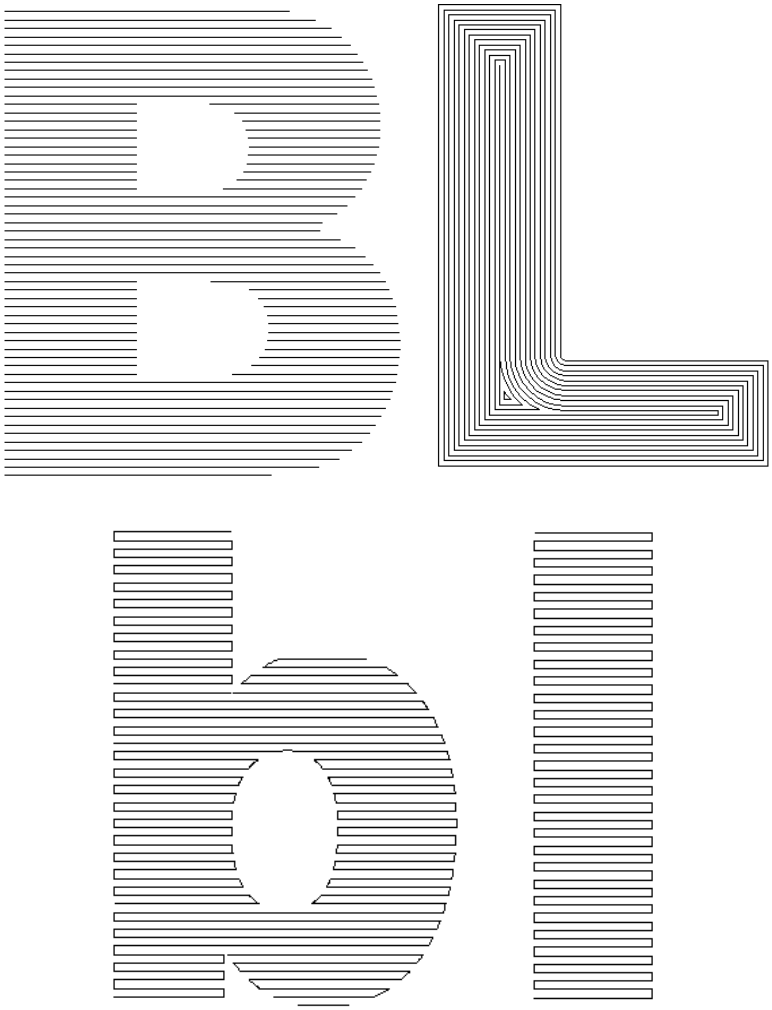
means when selected, mark contour first then mark hatch line

2. **Hatch 1/2/3**: Users may have three independent hatch parameters to hatch the same object at the same time. Each set of hatch parameters can be appointed a Pen No. which stands for a set of marking parameters
3. **Type**: Can be selected to switch between the Unidirection, bidirectional, and ring-like hatch
4. **All Calc**: Calculate all the selected objects as a whole. This is an optimizing option. In some cases, the speed of marking may highly be raised. It will take long time to calculate large, complex objects. When not selected, the objects will be calculated separately.
5. **Follow Edge Once:** Allows you to outline your hatched object with a single line.
6. **Cross Hatch:** This option will vertically go across your selected item whereas typically the hatches run horizontal without angles applied.
7. **Angle**: Hatch Angle feature angles between hatch lines and X axis.
8. ☐ **Hatch one by one:** If multiple hatches are set and this box is checked the software will run all of the hatches individually by the number of passes you designate. Meaning if you have it set to run 10 passes all of hatch 1 will run 10 times, then all hatch 2 will run 10 times, then hatch 3 will run 10 times. Unchecked the software will run all the hatches together. Hatch 1, 2, 3, hatch 1,2,3, until it has gone 10 times.
9. **Count:**
10. **Line Spacing**: This is the space between two hatch lines
11. **Average Distribute Line:** When checked, the software automatically adjusts the hatch line distance to the settings you specified and will set the hatch lines to an average distance.
12. **Edge Offset:** This setting determines the distance between the hatch lines and the edge the selected object's outline.
13. **Start Offset:** This setting controls the distance between the **first** hatch line and the border of the object.
14. **End Offset:** This setting controls the distance between the **last** hatch line and the border of the object.
15. **Line Reduction:** This setting controls the line reduction on both sides of the hatch lines.
16. **NumLoops:** This setting controls the number of hatch lines that are completed before the hatches are completed within the same object. Ring-like hatches are not able to use this feature.
17. **Auto Rotate Angle:** Open to refer to after every mark, the hatch line will fill with a revolving angle which is set automatically to mark again. For example, if the angle is set to 0 and the check box is checked, the auto rotate angle is specified to 30. The first mark angle will be 0, the second 30, and the third 60, and so on.

Icon	Description
	**Infinite Bi-directional hatch:** similar with bidirectional hatch, but the end of each end connects.
	**Segmented hatch:** similar with Gong, will jump in null place
	**Unidirection hatch:** The hatch lines will be marked from left to right
	**Bi-directional hatch:** The hatch lines will be marked from left to right first, and then from right to left
	**Ring-like hatch:** fills objects from the outside to the inside like a ring

Examples of The Different Hatch Types

There are 5 Types of hatch designs to use the top left object is being filled by Unidirection Hatch or Bidirectional Hatch, the right object by Ring-like hatch. The bottom right one is Optimization two-way Hatch and the bottom left is Segmented hatch.



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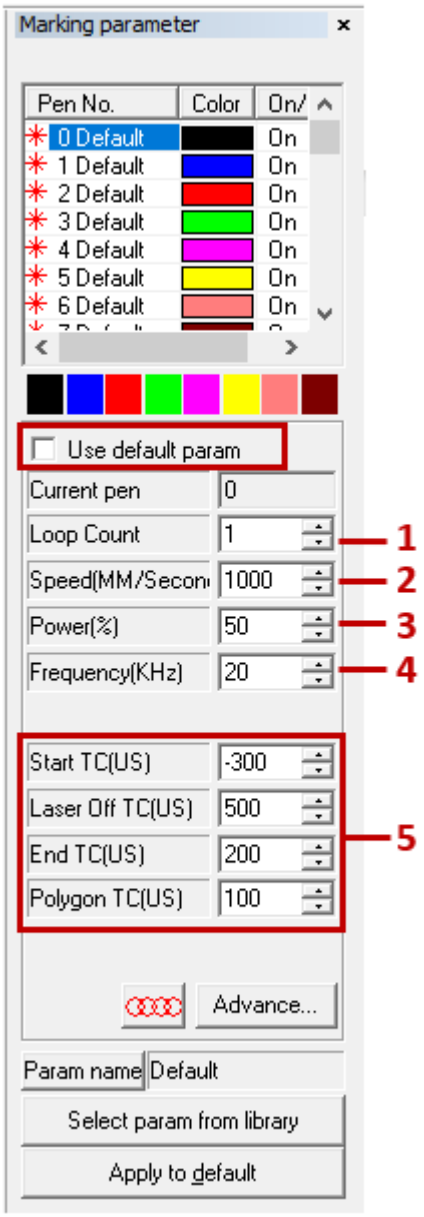
Assign your "Power Settings"

We'll introduce you to the power settings interface. Here you'll be able to understand what each parameter affects your file (below you will see the power settings window).

As illustrated the Marking Parameters have several points to outline.



The Pen no. is essentially layers. You can assign different objects to different Pen no. Therefore, you'll be able to assign different power settings per layer.
Note: Make sure your current pen number is the actual pen you are trying to modify the power settings for.

Uncheck the "**Use default param**" to be able to edit the following.

1. **Loop Count:** This is set to 1 by default and it will for most applications stay that way. This is designed for you to repeat this layer color multiple times.

2. **Speed:** The velocity is in mm/s. Your machine is capable of speeds ranging from 1 - 5000 mm/s. This will determine the speed processing of your file.

3. **Power:** This is the fiber laser's power in percentage. This ranges from 10 - 100%.
   Depending on your material you may see results even at as low as 1% power.

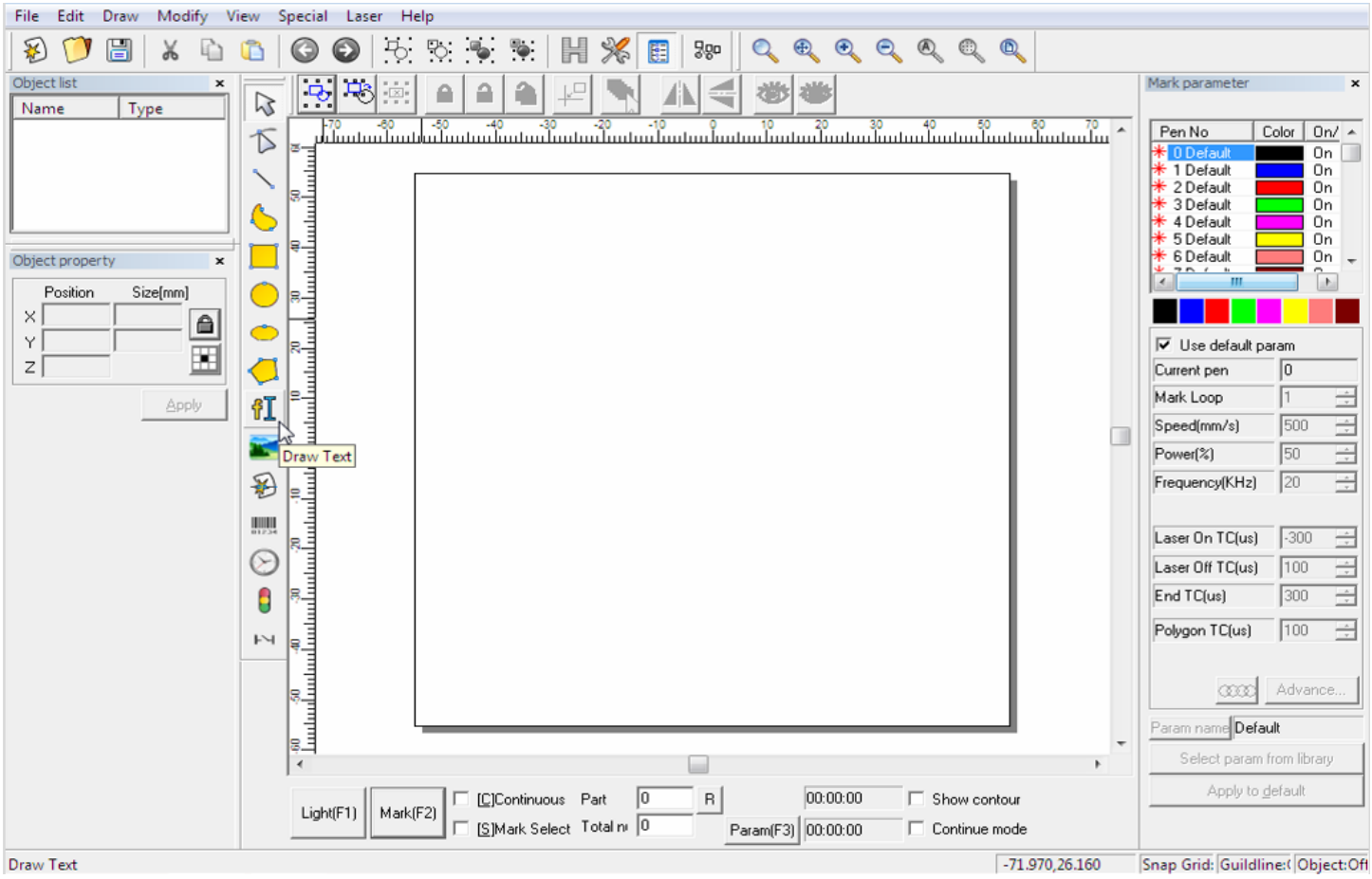
4. **Frequency:** The speed at which your laser can pulse. The laser can pulse from 20 - 80 KHz. This means that the laser, if set at 20 KHz, will pulse 20,000 times in one second.

5. **Advanced Laser Delay Settings:** Those settings have been set by us, BOSSLASER. Please **DO NOT** modify these parameters as it can lead to poor job quality.

If you have a Parameter Setting set, you'd like to use again. Save the settings by selecting "Select param from library" then "save current param as" and a new window will appear. Name and save setting set.

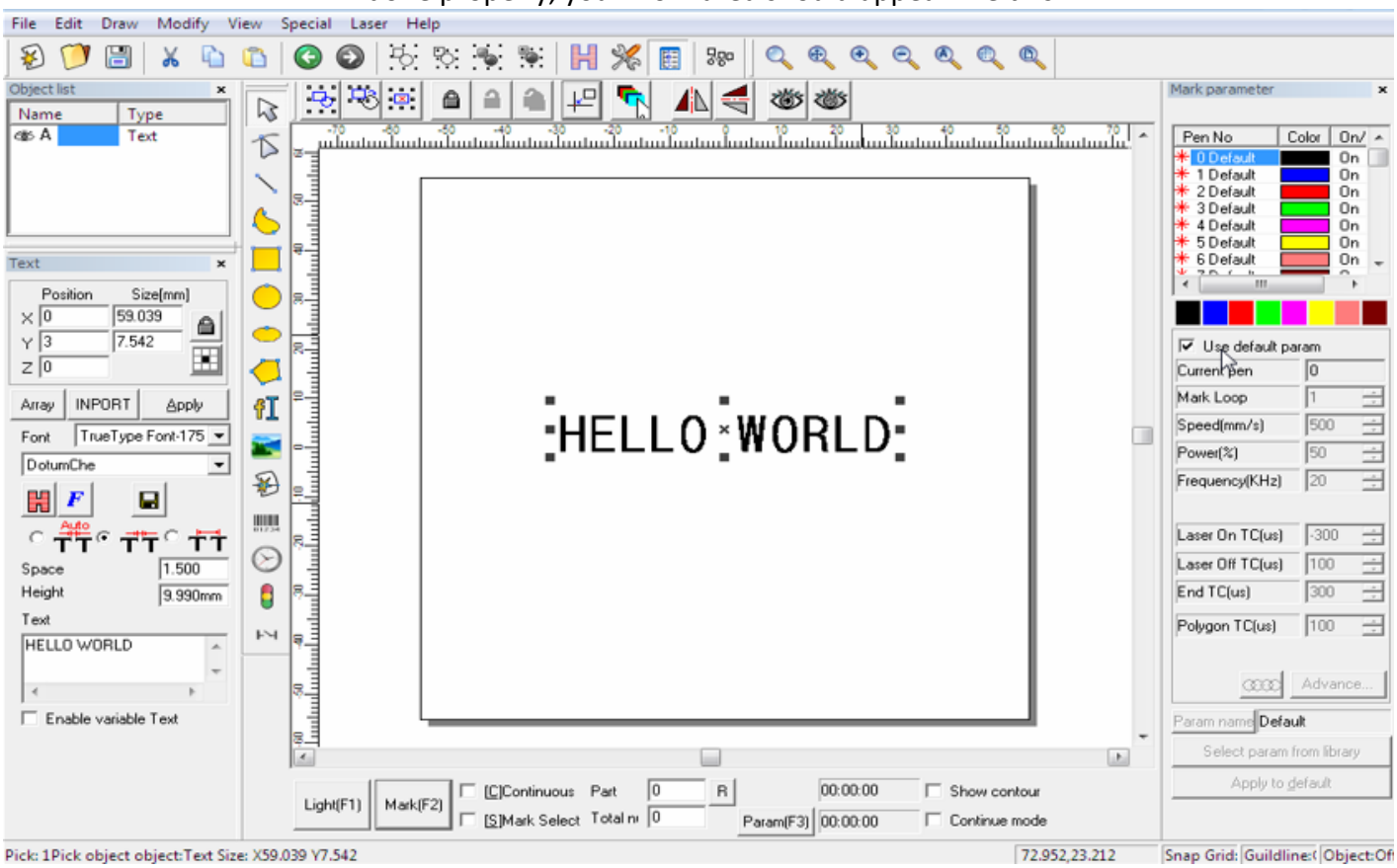
First Text File

Now that you understand the terminology of what a hatch consists of, we will now go through on setting up the test file using text and hatch; “Hello World” test file.



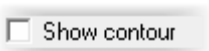
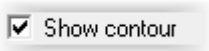
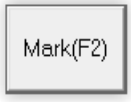
1. From a new workspace (Ctrl + n), select the Draw Text from the Drawing Toolbar. The word Text will appear.
2. Edit the word text by clicking within the Text field on the Object Properties menu. Type “Hello World” and click apply.
3. Select Hatch from either the Object Properties or from the Command Toolbar. A new window will appear.
4. Do the following:
    a. Make sure Mark Contour is unchecked.
    b. Enable one Hatch only.
    c. All calc: Checked
    d. Hatch Type: Bidirectional hatch
    e. Hatch Angle: 0 degrees
    f. Line Spacing: 0.04 MM

If done properly, your work area should appear like this



Pro Tip: To double check if your hatch pattern is correct to your parameters, you can simply zoom in very closely to one area of the file and visually see the lines that make up the hatch pattern you've selected.

Positioning the File onto the Material

Understanding the lower Menu Bar	
	
Icon	**Description**
	Depending on the version of the software you currently are using either button will appear on the lower menu bar. These buttons will allow you to see where the laser is lined up on your material without actually firing.
	Shows size the boundaries or size of the file loaded. 
	Shows the actual outline of the file being ran. 
	Will fire your laser. ⚠ Fiber glasses must be worn at this time.

Position the file onto your piece of material is a very simple process.

