



Users should read this manual before using the controller.

- This manual contents is the system operation manual
- Read this manual carefully to ensure proper electrical connection

# RDC6563F

## Standalone Fiber Cutting Control System User Manual V2.0

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This product has passed the US Federal Communications Commission safety certification, in line with US electronic product safety regulations.

## Safety information

Please make sure that the operation is correct and the method is safe when using the system. Some signs or words will be used to remind you of dangerous matters and some important information.



**Important:**

It indicates important information that needs attention during using of the product. Please don't ignore this information, which will provide effective operation assistance.



This mark indicates laser radiation and is generally applied to the product that outputs the laser. Please be careful when using this type of equipment, pay attention to safety.

## Receiving, Unpacking, Inspection

The product has a plastic or metal casing to protect the exterior electrical component from damage. The product is wrapped in a foam bag and packed in an antistatic bag. If the package has any external damage, please check the goods and notify the carrier of the damage situation in writing.



**Important:**

**After receiving the products, please check whether the outer packaging is in good condition, whether the product is complete after unpacking, and whether the parts are in good condition. If you find damage, please contact Ruida Technology immediately.**

Keep the packaging materials and wiring accessories when unpacking. Please be careful when disassembling the package. After unpacking the goods, please check if the parts are complete. If you find that the parts are missing or the parts are damaged, please contact Ruida Technology immediately. If you notice any obvious damage to the device, do not install the device or commission the device.

RDC6563F standalone fiber cutting system delivery list is shown in the following:  
(As the product is constantly updated, the accessories that may be received are different from this list)

Component	Quantity	Description
RDC6563F mainboard	1	
RDC6563F-HMI panel	1	
DB9-3M	1	
USB cable-2.0-black	1	
USB Adapter cable AM/AF- 1M	1	
USB Adapter cable -1M-black	1	
Network cable -5M-blue	1	
BWK301- Wireless handset	1	include: BWK301- Wireless remote control, BWK301R-wireless receiver, 433MHz-2dB helical antenna
LFS-AP02 Amplifier	1	
15m Amplifier cable-black	1	



Sensor cable -16cm- Silver white	1	
U-disk-4G	1	
Steel rail 350*35*7.5MM	1	
Rail mount	2	
3.81MM- Curved insertion -6P socket-black	6	
5.08MM- Curved insertion --3P socket - black - With fixing screws	1	
DB15- Welding wire-3	4	
DB15-VGA shell	4	
DB15 motor cable-2m	3	
DB25 motor cable-2m	1	

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# Chapter 1 Overview

## Main contents

- RDC6563F system introduction
- RDC6563F Technical parameter introduction
- Product installation dimension drawing

## 1.1 Introduction to standalone fiber cutting control system

RDC6563F is a fiber cutting control system independently developed by Ruida Technology. This control system has better hardware stability and better resistance to high voltage and antistatic interference. The human-machine operating system based on LINUX has a more friendly operation interface and more powerful functions. The controller includes more complete and better motion control functions, large-capacity file storage, more compatible U disk driver, multi-channel general/dedicated IO control, integrated dedicated time system to support hardware encryption algorithm, and PC communication support. Ethernet communication and USB communication are optional.

The Z-axis is an automatic height-adjusting system based on capacitive sensing technology. It uses a high-performance amplifier and a professional anti-jamming design. The use of speed closed-loop control greatly improves the performance of the height controller speed and response speed, and achieves precise automatic height control. With the RDCutist software, you can achieve the functions of leapfrog, flight cutting, short-distance without lifting.

### 1.1.1 Functional Description

- Achieve high-speed motion and response speeds of servo motors or stepper motors.
- Support leapfrog, flight cutting, short-distance without lifting
- Support automatic feeding, AB switching movement functions.
- Supports multiple protection functions such as collision alarm, limit protection, and servo alarm.
- Capacitor parameter auto-calibration can be achieved to match any cutting head.
- Support different lifting height and speed settings to facilitate different ways of cutting
- Supports a variety of punching methods such as segmental punching, progressive punching, and pulse punching.
- Optimized gas control, effective reduction of gas loss, 3-way gas control output.
- Support remote control of wireless controller, USB, Ethernet.
- The system comes with a time system for system encryption and installment payment management.

## 1.2 RDC6563F main technical parameters

### 1.2.1 RDC6563F main technical parameters

- Supports up to 6 axes of high speed motion, and with a maximum pulse frequency of 500 KHz.
- Each axis supports positive and negative limits, servo alarm input detection and protection.
- Linear/Arc/B-spline interpolation accuracy +/- 0.5 pulses.
- Supports small circle speed limit, power following functions.
- 15 general-purpose opto-isolated inputs compatible with 5V/12V/24V logic voltage.
- 15 general-purpose opto-isolated OC gate output, maximum 300mA drive capability (with freewheeling protection), it can directly drive 24V/5V DC relay.
- S-type acceleration and deceleration control and adaptive speed look-ahead processing ensure smooth running.
- Lasers can support a variety of laser types such as fiber optics and glass tubes.
- Support 5V, 24V PWM / L\_ON laser control signal output.
- Support 5V, 10V analog voltage laser power control output.

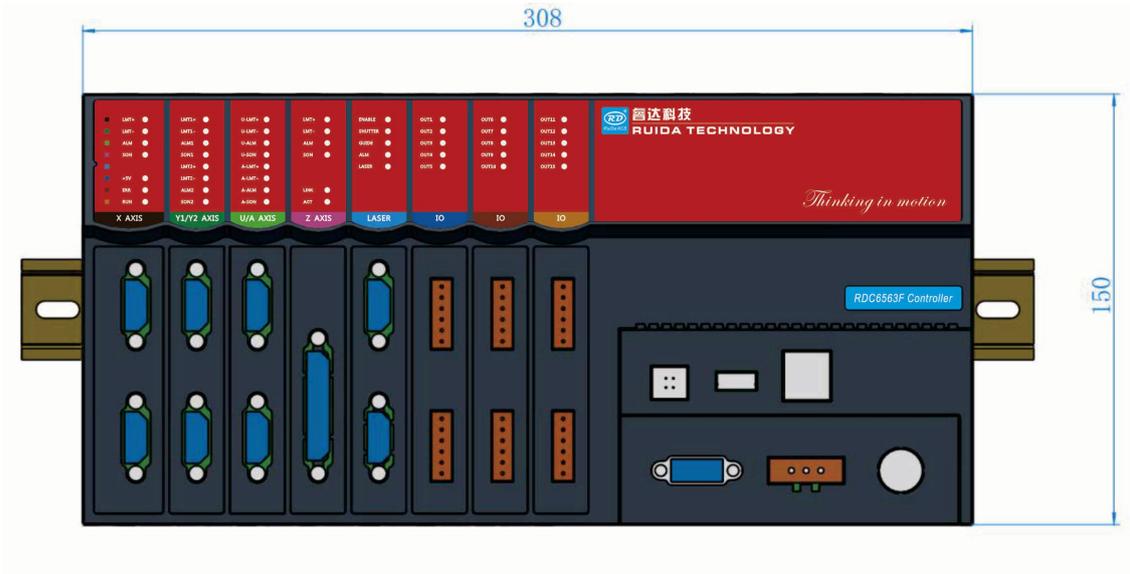
### 1.2.2 Z Axis following system technical parameters

- The dynamic following accuracy is less than 0.1mm.
- The detection accuracy is less than 0.01mm.
- Capacitance detection range is 0 to 9.9mm.
- -10V ~ +10V servo drive analog voltage control output.
- The maximum speed can reach 800mm/s, and the maximum acceleration can reach 10000mm/s<sup>2</sup>.

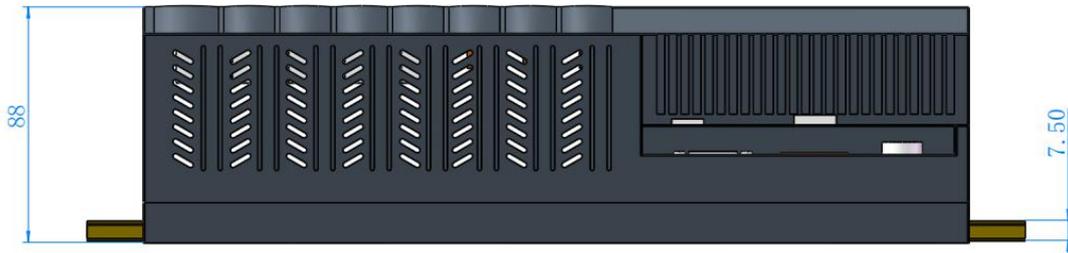
### 1.3 Mainboard size chart

RDC6563F Mainboard size is shown below:

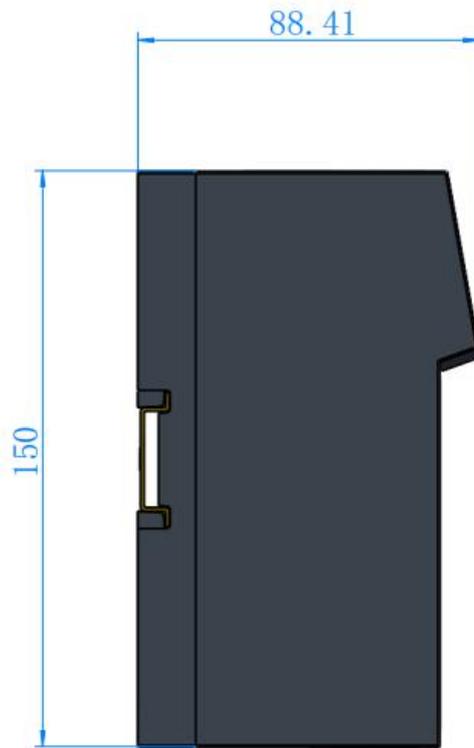
unit: mm



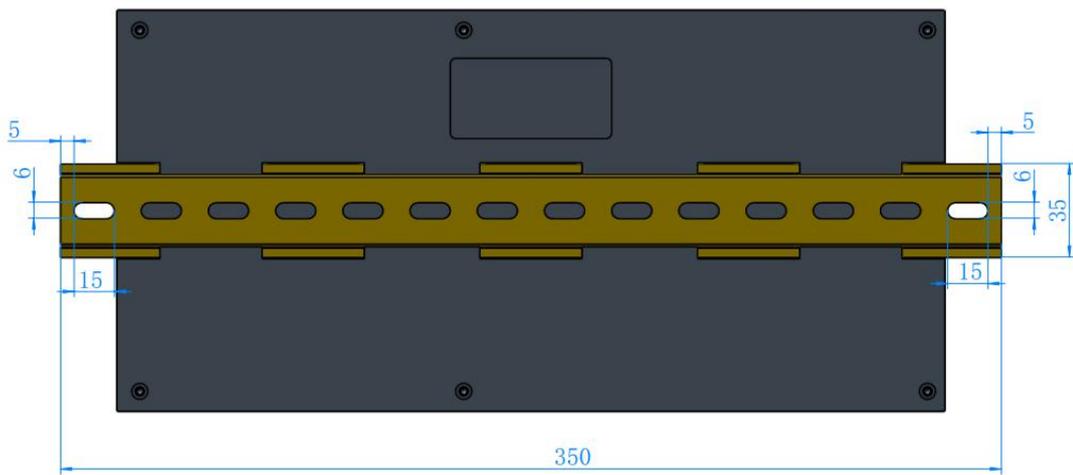
Top view



Front view



Left view



Bottom view

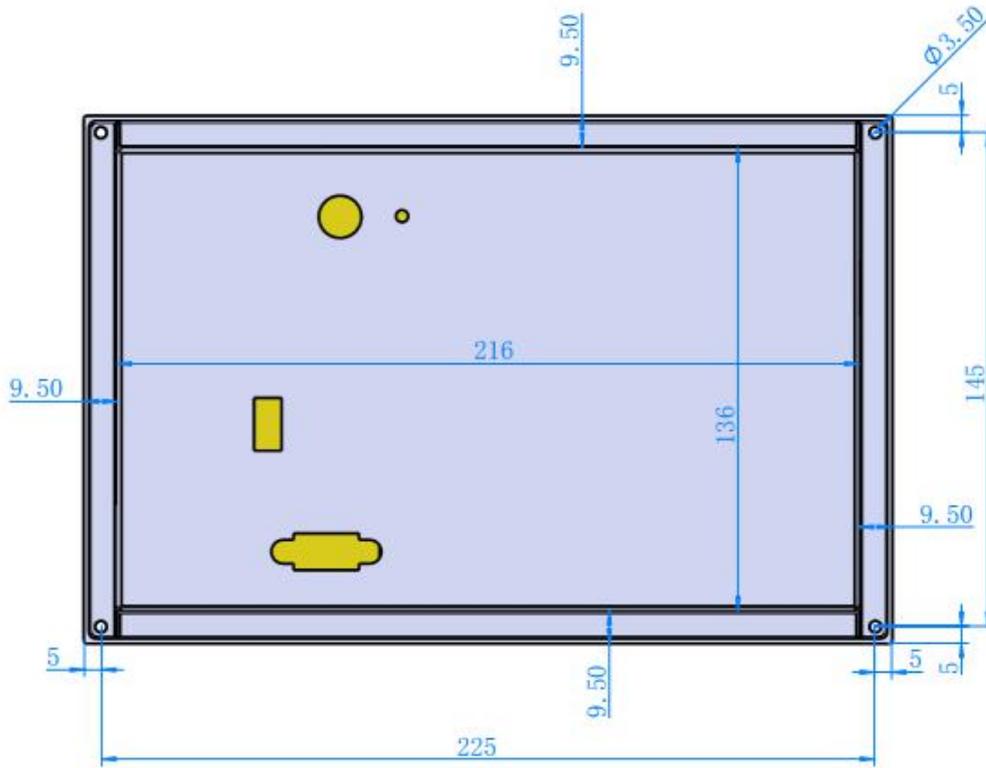
## 1.4 Panel size chart

RDC6563F panel size is shown below:

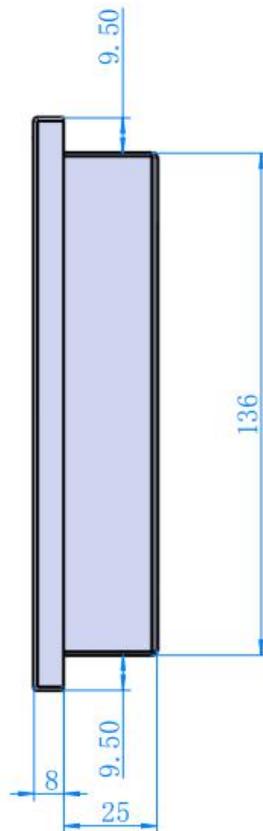
unit: mm



Front view



Bottom view

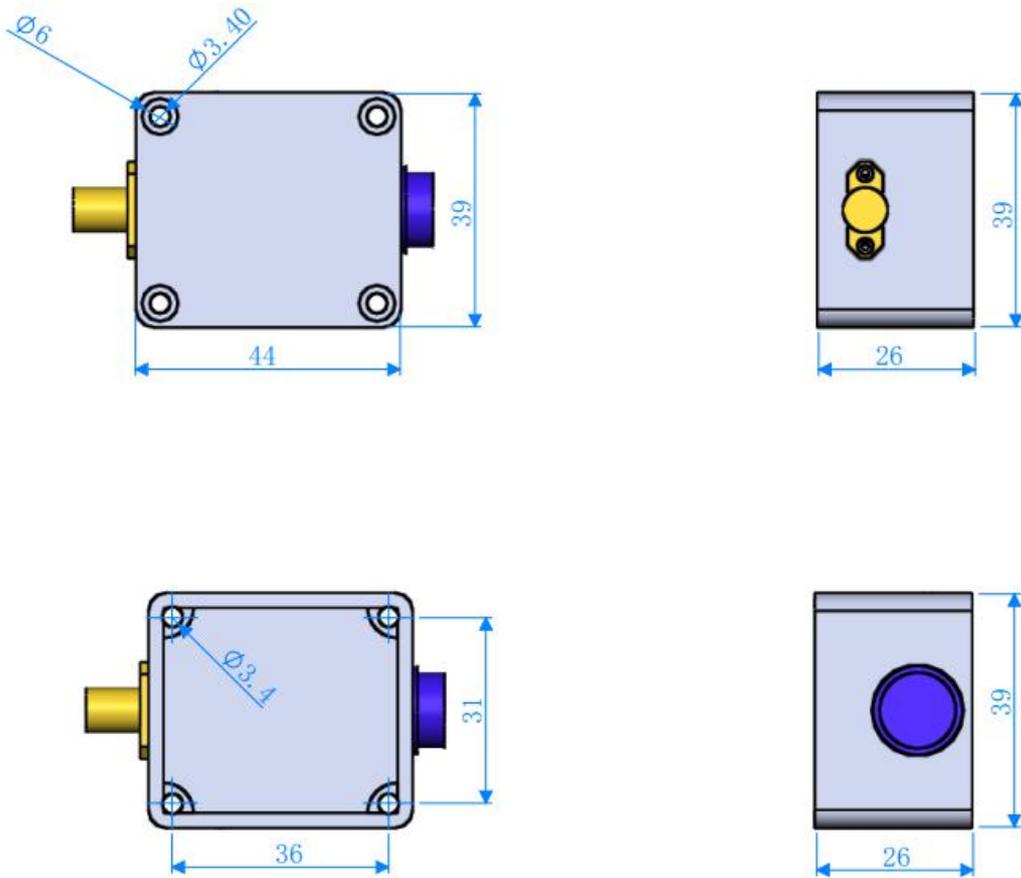


Right view

## 1.5 Amplifier installation Dimensions

The amplifier size is shown below:

Unit: mm



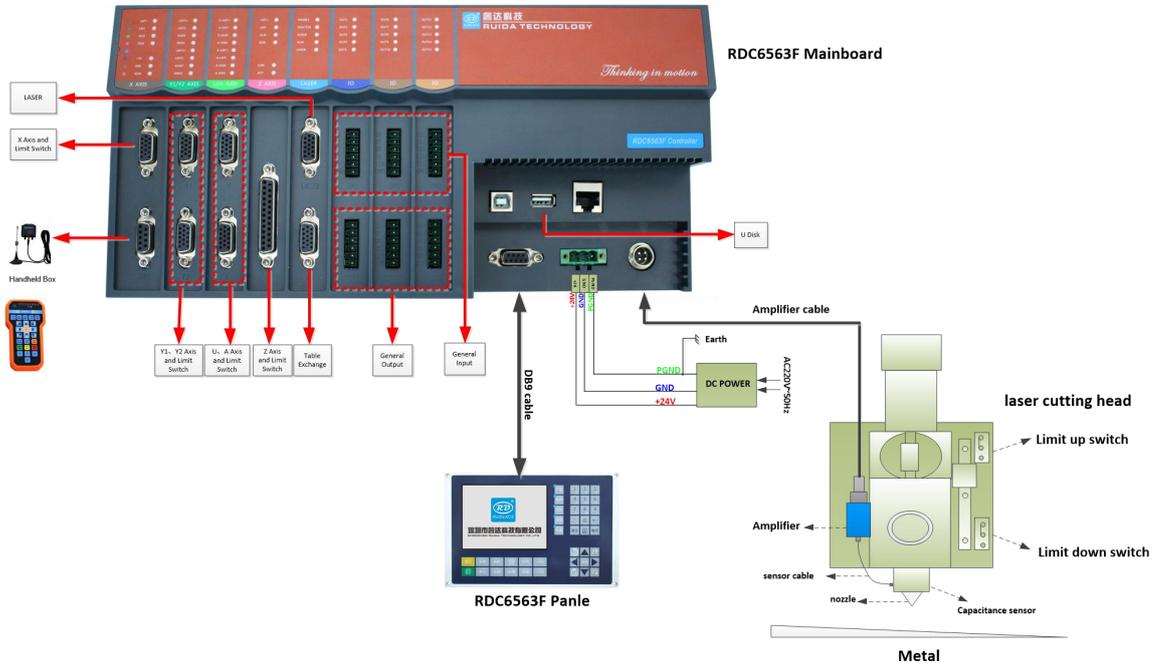
# Chapter 2 Hardware Wiring Instruction

## Main contents:

- System wiring diagram
- Hardware interface description
- Motor wiring instructions
- Laser wiring instructions

## 2.1 System wiring diagram

The overall wiring diagram of the system as following:



## 2.2 Sensor Amplifier interface

Sensor is an amplifier connection interface , this interface is connects one end of the 15-meter cable to the height sensor and the other connects to the amplifier.

