

User Manual

NOVA and NOVA Elite



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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.

Laser Safety

The AEON Laser Canada – NOVA Laser Systems are Class 4 laser products, as defined in International Standard IEC 60825-1.

DANGER – RISK OF FIRE

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.

Warning! 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.
- 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.
- Keep a fire extinguisher close to your machine and work area.
- Always keep a properly maintained and inspected fire extinguisher on hand. AEON 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.
- 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.
- 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.

1 INTRODUCTION

Thank you for buying an AEON NOVA Laser System. Your NOVA laser has been designed with ease of use in mind. Although ease of use is important, we also want our customers to utilize their lasers to maximize the value of their work. To help you gain deeper knowledge on the features and capabilities of your NOVA laser system, we've prepared this user manual to help you familiarize yourself with the basic features of your system and to have access to using some of the more advanced features as you get more comfortable with your new NOVA laser's capabilities.

This User Manual details the installation, set-up, start-up, operation, configuration for different operating conditions, maintenance, inspection and repair, the switch-off procedures, and different modes of operation.

The early part of this manual is designed to get you comfortable with your laser system and using the basic features of your NOVA and the latter sections will help you access and use the more advanced features when you need them.

This user manual was designed to help you to get to know how to use our laser engraving and cutting machine safely, properly, and effectively with step-by-step instruction. This manual also has a maintenance section so that you can care and maintain your NOVA to get as much value from it.

The user manual is conveniently divided into five (5) separate chapters: general information, safety, installation guide, operation instructions, and a maintenance section that includes basic trouble shooting techniques. We've included a number of photos to make it easier for you to see the components of your machine which will help you identify and locate different features of your NOVA.



Caution: Before you try operating your machine

Before your machine is ready for use you will need to complete a couple of important setup steps and verifications. The first and foremost step is reading your NOVA User's Manual (this document). Please read and follow this Manual carefully. It will help get you familiar with your machine and the location of its different features.

IMPORTANT

Injury or damage to yourself and/or other persons and/or material can result from not using your NOVA without a proper understanding of how it works or following the safety protocols associated with the use of your NOVA laser system which are covered within this Operation Manual!

Note that operation of your NOVA laser system is only designed for use with equipment and spare parts supplied or listed in the spare parts and consumables lists.

- Auxiliary equipment must be assessed on a case-by-case basis and may be inappropriate or incompatible for use with the machine as designed and delivered to you.
- We strongly recommend that you discuss the use of any changes or additions to your machine by making queries to dealer or manufacturer.

Your NOVA laser system setup must meet the installation requirements of your specific AEON Laser. Proper setup will ensure your NOVA system is operating at peak performance, maximizes its life, minimizes maintenance costs, and avoid accidental damage.

The purpose of this manual and the installation instructions is to provide you with the best setup configuration.

With the above in mind, it is important that you, as our customer and the proud owner of a NOVA laser system, understand these notes before you begin setup and installation of your NOVA laser system. With this knowledge, you will minimize any installation problems.

After your setup and installation our team is available to help you with any specific setup and installation instructions for your particular use.

Note: Should you encounter any setup or installation issues, our service desk and technical support staff will be there to help you.

We welcome any comments or suggestions you might wish to provide.

2 OPERATIONAL CAUTIONS

The AEON NOVA Laser Systems comply with 21 CFR 1040.10 and 1040.11, the US Federal Performance Standards for Light-Emitting Products, except for deviations pursuant to Laser Notice No. 50, dated July 16, 2001. The Center for Devices and Radiological Health, of the US FDA, issued Laser Notice No. 50 to permit manufacturers to classify and manufacture their products in accordance with the International Standard.



Safety Features:

- ★ You should always wear laser glasses when operating the laser.
- ★ The output of the laser is directed to the work surface and contained in the cabinet.
- ★ The laser cabinet has a safety sensor located in the back right hand corner, near the hinge, that turns the laser off if the glass door is opened during operation.
 - If the safety sensor equipped glass door is opened while the machine is operating the laser will immediately stop the laser from firing.
- ★ As an additional feature, access doors are locked and cannot be opened without the use of a special tool.
 - Access panels are do not disable the laser when not in place.



Safe Operation Caution:

- *For Safety and Protection*, Access panels must always be installed and locked when the laser is operating.
- Never operate the laser system with an access panel removed.



Laser Light Cautions:

Laser Diode Pointer (Red Dot Pointer):

- The visible output beam of the Laser Diode Pointer (Red Dot Pointer) is accessible to the operator. While this device employs the same technology as the familiar laser pen-pointers, like them it is potentially hazardous if its beam is directed into the eye.
- We have made every effort to make the Laser Diode Pointer (Red Dot Pointer) as safe as possible. Its beam path is located well inside the cabinet, and under normal conditions, no hazardous levels of laser radiation can escape.

**Operating Cautions:**

The operator of the AEON NOVA Laser Systems (including Elite models) should observe the following:

DO NOT disassemble the machine or remove any of its protective covers while the unit is plugged in.

DO NOT attempt to defeat the door sensor.

DO NOT operate the system without the access panels installed or unlocked when the laser is operating.

DO NOT look directly into the beam or reflection of the Laser Diode Pointer (Red Dot Pointer).

DO NOT operate the Laser Diode Pointer (Red Dot Pointer) without the machine's focus lens in place. If the unfocused beam strikes a reflective surface, it could be directed out of the cabinet.

**Caution – Hazardous Operation**

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser radiation exposure.

**Operational Caution**

Caution when processing conductive materials (carbon fibers), Conductive dust or particles in the ambient air might damage electrical components and lead to short circuits.

Bear in mind that those defects are not warranted.

3 SAFETY INFORMATION

3.1 GENERAL PRINCIPLES OF A CO₂ LASER

LASER is the acronym for Light Amplification by Stimulated Emission of Radiation.

A CO₂ laser works by applying a high voltage to stimulate the molecules within a carbon dioxide gas mixture to increase the energy of the individual gas particles, which produces light when the energy is released. A mirror system reflects the light back and forth along the tube to high intensity which is fractionally released from the minimally transparent mirror. The light beam comes out the lightly transparent mirror end. This invisible light, when focused through a lens, is very intense and the resulting beam will vaporize many materials. Depending on the speed of the laser engraving head and intensity of the projected beam, a CO₂ laser may be used to engrave or cut through a wide variety of materials.

3.2 LASER SAFETY LABELS

3.2.1 CDRH LABEL

This label indicates the class level of CDRH.



3.2.2 LASER PATH LABEL

This label indicates the laser path. Normally you can find this label inside of machine. Please take extra caution with this area and ensure there are no objects in this area when you use the NOVA Laser System or any conduct maintenance.



3.2.3 LASER PATH DANGER LABEL

This label indicates the laser 'light beam's' path. Ensure that no object interferes with this path as any object will interfere with your engraving operation and may cause direct exposure to visible or invisible beam.



3.2.4 LASER PATH CAUTION LABEL

AEON NOVA Laser Systems are designed to operate safely under normal operating conditions. Despite this, the Laser Path Warning Label is affixed in the area of the laser beam's path. When an operator is near one of these paths, they need to be careful as there is a high-risk injury, including eye injuries or burns, from accidentally interfering with the laser light path while the machine is operating.



3.2.5 LASER WARNING LABEL

This label Indicates that the NOVA Laser System produces invisible laser light/radiation This warning label is found on the outside body of the machine. Anyone near the room where the machine is being operated must pay attention, be cautious in their actions while the NOVA Laser System is operating in order to avoid accidental exposure to the laser light/radiation from the laser beam path or engraving surface.

3.3 OTHER SAFETY LABELS/WARNINGS

All personnel involved in the installation, setup, operation, maintenance, and repair of the machine, must have read, and understood this User Manual and in particular this **Safety Section**.



Laser Light Hazards

This laser engraving system contains a carbon dioxide (CO₂) laser of class 4 that emits intensive and invisible laser radiation.



- ★ Without safety precautions the direct radiation or even diffuse reflected radiation is dangerous!
- ★ Without safety precautions, the following risks exist with exposure to laser radiation:

Eyes: Burns to the cornea

Skin: Burns

Clothing: Danger of fire

High Voltage Hazards



There are high voltage and other potential dangers in this machine. Please keep from those that have little knowledge of this machine.

3.4 HAZARDS

3.4.1 FIRE



FIRE HAZARD - Fire extinguishers should be located near the NOVA Laser System.

- It is unsafe to store any flammable materials anywhere inside the NOVA Laser System.
- Any materials left after any production run must be cleared from the cutting bed.
- It is recommended to inspect and clean the inside, if necessary, of the machine after each run to remove any fire hazard risk.

LASER RADIATION - These lasers emit invisible radiation; for your protection, safety glasses should be worn when maintenance is performed on these machines.



3.4.2 ENVIRONMENT

Operational Constraints –

- Temperature - Keep the machine in a dry location and above 5 degrees Celsius.
- Humidity - The environmental humidity should be between 5-95% (no condensed steam).
- Pollution - Do not use the machine where there is pollution.
- Laser (Cooling Water) Temperature - The NOVA Laser System is only designed to operate in the 5-40°C environmental temperature range.
- Electromagnetic Interference (EMI) Sensitivity - The laser machine should be far from EMI sensitive equipment as it generates strong electromagnetic signals.
 - Avoid operating the machine near strong electric fields and strong magnetic fields, or any other potential environmental hazards, etc.

Power Supply Stability - Do not turn on the machine when the power supply voltage is unsteady or does not conform to the NOVA Laser System's requirements.

3.5 MATERIALS SAFETY

HARMFUL MATERIALS RISKS



Before processing materials, the user must verify, whether harmful or flammable gases are released or generated during material processing with the laser and whether the filter equipment of the exhaust system is suitable for clearing the harmful gases.

It is the responsibility of the user, to consider the national and regional threshold values for dust, fogs and gases when selecting the filters and the exhaust system. (The values for the maximum workplace concentration must not be exceeded.)

3.5.1 MATERIALS WHICH CAN BE CUT SAFELY

Your NOVA Laser System is designed to cut or etch a number of materials. The NOVA CO2 laser works better with some materials and not so well with others.



Some materials release toxic gases and/or flammable gases when cut.

It is important to know the material you are working with in order to ensure you are not exposing yourself to serious toxic hazards.

- For example, although PVC is easy to cut, it releases chlorine gas that's toxic and not healthy for human to breath and can cause damage to your NOVA Laser System.

Below is an incomplete list of materials you can use. Note that new materials come out all of the time. If you are uncertain as to whether they can be safely cut with your NOVA Laser System, you need to contact the supplier to get more information.

3.5.1.1 PLASTICS:

- ABS (acrylonitrile butadiene styrene)
- Acrylic (also known as Plexiglas, Lucite, PMMA)
- Delrin (POM, acetal)
- High density polyethylene (HDPE) - melts badly
- Kapton tape (Polyimide)
- Mylar (polyester)
- Nylon - melts badly
- PETG (polyethylene terephthalate glycol)
- Polyethylene (PE) - melts badly
- Polypropylene (PP) - melts somewhat

3.5.1.2 STYRENE

Two-tone acrylic-top color different than core material, usually for custom instrumentation panels, signs, and plaques.

3.5.1.3 FOAM

Depron foam - often used for RC planes

3.5.1.4 EPM

Gator foam - foam core gets burned and eaten away compared to the top and bottom hard shell

3.5.1.5 OTHER:

- Cloths (leather, suede, felt, hemp, cotton)
- Papers
- Rubbers (only if they do not contain chlorine Teflon (PTFE, Polytetrafluoroethylene))
- Woods (MDF, balsa, birch, poplar, red oak, cherry, holly, etc.)

3.5.2 MATERIALS THAT CAN'T OR SHOULD NOT BE CUT

DO NOT CUT



- PVC (Cintra) - contains chlorine b.
- Most Rubber materials (Unless they do not contain chlorine Teflon (PTFE, Polytetrafluoroethylene))
- Metals
- Polycarbonate (PC, Lexan) due to the fumes
- Any materials containing chlorine a.
- Vinyl - contains chlorine
- High pressure materials include all the above guidelines and as listed:

- Stainless steel up to 18 gauge
- Mild steel up to 18 gauge
- Thicker and denser woods

4 OPERATOR SAFETY

4.1 AUTHORIZED/TRAINED PERSONNEL

Authorized Personnel Only



The NOVA Laser System must only be operated by trained and authorized personnel.

The **safe operation** of your NOVA Laser System is dependent on proper training and familiarity with its different features and modes of operation.



4.2 SAFETY SENSOR SYSTEM

**WARNING**

- DO NOT operate the laser system if any component of the safety system is malfunctioning.
- DO NOT attempt to remove or modify any component of the safety interlock system.

The NOVA Laser System is equipped with a safety sensor system which interrupts the laser power when contact is broken. The system design utilizes magnetic sensors on the top right corner of the laser working window.

When the glass lid is opened, loss of contact between the magnetic sensors will deactivate the laser. When the lid is closed, the laser can be powered again.

4.3 BEFORE FIRST USE

Before using NOVA Laser System, you must define how it will be used and develop the procedures you and your team will use to complete those operations safely.

- The development of the procedures must incorporate the information pertinent to the NOVA Laser System's controls.

4.3.1 MAINTENANCE & OPERATIONAL SAFETY

Maintenance of the NOVA Laser System must only be performed by qualified experts with the necessary electrical and mechanical training as well as special training in laser systems.

Switch OFF and Unplug Prior to Any Maintenance or Operation - Preparation, retooling, preparing each work piece,

- maintenance and repair activities must only performed by trained personnel **with equipment unplugged.**

Safety Features - Do not disable limit switches or safety features as this can invalidate warranties and cause damage to you and the machine.

Unattended Machine Dangers - Do not leave the laser unattended when it is working, small scraps can ignite and without supervision can destroy the machine if not checked or cause a major fire.

4.3.2 SAFETY PRIOR TO EACH USE

Safety Inspection of the machine by the operator must be completed before performing any work or maintenance on the NOVA Laser System.

- This safety inspection should look for and document
 - any externally visible damage and defects, and
 - to immediately identify, document any issues or problems that impact the safe use of the NOVA Laser System.



It is critical to fix any safety related issues or problems.

- Failure to do so could result in harm to the operator or damage to the NOVA Laser System.
- These issues or problems, as they impact the safe operation of the NOVA Laser System, **must be fixed before using the machine.**

System Modifications will void your warranty.

- Unauthorized modifications and changes to the NOVA Laser System could harm the operator or the machine.
- Any unauthorized modifications to the machine are not permitted as they could impact the safety features of the NOVA Laser System and the machine may no longer be safe to use.

4.3.3 LASER RADIATION

LASER RADIATION –

- This laser product outputs up to 150 Watts (depending on the laser tube installed in your machine or model) of infrared laser radiation at 10.6 μm wavelength range (which is invisible to the unaided eye).
- **Eye Safety** - These lasers emit invisible (to the unaided eye) radiation; for your protection safety glasses for a CO₂, 10.6 μm must be worn when performing maintenance of these machines.
 - ★ **Anyone operating or near the laser must wear the appropriate laser protective eyewear: the laser protective eyewear must protect against the laser wavelength (10.6 μm).**
- Avoid direct or indirect eye and skin exposure to the laser output radiation including any scattered radiation.
- **Safety Hazards** - The laser radiation may cause the following:
 - ★ Eye damage,
 - ★ Skin burns,
 - ★ Ignite surrounding combustibles,
 - ★ The release of toxic and harmful gases from processing of different materials using the laser radiation.
- The optical path between mirrors must not be blocked (inside the cabinet above the bed, from second to third mirror).
- Avoid obstructing any part of the laser path with any object between mirrors during maintenance, engraving, cutting, or during any debugging or operation of the laser.
- **Scattered Laser Light Risk** - Any processing of material using the laser may result in scattered light.
 - ★ Materials or objects with reflective surfaces or with diffuse reflection must not be placed in the device as the scattered or reflected laser radiation could cause injury to the human body or ignite flammable materials.

4.3.4 HARMFUL MATERIALS RISKS

HARMFUL MATERIALS RISKS –

- **Before processing materials, the user must verify, whether** harmful materials can be generated and whether the filter equipment of the exhaust system is suitable for the harmful materials.
 - ★ It is the responsibility of the user, to consider the national and regional threshold values for dust, fogs and gases when selecting the filters and the exhaust system. (The values for the maximum workplace concentration must not be exceeded.)

- **Toxic Gas Risk** - Any processing of material using the laser may result in the release of toxic gases.
 - ★ as such any operation should be carefully reviewed before processing the object or material to ensure it is suitable and safe for the laser operation.



4.3.5 GENERAL SAFETY

Safety Features - Do not disable limit switches or safety features as this can invalidate warranties and cause damage to you and the machine.

Unattended Machine Dangers - Do not leave the laser unattended when it is working, the material being processed can ignite. Leaving the machine without supervision can result in a fire which could destroy the machine or operational error that could damage the machine.

Maintenance - Replacement of worn, broken parts, power control, or components of the laser system must be performed by a qualified technician.

4.4 ELECTRICAL SAFETY

ELECTRICITY -

Electromagnetic Interference (EMI) Sensitivity - The laser machine should be far from EMI sensitive equipment as it generates strong electromagnetic signals.

This device uses both DC and AC electricity either of which may be fatal even if your laser system is powered off.

This laser system must be used according to the specified electrical operating conditions. The power connection must be properly grounded to prevent an electrical hazard and electrical damage to the laser system.

When the equipment is not in use, the operator key should be removed from the key switch to prevent unauthorized use.

In the event of a fault alarm sound or a fault light is triggered, the laser system must be shut down. The cause of the alarm or fault must be determined prior to restarting the laser system to ensure the system issue has been properly rectified.

In the event the laser tube is ruptured, the Emergency Stop Button must be pressed to immediately cut the power to the laser tube and system. Using the laser with a ruptured laser tube may result in a serious damage or personal injury.

Unexpected events - you should immediately stop work, cut off the power, then contact us if needed.

Power Supply Stability - Do not turn on the machine when the power supply voltage is unsteady or does not conform to the NOVA Laser System's requirements. If the power supply is unstable or is interrupted a sudden change in voltage in the electrical circuits, or electrical equipment could burn out the laser system. The electrical installation should include a 2000W power supply regulator.

Environmental Constraints - Keep the machine in a dry location, do not use the machine where there is pollution, avoid operating the machine near strong electric fields and strong magnetic fields, or any other potential environmental hazards, etc. The NOVA Laser System is only designed to operate in the 5-40°C environmental temperature range. The environmental humidity should be between 5-95% (no condensed steam).

- Avoid using the laser system when there is thunder and/or lightning.
- High humidity can cause unexpected laser discharge, endangering personal safety and could cause damage to the laser power or other components of the laser system.

Air Circulation – to keep the laser system within safe operating conditions, there must be sufficient space around the machine and air intake ports to allow hot air to exit the machine and fresh air to enter the machine.

Cooling Water Temperature - The cooling water must remain between 20 °C and 30 °C. Outside this operating temperature the laser energy output will decline rapidly. A temperature below 0 °C will allow the cooling water to freeze in the laser tube causing the laser tube to rupture or crack.

4.4.1 EQUIPMENT SAFETY STANDARDS

This product is designed to the following national standards:

GB of 18217-2000 - laser safety signs

GB 7247.1-2001 - Radiation Safety of Laser Products, Equipment Classification,

Requirements and User's Guide

GB 1032 thousand -1995 - laser equipment and facilities of the electrical safety GB / T 5226.1-1996 - Electrical equipment of industrial machinery - Part 1:

5 GENERAL INFORMATION

5.1 OVERVIEW

The Nova series laser cutting machine is widely used for cutting non-metallic materials (such as acrylic, leather, cloth, etc.). The machine uses a computer-controlled carbon dioxide laser light source. The Nova Laser System is designed for automatic, computer controlled, precision cutting or engraving. The system incorporates computer control software, and other high performance high-tech components.

The system's optical design and control system is competitive with that of other high-end manufacturers.

The principal components of the NOVA Laser System include:

- 1) A CO₂ laser light source with different optical power settings for cutting different material thickness.
 - a. The advantage of using laser cutting systems provides non-contact processing which reduces the potential for damaging workpieces resulting in greatly improved consistent product quality.
- 2) A Special Dustproof Linear Module.
 - a. With a 3-year warranty.
- 3) X and Y axes gantry which allows for very fast precision cutting or engraving processing speeds up to 72,000 mm/minute.
- 4) A Strong Frame Structure/Strong Body laser cutting design that ensures transportation or long-term use will not degrade its original factory assembly.
- 5) A large window of laser protective material allows for monitoring the processing of your LED illuminated material during the cutting or engraving operation.
- 6) A rail mounted optical system and laser beam allows for the processing of large sized materials or components.
- 7) A computer numerical control (CNC) system which supports a variety of general-purpose graphics that generate PLT, BMP (1 bit) and DXF file formats to produce a variety of images and patterns according to different graphics, and text specifications.
- 8) A laser system design consistent with popular modular electrical design which provides good stability for continuous work at high cutting speeds, without compromising precision positioning accuracy, while maintain simple operation and maintenance as convenient advantages.
- 9) A simple feature-rich CNC laser cutting software, friendly user interface.
 - a. That allows a mixture of vector and lattice work pattern, cutting work to be completed on the same page.
- 10) A design focused on safety that uses a magnetic sensor on the lid's upper right corner to interrupt the laser's operation in case the lid is open while the system is operating.
- 11) A digital ampere meter.
- 12) Additional power outlets for components which can be used with the machine such as the exhaust blower, or air pump which can all be controlled from the panel.
- 13) Rubber gaskets at each door a to minimize noise and prevent scratching or flaking when a door is closed.

5.2 NOVA LASER SYSTEM USES

Your NOVA Laser System was purpose built, designed, and manufactured for general industrial applications related to engraving or cutting of signs, stamps, and other products. Any other uses are not part of the design scope.

The NOVA Laser has the ability to cut a wide variety of materials such as rubber, acrylic, coated metal, tin, special steel, anodized aluminum, cork, cardboard, glass, leather, marble, several plastics, and wood. These materials can be processed within the NOVA Laser System cutting cabinet within the constraints of the cutting platform and laser cutter.

5.2.1 FOR OPTIMAL PERFORMANCE:

The engraving or cutting process must only be performed with a properly adjusted machine.

For cutting applications, the use of the cutting table is absolutely necessary.

5.2.2 DISCLAIMERS:

AEON Laser Canada reserves the right to modify the Laser Systems described in this manual and product specifications document without prior notice.

AEON Laser Canada is not liable for damage to personal and/or equipment resulting from improper use of the Nova Laser System.

Failure to use the NOVA Laser System according to its purpose-built uses, not following the instructions for safe operation, maintenance and repair as described in this User Manual will void your NOVA Laser System machine's warranty.

- The liability resulting from improper use of the NOVA Laser system, including any resulting defects resulting from improper use, is the responsibility and liability of the NOVA Laser System purchaser.

The NOVA Laser System must only be operated, maintained, and repaired, by properly trained and authorized personnel that are familiar with the use of laser engraving/cutting systems and the dangers associated with the operation of laser cutting systems.

