MC150-D-B Laser Marking Machine

Owner's Manual
Preface

Thank you for purchasing MC150-D-B laser marking machine from our company.

This is a hi-tech product integrating with optics, machine and electricity featuring high professional and technical content. For better use and maintenance of the machine, we specially work out this owner’s manual for users.

There are many illustrations in the manual for your easy understanding. We make a detailed introduction to installation, debugging of the machine, installation, setting and operation of software, daily maintenance of the machine and safety precautions. We are sure that the content of this manual will be a great help for you to your control and maintenance of the machine. Therefore, you are recommended to carefully read through this manual before using the machine.

Please properly keep this manual for future reference.

There may be some mistakes or shortcomings in the manual. Your advice and suggestion are highly appreciated.
Safety Precautions

★ Before using the machine, users are required to carefully read this manual and other operating requirements, strictly abide by the operating specifications. Professional are required for operating the machine.

★ The machine uses class 4 laser (strong laser radiation). The laser radiation may possibly cause the following accidents: ① emblaze the surrounded flammable materials; ② generate other radiations and toxic or hazardous gas by processed objects during laser processing; ③ direct irradiation of laser radiation cause harm to human body. Therefore, firefighting devices are required in the operating place of the machine. Stacking flammable or explosive objects near the machine is strictly prohibited. Good ventilation is a must. Only the qualified personnel are authorized to approach the machine.

★ The processed objects and discharged materials are required to satisfy requirements as per local laws and regulations.

★ Laser processing is with potential risks. Users should carefully make sure if the processed objects are suitable for laser processing.

★ There is high voltage and potential risk in the laser machine. Unauthorized disassembly by unqualified personnel is prohibited.

★ After power-on, special personnel are required for monitoring. Unauthorized leaving is strictly prohibited.

★ During operation, it is strictly prohibited to open any protective shield (panel). Do remember not to place any flammable objects or any part of human body on transmission path of the optical path.

★ Reliable earthing is required for the machine and related other machine before power-on.

★ It is strictly prohibited to placing any unrelated all-reflective or diffusion reflective objects in the machine to prevent laser reflecting to human body or flammable materials.

★ During operating, the operators are required to observe working status of the machine all the time. In case of any abnormality, it is immediately to disconnect power supply and take active and corresponding measures.

★ The environment for the machine should be dry, free of interference and influences from pollution, vibration, high voltage and strong magnet. The operating ambient temperature ranges 5-35 ℃, and the humidity <75%RH (no dew).

★ The machine should be far from electric appliances sensitive to electromagnetic interference.

★ Operating voltage: AC220V, 50Hz; total power at roughly 7,500W. Power-on is strictly prohibited in case of unstable voltage of the power grid or unspecified voltage.

The manufacturer shall not be liable for any losses caused by mis-operation or disobedience of the regulations above.
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Chapter 1  Machine Introduction

1.1 Machine Overview

- MC150-D-B laser marking machine is a multifunctional, fire-new and radiation-proof machine which with radiation-proof acrylic and safety slip door that producing from our company; it is not only effective to prevent laser radiation, but also convenient for people to observing. the effect of closed upper and lower blowing system is good, neither pollute the lens nor pollute the processing environment;
- The laser device can be electric lifting adjusted (to adapt the different marking breadth), the measuring scale and digital display of the laser device is more quickly and accurately to adjusting the focus.
- The machine adopts CO2 laser generator from Germany rofin. Equip with the 3-axis dynamic marking scanner of world’s leading technology which focus automatically. Once the largest processing breadth is 600mmx600mm.
- You can select reamer strip board, optional cellular board, knife slats, vacuum adsorption platform, removable working platform, etc. It is satisfied for the different users on different industries, the removable working platform can used for large breadth seamless splicing processing, the maximum processing breadth is 1200mmX600mm.
- With light guide software developed by Han’s Yueming, marking and cutting of materials at breath of 1200mm X 600mm can effectively be achieved.

1.2 Machine Compositions

This machine is composed by mechanical system, control system, optical system and blowing system. The mechanical system includes a main unit, optical seat auto-lifting system, the workbench which can be moved left and right and the blowing system.
1.3 Machine Parameters

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</tr>
<tr>
<td>Laser wavelength (μm)</td>
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<tr>
<td>Light beam quality (M²)</td>
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<tr>
<td>Laser power (W)</td>
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<tr>
<td>Pulse frequency (KHz)</td>
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<td>Response time (m s)</td>
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<td>Cooling manner</td>
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<td></td>
<td>1200X600</td>
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<td>---------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>frequency (Hz)</td>
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<td>Overall dimensions</td>
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<td>Water chiller (mm X mm X mm)</td>
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<td>Water chiller(kg)</td>
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<td>Protective grade</td>
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<td></td>
<td>Safety grade of laser device</td>
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</table>

### 1.4 Operating environment

- Humidity: 40%-80%; no dew, dehumidifier is required in case of over high humidity;
- Ambient temperature: 15-35%; air conditioning system is required in case of over high humidity;
- Power supply input: AC220V; 50Hz;
- Power grid electric force fluctuation: ±5%; power grid satisfied the state standard. In case of over 5% of voltage range, automatic digital stabilizer is required for the system;
- Free of interference from nearby device with strong signal. No radio emitting station nearby.