When installing the amplifier, make sure that the outer casing of the amplifier and the outer casing of the cutting head are reliably connected; Use a multimeter to measure the conduction state. The cutting plate needs to be in effective contact with the machine body, and the impedance between the two is less than 10 ohms, otherwise the detection effect of the capacitive sensor will be affected.



### Important:

**Do not disassemble or cut the 15-meter amplifier cable. Otherwise, the amplifier may be damaged or the signal may be unstable.**

## 2.3 Main power input interface

Main power input interface definition, as shown in the following table:

signal	definition	Description
+24V	+24V power input	controller+24V power input, Power supply current output capability is greater than 3A
GND	GND	—
PG	External shield	Generally connected to the earth or the shell

## 2.4 HMI interface

HMI is DB9 interface, the manufacturer's special shielded cable to connect mainboard and HMI.



**Important:**

**Do not use hot plug the DB9 terminal during to avoid damage to internal components.**

## 2.5 PC-USB interface

PC-USB is USB-BM port.It is the interface that the motherboard and PC access through USB2.0.Connect PC from USB cable. If using USB to connect the controller, please set to USB from RDCutist software. If you are the first time connect the controller in this PC, you should install the USB driver, about USB driver Installation details. Please refer to the "Device Connection" section for instructions.

## 2.6 U-disk interface

U-disk is USB-AM port, it is the port for mainboard access the U disk, it can copy standalone files. The capacity of the U disk is generally less than 8G. Otherwise, the read and write speed may be too slow or even the U disk may not be recognized.



**Important:**

**Please pay attention to the USB interface on the panel and the Udisk interface on the mainboard. The USB interface on the panel is used for panel firmware upgrade. The U-disk interface on the motherboard is used for copying standalone files.**

## 2.7 Ethernet interface

Ethernet is an Ethernet communication interface, which is connected to the PC network port through a network cable, enabling 10/100 MHz Ethernet communication between the mainboard and the PC. When set to network cable connection, Select network connection from RDCutist software. For details, please refer to the description of the "Device Connection" section.

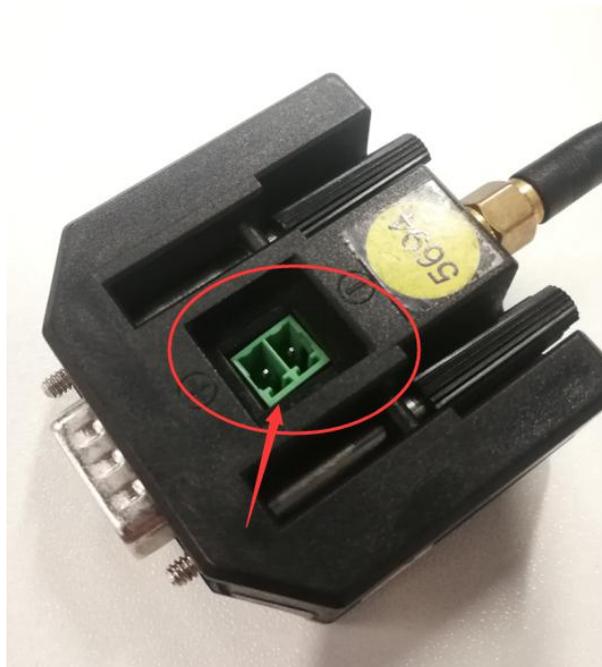


**Important:**

**Please use the PIN to PIN Ethernet parallel line.**

## 2.8 BWK interface

BWK is the wireless handheld box receiver interface. It only needs to insert the receiver into the DB9 terminal of the motherboard BWK. The 2PIN green terminal on the receiver does not need to be connected (the green terminal shown in the figure below). For details on the wireless handheld box, please refer to the introduction of the "BWK Handheld Box" section.

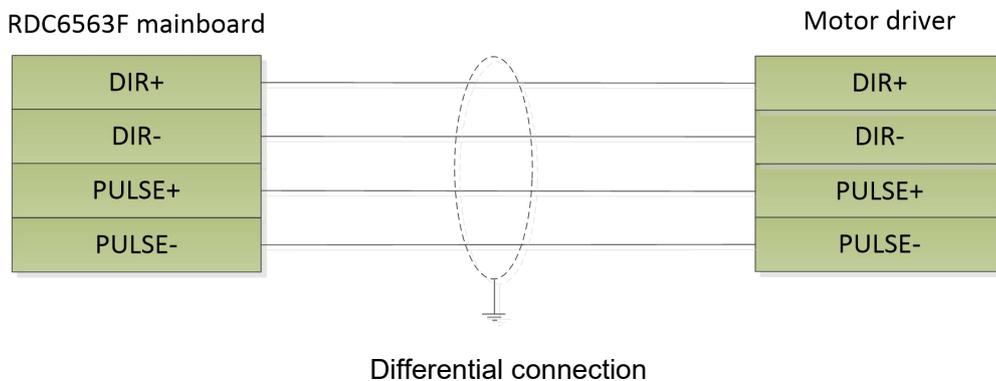


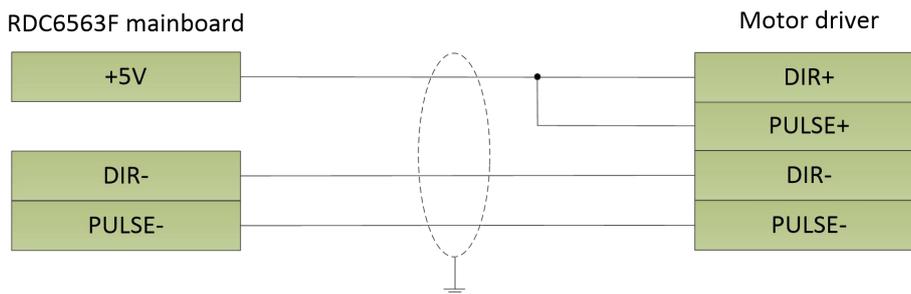
## 2.9 X、Y、U、A axis motor interface

The motor interface is defined as shown in the following :

PIN	Signal	definition	Description
PIN1	5V	+5V power (output)	controller+5V power output, Current output capability greater than 500mA
PIN2	DIR-	DIR-	
PIN3	DIR+	DIR+	
PIN4	PULSE-	PULSE-	
PIN5	PULSE+	PULSE+	
PIN6	SON	Servo drive enable signal (output)	
PIN7	CLR	Servo alarm clear signal (output)	
PIN8	ALM	Servo alarm signal (input)	
PIN9	LMT-	Negative limit	
PIN10	LMT+	Positive limit	
PIN11	+24V	+24V power (output)	controller+24V power output, Current output capability more than 500mA
PIN12	GND	GND	—
PIN13	GND	GND	—
PIN14	GND	GND	—
PIN15	GND	GND	—

- 1) If connects stepper motor, the wiring method such as differential connection, common anode connection, and common cathode connection can be used. The wiring method can be determined according to the specific conditions of the stepper motor driver. It is recommended to use the differential connection method.

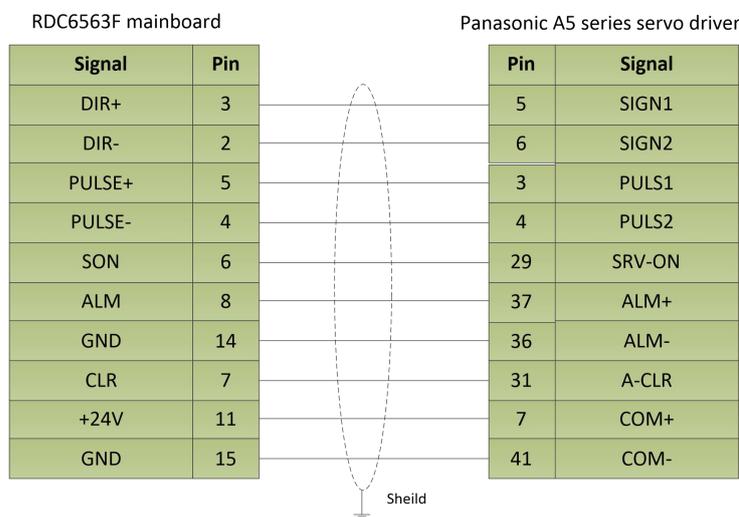




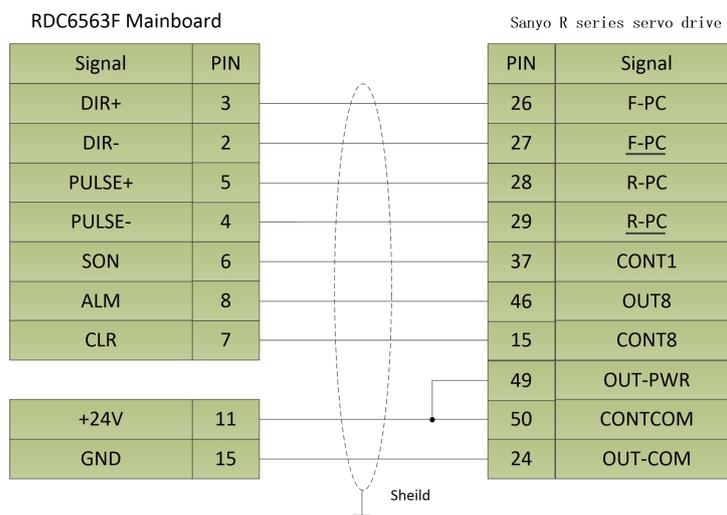
Common anode connection

- 2) If connects to servo motor, please set servo driver parameters correctly according to the specific model.

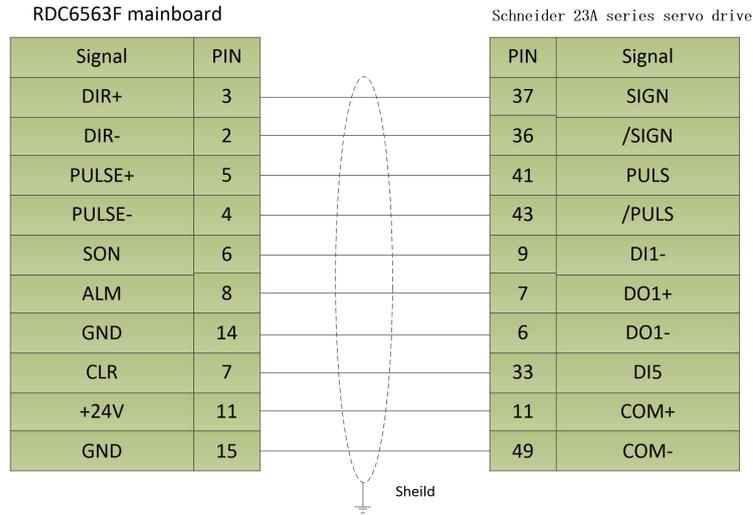
### Panasonic A5 series servo drive wiring instructions



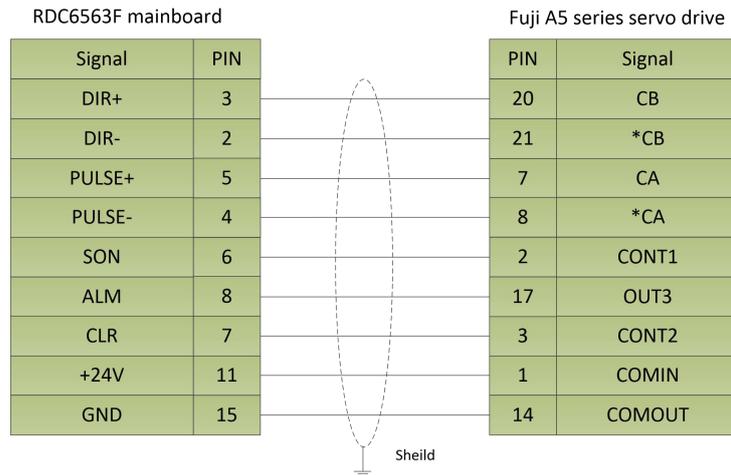
### Sanyo R series servo drive wiring instructions



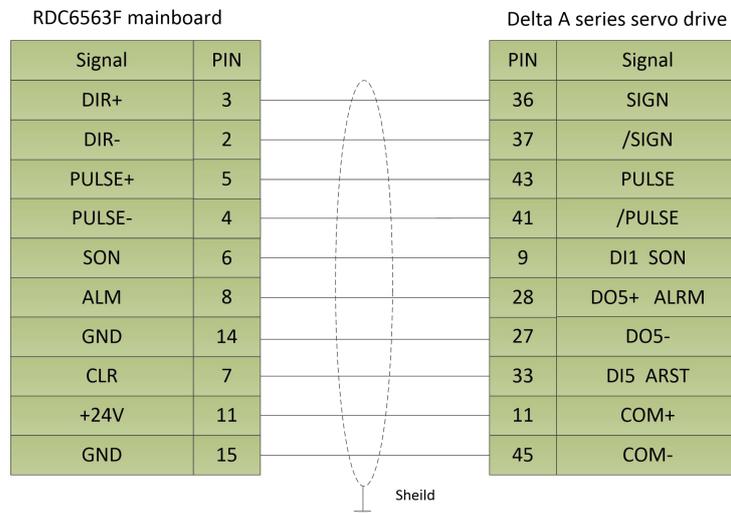
## Schneider 23A series servo drive wiring instructions

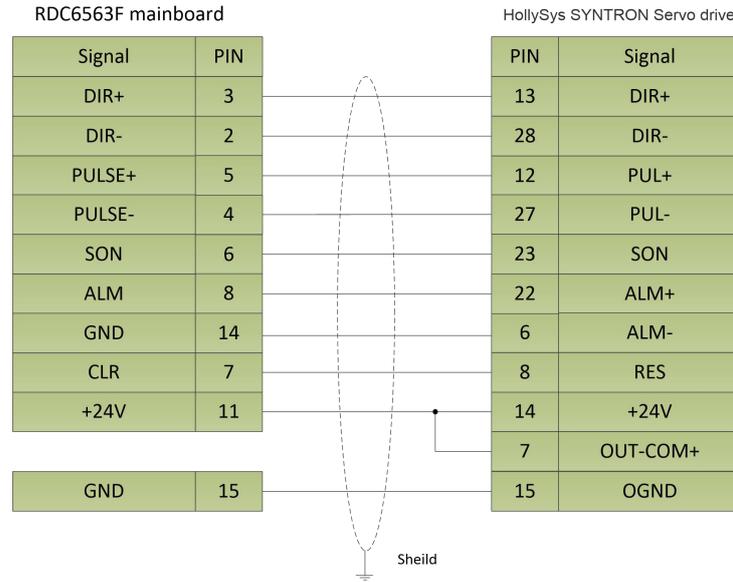


## Fuji A5 series servo drive wiring instructions



## Delta A series servo drive wiring instructions





## 2.10 Z axis motor interface

Z-axis motor interface is defined as shown in the following:

PIN	signal	definition	Description
PIN1	GND	GND	
PIN2	ALM	Servo alarm signal (Input)	
PIN3	SON	Servo drive enable signal (output)	
PIN4	A-	Encoder A phase signal differential negative	
PIN5	B-	Encoder B phase signal differential negative	
PIN6	LMT-	Upper limit switch input	
PIN7	+5V	+5V power (output)	controller+5V power output, Current output capability more than 500mA
PIN8	DA	-10V~+10V Analog output	
PIN9	—	NC	
PIN10	—	NC	
PIN11	—	NC	

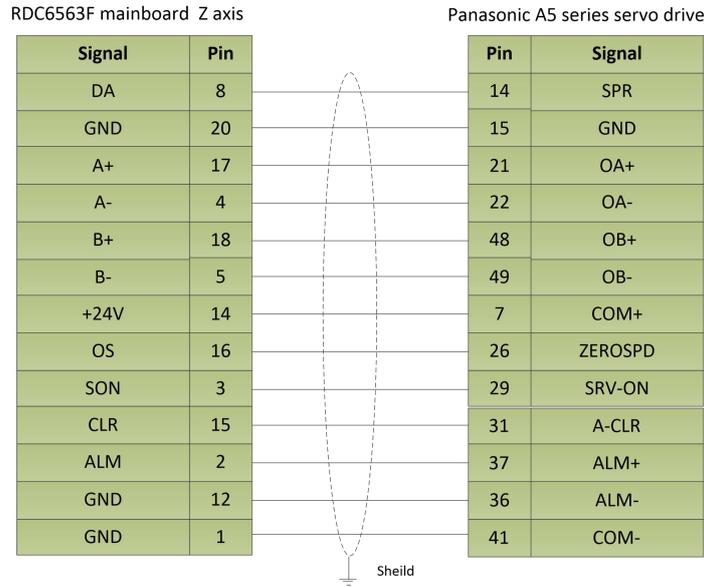
PIN12	GND	GND	
PIN13	GND	GND	
PIN14	+24V	+24V power (output)	controller+5V power output, Current output capability more than 500mA
PIN15	CLR	Servo alarm clear signal (output)	
PIN16	OS	Servo zero speed clamp signal (output)	
PIN17	A+	Encoder A phase signal differential positive port	
PIN18	B+	Encoder B phase signal differential positive port	
PIN19	LMT+	Lower limit switch input	
PIN20	GND	GND	
PIN21	GND	GND	
PIN22	—	NC	
PIN23	—	NC	
PIN24	ANALOG_OUT	0-10V Analog voltage output	For controlling proportional valve
PIN25	GND	GND	



**Important:**

- **Some servo drives only support pulse control mode, but not speed control mode. Please select the servo drive that supports speed control mode correctly.**
- **Z-axis servo drive only supports Panasonic A5 series, Sanyo R series, Yaskawa  $\Sigma$  series, Schneider 23D, Fuji A5 series servo drives .**

## Panasonic A5 series servo drive wiring instructions



## Panasonic A5 series servo drive parameter setting instructions

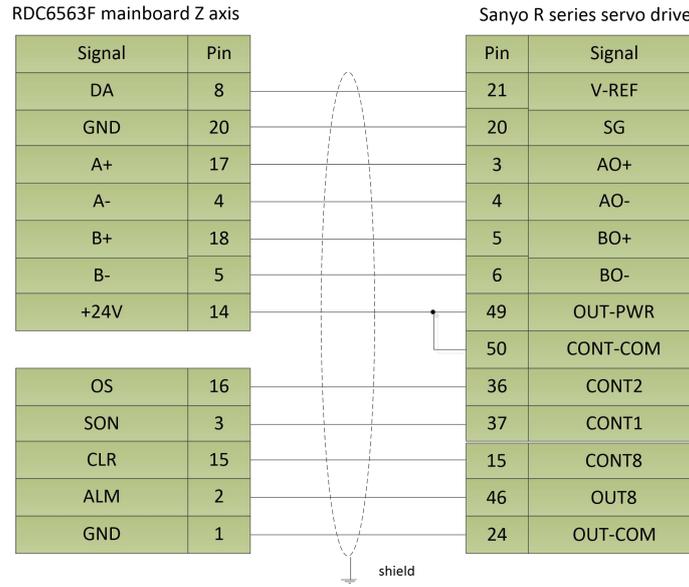
Parameter NO.	Settings	Description
Pr0.01	1	Set to speed mode
Pr0.02	3	Set to auto-adjust in real time
Pr0.03	17	Set servo stiffness
Pr0.11	2500	The encoder pulse value is 10000
Pr3.02	500	Speed gain is set to 500r/min/V
Pr3.15	1	Zero speed clamp is valid



### Important:

Here only some parameters are recommended to ensure that the servo motor can move normally. If you want the servo motor to have better motion, you need to ask the professional to debug.

