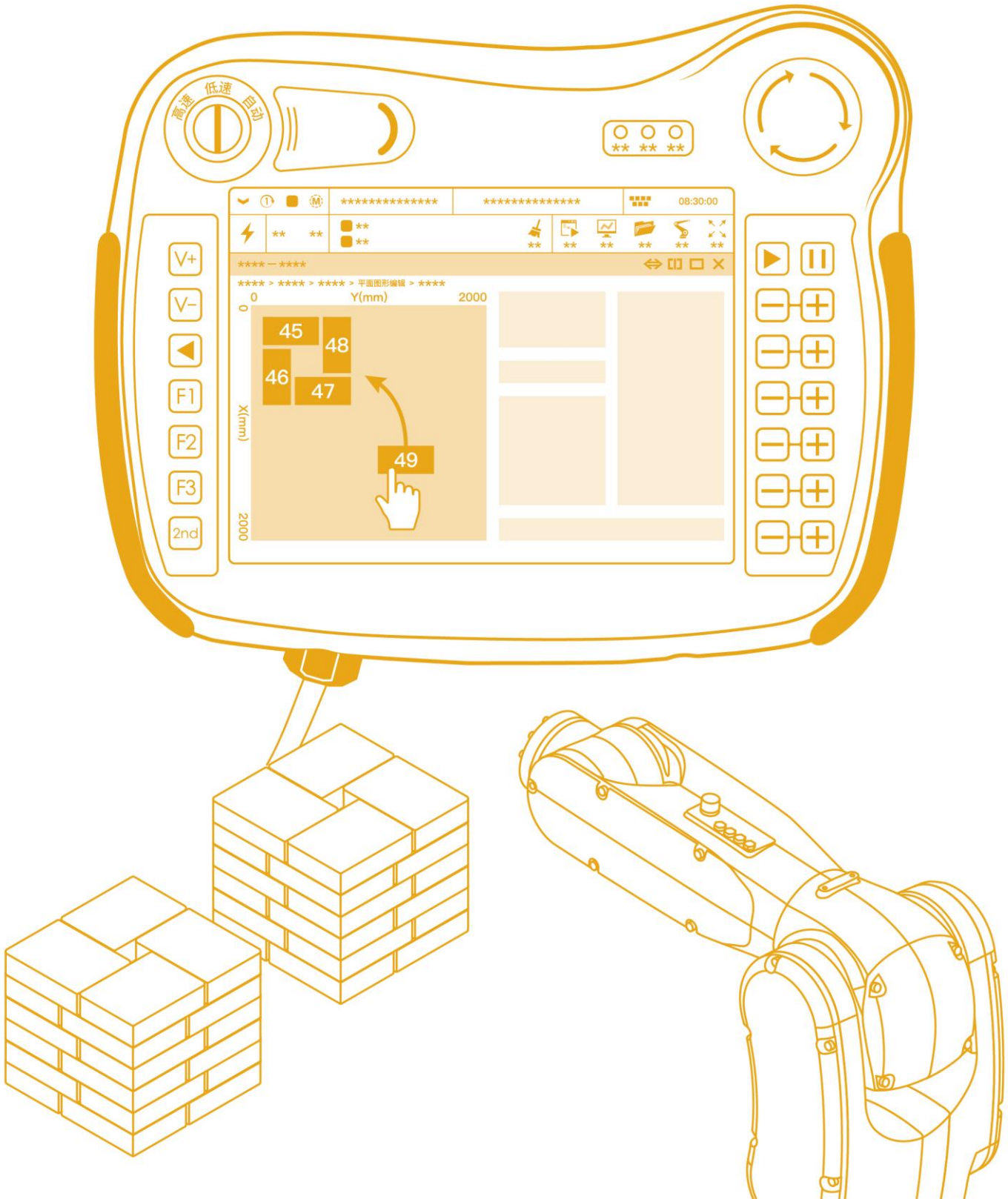
PEITIAN ROBOTICS

Convenient palletizing package user manual

V1.4.0



Foreword

About This Manual

This manual introduces the convenient version of robot palletizing function, and describes the configuration process of convenient version palletizing in detail. Reading this document will help readers master the working principle and various configuration information of the convenient stacking function.

Prerequisites

Before operating the robot, be sure to read the relevant safety instructions and operation instructions of the product carefully. Users must understand the safety knowledge and basic operation knowledge before using the robot's arc welding feature pack.

Please read the following documents when necessary:

- "Operation Manual of AIR-TP Teach Pendant"
- "ARL Programming Manual"
- "Fault and Troubleshooting Manual of AIR Series Industrial Robot System"

Target Groups

- Operators
- Product technicians
- Technical service personnel
- Robot teachers

Meaning of Common Signs

The signs and their meanings in this manual are detailed in Table 1.

Table 1 Signs used in this manual

Sign	Meaning
 Danger	Failure to follow the instructions may cause accidents, resulting in serious or fatal personal injury.
 Warning	Failure to follow the instructions may cause accidents, resulting in moderate or minor personal injury, and may also cause damage to materials only.
 Notice	You are prompted to keep in mind environmental conditions and important matters, or quick operation methods.

Sign	Meaning
 Tip	You are prompted to refer to other literature and instructions for additional information or more details about operation instructions.

Manual Description

The contents of this manual are subject to supplementation and modification. Please visit "Download Center" on the website regularly to obtain the latest version of this manual in a timely manner.

Website URL: http://robot.peitian.com/

Revision History

The revision history contains the instructions for each document update. The latest version of the document contains updates to all previous versions of the document.

Table 2 Signs used in this manual

Version	Publication date	Modification description
V1.0.0	2019/12/17	1st official publication
V1.0.1	2020/1/18	Second official release Fix known bugs.
V1.0.2	2020/2/25	Third official release Add a configuration example of layer arrangement settings.
V1.2.0	2020/6/30	Fourth official release Upgrade the software version to v2.6.2.
V1.3.0	2020/8/30	Fifth official release Upgrade software version to v2.6.3 Added "function of automatic register cleaning".
V1.4.0	2021/03/31	Sixth official release Upgrade software version to v2.6.4 Add "P_COR point".

Document Number and Version

The document-related information is shown in Table 3.

Table 3 Document-related information

Document name	Convenient palletizing package user manual
Document number	UM-S01500000003-008
Document version	V1.4.0
Software version	2.6.4

Contents

Foreword I

Contents i

1 Introduction to convenient palletizing 1

1.1 Palletizing Robot 1
1.2 Features of convenient palletizing 1
1.3 Convenient palletizing application scenario 1

2 Basic operation 3

2.1 Privilege level 3
2.2 Installation and upgrade 3
2.3 Uninstall 6
2.4 Authorization 7
2.5 Check configuration 9

3 Process document setting 11

3.1 Simple mode 12
3.1.1 Pallet settings 12
3.1.2 Workpiece setting 15
3.1.3 Position setting 16
3.1.4 Load point setting 18
3.1.5 Approach parameter setting 19
3.1.6 Graphic edit setting 20
3.1.7 Layer arrange setting 33
3.2 Complex mode 46
3.2.1 Pallet settings 47
3.2.2 Workpiece setting 49
3.2.3 Position setting 49
3.2.4 Load point setting 51
3.2.5 Approach parameter setting 51
3.2.6 Graphic edit setting 51
3.2.7 Layer arrange setting 51
3.3 Register function 51

4 Auxiliary programming 55

4.1 Register auto cleanup function 55
4.2 Palletizing 55
4.3 Destacking 58
4.4 Program Execution 60

1 Introduction to convenient palletizing

1.1 Palletizing Robot

Palletizing robot is a kind of robot used for palletizing finished products. By automatically adjusting the placement position of articles, articles can be stacked regularly. As shown in Figure 1-1.

Figure 1-1 Diagram of operator packaging

1.2 Features of convenient palletizing

- Convenient palletizing introduces the concept of graphics, that is, a pallet contains one or more layers, and the arrangement of each layer is represented by a graphic. There is no need to configure rows and columns.
- Convenient palletizing can automatically generate palletizing and destacking procedures without operator programming.

1.3 Convenient palletizing application scenario

Convenient palletizing is mostly used for packing and palletizing finished products such as bags, cartons, cans, boxes and bottles in 3C (i.e. the general name of computer, communication and consumer electronics) industries and chemical, beverage and food industries. It generally needs to be used together with automatic production lines, logistics storage and other goods conveying lines to complete the palletizing or destacking of goods.

2 Basic operation

2.1 Privilege level

When using the air-tp teaching pendant for the first time, the user interface at the first login will be prompted. The user can choose:

- Teacher: Authority 4

Under this permission, you can write the robot working program and modify some parameters. The initial login password is peace.

- Operator: Authority 5

Under this permission, you can simply view the operation of the robot's position parameters, without program modification and parameter modification permission. The initial login password is love.


Tip

Ordinary users can only log in to the teaching pendant with the authority of teacher and operator.

2.2 Installation and upgrade

Before installing the convenient palletizing function package, confirm whether the HMI / arcs version has been upgraded to the version matching the function package. The installation procedure is the same as the upgrade procedure.

The steps are as follows:

Step1. Copy the installation package to the root directory of the USB flash drive.

Step2. Log in to the teaching pendant with the authority of teacher and above, and plug in the USB flash disk of the copied installation package after logging in.

Step3. Click [Extend] to pop up the drop-down list as shown in Figure 2-1.

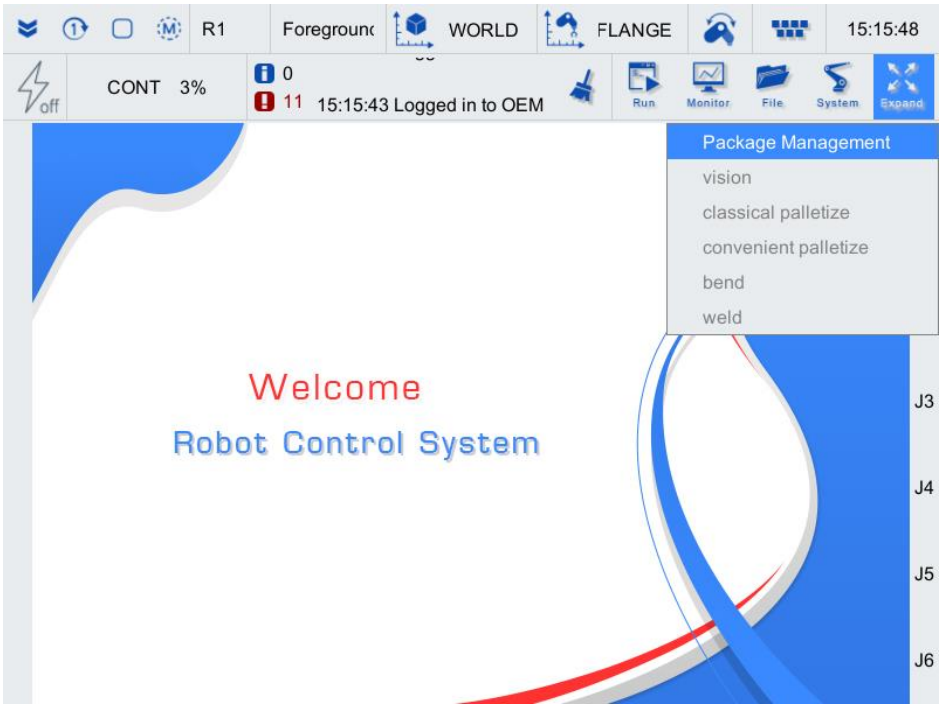


Figure 2-1 Feature Pack list

Step4. Click function [Package Management] to open the [Package Management] interface as shown in Figure 2-2.

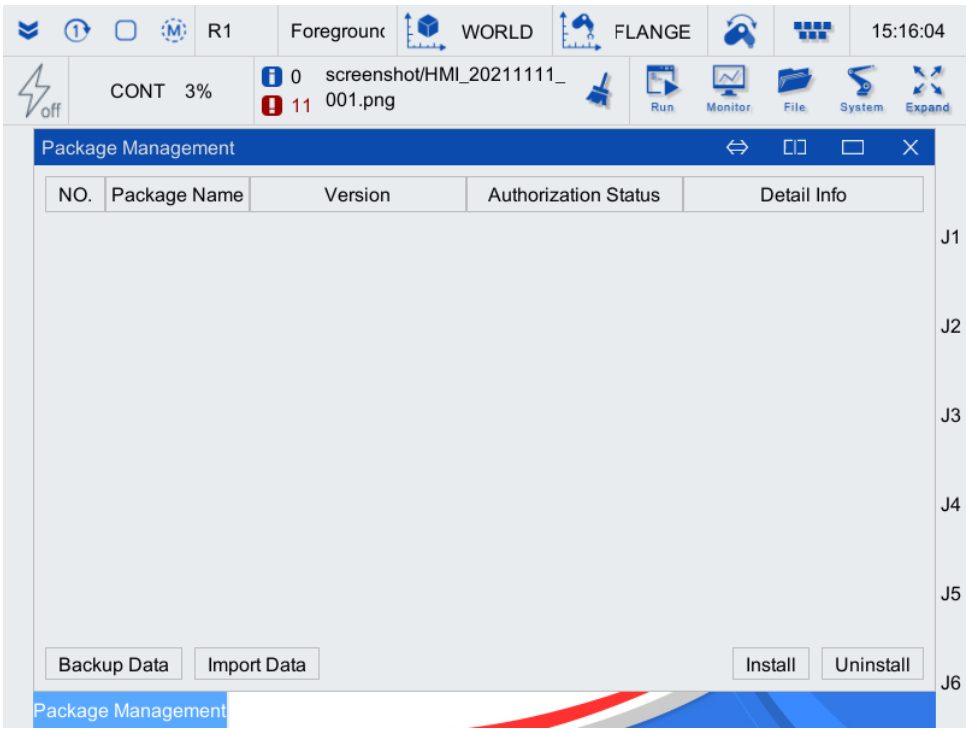


Figure 2-2 Package Management interface

Step5. Click the <install> button to pop up the [Select package version] dialog box as shown in Figure 2-3.

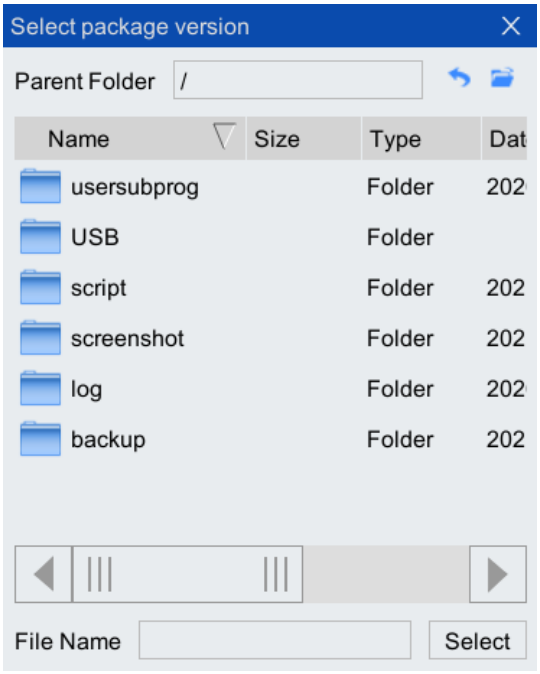


Figure 2-3 Select package version dialog box

Step6. Double click the "USB" folder, find the installation file of the convenient palletizing package under the USB folder, enter the interface shown in Figure 2-4, and then click the <Select> button.

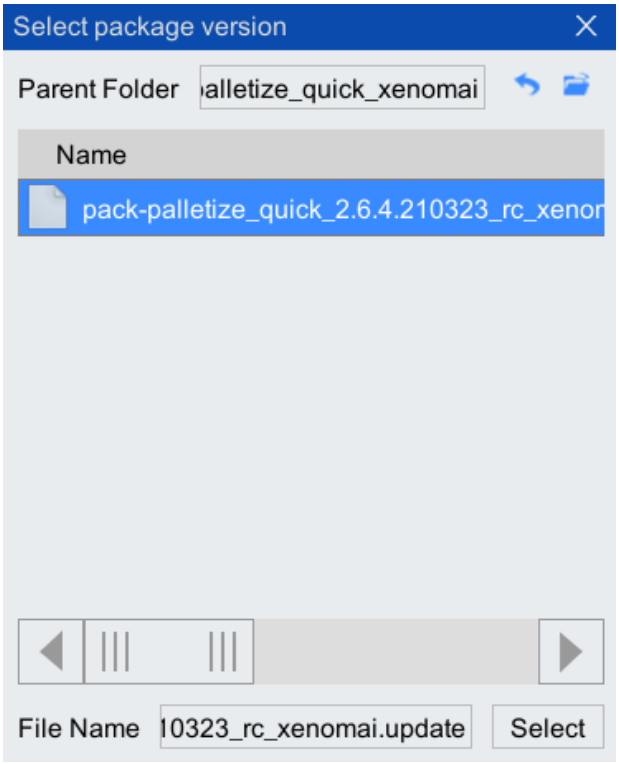


Figure 2-4 Installation package selection interface

Step7. The dialog box shown in Figure 2-5 pops up to prompt whether to upgrade. After checking, click the <Yes> button.

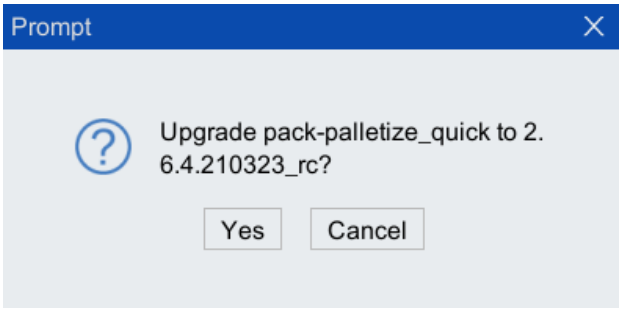


Figure 2-5 Prompt dialog box

Step8. After the progress bar is updated, the [install and upgrade] dialog box shown in Figure 2-6 will pop up, and click <Yes>. At this time, power off and restart the equipment to complete the package upgrade.

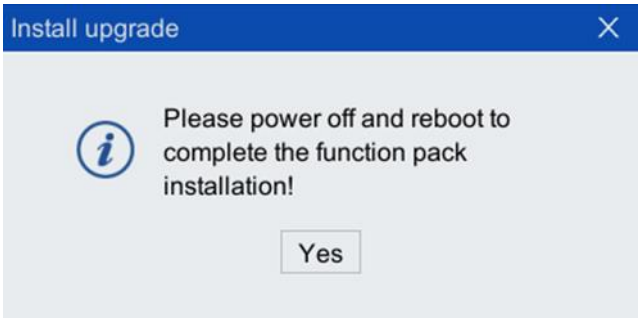


Figure 2-6 Install upgrade dialog box

2.3 Uninstall

The unloading steps of convenient palletizing package are as follows.

Step1. Click [Extend] to pop up the drop-down list as shown in Figure 2-7.

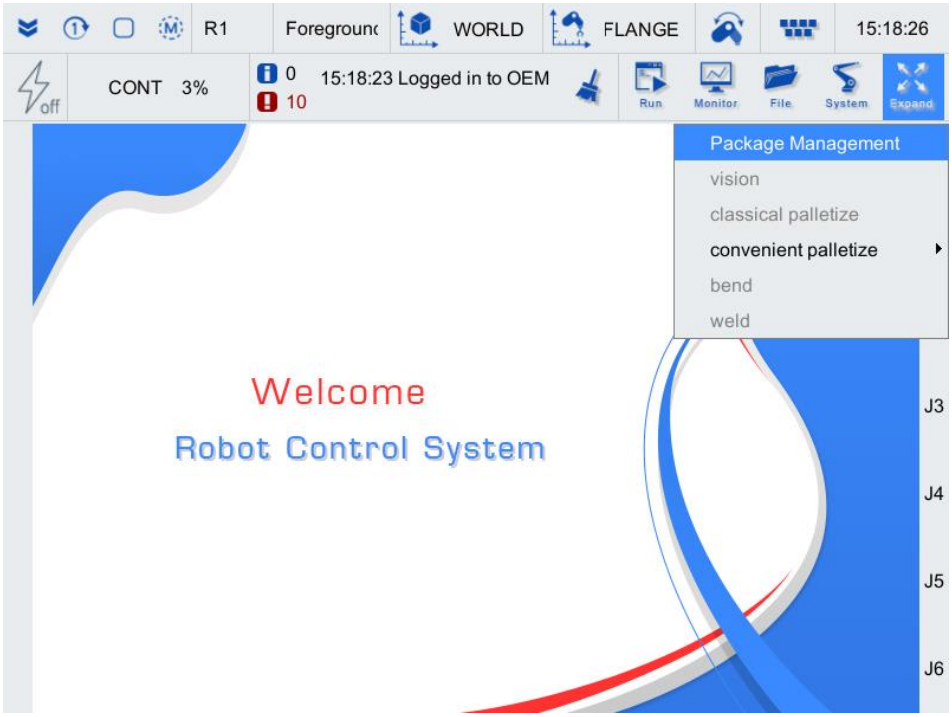


Figure 2-7 Package management list

Step2. Click [package management] to open the [package management] interface as shown in Figure 2-8.

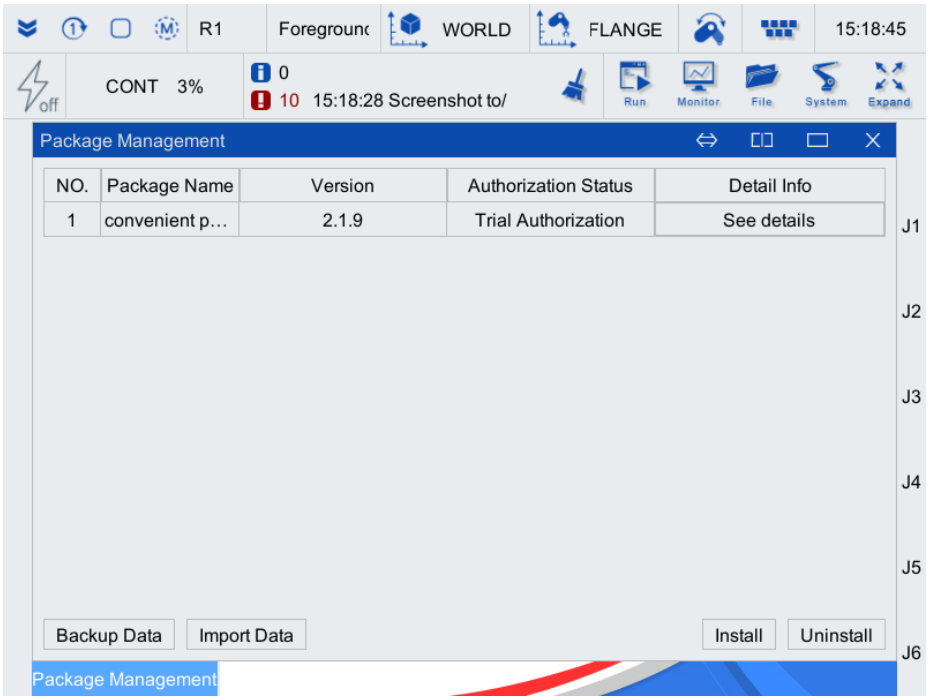


Figure 2-8 Package management box

Step3. Select the package to be uninstalled and click the < uninstall > button to pop up the prompt dialog box as shown in Figure 2-9.

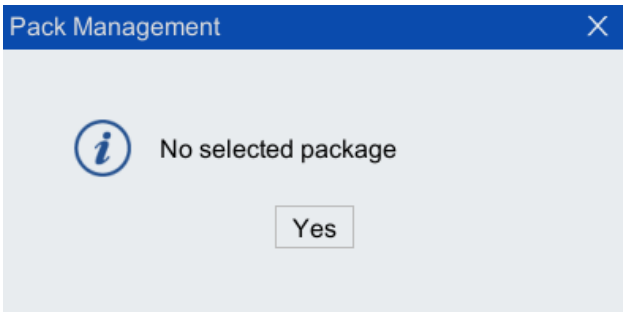


Figure 2-9 Pack Management dialog box

Step4. Click the <Yes> button. After uninstalling, power off and restart the control cabinet.

2.4 Authorization

After the package is installed, you need authorization to start using the Package.

The specific authorization process is as follows:

Step1. Contact relevant personnel of our company to obtain corresponding authorization documents.

Step2. Put the obtained authorization file into the USB flash disk, and then insert the USB flash disk into the USB interface of the teaching pendant.