The manufacturer retains the product and software patents related to the Nova Laser System, and the copyright and other intellectual property rights related to the laser system design. The purchaser is not authorized to use or distribute any intellectual property related to the NOVA Laser System and shall not directly or indirectly copy, manufacture, process, use this product and its associated parts for any other purpose.

6 INSTALLATION GUIDE

6.1 UNPACKING THE NOVA



- 1) Once you have the crate on the floor, remove the top of the box.
- 2) With the top off, gently pry off the sides of the wooden box, without touching the laser system's casing.
- 3) Once the shipping crate top and sides are removed, carefully inspect the outside of the laser system. Ensure the appearance of the equipment is in good order (refer to the figures above).
 - a) If you have any questions or observe any damage, take some pictures, and contact us.
- 4) Once the sides of the wooden box are removed use a lift to move the NOVA Laser System off the bottom of the box and move it to the operating location.
- 5) Once it is in the desired operating location, you can open the glass lid to remove the items included with the laser.
 - a) Lower the castor stops to ensure your laser does not move during operation or leaned against.
- 6) Once your visual inspection is complete, ensure the items and accessories listed on your invoice are present.
 - a) If you find an item that does not match, is damaged, and/or some accessories are missing, note the details and contact us as soon as you can.



IMPORTANT – CAUTION

The gantry of the machines is locked in place.
 Do not power on the laser without removing the gantry locks.
 You could damage the Y-axis of your machine!

6.2 MANUFACTURER'S LABEL

This label is located at the right-back side of machine.

- All the product information such as Serial Number, Model Numbers, Laser Power, and Electric power can be found here.
- When contacting tech support, you will need to provide this information to access your file.

6.3 LASER MACHINE OVERVIEW

What's Included with your System

6.3.1 ACCESSORIES INSIDE THE LASER BOX:



6.3.2 ACCESSORIES INCLUDED WITH YOUR SYSTEM:



Remove all of the items that are inside the machine.

1. Your machine's test cut which includes your machine's details
2. 2 x laser power keys
3. Set of metric Allen keys compatible with screws on your laser system
4. Power Cable
5. Ethernet/LAN Cable
6. USB cord w/ Ruida software
7. USB Stick
8. Acrylic block with scanning offset (motor) adjustments
9. Dust System components
 - a. 6" Dust hose
 - b. 6" hose attachment for back of machine
 - c. 2 x 6" hose clamps
10. Focus and Alignment tools
 - a. Focus gauge
 - b. Set of 3 targets for alignment
11. Spare parts
 - a. 2x replacement motor belt
 - b. 6 extra screws
 - c. 5 replacement auto focus pins

6.3.3 GETTING YOUR MACHINE READY

Before You start

- 1) Ensure the castor stops are lowered so that your laser does not move
- 2) Ensure all loose products are removed from the machine bed
- 3) Remove any zip ties and obstructions from movement
- 4) Inspect laser tube for cracks and secure positioning
- 5) For NOVA series make sure the air compressor is hooked up
- 6) Hook up ventilation hose to extract potentially harmful fumes
- 7) Setup Lightburn with your machine dimensions, Wi-Fi and scanning offset

Safety Reminders



- Do not use a high output setting when using new material to see how the material will react
- Always keep your fire extinguisher close to the machine
- Never leave your machine unattended
- Do not cut too slow, monitor for large flames
- Always use your fume extractor to reduce smoke buildup

6.4 YOUR LASER – A CLOSER LOOK

6.4.1 OPERATING DESIGN

A high voltage (about 20,000 volts) is applied to the laser tube to excite the carbon dioxide gas within the tube to energize the particles. The particles in the laser tube release infrared light which is amplified along the resonator by the laser tube mirrors on each end. This resonance results in a continuous laser beam from the lightly transparent mirror on the output end of the laser tube.

Computer engraving and cutting instructions are used to control the laser beam and power as it moves over the table to complete the required cuts or engraving. The output of the laser is focused on non-metallic surface to form a high-intensity spot which vaporizes the material. The vapor is cleared by the air assist to ensure a clean cut.

6.4.1.1 PARAMETERS

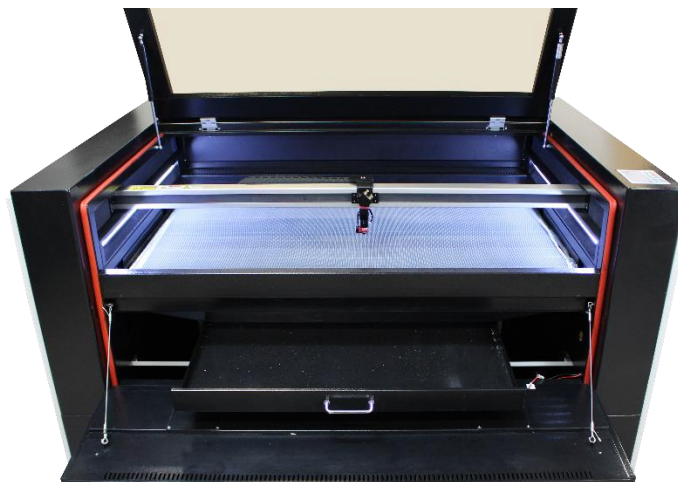
Laser wavelength	10.6 μ m	Cutting speed	Up to 6000 mm/min
Laser type	Sealed CO2 Laser	(The cutting speed is set according to the material thickness)	
Working area	Nova 10 1000 × 700 mm Nova 13 1300 × 900 mm Nova 14 1400 × 900 mm Nova 16 1600 × 1000 mm	Max laser output	80 W/ 100 W/ 130 W/ 150W
Cutting depth	20 mm or less	Laser energy adjustment	0~100% Manual automatic (software setting)
Cutting line width	≤0.5 mm	Cooling system	Circulating water cooling
Cooling water temperature range	5 °C~30 °C	Electric power	110V/60Hz/2KW

6.4.2 SYSTEM STRUCTURE

The NOVA Laser System series laser cutting machine includes an operator panel, cabinet, laser, working platform, constant temperature water-cooling, negative pressure vacuum fans, air assist cutting, and other systems.

6.4.3 APPEARANCE

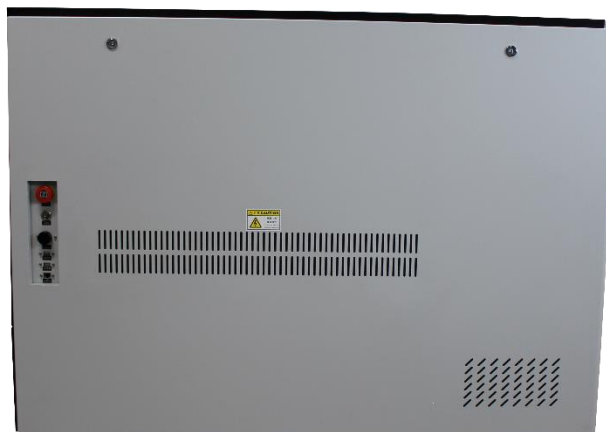
6.4.3.1 FRONT MACHINE



6.4.3.2 BACK OF MACHINE

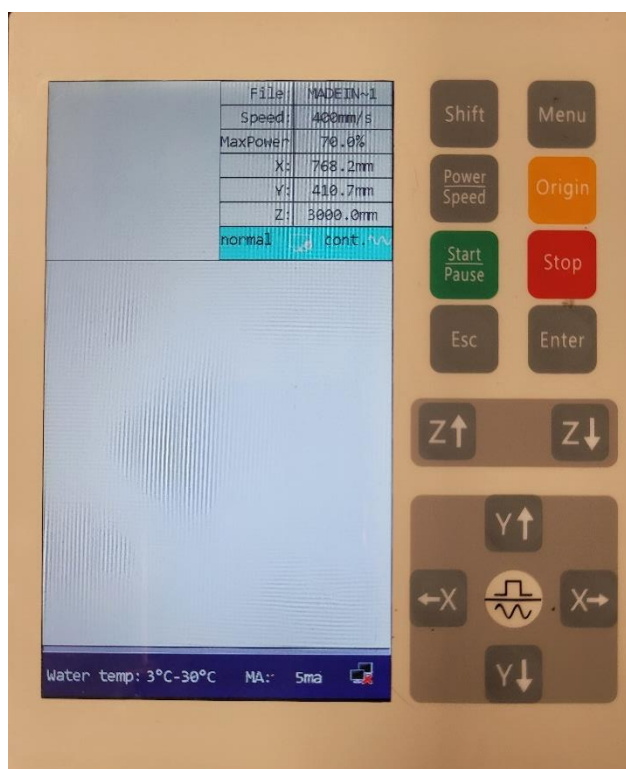


6.4.3.3 RIGHT SIDE OF MACHINE



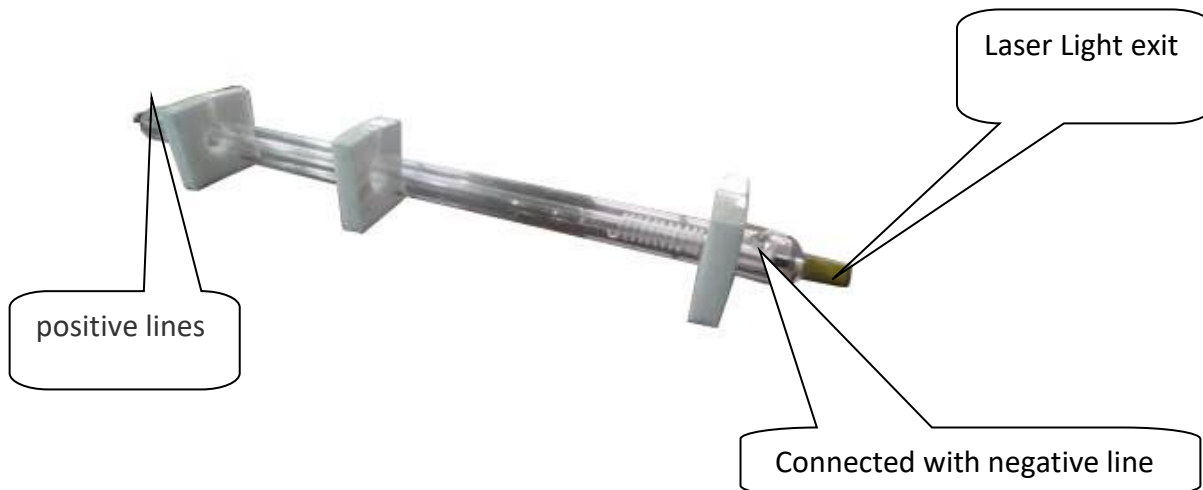
6.4.4 MAIN-OPERATION-CONTROL-PANEL

Your laser system is designed to be operated using the manual control interface or CNC computer control software.

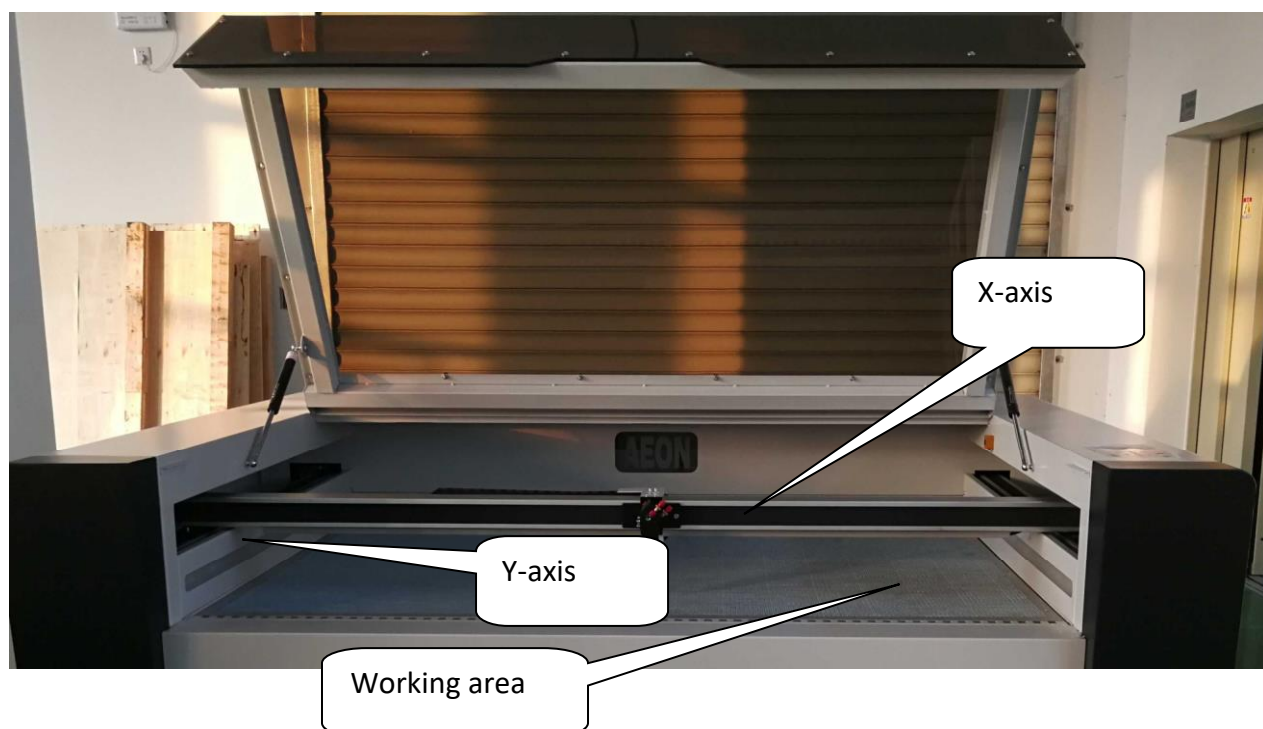


6.4.5 CO2 LASER TUBE

The Laser tube is made of glass and must be handled with care. (Below it is shown with foam support materials as it is not installed in the laser system.)



6.4.6 WORKING PLATFORM



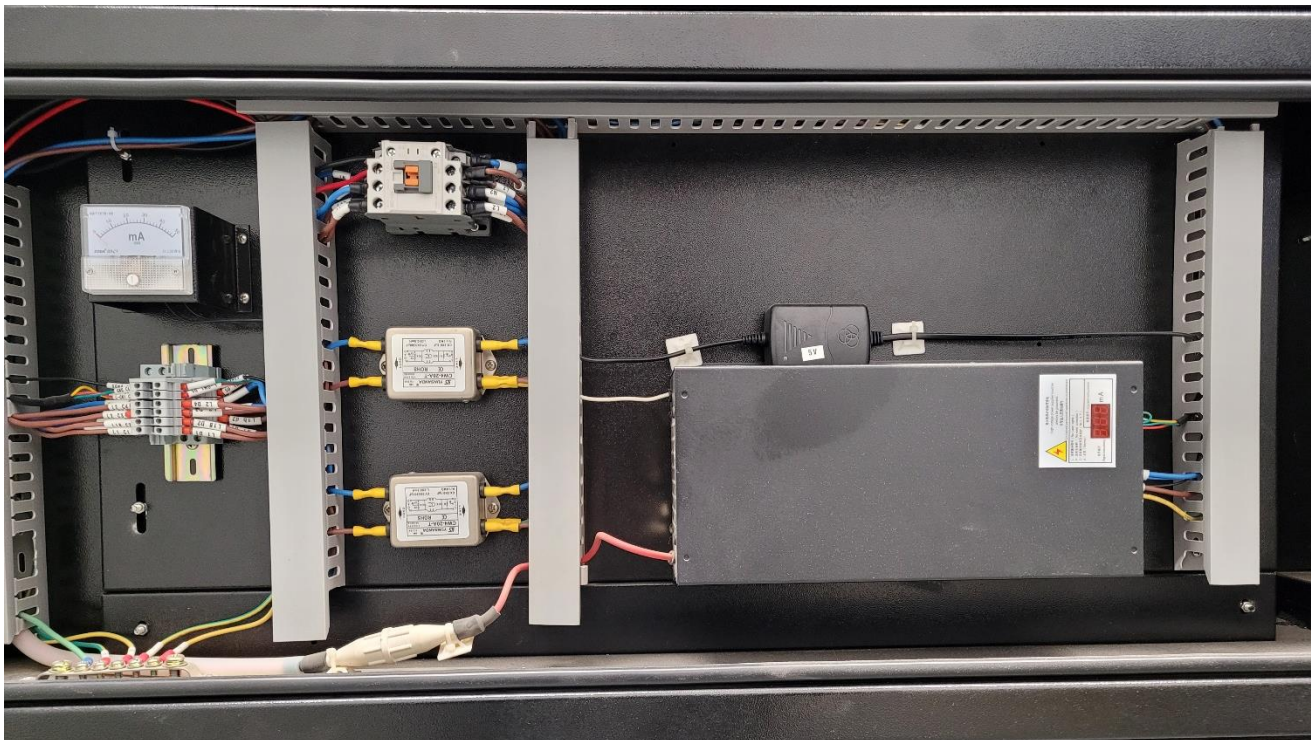
6.4.7 SYSTEM DESIGN

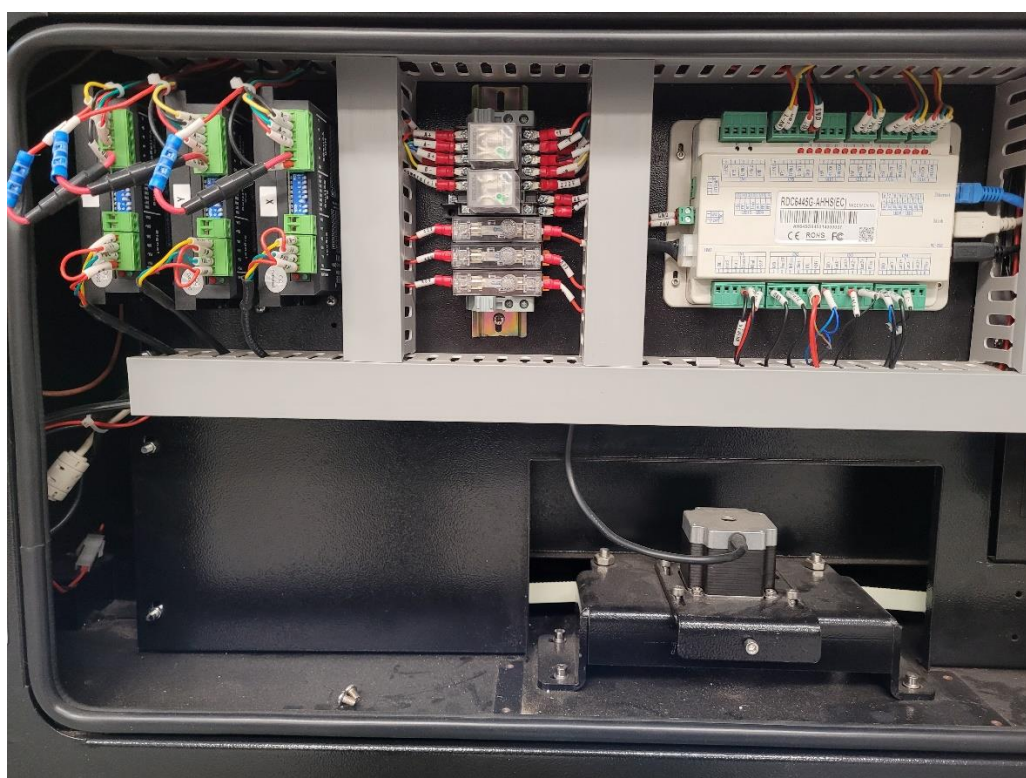
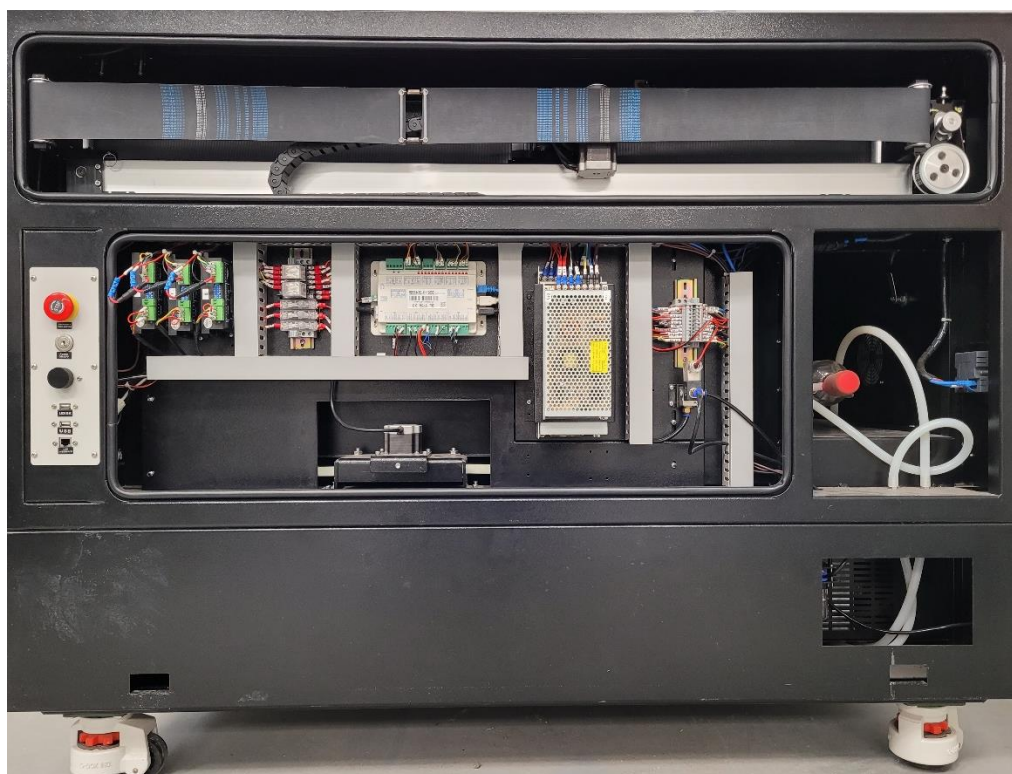
One of the key features of the NOVA Laser System is its compact design. The design includes an integrated water-cooling system, and an air assist system. Having these integrated components simplifies the setup process.

6.4.8 LASER WATER-COOLER



6.4.9 ELECTRONIC CONTROL BOARD







7 SET UP AND INSTALLATION

One of the key features of the NOVA Laser System is its compact design. The design includes integrated water-cooling, smoke extraction, and air assist systems.

Setting up your system is completed in four steps. This ensures you'll have your new NOVA Laser System up and running in short order.

Before Power Up

- 1) Ensure the Chiller is filled with DISTILLED water to the bottom of the FULL line.
- 2) Ensure the Exhaust Pipe is connected and vented to the outside or a fume extractor.
- 3) Connect your computer to the laser via USB cable (or you can hookup using WIFI – instructions are included below).
- 4) Connect the Laser's power.

7.1 FACILITIES REQUIREMENTS AND INFRASTRUCTURE

7.1.1 LOCATION AND ENVIRONMENT

The Nova Laser System dimensions depend on the model you select.

The system should be located in a dust limiting clean room, with stable operating temperature and humidity.

★ Surface - The Nova Laser System needs to be installed on a flat surface.