### 1.5 Suitable materials

Leather, cloth, woodwork, bamboo, plastic, rubber, marble, crystal, boulder, metal surface, oxidation layer, etc.
1.6 Applicable fields

The industry of clothes, leather products, technics present, packing, packing, light guide, etc.

1.7 Safety Warnings

This laser marking machine can be used only for processing the materials specified by manufacturer. In case of no written consent from the manufacture, all the losses caused by unauthorized change of use or specified basic operating conditions shall be beyond the responsibility of the manufacture.
Chapter 2 Safety Rules

This chapter mainly introduces safety warnings for protecting personnel and the machine, and makes an introduction to signs used in the owner’s manual. The machine is already equipped with sufficient safety guarantee, yet it is still with certain risk. All the operators are required to carefully read through and well understand the safety rules.

2.1 Warning and signs

<table>
<thead>
<tr>
<th>Warning</th>
<th>May possibly cause serious harm to human body or danger to life and property</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Note</th>
<th>What the operator and maintenance personnel should pay attention to</th>
</tr>
</thead>
</table>

2.2 Product safety

The following conditions are required to be satisfied to ensure safe work:

- Abide by operation manual and instruction signs;
- Operators and maintenance personnel have received training held by machine manufacture;
- In case of operation by couples of person at the same time, division of responsibility should be made and followed;
- No admission to the working area for the unauthorized personnel;
- Avoid any working method breaking the safety rules;
- Timely eliminate all the failures possibly causing lower safety coefficient;
- Abide by maintenance regulations of the machine.

2.3 Safe equipment

Safety equipment are used for protecting personnel, and unauthorized disassembly, bridge-group or by-pass connection are strictly prohibited; in case of failure with the safety machine, professional are required for repair. If part replacement is needed, the product with same model, specification and from the same manufacture is required; otherwise, written consent from the manufacturer is required.
2.4 Safety awareness

The machine can be operated only by skilled personnel or under supervision of them. Improper use or operation may possibly be very dangerous and cause damage to the machine. Therefore, the followings are strictly prohibited:

- Placing heavy objects or stepping on the working table of the machine;
- Used for processing the materials unapproved by manufacturer;
- Staying of unauthorized personnel in the dangerous area (It is the responsibility of operators to ensure keeping unauthorized personnel away from the working area.);
- Block of using emergency stop button (Regular check is required to ensure a good condition for the emergency stop button.)

2.5 Requirements for personnel

After trial operation, maintenance personnel from the manufacturer may perform training on the operators.

It is the responsibility of machine owner to have operators trained at corresponding level.

We have prepared ready a series of training course for your option. Please make phone call to our Customer Training Center for details.

2.5.1 Definition of terms

All the personnel using or operating the machine are called User in the manual;

Different requirements are for different users. Users are classified into the followings:

- Owner
  Owner means the authorized person or representative to sign contract with the manufacturer. With authorization, the owner has rights to sign the agreement with binding force of law;
- Operator
  Operator means the personnel trained for operating the machine. Training of the operator includes participation of training held by the manufacturer.
- Maintenance personnel
  Maintenance personnel mean the technicians having received formal training for machine and electric engineering. The maintenance personnel are responsible for daily maintenance of the machine, and repair at low level if needed. Training on the maintenance personnel contains participation training held by manufacturer.

2.5.2 Qualifications

The operator is required to accept guidance and training of the owner, and the operator is responsible for the safety of a third party in the working area; the personnel required for further
2.5.3 Responsibility

It is a must to clarify the related responsibilities of each performance (operation, maintenance, parameter setting), and carry it out. Unclarified responsibilities will cause safety hidden risks.

Owner is required to provide operation manual for the operators and maintenance personnel, and ensure that they have read and understood the operation manual.

2.5.4 Personal protective devices

When technology or measures fail to absolutely avoid risk of health, the owner is required to provide personal protective devices for operator and maintenance personnel. For example,

- Protective gloves;
- Laser-proof goggle;
- Light respirator

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal protective devices shall not be provided together with the laser marking machine.</td>
</tr>
</tbody>
</table>

2.6 Special product risks

2.6.1 Laser radiation risk

Based on level of potential risk of laser radiation, the national standard GB 7247.1-2001 makes classification for them. Laser class applicable for this laser marking machine depends on operation mode. The followings are abstract of laser device classification prescribed by the state:

Class 1: safe laser device under reasonable and foreseeable working conditions

Class 2: laser device is emitting visible light at wave length of 400nm-700nm. Generally, avoidance response including blink reflection provides protection.

