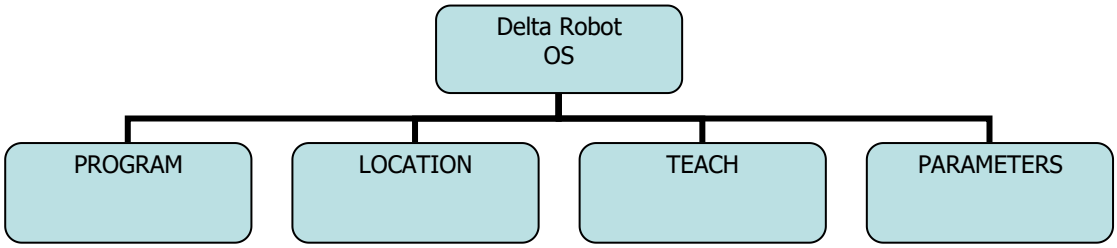
Delta Robot Program Manual

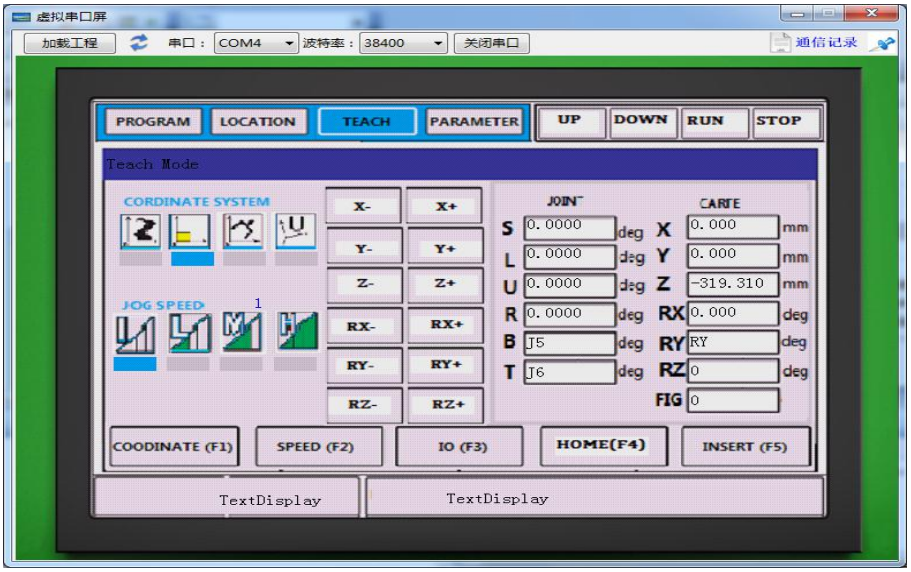
一、 Program introduction



The robot is driven by the program, and the program can be written in the teach pendant.（Teaching-Programming Pendant）or PC virtual teach pendant

Teach Pendant:

PC virtual teach pendant:



The programming interface is divided into four main parts: PROGRAM (program) screen, LOCATION (location) interface, TEACH (teaching) screen and PARAMETER (parameter) interface.

二、PROGRAM (program)interface

The main menu includes 3 parts:

Command display area, operation area and status bar.

1、 The command display area displays all the instructions of the current document and displays the current execution line.

2、 The operation area，LOAD（load file）、SAVE（save file）、EDIT（edit program）、INSERT（insert command）and DELETE（delete command）4 parts。

LOAD： Load the program file;

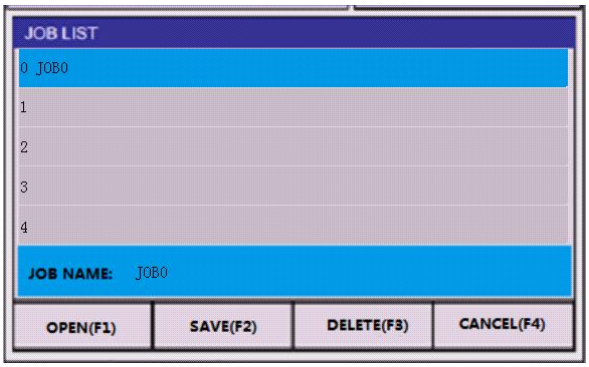
SAVE： Save program file;

EDIT： Edit current command;

INSERT： Insert an instruction before the selected command line;

DELETE： Delete the currently selected instruction;

"LOAD"and SAVE are file operation buttons, click to pop up JOB LIST (program list) interface:



This interface can do OPEN、SAVE、DELETE CNACEL for files operation.

