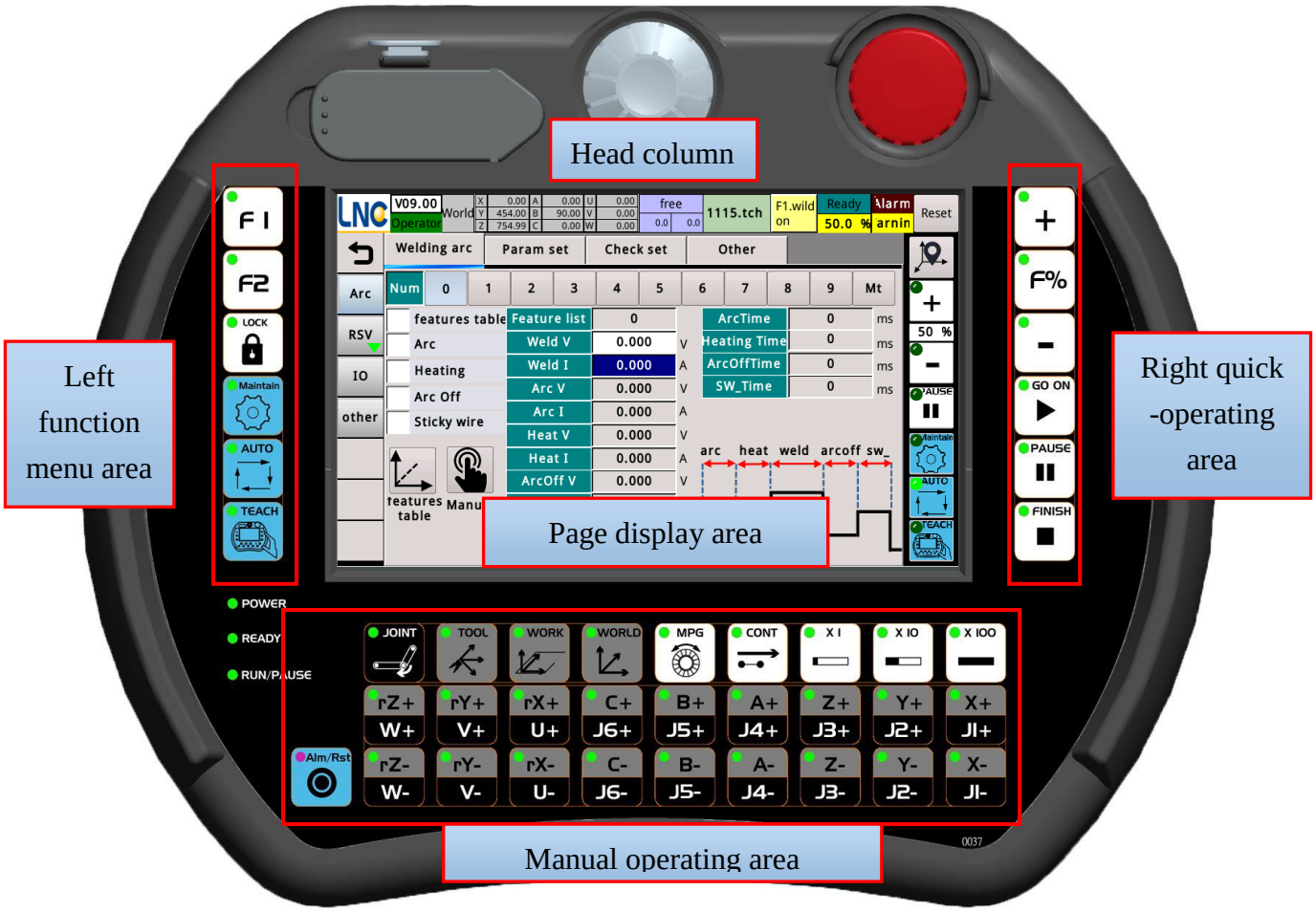
Mechanical Arm Series

Manual for Joint Manipulator Operation and Welding Procedures

Leading Numerical Controller

1. Description of screen configuration

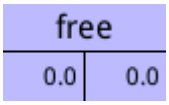
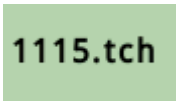
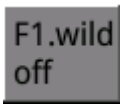
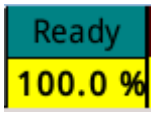
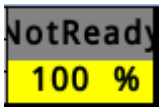
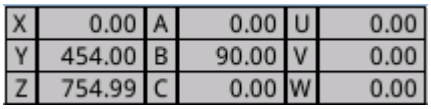
The system operation screen configuration can be modified according to the on-site operation requirements. For detailed usage, please refer to the “Application Manual”. The default operation screen of the machine is configured as follows

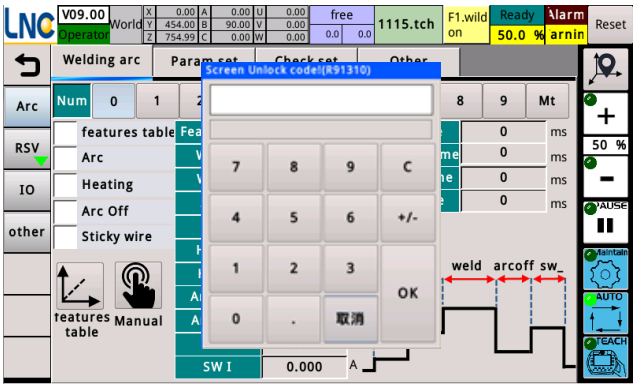


Head column and left function area

You can edit it yourself using the HMI editor. A commonly used modification is the Logo graphic in the upper left corner.

LNC V09.00 Operator	Display the system version number, the current login level, click on this area to enter the permissions page.
World X 0.00 A 0.00 U 0.00 / Y 454.00 B 90.00 V 0.00 / Z 754.99 C 0.00 W 0.00	This area will display the coordinate values in the coordinate system according to the system mode (maintenance, automatic, teaching), and the selected coordinate system (world, work, tools, joints).

	Displays the welder status of the command and the AO1 and AO2 voltage displays.
	Displays the name of the currently executing teach-in program.
	The Function Key function displays the functions currently used by F1.
 Click on the upper half to switch the start status of servo. 	Displays the percentage of the system running speed in the current system state and automatic mode. Unprepared: Stays in this state until the coordinates of any of the motors are not confirmed. In this state, the automatic mode cannot be used, and the teaching mode operation can only be the joint coordinates. Prepared: When the coordinates of each motor have been confirmed, it will become prepared state. After the preparation is completed, there is a way to enter the "automatic mode", because the kinematics calculation path of the robot of the system is meaningful after the coordinates of each axis are correct. Running: The automatic program is running. Pause, section stop: The system has been running but entered the pause state for reasons. Teaching: Performing teaching.
	Enter the connection to the coordinate page.
	Prompt whether the system currently has an alarm warning. Click on the alarm warning area to display the current alarm warning content. Click "Reset" to clear the current alert warning if the conditions of establishment for the alert warning has disappeared.

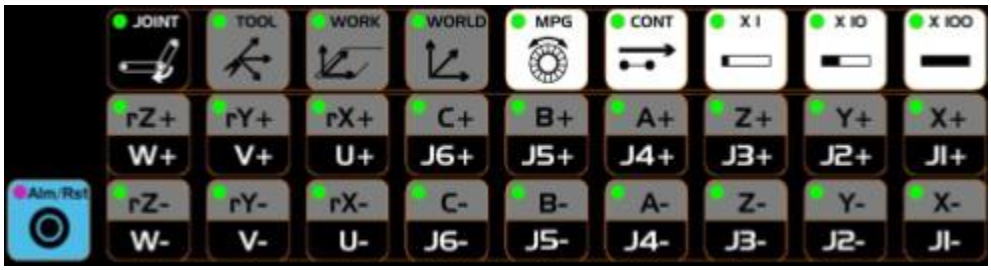
	Auxiliary buttons, which can be used to customize the functions.
Click the lock button 	Screen lock function: It can make the system enter the screen lock state, which need to operate by entering the correct passwords. If you click Cancel, a small box of "Forbid"will be displayed in the upper right corner. Click it and a window for passwords will pop up. 
	These three buttons switch system modes: Maintenance mode: Operation control of a single motor. Usually used for the time of matching the machine. Automatic: Use to start the program, or to operate specific moves on each page. Teaching: You can move with the direction of the coordinate system such as "world", "work", "tool" and "joint" as a reference for motion.

Right quick-operating area

	Automatic mode: adjust the percentage of speed during automatic operation Maintenance and teaching mode: the percentage of speed when the machine is manually operated

	In the automatic mode, program execution can be performed.
	In the automatic mode, make the running program enter the pause state.
	In the automatic mode, the executed program stops running.

Manual operating area



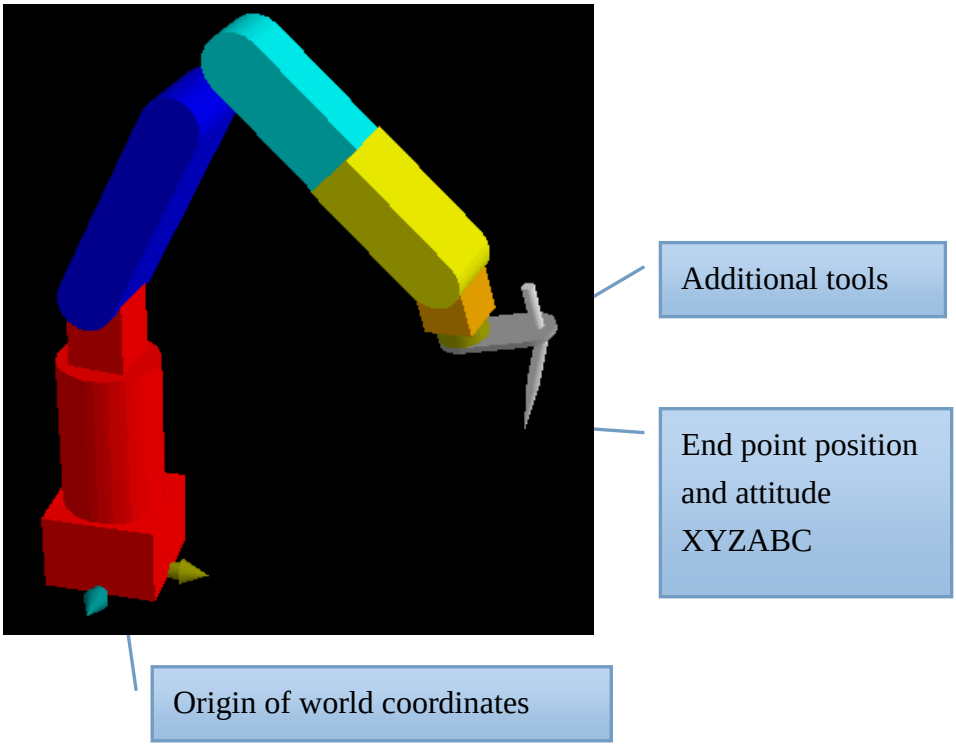
Use to select the coordinate, continuity, and speed ratio of the moves, then press the move button to move manually.

2. Introduction to basic concepts

Introduction to spatial coordinates (position and attitude)

The coordinates of the manipulator generally refer to the position and attitude of the end point. Refer to the following figure, which is a schematic diagram of a six-joint manipulator with additional tools.

The origin of the world coordinate system of Advantech LNC joint robot (base coordinate system) is defined in the center of the base. The direction definition of the XYZ axis can think of the arm as a person, in the same direction as our well-known axis, with +X on the right, +Y on the front, and +Z above.



To represent the space coordinates, there is an attitude in addition to the position. The position in the space is as commonly understood and commonly used (X, Y, Z), but the attitude information (A, B, C) is not so easy to understand.

ABC is used to indicate the direction of the end point. It has a specific rule, collectively called Euler's rotation theorem, which is used to indicate the possibility of various directions. The description of the Euler's rotation theorem can be found online for a more detailed explanation.

The rules of the Euler's rotation theorem are not necessarily the same in each robot system.

The Euler's rotation theorem of Advantech LNC is defined as ZXZ, the universal right-hand rule, ie

A is the angle of rotation around the +Z axis.

B is the angle at which the axis rotates around (+X after A rotation).

C is the angle at which the axis rotates (+Z after AB rotation).

Various coordinates and their relevance

This system contains a variety of robot types, all of which are developed with the same concept, the following are some of the specific nouns:

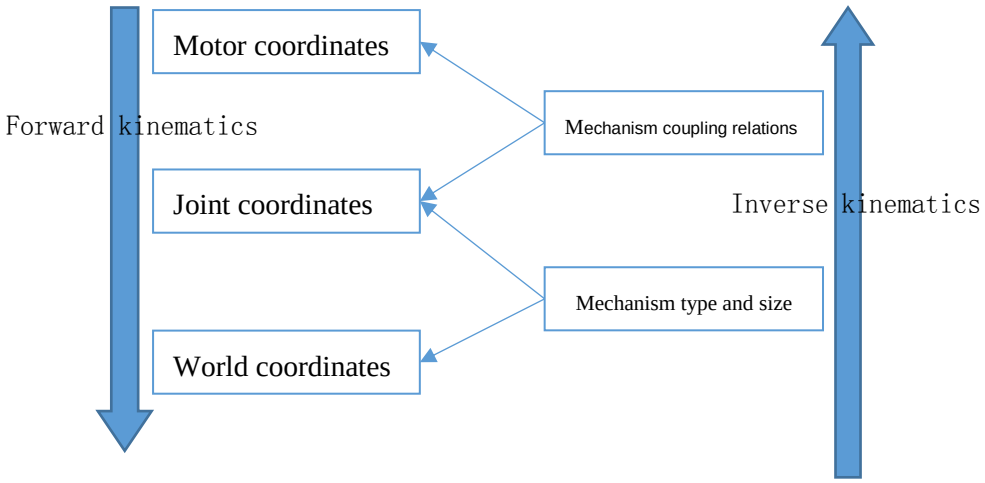
Motor Coordinate: The actual coordinate value of the motor is independent of the coaction between the mechanisms.

