

THUNDER LASER SYSTEMS



Installation and operation manual MARS-90

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Introduction

This manual has been designated as the thunder laser systems, laser cutting machine installation and user guide; The manual is divided into five chapters, Including general information instructions, safety instructions, the key components of every laser cutting systems and the installation steps, operation instructions and maintenance instructions from THUNDERLASER Company.

Frist, it should be emphasized that the installation of each system must meet the requirements, and make it consistent with the installation requirements of THUNDERLASER. If not, the machine will not working properly, poor performance, life shortened, maintenance costs increased and even machine damage .

The note is for getting a specific requirement of system installation, and we hope every customer try to understand these notes before installation and usage, thus you can correctly install and use. If you meet any installation problems, you can contact our technical staff and customer service staff. **(At the same time, you can also refer to the machine installation video that we posted on youtube. The specific URL is www.thunderlaser.com/videos.php or http://www.youtube.com/watch?v=likSTBR2_hM&feature=player_embedded.)**



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Chapter1 General

1.1 General Information

Caution:

Please read and follow this Operation Manual carefully, before installation and operation. Damage to persons and/or material can result from not following individual points of the Operation Manual!

Operation of the system is only permitted with equipment and spare parts supplied or listed in the spare parts and consumables lists.

Auxiliary equipment must be adjusted to the base machine (any queries to dealer or manufacturer).

The following symbols are used for easier understanding of the Operation Manual:



If the Operation Manual is not observed, this area represents a particular danger for the operating personnel or the personnel responsible for maintenance.



Caution: This component is under voltage. In these areas strictly observe the safety instructions regarding electricity. Care is to be taken in particular during maintenance and repair work.



Caution: In this area pay attention to the possible dangers of the laser beam.

Tips: Note or information on individual components of the device that simplify the use or make it more understandable.



1.2 Designated

The THUNDER LASER MARS-90 is used for engraving and cutting of signs, stamps and suchlike.

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 can be processed on the laser.



1. The engraving process must only be performed with a perfectly adjusted machine.
2. For cutting applications with 60 W the use of the cutting table is absolutely necessary.
3. Use of the system in other areas is against the designated use. The manufacturer does not admit liability for damage to personal and/or equipment resulting from such use.
4. The system must only be operated, maintained and repaired, by personnel that are familiar with the designated field of use and the dangers of the machine!
5. Non-observance of the instructions for operation, maintenance and repair described in this Operation Manual excludes any liability of the manufacturer if a defect occurs.
6. 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.

1.3 Disposal remarks



Do not dispose the machine with domestic waste!

Electronic devices have to be disposed according to the regional directives on electronic and electric waste disposal. In case of further questions, please ask your supplier. He might take care of proper disposal.



1.4 Technical Data / Device Specification

Mechanics

Working area	35.4"x 23.6" / 900 x 600 mm
Table Size	39.4"x 28.7" / 1000 x 730 mm
Z Axis Height	10.4 inch / 265 mm
Max. Height of work piece (Motorized Table, Standard laser head)	10.5 inch / 267 mm
Max. Height of work piece (No Motorize Table, Standard Laser head)	1-2.1 inch / 27- 55mm
Max. engraving speed	23 inch/sec. / 600 mm/sec. Standard
Cutting speed	depending on material, thickness, laser power
Motor	3 phase step motor
Driver	3 phase step motor driver
Work piece table	Solid metal (Honey comb table)
Max. load of work piece table	40 kg
Net Weight	230kgs (507lbs)
Lenses available (focal distance)	2, 0"
Focus lens diameter	20mm
Reflector diameter	25mm
Beam combiner diameter	25mm

Dimensions

W x D x H	57.1" x 42.7" x 43.5" / 1450 x 1085 mm x 1105 mm
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Max Part Size (W x L x H)

Front Door Closed	39.4"x 28.7"x 10.6" / 1000 x 730 mm x 270 mm
Pass-Through Door	39.4" x ∞" x 1.2" / 1000 x ∞mm x 30 mm

Features

Standard:

Red Dot Pointer, Auto Focus, Motorized Table, Pass-Through Door, Air Assist, Water Pump, Exhaust Fan, Honey Comb Table, 2,0"(50.8mm)Focus Lens, Easily Adjustable Home Position, LCD Display, 3D Engraving, "No Water "protection, Emergency Stop, Open cover protection

Optional:

Rotary Attachment, Water Chiller Attachment, High Resolution head (up to 1000DPI, while standard laser head Max is 500DPI), Air Compressor, Oil-Water Separator

Control System

Laser power	Adjustable from 0 - 100% (typically 10-100%)
Interface Hardware	USB: connect to PC and U-disk
Interface Software	LaserGRAV
Operating Modes	Optimized raster, vector, and combined mode
Buffer Memory	48MB Standard

**Laser Equipment**

Laser Type	Sealed CO2 Glass Laser Tube
	Laser Power: 60W, 90W, 120W
Wavelength	10, 6μm

Cooling System

Air Cooling System	Air-Cooled
Water Cooling System	Water Cooled

Electricity, Power, Fuse

Electricity Requirement	110 to 240 volts, 50 or 60 Hz, Single phase
Power consumption	700W (Assembly 60Watt Laser Tube)
Recommended fuse	10A (220V), 10A (110V)

Ambient Conditions

Ambient temperature	+15°C to +25°C / 59°F to 77°F
Humidity	40% to max. 70%, not condensing

Laser Safety

Laser class	CDRH Laser Safety
	Laser Class 4(H)
	CE compliant, FDA approved



1.5 Manufacturer's Label

The manufacturer's label is located on the back of the device (see Figure below).



It is recommended to enter data such as serial number and year of manufacture into the manufacturer's label below so that you always have this data handy if you have problems with your device or require spare parts.

 THUNDER LASER CUTTER		CE
THUNDER LASER TECH CO.,LTD This Product Complies With 21 Cfr Part 1040.10		
Input Power:		601,Unit 1,Building 2,BinYuan Garden, JinTang Street,HongLing South Road,LuoHu District,ShenZhen,China
Nominal Power:		
Lasertype:		
Model/Type:		
Serial Number:		
Manufactured:		www.thunderlaser.com MADE IN CHINA

Chapter 2 Safety

2.1 General Safety Information

All personnel involved in installation, set-up, operation maintenance and repair of the machine, must have read and understood the Operation Manual and in particular the "Safety" section. The user is recommended to generate company-internal instructions considering the professional qualifications of the personnel employed in each case, and the receipt of the instruction/Operation Manual or the participation at introduction/training should be acknowledged in writing in each case.

Safety-conscious of Working

The machine must only be operated by trained and authorized personnel.

The scopes of competence for the different activities in the scope of operating the machine must be clearly defined and observed, so that under the aspect of safety no unclear questions of competence occur. This applies in particular to activities on the electric equipment, which must only be performed by special experts.

For all activities concerning installation, set-up, start-up, operation, modifications of conditions and methods of operation, maintenance, inspection and repair, the switch-off procedures that may be provided in the Operation Manual must be observed.

Safety Information for the User and/or Operating Personnel

1. No working methods are permitted that affect the safety of the machine.
2. The operator must also ensure that no unauthorized persons work with the machine (e.g. by activating equipment without authorization).
3. It is the duty of the operator, to check the machine before start of work for externally visible damage and defects, and to immediately report changes that appear (including behavior during operation) that affect the safety.
4. The user must provide that the machine is only operated in perfect condition.
5. The user must guarantee the cleanness and accessibility at and around the machine by corresponding instructions and controls.
6. Principally, no safety components may be removed or disabled (already here we emphasize the imminent dangers, for example severe burns, loss of eye-sight). If the removal of safety components is required during repair and service, the replacement of the safety components must be performed immediately after completion of the service and repair activities.
7. Preparation, retooling, change of work piece, maintenance and repair activities must



only performed with equipment switched off, by trained personnel.

8. It is forbidden to perform unauthorized modifications and changes to the machine. It is emphasized, that any unauthorized modifications to the machine are not permitted for safety reasons.



2.2 Laser Safety Information



1. To assess the potential dangers laser systems pose, they are classified into 4 safety classes, thunder laser MARS-90 is a device of class 4. This is guaranteed by the protective housing and the safety installations.

Please note that improper operation of the device can override the status of safety class 4 and can cause the emission of harmful radiation.

2. 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!

3. Without safety precautions, the following risks exist with exposure to laser radiation:

Eyes: Burns to the cornea

Skin: Burns

Clothing: Danger of fire

4. Never try to modify or disassemble the laser and do not try to start up a system that had been modified or disassembled!

5. Dangerous radiation exposure can result from the use of operation or adjustment equipment other than that described here, and if different operational methods are performed.



2.3 Safety Precautions when Operating the Device

In your thunder laser MARS-90, a closed safety system is integrated which immediately switches off the power to the laser tube when the protection cover is opened. Consequently an incomplete engraving can occur if the cover is opened during operation. Therefore, first press the "PAUSE" button, if you want to interrupt an engraving process.

Please remember the following safety precautions when working with this device:

A fire extinguisher must always be handy as the laser beam can ignite flammable materials. Do not store any flammable materials in the inside of the device or in the immediate vicinity of the device. Particularly leftovers of produced materials have to be removed to prevent fire hazard.

Unsupervised operation of the system is not permitted:

Because of their low absorption many metals, in particular un-coated aluminum, copper, silver and gold cannot be processed with the laser and lead to high reflections of the laser beam. Such materials must not be inserted into the beam, as a directed reflection could destroy the protection cover.

Adjustment of the beam path must be performed only by especially trained personnel. An improper setting can lead to uncontrolled emission of the laser radiation.

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. We emphasize that 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.)

Please refer to the manual of the exhaust system on how and in what intervals you need to replace filters.

PVC (polyvinyl chloride) must under no circumstances be processed with the laser.

