



CypWeld Intelligent Welding Control Software User Manual

System: FSWELD 3800

Software Version: 10.2502.6.0

Document Version: V1.0.0

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Foreword

Thank you for using BOCHU FSWELD Intelligent Welding Control System!

BOCHU CypWeld Intelligent Welding Control Software (hereinafter referred to as CypWeld) is the operating software for the Intelligent Welding Control System. BOCHU FSWELD 3800 Intelligent Welding Control System now incorporates specialized features such as point cloud reconstruction and large - line - scan initial positioning, in addition to its core functionalities including robotic arm TCP calibration/zero-point calibration, workpiece initial positioning, weld seam extraction, weld seam editing, batch weld seam generation, path planning, simulation, weld seam seeking, arc tracking, continuous fillet welding, multi - layer multi - pass welding, corbel parametric modeling, and multi-workstation machining control.

Before using the software, please be sure that CypWeld is only available for actual processing when working with BOCHU intelligent welding CNC host and the corresponding license. CypWeld will be in DEMO mode if working in an unauthorized CNC host or PC, or without licenses. Meanwhile, to utilize the special functions of the FSWELD3800 Intelligent Welding Control System, please ensure proper configuration of the corresponding equipment software, as the hardware of the FSWELD2800 does not support all the features of the FSWELD3800.

Please note that this manual only serves as the instruction of the special features of FSWELD3800. Please refer to other manuals or contact technical support for other software instructions besides CypWeld.

This manual is based on CypWeld 10.2502.6.0. We apologize for the fact that the software you are using may differ in some respects from what is stated in this manual due to the continuous updating of system features. We make every effort to ensure that the contents of the manual are applicable, but reserve the right of final interpretation. Contents of this manual are subject to change without prior notice

For any questions or suggestions during usage, please contact us through the information provided.

Convention Symbol Explanation

- Notice: Supplementary or explanatory information for the use of this product.
- Caution: If not operated as specified, it may result in minor physical injury or equipment damage.
- Warning: If not operated as specified, it may lead to death or serious physical injury.
- Danger: If not operated as specified, it will cause death or serious physical injury.

Safety Statement

The operation of the robot/external axis and the final welding result are directly related to the welding material, welding machine, gases used, gas pressure, and the parameters you set. Please set all parameters carefully and diligently according to your welding process requirements.

Improper parameter settings or operations may result in suboptimal welding quality, equipment damage, or even personal injury. FSWELD incorporates built-in safety features; however, both equipment manufacturers and end users are required to strictly follow all operating procedures to minimize safety risks

BOCHU shall not be held liable for any direct or indirect losses arising from the following circumstances:

- Losses caused by misuse of this manual or the product;
- Losses due to non-compliance with safety guidelines;
- Losses resulting from force majeure events, such as natural disasters.

Additionally, welding systems in operation carry inherent risks. Users are responsible for ensuring that they have comprehensive fault handling and safety protection mechanisms. BOCHU assumes no responsibility for any incidental or consequential damages resulting therefrom.

Revision History

Version No.	Date	Description
V2.1.0	2026/01/08	Updated based on CypWeld 10.2502.6.0.

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Chapter 1 FSWELD3800 System Overview

1.1 Product Introduction






The FSWELD3800 Intelligent Welding Control System builds upon the original FSWELD2800 by adding BCW181P 3D Laser Profiler and corresponding cables, and upgrading the host to the more powerful HypTronic3_HPC3870E-W CNC host.

! Notice: The software is backward compatible with FSWELD2800. However, as this CNC host is dedicated to FSWELD3800, functions such as point cloud reconstruction and large line scan rough positioning are not available for FSWELD2800.

1.2 Product Components

The components of FSWeld3800 include HypTronic3-HPC3870E-W CNC Host, BCW181P 3D Laser Profiler, BCW600P Seam Tracker and other cables.

Table 1-1 FSWeld3800 System Material List

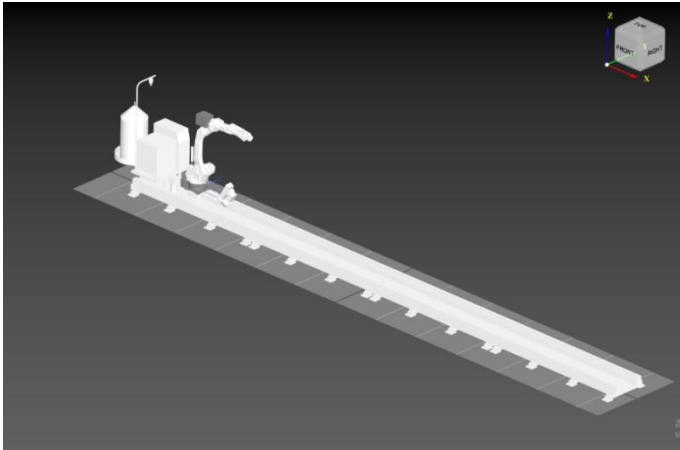
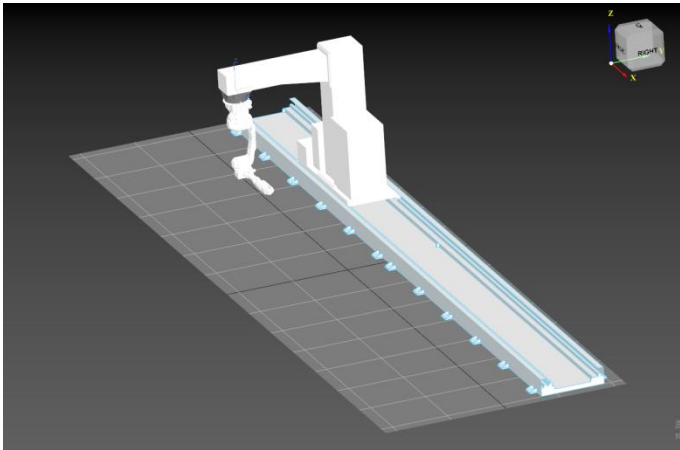
HypTronic3_HPC3870E-W CNC Host*1	BCW181P 3D Laser Profiler,	BCW600P Seam Tracker*1
		
BCW020 Adapter Box*1	HPL2720E Terminal Board*1	WKB SW*1
		

Calibration Triangular Pyramid*1	IO-30 Towline Power Cable *1	Towline Cable (As required)
		

⚠ Notice: The components and quantity may vary according to different packages. The above list is for reference only.

1.3 Supported Machine Types

Table 1-2 Adaptable Machine Types

Name	Diagram
Ground rails	
Ground rail cantilevers	

Name	Diagram
8-axis gentries/cantilevers	
9-axis gentries/cantilevers	

1.4 Applicable Workpieces

Horizontal plate and assembled vertical plate, generally for H beam/.

- A horizontal web, unobstructed when viewed from above.

⚠ Notice: The web plate can be a trapezoid with non-uniform width.

- The horizontal plate needs to be approximately level, with an inclination angle less than 15°. The presence of holes is permitted.
- The vertical plate(s) can be attached on top of the horizontal plate (e.g., stiffeners perpendicular to the web plate on an H-beam web). The spacing between parallel rib plates must be greater than 20 mm. The upper edge of the vertical plate should have an inclination angle within 30°, a thickness between 5 mm to 40 mm, and an aspect ratio (length to width) greater than 10:1.

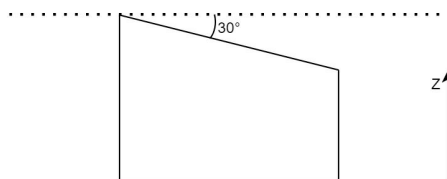


Figure 1-2 Diagram

- The thickness of the plates can be different, but the thickness of the same plate must be consistent.

⚠ Caution: The unsupported workpiece types are as follows

1. Horizontally placed curved plate.
 2. Obliquely placed flat plate or curved plate.
 3. Horizontal plate placed on the vertical plate to form an obstruction..
-

Chapter 2 Hardware Description

2.1 BCW181P 3D Laser Profiler

2.1.1 Technical Specifications

Table 2-1 BCW181P Specifications

Parameter	Model	Value
Near FOV		1000 mm
Far FOV		2600 mm
Clearance Distance		700 mm
Measurement Range		1000 mm
Scanning Frame Rate		1140 fps @ 1 m depth measurement range
Laser Safety Class		Class 3B
Power		12 V DC to 24 V DC
Dimension		354.1 mm × 65 mm × 123.4 mm
Weight		1.6 kg
Working Temperature		0°C to 45°C
Storage Temperature		-30°C to 80°C
Humidity		20% to 85% RH (Non-condensing)

2.1.2 Interface Description

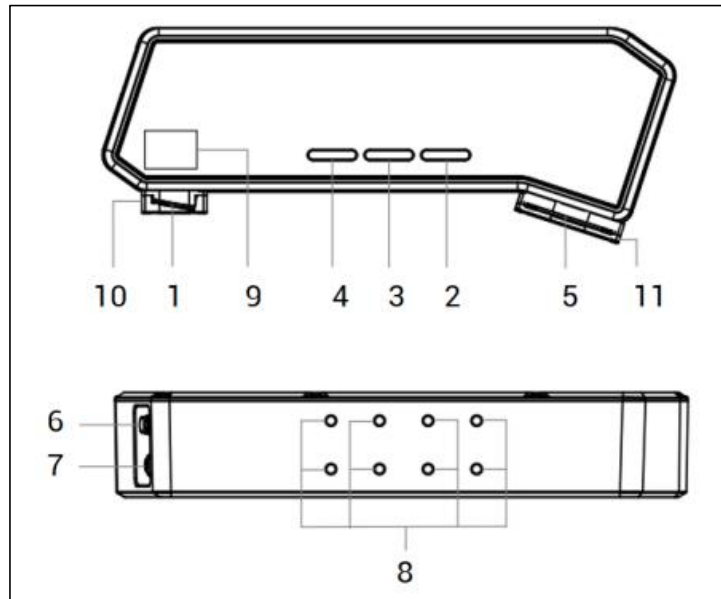


Figure 2-2 The interface layout and the pneumatic protection device

- | | |
|-------------------------|--|
| 1. Laser | 7. Gigabit Ethernet Port |
| 2. Laser Indicator | 8. Screw Holes |
| 3. Status Indicator | 9. Laser Safety Label |
| 4. Power Indicator | 10. Protective Window Quick-Change for Laser Filter |
| 5. Image Sensor | 11. Protective Window Quick-Change for Image Sensor Filter |
| 6. Power, I/O Interface | |

Table 2-2 Interface and Indication Specifications

Name	Description
Laser	It sends out the laser to the object's surface.
Laser Indicator	It displays the operating status of the laser. The indicator light turns green when the laser is operating normally.
Status Indicator	It displays the operating status of the device. The indicator light turns yellow when the device is working properly.
Power Indicator	It displays the status of the power supply. The indicator light turns blue when the device is powered on normally.
Image Sensor	It acquires the laser contour of the object.
Power and I/O Connector	It provides power supply, input/output signal, and serial port functions. Featuring a threaded design, the interface can be screwed tight to reduce loosening caused by vibrations in the field.
GigE Interface	The aviation plug to RJ45 adapter with Gigabit Ethernet port features a threaded interface. The interface is used to secure the connection between the device and the cable. It can be screwed tight to reduce loosening caused by vibrations in the field.
Screw Holes	Eight M6 screw holes on the top of the device are used to fix the device to the mounting bracket. It is recommended to use the hexagon screws for installation. If other screws are required, countersunk screws are recommended. The screw length should be shorter than the combined thickness of the mounting plate and the depth of the screw hole.
Laser Safety Label	Displays the laser-related information and safety warnings of the Profiler. The yellow triangle on the label indicates the location of the laser emission.
Protective Window Quick-Change for Laser Filter	Supports and secures the protective window for the laser filter. It also allows for easy window removal and replacement on site.
Protective Window Quick-Change for Image Sensor Filter	Supports and secures the protective window for the image sensor filter. It also allows for easy window removal and replacement on site.

2.1.3 Wiring diagram

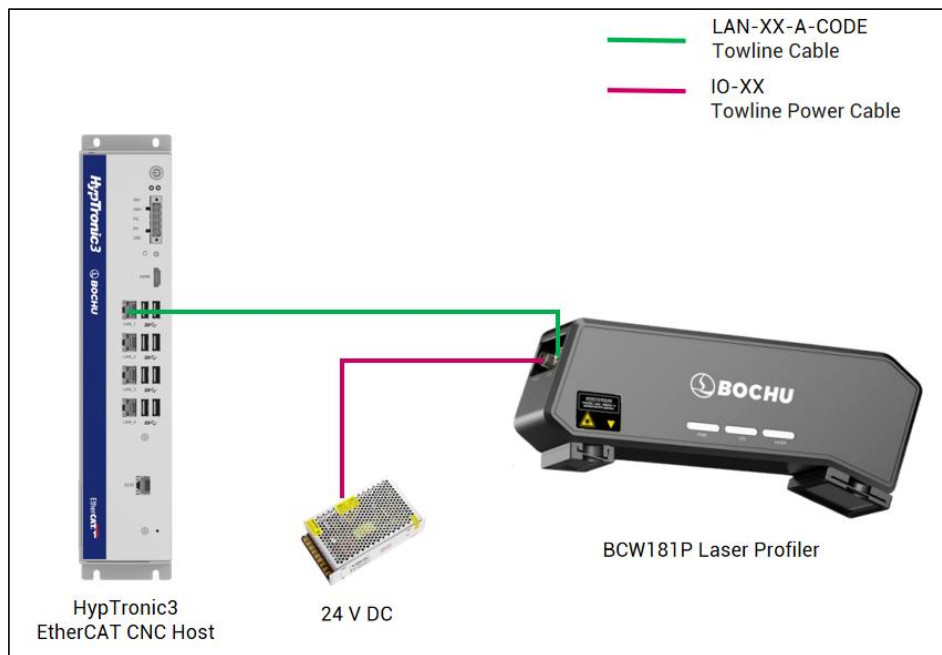


Figure 2-3 Wiring diagram for BCW181P 3D Laser Profiler

 **Notice:**

1. XX in the diagram represents the cable length, which may vary depending on the actual configuration.
2. It is recommended to use a power supply with at least 350 W for the HypTronic3 CNC host.

The line laser 3D camera requires two cables:

- LAN-XX-A-CODE Towline Cable: One end connects to the Profiler, and the other end connects to the CNC host.
- IO-XX Towline Power Cable: One end connects to the Profiler, and the other end connects to the 24 V switch power supply. For the power cable, the brown wire connects to the V- terminal of the 24 V power supply; the white wire connects to the V+ terminal of the 24 V power supply, as shown in Figure 2-4 and Figure 2-5.

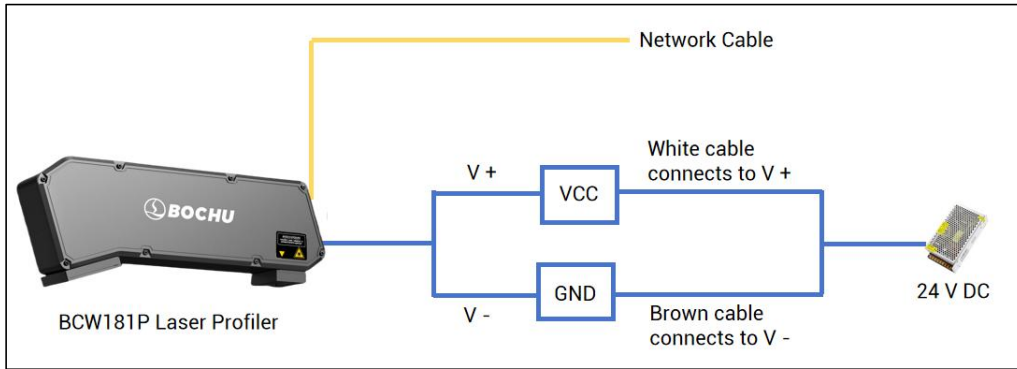


Figure 2-4 Wiring diagram for BCW181P 3D Laser Profiler

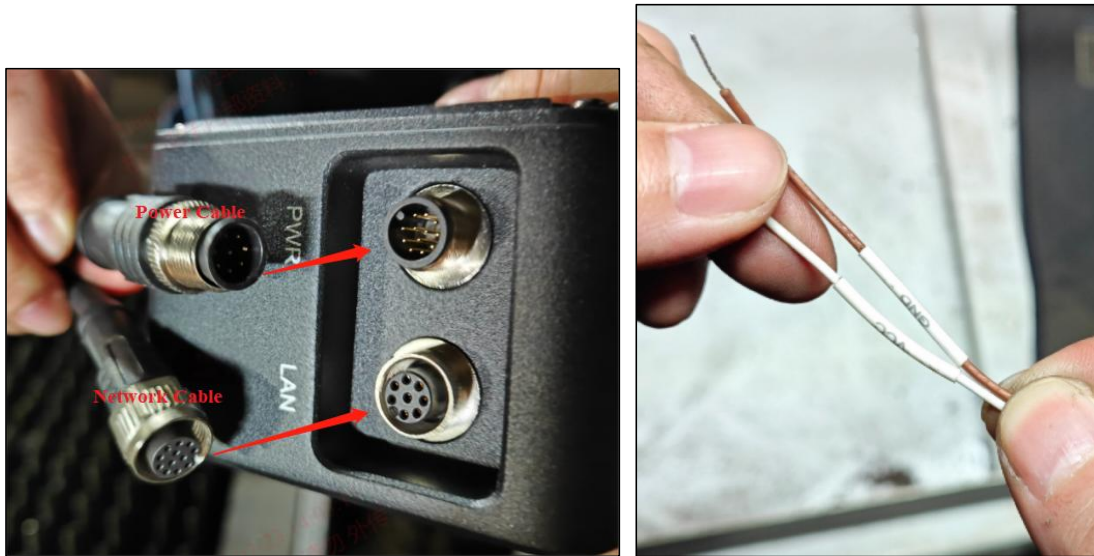


Figure 2-5 Wiring diagram for BCW181P 3D Laser Profiler

⚠ Caution:

1. Both the Ethernet cable and the power cable are the matching harnesses for the BCW181P 3D laser profiler.
2. The 24 V power box is for the exclusive use of the BCW181P 3D laser profiler. Connecting other loads is prohibited! Otherwise, the BCW181P 3D Laser Profiler may fail to operate normally.

2.1.4 Installation Position

The distance between the bottom of the laser emitter and the upper surface of the workpiece should be maintained within the range of 700 mm to 1700 mm to ensure the optimal field of view.

⚠ Caution: If the installation distance exceeds this range, it may lead to increased camera calibration errors, unclear image capture, and affect normal operation.

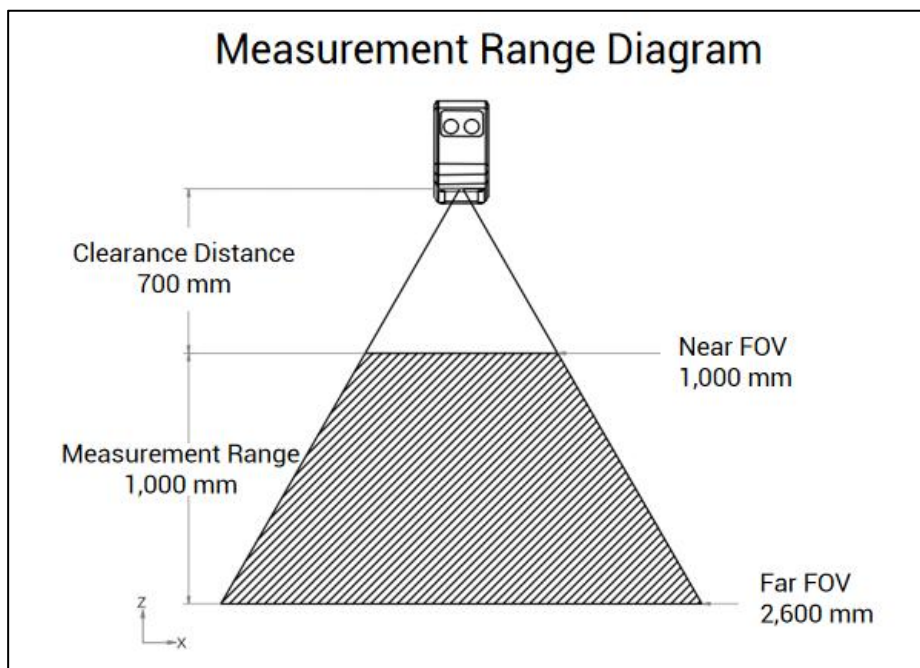
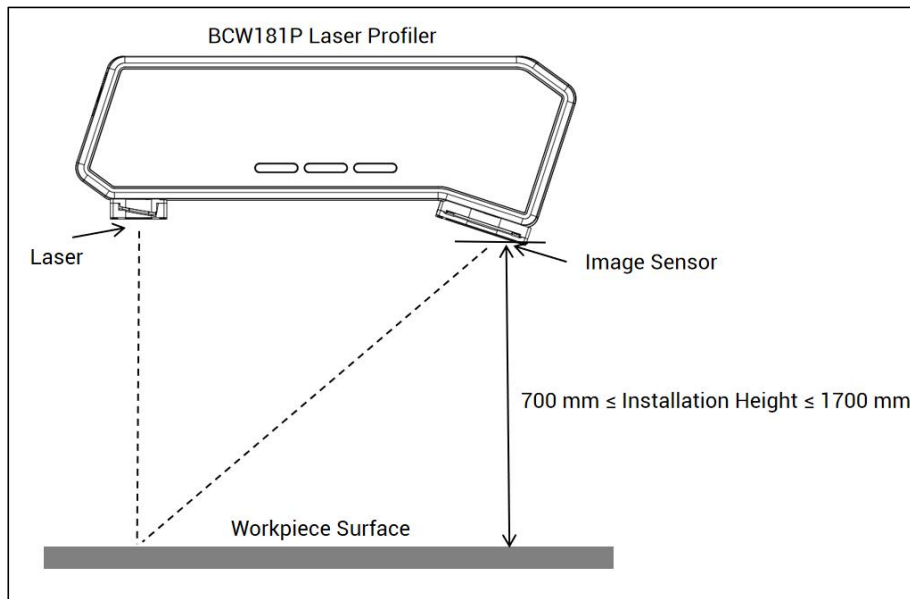


Figure 2-6 Wiring diagram for BCW181P 3D Laser Profiler

2.2 Precautions for the First Installation

Open *Platform Configuration Tool* → *Seam Tracker Camera* → *Large Line Camera Orientation*, and select the desired direction.

