

# Operational & Maintenance Manual

**ND: YAG Q-SWITCH LASER TATTOO REMOVAL SYSTEM**

**Model #: FG2010**



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## Label & Symbol Instruction



Symbol for Laser Products



Warning and Caution Symbol

The users must read the user manual in details where this symbol appears, and must operate strictly as the request.



This is an instruction label.

Please find the instruction label in black in machine shell, and please carefully read the instructions.

This manual is specifically to medical staff and technical staff to better use pulse (Q-switch) ND: YAG LASER. In the manual, you will find detail information about ND: YAG LASER and other important notices, such as how to install, adjust, operate and maintain the laser.



The laser radiation in using may cause harm to human body. Please must read this manual carefully before operation, so be better to understand and master the security knowledge to avoid accidents.

Our company shall not be responsible for any operation damage, if the operator don't follow this instruction.



## Safety Tips

- ◆ Please keep the power cord off, if not using the laser for long time
- ◆ Do not use the poor power cord, plug or socket. Do not touch the plug with wet hands, otherwise electric shock or fire may occur.
- ◆ Do only plug into a grounded outlet, otherwise electric shock or injury may happen
- ◆ Do not plug few multiple outlets (socket) or plug into one outlet, otherwise may catch fire
- ◆ Please keep the power cord off, if not using for long time or in thunderstorm, any abnormal operation may cause electric shock or fire
- ◆ Do not grasp or pull the power cord directly to unplug the power cord, which may cause electric shock or fire.

# Chapter I Products Instruction

## 1.1 Instrument Description

### 1.1.1 Machine Introduction

The design and production of this PULSE (Q-SWITCH) ND: YAG LASER fully comply with the relevant national safety standards for laser medical equipment and quality inspection requirements, which has reached the international advanced level. This machine adopts the advanced optical technology in Korea and parts. Multifunctional microcomputer control and adjustable laser spot size, facility treatments for different places of body disease.

### 1.1.2 Main Components

#### ◆ Body (main machine)

High voltage power supply,  
Low voltage power supply,  
Cooling system.

#### ◆ Controller

Key Touch Mask

Display

#### ◆ Power Control Switch

- a. Emergency Switch: it's a switch for emergency condition. Press emergency switch down to cut down power supply system immediately, in case of any abnormal condition of laser.

- b. Key Switch: The switch by using key to control the switch state. Plug into the key and clockwise turn to turn on machine; counterclockwise key turning means cut down power supply and turn off.

#### ◆ Optical System

It consists of 3 parts:

- 1). Beam transmission system (Optical articulated arm)  
Beam transmission is completed by the optical 7-articulated arm, which is transferred the laser to patient's treatment area.
- 2). Aiming indicator light: the aiming beam is of 650nm
- 3). Laser: the light source

#### ◆ Power Input Panel

- 1). Power cord: it's used to connect the AC power supply
- 2). Foot pedal switch: it is to control laser shooting
- 3). Power socket: connect with power cord
- 4). Control switch (master switch): air switch

## 1.2 Performance index:

### 1.2.1 Output features:

- ◆ Laser type: ND YAG Q-switch laser
- ◆ Wavelength : 1064nm, 532 nm
- ◆ Frequency : 1-10Hz
- ◆ Diameter of spot : Min.0.2mm in focus
- ◆ Max energy : 800mJ adjustable
- ◆ Aiming Indicator light: < 2mW, semiconductor aiming light.
- ◆ Beam of light transmission: smart optical 7-articulated arm

### 1.2.2 Controller features:

Based on color touch LCD screen controller.

### 1.2.3 Wavelengths:

- ◆ 1064 nm: for neutral color tattoo removal.
- ◆ 532 nm: for colorful tattoo removal.

### 1.2.4 The display of controller:

All parameters will display on controller, such as laser energy value reaching to skin, frequency of output laser etc.