1. Select the Light/Red button from the lower menu bar. This turns on the red dot.
2. Place the material on the worktable. Where you think you should have it positioned.
3. Depending on your preference select or deselect “Show Contour” on the lower menu bar.
4. Once you are happy with your placement and Fiber Glasses are covering your eyes. Select Mark.

If **ALL** the steps were done properly up to this point, you should be left with this finished engraving/marking similar to this one here.

Congratulations! You have successfully performed your first file!

⚠ Note: If you have purchased a Chuck Rotary with your FM machine, you can skip the “How to Properly Turn Off Your Machine” below and continue to Appendix B.

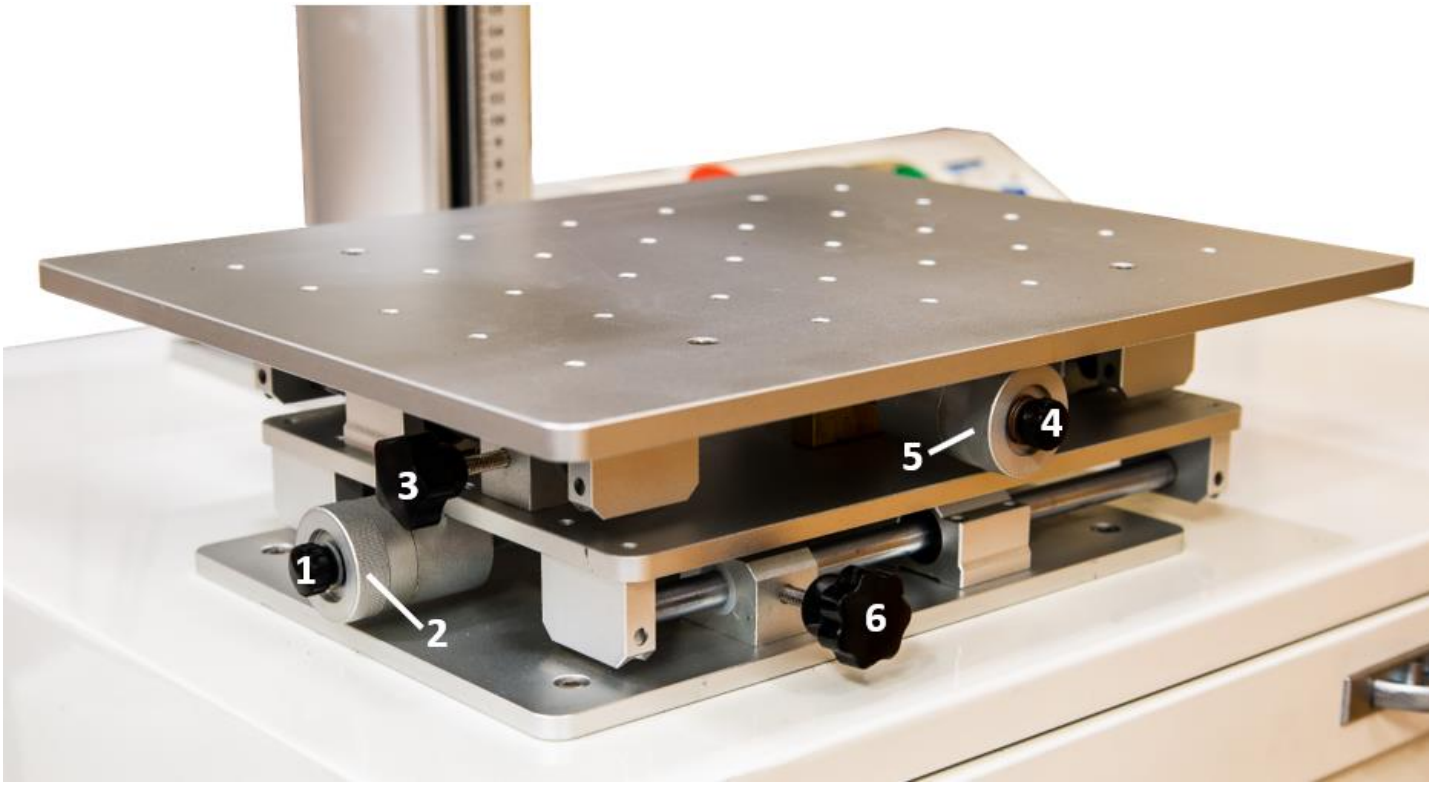
How to Properly Turn Off Your Machine

Powering the machine down in these specific steps is important. You must follow the sequence otherwise you will run the risk of your machine not functioning properly and hard resetting. If your machine does this, you will need to contact the Tech Support team for assistance.

1. Put back the Lens Cap onto the Lens.
2. Turn off the Laser On/Off button
   2a. On the FMS Only – Power down the computer before cutting the power to the machine.
3. Press down the Emergency Switch
4. Turn the key to the OFF position
5. Flip down the Circuit Breaker

Precision Worktable Operation (Optional)

In some cases, you will need to adjust the worktable. We will now show you how to properly use this table. Your worktable only has two moving axes (X & Y).
When using the Chuck Rotary, you will need to use the worktable's operation to properly align the workpiece.



1. X-Axis Locking Knob
2. X-Axis Knob
3. X-Axis Brake
4. Y-Axis Locking Knob
5. Y-Axis Knob
6. Y-Axis Brake

Adjusting the Y-Axis
To move the worktable on the Y-Axis, first make sure that the Y-Axis BRAKE has been loosen #6 (if you try to move the worktable with the BRAKE still applied, you may damage your worktable). Loosen the Y-Axis Locking Knob #4, then rotate the Y- Axis Knob #5 clockwise to move the worktable towards the back of the machine and counterclockwise to move the worktable towards the front of the machine when the worktable is at the desired position, please apply the Y-Axis Brake #6 and Y-Axis Locking Knob #4.

Adjusting the X-Axis
To move the worktable on the X-Axis, first make sure that the X-Axis BRAKE has been loosen #3 (if you try to move the worktable with the BRAKE still applied, you may damage your worktable). Loosen the X-Axis Locking Knob #1, then rotate the X- Axis Knob #2 clockwise to move the worktable towards the right of the machine and counterclockwise to move the worktable towards the left of the machine when the worktable is at the desired position, please apply the X-Axis Brake #3 and X-Axis Locking Knob #1.

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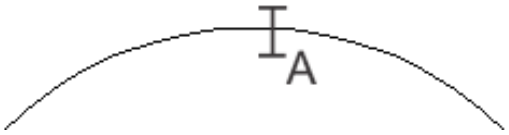
Advanced Functions within the Software

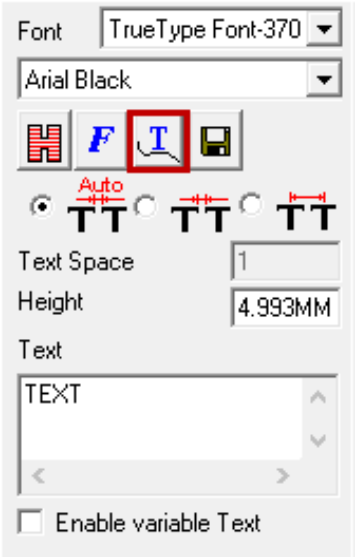
Path Text

Curve Text to an Object

1. In your workspace draw a shape, we've used the circle tool to draw a circle in our workspace.

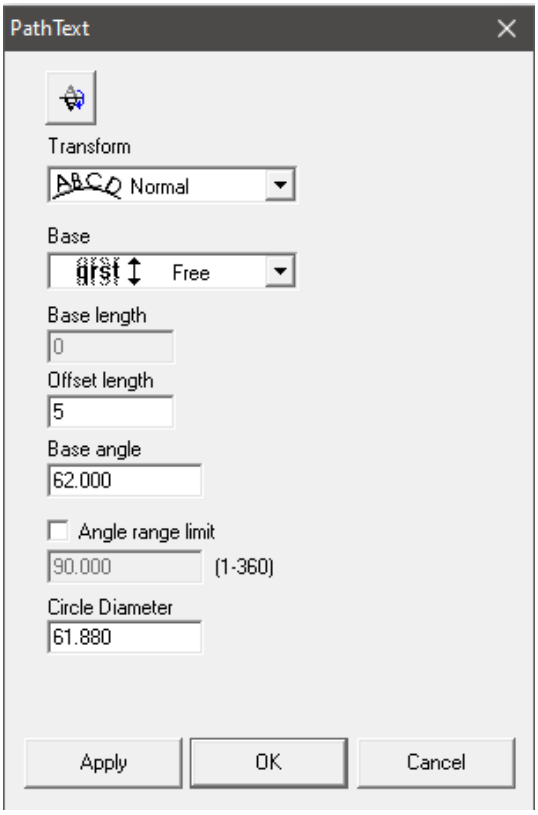


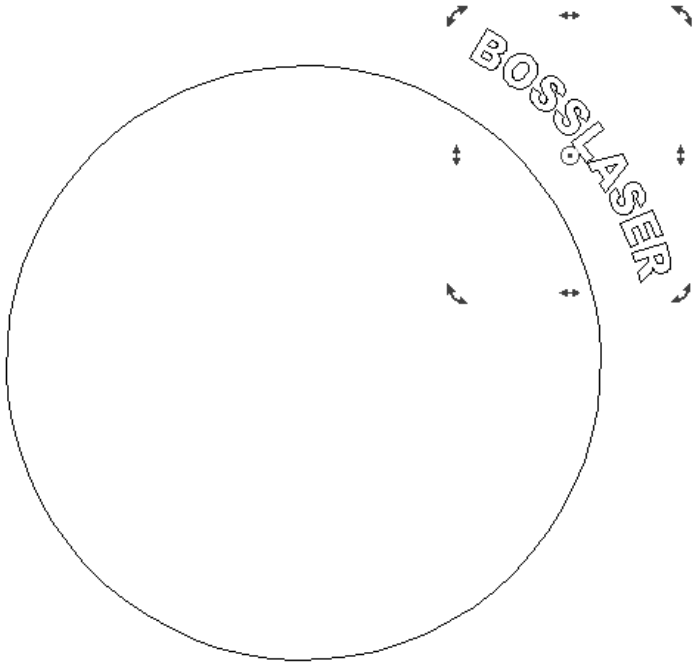
2. Next select the **text tool**. The image here is zoomed in to show the detail of text tool and part of the circle. We've positioned the curser over the circle.
3. Now you will click the circle as shown. This will indicate to the program you wanting to have the text follow that path.
4. You will notice a change in the object properties. There is now a **Path Text** feature visible. When selected a new window with several new options appear.
5. Choosing your various options will dictate how the outcome of your workspace will look. We've will include the settings we used to illustrate this example shown below.
6. You are now ready to start making your text follow curved paths!

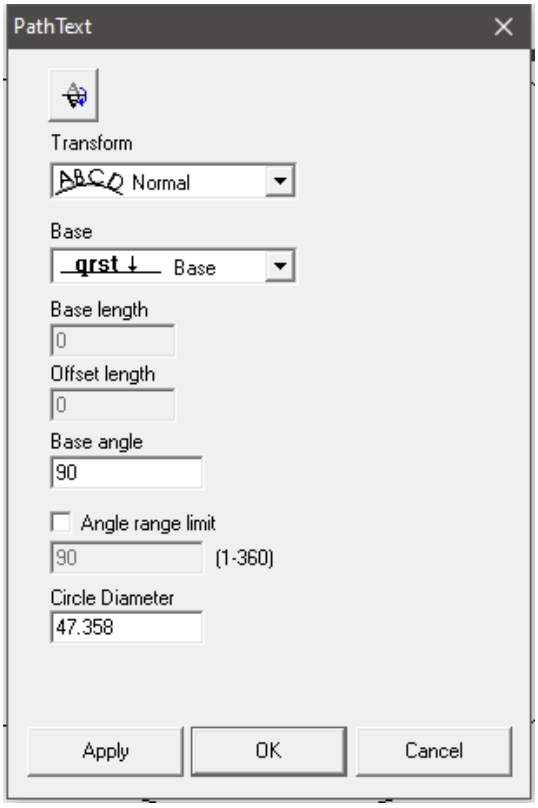


Pro Tip:

1. When done with the curved path you can delete the circle to finish what you are working on.
2. Double clicking on the text will allow you to rotate the text. The arrows in between the corner arrows will allow you to skew the font further.







When on, Circle Text will mirror the text vertically.

Transform: Adjusts the way text follows the curve.

ABCD Normal — When selected, the text will stay parallel with the curve

ABCD Project — When selected, the text will stay vertical in correspondence with the curve

Base:

qrst Base — Sets the base of the text to the curve as shown in the ABCD Normal figure.

qrst Top — Sets the very bottom of the text to the curve.

qrst Bottom — Sets the center of the text onto the edge of the curve.

qrst Center — Sets the top of the text onto the bottom edge of the curve.

qrst Free — Sets the text freely onto the curve which allows for free adjustment. The offset length can be adjusted, if selected.

Base Length: Controls how far away the left edge of the text is away from the left edge of the curve.

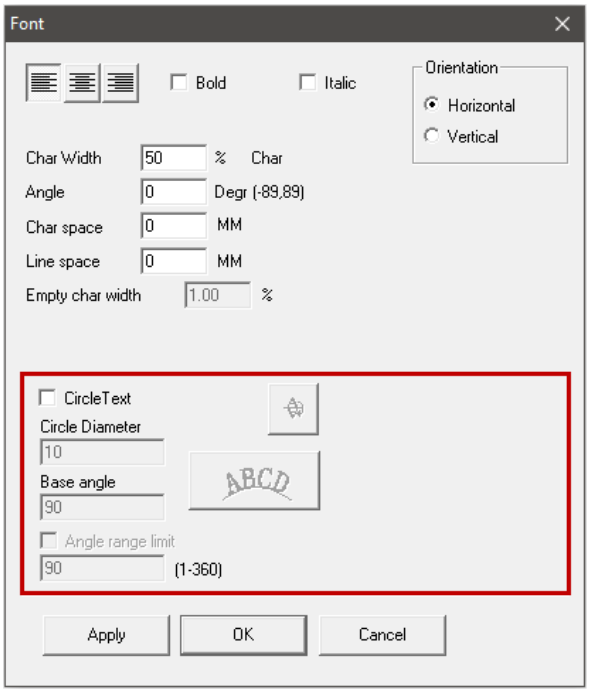
Offset Length: Controls how far away the base of the text is offset from the curve line. Only available when "Free" is selected.

Base Angel: The benchmark of the text aligning the circle.

☐ **Angle Range Limit:** When checked, no matter how much characters that are typed in, the text will be limited in the angle range

Circle Diameter: is the diameter of the shape drawn. Adjusting this number moves the text in a similar fashion as the offset would.

Circle Text Features



☐ **Circle Text :** Checking this box enables the Circle Text features.

Circle Diameter: Specifies the diameter of the circle you intend to have the text follow.

Base Angle: represents the baseline angle of the text.

☐ **Angle Range Limit:** this setting sets the range the base angle settings can be set to. If set, no matter how many characters are inputted the system will compress all the characters to be within the limit range.

When on, Circle Text will mirror the text vertically.

ABCD — Flip the text to start from end to beginning.

Barcodes & QR Codes

In this section we will cover barcodes and QR codes. If you have not already selected the barcode type you are going to use, you will first need make sure the equipment you are using can read the code you are creating. If you need help selecting what type of barcode you will need there are several resources of information on the internet.

Barcode Types:

1- Dimensional Barcode:
Typically, one of the most recognized types of barcodes, usually encapsulating information related to date, type, product number, production dates and so on.

Pro Tip: The “Code 39” and “Code 128” bar codes can contain letters and digits. These are permit a slightly longer number of characters than UPC. These are typically used by companies in order to track items.

2-Dimensional Barcode: Data Matrix Barcode
A less common barcode used is the Data Matrix. This barcode is actually printed in 2d (like QR Code) as opposed to 1d (like UPC). If you flip over your driver’s license there is a good chance that you will see an example of this type of barcode. Although not as common, this barcode is slightly better than QRCode at being able to store a larger capacity of data. PDF417

QR Code
The QR Code differs from other barcodes because it is capable of repeating its own data in a “redundant” fashion in order to avoid “invalid scans” from occurring. While QR Code’s technical capacity is over 1024 characters it is generally found that real-life limitations reduce this to 128 characters or less.