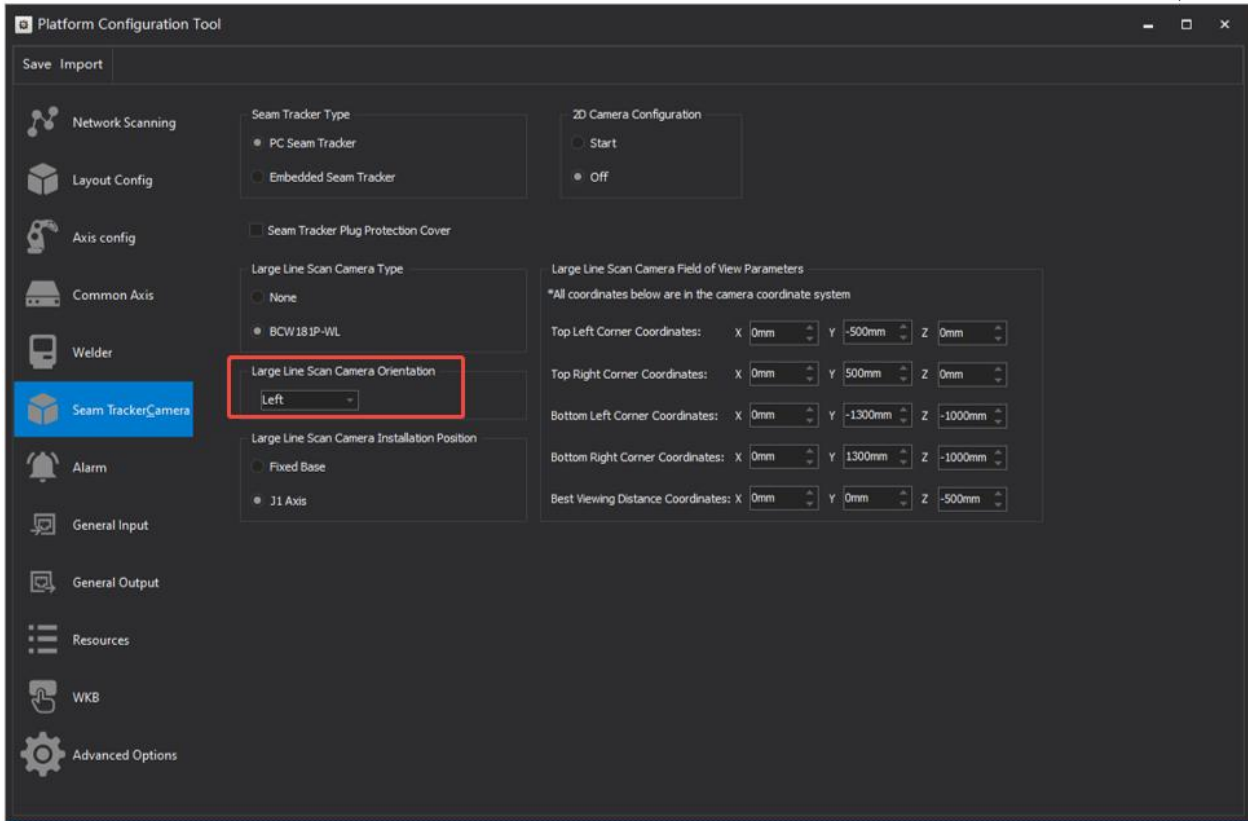


Figure 2-7 Configure the orientation

How to select orientation:

Step 1 Under the mechanical arm's zero position, when observing the seam tracker toward the extension direction of the mechanical arm's J4 axis, the side where the indicator light is located is defined as the orientation side.

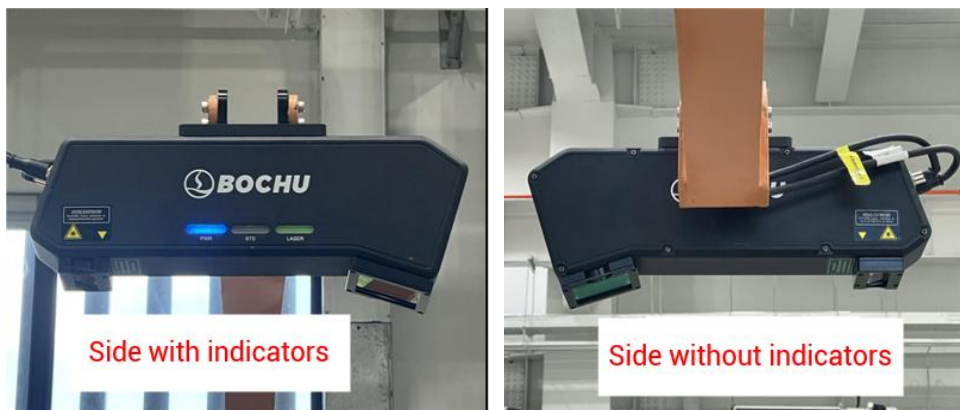


Figure 2-8 Confirmation of indicator light position

Step 2 Observe the orientation of the indicator light (as shown in the figure below) and fill in the installation posture of the line camera.

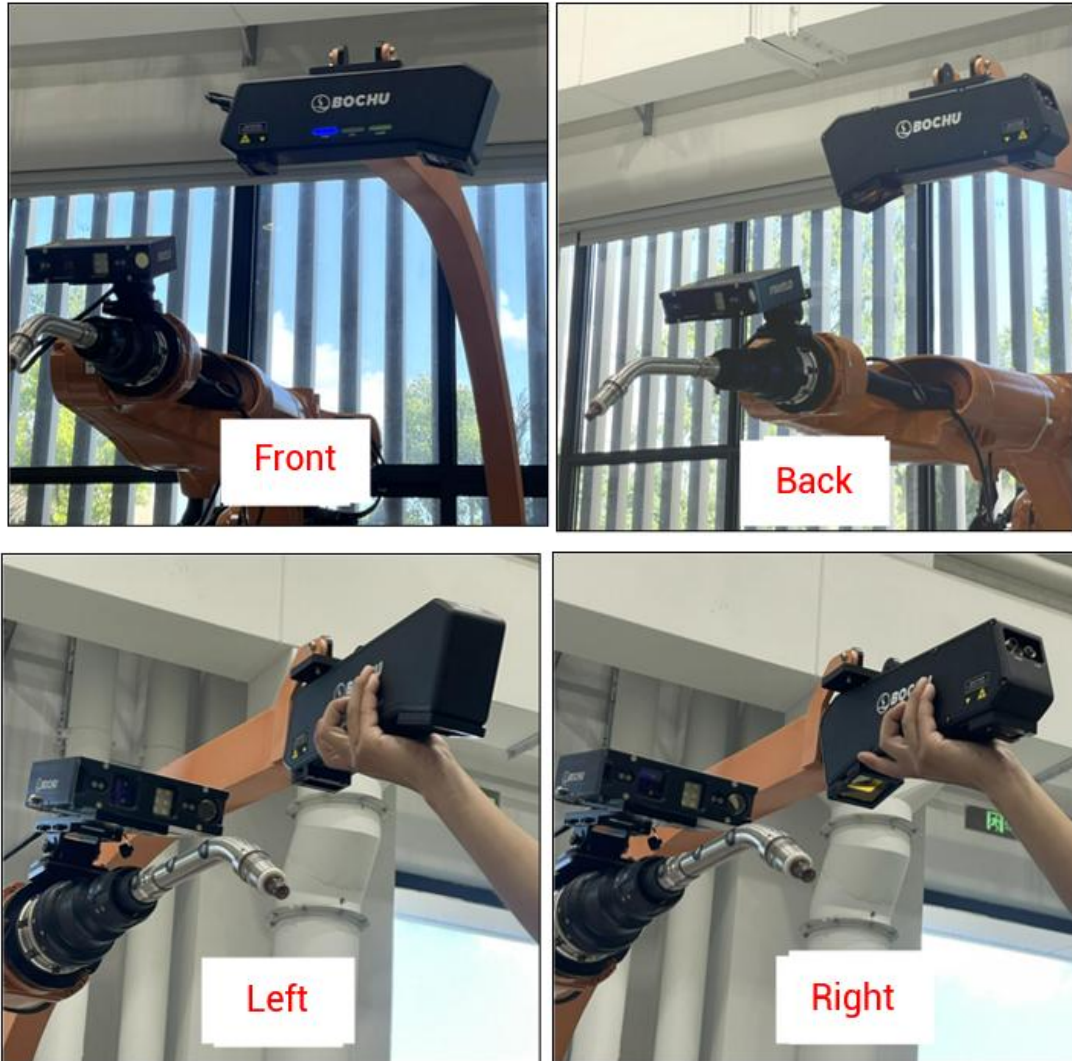


Figure 2-9 Different orientations of large line camera initial

Chapter 3 Debugging and Configuration

3.1 Line Scan Camera Connection

Step 1 Please follow the BCW181P 3D Laser Profiler Installation Manual to finish the installation, and configure the camera type, [orientation](#) and installation position in *Platform Configuration Tool*.

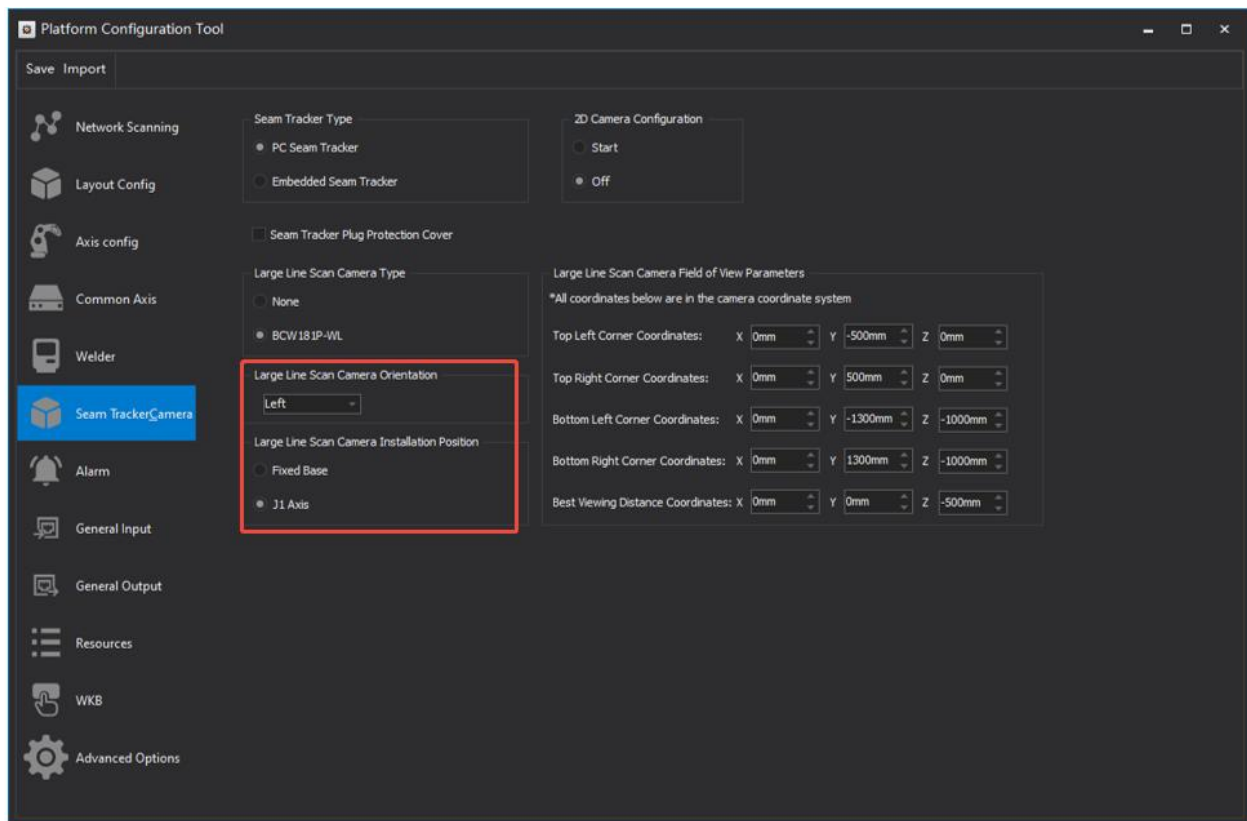


Figure 3-1 Configure the camera type and installation position

Step 2 Open CypWeld, locate and open the *Seam Tracker* interface on the left bottom corner, click *Third party camera control* under *Debug*, and enter the configuration page.

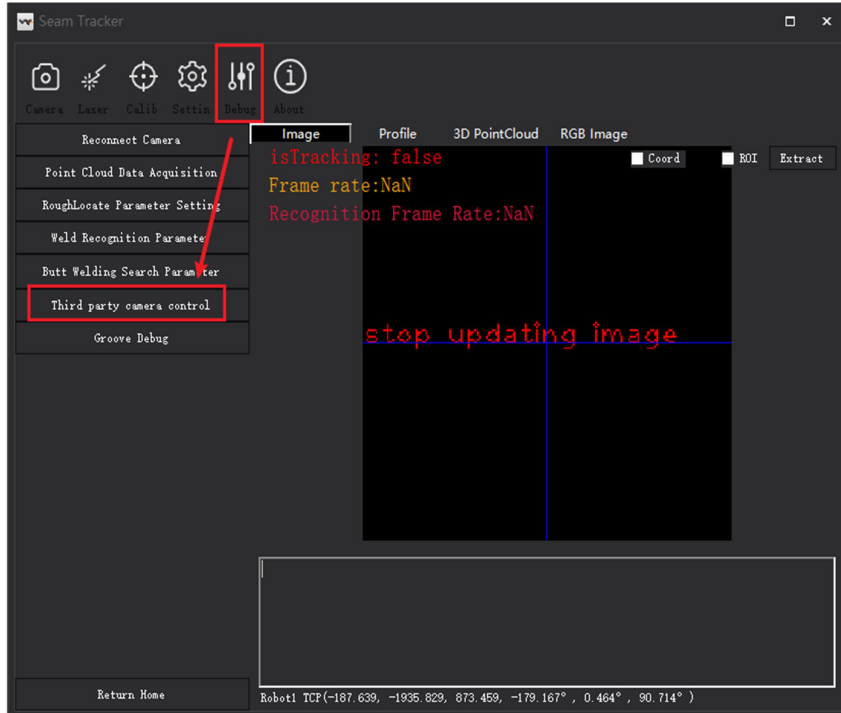


Figure 3-2 Seam tracker debugging

Step 3 Click *Connect Camera* under *Third party camera control*.

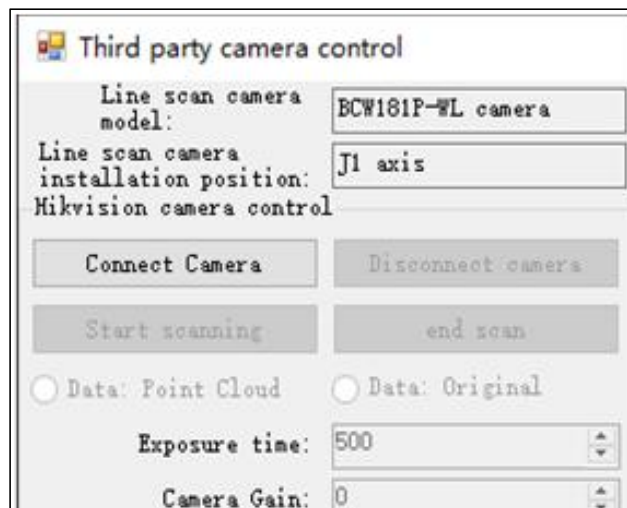


Figure 3-3 Third party camera control

Step 4 After the successful connection, the *Start scanning* button will be available to click. Select *Data: Original*, click *Start scanning*, and a black-and-white image from the camera will be displayed on the right screen. The camera connection configuration is considered complete once you confirm that the physical object can be clearly identified with the current exposure parameters.

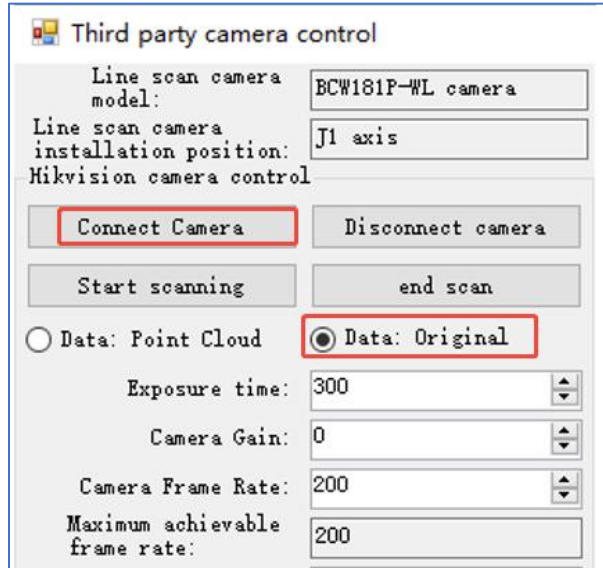


Figure 3-4 Select *Start Scanning*

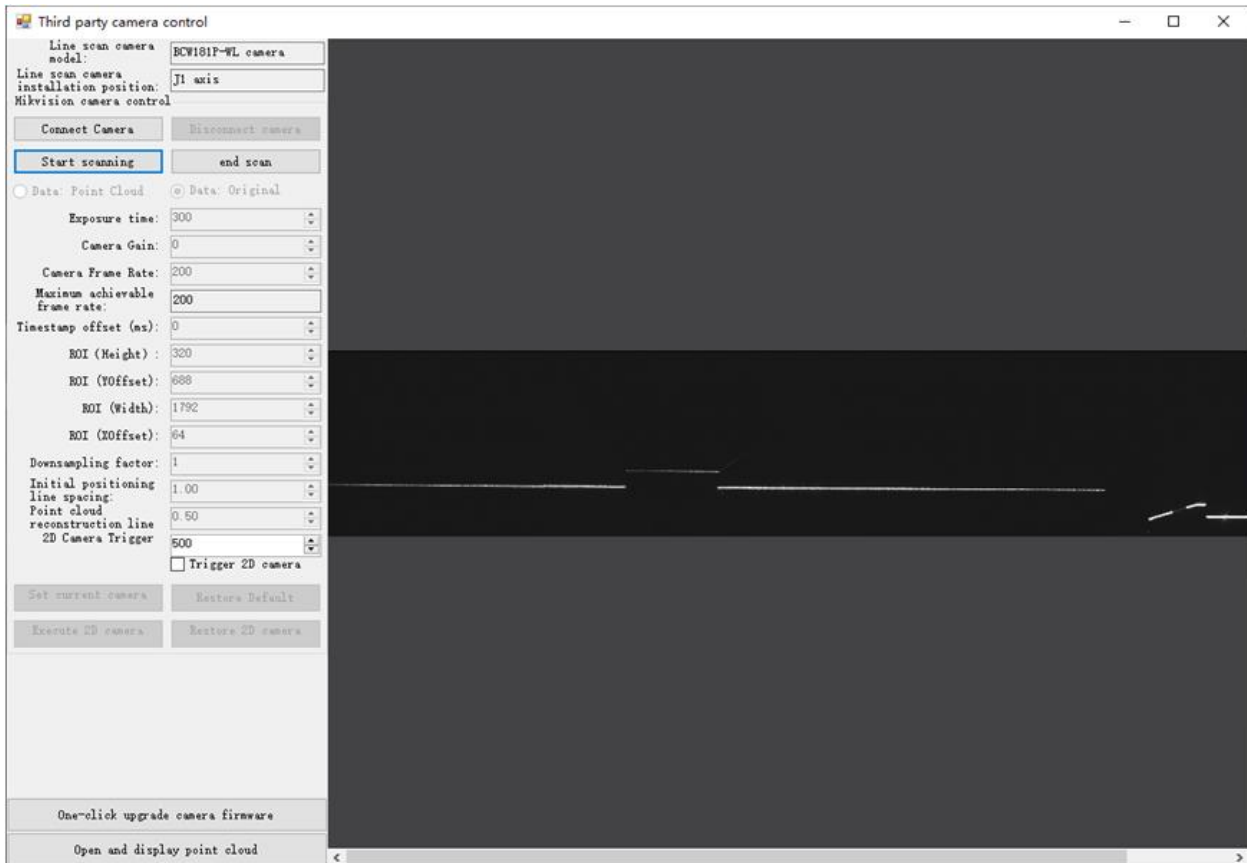


Figure 3-5 Black-and-white image displayed on the right screen

3.2 Large Line-Scan Camera Initial Positioning

3.2.1 Pre-calibration Preparation:

Step 1 Execute TCP calibration, and ensure the TCP calibration accuracy error is within 1.5 mm. Refer to the third Chapter of *CypWeld Intelligent Welding Controlling Software User Manual* for detailed TCP calibration.

Step 2 Configure the static IP of BCW181P.

1. Method 1: Automatically modify static IP

- a. Navigate to the camera IP configuration tool "IPConfigCH" via the path: C:\Program Files (x86)\Friendess\BCVWeldTrack\IpConfig. Click the **Quick Configuration** button and close the tool after the loading is complete. This function automatically modifies the IP address of the large line scan camera and the adapter IP, ensuring they are in the same network segment.

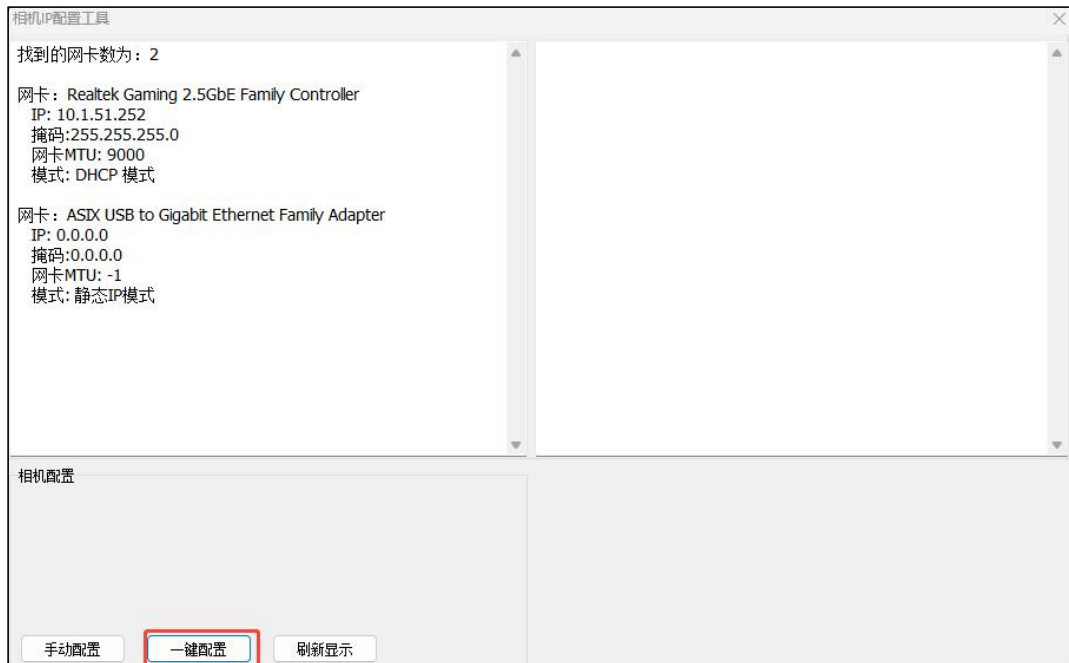


Figure 3-6 Quick configuration interface

2. Method 2: Manually modify static IP

- a. Locate the network adapter port connected to the large line scan camera and configure the IP address according to the steps shown in the figure below. Example IP modification: 169.254.50.1.

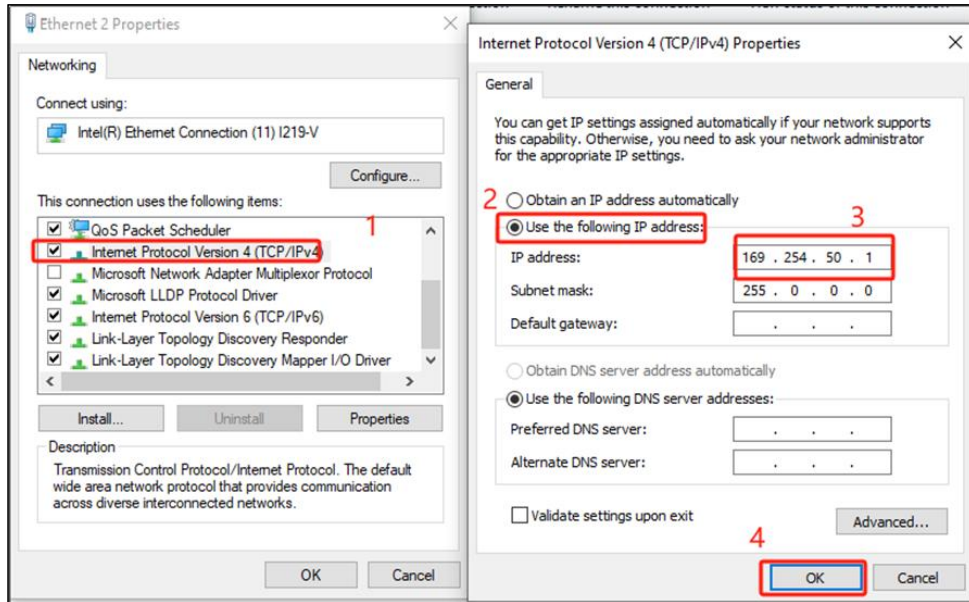


Figure 3-7 IP Modification interface

- b. Configure a static IP for the large line scan camera in the 3DMVS software (taking version V3.1.2 as an example) – only the last segment of the IP address needs to be modified. Ensure the IP address of the adapter port and the large line scan camera are in the same network segment but not duplicated.

