



***X/SERIES CO2 LASER
OWNER'S MANUAL***

***MCNCLTLC02MU2012-40W, MCNCLTLC02EC2436-80W, MCNCLTLC02EC3652-150W
PRECISION CO2 LASER ENGRAVING & CUTTING MACHINE
8/27/2018***

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CO2 Laser Machine © 2018 Laguna Tools 8/27/2018



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Saftey

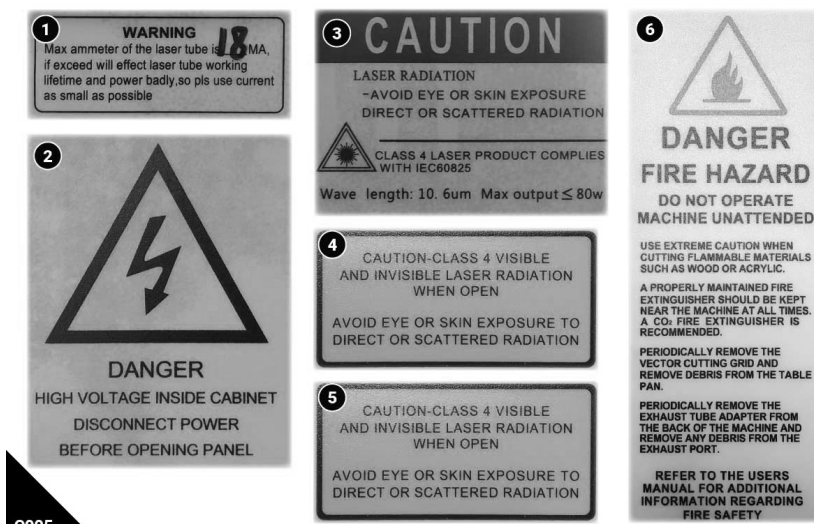
Proposition 65 Warning of Harmful Exposure

Some dust created by power sanding, sawing, grinding, drilling and other construction activities contains chemicals known to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals:

- Lead from lead-based paint.
- Crystalline silica from bricks, cement, and other masonry products.
- Arsenic and chromium from chemically treated lumber.

Your risk of exposure varies, depending on how often you do this type of work. To reduce your exposure to these chemicals, work in a well-ventilated area and work with approved safety equipment, such as face or dust masks that are specifically designed to filter out microscopic particles.

WARNING! For Your Own Safety Read Instruction Manual before Operating Laser



1. At all times, this machine must be operated with a water-cooling system, venting system, and an air assist system. Before every use, check that all systems are working and properly adjusted prior to turning on the laser machine.
2. Never leave tool running unattended. Turn power off. Don't leave tool until it comes to a complete stop.
3. Do not process materials that emit a toxic byproduct, are unstable, produce a degrading byproduct, or leave a residue on the machine.
4. At all times, there must be a chemical fire extinguisher within close range of the machine.
5. Personnel who have not received any prior training are prohibited from operating the machine. Reading and understanding the owner's manual shall serve as training.
6. Only distilled or deionized water is to be used with the water cooling system.
7. Never operate the machine with the interlocks defeated, or any of the panels or doors removed.
8. Never open any access panels when the machine is connected to the power source.
9. Never operate the machine without the focal lens in place.
10. Use proper extension cord. Make sure your extension cord is in good condition. When using an extension cord, be sure to use one heavy enough to carry the current your product will draw. An undersized cord will cause a drop in line voltage resulting in loss of power and overheating. Table A shows the correct size to use depending on cord length and nameplate ampere rating. If in doubt, use the next heavier gauge. The smaller the gauge number, the heavier the chord.
11. Do not wear loose clothing, gloves, neckties, rings, bracelets, or other jewelry which may get caught in moving parts. Non-slip footwear is recommended. Wear protective hair covering to contain long hair.
12. Never modify this machine in any way.
13. Always use proper personal protective equipment when using this machine.

14. Disconnect tools before servicing and when changing accessories and consumable parts.
15. Use recommended accessories. Consult the owner's manual for recommended accessories. The use of improper accessories may cause risk of injury to persons.
16. Never stand on tool. Serious injury could occur if the tool is tipped or if the cutting tool is unintentionally contacted.
17. Check for damaged parts. Before further use of the tool, a guard or other part that is damaged should be carefully checked to determine that it will operate properly and perform its intended function; check for alignment of moving parts, binding of moving parts, breakage of parts, mounting, and any other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced.
18. Maximum continuous use is 5 hours.
19. Safe operating temperature is from 10 to 33 degrees Celsius.

Grounding Instructions

All grounded, cord-connected tools: In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This tool is equipped with an electric cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into a matching outlet that is properly installed and grounded in accordance with all local codes and ordinances.

Do not modify the plug provided - if it will not fit the outlet, have the proper outlet installed by a qualified electrician.

Improper connection of the equipment-grounding conductor can result in a risk of electric shock. The conductor with insulation having an outer surface that is green with or without yellow stripes is the equipment-grounding conductor. If repair or replacement of the electric cord or plug is necessary, do not connect the equipment-grounding conductor to a live terminal.

Check with a qualified electrician or service personnel if the grounding instructions are not completely understood, or if in doubt as to whether the tool is properly grounded.

Use only 3-wire extension cords that have 3-prong grounding plugs and 3 pole receptacles that accept the tool's plug.

Repair or replace damaged or worn cord immediately.

Ampere Rating		Volts	Total length of cord in feet			
		120	25	50	100	150
		240	50	100	200	300
More Than	Not More Than		Minimum gage for cord			
0	6		18	16	16	14
6	10		18	16	14	12
10	12		16	16	14	12
12	16		14	12	Not Recommended	

Warranty

Registration

To prevent voiding this warranty, all products sold must be registered within thirty (30) days of receiving the product. All registered purchases will receive notifications about important product changes, receive customer service, and be able to file a warranty claim against defective workmanship, parts, or materials.

You must register your purchase! Please follow this link or QR code:



<https://lagunatools.com/policies/warranty/>

Length of Warranty

All new machines and optional accessories sold through an authorized dealer carry a two-year warranty effective the date of receiving the product. Machines sold for either commercial or industrial use have a one-year warranty. Wearable parts like throat plates, band-saw guides, etc., have a ninety-day warranty. Aside from being free of defects upon receiving, consumable parts, like cutters and abrasives, are not covered by this warranty unless otherwise stated by Laguna Tools. These parts are designed to be used at the expense of the operator and are available for replacement or inventory purchase. The determination of a consumable part will be made on a case-by-case basis by Laguna Tools.

- 2 Year – New Machines Sold Through an Authorized Dealer
- 2 Year – Accessories Sold as Machine Options (excluding blades)
- 1 Year – Machines Sold for Commercial or Industrial Use
- 1 Year – Blades and Accessories outside of Machine Options
- 90 Days – Wearable Parts

Who is Covered

The applicable warranty covers only the initial purchaser of the product from the date of receiving the product. To file such claims, the original purchaser must present the original receipt as proof of purchase.

What is Covered

The warranty covers any defects in the workmanship of all parts and materials that make up the machine unless otherwise specified. Any part, determined by Laguna Tools®, to have a defect will be repaired or replaced (and shipped), without charge. The defective item must be returned to Laguna Tools with the complaint and proof of purchase and in the original packaging. In the event the item is determined to be not covered by this warranty, the customer will be responsible for the cost to replace the item/part and all related shipping charges.

Warranty Limitations

This limited warranty does not apply to natural disasters, acts of terrorism, normal wear and tear, product failure due to lack of maintenance or cleaning, damage caused by accident, neglect, or inadequate dust collection. The warranty may be voided against proof of misuse/abuse, damage caused where repair or alterations have been made or attempted by others, using the product for purposes other than those

described as intended use (unless with consent by Laguna Tools®), modification to the product, or use with an accessory that was not designed for the product. It is the responsibility of the user to understand basic woodworking machinery settings and procedures and to properly maintain the equipment in accordance with the standards provided in this manual.

Shipping Damage

Laguna Tools® is not responsible for damage or loss caused by a freight company or other circumstances not in the direct control of Laguna Tools. All shipping-related claims for loss or damage goods must be made to Laguna Tools within twenty-four hours of delivery.

How to Receive Support

To file a warranty claim, please contact the warranty department at 1-949-474-1200. To receive customer service or technical support please contact the customer service department at 1-800-332-4094. Warranty parts are shipped at the expense of Laguna Tools either by common carrier, FedEx ground services or similar method. Technical support to install replacement parts is primarily provided by phone, fax, email, or the Laguna Tools Customer Support Website.

Introduction

Welcome to the Laguna Tools group. We understand that you have a choice of where to purchase your machines and appreciate the confidence you have in the Laguna Tools brand.

Through hands-on experience, Laguna Tools is constantly working hard to make innovative, precision products. Products that inspire you to create works of art, are a joy to operate, and encourage your best work.

This document provides the operator(s) vital safety instructions pertaining to the proper setup, adjustments, maintenance, and service of this product. Please save this document, keep it close to the product, refer to it often, and use it as an education tool to instruct other operators. Failure to read, understand and follow the instructions in this manual may result in personal property damage or serious personal injury—including amputation, electrocution, or death. The owner of this product is solely responsible for safe operation. The owner's responsibility includes but is not limited to the proper installation of the product in a safe environment, personnel training and usage authorization, proper inspection and maintenance, owner's manual availability and comprehension, application of safety devices, cutting/sanding/grinding tool integrity, and the usage of personal protective equipment. The manufacturer will not be held liable for injury or property damage from negligence, improper training, machine modifications or misuse.

LAGUNA TOOLS
THRIVING ON INNOVATION

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**For any feedback, good or bad, on the quality of this manual,
please email us at manuals@lagunatools.com.
We really appreciate your feedback!**

1. Reference



1. Reference Contents

- [1.1 X|Series CO2 Laser Specifications](#) ⁵
- [1.2 Dimensions](#) ⁷
- 1.3 External Map
- 1.4 Internal Map
- [1.5 Control & Display Elements](#) ⁸
- [1.6 Accessories & Options](#) ⁹

LAGUNA LASER - Precision Cutting & Engraving

CO2 laser machines function by essentially bouncing light emissions between mirrors until the beam is strong enough to penetrate a partially transparent mirror at the tip of the router head. These lasers are capable of cutting most polymeric and composite materials.

These machines need auxiliary equipment to function properly. At Laguna, we have bundled all the necessary auxiliary equipment with each laser machine that we sell. Each Laser sale will include: Water chiller/circulator unit, Air blower and ducting, air compressor, honeycomb table, and all connecting tubes and cables. This ensures that you are up and running with precision equipment in the shortest time possible.

LASER|TX 50W (MCNCLTLC02MU2012-40W)

The Laguna SmartShop® Laser|TX is a small profile CO2 laser on a precision drive system with automatic focusing, controlled by a universally acclaimed and user-friendly control system. The TX makes alignment simple with the red dot beam combiner technology that puts a red dot down the same line as the high powered cutting beam. In addition, we packed a 50W laser tube in this small body which gives a 75% increase in cutting capability than other machines of this size.

LASER|MX 100W (MCNCLTLC02EC2436-80W)

The Laguna SmartShop® Laser|MX comes equipped with a RECI laser tube offering high output power with incredible resolution. The MX series uniquely features dual dust and fume extraction for harmful chemicals and debris making this machine a standout for high volume cutting use. In addition, convenient WiFi controls, automatic focusing, precision linear guide rails, and more features come together to

create a user-friendly CO2 laser cutter capable of both incredible power and fine detail.

LASER|EX 150W (MCNCLTLC02EC3652-150W)

The Laguna SmartShop® Laser|EX is a powerful CO2 laser cutter and engraver that comes packed with user-friendly features to make operation a breeze. The EX comes with a specialized linear guide rail system for increased accuracy and longevity, an automatic focusing head, and a very large work area. With a 130W laser tube packed inside, this machine has no trouble with thick acrylic or other materials.

See the [specifications](#) ⁵ sheet to further explore the X|Series CO2 Laser features and comparisons.