Class 3A: safe laser light visible to naked eyes. Generally, avoidance response including blink reflection provides protection. Harm to naked eyes of other wave lengths will be less Class 1 laser device. Class 3A light beam internal observation with optical device (e.g. glasses, telescope, and microscope) may be dangerous.

Class 3B: dangerous laser device is to directly and internally see light beam. Generally, observation of diffuse reflection is safe.

Class 4: laser device with diffuse reflection causes danger. They may possibly cause skin burn, or fire accident. Great care is required to use this kind of laser device.
2.6.1.1 **Common mode**

In the normal operating mode, the laser marking cutting machine equals to Class 4 laser radiation. In this operating mode, there will harm of laser radiation to eyes and skin; you are required to wear goggles with antiglare filter.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common working mode must ensure:</td>
</tr>
<tr>
<td>● Laser optical path is in safety protection mode;</td>
</tr>
<tr>
<td>● Correct operation of the laser marking machine;</td>
</tr>
<tr>
<td>● Materials to be processed have been verified suitable for laser processing with 10.6μm wave band</td>
</tr>
</tbody>
</table>

2.6.1.2 **Direct laser**

You are required to pay attention to the followings while operating the laser machine:

- It is strictly prohibited to directly expose any parts of human body, explosive object and flammable objects to direct laser;
- Modification of fasteners on the optical parts is strictly prohibited;
- Unauthorized change of optical path is strictly prohibited;
- Abide by all instructions prescribed in the operation manual.

2.6.1.3 **Reflection and diffuse radiation**

Avoid exposing eyes and skin to mirror reflection and diffuse radiation. In the maintenance mode, the maintenance personnel are required to wear laser-proof glasses, and the laser-proof glasses should satisfy the requirements as per **EU standard EN207A1:2002**.

![Version of glasses wearing](image)

![Standard design](image)

**Fig.2-1**
2.6.2 High voltage risk

The external power supply is at 220V.

- High voltage 220V!
- The voltage over 50V and the current over 20mA are with the risk of danger and may cause death.
- Only the maintenance personnel from the manufacturer are permitted to perform operation on the inner parts.

2.6.3 Risk of electric shock

While operating electric machine or device, mis-operation or neglect during operation may possibly cause serious hurt or human body or even death;

Technicians with related qualifications are required for operating the electric machine or device or perform operation under their supervision.

The followings are required for operating of installing the electric machine:

- It is a must to use the specified fuse provided by the manufacture;
- Immediate pressing the emergency stop button is required in case of power failure;
- Unless otherwise prescribed, power disconnection of the electric part is required for maintenance;
- First check if there is live power on the insulated part, and then perform the treatment of earthing and open circuit, and perform insulation for the nearby live (charge) parts;
- Make regular check on the electric machine. Timely correct failure like poor contact or burnt power cord;
- While operating live (charge) parts, minimum two persons are required at the site for pressing the emergency stop button or disconnecting power supply if necessary; Mark the working area with red-and-white band and warning sign;
2.6.4 Risk of optical system

2.6.4.1 Routine operation

The reflector of the optical system adopts glass as reflector medium, and the marking head focus lens is made of glass material. In normal condition, these optical parts are free of danger.

| Note | During cleaning, please wear on goggle and gloves. The damaged parts must be sealed in a container and properly packaged, and then returned to the manufacturer. |

2.6.4.2 Warning for fire accident

Damaged machine or improper operation of the machine will cause risk of fire accident. Fire extinguisher must be equipped according to fire control regulations prescribed by the state.

| Attention | Atomizer or flammable or explosive substances are strictly prohibited to approach the machine, make regular check on the fire extinguishers to ensure a good condition. |

2.6.5 Other risks

To ensure safety, modification or changing use of the machine with no consent from the manufacturer is strictly prohibited; any change of operating software or function to the machine is strictly prohibited, or it is strictly prohibited to perform integration of the machine with other system.

2.6.6 Measures for emergency

2.6.6.1 Measures for personal injury

In case of personal injury, the followings should be performed:

- Stop hurting (e.g. stop the machine, disconnect the power supply);
- It is a must to take first aid measures;
- Notify professional medical personnel;
- Notify the competent management department;
- Abide by the related regulations prescribed by the state and the company...
2.6.6.2 Measures for fire accident

In case of fire accident, the following measures should be taken:

- Emergency stop of the machine, disconnection of power supply;
- Control of fire with the fire extinguisher, evacuation of personnel;
- Notify the competent management department;
- Abide by the related regulations prescribed by the state and the company.
Chapter 3 Installation and Operation of the Machine

3.1 Mechanical parts installation (connection)

3.1.1 Unpacking

Firstly check if there is damage caused during transportation to the appearance of the packing carton. In case of serious damage, contact the manufacturer. In case of no damage, it is to unpack the carton. The machine is packaged in two cartons:

a) Main unit and blower in one carton;
b) Electric control box and water chiller in one carton;

3.1.2 Connection of mechanical parts

After unpacking, firstly place the main unit properly, adjust mesh belt working surface to the horizontal state. And then connect all the other parts:

a) Connection of the main unit with the operation panel: Place the electric control box at the right position of the main unit. Joint them one by one according to the mark of main unit and interface, then screwing down. As shown in figure 3-1:
Vertical air pump is only used for lighting industry, other industry (leather marking, cloth marking) use below blower.

b) Connection of the main unit with water chiller as fig.3-3, fig.3-4:
c) Connection of the main unit with blower as fig.3-5

Fig.3-5

The windpipe interface of vertical air pump

Water outlet

Polluted outlet

Water inlet

Blowing windpipe interface

Back view of water chiller

Front view of water chiller
Now all the connections are completed.

