Medium Power Fiber Laser Cutting Control System
User Manual----RDC6333F

Shenzhen RuiDa Technology CO., LTD
Tel: 86-0755-26066687
Fax: 86-0755-26982287
Web: www.rd-acs.com
E-Mail: support@rd-acs.com
Add: 1B-1, Building 5, Tian'an Nanyou Industry Area,
   Dengliang Road, Nanshan District, Shenzhen, P.R.C.
CONTENTS

Copyright Declaration .................................................................................................................. 6

Chapter 1 The Structure of Fiber Laser Cutting Control System ................................................. 7

Chapter 2 RDC6333F Controller .................................................................................................. 9

2.1 Introduction ............................................................................................................................. 9

2.2 Controller Interface Description ............................................................................................ 9

2.2.1 Main power supply interface CN1 .................................................................................. 9

2.2.2 Display panel power interface CN0..................................................................................10

2.2.3 Display panel data cable interface HDI..........................................................................10

2.2.4 HMI ....................................................................................................................................10

2.2.5 Udisk ..................................................................................................................................10

2.2.6 USB interface ....................................................................................................................10

2.2.7 Ethernet interface .............................................................................................................11

2.2.8 General/dedicated output CN2 .......................................................................................11

2.2.9 3-axis limit and dedicated input port CN3/CN4 ..............................................................12

2.2.10 X/Y/Z axis driver port ..................................................................................................13

2.2.11 Laser control ports CN6/CN7 .......................................................................................14

2.2.12 Water protection input port CN5 ..................................................................................14

2.3 Wiring Instruction of Step Motor .......................................................................................... 15

2.3.1 Pulse signal rising edge valid .......................................................................................... 16

2.3.2 Pulse signal falling edge valid ........................................................................................ 17

2.4 IO Wiring Description .......................................................................................................... 19

2.4.1 Input port ..........................................................................................................................19

2.4.2 Output port .......................................................................................................................20

2.5 Manufacturer/User Parameters ............................................................................................ 20

2.5.1 Vendor parameter s.........................................................................................................20

2.5.2 User Parameters ..............................................................................................................24

Chapter 3 Laser Control Wiring Diagram .................................................................................... 27

3.1 RayCus 300W Fiber Laser Wiring Diagram......................................................................... 27

3.2 MaxPhotonics 300W Fiber Laser Wiring Diagram ............................................................... 28

Chapter 4 LFS System ................................................................................................................... 29

4.1 Function Description ..............................................................................................................29

© 2016 Ruida Technology. All Rights Reserved
4.2 LFS Operation Introduction

4.2.1 Main interface.................................................................31
4.2.2 Panel Function keys......................................................33
4.2.3 Menu function...............................................................35
4.2.4 Parameters setting interface.........................................37
4.3.1 Dial switch....................................................................41
4.3.2 Sensor amplifier interface..............................................41
4.3.3 CN1 is the analog amplifier interface............................41
4.3.4 CN2 is power input interface..........................................42
4.3.5 CN3 is the interface between LFS and controller............42
4.3.6 CN4 External Input Interface..........................................43
4.3.7 CN5 External output interface........................................43
4.3.8 CN6 External output interface........................................44
4.3.9 MOTOR Control Interface..............................................44
4.3.10 Indicator Light description..........................................46
4.3.11 Wiring of LFS & Controller..........................................47
4.1.12 LFS & operation panel wiring.................................48
4.3.13 LFS limit wiring..........................................................48
4.3.14 Amplifier installation and wiring...............................49
4.3.15 Gas wiring.................................................................50

4.4 The LFS Commissioning..................................................51

4.5 Metal Cutting....................................................................51

Chapter 5 Wireless Operating Handle........................................54

5.1 Overview........................................................................54
5.2 Wireless Handle............................................................54
5.3 Wireless Adapter............................................................56

Chapter 6 RDC6333F Operational Panel.......................................57

6.1 Overview........................................................................57
6.2 Keys Description............................................................57
6.3 Main Interface..................................................................60
6.3.1 System reset.................................................................61
6.3.2 Limit alarm state..........................................................62
6.3.3 Shutter on-off state.......................................................62
6.3.4 Network connecting state..............................................62
6.3.5 Set speed.................................................................63
6.4 Set Power......................................................................63
6.5 File management........................................................................................................ 65
   6.5.1 Main interface....................................................................................................... 65
   6.5.2 File operation...................................................................................................... 66
   6.5.3 U-disk file........................................................................................................... 67
   6.5.4 Other menu......................................................................................................... 67
6.6 File Layer Parameters Modification...................................................................... 68
6.7 System Information ................................................................................................. 69
6.8 User Parameters....................................................................................................... 70
   6.8.1 Main interface operation..................................................................................... 70
   6.8.2 Set parameters................................................................................................... 74
   6.8.3 Soft keyboard operation.................................................................................... 76
6.9 Vender Parameters................................................................................................. 77
6.10 System Configuration ............................................................................................ 80
6.11 System Menu.......................................................................................................... 82
6.12 Function Interface.................................................................................................... 83
6.13 Home Interface....................................................................................................... 85
6.14 Diagnose Interface................................................................................................. 85
6.15 Keyboard Lock Function........................................................................................ 87
6.16 Alarm Information................................................................................................... 88
6.17 Modify Startup Picture............................................................................................. 88
6.18 Ports Description.................................................................................................... 90
   6.18.1 Power port JP1, JP2.......................................................................................... 90
   6.18.2 General input port JP3...................................................................................... 91
   6.18.3 General output port JP4................................................................................... 91
   6.18.4 To connect the port of controller HDI.................................................................. 91
   6.18.5 To connect the port of LFS RS232...................................................................... 91
   6.18.6 U disk interface............................................................................................... 92
   6.18.7 PC interface...................................................................................................... 92
6.19 Wiring instructions.................................................................................................. 92
   6.19.1 Tricolor alarm lamp wiring ............................................................................. 92
   6.19.2 Optical shutter wiring..................................................................................... 93
   6.19.3 Laser alarm input............................................................................................ 93

Chapter 7 MetalCut Software ......................................................................................... 94

7.1 MetalCut Overview ................................................................................................. 94
7.2 Cutting Path Process................................................................................................................. 94
7.3 Cutting Preprocess....................................................................................................................... 96
7.4 Cutting Path Handle.................................................................................................................... 97
7.5 Cutting Path Preview.................................................................................................................... 98
7.6 Primitive Attribute Modification............................................................................................... 99
7.7 Enable Link Near......................................................................................................................... 100
7.8 Laser Head Un-lifting within Short Distance............................................................................ 100
7.9 Punch Operation........................................................................................................................ 101

Chapter 8 Installation Dimensional Drawing................................................................................... 102

8.1 Controller Drawing..................................................................................................................... 102
8.2 Operating drawing (Unit:mm)................................................................................................... 103
8.3 LFS Drawing............................................................................................................................... 104
8.4 Amplifier Drawing....................................................................................................................... 104
Copyright Declaration

Shenzhen Ruida Technology Co., Ltd. (hereinafter referred to as “Ruida Technology”)
All rights reserved.

1. Ruida Technology holds the patent rights, copyrights and other intellectual property rights for this product and its related software. Without authorization, none company or organization or individual is allowed to copy, manufacture, process and use this product and its relative parts directly or indirectly, otherwise shall be investigated for legal responsibility according to the law.

2. Ruida Technology is entitled to increase or reduce and modify the products and functions of this product stated herein as well as amend any documents attached to this product, without prior notification.

3. The users should peruse this manual prior to using the product stated herein, Ruida Technology shall not be responsible for the direct, indirect, special, incidental or corresponding losses or damages arising out of improper use hereof or of this product as below:
   - Users using this manual or product improperly
   - Users not follow the related safety operation rules
   - The loss caused by the forces of nature

4. The machine in operation is dangerous, so the users are obliged to design and institute the effective mechanism for error handling and safety protection. Ruida Technology shall not undertake any duties or responsibilities for the incidental or corresponding losses arising therefrom.
Chapter 1 The Structure of Fiber Laser Cutting Control System

RDC6333F, is one set of cost-effective control system dedicated for fiber laser. This system includes below accessories:

1. 5.6-inch TFT TrueColor operation panel.
2. RDC6333F controller
3. Wireless operational panel and adapter
4. Fiber laser conversion terminal
5. LFS, sensor

The structure drawing of RDC6333F is showed as below, here taking RayCus 300W fiber laser as example:
Chapter 2 RDC6333F Controller

2.1 Introduction

RDC6333F system is the latest laser cutting control system developed by Ruida Technology; this control system has better stable hardware with antistatic, resistance to high pressure. The human-machine operation system based on LINUX, has better operation interface and power functions. Excellent motion control functions, high-capacity memory, 2-way independent digital/analog laser power control interface, strong compatible U disk drive program, multiple ways general/dedicated IO control. Integrated dedicated time system supporting hardware encryption algorithm, supporting connect to PC through Ethernet communication or USB communication.

2.2 Controller Interface Description

2.2.1 Main power supply interface CN1

<table>
<thead>
<tr>
<th>SN</th>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OGND</td>
<td>24V power- (input)</td>
</tr>
<tr>
<td>2</td>
<td>+24V</td>
<td>24V power+ (input)</td>
</tr>
<tr>
<td>3</td>
<td>PGND</td>
<td>Reserved for GND, or NC</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>NC</td>
</tr>
</tbody>
</table>
24V power supply for control system, 24V/2A is recommended for keeping a certain margin. Meanwhile, this control system is compatible with 36V power supply, that is, can use the driver 36V power directly connects to main power supply interface, but this method is not recommended.

2.2.2 Display panel power interface CN0

<table>
<thead>
<tr>
<th>SN</th>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P+</td>
<td>+5V</td>
</tr>
<tr>
<td>2</td>
<td>P-</td>
<td>Reference Ground</td>
</tr>
</tbody>
</table>

CN0 interface, only provides power for 320*240 color display panel, it cannot for other purpose. The controller P+ connects to display panel P+, controller P- connects to display panel P-.

2.2.3 Display panel data cable interface HDI

HDI is standard DB15 interface, the controller connects to 320*240 color display panel through the dedicated twisted shielded cable.

2.2.4 HMI

HMI is the wireless panel adapter interface, more details please refer to the concerned user manual.

2.2.5 Udisk

Udisk is USB-AM interface for controller visiting Udisk.

2.2.6 USB interface

USB is USB-BM interface for controller and PC access via USB2.0.
2.2.7 Ethernet interface

The controller and PC can communicate at 10/100MHZ via Ethernet interface.

Please use Ethernet parallel lines with PIN to PIN.

2.2.8 General/dedicated output CN2

The definition of general/dedicated output (6Pin, 3.81 mm spacing)

<table>
<thead>
<tr>
<th>PIN</th>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>O GND</td>
<td>External Reference Ground (output)</td>
</tr>
<tr>
<td>2</td>
<td>Out4</td>
<td>General output 4, reserved</td>
</tr>
<tr>
<td>3</td>
<td>Out3</td>
<td>General output 3, reserved</td>
</tr>
<tr>
<td>4</td>
<td>Out2</td>
<td>Dedicated output 2, working state signal port. If this port connects to relay, the relay coil conducted when working, and no influence when paused; the relay coil will be off when finished work or artificial cancelled.</td>
</tr>
<tr>
<td>5</td>
<td>Wind</td>
<td>Dedicated output 1, when enable fan control, this port output fan control signal, otherwise, other dedicated control signal. When connecting and enable the fan control, can set the fan switch in each layer, if connects to relay, the relay coil will be conducted when the fan working, and vice versa.</td>
</tr>
<tr>
<td>6</td>
<td>O 24V</td>
<td>External power output (If 24V power for main power interface, the pin is 24V, if 36V, the pin is 36V.)</td>
</tr>
</tbody>
</table>

All photoelectric coupling isolation output signal. OC gate output, the max. drive capability is 500mA, can drive 6V/24V relay.
2.2.9 3-axis limit and dedicated input port CN3/CN4

Z-axis limit and dedicated input port CN3 (6Pin, 3.81mm spacing).