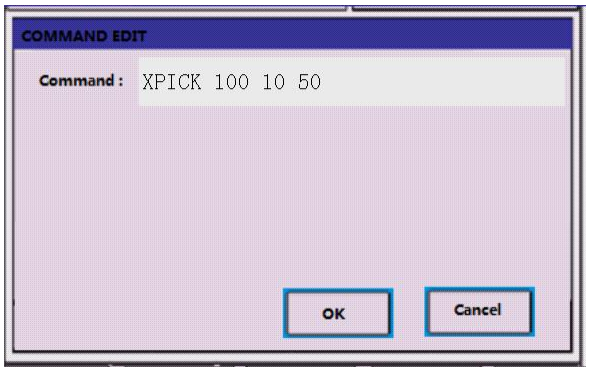
OPEN： Open the selected program file;

SAVE： Save current program file;

DELETE： Delete selected program files;

CNACEL： Cancel and exit the current interface。

3、 Click“EDIT”and“INSERT“buttons then it’s will pop up COMMAND EDIT interface：



EDIT： Refers to editing to modify the currently selected instruction;

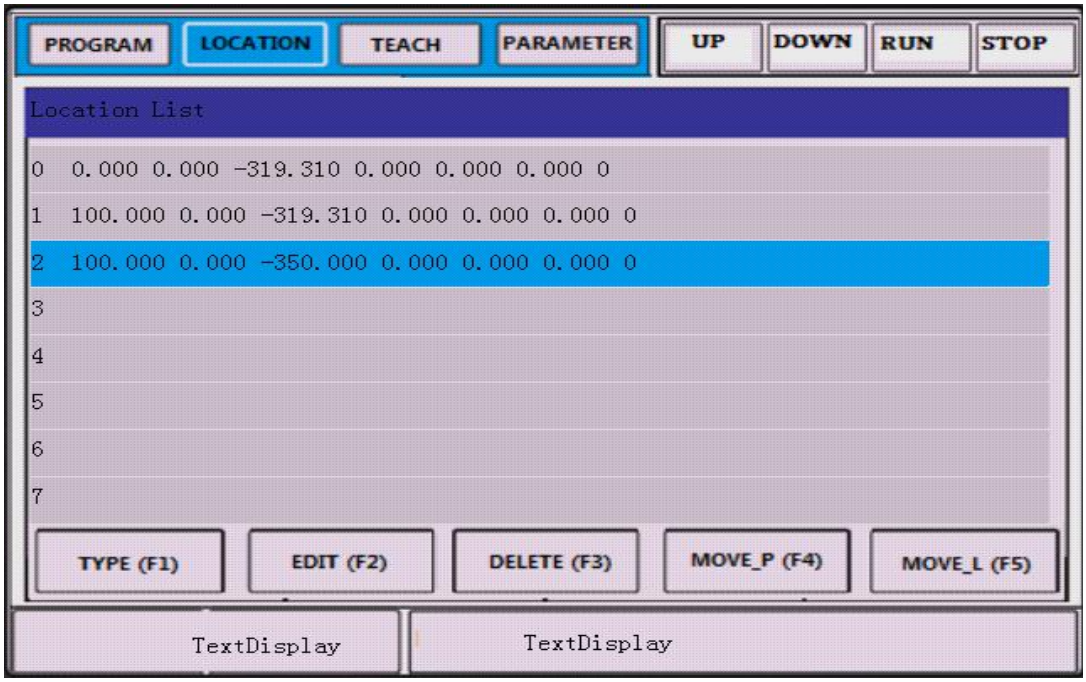
INSERT： Means inserting a new instruction before the selected command line。

DELETE： Delete the currently selected command line。

Specific detailed programming instructions refer to "Programming Instruction Manual v1.0"

Note: In the upper right corner“UP“、"DOWN“ for Jump line or page down button，"RUN“、"STOP“for Motion execution and stop button。

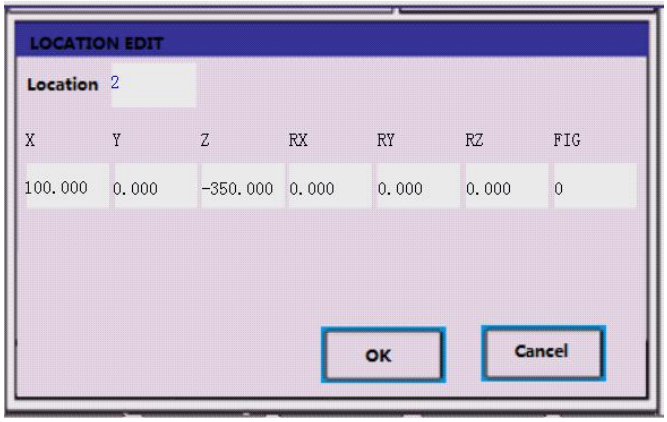
三、LOCATION interface



The six parameters in the display area are the position values of the each axes.