1.1 CO2 Laser Specifications



	Laser TX	Laser MX	Laser EX
MACHINE - MODEL - TUBE WATTAGE. EXAMPLE: M-L-MX-80			
Models	MCNCLTLC02MU2012-40W	MCNCLTLC02EC2436-100W	MCNCLTLC02EC3652-150W
1.1.1 Electrical			
Power Requirements	110V-1PH-60HZ*		
Amperage (FLA)	Variable <11 AMP	Variable <13 AMP	Variable <15 AMP
Starter Switch	Magnetic		
Plug Included	5-15		
Circuit Breaker Requirement	110V - 15 AMP**		
Receptacle Requirement	5-15		
(*) The Ex may be 220V depending on serial number. Always check the name plate prior to power connection. (**) The circuit breaker requirement shown is only for the laser machine. You must operate the auxiliary components - blower/chiller/compressor - with the laser machine. Always reference the included auxiliary equipment service manuals for the respected power requirements and breaker requirements. A certified electrician must conduct the proper circuit breaker sizing and installation.			
1.1.2 General NOTE: W - width (front to back). L - length (left to right)			
Certification	CE, FDA		
Net Weight	220LB (100kg)	760LB (345kg)	1050 LB (476kg)
Shipping Weight			

1. REFERENCE

	Laser TX	Laser MX	Laser EX
Shipping Dimensions			
Overall Size	L51.8" W26" H17.7" (L1300mm W660mm H450mm) Stand: +27" to Height	L53.5" W39.8" H42.1" (L1360mm W1010mm H1070mm)	L71.7" W51.6" H42.1" (L1820 W1310 H1070mm)

1.1.3 Machine Type: CO2 Laser NOTE: W - width (front to back). L - length (left to right)

Laser Type	Sealed Water Cooled CO2 laser tube		
Laser Power	50W	100W	150W
Work Envelope (fit a work peice in)	L19.7" W11.8" H (L500mm W300mm)	L35.4" W23.6" H (L900mm W600mm)	L53.5" W37.6" H (L1,360mm W955mm)
X-Axis Range (limit)	19.7" (500mm)	34" (865mm)	53.1" (1350mm)
Y-Axis Range (limit)	11" (280mm)	23.22" (590mm)	37.4" (950mm)
Z-Axis Range (limit)	6.3" (160mm)	12.6" (320mm)	8.66" (220mm)
Process Speed*	0-2125 in/min (0 - 54,000mm/min)	0-2350 in/min (0 - 60,000mm/min)	
Resetting position accuracy	±0.02" (0.05mm)		
Controlling Software	Ruida		
Design Software Integration (not included)	CorelDraw, AutoCAD, Adobe, and more..		
Graphic Format Supported	BMP, PLT, DST, DXF, AI, and more..		
Color Separation	Yes		
Working Environment	33-112 Fahrenheit (1-45 Celsius)		

(* Optimal processing speed will vary between cutting or engraving, depth of cut, material characteristics, and working environment. The metric shown is the maximum pace the drive system can produce.

1.1.4 Dimensions See Dimensions sections for Diagrams. NOTE: W - width (front to back). L - length (left to right)

	L51.8" W26" H17.7" (L1300mm W660mm H450mm) Stand: +27" to Height	L53.5" W39.8" H42.1" (L1360mm W1010mm H1070mm)	L71.7" W51.6" H42.1" (L1820 W1310 H1070mm)
Overall Size			
Work Envelope (fit a work peice in)	L19.7" W11.8" H (L500mm W300mm)	L35.4" W23.6" H (L900mm W600mm)	L53.5" W37.6" H (L1,360mm W955mm)
X-Axis Range (limit)	19.7" (500 mm)	34" (865 mm)	53.1" (1350 mm)
Y-Axis Range (limit)	11" (280 mm)	23.22" (590 mm)	37.4" (950 mm)
Z-Axis Range (limit)	6.3" (160 mm)	12.6" (320 mm)	8.66" (220 mm)
Focal Lens Diameter	20mm	20mm	20mm

1.1.5 Fume Extraction

Dust Port Outer Diameter	3.95" (100mm)	2x 5.95 (150mm)	5.95 (150mm)
CFM Requirement	400CFM	400CFM Fume 600CFM Debris (lower)	600CFM

	Laser TX	Laser MX	Laser EX
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1.1.6 Materials

Cabinet	Sheet Steel		
Optical Lens	Zinc Selenide (ZnSe)		
Linear Rails	Low Friction Stainless Steel		
Laser Head Assembly	Aluminum		

1.1.7 Features

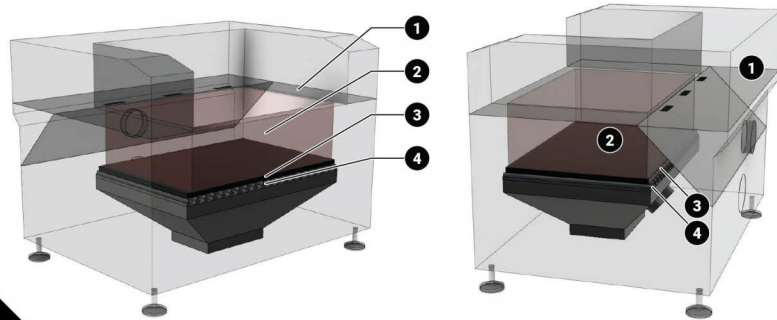
Automatic Focusing	✓	✓	✓
Precision Linear Guide Rail	✓	✓	✓
Z Axis Control	✓	✓	✓
Dust Debris Extraction in addition to fume extraction	NO	NO	NO
Beam Combiner Red Dot Sight	✓	✓	✓
Head Assembly Red dot sight	✓	✓	✓
U.S II-VI Optical Lenses	✓	✓	✓
Honeycomb Table	✓	✓	✓
Wifi Control	✓	✓	✓
Integrated HEPA Filtration	NO	NO	NO
Auxiliary Exhaust Fan	✓	✓	✓
Auxiliary Chiller System	✓	✓	✓
Auxiliary Air Pump	✓	✓	✓

1.1.8 Accessories & Options

Rotary 4th Axis	SKU: 3 Jaw Rotary 80mm Dia 480mm Length	SKU: 3 Jaw Rotary 80mm Dia 480mm Length SKU: 3 Jaw Rotary 80mm Dia 600mm Length SKU: 3 Jaw Rotary 120mm Dia 600mm Length
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Key: V - voltage. PH - phase. HZ - hertz. FLA - full load amperage. HP - horsepower. kW - kilo watt. AMP - amperage. L - length (left to right). W - width (front to back). H - height (bottom to top). M - meter. Ft - foot. MM - millimeter. (") or IN - inch. MPA - mega pascals. PSI - pounds per square inch. LB - Pound. Kg - Kilogram. CFM - cubic feet per minute.
Disclaimer: The information contained in this publication was correct at the time of print written on the front of this manual. In the interest of continuous innovation, we reserve the right to change specifications, design or included equipment without notice or obligation. No part of this publication may be reproduced, transmitted, or translated into any language in any form by any means without our written permission. Errors and omissions may be current.

1.2 Dimensions

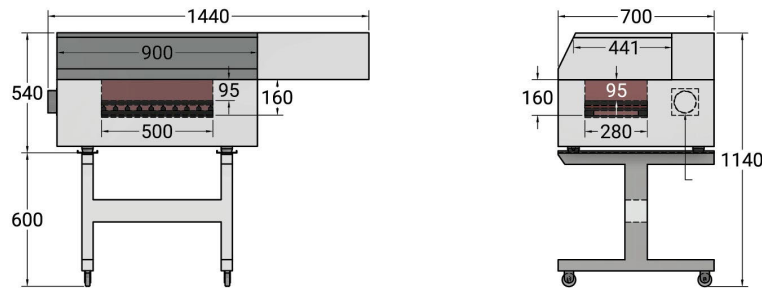


C022

Fig C022: Laser machine capacities and effective volume.

1	Zero Level Plane	This is the relative plane that the drive system is mounted to. It serves as a "reference" plane to the z axis range of the laser- "able" volume. The laser head assembly has a small range of adjust-ability that will allow it to go a 1-3" from this plane in the z direction.
2	Laser-"able" Volume	This is the area that can be processed by the drive system. The edges are defined by the X,Y, and Z limits of the laser machine (see below). Both (2) Honeycomb Table and (3) Material Ribs can be removed for additional Z-axis range.
3	Honeycomb Table	The honeycomb table is ideal because it is not damaged ruined by the laser beam and will remain flat. This table can be removed to allow for additional Z-axis range.
4	Material Ribs	The metal ribs are used as effectively as the honeycomb table for larger materials. Like the honeycomb table, the laser does not harm the build materials and ribs will remain flat. The ribs can also be removed and replaced.

TX (SKU1)

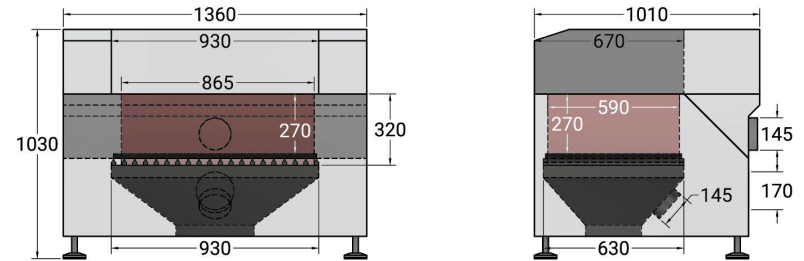


TX LASER MACHINE
UNITS: mm
N.T.S

C023

Fig C023: TX Laser machine capacities and dimensional drawing.

MX (SKU3)

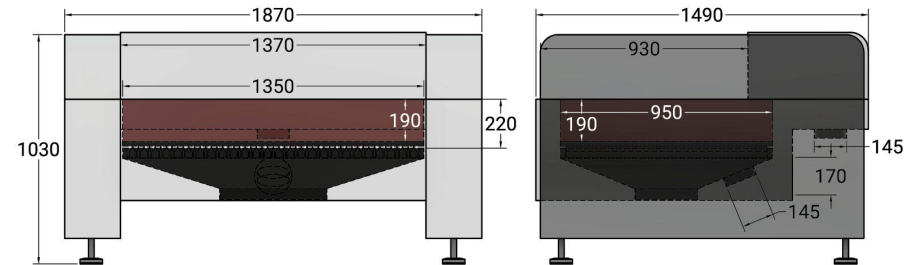


MX LASER MACHINE
UNITS: mm
N.T.S

C024

Fig C024: MX Laser machine capacities and dimensional drawing.

EX (SKU3)



EX LASER MACHINE
UNITS: mm
N.T.S

C025

Fig C025: EX Laser machine capacities and dimensional drawing.

1. REFERENCE

1.3 Control & Display Elements



Figure C008: CO2 Laser control panel. (1) Emergency Stop. (2) On/Off Button or Key Start. (3) Ammeter. (4) Ruida Control Panel.

Key	Name	Description
1	Emergency Stop	Hitting the emergency stop will kill the power to the laser beam at any time. Opening the lid will do the same function.
2	On/Off Key	Turns on or turns off the machine.
3	Ammeter	Displays the current working amperage of the machine.
4	Ruida Controller	Main control interface for controlling manual movements of the laser head and selecting functions within the interface.
5	File Number	Displays the file number of the work file.
		Jogs the laser head or moves the cursor of Ruida Interface.
	Z/U	Show entries in interface. Selects the Z Axis navigation.
	Esc	Stop Work or Escape a menu
	Enter	Validate the change
	Origin	Displays the "Set the relative origin" prompt.
	Frame	Samples the file specified or default frame size
	Start-Pause	Start or Pause the selected file.
	File	Enters the file manager menu.
	Max-Power	Set maximum laser power of current layer
	Min-Power	Set minimum laser power of current layer
	Speed	Set speed of current layer
	Pulse	Pulse laser control. NOTICE! Pressing the pulse key will fire the laser beam. Use caution not to damage workpiece.
	Reset	Reset the controller and return to the home position.

