FusionPro 32/48

Laser System Manual | Model 16000

Original Instructions

EpilogLaser

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FIRE WARNING

Fire Warning

Your laser system uses a high intensity beam of light that can generate extremely high temperatures when it comes into contact with the material being engraved, marked or cut. Some materials are extremely flammable and can easily ignite and burst into open flame setting the machine afire. This open flame is very dangerous and has the potential to destroy not only the machine, but the building in which it is housed.

Experience shows that vector cutting with the laser has the most potential to create an open flame. Many materials are susceptible to igniting, but acrylic, in all its different forms, has been shown to be especially flammable when vector cutting with the laser.

Please read the following warnings and recommendations and follow them closely at all times!

- **Stay with the laser.** Never operate the laser system while unattended.

- **Keep the area clear.** Clean around the machine and keep the area free of clutter, combustible materials, explosives, or volatile solvents such as acetone, alcohol, or gasoline.

- **Be prepared with a fire extinguisher.** Always keep a properly maintained and inspected fire extinguisher on hand. Epilog recommends a Halotron fire extinguisher or a multi-purpose dry chemical fire extinguisher. The Halotron extinguishers are more expensive than a dry chemical, but offer certain advantages should you ever need to use an extinguisher. The Halotron extinguisher discharges a clean, easily removable substance that is not harmful to the mechanics or wiring of the laser system. The dry chemical extinguisher discharges a sticky, corrosive powder that is very difficult to clean up.

- **Use Air Assist.** Always use the system's Air Assist feature when vector cutting.

- **Use caution when vector cutting.** Many materials have the potential to suddenly burst into flames when cut with a laser – even materials that may be very familiar to the user. Always monitor the machine when it is operating.

- **Clean the laser.** A buildup of cutting and engraving residue and debris is dangerous and can create a fire hazard in its own right. Keep your laser system clean and free of debris. Regularly clean underneath the Vector Cutting Table to clean any small pieces that have fallen through the grid.

INTRODUCTION

How to Use This Owner's Manual

Thank you for purchasing an Epilog Fusion Pro Laser system. Your Epilog system has been designed to be easy to operate, but you will utilize it to its fullest potential by taking some time to read this owner's manual prior to use. You will be ready to use the Epilog Laser system as soon as you read the first few sections. Then you can refer to topics in the remaining sections, as you work.

Icons Used in this Manual

Look for these symbols to help you find valuable information throughout the text:

Helpful notes to keep in mind when running the laser!

This icon signifies advice you can try that will save you significant time.

This icon highlights current contact information for receiving help.

Warnings and cautions to keep in mind when running the laser.

This icon indicates the potential for fire damage when operating the laser.

SECTION 1: SAFETY

Laser Safety

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 Epilog Model 16000 Laser System is performed in accordance with all applicable laws.

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

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

Electrical Safety

The AC input power to the Epilog Model 16000 Laser System is potentially lethal and is fully contained within the cabinet.

- **DO NOT** open any of the machine's access panels while the unit is plugged in. Opening a panel may expose the operator to the unit's AC input power.

- **DO NOT** make or break any electrical connections to the system while the unit is turned on.

Fusion Pro Electrical Specifications

Model	Wattage(s)	Voltage	Amp draw-MAX
Pro 32	50, 60, 80	120	13A
Pro 32	50, 60, 80	240	6.5A
Pro 32	120	240	10A
Pro 48	50, 60, 80	240	6.5A
Pro 48	120	240	10A

SECTION 1: SAFETY

Safety Features and Regulatory Compliance

Epilog has incorporated specific safety features into the Model 16000 Laser System in order to meet the requirements of 21 CFR 1040 and the International Standard IEC 60825-1. These safety features include:

- A safety enclosure (cabinet), which fully encloses the engraving laser and its beam path.

- Dual redundant interlock systems that turn off the engraving laser when the window is opened.

- A visible emission indication when the Laser Diode Pointer (Red Dot Pointer) is operating. There is an LED indicator on the machine's front panel.

21 CFR 1040 and IEC 60825-1 require that certification, identification, and warning labels be placed on laser products. Reproductions of labels on the Epilog Model 16000 Laser System follow, with their locations specified:

1. **Certification/Identification Plate:** This engraved plate is located on the right side of the machine's cabinet.
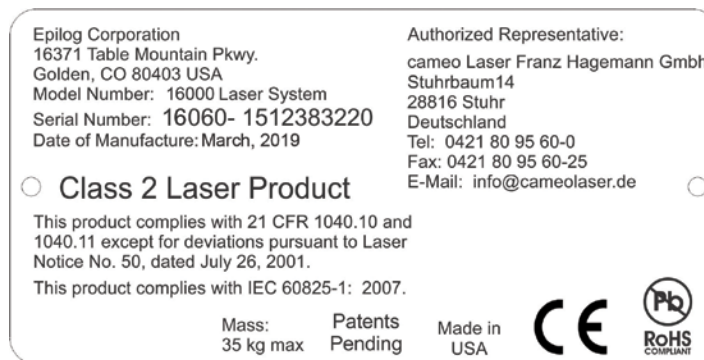
2. **Warning Logotype:** This label is located on the right side of the machine's cabinet, above the Certification/Identification plate.

SECTION 1: SAFETY

3. Descriptive Label: This label identifies the classification of the Model 16000 in accordance with 21 CFR 1040.10 and IEC 60825-1. It is located on the right side of the machine's cabinet, below the Warning Logotype.

4. Non-interlocked Protective Housing Safety Labels: These labels are located on, or adjacent to, removable access covers on the machine's cabinet as shown in the diagrams to follow. Where a label is located on a removable cover, there is an additional label under the cover so that it will be visible when the cover has been removed.

5. Defeatably-interlocked Protective Housing Safety Labels: There is one label on each of the machine's cabinet doors; one on the front door and one on the top door.

6. Emergency Stop Label: This label is located below the red Emergency Stop switch on the top right side of the machine.

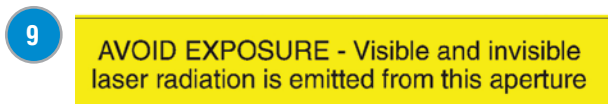**7. Electrical Safety Label:** This label is located on the back of the machine in the lower left hand corner.

8. Main Breaker Label: This label is located on or above the power module panel at the right side of the machine's cabinet.

9. Aperture Safety Label: This label is located above the aperture, inside the cabinet, where laser beams enter the machine's engraving area.

10. Power Labels: The appropriate label for the machine is located on or below the power module panel at the right side of the machine's cabinet.

11. Fire Warning Label: There are two labels on top of the machine's cabinet; one to the left and one to the right of the top cabinet door.

3
LASER RADIATION
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT

1 mW CW MAXIMUM 600-700 nm

4
CAUTION - CLASS 4 VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN

AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

5
CAUTION - CLASS 4 VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN AND INTERLOCKS DEFEATED

AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

6
EMERGENCY STOP

7
DANGER

HIGH VOLTAGE INSIDE CABINET

DISCONNECT POWER BEFORE OPENING PANEL

8
AC MAIN CIRCUIT BREAKERS

9
AVOID EXPOSURE - Visible and invisible laser radiation is emitted from this aperture

10
POWER
100-240V AC
47-63Hz 8A

POWER
100-240V AC
47-63Hz 15A

POWER
208-240V AC
47-63Hz 15A

11
DANGER
FIRE HAZARD
DO NOT OPERATE MACHINE UNATTENDED

USE EXTREME CAUTION WHEN CUTTING FLAMMABLE MATERIALS SUCH AS WOOD OR ACRYLIC.

A PROPERLY MAINTAINED FIRE EXTINGUISHER SHOULD BE KEPT NEAR THE MACHINE AT ALL TIMES. EPILOG RECOMMENDS A CO_2 FIRE EXTINGUISHER.

PERIODICALLY REMOVE THE VECTOR CUTTING GRID AND REMOVE DEBRIS FROM THE TABLE PAN.

PERIODICALLY REMOVE THE EXHAUST TUBE ADAPTER FROM THE BACK OF THE MACHINE AND REMOVE ANY DEBRIS FROM THE EXHAUST PORT.

REFER TO THE USERS MANUAL FOR ADDITIONAL INFORMATION REGARDING FIRE SAFETY

SECTION 1: SAFETY

The following diagrams show the location of each specific label.

Fusion Pro 32:

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-19
EMERGENCY STOP LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-1
WARNING LOGO

MT0502-2
DESCRIPTIVE LABEL

CERTIFICATION/
IDENTIFICATION
PLATE

MT0502-14
MAIN BREAKER LABEL

MT0502-11
POWER LABEL

MT0502-3
DEFEATABLY-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-3
DEFEATABLY-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-19
EMERGENCY STOP LABEL

TOP VIEW

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-1
WARNING LOGO

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-3
DEFEATABLY-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-7
ELECTIRCAL
SAFETY
LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-2
DESCRIPTIVE LABEL

CERTIFICATION/
IDENTIFICATION
PLATE

MT0502-14
MAIN BREAKER
LABEL

MT0502-11
POWER LABEL

BACK VIEW

LEFT SIDE

FRONT VIEW

LEFT SIDE

SECTION 1: SAFETY

Fusion Pro 48:

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-5
APERTURE LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-3
DEFEATABLY-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-19
EMERGENCY
STOP LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-7
ELECTRICAL SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-3
DEFEATABLY-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-1
WARNING
LOGO

MT0502-2
DESCRIPTIVE
LABEL

CERTIFICATION/
INDENTIFICATION
PLATE

MT0502-14
MAIN BREAKER
LABEL

MT0502-11
POWER
LABEL

DETAIL A
SCALE 1 : 4

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-4
NON-INTERLOCKED
HOUSING SAFETY LABEL

MT0502-5
APERTURE LABEL

DETAIL B
SCALE 1 : 2

SECTION 1: SAFETY

FCC:

Supplier's Declaration of Conformity
47 CFR Paragraph 2.1077 Compliance Information

Laser Materials Processing System Model 16000

Epilog Laser Corporation
16371 Table Mountain Parkway
Golden, CO 80403

Telephone: (303) 277-1188

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation..

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equpment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This product contains a Certified transmitter module (wireless network interface), FCC ID: Z64-WL18DBMOD

SECTION 1: SAFETY

Dos and Don'ts

Don'ts

Do Not Run the Laser Unvented: Never operate the machine without a properly operating vent to the outside or to a filtration unit! Most material will only produce an irritating smoke when engraved. Some materials, including but not limited to paint, varnish, composition board and plastics, produce compounds that can be harmful if concentrated. A properly installed vent is the only way to ensure that problems do not occur.

Do Not Engrave or Cut PVC: Never engrave or cut *any material* containing PVC or vinyl. When engraved, a corrosive agent is produced that will destroy your machine. Your warranty will be void if your machine is damaged by corrosion from engraving or cutting PVC or Vinyl.

Do Not Operate Machine While Unattended: Never operate your machine without someone watching the system. There is a significant risk of fire if the machine is set improperly, or if the machine should experience a mechanical or electrical failure while operating.

Do Not Vector Cut While Machine is Unattended: Never laser cut any material with the laser without someone watching the system. Because vector cutting moves relatively slowly compared to raster engraving, a tremendous amount of heat is applied to the material being cut. This buildup of heat can cause significant fire risk and the machine should always be monitored. Additionally, the Air Assist should always be turned on when vector cutting to reduce the risk of fire.

Do Not Operate The System While Doors are Open: Never operate with any of the covers or enclosures removed, and never modify the enclosure. The laser beam is invisible and is very dangerous!

Dos

Clean the System: Please allow a few minutes a week for cleaning your machine. Just a small amount of effort at the end of the week will pay off with years of trouble free operation of your machine.

SECTION 2: GETTING STARTED

Setting up your Epilog Laser System is easy to do! If you've ever installed a paper printer, this is only slightly more difficult. The following information will help you understand the entire system and how it works.

Your Fusion Pro laser system consists of the following components:

1. Fusion Pro Laser System

2. Epilog Driver Disc

3. USB and Ethernet Cables

You will also need:

1. A computer or laptop.

2. An exhaust fan: The exhaust fan is mandatory and is used to remove smoke and debris from the Fusion Pro work area. The exhaust air can be ported to the outside or into a filter box.

Follow these steps to setup your Fusion Pro Laser system:

1. Unpack the laser system.

2. Choose where to locate the system.

3. Connect the exhaust system to your laser.

4. Connect the electrical power.

5. Connect the laser to your computer through USB or Ethernet connection.

6. Sign up for driver updates and register your system at www.epiloglaser.com/register.

SECTION 2: GETTING STARTED

1. Unpacking the Laser System

Unpack the laser system from the crate provided by Epilog. Please be sure to hold on to all packing materials and crating in case you need to move the system in the future.
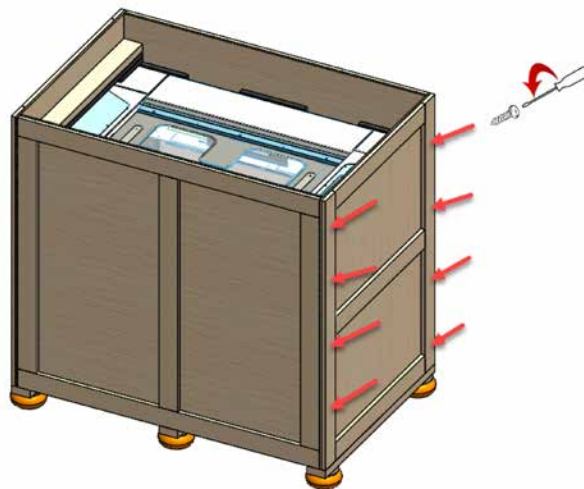
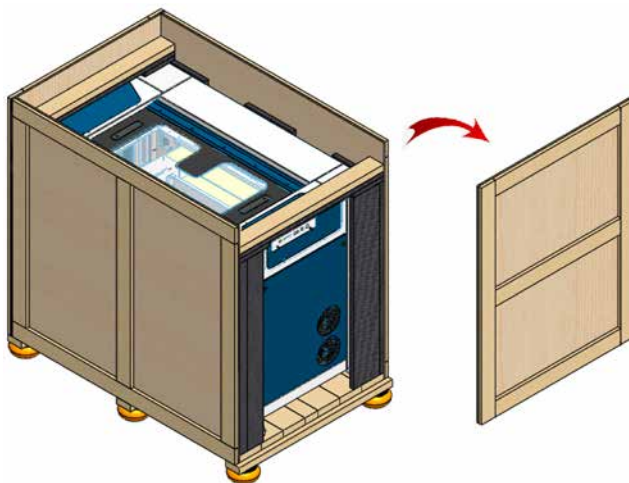1. First, remove the screws securing the top lid using a screwdriver.
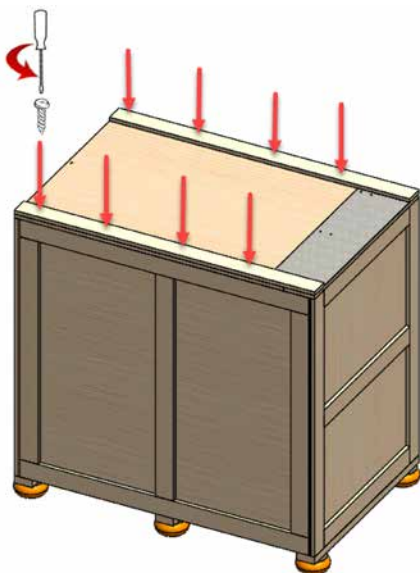
2. Remove the top lid and set it to the side.
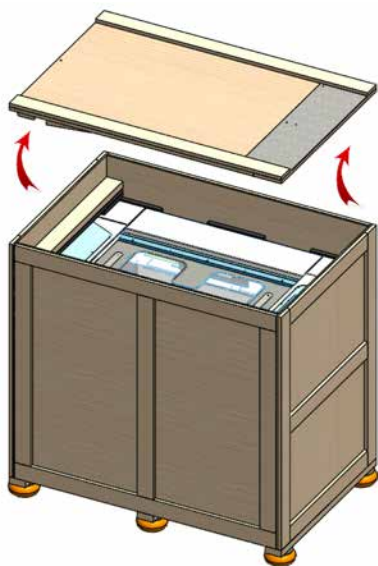
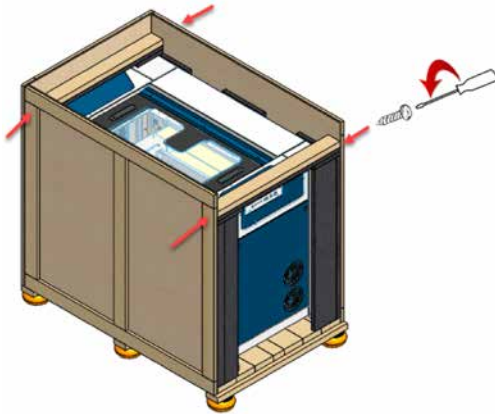
3. Remove the screws securing the front panel.
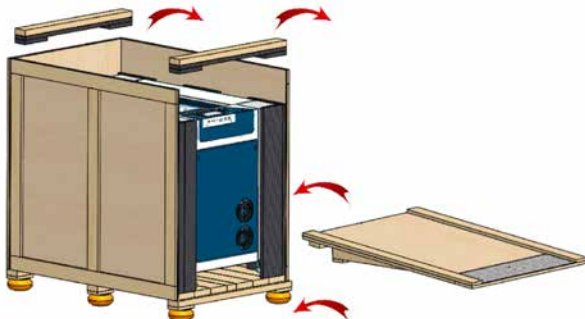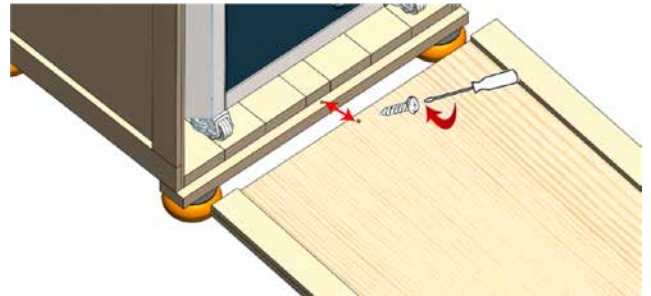

4. Slide the front panel out of the box.

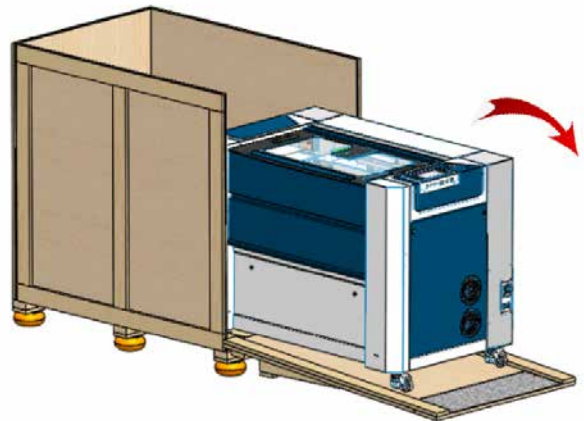5. Remove the outer screws holding up the two braces.

6. Remove the braces as well as any foam pieces around the machine.

7. Using the top panel you removed at the beginning, align its corners with the ledge on the bottom of the box, making a ramp. Secure the ramp with a screw.

8. Roll the machine down the ramp slowly and carefully until it is out of the box and on level ground.

SECTION 2: GETTING STARTED

## 2. Choose Where to Locate the System

Cooling Requirements and Operating Temperatures

All Epilog Laser systems use air-cooled laser tubes. Laser technology is such that the laser tubes generate a lot of excess heat and the tubes must be cooled for proper operation. There are cooling fans located on both sides of the laser. The fans and vents should always be clear of restrictions and should never be covered.

Warning: The cooling fans and vents are located on both sides of the Fusion Pro and should never be covered or blocked in any way. Lasers that overheat will not operate properly and may begin to produce erratic laser output or possibly complete failure.

Ambient air temperature where the laser system is operating should not exceed 90 degrees F (32 C). Operating in an environment where the ambient air temperature is above 90 degrees F (32 C) will void the Epilog warranty. **For more information, see the "Warranty Statement for the Fusion Pro Laser" on page 127.**

COOLING FAN INLETS

FOCAL PLANE EXHAUST

DOWNDRAFT EXHAUST

RIGHT SIDE

REAR
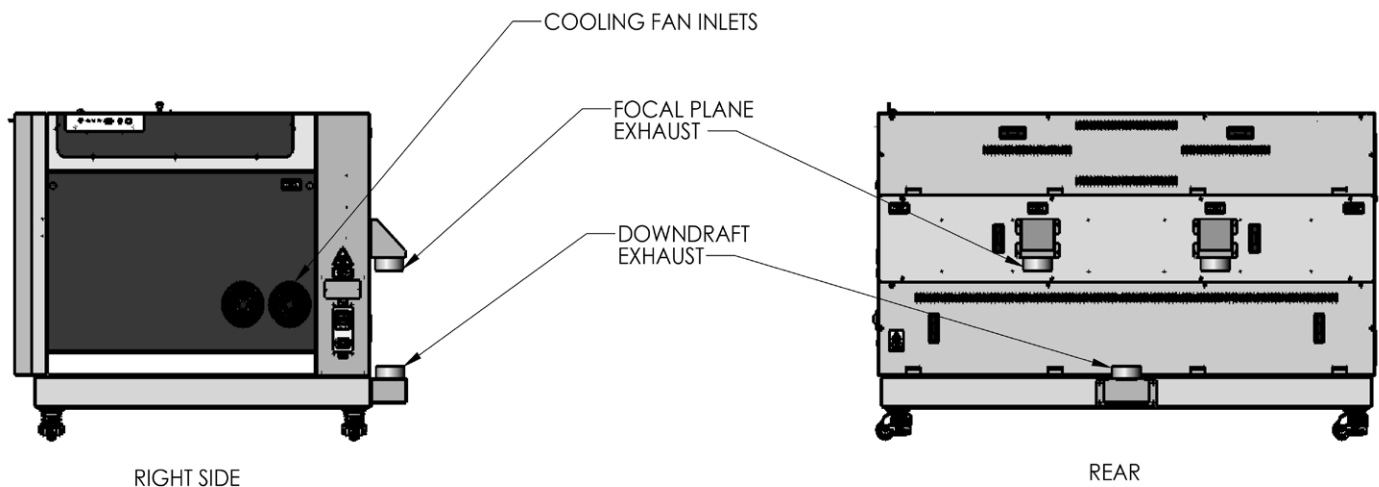
3. Connecting the Exhaust

In this manual, the term "exhaust" refers to either an exhaust fan or a filter unit and the term "exhaust" is used for simplicity. The important point is that it is mandatory that an exhaust unit or filter system is incorporated as part of your laser system. Never operate your laser system without a properly functioning exhaust. The exhaust removes the dust, debris and smell from the engraving cavity and exhausts it to the outside of the building or to the filter unit. Prior to the installation of the laser system, you may need a contractor to install the exhaust system. The blower should be mounted outside your building for noise considerations. Ideally, the blower should not be more than twenty feet (6 meters) from the laser. You should provide a metal duct (flexible aluminum or galvanized sheet metal) from the blower to the laser. All Epilog model 16000 laser systems require an exhaust fan that is rated at a minimum of **800 CFM** for external exhaust.

The exhaust requirements for the Fusion Pro 32 and 48 are the same:

* **The Fusion Pro 32** model requires 400 CFM for the primary exhaust port (upper port) and 400 CFM for the downdraft exhaust port (lower port) totaling 800 CFM.

* **The Fusion Pro 48** model also requires a total of 400 CFM for the two primary exhaust ports (200 CFM per upper port) and 400 CFM for the downdraft port (lower port) totaling 800 CFM.

Epilog provides recommended exhaust flow rates (CFM) only for direct ventilation exhaust systems that are ported to the outside. Please note that this is also a recommendation and not a requirement, because factors such as length and type of tubing from the Epilog laser to the exhaust fan and from the exhaust fan to the outside of the building can produce significant losses on the true amount of air that is drawn from the Epilog laser.

Exhaust flow rates (CFM) for filter systems are not specified in this document. However, exhaust flow rates for filtration units will be lower than a direct ventilation exhaust systems because filters are designed to be placed directly adjacent to the laser system and do not exhibit the air-flow losses that are typically found with direct exhaust fans. Epilog has worked with most major filter manufacturers to recommend a specific filter system for each model of Epilog laser. Please contact your Epilog distributor to match a filter to the Epilog laser system you are using.

Note: Remember to put the blower switch for the laser system in an obvious and accessible place so it can be routinely switched on prior to using the engraver. Please connect the exhaust blower to the laser as shown below and on the following pages.

Remember, you may need a contractor to install the exhaust. This must be done PRIOR to installation of the laser system.
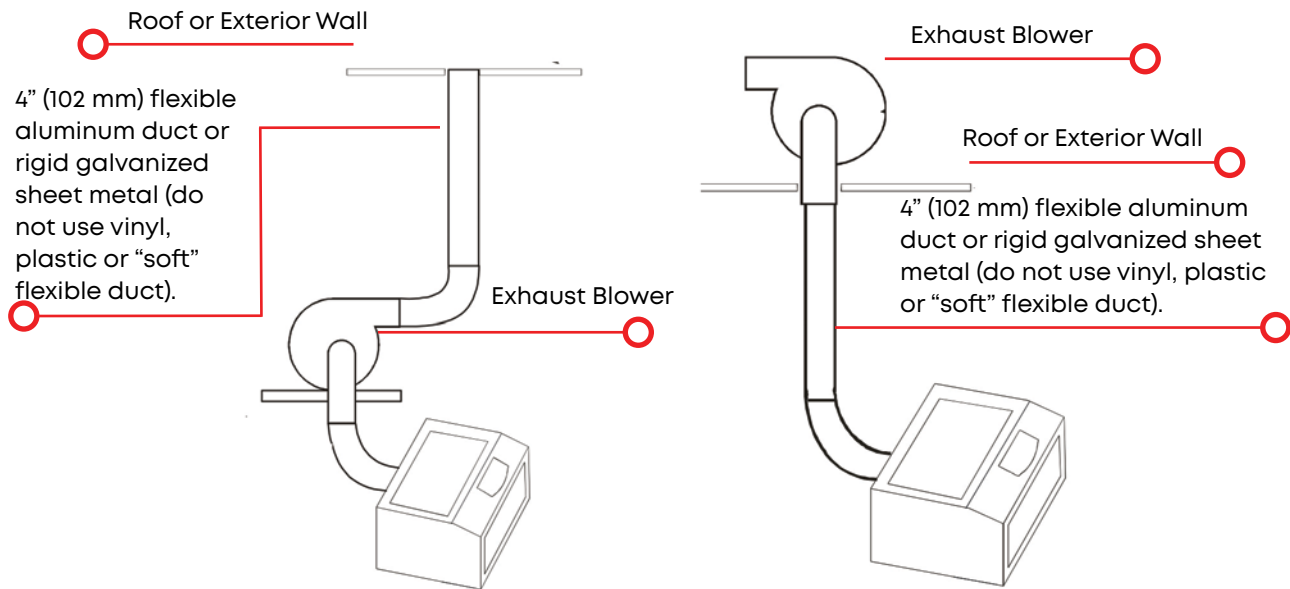
Warning: It's important that either rigid or flexible metal ducting be used for all connections leading to and from the laser system and the exhaust fan. Vinyl, plastic, or any type of "soft" ducting is potentially flammable and should not be used unless provided by the filtration system manufacturer and made from fire-proof materials.
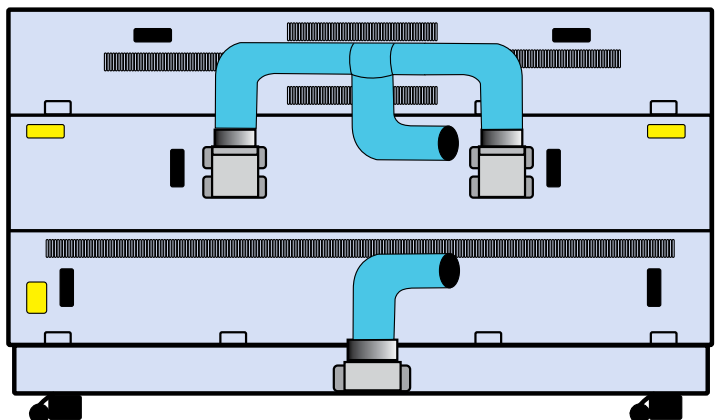
SECTION 2: GETTING STARTED

Epilog Exhaust/Filter Connections

There are two 4" (102 mm) ports attached to the back of the Fusion Pro 32 laser system, and three 4" (102 mm) ports attached to the back of the Fusion Pro 48 laser system. Attach your ducting to the machine as shown in the diagram.

Roof or Exterior Wall

4" (102 mm) flexible aluminum duct or rigid galvanized sheet metal (do not use vinyl, plastic or "soft" flexible duct).

Exhaust Blower

Exhaust Blower

Roof or Exterior Wall

4" (102 mm) flexible aluminum duct or rigid galvanized sheet metal (do not use vinyl, plastic or "soft" flexible duct).

Check your exhaust system for leaks. Most small leaks can be remedied with duct tape. DO NOT OPERATE your laser with inadequate or leaking exhaust.

The drawings above show the typical exhaust setup. The left drawing shows the exhaust near the machine and the right drawing shows the exhaust fan on the roof. Where the exhaust fan is placed is a choice of personal preference. Some users like the exhaust fan outside because of noise considerations.

4. Connecting Electrical Power

Epilog supplies the appropriate power cord for the system you ordered. The power cord is found in the accessory package with your machine. The power cord for the laser plugs into the power receptacle located on the left side of the machine in the rear corner. It is recommended that a dedicated 15 amp circuit be used if available, but it is not required.
The Fusion Pro 48 laser system requires 208/220/240 volt electrical power. This system will not operate on 120 volt power. The Fusion Pro 48 power cord comes with a male plug type NEMA L6-15R (which is a Hubble HBL4570C equivalent).
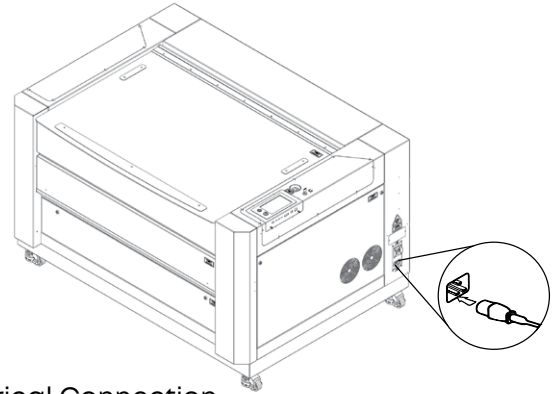
Electrical Connection
220 V-50/60 Hz

We recommend using 208/220/240 volt electrical power on all systems to achieve maximum performance. For more information, **see "Fusion Pro Electrical Specifications" on page 3.**

5. Connect the Laser to Your Computer

You are now ready to connect your computer to the laser. The following connections can be used:

1. **USB only connection:** You can use the USB port for connecting to the Epilog Job Manager. Multiple laser systems cannot be operated from a single computer through the USB connections. If you are using the USB connection, you will need one computer for each laser system.

2. **Ethernet only connection:** With an Ethernet connection you can print from the Laser Dashboard and use the Epilog Job Manager.

USB Connection

A USB cable is included in the accessory kit. The USB port is located on the right hand side of the machine. USB cables have different connectors on each end. The USB connection will behave similarly to an Ethernet cable when communicating with the laser. Both the computer and machine should recognize the USB without any need to reboot.

Connect to the laser
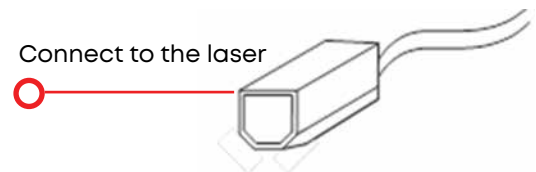
SECTION 2: GETTING STARTED

Ethernet Connection

The Ethernet Port is a standard 10BaseT connection. Your Epilog Laser has all of the versatility of a network capable peripheral. As such, there are many different ways that the laser can be connected to a computer or a network. A direct connection using an Ethernet cable is the only method that will be described in this manual. Connect the Ethernet cable (included in the accessories kit) to the Ethernet port, located on the right hand side of the machine. Plug the cable into the Ethernet port on the laser, then plug the other end into the Ethernet port on your computer.

The Epilog Dashboard is the print driver that allows your computer to talk to your Epilog Laser system when either the USB or Ethernet cables are connected. The driver is included in the accessories kit on a CD-ROM or on our website at www.epiloglaser.com. To see detailed instructions on installing the print driver, **see "SECTION 3: SOFTWARE INSTALLATION" on page 21.**

6. Set the Fusion Pro's IP Address

Ethernet Cable Setup

1. Once your machine is booted up, select the **Settings** ⚙ button in the upper right corner of the touchpad.

2. Select **Network** in the settings list.

3. Under Network you will see "IP Address" and "Netmask", press **"IP Address"** and then press the numbers that appear next to them. A keyboard should show up at the bottom of the screen.

4. Press the **"123"** Button in the bottom left corner of the keyboard to access the numerical keypad.

5. Type in whichever IP Address you prefer to use. Most Epilog users will use the IP Address of **192.168.3.4** which is what we use in this manual.

6. Press the **Close** key to close the keyboard, then press the **Job Menu Button** to return to the main screen and your settings should be saved.
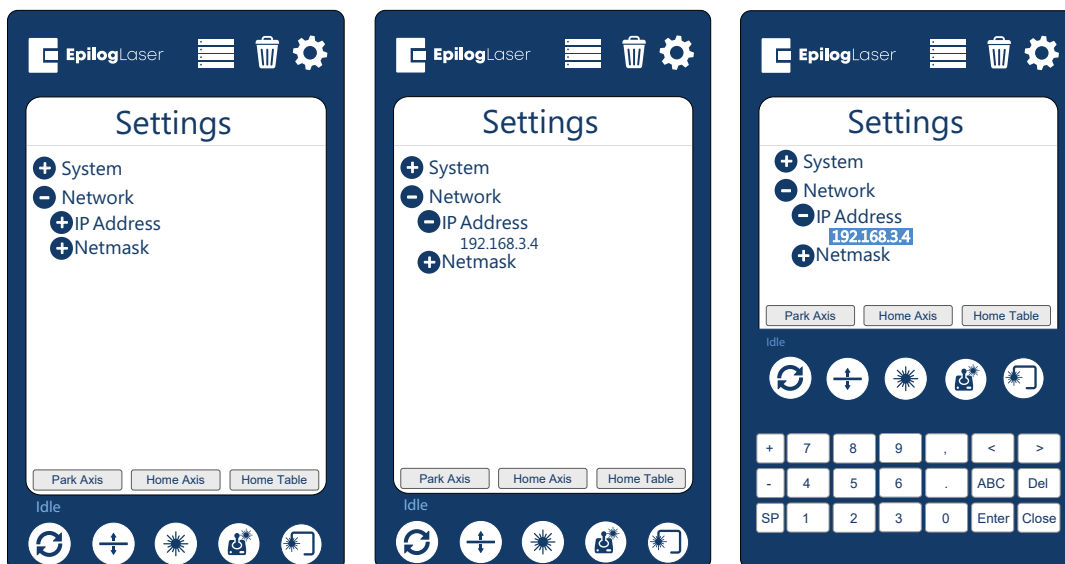
SECTION 2: GETTING STARTED

USB Cable Setup

1. Once your machine is booted up, select the **Settings** ⚙ button in the upper right corner of the touchpad.

2. Select **USB** in the settings list.

3. Under USB you will see "IP Address" and "Netmask", press **"IP Address"** and then press the numbers that appear next to them. A keyboard should show up at the bottom of the screen.

4. Press the **"123"** Button in the bottom left corner of the keyboard to access the numerical keypad.

5. Type in whichever IP Address you prefer to use. In this case we used **169.254.7.2**

6. Press the **Close** key to close the keyboard, then press the **Job Menu Button** to return to the main screen and your settings should be saved.

7. Sign Up for Driver Updates and Register Your System

Go to www.epiloglaser.com/register and register your system. You can also sign up for our monthly e-newsletter, quarterly customer printed newsletter, and sign up for driver update notifications.

SECTION 3: SOFTWARE INSTALLATION

Epilog Job Manager Instructions

The Epilog Job Manager is a powerful new tool that will quickly become one of your favorite features on your laser system. From one piece of software, you can access any job you have sent to the laser, view the settings you used on any past job, re-run projects, access your material database, and much more. It's a great addition to the Epilog Laser product features, and we look forward to seeing how our customers use this software!

- **Windows 7/8/10** is required to use the Epilog Job Manager.

Uninstalling the Previous Job Manager

If you have installed a previous version of the Job Manager on your computer, you must uninstall it first before you continue.

1. Go to Control Panel > Programs and Features and click on Epilog Job Manager
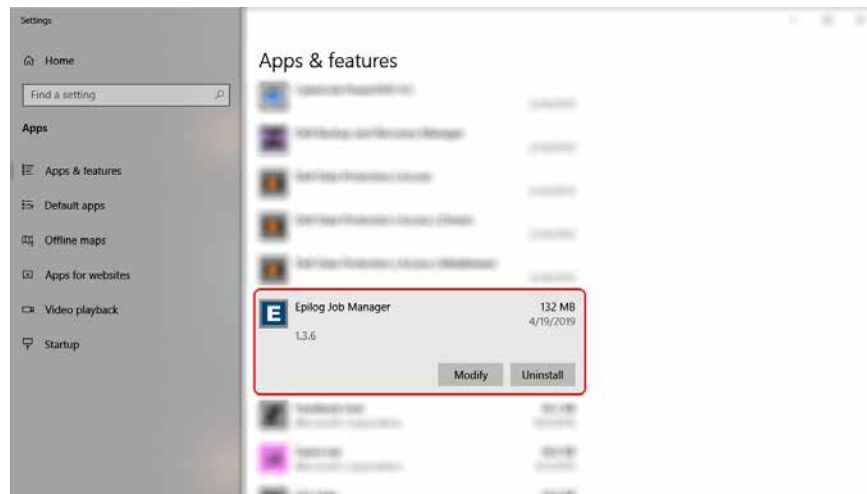
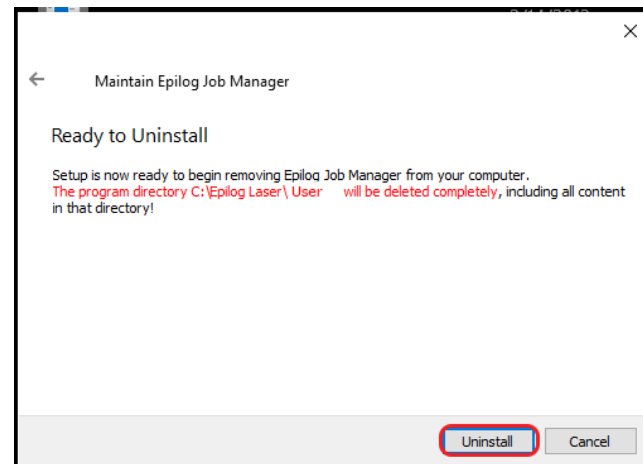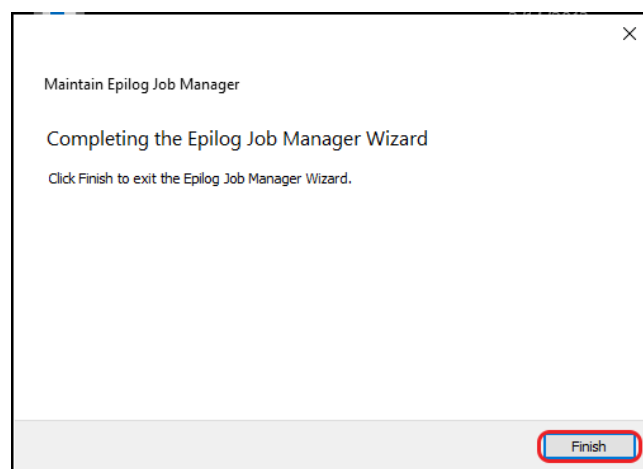2. Click "Uninstall" and confirm if asked again.
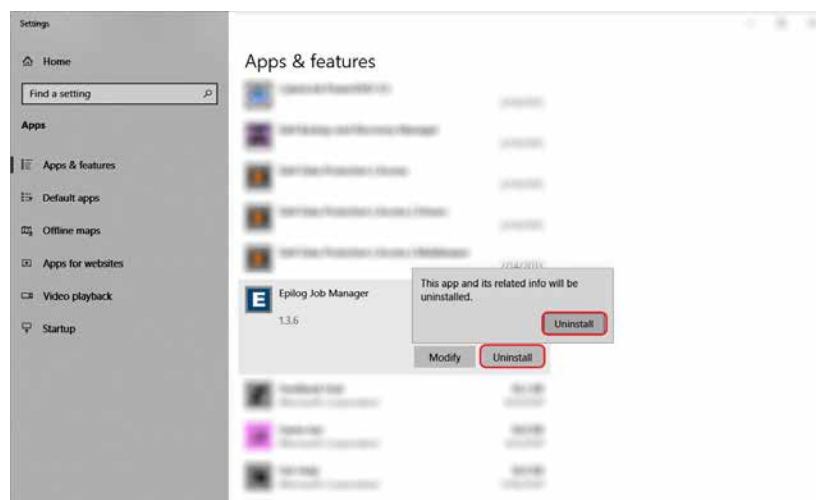
3. Select "Remove all components" and then click "Next".
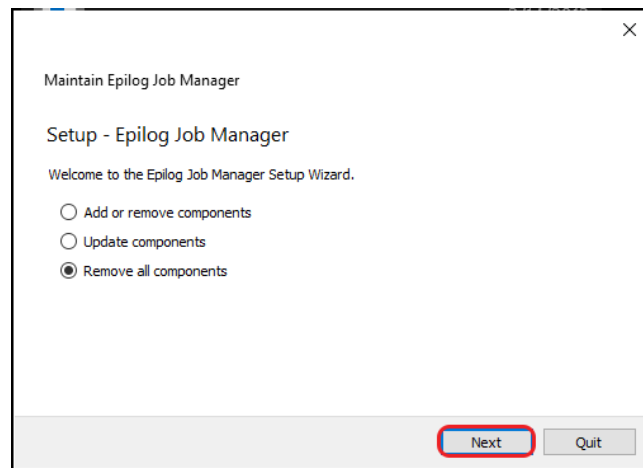
4. Click "Uninstall".