### 1.2.5 Laser shooting control: Foot Pedal

### 1.2.6 Input features:

- ◆ power requirement : 220V/110VAC, 50/60Hz, 10A
- ◆ cooling system : closed-off water circulation

### 1.2.7 Physical features:

- ◆ temperature:
  - ☆ usage temperature      10 ~ 30°C
  - ☆ storage temperature      1 ~ 40°C

## 1.3 Applications:

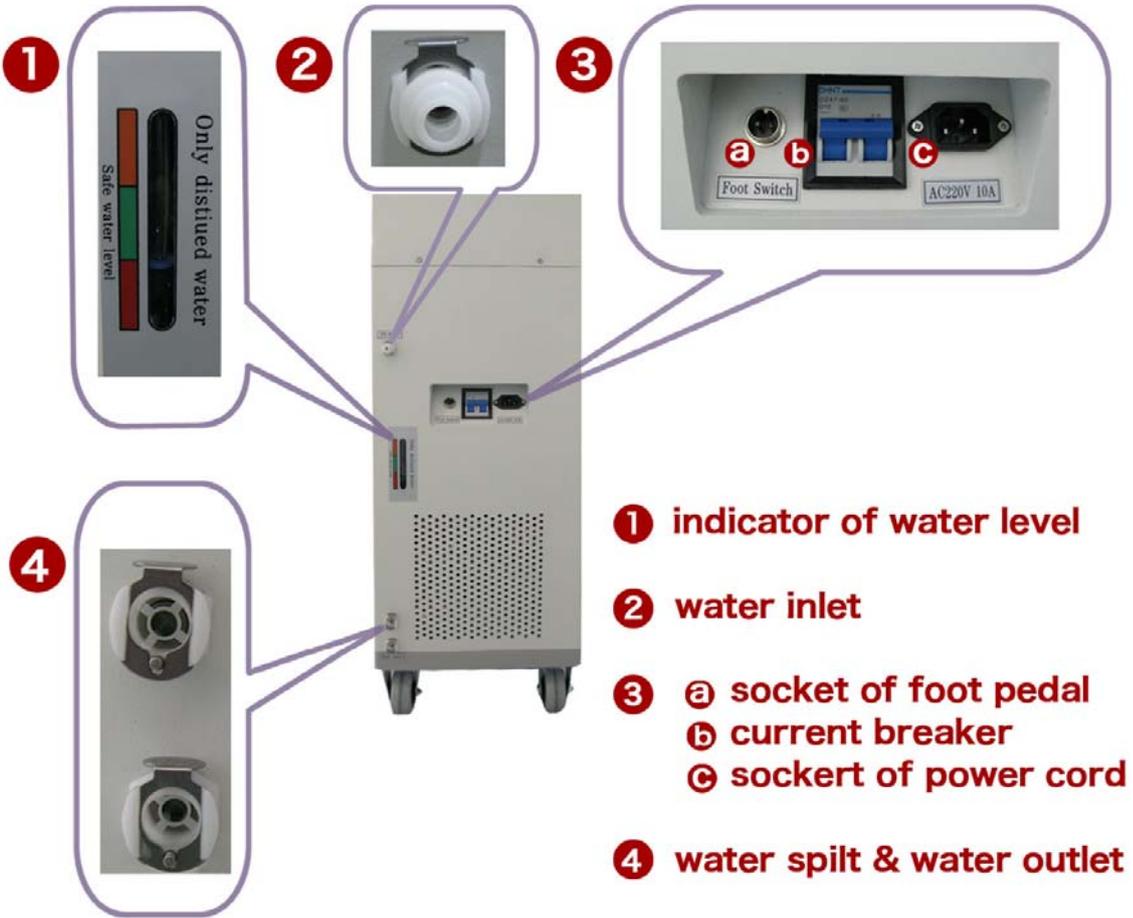
This machine is suitable for tattoo removal, freckles, age spots, superficial pigment spots, nevus, warts, port wine stains, telangiectasia treatment, and with obvious perfect performance

## 1.4 Machine illustration:

### 1.4.1 Main body:



### 1.4.2 Back panel show:



# Chapter II Operation safety regulations

## 2.1 General description:

The pulse ND: YAG Q-switch laser strives for reducing operation to human body causing from laser, in the status of installation, adjustment and operation. In this chapter, introduce security knowledge of laser, taking necessary measures during problems occur and some attentions in details.