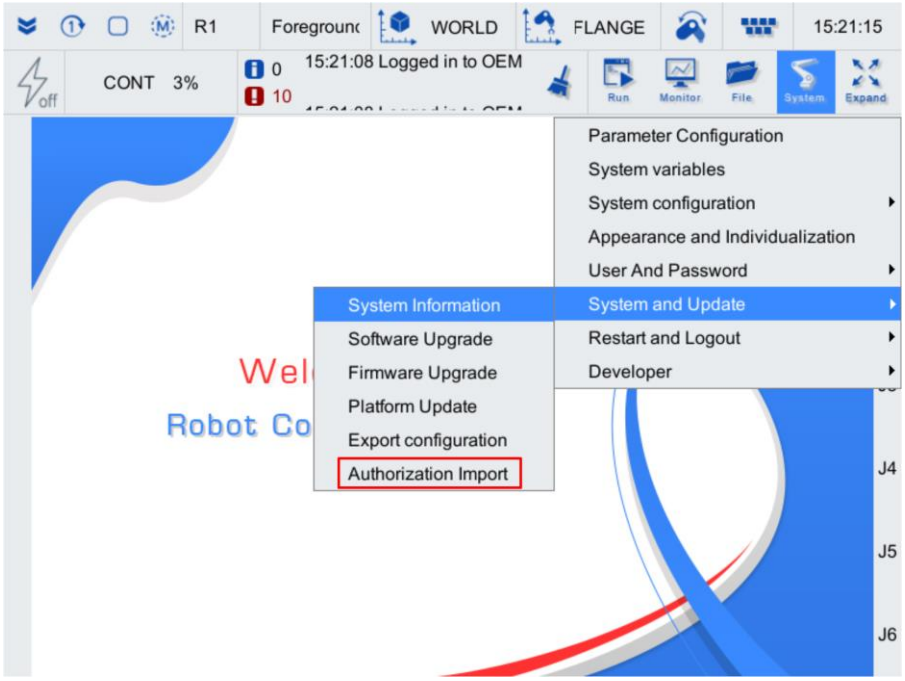


Figure 2-10 Main interface of teaching pendant

Step3. Click [authorization import] to open the [choose an authorization file] dialog box shown in Figure 2-11. Under the USB folder, find the authorization file and click to select it. Click the < Select > button to start authorization.

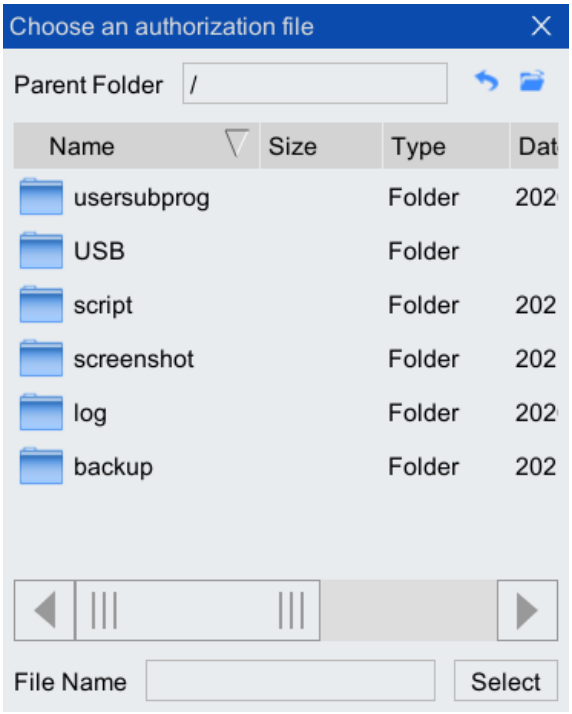


Figure 2-11 Select authorization file dialog box

Step4. After the authorization is successful, a dialog box as shown in Figure 2-12 will pop up, and click <Yes> to complete the authorization.

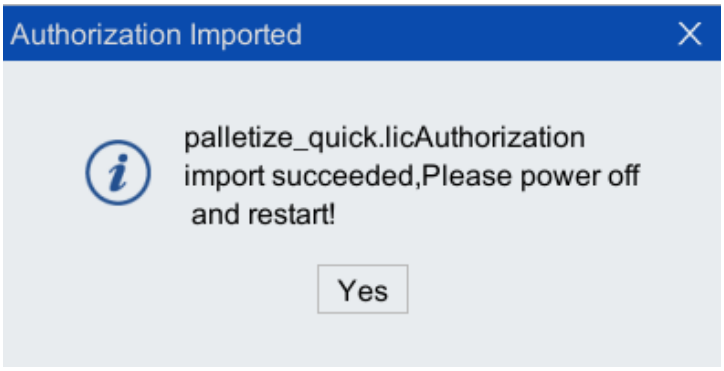


Figure 2-12 Interface for selecting the required authorization file

Step5. Power off and restart the control cabinet, and the authorization takes effect.

2.5 Check configuration

After the authorization is completed, you can check whether the authorization is successful on the teaching pendant.

The viewing steps are as follows:

Step1. Click [extend] to open the drop-down list shown in Figure 2-13.

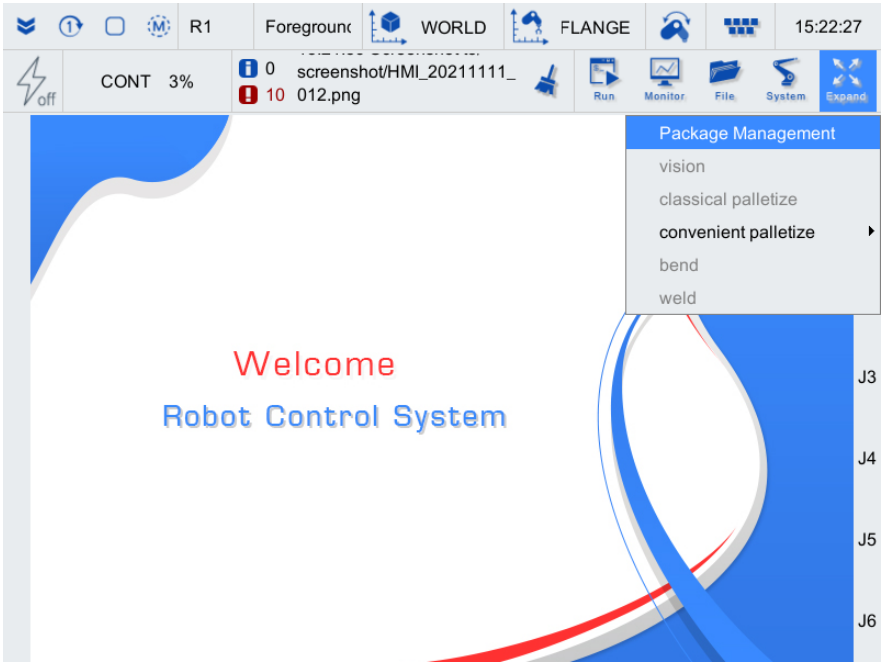


Figure 2-13 Package list

Step2. Click [package management] to open the [package management] interface as shown in Figure 2-14. Check the authorization status to determine whether the authorization is successful.

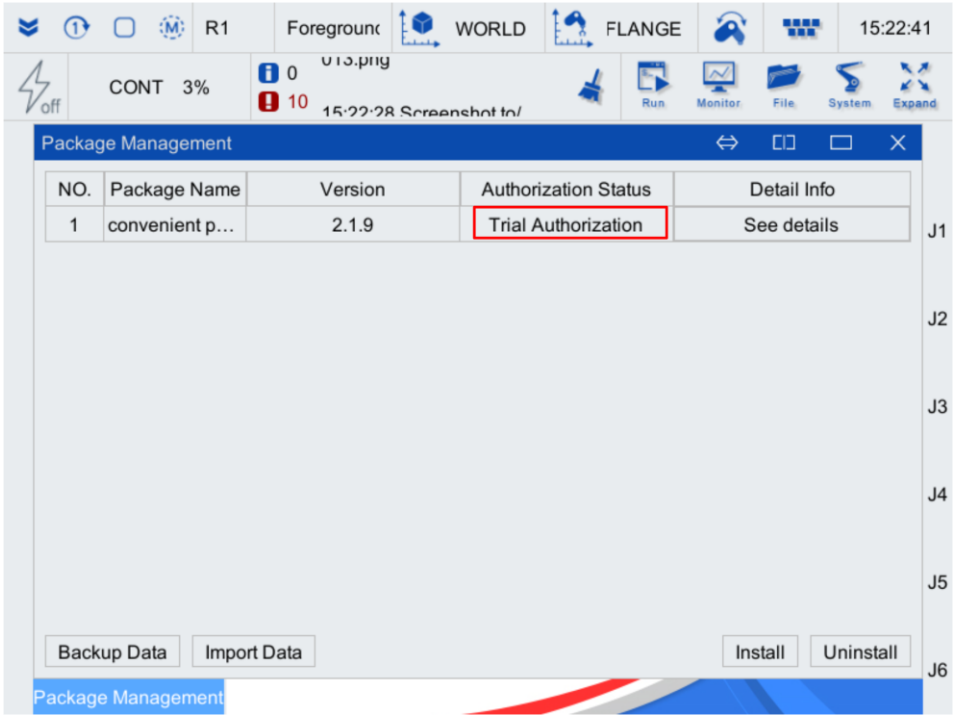


Figure 2-14 Package management interface

Step3. Click [See Details] to see the details of the package.

3 Process document setting

After installing the convenient palletizing package, log in to the main interface of the teaching pendant, and click [extended / convenient palletize / process document] in the upper right corner to enter the process document operation interface.

The process document interface is divided into three areas, as shown in Figure 3-1.

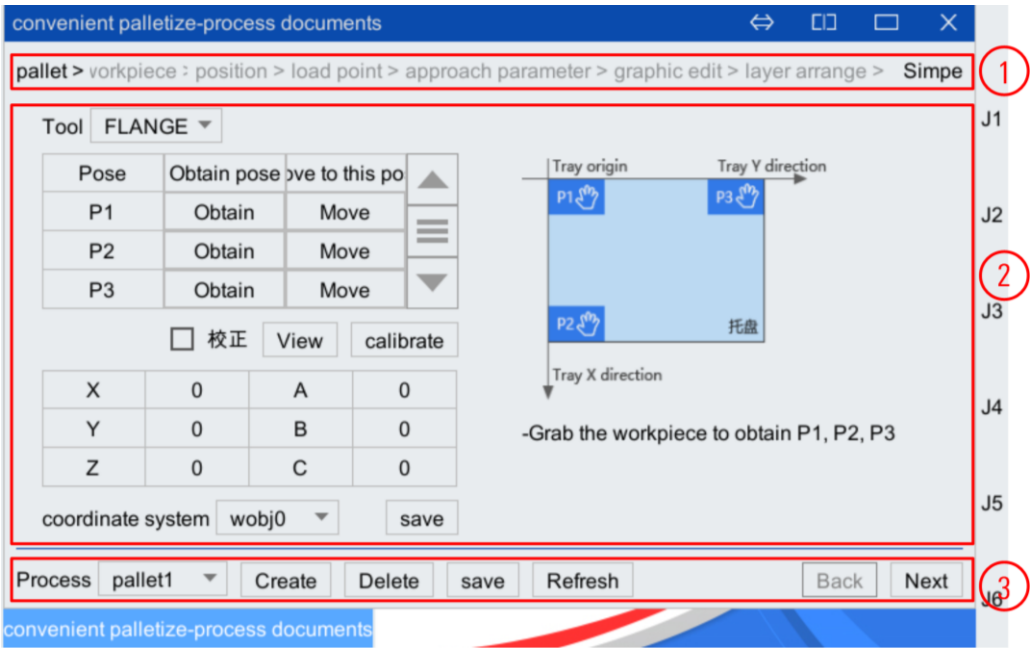


Figure 3-1 Process document operation interface

See Table 3-1 for the description of interface area.

Table 3-1 Interface area description

Area number	Area name	Description
1	Wizard bar	The wizard bar lists the seven steps to create a palletizing process document (and highlights the current step), which are: ■ Pallet settings ■ Workpiece setting ■ Position setting ■ Load point setting ■ Approach parameter setting ■ Graphic edit setting ■ Layer arrange setting
2	Parameter setting area	The main display area of the current step. You can configure the parameters of the current step.
3	Operation area	Includes the following operations: ■ Create Creating process document supports two modes: simple mode and complex mode. When clone current document is checked, the current process document is copied in the new process document; If you uncheck clone the current

Area number	Area name	Description
		document, an empty process will be created. ■ Delete Click the drop-down triangle of the process list, select any process, and click <Delete> to delete the process. ■ Save Click <Save> to save the edited content. ■ Refresh Click the <Refresh> to automatically restore to the last saved state. ■ Back/Next Click <Back> and <Next> to switch the interface of each step.

Tip

- The saving path of process documents is: /script/package/palletize_quick.
- Under this path, each folder represents a process, the folder name is the process name, and the pallet.xml under the folder is the process parameter file.

The convenient palletizing package includes two modes:

- Simple mode (only 90 ° workpiece rotation is supported)
- Complex mode (support workpiece rotation at any angle)

3.1 Simple mode

Click < Create > at the bottom of the interface to open the [new process] configuration interface (as shown in Figure 3-2), select [simple], and click <Yes> to enter the simple mode configuration interface.

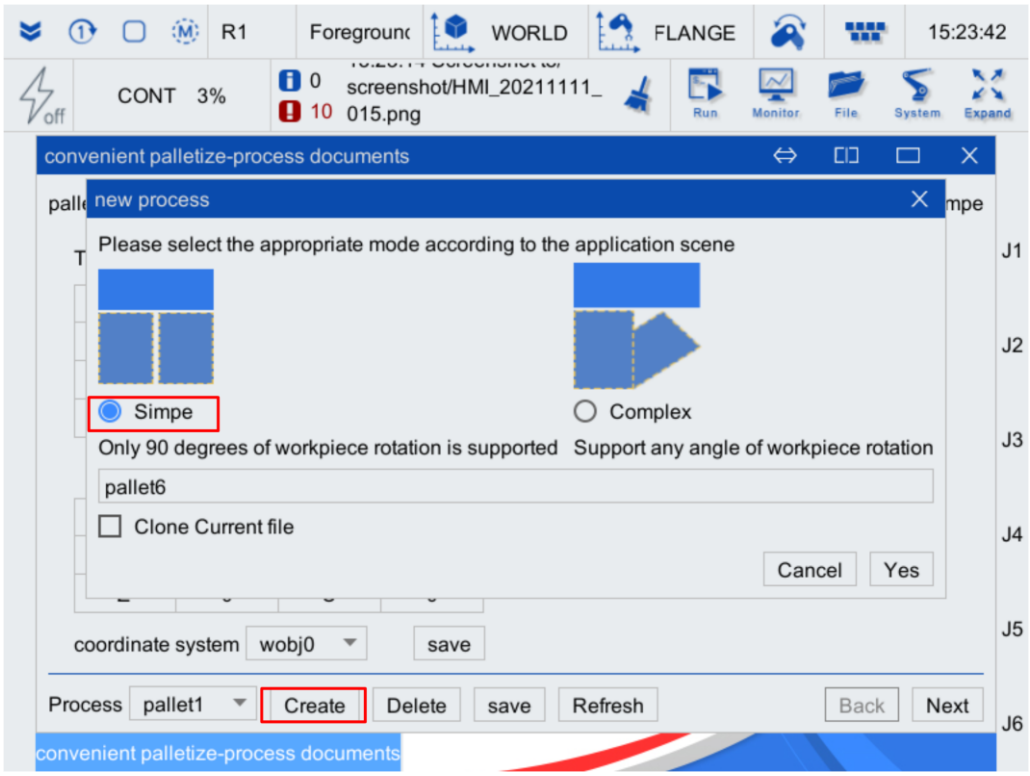


Figure 3-2 Mode selection interface

3.1.1 Pallet settings

After entering the process file editing interface, the pallet setting interface shown in Figure 3-3 is displayed. The purpose of this interface is to calibrate the pallet coordinate system. Before calibration, you need to define the XYZ direction of the workpiece and the XYZ direction of the pallet. For all point teaching, you need to ensure that the XYZ direction of the workpiece is consistent with the XYZ direction of the pallet coordinate system, except for the workpiece points taught after the rotation angle.

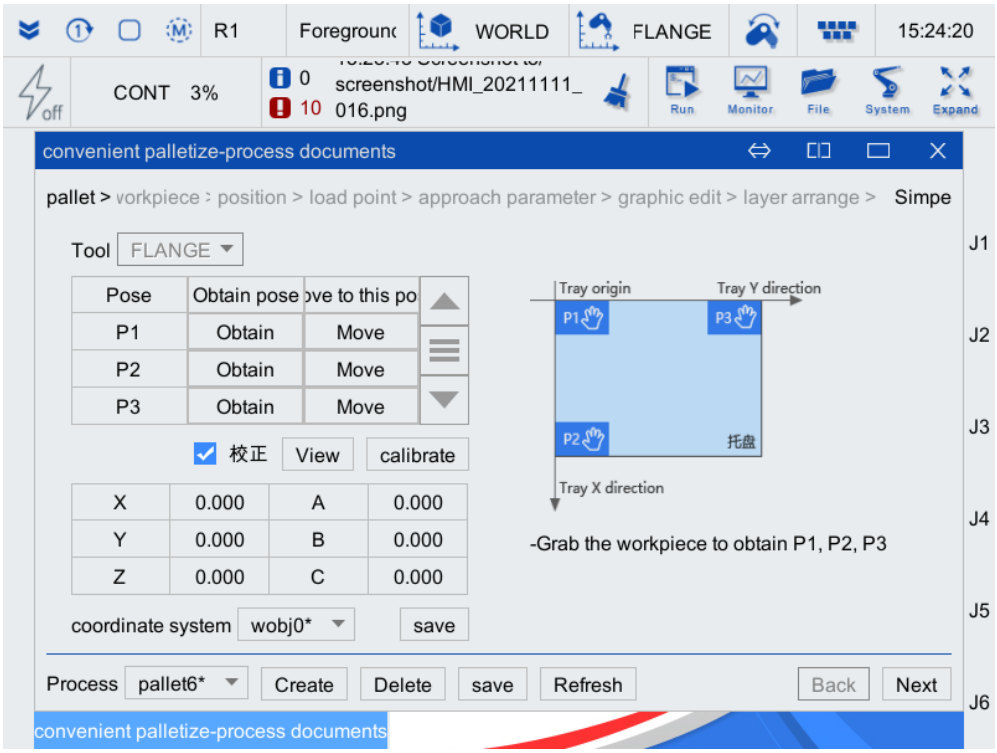
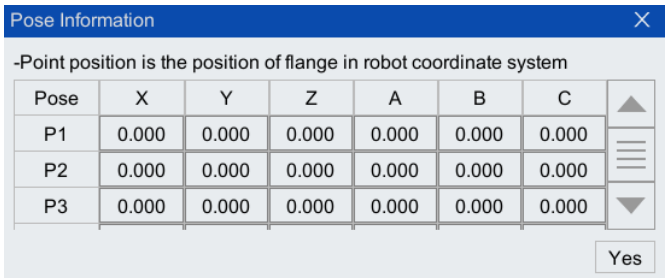


Figure 3-3 Pallet setting interface

The parameters and buttons are described in Table 3-2.

Table 3-2 Description of parameters and buttons

Parameter	Description
Tool	The name of the tool coordinate system. In simple mode, the tool coordinate system cannot be selected and is in gray state.
P1	After P1 teaching, determine the origin of the pallet coordinate system. Generally, P1 is placed at the first palletizing point, or other positions can be selected. The teaching method is as follows: ■ After the workpiece is placed in P1 position, click the < Obtain > button. After completing the teaching of P1 point, there is "*" in the upper right corner of P1 point; ■ When the robot is not in P1 position and wants to return to P1 position, you can directly click the < Move > button after P1.
P2	After P2 teaching, determine the X direction of the pallet coordinate system. The teaching method is as follows: ■ After the workpiece is placed in P2 position, click the < Obtain > button. After the P2 point teaching is completed, there is "*" in the upper right corner of P2 point; ■ when the robot is not in P2 position and wants to return to P2 position, you can directly click the <Move> button behind P2.
P3	After P3 teaching, determine the Y direction of the pallet coordinate system. The teaching method is as follows:

Parameter	Description
	■ After the workpiece is placed in P3 position, click the < Obtain > button. After completing the teaching of P3 point, there is a "*" sign in the upper right corner of P3 point; ■ when the robot is not in P3 position and wants to return to P3 position, you can directly click the < Move > button after P3.
P_COR	After P_COR teaching, determine the palletizing point position with the same maximum value in X and Y directions in the pallet coordinate system. When the perpendicularity of the actual tray in X and Y directions is not enough, or the accuracy requirements for the farthest placement position are high, you can click the < Obtain > button to obtain P_ Cor point coordinates and check "correction" to automatically calculate and compensate the arrangement error in XY direction.
Correcting	The default configuration is unchecked. ■ If "correction" is not checked, calibrate the tool coordinate system according to "P1, P2 and P3" in turn. ■ click the <Obtain> "P1, P2, P3, p_cor" points in sequence, check the "correction", and then click the <Calibration> button on the right to automatically calculate the value of pallet coordinate system x/y/z/a/b/c.
View	You can view the point information of the tool coordinate system. The point position is the pose of the flange in the robot coordinate system. 
calibrate	After teaching P1, P2 and P3 points, click the < calibration > button to automatically calculate the value of pallet coordinate system x/y/z/a/b/c.
Pallet coordinate system	You can select the name of the pallet coordinate system.
X	The distance between the origin of the pallet workpiece coordinate system and the origin of the robot's base coordinate system in the X-axis direction.
Y	The distance between the origin of the pallet workpiece coordinate system and the origin of the robot's base coordinate system in the Y-axis direction.
Z	The distance between the origin of the pallet workpiece coordinate system and the origin of the robot's base coordinate system in the Z-axis direction.
A	The rotation angle of the origin of the pallet workpiece coordinate system in the Z-axis direction relative to the origin of the robot's base coordinate system.
B	The rotation angle of the origin of the pallet workpiece coordinate system in the Y-axis direction relative to the origin of the robot's base coordinate system.
C	The rotation angle of the origin of the pallet workpiece coordinate system in the X-axis direction relative to the origin of the robot's base coordinate system.
save	Save the configuration.

Tip

Convenient palletizing only ensures the accuracy of the relative relationship between the plane graphics and the pallet coordinate system, which has nothing to do with the shape of the actual pallet.

3.1.2 Workpiece setting

After setting the pallet, click the <save> button, click <next> in the lower right corner to switch to the [workpiece] setting interface in Figure 3-4, which can calculate the size of the workpiece in the pallet coordinate system. See Table 3-3 for parameter description.

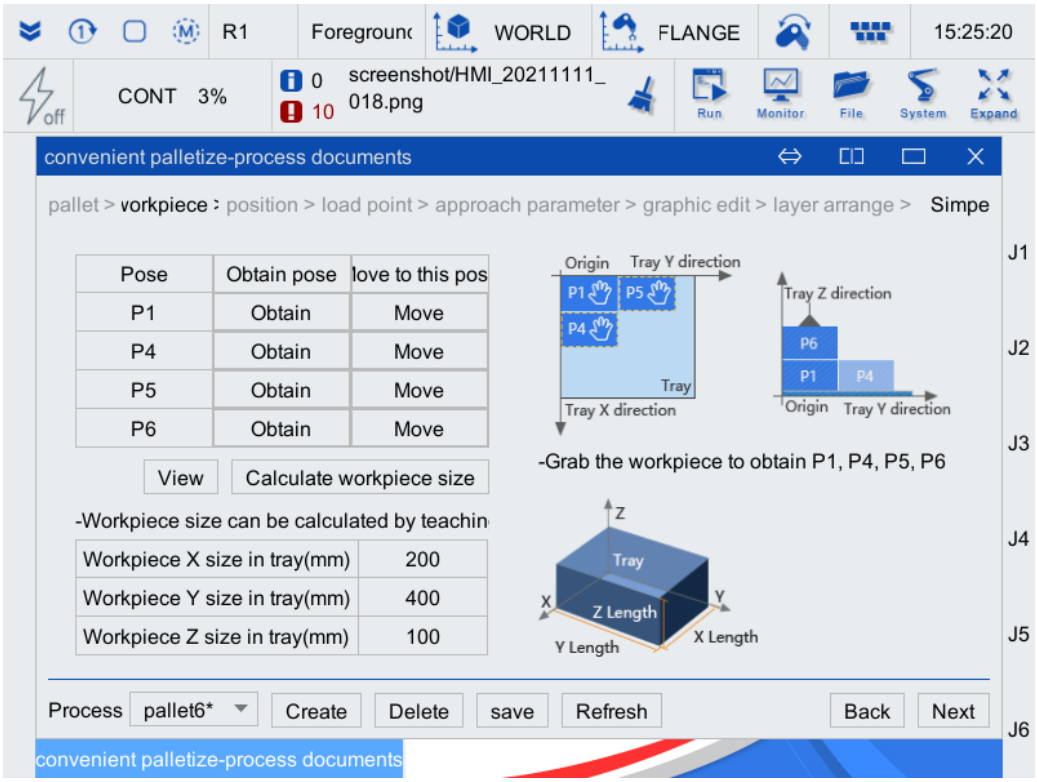


Figure 3-4 Workpiece parameter setting interface

Table 3-3 Parameter description

Parameter	Description
P1	The P1 point of the workpiece parameter interface is the same as the P1 point of the pallet setting interface, which is usually placed at the first palletizing point. After teaching the P1 point of the pallet setting interface, the P1 point of the workpiece parameter interface does not need to be taught again.
P4	The position of the second workpiece point adjacent to P1 point in the pallet X direction (if the two workpieces are not only next to each other in the pallet X direction, the automatically calculated workpiece size may not be the actual size of the workpiece and will not affect palletizing).
P5	The position of the second workpiece point adjacent to P1 point in the pallet Y direction (if the two workpieces are not only next to each other in the pallet Y direction, the automatically calculated workpiece size may not be the actual size of the workpiece and will not affect palletizing).
P6	The position of the second workpiece point adjacent to point P1 in the pallet Z direction (if the two workpieces are not only next to each other in the pallet Z direction, the automatically calculated workpiece size may not be the actual size of the workpiece and will not affect palletizing). If the stacking type has only one layer, this point may not be taught.
View	Point information. The point position is the pose of the flange in the selected pallet coordinate system.