Joint coordinate: The coordinate value after the motor coordinate is converted by the mechanism coupling relationship. (visual mechanism state of appearance)

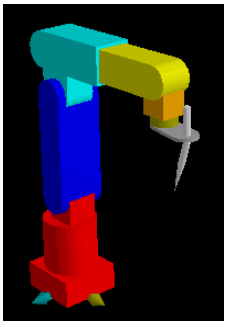
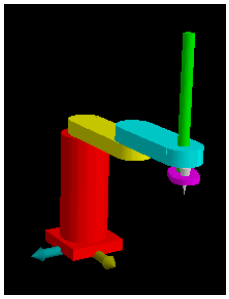
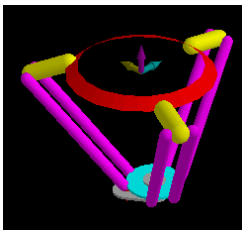
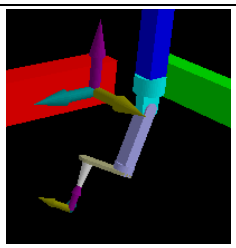
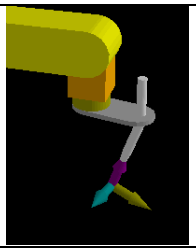
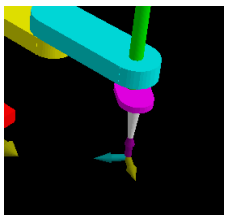
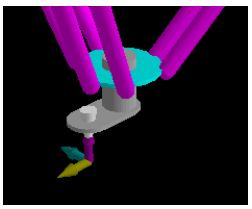
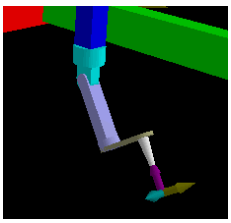
World Coordinate: The position and attitude of the end point of the tool with the center of the base of the manipulator as the origin.

Forward kinematics: An algorithm that converts motor coordinates to world coordinates.

Inverse kinematics: an algorithm that converts from world coordinates to motor coordinates.



Comparison of characteristics of several common robot types

Type	Standard six joints	Scara	Delta	XYZABC
Appearance				
Degree of freedom	XYZABC	XYZA	XYZA	XYZABC
Origin of world coordinates	Base center	Seat center	Fixed disk center	Arbitrary custom origin of world coordinates
Tool calibration items	Offset X Offset Y Tool length	Offset X Offset Y	Offset X Offset Y	Offset X Offset Y Tool length
Tool calibration items				

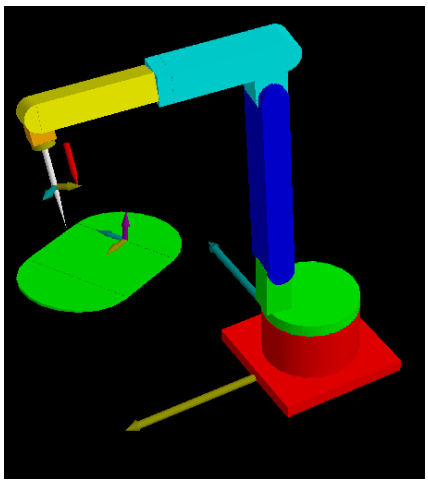
Work coordinates

When the manipulator is used for glue coating, polishing, etc., all the motions are determined according to the position of the workpiece. When the production line requires multiple manipulators to perform the same work, each manipulator should use the same machining program, but because the relative position between the machine and the workpiece is difficult to achieve during installation, a coordinate system is required to be defined to describe the position of placement and rotation angle of the workpiece.

When you are editing a program, it is better to follow a certain work coordinate system, so that when the reference position of the subsequent action is modified, the program can be transferred simply by changing the definition of the work coordinate system without re-modifying the relevant action points.

As shown in the figure below, the two sets of workpieces are the same, just that the position and angle are different. Therefore, when editing the program, the path can be edited in the work coordinate system for the normally placed workpiece. When the other set of workpieces is to be machined, it's ok to switch the work coordinate system to the reference position of the set of

workpieces.



Description of application sequence of various coordinate system setting methods

Direct setting

Fill in the value of the coordinate system directly.
It is suitable for use in the development environment where any input value or coordinate system is fixed.

World record XYZ

Set the position (X, Y, Z) in the set world record number to "Work coordinate system", but set (A, B, C) to 0.
It is suitable for the situation where the table is placed on the right angle machine without tilting and rotation. It is convenient to set the coordinate system only by calibrating one point.

World record XYZABC

Set the position (X, Y, Z) and (A, B, C) in the set world record number to "Work coordinate system".
It is suitable for the purpose of loading and unloading. And it only needs to calibrate the point at which the material of loading and uploading, then can be applied to the complete action position of material of loading and uploading. The method is to first set the world record point as the coordinate system, and then move to the position under the coordinate system, for example:

```
G54 O2 P15                      // Set P15 as the coordinate system
G01 X0 Y0 Z10 A0 B0 C0 F3000    // Straight line to the position of Z10 of coordinate system
G01 Z0 F1000                     // Move slowly to the position of coordinate system Z0
G22 O201 S1 P100                 // O201 is set to On and waits for 100ms.
G01 Z10 F3000                    // Move up to Z10 position
```

Coordinate system record

Set the coordinate system record to "Work coordinate system".
Suitable for multiple sets of coordinate systems that need to be calibrated.

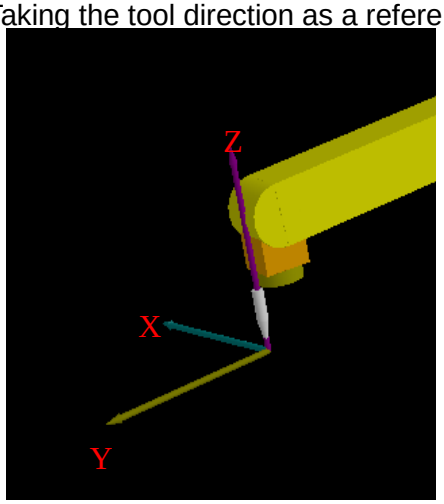
Current position and attitude

Set the world coordinate position (X, Y, Z) and (A, B, C) when the program is executed to this line to the "work coordinate system".
It is suitable to perform multiple moves according to the position after moving to a certain position while teaching the recording program, and if the point is modified later, all the subsequent moves can be automatically adjusted based on the modified point.

Tool coordinates

During the running of the program, it is sometimes necessary to move in the direction of the tip of the manipulator. For example, the loading and uploading action of the lathe needs to be taken out and placed according to the direction of the end of the current arm. Because the tip of manipulator will definitely install another tool, it is called the tool coordinate system. When the program needs to use the current attitude as a reference, it can be set to use the tool coordinate system.

Taking the tool direction as a reference



Safety precautions

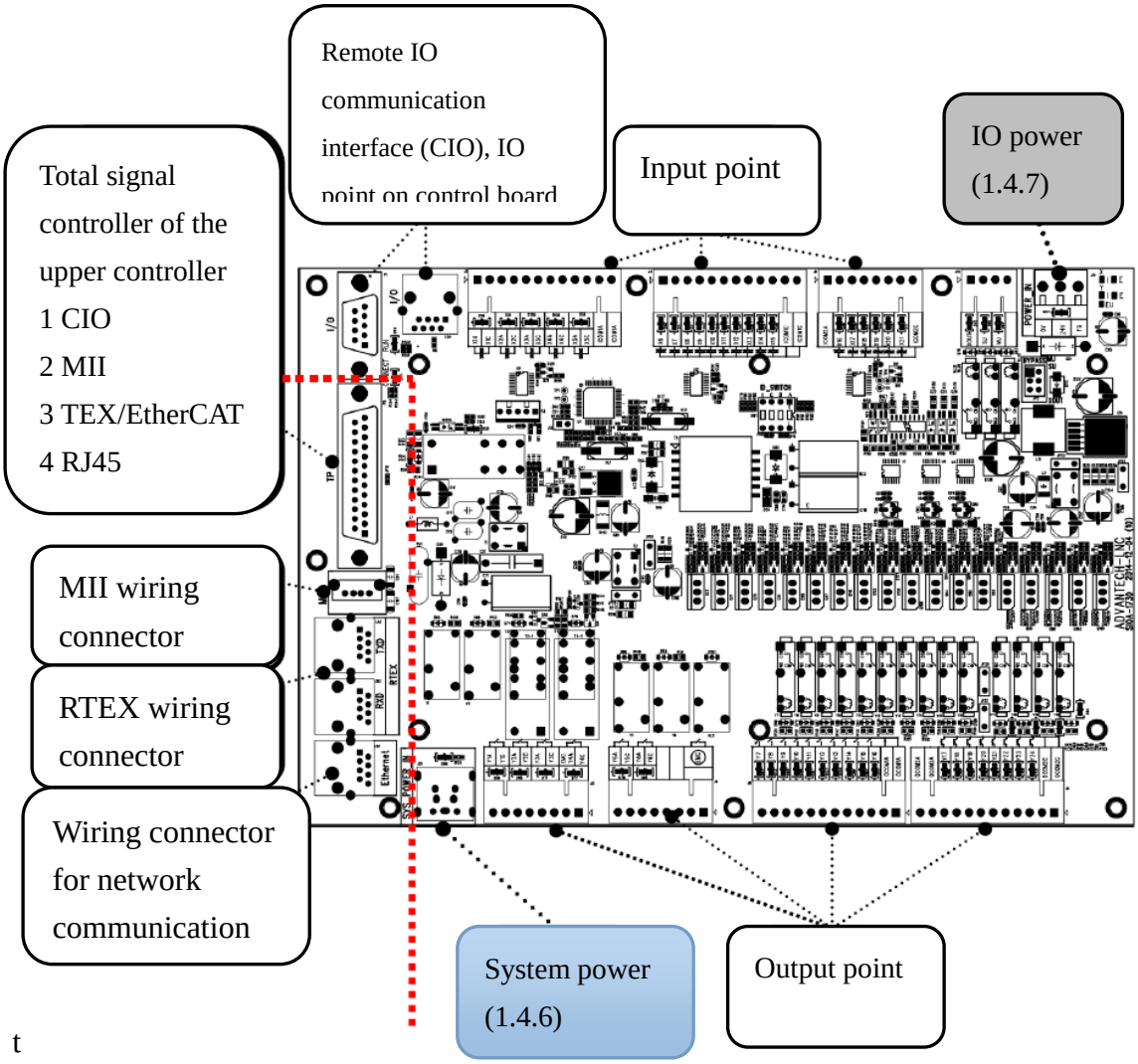
1. The operating robot must first confirm the space for safe operation.
2. Keep a certain safe distance from the operator when the machine is in operation.
3. When editing the program for the first time, you must first simulate it in handwheel mode to confirm whether the robot action meets the requirements.
4. If any abnormal deviation from the expected action is detected during the robot motion, quickly press the emergency stop switch in the upper right corner of the controller to ensure safety.
5. If the operator is not familiar with the controller, do not operate the robot that has been edited by others and is already running automatically.

6. If you want to leave the robot for a long time and do not do any automatic operation, please press the emergency stop switch in the upper right corner.
7. Do not play, chat, cause distraction, etc. when operating the robot. Please focus on the moves of the robot when pressing the move button.
8. If the robot has been completely set up to operate automatically, it is recommended to mark the sign of prohibition of entering in the working area of the robot.
9. After the auto-running robot is set up, if the operator wants to leave and let the robot run automatically, it is recommended to lock the screen to prevent others from operating the controller.
10. When editing robot motions, please optimize the motion path to make it softer, and avoid some manipulators to make sudden stop or sharp turns after long distance of motion.

Uses of IO version

Product overview of SIOA1730：

Product name	Item	Specifications
SIOA1730	Input points	21 points
	Input specification	DC24V optocoupler input, available for NPN/PNP switching
	Output points	24 points
	Output specification	Y1~Y6 Relay dry contact output Y7~Y16 Relay common connection point output Y17~Y24 Crystal low level output
	Power requirements	DC24V±10%



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3. Basic operating instructions

Prepared conditions

Prepared state, indicating that the system is in a situation where the motion command can be sent to the axis. Each axis in the system that must be controlled must meet the following conditions before it is in the prepared state.

Axis coordinate state

Depending on the difference of hardware used for pulse control or communication control, the method for knowing the coordinates of each axis is different. The following are general rules for the numerical significance of the axis coordinate state:

Less than 0: When reading the pulse type absolute encoder value using COM communication, a reading failure occurs.

Equal to 0: Any action of set coordinates has not been executed when using pulse control, or the axis has not been servo-started when using communication control.
1~9：: The process of rotating the motor to find the reference point or the process of reading the absolute encoder when using pulse control.
10：The reference point has been found or the status of the absolute encoder value has been successfully read.
11~19：The process of estimating coordinates based on the results of state 10.
20：The state of the coordinates has been calculated.
21~22：The process of setting coordinates
23：: Set the state of coordinate completion when using pulse control, or start the servo of the axis when using communication control.

Axis servo starting

When the axis servo is started, the axis can execute the motion command issued by the controller, so the axis servo start is a necessary condition for completion of preparation.
The axis servo can be started after the emergency stop button is released, and is automatically started according to the built-in sequence. It is also possible to temporarily close the operating interface with the emergency stop button released, for example to force the shaft to be released for unpowered dragging.

Axle brake

When the axle brake is released, the axis can normally execute the motion command issued by the controller, so the shaft servo start is a necessary condition for preparation.
In order to avoid the jitter when the axis servo is started, or ptosis of the mechanism when the brake is released, the axle brake will automatically release according to the built-in sequence after releasing the emergency stop button, or it can be temporarily closed on the operation interface when the emergency stop button is released, for example, the shaft is forcibly released for unpowered dragging.

Axis release command

When the axis has a forced release (R23023.x) (forced servo Off, brake On), it shall be unable to become completion of preparation.

Axis emergency state

When the axis servo is not started or the brake is not released, the axis must be in an emergency state. In this state, the servo will update the command coordinates with the encoder feedback coordinates.
In the program, the command can also be forced to temporarily enter the emergency state to achieve the purpose of updating the command coordinates by feedback coordinates. For example,

after performing the origin calibration, the axis can be forced into an emergency state to reset the current coordinates.

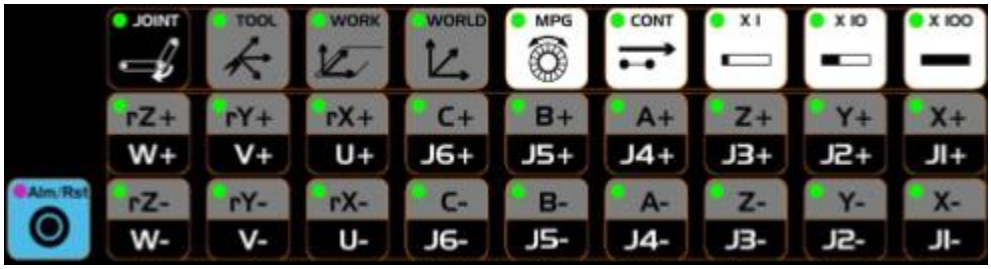
Classification of operations

System operation can be divided into two categories: manual operation and automatic operation. It contains:

Operation method	Mode	State	Coordinate system	Speed reference	Description
Manual operation	Maintenance	In maintenance	Motor	Manual parameters	Operates against a single motor, regardless of the effects of mechanical coupling. Usually used in the matching and calibration process.
	Teaching	In teaching	Joint World Work Tools	Manual parameters	When in the unprepared state, only the joint coordinates can be selected.
	Teaching	In action of to be prepared for completion	According to the purpose of action	Manual parameters	In the non-handwheel mode, the action is performed when pressed, and stopped when released. In the handwheel mode, it's controlled at the handwheel rotation speed after starting.
Automatic operation	Automatic	In action of to be prepared for completion Pause Section stop	Joint World Work Tools	Automatic parameters	Use the method of starting after releasing the time of duration of pressing to avoid accidental pressing.