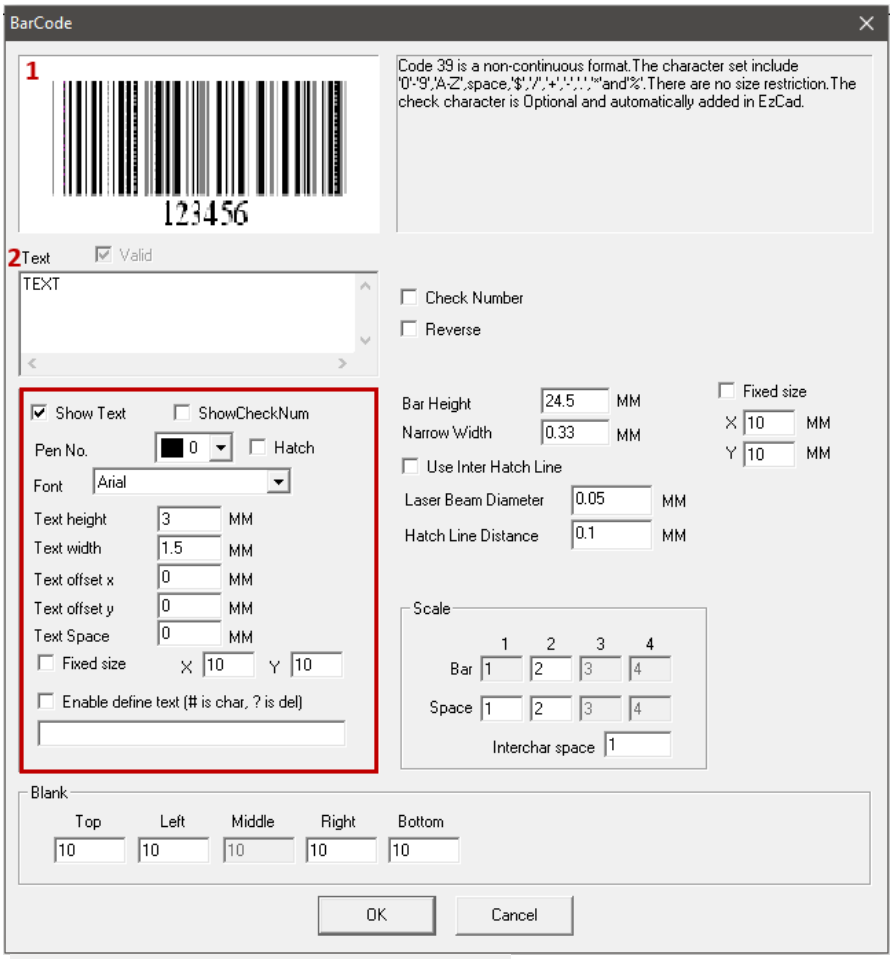
Barcode Object Properties:

To bring up the barcode properties, the user will select the Barcode icon in the Draw Toolbar then make a selection within the workspace. The Object Properties will now reflect barcode properties to be changed and customized. In this space the user will make a selection within the Font drop down menu. This selection is a group of five various barcode groups to choose from. The user can further customize the type of Barcode by using the drop-down menu below the grouped types of fonts.

From the Object Properties once the user has selected the type of barcode, they would like to use the user will then select the barcode icon within the Object Properties. A new window of properties will appear. Depending on the type of barcode the user wishes to create and the selection that is made, with vary Barcode Properties that will appear in the pop-up window. We will go over those in this next section.

Barcode Properties

1-Dimensional Barcode:



1. Preview: This window shows a sketch of what the current selected barcode will look like before being created.

2. Text: This portion refers to the information that will be made into a barcode.

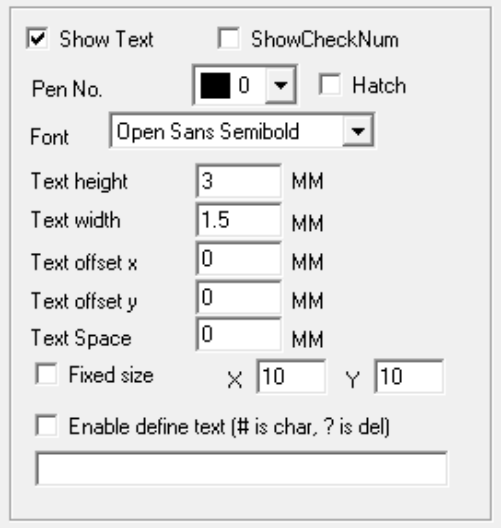
☐ **Check Number:** Will verify the code within the selected barcode.

☐ **Reverse:** By selecting this box you will be creating a box around the barcode, thusly engraving the inverted image.

☐ **Show Text:** Enables the highlighted box for additional editing features.

CheckNum: Indicates whether or not the barcode requires a verification code. Users can freely choose which barcode they would like to require a verification code for.

Reverse: Indicates whether or not to reverse the parts that are to be marked into unexpected locations of the object. This function is typically utilized when a barcode being marked appears as a light color after the marking is completed.



Font: Font of correctors to be displayed.

PenNo: Layer selected

☐ **Hatch:** Gives user the ability to hatch the text part of the barcode.

Font: The font of the current characters to be displayed

Text Height: The height of characters displayed.

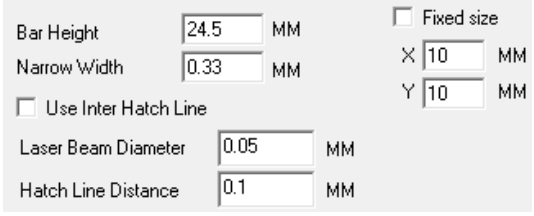
Text Width: The width of characters to be displayed.

Text Offset X: When selected and enabled, the text displayed under the barcode will be aligned towards either the positive or negative coordinates of the X axis.

Text Offset Y: When selected and enabled, the text displayed under the barcode will be aligned towards either the positive or negative coordinates of the Y axis.

Text Space: Displays the space in between characters.

☐ **Fixed Size:** Refers to size to be fixed size.



Bar Height: The height of the barcode.

Narrow Width: The width of the bar unit. Commonly a one-dimensional barcode consists of bars with four types of widths and spaces with four types of widths, 1/2/3/4. The narrowest bar width indicates the width is unit.

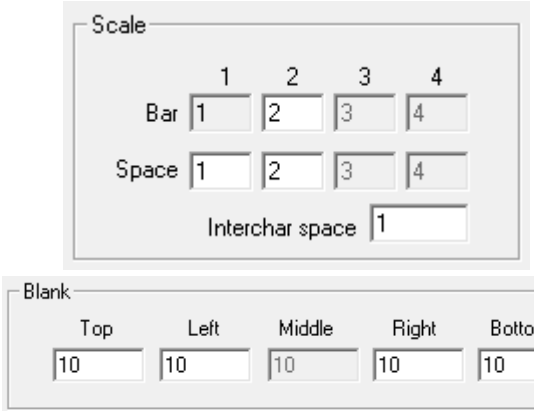
☐ **Fixed Size:** Refers to the size to be fixed. Similar to lock aspect ratio.

Laser Bean Diameter: The size of laser facula.

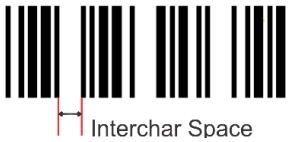
Hatch Line Distance: The space between two hatch lines

Pro Tip: Use Inter Hatch Line: If the facula diameter of laser beam is big, there will be a half facula over boundaries after common hatch, then the code gun cannot distinguish because actual marking width is bigger than design width.

Barcode Properties



Bar: Used to set the width of one bar.
Space: Used to set the width of the space between bars.
Interchar Space: Some barcodes have distance between characters. This setting controls that distance. As we've illustrated here.



Blank: These settings refer to the size of the barcode's blank area when "Reverse" is checked. The actual size of the blank area is the multiple of the bar unit.

We will now run through a quick example of creating a barcode:

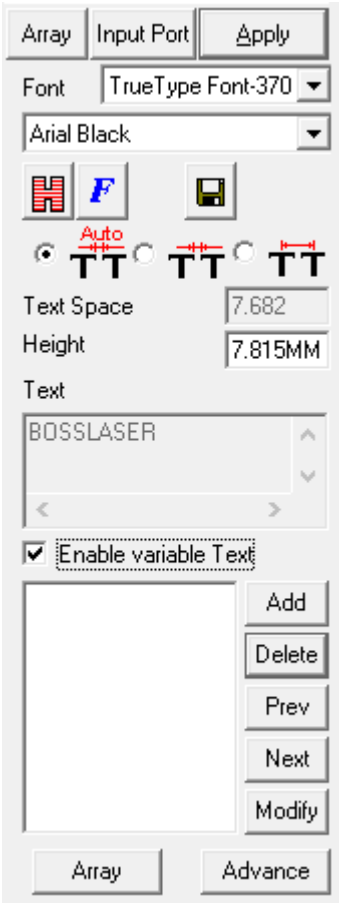
1. Select the barcode icon from the draw menu bar. Select within your workspace to enable the barcode features under the object properties.
2. Select an option under the Font drop-down menu bar. We chose BarCode Font-34.
3. Select Code 39 from the fonts list. Then select the blue barcode icon within Object Properties. A new window will appear.
4. In the text field we are going to enter the numbers "123456". We want the numbers to appear on the barcode so we will check the box show text" from there we will choose our text height and width if the default figures are not what we'd like to display.
5. We will then next add hatch to the barcode.
    a. Angle needs to be going the same as the barcode lines.
    b. The user will want to use an open-ended hatch like Bi- directional hatch. Using a different type of hatch could leave room for error and the laser could over run as it is creating the vertical lines.
    c. Before closing the hatch window make sure Mark Contour is not selected.
6. Following these steps will leave you with a similar image as the one shown to the right.

Pro Tip: If the user is engraving on stainless steel, the outcome will be a black mark on the material. However, if the user is engraving on a colored material the outcome could be a completely different color.

The way some of these barcodes work is that the scanners are looking for specific fields to be certain colors. Such as white or black. Some applications may require the user to use the reverse (inverting the image) feature in order for a readable format for the software reading the barcode. The user may have to contact Tech Support or play around with the settings to get the desired outcome.

Variable Text Features

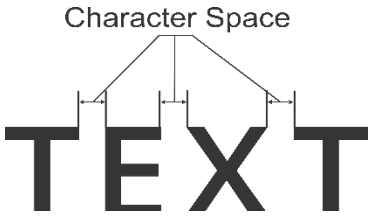
Before we dive into this feature, we need to explain a couple of the software icons and how they work.



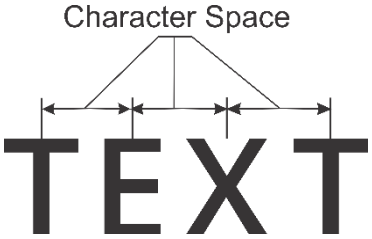
Variable Text: This function is available after the "Enable variable text" box is checked as shown below. Variable Text is a disciplinary and dynamic text which can be customized during operation.

When selected, the characters will be spaced automatically

When selected, the adjacent character spacing refers to the left side of the character right boundary to the right-side character left boundary distance.



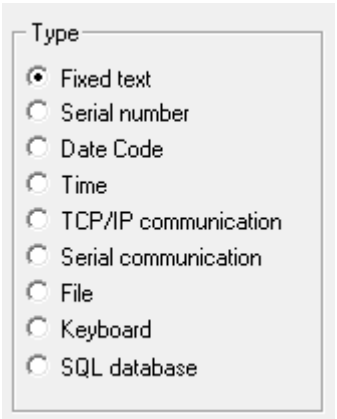
When selected, the adjacent character spacing refers to the left side of the characters center, to the right side of the characters center distance.



Text Space: Set the adjacent character distance in the current text character arrangement.

Height: Is the height of the text in the workspace.

Add: After making this selection a new window will appear with several variable text options. Pictured to the left.



Fixed Text: Refers to the fixed invariable element within the operating process.

Serial Number: Specify the system to change the text according to the fixed increments when in the operating process.

Date: When the operation is taking place, the system will automatically pick up the date information from the computer as new text.

Time: When the operation is taking place, the system will automatically pick up the time information from the computer as new text.

TCP/IP Communication: When the operation is taking place, the system will pick up the new text from the network.

Serial Communication: When the operation is taking place, the system will pick up the new text from the serial port.

File: The system will seriatim what to be marked in the customized text file line by line.

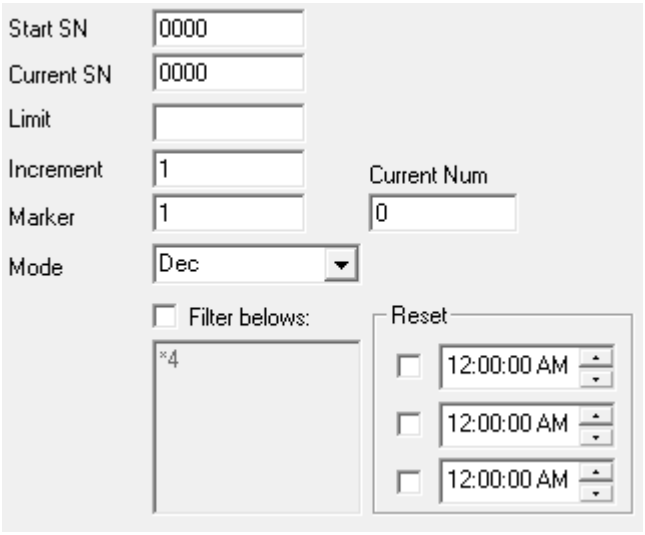
Keyboard: Type text to be marked through keyboard when the marking is in process

Prev & Next: Change the order of the files.

Modify: Edit the selected text

Serial Number

Serial number text is a text which is changed according to the fixed increments set during the operating process. When selected, a serial number parameter setting page will automatically appear.



Start SN: This item indicates the first serial number to be marked at the present
Current SN: the serial number to be marked at the present
Limit: when mark the limit serial number, it will back to start serial number automatically
Increment: the increment of the current serial number. The value may be plus or minus.
⚠ When it comes to 9999, the system will be back to 0000 automatically.
Marks per: the marked number. This item indicates how many times every serial number is marked before changing.
Current num: the marking time of current serial number, when marking number equals to marks per, it will turn to 0 automatically.

Mode: Specifies the mode of the current number series being used.

Dec: Series number carry according to decimal system. The effective character is from 0 to 9.
HEX: Series number carry according to capital letter hexadecimal system, the effective character is from A to F
hex: Series number carry according to small letter hexadecimal system, the effective character is from a to f
User define: The series number carry defines according to user define system, after selecting, the system will display a dialog box

☐ **Filter belows:** won't mark numbers end with 4.
⚠ * means any digit.
Reset: The number will become the start SN in the set time

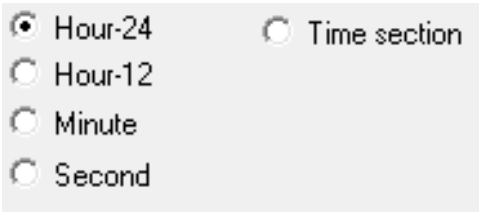
Date Code

When the operation is taking place, the system will automatically pick up the date information from the computer as new text. When selected a date parameter window will be shown in a dialog box.

Year-2020: Uses the computer clock's current year for corresponding text. Four characters are used to specify the year.
Year-20: Uses the computer clock's current year for corresponding text. Two characters are used to specify the year.
Month-05: Uses the computer clock's current month for corresponding text. Two characters are used to specify the month.
Day of Month-15: Uses the computer clock's current date of month for corresponding text. Two characters are used to specify the date.
Day of Year-136: Uses the computer clock's current date for corresponding text. January 1st is specified as 001, January 2nd is 002, etc. Three characters are used to specify the date.
Day of Week-05: Uses the computer clock's current week date for corresponding text. Two characters are used to specify the day of week.
Week of Year-20: Uses the computer clock's current week of year for corresponding text. January 1 to January 7 is specified as 01, January 8 to January 14 as 02, etc. Two characters are used to specify the week of year.
Date: Specify a displacement date to be marked using this setting. This is commonly used for guaranteeing food expiration dates.

Time

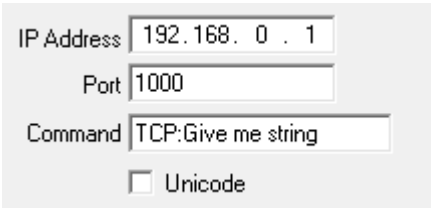
When the operation is taking place, the system will automatically pick up the time information from the computer as new text.



Hour-24: Uses the computer clock's hour for the corresponding text. This time format uses the standard 24-hour setting.
Hour-12: Uses the computer clock's hour for the corresponding text. This time format uses a 12-hour setting.
Minute: Uses the computer clock's current minute for the corresponding text.
Second: Uses the computer clock's current second for the corresponding text.
Time Section: Divides a 24-hour day into 24-time sections, allowing the user to define each time section as text.

TCP/IP Communications

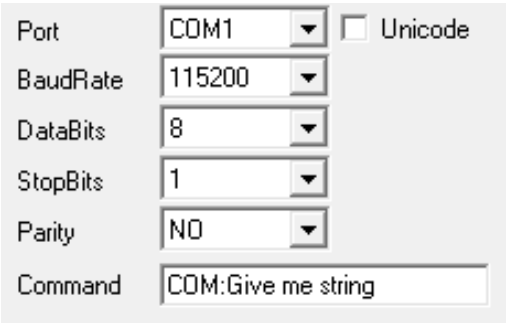
When the operation is taking place, the system will pick up the new text from the Network.
⚠ The network interface shown, is the network interface used in the TCP/IP agreement.



IP Address: Specify IP Address which data is read from.
Port: Specify the port that the TCP/IP communication uses.
Command: When the laser system processes this text object, the system uses. The network interface to transmit this specific character string order to a computer assigned by the IP Address. From there the computer processes the string order sent. The system will not start until the computer replies.
After the response is received the laser system will process the response text automatically.
Unicode: when box is checked the fiber, system recognizes the characters in Unicode form rather than ASCII form.

Serial Communications

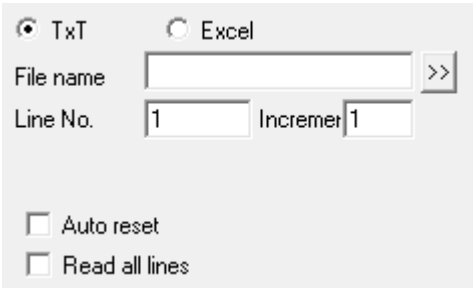
When the operation is taking place, the system will pick up the new text from the serial port.



Port: Select the port with which the computer and peripheral equipment connect with.
BaudRate: Select the BaudRate with which the serial communication utilizes.
DataBits: Select the DataBits with which the serial communication utilizes.
StopBits: Select the digits of StopBits with which the serial communication uses.
Parity: Select the digits of Parity with which the serial communication utilizes.
Command: When the laser system processes this text object, the system uses the serial port to transmit this specific character string order to a specific peripheral equipment. From there the peripheral equipment processes the string order sent. The system will not start until the peripheral equipment replies. After the response is received the laser system will process the response text automatically.
Unicode: When box is checked, the fiber system recognizes the characters in Unicode form rather than ASCII form.