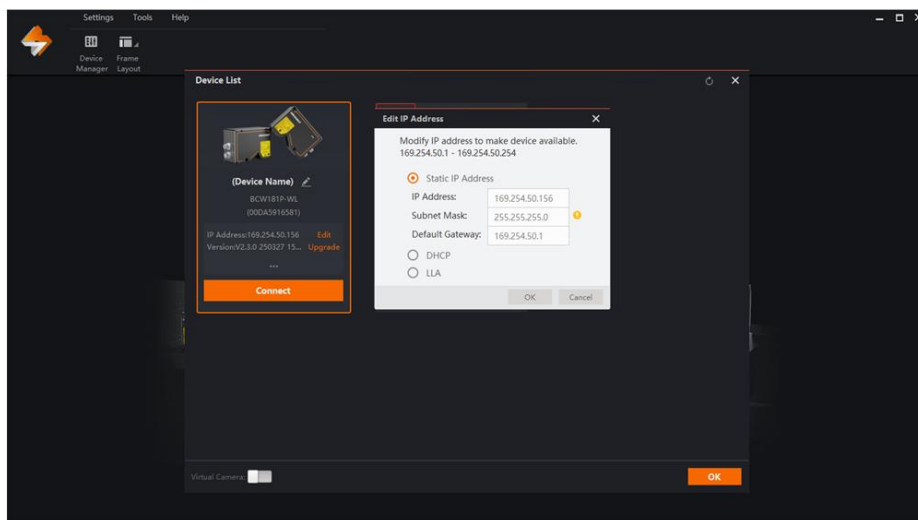


Figure 3-8 Modify the static IP of the BCW181P

Step 3 Disable the IP Address of the BCW181P 3D Laser Profiler.

1. To prevent the seam trackerr software from mistakenly connecting to the large line scan camera, disable the IP address of the BCW181P 3D Laser Profiler before launching CypWeld.
2. Double-click to open the 3DMVS software. Locate the connected BCW181P Line Laser 3D Camera in the device list, record its IP address, and then close the software. (As shown in the figure, the IP address of this line laser 3D camera is 169.254.50.156.)

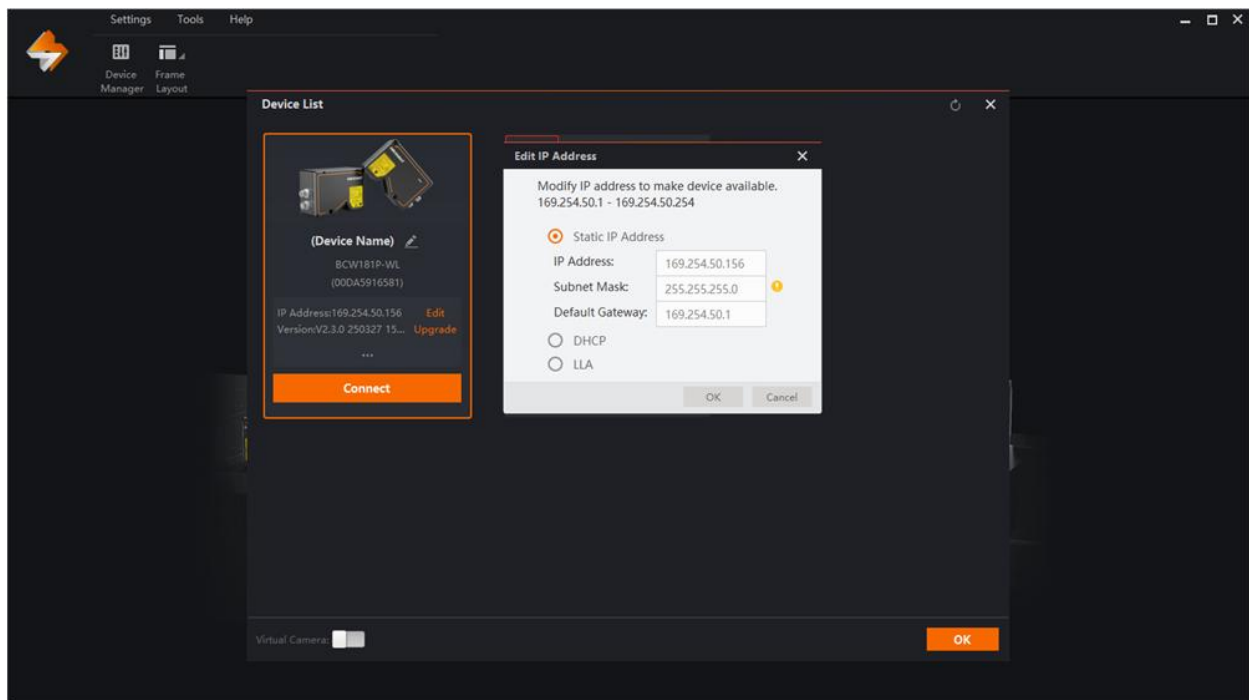


Figure 3-9 Line laser camera IP address

3. Navigate to the camera IP configuration tool "IPConfigCH" via the path: C:\Program Files (x86)\Friendess\BCVWeldTrack\IpConfig. Open the tool and click **Disable Camera**.
4. Check the IP address of the BCW181P 3D Laser Profile and click **Save and Return** to complete the camera disablement setting.

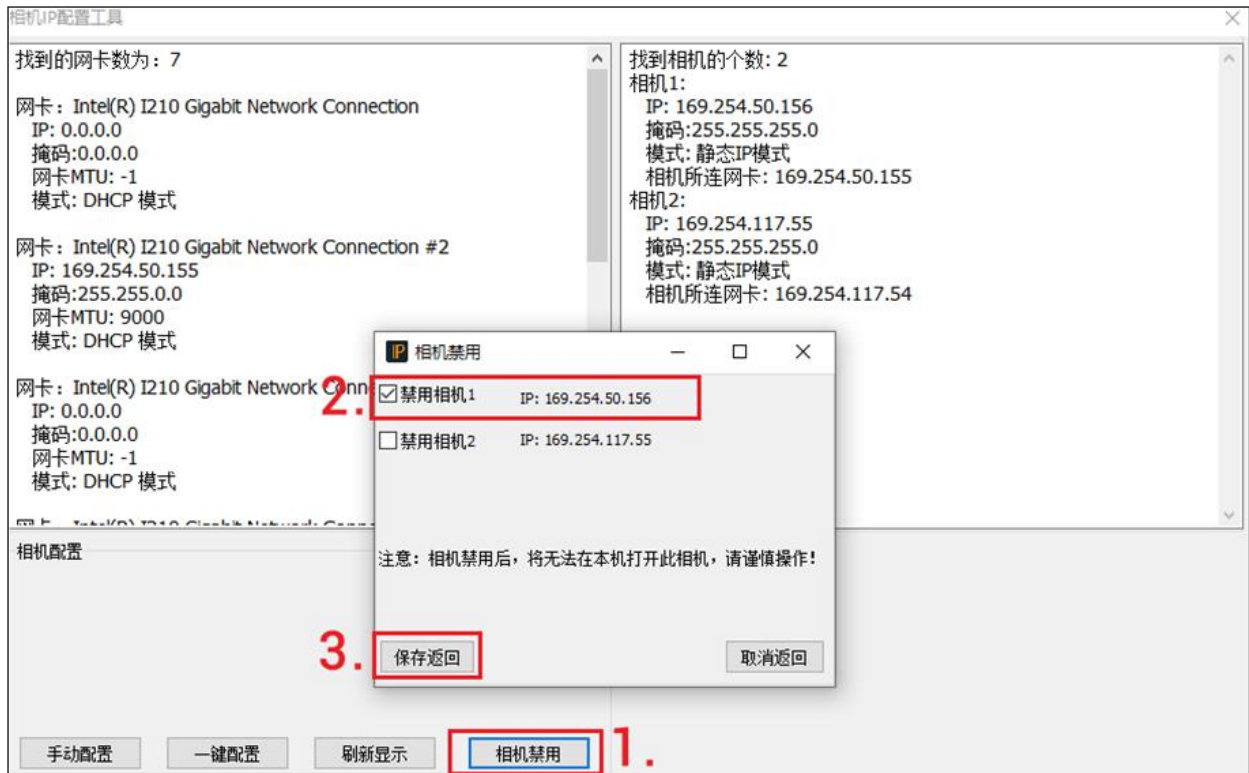


Figure 3-10 Check the IP of the camera as disabled and click **Save and Return**

Step 4 Set the appropriate *Exposure* and *ROI*.

1. Double-click to open the 3DMVS software (taking version V3.1.2 as an example), locate the corresponding BCW181P 3D Laser Profiler in the settings list, and click the *Connect* button.

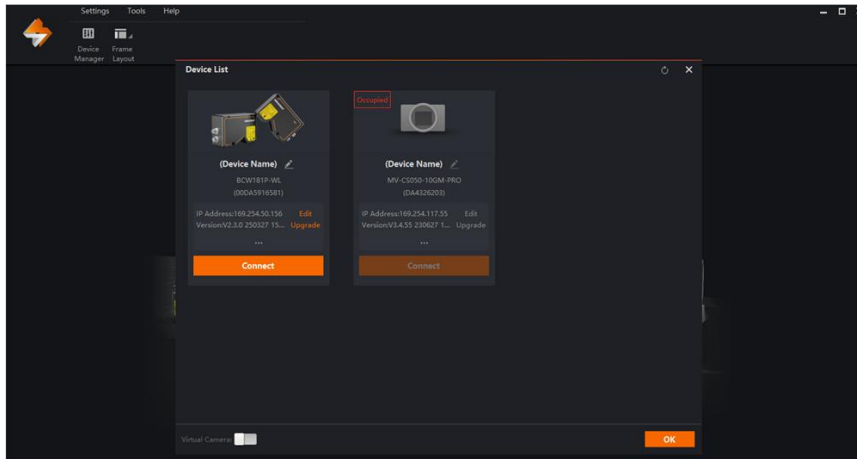


Figure 3-11 Connect to enter 3D Laser Profiler,

2. Navigate to *Common Feature* → *Image Control* → *Exposure Time*. During calibration, set the exposure time to 10000 μs to ensure clearer imaging, which facilitates calibration.

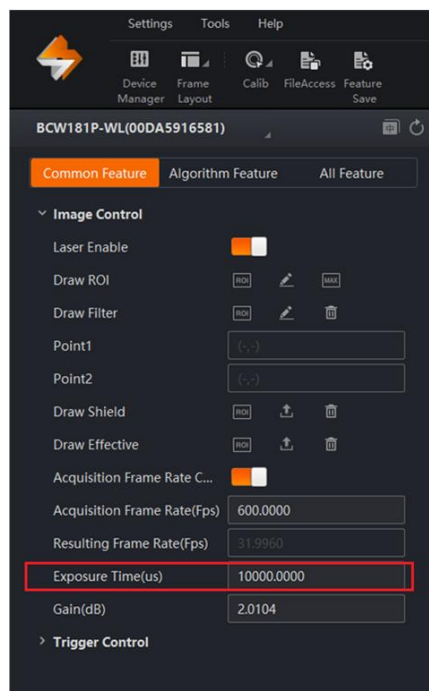


Figure 3-12 Exposure time configuration

⚠ Caution: After calibration, the exposure time must be adjusted back to 500 μs to 600 μs.

- In the **Draw ROI** row, click the **MAX** icon to restore the maximum frame size.
You can view the black-and-white camera image via the preview button.

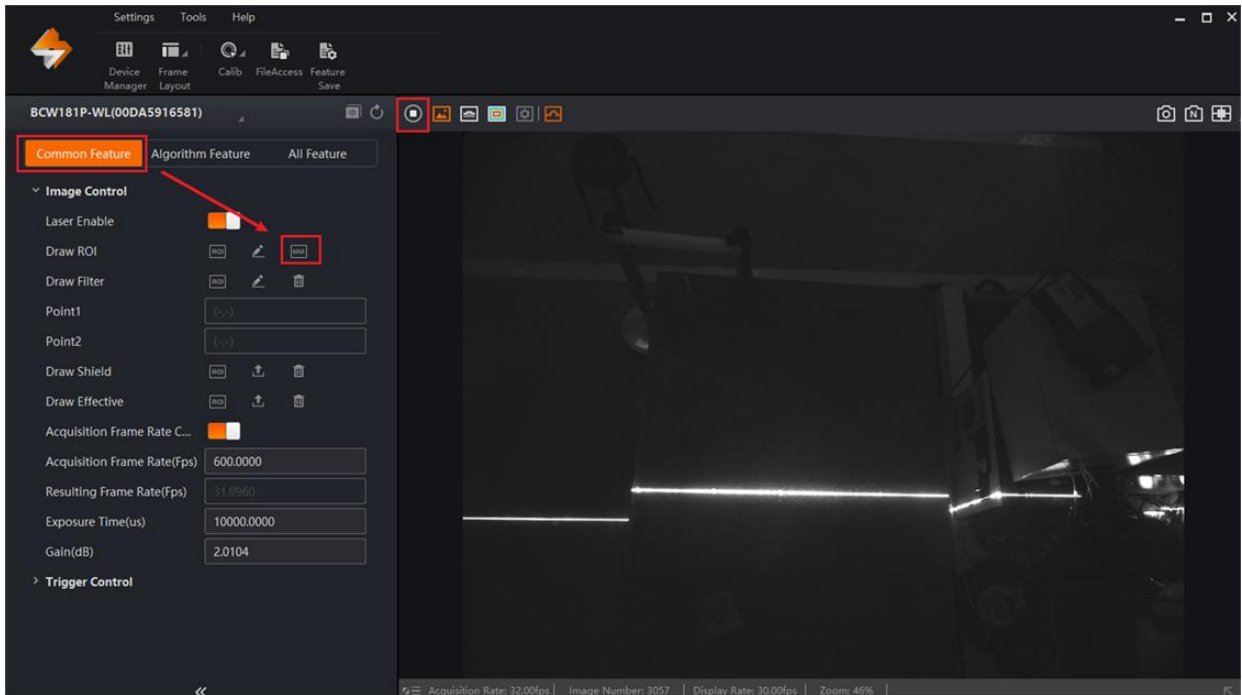


Figure 3-13 Set ROI to restore maximum frame size

- Click **Feature Save** → **Execute**, and then exit the software.

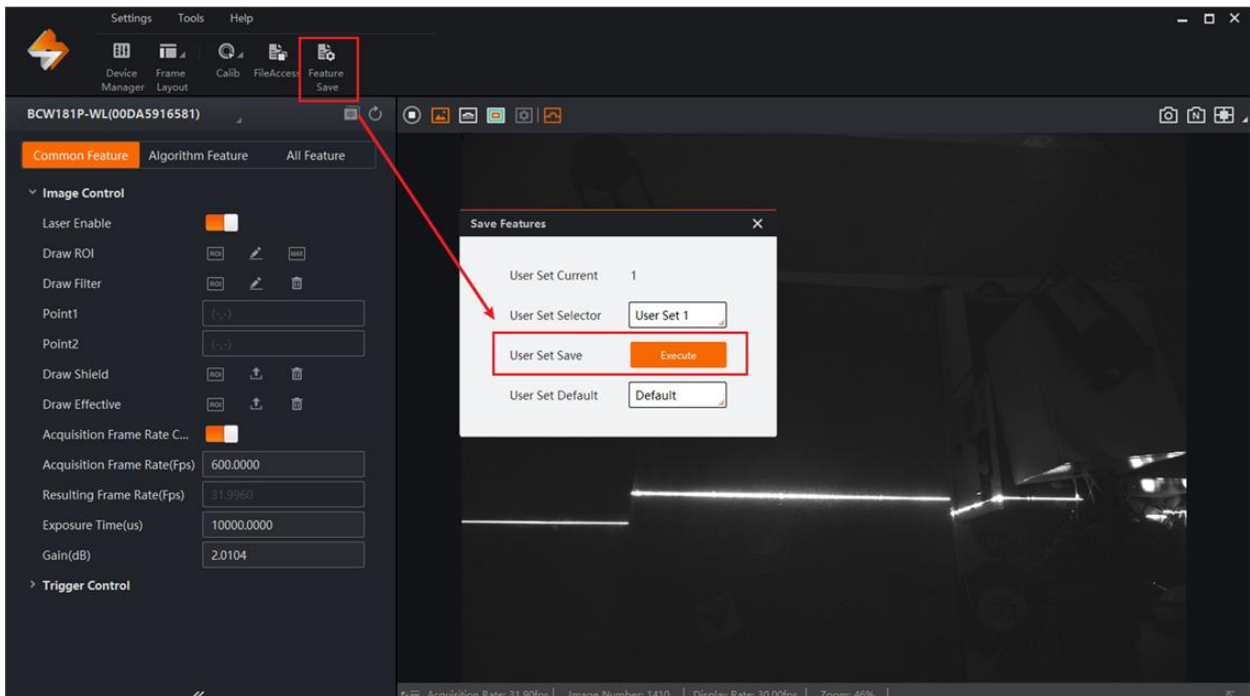


Figure 3-14 Save parameter settings and execute

- To prevent point cloud fluctuation during calibration, it is recommended that the working distance (in height) be within the range of 0.7 m to 1.7 m.

3.2.2 Manual Calibration of Line Scan Camera

Click **Tools** → **Parameter Settings** → **Line Scan Calibration** to enter the TCP calibration interface. The operation procedure for calibration can be referenced in the following diagram.

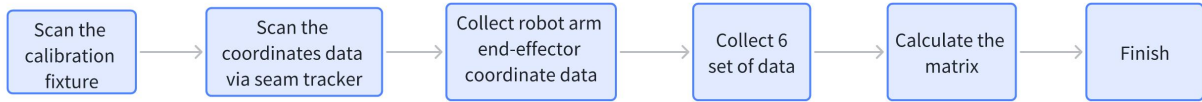


Figure 3-15 Calibration diagram

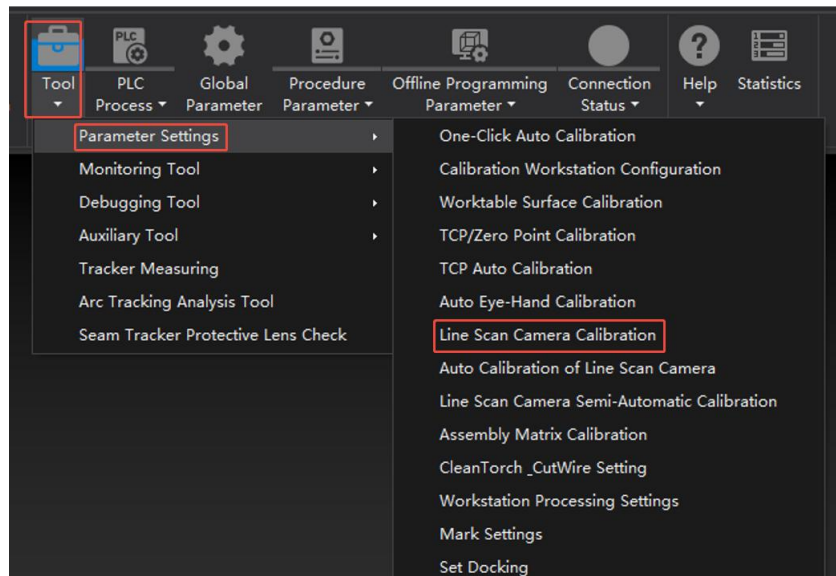


Figure 3-16 Enter the calibration interface

Step 1 Prepare a disk calibration fixture with a diameter of 300 mm and a thickness greater than 8 mm, and mark its center point to facilitate alignment with the laser line and TCP during subsequent calibration.



Figure 3-17 Disk calibration fixture

Step 2 Prepare an infrared night vision device. Since the line laser of the large line scan camera is invisible, it can be observed through the night vision device's screen.



Figure 3-18 Infrared night vision device

Step 3 Click **Start Recognition**. When the camera status shows as connected, it indicates that the line laser has been activated.

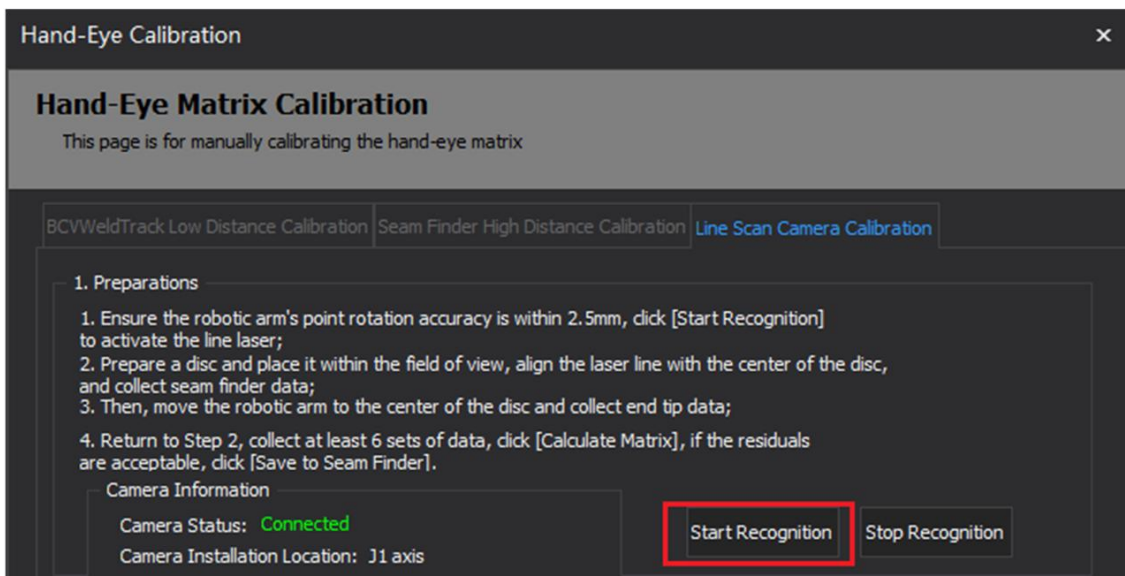


Figure 3-19 Recognize the line scan camera

Step 4 Collect Data: Seam tracker recognizes coordinates

1. Place the disk calibration fixture at a certain height within the camera's line-of-sight range. Jog the external axis or the robot arm's J1 axis so that the line laser in the infrared camera night vision image passes exactly through the center of the disk. Click **Collect Data** to acquire the seam finder recognition coordinate data.