### 3.1.3 Machine lubrication

Before use the machine for the first time, lubrication of all parts requiring lubricant with ZG-2H branded calcium base grease synthetic (ZBE36005-88) is needed. During using, regular lubricating all parts requiring lubrication is needed (Refer to section of maintenance for more details). The following parts require lubricants:

a. The lead screw of lifting frame, linear support rail; shown as figure3-6:

b. Lubrication of ball screw, move the ball screw below table. Shown as follow:
c. Guide rail and slider; connect the guide rail slider with movement workbench and host frame, shown as follow:
3.2 Electric part installation (connection)

3.2.1 Power on button

3.2.1.1 Main power supply control

Turn right the on-off to power on. Ensure the entire circular operation button is at the pop-up state to prevent the instantaneous current of the power-on excessive damage electrical components and optical components.

![Fig.3-9](image)

3.2.1.2 Accessorial socket

Provide the power or low-power auxiliary equipment to the manipulation cabinet. Plug-in high-power equipment such as chiller, blower is prohibited.

![Fig.3-10](image)
3.2.1.3 Control button

- Scanner: Self-locking illuminated button, the 3-axis dynamic scanner power supply, the red light lighting when pressed.

- Laser: Self-locking illuminated button, CO2 RF laser power supply, the red light lighting when pressed.

- Adsorption: resetting illuminated button, rotate it left and the knob lights, the solenoid valve of vortex air pump powered off, the valve opens, vacuum adsorption platform inhale; rotate it right and the knob lights out, the solenoid valve of air pump power on, The valve is closed, the vacuum suction platform stop to inhale. Please open the adsorption to power off the solenoid valve to prevent the fever in power state burns the solenoid valve when not processing for a long time.

- Driver: Self-locking illuminated button, the driver of the movement axis and electric lifting axis powered, presses and the red light lighting.

- Emergency: Press any emergency stop button, the system does not powered off. Radio frequency laser device is at protected state, prohibit lights out; stepper drive input enable signal; you cannot move or lift it. When rotating to pop up emergency stop button, the light and drive take effect.
3.2.1.4 Aeronautic connector

- Connect with foot switch
- Connect with magnetic valve
- Connect with emergency
- Connect with water chiller
- Connect with AC input

Fig.3-12

3.2.2 Electric box

3.2.2.1 Electric element layout

Fig.3-13
### 3.2.2.2 Element code name of the electric box

<table>
<thead>
<tr>
<th>序号</th>
<th>元件标号</th>
<th>名称</th>
<th>数量</th>
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<td>运动控制板端子板</td>
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<tr>
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<td>G1</td>
<td>开关电源</td>
<td>1</td>
<td>接触器开关电源</td>
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<td>3</td>
<td>G2</td>
<td>开关电源</td>
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<td>三维动态扫描系统供电</td>
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<td>QF1</td>
<td>断路器</td>
<td>1</td>
<td>电动泵组供电控制</td>
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<tr>
<td>13</td>
<td>OF2</td>
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<td>1</td>
<td>升降台组供电控制</td>
</tr>
<tr>
<td>14</td>
<td>J2</td>
<td>端板</td>
<td>1</td>
<td>模拟电控电极分配、外围控制输入</td>
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<td>15</td>
<td></td>
<td>接线端子</td>
<td>44</td>
<td></td>
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<tr>
<td>16</td>
<td>U3</td>
<td>步进电机驱动器</td>
<td>1</td>
<td>升降台驱动器</td>
</tr>
<tr>
<td>17</td>
<td>U4</td>
<td>步进电机驱动器</td>
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<td></td>
<td>线槽</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
3.2.2.3 Power supply of the laser device

Fig.3-15

3.2.3 Control tank

3.2.3.1 Computer connection

Fig.3-16
3.2.3.2 Control panel

3.3 Optical system installation (Part connection)

3.3.1 Introduction to integrated machine

External light path of MC150-D-B laser marking machine adopts a constant optical path structure composed of the parts of radio frequency CO₂ laser device, 3D reflector holder, 4D adjustment stand, beam expander and dynamic focus scanning galvanometer.
As shown in the figure above, the whole optical path takes radio frequency CO₂ laser device as light source; reflector 1# and reflector 2# changes light transmission direction for 180°; beam expander performs collimation and compressed diffuse angle for the reflected beam; the dynamic focus scanning galvanometer system is responsible for flat equal focus of the laser beam.