File

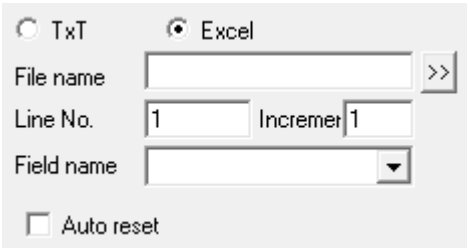
This feature supports TxT and Excel files.



TxT Files When "File" is selected and TxT highlighted, the following parameters will appear in the dialog box as shown. As displayed the system will ask for the "File Name" and the current text line number.

Auto Reset: when checked the line number will change to 0 automatically when the last line is reached. The next mark will start from the first line again.

Read All Lines: when checked the laser system will process the entire document.



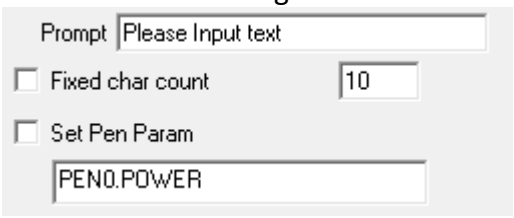
Excel Files The file name, field name, and line number will tell the software which cell within the excel table will be marked.

When creating your excel file for importing, make sure to only include the fields listed. By adding additional lines, the possibility of the feature not working properly is likely.

It is highly recommended to use the File feature over the Serial number feature if you are tracking the serial numbers you are engraving or if you have a specialized serial number specific to your company. By importing spreadsheets with the information, the user is able to track what has been engraved more accurately. Once the machine is powered down all of the engraved information through the Serial feature is lost. There is not a way to save that information without doing double the work.

Keyboard

The Keyboard option allows the user to process text via keyboard entries. When the Keyboard option is selected the following is shown within the dialog box:



Prompt: When the process starts, the system will open a dialog box to have you input the processing text that will match the keyboard variable text input.

Fixed Char Count: Check and specify the number of characters within the string.

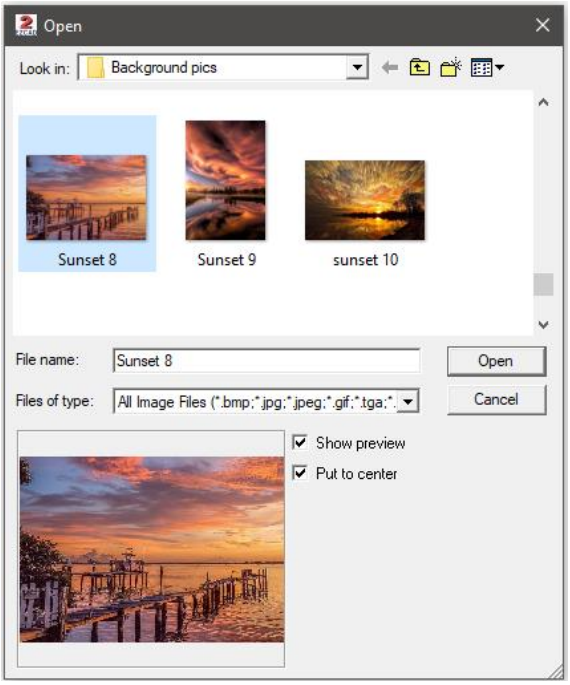
Bitmap Tool

This tool will allow the user to import a bitmap file previously saved onto your computer. The user can also access bitmaps via the Draw menu or importing them via the File menu.

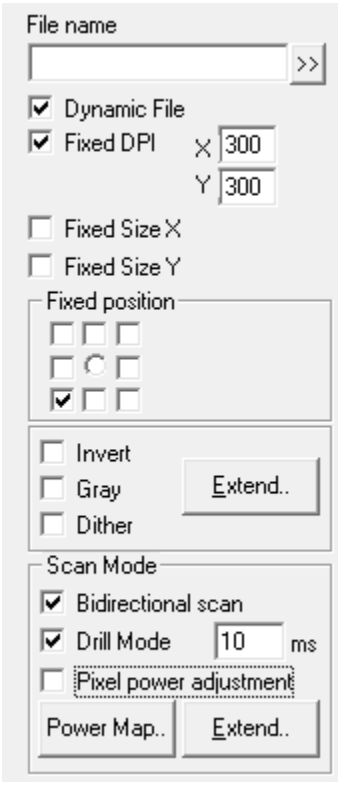
The current supported graphic files are:
bmp, jpeg, jpg, gif, tga, png, tiff, and tif.

Show Preview: When box is checked, users can preview the design before they import the image.

Put to Center: when checked, the image will be centered in the workspace once imported.



After the desired image is brought into the Marker software, the following dialog will appear below the Object Properties

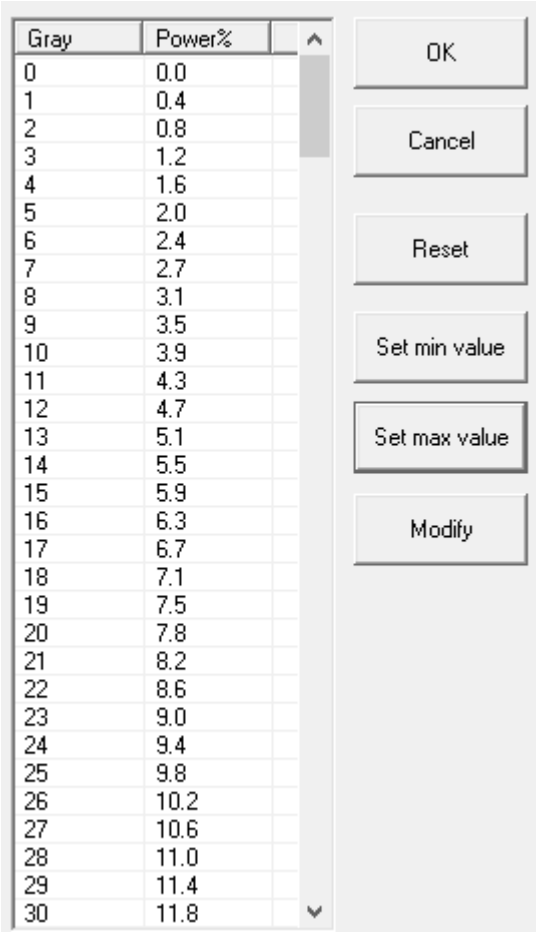


Dynamic File: When checked, it will allow the system to reread the file at a different position.
Fixed DPI: "DPI stands for "Dots Per Inch". When selected the system will allow you to set a fixed X/Y DPI that you can specify. A DPI to Scan Gap chart is provided on the next page for reference.
Fixed Size X: When checked, the width of the dynamic photo will be set to an appointed size. When unchecked, the photo will remain the original size.
Fixed Size Y: When box is checked, the height of the dynamic photo will be set to an appointed size. When unchecked, the photo will remain the original size. **Fixed Position:** Determines the position of the image when changing image sizes.
Extend: When selected, it will open another "Bitmap" dialog box
Scan Mode

Bidirectional Scan: When checked, the laser will mark the image bidirectionally.
Drill Mode: When checked, it will allow you to control whether the laser is kept on or restricted for a specific duration per pixel during the marking process.
Pixel Power Adjust: When selected, the laser's power is adjusted according to each pixel's "gray level" when in the marking process.

Bitmap Tool (Continued)

Scan Mode Power Map: When the "Power Map" button is selected, the following dialog box will appear.



The idea to keep in mind when the users are working with a gray image, there are 256` shades of gray to engrave.
0 represents white and the closer the user gets to 255 will be darker. 255 represents black.

Set min value: Setting the minimum value as a percentage of the laser power.

Set max value: Is setting the max value of the laser the user will be maxing out the power at.
Typically, the best results have been seen at 50% and below.

Pro Tip: If you are engraving on anodized material make sure to invert the image. The whites will be dark. Darks will be light once engraved.

The table to the right will show the user the DPI in relation to the scan gap. DPI is dots per inch. It is essentially the number of pixels or dots are within every inch of an image, which will tell the user the resolution of the image. Scan gap is the spacing between lines when scanning to engrave an image.

The larger the DPI the closer the dots gather within the image which will improve the quality of the output but also increase job duration. Keep in mind there will be more pixel density causing more heat to be present at the material as it is marked by the laser.

Pro Tip: Calculating the scan gap is a simple equation.

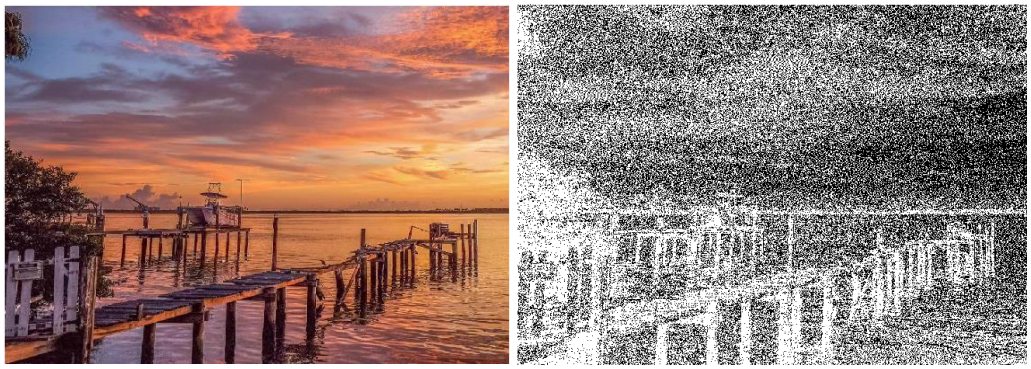
$$\text{Scan Gap} = \frac{25.4}{DPI}$$

Engraved Vector Approximations of DPI	
100	**.25**
150	**.17**
200	**.13**
250	**.10**
300	**.08**
350	**.07**
400	**.06**
450	**.06**
500	**.05**
550	**.05**
600	**.04**
700 & up	**.03**

Bitmap Tool (Continued)

Gray: When checked, it will convert the selected image to grayscale

Dither: When checked, the system will utilize a combination of both black and white pixels to simulate an image with dots arranged in different densities within the image. You essentially are removing every color but black and white. Therefore, you cannot use gray and dither at the same time.



Invert: When checked, the system will show the negative image of a photo.

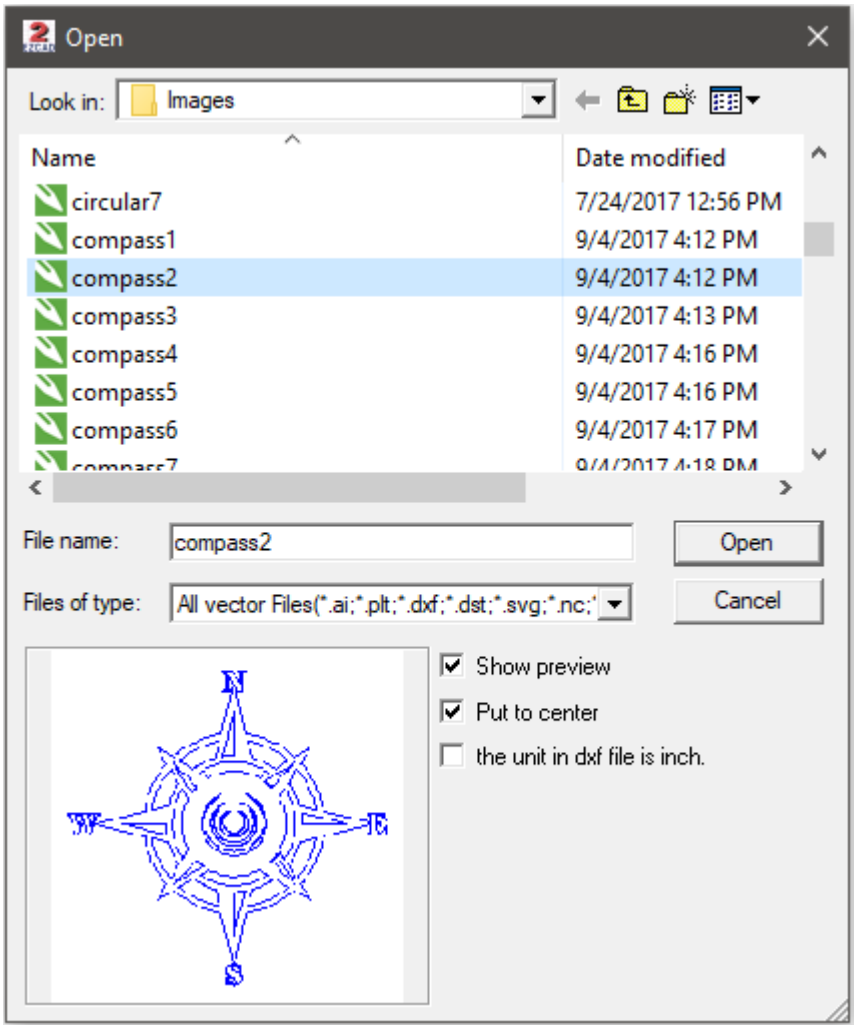
Inverted Dithered Image

Inverted Gray Image

When inverting an image, the user is instructing the machine to engrave the negative space and leave behind material that would leave the user with a desired look.

Vector Tool

Vector tool will allow the user to import a premade vector design into the workspace. Once the vector tool icon is selected the following dialog box will appear for the user to import their desired selection.



Currently supported are the following vector file formats: PLT, DXF, DST, SVG

Be sure to have "Show preview" clicked so you are able to see the image you are importing. As you can see from our example, we have several different compass images. We also have Put to center selected so that our artwork will import to the center of our workspace.

Pro Tip:

1. If you are importing and the image is far greater than your workspace. In the Object Properties, make sure the lock is closed to keep the aspect ratio. Enter a value that would resize your image a more manageable size within your workspace.
2. If the vector file includes color within the design such as images designed in software like CorelDraw, AutoCAD, Photoshop and so on, Marker is capable of distinguishing the colors automatically. From there the user can pick the object according to the color or pen and set marking parameters.

Once a vector image is present in the workspace the following will be located under the Object Properties.
Optimize the marking Order: With this box checked, the system will optimize the image for best output.
Auto Connect Curve: With this box checked and applied, the system will connect lines automatically within the design.
Dynamic File: Assign a fixed size for both the X and Y of the vector image as well as assign fixed coordinates.

As shown in a couple different places in this manual it is very important to power down your machine in these exact steps. Not following these steps could harm the settings of the machine.

How to Properly Turn Off Your Machine

1. Put back the Lens Cap onto the Lens.
2. Turn off the Laser On/Off button
   2a. On the FMS Only – Power down the computer before cutting the power to the machine.
3. Press down the Emergency Switch
4. Turn the key to the OFF position
5. Flip down the Circuit Breaker

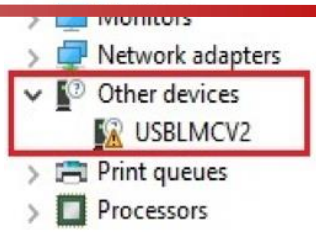
BOSSLASER™

Users Manual for FM Series

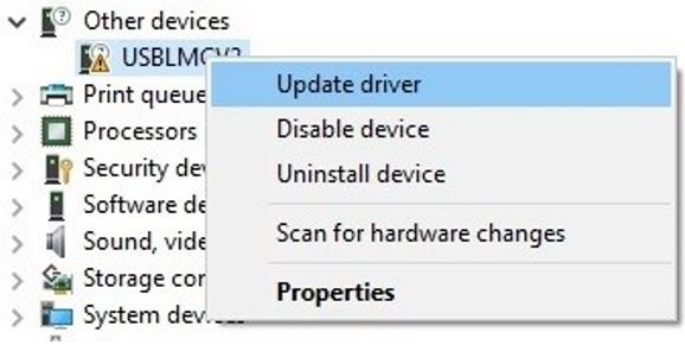
SECTION 4: SERVICE

Appendix A: Installing the USB Driver for the Controller Card

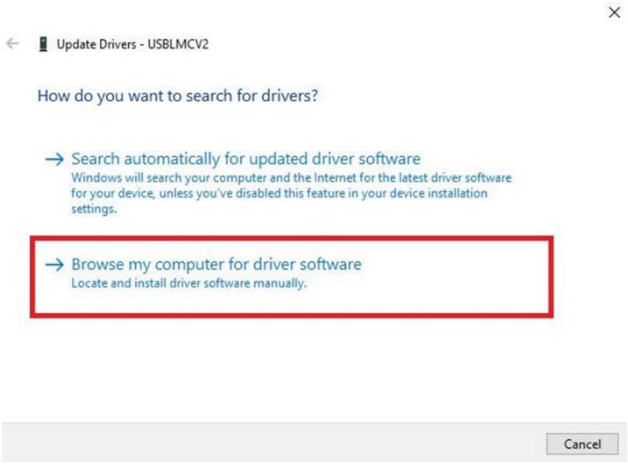
1. Open you Device Manager, which can be found in the Control Panel of Windows.
2. With the FMD powered on you'll notice an unknown device titled USBLMCV2. This is the controller card being recognized by the PC.



