Handling Robot

System Functional Manual

Revision date 2019.12

Contents

Catalogue

1. System

1.1. Screen Layout

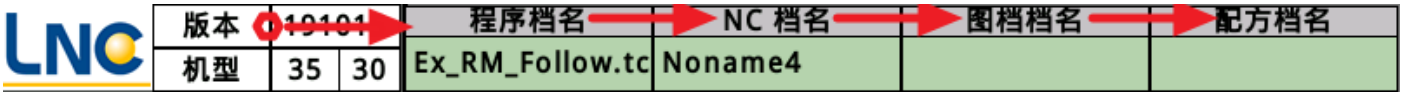
Upper action area

The left side is the information display area, and the right side is the permanent function area.

Left information area operation index:

Click the logo several times in a row: Touch lock. The default unlock password is 0.

Click [Version][Release Date]: Display the file selection bar, [NC]/[Program]/[Picture File]/[Recipe].

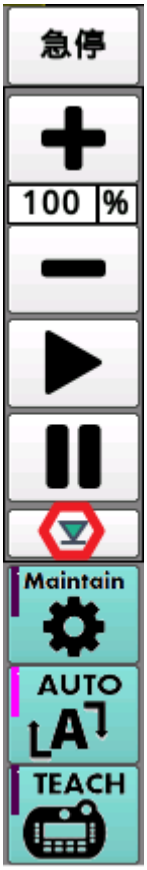


Click [World] / [Work] / [Joint] / [Tool] / [Motor]: Display the current coordinate value information.

Click the workstation display field: connects to the coordinate system page.

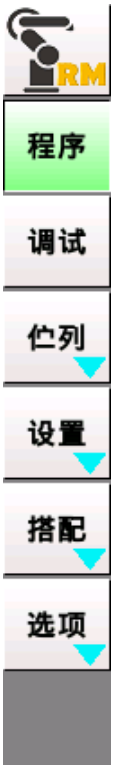
Click the tool display field: connects to the application installation page. Click the next/previous page icon: switches between left-side information display pages. (Content displayed may vary depending on user interface selection)

Right-hand operation area

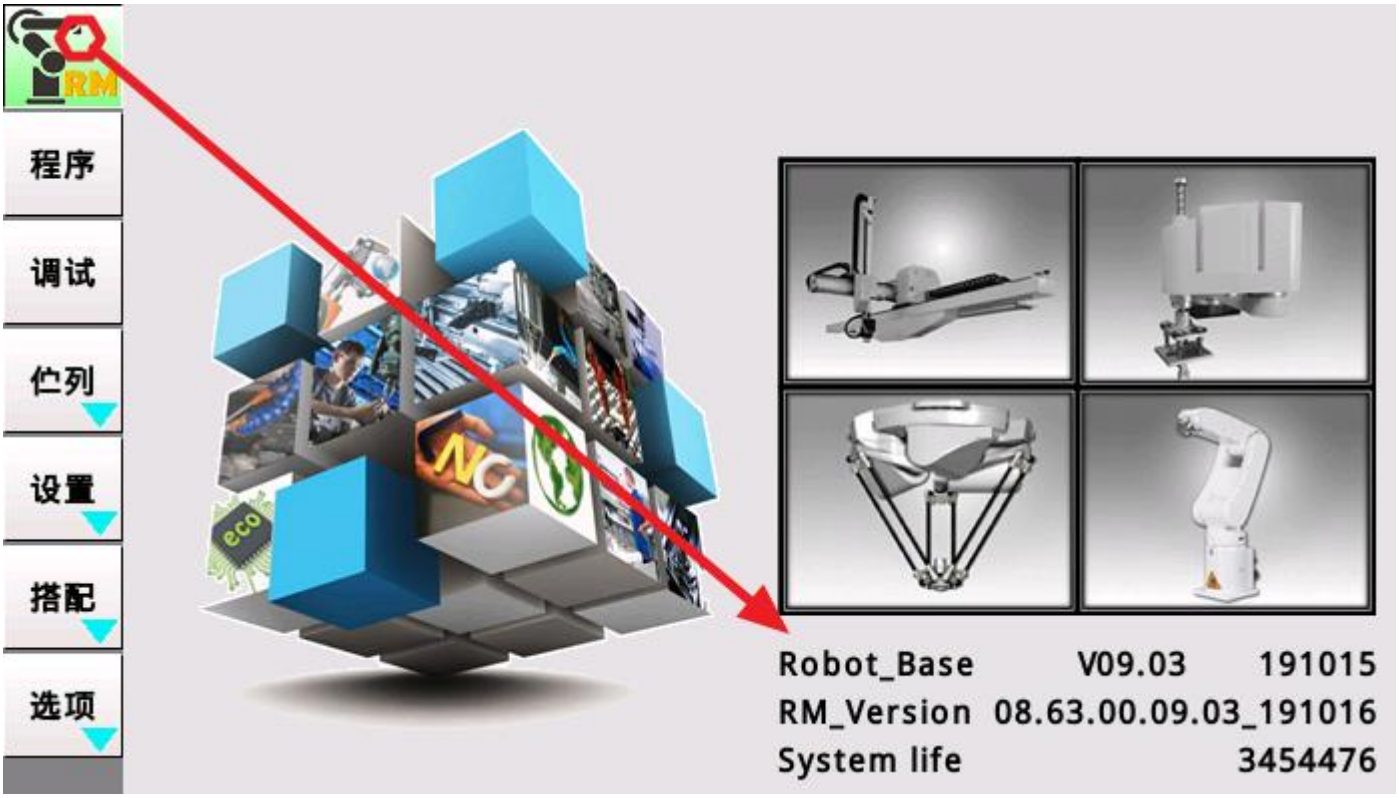


Click the next page/previous page diagram: Switch to the right operation distinction page. (The displayed content varies according to the application human-machine selection)

Left Operation Area



Menu Bar. (The displayed content varies according to the application and human machine selection)



Robot_Base: Joint manipulator standard version number.

RM_Version: The serial number of the industry version, which is used for version query and comparison. The latter code is the release date of the version.

System life: The values must add up normally and jump.

1.2. User Relevant

Scope of Use of IOAR

class	Input_I	Output_O	Assist_A	Register_R
scope	3000 ~ 4095	3000 ~ 4095	3000 ~ 4095	0~7999 (can not save) / 8000~9999 (can save)

Customize Human-Machine Content

Transfer the developed man-machine to the corresponding folder, and select-1 in the man-machine selection screen.

2. Linear Pursuit

The application can achieve the purpose of dynamic tracking by the arm according to the visual feedback offset and calculated conveyor belt speed without stopping the conveyor belt. It can be applied in follow-up grasping, follow-up placement and other situations.

2.1. I/O Configuration Definition

Input

I	A	definit-ion
2000	2000	The detected signal in the first group
2010	2010	The detected signal of the second group

Output

A	O	definit-ion
	2000	First group trigger recognition
	2001	The first set of ambient light sources
	2002	First group conveyor belt control
	2010	Group 2 triggers recognition

	2011	The second set of ambient light sources
	2012	Group 2 conveyor belt control
2030	2030	Quick Output 1
	2031	Quick output 2
	2032	Quick output 3
	2033	Quick Output 4
	2034	Quick Output 5

** It is being added according to industrial functions*

2.2. Parameter Setting

Input tracking _ Conveyor belt setup

编号	暂存器	说明	内容
A01	129123	运转速度根据【0:时间 1:编码回授 2:伺服驱动】	0
A02	129122	编码回授根据【0:无 7:U轴 8:V轴 9:W轴】	0
A03	129128	伺服速度根据【0:无 7:U轴 8:V轴 9:W轴】	0
A04	129125	伺服驱动-运转方向【0:正转 1:反转】	0
A05	129129	伺服驱动-运转速度【mm/min】	0
A06	129124	单位速度(mm/int)	0.00000
A07	129126	秒速度(mm/sec)	0.00
A08	129127	分速度(mm/min)	0.00

A01. Speed according to [0: Time 1: Code Feedback 2: Servo Drive] [Must restart]

0: Time. In the case of no encoder, the following speed is calculated based on the time velocity measurement

1: Encoding feedback. The following speed is calculated based on the value of encoding feedback

2: Servo drive. The conveyor belt is controlled by the servo, and the following speed is based on the servo synthesized speed

A02. Code feedback according to [0: None 7: U-axis 8: V-axis 9: W-axis] [Must restart]

0: No encoder feedback.

7/8/9: Encoding Feedback (U/V/W). The momentum is calculated using the encoding feedback values. Note that the encoding feedback must be a positive accumulation, and the speed value must be positive.

A03. Servo speed according to [0: None 7: U-axis 8: V-axis 9: W-axis] [Must restart]

0 : No servo drive

7/8/9: Servo drive (U/V/W) (moving speed is determined by servo speed)

Input Tracking-Options Settings

编号	暂存器	说明	内容
A01	129145	是否搭配视觉单元【0:否 1:是】	0
A02	129146	是否为串接设备的从机【0:否 1:是】	0
A03	129120	物件触发纪录方式【0:检知感测 1:固定距离】	0
A04	129135	检知感测延迟拍照距离(mm)	0.000
A05	129134	检知感测响应时间【MAX:10s】	0.0
A06	129121	固定距离触发_间隔移动距离(mm)	0

A01. Whether to match the visual unit [0: No 1: Yes]

The purpose is to provide a use in an environment where the source of materials is not offset and no visual unit is required. Compatibility is shown in the following table.

Periph-eral matching mode	No visual pairing		Pairing visuals	
	Time and speed	code	Time and speed	code
Detected trigger	●	●	●	●
Fixed distance trigger	○	●	●	●

● Software support ○ Software does not support

A02. Whether it is a slave of a serial device [0: No 1: Yes]

Set whether the manipulator is a slave (Slave) to the serial device.

Purpose to be used by the program to determine which queue information should be passed to the next connected device.

** The software only supports encoding mode*

A03. Object trigger recording mode [0: detect induction 1: fixed distance]

0. Detection and Sensing Trigger (sensor Triggered Identification).

1. Fixed Distance Trigger (trigger Identification by Coded Feedback Fixed Distance Trigger, Which Must Be Set to **06.**).

** Fixed distance trigger only works when paired with vision*

A04. Detection sensing delay camera distance (mm)

Set the distance between detection and visual camera position. When detection is sensed, the function of delay trigger will be performed according to the set value.

** Delayed camera distance only works when paired with vision*

A05. Sensor response time [MAX: 10s]

Set the range from 0.0 seconds to 10.0 seconds. After the start is detected within the set number of seconds, any floating ON-OFF signals will not be affected.

** Valid only under the software number I 2000*

A06. Fixed distance trigger _ Interval movement distance (mm)

If the setting value is 100.000, the conveyor belt will be photographed once when it moves 100mm.

编号	暂存器	说明	内容
B01	129130	装设工具数量【1 ~ 5】	1
B02	129107	装设工具对应动作 O 档 _ 设置起始编号	0
B03	129138	O档完成平移后关闭 DO【起始编号 >= DO 3000有效】	0
B04	129131	工具配置模式【0:装设工具循环 1:由物件样式P决定】	0
B05	129110	样式P_0的物品厚度【1mm ~ 100mm】	0.0
B06	129111	样式P_1的物品厚度【1mm ~ 100mm】	0.0
B07	129112	样式P_2的物品厚度【1mm ~ 100mm】	0.0
B08	129113	样式P_3的物品厚度【1mm ~ 100mm】	0.0

B01. Number of installation tools [1-5]

It is set according to the number of tools installed on the actual arm, with a maximum of 5 groups.

B02. Install tool and apply corresponding action file O Start number

The action file of the installation tool is edited by the program and exported as an O file number. One installation tool corresponds to one action O file. If there are multiple installation tools, the O file number must be a continuous number corresponding to tool 0 ~ tool 4.

B03. After the file is completed and moved, close DO [Starting number: ≥ DO 3000 valid]

When set to greater than or equal to 3000, the function is valid.