### 3.3.2 Introduction to all parts and regulation method

1. Radio frequency laser device; as shown in figure 3-19 and 3-20

In the figure above, the laser device assembly is a standard configuration assembly from the imported laser device manufacture. When installing the laser device, using as support and loading carrier is prohibited.
Please note that water in/out direction of the laser device should satisfy the principle of water-in is lower than water-out.

Definition of state indicators on the laser device:

Normal radio frequency – green indicator;
Normal modulate signal – green indicator;
Wrong voltage standing wave ratio – yellow;
Failure of DC power supply - red;
Temperature failure – red;
Prohibition of radio frequency - red

Normal radio frequency: This indicator shows radio frequency magnification state of the last radio frequency output pulse.

Please note that as long as modulate signal stops, the indicator will turn off.

Normal modulate signal: This indicator shows if one input pulse signal has been received by radio magnifier.

Wrong voltage standing wave ratio: The voltage standing wave ratio indicator shows that some improper configurations may possibly be detected by the system.

Failure of DC power supply: Voltage range provided by DC power supply is expected within ±1V. In case of higher standard or lower than the expected range, laser output may possibly be stopped.

Temperature failure: Water flux is recommended to be kept over 4lt/min. If the flux is lower than 4lt/min or cooling effect of the pipe is lower than the acceptable level, the temperature failure indicator starts up. If the indicator lights, radio frequency magnification will not work.

Prohibition of radio frequency: In case of failure of radio magnification due to any of the reasons above, radio frequency prohibition indicator will start up.

2. Reflective holder
It is to ensure transmission direction of the laser beam in parallel with the corresponding shaft direction, and it is free of barrier during transmission. After the initial installation of optical lens, optical path adjustment is needed. Because the reflector holder of the external optical path adopts an advanced design scheme, after cleaning the lens, re-adjustment of the optical path is not required. As shown in figure 3-21, there are 3 adjusting screws on the reflector holder. XY axis coordinate is established with the plane with location of the three screws. The common adjustment method: taking adjusting screw B as base point, respectively adjust screw A and C making lens surface turn at certain level around X and Y axis, adjust direction of laser beam. For example, counterclockwise turning the adjusting screw C, it can make the lens surface inward turning around Y-axis. It means that light moves along negative direction of X-axis. It is the same that to turn the adjusting screw C clockwise, it makes the lens surface turn outward around X-axis, meaning that light moves along the negative direction of Y-axis.

It is to judge if the optical path is properly adjusted by “burning target”. When burning target, generally place thermal paper to next reflector holder center of the holder to be adjusted. Burn the burning paper laser pulse at 5% power. Based on mark of burning target, it is adjust reflector holder till the mark locates at center of the reflector holder.

3. Compositions and regulation method of dynamic focus scanning galvanometer as shown in figure 3-22:
Fig. 3-22

① Line moving module; ② laser inlet; ③ dynamic axis lens; ④ focus lens components; ⑥ deflexion component; ⑦ the motor with reflector scanning; ⑧ laser outlet; ⑨ processing breadth

Fig. 3-23

① dynamic axis module; ② focus component

Purpose of adjustment: to make laser light spot right locate at the center of reflector assembly galvanometer lens;

Firstly remove the dynamic axis module of the scanner and focus lens component from the scanner box.
Place two optical path regulators at light-in hole of the galvanometer, and insert light sensitive paper into the optical path regulator.

Open the machine, open Han’s Yueming marking software, open laser, and adjust the parameters to achieve light mark on light sensitive paper after one marking. Observe if there are four equal partitions formed on the light sensitive paper as shown in the figure. If not, readjustment is required. As shown in figure 3-25:

After the incidence light passes through the center of optical path regulator, therefore, an optical path adjustment is finished.

When the incidence laser passes through the center of both optical path regulator 1 and regulator 2 at the same time, it indicates that the incidence laser light and light axis at the same axis.

Debugging techniques: when the small optical path regulator at the light inlet, adjust the No.1 reflector frame; when the big optical path regulator at the light outlet, adjust the No.2 reflector frame. Repeatedly adjust until spot can be located at the center between big optical path regulator and the small optical path regulator.

Reinstall the dynamic axis module and the focusing lens group after adjusted the scanner optical path. Focusing lens group locking, dynamic axis module can slide freely. Take the marking range 599mm * 599mm for example:

Adjust the working distance from scanner surface to the material surface to 701mm.
Open Han's Yueming marking software, draw an 80mm * 80mm square, 2mm pitch filled, and the frequency is 5 KHz, 5 to 8% of the light intensity continuous marking. The material can be selected wood or A4 paper.

Find the strongest point of marking sound through sliding dynamic axis module left and right, fixed the dynamic axis module.