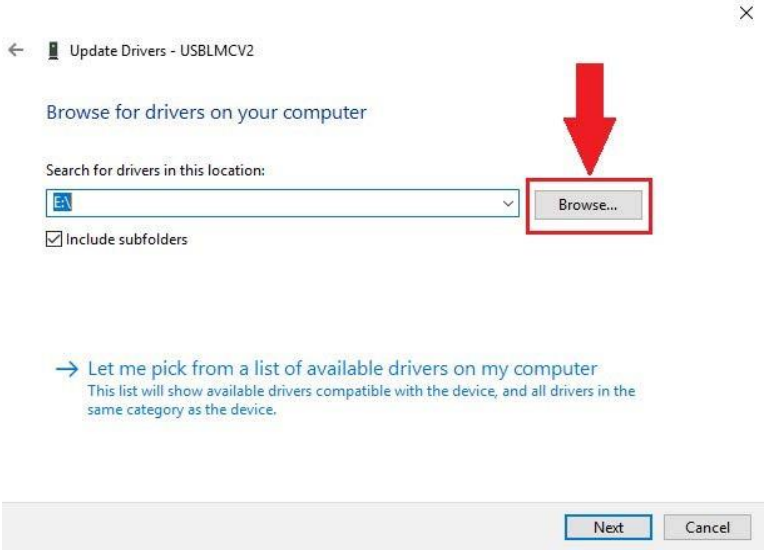
3. Right-mouse click on USBLMCV2 and press "Update driver" (as shown below)



4. Click on **Browse my computer for driver software**



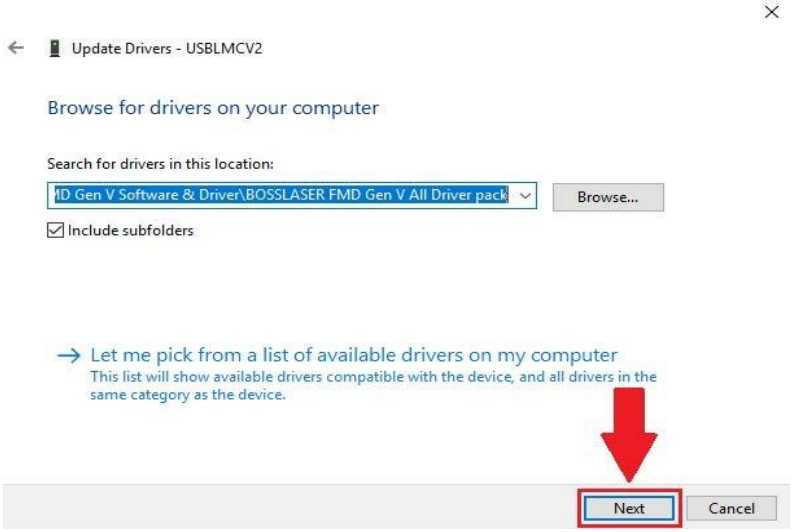
5. Then click on the Browse... button so we can locate the driver.



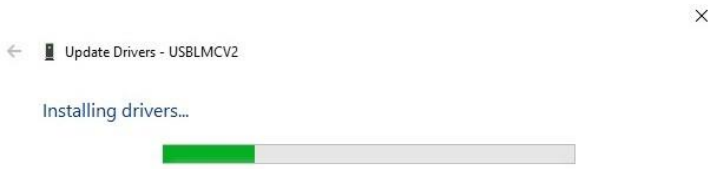
Appendix A: Installing the USB Driver for the Controller Card

6. Make sure the Boss Laser USB Flash Drive is plugged into your PC. Now locate the USB, within the “Factory” folder select the BOSSLASER FMD Gen V All Driver pack and press OK

7. Once this is selected, press the Next button (as shown below with the red arrow pointing to it)



8. At this point, Windows will search for the correct driver within the folder that was selected and start the installation process.



9. Finally, when that's finished, you should get a notification (shown below) that the driver for the controller card was successfully installed/updated.

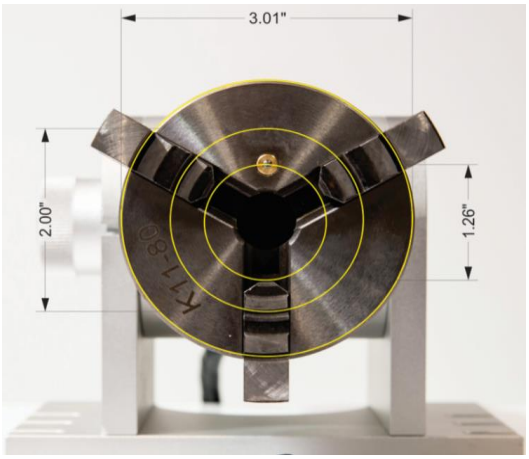
BOSSLASER™

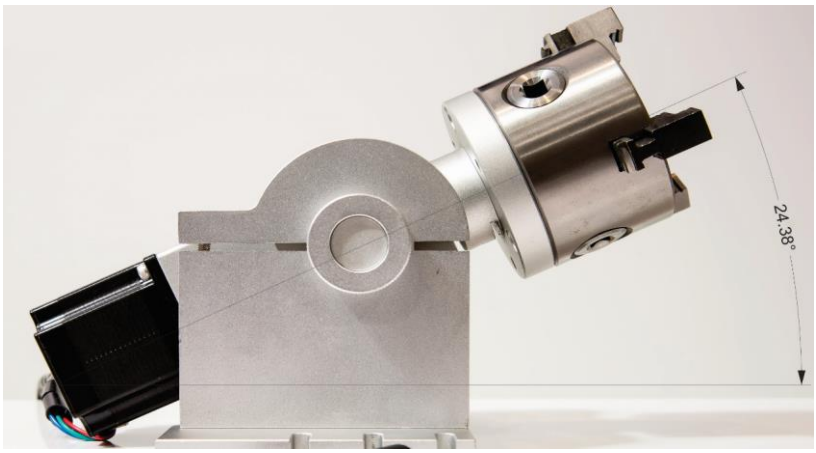
Appendix B: Rotary Installation and Test File

Chuck Rotary & Setup Instructions

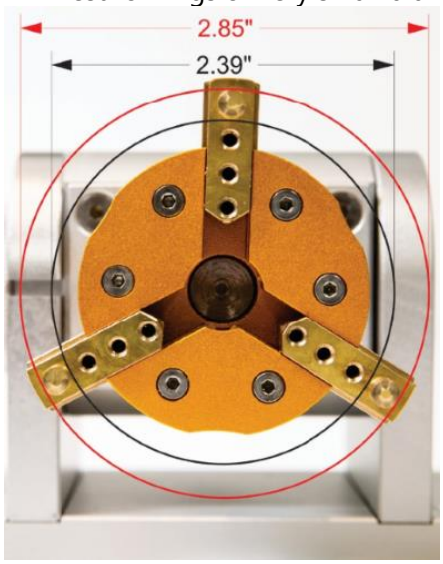
Chuck Rotaries Offered by BossLaser

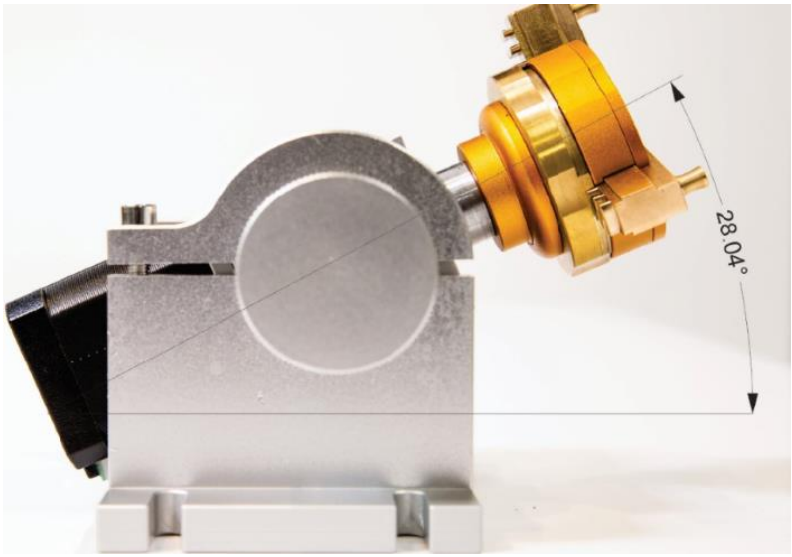
80 mm





50 mm - Best for rings or very small diameter parts





Once you have one of these chuck rotaries, place it on the worktable (for now) and locate the connector at the end of the power cord (it should look like one of the pictures illustrated below):

FMS Connector

FMD Connector

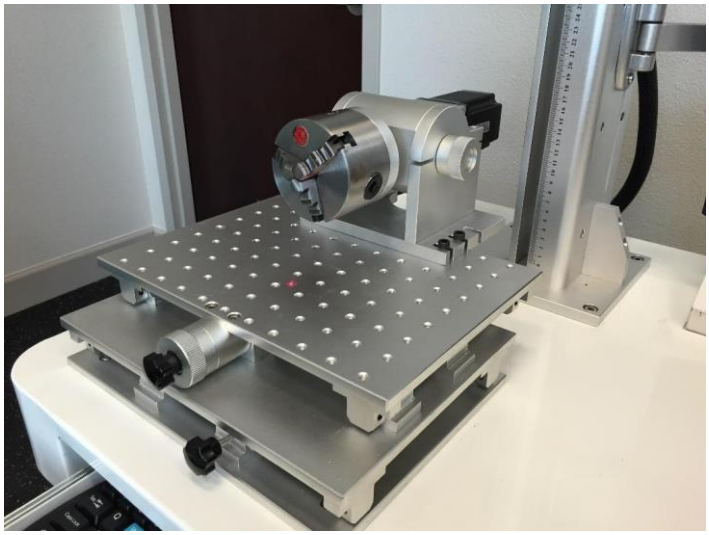
Appendix B: Rotary Installation and Test File

Now locate the Rotary Attachment outlet at the back of the machine labeled “Rotary Connection”.

To properly connect it, line up with the notch/slot and 5 pins with each other and secured it tightly. The picture below shows where/how it should be connected.

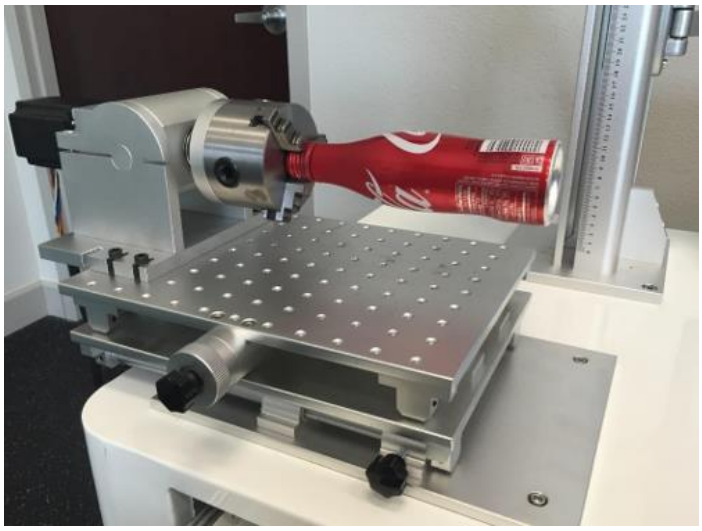
Next, we will need to secure the chuck rotary to the precision worktable. To do so, you’ll need to figure out on which axis you will use your rotary system. We will help you to decide on which axis will work better for you in a few words…

Rotary Orientation



The orientation of the rotary axis is always determined by the item you are processing. It would be better for you to install the chuck rotary on the X-axis (as shown below).

For example, if you're going to be processing mostly small items such as **rings, shafts, sockets, etc.**



It would be better for you to install the chuck rotary on the Y- axis if you are going to be processing mostly larger/longer items such as **bottles, tubes, cups, etc.**

Now you should know which axis to mount your rotary on depending on your application.

To properly mount the chuck rotary, use the M6 Allen screws (provided by BossLaser) as shown as the picture above. There are two plugins that you can use for your chuck rotary. They are located under **Laser**.
Laser menu mainly aims at expansion axis control, it includes modules RingTextMark and RotaryMark

Pro Tip: You can use different holes than picture shows. They are all equal distance from each other.

For the chuck example, we will be marking on a nozzle. Therefore, we will mount our rotary on the X-axis. If the user needs to use the Y-axis because they will be engraving on something larger, there are only few differences which will be noted later on.

(Introduction) Differences in RotaryMark & RingTextMark

Note: Some of the terminology below will be explained in more detail in each respective walkthrough. The differences discussed below are made to help you determine which plugin you should learn first.

RotaryMark can be used for about any application (**Note:** Only vector files & text can be processed using the rotary. Bitmaps, however, are **NOT** supported). **RotaryMark** works as described below. The vector file or text is separated/cut-out in multiple lines (split lines). Therefore, the rotary will incrementally move by the determined split line size. That is great for all applications, it however, restricts you to only using one hatch at a time (not against the rotary axis). **RotaryMark CAN** be used with both the X & Y-axis setup.

RingTextMark is usually used when marking text or small vector files that needs to be positioned accurately on the workpiece (**Note:** Only vector files & text can be processed using the rotary. Bitmaps, however, are **NOT** supported). Ring text mark means mark text on ring, can mark on out surface of the ring, also can mark on inside surface of the ring, out surface mark is normal ring mark, and inside surface mark need the help of rotary marking and slant rotary axis together.

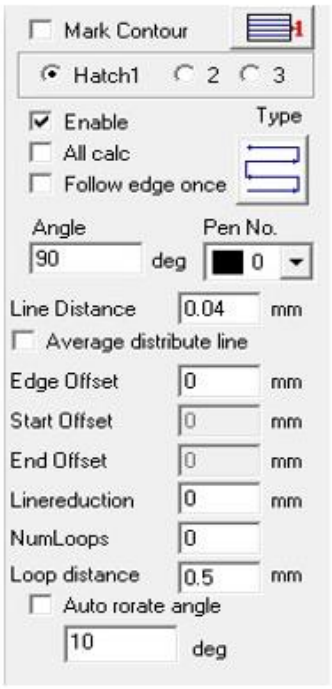
RingTextMark is only for small items or letters which will be marked individually. The rotary will rotate then engrave/mark the small item or letter while the rotary is not moving. Then the rotary will rotate to the next small item or letter and mark it. The fact that the rotary isn't moving while the engraving is happening makes it work more like you are not using the rotary. Therefore, you are able to use more than one hatch at a time (up to three hatches). **RingTextMark** can **NOT** be used with the Y-axis setup; **Only the X-axis.**

It is recommended to learn both of these plugins so you will know which will best fit your application. It is also recommended to read this manual in the order in which it was written.

RotaryMark

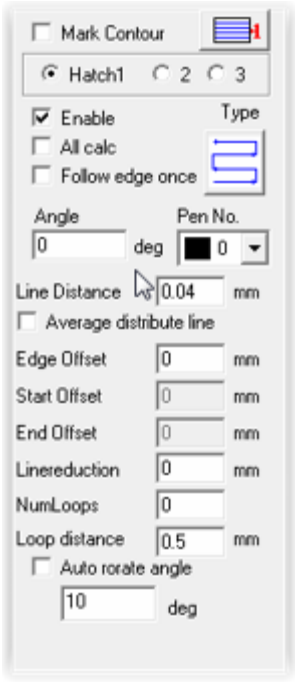
We will start on how **RotaryMark** works, but first, we would want to make sure that the file is good, the hatch is set properly, and the Power/Speed/Frequency settings are acceptable.

For the example, we will be writing "*Boss Laser*" with the text tool, then set our hatch. The only thing to know about hatches when using the rotary is that you ***do NOT want your hatch pattern to go to against the rotary axis or use multiple hatches.***



Example 1

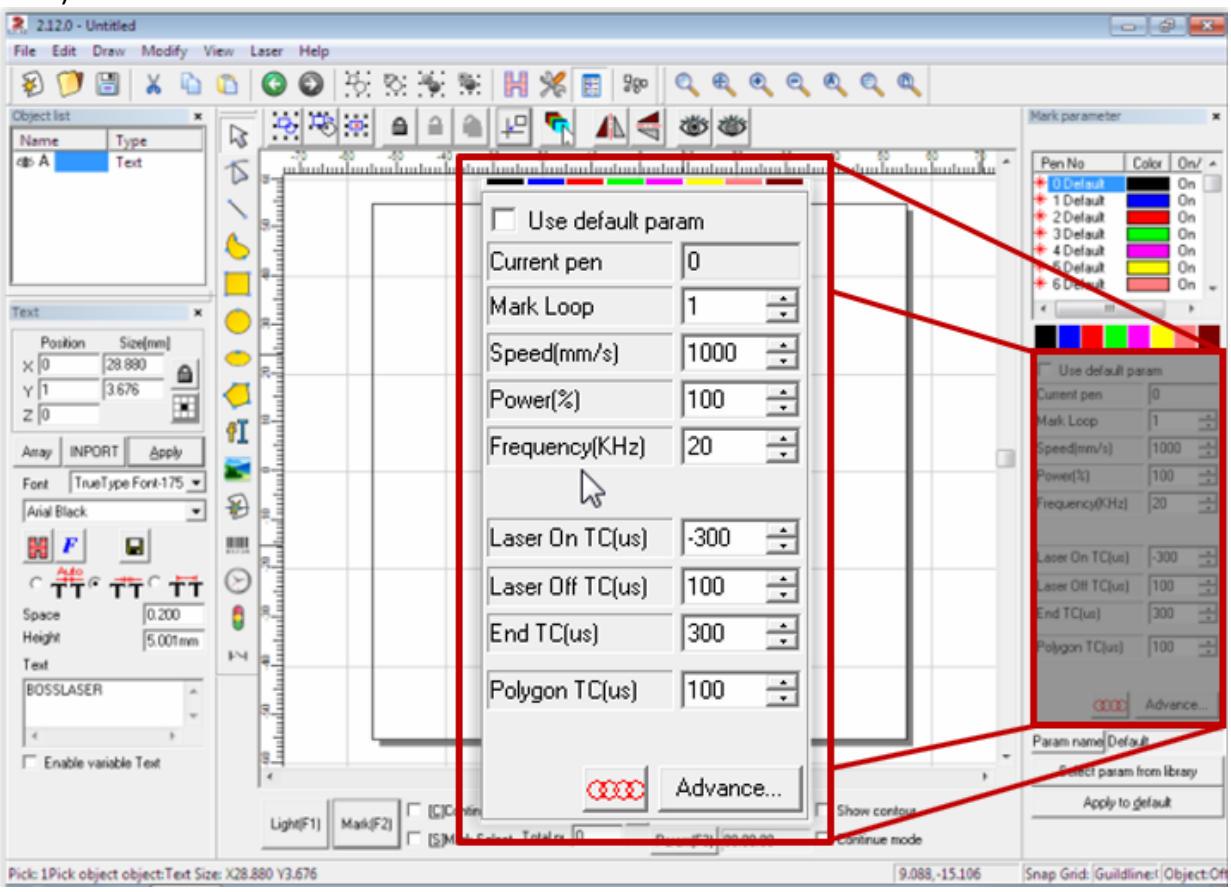
If you are using the rotary on the X-axis, your ***hatch pattern angle should be 90º***.