Close the set DO output after the O file is completed and the translation is finished.

** Suitable for glue following applications*

B03. Tool Configuration Mode [0: Tool Installation Cycle 1: Determined by Object Style P]

0: Multiple sets of tool actions to grasp an object according to the setting of the number of installation tools.

1: The installation tool group used is determined by the object identification result, which is used for the setup of various tools to capture various objects.

** When this parameter is set to 1, the abandon wait-following function is turned off and the single retrieval mode is maintained.*

B04. Thickness of items in style P_0 (1mm ~ 100mm)

** When the tool configuration mode is selected 0. The number of tools installed will only refer to the thickness of the item in P0.*

B05. Thickness of items in style P_ 1 (1mm ~ 100mm)

B06. Thickness of items in style P_2 (1mm ~ 100mm)

B07. Thickness of items in style P_ 3 (1mm to 100mm)

*15.16.17. Only when the tool configuration mode is selected 1. The thickness of the item set is valid if it is determined by the object style P.

Payment Tracking _ Tracking Settings

编号	暂存器	说明	内容
A01	129106	开始追随线上的取物工作座标系组次【0 ~ 9】	0
A02	129114	工作座标系套用视觉回传C偏移【0:套用 1:不套用】	0
A03	129100	视觉原点到开始追随线的距离【MAX:20000mm】	0.000
A04	129101	视觉原点到放弃追随线的距离【MAX:20000mm】	0.000
A05	129104	追随接触平移距离 X【5mm ~ 50mm】	0.000
A06	129103	追随接触下降距离 Z【5mm ~ 50mm】	0.000
A07	129102	工具O档完成时平移时间 S【0.0s ~ 5.0s】	0.0
A08	129109	追随离开平移距离 X【5mm ~ 50mm】	0.000
A09	129105	追随离开上升距离 Z【5mm ~ 50mm】	0.000
A10	129108	取物次数到达离开距离 Z【0mm ~ 200mm】	0.000

A01. Begin to follow the online reference point coordinate system group [0 ~ 9]

Refer to the group content setting of the coordinate system.

A02. Work coordinate system applies visual back projection C offset [0: applies 1: does not apply]

Select whether to apply the rotation offset of the visual return to change the working coordinate system.

A03. Distance from visual origin to start-following line [MAX: 20,000 mm]

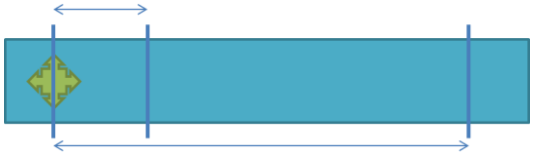
Status 1: There is a detection but no setting of [Detection Sensing Delay Shooting Distance]. Please set the distance from detection to the start line and the give-up line.

Status 2: When the detection is installed and the [Detection Sensing Delay Shooting Distance] setting is enabled. Please set the distance from the visual to the start line and the abandon line.

Status 3: Set a fixed distance to take a picture. Please set the distance from the visual line to the start line and the give up line.

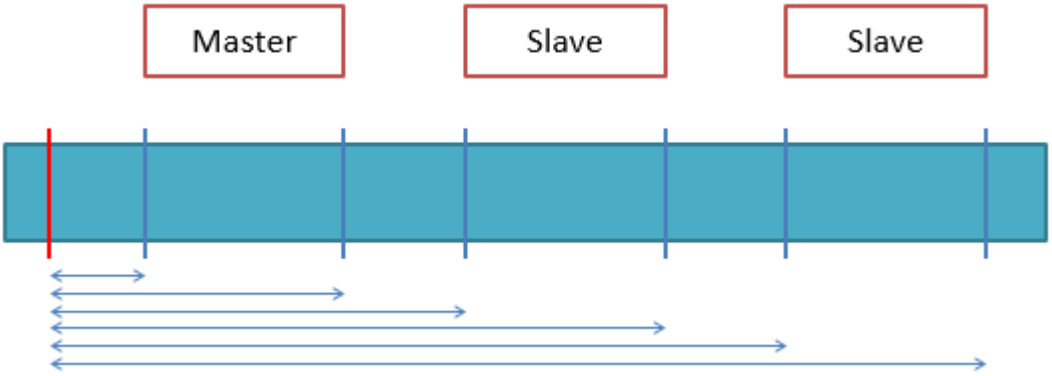
Status 4: If the serial device is used with a slave, set the distance between the start line and the give-up line detected by the host or visually started.

A04. Distance from visual origin to the abandonment line [MAX: 20,000 mm]



The green area is the visual identification center, the short distance is 02., and the long distance is 03..

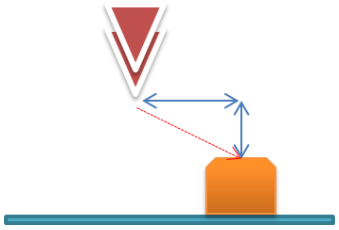
If the system is a serial device, the distance setting relationship of the slave machine.



The distance setting of the machine is calculated from visual identification of the origin or detection of the sensing point.

A05. Follow contact translation distance X [5mm ~ 50mm]

A06. Follow contact descent distance Z [5mm ~ 50mm]



According to the set depth of follow-down and translation length, the speed amplification ratio of the red line path is calculated by the system.

A07. Tool O The completion time of the translation S [0.0s ~ 5.0s]

After the tool is completed in the O file, follow the corresponding distance according to the set time.

A08. Follow the displacement distance X [0mm ~ 100mm]

Follow the target and set the tool to complete the X-directional translation distance.

A09. Follow the distance Z [0mm ~ 100mm] away from the rise

Follow the target and set up the tool to move upward after completion.

A10. The number of times to retrieve the object reaches the departure distance Z [0mm ~ 200mm]

When the number of times to retrieve reaches the set value of the number of installation tools, the distance away from the top.

The number of items taken is set according to the tool installed at the end, and the flag of the number of items taken follows the set value content of the tool installed at the end.

B01. Whether to give up waiting for the next object [0: No 1: Yes]

Reduces the waiting time for objects that have not been identified for a long time. Currently only available when the number of installed tools is greater than 1.

B02. Give up waiting to follow [MAX: 20s]

Related to **B01.** When enabled, the wait time can be set to a maximum of 20s. If no data is available after the set wait time, the wait will be abandoned and subsequent action processing will be performed directly.

B03. Number of flag operations per single flag [MAX: 10]

Set how many times you want to follow and retrieve an item before moving on to the next flag.

→ *Indicates the current number of executions and the maximum number of executions.*

** Suitable for visual recognition of a row of objects, and then individual follow-up applications based on offset*

B04. Number of flag execution times per single stroke coordinate system offset value Y [+-500mm]

Set the offset value between objects, and the system will adjust the follow offset position according to the current number of times the run flag is executed.

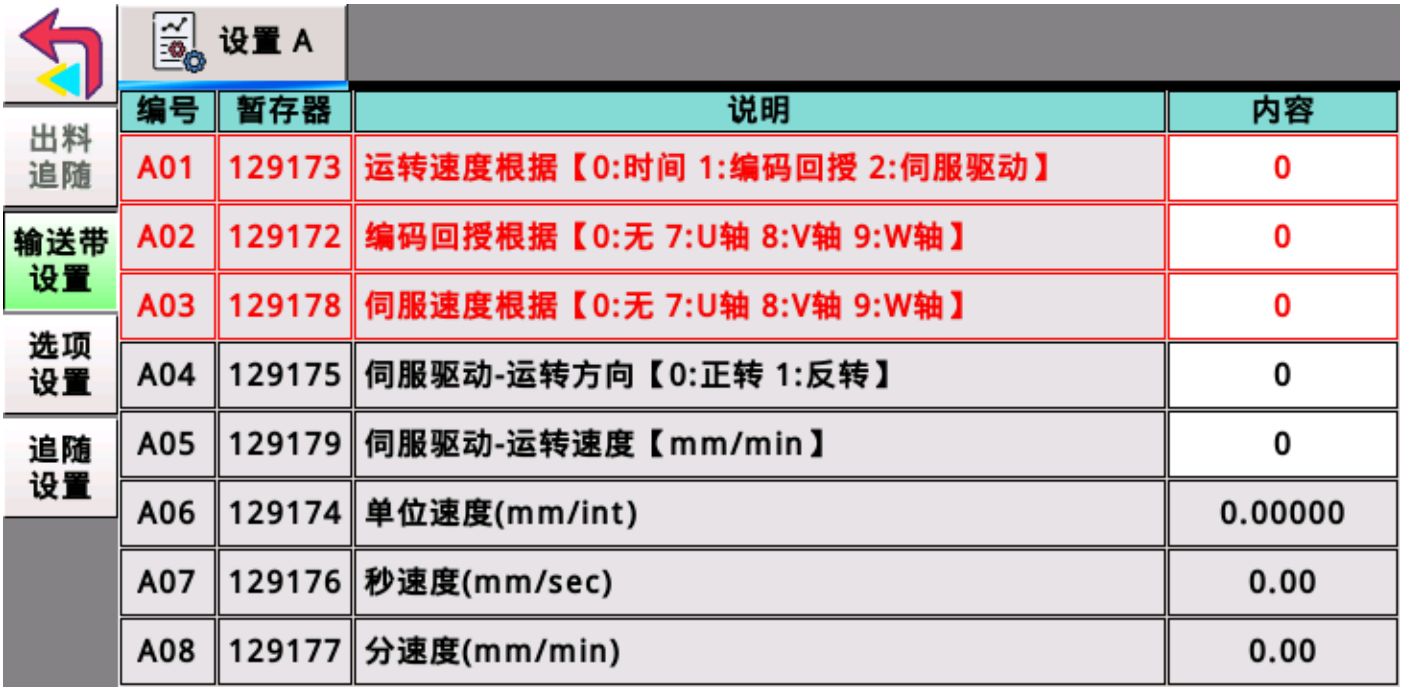
In the diagram, three object tracking placements will be performed within a single flag, so this item must set the origin of the coordinate system at the position of [Box 1] or [Box 3], and the offset value Y is set to a distance of +/ -Y according to the placement spacing.

Input Tracking_Application Settings

adhesive and dispense：

The coordinate system of the object in the record, and the offset of the dispensing position. This can be repeatedly verified by taking a point position to a point position.

Output Following _ Conveyor Belt Setup



编号	暂存器	说明	内容
A01	129173	运转速度根据【0:时间 1:编码回授 2:伺服驱动】	0
A02	129172	编码回授根据【0:无 7:U轴 8:V轴 9:W轴】	0
A03	129178	伺服速度根据【0:无 7:U轴 8:V轴 9:W轴】	0
A04	129175	伺服驱动-运转方向【0:正转 1:反转】	0
A05	129179	伺服驱动-运转速度【mm/min】	0
A06	129174	单位速度(mm/int)	0.00000
A07	129176	秒速度(mm/sec)	0.00
A08	129177	分速度(mm/min)	0.00

A01. Speed according to [0: Time 1: Code Feedback 2: Servo Drive) [Must restart]

0: Time. In the case of no encoder, the following speed is calculated based on the time velocity measurement

1: Encoding feedback. The following speed is calculated based on the value of encoding feedback

2: Servo drive. The conveyor belt is controlled by the servo, and the following speed is based on the servo synthesis speed

A02. Code feedback according to [0: None 7: U-axis 8: V-axis 9: W-axis] [Must restart]

0: No encoder feedback.

7/8/9: Encoding Feedback (U/V/W). The momentum is calculated using the encoding feedback values. Note that the encoding feedback must be a positive accumulation, and the speed value must be positive.

A03. Servo speed according to [0: None 7: U-axis 8: V-axis 9: W-axis] [Must restart]

0 : No servo drive.

7/8/9: Servo drive (U/V/W). The moving speed is determined by the servo speed

Output Following _ Options Settings

A01. Whether to match the visual unit [0: No 1: Yes]

The purpose is to provide a use in an environment where the source of materials is not offset and no visual unit is required. Compatibility is shown in the following table.