TYPE（coordinate mode）： Relative Mode（Axis joint coordinate）or Coordinate Mode;

EDIT：Pop up LOCATION EDIT interface:



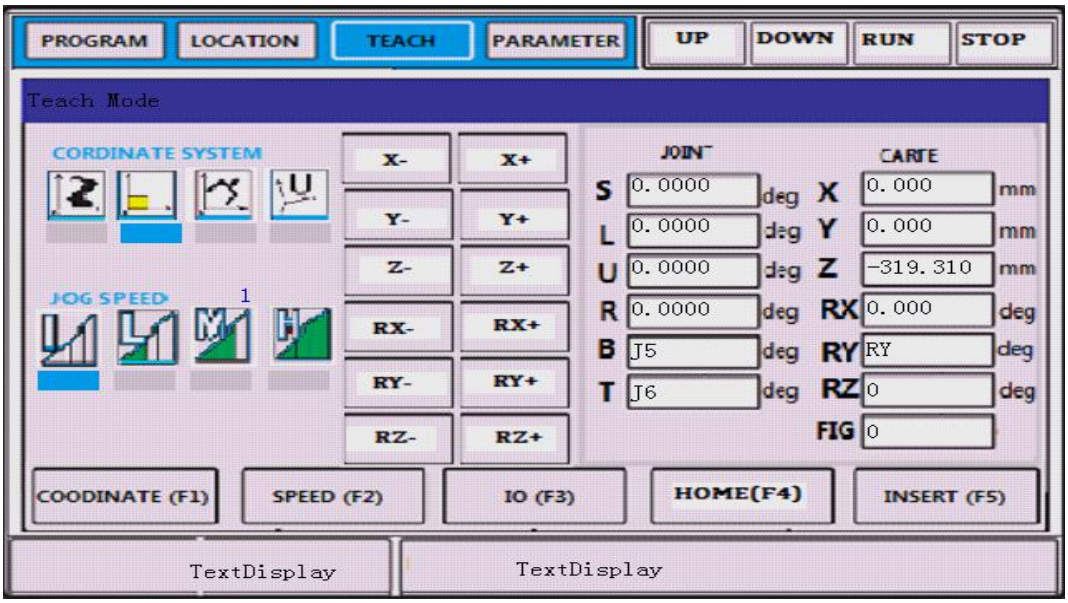
It's can be modified any selected coordinate value。

DELETE： Delete selected location points。

MOVE_P（point to point）： Refers to the point-to-point movement to the current position;

MOVE_L（Linear motion interpolation）： Refers to the movement of the linear interpolation to the current position。

四、TEACH interface



Coordinate System： Includes joint coordinates, world coordinates, tool coordinates, and user coordinates (current tool coordinates and user coordinates are not enabled). Coordinates can be switched via the "COORDINATE" button。

JOG SPEED（For teaching speed ratio）：

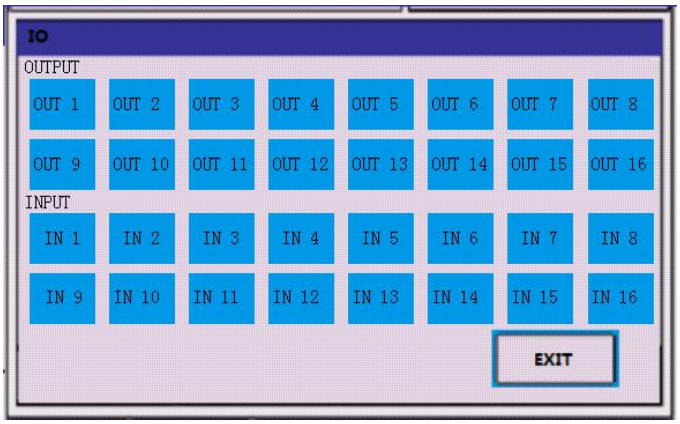
"I" is 1% of the maximum speed, "L" is 10%, "M" is 25%, "H" is 75%. The "SPEED" button can be used to switch between the actual situation. Note: This speed is only the JOG speed, and the offline motion speed of the machine is based on the speed set by the command.