Figure 3-20 Observe line laser position using infrared night vision device

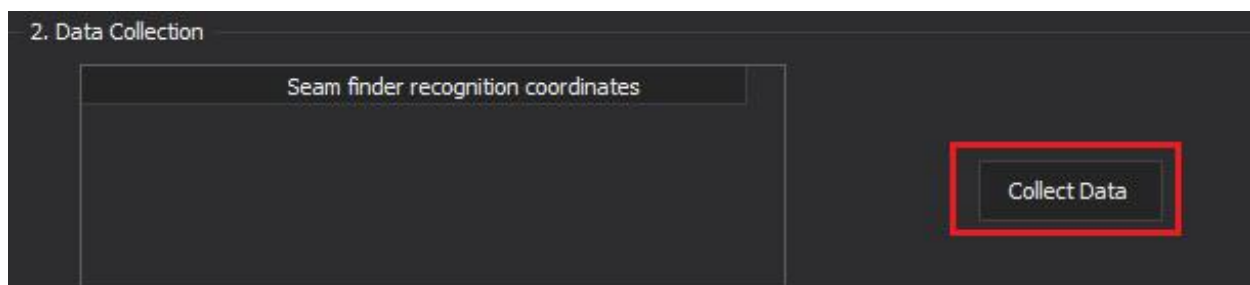


Figure 3-21 Collect seam tracker recognition coordinates

Step 5 Collect Data: Robot arm end coordinates

1. Without moving the external axis, jog the robot arm to the center of the disk so that the TCP precisely contacts the center point. Click **Collect Data** to acquire the robot arm end coordinate data. This completes the collection of one set of data.



Figure 3-22 Jog the robot arm to make TCP contact the center point

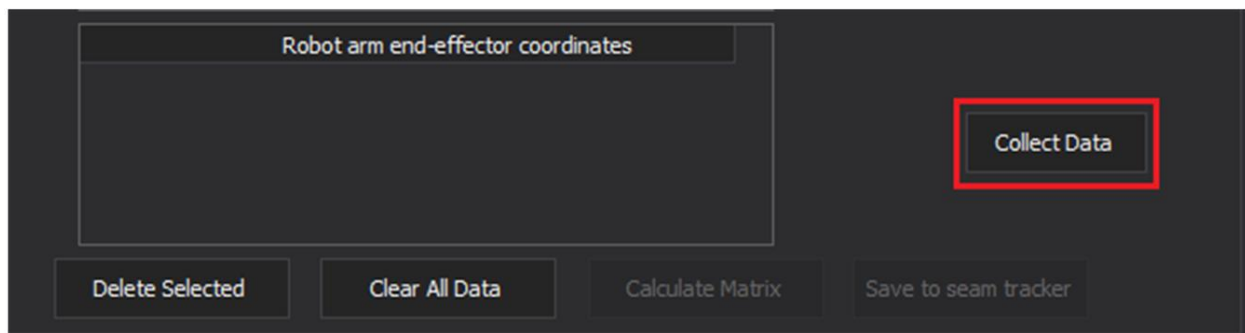


Figure 3-23 Collect robot arm end-effector coordinate data

Step 6 Reposition the disk calibration fixture to different locations and heights, and repeat the collection process to obtain at least 6 sets of data. For each set, it is recommended that the X, Y, and Z axes each have a deviation of at least 50 mm.

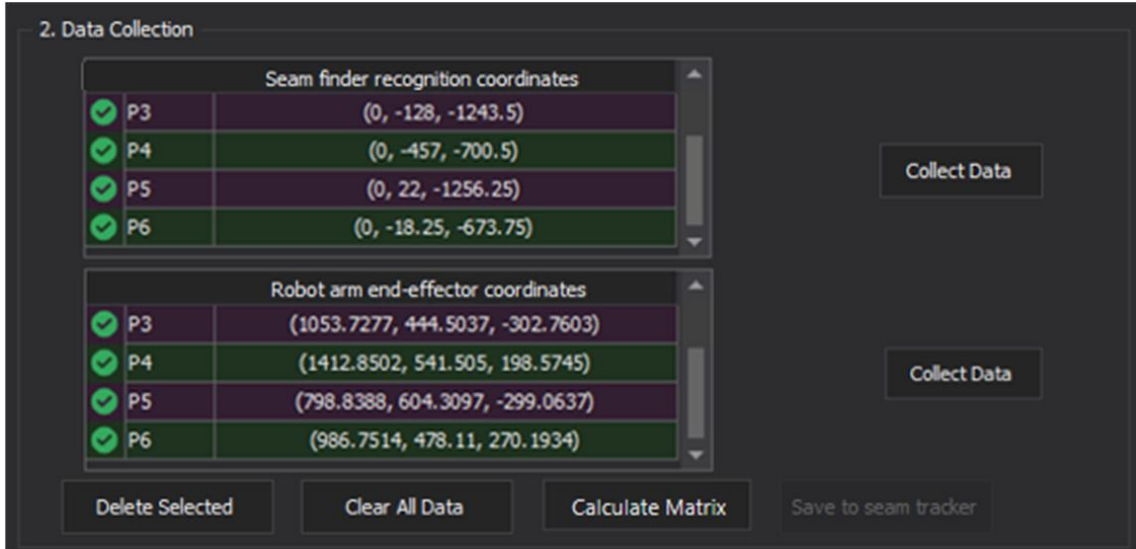


Figure 3-24 Repeat the operation to complete collection of 6 data sets

Step 7 After all data is collected, click **Calculate Matrix** to begin the calibration calculation. It is recommended to keep the calibration result error within 10 mm.

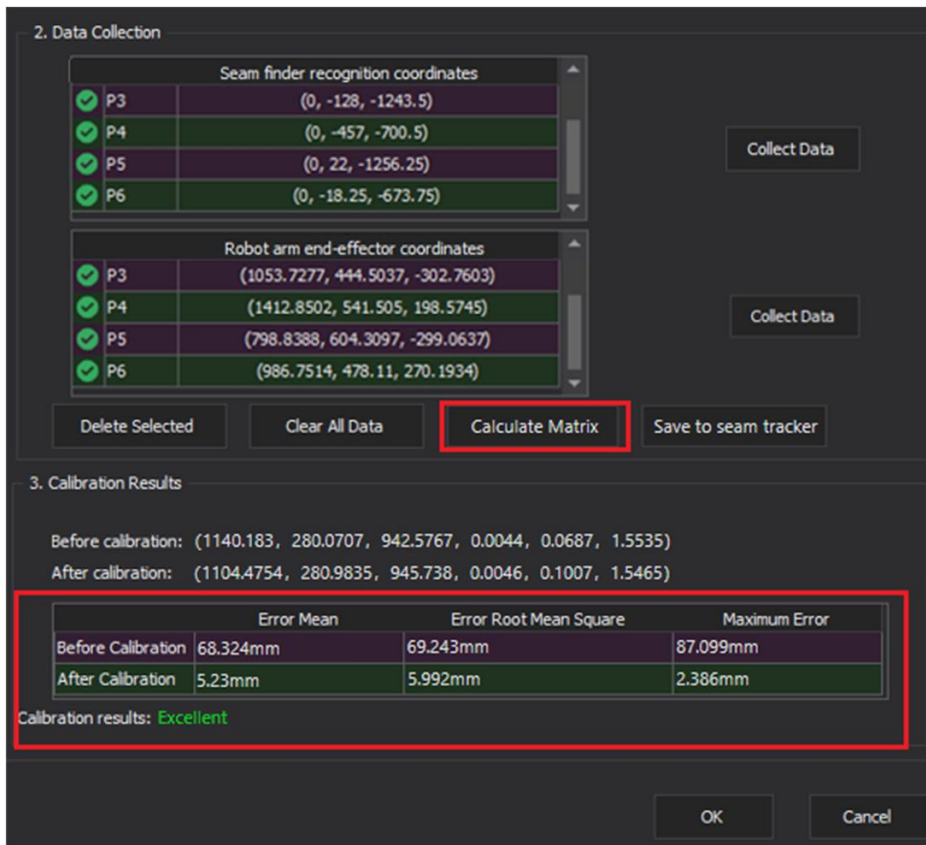


Figure 3-25 Calculate calibration results based on the matrix.

Step 8 At this point, the calibration operation is complete. Click **Save to Seam Tracker** to save the line scan camera hand-eye matrix result, then click **OK** to exit the calibration interface.

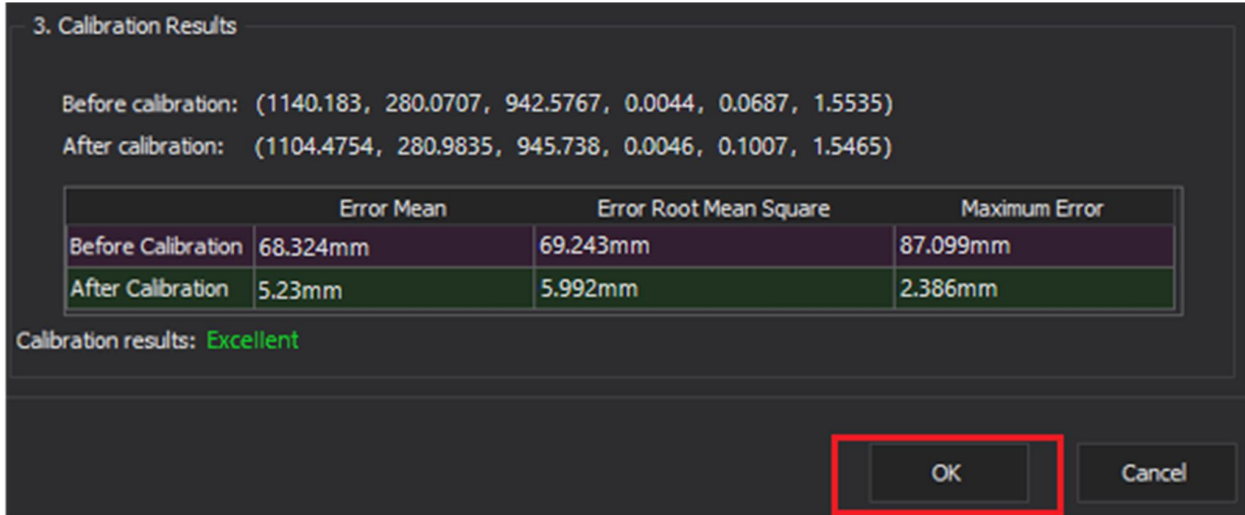


Figure 3-26 Save calibration results

3.2.3 Line Scan Camera Automatic Calibration

Click **Tools** → **Parameter Settings** → **Calibration** to enter the **Begin Calibration**. The operation procedure for calibration can be referenced in the following diagram.

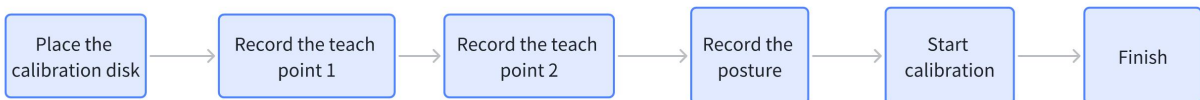


Figure 3-27 Line scan camera automatic calibration

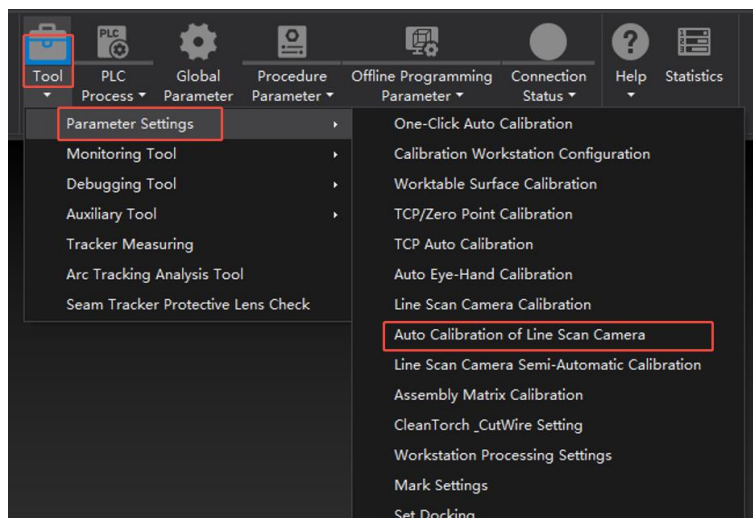


Figure 3-28 Entering the **Auto Calibration of Line Scan Camera** Interface

Step 1 Prepare two calibration disks and place them within the robot's working range with a height difference of 300 mm and a horizontal separation of 500 mm.

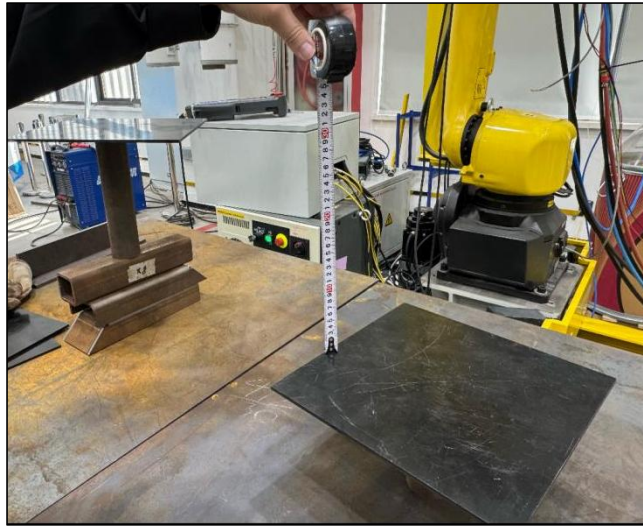


Figure 3-29 Calibration disk height difference of 300 mm

Step 2 Align the TCP with the center of each calibration disk in turn, and record Teaching Point 1 and Teaching Point 2.

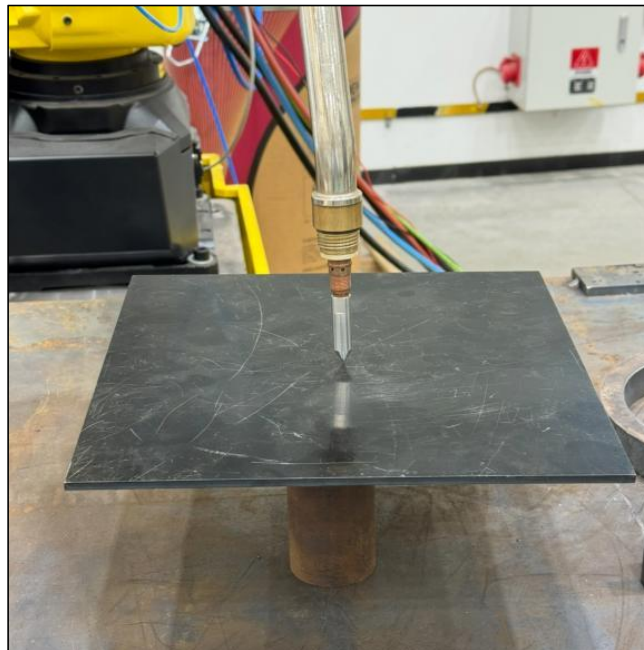


Figure 3-30 Align TCP with calibration disk center

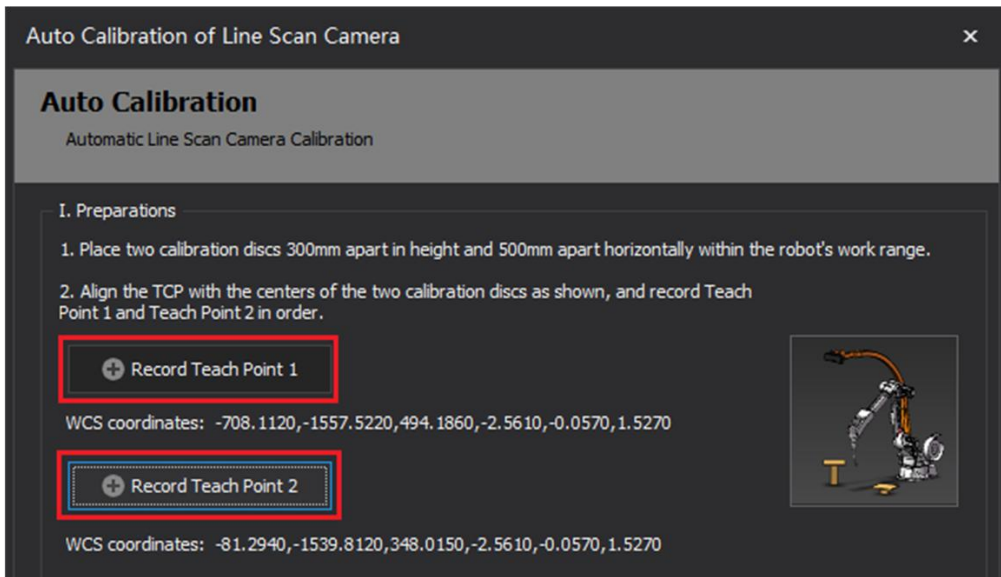


Figure 3-31 Record teach point 1 and teach point 2

Step 3 Move the line scan camera to a position between the two calibration disks. Jog the robot arm posture to avoid occlusion during the line scan camera's scanning, then click *Record Posture*.

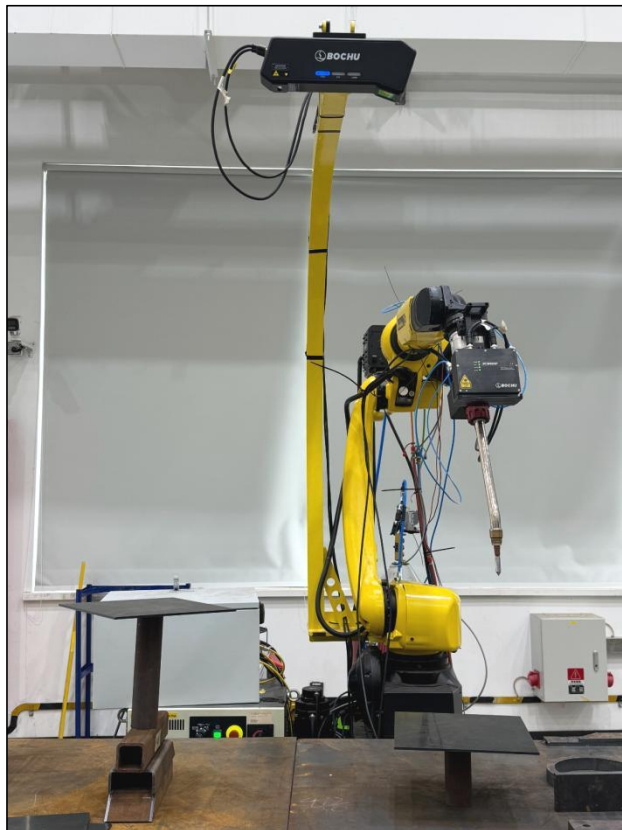


Figure 3-32 Jog the camera to the position between the two calibration disks

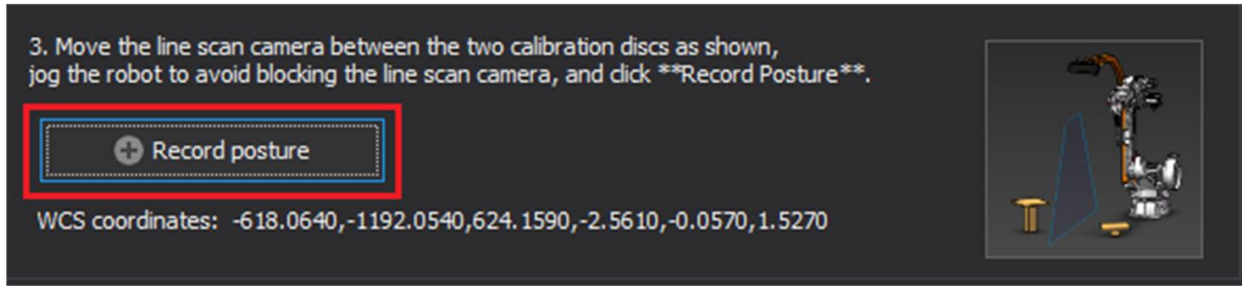


Figure 3-33 Record posture

Step 4 Click *Start Calibration*. A pop-up prompt will appear; select **Yes**. The line scan camera will then perform automatic scanning to acquire data, followed by the seam finder scanning to calculate the calibration result.

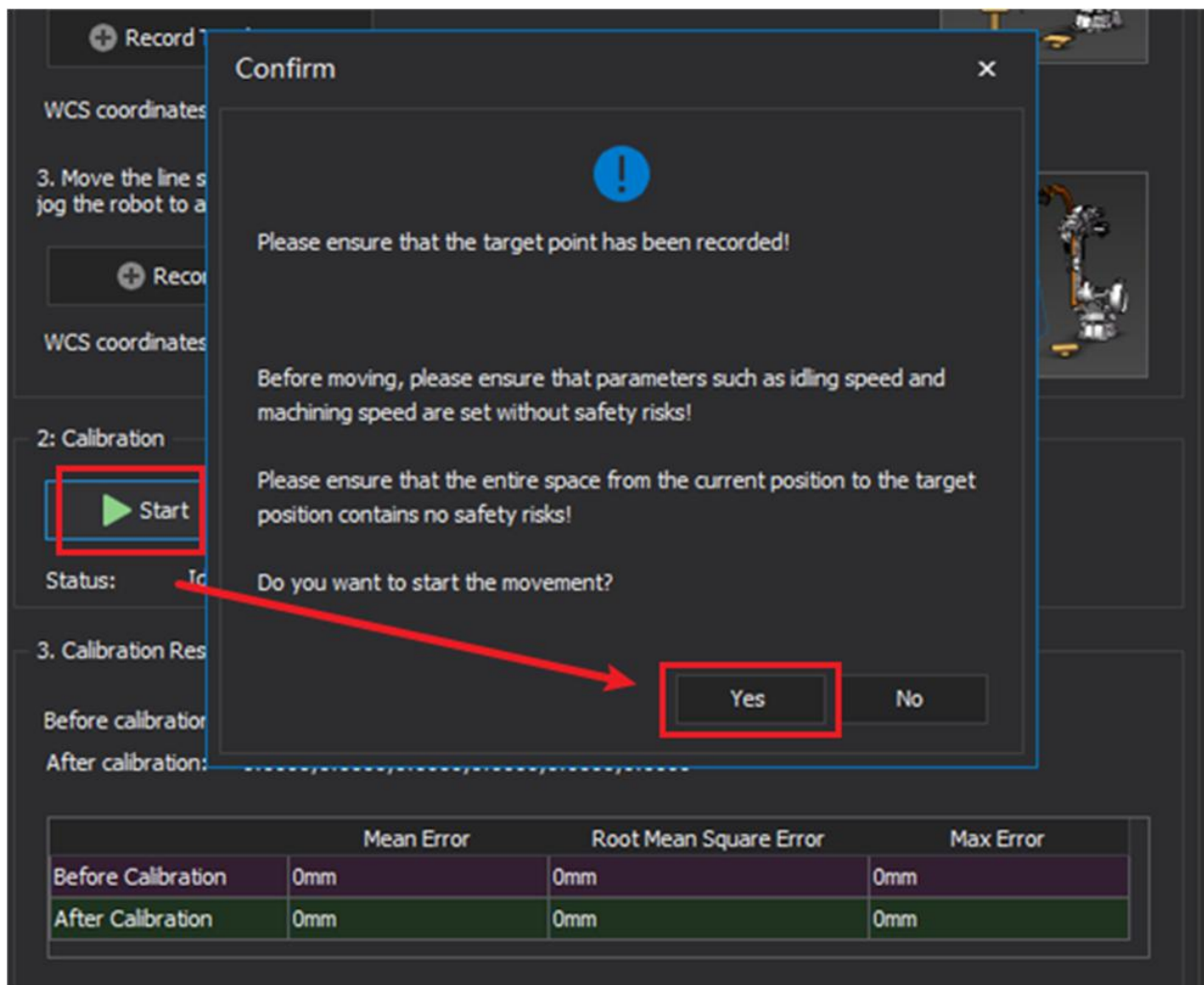


Figure 3-34 Start calibration

Step 5 After the automatic calibration is completed, the current calibration status will display as "Calibration successful". It is recommended to keep the calibration result error within 5 mm. At this point, the fully automatic calibration operation for the line scan camera is complete. Click **OK** to exit the calibration interface.