Periph-eral matching mode	No visual pairing		Pairing visuals	
	Time and speed	encoding	Time and speed	code
Detected trigger	●	●	●	●
Fixed distance trigger	○	●	●	●

● **Software support ○ Software does not support**

A02. Object trigger recording mode [0: detect induction 1: fixed distance]

0. Detection and Sensing Trigger (sensor Triggered Identification).
1. Fixed Distance Trigger (trigger Identification by Coded Feedback Fixed Distance Trigger, Which Must Be Set to **06.**).

** Fixed distance trigger only works when paired with vision*

A03. Detection sensing delay and photo distance (mm)

Set the distance between detection and visual camera position. When detection is sensed, the function of delay trigger will be performed according to the set value.

** Only works when paired with a visual unit. 01. Works when set to 1*

A04. Sensor response time [MAX: 10s]

Set the range from 0.0 seconds to 10.0 seconds. After the start is detected within the set number of seconds, any floating ON-OFF signals will not be affected.

** Valid only under the software number I2010*

A05. Fixed distance trigger_ Interval movement distance (mm)

If the setting value is 100.000, the conveyor belt will be photographed once when it moves 100mm.

Output Tracking _ Tracking Settings

编号	暂存器	说明	内容
A01	129156	开始追随线的取物参考点座标系组别【0 ~ 9】	0
A02	129150	视觉原点到开始追随线的直线距离【MAX:20000mm】	0.000
A03	129151	视觉原点到放弃追随线的直线距离【MAX:20000mm】	0.000
A04	129154	追随动作平移距离【5mm ~ 50mm】	0.000
A05	129153	追随动作下降距离【5mm ~ 50mm】	0.000
A06	129152	工具O档完成后平移距离 X【0mm ~ 100mm】	0.000
A07	129155	工具O档完成后离开距离 Z【0mm ~ 100mm】	0.000
A08	129158	取物次数到达离开距离 Z【0mm ~ 200mm】	0.000

A01. The coordinate system group of the reference point for starting to follow the line [0 ~ 9]

Refer to the group content setting of the coordinate system.

A02. Distance from visual origin to start follow line [MAX: 20000mm]

Status 1: There is a detection but no setting of [Detection Sensing Delay Shooting Distance]. Please set the distance from detection to the start line and the give-up line.

Status 2: When the detection is installed and the setting [Detection Sensing Delay Shooting Distance] is enabled. Please set the distance from the visual to the start line and the give-up line.

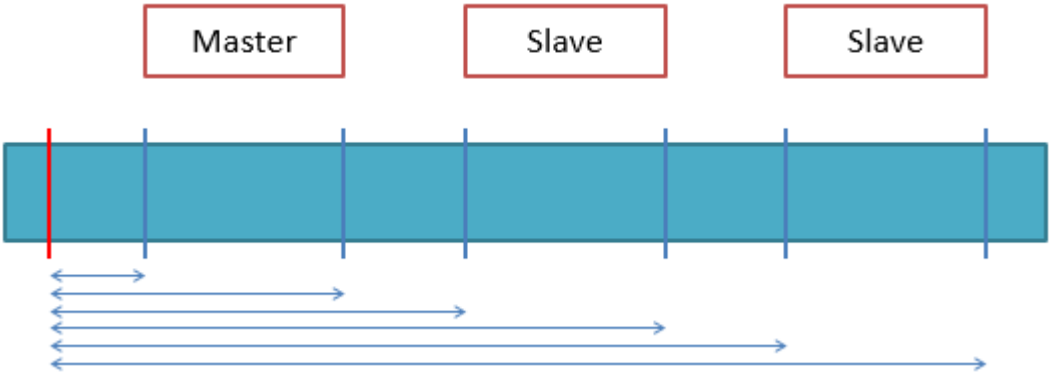
Status 3: Set a fixed distance to take a picture. Please set the distance from the visual line to the start line and the give up line.

Status 4: If the serial device is used with a slave, set the distance between the start line and the give-up line detected by the host or visually started.

A03. The straight-line distance from the visual origin to the abandoned follow line [MAX: 20,000 mm]

The green area is the visual identification center, the short distance is 02., and the long distance is 03..

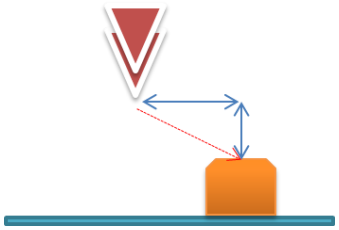
If the system is a serial device, the distance setting relationship of the slave machine.



The distance setting of the machine is calculated from visual identification of the origin or detection of the sensing point.

A04. Follow action translation distance [5mm ~ 50mm]

A05. Follow the action down distance [5mm ~ 50mm]



According to the set depth of follower descent and translation length, the distance between red line and follower moving speed are calculated by the system.

A06. After completing the action in O mode, perform a translation distance of X [0mm to 100mm].

Follow the target and set the tool to complete the X-directional translation distance.

A07. After completing the action O mode, move away from distance Z [0mm ~ 100mm]

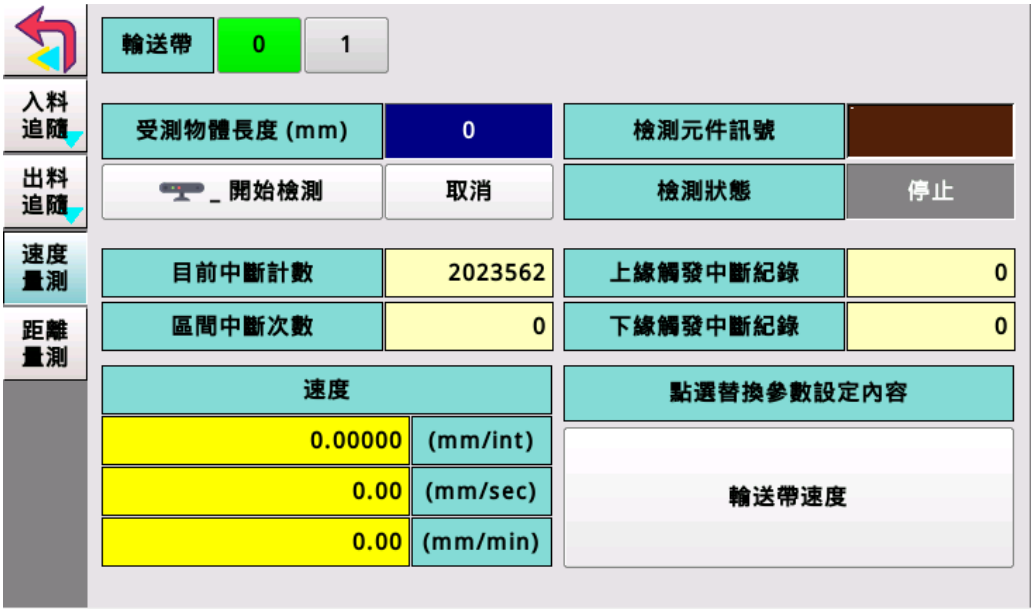
Follow the target and set up the tool to complete the upward departure distance.

A08. The number of times to retrieve the object reaches the departure distance Z [0mm ~ 200mm]

When the number of times to retrieve reaches the set value of the number of installation tools, the distance to leave upward.

The number of items to be taken is set according to the tool installed at the end, and the flag of the number of items to be taken follows the value set by the tool flag.

2.3. Speed Measurements



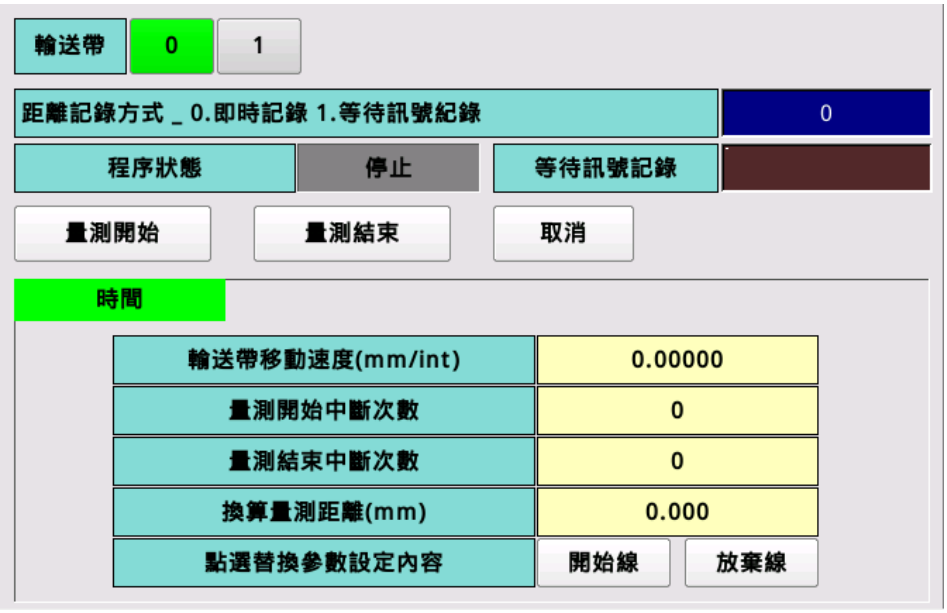
The system will calculate the moving speed of the conveyor belt according to the set object length and detect the object moving on the conveyor belt. The calculated result can determine whether to replace the current speed reference value according to the situation.

mode of operation：

Start detection → Wait for items to pass through the detection component → Select whether to replace conveyor belt speed.

2.4. Distance Measurement

Time and speed patterns

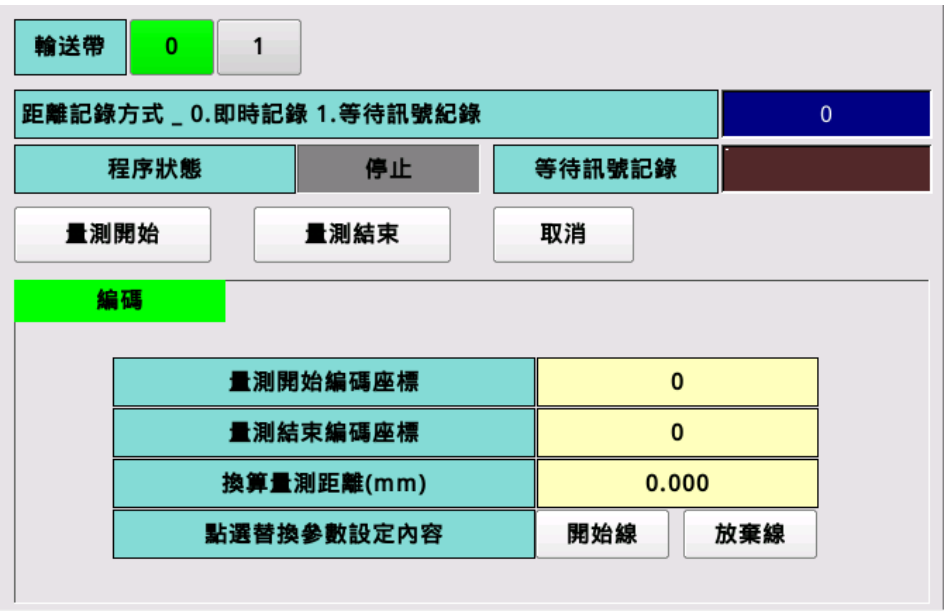


After the measurement starts, it will refer to the moving speed of the conveyor belt and record it until the end of the measurement, and convert the distance moved. You can use the shortcut key to replace the Settings of the start line or the abandon line.

mode of operation：

Start measurement → End manual measurement when the measurement is complete according to the recording method → Replace the starting line or abandon the line.