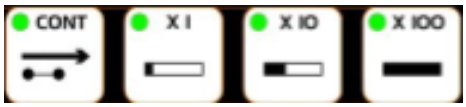
Maintenance and teaching mode

Before performing coordinate adjustment, you need to switch to "Teaching mode" to start the adjusting procedures.



Handwheel mode: switch whether to operate with the handwheel

CONT/INCR



Press the CONT button to switch the way of motion, which is CONT /INCR.
Under "CONT", pressing the 18 buttons will cause the adjusting motion to continue to move according to the selected function until the button is released. The speed of the motion can be determined by the three speed selections below.
Under " INCR", pressing the 18 button will only move the manipulator a certain distance, and the length of the distance will be determined by the three distance selections below.
The usual usage is to use the "CONT" method when it is far enough away from the target point, so that the target point can be approached quickly; when the target position is approached, the " INCR" mode is used so that the target point can be accurately adjusted.

The basis coordinate system of the motion

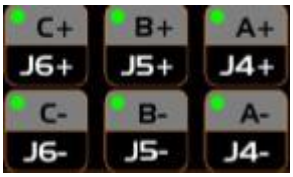
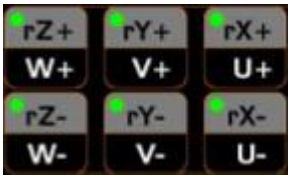
The direction of the motion is converted by the coordinate system depending on the selected coordinate system.
Note: If the system status is "Unprepared", It can only be "Joint Coordinates" in "Teaching".

World coordinate system: It is fixed, and the coordinate system axis referenced during adjustment is determined according to the definition of world coordinates.
Work coordinate system: The coordinate system axis referenced during adjustment is determined according to the set value of the work coordinate system.
Tool coordinate system: Determines the coordinate system axis referenced when adjusting

according to the set value of the tool coordinate system.
When the position and attitude of the current end point are set to the current tool coordinate system, you can press "Tool" again, and the value next to it will also change to 0. This value represents the spatial distance between the position of the end point after the motion and the position of the end point when the "Tool" is pressed.
Joint coordinate system: is fixed and based on the definition of joint coordinates.

Motion button

Depending on the difference of selected motion (CONT/INCR), speed (1%, 10%, 100%) or distance (x1, x10, x100) and the selected coordinate system (world/work/tool/joint), the moves when pressing the motion button will be different.

Buttons	Description	Remarks
	Joint coordinates: Joints 1~3 move positively and negatively. For world, work and tool coordinates: The end point moves to the selected coordinate system axis.	
	Joint coordinates: Joints 4~6 move positively and negatively. For world, work, and tool coordinates: Determine the direction of rotation when clicking according to the settings in the "Setting page/Teaching mode" parameters.	Please refer to the "Introduction to Basic Concepts" to understand the meaning of ABC.
	Additional U, V and W axes move positively and negatively.	

System alarm/warning reset button.

Direction rotation during teaching

There are three ways to rotate the direction during teaching. You can choose the options that are easier to understand according to the type of mechanism and personal habits. The options are as

follows.

Spatial rotation mode ABC coordinates

Directly operate the ABC value of the current coordinate of the selected coordinate system, which is more suitable for the end axis of the orthogonal robot.

Teaching rotation mode Tilting in the direction of the selected coordinate system

Rotate the XYZ axis of the selected coordinate system and maintain the rule of same angle with the coordinate axis to rotate in different directions.

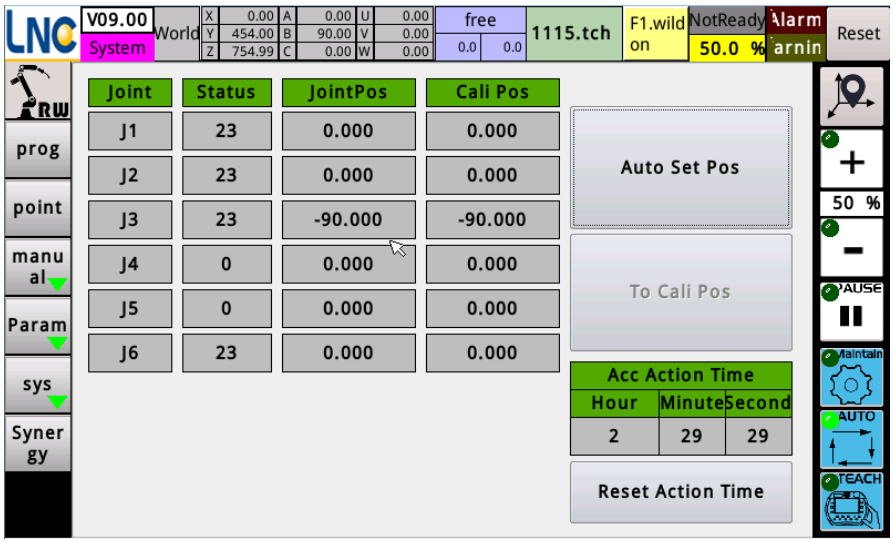
Space rotation mode Tool direction

Regardless of the currently selected coordinate system, it is forced to change to the direction of the tool. It can be imagined that people sit in the tip of the tool, the eyes are facing the Y+ direction, the joystick is in the hand, A+ and A- are equivalent to the left and right of the joystick, which will cause the tool to tilt in the X direction; B+, B- is equivalent to the front and rear of the joystick, which will cause the tool to tilt in the Y direction; C+, C- means rotate in place.

4. Common pages

Booting

When the system is booting, the “Booting” page will be displayed first. You can see the coordinate status of each axis on this page. The number in the "Status" column represents the result of the set coordinates, 23 represents the completion of the set coordinates, and the remaining numbers represent "Unset", "Setting" or "Setting failure".



Perform automatic set coordinates:

In the automatic mode, pressing this button automatically executes the program for which coordinates are to be set.

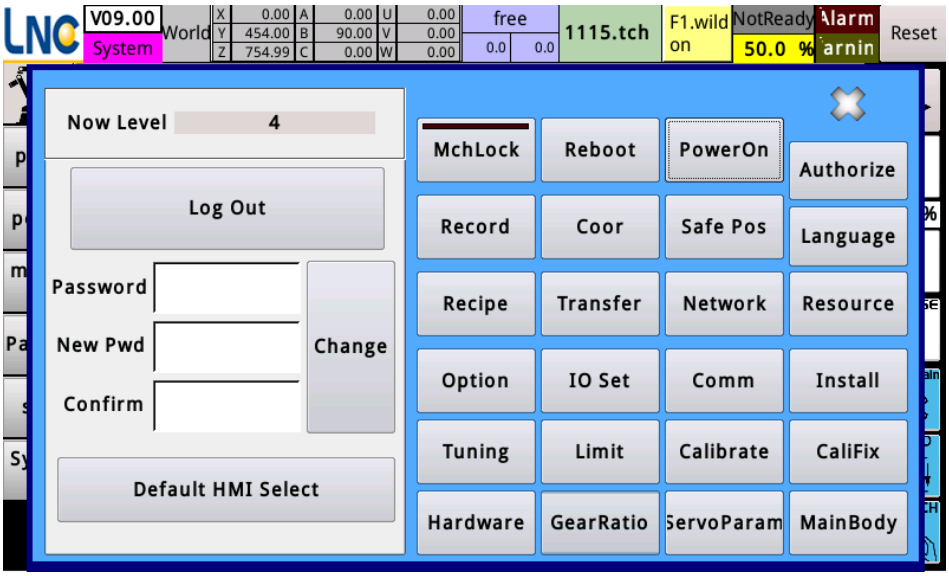
Note 1: The operation of setting the coordinates differs depending on the "absolute motor" used. If "absolute motor" is used, the set coordinates will directly read the motor's encoder and convert it to the coordinates in the controller, there will be no actual mechanism motion. If a "non-absolute motor" is used, there will be an actual mechanism motion to find the reference point (origin Sensor or Z-phase signal).

Note 2: The preset is to set the coordinates at the same time. If there is a need to set the coordinates (return to the origin) in each axis, you can edit the maker_func_ins_macro7 to replace it. If this need exists, please refer to the “Rx8000 Development Manual”.

Return to the correction point:

In the "automatic" mode, the coordinates of the mechanism may gradually move toward the correction point when pressed, and stop when it arrives or is released.

Permissions



Calling mode of the permission page, click on the area on the screen: 

This system is divided into five types of permissions:

0. Operator: the operator of end-customer, who is responsible for operating the machine. This is the preset permission to power when booting.
1. Manager: The management of the end customer, who is responsible for the editing and writing of the program. Please ask the factory personnel for the default password of factory.
2. Developer: The action process developer, who is responsible for writing the machine action process. Please ask the machine factory for the default password.
3. Machinery factory: The machinery factory that manufactures robots, which is responsible for robot debugging, origin calibration, limit and authorization settings. Please ask the machine factory for the default password.
4. System level: The person responsible for system setting, who is responsible for setting the mechanism and motor parameters of the robot. Please ask the machine factory for the default password.

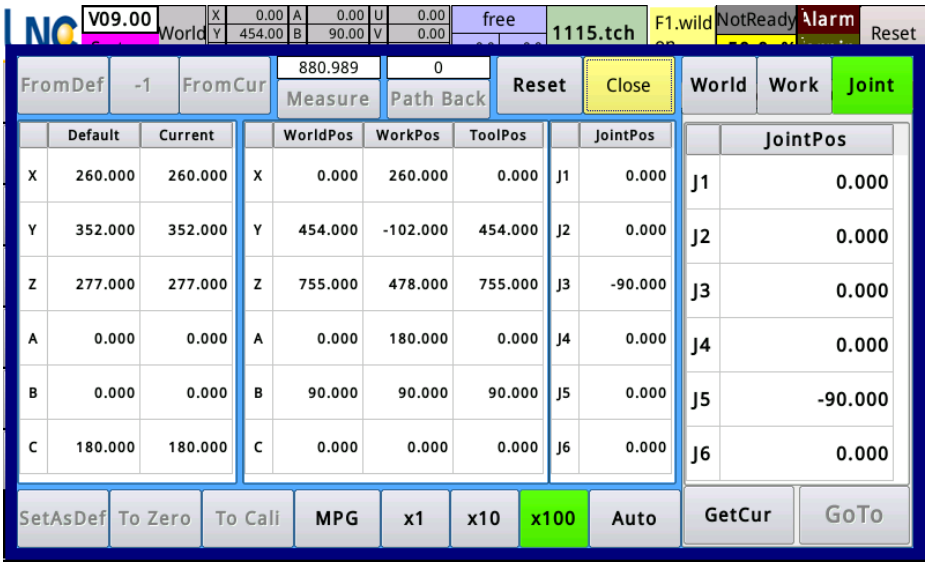
The default permission of the system after booting is the operator.

The method of login permission: Click on one of the managers, developer and machine factory and the input password screen will pop up. After inputting correctly, you can see the functions that can be performed.

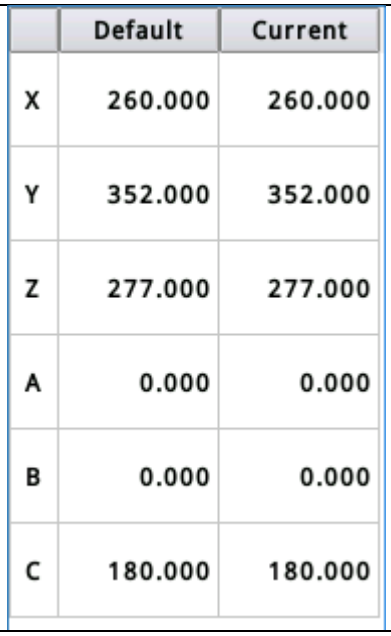
Change password: Enter the current password and new password, and press "Change" after confirming the password.

Coordinates

This page contains functions of coordinate system display and settings, coordinate display and coordinate motion. 

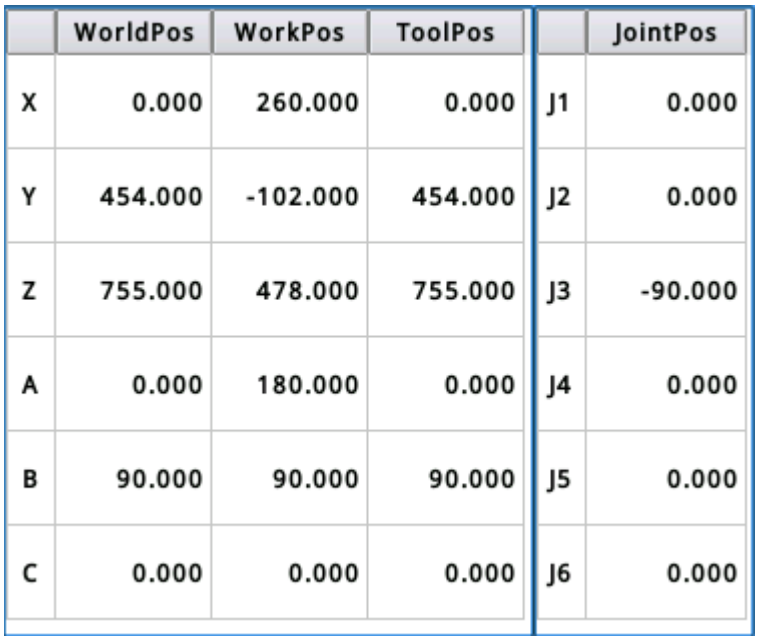


Coordinate system and settings

	Preset: When the power is booted, the system will set this set value to the current work coordinate system. You can enter a value on the content of the field. Coordinate system: In the currently used work coordinate system, you can enter a value on the contents of the field.
	Reapply the settings in the preset coordinate system to the work coordinate system.
	Set the coordinate system with the current world coordinates. You can also click on a field in the world coordinates to set the value of the field to the current coordinate system.

