Manufacturer's Manual of NcStudio Phoenix Nine Axis Six-Side Drilling System

Contents

Preview

Thank you for using the **NcStudio Phoenix Nine Axis Six-Side Drilling System**.

This manual introduces the software interface, shape-related functions, and methods for wiring, machine debugging, and material measurement.

Before installing and using this product, please read this manual carefully to help you understand how to use the product.

You will not be notified of any improvements or changes to the product. You can find related product information on our official website: https://www.weihong.com.cn/en/.

Special Icon

The icon is used to indicate supplementary information and notes that require your attention other than safety precautions.

Revision History

Version	Date	Update Reason
R1.0	2021-1-17	Released the first time.

1 System Introduction

1.1 Overview

This section introduces the **NcStudio Phoenix Nine Axis Six-Side Drilling System** hardware, software, and machine structure.

The **NcStudio Phoenix Nine Axis Six-Side Drilling System** supports only bus configuration.

Hardware

- Industrial computer: NC65C
- Controller: Lambda 21B
- EX series terminal board:
    o <u>EX Series Terminal Board</u>: Supports 32-channel output
    o <u>EX Series Terminal Board</u>: Supports 32-channel input

For connection diagram of the system hardware, see <u>Hardware Connection Diagram</u>.

Software

For the introduction of the **NcStudio Phoenix Nine Axis Six-Side Drilling System** software interface, see <u>Software Interface</u>.

Machine commonly includes a symmetrical left part and right part. This section takes the left part as an example to introduce the machine structure.

1.2 Hardware Connection Diagram
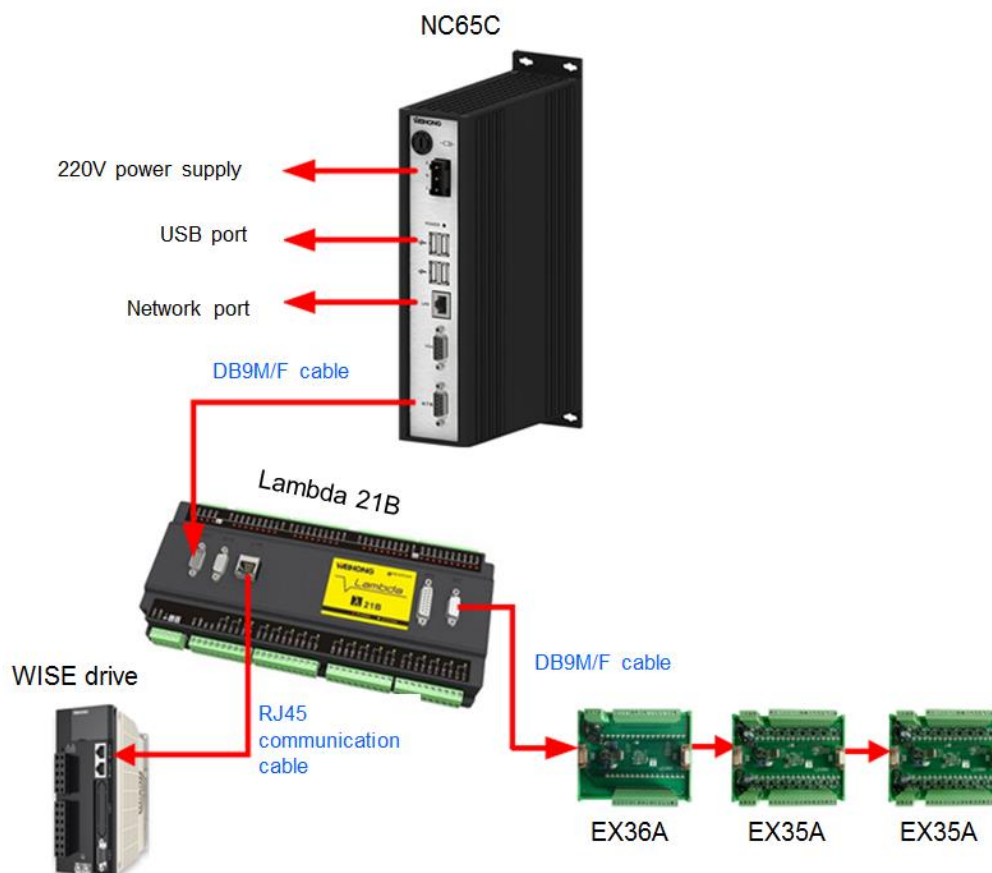
1.3 Software Interface

After the software is opened, **Process** screen is displayed by default. Click the **Process** or **Control** tab in the upper right corner to switch between the two screens.

Different content is displayed in **Process** and **Control** screens.

- ✦ **Process**: Plate editing and machining control functions.
- ✦ **Control**: Cylinder, valve output, and axis movement control functions.

1.3.1 Process

The layout of the **Process** screen is shown below:
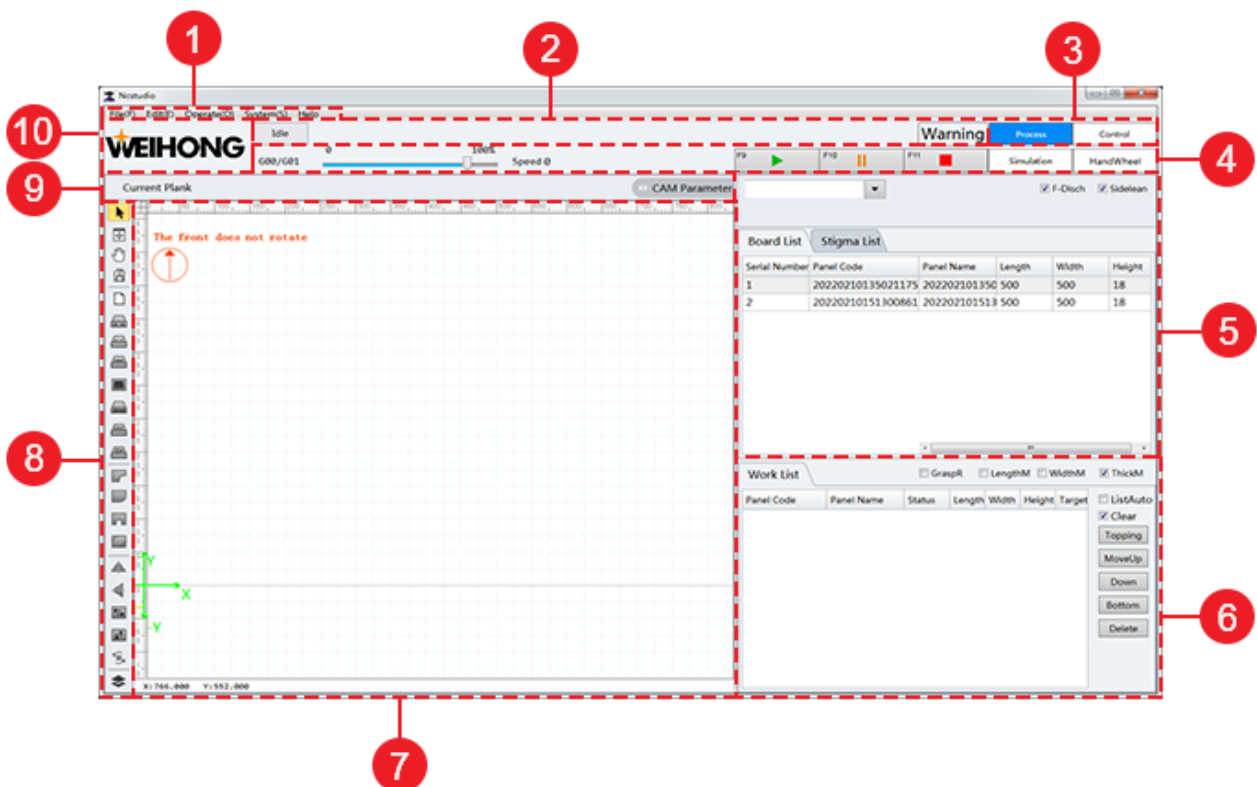
1. <u>Menu Bar</u> 2. <u>Status Bar</u> 3. <u>Screen Switch</u> 4. <u>Machining Operation Bar</u> 5. <u>Board and Stigma List</u> 6. <u>Work List</u> 7. <u>Board Display Area</u> 8. <u>Board Editing Bar</u> 9. Board information and parameter bar 10. WEIHONG logo

1.3.1.1 Menu Bar

In the menu bar, you can:
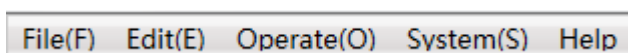
- ✦ **File**: <u>Load a Machining File</u>, close/restart the system, restart the software, and <u>Create Installation Package</u>, etc.
- ✦ **Edit**: <u>Creating and Editing Holes</u>, <u>Shape-Related Functions</u>, etc.
- ✦ **Operate**: <u>Execute Simulation</u>, <u>Change I/O Port Polarity</u>, <u>Edit Drills</u>, <u>Set Datum</u>, etc.

- ✦ **System**: <u>View the Log</u>, <u>Change the Password</u>, back up and restore parameter settings, <u>View Machining Statistics</u>, <u>Check Tool Lifespan</u>, and <u>Board Measurement</u>.
- ✦ **Help**: Check the system information and remaining time, and <u>Register the Software</u>.

1.3.1.2 Status Bar
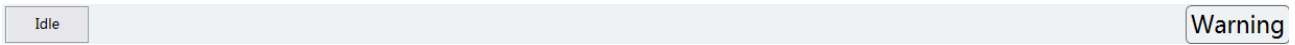
Displays the following information:

- ✦ Current system status: running, idle, or emergency stop
- ✦ System prompts or alarms

Double-click the blank area to open the **Log** dialog box and <u>View the Log</u>.

1.3.1.3 Screen Switch

Click the **Process/Control** tab in the upper right corner to switch between the screens.

1.3.1.4 Machining Operation Bar

You can adjust the feed rate, start/pause/stop the machining process, execute simulation, and use the handwheel to guide machining.

: Feedrate adjustment slider

: Start machining

: Pause machining

: Stop machining
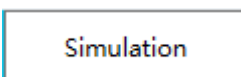
: Execute simulation
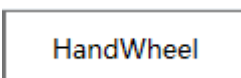
: Use handwheel

1.3.1.5 Board and Stigma List

Includes the following lists:

- ✦ Board list: Shows the code, name, and size of the imported board.
- ✦ Stigma list: Shows the information of the hole positions created on the board.

1.3.1.6 Work List

Shows the information of the current board and available operations.

1.3.1.7 Board Display Area
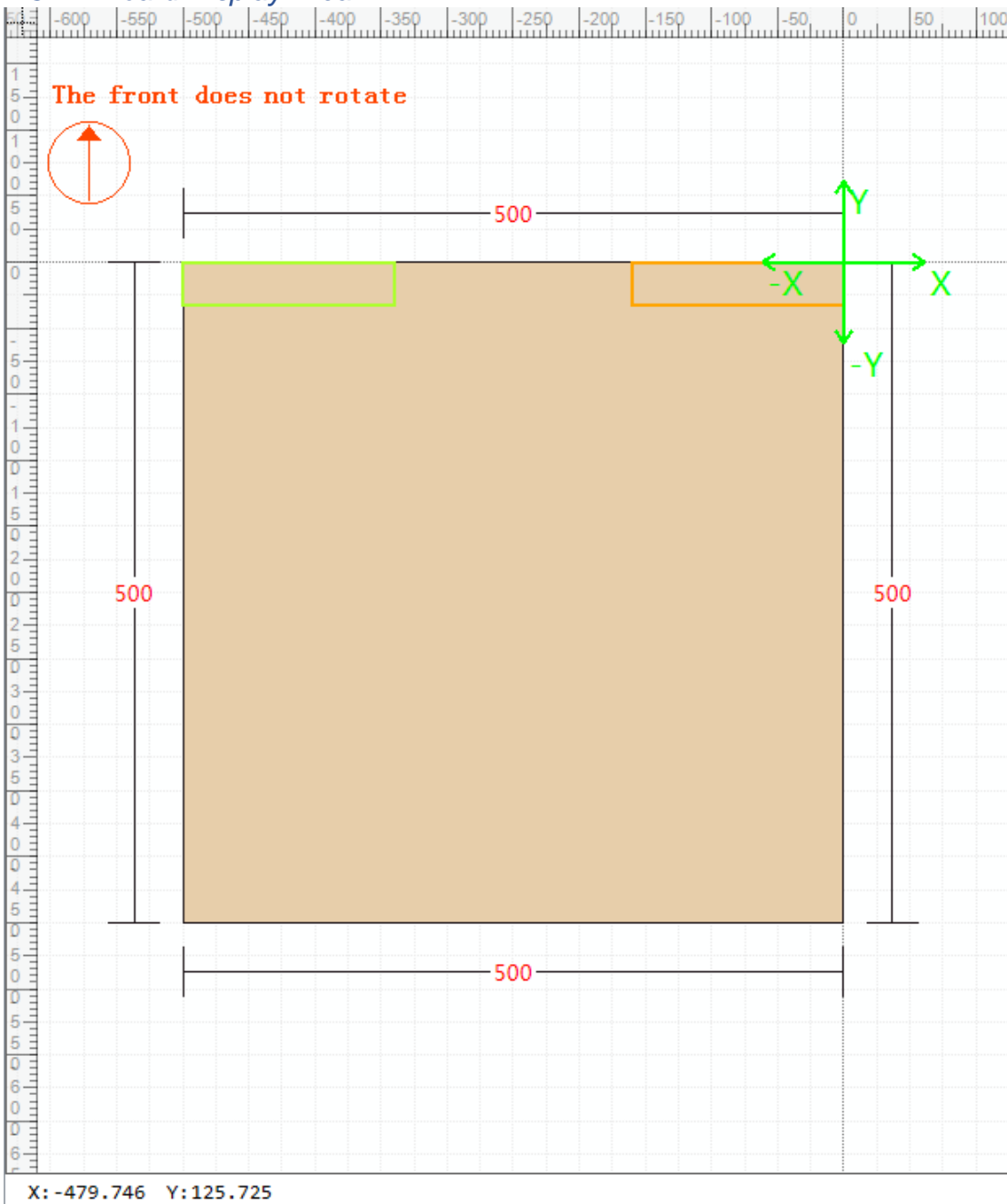
Shows the created or imported board and holes.

1.3.1.8 Board Editing Bar

The following operations are available:

: For selecting objects.

: For making the board view adjusted to the window.

: For moving in the board view.

: For saving the current board settings.

: For creating a new board.

/ : For creating a side/vertical hole on the board.

: For creating a slot on the board.

: For pocket milling on the board.

/ : For creating a side/front lamello on the board.

: For creating a lock on the board.

: For cutting an angle on the board.

/ : For pocket milling of round corners/slots on the board.

: For removing chamfering and undo all created angles and pocket milling of round corners and slots.

/ : For creating mirroring.

/ : For flipping the board upward/downward/leftward/rightward.

: For rotating the board.

: For managing the layers and layer attributes, such as color.

1.3.2 Controller

The layout of the **Controller** screen is shown below:
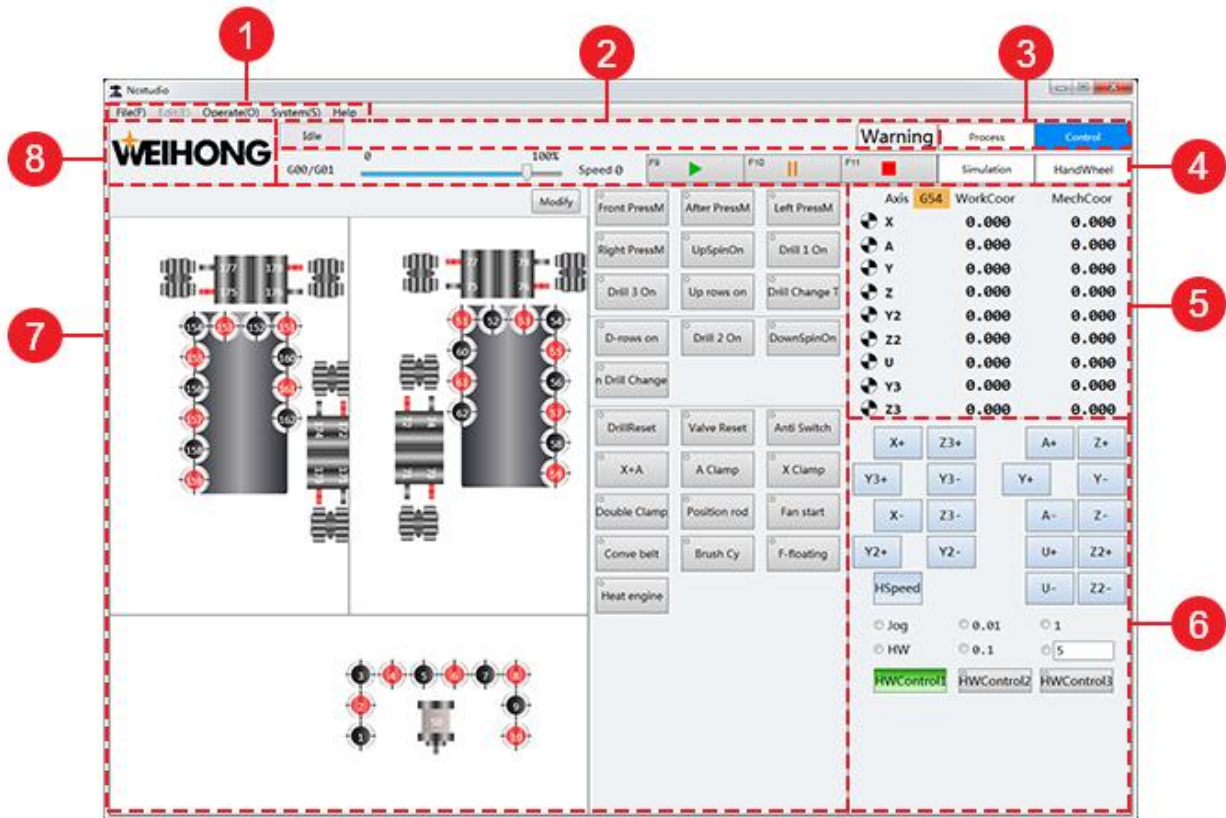
1. <u>Menu Bar</u> 2. <u>Status Bar</u> 3. <u>Screen Switch</u> 4. <u>Machining Operation Bar</u> 5. <u>Axis Coordinate Area</u> 6. <u>Axis Direction and Mode Selection Area</u> 7. <u>Valve Control Area</u> 8. WEIHONG logo

1.3.2.1 Menu Bar

In the menu bar, you can:
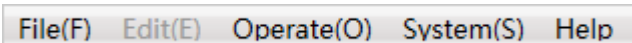
- **File**: <u>Load a Machining File</u>, close/restart the system, restart the software, and <u>Create Installation Package</u>, etc.
- **Operate**: <u>Execute Simulation</u>, <u>Change I/O Port Polarity</u>, <u>Edit Drills</u>, <u>Set Datum</u>, etc.
- System: <u>View the Log</u>, <u>Change the Password</u>, back up and restore parameter settings, <u>Check Tool Lifespan</u>, <u>View Machining Statistics</u>, and <u>Board Measurement</u>.
- **Help**: Check the system information and remaining time, and <u>Register the Software</u>.

1.3.2.2 Status Bar

Displays the following information:

- Current system status: running, idle, or emergency stop
- System prompts or alarms

Double-click the blank area to open the **Log** dialog box and <u>View the Log</u>.

1.3.2.3 Screen Switch
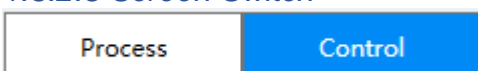
Click the **Process/Control** tab in the upper right corner to switch between the screens.

1.3.2.4 Machining Operation Bar

You can adjust the feed rate, start/pause/stop the machining process, execute simulation, and use the handwheel to guide machining.

: Feedrate adjustment slider
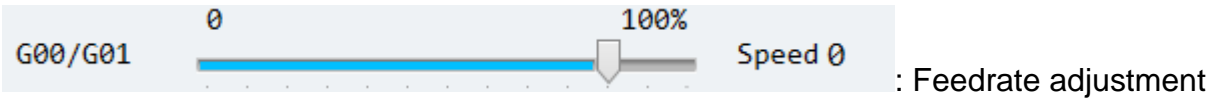
: Start machining

: Pause machining

: Stop machining

: Execute simulation

: Use handwheel

1.3.2.5 Axis Coordinate Area

Shows the name of the current workpiece coordinate system, and the mechanical and workpiece coordinates of the axes.

After an axis goes to the machine origin, the icon will be displayed before the axis.

1.3.2.6 Axis Direction and Mode Selection Area

X+	Z3+		A+	Z+
Y3+	Y3-		Y+	Y-
X-	Z3-		A-	Z-
Y2+	Y2-		U+	Z2+
HSpeed			U-	Z2-

○ Jog   ○ 0.01   ○ 1
○ HW   ○ 0.1   ○ 5
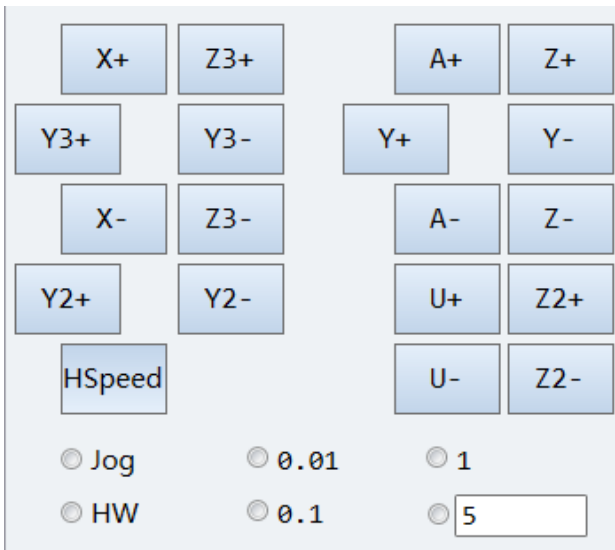
Includes the following functions:

- Axis direction buttons: For control of the axis movement in the positive and negative directions.
- Mode selection:
    - **Jog**
        - Continuous low-speed movement: Click and hold an axis direction button to make the axis move at a relatively lower speed continuously until the button is released.
        - Continuous high-speed movement: Highlight the **HSpeed** button. Click and hold an axis direction button to make the axis move at a relatively higher speed continuously until the button is released.
    - **HW**: Use a handwheel to control the axis movement.
      Rotate the axis dial and multiplier dial of the hand wheel to select the target axis and movement multiplication ratio. Rotate the biggest control dial by certain degrees. The selected axis moves in the target direction.
    - **Step**: In **Step** mode, you need to select or specify a step value.
      The axis moves by the specified step in the target direction after the axis direction button is clicked.

⚠️ **Caution**

Do not set the step to a very large value or click an axis direction button too quick. Otherwise, the machine may be damaged due to misoperation.

1.3.2.7 Valve Control Area
Includes the valve control buttons and drilling package display area.
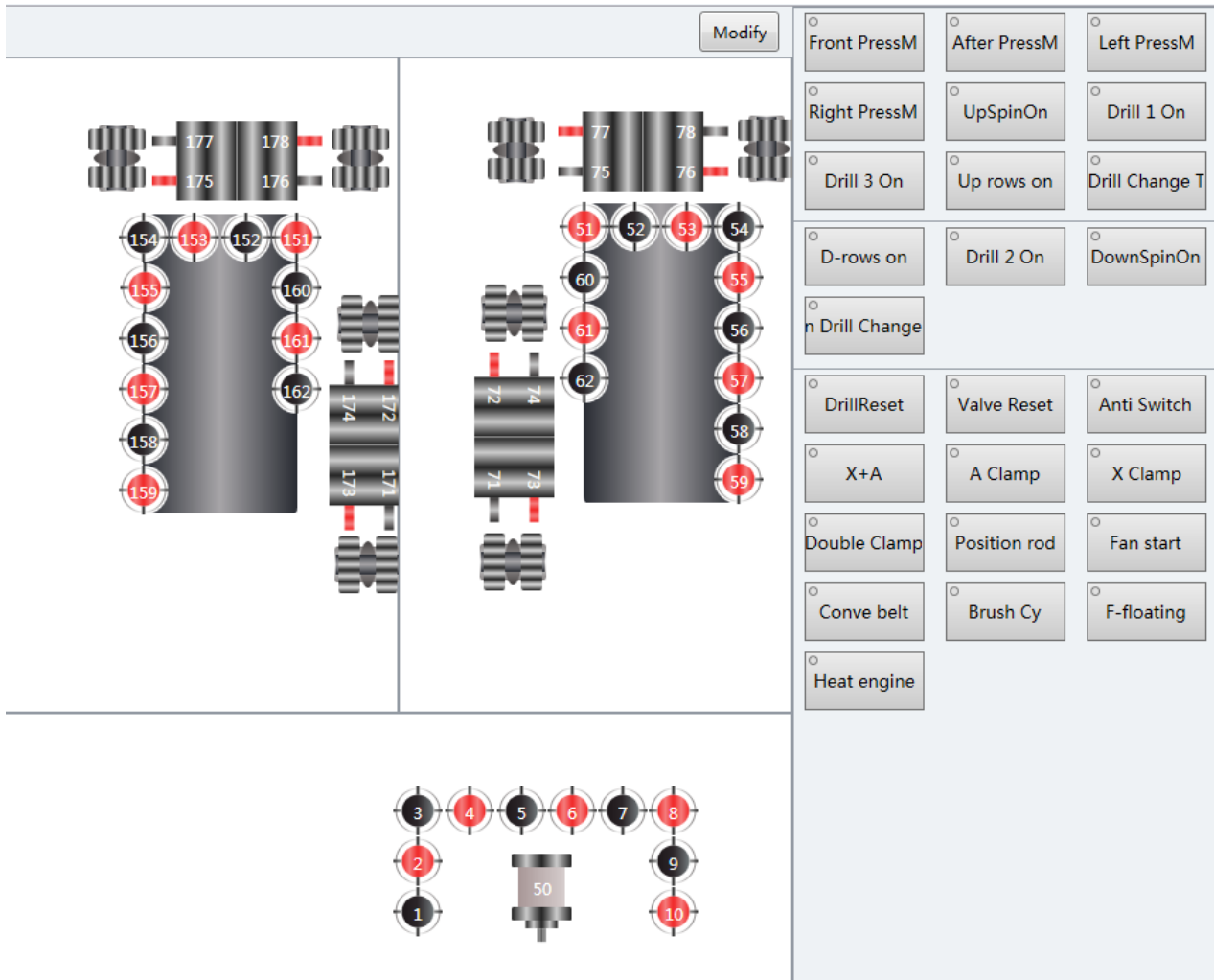
You can edit the drilling package display area based on the actual situation.

1.4 Machine Structure

The main components are the clamp, drilling packages, and side leaning mechanism. The structure of the left part is shown below:
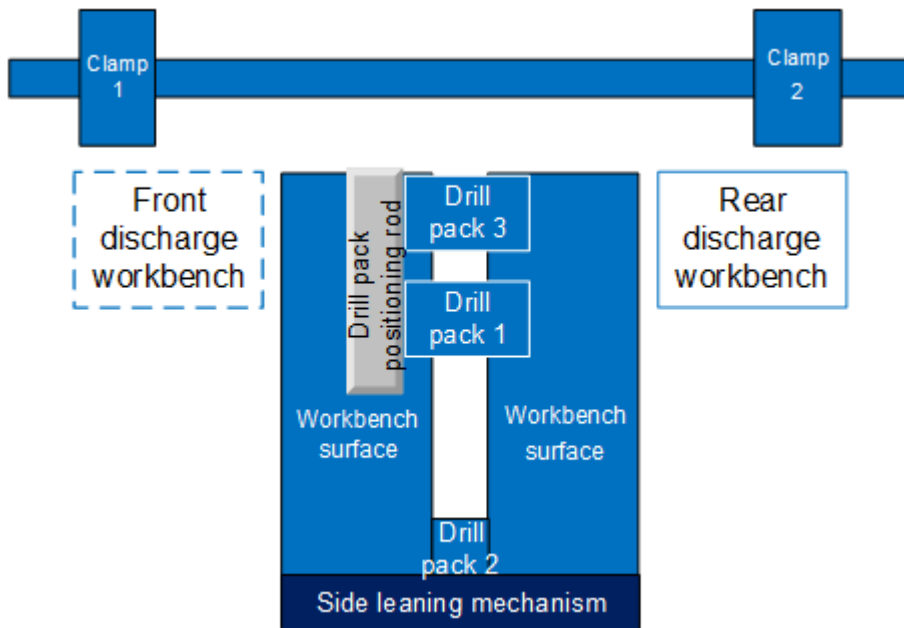
1. Clamp: One or two clamps (clamp 1 and clamp 2) are used to hold the board and make it move in the X1 and X2 directions.
2. Drilling packages: Used to process the board. Include drilling package 1, 2, and 3. The types of drills in the packages include vertical drill, spindle drill, upper and lower horizontal drills, left and right horizontal drills, X drill, Y drill, side drill, milling tool, etc.
3. Side leaning mechanism: Used to secure the board during machining and measure the Y-axis width. The corresponding axis is axis U.

2 Wiring

This section introduces the signals supported by the **NcStudio Phoenix Nine Axis Six-Side Drilling System** and the port definitions to help you in wiring.

2.1 Port Definition

This section introduces the port definitions of NC65C, Lambda 21B, and EX series terminal boards.