Coding backfeed mode (U/V/W)



After the measurement starts, record the coordinates of the measurement start code and the coordinates of the measurement end code according to the recording mode, and convert the distance moved,

You can use the shortcut key to replace the Settings of the start line or the abandon line.

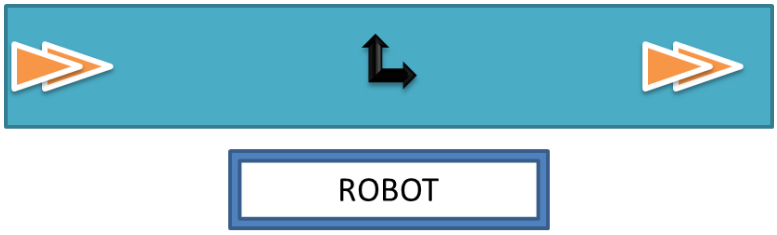
mode of operation：

Start measurement → End manual measurement when the measurement is complete according to the recording method → Replace the starting line or abandon the line.

2.5. Work Coordinate Calibration

Coordinate system inner pages

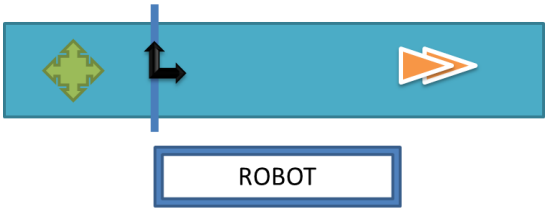
Rule: The moving direction of the conveyor belt is the X+ direction of the working coordinate system.



According to the direction of the conveyor belt, the working coordinate system must also be set as the X+ direction according to the direction of the conveyor belt, according to the right hand coordinate

The system determines the Y+ direction of the working coordinate system.

Origin calibration of working coordinate system:



The origin of the working coordinate system should be calibrated at the intersection of the following start line and the horizontal centerline of the conveyor belt, and it should be flat on the plane of the conveyor belt. When the three points of the coordinate system are P0, P1 and P2 respectively as X+ and Y+, P1 and P2 need to follow the horizontal direction and vertical direction of the conveyor belt.

2.6. Queue

W	佇列資訊					R
0	參照	偏移 X	偏移 Y	偏移 C	P	0
0	0	0.00	0.00	0.00	0	0
1	0	0.00	0.00	0.00	0	1
2	0	0.00	0.00	0.00	0	2
3	0	0.00	0.00	0.00	0	3
4	0	0.00	0.00	0.00	0	4
5	0	0.00	0.00	0.00	0	5
6	0	0.00	0.00	0.00	0	6
7	0	0.00	0.00	0.00	0	7
8	0	0.00	0.00	0.00	0	8
9	0	0.00	0.00	0.00	0	9

-Two sets of queue information-

Provide a list of 100 groups (0~99) of queues, and write the current visual identification value sequentially according to flag [W].

The content to be written serves as a reference for identifying the current state (two types of references are selected based on object movement: interruption or encoding values), followed by the object's offset X.Y.C. Similar to style P.

2.7. Order

In the file "Yu Teach", there are demonstration examples for users to refer to. **Example name:** Ex_RM_Follow.tch

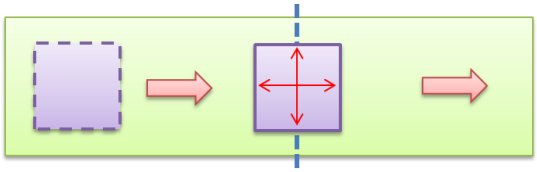
Action description:

When executing a program automatically, the system first sets the **queue synchronization flag** (to abandon previously identified data from that point onward). Subsequently, **call action programs (O files)** can be inserted as needed. Before the main loop actions, an **entry point label** should be added to serve as the entry point for loop operations. This allows internal planning of initiating preceding action program calls and following completion action program calls. After completing an action cycle, the program jumps to the **entry point label** through **jump instructions**.

2.8. Shakedown Test

#1 Follow the center of gravity shift

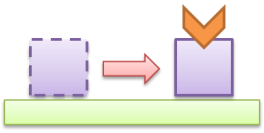
#1.1. Correct and adjust the offset error of identifying the center position, and provide XY C offset error adjustment.



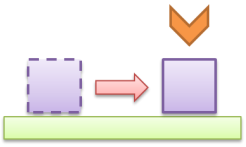
Timing: When the follower starts, the target passes through the starting line. After the object/thing condition is achieved, if the action position is not in the center of the target, increase or decrease the offset distance in XY C direction according to the current situation to make the action position close to the center.

#1.2. Correct the offset gap of the contact during the following process.

Linear pursuit



*(excessive exposure to targets; **Z+** adjustment)*

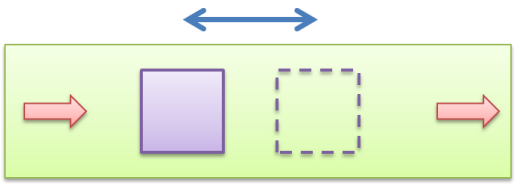


*(No contact with the target; **Z-adjustment**)* **When using:** Follow the movement to the target. When picking up or putting things down, if you touch the target too deeply (overpressing the object), it will add positively;

If it does not reach the target, it accumulates negatively.

#2 Pre-positioning distance_X

The purpose is to correct the offset error caused by the continuous forward movement of the target on the conveyor belt during the movement of the arm. This parameter will be advanced to the front of the object before starting to follow.



Usage Scenario: This parameter corrects excessive tracking offset errors caused when the arm's initial positioning distance exceeds the target's vertical height during object retrieval or placement tasks. Once configured, it pre-positions the arm in front of the target to initiate tracking when conditions are met. **The parameter balances dual displacement errors from both the robotic arm and conveyor belt movements**. *(Note: Increased set distance proportionally extends the waiting period for tracking initiation)*

FIRST: If the number of objects taken is 1, the distance taken is the pre-positioned distance. If the number of objects taken is> 1, it only applies to the first object, because the first object usually takes a longer distance to reach.

NEXT: If the number of items taken is 1, this setting is invalid. If the number of items taken is> 1, it only applies to the objects after the first object. Because the movement after the first object is much smaller than the first object, the working time is shortened and the overall efficiency is improved.

2.9. From Machine Synchronization

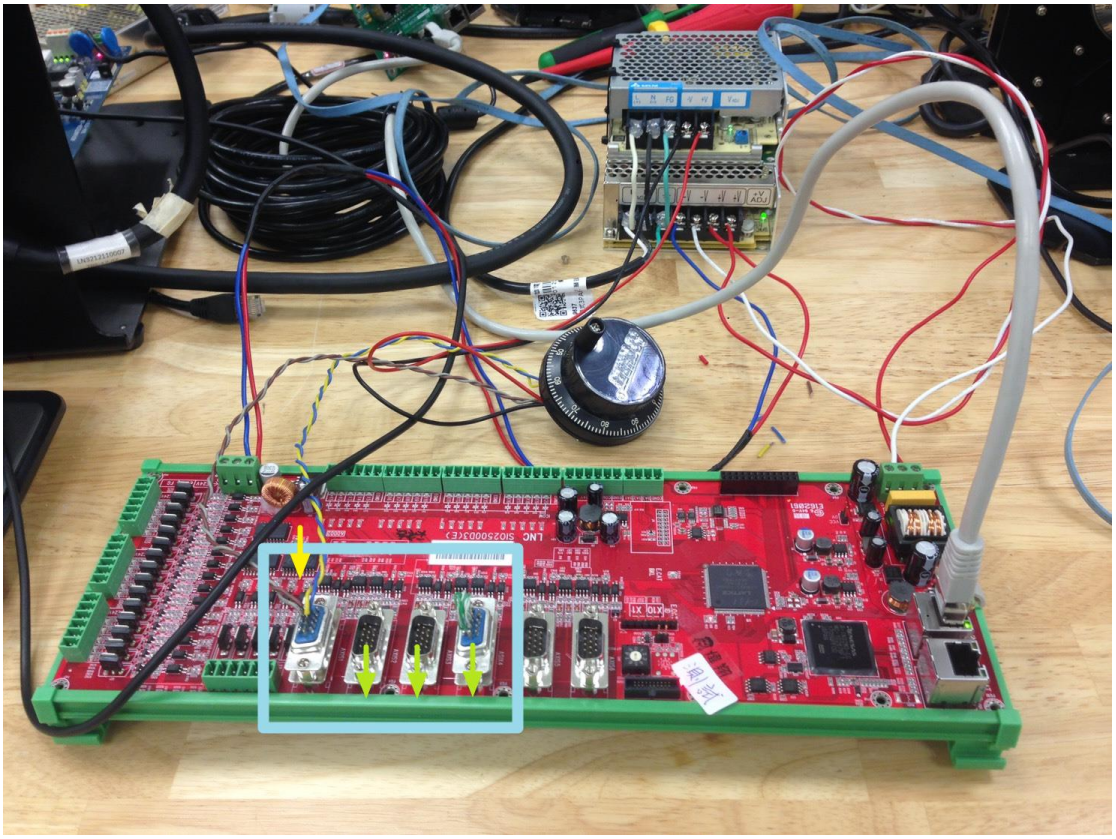
Hardware Architecture

※ The software only supports encoding mode.

* Controllers for specific models are required to distribute external encoders to connected device controllers simultaneously. (To be verified by development)

Original architecture: The system is read by means of RS485

New plan 1:



The yellow arrow represents the input of the [external encoder].
The green arrow represents [pulse wave output].

The purpose is to distribute the signal from the [external encoder] to the other three axes for output, so that the mechanical hand on the conveyor belt can encode the signal synchronously.

The original way of using RS485 port to receive coded signal on the host side remains unchanged.

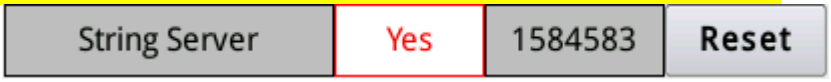
It simply changes the source of the encoded signal from the [external encoder] to one of the axial [pulse output] ports (green arrow).

!! This card is only for this purpose!!

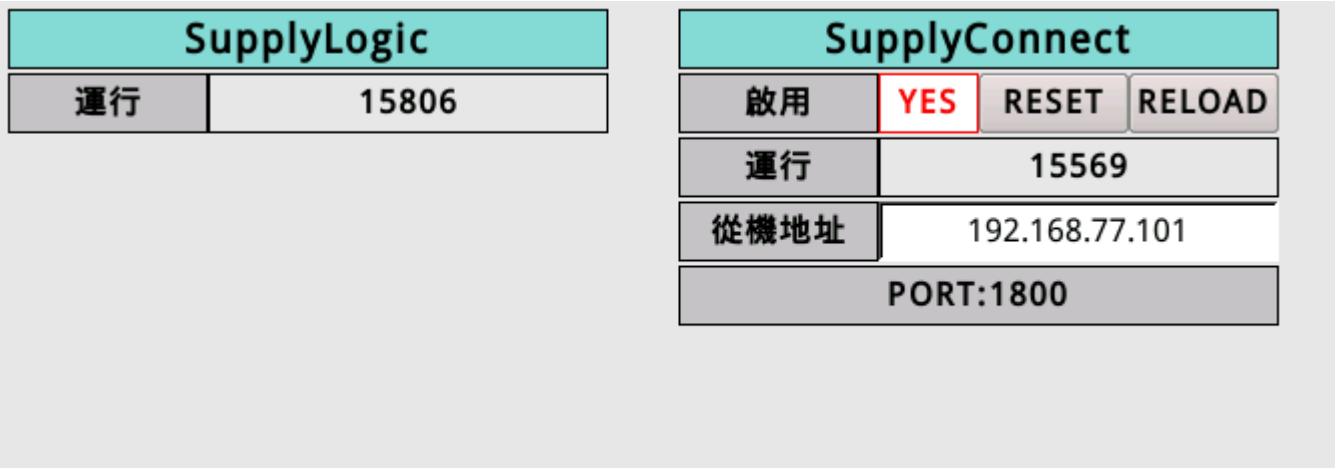
Computer Setup

You need to wake up the underlying execution file to connect with the slave.