- ★ Air - The installation room must be well ventilated, and the air must be circulated to the outside with fresh air intake.
 - The intake should be located far from the air outlet. Recirculated air is not recommended.
 - The principal reason for the ventilation is to vent out any stray hazardous dust or toxic gas that may be created during the engraving or cutting process which are not removed by the exhaust pipe.
- ★ Environment - The Nova Laser System needs to have low dust exposure, be kept away from sources of vibration, and away from strong electromagnetic interference.
- ★ Temperature - The ambient temperature must be kept between 15 °C ~ 30 °C.
- ★ Humidity - The relative humidity must be less than 85%.
 - The humidity level must be kept low to ensure there is no condensation within the laser system and the water-cooled laser tube.

7.1.2 POWER REQUIREMENTS

The system must be connected to single-phase three-wire (110V/10A) power.

- Power must be grounded to ensure users are not exposed to electrical risks.
- The power supply must allow for up to 2 kilowatts of peak power to ensure it is able to provide sufficient power to the laser tube for it to create the laser light beam.

7.1.3 AIR SWITCH LOCATION

The air switch should be installed on a wall located over two meters away from the equipment station, and a height of 1.2 meters from the floor.

7.1.4 WATER REQUIREMENTS

The cooling system requires pure, clean water. Either deionized or distilled water will maximize the laser tube's life.

- The system needs approximately 18 liters of water.

7.1.5 VENTILATION

The ventilation system should precondition the air so that moisture is not drawn into the space from the outside, especially during periods of rain or high outdoor humidity. This will ensure the humidity is kept as low as possible as required for operating the laser.

The exhaust dust ventilation pipe should have a diameter of at least 100 mm and meet local code.

7.2 PREPARATION BEFORE INSTALLATION AND ADJUSTMENT



Caution - Setup and installation usually requires 3 to 4 reasonably strong people.

The following equipment is recommended for unpacking your Nova Laser System:

- A forklift rated for more than 1 ton of lift capacity for lifting and moving,
- a 12 " or 15" adjustable wrench,
- a multimeter, and
- a vernier caliper.

You will also need some materials:

- 1) acrylic board,
- 2) insulation tape (1 spare roll just in case),
- 3) 1 roll of scotch tape.

7.3 BEFORE STARTUP

One of the key features of the Nova Laser System is its compact design. The design includes integrated water-cooling system, smoke extraction, and air assist system.

Setting up your system is completed in four steps. This ensures you'll have your new Nova Laser System up and running in short order.

Before Power Up You will complete the following steps below

- 1) Ensure the Chiller is filled with DISTILLED water to the bottom of the FULL line.
- 2) Ensure the Exhaust Pipe is connected and vented to the outside or a fume extractor.
- 3) Connect your computer to the laser via USB cable (or you can hookup using WIFI).
- 4) Connect the Laser's power.
- 5) Set the rubber down on the wheel castors.

7.3.1 STEP 1: FILLING THE WATER RESERVOIR

The Nova Laser system ships without water, so there is no water visible in the water level indicator (see picture below for indicator). Before first use you will need to fill the water in the tank until the level is indicating 'green' or above (see picture below). At that point you don't need to add any additional water.

After your system is operating for a period of time, the water level may be indicating 'yellow' or 'red', at that point you need to add water to your laser cooling system.

- Locate and open the 'Water Inlet' cap.
- This is where you add water to keep your laser cool.



- Add distilled or deionized water into the water reservoir.

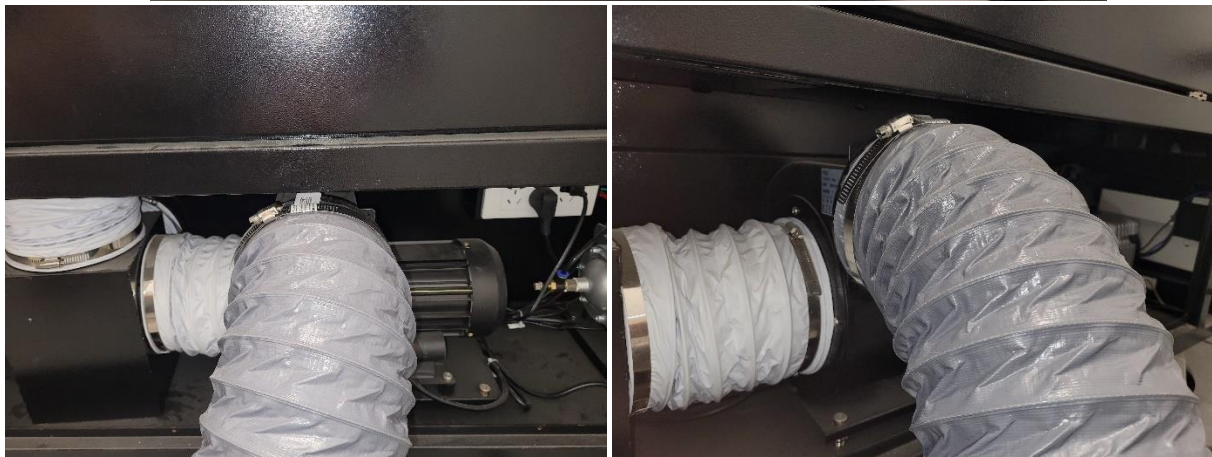
Caution – Only Fill until the water level is in the 'Green' or "Normal" fill indicator zone.

Note: Purified or Distilled water are recommended to maximize laser tube life.

7.3.2 STEP 2: INSTALL THE EXHAUST PIPE

Locate the Exhaust Pipe attachment as seen in the picture below.

- If the Exhaust Pipe attachment is not installed, using a screwdriver, attach the Exhaust Pipe attachment to the back of the machine using the four screws. Ensure they are tight enough.
- Once installed, attach the exhaust pipe fixture to the back of your MIRA Laser System's housing.
- The exhaust pipe fixture must be secured using a fastening ring to ensure it doesn't get dislodged during operation.
- The other end of the exhaust pipe must be connected to a vent to the outdoors or a fume extractor.



Caution: As can be seen in the right part of the picture above, the exhaust pipe fixture must be secured using a fastening ring to ensure it doesn't get dislodged during operation.

Caution: The other end of the exhaust pipe must be connected to a vent to the outdoors or to a fume extractor.

7.3.3 STEP 3: CONNECT YOUR MACHINE TO A COMPUTER

You can direct connect your computer to the NOVA Laser System using the USB port located on the side of the machine as shown in the picture below.

Connect your computer directly to the NOVA Laser System using the USB port located on the side of the machine as shown in the picture below.



Alternatively, you can connect the machine to the computer by accessing its Wi-Fi signal.

7.3.4 STEP 4: CONNECT THE POWER

The NOVA Laser System comes with a power connector plug. Plug in the power cord to the connector plug before connecting it to the power (at location shown below).



7.4 FIRST TIME - POWERING UP YOUR NOVA LASER SYSTEM

In order to turn on your NOVA Laser System.



Caution: Before completing the following steps, ensure there is nothing on the table inside the laser working area. When powered on, the laser head automatically moves to the machine's origin point (factory default location is set to the upper right of the table).

1. Ensure the Nova Laser is plugged in.
 - a. Check that the power plug is connected to the back of your laser, if not, insert/attach it.
2. Move the switches above the power plug to "1" or 'Up', the 'on' state, if they are not.
3. Your machine now has power. In order to power it on the Key will need to be inserted and turned into the on position.



4. Ensure 'E-Stop' (the red button in the above picture) on the right-hand side of the machine is released by rotating clockwise (in the direction shown by the arrows) or pulling out this button.
 - a. Rotate the "Red" Control Switch (shown in the picture below) clockwise,
 - i. The button will bounce out, and the machine will be powered on.
 - ii. Note that the Laser head will move back to its origin point.
5. Your machine will start moving towards the rear right side of the machine.



Caution –
Wait!

During initial power up, once the machine is turned on and the laser is moving to it's origin point.

Caution



Do not operate the machine immediately.
Wait two minutes to let the water-cooling system fill laser tube.

Ensure the Cooling System is working!

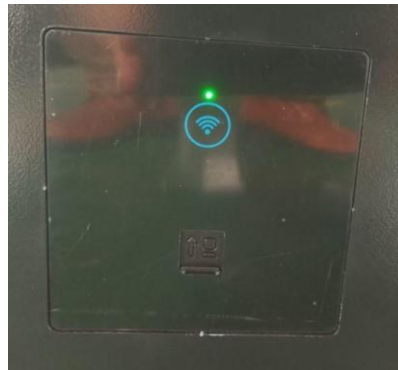
7.5 WIFI SETUP

WiFi connectivity is available on the NOVA Laser System.

To access this functionality please follow the steps in section 9.4.1.1:

The WiFi indicator is located on the back panel located in the middle left of the machine.

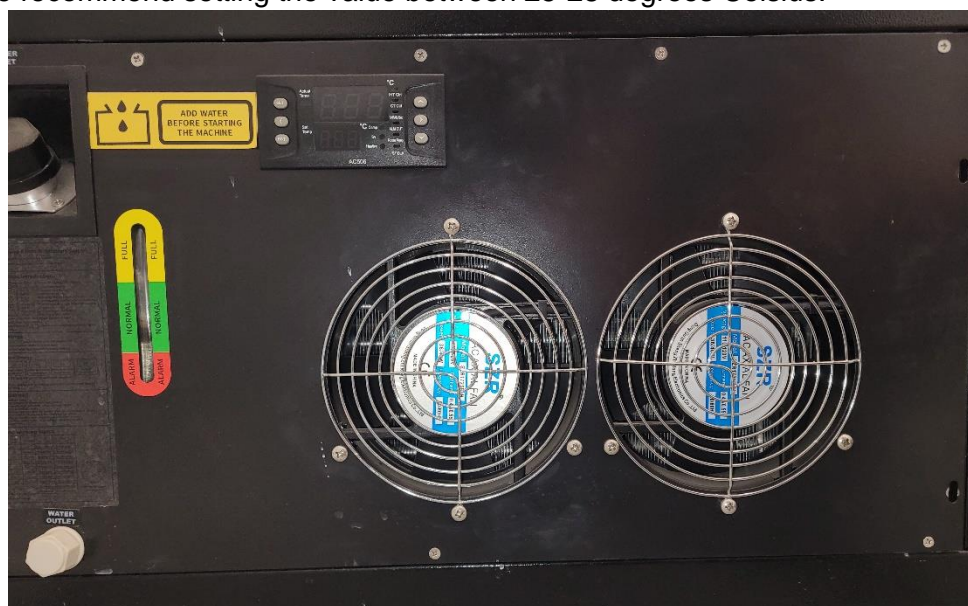
1. A green blinking light indicates the WIFI is operating and can be connected to.
2. During setup, the NOVA Laser System's WiFi will appear in the list of available networks in your computer's network connection menu. This must be connected to your computer for the connection to function.



7.6 SET/VERIFY LASER COOLANT (WATER) TEMPERATURE

The water temperature is to be kept below 35 degrees Celsius.

- We recommend setting the value between 25-28 degrees Celsius.



Open the back lid to check that the laser tube is full of water.
Once the laser tube is full, you can start firing the laser.

8 OPERATION GUIDE

8.1 POWERING UP YOUR NOVA LASER SYSTEM



Caution – Wait!

During each power up cycle, the laser head will move to it's origin point.



Caution

After powering on, do not operate the machine immediately.

Wait one to two minutes to let the water-cooling system fill laser tube.

Open the back lid to check that the laser tube is full of water.

Once the laser tube is full, you can start firing the laser.

To power on, rotate the Control Switch clockwise (see picture below),

- a. the button will bounce up, and the machine will be powered on.
- b. Note that the Laser head will reposition to it's pre-set, origin point.

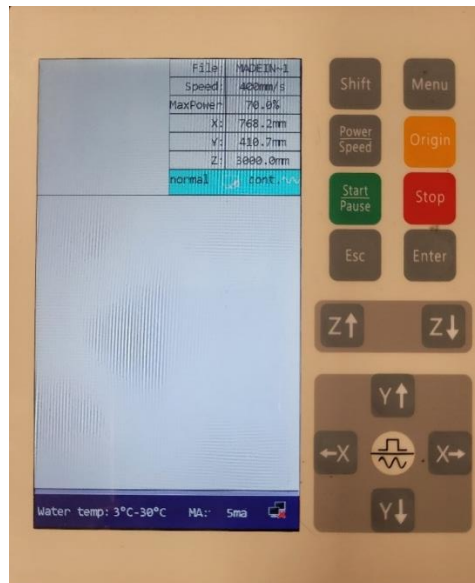


8.2 OVERVIEW OF THE KEYS ON THE CONTROL PANEL

Once your system is powered up you need to get familiar with the features of the Control Panel. The following functions are available.

8.2.1 CONTROL PANEL

8.2.1.1 HOME SCREEN



8.2.1.2 CONTROL PANEL – STATUS BAR

The control panel includes a bottom status bar.

- Water temp: water temperature settings.
- MA: current meter reading.
- 'computer connectivity' icon: Red 'X' not connected, Green '√' means it is connected.

8.2.2 CONTROL BUTTONS

Menu: A secondary menu with additional options

Esc: To exit to some menu.

Start/Pause: To start or pause the work.

Enter: Validate the change, or for navigating menus

Shift: Used in combination with other keys to activate various features.

8.2.3 SETTING BUTTONS

Power / Speed: Allows you to set the Max/min power and jog speed of the machine.

8.2.4 LASER HEAD CONTROL BUTTONS

‘←X’ ‘X→’ buttons: To move the X axes left/right or the cursor.

‘Y↑’ ‘Y↓’ buttons: To move the Y axes up/down or the cursor.

‘Z↑’ ‘Z↓’ buttons: To move the Z axes (raise or lower bed).

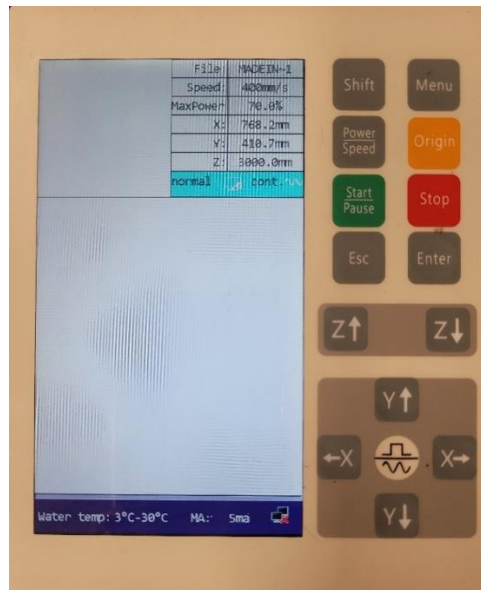
Origin: Sends the laser to the user set origin point.

8.2.5 SHORT CUTS/COMBINATION KEYS

Select the ‘Menu’ key and then use the ‘Y↑’ ‘Y↓’ button to view the ‘Combination key description+’ shortcuts.



8.3 INTRODUCTION TO THE MAIN INTERFACE



When the system is powered on, the following areas will be visible on the control screen:

Upper Right:

- Displays the active file.
- Speed for moving the laser head.
- MaxPower as a %.
- Coordinate: Displays the current coordinate of X, Y and Z axes.

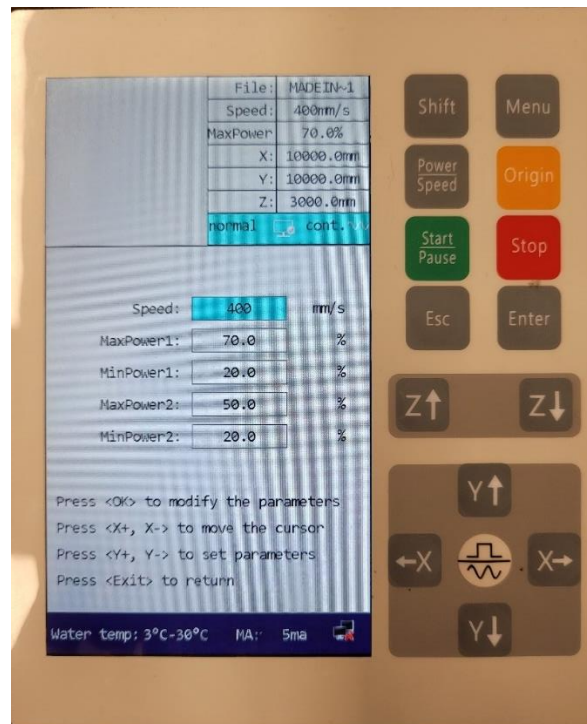
Bottom:

- Water Temp
- Current
- Connection: Computer/WiFi

8.4 THE POWER/SPEED BUTTON

Using the 'Power/Speed' short cut menu button allows users to set:

- Speed of cutting or engraving
- Max/Min % Power for the Power 1 and Power 2 settings.



8.5 FILE LOAD – TO SET THE LAYER PARAMETERS

The easiest way to control the laser for any job is to use a file generated by a laser cutting or engraving software (such as Lightburn).

A file can be loaded using the file load function which is accessed by pressing the “combination key” ‘Shift + Menu’ buttons. This Menu will allow you to load a file from a USB onto the machine.

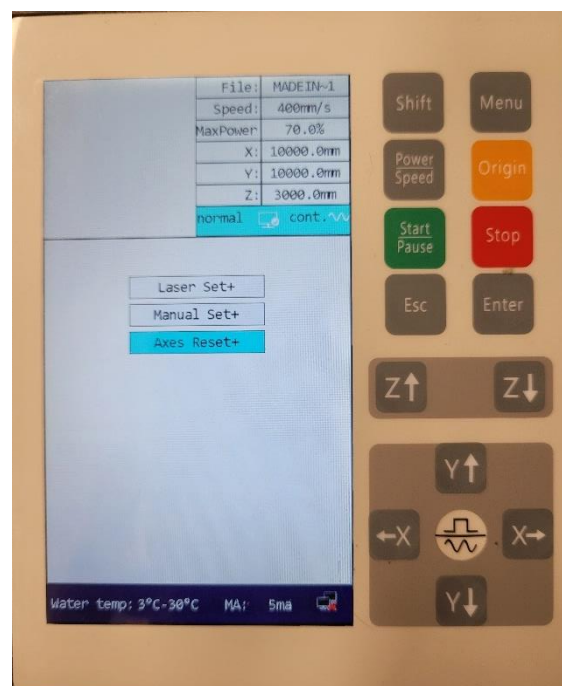
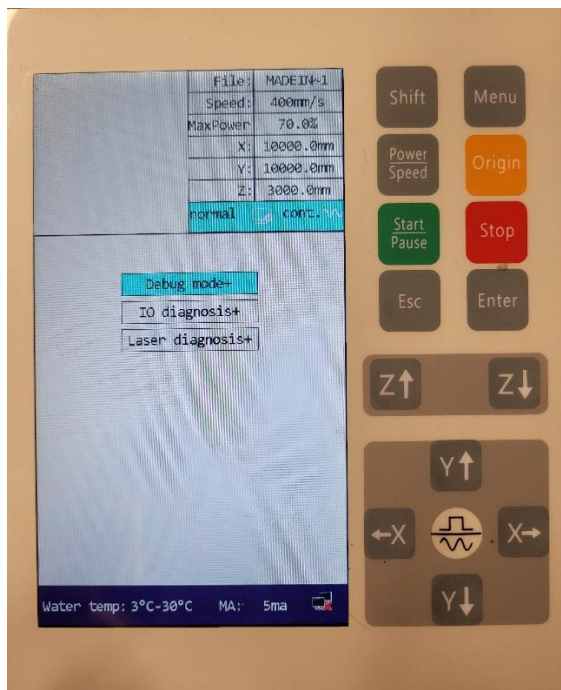
- Minor adjustments can also be made from this menu.

Alternatively, the laser cutting, or engraving process can be run from the Lightburn software using a computer connected to the USB port.

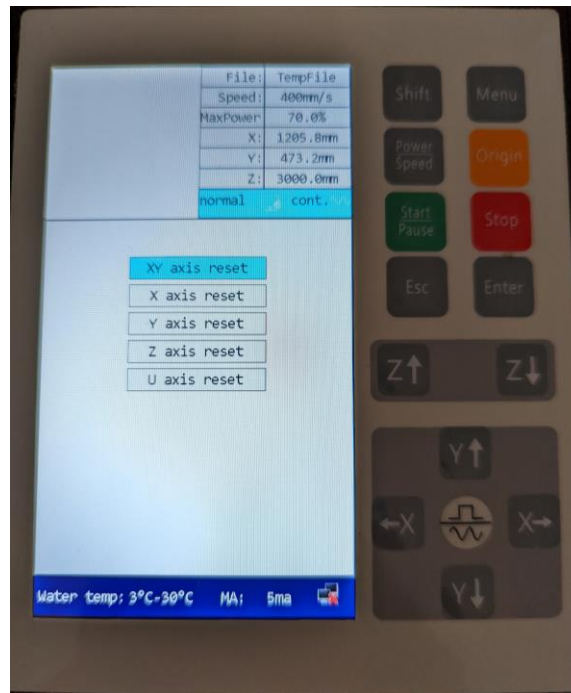


8.6 AXIS RESET+

Start by pressing the menu button, next press the 'Debug mode' then the 'Axes reset' button.



Press the "Y↑" / "Y↓" buttons to move the cursor to the axis which needs to be reset, then press "Enter" to reset the selected axis. The machine will make an audible beep when it has finished the process.

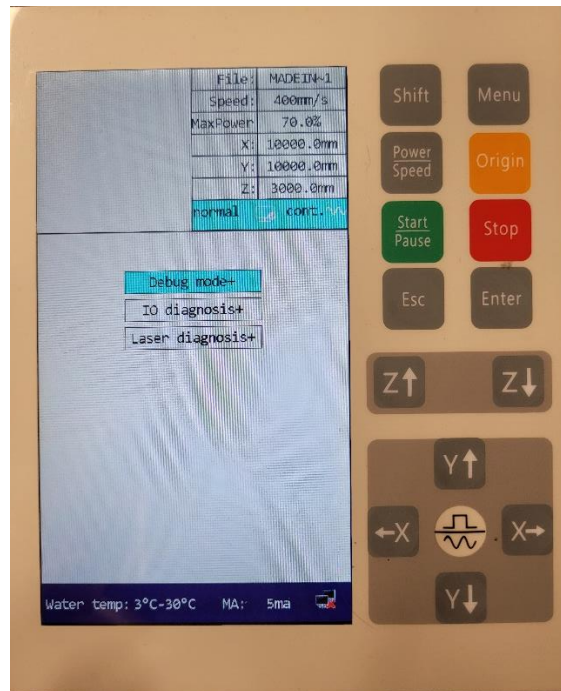


8.7 LASER SET+

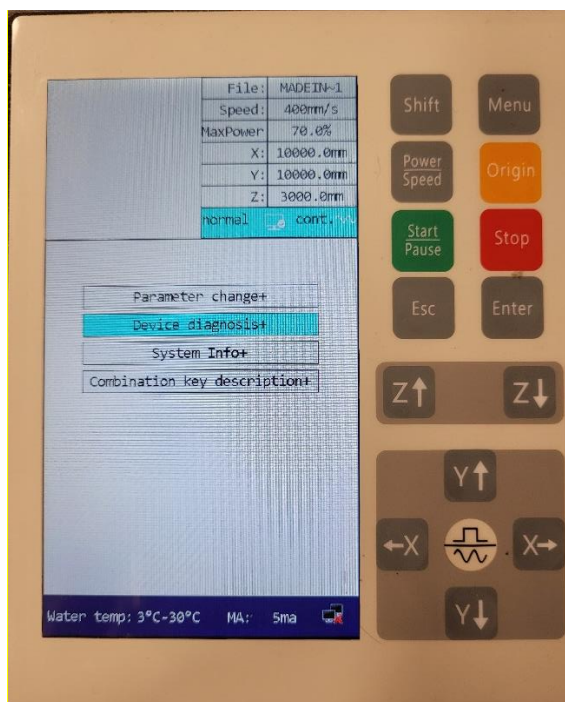
The 'Laser Set+' provides access so you can pulse your laser machine.