Should you have further questions before starting work, please feel free to write us an email at: tech@thunderlaser.com

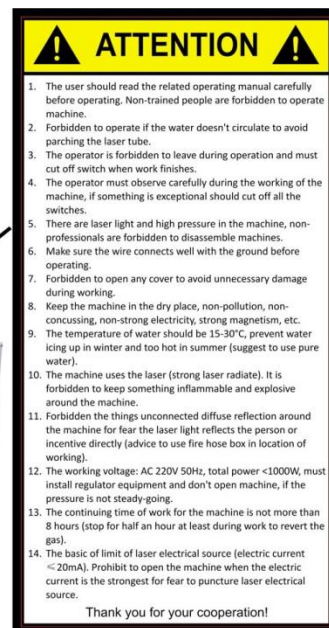


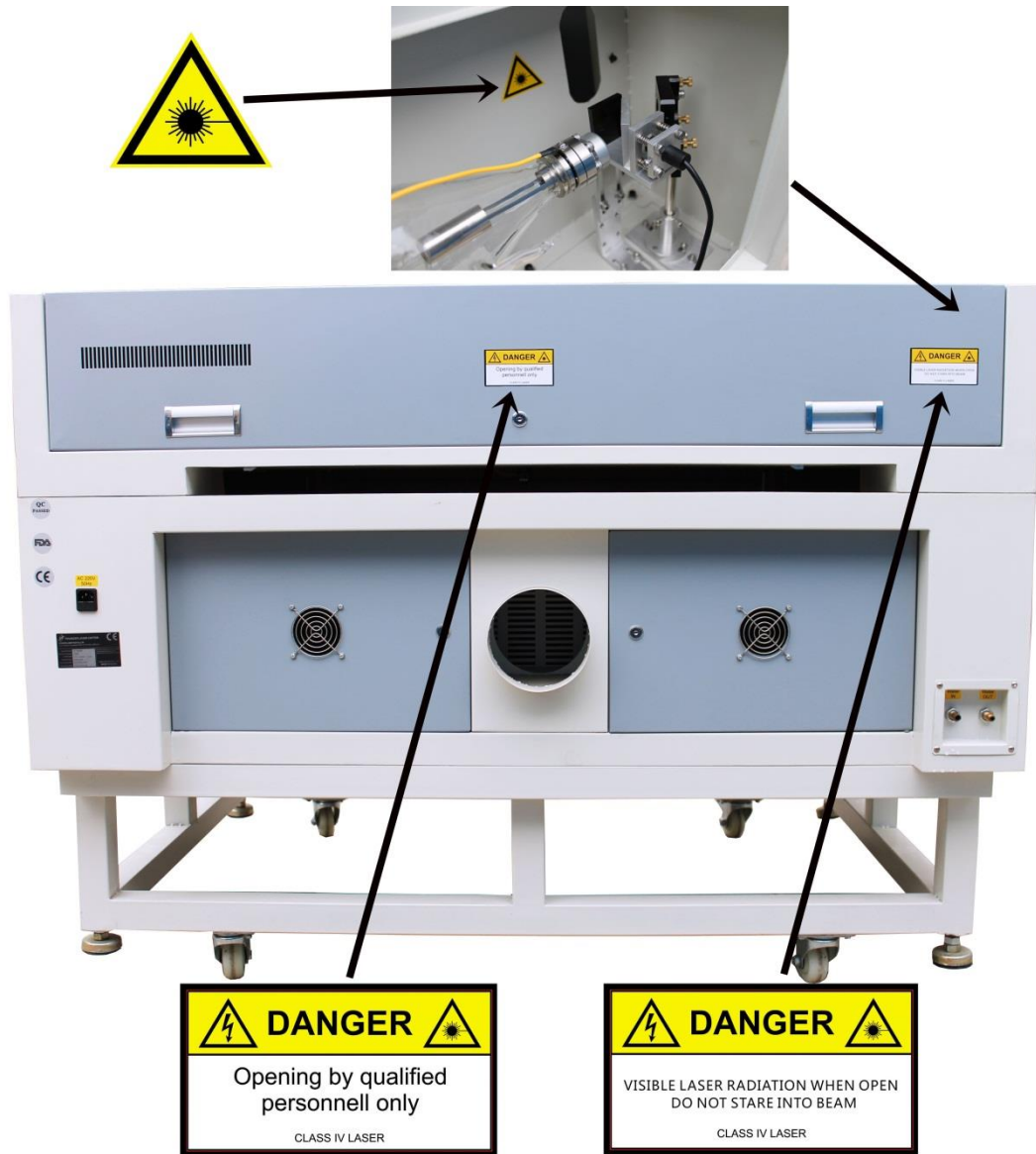
2.4 Warning and Information Labels



The warning and information labels are attached in such positions of the device that could represent a source of danger during set-up and operation. Therefore, follow the information on the labels. If labels are lost or damaged, they must be replaced immediately.









Chapter 3 Process of Installing

3.1 Unpacking

You receive your THUNDER LASER MARS-90 packed in a wooden box, which contains the laser machine and additional accessories. The following steps give you an overview of the unpacking and assembly of the laser. Please follow these steps carefully.

Tips: Keep the packing box. You will require it in case of a return.

Dispose all waste according to the applicable waste disposal law.

1. Put the wooden box on a flat and spacious room for unpacking.
2. Remove the machine box, carefully remove the foam material, which protects the viewing window of the cover and around the machine.
3. Take out the key, open the door of the laser, Remove the accessories box which contains all accessory parts required for the installation of the laser machine. And check if there's anything damaged or missed during shipping.
4. You will see an attachment table on the machine; please check whether the accessories that listed on the table are all in there.
5. Please keep the keys and the warranty certificate well (and please show us your warranty certificate if you need tech support for the machine failure, then we will provide you the best technical service).
6. Remove the sponge and nylon cable ties inside the machine, and start to install the machine (below chapters are installation details)



3.2 Contents of Delivery

1. Transport and service packaging
2. Laser including optics
3. Other optional components that you buy.
4. Accessories box and the other machine parts, which contains the following parts:

	ITEM	QTY
1	Guiding DVD	1
2	Adapter	1
3	Fuse	2
4	Extention Wire	1
5	Ruler	1
6	Long USB Cable	1
7	228 Belt	2
8	Power Cable	1
9	Ruler for adjust focus	1
10	Water Pump	1
11	Micro Switch	2
12	Lens Cleaning Liquid	1
13	Air Comperssor	1
14	Lubricating oil	1
15	M3M4 Allen Wrench	1
16	Main Switch	2
17	Sticker	5
18	Ribbon	10
19	Exhaust Fan	1
20	Exhaust Pipe(two colors)	2
21	Hose Clamp	1
22	Lens Cleaning Paper	1
23	Socket	1
24	Silcon Water Pipe	1
25	Key	2 sets
26	Focal Distance(standard laser head)	6.0mm





5. THUNDER LASER Product Warranty Certificate

 THUNDER LASER TECH CO., LTD Product Warranty Certificate Product Name: LASER CUTTER Specification: MARS-90 Serial Number: 6233561488 Inspection Date: 2013-04-22 Ex-Factory Date: 2013-04-29 Quality Inspection Conclusion: PASS THUNDERLASER Product Warranty Terms 1.Warranty Period: The warranty for whole machine is effective 14months from the Ex-Factory Date. But for the laser tube and focus lens and the reflective mirrors, the warranty is 6months. 2.Warranty Provisions: 1. Please keep the certificate, you need to show us this certificate for warranty. 2. Damage caused by lightning or other electrical system is not covered. 3. Damage caused by improper operations like liquid leakage to mainboard or power supply is not covered. 4. Damage caused by accidents, disasters, wars and other irresistible factors is not covered. 5. Damage caused by not following our User Guide Manual and result in improper operating and maintaining is not covered. 3.Warranty: 1. We will send you the spare parts and offer tech support for free during warranty when there is a machine fault, including the part fault. 2. User will need to send back the old parts to us within one week after receiving the new parts,(we will inform you the address for returning the old parts) And a tracking number must be provided as voucher. 3. If we don't get the old part (or tracking number) one week after user receiving the new one, we will stop the machine warranty until we receive the old part. And user must take responsibility for his own loss during this period. 4. We will charge for replacing/repairing (including labor costs and transportation costs) when the warranty is expired. 5. User will need to buy new parts for replacing from us (or with our permission if buy from other company), If not, we won't take any legal responsibility when there's any tech problem or machine fault, meanwhile, we will stop the warranty. 6. If there's any problem in future, we will provide you tech support by sending email/telephoning/skype/msn. THUNDER LASER TECH CO., LTD 601,UNIT 1 ,BUILDING 2,BINYUAN GARDEN,JINTANG STREET,HONGLING SOUTH ROAD,LUOHU DISTRICT,SHENZHEN,CHINA Post code: 518008 Tel : (86)755 82689501 Email: tech@thunderlaser.com Website: www.thunderlaser.com <i>For and on behalf of</i> THUNDER LASER TECH CO., LIMITED 陳氏雷宇激光科技有限公司 <i>Authorized Signature(s)</i> Company Stamp:
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3.3 Location

Before you install the laser system, you should select an appropriate location. Follow the guidelines shown below:



1. Avoid locations where the system is exposed to high temperatures, dust and high humidity. (The humidity must not exceed 70% and the temperature must not be close to the dew point.)
2. Avoid locations, where the system is exposed to mechanical shocks.



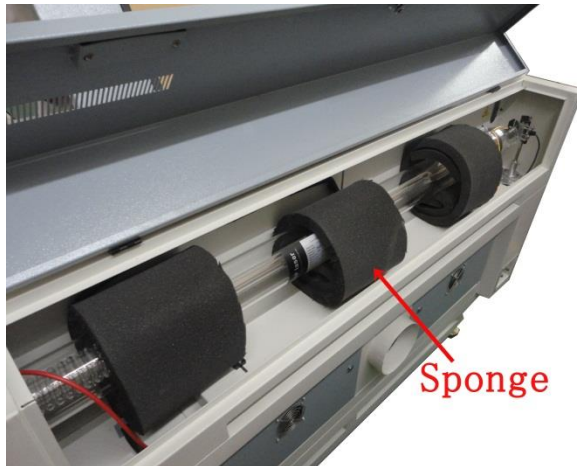
1. Fuse protection:
Do not connect other devices via the laser fuse, as the laser system requires the full amperage.