2.1.1 NC65C

The appearance and structure of NC65C are shown below:
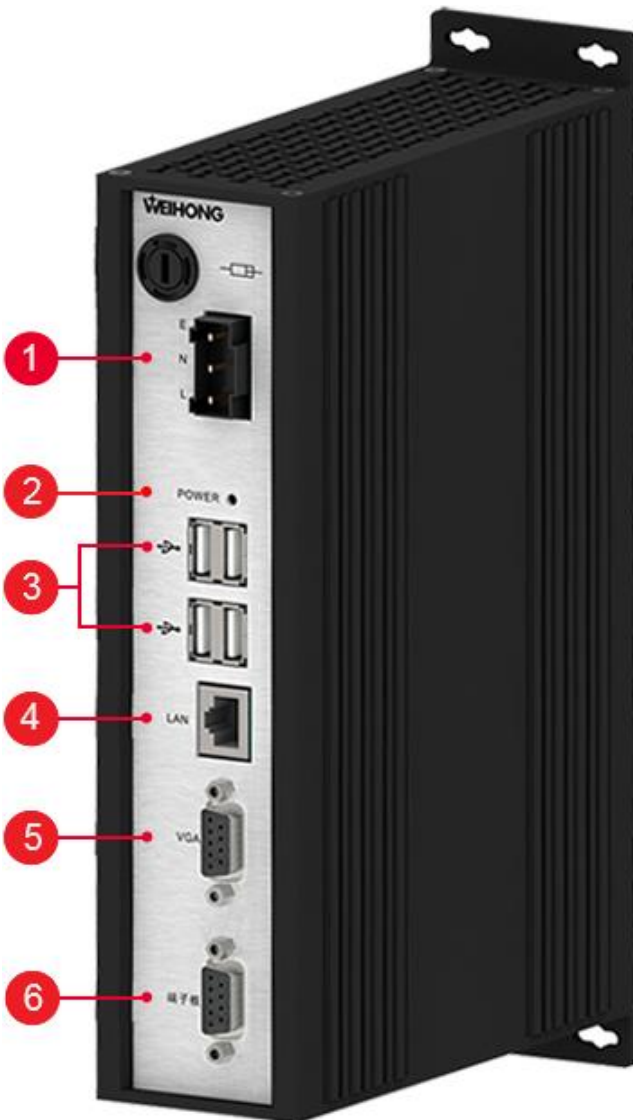
1. LNE (live, neutral, and earth) port 2. Indicator 3.USB 2.0 port ×4 4. Network cable port 5. VGA port 6. Terminal board port

Port	Function
LNE	Connect to a 220V power supply
Indicator	Power indicator

Port	Function
USB 2.0 ports	USB data transmission
Network cable port	Connect to a network. Its transmission rate is 100 Mbps.
VGA port	Connect to a display
Terminal board port	Connect to the Lambda controller

2.1.2 Lambda 21B

Lambda 21B can connect to multiple EX35A terminal boards. An example of the port definition of the Lambda controller is shown below:
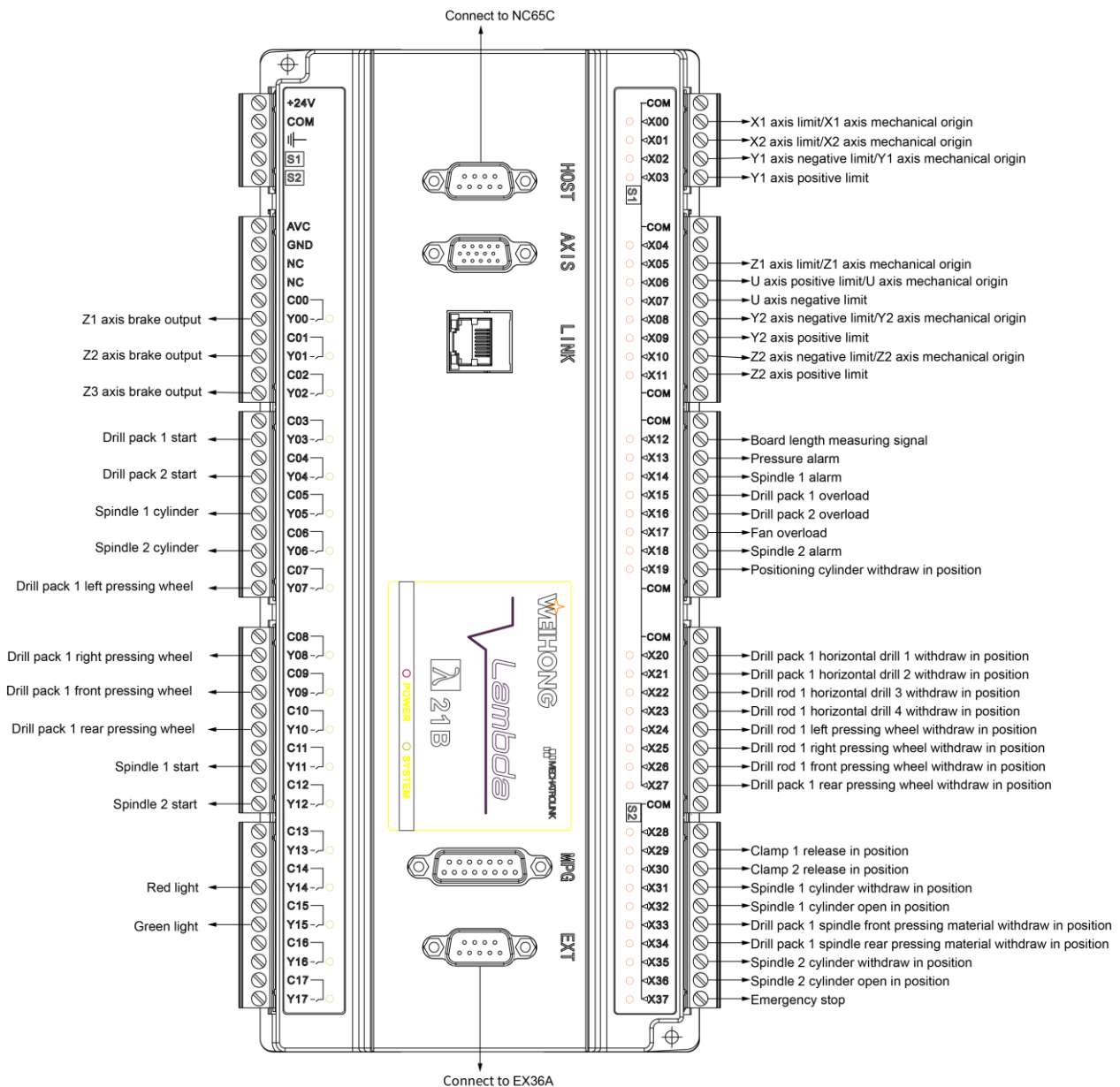
2.1.3 EX Series Terminal Board

Select an extension terminal board based on your needs:

- EX35A: Supports 35-channel output
- EX36A: Supports 32-channel output

The following section introduces the port definitions in a case that a Lambda 21B controller is connected to an EX36A terminal board, which in turn is connected to two EX35A terminal boards.

Connect to EX 36A

Vertical drill 1 (2# drill pack)
Vertical drill 2 (2# drill pack)
Vertical drill 3 (2#drill pack)
Vertical drill 4 (2#drill pack)
Vertical drill 5 (2#drill pack)
Vertical drill 6 (2#drill pack)
Vertical drill 7 (2#drill pack)
Vertical drill 8 (2#drill pack)
Vertical drill 9 (2#drill pack)
Vertical drill 10 (2#drill pack)
Clamp 1 hold
Clamp 1 release
Clamp 2 hold
Clamp 2 release
Positioning cylinder
Drill pack 1 spindle front pressing material

Vertical drill 1 (1#drill pack)
Vertical drill 2 (1#drill pack)
Vertical drill 3 (1#drill pack)
Vertical drill 4 (1#drill pack)
Vertical drill 5 (1#drill pack)
Vertical drill 6 (1#drill pack)
Vertical drill 7 (1#drill pack)
Vertical drill 8 (1#drill pack)
Vertical drill 9 (1#drill pack)
Vertical drill 10 (1#drill pack)
Vertical drill 11 (1#drill pack)
Vertical drill 12 (1#drill pack)
Horizontal drill 1 (1#drill pack)
Horizontal drill 2 (1#drill pack)
Horizontal drill 3 (1#drill pack)
Horizontal drill 4 (1#drill pack)

Connect to EX35A

2.2 Signal Type

The following signal types are supported:

- Switch Value Input Signal
- Relay Output Signal
- Analog Output Signal

2.2.1 Switch Value Input Signal

The switch value input signal supports active high and active low:

- Connecting to the COM port in NO mode means to receive signal.
- Disconnecting with the COM port in NC mode means to receive signal.

The figure is as follows:
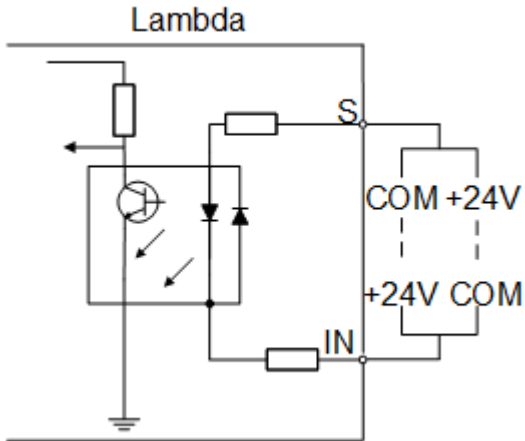
The input port supports active high and active low:

- When the common port S of the Lambda controller is connected to the COM port, inputs are active in high voltage.
- When the common port S of the Lambda controller is connected to +24V, inputs are active in low voltage.

2.2.2 Relay Output Signal

The Lambda controller outputs relay signals.

The load capacity of relay output contact points is AC 7A/250V or DC 7A/30V. If high power load is needed, a contactor should be connected as follows:
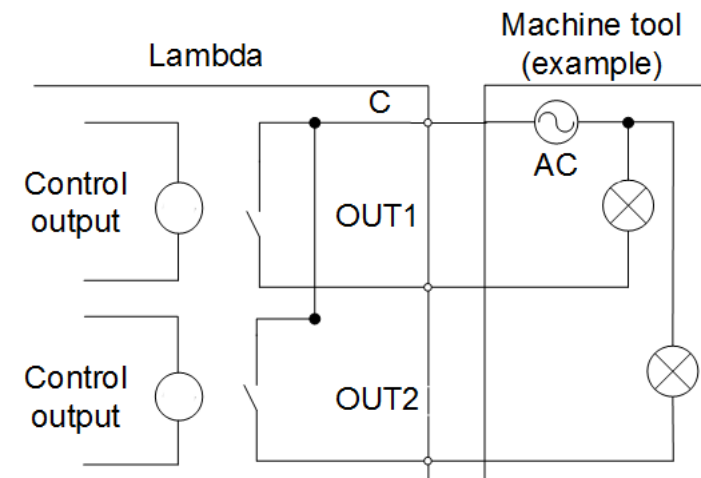
2.2.3 Analog Output Signal

The AVC port, externally connected to the inverter's analog voltage frequency command input port, can output controllable voltage from 0V to 10V. By changing the voltage, it controls the inverter frequency and in turn the spindle speed.

The figure is as follows:
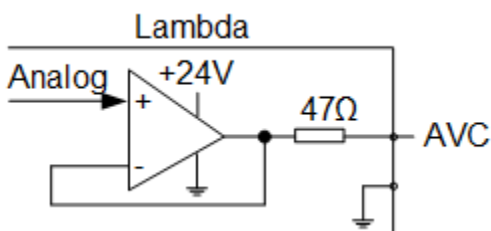
3 System Debugging

3.1 Overview

This section introduces a debugging process for the **NcStudio Phoenix Nine Axis Six-Side Drilling System**.

If a password is required during debugging, please contact the manufacturer.

The debugging process is shown below:
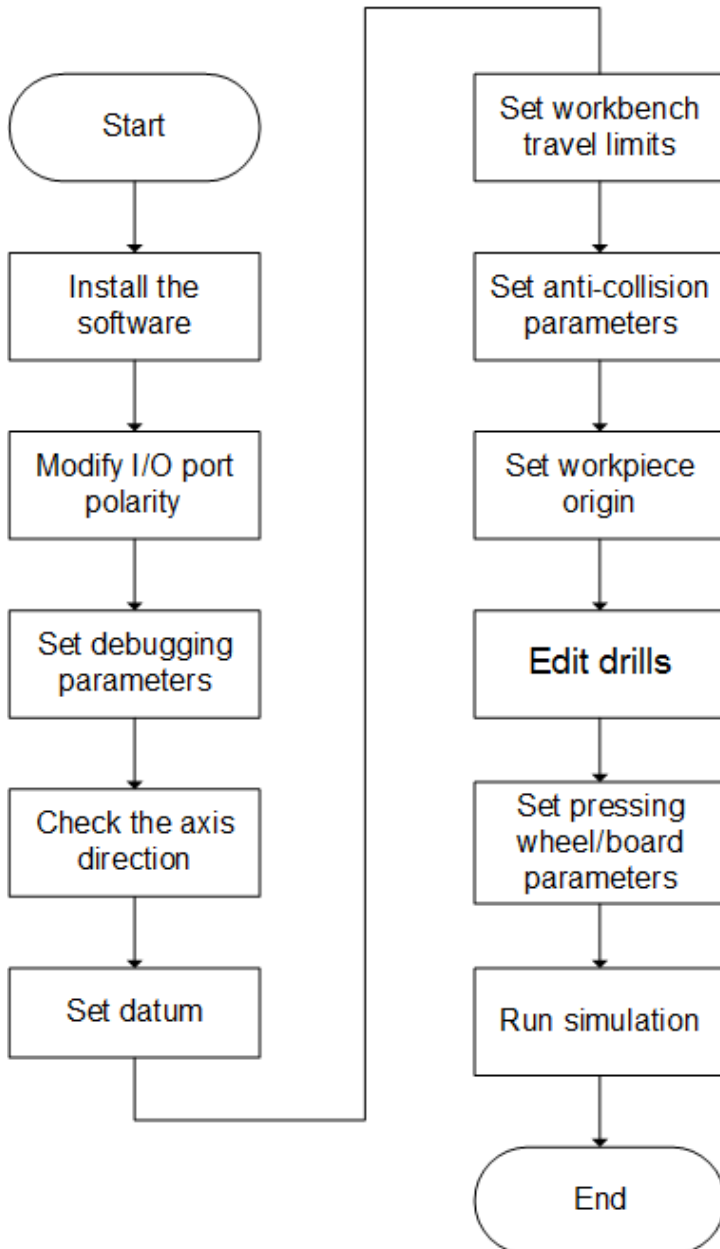
The operations above can be executed in both the **Process** and **Control** screens if no information is mentioned indicating otherwise.

3.2 Install the Software

This section introduces how to install the **NcStudio Phoenix Nine Axis Six-Side Drilling System**.

Prerequisite:

The software installation package is stored on the computer.

Procedures:

1. Decompress the installation package. Double-click . Follow the displayed installation wizard.
2. Set the installation language to **English**. Deselect **Keep manufacturer parameters** or **Keep local user parameters** based on your needs.
3. (**Optional**): Check **Enable automatic startup** and select **Complete startup (initialize the desktop first and the software next)** or **Start software only**.
4. Click **Next**. Check your settings and click **Next**. The software installation process starts.
   After the installation is complete, a message will be displayed, indicating installation success.
   Double-click the desktop icon to open the software.

3.3 Change I/O Port Polarity

After the software is started normally, modify the port polarity based on the detection switch and limit switch type:

- ✦ Set the port polarity of normally closed switches to NC.
- ✦ Set the port polarity of normally open switches to NO.

The mapping between the port state and icons are shown below:

- ✦ Input port: 🔴 No signal detected; 🟢 Signal detected

- ✦ Output port: ⭕ No signal detected; ⭕ Signal detected

Procedures:

1. In the menu bar, go to **Operate** > **Port**.
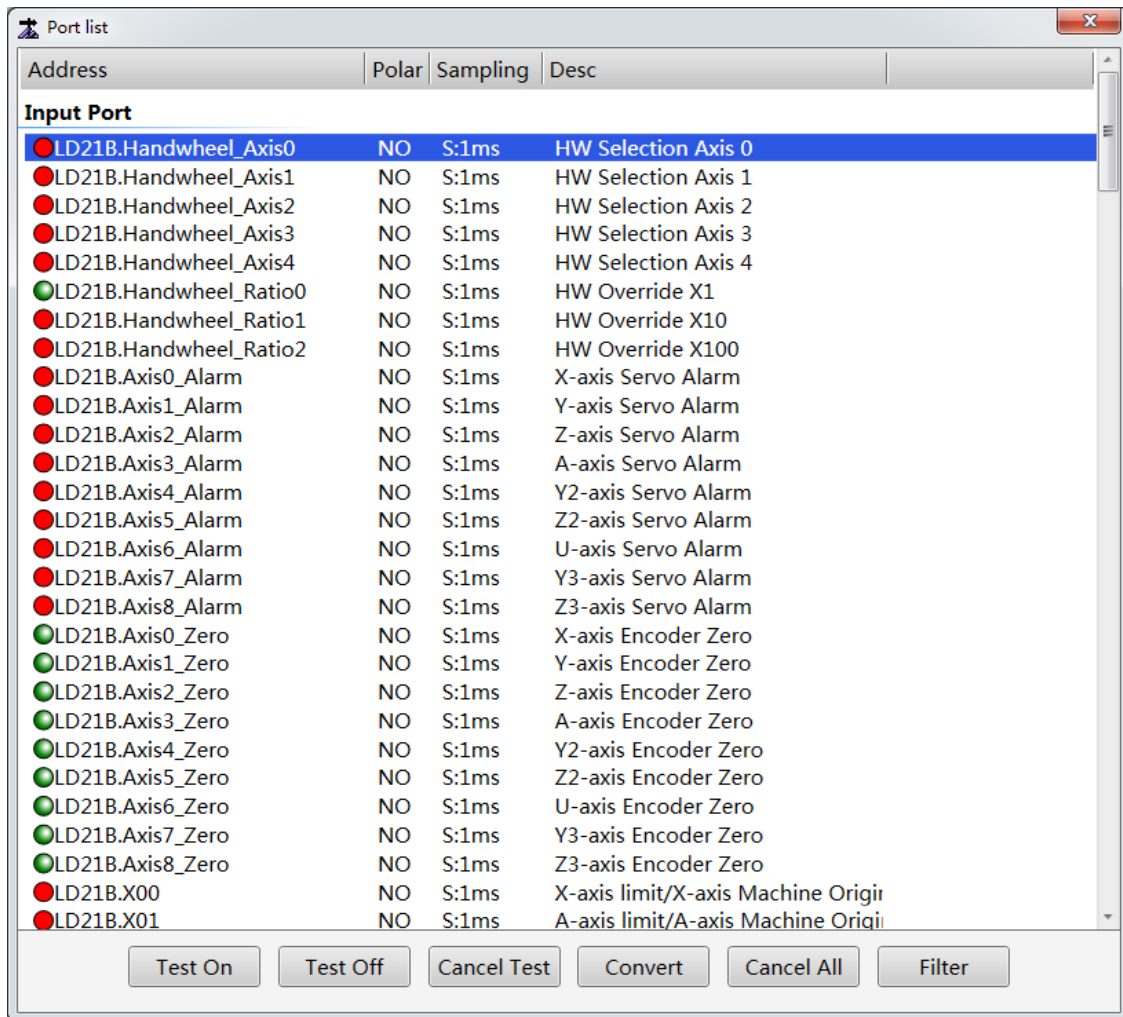
2. In the **Port list** dialog box, select the target port and click the **Convert** button to set its polarity to NC/NO.
3. After the polarity of a port is modified, you can use the following functions based on your requirements:
   o To test if a port has output signals, click **Test On/Test Off**.
   o To cancel a port test, click **Cancel Test**.
   o To cancel all port tests, click **Cancel All**.
4. (**Optional**): To set sampling interval, follow the steps below:
   a. Click **Filter**.
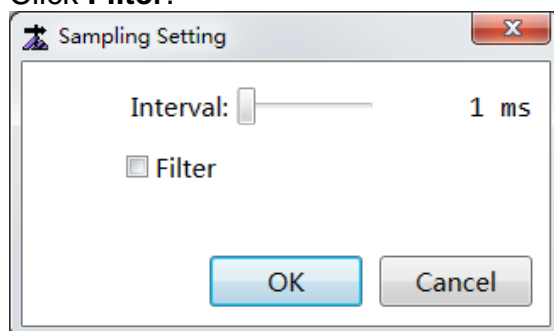
   b. In the **Sampling Setting** dialog box, drag the **Interval** slider.

If the box before **Filter** is checked, the system will rule out signals whose duration is shorter than the interval.

3.4 Set Debugging Parameters

You need to set the debugging parameters to avoid damage caused by improper movement.

Procedures:

1. In the menu bar, go to **System** > **Global Parameters**.
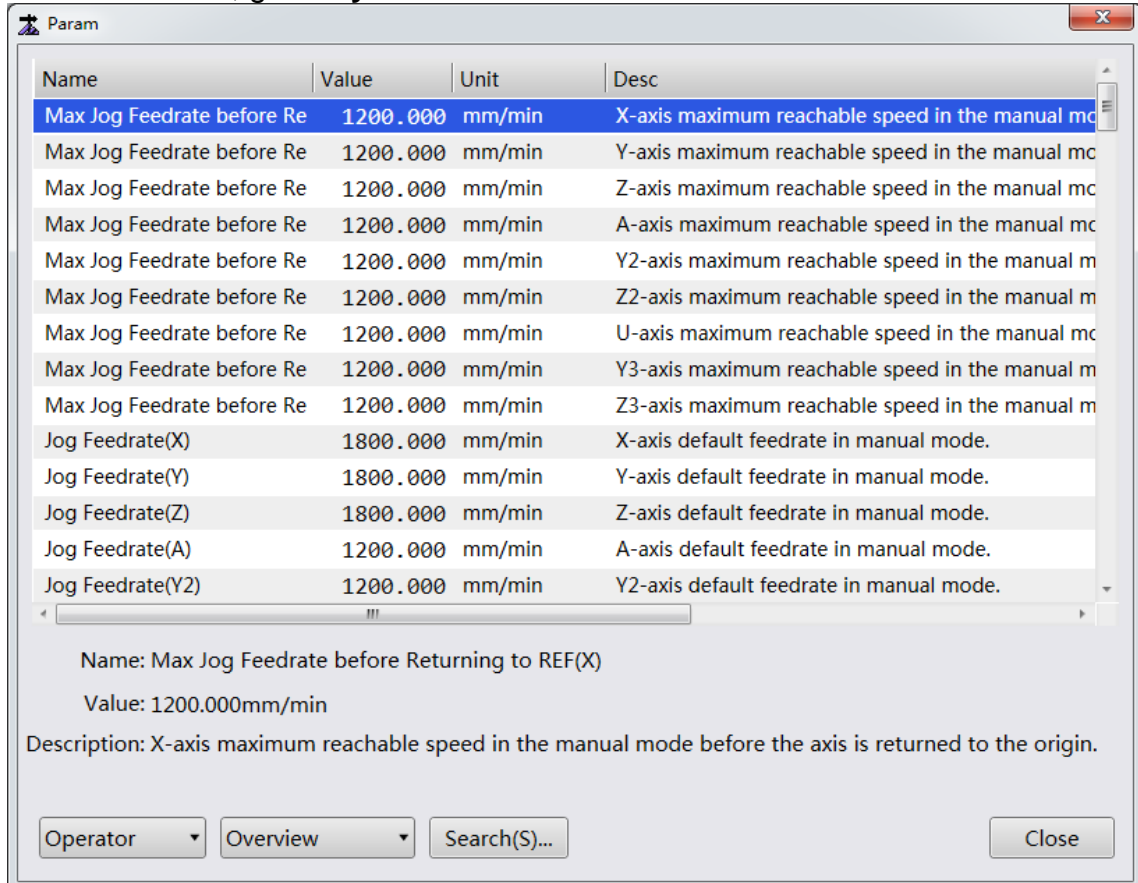
2. In the **Param** dialog box, click the first pull-down menu in the lower left corner and select **Manufact**.
3. Click the second pull-down menu in the lower left corner and select **Axis**. Set the following parameters:

Parameter	Description
Handwheel Direction	Indicates the direction of the axis encoder. 1: positive; -1: negative.
Encoder digits	Indicates the number of the encoder digits. Range: 10–30.
Electronic gear ratio(numerator)/electronic gear ratio(denominator)	Determines if the servo drive enlarges or shrinks the frequency sent from the upper computer. If the ratio is larger than 1: enlarging; if the value is smaller than 1: shrinking.

Parameter	Description
Pitch	Indicates the distance or angle change by the axis every lead screw turn.

4. Double-click the target parameter row. An input box is displayed.
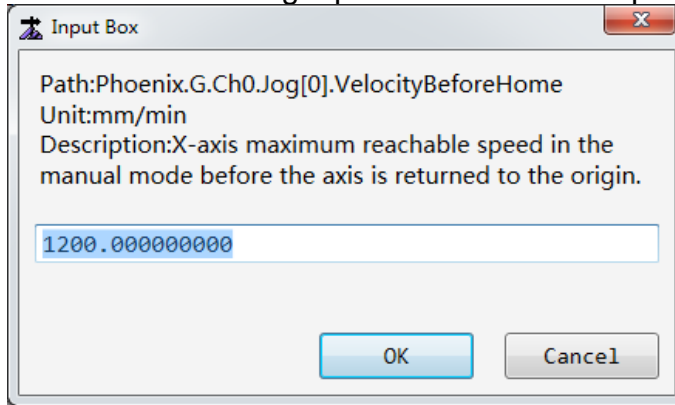
5. Enter the desired value in the field and click **OK**.

3.5 Check Axis Direction

Determine the positive direction for each axis with the right hand rule. The purpose is to avoid machine damage caused by axis moving in the wrong direction.

Operations for checking each axis direction are similar and this section takes those for the X axis as an example.

Procedures:

1. (**Optional**): Click in the upper right corner to switch to the **Control** screen.
2. Determine the X-axis positive direction based on the right hand rule
3. In the menu bar, go to **System** > **Global Parameters**.
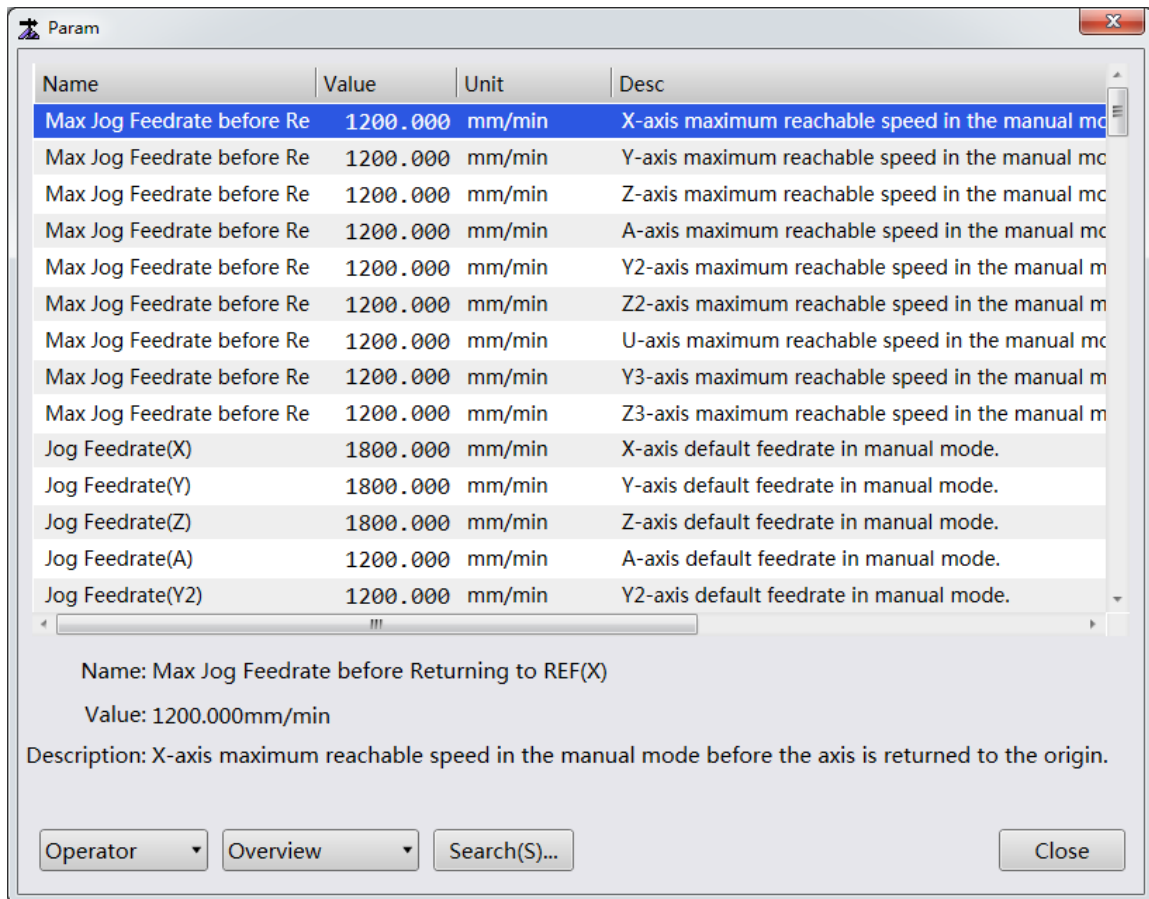
4. In the **Param** dialog box, click the first pull-down menu in the lower left corner and select **Manufact**. Click the second pull-down menu in the lower left corner and select **Axis**. Check the value of **Axis Direction(X)**:
   - 1: positive
   - -1: negative
5. In **Jog** or **Step** mode, click the **X+** button. Check to see if the X axis moves in the positive direction as determined by the right hand rule.
   - Yes: The axis direction is correct.
   - No: Set **Axis Direction(X)** to opposite of its current value.

3.6 Set Datum
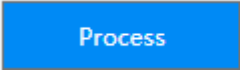
If an absolute encoder is used, its datum can be directly set and no need of going to the mechanical origin.

In cases of system reboot, power cut, or emergency stop, the system reads the datum automatically and there is no need of datum resetting. However, datum resetting is required if the drive or motor is replaced.

Prerequisite:

- The hardware is properly connected.
- The axis directions are correct.
- There is an anti-collision model in the software.

Procedures:

1. (**Optional**): Click [Process | Control] in the upper right corner to switch to the **Control** screen.
2. Control the target axis to move to the target position in **Jog** or **Step** mode.
3. In the menu bar, go to **Operate** > **Datum setting**.
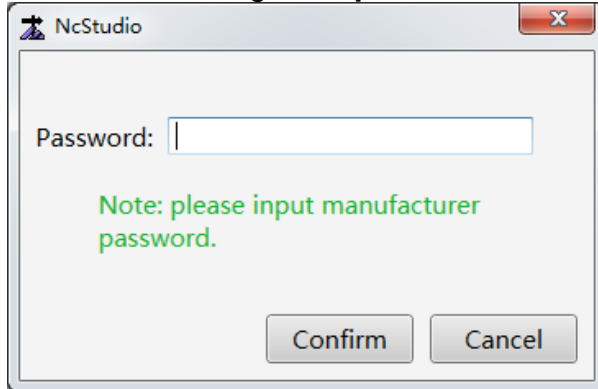
4. In the **NcStudio** dialog box, enter the password and click **Confirm**. The **Datum setting** dialog box is displayed:
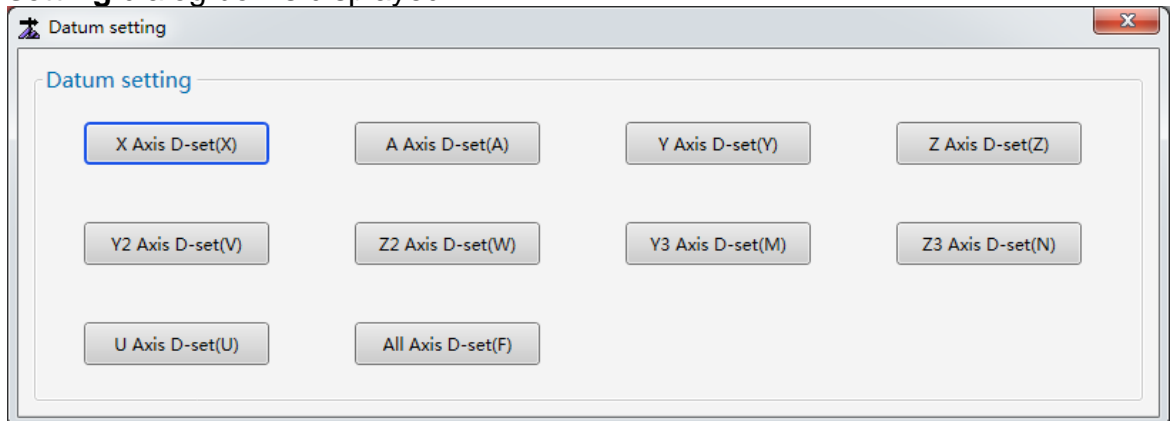
5. Click the corresponding button to set datum for a single axis or all axes.