In the middle is the JOG button. In the joint coordinate mode, "X", "Y", "Z", "RX" control the rotation of four motor shafts, each axis is independent of each other; in the Cartesian coordinate mode, it refers to the linkage of three-dimensional space. , "RX" is the rotation of the fourth axis, and remains independent in the linkage.

Note: Delta is connected to the four-axis robot, and the "RY" and "RZ" coordinates and buttons are invalid.

The right side shows the displayed values of joint coordinates and Cartesian coordinates.

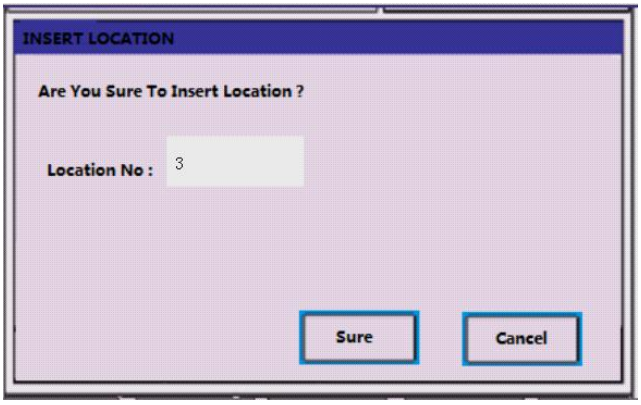
IO（input/output）： The button will pop up the IO (input and output) interface:



IO operation includes 16 outputs and 16 inputs, which can manually output the specified IO port and monitor the input IO port.;

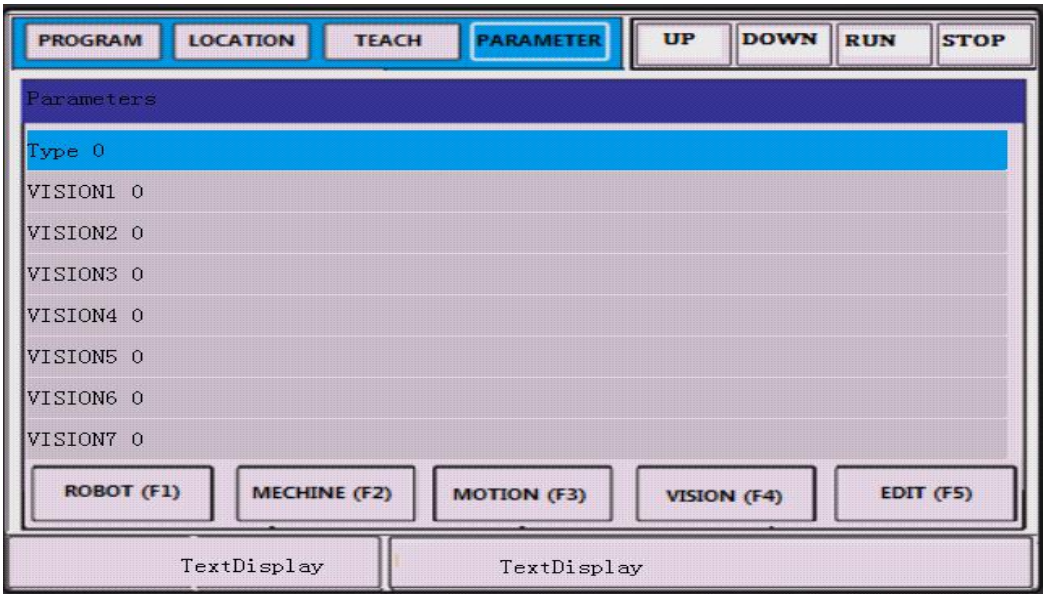
HOME（Back to zero）： Reset the zero return button to return the machine to the mechanical zero position。

INSERT： Insert the position point button, click the button to pop up the INSERT LOCATION interface:



Input Location No（position No.），Click"Sure"，The location will be stored in the location list and all location points can be viewed in the LOCATION interface.

五、PARAMETER interface



ROBOT(F1)： Refers to the selected machine type;

MACHINE(F2)： Specify relevant mechanical parameters;

MOTION(F3)： Specify relevant motion parameters;

VISION(F4)： Specify relevant visual parameters;

Note: The current parameter editing is set by the manufacturer and is not open to the user.

The status bar dynamically displays alarms and returns to zero.

Program Commands Manual

Programming commands are divided into two basic command and advanced command. All commands must be written in Capital.