Tips:

1. Avoid locations with poor air circulation.
2. Select a location, whose room temperature is between 15 °C and 25 °C (59° – 77° F).
Avoid higher ambient temperatures and strong exposure of the engraver to the sun.
Use blinds, if required.
3. Select a location close to ventilation (if available).
4. Select a location that is not more than 4.50 m away from your computer (max. cable length to avoid disturbing interferences).
5. Try to place a working table or a place to put things next to it. This shall avoid, that the machine is misused as a table.

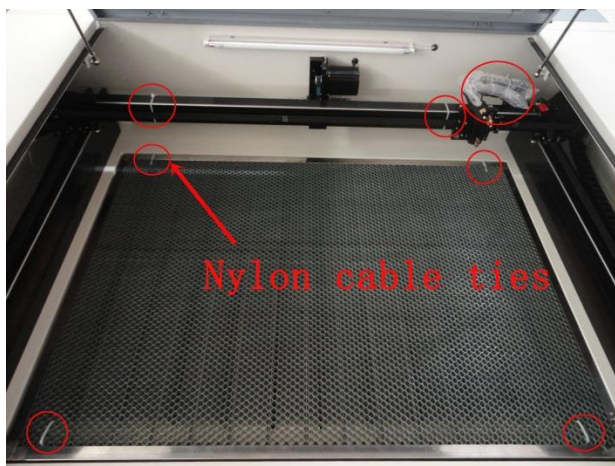
3.4 Before Installation

1. Take out the sponge around the laser tube. Like below:



2. Take out the nylon cable ties around the honey comb plate and X axis, and then install the laser head.

Like below:





3. Please try to use machine special grounding line (yellow/green line) to ground for safety. Because it is possible that domestic socket of grounding wire didn't answer. Like below:



4. Open the rotate emergency switch (must do it for the first time to use the machine). Like below



3.5 Exhaust System – Requirements

To guarantee the right ventilation during the engraving and the cutting. The device must be equipped with a fine dust filter (generation of rubber dust) as well as an activated carbon filter (neutralization of smells). A good filtering of the outgoing air is also required when cutting plastics or engraving wood.



Connection - see section 3.7.3 connecting the Exhaust System.



Do not start the machine without an adequate exhaust system.

3.6 Computer – Requirements

The following recommendation represents the minimum requirements. When using a more powerful computer the graphics are generated and displayed faster and the computing times and the data transfer to the laser are reduced. To use the newest software version, you might have to abide other requirements.

- Windows 7
 - Windows Vista (with Service Pack 1 or later)
 - Windows XP (with Service Pack 2 or later)
- 1024 MB of RAM, 400 MB of hard disk space
- Pentium® 3 or 4 processor or AMD Athlon™ XP
- 1024 x 768 or better monitor resolution
- 1 free USB interface
- CD drive
- Mouse



3.7 Connections



Perform the connections exactly in the order described; otherwise electrostatic charging can damage your computer and/or the electronics of the laser system.

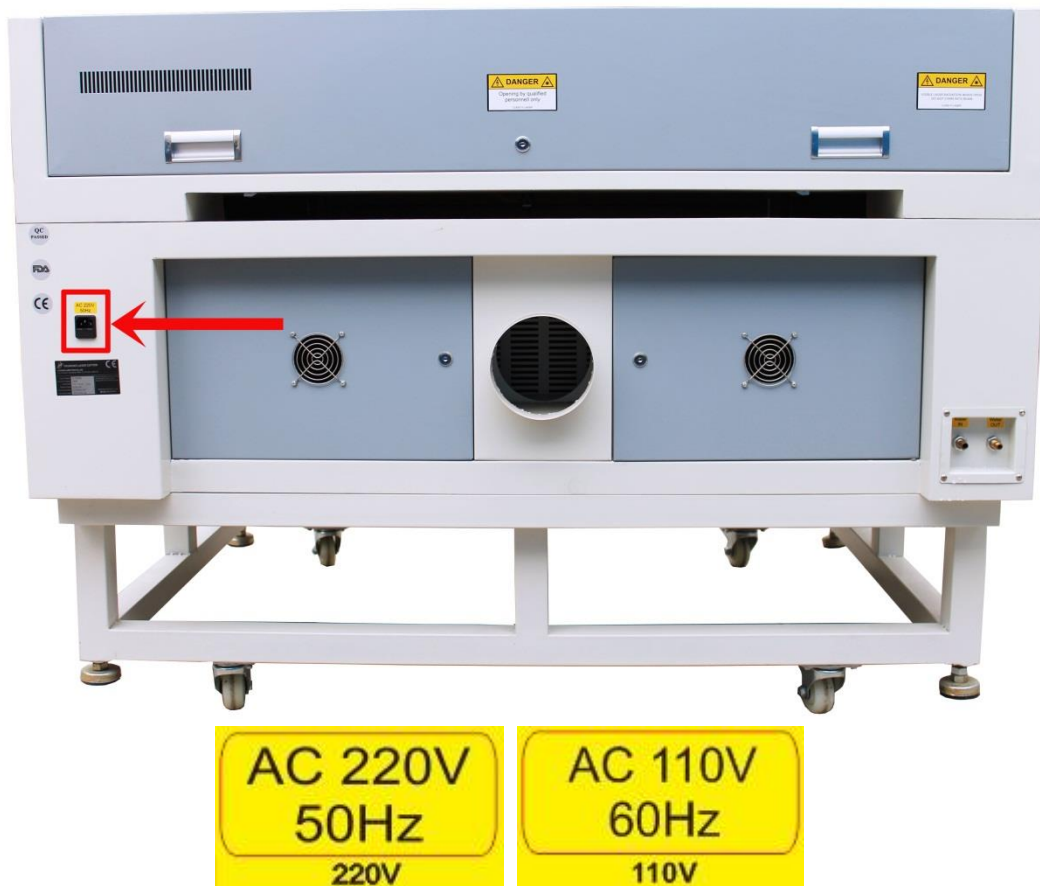
3.7.1 Connecting the Mains

Connect one end of the mains cable with the connection socket at the rear side of the laser device (see Figure below) and the other end with a protected power outlet.



Mains voltage and operating voltage must correspond (AC 220 V/50 Hz or AC 110 V/60 Hz) – see information label beside the connection socket.

Under no circumstances switch on the device if the voltages do not correspond.



Tips: The main fuses are located inside the connection socket and are accessible from the exterior.



3.7.2 Connecting the Computer and the machine by using the USB cable.

Like below:



3.7.3 Connecting the Exhaust System

Installation of the exhaust transposition. Insert one side of the gray exhaust pipe into the fan inlet and the other side into the fuselage behind the exhaust tank. Insert one side of the blue exhaust pipe into the fan outlet and put the other side of the pipe outside where you work (If the machine is far from the outside of the room that the gas manufactured by the machine cannot be discharged; then you might need an dust/fume filter, it can keep the air quality of your working environment well).

Please refer to the following pictures about how to install the exhaust pipe:





3.7.4 Connecting the Cooling System

If you have the water chiller, and please connect to the water chiller priority. If not, and please connect to the water pump.

The connection of the machine and the **Water chiller**.

- ① Take out one of the water pipes and connect to the water chiller where marked as “OUTLET”, the other side of the pipe connect to the machine where marked as “Water IN”.
- ② The other pipe, please connect to “INLET” of water chiller and “Water OUT” of machine.

Like below:



The connection of the machine and the **Water pump**

- ① Take out one of the water pipes and connect to the water pump, the other side connect to the machine where marked as “Water IN”.
- ② The other pipe, please connect to the machine where marked as “Water OUT”, the other side directly into the water.

Like below:



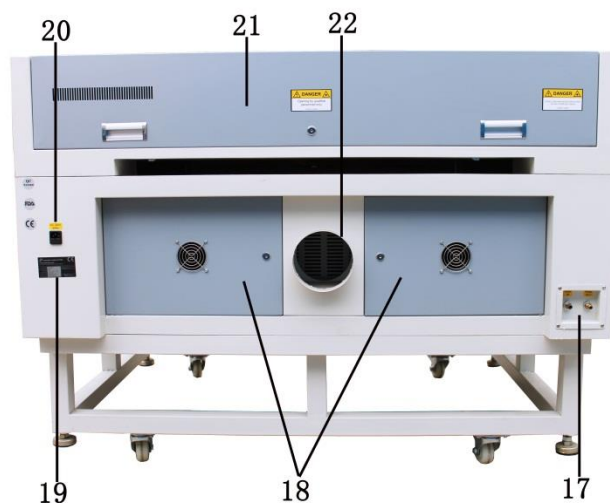
Get through the water chiller or the water pump , and turn on the main power.

Check the water chiller or pump to work (If normally work, the green light will light or water will flow from the pipe) .



Chapter 4 Operation

4.1 Machine View





- | | |
|------------------------|----------------------------------|
| 1. Top lid | 12. PC connection port(USB) |
| 2. Left-up side door | 13. U-disk connection port(USB) |
| 3. Left side door | 14. Main power switch |
| 4. Autofocus sensor | 15. Laser power switch |
| 5. Laser head | 16. Connection Socket for Rotary |
| 6. X-axis | 17. Water in and water out |
| 7. Y-axis | 18. Rear door |
| 8. Working table | 19. Manufacturer's label |
| 9. The display | 20. Power supply socket |
| 10. Right-up side door | 21. Laser tube cover |
| 11. Right side door | 22. Exhaust hose |

1. Top lid

If the Top lid is opened, no data is processed. When the protection cover is opened during working, the motion system is stopped and the laser source is turned off. During processing of commands the protection cover must only be opened after pressing the "Pause" button.

2. Left-up Side Door

Open this door for cleaning the second reflective mirror

3. Left Side Door

There is laser power supplier, air pump and red dot pointer power supply interface here, please open this door for checking these parts, but must pay attention to the electric current.

4. Autofocus sensor(optional)

Used for the automatic focusing of the work table.

5. Laser head

The laser and red dot pointer comes out from the laser head, and the Auto Focus switch is installed on the laser head, too. The bottom of laser head is parallel to the bottom of the autofocus switch.

6. X-axis

The motion system is that performs the mechanical movements in X direction. The X-axis is visible in the working area.

7. Y-axis

The motion system is that performs the mechanical movements in Y direction. The Y-axis is visible in the working area.