   After datum is set for an axis, the icon will be displayed before the axis in the axis coordinate area.
6. (**Optional:**) If the set datum does not meet the requirements, you can cancel the datum for a single axis or all axes.
   a. In the menu bar, go to **Operate** > **Datum cancellation**.
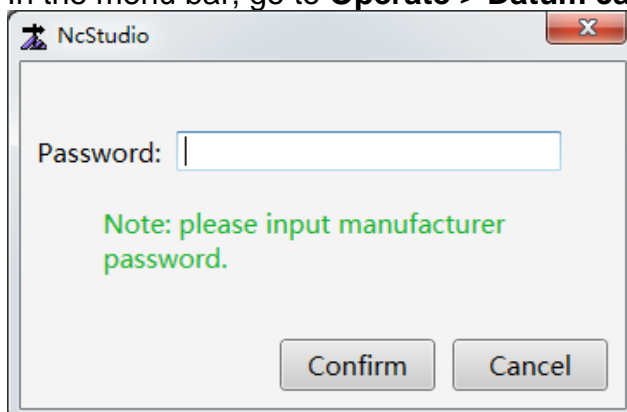
b. In the **NcStudio** dialog box, enter the password and click **Confirm**. The **Datum cancellation** dialog box is displayed:

Datum cancellation

Datum cancel

X Axis D-cancel(X)	A Axis D-cancel(A)	Y Axis D-cancel(Y)	Z Axis D-cancel(Z)
Y2 Axis D-cancel(V)	Z2 Axis D-cancel(W)	Y3 Axis D-cancel(M)	Z3 Axis D-cancel(N)
U Axis D-cancel(U)	All Axis D-cancel(F)		
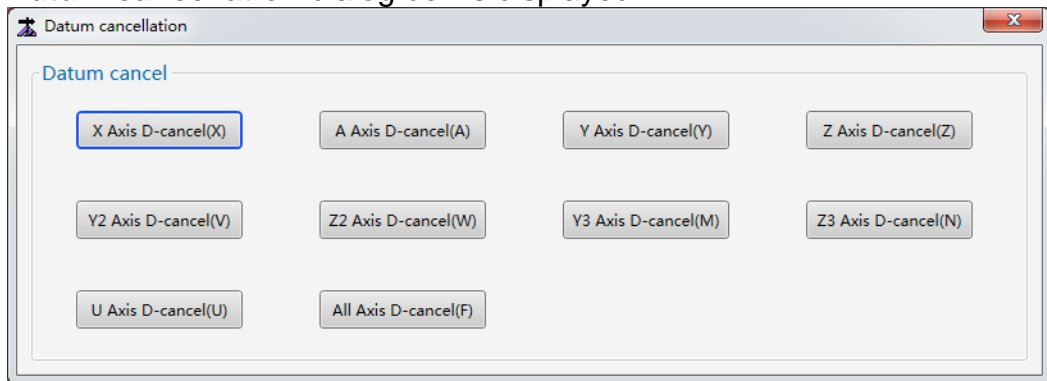
c. Click the corresponding button to cancel the datum for a single axis or all axes.

3.7 Set Workbench Travel Limits

The purpose is to set the travel lower and upper soft limits to restrict machine movement in the X, Y, and Z directions.

If this is the first time that you set the limits, check the actual range of machine movement first to avoid accidents.

Procedures:

1. In the menu bar, go to **System** > **Global Parameters**.

Param

Name	Value	Unit	Desc
Max Jog Feedrate before Re	1200.000	mm/min	X-axis maximum reachable speed in the manual mc
Max Jog Feedrate before Re	1200.000	mm/min	Y-axis maximum reachable speed in the manual mc
Max Jog Feedrate before Re	1200.000	mm/min	Z-axis maximum reachable speed in the manual mc
Max Jog Feedrate before Re	1200.000	mm/min	A-axis maximum reachable speed in the manual mc
Max Jog Feedrate before Re	1200.000	mm/min	Y2-axis maximum reachable speed in the manual m
Max Jog Feedrate before Re	1200.000	mm/min	Z2-axis maximum reachable speed in the manual m
Max Jog Feedrate before Re	1200.000	mm/min	U-axis maximum reachable speed in the manual mc
Max Jog Feedrate before Re	1200.000	mm/min	Y3-axis maximum reachable speed in the manual m
Max Jog Feedrate before Re	1200.000	mm/min	Z3-axis maximum reachable speed in the manual m
Jog Feedrate(X)	1800.000	mm/min	X-axis default feedrate in manual mode.
Jog Feedrate(Y)	1800.000	mm/min	Y-axis default feedrate in manual mode.
Jog Feedrate(Z)	1800.000	mm/min	Z-axis default feedrate in manual mode.
Jog Feedrate(A)	1200.000	mm/min	A-axis default feedrate in manual mode.
Jog Feedrate(Y2)	1200.000	mm/min	Y2-axis default feedrate in manual mode.

Name: Max Jog Feedrate before Returning to REF(X)

Value: 1200.000mm/min

Description: X-axis maximum reachable speed in the manual mode before the axis is returned to the origin.

Operator ▼   Overview ▼   Search(S)...   Close

2. In the **Param** dialog box, click the first pull-down menu in the lower left corner and select **Manufact**. Set **Check Worktable Stroke** to **Yes** to enable the travel limits.
3. Set the following parameters based on actual situation:
   o **Upper Limit of Worktable Stroke**: The mechanical coordinate of the upper limit.
   o **Lower Limit of Worktable Stroke**: The mechanical coordinate of the lower limit.

3.8 Set Anti-collision Parameters

Set anti-collision parameters to avoid collision between the drilling package and clamps and between clamp 1 and clamp 2.

Procedures:

1. (**Optional**): Click [Process | Control] in the upper right corner to switch to the **Control** screen.
2. In the menu bar, go to **System** > **Global Parameters**.
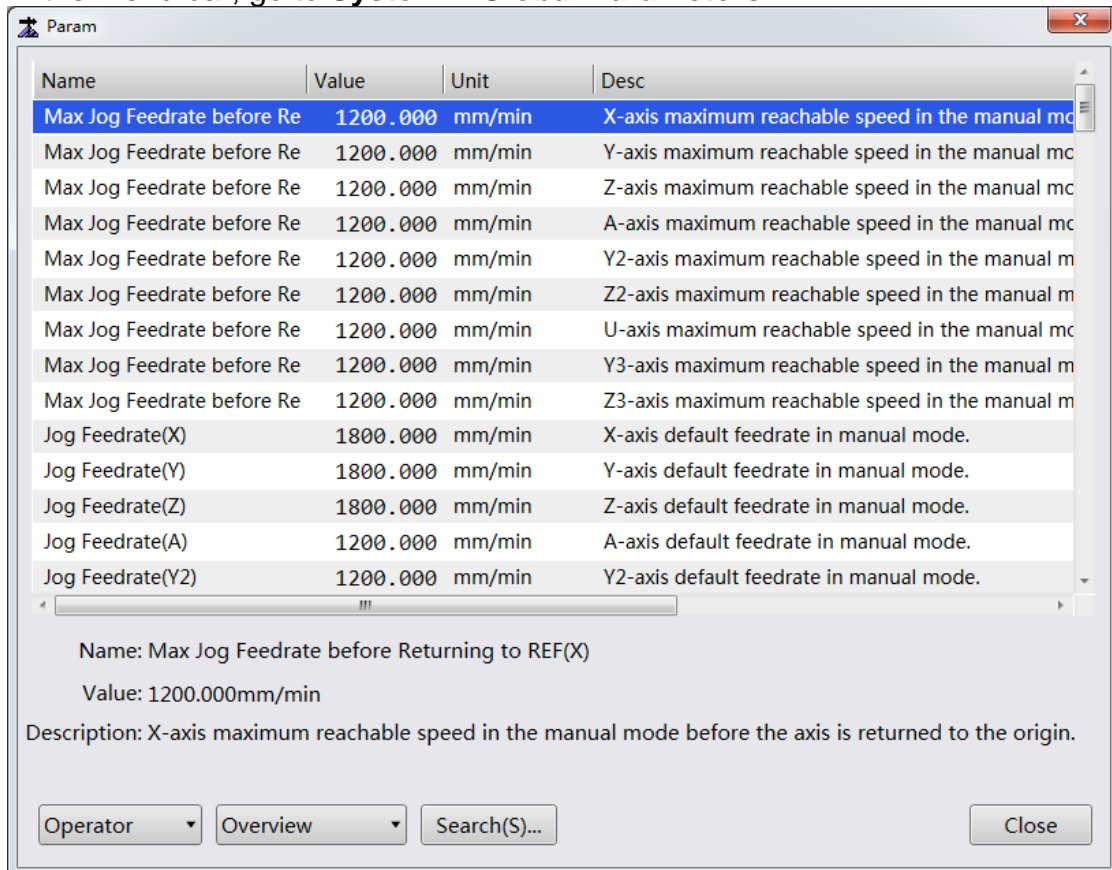
3. Click the second pull-down menu in the lower left corner, select **Anti-collision** and set related parameters:
   o **Minimum distance of double gripper**: The minimum distance between the closest sides of the two clamps during manual movement control. If the distance between the two clamps becomes smaller than this value, a soft position limit alarm will be reported. In this case, you need to manually control the clamps to move away from each other.

Minimum distance between two clamps
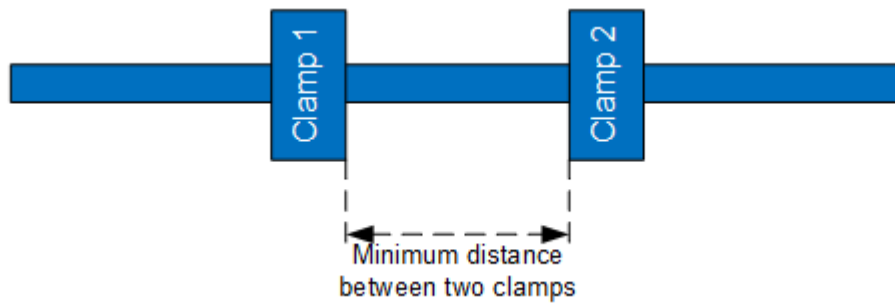
- **Clamp/gripper length**: The actual length of the clamp
- **Minimum value of axis A in anti collision zone between drill bag and gripper**: The minimum workpiece coordinates of axis A within the anti-collision zone between the drill package and clamps.
- **Maximum value of axis A in anti collision zone between drill bag and gripper**: The maximum workpiece coordinates of axis A within the anti-collision zone between the drill package and clamps.
- **Minimum value of x-axis in anti collision zone between drill bag and gripper**: The minimum workpiece coordinates of the axis X within the anti-collision zone between the drill package and clamps.
- **Maximum value of x-axis in anti collision zone between drill bag and gripper**: The maximum workpiece coordinates of axis X within the anti-collision zone between the drill package and clamps.
- **Reference distance of double gripper**: The distance between the farthest sides of clamp X and clamp A after the datum is set.
- **X gripper length**: The length of clamp X in the X direction
- **Anti Collision Upper Limit Y3**: The Y3 axis mechanical coordinate upper limit for anti-collision between the upper drill package and clamps
- **Upper limit of Y-axis collision prevention between upper drill bag and gripper**: The Y axis mechanical coordinate upper limit for anti-collision between the upper drill package and clamps
- **Anti Collision Lower Limit Y3**: The Y3 axis mechanical coordinate lower limit for anti-collision between the upper drill package and clamps
- **Lower limit of Z axis for collision prevention between upper drill bag and clamping jaw**: The Z axis mechanical coordinate lower limit for anti-collision between the upper drill package and clamps
- **The upper limit of Z2 axis anti-collision between the down drill bag and the beam**: The Z2 axis mechanical coordinate upper limit for anti-collision between the lower drill package and horizontal beam
- **Upper drill bag length (Y direction)**: The length of the upper drill package in the Y direction.
- **Datum Distance Double UpDrill**: The distance between the farthest sides of drill package Y and drill package Y3 after the datum is set.
- **Min Distance Double UpDrill**: The minimum distance between the closest sides of the two upper drill packages during manual movement control.
- **UpDrill 2 Length**: The length of the upper drill package 2
- **UpDrill And SideView Datum Distance Y3**: The distance between the closest sides of the drill package 3 and the side leaning axis base point in the Y3 axis direction.
- **UpDrill And SideView Datum OffsetY**: The offset between the drill package 1 and side leaning axis based point in the Y axis direction. A positive value

means the side leaning axis is in the front while a negative value means the side leaning axis is in the back.

- o **Side structure length (U direction)**: The length of the side leaning mechanism.
- o **Enable anti-collision check**: Indicates whether to enable anti-collision check.
- o **Anti collision tolerance**: The maximum tolerance for anti-collision auto-check.
- o **Z axis minimum value of interference between upper drilling and side rest**: The lower drill package crosses the side leaning axis. If the Z2 axis coordinate exceeds this value, the lower drill package cannot drill.

3.9 Set Workpiece Origin

The purpose is to set the current point as the workpiece origin, which means to clear the workpiece coordinates of all axes at the current point and set the workpiece offsets to the axis mechanical coordinates.

Procedures:

- ✦ Clear the X Axis
- ✦ Clear the Y Axis
- ✦ Clear the Z Axis
- ✦ Clear the U Axis

3.9.1 Clear the X Axis

The process is shown below:
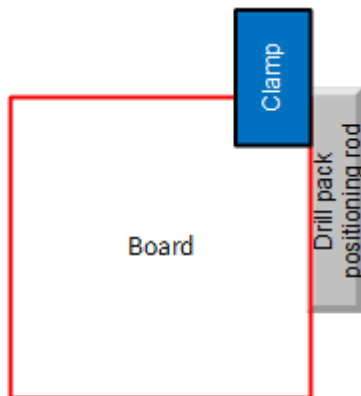
Clear X1 and X2

Procedures:

1. (**Optional**): Click [Process | Control] in the upper right corner to switch to the **Control** screen.
2. In the valve control area, click the **X Clamp** button to align the clamp with a board edge.
3. Lower the positioning cylinder. Move the clamp to make the board lean against the drill package positioning pillar.
4. In the menu bar, go to **Operate** > **Offset**.
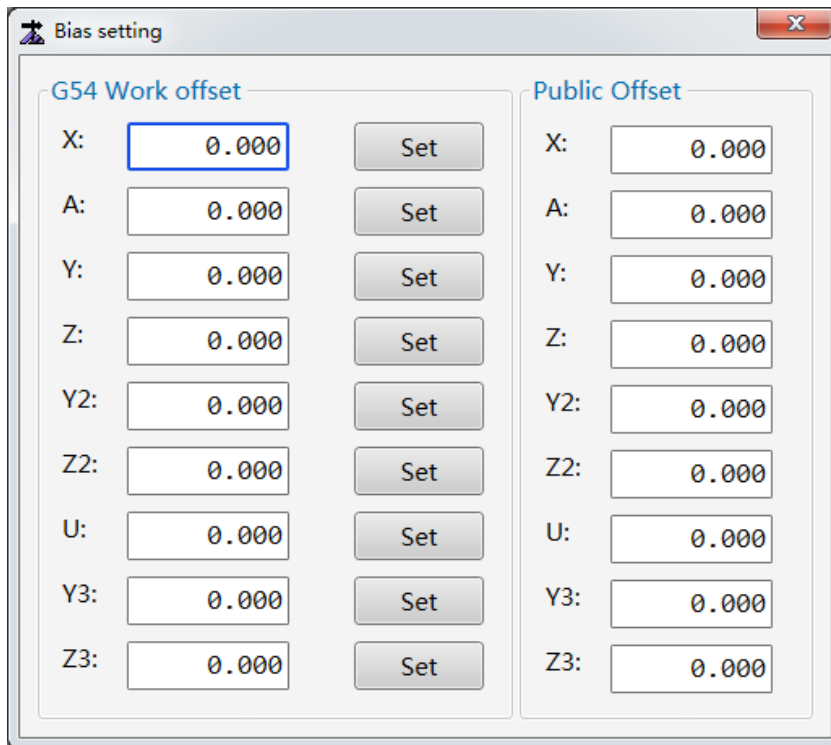
5. In the **Bias setting** dialog box, click the **Set** button behind the X axis in the **G54 Work offset** region.
6. In the displayed message box that requires your confirmation, click **Yes** to complete offset setting.

3.9.2 Clear the Y Axis

The process is shown below:

Clear Y1 and Y2

Procedures:

1. (**Optional**): Click in the upper right corner to switch to the **Control** screen.
2. In the valve control area, click the **X Clamp** or **A Clamp** button to hold the board by its edge and move it to the datum tool.

3. Click to lower the datum tool. Move drill package 1 to align the datum tool center with the board clamp side edge.
4. In the menu bar, go to **Operate** > **Offset**.
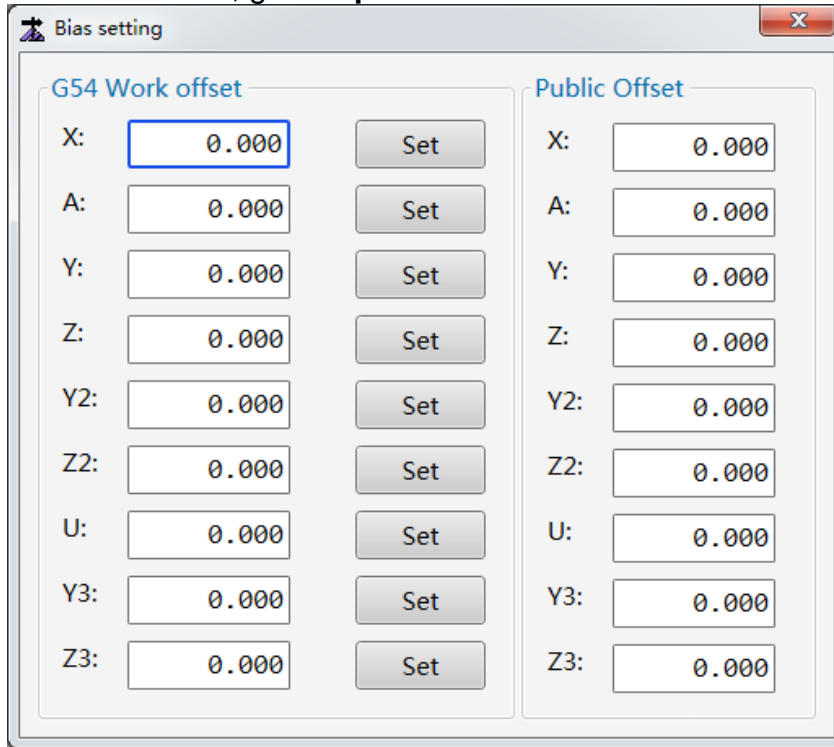
5. In the **Bias setting** dialog box, click the **Set** button behind the Y axis in the **G54 Work offset** region.
6. In the displayed message box that requires your confirmation, click **Yes** to complete offset setting.

Repeat the steps above with drill package 2 and 3 to set offsets for axis Y2 and Y3.

3.9.3 Clear the Z Axis

The process is shown below:
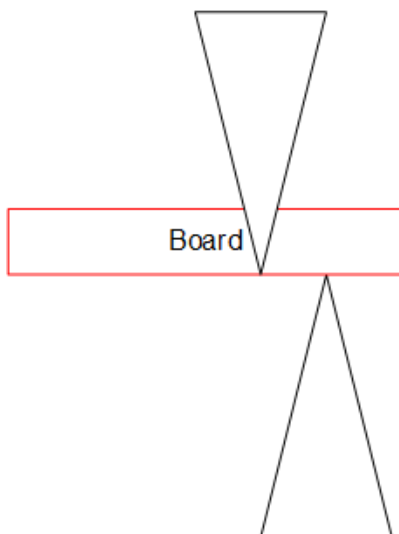
Procedures:

1. (**Optional**): Click [Process | Control] in the upper right corner to switch to the **Control** screen.

2. In the valve control area, click to lower the datum tool and manually control the Z axis to move to the workbench surface.

3. In the menu bar, go to **Operate** > **Offset**.

Bias setting					
G54 Work offset			**Public Offset**		
X:	0.000	Set	X:	0.000	
A:	0.000	Set	A:	0.000	
Y:	0.000	Set	Y:	0.000	
Z:	0.000	Set	Z:	0.000	
Y2:	0.000	Set	Y2:	0.000	
Z2:	0.000	Set	Z2:	0.000	
U:	0.000	Set	U:	0.000	
Y3:	0.000	Set	Y3:	0.000	
Z3:	0.000	Set	Z3:	0.000	
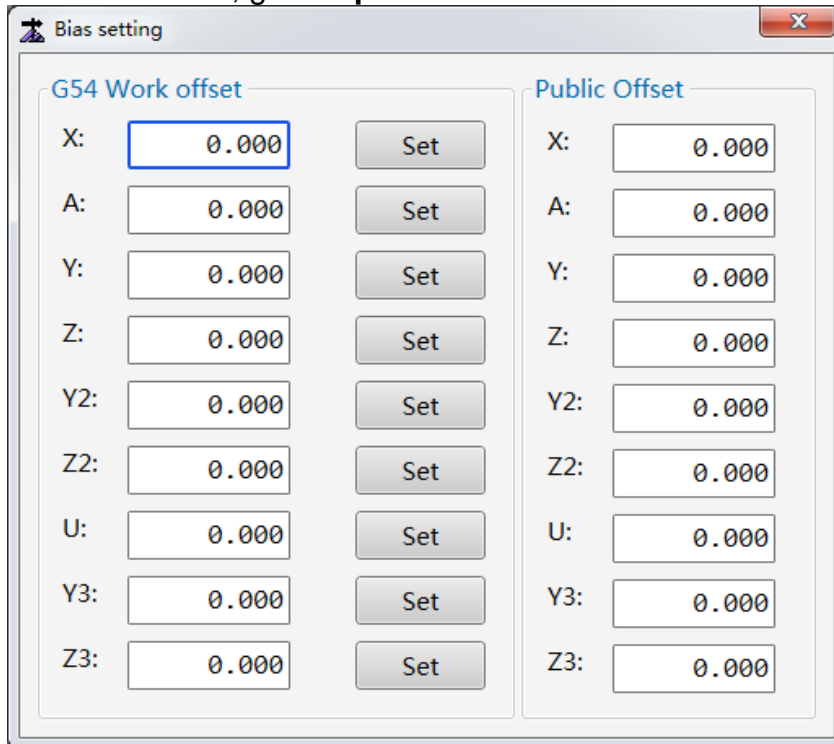
4. In the **Bias setting** dialog box, click the **Set** button behind the Z axis in the **G54 Work offset** region.
5. In the displayed message box that requires your confirmation, click **Yes** to complete offset setting.

Repeat the steps above with drill package 2 and 3 to set offsets for axis Z2 and Z3.

3.9.4 Clear the U Axis

The process is shown below:

Procedures:

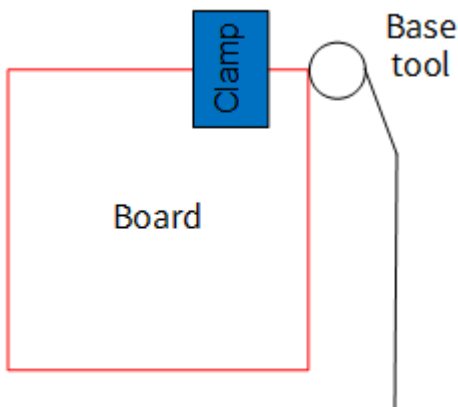1. (**Optional**): Click [Process | Control] in the upper right corner to switch to the **Control** screen.
2. In the valve control area, click the **X Clamp** or **A Clamp** button to hold the standard board.
3. Manually control the side leaning mechanism to touch the board tightly and record the current coordinate U.
   If the board width is 400 mm, the U-axis offset = U-400.
4. In the menu bar, go to **Operate** > **Offset**.
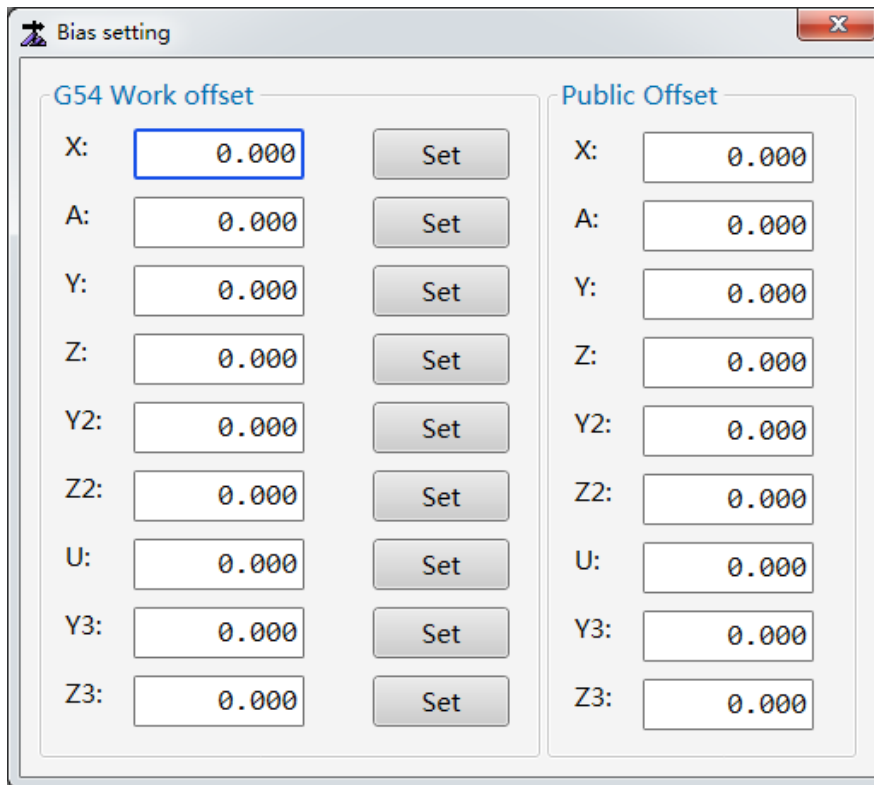
5. In the **Bias setting** dialog box, click the **Set** button behind the U axis in the **G54 Work offset** region.

6. In the displayed message box that requires your confirmation, click **Yes** to complete offset setting.

3.10 Edit Drills

You can add and arrange drills in the upper and lower drill packages and set related parameters.

A drill package can include:

Drill	Description
Vertical drill	For machining of vertical holes
Spindle	For machining of slots and lamello, and pocket milling.
Cross drill	For machining of front and rear side holes.
Left and right cross drill	For machining of left and right side holes.
XSaw	For machining of lamello in the X axis direction.

Drill	Description
YSaw	For machining of lamello in the Y axis direction.
SideSaw	For machining of lamello on the sides.
MillingTool	For milling lamello once or twice
Left milling cutter	For milling of lamello on the right.
Right milling cutter	For milling of lamello on the left.
Upper milling cutter	For milling of lamello on the back.
Lower milling cutter	For milling of lamello in the front.

Procedures:

1. In the menu bar, go to **Operate** > **Drill Edit**. Enter the password.
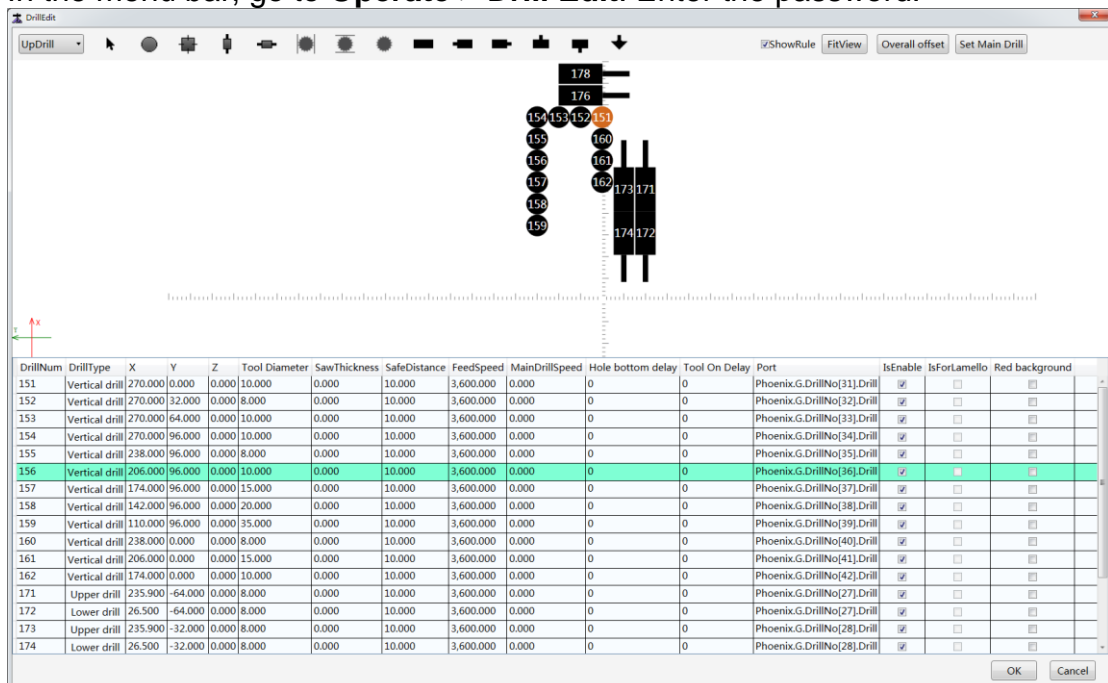
2. In the displayed **DrillEdit** window, click the pull-down menu in the upper left corner to select the drill package you want to edit.
3. Different types of drills are displayed on the top. Select the target drill and click on the target position to add the drill to the position.

4. (**Optional**): To move a drill, double-click on the corresponding field and enter the desired values.
5. Set the parameters based on the drill number:

Parameter	Description
X/Y/Z	The drill/spindle offset in the X/Y/Z axis direction.
Tool Diameter	The drill or spindle tool diameter.
SafeDistance	The required minimum distance between each tool. Machining is not allowed if the distance between tools is smaller than the safe distance.
FeedSpeed	The tool speed during machining.
Hole bottom delay	The duration that a tool stays on a hole bottom.
Port	The output port of each tool.