5. Click Finish to complete the uninstallation of the previous Job Manager.
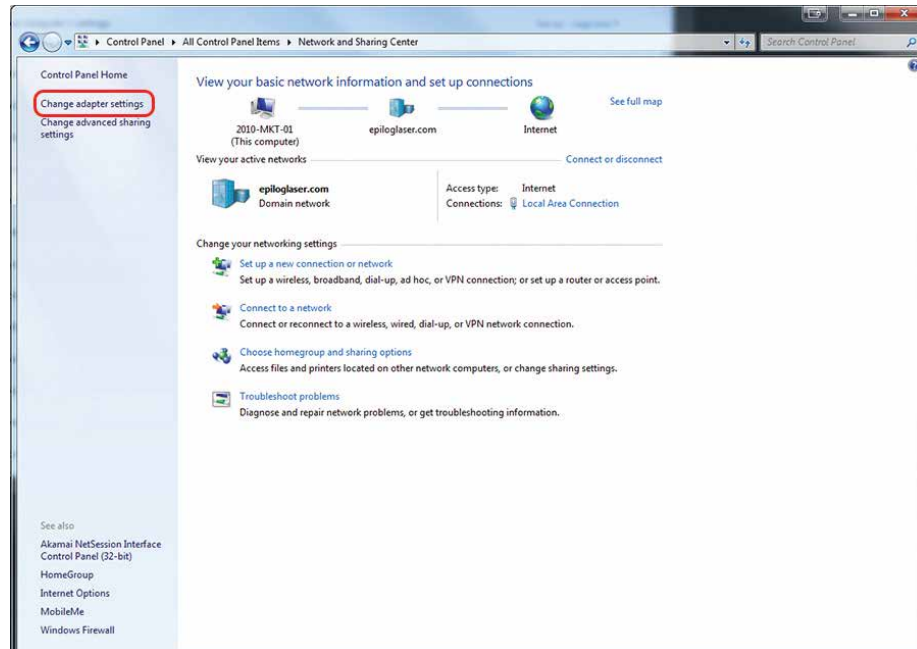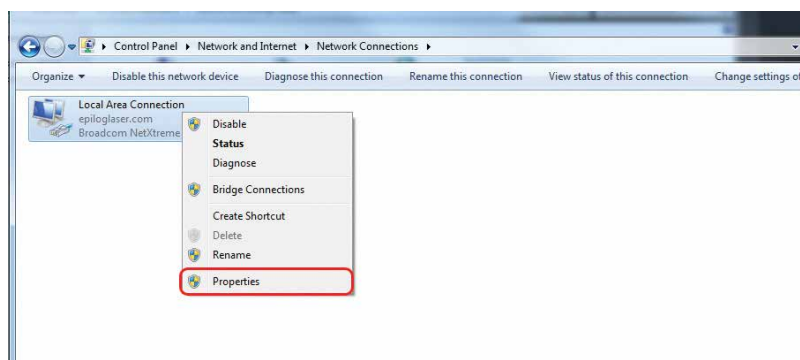
Windows 7: Ethernet Installation

Set Up TCP/IP Address in the Computer

Go to your Network and Sharing Center in your computer's Control Panel.
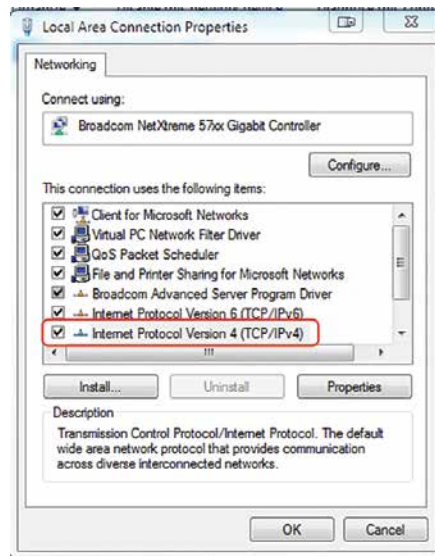
1. Click **Change Adapter Settings.**

2. Right click **Local Area Connection**, then click **Properties.**

3. Select **Internet Protocol Version 4 (TCP/IP).** Make sure you do not select Version 6.
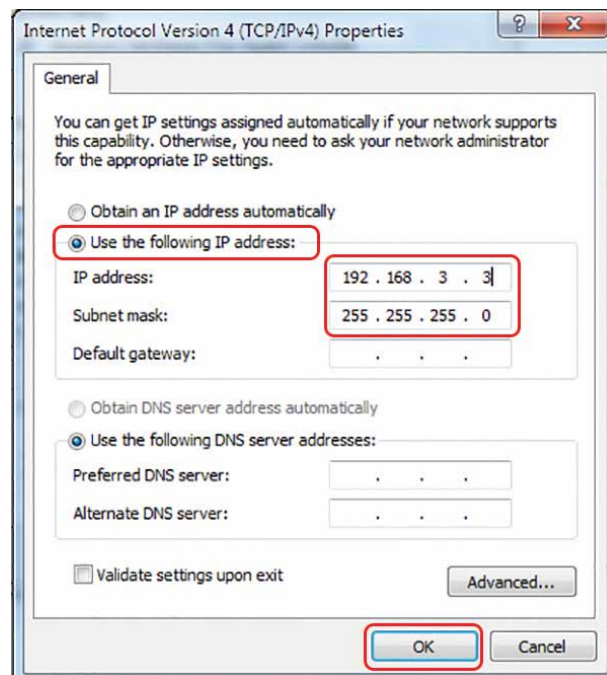

4. Select **Use the following IP Address.** Type in the following IP Address: **192.168.3.3.**

This number is not an error; the last digit of the IP address in **this window must be different than the IP address you set in the laser.**

Type in a Subnet Mask of **255.255.255.0**, then click **OK**.

SECTION 3: SOFTWARE INSTALLATION

How to Install the Epilog Job Manager

1. Go to epiloglaser.com/drivers and select the Epilog Fusion Pro. Then click on the Epilog Software Suite to download the installation file.

2. The installation file will download as a .zip folder that will need to be extracted. Right click the folder and click "Extract All". Once finished, double click on the **EpilogSuite** file.
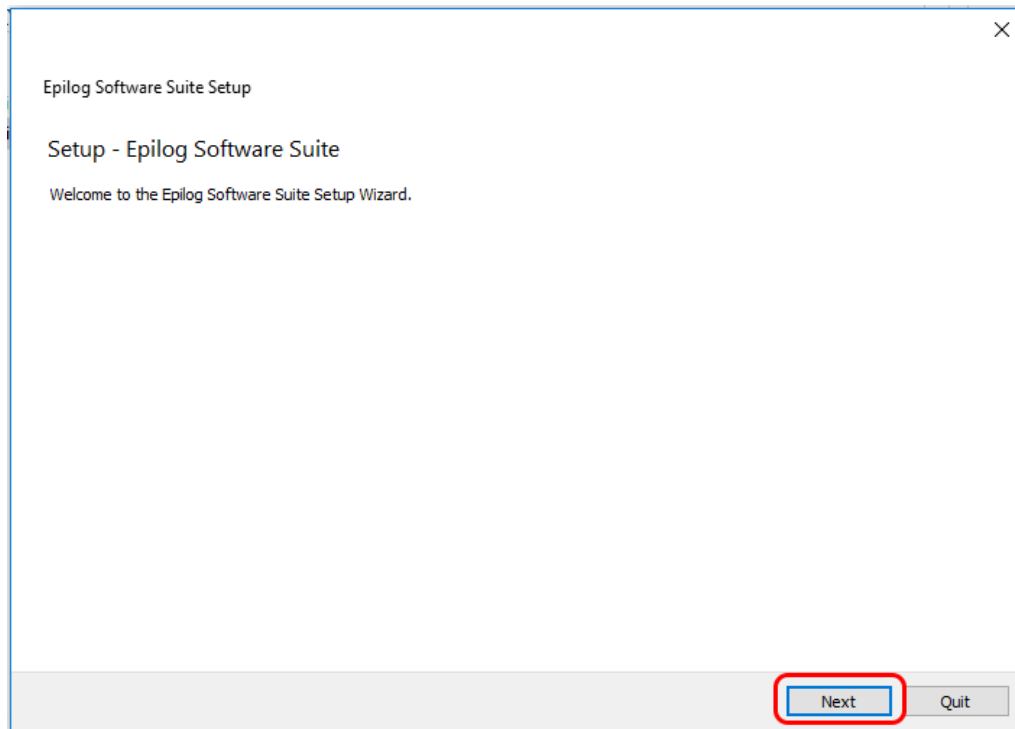
Note: Make sure that the "Ghostscript" folder included in the download is always in the same location as your Epilog Suite installation file, or the installation will not be able to complete.
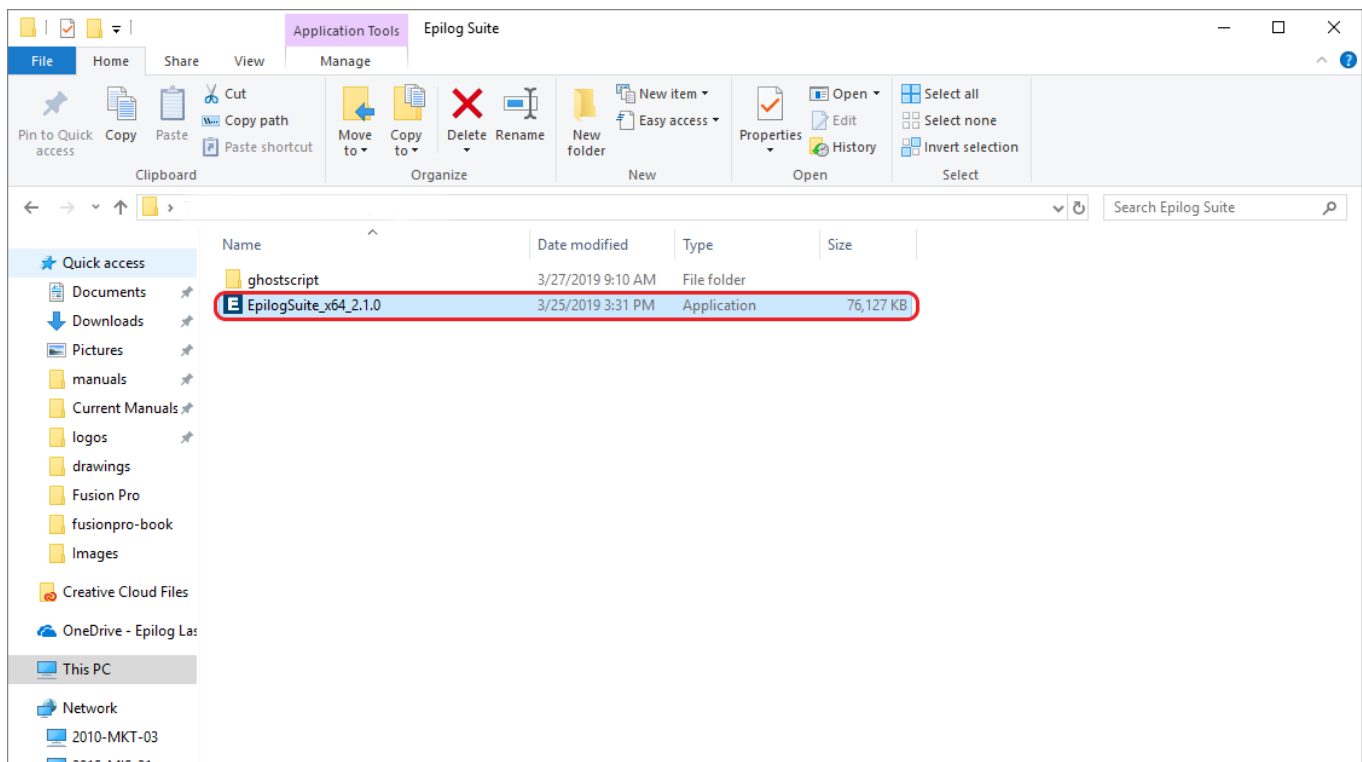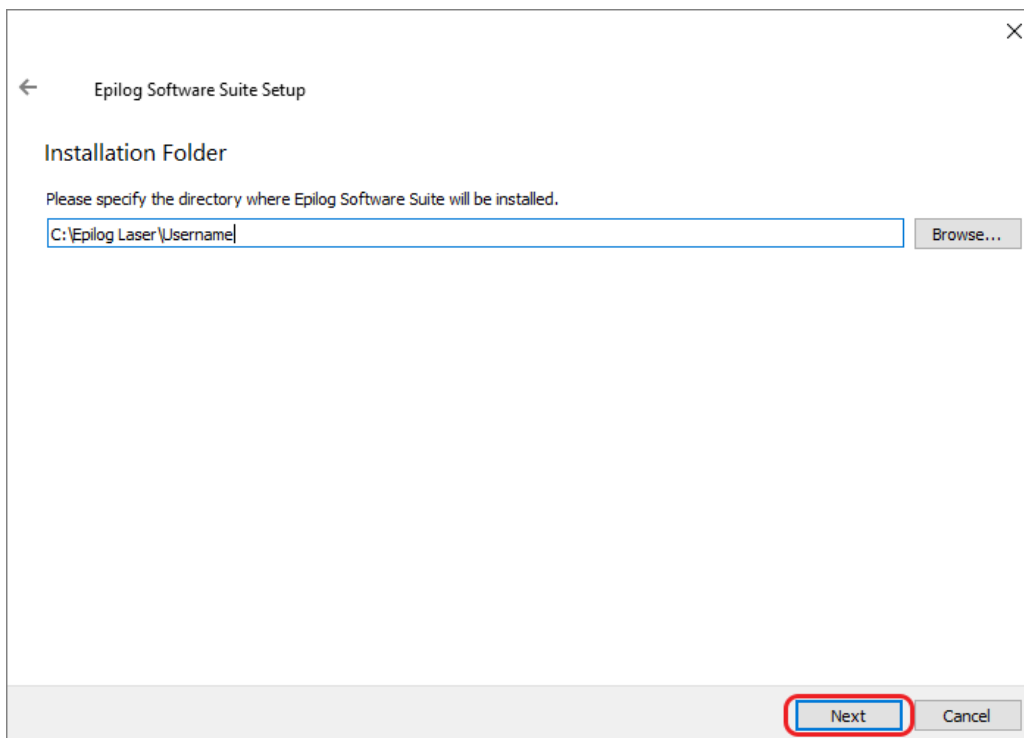
3. A welcome screen appears, click **Next.**
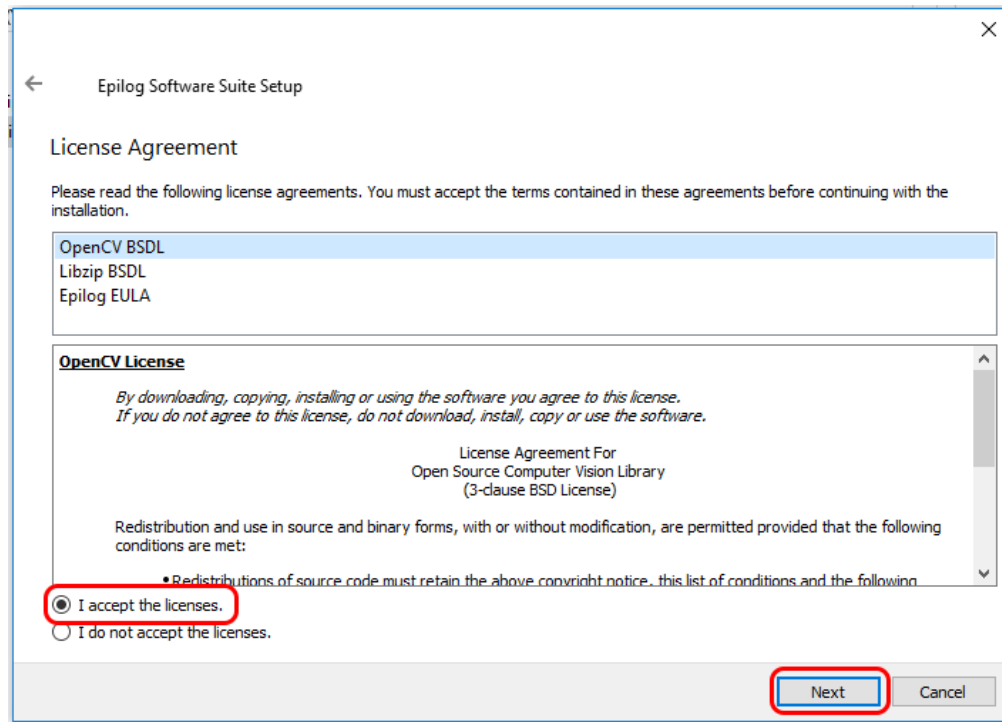

4. Select a directory location for the installation file and click **Next.**
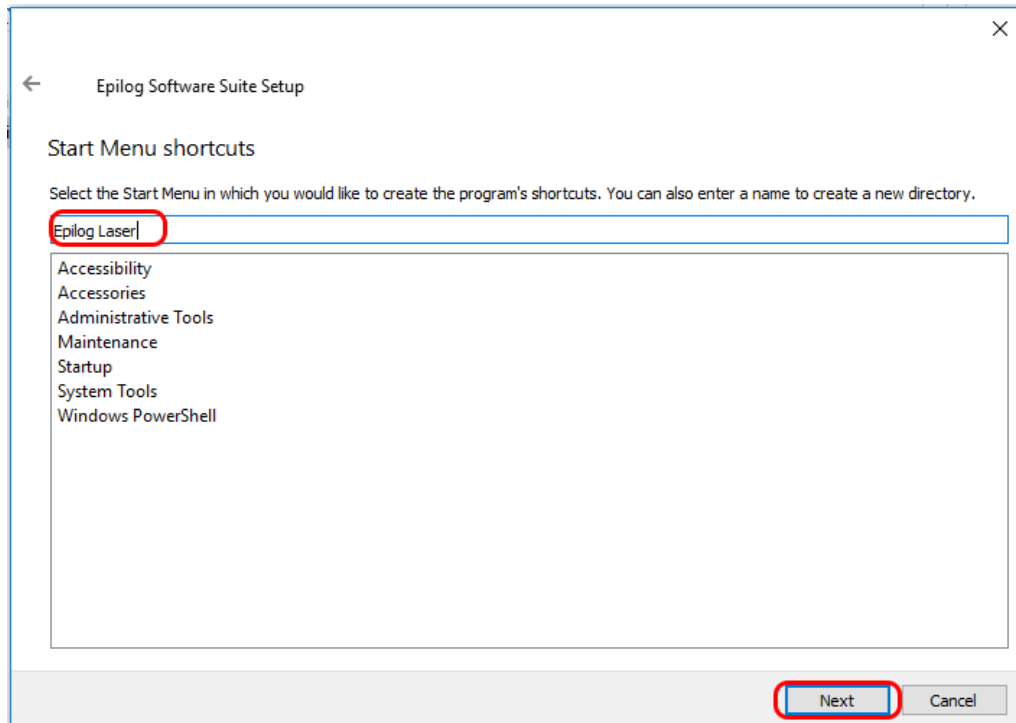
5. Read and accept the license agreements and click **Next.**

6. Click **Next** to use the default start menu, or choose a start menu name of your choice.

7. Click **Install** to begin the installation.
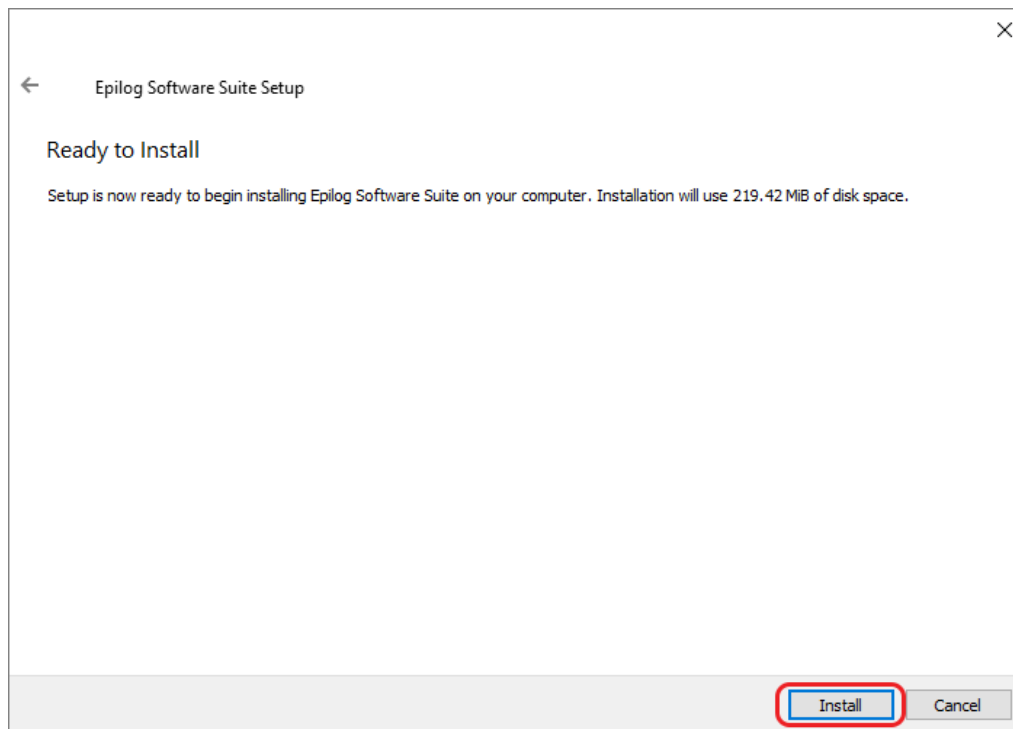
8. The Epilog Software Suite will begin installing, during the installation a dialog box will pop up to also install the AGPL Ghostscript Package, click **Next.**
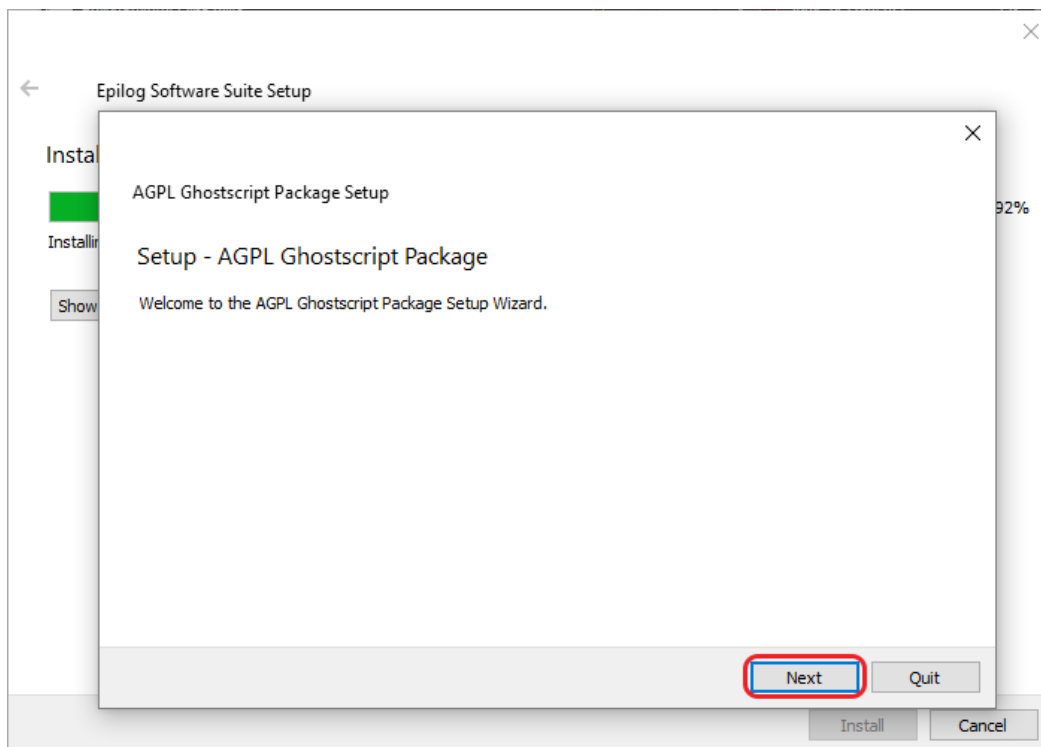
9. Read and accept the AGPL Ghostscript License Agreement, then click **Next.**
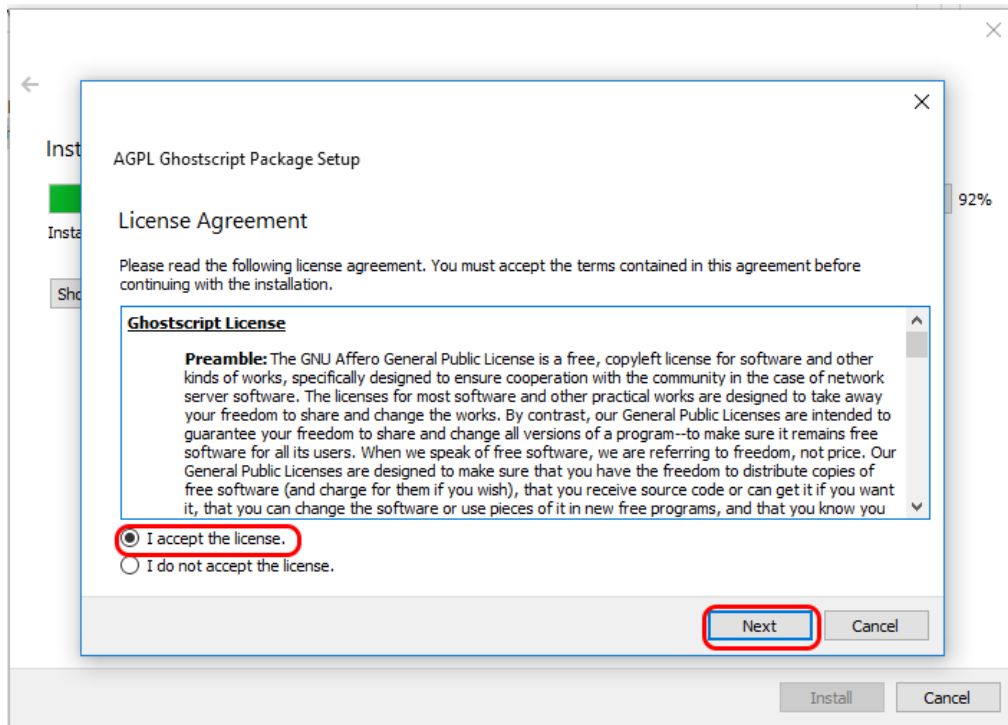
10. Click **Finish** to complete the AGPL Ghostscript installation and resume the Epilog Software Suite installation.
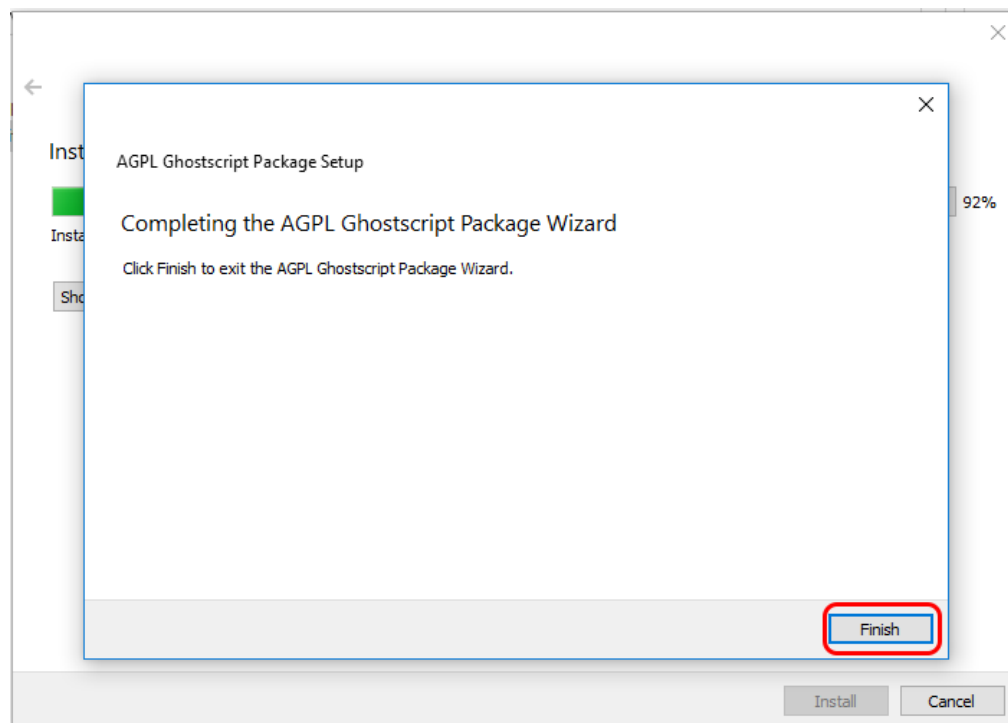
11. Select whether or not you want to run the program now. Click **Finish** to complete the installation.
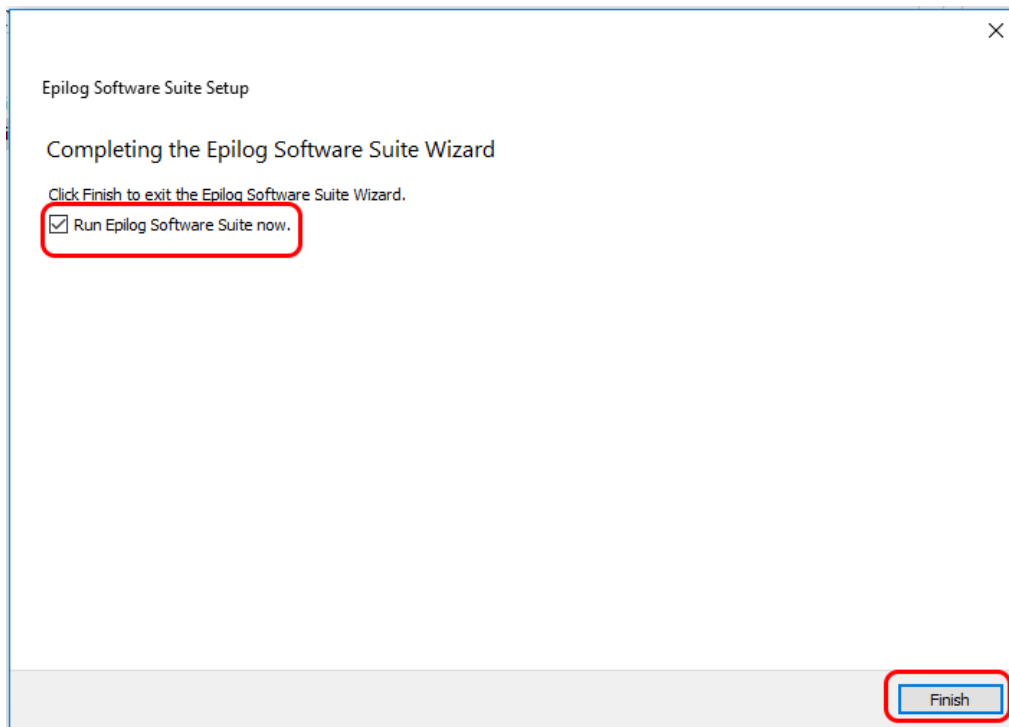
12. An icon for the Job Manager will be automatically added to your Desktop. You are now ready to use the Job Manager.
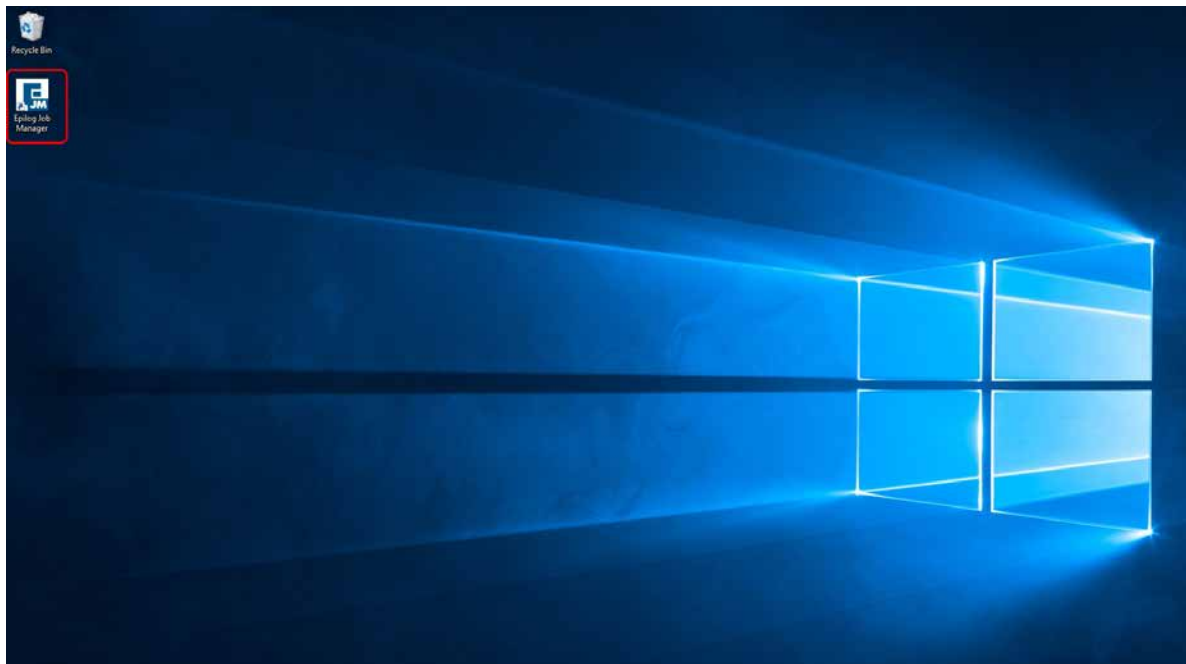
SECTION 3: SOFTWARE INSTALLATION

Troubleshooting the Job Manager

If you were unable to install the Job Manager, it's possible that your Anti-Virus software is blocking installation.

To disable Symantec Anti-Virus software, choose **Options**. Other anti-virus packages should have something similar to Symantec.

Disable all Virus and Spyware Protection Features. After the Job Manager has been installed go back into your Anti-Virus software and re-enable the setting that was disabled.
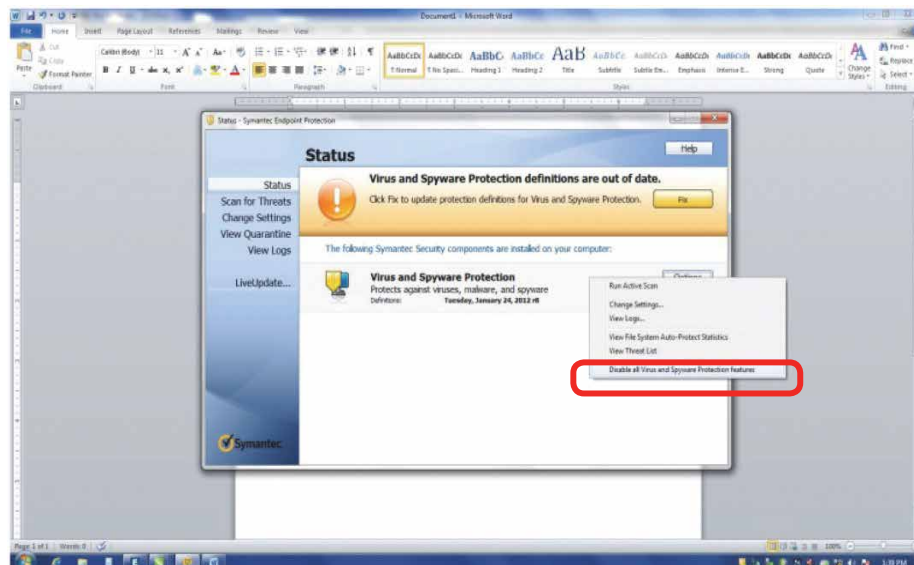
SECTION 3: SOFTWARE INSTALLATION

Important Job Manager Notes

- **Warning:** Before activating your laser, install the newest version of the driver to properly associate the correct machine with the Job Manager.

- We suggest a minimum of **1 GB of free RAM** space when managing very large raster and vector jobs.