8. Working Table

The honey comb plate to be processed is put onto the working table. Put the material on the working table for engraving & cutting

9. The display

You can control the X-axis, Y-axis and Z-axis manually by the display panel, it also shows the working time, power, speed and the whole working time and affords many function options(please view this chapter 4.3 for detail).

10. Right-up Side Door**11. Right side door**

There are laser controller, driver, power supplier (both 24v DC and 36vDC), the main connecting cables and cooling fan here, please open this door for checking these parts, but must pay attention to the electric current. if you need to repair, please contact with professional maintenance staff.

12. PC connection port(USB)**13. U-disk connection port(USB)****14. Main power switch****15. Laser power switch****16. Connection Socket for Rotary Attachment(option)**

Supplies the rotary attachment with the required electric signals.

17. Water in and water out**18. Rear door****19. Manufacturer's Label**

Shows important data of the machine like serial number or manufacturing date etc.

20. Power Supply Socket

To connect the main power according the label information. In the power socket have the fuses.

21. Laser Tube Cover

There installed the laser tube, red dot pointer device, beam combiner and the first reflective mirror inside.

22. Exhaust hose

This is for installing the exhaust device.

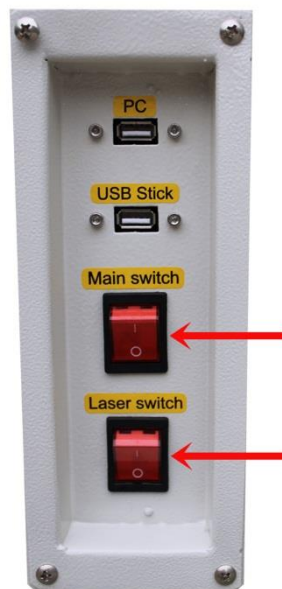


4.2 ON/OFF Switch

Switches the mains and the laser supply power ON/OFF.

The following conditions must be fulfilled for correct start up:

- Unrestricted freedom of motion of the mechanics
- No materials under the engraving table
- Protection covers closed
- When turn on the power of machine, and note that turn on the main switch first and then the laser supply power.



If all covers are closed, immediately after being switched on, the device starts the referencing process. When the referencing process is completed correctly, an acoustic signal sounds and the device is ready for operation. The operation panel will display the home screen when the laser is completed resets.



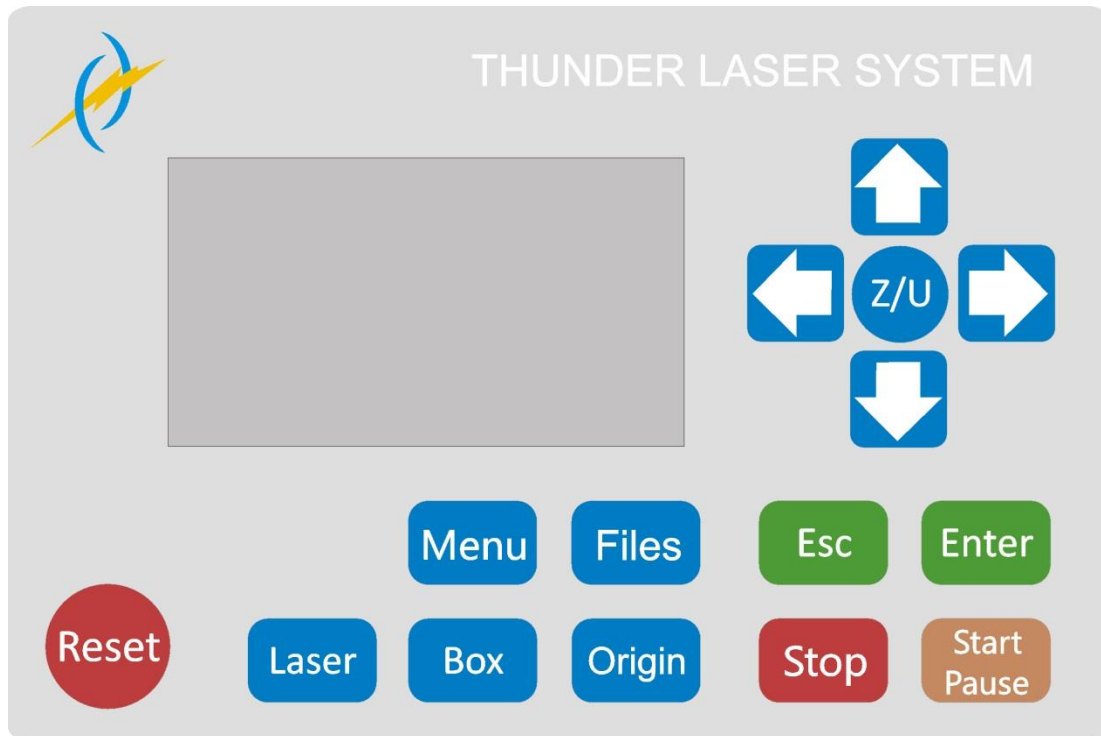
Before switching on the device, the user must make sure that no objects of any kind are located inside the operating space, which could limit or obstruct the mechanics of the device.

Tips: When switching off the mains supply, all processing data is lost.



4.3 How to use the display

4.3.1 Function of the Buttons



- ✧ Arrow buttons: control the movement of the laser head.(also can be used to change the parameters in the control panel)



- ✧ Laser button: single press to draw a dot, press and hold to drill a hole.



- ✧ Origin button: set the starting point for the laser head.



- ✧ Box button: trace the path of the current job. Help user to put the material on the correction position before starting the job.



- ✧ Start/Pause button: run/pause the current job.



- ✧ Files button: select a file saved in the memory of the controller.



- ✧ Enter button: confirm your selection.



- ✧  Stop button: cancel the current job.
- ✧  Reset button: reset the machine.
- ✧  Menu button: change the settings of the controller.
- ✧  Esc button: return to the last menu.
- ✧  Z/U button: control the movement of the Z/U axis and the auto focus function is also here.



4.3.2 How to Change the Power and Speed

File :000
Power 1 :14.0/6.0%
Speed :150 mm/s
Wait . . . 000

File :000
Power 1 :14.0/6.0%
Speed :150 mm/s
Wait . . . 000

Max power 1
14.0%

Maxpower: power used when you press the "laser" button and also used for cutting the current work when you select the Manual mode.

Press     to change the power.

File :000
Power 1 :14.0/6.0%
Speed :150 mm/s
Wait . . . 000



Min power 1
6.0%

Minpower: power used for cutting the corners of current work when you select the Manual mode.

File :000
Power 1 :14.0/6.0%
Speed :300 mm/s
Wait . . . 000

Speed
300 mm/s

Speed: moving speed of the laser head when you press the "arrows" and also speed for the current job when you select the Manual mode.

Press     to change the speed.

File :000
Power 1 :14.0/6.0%
Speed :150 mm/s
Wait . . . 000



File :000
Power 2 :14.0/6.0%
Speed :150 mm/s
Wait . . . 000

Power1/Power2: if your machine has two laser heads, you can change this to control power of different laser head.

4.3.3 How to Set Different Functions

Press  button to show the following list:

1. **UsbFile**
2. LaserMode
3. CutMode
4. FrameMode

5. MoveDistance
6. Frame
7. Format
8. Language

Press   to choose different menu. And then press  to confirm.

1. Usb File Menu: Read files from Memory stick directly.



Please insert the memory stick to the USB port in the laser machine and then choose UsbFile menu.



001: File 1

002: File 2

003: File 3

004: File 4

Choose the file you want to copy and then choose "To Memory" and confirm

To Memory

Delete

The display will show "Copying"

Copying

When the "copying" message disappears (file copied), please press  twice to return to the main menu.

2. LaserMode Menu: change the way of controlling the speed and power.

Auto

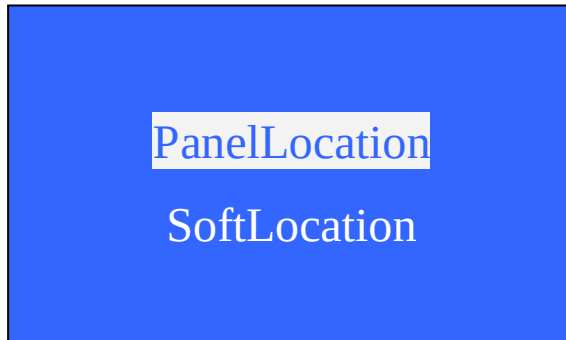
Manual

Auto: The speed and power is controlled by the software.

Manual: The speed and power is controlled by the display.



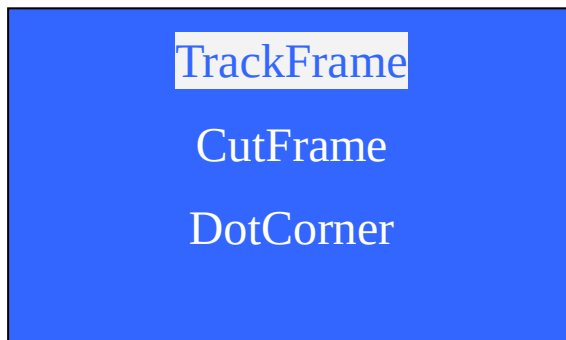
3. CutMode Menu: change the way of set the origin point(start working point).



PanelLocation: the starting point is decided by the  on the display panel.

SoftLocation: the starting point is decided by the software.(the position of the drawing in the Coordinates of the software)

4. FrameMode Menu: change the function of the  button.



TrackFrame: track the frame of current work.

CutFrame: cut the frame of current work.

DotCorner: draw dots in the four corners of current work.

5. MoveDistance Menu: moving distance of the laser head when press the "arrows".

When the setting is "000.0mm", the laser head moves without break by pressing the "arrow".

