

GY-QCFXYP300Max User Manual of Laser Cleaning System

Scope of Application

(Customizable)

QCS connector: 17 mm; 20 mm (customizable)

1 Preface

1.1 Welcome

Thank you for choosing our GY-QCFXYP300Max laser cleaning system. This user manual provides important safety, operation, and maintenance guidelines. Therefore, please read this manual carefully before using the product and keep it safely stored. To ensure safe operation and maintain the optimal condition of the product, please adhere to the following precautions and warnings.

This user manual is not a quality assurance document; any corrections to printing errors, modifications to the information provided, or improvements to the product shall be subject to interpretation by our company at any time without prior notice; such corrections will be incorporated into a revised edition of this user manual.

2 Product Introduction

Laser cleaning is a novel technology based on the interaction between lasers and materials, enabling the removal of contaminants and adhered deposits from object surfaces. Compared to traditional cleaning methods, laser cleaning offers advantages such as being contactless, causing no damage to the substrate, allowing for precise cleaning, being environmentally friendly, and supporting online processing; it is particularly suitable for high-speed online cleaning applications in designated areas.

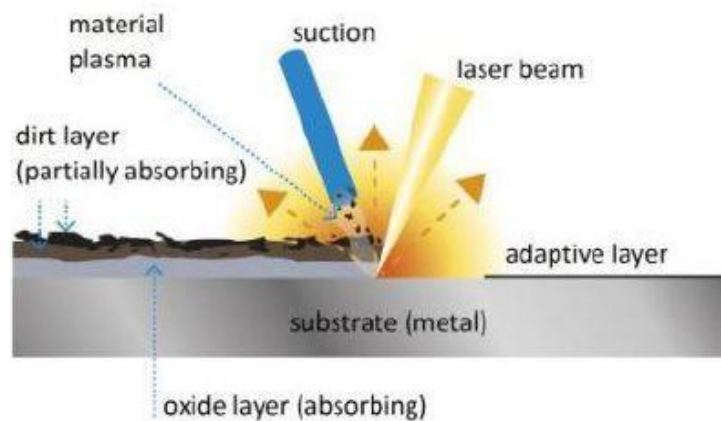


Figure 2.1 Laser cleaning schematic diagram

The laser cleaning equipment manufactured by our company represents a cutting-edge high-tech solution for surface treatment; it is easy to install, operate, and automate. The operation is straightforward: simply plug in the power supply and turn on the device to initiate a cleaning process that requires no chemical reagents, no cleaning media, no dust, and no water. This equipment is capable of cleaning curved surfaces and achieves high surface cleanliness, effectively removing resin, paint, oil stains, dirt, grime, rust, coatings, plating layers, and oxide layers from surfaces. It finds wide application across various industries, including shipbuilding, automotive repair, rubber mold manufacturing, high-end machine tools, rail systems, and environmental protection applications.

2.1 Laser Cleaning Characteristics and Implementation Standards

(1) Laser cleaning characteristics

- ◎ Contactless cleaning – does not damage the component substrate;
- ◎ Precision cleaning enables targeted cleaning at specific locations and with precise dimensional accuracy;
- ◎ No chemical cleaning solutions required; no consumables needed; safe and environmentally friendly;
- ◎ Simple operation – can be used handheld or in conjunction with a robotic arm for automated cleaning;
- ◎ Ergonomic design significantly reduces operational fatigue;
- ◎ The laser cleaning system is stable and requires almost no maintenance;

(2) Product Implementation Standards

Our company has obtained ISO 9001 International Quality Management System certification and has established a comprehensive quality assurance system covering the design, manufacturing, and service of small-and medium-power laser processing equipment.

Our company has established detailed standards covering the work environment and working conditions during the production process, basic technical requirements, cooling requirements, laser radiation safety, electrical safety, testing methods, inspection and acceptance procedures, as well as packaging and transportation. The national standards referenced in these standards include:

GB10320 – Electrical Safety for Laser Equipment and Facilities

GB7247 – Radiation Safety, Equipment Classification, Requirements and User Manual for Laser Products

GB2421 – Basic Environmental Test Procedures for Electronic Products

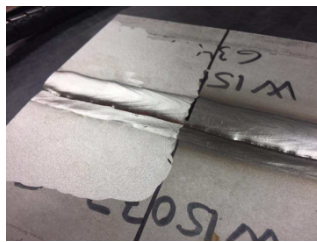
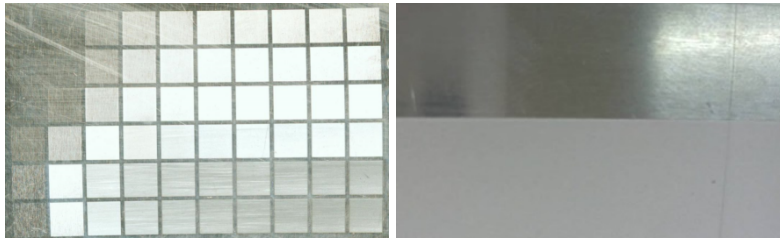
GB/TB360 – Specification for Test Equipment for Laser Power Energy Measurement

GB/T13740 – Test method for divergence angle of laser radiation

GB/T13741 – Test method for determining the beam diameter of laser radiation beams

GB/T13862-92 – Test method for laser radiation power

2.2 Laser Cleaning Product Applications



Laser cleaning of aluminum alloys before and after welding



b Metal surface oxide laser cleaning



C Laser cleaning of oil and paint stains



D-Laser Rust Removal
Figure 2.2 – Typical laser cleaning applications

2.3 Product Technical Features

Our company's independently developed laser cleaning system features the following characteristics:

(1) Self-developed dedicated underlying control system and application software for laser cleaning

- Perfectly compatible with the vast majority of laser cleaning light sources available on the market;
- The dedicated software features a clear and concise interface with user-friendly operation;
- Built-in database system capable of storing and editing up to 100 sets of process data;
- Laser parameters such as laser power and laser repetition frequency can be freely adjusted;
- Equipped with an online pulse width adjustment function (if the laser supports it), allowing for the optimization of process parameters based on specific on-site conditions;
- The system enables real-time monitoring of laser parameters, operating status, alarm status, and other functions on the screen interface; when an

alarm is triggered, there is no need to connect to the laser host computer software, providing faster and more intelligent operation.

- Optimized mirror control and sine wave signal control effectively reduce the heat generation in the mirror, thereby extending its service life;
- The dual-axis version offers 13 cleaning modes: Linear, Rectangular 1, Rectangular 2, Circular, Sinusoidal, Spiral, Free Mode, Ring, Rotating, Triangular, Rotating Circle, Rotating Linear, and Linear Rotating Circle – designed to meet the diverse requirements of various application scenarios;
- Adjustable scanning speed, up to 30,000/min;

(2) Professional laser cleaning optical design

- Mirrors with a high damage threshold and field lenses featuring high optical efficiency and large focal depth, designed for prolonged operation in high-power laser cleaning applications;
- High-performance laser scanner featuring fast scanning speed and high precision; when combined with a professional control software system, it meets a wide range of laser cleaning application requirements;

(3) Lightweight cleaning head structural design

- Portable design: The cleaning head is compact and easy to carry, with a comfortable, well-balanced handle for effortless use;
- Lightweight design: The cleaning head weighs less than 1.46 kg, making it more suitable for extended handheld use;
- Dust-proof sealing design: An external optical path sealing and dust-proof design effectively prevents dust and other contaminants generated during cleaning from entering the optical path or the cleaning head, thereby avoiding performance degradation or damage;
- The field lens features a dust-blowing air curtain design, where a high-speed fan effectively protects the lens from dust or oil contamination; the blowing distance and airflow intensity are significantly greater than those of traditional compressed air systems.
- Anti-interference design: The cleaning head's resistance to interference is enhanced through measures such as signal amplification, signal line shielding layers, galvanometer encapsulation, and a metal shielding housing. This ensures that the system's light output stability remains unaffected even

when integrated with robots or vacuum cleaners.

2.4 Cleaning Head Structure and Dimensional Drawing

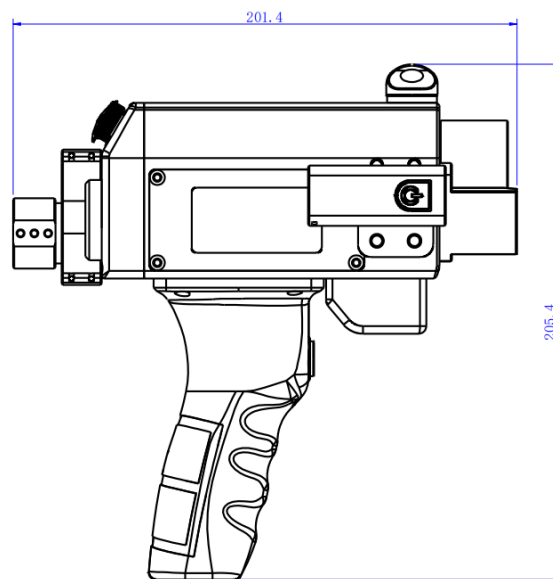
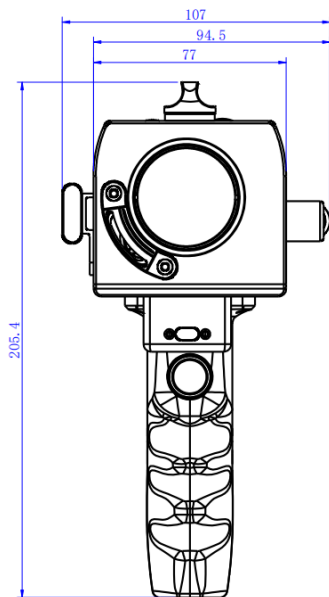


Figure 2.3 GY-QCFXYP300Max

2.5 Main Product Technical Specifications

Java runtime environment Java	
content	parameter
service voltage	Single-phase 220 V $\pm 10\%$, 50/60 Hz AC power (Customizable: 110V, 50Hz AC power)
System power consumption	Less than 120 W
operating ambient temperature	0°C ~ 40°C
Work environment humidity	$\leq 80\%$
Optical parameters	
Acceptable average laser power	$\leq 300\text{W}$
Light transmittance	$\geq 98\%$
Laser power adjustment	10%–100% continuous gradient adjustable
Laser pulse frequency adjustment	Continuous adjustable frequency range from 1 kHz to 3000 kHz (customizable)
Laser pulse width adjustment function	support
focal distance	Standard: 210 mm (160 mm, 254 mm, 330 mm, or 420 mm available as optional)
Incident light spot diameter	$< 10\text{mm}$
Cleaning head and galvanometer/field mirror parameters	
Cleaning head dimensions	As shown in Figure 2.3, the special QCS joint supports customization.
Cleaning head weight	$< 1.46\text{KG}$
run-length	Available in 0 mm–300 mm ranges
scan frequency	Maximum frequency: no less than 300 Hz
Maximum scan line speed	Approx. 50,000/min
Mirror material	quartz
Mirror material	quartz
Field shot	quartz
Other parameters	
screen size	Standard: 7-inch display (4.3-inch display available as an option) + 2.8-inch secondary screen

Cable length	Standard length: 6 meters
mode of operation	Handheld/Automated

2.6 Configuration List

name	ts	unit	quantity	remarks
Laser cleaning head	GY-QCFXYP300Max	individual	1	
Control Card/Box	GY-FLCS	Set	1	Includes a galvanometer system, etc.
touch screen	7-inch	individual	1	Features a 2.8-inch small screen
Process Database	built-in	Set	1	
LEDlamp	T5 pro	Set	1	
Field shot	Standard F210 field lens included	individual	1	Available in 160 mm – 420 mm
Protective lens	43*2	Film	2	

3 Installation and Operation of the Laser

Cleaning Machine

Pre-use precautions:

- Check whether the product appearance is abnormal or if the output cables are damaged, among other issues;
- Please correctly connect the quick connector according to the label on the control box;

- Connect the power supply correctly and ensure that the power cable connections are secure;
- Check and ensure that the cleaning head's protective lens is free of any dust or dirt;

3.1 Operating Procedures

Step 1: Remove the handheld cleaning gun, ensure that the button switch on the handle is in the released position, and take off the dust cover from the front end of the laser cleaning gun;

Step 2: Unplug the external power cord to power on the device, then turn on the emergency stop switch;

Step 3: Press the "Start" button; the system will power on and initialize;

Step 4: After the system has started up, complete the laser cleaning parameter settings via the touchscreen interface;

Step 5: After completing the laser parameter settings, press the Laser Enable button on the laser cleaning operation screen (before pressing the button, be sure to confirm that the button switch on the handheld head handle is in the released position);

Step 6: Wear laser safety goggles, align the gun tip with the workpiece to be cleaned, and press the black button on the handheld handle – the gun tip will then emit light to begin the cleaning process.