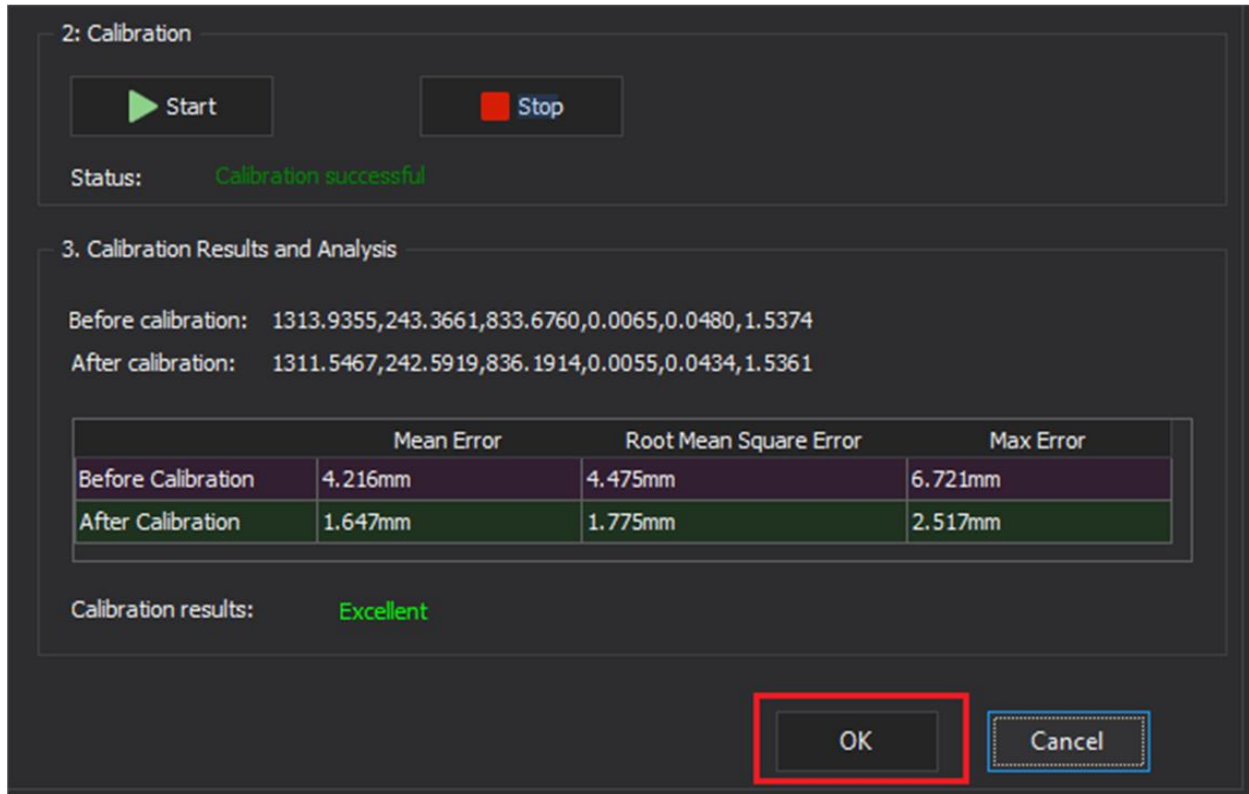


Figure 3-35 Calibration successful

3.2.4 Line Scan Camera Semi-Automatic Calibration

Click *Tools* → *Parameter Settings* → *Line Scan Semi-Automatic Calibration* to enter the TCP calibration interface. Begin calibration. The operation procedure for calibration can be referenced in the following diagram.



Figure 3-36 Line scan camera fully automatic calibration flowchart

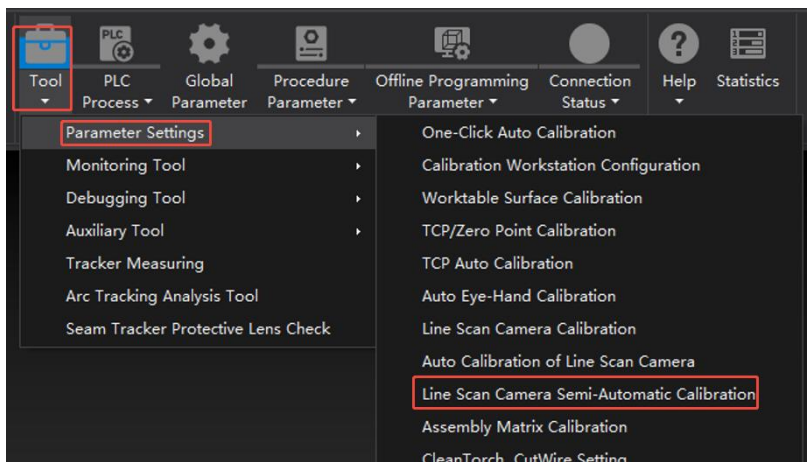


Figure 3-37 Enter the line scan camera fully automatic calibration flowchart

Step 1 Ensure the robot arm's TCP point around accuracy is within 2.5 mm. Place multiple markers within the scanning area.



Figure 3-38 Place markers

Step 2 Ensure the external axis scanning speed is set to 150 mm/s. Click **Start Recognition**. The scanning status will change from *Idle* to *Scanning*. Use the WKB to move the external axis so that the line scan camera covers the scanning area.

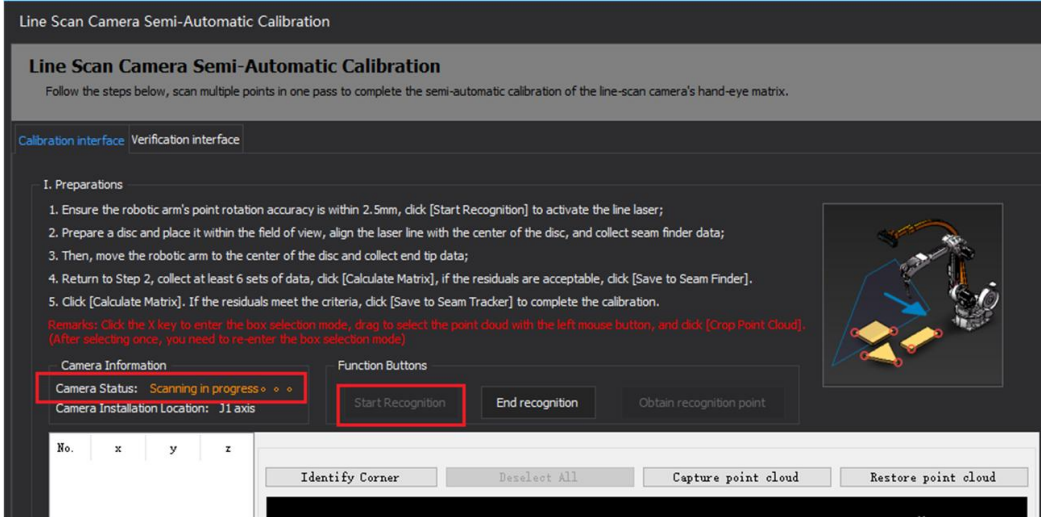


Figure 3-39 Start recognition

Step 3 After scanning is complete, click **End recognition**. The point cloud interface will display the scanning results.

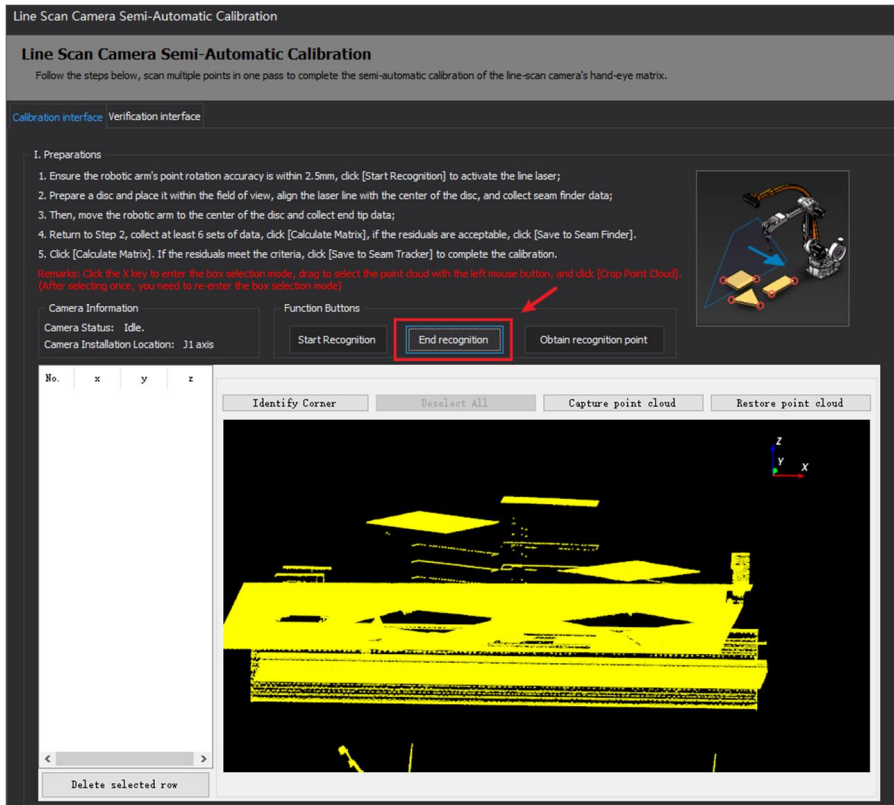


Figure 3-40 End recognition

Step 4 Click **Identify Corner** to allow the system to automatically acquire feature points.

You can manually delete or retain the necessary feature points. For feature points that were not automatically detected, you can select them by pressing **Shift** + left mouse button.

! Notice: To delete a feature point, select the corresponding coordinate row, then click **Delete Selected Row**. A confirmation pop-up will appear (it may be necessary to click on the taskbar to display the pop-up). Click **OK** to proceed, as shown in Figure 3-42.



Figure 3-41 Select feature points

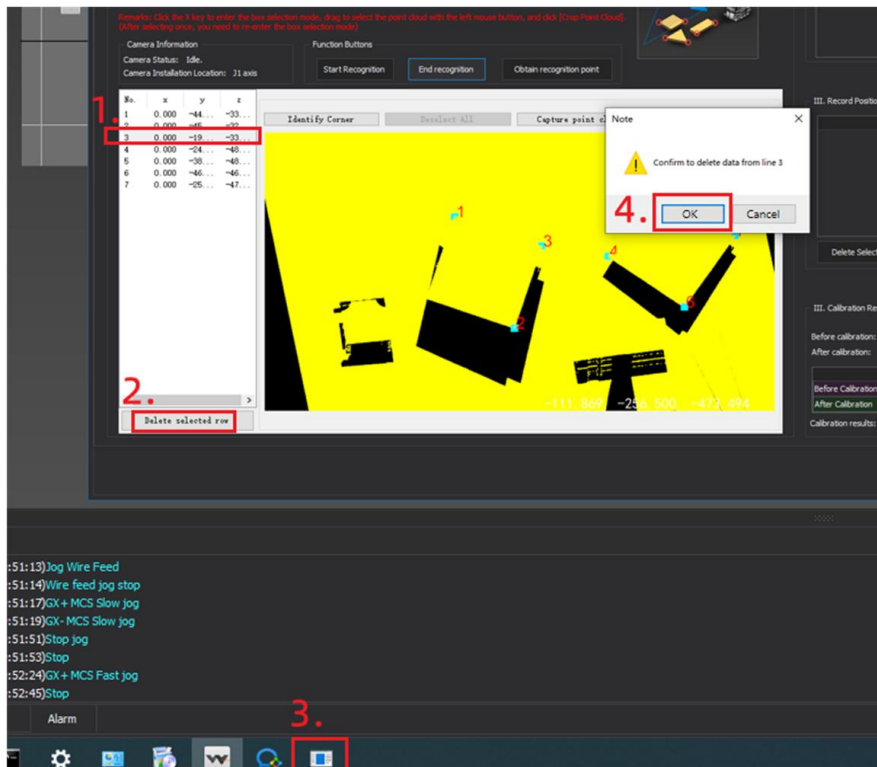


Figure 3-42 Delete selected row

Step 5 After selecting all feature points, click **Obtain recognition points**. The line scan

camera recognition coordinates will be extracted automatically.

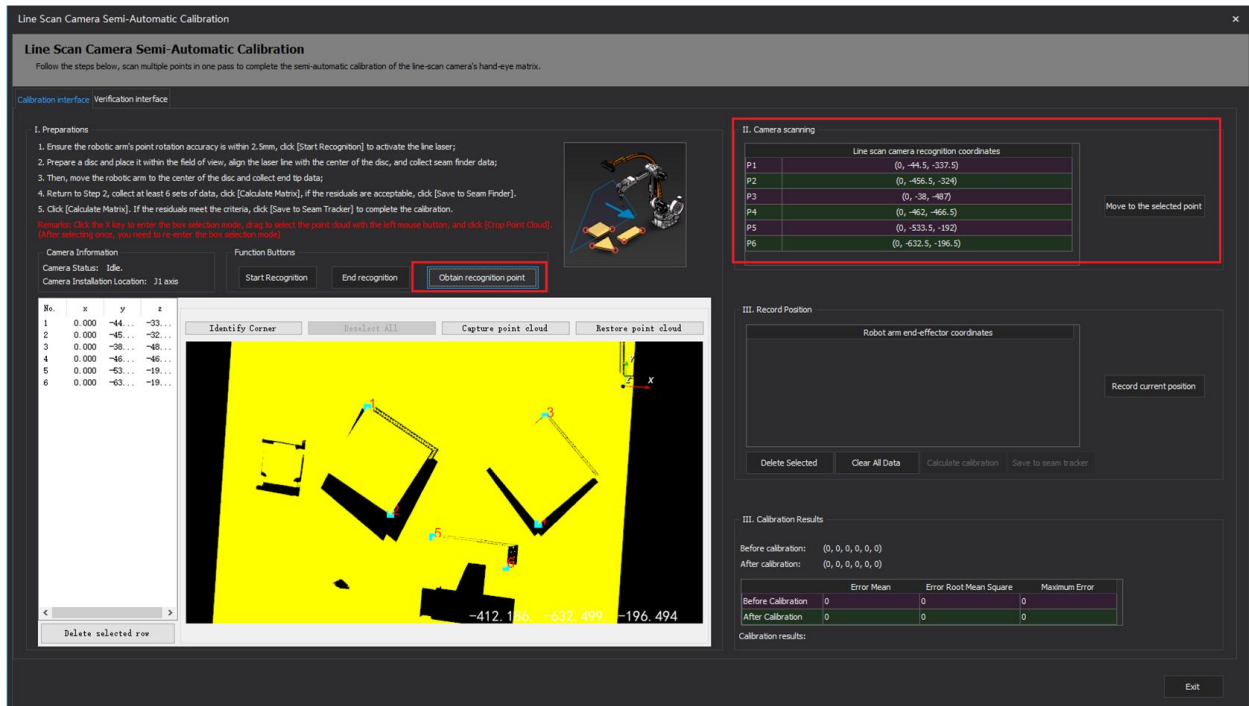


Figure 3-43 Obtain the line scan camera recognition coordinates

Step 6 Following the order of point selection, select the row corresponding to *P1*, click *Move to the selected point*, move the robot arm to align the TCP tip with the feature point, and then click *Record current position*. Repeat the above steps to complete the collection of robot arm end coordinates for all 6 feature points.

! Caution:

1. After clicking *Move to the selected point*, once the external axis has moved to that point, the external axis must not be moved further. Only move the individual axes of the robot arm to align the tip of the robot arm's TCP with the feature point.
2. After recording the robot arm end coordinate for one feature point, lift the robot arm to a safe position before selecting the next feature point, to avoid collisions with the welding torch during external axis movement.

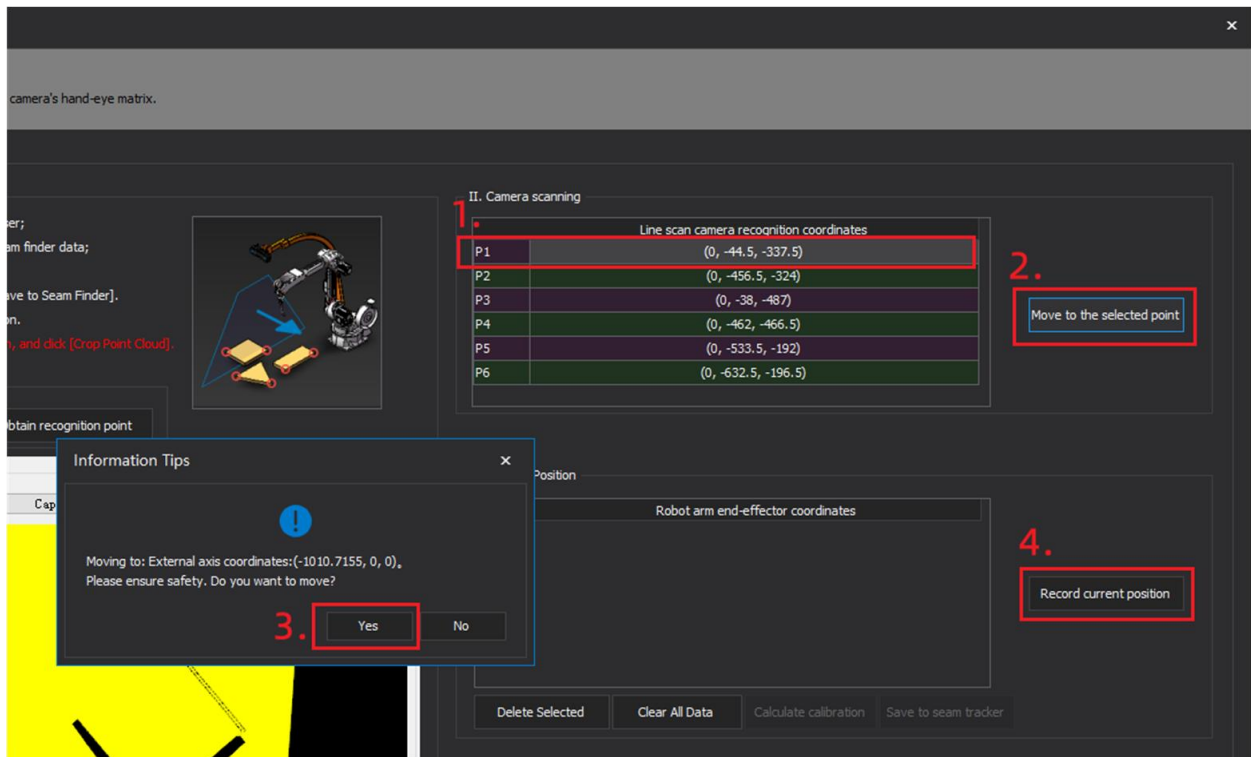


Figure 3-44 Record coordinates of the robot arm end

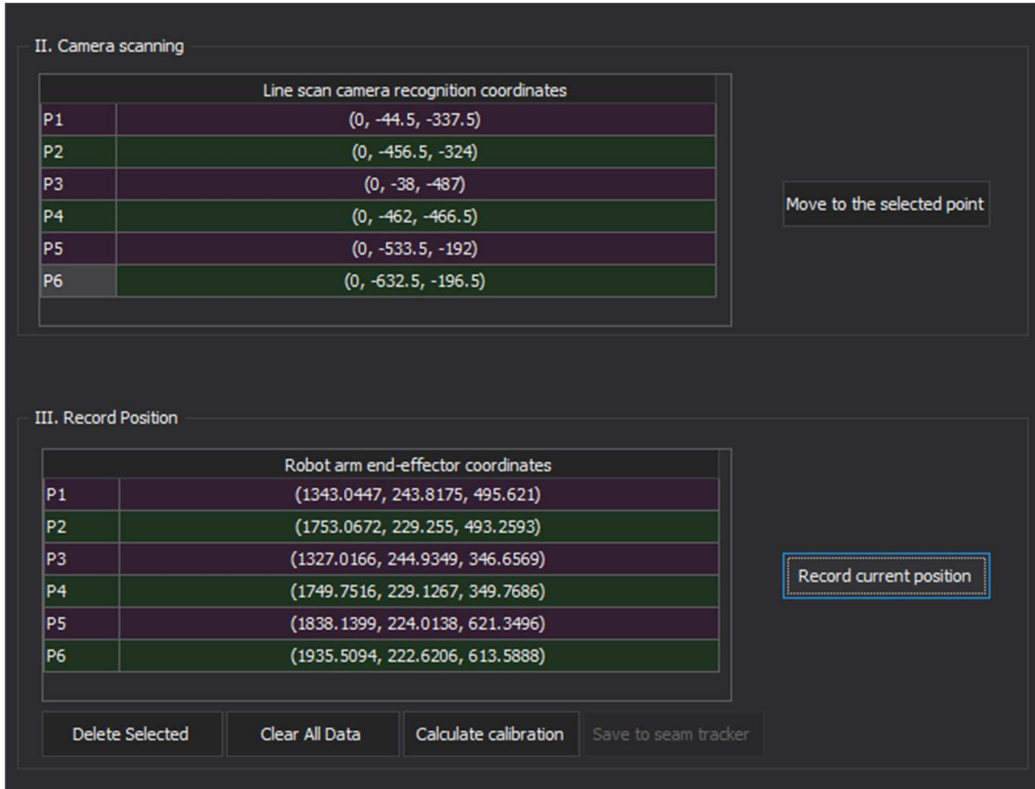


Figure 3-45 Complete robot arm end coordinate collection

Step 7 After completing the collection of robot arm end coordinates, click **Calculate calibration**. The calibration results will be generated automatically. It is recommended to keep the calibration result error within 5 mm.

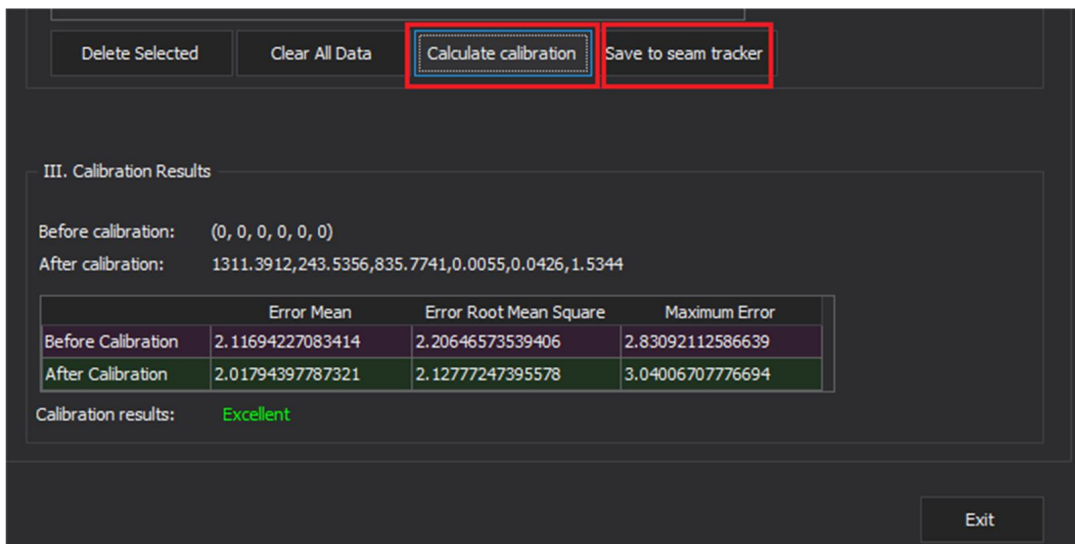


Figure 3-46 Calculate calibration results.