The basic instruction parameters have 1 parameter or no parameters. Specifically includes:

Acceleration and Speed: ACC、SPEED

Basic motion commands: MOVEP（Point position）、MOVEL（Line）、MOVEC

IO operation: OUTON（open output）、OUTOFF（close output）、CHECK（waiting output）

Logical command: DELAY、FOR（cycle times）、 NEXT（cycle ends）、END（back）

JUMP、SUBNAME 、SUBEND

Advanced commands have 3 parameters, including:

Command setting: TOOL（tool setting）、GETPOS（position gain）、POSBOX（Tray setting）

Pick and place commands: PICK（Vertical grab）、 PLACE（Vertical release）、XPICK（Arc grab）、XPLACE（Arc release） XXPICK（Arc grabbing and lifting） 、XXPLACE（Arc release without IO）

Note: Each time you use a pick and place command, you must use the GETPOS command to get the desired position.

一、Basic Commands

1、 ACC [Acceleration time]

Set the acceleration/deceleration time of the motion in MS.

Example: ACC 10, set the acceleration to 10ms

2、 SPEED [Speed time]

Set the time value for executing a motion command. The unit is MS. The larger the SPEED, the slower the motion, and the faster the reverse. After setting the speed using SPEED, the basic motion command will be executed at this speed. If you need to change the speed, you must call the SPEED command again to set the new speed.

Example: SPEED 100 sets the movement speed time to 100 ms

MOVEP 1 machine moves to the specified position point 1 with speed 100MS

MOVEL 2 machine moves in a straight line to the specified position at speed 100MS.

SPEED 200 sets the movement speed time to 200 ms

MOVEL 1 machine moves linearly to the specified position point at speed 200MS

3、 MOVEP 【Position point】

The command is moved to the specified position by the point mode at the speed set by the previous SPEED command. The specified location point must be the existing saved location point.

Example: MOVEP 1 , move to the teaching position by point mode 1

4、 MOVEL 【Position point】

The command moves in a straight line to the specified position point at the speed set by its previous SPEED command. The specified location point must be the existing saved location point.

Example: MOVEL 1 , linear interpolation moves to the teaching position point 1

5、 DELAY 【Delay time】

Delay command in ms.

Example: DELAY 100, time delay 100ms

6、 OUTON 【Output port】

Output port operation, enable the specified output port number.

Example: OUTON 5, enable the 5th IO port.

7、 OUTOFF 【Output port】

Output port operation, close the specified output port number.

Example: OUTOFF 4, close the 4th IO port.

8、 CHECK 【Input port】

Wait for the specified input port to have a signal input before proceeding. If there is no signal input, wait for it.

Example: CHECK 3, waiting for the third IO port to have a signal input.

9、 FOR 【Cycle times】

The logic sentence, the start of the loop, followed by the parameter is the number of times the loop is set, must be used in conjunction with NEXT.

Example: FOR 4, the block between FOR and NEXT loops four times before jumping out of the loop.

Program segment User writes any program segment NEXT

10、 NEXT

Logic sentence, no parameters, loop end flag, must be used with FOR.

Example: See the FOR command

二、Advanced Commands

1、 TOOL 【X offset】 【Y offset】 【Vacuum port】

Specify the suction cup center coordinate offset value and the vacuum and vacuum output IO port number. This command is followed by 3 parameters.

【X Offset] Specify the X offset value of the suction cup off center.

[Y Offset] Specify the Y offset value of the suction cup off center.

[Vacuum port] Specify the vacuum output port. If it is set to n, the output port n is vacuum, and n+1 is vacuum blown.

Example: TOOL 0 0 3 There is no offset in the center of the suction cup, the output port 3 is the vacuum output, and the output port 4 is the vacuum blowing.

2、 GETPOS 【Type】 【Position code】 【Moving speed】

Gets the position instruction followed by 3 parameters.

[Type]: Extract the location source. 0 - extracted from the teaching position, 1 - extracted from the visual FIFO, 2 - extracted from the tray array

[Position code]: Location number. 0- Position number, 1-buffer number, 2-disk number.

[Moving speed]: Position moving speed. This parameter is the moving speed and 0 is static.

Example: GETPOS 0 2 0 , read from the second position in the taught position list, the position movement speed is 0.

GETPOS 1 0 100, reading position from the 0th buffer of the visual position, the position moving speed is 100.

GETPOS 2 2 0 , select the position from the No. 2 tray, which moves at a speed of 0.