Step 7: After use, sequentially turn off the enable button, cover the field lens dust cover, release the "Start" button, turn off the emergency stop switch, return the cleaning nozzle to the main unit storage box, and disconnect the main power supply.

3.2 Software Control Interface

3.2.1 Boot Screen

When powering on the device, you will be greeted by the Power-On Wait Interface (as shown in Figure 3.1). This interface indicates that the screen and the control board are currently connected. If the connection is normal (this process takes

approximately 5 seconds), the system will automatically switch to the operation interface. If the system does not switch within this time frame, it may indicate an abnormal connection between the screen and the control board; in this case, please power down the device and check whether the connectors are properly and securely seated.



Figure 3.1 – Software Startup Interface

Note: The software interface logo, device model, company information, etc., can be customized; this illustration is for descriptive purposes only (the same applies below).

3.2.2 Setup Interface

After system initialization is complete, the operation interface will be displayed. Before using the cleaning equipment, first click the "Settings" button in the lower-left corner of the operation interface to access the Cleaning System Settings screen, as shown in Figure 3.2. The System Settings screen displays the control card version number and the touchscreen version number. From this screen, you can configure settings such as safety distance adjustment, laser type, whether single-or double-click determines the laser output control mode, and whether the system uses a single-or dual-axis scanning mechanism (to select the galvanometer type).

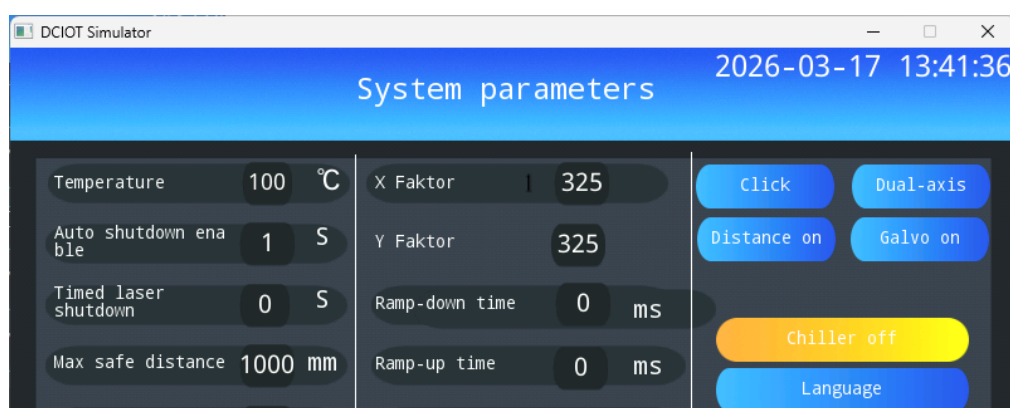
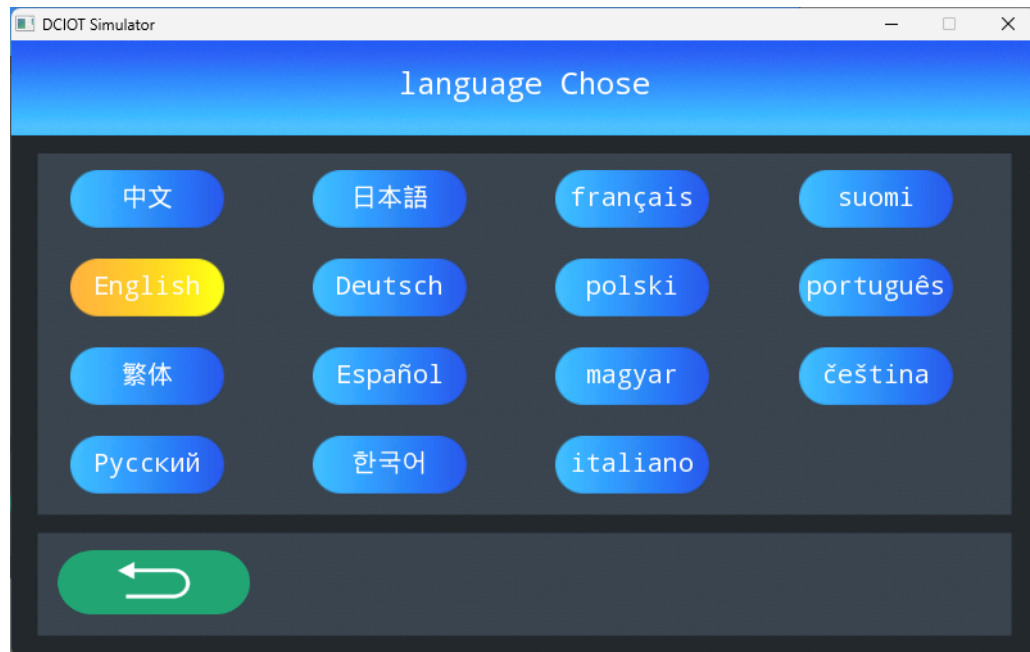


Figure 3.2 – System Configuration Interface



- Automatic Shutdown Enable: Set the automatic shutdown enable duration (in minutes). Clicking "Enable" will activate the feature; when the preset time is reached while the laser is active, the feature will be disabled.
- Timed laser shutdown: Set the duration of a single laser pulse (unit: seconds); once the set duration is reached, the laser will stop emitting.
- Safety distance: The ranging sensor's operating range is set by default to a minimum of 10 cm and a maximum of 50 cm; when the distance is less than 10 cm or greater than 50 cm, the ranging alarm will not emit light; however, within the range of 10–50 cm, the laser will operate normally.
- Single-click: Press the Cleaning Head button once to emit a laser beam; after clicking "Single-Click", switch to Double-Click mode. Dual-axis: The cleaning head operates on both X and Y axes; if the cleaning head is single-axis, click "Dual-Axis" to switch to Single-Axis mode. Distance Measurement: Activates the distance measurement sensor; Mirrors On: Activates the mirror alarm switch; Chiller On: Activates the chiller alarm switch; if the equipment does not come equipped with a chiller, click "Chiller On" to disable the chiller alarm.
- X/Y Coefficients: Used for setting field lenses/focusing lenses; when the focal length or actual working distance of different field lenses/focusing lenses does not match, the actual scanning width and height can be corrected using the field lens coefficient. Password to modify: 123;

Field Lens Model	X coefficient	Y coefficient
F160	84	84
F210	110	110
F254	135	135
F330	150	150
F420	195	195

- Language Switch: Configure your system language settings; currently supports 15 languages; additional languages can be customized.
- Distance function: Default enabled;
- Temperature setting: Default – 50°C;

3.3 User Interface

3.3.1 Scanning Method

The operating interface offers 13 cleaning modes, which can be switched by tapping the "Scan Mode" option on the screen (with cyclic switching): Linear Mode, Rectangular Mode 1, Rectangular Mode 2, Circular Mode, Sinusoidal Mode, Spiral Mode, Free Mode, Ring Mode, Rotation Mode, Triangle Mode – Rotating Circle Mode, Rotating Line Mode, and Linear Rotating Circle Mode.

(1) Linear Mode

In this mode, the scanning method is linear; the interface is shown in Figure 3.3.

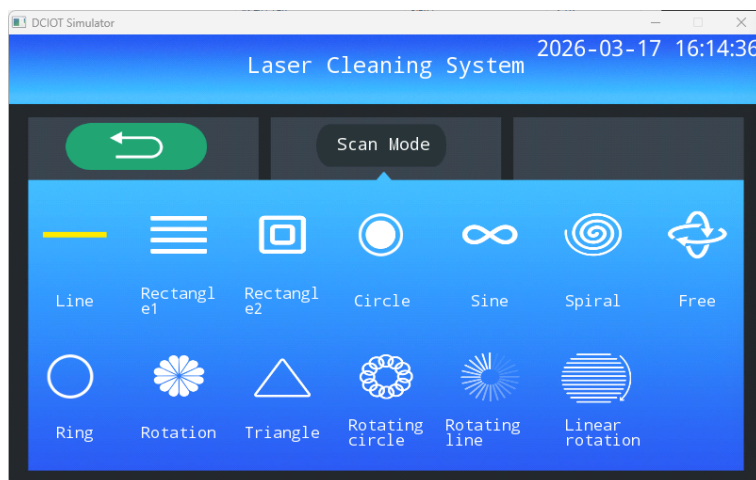


Figure 3.3 – Linear Scan Mode Operation Interface

- Laser power: Set the average laser output power within the range of 10%–100%;
- Frequency: Laser pulse repetition frequency setting, range: 1–4000 kHz;
- Scanning speed: The speed at which the laser spot focused on the workpiece surface moves; the maximum scanning speed depends on the scanning width;

run-length (mm)	Scanning speed (mm/s) (Upper limit)
Above 50	50000
40-49	40000
30-39	32000
20-29	16000
10-19	8000
5-9	6000
3-5	4000
1-3	2000

- Scan width: Set the linear scan width, ranging from 5 mm to Mx (the Mx value depends on the size of the field lens or focusing lens);

Scene Type	Scanning range: Mx (mm)
F160	105
F210	140
F254	160
F330	185
F420	300

- Scan count: To be used under special circumstances; the number of scans can be set; when the specified number of scans is reached, the light output will stop; the default value is 0.
- Enable: After completing the parameter settings, click the Enable button; the system and laser will then enter the light output preparation state.
- Pulse width: Set according to actual field requirements; range: 1–500 ns;
- Edge Coefficient: Edge Extinction – eliminates strong light spots at both ends of the laser; default value is 0; maximum setting is 2000 – adjust this value according to actual field requirements; when using this function, it is recommended to set the value to 500. Password: 123;
- Extinction Delay: When combined with the Edge Coefficient, this feature effectively eliminates strong light spots on both sides; the default value is 0 – it is recommended to set this to 0.5 when using this function. Password: 123;
- Chiller alarm: The chiller fault output signal is connected to the control card; when a chiller alarm occurs, this can be displayed on the interface. For air-cooled equipment, please short-circuit this signal to suppress it or disable the chiller alarm signal on the screen interface.

(2) Rectangular Mode

In this mode, the scanning method is rectangular; the interface is shown in Figure 3.4. The definitions and ranges for power, frequency, pulse width (duty cycle), scanning speed, scanning width, and number of scans are identical to those in the linear mode; these will not be reiterated hereafter (the same applies throughout).