Example 2

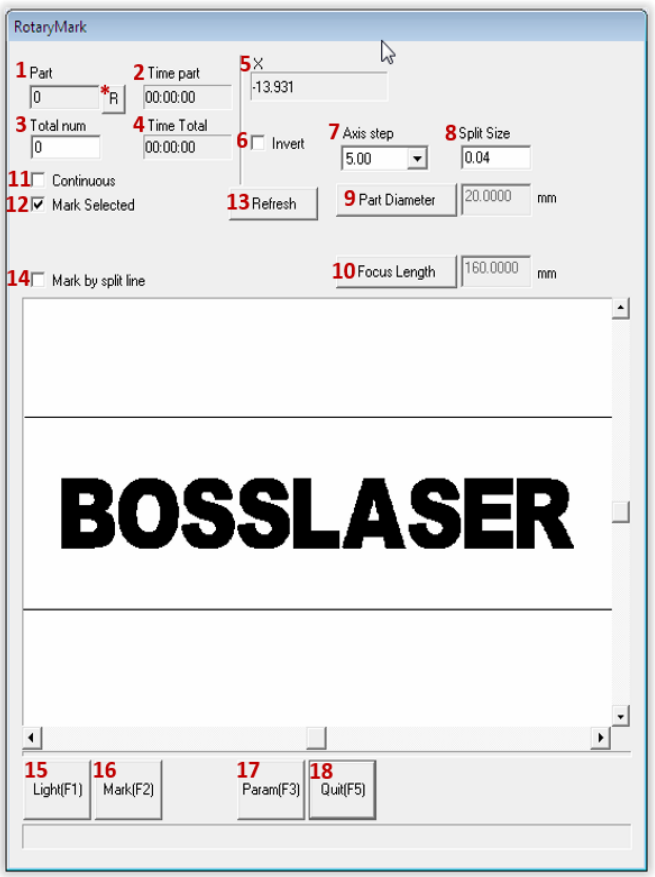
If you are using the rotary on the Y-axis, your ***hatch pattern angle should be 0º.***

Speed, Power, and Frequency parameters should be set ***PRIOR*** to opening the RotaryMark Plugin (**Laser > Rotary Mark**).



Note: You may need different settings depending on the item you are trying to engrave.

We are now ready to open the plugin. As we mentioned earlier, we will start with **RotaryMark**. The window should look like this (as shown below):



1. **Part:** This value indicates how many times the engraving/marking has been completed. This value/box is grayed out because it *cannot* be edited/changed, however, you can click the **R button** to reset the engraving/marking count.
2. **Time part:** Time elapsed of the given engraving/marking
3. **Total num**: The amount of time that the engraving/marking will repeat itself. In other words, if the value is 0, the engraving/marking will be performed once. On the other hand, if the value is 5, the engraving/marking will be repeated over five times.
4. **Time Total:** The total engraving/marking time including Total num repetitions that are entered
5. **Rotary X or Y:** To the upper-center part of the window, you'll find a coordinate reading of the rotary axis. If you have setup the rotary to work with the X-axis, it will display "X" above the box. If you have chosen the Y-axis, it will display "Y".
   ⚠ This reading is for reference only and is most of the time not used.
6. **Invert:** If your engraving/marking looks inverted on the work piece, checking this box will make it look normal or vice versa.
7. **Axis Step:** is the desired jog distance in millimeters You can in this drop-down window select the distance in millimeters that you would like to jog your rotary axis this is usually used for proper placement on the work piece. (Manual Jogging is illustrated on the next page)
8. **Split Size:** is the distance, in millimeter (mm), in which the rotary will incrementally move.
9. **Part Diameter:** is the actual size of the item that you are trying to engrave/mark.
   ⚠ **Note:** A new window will appear. You will need to measure the part you are trying to engrave/mark with calipers. (Illustrated on next page)
10. **Focus Length:** is the distance, in millimeter (mm), from the lens to the item's surface that you are wanting to engrave/mark. ⚠ **Note:** A new window will appear for values to be entered.
11. **Continuous:** If checked, your file/engraving will repeat itself continuously until you manually stop it (by pressing the ESC key or clicking the STOP button).
12. **Mark Selected**: If checked, only the item selected in the work area will be processed.
13. **Refresh:** This will update the workspace size This function will change the size of the workspace according to the part diameter, it is commonly used for accurate software placement on the work piece, the height as a default is set to 10 millimeters. ⚠ **Note:** When you are done using the rotary you will need to change the workspace back previous settings, explained at the end of the rotary tutorial.
14. **Mark by split line** - If checked, this rotary will move according to the split line drawn not by the split size value.
    ⚠ **Note:** If mark by split line is checked and that you have NOT drawn any split lines, the rotary might act unexpectedly.
15. **Light:** Perform the same function as when you are not using the rotary
16. **Mark:** Perform the same function as when you are not using the rotary
17. **Param (F3)** - This will open the rotary parameter window. Click to open Parameter Window
18. **Quit:** Closes the window.

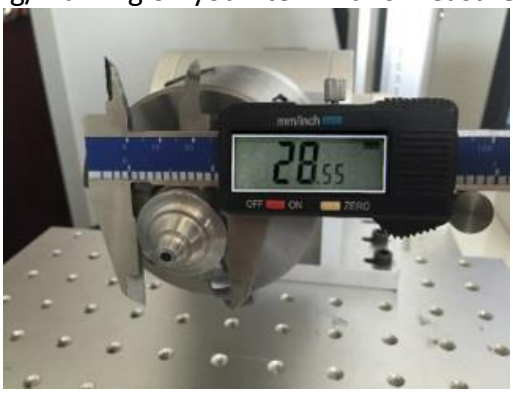
Manually jog:

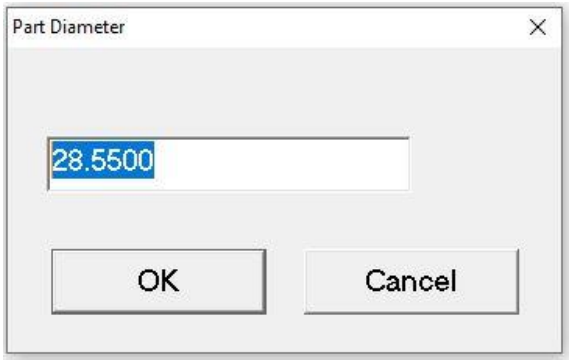
Manually jogging your rotary is simple to accomplish you will want to use Hold and Press, CTRL + left or right arrow keys on your keyboard to adjust the X-Axis.

Same process for adjusting your Y-axis, Hold and Press, CTRL + up or down arrow keys on your keyboard.

Measuring Part Diameter:

Using a caliper is recommended for precision measurements as it could distort or stretch your engraving/marking on your item if this measurement is not accurate.





To change this value, you will need to click on **Part Diameter** (this window should appear) enter the value from your calibers and click OK.

Focus Length:
When using the chuck rotary, it is highly recommended that you use the shortest lens that we provide

Focal Length Reference Table	
160	110m or 4.3 inches
290/330	200 mm or 7.8 inches
420/430	300mm or 11.8 inches

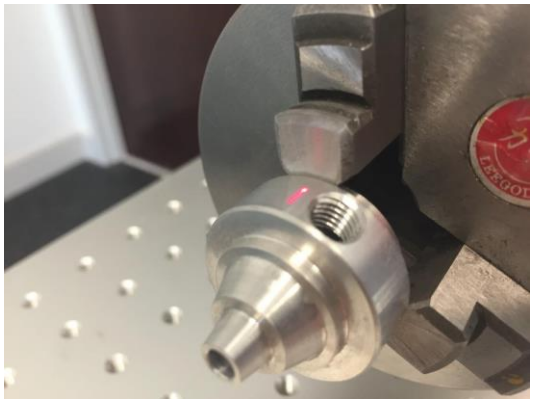
The default value should be 160 mm. If it isn't the case, click on Focus Length button, enter the correct value and click OK.

Split Size
For example, if the value 0.04, the rotary will rotate 0.04 mm every 0.04 mm. If the value is 2, the rotary will rotate 2 mm every 2 mm.
⚠ Note: Split size has to match your line spacing for your hatch when using the rotary.

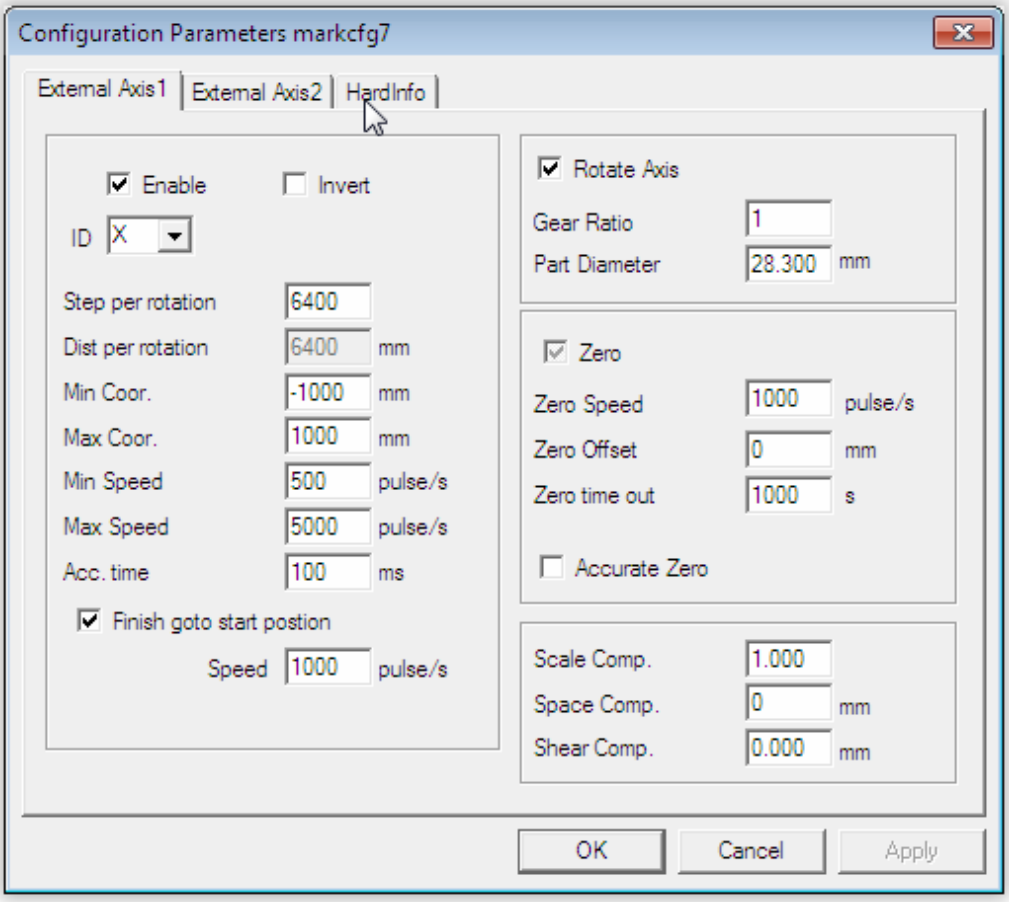
Draw split lines - To draw a split line, place the cursor where you would like to create it in the workspace, then double click, a red line will appear (as shown below)

Note: For our example, our rotary is mounted on the X-axis. Therefore, our split lines are vertical. On the other hand, if you were to mount it on the Y-axis, your split lines are horizontal.
You can create as many split lines as you would like, certain split line setup might make the rotary act unexpectedly it is recommended to keep the split lines setup as simple as possible.
🔍 **Pro Tip:** You can move the split line after it's created by clicking and holding the left mouse button and drag it to the desired position.
To remove or delete a split line hover over the desired split line and click on it with the right mouse button.

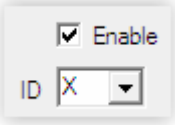
Note: When using the **RotaryMark** plugin, the red dot preview will only show the first split line (as shown below)



From the top menu bar select **Laser** then select **RotaryMark** the window we discussed early on in this manual will now appear. Selecting **Param (F3)** on the lower menu bar of Rotary Mark. This will open the rotary parameter window (as shown below)



The machines come with preset parameter, it is ***HIGHLY*** recommended not to change these values, the ***ONLY*** value that you will need to modify in here is the **ID**



To change it, simply click on the arrow to open the drop-down window then select the desired axis. Do make sure that the **Enable** box is checked.

If you have installed your rotary on the X axis the **ID** needs to be set for X
If you have installed your rotary on the Y axis the **ID** needs to be set for Y

As shown above, there are the three tabs available in the Parameter Window. **External Axis1, External Axis 2,** & **HardInfo**.

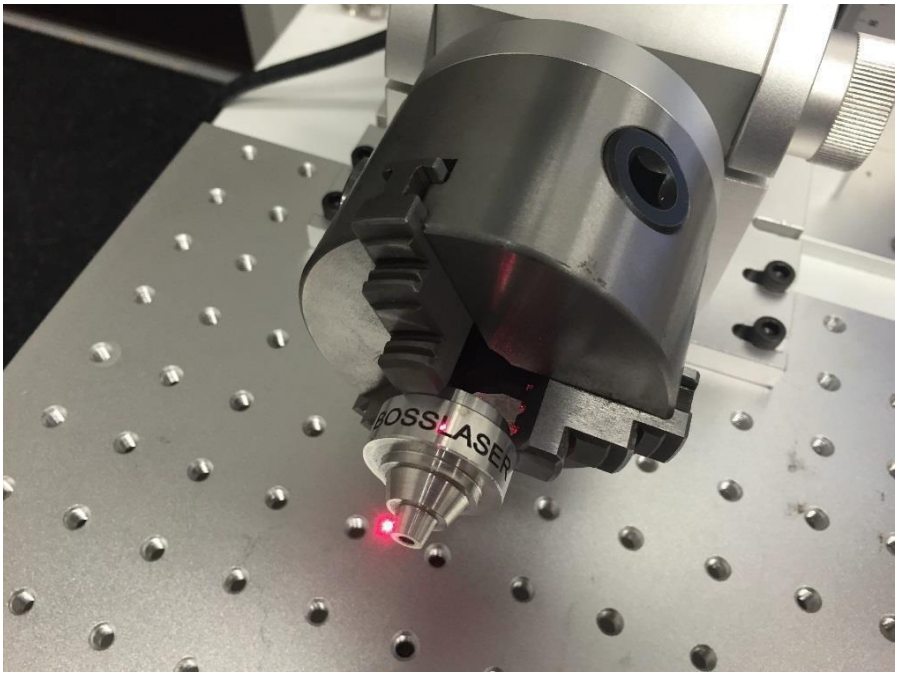
External Axis 1 will be the only one we will be use, due to the machine's configuration.
External Axis 2 is not applicable. By clicking on the tabs, you are able view that **External Axis 2** is NOT checked. This is default setting from our facility.
HardInfo reflects your controller's type, version, and serial number.

You now know every function of the **RotaryMark** plugin, and you are ready to engrave/mark your piece.

Chuck Test File – Rotary Mark

1. As you have your item secured in the chuck device make sure that you are correctly focused to the material. To do this click on **Light/Red** button (Keyboard short cut: Press **F1**). This will display the red outline on the material. Depending on preference, contour could be checked or unchecked.
2. ⚠ **At this point wearing your fiber laser safety glasses is MANDATORY**, anyone within a 10 ft radius of the laser should be wearing fiber laser safety glasses. Press **Esc** key to stop the preview.
3. You are now ready to mark your item in your chuck. By clicking on **Mark** (Keyboard short cut: Press **F2**).
4. Your file will begin to engrave/mark on your item.
5. **Important!** – The sequence to engrave/mark is very important. You HAVE to click Light or press **F1** even if you don't need to.
6. Then press **ESC** key or click STOP (make sure the rotary stops moving before continuing onwards).
7. Finally, you must click Mark or press **F2**.

The outcome should look as pictured.



NOTE: The shutting off procedure sequence is **VERY IMPORTANT.** The process is essentially the same procedure when starting up your FM, but in reverse.

Steps to Turning Off Your Machine

1. Put back the Lens Cap onto the Lens.
2. Turn off the Laser On/Off button
   2a. On the FMS Only – Power down the computer before cutting the power to the machine.
3. Press down the Emergency Switch
4. Turn the key to the OFF position
5. Flip down the Circuit Breaker

RingTextMark

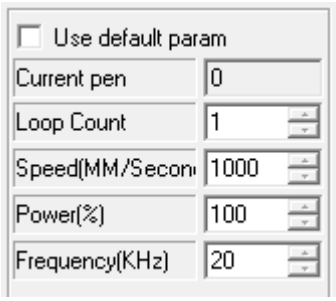
We will now explain what the **RingTextMark** plugin works. It is located right above the **RotaryMark** plugin under **Laser** (as shown below).