6. Click **OK** to save your settings.
7. You can uncheck the **IsEnable** box of a drill to disable it.
8. (**Optional**): To show the drill view in the middle, click the **FitView** button on the top side.

Related tasks:

- Arranging the table by a certain parameter value in ascending/descending order
  - Click a parameter name to arrange the table by the column values in ascending order.
  - Click the parameter name again to arrange the table by the column values in descending order.
- Setting a drill as the base/main drill

  a. Click the target drill shape. It turns green 51 .
  b. Click the **Set Main Drill** button on the top. The X, Y, and Z values of the selected drill become 0.
  c. Click **OK** to save your settings.
- Setting offsets for all drills
  a. Click the **Overall offset** button on the top. The **Overall offset drilling package** dialog box is displayed:
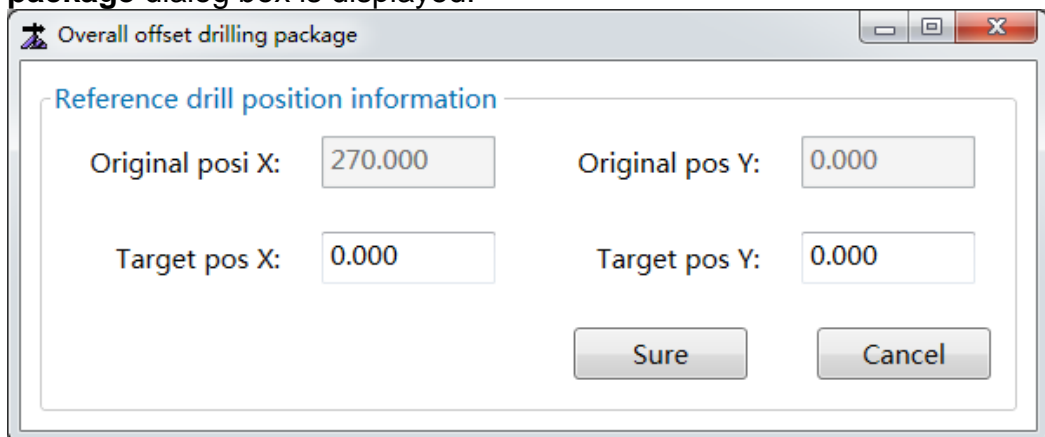
    b. Enter the target position X and Y coordinates for the base/main drill and click **Sure**.

    c. Click **OK** to save your settings.

3.11 Set Pressing Wheel and Board Parameters

You need to set the pressing wheel and board related parameters.

Procedures:

1. (**Optional**): Click [Process | Control] in the upper right corner to switch to the **Process** screen.

2. In the board information and parameter bar, click the **CAM Parameter** button on the right side to access the **Parameter List** screen.
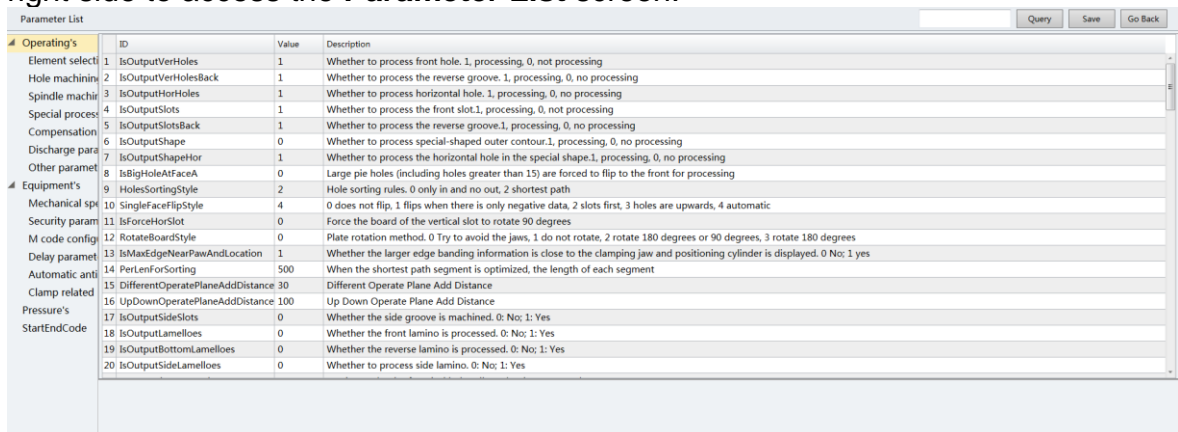
3. (**Optional**): Click the **Advanced** button in the upper right corner and enter the manufacturer password.

4. In the left list, click **Pressure's** to show related parameters on the right.

Parameter	Description
Length X	The length of the pressing board in the X axis direction.
Width Y	The length of the pressing board in the Y axis direction.
Coordinates X	The center point offset relative to the base drill in the X axis direction.
Coordinates Y	The center point offset relative to the base drill in the Y axis direction.
Press table Z	Adjust this value based on the spindle datum to make the pressing board press on the board material.
Open Code	Specify an M code for enabling the pressing wheel and board.
Close Code	Specify an M code for withdrawing the pressing wheel and board.
Open T(ms)	Delay for enabling the cylinder.
Close T(ms)	Delay for withdrawing the cylinder.
Check code for closed	Specify an M code for pressing wheel and board withdrawal detection.

3.12 Execute Simulation
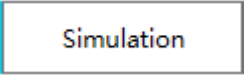
During simulation, the system does not drive machine movement or consume machine or workpiece resources. Only the machining path and process are displayed in the software for you to spot possible problems and edit the program accordingly.

Prerequisite:

A machining file is loaded. For details, see Load a Machining File.

Procedures:

1. Select one of the following methods to enter simulation mode:

   o In the machining operation bar, click .
   o In the menu bar, go to **Operate** > **Simulate**.
2. Select one of the following methods to start simulation:
   o Press the **F9** key.

   o In the operation button bar, click .
   o In the menu bar, go to **Operate** > **Cycle Start**.

4 Quick Start

4.1 Overview

This section introduces a simple machining process using the **NcStudio Phoenix Nine Axis Six-Side Drilling System**.

The process is shown below:
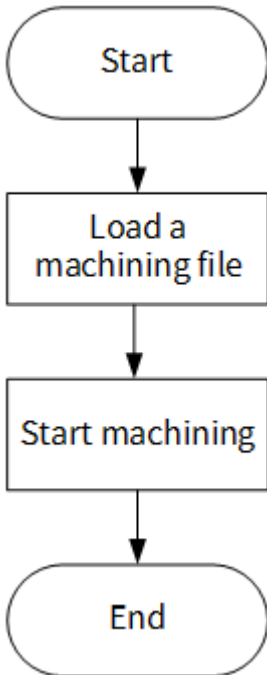
The operations above need to be executed in the **Process** screen if no notes are provided indicating otherwise.

4.2 Load a Machining File

Before starting machining, you need to load a machining file. After the file is loaded, the board information in the file is shown in the **Board List** on the right.

Procedures:

1. Use one of the following methods to load a machining file:
   o Creating an XML file

      In the board editing bar, click .
   o Importing an XML file
      ▪ In the menu bar, go to **File** > **Open** > **Open standard XML/Open SVJ XML**.
      ▪ Right-click on the **Board List** and click **Import xml**. Select an option as needed.
   o Importing an MPR/BAN file
      ▪ In the menu bar, go to **File** > **Input** > **InputMpr/InputBan**.
      ▪ Right-click on the **Board List** and click **Import mpr/ban**.
   o Importing a CIX file
      ▪ Right-click on the **Board List** and click **Import cix**.
2. (**Optional**): After loading a file, if you need to edit it, see Creating and Editing Holes.

4.3 Start Machining

Prerequisite:

No alarm is reported, such as an emergency stop alarm.

Procedures:

1. Use a scanner to scan the barcode on the board.
2. Select one of the following methods to start machining:
   - If the CAM parameter **EnableScanAuto** is set to **1**, follow the steps below after the system starts to run the initial code:
     i. Place the board on the workbench.
     ii. Select one of the following methods to start machining:
        - Step on the pedal.
        - Press the **F9** key.

        - In the machining operation bar, click .
        - In the menu bar, go to **Operate** > **Cycle Start**.
   - If the CAM parameter **EnableScanAuto** is set to **0**, follow the steps below:
     i. Select one from the following methods to run the initial code:
        - Step on the pedal.
        - Press the **F9** key.

        - In the machining operation bar, click .
        - In the menu bar, go to **Operate** > **Cycle Start**.
     ii. Place the board on the workbench.
     iii. Select one of the following methods to start machining:
        - Step on the pedal.
        - Press the **F9** key.

        - In the machining operation bar, click .
        - In the menu bar, go to **Operate** > **Cycle Start**.
3. (**Optional**): To stop machining, select one from the following methods:
   - Press the **F11** key.

   - In the machining operation bar, click .
   - In the menu bar, go to **Operate** > **Cycle Stop**.
   After machining is stopped, the system enters idle state.

Related task:

Customization of M code:

1. In the menu bar, go to **Operate** > **MDI**.
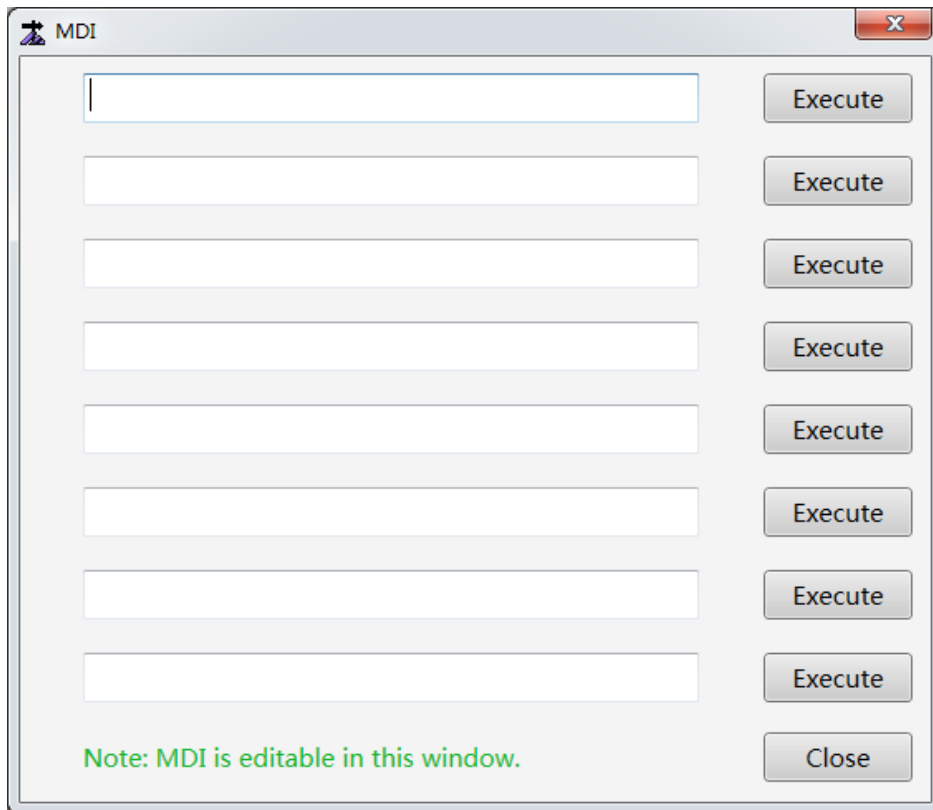
2. In the **MDI** dialog box, enter the M code in a box and click the corresponding **Execute** button.

5 Creating and Editing Holes

This section introduces how to create and edit holes in the **NcStudio Phoenix Nine Axis Six-Side Drilling System**.

The system supports different types of holes:

⬜ : Side hold

⬜ : Vertical hole

⬜ : Slot

⬜ : Pocket milling

⬜ : Side lamello

⬜ : Front and rear lamello

⬜ : Lock

⬜ : Cutting angle

⬜ : Round angle

⬜ : Groove

The operations need to be executed in the **Process** screen if no notes are provided indicating otherwise.

5.1 Creating a Side Hole

Procedures:

1. Select one of the following methods to enable the side hole tool:

   o In the board editing bar, click ⬜ .
   o In the menu bar, go to **Edit** > **CreatSideHole**.

2. Move the mouse pointer to a board edge. The mouse pointer becomes

   . Click where you want the side hole reference point.

3. Move the mouse pointer to the target hole position and click.
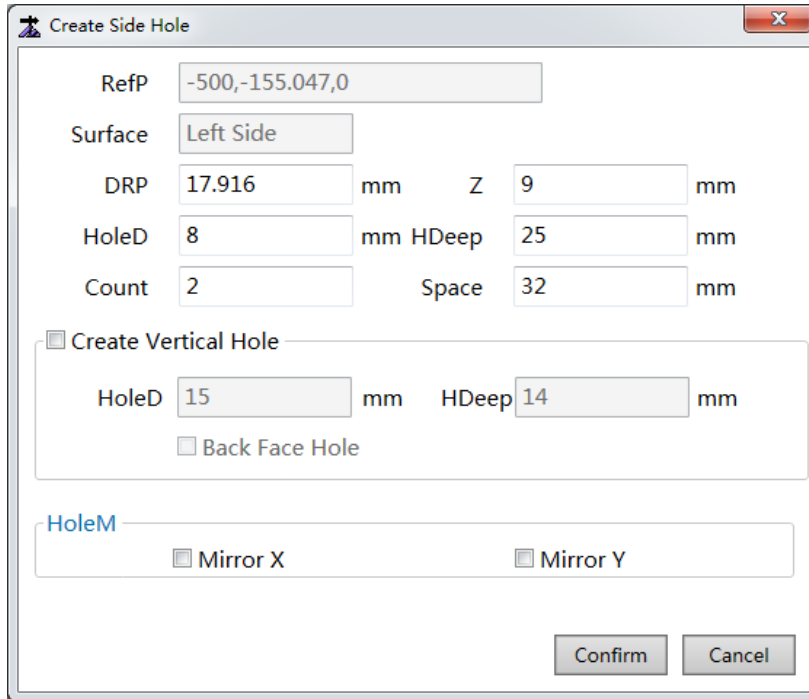
4. In the displayed **Create Side Hole** dialog box, set the following parameters:

Parameter	Description
DRP	The distance between the side hole and the reference point.
Z	The Z-axis position of the side hole.
HoleD	The side hole diameter.
HDeep	The side hole depth.
Count	The side hole number.
Space	The distance between side holes.

5. (**Optional**): To create a vertical hole, check **Create Vertical Hole** and set **HoleD** and **HDeep**.
6. (**Optional**): To create a symmetrical hole in the X-/Y-axis direction, check **Mirror X/Mirror Y**.
   An example of created holes is shown below:
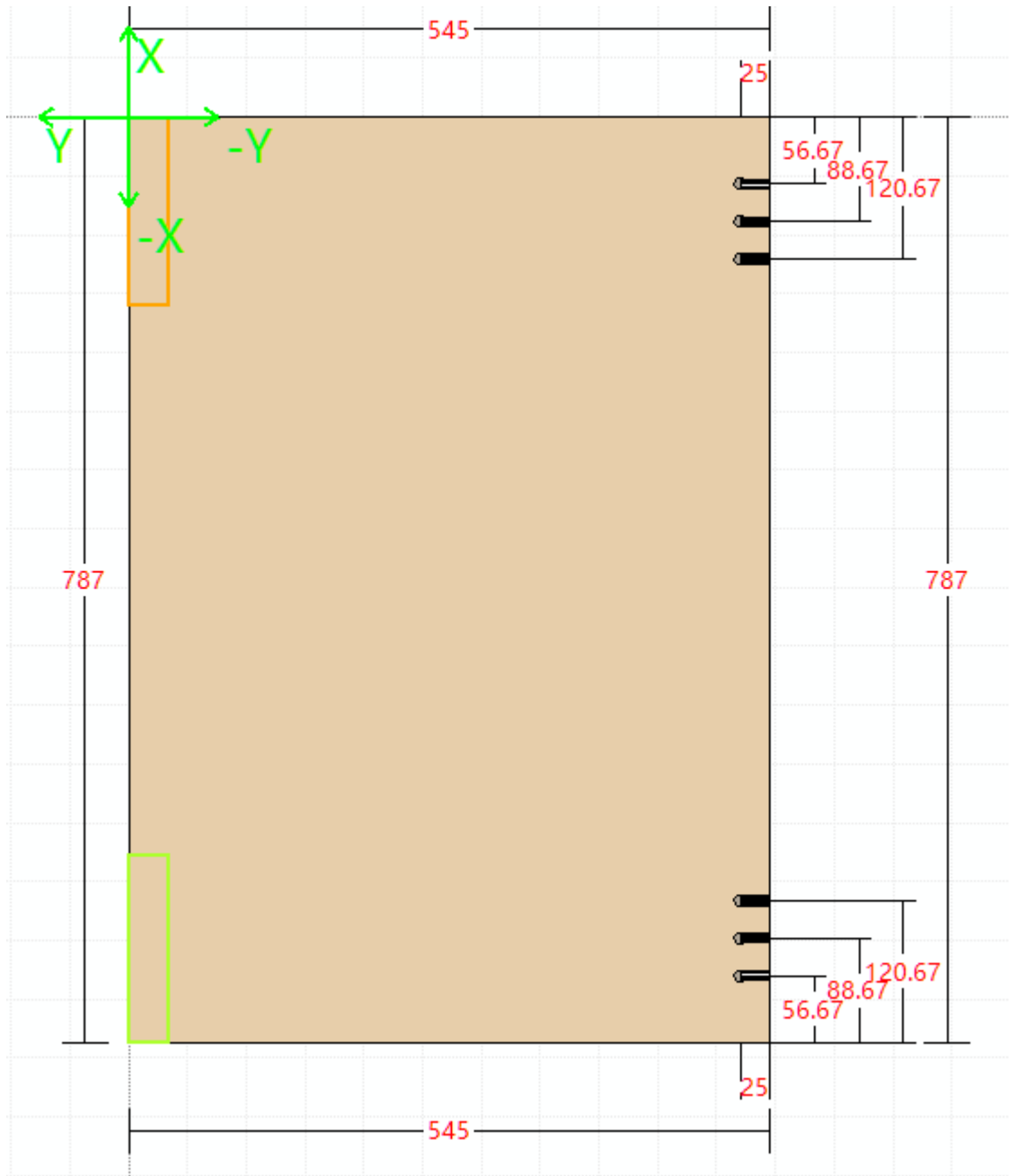
Related task

Modifying side hole parameters

1. Double-click a side hole.
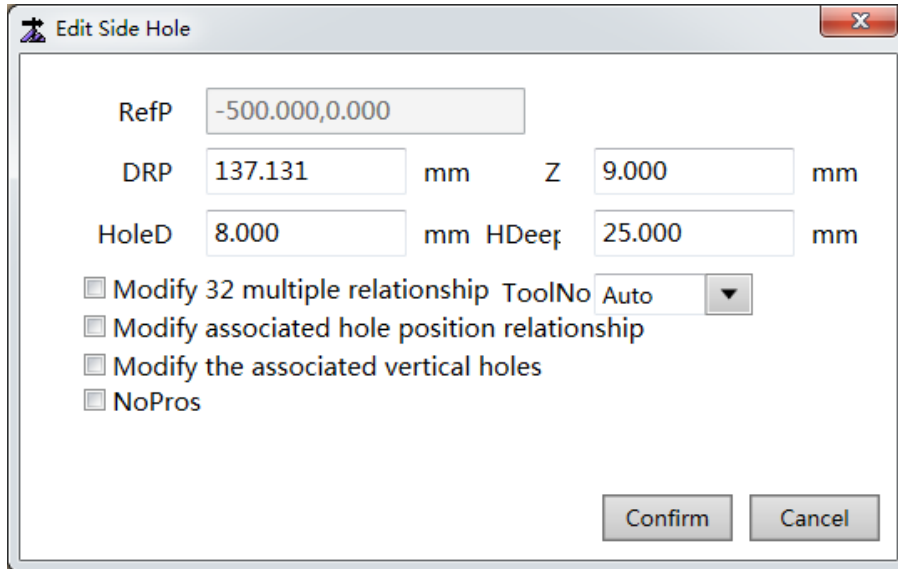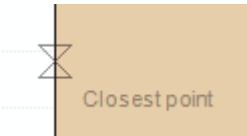
2. In the displayed **Edit Side Hole** dialog box, change the values of **DRP**, **Z**, **HoleD**, and **HDeep** parameters.
3. Check the options based on your needs.
   - **Modify 32 multiple relationship**: Change the parameter settings for side holes whose distances are 32 mm multiplied by x (an integer) at the same time.
   - **Modify associated hole position relationship**: Change the parameter settings for the mirrored symmetrical hole at the same time.
   - **Modify the associated vertical holes**: Change the parameter settings for the corresponding vertical hole at the same time.

5.2 Create a Vertical Hole
Procedures:

1. Select one of the following methods to enable the vertical hole tool:

   - In the board editing bar, click .
   - In the menu bar, go to **Edit** > **CreatVerHole**.
2. Move the mouse pointer to a board edge. The mouse pointer becomes

. Click where you want the vertical hole reference point.
3. Move the mouse pointer to the target hole position and click.
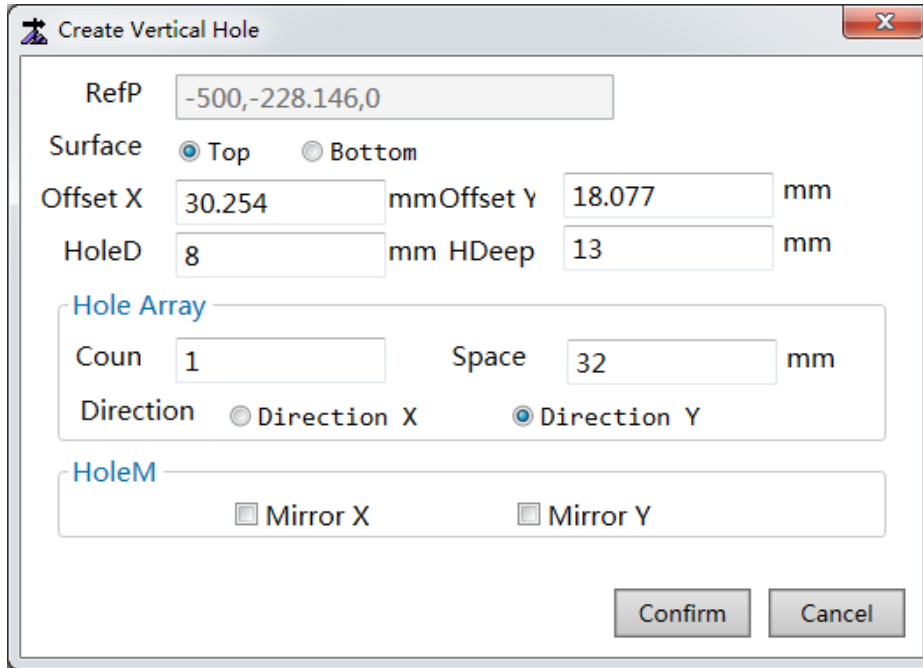
4. In the displayed **Create Vertical Hole** dialog box, set the following parameters:

Parameter	Description
Surface	Select whether to create the vertical hole in the front or back surface of the board.
OffsetX	The distance between the vertical hole and the reference point in the X axis direction.
OffsetY	The distance between the vertical hole and the reference point in the Y axis direction.
HoleD	The vertical hole diameter.
HDeep	The vertical hole depth.
Count	The vertical hole number.
Space	The distance between vertical holes.
Direction	Select whether to create a vertical hole in the X axis or Y axis direction.

5. (**Optional**): To create a symmetrical hole in the X-/Y-axis direction, check **Mirror X/Mirror Y**.
   An example of created holes is shown below:
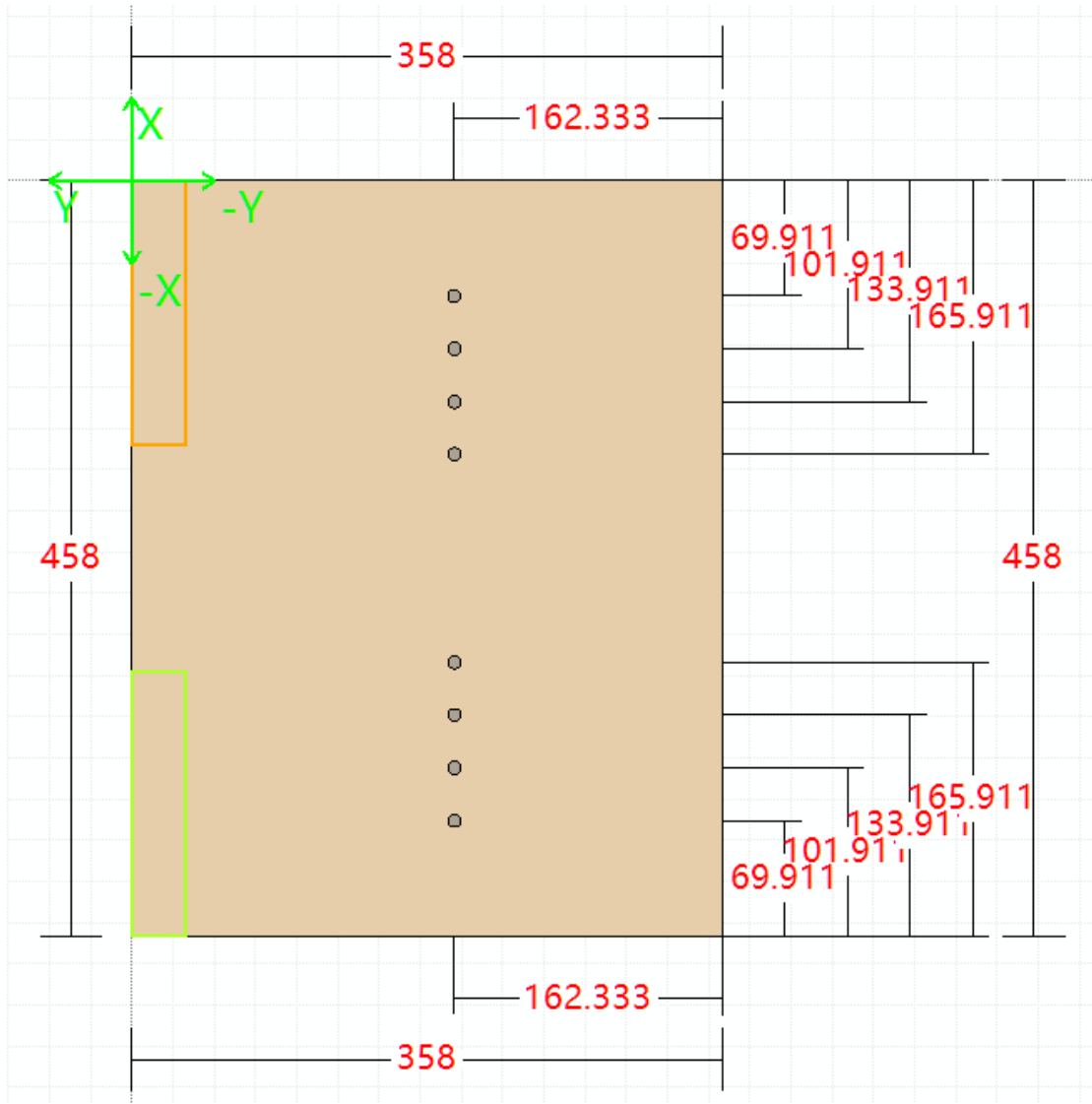
Related task

Modifying vertical hole parameters

1. Double-click a vertical hole.
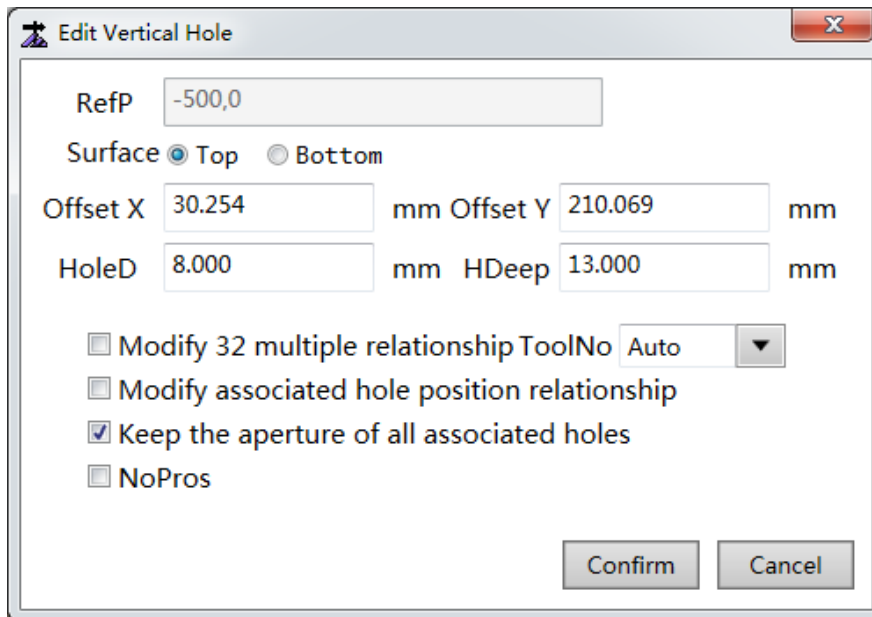
2. In the displayed **Edit Vertical Hole** dialog box, change the values of **Surface**, **Offset X**, **Offset Y**, **HoleD**, and **HDeep** parameters.
3. Check the options based on your needs.
   o **Modify 32 multiple relationship**: Change the parameter settings for side holes whose distances are 32 mm multiplied by x at the same time.
   o **Modify associated hole position relationship**: Change the parameter settings for the mirrored symmetrical hole at the same time.
   o **Keep the aperture of all associated holes**: Do not change the hole diameter of all associated vertical holes.