The 'Laser Set+' menu can be accessed as follows:

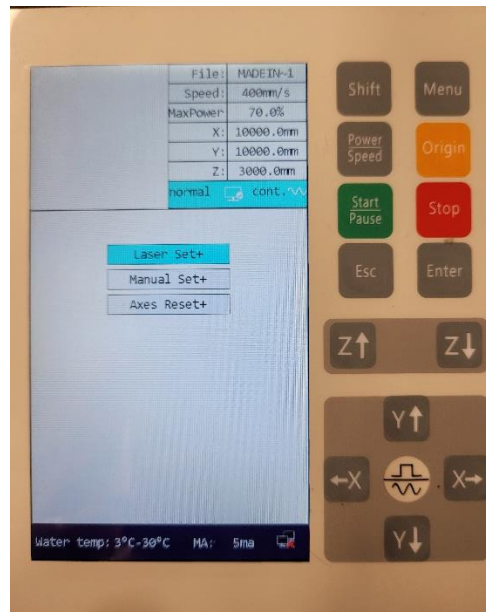
1. To access this menu, select the 'Menu' button to display the top-level Menu (below).



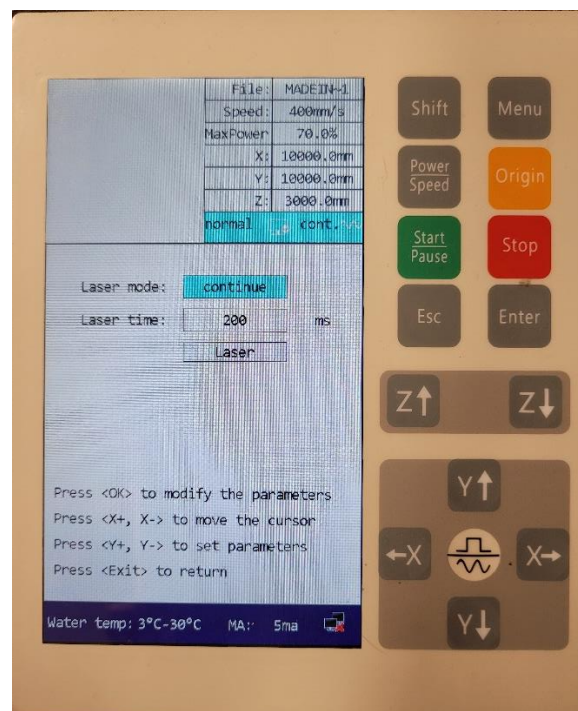
2. Select 'Debug mode+' to access the next menu (below).



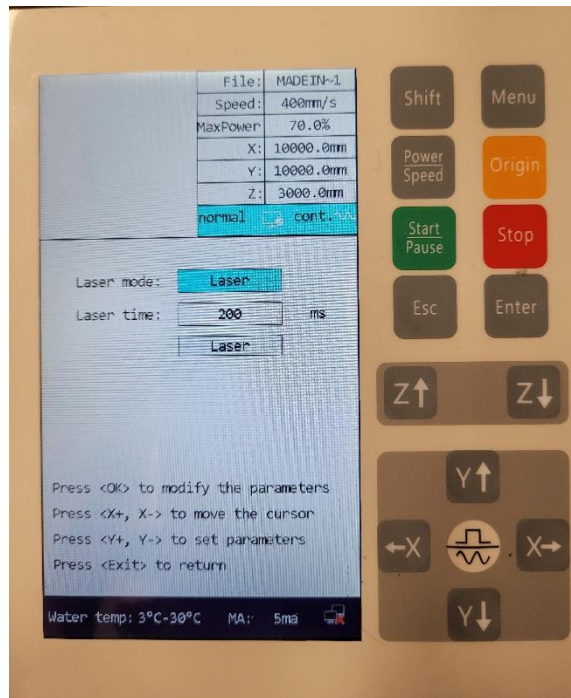
3. Select 'Device diagnosis+' to access the next menu (below).



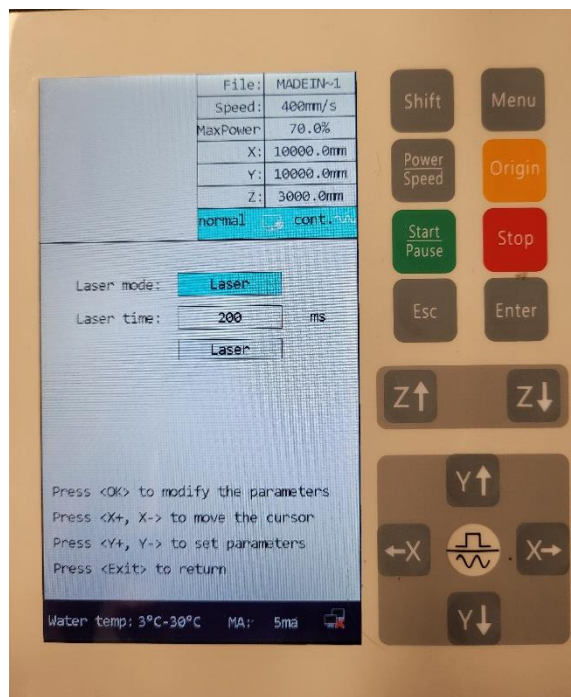
4. Now select the Laser Set+ menu item to access the Laser Mode menu. The following menu will appear.
 - When "Laser mode" is highlighted (the first item), press the "←X" / "X→" buttons to select either "Continue" or "Laser".



- When "Continue" is selected, highlighting then selecting the "lower" 'laser' field and then pushing the "Enter" button (again) will fire the laser until the button is released.

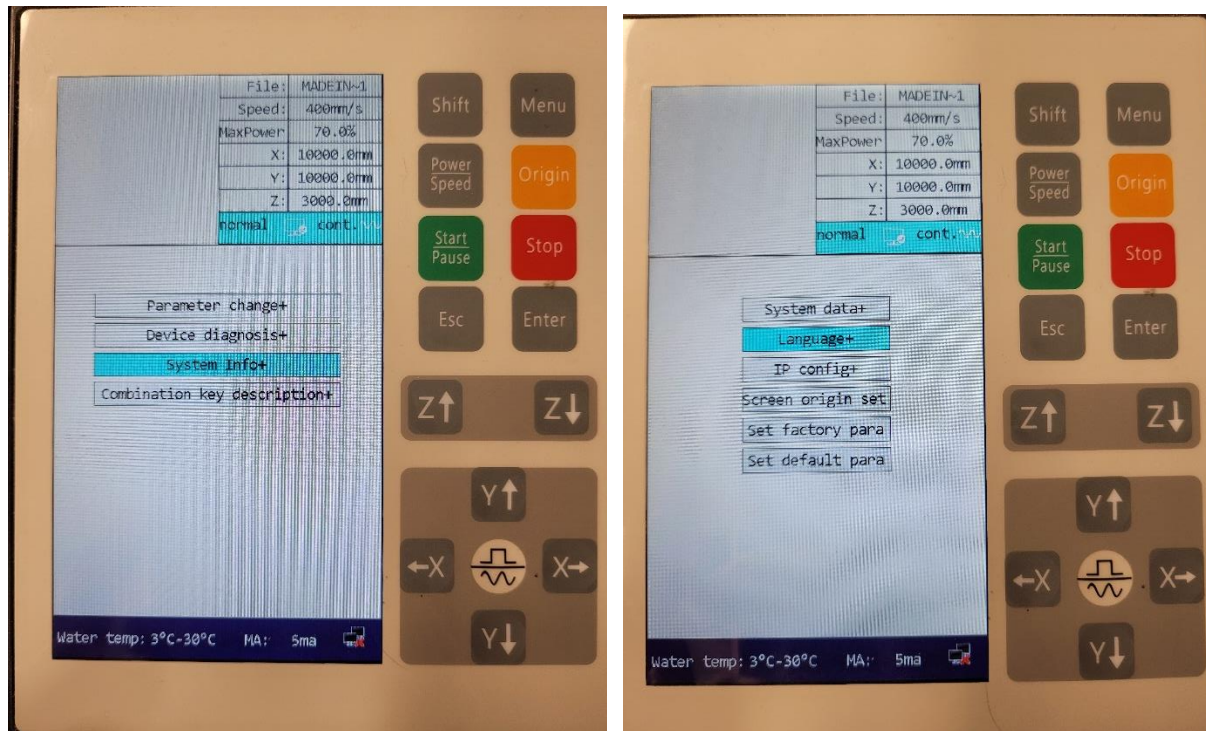


- When “Laser” is selected, highlighting then selecting the “lower” ‘laser’ field and pushing the “Enter” button again will fire the laser for the amount of time set in “Laser time” field.

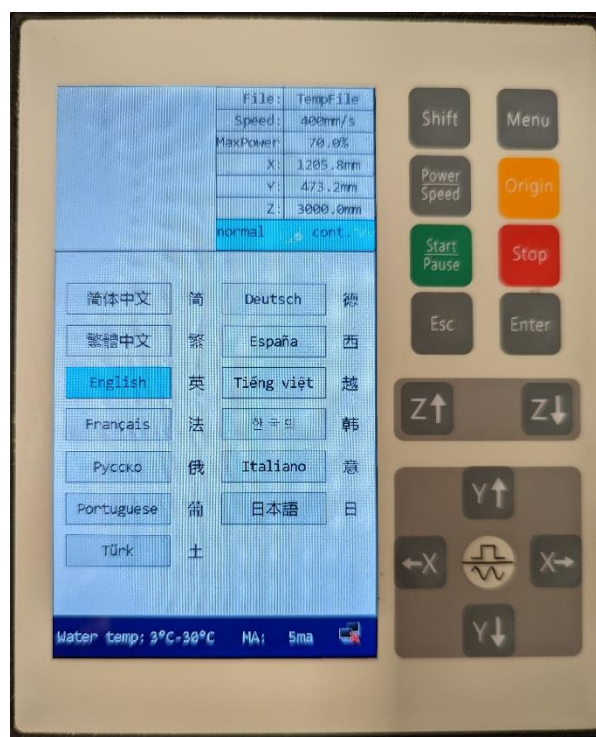


8.8 LANGUAGE

Changing the ‘Language’ is accessed by selecting ‘Menu’ then selecting ‘System Info’ and then selecting ‘Language’ option.



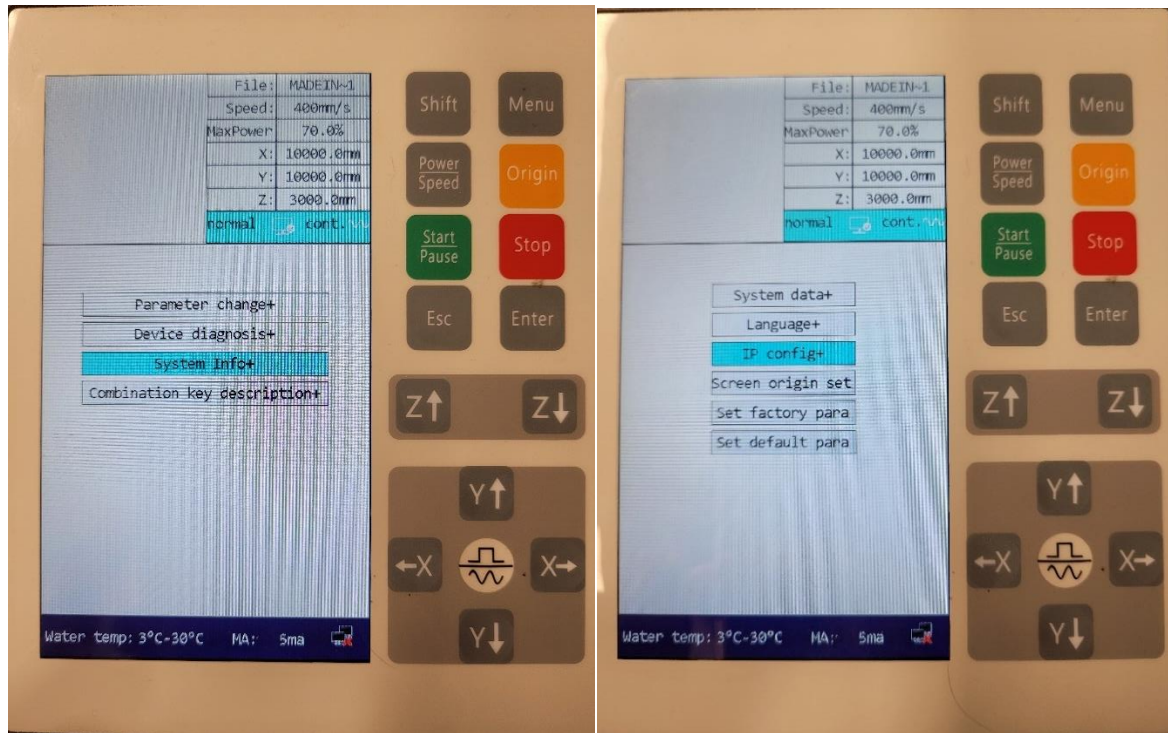
You can select a different language from the options in the menu.



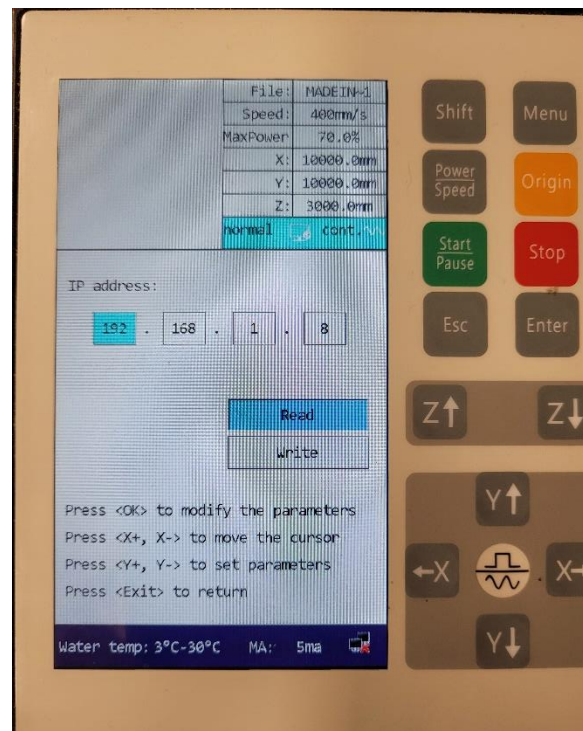
When the language you want is highlighted, press the "Enter" button to enable it:

8.9 IP SETTING

Setting your Nova Laser's 'IP address' is done by selecting 'Menu' then selecting 'System Info' and then selecting 'IP Config' option.



The IP address screen is displayed.

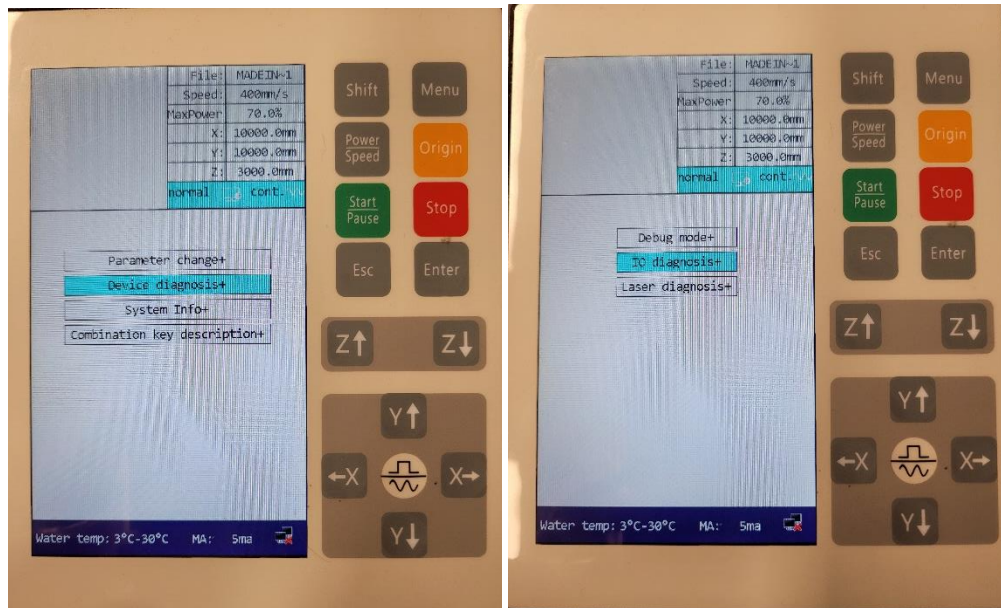


Press the “←X” / “X→” buttons to select digits, and “Y↑” / “Y↓” buttons to change the value, when the IP and Gateway values have been changed, press

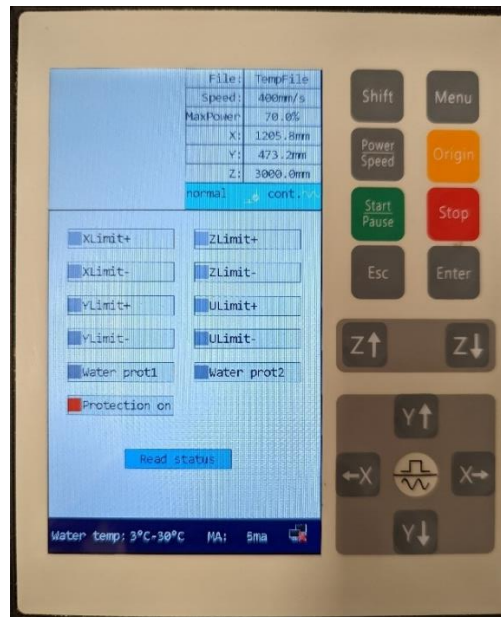
- “Enter” to write the change to the laser’s memory.
- “Esc” key is used to cancel changes.

8.10 SYSTEM INFO

To access the ‘System Status Info’, select Menu then “Device Diagnosis” button then select the ‘IO diagnosis’ item.

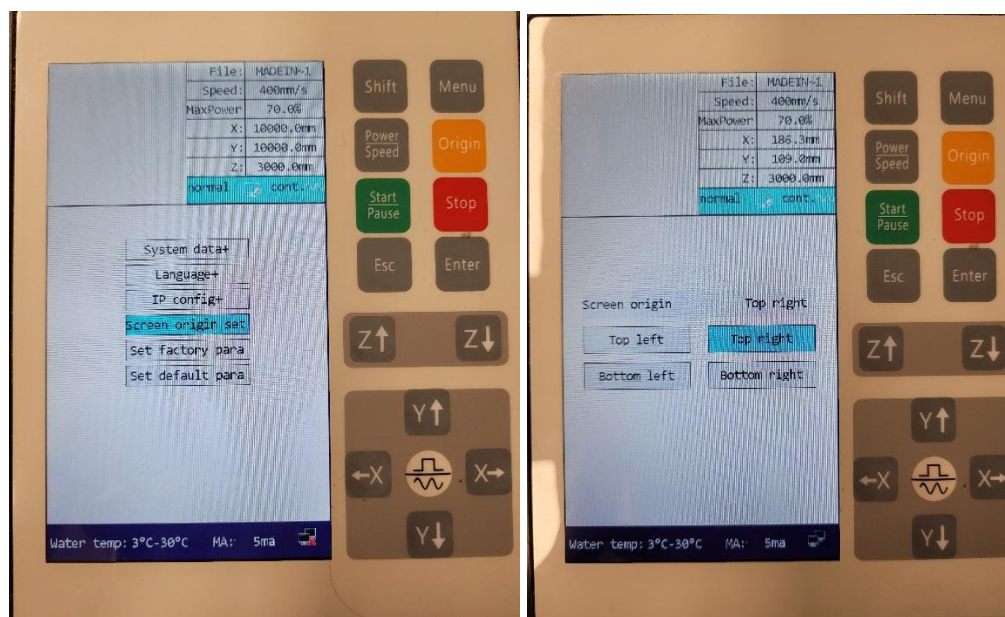


Doing so will display the status of most of the sensors in the machine, including the door and water coolant statuses as well as the upper and lower limits for each of the axes.



8.11 SCREEN ORIGIN

When the “Screen Origin” option is selected, the system will show as below:



There are four entries to be selected: Top Left, Top Right, Bottom Left, and Bottom Right.

- When one is selected, the previewed graph on the screen would be mirrored based on X or Y direction.

Note: Make sure the Origin location is set to TOP RIGHT

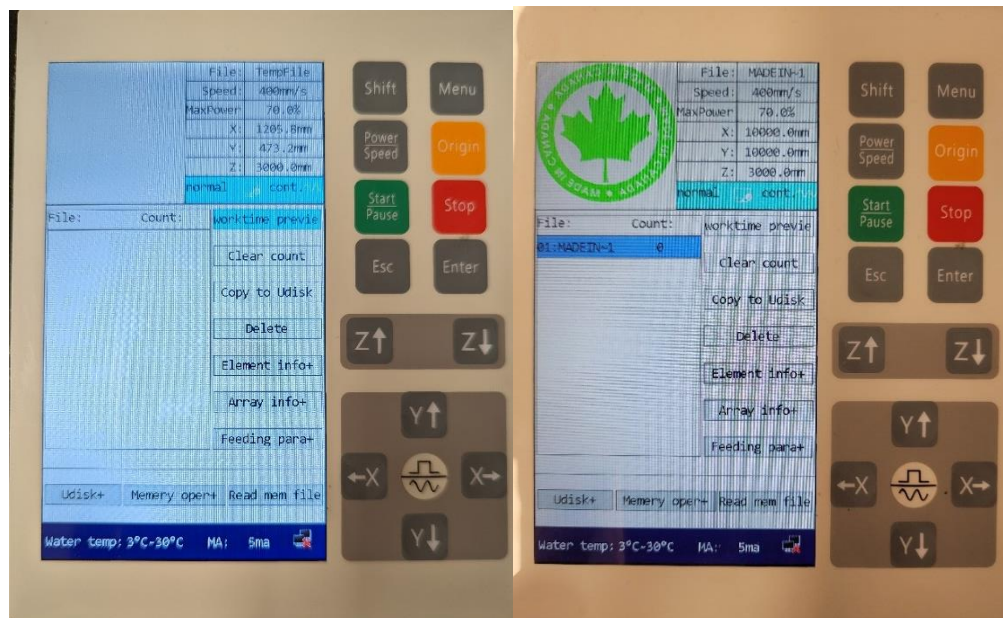
For Lightburn, Also ensure the Origin Location is set to TOP RIGHT

8.12 FILE BUTTON

The easiest way to control the laser for any job is to use a file generated by a laser cutting or engraving software (such as Lightburn). The laser cutting, or engraving process can be run from the Lightburn software using a computer connected to the USB port.