1.4 Accessories & Options

The following accessories are designed for the X-Series CO2 Laser Machines. These instructions should be followed exactly to properly set up the equipment. Some of these accessories are designed to fit multiple machines offered by Laguna Tools. Check the [specification](#) sheet for a fit guide of all CO2 Laser accessories.

Fume Extraction Machine

SKU: MDCEF1, MDCEFIL, MDCEF3220, MDCEF75220

Fits: All CO2 and Fiber Laser machines.



Fig C010: Fume Extraction Units. (1) 7.5HP HEPA Fume/Debris Extractor (2) 3HP HEPA Fume/Debris Extractor (3) 1HP HEPA Fume Extractor (4) In-Line Fume Filter Box.

Q: Which fume extractor is best for the Laser | TX MCNCLTLC02MU2012-40W?

A: The TX requires 400CFM. Dust/Debris will settle at bottom of machine and should be vacuumed out frequently.

Q: Which fume extractor is best for the Laser | MX MCNCLTLC02EC3652-150W?

A: The MX features two exhaust ports - top for fumes and bottom for dust/debris. The top port has a 400CFM fume extractor CFM, the bottom - 600 dust collector CFM. Use a dedicated fume extractor to capture the fumes and run a line from the dust collector to capture the debris.

Q: Which fume extractor is best for the Laser | EX MCNCLTLC02EC3652-150W?

A: The EX has a 600 CFM extraction requirement. Dust/Debris will settle at the bottom of the machine and should be vacuumed out frequently.

Q: How does a fume extractor differ from a dust collector?

A: A fume extractor consists of up to 4 layers of filtration: as the waste goes into the machine it crosses a material catch, a Prefilter (10 micron) layer, a HEPA (0.2 micron) layer, and an activated charcoal (adsorption) layer. This ensure that the fumes are isolated and stay inside the machine. A dust collector focuses on separation of the dust (large particles) and air. This is usually done with a large 1 micron (or HEPA 0.2 micron) filter.

Q: How do i use the in line model?

A: Each laser machine that Laguna Tools sells comes with an auxiliary blower. If the machine does not have a fume extractor, the blower is used to move the fumes to a

Fume Extraction units are used to control the toxic gasses emitted by some materials upon melting. It is important to know the process you will use and and materials you are processing prior to selecting a fume extractor. The laser machine also matters, for example, the Laser | MX allow for dust and debris extraction in addition to fume extraction. You will find two ports on the rear of the machine.

Please go to lagunatools.com or give us a call at +1 (800) 234-1976.

location away from the machine and operators. With a filter stack (in line model) the blower is still used but the filter stack is then attached in-between the CO2 machine and the axillary blower.

Rotary Fourth Axis Turner

SKU: Check LagunaTools.com

Fits: All CO2 and Fiber Laser machines depending on Work Area & Z axis Range.

Rotary turners allow you to operate on contours and round objects. The turner will plug into the Ruida Controller. It is very simply to set-up and use with the Ruida connections. It is important to select a turner that will fit inside the work area of the of the machine based on the z axis clearance of the laser machine (in [specifications](#)) and the height of the object you are wanting to place on/in the rotary turner.



Fig C014: Rotary attachment accessories for Ruida Controlled CO2 Lasers. (1) Drive motor connected to RUIDA controller. (2) Work piece rests and rotary mechanism.

Q: Which rotary attachment accessories will work with my CO2 Laser machine?

A: You must first select a rotary device that will fit inside the work area. Once that is defined, there are two type of rotary turners: chucked rotary attachments (similar to a wood lathe) and wheel rotary attachments (shown in C014). The wheel rotary attachments are great for use with fragile or glass work pieces.

Honeycomb Table

SKU: N/A included with laser machine

Fits: All CO2 and Fiber Laser machines, depending on work area.



Fig C013: Honeycomb table for CO2 and Fiber Laser machines.

Q: Is this a consumable product? In other words, does the laser ruin the honeycomb?

A: A mark will be left as the laser passes through, but each side will last for a very long time.

2. Setup

WARNING!
WARNING! Never perform any setup, maintenance or adjustments with the machine connected to the power source!
WARNING! If you have any doubt about the described procedure, seek professional assistance. Do not attempt any procedure that you feel is unsafe, or that you do not have the physical capability of achieving.
WARNING! Only operate the Laser machine after proper installation of the Chiller, Air Pump, & Exhaust System. Never operate machine without all systems running.
WARNING! When removing packaging banding, extreme caution must be used as the banding will spring when cut.
CAUTION! The machine is heavy. Ensure that you have enough people to do the job safely.
CAUTION! Use extreme caution when handling the fragile glass laser tube.
NOTE: There may be sawdust in or around your new machine as a result of thorough testing before shipping.

The machine comes as assembled as possible without impacting shipping costs and the possibility of damage. Because of this, there will always be some setup procedures and adjustments that the craftsman must perform prior to using the machine. Those setup sections that must be done to complete the assembly of the machine are in the Machine Setup sub-section. Those help topics for making operational changes to the machine in order to set up for a different function are in the Functional Setup Section. All help topic pertaining to the proper set-up of Accessories and Auxiliary Equipment are in the respective categories.

If you are looking for adjustments, like how to replace belts or align the mirrors, please navigate to the [Maintenance Sections](#) ^[17].

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 - [Exhaust Ventilation](#) ^[15]
 - [Water Chiller & Pump](#) ^[16]
 - [Air Compressor](#) ^[16]
- [2.6 Software Set-Up & Installation](#) ^[16]

2.1 Preparing For Setup



Receiving

It is likely that your machine will be delivered by a third party. Before unboxing, be sure to inspect the packaging and shipping documents supplied by the driver. Ensure that there is no visible damage to the shipment. If any damage has occurred because of shipment, note the damage on the bill of lading or refuse the shipment. Immediately call the dealer store where the machine was purchased.

1. Never accept a shipment that is damaged or partial without notifying the shipping company and the purchasing store.

Placement

Prior to removing the machine from the packaging, decide the operating location of the machine. The dimensions and floor space can be found here: [Dimensions](#) ^[7].

1. There should be sufficient area at the front of the machine to allow you to work on it comfortably.
2. There should be sufficient area at the back of the machine to allow access for adjustments and maintenance to be conducted.
3. Adequate lighting. The better the lighting the more accurately and safely you will be able to work.
4. Solid floor. You should select a solid flat floor, preferably one made of concrete or something similar.
5. Locate it close to a power source and dust collection or fume extraction.

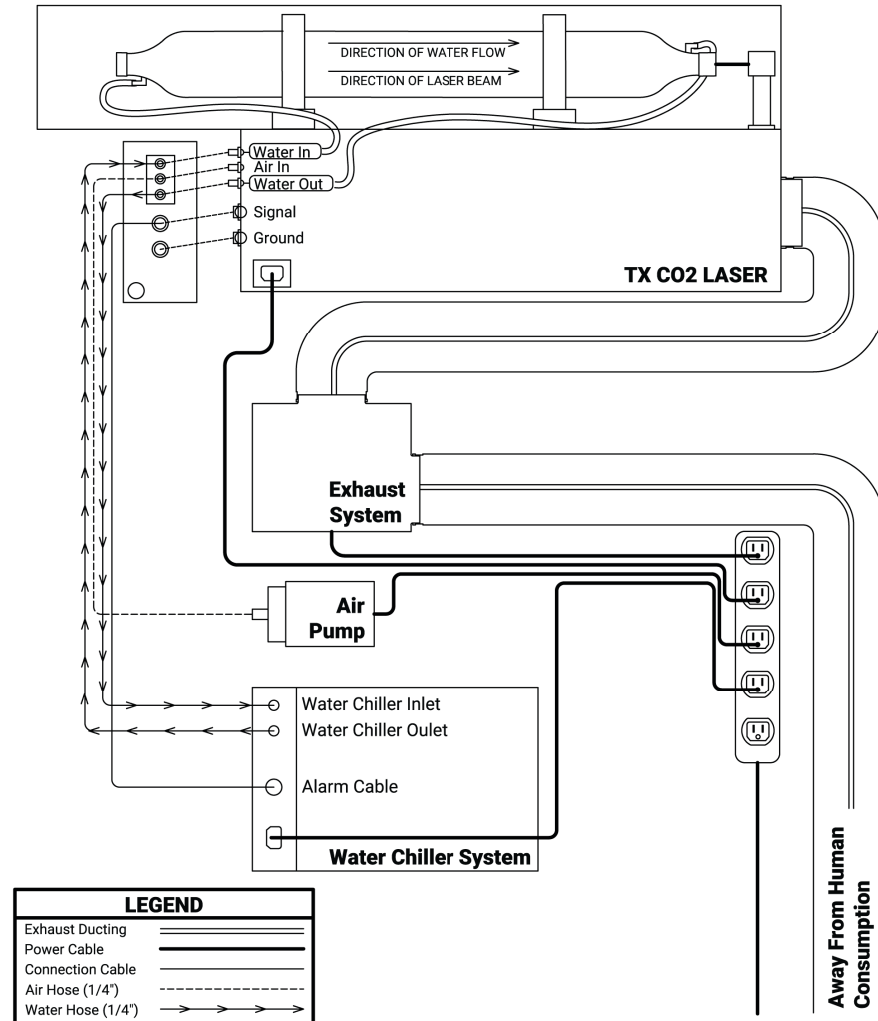
Unboxing

Once in place, carefully unbox and remove all components. Do not unpack the laser tube until prompted in the setup procedures. Unboxing guidelines:

1. Do not cut deep into a box with a brazer blade as it could scratch the paint. Only cut deep enough to cut the tape or use a dull edge.
2. Organize the hardware and setup tools needed (at beginning of each setup section) prior to proceeding with setup.

2.2 Connection Diagrams

TX (MCNCLTLC02MU2012-40W)



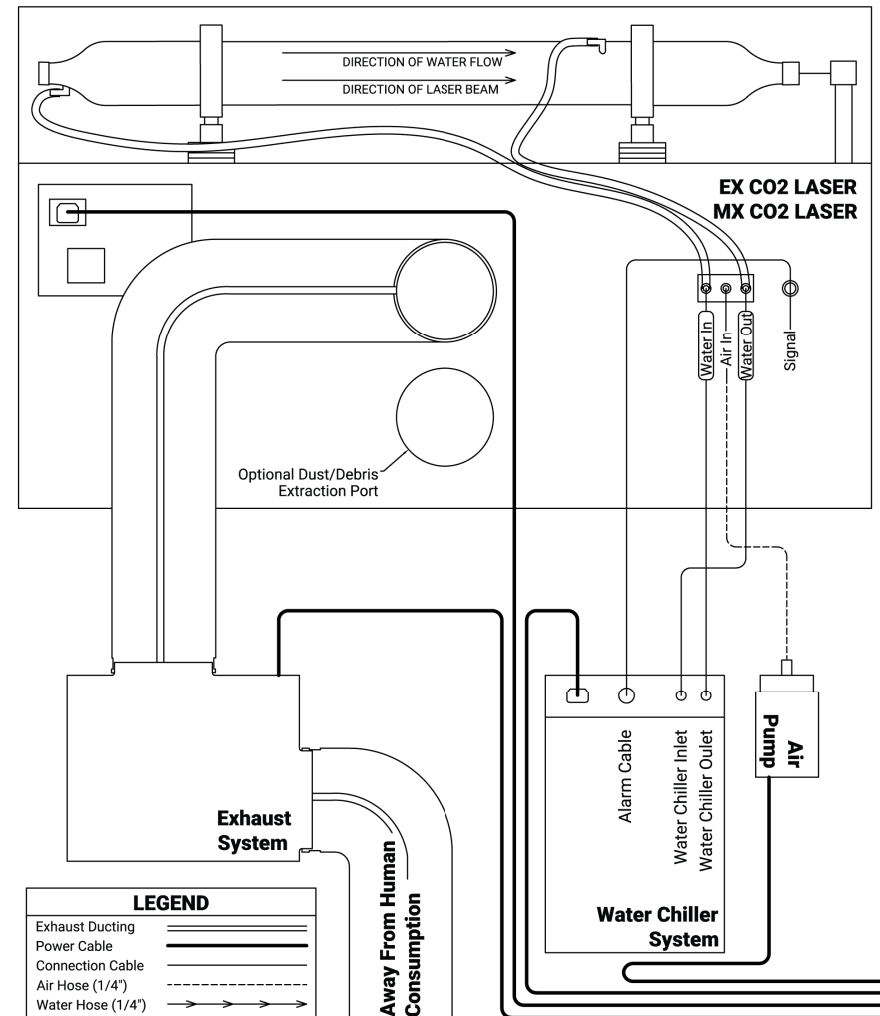
C018 LAGUNA

Fig C018: Connections Diagram for TX-Series CO2 Laser Machine.