Parameter	Description
	Pose Information -The point position is the position of the flange in the selected tray coordinat Pose X Y Z A B C P1 0.000 0.000 0.000 0.000 0.000 0.000 P4 0.000 0.000 0.000 0.000 0.000 0.000 P5 0.000 0.000 0.000 0.000 0.000 0.000 P6 0.000 0.000 0.000 0.000 0.000 0.000 Yes
Calculate workpiece size	After teaching P1, P4, P5 and P6, click the <Calculate Workpiece Size> button to automatically calculate the length of the workpiece in the XYZ direction of the pallet coordinate system. Tip If P6 points are not taught, a prompt box "if P6 points are not taught, the length of the workpiece in Z direction cannot be calculated" will pop up. Click <Yes>, and the length of the workpiece in Z direction of the pallet is 100mm by default.
Workpiece X size in tray (mm)	The length of the workpiece in the X direction in the pallet coordinate system.
Workpiece Y size in tray (mm)	The length of the workpiece in the Y direction in the pallet coordinate system.
Workpiece Z size in tray (mm)	The length of the workpiece in the Z direction in the pallet coordinate system.

3.1.3 Position setting

After setting [workpiece], click the <save> button, click <Next> in the lower right corner to switch to the [position] setting interface in Figure 3-5.

- Position setting can set palletizing workpiece point, auxiliary point and entry point.
- Each workpiece passes through 7 points, namely entry point, auxiliary point, auxiliary point 2 (see "3.1.5 proximity parameter setting"), workpiece point, fallback auxiliary point 2, fallback auxiliary point and fallback entry point.
- The entry point is the same as the fallback entry point, the auxiliary point is the same as the fallback auxiliary point, and the auxiliary point 2 is the same as the fallback auxiliary point 2.

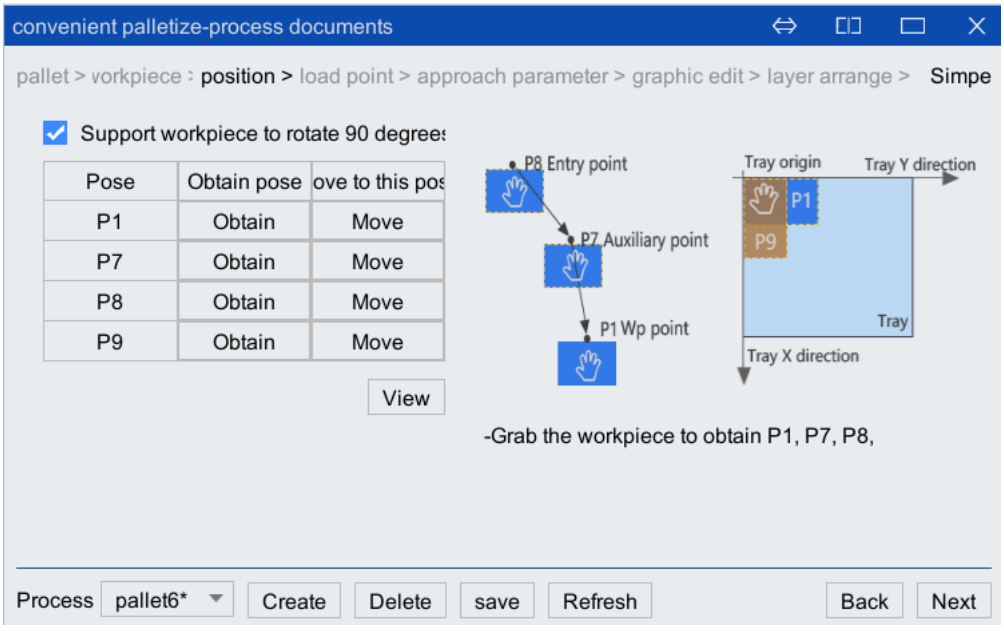
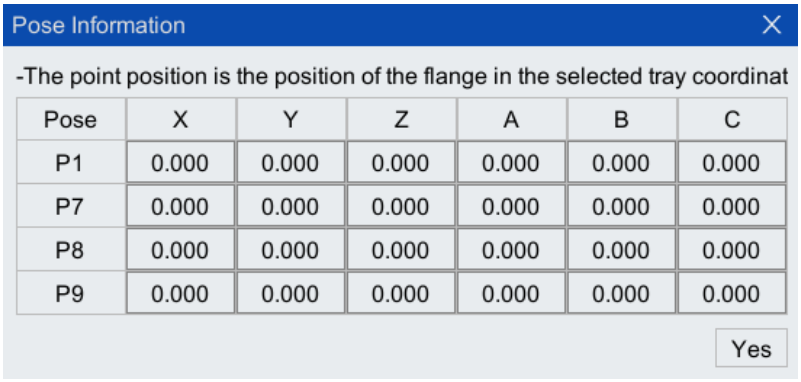


Figure 3-5 Location setting interface

In the table of the interface, the point position of the current tool of the workpiece at the specific workpiece point, auxiliary point and entry point is displayed, and all points refer to the pallet coordinate system. Parameters and key descriptions are shown in Table 3-4.

Table 3-4 Parameter description

<table>
<tr><td>Parameter</td><td colspan="2">Description</td></tr>
<tr><td>Support workpiece to rotate 90 degrees</td><td colspan="2">If there are workpieces that need to rotate 90 degrees in the stack type, you need to check the [support workpiece to rotate 90 degrees] .</td></tr>
<tr><td>P1</td><td colspan="2">Workpiece point. It is necessary to teach when the robot holds the workpiece. When teaching the workpiece point, the length, width and height of the workpiece must coincide with the X, Y and Z axes of the pallet coordinate system respectively.</td></tr>
<tr><td>P7</td><td colspan="2">Auxiliary point. Relative to the auxiliary point of the workpiece point, the values in the table can be taught or directly modified.</td></tr>
<tr><td>P8</td><td colspan="2">Entry point. Relative to the entry point of the workpiece point, the values in the table can be taught or directly modified.</td></tr>
<tr><td>P9</td><td colspan="2">Rotate the workpiece point by 90 °. When the robot holds the workpiece, rotate the workpiece 90° and teach the workpiece point.</td></tr>
<tr><td rowspan="7">View</td><td colspan="2">View the point position information, which is the position and pose of the flange in the selected pallet coordinate system.
 
</td></tr>
<tr><td>X</td><td>The distance from the projection point in the X direction to the origin in the workpiece coordinate system.</td></tr>
<tr><td>Y</td><td>The distance from the projection point in the Y direction to the origin in the workpiece coordinate system.</td></tr>
<tr><td>Z</td><td>The distance from the projection point in the Z direction to the origin in the workpiece coordinate system.</td></tr>
<tr><td>A</td><td>The angle at which the point rotates along the Z axis in the workpiece coordinate system.</td></tr>
<tr><td>B</td><td>The angle at which the point rotates along the Y axis in the workpiece coordinate system.</td></tr>
<tr><td>C</td><td>The angle at which the point rotates along the X axis in the workpiece coordinate system.</td></tr>
</table>

Notice

When the next approach parameter is not enabled, the auxiliary point and auxiliary point 2 are the same point.

3.1.4 Load point setting

After setting the position, click the <save> button, click <Next> in the lower right corner to switch to the [load point] setting interface in Figure 3-6.

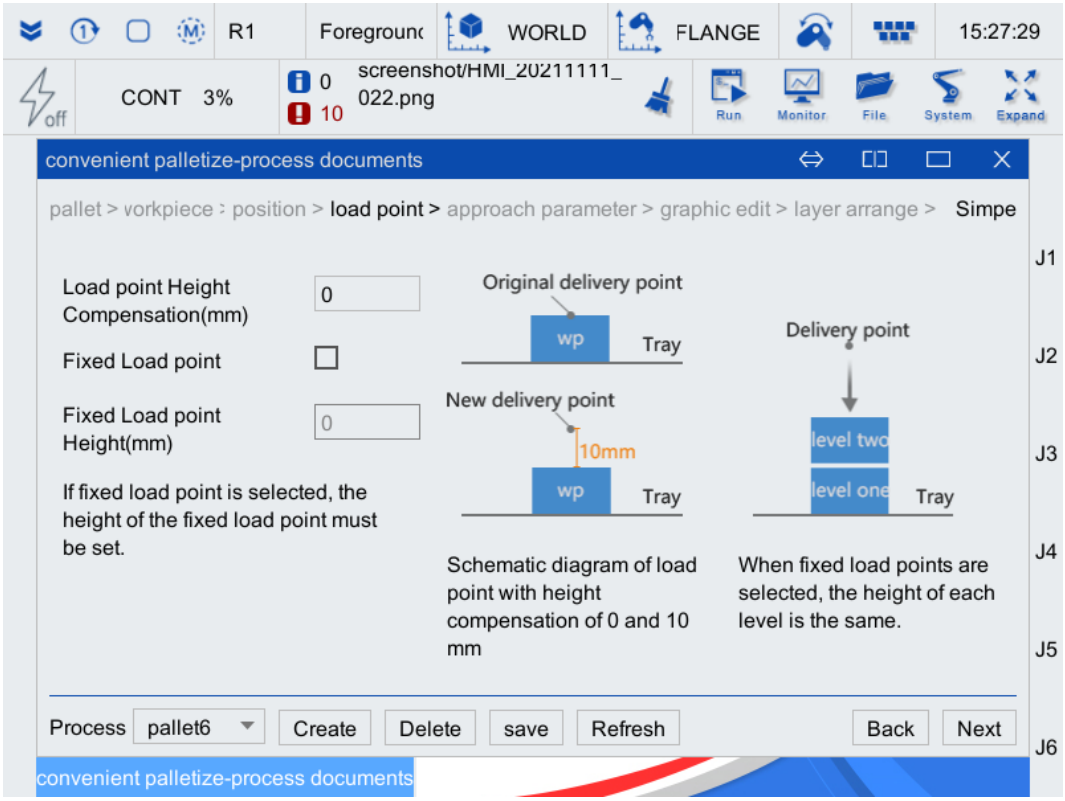
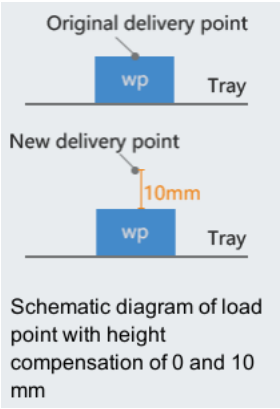
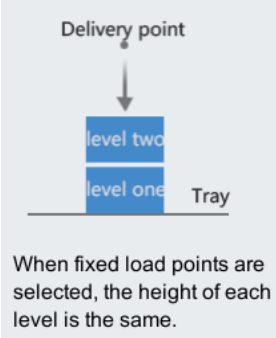


Figure 3-6 Load point setting interface

Parameter description is shown in Table 3-5.

Table 3-5 Parameter description

Parameter	Description	Picture
Load point Height Compensation(mm)	The height that deviates from the original delivery point. After the height compensation of the delivery point is filled in, the height of the delivery point of all workpieces will be offset. If the value is positive, it will be offset in the Z + direction, and if the value is negative, it will be offset in the z-direction (this parameter is invalid during destacking).	

Parameter	Description	Picture
Fixed delivery point	When the fixed delivery point is checked, the delivery point height of all workpieces shall be the same, and the value shall be greater than or equal to the height of the highest workpiece point. This value and the delivery point height compensation can be superimposed (valid only during palletizing).	

Tip

When the height compensation is 0, the delivery point is the workpiece point.

3.1.5 Approach parameter setting

After setting the delivery point, click the < save > button, click < next > in the lower right corner to switch to the [Approach parameter] interface (as shown in Figure 3-7). Approach parameters can set the approach related parameters of the robot from the auxiliary point to the delivery point. The parameter description is shown in Table 3-6.

In "3.1.3 position setting", the entry point, auxiliary point and workpiece point are set, and the approach parameter is the second auxiliary point.

- If the approach parameter is set, the palletizing process will change into entry point, auxiliary point, second auxiliary point and workpiece point.
- If the approach parameter is not set, the second auxiliary point is in the same position as the first auxiliary point by default, that is, it directly reaches the delivery point from the auxiliary point.

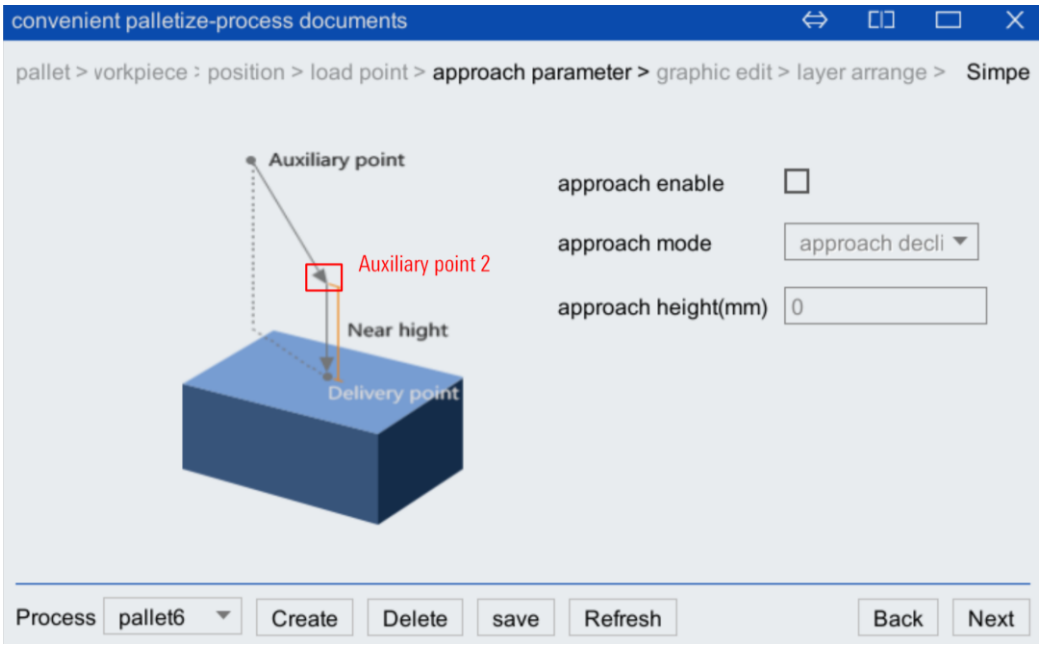
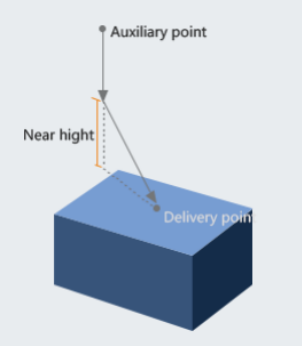
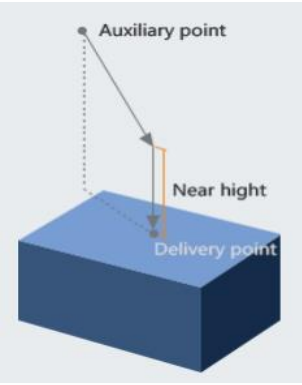


Figure 3-7 Approach parameter interface

Table 3-6 Parameter description

Parameter		Description	Picture
Approach enable		Approach function enable switch.	-
Approach mode	Descent approach mode	First descend from the auxiliary point along the Z axis to the approach height (the length of the pallet in the Z direction), and then move synchronously to the delivery point according to the approach distance XYZ axis.	
	Approach descent mode	First, move a distance to auxiliary point 2 synchronously according to the approach distance XYZ axis, and then descend from auxiliary point 2 along the Z axis to the delivery point.	
Approach height (mm)		The height of the second auxiliary point from the delivery point.	-

3.1.6 Graphic edit setting

After setting the approach parameters, click <Next> in the lower right corner to switch to the [graphic edit] interface in Figure 3-8.

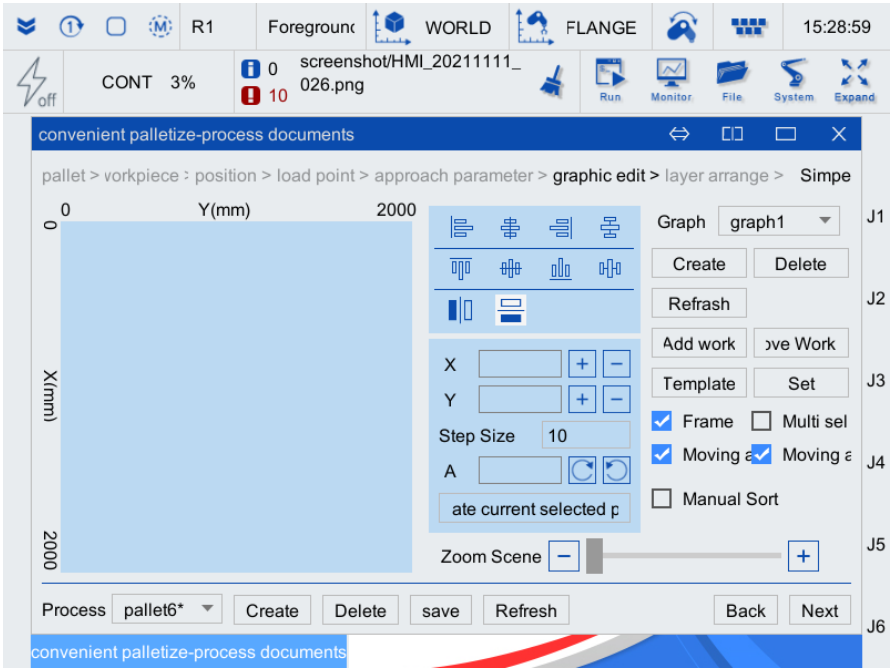


Figure 3-8 Graphic edit interface

Templates are divided into fixed graphic templates (row and column, crisscross, "back" font) and customize graphic templates. You can select an existing template (or edit on an existing template) or customize a new template according to the actual situation.

3.1.6.1 Directly use existing graphic templates

Click the < Template > button to insert the workpiece according to the specific graphic template. The graphic template includes the following three types:

- Ranks:

The workpiece directions of the whole layer of graphic templates are consistent and stacked in turn, as shown in Figure 3-9 and Figure 3-10.

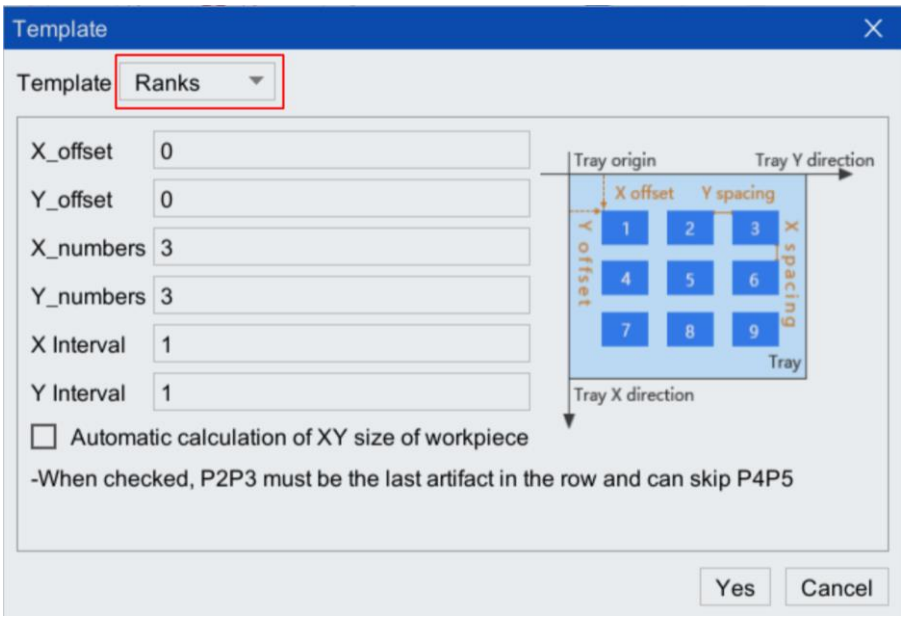


Figure 3-9 "Ranks" graphic template setting interface

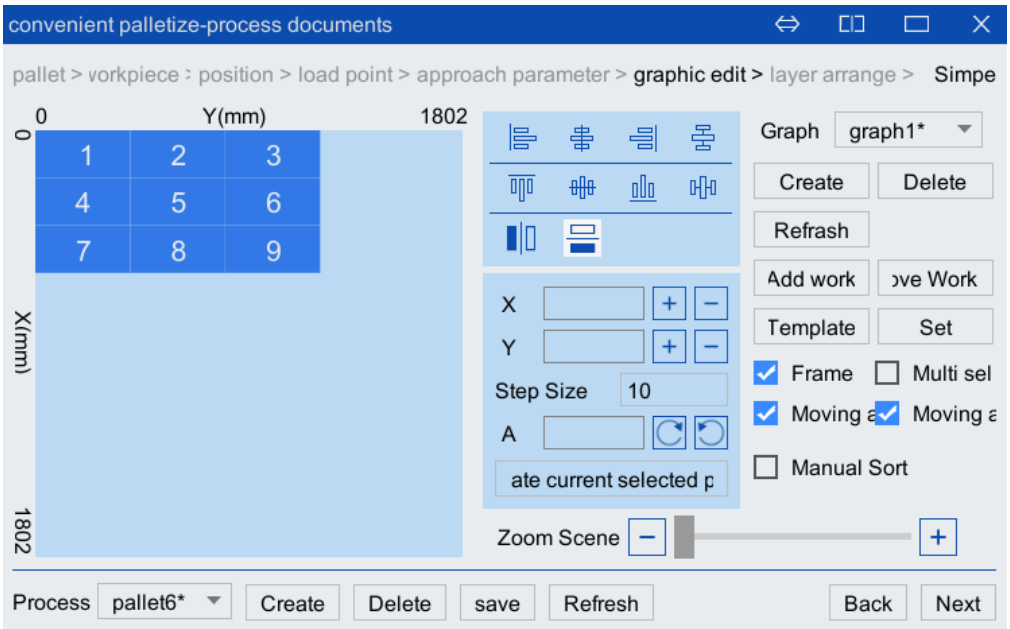


Figure 3-10 Ranks graphic template setting effect
Parameter description is shown in Table 3-7.

Table 3-7 Parameter description

Parameter	Description
X_offset	The coordinate offset of the upper left corner of workpiece 1 relative to the pallet origin in the X-axis direction.
Y_offset	The coordinate offset of the upper left corner of workpiece 1 relative to the pallet origin in the Y-axis direction.
X_numbers	Number of workpiece rows
Y_numbers	Number of workpiece columns
X Interval	The distance between the workpiece and the adjacent workpiece in the tray X direction.
Y Interval	The distance between the workpiece and the adjacent workpiece in the tray Y direction.
Automatically calculate of XY size of workpiece	After this button is checked, P1, P4, P5 and P6 in the workpiece parameter interface can be calculated directly according to P1, P2 and P3 points in the pallet setting interface without teaching, provided that P2 and P3 points must be located at the last workpiece in the row and column.

■ crisscross :

The direction of the workpiece is horizontal, vertical and staggered, as shown in Figure 3-11 and Figure 3-12.

Figure 3-11 "crisscross" graphic template setting interface

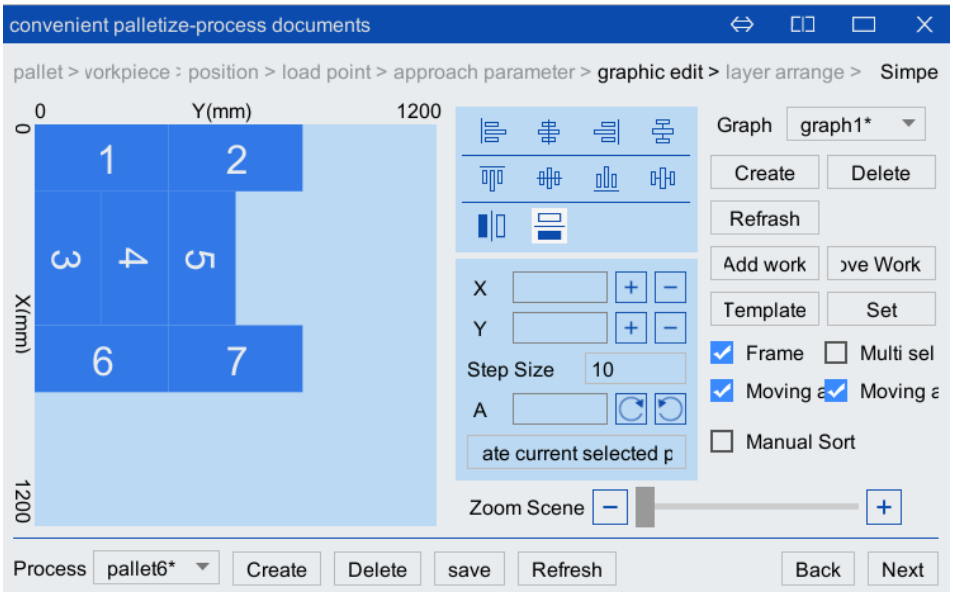


Figure 3-12 "Crisscross" graphic template setting effect interface

Parameter description is shown in Table 3-8.