SECTION 4: THE JOB MANAGER

Using the Epilog Job Manager

1. The first time you open the Job Manager you'll see a tab for each of the machine models. Begin by selecting the correct model, naming your machine, setting the IP Address, and selecting the correct laser wattage, then click **Save.**
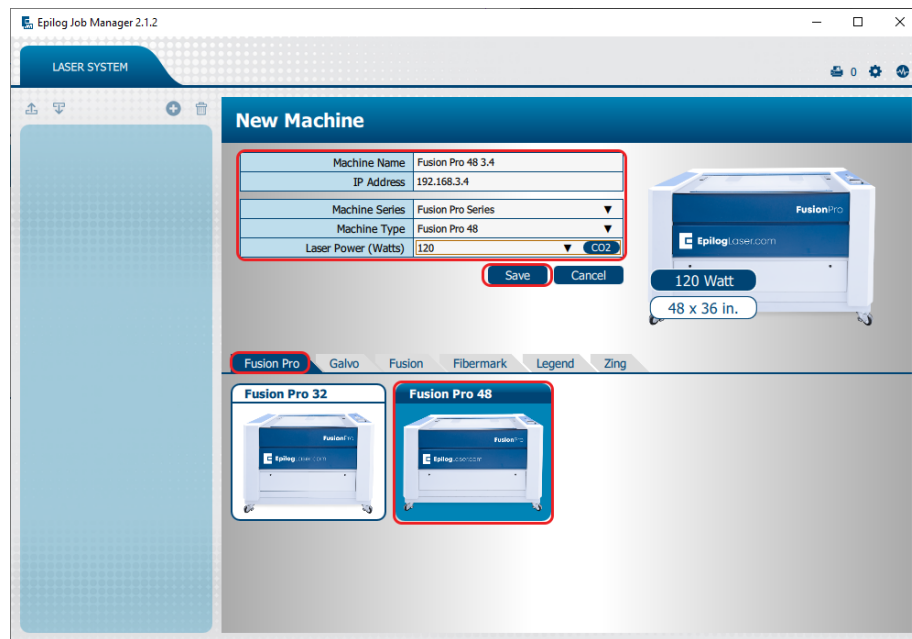
2. Your new laser has been activated in the Job Manager and now appears in the left panel. It is now ready to accept jobs from the print driver. Use the **Add or Delete** buttons to add or remove additional machines. Below you can see we have installed an additional Fusion Pro 32 laser system.
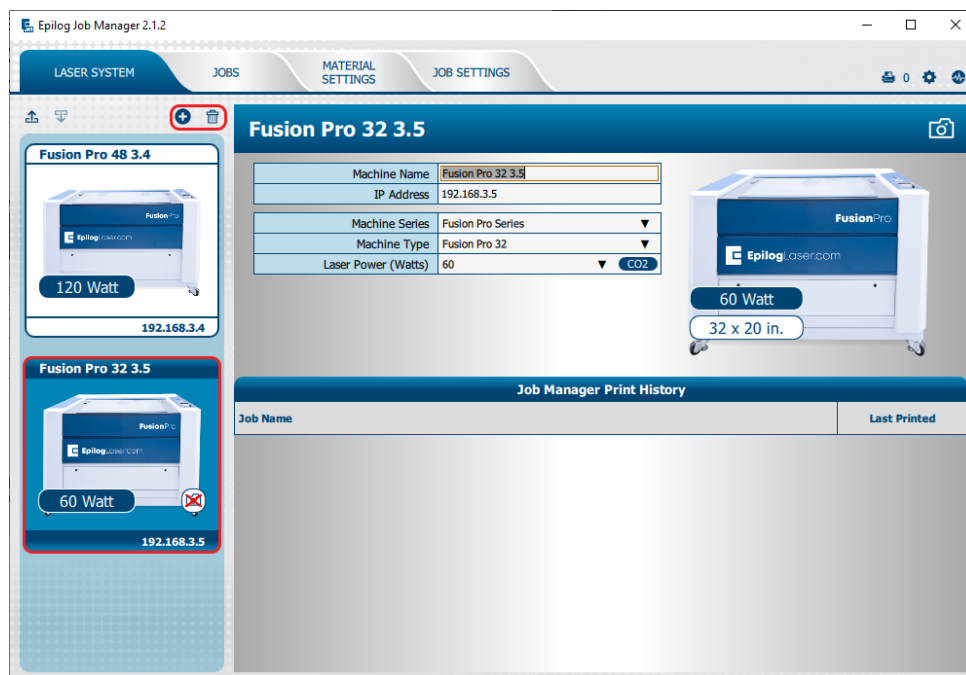
SECTION 4: THE JOB MANAGER

Printing to the Epilog Job Manager

Create a file in your graphic software and select **Print**. When the print dialog opens up, make sure you select **Epilog Engraver** as your printer and set the Page to **Match Orientation and Size**. Once your desired settings are selected, click **Print** again.
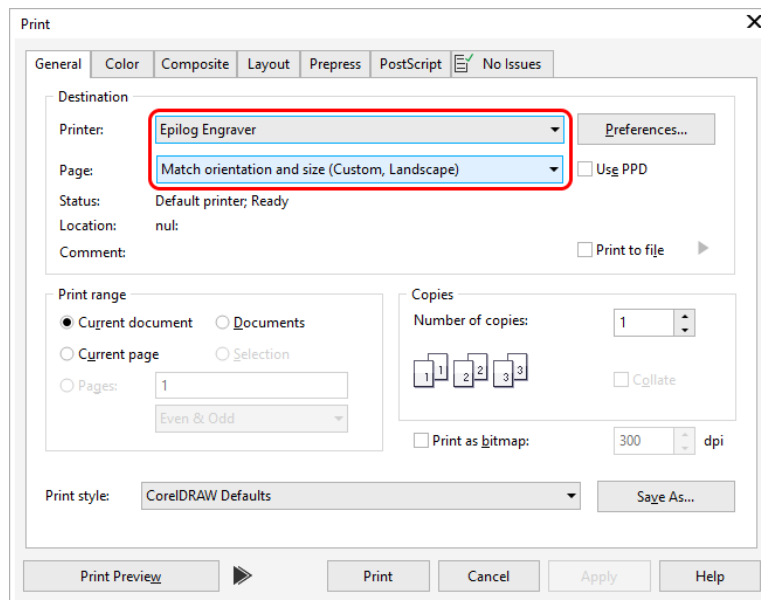
Organizing Your Print Jobs

Click the **Jobs tab**. All print jobs will be displayed in the Uncategorized folder. Click on your job to highlight it. You can now Print, Edit, Preview or Delete this job using the available icons.

SECTION 4: THE JOB MANAGER

Create and Delete Job Folders

Click the Add Job Folders icon to add folders. You can add as many folders as you'd like.

Type in the folder name and click the **check mark** to create your new folder.

Move an Uncategorized File to a Folder

When you highlight a folder you will see **From Uncategorized** on the right side of the folder. Click **From Uncategorized** to move a job from the Uncategorized folder to this subfolder. **Select the job** you want to move and click **OK**.
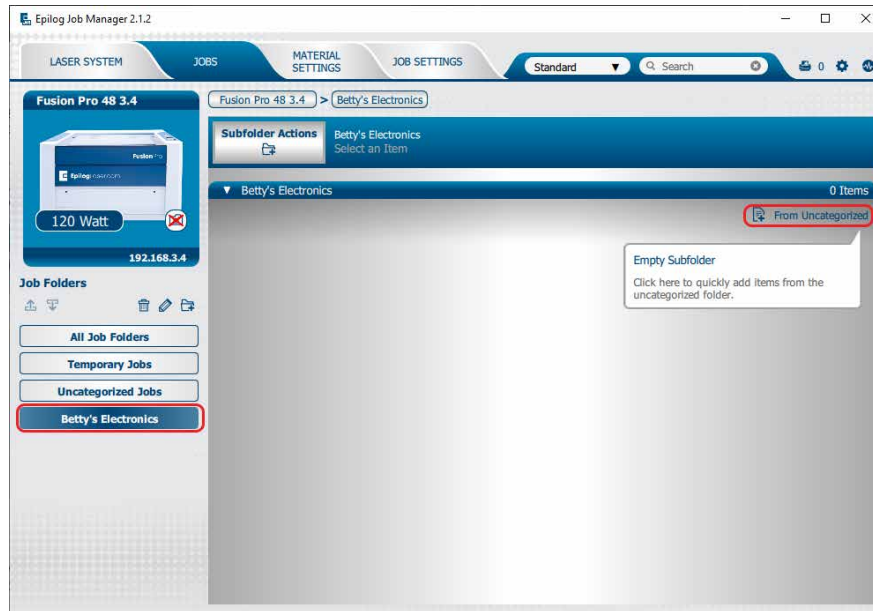
Create Subfolders

First, highlight the folder in the left panel where you want to add a subfolder. Below we have highlighted the Betty's Electronics folder. Click the **Add Subfolder icon**. Type the subfolder name in the **Add Subfolder** field, then click the **check mark** to create the subfolder.
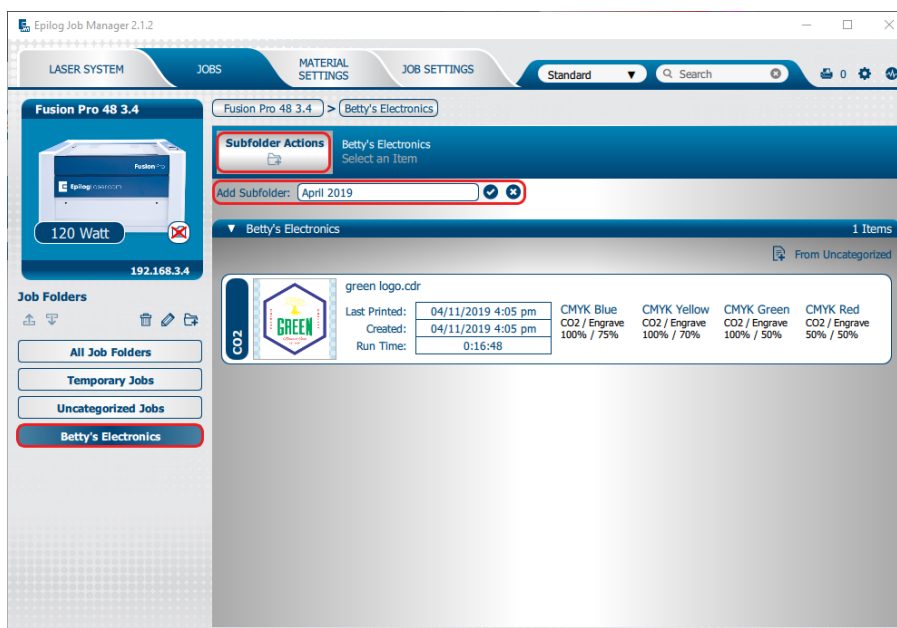
Move a Job Between Folders

You can also move any job to another folder or subfolder by **clicking and dragging** it up or down between folders. An arrow will indicate where you are placing the job. Once you see the arrow selecting the correct folder, let go of the job file to place it in that folder.
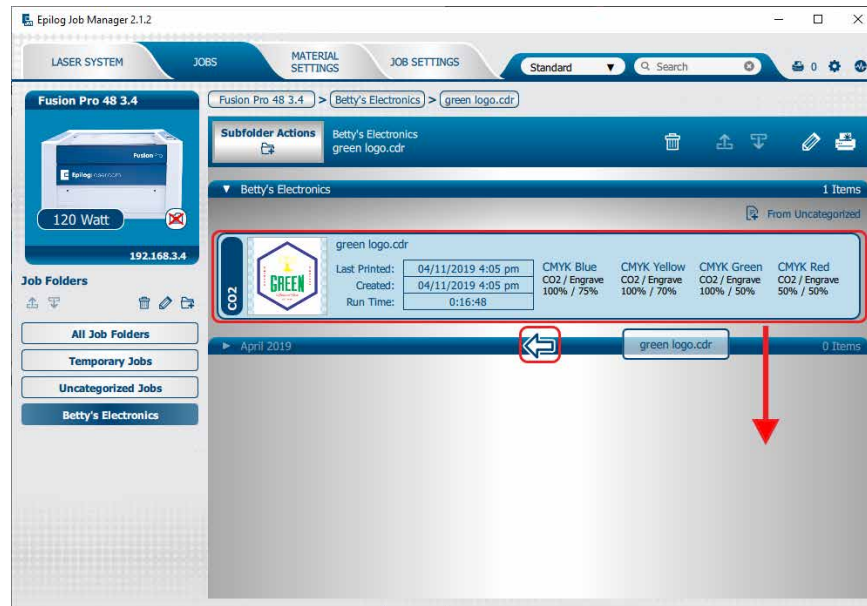
Switch Machine Selection

By clicking on the machine photo in the upper left corner, you can quickly change which machine model you want to have active.
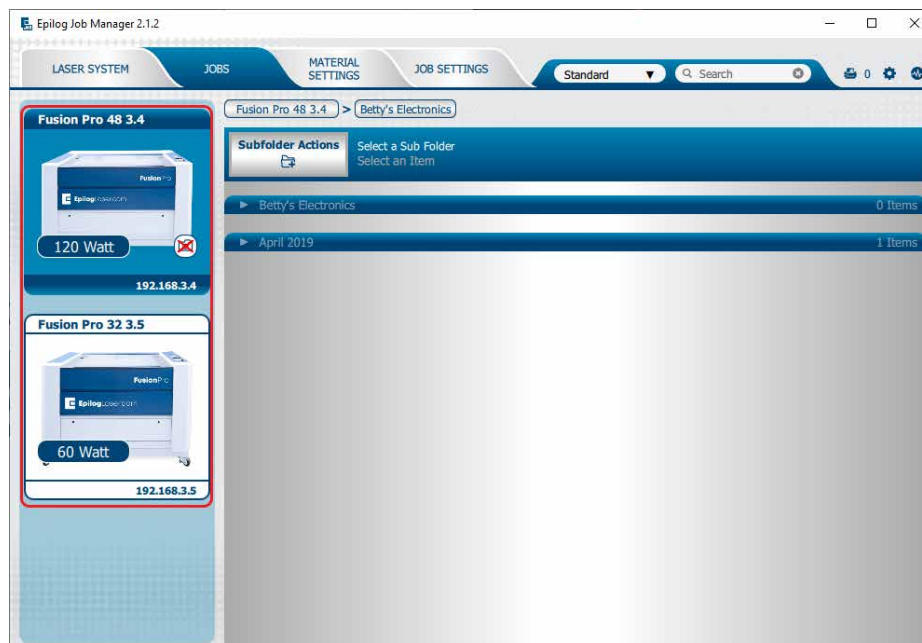
SECTION 4: THE JOB MANAGER

Previewing Your Job

To view a preview of the job, double click on one in the Jobs Tab. A Preview Tab will open and you can preview the combined raster vector job, just the raster components, or just the vector components. We have selected vector to show only the vector components of this job. The preview mode is very useful in identifying unwanted vector components in a job. **For more information, see "Presetting Your Cut Lines" on page 52.**
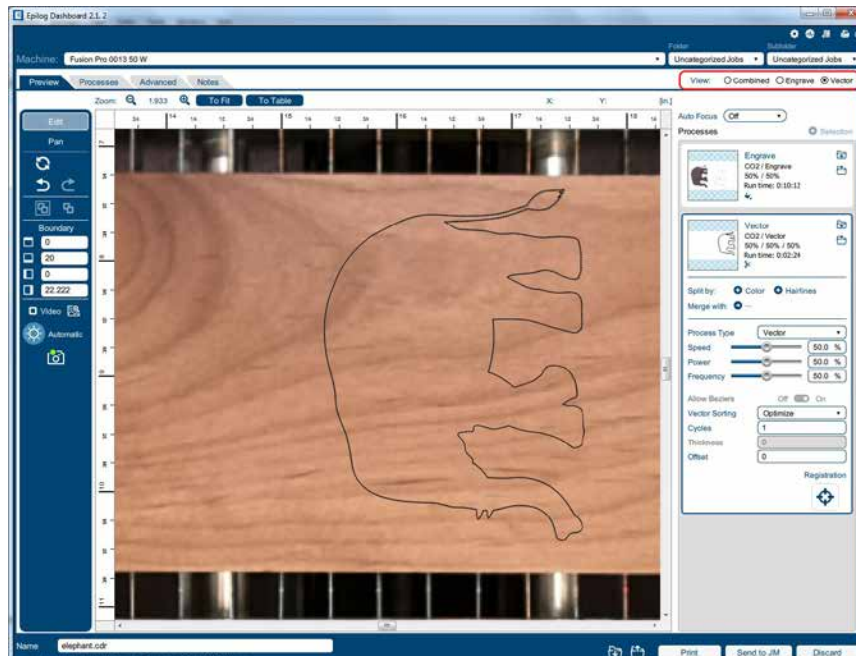
Searching for a Job

The Job Manager has a powerful search function. Type in part of a file name and press enter to find all files related to that name. You can organize files by **Standard**, **Created**, **Last Printed**, or **Alphabetically** to find a specific file.
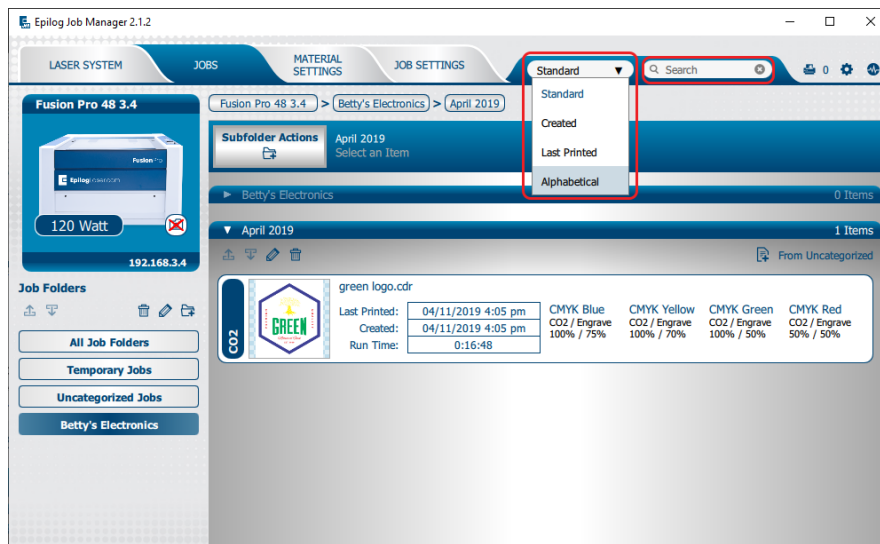
Notice that the jobs are displayed differently if you change the search category to **Alphabetical**. Your jobs are now displayed in alphabetical order. Once the search is finished, most users revert back to the default selection of **Standard**.

Finding Job History

You can find the **Job Manager Print History** under the **Laser System tab** to see a full print history of a machine, including settings you used in each print. Clicking on each job will expand it and reveal its settings. Clicking on each machine's icon will only reveal the print history on the selected machine.
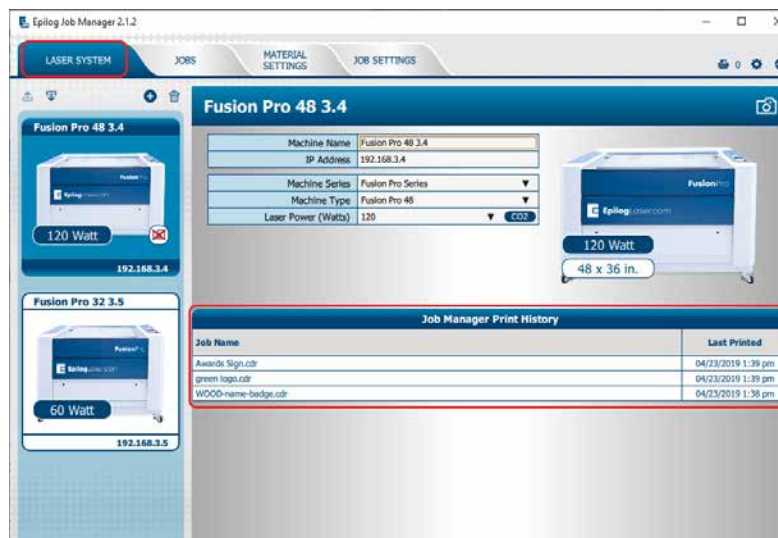
Under the **Jobs** tab you can modify, print or save jobs from this window using the listed settings or with new settings. The new settings will be saved as the next print job complete with time stamp and date. You'll see which machine it was printed to, when it was first printed (Initial Print), all subsequent prints, and all laser parameters used. To access this, double-click on the job, then select **History**. To view the laser parameters of this job, click on the print version. In this example we have clicked on the Initial Print.
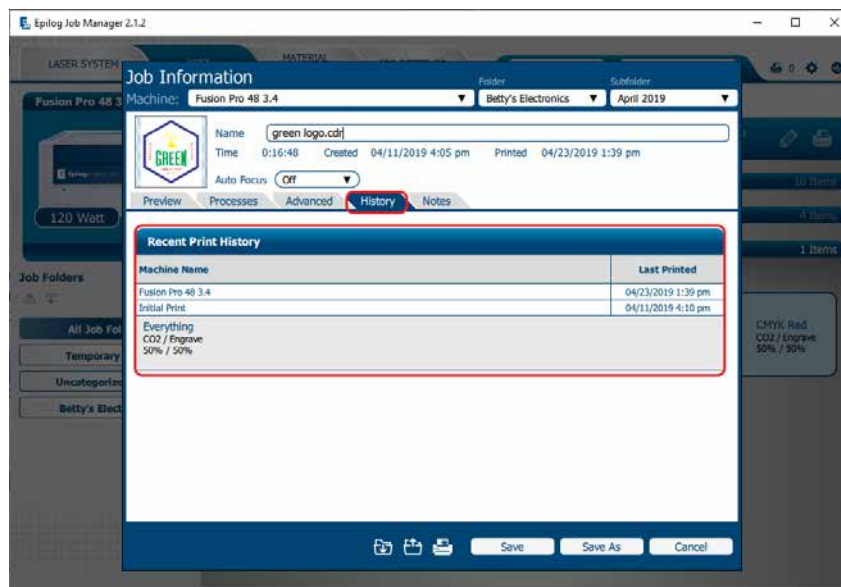
Vector Sorting

You can determine the cutting order of vector lines directly from the Epilog Job Manager.
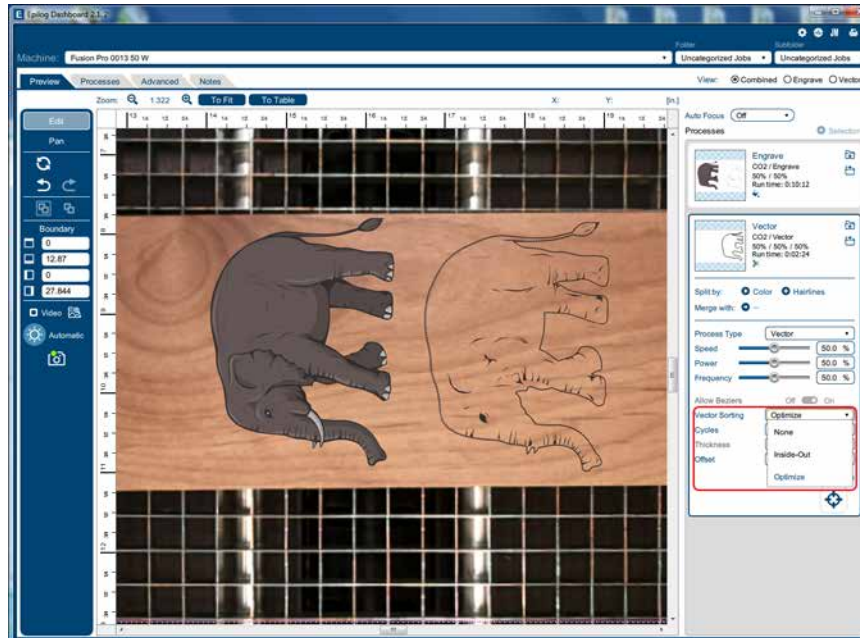
You can choose from three different vector sorting options:

1. **None:** Vector line cutting order is determined by the order they were created.

2. **Inside/Out:** All internal vector paths in the file will be process prior to the external vector paths. For example, if cutting the letter O, the inner oval will be cut before the outer oval.

3. **Optimized:** The laser will process the vector lines looking for the next closest node for quicker vectoring.

SECTION 4: THE JOB MANAGER

Material Settings Tab

The Material Settings Tab allows you to save and import settings for individual processes. If you frequently use the same settings for engraving or cutting, this feature allows you to import those settings into a single process quickly.

Saving Material Settings

1. To save a process setting, first you need to create a folder in the Job Manager under the Material Settings Tab by clicking the "Add Subfolder" button.
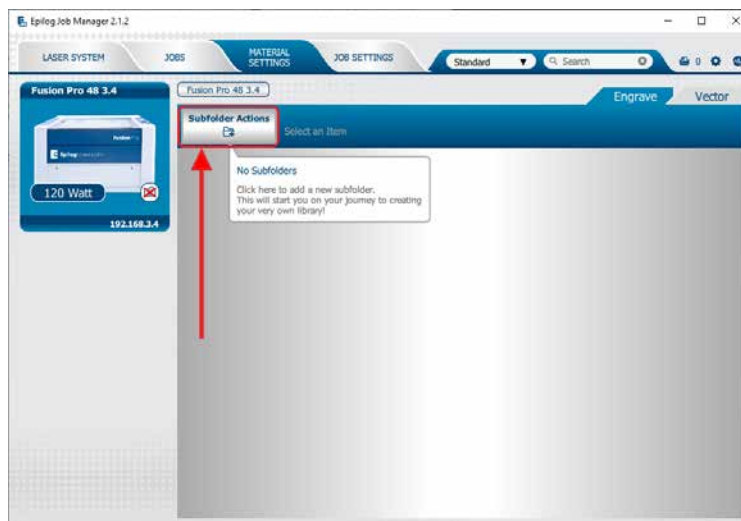
2. Name the folder and click the check mark to save it.
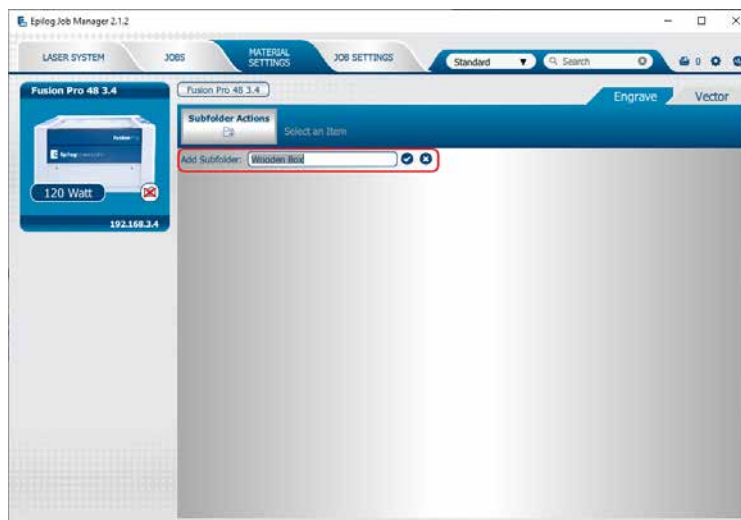
3. Now go to the Epilog Dashboard and set up the file to your preferred settings. Click on the process that has settings you want to save. In this example we have clicked on CMYK Blue. The Process box should open, then click the "Export Settings to Material" button.
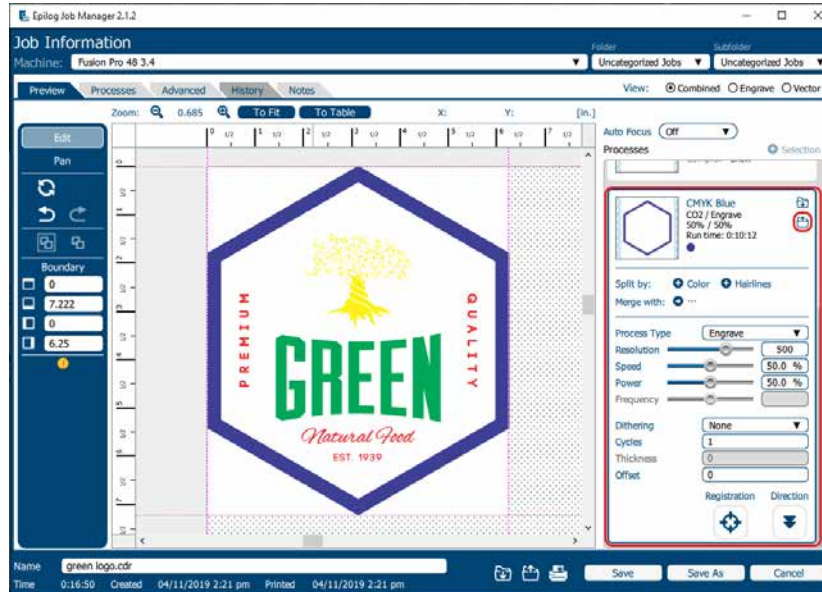
4. A box will appear asking you to name the Material Setting and select a folder to save it in. Fill out this information and then click "Save".
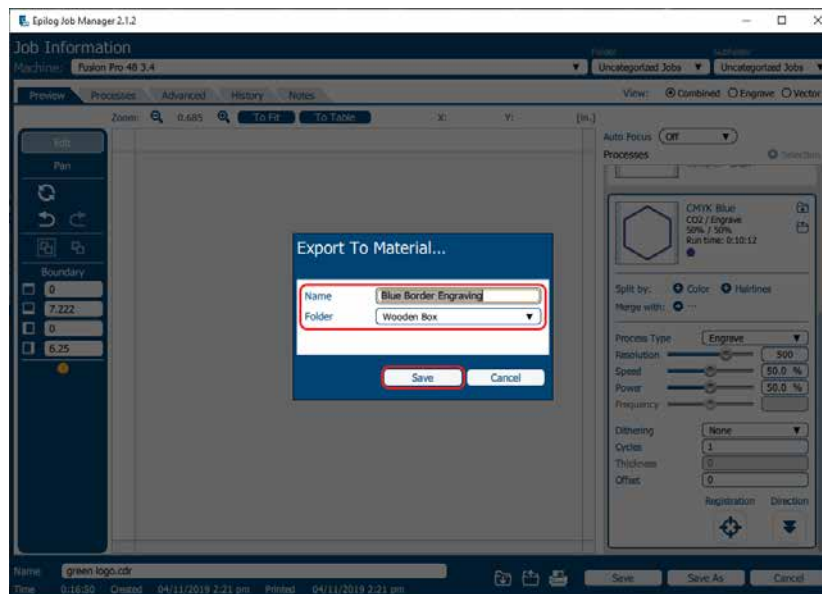
Importing Material Settings

1. To import previously saved settings to a new job, click on the process you want to apply the settings to. Then click the "Import Material Settings" button.
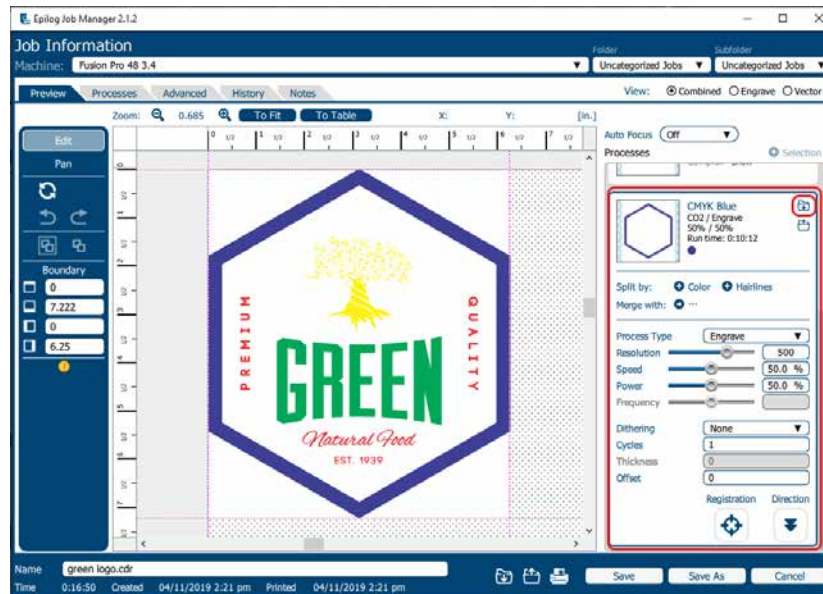
2. A box will appear asking you to select the settings you want to load into this process. Select your settings and click "Import".
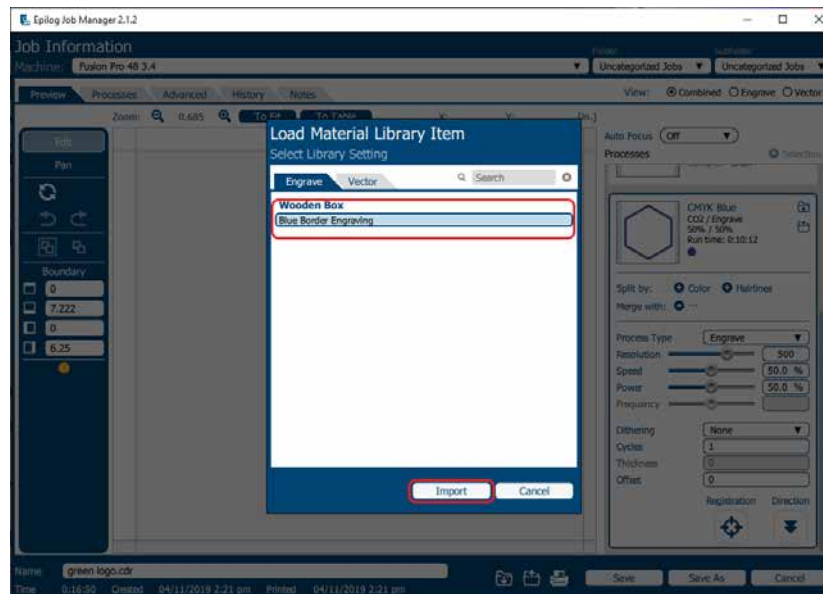
3. The material settings should load on to that process and be ready to print to the laser.

SECTION 4: THE JOB MANAGER

Job Settings Tab

The Job Settings Tab allows you to store all the information that is in a job, except for the artwork, as a file you may import into future jobs. If you have a project you run frequently that requires the same settings every time, this feature allows you to import those settings quickly.

Saving a Job's Settings

1. To save a job's settings, first open the job in the Epilog Dashboard and set up the file as you normally would to print. Once your settings are ready to save, click the Export Job Settings button at the bottom of the screen.
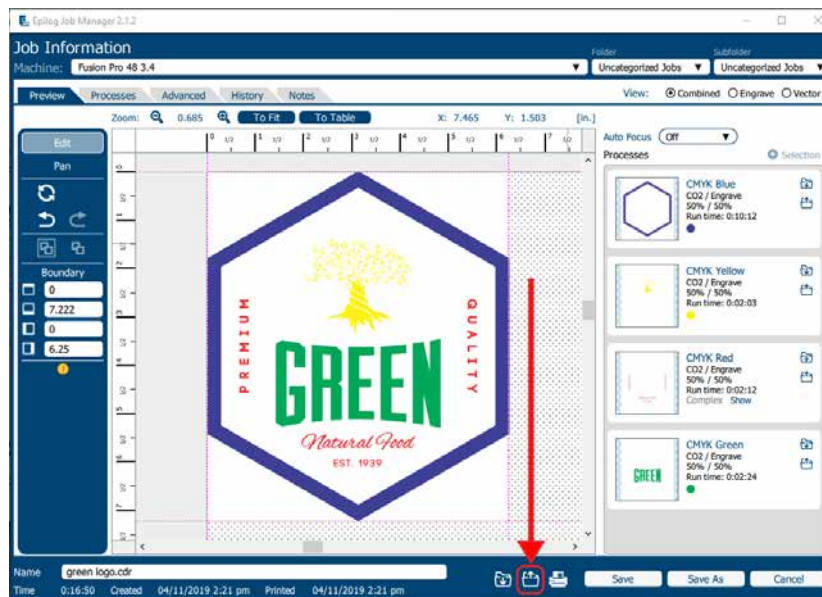
2. A box will appear asking you to name the Job Settings file and select a folder to save it in. Fill out this information and then click "Save".
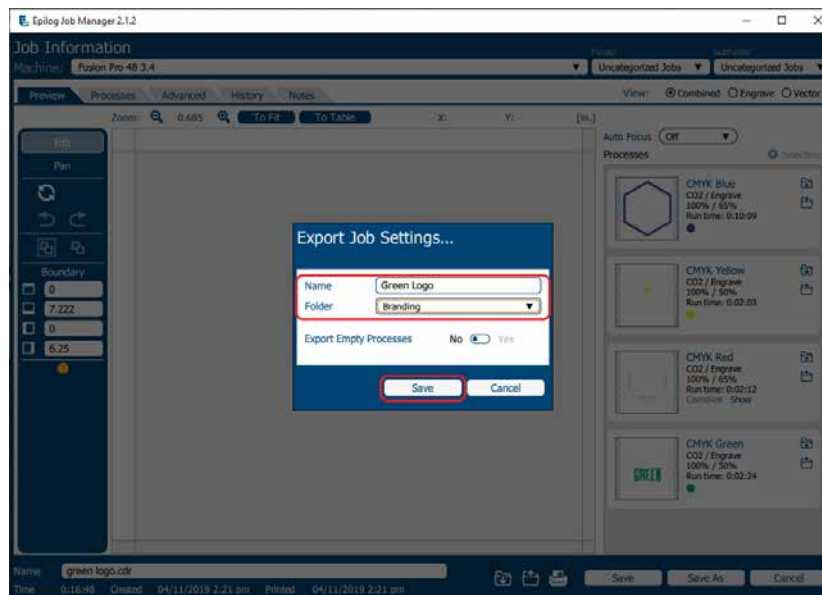
Importing Job Settings

1. To import previously saved settings to a new job, click the Import Job Settings button at the bottom of the screen.
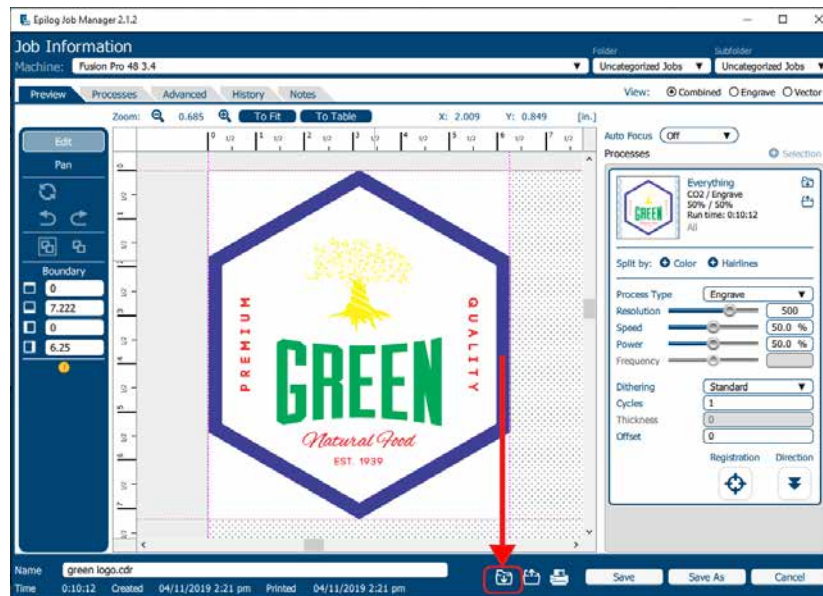
2. A box will appear asking you to select the settings you want to load into this job. Select your settings and click "Import".
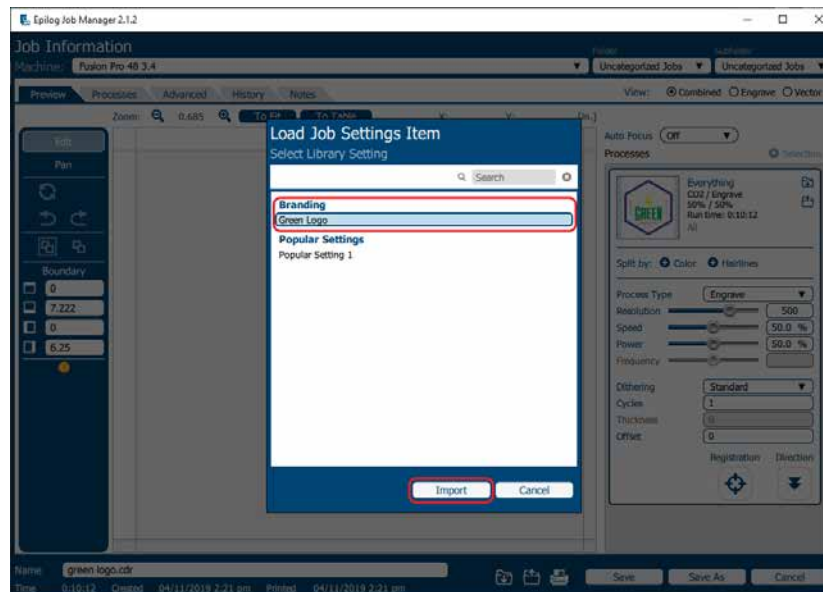
3. The job settings should load into the file, ready for printing to the laser.

 Note: You may also create Job and Material settings from scratch in their respective Job Manager tabs.

SECTION 4: THE JOB MANAGER

Changing Program Settings

You can access the Program Settings by clicking on the gear at the top right of the page. On this screen you can set several different system settings, including:

Display Tab:

- **Language:** Choose from several languages.

- **Default Length Units:** Choose from inches, centimeters, or millimeters.

Dashboard Tab:

- **New Job Settings:** Uses the Epilog Default, Previous Settings, Split by Color, Split by Hairlines, or Split by Color and Hairlines. **For more information see "Dividing Your Job Into Processes" on page 53.**

- **Open Job Manager Automatically:** When "Send to JM" is clicked, and this option is On, the Job Manager will automatically be opened.

- **Discard After Printing:** When "Print" is clicked, and this option is On, the job will be discarded.

Alerts Tab:

Choose when the program asks for confirmation when you delete machines, folders, subfolders, or jobs and materials.

Database Tab:

- **Backup Database:** Save a backup of all files, material settings, etc.

- **Restore Database:** Reload settings from a previous backup.

- **Clear Entire Database:** Delete all settings, machines and jobs from the database.

- **Clear All Jobs:** Delete all jobs in the database.

- **Clear Uncategorized:** Clear out all uncategorized jobs in the database.

- **Clear Dashboard Jobs:** Delete all queued jobs in the database.

We will be adding new features to the software often, so sign up for the Driver Update Notification list at www.epiloglaser.com/tech-support/epilog-drivers.htm.