A file can be loaded using the file load function which is accessed by pressing the “key combination” ‘Shift + Menu’ buttons. This Menu will allow you to load a file from a USB onto the machine.

- Minor adjustments can also be made to the file parameters from this menu.



When this menu is open, the system reads the list of files. The file name and start parameters of the selected file are listed at the top right of the screen. The “Y↑” / “Y↓” keys can be used to move the cursor up/down the file name list. When the cursor is on the file name you want to select, press the “Enter” key, and the selected file will be previewed on the main interface in the upper right corner. Pressing the “Esc” button clears the preview screen.

Start/Pause (Green button on the Control Panel): To run/pause the selected file.

“Y↑” / “Y↓” keys are to move the cursor up and down the items listed below:

Worktime preview: To show the running time of the selected file.

Clear count: To clear the number of times the selected file has been ran.

Copy to Udisk: To copy the selected file to Udisk.

Udisk+: Read the U disk file list.

Read mem file: read the memory file list.

Read Udisk: Read the file list in the Udisk.

Copy to memory: Copy the target Udisk file to the system memory.

Memory oper+: provides access to the following menu

Clear all mem file count

Del all mem file

Format memory+

Cur file entity+

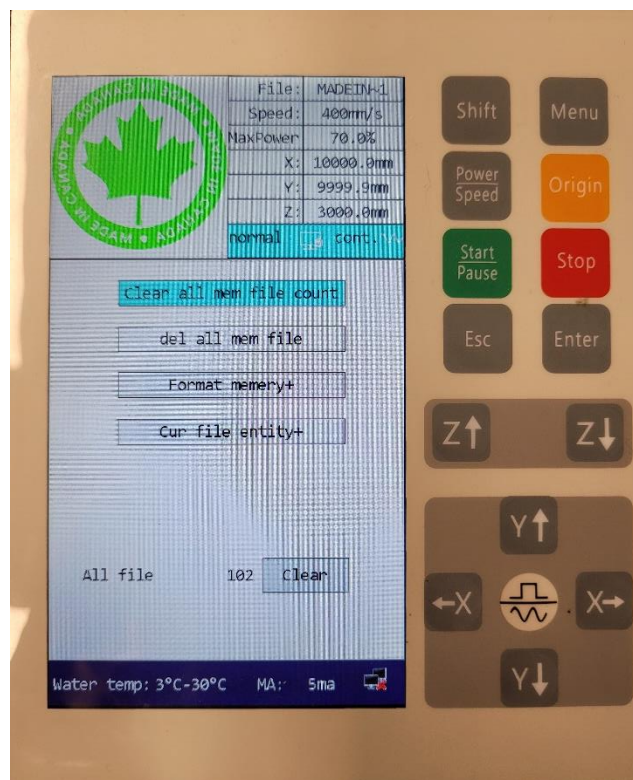


Figure 4-C

8.13 WIFI SETUP

WIFI connectivity is available on the NOVA Laser System.

WIFI indicator is located on the panel located in the lower left corner of the machine.



- A green blinking light indicates the WIFI is active and can be connected to.
- A red light means the WiFi is not active.

8.13.1 WIFI CONNECTION TO NOVA LASER

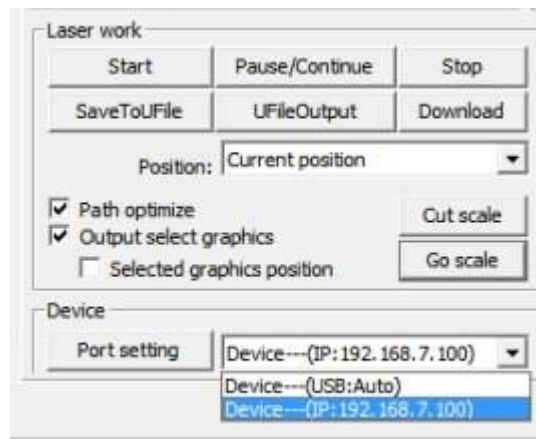
To access this functionality using your computer, follow the steps below:

- On your computer, search for available WIFI connections.
- The NOVA Laser System's WIFI will appear in the list of networks available in your computer's connection menu.

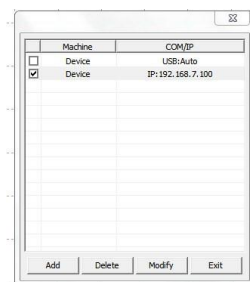


Once your computer is connected, proceed to open the RDworks engraving software to set up and test.

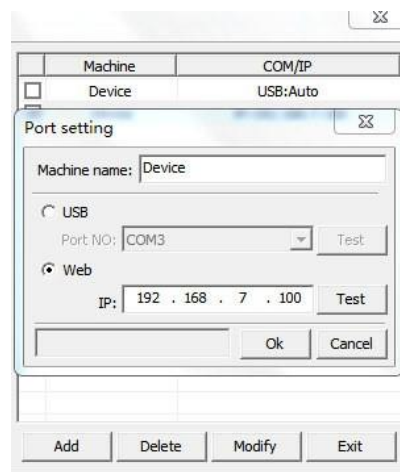
Step 1: At the bottom right corner of the software's window, choose the Device with an IP address (as per example below):



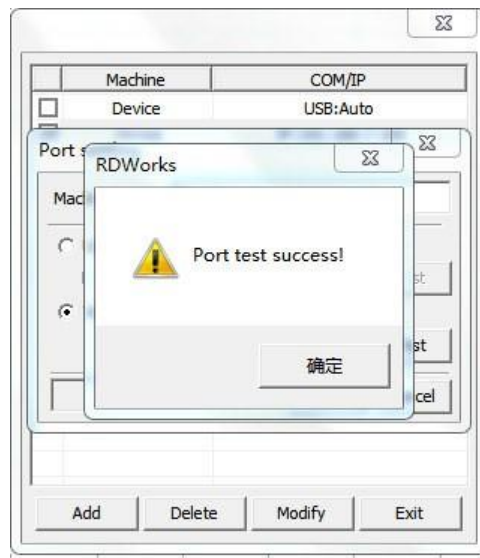
Step 2: click the “port setting” of the software to show the port setting dialogue window



Step 3: double click the device with IP address, then another box appears, go to the control panel of the machine, choose IP config and press Enter to show machine IP, not the IP address in the dialogue box.



Step 4: click the ‘Test’ to test the connection, it shows port test successful, then you can click “确定 (Are you sure?)”to quit and then WIFI setting is ready.



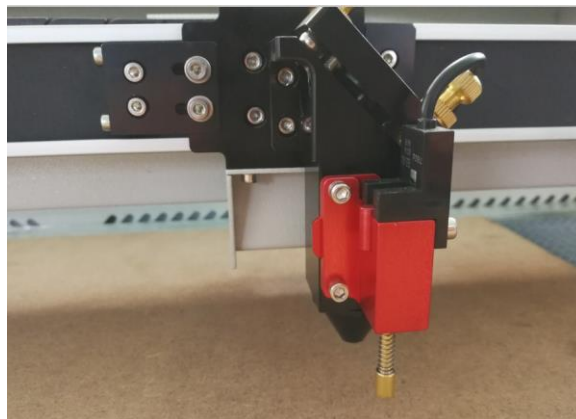
8.14 AUTOFOCUS FUNCTION (OPTIONAL FUNCTION)

If your machine is equipped with the Autofocus Function refer to the following steps.

- Ensure there is material under the brass pin/laser head before focusing the machine, or the laser head will crash. (**Warning** – Remember that the Laser Head moves when the machine is restarted).

This is one of the simplest functions to use for beginners.

Step 1: place the material under the laser head



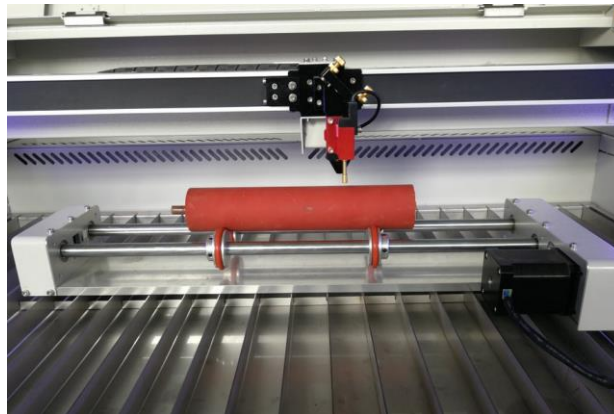
Step 2: On the control panel, Press and hold “Shift” + “Z↑” at the same time, and then press “Enter”, the machine will move UP then DOWN. When the probe comes into contact with the material, it will stop and register the distance to set the laser’s focus. When the laser head stops moving, the laser is focused.

8.15 HOW TO USE 4 AXIS ROTARY DEVICE (OPTIONAL FUNCTION)

A rotary engraving function allows you to use a Rotary Device to engrave on cylinder shaped products, like wine bottles, pipes, etc.

If your machine is equipped with a Rotary device refer to the following steps.

Step 1: Put the rotary device on the worktable of the machine ensuring the height of the worktable can accommodate it on the laser cutting bed:

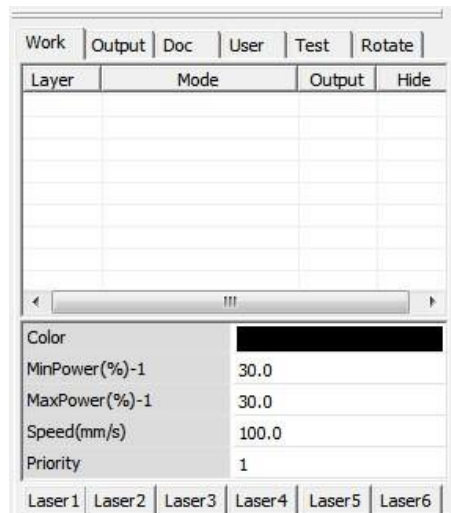


Step 2: Once installed, connect the rotary device into the power port found on the right side of the machine:

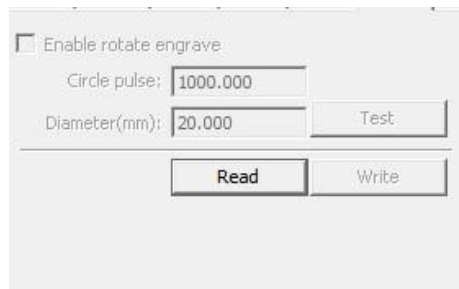


Step 3: Go the RDworks engraving software to set up the laser to use the Rotary Device:

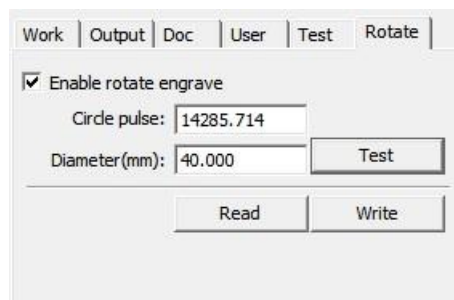
This option is found at the upper right corner of the software, click "Rotate"



Once selected, the setup page will appear.



Click "Read"



Select the "Enable rotate engrave",

Use the following settings:

- "Circle pulse:" 14285.714
- "Diameter (mm):" 40.000
- Then select "Read" then "Write"

At this point the rotary device set up is finished.

- The rotary device is now ready for engraving.

8.16 FOCUSING THE LASER

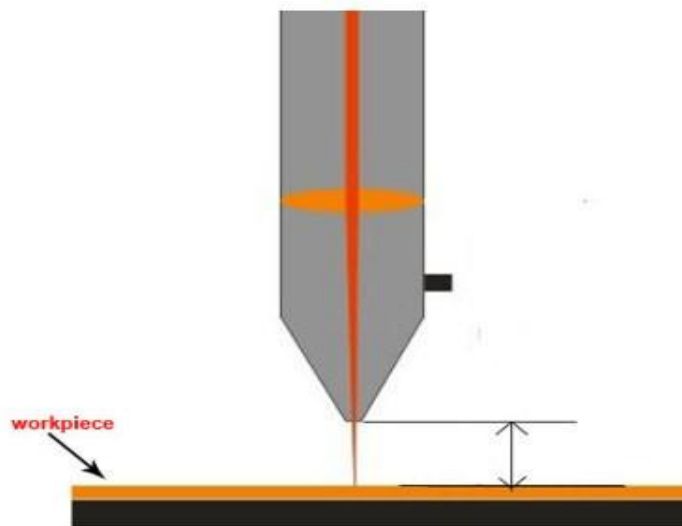
8.16.1 PRECISION FOCUSING

The laser focusing must be completed every time new material is placed on the working platform/cutting bed. If the focusing step is not completed, the laser may not be optimally focused on the surface being cut. The distance between the work piece and the laser head must never exceed 20 mm.

The maximum laser cutting, or engraving efficiency occurs with the smallest laser spot size, which also creates the best cut. The smallest spot size also is the laser's maximum focus which produces the strongest laser power and most precise engraving result or laser cuts.

To maximize the focus:

Step 1: put a piece of white printing paper or other flat material on the worktable.

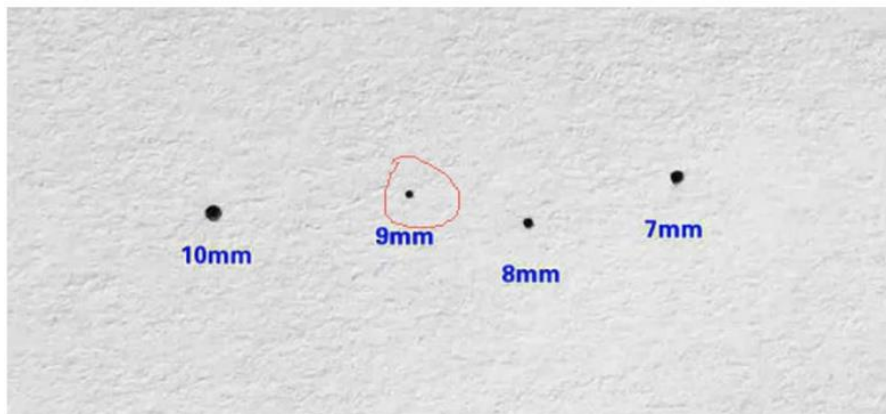


Step 2: Press the 'Z↑' / 'Z↓' buttons on the control panel

- adjust the distance between the laser head tip and the paper to the to about 20 mm.

Step 3: Press the PULSE button on the control panel to pulse fire the laser

- The laser will fire a single pulse for a very short time and make a 'burn' spot on the paper.
- Note this spot as '20 mm'.
- Adjust the laser head distance so it is more than 20 mm (measure the distance) and repeat the process. Note this spot as 'xx mm'.
- Adjust the laser head distance in the opposite direction so it is less than 20 mm (measure the distance) and repeat the process. Not this spot as 'yy mm'.
- Now compare the 3 dots to see which one is the smallest.
- Using this relative sizing information, adjust the laser head distance to the setting that gave the smallest spot.
- Repeat step 3 to confirm this the correct setting for the smallest spot.



For example, if you make spots at 10 mm, 9 mm, 8 mm, 7 mm distance, and found that the smallest spots is the one that made at 9 mm, then the focus is 9 mm. Remember this distance, it's the focus setting for this laser lens for your machine.



Caution:

Always be careful when focusing your laser.

Do not to allow the material and the lens housing to touch.

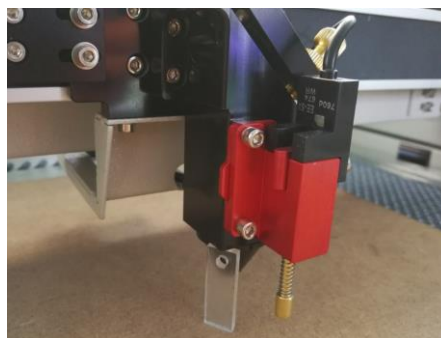
This can cause serious damage to the laser machine.

8.16.2 LASER FOCUS TOOL - FOCUSING

The focus tool is a rectangular acrylic block designed to provide a good focus of your laser. This tool is a convenient way to achieve an approximate focus when your time is limited.

Note: Using the Focusing Tool may not provide the accuracy you want for your processing.

You should find the Focusing Tool inside the accessory bag provided with your machine. See the below illustration photo:



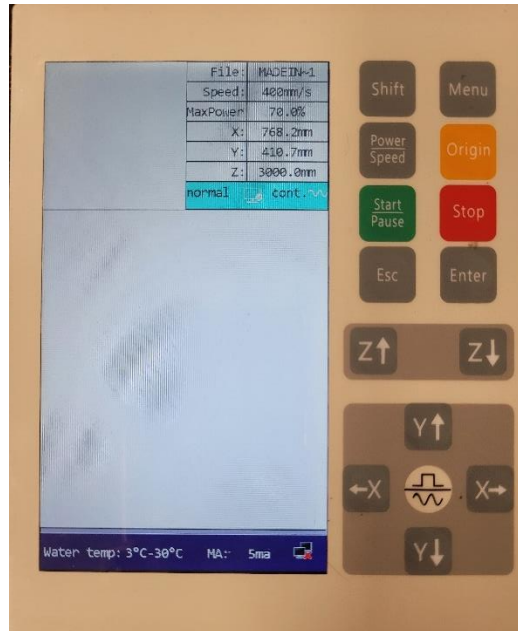
Use the 'Z↑' / 'Z↓' buttons to adjust the worktable so that the flat surface barely touches the material's surface. Once this happens, the laser is approximately focused.

9 USING YOUR MACHINE

9.1 MOVING THE LASER CUTTING LOCATION

9.1.1 X/Y AXIS

- To move the laser head, you need to be in the 'top/clear' menu as per image below:



- You can move the laser head to a precise location uses the “←X” / “X→” and “Y↑” / “Y↓” arrow buttons.
- The same can be achieved when using the Lightburn software.

9.1.2 Z AXIS

- From the Control Pad you can adjust the production table height.
- Warning:** Ensure there is material under the brass pin/laser head before moving the machine bed, or the laser head will crash. (**Warning/Note** - Head moves when the machine is restarted).
 - if you press the “Z↓” the bed will move downwards,
 - if you press the “Z↑” the bed will move upwards

9.2 PULSING THE LASER AND CHANGING SETTINGS ON THE MAIN SCREEN

9.2.1 PULSE BUTTON

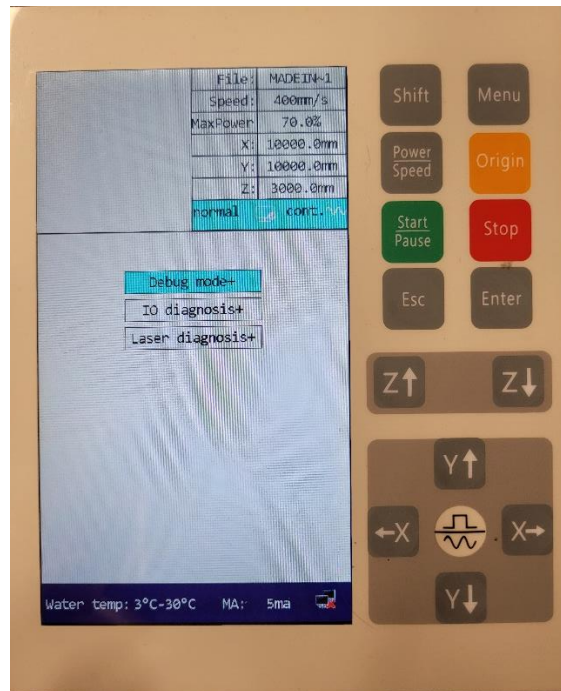
To pulse the laser with the lid closed:

- It is recommended the max power is set to 50% or less when using the pulse function

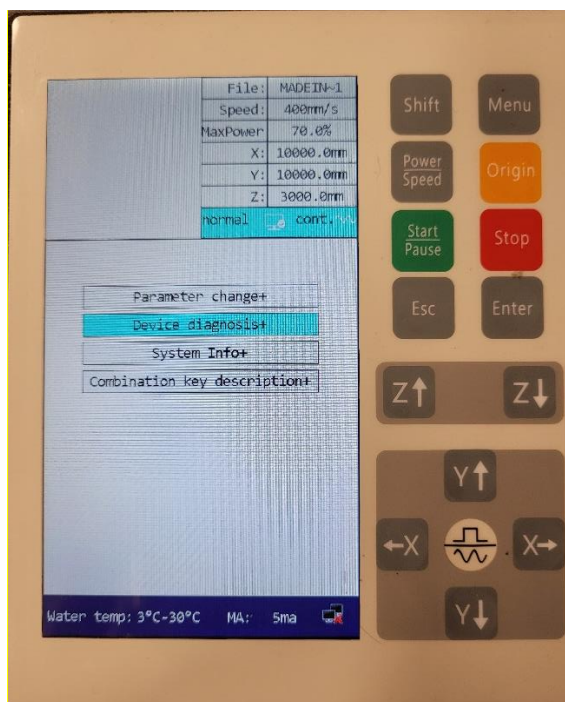
The 'Laser Set+' allows the user to pulse their machine.

The 'Laser Set+' menu can be accessed as follows:

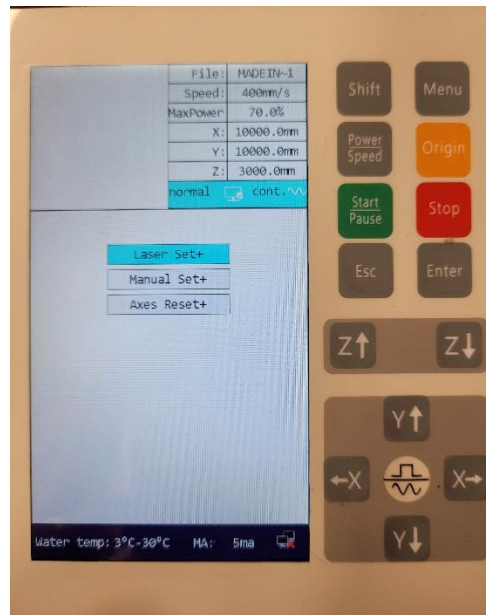
- To access this menu, select the 'Menu' button to display the top-level Menu (below).