Table 3-8 Parameter description

Parameter	Description
X_offset	The coordinate offset of the upper left corner of workpiece 1 relative to the pallet origin in the X-axis direction.
Y_offset	The coordinate offset of the upper left corner of workpiece 1 relative to the pallet origin in the Y-axis direction.
X_numbers	Number of workpiece rows
Y1_numbers	Number of columns for the first row of workpieces
Y2_numbers	Number of columns in the second row
X Interval	The distance between the workpiece and the adjacent workpiece in the tray X direction.
Y Interval	The distance between the workpiece and the adjacent workpiece in the tray Y direction.

■ "回":

There are 4 workpieces in one layer, arranged in a "回" arrangement (the second workpiece rotates 90 ° compared with the first workpiece, the third workpiece rotates 90 ° clockwise compared with the first workpiece, and the fourth workpiece rotates 0 ° counterclockwise compared with the first workpiece), as shown in Figure 3-13 and Figure 3-14 P9 must be taught before using this template.

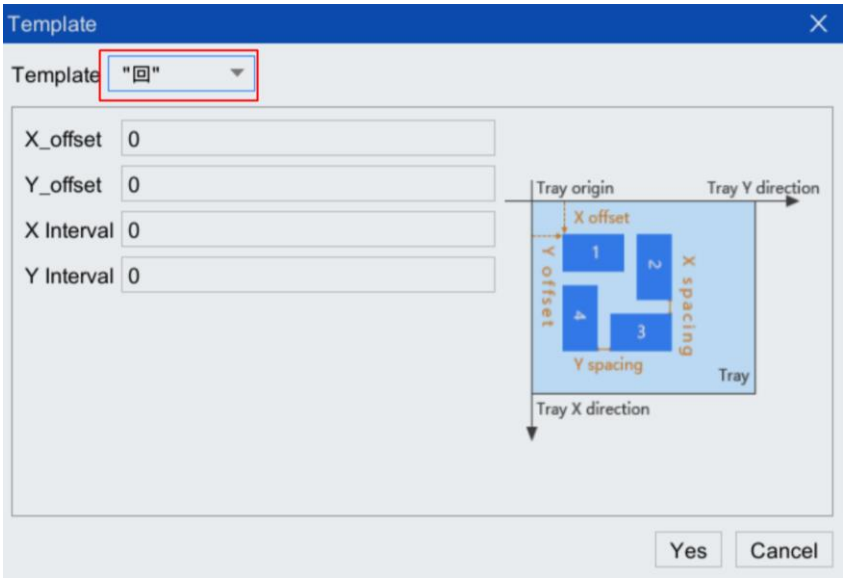


Figure 3-13 "回" graphic template setting interface

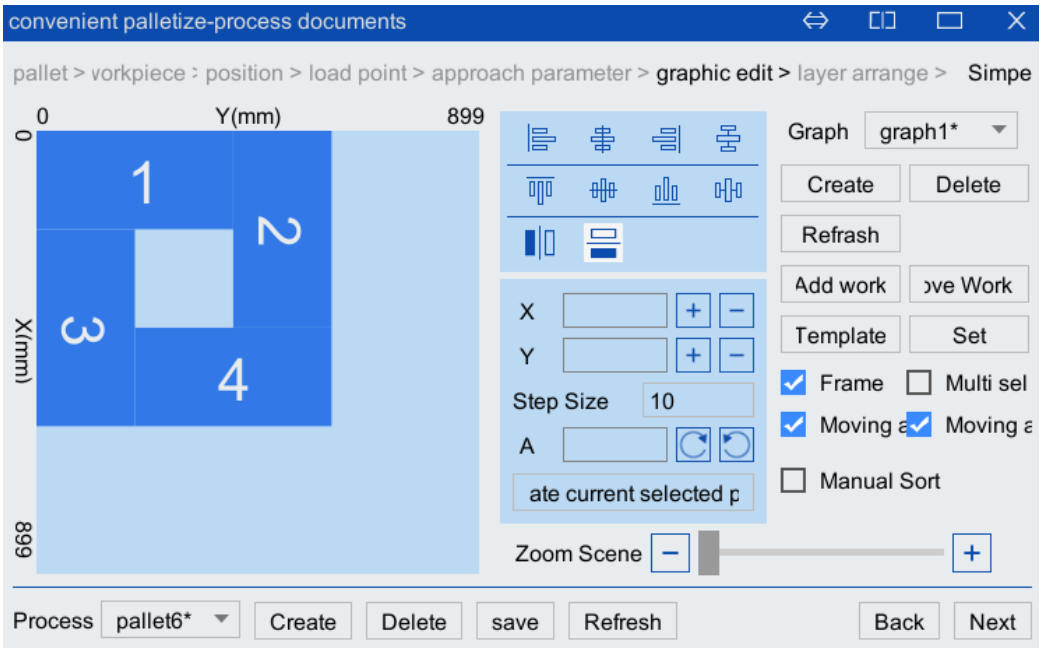


Figure 3-14 Setting effect interface of "回" graphic template

Parameter description is shown in Table 3-9.

Table 3-9 Parameter description

Parameter	Description
X_offset	The coordinate offset of the upper left corner of workpiece 1 relative to the pallet origin in the X-axis direction.
Y_offset	The coordinate offset of the upper left corner of workpiece 1 relative to the pallet origin in the Y-axis direction.
X Interval	The distance between the workpiece and the adjacent workpiece in the tray X direction.
Y Interval	The distance between the workpiece and the adjacent workpiece in the tray Y direction.

After selecting the graphic template, click <Yes>.

3.1.6.2 Custom graphic template

You can also further edit and set based on the selected graphic template, or customize a new graphic template. As shown in Figure 3-15 and Figure 3-16.

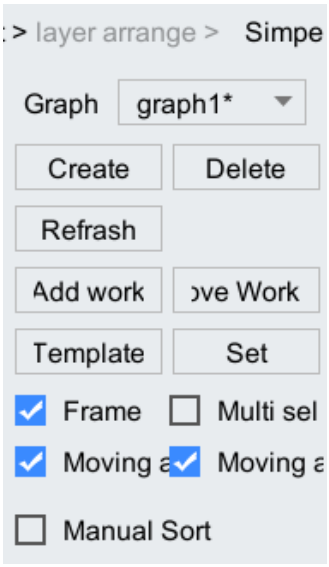
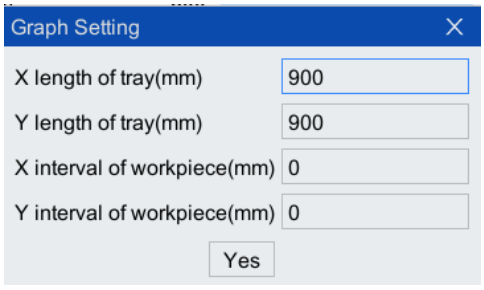


Figure 3-15 Operation panel

Key and parameter descriptions are shown in Table 3-10.

Table 3-10 Key description

Key	Description
Graph	Select the stack type name to edit.
Create	Click the <Create> button to create a graphics file. When cloning the current file is checked, the current graphics file is copied into the new graphics file; If you uncheck clone the current file, an empty drawing will be created.
Delete	Click the <Delete> button to delete the current graphic file. If the current graphic has been used in the layer arrangement setting interface, it cannot be deleted.
Refresh	Click the <Refresh> button to display the data in the graphics file on the graphic interface according to the latest saved configuration.
Add workpiece	Insert a workpiece at the origin of the pallet coordinate system.
Delete workpiece	Delete one or more selected workpieces.
Set	Click <Set> to pop up the graphic setting interface. In this interface, you can set the length of the tray in the X direction and Y direction in the tray display, so as to adjust the display ratio between the tray display and the workpiece. You can also set the automatic suction spacing between the workpiece and the workpiece in the X direction and Y direction of the tray. 

Key	Description
Frame	Multiple workpieces can be selected simultaneously with a stylus.
MultiSelect	Multiple workpieces can be selected at the same time.
Moving along X axis	Drag the selected workpiece to move along the X axis.
Moving along Y axis	Drag the selected workpiece to move along the Y axis.
Manual sort	Manually adjust the workpiece position sequence.

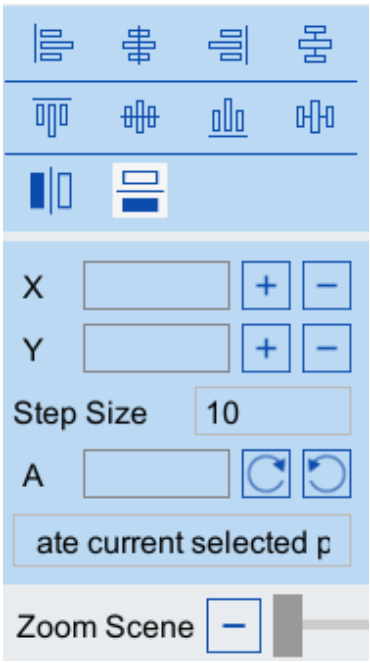


Figure 3-16 Operation panel 2

Key and parameter descriptions are shown in Table 3-11.

Table 3-11 Key and parameter description

Parameter		Description
Alignment		Align left, align left in the X direction based on the first selected workpiece. For example, if the selection order of workpiece 1, 3 and 2 is 123 or 132, the left alignment is based on the left side of workpiece 1. If the selection order is 213 or 231, the left alignment is based on workpiece 2, and the value in Y direction remains unchanged.
		Center alignment, Center alignment in the X direction based on the first selected workpiece.
		Align right, align right in the X direction based on the first selected workpiece.
		Scattered alignment, automatically arrange the selected workpieces according to their positions along the X direction to maintain an equal distance.
		Align up, align up in the Y direction based on the first selected workpiece.
		Vertical center alignment, Center alignment in the Y direction based on the first selected workpiece.

Parameter		Description
		Align bottom, align bottom in the Y direction based on the first selected workpiece.
		Vertically dispersed and aligned, and automatically arranged according to the selected workpieces, so that their positions along the Y direction are kept at an equal distance.
		Vertical mirror flip.
		Horizontal mirror flip.
X		The distance between the centroid position of the selected workpiece and the origin in the X-axis direction
Y		The distance between the centroid position of the selected workpiece and the origin in the Y-axis direction
Step Size		The value changed when clicking "+" or "-" for "X" and "Y" parameters.
A		The deflection angle of the workpiece relative to its original position can be set at any angle.  : When the A value is not set, click once, and the workpiece will deflect 90 degrees clockwise relative to the original position; After setting the A value, click once, and the workpiece will deflect the set a value angle clockwise relative to the original position.  : When the A value is not set, click once, and the workpiece will deflect 90 degrees counterclockwise relative to the original position; After setting the A value, click once, and the workpiece will deflect the set a value angle counterclockwise relative to the original position.  Tip In simple mode, the workpiece can only rotate 90 ° at a time. If the A value is set to anothe angle, an error will occur when executing the program.
Zoom Scene		Adjust the display ratio between the pallet display and the workpiece to facilitate the adjustment of the position of the workpiece in the pallet display.


Tip

If the workpieces are overlapped, which causes the workpieces displayed on the interface to turn red, it is not allowed to save the process file at this time. It is necessary to modify the workpiece position to ensure that its color is blue (no overlapped workpieces) and in a reasonable position.

3.1.6.3 Configuration example

Setting requirements

In the process file pallet1 *, set the total number of workpieces to be stacked as 16, the number of workpieces to be stacked in the X direction as 5, the number of workpieces to be stacked in the Y1 direction as 3, and the number of workpieces to be stacked in the Y2 direction as 3. Insert the 16th workpiece between 11 and 12. Adjust the workpiece arrangement so that the workpiece arrangement is as shown in Figure 3-17.

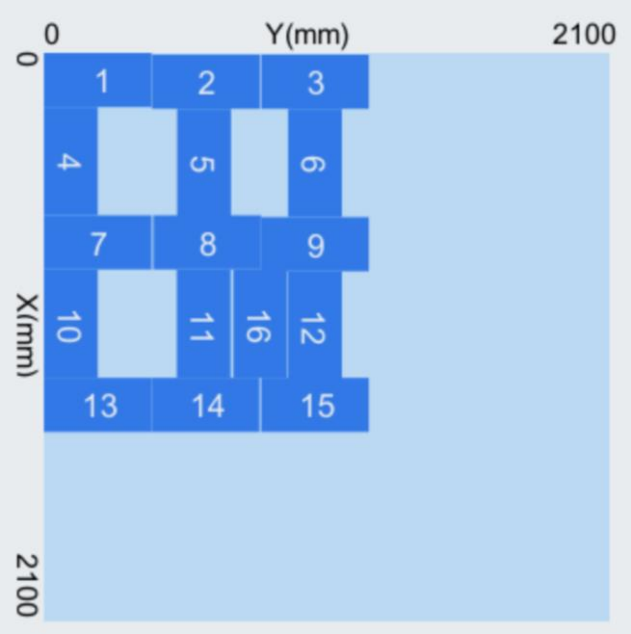


Figure 3-17 Expected stacking effect

Configuration steps

Step1. In the " graphic edit" interface, click " Template ", as shown in Figure 3-18.

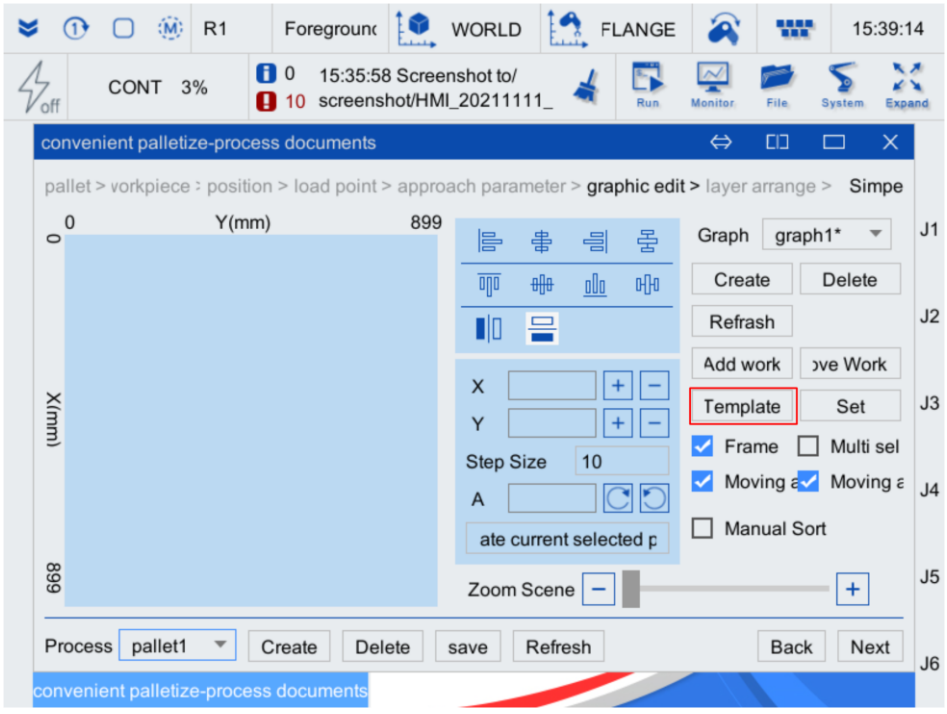


Figure 3-18 Graphic edit interface

Step2. [Template] is configured as "crisscross". In the pop-up graphic template dialog box, set the number of "X direction" to 5, the number of "Y1 direction" to 3, and the number of "Y2 direction" to 3. Click <Yes>. As shown in Figure 3-19.

Figure 3-19 Graphic template dialog box

Step3. The arrangement of workpieces is displayed on the interface, as shown in Figure 3-20.

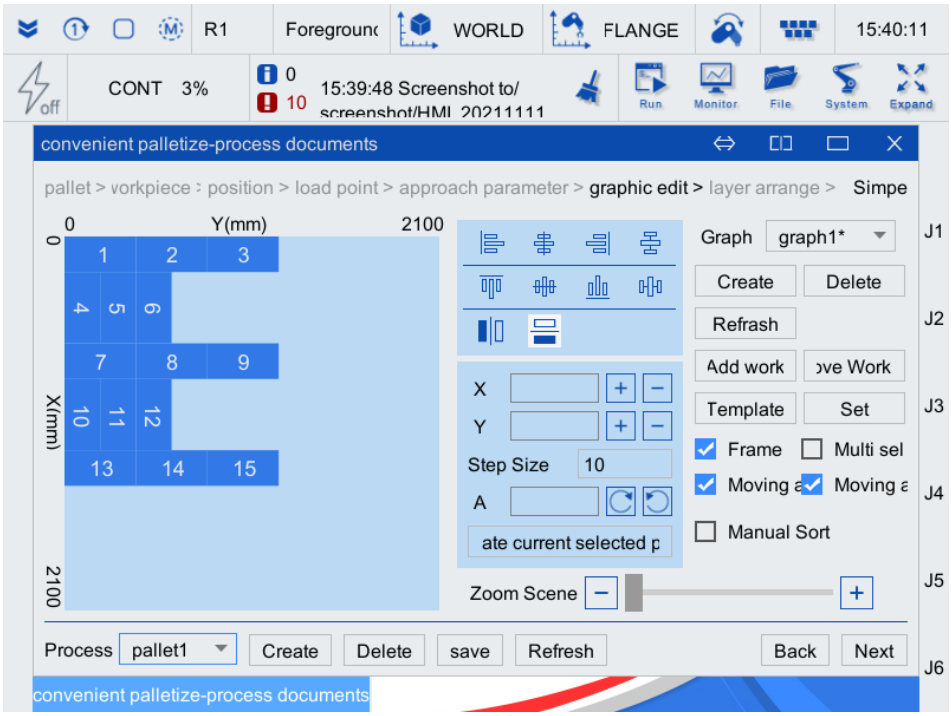


Figure 3-20 Display workpiece arrangement

Step4. Manually drag workpiece 6 between workpiece 3 and workpiece 9, drag workpiece 5 between workpiece 2 and workpiece 8, between workpiece 12 to 9 and 15, and drag workpiece 11 between workpiece 8 and workpiece 14. Select the workpiece to be fine tuned, and add "Step Size" when dragging, that is, fine tune by clicking "+ / -" after "X / Y", as shown in Figure 3-21.

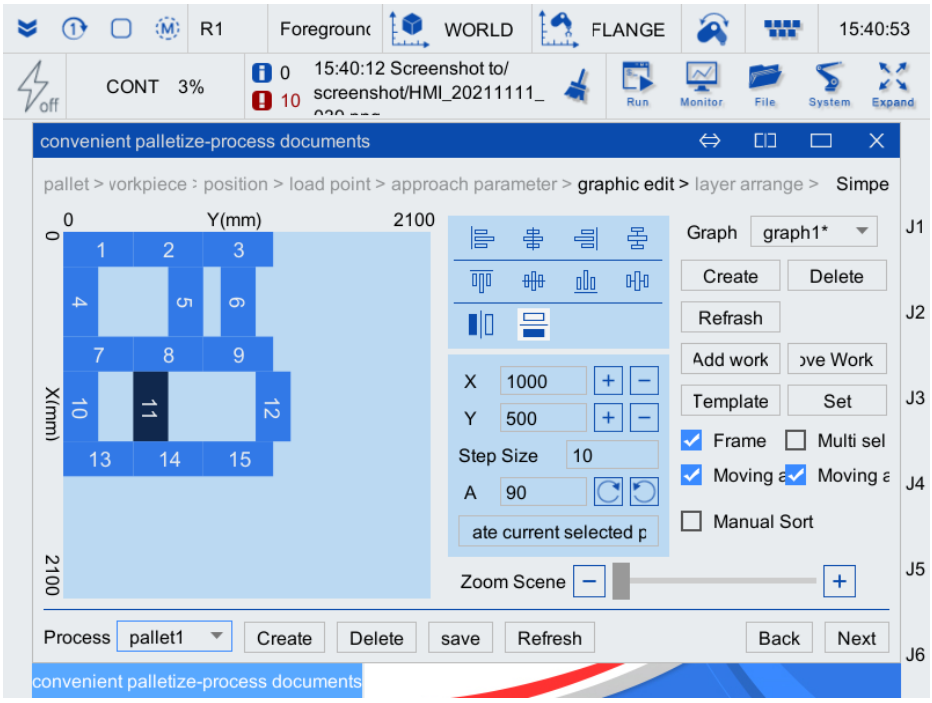


Figure 3-21 Diagram after dragging manually

Step5. Click the "box selection" (or "multiple selection") check box (as shown in Figure 3-22), and box select (or multiple selection) workpieces 3, 6, 9, 12 and 15 at the same time, and click <> to a align right.

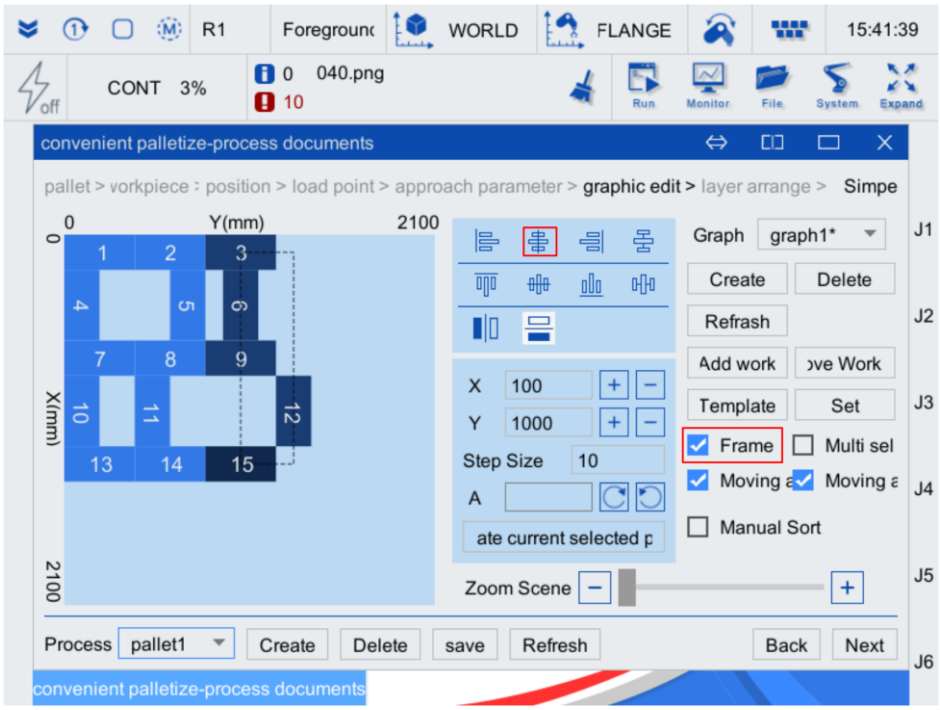


Figure 3-22 Diagram of frame selection effect

Step6. At the same time, frame select (or multiple select) workpieces 2, 5, 8, 11 and 14 (as shown in Figure 3-23), and click the <> to align them in the center.

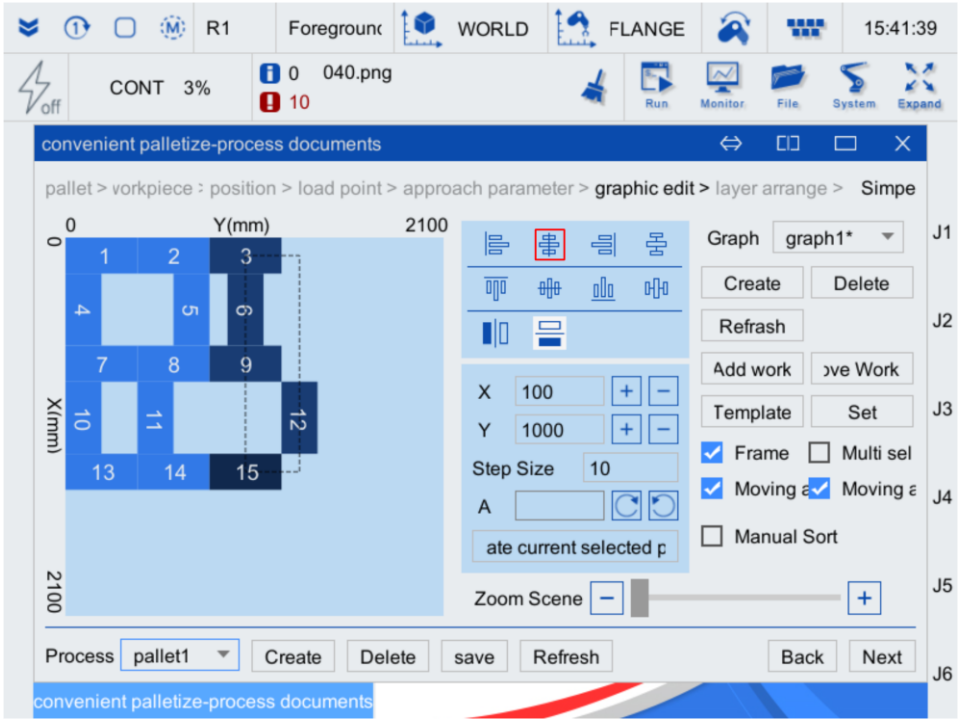


Figure 3-23 Diagram of frame selection effect

Step7. After arranging neatly, click "Add workpiece", and the newly added workpiece 16 will overlap with workpiece 1. When the workpiece overlaps, it will be displayed in red. As shown in Figure 3-24.