*** Please first determine whether the slave machine is properly enabled for String Server communication protocol.**



Page Settings:



SupplyLogic: Internal execution files that are continuously monitored after startup.

SupplyConnect: The function takes effect after reboot. The same is true for the function turned off.

Reload RESET: Will re-execute the Settings and attempt to connect online. When the running value stops accumulating, please confirm whether the String Server function of the slave is properly enabled and perform a rebuild action.

Rebuild RELOAD: reload the executable file and attempt to connect online.

Operation count: Under normal online conditions, the value will be accumulated at a speed of 50ms. If there is a delay in the accumulation speed or a stop, it indicates that there is a problem in the online.

From the Fleet Queue

Content placement The upper controller gives up a maximum of 30 pieces of data.

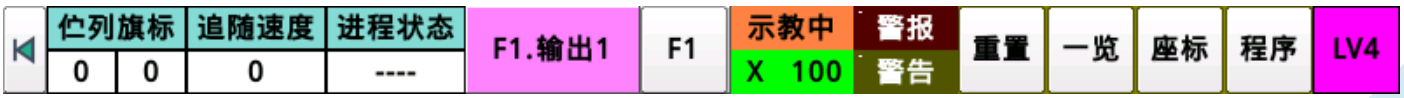
Write	NO.0~9	Read	Write	NO.10~19	Read	Write	NO.20~29	Read
0	0	0	10	0	10	20	0	20
1	0	1	11	0	11	21	0	21
2	0	2	12	0	12	22	0	22
3	0	3	13	0	13	23	0	23
4	0	4	14	0	14	24	0	24
5	0	5	15	0	15	25	0	25
6	0	6	16	0	16	26	0	26
7	0	7	17	0	17	27	0	27
8	0	8	18	0	18	28	0	28
9	0	9	19	0	19	29	0	29

There are two modes of transmission.

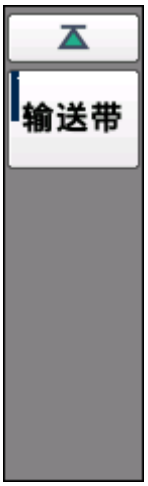
Host → Slave: When the host runs the judgment to give up, it sends the Read flag number in the queue to the slave and increases the Write flag of the slave by ++.

Slave → Slave: When a slave is running to abandon, it retransmits the contents of the Read flag number in the slave queue to the slave and increments the Write flag of the slave by + 1.

2.10. Quick Applications



Status prompt and F1 output items on the upper page.



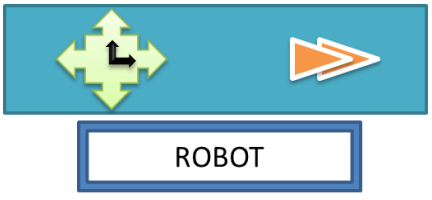
Quick output block, currently only provides conveyor belt quick output keys.

2.11. Visual Setup

protocol

This page is based on the visual IP/PORT number and the string content to be handed over.

Visual coordinate system



The left side of the diagram is the visual identification area and visual coordinate system, and the right side is marked as the forward direction of the conveyor belt

Rule: To establish the visual coordinate system, it is necessary to follow the direction of the working coordinate system of the arm and the moving direction of the conveyor belt as the X+ direction.

Visual Backcast Rule

The dynamic tracking function is mainly used to sequentially fill a series of identification data into the queue list and execute it in the first-in-first-out manner. The feedback value of the serial data: (N: composed of multiple sets of XYCP)

Example: N=1.12_2.12_3.22_0_4.55_2.11_2.33_1, ***(contains two object data entries)***

N = var.x_var.y_var. c_var. p,(Note)

Visual Feedback Precautions

存活偵測字串	ns
存活偵測間隔	2000

To ensure that the communication program is always in a situation where data is handed over, the system will send a valid string to the Server. The Server must respond to any string content to ensure that the communication connection is not reconnected due to timeout.

remarks：

200 units per camera

Visual response format description: The field is represented by "letter code + bit address", "=" represents continuation, "number group" represents content, and "," represents the end of individual data. Example

P0=1,X0=1.23,Y0=4.11,C0=12.333,

Place 1 in the P0 field, 1.23 in the X0 field, 4.11 in the Y0 field, 12.333 in the C0 field. Possible letters

P： pattern

X：X coordinate

Y：Y coordinate

Z：Z coordinate

A：A coordinate

B：B coordinate

C：C coordinate

S：S scheme

L: Barcode. For example: L=12345ADLSD,

N: Multiple groups of XYCP composition. For example: N=1.12_2.12_3.22_0_4.55_2.11_2.33_1,

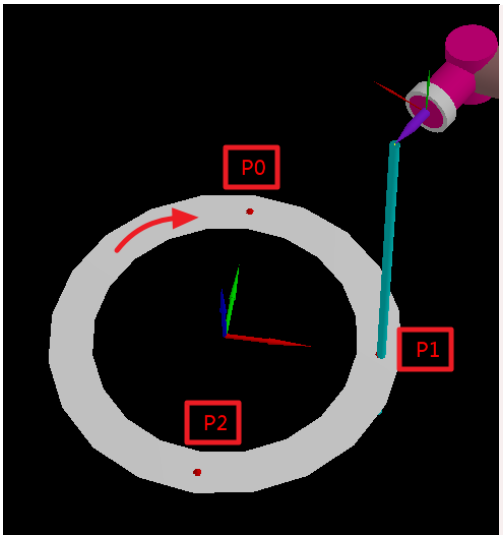
3. Arc-Shaped Following

It is used for the arc following function under the disk transfer equipment or the arc conveyor belt transfer equipment. The main functions are extensions of the straight line function, and some of them can be referenced to the content of the straight line following function.

3.1. Arc Formation

Purpose: To obtain the center of circle, radius, and establish the coordinate system of the center of circle.

Method: Calculate the P0, P1 and P2 points on the arc path as far as possible.



	P0	P1	P2	ArcCoor	Center
X	-1200.049	-845.905	-845.916	-1198.890	-1039.106
Y	353.424	0.791	0.808	0.441	160.905
Z	1350.014	1350.023	1350.053	1350.020	1190.508
A	149.998	149.999	149.999	0.000	Radius
B	89.995	89.996	89.997	179.998	297.33
C	-0.002	-0.000	0.000	-90.188	
	取	取	取		
	到	到	到		

-20 推算 試跑

The meaning given by the flag code:

[1] Calculate the center and radius → [10] Success [-10] Error.

Error message: The result is unreasonable! Please confirm that the P0, P1 and P2 of the arc path are calculated in the center coordinate system → [20] successfully [-20] error.

Error message: The result is unreasonable! Please confirm that the arc coordinate system reference P0 P1 [21] is used for the arc path around the arc [trial run].

3.2. Arc Follower Setting

A01. Arc path direction [0: reverse arc 1: forward arc]

Set the direction of arc equipment operation.

A02. Arc path Angle [MAX: 90°]

Set the maximum angle of the trajectory. The arc-shaped P0 is calculated starting from zero degrees. **A03. Disc radius (mm)**

The actual disc radius is used to calculate the ratio of the outer circumference to the actual motion circumference.

A03. Arc plane height adjustment (mm)

Adjust the plane of the arc to meet the action requirements.

編號	暫存器	說明	內容
B01	129100	參考點到弧零度開始追蹤的距離【MAX:20000mm】	0.000
B02	129101	弧零度開始追蹤到放棄追蹤的角度【MAX:90°】	70.000
B03	129104	追蹤動作平移角度【5° ~ 50°】	5.000
B04	129103	追蹤動作下降距離【5mm ~ 100mm】	99.000
B05	129102	工具O檔完成時平移角度【1° ~ 50°】	1.000
B06	129105	工具O檔完成時離開距離 Z【0mm ~ 100mm】	50.000
B07	129108	取物次數到達離開距離 Z【0mm ~ 200mm】	0.000

B01. Reference point to arc zero start follow distance [MAX: 200000mm]

Taking a smooth arc as an example: For a zero-degree arc (P0), set the distance to 0 before the reference point; otherwise, set a reasonable distance. **B02. The angle from when the arc starts tracking to when it stops tracking [MAX: 90°]**

Set the object to move to the maximum Angle from which it can no longer follow.

B03. Follow action translation angle [5 ° to 50°]

Start tracking the timing of the motion as it moves sideways, which will be accompanied by a downward motion.

B04. Follow the action down distance [5mm ~ 100mm]

Start tracking the distance of the action as it drops, which will be combined with the translation.

B05. Tool O: Translational Angle upon Completion [1 ° ~ 50°]

The Angle of translation when the action tool O is executed.

B06. When the tool is completed in the O position, leave a distance Z [0mm ~ 100mm]

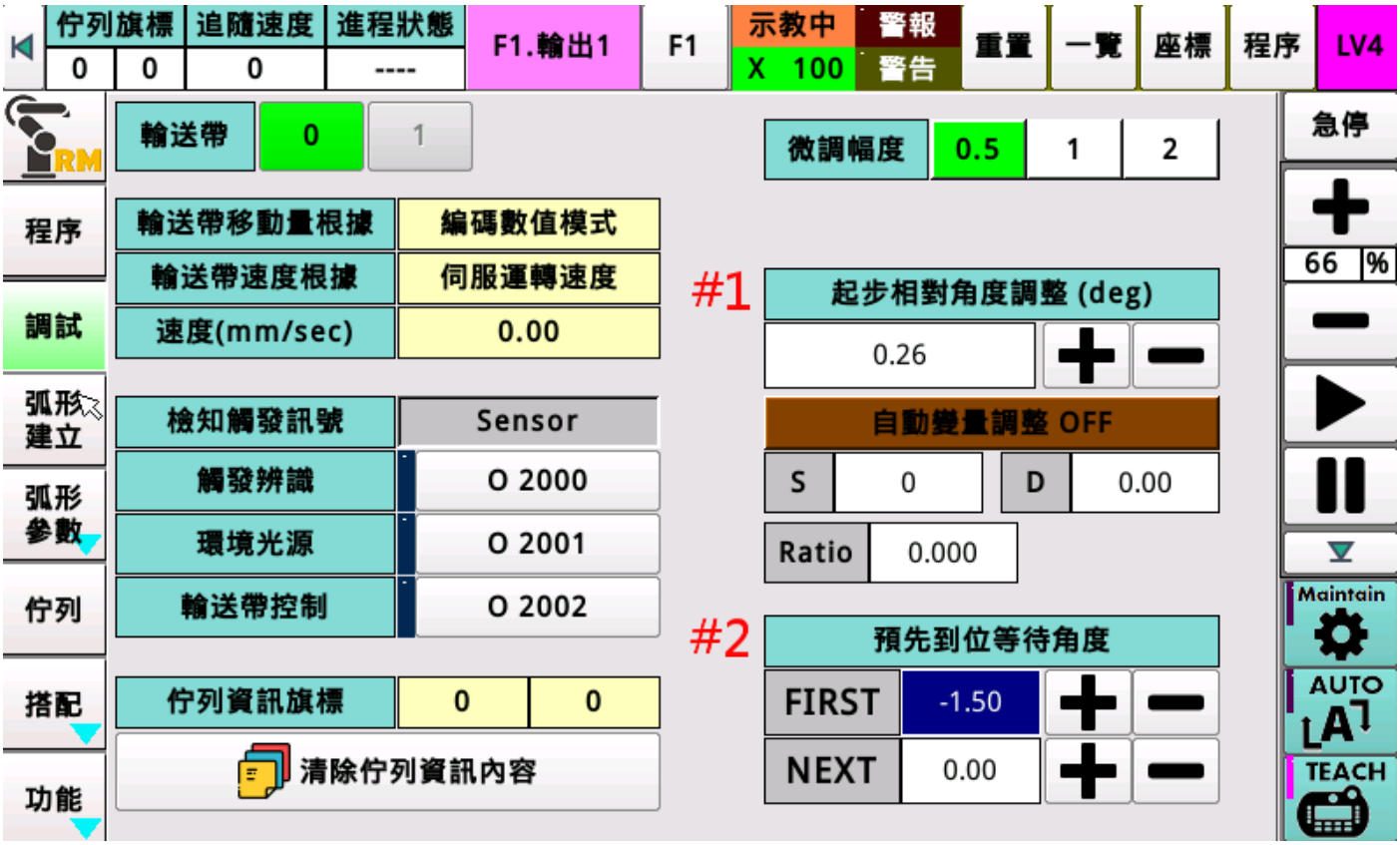
When the action tool is completed at O, the distance away.