3、 POSBOX 【Tray No.】 【Function code】 【Function parameter】

[Tray No.] : Specify the tray number. Specify up to 4 trays. Parameter range 0-3.

[Function code]: A total of 9 function codes; 0-reference position; 1-Enable; 2-row number; 3-column number; 4-layer number; 5-line spacing; 6-column distance; 7-layer spacing; 8-angle deviation

[Functional parameters]: Parameter values

Example: POSBOX 1 0 0 (Create tray No. 1 with reference point 0 as the reference point)

POSBOX 1 1 1 (Enable tray No. 1)

POSBOX 1 2 2 (Specify number of pallets No. 1 is 2)

POSBOX 1 3 5 (Specify the number of pallets No. 1 is 5)

POSBOX 1 4 1 (Specify the number of pallets in No. 1 is 1)

POSBOX 1 5 205 (Specify the pallet spacing of No. 1 pallet is 20.5MM)

POSBOX 1 6 100 (Enable No. 1 pallet spacing) 10.0MM)

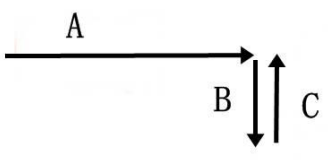
POSBOX 1 7 0 (Specify No. 1 pallet layer distance is 0)

POSBOX 1 8 0 (Specify No. 1 pallet angle deviation is 0)

4、 PICK 【Speed 1】 【Speed 2】 【Lifting height】

The vertical fetch instruction, which is followed by three parameters, must be obtained using the GETPOS instruction before use. The machine uses linear interpolation to capture the position determined by GETPOS.

The action of this command starts at the beginning of arrow A, the line is interpolated to the end A, the B arrow is taken, the vacuum IO is turned on, and the C arrow is taken.



[Speed 1] : Take the speed value of the A section.

[Speed 2] : Take the speed value of the B or C path.

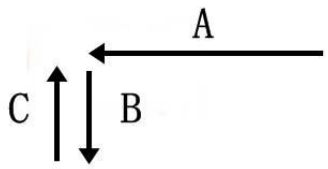
[Lifting Height]: The height of the B or C path.

Example: PICK 100 20 50

5、 PLACE [Speed 1] [Speed 2] [Lifting height]

Place the instruction vertically, followed by 3 parameters. You must use the GETPOS instruction to get the position before using it. The T machine linearly interpolates to release the position determined by GETPOS.

The action of this command starts at the beginning of arrow A, the line is interpolated to the end A, the B arrow is taken, the vacuum IO is turned off, the air is blown, and the C arrow is taken. Normally used in conjunction with the PICK command to form a looping action for grabbing and placing.



[Speed 1] : Take the speed value of the A section.

[Speed 2] : Take the speed value of the B or C path.

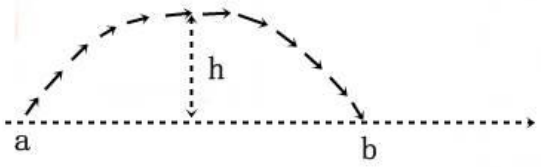
[Lifting Height]: The height of the B or C path.

Example: PLACE 100 20 50

6、 XPICK [Speed] [Delay] [Lifting height]

Arc grab command, which is followed by 3 parameters, must be obtained using the GETPOS command before use. The machine uses circular interpolation to capture the position determined by GETPOS.

The action of this command starts at point a, opens vacuum IO, moves along elliptical arc to point b, and grabs the product.



[Speed]: The speed value from point a to point b.

[Delay]: Grab the delay time.

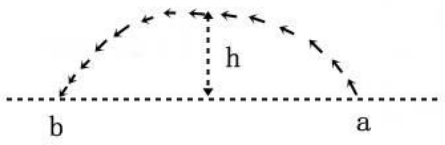
[lift height]: Increase the value of height h. This value does not change due to the grab distance.

Example: XPICK 100 10 50 With a speed value of 100 from point a (which can be regarded as the current point) to grab the product at point b, the process has opened vacuum IO, the arc height is 50mm.

7、 XPLACE [Speed] [Delay] [Lifting height]

Arc placement instruction, which is followed by three parameters, must be obtained using the GETPOS instruction before use. The machine releases the position determined by GETPOS in circular interpolation.

The action of this command starts at point a, moves along elliptical arc to point b, closes vacuum IO, and releases the product. Use with XPICK to form a looping action for grabbing and placing.



[Speed] : The SPEED value from point a to point b.

[Delay]: Blowing delay time to ensure that the product is blown off the nozzle.