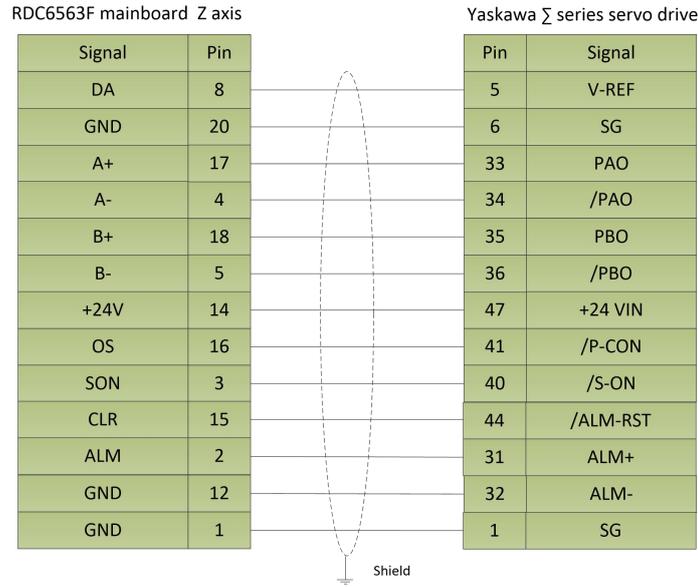
### Sanyo R series servo drive wiring instructions



### Sanyo R series servo drive parameter setting instructions

Parameter NO.	Settings	Description
SY08	01	Set to speed mode
Gr0.00	00	Set to auto-tune
Gr8.25	500	Speed gain is set to 500r/min/V
Gr9.00	00	Allow the motor to rotate forward
Gr9.01	00	Allow motor reversal
GrC.05	2500/32768	The encoder pulse value is 10000

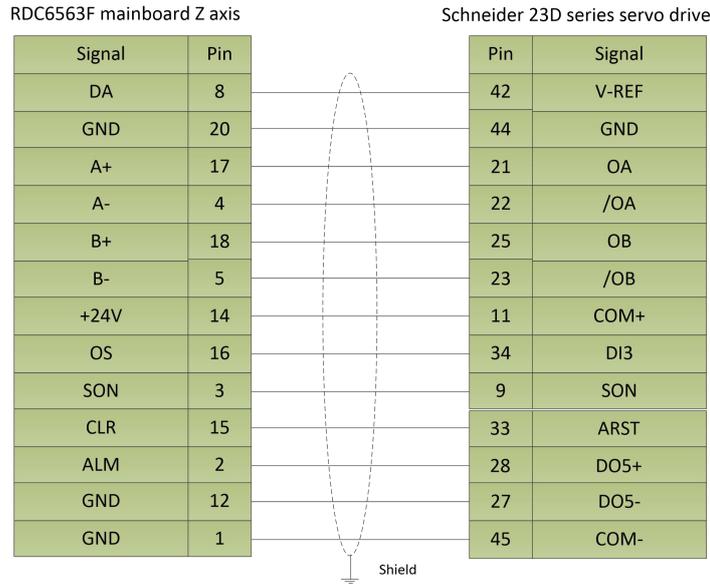
## Yaskawa $\Sigma$ series servo drive wiring instructions



## Yaskawa $\Sigma$ series servo drive parameter setting instructions

Parameter NO.	Settings	Description
Pn000	00A0	Set to speed mode
Pn00B	0100	Set to single-phase power input
Pn212	2500	The encoder pulse number is set to 10000
Pn300	6.00	Speed gain is 500r/min/V
Pn501	10000	—
Pn50A	8100	Allow the motor to rotate forward
Pn50B	6548	Allow motor reversal

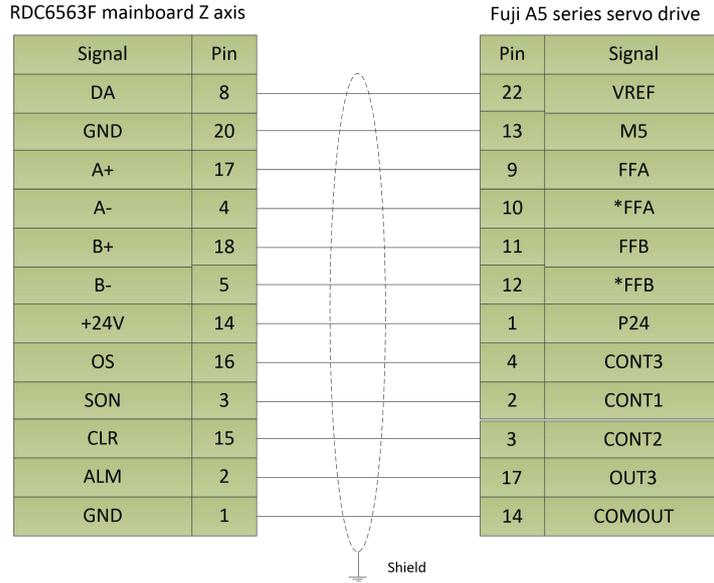
### Schneider 23D series servo drive wiring instructions



### Schneider 23D series servo drive parameter setting instructions

Parameter Type	Settings	Description
P1-01	2	Set to speed mode
P1-38	2000	—
P1-40	5000	Speed gain is set to 500r/min/V
P1-46	2500	The encoder pulse number is 10000
P2-10	101	Set IN1 to SON function
P2-11	0	—
P2-12	5	Set IN3 to OS function
P2-13	0	—
P2-14	0	—
P2-15	0	—
P2-16	0	—
P2-17	0	—
P2-68	1	Set the SON signal mode

### Fuji A5 series servo drive wiring instructions



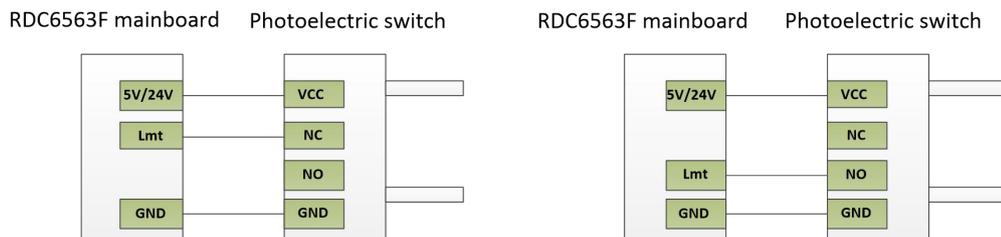
### Fuji A5 series servo drive parameter setting instructions

Parameter Type	Settings	Description
PA-101	01	Set to speed mode
PA-108	2500	The encoder pulse number is 10000
PA-115	17	Rigid rating
PA-303	02	—
PA-331	6.0	Speed gain is set to 500r/min/V

## 2.11 Limit switch interface

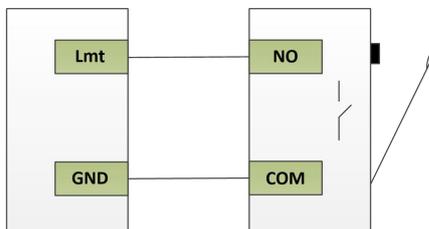
The limit switches supports both normally open and normally closed. The limit switch can use mechanical contact switch, photoelectric switch, and proximity switch and support 5V or 24V output voltage.

The two typical connections for photoelectric switches are shown below:



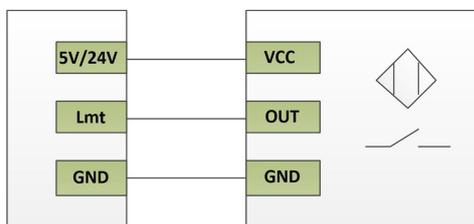
The typical connection of the mechanical contact switch is shown in the figure below:

RDC6563F mainboard    Mechanical contact switch



The typical connection of the proximity switch is shown in the figure below:

RDC6563F mainboard    proximity switch



**Important:**

**When the Y-axis dual drive is enabled, the positive and negative limit switches of the Y1 and Y2 axes must be installed, or the limit switches of the Y1 and Y2 axes must be connected together. It is not allowed to connect only Y1 axis or Y2 axis limit switch.**

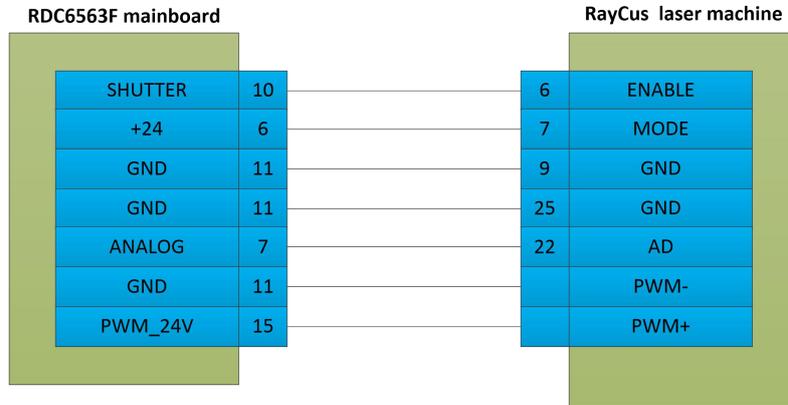
## 2.12 LASER interface

RDC6563F can support fiber lasers, CO2 lasers, RF tube lasers, etc., and is connected to the laser through three rows of DB15. The LASER interface pin definitions are shown in the following table:

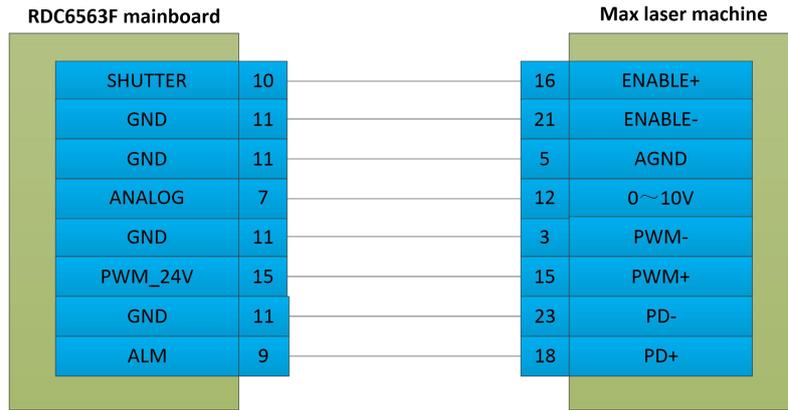
Pin	Signal	Definition	Description
PIN1	+5V	+5V power (output)	controller +5V power output, current output capability is more than 500mA
PIN2	—	NC	
PIN3	—	NC	
PIN4	—	NC	

PIN5	—	NC	
PIN6	+24V	+24V power (output)	controller +5V power output, current output capability is more than 500mA
PIN7	ANALOG	0 ~ 10V Analog voltage output	fiber laser power conditioning
PIN8			
PIN9	ALM	Laser machine alarm input	High voltage valid
PIN10	SHUTTER	Laser machine shutter signal (output)	High voltage valid
PIN11	GND	GND	
PIN12	—	NC	
PIN13	—	NC	
PIN14	—	NC	
PIN15	PWM_24V	Laser machine PWM signal (24V)	Laser machine 24V modulation signal

**Raycus laser machine wiring as shown bellowing::**



**MAX laser machine wiring as shown bellowing:**



## 2.13 AB switch interface

PIN	Signal	Definition	Description
PIN1	IN1	switch 1 input	Used for control the movement of the AB exchange
PIN2	IN2	switch 2 input	Used for control the movement of the AB exchange
PIN3	IN3	switch 3 input	Used for control the movement of the AB exchange
PIN4	IN4	switch 4 input	Used for control the movement of the AB exchange
PIN5	IN5	switch 5 input	Used for control the movement of the AB exchange
PIN6	+5V	+5V power (output)	controller+5V power output, Current output capability greater than 500mA
PIN7	LMTA+	A positive limit input	—
PIN8	LMTA-	A negative limit input	—
PIN9	LMTB+	B positive limit input	—
PIN10	LMTB-	B negative limit input	—
PIN11	GND	GND	—
PIN12	DIR_B	B motor direction signal	—
PIN13	DIR_A	A motor direction signal	—
PIN14	PUL_B	B motor pulse signal	—

PIN15	PUL_A	A motor pulse signal	—
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## 2.14 Input IO

General input IO interface definition, as shown in the following table:

Signal	Definition	Description
I1	General input IO	Reserved
I2	General input IO	Reserved
I3	General input IO	Reserved
I4	General input IO	Reserved
I5	General input IO	Reserved
I6	General input IO	Reserved
I7	Foot switch input	Dedicated input, foot switch input. Connection method: When the pedal is stepped on, input a low voltage signal to the port. When the pedal is released, the connection of the port is disconnected or input a high voltage signal. When the pedal is depressed for at least 100ms, if the machine is idle, the work will start. If the machine is in working state, the work will be suspended. If the machine is in the pause state, the suspended work will be restarted, that is, the foot switch and the [Start/Pause] function on the keyboard are similar. If the time when the second foot switch is stepped down from the first time is less than 100 milliseconds, the second foot motion is considered invalid by the main board.
I8	Machine protection input	Dedicated input, protection signal input. If the machine needs to be protected under certain conditions (such as cover protection), the protection signal is input from this pin. When the machine protection is enabled in the factory parameters, when the input is high or the input is left floating, the machine is protected, the ongoing work is paused, and the laser is on off.
I9	Stop input	Dedicated input, external stop button input (low voltage valid), it likes stop button function on the

		HMI, when the input port is triggered, the motion of the machine stops.
I10	External laser input	Dedicated input, it is laser hardware switch input port, when connected to low voltage, laser spotting can be run, when high voltage, no laser.
I11	Gas alarm input	Dedicated input, used for gas detection alarm input port. When input voltage level, gas alarm, and the main board will stop cutting.
I12	General input IO	Reserved
I13	General input IO	Reserved
I14	General input IO	Reserved
I15	General input IO	Reserved
GND	General input IO	—



**Important:**

**All input IO pins are compatible with 5V Or 24V inputs.**

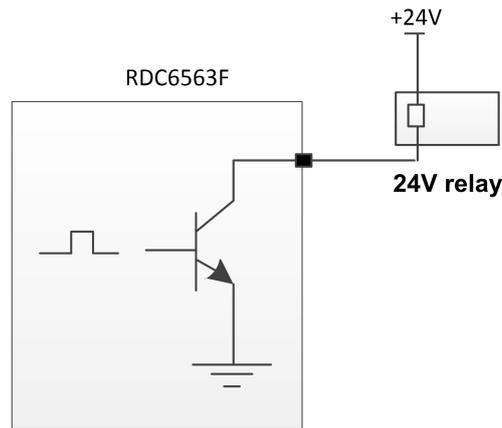
## 2.15 General Output IO

General output IO interface definition, as shown in the following table:

Signal	Definition	Description
Q1	General output IO	Buzzer control signal, low voltage valid
Q2	General output IO	Tricolor lamp control: Green light control signal, low voltage valid
Q3	General output IO	Tricolor lamp control: yellow light control signal, low voltage valid
Q4	General output IO	Tricolor lamp control: red light control signal, low voltage valid
Q5	General output IO	Status output
Q6	General output IO	Reserved
Q7	General output IO	Reserved
Q8	General output IO	Gas 1 control signal, low voltage valid, it can control the relay to control the solenoid valve directly

Q9	General output IO	Gas 2 control signal, low voltage valid, it can control the relay to control the solenoid valve directly
Q10	General output IO	Gas 3 control signal, low voltage valid, can control the relay to control the solenoid valve directly
Q11	General output IO	Reserved
Q12	General output IO	Reserved
Q13	General output IO	Reserved
Q14	General output IO	Reserved
Q15	General output IO	Reserved
24V	+24V power (output)	controller +24V power output, current output capability is more than 2A

All output IO use OC output to drive the relay directly, the maximum current can reach 500mA, and the wiring diagram is as follows:



**Auxiliary gas wiring instructions:**

- When using one gas, you can arbitrarily select one channel from the three gas channels as the blowing channel, and the gas is set as a cutting gas and a perforated gas in the layer. If the relay is connected to the pin Q9, then the layer parameter cutting gas and the punching gas need to be set to gas 2, and so on.
- When two gases are used, two channels can be arbitrarily selected from the three gas channels as the blowing channels. If the high pressure gas is connected to the pin Q9 and the low pressure gas is connected to the pin Q10, the layer parameter cutting gas needs to be set to gas 2, and the perforated gas is set to gas 3. The same as other channels.

## 2.16 Indicator Description

Type		Definition	Description
X AXIS	LMT+	X-axis positive limit indicator	When the input port is low voltage, the indicator is on.
	LMT-	X-axis negative limit indicator	When the input port is low voltage, the indicator is on.
	ALM	X-axis servo drive alarm indicator	When the input port is low voltage, the indicator is on.
	SON	X-axis servo drive enable indicator	When the input port is low voltage, the indicator is on.
	+5V	+5V Power Indicator	When the system power is normal, the indicator is on.
	ERR	System error indicator	When the mainboard hardware fails, the indicator light is on.
	RUN	System operation indicator	When the system is running normally, the indicator light flashes at a frequency of 2 seconds/time.
Y1/Y2 AXIS	LMT1+	Y1 axis positive limit indicator	When the input port is low voltage, the indicator is on.
	LMT1-	Y1 axis negative limit indicator	When the input port is low voltage, the indicator is on.
	ALM1	Y1 axis servo drive alarm indicator	When the input port is low voltage, the indicator is on.
	SON1	Y1 axis servo drive enable indicator	When the input port is low voltage, the indicator is on.
	LMT2+	Y2 axis positive limit indicator	When the input port is low voltage, the indicator is on.
	LMT2-	Y2 axis negative limit indicator	When the input port is low voltage, the indicator is on.
	ALM2	Y2 axis servo drive alarm indicator	When the input port is low voltage, the indicator is on.
	SON2	Y2 axis servo drive enable indicator	When the input port is low voltage, the indicator is on.
U/A AXIS	U-LMT+	U-axis positive limit indicator	When the input port is low voltage, the indicator is on.
	U-LMT-	U-axis negative limit indicator	When the input port is low voltage,

			the indicator is on.
	U-ALM	U-axis servo drive alarm indicator	When the input port is low voltage, the indicator is on.
	U-SON	U-axis servo drive enable indicator	When the input port is low voltage, the indicator is on.
	A-LMT+	A-axis positive limit indicator	When the input port is low voltage, the indicator is on.
	A-LMT-	A-axis negative limit indicator	When the input port is low voltage, the indicator is on.
	A-ALM	A-axis servo drive alarm indicator	When the input port is low voltage, the indicator is on.
	A-SON	A-axis servo drive enable indicator	When the input port is low voltage, the indicator is on.
Z AXIS	LMT+	Z axis lower limit indicator	When the input port is low voltage, the indicator is on.
	LMT-	Z axis upper limit indicator	When the input port is low voltage, the indicator is on.
	ALM	Z axis servo drive alarm indicator	When the input port is low voltage, the indicator is on.
	SON	Z-axis servo drive enable indicator	When the input port is low voltage, the indicator is on.
	LINK	Network connection indicator	This indicator lights up when the Ethernet is connected.
	ACT	Network communication indicator	This indicator lights up when communicating
LASER	ENABLE	Reserved	—
	SHUTTER	Shutter status indicator	When the shutter is off, the indicator lights up.
	GUIDE	Reserved	—
	ALM	Laser machine alarm input indicator	When the input port is in low voltage, the indicator is on.
	LASER	Laser machine PWM signal indicator	When PWM signal output, the indicator lights up
IO	OUT1~ OUT15	General purpose output IO indicator	When the output port in low voltage, the indicator is on.

# Chapter 3 HMI Functions Introduction

## Main contents:

- HMI features Introduction
- HMI operation Introduction
- User ,vendor parameters description

## 3.1 Introduction

### 3.1.1 Overview

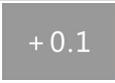
RDC6563F-HMI panel (Hereinafter referred to as "panel") It is a man-machine interface based on 5.6" TFT LCD screen. It has beautiful interface, friendly man-machine, smooth control and high cost performance. The panel can depict the motion track of the controller in real time, users can see the current processing graphics at a glance, support file management, file preview, user and manufacturer parameter modification, support for multi-language interface switching and other functions.