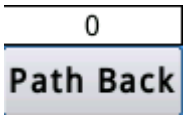
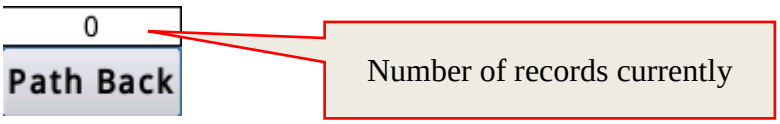
SetAsDef	Set the current coordinate system value to the preset coordinate system for next booting
To Zero	Move straight to the origin of the coordinate system
To Cali	Move quickly to the correction point

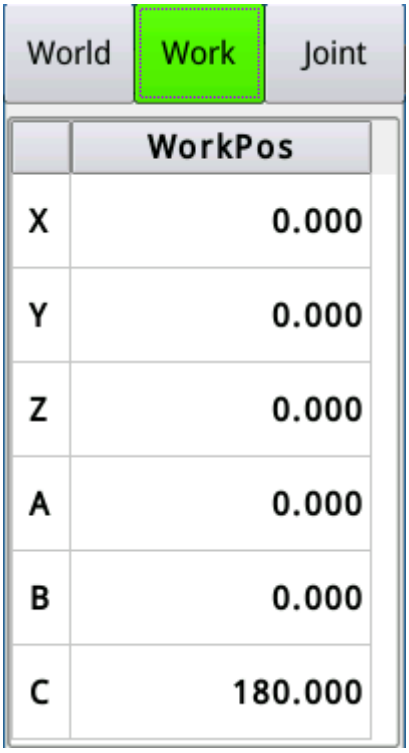
Current coordinates display

	Current coordinate system display
	Zero the current tool coordinates to understand the distance of motion or to obtain the relative relationship between the two points via the tool coordinate information. Note: When the "tool" selected by the coordinate is pressed, or when the action of a tool coordinate system is pressed, the current world coordinate is automatically set to the tool coordinate system, that is, all the content of tool coordinate XYZABC will become 0. After that, as soon as it is moved, the value of the tool coordinates will change, and the XYZ value in the tool coordinates will be used to calculate the actual offset distance between the current position and the tool coordinate system.

Motion operation

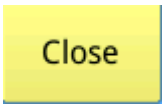
	WorldPos	WorkPos	ToolPos		JointPos
X	0.000	260.000	0.000	J1	0.000
Y	454.000	-102.000	454.000	J2	0.000
Z	755.000	478.000	755.000	J3	-90.000
A	0.000	180.000	0.000	J4	0.000
B	90.000	90.000	90.000	J5	0.000
C	0.000	0.000	0.000	J6	0.000

<table>
<tr><td> 
</td><td>Press this button to move the robot to the origin of the coordinate system. Stop when it is released or arrives.</td></tr>
<tr><td> 
</td><td>The system will automatically record the path that has been moved. This function can be used to reverse back in accordance with the path that has passed. In the automatic mode, press this button and it will stop if released.
 

Note 1： It is determined according to the running time of the background program, the default is to record one every 50ms, it will record when each motion is found, which up to 20,000.</td></tr>
<tr><td> 
</td><td>Press this button to move the robot to the calibration point. Stop when it is released or arrives. Just like "Return to Calibration Point" in the boot page.</td></tr>
<tr><td>To the self-set coordinates
 
</td><td>Coordinates selection:
The coordinates of "World", "Work" and "Joint" can be selected.

Coordinates input:
You can click on the field of the coordinate value, input the value directly, or press "Get Current" first, then bring in the current coordinate value and then modify it for the specific items.

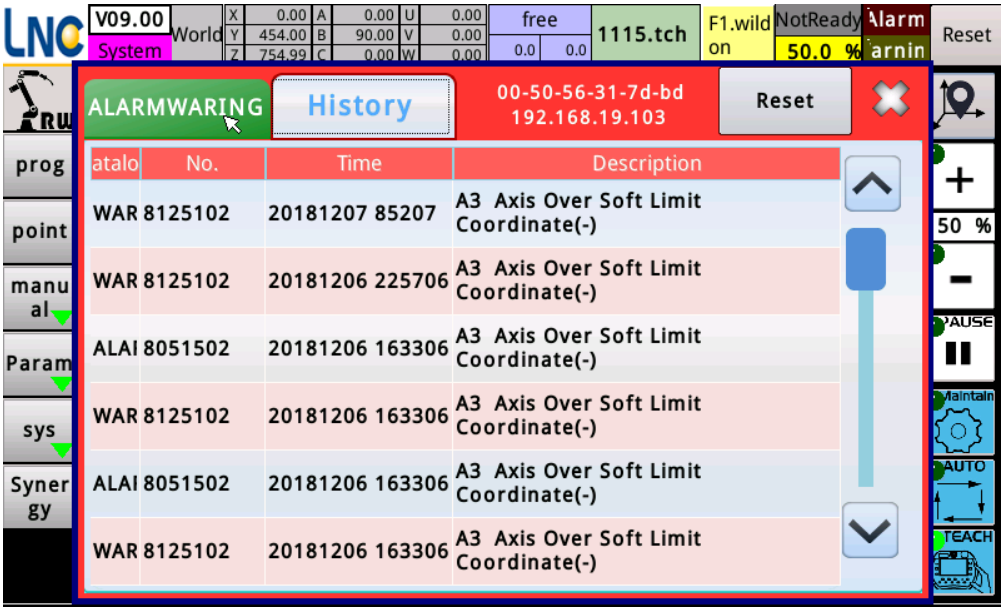
Motion to coordinates:
Press "To" to move to the target coordinate value, which stops when it is released.</td></tr>
<tr><td> 

 
</td><td>If an alarm occurs during the motion, press this button to clear the alarm.

Click this button to close this page</td></tr>
</table>

Alert and warning page

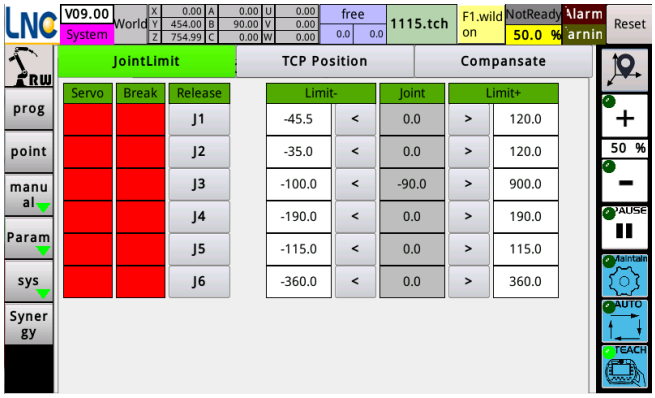
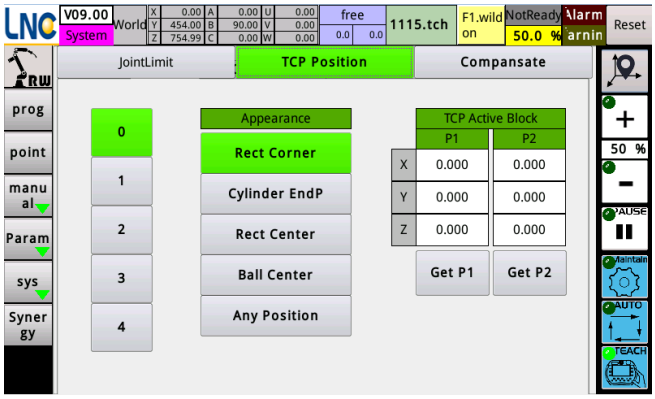
This page shows current and historical alerts and warnings. History records historical alarm content and codes!

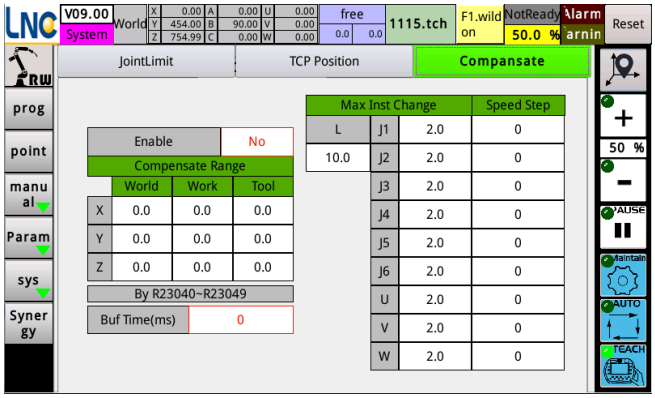


5. Common functions

Limits

In addition to the limited rotation angle or trip of each joint, the limit includes items such as cusp range, process range, and coordinate compensation. These items are used to limit the range of action.

	Although each type of mechanism has a mathematically computable range when performing calculations, such a large range may not be allowed to be rotated due to the relationship of mechanism interference or the relationship of wire rolling and tearing. For various types of mechanisms, if the first axis is a rotating axis, the default limit of the mechanism algorithm is -210~210. Release: Servo Off, brake On, you can manually push the mechanism and directly observe the coordinate values of each axis.
	This range is used to set the allowable active area of the tip of tools after the tool parameters setting. If the value in the XYZ direction of the field is filled with 0, it means that the range of motion is not limited. The tolerance of the ambiguous point: represents the maximum positional tolerance value if the coordinates of the same value with the ideal value are not obtained at the path point during the calculation of the algorithm.
	This range is used to limit the maximum allowable offset range when using the process for offset of the path.



Set the maximum compensation value when using the R value to determine the compensation amount to avoid the danger of input errors.

Dynamic compensation (R23040~10)

40	Dynamic position compensation start flag	0 Close、1 Start、2 Clear
41	Dynamic position compensation X	World coordinate compensation
42	Dynamic position compensation Y	
43	Dynamic position compensation Z	
44	Dynamic position compensation X	Working coordinate compensation
45	Dynamic position compensation Y	
46	Dynamic position compensation Z	
47	Dynamic position compensation X	Tool coordinate compensation
48	Dynamic position compensation Y	
49	Dynamic position compensation Z	

Origin correction

Origin calibration process: perform tool calibration first, then origin correction

I. Tool correction

1）. TX, TY correction

1. Tool Calibration: After installing the calibration tool, use the "Installation Application/Tools" to correct the approximate tool size TX, TY

1. Select TX, TY and press "Clear"

2. Adjust the two cuspidal points to align and press "Point 1"

3. Rotate the world coordinate C about 180 degrees, then move the XYZ to realign the two cuspidal points and press "Point 2".

4. Press "Calculation" and the system will display "Error X" and "Error Y".

5. Click the white box to display the error value and add the error value to the tool parameters.

6. Press and release emergency stop to make the changed content effective.

2）TZ correction

1. Select TZ and press "Clear"

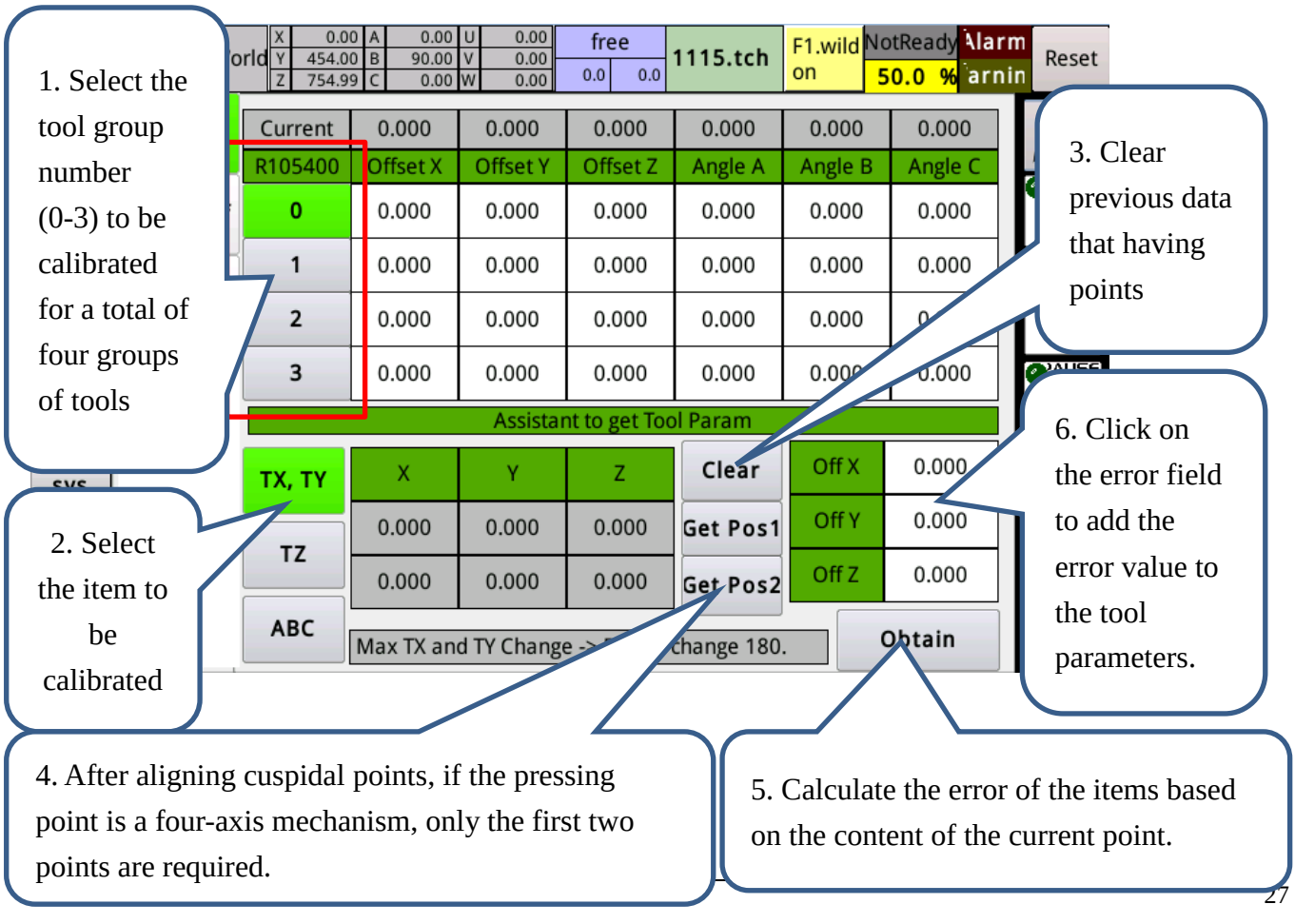
2. Adjust the two cuspidal points and align, press "Point 1"

3. Rotate the world coordinate B (tool direction) about 30~60 degrees (do not exceed J5=0), then move XYZ to align the two cuspidal points, and click "Point 2".

4. Press "Calculation" and the system will display "Error Z".

5. Click on the white box showing the error value and add the error value to the tool parameters.

6. Press and release emergency stop to make the changed content effective



II. Origin correction:

1. Press "Clear" to clear the original data of calibration points.

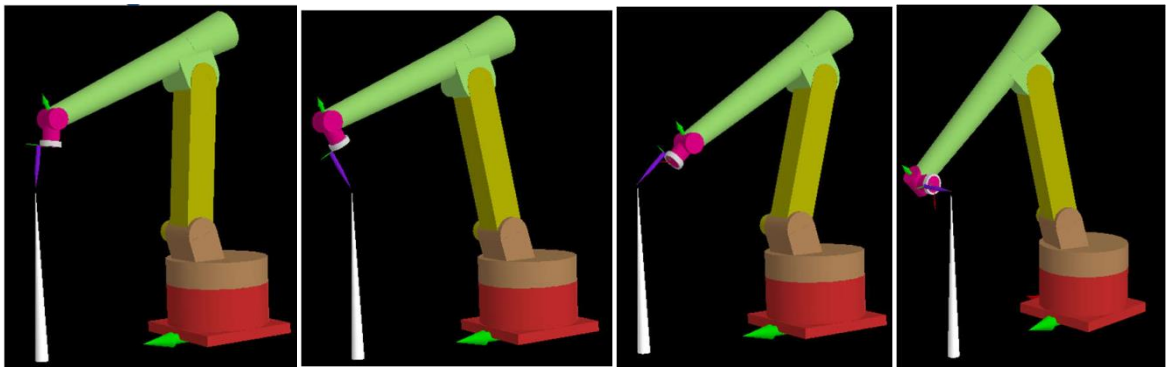
2. Arbitrarily take 8~10 points with large changes in attitude, and then click "Point" after alignment.