<table>
<thead>
<tr>
<th>PIN</th>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OGND</td>
<td>External Reference Ground (output)</td>
</tr>
<tr>
<td>2</td>
<td>DrProc</td>
<td>Dedicated input 2, protect port input (cover protection, if the machine should work in the specific status (such as cover protection, the protect signal input from this pin. This pin can enable and disable, when the pin is disable, this signal cannot be inquired by controller; if this pin is enable, and the input is high level or port NC, the machine is protected, the on-going work should be suspended, and the laser will be off.</td>
</tr>
<tr>
<td>3</td>
<td>FootSW</td>
<td>Dedicated input 1, foot switch input port. The connection way: when hit the foot switch, input low level signal to this port; when leave the foot plate, cut off the connection or input high level to this port; the time of hit the foot plate is not less than 100ms, if the machine is in idle state at present, the machine will start work; if the machine is in working, it will be paused; if the machine is paused, the paused work will be restart. That means the foot switch function is the same as “start/pause” keys. If the hitting foot switch time interval is less 1.5seconds, the second hitting action is invalid for controller.</td>
</tr>
<tr>
<td>4</td>
<td>LmtZ-</td>
<td>Z-, the limit when Z axis moves to 0 coordinate</td>
</tr>
<tr>
<td>5</td>
<td>LmtZ+</td>
<td>Z+, the limit when Z axis moves to the max. coordinate</td>
</tr>
<tr>
<td>6</td>
<td>O 5V</td>
<td>External power +5V (output)</td>
</tr>
</tbody>
</table>
X/Y axis limit input port CN4 (6Pin, 3.81mm spacing)

<table>
<thead>
<tr>
<th>PIN</th>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OGND</td>
<td>External Reference Ground (output)</td>
</tr>
<tr>
<td>2</td>
<td>LmtY-</td>
<td>Y-, Y moves to the limit of 0 coordinate</td>
</tr>
<tr>
<td>3</td>
<td>LmtY+</td>
<td>Y+, Y moves to the limit of the maximum coordinate</td>
</tr>
<tr>
<td>4</td>
<td>LmtX-</td>
<td>X-, X moves to the limit of 0 coordinate</td>
</tr>
<tr>
<td>5</td>
<td>LmtX+</td>
<td>X+, X moves to the limit of the maximum coordinate</td>
</tr>
<tr>
<td>6</td>
<td>O 5V</td>
<td>External power +5V (output)</td>
</tr>
</tbody>
</table>

The limit polarity is selectable, if the motion axis moves to limit position, one low level signal will be triggered, and the corresponding LED of each limit (under the shell) will be on; when the motion axis moves away from limit position, will trigger high level signal or cut off the limit signal connection, the limit indicator will be off, at this time, the limit polarity is negative; otherwise, when the motion axis closes to limit, the indicator will be off, when leaving the indicator light will be on, at this time, the limit polarity is positive. The limit polarity setting wrong will lead to the axis crash due to the limit cannot be tested when system reset.

### 2.2.10 X/Y/Z axis driver port

All the three motion axis ports are the same (6Pin, 3.81mm spacing), taking X port as example.

<table>
<thead>
<tr>
<th>PIN</th>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OGND</td>
<td>Internal Reference Ground (output, only for driver common cathode connection)</td>
</tr>
<tr>
<td>2</td>
<td>xDir+</td>
<td>Direction signal differential positive</td>
</tr>
<tr>
<td>3</td>
<td>xDir-</td>
<td>Direction signal differential negative</td>
</tr>
<tr>
<td>4</td>
<td>xPulse-</td>
<td>pulse signal differential negative (if using common anode connection, and pulse rising edge valid, this pin connects to driver pulse end)</td>
</tr>
<tr>
<td>5</td>
<td>xPulse+</td>
<td>pulse signal differential positive (if using common anode connection, and pulse falling edge valid, this pin connects to driver pulse end)</td>
</tr>
<tr>
<td>6</td>
<td>+5V</td>
<td>Internal 5V power+ (output, only for driver common anode connection)</td>
</tr>
</tbody>
</table>
The direction signal polarity of driver pulse signal can be set. When one axis reset, the axis moves to the negative direction of machine origin, that means the axis direction signal polarity is wrong, at this time, cut off the connection of this axis and motor driver (Otherwise, the controller cannot find the limit, which will cause this axis crash.). Until the axis resetting, the direction signal polarity can be corrected, and then press “reset” key to reset the controller.

2.2.11 Laser control ports CN6/CN7

This control system has 2-way independent laser control ports. The two ways signal meaning and order are the same, here taking the first way port CN6 as an example (6Pin, 3.81 mm spacing, the second way laser port is CN7):

<table>
<thead>
<tr>
<th>PIN</th>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LGND</td>
<td>Reference Ground</td>
</tr>
<tr>
<td>2</td>
<td>L-On1-</td>
<td>Laser control port</td>
</tr>
<tr>
<td>3</td>
<td>L-On1+</td>
<td>Laser control port</td>
</tr>
<tr>
<td>4</td>
<td>LPWM1+</td>
<td>Laser control port</td>
</tr>
<tr>
<td>5</td>
<td>LPWM1-</td>
<td>Laser control port</td>
</tr>
<tr>
<td>6</td>
<td>L-AN1</td>
<td>Analog voltage, connecting to laser power control terminal</td>
</tr>
</tbody>
</table>

2.2.12 Water protection input port CN5

Water protection input port（5pin，3.81mm）

<table>
<thead>
<tr>
<th>PIN</th>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LGND</td>
<td>Laser power 5V ground (output)</td>
</tr>
<tr>
<td>2</td>
<td>L-On1-</td>
<td>The first laser power water protection state input port. When enable water protection 1, the controller will test it, if this port is low level, which means it is in normal state; if this port is high level, the controller will force-close laser, and stop the processing, and the system will be alarmed. If water protection 1 cannot be enabled, the controller cannot test water protection 1 input port, user cannot connect water protection 1.</td>
</tr>
<tr>
<td>3</td>
<td>L-On1+</td>
<td>The second laser power water protection state input port. When enable water protection 2, the controller will test it, if this port is low level, which means it is in normal state; if this port is high level, the controller will force-close laser, and stop the</td>
</tr>
</tbody>
</table>
2.3 Wiring Instruction of Step Motor

All the input signal terminal of step motor driver adopts photoelectric coupling isolation technology. For step pulse signal, some are the diode negative input pulse signal falling edge valid, some are the diode negative input pulse signal rising edge valid. When indicate the motor driver signal rising edge valid or falling edge valid, all the pulse signals should be input from isolation side optocoupler diode negative terminal.

Some of motor driver input signal are independent, some are internal common, so some of the outgoing line are 4 lines, some are 3 lines (only for pulse and direction signal), see Figure 10, Figure 11, the input signal can compatible with different voltage classes, if more than 5V signal, externally connecting to current-limiting resistance, the motor driver port signal of RuiDa controller is 5V, it should directly connect to the corresponding terminal of the driver.

Each motor driver port of RuiDa controller provides two signals, one is rising edge valid, the other is falling edge valid. If the pulse signal incorrect using, which maybe lead to motor losing step when rotating, even reverse, so the final result is the processing graphics misplaced, meanwhile, the controller provides two direction signals, the direction signals are not strict, any one of signal and driver direction signal connection in common anode mode, and two direction signals and driver connection in differential mode as well, positive and negative and be exchange, the exchange result is the motor rotation direction is not the same as the actual expected, you can modify the polarity of motor direction signal in PC software. This chapter is mainly talking about controller and motor driver wiring diagram, here taking the leading step motor driver in the market as example, recommend the common anode connection in all the wiring diagram.
2.3.1 Pulse signal rising edge valid

The early Leadshine step motor driver is rising edge valid, some of products support rising/falling edge valid for selection. All the products set as rising edge valid when leaving factory. In addition, the new driver model from this factory, such as 3ND556, MD556, etc., the pulse signal is falling edge valid.

The wiring diagram of RUIDA controller and Leadshine driver with rising edge valid, the typical driver model of pulse signal rising edge valid: M860, 3MD560, etc.

4 input, rising edge valid, common anode connection

4 input, rising edge valid, differential connection
2.3.2 Pulse signal falling edge valid

The driver pulse ends of drivers for step-servo motors presently produced by most of manufacturers are valid falling edge. The typical companies include BERGER LAHR, Beijing HollySyn Motor Technology Co., Ltd., Shenzhen YAKO Automation Technology Co., Ltd., Shenzhen Baishan Mechatronics Co., Ltd., Beijing Jektechnology Co., Ltd. and the like. The input signals for some motor drivers are independent and some of common anode.

(1) The drivers with independent input signals include D921 and WD3-00X from BERGER LAHR, YKA3722MA from Shenzhen YAKO Automation Technology Co., Ltd., JK-2HB402M from Beijing Jektechnology Co., Ltd., Q2HB44MC(D) and Q3HB64MA from Shenzhen Baishan Mechatronics Co., Ltd.
(2) The drivers with common-anode input signals, such as YKA2304ME from Shenzhen YAKO Automation Technology Co., Ltd., Q2HB34MB and Q2HB44MA(B) from Shenzhen Baishan Mechatronics Co., Ltd.

3 Inputs, Falling Edge Valid and Common Anode Connection
2.4 IO Wiring Description

2.4.1 Input port

Taking X/Y negative limit input wiring as example:
2.4.2 Output port

2.5 Manufacturer/User Parameters

2.5.1 Vendor parameters

(1) Axis parameters

**Direction Polarity:** Direction polarity modification can move the motor to the opposite direction. The modification purpose is to make the axis moving to the origin when resetting. If this axis moves far from the origin on resetting, it means the direction polarity setting is wrong and should be modified.

**Spacing/limit Polarity:** it is used to set the high and low level mode of spacing/limit signal. When the motion axis arrives at the spacing/limit position and input a low-level signal to the controller, the spacing/limit polarity should be set to negative at this time.

**Key Polarity:** it is used to control the movement direction when moving axis by keys manually. When the direction polarity is set correctly, if you press the directional keys on the operating panel, this axis will move to the opposite direction, in such a case the polarity of keys should be modified.
Control Mode: Double PWM and direction + single pulse are optional; it is configured with the motor driver types. In general, direction + single pulse is selected.

Hard limit/spacing Protection: it is used for whether the hard-spacing protection of this axis is enabled.

Reset Enable: if the machine is configured this axis, “Reset Enable” should be opened; if no, “Reset Enable” should be prohibited. This parameter is mainly to control the “Reset Enable” option in user parameters and “axis reset” in function keys, to prevent user to reset one axis which is not exist in real.

Motor Step Length: it means the impulse equivalent, the absolute distance by the corresponding motion axis when a pulse is delivered to the motor. Prior to the correct setting of this value, a larger rectangle can be cut with the machine (the larger the graphics is, the smaller the difference is). The motor stepping can automatically be calculated according to the graphics length and measuring length.

Jump-off Speed: it means the speed of the motion axis in direct start from the idle condition. If this value is excessively large, it will make the motor lose steps, jar and even squeak; if small, it will reduce the running speed of the whole figure. If the inertia of the motion axis is larger (the axis is heavier), you can set a smaller takeoff speed; if smaller (the axis is lighter), the jump off speed can be increased. For example, the typical value is 5~30mm/s.

Maximum Speed: it means the maximum limit of motion speed that this axis can bear. This parameter has something to do with the driving force of motor, the inertia of motion axis and its drive ratio. For example, the typical value is 200~500mm/s.

Acceleration: it means the maximum acceleration of the motion axis in accelerated or decelerated motion. If the acceleration is set too large, it will make the motor lose steps, jar and even squeak; if too small, it will cause the reduction of acceleration so as to reduce the running speed of the whole figure. For the axis with larger inertia, such as Y axis corresponding to the beam, its typical setting range is 800~3000mm/s²; for the axis with smaller inertia, such as X axis corresponding to the car, its typical setting range is 8000~20000mm/s².

Breadth: it means the farthest distance that the motion axis can move, which is determined in accordance with the actual condition of the machine.

Key Jump-off Speed: it means the starting speed to move the axis by way of the keys on the keyboard, which can’t be higher than the jump off speed.

Key Acceleration: it means the acceleration to move this axis by way of the keys on the keyboard, which can’t be higher than the maximum acceleration of this axis.
**Estop Acceleration:** if the hard-limit protection enabled by this axis, so when the axis moves to the limit position, it will stop the machine at Estop acceleration. The value can be 2~3 times of the maximum acceleration of this axis.

**Distance from Origin to Hard Limit:** if this axis enables hard-spacing protection, generally this value should be set to be 2~5mm; if it is set to be 0, when this motion axis moves to the smallest coordinate, i.e. 0, this spacing may be validate, which may wrongly triggers the hard-spacing protection and scram the machine. If the hard-spacing protection is not enabled, this value can be set to be 0~5mm.