Connect all Auxiliary components as shown in C018. Explore further instructions on how to set up each auxiliary unit in the following setup sections. For further electrical diagrams, see [A1. Wiring](#).^[23]

NOTE: Laguna recommends putting the main power of the machine on a dedicated outlet.

EX & MX (MCNCLTLC02EC2436-80W, MCNCLTLC02EC3652-150W)



C019 LAGUNA

Fig C019: Connections Diagram for MX & EX-Series CO2 Laser Machine.

Connect all Auxiliary components as shown in C019. Explore further instructions on how to set up each auxiliary unit in the following setup sections. For further electrical diagrams, see [A1. Wiring](#).^[23]

NOTE: Laguna recommends putting the main power of the machine on a dedicated outlet.

2. SETUP

2.3 Unboxing & Inventory

The Laser Machine will arrive in an insulated wooden crate to prevent shipment damage. Use the appropriate tools to remove the lid and four vertical sides of the wooden crate. Do not unpack the laser tube until prompted in the setup procedures.

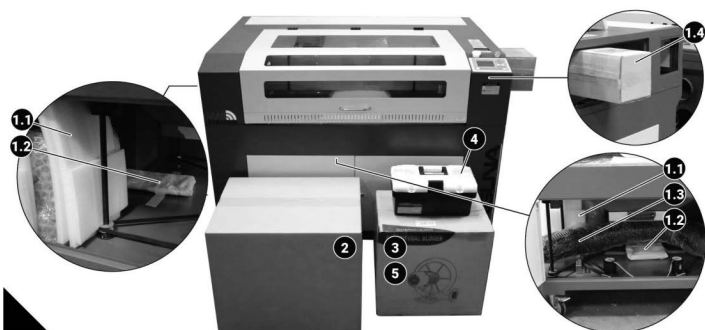


Fig C020: MX (MLTX6011) Receiving (1.1) Laser Tube Cover. (1.2) Right Side upper Panel. (1.3) Exhaust Tubing. (1.4) **FRAGILE** C02 Glass Laser Tube. (2) Water Chiller. (3) Exhaust Fan. (4) Small Parts Box. (5) Air Pump.



Fig C021: MX (MLTX6011) Inventory. (1.1) Laser Tube Cover. (1.2) Right Side Upper Panel. (1.3) Exhaust Tubing. (1.4) **FRAGILE** C02 Glass Laser Tube. (2) Water Chiller. (3) Exhaust Fan. (4) Small Parts Box. (5) Air Pump.

Fig C026: Toolbox contents. (4.1) Ignition Keys - smaller of the three sets. (4.2) Locking keys. (4.3) USB Thumb Drive - Software and Help Files. (4.4) Tools. (4.5) Air Valve (4.6) Universal Connector. (4.7) Spare Limit Switch. (4.8) Alignment Cross-hairs. (4.9) Water Hose Clamps. (4.10) Exhaust Hose Clamps.

Inventory

Key	Name	Description
1	MX C02 Laser Machine	
1.1	Laser Tube Cover	Provides an enclosure for the extended length laser tube.
1.2	Right Side Upper Panel	Encloses machine - must be installed to operate laser machine.
1.3	Exhaust Tubing	Used in Exhaust System
1.4	FRAGILE C02 Glass Laser Tube	USE EXTREME CAUTION WHEN HANDLING. The glass laser tube transfers electrical energy into a light source that is concentrated and then directed through the mirror assemblies to cut, engrave, or sinter materials.
1.5	Honeycomb Table	NOT SHOWN: The honeycomb table will arrive pre-installed and is used as a platform for work pieces.
2	Water Chiller	Chills and pumps water through the glass laser tube to effectively cool the machine.
2.1	Water Tubing x 2	NOT SHOWN: Connect Chiller to Laser Machine through inlet and outlet ports on rear of laser machine.
2.2	Power Cable	NOT SHOWN: Power connection for Water Chiller.
2.3	Connection Cable	NOT SHOWN: Connection Cable From Laser Machine to Water Chiller. AKA "Alarm Cable"
3	Exhaust Fan	Pulls fumes and polluted air from the laser machine to a safe location.
3.1	Metal Expanding Exhaust Ducting	NOT SHOWN: Used from Exhaust fan outlet to direct polluted air away from operator.

4	Small Parts Box	Contains all smart parts, including adjustment tools, spare parts, and software installers.
4.1	Ignition Keys - smaller of the three sets	Starts or stops the laser machine through the ignition switch.
4.2	Locking Keys	All four keys lock or unlock each panel on the laser machine.
4.4	USB Thumb Drive	Contains Ruida Laser Works Software package installer, Owner's Manuals, and Setup Videos.
4.4	Tools	Setup and Adjustment Tools
4.5	Air Valve	Used to regulate air flow form the air pump
4.6	Universal Connector	Used with the purchase of rotary adapter accessory.
4.7	Spare Limit Switch	To repair a faulty limit switch in the x or y limit of the drive system.
4.8	Alignment Crosshair	Used in alignment procedure to help align laser beam to mirror center.
4.9	Water Hose Clamps	Used to fasten tubing to the chiller inlet and outlet.
4.10	Exhaust Hose Clamps	Used to fasten tubing to exhaust ports.

5	Compressor	Supplies compressed air through the laser head assembly to prevent fire and damage to laser lens.
5.1	Air Hose Fitting	NOT SHOWN: Screws into the compressor and allows for air hose attachments.
5.2	Air Hose	NOT SHOWN: Used to connect the compressor and the Air Inlet on Laser machine.

2.4 Machine Set-Up

The following sections should be followed exactly in order to properly set-up the machine.

Removing Zip Ties and Shipping Devices

DANGER! Make sure that the machine is not connected to the power source during laser tube installation.

WARNING! Do not plug in machine or connect anything to a power source until prompted to do so.

NOTICE! Use caution when removing zip ties to avoid damaging the belts..

NOTICE! Use extreme caution when handling the laser tube as it is fragile.

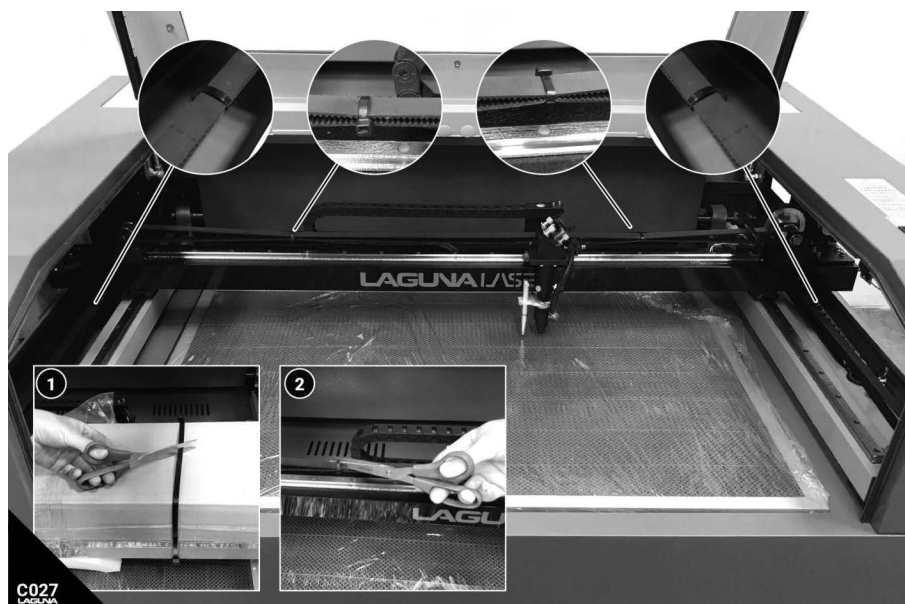


Figure C027: Removing Zip Ties and Shipping Devices. (1) Remove packaging zip ties with scissors. (2) Remove belt zip ties with scissors.

The machine is shipped such that nothing can move in transit. Use a pair of scissors to remove all zip ties as described in C027. Avoid using a razor blade or knife when remove the zip ties on belts to avoid damaging the belts.

Tools Needed: Scissors.

Leveling the Machine

Leveling the machine is important to ensure the flatness of the work area and the alignment of the laser mirrors. Make certain to position the laser machine on a flat solid surface and level the machine by adjusting each caster. Perform this step prior to installing the laser tube to reduce the risk of breaking the laser tube.

Installing Panels and Laser Tube Cover

Note: Although only the MX machine is shown, this section is similar for all Laguna laser machines.

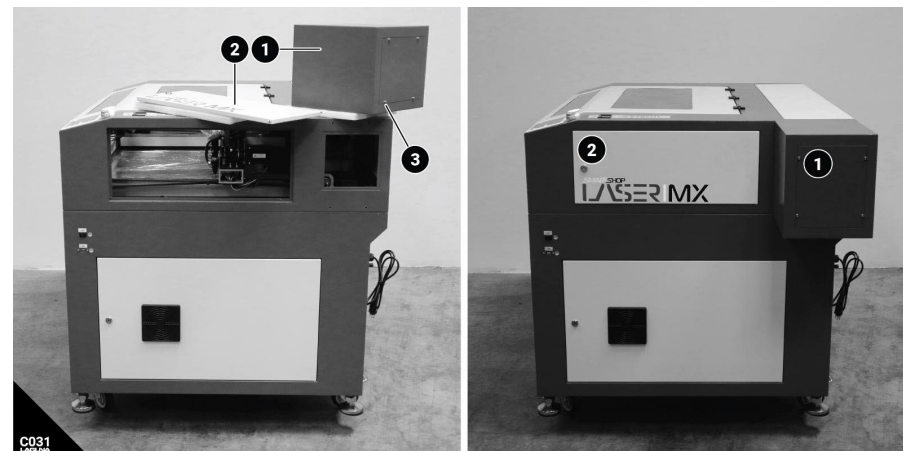


Figure C031: Installing Panels and Laser Tube Cover. (1) Laser Tube Cover. (2) Right side Panel. (3) Screws for Laser Cover.

These panels are located inside the bottom of the laser machine upon shipment. Remove them and follow the procedure exactly to properly install the panels.

Tools Needed: Allen Wrenches.

1. Install the (2) right side panel by pulling down the quick release pin and positioning the pins in the pin holes of the laser machine door frame.
2. Remove the (3) four screws on the (1) Laser Tube Cover.
3. Position the Laser tube cover and re-install the screws..

2. SETUP

Installing the Laser Tube

Note: Although only the MX machine is shown, this section is similar for all Laguna laser machines.