SECTION 5: THE LASER DASHBOARD
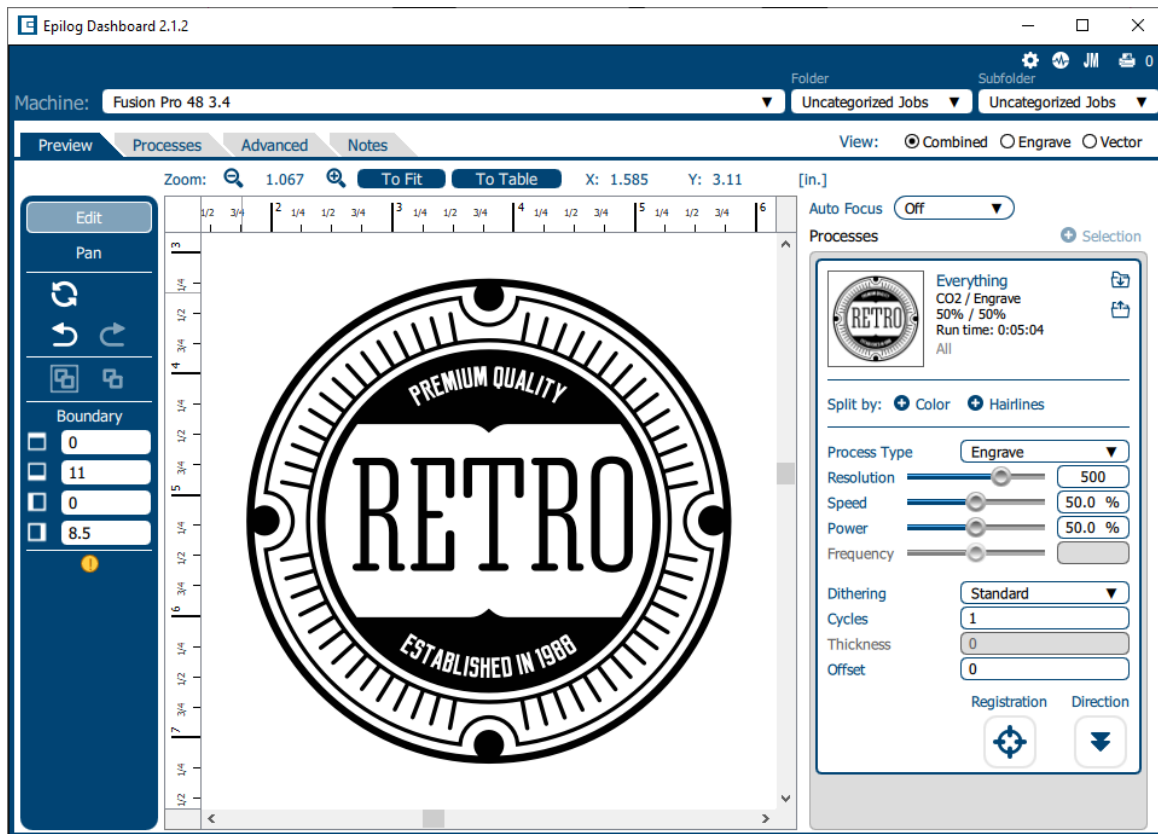
The Epilog Dashboard is your portal between your graphic file and the laser. Install your Dashboard at epiloglaser.com/drivers. There are four main areas we'll cover to get you started:

1. Sending Your First Project

2. Presetting Your Cut Lines

3. Placing Artwork

4. Dividing Your Job into Processes

If you have worked with Epilog's previous print driver, you'll see some new ways that the Dashboard lets you interact with your file. It may seem different at first, but you'll quickly find that you can still use your traditional methods of printing to the laser, or use several new ones that make file setup quicker and easier!

SECTION 5: THE LASER DASHBOARD

Setting Up CorelDRAW for the Laser

If you are using CorelDRAW, first make this quick, one time change to the settings.

1. Go to Tools > Options > Global > Printing > Driver Compatibility.

2. Select **Epilog Engraver** from the drop-down list.

3. Select **"Printer can match document page sizes"**, and click OK. You're ready to go!
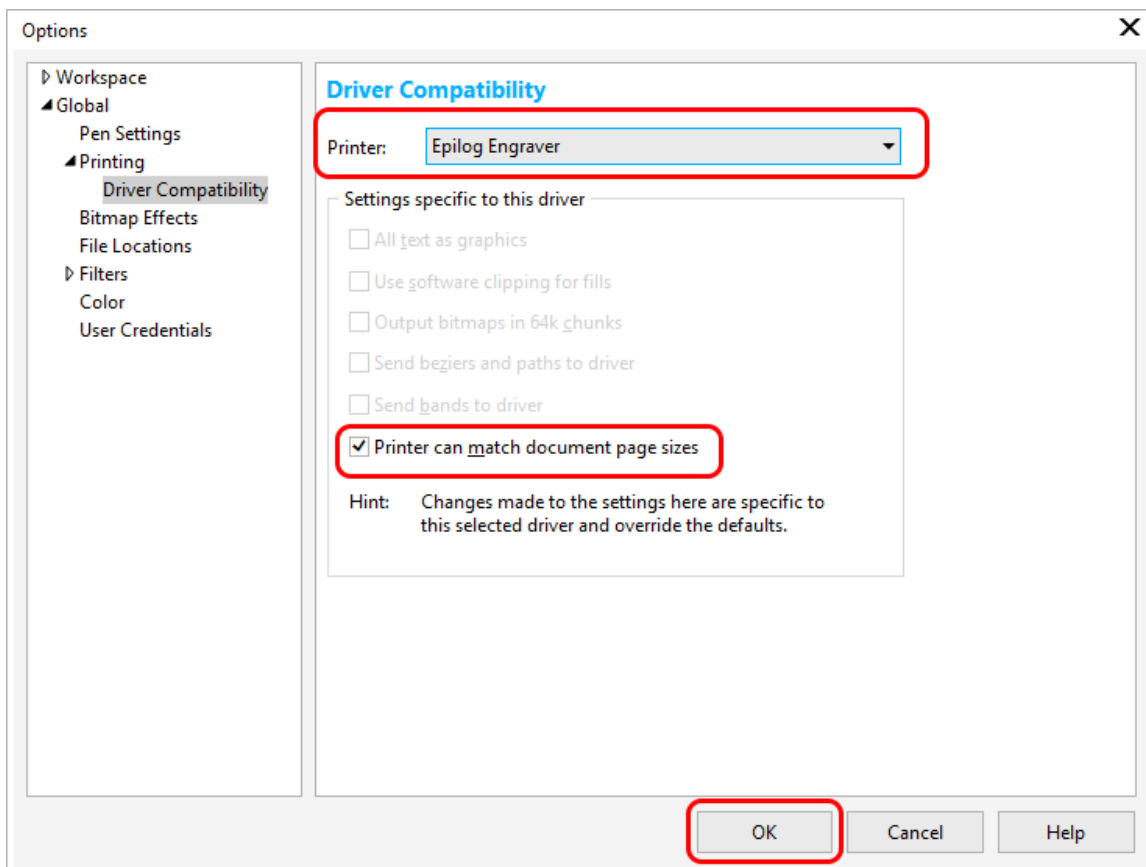
SECTION 5: THE LASER DASHBOARD

Sending Your First Project

1. When you have your file designed, print it to the laser. Choose the **Epilog Engraver** as your printer and set the **Page to Match Orientation and Size**.
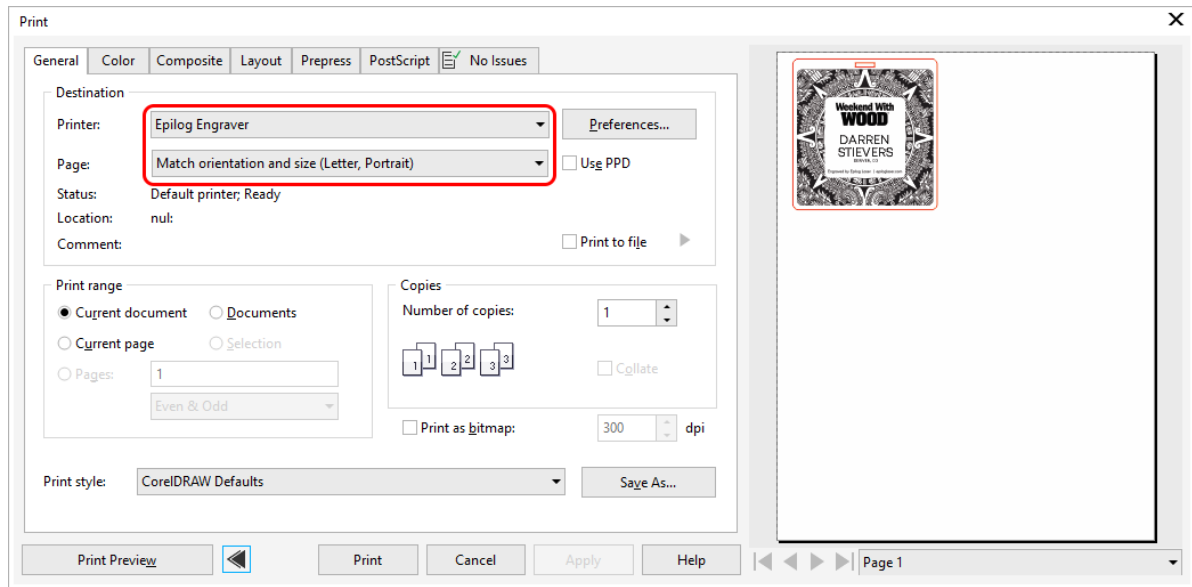
2. Click on the **Color tab** and select Output colors as **RGB**. Then click **Print**.
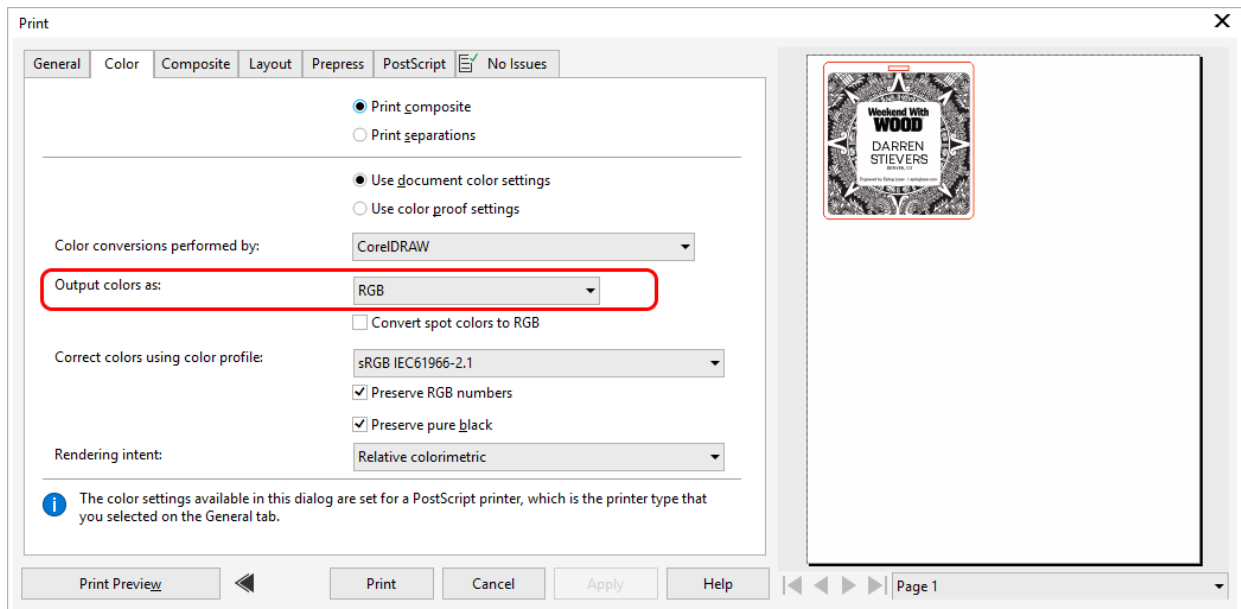
3. Your file will open in the Laser Dashboard. Select **"To Fit"** to zoom in on your object.
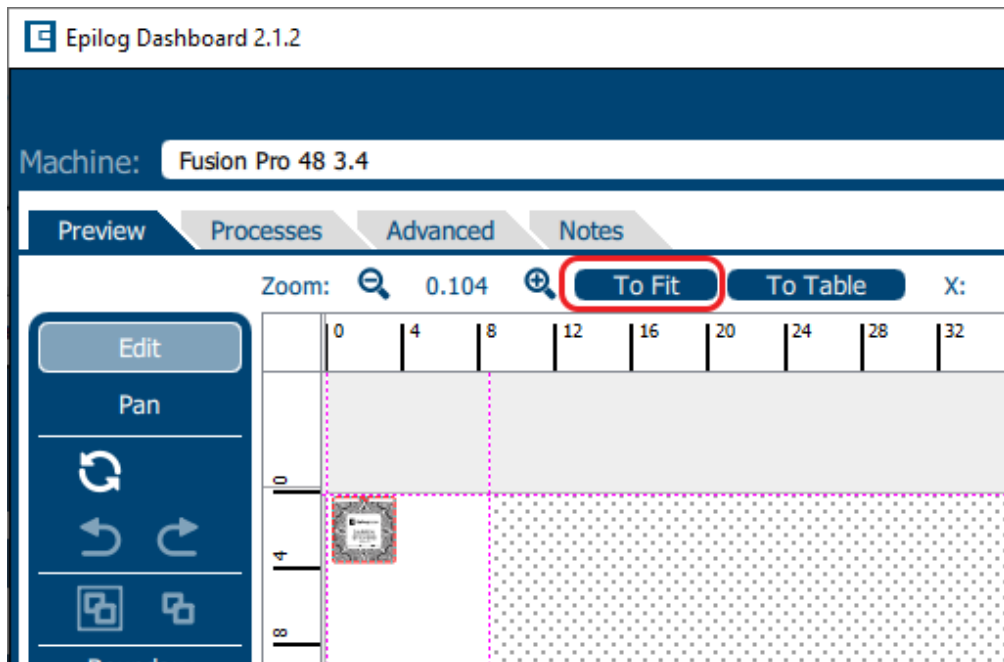
4. On the right side of the screen you can see two processes in the process list: Engrave and Vector.
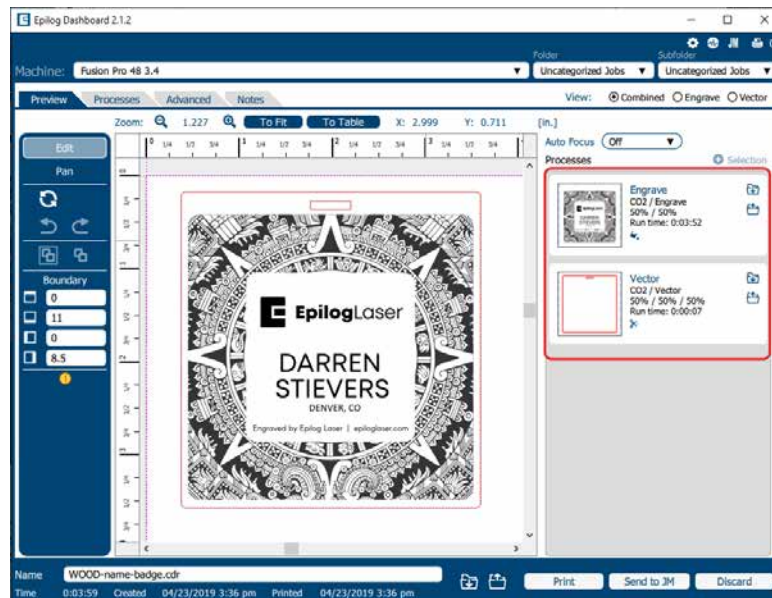
These layers automatically separated because we set the line width of cut lines to .003" (0.077 mm) or thinner). You can set the Dashboard to automatically separate vector lines by line thickness, color, or no action. **For more information, see "Presetting Your Cut Lines" on page 52.**

5. With the Engrave process selected, we can now adjust the settings for this process.

- **Process Name**: Click on the process name ("Selection" in this example) to rename the process.

- **Run Time:** Each process will show an estimated run time, which depends on the size of the artwork, the Speed settings and the Resolution settings.

- **Split By**: Select either "Color" to move every color in the graphic to separate processes (useful for color mapping), or "Hairlines" to manually move .003" (0.077 mm) or thinner vector lines to a separate process.

- **Merge With**: Merge the current process with another process layer. For more details, **see "Merging Processes" on page 57.**

- **Process Type**: Choose if you want the process to be "Off" (ignored by the laser), "Engrave", or "Vector".

  Setting the process to **Engrave** will engrave all graphics and lines, regardless of line width.

  Setting the process to **Vector** will ignore any raster graphics and only cut all vector lines in the process, regardless of line width.
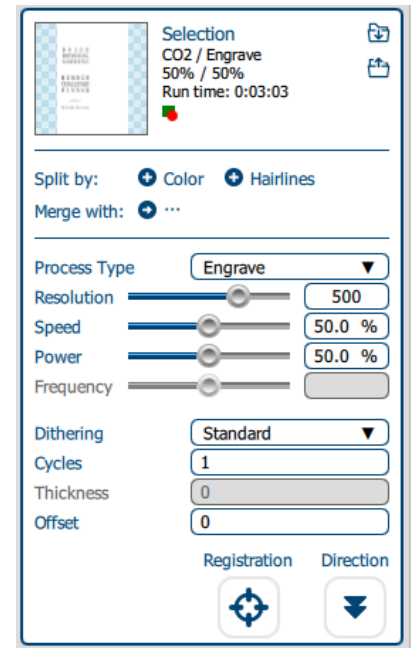
- **Resolution** can be set anywhere between 75-1200 DPI. For more information about resolution, **see "Resolution" on page 81.**

- Set your **Speed** and **Power**. **Frequency** will only be active when the process type is set to Vector. For more information, **see "Frequency" on page 65.**

- **Dithering / Vector Sort**: The dithering drop-down will appear for Engrave processes, and Vector Sort for Vector processes.

  For more information on Dithering settings, **see "Image Dithering" on page 87.**
  For more information on Vector Sorting, **see "Vector Sorting" on page 40.**

- **Cycles**: How many times to repeat this process.

- **Laser**: This will only appear if you are working with a Dual Source machine. Choose between the CO_2 and Fiber laser for each process.

- **Thickness**: This feature will be available soon.

- **Offset**: Only activated if Auto Focus is turned on. Set the offset you would like. **For more information, see "Offset" on page 65.**

- **Registration**: Feature coming soon.

- **Direction:** Choose whether you want the engraving to start at the bottom of your piece or the top. For more information, **see "Engrave Direction" on page 64.**

6. Repeat this set up with the Vector process layer.

7. Print the file to the laser.

Presetting Your Cut Lines

Although you can select any vector line in the Dashboard and set it as a cut line, there are several ways in the Dashboard to preset your cut lines to save you time.

Click the settings icon in the Dashboard and go to the Dashboard tab. Choose between New Job Settings:

1. **Epilog Default**: No automatic separation of processes when a new job is sent to the Dashboard.

2. **Previous Settings**: Use the settings from the last job sent to the laser.

3. **Split by Color**: Automatically split all processes by colors. This is helpful when using color mapping to set different settings to different colors in your artwork, or if you always set your cut lines to a specific color.

4. **Split by Hairlines**: Automatically split all thin vector lines (line thickness set to .003" (0.077 mm) or less).

5. **Split by Color and Hairlines**: Automatically split files by both color and line thickness.

> By using the same process to identify your cut lines every time you are setting up a file, you will find the process to be quick and easy to have your processes set up whenever you print a new job to the Dashboard!

Placing Your Artwork

With the Laser Dashboard, you can move your image anywhere on the page to line up with your material on the table. There is no need to precisely place your artwork in your design software, because you can align it with your material using the live camera system on the Fusion Pro.

> For the most accurate results, we recommend placing your material as close to the center of the camera as possible.

- **Edit**: You can click on the file and move it wherever you would like on the table.

- **Pan**: Change to Pan mode to move around the table without moving the graphic's position on the table. You may also center-click and drag, or hold down the space bar to activate Pan mode.
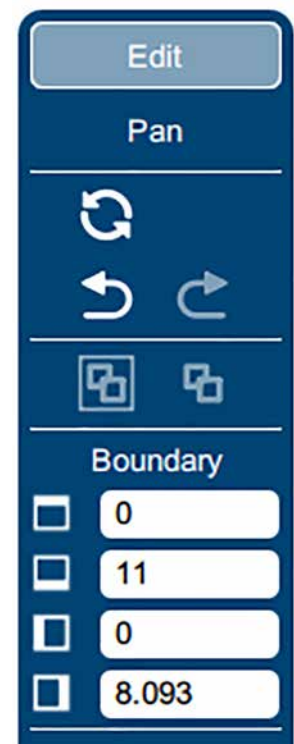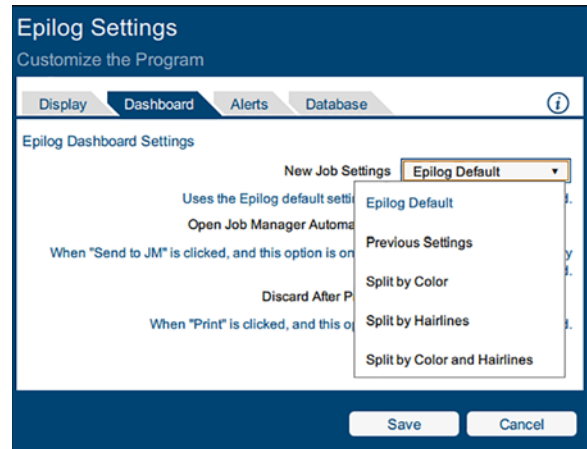
- **Reset**: Reset the entire file back to its original status when printed to the Dashboard. This will also reset all laser parameters such as speed and power settings.

- **Undo / Redo**: Undo one change, or redo one change.

- **Group / Ungroup**: The file will initially appear grouped. If you want to move individual sections of the file, with the graphic selected click the ungroup icon several times until all items are ungrouped.

- **Boundary**: This is the working boundary the laser will recognize. It will ignore any graphics outside this boundary area.

Dividing Your Job Into Processes

When you have your job in the Dashboard, there are several ways to split your project into separate processes.

Split by Color (Color Mapping)

When you set several items to different colors in your design file, you can color map them to their own processes and define their speed and power settings individually. There are two ways to separate each color into a different process:

1. In your Dashboard settings, select "Split by Color" to automatically process. **For more information "Presetting Your Cut Lines" on page 52.**

2. When the file appears, select **"Split by Color"** in the single process on the right side of the screen. (See below).
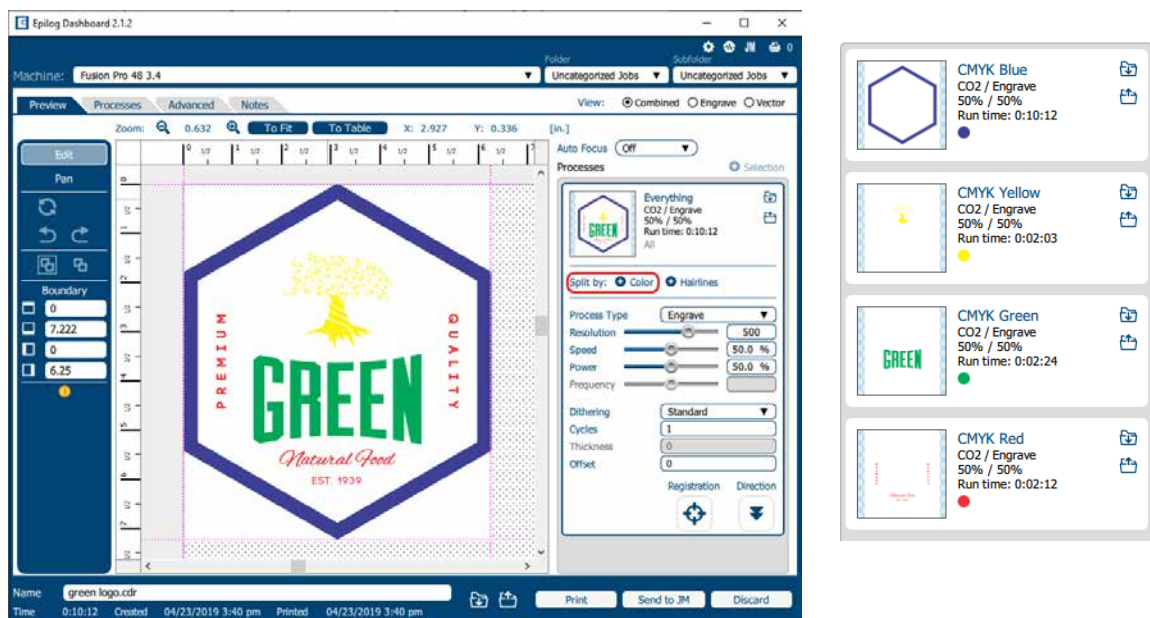
3. Now all of your colors have been separated into different processes and you can assign settings to each process separately. Processes are labeled by the name of each color.

SECTION 5: THE LASER DASHBOARD

Split by Hairline

When you print your file to the laser, you can manually select to split your processes by hairline.

1. Click on the process and select **"Split by Hairline"**.

2. All hairline vector lines will be grouped into a separate process.

Split by Selection

After you have ungrouped your artwork, select a portion of your artwork you want to separate into its own process and select **"+ Selection".** In this example we have moved the text into a separate process from the other graphics, letting us adjust the speed and power settings for just that portion of the engraving.
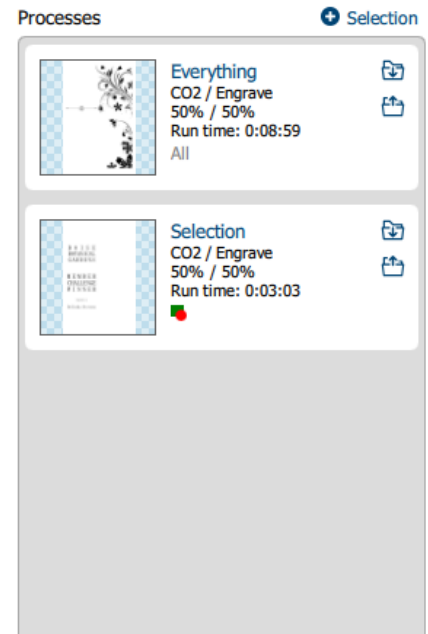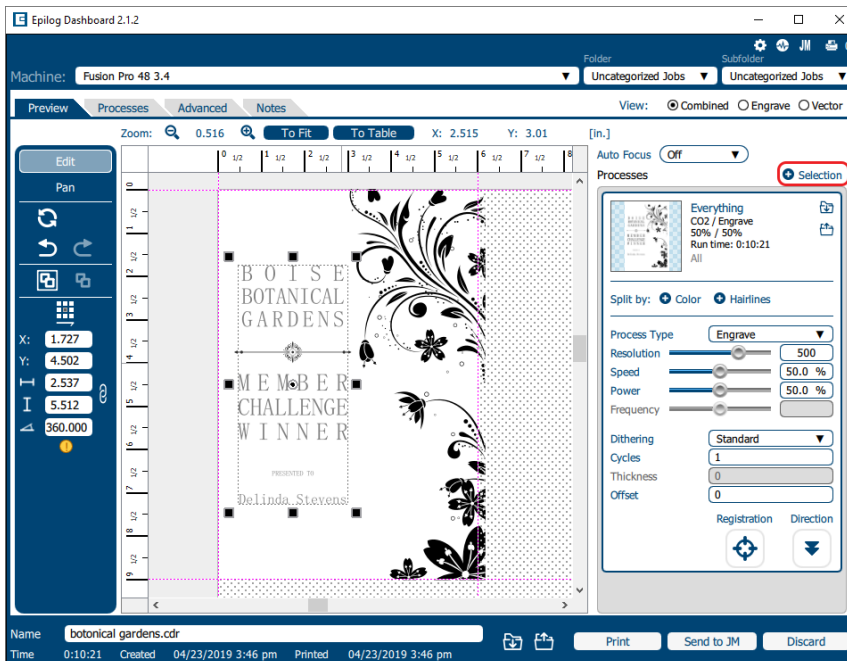
SECTION 5: THE LASER DASHBOARD

Ordering Processes

In the Processes section of the Dashboard, you may rearrange the order in which each process runs on the laser. The order of the processes in the list is the order that they will be completed by the laser. You can change the order of the processes by clicking and dragging them up and down in the list. In this example we are engraving and cutting leather bookmarks. The top most process will engrave first, and the job will finish with the leftmost outline being cut.
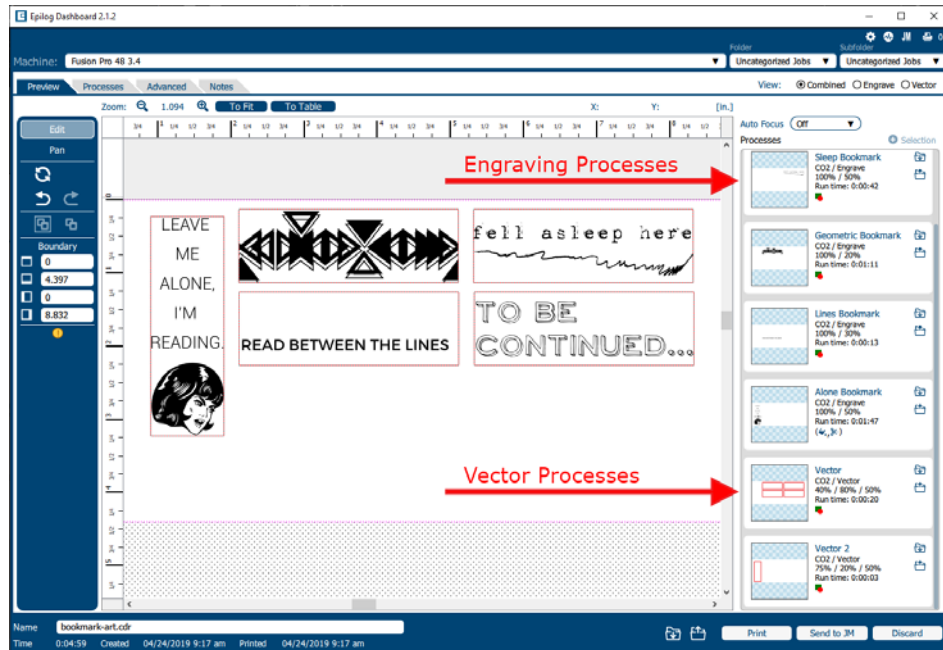
The process order will always begin with any engraving processes, then follow with your vector processes. If you attempt to move a vector process above an engraving process, it will automatically go back to its previous position below all the engraving processes. This is to ensure that the engraving processes are completed while the piece is as flat as possible. Once cut through, pieces may shift as they are cut out of the item, providing a misaligned engraving.

Merging Processes

If you want certain proccesses to be engraved at the same time with the same settings, you may merge them into one process. Click on the process you want to merge with other processes, then click on the icon next to "Merge with".
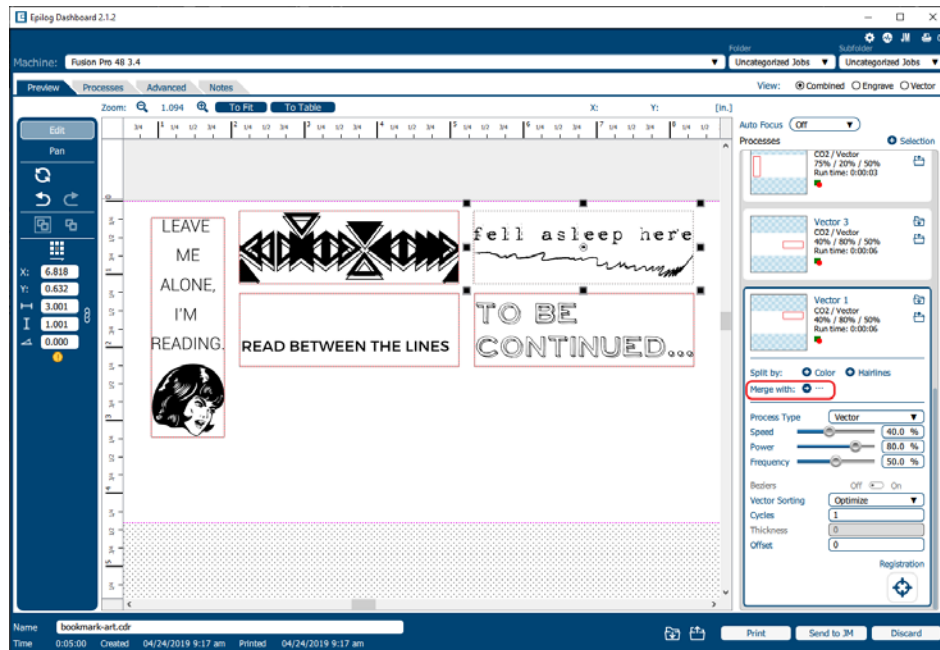
A list of processes will drop down, select a process to merge with by clicking on it.
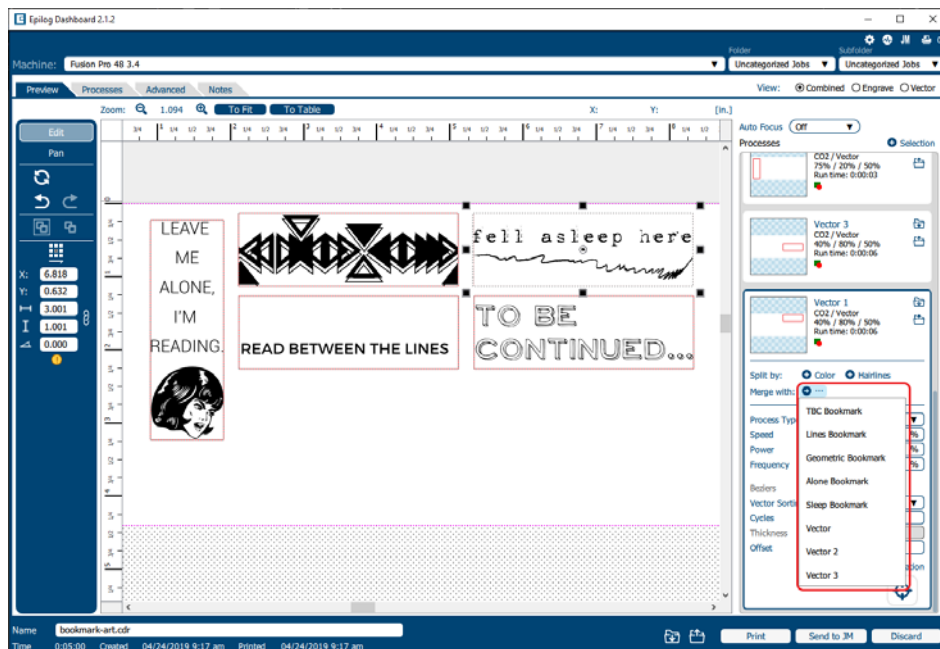
If you want to merge multiple processes all at once, hold down "ctrl" before clicking on multiple processes in the list.
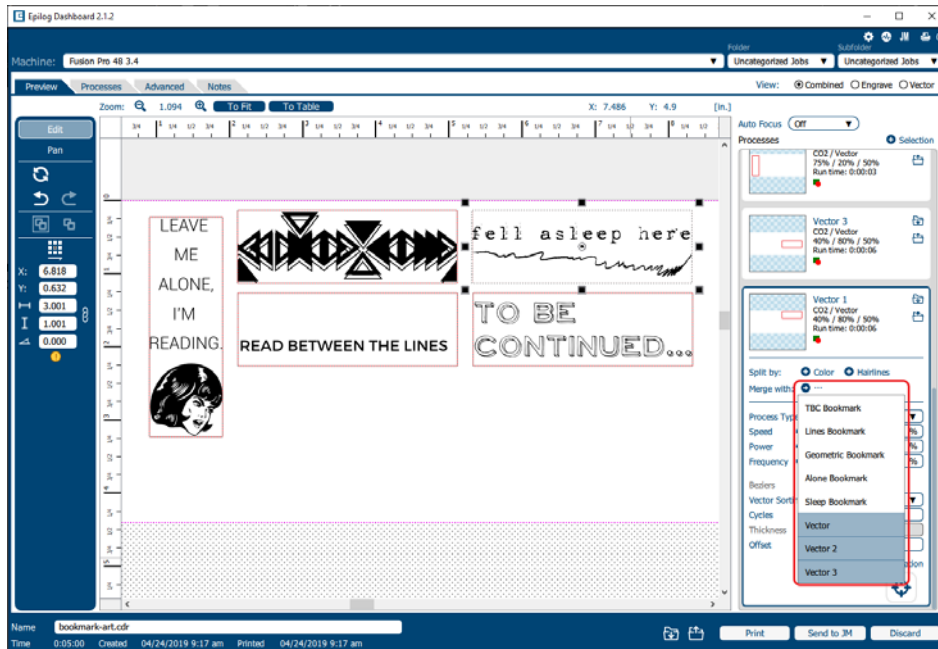
Once you let go of the "ctrl" button, all of the processes should be merged together as one process.
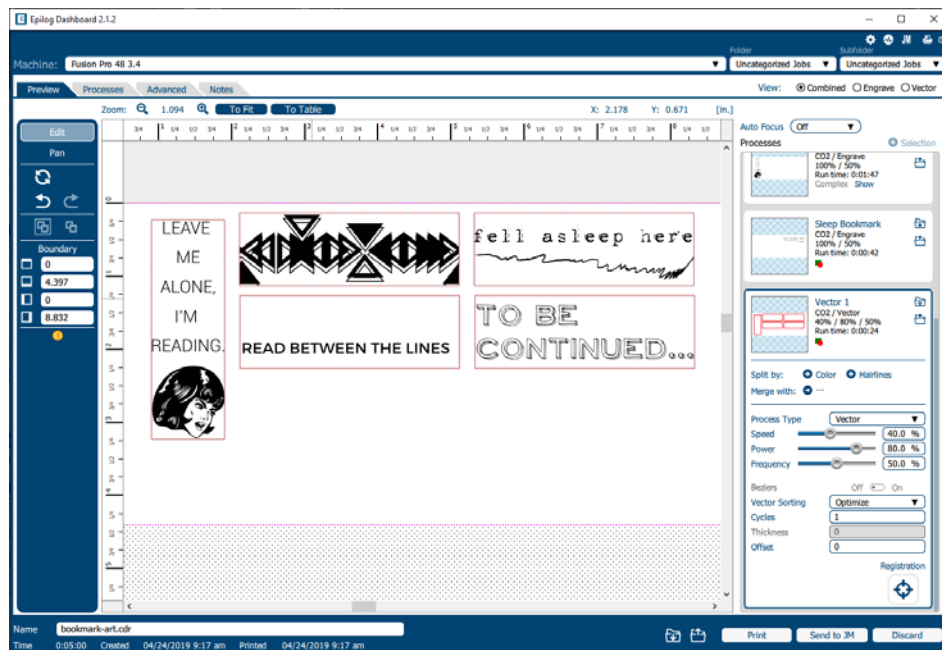
SECTION 5: THE LASER DASHBOARD

Editing Artwork with Live View

Occasionally you may want to edit your engraving artwork to fit a uniquely shaped object. With the IRIS™ Camera on the Fusion Pro, you can copy the live preview image of your engraving piece and open it up in your preferred graphic software. From there you may adjust your graphic accordingly to the shape of your engraving piece. In this example we will create a custom curve for text to follow, for engraving a quote onto a clothes hanger.

1. First, place the object you want to engrave on the engraving table, then close the top door of the machine.

2. Once the live preview of the table appears in the Dashboard, click on the **"Copy Background Image"** button.
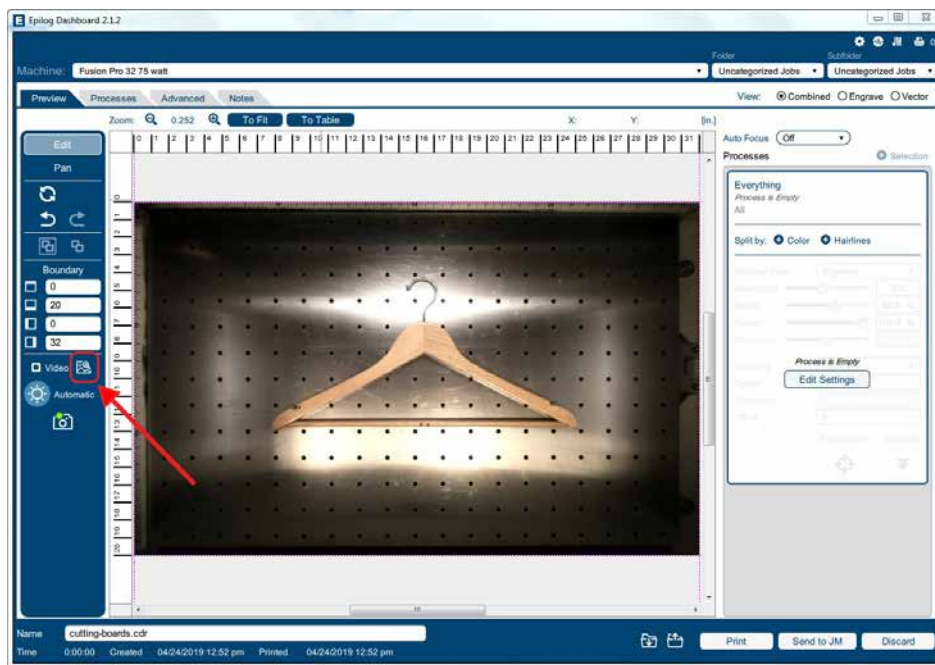
3. Open up your preferred graphic software and paste the image into a new document, with the table size as the dimensions of your document. In this example we used Corel Draw with the Fusion Pro 32, so our document size is 32" x 20".