3. Select J2~J5, TX, TY, TZ as the items to be calculated, and then press Calculation to calculate the deviations and "maximum error".

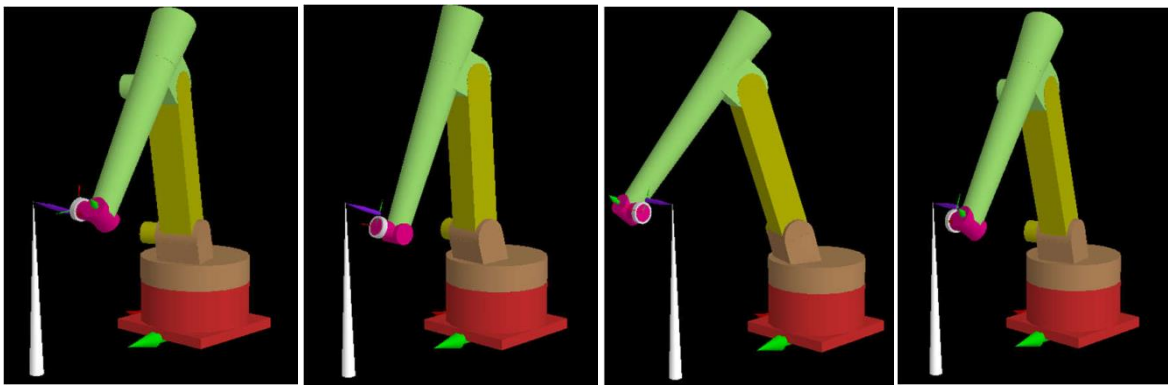
4. If the value of "maximum error" is greater than 2, it means that the system may have a problem that the reduction ratio is incorrect or the size of the mechanism is incorrect. The result of the calculation is also meaningless, skipping the next steps.

5. Click on the field that displays the error to bring the error value into the system.

6. Press and release emergency stop to make the changed content effective



(1)J5<0 (2)J5<0 (1)+B (3)J5<0 (1)-B (4)J5<0 (1)+A

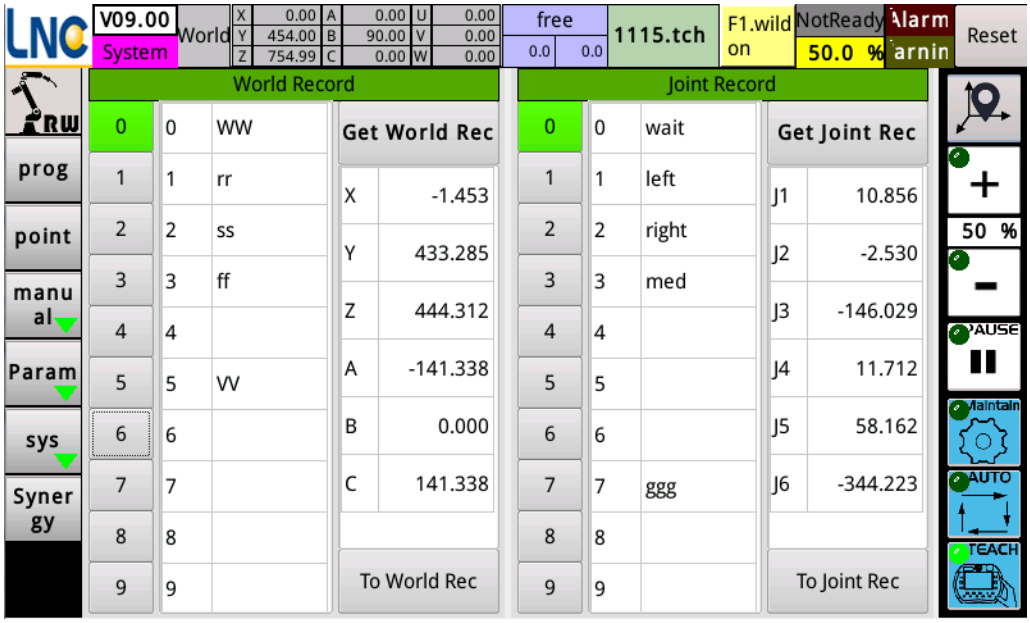


(5)J5<0 (1)-A (6)J5>0 (7)J5>0 (6)+A (8)J5>0 (6)-A

Note：Tool Calibration: After replacing with the tools in actual operation, use the Install Application/Tools to correct the exact sizes of tools.

Point records

There are two types of coordinate records: world records, joint records. Pressing the "points record" button, which is the coordinates record page. The page is as follows:



World record

Contains 100 sets of records, you can click the column of record number to select the record, or press the six buttons of record motion to select.The world record has three function buttons:

Get World Rec: Update the currently selected world record with current world coordinates

To World Rec: The straight path is calculated and moved according to the current and target positions.

Joint record

Contains 100 sets of records, you can click the column of record number to select the record, or press the six buttons of record motion to select. You can click the field next to the column of record number to set a name for point position. The name can be up to 11 English letters.
The joint record has two function buttons:

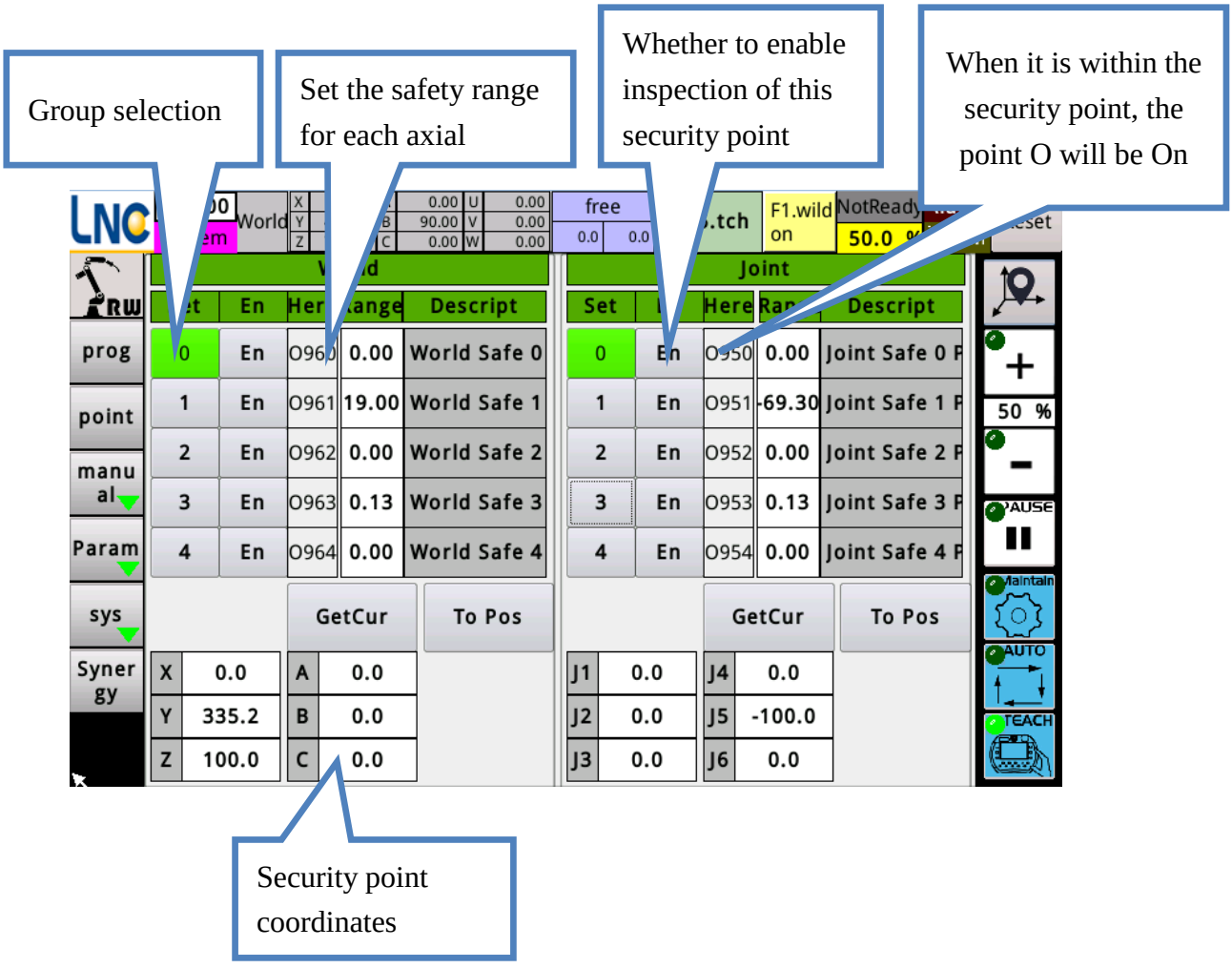
Get Joint Rec: Update the currently selected world record with current world coordinates

To Joint Rec: Move to the selected joint record position in a fast moving manner.

Security point

During the running of the program, the starting position of the restarting program may be different from the ideal starting position due to a sudden power failure or reset. If the manipulator is parked in a location that might be used for interference, it is dangerous to start the program rashly. Therefore, the system provides this function, which is convenient for checking the current position of the manipulator arm in the program, thereby reducing the occurrence of danger and the loss of property.

The system plans five sets (0~4) of the inspection interval of joint coordinate, five sets (0~4) of the inspection interval of world coordinate, and the setting of position interval can be set through the following pages.



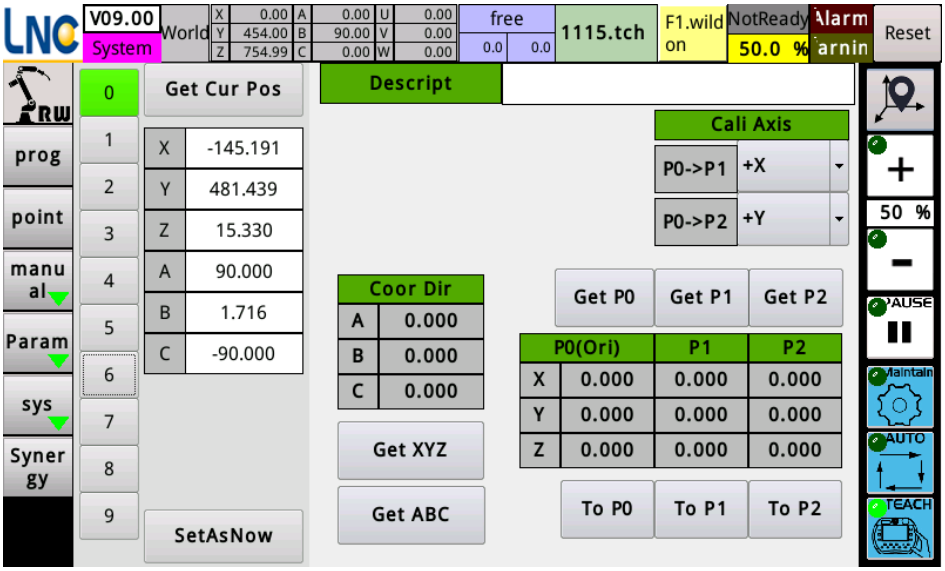
Coordinate system

Use of the coordinate system

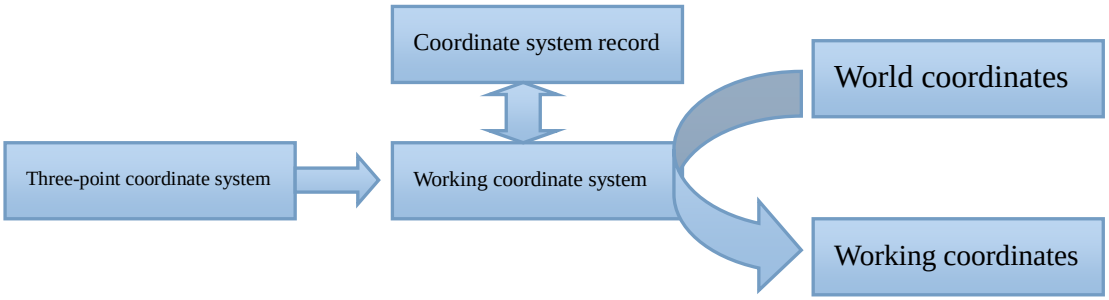
In the field processing, because the relative position between the workpiece placement position and the manipulator body is not the same as when writing the program, a method must be provided to adapt to the change. The coordinate system is used for such purposes. The coordinate system of this joint manipulator system can compensate for rotation and tilting in addition to the offset of the spatial point.

Because a manipulator may have multiple working areas at the same time, the system provides up to 10 sets of coordinates for customers to use according to actual needs.

The following figure can be divided into two areas, the left side is used to view the current coordinate system record, and the right side is a three-point coordinate system method to help calculate the positional offset, direction rotation and tilting of the coordinate system.



After the coordinate system is determined using three points, it can be stored in the coordinate system record for use in the program.



Coordinate system record

0 ~9: Click to select the coordinate system number to be operated.

Principle and operation of three-point coordinate system

In mathematics, we can determine a coordinate system through three-point positions, where:
P0: origin of the coordinate system
P1: the point on the main axis
P2: point on the secondary axis (on the plane)
According to the difference of the actual workpiece or the direction of the action path, the main axis may be a point on +X, -X, +Y, -Y, +Z, -Z, and the secondary axis is also the same, so 24 kinds of three-point definition can be provided.
Select XYZ: Bring the XYZ of the right P0 into the coordinate system record.
Select ABC: Bring the "Coordinate System Attitude" ABC calculated from the right three-point coordinate system into the coordinate system record.
Set to current: Set the selected coordinate system record value to the current work coordinate system.

After selecting the relative position of the object in the working area and the manipulator arm, the three-point coordinate system can be set. The operation mode is as follows:

1. When using for the first time, first set the attitude to teach, or to the teaching page, adjust the arm attitude to the teaching attitude, and then press "record calibration attitude" so that each teaching is taught in the same attitude.
2. Press "To Calibration Attitude" to adjust the manipulator to the recorded calibration attitude.
3. First select the origin P0 and P1, P2 to be used as the basis for the calculation of the coordinate system.
4. According to the axial direction where P1 and P2 are located, click the upper axial selection to switch the axis.
5. Press XYZABC below to align the tip to P0, then press "P0" to bring "Current World Coordinates" into P0 coordinates.
6. If you only intend to use the position of the offset coordinate system and do not intend to change the rotation of the coordinate system, just correct P0.
7. Press XYZABC below to align the tool tip to P1, then press "P1" to bring "Current World Coordinates" into P1 coordinates.
8. Press XYZABC below to align the tool tip to P2, then press "P2" to bring "Current World Coordinates" into P2 coordinates.
9. The system automatically calculates the attitude of the coordinate system.