B07. The number of times the object is taken reaches the distance Z [0mm ~ 200mm]

When multiple items are taken, the distance from which to leave after the number of items is taken.

Other Settings and program editing can be referenced in the Line Follow chapter.

3.3. Shakedown Test



#1 Starting relative Angle Adjustment

The purpose is to fine-tune the timing of the initial follow-up action.

[Automatic variable adjustment ON/OFF]

When it is turned on, the relative Angle of departure and the current speed value are recorded once. When the speed changes, the relative motion Angle is adjusted according to the Ratio proportion.

#2 Pre-positioning Angle

This section may be consulted with reference to the chapter on linear following, which contains a detailed explanation of its purpose.

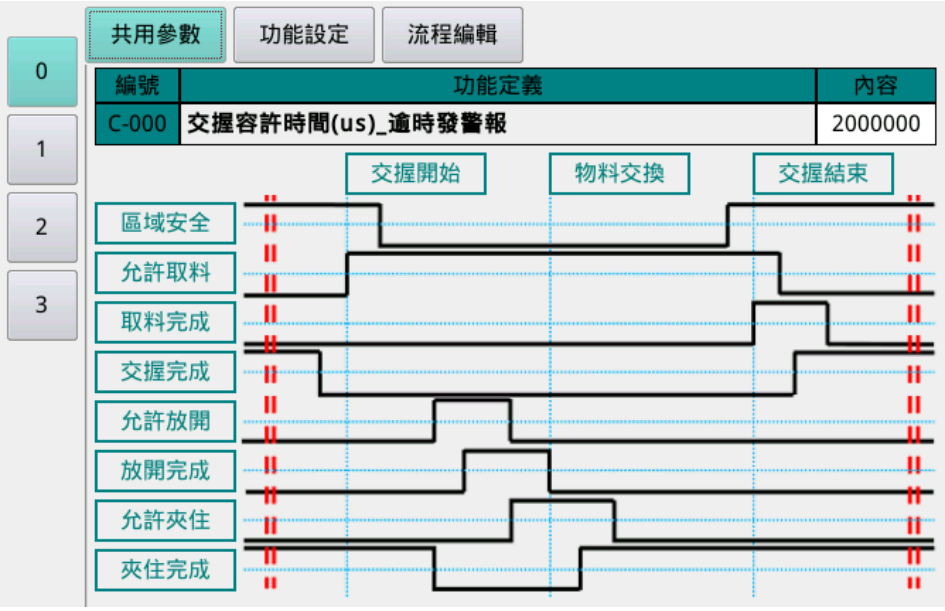
4. Crossing Paths Online

Preface

To better meet the operational requirements of loading and unloading operations for robotic arms in machine tools such as lathes, milling machines, and injection molding machines, a safety gripping standard based on the Euromap67 protocol has been developed. Through configuration settings in the online interface, users can efficiently edit online gripping actions.

4.1. Binding Settings

Function Settings



C-000. Shared parameter: interlock allowable time (us) timeout alarm

Note that you enter the unit. If you want to set 2 seconds, enter 2000000.

L-000. Interlocking program function_0~3 (0: off 1~8: reference interference zone group 0~7)

0: Close the handshake program.

1~8: Pair the image group of interference zone 0~7 as the safety area notification.

L-001~005. Equipment end → Safety signal scanning for manipulator

0: It is enabled by default. The scan security signal starts after the program starts and the handshake begins.

1: Turn off and do not scan the security signal.

Junction I/O/A Configuration

EUROMAP 67										
第1組		第2組		第3組		第4組		協定	一般機台說明	注塑機說明
A	I	A	I	A	I	A	I			
301	301	351	351	401	401	451	451	EUROMAP67	緊急停止：ZA1	緊急停止：ZA1
302	302	352	352	402	402	452	452	EUROMAP67	緊急停止：ZA2	緊急停止：ZA2
303	303	353	353	403	403	453	453	EUROMAP67	安全門：ZA3	安全門：ZA3
304	304	354	354	404	404	454	454	EUROMAP67	安全門：ZA4	安全門：ZA4
305	305	355	355	405	405	455	455	EUROMAP67		
306	306	356	356	406	406	456	456	EUROMAP67	取料完成：ZA6	關模完成：ZA6
307	307	357	357	407	407	457	457	EUROMAP67	允許取料：ZA7	開模完成：ZA7
308	308	358	358	408	408	458	458	EUROMAP67		
309	309	359	359	409	409	459	459	EUROMAP67		
310	310	360	360	410	410	460	460	EUROMAP67		
311	311	361	361	411	411	461	461	EUROMAP67		
312	312	362	362	412	412	462	462	EUROMAP67	交握模式：ZB2	自動模式：ZB2
313	313	363	363	413	413	463	463	EUROMAP67	夾住完成：ZB3	頂針退回：ZB3
314	314	364	364	414	414	464	464	EUROMAP67	鬆開完成：ZB4	頂針前移：ZB4
315	315	365	365	415	415	465	465	EUROMAP67		中子1前進：ZB5
316	316	366	366	416	416	466	466	EUROMAP67		中子1後退：ZB6
317	317	367	367	417	417	467	467	EUROMAP67		中子2前進：ZB7
318	318	368	368	418	418	468	468	EUROMAP67		中子2後退：ZB8

第1組		第2組		第3組		第4組		協定	一般機台說明	注塑機說明
A	O	A	O	A	O	A	O			
501	501	551	551	601	601	651	651	EUROMAP67	緊急停止：A1	緊急停止：A1
502	502	552	552	602	602	652	652	EUROMAP67	緊急停止：A2	緊急停止：A2
503	503	553	553	603	603	653	653	EUROMAP67	區域安全：A3	模區安全：A3
504	504	554	554	604	604	654	654	EUROMAP67		
505	505	555	555	605	605	655	655	EUROMAP67		
506	506	556	556	606	606	656	656	EUROMAP67	取料完成：A6	允許關模：A6
507	507	557	557	607	607	657	657	EUROMAP67		
508	508	558	558	608	608	658	658	EUROMAP67		
509	509	559	559	609	609	659	659	EUROMAP67		
510	510	560	560	610	610	660	660	EUROMAP67		
511	511	561	561	611	611	661	661	EUROMAP67		
512	512	562	562	612	612	662	662	EUROMAP67	交握模式：B2	機器人操作模式：B2
513	513	563	563	613	613	663	663	EUROMAP67	允許夾住：B3	允許頂針退回：B3
514	514	564	564	614	614	664	664	EUROMAP67	允許鬆開：B4	允許頂針前移：B4
515	515	565	565	615	615	665	665	EUROMAP67		允許中子1前進：B5
516	516	566	566	616	616	666	666	EUROMAP67		允許中子1後退：B6
517	517	567	567	617	617	667	667	EUROMAP67		允許中子2前進：B7
518	518	568	568	618	618	668	668	EUROMAP67		允許中子2後退：B8

Crossed Editor

Through 20 sets of step editing Settings, the interlocking action flow is pieced together **left side flow:**

The operation mode of the class procedure page is to assign items to modify the referenced point record points or change the call O file name number.

Right-hand menu:

1. finish	7. Material transfer completed	13. Neutron 1 backtracks	19. Neutron 4 backsliding
2. Joint record	8. Tap forward/allow to release	14. Neutron 2 forward	20. Neutron 5 forward
3. world record	9. Pin retracts/allows to clamp	15. Neutrino 2 Backlash	21. Neutrino 5 Backlash
4. Release action	10. miscellaneous exercises	16. Neutron 3 forward	
5. Collection action	11. ignore	17. Neutrino 3 Backlash	
6. Allowing refueling	12. Neutron 1 forward	18. Neutron 4 forward	


The upper five elements.

Last row.

Next line.

The lower five elements.

abouchem

delete 。

Secondary fields:

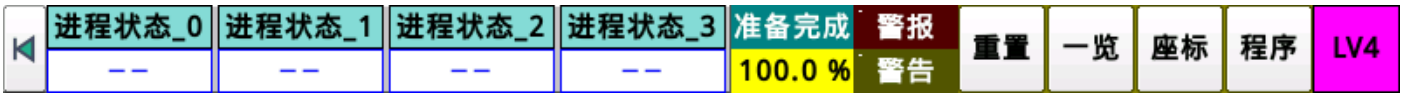
Provide the number assigned to the input joint record or world record; or call the number of the O file.

4.2. Order

In the file "Yu Teach", there are demonstration examples for users to refer to. **Example name:** Ex_RM_Handshake.tch

In this example, four devices are linked together to perform the online handshake action in conjunction with the interactive editing steps of the online page.

4.3. Quick Applications



The upper page provides the process status display during program execution. (It is displayed only when online use setting is enabled)

5. Mats/Stacks

5.1. Matrix-Position and Attitude

Point form

點位型式	點位型式	點位型式
世界座標系+三點	工作座標系+三點	工作座標系+直交

(The setting of the point form directly affects the content within the spacing setting, so please refer to 3-2. Spacing Setting)

Motor post-ure

Record the ABC posture (end-effector angle configuration) during robotic arm operation matrix calibration. The system can utilize this posture data to access pre-recorded motion profiles.

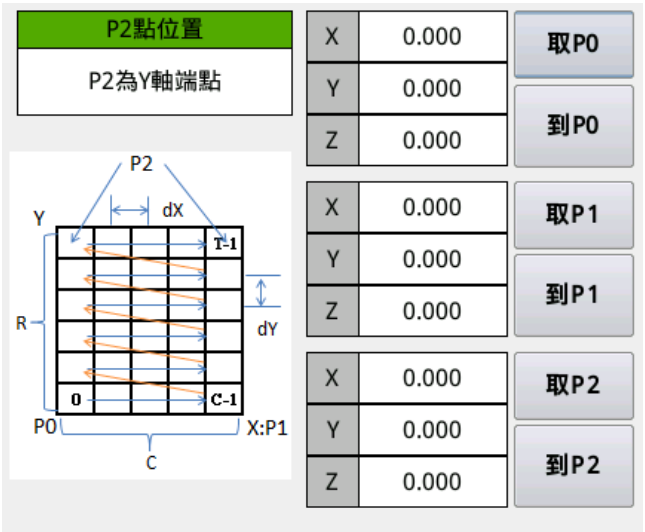
Use the transition point

This feature can be enabled or disabled to determine whether a transition point is required to enter the matrix to avoid the risk of collision.

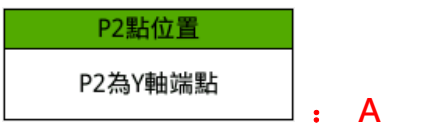
(The recorded coordinate content is determined by the point form coordinate system content)

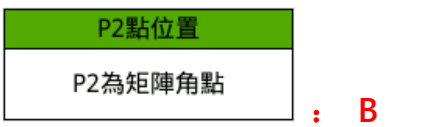
5.2. Matrix-Spacing Setting

Three Points

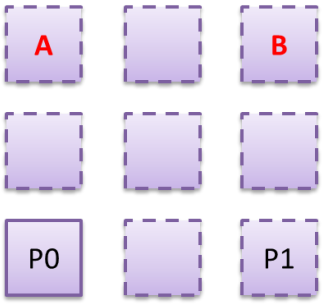


The obtained point coordinates will be determined according to the coordinate system content set in the **point form**.