5.3 Create a Slot
Procedures:

1. Select one of the following methods to enable the slot tool:

   o In the board editing bar, click .
   o In the menu bar, go to **Edit** > **CreatSlot**.
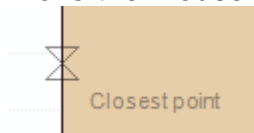2. Move the mouse pointer to a board edge. Click where you want the slot.
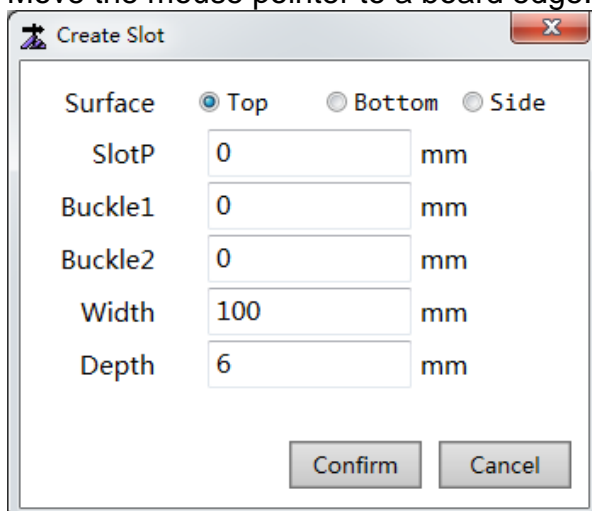
3. In the displayed **Create Slot** dialog box, set the following parameters:

Parameter	Description
Surface	Select whether to create the slot in the front or back surface of the board.
SlotP	The slot offset relative to the board edge.
Buckle1/Buckle2	The reduced slot length relative to the board length. Used to change the slot length. The default slot length equals to the board length.
Width	The slot width,
Depth	The slot depth.

An example of a created slot is shown below:
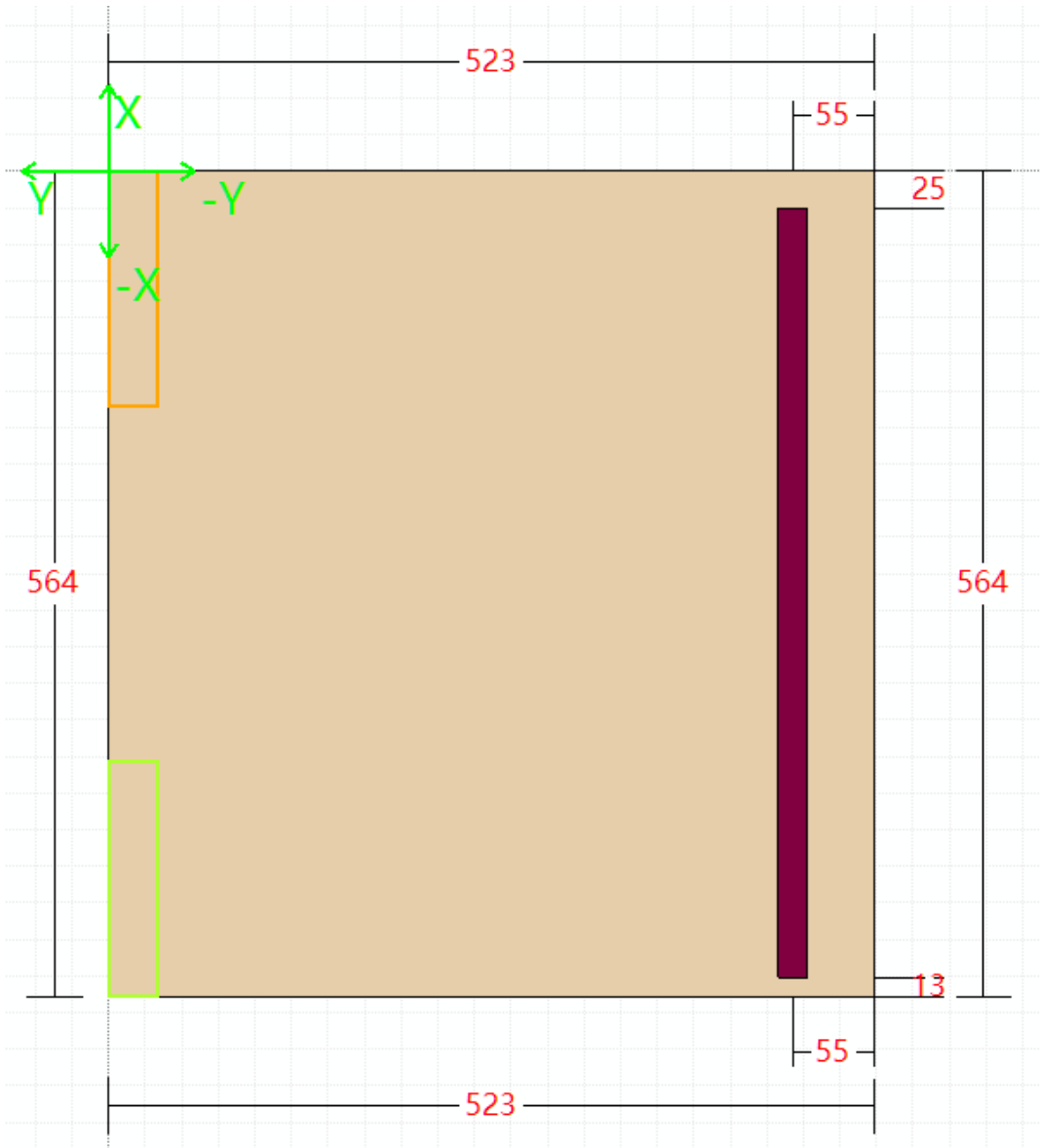
Related task

Modifying slot parameters

1. Double-click a slot.
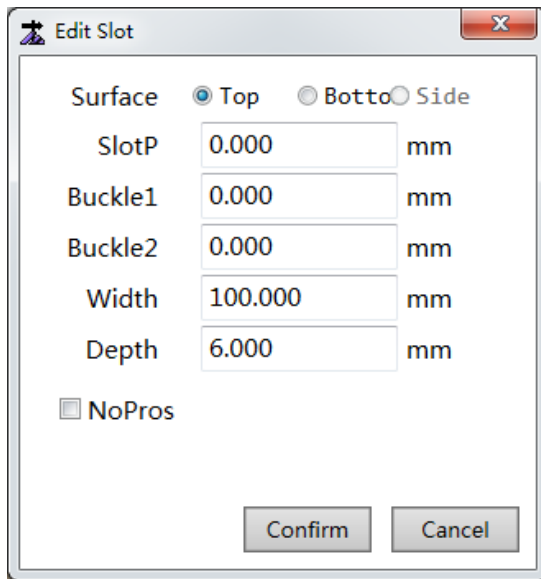
2. In the displayed **Edit Slot** dialog box, change the values of **Surface**, **SlotP**, **Buckle1**, **Buckle2**, **Width**, and **Depth** parameters.

5.4 Create a Pocket Milling

Procedures:

1. Select one of the following methods to enable the pocket milling tool:

   o In the board editing bar, click [icon].

   o In the menu bar, go to **Edit** > **CreatPocketMilling**.
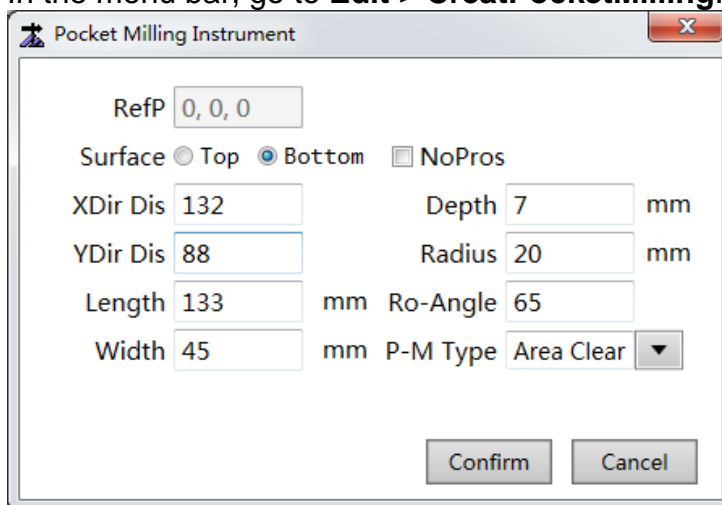
2. In the displayed **Pocket Milling Instrument** dialog box, set the following parameters:

Parameter	Description
Surface	Select whether to create the pocket milling in the front or back surface of the board.
XDir Dis/YDir Dis	Specify the position of the pocket milling.

Parameter	Description
Length	The pocket milling length.
Width	The pocket milling width.
Depth	The pocket milling depth, which needs to be equal to or smaller than the board thickness.
Radius	The radius of the four round corners of the pocket milling.
Ro-Angle	The pocket milling rotation angle (anti-clockwise).
P-M Type	**Area Clear**: Cut the target shape with the milling tool step by step. **Processing Along The Inside**: Cut along the target shape inside the frame once. **Processing Along The Center Line**: Cut along the target shape on the frame once. **Processing Along The Outside**: Cut along the target shape outside the frame once.

An example of a created pocket milling is shown below:
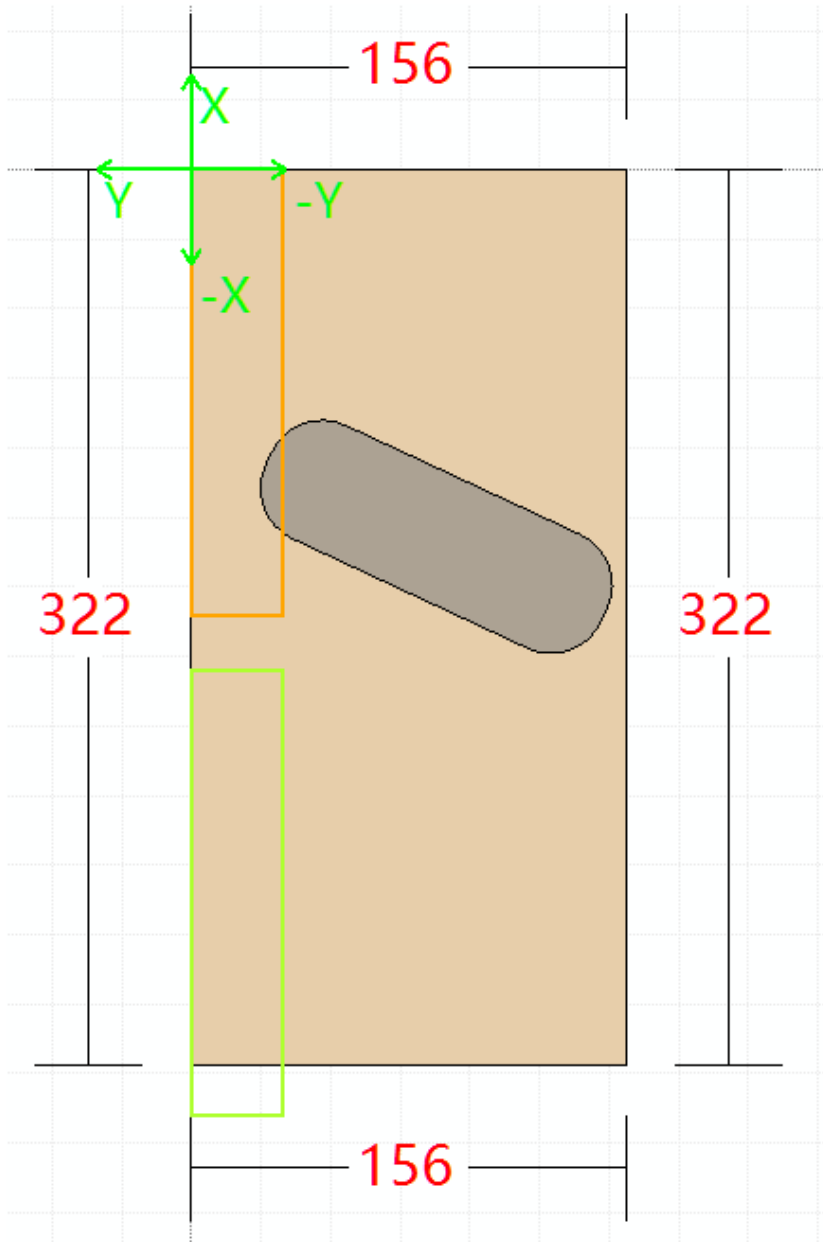
Related task

Modifying pocket milling parameters

1. Double-click a pocket milling.
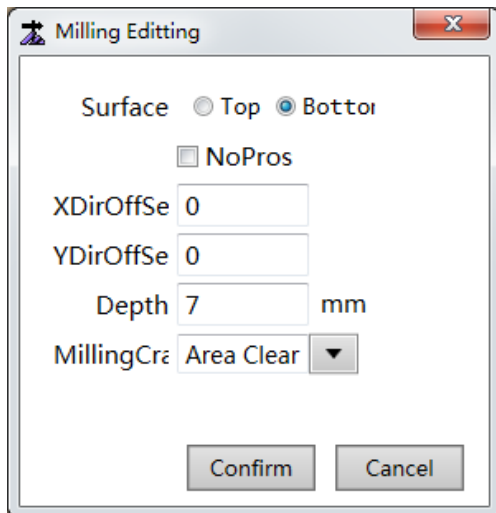
2. In the displayed **Milling Editing** dialog box, change the values of **Surface**, **XDirOffSet**, **YDirOffSet**, **Depth**, and **MillingCraftType** parameters.

5.5 Create a Side Lamello

Procedures:

1. Select one of the following methods to enable the side lamello tool:

   o In the board editing bar, click .
   o In the menu bar, go to **Edit** > **Creat Side Lamello**.

2. Move the mouse pointer to a board edge. The pointer becomes . Click where you want the side lamello reference point.
3. Click where you want the side lamello.
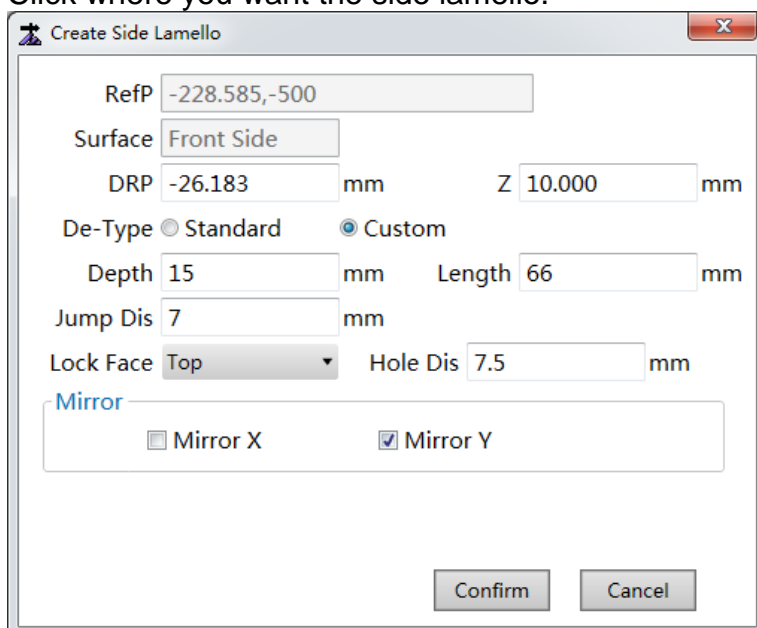
4. In the displayed **Create Side Lamello** dialog box, set the following parameters:

Parameter	Description
DRP	The distance between the side lamello and the reference point.
Z	The Z-axis position of the side lamello.
De-Type	**Standard**: Set the **Type** and **Lock Face** parameters based on the model of the lamello invisible connection piece. **Custom**: Enter the **Depth**, **Length**, **Jump Dis**, **Lock Face**, and **Hole Dis** parameter values based on the actual situation.

5. (**Optional**): To create a symmetrical side lamello in the X-/Y-axis direction, check **Mirror X**/**Mirror Y**.

An example of a created side lamello is shown below:
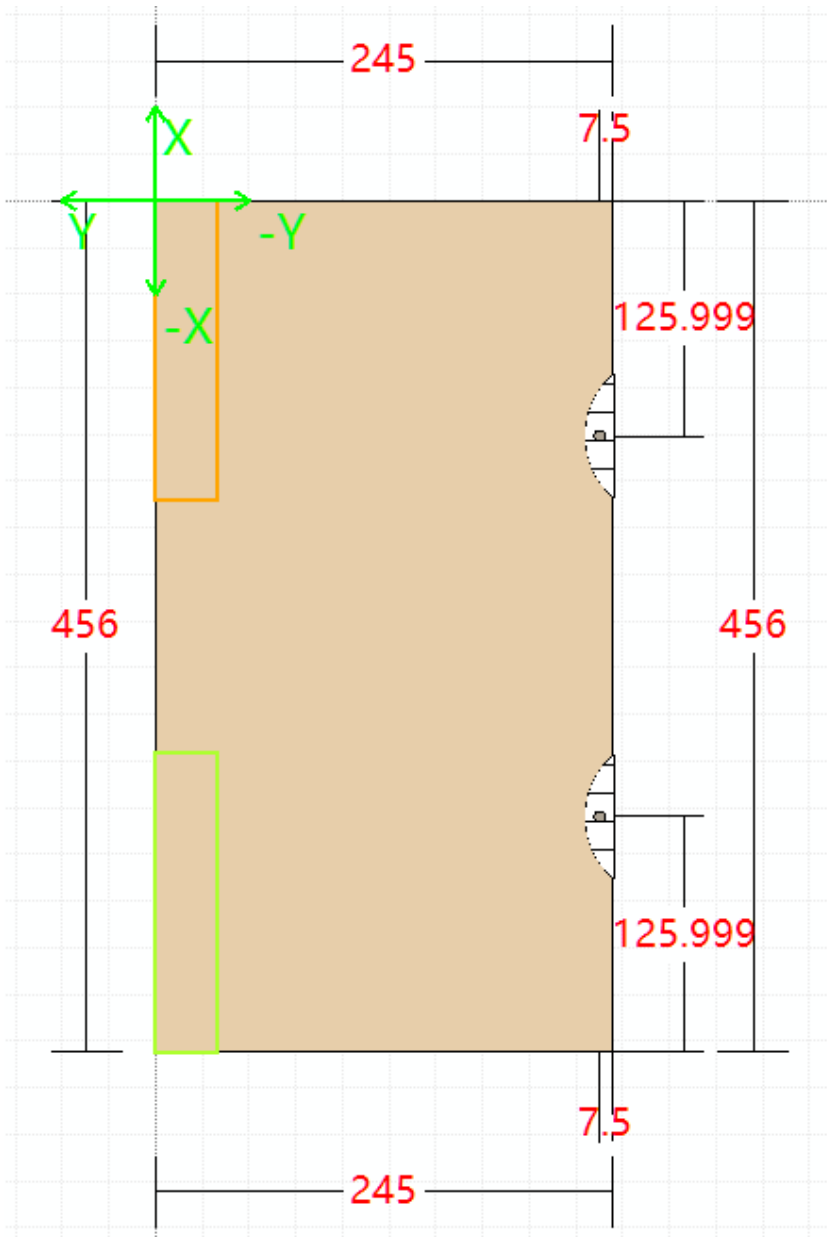
Related task

Modifying side lamello parameters

1. Double-click a side lamello.

Edit Lamello

RefP	-500,0			
DRP	245.232	mm	Z 10.000	mm

De-Type ○ Standard ● Custom

Depth	15	mm	Length 66	mm
Jump Dis	7	mm		

Confirm   Cancel
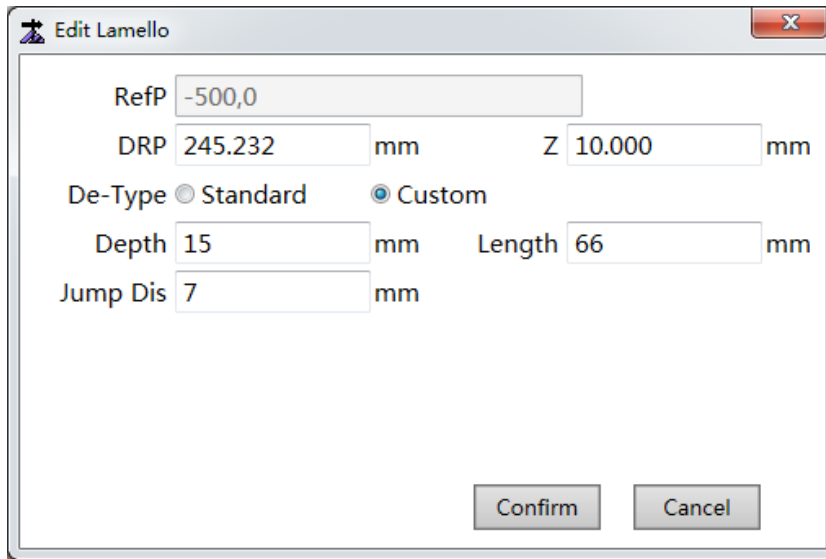
2. In the displayed **Edit Lamello** dialog box, change the values of **DRP**, **Z**, and **Standard**/**Custom** parameters.

5.6 Create Front Lamello

Procedures:

1. Select one of the following methods to enable the front lamello tool:

   o In the board editing bar, click [icon].
   o In the menu bar, go to **Edit** > **Creat Vertical Lamello**.

2. Move the mouse pointer to a board edge. The pointer becomes [Closest point]. Click where you want the lamello reference point.

3. Click where you want the lamello (inside the board).

Create Front Lamello

RefP	-118.013,-500,0

Surface ● Top   ○ Bottom

Offset X	-11.183	mm	Offset Y 88.948	mm

De-Type ○ Standard ● Custom

Direction Y ▾

Depth	15	mm	Length 66	mm
Jump Dis	7	mm		

Mirror
☐ Mirror X   ☑ Mirror Y

Confirm   Cancel

4. In the displayed **Create Front Lamello** dialog box, set the following parameters:

Parameter	Description
Surface	Select whether to create the lamello on the front or back surface of the board.
Offset X	The distance between the lamello and the reference point in the X axis direction.
Offset Y	The distance between the lamello and the reference point in the Y axis direction.
De-Type	**Standard**: Set the **Direction** and **Type** parameters based on the model of the lamello invisible connection piece. **Custom**: Set **Direction** and enter the **Depth**, **Length** and **Jump Dis** parameter values based on the actual situation.

5. (**Optional**): To create a symmetrical lamello in the X-/Y-axis direction, check **Mirror X/Mirror Y**.

An example of a created front/vertical lamello is shown below:
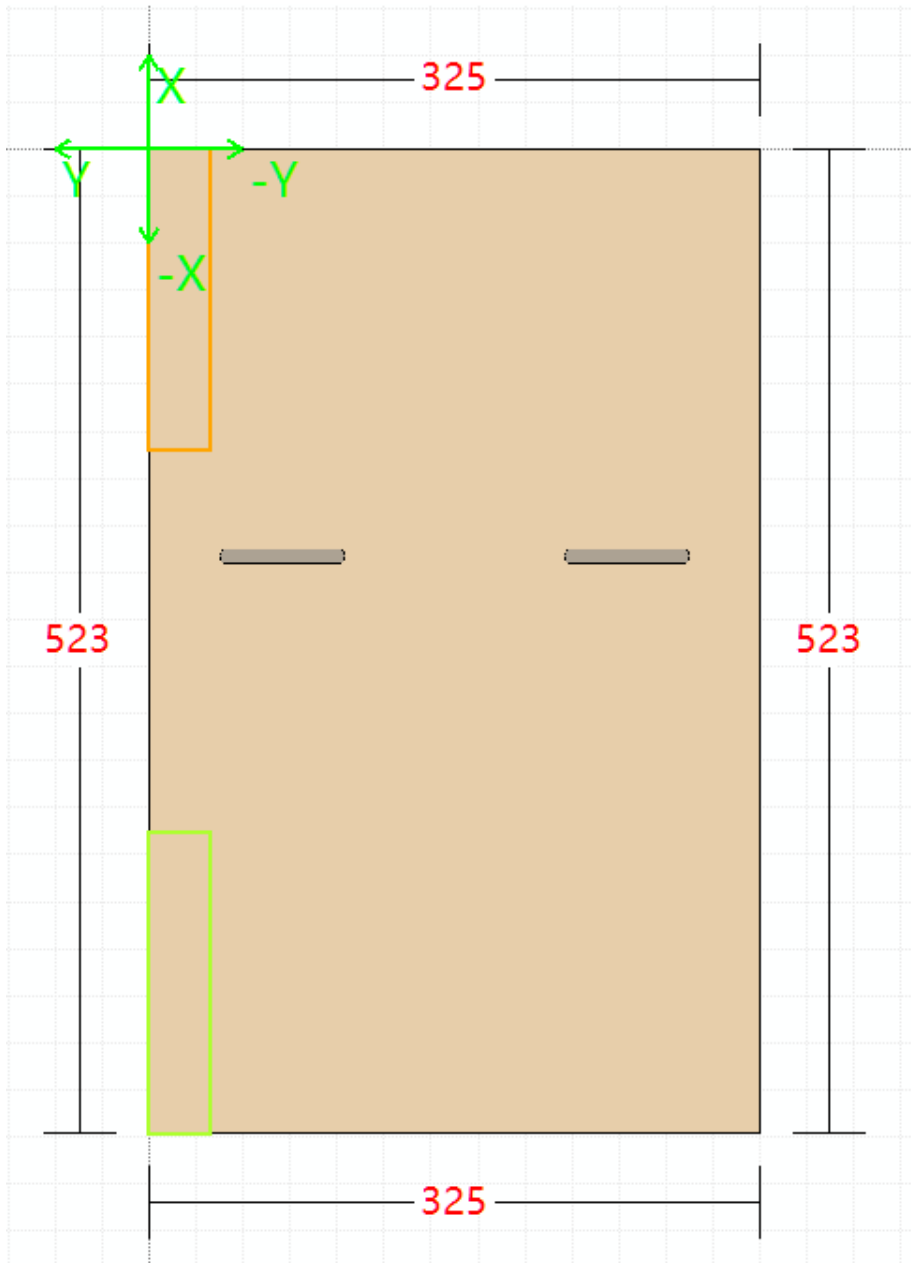
Related task

Modifying front lamello parameters

1. Double-click a front lamello.
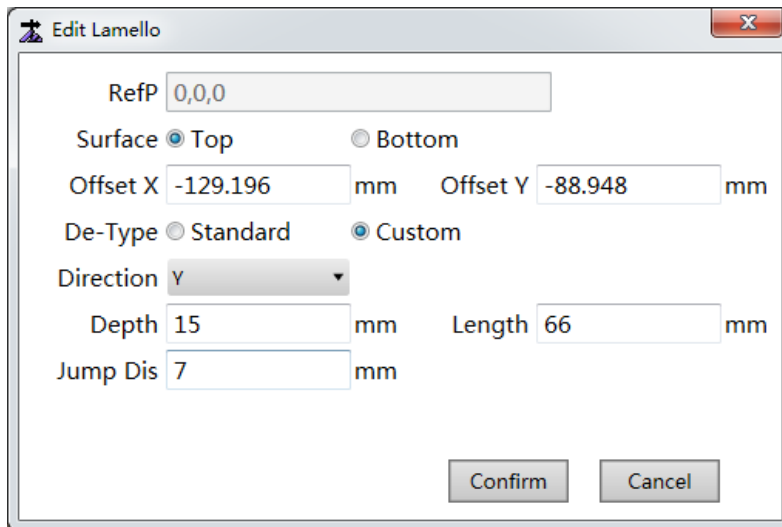
2. In the displayed **Edit Lamello** dialog box, change the values of **Surface**, **Offset X**, **Offset Y** and **De-Type** parameters.

5.7 Create a Lock

Procedures:

1. In the board editing bar, click .
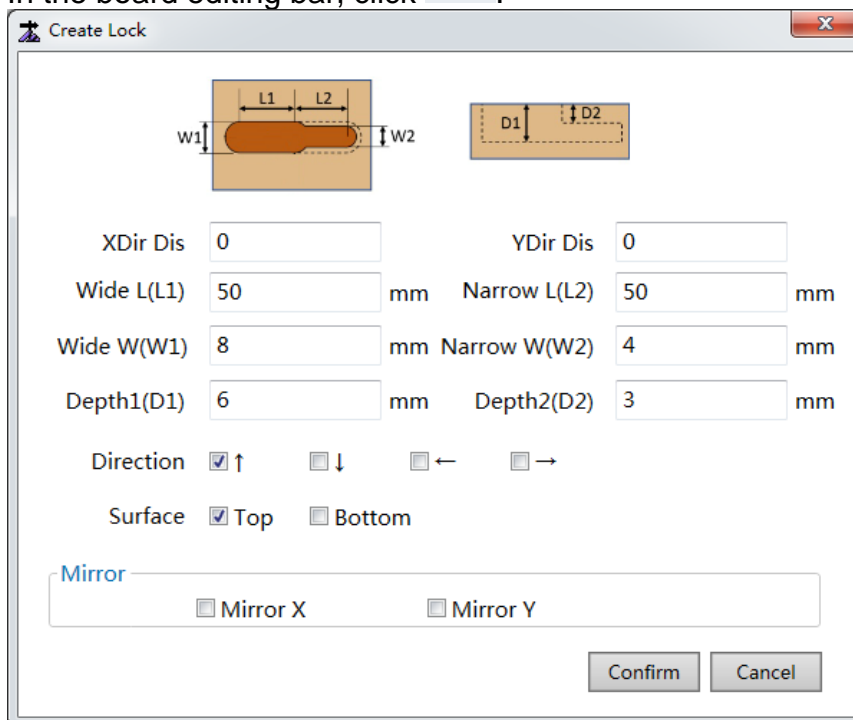
2. In the displayed **Create Lock** dialog box, set the following parameters:

Parameter	Description
XDir Dis/YDir Dis	Determine the position of the lock.
Wide L(L1)	The length of the wider slot of the lock

Parameter	Description
Narrow L(L2)	The length of the narrower slot of the lock
Wide W(W1)	The width of the wider slot of the lock
Narrow W(W2)	The width of the narrower slot of the lock
Depth1(D1)	The depth of the wider slot of the lock
Depth2(D2)	The depth of the narrower slot of the lock
Direction	The direction of the narrower slot. ↑: up; ↓: down; ← : left; →: right.
Surface	Select whether to create the lock on the front or back surface of the board.

3. (**Optional**): To create a symmetrical lock in the X-/Y-axis direction, check **Mirror X**/**Mirror Y**.