## 2.2 Electricity security



It's very dangerous to human body, the necessary high voltage (can reach several thousand volts) for the pulse ND: YAG

Q-switch laser. Therefore, the non-professional personnel is not allowed to install, adjust and maintain the laser at ramble.

## 2.3 Optical security

### 2.3.1 Burn damage



Laser wavelength is 532nm and 1064nm. The max laser output energy is 1J, which can result in light burn. So please pay more attention during treatment.

### 2.3.2 Harm to people's eyes by reflection laser and direct laser:



Laser is harmful to people's eyes, the visible red helium neon laser

**produced, not visible YAG laser and green laser of 532nm.**

**Attentions:**

**Anytime please do not look at the laser directly. Direct laser will lead to irreversible blind. Therefore, the operator must be careful in operation. The object surface is able to reflect light, especially the smooth metal or glass. So please keep all those objects off to the path laser beam goes through. In other words, don't make laser shoot the reflective object; avoid the harm to human body causing from laser reflection laser or dispersive laser.**

**2.3.3 Goggles**



**Goggles are used to protect people's eyes specially. All people around treatment scene should wear the goggles.**

**2.3.4 The safety of patients**



**In order to enhance the safety of patients, please cover the patient's eyes during facial beauty treatment. The patient must wear goggles during treatment around eyes.**

## 2.4 Flammable and combustible possibility



**Please do not use this laser machine in the scene of including flammable and combustible goods which is not allowed to be**

**Placed or stored around in the instrument.**

**Inflammable and explosive items, include gas, alcohol, narcotic, solvent, desiccant, ointment, synthetic resin etc..**

## Chapter III Installation



**Installation should be operated by the trained staffs!**

### 3.1 Package checkup in receiving

We do performance test and quality inspection before shipment. Therefore, the device can be installed to use after water input, as opening the package.



**Attentions:**

**Any damage or quality problem found after opening package, please contact us our distributors immediately. Our Company will be responsible to solve all problems happen in transportation till your satisfactory.**



**Accessories:**

 <p>Optical 7-articulated arm</p>	<p>for laser transferring</p>	<p>1 set</p>
 <p>Treatment Probes</p>	 1064nm & 532nm for different colors of tattoo removal  1064nm skin rejuvenation probe.	<p>2 pcs</p>
 <p>Water valves</p>	<p>for water input, water output, air in turn</p>	<p>3 pcs</p>
 <p>Foot pedal</p>	<p>to control laser output</p>	<p>1 pc</p>
 <p>Balance weight hammer</p>	<p>adjust balance weight of arm in treatment</p>	<p>1 pc</p>
 <p>Port for laser output</p>	<p>the base for 7-articulated arm installation</p>	<p>1 pc</p>
 <p>Dimmer</p>	<p>adjust the accuracy of laser beam (don't use in the normal)</p>	<p>1 pc</p>
 <p>Protecting Glasses</p>	<p>to protect the doctor's eyes during the treatment procedure.</p>	<p>1 pc</p>

 Goggles for clients	to protect the client's eyes during treatment procedure.	1 pc
 Keys	used for lock the machine to avoid	1 pc
 Water funnel	Tool for water input.	1 pc
 Power cord	Power cord	1 pc
 protector for eyeball	Protector for eyeball	1 pc
 blowing pipe	for air blowing transfer	1 pc

## 3.2 Installation environment in installation

- ◆ Don't install the device in the dusty place. Any dust entering into internal structure of device, may cause electric shock or fire.
- ◆ Don't install the device on wet floor or with oil. Or may cause electric shock or fire.
- ◆ Don't install the device in an environment gathering the easy-burst gas (for example: propane, butane, propylene, butylene )
- ◆ Don't place in the high salt for device installation, or speed the corrosion rate of the instrument.
- ◆ Don't install the device where nearby the tinder (such as oil <kerosene, gas >, benzene)
- ◆ Don't install the device in the shaking place.
- ◆ Usage room temperature blows 0<sup>0</sup>C, please keep connecting and water tube away from frozen.
- ◆ Don't install the device in the direct sunshine.
- ◆ Don't install the device nearby the radiator or the heater.