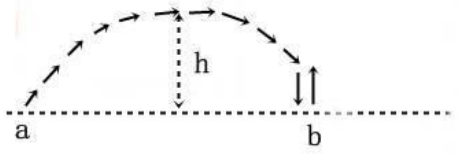
[lift height]: Increase the value of height h. This value does not change due to the grab distance.

Example: XPLACE 100 5 50 Moves from point a (which can be regarded as the current point) to point b and releases the product at a speed of 100. The air blows, the delay is 5ms, and the arc height is 50mm.

8、 XXPICK 【Speed 1】 【Speed 2】 【Lifting height】

Arc grabs and raises the command, which is followed by three parameters. Before using, you must use the GETPOS command to get the position. The machine uses circular interpolation to capture the position determined by GETPOS.

The action of this command starts at point a (as the starting point), opens the vacuum IO, moves along the semi-elliptical arc to point b, grabs the product, and lifts 20 mm (this value is set internally).



[Speed 1] : The speed value from point a to point b.

[Speed 2] : Lift the speed value of 20mm at point b.

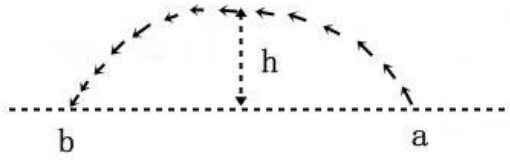
[lift height]: Increase the value of height h. This value does not change due to the grab distance.

Example: XXPICK 50 6 50 The machine opens the vacuum at point a, and moves from point a (the current point of the machine) to point b to grab the product at a speed of 50MS. Immediately after lifting the product, the height is 20mm and the lifting speed is 6MS. The middle arc of point b is 50mm high.

9、 XXPLACE 【Speed】 【Delay】 【Lifting height】

Arc motion command, this command is followed by 3 parameters, you must use the GETPOS command to get the position before use. The machine moves in circular interpolation to the position determined by GETPOS.

The action of the change instruction starts at point a (as the starting point), moves along elliptical arc to point b, and delays. This command action is consistent with XPLACE, the difference is that XXPLACE is just a circular motion command, no IO operation.



[Speed]: The speed value from point a to point b.

[Delay]: Delay time.

[lift height]: Increase the value of height h. This value does not change due to the grab distance.

Example: XXPLACE 100 10 50 The speed of 100MS is moved from point a (the current point of the machine) to point b, with a delay of 10ms, wherein the height of the middle arc passing through points a and b is 50mm.

Sample program

Sample program1

/ / Description of the program: follow the capture followed by placement

/ / Grab the following channel (FIFO 0): visual write position; encoder channel 0

/ / Place the following channel (FIFO 1): IO trigger write (teaching position 0 point); encoder channel 1

//IO output: 0 vacuum 1 blowing 2 rotating cylinder (please confirm)

//IO input: 0 IO trigger input (please confirm)

//Follow X configuration for X-axis follow-up (should be configured according to actual conditions)

//The following direction is configured to flow from the positive axis to the negative axis (should be configured according to the actual situation)

//10000 pulse belt distance (should be configured according to actual conditions)

FIFO 0 0 0 //Location derived from configuration: 0 visual write; 1 IO triggered write

FIFO 0 1 0 //IO trigger input port configuration

FIFO 0 2 0 //Encoder input channel configuration 0 channel or 1 channel

FIFO 0 3 0 //IO trigger load mode: 0 load single 1 load tray

FIFO 0 4 0 //Load location point number or load tray number

FIFO 0 5 0 //Follow mode: 0 axis following; 1 Y axis following

FIFO 0 6 2000 //The encoder feeds back the distance of 10,000 pulse belts

FIFO 0 7 2 //Following direction configuration: 1 From negative to positive 2 From positive to negative

FIFO 0 8 200 //Set the capture minimum,

FIFO 0 9 200 // grab the maximum value,

FIFO 0 10 255 //Over-range output 255 means no output enabled

FIFO 1 0 1 //Location derived from configuration: 0 visual write; 1 IO trigger write

FIFO 1 1 0 //IO trigger input port configuration

FIFO 1 2 1 //Encoder input channel configuration 0 channel or 1 channel

FIFO 1 3 0 //IO trigger load mode: 0 load single 1 load tray

FIFO 1 4 0 //Load position point number or load tray number

FIFO 1 5 0 //Follow mode: 0 axis following; 1 Y axis following

FIFO 1 6 2000 //The encoder feeds back the distance of 10,000 pulse belts

FIFO 1 7 2 // Follow direction configuration: 1 From negative to positive 2 From positive to negative