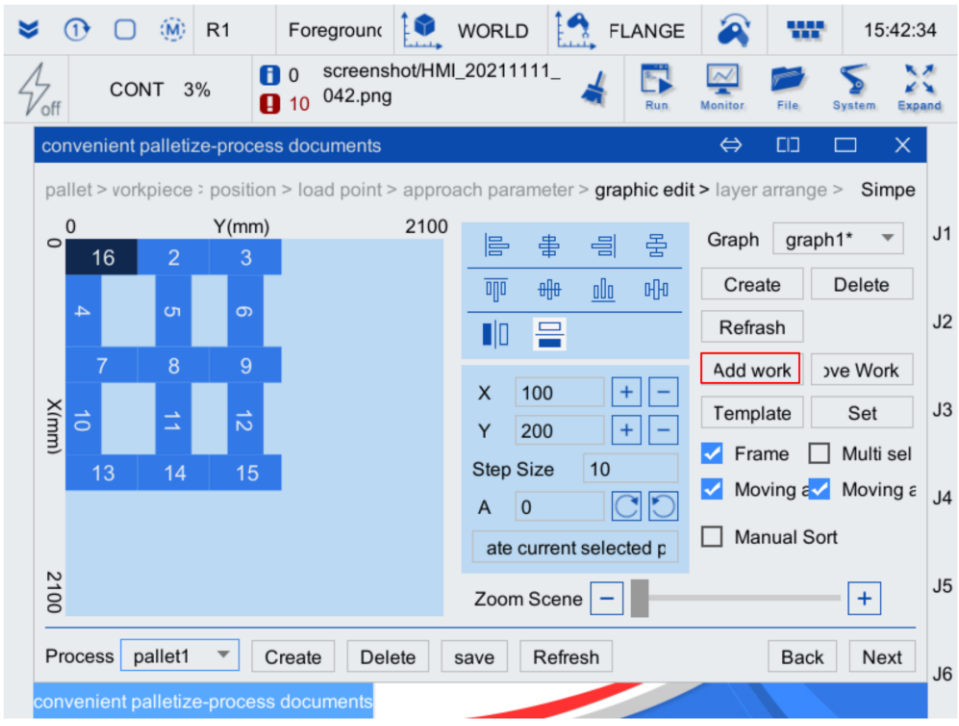


Figure 3-24 Add workpiece diagram

Step8. Drag workpiece 16 between workpiece 11 and workpiece 12. As shown in Figure 3-25.

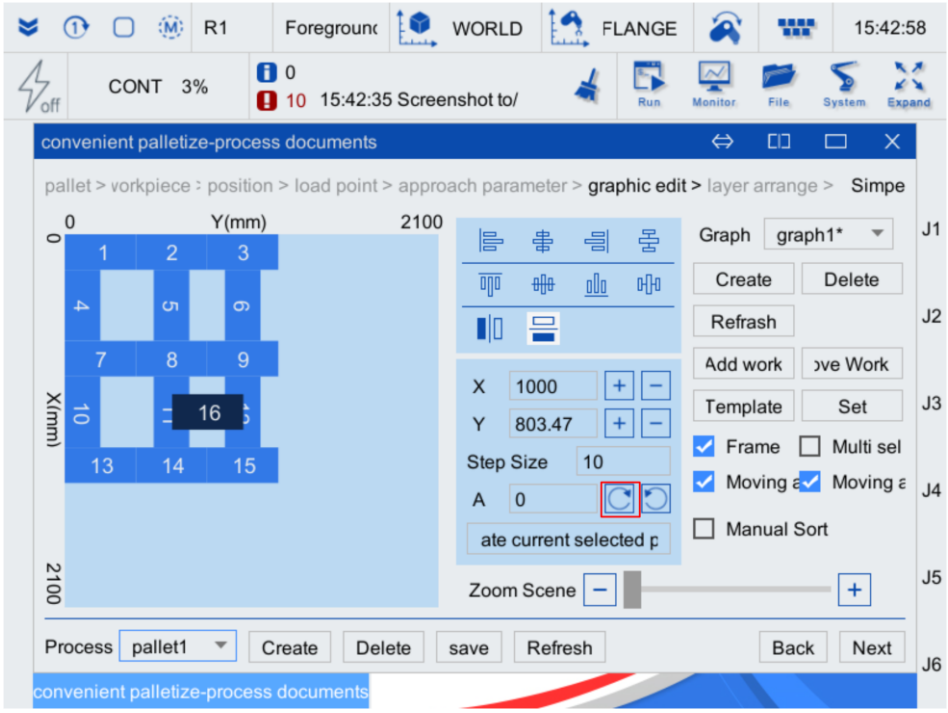


Figure 3-25 Diagram of workpiece dragging effect

Step9. Click to select workpiece 16 and click to rotate workpiece 16 90 degrees clockwise. If there is overlap, move the workpiece so that it does not overlap. As shown in Figure 3-26.

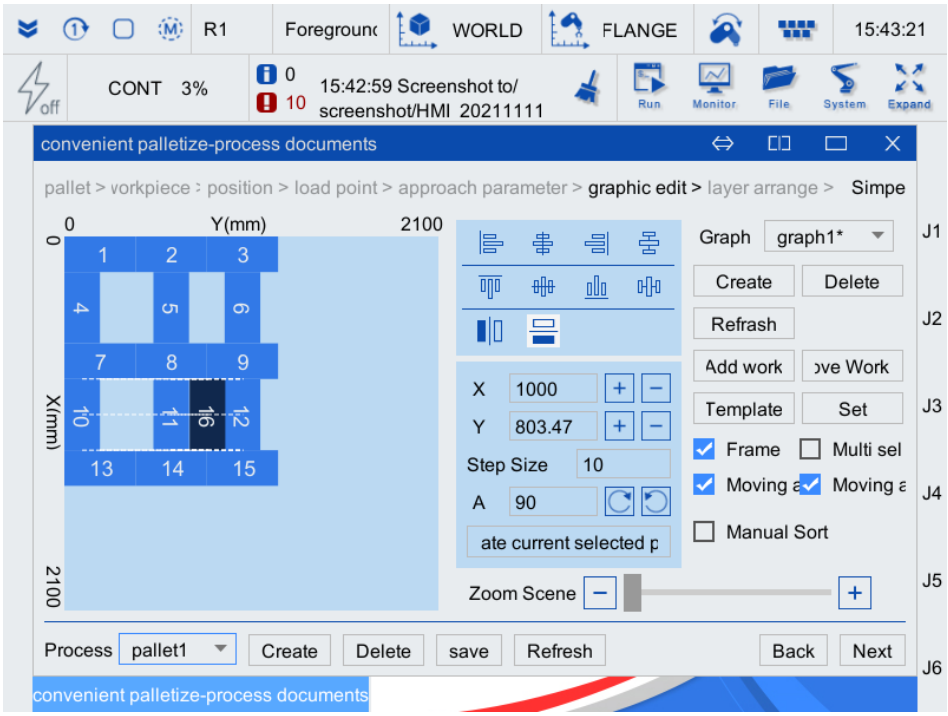


Figure 3-26 Effect picture after setting

Step10. Click <save> to save the graphic template. After saving, the "*" in the process name "graph1 *" will disappear.

Check configuration

When entering the " graphic edit " interface again, select the file name "pallet1" in "Process" to view the graphic template. As shown in Figure 3-27.

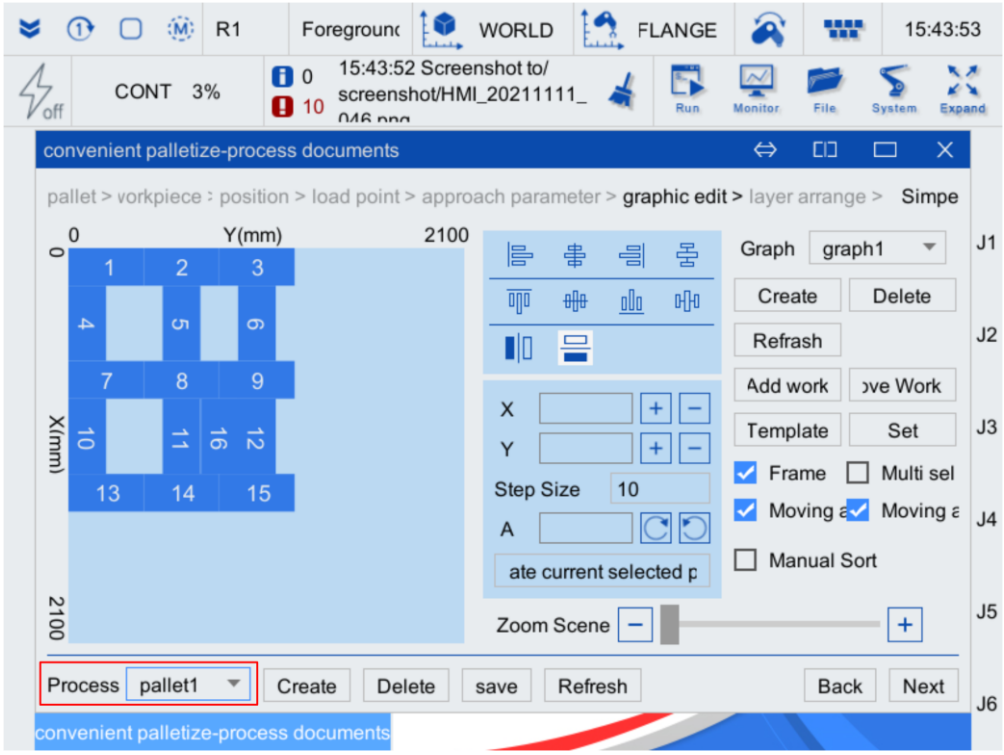


Figure 3-27 View configuration interface

3.1.7 Layer arrange setting

3.1.7.1 Layer arrange interface setting

After editing the graphics, click < Next > in the lower right corner to switch to the layer arrange setting interface in Figure 3-28.

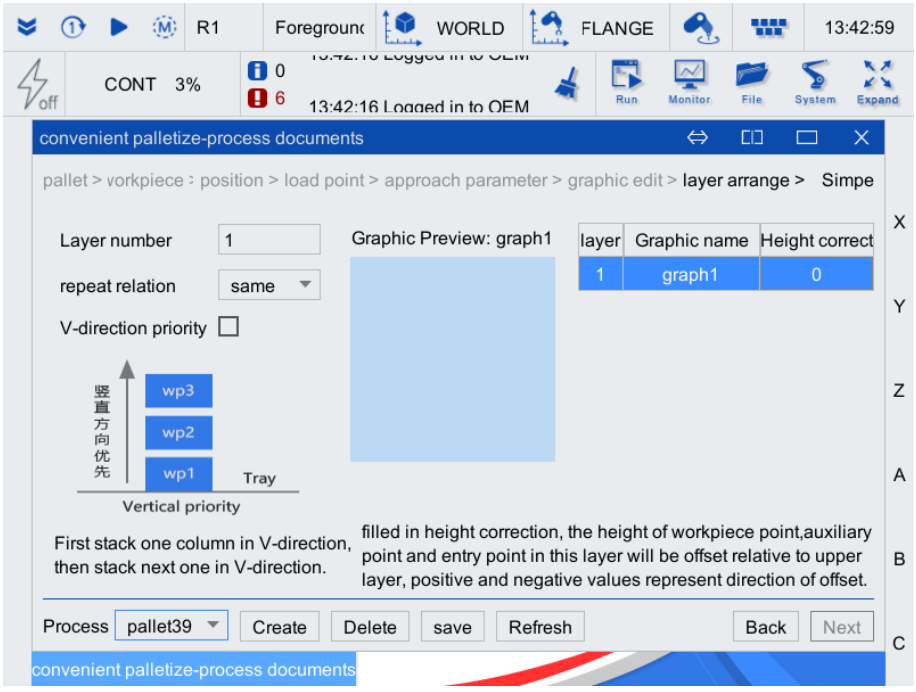


Figure 3-28 Layer arrange setting

The parameter description is shown in Table 3-12.

Table 3-12 Parameter description

Parameter	Description
Layer number	Number of layers per pallet.
Repeat relaition	Repeating relationships include the same, alternation, and custom. ■ Same: The graphics of each layer are the same. ■ Alternation: One figure for odd layers and one figure for even layers. ■ Custom: Define the graphics of each layer of pallets according to the actual needs.
V-direction priority	■ If this option is checked, it is necessary to ensure that the number of workpieces in each layer is the same, and the stacking will be one column by one during stacking; ■ If it is not checked, stack in normal order, stack the first layer first, then the second layer, and so on. Notice: This option is only valid for the row column graph template.
Graphic name	For the graphics used in different layers, the stacking arrangement of each layer can be previewed in the preview area. Tip: For example, when the repetition relationship is alternating or customized, click graph1 in the graphic name, and then select graph1, graph2 and other different options through the drop-down triangle on the right.
Height correct	In the height correction list, you can set the height correction value of each layer. After setting the height correction value, the workpiece point, auxiliary point and entry point of this layer will be offset as a whole according to the correction value. As shown in Figure 3-29.

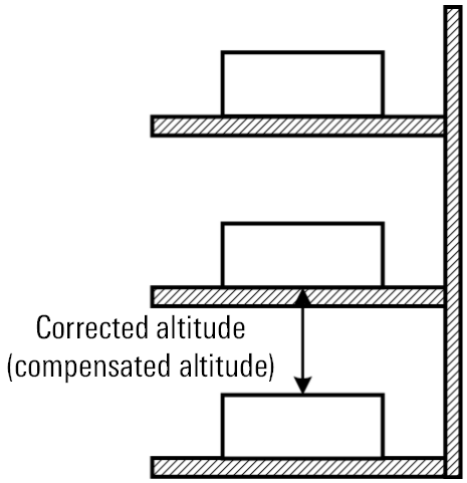


Figure 3-29 Diagram of corrected height

After setting the process file, click the path: " / script / package / palletize_ Quick "will automatically generate an XML file named after the process file name. The file includes relevant parameters and graphic settings. You can copy the file to quickly copy the relevant process flow.

3.1.7.2 Configuration example

Press seam stacking

The stack shape of seam pressing stacking is shown in Figure 3-30.

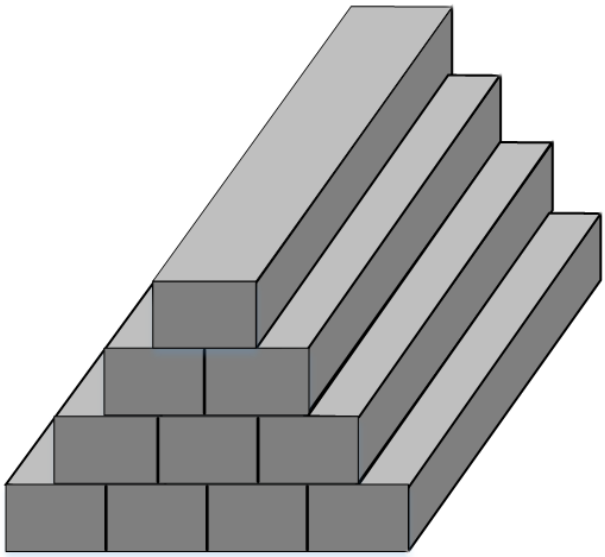


Figure 3-30 Diagram of pressing seam stacking

The setting steps of pressing seam stacking are as follows:

Step1. In the [graphic edit] interface, click < New >, and create the [graph] with the name of "graph1".

Step2. Click [Add workpiece], and "workpiece 1" will be displayed on the left side of the interface. Repeat this step and add "workpiece 2" to "workpiece 4".

Step3. Drag the workpieces with the stylus to make the arrangement of workpieces as shown in Figure 3-31.

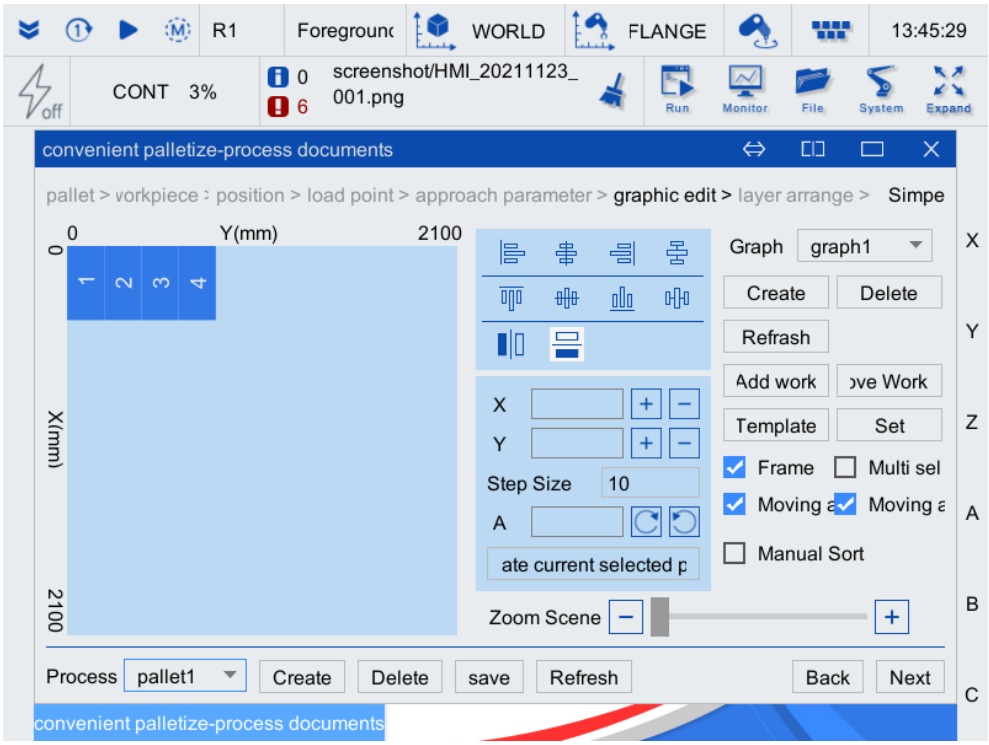


Figure 3-31 Graphic editing interface of the first floor of pressing seam palletizing

Tip

When placing the workpiece, keep the direction of the numbers on the workpiece consistent. If the direction of the numbers is inconsistent, the robot will adjust the posture according to your placement mode to place the workpiece according to the planned orientation.

Step4. Click < save > on the right side of the interface.

Step5. In the [Graphic edit] interface, click <Create>. In the pop-up [Create graphic] dialog box, select [Clone Current file] with the name of "graph2". Click <Yes>.

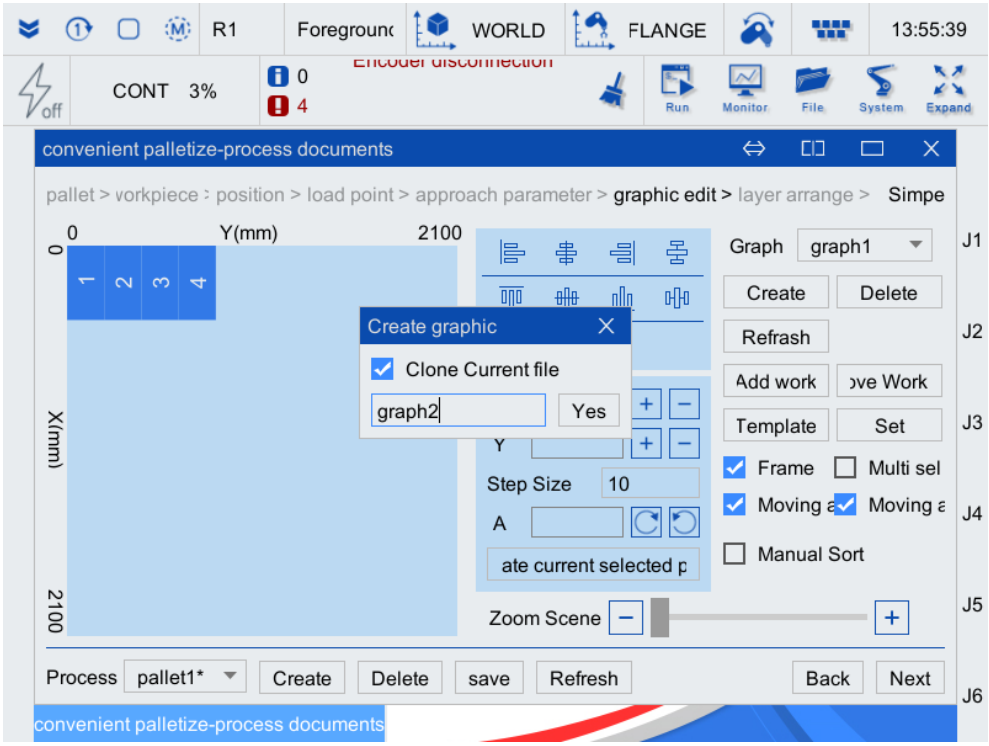


Figure 3-32 Press the seam type new graphic graph2 interface

Step6. Click [Add workpiece], and "workpiece 5" will be added on the left side of the interface. Repeat this step and add "workpiece 6" to "workpiece 7".

Step7. Drag the workpieces with the stylus to make the arrangement of workpieces as shown in Figure 3-33.

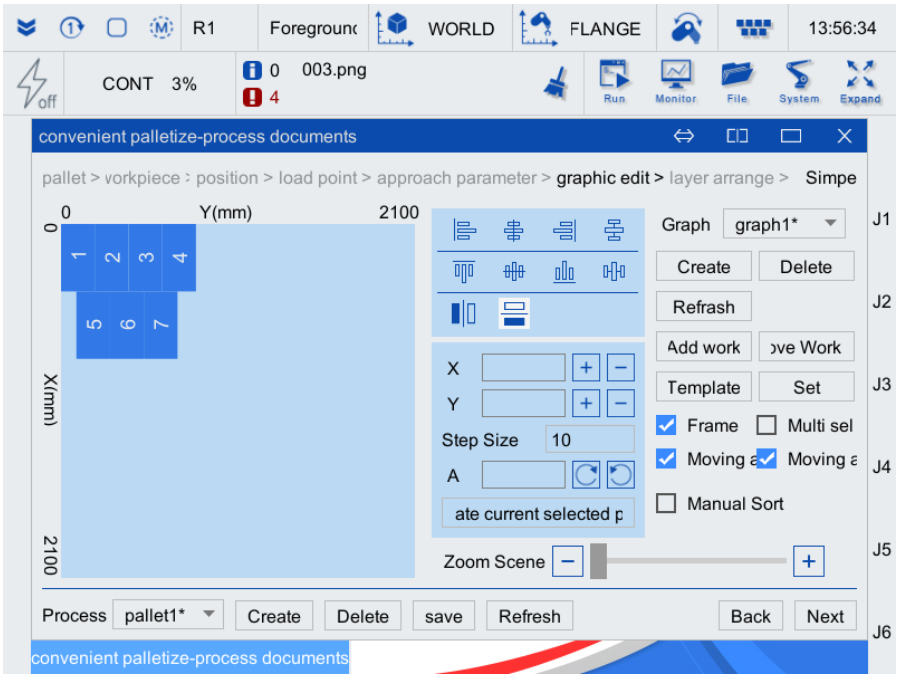


Figure 3-33 Graphic editing interface for adding workpieces 5~7 by pressing seam

Step8. Delete "workpiece 1" to "workpiece 4". Select the remaining three workpieces and set the value of [X] on the right to "0".

Step9. The workpiece arrangement is shown in Figure 3-34. Click < save > on the right.

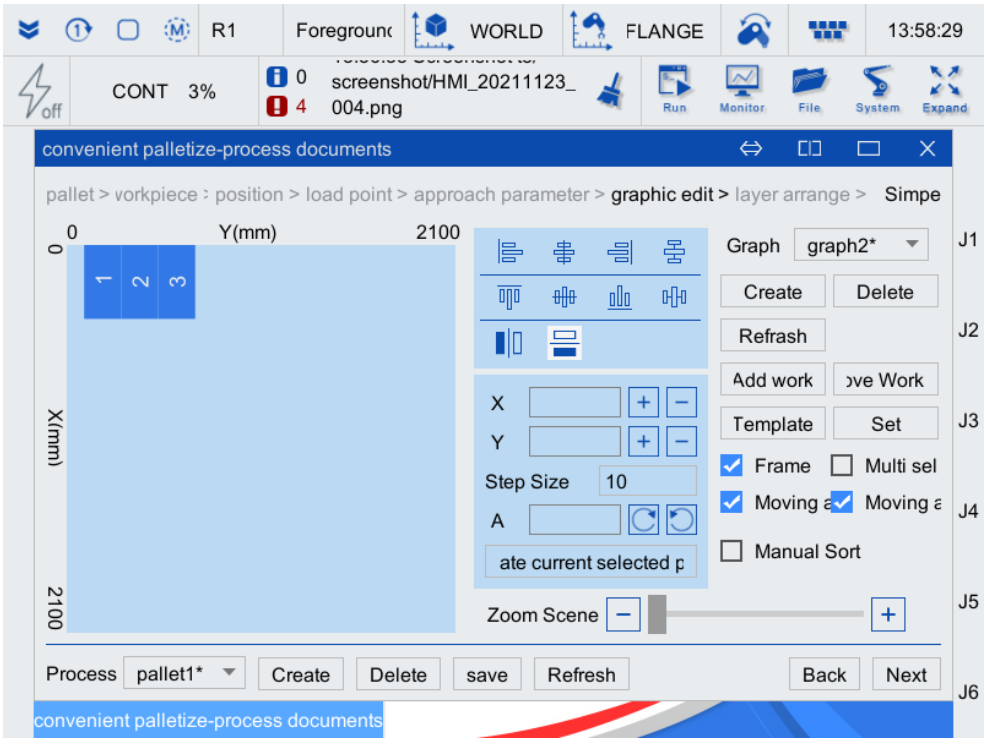


Figure 3-34 Graphic editing interface of the second layer of pressing seam palletizing

Step10. In the [plane graphics editing] interface, click <Create>. In the pop-up [Create graphic] dialog box, select [Clone Current file] with the name of "graph3". Click <Yes>.