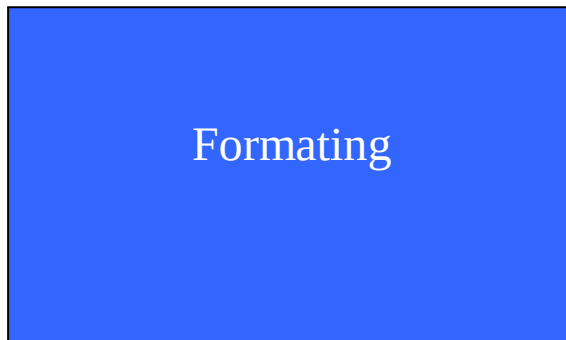




6. Frame Menu: set the frame size of current work.



7. Format Menu: format the files saved in the DSP controller.



8. Language Menu: change the language in the display.

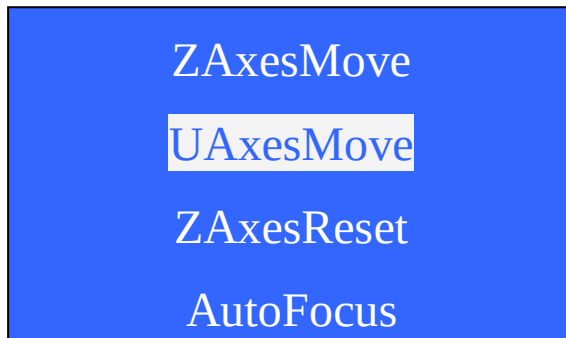
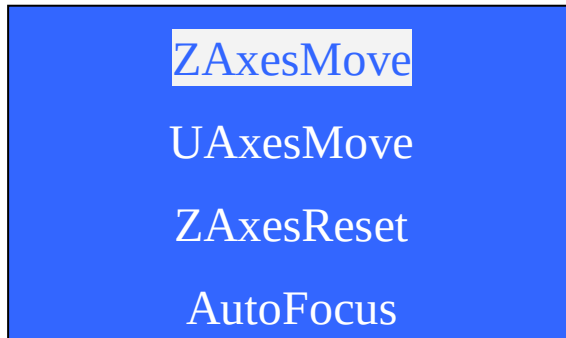


Press  button and then move   to change the power and speed from display directly.



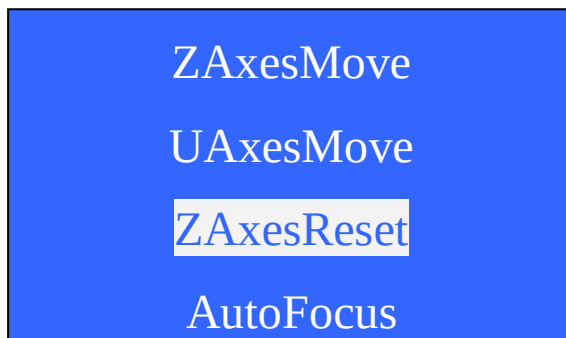
4.3.4 How to Use U/Z and Auto Focus

Press  button to show the following list:



Press   to move to different menu.

And press   to control the movement of U/Z axes.



Choose "ZAxesReset" and press confirm to reset the Z axes (motorized table will move down till it reach the limit switch on the bottom)



ZAxesMove

UAxesMove

ZAxesReset

AutoFocus

Choose "AutoFocus" and press confirms to use the auto focus function. (The table will keep moving up till it reach/get near to the limit switch in the laser head and then move back to the correct focus).



4.4 The First Time Running the Laser



1. Using the machine for the first time, and please note that the machine working voltage of 220V (110V for USA).
2. Please put the honeycomb on the standard table .Unless you need to engrave on thick material or use the rotary axis.
3. Lower the laser head, and the upper part of the head tube must be longer than 38mm
4. Please reset Z-axis after turn on the laser machine (watch the guiding video to learn how to reset the Z-axis, and refer to the thunder laser operation video).
5. Please don't use the autofocus function if there's no materials on the table.

For example, first engraving tests

The following steps describe how to successfully engrave a first pattern. Please follow the individual steps:

1. First switch on the computer and the Laser.

Tips: When turn on the power of machine, and note that turn on the main switch first and then the laser supply power.

2. Put the object to be engraved into the laser and move into the desired position on the engraving table. Usually the object is positioned in the upper right-hand corner. Use the rulers to determine the dimensions of the object to be engraved.
3. With the positioning keys the lens is positioned over the material to be engraved. You focus with the help of the focus tool or by auto focus.
4. Generate a graphic with the help of your graphics software, or load in a picture that you want to engrave, but before this, you must click the "Find Com" in the software. The size of the graphic does not matter as the printer driver adjusts it to the work piece automatically if requested. If you have any questions, and also consult the Software Manual for further information.
5. Double-click the layer in the window of "Layer Options", then you can modify the parameters such as power, speed, ramp engraves and so on.
6. Select "Load", you can change the file name and optimize the engraving parameters, then click" Send File to machine".
7. Click "Original" and "box" on the display, please make sure that the material is in the right location and there is enough space for working.
8. Switch on the exhaust system and the cooling system. For MARS-90, you need to



connect the exhaust system and switch on the power supply by manually. Please check the water cooling system is working properly; the water is running into and filling the laser tube. Please do not start your work if the laser tube isn't full of water, because that may led to laser tube damage due to the high temperature.

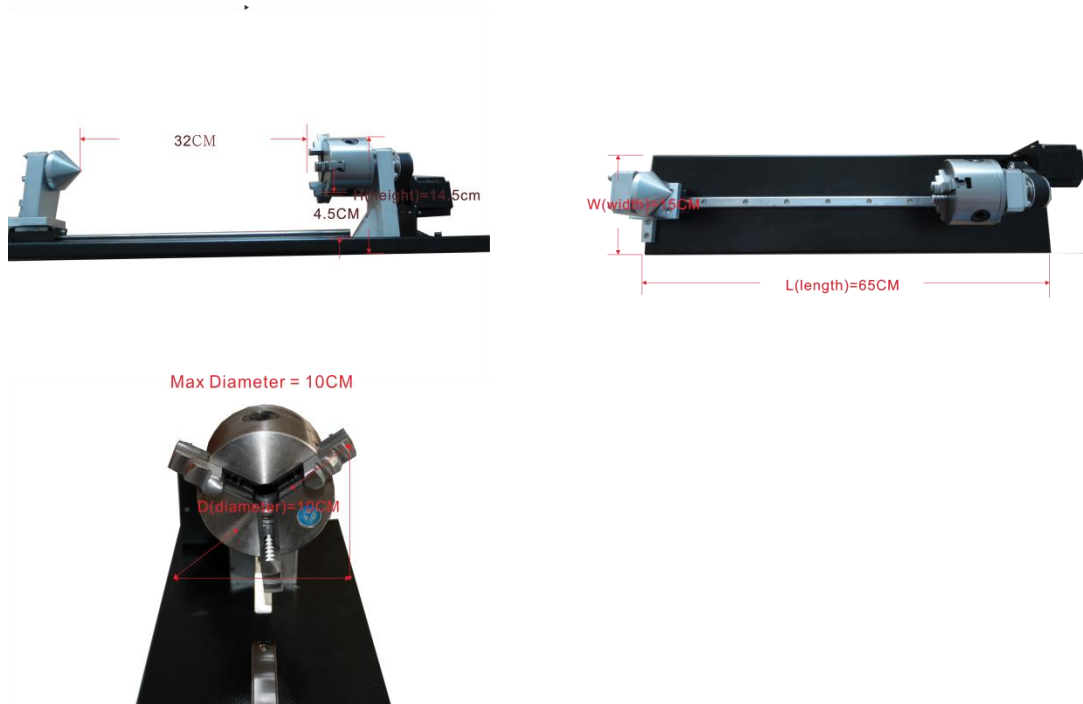
9. Finally press the START button in the display, to start the engraving process.
10. While the laser is engraving, you can generate the next graphic.
11. When the engraving is complete, the laser machine will give out the notification sound and the laser head will go back to the original point, and you can repeat engraving.



4.5 Rotary Engraving Attachment

The rotary engraving option in the printer driver is used in combination of the rotary engraving attachment, to engrave cylindrical objects. To compensate for the different diameters of different objects, the image must be adjusted. This is performed automatically by the engraving driver, by selecting the rotary engraving option and entering the diameter of the object to be engraved.

The Rotary size:

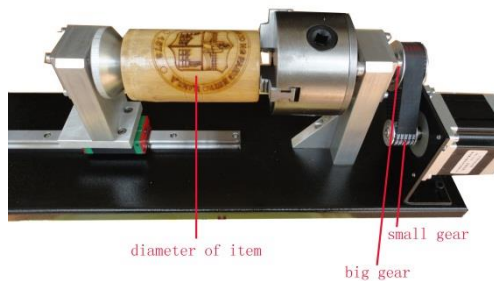


To install and set-up the rotary engraving attachment proceed as described as follows:

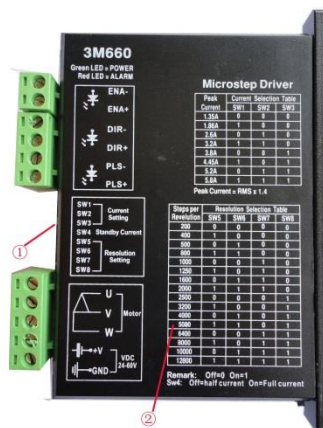
1. Move the working table to the lower position switch off the laser and open the top lid.
2. Put the rotary engraving attachment onto the working table and connect the rotary engraving attachment to the working table. Before you fix the rotary engraving attachment, align it so that its sides are parallel to the rulers. The rulers offer a visual aid for placing the graphic.
3. Connect the rotary engraving attachment via the control cable with the connector of the motion system. The connector is located inside the right front of the laser. Connected it to this interface and fixed, then turn on the switch, and then you have finished the device connection. Like below:



4. Before you mount the object into the rotary engraving attachment, measure the diameter of the object at the position to be engraved with a sliding caliper or a similar tool. Write down this value. And how to set the parameter about “Pulse per round”, please refer to following the picture indicates. Like below:



- ① Diameter of item = 80mm
- ② Gear ratio = big gear/small gear = 2



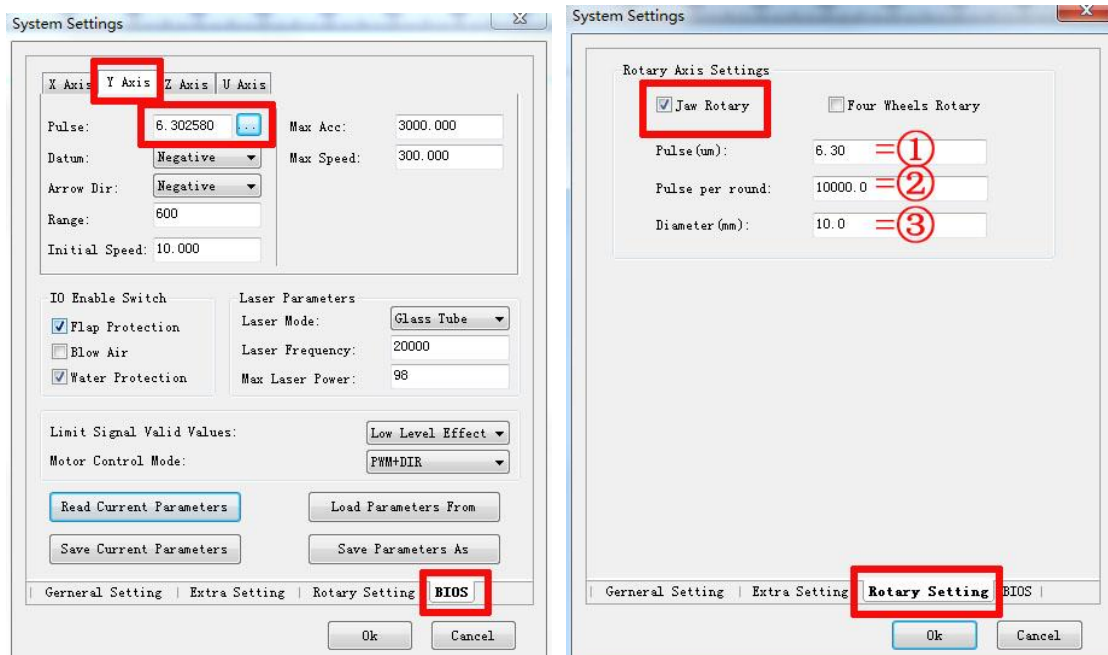
- ① See the settings of your motor driver
- ② The subdivision of our motor driver is set to 5000 (the “Pulse per round” is 5000 x 2)

5. Adjust and fix the slider to make the work piece fitting into the rotary engraving attachment.
6. Now switch on the laser and wait until the referencing is finished. Position the working head over the object at the position, where you want to engrave. Now focus the object with the focus tool or by auto focus.
7. Generate a graphic with the help of the graphics software. The graphics size must be



adjusted until less than the dimensions of the work piece.

8. Select "factory parameters", and then copy the Y-axis Pulse Unit number to the rotate Pulse unit, input the diameter of the object and the pulse per round. Like below:



Select "Rotate Engrave", and then tick "Jaw Rotary"

- ① The same as Y-axis pulse
- ② 5000*2
- ③ The diameter of the target item

9. Select "Load" and "Send file to Machine", click "Original" and "box" on the display, please make sure that the material is in the right location and enough space for working.
10. Switch on the exhaust system and the cooling system. For MARS-90, you need to connect the exhaust system and switch on the power supply by manually. Please check the water cooling system is working properly; the water is running into and filling the laser tube. Please do not starts you work if laser tube isn't full of water, because that may led to laser tube damage due to the high temperature.
11. Finally press the START button in the display, to start the engraving process.



4.6 For Laser Engraving

The engraving depth can easily be varied through the laser power or the speed. To increase the engraving depth, reduce the speed or increase the power setting. This way you increase the amount of energy per area unit. Engraving too deep, however, reduces the quality of the details. With coated materials the required power depends of the kind and thickness of the coating. With power set too high the individual lines become too thick and a sharp picture cannot be achieved. The resolution of the graphics should usually be at 500 dpi. The dpi setting (number of laser dots per inch) depends on the material. The lower this setting is, the lower the resolution of the engraved picture will be. This, however, reduces flaming and increases the energy of a pulse, which can improve the overall result (e.g. when engraving some sorts of plastic materials).

1. Plastics

Plastics for engraving are available in many different colors and thicknesses and with many different coatings and surfaces. The majority of available plastics can be well engraved and cut with the laser. Plastics with a micro-porous surface seem to give the best result, because less surface material needs to be removed. As most plastic materials have a low melting point, a low pip setting should be selected to reduce the danger of melting.

2. Acrylic

There are two different types of acrylic – cast and extruded. The cast acrylic becomes white or mat after engraving, the extruded acrylic remains clear. Use extruded acrylic for engravings that are filled with paint and cast acrylic for normal engravings. Cast acrylic can be best engraved without protection foil. It is better to engrave the entire surface with a low energy setting.

3. Engrave the rubber stamp

The various mixtures and densities of rubber plates cause a slightly varying engraving depth. The settings in the overview table give a good indication. Since engraving a standard rubber material requires a relatively high laser power, the laser power is principally set to 40% or more high and only the speed is varied. Due to their lower density, so-called micro porous rubber materials allow a significantly higher engraving speed. Test the rubber first, to find out the correct speed setting.

The LaserGRAV software using the engraving function, you can choose “ramp engrave” or common engraving, once you choose “ramp engrave” and you will need to set the minimum power, generally we set it to about 13%, but if you want to make it better, you may need to test different kinds of power and speed by yourself, then you can get the best result.

Engraving rubber produces a considerable amount of dust and terrible gas. Therefore a well-dimensioned exhaust system and its regular maintenance are very important.



Chapter 5 Maintenance

5.1 Cleaning the Laser Machine



1. Caution – use of controls or adjustments or performance of procedures other than those specified here in may result in hazardous laser radiation exposure.
2. Before starting cleaning and maintenance work always switch off the device and unplug the mains plug.
3. Always keep the system clean, as flammable parts in the working area or exhaust area rise the fire hazard.

Tips: You should check at least once a day, whether dust has accumulated in the engraving system. In case of soiling the machine must be cleaned. The cleaning interval strongly depends on the material that is being processed and the operating time of the device. Please bear in mind that only a clean machine guarantees optimal performance and reduces the service costs.

General Cleaning Notes:

1. Make sure, that the device is switched off and unplugged. Open the protective cover.
2. Move the working table into a position in which it is easiest for you to clean the surface with a window cleaning agent and paper towels.
3. Thoroughly remove all loose dirt particles and deposits in the interior of the machine.
4. Clean the cover of the laser tube.
5. You can clean the viewing window with a cotton cloth. Do not use paper towels as they could scratch the acrylic.



5.2 Cleaning the Optical Parts

The lens has a durable multi-coating and won't be damaged by correct and careful cleaning. You should inspect the focus lens and the mirrors and the beam combiner according the maintenance plan. If you discover a veil of haze or dirt, you must clean them.



It is suggested to clean the mirrors/lens before work every day in order to run the machine at max efficiency.

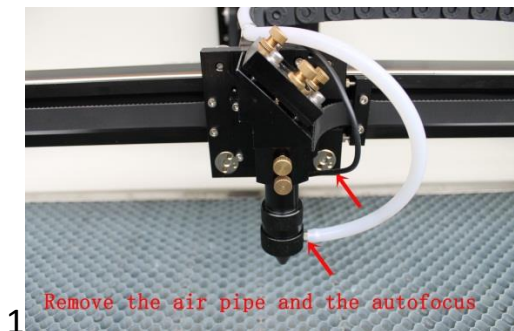
Follow the instructions below for the cleaning of optical parts:

5.2.1 Cleaning the Focus Lens

1. Move the engraving table to a distance approx. 10 cm under the lens holder.
2. Move the working head into the center of the working surface and put a cloth under the lens holder (so that the lens is not damaged if it accidentally falls out of its holder).
3. Now you can unscrew the lens holder.
4. Once positioned over a clean lens cleaning tissue, remove the lens from the lens holder by carefully turning the lens holder and letting the lens and the O-ring drop onto the cleaning cloth.
5. Examine the O-ring and, if necessary, clean it with a cotton bud and a lens cleaning tissue.
6. Remove the coarse dust as good as possible by blowing air onto the lens surface.
7. Check the surface and if necessary clean the lens with the lens cleaning liquid and lens tissue.
8. Hold the lens assembly by its edge with a lens cleaning tissue and use a drop of lens cleaning liquid from the little bottle which you received as an accessory delivered with the laser. While holding the lens on an angle, flush both surfaces of the lens, to wash away coarse soiling.
9. Put the lens on a clean lens cleaning tissue. Put some lens cleaning liquid on one side of the lens. Leave the liquid to take effect for approximately one minute and then gently wipe it away with lens cleaning tissues soaked with lens cleaning liquid.
10. Finally, dry this side of the lens with dry lens cleaning tissues and repeat the cleaning process on the other side of the lens. Never use a cleaning tissue twice. Dust accumulated in the cleaning tissue could scratch the lens surface.
11. Examine the lens. If it is still soiled, repeat the cleaning process until the lens is clean.
12. Carefully insert the lens into the lens holder. Ensure, that the rounded side (= convex) of the lens is facing upwards. Then put the O-ring on top of the lens.
13. Carefully assemble the lens in reverse order.