⚠ **Important:**
Remember that this plugin can ONLY be used when your rotary is mounted on the **X-Axis** position.

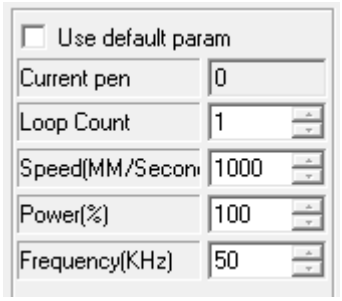
For this example, we will be writing "*Boss Laser*" (on the inside of a ring) with the text tool, then set our hatch.

Before continuing forward, we would want to make sure that the file is good, the hatch is set properly, and the Power/Speed/Frequency settings are acceptable.

If your machine has a 20w or 30w power source the following settings should be what you are using.



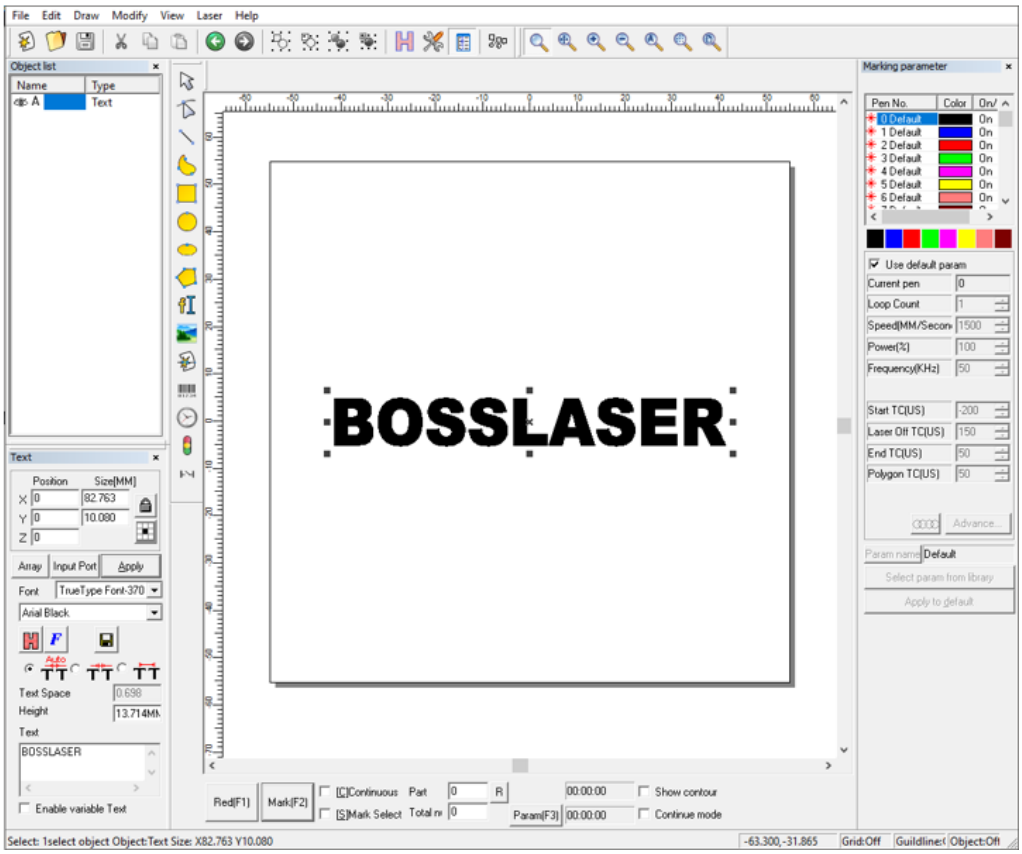
If your machine has a 50w power source the following settings should be what you are using.



Since we will be using **RingTextMark** for this exercise, you can apply up to three hatches**.** The reason for this is because RingTextMark works differently than RotaryMark. RingTextMark is only for small items or letters which will be marked individually. The rotary will rotate then engrave/mark the small item or letter while the rotary is not moving. Then the rotary will rotate to the next small item or letter and mark it. The fact that the rotary isn't moving while the engraving is happening makes it works more like you are not using the rotary. Therefore, you are able to use more than one hatch at a time.

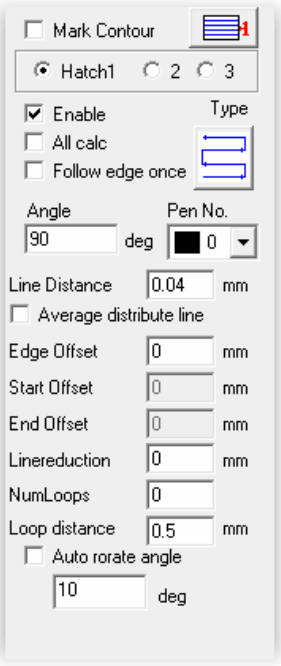
Now that we have the settings set correctly, we will use the same file that we have used for **RotaryMark example**, we will just go onto modifying our hatch a few settings.

For the example, we will add a second hatch going **against** our rotary axis.



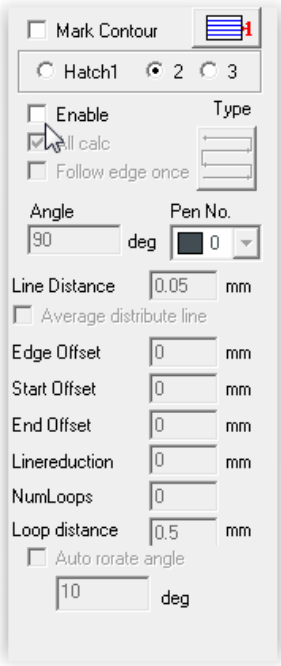
Select your image/text, for this case, BossLaser, then click on the **Hatch** icon located in the System Toolbar. The hatch window should appear, from here we will add second hatch.

Hatch1



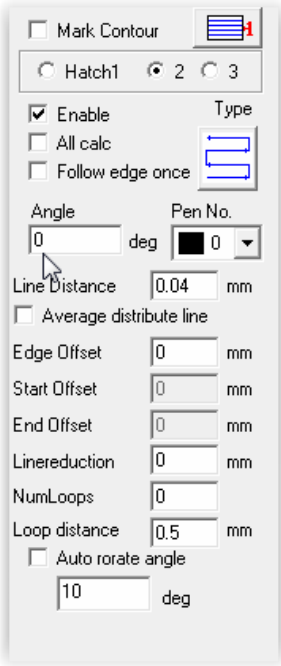
As a reminder, your first hatch should have these settings entered from the last example.

Hatch 2 (Disabled)



When selecting the 2nd hatch, by default it should not be enabled. All the fields are grayed out as pictured until the hatch is enabled.

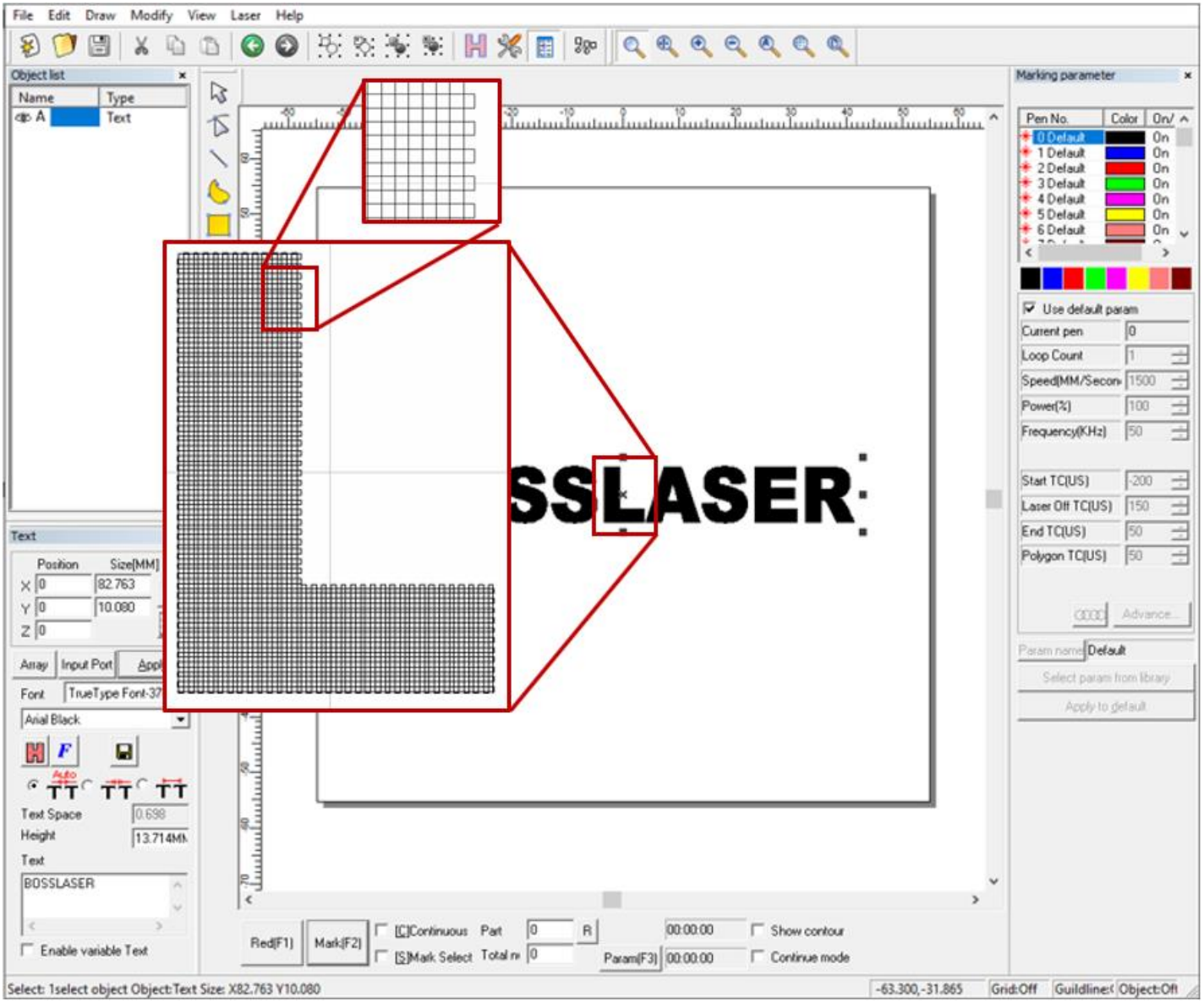
Hatch 2 (Enabled)



Once the Enable box is checked the fields then become fillable. Fill your settings to match the picture above.

⚠ Note: The major difference between these two hatches are the numbers entered in the Angle field. Then click **OK**.

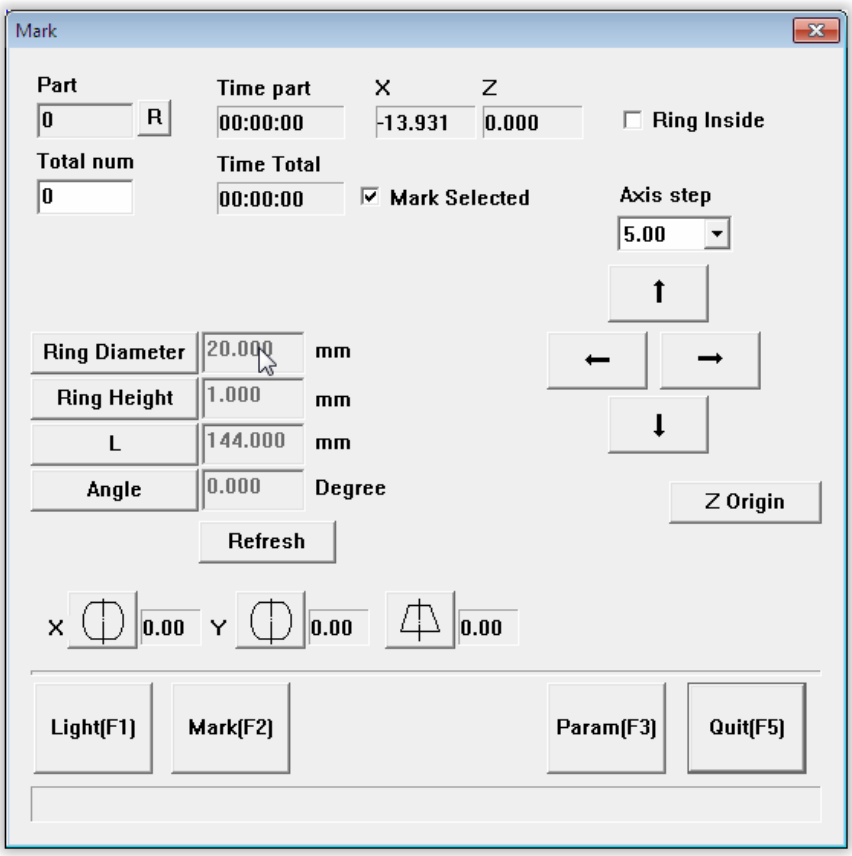
The image should look like this with the two hatches (as shown below):



You can distinctively see the two hatches. One vertical (90°) and one horizontal (0°).

Now that your hatch looks like this, you are ready to open up the **RingTextMark** plugin. A window will pop up and it should look appear like the one on the next page.

We will now explain all the functions in within this window



Part: This value indicates how many times the engraving/marking has been completed. This field is grayed out because it *cannot* be changed. However, you can click the **R button** to reset the engraving/marking count.
Time Part: Time elapsed of the given engraving/marking
Total num: The number of times that the engraving/marking will repeat itself. In other words, if the value is 0, the engraving/marking will be performed once.
Time Total: The total engraving/marking time including **Total num** which is the number repetitions preformed.
Mark Selected - If checked, only the item selected in the work area will be processed.
X & Z Coordinates: Located **in** the upper-center part of the window, are the coordinate reading of the rotary axis.
⚠ **Note:** Z isn't used in your machine configuration

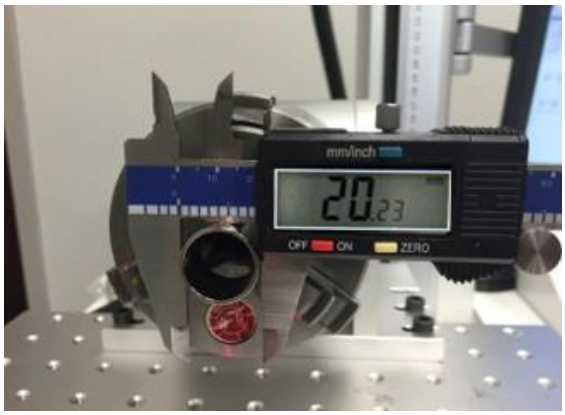
Axis Step: The desired jog distance in millimeters. The drop-down menu has various selections. Keep in mind those are distance in millimeters. This is usually used for proper placement on the work piece.

⚠ To manually jog your rotary on the X-axis, hold **CTRL + left or right arrow OR click on the Axis step arrow keys within the RingTextMark window**

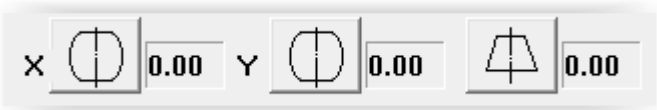
To change the next following values, you will need to click on the buttons next to the grayed fields.

Ring Diameter is the actual size of the item that you are trying to engrave/mark.

⚠**Note:** You will need to measure the outside diameter of your part you are working with using calipers for precision measurements. Precise measurements are recommended as the quality of your engraved image could be distorted or stretched if measurement is not accurate.



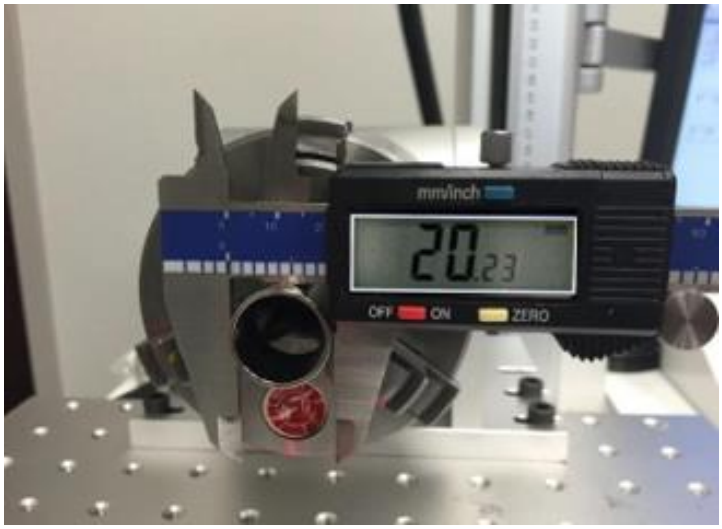
Refresh: This will update the workspace size
This function will change the size of the workspace according to the ring diameter, it is commonly used for accurate software placement on the work piece.
Ring Height: The height of the object can be modified in a similar process.
L & Angle are typically used when engraving on the inside of a ring.
L is the length from the pivot of the rotary to the end of your workpiece.
Angle: Used to adjust the chuck for the laser to engrave on the inside surface.



Distortion Compensation in some cases are used when engraving the inside of a ring with an incoming angle (**Angle)** and a certain pivot length (**L**) the text can appear slightly distorted.

Rotary Mark Test File

Let's start with putting your object in the chuck rotary. We will be using a small ring in this example. As pictured, we started off by measuring the diameter with calipers.