### 3.3 Installation



**Warning:**  
Where install the device, must be of 220V/110V AC, 10A power supply where must be connect with ground wire.

#### 3.3.1 Installation of laser arm:



Please keep the black cap off, screw off as the arrow showing.



Please install the port of laser output, and tighten as the arrow showing.

**Attention: must be tightened 100%**



**Attention: it's the hoop for fixing laser arm**

**Operation steps:**

- a. Take out the laser arm from package case
- b. Keep the cap off, which covers the laser port
- c. Plug the laser arm into the port of laser output carefully (please make sure special attention for successful insert)
- d. After plug laser arm, please tighten the hoop for fixing.

**Attentions:**

**Please protect the laser arm from any damage during installation**



Take out the balance weight hammer from package case, and install as picture showing



**Please plug the blowing pipe to machine and arm head in turn.**



After successful installation of laser

3.3.2 Probes exchange



Probes of 1064nm and 532nm

Professional for skin rejuvenation



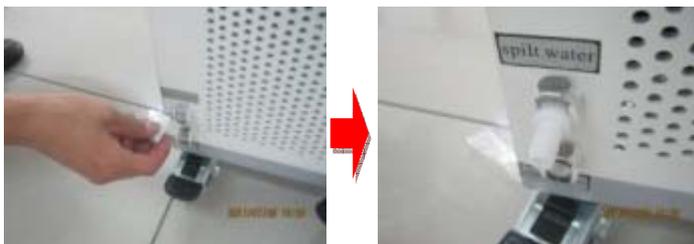
**Attentions:**  
Where switch the probes, or affect the installation of another probe.

### 3.3.3 Water input and water change

#### 3.3.3-1 Water input



**Warning:**  
Distilled water is allowed only. If tap water or mineral water Input, will affect the output laser energy and reduce its life at the same time.  
Water temperature:  $\leq 10^{\circ}\text{C}$



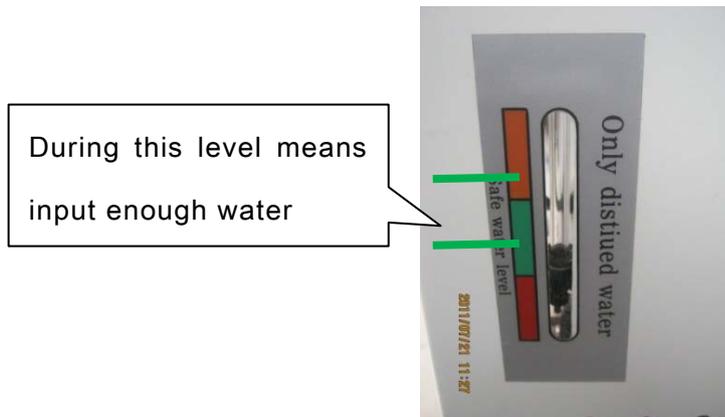
Plug water valve to water spilt please



#### Operation Steps:

- a. Please connect one water valve to water tube (with water funnel) firstly
- b. Plug the other end of water valve to water input

- c. **Input distilled water through water funnel. Input water till up to the green level, means enough water input; the red water level means less water inside, should input water till up to the green level.**



### 3.3.3-2 Water output

Method: please plug water valve to water spilt and water output in turn, and then water output automatically.