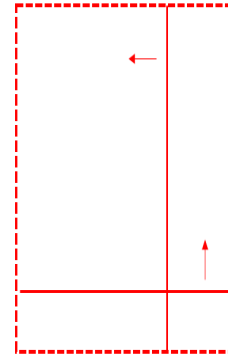
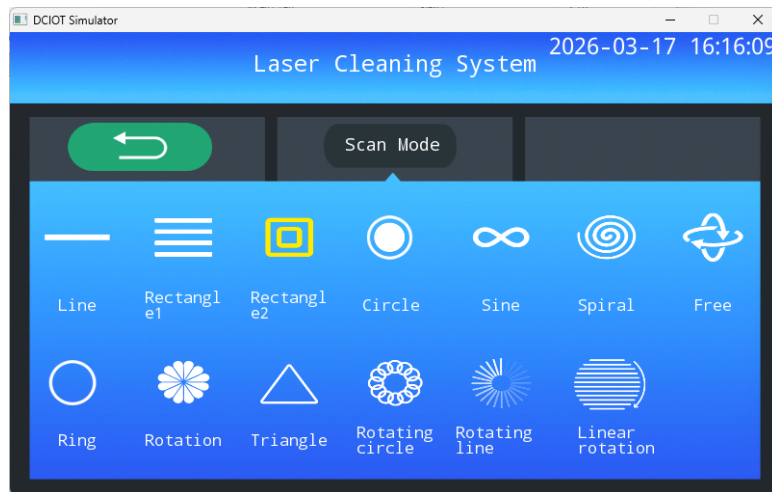
Figure 3.4 – Rectangular Scanning Mode Operation Interface

- Fill spacing: Sets the laser filling distance within the rectangle (range: 0.01–1 mm); affects the spot overlap rate along the Y-axis; default value: 0.1;
- Scan Height: Set the scanning height for the rectangle; range: 1 mm to Mx (the Mx value depends on the field lens coefficient);

Scene Type	Scanning range: Mx (mm)
F160	105
F210	140
F254	160
F330	185
F420	300

(3) Rectangular Two-Mode

The Rectangular Mode II is largely similar to Rectangular Mode I; it adds a lateral cleaning mode to the vertical cleaning mode used in Rectangular Mode I.



(4) Circular Mode

In this mode, the scanned shape is circular (as shown in Figure 3.5); the scanning range is defined solely by the circular diameter and the fill spacing;

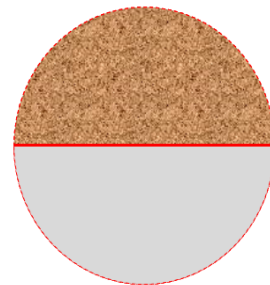
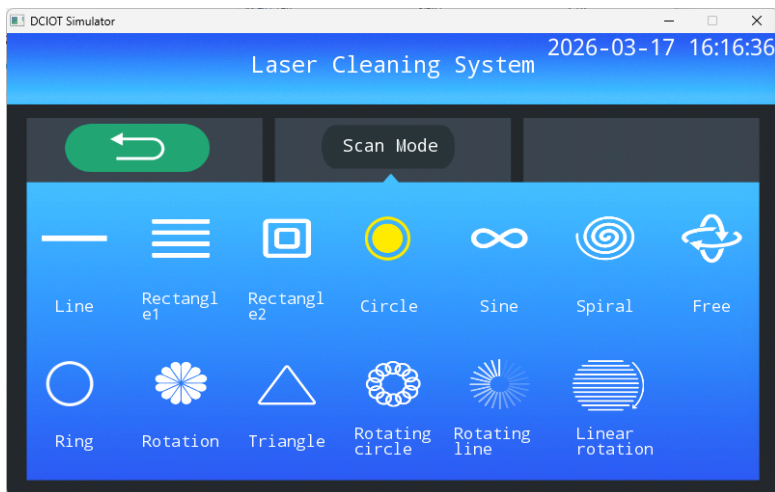


Figure 3.5 – Circular Scanning Mode Operation Interface

(5) Sinusoidal Mode

In Sinusoidal Mode, the scan waveform is a sine curve; the operating interface is shown in Figure 3.6. In Sinusoidal Mode, the sinusoidal period must be set: this represents the period of the sine wave along the X-axis; a smaller numerical value corresponds to a higher waveform oscillation frequency, with a range of 1 mm–100 mm;

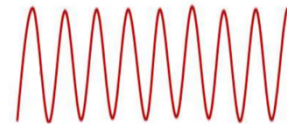
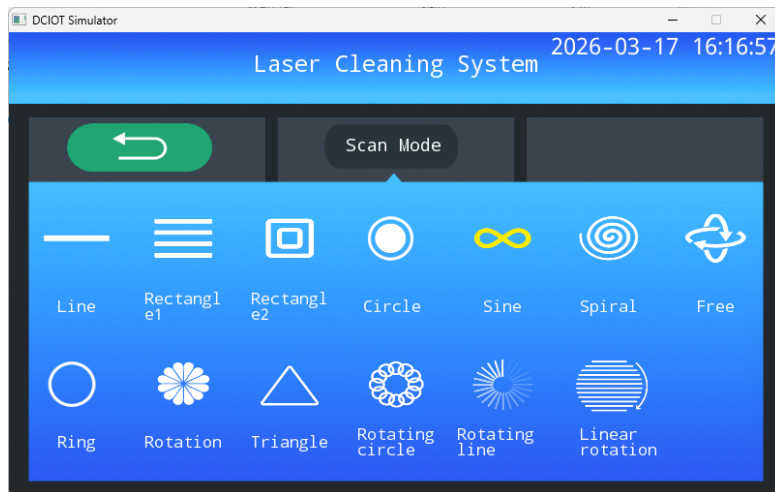


Figure 3.6 – Sinusoidal Scanning Mode Operation Interface

(6) Spiral Mode

In the spiral mode, the scanning waveform follows a spiral curve; the operating interface is shown in Figure 3.7. The parameter settings are identical to those in the sine wave mode.

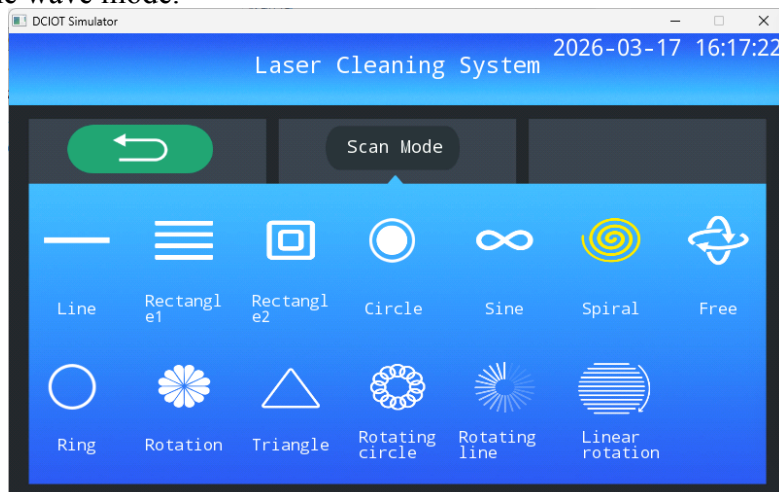


Figure 3.7 – Helical Scanning Mode Operation Interface

- Series: Number of waveforms in spiral mode (range: 1–16);

(7) Free Mode

In Free Mode, the width and frequency of the X-axis and Y-axis motors can be

freely configured within a specified range. In this mode, the scanning speed is not constant and may even be difficult to calculate precisely; moreover, various scanning waveforms are possible. This mode serves as a supplement to the aforementioned five modes, enabling it to accommodate a wider range of application scenarios.

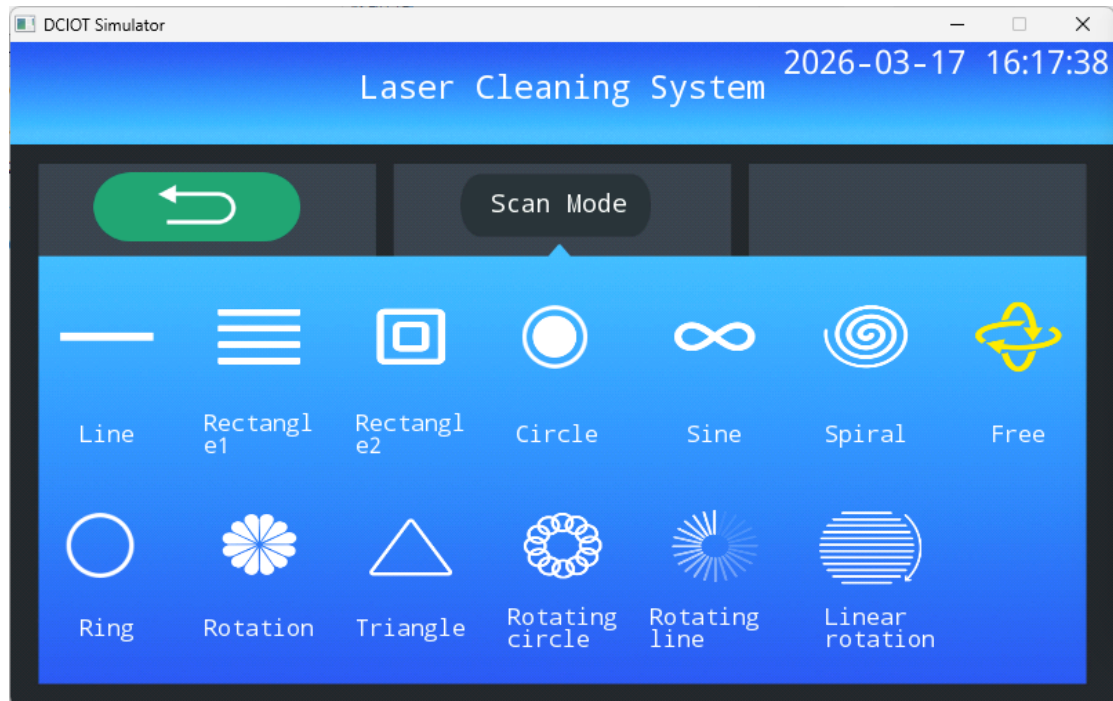


Figure 3.8 – Free Scan Mode Operation Interface

- X/Y frequency: less than 100 Hz;
- Scan Height: Set the scan height for Free Mode; range: 1 mm – 50 mm;

(8) Circle

This mode represents a scenario in which a ring gradually contracts inward; as shown in Figure 3.9, the fill spacing corresponds to the rate of the ring's contraction.