In practical applications, in order to obtain a smaller spot, a higher energy density and faster marking speed, typically increase the beam expander system in front of the dynamic scanner, the following adjustment mode after increasing the beam expander system:

4. Adjust the four-dimensional adjustment frame and the beam expander

Move two M6 screws to adjust left and right thick adjustment. There are four knobs on the four-dimensional adjustment frame, they are vertical inching, horizontal inching, left inching and right inching, or so coarse is regulated by two M6 screws mobile.

Through adjust the four-dimensional adjustment frame by adjusting the offset of near point ("up and down inching", "left and right inching") and adjusting the angle of far point ("vertical adjustment", "level adjustment") to adjust the optical path of beam expander.

The purposes of using four-dimensional adjustment frame and adjustable beam expander:

Make the collimated beam diameter size which rip into the scanner light input to satisfy the incidence diameter size request of dynamic focusing scanner;

Make the optical paths which after the beam expand and before expand completely overlap.

Adjust the spacing of the two lenses; make the energy strongest point at the specified focus position after laser focusing.

Debugging techniques: first adjust the space between the beam expander, and then take down dynamic axis module of the dynamic scanner and focus lens group, adjust the four-dimensional adjustment frame, so that the beam out from the center of the beam expander (using small intensity to observe in the light-sensitive paper), through the center of scanner light outlet (using light block to observe). Then install back the dynamic axis module and focus lens group, re-adjust the dynamic axis module to the strongest position of the marking voice and locked it.

To ensure the stability of the system, installed water cooling loop on the beam expander to water-cooling.
Thus, the entire optical system adjustment of the MC150-DB laser marking machine is completed.

In practical applications, for example, the light guide industry require a larger spot diameter, the position of the dynamic axis module can be re-adjusted to obtain a larger spot effect.

NOTE: Simple defocus adjustment is prohibited to adjust the space of the beam expander.

Warning: The laser beam can cause serious damage to the eyes and skin. Ensure that all staffs at the laser area wear suitable goggles. If possible, wear protective clothing.

3.4 Machine operation

3.4.1 Preparations

Before power-on, check if all connectors are reliably connected, especially the electric connectors and water pipe connectors, and if water level in water chiller satisfies the requirements.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water in the water chiller must be distilled water.</td>
</tr>
</tbody>
</table>

The materials to be marked are placed as shown in figure 3-27.

Fig.3-27
3.4.2 Steps of startup

To start up the machine in the following steps:

1. Power on the computer;
2. Turn on the laser water chiller and set its temperature;
3. Power on the master power supply of machine;
4. Startup exhaust blower;
5. Turn on the vertical air pump; make the marking materials to adsorb tidiness (only used for lighting industry). Other marking (such as leather, cloth, etc.) use the below blowing.
6. When turn on the master power supply, the ionic wind stick is powered on (only used for the lighting industry).

![Image of water chiller startup button and temperature setting](image-url)

**Fig. 3-28** The button and panel of the water chiller

| Note | Instruction to temperature regulation of water chiller: It is requested to set temperature of water chiller within a range of ±5°C with the current room temperature. |

7. Press “Scanner” button with indicator, red button indicator lights, and the dynamic scanning galvanometer is powered on.

![Image of scanner button](image-url)

**Fig. 3-29**

8. Press “Laser” button with indicator, red button indicator lights, and the laser DC power is enabled.
9. Press “Driver” button with indicator, red button indicator lights, and the laser DC power is enabled.

10. Rotating the “Adsorption” lighting knob, the vacuum adsorption platform adsorbs the marking materials.

11. Open “SmartScanner” marking software to wait for the dynamic axis back to zero and positioning. After entering the main interface, system data is input. Open processing document, adjust processing parameters.

12. Start processing

| Note | If you want to process for a lot, you can limited on the workbench to improve the working efficiency, this machine has collocated the limited block. |

### 3.4.3 Steps of shutdown

1. Save document and parameters, close “SmarScanner” marking software;
2. Press “Laser” button with indicator, red button indicator turns off, and the laser DC power is disconnected;

3. Press “Scanner” button with indicator, red button indicator turns off, and the dynamic scanning galvanometer is powered off;

4. Press “Driver” button with indicator, red button indicator turns off, and the step motor is powered off;

5. Close the operation system;

6. Turn the control cabinet power switch counterclockwise, the master power line is disconnected;

7. Turn off the computer;

8. Close the startup button of laser device water chiller;

9. Power off the power supply of vertical air pump;

10. Power the air blower off.
Chapter 4 Debug marking effect

The marking effect of new machines has been tested at ex-factory. I.e. achieve the splicing requirements in the X and Y direction. Normally, adjust the level of the machine working platform at the customer’s place, plug in the power to processing. But due to transportation and other reasons, it should be re-calibrated the marking breadth, it may affect the splicing effect in X, Y direction. In this case, about the X-axis errors, you can set interleaving compensation in the software. About the Y-axis error, you must re-adjust the rotating part of the laser device. Please refer to the software operation manual about the interleaving compensation parameter.