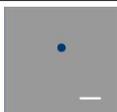
Panel characteristics:

- 5.6 inch TFT
- 640×480 Screen resolution
- 64K color
- Buzzer
- RS232 Standard serial communication

## 3.2 Button function introduction

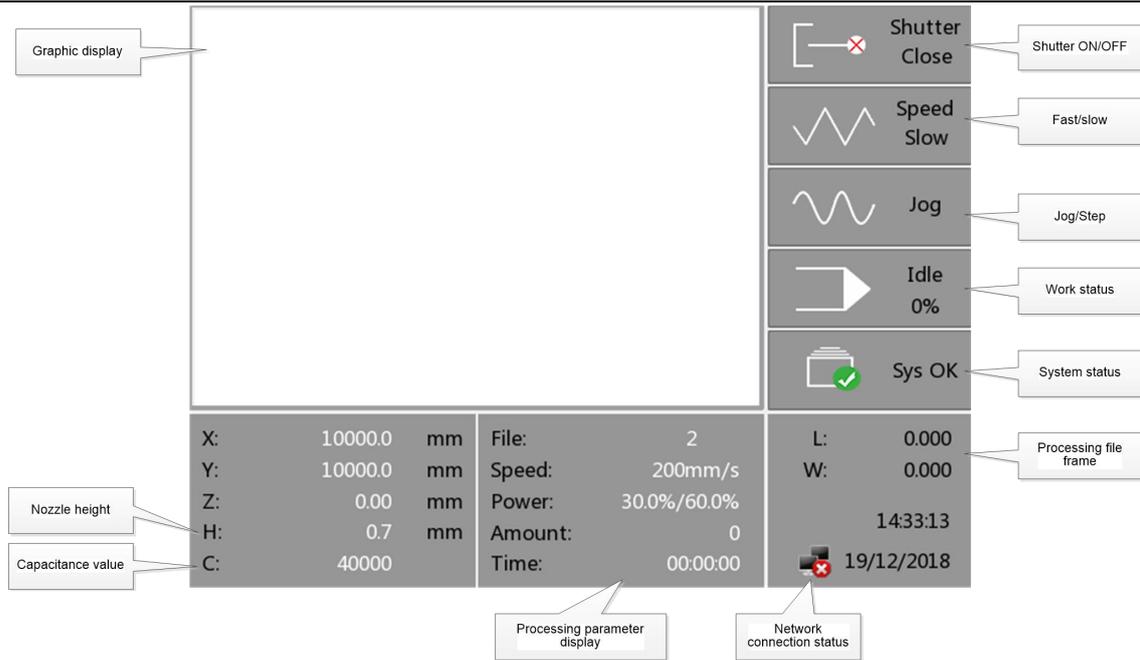
NO.	Button design	Function
1	RESET	System hardware reset.
2	RUN PAU	Start work or pause/restart work.
3	FRAME	Frame on the current processing file
4	STOP	Stop processing or axis movement.
5	LASER	Laser on
6	SHUTTER	Control the laser to enable or disable.
7	STEP JOG	Jog and continuous motion switching when manually moving the axis
8	SLOW FAST	The speed is switched when the axis is manually moved.
9	AUX.GAS	Gas on or off.

10		Control the Z axis up and down
11		Z axis nozzle height rise up 0.1mm。
12		Z axis nozzle height down 0.1mm。
13		Vendor parameters setting
14		User parameters setting
15		Memory file and U disk file management
16		Speed setting, power setting, controller configuration and other parameters.
17		Operation of functional movements such as servo calibration, capacitance calibration, and axis reset.
18		Use for move the X-axis or move the left button in the menu.
19		Use to move the X axis or move the option right in the menu.
20		Used for move the Y-axis or move the option up key in the menu.
21		Used for move the Y-axis or move the option down key in the menu.
22		Manually control the Z axis to rise.
23		Manually control the Z axis down
24		Manually move the U axis.

25		Manually move the U axis.
26		Set the anchor point.
27		Used for return to the previous menu, cancel parameter settings, etc.
28		Used for enter the next level menu, operation confirmation, etc.
29		Switch between numeric and alpha input modes.
30		Decimal point.
31		Used for delete parameters.
32	 ~ 	Enter a number or letter. Press the number 0 under system idle to return to the stop.

### 3.3 Main interface function

The main interface will be displayed when the system power-on reset is completed. As shown below:



- **Graphic display area:** This area is used for describe the processed file image during file preview display and processing.
- **Processing parameter display area:** Display the file name, maximum speed and maximum power of the current processing file, the current file processing number, processing time.
- **Current coordinate X/Y:** Displays the coordinate value of the current position of the laser head.
- **Current coordinate Z:** Display the coordinate value of the current Z axis cutting head
- **Nozzle height H:** Display the current nozzle height from the metal plate
- **Capacitance value C:** Display the capacitance reference between the current nozzle and the metal plate
- **Shutter on/off:** Display current laser shutter enable status.
- **Fast/slow:** Display current manual speed mode
- **Jog/Step:** Display current manual moving axis motion mode
- **Working status:** Used for display the current working status of the system: idle, pause, finished, run
- **Processing progress:** Display current processing progress
- **System status:** Display current system status, display alarm information if there is an alarm.
- **Processing file frame:** Display the range of the processing file, L is long, W is wide
- **Network connection status:** Used for displaying the status of the mainboard connected to the network, when using network communication and establishing a connection,

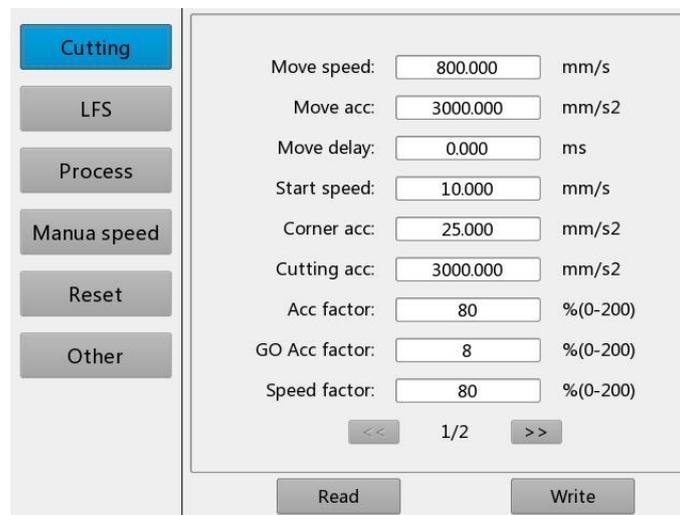
This area is , otherwise is 

In the completion/idle state, all function buttons can be operated, and the user can perform file processing, user and vendor parameter setting, file preview and other operations.

In the running/pause state, in order to ensure the safe operation of the machine, some buttons cannot be operated, such as positioning, frame, user, manufacturer, file and other buttons.

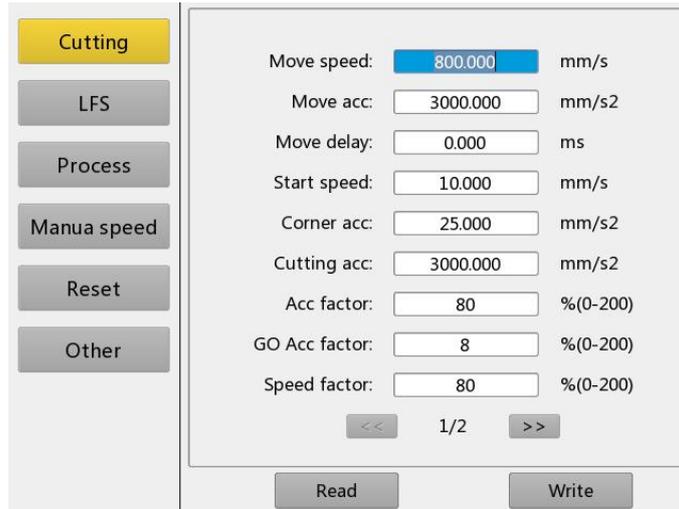
### 3.4 User parameters

User parameters: Cutting parameters, LFS parameters, process parameters, Manual speed, reset speed, other parameters.



When entering the user parameters, the panel will read the mainboard parameters automatically and display them, and display the progress of the read parameters on the [Read Parameters] option. After all parameters have been read, the user can press the [Up/Down] key to move the blue cursor to select parameters, such as [Following Parameters], [Process Parameters], etc. The parameter area on the right side displays the corresponding parameter. If the user does not need to modify the parameter, press [Exit] to return to the previous menu.

If the user needs to modify the parameters, press the [Right] key, then the blue cursor switches to the first parameter in the right parameter area, as shown below:



At this time, the user can press the [Up/Down] key to select the parameter to be modified, and press the number key to modify the numerical parameter (such as [Idle speed]).

For text parameters (such as [yes/no]), when the blue cursor stops on this parameter, press [Enter] to enter the modification mode, as shown below:



Users can press the [Up/Down] key to select the parameters. After the modification is completed, press the [Enter] key to exit the modification mode. After the current interface parameters are modified, move the blue cursor to the [Write Parameters] option and press the [Enter] key. The panel saves all parameters on the main board and takes effect. At the same time, the save progress is displayed on the [Write Parameters] option. If the user wants to check whether the parameter is saved successfully or not, move the blue cursor to the [Read Parameter] option and press the [Enter] key. At this time, the panel re-reads the mainboard parameters and displays. When the [Left] key is pressed, the blue cursor switches back to the parameter category. At this time, the user can select other parameter categories to modify or press the [Exit] key to return to the previous menu.

**User parameters are detailed as follows:**

<b>Cutting parameters</b>	<b>Move speed</b>	This parameter determines the maximum speed at which the machine no fire during motion.
	<b>Move acceleration</b>	The highest acceleration without fire movement. The settings of the idle speed and the idle acceleration are large, which can shorten the working time of the entire graphic, but if the setting is too large, which may cause the track to be shaken.

<b>Move delay</b>	If the parameter is 0, no delay will be made after the idling otherwise the speed will be decelerated and delayed after the idling.
<b>Corner speed</b>	The speed at which sharp corners are cut during cutting is also the lowest speed during the entire cutting process.
<b>Corner acceleration</b>	Acceleration at sharp corners during cutting. If the cornering speed and the cornering acceleration are set too large, the cornering will be shaken. If the setting is too small, the cutting speed will be affected. The cornering acceleration is the minimum acceleration value in the entire pattern cut.
<b>cutting acceleration</b>	The highest acceleration value when the light is emitted during the entire cutting process.
<b>Cutting jerk</b>	This parameter reflects the degree of change in acceleration during the opening motion.
<b>Move jerk</b>	This parameter reflects the degree of change in acceleration when the light is off.
<b>Corner jerk</b>	This parameter reflects how fast the curve bends when cutting arcs of various curvatures.
<b>LFS Frog Jump Enable</b>	When the leapfrog is enabled, one element is processed to go to the next element, and when the cutting head starts to lift, it begins to move when it is empty. Otherwise, it is necessary to wait for the cutting head to rise in place before starting the air movement.
<b>Frog Jump maximum distance</b>	The maximum length of the leapfrog, the length of the idling exceeds this value, and the leapfrog is not used.
<b>Short distance No rise enable</b>	If the move less than the lift length, the cutting head does not rise.
<b>the length when it is not rising</b>	The maximum length of the idling that the cutting head does not rise.
<b>X-axis backlash</b>	Backlash of the X axis. The value is set to 1um depending on whether the machine actually has a backlash. If the value is not zero, the board will compensate for the backlash.
<b>Y-axis backlash</b>	Backlash of the Y axis. The value is set to 1um depending on whether the machine actually has a backlash. If the value is not zero, the board will

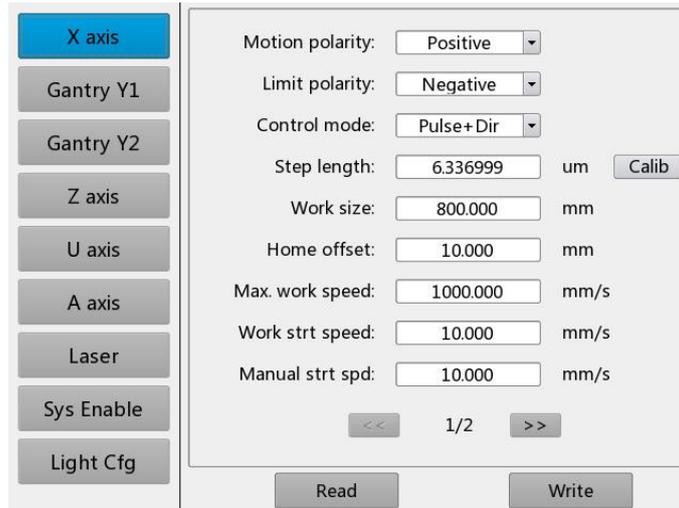
		compensate for the backlash.
<b>Following parameters</b>	<b>Rise height</b>	The height of the upper jump during the cutting process.
	<b>Standby height</b>	The height of the cutting head when the entire graphic cutting.
	<b>Rising speed</b>	It is the speed at which lifting during the cutting process.
	<b>Following speed</b>	It is the maximum speed following the cutting process
	<b>Follow-up delay</b>	When the delay mode is used, the time the cutting head rises is considered to have been in place if beyond this time.
	<b>Following-down delay</b>	When the delay mode is used, the time the cutting head descends is considered to have been in place beyond this time.
	<b>Following finished delay</b>	When the delay mode is used, the lifting time of the cutting head after processing is considered to be in place after this time.
	<b>Soft limit enable</b>	If the software limit is enabled, when the limit is triggered, the limit protection will be generated; if the limit is disabled, when the limit is triggered, no protection. When the upward movement exceeds the origin coordinate value (the origin coordinate is 0), the software limit is triggered; when the downward motion exceeds the maximum stroke, the soft limit is also triggered.
<b>Process parameters</b>	<b>LFS gain</b>	Increasing this parameter can increase the response speed of the following, but it is easy to cause oscillation during following.
	<b>Gas delay</b>	During the cutting process, when the cutting head is moving down, the delay time is started in advance.
	<b>Gas switch delay</b>	Different gases are used for punching and cutting. When the perforation is switched to the cutting, the time is delayed, the gas in the trachea is drained, and the mixed gas is prevented.
	<b>Collision alarm enable</b>	If the collision alarm is enabled, if the cutting head occurs during the movement, the cutting head will automatically be lifted to a safe height; if the collision alarm is prohibited, the collision protection will be ignored.
	<b>Collision filter</b>	This parameter should not be set too large. The excessive alarm filter coefficient will make the cutting head fail to lifting protection in time after the collision

		alarm occurs. On the contrary, the too small alarm filter coefficient is likely to cause false alarm caused by cutting slag.
	<b>Punch Filter</b>	This parameter is the filter time of collision alarm in punch, too small alarm filter coefficient is easy to cause false alarm caused by slag spraying in punch.
	<b>Jitter filtering</b>	This parameter is used to suppress the jitter of the thin plate during cutting. The larger the parameter, the more obvious the suppression effect, but it will reduce the response speed of the follow-up. Generally set between 0 and 80.
	<b>Maximum following error</b>	When the cutting head is in the following state, the maximum following error is allowed. When the following error exceeds the set maximum following error, an alarm of "following large error "is generated.
	<b>Nozzle height</b>	Refers to the position of the set nozzle, the height of the cutting head nozzle from the metal plate during cutting.
	<b>Low start speed</b>	If the low speed start length is not zero, use this speed to cut during the length of the start of machining. This speed is not allowed to exceed the cornering speed.
	<b>Low speed start Power</b>	The length of the low speed cut when starting the cutting
	<b>Low speed start length</b>	Cutting power at low speed start cutting
<b>Manual speed</b>	<b>Manual fast X</b>	Refers to the speed of manually moving the X axis when [speed is fast]
	<b>Manual slow X</b>	Refers to the speed at which the X axis is manually moved when [Slow].
	<b>Manual fast Y</b>	Refers to the speed at which the Y axis is manually moved when [Speed is fast].
	<b>Manual slow Y</b>	Refers to the speed at which the Y axis is manually moved when [Slow].
	<b>Manual fast Z</b>	Refers to the speed of manually moving the Z axis when [speed is fast].
	<b>Manual slow Z</b>	Refers to the speed at which the Z axis is manually moved when [speed is slow].
	<b>Manual fast U</b>	Refers to the speed at which the U axis is manually moved when [speed is fast].

	<b>Manual slow U</b>	Refers to the speed at which the U axis is manually moved when [speed is slow].
	<b>Manual fast A</b>	Refers to the speed at which the A-axis is manually moved when [Speed].
	<b>Manual slow A</b>	Refers to the speed at which the A-axis is manually moved when [Slow].
<b>Reset parameter</b>	<b>X reset speed</b>	Speed when X-axis is reset
	<b>Y reset speed</b>	Speed when Y axis is reset
	<b>Z reset speed</b>	Speed at Z-axis reset
	<b>U reset speed</b>	Speed when U axis is reset
	<b>A reset speed</b>	Speed when A axis is reset
	<b>X power-on reset enable</b>	If the X-axis power-on reset is enabled, the Z-axis will be automatically reset when the machine is turned on, otherwise it will not be reset automatically.
	<b>Y power-on reset enable</b>	If the Y-axis power-on reset is enabled, the Z-axis will be automatically reset when the machine is turned on, otherwise it will not be automatically reset.
	<b>Z power-on reset enable</b>	If the Z-axis power-on reset is enabled, the Z-axis will be automatically reset when the machine is turned on, otherwise it will not be automatically reset.
	<b>U power-on reset enable</b>	If the U-axis power-on reset is enabled, the Z-axis will be reset automatically when the machine is turned on, otherwise it will not be reset automatically.
<b>A power-on reset enable</b>	If the A-axis power-on reset is enabled, the Z-axis will be automatically reset when the machine is turned on, otherwise it will not be reset automatically.	
<b>Other parameters</b>	<b>Return position</b>	The position where the laser head is stopped after processing is completed. There can be four kinds of mechanical origin, positioning point, no return, and back stop.
	<b>Frame mode</b>	The movement mode when the panel starts the frame movement. It can be related to the light walking border, the light walking border and the four corners.
	<b>Go scale blank distance</b>	The distance of the frame motion track relative to the actual graphic frame.
	<b>Dock X position</b>	Used to set the X-axis coordinate position of the stop.
	<b>Dock Y position</b>	Used to set the Y coordinate position of the stop.

### 3.5 Vendor parameters

Press the [Vendor] button in the main interface. If it is the first time to use, the password input interface will pop up. Only after entering the correct password then you can enter. After successful entry, the following interface pops up:



The Y1 axis interface is the same as the Y2 axis

When modifying the parameters of the three-color lamp configuration page, select a parameter and press the [Enter] key to switch the enable state. Red means enable, gray means disable.

Other interface operations and settings of the vendor parameters are the same as the user parameter interface, and will not be described here.