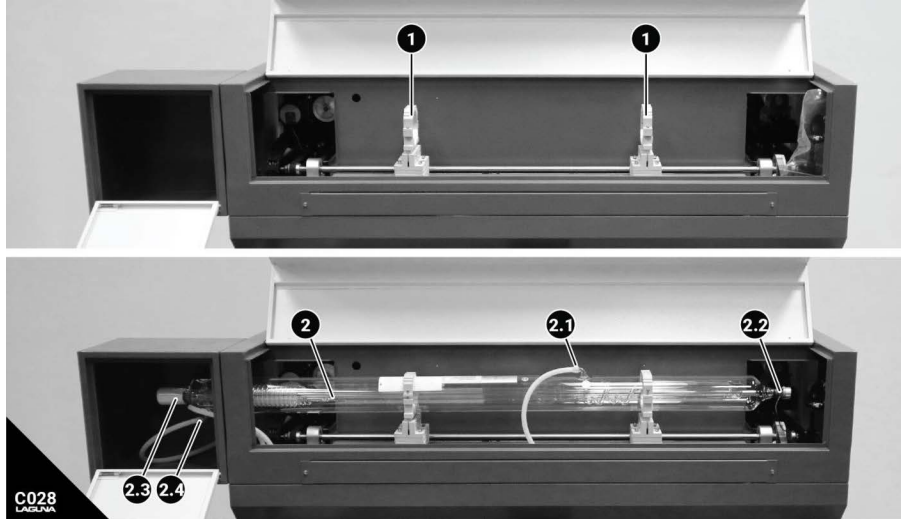


Figure C028: Laser Tube Installation. (1) Laser Tube mount. (2) Laser Tube. (2.1) Water Outlet. (2.2) Anode Terminal. (2.3) Cathode Terminal. (2.4) Water Inlet.

The laser tube must be shipped in a separate insulated package to prevent damage upon shipment. In our quality and testing facility, the tube is mounted and the laser machine mirrors are aligned accordingly. The laser tube is then removed and put back in the original packaging. **Because of this, it should not be necessary to realign the mirrors.** To reinstall the laser tube, follow the procedure exactly. Avoid any adjustments to mirrors or laser tube mounts during the installation.

Tools Needed: Allan Wrenches. Phillips head screwdriver (short)

DANGER Make absolutely sure that the machine is not connected to the power source.

- Remove the top portion of each (1) laser tube mount with an allen wrench. Do not make any adjustments to the other components of the laser tube mounts.
- Carefully remove the (2) laser tube from the packaging.
- Carefully place the (2) laser tube in the laser tube mounts. Once in place, rotate the laser tube so that the (2.1) water outlet tube is pointed straight up. This will eliminate any air bubbles from staying stagnate in the laser tube.
- Position the laser tube by translating the position of the laser tube to a distance of 1.5-2" from the first mirror assembly. A width of 2 fingers is adequate.
- Reinstalled the top mounts of the (1) laser tube mounts. Only tighten down enough to secure the tube - DO NOT over-tighten. DO NOT adjust the height or position of the tube mounts at this time.

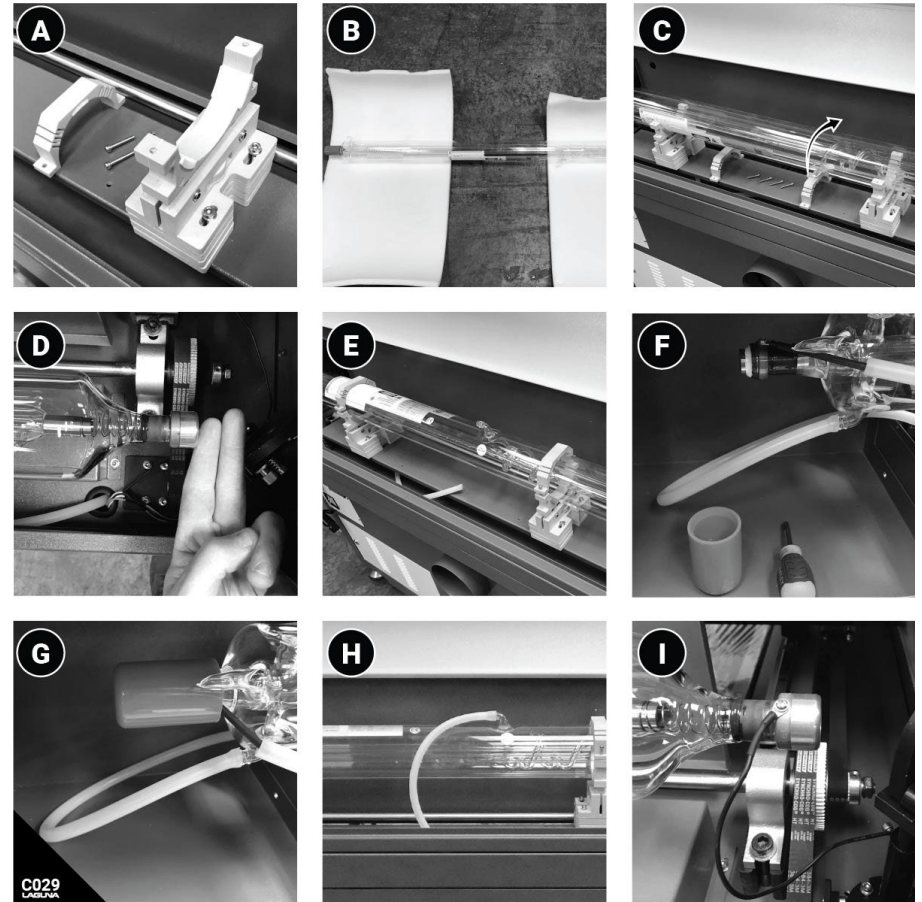


Figure C031: Laser Tube Installation Procedures. (A) Laser tube Mount. (B) Laser tube packaging. (C) Laser tube in place, rotate water outlet vertical. (D) Laser tube two finger spacing from mirror. (E) Laser tube mounted. (F) Cathode Connection & Water Inlet Connection. (G) Cap. (H) Water Outlet Connection. (I) Anode Connection

- Unscrew the red cap and connect the (2.3) cathode wire to the laser tube with the Phillips head connection screw. Install the (2.4) water inlet connection by wetting the tube with water and pushing it completely into place.
- Screw the red safety cap back in place.
- Connect the (2.1) water outlet tube by wetting the end of the tube and pushing into place.
- Connect the (2.2) anode wire to the laser tube with the phillips head connection screw.

Laser Tube (height) Adjustment Notice

In our quality and testing facility, the tube is mounted and the laser machine mirrors are aligned accordingly. The laser tube is then removed and put back in the original packaging. **Because of this, it should not be necessary to re-align the mirrors or Laser tube Mount.** After completion of Axillary equipment and software setup, the operator will continue to the First Use Section. If it is then discovered that the laser is not aligned, proceed to the maintenance sections: Checking for Alignment, Laser Tube Mount Adjustments, Mirror Adjustments, Alignment Procedures.

2.5 Auxiliary Equipment Setup

The following axillary accessories were designed for the X-Series Laser Machines and are required to operate the laser machine. These instructions should be followed exactly to properly set up the equipment. Some of these accessories are designed to fit multiple machines offered by Laguna Tools, check the [specification](#) sheet for a fit guide of all X-Series Laser accessories.

Exhaust Ventilation

WARNING! Do not connect to a power supply until the set-up is complete. Do not perform any of the following steps, installations, or adjustments with the machine connected to a power source unless directed to do so.

WARNING! The fan can tip over if not fastened to a base.

NOTICE: It is a good idea to use a power strip with an on/off switch to give power to all components at the same time, and to turn the machine (systems) on and off easily.

NOTICE: The use of an indoor fume extractor can be very helpful in isolating and controlling the fumes emitted from laser cutting and engraving.

The machine must be ventilated during operation. You will need 3 band clamps, 2 ducting coils or other duct-work, the blower unit, and a flat-head screwdriver to fasten the clamps.



Fig C010: Exhaust Blowing unit for laser machines. (1) Positive Pressure output (air comes out here). (2) Negative pressure input (air is sucked in here). (3) Mounting Bolt Holes. (4) TEFC AC Induction Motor.

SKU: N/A included with laser machine
Fits: All CO2 and Fiber Laser machines < 100Watt.

The purpose of the exhaust blower is to pull harmful gasses away from the machine and operator and direct them to a safe location through the included duct-work. The exhaust system must be set up such that it is in compliance with all local safety and

environmental codes. Laguna Strongly recommends purchasing a fume extractor or filter stack to protect people from the toxic fumes produced in some laser cutting applications/procedures.

Q: Can I use a different blower than the one included?

A: The unit was choose because it is best suited for the operating conditions of the Laser Machine. It is our recommendation to use the included auxiliary machines.

Q: I am not getting enough suction with the included blower to pull the dirty air through a filter arrangement like the in-line filter.

A: Because of the higher pressure needed to force air through the filters, the included fan may not be sufficient - if this is the case then attach the filter stack to the output of the exhaust blower. If still not efficient, a higher powered blower is required.

Set-up

Tools Needed: Allan Wrenches, Phillips Head Screw Driver.

1. Connect the exhaust intake (2) to the rear of the laser machine with 1 (of 2) ducting coils.
2. Fasten the ducting coils together with the included band clamps.
3. Connect the exhaust outlet (1) to the second ducting coil with a band clamp.
4. Fasten the fan to the floor to prevent it from tipping under centrifugal load.
5. The exhaust must, safely and legally, take the fumes from the laser machine away from any individuals who could inhale the fumes.

2. SETUP

Water Chiller & Pump

WARNING! Do not connect to a power supply until the set-up is complete. Do not perform any of the following steps, installations, or adjustments with the machine connected to a power source unless directed to do so.
USE CAUTION! Only use deionized or distilled water. (Tap water or bottled water has minerals in it that will affect the performance and life of the laser tube.) DO NOT USE ANY TYPE OF CHEMICAL COOLANT.
NOTICE! The chiller will leak water out the inlet and outlet ports, so use caution when moving the machine.

You will need 7 liters of distilled or deionized water, the water chiller tubing, the alarm cable, and one of the power cables.



Fig C010: Water Chilling/Pumping Unit for CO2 & Plasma Laser Machines. (1) ON/OFF Switch (2) All systems normal LED indication light. (3) Alarm LED indication light. (4) Temperature digital read out (DRO). (5) Water fill cap. (6) 5-15 to C13 Power cable input. (7) Alarm Cable Input (8) Water Return Input Nozzle. (9) Water to machine Output Nozzle.

SKU: N/A included with laser machine
Fits: All CO2 and Fiber Laser machines < 120Watt.

A chiller must be used to operate the laser tube. The Ruida controller has several safety features;

one of those features detects when water is not in circulation. When this is detected the laser beam is shut off and an alarm sounds until the water can pass through. It is a good idea to test this by pinching the lines of a properly installed chiller.

Q: What type of water should be used?

A: It is important to only use deionized or distilled water. The purer the water (the less minerals and contaminants) the better.

Q: Can I use a different chiller than the one included?

A: The unit was chosen because it is best suited for the operating conditions of the Laser Machine. It is our recommendation to use the included auxiliary equipment.

Setup

Tools Needed: None needed

1. Place the chiller in its location.
2. Unscrew the cap [5] and fill the unit with 7 liters of water. There is no indication of a fill limit, so measure it out prior to filling.
3. Connect the water inlet to the machine outlet according to the connection diagram.
4. Connect the water outlet to the machine inlet according to the connection diagram.
5. Connect the alarm cable to the laser machine [7].
6. Do not connect to power until set-up is complete.

Air Compressor

WARNING! Do not connect to a power supply until the set-up is complete. Do not perform any of the following steps, installations, or adjustments with the machine connected to a power source unless directed to do so.
NOTICE: Make sure the air hose fits all the way into the adapter. The connection should leak very slightly – this is normal.
NOTICE: It is a good idea to use a power strip with an on/off switch to give power to all components at the same time, and to turn the machine (systems) on and off easily.

The air pump needs to supply air to the nozzle to direct fumes away from the focal lens. To install, you will need the air pump, the quick set adapter, and a ¼" air hose.

Fig C011: Air compressing unit for CO2 laser machines. (1) Threaded nozzle insert.

SKU: N/A included with laser machine
Fits: All CO2 and Fiber Laser machines < 100Watt.



The air compressor supplies a continuous air supply through the laser head assembly so that fumes and debris cannot obstruct the laser pathway. The air compressor must be used in operation with the CO2 Laser machine.

Q: Can I use a different air compressor than the one included?

