



# Platform Laser Welding Software Operations Manual

Automation Products

# 1. Introduction to the System

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Using platform laser welding equipment with this software operations manual, which explains in detail the functions of the buttons and how to use them on the software screen, the user can quickly and easily control the welding equipment to complete the process.

For ease of reading, the descriptions of the components are uniformly formatted as follows:

1. All clickable buttons on the software are denoted by "**boldface and quotation marks**," e.g. "**Start Button**."
2. Input box are uniformly indicated by <**boldface and angle brackets**>, e.g. <**Input Value**>.
3. CW laser sources are introduced throughout the manual. Since the laser parameters must be set on the YAG laser source, the YAG screen will be different in some cases, see [1.2.1 YAG Screen Introduction](#) (see page 8).

## 1.1 Software Functions

Functions are listed by order in the table of contents.

1. Multi-axis control and operation of welding machines
2. User operation right management
3. Multi-workstation settings
4. Instructional welding coordinates function
5. Teaching function for spot welding
6. Input and Output teaching function
7. Motion modes: JOG, INCJOG, homing, MPG and automatic
8. Laser on/off time - power setting
9. Laser speed modulation settings
10. Laser emission protection design, manual emission and red-light alignment
11. Laser power, frequency and duty cycle settings
12. Air pressure correction, blowing control function
13. MPG simulation running, breakpoint continuous welding function
14. Input and Output monitoring function
15. Rotary axis mode

## 1.2 About the Screen



1. **Status bar**: displays messages from left to right: date and time, control mode, controller status, laser status, file in process, alarms, operation panel and user rights.  
 (\*This status bar is included as part of the background frame and is visible on any page.)  
 (\*The "Alarms" button on the right is touchable. When pressed, it redirects you to the alert page, and when pressed again, it redirects you to the previous page.)



2. **Function keys**: they are part of the background and visible on any page, their content varies from page to page.

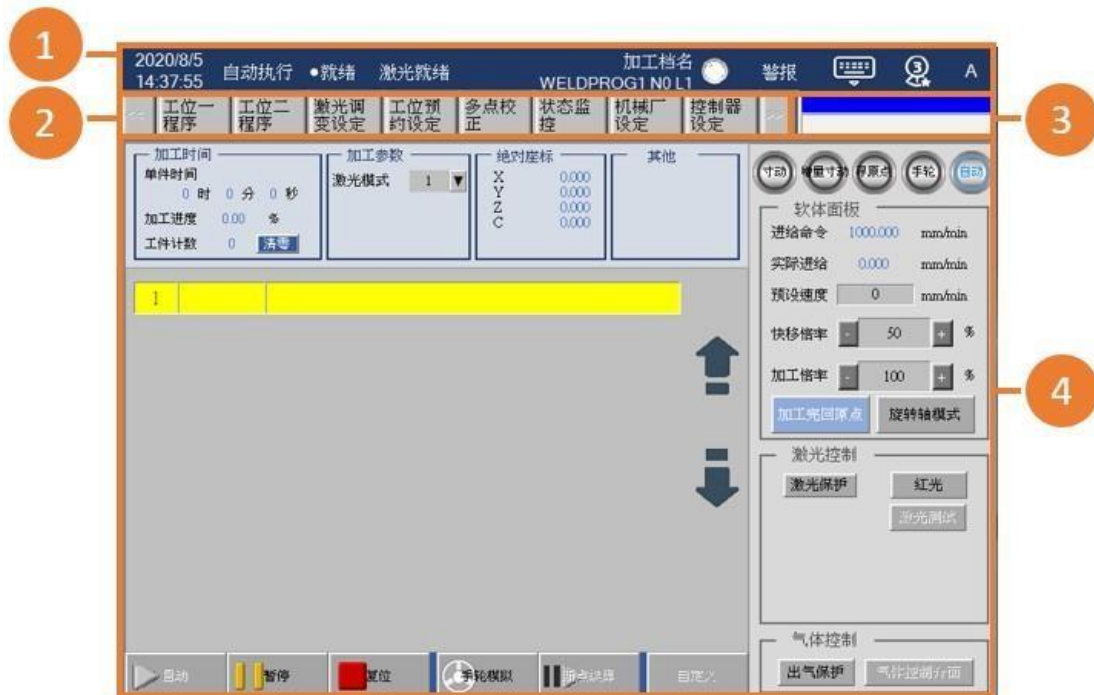


3. **Input box**: the blue one is the input box can enter by the user, the white one at the bottom will prompt an input range.



4. **Function screen:** When different function keys are pressed, a corresponding screen function will be displayed. The detailed description of the screen and operation is given in the following sections.

### 1.2.1 YAG Screen Introduction



1. **Status:** same as Section 1.2

2. **Fenubar function keys:** same as Section 1.2
3. **Input box:** same as Section 1.2
4. **Function screen:**



a. Status monitoring:

1. Processing parameters: do not display power, frequency, duty cycle, laser mode, but can select a layer for teaching and laser emission testing.
2. Other: the content of the modulation status will not be displayed and modified to other.

b. Welding instruction: time power is not displayed in the pop-up window; new laser mode is added in spot welding.

c. Laser control: Power, frequency, duty cycle and speed power are not displayed.

## 1.3 User Rights

For different users, the welding software provides four types of operating rights, and users can modify the rights using the avatar in the upper right corner of the status bar.

**Classification of Rights.:**





The open functions of each level of authority are as follows:

Classification	Functionality	Operator	User	Machine	Administrator
Password		None	666	520	5566
Workstation procedures (F1, F2)	<ul style="list-style-type: none"> <li>● Start, Pause, Reset</li> </ul>	√	√	√	√
	<ul style="list-style-type: none"> <li>● MPG simulation, continued welding at breakpoint</li> </ul>		√	√	√
	<ul style="list-style-type: none"> <li>● Workpiece counting and reset (Note 1)</li> </ul>		√	√	√
	<ul style="list-style-type: none"> <li>● Software panel               <ul style="list-style-type: none"> <li>● Motion mode</li> <li>● Axis control</li> <li>● Back to home after processing</li> <li>● Endpoints Control</li> </ul> </li> </ul>		√	√	√
	<ul style="list-style-type: none"> <li>● Laser protection</li> <li>● Speed modulation</li> <li>● Gas protection</li> <li>● Rotary axis mode</li> </ul>	√	√	√	√
	<ul style="list-style-type: none"> <li>● Red light</li> <li>● Laser testing</li> <li>● Power</li> <li>● Frequency</li> <li>● Duty cycle</li> <li>● Gas control interface</li> </ul>		√	√	√
	<ul style="list-style-type: none"> <li>● Teaching process               <ul style="list-style-type: none"> <li>● Programming</li> <li>● Command editing</li> <li>● Current workstation</li> </ul> </li> </ul>		√	√	√

Laser modulation setting (F3)	<ul style="list-style-type: none"> <li>● Time power modulation</li> <li>● Velocity modulation</li> </ul>		√	√	√
Workstation reservation setting (F4)	<ul style="list-style-type: none"> <li>● Activate reservation function</li> <li>● Cancel reservation</li> <li>● Cancel all reservations</li> </ul>	√	√	√	√
Multi-point calibration (F5)	● Multi-point correction settings	√	√	√	√
	● Reference point settings		√	√	√
Status monitoring (F6)	● Input and output monitoring		√	√	√
	● Laser monitoring			√	√
Machine setting (F7)	<ul style="list-style-type: none"> <li>● Axial settings</li> <li>● Workstation settings</li> <li>● Homing settings</li> <li>● Welding parameters</li> </ul>			√	√
Controller setting (F8)	<ul style="list-style-type: none"> <li>● Axial modules <ul style="list-style-type: none"> <li>● Machine coordinates</li> <li>● Programming</li> <li>● Process monitoring</li> </ul> </li> <li>● Electronic control module <ul style="list-style-type: none"> <li>● Maintenance</li> <li>● Parameter settings</li> <li>● Diagnosis</li> <li>● System management (Note 2) <ul style="list-style-type: none"> <li>● Software installation</li> <li>● Data backup</li> <li>● Data recovery</li> <li>● Import/export</li> <li>● Image file installation</li> <li>● Driver hardware</li> </ul> </li> </ul> </li> </ul>			√	√
Alerts	<ul style="list-style-type: none"> <li>● Existing alerts</li> <li>● Historical alerts</li> <li>● Storage alerts</li> </ul>	√	√	√	√

(Note 1: The password for workpiece counting and reset is the same as the user password.)

(Note 2: The controller password 520 is still required for input to access the system administration settings.)

Method of modifying rights:

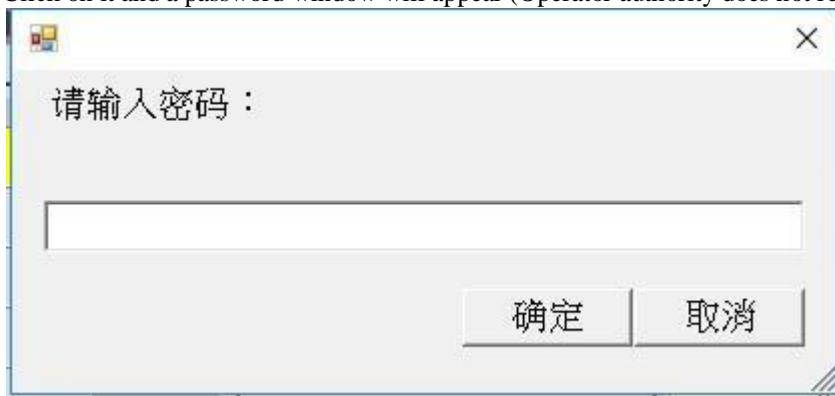
1. Click on the "Rights" button on the status bar (the avatar in the red box as shown).



2. The right selection window pops up and you may select which right you want to switch to.



3. Click on it and a password window will appear (Operator authority does not require a password).



4. After entering a correct password, you can switch rights.



## 2. Machine Makers Setting

This section provides the basic parameters of the machine set by the machine makers.

### 2.1 Pre-setting of the Welding Machine

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Parameter setting (F2)

**Function screen:**

编号	说明	数值
3402	速度功率曲线调变方式(R82)。0:频率、1:占空比、2:DA	0
3403	激光器类型(R83)。0:锐科、1:创鑫、10:YAG	0
3404	硬件模块(R84)。0:ADDA、1:SLSR	1
3405	额外工位数(R85)	20
3406	*气压校正曲线阶数(R86)。1:一阶、2:二阶、3:三阶	1
3407	MLC缓存器R87	0
3408	预开气时间(ms)(R88)	0
3409	启用急停按钮(R89)。0:不启用、1:启用	0
3410	*控制器上的 DA 输出电压最大值(R90)。0:10V、1:5V	0
3411	限位开关使用方式(R91)。0:不使用、1:硬极限、2:原点、3:硬极限及原点	0
3412	限位开关种类。0:常开、1:常闭	0
3413	坐标系设定(R93)。0:浮动、1:寻边结果、2:工位1、3:工位2、4:工位3、5:工位4	0
3414	MLC缓存器R94	0
3415	MLC缓存器R95	60
3416	MLC缓存器R96	0
3417	MLC缓存器R97	1

**Functionality:**

New generation of welding electronic control schemes with platform welding equipment, before delivered to the end customer, require pre-setting for different hardware. The following parameter settings are unique to welding schemes in the generation of controllers.

**Parameter description:**

Parameter No.	Description	Set Value	Remark
Pr3401(R81)	Maximum voltage output by laser source	On-site decisions	10V=10000

Parameter No.	Description	Set Value	Remark
Pr3402 (R82)	Modulation options 0: Freq 1: Duty 2: DA	2	*Currently only DA modulation is available
Pr3403 (R83)	Laser source type 0: Raycus 1: Maxphotonics 10: YAG	On-site decisions	
Pr3404 (R84)	Hardware outputs 0: ADDA 1: LWM, SLSR*	On-site decisions	*If standard software is installed using SLSR, the relationship with the IO in the PLC needs to be modified
Pr3405 (R85)	Number of extra workstations	0~1	Increase the number of workstations and support up to two workstations. V1.1.0
Pr3406 (R86)	*Barometric correction curve order 1: 1st order 2: 2nd order 3: 3rd order	On-site decisions	You must reboot to make it work after changes
Pr3409(R89)	Activate emergency stop button 0: Not activated 1: Activated	On-site decisions	

Parameter no.	Description	Set Value	Remark
Pr3410 (R90)	*Maximum DA output voltage on controller  0:10V  1:5V	On-site decisions	You must reboot to make it work after changes
Pr3411	How to use limit switches  0: Not use limit switches  1: Use only hardware limits  2: Use only the home  3: Use hardware limits and home	On-site decisions	
Pr3412	Limit switch type  0: Normally open  1: Normally closed	On-site decisions	
Pr3804	Workpiece counting M code	88	
Pr3813	Number of extended shared variables	20000	This parameter must be set to 20000 to operate the axes normally. You must reboot to make it work.
Pr3851	Breaking point processing program number	999900	
Pr3852	*Activate custom pause point return	1	

## 2.2 Axial Setting

**Fenubar entry path:** Home screen → Machine makers setting (F7) → Axial setting (F1)

**Function screen:**



The function screen for axial setting is divided into home position setting (left) and stroke limit setting (right).

The Axial Setting page only shows the enabled axes (Pr21~Pr40), the machine zero point setting field can display up to 8 axes per page, and the stroke limit setting field can display up to 4 axes of information per page.

If the number of axes enabled exceeds the number of axes that can be displayed on one page, press "**Previous Page**"/ "**Next Page**" to toggle the display of axial information and setting functions.

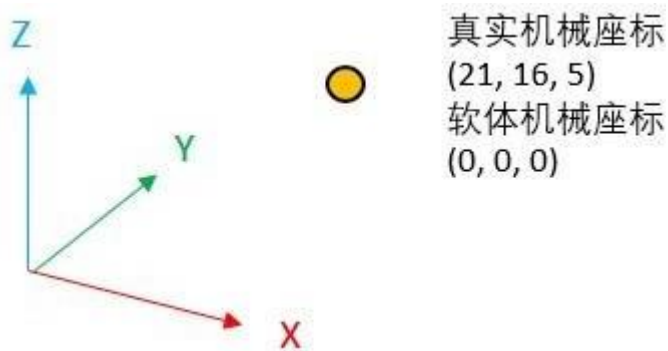
## 2.2.a Machine Zero Point Setting

### Functionality:

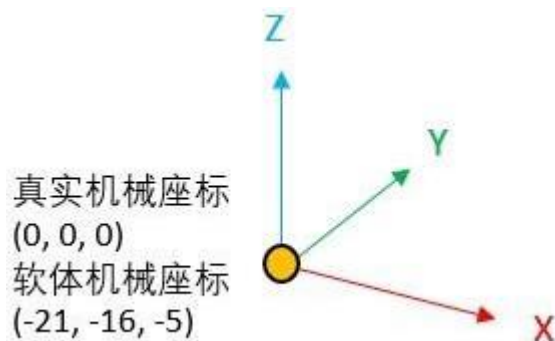
When the software is operated for the first time, the starting value of the zero point of the mechanical coordinates in the software is zero, but in fact, the position of the machine may not be at the designed machine zero point. To calibrate the origin of the mechanical coordinates in the software to be consistent with the designed zero point of the machine, refer to the following correction procedure:

**Correction process:** (citing the three axes as an example)

1. When the software is turned on, the zero point of mechanical coordinates of the software is different from the zero point of the real mechanical coordinates.



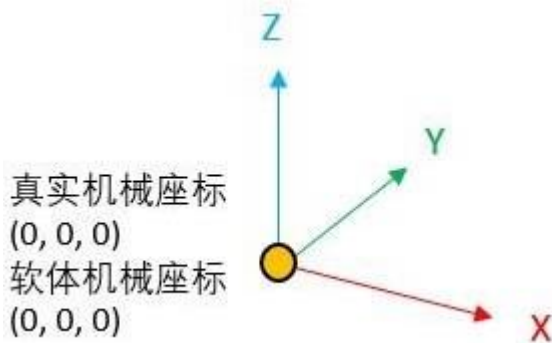
2. Control of the axes to move the machine to the zero point of the true mechanical coordinates.



3. Click the "Machine Zero Point Setting" button for each axis on the machine zero point setting screen.



4. The zero point of each axis has been set. The schematic is shown in X, Y, and Z axes only, but the axes can be calibrated depending on the machine design and electronic control scheme.



## 2.2.b Stroke Limit Setting

### Functionality:

When using the software for the first time, the starting limit position of each axis is zero and the limit position must be set manually by referring to the following procedure:

### Correction process: (example of a single axis)

1. Click the "**Reset**" button on each axis; after reset, the positive and negative limits are -99999.999~99999.999mm, to ensure that the "stroke limit exceeded" alarm does not pop up during the movement.

First-time use	After reset
<p>行程极限设定</p> <p>X 轴正极限 0.000 设定 重置</p> <p>X 轴负极限 0.000 设定 重置</p>	<p>行程极限设定</p> <p>X 轴正极限 99999.999 设定 重置</p> <p>X 轴负极限 -99999.999 设定 重置</p>

2. After moving to the limit position, press the "**Set**" button to complete correction.



Move the X-axis to the positive limit position (300), press "**Set**" on the X-axis positive limit, and then "300.000" is displayed in the text box, indicating that the positive limit has been set.

Move the X-axis to the negative limit position (-10), press "Set" on the X-axis negative limit, and then "-10.000" is displayed in the text box, indicating that the negative limit has been set.



## 2.3 Workstation Setting

**Fenubar entry path:** Home screen → Machine makers settings (F7) → Workstation settings (F2)

**Function screen:**

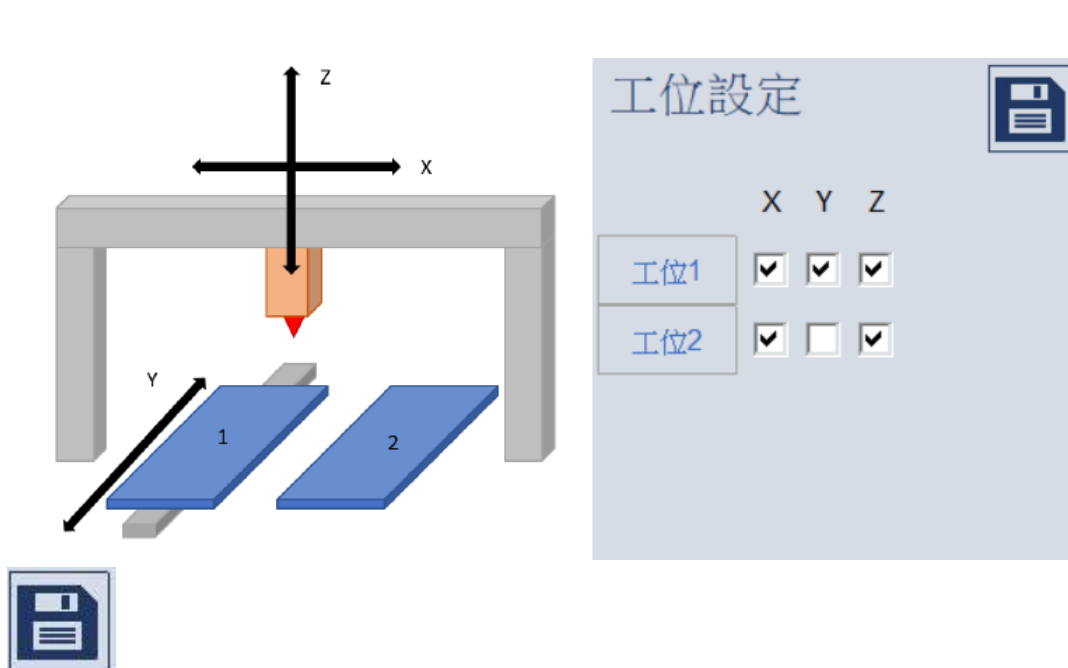


**Functionality:**

The system can be configured with multiple axes and multiple workstations. The number of workstations and axes for supporting depends on the software version and the chosen scheme, and the maximum number of workstations for supporting is double workstations, with a single workstation supporting up to five axes.

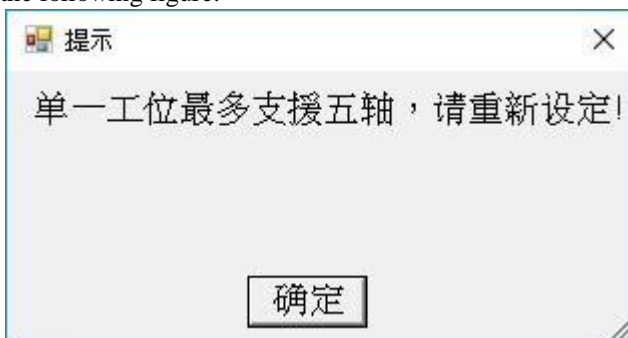
The following is a demonstration of a three-axis dual workstation:

Assuming that a platform welding machine supports two workstations, and the soldered joint is X, Z movable dual-axis, workstation 1 is a movable Y-axis platform, workstation 2 is a fixed platform, the number of workstation axes are set as follows:



(\* Note: You must click "**Save**" after you have selected the workstation setting to complete the setting.)

If more than five axes are selected for a single workstation, click "**Save**," the workstation settings will not be saved, and a pop-up window will appear indicating the axial number limit enabled for the workstation as shown in the following figure:



## 2.4 Back to Homing Setting

[Fenubar entry path](#): Home screen → Machine makers setting (F7) → Back to Homing setting (F3)

Function screen:






#### Functionality:

The system can set the order in which each workstation performs the return to the home position. In the drop-down menu, you can set the order of returning to the home position for the axes in steps 1~5 or not; if position 1 wants to return to the home position, then return to the X and A axes first, then move back to the Y axis and the Z axis, before returning to the home position. If position 2 wishes to return to the home position only on the Z-axis and not on any other axes, the back to home position is set as follows:



(\* Note: You must click "Save"  after you have selected the workstation setting to complete the setting.)

## 2.5 Welding Parameter Setting

**Fenubar entry path:** Main screen → Machine makers settings (F7) → Welding parameters (F4)

### Functionality:

This interface allows quick setting of welding parameters during the adjustment phase of the machine.

### 2.5.a Axial Parameter Setting

**Fenubar entry path:** Main screen → Machine makers settings (F7) → Welding parameters (F4) → Axial parameters (F1)

#### Function screen:

编号	说明	数值
9	轴板型态(103:M3,110:ECAT,120:RTEX)	103
41	X轴运动方向反向	0
42	Y轴运动方向反向	0
43	Z轴运动方向反向	0
44	第四轴运动方向反向	0
61	X轴传感器分辨率(编:Pulse/转;光:Pulse/mm)	1000
62	Y轴传感器分辨率(编:Pulse/转;光:Pulse/mm)	1000
63	Z轴传感器分辨率(编:Pulse/转;光:Pulse/mm)	1000
64	第四轴传感器分辨率(编:Pulse/转;光:Pulse/mm)	1000
121	X轴螺杆侧齿数	1
122	X轴马达侧齿数	1
123	Y轴螺杆侧齿数	1
124	Y轴马达侧齿数	1
125	Z轴螺杆侧齿数	1
126	Z轴马达侧齿数	1
127	第四轴螺杆侧齿数	1

### Functionality:

Before the axial debugging of the welding machine in the Syntec electric control scheme, the basic parameters of each axis should be set. The following table shows the commonly used axial parameters.

## Parameter description:

Parameter No.	Description	Set Value	Remark
Pr9	*Axial plate morphology	On-site settings	Takes effect after restart
Pr41~Pr44	Direction of motion of each axis	On-site settings	
Pr61~Pr64	Resolution of motion sensor for each axis (Encoder: Pulse/rev; optical ruler: Pulse/mm)	On-site settings	Z3 motor (24bit) setting: 4194304 H2 motor (17bit) setting: 32768
Pr121-Pr128	Screw on each axis/number of teeth on motor side	On-site settings	
Pr161-Pr164	Screw on each axis PITCH(BLU)	On-site settings	
Pr3821	* First set of axes couple active axis numbers	On-site settings	Takes effect after restart
Pr3822	* First set of axes couple following axis numbers	On-site settings	Takes effect after restart
Pr3823	* First set of axes couples active axis components	On-site settings	Takes effect after restart
Pr3824	* First set of axes couple following axis components	On-site settings	Takes effect after restart
Pr3825	*First set of axis-coupled morphologies (0: no; 1: machine, 2: pair-wise; 3: set; 4: main-wise; 5: one-to-many; 6: feedback)	On-site settings	Takes effect after restart
Pr3826	First set of axes coupling time (ms)	On-site settings	
Pr3826	First set of axes coupling/separation time (ms)	On-site settings	

## 2.5.b Motion Parameter Setting

**Fenubar entry path:** Main screen → Machine makers settings (F7) → Welding parameters (F4) → Axial parameters (F2)

**Function screen:**

编号	说明	数值
401	切削时的加减速时间(ms)	300
402	加速到加速度1G所需的时间(Jerk,单位:ms)	150
404	后加减速切削钟型加减速时间(ms)	20
405	切削时的最高速度(mm/min)	5000
461	X轴快速移动最高速度(mm/min)	10000
462	Y轴快速移动最高速度(mm/min)	10000
463	Z轴快速移动最高速度(mm/min)	10000
464	第四轴快速移动最高速度(deg/min)	10000
521	X轴JOG速度(mm/min)	6000
522	Y轴JOG速度(mm/min)	6000
523	Z轴JOG速度(mm/min)	6000
524	第四轴JOG速度(deg/min)	6000

#### Functionality:

The parameters on this page allow you to adjust the smoothness of the automatic/manual axial motion to optimize the performance of the machine. The following table shows the common motion parameters.

#### Parameter description:

Parameter No.	Description	Set Value	Remark
Pr401	Acceleration/deceleration time during cutting	On-site settings	
Pr402	Time required for acceleration to 1G (Jerk, unit: ms)	On-site settings	
Pr404	Post-acceleration/deceleration cutting bell-shaped acceleration/deceleration time (ms)	On-site settings	
Pr405	Maximum cutting speed (mm / min)	On-site settings	
Pr461~Pr464	Maximum speed of rapid movement on each axis (mm / min)	On-site settings	
Pr521~Pr524	JOG speed on each axis (mm/min)	On-site settings	

## 2.5.c Home/Limit Parameter Setting

**Fenubar entry path:** Main screen → Machine makers settings (F7) → Welding parameters (F4) → Home/limit parameters (F3)

**Function screen:**

编号	说明	数值
841	X轴寻原点的第二段低速速度(mm/min)	2000
842	Y轴寻原点的第二段低速速度(mm/min)	2000
843	Z轴寻原点的第二段低速速度(mm/min)	2000
844	第四轴寻原点的第二段低速速度(deg/min)	2000
861	X轴寻原点方向为负方向	0
862	Y轴寻原点方向为负方向	0
863	Z轴寻原点方向为负方向	0
864	第四轴寻原点方向为负方向	0
881	X轴寻原点的偏移量(BLU)	0
882	Y轴寻原点的偏移量(BLU)	0
883	Z轴寻原点的偏移量(BLU)	0
884	第四轴寻原点的偏移量(BLU)	0
3409	启用急停钮(R89)。0:不启用、1:启用	0
3411	限位开关使用方式(R91)。0:不使用、1:硬极限、2:原点、3:硬极限及原点	0
3412	限位开关种类。0:常开、1:常闭	0

**Functionality:**

When a non-absolute motor starts up and returns to the home position, it is necessary to set the back to home position parameter for each axis and the limit switch parameter to find the home position. The following parameters for home and limits all needs to be set.

Parameter No.	Description	Set Value	Remark
Pr841~Pr844	Second-stage low velocity (mm/min) at the home searching on each axis	On-site settings	
Pr861~Pr864	The direction of home searching on each axis is negative	On-site settings	

Parameter No.	Description	Set Value	Remark
Pr881~Pr884	The offset of home searching on each axis (BLU)	On-site settings	
Pr3409	Enable emergency stop button (R89). 0: not enabled, 1: enabled	On-site settings	
Pr3411	Phase switch use mode (R91). 0: Not applicable, 1: Hard limit, 2: Home, 3: Hard limit and home	On-site settings	
Pr3412	Limit switch type.0: Normally open, 1: Normally closed	On-site settings	

### 2.5.d Other Parameter Setting

**Fenubar entry path:** Main screen → Machine makers settings (F7) → Welding parameters (F4) → Other parameters (F4)

Function screen:

编号	说明	数值
3209	Language-0 英文(ENG);1 繁中(CHT);2 LOCAL;119 简中(CHS)	119
3251	*触控屏(0:无;1:PM USB;2:EETI;3:PM9k C1;4:PM9k C2;5:TK C1;9:鼠标)	0
3401	激光器输出最大电压(mV)(R81)	0
3402	速度功率曲线调变方式(R82)。0:频率、1:占空比、2:DA	0
3403	激光器类型(R83)。0:锐科、1:创鑫、10:YAG	0
3404	硬件模块(R84)。0:ADDA、1:SLSR	1
3405	额外工位数(R85)	20
3406	*气压校正曲线阶数(R86)。1:一阶、2:二阶、3:三阶	1
3407	MLC缓存器R87	0
3408	预开气时间(ms)(R88)	0
3410	*控制器上的 DA 输出电压最大值(R90)。0:10V、1:5V	0
3413	坐标系设定(R93)。0:浮动、1:寻边结果、2:工位1、3:工位2、4:工位3、5:工位4	0
3414	MLC缓存器R94	0
3415	MLC缓存器R95	60
3416	MLC缓存器R96	0
3417	MLC缓存器R97	1

Functionality:



This field provides common application parameter settings and reserved expansion parameter settings, and users can expand the application as needed.

**Parameter description:**

Parameter No.	Description	Set Value	Remark
Pr3209	Language- 0:ENG;1:CHT;2:LOCAL;119:CHT	119	
Pr3251	*Touch screen (0:None;1:PM USB;2:EETI;3:PM9k C1;4:PM9k C2;5:TK C1;9:Mouse)	On-site settings	Takes effect after restart
Pr3401	Maximum laser output voltage (R81)	On-site settings	10V=10000
Pr3402	Velocity power curve modulation mode (R82). 0:Freq;1:Duty;2:DA	2	*Currently only DA modulation is available
Pr3403	Laser type (R83).0:Raycus,1:Maxphotonics,10:YAG	On-site settings	
Pr3404	Hardware modules (84). 0:ADDA, 1:LWM/SLSR	0	*If standard software is installed using SLSR, the relationship with the Input and output in the PLC needs to be modified
Pr3405	Number of additional workstations (R85)	0~1	Increases the number of workstations and supports up to two workstations.
Pr3406	*Barometric correction curve order (R86). 1:1st order, 2:2nd order, 3:3rd order	On-site settings	Changes take effect after restart
Pr3407	MLC Buffer (R86)	Extended use	
Pr3408	Pre-venting time (ms) (R88)	On-site settings	
Pr3410	*Maximum DA output voltage on the controller (R90). 0:10V, 1:5V.	On-site settings	Changes take effect after restart
Pr3413	Coordinate system setting (R93). 0: floating, 1: edge-finding result, 2: workstation 1, 3: workstation 2, 4: workstation 3, 5: workstation 4	On-site settings	
Pr3414	MLC Buffer (R94)	Extended use	

Parameter No.	Description	Set Value	Remark
Pr3415	MLC Buffer (R95)	Extended use	
Pr3416	MLC Buffer (R96)	Extended use	
Pr3417	MLC Buffer (R97)	Extended use	
Pr3418	MLC Buffer (R98)	Extended use	
Pr3419	MLC Buffer (R99)	Extended use	
Pr3420	MLC Buffer (R100)	Extended use	
Pr3813	Number of extended shared variables	20000	This parameter must be set to 20000 to operate the axes normally, and takes effect after restart



# 1. Teaching Mode

**Fenubar entry path:** Home → Workstation 1 (F1)/Workstation 2 (F2)

Teaching mode is an important function of the software. The user can move to the target coordinate by controlling the axis and record the coordinates of welding points one by one. The system will generate welding processing path by itself to achieve the teaching processing function.

## 1.1 Introduction to Teaching Programs

The most important function of teaching mode is writing a teaching program. This section first introduces the functions of each module on the screen, and then demonstrates the operation process. Details of the instructions and modifications are described in subsequent chapters.

### 1.1.a Screen Style



The screen is divided into five modules, namely (1) status display, (2) main program, (3) start command, (4) axial operation, and (5) laser gas control.

#### (1) Status display module



From left to right are machining time, machining parameters, absolute coordinates, and modulation status, which can display the current machine status. Aside from the "Reset" button, which can reset the number of workpieces processed, all other information in this module is only for display and not for modification.

More detailed information can be found in [7 Status Monitoring](#) (see page 74).

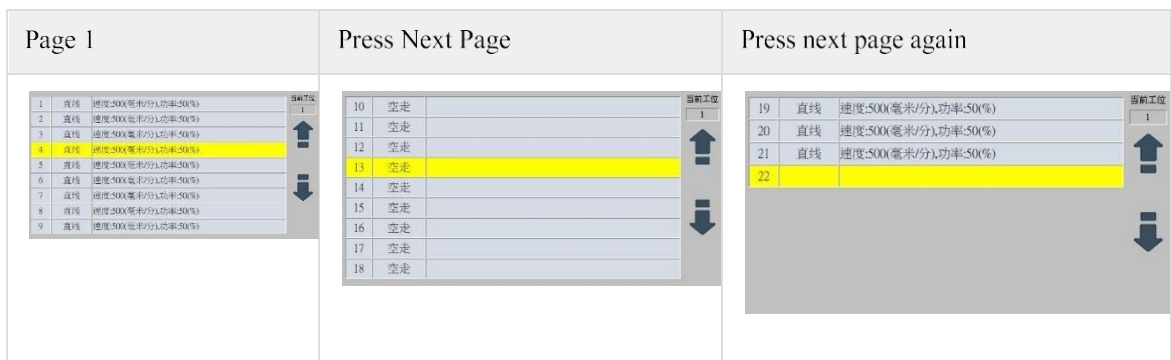
## (2) Main program module



The main module of the program contains the workstation selection, the program home page, program instructions, and the previous page and next page buttons.

Select the correct workstation before programming and processing. The program home page displays 9 lines of programs at a time. If more than 9 lines, the program codes of other pages will be displayed on the previous / next page on the right.

Each program line can carry a program instruction, and the instruction list is at the bottom of the screen. For detailed description of each instruction, please refer to [Section 3.3 Teaching Program Instructions](#) (see page 38).



## (3) Initiate command module



Please refer to [3.5 Execution of Machining Processes](#) (see page 54) for detailed description of the instructions used to control the processing action.

#### (4) Axial operation module



For axial motion control, please refer to [4 Axial Operation](#) (see page 55) for details.

#### (5) Laser gas control module



Please refer to [5.3 Laser Control Parameters](#) (see page 66) and [5.4 Gas Control](#) (see page 67) for details regarding the modules for laser and gas control.

### 1.1.b Dual-Station Operation

If an extra workstation is enabled (Pr3405), you will see two workstation program buttons on the Fenubar, which can be pressed to switch to different workstation programs with their own teaching files. The screen background colors vary from workstation to workstation.



The operating procedure is the same for both workstations and is detailed in the following sections

### 1.1.c Operating Procedures

To quickly become familiar with and operate the teaching mode, refer to the following procedure, which lists the complete basic operations:

#### (1) Confirm work workstations

The background color of the current screen can be used to confirm which program is in which workstation, and the workstation program can be switched by Fenubar.

#### (2) Start writing programs

Click the teaching program field to start editing the program line by line. The instruction contains functions such as adding, modifying, copying and deleting, etc. The details are described in the next section, 3.2 Teaching Program Writing (see page 34).



#### (3) Set preset speed

After the program is written, it is necessary to set an appropriate <Preset Speed>, otherwise the system will not start processing smoothly.



## (4) Set laser parameters

Then set the laser parameters <Power>, <Frequency>, <Duty Cycle> during machining, and the parameter values will vary according to different materials and different processes. Advanced laser parameters are described in detail in 5 [Process Tuning](#) (see page 63).



## (5) Turn on the protection device

Press "**Laser Protection**" and "**Venting Protection**" to activate the laser and venting devices, otherwise the welding process will not proceed smoothly.



## (6) Start the program

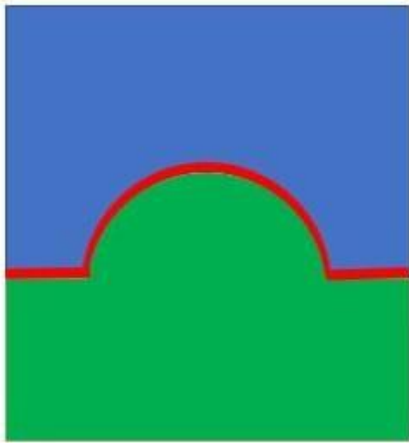
Finally, press the "**Start**" button to start the written program.



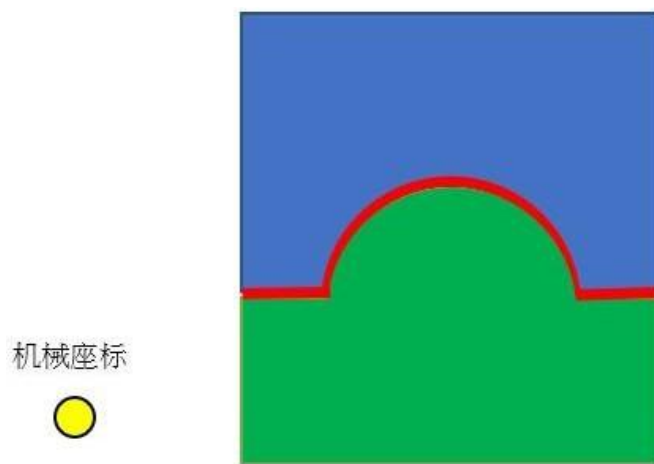
## 1.2 Teaching Program Writing

The coordinates to be welded by the machine are given in a teaching manner and the program can be written according to the following procedure.

The following diagram illustrates the need to weld the top half (blue) to the bottom half (green) of the workpiece, with the desired weld being the red path:



(1) Move to starting point



At first the mechanical coordinates may be elsewhere. The first step is to move quickly to the starting point of welding. First control the axial direction to the welding starting point (a), click on the first line of the program, press "**Fast Move**," and then press "**Confirm**."



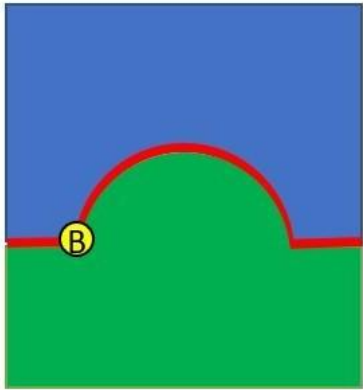
## (2) Weld straight to the next point

To start welding, you need to click "Start Welding," input <Modulation Parameter No.> enable the "Time Power" function, enter the <Advance Blowing> time, input the <Laser on Delay> time, and click "Confirm."



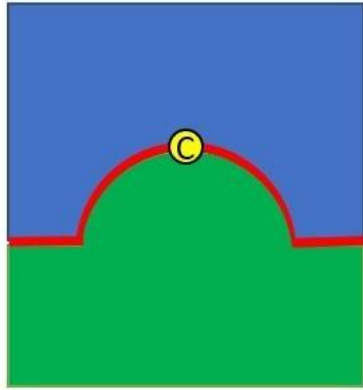
The next step is to move straight to a fixed point (B), first control the axis to a fixed point (B), click on the next blank program line, press "Straight Line," then press "Confirm."

(\*Note: If <Velocity> and <Power> are blank, then the system will automatically bring in the default parameters. Modifying the default parameters is described in Sections 5.3 Laser Control Parameters (see page 66) and 5.5 Processing Velocity (see page 69).

Coordinates	Program	Diagram						
<div style="border: 1px solid black; padding: 5px;">           绝对坐标            X 35,000            Y 20,000            Z 3,000         </div>	<div style="border: 1px solid gray; padding: 5px;">           直线  <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>35,000</td> <td>20,000</td> <td>3,000</td> </tr> </tbody> </table>           当前坐标            速度 毫米分            功率 %            下一行 确认 取消         </div>	X	Y	Z	35,000	20,000	3,000	<div style="text-align: center;">           机械坐标            (35, 20, 3)         </div> 
X	Y	Z						
35,000	20,000	3,000						

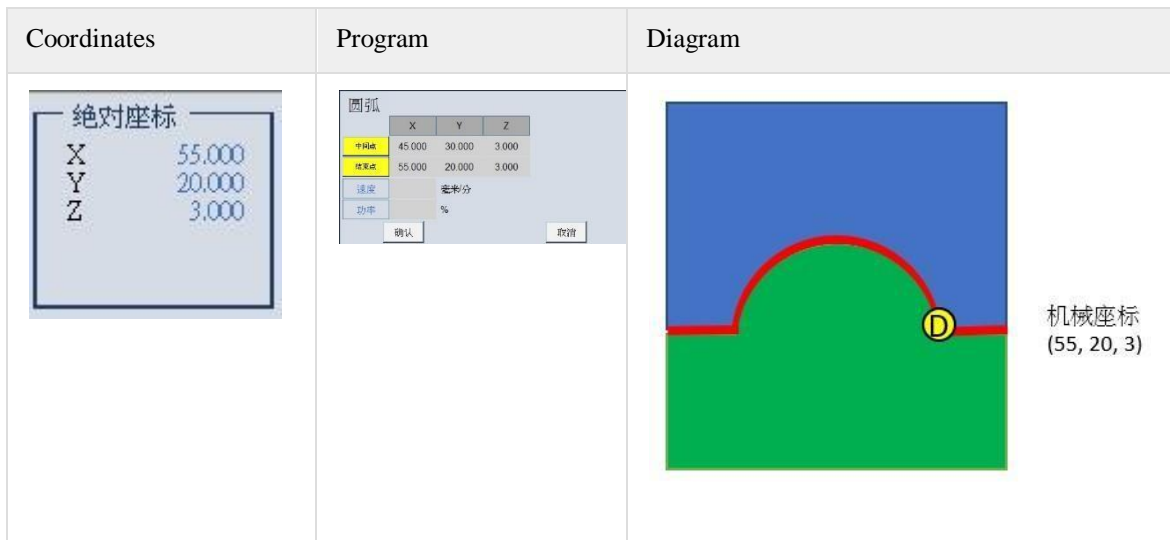
### (3) Arc welding

The next weld is a semi-circular arc; first move the axis to one of the points (C) of the arc, click on "**Arc**" on the next blank program line and click on "**Midpoint**."

Coordinates	Program	Diagram						
<div style="border: 1px solid black; padding: 5px;">           绝对坐标            X 45,000            Y 30,000            Z 3,000         </div>	<div style="border: 1px solid gray; padding: 5px;">           圆弧  <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>45,000</td> <td>30,000</td> <td>3,000</td> </tr> </tbody> </table>           中点            速度 毫米分            功率 %            确认 取消         </div>	X	Y	Z	45,000	30,000	3,000	<div style="text-align: center;">           机械坐标            (45, 30, 3)         </div> 
X	Y	Z						
45,000	30,000	3,000						

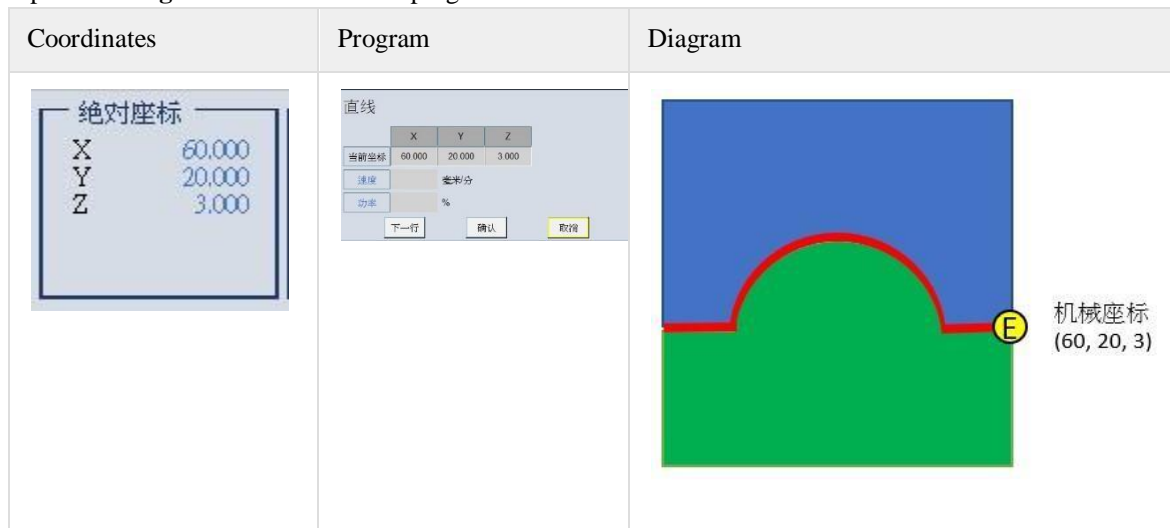
Then move to the end point (D) of the arc, click "**End Point**," and then click "**Confirm**."





#### (4) Last straight-line welding

The last step is to make a straight line to the welding end point (E), and then move the axis to a fixed point (E) and press "**Straight Line**" on the blank program line and then "**Confirm**."



#### (5) Finish welding

At the end of welding, press "**Finish Welding**" in the blank of the last line of the program. Input the time of "**Extended Blowing**" and "**Laser off Delay**" as required, and decide whether to turn on the "**Time Power**" function.



After teaching the whole program, the program to be displayed is as follows:

1	空走	
2	焊接开始	调变参数:1,时间功率:开,提前吹气:500(毫秒)
3	直线	默认参数
4	圆弧	默认参数
5	直线	默认参数
6	焊接结束	时间功率:开,延长吹气:300(毫秒)
7		

## 1.3 Teaching Program Instructions

**Functionality:** The machine is operated by teaching to achieve ideal welding action, while the actual operation requires various instructions to finish a complete machining program.

**Entry path:** Home screen → Workstation 1 program (F1) → lower field

**Enabling conditions:** the command line can only be seen in the four modes of inching, INCJOG, HOME and MPG, and the command line will be hidden in the automatic mode.

In this chapter, the teaching instructions are divided into four categories: A. axial action, B. welding action, C. peripheral control, D. auxiliary instruction. The functions are classified in order and explained.

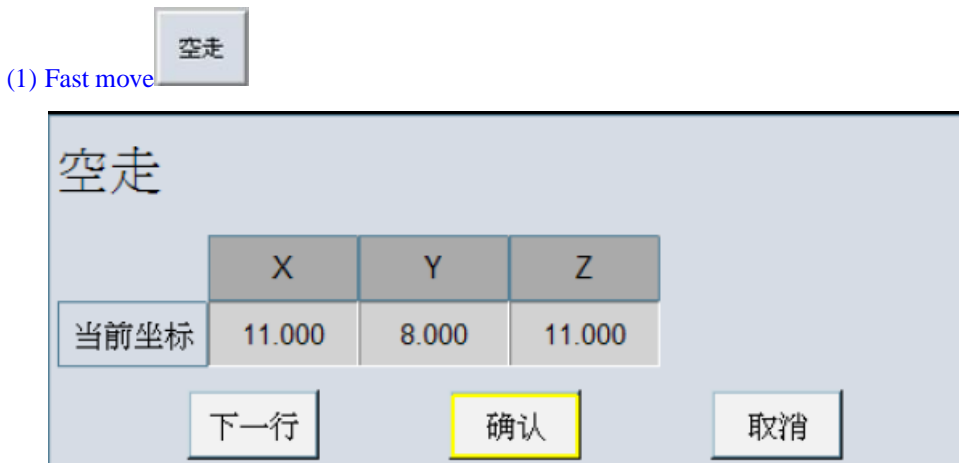
### 1.3.a Axial Motion

**Functionality:** The instructions in this section relate to the movement of the basic axial path of the machine to achieve the function of teaching the welding point.

**Coordinate definition:** the command of axial action will need coordinate position. The coordinates here are all the axial positions of the current machine and will be updated with the axial movement.

**Common setting:** the command usually does not need to specially define the Velocity and power, and the system will automatically set it as the default parameters. If it is necessary to modify the Velocity and power of the command in a single section individually, input <Velocity> and <Power> in the single section.

The commands for axial motion consist of four items: (1) fast move, (2) straight line, (3) arc, and (4) full circle.



**Command function:** move to the specified position (current coordinates) with fast speed.



**Parameter definition:**

1. Fast-moving multiplying: The fast-moving speed of the fast move command can be adjusted in the fast-moving multiplying power of 4.5 Auto Mode (see page 61).

**Operating instructions:**

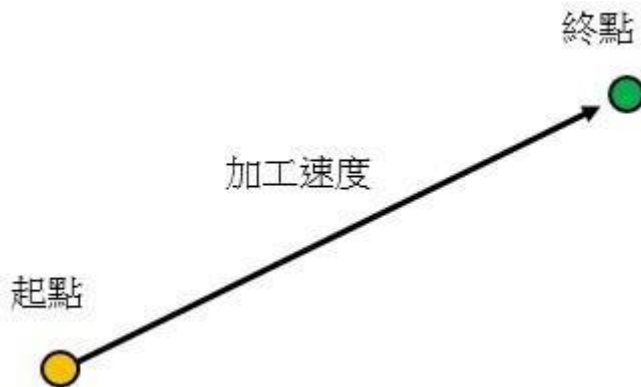
1. Click on the "Fast move" button to enter the Fast move teaching page.
2. Move the axis to the target position.
3. The next time you need to continue the fast move teaching step, click the "Next Line" button. (The current point will be taught, and the next line of fast move teaching will start).
4. If the next line no longer teaches the fast move step, click "Confirm" to complete the teaching.
5. Click "Cancel" to cancel the teaching.

**直线**

(2) Straight Line

直线			
	X	Y	Z
当前坐标	11.000	8.000	11.000
速度	毫米/分		
功率	%		
下一行		确认	取消

**Command function:** move to the specified position (current coordinates) with machining speed.



**Parameter definitions:**

1. <**Velocity**>: You can input the processing Velocity in mm/min here, the entered Velocity only affects this single section, without affecting the Velocity of other programs; if you do not enter it, the default is the preset Velocity, as described in Section 5.5 Processing Velocity (see page 69).
2. <**Power**>: You can input the laser power in % here; the input power only affects this single section, without affecting the power of other programs; if no input, the default is the power in laser control, which is introduced in 5.3 Laser Control Parameters (see page 66).

**Operating instructions:**

1. Click on the "**Straight Line**" button to enter the Straight Line teaching page.
2. Move the axis to the target position, you can selectively set the movement <**Velocity**> and the machining <**Power**>.
3. If you want to teach the next line of the straight line, click the "**Next Line**" button. (The current point will be taught and the next line of straight line teaching will commence)
4. If the next line does not teach the straight-line step, after inputting the output power, click "**Confirm**" to complete the teaching.

5. Click "Cancel" to cancel the teaching.

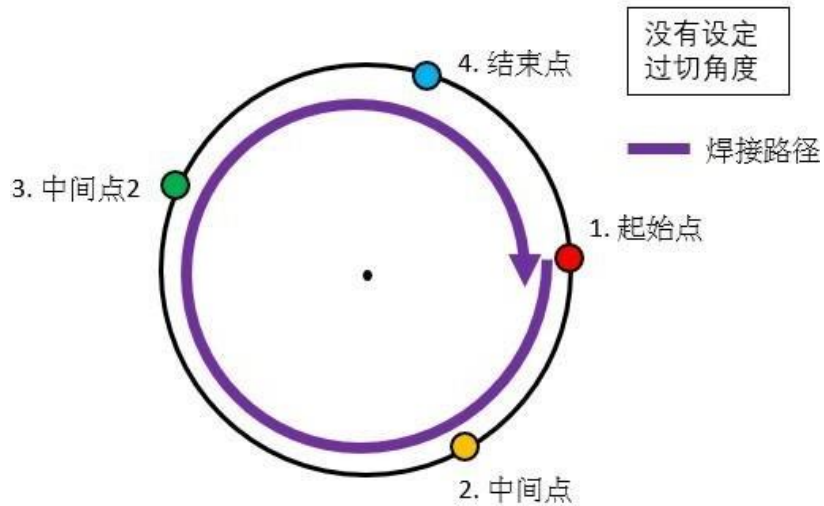
(3) Circle

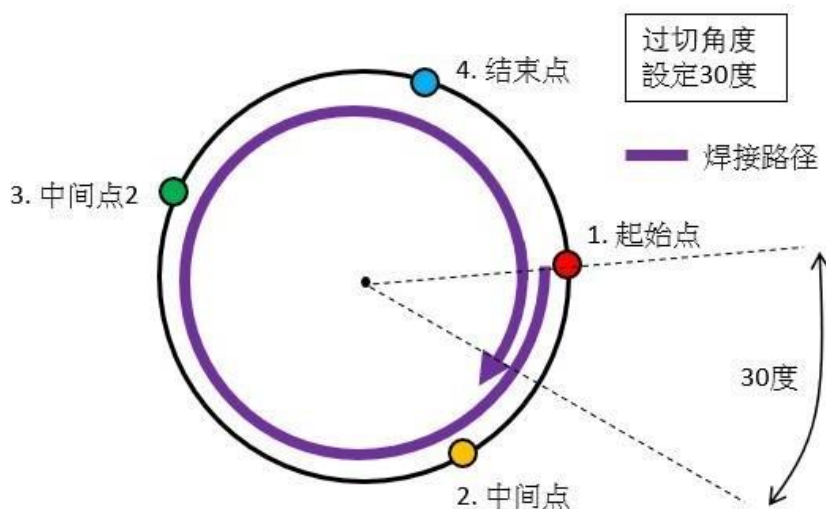
全圆

	X	Y	Z
起始点	10.000	0.000	0.000
中间点	0.000	10.000	0.000
中间点2	-10.000	0.000	0.000
结束点	0.000	-10.000	0.000

速度  功率  过切度数

**Command function:** move quickly to the starting point and finish the circle with machining speed.





#### Parameter definitions:

1. <Velocity>: You can input the processing Velocity in mm/min here, the entered Velocity only affects this single section without affecting the Velocity of other programs; if you do not enter it, the default is the preset Velocity, which is described in Section 5.5 Processing Velocity (see page 69).
2. <Power>: You can input the laser power in % here; the input power only affects this single section, without affecting the power of other programs; if no input, the default is the power in laser control, which is introduced in 5.3 Laser Control Parameters (see page 66).
3. <Overcutting Degrees>: if 30° is filled in, 390° is actually processed, and more than 30° is processed beyond the starting point.

#### Operating instructions:

1. Click on the "Circle" button to go to the Circle teaching page.
2. Move the start position of the axial circle and press "Starting Point."
3. Locate the intermediate point on the circle to be welded, move it into position and click on "Middle Point."
4. Locate the second midpoint on the circle to be welded, move it into position and press "Middle Point 2."
5. Find the end point on the circle to be welded, move it into position and click "End Point." (The end point does not have to coincide with the start point, just make sure it is on the welding circle.
6. After completing all points on the circle, you can set <Overcutting Degrees>.



圆弧			
	X	Y	Z
中间点	10.000	0.000	0.000
结束点	0.000	10.000	0.000
速度	毫米/分		
功率	%		
确认		取消	

**Command function:** use the previous single-section endpoint as the start of an arc to complete an arc at machining speed.



**Parameter definitions:**

1. **<Velocity>**: You can input the processing Velocity in mm/min here, the entered Velocity only affects this single section without affecting the Velocity of other programs; if you do not enter it, the default is the preset Velocity, which is described in Section 5.5 Processing Velocity (see page 69).
2. **<Power>**: You can input the laser power in % here; the input power only affects this single section, without affecting the power of other programs; if no input, the default is the power in laser control, which is introduced in 5.3 Laser Control Parameters (see page 66).

**Operating instructions:**

1. Click the "**Circular Arc**" button to enter the arc teaching page.
2. Move to a point in the middle of the arc and click on "**Middle Point**" for teaching.
3. Move to the last point of the arc, click "**End Point**" for teaching, and then click "**Confirm**" when finished.

### 1.3.b Welding Action

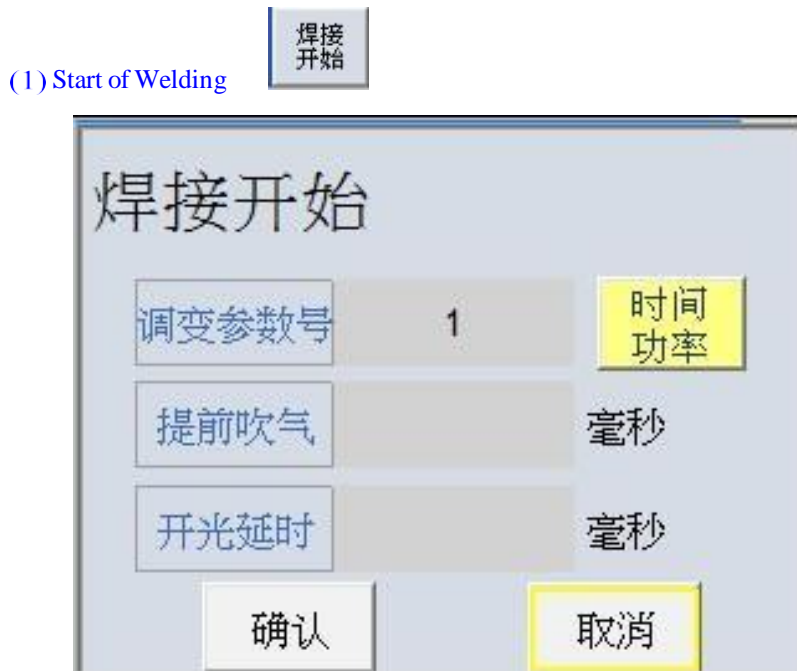
**Functionality:** The commands in this section control welding-related actions.

**Definition of blowing:** The welding process requires blowing to assist in improving the quality of the weld, and depending on the equipment, the software provides the setting of the blowing time.

**Power setting:** the most important thing for welding is the control of the laser. The power parameter has more detailed teaching in 5 [Process Tuning](#) (see page 63). What can be modified in this command is the function of turning on or off time power, and which **<Parameter No.>** to use for the time power.

**Operating Restrictions:** Since this command involves a laser switch, it is necessary to press the "Laser Protection" and "Venting Protection" before the subsequent welding and venting actions can operate normally.

The instructions for welding include (1) start of welding, (2) end of welding, and (3) spot welding:



**Command function:** The program runs to this point and from this line onwards, it will turn on the light and weld and execute the subsequent welding path.

**Parameter definitions:**

1. **<Modulation Parameter No.>**: One can enter the numbers from 1 to 10, each modulation parameter number corresponding to the time power setting and Velocity power graph. See [5.1 Laser Time Power](#) (see page 63) and [5.2 Laser Velocity Power](#) (see page 64) for details.
2. **<Advance Blowing>**: before moving to the welding start coordinates, blow in advance for a period of time, and reach a fixed point before emitting light, to ensure the welding quality of the workpiece, in milliseconds.
3. **<Laser on Delay>**: After moving to the welding start coordinates, maintain the light at a fixed position for a period of time to ensure the welding quality of the workpiece, in milliseconds.
4. **"Time Power"**: when pressed, the button appears yellow to enable the laser on time power curve function, when pressed again, it appears gray to turn off the time power curve function.

**Operating instructions:**

1. Click the **"Start of Welding"** button at the bottom of the screen.



2. Enter the <**Parameter No.**> of the light-on time power curve to be invoked and select whether to enable "**Time Power.**"
3. Enter the desired time for "**Advance Blowing**" and "**Laser on Delay**" and click "**CONFIRM.**"

(2) End of Welding 



**Command function:** The program runs to this point and will turn off the laser from this line onwards.

**Parameter definitions:**

1. <**Extended Blowing**>: When moving to the welding end point, issue a light off command. At this time, the gas blowing is extended for a period of time before closing the blowing. Make sure to close the light first, then turn off the gas blow, and then proceed to the next line when the gas blow is finished, in milliseconds.
2. <**Laser off Delay**>: When moving to a welding end point, maintain at a fixed point and continue to emit light for a period of time before issuing the receiving command to ensure the welding quality of the workpiece, in milliseconds.
3. "**Time Power**": when pressed, the button appears yellow to enable the laser off time power curve function, when pressed again, it appears gray to turn off the time power curve function.

**Operating instructions:**

1. Click the "**End of Welding**" button at the bottom of the screen.
2. Select whether to enable the "**Time Power**" curve.
3. Fill in the time required for "**Extended Blowing**" and "**Laser off Delay**" and click "**Confirm.**"

(3) Spot Welding 

点焊

调变参数号 10 时间功率

	X	Y	Z	A
当前坐标	0.000	0.000	0.000	0.000

速度 毫米/分 等待时间 毫秒

功率 % 持续时间 毫秒

下一行 确认 取消

**Command function:** Wait for a certain time after moving in a straight line to the specified position, then turn on the light at the target point, the on time can be set for single-point welding.

**Parameter definitions:**

1. Current coordinates: i.e. the current position of the machine.
2. <Velocity>: The Velocity from the previous position to a fixed point, in mm/min. The Velocity entered only affects this single section, not the Velocity of other programs; if no Velocity is input, it defaults to the preset Velocity, which is described in section 5.5 Processing Velocity (see page 69).
3. <Power>: One can input the laser power here, in %; the input power only affects this single section, without affecting the power of other programs; if no input, the default is the power in laser control, which is introduced in 5.3 Laser Control Parameters (see page 66).
4. <Waiting Time>: How long does one have to wait for the light to emit after arriving at a fixed position, in milliseconds.
5. <Duration>: How long the laser continues to emit light at this point, in milliseconds.
6. <Modulation Parameter No.>: One can enter the numbers from 1 to 10, each modulation parameter number corresponding to the time power setting and Velocity power graph. See 5.1 Laser Time Power (see page 63) and 5.2 Laser Velocity Power (see page 64) for details.
7. "Time Power": when pressed, the button appears yellow to enable the laser on time power curve function, when pressed again, it appears gray to turn off the time power curve function.

**Operating instructions:**

1. Click on the "Spot Welding" button to enter the spot-welding teaching page.
2. Move the axis to the target position.
3. Fill in <Waiting Time>, <Duration>, <Modulation Parameter Number>, whether to enable "Time Power", and light output <Power>, <Velocity> as required, and then click "CONFIRM."
4. If the next line is also a spot weld, click the "Next Line" button. (The current point will be taught, while the next line of spot welding teaching will begin.)
5. If the next line no longer teaches the spot welding steps, click "CONFIRM" to complete the spot welding instruction.
6. Click "Cancel" to cancel the spot welding instruction.

### 1.3.c Peripheral Control

**Functionality:** Provides the function of controlling the peripheral external devices (such as clamping, cylinder, blowing, workstation switching, position signal, foot switch signal), and reaches the automatic control of peripheral devices through I and O contacts.

**Input and output point definition:** I and O represent the input and output respectively, which need to be matched with the actual wiring points, and currently 64 points each for I and O are supported.



**Command function:** You can select the point of the output for teaching, or wait for the input signal before executing the subsequent action.

**Parameter definitions:**

1. **"Output"**: Pressing "Output" bottom, the other bottoms below will switch to the output point position button and display 8 positions on one page.
2. **"Wait"**: Pressing "Wait" bottom, the other bottoms below will switch to the input point position button and display 8 positions on one page.
3. **"Output 0-64"**: After pressing one of the output points, the button will appear yellow, indicating that the output point has been selected.
4. **"Input 0-64"**: After pressing one of the input points, the button will appear yellow, indicating that the input point has been selected.
5. **"On" / "Off"**: Selecting the points I and O, if it is O, the program will perform on or off O point when it runs to this line. If it is I, it will wait for the signal of I to be turned on or off before executing the next line of program.
6. **"Confirm"**: Click Confirm to complete the input/output teaching.
7. **"Execute"**: Press Execute to test if the point number and function are working properly.
8. **"Cancel"**: cancels this input/output teaching.
9. **"Previous Page"/"Next Page"**: Each page displays 8 points, and other I and O points are displayed on the previous page and next page.

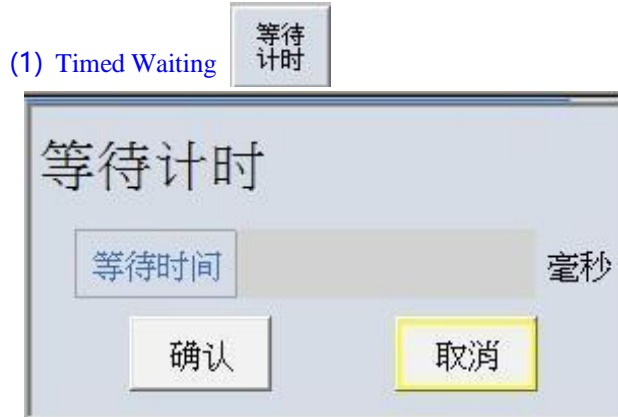
**Operating instructions:**

1. Click the **"Input/output"** button to enter the teaching page.

2. Select point I or O for teaching, click "**Wait**" for point I and "**Output**" for point O.
3. Select the point number to be controlled, and use "**Previous Page**" and "**Next Page**" to change pages if it is more than 7.
4. Select "**On**" or "**Off**" according to the program requirements.
5. Press "**Execute**" first to test if the function is as expected.
6. After testing and finding the function and number normal, press "**Confirm**" to complete the teaching.
7. If you click "**Cancel**", the welding instruction will be cancelled.

### 1.3.d Auxiliary Instructions

The software provides some auxiliary commands to achieve the needs of multiple customization.



**Command function:** You can insert a timed waiting step in the program, the machine will pause for a while and then resume the motion.

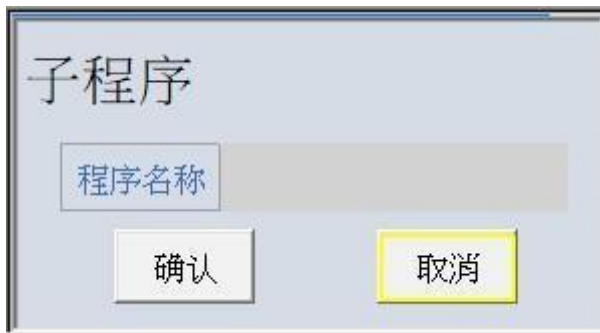
**Parameter definitions:**

1. <**Waiting Time**>: Enter the time, in ms, at which you want to pause the motion.

**Operating instructions:**

1. Click "**Timed Waiting**," enter <**Waiting Time**>, and click "**Confirm**".





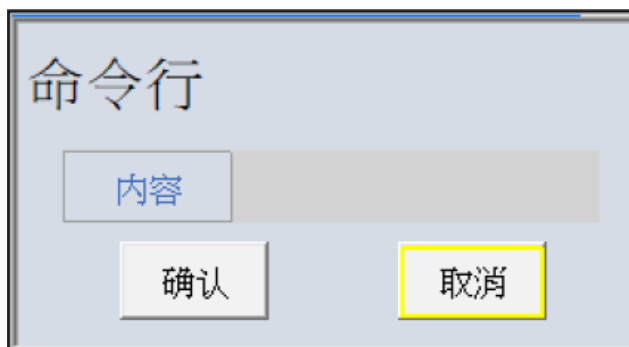
**Command function:** You can insert other subprograms in the middle of the program, enter the subprogram to start executing, and after finishing the subprogram, return to the main program to continue executing.

**Parameter definition:**

1. <**Program Name**>: Enter the file name of the subprogram.

**Operating instructions:**

1. Click "**Other Commands.**"
2. Click "**Subprogram,**" enter "**Program Name**" and click "**Confirm.**"



**Command function:** The command list input box supports NC commands as well as special MACRO commands.

**Parameter definition:**

- 1.<**Content**>: Enter the NC or MACRO command.

**Operating instructions:**

1. Click "**Other Commands.**"

2. Click "**Command List**," enter "**Content**" and click "**Confirm**."



**Command function:** Processing file management.

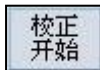
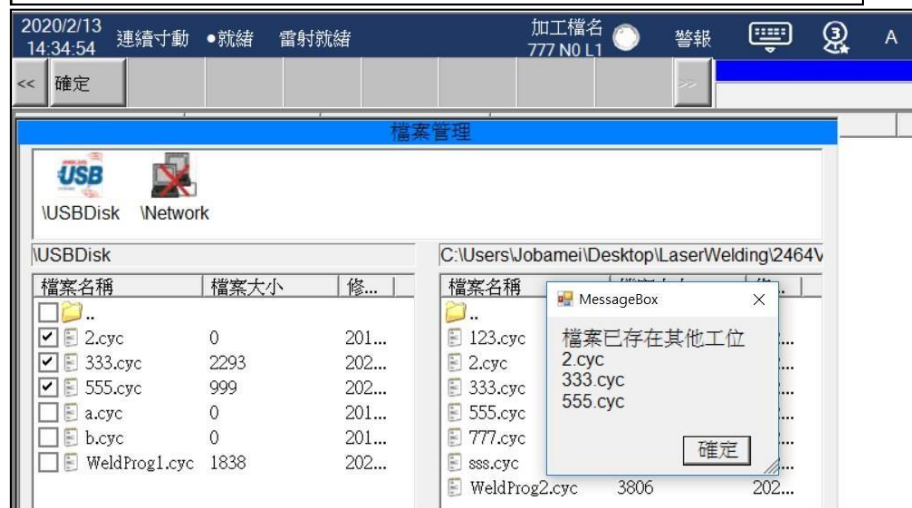
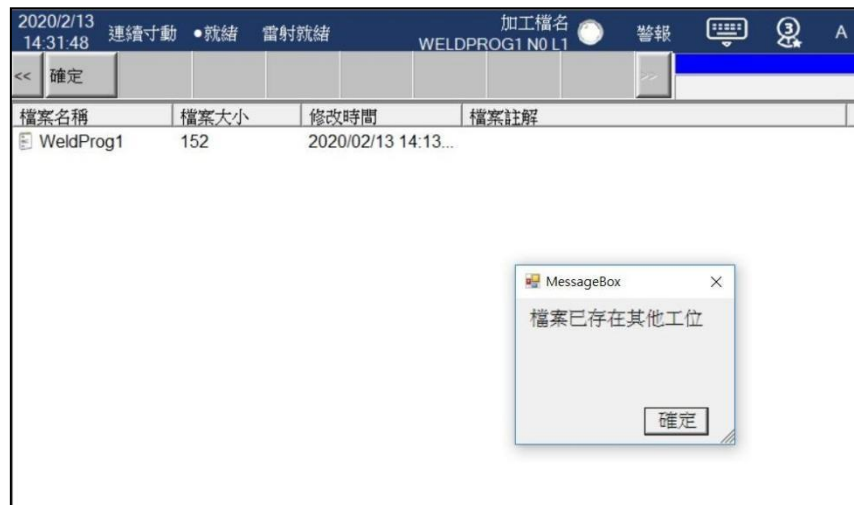
**Parameter definitions:**

1. "**New File**": creates a new empty file.
2. "**Copy File**": makes a copy of a selected file.
3. "**Delete File**": deletes a selected file.
4. "**Import File**": imports files in an external device to the program.
5. "**Export File**": exports files in the program to an external device.

**Operating instructions:**

1. Click on "**File Management**" to enter the file operations page.
2. You can select "**Open File**," "**Copy File**," "**Delete File**" and "**Import/Export File**."
3. Double-click the file name, or click on it and press Enter to load the file.

Note: Dual-station application does not allow teaching files with the same file name to exist in the two workstations. When you click "New file," "Copy File" or "Import File," the system will check if the file name already exists in the other workstations, and the operation with the same file name is not allowed, as shown in the following figure.

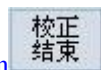


#### (5) Start Correction

**Command function:** The program runs to this point, and from this line on it will translate and rotate the coordinate system to execute the subsequent path according to the calculated correction results from the 3-point positioning screen.

**Operating instructions:**

1. Click "Start Correction"



#### (6) End Correction

**Command function:** The program runs here, clears the three-point correction offset, and replaces it with the original coordinate system.

**Operating instructions:**

1. Click "End Correction"

## 1.4 Modifications to Teaching Programs

Function screen:



Functionality:

If you want to modify a program you have already written, right-click on the line or hold down the left mouse button to display the modification-related functions, which are described below in order.



(1) Edit Command

**Functionality:** You can edit all the contents of the current line number.

**Operating instructions:**

1. Click on the program line to be modified.
2. Right-click and then click "**Edit Command**" to edit the command.
3. Modify what needs to be corrected, including coordinates, Velocity, commands, points, etc.
4. Click "**CONFIRM**" when you are finished editing.



(2) Single-step Execution

**Functionality:** Users can execute the contents of the current line.



Operating instructions:

1. Right-click, then click "**Single-step Execution**" and click "**Confirm.**"



(3) Insert

**Functionality:** Can insert a blank line in front of the selected line to make it easier to add actions.

Operating instructions:

1. Right-click and then click "**Insert.**"



(4) Copy

**Functionality:** Copies the contents of the current line number.

Operating instructions:

1. Click on the line number to be copied.
2. Right-click and click the "**Copy**" button.



(5) Paste

**Functionality:** Paste the contents of the previously copied line number into the current line number.

Operating instructions:

1. Click on the line where you want to paste it.
2. Right click and then click "**Paste.**"



(6) Delete

**Functionality:** Deletes the contents of the current program line.

Operating instructions:

1. Click on the program line to be deleted.
2. Right click and then click "**Delete.**"



#### (7) Delete All

**Functionality:** Deletes all programs in the open file.

#### Operating instructions:

1. Go to "**File**" and select the files you want to delete completely.
2. Right click and then click "**Delete All.**"

## 1.5 Perform Processing Programs

#### Function screen:



**Functionality:** Once the program has been written, it is necessary to manually press a button to start processing as this function is in the command start module.

#### Instruction description:

1. "**Start**": the motion mode will switch to "automatic," the controller state will be changed to "Busy," and the programmed teaching program will be started.
2. "**Pause**": The controller state changes to "Free Hold" to temporarily stop the processing program. Press Start again to proceed with the processing program.
3. "**Reset**": Equal to the Reset button function, where all ongoing activities cease, the controller state returns to "ready," and the processing program is Reset back to the first line to wait for starting again.
4. "**MPG Simulation**": This can be pressed at any time to simulate the machining path using a MPG device. For details, see section [6.1 MPG Simulation](#) (see page 73).
5. "**Continuous Welding at Breakpoint**": If you press the emergency stop or Reset during machining, the machine will stop immediately. After the ready state is restored, press "**Continuous Welding at Breakpoint**" to continue the processing program from the stopped single section.
6. "**Customization**": provides users with customization features.

## 4. Axial Operation

**Fenubar entry path:** Home screen → Workstation 1 Program (F1) /Workstation 2 Program (F2) → Upper right field

### Functionality:

The user can select different motion modes, and then controls the movement of each axis via the buttons on the software panel, and moves to the desired coordinates.

The following five modes are introduced in order: inching, INCJOG, back to home, MPG, and automatic.

### 4.1 JOG Mode

#### Function screen:







**Functionality:** In the JOG (continuous JOG) mode, the buttons on the screen and the multiplier adjustment can be used to quickly move each axis.





#### Component description:

1. Manual multiplication "-" and "+": Adjust the movement speed of inching, with the default value being 100%, press "-" to decrease the value in the white box by 10, press "+" to increase the value in the white box by 10, the limit of manual multiplication being 10% to 200%.
2. **"Back to Home"**: Press to move the unit to the home position set by the program.
3. **"Coordinate Reset"**: press to reset the position of each axis in the absolute coordinates, and use the current position as a new program origin.
4. **"RTCP"**: This function button is displayed only when the Pr3001 parameter is not set to 0. When pressed, the RTCP function is turned on/off instantly.
5. Each axial direction "←" and "→": Pressing "→" moves the axis to positive direction, pressing "←" moves the axis to negative direction, holding down the button moves the axis continuously, releasing the button stops the movement.

#### Mode of operation:

1. Click JOG mode in the teaching mode, the button before clicking is in black , and will turn blue  after successfully switching to JOG mode.
2. On the software panel, click "RTCP" to turn on / off RTCP function. Before clicking, the button is black on a gray background , and after successful opening, the button turns into white on a blue background .

(\*Note: This function needs to enable the right of rotation tool center point (RTCP). For manual RTCP description, please refer to 3.2 Manual RTCP Function.)

3. Click on  and  of the manual multiplication to adjust the Velocity of movement. (It is recommended that you lower the multiplier for first-time use to avoid accidents caused by high-speed movement.)
4. Click on  and  in each axis to control the movement of different axes.

## 4.2 INCJOG Mode

Function screen:

? 未知的附加檔案



Functionality:



In INCJOG mode, the distance of INCJOG can be set through the input box <INJOG Distance> in the panel, so that the laser point position can move the required distance accurately in manual mode.

Component description:



1. <INJOG Distance>: Enter the distance you want to move (mm) or the angle of rotation (degree), ranging from 0.001-100 mm or degree.
2. "Back to Home": Press to move the unit to the home position set by the program.
3. "Coordinate Reset": press to reset the position of each axis in the absolute coordinates, and use the current position as a new program origin.
4. "RTCP": This function button is displayed only when the Pr3001 parameter is not set to 0. When pressed, the RTCP function is turned on/off instantly.
5. Each axial direction "←" and "→": Pressing "→" moves the axis to positive direction, pressing "←" moves the axis to negative direction, pressing and holding only moves a fixed distance, releasing and clicking again can trigger the next move command.

Mode of operation:

1. Click INCJOG mode in the teaching mode, the button before clicking is in black , and will turn blue  after successfully switching to INCJOG mode.

- On the software panel, click "**RTCP**" to turn on / off RTCP function. Before clicking, the button is black on a gray background , and after successful opening, the button turns into white on a blue background .

(\*Note: This function needs to enable the right of rotation tool center point (RTCP). For manual RTCP description, please refer to 3.2 Manual RTCP Function.)

- Enter the **<Amount of Movement>** field to adjust the desired movement distance (mm) or rotation angle (degree), ranging from 0.001-100 mm or degree.
- Click  and  in each axial direction, and the laser point position will move in the desired direction with equal distance or angle according to the input value.

## 4.3 Home Search Mode

### Function screen



### Functionality:






Move a single axis until the controller receives the home dog signal, and then move the second segment until the motor index signal is triggered. The system will automatically move according to the offset, and return the mechanical coordinates to zero, which is also called home searching.

### Component description:

- Manual multiplication "-" and "+": Adjust the Velocity of movement back to the origin., with the default value being 100%, press "-" to decrease the value in the white box by 10, press "+" to increase the value in the white box by 10, the limit of manual multiplication being 10% to 200%.
- "**Back to Home**": Press to move the unit to the home position set by the program.
- "**Coordinate Reset**": press to reset the position of each axis in the absolute coordinates, and use the current position as a new program origin.
- When you press the "**Home searching**" button, the axes will move in the direction of Pr861~Pr865, and keep moving until the motor index signal is triggered or press the "**Reset**" button.
- "**One Click Home searching**": when pressed, all axes start home searching.

**Modes of operation:** There are two ways to operate it: seek home for each axis separately or use one click to find home.

Mode 1: Find the origin of each axis separately.

1. Click home searching mode in the teaching mode, the button before clicking is in black , and will turn blue  after successfully switching to back to home mode.
2. Click on  and  of the manual multiplier to adjust the Velocity of the movement.
3. Click  to control the different axial directions to trigger the motor index signal.

Mode 2: One-click home searching

1. If no axes have finished home searching, click  to start home searching for all axes.

## 4.4 MPG Mode

**Function screen:**

 未知的附加檔案

**Functionality:** Uses an external MPG device to turn the rotary table and move each axis to a specified position.

**Component description:**

1. **"Back to Home"**: Press to move the unit to the home position set by the program.
2. **"Coordinate Reset"**: press to reset the position of each axis in the absolute coordinates, and use the current position as a new program origin.
3. **"RTCP"**: This function button is displayed only when the Pr3001 parameter is not set to 0. When pressed, the RTCP function is turned on/off instantly.

4.MPGaxis and MPG multiplier: set on MPG device.



**Mode of operation:**

1. Connect the MPG to the MPG hole on the FC controller.



2. Go to the parameter settings page and modify the Pr2021 parameters.

参数总表	应用参数	机构参数	机构补偿参数	跳至参数号码	>>	111 (0~65535)
编号	说明					数值
1984	攻牙时第四主轴加速度加速到1000 RPM/s时间(ms)					100
1985	攻牙时第五主轴加速度加速到1000 RPM/s时间(ms)					100
1986	攻牙时第六主轴加速度加速到1000 RPM/s时间(ms)					100
1991	检查主轴转速到达(0:关闭,1:切削,2:车牙,3:切削和车牙)					0
1992	切削时主轴转速到达检查范围(%)					15
2001	手轮第四段倍率(最小输入单位,LIU)					100
2003	MPG程序仿真对应手轮号码					1
2021	*一号手轮对应的轴卡端口号码或缓存器号码					0
2022	*二号手轮对应的轴卡端口号码或缓存器号码					0
2023	*三号手轮对应的轴卡端口号码或缓存器号码					0
2031	一号手轮对应的轴号(0:MLC;1-18:轴向)					0
2032	二号手轮对应的轴号(0:MLC;1-18:轴向)					0
2033	三号手轮对应的轴号(0:MLC;1-18:轴向)					0
2041	一号手轮分辨率(Pulse/转)					100
2042	二号手轮分辨率(Pulse/转)					100
2043	三号手轮分辨率(Pulse/转)					100

Parameter No.	Description	Model	MPG set value	Remark
Pr2021	The axle card port number or register number corresponding to the MPG	FC-A	5 for HHPin7~10)	Note that the Port number set in the left table represents the MPG port (MPG) on the hardware. Whether this port works or not is dependent on the Pr9*axillare type and the number of Pr13 *axillares.
		FC-B	20 (for HHPin7~10)	
		7C / 8B / 8C / 8C-5 / 8E / 10B / 10C / 10C-5 / 10E	20	
		12B / 15B / 15C / 15C-5 / 15E / 80MI	20	
		8A / 10A / 12A / 15A	5	
		11R	9	
		21R / 81R	20	

3. The button before clicking "MPG" mode is in black , and will turn blue  after switching to MPG mode.



- On the software panel, click "**RTCP**" to turn on / off RTCP function. Before clicking, the button is black on a gray background , and after successful opening, the button turns into white on a blue background .

(\*Note: This function needs to enable the right of rotation tool center point (RTCP). For manual RTCP description, please refer to 3.2 Manual RTCP Function.)

- Turn the axial knob to a specified axial direction.
- Turn the multiplier knob to a specified multiplier.
- Rotate the MPG to move the axis.

## 4.5 Auto Mode

Function screen:







**Functionality:** In automatic mode, one can set the machining Velocity and adjust the multiplier. Only in automatic mode can one initiate the machining program.

**Component description:**

- <**Preset Velocity**>: A preset processing Velocity in mm/min can be entered in this field.
- Fast stroke multiplier "-" and "+": Adjust the Velocity of rapid movement of the machine, with a total of 3 stages: 25%, 50% and 100%; press "-" and "+" to switch.
- Processing multiplication "-" and "+": Adjust the Velocity of the machine during processing, with the default value being 100%, press "-" to decrease the value in the white box by 10, press "+" to increase the value in the white box by 10, the limit of processing multiplication being 0%~200%.
- "**Return Home after Machining**": After all the machining processes are completed, the program will return to the home position automatically. For more details, please refer to [8.1 Return Home after Machining](#) (see page 81).
- "**Rotary Axis Mode**": At the beginning of machining, the current position of the axis of rotary serves as a starting point. Refer to [8.2 Rotary Axis Mode](#) (see page 81) for details.

**Mode of operation:**

1. Click automatic mode in the teaching mode, the button before clicking is in black , and will turn blue  after successfully switching to automatic mode.
2. Enter <**Preset Velocity**>.
3. Click on  and  to adjust the fast movement multiplier and processing multiplier
4. Click "**Return Home after Machining**" or "**Rotary Axis Mode**" button depending on the machining requirements.
5. Finish setting the automatic mode parameters before starting processing.

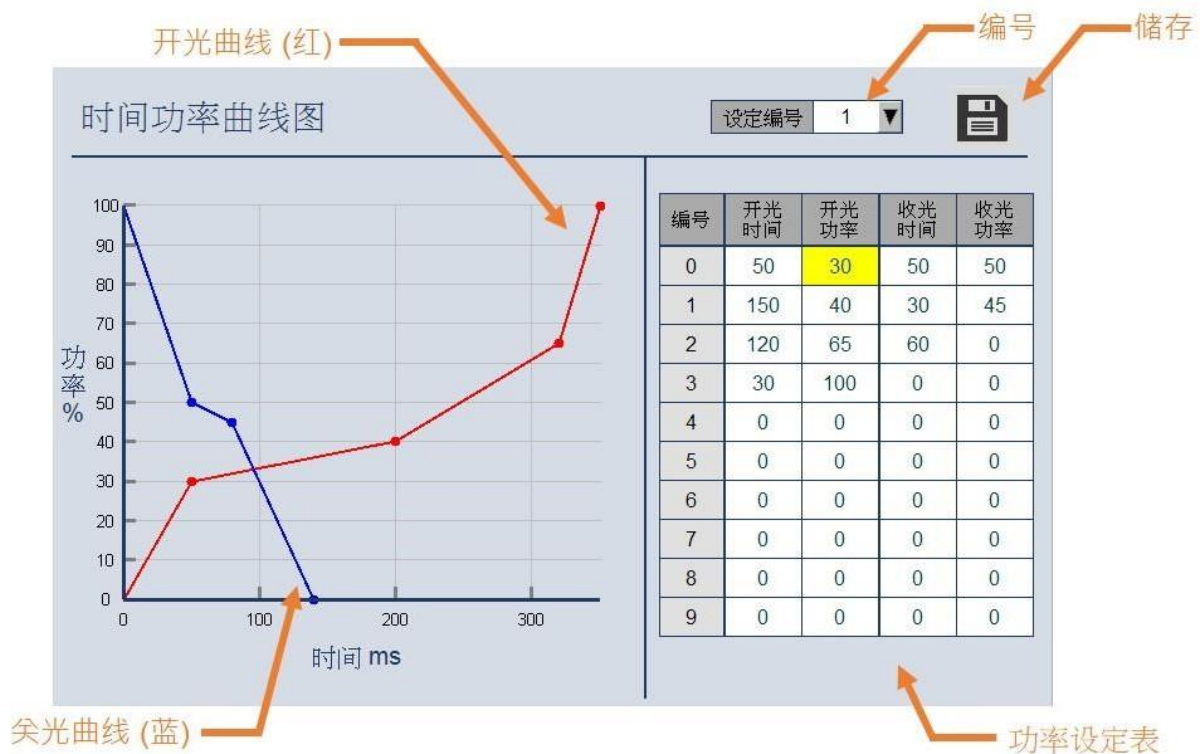
## 5. Process Tuning

This section describes the various parameters associated with the laser welding process and how they can be adapted to achieve better processing results.

### 5.1 Laser Time Power

Fenubar entry path: Home screen → Laser modulation setting (F3) → Time power setting (F1)

Function screen:



Functionality:

Here set the laser on (red), off (blue) power and time relationship, also known as the slow rise and fall power, to avoid the dramatic changes in the energy of light on, light off, resulting in over-welding.


Component description:

1. <Number>: One can enter the number of the modulation parameter, ranging from 1 to 10.
2. "Save": Press to store the time power meter to the setting of the modulation parameter number.
3. <Time Setting Table>: Enter the time for turning on and off the light and the corresponding power in the table, with the time unit being ms, for incremental design.
4. Time Power Curve: A time setting table for previewing the input.

**Mode of operation:**

1. Click on the "**Time Power**" function button to enter the time power curve screen.
2. Enter the modulation parameter <**Number**> to be modified.
3. In the table below, enter the light on time, the corresponding light on power (0% to 100%), the light off time, and the corresponding light off power (100% to 0%), in order, such as 0-50 ms, 20% from 0 on the main screen, 50 ms-100 ms, 40% from 20% on the screen and so on, as shown above.

As shown above, welding 0-50 ms, the power rises from 0 to 20% on the main screen, 50 ms-100 ms, the power rises from 20% on the main screen to 40% and so on, as shown above.

4. When finishing the input, confirm the preview above is correct and press  to complete the setting.
5. To enable the time power curve, one needs to click on the "**Time Power**" button in the program command for "**Start of Welding**" and "**End of Welding**," or if not needed, turn it off here.

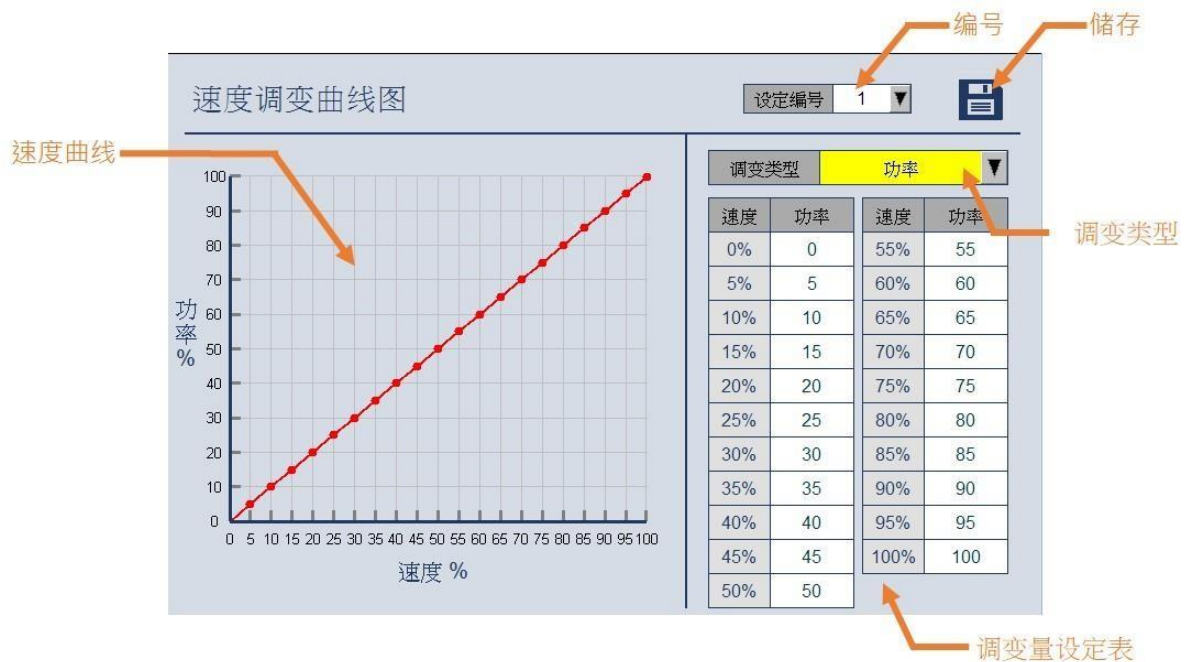
Enable time power function	Disable time power function
	

(\*Note: The power percentage here will be superimposed on the 5.3 laser-controlled power percentage. For example: 5.3 Laser Control Parameters is entered as 80% and the time power is set as shown in the diagram above. 100 ms after light on, the process laser power is  $80 * 40\% = 32\%$ , 500 ms after light on is  $80 * 100\% = 80\%$ .)

## 5.2 Laser Velocity Modulation

**Fenubar entry path:** Home screen → Laser modulation setting (F3) → Velocity modulation setting (F2)

**Function screen:**



#### Functionality:

Set here the laser power/frequency/duty cycle relationship with speed as it changes to adjust the power/frequency/duty cycle in real time to avoid the concentration of energy in non-equivalent speed situations that can lead to over-welding.

#### Component description:


1. <Number>: One can enter the number of the modulation parameter, ranging from 1 to 10.
2. "Save": Press to store the time power meter to the setting of the modulation parameter number.
3. <Modulation Type>: One can select the type of modulation, with options available for "Power," "Frequency" and "Duty Cycle."
4. <Modulated Quantity Setting Table>: Enter the laser settings corresponding to the speed percentage in the table.

Example: When the speed is 25% and the power is set at 25%, the speed changes to 25% of the target speed and the actual output power changes to 25% of the target power when the speed power curve is turned on during actual machining

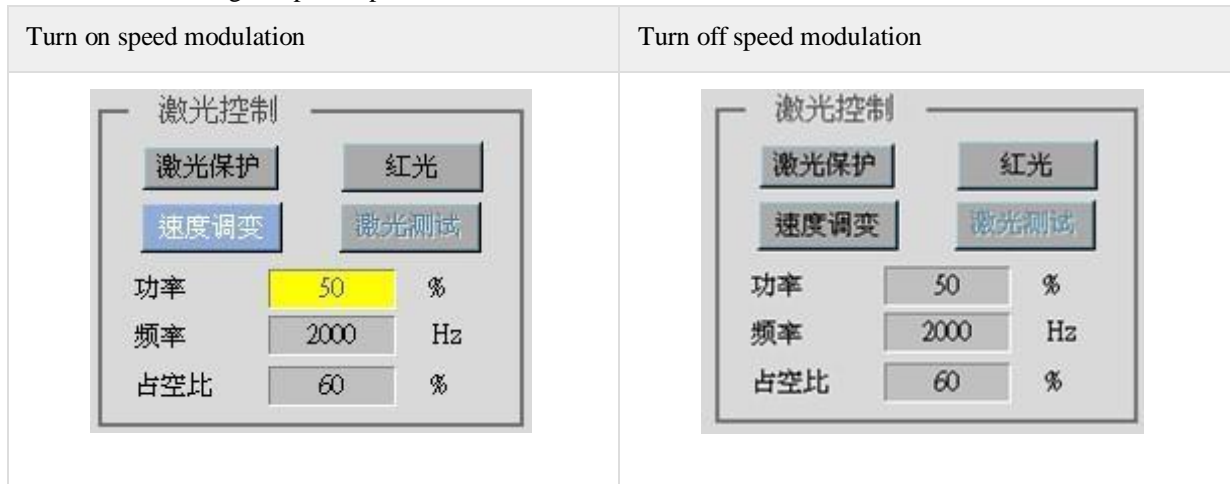
5. Velocity curve: A modulated quantity setting table with a preview of the input.

#### Mode of operation:

1. Click the "Speed Modulation" function button to enter the speed power curve.
2. Enter the modulation parameter <Number> to be modified.
3. Select the type of modulation you want to use <Modulation Type>.
4. Enter the output modulated quantity for each velocity percentage in order in the table below.

5. When finishing the input, confirm the preview above is correct and press  to complete the setting.

6. To enable the speed modulation function, you need to click on "**Speed Modulation**" in the laser control panel. When the button lights up, the speed modulation function is turned on.



### 5.3 Laser Control Panel

**Fenubar entry path:** Main screen → Workstation 1 program (F1)/Workstation 2 program (F2) → lower right corner of the screen.

**Function screen:**



**Functionality:** This panel allows you to control the laser and set the laser process parameters.

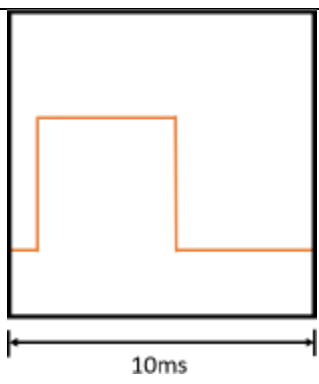
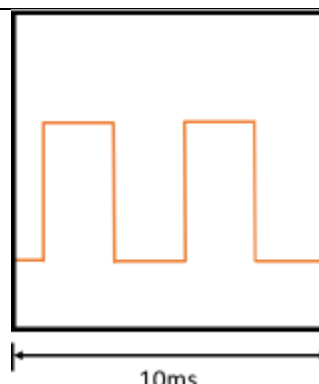
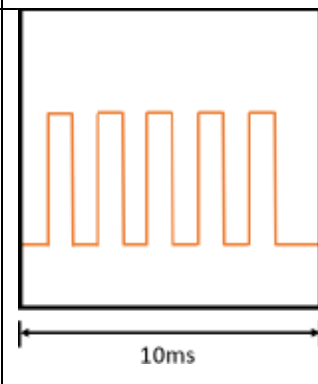
**Component description:**

1. "**Laser Protection**": If the laser protection button lights up, The machine will be able to output lasers for processing. If it is not lit, the laser can't output to avoid danger caused by accidental touch.
2. "**Laser Guidance**": You can turn on the guidance light of the laser to facilitate teaching.
3. "**Speed Modulation**": Enables the speed modulation function.
4. "**Laser Test**": You can only click on the "**Laser Test**" button when the "**Laser Protection**" button is enabled. The laser will output when the mouse is pressed, mainly used for spot welding or testing the laser.

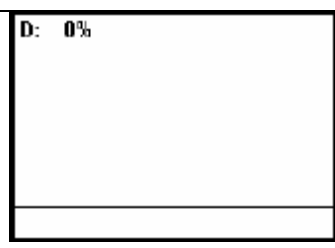
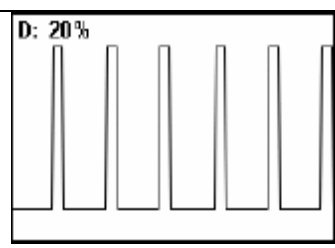
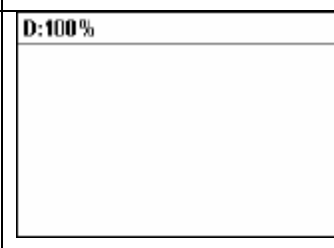
One cannot click "Laser Test" when "Laser Protection" is not enabled.	Click on "Laser Test" only after "Laser Protection" is enabled.	Keep pressing "Laser Test" and the button will be shown in white on a blue background.
		

5. <Power>: Set the laser's output power in % of the maximum power.

6. <Frequency>: Set the frequency of the pulsed laser in Hz (1/sec).

Frequency	100Hz	200Hz	500Hz
Duty cycle	50%		
Description	Pulsed laser 1 time in 10 ms $1 / 0.01 = 100 \text{ Hz}$	Pulsed laser 2 times in 10 milliseconds. $2 / 0.01 = 200 \text{ Hz}$	Pulsed laser 5 times in 10 milliseconds. $5 / 0.01 = 500 \text{ Hz}$
Diagram			

7. <Duty Cycle>: Set the duty cycle of the pulsed laser.

Duty cycle	0%	20%	100%
Diagram			

## 5.4 Gas Control Panel

[Fenubar entry path](#): Main screen → Workstation 1 program (F1)/Workstation 2 program (F2) → lower right corner of the screen.

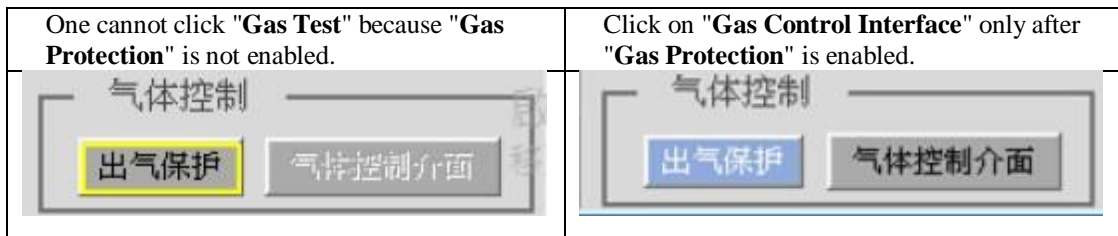
[Function screen](#):



**Functionality:** The panel is used to control gas.

**Component description:**

1. **"Gas Protection"**: If the **"Gas Protection"** button is lit, The machine will be able to output gas for processing
2. **"Gas Control Interface"**: If the **"Gas Control Interface"** button is lit, a gas control pop-up appears on the screen.



3. **"Gas Type"**: select the gas you want to output.
4. **"Calibrate Voltage"**: the voltage output to the proportional valve when the air pressure is calibrated.
5. **"Calibrate Air Pressure"**: When calibrating air pressure, enter the value displayed on the proportional valve.
6. **"Test Air Pressure"**: the air pressure output during the gas output test.
7. **"Finish Correction"**: After filling in the calibrated air pressure, press this button, the system will calculate the air pressure curve and save it.
8. **"Close Pop-up Window"**: closes the popup window.
9. **"Gas Test"**: When the **"Gas Protection"** is on, click the **"Gas Test"** button. When the button is lit, it output gas. Click the button again and the gas output will stop.



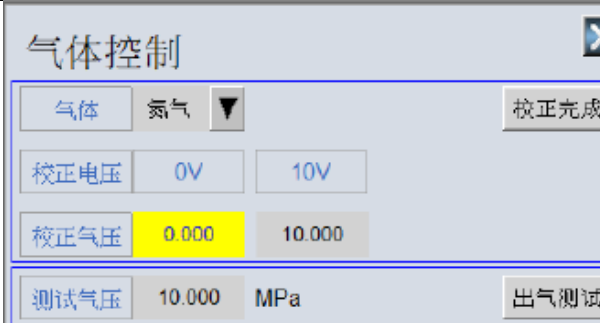

One cannot click "Gas Test" if "Gas Protection" is not enabled.	Click "Gas Test" only after "Gas Protection" is enabled.	Press "Gas Test" and the button will appear white on a blue background
		

### Instructions:

1. Select the gas you want to output and calibrate the gas.

(\*Note: If an uncalibrated gas undergoes gas testing directly, no matter how much test pressure is input, only 1 V voltage will be output to the proportional valve)

2. Click the Calibrate Air Pressure input box, and the system will output the calibrated voltage corresponding to the input box to the proportional valve. At this time, fill in the air pressure value displayed on the proportional valve into the Calibrate Air Pressure input box, and complete all the Calibrate Air Pressure input boxes in this manner.

Click the Calibrate Air Pressure input box under 0 V to output 0 V voltage to the proportional valve	Click the Calibrate Air Pressure input box under 10 V to output 10 V voltage to the proportional valve
	

3. After entering the calibrated air pressure value, press Finish Correction. The system will calculate the current air pressure curve and save it in the system.
4. Input Test Air Pressure and press Gas Test to control the proportional valve to output gas at specified pressure.

## 5.5 Processing Speed

**Fenubar entry path:** Home screen → workstation 1 program (F1)/Station 2 program (F2) → Axial operation software panel → Auto mode

**Function screen:**



**Functionality:** The speed is set on the software panel in automatic mode, which affects the processing quality directly.

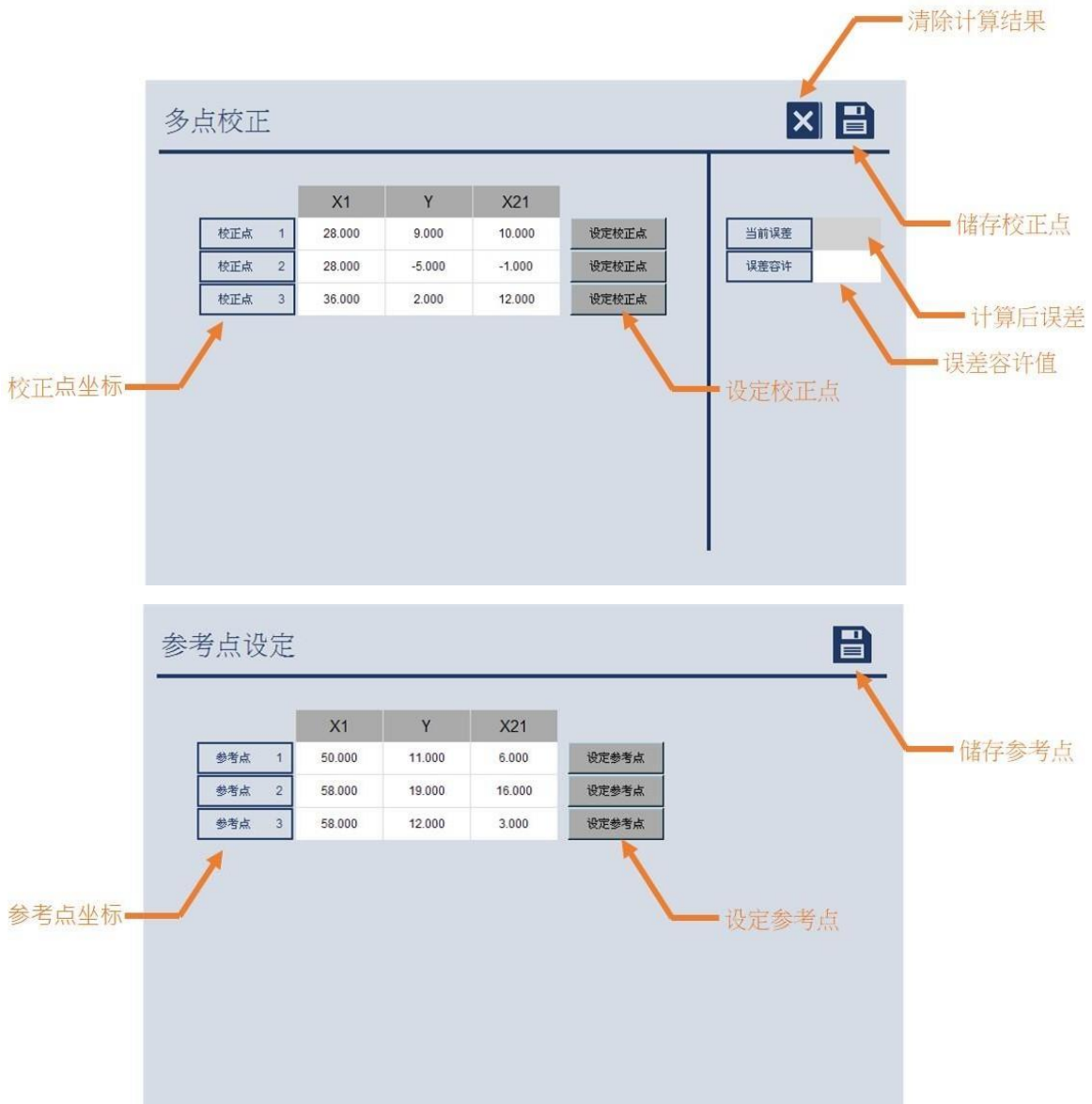
**Component description:**

1. Feed rate: displays the target speed that the controller sends to the machine.
2. Actual feed rate: shows the actual processing speed of the machine.
3. <Default Feed rate>: The default processing speed, in mm/min.
4. Fast stroke move multiplier: Adjust the speed of rapid movement of the machine, with a total of 3 stages: 25%, 50% and 100%; press "-" and "+" to switch
5. Feed rate multiplier: Adjust the speed of the machine during processing, with the default value being 100%, press "-" to decrease the value in the white box by 10, press "+" to increase the value in the white box by 10, the limit of processing multiplication being 10%~200%.

## 5.6 Multi-point Correction

**Fenubar entry path:** Home screen → Multi-point correction (F5)

**Function screen:**



**Functionality:** Translate and rotate the coordinate system so that the correction point coincides with the reference point to achieve the effect of offsetting the teaching path.

**Component description:**

1. <Correction Point Coordinates>: manually enter the correction point coordinates.
2. "Set Correction Points": automatically fill in the current coordinates as the correction point coordinates.
3. "Save Correction Points": Save correction points and calculate the correction value, with the correction result shown in a pop-up window.
4. "Clear Calculation Results": Clear the correction values to prevent incorrect correction values from affecting processing.
5. <Tolerance of Error>: Set the error tolerance value of the correction result, with the value to be greater than zero.
6. <Reference Point Coordinates>: manually enter reference point coordinates.

7. "**Set Reference Points**": automatically fills in the current coordinates as the reference point coordinates.
8. "**Save Reference Points**": store reference points.

Operating procedures:

1. First time at workstation 1 — loading

1. Clamp workpieces
2. Go to the reference point setting screen
3. Jog the coordinates to the first reference point, or manually enter the coordinates of the current reference point.
4. Press "Set Reference Points"
5. Repeat steps 3 and 4 to set and save the second and third reference points.
6. Press the "**Save Reference Points**" button.
7. Teach the processing programs
8. Start processing

2. Nth time at workstation 1—loading (N>1):

1. Clamp workpieces
2. Go to the multi-point correction screen
3. Jog the coordinates to the first reference point, or manually enter the coordinates of the current reference point.
4. Press "Set Correction Points"
5. Repeat steps 3 and 4 to set and save the second and third correction points.
6. Input correction error tolerances
7. Press the "Save Correction Points" button to display whether the correction was successful or not.
8. Add "**Start Correction**" and "**End Correction**" before and after the segments to be offset in the machining programs.
9. Start processing

(Note: The first three axes of the workstation must be linear as well as the first three axes of the system for this function to work properly.)

## 6. Processing simulation

If the programming is complete and you want to simulate it first to see if the path is as expected, you can use the processing simulation function.

### 6.1 MPG Simulation

**Functionality:** Use manual pulse generator for a step-by-step simulation of the machining programs, which can operate the process in either forward or reverse direction.

**Operating instructions:**

1. Refer to the setting of [4.4 MPG Mode \(see page 58\)](#) to connect the controller to the manual pulse generator MPG
2. Click on "**MPG Simulation**" and the button will appear in blue as shown below.



3. Turn the manual pulse generator MPG to begin a simulation of the machining program.
4. To cancel the simulation, simply press the "**MPG Simulation**" button again and the button will be grayed out.

### 6.2 Pause

**Functionality:**

If you need to pause the machining process, press the "**Pause**" button.

### 6.3 Continuous Welding at Breakpoint

**Functionality:**

If you press the emergency stop or Reset during machining, the machine will stop immediately. After the ready state is restored, press "**Continuous Welding at Breakpoint**" to continue the processing program from the breakpoint.

## 7. Status Monitoring

**Fenubar entry path:** Home screen → Workstation 1 program (F1)/Workstation 2 program (F2) → top of the function screen.



### 7.1 Processing Time

**Fenubar entry path:** Main screen → Workstation 1 program (F1)/Workstation 2 program (F2) → 1st frame at the top of the screen.

**Function screen:**



**Functionality:**

1. Single workpiece time: After pressing Start Processing, the system will start timing until the end of the processing, and display the elapsed time.
2. Processing progress: the processing progress is 0% at the beginning of the first line of the program and 100% at the end of the program, and the percentage of processing progress can be used to know the percentage of the program that has been implemented.
3. Workpiece counting: after each run of the processing program, the workpiece count plus one, which is used to count the total number of processing.
4. "**Reset**": press to reset the workpiece count to zero.

### 7.2 Processing Parameters

**Fenubar entry path:** Main screen → Workstation 1 program (F1)/Workstation 2 program (F2) → 2nd frame at the top of the screen.

Function screen:

加工参数		
功率	100.00	%
频率	80	Hz
占空比	30	%

Functionality:

1. Power: displays the current output power of the laser.
2. Frequency: displays the current output frequency of the laser.
3. Duty cycle: displays the current output duty cycle of the laser.

## 7.3 Absolute Coordinates

**Fenubar entry path:** Main screen → Workstation 1 program (F1)/Workstation 2 program (F2) → 3rd frame at the top of the screen.

Function screen:

绝对坐标	
X	83.600
Y	167.000
Z	25.000
A	0.300

Functionality:

1. Absolute coordinates: instantly display the current program coordinates on each axis of the machine.

## 7.4 Modulation State

**Fenubar entry path:** Main screen → Workstation 1 program (F1)/Workstation 2 program (F2) → 4th frame at the top of the screen.

Function screen:

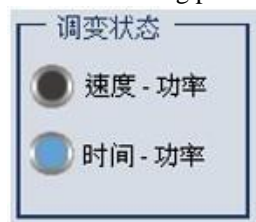


**Functionality:**

1. Speed-power: Where the speed-power function is enabled, and the power is modulated according to the velocity during the machining process, the speed-power lamp in this modulated state will light blue.



2. Time-power: Where the time-power function is enabled, and the laser power is ramp up or ramp down during the machining process, the time-power lamp in this modulated state will light blue.





## 7.5 Input and output Monitoring

**Fenubar entry path:** Home screen → Status monitoring (F6) → Input and output monitoring (F1)

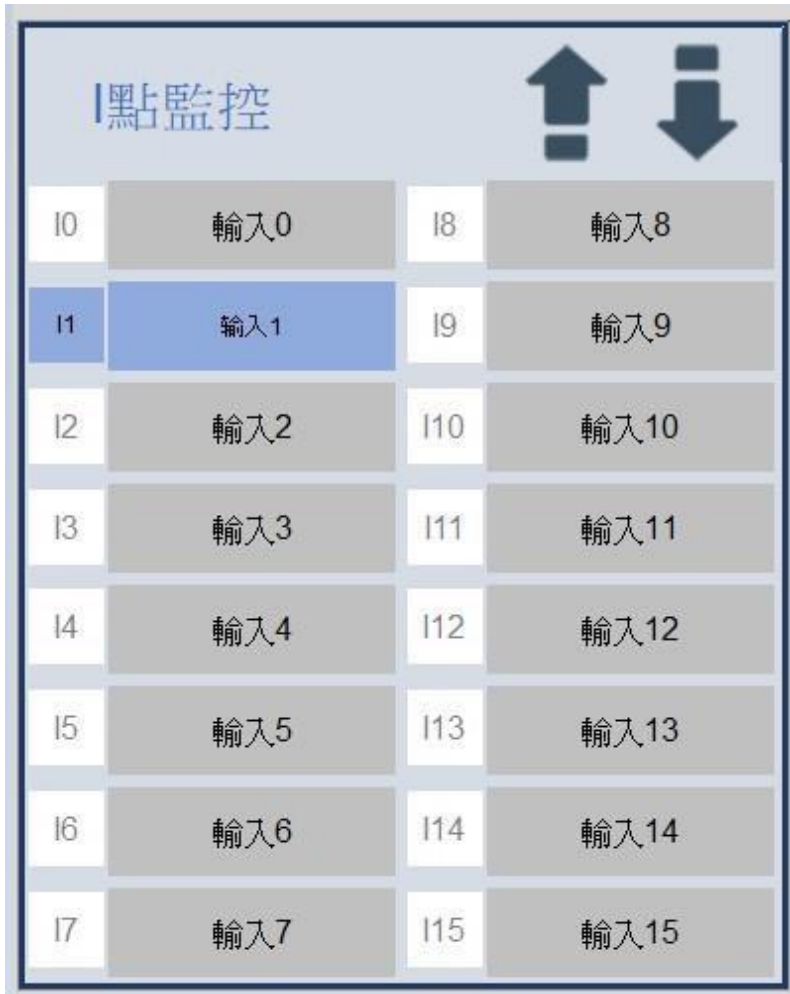
**Function screen:**



I点监控 				O点监控 			
I0	输入0	I8	输入8	O0	输出0	O8	输出8
I1	输入1	I9	输入9	O1	输出1	O9	输出9
I2	输入2	I10	输入10	O2	输出2	O10	输出10
I3	输入3	I11	输入11	O3	输出3	O11	输出11
I4	输入4	I12	输入12	O4	输出4	O12	输出12
I5	输入5	I13	输入13	O5	输出5	O13	输出13
I6	输入6	I14	输入14	O6	输出6	O14	输出14
I7	输入7	I15	输入15	O7	输出7	O15	输出15

Functionality:

1. Input monitoring: 64 input signals can be monitored, when any input signal is received, the label will appear blue, as shown below:



2. Output monitoring: 64 output signals can be opened manually. After pressing any output signal button, a confirmation window will pop up to confirm whether to output this signal or not. After clicking "**Confirm**," the color of the button will change to white on blue background, and after pressing the same output signal button again, a confirmation window for closing will pop up.

	On O2	Off O2
Pop-up window		
Button shape		

3. This page can be toggled by pressing "**Previous Page**"/"**Next Page**," supporting up to 64 input points and 64 output points.

## 7.6 Laser Monitoring

**Functionality:** provides a complete status display of the laser, allowing maintenance personnel to troubleshoot in the event of a laser alarm.

**Fenubar entry path:** Home screen → Status monitoring (F6) → Laser monitoring (F2)



**Enable condition:** The laser monitoring function only supports Raycus and Maxphotonics lasers (Pr3403 = 0 or 1). Only when Pr3403 is 0 or 1 can the laser monitoring page be accessed from the "**Laser Monitoring**" entry point.

### 7.6.a Raycus Lasers

**Function screen:**

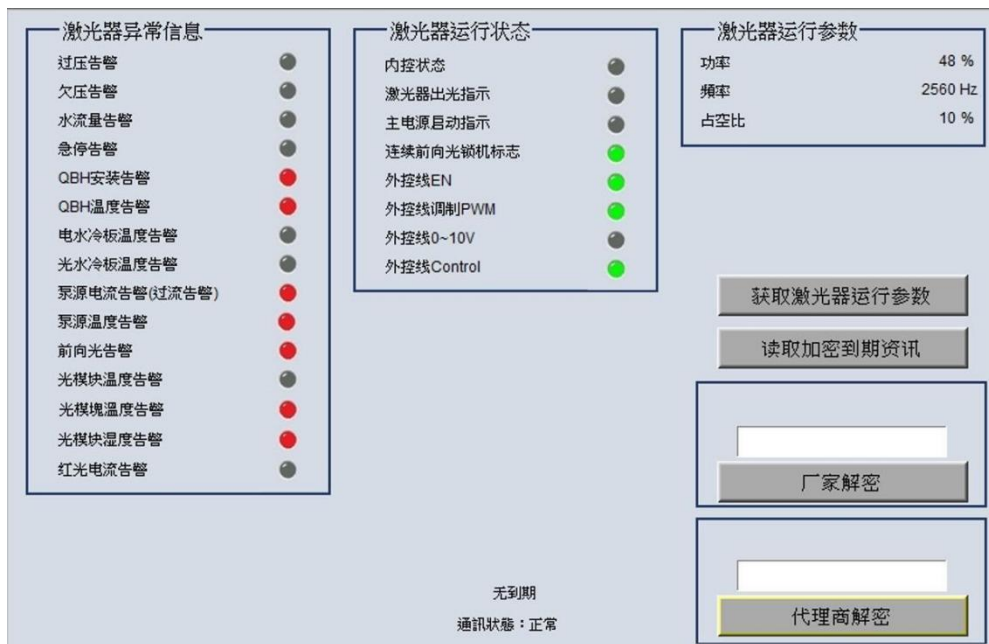


**Functionality:**



1. Click "**Get Laser Operating Parameters**" to update and retrieve the laser operating parameters.
2. Press "**Laser Anomaly Reset**" to reset the laser's alarm.
3. Press "**Read Laser Lock Time**" to read the current lock time of the laser and the number of failed decryption attempts, and display it at the bottom of the screen.
4. Press "**Laser Encryption & Decryption**" to read the value in the input box of "**Laser Encryption & Decryption**" and perform the encryption and decryption on the laser.
5. In the laser anomaly information, the red light on  on the right indicates that the laser is experiencing this abnormality.
6. In the running status bar of the laser, the green light on  on the right indicates that this function is being performed.
7. The bottom of the screen shows the current lock time, the number of failed decryption attempts and the communication status.

### 7.6.b Maxphotonics Lasers

**Function screen:**



#### Functionality:

1. Click "**Get Laser Operating Parameters**" to update the operating parameters, mainly power, frequency and duty cycle.
2. Click "**Read Encryption Expiry Information**" to read the laser expiry information and display it at the bottom of the screen.
3. Press "**Manufacturer Decryption**" to read the password in the input box of "**Manufacturer Decryption**" and perform the manufacturer decryption on the laser.
4. Press "**Agent Decryption**," read the password in the input box of "**Agent Decryption**," and perform the agent decryption on the laser.
5. In the laser anomaly information bar, the red light on  on the right indicates that the laser is experiencing this abnormality.
6. In the running status bar of the laser, the green light on  on the right indicates that this function is being performed.
7. The bottom of the screen shows the current decryption expiration status and communication status.

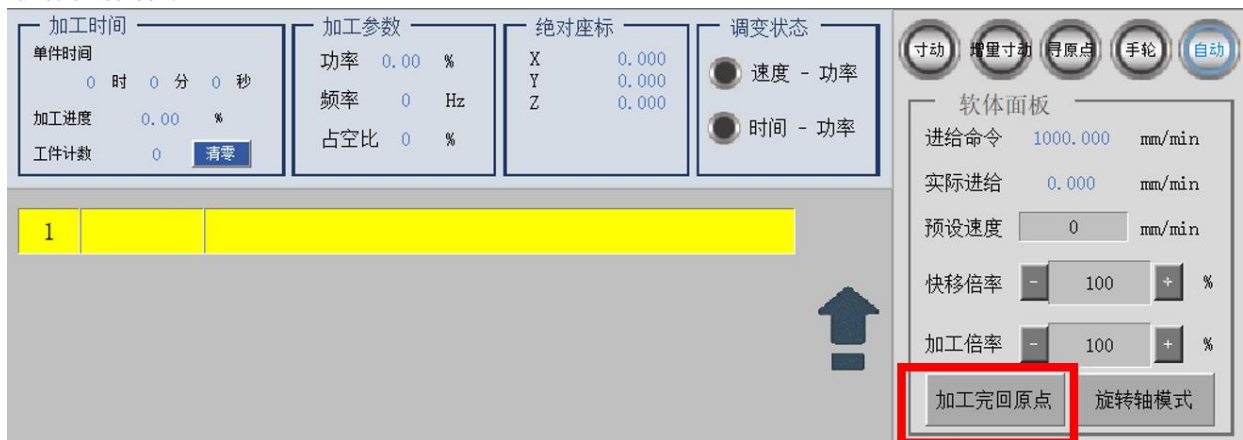
## 8. Other Application Features

This section contains other applications of the software that do not affect machining quality, but can assist in machine operation to boost machining efficiency.

### 8.1 Return Home after Machining



**Fenubar entry path:** Home screen → workstation 1 program (F1)/Station 2 program (F2) → Axial operation software panel → Auto mode

**Function screen:**



**Functionality:** After executing the last line of the machining program, each axis of the machine automatically returns to home position.

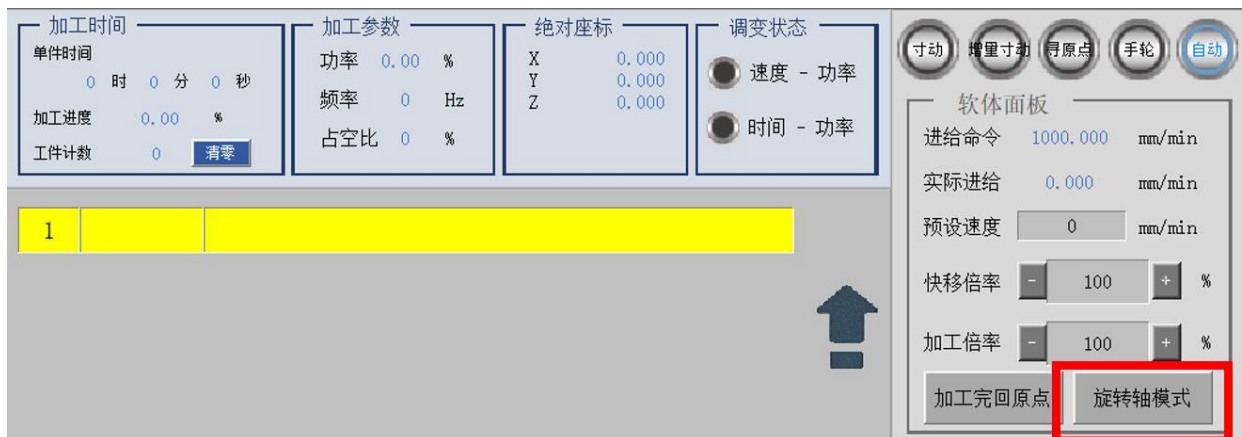
**Operating instructions:**

1. Please refer to [2.4 Back to Home Setting](#) (see page 20) to set the back to home action.
2. The button "**Return Home after Machining**" before pressed is black on a gray background , and white on a blue background  after pressed.
3. Start the processing programs.
4. After finishing processing, the axes return to the home position in order according to back to home setting.

### 8.2 Rotary Axis Mode

**Fenubar entry path:** Home screen → workstation 1 program (F1)/Station 2 program (F2) → Axial operation software panel → Auto mode

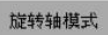

**Function screen:**

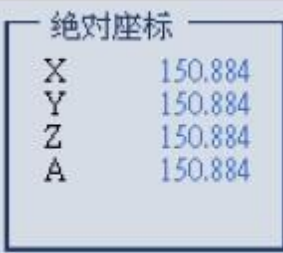
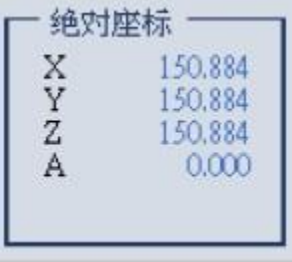


#### Functionality:

After starting machining, the current position of the rotary axis serves as a starting point, which means there is no need to reverse back to the starting point of the previous machining, thus improving machining efficiency.

#### Operating instructions:

1. Confirm the axis you want to set into rotary axis mode, which axis type parameter is setting right (Pr221~240 set to 1~5).
2. The button "**Rotary Axis Mode**" before pressed is black on a gray background , and white on a blue background  after pressed.
3. Press the "**Start**" button.
4. The current position of the rotary axis serves as a program origin and a processing starting point, with the values on the absolute coordinates reset, as shown in the figure.

	Previous processing finished	Press to start in rotary axis mode
Absolute Coordinates Info		 (Axis A is the axis of rotation)

(Note: If axial home searching parameters Pr961~980 are set to 4 or 5 or 6, this function is invalid, refer to Pr961~Pr980 axial home searching methods.)

## 8.3 Next Point Editing

#### Function screen:

直线			
	X	Y	Z
坐标	10.000	20.000	30.000
速度	毫米/分		
功率	%		
◀上一点	下一点▶	确认	取消

圆弧			
	X	Y	Z
中间点	10.000	20.000	30.000
结束点	20.000	40.000	50.000
速度	毫米/分		
功率	%		
◀上一点	下一点▶	确认	取消

(Straight line and arc editing screen as

an example)

#### Functionality:

If the shape of the workpiece to be welded is complex and a large number of teaching points are needed to fit the weld path, the next point editing function can be used to provide the efficiency way to editing points.

#### Operating instructions:

1. Refer to [3.4 Teaching Program Modification](#) (see page 52), right-click the content of program to edit the processing parameters. The point coordinates of this content of program can be adjusted when editing the dry fast move, straight line, circle, arc and spot welding action.
2. Move the machine to the correct position and press the "**Import Current Coordinates**" button to import the current coordinates into this content of program; or select the coordinates directly to enter a value to adjust the point position.
3. After point coordinates adjustment, press "**Previous Point**" / "**Next Point**" button, the adjusted points will be stored automatically, and the machine will automatically move to the previous / next position according to the button pressed, then the user can proceed with editing for the next point.
4. Repeat steps 2 to 3 to complete the editing of a large number of points, then you can begin processing.

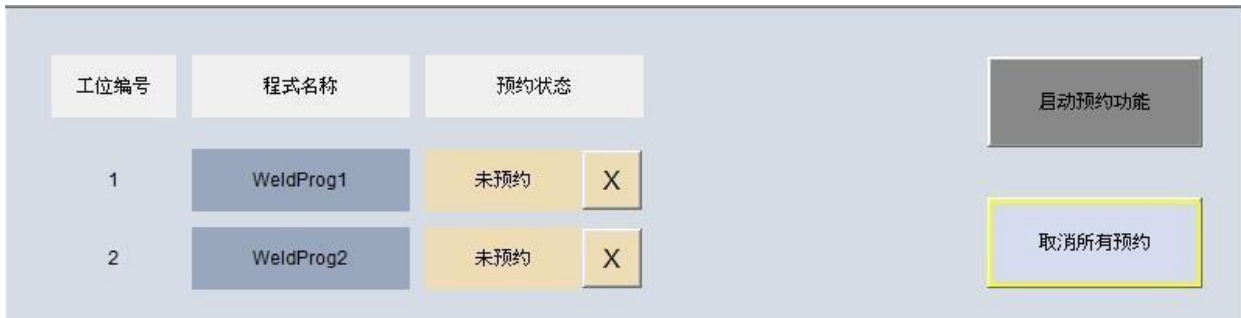
Note: If you want to move the machine to the currently displayed point coordinates when editing the point coordinates, you can click the "**Point Arrival**" button.

## 8.4 Multi-station Reservation Function

Fenubar entry path: Home screen → Workstation reservation setting (F4)



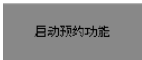
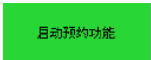



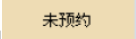


## Function screen:



## Functionality:

In multi-station machine configuration, if workstation 1 is engaged in processing, it can make a reservation for workstation 2, and when workstation 1 finishes processing, it will automatically initiate processing at workstation 2, saving the machine's idle time.

## Component description:

1. **"Enable Reservation Function"**: start the switch of the reservation function. The system starts with the default state of off. Click the button to turn on the reservation function, and the button will change from  to . The status column will display the words "Start Reservation,"    and press the button again to turn off the reservation function.
2. **"Cancel All Reservations"**: cancel all the currently reserved workstations. If the workstation's reservation status is "under machining" or "not reserved," it will not be affected.
3. Cancel single reservation "X": cancel the reserved status of a single workstation. If the reservation status is "under machining" or "not reserved," it will not be affected.
4. Program name: displays the name of the workstation's processing file.
5. Reservation status: displays the current reservation status at the workstation, which is divided into three types of status: not yet reserved , already reserved with a reserved order , and under machining at the workstation .

## Operating instructions:

1. Connect workstation 1's physical start button to the I0 point and workstation 2's physical start button to the I1 point.
2. If you want to use lights to display station status, you can modify the PLC program by connect the R257.0 signal with the workstation output signal used to display the workstation 1 status, and workstation connect the R257.1 signal with the output signal used to display the workstation2 status
3. Teach at individual workstations or open processing files that have been taught.
4. Click **"Activate Reservation Function"** on the reservation setting screen.
5. After the reservation function is turned on, make sure the program name of the workstation is displayed correctly.
6. Press the physical start button at workstation 1, the system will start machining for workstation 1, and the reservation status of workstation 1 will show "under machining," with the start light blinking.



7. During the processing at workstation 1, press the physical start button at workstation 2 to allow the system to add workstation 2 for reservation, and then the reservation status at workstation 2 shows "Reservation 1," with the start light always on.
8. There are several ways to cancel a reservation at workstation 2:
  - a. Press the physical start button at workstation 2 again.



- b. Click on the cancel button  at workstation 2
  - c. Click on the "**Cancel All Reservations**" button

## 9. Diagnosis

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### 9.1 PLC Status

**Fenubar entry path:** Main screen → Controller setting(F8) → Electronic control module(F2) → Diagnostic function(F3) → PLC status(F1). You can view PLC related status, including PLC I, O, S, C, A bit data, PLC register, PLC counter, PLC timer, and ladder diagram.

### 9.2 System Data

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Diagnostic function (F3) → System data (F2). You can view system data. This screen also provides a function to skip to the page with a specified system data number.

### 9.3 Shared Variables

**Fenubar entry path:** Home screen → Controller setting(F8) → Electronic control module(F2) → Diagnostic function(F3) → Shared variables(F3). You can check the status of shared variables. This screen also provides a function to skip to the page with a specified number of shared variables and to clear the field.

### 9.4 Program Variables

**Fenubar entry path:** Home screen → Controller setting(F8) → Electronic control module(F2) → Diagnostic function(F3) → Program variables(F4). You can view the program variables. This screen also provides a function to skip to the page with a specified program variable number.

### 9.5 Operation Logs

**Fenubar entry path:** Home screen → Controller settings (F8) → Electronic control module (F2) → Diagnostic function (F3) → Operation log (F5). You can view the operation log. This screen provides the following functions:

- Search date and time
  - Search alert
  - Search for I-Bit
  - Export operation logs

### 9.6 SRI Status

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Diagnostic function (F3) → Next page (F10) → SRI status (F1).

You can view the SRI status and the status of each port number.

## 10 Maintenance

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### 10.1 Alarm Display

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Maintenance (F1) → Alarm display (F1)

To prevent incorrect operation that could endanger the safety of people and machines, a number of protections are set in the system or PLC. When these protective conditions are triggered, the system will issue a warning or alarm to alert the user. This section describes how to access alarms and how to troubleshoot them when they occur.

Alerts are basically divided into existing alerts and historical alerts:

#### 10.1.1 Existing Alerts

1. Current alert status of the system.
2. When an alarm occurs, the controller will pop up an alarm window showing the current alarm content.
3. Click ESC to exit the window.
4. If the alarm has not been cleared, click Reset to bring up the alarm window again.
5. Switch to the "Maintenance" page and the existing alert will be displayed automatically.

#### 10.1.2 Historical Alerts

- Alarms that have occurred in the system can be viewed on this page for possible causes of the problem.
  - Switch to the "Maintenance" page, click "Alert Display," and then click "Historical Alerts" to display the historic alerts.
  - The smaller the serial number of the alarm, the more recently the alarm has occurred.

#### 10.1.3 Alarm Export

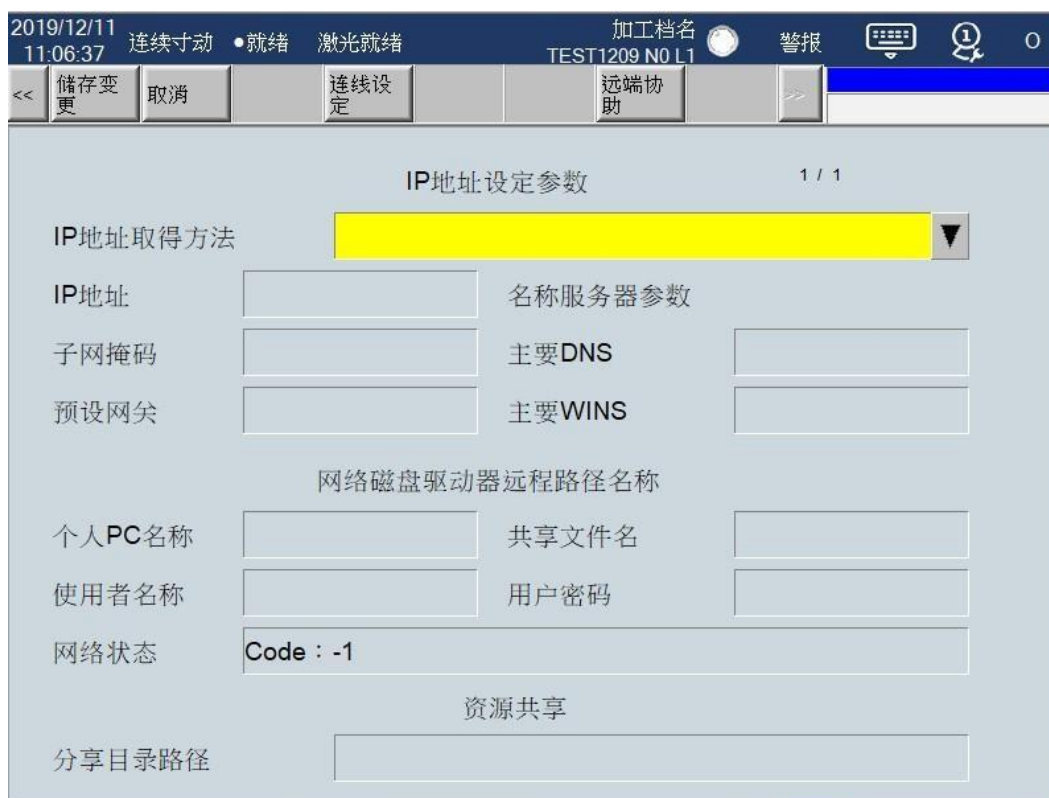
When an alarm occurs in the system, it may be necessary to contact the machine maker for maintenance. At this point, the alarm export function can be used to export the alarm conditions that have occurred to an external storage device for transmission to the machine maker so that the machine maker can identify the possible causes of the problem before arriving at the scene.

**Operating steps:**

1. Insert an external storage device into the controller, or set up a corresponding network folder.
2. Switch to the "Alert Display" screen.
3. To export an existing alarm, click "Existing Alerts" to display an existing alarm.
4. To export a historical alarm, click "Historical Alerts" to display a historical alarm.
5. Click "Save Alerts."
6. On the pop-up external storage device selection window, select the target folder for saving. Click "OK" to export the alarms. A message will show up when the export is complete, click OK to confirm.
7. File name.
8. Existing alert: Actalm.txt.
9. Historical alert: Histalm.txt.

### 10.2 Network Setting

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Maintenance (F1) → Network setting (F2)



### Parameter Description

#### IP address acquisition method

- Select "Specify IP Address Directly" when using jumpers.
  - Select "Specify IP Address via DHCP" and skip the "IP Location" and "Subnet Mask" settings when using a network line.

#### IP Address

- Enter an IP address available in the domain.

#### Subnet Mask

- Enter the subnet mask in the IP address.
  - Must be consistent with PC settings

#### Personal PC Name

- Enter the name of the PC you want to link to
  - Must be consistent with PC settings

#### Shared Directory Name

- Enter the name of the folder shared on the PC (Must be consistent with PC settings)

#### User Name

- If a folder shared by a network drive is not protected by a user IP and password, you do not need to make any settings, otherwise set a corresponding user IP and password.

#### User Password

- If a folder shared by a network drive is not protected by a user IP and password, you do not need to make any settings, otherwise set a corresponding user IP and password.

## 10.3 Quick Diagnosis

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Maintenance (F1) → Quick diagnosis (F3).

This screen displays simple diagnostic information (F1 system information or F2 axial information), as shown below.

The screenshot shows a software interface with a top status bar and a main data table. The status bar includes the date and time (2019/12/11 11:05:25), operational status (连续寸动, 就绪, 激光就绪), work order name (加工档名 TEST1209 N0 L1), and an alarm indicator (警报). The main table, titled '系统资讯' (System Information), lists various system parameters and their values.

Item	Value	Item	Value	Item	Value
0. 人机执行次数	69691	23. 差值百分比	100	39. CPU温度(摄氏)	-1
1. 运动差值次数	702418	29. 手轮绝对位置	0	54. 插补逾时次数	0
2. PLC扫描次数	702418	12. 主轴DA值	2000	55. 细插逾时次数	0
3. I/O扫描次数	702418	44. 主轴速度命令	1000	68. 轴卡同步失败次数	0
4. 运动差值时间	10000	28. 主轴位置回授	0	69. 轴卡回授异常次数	0
5. PLC扫描时间	10000	52. 主轴索引位置	467740000	70. 轴卡回授异常数值	0
6. SRAM写入次数	240	13. 攻牙最大误差	0	320. 解译串列单节数	0
77. 人机记忆体	1640615936	14. 攻牙动态误差	0	324. 差值串列单节数	0
78. 硬体记忆体	2147483647	79. 软体版本	10.118.221	机型代码	B

Axial information screen in quick diagnosis

Axis Data	X	Y	Z	
程式座标	35000	8000	-78000	0
机械座标	35000	8000	-78000	0
绝对位置命令量	35000	8000	-78000	0
绝对位置回授量	35000	8001	-78000	0
实际追随误差	0	0	0	0
合理追随误差量	0	0	0	0
最大容许追随误差量	11111	11111	11111	0
索引位置计数器	24000	4000	-60000	0
极限偏移量	0	0	0	0
马达实际Kp估测值	0	0	0	0
双回路绝对位置回授量	0	0	0	0
双回路索引位置计数器	0	0	0	0
双回路位置回授误差量	0	0	0	0

## 10.4 Extended Parameter Bits

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Maintenance (F1) → Extended parameter bits(F4)

The new-generation controller provides a total of 20 sets of R81~R100 registers for machine makers, each register featuring 16Bits setting function. Machine makers can use these 20 sets of registers to provide users with control flags for specific PLC control functions, as shown in the figure below.



2020/1/30 09:20:19		自动执行 ●就绪 激光就绪		加工档名 0108 N0 L1		警报												
<< 警报显示		网络设定		快速诊断		扩充参数位元		系统设定		>>		(0~1)						
编号	说明	数值	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
3401	激光器输出最大电压(m	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3402	速度功率曲线调变方式	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3403	激光器类型(R83)。0:轴	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3404	硬件模块(R84)。0:ADL	0x0001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3405	额外工位数(R85)	0x0001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3406	MLC缓存器R86	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3407	MLC缓存器R87	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3408	预开气时间(ms)(R88)	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3409	启用急停钮(R89)。0:不	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3410	MLC缓存器R90	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3411	限位开关使用方式(R91)	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3412	限位开关种类。0:常开	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3413	坐标系设定(R93)。0:浮	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3414	MLC缓存器R94	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3415	MLC缓存器R95	0x003C	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0
3416	MLC缓存器R96	0x0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
扩充参数位元R81.1		PR3401~数值不在0-65535者，此页无法编辑																

#### Operating instructions:

1. Use touch to select and change parameter addresses.
2. Use [Page Up] [Page Down] to toggle between previous and next pages.
3. Only [0] or [1] can be input.
4. Notes can be made for each bit.

# 11 Parameters

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## 11.1 Parameter Summary Table

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Parameter setting (F2) → Parameter summary table (F1)

Displays a parameter summary table.

## 11.2 Application Parameters

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Parameter setting (F2) → Application parameters (F2)

Displays an application parameter summary table.

## 11.3 Mechanism Parameters

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Parameter setting (F2) → Mechanism parameters (F3)

Displays a mechanism parameter summary table.

## 11.4 Mechanism Compensating Parameters

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Parameter setting (F2) → Mechanism compensating parameters (F4)

Displays a mechanism compensating parameter summary table.

## 11.5 Skip to Parameter Number

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Parameter setting (F2) → Skip to parameter number (F5).

You can enter the parameter number you want to view to skip to the page.

## 11.6 SRI Parameter Settings

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Parameter setting (F2) → Next page (F10) → SRI parameter setting (F3)

1. Click settings
2. Click editing devices
3. Click the I/O comparison table
4. Perform settings
5. Exit this page and click on Save parameter settings.
6. Restart

The following is an example of an FC-Input and output module:

1. Locate the input field for the FC-Input and output module of the SRI. The name SRI-1-1-1 represents the sequence on the hardware connected through the SRI.



2. Set the starting point of Input and output's **first workstation to 0**, 16 for the 2nd workstation, 32 for the 3rd workstation, and so on ... (The default is -1, which means that it is not enabled.)
3. Since I/O needs to use 16 bits respectively; after setting 0, Input and output 0~15 are set to correspond to Input and output board.  
PS. If there is an analog module ex. ADDA installed, please switch from Fenubar to analog mode and set the R value for this module.

## 11.7 I/O Comparison Table

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Parameter setting (F2) → Next page (F10) → I/O comparison table (F4)

Displays the I/O comparison table setting page.

## 11.8 Serial Parameters

**Fenubar entry path:** Main screen → Controller setting (F8) → Electronic control module (F2) → Parameter setting (F2) → Next page (F10) → Serial PLC axis parameters (F2)

Displays general serial axis and serial PLC axis setup options.

## 12. System Management

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### 12.1 Software Installation

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → System management (F4) → Software installation (F1)

**Update software version:**

- For foreground installation, choose between a handheld kit or a controller kit.
- One can install a foreground/background kit in the foreground and then turn power off and on again.

### 12.2 Data Backup

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → System management (F4) → Data backup (F2)

Restores the backup system data.

### 12.3 Data Recovery

**Fenubar entry path:** Home screen → Controller settings (F8) → Electronic control module (F2) → System management (F4) → Data recovery (F3)

Restores the backup system data.

### 12.4 Import/Export

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → System management (F4) → Import/export (F4)

- F1 system data management: can import/export system data such as parameter files, PLCs, etc.
- F2 Macro management: imports/exports Macro

### 12.5 Image File Installation

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → System management (F4) → Image file installation (F5)

Upgrades system image files.

### 12.6 Driver Hardware Management

**Fenubar entry path:** Home screen → Controller settings (F8) → Electronic control module (F2) → System management (F4) → Driver hardware management (F8)

Manages the driver hardware.

### 12.7 ESI Import Function

**Fenubar entry path:** System (F5) → System management (F4) → Next page (F10) → ESI import (F5)

Imports ESI files

## 12.8 Notes for System Management

1. For software installation, system data import, system recovery and image file installation, the system can only select one for execution at a time. If you want to run the second one, you need to restart and finish upgrading the system.
2. One can finish upgrading a foreground/background kit in the foreground at one go and then turn power off and on again.

## 13. About

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### 13.1 About

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Maintenance (F1) → Next page (F10) → System information (F5) → System information (F1)

Provides controller version information.

### 13.2 System Rights

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Maintenance (F1) → Next page (F10) → System information (F5) → System rights (F7)

On this page, you can view system-related rights, including "Controller Serial Number Setting," "System Expiration Date Setting," "Function Option Setting," and "Controller Setting Recovery."

### 13.3 Machine Makers Information

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Maintenance (F1) → Next page (F10) → System information (F5) → Machine makers information (F5)

Displays information about machine makers.

### 13.4 On-call Repair Service

**Fenubar entry path:** Home screen → Controller setting (F8) → Electronic control module (F2) → Maintenance (F1) → Next page (F10) → System information (F5) → On-call repair service (F6)

This page provides a QR code for the user to call for a repair service.