**The manufacturer parameters are detailed in the following table:**

<b>X、Y1、Y2、U、 A axis</b>	<b>Directional polarity</b>	Modifying the direction polarity allows the motor to move in the opposite direction. The target of the modification is to make the axis move to the origin when resetting. If the axis moves away from the origin when resetting, it indicates that the polarity of the axis is set incorrectly and should be modified.
	<b>Limit polarity</b>	Used to set the high and low mode of the limit signal. If the motion axis reaches the limit position, input a low voltage signal to the main board, then the limit polarity should be set to negative.
	<b>control mode</b>	The types of controller output pulses include positive and

		negative pulses and pulse + direction. Generally set to pulse + direction mode.
	<b>Motor step length</b>	That is the pulse equivalent of the motor, when sending a pulse to the motor, the absolute distance value corresponding to the moving axis. Before the value is set correctly, the machine can cut a large rectangle (larger figure, which can make the error smaller), and calculate the motor step by the length of the figure and the length of the measurement automatically.
	<b>Work size</b>	The farthest distance that the motion axis can move depends on the actual conditions of the machine.
	<b>Home offset</b>	If the axis is enabled with hardware limit protection, the value should normally be set to 2~5mm. If it is set to 0, when the motion axis runs to the minimum coordinate 0, it is possible to make the limit valid, which will trigger incorrectly. Hard limit protection for machine protection.
	<b>Maximum speed</b>	The maximum speed of movement that the shaft can withstand. This parameter is related to the driving capability of the motor, the inertia of the moving shaft, and the gear ratio.
	<b>Work start speed</b>	The speed at which the motion axis starts directly from the standstill state. If the value is too large, it will cause the motor to lose step, jitter, and even whistle. If the setting is too small, the running speed of the entire graphic will be reduced. If the inertia of the moving shaft is large (the shaft is heavy), a small take-off speed can be set. If the inertia of the moving shaft is small (the shaft is light), the take-off speed can be appropriately increased. Typical values are 5 to 30 mm/s.
	<b>Manual start speed</b>	The starting speed of the movement of the axis on the keyboard cannot higher than the starting speed of the axis.
	<b>Maximum acceleration</b>	The maximum acceleration value of the motion axis during acceleration and deceleration, the acceleration setting is too large, which will also cause the motor to lose motion, jitter and even whistle. If the setting is too small, the acceleration will be slow and the running speed of the whole graphic will be reduced. For a shaft

		with a large inertia, such as the Y axis corresponding to the beam, a typical setting range is 800 to 3000 mm/s <sup>2</sup> , which corresponds to an axis with less inertia. For the corresponding X axis, a typical setting range is 8000 to 20000 mm. /s <sup>2</sup> .
	<b>Manual acceleration</b>	The acceleration value when the button moves the axis movement cannot be higher than the maximum acceleration of the axis.
	<b>Emergency stop acceleration</b>	If the axis is enabled for hard limit protection, when the axis moves to the limit position, the axis will be emergency deceleration and stop operation with an emergency stop acceleration. This value can take 2 to 3 times the maximum acceleration of the axis.
	<b>Hard limit protection</b>	If the hardware limit is enabled, when the hardware limit is triggered, the limit protection will be generated. If the hardware limit is disabled, the protection will not occur when the hardware limit is triggered.
	<b>Reset Enable</b>	If the machine is equipped with this axis, the [Reset Enable] option of the axis should be turned on. If the axis is not used, the [Reset Enable] option of the axis should be disabled.
	<b>Pulse rising edge is valid</b>	The pulse signal used to set the motor driver is valid for the rising edge or the falling edge. When the item is not enabled, the controller uses the falling edge. When the item is enabled, the controller uses the rising edge.
	<b>Servo alarm enable</b>	If the servo alarm is enabled, protection will be generated when the servo drive alarms; if the servo alarm is disabled, no protection will be generated when the servo drive alarms.
	<b>Manual move reverse</b>	Used to control the direction of motion when the manual button moves the motion axis. When the direction polarity parameter is correctly set, if the direction key is pressed on the operation panel and the axis moves in the opposite direction, the reverse button can be enabled.
	<b>Gantry enable</b>	Checking this option has two Y-axis output channels Y1 and Y2 for use on machines with bilateral gantry structures. This parameter has only the Y1 axis parameter, and the other axes are not. After setting, Y1

		and Y2 use the parameter of Y1.
<b>Z axis</b>	<b>Directional polarity</b>	Used to set the direction in which the motor rotates.
	<b>Limit polarity</b>	Set the hardware limit polarity. If the hardware limit is low when the hardware limit is triggered, set the hard limit polarity to negative polarity. If the hardware limit is high when the hardware limit is triggered, the hard limit polarity is set to positive polarity.
	<b>Encoder polarity</b>	Used to set the polarity of the encoder.
	<b>Maximum acceleration</b>	Used to set the maximum acceleration during exercise.
	<b>Home offset</b>	The distance that moves downward after hitting the upper limit switch at reset.
	<b>Screw pitch</b>	The pitch of the screw, this parameter needs to be set according to the actual situation of the machine.
	<b>Encoder resolution</b>	Set the number of pulses fed back by the encoder per revolution of the motor, which needs to be consistent with the drive parameter settings.
	<b>Speed gain</b>	Each of 1V analog voltage corresponds to the actual motor speed and needs to be consistent with the driver parameter settings.
	<b>Servo type</b>	According to the principle of different servo driver control signals and the level logic, the servo drivers are divided into different types, and each type of servo driver needs to select the corresponding type. Type I: Panasonic A, Fuji A5 , Schneider 23D series Type II: Sanyo R, Yaskawa $\Sigma$ Series
	<b>Max speed limit</b>	Set the maximum speed allowed by the motor. When the actual speed exceeds the upper limit of the speed, a servo alarm will be generated.
	<b>Maximum stroke</b>	Refers to the maximum distance the cutting head moves downward (referenced to coordinate value 0). When the soft limit is enabled and the distance moved downward exceeds the maximum stroke, it is protected.
	<b>Reset Enable</b>	Used to set whether to enable the reset function
<b>Hard limit protection</b>	If the hardware limit is enabled, when the hardware limit is triggered, limit protection will be generated; if the hardware limit is disabled, when the hardware limit is	

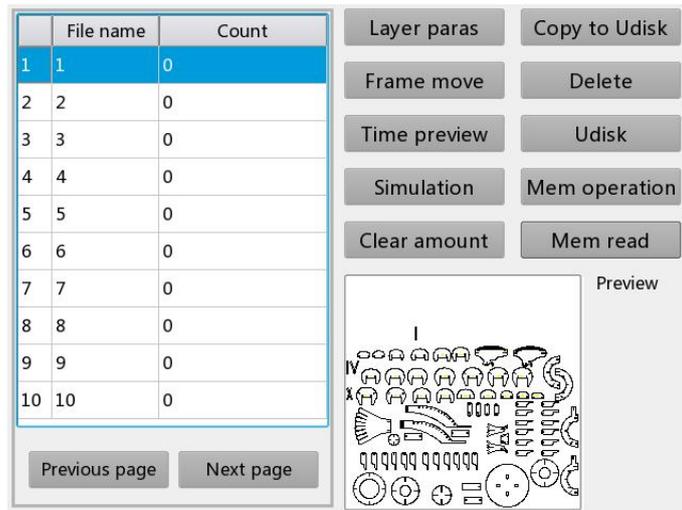
		triggered, no protection will be generated.
	<b>Servo alarm enable</b>	If the servo alarm is enabled, protection will be generated when the servo drive alarms; if the servo alarm is disabled, no protection will be generated when the servo drive alarms.
	<b>Collision capacitance</b>	It is used to set the capacitance value of the nozzle when it touches the plate. This parameter must be set correctly, otherwise, it may happen that the plate is touched repeatedly or the collision alarm is mistakenly triggered when the film is calibrated. When setting this parameter, manually move the z-axis to move the nozzle to the height that just touches the metal plate, and the capacitance value displayed on the plate is the value of the colliding plate capacitance.
<b>LASER MACHINE</b>	<b>Laser enable</b>	Laser type can choose fiber laser, glass tube and RF tube, please according to the actual situation of the machine enable laser.
	<b>Pre-enable</b>	For non-fiber lasers, the pre-ignition mode can be used.
	<b>Predicted frequency</b>	When it is a radio frequency laser and a pre-ignition pulse is required, the characteristics of the pre-ignition pulse can be configured by the pre-ignition frequency and the pre-ignition pulse width.
	<b>Predicted pulse width</b>	When it is a radio frequency laser and a pre-ignition pulse is required, the characteristics of the pre-ignition pulse can be configured by the pre-ignition frequency and the pre-ignition pulse width.
	<b>Maximum power</b>	The system limits the maximum power that the laser can output.
	<b>Minimum power</b>	The system limits the minimum power that the laser can output.
	<b>Laser frequency</b>	Laser PWM output signal frequency.
	<b>Laser ON signal valid</b>	Set the laser ON signal logic level
	<b>Laser alarm enable</b>	When the laser alarm is enabled, when the laser generates an alarm, the motherboard will generate protection, otherwise it will not be protected.
<b>Enable parameter</b>	<b>Machine protection enable</b>	When the signal is externally input, it can be connected to external devices such as water tanks and sliding

		doors. When this option is enabled, the system will detect whether these devices generate this type of alarm.
	<b>In-position signal enable</b>	When the in-position signal is enabled, the in-position signal is used to detect whether the following or rising is in place when the Z-axis is followed; otherwise, the delay is used instead of the bit signal. Generally set to in place mode.
	<b>Enable engraving function</b>	—

### 3.6 File

#### 3.6.1 Memory file

In the main interface, press the [File] button, the following interface pops up:



When entering the interface, the controller will automatically read the system's memory file, the file name and the number of work pieces will be displayed on the list, and the selected file will be previewed in the preview area in the lower right. When there are multiple files, press the up and down keys to select a file, then the file will be previewed, and the graphic will be displayed at the bottom right of the interface. When the [enter key is pressed, the file will be previewed on the main interface, and the current file interface will be closed. If you want to cancel the preview, press the [Exit] key.

When the number of files is large, you can page up/down. Press [Up] or [Down] to cycle through the blue list between the file list, [Previous] and [Next]. When the blue cursor is stopped at the [Previous] or [Next] option, press the [Enter] key to page through.

Press the left or right button to switch the blue cursor back and forth between the left file list and the right option, indicating that the list or option is selected for user convenience. If the file is being previewed, press [Enter] when switching to the option, the file preview will be cancelled. When the blue cursor is on the option, press the up and down keys to select an option, press the [Enter] key to activate the option or enter the lower menu.◦

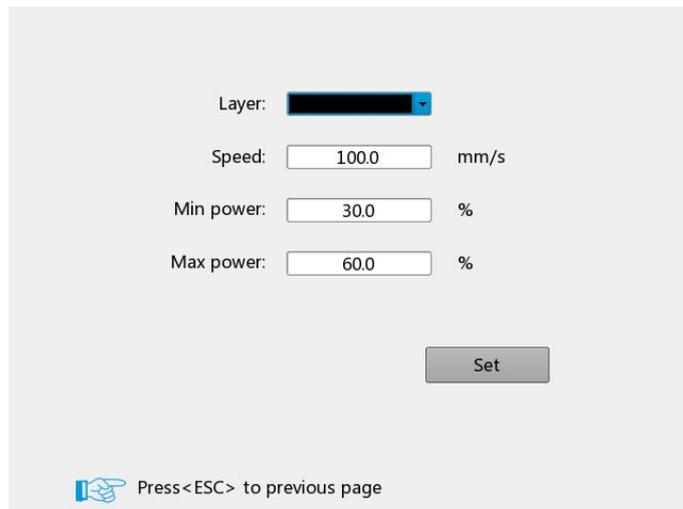
- Layer parameters: modify the layer parameters of the currently selected file.◦
- Frame: Take the border of the selected file.
- Work preview: The total time of processing of the file is predicted, and the predicted time and the actual running time differ only to the millisecond level.
- Simulation processing: Simulated processing of selected files (no gas, no laser).
- The number of pieces is cleared : Clear the number of processed files of the selected file
- Copy to U disk: Copy the selected file to the USB flash drive.
- Delete file: delete the selected file.
- U disk file: U disk file menu.
- Memory operation: Enter the lower level menu of memory operation.

Read memory file: Read the memory file list.

In addition, you can directly process the selected file by pressing the [Start] button.

### 3.6.2 Layer parameters

When the [Layer Parameters] option is selected, press the [enter] key to pop up the following interface:



Layer:

Speed:  mm/s

Min power:  %

Max power:  %

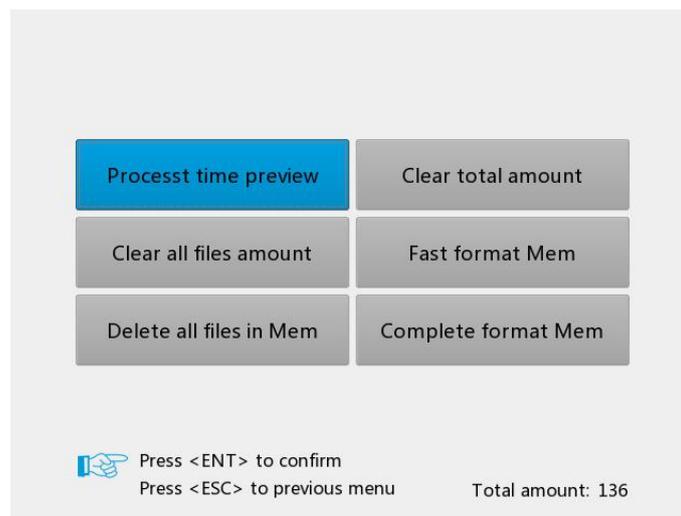
 Press <ESC> to previous page

At this time, the blue cursor stays on the layer number option. User can press the [Enter] key to enter the selection layer mode, press the [Up/Down] key to select other layers, and then press the [Enter] key to exit the layer selection mode. Then press the [Up/Down] key to move the blue cursor to the layer parameter option to be modified, press the number key and the delete key to

set and modify the parameters. After setting the parameters, move the blue cursor to [Setting] and press [Enter] on the option to save the current layer parameters, the parameters take effect, and otherwise the parameters are not saved. Press the [Exit] key to return to the file interface.

### 3.6.3 Memory Operation

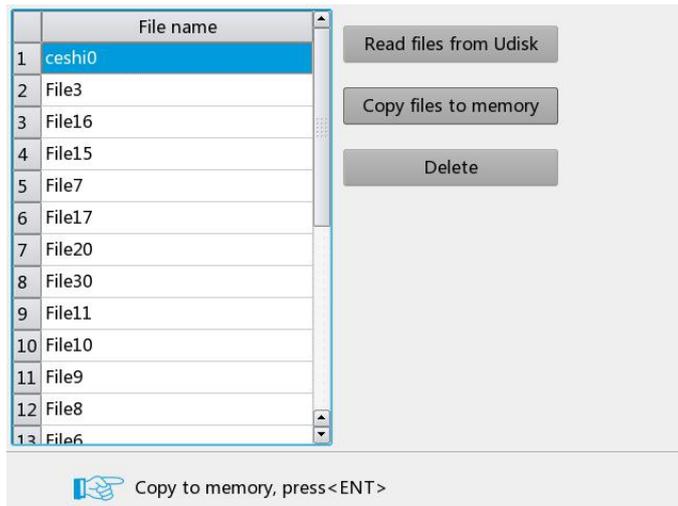
When the [Memory Operation] option is selected, press the [enter] key, the pop-up menu is as shown below:



- Current document time preview: predict the total processing time of the current processing file
- Current document time preview: predict the total processing time of the current processing file
- All memory files are cleared: Clear all memory files.
- Delete all memory files: empty all memory files
- The total number of files is cleared: the total number of files is cleared.
- Quickly format the memory: empty all the contents of the memory, faster
- Thoroughly format the memory: Deep initialization of the memory is slower.
- Total files: Displays the sum of the number of processed parts of all memory files.

### 3.6.4 U-disk files

Select the [U disk file] option on the [File] screen, and press the [enter] key to pop up the U disk file list, as shown in the figure:



- Read U disk file: read U disk file list
- Copy to memory: copy selected files to memory
- Delete file: delete the selected file of the U disk



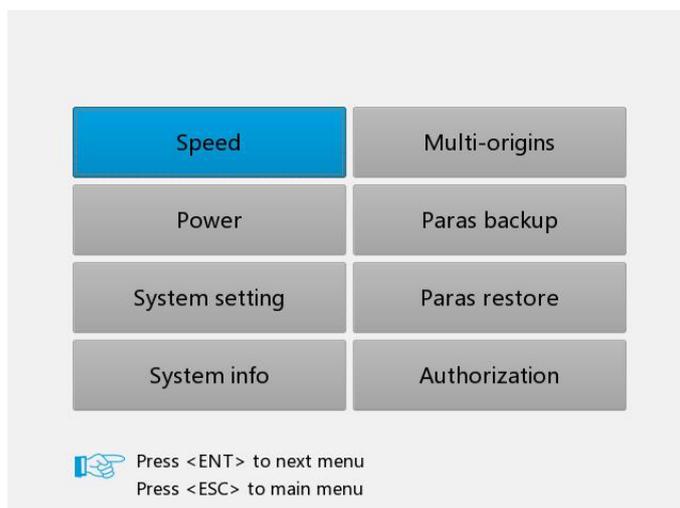
**Important:**

**This system supports the FAT32 and FAT16 file formats of U disk. The system must be placed in the root directory of the U disk to be recognized by the system. The file name of more than 8 characters will be cut off by the system automatically. The file names other than English and numbers will be copied to it will**

**not be displayed in the main board. Copy the Files from the mainboard to the USB flash drive are placed in the root directory of the USB flash drive.**

### 3.7 Menu

Press [Menu] in the main interface, the pop-up menu interface is as follows:

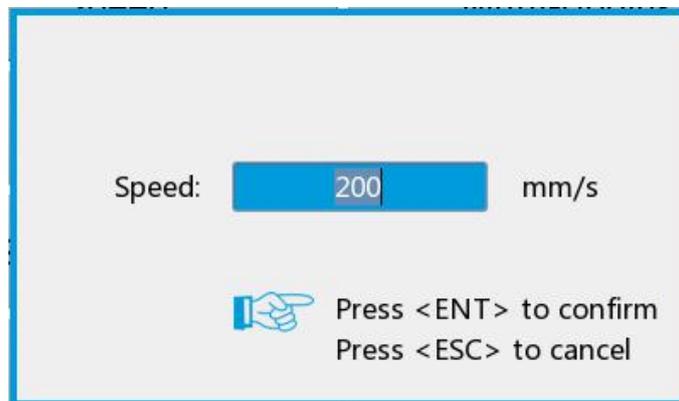


- Speed: Enter submenu, set manual speed or modify speed in real time during processing
- Power: Enter the submenu, set the spot power or modify the power in real time during processing.
- Controller configuration: Enter the submenu, network settings, language settings, etc.
- System Information: View board processing information, version number, etc.
- Multi-positioning point setting: Enter the submenu, set multi-positioning point enable, positioning point coordinates and so on.
- Parameter backup: backup all parameters of the user and the manufacturer.
- Parameter recovery: Restore the parameters of the previous backup. If the parameters have not been backed up, the factory parameters will be restored.
- Privilege setting: Enter the authorization code to activate the board

Press the direction keys to select the option, press the [Enter] key to enter the submenu or perform the operation, and press the [Exit] key to return to the previous menu.

### 3.7.1 Speed settings

Press [Enter] when the [Speed] option is selected under the menu interface, the following interface will as following:



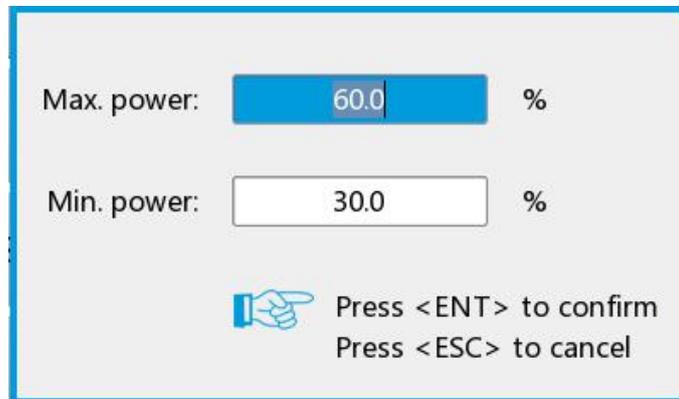
At this time, you can press the number key and the delete key to set and modify the parameters. After the modification is completed, press the [Enter] key to save the parameters, and press the [Exit] key to cancel the modification parameters and return.

This parameter has different uses such as:

- When in idle, this speed is the speed at frame.
- During the cutting process, you can modify the speed of the current layer to modify the processing speed of the current layer.

### 3.7.2 Power settings

Press [Enter] when the [Power] option is selected under the menu interface, the following interface will as bellowing:



At this time, the blue cursor stays on the first parameter to indicate that the parameter is selected. Press the number key and the delete key to set and modify the parameters. Press the direction keys to move the blue cursor to select other parameters for modification. When the parameters have been modified, press the [Enter] key to save the parameters, and press the [Exit] key to cancel the modification of the parameters and return to the previous interface.

During the cutting process, the laser power of the current layer can be modified by modifying the maximum power and the minimum power.

### 3.7.3 Language Settings

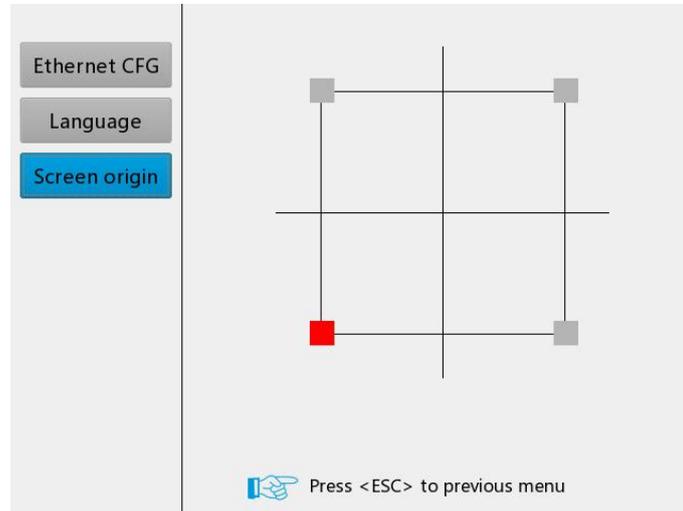
When the blue cursor is stopped in the [Language] option, the display interface is as follows:



Press the direction keys to select the language and then press the [Enter] key to make the settings take effect.

### 3.7.4 Screen Origin Settings

When the blue cursor is stopped at the [Screen Origin] option, the display interface is as follows:



In here, set the origin position of the display screen, and select different screen origin positions to mirror the display graphics in different X/Y directions. Please match the origin position of the screen with the actual origin position of the machine. Otherwise, the screen graphic display will be mirrored, which is inconsistent with the actual cutting direction of the graphic.