4.1 Set the interleaving compensation

Please refer to software operation manual.

4.2 Adjust the machine

The machine adjustment is mainly adjusting the angle between laser device and guide rail, as shown below:

Adjustment manner:
Loosen the connecting screw between the laser device and the lifting frame, and rotating the angle to adjust the angle adjustment screw of the apparatus. Slowly rotating the laser device member, adjust once to splicing marking per time in the Y-axis, until the Y-axis can be completely spliced, locking the connecting screws to finish the adjustment.

Please refer to software operation manual about how to adjust the lay point of light guide.
Chapter 5 System Maintenance

5.1 Mechanical maintenance

During using the machine, the main task of maintenance is to apply lubricant (yellow oil) on all the lubrication parts. The position to apply lubricant is marked on the parts of the machine. Frequency if applying lubricant depends on use state of the machine, and generally to apply lubricant of all parts once every month.

5.2 Electric part maintenance

Foreign matters in control box of the machine are prohibited. The box is not permitted to use as “toolbox” or “deposit cabinet”.

After running for 1~2 month(s) of the machine, please clean the electric control box with dry and clean air. Keep the interior of the control box clean to prevent super more dusts accumulated causing failure to the electric parts.

After running for half a year, please check connection reliability of all the electric parts with a screwdriver to prevent unsecured or poor contact.

5.3 Optical path cleaning and maintenance

Optical path cleaning and maintenance are mainly to clean and maintain the lens. The optical part of the machine (means the lens) plays the function of reflection and focusing of the laser beam. Although we have performed sufficient protective measures, there is still possibility of lens pollution. The polluted lens may cause the following consequences:

1. Effective power of the laser beam is reduced, and power loss is increased; output power is unstable;
2. Excursion of laser beam focus;
3. In case of serous pollution, the focusing lens may be broken down or burn damage to plating layer causing absolute malfunction.

Therefore, lens maintenance is very important. Steps of cleaning the lens are as below:

① Gentle cleaning for slight pollution (dust, fiber granule):

Before starting the following steps, firstly blow off the contamination on surface of the lens with an air chamber; in case of fail to remove the contamination, please perform the step ②;

② Gentle cleaning for slight pollution (stain, fingerprint):

Dip a new absolute cotton tipped stick in acetone or isopropanol alcohol for roughly 30 seconds. With slight pressing force, make the tipped cotton move helically from the center to edge for cleaning. During moving the cotton tipped stick, control the speed and force making liquid left following the cotton tipped stick immediately vaporized to avoid mark left, as shown in figure 4-1. In case of fail to remove the contamination, please perform step ③.

Avoid using air channel in the workshop. This is because they contain plenty of water and oil. The contamination will form a harmful absorption layer on the surface of lens.

Note
③ Cleaning for medium level contamination (saliva, oil) on lens:

Dip a new absolute cotton tipped stick in distilled white vinegar, with slight pressing force, make the tipped cotton move helically from the center to edge for cleaning (Refer to step 2 for operation.), and clean the excessive distilled white vinegar on the lens with another new cotton tipped stick.

Immediately after that, gently clean the lens with new cotton tipped stick dipped in acetone to remove all the vinegar acid. In case of fail to remove the contamination, please perform step ④.

④ Strong cleaning of serious contamination (splash) on lens:

A. After sufficiently shaking the container with polisher in, pour out 4-5 drops of polishing agent, and drip them on to the cotton ball. Gently move the cotton ball in circle on surface of the lens to be cleaned. During cleaning, it is strictly prohibited to press the cotton ball, but to move it gently on the surface of lens with the cotton ball weight.

Keep turning the lens to avoid over more polishing on a certain direction. The operation time for this step is maximally 30 seconds. In case of color change of the lens surface during performing this step, it is to immediately stop operation. Color change on lens surface indicates external corrosion of lens coating.

B. After using polishing agent, dip new cotton tipped stick in to distilled water, and then gently clean the surface of the lens with it. Wetting the whole surface of lens and remove

Note

Operation force must be properly controlled. Over large force may cause damage to the plating layer of the lens.

Attention

Only when the lens is seriously contaminated during using together with the fail of achieve acceptable cleaning effect after step 1, 2 and 3, this step is to be performed.

In case of removing the coating of the lens, performance of the lens will be completely damaged. In case of remarkable change of lens color, it indicates that the coating is completely destroyed.

A. After sufficiently shaking the container with polisher in, pour out 4-5 drops of polishing agent, and drip them on to the cotton ball. Gently move the cotton ball in circle on surface of the lens to be cleaned. During cleaning, it is strictly prohibited to press the cotton ball, but to move it gently on the surface of lens with the cotton ball weight.

Keep turning the lens to avoid over more polishing on a certain direction. The operation time for this step is maximally 30 seconds. In case of color change of the lens surface during performing this step, it is to immediately stop operation. Color change on lens surface indicates external corrosion of lens coating.