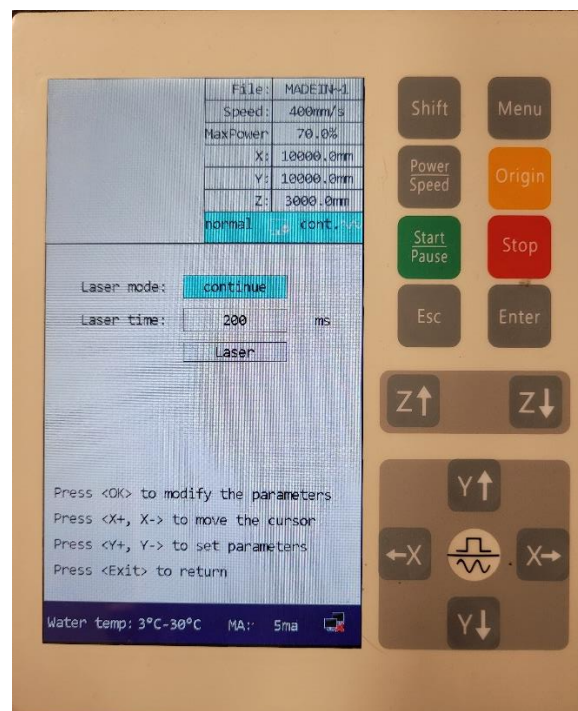
2. Select 'Debug mode+' to access the next menu (below).



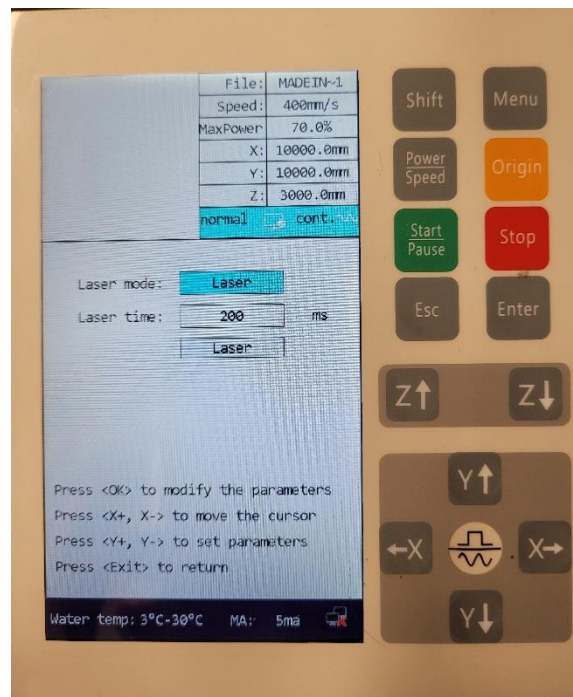
3. Select 'Device diagnosis+' to access the next menu (below).



4. Now select the Laser Set+ menu item to access the Laser Mode menu. The following menu will appear.
 - When "Laser mode" is highlighted (the first item), press the "←X" / "X→" buttons to select either "Continue" or "Laser".



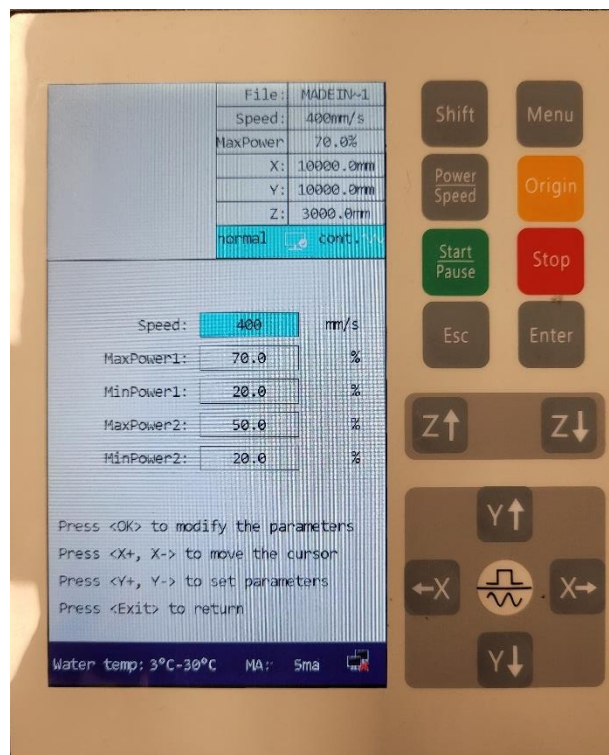
- When "Continue" is selected, highlighting then selecting the 'lower' 'laser' field and then pushing the "Enter" button (again) will fire the laser until the button is released.



- When “Laser” is selected, highlighting then selecting the ‘lower’ ‘laser’ field and pushing the “Enter” button again will fire the laser for the amount of time set in “Laser time” field.

9.2.2 CHANGING THE SPEED AND POWER SETTINGS.

- Select the Power/Speed (grey) button on the user interface. The following will appear:



- On the screen, you will see the Speed, MaxPower1, MinPower1, MaxPower2, and MinPower2. Each of these values can be set as described below.

- **Speed** - When selected, use the “←X”, “X→”, “Y↑”, and “Y↓” button to adjust the value.
- **MaxPower1/2** - When selected, on single source machine, MaxPower 1 is the only value that needs adjusting. To adjust, use the “←X”, “X→”, “Y↑”, and “Y↓” button to adjust the value.
 - Note: these power values only affect the pulse button’s power.
- **MinPower1/2** - When selected, on single source machine, MinPower 1 is the only value that needs adjusting. To adjust, use the “←X”, “X→”, “Y↑”, and “Y↓” button to adjust the value.
 - Note: these power values only affect the pulse button’s power, so MinPower is redundant.

9.3 LIGHTBURN SOFTWARE

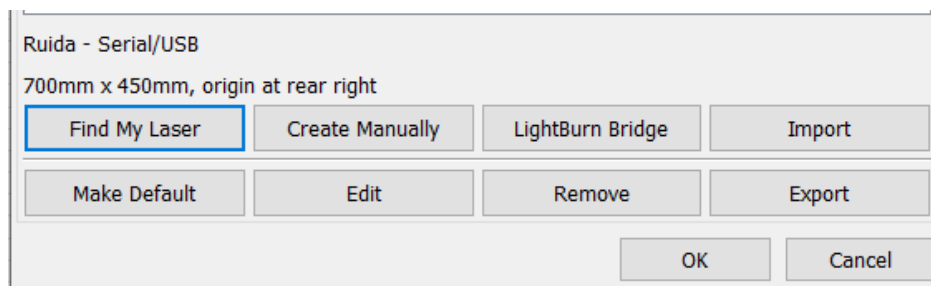
9.3.1 CONNECTING TO LIGHTBURN

9.3.1.1 CONNECTING VIA WI-FI MACHINE

- 1) In the bottom right-hand side of Lightburn press the Devices button
- 2) Select “Create Manually”
- 3) Select “Ruida” from the controller list
- 4) For Wi-Fi select Ethernet/UDP
- 5) Enter the IP address found in the “IP Setting” menu as described in section 8.9.
- 6) Name your device as you like and enter the dimensions based on the machine
- 7) Set the Origin of the machine to rear right, then press finish
- 8) With the machine on, connect to the Wi-Fi network being created by the machine, it will be named NOVA, NOVA or laser XXXX

9.3.1.2 CONNECTING VIA USB

- 1) In the bottom right-hand side of Lightburn press the Devices button
- 2) Select “Find My Laser” and Lightburn will import settings directly from the machine. If it works, skip to section 9.4.2. IF this button does not work, go to the next step. Note: Ensure you select right as the origin when reviewing the imported information.



- 3) Select “Create Manually”
- 4) Select “Ruida” from the controller list
- 5) Select Serial/USB
- 6) Name your device as you like and enter the dimensions based on the machine

- 7) Origin of the machine is rear right, then press finish
- 8) With the machine on and the devices selected Lightburn should say ready, if not ask customer to install driver located in the drive Ruida Folder
<https://drive.google.com/file/d/1O3tbfW0pRLkVtsTeLrCvhCu4JUYPAhdz/view?usp=sharing>

9.3.2 USING LIGHTBURN SOFTWARE

The following will show you how to cut a square using your laser.

- 1) Draw a square
 - Along Left-hand side grab the square tool, click and drag to draw a square
- 2) Editing Cut Properties
 - You will see a layer pop up on the right-hand side of Lightburn on the cut/layers tab.
 - Double click that layer to see all the options
 - Review the "Fill", "Line", "Fill+Line", and "Offset Fill" Options
 - Fill - will engrave the entirety of the square (Engrave mode)
 - Bidirectional fill - Beam will fire while travelling left and right
 - Cross-Hatch - Beam will make a second pass filling the cut up and down. This setting is not recommended as the machine cannot move forward and back at high speeds
 - Line Interval - Describes the distance between each beam "line"
 - Lines per Inch - Same as line interval, changing one changes the other
 - # of Passes - How many times the machine will go over a cut
 - Line - will go around the outline of the square (Cut mode)
 - Kerf offset - Allows you to adjust for beam Thickness
 - Tab Generation - Creates Tab to hold material in place
 - Override PWM - Changes beam frequency (high for acrylic, low for woods)

Fill + Line - Combination of fill and line. Will engrave the object, then will do the outline

- Main speed & power settings are the fill settings
- Double click the layer to find the adjustments for Line settings.

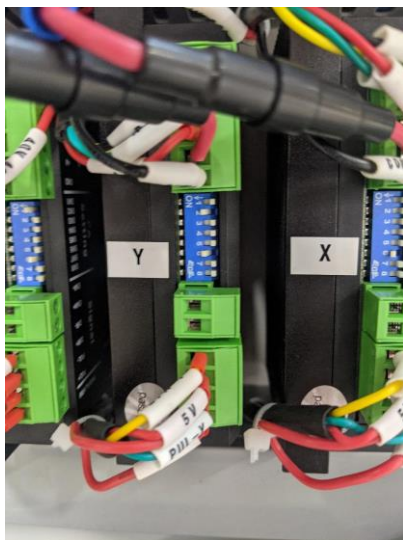
Offset Fill - Similar to normal fill mode, but starts in the center of the object and fills in a helix pattern

- 3) Draw another rectangle and then press a colour in the colour bar along the bottom of Lightburn
- 4) Now you should have 2 layers in the layer box, and you can change the cutting properties separately.
- 5) To import files, press the file menu in the top left and select import
- 6) To preview your design, press the button that looks like a monitor in the top bar in Lightburn

- 7) along righthand side at the bottom of the cuts and layers box you should see a tab that says move
- 8) from this tab you can move and auto focus the laser
- 9) Laser Control Area
 - a) **Frame** will move the laser head in an outline of your cut
 - b) **Job Origin** describes the position your laser head is in relative to where you want you cut
 - c) **The “Start from”** drop down decides the positioning of the file
 - **Current position** will start the cut from where the laser head currently is
 - You can demonstrate by pressing the frame button in Lightburn
 - **Absolute Coordinates** will start the cut where the cut is on the virtual Lightburn machine bed.
 - **User Origin** will start the cut from wherever the work origin is set.
 - d) **Pause** will stop mid cut and all you to resume with the start button
 - e) **Stop** cancels the job completely
 - f) **Start** will send the file to the machine and start the cut
 - g) **Send** will send the file to the machine but not start cutting
 - h) **Save RD file** allows you to put the RD file on a USB to run on the machine
 - i) **Run RD file** will tell the machine to run the RD file currently loaded on the machine

9.4 HOW TO USE 4 AXIS ROTARY DEVICE(OPTIONAL FUNCTION)

On your machine in the right-hand side lower panel, you will see a driver for the Y-motor. This driver has a series of switches pictured below.



Normal Operation

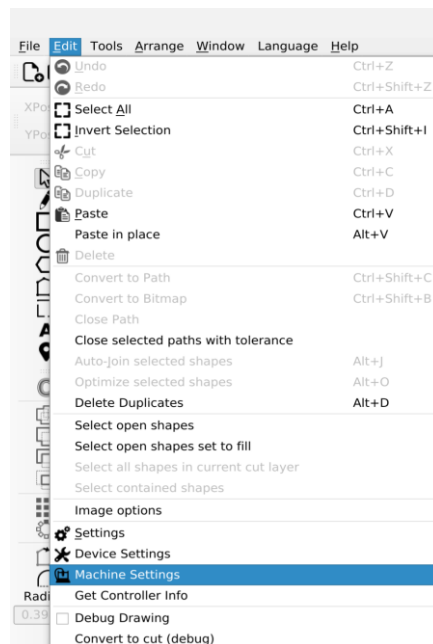


Rotary

Enable

The rotary motor takes over for the Y-axis but requires less power. To adjust this, we will turn switch 3 down as pictured above. **NOTE: Turn this switch back when not using the rotary or you can risk damage of your Y-axis motor.**

Next on Lightburn, you will want to lower the acceleration of your machine so that the Rollers don't throw your piece off of the rotary. To do this we will have to enter the machine settings menu pictured below



In this menu you will want to change the parameters below.

BEFORE:

Property	Value
▼ Cut Parameters	
Idle speed (mm/s)	300.000
Idle acceleration (mm/s^2)	2,000.000
Idle delay (ms)	0.000
Start speed (mm/s)	5.000
Min acceleration (mm/s^2)	400.000
Max acceleration (mm/s^2)	2,000.000
Accel factor % (0 to 200)	80
G0 accel factor % (0 to 200)	120
Speed factor % (0 to 200)	40

AFTER:

Property	Value
▼ Cut Parameters	
Idle speed (mm/s)	20.000
Idle acceleration (mm/s ²)	100.000
Idle delay (ms)	0.000
Start speed (mm/s)	5.000
Min acceleration (mm/s ²)	20.000
Max acceleration (mm/s ²)	100.000
Accel factor % (0 to 200)	80
G0 accel factor % (0 to 200)	120
Speed factor % (0 to 200)	40

NOTE: It is recommended to return these settings to normal when the rotary is removed as it will significantly reduce your engrave speed and can change the quality of your engravings.

Now we will enable our rotary and input some basic settings. Select Tools > Rotary Setup. In this menu we will select the type of rotary we are using (roller/chuck), then we will input the steps per rotation (14585.70) and the roller diameter(38mm). The Object diameter is the diameter of the object you are trying to engrave, and the circumference will be automatically updated when the diameter is changed.

The screenshot shows the AEON Laser software interface. The 'Tools' menu is open, and 'Rotary Setup' is highlighted. The 'Rotary Setup' dialog box is displayed, showing the following settings:

- Rotary Type:**
 - ☐ Chuck
 - ☒ Roller
 - ☒ Enable Rotary
- Rotary Axis:**
 - ☒ Y Axis
 - ☐ Z Axis
 - ☐ A Axis
- Steps per rotation:** 14585.70
- Roller Diameter:** 38.000mm
- Object Diameter:** 50.000mm
- Circumference:** 157.080mm

The 'Test' button is disabled, and an error message is displayed: 'Error: Settings could not be read from controller'. The 'Read Settings' button is also disabled. The 'OK' and 'Cancel' buttons are visible at the bottom right of the dialog box.

9.5 SCANNING OFFSET ADJUSTMENT

The scanning offset settings are etched on the acrylic block which was included with your system.

To enter the settings, you'll have to go into the device settings in Lightburn.



In your device settings, you will want to Enable Scanning Offset Adjustment.

The Larger number on the block is the Speed in mm/s and the smaller number is the Line shift in mm.

When your settings are entered they should look like the image below.

The screenshot shows the 'Basic Settings' tab of the AEON Laser software. It includes sections for Working Size, Origin, Laser Offset, Z Axis Control, Scanning Offset Adjust, and Other options. The Scanning Offset Adjust section contains a table with Speed, Line Shift, and Initial Offset values.

Speed	Line Shift	Initial Offset
100.0	0.00	0.00
600.0	0.22	0.00
800.0	0.19	0.00
1000.0	0.23	0.00

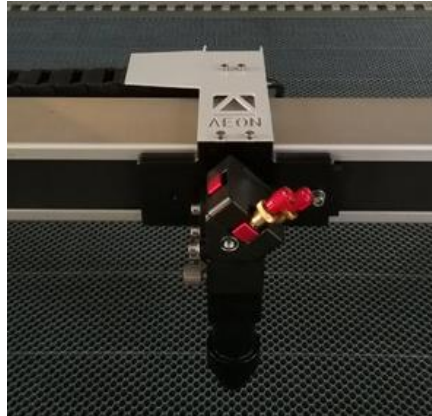
9.6 FOCUSING THE LASER

One of the most important things to do before starting a cut. The machine must be focused to the material based on the focal length of your lens (2" or 50.8mm is the default). You can use the autofocus feature included on the machine, or you can focus your laser using a focus gauge. Focusing the laser must be completed every time the material's height is changed, not focusing the laser increases the risk of combustion on the material and will reduce the quality of the engraving/cut.

9.6.1 AUTOFOCUS FUNCTION – EVERY TIME YOU START CUTTING A NEW PIECE

Your machine is equipped with the Autofocus Function to save you time when you are cutting a new piece of material.

Step 1: Place the material on the cutting table and position the laser head over the material to be cut.



Step 2: On the control panel, select and hold both “Shift” + “Z↑” Until the menu window shows the “Autofocus” function is activated then press “Enter”. The laser’s table will move up until the material presses up the brass autofocus pin then will move down a set distance matching the focal lens setting for the laser head. This value can be changed if required. The laser cutting table is now located at the laser’s focal point.



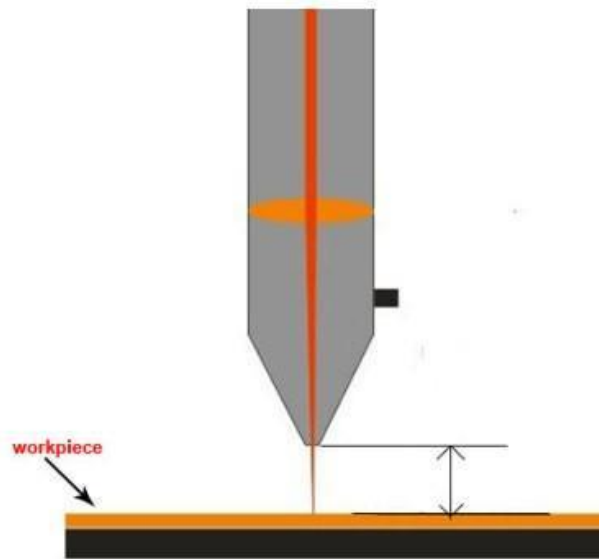
9.6.2 MANUAL FOCUS

The manual focus process requires finding the distance that creates the smallest ‘burn’ spot size, optimal focus distance. This optimal focus distance is the ideal distance for efficiently cutting or engraving. The smallest ‘burn’ spot size creates the strongest laser power and precision engraving result.

Follow the following procedure to achieve the best focus:

Step 1: Prepare the focus test material.

- Place a piece of white printing paper or other flat material on the cutting table.



Step 2: Set the Starting Position

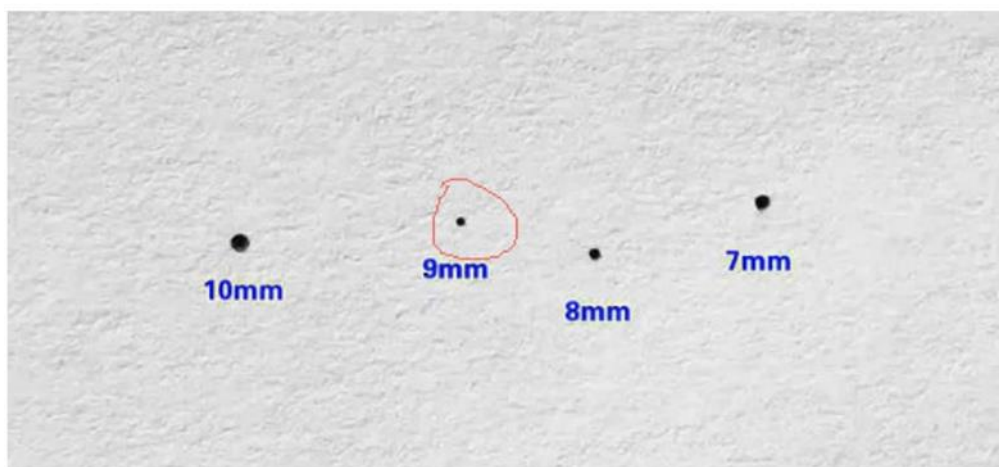
- Manually adjust the distance between the paper and the laser head to approximately 20 mm using the “Z↑” / “Z↓” buttons on the control panel.

Step 3: Create first 3 test spot sizes.

- Press the PULSE button on the control panel to fire pulse the laser
 - The laser will fire for a very short time and make a spot on the paper.
 - Note this spot as the '20 mm' distance.
- Adjust the laser head distance so it is more than 20 mm (measure the distance) and repeat the process. Note this spot as 'xx mm'.
- Adjust the laser head distance in the opposite direction so it is less than 20 mm (measure the distance) and repeat the process. Note this spot as 'yy mm'.

Step 4: Home in on the smallest spot.

- Now compare the 3 dots to see which one is the smallest.
- Using this relative sizing information, adjust the laser head distance to the setting that gave the smallest spot. Repeat step 3 to confirm this the correct setting for the smallest spot.



- In the example, if you make spots at 10 mm, 9 mm, 8mm, 7 mm distance, and find that the smallest spot is the one that is made at 9 mm, then the focus is 9 mm. Remember this distance, it's the focus of this laser machine.

Caution:

Always be careful when focusing your laser.

Do not allow the lens housing to collide with the material you are cutting.

This can cause serious damage to the laser machine.

9.6.3 FOCUS TOOL

The 'focus tool' is a piece of rectangular acrylic block (included with your accessories) made by the manufacturer to set the proper focus distance. This acrylic block can also be used to focus the laser when you don't have time to find the focus using the manual method.

See the below illustration photo:



Use the “Z↑” / “Z↓” button to adjust the worktable so that the flat surface touches the material's surface.

10 YOUR FIRST ENGRAVING TEST.

Follow the following steps for engraving your first pattern:

1. Power up your computer and NOVA Laser System.
2. Open your engraving bay and place the object or material to be engraved on the laser table.
3. Move the laser head to the desired position on the engraving table.
 - Most work is completed with the object or material positioned in the upper right-hand corner or in the middle of the table.
4. Use the rulers to measure the dimensions of the object to be engraved.
5. Frame the engraving area on the object or material and ensure the laser head is positioned over the material to be engraved.
6. Focus the laser using the autofocus, manual focus or a focus gauge.
7. Double check any layer speed/power settings in Lightburn.
8. Ensure the blower/smoke extraction is on.
9. Press the start button in Lightburn or send the file to the laser and hit start on the control panel.
 - You can pause the engraving at anytime.
10. Once the engraving file is complete, the laser will turn off and reposition to the starting position.

11 ADJUSTING THE OPTICAL PATH / MIRROR ALIGNMENT

Each NOVA Laser System is calibrated prior to shipping including setting the laser optical path. But, after transportation or day-to-day use of the machine, the optical path may deviate from the design's optimal path.