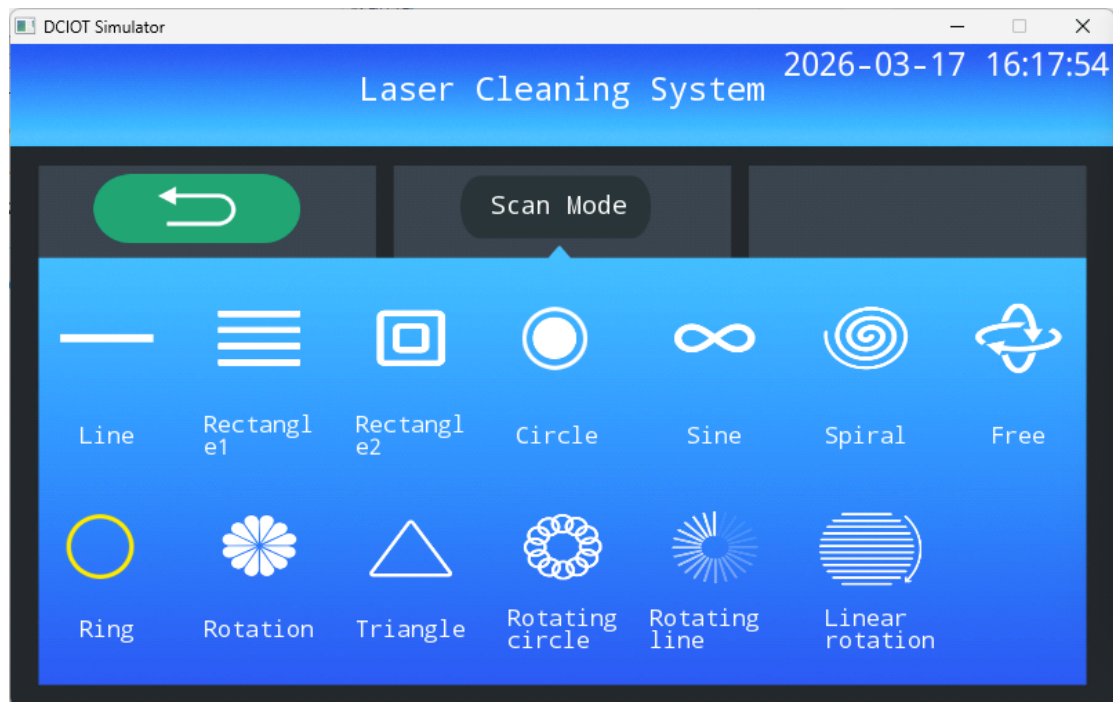
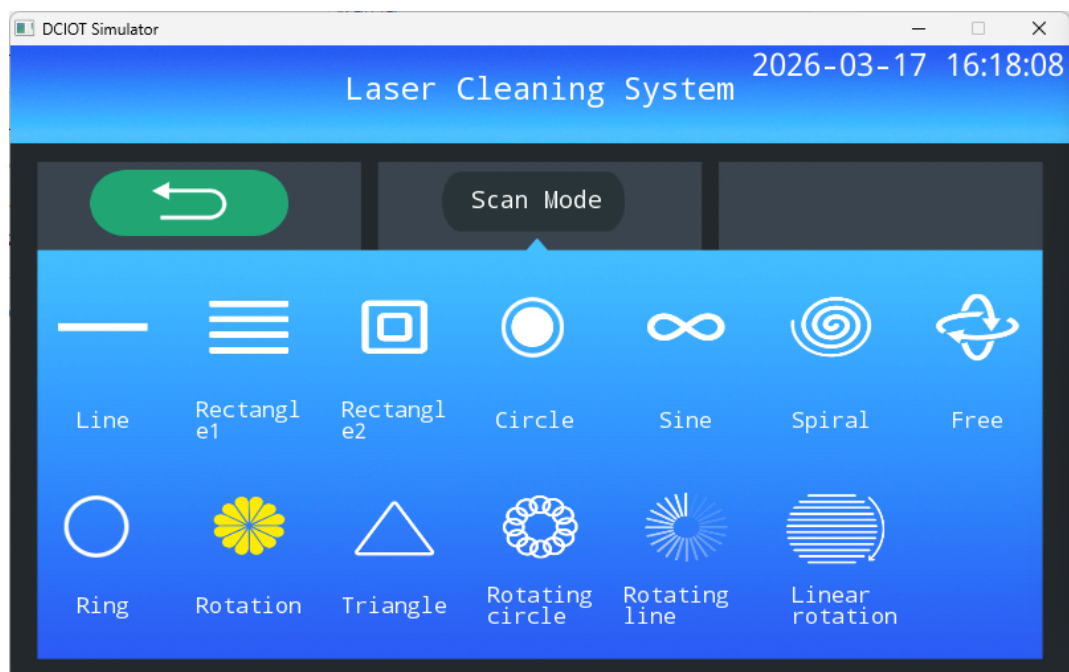


Figure 3.9: Ring Mode Operation Interface

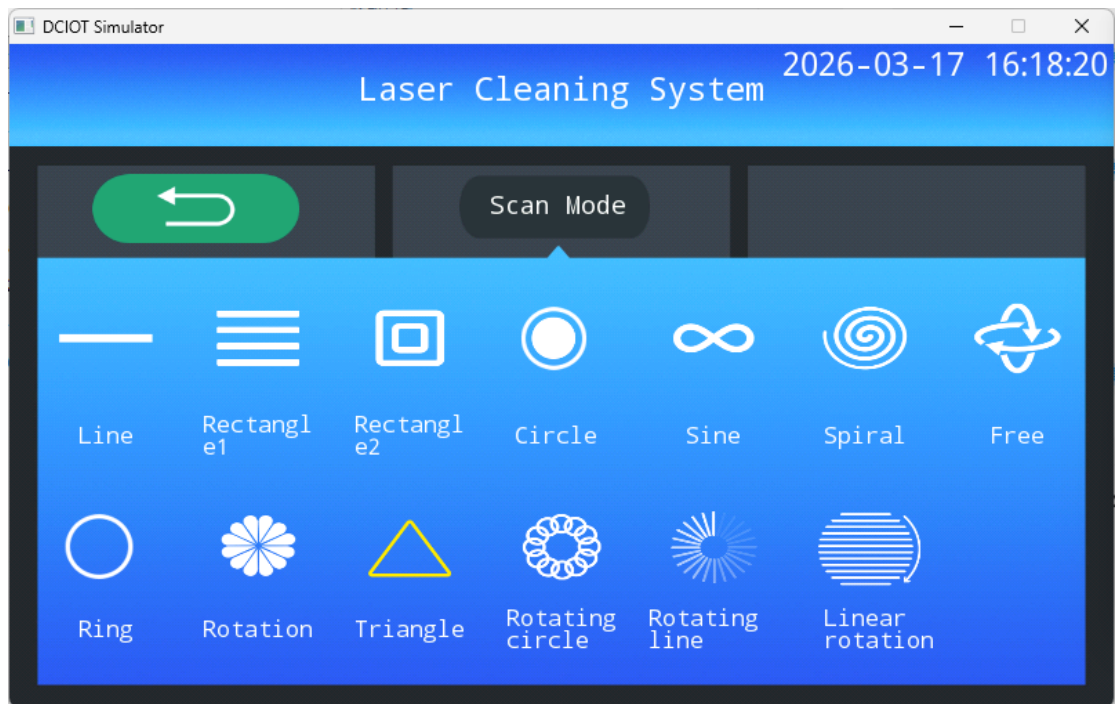
- Edge Factor: Adjustable inner circle size; Range: 0–100%;

(9) Rotation



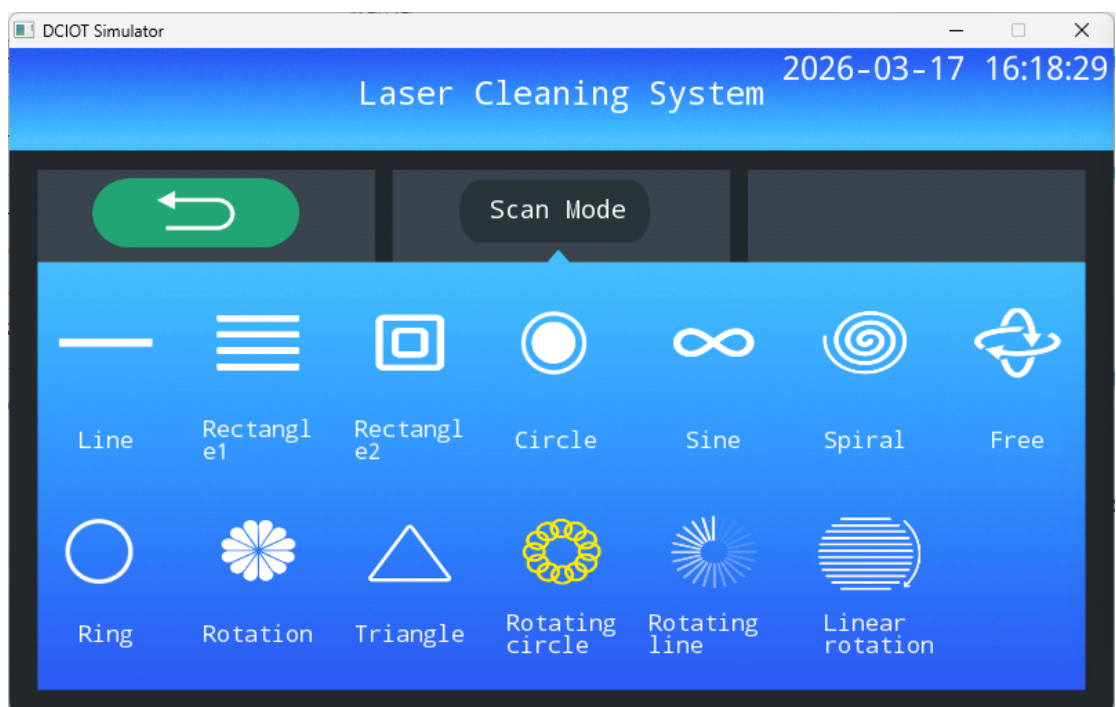
- The graph can be adjusted based on parameters such as period and series;

(10) **Triangle**



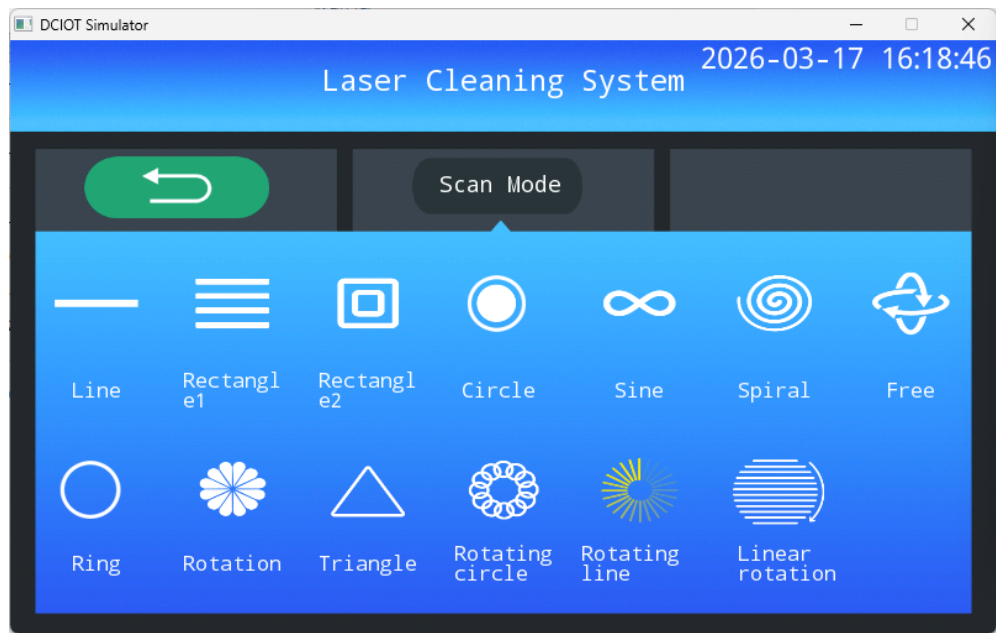
- Scan Parameters Interface – Adjust triangle size;

(11) **Rotating circle**



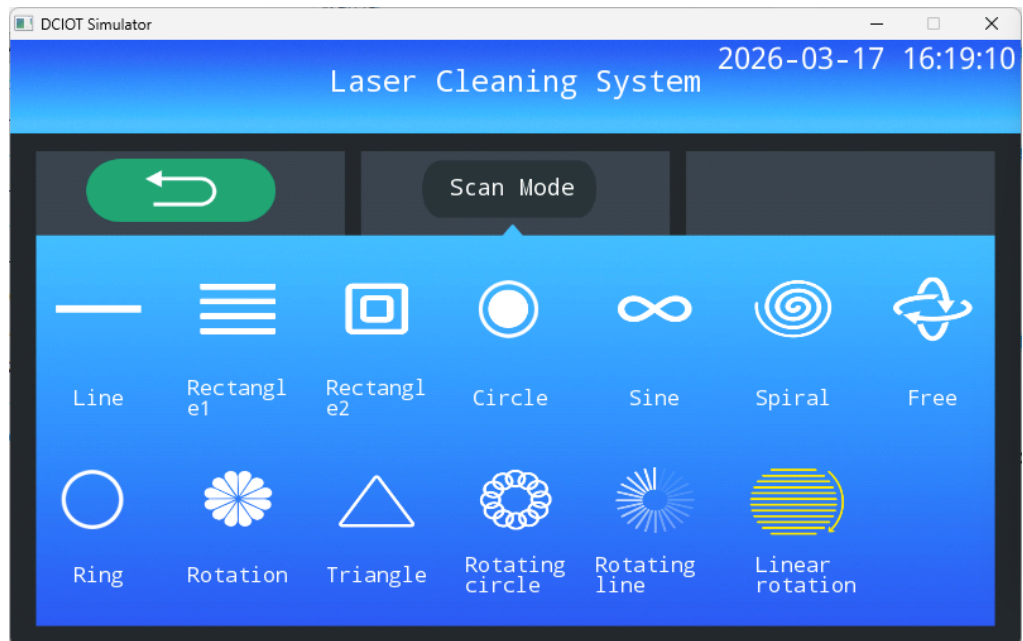
- Multiple circular elements are seamlessly connected and arranged in a 360° circle; their size can be adjusted on the scanning interface;