Step 8 At this point, the calibration operation is complete. Click **Save to seam tracker** to save the semi-automatic calibration results for the line scan camera, then click **Exit** to leave the calibration interface.

3.2.5 Calibration Verification

Step 1 Navigate to *Tools* → *Debugging Tools* → *Seam Tracker Precision Debug*. In *Seam Finder Field of View*, select *Line-scan camera*.

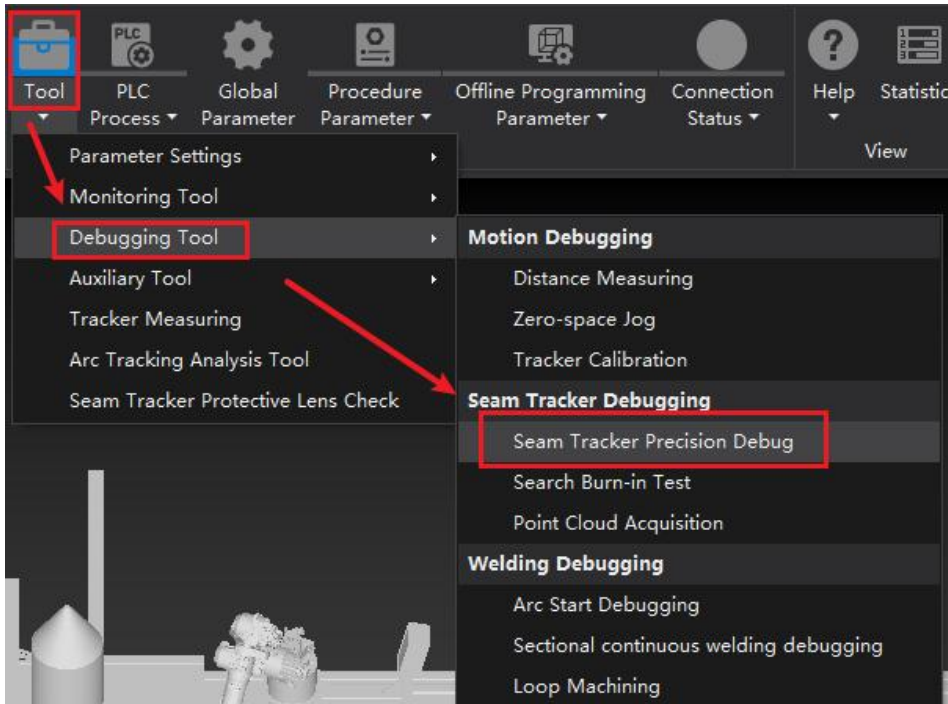


Figure 3-47 Enter *Seam Tracker Precision Debug* interface

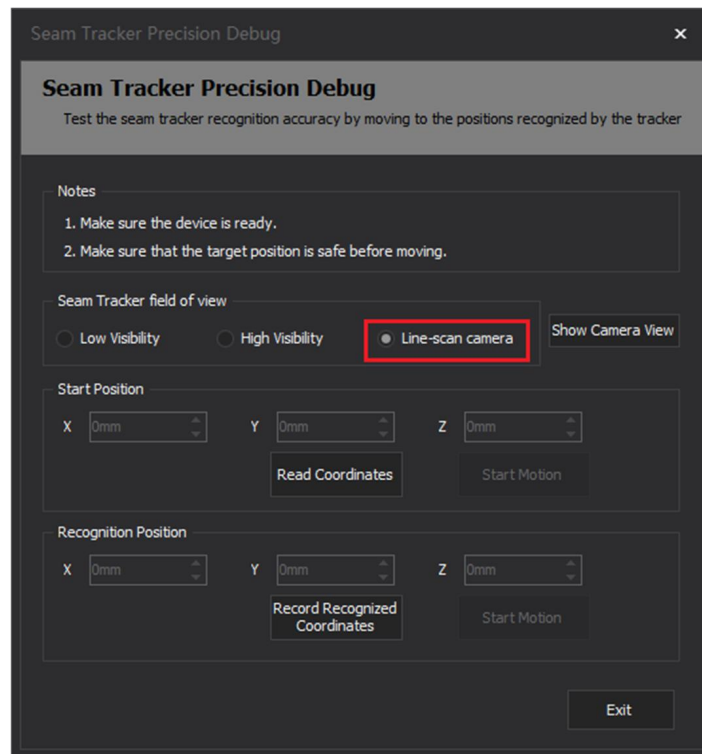


Figure 3-48 Select the field view for Seam Tracker

Step 2 Record *Start Position* and *Recognition Position*

1. Jog the external axis and the robot arm's J1 axis so that the line laser of the large line scan camera passes exactly through the center of the calibration disc. Click *Record Coordinates* and then *Record Recognized Coordinates* sequentially.

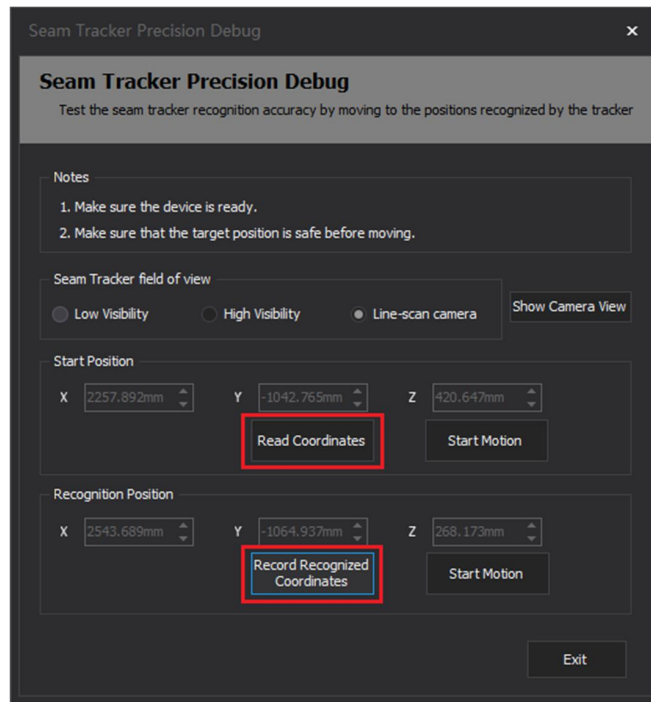


Figure 3-49 Record start position and recognition position

Step 3 After ensuring there is no risk of collision within the robot arm's motion range, click *Start Motion* for the recognition position. Check the error between the TCP contact point and the center of the disc.

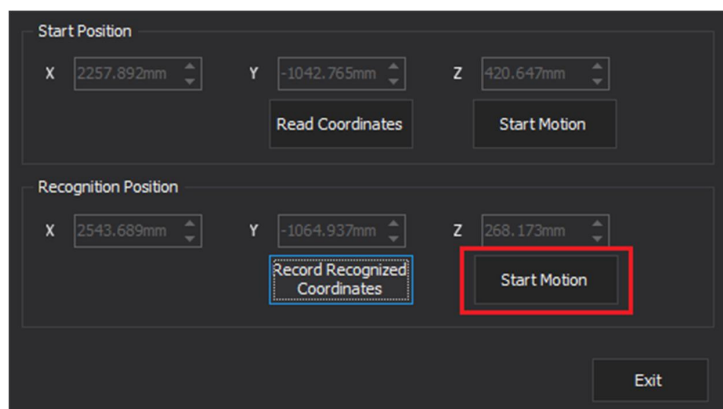


Figure 3-50 Verify error

Chapter 4 Function Description

4.1 Point Cloud Reconstruction

4.1.1 Specific Steps

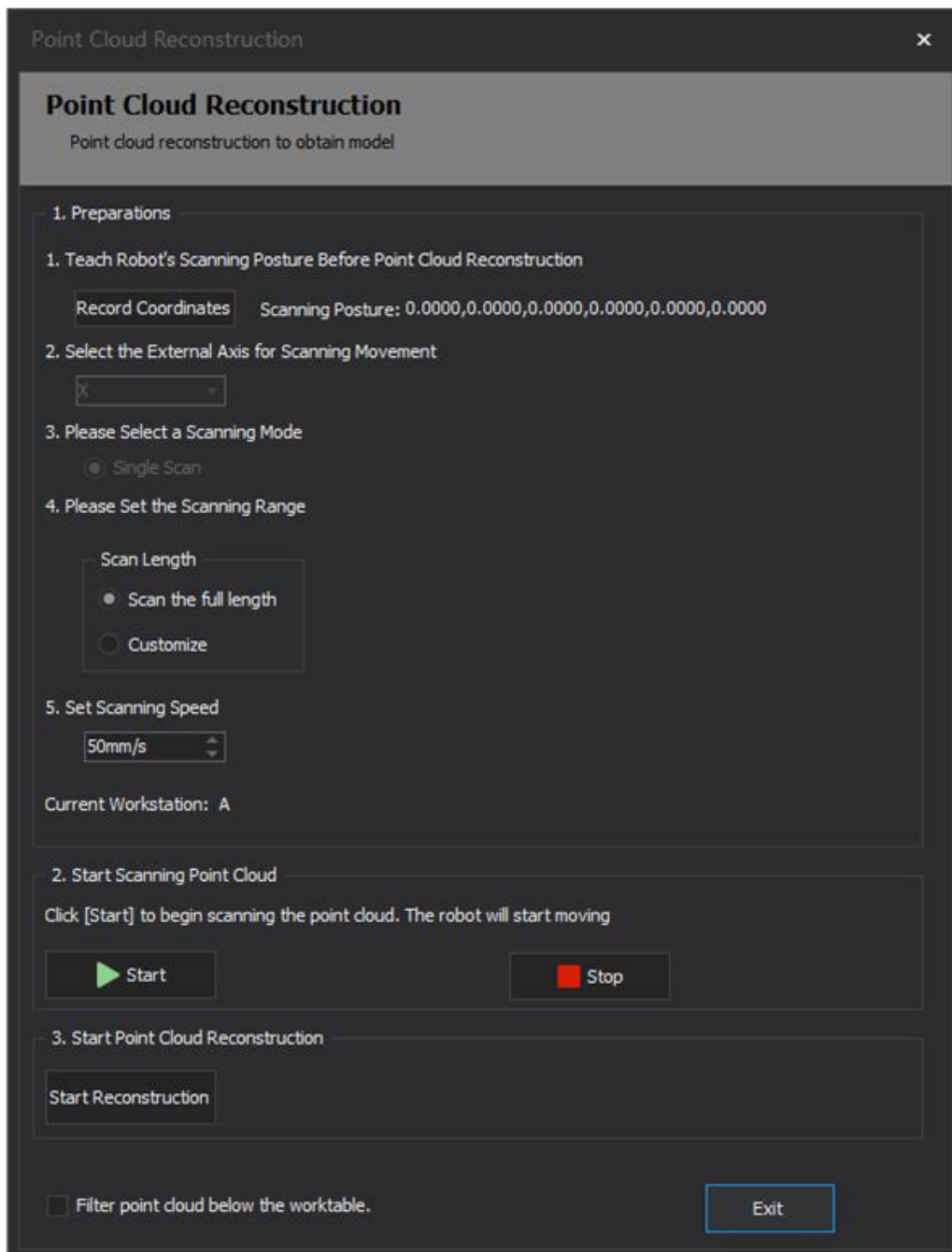


Figure 4-1 Point cloud reconstruction interface

Step 1 Preparation: Set and adjust appropriate exposure and ROI.

1. Double-click to open the 3DMVS software (using version V3.1.2 as an example). Navigate to *Common Feature* → *Image Control* → *Exposure Time*. For point cloud reconstruction, set the exposure time to 500 – 600 μ s.
2. Open *Image Control* → *Draw ROI*. As shown in Figure 4-2, click the draw icon, and select an appropriate frame area ensuring the workpiece is within the frame and the ground is excluded. After drawing, click the checkmark (✓) next to the blue frame, as shown in Figure 4-3.

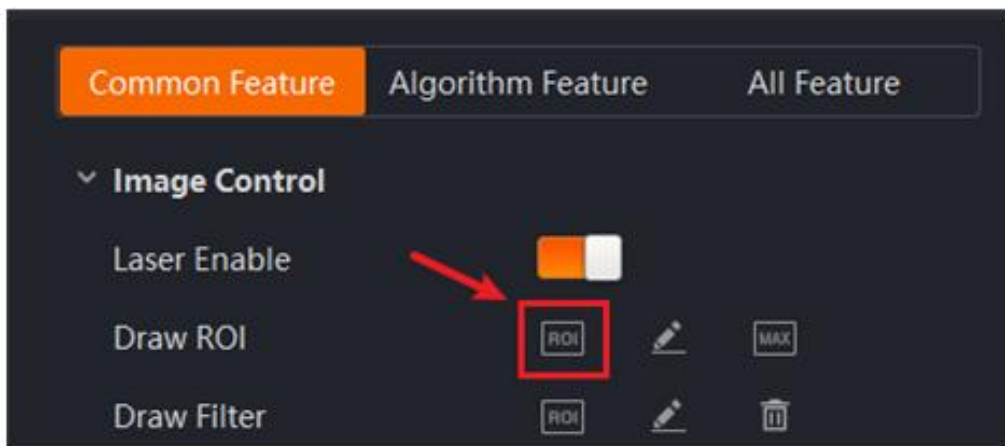


Figure 4-2 Draw ROI option

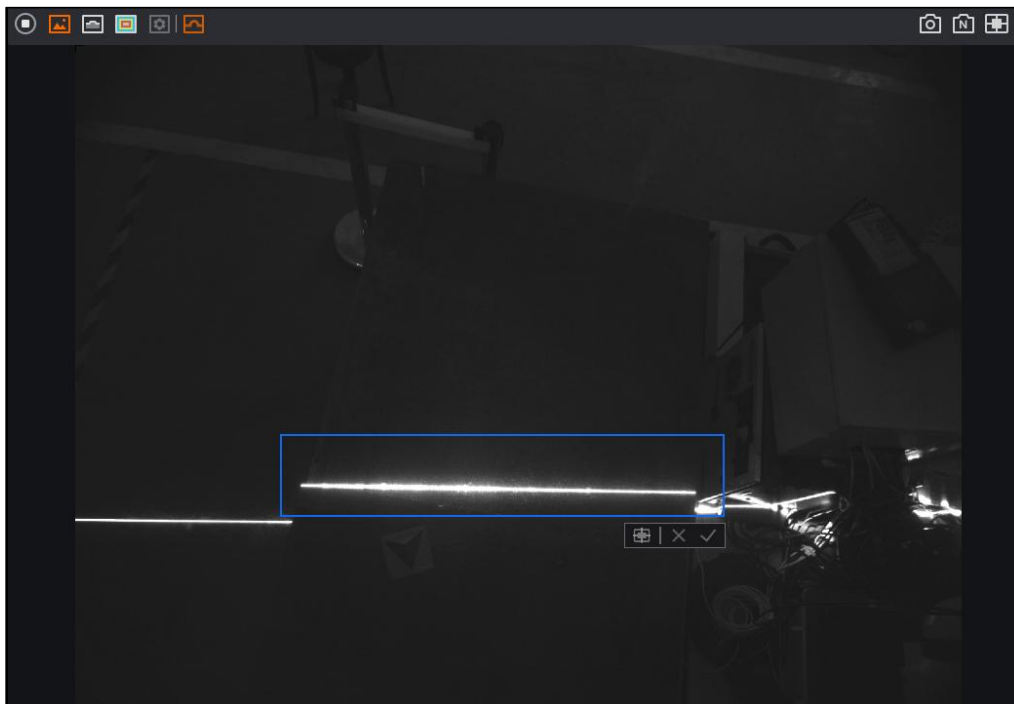


Figure 4-3 Select an appropriate ROI by framing

3. Click **Feature Save** → **Execute**, and then exit the software.

Step 2 After completing the teaching of the initial pose of the robotic arm, click **Record Coordinates** to record the scanning pose.

Step 3 Based on the workpiece placement and the external axes configuration of the machine model in use, combined with the world coordinate system indicator in the digital twin scene, set the external axis for motion during scanning. Typically, for 7-axis ground rail/gantry models, it is the X direction; for 8-axis and 9-axis gantry/gantry models, it is the Y direction.

Step 4 Set the corresponding scanning mode, scanning range, and scanning speed (default settings are usually sufficient under normal conditions).

Step 5 Start scanning the point cloud. Click the **Start** button. The external axis will start moving according to the set scanning direction to perform point cloud scanning, while the robot arm pose remains stationary.

Step 6 After scanning is complete, click **Start Reconstruction** to enter the point cloud reconstruction interface.

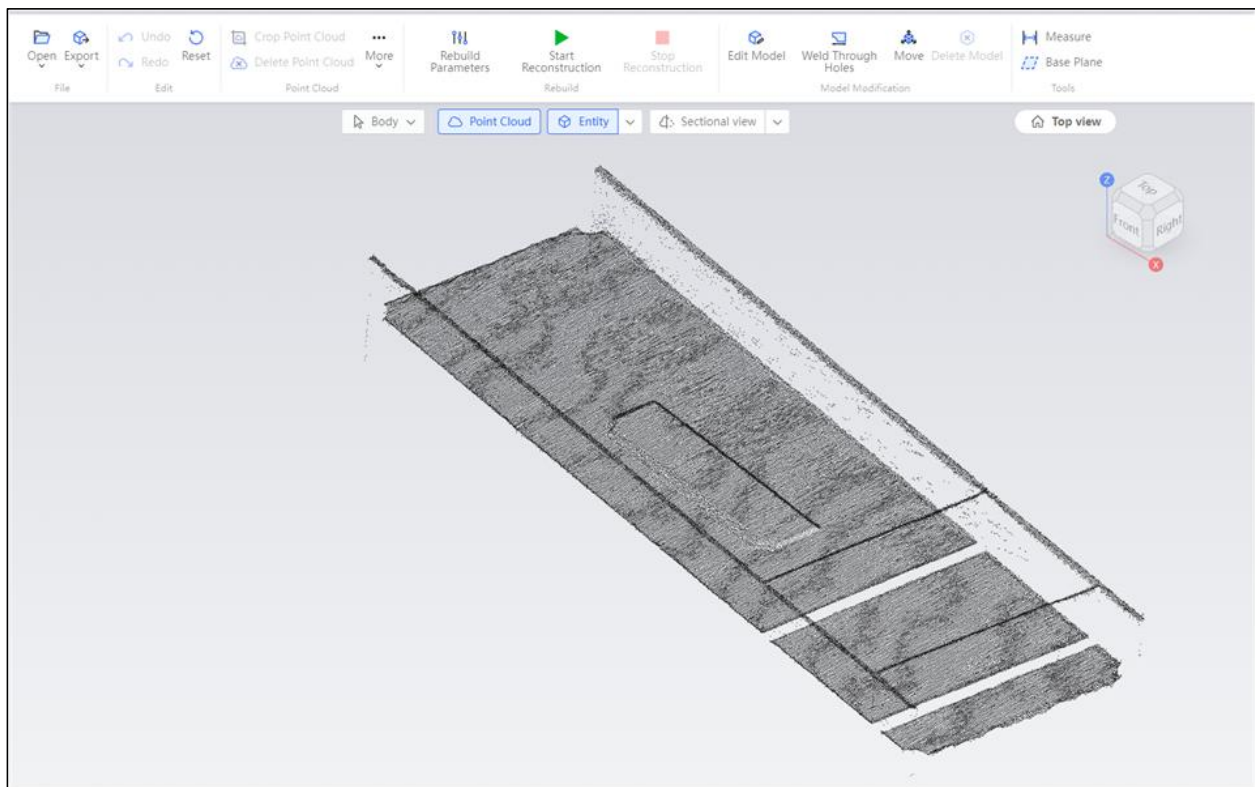


Figure 4-4 Point cloud reconstruction interface

⚠ Notice: Point cloud reconstruction automatically loads the point cloud scanned in the previous step into the reconstruction interface. It also supports editing and reconstructing externally imported point clouds of the same format (*.pcb).

Step 7 Set parameters according to the actual situation to control the details of point cloud reconstruction. Hovering the mouse over underlined parameters displays an illustration of the current parameter. For parameter explanations for different workpiece types, please refer to [Reconstruction Parameters](#).

Step 8 After completing parameter settings, click **Start**. The reconstructed 3D model will be displayed. You can check the display status of the point cloud and the solid model according to actual needs. Hold down the mouse wheel and drag to rotate the view for inspection.