Automatic mode

Program classification

Use	Included items	Actionc description
Manual operation (specific action)	Calibration point Path return Specified coordinates Point record Security point …	In the non-handwheel mode, the action is performed when pressed, and stopped when released. In the handwheel mode, it's controlled at the handwheel rotation speed after starting.
Automatic operation (Files edited by the user)	Teaching procedure Program list NC execution …	Use the method of starting after releasing the time of duration of pressing to avoid accidental pressing.

Options

Key tone: On/Off

Touch tone: On/Off

Tone length (ms)：0~1000

Backlight brightness (%)：0~100

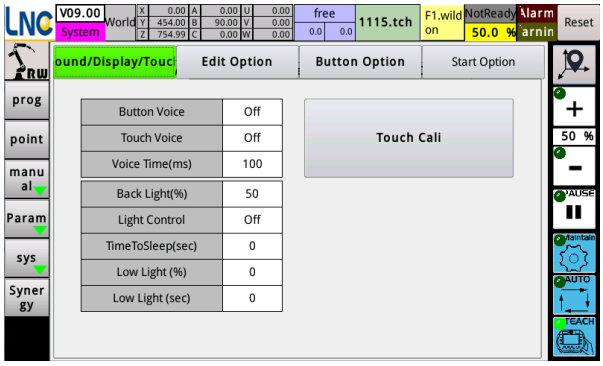
Backlight control：On/Off

Sleep time (seconds): When the backlight control is On, how long it takes to enter the low backlight state.

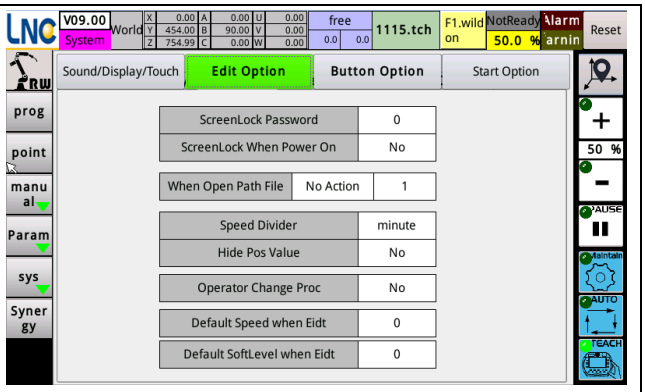
Low backlight brightness (%)：0~100

Low backlight time (seconds): The time to maintain a low backlight state. When the time is up, the backlight is completely dark.

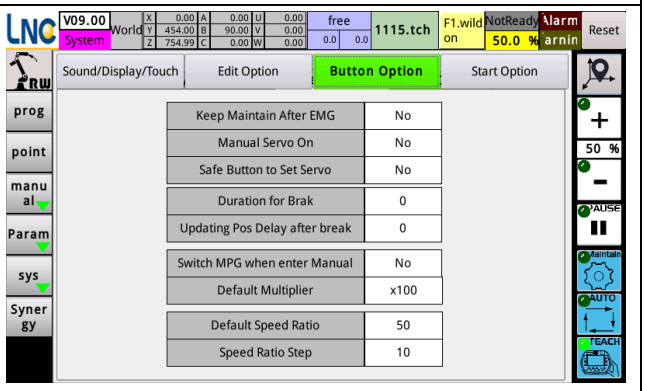
Touch correction: When the touch is not correct, click this button to enter the touch correction function. After the calibration is completed, you need to manually perform the shutdown and restart.



Screen lock password: set the password when the screen is locked.
Lock screen when booting: Whether to lock the screen when booting.
When opening a program file: Whether to change the speed ratio and its value.
The program page speed shows the denominator: the speed denominator is in minutes or seconds. Hiding coordinates of program page: Whether the program page should hide the coordinates as it is not understood by the general operators.

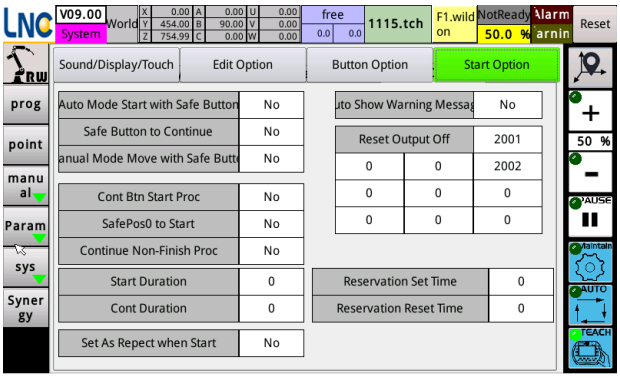


Manually start the servo after an emergency stop: After the emergency stop is released, whether to manually start the servo, the servo can be started by pressing "Prepared" or "Unprepared" on the head list.
Time required for brake clamping: When the emergency stop is pressed, the brake will be clamped first, and the servo will be turned off after the set time has passed.
Switching mode of the security button: Whether to use the security button to switch the auto/teaching mode.
Safe button control servo in manual mode: In manual mode, the servo will be started only when the security button is pressed, which is used in large robots to ensure safe operation.
Default speed ratio (%): How much the speed ratio should be changed when the F% key is pressed and when rebooted.
Adjusting space of the speed percentage: How much the speed percentage changes when the +, - key is pressed.



Default speed multiplier: The default speed multipliers when booting is x1, x10, x100.
Overload automatic deceleration: When the load of any axis exceeds 100%, whether to automatically reduce the speed so that the load is reduced to less than 100%.
When turning off the handwheel mode: whether to reset the program or change the speed percentage.

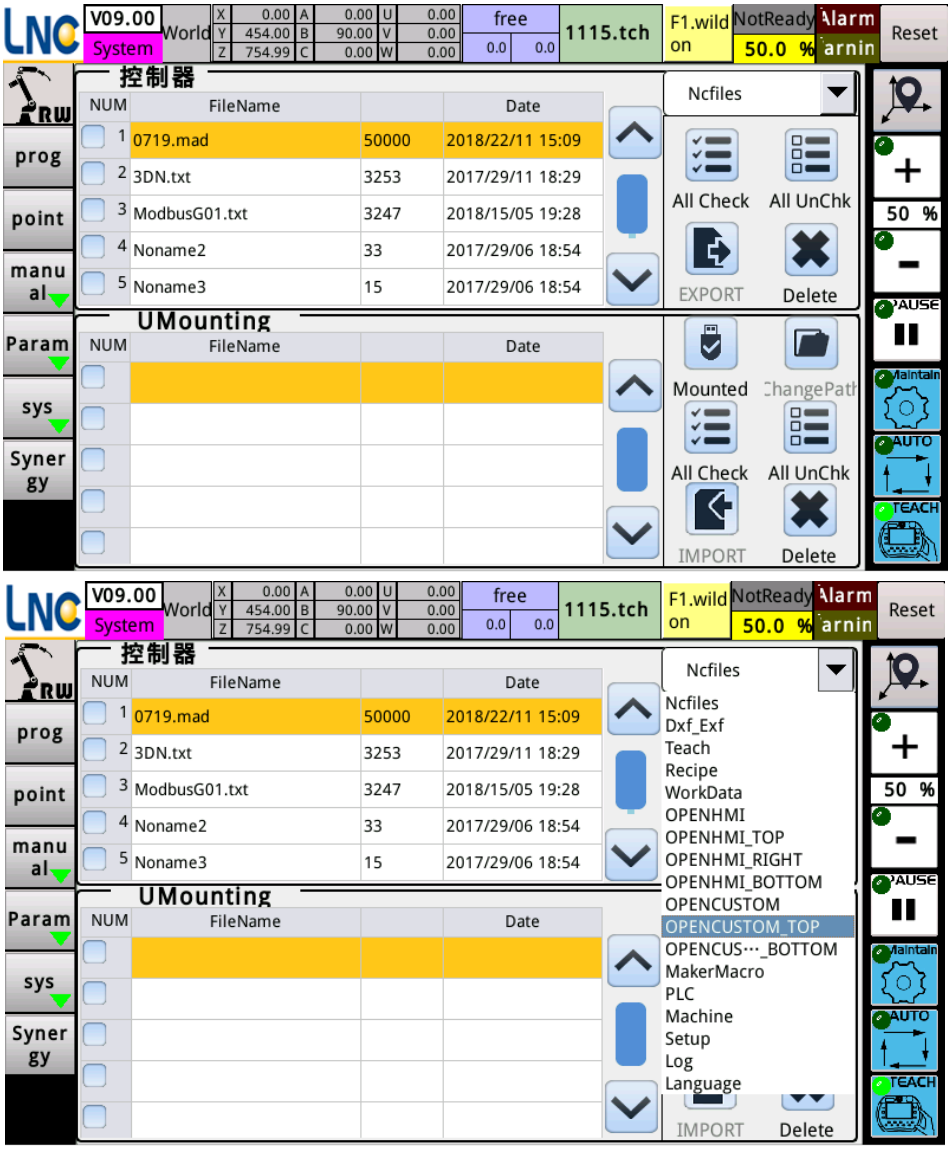
The automatic mode requires a security button: whether it is necessary to press the security button to start the program in the automatic mode.
The automatic mode requires a security button: whether it is necessary to press the security button to act in the automatic mode.
The automatic mode requires a security button: whether it is necessary to press the security button to pause the program in the automatic mode.
Start the program by CONT button: In the automatic mode, whether to start the program directly by pressing the CONT button.
When the action button is released: In the teach mode, pause or reset the action when the action button is released.
It must be at the security point 0 when starting: whether to check if it is at the position of joint security point 0 when starting the program, if not, an alarm will be issued.
Continued unfinished program: When Yes is selected for this option, if the program is not completed and interrupted, the system will record the last line that was executed, and the start button of the program page will turn red, indicating that if the program is started directly, the system will continue to execute since the line. If you do not plan to continue, press the system reset button to clear the continuous action.



Time required for start (ms): How long it takes for the start button to be valid.
Time required for CONT (ms): How long it takes for the CONT button to be valid.
Automatic pop-up window when warning: Whether the alarm window pops up automatically when a warning occurs. Determined according to operating habits.
O point closed at reset: When pressing reset, the O point to be closed at the same time can be filled in four numbers.

Files transfer

The files transfer page can be used to transfer files between the controller and the USB flash drive.




Click this button, you can see the folders to be backed up in the select menu and click on the items to be backed up for backup.

1. Teaching files: program edited in program page
2. Manufacturer macro: macro program
3. PLC: The user uploads his own PLC here.
4. Mechanical parameters: system parameter data, such as: reduction ratio, speed and other parameters
5. 5. Upgrade files: When upgrading the system, upload the system files here

6. Programs

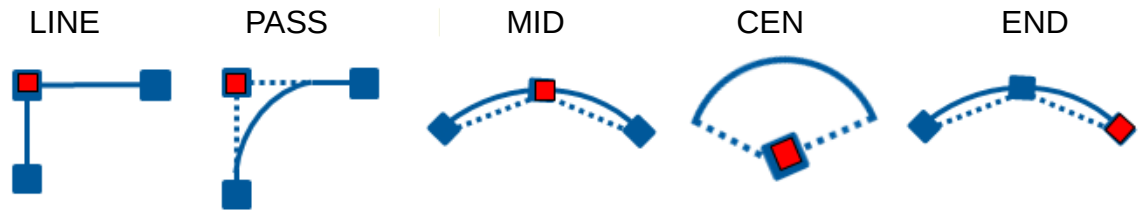
This feature provides a process for editing a program without using a PC editor.

Description of motion behavior and motion path

Motion behaviors and motions can be roughly classified as follows:

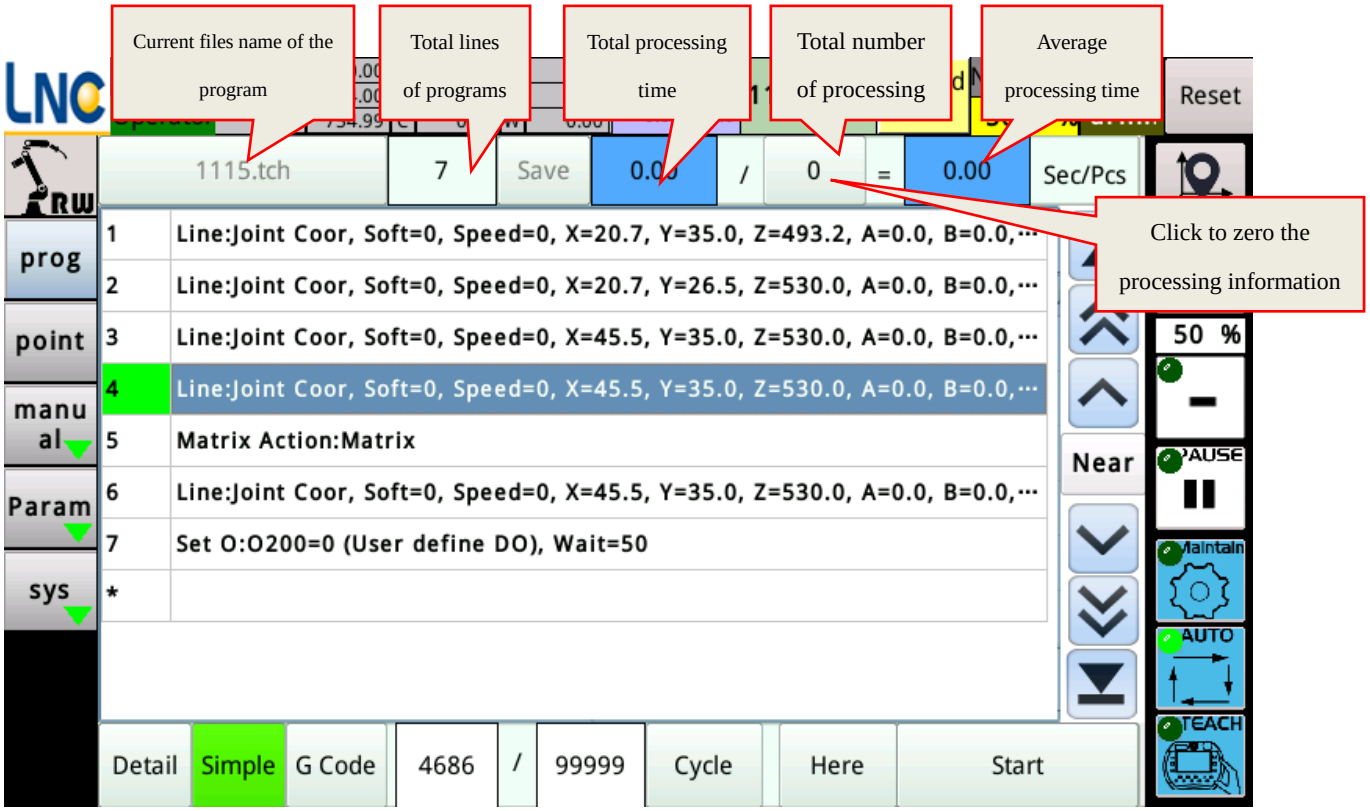
Motion behaviors	Location division	Speed conversion	Use
Fast-moving	No	No (moving speed)	This command can be used when the joint 3 and 5 have a span of 0 degrees of current joint coordinates and the target joint coordinates. The change process of each joint is proportionally converted according to the difference of the joint coordinates between the current coordinates and the target coordinates, so that the target point can be reached most quickly. However, since the attitude change during the actual conversion process is related to the current coordinates, the change process cannot be ensured, so care should be taken when using it.
Direct motion	No	Yes (Linear speed)	It is similar to fast moving, but the equivalent speed that moves the current position to the target position matches the set value of the linear speed. This motion method is usually combined with an external CAD/CAM to split the motion path into small line segments to obtain GM code processing program, which is directly used by the joint manipulator system.
Path motion	Yes	Yes (Linear speed)	The system automatically generates the motion path according to the set coordinates and commands of each path point, and ensures that the overall moving speed is consistent with the set linear speed.