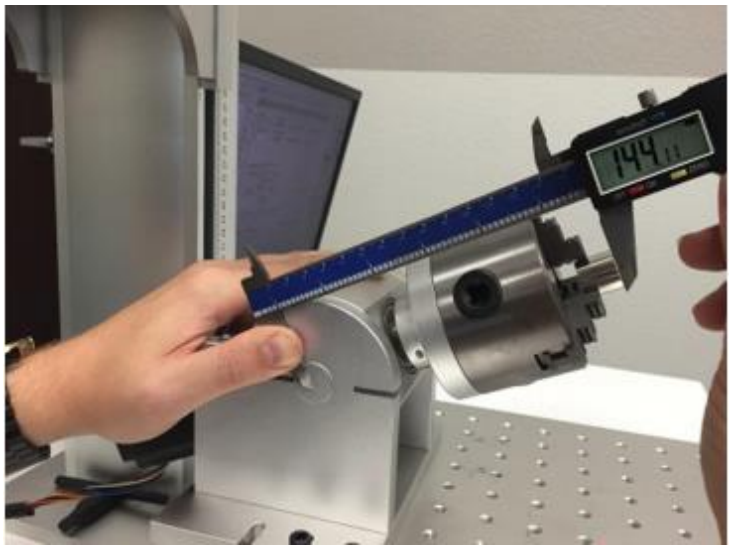


1. **Back at the Software:** We are working in the Ring Text Mark window.
2. Select **Ring Diameter**, enter the value on your calipers in the window (Part Diameter). Then press ok.
3. Next we are going to enter the **Ring Height.** Again, select the button and enter the value from your calipers in this window. We will be entering 5mm for this value.

Pro Tip: The width will be the calculated part circumference.

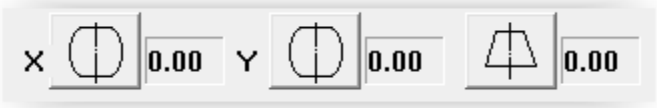
For example, if the part diameter is 20.23 millimeter, the workspace width will be 20.23 x π = 63.52 millimeter. This allows you to know how much room you have to work with for your engraving/marking or to place it accurately.

4. Check the box next the **Ring Inside.** This feature tells your machine we are going to engrave on the inside of the object.
5. We will fill in the **L** with the measurements by measuring the length from the pivot of the rotary to the end of your workpiece. We will be entering 144.11 mm.



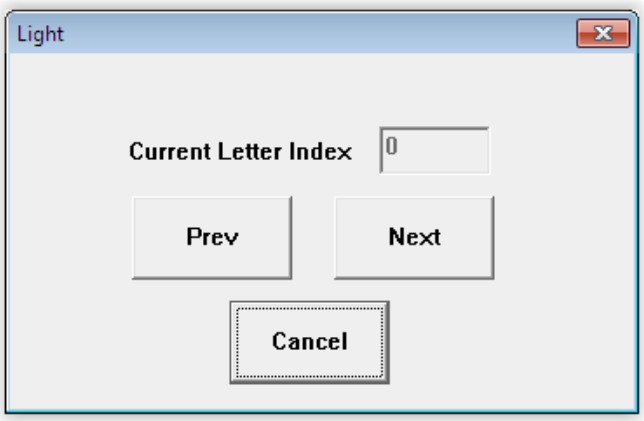
6. Next we will need to account for the **Angle**. Angle is the degree at which the workpiece is set to. To measure you will want to use square like the one pictured here. We've illustrated this process as well to help with the visual. Back in the software you will click on Angle and enter the value from your square.

7. **Distortion Compensation** in some cases when engraving the inside of a ring with an incoming angle (**Angle)** and a certain pivot length (**L**) the text can appear slightly distorted.



⚠ **Note:** It is recommended to change these values in increments of 0.02
To change these values simply click on one of the distortion symbols then a window will popup.
*The maximum distortion coefficient is 0.2 and the minimum distortion coefficient is -0.2

8. **Light(F1)** – Light function is a little bit more elaborated in the **RingTextMark** when you click on light now a new window will popup (as show bellow):



This will enable you to show every individual letter one at the time.

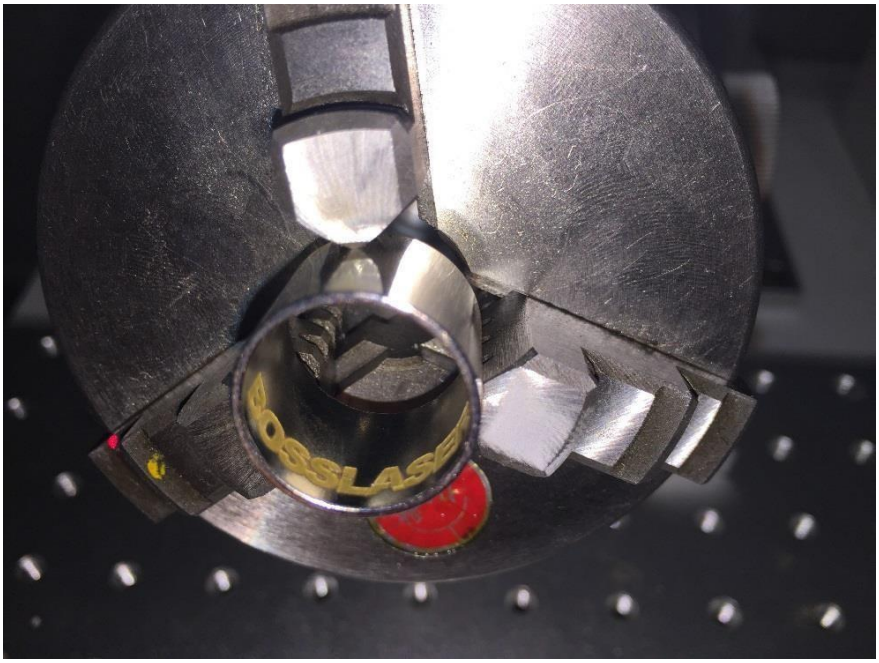
For this example, we are writing BOSSLASER. It has nine letters. **B** will be letter index 0, **O** will be letter index 1, **S** will be letter index 2, etc. Until the letter **R** will be letter index 8.

⚠ As you are moving through the index you will notice the rotary moving to each location of the letter it will be engraving.

9. **Mark:** Will fire the laser. Fiber glasses must be worn when using this function.

10. **Param (F3):** This will open the rotary parameter window. We will be modifying ONLY the ID value.
    a. Depending on which axis your rotary is installed on will determine the axis you will be selecting. We are selecting X.
    b. While in this window Check to make sure the Enable box is checked.
11. We are now ready to run our test file.
    a. Final time click on Light button to make sure everything is aligned properly. The red light will give you a preview of the file on your material.
    b. Make sure to press Next to preview all the letters that constitute your image/file to ensure a proper placement.
    c. At this point wearing your fiber laser safety glasses is MANDATORY, click CANCEL or Esc
    d. Firing the Laser! Click on Mark or F2. Your file will begin to engrave/mark.

This was our final result!



⚠ Important Information:
The sequence to engrave/mark is very important.

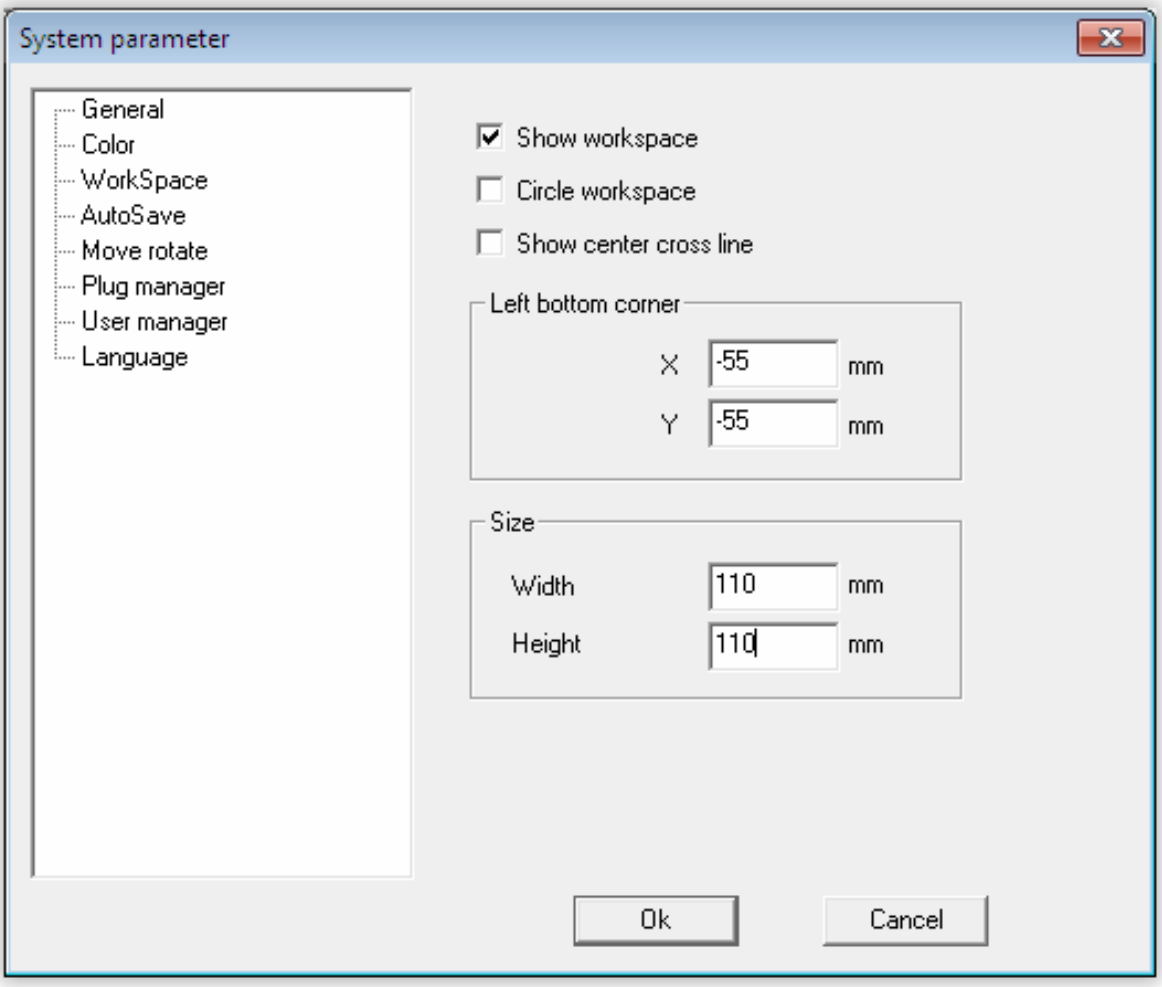
1. Light or press F1 even if you don't need to.
2. Then press ESC or click CANCEL (make sure the rotary stops moving before continuing onwards).
3. Finally, you must click Mark or press F2.

BOSSLASER™

Change the Workspace Back to Flat Surface

When you are done using a rotary, you will need to revert your workspace settings back to normal. The process is very similar to turning the rotary on, except the step are in reverse. To do so, click on **File > System parameter > Workspace**.

If you are using a 160-millimeter lens (f=163 mm), your workspace should look like this (as shown below):



If you are wanting to use any other lens, please look at your backup settings that you have received with your machine.

BOSSLASER™

Users Manual for FM Series

SECTION 5: MAINTENANCE

Appendix C: Maintenance

Fiber Laser Markers require very little maintenance. However, the following is recommended:

Keep Area Clear of Debris and Clutter Free:
Cleaning your work area is as simple as wiping it down with non-abrasive wipes or keeping a vacuum nearby. Keep the area clean and free of debris by vacuuming or wiping the area with a clean rag after each use will ensure top quality each time you use your machine.

Clean Lens:
The lens is far from the material and so will not typically need to be cleaned after each job. Depending on workflow, check and clean your lens weekly. Use only non-abrasive optic wipes when cleaning the lens is recommended.

Fire Extinguishers:
While fire is not likely while running this machine, the possibility is always there. We recommend inspecting your fire extinguishers annually with certified company. Monthly inspections are also recommended per OSHA guidelines.

Computers:

Depending on your computer set up will depend on the updates you allow your computer to run.

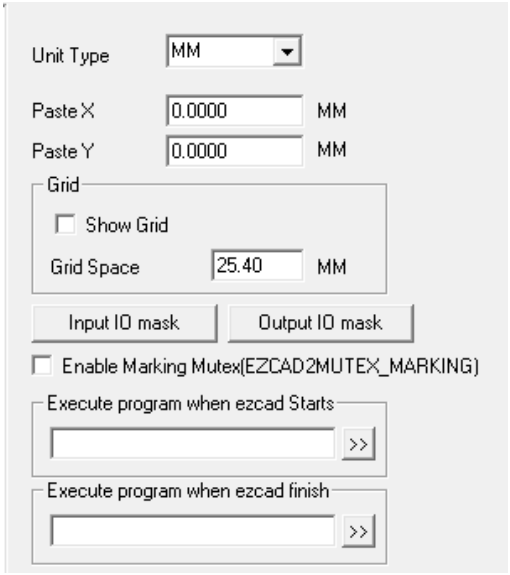
Windows 7 users: It is best to now allow your computer to do any updates as they tend to reset parameter settings.

BOSSLASER

Appendix D: Frequently Asked Questions

Customizing your Workspace

To access the System Parameter, select File from the top menu bar then System Parameter. From there you'll be able to make the desired adjustments.



General

Under the General tab common parameters can be adjusted.

Unit Type

Change between mm and inches as your unit type.

Paste X and Paste Y

Set the relative offsets to a previously pasted object.

Grid

Check to show or hide the grid within the software.

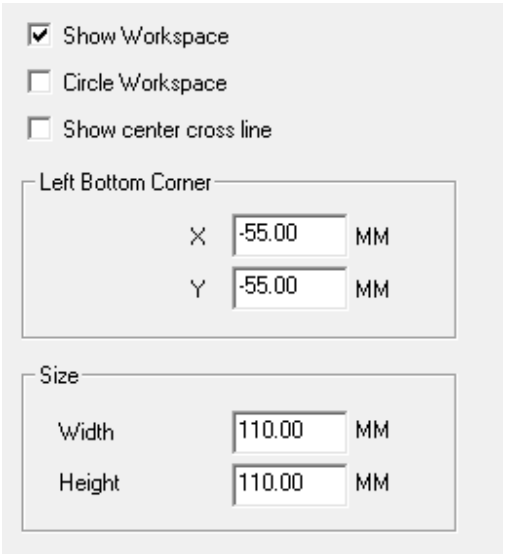
Grid Distance

Adjust the distance within the grid in the work area.

⚠ We recommend working in mm opposed to working in inches.

Color

The color tab allows you to set the colors of the software's background, workspace, guideline and grid, etc. Double click the color stripe will allow you to change the setting to your desired colors.



Workspace

The workspace tab allows you to specify what type of workspace is desired as well as control the size of the workspace.

Show Workspace

Check or unchecked to show or hide the workspace present within marker.

Circle Workspace

Check or uncheck to illustrate a square or circle workspace within marker.

Show Center Cross Line

Check or uncheck to illustrate a center cross line within the workspace.

Left Bottom Center

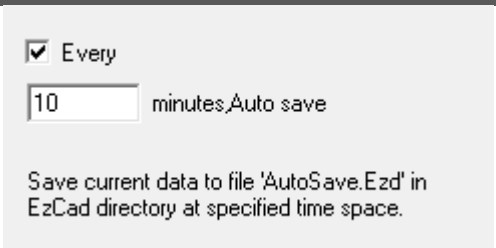
Set what the center of the workspace offset is going to be.

Size

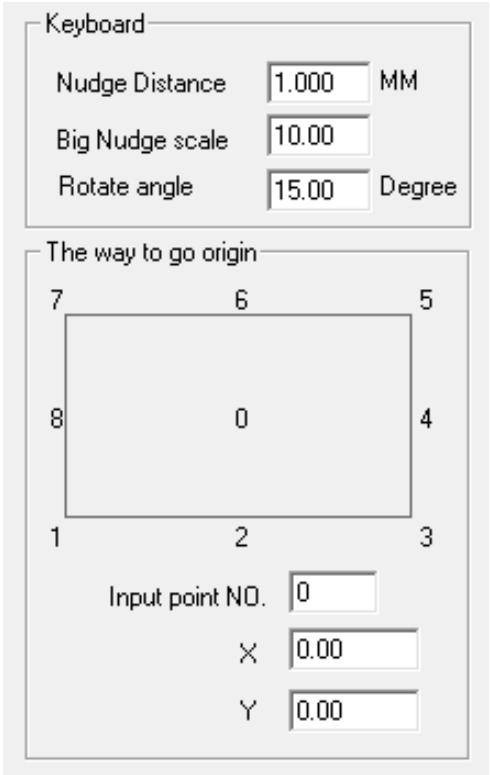
Set the exact size of the workspace.

Appendix D: Frequently Asked Questions

Customizing your Workspace



Autosave
The autosave tab allows you to specify a specific time between autosaves to be saved to your Marker directory.



Move Rotate
These settings allow you to optimize specific options when adjusting objects.
Nudge Distance
Increase or decrease this setting to control the distance an object moves when using the directional keys each time they are pressed.
Big Nudge Scale
Set a distance that multiplies the nudge distance when holding the “shift” key and pressing the directional keys to allow an object to jump that distance.
Rotate
Specify the angle an object rotates here so that when holding the “ctrl” key and using the directional keys the object will rotate at that desired angle.
To Origin
Specify when using the “put to origin” function which point of the object is set to the origin.

PLUG Manager This tab displays the Marker software’s plugs which have already been installed into your computer. You can activate or deactivate each plug.
Language Adjust the language you want the software to use when opened.

Notes: