VisionCut Laser Cutting System Operation Manual

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Safety

Live Focus System (LFS) is applied in laser processing machine. Laser protection is CLASS3 and CLASS4.

Please reference to GB7247.1-2001 and take some safety protection measures.

The following should be executed:

- Operation persons should wear protection glasses.
- Connected to the ground. A valid connection to ground should be done and the resistance should be less than 1 ohm. CNC machine tools, LFS, sensor shell and support plate should be stable grounding.
- Please do not try to disassemble the parts of LFS. Otherwise, the LFS will be fault.
- Laser beam nozzle and the LFS sensor are integrated design. When the LFS is working, please do not touch the sensor. Otherwise will cause damage to your body.
- When cutting glossy surface metal, please notice the reflect laser beams from the metal surface. Some protection measure should be taken to avoid the body to be damaged. Preventive measures should be taken and operate carefully, to prevent burn out parts by laser beam off center axis.
- Keep the sensor and nozzle clean. Avoid the cooling water, condensed water or other foreign matter flowing into sensor; otherwise the sensor will be fault. The laser power and other controllers should meet the EMC standard and should be connect to the ground reliably.
- Sensors and electrical cabinet parts must be grounding as requirements. Processed metal artifacts should be reliable grounding.
视力切割激光切割系统操作手册

第1章 电气手册

1.1 概述—视力切割介绍

视力切割激光切割控制系统是专为处理带有标记点的材料而设计的。此系统基于RDS3040G运动控制器和DSP+FPGA框架，具有高性能的运动控制和激光控制。此系统使用PCI接口，并具有强大的操作能力，视力切割可以满足激光切割行业的要求。此激光切割系统可以与CO2激光、高功率YAG激光和Fiber激光等进行接口，同时具有限位开关输入、主开关、伺服报警和激光保护功能，可以控制伺服电机和步进电机。

以下图示为视力切割激光切割系统的组成图。请参阅图1-1。电气连接细节如图1-2所示。

 nationalsignature
Picture 1-2 Electrical Connection of VisionCut laser cutting system
Chapter 2 Installation & Operation

2.1 List of product

When you received our product, please check the type and accessories and make sure these are what you ordered. If wrong, please contact RuiDa technology.

In the case of industrial applications, we expect our products to be protected from hazardous or conductive materials and/or environments that could cause harm to the controller by damaging components or causing electrical shorts. When our products are used in an industrial environment, install them into an industrial electrical cabinet or industrial PC to protect them from excessive or corrosive moisture, abnormal ambient temperatures, and conductive materials. If RuiDa control systems, products are exposed to hazardous or conductive materials and/or environments, we cannot guarantee their operation.

List of product:
RDS3040G-PCI Motion controller (1pcs);
Extended terminal board (1pcs);
68-PIN SCSI cable (1pcs);
Instruction and CD (1pcs)
Lens (1pcs)
Camera (with connecting line) (1 set)
Antistatic glove (1pcs)
Brightness regulator (with connecting line)
Driver board (1pcs)

⚠️ **Dangerous !**

Avoid the controller form ESD, please release the static charge before touching the motion controller.
2.2 RDS3040G-PCI Motion Controller Configuration Diagram

![Diagram of RDS3040G-PCI](image)

**Sheet 2-1 Encoder Switch SWT1 default state**

<table>
<thead>
<tr>
<th>Pin</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>4</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>OFF</td>
</tr>
<tr>
<td>6</td>
<td>OFF</td>
</tr>
</tbody>
</table>

J2: extend interface  
J1: extend interface  
JP101: extend interface
JP13: extend interface
JP14: extend interface
JP15: extend interface
JJP16: extend interface
JP17: Quadrature encoder interface
JP11, JP12, JP20: reserved

The diagram of the matched terminal board with RDS3040G-PCI is shown in Picture 2-2.

Sheet 2-2 Connector Definition

<table>
<thead>
<tr>
<th>Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN0</td>
<td>Connect with RDS3040G-PCI</td>
</tr>
<tr>
<td>CN2</td>
<td>X axis motor interface</td>
</tr>
<tr>
<td>CN3</td>
<td>Y axis motor interface</td>
</tr>
<tr>
<td>CN4</td>
<td>Z axis motor interface</td>
</tr>
<tr>
<td>CN5</td>
<td>A axis motor interface</td>
</tr>
<tr>
<td>CN7</td>
<td>Reserved</td>
</tr>
<tr>
<td>CN8</td>
<td>Reserved</td>
</tr>
<tr>
<td>CN9</td>
<td>General purpose IO output(low 16 channels)</td>
</tr>
<tr>
<td>CN10</td>
<td>General purpose IO input(high 12 channels)</td>
</tr>
<tr>
<td>CN11</td>
<td>Dedicated purpose IO input</td>
</tr>
<tr>
<td>CN12</td>
<td>General purpose IO input</td>
</tr>
<tr>
<td>CN1</td>
<td>Power(24V)</td>
</tr>
</tbody>
</table>
2.3 System Installation & Application Procedures

Please follow the steps to set up your laser cutting system:

**Step 1:** Insert the RDS3040G motion controller into PCI slot
↓
Switch off the AC power
↓
Wear the ESD gloves
↓
Open the computer box and install the RDS3040G controller into the PCI slot
↓
Tighten the screw
↓
Switch on PC power, if the top left indicator flashing on the RDS3040G, which shows the RDS3040G work well.
↓
Shut off computer, and Switch off the PC power.
↓
Connect other devices to RDS3040G terminal board, such as laser device, motors etc.
↓
Restart the PC power, then the system can work normally.

**Step 2:** Connect the RDS3040G controller with the terminal board
Connect the RDS3040G controller to terminal board with the 68 pin SCSI wire.
The power supply of the terminal board is 24V/3A, if 24V power on, the led indicator in the terminal board will turn on, it can work normally, but if there is one or both off, which indicated there is fault in the terminal board, and please contact technical support staff of RuiDa technology.

**Step 3:** Install the PCI driver in windows XP
The PCI driver is just for window XP, if others, please contact RuiDa technology.
When windows started, system will check the PCI device automatically and remind user to install PCI driver.

Select “install from a list or the specific location”, click “NEXT”.

In this page, select “search the best driver in the location”, and select “search include the location”, click “browse”.

Insert the CD in the cd-rom. Click “Browse” and select the directory “CDROM: \\driver\\win xp” “Add Hardware Wizard”, click “NEXT”. In the device manager, there is a new device named “RDDriver “, click “+”, “ RuiDaTech RD400SCAN Ver1.0” is displayed.

**Step 4: RDS3040G-PCI Running Test**

Open the VisionCut software, if opened successfully, the PCI driver is installed correctly. If there are faults during opening the VisionCut software, the PCI driver is installed unsuccessfully.

**Step 5: Connect X, Y axis motor**

There are 4 channels DB15 interface for motor control, the signals including pulse+dir, alarm, servo on and encoder signals. Figure 3 is the definition of the signals in details.

The controller provides signal output in differential method. The electrical diagram as showed in Picture 2-3. Servo alarm input and enable output are in photoelectric isolation mode, the electrical diagram as showed in Picture 2-4 and Picture 2-5. The connection between RDS3040G and motors is described in detail in appendix 1.

- **Motor control signals output**

![Picture 2-3 pulse +dir differential output](image)

![Picture 2-4 Servo alarm signal input](image)
Sheet 2-3 CN2–CN5 Signal Definition

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN1</td>
<td>OGNd</td>
<td>24V referenced ground</td>
<td>PIN14</td>
<td>OVCC</td>
<td>24V output</td>
</tr>
<tr>
<td>PIN2</td>
<td>ALM</td>
<td>Servo alarm input</td>
<td>PIN15</td>
<td>CLR</td>
<td>Servo reset output</td>
</tr>
<tr>
<td>PIN3</td>
<td>SON</td>
<td>Servo enable output</td>
<td>PIN16</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>PIN4</td>
<td>A0-</td>
<td>ENCODER A-</td>
<td>PIN17</td>
<td>A0+</td>
<td>ENCODER A+</td>
</tr>
<tr>
<td>PIN5</td>
<td>B0-</td>
<td>ENCODER B-</td>
<td>PIN18</td>
<td>B0+</td>
<td>ENCODER B+</td>
</tr>
<tr>
<td>PIN6</td>
<td>C0-</td>
<td>ENCODER C -</td>
<td>PIN19</td>
<td>C0+</td>
<td>ENCODER C+</td>
</tr>
<tr>
<td>PIN7</td>
<td>+5V</td>
<td>+5V output</td>
<td>PIN20</td>
<td>GND</td>
<td>Digital ground</td>
</tr>
<tr>
<td>PIN8</td>
<td>Vout</td>
<td>Speed referenced command</td>
<td>PIN21</td>
<td>GND</td>
<td>Digital ground</td>
</tr>
<tr>
<td>PIN9</td>
<td>DIR+</td>
<td>DIR+</td>
<td>PIN22</td>
<td>DIR-</td>
<td>Dir-</td>
</tr>
<tr>
<td>PIN10</td>
<td>AGND</td>
<td>Analog referenced ground</td>
<td>PIN23</td>
<td>PULSE+</td>
<td>Pulse+</td>
</tr>
<tr>
<td>PIN11</td>
<td>PULSE-</td>
<td>Pulse-</td>
<td>PIN24</td>
<td>GND</td>
<td>Digital ground</td>
</tr>
<tr>
<td>PIN12</td>
<td>NC</td>
<td>NC</td>
<td>PIN25</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>PIN13</td>
<td>GND</td>
<td>Digital ground</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Step 6: Connecting to the dedicated IO for X, Y axis motors

The signal for the motor control includes: LIMIT input, HOME input. If connects to servo motors, there are still include SERVO ON and ALARM input.

HOME and LIMIT, SERVO ON, ALARM signals are all photoelectric isolated. Just is shown as picture 2-6.
The definition of dedicated IO is described in Sheet 2-4 in detail.

**Sheet 2-4   Definition of the dedicated IO in CN11**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
<th>Pin</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN1</td>
<td>HOME0</td>
<td>HOME input for axis X</td>
<td>PIN9</td>
<td>LMT2+</td>
<td>LIMIT+ input for axis Z+</td>
</tr>
<tr>
<td>PIN2</td>
<td>HOME1</td>
<td>HOME input for axis Y</td>
<td>PIN10</td>
<td>LMT2-</td>
<td>LIMIT- input for axis Z-</td>
</tr>
<tr>
<td>PIN3</td>
<td>HOME2</td>
<td>HOME input for axis Z</td>
<td>PIN11</td>
<td>LMT3+</td>
<td>LIMIT+ input for axis A+</td>
</tr>
<tr>
<td>PIN4</td>
<td>HOME3</td>
<td>HOME input for axis A</td>
<td>PIN12</td>
<td>LMT3-</td>
<td>LIMIT- input for axis A-</td>
</tr>
<tr>
<td>PIN5</td>
<td>LMT0+</td>
<td>LIMIT+ input for axis X+</td>
<td>PIN13</td>
<td>OVCC</td>
<td>24V power output</td>
</tr>
<tr>
<td>PIN6</td>
<td>LMT0-</td>
<td>LIMIT- input for axis X-</td>
<td>PIN14</td>
<td>OVCC</td>
<td>24V power output</td>
</tr>
<tr>
<td>PIN7</td>
<td>LMT1+</td>
<td>LIMIT+ input for axis Y+</td>
<td>PIN15</td>
<td>OGND</td>
<td>24V referenced ground</td>
</tr>
<tr>
<td>PIN8</td>
<td>LMT1-</td>
<td>LIMIT- input for axis Y-</td>
<td>PIN16</td>
<td>OGND</td>
<td>24V referenced ground</td>
</tr>
</tbody>
</table>

**Step: Connecting to laser**

**Sheet 2-5 J1 Signal Description**

<table>
<thead>
<tr>
<th>PIN</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN1</td>
<td>VCC</td>
<td>+5V power output</td>
</tr>
<tr>
<td>PIN2</td>
<td>PWM1</td>
<td>The first channel PWM output</td>
</tr>
<tr>
<td>PIN3</td>
<td>DA2</td>
<td>The second channel analog quantity signal output</td>
</tr>
<tr>
<td>PIN4</td>
<td>START</td>
<td>external startup signal input</td>
</tr>
</tbody>
</table>
### PIN5, PIN6, PIN7, PIN8, PIN9 Details

<table>
<thead>
<tr>
<th>PIN</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN5</td>
<td>GND</td>
</tr>
<tr>
<td>PIN6</td>
<td>LASERON</td>
</tr>
<tr>
<td>PIN7</td>
<td>PWM2</td>
</tr>
<tr>
<td>PIN8</td>
<td>DA1</td>
</tr>
<tr>
<td>PIN9</td>
<td>STOP</td>
</tr>
</tbody>
</table>

**PIN6 LASERON**
- Laser switching signal

**PIN7 PWM2**
- The second channel PWM output

**PIN8 DA1**
- The first channel analog signal output

**PIN9 STOP**
- External stop signal input

---

**Picture 2-7 The laser connection**

![Laser connection diagram](image)

---

**Picture 2-8 The Laser jumper connection**

![Laser jumper connection diagram](image)
### Chapter 3 Software Operation Manual

#### 3.1 Software Installation

Double click the VisionCutSetup.exe, the software will be installed in the computer. Please follow

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal definition</th>
<th>instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP20</td>
<td><img src="signal1.png" alt="Signal Diagram 1" /></td>
<td>PWM1-</td>
</tr>
<tr>
<td></td>
<td><img src="signal2.png" alt="Signal Diagram 2" /></td>
<td>PWM1+</td>
</tr>
<tr>
<td></td>
<td><img src="signal3.png" alt="Signal Diagram 3" /></td>
<td>LASERON-</td>
</tr>
<tr>
<td></td>
<td><img src="signal4.png" alt="Signal Diagram 4" /></td>
<td>LASERON+</td>
</tr>
<tr>
<td></td>
<td><img src="signal5.png" alt="Signal Diagram 5" /></td>
<td>PWM2-</td>
</tr>
<tr>
<td></td>
<td><img src="signal6.png" alt="Signal Diagram 6" /></td>
<td>PWM2+</td>
</tr>
</tbody>
</table>

Picture 2-10 Polarity choices of output signal
the step to install the software correctly. Press “next”.

Pop-up “choose install location”, user can modify the installation path, and also can choose the default installation path the display showed.

Click “next”, pop-up dialog box “select shortcuts”.
Click “next”, pop-up whether to create a Desktop icon

Click “next”, pop-up “ready to install”, after confirmed, click “install” to install.
A dialog will be popped-up to prompt “update camera driver...”.
If “yes”, will update the camera driver, if “no”, will not update.

Device Driver Installation Wizard
Welcome to the Device Driver Installation Wizard!
This wizard helps you install the software drivers that some computers devices need in order to work.

To continue, click Next.

Device Driver Installation Wizard
The drivers are now installing...

Please wait while the drivers install. This may take some time to complete.
Click “finish” camera driver installation finished, VisionCut installed at the same time.
3.2 VisionCut Introduction

3.2.1 Main Interface of VisionCut

The main interface of the VisionCut is shown as Picture 3-1.

Picture3-1 Main interface of the software

The main interface includes 10 functional areas, such as Menu, Tools, Status, View, Edit, Modify, Draw, Align, Work area, and Control Panel.

a. **System Menu**: Include of File, Edit, Draw, Check, Para, Modify, Coordinate, Test, View, and Help.
b. **System Tools**: Mainly including: New, Open, Save, Import, Export, Undo, and Redo.
c. **System status**: Just as shown in Picture3-2. To display the X, Y coordinate position, system alarm status, process quality and the attribute display of internal and external mold.

d. **View Tools**: Including: Move, Frame selection, Page range, Data scale, display all, zoom in/out, Path display, Polygon display.
e. **Edit Tools**: Including: close lines, delete Overlapping lines, Merge joined lines.
f. **Modify Tools**: Path optimization, sequencing manually, setting start point.
g. **Draw Tools**: Including: move, draw polygon line, draw rectangle, draw ellipse, horizontal mirror,
vertical mirror, rotate, array.

h. **Align Tools:** Top align, bottom align, left align, right align, horizontal and vertical middle align, horizontal and vertical array with uniformly-spaced, uniformly-width, uniformly-height, displayed in the center of page, moving to bottom left, moving to bottom right, moving to top left, moving to top right.

i. **Image capture Area:** To display the image captured for matching test.

j. **Control panel:** Mainly to achieve the related processing functions, which including manual and automatic processing.

### 3.2.2 Module Function

1) **Menu--File**

File operation includes new, open, save, save as, import, and export. File menu is shown as picture 3-3.

<table>
<thead>
<tr>
<th>File</th>
<th>Edit</th>
<th>Draw</th>
<th>View</th>
</tr>
</thead>
<tbody>
<tr>
<td>New...</td>
<td>Ctrl+X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open...</td>
<td>Ctrl+O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Save</td>
<td>Ctrl+S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Save As...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Import</td>
<td>Ctrl+I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Export</td>
<td>Ctrl+Z</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. U123.rlc
2. default.rlc
3. U0.rlc
4. default00.rlc

**Exit**

![Picture 3-3 File menu](image)

**a. New**

Click “new”. If there are graphics in the display area, VisionCut tell you the displayed file to be saved or not. If you select saving none, then the display area will be cleared. If you select to save, the file in the display area will be saved.

**b. Open**

Click “open”, then the file with extension *.rlc can be only opened. The *.rlc file is generated by VisionCut itself.

**c. Save and Save as**

File can be saved as *.rlc with save or save as operation. The *.rlc file is not only included position of the segment but also the work parameters and other information.

**d. Import**

Click “Import”, then the file dialog will be appeared. VisionCut supports the Ai, plt, dxf format file.
The software has file parameter setting, you can set the precision of plt file, the data unit of dxf files and whether import the dxf information or not.

![File parameter](image)

**Picture 3-4 File parameter**

e. **Export**

All the file that displayed on the VisionCut can be exported as *.ai or *.plt format.

2) **Menu—Edit**

Edit operation includes Undo, Redo, Generating Parallel lines, Force close lines, Delete Overlapping lines, Merge joined lines, Outline compensation, horizontal and vertical mirror, Rotate, Array, delete the graphics selected. The edit menu is shown as picture 3-5.

![Edit Menu](image)

**Picture 3-5 Edit Menu**

a. **Undo and redo**

Cancel and restore the operation steps.

b. **Mirror**

Mirror operation includes horizontal and vertical mirror.
c. **Rotate**

When you rotate the graphics, the rotate angle can be set. But the X, Y position could not be set. The position of X, Y that is displayed in the picture3-6 the graphics center position that you have selected. They cannot be set.

![Rotation function](Picture 3-6 Rotation function)

**d. Array**

VisionCut supports graphic elements array. You can set the elements space align with X direction or Y direction. The rows and columns quantity of arrays in the X or Y direction can be set too. When using auto-full function, which will calculate the rows and columns quantity of array according to the width and height of the material. Click “Array” to array the graphics. Shown as picture 3-7

![Array function](Picture 3-7 Array function)

**e. Closed curves.**

Click “closed graphics”, will pop up a dialog box “close the lines”, to make a judgment of the graphics whether need close operation, if “Force close”, whatever the length between the start point and the end point is, VisionCut will force to close the polygon lines.
f. Delete overlapping lines

If there are two or more lines are too closed with each other, one of them is not useful. It can be deleted. The interval length limit of two lines should be set. When VisionCut check that the interval length of two lines is less that the interval length limit, VisionCut will delete the un-useful lines. Function is shown as picture 3-9.

g. Merge Intersect

When some polygon lines of a closed graphics are not connect with each other, the merge polygon lines function can made the lines connect with each other. Before that, the merge error limit should be set. When the length of two polygon lines is less that the merge error limits, the polygon line will connect with each other. When the length of two polygon lines is more than the merge error limit, the merge polygon function will be ignored.

h. Delete selected

Delete the graphics selected (you can use the “Delete “key on the keyboard)

i. Select all

Select all graphics on the display window (you can use the “Ctrl+A” on the keyboard).
3) Menu--Draw

Draw graphics include graphics drawing, graphics transformation, and align tools. Graphics drawing includes drawing polygon line, rectangle, and ellipse. Graphics transformation can change the position and proportion quantitatively. Align the selected graphics with various operations.

1. Draw tools
   The draw tools are shown as picture 3-11.

<table>
<thead>
<tr>
<th>Draw tools</th>
<th>Key</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polygon Line</td>
<td>Ctrl+4</td>
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</tr>
<tr>
<td>Rectangle</td>
<td>Ctrl+6</td>
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<tr>
<td>Ellipse</td>
<td>Ctrl+7</td>
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<tr>
<td>Transformation</td>
<td></td>
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<tr>
<td>Align</td>
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</tbody>
</table>

   Picture 3-11 Draw tools

a. Move selected:
   Click " " and then select the graphics in the display window, the graphics selected can be moved when the cursor is placed on the center of the selected graphics with the left key of the mouse is being pressed down.

b. Polygon lines:
   Click the polygon lines, Move the cursor and press down the left key of the mouse, the polygon lines will be drew. To end the draw, press the right key of the mouse.

c. Rectangle:
   Click the rectangle, press down the left key of the mouse and move the cursor. Then release the left key of the mouse, a rectangle is drew on the display window.

d. Ellipse:
   Click ellipse, press down the left key of the mouse and move the cursor. Then release the left key of
the mouse, an ellipse is drawn on the display window.

2. **Transformation**

![](Transformation)

**Picture3-12 Transformation parameters**

To change the position of the graphics, you can change the graphics center position, and the change of width and height of the graphics and scaling to change the size.

Rotation can be set to rotate the graphics based on the center point of the graphics.

3. **Align**

The align function is shown as picture3-13.
4) Menu—View

View function can help users to check the graphics more clearly. View tools include of move selected, offset, zoom in, zoom out, display all, view selected, view all the page, display path, display polygon point. As showed in Picture 3-14.

1. Move selected
   Use the left key of the mouse to select the graphics and move the graphics.

2. Move page
   You can move the entire display window when pressing down the left key of the mouse.

3. View selected
Pressing down the left key of the mouse and select a rectangle area, then release the left key of the mouse. The rectangle area will be zoomed in to display in all window.

4. **View full page**
   Restore the display page to the original display page.

5. **View full scale**
   View the selected graphics in all the scale of the display window.

6. **View all**
   Display all the graphics in the display window.

7. **Zoom in and Zoom out**
   Click “zoom in” or “zoom out”, when the left key of the mouse is clicked, the display windows will zoom in or zoom out based on the cursor point.

8. **Graphics path**
   This function will display the cutting path, the jump path and the graphics sequence.

9. **Polygon node**
   The function will display all the polygon points of the graphics in the display window.

5) **Menu—Parameters**

The parameters include machine parameter, system parameter, cut parameter, file parameter.

1. **Machine parameter**
   The machine parameter is just only opened to the machine manufacture. So the parameter is not allowed to be modified without the manufacture’s authorization.

   There is a password protect to prohibit to modify the parameters. When the password you entered has been authorized; the dialog will be opened as picture 3-15.
a. **Direction Polarity**
   
   You can change the direction of the axis motion when you send positive pulse. For example, you have defined the positive direction of an axis. If you find that the axis run to negative direction when you send a positive movement, you should change the direction polar.

b. **HOME Polarity**
   
   Choose which electrical level to trigger HOME switch, select “High”, which means rising edge is triggered; select “Low”, the falling edge is triggered.

c. **Limit Polarity**
   
   Limit switch triggered by electrical level. Select “High”, triggered by high level; select “Low”, means triggered by lower level.

d. **Control Signal**
   
   Pulse+dir signal is valid to motor control.

e. **Pulse Equivalency**
   
   That means the quality of the pulse when axis moved 1m.

f. **Cut Range**
   
   Set the cut range according to the machine work area. The cut range is usually smaller than the machine work area.

g. **Maximum velocity**
The maximum working velocity.

**h. Start velocity**
The first moving velocity at start point.

**i. Maximum acceleration**
The maximum acceleration is to limit the cut velocity and the jump velocity.

**j. Jog acceleration**
Emergency Stop acceleration
The acceleration is for the emergency stop, such as limit trigger, alarm trigger.

**k. Write para**
Save the parameters to the card.

**l. Read para**
Read the parameters from the card.

**m. Open**
Open the file of .RDSet format, to set the parameters.

---

2. **System parameter**
System parameter is related to the VisionCut configuration.
a. Graphics Reference point

The point is set on the external rectangle of graphics outline. There are 9 points for that. If you select one, VisionCut will consider that the point is the graphics start point. The cutting process will happen from the point. If you changed the reference point, the green brick will display on the reference point.

b. Grid size

The distance of the grid in the display window can be set.

c. Move distance

User can use the up key, down key to move the select graphics to move up and down. The unit is set in the adjust distance column. User can use the left key, right key to move the select the graphics to move left and right.

d. Move factor:

If you want to move the graphics faster with the up, down, left, right key, you can set the adjust ratio. For example, if you set the adjust ratio to be 10, the unit of movement is adjust ratio*adjust distance.

You can press shift + up, shift + down, shift + left, shift + right to have a faster movement.

e. Rotation angle

When the adjust rotation angle is set correctly, you can use Ctrl+up, Ctrl+down to rotate the graphics.

3. Cutting parameter
The cut parameter includes motion parameter and delay parameter.

**Motion parameter:** the parameters related to movements, which can be set by user.

![Cutting parameter](image)

- **Jump velocity:** moving velocity without laser emits.
- **Jump acceleration:** moving acceleration without laser emits.
- **Jump delay:** Delay for a period of time to wait for the machine stopped.
- **Decelerator factor:** Bigger coefficient can cause, the faster end point velocity, but the lower process precision.
- **Cutting Acceleration:** moving acceleration with laser emits.
- **Home going velocity:** the velocity to back.
- **Home going offset:** The offset to the home switch position.
- **Return to stop point:** this option is to judge the laser head whether back to stop point after finished process.

4. **File Parameter**

When import a file, some parameters should be set. As shown in picture 3-18.

![File import parameter](image)
PLT import dpi: When a PLT file is imported, the parameter should be set. The default is 1016 DPI.

DXF data unit: one data unit corresponding to the length unit when DXF file import,

Import text info.: Whether to import text information or not when import the DXF file.

6) Menu—modify

Modify menu includes path optimization, sequence manually, data check, as showed in Picture 3-19.

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<thead>
<tr>
<th>Modify</th>
<th>Coordinate</th>
<th>Test</th>
<th>Check</th>
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<tbody>
<tr>
<td>Path optimization</td>
<td>Sequence Manually</td>
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<td></td>
</tr>
<tr>
<td>Inner and outer mold</td>
<td>Automatically add introducing line</td>
<td></td>
<td></td>
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<tr>
<td>Manually add introducing line</td>
<td>Edit introducing line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delete introducing line</td>
<td>Data check</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cut Simulation</td>
<td>Add bridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistics</td>
<td>Re-Locate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Picture3-19 Handle Menus

1. Path optimization

According to the optimization conditions, the sequence of the graphics elements can be controlled as your wish. As showed in Picture 3-20.
2. **Sequence Manually**

User can make the order of the graphics elements manually. As shown in Picture 3-21.

![Picture 3-21 Making cut order manually](image)

When you opened the dialog, the graphics elements will display in the display window. The jump and cut path will be displayed in the window. The sequence of the graphics element described in Arabic numerals is displayed in the window too.

You can use the cursor to click on the graphics element. The element’s name will be displayed in the right bar.

- **>>**: to add the selected left graphics element to the right bar.
- **>****: to can add all the graphics elements to the right.
- **<<**: to restore the entire graphics element in the right to the left.
- **Reverse sequence**: to make a reverse sequence of all the graphics elements.
- **Reverse direction**: to make a reverse cutting direction in one graphics element.

Using **Up** and **Down** can modify the element’s sequence in the right bar.
Click <VisionCut> and move the cursor to the graphics polygon point, then double click the mouse; a new cut start point is generated. User can use the function to change the cut start point.

3. Data check
Data check includes close, intersect, self-intersect, overlapping. VisionCut can handle these incorrectly data automatically.

![File data Check]

**Closure check:**
To check the graphics is closed or not. If the distance is less than the close error limit, VisionCut will close the graphics automatically.

**Self-intersect check:**
If a closed graphics is self-intersect, VisionCut will separate the graphics.

**Intersect check:**
To check the graphics is intersect or not. If there are intersections, VisionCut will automatically merge the intersection line.

**Data overlap check:**
To check the graphics is overlap or not. If overlapping, VisionCut will delete the overlapping lines.

**Notice:** this operation will make a closed graphics to be un-closed graphics.
7) Menu—Test

Test function includes signal test, motion test, and Run frame. As shown in Picture 3-23.

![Test Menu]

Picture 3-23 System test

1. Signal test

The signal test can test the level status of the current limit switch and general input & output IO and set the output level. Test dialog is shown as picture 3-24.

![Signal Test Dialog]

Picture 3-24 Signal test
2. Motion test

User can test the machine motion at the first step. With this function, the negative and positive direction of the X, Y axis can be identified. The limit switch is triggered or not can be displayed in the dialog.

3. Zero position
Set the current position to the origin position.

4. Reset
The machine goes back to home switch.

8) Menu—Check
As shown in Picture 3-26.
9) Menu--Help

As shown in Picture 3-27.

10) Menu--position

This function just used for ordinary cutting for ensuring the locating point.
Absolute coordinate: take left bottom as original point, move the view area data into this area for cutting.
Current position: move the view area data into laser head current position for cutting.
Locating point: move the view area data into locating point for cutting.

3.3 Graphics Capture Area Introduction

Showed as below:
Mainly for real-time displaying the graphics captured. You can adjust size of the effective area when using it, rolling the mouse wheel can adjust the captured graphics.

### 3.4 Process Control Area Introduction

Process control area shown as 3-29, includes manual process and automatic process.

![Picture 3-29 Process control area](image)

#### 3.4.1 Manual Process

In this function, you can do machine test, inching, continuous moving and frame work.

**a. Inch**

The length of the inching is 0.01mm, 0.1mm, 1mm, 10mm, and 100mm. Also you can customize the distance.

**b. Continuous moving**

Pressing down the “up” “down” “left” “right” button can move the X, Y axis. Release the button
will stop the motion.

c. **Speed**
The motion speed when set manually.

d. **Pulse power**
The power when setting pulse.

e. **Pulse**
Press “pulse” to emit laser for dotting.

f. **Speed ratio**
Generally, the speed ratio adjustable range is 0% ~200%, if user wants to adjust it to make the feed speed more than the max. speed when system initialized, the controller take the max. speed as feed speed.

### 3.4.2 Automatic Process

a. **Work control**
Work control includes start, pause/continue, and stop.

b. **Process the selected graphics**
Select the selected process graphics.

c. **Move the Z-axis to focus, and also can move Z-axis to fixed position.**

d. **U-axis control, to control the feed axis movement, also can feed automatically after processing.**

e. **Ordinary Cutting, cutting directory omitting vision**

f. **Whether blowing, blowing automatically when processing after checked it. And stop blowing process stopped.**

g. **Foot pedal**
Press “foot pedal”, the same as press “start” bottom.

### 3.4.3 Enable Effective Area

Green frame will be appeared when selected; only the green frame internal is effective.

### 3.4.4 Positioning

Take the current position point as processing start point.
3.4.5 Back to position point

The laser head backs to processing start point.

3.4.6 Process parameters

Double click the related layer to set the layer parameters.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Speed</th>
<th>Output</th>
<th>Blowing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-0</td>
<td>100.000</td>
<td>YES</td>
<td>吹气1</td>
</tr>
<tr>
<td>3-30</td>
<td>80.000</td>
<td>YES</td>
<td>吹气1</td>
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<tr>
<td>3-35</td>
<td>50.000</td>
<td>YES</td>
<td>吹气1</td>
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<tr>
<td>3-40</td>
<td>30.000</td>
<td>YES</td>
<td>吹气1</td>
</tr>
</tbody>
</table>

**Layer**: Software distinguishes the graphics processing technology parameters from different layers. For scanning processing methods, multiple bitmaps in the same layer will as a whole picture output, if each bitmap output individually, it can be placed in different layer.

**Is Output**: 2 options: “yes” and “no”. Choose “yes”, the corresponding layer will output processing; choose “no”, no output processing.

**Speed**: The processing speed corresponding to processing method.
For cutting processing, the slower speed, the better processing, the smoother track; the faster, the processing effects, the worse the track;
For scan processing, the slower speed, the more depth scanning at the same energy, the thicker scanning trace, and the scanning resolution also reduced.
The faster speed, the thinner depth scanning at the same energy, details distortion increased.
For dot processing, the main change is idle speed.

**If Blowing**: if the machine connected external fan, and fan has enabled, then if choose "yes", then this layer in data processing, will open the fan, otherwise, will not open the fan. If disable the fan, no matter choose "yes" or "no", that is meaningless.

**The minimum / maximum power**: the power values range is 0 to 100, which means the laser strong or weak in processing; big value, the laser is strong; small value, the laser is weak. Minimum power is less or equal to the maximum power.

**Seal**: The seal unclosed when cutting closed graphics, you can use seal compensation to close. But it will
be failed if the seal is misplaced.
Laser turn-on delay: turn on punching time/ turn-on delay
Laser turn-off delay: turn off punching time/ turn-off delay

3.4.7 Camera parameters

Click 【camera para】 on the operation panel button, can appear the following camera parameters Settings dialog:

![Camera parameter dialog](Picture3-31)

**a. Camera parameter**

The camera adjustment on the hardware mainly through adjusting the aperture and focal length to adjust the quality of the image, but which can't adjust freely after the camera is installed. Usually it is to adjust the ambient light.

The camera parameters adjustment in the software:

**Contrast**: Mainly through adjust the background color and contrast material color difference to fine image quality.

**Gain**: the brightness of the image magnification.

**Exposure**: the longer the exposure, the higher of the image brightness. Click 【Exposure】 can perform automatic expose operation.

"Contrast", "gain" are both to deal with image data. So when image is in dim, firstly adjust the light source (lamp on the camera ) and 【Exposure】, if still cannot get the desired effect, to adjust brightniss,
contrast, gain.

b. Camera Calibration:
【Speed】: In the process of camera calibration, laser head moving speed or when cutting cross or dotting.
【Power】: The processing power when camera calibration.
【Cut Cross】: Click the "cross cutting", the laser will quickly cut a cross.

![Picture 3-32 Cut Cross](image)

【Camera Distance Calibration】: Cut a cross, then move the camera view cross center to coincide with the cross center, click "camera calibration". System will calculate the offset from camera view center to the center of the laser head.

![Picture 3-33 Camera Distance Calibration](image)

After calibration, execute the second step to calibrate precision, cutting a circle as appointed, press "cut circle", the system will cut a circle on the platform and then matching test the circle size in the model parameters as below showed:
Click “<<<” to correct the pixel precision, fill the matching test result into Measuring Length Bar, then click “confirm”, the system will confirm the proportionality coefficient automatically.
3.4.8 Model Parameters

![Model param](image)

a. Mark Point Parameters

To choose the needed mark point types to make model, respectively supporting circle, cross, rhombus, circular ring, rectangle, square, and triangle. When making models please make corresponding parameters (diameters, width, and height) as pictures showed.

b. Model matching parameters

【Smooth coefficient】: The higher smoothing coefficient, the less scattered points of feature region be extracted. (Detailed Description please refer to chapter 5.2.3).

【Similarity】: The matching score of model and actual graphic, the higher scores, the more similar. The similarity setting directly affects the matching quality.

【Overlap】: The overlap percentage of two target object envelope rectangular. This parameter controls whether targets can be identified when overlapping.

【Match Angle】: The model rotation and searching angle range. For example, the value set to 180°. In the matching process, the searching angle range is -180°~180°. To set the search angle according to actual needs. The larger searching angle, the longer matching time required. If the user does not need to set this parameter, and you should remove the option directly.

【Timeout】: When you set the parameter of ‘Match num’, you need to set this parameter to control
matching time. In process of matching, in order to avoid waiting for a long time or lacking of time to cause the failure of target image matching. This parameter is mainly affected by the model characteristics of complexity.

【Match test】: Match the current model and the target image of camera field view, test results will be returned as results-interface. When the matching results are not satisfied, adjust the similarity until the matching results satisfied.

c. Enable Secondary Positioning
After searching the target, not set this location coordinates as criterion, but moved to the target automatically, take photos again, and repositioned target location coordinates.

Distance offset / Angle offset: When two-point positioning, such as you might find more features when searching feature 2, according to the distance between feature 1 to feature 2, if found multiple features in the circle arc of feature 1 as origin, then as angle to distinguish them.

Note: But when the offset is set too small, missing cut will be happened. Generally distance offset can be set within 2mm, angle offset within 5°, such as the workpiece requires more accurately, you can set smaller.

d. Mark point identification settings

Support any point identification, which is fit for mark point cutting with different quantity. To choose the mark point in the view area, click [ ] to set the starting point, and choose other mark point, click
to set. You can also click to search all the mark points automatically.

e. Mark point searching path
Click the starting point to confirm the starting point coordinate, also can choose the mark point in the view area to click to set the starting point.
The system will search the marking points starting from the closest other marking points.

Appendix 1

1. RDS3040G connecting to Panasonic Servo Driver
control terminal blocks (CN2, CN3) servo drivers terminal
2. RDS3040G controller & YASKAWA SERVOPACK Connection Diagram

control terminal blocks (CN2, CN3)       servo drivers terminal
3. **RDS3040G controller & YASKAWA SGDE Connection Diagram**

control terminal blocks (CN2, CN3)  servo drivers terminal

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4. RDS3040G controller & YASKAWA SGDM Connection Diagram
control terminal blocks (CN2, CN3)  servo drivers terminal

<table>
<thead>
<tr>
<th></th>
<th>OGN</th>
<th>ACO</th>
<th>ENABLE</th>
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</table>
5. Controller & Mitsubishi MELSERVO-J2-Super series driver position control mode connection

control terminal blocks (CN2, CN3) servo drivers terminal
6. Controller & Mitsubishi MR-E series Driver Position Control Mode Connection

control terminal blocks (CN2, CN3)  servo drivers terminal

![Connection Diagram]
7. **Controller & SIMENS SINAMICS V80 Driver Position Control Mode Connection**

control terminal blocks (CN2, CN3)  servo drivers terminal

![Diagram of control terminal blocks and servo drivers terminal connections](image-url)

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Appendix 2 Expansion Interface

OUT15 is blowing, IN3 is stop signal join-up, and IN11 is start signal join-up.

Appendix 3 CCD System Specification of Visioncut System

1. Electrical Connection

User must connect the lighting system according to this specification correctly. Lighting system consists of the following parts:
- LED ring lighting group
- drive plate
- light controller (with wire)
- folding cable for switching over
- mechanical mounting bracket (2 pcs)

Electrical connections are shown in Figure-1 below. Please correctly connect them according to the following strictly.
2. Brightness Control

Rotating light controller can adjust the brightness of the LED lighting, rotating the light controller counterclockwise until the voice of "pa" to close the LED lighting system; clockwise rotation, brightness will increase gradually.

3. Camera and lighting system installation size

After installed the camera and lighting components, the component must be fixed to the machine, the size of the fixed plate as shown in the figure below.
The two slotted holes in the middle of plate, suggested use six-head stud to fix them to the machine. You can adjust the height of the camera up and down through a rectangle slotted holes. The depth of sink groove is 2 mm.
4. Installation steps

The whole mechanical components includes the following components:

- camera
- camera fixed bracket
- light source
- light source fixed bracket

Components as shown in the Figure-3/4 below:

First of all, fixed camera and camera bracket, fixed the mounting bracket on the back of the camera (labeled on the back). The camera just nested to the concave part of the mounting bracket. And keep the camera and mounting bracket perpendicularly, fixed with the matching M3 interior hexagon screws. After the installed, the picture as showed in Figure-5.
Note: be careful during the installation process by all means, screw down the screws should be moderate, otherwise easy to damage the camera.

Second, light source and light source bracket, the light source and light source mounting bracket as shown in Figure-6 and Figure-7. In the process of installation, try to make bracket closing to the center of the light source circle part. So that ensure the camera is located in the center of the whole light source hole.
Figure-8 Light source components

Light source components installation is completed, light source components installed in the proper place to X beam of cutting machine, keep the bottom edge of light source away from the cutting plane distance is about 125 mm. The height would be adjusted by sliding groove of light bracket.

Fixed light sources and bracket, you can install the component. There is a rectangular bar hole in camera mounting bracket for connecting to light bracket and installation, and light bracket has two mounting holes of the M3, connecting rectangular mounting holes of camera components and light bracket screw holes through screw. When installation, make the top of the strip-type holes of camera and mounting holes of light source aligned. As shown in Figure-9. If the user wants to adjust the distance between camera and cutting plane, the camera components installation has 10 mm allowance. You can adjust the up and down, but ensure the light does not affect the camera taking pictures.

Figure-9 installation drawing of camera components and light components

Installed correctly or not, please refer to the conditions:
1. the camera is perpendicular to the cutting plane, that is, the camera on front and behind and left and right and direction is perpendicular to the cutting plane. If tilted, the user need to fine tune.
2. Camera lens is located in the center of the light source; make the lens is located in the center of the light hole. As shown in Figure-10.
If checked and meet the above conditions, then fasten the screw.

Figure-10 camera and light source bottom view
5. Camera parameter

When camera configured to 8 mm, the camera's field of view parameters shown as below for your reference:

Equipped lens with 8 mm

<table>
<thead>
<tr>
<th>The field width (mm)</th>
<th>The camera height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 x64</td>
<td>90</td>
</tr>
<tr>
<td>100 x80</td>
<td>109</td>
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<tr>
<td>120 x96</td>
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<td>160 x128</td>
<td>193</td>
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<tr>
<td>180 x144</td>
<td>218</td>
</tr>
</tbody>
</table>

Sheet 1 The height relation of field of view and camera

Remarks: camera height refers to the camera after lens installation, the distance between the bottom border edge of lens and cutting plane.
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