### 3.3.4 Connection of power cord

Plug the power cord at the rear machine shell, and then plug the other end of power cord to power socket (220V or 110V power supply for machine); afterwards turn on "current breaker" (turn on means lift the current breaker up); finally plug foot pedal to machine. Show as following:



# Chapter IV Operation

This chapter will give the details of operation and instruction.



The operator should not use the machine without any professional training, and related credentials.

## 4.1 Preparation before treatment

- ◆ Keep the appearance of machine clean
- ◆ Arrange the proper position for machine and patient



Please be more careful when you move machine, should keep the machine in good condition and position. Although the YAG laser is of good structural seismic design based on function, should be more

Careful anyway and avoid hit on other items. Strong vibration to machine.

- ◆ Prepare all necessary instruments and tools
- ◆ Please prepare a wet towel for patient when use ordinary anesthetic
- ◆ Please wear the laser protector glass for patient
- ◆ Please connect the power cord and foot pedal
- ◆ Plug key
- ◆ Please lift up the current breaker and emergency switch, and then switch key to “ON” (means turn on machine)

### Attentions:



Once any anomalous critical situation happens, please press the emergency switch down to cut down power supply immediately and assure safety.

**◆ Inspect the optical system before each treatment, whether good or not; especially the optical system of aiming indicator light and YAG laser**



Any big misregistration of optical system, please contact with our technician timely

**The optical system means whether the aiming indicator light and YAG laser in one line or not, in other , the laser spots should be in the same place with the aiming indicator light. YAG laser and the aiming indicator light will be in different place in the bad optical system condition, which shall not get accurate treatment in turn. Generally, strong vibration will cause the imbalance of optical system.**

#### **4.1.1 What will cause the imbalance of optical system:**

1. The articulated light arm
2. The aiming indicator light
3. Do not adjust well the optical system

#### **4.1.2 The steps to check up optical system:**

**Necessary tools: one piece of paper (as light target)**

**Take the album paper to treatment head 10cm away, and don't move it afterwards.**

1. Wear the laser protective goggles
2. Turn on machine
3. Then turn on the aiming indicator light, which shoot through the articulated light arm's central axis
4. Set up the energy as 100mJ
5. Make sure the red aiming indicator light on album paper
6. Press the foot pedal
7. Check up whether the laser's burn spot is in the same point with in indicator light or now
- 8 . If two lights have badly deviation, then the strong laser energy will be shoot to internal of articulated light arm easily, and result in the energy lose or weak, and damage the articulated light arm and optics

## 4.2 During treatment

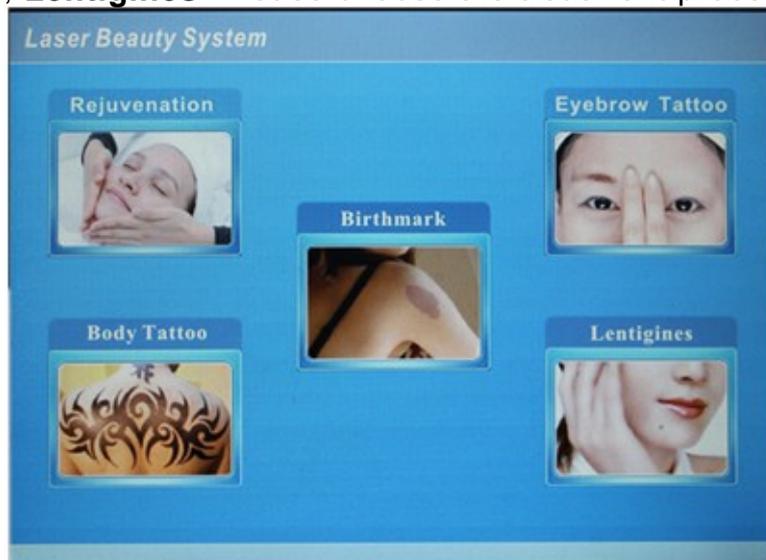
When turn on machine, program start to self-inspect automatically. Show as picture1.