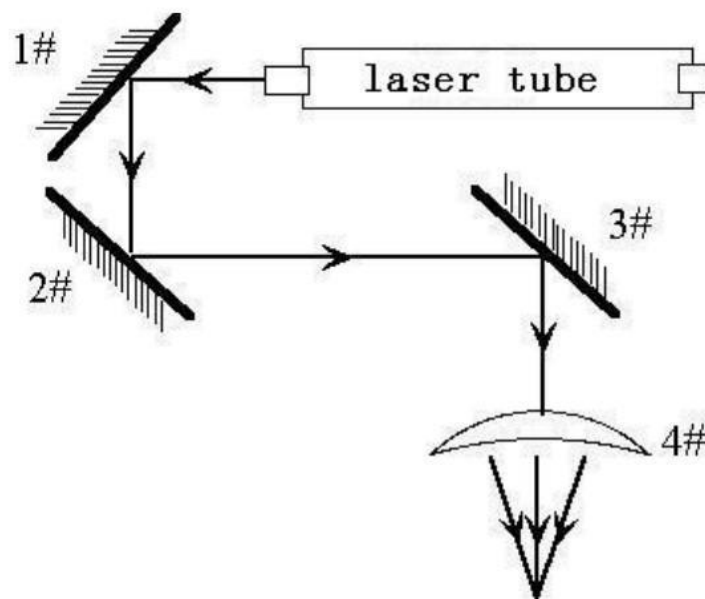
Note: The NOVA has 3 mirrors and NOVA Elite has 4 mirrors which need to be aligned using the same process.

Over time if the resulting laser or light path becomes abnormal or the power becomes insufficient to cut, then the following method should be used to adjust the laser's optical path:

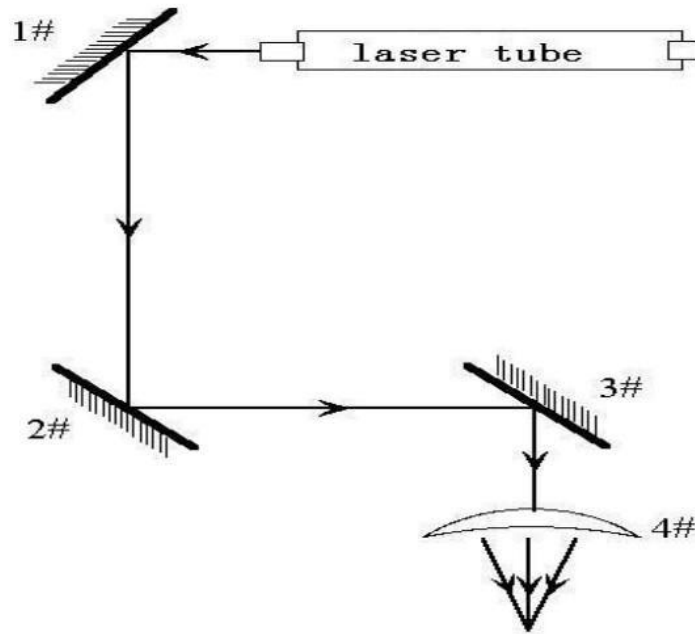
Step one: Align the laser beam from laser tube to the center of 1# mirror.

Step two: Align the laser beam reflecting from the 1# to the 2# mirror.

- To achieve this centering, affix multiple layers of tape on the mirror housing (Or alternative, non-reflective material which can be marked on),
- Move the y axis to the back of the machine and pulse the laser (using a suitable power level (30-40%) to get a spot on the paper)



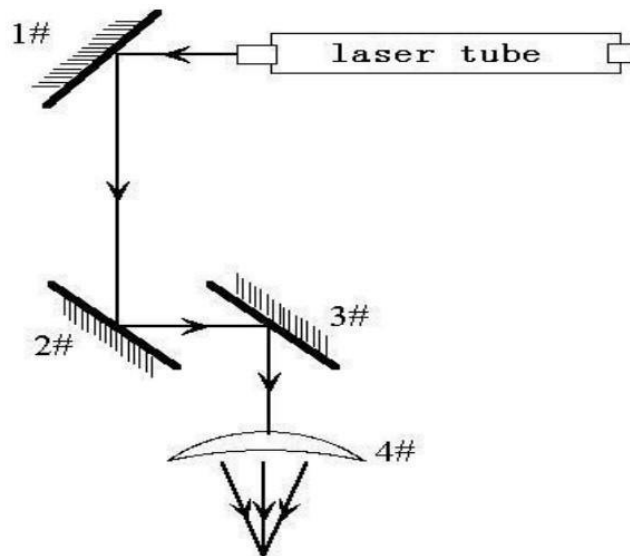
Step three: Move the y-axis to the front limit of the machine, press pulse, and get another spot on the tape. You want to see that the two dots align perfectly. The easiest way to tell is if the circle is perfectly round (not egg shaped, oblong circle, or 8 shaped).



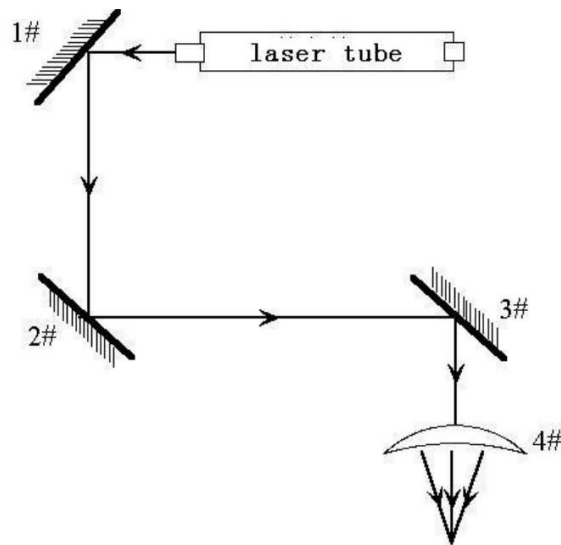
Step four: If the two spots are not aligned, adjust the screws on the back of the 1#mirror to make the laser fire on the same position as the first spot.

Step five: Repeat the second to the fourth steps until the two spots are perfectly. Ideally the spots should be in the center of the hole, but it is more important for the two spots to line up perfectly.

Step six: affix multiple layers of tape on the mirror housing for mirror 3#, move laser head to the nearest position from 2# mirror (X+ or left side of machine), press pulse(still at 30-40% power), get a spot on the paper.



Step seven: Move the laser head all the way to the right side of the bed (X-), press pulse, and get another spot on the tape. Again, You want to see that the two dots align perfectly. The easiest way to tell is if the circle is perfectly round (not egg shaped, oblong circle, or 8 shaped).

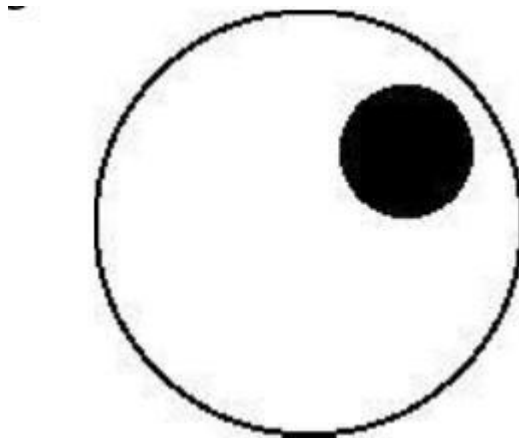


Step eight: If the two spots are not perfectly aligned, adjust the screws on the back of the 2# mirror to make the laser fire on the same position as the first spot.

Step nine: Repeat the sixth to eighth steps until the two spots overlap completely. Ideally the spots should be in the center of the hole, but it is more important for the two spots to line up perfectly.

Step ten: Affix a single piece of tape paper on the bottom of the cone, press pulse, a spot will burn through the tape. Take the nozzle off the head by spinning it clockwise. Look through the nozzle and if the burn mark is in the center of the nozzle hole, then your machine is fully aligned .

Step eleven: If the laser mark is not in the center of nozzle, as figure below:

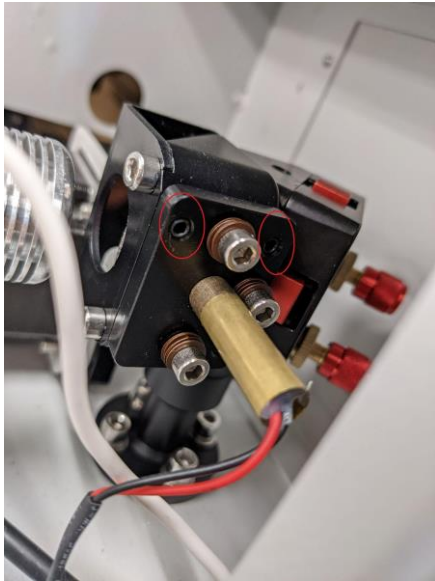


In the above Figure, the spot is upper and right biased. To move the dot down, you will need to tighten the upper screw on mirror #3. To move the dot to the left, you will need to loosen the bottom/right screw on mirror #3. Now reattach the nozzle and place a new piece of tape over the bottom. Repeat steps 10/11.

11.1 ADJUST THE RED BEAM COMBINER

The beam combiner is a red laser pointer, which travels the same path as the laser beam, all the way to the output, which is convenient to position the laser head and for the users to get an idea of where to start. Sometimes, the red dot is shifted, and you need to adjust it.

You will use a 2.5 mm hexagon Allen key to adjust the positioning screws of the beam combiner. There are 3 small black set screws in the corners of the plate. Loosening/tightening these will adjust left/right/up/down.



12 MAINTENANCE

12.1 MAINTENANCE SCHEDULE:

CAUTION

Avoiding the maintenance of your laser could impact the performance of your laser or even put it in an inoperative state... essentially it either doesn't work right ...or doesn't work at all.

To keep your NOVA Laser System working to maximum potential it is important to regularly maintain the system. The items below need to be included in your maintenance schedule.

Some regular maintenance of the optical and mechanical parts of the NOVA Laser System is needed.

Emergency cleaning should be performed immediately after an unexpected cutting or engraving outcome or an unintended amount of smoke, small flame, or material by-product.

12.2 LENS REPLACEMENT AND CLEANING

The NOVA Laser System lenses need regular maintenance.

12.2.1 LENS AND FOCUSING MAINTENANCE SCHEDULE:

Weekly cleaning is recommended.

The lens used to focus the laser beam that comes with your NOVA Laser System must receive regular maintenance for optimal engraving performance.

The lens cannot be cleaned when it is mounted in the laser beam focal tube. Once the lens is cleaned and remounted the laser beam alignment must be checked.

If there is a lot of smoke or fumes during the laser cutting or engraving process the lens should be checked and cleaned to ensure it is not covered with smoke particles or foreign material that can degrade the beam quality or power.

12.2.2 FOCUS LENS CLEANING/REPLACEMENT

The focus lens must be cleaned regularly otherwise dirt could be baked onto the lens surface. Once dirt is baked on it cannot be removed and at that point the lens must be replaced.

Lens cleaning is simple and should be done on a weekly basis. Any photography lens cleaning wipes can be used to clean your laser's lenses.

Use denatured alcohol and/or acetone to clean the lens' surface with lens paper or Felt swabs (avoid cotton swabs, they can leave particles on your lens) to gently apply the solvent. Alternatively, lens wipes with alcohol-free solution can also be used. Avoid rubbing the lens as doing so may create scratches which will degrade the beam focus and power and will lead to damaging the lens beyond use. Only use lens cleaning solvents (acetone, alcohol, or alcohol-free solution) to dissolve the dirt from the lens surface. Once the solvent is applied, use a dry piece of lens paper to absorb the solvent before it evaporates otherwise a residue of foreign matter will remain on the lens which could cause

excessive heating if it blocks the laser beam. Repeat the cleaning process until the lens is properly clean to the visible eye. Difficulty seeing the lens surface is a good indication that the surface has been properly cleaned. Looking at the reflection of an object by angling the lens should reveal the presence of any unwanted material on the lens. Ensure that no water marks or dirt traces appear on the lens surface. If none are visible then the lens has been properly cleaned.

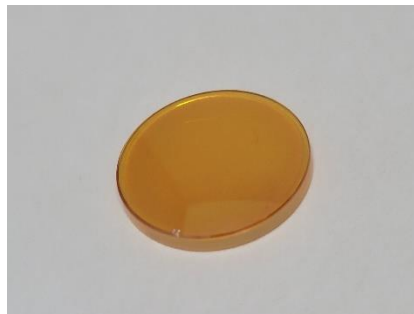
The lens must be replaced if:

- The lens is cracked,
- the lens coating is scratched/pitted,
- the core of the lens material is darkened,
- the lens coating is delaminating
- there is any other significant visible damage to the lens.

Caution - Note that some minor blemishes might be acceptable,

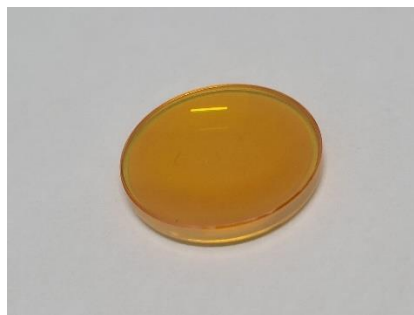
- any blemishes will reduce the beam's power and alter the shape of the cutting beam at the surface of the target material.
- Any dirt, other contaminate, or damage will degrade the lens' focus and properties and will cause internal damage to the lens which will grow with time.

Note that the focus lens is small, and measures 18 mm in diameter. Each lens has 2 distinct sides (see below), one side is flat and the other one is convex, i.e., curved out. After the lens is cleaned, the lens must be reinstalled with the curved side facing up (so the beam comes out the flat side onto the table to avoid defocusing/deviating the beam).



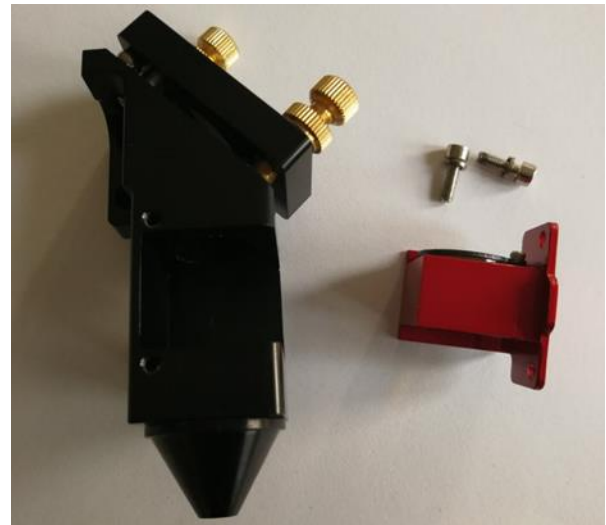
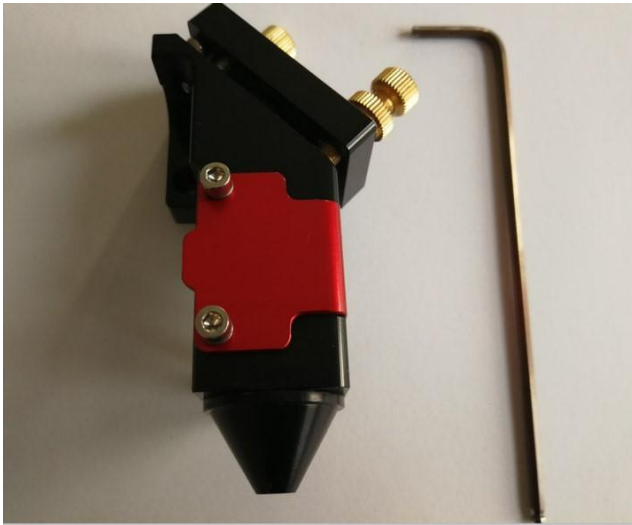
FLAT SIDE DOWN/CURVED-CONVEX SIDE UP

(THE DOWNSIDE EDGE LIES FLAT)



FLAT SIDE UP/CURVED-CONVEX SIDE DOWN

(YOU CAN SEE THE DOWNSIDE EDGE DOES NOT LIE FLAT – BOTTOM OF IMAGE)



Looking at the above picture, use the hex wrench to remove the lens assembly by removing the two screws holding the assembly in place.

Once removed, you can examine the lens, clean it to see if you can remove any dirt. Ensure you handle the lens carefully, using acetone or lens cleaner/wipes clean the flat side by lightly rubbing the wipes on both sides of the lens. Proper cleaning of the lens using lens cleaner, or wipes should have a brown residue on the lens paper or wipes after cleaning.

Once you've cleaned the lens, inspect it to see if it is scratched or has permanent/baked on residue which cannot be removed using the cleaning process. Any residue will degrade the performance and laser beam quality. If the power is insufficient for your cutting tasks, you will need to replace the lens.

If you removed the lens from the holder, as noted above, make sure to place the flat side down/nozzle end, i.e. towards the working platform when reassembling, curved side always faces up/the laser beam. The order of assembly is as follows: lens first, the rubber washer, and the screw.

CAUTION!

Do not over tighten the screw holding the lens.

When you tighten the screw, just snug it up against the washer. At that point, tighten it a quarter turn more. Overtightening the screw can cause the lens to crack.

Warning! Burned lenses are a common problem for new users of any laser machine. Please make sure to clean it often (weekly), especially if you are cutting or engraving frequently every week. Keeping your lens clean will ensure your work is of the highest quality and that you maximize the life of the lens.

12.2.3 MIRROR MAINTENANCE/CLEANING

12.2.3.1 MIRROR RUST

- What is unfamiliar to most people is that the metal surface of the laser mirrors can rust.

- It is important to control the humidity level in the laser work area.
- Periodically clean the mirrors and check for this oxidation as a possible problem.
- Any damaged mirrors, especially once rust develops, must be replaced as they will degrade the performance of your NOVA Laser System.

12.2.3.2 MIRROR #3

Mirror #3, located on the top of the laser head, must be cleaned at least once a month.

- This mirror is located directly above the focal lens.

If your cutting creates a lot of smoke or fumes, then it is advised to clean Mirror #3.

- Although it is possible to clean the mirror when it is in its mounting bracket, this is not recommended.
- You should remove the mirror from its mounting position and thoroughly clean it similar to the process used to clean the focusing lens.
- Use denatured alcohol and/or acetone as the cleaning solvent.
- Place a drop of solvent on the mirror or use a lens tissue or felt tipped swabs soaked in solvent to apply the solvent to the mirror's surface to prevent any scratching. Lens wipes pre-soaked with an alcohol-free solution will also do the trick.
- Do not scrape the mirror surface. The solvent will dissolve the dirt from the mirror surface.
- When wetting the surface, use gentle, soft swirling motion when applying the solvent.
- Use a piece of dry lens paper or swab to absorb the solvent before the solvent evaporates ensuring any dissolved dirt or material on the mirror's surface is absorbed by this drying material. Repeat the process until the mirror's surface is clean.
 - When properly cleaned the mirror surface should be difficult to see.
 - Look at a reflection of an object in the mirror to determine if any dirt or smudges remain on the surface.
 - Make sure that the mirror does not have any water marks or dirt smears.
 - Replace the mirror if it is pitted or scratched, rusted, discolored from heat damage, or any other damage is found.
 - Although minor blemishes might seem acceptable, these blemishes will degrade the laser power and focus at the target material.
 - Any dirt, contaminate, or damage on the mirror will cause further degradation to the mirror with use to the point where the mirror causes a risk of injury. .

12.2.3.3 MIRROR #2

Mirror #2 must be cleaned at least every 2 months. Mirror #2 is located directly at the end of the gantry rail.

- Use the same cleaning and maintenance instructions as for Mirror #3.

12.2.3.4 MIRROR #1

Mirror #1 must be cleaned at least every 2 months. This mirror is located directly in front of the laser tube.

- Use the same cleaning and maintenance instructions as for Mirror #3.

12.2.3.5 LASER TUBE OUTPUT COUPLER LENS

Laser Tube Output Coupler Lens must be cleaned at least every three months. This lens is located inside the output end of the laser tube.

Cleaning this lens requires special care.

- **Caution -** be gentle when cleaning this lens as it cannot be replaced
- This lens cannot be removed from the laser tube.
- You can use a felt swab to apply enough acetone to properly wet the surface. Alternatively, lens wipes with alcohol-free solution will also do the trick.
- This lens should not see much dirt. Ideally, you are only removing dust, film contaminate from humidity, or smoke fumes.
- **Caution -** Do not scratch this lens. It is not replaceable.

1.1.1.1 LINEAR RAILS

Linear Rails should be given some attention every other month. The linear rails are the guiding rails along the left and right sides, and across the gantry.

The linear rails should be clean, without rust, and have a slight glaze coating of some oil. The surfaces of the metal should always have oil on them such that they are wet to the touch.

- The best way to see that you need to do some cleaning is to check the end of the rail near where the home switch is located. If you see a dirt line, then wipe the dirt from the rails and lubricate the rails with fresh oil.

12.2.3.6 LINEAR BEARINGS

Linear Bearing should be given some attention every other month. The linear bearings are found under the gantry (to mount the gantry to the side rails) and under the focal head (to mount the focal head to the gantry).

These bearings have grease fittings for pushing lubricant into the ball bearing areas.

- You might not have a special grease pump to lubricate the bearings. Try the cheap and easy approach.
 - 1) Remove the grease fitting,
 - 2) Apply the grease to your finger,
 - 3) Push the grease into the little hole,
 - 4) push more grease into the little hole,
 - 5) Repeat step #2
 - 6) Put the grease fitting back on.

12.2.3.7 RUBBER BELTS

Rubber Belts should be checked for appropriate tension at least every six months. These side belts work together to move the gantry from front to rear.

The belts on each side should be the same tension and should be tensioned at the same time.

- If one belt is tensioned more often than another, then that belt could become stretched more than the other.
- It is difficult to describe how tight the belts should be, but there should not be a slack, sagging, or flapping.
- If the belt appears to be worn on one side, check the bearing alignment or damage to the matching bearings.
- There are many laser machine designs, but the method of changing the belt tension should not be too complex.
- It is normally a method of tightening a screw and then applying a lock nut to keep the screw in place.

12.3 WATER RESERVOIR – FILL AND MAINTENANCE

The water-cooling system is self-contained, and a closed, sealed system. It does not require you to add water during normal operation.

Note: a small amount of antifreeze can be added to the system if you are worried about freezing. The mix ratio is about 15:1 (water: antifreeze). Ethelene glycol or automotive antifreeze should not be used.

RV antifreeze (propylene glycol) can be used but this should be only used as a last resort.

The water should be changed with new, clean (distilled or deionized) water every 6 months.

12.3.1 ADDING OR CHANGING WATER AND CLEANING THE WATER RESERVOIR.

The water that cools the laser cavity flows into the discharge water reservoir (behind the panel in the picture below) where it is cooled before recirculating through the laser cavity.

To access the discharge water,

- You'll find the 'Water Outlet' on the left-hand, bottom edge of the panel (see pictures below).
- Place a bucket below the water outlet to catch the water when it is released.
- Use a spanner to unscrew the cap of the 'Water Outlet' port to allow the water to discharge from the machine.
- After that, flush fresh water to clean the reservoir by adding flowing water to the Water Inlet port.
- Once the flush is complete, fasten the cap of the water outlet.
- After that, add fresh (distilled or deionized) water to refill the reservoir and ensure the amount of water fill line showing in the water level indicator in the left-hand picture is in the green zone.



12.4 LASER STORAGE

Your NOVA Laser System must be stored in a clean, dry, warm location with no vibration.