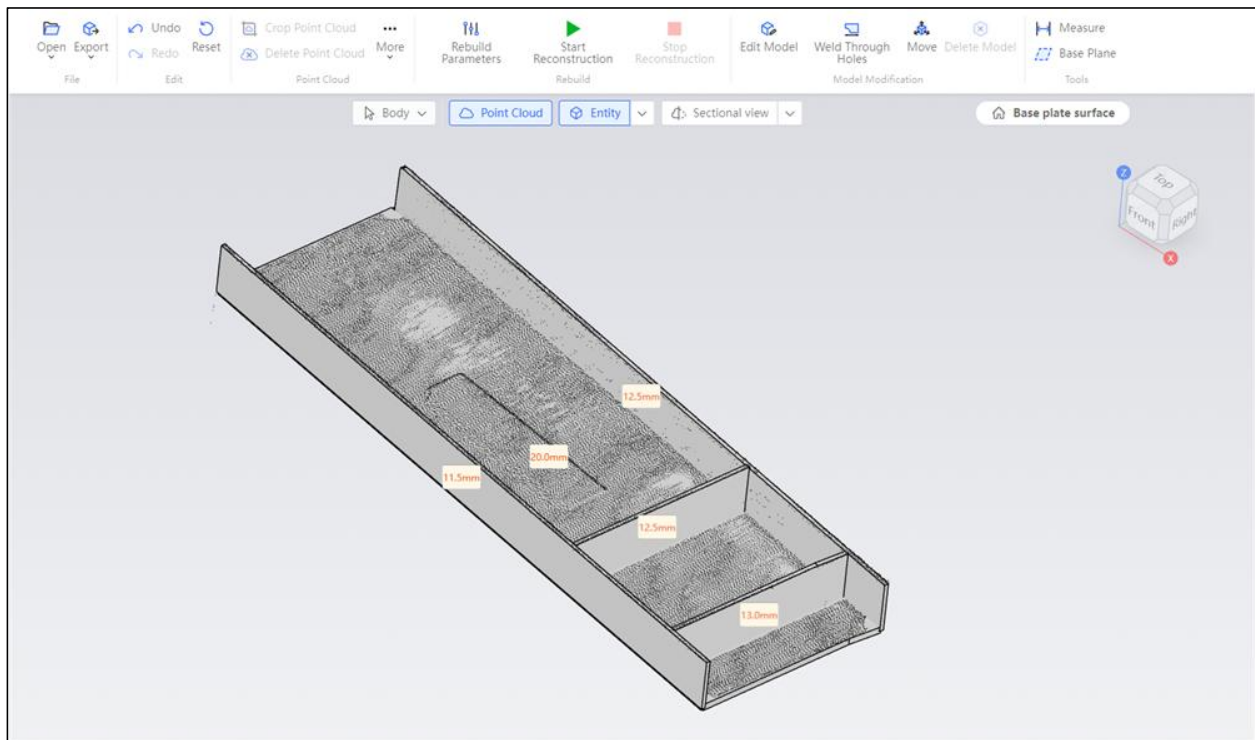


Figure 4-5 Point cloud reconstruction finished



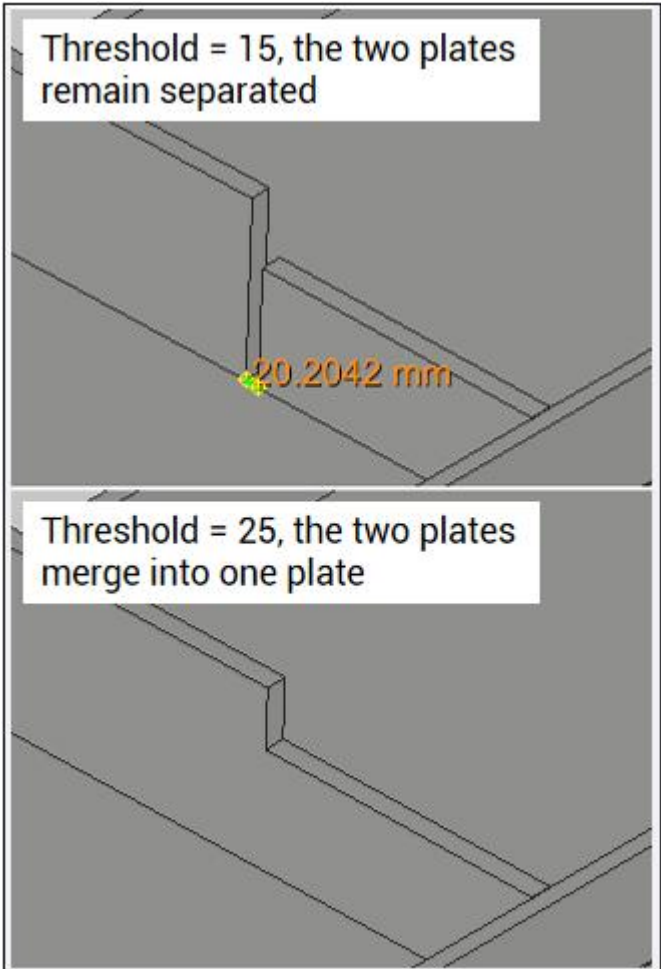
Figure 4-6 Point cloud / solid model display status

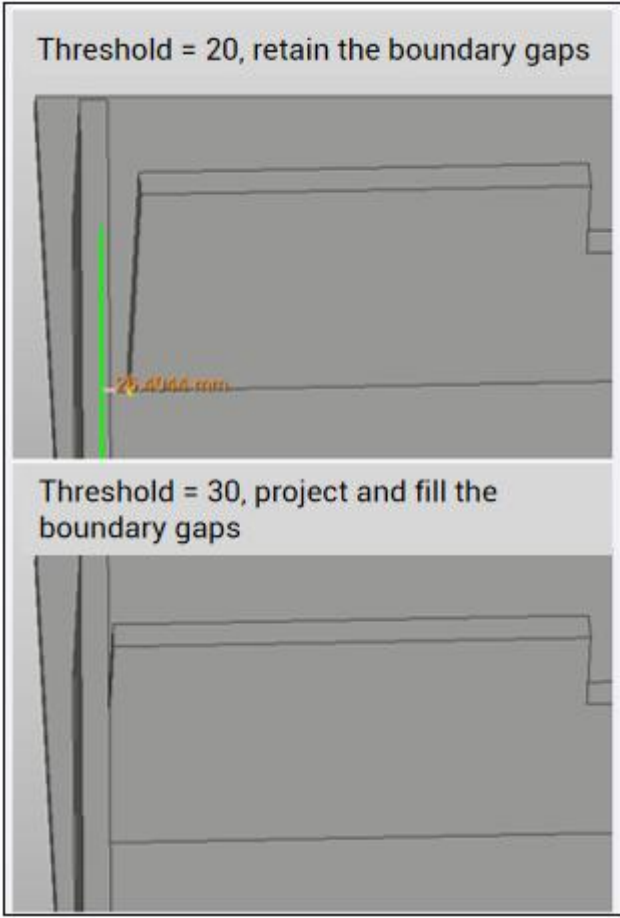
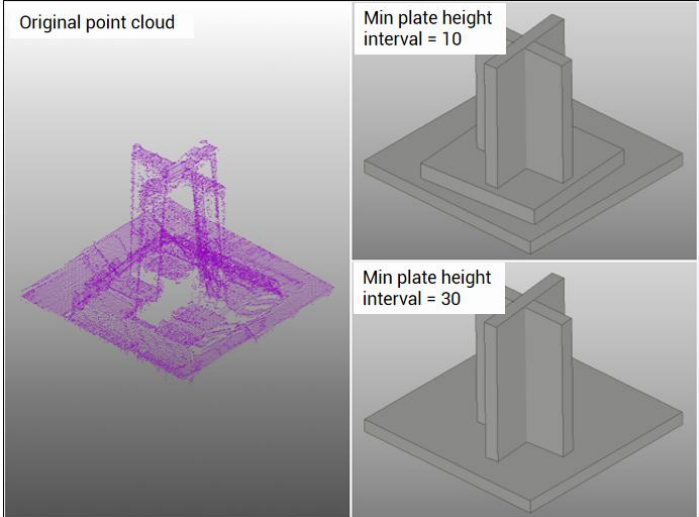
⚠ Caution:

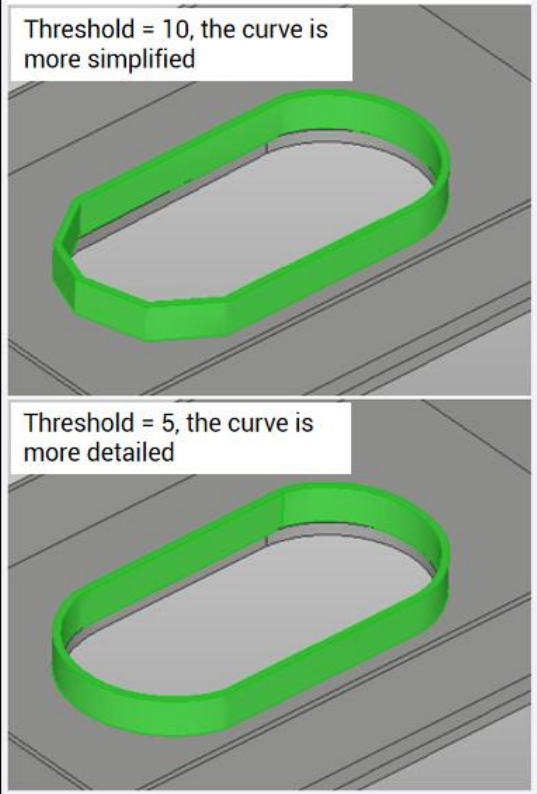
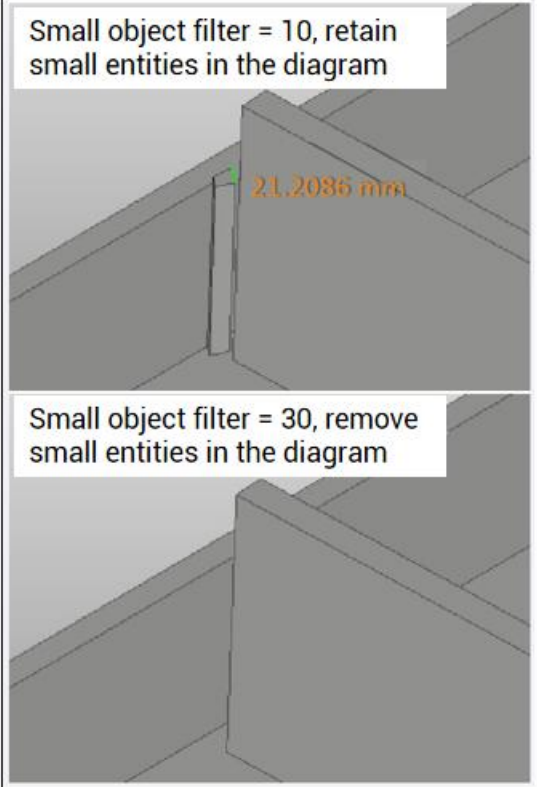
1. Point cloud reconstruction does not support welding for purlin bearing plates, but solid models can be generated.
2. Vertically, the weld seam length error is within 3 mm; in other directions, the weld seam length error is within 5 mm.
3. Plate thickness error is within 1 mm.

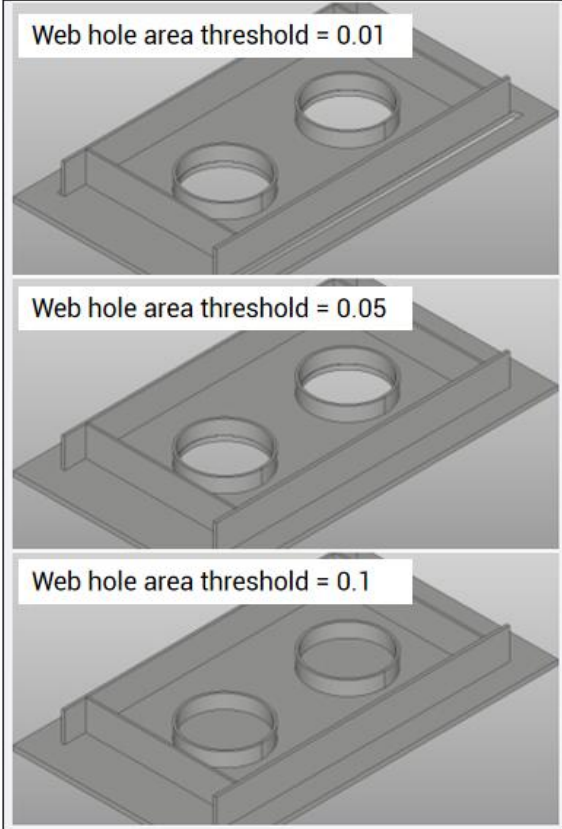
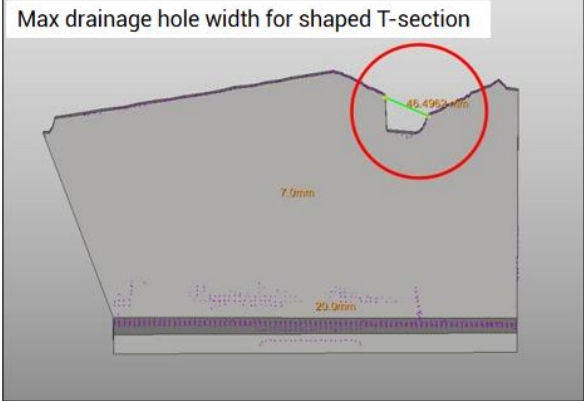
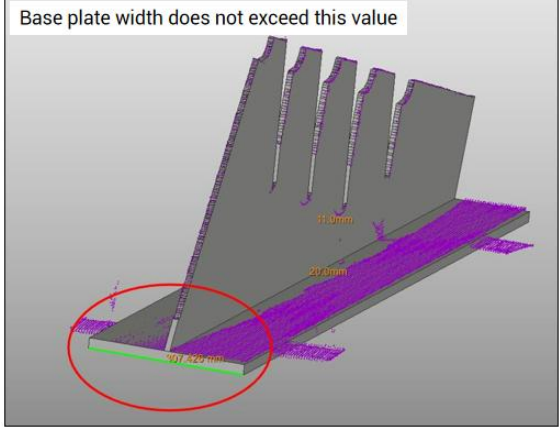
4.1.2 Reconstruction Parameter Description

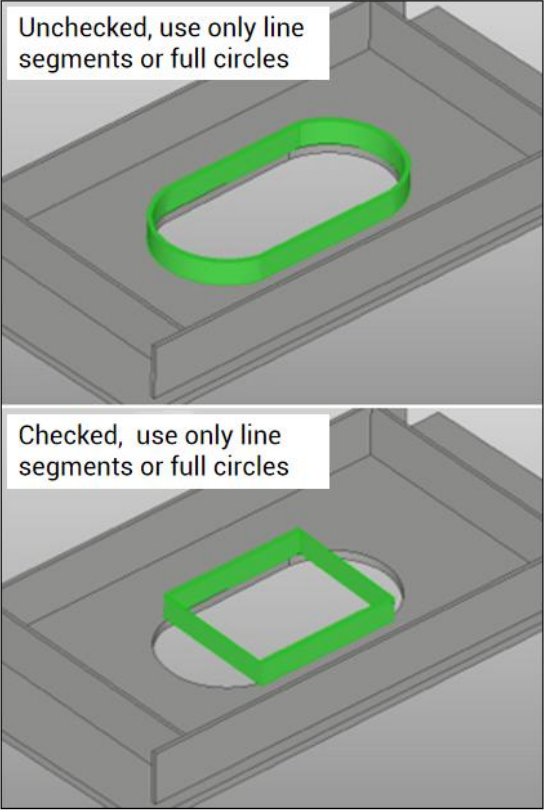
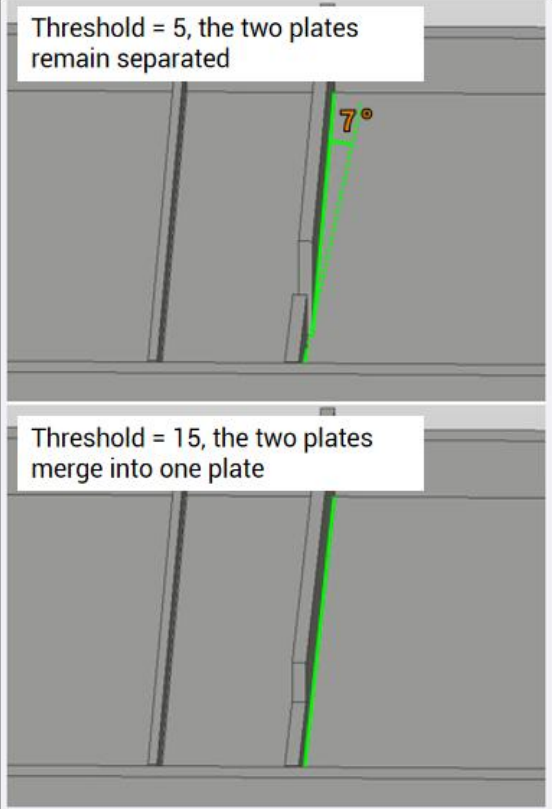
Table 4-1 Schematic Table for Some Point Cloud Reconstruction Parameters

Parameter	Description	Diagram
Curve Merge Distance Threshold	When the distance between the projection curves of two plates is less than this threshold, the plates will be merged.	

Parameter	Description	Diagram
<p>Boundary Projection Distance Threshold</p>	<p>Gaps smaller than this threshold in the boundary will be filled by projection.</p>	 <p>Threshold = 20, retain the boundary gaps</p> <p>Threshold = 30, project and fill the boundary gaps</p>
<p>Minimum Plate Height Interval</p>	<p>Plates with a thickness within the set value will be automatically filtered out.</p>	 <p>Original point cloud</p> <p>Min plate height interval = 10</p> <p>Min plate height interval = 30</p>

Parameter	Description	Diagram
<p>Boundary Curve Simplification Threshold / Curve Simplification Threshold</p>	<p>A larger threshold simplifies the curve more, generating polygons; a smaller threshold makes the curve more complex and detailed.</p>	 <p>Threshold = 10, the curve is more simplified</p> <p>Threshold = 5, the curve is more detailed</p>
<p>Small Volume Filtering Threshold</p>	<p>Filters out and removes entities whose bounding box length in the X or Y direction is smaller than this threshold.</p>	 <p>Small object filter = 10, retain small entities in the diagram</p> <p>21.2086 mm</p> <p>Small object filter = 30, remove small entities in the diagram</p>

Parameter	Description	Diagram
Web Plate Hole Area Threshold	A larger threshold means holes with a larger area will be filled.	
Drain Hole Maximum Width	The maximum width of drain holes.	
Upper Limit for Base Plate Width	The base plate width must not exceed this threshold.	

Parameter	Description	Diagram
<p>Use Only Line Segments or Full Circles</p>	<p>If checked, shapes will be square; if unchecked, they will be elliptical.</p>	
<p>Curve Merge Angle Threshold</p>	<p>When the angle between the projection curves of two plates is less than this threshold, the plates will be merged.</p>	

4.1.3 Auxiliary Functions

➤ Delete Point Cloud

- Crop Point Cloud: Keep the selected point cloud and delete the rest.
- Delete Point Cloud: Delete the selected point cloud and keep the rest.

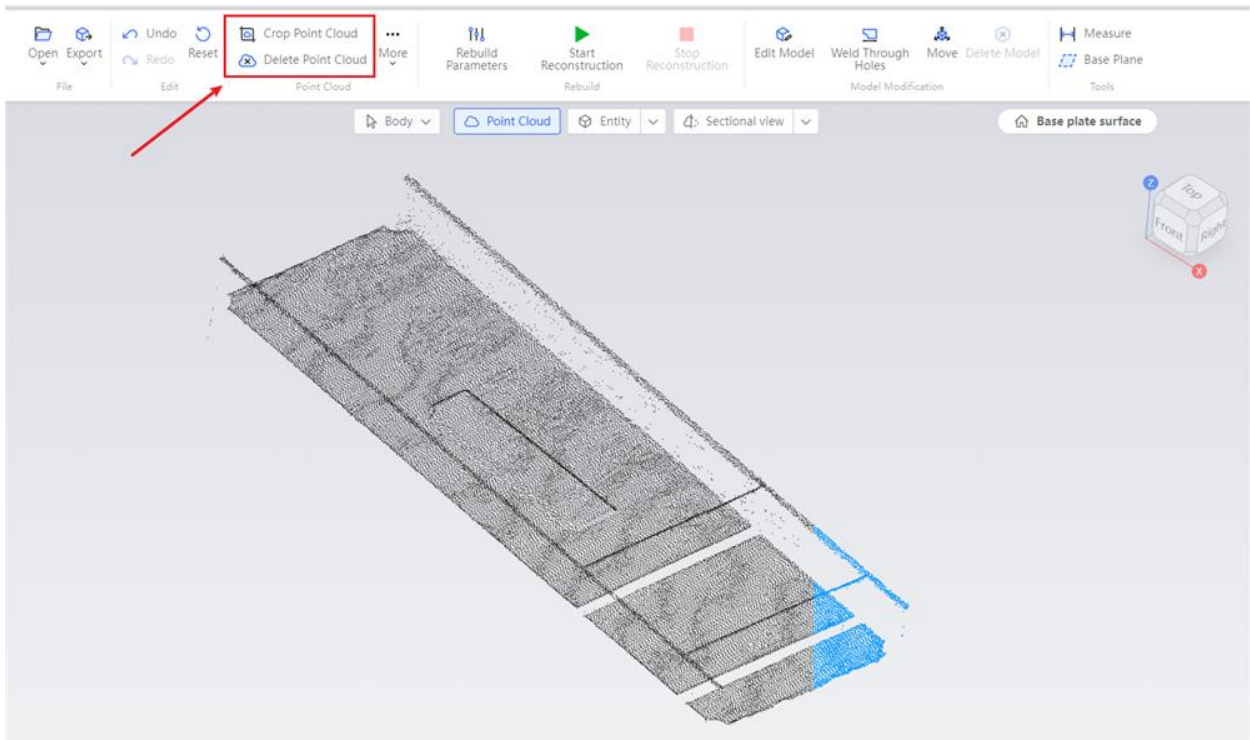


Figure 4-7 Delete point cloud

- Auto-Align & Remove Duplicates When Stitching: When scanning large workpieces with a line laser camera, multiple scans are performed. The point clouds from these multiple scans need to be stitched together. In this case, you can check ***Auto Alignment*** and ***Remove Duplicates When Stitching*** to optimize the scan results.



Figure 4-8 ***Auto-Align & Remove Duplicates When Stitching***

- Edit Model: When the parts on the scanned workpiece are regular rectangles, circles, polygons, or multiple rectangles, modeling can be performed by selecting points, followed by dimension adjustment.

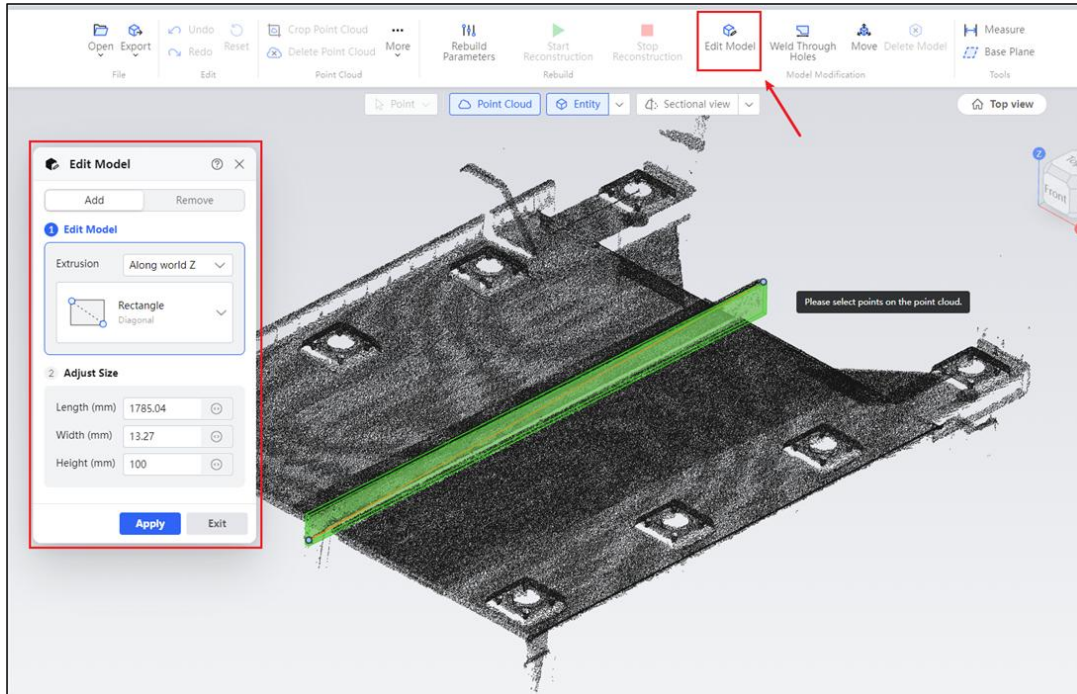


Figure 4-9 Edit model

- Weld Through Holes: After reconstruction is complete, you can select the plate(s) where weld through holes need to be added. The system will automatically generate them, and you can check the ones you wish to keep according to your needs.

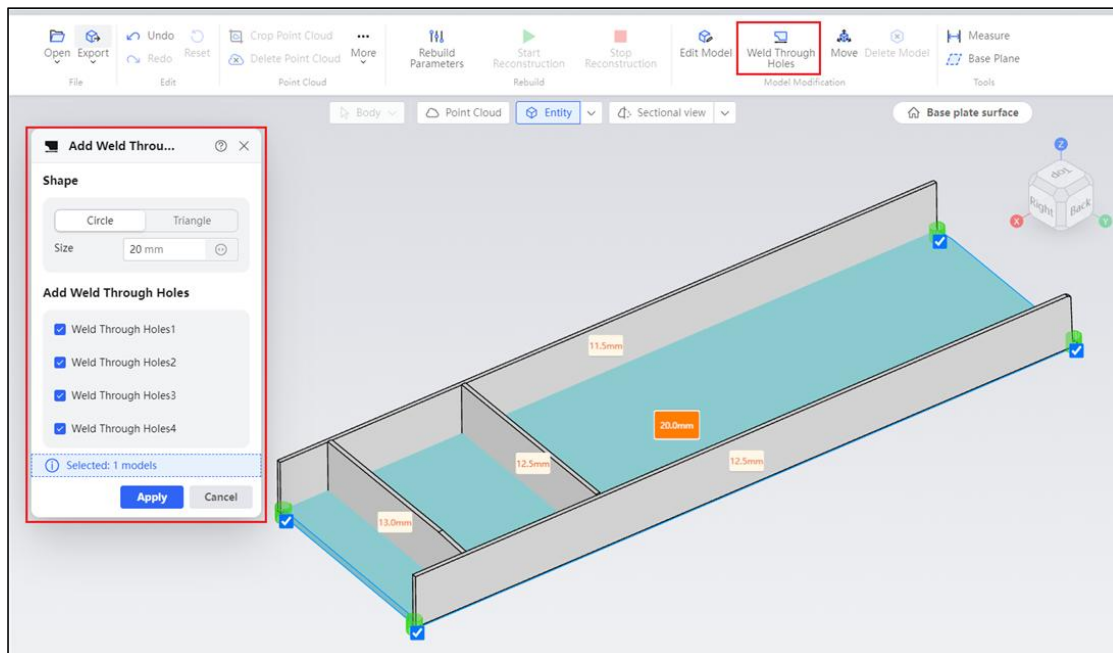


Figure 4-10 Generate weld through holes

- Move: Select the part model(s) you want to move, enter the *Translation parameters*, and the position change is completed.