Picture1 Machine self-checking

Then, machine will enter into the adjustment menu automatically as **picture2**

5 treatments for your choice including: **Rejuvenation**, **Body Tattoos**, **Birthmark**, **Eyebrow Tattoo**, **Lentigines**. Please choose the treatment procedure you want.



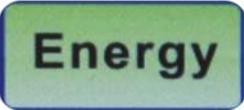
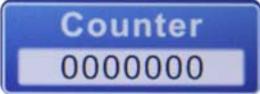
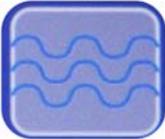
Picture2

Here, take “**Rejuvenation**” as an example. Press picture1.



Picture1



	Aiming indicator light, ON/OFF optional.
	It shows the working mode of laser itself. In other words, to show which wavelength for working now, 1064nm / 532nm option.
	Laser Shot number in one second selection. 1-10 HZ adjustable.
	Energy adjustable here. Press  and  to adjust the suitable energy you want.
	Press to enter into working condition after all parameters setup. After pressing "Ready", it will change into
	Counter for the shots number of each treatment. The number will turn to "0" after shut down the machine.
	Water temperature detection system.
	Water flow detection system.
	Press here to save the parameters adjusted.

The same to other optional items including Eyebrow Tattoo, Birthmark, Body tattoo, Lentigines.

### **4.2.1 Energy setup**

Press the ENERGY key ▲ or ▼ to adjust energy value in controller, and the energy adjustable from 100mj-1000mj.

### **4.2.2 Frequency setup**

Press the FREQUENCY key ▲ or ▼ to adjust frequency in controller, adjustable from 1Hz-10Hz.

### **4.2.3 Setup of laser working mode**

Press WAVE key, to switch between W.L.: 1064nm or 532nm

### **4.2.4 Turn on/off the aiming indicator light**

It's off as turning on, selectable to turn on or off taking advantage of the key in controller.

### **4.2.5 Working**

**After all parameters setting up well, please press "READY" in controller.**

If want to reset the parameters, please press the **Standby** key firstly, then will display "SET" at the bottom of controller. In this case, you can reset energy value, frequency etc., press "READY" once again to start work.

## **4.3 After treatment**

4.3.1 After using, please back to “standby” before turning off

4.3.2 Switch the key to “OFF”, to turn off machine

4.3.3 Put the articulated light arm to safe place, and avoid any affecting to the optical system

4.3.4 Disconnect the treatment head and other tools, facilitying clean and disinfection

## Chapter V Maintenance

This chapter will tell you how to inspect and maintain regularly.

### 5.1 Regular inspection

Inspect machine regularly and solve the problems found, to maintain machine in a good working condition. In that case, we suggest:

1. Inspect the power cord and power socket (every week)
2. Inspect foot pedal, wire connection and socket (every week)
- 3 . Inspect the controller, keys in controller (any time)
- 4 . Inspect the optical system (before each treatment)
- 5 . Inspect the output power (before each treatment)
- 6 . Inspect the laser exposure time (before each treatment)
- 7 . Power calibration (every half year)

### 5.2 Disinfection of articulated-arm and probe

Disconnect the probe and the arm with focus lens from articulated-arm, and take apart

the probe and arm afterwards.

Take apart the focus lens from the arm, please do not disinfect the focus lens anyway.

The arm without the focus lens and the probe can be boiled to disinfect.

Boiling temperature : 132°C

Time : 6 minutes

### **Clean the focus lens:**

If the focus lens is smoke-smudged, should clean in turn, to ensure high transitivity and avoid burning-out the focus lens because of poor transmission.

The focus lens can be wiped gently by the lens paper, or absorbent cotton with a little alcohol or acetone. Don't excessive press or grab in hand, to avoid damaging the focus lens film in surface which affects the transitivity rate accordingly.