(12) Rotating line



- The endpoint of the straight line segment points toward the center; rotating the segment by 360° enables rotational scanning cleaning;

(13) Linear rotating circle

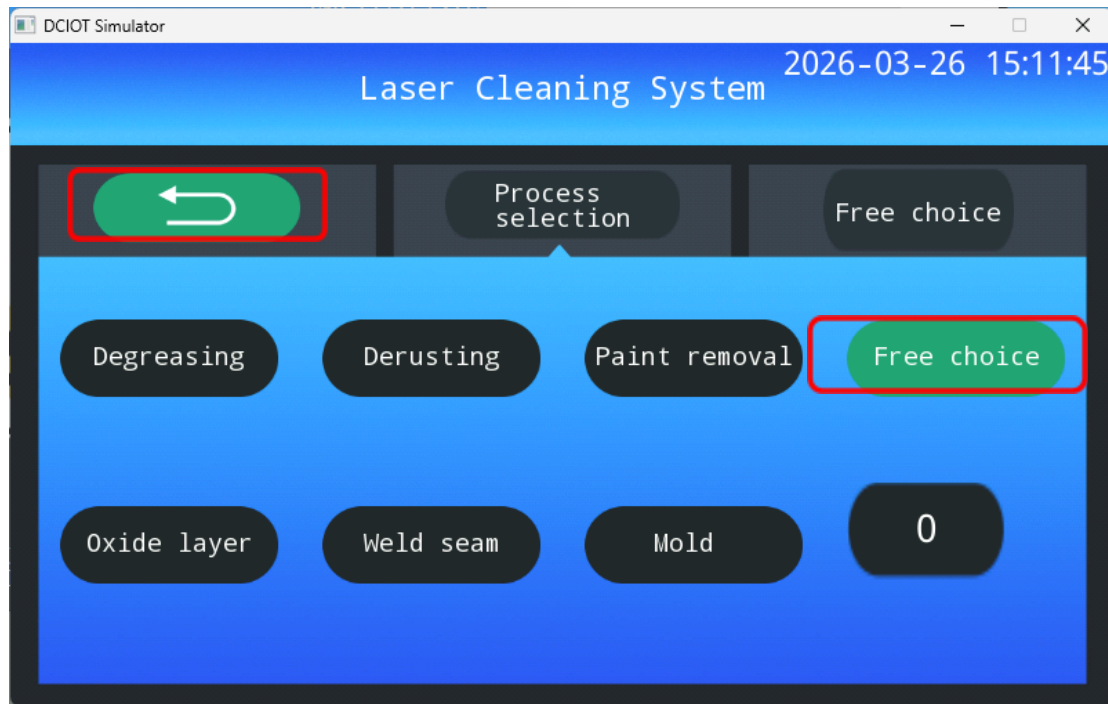


- Linear scanning with multi-angle环绕 motion – no fill spacing setting required in this mode;

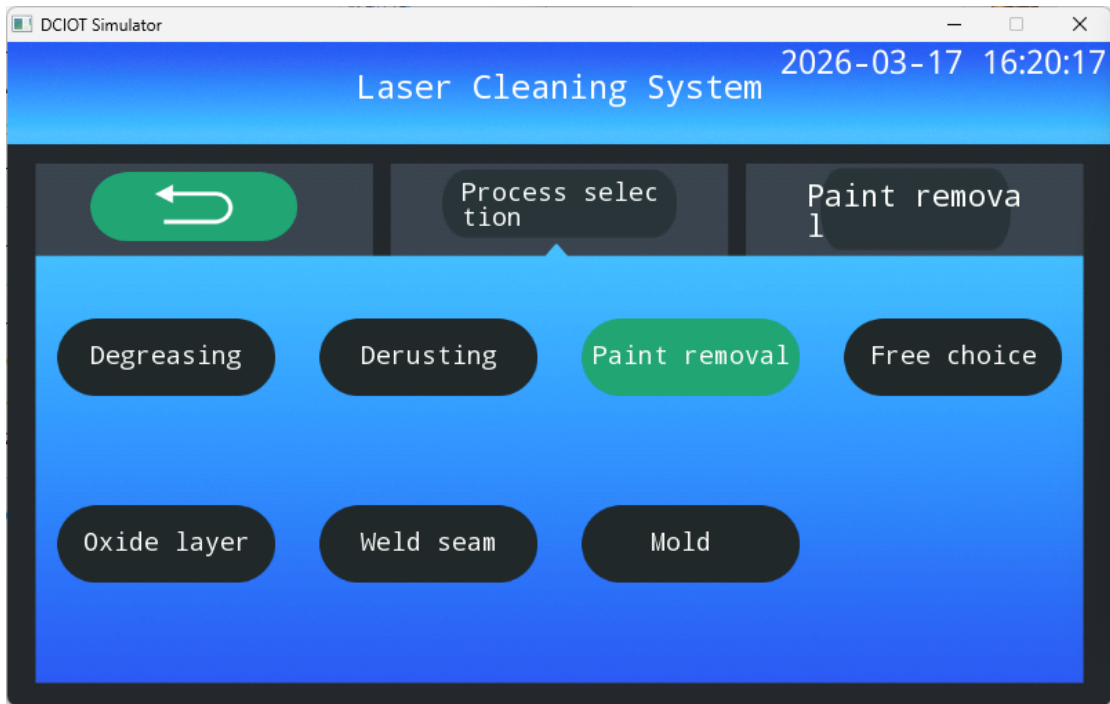
3.3.2 Database

(1) Custom Database

Custom cleaning parameters: This system provides a total of 100 customizable parameter sets (ranging from Set 1 to Set 100), with Set 1 designated as the default set; Sets 2–21 support custom cleaning parameter labels (Chinese/English – other languages are not currently supported). By configuring different process group parameters, users can quickly retrieve the appropriate parameter set for specific cleaning requirements, eliminating the need for manual reconfiguration.



- Enter the "Process Selection" menu, then click the "Free Selection" button. In the numeric input field below "Free Selection," enter your custom parameter set. Based on the actual cleaning conditions, tune the appropriate parameters and sequentially write them into the relevant fields. Finally, enter the process tag "wood" in the "Process Tag" column (Chinese/English support is currently available).



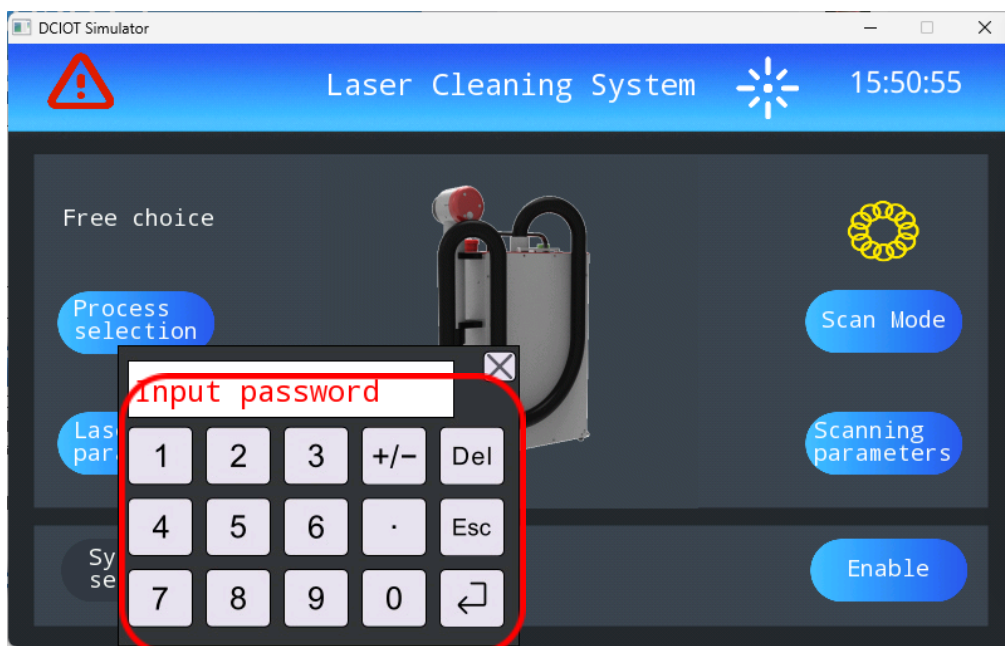
(2) Default Process Library

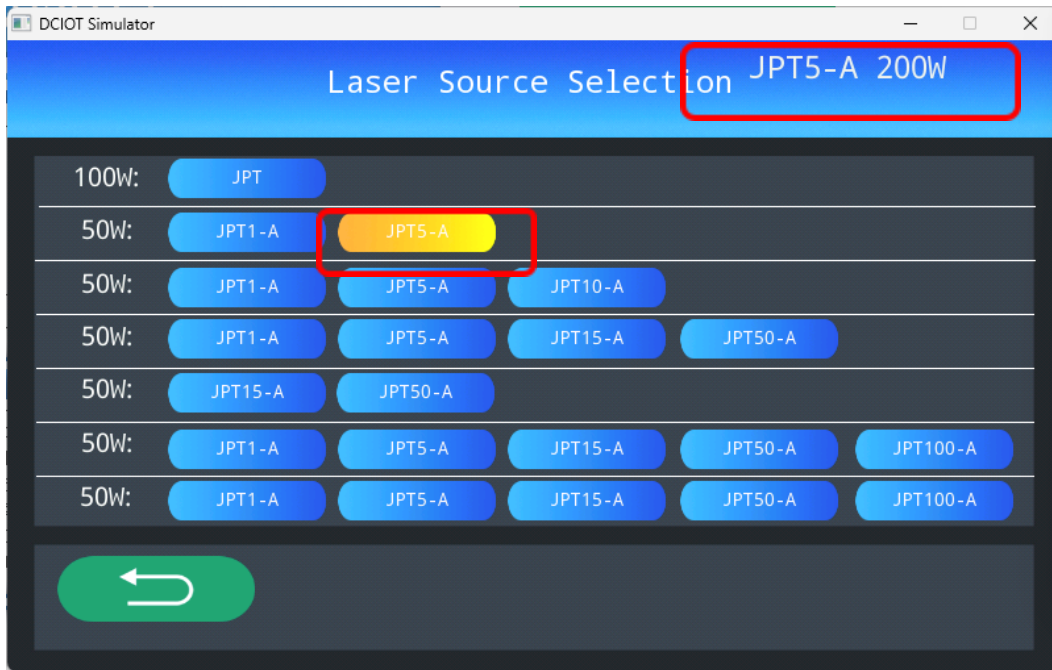
- The default process library is a system-integrated process database designed to accommodate lasers from various brands and specifications. By selecting and invoking appropriate parameters, users can effectively streamline the parameter adjustment process, enhance equipment compatibility, and reduce operational complexity for personnel.
- Serial Number: Select the database identifier to retrieve the process data stored for that specific serial number (default: No.1); Password: 123.
- Step 1: Before using the device, please verify the laser brand, single-pulse energy, and other parameters according to the data provided by the laser supplier. Refer to the JPT Laser Example to confirm the relevant laser parameters.