The four small squares on the map correspond to the upper left, lower left, upper right, and lower right origin of the display screen, and red indicates the current screen origin position. Press [Up/Down], key to select an origin and press [Enter] to set the setting to take effect.

### 3.7.5 System Information

When the [System Information] option is selected under the menu interface, press the [Enter], the interface as the following:

In this interface, you can view information such as various processing times, strokes, and the version number of the motherboard.

Power on time:	177 : 28 : 00	hour:min:s
Process time:	1 : 33 : 37	hour:min:s
Previous time:	0 : 00 : 01	hour:min:s
Laser on time:	0 : 37 : 21	hour:min:s
All amount:	136	
Total X dist:	185	m
Total X dist:	187	m
DSP version:	V20.01.02	
HMI version:	V2.25.00	
Firmware ver:	V4.01.001	

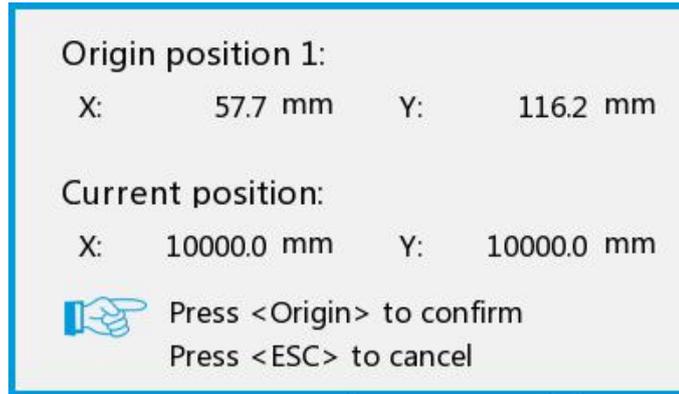
 Press <ESC> to previous menu

### 3.7.6 Multiple Anchor Point Settings

In the menu interface, select the [Multiple Positioning Point Setting] option, and press the [Enter] ,the interface as the following:



At this time, the blue cursor defaults to the [Multiple Position Enable] option. Press [enter] to select or cancel the entry. When multiple anchor points are enabled, first move the blue cursor to [Origin 1 Enable] .Press the [enter] key to enable the option, then press the [Right] key to select the [Set] option and press the [Enter] . The interface as following interface:



At this time, press the direction key to change the coordinate value of the X/Y axis, press the [Position] key to set the current coordinate value to the positioning point 1, and finally press the [Exit] key to return to the last interface. Other anchor point setting methods are the same as above.

The various sub-options are described as follows:

- Multiple positioning points enable: [Enable], [Disable] can be selected. When [Disable] is selected, the system uses single positioning point logic, press the [Position] key on the keyboard to set the positioning point, and only this positioning point works. When [Yes] is selected, the system uses multiple positioning point logic, and the [Positioning] key on the keyboard is invalid. The values of the individual positioning points need to be set in the menu, see below.
- Locating points 1 to 4 enable: When multiple positioning point logic is enabled, the four positioning points can be individually disabled and enabled.
- Start positioning point: 0~4 is optional, showing the positioning point to be used in the next picture to be worked. The 0th positioning point indicates the positioning point set by the [Positioning] key on the panel of the single positioning point logic, and the 1~4 indicates the positioning point number in the multi-positioning point logic. The next positioning point can be modified to any point from 1 to 4, so as to control the starting position of the next working time (in the condition of the positioning point is enabled), and cannot be modified to the positioning point of 0 (if it is a single positioning point logic, it will always take 0) Number anchor point).



**Important:**

**Once the multi-locating point logic is selected, If the starting anchor point number is 1, and all four positioning points are enabled, when the memory file is started (including keyboard startup and PC startup), or when the PC starts working with direct output and When the "Use original positioning point as the**

**positioning point" option is selected, each starting work will use different positioning points, and the positioning point rotation order is 1->2->3->4->1->2..... . If the PC starts working with direct output and selects [Use current point as positioning point], the system always uses the current point as the positioning point.**

### 3.7.7 Parameter Backup

In the menu interface, users can select the [Backup Factory Parameters] option, and press the [Enter] key to pop up the password input interface. If the input password is correct, all current factory parameters and user parameters are backed up to factory parameters and the interface showing [Set parameters successfully].



#### **Important:**

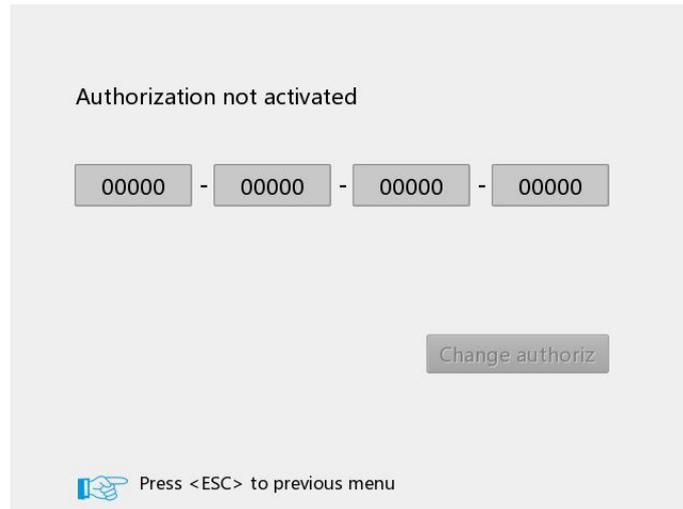
**When the machine set out from the factory, use the function of [Backup Factory Parameter] to back up all the debugged factory parameters and user parameters. Then, at any time, you can use the [Restore Factory Parameters] to restore all the parameters of all manufacturers and users.**

### 3.7.8 Parameter Recovery

In the menu interface, select the [Backup Factory Parameters] option, and press the [Enter] to pop up the password input interface. If the input password is correct, all current user parameters and manufacturer parameters will be restored to the factory parameters and the interface showing [Resume parameters successfully].

### 3.7.9 Permission Settings

In the menu interface, select [Permission Settings] option, press [Enter], it will show the following interface:



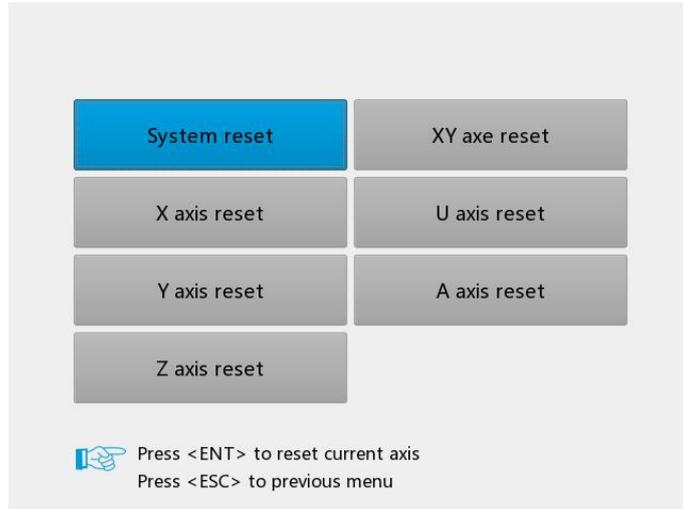
The interface displays the current board authorization status. If [Authorization is not activated] is displayed, it needs to be activated on the PC software. When the activation is successful, the interface displays [Authorization activated], and the authorization code is refreshed. [Change Authorization Code] option becomes valid. When the license key needs to be updated after the license card expires, users select the [Change Authorization Code] option and press the [Enter] key to enter the Change Authorization Code interface. After entering the correct authorization code, select the [Confirm Authorization Code] option and press [Enter]. Press [Exit] to return to the previous interface.

## 3.8 Functions

Function include: servo calibration, capacitance calibration, auto-tuning, axis reset, auxiliary functions, alarm logging, keypad lock, diagnostics, HMI firmware upgrades and more.

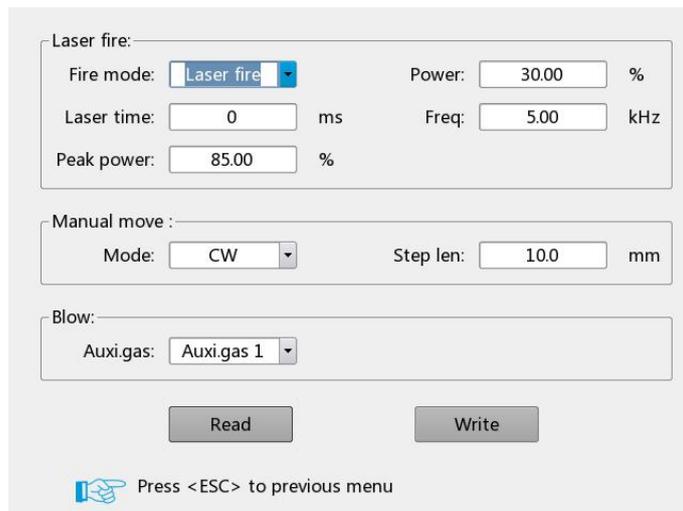
### 3.8.1 Axis reset

Axis reset includes reset operations such as system reset, X-axis reset, Y-axis reset, Z-axis reset, XY-axis reset, U-axis reset, and A-axis reset. When the system is reset, the Z axis will be reset first. After the Z axis reset is completed, the XY axis will be reset at the same time, which is the same as the reset function on the wireless handset. When the XY axis is reset, only the XY axis is reset at the same time. Others are reset for a separate axis and only the corresponding axis is reset.



### 3.8.2 Accessibility

When the blue cursor stops on this option, press the [Enter] key, the following interface as following:



- Pulse setting: If the shooting mode selects [Continuous], when the point is pressed, the laser will always on, and when loose the pulse bottom, laser off. If the pulse mode selects [pulse], each time the pulse button is pressed, the laser on, and the time of laser on is the pulse time value set by the user.
- Jog setting: When the jog mode is [Continuous], the jog parameter does not work. When the direction key is pressed, the axis moves. When loose the direction key, the axis stops moving; when the jog mode is [Jog], each time the direction key is pressed, the corresponding motion axis runs once, and the running distance is equal to the jog distance value set by the user (without exceeding the machine format).
- Air setting: There are [Gas 1], [Gas 2] and [Gas 3] available for blowing, which

correspond to different blowing channels.

After the parameter is modified, select the [Write Parameter] option and press the [Enter] key to take effect. Press the [Exit] key to return to the previous menu.

### 3.8.3 Alarm Record

When the blue cursor stops on this option, press the [Enter] key, the interface as following:



The interface can record the alarm information generated during the movement, so that the user can troubleshoot the fault and save up 20 alarm information. Press the [←] button on the panel to clear all alarm records.

### 3.8.4 Keyboard lock

When the blue cursor stops on this option, press the [Enter] key, the interface as following:



#### ➤ Password settings

This option can set the default password for keyboard lock. After the setting is successful, use the new password to lock the button.

➤ Keyboard lock

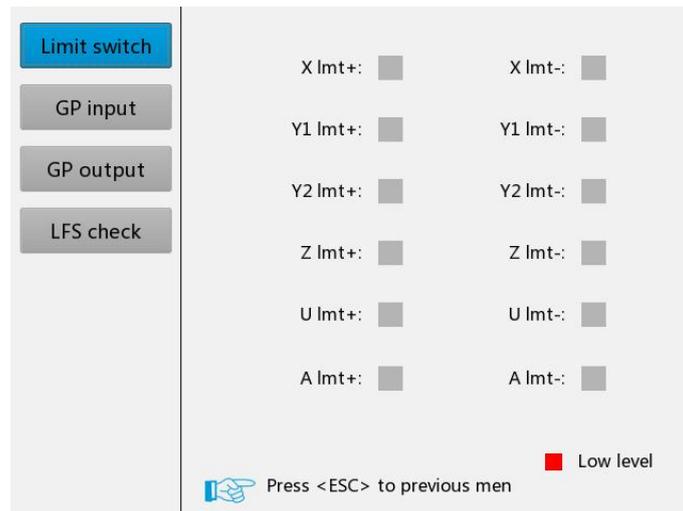
This option can lock the panel keys. After inputting the correct password, the button will lock automatically and return to the main interface. When any button is pressed, the interface needs for a password to unlock the button.

## 3.8.5 Diagnosis

### Limit switch

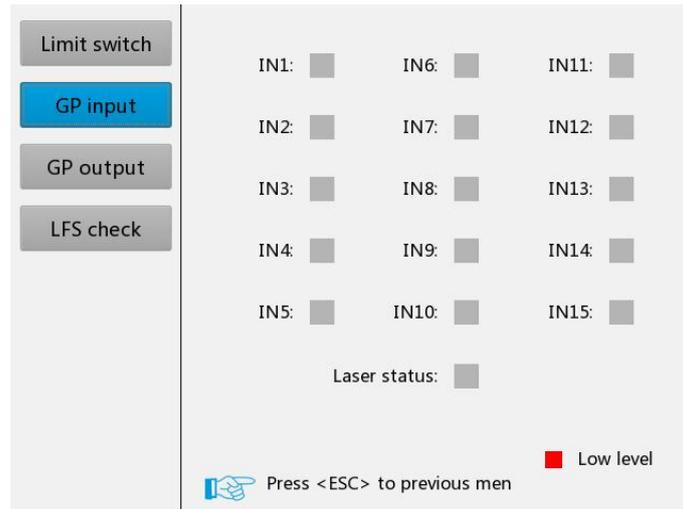
When the blue cursor is stopped at this option, the interface is as shown below:

The interface can monitor the status of the limit switch of the board in real time. The red square indicates low voltage and the gray square indicates high voltage, which is convenient for users to diagnose faults.



### Input IO

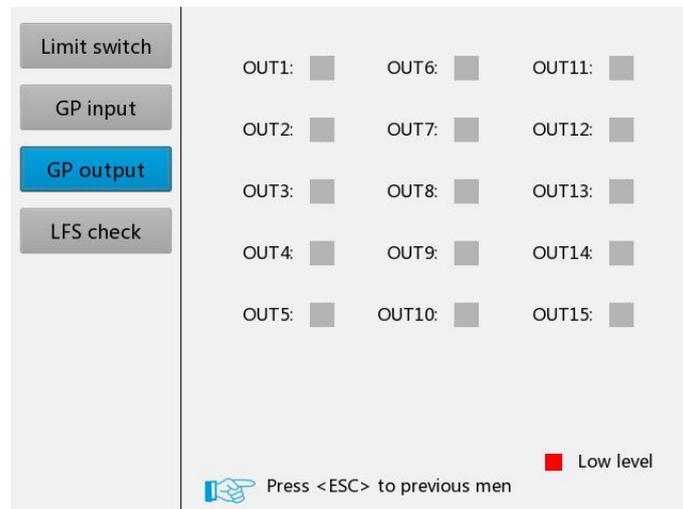
When the blue cursor is stopped at this option, the interface is as shown below:



The interface can monitor the input IO status of the board in real time. The red square indicates low voltage and the gray square indicates high voltage, which is convenient for users to diagnose faults.

## Output IO

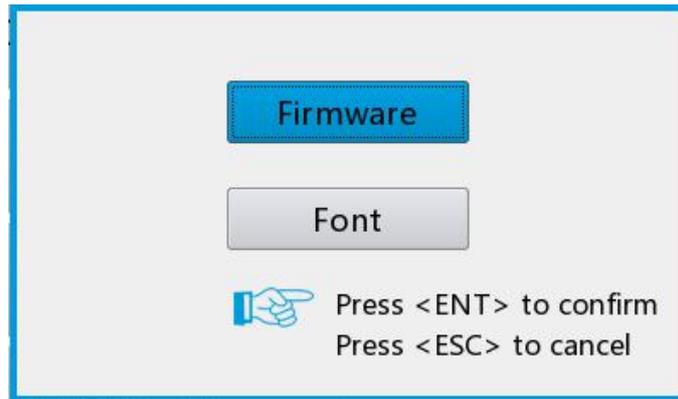
When the blue cursor is stopped at this option, the interface is as shown below:



When the key is pressed to select an output port, press the [Enter] key to change the output status. Red indicates low voltage and gray indicates high voltage.

### 3.8.6 HMI Firmware Upgrade

When the blue cursor stops on this option, press the [Enter] key, the interface as following :



If the panel program needs to be updated, first copy the upgrade file to the U-disk, then insert it into the USB port on the panel, select the [HMI Program Upgrade] option and press the [enter] key to start the program upgrade. After the upgrade is completed, the upgrade is successful. If the upgrade is unsuccessful, re-plug the U-disk or replace the other U-disk. The font upgrade is mainly used to update the interface font or size. The upgrade process is the same as the program upgrade.

## 3.9 Password Management

### 3.9.1 Password input

When entering certain interfaces or performing certain operations, you need to enter a password. The interface is as follows:



At this time, you can enter the password by pressing the number keys directly. When you need to input letters, press the [123/ABC] key to switch to the letter mode, as shown below:

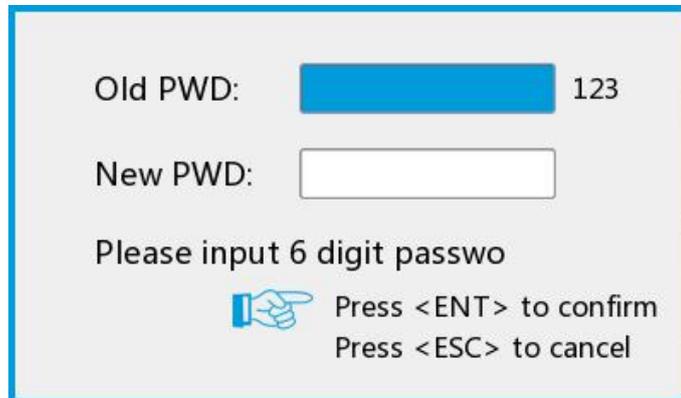


When the first letter is pressed by pressing the letter key [ABC], the input box is displayed as "A". If the key is pressed quickly, the input box will change to "B" → "C" → "A"... When the stop button is waited for about one second, the last displayed letter is the first password, and the second, third ... sixth password is entered according to this method.

Press [Enter] when inputting 6 passwords. If the password is correct, go to the next interface or perform the operation. Otherwise, [Password Error] is displayed, please re-enter.

### 3.9.2 Password Settings

The password setting interface is shown below:



At this time, you can enter the password by pressing the numeric keys or the letter keys. If the password is entered correctly, the new password will take effect, otherwise [Password Error] will be displayed.

# Chapter 4 Follow System

## Main contents:

- servo calibration operation Introduction
- Capacitor calibration operation introduction
- automatic tuning operation Introduction

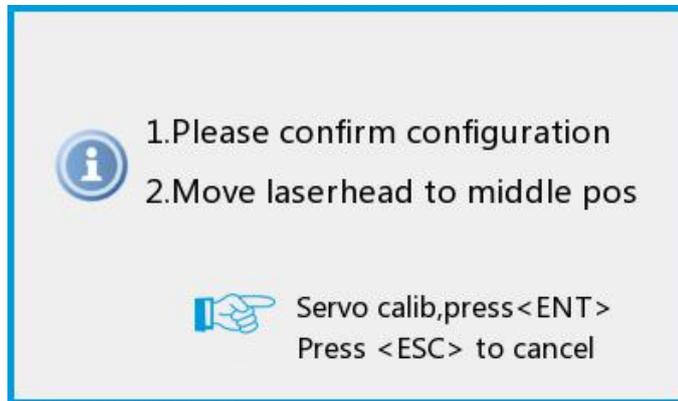


## 4.1 Follow-up system function

### 4.1.1 Servo calibration

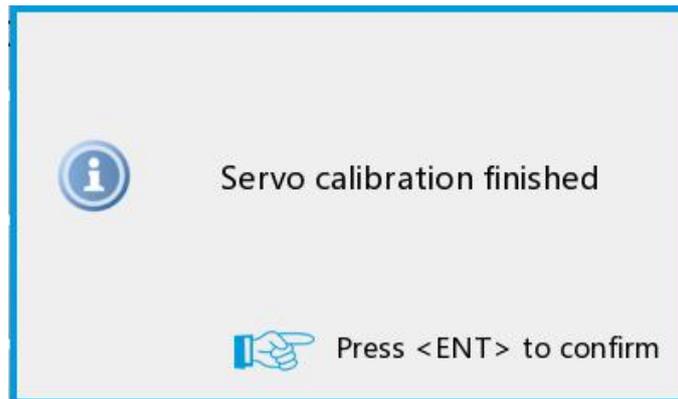
The purpose of servo calibration is to eliminate the zero drift of the servo motor. Due to the servo calibration, the motor will move back and forth in a small amount. Therefore, it is necessary to jog to the middle of the stroke to prevent the stroke range from being exceeded or the limit switch being touched. If the alarm, such as limit, collision alarm, servo alarm, etc., is triggered during servo calibration, the servo calibration processes will stop.