Note: In CorelDraw you can lock the background image into place by right clicking on the image and selecting **"Lock Object"**.

4. To make our quote follow the shape of the hanger, we will need to trace the area we want to place the text with the Freehand tool.
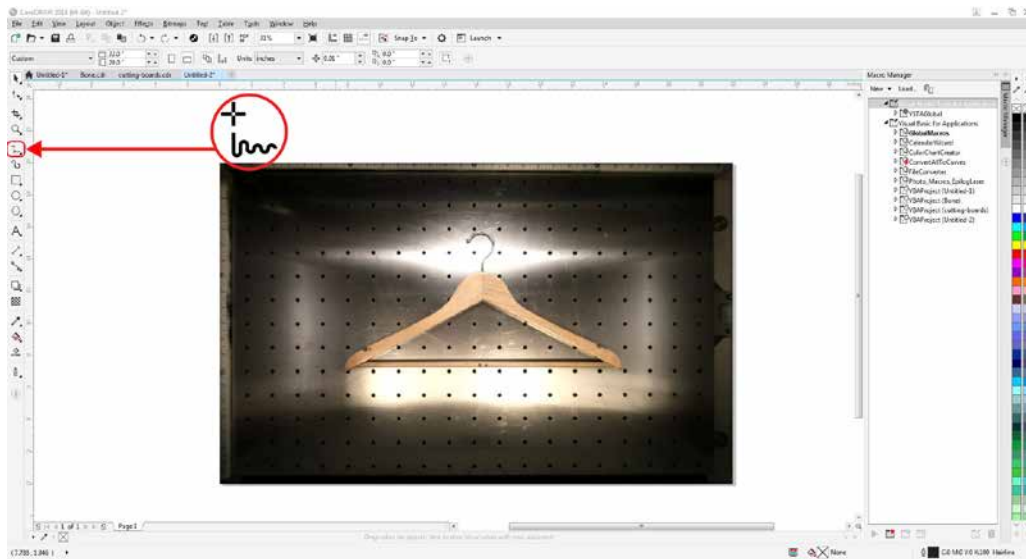
5. Once the tracing is finished, select the Text tool and move the mouse over the traced line until you see a curved line icon appear. Click on the traced line when this icon appears.
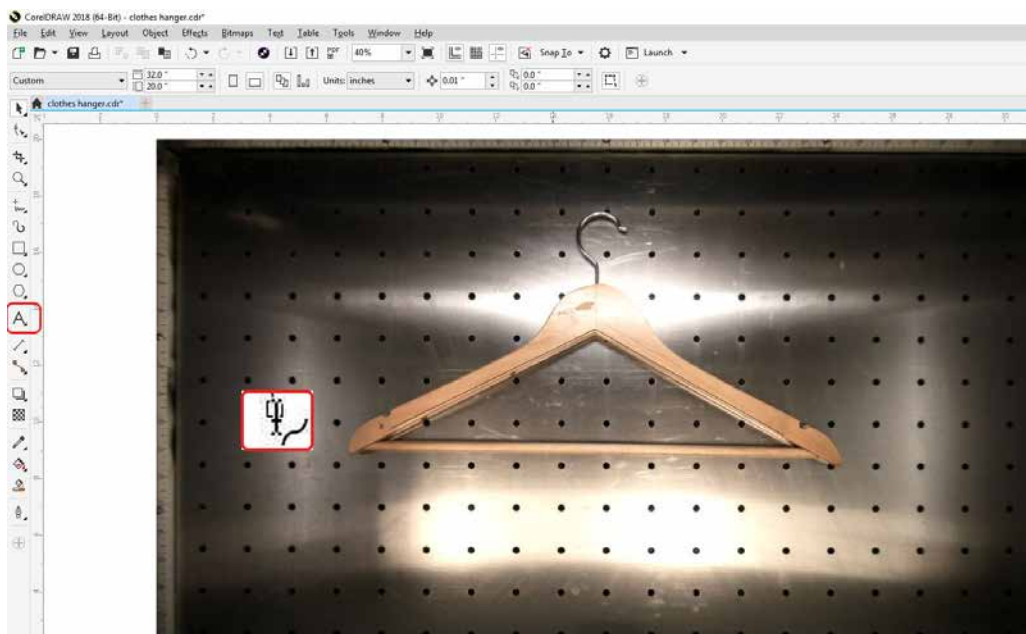
6. The text box will appear and anything typed out will automatically follow the path of the line. Adjust your font face and size as needed.
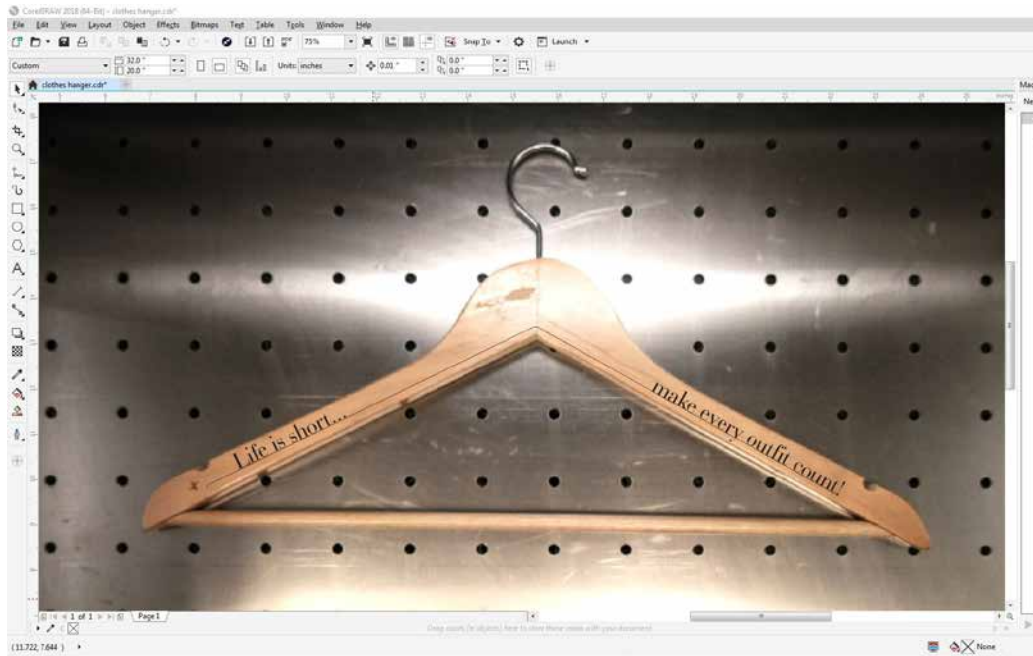
7. Once your text is ready, select the line you used to curve the text with the Shape tool

8. Then click on the Pick tool and hit **"Delete"** on your keyboard to remove the line.

9. Select the text, go to **File > Print** and change the Print Range to **"Selection"**, then print to the Epilog Engraver.
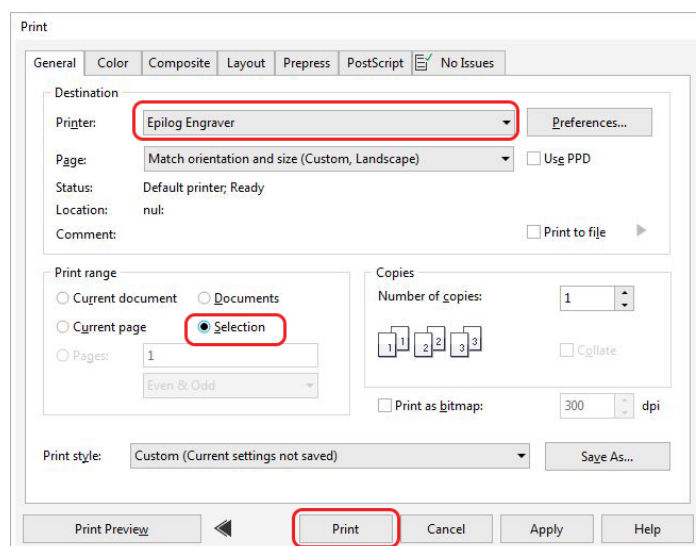
10. The text should now fit the shape of your engraving piece and be ready to print with your preferred settings.
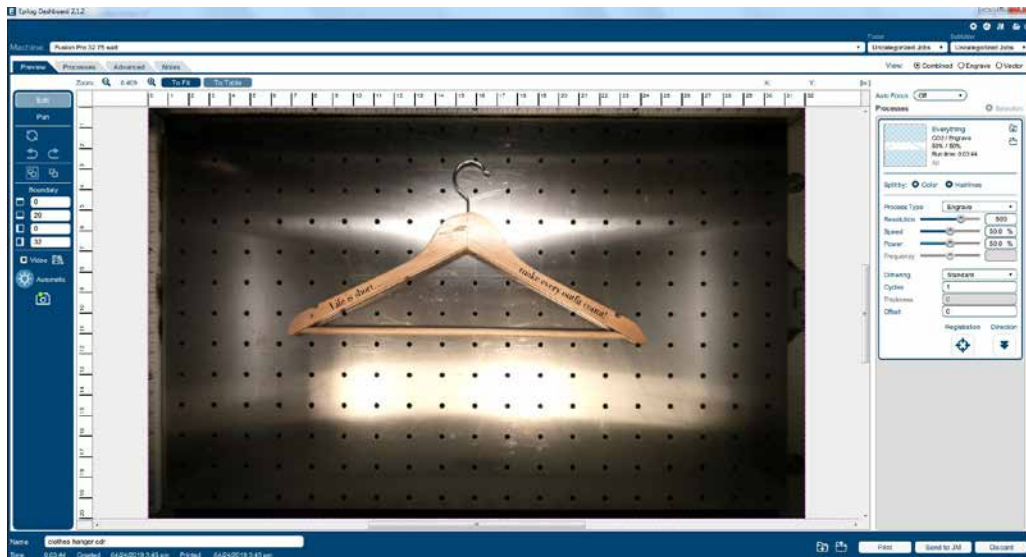
Saving Your Settings

You have two ways you can save settings for your jobs - by material and by job.

1. **Settings by Material**: Next to each process you will see a small upload and download folder icon. These settings will only affect the currently selected process.

   • **Import** current material settings by clicking the folder with the down arrow. Select between the Engrave and Vector tabs, then choose your material from the list.

   • **Export** your new material settings by clicking the folder with the up arrow. Add a settings name and add it to an existing folder.

   • **For step by step instructions see "Material Settings Tab" on page 41.**
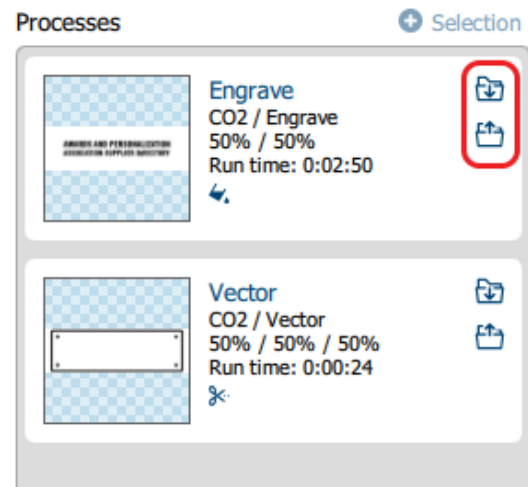
2. **Settings by Job**: Your settings for the entire job can be saved by clicking on the folder icons at the bottom of the Dashboard.

   • Click the folder with the down arrow to import saved job settings.

   • Click the folder with the up arrow to export your current job settings.

- When is this helpful? When you have a series of processes you use frequently. For example, you often use a specific two-ply plastic for creating signs. You can save both your engraving and vector processes.

- **For step by step instructions, see "Job Settings Tab" on page 44.**

File Settings

At the top of the Dashboard, you will see several file-related settings:

- **Machine**: Choose which laser you are sending the file to. This will show any lasers you have installed in the Job Manager.

- **Folder / Subfolder**: Which folder and subfolder you want to save the file to in the Job Manager.

- **View**: This will change what portions of the graphic are shown in the preview. Choose to show all processes (Combined), or just your Engrave or Vector processes. This is a good way to preview your job and make sure you have set all of the lines you want to cut rather than engrave.

At the bottom of the page you'll see several additional file settings:

- **Name:** Set your file name.

- **Time:** Displays the estimated time the project will take to run at the laser.

- **Created / Printed:** Displays the date and time the file was created and last printed.

- **Print**: Press the print button to send the job to the laser.

- **Send to JM**: Press this button to send the job to the Job Manager.

- **Discard**: Delete the file from the Dashboard.

SECTION 5: THE LASER DASHBOARD

Settings in Detail

Resolution

Set your print resolution anywhere from 75 to 1200 DPI. For the best engraving results, use a resolution equal to the resolution in the raster images within your project setup. We recommend using a resolution of 400-500 for most standard engraving jobs. Use 600 DPI for jobs requiring finer detail. The resolution setting in the print driver will affect the engraving time (there are twice as many engraved lines at 600 DPI as at 300 DPI) and the quality. For a detailed discussion on Resolution, **visit "Resolution" on page 81.**

Engrave Direction

This feature applies to engraving only and allows you to engrave your project either from the top-down or the bottom-up direction. In standard top-down engraving there can be a large amount of engraving debris generated, especially on materials such as plastic, wood and rubber. As the debris moves toward the exhaust plenum, some of it collects in the area that has just been engraved. Bottom-up engraving prevents the debris from collecting in the freshly engraved spaces.

Process Type

Choose between the three modes of operation.

- **Off:** This setting will tell the laser to ignore any items within this process.

- **Engrave Mode:** Used for engraving or marking materials. Typical uses include engraving clipart, scanned images, photos, text and graphic images.

- **Vector Mode:** Selected when you are running only cut lines or for use with the Red Dot Pointer for previewing the job processing area.

Speed

Determines the travel speed of the carriage and is adjustable in 1% increments from 1 to 100%. The slower the speed, the deeper the engraving or cutting. Speed settings are heavily dependent on the hardness and the thickness of the material being engraved or cut, with harder materials requiring slower speeds for deeper engraving/cutting. **Please refer to "APPENDIX B: MATERIAL SETTINGS" on page 129 in this manual.**

Power

Determines the amount of laser energy that is delivered to the piece being cut and is adjustable in increments from 1 to 100%. The higher the power, the deeper the engraving/cutting. **Please refer to "APPENDIX B: MATERIAL SETTINGS" on page 129 in the manual.**

SECTION 5: THE LASER DASHBOARD

Frequency

The frequency setting is only active on vector processes, and controls the number of laser pulses that the laser fires per inch of travel. The frequency is set in the dashboard and can be adjusted from 1 to 100%. A lower frequency number will have the effect of less heat because fewer pulses are being used to cut the material. Lower frequency rates are helpful for products like wood, where charring is evident at higher frequencies. High frequencies are useful on materials like acrylic where a large amount of heat is desirable to melt or flame polish the edges.

Dithering

Dithering is used only for Raster engraving and has no effect on vector cut lines. This setting defines how the dot patterns will be engraved in raster images that contain grayscale images, blends, or color. The Dashboard offers six different dithering patterns to enhance your engraving projects. The default mode is Standard. This mode can be used for all images including photographs, but some images improve when engraved with other dithering patterns. **For more information, go to "Image Dithering" on page 87.**

Offset

Offset allows you to focus at any point above or below the surface of your material. When engraving acrylic, many users like to focus above the surface to produce a "softer" finish to the engraving. Conversely, when cutting acrylic, many users like to focus about half way into the acrylic. Offset allows you to do this automatically. A positive value will move the table away from the focus lens. A negative value, such as -.095, will move the table closer the focus lens.

SECTION 5: THE LASER DASHBOARD

Processes Tab

The Processes tab is an alternative view of the various processes within your file. You can see each process with the settings located next to the process without the video view of the table.
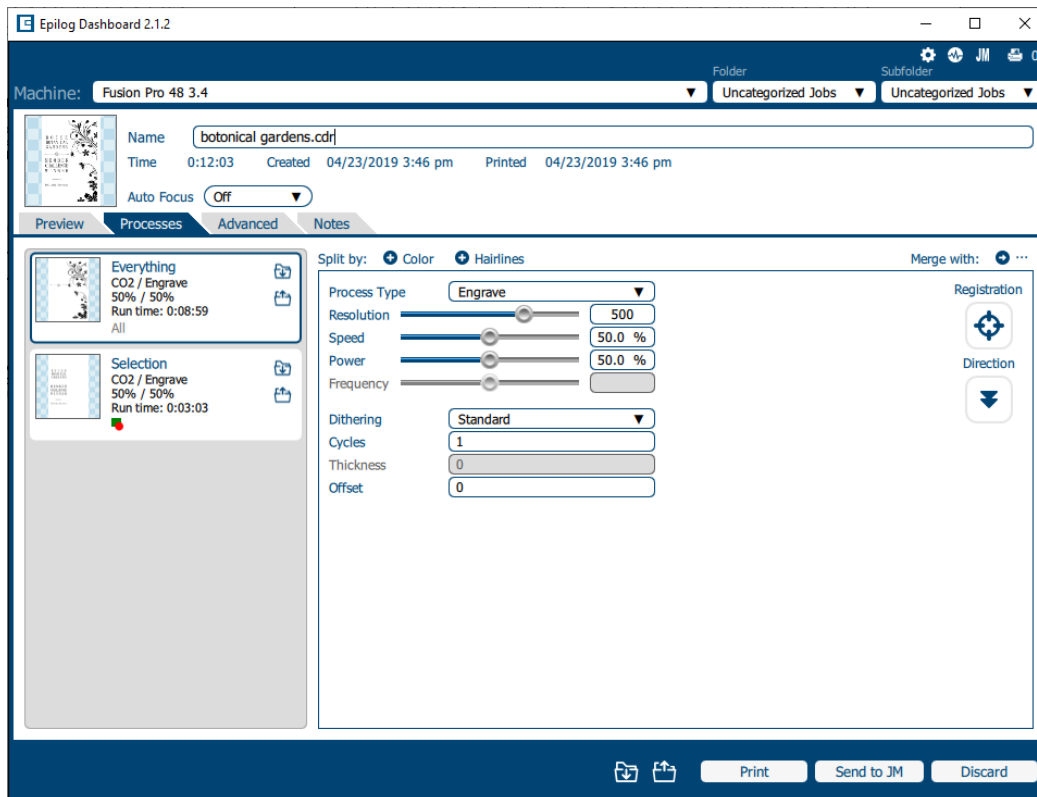
SECTION 5: THE LASER DASHBOARD

Advanced Tab

On the Advanced tab, you can change settings that will affect the entire job. More features will be added to this tab in the near future.
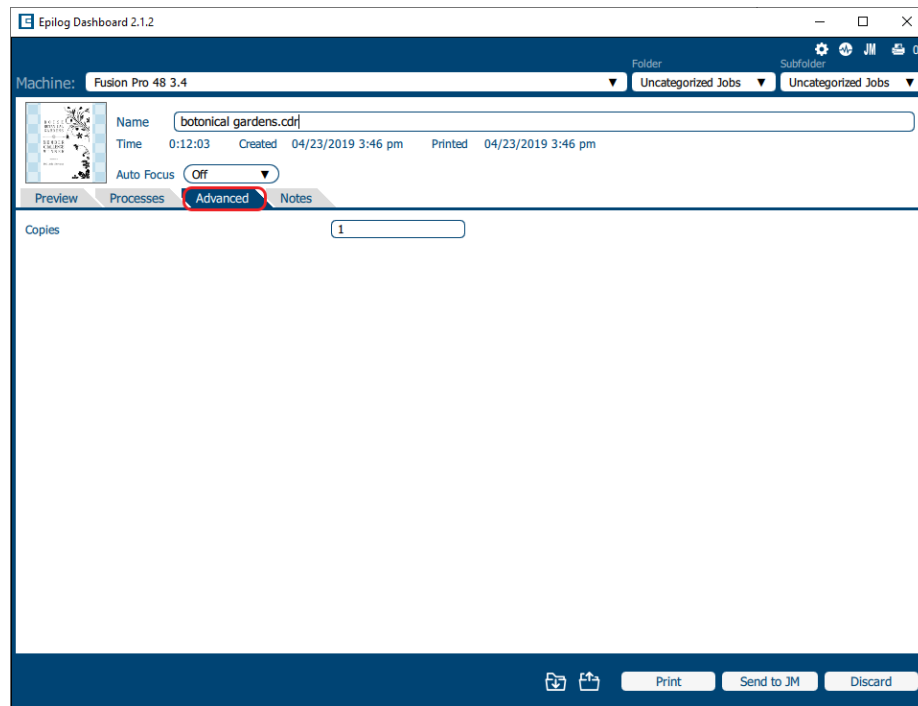
- **Copies:** Set the number of times you would like to rerun the job. If you have 2 processes, the laser will complete each of the two processes, then run the two processes a second time. If you have a process with more than one cycle (process 1: cycles 1, process 2: cycles: 2) and set the copies to 2, it will run process 1 once, process 2 twice, then process 1 once again, and process 2 twice more. This is useful when using the fiber laser with the system.

Notes Tab

Use the Notes tab to keep notes on running your file. This can include suggestions for artwork placement, speed and power notes, or anything else a laser operator may find helpful when running that project.

SECTION 5: THE LASER DASHBOARD

File Setup FAQs

I have a file with only cut lines, but they came in as an "Engrave" process. How do I change it to a cut process?

Select the process and change the Process Type to "Vector".

I merged two of my layers, but now it lost part of the graphic.

Change the Process Type to "Engrave" and see if they show up now. It may have changed your process to Vector and hidden any non-vector parts of your image.

I want to set up the Dashboard to automatically process all files I print to the laser with hairlines as cut lines. How do I do this?

Go to the Settings icon and in the Dashboard tab, change your New Job Settings to "Split by Hairlines".

I forgot to remove part of the artwork I don't want to engrave. How do I get rid of that part of the file?

There are two ways to do this. Either ungroup your image, select the item and delete it, or separate it by selection and turn that process to Off.

Additional CorelDRAW Laser Dashboard Features

Each program you use will provide different ways to manage these functions. CorelDRAW offers a very straight forward way to access each of these features.

Multiple Passes

You can automatically engrave or cut a job multiple times by setting the Number of Copies to the number of passes that you want to make. When each pass is finished the laser will automatically start another pass until all passes are complete.

Print Range

If you only want to print one aspect of your project (for example, just the text in the document), you can select that part of the file, then click Selection and the laser will only engrave or cut that piece of your file.

Multiple Pages

When you want to engrave multiple pieces within one document, such as five different engraved glass coasters, each with a different name, you can use the Multiple Pages feature of CorelDRAW. Set up each of the coaster files on a separate page in your single CorelDRAW file, then when you print to the laser you

can choose either **Current document** to print all of the pages or you can specify which pages you want to print by adjusting the settings in the **Print range box**. You can view the different pages in the Print Preview screen.

When a multiple page job is printed to the laser, each of the pages will transfer to the Control Panel with the first file coming across as Job:1. File Name, then Job:2. Page 2, Job: 3. Page 3. Remember, the last page of the job will be the current file when you go to the Fusion's control panel, so scroll back to Job 1: File Name to run that one first.

If you start engraving the jobs and become uncertain about which pages are which, you can refer back to your print preview screen and the Page number in the laser will correspond to the page number in the print preview.

SECTION 6: CONTROL PANEL

Display

The display shows valuable information associated with the highlighted Functional Menu items. We will explain the different information that will be displayed as we go through the description of each menu item.

Reset	**Speed**
Focus Menu	**Power**
Pointer	**Job Menu**
Jog Menu	**Delete**
Trace	**Settings Menu**
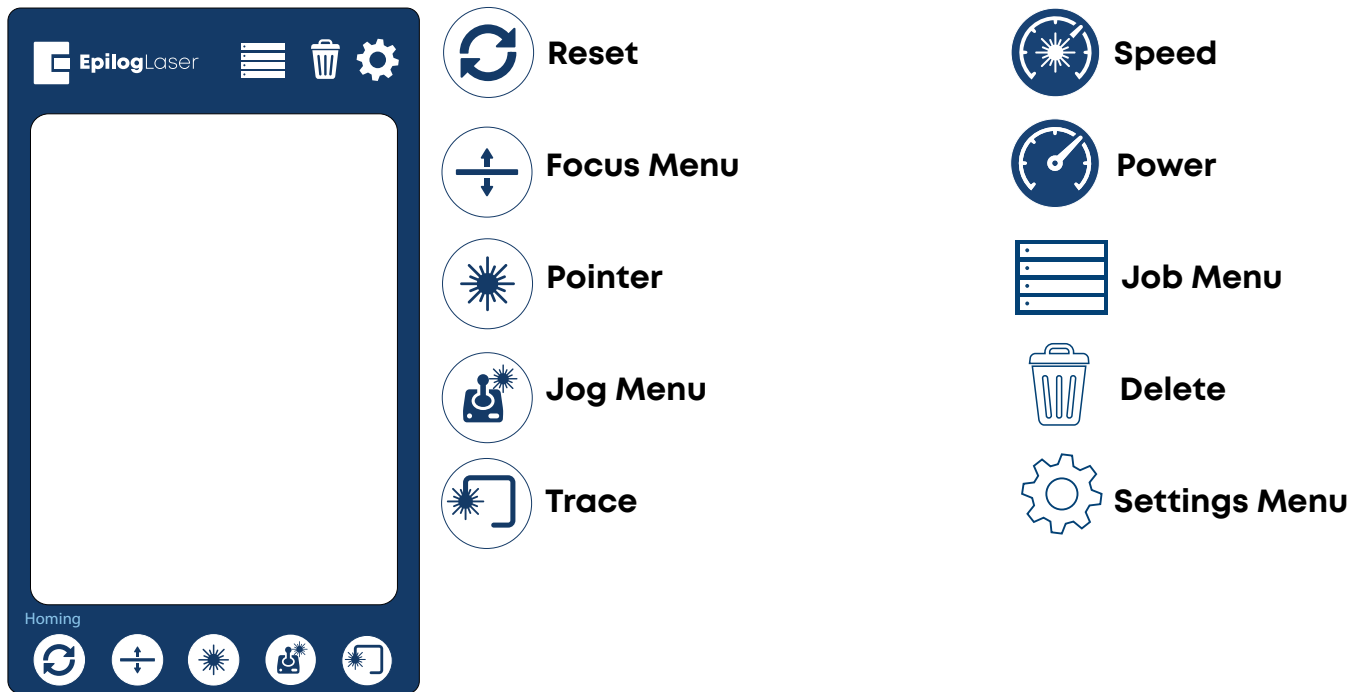
Status Indicator

In the bottom left corner of the screen you will see text displaying the current status of the machine.

- **Homing:** This indicates the machine is still powering on. None of the functions are available until powering on is completed.
- **Idle:** The machine is inactive and ready to run or resume a job.
- **Running:** A job is in progress when this is displayed.
- **Parking:** The axis is returning to Home position.
- **Jogging:** Jog mode is active.

Symbols

Go/Stop Button

Press the Go/Stop button to start and pause a job.

SECTION 6: CONTROL PANEL

- Pressing the Go/Stop button during a running job will stop the lens carriage and the laser beam will be shut off. If the Go/Stop button is pressed during raster engraving mode the lens carriage will pause on either the far left or far right of the engraving line that is in process. If the Go/Stop button is pressed while in vector cutting mode, the lens carriage will stop at the end of a line segment or at the next line node location.

- Once the lens carriage has stopped, you can open the door to examine the job. By closing the door and pressing the Go/Stop button, the job will commence where it left off. If the item being engraved/cut has not been moved, the engraving/cutting registration will not be affected.

- **Note:** Opening the door on the laser during engraving or cutting will stop the laser from firing; however, the lens carriage will continue to move. It is important to stop the job before you open the door to ensure the engraving/cutting is completed.

- If you press the Go/Stop button while in vector mode it may take some time for the system to actually stop. The system needs to get to the next node in a vector before it can stop.

LED Status

The ring around the Go/Stop button will change certain colors depending on the Fusion Pro's status.

- **White:** The machine is booting.

- **Purple:** The machine is waiting for the touch screen configuration to load.

- **Multi-colored:** The machine is Homing.

- **Alternating Light Blue to Green:** Machine is Idle and ready to run a job.

- **Green:** Machine is actively running or tracing a job.

- **Red:** A drive has failed. The number of flashes determines the drive number that failed. If more than one drive has failed, it flashes for the first sequential drive.
  - 1 - X Axis
  - 2 - Y Left Axis
  - 3 - Y Right Axis

Reset Key

- Pressing the Reset key will move the carriage back to its Home Position. Press the Reset key after you have moved the carriage when in Jog mode.

- You may also press this key if you want to start a job over after pausing it with the Go/Stop button. Reset does not erase the job from the laser systems memory; rather it will stop the engraving job in process and send the carriage back to the Home Position.

Focus

The Focus function allows you to manually set the table to the correct height for engraving while using the Focus Gauge. With Focus highlighted, use the Joystick to move the table up or down. The display will show a digital readout of the table position. Press once to enable the Focus feature and the icon will turn green. Press again to exit this feature.
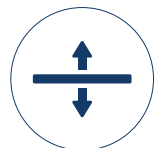
SECTION 6: CONTROL PANEL

Pointer

The Pointer key is a toggle switch that turns the laser system's Red Dot Pointer on and off. **For more information visit "Red Dot Pointer" on page 93.**

Jog

The Jog function allows you to move the laser head around the table with the use of the Joystick. To make it easier to use, turn on the Red Dot Pointer for a visual indicator of where the carriage is moving. The carriage can be moved in X, Y or diagonally. The display will show a digital readout of the carriage position. This function is useful for bringing the focus gauge to any object on the table to ensure it's focused properly. **For more information see "Auto Focus vs Manual Focus" on page 86.**

Trace
The Trace function is a new feature that will be added soon. For now this key will be inactive.

Job Menu

- The Job Menu allows you to scroll through the jobs in your laser system. You will be able to see a list of jobs that have been sent to the laser. The job name displayed is the same as the file name that you printed to the laser.

- When the job you want has been selected, it will be highlighted in blue. Press the Go/Stop button to start the job.

- After the job starts, the job's settings and a timer will be activated and will be shown at the bottom of the display.

- Saved jobs will always be visible at the top of the list with a save icon next to the job name.

- Pressing and holding down your finger on a job will pull up the job's settings, allowing you to view the Speed, Power, and Resolution or Frequency. A save button will also be visible in the upper right corner that allows you to save the job permanently to the laser.

Speed
This icon indicates the speed settings on the selected job. It ranges from 1-100%.

Power
This icon indicates the power settings on the selected job. It ranges from 1-100%.

DPI
This icon indicates the resolution settings on the selected job. It ranges from 75-1200.

Frequency
This icon indicates the frequency settings on the selected job. It ranges from 1-100%.

Delete Button

The Delete Button will permanently erase jobs from the Job Menu. To delete a job, select the job in the Job Menu, and then select the Delete Button. A dialog will pop up to confirm that you want to delete the file. Select "Yes" and the file will be removed from the Job Menu.

Note: If you have marked a job as "Saved" and delete the file, it will still be erased from the Job Menu.
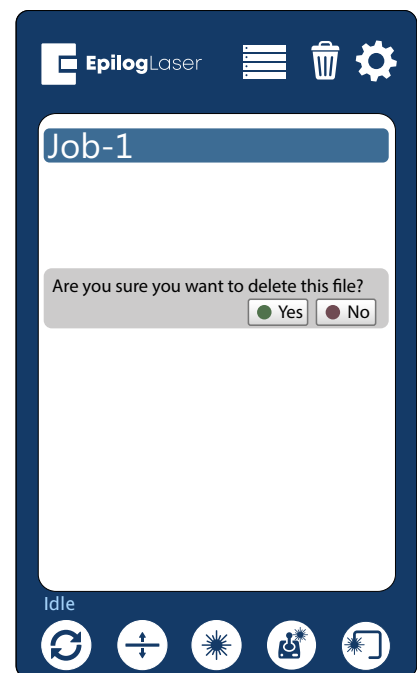
SECTION 6: CONTROL PANEL

Settings/Config Menu
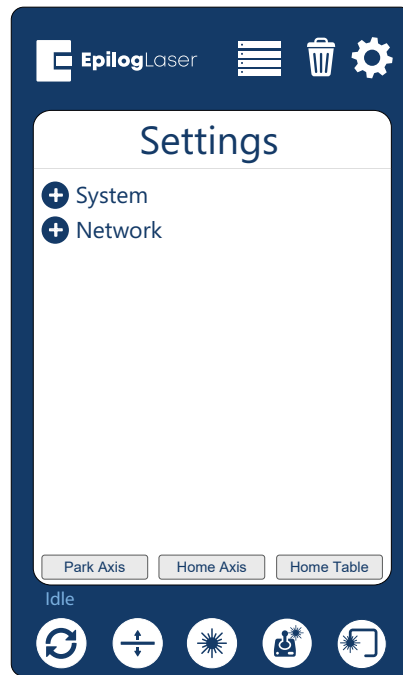
The Settings/Config menu has two sub-menus, System and Network Settings.

System
Once selected, the System Settings display detailed information about the machine. These are factory settings that should not be changed unless instructed by Epilog Technical Support.

Network
Once selected, the Network Settings allow you to change the IP Address and the Netmask. The IP Address on this screen should match the IP Address you have assigned your machine in the Job Manager. If you have multiple machines, each one will need it's own IP Address. For more information, see **"6. Set the Fusion Pro's IP Address" on page 18.**

Park Axis
Pressing Park Axis returns the Laser to the Home Position.

Home Axis
Pressing Home Axis repeats the Homing process that happens when the machine powers on.

Home Table
Home Table resets the table height to its Home Position.

SECTION 6: CONTROL PANEL

Jog Menu

Access the Jog Menu by pressing the Jog key, which will turn green when active. The Jog Menu allows you to adjust the current X and Y axis positions of the laser head. You may change the current position of the laser head either using the Joystick, or by entering precise coordinates. The Nudge arrows allow you to fine-tune the position down to a thousandth of an inch. Once you are finished using the Jog Menu, press the Jog key again to return to the main Job Menu. Press the Reset key to return the laser back to its home position.

Auto Focus
When you have jogged the lens carriage above your material, press the Auto Focus button to use the pluger Auto Focus. The table will rise until the material touches the plunger, then set the table to the correct height. Your job should now be in focus.

Focus Menu

To access the Focus Menu press the Focus key, which turns green when active. The Focus Menu is used for raising or lowering the table level to focus the laser precisely to your engraving or cutting material using the Focus Gauge. The height of the table is adjustable by either using the joystick, or using the Nudge arrows to fine-tune the height down to a thousandth of an inch. Once you are finished using the Focus Menu, press the Focus key again to return to the main Job menu.

Home Table
Pressing the Home Table button resets the table height to its home position, which is the default every time you turn on the machine.
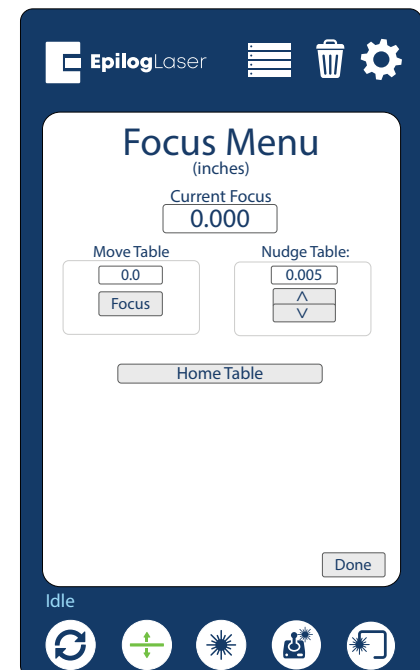
SECTION 6: CONTROL PANEL

Joystick

The Joystick feature is used in Jog mode and Focus mode. The Joystick is progressive and touch sensitive and provides a continuously variable range of adjustments. It is sensitive to the degree of tilt that is being applied. The more you tilt the Joystick, the bigger your impact on the function you are using.

Job Storage

The Fusion Pro has 1 GB of permanent storage. While powered on, the machine will store any and all jobs sent until there is no free memory left. This feature allows you to save your most run jobs right at the laser without needing to first print them from the computer.

To save a job, press and hold down on a job in the Job Menu until it pulls up the job's settings. Select the save button in the upper right corner and the job will save permanently to the laser until manually deleted. If you do not save a job, it will be deleted upon powering down the machine.

Artwork Setup

Create your job in the graphics software of your choice, such as CorelDraw or Adobe Illustrator. There are three different modes of operation for the laser and the way you setup your artwork will determine if you raster engrave, vector cut, or use combined mode.

Raster Engraving

Raster engraving can best be described as very high resolution dot matrix "printing" with a laser. Raster engraving is used to create highly detailed graphic images. The laser head scans back and forth, left to right, engraving a series of dots one line at a time. As the laser head moves down line by line, the dot pattern forms the image that was printed from your computer. You can raster engrave scanned images, text, clipart, photographs, or line drawings.

This artwork is a good representation of a raster file. The photograph of the leopard will raster engrave, as will the text that has been placed on the page. For more information on engraving photographs, **see "PhotoLaser Plus" on page 98.**

Vector Cutting

When you are vector cutting, the laser is following a continuous path that follows the outline or profile of an image. Vector cutting is normally used to cut completely through materials such as wood, acrylic, paper, etc. It can also be used for quick marking of characters and geometric patterns. You can vector cut with the laser by setting objects and text to be unfilled and drawn with a 0.003" (0.0762 mm) or less outline. The thin outline will produce a vector cut.
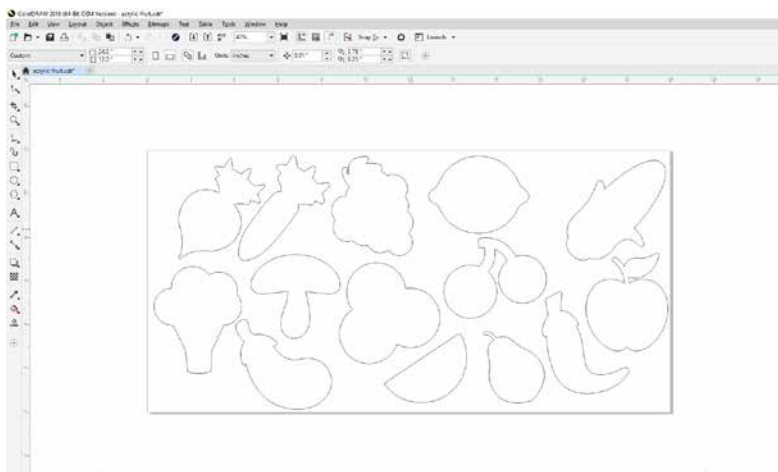
This graphic shows a vector image made up of lines. You can tell it is a vector image because you can individually select any of the points on the lines and manipulate that part of the graphic.

When vector cutting, we always suggest that you use the Vector Cutting Table or the Slat Table to protect the back of your material as well as your table from laser marking. **For more info, see "Vector Cutting Table" on page 97.**

Note: If your raster artwork contains thin lines between .001" (.025 mm) and .003" (.177 mm) depending on resolution, and you are using Vector or Combined mode, those thin lines will all vector cut. The most common setup where this occurs is when you have a clipart image with

hidden lines that you send to the laser using Combined mode. The artwork shown below is a good example of a piece of clipart as it appears on the screen (top) and the hidden lines (bottom) that will vector cut if you are in Combined or Vector mode. If you only want to raster engrave, make sure you select Raster mode in the Epilog Dashboard.

In CorelDraw you can view just the lines (bottom view) by clicking on the **View** key in the menu bar and selecting **Simple Wire Frame**. The upper image is a complex piece of clipart. The lower image shows all of the hidden lines that are in this piece of clipart. If this clipart image were run in Combined mode, it would first raster engrave most of the elephant then vector cut any of the thin lines below .003" (0.077 mm) in CorelDraw, or .001" (0.025 mm) in Adobe Illustrator. You can also use the Preview function of the Epilog Job Manager to view only vector lines. See **"Previewing Your Job" on page 38.**
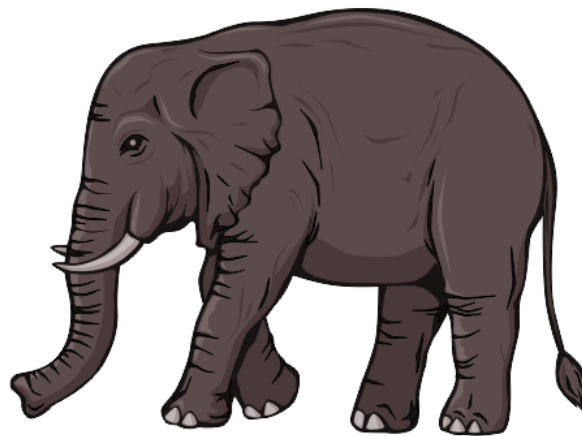
Clipart that looks like it is a raster file is actually often made up of small lines. If the lines are set too thin, then it may cut as well as engrave if you send it to the laser in combined mode.
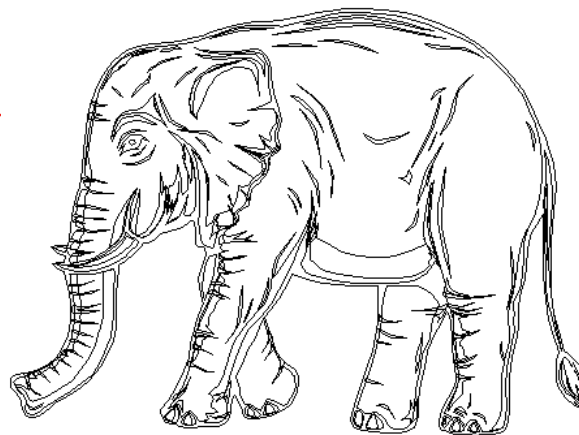
Setting a Vector Cutting Line

With the new Job Manager you have many options for setting your Vector Cutting lines. The easiest way to do it is by line width, but you may also set it to Vector by a specific color or by selecting the individual processes in the Job Manager that you want to cut instead of engrave. The key is to be consistent in which method you pick to avoid confusion.