The way to set the pixel element at P2 after setting is shown in the figure below:

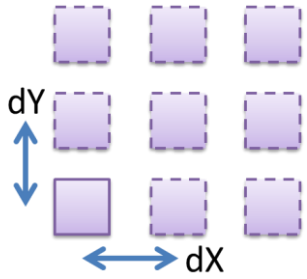


Vertical Type

Select the working coordinate system in point position form + orthogonal

dX (mm)	0.000
dY (mm)	0.000

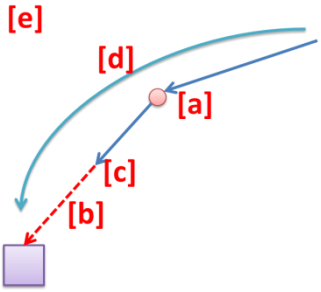
Directly set the offset value of the object center and the x and y directions of the object center in the matrix.



5.3. Matrix-Run Parameters

Entry point setting and planning

進入點		慢速距離	過渡半徑
X	0.000	0.000	0.000
Y	0.000	接觸速度	慢速延時
Z	0.000	0	0



[a]: The entry point is set. The incremental coordinates of the matrix target point are set to determine the position of the entry point.

[b] Slow distance setting: start slow contact action according to contact speed, and move direction according to the vector direction of the entry point position.

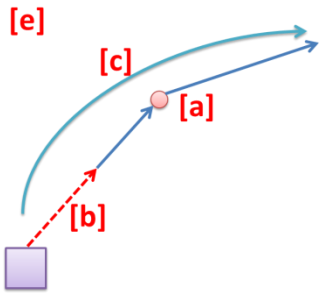
[c] Slow delay setting, which sets the delay time at slow distance from the entry point.

[d] Transition radius: The position of the entry point is modified by the arc transition according to the size of the transition radius set.

[e]: Fast speed, the speed at which the matrix is run.

Setting and Planning of Departure Points

離開點		慢速距離	過渡半徑
X	0.000	0.000	0.000
Y	0.000	離開速度	快速速度
Z	0.000	0	0



[a]: The departure point is set. The incremental coordinates of the matrix target point are set to determine the starting position of the departure point.

[b]: Slow distance setting starts from the departure speed and moves in the direction of the vector at the departure point.

[c] Transition radius: The position of the departure point is modified according to the size of the transition radius to make an arc transition.

[e]: Fast speed, the speed at which the matrix is run.

End Effector Action Call

Call O file:

末端效應器動作檔	呼叫O檔	1000

The call O number must be between O1000 and O9999.

Call the G file:

末端效應器動作檔	呼叫G檔	10000

The call G file number must be above G10000.

Usage rule: The program screen editor tool program needs to be enabled. After the matrix target point is in place, the call program will be started.

Note: The call action program must be operated carefully. When the matrix is in place, it will call the numbered program set in the matrix. Therefore, action errors or no movement often occur after the matrix is in place.

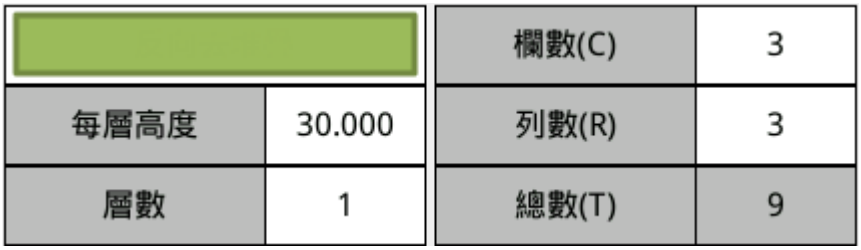
5.4. Matrix-Elements

The matrix content is stacked in a forward order according to the setting.

The Matrix Content Is Reversed and Destacked According to the Setting, Starting from the Maximum Value of the Target.

Element Settings

Set the relevant parameters according to the contents of the table, where each layer height is the item height.



Numbered Cache

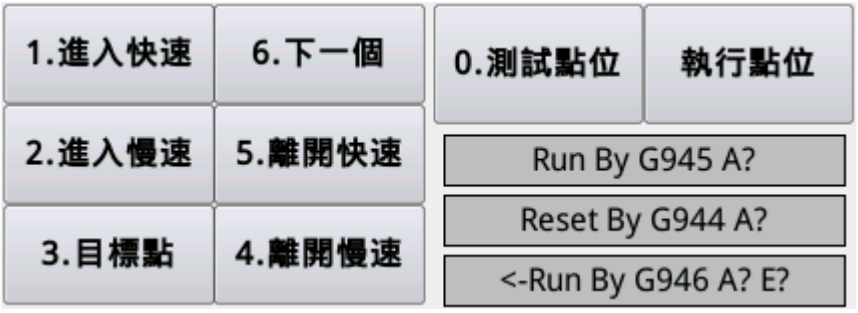
R23470: Displays the matrix number currently in action.

R109042: Displays the matrix number of the action currently completed.

R23480: Displays the matrix hierarchy number of the current calculation. **R109015:** Displays the matrix hierarchy number of the current action completed.

motion tests

According to the following operation keys, the initial action is confirmed and adjusted. *(Valid in teaching mode, long press action)*



Based on the current hierarchy content and the current numbering content action.

5.5. Matrix-Programs

In the file "Yu Teach", there are demonstration examples for users to refer to.

Example name: Ex_RM_Matrix.tch

matrix reset instruction with labels and jumps

It can be implemented in this way, as shown above. *(If you do not need to clear it, you do not need to add it)*

Action description:

When the program executes, it clears the matrix data using a **reset command** and designates a **label** as the entry point for the loop. The subsequent **rapid** and **linear** instructions simulate actions preceding matrix operation initiation. Upon completion of preparatory actions, the system initiates **matrix operations** based on current hierarchy and numbering. Upon reaching target positions, it immediately calls the **end effector action module**. Post-arrival processing follows through post-processing procedures, then proceeds to **matrix completion** evaluation. Finally, the program **jumps** to the designated label to complete each cycle of operational execution.

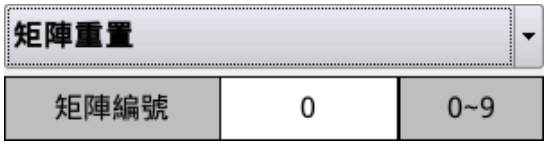
Matrix Process Instructions

Matrix action:

Set the matrix number setting and the R buffer address with a uniform offset.

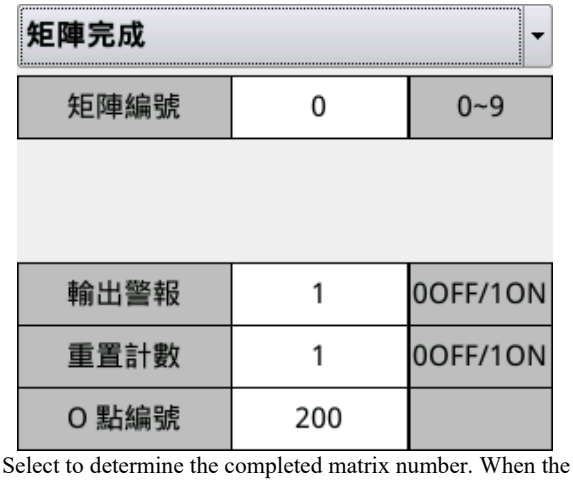
If no offset is required, the cache preference does not need to be filled in.

Matrix reset:



Select the matrix number to reset.

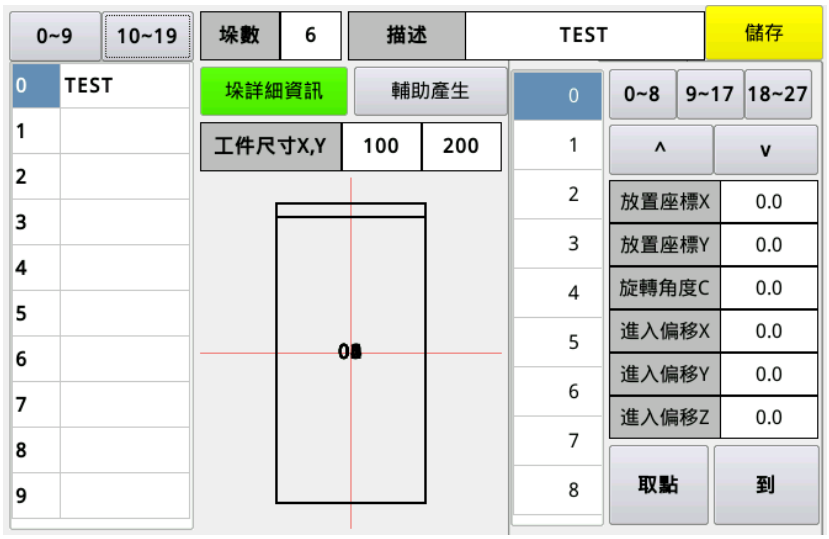
Matrix completion:



Select to determine the completed matrix number. When the matrix is determined to be completed, it will output an alarm based on the value set below the figure above, reset the count, and output when matrix number 200 is completed at point O. *(If not used, there is no need for the value below)*

5.6. Mado-Typography

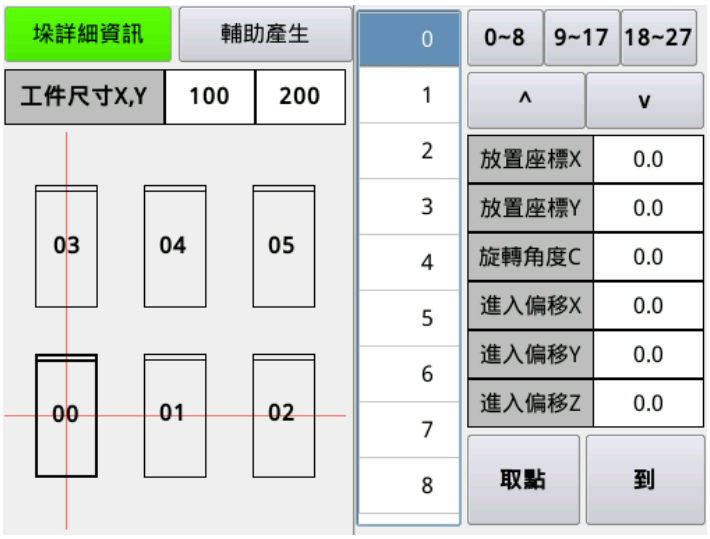
Using the **container setting**, the inner page setting stack mode is included, including stack configuration and specified processing of marking outward side; in the **stack** setting, configure the style of stack level and operation configuration, so as to quickly complete the stack operation.



Provides 20 Stack Configurations. Each Configuration Contains the Number of Stacks, Stack Description, Appointment Screen Display, and **Stack Details** and **Auxiliary Generation** of the Content Page.

** Internal coordinate information is all in the working coordinate system*

Stack details



The maximum number of stacks is 28.

Screenshot preview:

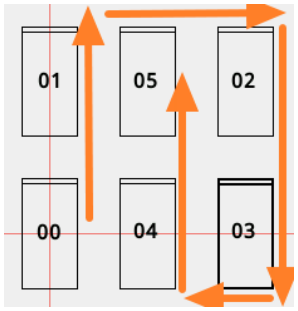
The arrangement after stacking can be previewed directly in the picture, and **the double lines** are open direction or label direction.

Stacking Directive List:

A maximum of 28 stack information displays and modifications can be provided.