As following the picture indicated:



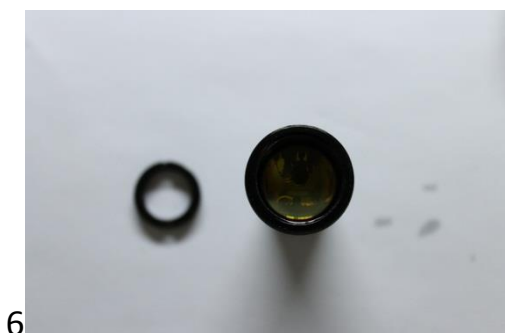
Remove the air pipe and the autofocus



Rotation of the left, and the head is divided into two parts



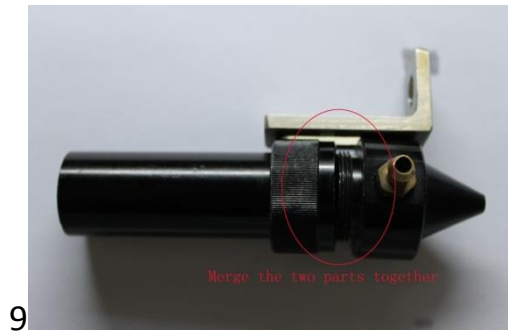
Direction of rotation



The focus mirror bump on both sides,

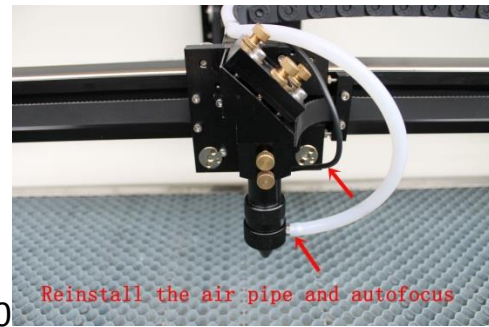


Rotate right, and focusing mirror fixed,



9

Merge the two parts together



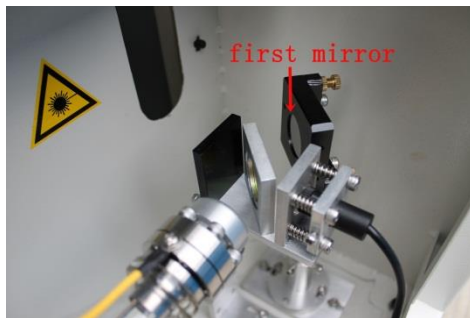
10

Reinstall the air pipe and autofocus

5.2.2 Cleaning the Mirrors

There are three mirrors in the operating area of the laser, which may have to be cleaned if they are soiled. To clean the reflector, follow the instructions below.

The Mirror#1



The mirrors are easily get dirty. And this will reduce the efficiency of the laser beam. Meanwhile, laser energy absorbed by the mirror may cause heat and destroy the mirrors too. For the first two mirrors, you can clean them directly. The 3rd mirror and the lens need to be removed from the laser head before cleaning.

The Mirror#2



Make sure the power of the laser machine is turned off while cleaning. There're 3 reflective mirrors and 1 focus lens inside the machine. The 1st mirror is installed near the laser tube, on the rear left corner of the machine. The 2nd mirror is installed on the left side of X rail. The 3rd mirror is installed on the top the laser head. The focus lens is mounted on the bottom of the laser head.

The Mirror#3

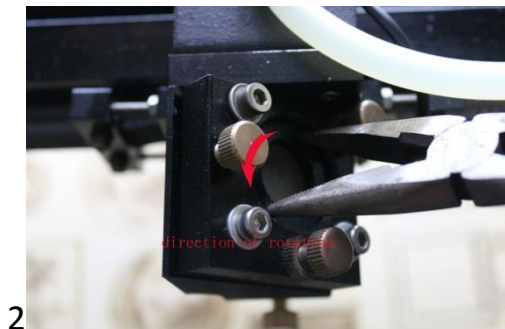
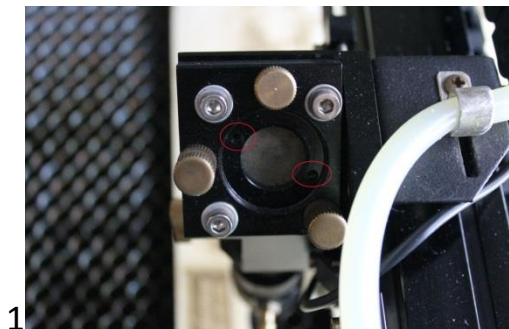


Cautions:

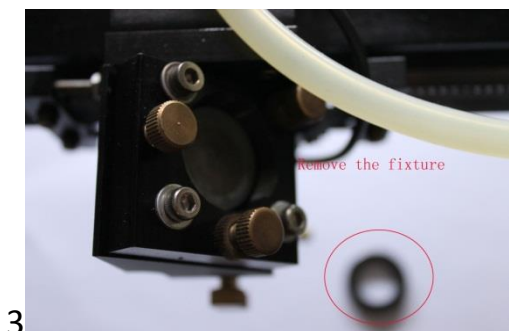
- 1) Mirrors must be cleaned carefully by using lens cleaning paper to avoid scratching the surface.
- 2) Do not touch the surface of the mirrors/lens after cleaning
- 3) The concave side of the lens must be on the bottom when installed.



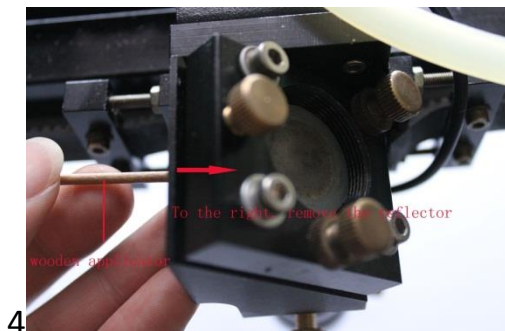
How to take out the mirror#3 as following the picture indicated:



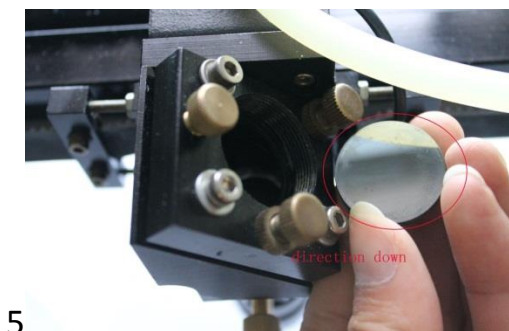
Direction of rotation



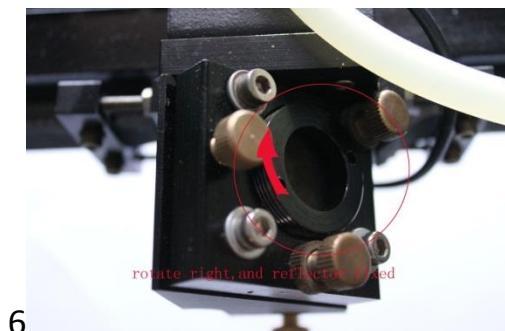
Remove the fixture



Use woden applicator to the right, remove the reflector



Direction down



Clean lens by the lens clean liquid, then install it back and fixed.



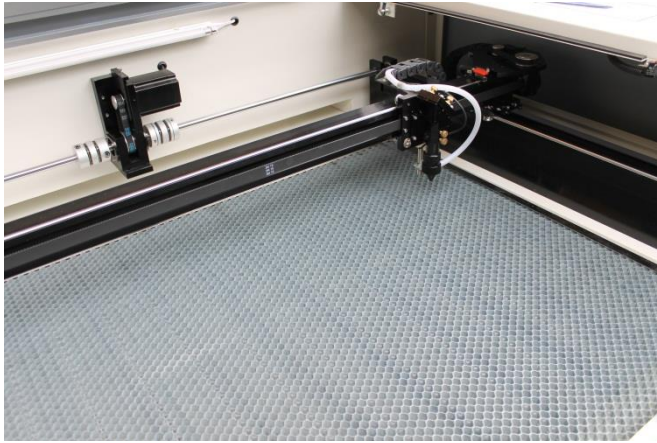
5.2.3 Cleaning the Beam Combiner



- ① The beam combiner must be cleaned carefully by using lens cleaning paper to avoid scratching the surface.
- ② Do not touch the surface of the beam combiner after cleaning.



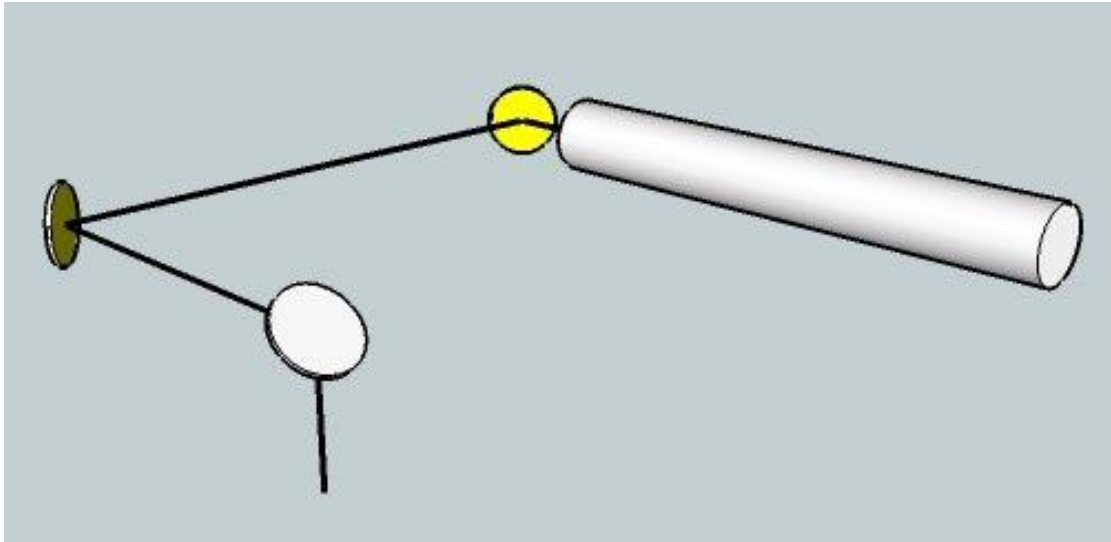
5.3 Maintain the X/Y/Z Rails



It is suggested to add Rust Preventative Grease to the rails/screws at least every two weeks.



5.4 Check the Beam Path



After being used for a long time, the beam path might be deflective. This will reduce the efficient of the laser beam or even cause no laser beam. At this moment, you will need to re-adjust the beam path again.

If you need to know that about adjust the laser beam path of the video on YouTube released by our company and please link to the URL:

http://www.youtube.com/watch?v=Fy6XDhYvP9M&list=PL7D79E4B3C58BB303&index=3&feature=plpp_video



5.5 Change Cooling Water for The Water Chiller



It is suggested to change the water at least once every month

Make sure the laser tube is filled with water before starting the machine. It is advised to add water every 3 days.

The quality and temperature of the cooling water affects the life time of the laser tube.

You need to use pure(distilled) water and control the temperature below 35°C (95°F) .