If your location has any level of humidity, you need to use a dehumidifier and a desiccant (is a hygroscopic substance that is used to induce or sustain a state of dryness (desiccation) in its vicinity) to absorb any moisture.

- It is a fact that humidity can cause the metal parts of the laser machine to rust.
- Without moisture control, all metal is expected to rust.

12.5 DISPOSAL OF THE MACHINE

Do not dispose the machine with domestic waste!



Electronic devices have to be disposed according to your local region's electronic and electric waste disposal regulations.

If you have questions with respect to machine disposal, you can address your enquiry to our service desk and/or technical support staff.

13 . COMMON PROBLEMS AND SOLUTIONS

Common Faults Analysis

No.	Phenomena of Malfunction	Analysis method	Solution
1	Open the machine but no movement	Check power supply of machine connects well or not	Make all power supply electrify again
		Mainboard parameter is right or not	Correct the parameters according to software operating manual
2	Working with nonstop laser	Mainboard parameter is right or not	Correct the laser parameters according to software operating manual
3	Desultory light when working	Check water circulation is swimmingly or not	Clean water tank, water pump and water pipe
		Voltage is stable or not	Add regulator for the laser machine
4	Self-test abnormal when starting	Mainboard parameter is right or not	Correct the X and Y axis direction ,limit position parameters according to software operating manual
5	After output data ,machine no action	Check whether the data port choice is correct.	Choose correct port
		Check whether turn on the machine	Turn on the machine
		Check whether connected ground wire for the machine	Connect ground wire
		check whether installed the USB driver	install the USB driver
6	No laser when working	Check whether optical path is bias	Adjust the optical path
		Check whether the cooling water is running	Ensure the water is running
7	Can't detect the laser equipment	The computer or USB communication problem	Change computer or USB line

13.1 MAIN EQUIPMENT PART



The following common faults should be checked by a qualified technician

13.1.1 FAULT: TURNING THE KEY SWITCH AND NOTHING HAPPENS

Fault	Solution
Power switch is off.	Turn on power switch
No Power	Check to ensure power cord is plugged into the machine and the wall. Check that the circuit breaker for the wall power outlet has not triggered.
The power switch is damaged	Replace the power switch.

13.1.2 FAULT: WEAK LASER OR NO LASER OUTPUT; ENGRAVING DEPTH IS NOT ENOUGH

Fault	Solution
Laser focus spot has increased in size	Carefully adjust the focus of the laser beam at the working surface
Optical path shift	Adjust optical path
Focusing mirror is dirty	Clean it
Reflector lens is dirty	Clean it
Cooling water is not circulating or no cooling water in the water tank.	Check to see if there is cooling water in the tank. Check to see if there is a leak. If not, fill the cooling tank with water. If yes, then replace the cooling tank.
Damaged laser tube or aging laser tube due to over 1000 hours of use.	Replace laser tube.
Laser power damage.	Replace laser power

13.1.3 FAULT: CUTTING / ENGRAVING DEPTH IS UNSATISFACTORY

Fault	Solution
Laser power settings are not optimal.	Adjust the laser focus.
Cutting/engraving is not achieving the result.	Set suitable parameter and laser focus
The laser output becomes weak	Set suitable parameter and laser focus

13.1.4 FAULT: CUTTING / ENGRAVING SIZE 'S ERROR OR MALFUNCTION

Fault	Solution
Signal line is not working properly	Replace signal line
Machine and the computer grounding is not normal	Reground equipment and computers
The computer operating system failure or virus infection	Reset computer system or clear virus.
Application software is not working properly	Reinstall the cutting software and driver software for the motion control card
Unstable power supply or interfering signals	Install a power regulator or eliminate electrical interference
Processing program executing incorrect instructions	Check the coding or instruction to modify them to execute the required cut or grind.

13.1.5 FAULT: THE RUN EFFECT IS NOT IDEAL

Fault	Solution
Rails are dirty or rusting	Clean rails and add Lubricating oil
Dirt on slider or pulley	Clean them
Gantry or z-axis belt is loose	Increase the tension in the belt
Synchronized drive wheel loose or worn out	Tighten wheel if loose or replace if worn out

13.2 THERMOSTATIC WATER-COOLED MACHINE PART
13.2.1 FAULT: THE BOOT WITHOUT POWER

Fault	Solution
System won't power on	Check power plug
Protection tube fuse	Check it and replace

13.2.2 FAULT: FLOW ALARM

Fault	Solution
Water tank water level is too low	Check waterways system for leaks and repair if there is a leak. Adjust the water level, adding recycling water as necessary.
Cooling water not circulating	Check the water pipe is not kinked or disconnected and unkink or replace as needed.

13.2.3 FAULT: WATER TEMPERATURE TOO-HIGH

Fault	Solution
Dust vent is congested resulting in poor heat dissipation.	Clean the dust vent, regularly.
The air inlet has poor intake	Ensure the inlet entrance and outlet openings are free of dust or obstructions.
Low or unstable voltage	Check the circuits to assess issues.
The Chiller is switching on too frequently	Ensure there is sufficient water in the cooling system and that the water is being cooling when it exits the laser
Excessive thermal loading	Reduce the thermal loading or increase the cooling capacity of the unit.

13.2.4 FAULT: ROOM TEMPERATURE TOO HIGH

Fault	Solution
The cooling water is not being cooled due to high room temperature	Improve ventilation in the laser room to ensure that the chiller operating environment below 40 Degrees Celsius.

13.2.5 FAULT: WHEN CHANGING THE WATER, OUTFALL DRAINAGE IS SLOW

Fault	Solution
Water is not flowing from inlet.	Open it

14 TECHNICAL PARAMETERS OF THE MACHINE

14.1 PARAMETERS

Laser wavelength	10.6 μ m	Cutting speed	Up to 6000 mm/min
Laser type	Sealed CO2 Laser	(The cutting speed is set according to the material thickness)	
Working area	Nova 10 1000 × 700 mm Nova 13 1300 × 900 mm Nova 14 1400 × 900 mm Nova 16 1600 × 1000 mm	Max laser output	80 W/ 100 W/ 130 W/ 150W
Cutting depth	20 mm or less	Laser energy adjustment	0~100% Manual automatic (software setting)
Cutting line width	≤0.5 mm	Cooling system	Circulating water cooling
Cooling water temperature range	5 °C~30 °C	Electric power	110V/60Hz/2KW

14.2 ELECTRICAL

Electricity, Power, Fuse

- Electricity Requirements: 110 V AC 60 Hz Single Phase
- Power Consumption: 1200 – 1440 Watts

14.3 MECHANICAL

Model	Nova 14	Nova 16
Working Area	35 7/16" x 55 1/8" 900mm x 1400mm	39 3/8" x 63 " 1000mm x 1600mm
Machine	55 1/2" x 74 13/16" x 40 11/32"	59 7/16" x 82 11/16" x 40 11/32"

Model	Nova 14	Nova 16
Size	1410mm x 1900mm x 1025mm	1510mm x 2100mm x 1025mm
Machine Weight	1150 lb (520kg)	1370 lb (620kg)
Machine Packing Weight	1350 lb (610kg)	1570 lb (710kg)
Crate Packing Size	59 1/2" x 78 13/16" x 44 11/32" 1510mm x 2000mm x 1125mm	63 7/16" x 86 11/16" x 44 11/32" 1610mm x 2200mm x 1125mm
Laser Tube	Reci W1/W2/W4/W6 Premium CO2 Glass Tube	
Input Voltage	120V AC Single Phase	
Frequency	60 Hz	
Engraving Speed	0-1200mm/second	
Cutting Speed	0-300mm/Second	
Locating Precision	<=0.01mm	
Air Assist	105W Built-In Air Pump	

Model	Nova 14	Nova 16
Cooling	Vapor Compression, built-in 5200 Water Chiller	
Blower	330W Built-In Exhaust Fan	
Engraving Software	Lightburn, RDWorks	
File Formats Supported	AI/PDF/SC/DXF/HPGL/PLT/RD/SCPRO2/SVG/LBRN/BMP/JPG/JPEG/PNG/GIF/TIF/TIFF/TGA	
Compatible Software	CorelDraw/Photoshop/AutoCAD/InkScape/Any software that can export into the supported file formats	
Worktable	Honeycomb + Blade table	
Red Dot Positioning	Beam combiner	
Built-in WIFI	Included	
Auto Focus	Included	
Add-Ons	3-Jaw Chuck Rotary, 4 Wheel Roller Rotary, Fume Extractor	
Warranty	All Aeon lasers are backed by the factory warranty and our Lifeline Plus care plan, which includes remote startup training and unlimited US based phone support.	

14.4 CONTROL SYSTEM

Laser Power: 40 W, 60 W, 75 W, 90 W, 100 W, 130 W, 150 W.

Interface Hardware: RD6442S

Interface Software: Lightburn, RD works

14.5 LASER EQUIPMENT

Laser Type: CO2 Laser

Wavelength: 10600 nm (far infrared)

14.6 COOLING SYSTEM

Air Cooling System: No

Water Cooling System: Yes

14.7 AMBIENT CONDITIONS

Ambient temperature: +15°C to +35°C / 59°F to 95°F

Humidity: 40% to max. 70%, not condensing

15 CONSUMABLE WEARING PARTS

15.1 LASER TUBE

When the laser power decay gradually and can not cut normally. After the exclusion of other factors, you need to replace the laser tube.



15.2 OPTICAL LENS

The optical lens is contaminated, the laser will damage the coating layer of lens . Should be replaced at this time. The machine includes three reflective lenses and a focusing lens.

16 LEVELING LASER BED

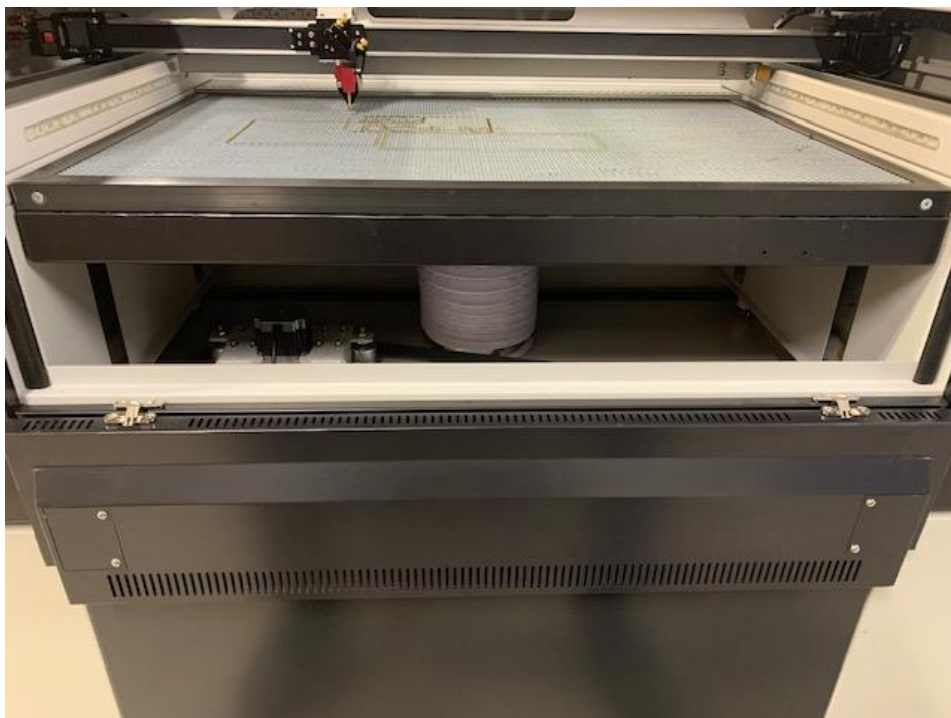
Leveling your laser bed is a simple process.

Step 1: Positioning the Gantry.

1. Move the gantry to the back of the table using the laser head Y-axis control.
2. Move the laser head to middle of the gantry so that it is out of the way.

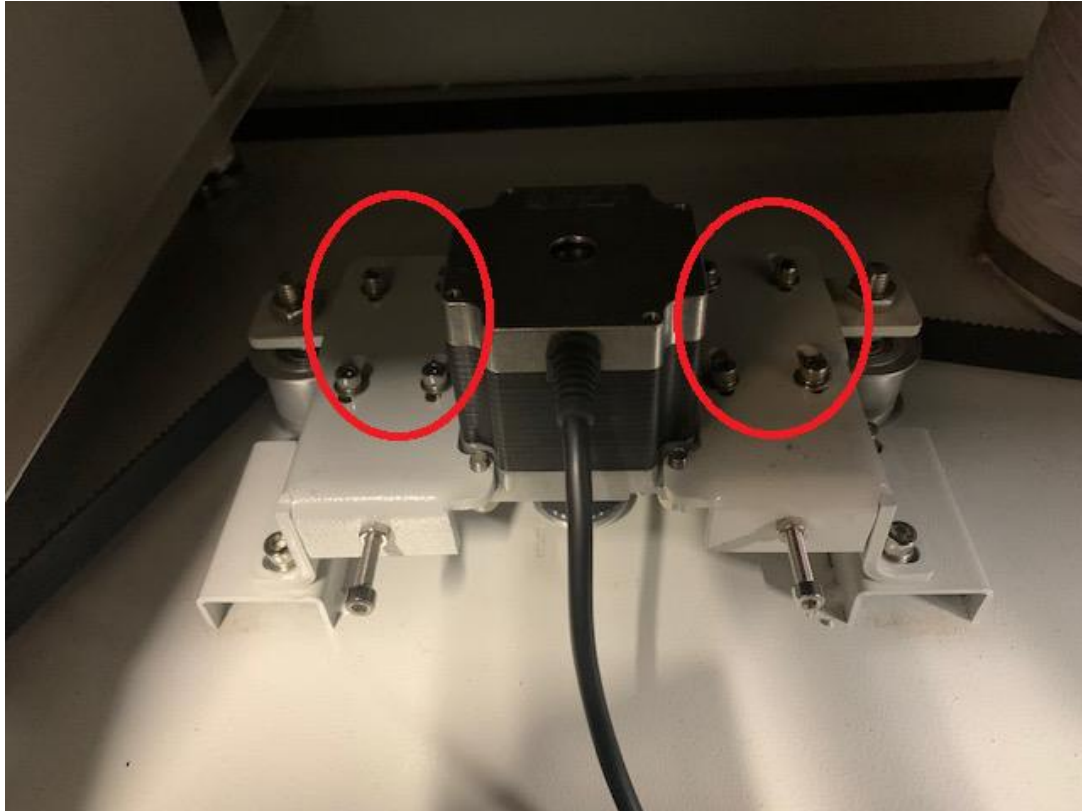
Step 2: Accessing the Z Axis motor and belt.

1. Using the control panel, select the Z-Axis motor control and raise the bed position to just below the Z position sensor.
2. Once the laser bed is at the top of the height, open the front drop down door.
3. Once this door is open you will be able to see the Z-motor location (to the bottom left in the picture below).



4. Before you can release the tension in the belt that controls the four (4) Z-axis bed platform screws (one Z-axis bed platform screws (one screw is connected to each corner of the bed raising hinges), you have to loosen the bolts that lock the belt tension setting.

Note: please note the location of the Z-Axis motor is slightly different between the Nova 14, Nova 16, MIRA 9 and MIRA 7 however the systems are the same. (see images below) (Mira 7)



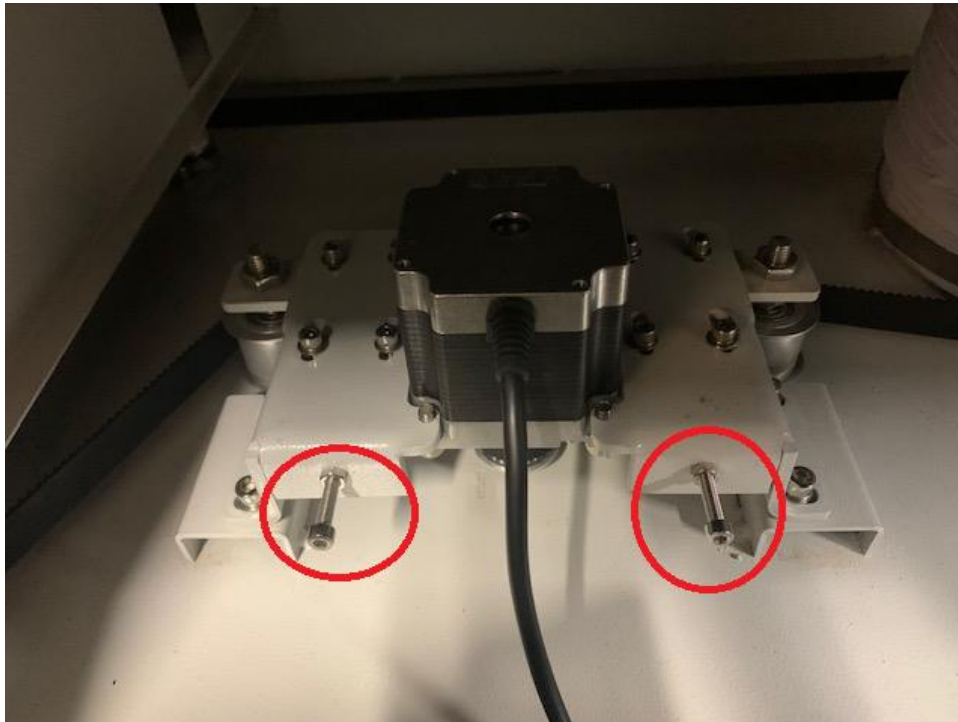
MIRA 9



Mira 7

Note: Before you release the tension, pull lightly on the belt to try to remember how tight the belt tension was before it was. You will need to apply approximately the same tension when reapplying tension to the belt upon reassembly.

5. Unscrew the tension screws to loosen the belt. (see images below.)



Mira 9



Mira 7

Step 3: Leveling the back of the Laser Table

1. With the tension removed use a dial caliper or another measuring tool to accurately measure the distance between the laser bed and the bottom of the gantry on the right far corner.

Note this measurement as this will be the one you use to set the other 3 corner between the gantry and the laser table.

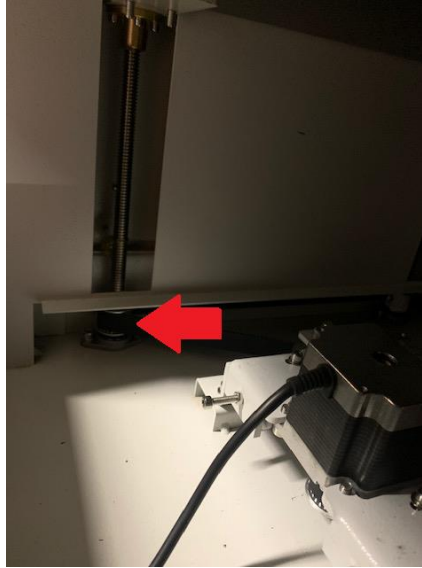
2. Set the bottom of the caliper against the laser bed and press the other edge against the top of the gantry to set the reference distance and then "lock in" the setting. (see images below.)



3. Once your measuring device has been locked compare the height at the left corner of your machine's gantry to that at the right.
4. The height of the left corner can be adjusted up or down using the 'ball screw' of the Left lifting ball screw below the bed at the back and bottom left of the machine. (See image below)



5. To adjust the 'ball screw' (see image below) pull the belt away from the sprocket mounted to the ball screw. This will allow you to turn that particular ball screw without rotating the ball screws that move the lift hinges at the other 3 corners of the table.



6. Turn that ball screw clockwise or counter-clockwise to raise or lower the bed for the corner you are adjusting.

Note: the two (2) back corners should now be level to the gantry.

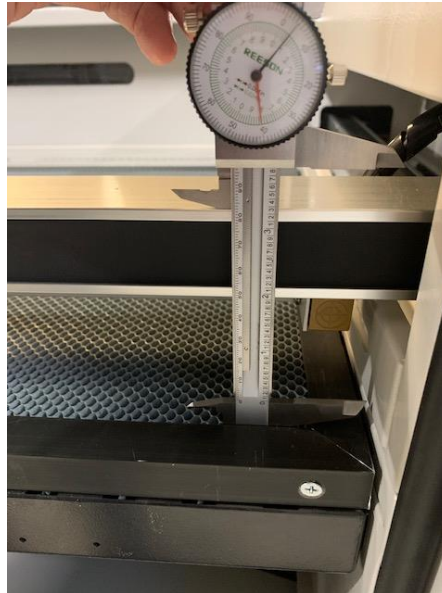
Step 4: Leveling the Front of the Laser Table

Leveling the front part of the laser bed is done using the same procedure.

1. Move the gantry to the front of the table using the laser head Y-axis control.
2. Ensure the laser head is in the middle of the gantry so that it is out of the way.
3. Using the same measuring device and locked setting as was used to set the level of the back of the laser bed compare the height at the right-hand corner of your machine's gantry to that of the right corner of the laser bed (see image below).



- (i) The height of the right corner can be adjusted up or down by turning the 'ball screw' at the Right below the bed at the front and bottom right of the machine.
- 4. To adjust the 'ball screw' pull the belt away from the sprocket mounted to the ball screw.
 - (i) This will allow you to turn that particular ball screw without rotating the ball screws that move the lift hinges at the other 3 corners of the table.
 - (ii) Turn that ball screw clockwise or counter-clockwise to raise or lower the bed for the corner you are adjusting to the setting on the caliper.



Once this is set, move to adjust the final corner of the laser table.

- 5. Using the same measuring device and locked setting as was used to set the level of the back and front right corner of the laser bed, compare the height at the left-hand corner of your machine's gantry to that of the right corner of the laser bed (see image below).



- (i) The height of the left corner can be adjusted up or down by turning the 'ball screw' at the Left below the bed at the front and bottom left of the machine. (See image)

6. To adjust the 'ball screw' pull the belt away from the sprocket mounted to the ball screw.
 - (i) This will allow you to turn that particular ball screw without rotating the ball screws that move the lift hinges at the other 3 corners of the table.
 - (ii) Turn that ball screw clockwise or counter-clockwise to raise or lower the bed for the corner you are adjusting to the setting on the caliper.

Once this is set, the table should be level.

Step 5: Final verification of bed level.

Although the laser bed should be level, the leveling should be checked at the back and the front as some adjustments to the different ball screws may have deviated the space between the gantry and bed at the other corners.

1. Move the gantry to the back of the laser and check the measurement between the gantry and the laser table at the right and left of the table.
 - (i) If the right corner is off, asset the caliper to the new distance and repeat steps 3 and 4, as necessary.
2. Once you are satisfied that the laser bed is level with respect to the gantry, then the leveling process is complete.

Step 6: Re-tensioning the Z-axis control belt.

Before you can use your machine, you need to re-engage the Z-axis control belt.

1. Move the gantry to the back of the table using the laser head Y-axis control.
2. Ensure the laser head is at the middle of the gantry so that it is out of the way.
3. Before you tighten the tension in the belt that controls the four (4) Z-axis bed platform screws (one Z-axis bed platform screws (one screw is connected to each corner of the bed raising hinges), you have to ensure the bolts that lock the belt tension setting are loose.

Once the leveling procedure is complete, test your bed Z-axis to confirm it is functioning properly and the tension is sufficient to raise and lower the bed.