When using path motion, the path can be represented by the point coordinates in the set space and its point attributes. The following figure is a diagram of point attribute and path:

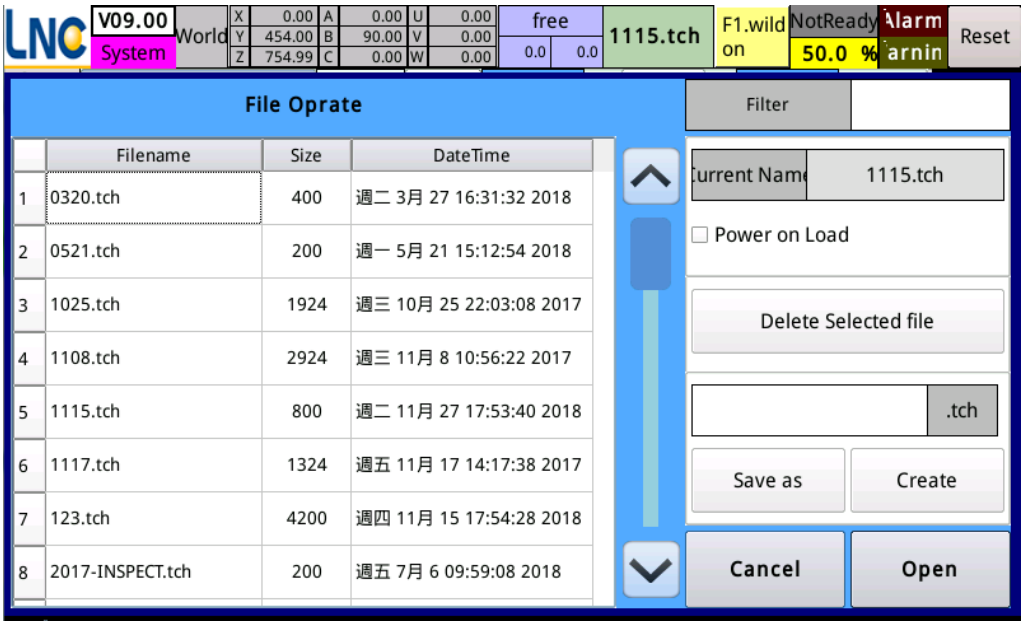


During the motion process, in addition to the end point of the tool as the calculation basis, the system also calculates the amount of attitude change, and performs an equal proportion of attitude change with the distance motion.

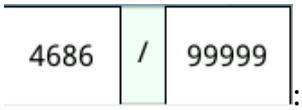
Programs running in automatic mode



Display the current files names, click to open other saved files, or operate on the saved files. The screen is as follows:

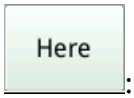


:The way that the screen is displayed can be switched.



: Sets the number of times the target program runs and displays the current number that it has been running under "Repeat" execution. If the target is set to 0, it means that continuous operation with no stop. The current number of times can also be filled in according to the actual situation.

: The switchable program ends after once execution, or it repeats execution.



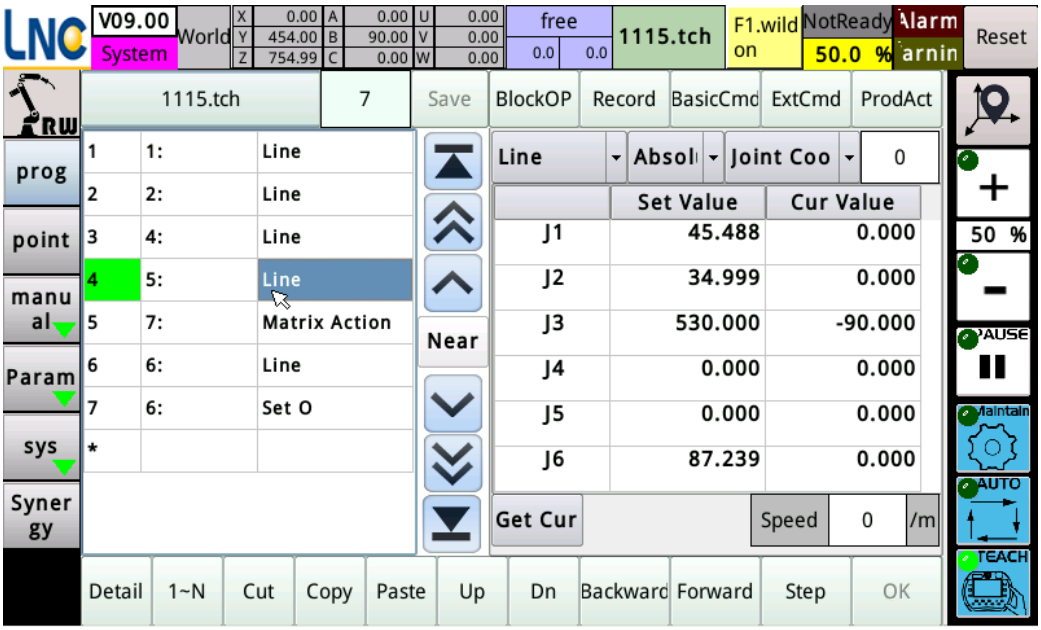
: Whether to start execution from the selected line when the program starts.

: Run the current program.

The average processing time: perform the times box to zero the count.

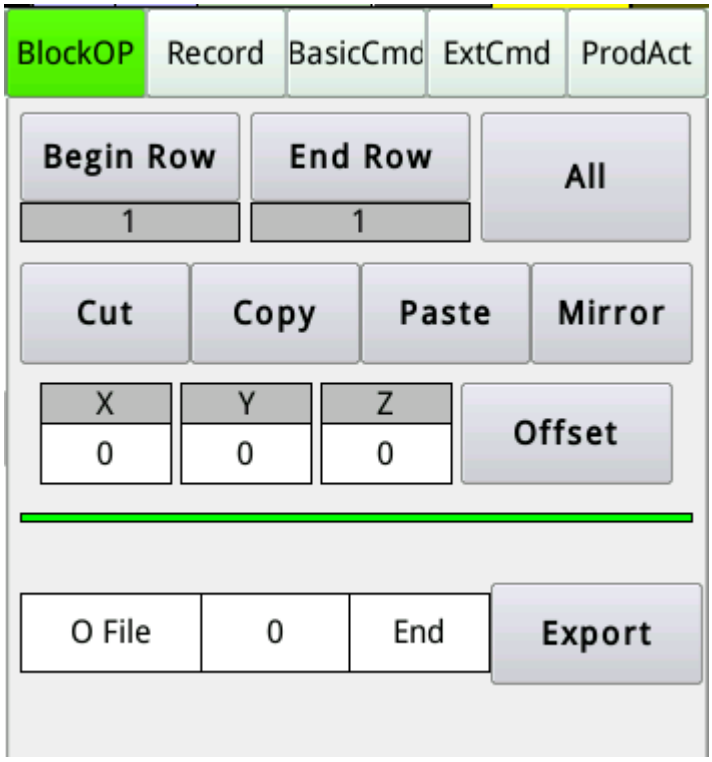
Editing program in maintenance mode or teaching mode

Note: editing program need to have "administrator" privileges to operate.



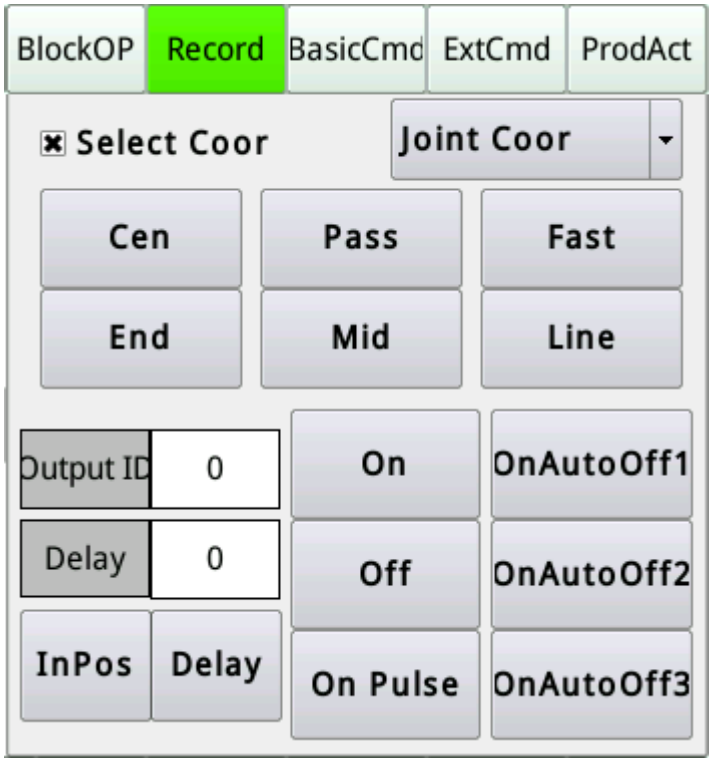
Block operation

: Used to perform moving of a whole process of program. After pressing the block operation, the command details will display the following contents. You can click the line number of the side and press "Start Column", "End Column" or "All Columns" to set it. Then, according to the need to copy or move, press "Cut", "Copy" and "Paste" to complete the operation. After the completion, press the block operation again to end the action.

	Start column, end column: After selecting a column in the list, press the two buttons to set the processing range. Cut: Cut the set range down Copy: Copy the set range. Paste: Paste the cut or copied portion to selected column of the current list. Offset XYZ: Offsets all the items of "World Coordinate" and "Work Coordinate" in the set range. Export: Export the current files to the o files. Note: The exported O files can be called as a subroutine or operated in the NC execution.

Recording

The recording function is mainly for the convenience of quickly teaching a motion path, so only a few path commands and output control commands are placed on the screen.



On the list of programs, after selecting the position where the recording command is to be inserted, click the button on this screen.

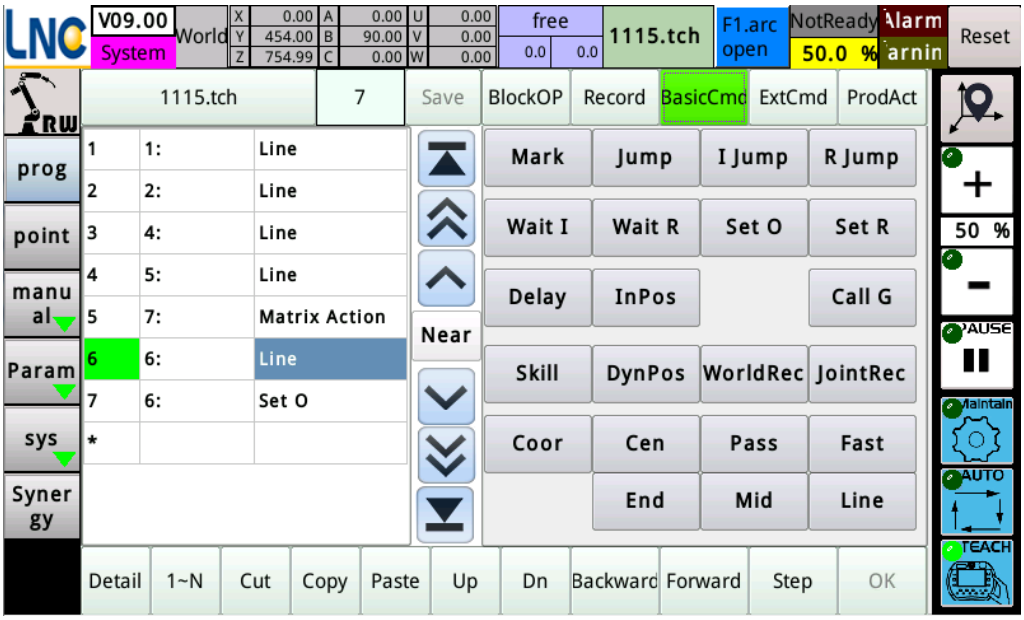
After moving the robot to the preset position, press the action to be performed to move to this position. This process is called "recording". Because each robot position has a variety of coordinate system representations, the recording is directly using the coordinate system used in the current teaching, or specifying which coordinate system to record.

Keys	Record command	Command parameters
Select coordinate system	Select coordinate system	The coordinate system selected is used as the recorded coordinate system.
Fast	Fast path	If the "Select Coordinate System" function is not on, the coordinate system of the teaching motions is used as the recording coordinate system to generate a command line that moves to the current position. If the "Select Coordinate System" function is on, the coordinate system selected at rear is the recorded coordinate system.
Linear	Linear path	
Arc midpoint	Arc midpoint	
Arc transition	Arc transition	
Arc center	Arc center	
Arc end	Arc end	
In place	In place/delay	In place or not and delay time
Delay	In place/delay	In place or not and delay time
Number O	Soft number at O 200	Enter the output number to execute
ON	Set O	Output number, ON
OFF	Set O	Output number, OFF
ON pulse	Set O	Output number, ON pulse signal
ON background OFF	Set O	Output number, receive command ON and then background OFF

Note: "Welding" and "Drilling" are achieved through custom commands (process packages). For detailed use, please refer to the development manual.

Insert built-in commands

The built-in commands contain the complete command content. Each click insert will display the various available commands. After clicking one of them, the details of item will appear for editing. After editing, press "OK" to add commands to the program list.



Note 1: "Graphics", "Tool Parameters", "Sensing Stop", "Security Point", and "Program List" are built-in process package commands.

Note 2： "Parameter Process" and "Coordinate Process" are for developers to write industry-specific commands (process packages) and integrate the operation interface into the program page. For details, please refer to the development manual.