A: The unit was chosen because it is best suited for the operating conditions of the Laser Machine. An alternative air compressor can be used at a set 60 PSI constant flow, and the appropriate fittings are installed. It is our recommendation to use the included compressor with the machine.

Set-up

Tools Needed: N/A

1. Screw the quick set adapter into the air pump adapter insert.
2. Press in the ¼" air hose.
3. Do not connect to power until set-up is complete.

2.6 Software Set-Up & Installation

To configure the included software, please refer to the software owners manual:

Laser Engraving & Cutting Software User Manual-RDWorks V8.0

Available @ <https://system.na3.netsuite.com/core/media/media.nl?id=2146197&c=860860&h=104e12797ee3c23af4e2&xt=.pdf>

3. Maintenance

WARNING!
WARNING! Never perform any setup, maintenance or adjustments with the machine connected to the power source!
WARNING! If you have any doubt about the described procedure, seek professional assistance. Do not attempt any procedure that you feel is unsafe, or that you do not have the physical capability of achieving.
WARNING! When removing banding, extreme caution must be used as the banding will spring when cut.
CAUTION! The machine is heavy. Ensure that you have enough people to do the job safely.
NOTE: There may be sawdust in or around your new machine as a result of thorough testing prior to shipment.

3. Maintenance Contents

- [3.1 Service Schedule](#) | 17
- [3.2 Maintenance Work](#) | 18
 - [Checking for Alignment](#) | 18
 - [Mirror Alignment](#) | 19
 - [Focal Lens](#) | 20

3.1 Service Schedule

Many laser engraving/cutting machines are sold under a service contract - a document outlining servicing tasks that must be completed and verified on a regular basis. These machines are not under a binding contract but it is in the owner's best interest to follow this schedule as closely as possible. The quality and speed of cut and, more importantly, length of machine life will be maximized if this scheduled maintenance is followed. Most importantly, the risk of personnel injury and damage to the machine is greatly minimized under strict compliance with this schedule.

	Clean	Lubricate	Check/Replace
Before Every Use	Exhaust Pathway Debris		Exhaust Pathway Mirror Alignment Chiller Water Level Air Supply
Weekly	Guide Rails Honeycomb Table / Work Surface	X,Y,Z Guide Rails	Focal Lens Belts Water Connections Laser Tube Connections
As Needed	Focal Lens (only when dirty) Mirrors (only when dirty)	X,Y,Z Guide Rails	

Cleaning - Cleaning metal parts (guide rails) is often best done with isopropyl alcohol, a lubricant, or mineral oil. Special care must be taken not to scratch or damage sensitive coatings applied to the optics - a microfiber cloth, cotton swab, and glass cleaning solution is adequate.

Cleaning the exhaust pathway and debris around the vector grid (work surface) is critical to prevent fire. Prior to every use, empty the collection bin and vacuum out any debris accumulated around or on the work area. On a weekly basis, take out the honeycomb table and clean it with compressed air and a wire brush.

Lubrication - The only lubrication needed is directly applied to the linear rails. The number one lubrication mistake is not whether to use grease or oil but rather not lubricating the machine often enough (or not lubricating it at all). A general purpose grease is adequate and recommended. Oil will also work if the grease already on the linear rails is removed before applying the oil. Apply the lubricant and cycle the drive system limits to distribute the lubricant to the bearings.

Replacement Parts - Many of the replacement parts can be purchased from several different sources. There are no components in the machine that are proprietary to Laguna Tools - making it easier for the service technician to find replacement parts like belts, motors, mirrors, mounts, and electronics.

If Focal Lens is dirty - Check the air supply, air valves, and all air connections. Many times the focal lens is contaminated by the evolution of gasses in the process. The air supply is designed to prevent those gasses from rising to and contaminating the focal lens.

If Mirrors are dirty - Check the exhaust system connections and CFM requirement of the machine. Often the mirrors are contaminated by fumes or particulate matter in circulation around the work area. It is the exhaust systems primary function to direct these contaminants away from sensitive components like the mirrors. If the process is generating a high volume of smoke/fumes - ensure that the Material Parameters are correct (not overpowered), and that the exhaust system is properly suited to capture the high volume.

3. MAINTENANCE

3.2 Maintenance Work Checking for Alignment

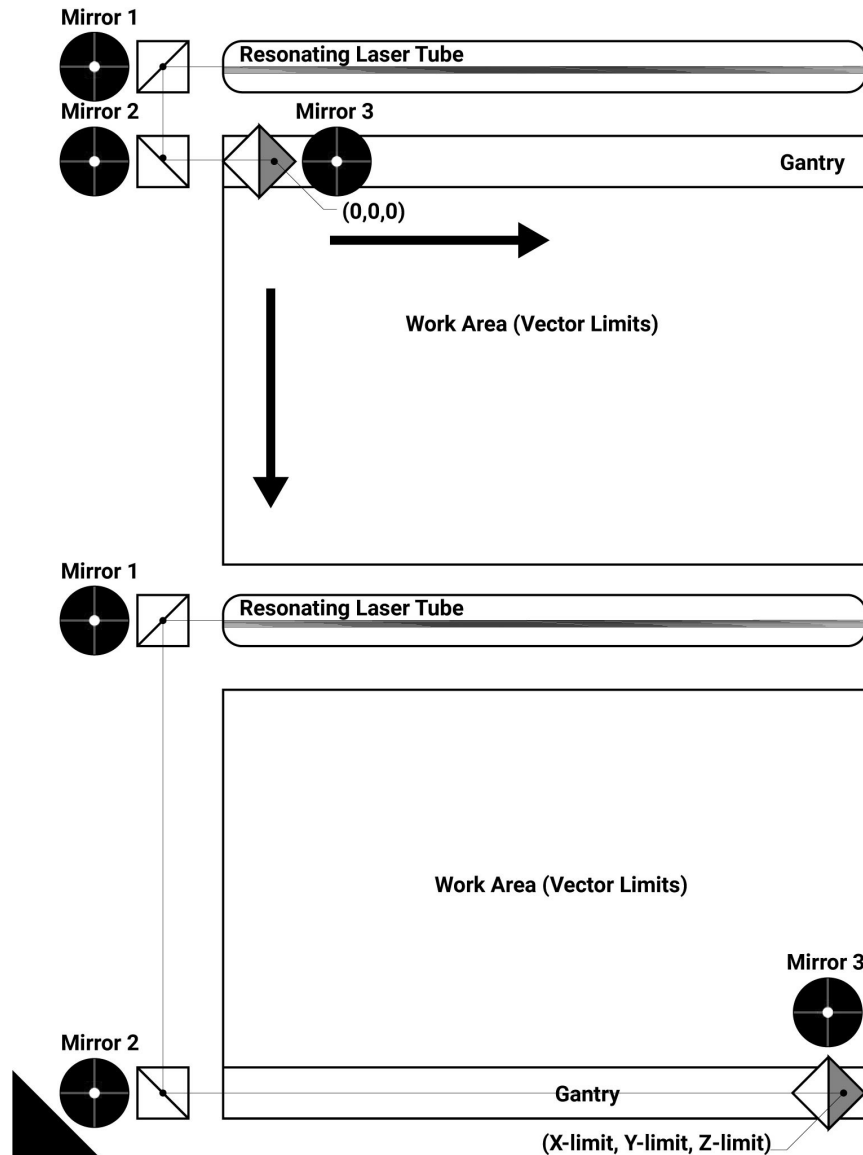


Figure C035: Checking for Alignment.

Many of the times, an un-aligned mirror is obvious because the laser does not reach the focal lens or is terminated somewhere other than the work piece - leaving a burn mark. Other times it is not as obvious because the laser is within the alignment limits on only certain areas of the work area. It is important to understand how to check for alignment prior to actually aligning the laser mirrors. In short, if the laser pulse hits the same spot on final mirror in the (0,0,0) position of the work area - or vector grid - as it does in the (x-limit, y-limit, z-limit) position, then the mirrors are properly aligned. All other cases result in improper alignment. In optimal alignment, those pulses are also in the center of each mirror - useful to the process when the beam is concentrated at the center of the focal lens (not the edge).

Tools Needed: Laser Marking Tape, Brain.

1. Disconnect the laser machine from power source.
2. Remove the bottom nozzle and tube (contains the focal lens) of the laser head assembly by unlocking the height adjust and pulling it completely out.
3. Position the gantry and laser head assembly in the (000) position as shown in C035. Note that this is the closest path possible for the beam to travel.
4. Tear off a piece of marking tape and place over the exposed tube of the laser head assembly.
5. Firmly press the edges of the tape that come in contact with the exposed head assembly tube to leave a circular imprint when removing the tape.
6. Give power to the laser machine, and hit the "pulse command" on the controller.
7. Position the gantry and laser head assembly in the (x-limit, Y-limit) position.
8. Pulse the laser again.

If there are two holes in different locations - then the laser needed to be aligned. The operator can further diagnose which mirrors need adjustment by only tested the X-axis limit, or Y-axis limit. To test only X-axis mirror alignment (mirror 2 & 3), start at (0,0,0) and end at (X-limit,0,0). Similar for testing only Y axis limit.

Mirror Alignment

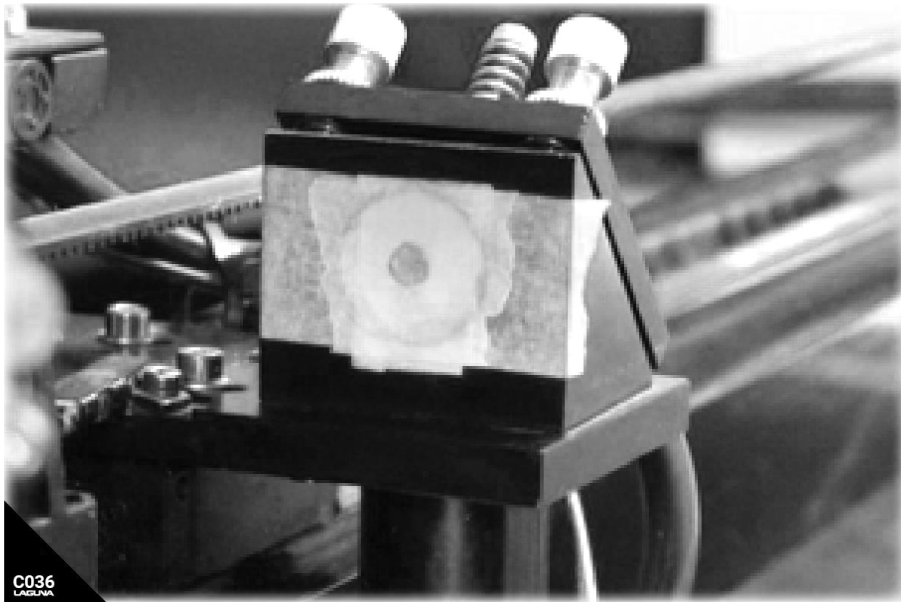


Figure C030: Mirror Alignment shown with marking tape.

Tools Needed: Allen Wrenches, Laser Marking Tape

1. Level the laser tube with the mounting plane of the laser machine - this is the plane that the tube brackets, linear rails, and other components are mounted to.
2. Confirm that the Z-axis height of mirrors 1,2,& 3 is identical.
3. Align the laser tube to mirror 1 by adjusting the height of the laser tube.
4. Align the laser tube to mirror 2 by adjusting the height of the laser tube.
5. Align the laser tube to mirror 3 by adjusting the height of the laser tube.
6. Check alignment and adjust as needed.