Enter the servo calibration interface by [Function] → [Servo Calibration] on the panel, and then press [Enter], the interface as following:



When confirm that it is correctly, press the [Enter] key to perform servo calibration. If you cancel the calibration during the calibration process, press the [Exit] key.

After the calibration is completed, press the [Enter] key to save the calibration result.



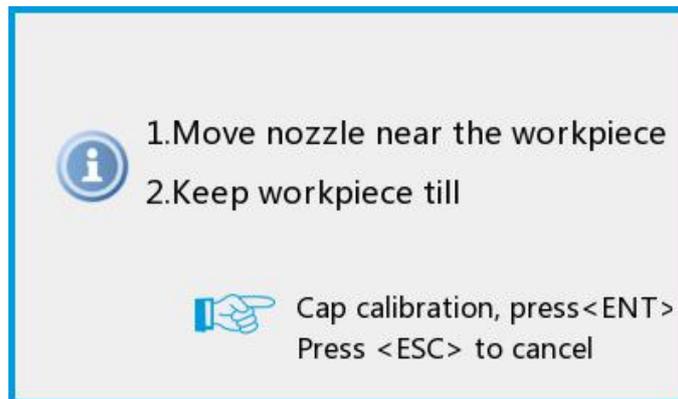
### 4.1.2 Capacitor calibration

Capacitor calibration is the process of automatic calibration of the servo system. If the temperature and humidity of the external environment are changed for a long time, it is

recommended to calibrate the capacitor before cutting to ensure the accuracy and stability during the cutting process. If the user adapts the new cutting sensor or replaces the existing sensor components, the capacitor calibration operation must be performed. Otherwise, the parameters of the sensor and the parameters of the board will not match, resulting in failure to work properly.

Before the capacitor is calibrated, put the system be idle, then the cutting head close to the metal plate, and ensure that the metal plate is reliably connected to the machine body. The machine itself is reliably grounded, and the capacitor calibration can be started. If the metal plate is not reliably grounded or is reliably connected to the machine body, it may cause the capacitor calibration to stop or the calibration to fail. If the cutting head moves all the way down during the calibration process and the metal plate is still moving, it is necessary to check whether the metal plate is reliably turned on. If the metal plate is reliably turned on with the machine, you need to check if the amplifier cable is normal or if the capacitor sensor is faulty.

If the capacitor is calibrated from a very high position on the metal plate, it may cause the capacitor calibration to fail. Move the cutting head close to the metal plate. During the calibration process, if the alarm is triggered (such as limit trigger, servo alarm, etc.), the capacitor calibration will stop.

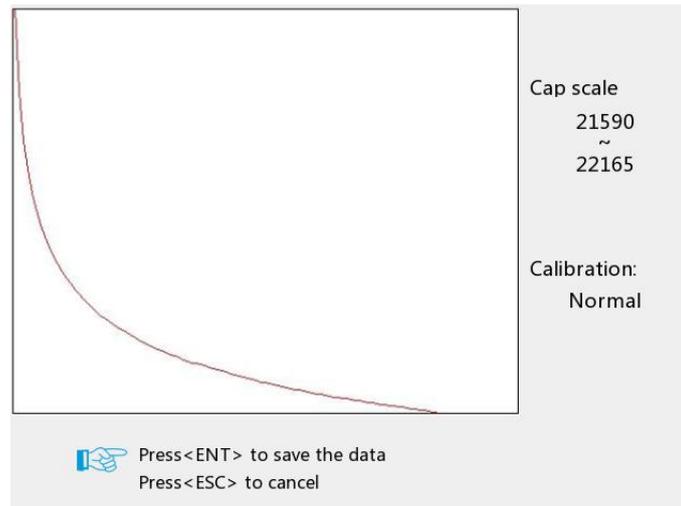


On the panel, enter the capacitance calibration interface by [Function] → [Capacitance Calibration], and press the [Enter] button to start the capacitance calibration process. The capacitor calibration process is as follows:

- 1) The cutting head moves downward for the first time until the working plate is detected;
- 2) After detecting the working plate, move up to 2mm distance and stay for about 1 second.
- 3) The cutting head moves down again at a lower speed until the working plate is detected.
- 4) After detecting the working plate, detect the cutting head capacitance value in the upward movement and record it.
- 5) After the capacitance detection is completed, move a safe distance of 10mm upwards.
- 6) Finally, the capacitance calibration curve is displayed. If the curve is smooth and the calibration result is normal, save the calibration result. If the calibration result is

abnormal, it needs to be recalibrated until the calibration result is normal. If the calibration result is abnormal all the time, you have to check whether the metal plate is reliably turned on or the machine is disturbed.

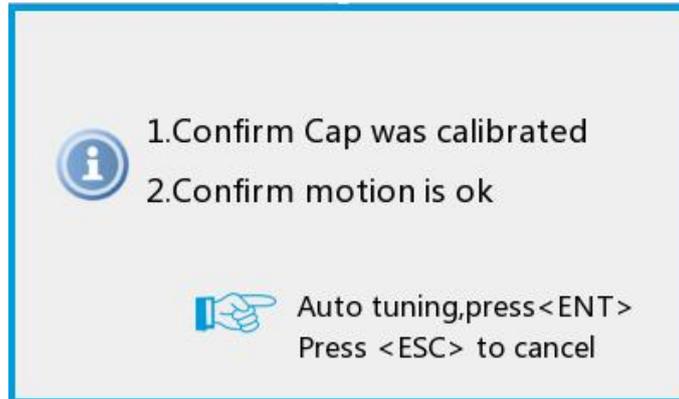
After finished the calibration, the panel will showing up the calibration curve and data range. And the calibration curve indicates the trend of the calibration process. If the calibration curve is a relatively smooth curve, the calibration result is normal, you can press [Enter] to save the calibration data; if the calibration curve is not smooth, or the calibration data has a large deviation, the calibration result is abnormal, you can press [ESC] , the calibration data is invalid.



Since the metal cutting sensor is a capacitive sensitive device that is very sensitive to external humidity and temperature, the system and amplifier and cutting head must be preheated for at least 5 minutes before calibration to ensure that the components in the system are already in a comparison and stable operating temperature.

### 4.1.3 Auto-tuning

The process of auto-tuning is to perform fine-tuning similar to high-frequency oscillation near the height of the nozzle to automatically optimize the internal parameters. Before auto-tuning, you need to ensure that the capacitor calibration has been performed and can be followed normally and there is a metal plate under the cutting head that can follow.



On the panel, enter the auto-tuning interface by [Function] → [Auto-tuning], and click the [ENT] button to start the capacitor calibration process. To cancel the calibration during the auto tuning process, press the [ESC] key.

After the auto-tuning is successful, press the [Enter] key to save the auto-tuning result.



## Following detection

Enter the detection interface through the panel [Function] → [Diagnose] → [LFS check]

The interface can display the nozzle height, actual position, following error, Z-axis coordinate, capacitance value, Z-axis motion status, and Z-axis alarm status in real time. Through this interface, the current motion state of the Z axis can be judged and it is convenient to debug.

Limit switch	Nozzle Distance:	0.7	mm
GP input	Actual pos:	0.0	mm
GP output	Follow err:	0.7	mm
LFS check	Z postion:	0.00	mm
	Cap value:	40000	
	Z motion status:	Idle	
	Z alarm info:	Sys OK	

 Press <ESC> to previous men

# Chapter 5 BWK Handheld Box

## Main contents:

- Handheld box button function introduction

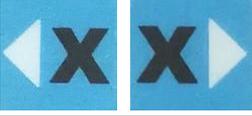
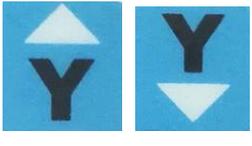
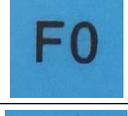
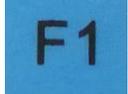
## 5.1 BWK Wireless Handheld Box Introduction

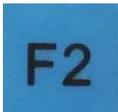
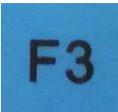
The wireless controller BWK301 uses the handle to establish wireless communication with the receiver, so that the user can control the mainboard through the wireless handheld box within a certain range (40m) to stably and reliably control the cutting machine. It is convenient for users to debug and control the machine, which improves work efficiency and communication is convenient and reliable. Works in parallel with the operator panel of the controller without interference.



### 5.1.1 handheld box button function description

Bottom	function
Shutter 光闸	Control the laser to enable or disable.
Aux 辅助气体	Turn auxiliary gas on or off
Follow 跟随开关	Control the Z axis to following or moving up
Pulse 点射	Laser on

	<p>Do a frame operation on the current processing file</p>
	<p>Manually move the U axis</p>
	<p>Manually move the X axis</p>
	<p>Manually move the Y axis</p>
	<p>Manually move the Z axis</p>
	<p>Speed switching when manually moving</p>
	<p>Return home</p>
	<p>Set the current coordinate as the positioning point</p>
	<p>Cancel the current operation, in the idle state, you can directly return to the positioning point or stop</p>
	<p>Start work or pause/restart work</p>
	<p>System reset, all axis perform reset motion</p>
	<p>Stop processing or axis movement</p>
	<p>Jog, continuous processing state switching when manually moving</p>
	<p>Reserved</p>

	Reserved
	Reserved

# Chapter 6 System Test

## Main contents:

- XY axis motion test description
- Z-axis motion test instructions
- Laser machine test description
- Cutting test instructions

## 6.1 X, Y axis motion test

Be cautious when running for the first time, please follow the steps below to debug:

- 1) Before connecting the motor driver, please set the vendor parameters and user parameters of the mainboard correctly, especially the parameters such as the movement speed, motor step, and movement distance to avoid unsafe movement due to unreasonable parameter settings.
- 2) Correctly determine the logic voltage of the limit switch on the diagnosis interface, and then correctly set the limit switch polarity in the vendor parameters.
- 3) Connect the motor cable correctly according to the motor driver model and set the drive parameters.
- 4) After the parameters are set correctly, connect the motor, the system is powered on, move the XY axis manually, to check whether XY can move or not, if it can't move, please check if the connection is correct, the mainboard parameters are correct and the drive parameters are correct.
- 5) Select [Function] → [Axis Reset] → [XY Axis Reset] on the panel to manually reset the XY axis. At this time, to check whether the XY axis moves to the negative limit direction of the XY axis. If not, please press the [Exit] button immediately to cancel the movement to avoid detecting the negative limits state. And modify the direction polarity in the vendor parameters until the XY axis is reset to the negative limit direction.
- 6) Move the XY axis manually to check if XY is consistent with the direction keys on the panel. Press [X+] to check whether the X axis moves in the X+ direction (the X coordinate is increasing). If the movement is inconsistent, you need to set the keying reverse in the vendor parameters until the XY axis moves correctly.
- 7) If the above procedure is normal, other tests can be performed.

## 6.2 Z Axis following test

Be cautious when running for the first time, please follow the steps below to debug:

- 1) Connect the amplifier through the 15-meter amplifier cable, then connect the cutting sensor head (touch nozzle) through the sensor cable to detect whether the collision alarm is valid, and touch the cutting head to the metal plate (communicating with the ground) to check whether the collision alarm is valid, to check whether the capacitance value has changed or not.
- 2) Before connecting the motor driver, please set the vendor parameters and user parameters of the mainboard correctly, especially the parameters such as the movement speed, motor step and movement distance to avoid unsafe movement due

- to unreasonable parameter setting.
- 3) Manually trigger the upper and lower limit bits, it will prompt [upper and lower limit trigger], it means normal. If the limit polarity is wrong, please set the limit switch polarity correctly in the vendor parameters.
  - 4) Please connect the motor cable correctly according to the motor driver model and set the driver parameters. For details, please refer to the driver's instructions.
  - 5) After the parameters are set correctly, connect the motor, the system is powered on, press the [Z+] [Z-] button to check the moving direction of the cutting head. If the direction of movement is wrong, modify the [Polarity] parameter until the movement normal. If the encoder polarity is wrong, modify the [Encoder Polarity] parameter until the motion is normal.
  - 6) When using in the first time, perform [Servo Calibration] with [Function] to eliminate the influence of servo zero drift.
  - 7) Perform [Capacitor Calibration] through [Function] to calibrate the sensor. If the calibration curve is smooth and the calibration result is normal, you can click "enter" to save the data.
  - 8) On the panel, press the [Follow] button. At this time, the cutting head will drop to the focus position (the height of the nozzle). Press it again and it will be lift up to the lift height.
  - 9) Perform [Auto Tuning] from [Function] to optimize the internal parameters automatically.
  - 10) If the above procedure is normal, other tests can be performed.

## 6.3 Laser test

- 1) According to the laser model, wire it correctly according to the wiring diagram.
- 2) Set the laser type to fiber laser in the vendor parameters and set other related parameters correctly.
- 3) Press [Function] → [Additional Function] on the panel to correctly set the relevant parameters of the pulse, and set the pulse power to about 20%.
- 4) Machine power on, wait about 1 minute, and then press the [Shutter] button on the panel to open the shutter.
- 5) Press the [pulse] button on the panel to check if the laser. If the laser is off, check the wiring or parameters.
- 6) If the above procedure is normal, other tests can be performed.

## 6.4 Cutting test

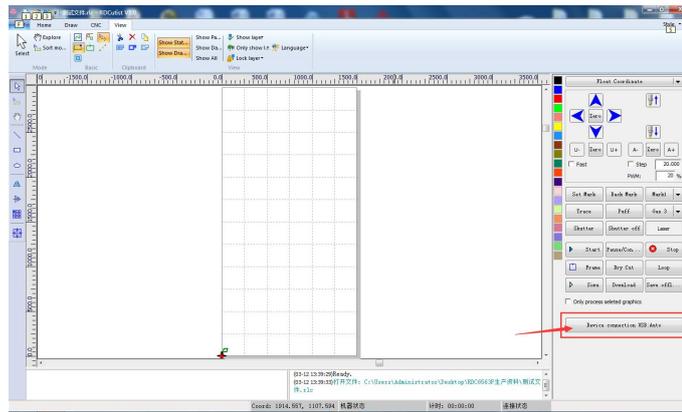
Before the cutting test, please ensure that the wiring is correct and the controller parameters

are set correctly. The X, Y, and Z axis movement tests are normal and have been reset successfully. The relevant parameter settings are only briefly introduced here. For details, please refer to the RDCutist software user manual.

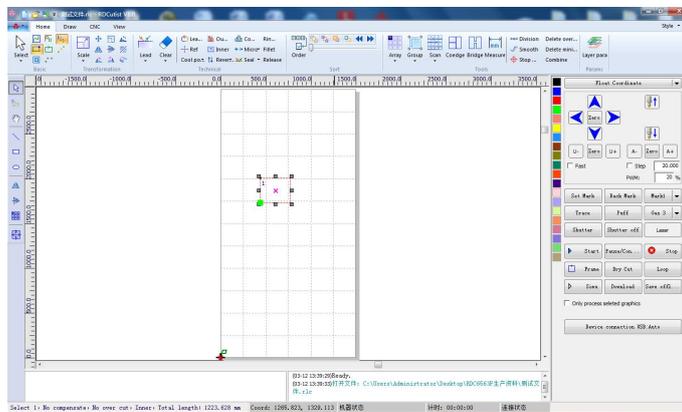
Please follow the steps below to perform the cutting test:



- 1) Double click to open RDCutist software. Click the device option in the lower right corner of the software to connect the card through USB or network cable. For details, please refer to Chapter 8 Device Connection.



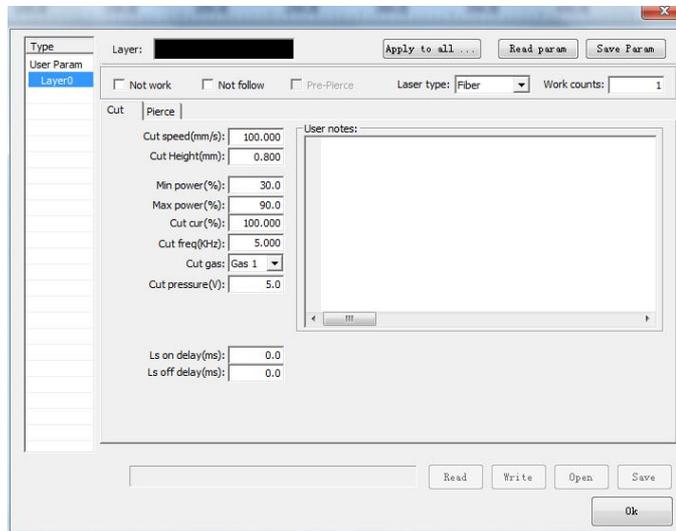
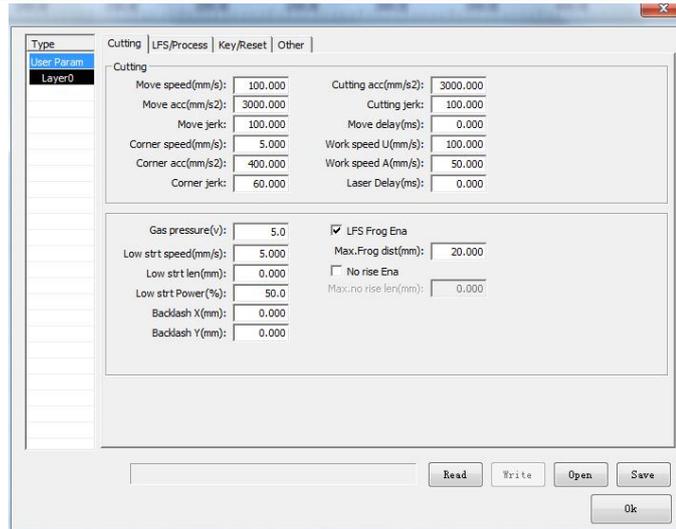
- 2) On the left side of the software, draw a simple graphic using a common drawing tool, taking a rectangle as an example:



- 3) Set the layer parameters correctly:

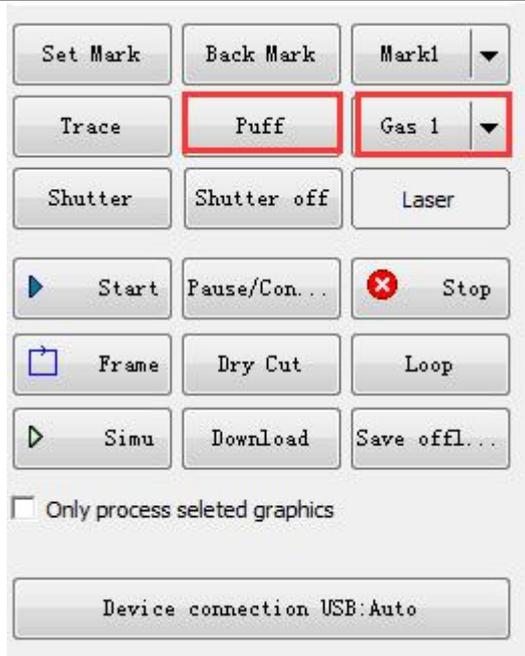


In the upper right corner of the interface, click , Enter the layer parameters and set the [user parameters] and each [layer parameter] correctly according to the actual situation.