An example of a created lock is shown below:
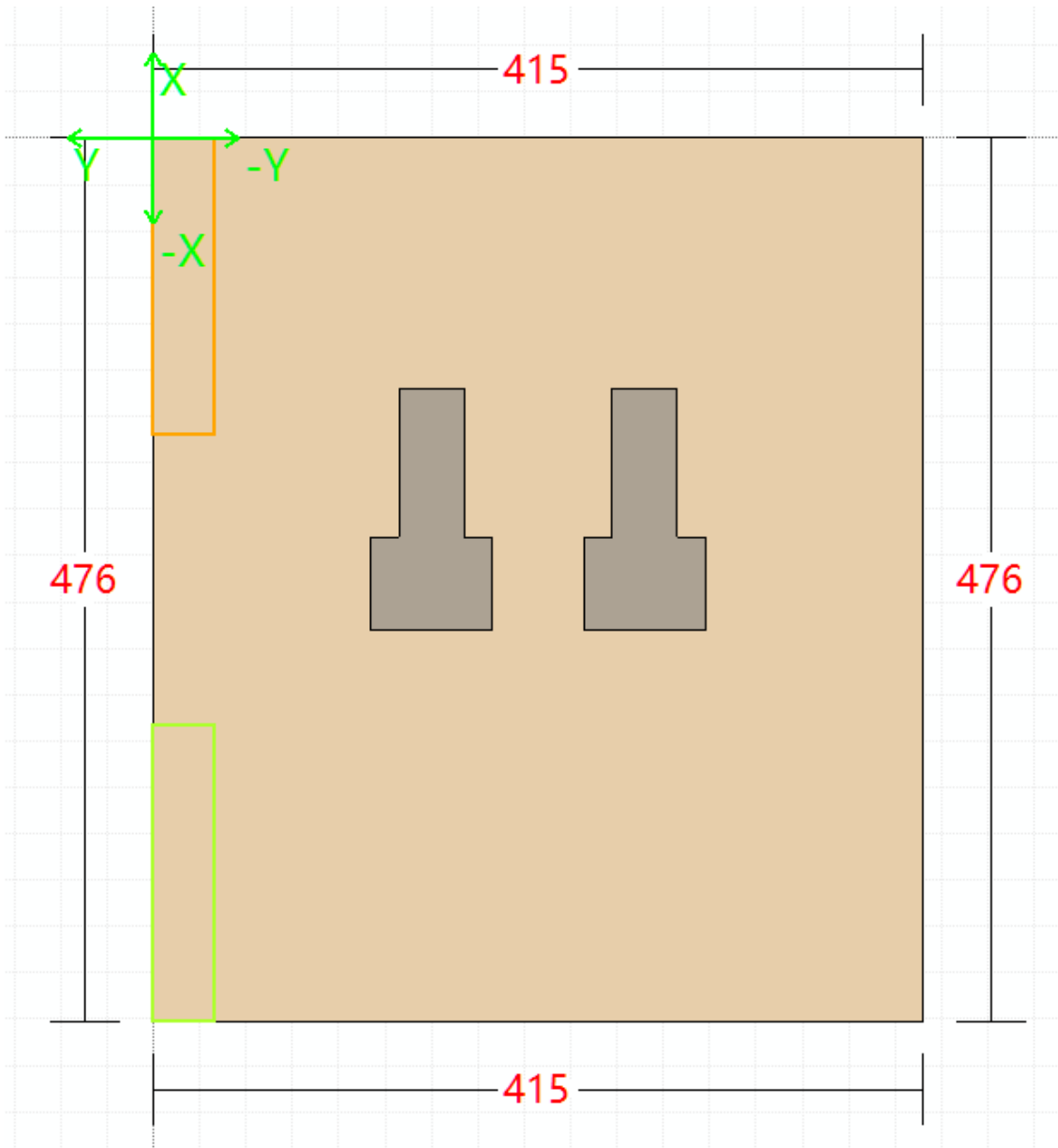
Related task

Modify lock parameters

1. Double-click a lock.
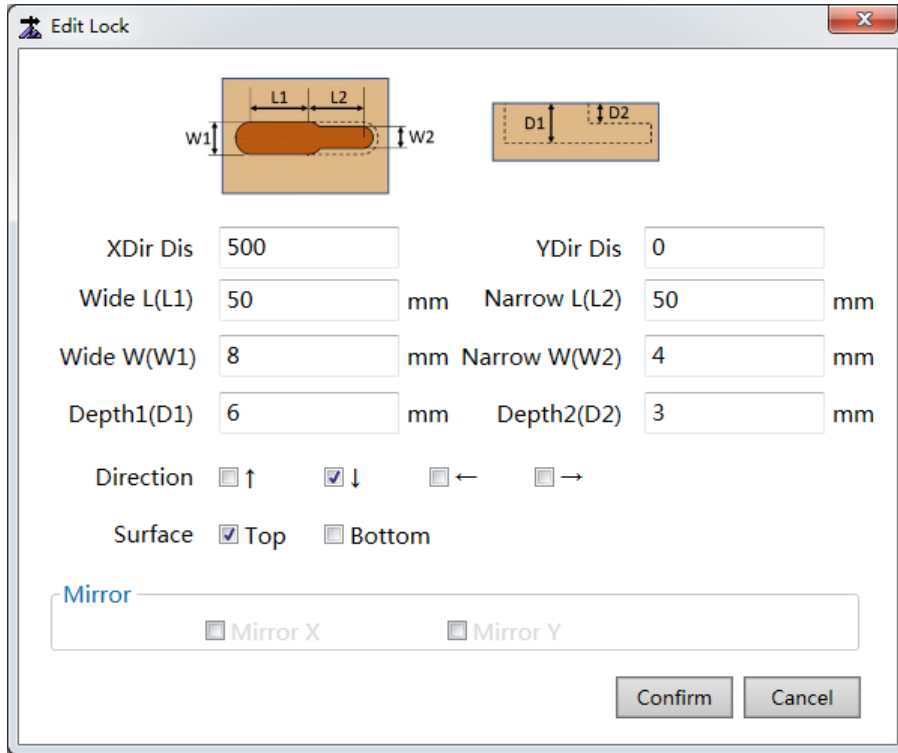
2. In the displayed **Edit Lock** dialog box, change the parameter values.

5.8 Create an Angle

Procedures:

1. Select one of the following methods to enable the angle cutting tool:

   o In the board editing bar, click [icon].
   o In the menu bar, go to **Edit** > **CreatLcorner**.

2. Click on a board corner.
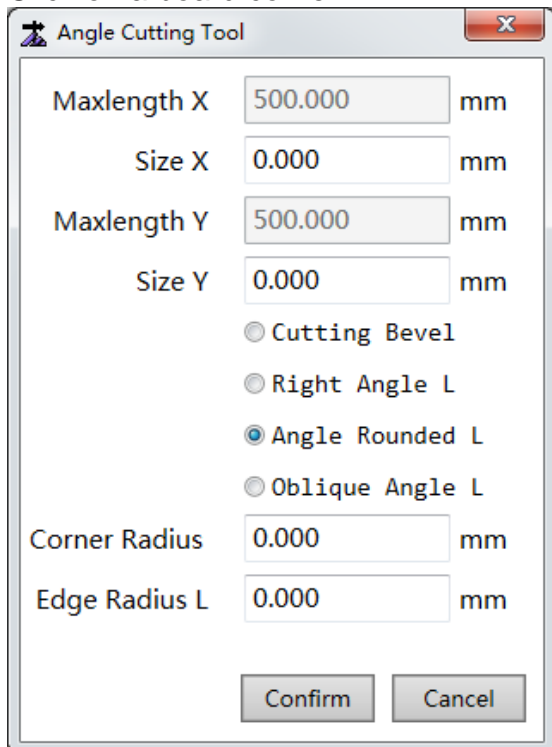
3. In the displayed **Angle Cutting Tool** dialog box, set the parameters based on the angle type:

Angle Type	Parameter
Cutting Bevel	**Size X** (angle X-axis length) and **Size Y** (angle Y-axis length).
Right Angle L	**Size X** (angle X-axis length) and **Size Y** (angle Y-axis length).
Angle Rounded L	**Size X** (angle X-axis length), **Size Y** (angle Y-axis length), **Corner Radius**, and **Edge Radius L**.
Oblique Angle L	**Size X** (angle X-axis length), **Size Y** (angle Y-axis length), **Corner Radius**, and **Edge Radius L**.

An example of a created angle is shown below:
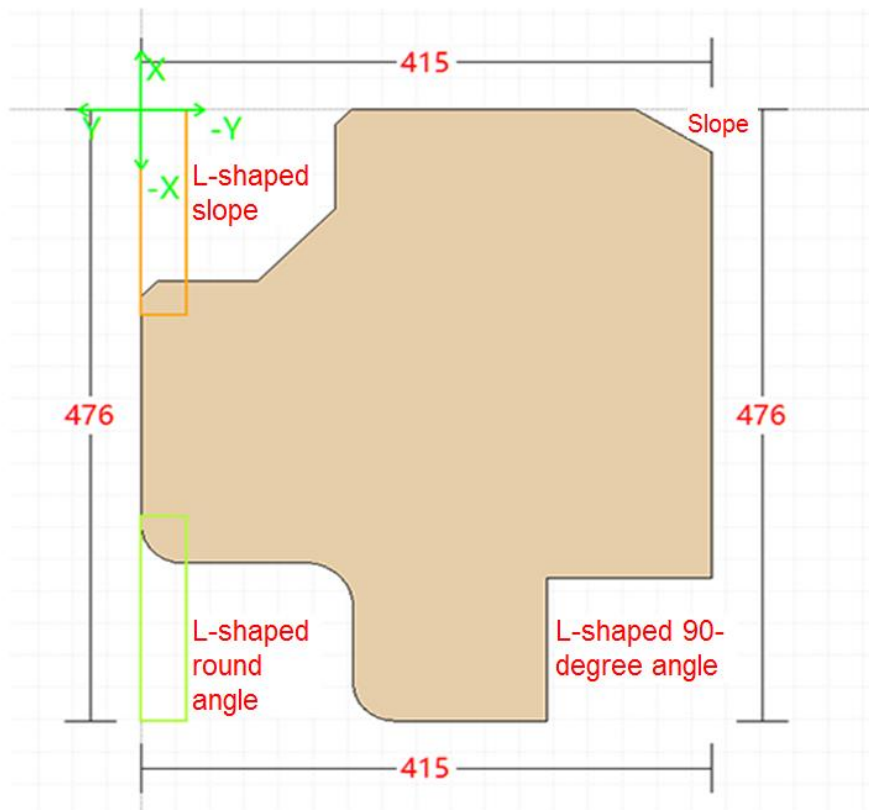
Related task

Removing an angle

For details, see Remove Chamfers.

5.9 Create a Round Angle
Procedures:

1. Select one of the following methods to enable the round angle tool:

    o In the board editing bar, click [image].

○ In the menu bar, go to **Edit** > **CreatRcorner**.

2. Click a board corner.
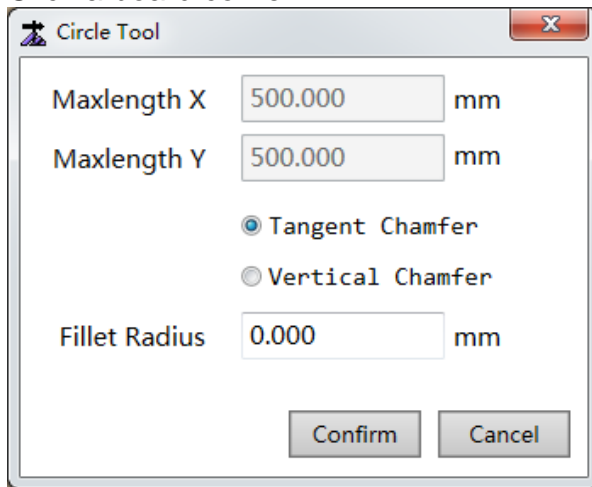
3. In the displayed **Circle Tool** dialog box, select the round angle type and set the angle radius.

An example of created round angle is shown below:
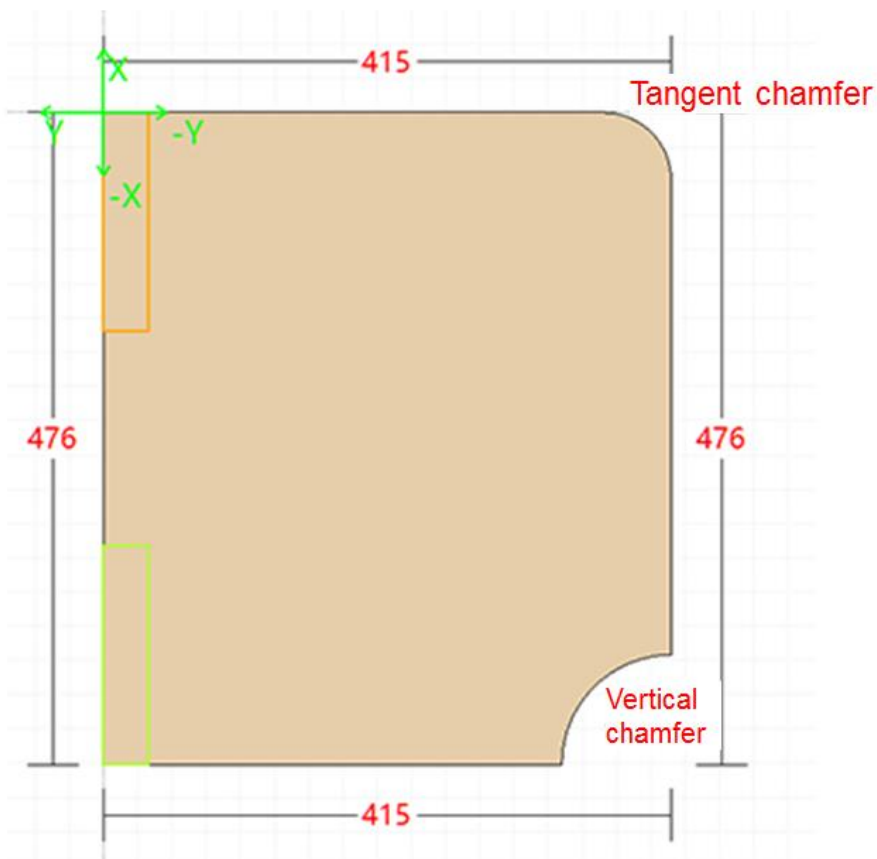
Related task

Removing an angle

For details, see <u>Remove Chamfers</u>.

5.10 Create a Groove

Procedures:

1. Select one of the following methods to enable the groove tool:

   - In the board editing bar, click ⊓ .
   - In the menu bar, go to **Edit** > **CreatGroove**.

2. Move the mouse pointer to a board edge. The mouse pointer becomes

   Closest point
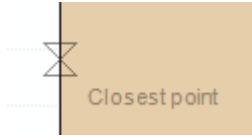
   . Click where you want the groove reference point.

3. Click where you want the groove.
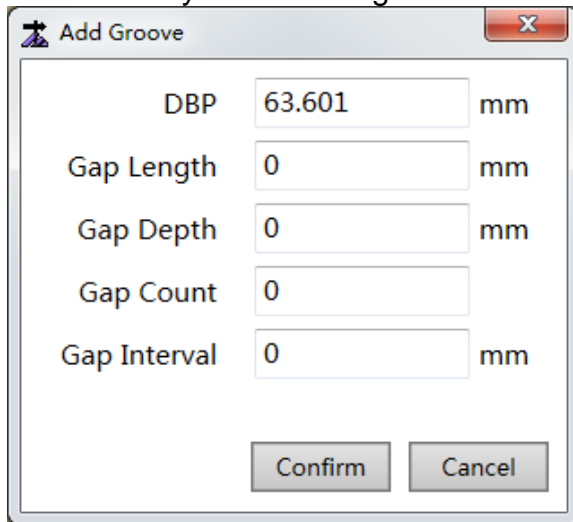
4. In the displayed **Add Groove** dialog box, set the following parameters:

Parameter	Description
DBP	The distance between the groove and the reference point.
Gap Length	The length of the groove.
Gap Depth	The depth of the groove.
Gap Count	The number of the groove(s).
Gap Interval	The distance between grooves.

An example of created grooves is shown below:

WEIHONG
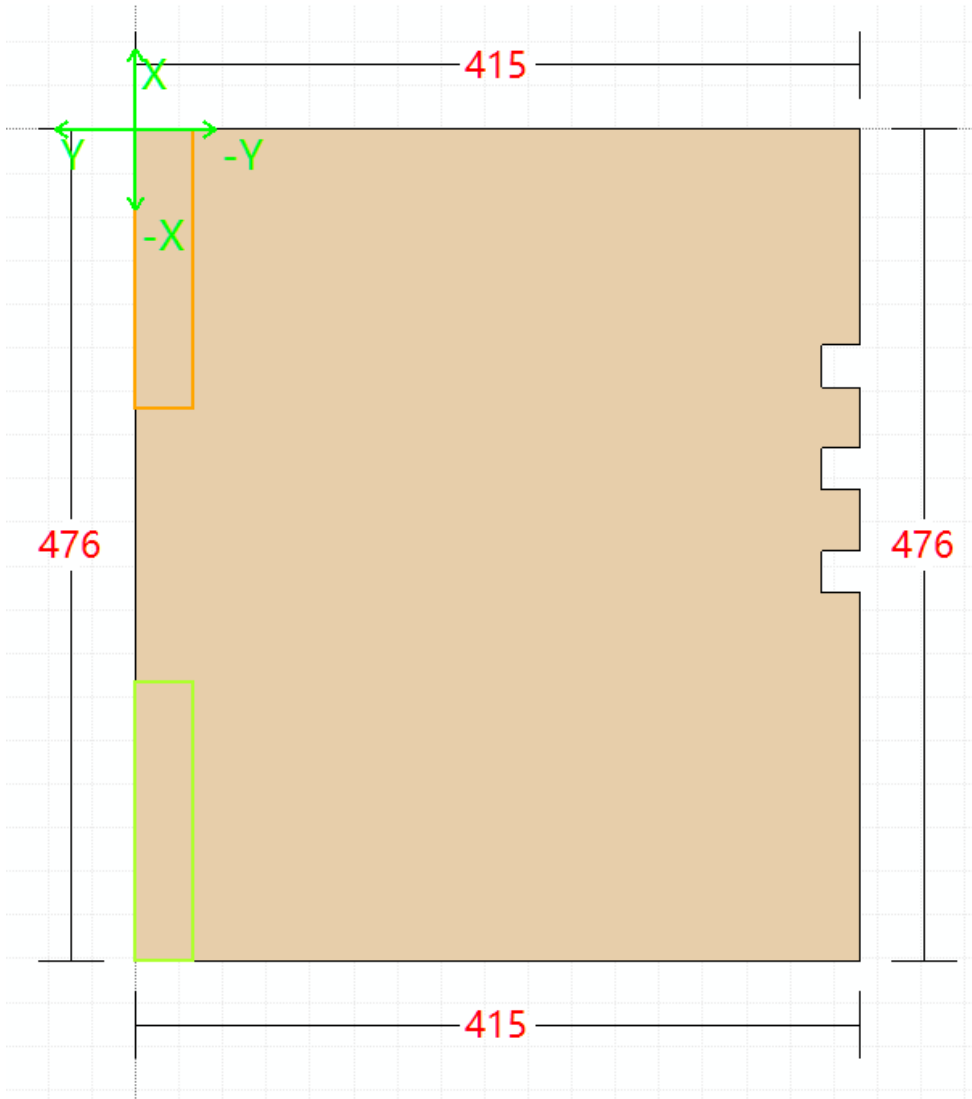
Related task

Removing a groove

For details, see Remove Chamfers.

5.11 Remove Chamfers

Use this function to remove unwanted angles and grooves.

Prerequisite:

At least one angle or groove has been created.

Procedures:

Select one of the following methods to enable the chamfer removing tool:
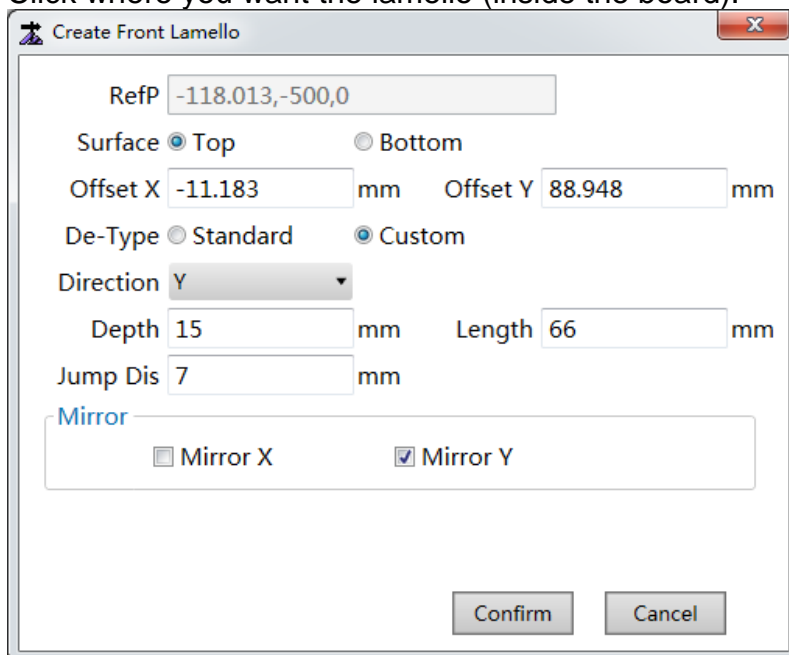
- In the board editing bar, click .
- In the menu bar, go to **Edit** ＞ **ClearLRCorner**.

 Note

This function erases all cut and round angles, and grooves. It does not support undo.

Related task

- Removing board(s)
  - Removing one board
    In the **Board List** on the right, click the target board to select it. Right-click on it and click **Remove Panel** in the right-click menu.
  - Removing all boards
    In the **Board List** on the right, right-click on the blank area and click **Clear Panel** in the right-click menu.
- Saving the current board file as an XML file

  - In the board editing bar, click ; or
  - In the menu bar, go to **Edit** > **SaveThisPanel**.
- Adding a board into the machining list
  In the **Board List** on the right, click the target board to select it. Right-click on it and click **Add to Machining List** in the right-click menu.

6 Shape-Related Functions

This section provides an introduction of the shape-related functions of the **NcStudio Phoenix Nine Axis Six-Side Drilling System**.

The following operations are available in the **Process** screen if not indicated otherwise.

6.1 Select an Object

You need to select an object, such as a hole, before being able to edit it.

Procedures:

1. In the board editing bar, click ![icon] to enable the selection tool.
2. Use one of the following methods to select one or multiple objects:
   o Select one object: Click on the target object.
   o Select multiple objects at one time: Press and hold the left mouse button to draw a square from the upper left corner to the lower right corner. All objects entirely inside the square will be selected. Or you can press and hold the left mouse button to draw a square from the lower right corner to the upper left corner. All objects included or intersected with the square will be selected.

6.2 Adjust the Window

You can make the board to adjust itself for better display.

Procedures:

In the board editing bar, click ![icon] .

6.3 Move the View

You can move the board view to check different areas.

Procedures:

Use one of the following methods to move the view:

* Press and hold the mouse wheel and move the mouse to the target position.
* Follow the steps below:

   a. In the board editing bar, click ![icon] .
   b. Select a base point and hold the left mouse button. Move the mouse until the view suits your need and then release the button.
   c. Press **Esc** to exit the tool.

6.4 Mirror an Object

Objects can be mirrored up/down and left/right.

* ![icon] Left/Right: Mirror the object along the Y axis.

* ![icon] Up/Down: Mirror the object along the X axis.

Procedures:

Use one of the following methods to mirror an object:

* In the board editing bar, click ![icon] / ![icon] .

- In the menu bar, go to **Edit** > **MirrorLR**/**MirrorUD**.

6.5 Flip a Board

Boards can be flipped up/down and left/right.

- ⬚ Left/Right: Flip the board left/right.

- ⬚ Up/Down: Flip the board up/down.

Procedures:

Use one of the following methods to flip a board:

- In the board editing bar, click ⬚ / ⬚ .
- In the menu bar, go to **Edit** > **FlipLR**.

6.6 Rotate a Board

A board can be rotated clockwise by 90° at one time.

Procedures:

Use one of the following methods to rotate the board:

- In the board editing bar, click ⬚ .
- In the menu bar, go to **Edit** > **Rotate**.

6.7 Manage Layers and Layer Properties

In this window, you can modify the layer properties.

Procedures:

1. In the board editing bar, click ⬚ . In the displayed **Layer** window, you can view the layer properties.
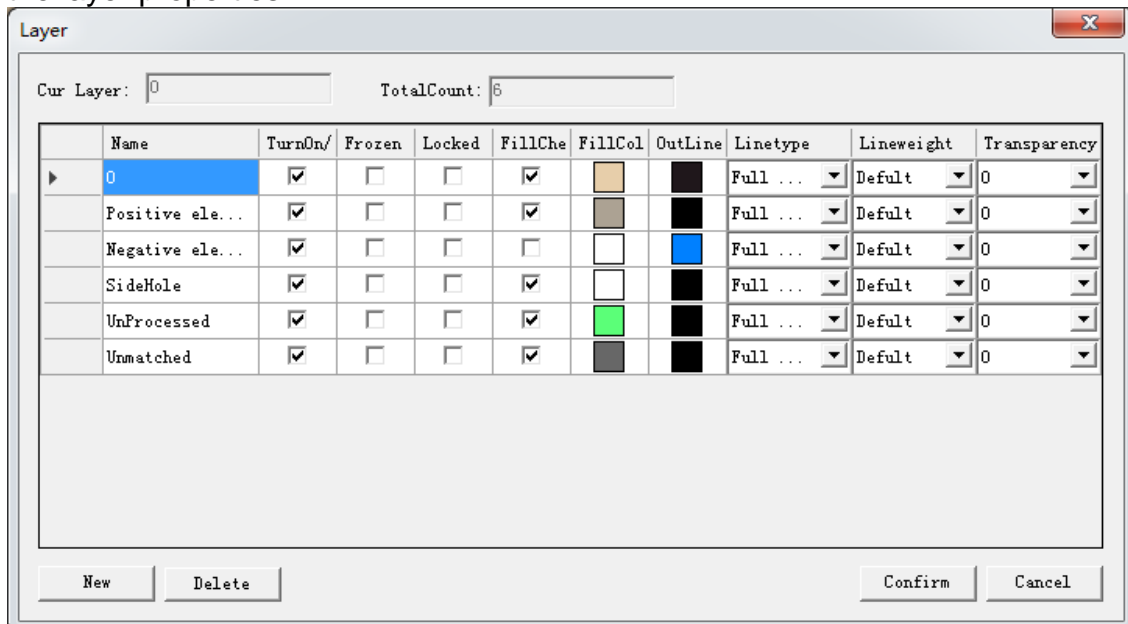
2. (**Optional**): **Modify layer properties** (taking modification of the **negative elements** layer as an example):
   a. Check the **FillCheck** box. Click the **FillColor** box.
   b. In the displayed dialog box, select the target filling color and click OK.

    c. Restart the software to make the modification take effect.

(**Optional**): Create a new layer and customize its properties:

1. Click **New** to add a layer.
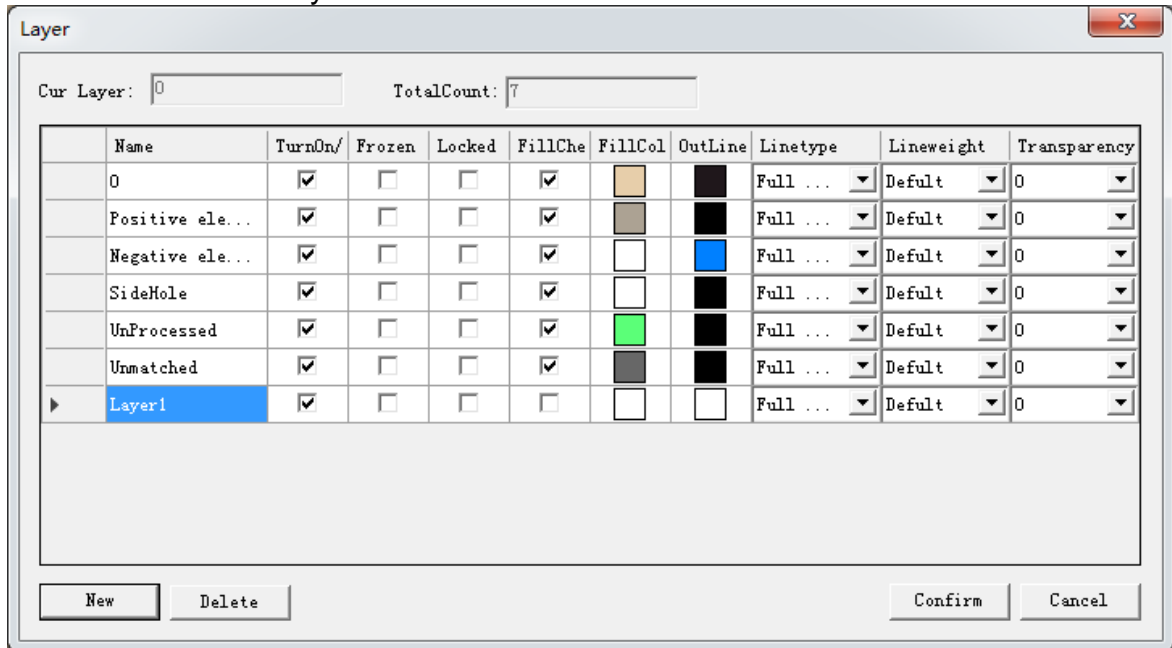
2. Edit the properties as needed. Click **Confirm**.
3. (**Optional**): Delete a layer:
       a. Click the leftmost column of the target row and click **Delete**.
       b. In the pop-up dialog box requiring confirmation, click **Yes**.

7 Board Measurement

This section introduces how to measure the width, length, and thickness of a board.
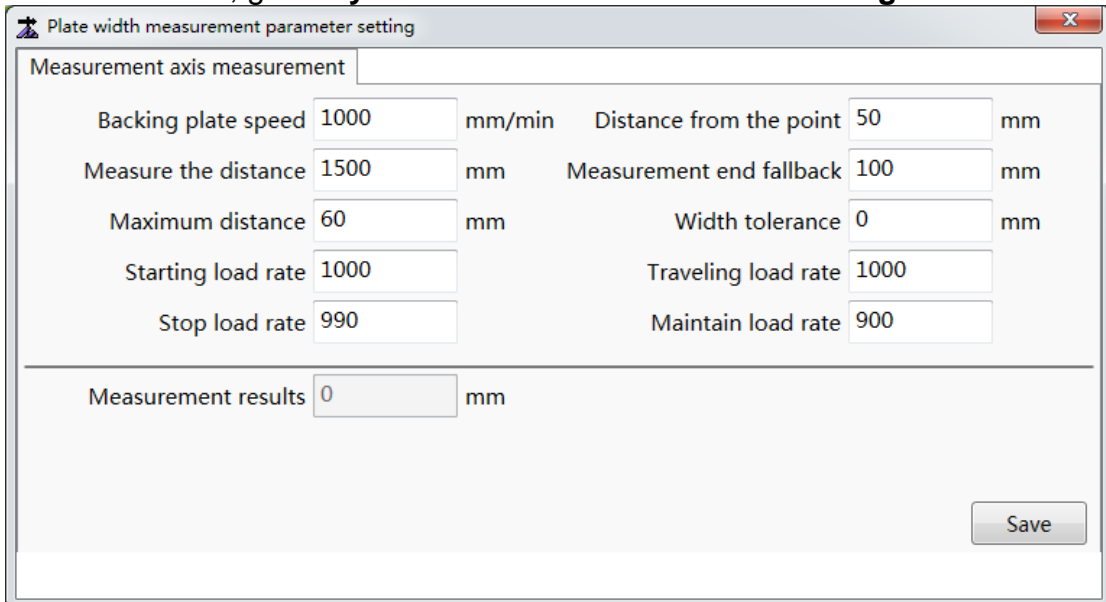
The operations below are available in the **Process** screen if not indicated otherwise.