Laser Tube Mount Adjustments

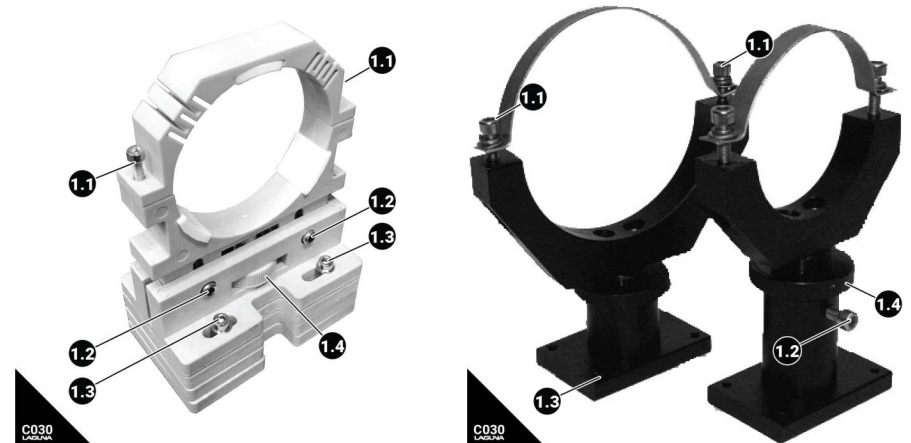


Figure C030: Laser Tube Mount Diagram. Left - EX/MX. Right - TX (1.1) Laser tube Bracket bolts. (1.2) Height Adjustment lock (1.3) Mounting Bolts. (1.4) Height Adjustment.

To adjust the Laser tube mounts, follow the procedure exactly.

Tools Needed: Allen Wrenches

1. Loosen both (1.2) Height Adjustment bolts on the mount that needs to be adjusted.
2. Rotate (1.4) fine adjustment wheel counter clockwise to lower, and clockwise to raise.
3. Re-fasten (1.2) Course Height Adjustment bolts.

3. MAINTENANCE

Mirror Adjustments

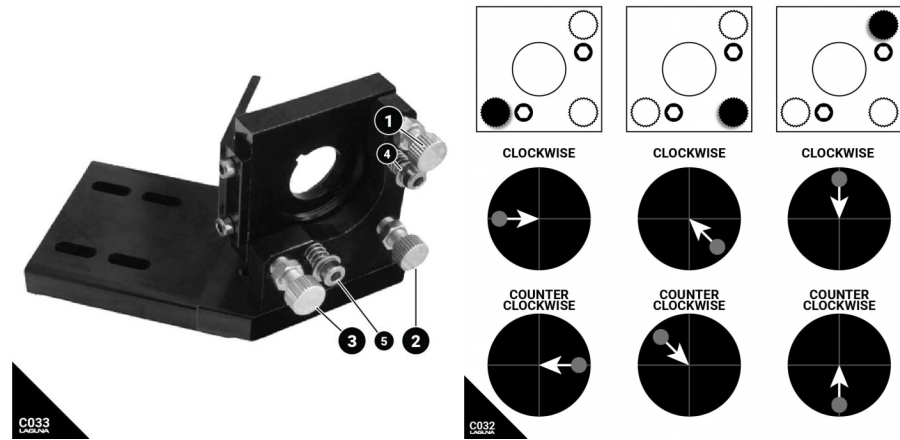


Figure C032: Mirror Assembly Adjustment (1) Y Knob. (2) XY Knob. (3) X Knob. (4,5) Spring Tension Mounting Screws.

Figure C032: Mirror Assembly Adjustment

There are three mirror assemblies on each of the C02 Laser Machines that we sell. To adjust each mirror, a laser pulse on a marking sample (taped on mirror) must be done before and after the adjustment (unless equipped with a red-dot beam combiner). Figure C032 should serve as a guide to where the laser beam should be directed for clockwise and counter clockwise adjustments.

Focal Lens

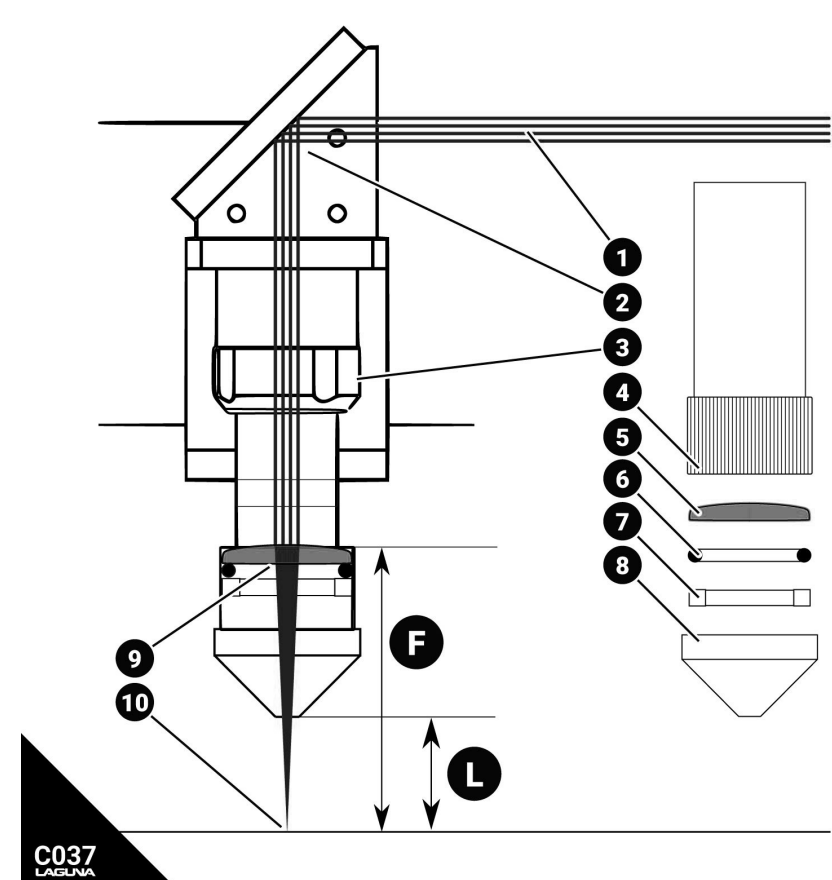


Figure C037: Focal Lens Assembly. (F) Focal Length. (L) Focal Spacing. (1) Unfocused Laser Beam. (2) Laser Head Mirror. (3) Head Removal Set. (4) Lens Removal Set. (5) Focal Lens. (6) Rubber Gasket. (7) Locking Nut. (8) Nozzle. (9) Focusing Beam. (10) Focused Beam @ Surface.

The laser will enter the head assembly and concentrate via the focal lens. Making sure that the laser has a correct (F) Focal Spacing, is extremely important to the quality of the process. This is done automatically via the Automatic Focusing Focus Focal Sensor.

The pre-installed lens is 20mm in diameter, made of ZnSe through the partial vapor deposition process (PVD), and has a focal length of 50.8mm. The lens should be checked often for cleanliness and can be changed for lenses of different purpose.

Lenses

Diameter / Material / Focal Length	Purpose
20mm / PVD ZnSe / 25.4mm	Optimized for engraving
20mm / PVD ZnSe / 50.8mm	General Use (Standard Lens)
20mm / PVD ZnSe / 101mm	Optimized for cutting or on round surfaces without Rotary attachment.

Installing/Removing Focal Lens

Tools Need: N/A

1. Unscrew the assembly by loosening the (3) head assembly set and remove from the Laser head. You may need to move the Z-axis down for clearance.
2. Unscrew the lense removal set(4) from (8) nozzle to expose the (7) locking nut.
3. Carefully remove the lock ring with a small rod (a screwdriver will work).
4. Change or clean the focal lens as needed. To clean:
 - a) Using a microfiber cloth and alcohol or appropriate glass lens cleaner, gently wipe the surface. To clean the mirrors, the same method is advised.
5. Re-assembly the assembly as shown. Note that the convex side of the lens is facing up.

3.3 Troubleshooting

Behavior	Possible Causes	Possible Solutions
Laser machine will not turn on	<ol style="list-style-type: none"> 1. Breaker is on defeated position 2. Improper input power 	<ol style="list-style-type: none"> 1. Flip Breaker Switch 2. Confirm Power supply meets Machine Specifications
All systems are powered but Laser will not fire	<ol style="list-style-type: none"> 1. Interlock Switch (door sensor) defeated 2. Chiller Alarm defeated 3. Water is flowing in the wrong direction 	<ol style="list-style-type: none"> 1. Close door, inspect switch 2. Troubleshoot Chiller Unit 3. Confirm direction of water flow (should be with direction of laser beam, towards first mirror)
Laser fires but does not process work surface or quality of process is poor	<ol style="list-style-type: none"> 1. Mirror is not aligned 2. Focal distance is not set correctly 3. Incorrect Focal Lens 4. Focal Lens is dirty 5. Non-compatible material 	<ol style="list-style-type: none"> 1. Perform mirror alignment procedure 2. Adjust focal spacing to 7mm from work surface. 3. Use lens with 50.8mm focal length 4. Clean focal lens and ensure that the Air Assist System is working. 5. No soln.

3.4 FAQ

Q: What materials can the CO2 Laser machine cut/engrave?

A: The processing capabilities of laser machines are distinguished by the wavelength of the laser beam and the power output of the laser tube. CO2 Lasers can cut and engrave most materials other than metals. By contrast, Fiber Lasers are engineered to produce a laser beam that can process metals. The 40watt CO2 laser can cut and engrave most polymers and polymer composites: plastics, woods, leathers, fabrics, papers, etc. It can also engrave several surfaces that it cannot cut, including anodized or coated metals, glass and stone. Please see Appendix 4, CO2 Laser Machine Single Pass Parameters for RDWorks, for a sample of what this machine can process. The operator must consider hazardous and problematic byproducts of some of these polymers. For example, polycarbonate should not be cut because it produces a toxic gas that can be harmful to the operator and will damage components of the laser machine. See the safety section for other hazardous materials and always check the Material Safety Data Sheet (MSDS) prior to cutting any questionable materials.

Q: How often do I need to change the Laser Tube?

A: The Laser Tube is classified as a consumable part and has a rated lifespan of 5000 hours of use. However, several variables affect the lifespan of the laser tube, like the power setting used and the quality of water coolant used. NOTICE: Only deionized or distilled water should be used with the chiller/laser tube cooling system.

Q: How often do I need to change the water in the chiller unit, and can I leave the water in the laser tube when not in use?

A: The water should be changed on a monthly (30 days) basis. The water can be left in the tube as long as the water cannot freeze. If you are operating this laser in

3. MAINTENANCE

temperatures where the water can freeze overnight, there is a high likelihood that the expanded frozen water will break the laser tube.

Q: Can I use a different Focal Length than the included 50.8mm focal length?

A: All focal lenses must be 20mm in diameter to fit the laser tube assembly. The shortest focal length that can be used is the 50.8mm, constraint by the laser assembly mounting tube. A longer focal length can be used by removing the removable bottom of the PL1220 and resting the machine on riser blocks to accommodate the larger focal spacing needed.

Q: What type of lubricant should I use for the linear bearings?

A: White lithium (PTFE) grease is recommended.

Q: Do I need to use a Fume Extractor with a CO2 laser cutting machine?

A: You must vent the machine to a safe location that will not harm yourself as the operator or any bystanders. This is most easily done with the use of a fume extractor machine. The use of a Fume Extractor is beneficial to the safety of the operator and bystanders as it filters the harmful byproduct away. This does not make it OK to use harmful materials as the fumes must still travel through the venting and parts of the machine that could be irreversible damaged.

A1. Parameters

WARNING!
It is the operators responsibility to understand the material properties and safety precautions peculiar to those materials. The Material Safety Data Sheet (MSDS) will always be available through the material manufacture.
NOTICE!
UNITS - These results were achieved using metric units – mm/s. Make sure that these settings are not inputted as inch/s. The max power is 100%. The max speed is 500mm/s. The default interval is 0.1mm.
THIS CHART MAY NOT BE ACCURATE! Because every laser machine is unique, it is difficult to produce a finite cut chart for reference. This chart should be used as a baseline for the operator to adjust the RDWorks parameters to perform a proper cut or engraving on the work material. It is highly advised that the operator save working parameters in the RDWorks Parameter Library. Feedback and suggestions will help us to further develop these parameters and are highly appreciated. Please email us at manuals@lagunatools.com
MULTIPLE PASSES - Start with low settings and gradually increase them. If the workpiece does not move, the work file can be run multiple times to complete a cut or further detail an engraving. This strategy can be used to cut thicker workpieces.