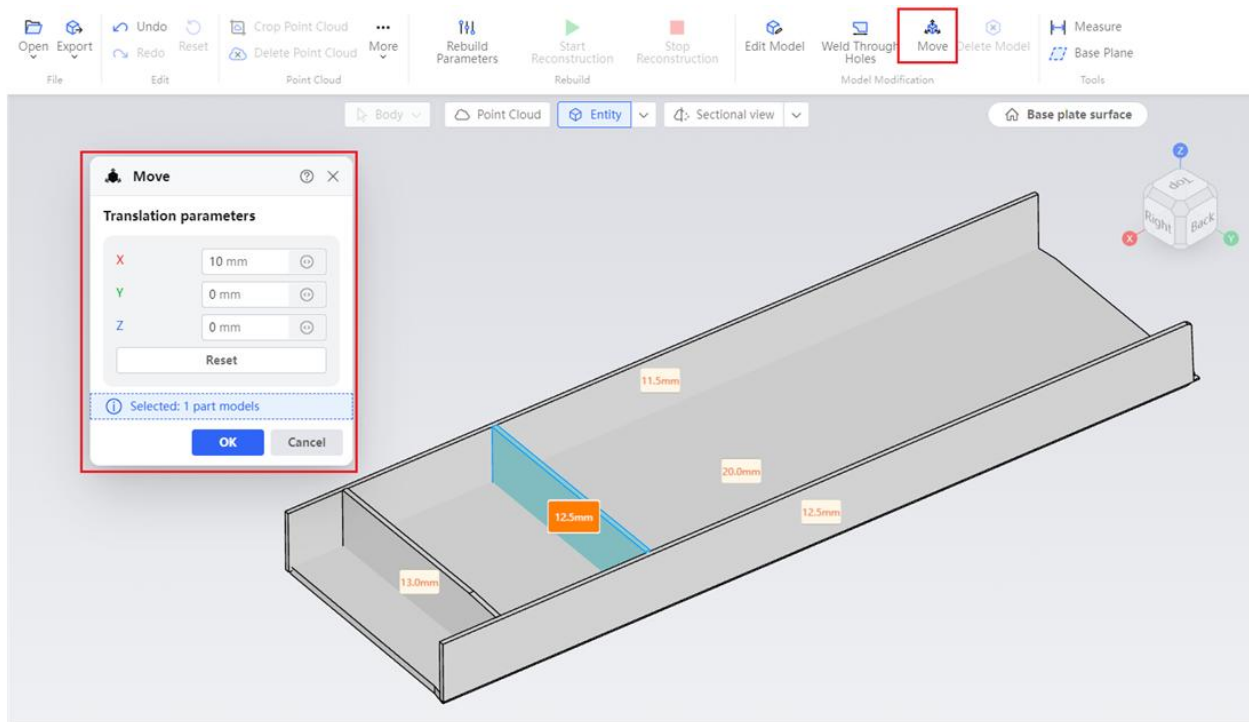


Figure 4-11 Move

- Delete Model: Select the unwanted part model(s) and click *Delete Model* to delete them.

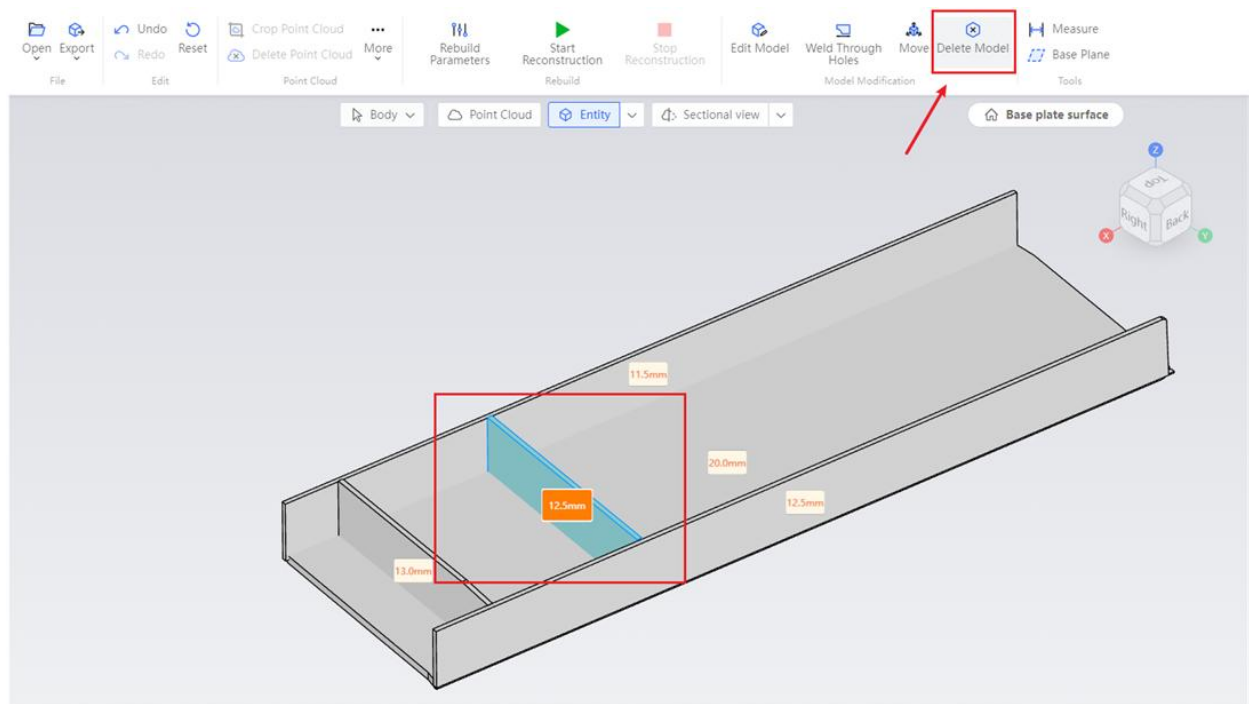


Figure 4-12 Delete model

- Measure: Click on vertices or edges of the model to measure edge length, distance between edges, point-to-edge distance, and point-to-point distance. Right-click the mouse and click **Exit Measurement** to exit the measurement state.

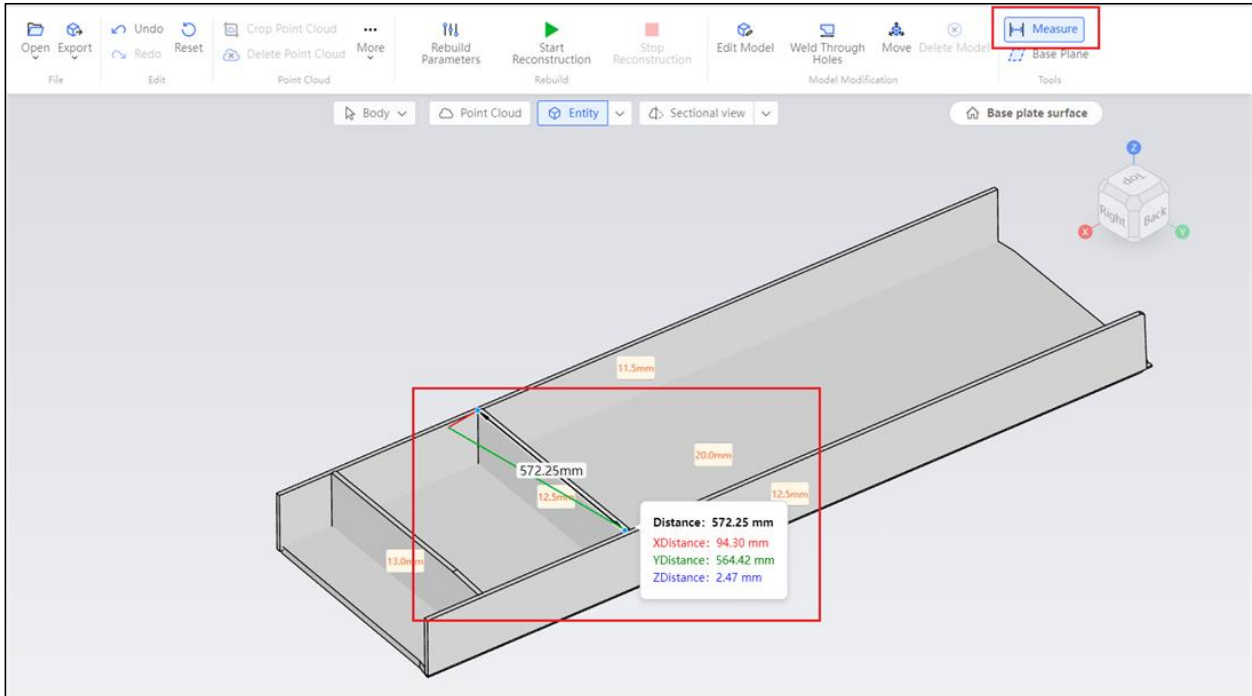


Figure 4-13 Model measurement

- Base Plane: By selecting a base plane, you can switch views and filter point clouds.

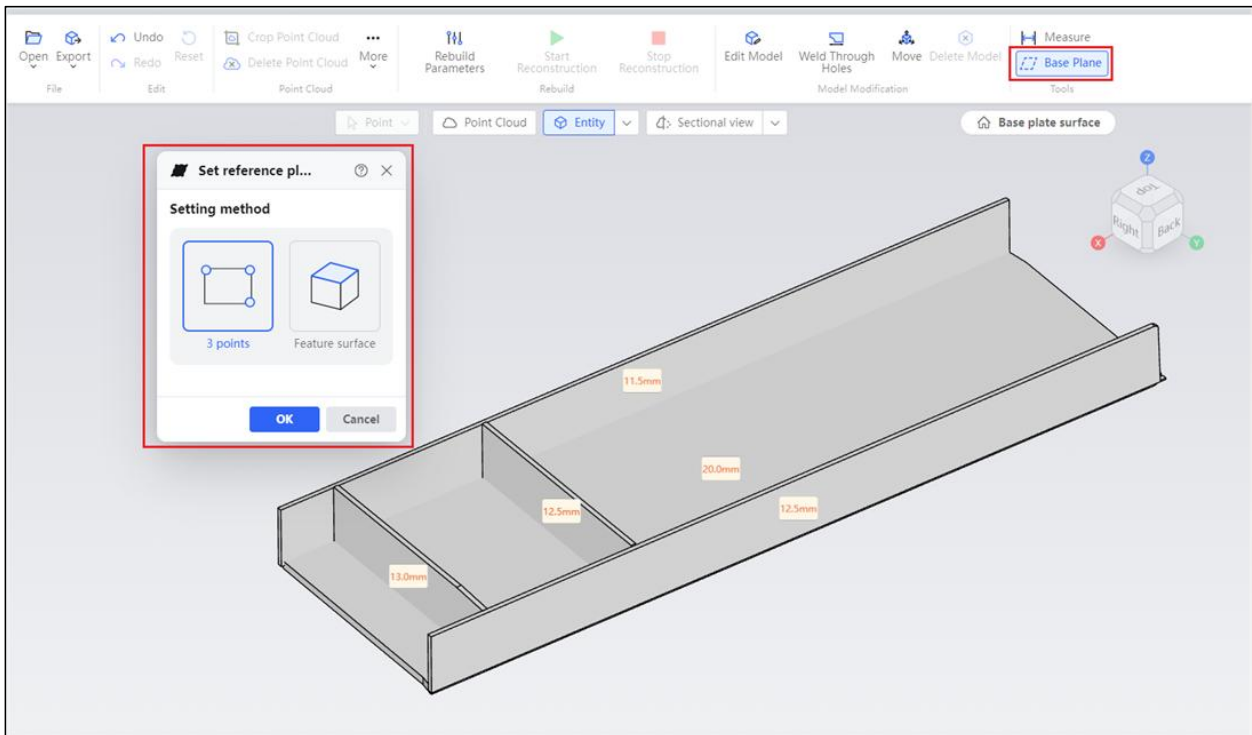


Figure 4-14 Set base plane

4.2 Large Line-Scan Camera Initial Positioning

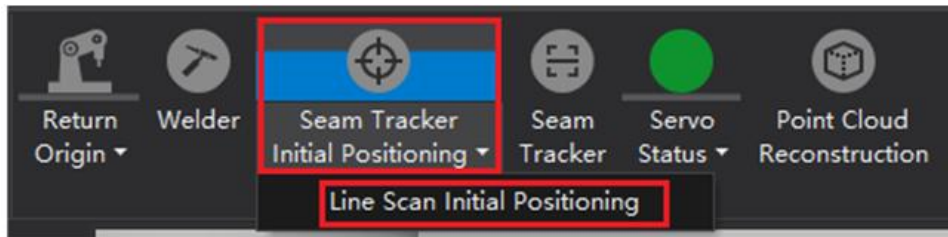


Figure 4-15 Open line-scan initial positioning

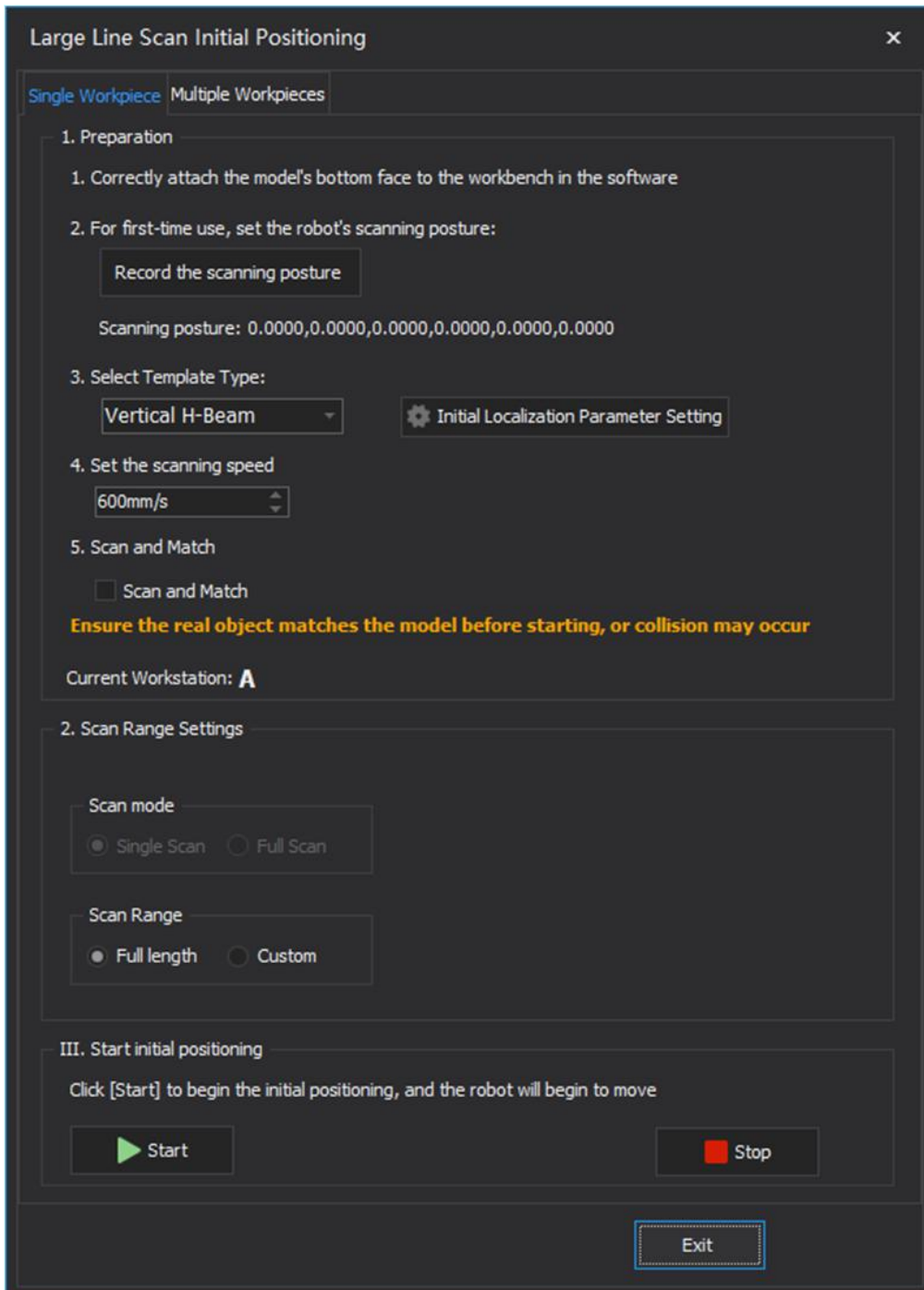


Figure 4-16 *Line-Scan Initial Positioning* Interface

- Step 1** Open via *Seam Tracker Initial Positioning* → *Line-Scan Initial Positioning* in the function bar.
- Step 2** Before starting initial positioning, jog the robotic arm to the initial pose to ensure the line-scan camera's field of view is not obstructed, and there is no collision risk during external axis movement. Click *Record the scanning posture*.
- Step 3** Set the scanning method and scanning speed. Default scanning speed is 500–600 mm/s.
- Step 4** Check *Scan and Match* as needed.
- Step 5** Click Start to initiate the positioning. The entire workstation will be scanned by default. After successful initial positioning, *Registration Successful* will appear. This concludes the line scan initial positioning process.

Chapter 5 FAQs

5.1 Large Line-Scan Camera Initial Positioning

The troubleshooting steps are as follows:

Step 1 Close CypWeld and use the 3DMVS client to check if a successful connection can be established.

Step 2 If the connection is successful, you can check if the IP of the line scan camera is disabled.

5.2 Failed to Recognize Center during Matrix Calibration

Hand-eye calibration cannot be identified during manual calibration of the line laser scanner. If manual calibration is used, you can troubleshoot according to the following steps:

Step 1 Ensure the camera's timestamp parameters are correct (unique to older firmware versions; if updated to the latest firmware, this item can be ignored). If the parameter of *Timestamp offset* is editable, you can set it to a value ≤ -50 ms to ensure the Point Cloud can be generated.

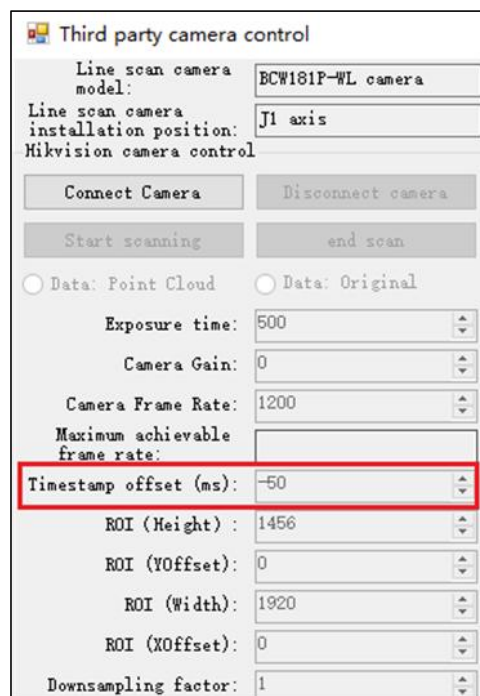


Figure 5-1 Modify the timestamp offset.

Step 2 Confirm that the disc diameter is 300 mm. A deviation exceeding 30 mm will cause identification to fail.

Step 3 Confirm that the disc diameter is 300 mm. Verify that the ROI parameters are reasonable and that the turntable portion is not excluded from the ROI. (Generally, it is recommended to use default ROI parameters during manual calibration).

Step 4 Remove any interfering objects from the camera's field of view, and ensure the turntable is placed at least 20 cm above the base surface.

5.3 No Point Cloud in Large Line laser Scanner Results.

Refer to steps 1 and 3 above for troubleshooting in [Failed to Recognize Center during Matrix Calibration](#).

5.4 Modifying Special Parameters in the Client or Visually Setting ROI

When it is necessary to modify certain parameters in the 3DMVS client that are not exposed in the CypWeld software, or to visually set the ROI in the 3DMVS client, and to ensure the parameters take effect, you can refer to the following steps:

Step 1 In 3DMVS, locate the corresponding parameter and modify it (the example below uses line width).

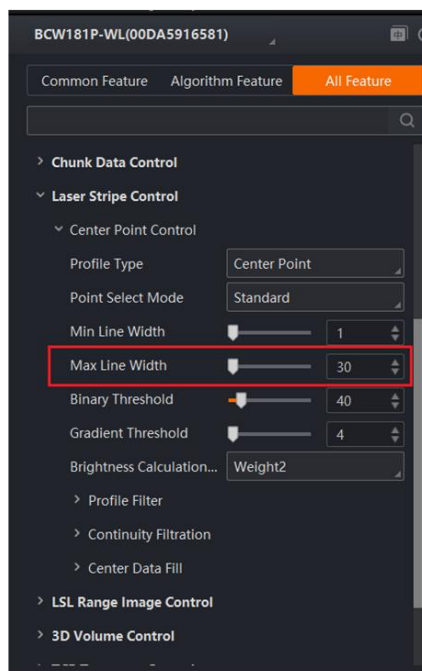


Figure 5-2 Modify the line width parameter

Step 2 After modification, locate *User Set Selector*, set it to *User Set 1*, and click *Execute*. This will make the parameter take effect.

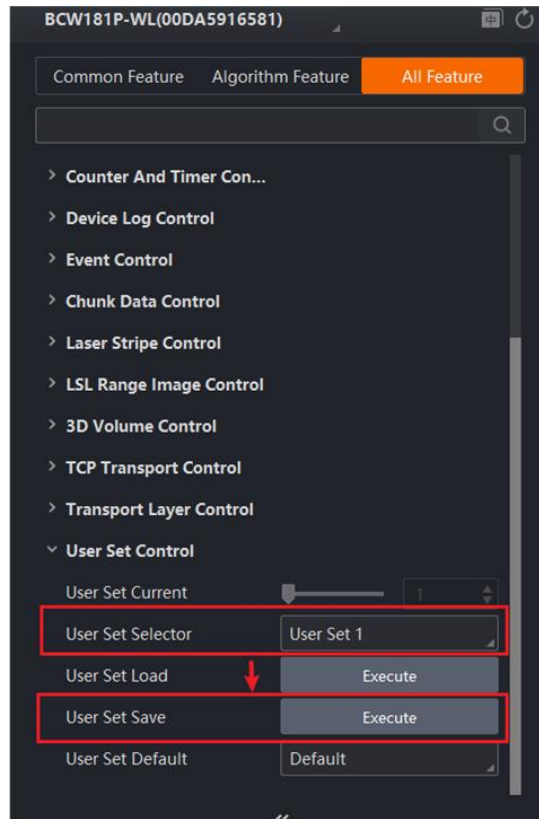


Figure 5-3 Save the *User Set*.



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