型号 指标		YDFLP-CL-200 -1	YDFLP-CL-300 -1	YDFLP-CL-200 -5	YDFLP-CL-300 -5	YDFLP-CL-300 -10
M ² 典型值		2		5		12
输出靶缆长度	m	5				
平均输出功率	W	>200	>300	>200	>300	>300
最大脉冲能量	mJ	1.5		5		15
频率可调范围	kHz	1-4000				
脉冲宽度	ns	2-500				

- Step 2: After powering on the device, access the Laser Cleaning System.

Click the "System Settings" option; a password entry window will appear. Enter the Primary Password (Password: 123) to enter the Device Management Interface. Then, click "Laser Selection" to navigate to the Laser Selection page. Based on the supplier's documentation, select the appropriate laser option. The laser model selected for the machine is displayed in the top-right corner; at this point, the default parameters (degreasing and cleaning) have been applied, and the data is ready. (To switch to the Default Process Library automatically, simply click the "Process Selection" button on the Process Library page – this will return you to Custom Process 1.)



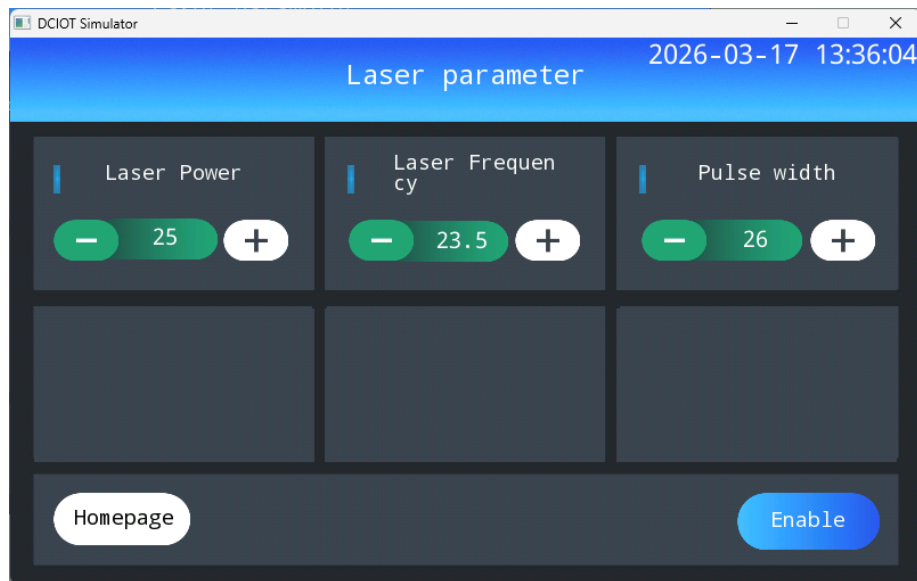


Select the appropriate laser type.

- Step 3: Return to "Process Selection." Depending on the workpiece, simply click the "Rust Removal" button; the corresponding process label will then appear in the tag row – indicating that the system has already prepared the process parameters for the rust removal operation. Return to the "Main Page," click "Enable," and then press the "Lighting" button to initiate the rust removal procedure. The same procedure applies to other default process operations.

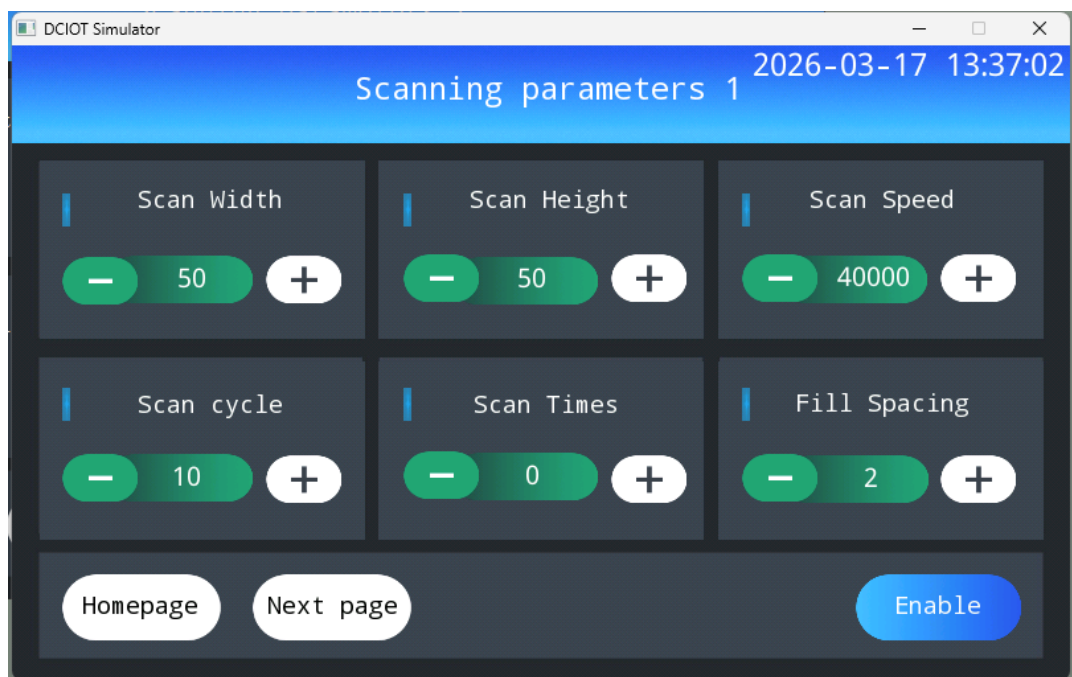
3.3.3 Parameter Settings

- (1) laser parameter



- Laser power: Set the average laser output power within the range of 10%–100%;
- Frequency: Laser pulse repetition frequency setting, range: 1–4000 kHz;
- Pulse width: adjustable from 1–500 ns;

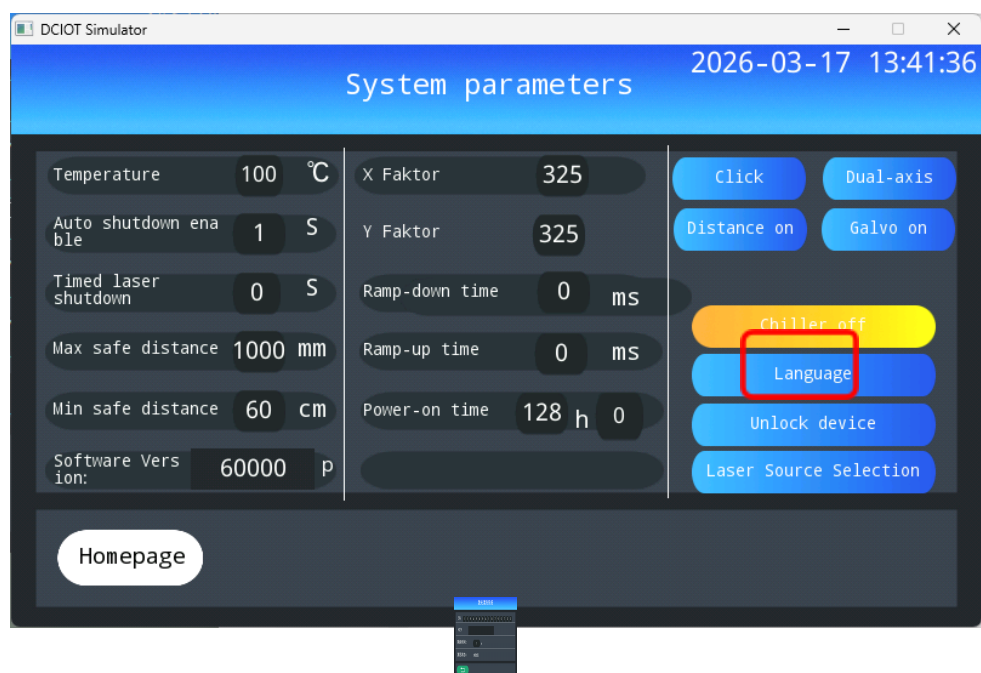
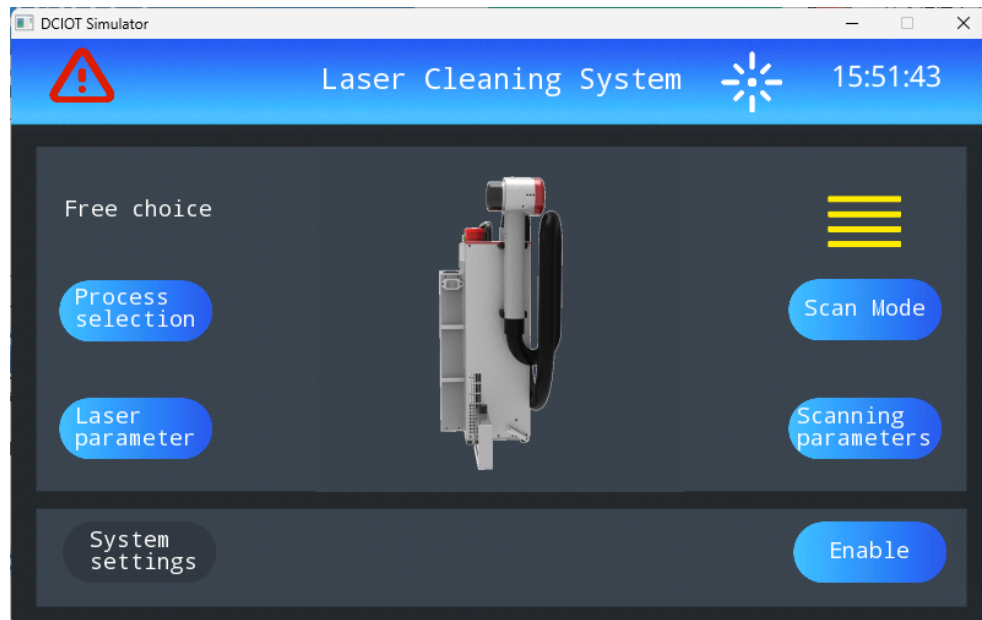
(2) Scanning Parameters

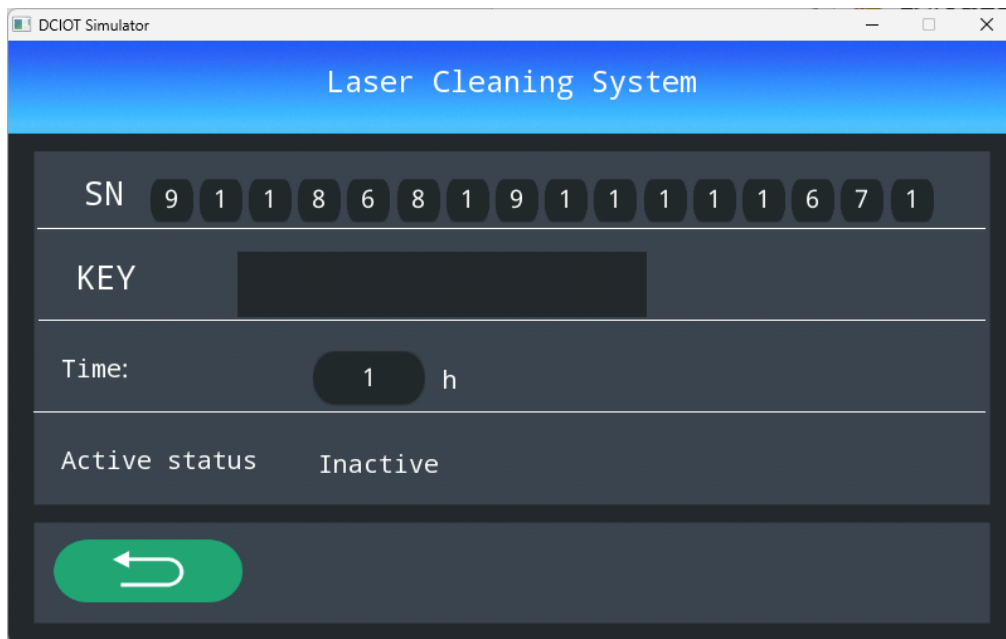


- Scanning Parameters: This interface allows you to configure parameters such as scanning width, scanning height, scanning speed, scanning cycle, number of scans, and filling spacing;