Use the following tables and select the material closest in material properties to the workpiece to be cut or engraved.

	Laser Tube Wattage
Material	Examples or sub categories of material.
Process	Speed (mm/s) – Min Power%

	40 Watt	60 Watt	80 Watt	120 Watt
Hard Plastics	Acrylic (Lucite, Plexiglass, PMMA), Delrin®, Polyethylene film (Mylar®),			
Engrave	450 - 50%	450 - 40%	450 - 35%	450 - 25%
Cut 1/8" (3.2mm)	25 - 100%	35 - 100%	50 - 100%	60 - 100%
Cut 1/4" (6.4mm)	10 - 100%	15 - 100%	20 - 100%	35 - 100%
Cut 3/8" (9.5mm)	-	-	5 - 100%	15 - 100%
Cut 1/2" (12.7mm)	-	-	-	5 - 100%
There are commonly two types of acrylic. Casted acrylic produces a frosted-look engraving. Extruded Acrylic (the cheaper of the two) is best for cutting and produces a clear engraving.				
Wood	Hardwoods, Plywoods, MDF, Particle Boards			
Engrave	150 - 100%	200 - 100%	300 - 100%	450 - 100%
Deep Engrave	75 - 100%	100 - 100%	175 - 100%	300 - 100%
Cut Veneer	150 - 80%	200 - 80%	250 - 80%	300 - 80%
Cut 1/8" (3.2mm)	25 - 100%	50 - 100%	100 - 100%	200 - 100%
Cut 1/4" (6.4mm)	5 - 100%	15 - 100%	25 - 100%	50 - 100%
Cut 3/8" (9.5mm)	-	-	5 - 100%	40 - 100%
Cut 1/2" (12.7mm)	-	-	-	5 - 100%

	40 Watt	60 Watt	80 Watt	120 Watt
Cut with the grain when possible. Consider that the density and water content of the wood will play a role in the above parameters. Do not process woods with flammable surface finishes like lacquer or varnish.				
Rubber	Silicone, Vulcanized Rubber, Polyurethane, Neoprene, Gaskets, Rubber vibration mats, Rubber stamps			
Engrave	100 - 80%	200 - 80%	325 - 80%	400 - 80%
Cut	50 - 100%	80 - 100%	120 - 100%	150 - 100%
Fabric	Polyester, Nylon, Leather, Denim, Netting, Neoprene, Cotton.			
Cut/Engrave	450 - 20%	450 - 20%	450 - 15%	450 - 15%
Paper (thin materials)				
Cut/Engrave	500 - 10%	500 - 10%	500 - 10%	500 - 10%
When cutting paper, be very cautious of the fire danger. Achieve laser settings such that the laser cuts the material as quickly as possible without leaving burn marks.				

A2. Parts

WARNING!
WARNING! Never perform and setup, maintenance or adjustments with the machine connected to the power source!
NOTICE! Only use authentic Laguna Tools parts for replacements.

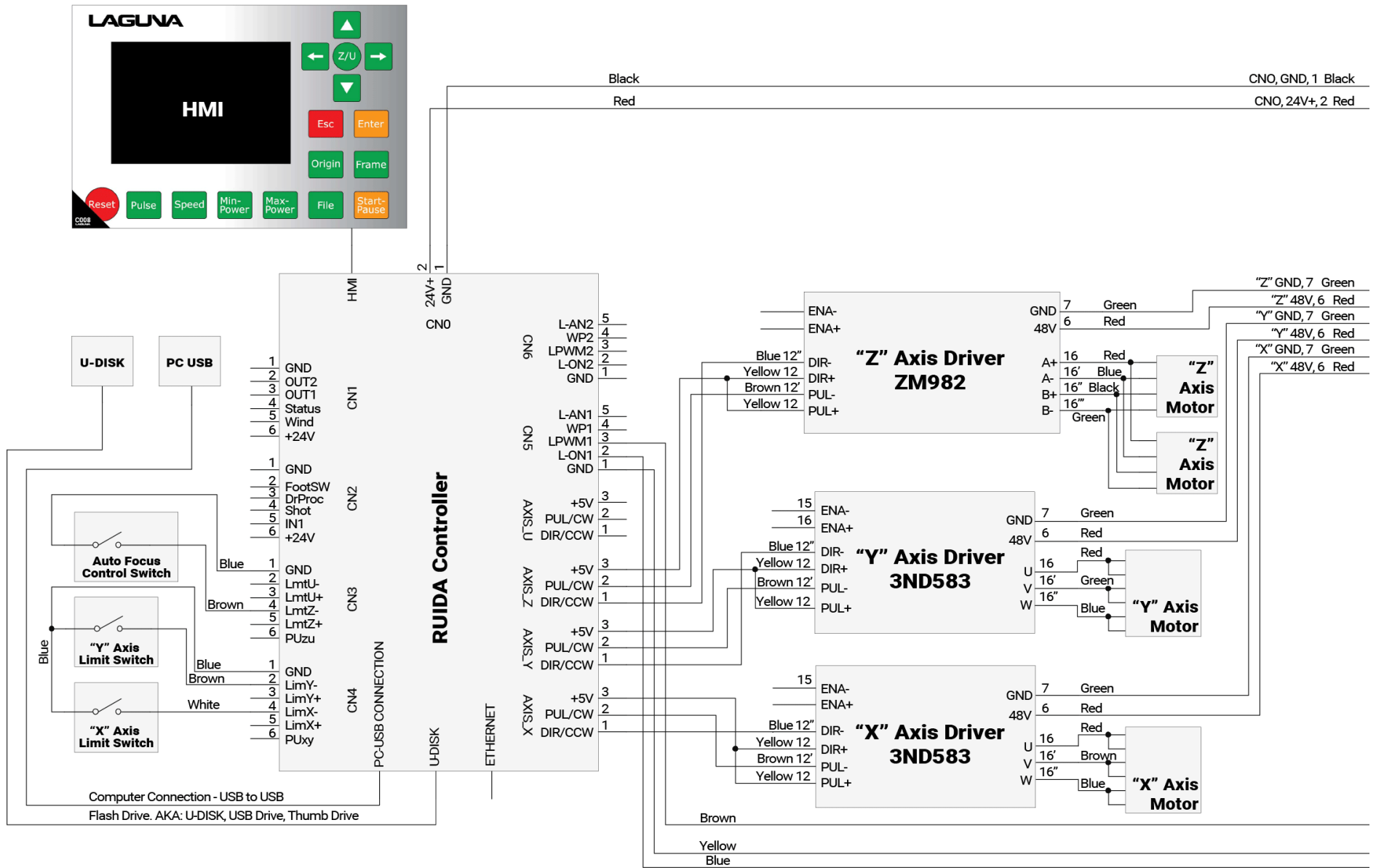
See Specifications here: [1.1 Specifications](#) ⁵
 Customer Support: (949)-474-1200 or customerservice@lagunatools.com

A3. Wiring

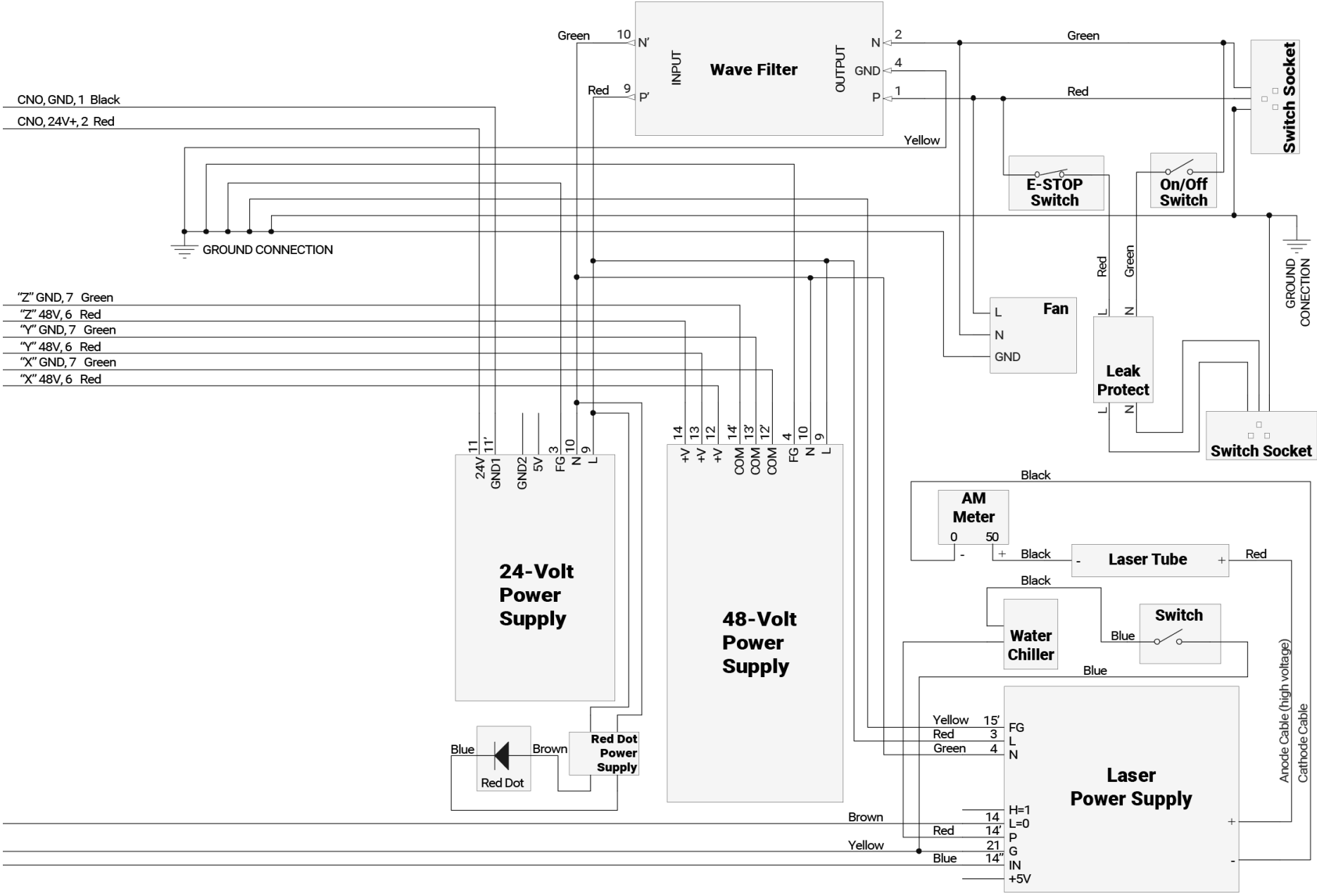
WARNING!
VOLTAGE. Before connecting this tool to a power supply (receptacle, outlet, etc.) make sure that the voltage supplied is the same that is specified on the nameplate of the tool. IF IN DOUBT, DO NOT PLUG IN THE MACHINE. Using this tool with a voltage different than that stated on the nameplate can damage the electrical components of this machine and any such damage will not be covered by a warranty.
CIRCUIT BREAKER. Also make sure that the power supply is equipped with the appropriate breaker and plug according to your local electrical code. To do this, first check the motor plate to get the FLA amperage of the machine, if worn out or not present refer to the specifications sheet. If there is any doubt in choosing the appropriate circuit breaker, please consult an electrician or an electrical supply source.
ELECTRICAL SHOCK. It is extremely dangerous to work on live wires and/or electrical systems that are connected to a power source. ALWAYS disconnect the power from the machine prior to performing any maintenance or adjustments work.
MOTOR WIRING: The information in this manual was current at the time of printing but may be different than the diagram on your machine. ALWAYS use the supplied wiring diagram with the machine or motor (under the electrical covering) if present.

See Electrical Specifications here: [1.1 Specifications](#) ⁵
 Customer Support: (949)-474-1200 or customerservice@lagunatools.com

A3. WIRING



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