Where do I set the Vector Line Width?

Different software packages set the line width in different places. In CorelDRAW, you can find the outline width in the top menu bar when a vector line is selected. In Adobe Illustrator it is called the stroke width and you can find this setting in the Stroke Panel. Vector line width will vary from program to program. We find that using .003" (0.077 mm) or less in CorelDraw, or .001" (0.025 mm) or less in Adobe Illustrator works best.

If you can't select a line to set the width, it may be because it is part of a grouped object. Try to ungroup the object, then select the line. You also can't select an individual line if that line is part of a raster image.

Resolution

Print quality is commonly referred to as Resolution and is one of the variables that determine image quality. Resolution is expressed in dots per inch (DPI) and is determined by the number of lines or dots that are engraved for every inch of movement. Each horizontal line is referred to as a raster line. The higher the resolution setting, the finer the detail that can be achieved. Keep in mind that engraving resolution is only one factor in determining image quality. The quality of the artwork being sent to the laser can have a bigger influence on the look of the final product than the resolution. If low quality artwork is being used, even the highest resolution will not improve it. Also keep in mind that image quality is subjective. 300 DPI may be just fine for some images and some customers, while 600 DPI is the absolute minimum for others.

This diagram shows the concept of raster lines and dots-per-inch (DPI). The arrows show the change in direction of the carriage between raster lines. The difference in dot density between 300 DPI and 600 DPI.
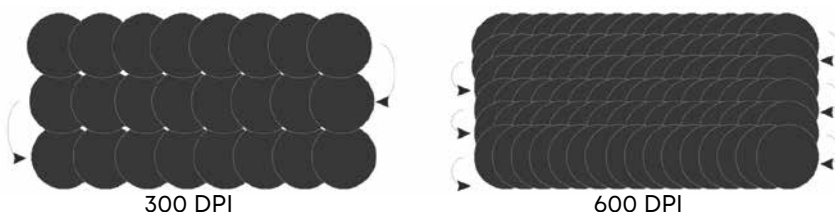
300 DPI

600 DPI

Resolution Settings:

75 – 200 DPI
These resolution values are typically used for non-production purposes where you want to experiment with image location, or if you want to quickly produce a rough draft. Low resolution settings are also useful when engraving products that you don't want to remove too much material from while engraving, such as fabric.

300 DPI
300 DPI is useful when engraving materials such as glass, marble, plastic and other items that don't benefit from the engraved dots being close together.

400 DPI
This resolution value is ideal for many applications. It combines very good image quality with fast engraving times. Many users like 400 DPI for all of their work.

600 DPI
When really fine detail or overall excellent results are required, most users choose 600 DPI.

1200 DPI
This resolution is used for projects that require the best engraving quality possible, or if engraving extremely small fonts. Although it's seldom used because, under normal circumstances, most people cannot visually discern the difference between 1200 and 600 DPI. There are some users that appreciate this high level of quality and are willing to take twice as long to produce an image at 1200 DPI as it would take them at 600 DPI.

Helpful Hints

- There are four times as many dots engraved at 600 DPI as there are at 300 DPI. Twice as many horizontally and twice as many vertically.

- The gap between the dots is very small at 600 DPI. At 300 DPI the lesser overlap is responsible for the jagged edges that are visible when engraving at lower resolutions.

- It's important to remember that while resolution plays a part in producing good image quality, the artwork that is sent to be engraved is just as important. If the artwork that is sent to the laser is poor quality, trying to engrave it at 600 DPI will not improve the quality. It's always best to start with high resolution images. Poor artwork will probably always look poor at any resolution, while good artwork will look good at any resolution.

- Twice as many dots and twice as many lines at 600 DPI produces a much deeper burn into materials like wood than you would see engraving the same image at 300 DPI. This is important to understand because depth of burn is closely associated with engraving resolution – the higher the resolution, the greater the depth of burn for a given speed. The relationship between resolution, depth of engraving and Speed and Power setting is something that most people figure out with just a little experience. **"APPENDIX B: MATERIAL SETTINGS" on page 129** helps to make this easy to understand by providing different Speed and Power settings and suggested engraving resolutions for each different material listed.

The next photo shows a clipart image engraved at 300 DPI (top) and at 600 DPI (bottom). This clipart image is full of different shades of gray and you can see that the dot spacing is spread out more on the 300 DPI than it is on the 600 DPI. Just changing the resolution to 600 DPI produces so much dot overlap that

the fill patterns tend to blend together. It's a matter of personal preference as to which resolution looks better, but these photos show the dramatic difference resolution can make, especially when engraving with grayscale images.

Landscape or Portrait

You can engrave using either landscape or portrait modes. Depending on the artwork, you can increase your efficiency and decrease the time it takes to engrave an image by changing the orientation of your file. Many users set up their artwork in portrait mode and then rotate the artwork 90 degrees if they are going to print from landscape mode.

300 DPI
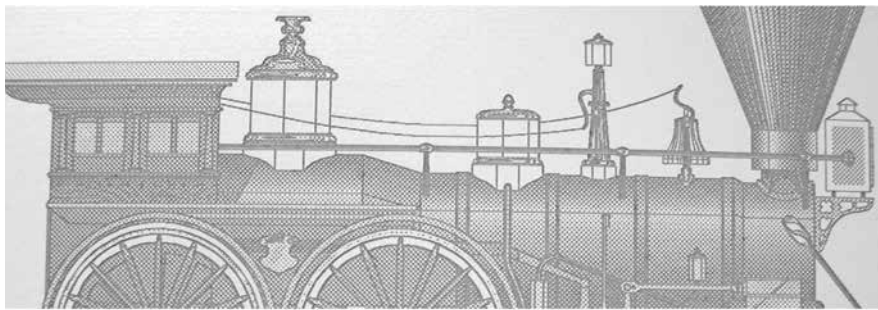
600 DPI
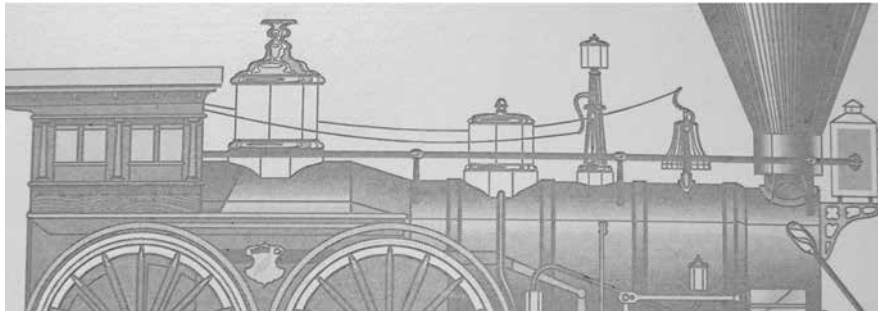
This project setup shows the same job in portrait mode (left) and landscape mode (right). The landscape mode will engrave quicker because there is less turnaround time as the laser makes longer passes across the engraving table. For example, at 100% speed and 100% power in portrait mode this graphic will take 56 minutes, 56 seconds, while in landscape mode it takes 38 minutes, 54 seconds, a 34% time savings.

Engraving Time: 56:56
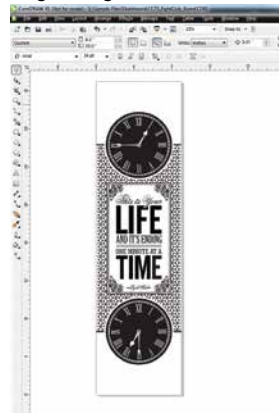
Engraving Time: 38:54
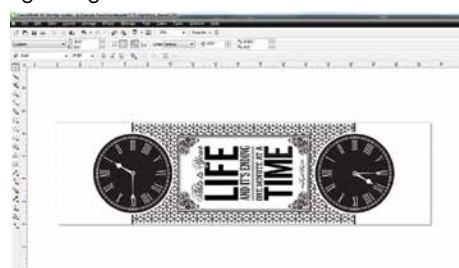
SECTION 7: QUICK START GUIDE

The drawings below show a job that works in the opposite way - the horizontal mode will take longer than the portrait mode. You'll notice in the portrait mode there are a number of white space lines that the laser can skip through, saving engraving time. In the landscape mode there is not white space for the laser to recognize as it moves down the page, taking the engraving time from 10:12 to 17:14. Experiment with the artwork that you use. It will quickly become second nature which mode works best for different types of artwork.

Engraving Time: 10:12
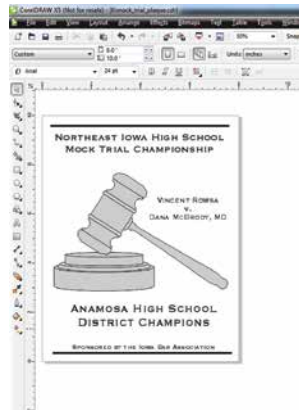
Engraving Time: 17:14
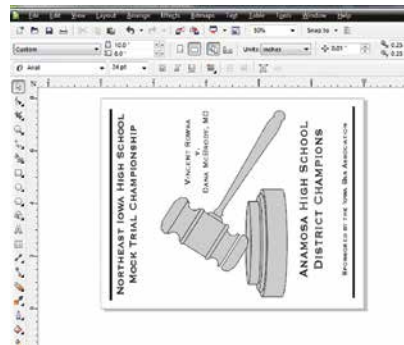
A third consideration for landscape or portrait art setup is material specific. Some materials, such as wood or plastics that have a grain or brushed look, will look better when engraved if the grain of the material runs parallel with the X-stroke of the carriage. While the orientation of material without a grain pattern is usually not important, it is important to keep this in mind with woods that have a stronger grain pattern.

Preferred

Less Desirable

Travel direction of carriage

Wood Grain

Wood Grain
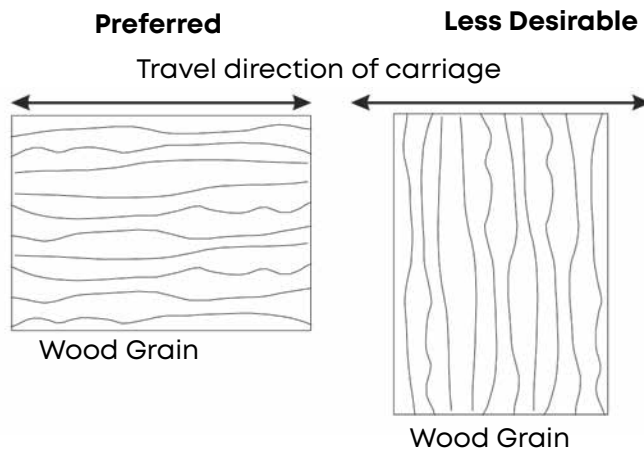
SECTION 8: SYSTEM FEATURES

IRIS™ Camera Positioning System

The Fusion Pro includes the IRIS™ Camera Positioning System which allows you to precisely place your artwork on screen in seconds. The overhead camera(s) provide a live picture of the working area for accurate artwork placement, and a camera at the lens allows the system to find preprinted registration marks. Your Fusion Pro will either have 1 or 2 overhead cameras, depending on whether you have the 32 or 48 model.

Using the IRIS™ Camera

The live preview of your projects can be viewed within the Epilog Dashboard under the Preview tab. The IRIS™ Camera Positioning System will provide the most accurate results when the piece being cut or engraved is placed directly underneath the camera(s), and the table level is focused to the piece. If the piece is not in focus on the table, the artwork may not be aligned properly in the live preview. The camera(s) may also be calibrated for improved accuracy. **For more information, see "Camera Calibration" on page 136.**

Note: The top door of the Fusion Pro must be completely shut to use the live preview in the Epilog Dashboard.

Touch Screen

The laser of the Fusion Pro is controlled by a 7" capacitive resolution touch screen. This feature allows you to select between jobs, change settings, and more. For more information on how to use the touch screen, **see "SECTION 6: CONTROL PANEL" on page 71.**

SECTION 8: SYSTEM FEATURES

Air Assist
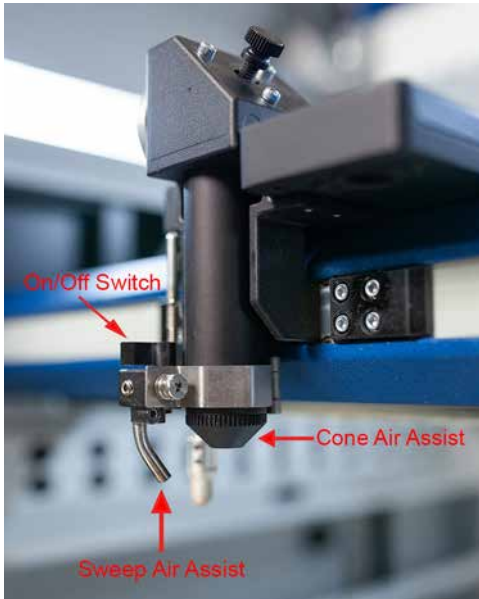
The Air Assist feature on the Fusion Pro Laser is used to keep combustible gases away from the cutting surface and to reduce flare-ups of more flammable materials as you cut through it, such as wood and acrylic.

The Air Assist directs a constant stream of compressed air across the material surface at the point of burn removing the heat and combustible gases from the work surface. The constant air stream helps reduce charring and scorching associated with materials, such as wood, rubber, and acrylic. The Fusion Pro systems also include an air compressor within the machine.

The Fusion Pro systems have two types of Air Assist:

• **Cone:** This feature directs air through the cone shaped part of the assembly, and permanently remains on while running any job to help keep the lenses clean.

• **Sweep:** This feature directs air through the Air Assist tube to the side of the cone. This feature has the option to be turned on or off by the switch directly on top of it.

Both types of Air Assist should always be activated during vector cutting operations to reduce the risk of fire! **For more information, see "FIRE WARNING" on page 1 of the manual.**

Auto Focus vs Manual Focus

In order to engrave or cut a crisp, clean image, your material must be the correct distance from the bottom of the focus lens. Setting the distance from the bottom of the focus lens to the top of your material is the process of focusing, and is accomplished by placing your material on the table and moving the table up or down.

Auto Focus

When you enter Jog mode and have jogged the lens carriage above your material, press the Auto Focus button to use the pluger Auto Focus. The table will then rise until the material touches the plunger, then set the table to the correct height. Your job should now be in focus.

Manual Focus

This photo shows the manual focus gauge that is used to determine the correct distance from the focus lens to the top of your material. This gauge is included with your system.

Place the object to be cut or engraved anywhere on the table of the machine. Select the **Jog** button on the touch screen and use the **Joystick** to bring the focus gauge to the object. Deselect the Jog button, then select the **Focus** button on the touch screen and move the **Joystick** up or down to move the table appropriately until your material just touches the bottom of the gauge. The speed at which the table rises or lowers can be controlled by applying varying pressure upwards or downwards on the **Joystick**. You may also fine-tune the table height in the Focus Menu. Once the focus

position has been established, flip the gauge back up into its locked position. Press the Focus button to leave the menu and then press the **Reset** key to bring the laser head back to its Home Position.

If your material has a taper or curve, pick an intermediate point between the highest and lowest points being engraved and focus on that point. In general, the area of the material being engraved needs to be relatively flat. If the area being engraved differs in height by more than about an .125" (3 mm), the image will begin to look "fuzzy" or out of focus.

Key Switch

The Key Switch feature is used to power the Fusion Pro on and off, and also allows you to lock out any unauthorized users by powering down the machine and removing the key.

Image Dithering

Dithering defines how the dot patterns will be engraved in raster images that contain grayscale graphics, blends, or color images. The Dashboard offers six different dithering patterns to enhance your engraving projects. The default mode is Standard. This mode can be used for all images including photographs. Dithering is used only for raster engraving and has no effect on vector cut lines.

Laser engraved photographs on wood usually require a third party software package to produce a good image that is suitable for the laser. Epilog recommends **PhotoLaser Plus** for this application. Users find it an invaluable piece of software that is easy to use and will produce much better looking images when working with wood. Please contact your Epilog representative to learn more about this software package. For more information on using PhotoLaser Plus, **see "PhotoLaser Plus" on page 98.**

What is Dithering?

300 DPI Standard Mode	300 DPI Stucki Mode

The best way to show dithering is to look at the exact same photo engraved in Standard mode and Stucki mode. Both photos were engraved at 300 DPI. With the two different dithering patterns you achieve a very different result, with a more structured pattern for the Standard mode, while the Stucki mode results in a more random pattern that looks more natural and pleasing to the eye.

SECTION 8: SYSTEM FEATURES

Dithering is a great way to enhance your engraved products, but it is very material dependent. A dithering pattern that looks good on marble, might look very different when engraved on plastic. Give yourself some time to experiment with the different dithering patterns. It's easy to do and once you have a feel for it, you will be able to use it with confidence

The drop-down list of dithering patterns is easier to think about if you separate the six options into two categories that we will refer to as Clipart and Photograph:

Clipart Modes

Standard

- **Standard:** This mode is the default mode and will be used for most engraving jobs that include text and clipart at 600 DPI.
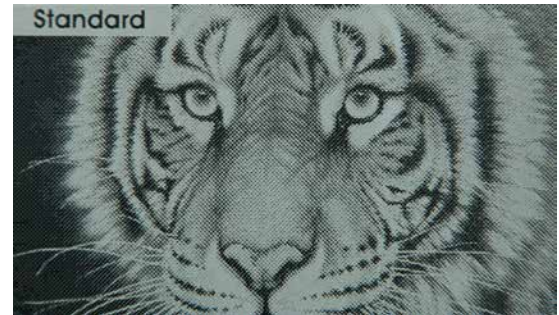
Photograph Modes:

Floyd Steinberg

- **Floyd-Steinberg:** Produces an almost wave-like pattern to an image. This works well for some photos containing a great deal of detail. Photos with more monotone swatches of color may not be as pleasing as Jarvis or Stucki modes.

Jarvis

- **Jarvis:** Many users find this mode good for engraving photographs at 300 DPI. This mode produces a very nice looking pattern on almost all photos.

Stucki

- **Stucki:** This mode produces results that are only marginally different than the Jarvis dithering pattern. It is also very good for engraving photographs at 300 DPI. The differences between Jarvis and Stucki are very subtle.

- **Bayer:** This mode is an efficient and widely used halftoning technique. It is easily distinguished by its noticeable crosshatch patterns. Bayer (ordered) dithering is more suitable for line-art graphics.

Experiment with the different dithering patterns to determine which effect is most pleasing. It is not mandatory that you use the clipart modes with only clipart images or photograph modes with all photographs. Many users prefer one of the photograph modes for many clipart images, and one of the clipart modes for photographs. The choice is entirely up to you and will take some experimentation.

Color Mapping

Using Color Mapping

When the **"Split By Color"** option is selected, the graphic's single process will split into separate processes by each color, allowing you to apply each color's settings individually. The laser will then use the settings assigned to each color.
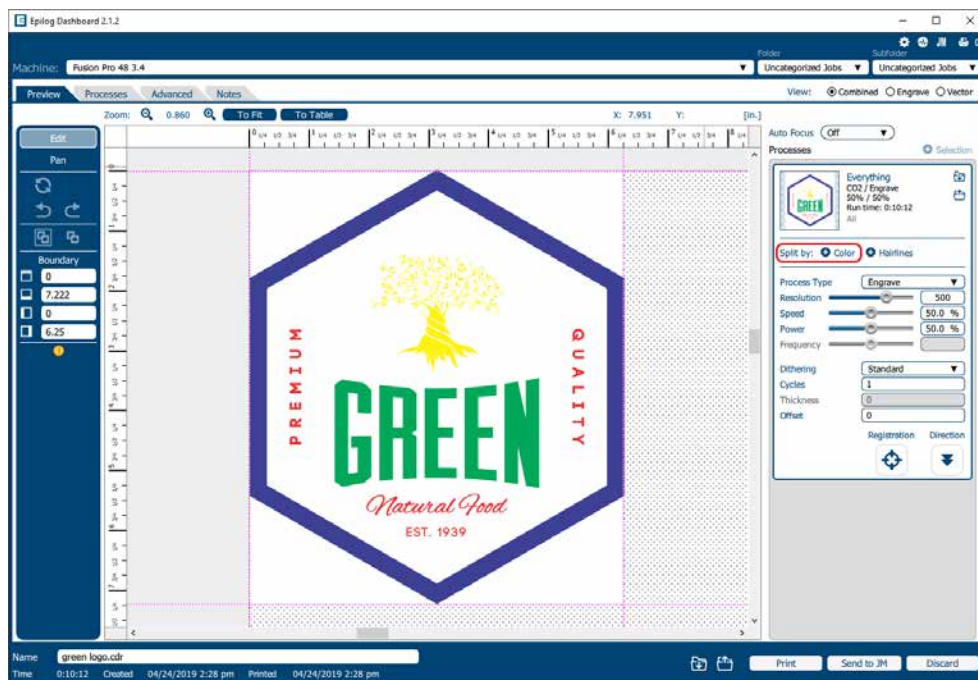
Color Map Settings

The Color Map Settings can be found under the Processes section located on the right side of the window, which lists of all of the color mapped processes.

1. **Select a color** in the Processes area. We selected the color Yellow. Once selected your laser settings will be revealed.
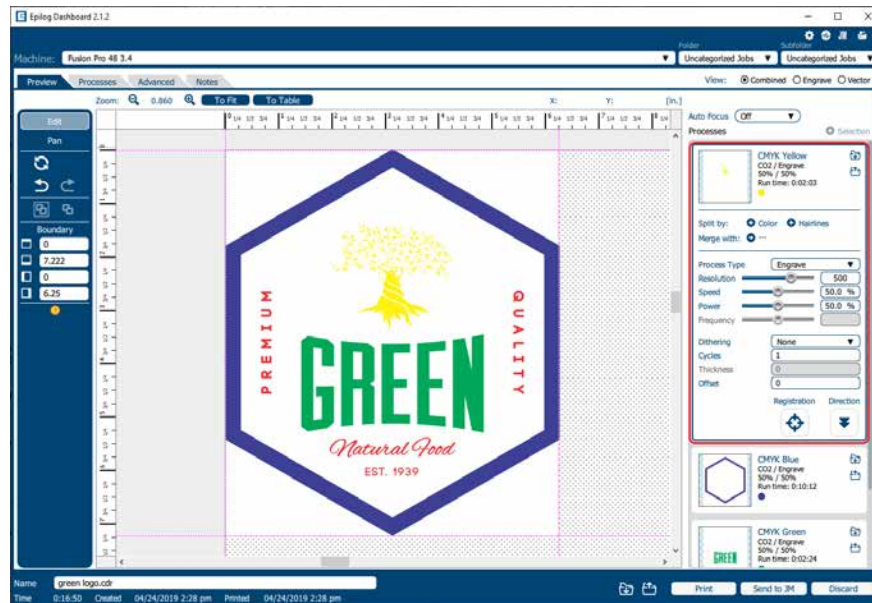
2. **Adjust the laser settings** on the selected process.

3. Once the laser values have been adjusted, you may select any other color processes that need to be changed.

4. When any process tabs are collapsed, you can still see their speed and power settings displayed under each process name.

Color Mapping Functions

Engrave: Setting a specific color process to Engrave means the laser will apply the same engraving settings to all objects set to that color.

Vector: Setting a specific color process to Vector means the laser will apply the same vector settings to all objects set to that color.

Speed: Applies a speed setting for all objects of the same color.

Power: Applies a power setting for all objects of the same color.

Frequency: Applies a frequency setting for all objects of the same color (Vector only).

Offset: Offset allows you to focus at any point above or below the surface of your material. When engraving acrylic many users like to focus above the surface to produce a "softer" finish to the engraving. Conversely, when cutting acrylic, many users like to focus about half way into the acrylic. Offset allows

you to do this automatically. A positive value will move the table away from the focus lens. A negative value, such as -.095, will move the table closer the focus lens.

Using Color Mapping for Multiple Speed and Power Settings

A fairly typical use for vector color mapping is in the architectural industry and making models. Users want to lightly mark one part of the work piece and cut out another part of the same piece.
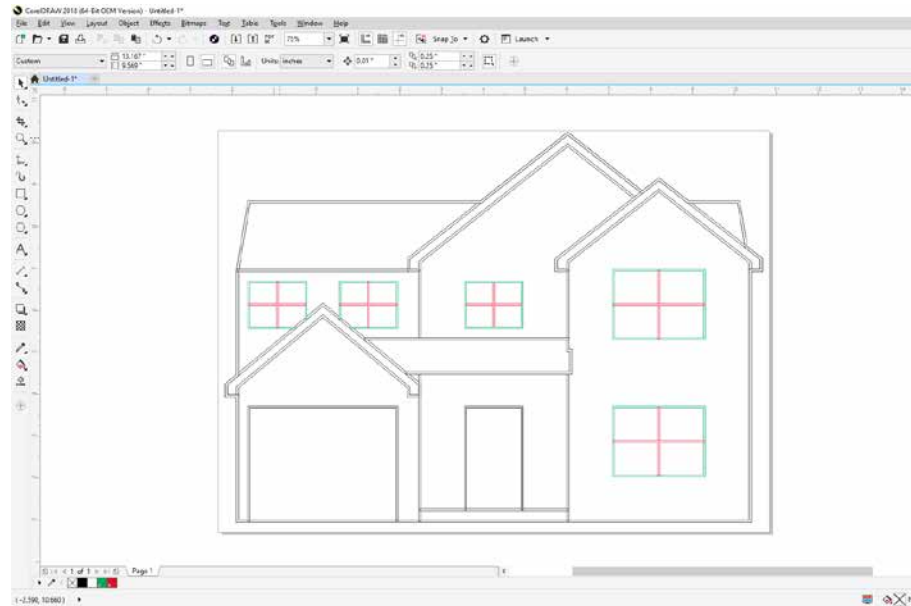
Usually, when using Color Mapping in Vector mode, users want to produce a different look on two separate areas of a single piece of material in a single job setup. To achieve a different look for each mark the marking processes require different speeds and powers so this is a perfect job for Color Mapping.

Note: While you could set the vector line you want to just mark to an engraving width, it takes much longer to engrave a box than to use vector settings to quickly follow the line and mark it.

The graphic shows a simple architectural drawing. The drawing is set up so that when we use Color Mapping, we can assign one speed and power setting to first lightly engrave the window frames and a different speed and power setting to then cut out the individual window panes.

Once you have split the graphic by color, the outside frame of the house will become one process, and the window frame and window panes will be individual processes as well.

You can use any colors you like for color mapping and are not restricted to using RGB or CMYK colors.

1. Make sure to select **Split By Color** so we can set up our color mapping settings.
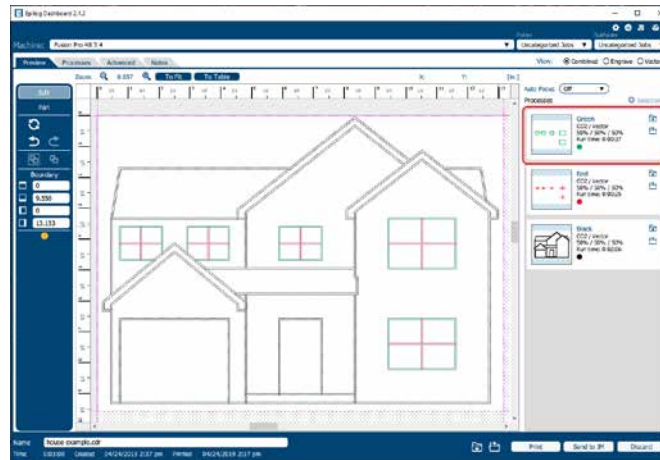
2. In our example we want to mark the green portion of the graphic first, so green must be the first color at the top of the list. In order to move it we just click and hold the process while dragging it up to move it up to the top position. We now have green at the top and red is the second color down. This is the order that the colors will be processed.

3. With the green color selected, we set a higher speed and lower power (50% speed, 10% power) to just mark the top of the piece. When you have your settings as you'd like them.

4. Repeat by selecting the Red color in the summary area, then adjusting the speed to 20% and power to 100%.

Using Color Mapping to Adjust Object Order

Another popular use for color mapping is to adjust the order a series of objects engraved or cut. In the example below, there are three columns of names we are engraving. If we engrave the left file in the image below, the laser carriage will have to travel all the way across the table, covering a lot of empty space, to engrave the image.

If we adjust the colors in each bar, we can setup the color mapping to engrave first the red bar, then the green bars in the center, and finally engrave the blue bar on the right side of the page. The engraving time drops from 39:09 to just 22:14 by using Color Mapping in the file setup.

Engraving Time: 39:09
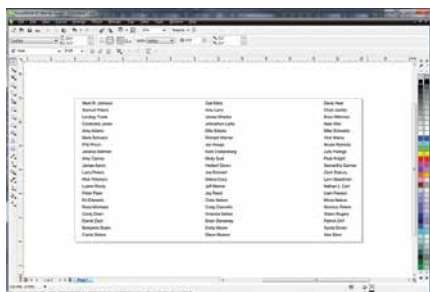
Engraving Time: 22:14
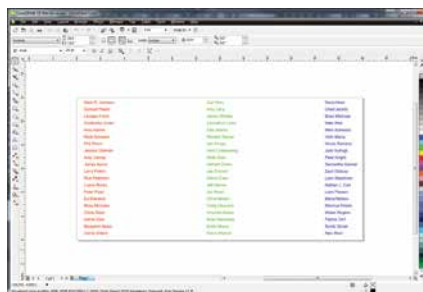
Additional Color Mapping Notes

- When color mapping is used, it always starts from the top color in the Map List and then descends through the remaining colors.

- There's one important distinction to recognize about how colors are raster engraved in standard engraving mode vs. Color Mapping mode. In standard engraving mode different colors are interpreted as different shades of gray that will produce different fill patterns when engraved. In Raster Color Mapping mode all of the different colors are engraved as if they have a black fill. There is no way for a color to produce both a fill pattern and be color mapped at the same time.

Non-Mapped Colors

Non-mapped colors will be processed last and will be processed using the Speed and Power settings from the General tab. An example would be artwork that has black lines as well as the red and green we are mapping. The black lines will be processed last at the speeds and powers that are set in the General tab.

Color Mapping in Combined Mode

Color Mapping in combined mode requires a little more planning than Raster only or Vector only modes.

1. Any object that is color mapped will be raster engraved first in the order the colors appear in the Summary section of the tab. Any other raster objects that are not color mapped will then be raster engraved using the raster settings found in the General Tab.

2. After all of the raster objects have all been engraved, the vector objects will be vectored in the order they appear in the Summary section of the tab. Any other vector objects that are not color mapped will then be vectored using the vector settings found in the General Tab.

For most jobs, Color Mapping is a powerful and easy tool to use and understand. Please keep in mind that because you can control seven different variables and 17 different colors doesn't mean that you should. With so many different settings available in a single setup it has the potential to get overly complicated. Sometimes it's easier to scale back on how many colors a job should use.

Red Dot Pointer

The Red Dot Pointer is a visible laser beam that runs in the same line as the invisible CO2 laser beam. It is useful for showing the location of the laser head when using Jog or Focus mode.

SECTION 8: SYSTEM FEATURES

Emergency Stop Button

On the top of the laser you will see a large, red Emergency Stop key. If there is an emergency, such as a fire, immediately press the Emergency Stop Button. The laser carriage will immediately stop and the system will shut down.

To reset the system, you must **turn off the system** using the Key switch, then twist the **Emergency Stop Button** clockwise to release the system, then **turn on the laser**.

If your laser ever stops running and you can't turn it on, check to see if the Emergency Stop Button has been pressed by accident.

Front Access Door

The front access door will open up to 180 degrees, and is usually used for easy loading and unloading of palletized materials. The door is interlocked and the laser will not fire if the door is open.

Task Plate/Vacuum Hold-Down Table

Task Plate

On the Fusion Pro, the task plate is used as the standard engraving table for jobs that do not include vector cutting. The task plate is stainless steel and allows you to use magnets to hold oddly shaped items in place. On the Fusion Pro 48 there are two taskplates, allowing you the option to split your table to both engrave and cut materials in the same process with a Vector Grid or Slat Table.

Vacuum Hold-Down Table

The holes in the task plate provide vacuum hold-down capability that keeps thin materials flat while engraving. The exhaust system is designed so that it evacuates from both the top and the bottom of the task plate when the task plate is at its highest position. The exhaust pulls air through the holes and forms enough of a vacuum that it will flatten slightly warped paper, wood, aluminum sheet stock and other materials. As long as the exhaust is operating and the task plate is no more than an inch (25.4 mm) below its highest point, the vacuum table will work.

If you have a piece of sheet stock that does not flatten out because it is not covering enough of the vacuum holes, you can use any material (including paper) to cover some of the exposed holes. Simply blocking most of the vacuum holes will be enough to flatten most sheet stock as long as it is not too severely warped, bent or too rigid. Magnets can be used to hold oddly shaped items in place if needed.

Exhaust Plenum

The Fusion Pro incorporates an exhaust plenum and an integrated Vacuum hold-down table. Both the exhaust plenum and the hold-down table use the airflow from the exhaust fan for two distinct functions.

1. **Exhaust Plenum:** The exhaust fan moves air from the front towards the rear of your machine and out the exhaust plenum. This air removes combustible gases and smoke through the exhaust plenum. The Fusion Pro has risers underneath the task plate(s) with funnels that are larger toward the front of the machine and smaller toward the back of the machine to provide uniform air flow through the entire table area. There is one exhaust port at the back of the Fusion Pro 32 and two at the back of the Fusion Pro 48.

2. **Vacuum Hold-Down Table:** There is a single exhaust port on the back of the Fusion Pro 32 and 48 that pulls air down through the table.

SECTION 9: OPTIONAL FEATURES

Vector Cutting Table/Vacuum Hold-Down Table

Vector Cutting Table

The optional Vector Cutting Table is primarily used for vector cutting jobs where the laser penetrates all the way though the material being cut. The Vector Cutting Table lifts your work material off of the crumb trays and allows the laser beam to penetrate all the way through the material without reflecting back up onto the backside of your work.

On the Fusion Pro 48, a divided table allows you to use a vector grid on half of the bed and engraving table on the other half for increased versatility.

Slat Table

The optional Slat Table is a second option for vector cutting jobs. The Slat Table has bars that are adjustable and removable to help avoid any kind of grid marks appearing on the back of the piece you're engraving.

On the Fusion Pro 48, a divided table allows you to use a slat table on half of the bed and engraving table on the other half for increased versatility.

Whenever you are vector cutting there is the potential for small pieces to fall through the grid and collect in the bottom of the Vector Cutting Table. These small pieces present a very dangerous fire hazard. Remove and dispose of the debris in the Vector Cutting Table on a regular basis.

PhotoLaser Plus

The PhotoLaser Plus software package (PLP) is an optional addition to your Epilog Laser System created by CadLink that provides an easy method of transforming photographs for your laser engraver, as well as incorporating variable badge making features. This software is not intended to replace your other graphic layout software, such as CorelDRAW or Illustrator; however it is a great complement to your other software.

Epilog only supports PhotoLaser Plus and badge layout functions in the software. The full EngraveLab software is a powerful standalone graphics package. Support for the full EngraveLab is available through CadLink.

Setting Up the PLP Software

Epilog has teamed up with CadLink to bring you a special custom version of PhotoLaser Plus designed to only be used with an Epilog Laser system. Primary functions such as printing, Copy, Paste, etc are unavailable unless an Epilog print driver has been established as the default printer within PLP.

1. Go to **Devices and Printers** on your computer and check your print driver's name to be sure the word **Epilog** is included. If it is, you are ready to install the software.

2. If the word **Epilog** is not included in the laser's name, right click on the icon for the laser and select **Printer Properties**.

3. In the **General tab**, change the name of the printer in the first field to include the word **Epilog**.

4. Insert the CD that came with the software into the disk drive and follow the prompts for a Full Install.

5. After the install is complete, you will need to activate PLP. Open the software and click the OK key on the pop-up screen.
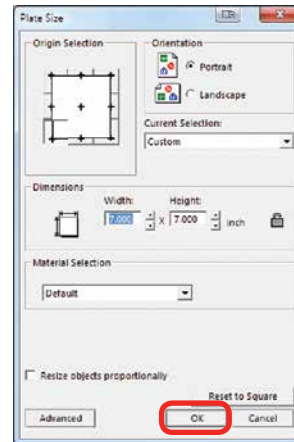
6. Place any graphic on the page. This can be an object, text, or an imported image. Print it by going to **File** then **Print**.
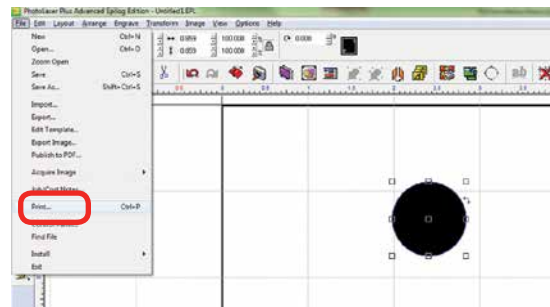
7. **Select your laser in the driver list**. Make sure this has the name Epilog in the driver, or move back to step one. Next close the print window by clicking the red X.
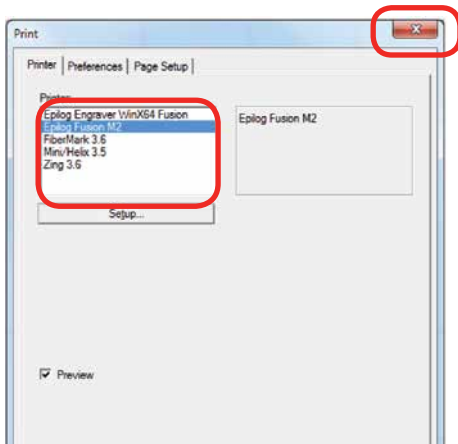
8. Close PLP, then reopen the software and you are ready to start using the software.

PhotoLaser Plus Photograph Transformation

When you first open PLP, your first step is to set your plate size, which is your page size. You can set this to match the material you are engraving, or the size of the engraving table.
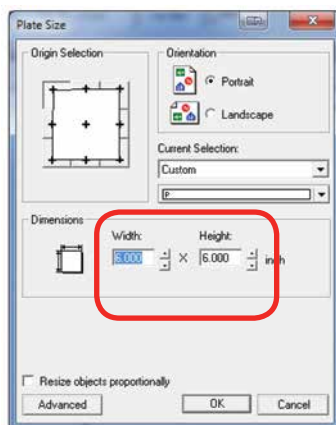
Import your photo to be transformed. Select **File** then **Import**.
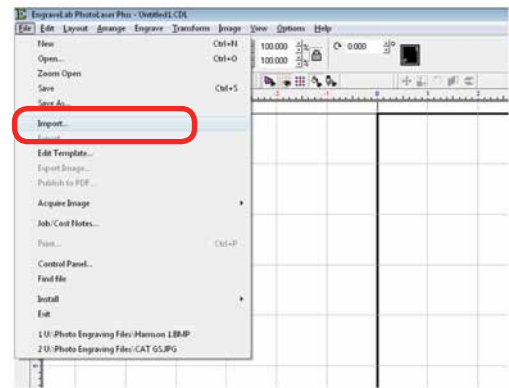
If the file looks bitmapped after the import, select **View** then **Show Reduced Bitmaps** to see the higher resolution version of the image.
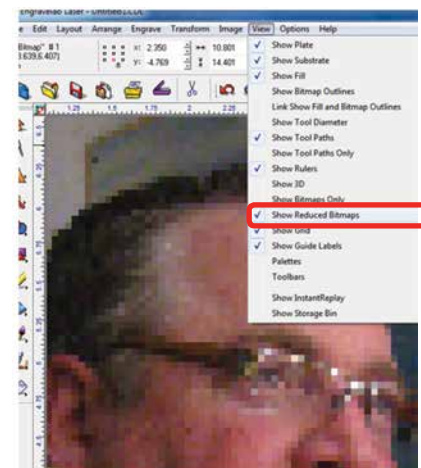
9. **Crop the Photo:** If you do not want to engrave the entire photo, double click on the photo to open the bitmap tools at the top of the page. Select the Rectangle or Ellipse tool to frame the area you want to crop. With the proper area framed, press the Crop key to finalize the crop.
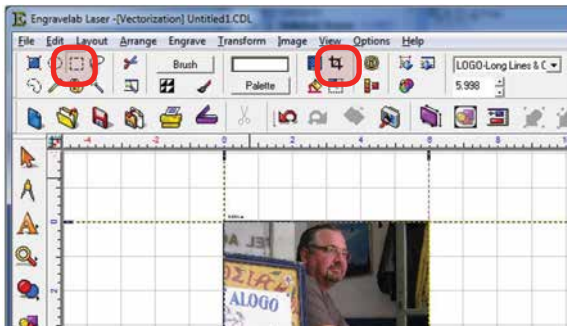
10. **Resize the Photo:** You must now resize the photo to the size you want to engrave. With the photo selected, type in the X and Y dimensions of the photo.
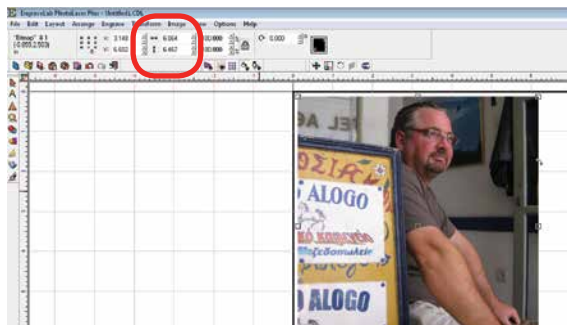
11. **Set the Resolution:** This number must match the resolution at which you will be engraving the photo. Select **Image** then **Image Size** from the menu. Type in the resolution and select **Apply**.