7.1 Measure Board Width

This function measures board width with the loading of the side leaning mechanism. After the loading reaches the set value, the side leaning mechanism stops movement and reads the coordinates. The measured width needs to be compared with the board actual width.

Procedures:

1. In the board and stigma list area, check **Sidelean** in the upper right corner to enable the side leaning mechanism.
2. In the **Work List** area, check **WidthM** to enable board width measurement.
3. In the menu bar, go to **System** > **Width measurement setting**.

4. In the **Plate width measurement parameter setting** dialog box, set the following parameters:

Parameter	Description
Backing plate speed	The speed at which the measuring point approaches the board.
Distance from the point	The distance between the measuring point and the board.
Measure the distance	The distance between the measuring axis mechanical origin and the clamp (for position calculation).
Maximum distance	The maximum distance that the measuring axis can move.
Measurement end fallback	The withdrawal distance of the side leaning mechanism after the measurement is complete.
Width	The tolerance allowed for width measurement.

Parameter	Description
tolerance	
Stop load rate	The side leaning mechanism stops when the load rate reaches this value. Set it to a value as large as possible to avoid stopping in middle of normal movement.
Starting load rate	The measurement starts when the side leaning mechanism reaches the board and the load rate reaches this value.
Traveling load rate	The load rate when the side leaning mechanism is in middle of movement.
Maintain load rate	The load rate that needs to be kept after side leaning is complete.

5. Click **Save** to save changes.
6. Use one of the following methods to start measuring:
   o Press the **F9** key.

   o In the machining operation bar, click ⬛.
   o In the menu bar, go to **Operate** > **Cycle Start**.
7. In the menu bar, go to **System** > **Width measurement setting**. In the **Plate width measurement parameter setting** dialog box, check the measurement result.
8. Compare the measuring result with the actual board width and see if the measuring error is within the tolerance:
   o Yes: Measurement is successful.
   o No: Repeat the steps above to measure again.

7.2 Measure Board Length

The opto-electric switch is used to calculate the board length by measuring the presence of signals, which needs to be compared with the board actual length.

Procedures:

1. In the board and stigma list area, check **Sidelean** in the upper right corner to enable the side leaning mechanism.
2. In the **Work List** area, check **LengthM** to enable board length measurement.
3. In the menu bar, go to **System** > **Length measurement setting**.
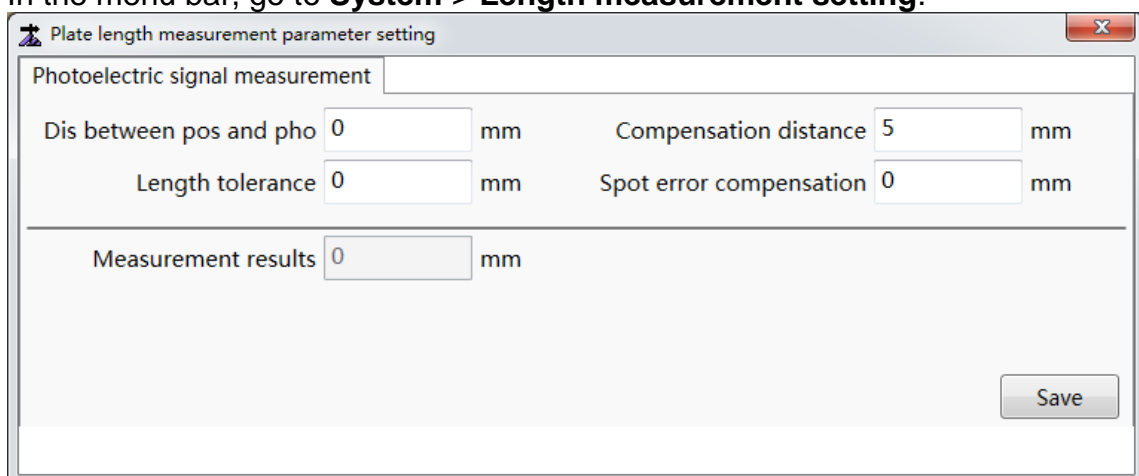
4. In the **Plate length measurement parameter setting** dialog box, set the following parameters:

Parameter	Description
Dis between pos and pho	The distance between the positioning cylinder and the opto-electric signal in the clamp movement direction.
Compensation distance	Compensation during movement to ensure the normal entry into and exit from the signal area of the board.
Length tolerance	Tolerance allowed during length measurement
Spot error compensation	Compensation for the measurement result if there are errors.

5. Use one of the following methods to start measuring:
   o Press the **F9** key.

   o In the machining operation bar, click [F9 ▶].
   o In the menu bar, go to **Operate** > **Cycle Start**.
6. In the menu bar, go to **System** > **Length measurement setting**. In the **Plate length measurement parameter setting** dialog box, check the measurement result.
7. Compare the measuring result with the actual board length and see if the measuring error is within the tolerance:
   o Yes: Measurement is successful.
   o No: Repeat the steps above to measure again.

7.3 Measure Board Thickness

Magnetic grating ruler is used to measure the height difference when the clamp is released and clamped. The measured thickness needs to be compared with the actual board thickness.

Procedures:

1. In the board and stigma list area, check **Sidelean** in the upper right corner to enable the side leaning mechanism.
2. In the **Work List** area, check **ThickM** to enable board thickness measurement.
3. In the menu bar, go to **System** > **Thickness measurement setting**.
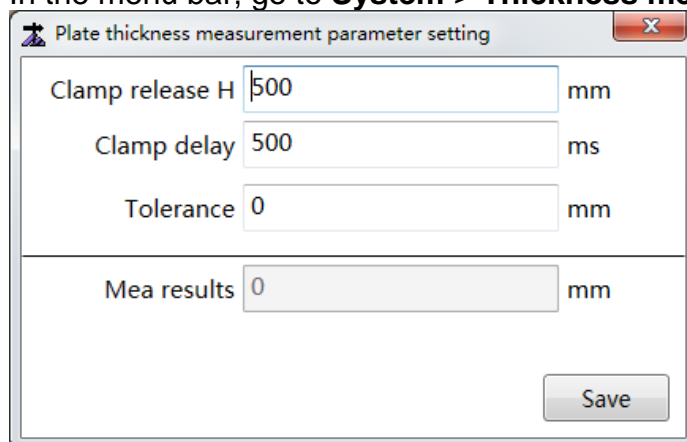
4. In the **Plate thickness measurement parameter setting** dialog box, set the following parameters:

Parameter	Description
Clamp release H	The maximum height between the clamp internal sides when the clamp is released.
Clamp delay	Delay before measurement.
Tolerance	The tolerance allowed during thickness measurement.

5. Use one of the following methods to start measuring:
   o Press the **F9** key.

   o In the machining operation bar, click _____.
   o In the menu bar, go to **Operate** > **Cycle Start**.
6. In the menu bar, go to **System** > **Thickness measurement setting**. In the **Plate thickness measurement parameter setting** dialog box, check the measurement result.
7. Compare the measuring result with the actual board thickness and see if the measuring error is within the tolerance:
   o Yes: Measurement is successful.
   o No: Repeat the steps above to measure again.

8 System Management

This section introduces system-related operations in the **NcStudio Phoenix Nine Axis Six-Side Drilling System**.

The operations below are available in the **Process** or **Control** screen.

8.1 Create Installation Package

You can create an installation package with the current system data for system file backup and keeping a copy of a stable system version.

Procedures:

1. In the menu bar, go to **File** > **Generate Installation Package**.
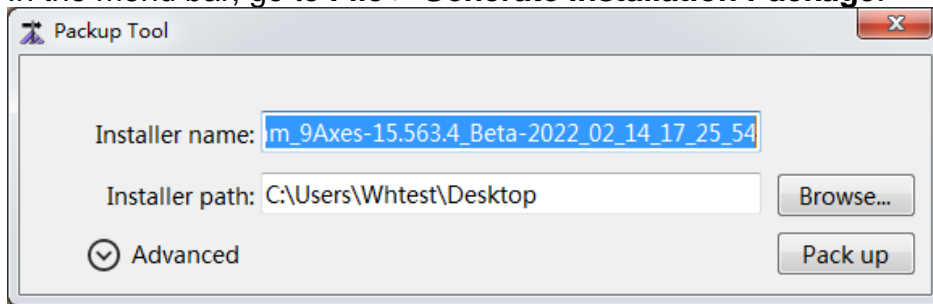
2. In the displayed **Packup Tool** dialog box, click **Browse** to select a storage path for the installation package.
3. Click **Pack up** to make the system start generating an installation package.
   After an installation package is generated, you can find it under the selected directory.

8.2 View the Log

The system log shows important user operations, and system events and time after current system boot and in history.

Procedures:

1. Use one of the following methods to view the log:
   - In the status bar, double-click the blank area/warning message.
   - In the menu bar, go to **System** > **Log**.
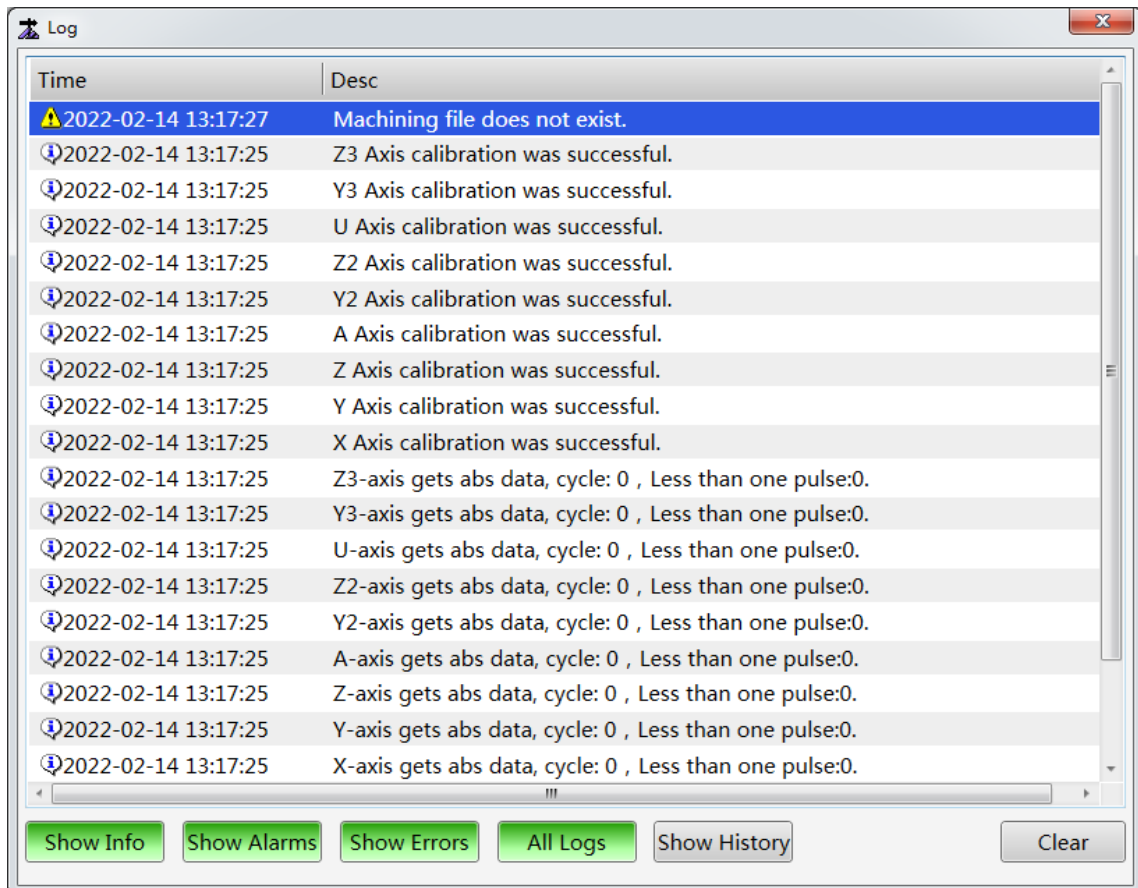
In the **Log** dialog box, all information after current system boot is displayed by default.

2. Highlight the corresponding button based on the type of log you want to check:
   o Software running information ( ): Click **Show Info**.
   o Alarms ( ): Click **Show Alarms**.
   o Errors ( ): Click **Show Errors**.
   o All logs after current system boot: Click **All Logs**.
   o All logs since the software is installed: Click **Show History**.
3. (**Optional**): To delete all log information, click **Clear**.

8.3 Change the Password

The manufacturer password is required to edit drills, view/modify global manufacturer parameters, and set datum.

Procedures:

1. In the menu bar, go to **System** > **Change Password**.
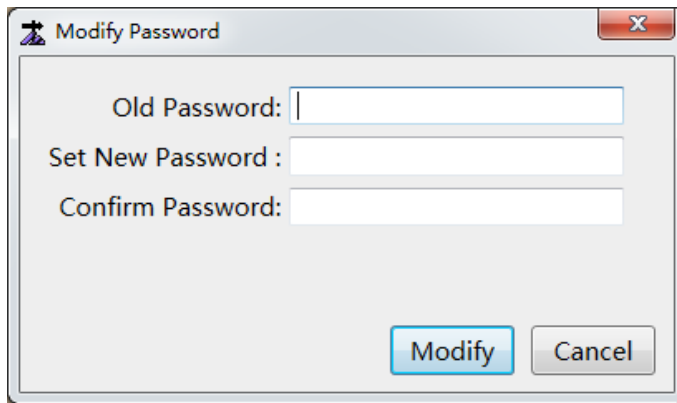
2. In the displayed **Modify Password** dialog box, enter the old password and new password.
3. Click **Modify**.

8.4 Back up and Restore CNC Parameter Settings

You can back up the machining parameter settings and import the backup data later if needed.

Procedures:

In the menu bar, go to **System** > **Recover Parameter Backup**.

- ✦ Click **Backup** to save the settings as an XML file in the directory **D:\Weihong\XML**.
- ✦ To import a backup file, select it and click **Restore**.

8.5 NcTune

NcTune includes functions that are not required during machining but may be needed during machine debugging.

In NcTune, you can use functions of lead screw error compensation, tool calibration, modifying port polarity, viewing the log, using MDI, setting drive parameters, setting tool compensation parameters, collecting data, centering, setting offset, using the control panel, updating firmware, setting system parameters, and viewing machining statistics data.

Use one of the following methods to show the NcTune page:

- ✦ In the menu bar of NcStudio, go to **System** > **NcTune**.
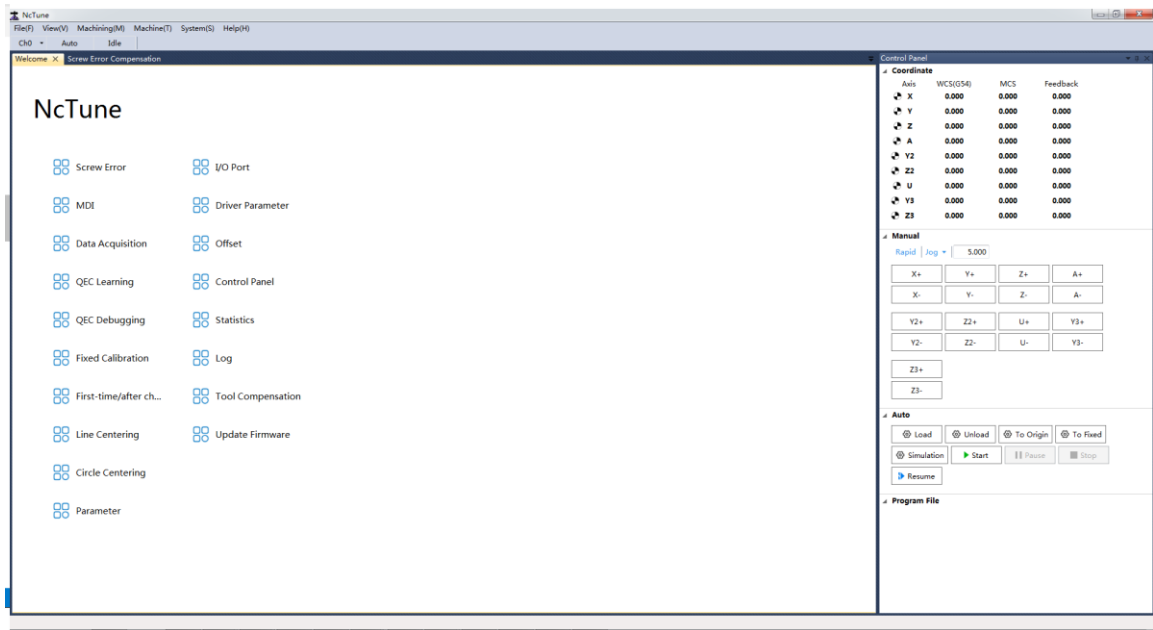
✦ Close NcStudio. Open the following directory, and find and double-click **NcTune.exe**:
C:\Program Files\Weihong\NcStudio\Bin
For details about machine debugging, see <u>Overview</u>.

8.6 Check Tool Lifespan

You can check the tool lifespan to replace old tools in time, manually clear tool wearing data and define the tool lifespan.

Procedures:

1. In the menu bar, go to **System** > **ToolLifeStatistics**.

ToolNo.	ToolType	ToolDia	UsableTimes	UsedTimes	UsableDistance	UsedDistance	UsableDuration	UsedDuration	opt
1	Vertical	15	0	0	5	0.00	0	0.00	Reset
2	Vertical	8	0	0	0	0.00	0	0.00	Reset
3	Vertical	10	0	0	0	0.00	0	0.00	Reset
4	Vertical	8	0	0	0	0.00	0	0.00	Reset
5	Vertical	5	0	0	0	0.00	0	0.00	Reset
6	Vertical	5	0	0	0	0.00	0	0.00	Reset
7	Vertical	8	0	0	0	0.00	0	0.00	Reset
8	Vertical	10	0	0	0	0.00	0	0.00	Reset
9	Vertical	8	0	0	0	0.00	0	0.00	Reset
10	Vertical	15	0	0	0	0.00	0	0.00	Reset
50	Spindle	6	0	0	0	0.00	0	0.00	Reset
51	Vertical	10	0	0	0	0.00	0	0.00	Reset
52	Vertical	8	0	0	0	0.00	0	0.00	Reset
53	Vertical	10	0	0	0	0.00	0	0.00	Reset
54	Vertical	10	0	0	0	0.00	0	0.00	Reset
55	Vertical	8	0	0	0	0.00	0	0.00	Reset
56	Vertical	10	0	0	0	0.00	0	0.00	Reset

2. The **UsableTimes**, **UsableDistance**, and **UsableDuration** fields of the tools can be modified.
3. The **UsedTimes**, **UsedDistance**, and **UsedDuration** fields show the automatically collected data.

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4. (**Optional**): If a tool has reached the set usable times/distance/duration and is replaced, you need to click **Reset** to clear the old data.
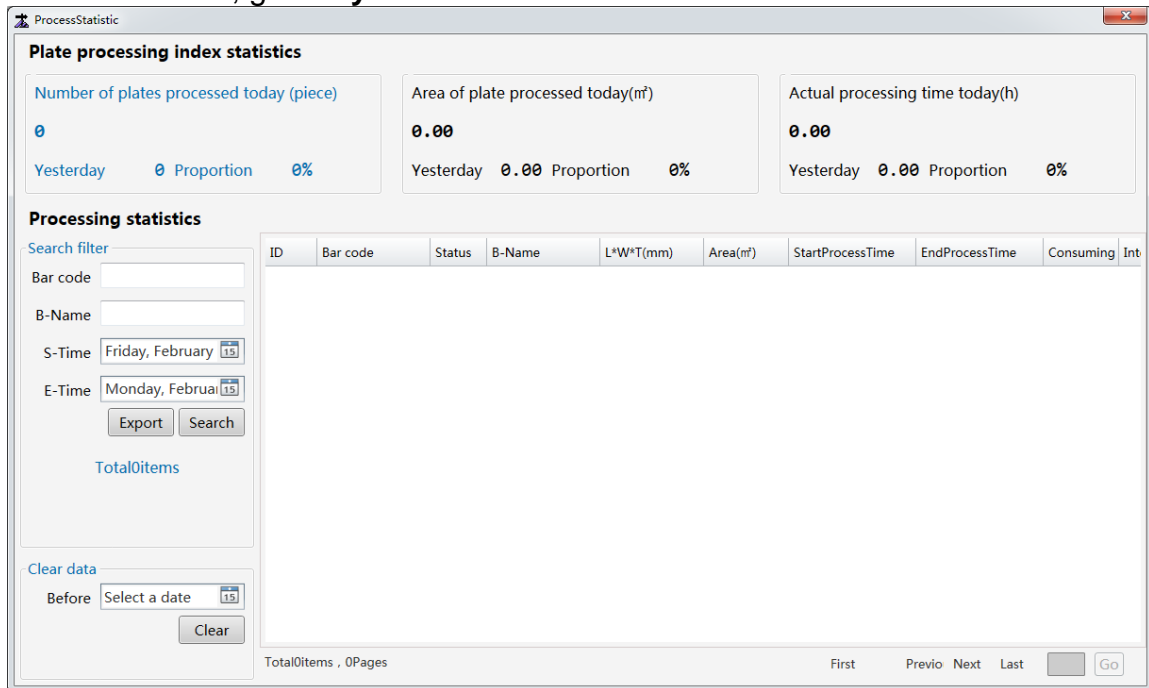
8.7 View Machining Statistics

The system records the number of boards and the board area processed, the machining duration, and compares those with yesterday's data.

On the statistics page, you can check the board size, machining duration, and the number of holes and slots.

Procedures:

1. In the menu bar, go to **System** > **ProcessStatistic**.

2. In the **ProcessStatistic** dialog box, enter the board bar code, name, and machining start and end time, and click **Search** to search for machining records that meet the conditions.
3. (**Optional**): To clear machining data, specify a date in the **Clear data** area and click **Clear**. Machining data before the specified date will be erased.

8.8 Register the Software

You need to register the software if the software use period has or is about to expire, or if the writing type does not match.

Procedures:

1. In the menu bar, go to **Help** > **About**.
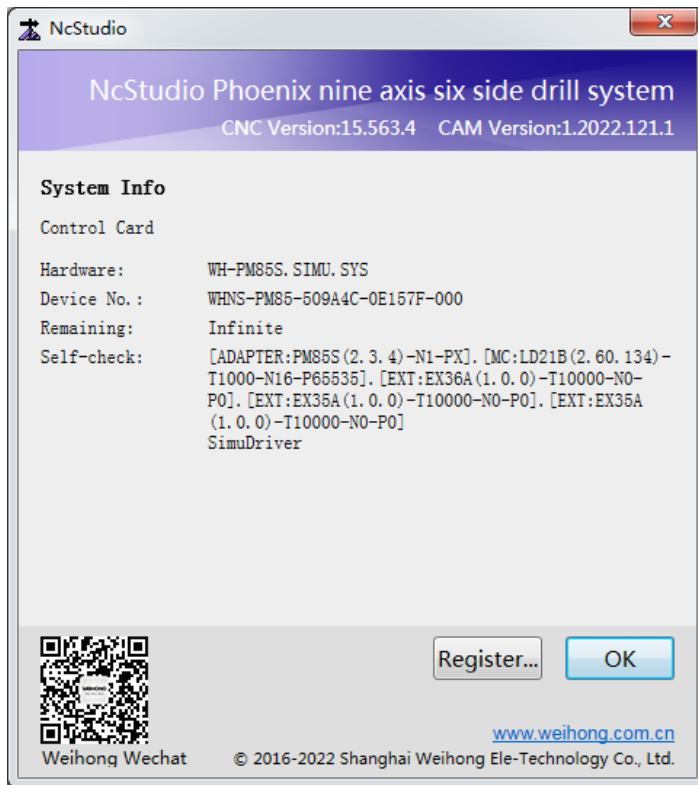
2. Click **Register**.
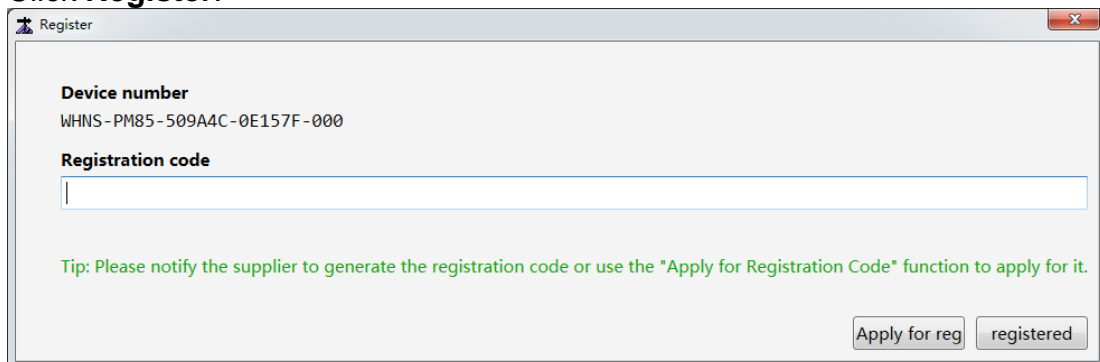
3. Use one of the following methods to acquire the registration code:
   o Send the device number to the machine manufacturer and get a registration code.
   o Click **Apply for reg**, follow the instructions, and click **OK**.
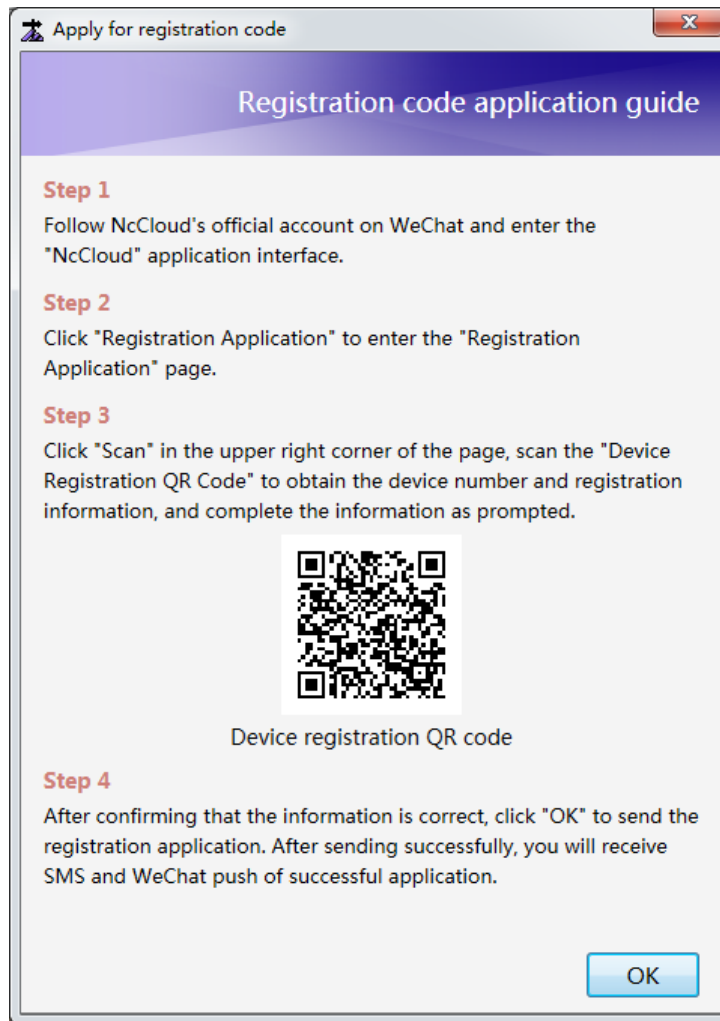
4. Enter the registration code in the field. Click **registered**.

8.9 Edit Start and End Codes

You can edit the start and end codes (supporting M codes) to change the machine movements before and after machining.

Procedures:

1. (**Optional**): To check the definitions of M codes, go to **System** > **Custom M instruction** in the menu bar:

Custom M instruction

M03: The upper spindle is fully started	M47: Right pressure roller off
M05: The upper spindle stops completely	M44: Left pressure roller on
M07: The lower spindle is fully started	M45: Left pressure roller off
M09: The lower spindle stops completely	M48: Front pressure roller on
M123: Upper spindle pre start	M49: Front pressure roller off
M133: Lower spindle pre start	M50: After pressure roller on
M13: Drill 1 Start	M51: After pressure roller off
M15: Drill 1 Stop	M40: Left pressure plate extends
M16: Drill 2 Start	M41: Left pressure plate retracted
M17: Drill 2 Stop	M42: Right pressure plate extends
M18: Drill 3 Start	M43: Right pressing plate retracted
M19: Drill 3 Stop	M146: Drill 3 right pressure roller on
M20: A Clamp closed	M147: Drill 3 right pressing roller off
M21: A Clamp release	M144: Drill 3 left pressure roller on
M22: X Clamp closed	M145: Drill 3 left pressure roller off
M23: X Clamp release	M148: Drill 3 front pressure roller on
M33: Double clamp closed	M149: Drill 3 front pressure roller off
M34: Double clamp release	M150: Drill 3 after pressure roller on
M52: Conveyor belt open	M151: Drill3 after pressure roller off
M53: Conveyor belt off	M140: Drill 3 Mid pressure Plate on
M56: Positioning cylinder pops out	M141: Drill 3 Mid pressure Plate off
M57: Position the cylinder retract	M152: Drill 3 right pressure Plate on
M81: Front pressing material out	M153: Drill 3 right pressure Plate off
M80: Front pressing material recovery	M62: Brush cylinder extends
M83: After pressing the material out	M63: Brush cylinder retracted
M82: After pressing material recovery	M84: Upper spindle cylinder lay down
M46: Right pressure roller on	M85: Upper spindle cylinder retracts

M38: Lower spindle cylinder lay down
M39: Lower spindle cylinder retracts
M24: Fan start
M25: Fan stop
M95: All Pressure roller/plate Off
M97: All spindle pressing M Off
M59: Front floating cy extends
M58: Front floating cy retracted
M120: Wait until the board is in place
M100: Length measurement
M101: Width measurement
M102: Thickness measurement

Close

2. In the NcStudio home page, select the **Process** screen in the upper right corner. Click the **CAM Parameter** button above the drawing area.

3. In the displayed **Parameter List** window, click **StartEndCode** in the left list:

Parameter List | Query | Save | Go Back

Operating's
- Element selection
- Hole machining
- Spindle machinin
- Special process
- Compensation pa
- Discharge param
- Other parameters

Equipment's
- Mechanical speci
- Security paramete
- M code configura
- Delay parameters
- Automatic anti-co
- Clamp related

Pressure's
- StartEndCode

Start Code
```
G00  Y2=-200
M1001
M95 M97
M39 M85
T0
M34
M24
//Simu
G00 X=#X A=#A Y3=#Y3 Y=#Y U=#U
Z3=#Z3
M56 //Location
M00
// G04 P400
M800(P="flag=start")
M20 M22
G04 P300.0
G00 Z=85.00
M57
Z3=85
```

End Code
```
//M9
M95 M97
T0
M25
M34
G00 Y2= -200
M1002
   // Y2=-200.00 Y-600 Y3=-350
M800(P="flag=stop")
M1000
//M62
//M52
M30
M99
```

4. Modify the codes based on your needs.

9 CAM Parameters

CAM parameters include operation parameters, equipment parameters, pressing wheel and board parameters, and start/end codes.