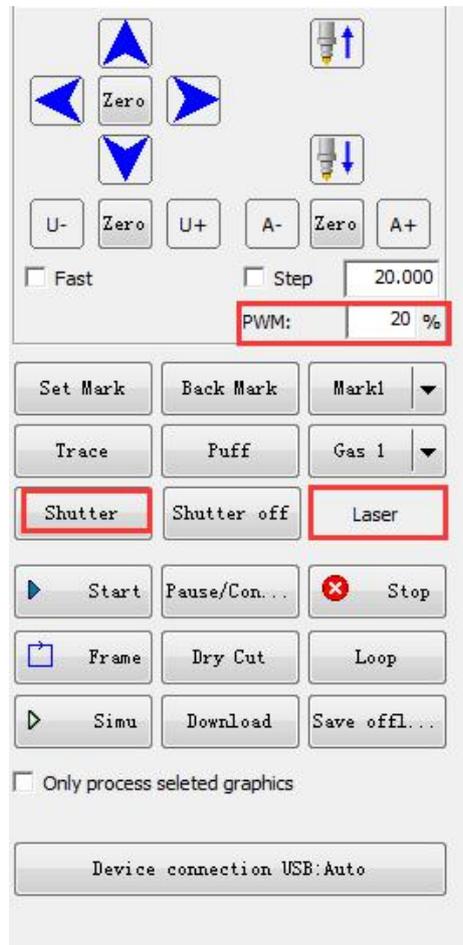
#### 4) Gas test

On the right side of the software interface, first select the gas to be tested. Here, take Gas 1 as an example, and then click “Puff” to test the gas.



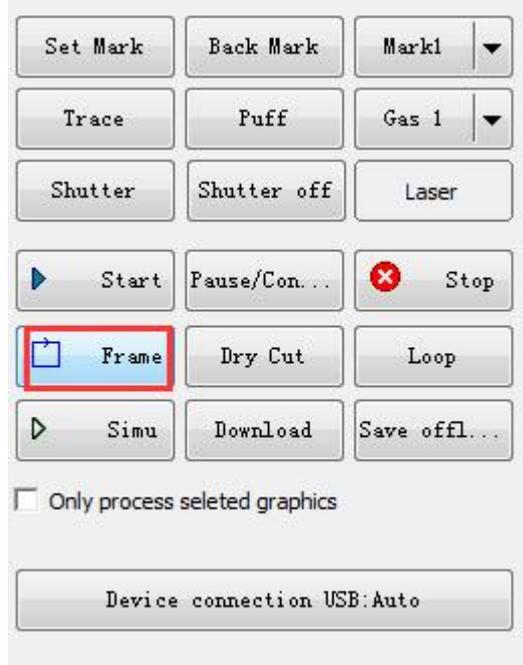
5) Laser pulse test

On the right side of the software interface, first set the spot power correctly, then press the [Shutter] button to open the shutter, and then press the [Laser] button, to test whether the laser is normal or not.



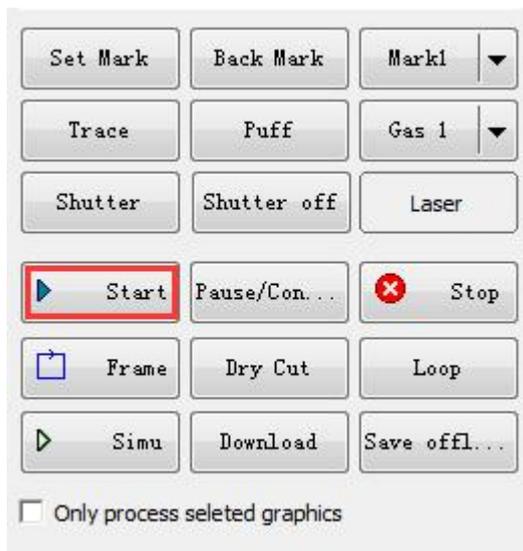
## 6) Frame

On the right side of the software interface, press the [frame] button, the cutting head will move along the largest rectangular boundary of the cutting pattern, indicating that the cutting head will not exceed the rectangular range when cutting, ensuring the safety of cutting.



## 7) Start cutting

When the function test is normal, on the software interface, press the [Start] button to start cutting, and press the [Stop] button to stop cutting.



# Chapter 7 Alarm Message Description

## Main contents:

- Alarm message description
- Alarm processing method

## 7.1 Alarm Information Description

During the operation of the main board, an abnormal situation may be encountered to generate an alarm, and a corresponding protection action is generated to protect the machine. Alarm information includes system error, limit trigger, reset error, collision alarm, excessive following error, small capacitance value, encoder error, servo alarm, laser alarm, machine protection, etc. When an error occurs, the corresponding error will be indicated on the panel. If an error occurs, please follow the error prompt to eliminate the error before running the system, otherwise it may affect the normal operation of the system.

### 7.1.1 System error

When the system fails and cannot run normally, a system error will be displayed and the system will stop moving. In this case, you need to power on the mainboard again. If the system is incorrectly displayed after repeated power-on, the mainboard cannot be used normally.

### 7.1.2 Upper and lower limit trigger

When the Z-axis limit is enabled, when the limit switch is triggered, the limit trigger is displayed. If the cutting head does not trigger the limit switch and still displays the limit trigger, it may be the situation as following:

- The limit polarity setting is incorrect. Please modify the polarity of the limit switch.
- The limit switch wiring is incorrect, please connect correctly;
- The limit switch is damaged, or the limit switch output voltage is incorrect. Please replace the limit switch.

### 7.1.3 X、Y、U、A Hard limit trigger

When the limit is enabled, when the limit switch is triggered, the limit trigger is displayed. If the limit switch is not triggered and the limit trigger is still displayed, it may be the situation as following:

- The limit polarity setting is incorrect. Please modify the polarity of the limit switch.
- The limit switch wiring is incorrect, please wire it correctly;
- The limit switch is damaged, or the limit switch output voltage is incorrect. Please replace the limit switch.

## 7.1.4 Reset error

If an error occurs in the Z-axis reset, a system reset error will be displayed, which may be the situation as following:

- When the reset motion is performed, the motor does not move or the movement speed is too slow, causing the timeout to exit. Please set the Z axis parameters correctly to ensure that the Z axis can operate normally.
- It may be that the motor movement polarity is incorrect, causing the lower limit switch to be triggered during reset, causing the reset to exit.

## 7.1.5 The capacitance value becomes smaller

If it is detected that the sensor capacitance value becomes smaller than a certain range, the display capacitance value becomes small. At this time, the metal material cannot be cut, which may be the following situation:

- It is no capacitor calibration for a long time, or the ambient temperature and humidity change greatly. Please do the capacitor calibration process again.
- When reinstalling or replacing accessories such as sensors and cables, re-do the capacitor calibration process.
- The wiring of the sensor, cable is not secure, resulting in poor contact. Please re-check the wiring of the sensor and the cable.
- Poor contact between the cutting plate and the amplifier shell (or high contact resistance), please ensure that the cutting plate and the amplifier shell are in good contact.
- Some of the laser is scattered on the capacitive sensor, causing the temperature of the sensor rising. Please check the lens and optical path of the laser.

## 7.1.6 Collision alarm

When the cutting head collides with the metal plate, a collision alarm is displayed. When the cutting head does not collide with the metal plate in actually, the collision alarm is still displayed, which may be the following situation:

- The sensor shell and the nozzle are shorted, please check the sensor.
- The sensor cable or amplifier is damaged. Replace the sensor cable or amplifier.
- The capacitance of the sensor is too large and exceeds the detection range of the amplifier. Please replace the sensor with a small capacitance.

## 7.1.7 Air pressure alarm

When cutting, when the main board detects that the air pressure alarm input (general input port I11) is low, the main board will generate a gas pressure alarm. If it is in processing, the processing will be suspended. If you need to continue processing, please eliminate the alarm first, and then continue processing, otherwise you will not be able to continue processing.

## 7.1.8 Large following error

In the cutting head following state, when the following error is greater than the setting value, an alarm with an excessive following error is generated. If the "following error too large" alarm is frequently triggered during the cutting process, the maximum following error parameter needs to be increased.

## 7.1.9 Encoder error

When the Z-axis servo motor cannot be a closed-loop control, an encoder error will occur, which may be the following situation:

- The encoder connection is incorrectly. Please check the Z-axis servo driver wiring.
- The encoder polarity setting is incorrect. Please set the encoder polarity correctly.

## 7.1.10 X、Y、U、A Axis servo alarm

When the board detects that the servo alarm signal input in high voltage, a servo alarm will be generated, or when the servo motor may have unsafe operation, a servo alarm will also be generated. There are several situations in which a servo alarm may occur:

- The servo drive has generated an alarm
- Servo driver servo alarm signal voltage logic is incorrect. When the servo driver alarms, the output must be high voltage. If it is the low voltage, please switch the voltage to high voltage by relay or other ways.
- The wiring is wrong, please check the connection.
- Poor grounding, resulting in large system interference, resulting in false triggering of the alarm, please ensure that the machine is well grounded.

## 7.1.11 Z Axis servo alarm

When the board detects that the Z-axis servo alarm signal input in high voltage, a servo

alarm will be generated; when the servo motor may have unsafe operation, a servo alarm will also be generated. There are several situations in which a servo alarm may occur:

- The servo drive has generated an alarm. Please power on the servo drive again.
- When the servo motor speed exceeds the maximum speed, a servo alarm will be generated. Please increase the maximum speed or reduce the running speed.
- When the servo motor acceleration exceeds a certain value, a servo alarm will be generated. Please check if the servo driver encoder wiring is correct and check if the encoder polarity setting is correct.
- The alarm signal voltage logic of servo driver is incorrect. When the servo driver alarms, the output must be high voltage. If it is low voltage, please switch the voltage to high by relay or other ways.
- The wiring is wrong, please check the connection.
- Poor grounding, resulting in large system interference, resulting in false triggering of the alarm, please ensure that the machine is well grounded.

## 7.1.12 Machine protection

After the machine protection function is enabled in the manufacturer parameters, and the mainboard detects that the machine protection input (general input port I8) is in high voltage or floating, the main board will generate an alarm for machine protection. If it is in processing, the machining will be suspended. . If you need to continue processing, please eliminate the alarm fault first, then continue processing, otherwise you will not be able to continue processing.

## 7.1.13 Following alarm

During cutting, when the Z axis triggers an alarm (such as a collision alarm, etc.), the Z axis will automatically protect the lifting automatically, and the panel will show the following alarm, and the main board will suspend processing.

## 7.1.14 Machine alarm

After the laser function is enabled in the manufacturer parameters, and the main board detects that the laser alarm input is high voltage or floating, the main board will generate an alarm. If it is in processing, the processing will be suspended. If you need to continue processing, please eliminate the alarm fault first, and then continue processing, otherwise you will not be able to continue processing. There are several possible situations in which a laser alarm can occur:

- The laser machine has generated an alarm. Please re-power on the laser.

- The laser is not powered. Please power on the laser machine.
- The laser wiring is incorrect. Please check if the wiring is connecting according to the laser model.

### **7.1.15 Frame crossing**

When the processing is started, there is the prompt will generate. It should be the situations as following:

- The cutting graphics exceeds the maximum breadth of the machine. Please make sure that the cutting pattern is smaller than the maximum size of the machine.
- The manufacturer parameters are not set correctly, and the XY axis format does not match the actual machine format. Please set the XY format correctly.

### **7.1.16 Mainboard communication failed**

The mainboard communication failure may occur during using the panel. The reasons may as following:

- The cable between the panel and the mainboard is not connected correctly. Please use the DB9 cable to connect.
- The connection between the panel and the mainboard is not securely connected to the DB9 terminal. Please check if the DB9 cable connection is stable. Please re-plug the DB9 terminal and lock the fixing screws at both ends of the DB9 cable.
- The cable between the panel and the mainboard is damaged. Please replace the new DB9 cable.
- The mainboard is not working properly. Please check whether the RUN indicator of the main board is normally. If the indicator does not flash, please power on the main board again.
- The mainboard or panel hardware interface has failed.

### **7.1.17 No file**

When there is no file in the memory of the mainboard, and the file is operated, a prompt that the file does not exist will pop up. Please download the file to the mainboard through the software, or copy the standalone file to the mainboard through the USB.

# Chapter 8 Device Connection

## Main contents:

- **USB drive installation**
- **USB device connection**
- **Ethernet device connection**

## 8.1 USB drive installation

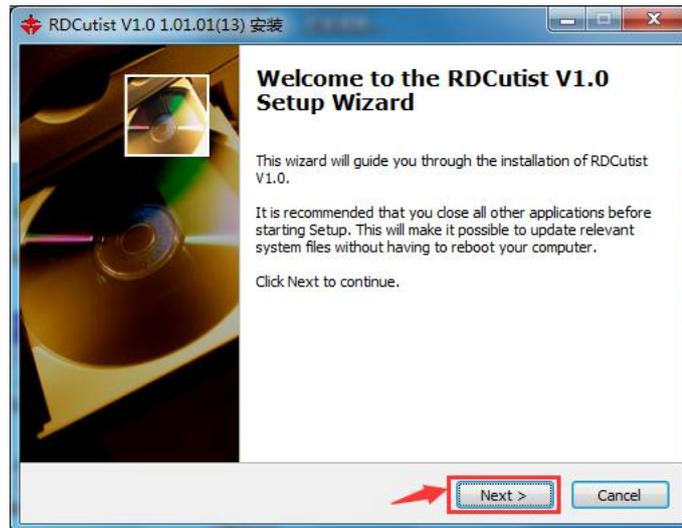
USB is divided into XP, WIN7 32-bit, WIN7 64-bit, WIN8, WIN10 and other 5 different USB drivers according to the system installed on the PC. The driver can be installed automatically or manually.

### 8.1.1 USB Automatic installation

**The procedures are as follows:**

If the RDCutist software is not installed, you need to install the RDCutist software first. The specific installation procedures are as follows.

- 1) Download the software at <http://www.rd-ac.com/>
- 2) Double-click the "RDCutist V1.0 1.01.01Setup.exe" file in the installation package file to start the installation of the RDCutist software. And then click Next or Install, the RDCutist software will be installed automatically.

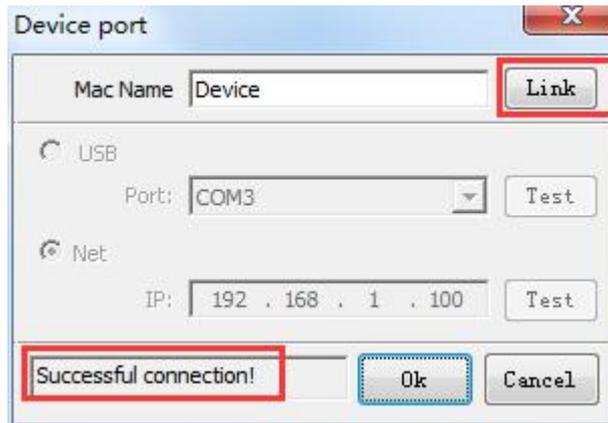


- 3) When the RDCutist software installation is completed. Then click install USB driver and start auto-installing the USB driver until the installation is complete.



If you have installed RDCutist, Click , Find the RDCutist software in programs, click on the RDUdbDriver software in the directory, and start to install the USB driver automatically. The other steps are the same as above.



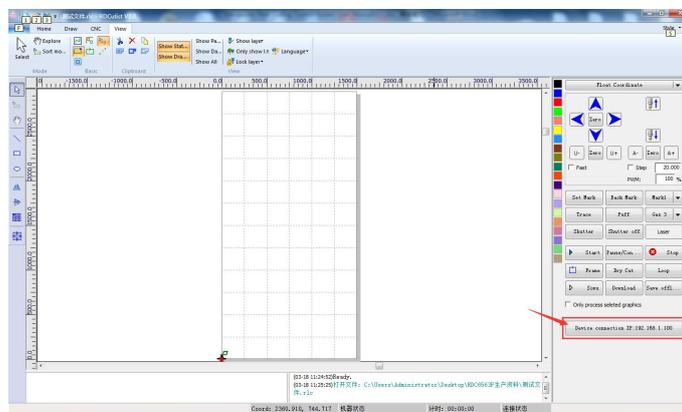


- 4) After the setting is successful, click the [Enter] button to complete the device connection.

### 8.3 Ethernet device connection

The procedures to connect the mainboard via Ethernet (network cable) are as follows:

- 1) Open RDCutist software, Click the [Device Connection] button in the lower right corner of the software.



- 2) Click the [Add] button to add the network device, and then set the network IP address correctly. The IP address is 192.168.1.XXX, and XXX indicates any number between 2 and 254. If there are multiple devices connected to the same LAN, please note that the IP addresses of different mainboards cannot be the same. Otherwise, the IP address conflict will cause the connection to fail.



on the panel.

When the blue cursor stops at the [Network Settings] option, press the [Right] key to enter the parameter area, press the [Up/Down] key to select a parameter and press the numeric keys to modify the parameters. After the modification is completed, select the [Settings] option. Press [Enter] to enter the parameter settings.



**Important:**

**The factory default IP address is 192.168.1.100. If you are in a LAN, you should ensure that the first three fields of the IP address are consistent with the first three fields of the gateway address of the network. Otherwise, the network may be incorrectly connected to the board.**



## Chapter 9 Appendix

### Main contents:

- Common troubleshooting methods

## 9.1 Common Troubleshooting Methods

Common Troubleshooting phenomenon	Reason	Solution
Manually move by Z axis on the panel, the cutting head does not move	The servo drive is not wired correctly	Refer to the user manual for proper wiring.
	Servo drive parameter settings are incorrect	Set the parameters correctly according to the servo drive manual
	Servo drive does not support speed control mode	Please select a drive that supports speed control mode
	An alarm occurs on the Z axis of the main board, causing to stop.	Eliminate alarm faults according to alarm prompts on the panel interface
	The panel is not connected properly with the mainboard.	1、 Check if the panel cable 2、 Z-axis movement can be controlled by
XY Axis manual does not move	The servo drive is not wired correctly	Refer to the user manual for proper wiring.
	Servo drive parameter settings are incorrect	Set the parameters correctly according to the servo drive manual
	The polarity of the limit is set incorrectly, causing to stop.	Correctly set the limit polarity
	Servo drive generates an alarm	Please restart the servo to cancel the alarm.
Communication failed via USB connection	USB driver not installed properly	Please install the USB driver correctly
	The mainboard and computer are not connected to the USB cable or the cable is faulty.	Please replace the USB cable to ensure that the USB connection is normal.
	Not set to USB connection properly	Please set the connection method to USB connection
Communication fails via Ethernet	Network IP settings are incorrect	Please set the mainboard IP address correctly.

connection	Not set to network connection properly	Please set the connection method to network connection
	The mainboard and computer are not connected to the network cable or the network cable is faulty.	Please replace the network cable to ensure that the network cable is connected properly.
U disk failed to read the file U	No file or format is incorrect	Please copy the standalone file in the correct format to the U disk
	U disk format is incorrect	Please format the USB flash drive in FAT16 or FAT32 format.
	U disk has a virus causing file corruption	Please clean up the U disk in time.
sometimes wireless handheld box buttons fail	Handheld battery is low on battery	Please replace the battery with a new one.
	Strong electromagnetic interference nearby	Try to avoid electromagnetic interference areas
	Do not operate the handheld box for a period of time, the button press time is too short.	Do not operate the handheld box for a period of time. the button needs to be pressed for a long time.
[Capacitor calibration], when touched the metal plate , it still moves downward.	There is slag on the nozzle, etc., causing the amplifier fail to detect the touch plate.	Clean the nozzle and keep the nozzle clean
	Poor contact between the metal plate and the machinel, causing the amplifier fail to detect the touch plate	Ensure that the metal plate is in good contact with the machine
	Metal plate with plastic protective	Remove plastic protective
[Capacitor calibration], prompt [capacitor calibration failed]	In [Capacitor Calibration], press the [Stop] button	—
	In [capacitor calibration], the cutting head is too high from the metal plate	When [capacitor calibration], first move the cutting head close to the metal plate

	Trigger upper and lower limit switches during [capacitor calibration]	In [capacitor calibration], manually move the cutting head off the limit switch .
	The motor does not actually rotate and causes a timeout to exit.	First ensure that the motor can move normally
The height following is significantly different from the actual height	No capacitor calibration for a long time	Re-capacitor calibration
	No recalibration of the capacitor after replacing the capacitor sensor and other accessories	Re-capacitor calibration
	Part of the laser is scattered onto the capacitive sensor, causing the nozzle temperature to rising.	Please check if the lens is clean and the laser is not biased.
	Blowing causes a large change in the detected capacitance value	Please check if the gas is dry and pure
When following, there is a serious jitter	Poor contact of the amplifier shell (or metal plate) with the machine	Ensure that the amplifier shell (or metal plate) is in good contact with the machine
	Filter coefficient setting is too large	Reduce the filter coefficient
	No capacitor calibration or calibration results are not good	Re-capacitor calibration
	Plate shake caused cutting shake when blowing	Appropriate increase of jitter filtering time
	Servo drive rigidity setting is too large	Reduce servo stiffness
	Large machine interference	Connect the height adjuster PGND to the machine shell while connecting the shell to the earth



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