B. After using polishing agent, dip new cotton tipped stick in to distilled water, and then gently clean the surface of the lens with it. Wetting the whole surface of lens and remove
residue of polishing agent as possible. It is strictly prohibited to keep surface of the lens dry, for that will make removal of polishing agent residue more difficult.

C. Rapidly dip new cotton tipped stick with isopropanol alcohol, and then gently clean surface of the lens with it. During operation, cover plane entirely with head of the cotton tipped stick for removing the polishing residue as more as possible.

D. Dip cotton tipped stick in acetone to clean surface of the lens to remove the residue of isopropanol alcohol and polishing agent left on surface the lens after performing the steps above.

While performing the steps, please pay attention to the following protective measures:

- Always wear fingertip or rubber/latex gloves free of powder. Contamination and Oil stain on skin will make optical parts seriously polluted causing its performance greatly lowered;
- Any tool (including forceps) are prohibited for use;
- For protection, lens should be always kept on lens cleaning paper (under the condition that lens is taken out for cleaning). It is prohibited to place the lens on hard or rough surface. That will make lens scratched.

During marking and debugging, if field lens (focus) is found “polluted” by smoke, you are required to clean the lens.

Focus lens cleaning: fold the lens cleaning paper for couples of time, dip it into cleanser solution (absolute ethanol), and gently clean the surface of focus in helical circle from the center to edge with the lens cleaning paper soaked with absolute ethanol for couples of time till the lens getting clean.

The last step is performed under the condition with good light and black background. Carefully check surface of the lens. If there are still polishing residue, you may repeat step 4B-4D for couples of time.
# Chapter 6  Failure Diagnosis

<table>
<thead>
<tr>
<th>Failure Description</th>
<th>Analysis on Failure Causes</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail of power-on</td>
<td>Poor contact of plug power supply cord</td>
<td>Securely plug the power cord</td>
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<tr>
<td></td>
<td>Fail to turn the master power switch to close position</td>
<td>Turn the master switch of power supply to close position</td>
</tr>
<tr>
<td></td>
<td>Poor contact of connectors inside the electric box</td>
<td>Check the line to ensure a reliable connection</td>
</tr>
<tr>
<td>No light emitted</td>
<td>Fail to screw out the emergency stop button</td>
<td>Screw out the emergency stop button to release emergency stop state</td>
</tr>
<tr>
<td></td>
<td>Fail to power on the laser device</td>
<td>Check if water chiller is started up</td>
</tr>
<tr>
<td></td>
<td>Optical path is blocked</td>
<td>Check optical path</td>
</tr>
<tr>
<td></td>
<td>Incorrect installation of control card drive</td>
<td>Install hardware drive following the instruction of drive installation</td>
</tr>
<tr>
<td></td>
<td>Control card failure</td>
<td>Check and replace the control card</td>
</tr>
<tr>
<td>No marking performed</td>
<td>Wrong regulation parameters of software to scanner</td>
<td>Select and modify correction parameters</td>
</tr>
<tr>
<td></td>
<td>Fail of power-on to scanner</td>
<td>Check power-on state of the scanner to ensure a satisfied power-on</td>
</tr>
<tr>
<td></td>
<td>Scanning galvanometer failure</td>
<td>Check or replace the scanning galvanometer</td>
</tr>
<tr>
<td></td>
<td>Poor connection of galvanometer digital signal line</td>
<td>Check the line connection to find if the electric connection satisfies the requirements</td>
</tr>
</tbody>
</table>
Chapter 7  Warranty

7.1 Warranty term

1. The integrated machine enjoys a one-year warranty counting from the date of purchase, but the following consumables are excluded:

2. One-year warranty for laser device;

3. Optical components like beam combinatory, galvanometer, reflector and scanner are beyond the range of warranty.

7.2 Warranty Clause

1. The warranty clauses is for products sold by Guangdong Han’s Yueming Laser Group Co., Ltd.;

2. With a valid warranty card, in case of failure during normal use, servicing free of charge by our company is available after showing the warranty card or invoice according to the content of the warranty clause;

3. The followings are beyond charge free servicing, but reasonable charge will be collected:
   - Maintenance caused by non-quality reason of the machine;
   - With an expired warranty card;
   - Fail to show or show a warranty card with unauthorized modification;
   - Fail to perform agreed liabilities as per the contract;
   - Perform unauthorized disassembly, reformation, maintenance with no consent from our company;
   - Machine failure caused by misuse or force majeure;

4. Our company shall be liable only for the products sold by us, but not for use of our products.

7.3 Customer service information

In case of any problems, please contact customer service department of the manufacturer. Before contacting the customer service department, please prepare ready the following information for a fast solution.

- Company and address of customer;
- Contact person and method of customer;
- Description of problem for a solution;
- Order number of the machine and machine model (Refer to the nameplate)
MC150-D-B Laser Marking Machine

Address of manufacturer: No.28 East Industrial Road, SongShan Lake Hi-tech Industrial Development zone, Dongguan City

Service hotline: 0769-88752222
Post

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