5.6 Maintenance Plan

1. The lens and the mirror#3 must be checking daily, and cleaning if required
2. The mirror#1 and the mirror#2 must be checking every monthly, and cleaning if required.
3. The beam combiner must be checking every weekly, and cleaning if required.
4. The working table must be cleaning daily.
5. The whole laser machine must be cleaning every monthly.
6. The exhaust system must be checking every weekly, and cleaning if required.
7. The air blower must be checking every monthly, and cleaning if required.
8. The other component (as the water cooling system) must be checking every monthly, and cleaning if required.



5.7 Troubleshooting

Below are some solutions to this problem , we advise customs consult the following thinking before encounter problems, and hope customs can revise our thinking at any time.

1. The machine no laser beam problem

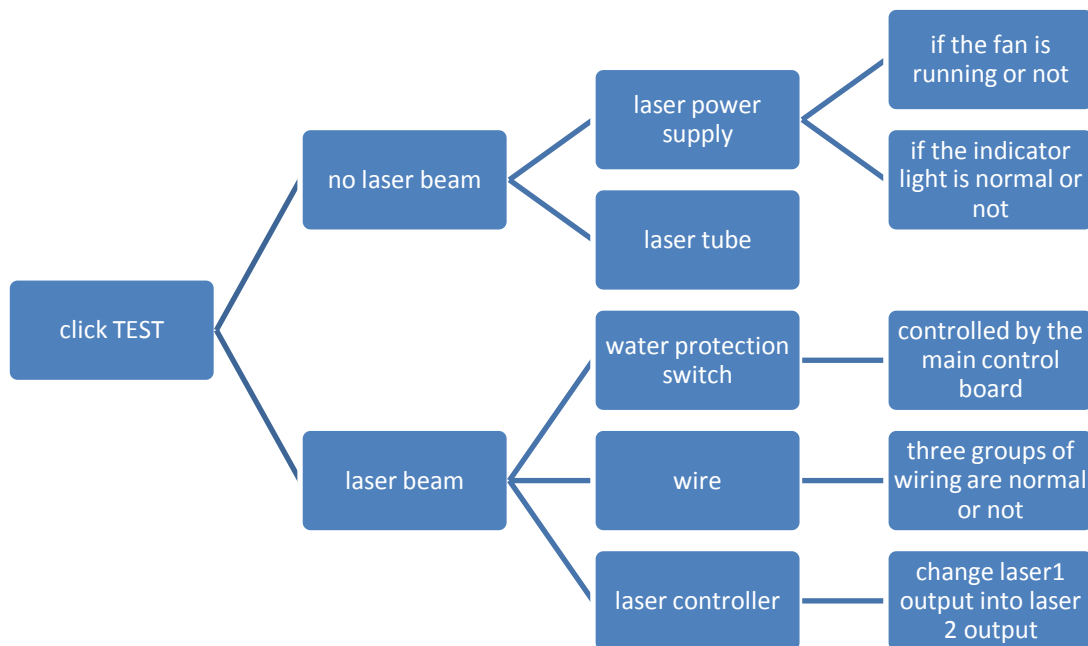
Please check the machine parts by following the lesson plan one step by one if you find there's no laser beam when the machine is working.

Step 1. Check the laser tube and laser power is normal or not;

Press the red button "TEST" on the laser power to check whether there is a laser beam in the tube or not;

If there isn't laser beam please refer to Option A; on the contrary, refer to Option B.

Here is the checking process:

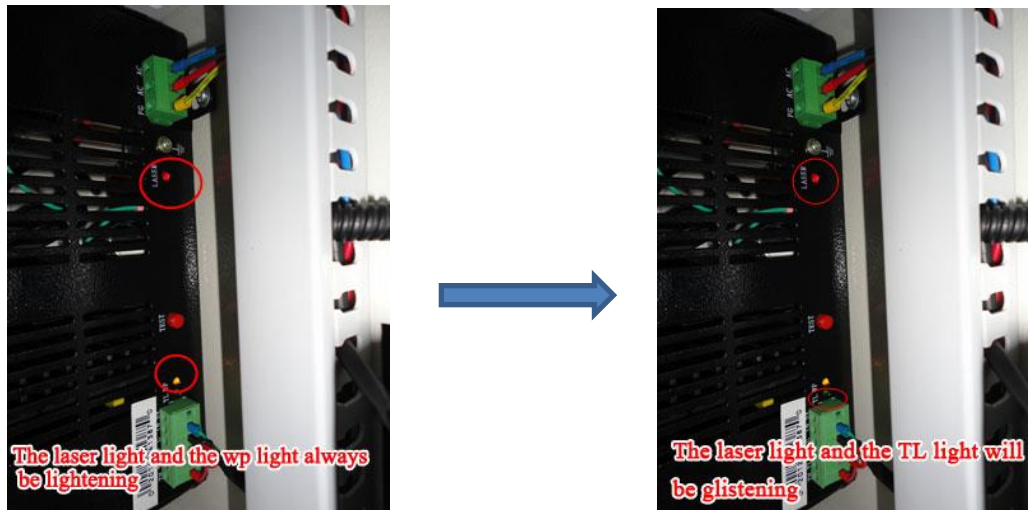


Option A: If there isn't a laser beam in the laser tube when press the red button "TEST" on the laser power supply, please check the laser tube and laser power supply;

1. Check the fan of laser power supply is running or not;
2. Check the indicator light of laser power supply is normal or not.

And you can refer to the following pictures:

If the water protection switch controlled by the laser controller, the indicator will change as follows:



If it's ok, then the laser power supply is ok, the problem of no laser beam should be caused by the laser tube;

If it is not ok, then the problem should be caused by the laser power supply (Normally, it's impossible for the laser tube and laser power are fault at one time).

Option B: If there is a laser beam in the laser tube when press the red button "TEST" on the laser power supply, it means the laser tube and laser power are both ok.

Then let's go to the second step:

We can exclude two components fault(laser tube and laser power) by Option B, then the fault should be caused by the water protection switch, the wiring or the laser controller;

Step 2 Check the water protection switch is normal or not;

1. If the water protection switch is controlled by the laser controller, there will appear information of "water error" on the control panel displays; the fault should be caused by water protection switch, water pump (cooling system) or blocked water pipe; then you will need to check the water pipes, water pump (water cooling) and water protection switch one by one.
2. Please check whether the internal of water pipe is clean or not;
3. If the water pipe is clean, then check the water pressure in the water pump or cooling system is normal or not; for details, please watch our video for cooling system;
4. If the water pump or cooling system is normal, too. Then it may be the water protection switch's fault, please check whether two wires of water protection switch has been tightly connected with the laser controller ports. And please re-connect them if it is caused by loose; if not, then you need to replace the water protection switch.
5. If the water protection switch, water pipes and water pumps (water cooling) are all normal. Let's go to the third step:

Step 3 Check the wiring is normal or not;

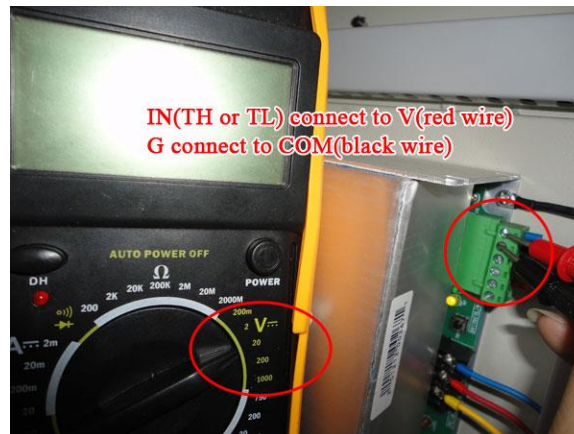
Check whether the wiring between the laser controller and the laser power supply is loose or short circuit, and there are three groups wire connected the laser controller to the laser power supply;

They are: 1.PWM port----- IN port 2.TTL + port ----- TH port (or TTL-port ----- TL port)
3.GND port ----- -G port;



If they are loose, please tighten; if they are short circuit, you can use a multimeter to examine the wire;

Use a multimeter to check the wire is normal or not, act as follows:



Measuring the laser power supply port: IN port - G port, TH port - G port (TL port - G port) whether the voltage changes normal or not before and after work;

	Before work (V)	After work (V)
IN port - G port	4.98	0.49
TH port - G port	0.09	3.58
TL port - G port	3.68	0.1

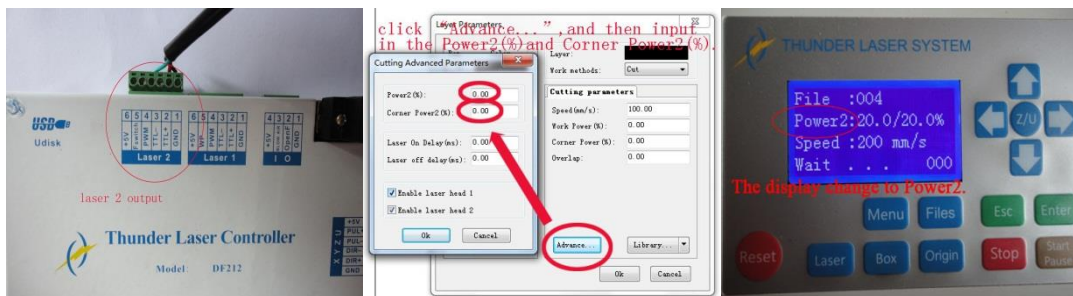
If the wiring is ok;

Go to the Step 4 and check:

Step 4 Check the signal output of the main control panel is normal or not;

1. If you use laser1 output on the laser controller for machine, set the interface into laser2 output, set the power input of software into POWER2, and set POWER2 display on the control panel, then test is it normal to use the laser2 output;

Specific location, please refer to the following pictures:



2. If there is laser beam with laser2 output, then we can make sure the laser1 output of controller is fault; if there isn't laser beam with laser2 output, it should be the main control panel fault without optical signal, and then you need to replace the laser controller.
3. If you check the machine by following our lesson plan, but still unable to pick out the fault parts, please contact our Technical Support Division, and send e-mail to: tech@thunderlaser.com.

If you want to know more information about troubleshooting, and you can visit our website: www.thunderlaser.com

Thanks to Thunder laser systems
lasering has become so easy



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