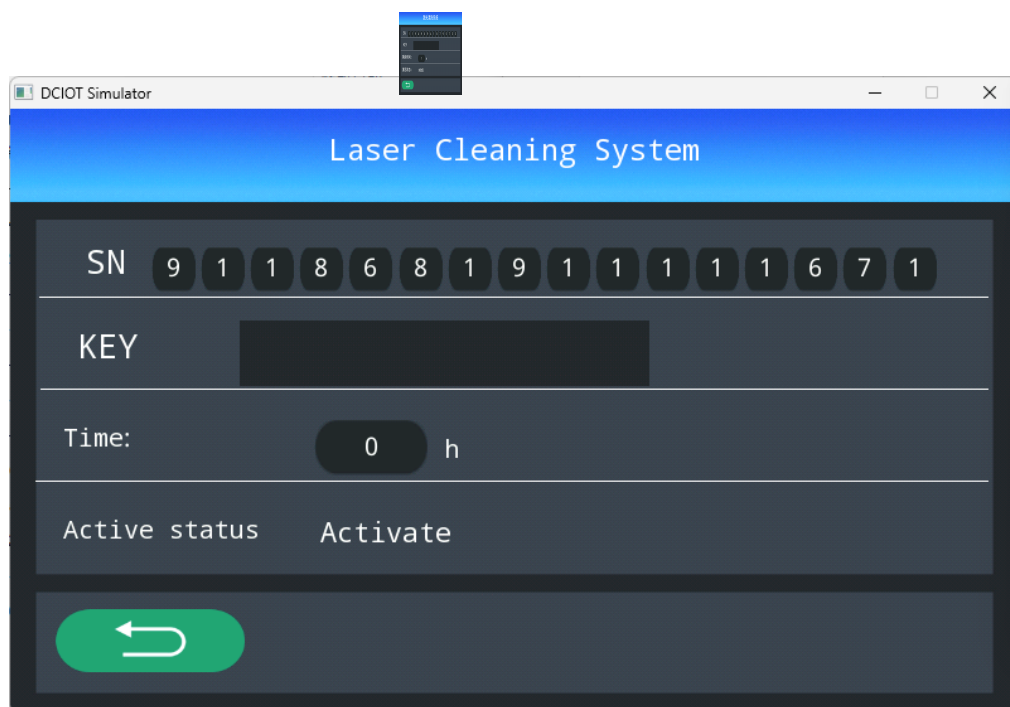
3.3.4 Decryption and Password Setup

- During the trial period, the phrase "Please activate" will appear in the top-right corner, indicating that the trial period has expired and the software needs to be activated.





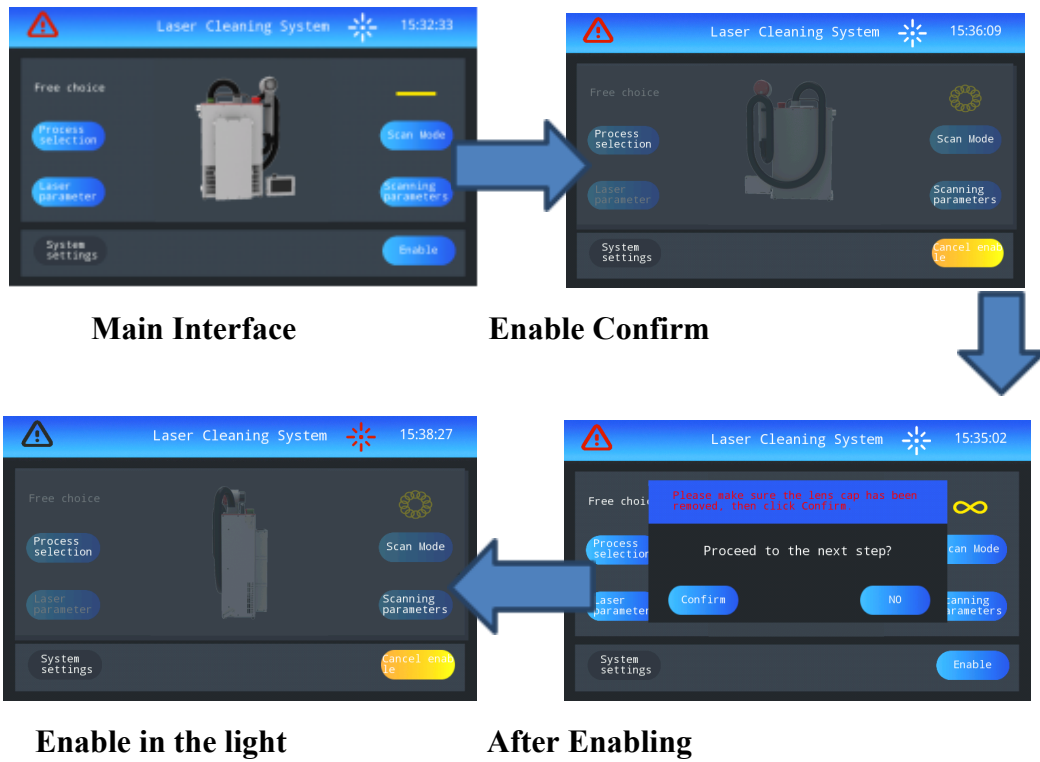
1 hour (Unactivated)



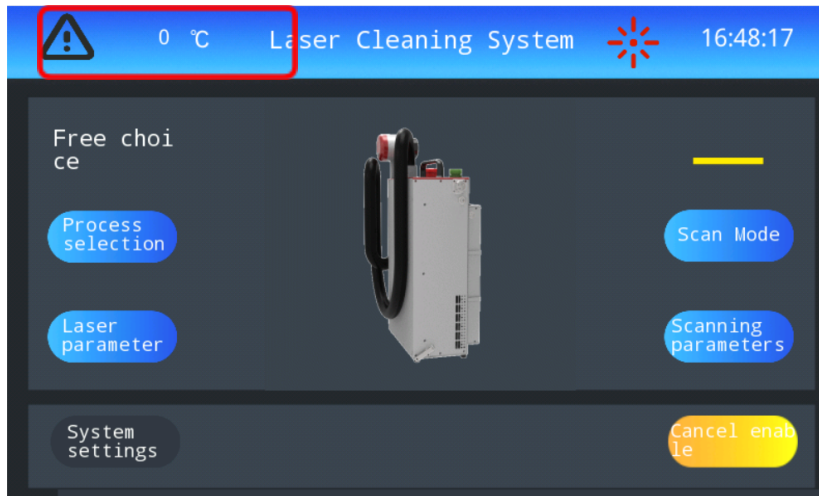
Permanent activation status

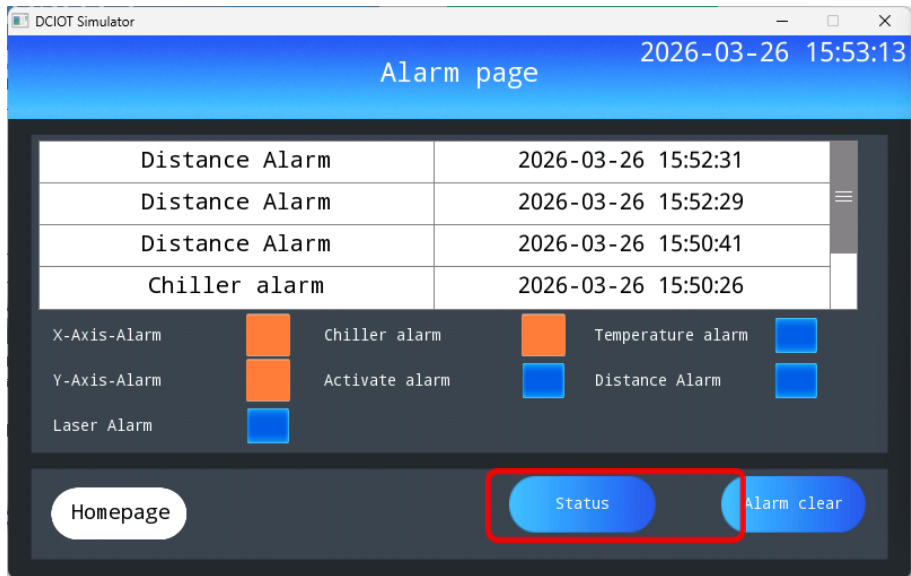
- Users can set a trial period or enable permanent decryption based on their specific on-site requirements.

(12) Other (Light Extraction Step)

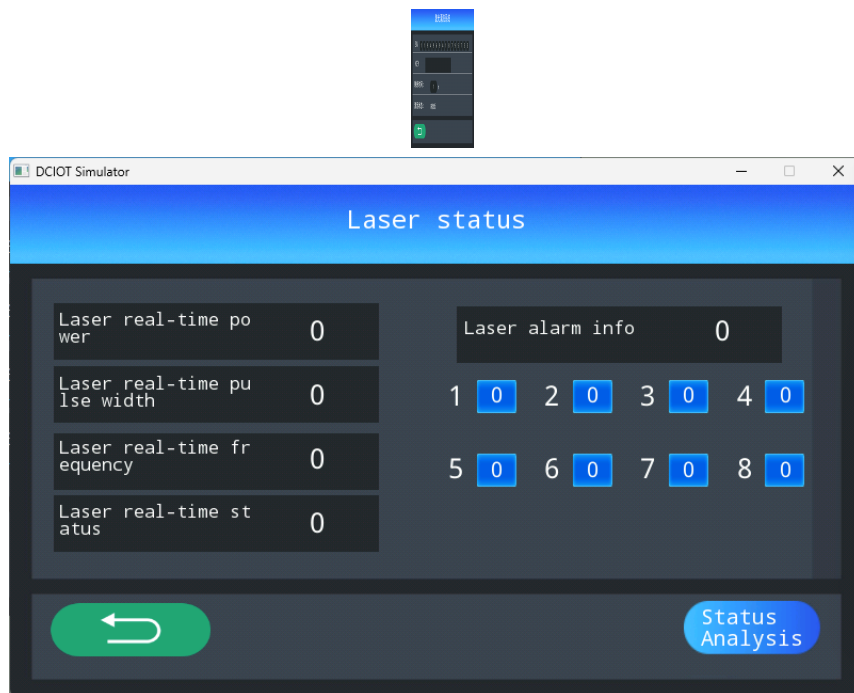


(14) Alarm View



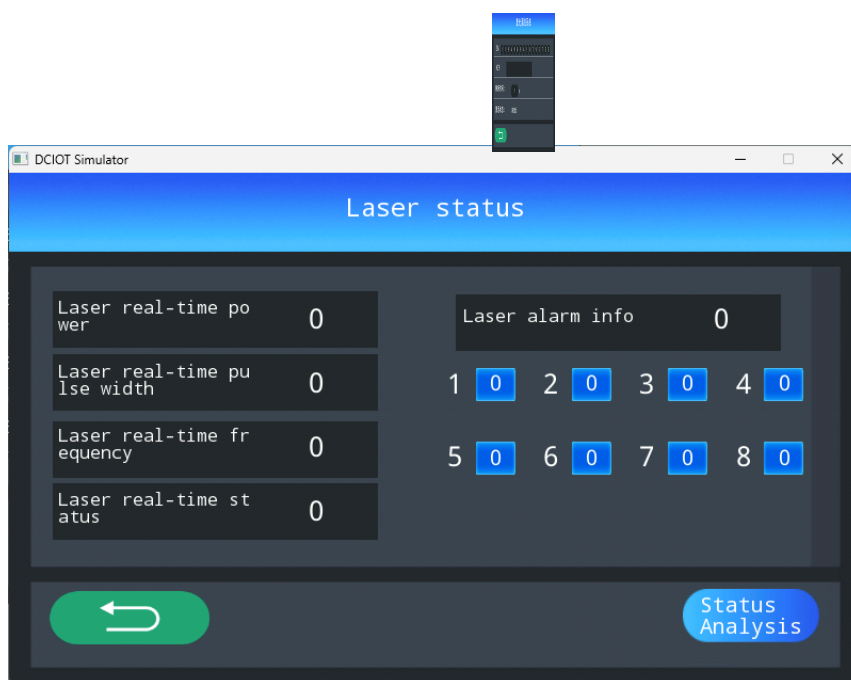


- This interface displays the alarm status of each component; red indicates an alarm, while blue indicates normal operation.