(2) Laser parameters

**Laser Configuration:** single laser and double lasers are available for selection and configured as the laser-tube quantity provided by the manufacturer.

**Laser Type:** glass tube, RF laser (not pre-ignition) and RF laser (pre-ignition) are available for selection.

**Maximum Power**

**Minimum Power**

**Laser PWM Frequency**

**Laser Attenuation Quotienty**

Laser PWM Frequency is to set the pulse frequency of control signal used by the laser, in general, glass tube is about 20KHZ, RF laser is about 5KHZ; the maximum/minimum power (%) is used to set the limit power of the laser tube, that is to say, when running, the maximum power of user setting can’t be higher than the maximum power and the minimum power of user setting is no less than the minimum power. When the laser power is attenuated after using for a time, user can set the laser power by the attenuation quotienty; if no attenuation, the quotienty is 0.

If it is only provided with the single laser, it will show the one-path parameter.

(3) Other Vendor parameters

**Machine Type:** In most cases, the “normal” engraving machine should be selected and other types are used for specific machines.

**Feed Mode:** single-direction mode and bi-direction mode for optional. If it is single-direction feeding, it is unnecessary to check the coordinates, feeding can be conducted in the single-direction mode; if it is
bi-direction feeding, the system will check the maximum and minimum coordinates. The odd sequence means feeding should be done to one direction and the even sequence means feeding done to the other direction. The initial direction for the first time can be changed through setting the directional polarity or modifying the positive and negative values of the feeding length. This parameter is valid only when the “Z function” is configured to “Drive for Feeding axes”.

**Power-Off-Restart Delay**: it can be set 0–3000ms. After power-off, the system power supply will be not dropped to 0V at once. There is a delay during the time. The delay value should be set basically the same as the actual power off delay value. If the deviation is larger, when in continuous engraving power-off-restart, the processing graphics is either not close with before, or coincided too much.

**Transmission Mode**: generally choose “Belt + step motor”, the control algorithm will be changed a little when other types are selected.

**Z-axis Function**: “platform” and “feeding axis” are optional.

After modified the configuration parameters in the vendor parameter s, such as directional polarity, control mode, laser type and laser PWM frequency, the system should be reset. Such a modification can function upon the resetting of the system.

(4) Enable Parameters

- Laser tube 1 Enabled
- Laser tube 2 Enabled
- Water Protect 1 Enabled
- Water Protect 2 Enabled
- Door Opening Protection
- Whether to Enable the blower

The Enable Parameters are to enable or disable the above functions. If the machine is provided with the parameters for the single-laser in the vendor parameter s, the display entry of enabling parameters will be changed accordingly.
2.5.2 User Parameters

(1) Cutting Parameters (Only affect cutting method)

**Idle Speed**: this parameter decides the highest speed of all non-lighting straight lines for the machine in the movement process.

**Idle Acceleration**: it means the highest acceleration of all non-lighting straight lines. Idle stroke speed and idle stroke acceleration can be set higher to reduce the working time of the whole graphics, but if they are set too high, it may cause the jarring of track, so comprehensive consideration should be given to the setting.

**Turning Speed**: the turning speed at the acute angle corner, which is also the highest speed in the whole cutting process.

**Turning Acceleration**: the acceleration at the acute-angle corner in cutting. If the two speeds are set too high, jarring will happen to the turning; if set too low, it will influence the cutting speed.

**Cutting Acceleration**: it means the highest acceleration value in the whole cutting process.

**Acceleration Mode**: it is divided into T acceleration and S acceleration. T accelerate will quicken the whole cutting process, but it will result in that its cutting effect is inferior to that of S acceleration.

(2) Sweep Parameters (Only affect scanning mode)

**X Start Speed**

**Y Start Speed**

**X Acceleration**

**Y Acceleration**

The above four parameters are used to set the starting speed and acceleration of two axes when scanning. The higher the two speeds are, the quicker the scanning is.

**Line Shift Speed**: this parameter is specially used to control the highest speed at which the previous line moves to the next line vertically in the scanning mode. If the line space is larger during the scanning or if the distance of each block is larger during scanning block graphics, it is necessary to position each line or block accurately. In such a case, the line shift speed can be set as a lower value.

**Scan Mode**: it is divided into general mode and special mode. If in special mode, the laser power should
be increased. The smaller the spot percentage is, the more the laser power reduces. The laser power should be set larger to reach the same scanning depth. The purpose to select the special mode is to emit laser light at high power in short time, to get the flatter bottom on depth scanning, but it should be notice that if the spot size adjustment is not appropriate, it might not achieve this goal. And the high power emitting in short time mode will influence the laser life. The system defaults as general mode.

**Facula/Spot Size**: When selected the general mode as scanning mode, this parameter is invalid; when selected the special mode, this parameter is valid. The controller will control this parameter among 50%~99%.

![Prompt]

The cutting and scanning parameters can’t exceed the limited ones in the axis parameters. If so, the setting will become ineffective and the system will automatically cover the parameters with the axis parameters.

(3) Reset Parameters

**Reset Speed**: it means the speed of X/Y-axis linkage reset to the origin.

**X-axis Startup Reset**

**Y-axis Startup Reset**

**Z-axis Startup Reset**

**U-axis Startup Reset**

You can select “Yes” or “No” in the field of the above four parameters, which is used to confirm whether each axis should be reset on the startup.

(4) Go Scale Parameters Setting

**Go Scale Mode**: “close laser go scale” means idling, for frame preview; “cutting frame open laser” means that cut off the well-processed graphics manually; “4-corner Dotting” means to emit the light at four corner points of the frame, laser one point and the other places turning off. The size and position of this graphics can be checked intuitively through the four points. The speed is the speed value set on the keyboard when the system is idle. For light output, its minimum/maximum power is the corresponding value set on the keyboard when the system is idle (The laser power on the 4-corner dotting means the setting maximum power).

**Go Scale Blank Distance**: It means whether to extend a certain length outside the actual frame of the figure on the preview/cutting of frame.
If the frame crosses the border, the interface will prompt it. If the Enter key is pressed at this time, the system will cut the border at the maximum/minimum coordinates, and then framing operation. This operation can be given up.

(5) Other User Parameters

**Array Mode:** Two-way array or one-way array can be selected, only be effective for virtual array. Two-way array means cutting the array back and forth in sequence; one-way array means the cutting the array always from one direction to another. When in one-way array, the action mode and fluency of each array elements are completely the same, which takes a little more time than two-way array. Two-way array is the default option.

**Return Position:** The locating point and the machine origin point can be selected. This parameter decides the parking position of laser head after each processing.

**Delay before Feeding:** set the time: 0~300s. The lagged time can facilitate user’s feeding and picking on the feeding device. The previous work is completed and delayed the value, the feeding axis begins to move. During the period of delay, it is convenient to feeding and select material for user.

**Delay after Feeding:** set the time: 0~9.9s. It is facilitated the feeding device delay debouncing after moving to the correct position, and waiting for the 2nd work when the feeding axis stands still completely.

**Focus Depth Setting:** it means the distance from the lens focal point of laser head to Z-axis original point. If there is no automatic focusing function, this parameter is invalid.

**Backlash X:** The backlash of X-axis, set the value according to the actual machine, accurate to 1 um, if this value is not 0, the control system will make compensation for backlash.

**Backlash Y:** The backlash of Y-axis, set the value according to the actual machine, accurate to 1 um, if this value is not 0, the control system will make compensation for backlash.
Chapter 3 Laser Control Wiring Diagram

3.1 RayCus 300W Fiber Laser Wiring Diagram

Operation panel extended IO signal connects to laser alarm output, which can monitor the laser whether has faults, if yes, the operation panel will alarm, and stop the controller motion. In addition, the extended IO can directly control the tricolor light. Conversion terminal, laser and operation panel share one 24V power source, controller and LFS share one 24V power source.

In above picture, there is a laser enable relay, “optical gate” button in the operation panel is laser enable button, when enabled, the screen will remind that the laser status enable.
3.2 MaxPhotonics 300W Fiber Laser Wiring Diagram

In above picture, there is a laser enable/ red light indicator relay, “optical gate” button in the operation panel is laser enable button, once laser enable, the red light indicator invalid. When laser forbids laser enable, the red indicator will be valid automatically.
Chapter 4 LFS System

4.1 Function Description

LFS-DM-T56 LFS live focus control system is developed by RuiDa technology especially for metal and non-metal mixed cutting system, which adopts all-digital control circuit, greatly improved the working speed and response speed of LFS system and other performances, achieving U-axis focus control accurately.

Main functions:
1) High working speed and response speed of step motor and servo motor
2) Crash alarm, limit protection and etc. multiple protections
3) Capacitance parameters auto-tuning function, can match with any cutting head
4) Support low pressure punch, punch gradually, low pressure cutting and other cutting technology
5) Focus position online modification and real-time detection
6) Cutting head real-time movement status display and multiple alarm information tips
7) Optimized auxiliary gas blowing control which reduced the gas loss effectively. Dual-channel gas control output and applied to switching between metal cutting and non-metal cutting
4.2 LFS Operation Introduction

4.2.1 Main interface

**Information display:** focus position, actual focus position, follow error, environment temperature and the nozzle temperature.

**Status bar:** follow on/off, speed fast/slow, step/ continue, manual/automatic, for display the current state.

**Running status:** including system idle, the Z axis in moving, Z axis finished movement, and Z axis resetting, these states will change according to the Z axis movement.

**System alarm status:** including the system in normal, upper limit trigger, lower limit trigger, system reset error, detection error, communication error, crash alarm, error amplifier, the temperature is too high, and multiple errors. When an error occurs, alarm light will on, prompting that the system error. If there is an error, please running again after eliminate the errors, otherwise it may affect the system normal work.

- System in Normal: display the system is in “normal operation”;
- Upper Limit Triggered: the limit is enabled when the upper limit switch is triggered, it will display “the upper limit triggered”; 
- Lower Limit Triggered: the limit is enabled when the lower limit switch is triggered, it will display “the lower limit triggered”; 
- Reset Error: when resetting error, it will show “reset error”.
- Detection error: if the capacitance sensor detection error, will display “detection error”, and unable to detect the distance of the Z axis, at this point, the automatic mode is not allowed to use;
- Soft limit trigger: The soft limit enabled, when in motion and exceeding maximum stroke or move to negative coordinate position, will alarmed “ soft limit trigger”, if in cutting process, the cutting will be stopped.
- Crash Alarm: The collision alarm is enabled when the laser head touched the metal plate. Crash warning will be displayed;
- Servo alarm: when servo motor alarmed, reminding “servo alarm”, and when alarm cleared, this alarm will be disappeared.
- Excess temperature: when the nozzle temperature is too high, will display the temperature too high, if in the process of cutting, will stop cutting automatically, and start the machine protection. Note: Only when you install the temperature sensor.
- Undervoltage alarm: Using for detecting gas valve switch, when the voltage is lower, the air valve close will trigger undervoltage alarm. If in cutting process, the machine will stop cutting and start up machine protection.
- Encoder polarity error: When the encoder feedback that the motion direction is wrong,
will prompt that “encoder polarity error”; if the encoder polarity error, please modify the polarity.

- Excessive follow error: In following state, the follow error is more than setting value, the system will alarm, if in cutting, the machine will stop cutting.
- Multiple Errors: When there are more than two kinds of errors, it displays "ERR: NUM", NUM is number, means the error code. Multiple error code binary as shown below:

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Error Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Excessive follow errors</td>
</tr>
<tr>
<td>9</td>
<td>Encoder polarity errors</td>
</tr>
<tr>
<td>8</td>
<td>Undervoltage alarm</td>
</tr>
<tr>
<td>7</td>
<td>Excess temperature</td>
</tr>
<tr>
<td>6</td>
<td>Servo Alarm</td>
</tr>
<tr>
<td>5</td>
<td>Crash Alarm</td>
</tr>
<tr>
<td>4</td>
<td>Soft limit trigger</td>
</tr>
<tr>
<td>3</td>
<td>Detection Error</td>
</tr>
<tr>
<td>2</td>
<td>Reset Errors</td>
</tr>
<tr>
<td>1</td>
<td>Lower Limit Trigger</td>
</tr>
<tr>
<td>0</td>
<td>Upper Limit Trigger</td>
</tr>
</tbody>
</table>

When the multiple errors happened, you can check the alarm information through pane “menu”—“alarm information”.
## 4.2.2 Panel Function keys

### Panel Function Keys

<table>
<thead>
<tr>
<th>Keys</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="on/off" alt="LFS" /></td>
<td>Follow switch</td>
</tr>
<tr>
<td><img src="Reset" alt="LFS" /></td>
<td>LFS reset</td>
</tr>
<tr>
<td><img src="Fast/Slow" alt="LFS" /></td>
<td>Set LFS speed fast/ slow</td>
</tr>
<tr>
<td><img src="+0.1" alt="LFS" /></td>
<td>LFS focus position increase 0.1mm</td>
</tr>
<tr>
<td><img src="%E2%88%920.1" alt="LFS" /></td>
<td>LFS focus position reduce 0.1mm</td>
</tr>
<tr>
<td><strong>Motion Control</strong></td>
<td>LFS step/ continuous switch</td>
</tr>
<tr>
<td><img src="ABC" alt="1" /></td>
<td>Control output compressed air</td>
</tr>
<tr>
<td><img src="DEF" alt="2" /></td>
<td>Control output high pressure oxygen</td>
</tr>
<tr>
<td><img src="GHI" alt="3" /></td>
<td>Control output low pressure oxygen</td>
</tr>
<tr>
<td>![.]</td>
<td>Following test</td>
</tr>
<tr>
<td><strong>Direction Key</strong></td>
<td></td>
</tr>
<tr>
<td>![U+]</td>
<td></td>
</tr>
<tr>
<td>![U−]</td>
<td></td>
</tr>
<tr>
<td>Menu</td>
<td>LFS system up/down motion control</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td><img src="image1" alt="Menu" /></td>
<td>LFS system main menu, auto-tuning, parameter setting, etc.</td>
</tr>
<tr>
<td><img src="image2" alt="" /></td>
<td>System reset</td>
</tr>
</tbody>
</table>

- **LFS-on/off**: Turn on/off following status, cutting metal in following on and cutting non-metal when in following off. This key status will be displayed in status bar.
- **LFS-Menu**: In the menu, you can operate parameter setting, auto-tuning, alarm information, servo calibration, parameters management, etc.
- **LFS-Reset**: Reset LFS system, back to origin position, if reset successfully, system will clear all the errors, and determine the coordinates again.
- **LFS-fast/slow**: Change the motion speed in real-time.
- **LFS-± 0.1**: Change the cutting head focus position online, if increase or reduce 0.1mm every time, no need to tuning again and taking effect immediately.
- **U+, U-**: Control the cutting head up/down, U+: move up; U-: move down. If in continuous mode, press the key, the cutting head will be moved all the time. If in step mode, the cutting head will be moved for a distance when press the key, the distance is set by step distance.
- **Step/Continuous**: Set the manual motion mode. If in continuous mode, press the key, the cutting head will be moved all the time. If in step mode, the cutting head will be moved for a distance when press the key, the distance is set by step distance.
- **Reset**: Reset the whole system (controller, panel, LFS)
- **Numeric key 1, 2, 3**: When the system is in idle, press numeric key 1, 2, 3, which means output air/high pressure oxygen/low pressure oxygen respectively.
4.2.3 Menu function

1) Parameters setting

This function is used for setting parameters of LFS system, including: filter parameter, height parameter, velocity parameter, motor parameter, enable parameter and other parameters. You must “read parameters” before “write parameters”.

2) Auto-tuning

Automatic tuning is a process of the LFS calibration automatically, if placed for a long time or large changes have taken place in external temperature and humidity, suggested that do a auto-tuning operation before cutting, ensuring the accuracy in the process of cutting. Before tuning, the system must be in idle or stop state, and then making the cutting head away from the metal plate, at the same time ensuring that the metal plate connects to the machine reliable, and the machine is reliable grounding, then you can start tuning automatically. If the metal plate is no reliable grounding or the machine is not conduct, which may cause the auto-tuning failure or stop.

After finished the tuning, it will pop up the curves and data range, tuning curves represents the change trend of tuning process. If tuning curve is a smooth curve, the data is in the normal range, you can press "ok" to save the data; if any strange curves are not smooth or data results deviation is bigger, you can press "cancel", the data is invalid. System has the function of automatic memory tuning results.

If user adapts new cutting sensor, or changes the existing components of sensor, automatic tuning must be done, otherwise which will lead to the sensor parameters and the LFS parameters not matching, and cannot work properly.

The metal cutting sensor is capacitive sensitive device, and extremely sensitive to outside humidity and temperature. Therefore, before tuning, the system and amplifier and cutting head must be preheat at least 5 minutes, to ensure that the components in the system is in a relatively
stable working temperature.

3) **Alarm information**

Check the current alarm information details, it is convenient for troubleshooting.

4) **Test Mode**

Choose test mode when test machine. In the test mode, after commissioning, press “ESC” or “enter into normal mode” exit test mode, running under normal mode.

5) **Parameters management**

Parameters management is mainly used for saving and restoring the LFS user parameters. Only when you have the authority, and input right 6 digits passwords, you can operate the system. To set the LFS parameters correctly according to the actual situation, you can save the current parameters as the factory values, and facilitated to recovery management. When in restoring the factory values, so save the last time factory value parameters as user parameters. If parameters without saving as factory value before restoring the operation parameters, the default values will be restored as user parameters.

Parameters management supports password modification, password must be made up of 6
digits from 0–9, please keep in mind the passwords after modified, otherwise you will be unable enter into parameter management, generally recommend use the default password, not recommend to revise the password.

4.2.4 Parameters setting interface

- **Filter parameter 1:**
  Filter parameter, do not recommend users to modify. Change these parameters, if set incorrectly can lead to vibrating and shaking. Parameters setting range: 10 to 1000, the default setting is 100. Increasing this parameter can improve the following response speed, but it will cause vibration.

- **Filter parameter 2:**
  Filter parameter, do not recommend users to modify. Change these parameters, if set incorrectly can lead to vibrating and shaking. Parameter setting range: 0 to 10, the default setting is 0.

- **Sensitivity:**
  This parameter is used to adjust the following sensitivity, and divided into: high, medium and low, you can set the value as needed. It is defaulted as “medium”.
● Alarm filter;

For adjusting the alarm filter, the parameter should not be set too large, which will cause the laser cutting head cannot rise up in time when collision warning; On the contrary, too small filter time will lead to false alarms caused by cutting spray residue. Parameter setting range: 10 to 500, the default setting as 50ms.

● Step move:

In manual mode, press the "up" or "down", the movement distance of Z axis. Parameter setting range of 0.1 ~ 20, the default setting is 10 mm.

● Focus position:

Focus position is the distance from the laser cutting head to the metal surface. This parameter is usually small. Parameter setting range: 0.3~8mm, the default setting is 1mm.

● Standby height:

When all the work has been finished, the laser head should rise up. Generally the height is a little high. Parameter setting range: 5 to 100, the default setting is 20mm.

● Alarm Height:

When the laser head has crashed to the metal surface, the LFS will rise up the laser head to prevent the laser cutting head from damage. The rising up height is the value. Parameter setting range: 5 to 50, the default setting is 20mm.

● Rising height

The height is the rising up height when start cutting. This height is usually small, which can be set as the actual situation. Parameter setting range of 5 to 100, the default setting is 10mm.

● Gradual punch height

The height of starting gradual punching. Generally, this value is set to 0.1~5mm, the default value is 2mm.

● Reset distance

The distance of moving down when in resetting and touched the upper limit switch. The setting range is 5~50, the default setting is 10mm.

● Maximum following error

The maximum following error allowed when the cutting head is in tracing, if the following error beyond the maximum following error, the system will be alarmed. The setting range is 0.1~5mm, the default setting is 5mm.

● Focus Speed

During auto-searching focus point, the laser cutting head moves down to metal surface at this speed. The speed should not be set too fast, too fast can cause touch metal and a greater focus position deviation. Parameter setting range: 1 to 10 mm/s, the default setting is 3 mm/s.

● Rising Speed

When in cutting, the laser head rises up speed. Parameter setting range: 1 to 500 mm/s, the default setting is 40 mm/s.

● Follow Speed

The follow speed when in cutting follow-up. Parameter setting range: 1 to 500 mm/s, the default
setting is 40 mm/s.

- **Rest speed**
  The reset speed, parameter setting range is 5 ~ 500 mm/s, the default setting is 40 mm/s.

- **Manual speed:**
  The speed of “manual continuous” mode, this parameter should not be too big, parameter setting range is 1 ~ 100 mm/s, the default setting is 40 mm/s.

- **Gradual punch speed**
  When punching gradually, the falling down speed from the height of punch gradually. The setting range is 0.1~10 mm/s, default as 2 mm/s.

- **Crash protection enable**
  If crash alarm is enabled, laser head will rise up to a safety height when the laser head touches the metal surface. If the cash alarm is banned, the crash alarm input will be neglected.

  When crash alarm happened, the machine should stop motion. So the crash alarm signal should connect to machine protect input on the RDC633XF. So when the crash alarm happened, the protection is valid and RDC633XF will stop the motion and give the information to the panel which displays “machine is protected”. The alarm must default as enabled. The protection settings as below:

- **Low Pressure Punch Enable**
  This option is used for setting whether to do low pressure oxygen punching operation. If “YES”, the block will automatically control low pressure oxygen output in laser punching process, in order to prevent the cutting small graphics of the blasting hole. In the normal cutting, switch to the high pressure oxygen status automatically. If you want to achieve this function, the output of the oxygen tank must be two channels, a channel to increase the pressure of reducing valve of low pressure oxygen output, the other channel for normal oxygen output, at the same time the two channels are controlled by independent magnetic valves. The default punch enabled.
Gradual punch Enable
To set whether enable this function, if enabled, the gradual punch height and speed should be set correctly.

Start Reset Enable
This function is used for setting whether reset when starting up the machine. If enabled, the LFS will reset once; if prohibited, the LFS will not reset when starting up. If there is motor polarity reversely when reset, at present, you need to press the emergency stop button. The default setting: starting reset disable.

Blowing Channel Enable
The LFS supplies 2 channels IO to control auxiliary gas relay. One is for O2 control in metal cutting; the other is for auxiliary compressed gas control in non-metal cutting.

The parameter is 1, only one channel blowing signal is available, that is O2 control channel. When cutting non-metal in Manual mode, 1st channel output relay closed, compressed gas will blowing; when switch to metal cutting in Auto mode, 1st output relay switch controlled by LFS.

The parameter is 2, the 2nd channel relay closed to control the compressed air valve conducting when non-metal cutting in Manual mode. When switch to metal cutting in Auto mode, the LFS will close the 2nd channel control output firstly, to make the 1st channel output under control.

Direction polarity
The parameter is to set up the motor moving direction. If executed “U-”, the laser cutting head rises up, the motor motion direction should be changed.

Limit Polarity
There are negative and positive limit inputs for protecting laser head during motion. If the limit is enabled and limit polarity is set correctly, the LFS will protect the laser head. During live focusing, the laser head touch the down limit; the laser head will rise up to a safe position. During rising up, if the upper limit is touched, the motor will stop motion immediately.

If the limit switch is normally open, one terminal connects to GND. Another terminal connects to limit input of LFS. The parameter named limit polarity should be set to be negative.

Once the limit is triggered, the DrProc pin of RDC633XF will be effective; the system will stop the XY axis movement. At the same time operating panel will pop-up warning: “machine is protected”.

Limit Enable
If the limit is enabled and limit triggered, the LFS will protect the laser head automatically, otherwise there is not protect and the limit status will be displayed on the main screen. The default as limit enabled.

Lead screw pitch
The pitch of lead screw, set the parameter should according to the actual situation, the parameters setting range is 0.1 ~ 100, the default setting is 4 mm.

Pulse count
The pulse count is the motor rotating one circle. If step motor, it refers to the motor driver segment; if servo motor, the command pulse count of motor rotating one round. This parameter should be set according to the actual situation, the parameters range is 1000 ~ 50000, the default setting is 4000 Pulse.

Acceleration
Set the acceleration when in motion, setting range is 100~30000mm/s², default setting is 1000mm/s².

- **Low pressure cutting enable**
  When low pressure cutting enable, output low pressure O2 in punching and cutting, otherwise, output high pressure O2.

### 4.3 LFS Wiring Instruction

![LFS Wiring Diagram]

#### 4.3.1 Dial switch

Dial switch is used for LFS system upgrade, all the dial switches are in OFF when in normal use. When LFS is upgrading, the dial switch 1 is in ON; when LFS power-on again, the LFS system can be upgraded.

#### 4.3.2 Sensor amplifier interface

Sensor port is digital amplifier interface, this port is not available when using the analog amplifier. This port connects to digital amplifier via DB15 cable.

#### 4.3.3 CN1 is the analog amplifier interface

Including capacitive sensor detection input, and temperature compensation input interface.

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>DEFINITION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>

41 / 105

© 2016 Ruida Technology. All Rights Reserved
### 4.3.4 CN2 is power input interface

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>DEFINITION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN1</td>
<td>+24V</td>
<td>LFS power source</td>
<td>+24V output, drive ability above 2A</td>
</tr>
<tr>
<td>PIN2</td>
<td>GND</td>
<td>GND</td>
<td>Reference ground</td>
</tr>
<tr>
<td>PIN3</td>
<td>PGND</td>
<td>External shielded grounding</td>
<td>Generally connect to earth</td>
</tr>
</tbody>
</table>

### 4.3.5 CN3 is the interface between LFS and controller

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>DEFINITION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN1</td>
<td>Trace</td>
<td>Follow signal Input</td>
<td>When low level, the LFS will control the laser head to follow down and follow; when high level or open, the LFS will rise up with laser head.</td>
</tr>
<tr>
<td>PIN2</td>
<td>Punch</td>
<td>drilling signal input</td>
<td>Board drilling signal, low level when drilling</td>
</tr>
<tr>
<td>PIN3</td>
<td>WrkOk</td>
<td>Working finished signal input</td>
<td>Working status signal input, which indicate the current work finish or not. When finished, the LFS will move to the highest point.</td>
</tr>
<tr>
<td>PIN4</td>
<td>UpOk</td>
<td>Rising up in-position signal output</td>
<td>LSF rises up in position, output low level</td>
</tr>
<tr>
<td>PIN5</td>
<td>DnOk</td>
<td>Going down in-position signal output</td>
<td>LSF goes down in position, output low level</td>
</tr>
<tr>
<td>PIN6</td>
<td>AlmOut</td>
<td>Crash alarm output</td>
<td>When the laser head crash into the metal plate, the alarm signal output is 24V.</td>
</tr>
</tbody>
</table>
4.3.6 CN4 External Input Interface

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>DEFINITION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN1</td>
<td>Lmt+</td>
<td>Upper limit switch input</td>
<td>Upper limit switch input, support normally open/close connection.</td>
</tr>
<tr>
<td>PIN2</td>
<td>Lmt-</td>
<td>Lower limit switch input</td>
<td>Lower limit switch input, support normally open/close connection.</td>
</tr>
<tr>
<td>PIN3</td>
<td>EmStp</td>
<td>low-voltage signal input</td>
<td>low-voltage protection signal input</td>
</tr>
<tr>
<td>PIN4</td>
<td>FocSwt</td>
<td>Reserved</td>
<td>Reserved</td>
</tr>
<tr>
<td>PIN5</td>
<td>ModeSwt</td>
<td>Reserved</td>
<td>Reserved</td>
</tr>
<tr>
<td>PIN6</td>
<td>GND</td>
<td>Signal reference ground</td>
<td>reference ground</td>
</tr>
</tbody>
</table>

4.3.7 CN5 External output Interface

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>DEFINITION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN1</td>
<td>LowP</td>
<td>Low pressure O2 control output</td>
<td>To control the relay to control the magnetic valve directly. Notice: Add high-speed FWD next to the relay contact when use 24V DC.</td>
</tr>
<tr>
<td>PIN2</td>
<td>HighP</td>
<td>High pressure O2 control output</td>
<td>To control the relay to control the magnetic valve directly. Notice: Add high-speed FWD next to the relay contact when use 24V DC.</td>
</tr>
<tr>
<td>PIN3</td>
<td>ModeOut</td>
<td>Reserved output</td>
<td>Reserved</td>
</tr>
<tr>
<td>PIN4</td>
<td>wrkSts</td>
<td>Working status indicator</td>
<td>Output low level during cut processing. When finished, high level output, can drive relay to connect the LED tricolor indicator.</td>
</tr>
<tr>
<td>PIN5</td>
<td>Fault</td>
<td>System fault output, can drive relay</td>
<td>When LFS goes wrong, low level output, and can drive the relay directly.</td>
</tr>
<tr>
<td>PIN6</td>
<td>GND</td>
<td>Signal reference ground</td>
<td></td>
</tr>
</tbody>
</table>
4.3.8 CN6 External output interface

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>DEFINITION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN1</td>
<td>LmtP+_out</td>
<td>Upper limit signal output</td>
<td>Low level output when triggered, when don’t trigger, high level output. This pin output state and external limit switch state are synchronized, reserved for external other controller.</td>
</tr>
<tr>
<td>PIN2</td>
<td>LmtN_out</td>
<td>Lower limit signal output</td>
<td>Low level output when triggered, when don’t trigger, high level output. This pin output state and external limit switch state are synchronized, reserved for external other controller.</td>
</tr>
<tr>
<td>PIN3</td>
<td>OUT0</td>
<td>Air switch controls signal output</td>
<td>To control the electromagnetic valve</td>
</tr>
<tr>
<td>PIN4</td>
<td>OUT1</td>
<td>RESERVED</td>
<td>Can control relay directly</td>
</tr>
<tr>
<td>PIN5</td>
<td>GND</td>
<td>Signal reference ground</td>
<td></td>
</tr>
</tbody>
</table>

4.3.9 MOTOR Control Interface

<table>
<thead>
<tr>
<th>PIN(wire colors)</th>
<th>SIGNAL</th>
<th>DEFINITION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN1(yellow black)</td>
<td>GND</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>PIN2(blue black)</td>
<td>ALM</td>
<td>Motor alarm output</td>
<td>When the pin is 0V, alarm is invalid; when in high level or off, alarm is valid.</td>
</tr>
<tr>
<td>PIN3(orange)</td>
<td>SON</td>
<td>Motor enable</td>
<td>When the pin is 0V, servo enable</td>
</tr>
<tr>
<td>PIN4(light green)</td>
<td>A-</td>
<td>Encoder A-</td>
<td>Encoder input</td>
</tr>
<tr>
<td>PIN5(brown)</td>
<td>B-</td>
<td>Encoder B-</td>
<td>Encoder input</td>
</tr>
<tr>
<td>PIN6(red)</td>
<td>C-</td>
<td>Encoder C-</td>
<td>Encoder input</td>
</tr>
<tr>
<td>PIN7(white black)</td>
<td>+5V</td>
<td>+5V output</td>
<td>+/−10V output</td>
</tr>
<tr>
<td>PIN8(green)</td>
<td>SPEED</td>
<td>speed command</td>
<td>TTL level</td>
</tr>
<tr>
<td>PIN9(gray)</td>
<td>DIR+</td>
<td>Direction signal differential positive end output</td>
<td>TTL level</td>
</tr>
<tr>
<td>PIN10(green black)</td>
<td>GND</td>
<td>Signal reference ground</td>
<td></td>
</tr>
<tr>
<td>PIN11(orange black)</td>
<td>PULSE-</td>
<td>Pulse signal differential negative end output</td>
<td>TTL level</td>
</tr>
<tr>
<td>PIN12</td>
<td>NC</td>
<td>N.C</td>
<td></td>
</tr>
<tr>
<td>PIN</td>
<td>Value</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>-----------------------------------------</td>
<td></td>
</tr>
<tr>
<td>PIN13</td>
<td>GND</td>
<td>Reference ground</td>
<td></td>
</tr>
<tr>
<td>PIN14</td>
<td>red black</td>
<td>24V</td>
<td></td>
</tr>
<tr>
<td>PIN15</td>
<td>brown black</td>
<td>CLR</td>
<td></td>
</tr>
<tr>
<td>PIN16</td>
<td>purple</td>
<td>SMODE</td>
<td></td>
</tr>
<tr>
<td>PIN17</td>
<td>pink</td>
<td>A+</td>
<td></td>
</tr>
<tr>
<td>PIN18</td>
<td>white</td>
<td>B+</td>
<td></td>
</tr>
<tr>
<td>PIN19</td>
<td>black</td>
<td>C+</td>
<td></td>
</tr>
<tr>
<td>PIN20</td>
<td>shielding</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>PIN21</td>
<td></td>
<td>Reference ground</td>
<td></td>
</tr>
<tr>
<td>PIN22</td>
<td>blue</td>
<td>DIR-</td>
<td></td>
</tr>
<tr>
<td>PIN23</td>
<td>gray black</td>
<td>PULSE+</td>
<td></td>
</tr>
<tr>
<td>PIN24</td>
<td>yellow</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>PIN25</td>
<td></td>
<td>NC</td>
<td></td>
</tr>
</tbody>
</table>

1) If connects to step motor, differential connection and common anode connection are available. The wiring method can be determined by step motor driver, the differential connection is recommended.

2) If connects to servo motor, please connection as the corresponding wiring method and servo driver model, and set the right parameters.

- Set the servo driver as position mode
- Direction and pulse polarity setting
- Set the pulse command number of motor rotating one circle
- Motor rotation direction setting

Note: If need to use high speed pulse signal, you should open high speed pulse method.

Panasonic A5 series servo wiring diagram
Panasonic A5 series servo parameters setting

<table>
<thead>
<tr>
<th>Parameter type</th>
<th>Recommended value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pr0.00</td>
<td>0</td>
<td>direction of rotation</td>
</tr>
<tr>
<td>Pr0.01</td>
<td>0</td>
<td>position mode setting</td>
</tr>
<tr>
<td>Pr0.02</td>
<td>3</td>
<td>real-time auto-adjust setting</td>
</tr>
<tr>
<td>Pr0.06</td>
<td>0</td>
<td>command pulse polarity setting</td>
</tr>
<tr>
<td>Pr0.07</td>
<td>3</td>
<td>command pulse input mode setting</td>
</tr>
<tr>
<td>Pr0.08</td>
<td>5000</td>
<td>pulse command number of motor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rotating one circle</td>
</tr>
</tbody>
</table>

4.3.10 Indicator Light description

<table>
<thead>
<tr>
<th>NAME</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVCC</td>
<td>24V power light</td>
</tr>
<tr>
<td>AlmOut</td>
<td>Crash alarm signal output, 24V output when</td>
</tr>
<tr>
<td></td>
<td>crashed; Otherwise, 0V.</td>
</tr>
<tr>
<td>DnOk</td>
<td>Going down in-position output, the indicator</td>
</tr>
<tr>
<td></td>
<td>will be on.</td>
</tr>
<tr>
<td>UpOk</td>
<td>Rising up in-position output, the indicator</td>
</tr>
<tr>
<td></td>
<td>will be on.</td>
</tr>
<tr>
<td>WrkOk</td>
<td>Working status input, the light turns off</td>
</tr>
<tr>
<td></td>
<td>when finished, and turn on when in working.</td>
</tr>
<tr>
<td>Punch</td>
<td>Punch indicator, when in punching, the</td>
</tr>
<tr>
<td></td>
<td>indicator will be on.</td>
</tr>
<tr>
<td>Trace</td>
<td>Following signal input, the light turns on</td>
</tr>
<tr>
<td></td>
<td>when following control, and turns off when</td>
</tr>
<tr>
<td></td>
<td>rising up.</td>
</tr>
<tr>
<td>ModeSwt</td>
<td>Reserved</td>
</tr>
<tr>
<td>FocSwt</td>
<td>Reserved</td>
</tr>
<tr>
<td>EmStp</td>
<td>Under-voltage alarm input is low level trigger</td>
</tr>
<tr>
<td></td>
<td>alarm, the indicator light will be on</td>
</tr>
<tr>
<td>Lmt-</td>
<td>connect to normally open contact, triggered</td>
</tr>
<tr>
<td></td>
<td>when closed, the light will be on</td>
</tr>
<tr>
<td>Lmt+</td>
<td>connect to normally open contact, triggered</td>
</tr>
<tr>
<td></td>
<td>when closed, the light will be on</td>
</tr>
<tr>
<td>Fault</td>
<td>System fault indicator, the light will be on</td>
</tr>
<tr>
<td>WrkSts</td>
<td>System working status output instruction, the</td>
</tr>
<tr>
<td></td>
<td>light will be on the system working, and</td>
</tr>
<tr>
<td></td>
<td>turns off when stopped.</td>
</tr>
<tr>
<td>ModeOut</td>
<td>Reserved</td>
</tr>
<tr>
<td>Medium Power Fiber Laser Cutting Control System User Manual—RDC6333F</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HighO2</th>
<th>High oxygen pressure output indicator, the light will be on when the relay working</th>
</tr>
</thead>
<tbody>
<tr>
<td>LowO2</td>
<td>Low oxygen pressure output indicator, the light will be on when the relay working</td>
</tr>
<tr>
<td>Out</td>
<td>Reserved output</td>
</tr>
<tr>
<td>Air</td>
<td>Compressed air control output instruction, the light will be on when the relay working</td>
</tr>
<tr>
<td>LmtNO</td>
<td>Lower limit output instruction</td>
</tr>
<tr>
<td>LmtPO</td>
<td>Upper limit output instruction</td>
</tr>
<tr>
<td>Clr</td>
<td>Zero-speed clamping indicator light</td>
</tr>
<tr>
<td>SMode</td>
<td>Servo mode switch output status, using for servo driving, the light will be off when in position mode, and it will be on when in speed mode.</td>
</tr>
<tr>
<td>Alm</td>
<td>Servo alarm input, the light will be on when ALM valid.</td>
</tr>
<tr>
<td>Son</td>
<td>Servo enable output status</td>
</tr>
<tr>
<td>DIR</td>
<td>Direction signal output instructions</td>
</tr>
<tr>
<td>PULSE</td>
<td>Pulse signal output instructions</td>
</tr>
<tr>
<td>System</td>
<td>System status instruction</td>
</tr>
<tr>
<td>Run</td>
<td>System running instruction</td>
</tr>
<tr>
<td>CRASH</td>
<td>Crash alarm instruction</td>
</tr>
<tr>
<td>Sts</td>
<td>Digital sensor status indicator</td>
</tr>
</tbody>
</table>

### 4.3.11 Wiring of LFS & Controller

The controller connects to LFS system by IO port, including: follow signal, punch signal, work finish signal, rising in position signal, falling in position and alarm signal.

![Wiring Diagram](image_url)
4.1.12 LFS & operation panel wiring

Operation panel RS232 port connects to LFS HIM port through a DB9 transfer 5PIN cable. See below picture:

![operation panel & LFS control panel wiring diagram](image)

4.3.13 LFS limit wiring

Limit switch includes upper/lower limit switch, support normally open/close connections. Set the LFS limit polarity as negative when in normally open; set as positive when in normally close.

Limit switch supports mechanical contact switch, optoelectronic switch, magnetic switch, etc. The output of limit switch must be 24V voltage, otherwise it cannot be used.

In the below wiring diagram, the limit switch is normally open, low level valid (when the limit switch closed, it connects to ground). So the limit polarity must be negative; otherwise, it will cause the limit triggered, and the LFS system cannot be controlled.

![LFS limit switch wiring diagram](image)
4.3.14 Amplifier installation and wiring

The amplifier and LFS system connection through one cable DB15* 9m, one end connects to LFS sensor port, the other end connects to digital amplifier DB15 port.

When install the amplifier to the laser head, the shell of amplifier must be conducted with sensor shell and in conducting state.

For the cutting head surface with oxidation treatment, which may cause external contact resistance of the amplifier and cutting head is very big, and so that cannot be shared ground. So when installing amplifier, try to remove the blue oxide layer of installation position to contact ground reliable.

In addition, for the placement of the metal plate cutting, cutting plate should contact the machine effective, the impedance must less than 10 Ohm. Otherwise it will affect the detection effect of capacitance sensor.
4.3.15 Gas wiring

LFS system provides two IO which can control relay for auxiliary gas controlling when in metal cutting. One is for controlling high pressure O2, the other is for controlling low pressure O2. The high pressure O2 is for cutting, and the low pressure O2 is for punching.

In cutting metal, the blowing channel is channel 1, the high & low pressure O2 valve will be opened when start to cut; and the blowing channel is channel 2, the air valve will be opened when start to cut.

The gas circuit control IO of LFS system as below table showed:

<table>
<thead>
<tr>
<th>Cutting material types</th>
<th>Blowing channel</th>
<th>Low pressure punching</th>
<th>Low pressure cutting</th>
<th>High pressure O2</th>
<th>Low pressure O2</th>
<th>Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal cutting</td>
<td>Channel 1</td>
<td>enable</td>
<td>enable</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>disable</td>
<td>Turn on when cutting</td>
<td>Turn on when punching</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>enable</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>disable</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Channel 2</td>
<td>enable</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>disable</td>
<td>Turn on when cutting</td>
<td>Turn on when punching</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>enable</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>disable</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td>Non-metal cutting</td>
<td>Channel 1</td>
<td>enable</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>disable</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>enable</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>disable</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td></td>
</tr>
</tbody>
</table>
4.4 The LFS Commissioning

After installing the LFS system, panel, cutting controller, the first commissioning should be careful. Please follow these below steps:

1. Set the driver model according to the driver parameters, the details please refer to driver user manual.
2. The LFS power-on, set the LFS parameters in “menu”—“parameters setting”.
3. Check limit switch whether is valid, trigger upper/lower limit manually, the panel will remind that “upper/lower limit triggered”, which means normal; Check the crash alarm whether is valid, the cutting head touches metal board (connecting to reference ground), the amplifier alarm indicator will be on, so the crash alarm is valid.
4. “Menu” -- “test mode” -- “continuous mode”, press “U+/U-”, observe the cutting head movement direction, if wrong direction, modify “direction polarity” parameter, until the movement be normal.
5. Press “step/continuous” switching to “step mode”; press “U+/U-”, observe the cutting head movement direction, and the motion distance whether is the same as the already setup “step distance”; if not the same, please check the parameters setting of “lead screw pitch” and “pulse number” whether is the same as actual parameters, until the movement be normal.
6. Press “LFS-reset” to reset LFS, and confirm the new coordinate origin.
7. “Menu”—“auto-tuning”, tuning the sensor.
8. Press “LFS-ON/OFF” to open the tracing switch, press numeric key “.”, the cutting head will down to the focus position, and press “.” again, the “rising height” will be raised.
9. Then, test another functions.

4.5 Metal Cutting

When the follow switch open, it is in metal auto-cutting; the LFS system will change the auxiliary gas to compressed O2 channel automatically, and control the blowing according to laser emitting. When the LFS is in standby, once receiving tracing signal from RDC633XF, the laser head will going down and tracing.

Before LFS running, the vendor parameter and user parameter of RDC633XF must be set up correctly. If in delay mode, the parameter settings please refer to below picture.
If in in-position mode, set up the control mode as in-position mode in vendor parameter. Tracing control parameter includes rising-in-position detection and falling-in-position detection. The controller type is common.

**Process parameters setting:**
Process parameters include punching parameters setting and link near parameters. As shown in below picture.

RDC633XF controller supports continuous punching mode and pulse punching mode, punching mode can be set up in the user parameters.
If the pulse punching enabled, the current punching mode is continuous punch; the laser will be emitted continuously for a period of time at the first point and then began to cut. The punching time is decided by the following factor: the times of first point punching (n) and single punching time (Ton).

\[
\text{Punching time} = n \times \text{Ton}
\]

Generally, punching time is set as 1, single punching time is the punch time which needed.

Pulse punching mode is always applied to the thick metal plate cutting and scribing. If the pulse punching mode is permitted, as the following picture shows: the times of first point punching is 4, single punching time is Ton, and the punching pause time is Toff.

![Diagram of punching time](image)

The manufacture parameters, user parameters and process parameters are set up, so that the machine can start to cut normally.

Notes: Please set up the punching power independently when punching, which can be set according to process requirement by users.

The layer parameters contain automatic judgment of link near settings and the max. link near distance. If using the automatic judgment of link near and set the maximum link near distance (supposed to 2mm), laser head will not rise up when the jump length is below the maximum micro-linking distance; on the contrary, the laser head will rise and start cutting, which can improve the cutting efficiency.
Chapter 5 Wireless Operating Handle

5.1 Overview

The Wireless Operating Panel BWK201F consists of two parts: wireless panel and wireless receiver. Wireless panel and wireless adapter communication, wireless receiver connection to RD motion controller, user can control the cutting process reliable within a certain range (10 m) through the wireless panel, easy to operate. The system allows the user can control the system real time in the production process, improving the working efficiency and easy to use and reliable. Parallel working with controller operation panel, there is no interference with each other.

Wireless controller BWK201F only supports communication with RDC63XX controller.

5.2 Wireless Handle

Buttons description:

“Start/Pause” Button : Start or pause working

“Stop” Button : Stop working

“Reset” Button : Reset the control board and HOME

“Trace On/Off” Button : Power on/off the trace signal to control the LFS module

“ESC” Button : Cancel
“Laser Gate” Button  Laser Enable/disable

“Pulse” Button  Laser emission

“Origin” Button  Set positioning point

“Frame” Button  Move along the curves of workpiece

“Speed” Button  Choose fast cutting speed or slow cutting speed

“X+/—” Button  X axis movement

“Y+/—” Button  Y axis movement

“Z+/—” Button  Z axis movement

“U+/—” Button  U axis movement

The LED indicator light of wireless handle is green/red light, the indicator light description:

<table>
<thead>
<tr>
<th>LED STATUS</th>
<th>The Wireless Handle Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red, Always On</td>
<td>The Wireless Handle is in standby status</td>
</tr>
<tr>
<td>Red, Flash</td>
<td>The Wireless Handle is in linking status</td>
</tr>
<tr>
<td>Always Off</td>
<td>The Wireless Handle is in connected status or power-off status</td>
</tr>
<tr>
<td>Always green or flashing red / green</td>
<td>Low battery, please replace batteries as soon as possible</td>
</tr>
</tbody>
</table>
5.3 Wireless Adapter

LED Indicator Light Description:

<table>
<thead>
<tr>
<th>DEVICE</th>
<th>STATUS</th>
<th>The Wireless Adapter Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED</td>
<td>Always On</td>
<td>The communication is in connected status</td>
</tr>
<tr>
<td>LED</td>
<td>Flash</td>
<td>The wireless adapter is in connecting status</td>
</tr>
<tr>
<td>LED</td>
<td>Always Off</td>
<td>The wireless adapter is power off</td>
</tr>
</tbody>
</table>

There is a hole in the side of wireless adapter, with a built-in reset button, the wireless adapter will be reset;

The wireless adapter P1 interface & wiring definition:

<table>
<thead>
<tr>
<th>PIN</th>
<th>SIGNAL</th>
<th>DEFINITION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN1</td>
<td>RXD</td>
<td>Receiving end</td>
<td></td>
</tr>
<tr>
<td>PIN2</td>
<td>TXD</td>
<td>Sending end</td>
<td></td>
</tr>
<tr>
<td>PIN3</td>
<td>RST</td>
<td>Reset</td>
<td>Low level effective</td>
</tr>
<tr>
<td>PIN4</td>
<td>CLR</td>
<td>Clear end</td>
<td>Low level effective</td>
</tr>
<tr>
<td>PIN5</td>
<td>+5V</td>
<td>+5V power source input</td>
<td></td>
</tr>
<tr>
<td>PIN6</td>
<td>GND</td>
<td>Reference Ground</td>
<td>GND</td>
</tr>
</tbody>
</table>
Chapter 6 RDC6333F Operational Panel

6.1 Overview

RDC6333F-HMI operational panel adopts the current Linux operation system, multi-task processing, human-computer interaction interface, a high performance man-machine operating device. It can communicate with RUIDA cutting controller with high speed, real-time display the processing information, processing graphics and layer information, etc. Meanwhile, it can communicate with RUIDA LFS, real-time display the LFS working information, alarm prompt, LFS parameters setting, etc. This panel has powerful functions and excellent graphics interface, much better than the traditional LCD control panel.

RDC6333F-HMI operational panel functions:
- 5.6-inch big screen display, rich display content
- Cutting information display, processing path display, layer parameter display, the processing file preview
- Machine parameters setting, such as motor parameter, laser parameter, etc.
- Alarm prompt
- The LFS working state display, parameter settings
- 5-way general input port
- 6-way general output port, can drive alarm tricolor light, optical shutter
- Support multi-language display, such as traditional Chinese, English, French, Turkish, Russian, Portuguese, German, etc

6.2 Keys Description

<table>
<thead>
<tr>
<th>Keys Sorts</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing control</td>
<td><img src="image" alt="Reset" /> : system reset</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="StartPause" /> : start-up file processing or pause</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Stop" /> : stop processing</td>
</tr>
<tr>
<td>Frame</td>
<td>Walking along with the max. rectangle frame of the graphics</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>Origin</td>
<td>Take the real position as processing origin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Direction key</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-axis positive / negative motion control</td>
</tr>
<tr>
<td>Y-axis positive / negative motion control</td>
</tr>
<tr>
<td>Z-axis positive / negative motion control</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laser control</th>
</tr>
</thead>
<tbody>
<tr>
<td>: Emit laser when press, and stop laser when release</td>
</tr>
<tr>
<td>: Enable or disable the laser enable signal</td>
</tr>
</tbody>
</table>

| 1 ABC | 2 DEF | 3 GHI |
### Number/letter keyboard

<table>
<thead>
<tr>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>JKL</td>
<td>MNO</td>
<td>PQR</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>STU</td>
<td>VWX</td>
<td>YZ</td>
</tr>
<tr>
<td>.</td>
<td>0</td>
<td>CL</td>
</tr>
</tbody>
</table>

Number/letter keyboard for parameters input, password input

- **“CL”**: clear key, delete input, equal to backspace key.
- **“Caps”**: Number/letter input switchover when input password.
- **“Esc”**: Exit from processing, menu return, etc.
- **“Enter”**: Enter into menu, user confirm the operation

### Menu

- **Info**: system/limit information display
- **User**: user parameter setting
- **Vender**: Vender parameter setting
- **Config**: system configuration, communication configuration
- **Menu**: main menu
- **Max-Power**: The max. power setting of laser
- **Min-Power**: The min. power setting of laser
6.3 Main Interface

When the system power on, the below interface will be displayed:

Main interface display information will be subject to the actual panel display.
6.3.1 System reset

When the system power on and initialized, or press \( \text{Reset} \), the main interface as below shown:

This state only responds to \( \text{Reset} \) and \( \text{Esc} \), if the system finished reset, this interface will disappear automatically, and press \( \text{Esc} \), the system will exit from reset process, and back to main interface immediately.
6.3.2 Limit alarm state

When the limit or alarm doesn’t triggered, displaying as below picture:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>水保护 1</th>
<th>开盖保护</th>
</tr>
</thead>
<tbody>
<tr>
<td>正限位</td>
<td>正限位</td>
<td>正限位</td>
<td>保护</td>
<td></td>
</tr>
<tr>
<td>负限位</td>
<td>负限位</td>
<td>负限位</td>
<td>保护</td>
<td></td>
</tr>
</tbody>
</table>

When the limit or alarm triggered, displaying as below picture:

(Example: X positive limit and laser alarm triggered)

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>水保护 1</th>
<th>开盖保护</th>
</tr>
</thead>
<tbody>
<tr>
<td>正限位</td>
<td>正限位</td>
<td>正限位</td>
<td>保护</td>
<td></td>
</tr>
<tr>
<td>负限位</td>
<td>负限位</td>
<td>负限位</td>
<td>保护</td>
<td></td>
</tr>
</tbody>
</table>

6.3.3 Shutter on-off state

System power on, the default shutter state is off, control signal output high level, see below picture:

Press [Shutter], the state is open, control signal output low level, see below picture:

If press this button again, the shutter switch will be off, on-off switchover as this.

6.3.4 Network connecting state

When controller doesn’t connect to Ethernet, the state as below:
When controller connects to Ethernet, the state as below:

6.3.5 Set speed

Press in the main interface, entering to speed setting interface, as below shown:

![Speed interface]

Press “direction key” “numeric key” “clear key” to change parameter, and then press , and

Press “X+” or “X-”, move the edit box cursor right and left.

6.4 Set Power

Press or in the main interface, entering into max./min. power setting interface, see below picture:
Press “direction key” “numeric key” “clear key” to change parameter, and then press Enter, and

: current input focus, press “Y+” or “Y-” to change the focus.
6.5 File management

6.5.1 Main interface

Press the "File" button in the system main interface, the file management interface will be appeared, see below picture:

When the interface appeared, the controller will automatically extract the memory file (if have), displaying all the files including file name and processing workpiece in the list, and display the selected file graphics in the upper right. If user wants to choose another file, he can press “Y+” or “Y-”. If the file is too large, it will take more time to display the preview graphics, press “direction key” or Esc to cancel the preview. If user chooses one file, press Enter to display, also can press Start/Pause to processing, interface will be back to system main interface automatically. Move the input focus to the "Read memory file" button, press Enter to read the controller file again. Press Esc to back system main interface.
6.5.2 File operation

In file management interface, if the current input focus in the file list, press \( Y+ \) or \( Y- \), the file operation interface will be popped-up. See below pictures:

![File operation interface](image)

Press “direction key” to move the input focus to the wanted selected items, and then press \( \text{Enter} \) to execute the related item function, press \( \text{Esc} \) to back the file management main interface.

When user executed \( \text{Delete} \) or \( \text{Clear count} \), click \( \text{Read} \) back to file main interface, then the file preview will be updated.
6.5.3 U-disk file

In file management main interface, move the input focus to U-disk, press Enter, the U-disk file management interface will be popped-up as blow picture showed:

Before operating the U-disk file, make sure the U-disk insert into the controller, otherwise this interface will no response.

6.5.4 Other menu

In file management main interface, move the input focus to Other, press Enter, the other file operating interface will be popped-up as blow picture showed:
6.6 File Layer Parameters Modification

When the file processing or file preview, file layer parameters will display in the main interface layer area as shown below:

<table>
<thead>
<tr>
<th>Layer</th>
<th>Speed</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100.0</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>34.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>30.0</td>
</tr>
</tbody>
</table>

Press \( \text{Enter} \), enter into layer area:

<table>
<thead>
<tr>
<th>Layer</th>
<th>Speed</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100.0</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>34.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>30.0</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td>30.0</td>
</tr>
</tbody>
</table>

Press \( \text{CL} \) in this interface, exit from this layer area.

In layer parameter area, press “Z+” or “Z-”, can select layer up and down, if you wants to recover “Z+” or “Z-” functions, press \( \text{CL} \), exit from this layer area.
If modify the layer parameter, press Enter, entering into modify layer parameter interface as below:

![Layer Parameter Interface]

You can modify the related layer parameters in this interface, such as speed, power, even change other layer. When modified the parameter, move the input focus to Ok, press Enter, the modified parameter becomes effective. Press Esc backing to main interface.

### 6.7 System Information

In system main interface, press Info, the system information interface will be appeared as below:
Input focus defaults in when the interface displayed, press to read controller information, press backing to main interface.

: clear the total workpieces information. : check the limit trigger information, the details will be expressed in the “diagnosis”.

### 6.8 User Parameters

#### 6.8.1 Main interface operation

In system main interface, press , the user parameter setting interface will be appeared as below:
Input focus defaults in Read when the interface displayed, press to read user parameter information, press “Z+” or “Z-” to change the input focus and switch the parameters category, the below picture showed the other parameters entry interface:

- **Mix-cut**
● Engrave

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>X start speed</td>
<td>20.000 mm/s</td>
</tr>
<tr>
<td>Y start speed</td>
<td>15.000 mm/s</td>
</tr>
<tr>
<td>X Acc</td>
<td>3000.000 mm/s</td>
</tr>
<tr>
<td>Y Acc</td>
<td>2000.000 mm/s</td>
</tr>
<tr>
<td>Line shirt speed</td>
<td>150.000 mm/s</td>
</tr>
<tr>
<td>Facula delay</td>
<td>0% (0-100)</td>
</tr>
</tbody>
</table>

● Feed

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay before feed</td>
<td>0.000 s</td>
</tr>
<tr>
<td>Delay after feed</td>
<td>0 ms</td>
</tr>
<tr>
<td>Progressive Feeding</td>
<td>No</td>
</tr>
<tr>
<td>Progressive Feeding repay</td>
<td>231.145.469 mm</td>
</tr>
<tr>
<td>Last feeding</td>
<td>Yes</td>
</tr>
</tbody>
</table>
- **Scale**

  ![Scale Diagram]

  - Go scale mode: **Close laser**
  - Go scale blank: 0.000 mm

- **Reset**

  ![Reset Diagram]

  - Reset speed: 80.000 mm/s
  - X on reset: **Enable**
  - Y on reset: **Enable**
  - Z on reset: **Enable**
  - U on reset: **Enable**
### Other

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Array processing</td>
<td>Bi-dir</td>
</tr>
<tr>
<td>Return position</td>
<td>Absolute Origin</td>
</tr>
<tr>
<td>Focus</td>
<td>0.000 mm</td>
</tr>
<tr>
<td>X Backlash</td>
<td>0.000 mm</td>
</tr>
<tr>
<td>Y Backlash</td>
<td>0.000 mm</td>
</tr>
<tr>
<td>Laser time</td>
<td>0 ms</td>
</tr>
<tr>
<td>Manual set</td>
<td>0.000 mm</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
</tbody>
</table>

#### Rotation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable rotating</td>
<td>No</td>
</tr>
<tr>
<td>Circle pulse</td>
<td>100000.000</td>
</tr>
<tr>
<td>Diameter</td>
<td>100.000 mm</td>
</tr>
</tbody>
</table>

### 6.8.2 Set parameters

In one certain parameter category, press “Y+” or “Y-” to select specified parameter, and then
modify it.

Parameter Types:

- **Edit box:**
  
  The parameter of Edit box as below picture showed:

  ![Image](image-url)

  Modification can refer to chapter “set speed”.

- **Multi-Checkbox**
  
  The parameter of Multi-Checkbox as below picture showed:

  ![Image](image-url)

  Modification: Move the input focus to this checkbox, press , the interface as below showed:

  ![Image](image-url)

  Press “Y+” or “Y-”, select the specified category:

  ![Image](image-url)

  Press , the selection will be changed, as below picture showed:

  ![Image](image-url)

- **CheckBox**
  
  The parameter of CheckBox as below picture showed:
6.8.3 Soft keyboard operation

For the convenience of the user to change parameters, the parameter can be modified by soft keyboard, the operation steps as below:

When the input focus in the edit box, press , the soft keyboard will be popped up,

```
  1  2  3  A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z
```

Press “direction key” to move the keyboard value, press , the keyboard value will be showed in above edit box, after input, move the input focus to , press to finish input. If give up the current operation, press , and quit.
6.9 Vender Parameters

In system main interface, press , the vender parameter password interface will be appeared as below:

If the password is “123ABC”, press “1”, “2”, “3”, see below picture:

When input alphabet, press switching to alphabet input mode, then press numeric key “1”, meanwhile, “A” will be showed in the edit box as below picture:

Then input “B”, press “1”, when “A” appeared, press “1” quickly, so “B” will be showed, waiting one second, so finished “B” input, the others alphabet input method is the same.
When input finished, the interface as below showed:

![Password Input Interface]

Press Enter, if the input password is right, the below vender parameter setting interface will be popped up:

![Parameter Setting Interface]

The other parameter entry main interface as below:
6.10 System Configuration

In system main interface, press , the system configuration interface will be appeared as below:
Firstly, press **Read** (press **Enter** ) to extract system information, the current interface means the controller communicates with PC through USB port, if change to Ethernet, you should move the input focus to **USB**, press **Enter**, the “com set password” interface pops up:

The password input method is the same as “vender parameter password”, input the right password, press **Enter**, the below interface pops up:

Then choose “Ethernet” (press “X+” or “X-”):
When finished, move the input focus to Ok and press Enter backing to main interface.

At present, the port is changed to “Ethernet”, the IP address and Gateway are valid at the same time. If change the IP address or Gateway address, you should press Write (move the input focus to Write), press Enter, the system will become effective. Finally, press Esc backing to main interface.

6.11 System Menu

In system main interface, press , the system menu interface will be appeared as below:
This menu includes most of function menus in operation panel, only select the related entry and press \( Y^+ \) or \( Y^- \), entering into the corresponding function.

\[ \text{Enter} \]

6.12 Function Interface

In system main interface, press \( \text{Function} \), the system function interface will be appeared as below:

Press “\( Z^+/Z^- \)”, move the input focus to the entry should be modified, when the input focus in origin enable entry, press \( \text{Enter} \) to select or unselect this enable, if enabled, the color frame in the left would be red, otherwise it’s gray.
Multiple Origin Enable: “Yes” or “No” can be selected. If you select “No”, the system will use the single-origin logic. You can press the “Origin” key and set the origin, and only this origin can become valid. If you select “Yes”, the system will use the multiple-origin logic and the “Origin” key on the keyboard become invalid. In such a case, the parameter of each origin must be set in the menu as follows.

Origin X Enable: After the multiple-origin logic is enabled, the four origins can independently be prohibited and enabled.

Set Origin 1/2/3/4: after the multiple-origin logic is enabled, you can stop the cursor at “Set as Origin 1/2/3/4”. Press the “Enter” key on the keyboard and the system will take the coordinate figures of current X/Y axles as the corresponding ones to the origin 1/2/3/4.

Next Origin: there are five digits as 0–4 for option, which are the origins to be used for the next figure. Origin 0 means the origin set by the “Origin” key on the panel in the single-origin logic. 1–4 means the serial number of the origins in the multiple-origin logic. Next origin can be modified to any one of origin 1–4, so as to control the start location of the next work (the premise is that the origin is enabled), but it can’t be modified to origin 0.

Once the multiple-origin logic is selected and if the serial number of the next origin is 1 and four origins are enabled, when the memory file function is started or the processing file is uploaded into the PC and this file selects “Take the Original Origin as current Origin”, the work started for each time will use different origins. The rotation order of origin is 1->2->3->4->1->2…….

Origin location: Set the original location of display screen, select different original location, it can mirror the display graphics in X or Y direction.

Set Para: System will set all the vender parameters and user parameters as the parameters of leave factory.

Recover Para: The previous “set para” will replace the current vender parameters and user parameters.

Auto Focus: Laser head or lift platform moves up or down, it will move a distance in reverse direction when touching the limit switch, until the focal distance is the same to the distance between laser head and platform.

Enable laser alarm: When checked this function, the panel will real-time detect laser alarm input port, when the input port level is high (24V), laser alarm triggered, and interface will prompt laser alarm, the processing will be paused if in processing.

When the machine leave factory, to store all the debugged vendor parameters and user parameters through “Set Para”, so “Recover Para” can be used to recover all the parameters at any time.
6.13 Home Interface

In system main interface, press \( \text{Home} \), the home function interface will be appeared as below:

![Home Interface](image)

- \( \text{U Move} \): can control U-axis movement, the way is stop the input focus on \( \text{U Move} \), then press “X+/X-“ to move. Press \( \text{Enter} \), the other entries can reset the related axis. Press \( \text{Esc} \) backing to system main interface.

6.14 Diagnose Interface

In system main interface, press \( \text{Diagnose} \), the diagnose interface will be appeared as below:
This interface can real-time detect limit state, alarm information, etc. Press **Read**, extract information, which can help user troubleshoot quickly.

The below picture showed “X positive limit” triggered:

Press **Esc**, back to system main interface.
6.15 Keyboard Lock Function

In system main interface, press the "Keyboard set", the keyboard set menu will be appeared as below:

![Keyboard set menu](image)

The default keyboard password set is “RD8888” when leaving factory, if the user wants to change it, press the "Password set", the below interface popped up:

![Password set interface](image)

The password input method can refer to the above chapter. The new password will be effective when the new password input, and saved in the mainboard, and it won’t lose even power off.

- **Keyboard lock**: Press the "Lock", input right password, the whole panel keyboard will be locked, and back to main interface automatically, meanwhile, the lock icon will be showed in main interface as below:

![Keyboard locked](image)

- **Keyboard unlock**: press one key, the interface will popup information “Key is locked. Unlock it!”; at the time, only input the right password can unlock the keyboard:
6.16 Alarm Information

When the system alarmed, the related information will prompt in the interface, if the water protection trouble triggered during processing, the below interface will be showed:

Then, press or , close the interface, work paused, if exit, user should removal water protection trouble, then press “direction key” moving to , and press , continue to work. The other alarm information operation is the same.

6.17 Modify Startup Picture

When panel powered on, the startup picture will be displayed before system reset, if change the picture, user can change the picture in PC software, the detailed steps as below:

1. Open the controller related PC software, choose “File”—“Vender setting” in menu bar, see below picture:
Input vender parameter password, enter into vender parameter setting interface:

2. Choose “panel logo”:

Choose the panel type as “640X480(TFT)”, then click “import”, open the jpg or bmp pictures as below:
3. Click “download”, input right password, download the picture to controller, the picture upgrading will be displayed in the panel:

![Image](image)

正在更新Logo...

23%

4. The panel will power on again when upgrading, the new startup picture modified successfully.

### 6.18 Ports Description

#### 6.18.1 Power port JP1, JP2

![Diagram](image)
JP1 is the main power supply of 24V, the shell of machine need to connect the ground wire to prevent interference. JP2 is 24V power supply of external I/O port. Pin 1, Pin 2 and pin 3, pin 4 of JP2 are connected in the internal circuit. Users can choose one of ports to connect. In generally, 24V power supply can be shared with JP1 and JP2.

For the stable operating of this system, it is recommended to use 24V, and the output current is above 2A DC switching power supply.

6.18.2 General input port JP3

JP3 can connect travel switch, key switch and alerting signal etc. Pin 6 of JP3 is not connected.

6.18.3 General output port JP4

JP4 can drive the relay, buzzer and alarm lamp etc.

6.18.4 To connect the port of controller HDI

This port can connect to the main board through DB15 to realize high speed data communication.

6.18.5 To connect the port of LFS RS232

This port can connect to the main board through DB9 to realize high speed data communication.
6.18.6 U disk interface

USB1 can connect U disk, support U disk upgrade application.

6.18.7 PC interface

USB2 can connect to PC through USB, and support online upgrading system.

6.19 Wiring instructions

6.19.1 Tricolor alarm lamp wiring

The meaning of alarm lamp:

<table>
<thead>
<tr>
<th>System status</th>
<th>indicator light</th>
</tr>
</thead>
<tbody>
<tr>
<td>System free/finish</td>
<td>Green light is on</td>
</tr>
<tr>
<td>System operation</td>
<td>Green and red light are on</td>
</tr>
<tr>
<td>System halt</td>
<td>Yellow light is on</td>
</tr>
<tr>
<td>System alarm</td>
<td>Red light is on</td>
</tr>
</tbody>
</table>
6.19.2 Optical shutter wiring

When enable the laser alarm function, pin 1 of JP3 is high level (24V), the panel will alarm.

6.19.3 Laser alarm input

When laser alarm signal is not connected. It is recommended to prohibit the laser alarm function.
Chapter 7 MetalCut Software

7.1 MetalCut Overview

RDC6333F is one set of medium power fiber laser cutting control system based on standalone running motion control system. The controller can carry out cutting by itself without depending on computer in cutting process. 256M memory onboard, U disk interface, USB communication interface and Ethernet communication interface.

The supporting software is MetalCut, the interface as shown below:

![MetalCut Interface](image)

7.2 Cutting Path Process

Cutting path process includes cutting path display, cut in/out, and edit cut property.

- Cutting path display includes display each graphic cutting sequence. The dashed line represents idle path, arrows represents cutting direction. See below picture:
- Cut in/out line setting as below shown, select the elements, and then set the in/out line.

- Set cutting property, can revise the elements cutting sequence manually, and also single element cutting direction.
Manual move the left side elements orderly to right side, you can manual edit the cutting sequence. The two parts provides inverted sequence respectively, after clicking, the two parts will cut in its own inverted sequence.

Inverted function, the user can cut the selected element in inverted direction.

: Manual select one element in the right side for ascending sequence or descending order.

: Totally move away/into.

: Choose one element to move away/into.

### 7.3 Cutting Preprocess

Path preprocess includes combine curves, delete overlap, curve smooth, curve auto close, and data check.

When the distance between two lines end-points is very small, less than combine error, the system will combine the two lines end-points automatically.

When the distance between two lines is less than overlap error, the system will delete one overlap line automatically.

Curves auto-close function is used for closing some end-points unclosed curves due to error by force, and form close curves.
Curve smooth is used for smoothing the processing curves to get better processing effect. The outside import curves file will bring discrete error due to discrete, and resulting in the path unsmooth. Curve smooth can optimize the processing effect, and improving efficiency.

![Curve smooth](image)

Data check includes data security check, such as check close, check self-cross, check cross, and check overlap. When executed this operation, the data error information will be displayed as below:

![Data check](image)

7.4 Cutting Path Handle

The cutting path handle includes cutting path optimize, indenting inward & expanding outward, contour compensation, and fillet.

![Cutting path optimize](image)

: Cutting path optimize, which can set the cutting direction, including inside to outside, outside to inside, up to bottom, bottom to up, left to right, right to left, etc. And also has the function of cutting according to layer.
Start point optimize is mainly for changing the cutting position of start point automatically to get the better cut effect.

 располагает функцией генерации параллельных линий, то есть, контурную коррекцию. Пользователь может расширить контур параллельно или сужать внутрь.

 располагает функцией отбортовки, настройка радиуса отбортовки.

### 7.5 Cutting Path Preview

 располагает функцией отображения обработки под симуляцией фактического состояния обработки.
7.6 Primitive Attribute Modification

To modify the primitives attributes by these below functions:

Determine the primitive inter-to-outer automatically and manually. Select the primitive, click “in mod” or “out mod” can set the current primitive attributes. Also can choose “Auto”, the system can determine the attributes of primitive element.

Lead-in/outgoing line can be added manually or automatically. Click “Cut In/Out”, system will add outgoing line automatically according to the In/Out mode of graphic elements. User can add in/out line manually. Click “Draw”, and click any point outside the graphics by mouse, then click any line in the graphics; system will automatically generate lead-in line according to the path.

“Check” function can effectively check the lead-in/outgoing line validity. If illegal, system will modify it automatically.
7.7 Enable Link Near

The system link near function has two methods: 1. By count; 2. By distance: the spacing distance between two link near. As the above picture showed, the enable link near function can ensure the processing work piece un-falling or tilt, effectively avoiding the cutting head crash.

7.8 Laser Head Un-lifting within Short Distance

In continuous cutting, when laser head cutting from one primitive to the another one, the laser head will not lift due to the two cutting elements idle distance is very short, which can improve the operating efficiency. The parameters setting as below picture:

This parameter is in layer parameter, if use this function, the “Enable auto check microlink” must be checked, and set the max. distance. Here taking an example: Set the max. distance as 2mm, if the idle distance between two graphics is less than 2mm, the laser head will not lift and continuously cutting in the focal position.
7.9 Punch Operation

There are two punch methods in punch operation, one is continuous punch, and the other is pulse punch, supporting punch the start point and end point of graphics path. See below picture:

Set the current laser power when in continuous punch. The punch time must set as 1, punch time should be set in the user parameter. User only should set single punch time, the single punch delay should be 0.

Set the pulse punch times firstly when in pulse punch, single punch time and punch delay should be set in user parameter.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow up delay(ms)</td>
<td>0.000</td>
</tr>
<tr>
<td>Follow down delay(ms)</td>
<td>0.000</td>
</tr>
<tr>
<td>Follow finish delay(ms)</td>
<td>0.000</td>
</tr>
<tr>
<td>Enable pulse punch</td>
<td>Yes</td>
</tr>
<tr>
<td>Punch time(ms)</td>
<td>50.000</td>
</tr>
<tr>
<td>Punch delay(ms)</td>
<td>50.000</td>
</tr>
</tbody>
</table>

User can enable or disable pulse punch function in user parameter.
Chapter 8 Installation Dimensional Drawing

8.1 Controller Drawing

The unit: mm, accurate to 0.1mm.
8.2 Operating drawing (Unit:mm)
8.3 LFS Drawing

8.4 Amplifier Drawing
Thank you very much for using the product from Shenzhen RuiDa Technology!
All parts of this manual description, all rights reserved by Shenzhen RuiDa Technology Co., Ltd. Without our permission, any company or individual shall not reprint, copy or distribute the content related to this product manual. We keep the rights to revise or update the contents without notice.
If any comments and suggestions please feel free to contact us.
Phone: 0755-26066687 Fax: 0755-26982287
Website: www.rd-acs.com
Address: 1B-1, Building 5, Tian'an Nanyou Industry Area,
      Dengliang Road, Nanshan District, Shenzhen, P.R.C.