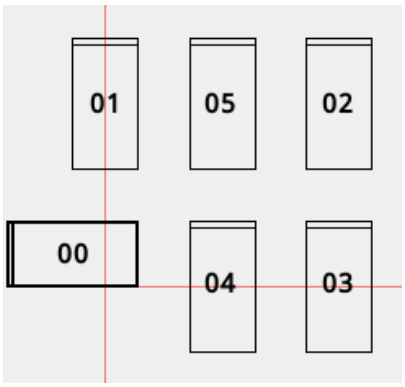
Stack order adjustment:

Refers to adjusting the order of stacking, starting from 0 and stacking in sequence.



As shown in the figure, this is the order of arrangement.

Adjust coordinate data:

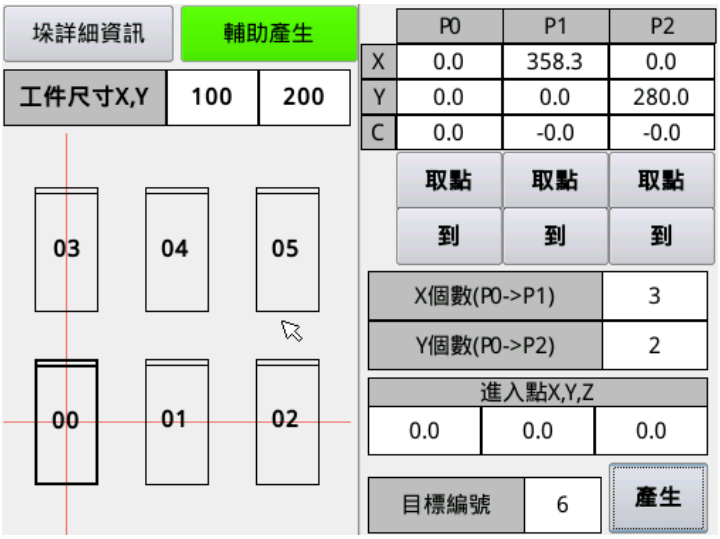


Taking the first stack object as an example, you can modify the generated coordinate content into the actual required **coordinate position and angle**. In addition, you can set the **entry offset position (incremental coordinates)** for each stack object. Additionally, you can actually operate the arm to the target position to **take a point** and record the actual coordinates.

Entering the offset:

The purpose of this setting is that the entry points of each stack position will be different because they need to move inward toward the stack body. Therefore, it is subdivided into the information of various stack objects to control the entry direction during placement. *(entry direction and vector direction of three-point coordinates)*

Assist in Production



P0, P1 and P2 take point records:

Similar to the way points are taken in the matrix, **P0** is the first pallet position in the stack and also the origin of the working coordinate system, **P1** is the last pallet position extending in the X direction of the working coordinate system, and **P2** is the last pallet position extending in the Y direction of the working coordinate system.

X, Y number:

X個數(P0->P1)	3
Y個數(P0->P2)	2

Enter the stacking mode on the pallet, the number of X direction and the number of Y direction, the multiplier of which is the number of stacks.

X, Y and Z entry point setting:

進入點X,Y,Z		
60.0	0.0	0.0

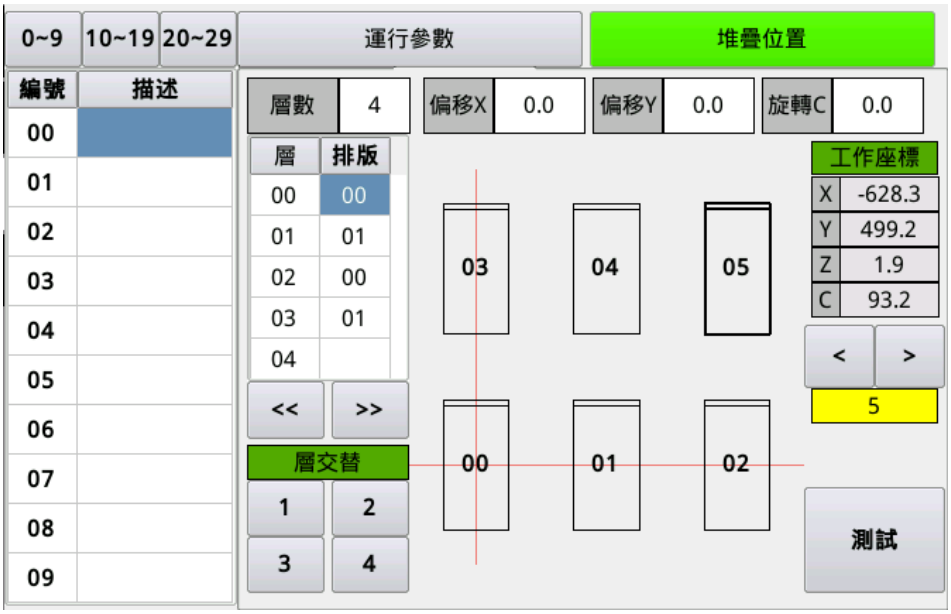
After setting, it will be synchronized directly to the entry offset of each stack object. Then adjust according to **the detailed information of the stack**.

produce：

目標編號	0	產生

The **setting information** is generated in sequence starting from target number 0.

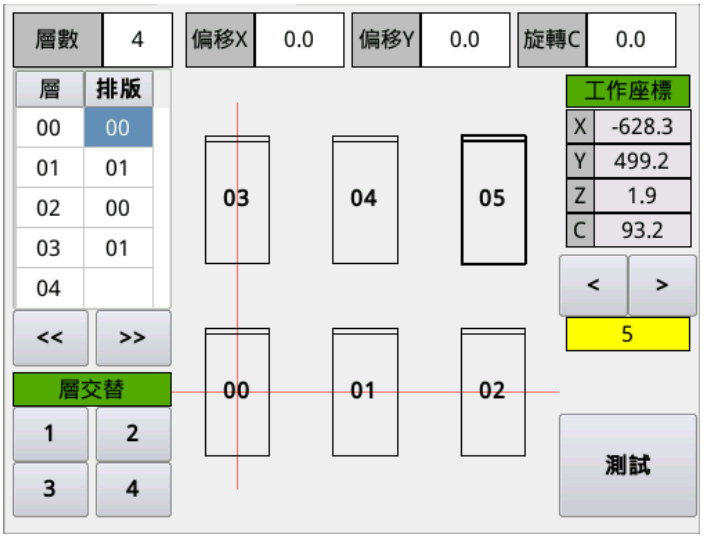
5.7. Mado-Stack



(Up to 30 pallet sample combinations can be edited)

The content includes group setting, stack layer setting, layer alternation setting, and point position action test.

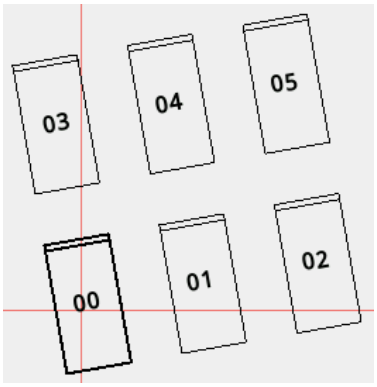
Stack Position



(The maximum number of floors is set to only provide 20 floors.) **Floor placement offset setting correction:**

偏移X	10.0	偏移Y	10.0	旋轉C	10.0

The setting example means that each layer is offset from the work coordinate system X_10mm, Y_10mm, C_10 degrees.



This value is adjusted according to the error in each layer.

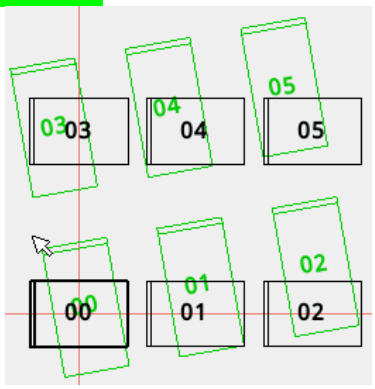
Typesetting Settings List:

層	排版
00	00
01	01
02	00
03	01
04	00

Click the left number to specify which group of numbers to reference for the stack content on each layer.

Click the field on the right to preview the introduced stack setting number content and set the offset of the layer.

Preview screen:

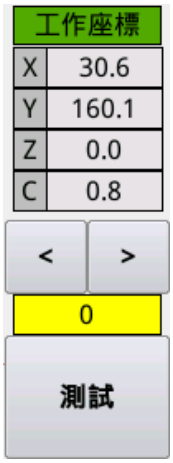


The black preview shows the current selected stack setting content; the green preview shows the stack setting content of the upper layer.

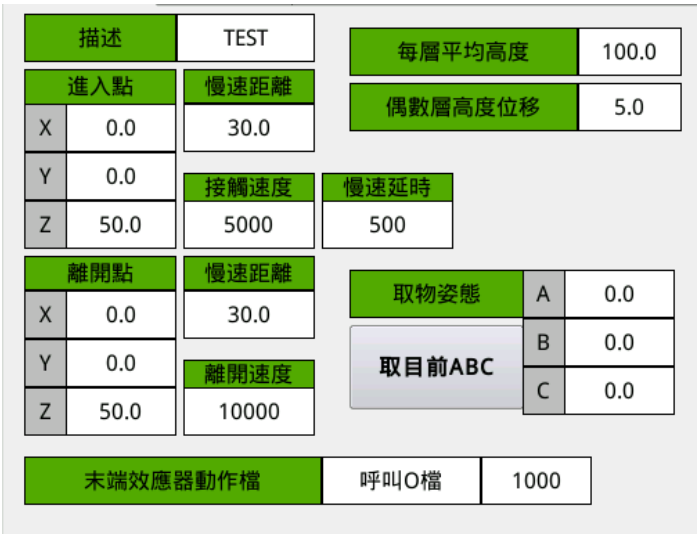
Layer alternation:

This function can quickly specify the layout content of each layer according to the content of 00 layer, 01 layer, 02 layer and 03 layer, and according to the current number of layers.

Point test:



In tutorial mode, you can select the stacking number of the current layout content. Long press the test button to enable the action. **Operation parameters**



5.8. Macho-Program

In the file "Yu Teach", there are demonstration examples for users to refer to. **Example name:** Ex_RM_Stack.tch

If you want to clear the current stack operation information when the program restarts, you need to use the stack reset instruction with the label and jump mode, as shown in the figure above. *(If you do not need to clear it, you can leave it out)*

Action description:

When the program executes, it clears the matrix data using a **matrix reset instruction** and designates a **label** as the entry point for the loop. The subsequent **rapid** and **linear** instructions simulate actions preceding matrix execution. After completing preparatory actions, the system initiates **matrix operations** based on current hierarchy and numbering. Upon reaching target positions, it immediately calls the **end effector action module**. Post-arrival processing follows through with post-processing procedures, then proceeds to **matrix completion** evaluation. Finally, the program **jumps** to the label to conclude each cycle of operational execution.

Mado Process Instructions

Stack application actions:

Set the group number of the stack action and the flag number after completing the action. The flag number is written as 1 after the stack action is completed,

When the action is repeated, it is written as 0. There is no need to write this number as 0 again.

Push the application's initial Settings: (written before label 0)

Application group number (0~9): This function is designed to store the number of groups to be stacked and the forward and reverse directions in this number, so as to echo the number group in the application action of the stack.

Stack group number(0~29): Corresponds to the 0~29 group number in the stack page and runs the set content of the number. **R(129900+2xA):** This field does not need to be filled in, provided for user lookup.

R129900 represents the current implementation tier for group 1.

R129901 represents the current number of executions in the first group.

By extension, 2R is a group of levels and subgroups.

Stack application reset:

Clears the temporary information in the corresponding group number (the number of layers and items stacked). If the reset is not performed, an alarm will occur because the record after the last stack completion has not been properly cleared.

5.9. Quick Applications

Matrix number shows increase or decrease

The group selection field allows users to choose from groups numbered 0-9. The system then displays the total matrix count, current execution hierarchy, and active execution ID for that group. During matrix operations, when object transfer errors or exception exceptions occur, users can perform addition/subtraction on IDs after completing preparation. This functionality enables seamless navigation between previous and subsequent operations.

Stack stack group shows the current operation level/number and execution level/number