## **5.3 Calibration of energy parameter**

**Remarks: it is just for reference only. It is forbidden to operate like this in using.**

The output laser energy will be reduced by 30% after 1 year using. Therefore it's necessary to regularly calibrate the laser power (generally every half year). This machine has the function of semi-automatic calibration. In calibration, make sure each actual output power value is in  $\pm 20\%$  (in real actual operation is  $\pm 5\%$ ).

Necessary tools: an accurate laser energy meter.

### **Process of calibration:**

1. Take the control panel out from machine; please don't pull out the socket.
2. Take apart the focus lens and treatment head from the articulated-arm
3. Ensure the laser beam shoot to the head of laser energy meter completely

4. Turn on machine
5. Press the “set and choose” key and set energy as 100mJ, laser working mode is 1064nm
6. Step the foot pedal
7. Test the actual laser output power; observe whether the value is in accordance with request. Any big different, please adjust the voltage of inner power supply control board till is in accordance with the laser energy.

## **5.4 Clean of the controller**

You can use wet soft cloth wipe the surface of the controller. In order to avoid the surface of the controller damaged by chemical or produce scratches, you can use detergent or soap water, but don't use the chemical reagent, coarse cloth, sand paper, sponge etc.

## Chapter VI Clinical Application

### Attention during the treatment:

During treatment, operator should make a right angle between handle and treatment area to make sure the light could shot upright and avoid losing energy of light as least as possible.

During treatment for tattoo in eyebrow, eye line and lip line, the spot of light should lap over a little to move in line. During treatment for spot or nevus, operator should treat a small area at one time; best result should be that the treatment area turns to white after treatment.

### Suggested parameter:

Treatment	Energy	frequency	Treatment times needed	Interval between two treatments
Eyebrow tattoo	50-100mj	5-6	3 –6 times	21—45 days
Body tattoo	50-100mj	5-6	3 – 5 times	
lentigines	50-100mj	5-6	3 – 5 times	
birthmark	50-100mj	5-6	5 – 8 times	
Skin rejuvenation	50-100mj	5-6	3 – 5 times	

### Attention during the treatment:

- a. Customer should not open eyes during treatment
- b. Keep frequency as 3 we recommend and able to adjust as actual treatment request, and control energy from lower to higher slowly
- c. Clean treatment area
- d. Select probes according to tattoo color
- e. Keep probe touch skin without any space for the 1<sup>st</sup> treatment. And then keep the focus distance from the 2<sup>nd</sup> treatment. 5-10 minutes later, tattoo color turn to dark, and lighten day by day.

- f. Keep spot shot target tattoo directly without any angle; and treat from one end to another end around treatment area
- g. Do not bleed in or after treatment

### **Notice:**

Use the protector of eyeball to protect patients' eye balls.

Operator should strictly protect customers' eyes with panel for eyelid or medical pledget (panel for eyelid) of 1cm depth.

Treatment should be started from **down eye line**, patient should deeply close eyes and keep eyeball up-sight inside. Operator should press the pledget (panel for eyelid) with forefinger and push up eyelid, peel down eyelid with middle finger to bare the eye line.

Then, treat **up eye line**. Patient should close eyes and keep eyeball down-sight inside. Operator should press the pledget (panel for eyelid) with middle finger and push eyelid down, push eyelid up with forefinger to bare the eye line.

**It is better to remove black, coffee, deep red and brown lip line with 1064nm head at first time and then, treat again with 532 nm head.**

**FAQ: after several treatments of tattoo removal on eyebrow, colors lighten a lot but it has been turned out to blue color.**

<p><b>Reason 1</b> Chemical pigment</p>	<p>Possibility in treatment and Solution</p> <p>Difficult to remove, if the color turns to blue, black or red after several treatments. Please take 1064nm for further treatment.</p> <p>Generally, the pigment penetration is less than 6mm will be easy to remove relatively.</p>
<p><b>Reason 2</b> Chemical pigment and deep penetration</p>	<p>Difficult to remove, try to take 1064nm probe for further treatment</p>
<p><b>Reason 3</b> Mixed chemical pigment</p>	<p>Difficult to remove and the color may turn to blue, black or red after several treatments. At this moment, please take 1064nm for further treatment till tattoo disappeared. Generally, the pigment penetration is less than 6mm will be easy to remove relatively.</p>
<p><b>Reason 4</b> Mixed chemical pigment and deep penetration</p>	<p>Difficult to remove, try to take 1064nm probe for further treatment</p>

## Chapter VII Malfunction maintenance guide

If something wrong happened on the machine, please report the time and phenomena. And then find out the problem according to table, fix it with right way. If you can't solve the problem by yourself, please contact with our company.