Contact us if the manufacturer password is required when modifying a parameter.

Procedures:

1. (**Optional**): In the NcStudio home page, select the **Process** screen in the upper right corner.
2. Click the **CAM Parameter** button above the drawing area to access the **Parameter List** window.

9.1 Operation Parameters

Include common parameters controlling the machining process.

The operation parameters are divided into the following categories:

- **Element selection**

Parameter	Description
IsOutputVerHoles	Whether to process holes on the board front side. 0: Not process; 1: process.
IsOutputVerHolesBack	Whether to process holes on the board rear side. 0: Not process; 1: process.
IsOutputHorHoles	Whether to process board horizontal holes. 0: Not process; 1: process.
IsOutputSlotes	Whether to process slots on the board front side. 0: Not process; 1: process.
IsOutputSlotesBack	Whether to process slots on the board rear side. 0: Not process; 1: process.
IsOutputShape	Whether to process irregular-shaped outlines. 0: Not process; 1: process.
IsOutputShapeHor	Whether to process horizontal holes in the irregular-shaped position (when not process irregular-shaped outlines). 0:

Parameter	Description
	Not process; 1: process.
IsBigHoleAtFaceA	Whether to forcibly flip the big hole (spindle tool) to the front side. 0: No; 1: Yes.
HolesSortingStyle	Hole sequencing rule. 1: only in and no out; 2: shortest path.
SingleFaceFlipStyle	Board flipping method. 0: not flip; 1: flip only when there is data on the rear side; 2: slots first; 3: side with more holes facing up; 4: automatic.
IsForceHorSlot	Whether to forcibly rotate the board with vertical slots by 90 degrees.
RotateBoardStyle	Whether to forcibly rotate the element in the clamp position by 180 degrees. 0: not rotate; 1: rotate.
IsMaxEdgeNearPawAndLocation	Whether to show information of larger edge seal near the clamp and positioning cylinder. 0: no; 1: yes.
PerLenForSorting	The length of each segment during shortest path segmental optimization.
DifferentOperatePlaneAddDistance	The distance punishment during sequencing of elements to be processed when switching on different operation surfaces of the upper drill package.
UpDownOperatePlaneAddDistance	The distance punishment during sequencing of elements to be processed when switching between the upper and lower drill packages.
IsOutputSideSlots	Whether to process side slots. 0: no; 1: yes.
IsOutputLamelloes	Whether to process the front side lamello. 0: no; 1: yes.
IsOutputBottomLamelloes	Whether to process the rear side lamello. 0: no; 1: yes.
IsOutputSideLamelloes	Whether to process the side lamello. 0: no; 1: yes.

✦ **Hole machining**

Parameter	Description
MaxDepthForVerHole	Maximum depth of a vertical hole.
MaxHorHoleDepth	Maximum depth of a side hole.

Parameter	Description
HorMaxDistanceFromPaw	The maximum X-axis distance between the side hole and the clamp. Effective when the **GraspR** box in the **Work List** is checked.
VerMaxDistanceFromPaw	The maximum X-axis distance between the vertical hole and the clamp. Effective when the **GraspR** box in the **Work List** is checked.
IsEnableFaceAPress	Whether to enable pressing board for the front side holes. 0: no; 1: yes.
IsHoleUseTwoPresses	Whether to enable dual-pressing for the front side holes. 0: no; 1: yes.
IsDownPressCanUseUpFace	Whether the pressing board for rear side holes can be used for the front side. 0: no; 1: yes.
FaceBPressHeight	The slight lift height of the pressing board for the rear side holes.
VerVelSinglePaw	The machining speed for vertical holes with single clamp.
HorVelSinglePaw	The machining speed for side holes with single clamp.
SizeHorVelSinglePaw	The machining speed for side holes at the side leaning position with single clamp.
MultiHorVelSingleSpeed	The machining speed when more than 3 side holes are processed at the same time.
HoleDelayCode	Hole bottom delay code.
UpVerHolePairWithHorHoleMaxDistance	When the distance between the side hole and the upper vertical hole is less than this value, the side hole will be processed first. If the value is less than 0, the function is disabled.
IsXHorHoleUseDoubleDrillMutilTool	Whether to enable dual-drill-package for processing of the X-axis side holes. 0: no; 1: yes.
IsYHorHoleUseDoubleDrillMutilTool	Whether to enable dual-drill-package for processing of the Y-axis side holes. 0: no; 1: yes.

Parameter	Description
UseDoubleDrillMinWidth	Minimum board width for enabling machining with dual drill packages when selecting tools matching the holes
XHorDoubleDrillNoPressMaxDistance	When using dual-drill-package to process X-axis side holes and if the distance between the side hole in the clamp position and the clamp exceeds this value, the pressing wheel will not press.
BrokenSkinDistanceForVerHole	Distance for vertical surface breaking.
BrokenSkinSpeedForVerHole	Machining distance during the vertical surface breaking distance.

✦ **Spindle machining**

Parameter	Description
MaxDepthForMain	The maximum depth that can be reached by machining with the spindle.
PerCutDepth	The maximum depth that can be reached in one time of cutting with the spindle.
IsMainSpindleFirstKnife	Whether to lower the tool first during machining with the spindle. 0: no; 1: yes.
IsUpMianCynStopSpindle	Whether the spindle stops running after the spindle cylinder is withdrawn. 0: no; 1: yes.
IsMainSpindleUsePress	The type of pressing material used during machining with the upper spindle. 0: pressing wheel; 1: spindle pressing material.
IsSMainSpindleUsePress	The type of pressing material used during machining with the lower spindle. 0: pressing wheel; 1: spindle pressing material.
IsMainSpindlePressCanUp	Whether to withdraw the cylinder for the spindle pressing material. 0: no; 1: yes.
MainSpindleSinglePaw	The spindle machining speed with one clamp.

Parameter	Description
SlotSpeed	The slot machining speed.
SlotShortMoveSpeed	Wide slot direction-changing machining speed.
NomalMillingSpeed	Pocket milling speed.
CutMillingSpeed	Milling cutting speed.
SlotToolSpacing	Spindle milling tool offset.
HorXSlotProcessingSettedDir	Whether specify machining direction for X-axis slots. 0: not specify; 1: X- to X+; 2: X+ to X-.
HorYSlotProcessingSettedDir	Whether specify machining direction for Y-axis slots. 0: not specify; 1: Y- to Y+; 2: Y+ to Y-.
IsSlotExpansionRadius	Whether to extend slots outward by the spindle tool radius. 0: no; 1: yes.
SlotConnectionDistance	The maximum distance that can be connected by slots with the same depth and width on the same surface.
SlotLengthForNoSlotExpansion	Slots whose lengths are smaller than this value will not be extended outward along with other slots.
IsUpSectionSlotUsePress	Whether to enable pressing material for the segmented slots on the front side. 0: no; 1: yes.
IsSlotChangePawsNeedPress	Whether a pressing material is required when replacing the clamp for segmented slots. 0: no; 1: yes.
BrokenSkinDistance	The surface cutting distance (equal to or more than the spindle tool radius is recommended).
InBrokenSkinSlotSpeed	The machining speed within the surface cutting distance.
IsBrokenSkinSlowSpeed	The surface cutting method. 0: no setting; 1: slow speed; 2: start cutting outside of the board.
IsThroughSlotMilling	Whether to process slots and milling shapes whose depths are the same as the board thickness into upper and lower parts. 0: no; 1: yes.
ThroughHoleAddDepth	Additional depth to half of the board thickness when processing elements

Parameter	Description
	whose depths are the same as the board thickness.
MinDistanceForUpDownSpindleSlots	Minimum distance allowed between the centers of the upper and lower slots when the upper and lower spindles are used for machining at the same time (-1 means creating slots up/down is forbidden).
MillingNeedPause	Whether to pause before discharging milled elements. 0: no; 1: yes.
ThroughObjUseCutMinLength	During cut-through machining, if any edge of the circumscribed rectangle of the board elements is smaller than this value, regional clearing will be enabled; otherwise, outline cutting will be enabled.
MillingCutMinRectLength	If any edge of the circumscribed rectangle of the milled shapes in the board outline is smaller than this value, regional clearing will be enabled; otherwise, outline cutting will be enabled.
AdditionalDepth	Additional depth to the element bottom during outline cut-through machining.
PreSatrtCodeAdvanceLineCount	The number of rows in advance in the M code for spindle pre-start.
IsSpindleUsingOneFrequencyChanger	Whether to use only one frequency inverter for the spindle. 0: no; 1: yes.

✦ **Special process**

Parameter	Description
MaxDepthForLock	The lock maximum depth.
MaxDepthForSaw	The maximum depth for saw machining.
MillingToolPath	How to process lamello with a milling tool. 0: one cut; 1: two cuts.
SideSlotPriorToolType	The type of tools to be used for side slots preferably. 1: milling tool; 2: saw.
SideFaceSlotForMaxWidth	Maximum board speed available for the tool milling side slots at the side leaning position.
SideFaceLRMaxDistance	Maximum distance between the left and

Parameter	Description
	right side slots and the clamp internal side.
IsSideSawAntiClockWiseMachining	Whether to process side slots anti-clockwise along the board with the side saw. 0: no; 1: yes.
DoublePanelModeType	Dual-board mode. 0: Disable dual-board mode; 1: mirror; 2: left/right; 3: up/down.

✦ **Compensation parameters**

Parameter	Description
IsUseCompZ	Whether to enable side hole Z-axis compensation if the pressing wheel does not press. 0: no; 1: yes.
FrontHorCompZ	Z-axis compensation for the left side hole.
BackHorCompZ	Z-axis compensation for the right side hole.
PawHorCompZ	Z-axis compensation for the clamp side hole.
SideHorCompZ	Z-axis compensation for the side hole at the side leaning position.
NoPressPawSlotUpZOff	Z-axis compensation for the upper spindle clamp slot when there is no pressing material.
NoPressPawSlotDownZOff	Z-axis compensation for the lower spindle clamp slot when there is no pressing material.
PanelHeightComp	Board thickness compensation. A positive value indicates that the board actual thickness is larger than the data while a negative value indicates that the board actual thickness is smaller than the data.

✦ **Discharge parameters**

Parameter	Description
BoardExitStyle	Material discharge method. 0: front; 1: rear.
MinWidthFroFront	If the board width is smaller than this value, materials will be forced to use front discharge.
MaxWidthForNormalVel	If the board width is larger than this value, materials will be forced to use front discharge with the low speed.
FrontBoardOutVel	Front discharge speed.
BoardOutLowVel	Front discharge low speed.
FrontBoardOutMaxX	The clamp maximum workpiece coordinates during front discharge.
BoardExitPos	The board head position for front discharge.
BoardExitPos2	The board tail position for rear discharge.

Parameter	Description
BackBoardOutVel	Rear discharge speed.
BackOutPanelMaxX	When the board head position is equal to or larger than this value during rear discharge, the rear discharge waiting M code will be added.

✦ **Other parameters**

Parameter	Description
UseHitWhereCatchWherePanelMinWidth	If the board width is smaller than this value, the **GraspR** function will be enabled forcibly.
IsDrawDimension	Whether to show hole information. 0: no; 1: yes.
IsAutoShowNextPanel	Whether to show the next board to be processed. 0: no; 1: yes.
IsEnableSide	Whether to enable side leaning. 0: no; 1: yes.
IsAnnotateNc	Whether to add notes for the tool path. 0: no; 1: yes.
IsClearTaskListFirstTime	Whether to clear the machining list after the software is restarted. 0: no; 1: yes.
IsProcessedPanelNeedTip	Whether to show a message window when you are trying to add a processed board. 0: no; 1: yes.
EdgePlus	Shrinking multiplier of edge seal information.
ChangeToolAddDistance	Distance punishment when replacing the lowered tool with the tool not lowered during tool selection.
ChangePressAddDistance	Distance punishment when replacing the lowered pressing material with the pressing material not lowered during pressing material selection.
HorHoleDownSlotMinSinglePawLength	The minimum length held by a single clamp during machining with a horizontal

Parameter	Description
	tool or spindle on the rear side.
NumPrecision	The number of digits after the decimal point of the tool path coordinates.
EnableScanAuto	Whether to enable automatic machining after code scanning. 0: no; 1: yes.
IgnoreOrRemainScanPIDFrontOrBackCharacter	Code reading filtering rule X-Y (0-0 by default). X: 0: Neglect the Xth digit from the end of the barcode; 1: Neglect the first X digits of the barcode; 2: Neglect the last X digits of the barcode; 3: Keep the first X digits of the barcode. Y: The filtering rule is effective when Y is larger than 0.
FolderPathForScanPanel	Fixed directory for board barcode scanning and downloading.
FileSuffixForScanPanel	The suffix of the board data file in the fixed directory (1: mpr; 2: ban; 3: xml).
XMLFileTypeForScanPanel	The source of the XML file in the fixed directory (1: KDTXml; 2: ProgramXml).
DistinguishIndexForScanFrontPanel	Use the Xth digit from the last of the file to distinguish between the front and rear sides (effective when larger than 0).
DistinguishScanFrontPanelCharacter	Scan in the fixed directory for file names containing front side data characters.
DistinguishScanBackPanelCharacter	Scan in the fixed directory for file names containing rear side data characters.
IsUpTableInM108	Whether to add workbench lifting movement in the received commands. 0: no;

Parameter	Description
	1: yes.
ZMinusFaceToolNumber	The tool number matching the operation surface opposite to the vertical pocket milling (ID 112 in the mpr file). If the tool number is not shown in the parameter screen, the surface is a side surface.
IsZCoorFromZeroForFaceBDepth	Whether to calculate the depth of rear side elements in the ban files as 0 surface. 0: no; 1: yes.

9.2 Equipment Parameters

Include parameters related to equipment, such as the drill packages, clamps, and side leaning mechanism.

The equipment parameters are divided into the following categories:

- **Mechanical specifications**

Parameter	Description
UsingFixLocation	The type of positioning cylinder. 0: movable; 1: fixed.
IsLocationInY	Whether the movable positioning cylinder is located on the drill package Y (the upper left drill package). 0: no; 1: yes.
LocationWidth	The Y-axis height of the movable positioning cylinder.
PawLocationInternelDistance	The minimum gap between the positioning rod and the clamp Y-axis edge.
BoardHeadOffset	The Y-axis offset of the movable positioning cylinder relative to the base drill.
ZLocationPostion	The Z-axis position when the positioning cylinder lowers with its bottom attached firmly on the workbench surface.
PawLength	The clamp length.
PawWidth	The clamp width.
OnePawToPanelDis	The distance between the released single clamp and the board.
MaxSinglePawLength	The maximum board length with a single clamp.
PawMinLengthAtBoard	The minimum clamp length held on the board

Parameter	Description
	when there are dual clamps.
MinSinglePawLength	The minimum clamp length held on the board when there is a single clamp.
MaxBoardLength	The maximum board length that can be processed.
MinBoardLength	The minimum board length that can be processed.
MaxBoardWidth	The maximum board width that can be processed.
MinBoardWidth	The minimum board width that can be processed.
MinLengthUsingSide	The minimum board length that allows side leaning.
MaxWidthUsingSide	The maximum board width that allows side leaning.
MinWidthUsingSide	The minimum board width that allows side leaning.
SideHeight	Side leaning width.
SideFarwardDir	Whether the side leaning mechanism moves in the positive direction.
SideOrigin	The workpiece coordinates of the side leaning mechanism when it is not enabled.
SideSimuDir	Whether the initial direction for the side leaning simulation is positive. 0: no; 1: yes.
PressMinLength	The minimum length that the pressing wheel/pressing board hold the board material.
DisableAxisID	Identifiers of disabled axes. Use blank spaces to separate the identifiers.
OpenTableTools	Serial numbers of tools that require a fully open workbench. Use English commas to separate the tool numbers.
HalfOpenTableTools	Serial numbers of tools that require a half open workbench. Use English commas to separate the tool numbers.
CloseTableTools	Serial numbers of tools that require a closed workbench. Use English commas to separate the tool numbers.
DownPressTools	Serial numbers of tools that enable lower support. Use English commas to separate the

Parameter	Description
	tool numbers.
SameToolHandle	Tool number for spindles with the same tool handle. Separate the same tool handles with the English underscore. Separate different tool handles with the English comma.

✦ **Security parameters**

Parameter	Description
AbsSafeHeight	Absolute safety height for upper drill packages.
AbsSDrillHeight	Absolute safety height for lower drill packages.
UpDrillSafeDistance	Safe distance between upper drill packages.
PawVerSafeDistance	Safe distance between the vertical drill and clamp.
PawHorSafeDistance	Safe distance between the horizontal drill and clamp.
MainSafeDistance	Safe distance between the upper spindle and clamp.
SMainSafeDistance	Safe distance between the lower spindle and clamp.
SawSafeDistance	Safe distance between the saw and clamp.
SideSawLameloSideAvoidDistance	Safe distance between the saw and side leaning mechanism.
PressSafeDistance1	Safe distance between the pressing wheel/pressing board and clamp.
PressSafeDistanceWithSide	Safe distance between the pressing wheel/pressing board and side leaning mechanism.
PawSafeDistance	Safe distance between the clamps.
SideBackerInit	Initial distance of the side leaning mechanism (safe distance between the side leaning mechanism and the board edge).
HorHoleCenterToPanelConcaveAngelSafeDistance	Safety distance between the irregular shape horizontal hole center and the board reentrant angle.
SDrillPawUpXSafeDistance	X-axis safety distance between the lower tray X+ side edge and the clamp (effective during machining on the lower operation surface).
SDrillPawDownXSafeDistance	X-axis safety distance between the lower tray X- side edge and the clamp (effective during machining on the lower operation surface).

Parameter	Description
XDirMillingToolPawSafeDistance	Safety distance between the X-axis side milling tool and clamp.
YDirMillingToolPawSafeDistance	Safety distance between the Y-axis side milling tool and clamp.
AbsUpSpindleSafeHeight	Absolute safety height of the upper spindle.
SidePressAvoidDistanceForSideTool	Safety distance for the side leaning mechanism to evade the board edges when the spindle elements face the machining side.
XHorDrillDownPalletYOff	The Y-axis safety offset of the lower drill package (lower tray) relative to the upper drill package during X-axis side leaning in the machining process.
SideHorPanelY2FollowMinDistance	If the board width is smaller than this value, enable evading for the lower drill package (lower tray) during machining of side holes at the side leaning position.
SideHorPanelY2AvoidDistance	Safety offset of the lower drill package relative to the upper drill package if evading is enabled for the lower drill package (lower tray) during machining of side holes at the side leaning position.
SideHorDrillDownPalletMinBoardLength	If the board width is smaller than this value, enable Y-axis offset relative to the upper drill package for the lower drill package (lower tray) during machining of side holes at the side leaning position.
SideHorDrillDownPalletYOff	Safety offset of the lower drill package relative to the upper drill package if offset is enabled for the lower drill package (lower tray) during machining of side holes at the side leaning position.
DownSpindleCutPanelPressYOff	Y-axis safety offset to be added for spindle pressing material during cut-through machining with the lower spindle.
UpSpindleCutPanelDownPalletYOff	Y-axis safety offset to be added for lower support during cut-through machining with the upper spindle.
XFaceSideSlotDownPalletYOff	Y-axis safety offset of the lower drill package (lower tray) relative to the upper drill package during machining of left and right side slots.
MaxPanelWidthForSideFaceSideSlotDownPalletAvoid	If the board width is smaller than this value, enable evading for the lower drill package (lower tray) during machining of side slots at the side

Parameter	Description
	leaning position.
SideFaceSideSlotDownPallet AvoidYOff	Safety offset of the lower drill package relative to the upper drill package if evading is enabled for the lower drill package (lower tray) during machining of side slots at the side leaning position.
XFaceSideLamelloDownPall etYOff	Y-axis safety offset of the lower drill package (lower tray) relative to the upper drill package during machining of left and right lamelloes.
MaxPanelWidthForSideFace SideLamelloDownPalletAvoi d	If the board width is smaller than this value, enable evading for the lower drill package (lower tray) during machining of side lamelloes at the side leaning position.
SideFaceSideLamelloDownP alletAvoidYOff	Safety offset of the lower drill package relative to the upper drill package if evading is enabled for the lower drill package (lower tray) during machining of side lamelloes at the side leaning position.
IsDrillAvoid	Whether to enable evading for the upper drill package. 0: no; 1: yes.
DrillAvoidDistange	Minimum distance between the upper drill package and clamp internal side. Effective when evading is enabled for the upper drill package.
IsSDrillAvoid	Whether to enable evading for the lower drill package. 0: no; 1: yes.
SDrillAvoidDistance	Minimum distance between the lower tray and clamp internal side. Effective when evading is enabled for the lower drill package.
SDrillInterferenceYLength	Y-axis length of the lower tray (for specifying a tool that allows for non-interference between the rear side holes and the clamp. Effective when evading is enabled for the lower drill package).
SDrillPawSafeDistance	Safety distance between the lower tray and clamp Y-axis edge (for specifying tools that allow for non-interference between the rear side holes and the clamp. Effective when evading is enabled for the lower drill package).
ToolPressThroughPawAvoid Style	Handling method for the tool and pressing material crossing the clamp. 0: withdraw tool and pressing material; 1: enable evading for the drill package.
IsThroughPawsBackTool	Whether to withdraw the tool when it is crossing

Parameter	Description
	the clamp. 0: no; 1: yes.
IsSideHorHoleThroughPawsUpZ	Whether to lift the horizontal drill when crossing the clamp. 0: no; 1: yes.
IsVerHorHoleThroughPawsUpZ	Whether to lift the vertical drill when crossing the clamp. 0: no; 1: yes.
ThroughPawsUpZPostion	The Z-axis position for lifting the upper drill package when it crosses the clamp.
IsChangePawNeedUpTool	Whether to withdraw tool for clamp replacement. 0: no; 1: yes.
IsNoPanlePawNeedClose	Whether to enable dry clamping for clamps holding no boards. 0: no; 1: yes.
IsThroughSideBackSide	Whether to withdraw the side leaning mechanism when the milling tool approaches it. 0: no; 1: yes.
IsSideAvoidIrregularOutLine	Whether to enable evading for the side leaning mechanism forcibly when the board corresponding side has an irregular outline. 0: no; 1: yes.
IsPressCanOutSide	Whether the pressing material can exceed the side leaning mechanism. 0: no; 1: yes.
IsDownPressCanParallelWithPaw	Whether the lower material stripper can be aligned with the clamp internal side. 0: no; 1: yes.
IsUpDrillUnloadAvoid	Whether to enable Y-axis evading for the upper drill package during material discharge. 0: no; 1: yes.
IsDownDrillUnloadAvoid	Whether to enable Y-axis evading for the lower drill package during material discharge. 0: no; 1: yes.
IsHorHoleCanUnderPaw	Whether side holes under clamps are allowed. 0: no; 1: yes. (To avoid empty running or collision between the drill and clamp.)

- **M code configuration**

Parameter	Description
PawClose	M code for clamping X+ clamp
PawLoosen	M code for releasing X+ clamp
Paw2Close	M code for clamping X- clamp
Paw2Loosen	M code for releasing X- clamp
AllPawsCloseM	M code for clamping all clamps.

Parameter	Description
AllPawsOpenM	M code for releasing all clamps.
Paw1MoveDownCode	M code for enabling X+ clamp floating.
Paw1MoveUpCode	M code for disabling X+ clamp floating.
Paw2MoveDownCode	M code for enabling X- clamp floating.
Paw2MoveUpCode	M code for disabling X- clamp floating.
LocationDown	M code for enabling the positioning cylinder.
Locationup	M code for disabling the positioning cylinder.
UpSpindleCyOnM	M code for enabling the upper left drill package spindle cylinder.
UpSpindleCyOffM	M code for disabling the upper left drill package spindle cylinder.
UpSpindle2CyOnM	M code for enabling the upper right drill package spindle cylinder.
UpSpindle2CyOffM	M code for disabling the upper right drill package spindle cylinder.
DownSpindleCyOnM	M code for enabling the lower spindle cylinder.
DownSpindleCyOffM	M code for disabling the lower spindle cylinder.
UpSpindleDownReadyCode	M code for enabling upper spindle in-position detection.
DownSpindleDownReadyCode	M code for enabling lower spindle in-position detection.
LocationUpReadyCode	M code for enabling positioning cylinder withdrawal in-position detection.
XHorPanelDownMCode	M code for lowering the workbench surface for machining X-axis side holes. Optional based on the machine model.
XHorPanelUpMCode	M code for lifting the workbench surface for machining X-axis side holes. Optional based on the machine model.
YHorPanelDownMCode	M code for lowering the workbench surface for machining Y-axis side holes. Optional based on the machine model.
YHorPanelUpMCode	M code for lifting the workbench surface for machining Y-axis side holes. Optional based on the machine model.
PanelHalfOpenMCode	M code for making the workbench half open. Optional based on the machine model.
PanelOpenMCode	M code for making the workbench entirely

Parameter	Description
	open. Optional based on the machine model.
PanelCloseMCode	M code for making the workbench entirely closed. Optional based on the machine model.
MainKnifeStart	M code for starting the upper left drill package spindle.
MainKnifeEnd	M code for stopping the upper left drill package spindle.
MainKnifeStart2	M code for starting the upper right drill package spindle.
MainKnifeEnd2	M code for stopping the upper right drill package spindle.
SMainStart	M code for starting the lower drill package spindle.
SMainEnd	M code for stopping the lower drill package spindle.
MainStartCheckCode	M code for checking upper spindle frequency arrival.
SMainStartCheckCode	M code for checking lower spindle frequency arrival.
UpSpindlePreSatrtCode	M code for upper spindle pre-start.
DownSpindlePreSatrtCode	M code for lower spindle pre-start.
DrillStart	M code for starting the upper left drill package group.
DrillEnd	M code for stopping the upper left drill package group.
Drill2Start	M code for starting the upper right drill package group.
Drill2Stop	M code for stopping the upper right drill package group.
SDrillStart	M code for starting the lower drill package group.
SDrillEnd	M code for stopping the lower drill package group.
HorSawStartCode	M code for starting the horizontal drill.
HorSawStopCode	M code for stopping the horizontal drill.
CheckBoardLenM	M code for board length measurement.
CheckBoardThickness	M code for board thickness measurement.

Parameter	Description
CheckBoardWidthM	M code for board width measurement.
SidePushCode	M code for side leaning torque material pushing.
WaitBackOutPanelMCode	M code for waiting when the board head position during rear discharge is larger than the parameter value.
FrontOutPanelMCode	M code for no response during front discharge.
BackOutPanelMCode	M code for no response during rear discharge.
SideInCode	M code for pushing the side leaning mechanism.
SideOutCode	M code for withdrawing the side leaning mechanism.

✦ **Delay parameters**

Parameter	Description
DelayPawClose	Clamp closing delay.
DelayPawOpen	Clamp releasing delay.
MoveDownDelay	Delay for enabling clamp floating.
MoveUpDelay	Delay for disabling clamp floating.
DelayDrillSel	Delay for pushing out the vertical drill.
DelayDrillBack	Delay for withdrawing the vertical drill.
DelayHorDrillSel	Delay for pushing out the horizontal drill.
DelayHorDrillBack	Delay for withdrawing the horizontal drill.
DelayMainSel	Delay for pushing out the spindle.
DelayMainBack	Delay for withdrawing the spindle.
DelayMainStart	Delay for starting the spindle.
DelayDrillStart	Delay for starting the drill package.
SawSelDelay	Delay for pushing out the saw.
SawBackDelay	Delay for withdrawing the saw.
HorSawSelDelay	Delay for pushing out the side saw.
HorSawBackDelay	Delay for withdrawing the side saw.
TableOpenDelay	Delay for opening the workbench.
TableCloseDelay	Delay for closing the workbench.
TableDownDelay	Delay for lowering the workbench.
TableUpDelay	Delay for lifting the workbench.

Parameter	Description
SideInDelay	Delay for pushing out the side pushing mechanism.
SideOutDelay	Delay for withdrawing the side pushing mechanism.

✦ **Automatic anti-collision**

Parameter	Description
PawMaxThickness	Clamp height when it is open.
PawThickness	The clamp thickness.
UpDrillXLength	The X-axis length of the upper left drill package.
UpDrillXOffset	Distance between the base drill of the upper left drill package and the drill package edge in the X- direction.
UpDrillYOffset	Distance between the base drill of the upper left drill package and the drill package edge in the Y- direction.
DownDrillOffsetZ	Z-axis offset from the bottom side of the lower drill package to the base drill.
DownDrillXLength	X-axis length of the lower drill package.
DownDrillXOffset	Distance between the base drill of the lower drill package and the drill package edge in the X- direction.
DownDrillYOffset	Distance between the base drill of the lower drill package and the drill package edge in the Y- direction.
UpDrill2OffsetZ	Z-axis offset from the bottom side of the upper right drill package to the base drill.
UpDrill2XLength	X-axis length of the upper right drill package.
UpDrill2XOffset	Distance between the base drill of the upper right drill package and the drill package edge in the X- direction.
UpDrill2YOffset	Distance between the base drill of the upper right drill package and the drill package edge in the Y- direction.

✦ **Clamp related**

Parameter	Description
InterferenceMaxCount	If the number of interference elements is larger than this value, remove certain interference elements based on the initial position quickly located and then iterate holding possibilities.
GetPawsPostionTime	Maximum time allowed for execution of the clamping strategy of a single type of elements. The unit is ms. Iterate holding possibilities.
PawsAreaMaxDistance	If the distance between the clamp and the

Parameter	Description
	board exceeds this value, do not iterate other holding possibilities.
WeightChangePawsCount	Weight of the times of clamp change in the evaluation function.
WeightFirstPawsPostion	Weight of the clamp initial position in the evaluation function.
WeightPawsDistance	Weight of the clamp interval in the evaluation function.
WeightPawsLength	Weight of the clamp holding length in the evaluation function.
IsAvoidMilling	Whether to evade milled outline.
NoChangePawsMaxDistance	Maximum distance for two times of clamping without clamp change.
IsUPaws	Whether the clamp is a U-shaped one.
UPawsConcaveUpXDis	The X-axis distance between the X+ edge of the U-shaped clamp notch and the X+ edge of the clamp.
UPawsConcaveDownXDis	The X-axis distance between the X- edge of the U-shaped clamp notch and the X- edge of the clamp.
UPawsConcaveYLength	The Y-axis length of the U-shaped clamp notch.

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