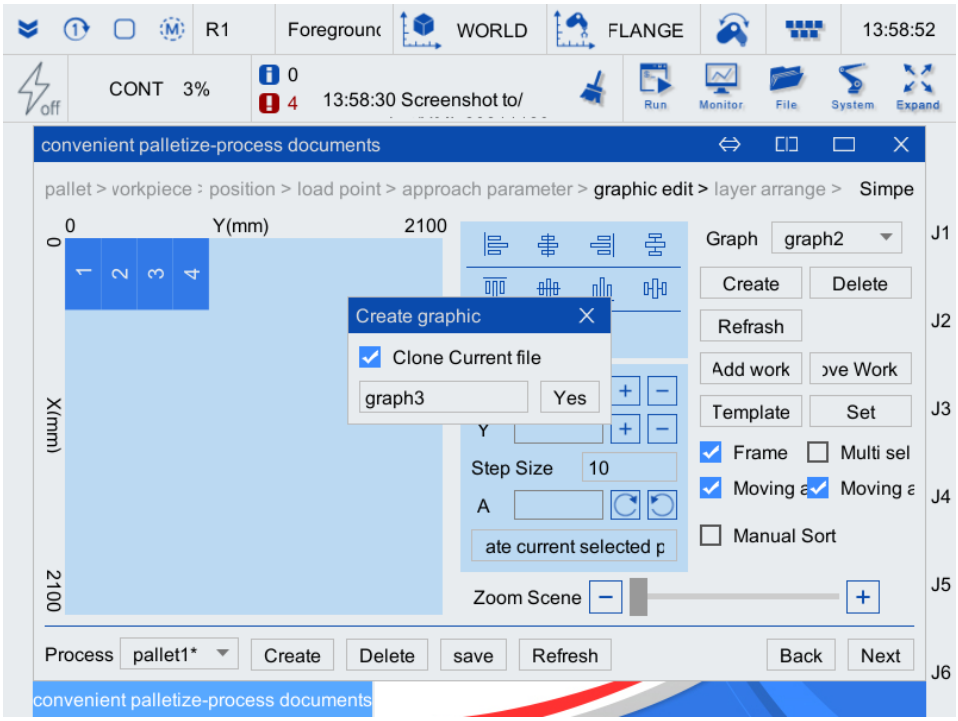


Figure 3-35 The interface of press seam new graphic graph3

Step11. Click [Add workpiece], and "workpiece 4" will be added on the left side of the interface. Repeat this step to add "workpiece 5".

Step12. Drag the workpieces with the stylus to make the arrangement of workpieces as shown in Figure 3-36

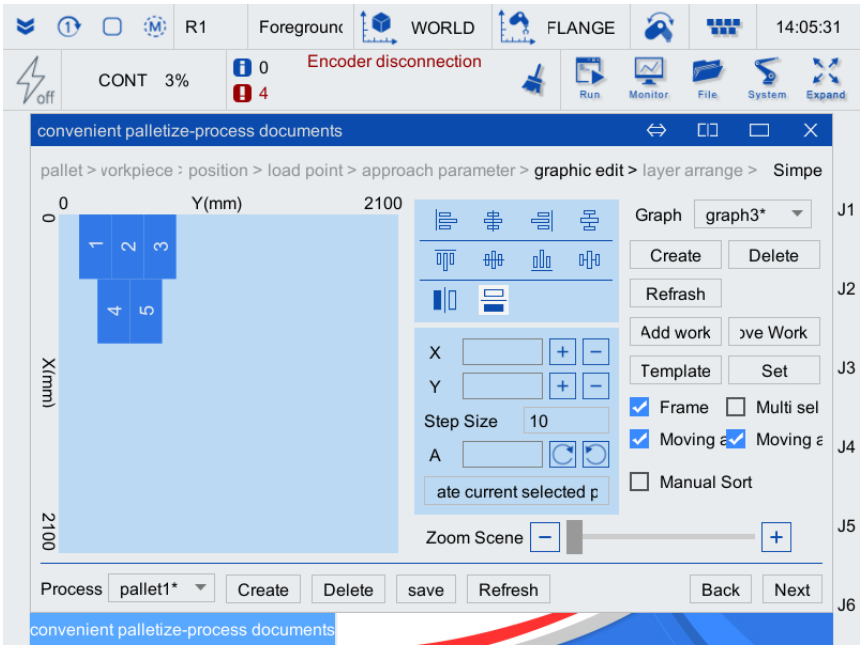


Figure 3-36 Interface for adding workpieces 4 ~ 5 by pressing seam

Step13. Delete "workpiece 1" to "workpiece 3". Select the remaining two workpieces and set the value of [X] on the right to "0".

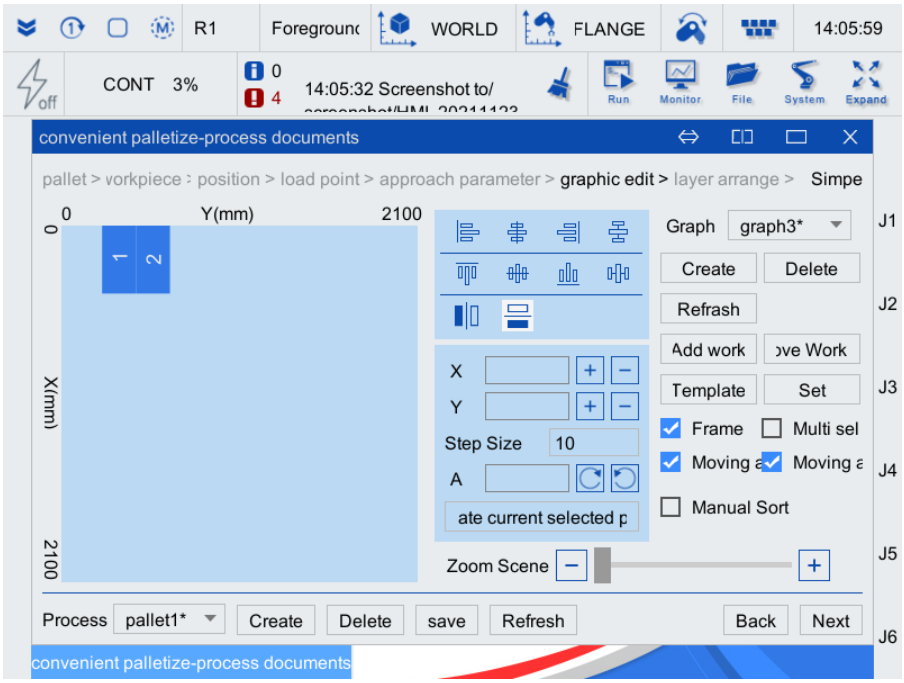


Figure 3-37 Editing interface of graphic of the third layer of pressing seam palletizing

Step14. The workpiece arrangement is shown in Figure 3-37. Click <save> on the right.

Step15. In the [Graphic edit] interface, click <Create>. In the pop-up [Create graphic] dialog box, select [Clone Current file] with the name of "graph4". Click <Yes>.

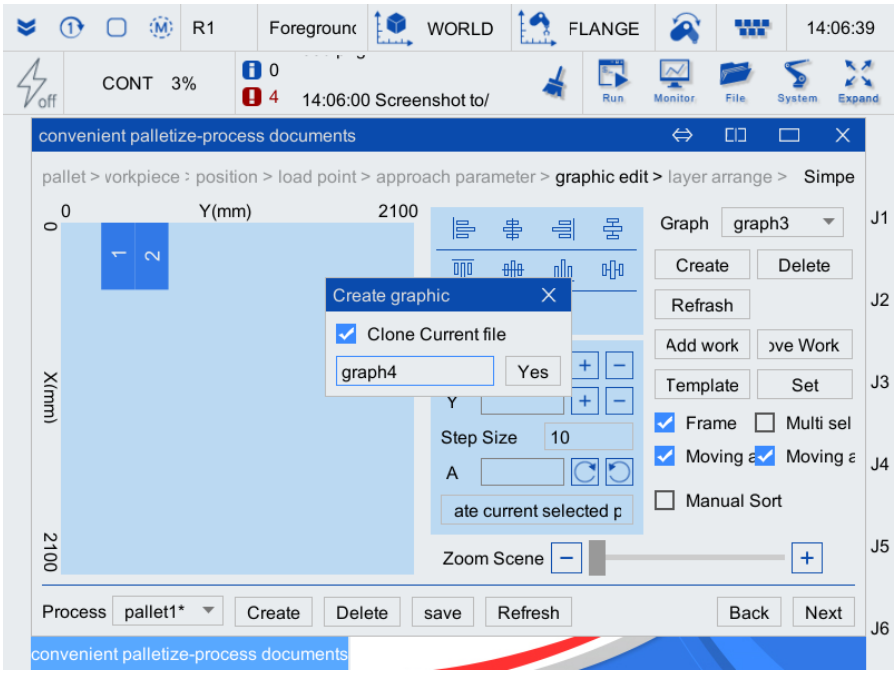


Figure 3-38 Interface of new graphic graph4 of pressing seam

Step16. Click [Add workpiece], and "workpiece 3" will be added on the left side of the interface.

Step17. Drag the workpieces with the stylus to make the arrangement of workpieces as shown in Figure 3-39.

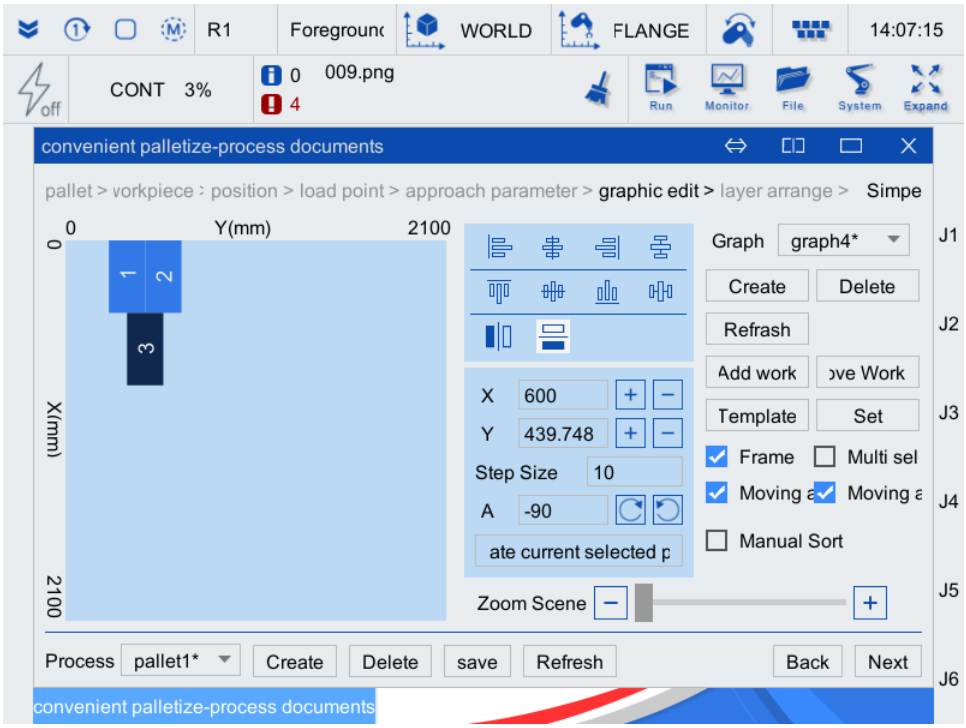


Figure 3-39 Interface for adding workpiece 3 in seam pressing mode

Step18. Delete "workpiece 1" and "workpiece 2". Select the remaining workpiece and set the value of [X] on the right to "0".

Step19. The workpiece arrangement is shown in Figure 3-40. Click <save> on the right.

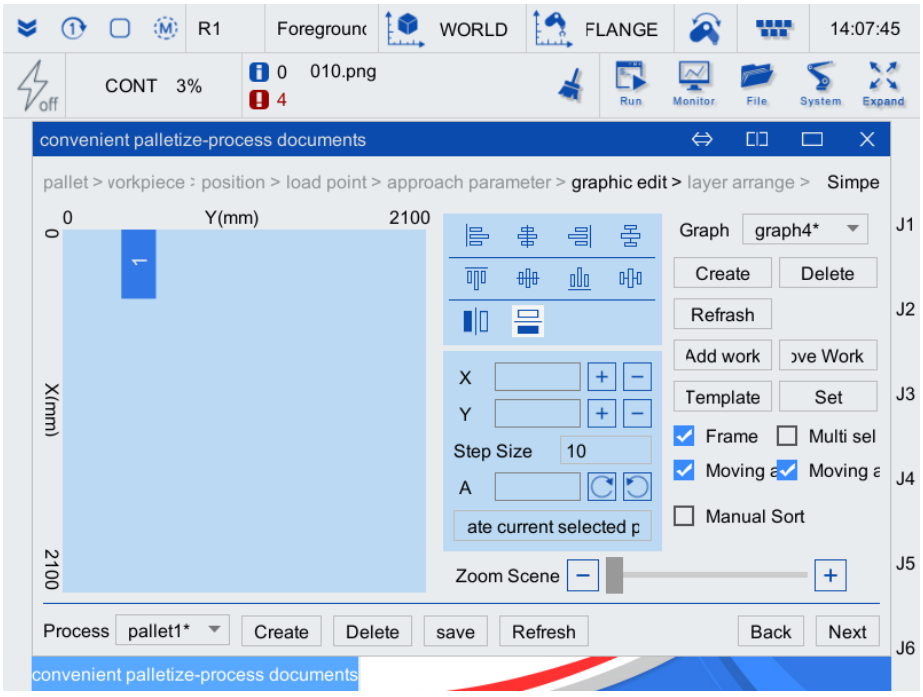


Figure 3-40 Plane graphic editing interface of the fourth layer of pressing seam palletizing

Step20. Click <Next> to enter the [layer arrange] setting interface.

Step21. Set the [layer number] to 4, and select "cuntom" in the [repeat relation].

Step22. Set the [Graphic name] of [layer 1] as "graph1", the [Graphic name] of [layer 2] as "graph2", the [Graphic name] of [layer 3] as "graph3", and the [Graphic name] of [layer 4] as "graph4".

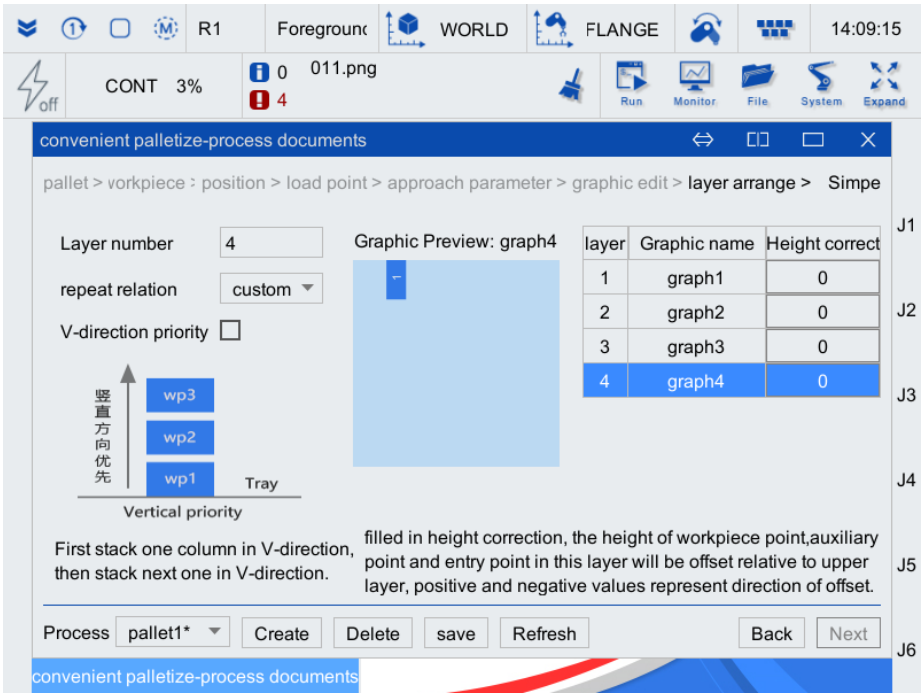


Figure 3-41 Setting interface of pressing seam layer arrangement

Step23. Click <save> at the bottom of the interface to save the process file.

Positive and negative staggered stacking

The positive and negative staggered stacking shape is shown in Figure 3-42.

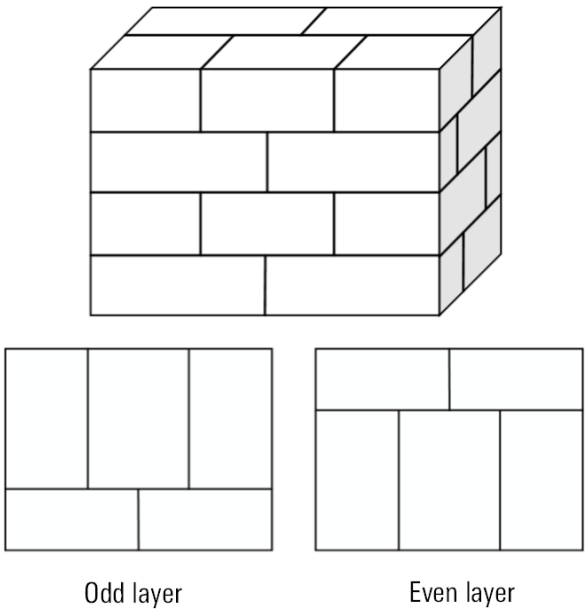


Figure 3-42 Diagram of positive and negative staggered stacking

The steps of positive and negative staggered stacking configuration are as follows:

Step1. In the [graphic edit] interface, click <Create>, and create the [Graph] with the name of "graph1".

Step2. Click [Add workpiece], and "workpiece 1" will be displayed on the left side of the interface. Repeat this step and add "workpiece 2" to "workpiece 6".

Step3. Drag the workpieces with the stylus to make the arrangement of workpieces as shown in Figure 3-43.

Step4. Click <save> on the right side of the interface.

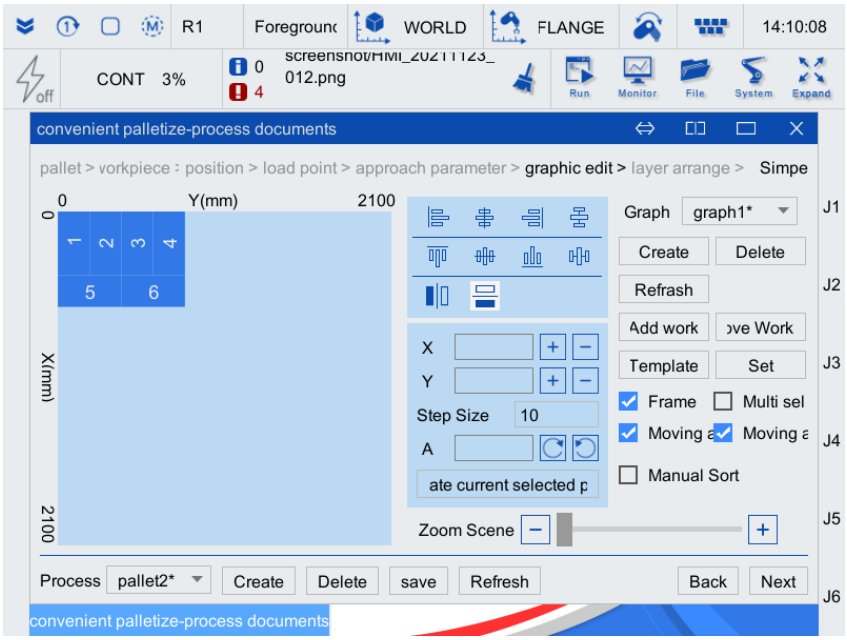


Figure 3-43 Graphic editing interface of the first layer of positive and negative staggered palletizing

Step5. In the [graphic edit] interface, click <Create>, and create the [Graph] with the name of "graph2".

Step6. Click [Add workpiece], and "workpiece 1" will be displayed on the left side of the interface. Repeat this step and add "workpiece 2" to "workpiece 6".

Step7. Drag the workpieces with the stylus to make the arrangement of workpieces as shown in Figure 3-44.

Step8. Click <save> on the right side of the interface.

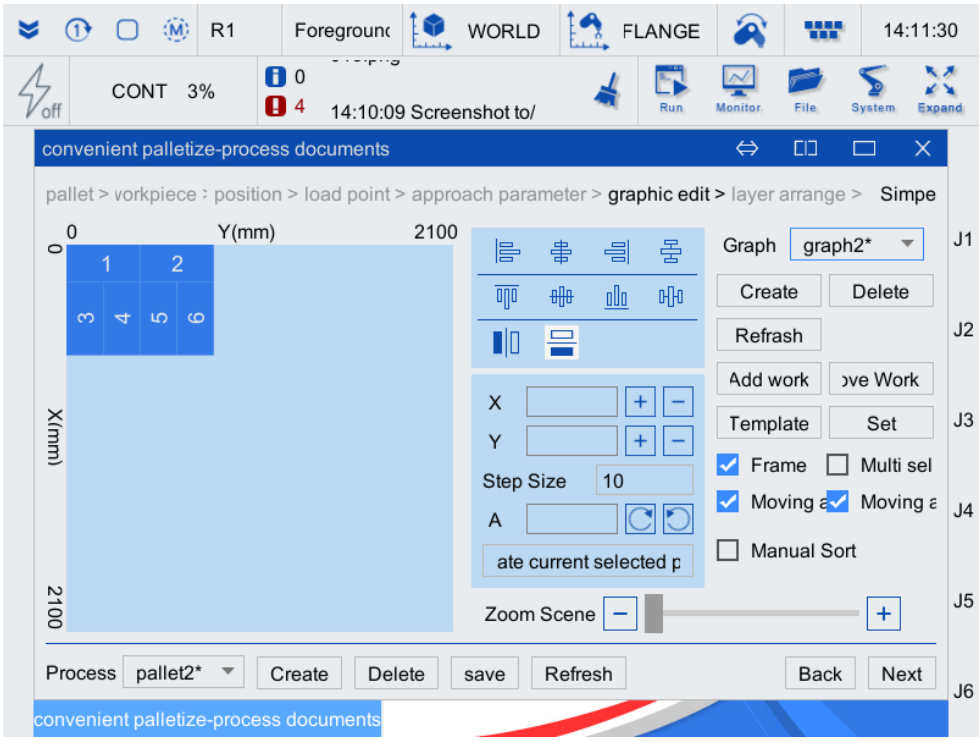


Figure 3-44 Editing interface of graphic of the second layer of positive and negative staggered stacking

Step9. Click <next> to enter the [layer arrange] setting interface.

Step10. Set [layer number] to 4, and select "alternate" in [repeat relation].

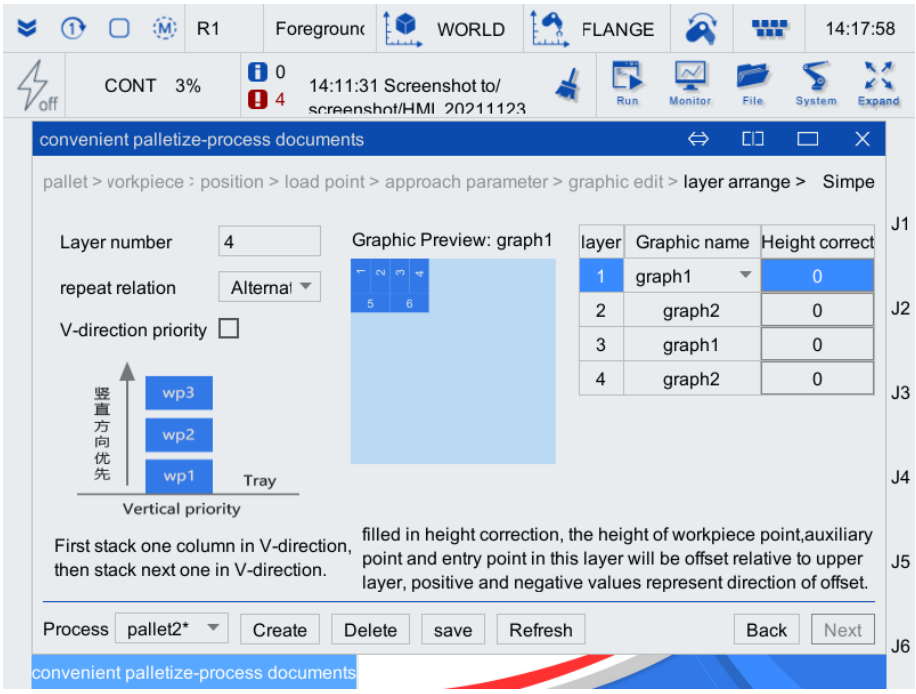


Figure 3-45 Setting interface of positive and negative staggered layer arrangement

Step11. Click <save> at the bottom of the interface to save the process file.