Make sure you have selected **Apply** or the new resolution will not be saved with the image.

12. **Transform the Photo:** With the photo resized and the resolution set, we are ready to transform the photograph. From the menu select **Transform** then **Photo Laser**. Choose **Interactive** to select the material you want to use. Choosing Automatic will apply the material settings you used on your last project.
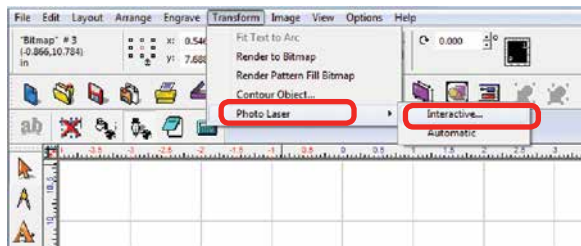
13. Select the yellow folder to open the materials folder.
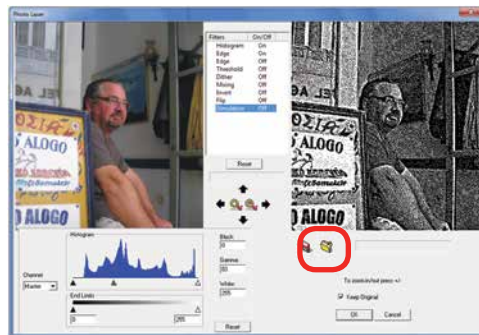
14. Choose the material you are going to engrave. If you don't see the Epilog settings, they can be downloaded from epiloglaser.com/photolaserplus_instructions.htm.
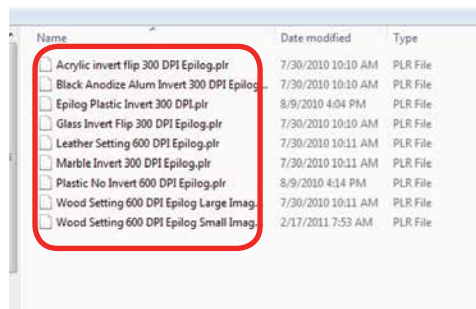
15. If you want to replace the photograph with the new 1-bit photograph, **uncheck Keep Original**, otherwise it will place the transformed image next to your original on the page. Press the **OK key** to finish.
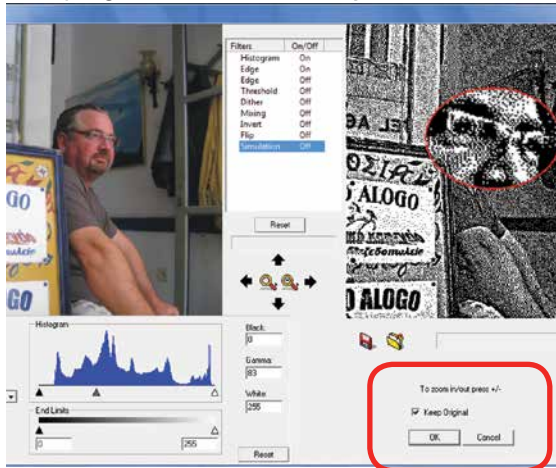
16. You can now print the file to the laser.

 Make sure you **print the image at the same resolution as you set in step 6**, or the image will not engrave correctly!

Using CorelDRAW in Conjunction with PLP

This section takes you through the steps to prepare a file in CorelDRAW and use PLP to transform the image. This allows you to use the powerful layout features of Corel or other design software along with the photo transformation capabilities of PLP.

1. Start by setting up your file in CorelDRAW. We've designed an 8" x 10" plaque, added the text and placed a box as a placeholder for the photograph.
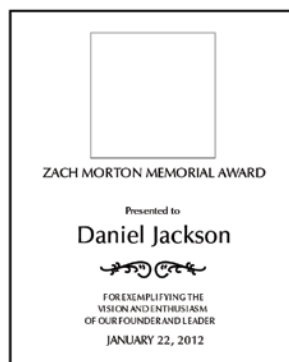
2. **Crop the Photograph:** Select the photograph, then select from the menu bar **Effects, PowerClip**, and **Place Inside Container**. Click the outline of the photo placeholder to place the photo inside the box.

3. To resize or move the photograph in the powerclip box, right click the photo and select **Edit Powerclip**. When you are finished adjusting the image, right click and select **Finish Editing this Level**.

4. **Convert to Bitmap**: With the photo selected click **Bitmaps**, then **Convert to Bitmap**.
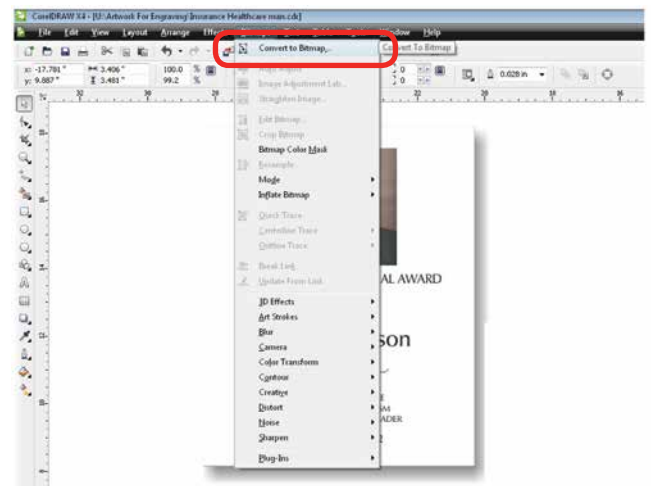
5. Set the resolution to match your engraving resolution. This is usually 300 or 600 DPi. Set the color mode to either RGB, CMYK, or Grayscale (it doesn't matter which one).
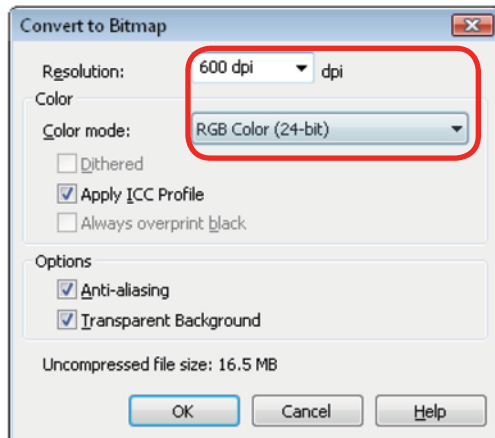
6. Copy the photo in Corel by selecting **Edit**, then **Copy**.

7. Open PLP and paste the image anywhere on the page by selecting **Edit**, then **Paste**.

8. Transform the photo by following steps 6 through 9 in the previous section.

9. After the transformed image is prepared, select **File** then **Export Image**. Export the file as a .bmp. Make note of where you saved the transformed file.

10. In CorelDRAW select **File** then **Import** and select your transformed file. Place the photo in the designated space **without resizing the image**.
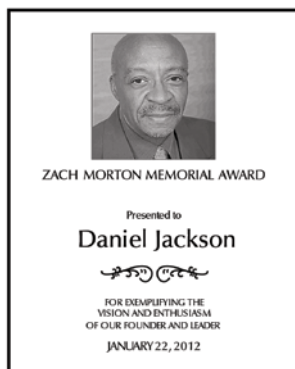
11. Print the file from CorelDRAW as you normally would, using the same resolution that you selected in step 5.

Creating Badges with Variable Names

Another feature of PhotoLaser Plus is it's flexible badge layout function. We'll show you how to setup multiple items, such as badges, on one page with different names on each badge.

1. Start by opening a new file and setting the plate size to the equivalent of one badge. 3" x 1" in this example.

2. Setup the badge by importing any images.
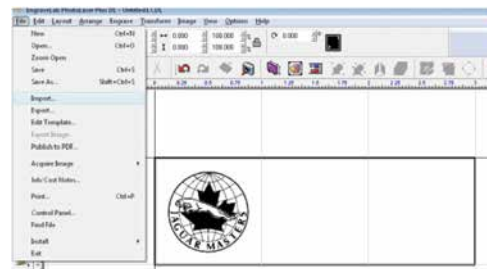
3. For the variable name, go to the **Text** tool and select the second option, the **Text Compose** tool (this tool allows you to auto condense long names).
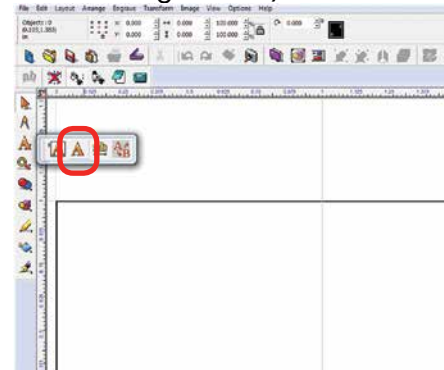
4. Click and drag a box within the badge. Size it to approximately accommodate your longest text string.
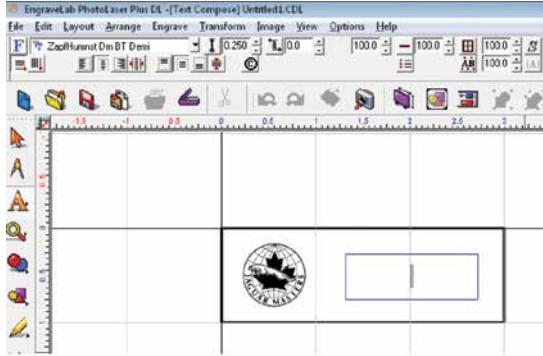
Make sure it fits in the badge area. Be sure to click and drag after selecting the tool. Just clicking in the badge will invoke a different use for the tool and you will not be able to auto-condense your names.

5. Type your variable in the text box. Here we used the word **Name**. Move it to its proper location on the badge.
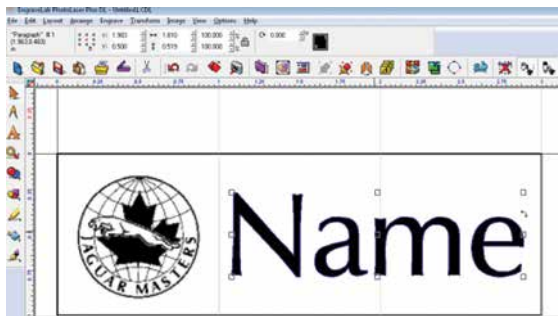
6. We're now ready to create the badges. First, **select everything on the badge**. If you don't select everything, the unselected objects will not be repeated on the badges.

7. Select the Badges icon in the tool bar.
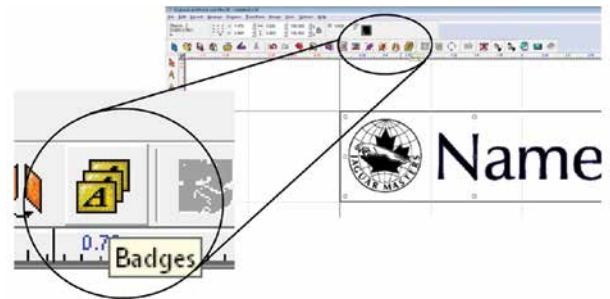
8. Set the Badge Setup parameters as shown below:

1 **Number of Copies:** the number of badges you want to create.

2 **Score Lines:** Optional setting that you can use to vector cut badges if you're using material like plastic.

3 **Use Plate:** It's important that this be checked so that the graphic corresponds with the actual plate size you're using.

4 **Custom Size:** The custom plate size corresponds to the size of your material you're using to engrave the badges. We're going to laser a 12" x 12" piece of plastic, so we've set this parameter to 12" x 12".

5 **Compress text equally over copies:** You do not need to check this box. Long names will automatically be compressed.

6 **Replaceable Items/text:** Select the variable text you typed in earlier, in this case.

7 **Replacement Data File:** If this box is checked you can browse for a data file that has the names already entered, such as a tab delimited text file. If you do not check this box, a box will open allowing you to type in the data.
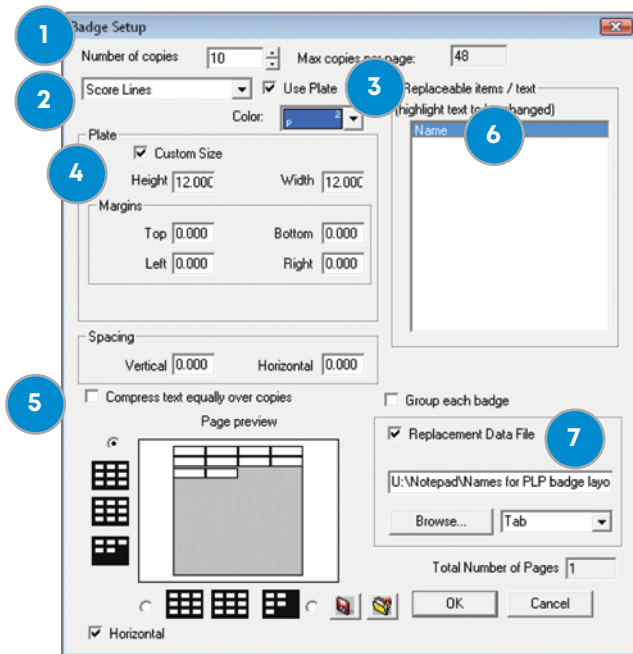
Troubleshooting Badge Layout

Problem: The logo doesn't appear on the badges.

Solution: In step 6, you didn't select everything on the badges before clicking the Badge tool.

Problem: The word **Name** is repeated on all of the badges.

Solution: In the badge setup parameters you didn't highlight Name as the field to replace.

9. After clicking OK, the text substitution box will open allowing you to enter or adjust the names for your badges.

10. After clicking OK, you will be taken back to your drawing page and badges will be properly laid out and populated. You can see that we have ten badges. One was left blank intentionally because we had ten badges and only nine names. You're ready to print your badges to the laser!
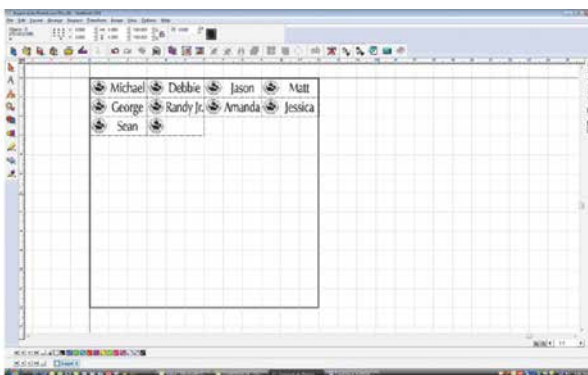
SECTION 10: ENGRAVING MATERIALS

CO2 Laser Materials/Techniques

Your Epilog Laser system is very versatile. It can mark and cut many different materials. Following is information regarding some of the materials the laser will mark and cut. Check the Epilog website (www.epiloglaser.com) periodically for new laser applications, tips and techniques to use with your laser.

For specific information regarding materials not mentioned below, please contact your local Epilog representative. See "Contacting Technical Support" on page 119.

Acrylic

Fire Warning: Your laser system uses a high-intensity beam of light that can generate extremely high temperatures when it comes into contact with the material being engraved, marked or cut. Some materials are extremely flammable and can easily ignite and burst into open flame setting the machine afire. This open flame is very dangerous and has the potential to destroy not only the machine, but the building in which it is housed.

Experience shows that vector cutting with the laser has the most potential to create an open flame. Many materials are susceptible to igniting, but acrylic -in all its different forms - has been shown to be especially flammable when cut with the laser.

For more information on fire hazards associated with lasers, please **read the full "FIRE WARNING" on page 1 of the manual.**

Choosing the Right Type of Acrylic

There are two types of acrylics and each is suitable for different applications. **Cast acrylic** sheets and objects are made from a liquid acrylic that is poured into molds that can be set into various shapes and sizes. This is the type of acrylic used for the awards you see on the market. Cast acrylic is ideal for engraving because it turns a frosty white color when engraved. While it can be cut with a laser, it will not give you flame-polished edges.

The second type of acrylic that you will use with your laser is formed into sheets by a machine and is called **extruded acrylic**. It is formed through a higher-volume manufacturing technique, so it is typically less expensive than cast, and it reacts very differently with the laser. Extruded acrylic will cut cleanly and smoothly and will have a flame-polished edge when laser cut. But when it is engraved, instead of a frosted look you will have a clear engraving.

Acrylic Engraving Techniques

- Most acrylic is engraved on the backside to produce a look-through effect from the front surface.

- Remove the protective adhesive paper from the back of the acrylic before engraving. Leave the front protective cover layer on to prevent scratching while handling the acrylic. Since you are engraving the backside of the acrylic, you will need to reverse or mirror your artwork before sending the job to the laser.

- Engrave the acrylic at a high speed and low power. A small amount of power is all it takes to mark acrylic and high power levels tend to distort the acrylic when engraving.

- There are a large number of acrylic products that are painted on one side to add color. You can engrave directly through the paint into the acrylic for a very nice presentation effect. Leave the speed the same as if you are engraving clear acrylic, and increase the power about 10% to get completely through the paint. Applying too much power to the paint will melt it and cause distortion.

Acrylic Cutting Techniques

Acrylic is one of the most popular cutting materials available. It comes in a variety of colors and thickness. Laser cutting produces very nice edge quality without the need for polishing or secondary clean up.

- Use the Vector Cutting Table to elevate the acrylic before cutting. Air Assist will greatly reduce flaming when cutting acrylic and should always be used for this material. Information on accessing the Vector Cutting Table is included in **"Vector Cutting Table" on page 97.**

- To find the perfect settings for cutting acrylic, you will need to experiment. Test different speed and power settings by cutting a small shape from a scrap piece of acrylic you will not be using.

- Cutting acrylic is usually best achieved with relatively slow speed and high power. This combination allows the laser beam to melt the edges of the acrylic and produce an almost flame-polished edge.

- Acrylics generally require only a single pass to cut, but thicker acrylics may need two passes. Some users find that spritzing the protective adhesive paper with water produces a better edge when laser cut.

- Setting the focus distance at the center of your acrylic sheet will produce better edge quality than focusing on top of the acrylic sheet.

- **Warning!** Never leave your laser unattended when vector cutting any material! Acrylic is very flammable. **Read the full "FIRE WARNING" on page 1 of the manual.**

Anodized Aluminum

Anodized aluminum is a coated aluminum that comes in a variety of colors and can usually be easily engraved with a CO_2 laser.

- Black anodized aluminum is great to work with because it turns white when engraved and provides the best contrast of all of the colors of anodized aluminum.

- Some colors of anodized – red for instance – will not turn completely white when laser engraved. Red anodized will produce a light pink color. Performing a second pass can result in some improvement, but usually a slight shadow of color will remain.

- Engrave anodized aluminum at high speeds and low powers for crisp, clean results. Too much power applied to the anodized coating will distort the engraving and tends to over-burn the image.

- **Warning!** Metals are reflective. Using full power with them can potentially cause damage to the machine.

Brass - Painted

Since the frequency of the CO2 laser is not compatible with bare metals, uncoated brass cannot be laser engraved. For bare-metal marking you will want to use an Epilog FiberMark system. In order to engrave brass with a CO2 laser you need to use brass that has some sort of coating – typically paint. The laser removes the paint and exposes the brass substrate.

There are two basic types of engraveable brass available, but they are not all compatible with the laser.

- By far, the most popular laser brass is actually brass-coated steel. First, a steel substrate is coated with a thin layer of brass. Next, the brass is polished to a reflective finish and a coat of lacquer is applied to the brass – Victory's LaserBrite™ product has a lacquer finish. Finally, a paint coating is applied on top of the lacquer for the finished product. When laser engraving brass-coated steel, you are removing only the paint and exposing the polished brass coating that is protected by the lacquer. The lacquer prevents the brass from oxidizing and the bright reflective surface will stay bright for years.

- Some manufacturers also sell painted brass that is solid brass, not brass-coated steel. If the brass is polished before the paint is applied you will have a bright, reflective engraved surface. If the brass is not polished, the result will be a dull, tarnished brass that will require a secondary polishing process after laser engraving. This is time consuming and most engravers do not want to spend the time and effort necessary to turn this into an acceptable product.

- **Note:** Always ask before lasering painted brass if you don't know the substrate! If you are unsure if your piece is brass-coated steel or genuine brass, you can test the material with a magnet. A magnet will stick readily to brass-coated steel, but since solid brass is not magnetic, a magnet will not adhere to solid brass.

Painted Brass Engraving Techniques

- Engrave painted brass with a high speed and low power setting. It takes very little power to remove the paint coating and too much power will melt the paint and distort the image. If your mark on brass is turning out "fat" or has a balloon appearance to it, you are probably using too much power. Reducing the power will bring back the nice sharp images that are normally produced with painted brass.

- **Note:** Use caution when trying to engrave brass coated pens. Many pens have a very hard epoxy paint that is completely unacceptable for CO2 laser engraving. You should only use pens that you have experimented with or that are specifically designed for CO2 laser engraving. Be aware that there are many pens that can be laser engraved with a fiber laser but these pens are usually not compatible with the CO2 laser that you are using.

- Some paints are "almost" CO2 laser engraveable. If you engrave through the paint and there is a slight shadow remaining, try to clean the engraved area with alcohol or lacquer thinner. Depending on the paint, there is a good chance that the shadow will disappear and an excellent engraving result achieved.

- Use caution when trying to engrave blue painted brass. Blue paints contain very aggressive pigments that penetrate the metal surface and it can be extremely difficult to remove all of the blue color, but again, try alcohol or lacquer thinner to remove the shadow.

Glass

When a laser strikes glass it fractures the surface but it will not engrave deeply or remove material. The fracturing of the glass surface will produce a frosted appearance but can cause roughness and chipping depending on the type of glass being engraved. While the frosted appearance is desired, the roughness and chipping are not. Below we explain how to eliminate the roughness and produce a very smooth frosted finish.

The composition and quality of glass varies widely and you cannot always predict the effect that you will achieve. It is always best to experiment with an unfamiliar glass source. Generally speaking, flat glass tends to have a very consistent hardness throughout, and the engraved areas do not tend to have lighter and darker areas. Bottles on the other hand, tend to have soft and hard spots that will cause the engraved area to appear lightly frosted in one area and heavily frosted in another. Engraving at medium speed and high power will somewhat compensate for this, as will two or more engraving passes.

While the laser beam itself is very hot, the heat does not build up easily and it should not prevent you from engraving onto full bottles of wine, champagne or other filled glass bottles. Laser engraving filled bottles is a very popular method of creating custom presentations for special occasions. The laser will not damage the liquid inside the bottle, and as long as you are not completely engraving away a large section of bottle you have very little chance of breaking the bottle.

Glass Engraving Techniques

To produce a smooth frosted finish, here are some tips:

- **300 DPI:** Using a lower resolution, around 300 DPI, produces a better result on glass as you separate the dots you are engraving.

- **80% Grayscale:** Change the black in your graphic to 80% black to improve the engraving quality.

- **Jarvis Dithering:** Running with a Jarvis dithering pattern in the driver (you'll find this under the raster speed and power settings) will also help provide a smoother finish.

- **Masking:** Some people find that applying a thin, wet sheet of newspaper or paper towel a little larger than the engraving area also helps with heat dissipation and improves the engraving. Just be sure that there are no wrinkles in the paper after it is applied.

- **Dish Soap:** Using your finger or a paper towel, apply a thin coat of liquid dish soap – any kind will do – over the area to be engraved. This will dissipate the heat when engraving.

- **Polish:** If there are small shards of glass, you can polish the area with a ScotchBrite pad or something similar.

Note: You need to be especially careful when laser engraving leaded crystal. The lead in the crystal expands at a different rate than the crystal does and this can cause cracking and breakage of the crystal. Using a lower power setting can help this problem, but we always recommend having a spare in case of breakage.

Combining Laser Engraving with Sandblasting

Combining the best of both processes, you can use your laser to engrave the artwork then use sandblasting to provide a deep etch into glass. Using the laser to create the artwork mask is an ideal process for one-of-a-kind custom pieces as well as large production runs. This eliminates the photo process usually associated with sandblast mask.

1. Apply an adhesive-backed mask material to the glass that you are going to engrave.

2. Laser completely through the mask and into the glass.

3. Remove the glass from the engraver and sandblast to the desired depth.

4. You now have a sandblasted glass presentation with the detail of laser engraving!

Notary Seals: Delrin

Notary seals can be easily manufactured using 1/16-inch (1.5 mm) thick delrin plastic. A seal consists of two pieces - a male die and a female die, both shown below. The male die consists of white lettering on a black background and the female die is an inverted and mirrored image of the male. Inverting and mirroring are easily accomplished in most graphics software packages. Simply duplicate the male die, invert the black and white colors, and then mirror the image.

Male Artwork   Female Artwork
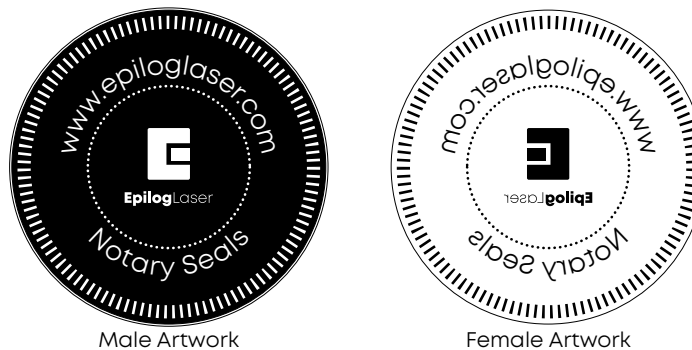
The male image should be produced without the use of outlines around the text or graphics. Add a .007 to .010 inch (0.178 mm to 0.254 mm) outline to the text and graphics of the female die. This outline creates a large enough void between the male and female dies to emboss paper without tearing.

Apply a .001 outline around the seal to define the outside edge of the seal. Use the Combined Mode to first raster engrave the seal and then vector cut out the seal.

Plastic Engraving/Cutting

There are two types of available engraving plastics: rotary plastics and laserable plastics. Rotary plastics are designed for rotary engraving systems that use a mechanical spinning bit to remove material. Therefore, the depth of the top layer or "cap sheet" was designed to make it easy to rotary engrave. Cap sheet thickness was approximately .010 inches (0.254 mm) thick and laser engraving was nearly impossible because by the time you applied enough power to get through the cap sheet the laser melted and deformed the plastic.

Laserable plastics have been developed with a thinner cap sheet that is .002" to .003" (0.051 mm to 0.076 mm) thick, providing much better engraving and cutting characteristics. These plastics are commonly referred to as micro laminates; micro-surfaced, or simply laser engraveable plastics. These plastics are generally very easy to engrave with a laser since they all have similar characteristics.

Because there is such a broad range of plastics it is necessary to experiment to determine if a particular type of plastic is laser compatible. Different color plastics, even if they are from the same manufacturer, will have unique speed and power settings. Use the guidelines in this manual as a starting point when determining the correct speed and power settings. If you do not get acceptable initial results with the recommended speed and power settings, start experimenting by first changing only the power setting. If adjusting the power setting does not work, start over and adjust only the speed setting. Once you have acceptable results, record those settings for that particular plastic so that you do not have to repeat the experimentation process.

Plastic Engraving Techniques

- Always remove the clear protective cover layer before engraving.

- Once you have the correct speed and power settings you can improve your engraving results even more by taking the focus lens out of focus (lower the table) by about 1/16 (1.5 mm) of an inch. This technique enlarges the focus beam a little bit and provides more beam overlap on each pass of the laser. The greater overlap produces a smoother engraved surface on the plastic and eliminates the grooves that you sometimes see when engraving plastic.

- With some plastics it is best to engrave using two passes. The first pass cuts through the cap layer and the second pass cleans away the residue that some plastics leave behind.

- Another technique that can be useful is to mask the plastic before engraving with transfer or masking tape. This will prevent a buildup of residue on the plastic surface. Misting the transfer tape with water will reduce heat buildup and melting on sensitive plastics.

Plastic Vector Cutting Techniques

- Use a Vector Cutting Table to elevate the plastic before cutting. Air Assist will greatly reduce flaming when cutting plastic.

- Vectoring plastics is similar to vectoring other materials. First, experiment to determine if the plastic can be cut with the laser. Plastics that are up to 1/16 inch thick can usually be cut in a single pass. Thicker plastics may need two passes.

- As with engraving, it is sometimes necessary to mask and dampen the plastic before cutting. Even masking and wetting both front and backsides of the plastic is desirable on sensitive plastics that have very low melting points.

- **WARNING!** Never leave your laser unattended when vector cutting plastics! Plastic can be very flammable. **Read the full "FIRE WARNING" on page 1 of the manual.**

SECTION 10: ENGRAVING MATERIALS

- **WARNING!** Do not engrave PVC (Polyvinyl Chloride). PVC will destroy the optics and mechanics of your Epilog system. Cutting or engraving PVC will void your warranty. The only way to find out if there is PVC in your plastic is to the check the manufacturer's Material Safety Data Sheet (MSDS).

Wood

Solid Wood

Wood is by far the most laser friendly material available because it can be engraved or cut very easily. When engraved, lighter colored woods like Cherry or Maple produce very nice contrast where the laser burns away the wood. This high visual contrast is what makes lighter woods so popular when combined with a laser. There are many types of other wood products that are designed for use with the laser and many more that are waiting to be discovered by you.

Every type of wood has its own characteristics. Some wood is denser than other wood, with the denser, harder woods requiring more laser power to cut or engrave. Epilog recommends that when working with wood other than the ones listed in this section that you investigate the engraving and cutting characteristics before committing to use. There are woodworking shops in nearly every large city that will have a wealth of information on nearly all woods. If you have access to the Internet, search on wood to see what you find.

- The most common woods used with the laser are Cherry, Walnut, Maple, Alder, & Oak. These woods are considered hard woods, and have grains that work well with lasers.

- Grain can very greatly in density. Cherry, Alder, Walnut & Maple all have fairly little veins of grain in them, while Oak has medium to large veins in it. For example: If a large box was engraved into a piece of Cherry and a piece of Oak, the box engraved into the Cherry would have a very uniform appearance, the area engraved or the background would be smooth with little variation in height. The Oak on the other hand would vary greatly in height and have a very non-uniformed appearance.

- Cherry and alder are the most popular woods for engraving. The light, red color of these two woods provides an excellent contrast when engraved.

- **Engraving bare wood**: When engraving bare wood, the smoke and debris produced while engraving can become embedded into the grain of the wood. To reduce this effect, always engrave with the Bottom-Top setting in the driver.

- **Engraving stained wood:** A stained wood is preferable for engraving because excess smoke and debris can be wiped off the surface of the wood after engraving with water.

Manufactured Wood Products

When choosing a manufactured wood product for engraving and cutting, we have found MDF to be vastly superior to plywood when working with a CO2 laser. Since plywood is constructed of layers of wood glued together and the grain of the wood chips in the plywood run in different directions, it is difficult to obtain a consistent depth when engraving. Air bubbles within the plywood cause problems because they severely disrupt the laser beam when cutting. Because of the glue, air bubbles and other

factors it is virtually impossible to cut cleanly through plywood.

MDF is an engineered wood product with glued together wood fibers. Since there are not layers of wood glued together, like in the plywood, the engraving and cutting is much better. You will produce some charring on the edge of MDF when cut, so you may need to sand the edges after cutting.

Wood Engraving Techniques

- To create a quality image on wood, contrast and depth are usually desired. The higher the power levels, the higher the contrast and depth will be.

- Speed and Power Settings: Wood is a great material to laser engrave because it discolors when engraved and the depth of engraving is greater than most materials. The downside is that it takes a lot of power to deeply engrave wood at high speeds. Most wood can be engraved using full power no matter whether you are using a 30-watt laser or a 120-watt laser. Depending on the wattage of your laser, the best approach is to set the laser power at 100% and adjust the speed to obtain the desired depth.

- **Resolution Settings:** Wood is a very easy material to work with and you can produce very nice detail with as little as 300 DPI engraving. 600 DPI engraving into wood produces fabulous results, especially on photos.

- **Gray Scales:** Gray scales look wonderful when engraved into wood. The reason for this is that the wood will react much differently to each level of gray scale, providing amazing contrast. Experiment! Take a piece of clipart and ungroup it and change the colors so that they range from a dark color like red, to a light color like yellow, then engrave it. This will create a shading effect that is almost 3-D in its appearance.

Wood Vector Cutting Techniques

Epilog Laser Systems are ideal for cutting through solid wood material. The thickness of the wood that you can cut varies with the wattage of the laser and the hardness of the wood, but in general you can cut approximately ¼ inch (6.35 mm) wood with a 30-watt laser and up to ½ inch (12.7 mm) wood with a 120 watt laser.

- When cutting wood of any thickness, Epilog recommends the use of the Vector Cutting Table and Air Assist options. The Vector Cutting Table raises the wood off of the solid metal engraving table and supports the wood on an aluminum grid. The grid greatly reduces backside burning of the wood and also provides ventilation that allows the fumes and smoke to be exhausted to the rear of the engraving cabinet. Information regarding accessing the Vector Cutting Table is located in **"Vector Cutting Table" on page 97.**

- Air assist greatly reduces flaming that may occur if too much laser power is applied to the wood piece being cut.

- Depending on the type of wood being vector cut, it is sometimes advantageous to apply a cover of masking or transfer tape to the surface before cutting. The masking tape will reduce residue buildup on the top surface of the wood surrounding the cut line.

- Reduce the frequency settings in the driver to around 20 for a better laser cut edge. The laser will pulse less frequency, reducing the charring and burning on the side of the wood.

- If you are cutting through thicker materials, focus the table up so that the new 2" focal distance will be to the center of the wood.

Warning: Wood is a combustible material. Never leave your laser unattended while vector cutting any material. Air assist greatly reduces flaming that may occur if too much laser power is applied to the wood piece being cut. **Read the full "FIRE WARNING" on page 1 of the manual.**

Wood Cleaning Techniques

When laser engraving or cutting wood, resin in the wood comes to the surface, mixes with the smoke and is deposited as a residue. If the wood has a coating of polyurethane or lacquer the coating protects the surface of the wood from the resin/smoke damage. You can remove the resin from coated materials with a wet chamois or a sponge with a web cover. Some people like to use 409, Windex or other mild cleaning product, but water works well and is usually the most readily available wetting agent. The chamois that Epilog recommends has a sponge in the middle of it, and is available in the automotive car wash section of many Target stores or many automotive supply shops.

- If the wood is not coated with polyurethane, the resin and smoke will stain the surface and you will need to sand the surface to remove the resin.

- Never use a paper towel to clean the wood surface. The paper towel will shred and it is impossible to get the shredded fibers out of the engraved recesses of the wood. Most wood products that are designed for laser engraving will have a polyurethane coating so that they are very easy to clean.

Wood Color Filling Techniques

Color filling engraved areas of wood adds either greater contrast or a splash of color to your wood presentation. Normally, color filling is not required for lighter colored wood materials such as maple or cherry, but walnut can often benefit from adding a black color fill to provide more contrast. You will need to take some precautions when color filling wood, because if you are not careful, the liquid color fill material will absorb into the grain of the wood on the surface of the plaque where it is not wanted.

The best way to add a black color fill is shown below:

1. Apply a thin coat of Johnson's Paste Wax to the surface of the wood before you engrave it.

2. Engrave through the paste wax into the wood. Do not wipe off excess paste or residue after engraving.

3. Fill the engraved voids with Turtlewax "Color Core" black liquid car polish. The car polish will absorb into the engraved wood grain, but will not absorb into the wood grain that is covered with paste wax.

4. Wrap a paper towel around a block of material that has a flat surface. Rub the flat surfaced paper towel over the surface of the wood to clean off the excess car polish and paste wax. The flat surface prevents the paper towel from getting into the engraved recesses.

SECTION 11: SPECIFICATIONS

Fusion Pro Laser Technical Specifications

	Fusion Pro 32 (CO2)	Fusion Pro 48 (CO2)
Maximum Engraving Area	32" x 20" (812 x 508 mm)	48" x 36" (1219 x 914 mm)
Max Material Thickness	12.25" (311 mm) (2" lens)	12.25" (311 mm) (2" lens)
Laser Source Wattages	50, 60, 80, or 120 watt, CO2, air-cooled, metal Waveguide tube, 10.6 micrometers	
Standard Features	Radiance High Definition Optics (CO2), Air Assist, Red Dot Pointer, relocatable Home Position, LED lighting, integrated floor stand, brushless servo motors, Super-Silent Cooling Fans, Joy-stick controls, removable exhaust plenum.	
Intelligent Memory Buffer	Store unlimited files up to 1 GB. Rolling buffer allows files of any size.	
Operating Modes	Optimized Raster, Vector and Combined modes.	
Motion Control System	High-speed, continuous-loop, brushless DC servo motors using rotary encoding technology for precise positioning.	
X-axis Bearings	Ground and polished, stainless steel, Teflon coated, self-lubricating bearings. Dual blocks on X-axis for greater rigidity	
Belts	Advanced B-style Kevlar belts (X-axis) and steel cord (y-axis).	
Resolution	Fully-flexible and user-controlled from 75 to 1200 DPI.	
Speed and Power Control (engraving depth)	Computer-controlled in .001 increments up to 100%. Color mapping feature links Speed, Power, Frequency, Raster/Vector mode, & Air Assist On/Off settings to any RGB color	
Print Interface	10Base-T Ethernet, USB, or Wireless connection. Compatible with Windows XP/Vista/7/8/10.	
Size (W x D x H)	54.6" x 34.2" x 42" (1387 x 869 x 1067 mm)	70.6" x 51.3" x 42.75" (1794 x 1304 x 1086 mm) Pedestal removed: 34" H (863 mm)
Weight	400 lbs (182 kg)	500 lbs. (227 kg)
Electrical Requirements	Auto-switching power supply accommodates 110 to 240 volts, 50 or 60 Hz, single phase.	240 volts, 50 or 60 Hz, single phase, 15 amp AC.
Ventilation Systems	400 CFM for primary exhaust port (upper port) and 400 CFM for downdraft exhaust port (lower port), totaling 800 CFM.	200 CFM per upper exhaust port and 400 CFM for the downdraft exhaust port (lower port), totaling 800 CFM.
Exhaust Ports	One output Port 4" (102 mm)	Two output ports 4" (102 mm)
Vacuum Table Port	Additional port for dedicated exhaust through table, 4" (102 mm)	
Laser System Classification	Class 2 Laser Product - 1 mW CW Maximum 600-700 nm.	

Technical specifications and product configurations subject to change without notice.

SECTION 11: SPECIFICATIONS

Compatibility

Your Epilog Laser has been designed as an "open architecture" product that can be run from almost any Windows based software.

Recommended PC

For Optimum Computer Performance
Investing in a new computer is a great way to make sure you're getting the most out of your new laser equipment. Why? Because today's software (CorelDraw for instance) requires a lot of computer processing speed and memory to function properly. A good computer won't make a big difference in how your laser runs, but when compared to a slow computer it will save untold amounts of time and frustration setting up the artwork that you "print" to the laser. Many users do not purchase new computers for use with their new laser because their current computers are perfectly adequate. There's no magical cut-off that makes a computer too slow. If you're comfortable with the performance and speed of your current computer, there's probably no reason to purchase another one. The following recommendations are just advice to consider if a new computer is necessary.

A new computer doesn't have to be expensive to work great. The minimum requirements are included in just about any new laptop or desktop that can be purchased.