### Malfunction guides

Table 8-1 is for small problems.

There are detail ways for fixing problems in Table 8-2.

**Table 8--1**

Malfunction Description	Reason and Solution
The machine has no reaction after connecting power	<ul style="list-style-type: none"> <li>◆ the machine didn't connect with AC power Check up whether plug power cord to power socket or not, and current breaker (at the rear machine shell), emergency switch up or not, and all socket connection.</li> <li>◆ low voltage power supply control block problem Check up the input of low voltage power supply control block, output socket, input/output voltage in normal condition or not?</li> <li>◆ controller problem Please contact with our company technical department</li> </ul>
Water flow switch problem	<ul style="list-style-type: none"> <li>the position of water flow sensor changes</li> <li>The wire's in poor connection</li> </ul>
Display is black	5V power supply control board broken or poor connection of plugs
High voltage sources	<ul style="list-style-type: none"> <li>High voltage sources is un-electrified</li> <li>Please check the AB connector of High voltage power supply control board</li> </ul>

**Table 8--2**

Malfunction	Malfunction Reason and Maintain Method
When turn "power" to "on", there is nothing reaction.	alternating current is un-connected 1. don't turn on "work" 2. the fuse is of poor connection
Control-keys do not work	1. T5S35 on Control board does not connect well 2. when the machine is in working condition, press foot pedal but there is no light output, then open the foot pedal and check up
Aiming indicator light is too weak	◆ wipe the dust on the reflect leas ◆ the helium-neon indicator light or the indicator power supply control block broken, please contact our technical department.
YAG spots are not on the same place with the aiming indicator light	◆ problem to the optical system adjust the optical system
Press foot pedal, but nothing light output	◆ Check up wire connection of foot pedal
Frequency adjustment is out of control	◆ CPU is of problem
Lower output energy in working	◆ Water temperature rises or lack of water ◆ Optical system problem ◆ Q crystal board or simmer board broken
Computer is out of control	◆ Turn off machine and turn it on once again

In working condition, output laser energy rises suddenly	<ul style="list-style-type: none"><li>◆ IGD broken</li><li>◆ Check up wire connection</li><li>◆ Q crystal board broken</li></ul>
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## Chapter VIII Simple Maintenance

### 1. Normal problems

No power in the machine

**Solution:**

- A. Check the emergency button, if it is bounced up, it is on, or it is off.
- B. Check up the power supply control switch at the rear panel. I means turn on
- C. check the power line broken or not, and whether there is short circuit
- D. check the insurance wire which is behind the power
- E. check the plug of power

Machine stop working immediately

**Solution:**

- A. high pressure interfere, check up whether high-power electrical around or not
- B. the software out of control, should replace the microchip or replace the controller

### 2. Common maintenance and repair

- a. the machine should be avoid of insulation
- b. after treatment, use some cloth to cover the machine to avoid the dust
- c. Clean the treatment head after using.
- d. keep the machine in the dry room( important)
- e. unprofessional operators are not allowed to use

### 3. Daily maintenance

- a. Keep machine away from sun exposure
- b. Cover treatment probes and mainframe after treatments, avoiding dust cover. It's very

important

- c. Carefully hand the treatment probes (important also)
- d. Change water every 3 months (pure water or distilled water only)
- e. Place machine in dry and dust-free room (very important)
- f. Non-professional operator is not allowed to operate this machine