Stacks in multiples of five

Stacks in multiples of five is to take five as the basic counting unit and stack into various goods stacks with multiple of five in total, which is convenient for counting, fast receiving and dispatching, and suitable for materials counted by

piece. By changing materials of different sizes, shapes and irregularity into regular, fixed and quantitative pallets. It is beautiful and tidy, which is conducive to the storage, maintenance, inventory and distribution of materials, reduce errors and improve the efficiency of receipt and delivery. The stacking shape of the stacks in multiples of five is shown in Figure 3-46.

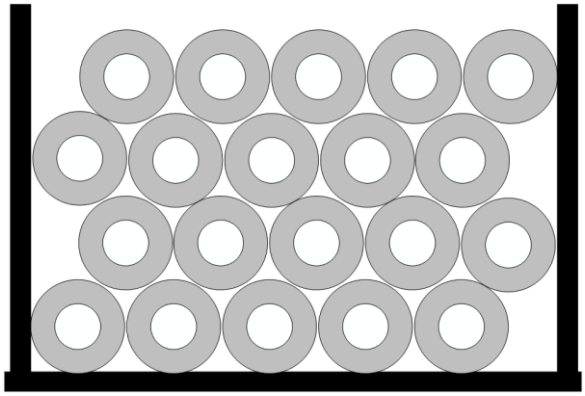


Figure 3-46 Diagram of stacks in multiples of five

The steps of stacks in multiples of five stacking configuration are as follows:

Step1. In the [graphic edit] interface, click <Create>, and create the [Graph] with the name of "graph1".

Step2. Click [Add workpiece], and "workpiece 1" will be displayed on the left side of the interface. Repeat this step and add "workpiece 2" to "workpiece 5".

Step3. Drag the workpieces with the stylus to make the arrangement of workpieces as shown in Figure 3-47.

Step4. Click <save> on the right side of the interface.

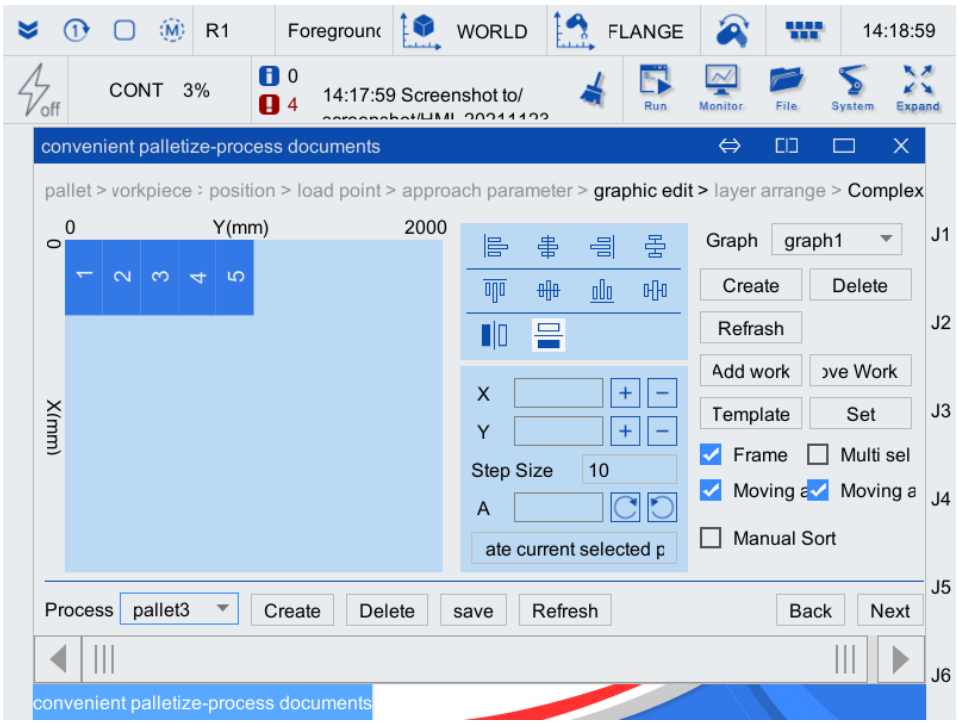


Figure 3-47 Graphic editing interface of the first layer of stacks in multiples of five

Step5. In the [graphic edit] interface, click <Create>. In the pop-up [Create graphic] dialog box, select [Clone Current File] with the name of "graph2". Click <Yes>.

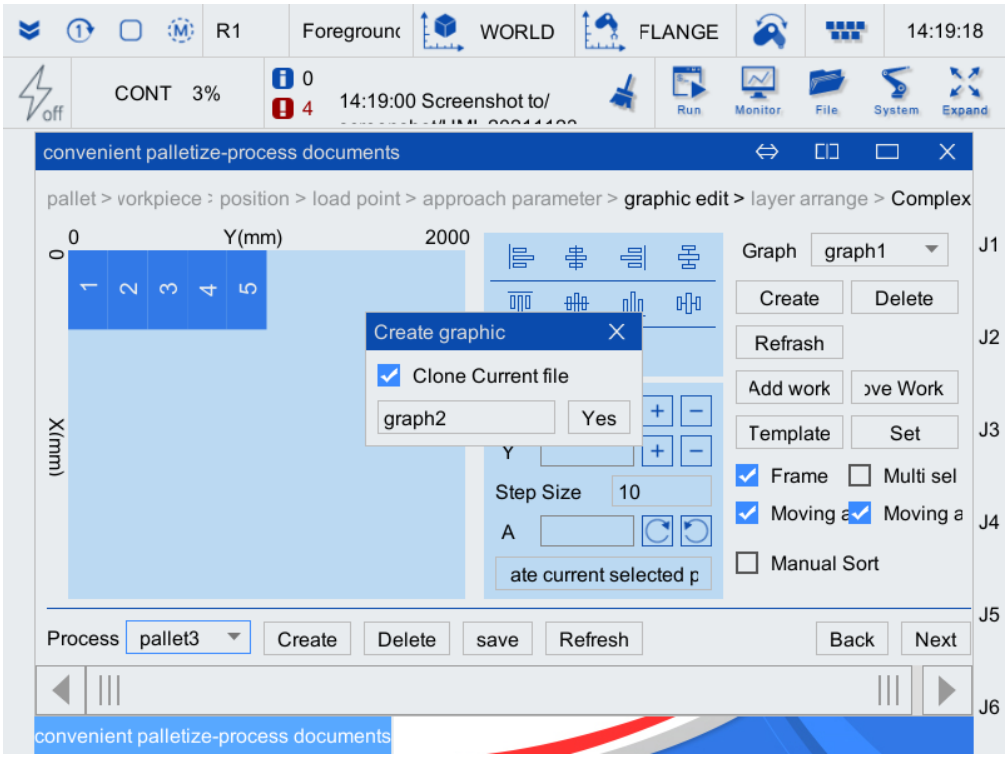


Figure 3-48 Interface of stacks in multiples of five to create new graphic graph2

Step6. Click [Add workpiece], and "workpiece 5" will be added on the left side of the interface. Repeat this step and add "workpiece 6" to "workpiece 10".

Step7. Drag the workpieces with the stylus to make the arrangement of workpieces as shown in Figure 3-49.

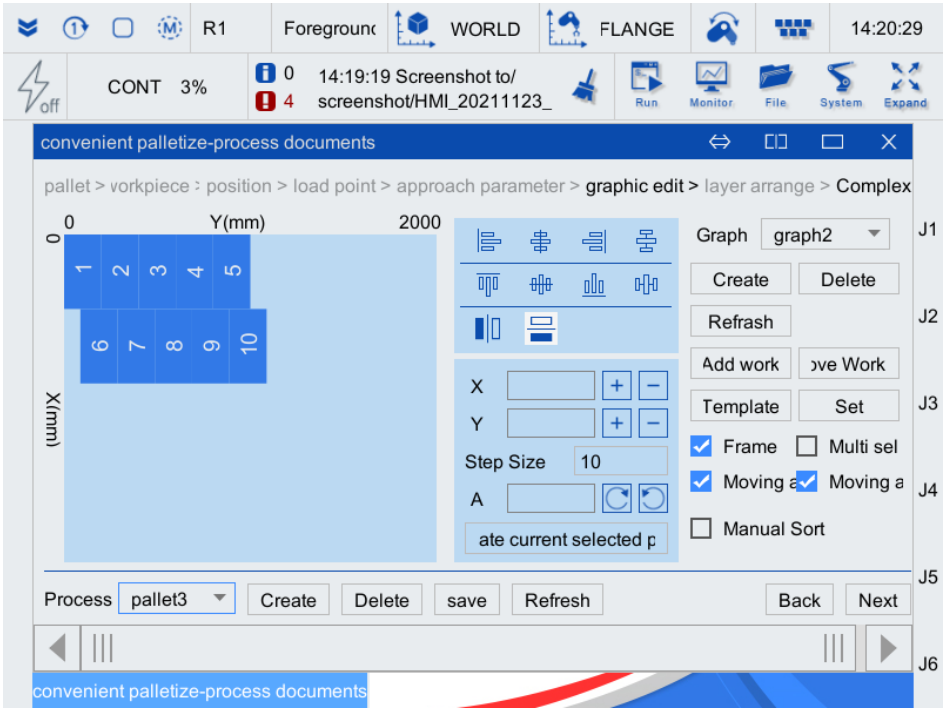


Figure 3-49 Editing interface of graphics on the second layer of stacks in multiples of five

Step8. Delete "workpiece 1" to "workpiece 5". Select the remaining five workpieces and set the value of [X] on the right to "0".

Step9. The workpiece arrangement is shown in Figure 3-50. Click <save> on the right.

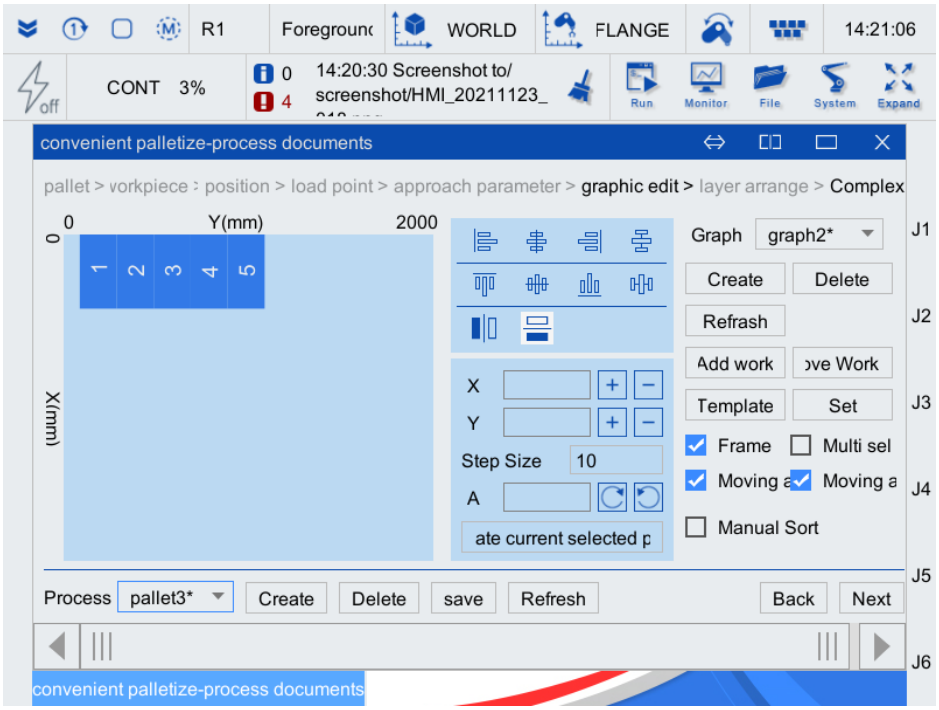


Figure 3-50 Editing interface of graphics on the second layer of stacks in multiples of five

Step10. Click <Next> to enter the [layer arrange] setting interface.

Step11. Set [layers number] to 5, and select "alternate" in [repeat relation].

Step12. Set [Graphic name] of [layer 1] to "graph1", and [Graphic name] of [layer 2] to "graph2".

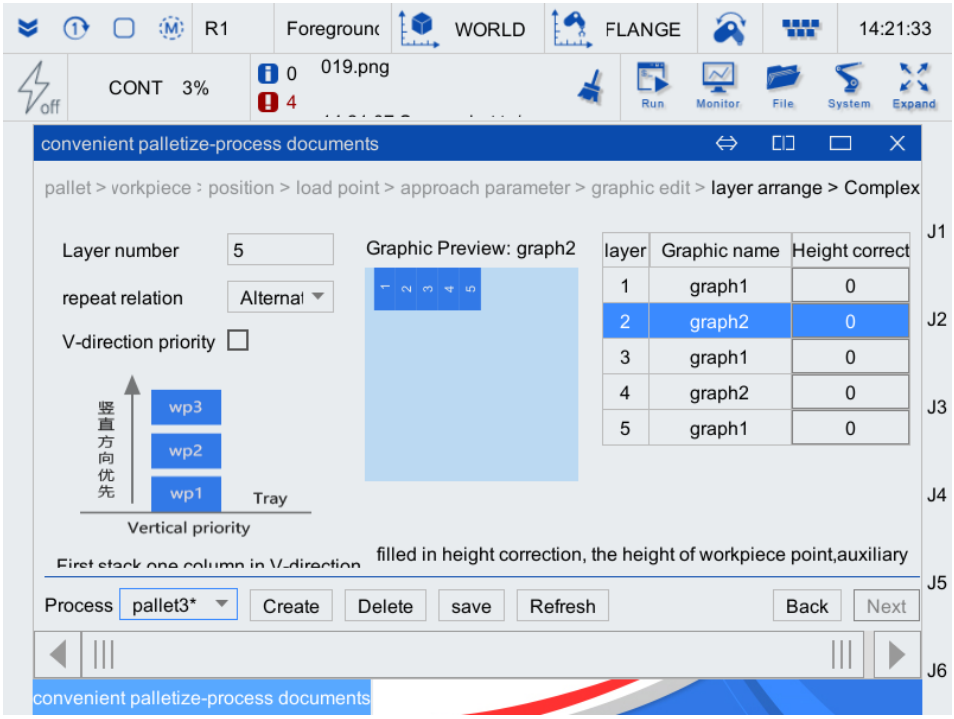


Figure 3-51 Arrangement of stacks in multiples of five

Step13. Click < save > at the bottom of the interface to save the process file.

3.2 Complex mode

Click <Create> at the bottom of the interface to open the [new process] configuration interface (as shown in Figure 3-52), select [complex], and click <Yes> to enter the [complex] mode configuration interface.

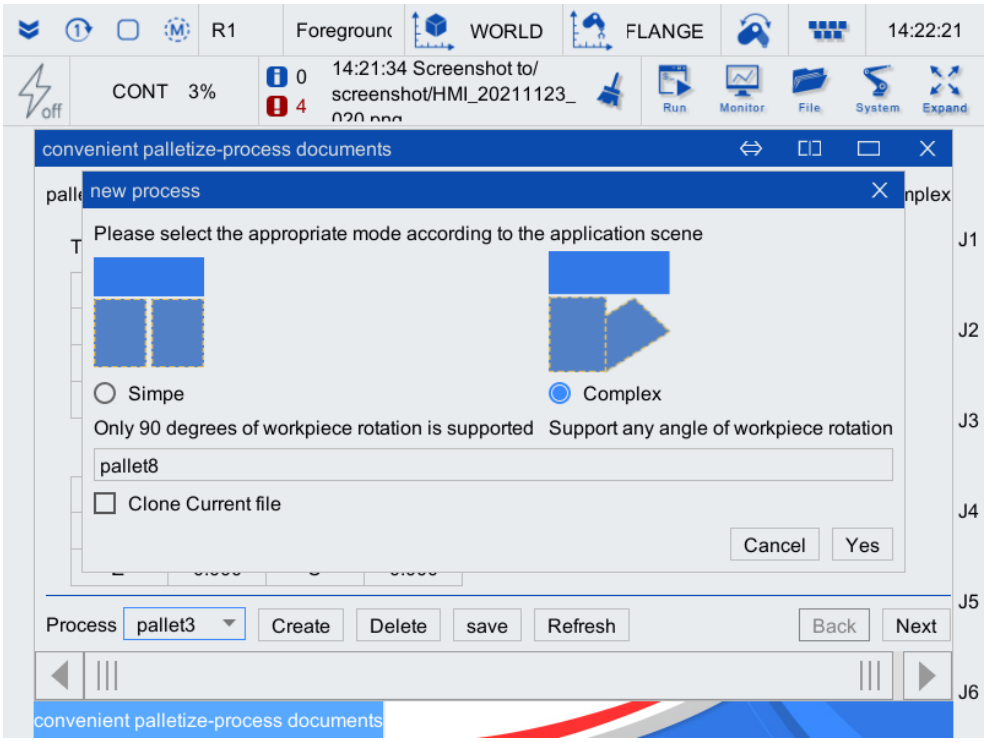


Figure 3-52 Mode selection interface

3.2.1 Pallet settings

In complex mode, you need to select [tool] first, and use the tool to calibrate three points to determine the pallet coordinate system. The three points are: the origin of the pallet coordinate system, a point in the X direction of the pallet and a point in the Y direction of the pallet.

Tip

When calibrating the tool coordinate system, it is necessary to use a calibration needle consistent with the length curvature of the tool for calibration. If there is no calibration needle on site, you can use sharp objects such as nails to replace the calibration needle and let the needle tip touch sharp objects to complete the calibration of the tool coordinate system. (the sharper the calibration needle tip and the touched object, the more accurate the calibration result.)

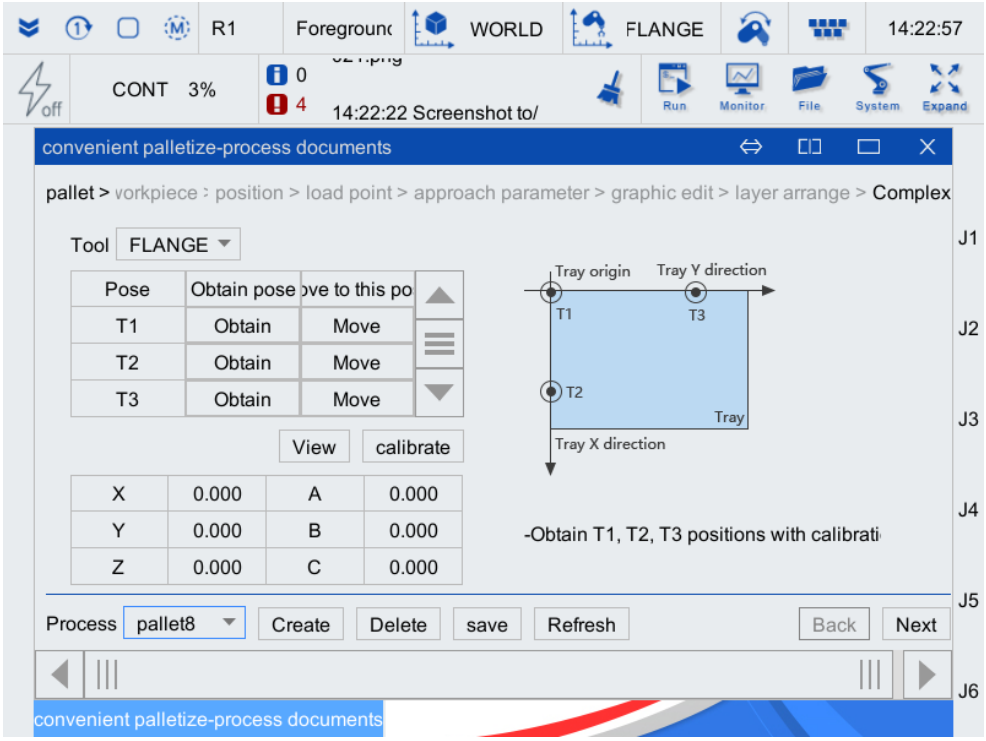
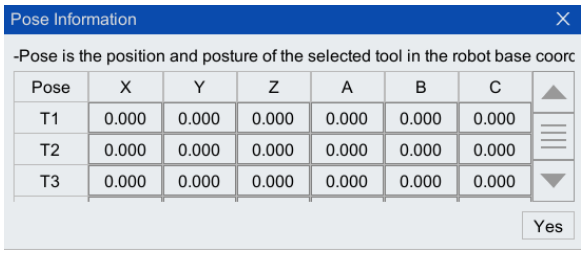


Figure 3-53 Tray setting interface

Parameter and button descriptions are shown in Table 3-13.

Table 3-13 Description of parameters and buttons

Parameters	Description
Tool	The name of the tool coordinate system. In complex mode, the tool coordinate system can be selected. Select a tool coordinate system that is conducive to calibrating the tray coordinate system. The default is flange.
T1	After T1 teaching, determine the origin of the tray coordinate system. Move the tool to the origin position and touch the sharp object placed at the origin. The teaching method is as follows: ■ Click the <Obtain> button. After completing the teaching of T1 point, there is "*" in the upper right corner of T1 point; ■ when the robot is not in T1 position and wants to return to T1 position, you can directly click the <Move> button after T1.
T2	After T2 teaching, determine a point in the X direction of the tray coordinate system. The teaching method is as follows: ■ Move the tool to a point in the x-axis direction, touch the sharp object placed at this point, click the <Obtain> button, and after completing the teaching of T2 point, there is a "*" sign in the upper right corner of T2 point; ■ when the robot is not in T2 position and wants to return to T2 position, you can directly click the <Move> button behind T2.
T3	After T3 teaching, determine a point in the Y direction of the tray coordinate system. The teaching method is as follows: ■ Move the tool to a point in the x-axis direction, touch the sharp object placed at this point, click the <Obtain> button, and after completing the teaching of T3 point, there is a "*" sign in the upper right corner of T3 point; ■ when the robot is not in T3 position and wants to return to T3 position, you can directly click the <Move> button behind T3.

Parameters	Description
View	You can view the point information of the tool coordinate system. The point position is the pose of the selected tool in the robot coordinate system. 
Calibrate	After teaching T1, T2 and T3 points, click the < calibration > button to automatically calculate the x/y/z/a/b/c value of the tray coordinate system.
Tray coordinate system	You can select the name of the tray coordinate system.
X	The distance between the origin of the tray workpiece coordinate system and the origin of the robot's base coordinate system in the X-axis direction.
Y	The distance between the origin of the tray workpiece coordinate system and the origin of the robot's base coordinate system in the Y-axis direction.
Z	The distance between the origin of the tray workpiece coordinate system and the origin of the robot's base coordinate system in the Z-axis direction.
A	The rotation angle of the origin of the pallet workpiece coordinate system in the Z-axis direction relative to the origin of the robot's base coordinate system.
B	The rotation angle of the origin of the pallet workpiece coordinate system in the Y-axis direction relative to the origin of the robot's base coordinate system.
C	The rotation angle of the origin of the pallet workpiece coordinate system in the X-axis direction relative to the origin of the robot's base coordinate system.
save	Click the < save > button to save the configuration.

Tip

When the shape of workpiece or pallet is irregular, the palletizing package shall be used, and the convenient palletizing package is not recommended.

3.2.2 Workpiece setting

The setting method is the same as the simple mode. Please refer to "3.1.2 workpiece parameter setting".

3.2.3 Position setting

After setting [workpiece], click the < save > button, click <Next> in the lower right corner to switch to the position setting interface in Figure 3-54.