Operating System
Windows 7, Windows 8.1, or Windows 10 will work with the Fusion Pro and the Epilog Software Suite. Operating system should have all system updates before installation of the Epilog Software Suite.

RAM – Random Access Memory
4 GB RAM is the minimum that is required, however we recommend 8GB or more if possible. RAM is like short-term memory. It's fast and readily available for the computer to access and makes time consuming tasks go much quicker if you have lots of it. Having more than 4 GB of RAM is nice if you demand a lot from your computer.

Processor Speed
A faster processor will allow you to do more tasks in less time. While it's not necessary to purchase the fastest processor available, you'll want adequate speed to operate your graphics program. Processor speeds are always improving, but processor speeds of about 3.0 GHz or faster are a good place to start.

Graphics Card
Your computer's graphics card will need to support OpenGL 3.0 (or higher) or OpenGL 2.0ES (or higher) to operate the Epilog Software Suite. For example, an Intel HD 2000 or greater, nVidia GeForce 8000 series or greater, or an AMD/ATI Radeon HD2000 series or greater will be sufficient.

10/100 Network Interface Card (NIC)
All new computers have a 10/100 network connection as standard equipment. As well as allowing multiple computers to be linked together in a network, this technology also allows direct printing from the computer to the laser. Epilog supplies a network Crossover cable with each laser system that allows one computer to print to a single Epilog Laser system.

SECTION 11: SPECIFICATIONS

Hard Drive
This is the permanent memory in your computer. Many users feel that you can never have a large enough hard drive. Luckily, most computer manufacturers put high capacity drives in new computers these days. When in doubt, buy bigger than you think you might need. It's so in-expensive that it's worth the peace of mind to have it available.

Software
Many users use Corel as their graphics software. Many other Windows software applications can also be used, although all software is different and may not be predictable, user friendly or functional. Additionally, the technical support staff at Epilog may be less familiar with software other than Corel and less able to help with questions. Consult with your Epilog distributor on software compatibility issues. Epilog does not guarantee compatibility with any software.

PhotoLaser Plus is a third party software for converting photos to laser compatible format. This is an indispensable option for engraving photos. **For more information see "PhotoLaser Plus" on page 98.**

Heavy Duty Surge Protector
The need for a surge protector varies greatly throughout the world. If the laser is operated anywhere that the electrical power is subject to spikes, outages, lighting, fluctuations, etc, a surge protector should be used on both the laser and the computer. A surge protector is a very cheap insurance policy against catastrophic electrical damage. A surge protector is designed to be an inexpensive device that absorbs any electrical problems before they can damage the expensive equipment (computer and laser) they are protecting.

About The CO2 Laser Source

Your Epilog CO2 laser system uses the latest in laser technology to provide a powerful tool that is simple and safe to setup and operate. The Epilog Laser can mark, engrave, and cut a variety of non-metallic materials.

The CO2 laser beam itself is invisible and operates at a wavelength of 10.6 microns. The beam is about half the diameter of a #2 pencil. Unfocused, it will just make an ugly burn, leaving lots of charred material behind. The focus lens gives the beam an hourglass shape. At the center point the energy density is concentrated, allowing the very precise and clean material removal that is characteristic of laser engraving. The center of the hourglass is the focal point.

The laser beam path is completely enclosed within the cabinet. Please do not disassemble or modify any of the covers or windows on the machine. If at any time you notice that the laser operates with a door or window open, please contact Epilog technical support immediately.

The laser has two basic operating methods. For cutting (vector), the laser is driven along a path and the laser is left on all the time. The path could be the outline of a letter or a geometric shape like a circle. The laser will cut entirely through the material, separating the part from the background. For marking (engraving), the laser is swept across the work from left to right, and the laser is turned on and off at the correct points to produce the first line of the image. Then the carriage advances one line and the process is repeated, eventually assembling a full image.

SECTION 11: SPECIFICATIONS

Federal Communications Commission (FCC) Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy; and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

SECTION 12: TECHNICAL SUPPORT

Contacting Technical Support

The technical support department at Epilog is available to assist with solving problems you may encounter using your Epilog. Please review first the common problems and solutions as noted below, then if you are still in need of assistance you may contact Epilog's technical support department at the number or website listed below. Technical support is available in Golden, Colorado USA during the hours of 6 a.m. and 6 p.m. Mountain Time.

Technical Support Direct Line: 1 (303) 215-9171
Email: tech@epiloglaser.com
Technical Support Online: support.epiloglaser.com

What to do prior to contacting Epilog Technical Support:

1. Have the machine serial number available.

2. Have time to work on machine. Many issues will require troubleshooting.

3. Clean your machine (especially the optics), this will solve many issues.

The machine serial number can be found on the Certification/Identification Label. This engraved plate is located on the back of the machine's cabinet. The ID label shown is for the Model 16000 80-watt product.

Epilog Corporation
16371 Table Mountain Pkwy.
Golden, CO 80403 USA
Model Number: 16000 Laser System
Serial Number: 16060- 1512383220
Date of Manufacture: March, 2019

Authorized Representative:

cameo Laser Franz Hagemann Gmbh
Stuhrbaum14
28816 Stuhr
Deutschland
Tel: 0421 80 95 60-0
Fax: 0421 80 95 60-25
E-Mail: info@cameolaser.de

○ Class 2 Laser Product

This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001.

This product complies with IEC 60825-1: 2007.

Mass: 35 kg max

Patents Pending

Made in USA

CE

RoHS COMPLIANT

SECTION 12: TECHNICAL SUPPORT

Frequently Asked Questions

Engraver Will Not Vector

1. Verify that the print driver is set to Vector or Combined mode.

2. Verify that the lines that you want to vector are set to .003" (0.077 mm) or less in CorelDraw, or .001" (0.025 mm) or less in Adobe Illustrator. You may also separate the desired Vector line and set it to a Vector process in the Dashboard.

3. Make sure the images are vector lines. Scanned and raster images will not vector.

4. Filled or solid images will not vector (outlines only).

Engraving Appears Lighter Than Usual

1. All mirrors and lenses need to be cleaned and inspected for damage.

2. Verify that the lens is in correct focus.

3. Verify correct Speed, Power and Frequency settings for the type of material that you are engraving.

The Exhaust Is Not Pulling Enough Air

1. Move the blower closer to the machine. The closer the two are, the better exhaust you will receive.

2. Clean your exhaust system on a regular basis, including the engraver and blower. Use a bottle-brush and a vacuum on the areas where the exhaust buildup accumulates.

The Engraving Quality is Poor/Blurry/Double Image

1. If you feel you are not getting quality you once were, this is probably a maintenance issue.

2. Clean the lenses of the system.

3. If you are experiencing a double image problem or other quality issue, it is best to run a sample and send a photo to: tech@epiloglaser.com.

The Laser Won't Turn On

Make sure the Emergency Stop Button on the top of the machine is not pressed in.

IP Address is not visible in the Settings Menu of the Fusion Pro

Make sure that your Ethernet or USB cable is plugged in fully, both at the machine and your computer.

How Can I Increase the Life of my Laser System?

- **Clean your system:** Debris in the laser and on the mechanics of the system can reduce the life of parts in your system. Wipe down your system on a regular schedule to keep the mechanics clean and long lasting.

- **Clean the lenses:** Lens life is greatly increased by keeping them clean and free of debris. Get in the habit of wiping them off on a regular schedule to keep them clean and well maintained.

- **Reduce speed when running very small items:** When you run at 100% speed on a graphic with a very short stroke, the lens assembly comes up to speed and slows down extremely quickly, which can place wear on the mechanics of the laser. Slow down to 80 - 90% speed and increase the lifetime of your laser system.

How to Shorten Your Engraving/Cutting Time

- **Lower the Resolution:** How important is the highest resolution image? Processing jobs at 400 DPI vs. 600 DPI can reduce cycle times by up to 30%, and processing at 300 DPI could mean half the cycle time.

- **Reduce White Space:** Orientate the parts to minimize engraving dead space (area where head travels, but has nothing to engrave).

- **Horizontal Layout:** If an option, horizontal text will engrave faster than vertical or curved (fit text to curve) text. For more information, **see "Landscape or Portrait" on page 83.**

- **Split by Color:** Use the Split by Color feature to save time by adjusting the order in which the objects engrave/mark. For more information, **see "Split by Color (Color Mapping)" on page 53.**

- **Run Multiples:** If you need to engrave multiples of the same image. You'll find you have a time savings per piece.

If these do not correct your issue or your issue is not listed, please contact the Technical Support Team at +1 303-215-9171 or tech@epiloglaser.com.

SECTION 12: TECHNICAL SUPPORT

Join Epilog Laser's Online Community

Find out the latest Epilog news, keep in touch with our customers, and stay connected through our social media channels!

Facebook page: www.facebook.com/epiloglaser
Fan page: www.facebook.com/groups/75753849193/

Youtube channel: www.youtube.com/epiloglaser

Twitter: www.twitter.com/EpilogLaser

Instagram: www.instagram.com/epiloglaser/

Pinterest: www.pinterest.com/epiloglaser/

LinkedIn: www.linkedin.com/company/epilog

SECTION 13: MATERIAL SUPPLIERS

Industry Material Supplier List

The following list contains supplier information for materials typically used with your Epilog Laser. Additional suppliers and links can be found on our website at https://www.epiloglaser.com/resources/industry-links.htm

ACRYLIC

Acrylic Idea Factory
Norcross, GA
800-543-9253
www.acrylicidea.com

E&T Plastics
Blaine, MN
763-780-3700
www.e-tplastics.com

Inventables
Chicago, IL
312-775-7009
www.inventables.com

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

Polycrylic
Norton, VT
800-809-4217
www.polycrylic.com

RB Fabrication
Orange, CA
714-998-2700
www.rbfabrication.com

U.S. Plastic Corp
Chicago, IL
312-775-7009
www.usplastic.com

COLOR FILL MATERIALS

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

Smoke-Wood
Elgin, OR
800-248-2352
www.smoke-wood.com

CORIAN AND FOUNTAINHEAD

Johnson Plastics Plus
Minneapolis, MN
800-869-7800
www.johnsonplastics.com

CORK

Jelinek Cork Group
Savannah, GA
800-959-0995
www.corkstore.com

CUSTOM ARTWORK AND GRAPHICS

Cascade Metal Designs
Burlington, WA
360-420-5962
www.freedxf.com

Digital Art Solutions
Tempe, AZ 85281
800-959-7627
www.digitalartsolutions.com

Gantry Company (3D Graphics)
Chippewa Falls, WI
715-288-6100
www.gantryco.com

Laser Pattern Werx
Nehamlem, OR
503-368-3194
www.etsy.com/shop/laserpatternwerx

EDUCATIONAL MATERIALS

CorelDRAW Help
Albany, OR
www.coreldrawhelp.com

FABRIC

SEF Americas - LaserFlex
Jacksonville, FL
844-720-9600
www.seftextile.com

Twill USA
Aurora, IN
866-806-9120
www.twillusa.com

Webster Fabrics
Chesterfield, MO
800-845-4323
www.websterfabric.com

GLASS

DiscountMugs.com
Medley, FL
800-569-1980
www.discountmugs.com

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

Max Gift International
Beaverton, OR
503-579-9804
www.max-gift.com

LASER ENGRAVEABLE PRODUCTS

Johnson Plastics Plus
Minneapolis, MN
800-869-7800
www.johnsonplastics.com

LaserGifts
Prescott, AZ
888-674-6612
www.lasergifts.com

LEATHER (AND LASERABLE FAUX)

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

Tandy Leather Factory
Forth Worth, TX
877-532-8437
www.tandyleather.com

MARBLE

Jon-Ko
San Diego, CA
800-537-9092
www.jon-ko.com

LaserSketch
Romeoville, IL
630-243-6360
www.lasersketch.com

Marble Max
www.max.com

MEDALS (ENGRAVEABLE)

Catania
Avon Lake, OH
800-633-2586
www.cataniainc.com

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

METAL (ENGRAVEABLE)

AlumaMark
Cleveland, OH
800-482-7758
www.alumamark.com

Identification Plates, Inc.
Mesquite, TX
800-395-2570
www.idplates.com

Inland Products
Riverside, CA
800-481-5500
www.inlandproducts.com

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

NapTags
Grand Rapids, MI
800-451-3330
www.NapTags.com

R.S. Owens & Company
Chicago, IL
800-282-6200
www.rsowens.com

Victory
Chicago, IL
800-327-5578
www.buyvictory.com

METAL MARKING COMPOUNDS

CerMark Sales
Multiple Shipping Locations
866-241-9881
cermarksales.com

EnduraMark
Austin, TX
512-236-6424
enduramark.com

Ferro ($500 minimum order)
Mayfield Heights, OH
800-245-4951
www.ferro.com

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

Johnson Plastics Plus
Minneapolis, MN
800-869-7800
www.johnsonplastics.com

LaserBond
Los Angeles, CA
844-577-7772
www.laserbondingtech.com

MOTHER OF PEARL

Duke of Pearl
Lusby, MD
410-231-2641
www.dukeofpearl.com

Aqua Blue Maui, LLC
Kula, HI
808-876-0217
www.aquabluemaui.com

PEN AND PENCIL SETS

IMARK Pen Co.
Arlington, TX
817-385-0306
www.IMARK-Pen.com

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

PLASTICS (ENGRAVEABLE)

Colorado Plastic Products
Lakewood, CO
303-443-9271
www.coloradoplastics.com

Innovative Plastics
Algonquin, IL
815-477-0778
www.inoplas.com

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

Johnson Plastics Plus
Minneapolis, MN
800-869-7800
www.johnsonplastics.com

Rowmark
Findlay, OH
800-243-3339
www.rowmark.com

Southeast Plastics
866-491-9044
www.southeastplastics.com

PLAQUES & TROPHIES

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

Marble Trophies of SD
South Dakota
619-422-8298
www.marbletrophiesofsd.com/

SLATE

Laser Slate
866-491-9044
www.laserslate.com

SPORTS MATERIALS

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

MiniSticks
Buffalo, NY
866-646-4784
www.ministicks.com

TAPES AND FOILS

Innotech of Wisconsin
Racine, WI
800-776-7194
www.innotape.com

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

Polyonics
Westmoreland, NH
603-352-1415
www.polyonics.com

TASKBOARD

Taskboard
Miami, FL
561-983-6289
www.taskboard.com

WOOD: PLAQUES AND SPECIALTY PRODUCTS

Colorado Heirloom
Loveland, CO
970-667-4222
www.coloradoheirloom.com

Infinity Woods
Clarion, PA
814-226-4361
www.infinitywoods.com

JDS
Sioux Falls, SD
800-843-8853
www.jdsindustries.com

Lasers & Woodworking
Cumberland, MD
301-777-0250
www.lasersandwoodworking.
com

Lazer Depot
Mason, IL
217-663-2708
www.thelazerdepot.com

Lee's Wood Products
Rocky Mount, VA
800-552-5337
www.leeswoodproducts.com

Stanton Mfg. Co. Inc.
Lake Ozark, MO
573-365-2441
www.stantonmfg.com/

Totally Bamboo
San Marcos, CA
760-471-6600
www.totallybamboo.com

WDI Custom Wood Products
Forest Lake, MN
800-899-4265
www.wdicustomwood.com

APPENDIX A: WARRANTY STATEMENT

Warranty Statement for the Fusion Pro Laser

Epilog Corporation warrants to the original purchaser of Epilog Fusion Model 16000 that the product will be free from defects in material or workmanship when purchased, and under proper, normal use within two (2) years from the original date of purchase, with the exception of the motors which are warranted for three (3) years from the original date of purchase.

Epilog will replace or, at its option, repair the defective part(s). Normally, Epilog will supply a replacement part for the customer to replace. Once the replacement has been performed, the replaced part must be returned to Epilog. In the case where repair is required, Epilog requires that the defective part, or machine, be returned to the Epilog factory or other Epilog designated facility. Epilog will be responsible solely for the cost of repairs, including parts and labor, which are made at an authorized Epilog facility. All other costs for replacement or repair, including, but not limited to, packaging and shipping both to and from Epilog, shall be paid by the owner. A "Core" charge may be required by Epilog to insure the return of replacement and repair parts. This warranty excludes any damage from abuse (including, without limitation, incorrect voltages, power surges, fires, improper or insufficient ventilation "acts of God" or other situations out of the control of Epilog), failure to operate in accordance with instructions provided in the Owner's Manuals for the Epilog model 16000, including specific safety and operational warnings contained therein, cosmetic damage sustained in use, and damage caused by unauthorized modifications of any equipment. All warranties to original purchasers are non-transferable. The registered owner must initiate warranty claims within the warranty period.

THE ABOVE AND FOREGOING IS THE ONLY WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED; INCLUDING BUT NOT LIMITED TO ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, THAT ARE MADE BY EPILOG ON MODEL 16000. ANY WARRANTIES IMPLIED BY LAW ARE HEREBY EXPRESSLY DISCLAIMED.

No oral or written information or advice given by Epilog, its dealers, its distributors, agents, officers, or employees shall create a warranty or in any way increase the scope of this warranty. Neither Epilog nor anyone else who has been involved in the creation, production, or delivery of the Epilog Fusion Models 16000 shall be liable for any direct, indirect, consequential, or incidental damages, including but not limited to damages for loss of business profits, business interruption, loss of business information, adverse health impacts, fire, and the like, arising out of the use or inability to use these products.

Epilog Corporation provides no warranties whatsoever on any software used in connection with Epilog Fusion Model 16000.

Fusion Pro Suggested Material Settings (CO2)

Material	DPI/Freq.	50 watt	60 watt	80 watt	120 watt
Acrylic					
Photo Engraving	300 DPI	100s 50p	100s 45p	100s 40p	100s 30p
Text/Clipart Engraving	300 DPI	100s 70p	100s 65p	100s 60p	100s 55p
Text/Clipart Engraving	500 DPI	100s 65p	100s 60p	100s 55p	100s 50p
Cutting 1/8" (3 mm)	100 f	6s 100p	8s 100p	12s 100p	20s 100p
Cutting 1/4" (6 mm)	100 f	3s 100p	4s 100p	6s 100p	10s 100p
Cutting 3/8" (9.5 mm)	100 f	2s* 100p	2s* 100p	3s 100p	5s 100p
Cutting 1/2" (13 mm)	100 f				2s 100p
Cutting Note: Adjusting the standard focus distance so it is closer to the lens by about .080" (2 mm) will produce better edge quality when cutting 1/4" (6mm) acrylic and thicker. Two passes can be used for cutting thicker materials. There are two types of acrylic: cast is better for engraving (it creates a frosted look when engraved) and extruded acrylic produces a much better flame polished edge.					
Alumamark					
Engraving	300 DPI	100s 35p	100s 25p	100s 20p	100s 15p
Engraving	500 DPI	100s 25p	100s 15p	100s 10p	100s 5p
Anodized Aluminum					
Photos/Clipart	400 DPI	100s 45p	100s 40p	100s 35p	100s 30p
Photos/Clipart	500 DPI	100s 40p	100s 35p	100s 30p	100s 25p
Text	500 DPI	100s 50p	100s 45p	100s 40p	100s 35p
We find when engraving anodized aluminum, text appears best at 600 DPI, but photos and clipart can be engraved with great detail down to 400 DPI.					
Cork					
Engraving	300 DPI	100s 40p	100s 35p	100s 30p	100s 25p
Fleece					
Engraving	200 DPI	100s 25p	100s 20p	100s 15p	100s 10p
When engraving fabric, try changing the graphic to 80% gray and use the Jarvis dithering pattern for the best results. Every fabric you are cutting will need to have adjusted setting - find a small swatch of the fabric you can test first.					
Glass					
Engraving	300 DPI	25s 100p	30s 100p	35s 100p	40s 100p
When etching glass, try changing the graphic to 80% gray before engraving and using the Jarvis dithering pattern. You can also diffuse heat by covering the glass with a thin sheet of dish soap.					
Leather					
Photo Engraving	300 DPI	100s 30p	100s 25p	100s 20p	100s 15p
Text/Clipart Engraving	500 DPI	100s 35p	100s 30p	100s 25p	100s 20p
Cutting 1/8" (3 mm)	50 f	40s 100p	50s 100p	60s 100p	75s 100p
Mat Board					
Cutting	50 f	25s 40p	25s 30p	30s 40p	30s 30p

APPENDIX B: MATERIAL SETTINGS

Fusion Pro Suggested Material Settings (CO2)

Material	DPI/Freq.	50 watt	60 watt	80 watt	120 watt
Marble					
Photo Engraving	300 DPI	100s 45p	100s 40p	100s 35p	100s 25p
Text Engraving	500 DPI	100s 55p	100s 50p	100s 45p	100s 35p
Every marble is very different for settings. Start low and increase the power with a second run if you haven't used that marble before.					
Painted Brass					
Engraving	300 DPI	100s 35p	100s 30p	100s 25p	100s 15p
Engraving	500 DPI	100s 30p	100s 25p	100s 15p	100s 10p
Plastics					
Engraving	300 DPI	100s 30p	100s 25p	100s 20p	100s 15p
These settings work well with many plastics, including plastic phones and covers. Even one color plastics can achieve a great look when engraved.					
Plastic (2 Layer Laser Engraveable)					
Engraving	300 DPI	100s 70p	100s 65p	100s 40p	100s 35p
Engraving	500 DPI	100s 50p	100s 35p	100s 25p	100s 20p
Cutting 1/16" (1.5 mm)	100 f	10s 65p	10s 55p	10s 40p	20s 40p
Stainless Steel w/Cermark					
Engraving	500 DPI	30s 100p	35s 100p	45s 100p	55s 100p
Twill					
Cutting	25 f	70s 100p	90s 100p	90s 80p	90s 60p
Wood					
Photo Engraving	500 DPI	50s 100p	60s 100p	70s 100p	100s 100p
Clipart/Text Engraving	300 DPI	40s 100p	50s 100p	60s 100p	90s 100p
Clipart/Text Engraving	500 DPI	45s 100p	55s 100p	65s 100p	85s 100p
Deep Engraving	500 DPI	20s 100p	25s 100p	30s 100p	60s 100p
Thin Veneer (Cutting)	10 f	40s 100p	40s 90p	50s 80p	50s 60p
Cutting 1/8" (3 mm)	10 f	6s 100p	8s 100p	12s 100p	20s 100p
Cutting 1/4" (6 mm)	10 f	3s 100p	4s 100p	6s 100p	10s 100p
Cutting 3/8" (9.5 mm)	10 f	2s* 100p	2s* 100p	3s 100p	5s 100p
Cutting 1/2" (12 mm)	10 f				2s 100p
When cutting wood, multiple passes may allow cutting of thicker materials. Using Color Mapping you can adjust the focus point between passes down to the center point of the cut for the best results. * The Fusion has two sets of Speed control for vector cutting applications. Checking the Speed Comp selection box in the print driver will reduce the speed setting you have selected by one half. Speed Comp is most useful for speeds of 1 to 10. Example: Cut a square at 5% speed. Then repeat the job at 5% speed and also select Speed Comp. The second square will take twice as long to cut as the first square. Speed Comp gives you more slower speed setting to work with. Always use Air Assist when cutting.					

- These are only suggestions: Every type of material will react differently with the laser, even from one plastic to the next. Use these settings as your starting point then adjust one variable at a time until you achieve the result you desire. Settings for any material are a matter of personal preference. Not every material that can be run at high speed should be run at high speed. A better mark can often be achieved by slowing your laser and giving the laser longer to react to your material.

- Test your material: If you have a small area of the material you won't be using, or an extra item, take advantage of this area to test out your settings by engraving a small square or cutting a small circle. You can fine tune your settings in these areas.

- Similar materials use similar settings: When you are working with a material you aren't familiar with, think about a similar material and what settings you would use with that product. Most anodized aluminums will react well with similar settings, as will most plastics.

- When in doubt, start low: Remember, you can always re-run your job as long as you don't move it in the machine. Let's say you're running a photograph in a one-of-a-kind wood plaque. Start with a lower power setting, look at the engraving, then run the project a second time at high speed and lower power a second time to add a little more depth if needed.

- Run only one part of the file: If running a job on a new material, you can always just select one piece of the engraving, like a piece of text, and run that part first to make sure your settings are perfect before running the whole file.

To print a copy of these settings to keep next to your laser, go to www.epiloglaser.com/material-settings.htm.

APPENDIX C: SYSTEM CALIBRATION

Auto Focus Plunger Calibration

This routine must be performed after Table Calibration and Laser Focus Calibration. This routine is found in the advanced settings menu under "Focus Commands". To begin the routine, press "Calibrate Auto Focus". This routine will touch the focus plunger onto the table, to measure how far the laser focus is from the plunger focus. To begin the routine, follow the instructions and "Clear Table, Press Start to begin".

Machine Settings:

- **Acceleration Match Offset [cnts]**
  - Number of encoder counts to delay firing laser when accelerating. Used for raster quality adjustments

- **Deceleration Match Offset [cnts]**
  - Number of encoder counts to delay firing laser when decelerating. Used for raster quality adjustments

- **Bed Margins [in]**
  - The margins around the bed, in inches that the carriage can travel to.
  - Format is as follows: TOP,LEFT,BOTTOM,RIGHT

- **Bed Size [in]**
  - The size of the bed in the machine in inches
  - Format is as follows: WIDTH,HEIGHT
  - Requires "Home Axis" to take effect

- **Disable Table Homing**
  - Setting to disable homing the table when the machine boots. For optimal operation, leave this at a value of 0
  - A value of 1 will disable table homing
  - Will take effect after reboot

- **Rotary Encoder [cnts/in]**
  - The number of encoder counts per inch of travel for the rotary device
  - Requires "Home Axis" to take effect

- **X Axis Encoder [cnts/in]**
  - The number of encoder counter per inch of travel for the X Axis
  - Requires "Home Axis" to take effect
  - Must recalibrate cameras if this changes

- **Y Axis Encoder [cnts/in]**
  - The number of encoder counter per inch of travel for the Y Axis
  - Requires "Home Axis" to take effect
  - Must recalibrate cameras if this changes

- **Home Offset [in]**
  - The offset of the table origin, relative to the X and Y limit switches
  - Requires "Park Axis" to take effect
  - Must recalibrate cameras if this changes

- **Joystick Center X**
  - The center X position of the joystick, in joystick units

- **Joystick Center Y**
  - The center Y position of the joystick, in joystick units

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- **Joystick Deadzone [%/100]**
  - The percentage of dead zone around the center of the joystick

- **Joystick Limit X**
  - The MIN and MAX limits for the X axis of the joystick, in joystick units
  - Format is as follows: MIN,MAX

- **Joystick Limit Y**
  - The MIN and MAX limits for the Y axis of the joystick, in joystick units
  - Format is as follows: MIN,MAX

- **Laser Match [cnts]**
  - Adjustment to synchronize left to right and right to left raster lines. Units are in number of encoder counts

- **Laser Match Offset [cnts]**
  - Offset of the raster data in X. Used to align raster and vector if needed. Units are in number of encoder counts

- **Velocity Match Offset [cnts]**
  - Offset of the raster data proportional to velocity. Units are in number of encoder counts

- **Park Position [in]**
  - The position in inches to park the laser head when the machine is idle
  - Requires "Park Axis" to take effect

- **Plunger Offset [cnts]**
  - The number of table encoder counts from the laser zero focus position, to the auto focus plunger

- **Rotary Offset [in]**
  - The offset of the rotary origin, relative to the X and Y limit switches

- **Rotary Table Height [in]**
  - The distance in inches to clear the rotary device

- **Scale [mm/in]**
  - A scale factor to adjust the scale of the X and Y axis
  - Format is as follows: X,Y
  - Requires "Home Axis" to take effect
  - Must recalibrate cameras if this changes

- **Table Switch Locations [cnts]**
  - A list of the locations in which the table switches were located

- **Table Current [A]**
  - The current in Amps to run the table drive

- **Table Resolution [cnts/in]**
  - The number of encoder counts per inch of travel for the table
  - Must "Home Table" if this value is changed

- **CO2 Tickle Duration [us]**
  - The duration of the laser tickle pulse in microseconds

- **CO2 Tickle Frequency [Hz]**
  - The frequency of the laser tickle pulse in hertz

APPENDIX C: SYSTEM CALIBRATION

- **CO2 Tickle Holdoff [us]**
  - The duration in which the laser tickle is stalled after a laser pulse in microseconds

- **CO2 Pulse Stretch [us]**
  - The amount to stretch all laser pulses in microseconds

- **Table Focus Offset [cnts]**
  - The distance in table encoder counts from the top crash switch, to the laser focus position

- **RHS Y Skew [cnts]**
  - The number of encoder counts to skew the right hand side of the Y axis after homing
  - Requires "Home Axis" to take effect

- **Air Assist Delay [s]**
  - The number of seconds to delay turning ON and turning OFF the air assist before and after a job finished
  - Format is as follows: ON,OFF

Camera Calibration

Note: Before beginning, reboot your machine if you have recently run any jobs.

1. Click the settings icon to enter the settings menu
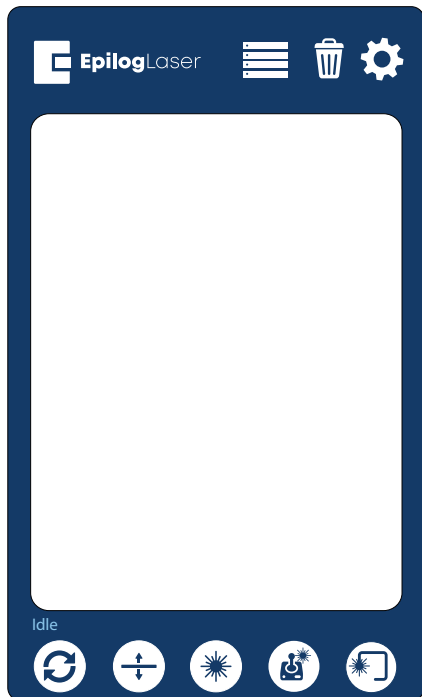
2. Long Press the "Settings" text for 5 seconds to enter the advanced settings menu
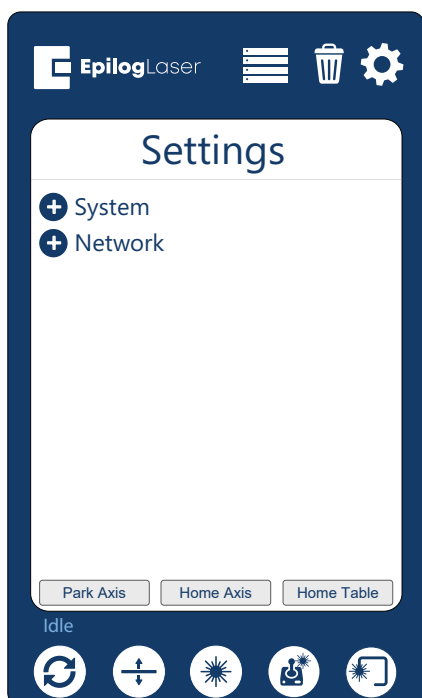
3. Click on "Calibrate Cameras" to enter the camera calibration menu
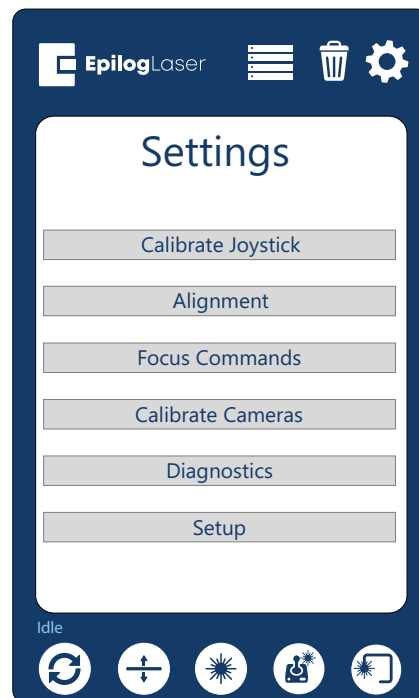
4. While the machine is Idle, follow the prompt, and begin the calibration routine by selecting "Ok". The calibration pattern mentioned in the prompt will be used by the single camera at the laser head. You can optionally skip this step by clicking Skip. You must use an 8 x 5 inch or larger piece of anodized aluminum.

This calibration routine requires you to engrave a calibration pattern onto black anodized aluminum. Before proceeding, place a 8" x 5" (200 x 125 mm) piece of anodized aluminum in the upper left corner of the machine. Ensure that the material is flat on the machine bed.

Click OK when the material has been loaded into the machine.
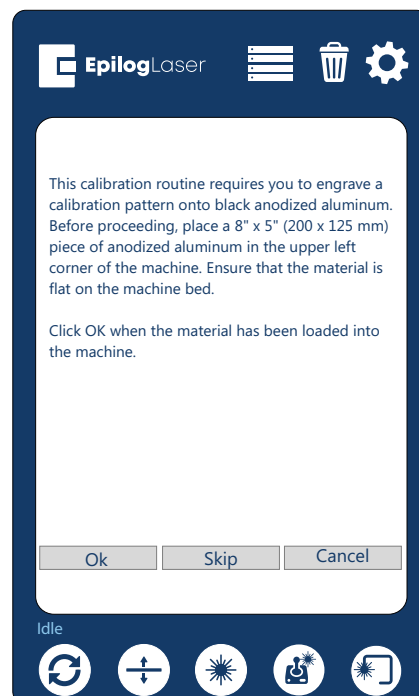
5. Follow the prompt and close the lid on the engraver. Once OK is pressed the laser will start engraving the calibration pattern. The engraver will automatically focus to the 0.025" thickness of the anodized aluminum, the engrave a calibration pattern.
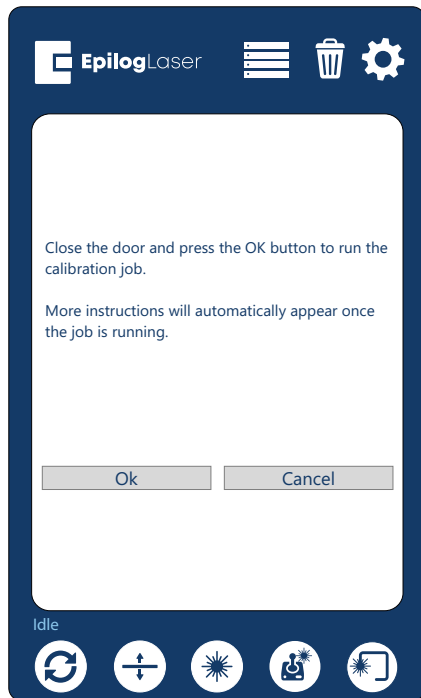
6. Allow the job to run until completion.
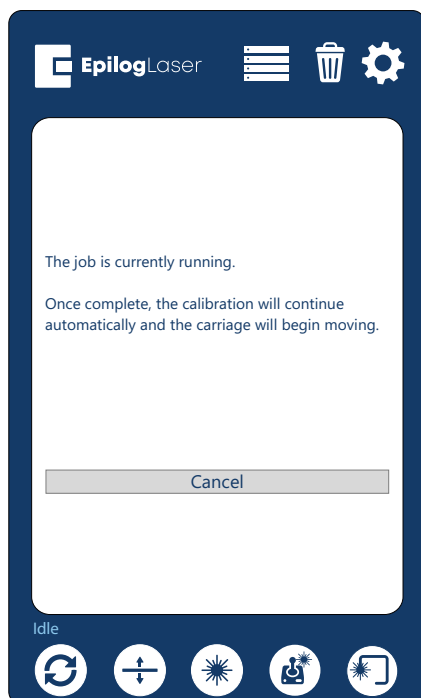
7. Once the job has finished engraving, the camera at the laser head will take pictures of the engraving to calibrate itself. This process takes several minutes.
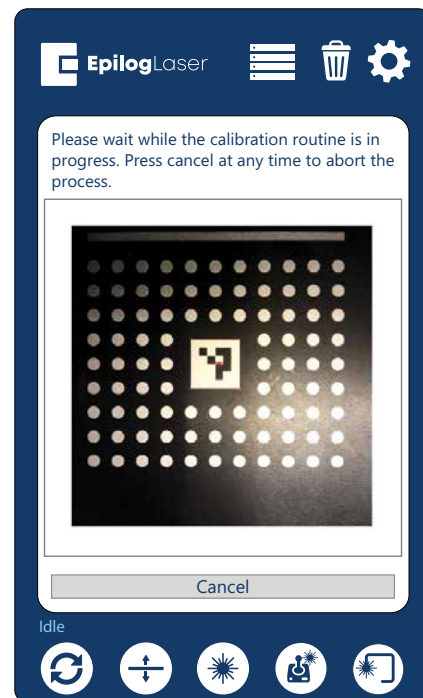
8. Once the calibration has successfully finished, a dialog will appear. The "Reprojection error" will be listed and is used to determine the quality of the calibration. The lower the value, the better. If the reprojection error is above 2.0, the user will see an error "Calibration unsuccessful. Error too high". A value of 0.6 or lower is desired. At the end of this stage, the table will move down several inches, to make room to place the calibration mat on the table.
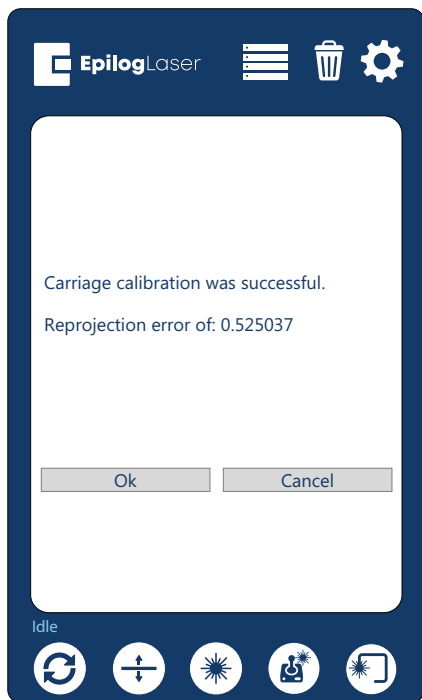
9. The calibration will now calibrate the overhead camera(s). The Fusion Pro 32 has 1 overhead camera, and the Fusion Pro 48 has 2 overhead cameras. Click Ok to continue.

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Carriage calibration was successful.

Reprojection error of: 0.525037

Ok   Cancel

Idle

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Place the chessboard calibration target in the machine bed, making sure the circle reference mark is in the top left corner.

Click OK to begin the calibration process.

The top door must be closed to perform the calibration. The carriage-mounted camera will scan the calibration pattern.

Ok   Cancel

Idle
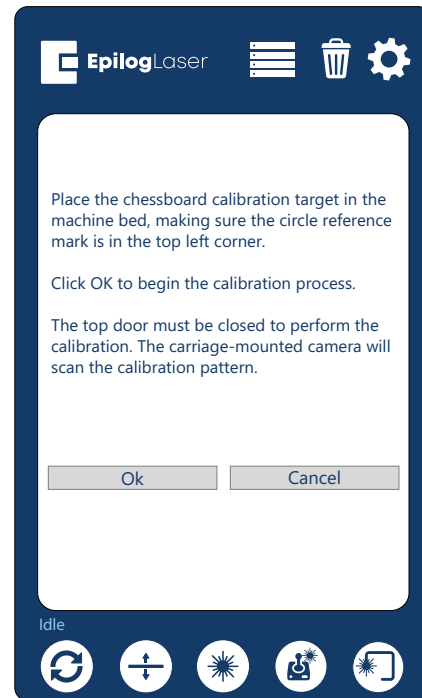
10. This process will take 10-15 minutes on a Fusion Pro 32, and 20-25 minutes on a Fusion Pro 48. The table will move back up into focus, and the carriage camera will begin scanning features on the chessboard calibration target.
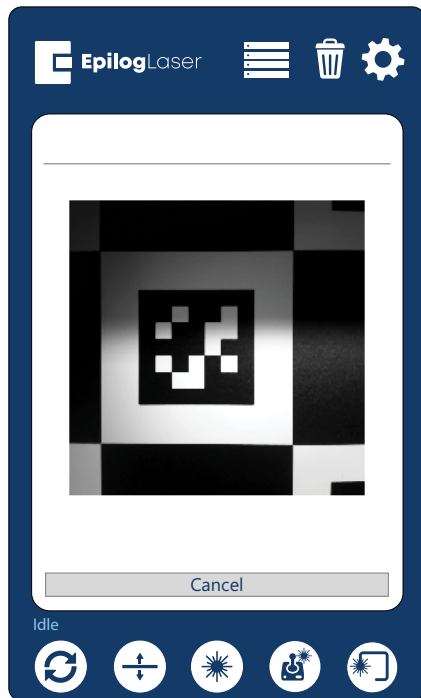
11. Once the calibration has successfully finished, a dialog will appear. The "rms error" will be listed and is used to determine the quality of the calibration. The calibration will fail if the rms error is above 2.0. The lower the value, the better. A value below 0.6 is desired. Click "Ok" to finish calibration and use the supplied results.

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