- This interface also allows you to monitor the laser's operating status during operation, displaying the laser power, pulse width and frequency, as well as the laser signal status in real time.

表【1.5】监控信息		
Byte	描述	单位
1	传感器 2 (L_Byte)	0.1℃
2	传感器 2 (H_Byte)	
3	传感器 1 (L_Byte)	0.1℃
4	传感器 1 (H_Byte)	
5	种子源 TEC 温度(L_Byte)	0.1℃
6	种子源 TEC 温度(H_Byte)	
7	二级电流 (L_Byte)	0.1A
8	二级电流 (H_Byte)	
举例：读取激光器的传感器 1		



- The operational status of each laser signal can be viewed directly on this interface without requiring a physical connection to the laser device.
- form

3.3.5 High-Speed Fan and LED Light Introduction

- The high-speed fan is paired with a 150 W, 24 V independent switching power supply, designed specifically for use with high-speed fans; do not mix this component with other components.
- Check whether the $\pm 24V$ power supply cable for the fan is connected incorrectly (brown wire for +24V, blue wire for 0V); incorrect wiring may

cause the fan to burn out and is not covered under the standard warranty.

- The fan speed adjustment is shown in the figure below.

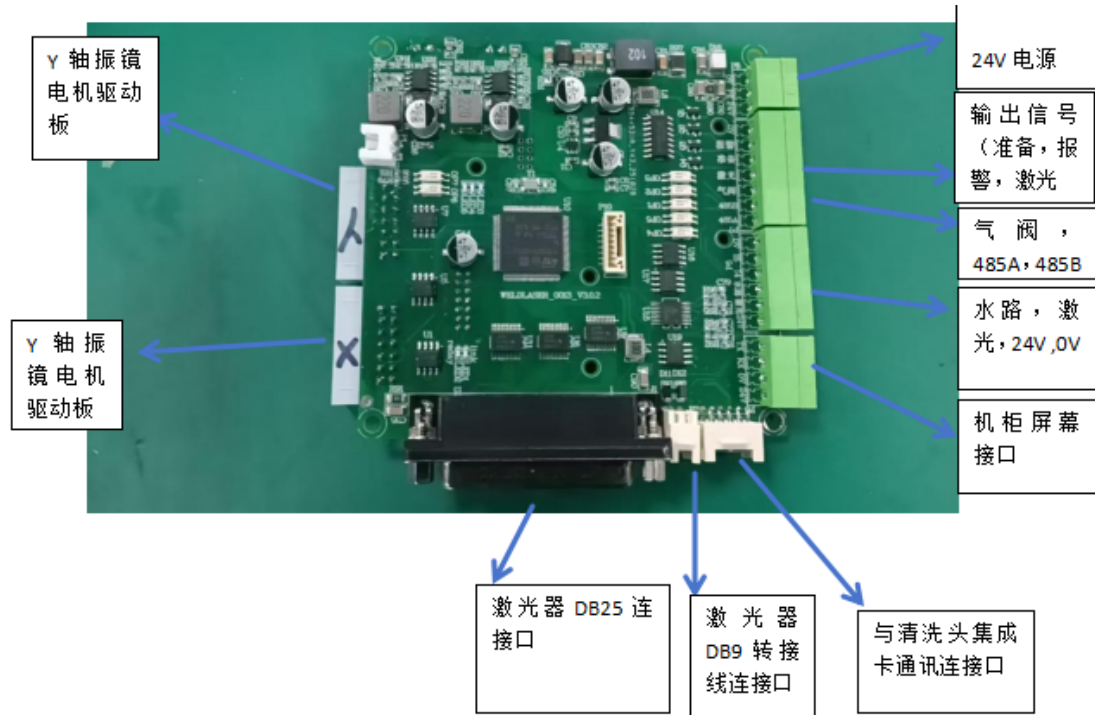


Turn the knob inside the red square: turn it left to increase airflow, or turn it right to decrease airflow.

- The LED light is located on the side of the cleaning head and features a portable card slot for easy installation and removal; a single-press switch allows sequential switching between: Front Light (Low Brightness) – Front Light (High Brightness) – Front Light (Flash Mode); a double-press switch activates Flash Mode + Beep Alarm. For the first use, the device requires a charging time of at least 5 hours. A TYPE-C fast-charging adapter is included for charging; during charging, the red light will flash, and once fully charged, the red light will remain steadily illuminated. This configuration is specifically designed for use in low-light conditions.

4. Wiring and Installation Instructions

4.1 Cleaning Card Interface Definition



P6: Power Interface

order number	Input/Output	voltage	remarks
1	import	24V	+24V power input
2			empty
3	import	0V	GND

P8: Touchscreen Interface

order number	Input/Output	voltage	remarks
1	output	24V	+24V power output
2	output	0V	GND
3			RX
4			TX
4			TX

J1: Mirrors Interface

order number	Input/Output	voltage	remarks
2	output		Y-axis: ± 5 V
3	output		GND

15	output		X-axis: ± 5 V
16	output		GND
9.10.22	output		+15V
11.23.24	output		GND
12.13.25	output		-15V

J2: Pulse Laser Interface (25-pin DB connector and laser plug-in)

pin	Input/Output	electrical level	function
1-8			Power control pin; Pins 2 and 3 receive pulse-width serial signals.
9			Latching signal
10.14			0V
17			+5V
18			MOswitching signal
19			Laser activation signal AP
20			Frequency-modulated signal
22			Red Light Enable – Pulse Width Adjustment ENABLE
23			ESTOP

P5: External Control Interface

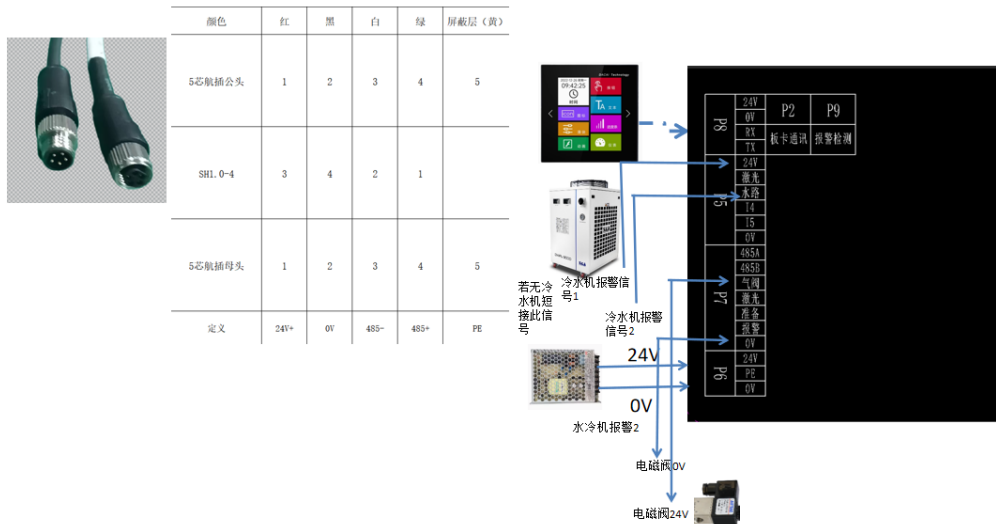
pin	Input/Output	electrical level	function
1	output		24V
2			Laser switch: short-circuit Pin 1 (24V) to activate laser output; disconnect Pin 1 (24V) to stop laser output.
3	import	24V	Position switch alarm input (distance sensor)
4	import	24V	Chiller alarm signal input (if not connected, short-circuit P5-1 and P5-4)
5			Keep
6			Keep
7		0V	

P7: Signal Output Interface

pin	Input/Output	electrical level	function
1	output	0V	GND
2	output	24V	Air valve output – 24 V
3	output	24V	laser output
4	output	24V	Prepare for output
5	output	24V	Alarm Output
6	output	24V	24V output (used for chillers and laser alarm signal sources)

4.2 System Wiring Instructions

- Two-core aviation connector: Fan power supply
- Five-core aviation connector: Provides integrated communication interface for connection with the cleaning card.
- X-and Y-axis galvanometer: Galvanometer connection



5 Pre-sales and After-sales Service

5.1 Service Commitment

Our company adheres to a customer-centric approach, thoroughly understands our clients' cleaning requirements, and provides comprehensive, personalized pre-sales and after-sales services—including installation, commissioning, training, and maintenance.

(1) Pre-sales Service

Prior to signing the contract, the company provides clients with various production process solutions, as well as technical consulting services for laser cleaning equipment, sample preparation, and equipment selection services.

(2) Installation and Commissioning

In accordance with the contract, our company will safely transport the equipment to the customer's designated installation site free of charge within the specified timeframe and will dispatch a Technical Service Engineer to perform on-site installation. Once the customer has prepared the necessary spare parts for installation and commissioning, the Technical Service Engineer will complete the machine installation and commissioning within two working days, making the equipment available for the customer's use, while ensuring that the installation and commissioning site remains tidy, clean, and well-organized.

(3) After-sales Training

The Company provides free technical training; upon completion of installation and commissioning, technical training shall be conducted for the Buyer's operators either at the Buyer's site or at the Seller's domestic training and maintenance center, until the operators are able to operate the equipment normally under standard conditions.

(4) After-Sales Commitment

- One-year free warranty on the device (excluding human-induced damage or lens damage);
- Free technical consultation, process and software upgrades, and other services;
- Customer service response time is within 8 hours;
- Lifetime maintenance service is provided; a fee is charged only for replacement parts.
- Providing comprehensive software and hardware support throughout your entire lifecycle.

5.2 Limitations of Warranty

Damage to products or their components resulting from tampering, opening, disassembly, incorrect installation, or modification by personnel other than our company; damage caused by misuse, negligence, or accidents; or damage resulting from use outside the specified parameters, improper installation or maintenance, misuse, or use in violation of the information and warnings provided in the User Manual are not covered under the warranty. The Customer is responsible for understanding and operating the product in accordance with the instructions set forth in the User Manual and within the approved operating range; damage arising from incorrect operation is not covered under the warranty. Accessories and other components are not covered under the warranty.

Within the scope of this warranty, should the Buyer identify any issue, they must submit a written request within 30 days from the date the issue is discovered; this warranty does not apply to any third party (including the Buyer, end-user or customer as defined), nor does it cover any parts, equipment or other products not manufactured by our company.

5.3 Technical Support and Product Maintenance

This product does not come with any additional accessories that users can maintain; therefore, all repairs outside the scope of the provided accessories must be performed by our company's technical personnel.

Should any malfunction occur during the use of the product, please promptly

notify our company's technical personnel, and we will promptly troubleshoot the issue.

All repair and replacement products must be placed in the original packaging box provided by our company; otherwise, in the event of any product damage resulting from this, we reserve the right to refuse free repair services.

Upon receipt of our products, please promptly check whether the shipment is intact and complete, and whether all accessories are present. Should you encounter any abnormalities, please contact both the carrier and our company without delay.

Our company will continuously develop new products. The product information listed in this manual may change without prior notice. All technical specifications are subject to the terms and conditions set forth in the contract.

The above warranty and service terms for our products are provided for user reference only; the official service and warranty provisions shall be governed by the terms set forth in the contract.