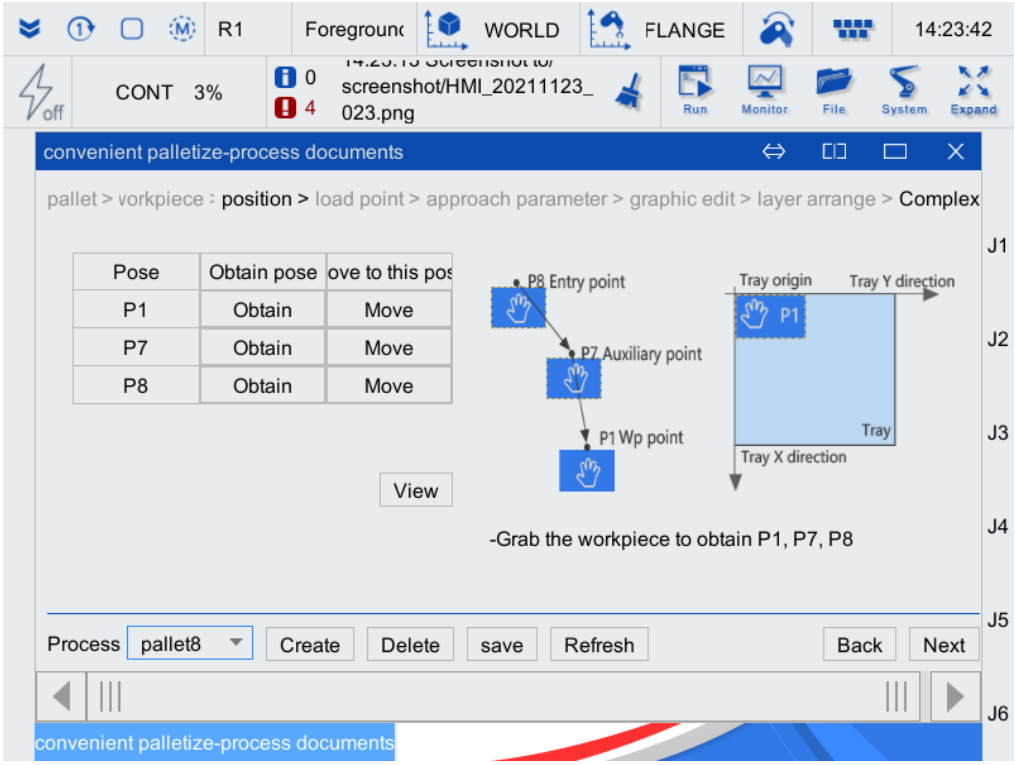


Figure 3-54 Position setting interface

In the table of the interface, the point position of the current tool of the workpiece at the specific workpiece point, auxiliary point and entry point is displayed, and all points refer to the tray coordinate system. Parameters and key descriptions are shown in Table 3-14.

Table 3-14 Parameter description

<table>
<tr><td>Parameter</td><td>Description</td></tr>
<tr><td>P1</td><td>Workpiece point. It is necessary to teach when the robot holds the workpiece. When teaching the workpiece point, the length, width and height of the workpiece must coincide with the XYZ axis of the tray coordinate system.</td></tr>
<tr><td>P7</td><td>Auxiliary point. Relative to the auxiliary point of the workpiece point, the values in the table can be taught or directly modified.</td></tr>
<tr><td>P8</td><td>Entry point. Relative to the entry point of the workpiece point, the values in the table can be taught or directly modified.</td></tr>
<tr><td rowspan="2">View</td><td>The point position is the pose of the flange in the selected pallet coordinate system.
Pose Information
-The point position is the position of the flange in the selected tray coordinat
Pose | X | Y | Z | A | B | C
P1 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000
P7 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000
P8 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000
Yes</td></tr>
<tr><td>X</td><td>The distance from the point to the origin in the X direction in the workpiece coordinate system.</td></tr>
</table>

Parameter	Description	
	Y	The distance from the point to the origin in the Y direction in the workpiece coordinate system.
	Z	The distance from the point to the origin in the Z direction in the workpiece coordinate system.
	A	The angle at which the point rotates along the Z axis in the workpiece coordinate system.
	B	The angle at which the point rotates along the Y axis in the workpiece coordinate system.
	C	The angle at which the point rotates along the X axis in the workpiece coordinate system.


Notice

When the next approach parameter is not enabled, the auxiliary point and auxiliary point 2 are the same point.

3.2.4 Load point setting

The setting method is the same as the simple mode. Please refer to "3.1.4 setting of delivery point".

3.2.5 Approach parameter setting

The setting method is the same as the simple mode. Please refer to "3.1.5 proximity parameter setting".

3.2.6 Graphic edit setting

The setting method is the same as the simple mode. Please refer to "3.1.6 plane graphics editing".

3.2.7 Layer arrange setting

The setting mode is the same as the simple mode. Please refer to "3.1.6.3 register function".

3.3 Register function

When the stacking program is being executed, the layer number and workpiece number of the currently stacked workpiece can be displayed in real time through the register. When the program stops, the layer number and workpiece number of the register can be manually set to allow the robot to start stacking from the specified position.

Record the number of currently stacked workpieces

Click [extended / convenient palletize / register] on the main interface of the teaching pendant. In the pop-up [convenient palletize - register] interface, you can view the layer number and workpiece number of the workpiece being stacked by the robot when the program is running, that is, record the workpiece on which the robot code is placed in the layer in real time. During the program running, the register can only display the current number of stacked workpieces in real time, and cannot be set.

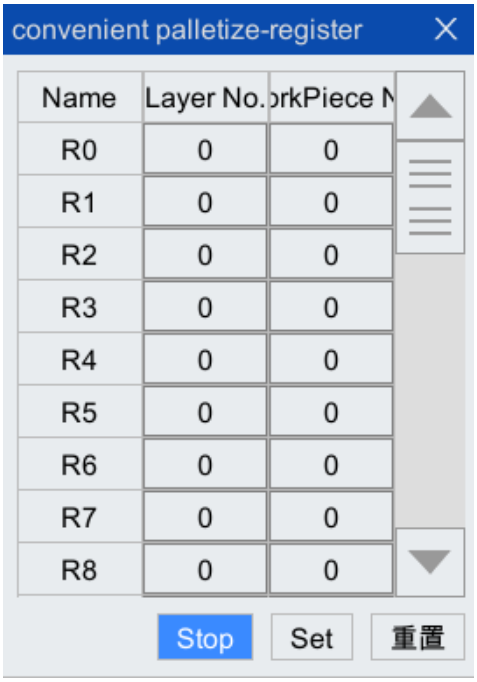


Figure 3-55 Register configuration interface

Set the starting stacking position

Set the starting stacking position:

Step1. Click the <Stop> button in the register interface (<Stop> button changes to <Refresh>), and the program operation stops.

Step2. Click the values of [layer No.] and [workpiece No.] to be modified and enter the parameters.

Step3. After modification, click <Set> to save the modification.

Step4. Click the <Refresh> button to run the program again.

Notice

The robot starts stacking from the set position of [layer No.] and "[workpiece No.] + 1".

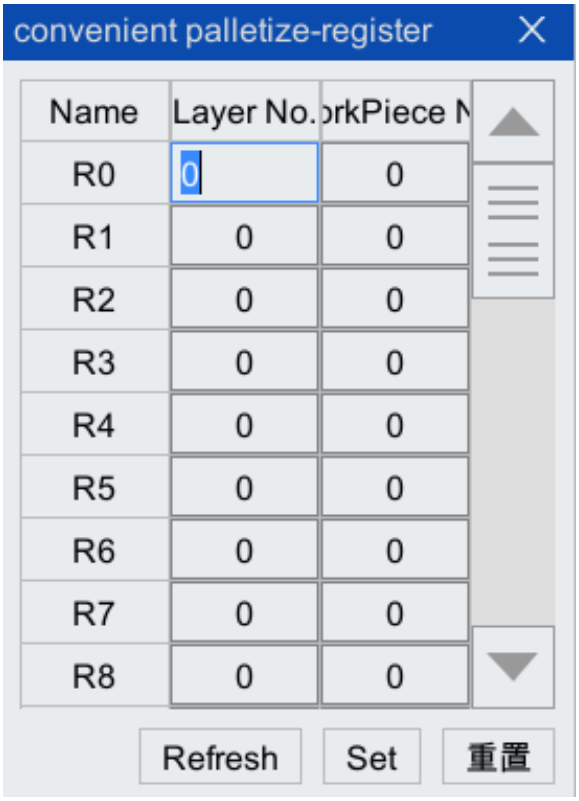


Figure 3-56 Register parameter modification interface

4 Auxiliary programming

4.1 Register auto cleanup function

Instruction description

Register auto cleanup function. When inserting an instruction block, if the number of pallets is 1, the register will be cleared automatically after the execution of the whole pallets; If the number of pallets is greater than 1, after all pallets are executed, only the first pallets register will be cleared, and then the while cycle will jump out, and the subsequent pallets will not be cleared. Therefore, it is necessary to manually insert the auto clear register function between "endwhile" and "pallet_deinit".

Instruction format

pallet_reset_reg(*reg_id*)

Parameter description

See Table 4-1 for the instruction parameters of ending stacking.

Table 4-1 Parameter description

Parameter	Name	Description
reg_id	Register number	Register number, in integer form, with a value range of 0 ~ 49. Each inserted pallet will be bound with a register. After the program is executed, the bound register number needs to be cleared.

4.2 Palletizing

The auxiliary operation steps of palletizing are as follows:

Step1. Click [File / File Management] in the main interface to enter the [File Management] interface, and click <New File> to create an. ARL program. As shown in Figure 4-1.

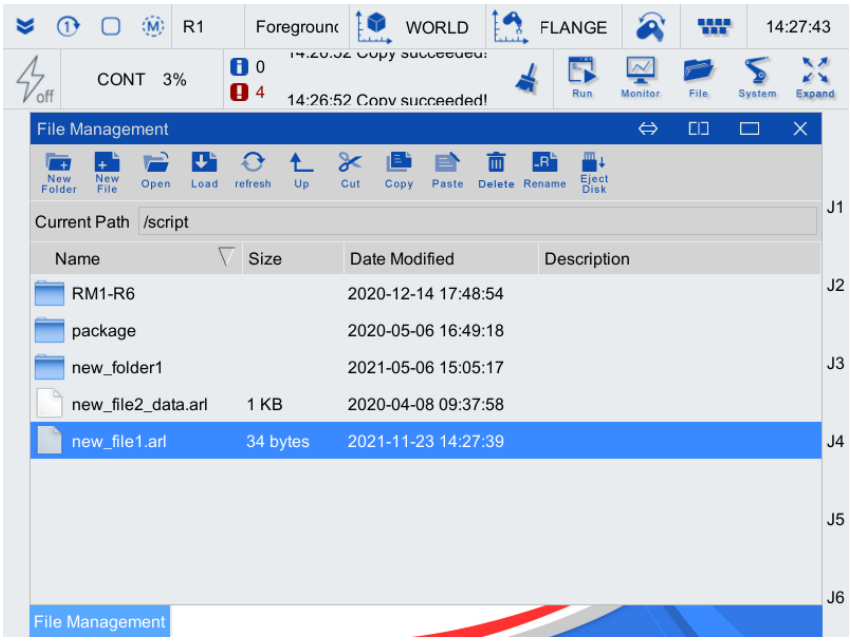


Figure 4-1 File management interface

Step2. Double click the file to open the program editor. As shown in Figure 4-2.

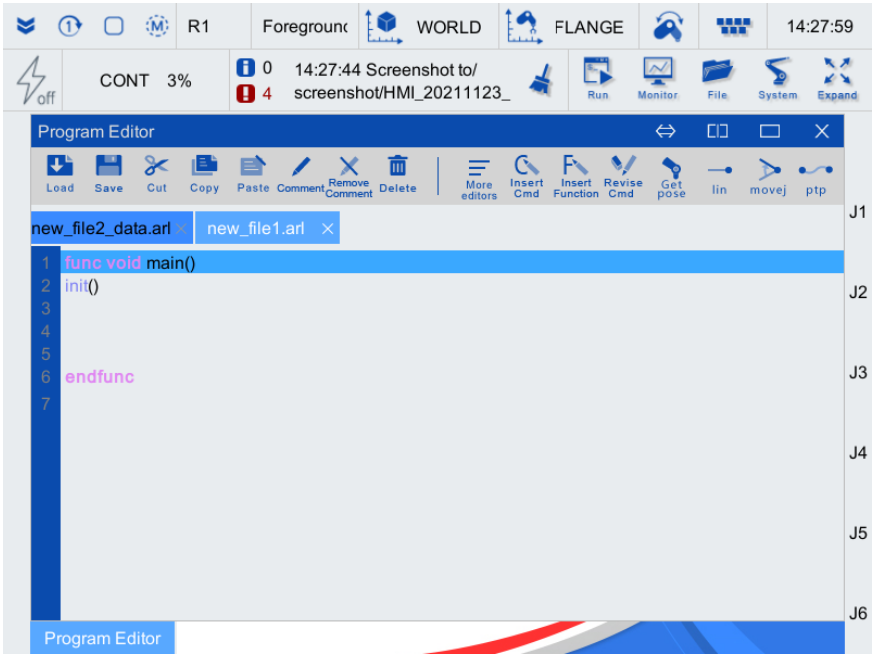


Figure 4-2 Program editor

Step3. Click [insert cmd / function package / convenient palletize / instruction block], as shown in Figure 4-3.

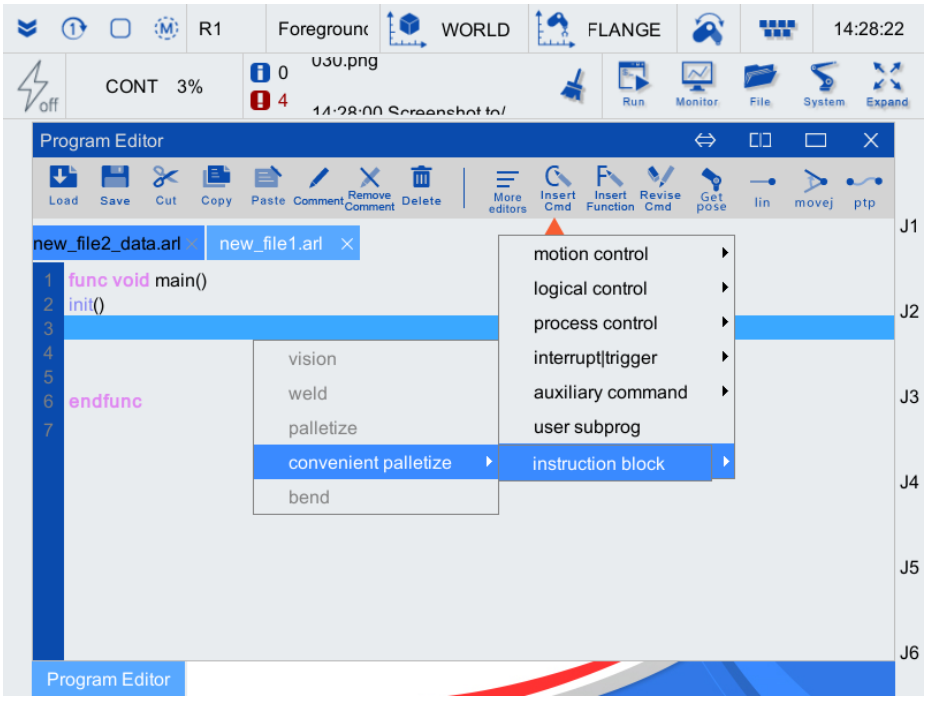


Figure 4-3 Drop down menu of inserted instructions

Step4. In the pop-up [convenient palletizing - instruction block] configuration interface, click and select the line of the parameter to be modified as required, and modify [instruct], [speed %] and [slip %]. As shown in Figure 4-4.

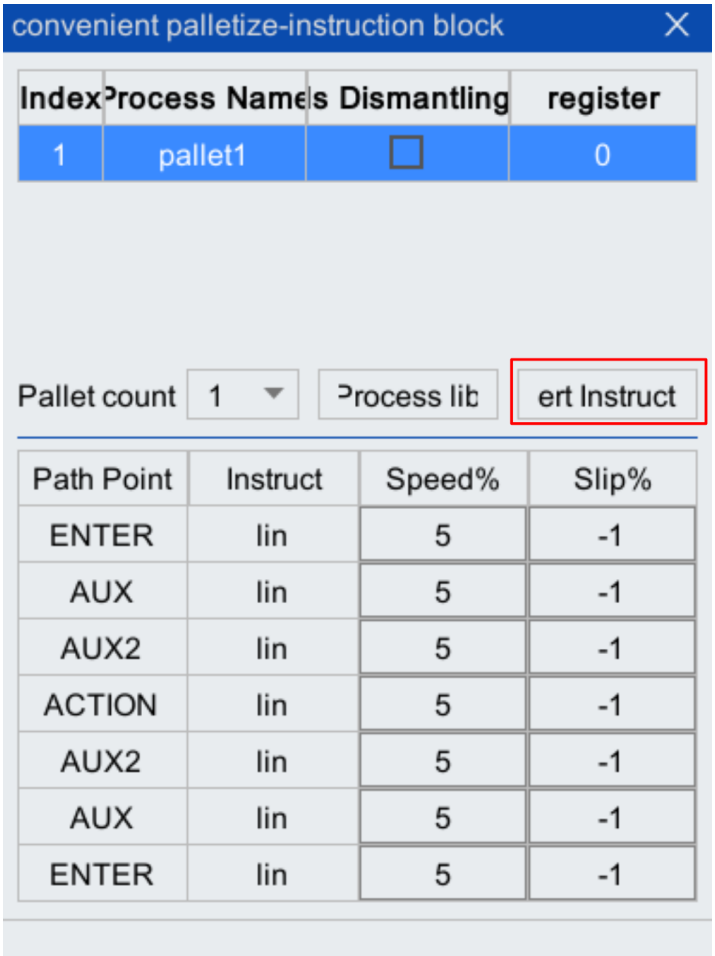


Figure 4-4 [Convenient palletizing-instruction block] interface

The path point parameters are described in Table 4-2 below.

Table 4-2 Path point parameter description

Parameter	Description
ENTER	Entry point
AUX	Auxiliary point
AUX2	Second auxiliary point
ACTION	Palletizing action point

Step5. Click < insert Instruction >, and the palletizing instruction will be inserted into the newly created ARL program.

The ARL code of palletizing is as follows:

```
func void main()
init()
//toolswitch(-1) // Default tool load
pallet_init "pallet1" // Pallet initialization
while (true)
```

```
pallet_next "pallet1","P","R0" // Update next stacking point position
if ($PALLET_REG[0].index!=0) // Judge whether the stacking of pallets is completed
//TODO: Move to the pick-up point to grab the workpiece (palletizing)
//$enter is the entry point, $aux is the auxiliary point, $aux2 is the second auxiliary point (approach point), $action is the action point
lin p:$PALLET_ENTER,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY
lin p:$PALLET_AUX,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY
lin p:$PALLET_AUX2,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY
lin p:$PALLET_ACTION,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY
// TODO: Lay down the workpiece (palletizing); Grab workpiece (destacking)
lin p:$PALLET_AUX2,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY
lin p:$PALLET_AUX,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY
lin p:$PALLET_ENTER,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY
// TODO: Move to the delivery point and put down the workpiece (destacking)
else
// Todo: Stacking or destacking completed
break
endif
endwhile
pallet_reset_reg(1) // A function that automatically clears register values.
pallet_deinit "pallet1" // Clean the pallets
endfunc
```

4.3 Destacking

Click the drop-down triangle after pallet1 in the [Process Name] column to display the previously created process. Select the required process name and check the [Dismantling] check box. After modifying the speed value and smooth value of each instruction as required, click <Insert Instruction>, and the destacking instruction will be inserted into the new ARL program. As shown in Figure 4-5.

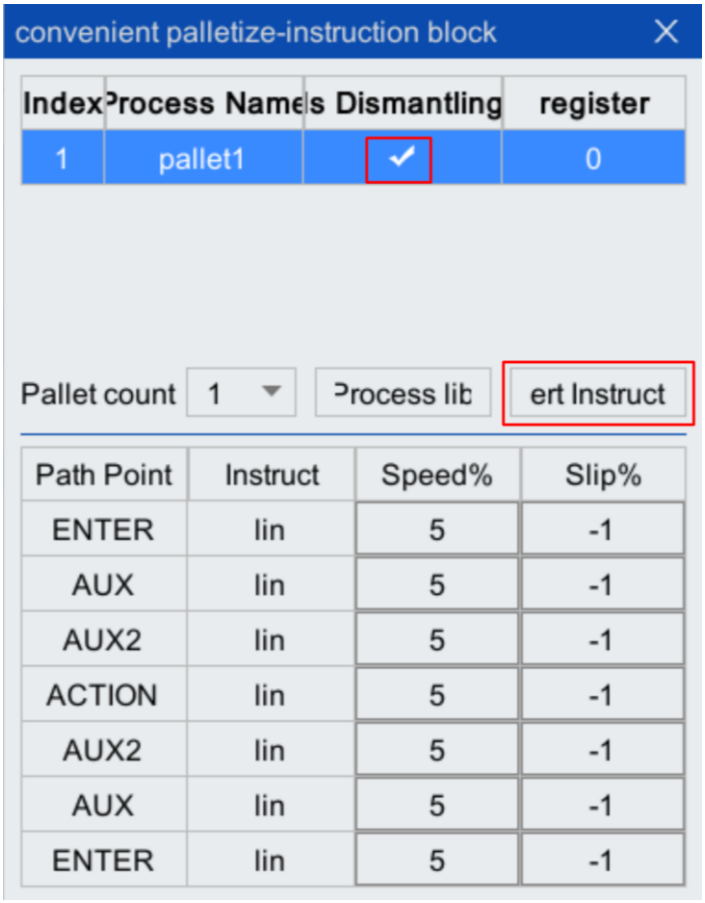


Figure 4-5 Destacking operation interface

Destacking ARL procedure:

func void main()

init()

//toolswitch(-1) // Default tool load

pallet_init "pallet1" // Pallet initialization

while (true)

pallet_next "pallet1","D","R0" // Update next palletizing point position

if ($PALLET_REG[0].index!=0) // Judge whether the stacking of pallets is completed

// TODO: Move to the pick-up point to grab the workpiece (palletizing)

//$ENTER is the entry point, $AUX is the auxiliary point, $AUX2 is the second auxiliary point (approach point), $ACTION is the action point

lin p:$PALLET_ENTER,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY

lin p:$PALLET_AUX,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY

lin p:$PALLET_AUX2,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY

lin p:$PALLET_ACTION,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY

```
// TODO: Lay down the workpiece (palletizing); Grab workpiece (destacking)
lin p:$PALLET_AUX2,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY
lin p:$PALLET_AUX,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY
lin p:$PALLET_ENTER,vp:5%,sp:-1%,t:$FLANGE,w:$PALLET_TRAY
// TODO: Move to the delivery point and put down the workpiece (destacking)
else
// TODO: Stacking or destacking is completed
break
endif
endwhile
pallet_reset_reg(1) // A function that automatically clears register values.
pallet_deinit "pallet1" // Clean the pallets
endfunc
```

4.4 Program Execution

The code execution steps are as follows:

Step1. After the code is generated, click <Load>, and load the code into the program debugger.

Step2. The mode switching key at the top left of the front of the robot teaching pendant rotates to the [manual low speed] mode. As shown in Figure 4-6.

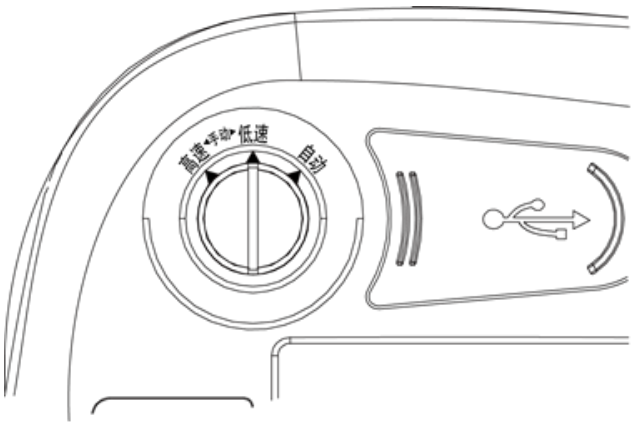


Figure 4-6 Teaching pendant mode switching key

Step3. Press the enable key of the rear shell of the teaching pendant to the II (middle) key position without loosening (as shown in Figure 4-7), and the " " in the upper left corner of the teaching pendant interface lights up (as shown in Figure 4-8), indicating that the motor has been powered on.

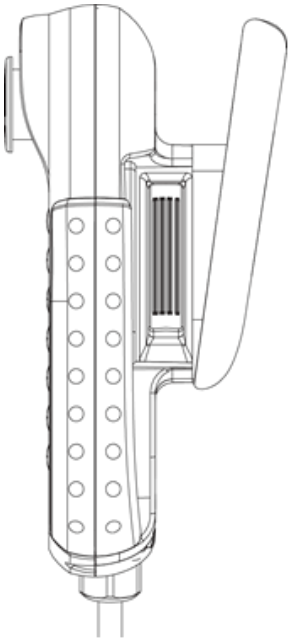


Figure 4-7 Teaching pendant enable switch

Figure 4-8 The motor is powered on

Step4. Select the debugging mode in the debugger (refer to "section 5.1 program debugger" in the operation manual of air-tp teaching pendant for specific methods), and press the "▶" key on the front panel of the teaching pendant to start executing the program. Run the program in low-speed mode to detect whether the program is running correctly and whether the robot interferes with the surrounding environment, causing potential safety hazards and other problems.

Step5. After confirming that the program is correct and there are no other faults, directly release the enable button and rotate the mode switching key at the top left of the front of the robot teaching pendant to the [automatic] mode. Press the < enable > button to power on the motor, and click the "▶" button to make the robot run automatically.

PEITIAN ROBOTICS

WeChat Official Account

Official Website

Sevice Hotline : 400-990-0909
Official Website : http://robot.peitian.com

UM-S01500000003-008 / V1.4.0 / 2021.12.03