FIFO 1 8 200 //Set the capture minimum,

FIFO 1 9 200 // grab the maximum value,

FIFO 1 10 255 //Over-range output 255 means no output enabled

TOOL 0 0 0 // Set up the tool center

ACC 200 //Set acceleration 200MS

TSPEED 500 //Set the speed of 400MS

GETPOS 1 0 500 //Get the grab position

OUTOFF 2 // Turn off the rotary cylinder

DPICK 30 30 40 //Grab the product

ACACC 50 //Set the acceleration 50MS

TSPEED 100 //Set the following time 100MS

XMOVEL 0 0 0 //Follow the movement 100MS

XMOVEL 0 0 50 //Upward 50 mm with the edge

OUTON 2 //Open the rotary cylinder

ACACC 200 //Set acceleration 200MS

TSPEED 500 //Set the speed of 400MS

GETPOS 1 1 500 //Get the placement

DPLACE 30 30 40 //Place the product

ACC 50 //Set the acceleration 50MS

TSPEED 100 //Set the following time 100MS

XMOVEL 0 0 0 //Follow the movement 100MS

Sample program2

Assume that the packaging machine puts 2X2X2 for each product. Line spacing (X direction) 30MM, column distance (Y direction) 25MM, layer number (Z direction) 20MM (that is, product height)

The first step is to create a pallet. Each trigger bar of the packaging machine is aligned with the trigger sensor and the tray is placed on the grid. Teach the first position of the tray! Assume that this teaching position is 3.

POSBOX [Tray No.] [Function No.] [Function Value]

Program example:

POSBOX 0 0 3 Specify the reference point as 3

POSBOX 0 1 1 Enable tray 0: Disable 1: Enable

POSBOX 0 2 2 Specify the number of rows (X-direction) products

POSBOX 0 3 2 Specify the number of columns (Y-direction) products,

POSBOX 0 4 2 Number of designated layers (Z-direction)

POSBOX 0 5 30 Specify line spacing (X direction)

POSBOX 0 6 25 Specify the column spacing (Y direction)

POSBOX 0 7 20 Specify the layer spacing (Z direction)

POSBOX 0 8 0 Specify the angle of the tray to the X axis

FIFO 0 0 0 Set position source (0: visual external write, 1: IO input trigger write)

FIFO 0 1 0 specifies the IO trigger input port (here 0 is the 0th input)

FIFO 0 2 0 Specify the encoder input port (here 0 is the 0th channel, there are 0, 1, 2 channels)

FIFO 0 3 0 Specifies the IO trigger position loading mode (0: means loading 1 position, 1: means loading multiple)

FIFO 0 4 0 Specify IO trigger position load position number

FIFO 0 5 0 Set the following axis (0: X axis following, 1: Y axis following)

FIFO 0 6 1953 Set the distance traveled by 10,000 pulse belts

FIFO 0 7 2 Set the incoming direction (1: from negative to positive, 2 from positive to negative)

FIFO 0 8 150 Set the grab negative direction range

FIFO 0 9 150 Sets the capture positive direction range

FIFO 0 10 255 sets the over-range output IO port, 255 means no output

FIFO 1 0 1 Set position source (0: visual external write, 1: IO input trigger write)

FIFO 1 1 0 specifies the IO trigger input port (here 0 is the 0th input)

FIFO 1 2 1 Specify the encoder input port (here 1 is the first channel, there are 0, 1, 2 channels)

FIFO 1 3 1 Specifies the IO trigger position loading mode (0: means loading 1 position, 1: means loading multiple)

FIFO 1 4 0 Specify the IO trigger load position number (where 0 is the pallet number)

FIFO 1 5 0 Sets the following axis (0: X-axis following, 1: Y-axis following)

FIFO 1 6 1953 Set the distance traveled by 10,000 pulse belts

FIFO 1 7 2 Set the incoming direction (1: from negative to positive, 2 from positive to negative)

FIFO 1 8 150 set to capture the negative direction range

FIFO 1 9 150 Sets the capture positive direction range

FIFO 1 10 255 sets the over-range output IO port, 255 means no output

TOOL 0 0 0

FOR 8 //2X2X2 A total of eight products

GETPOS 1 0 0 //Get the position from the 0th following channel

XPICK 300 40 60

GETPOS 1 1 0 //Get the position from the first follower channel

FFPLACE 300 40 60

NEXT