Editing

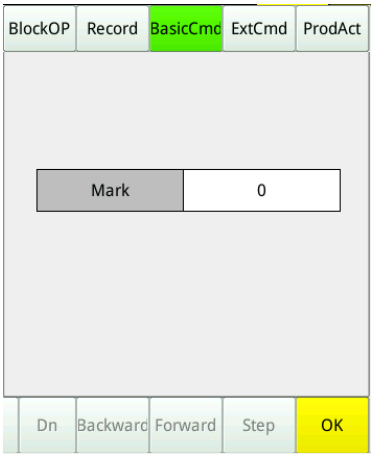
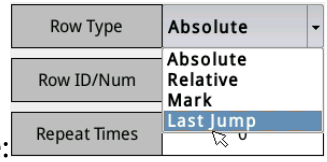
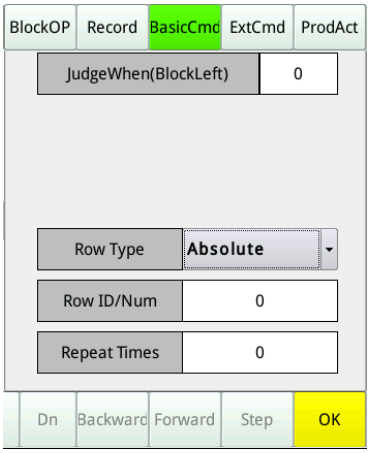
Delete: Delete the currently selected column.
Up: Moves the currently selected column up.
Down: Moves the currently selected column down.
Copy: Copy the currently selected column.
1~N： Re-arrange the order in the description based on the column number of the program. The main purpose of this action is to let the operator understand the order of the operations, so that when the insertion position is mishandled, it is convenient to know how to adjust the order of the commands by "up", "down" and "segment operation".
Comment: Switch the information displayed in the left half of the command list.
Back: If the current position is matched with the selected command line, pressing this button will move back one space and then press the single step to let the robot return along the path until the previous command point.
Forward: If the current position is matched with the selected command line, pressing this button will forward one step, allowing the robot to forward along the path until the next command point.
Single step: Move the robot to the position where the command line is currently selected.

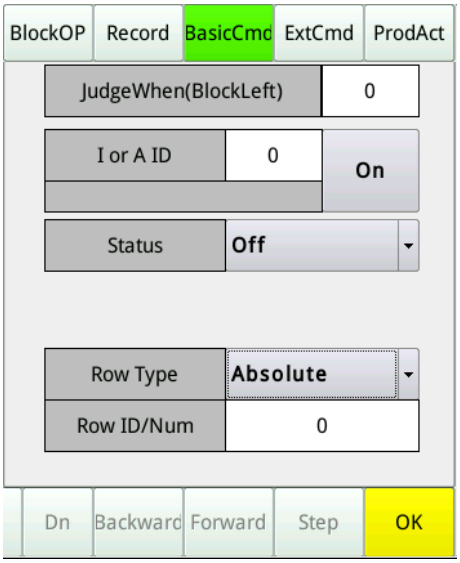
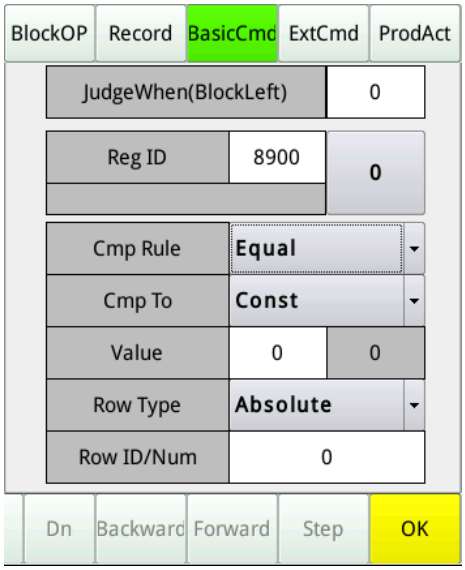
Description: The single step, forward and back functions are especially suitable for confirming the accuracy of the track and speeding up the debugging program.

Program content and instruction description

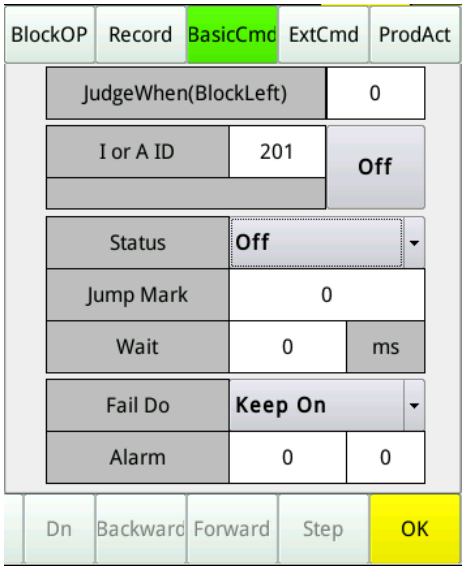
The commands included in the system can roughly be classified as follows:

Process control

Command name and description	Screen
Label Set the label of the command line for the jump setting reference.	
Skip Skip directly to a line. Line number type:  Absolute line number: (ie the actual program line number). Relative line number: (relative to the current line of line number, for example, currently line 8, -4 means skipping to the 8 - 4 = line 4). Label: (ie the label column set previously) Last skip: Return to the next line of the last calling skip command. Line number / lines: refer to skip mode Times: Repeat the times of this skip action	

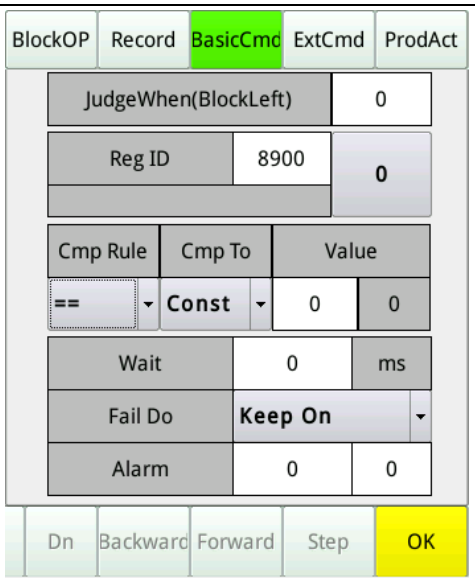
## I Skip Skip to the specified line when the conditions of I or A match. No: number of point I Value: When the state of point I is in accordance with this setting, the skip action is performed. Skip mode: refer to skip command	
## R Skip When the condition of R matches, skip to the specified line. No.: R value number Comparison method: Value: Constant (fixed value), R value (refer to the content of another R value). Right box (constant value / R value number) Skip mode: refer to skip command	

Waiting type

Command name and description	Screen
## Waiting for I Wait and continue after waiting for I to match the status Number: number of point I Value: When the status of point I is in accordance with this setting, the next action is performed. Waiting: The longest waiting time. Failure processing: processing after waiting time	

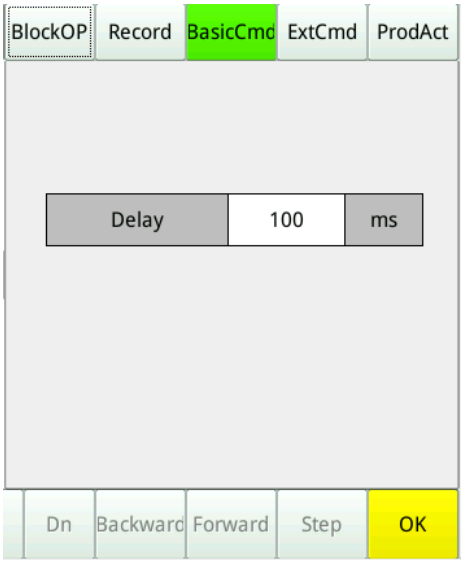
Waiting for R

Wait and continue after waiting for R value to match the status
No.: R value number
Comparison method:
Value: Constant (fixed value), R value (refer to the content of another R value). Right box (constant value / R value number)
Skip mode: refer to skip command
Waiting: The longest waiting time.
Failure processing: processing after waiting time



Delay

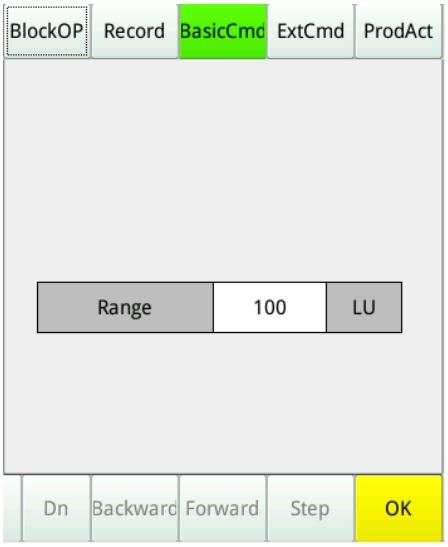
Moves after waiting time
Delay： The time need to wait



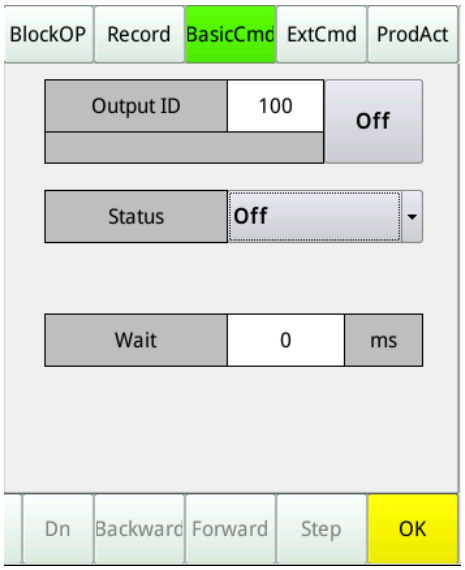
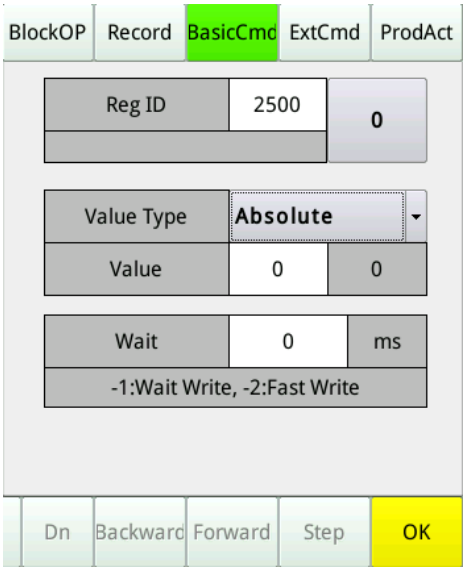
Arriving

Move after waiting for arriving the position
Arriving: 1/1000 degree, or 1um

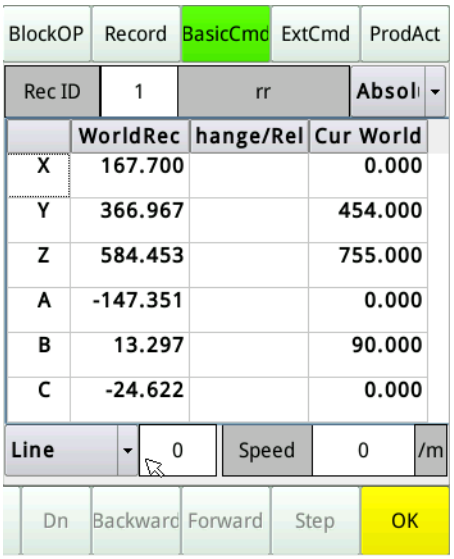
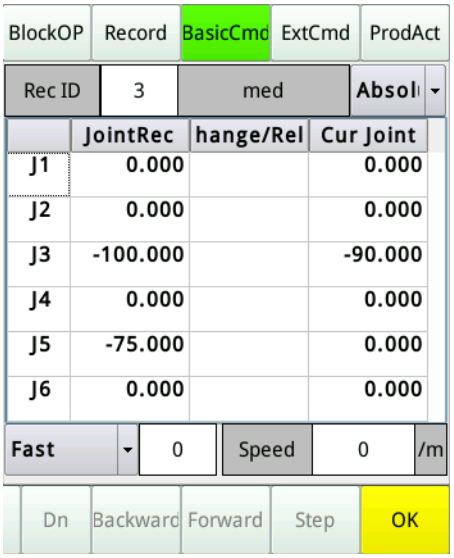
Note: The range of arriving will only be checked after the commands have been sent. So, setting a very large value may not have the desired effect.



Status setting

Command name and description	Screen
Set O Set the status of point O Number: the number of the point O Value: Off, On, commutation (change to another state based on the current state of the point O) Wait: Set how long to wait before executing the next line.	
Set R Set the content of R value Number: the number of R value Type of value: Absolute: directly set the content of the R value to the content in the "Value" field. Relative: Accumulate the content of the Value field based on the content of current R value. No.: Set the R value of the specified R number in the Value field to this R value. Add 1 to the circulation: Add 1 to the current R value and set it to 0 when the value is greater than the set value in the Value field. Value: Reference mode description Waiting：Set how long to wait before executing the next line. When this value is filled in -1, the system will wait until the previous command is executed, and then continue to interpret， which can be used to avoid synchronization during the motions, but it may make the motions less continuous. When set to -2, it means to write immediately, not to write until the motions arriving to this line.	

Motion command

Command name and description	Screen
World record World record location Record number: based on the record number. World record: Display the value of the world record directly based on the record number. Current world coordinates: Display current world coordinates. Point type: fast, linear... Speed: If the speed is 0, it means the default linear speed is used. -1~-100 represents the percentage of the set speed in the debugging page.	
Joint record Joint record location Record number: based on the record number. Joint record: Display the value of the Joint record directly based on the record number. Current joint coordinates: Displays the current joint coordinates. Point type: fast, linear... Speed: If the speed is 0, it means the default moving speed. -1~-100 represents the percentage of the set speed in the debugging page.	

Set coordinate system

Set work coordinate system

Direct setting: Use the content entered in the table as the current work coordinate system.

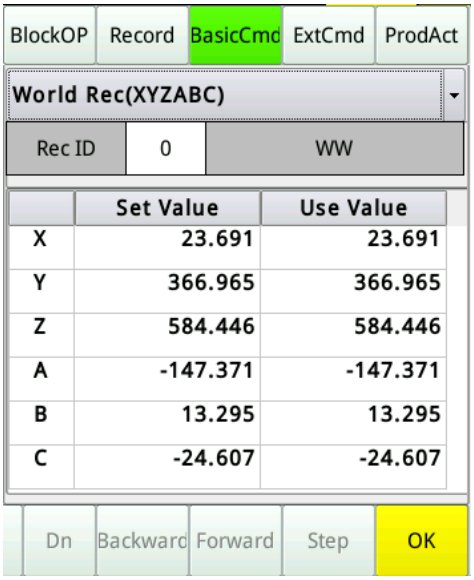
World record XYZ: Set the position (X, Y, Z) in the set world record number to "Work coordinate system", but set (A, B, C) to 0.

World record XYZABC: Set the position (X, Y, Z) and (A, B, C) in the set world record number to "Work coordinate system".

Coordinate system record: Set the coordinate system record to "Work coordinate system".

Current position and attitude: Set the world coordinate position (X, Y, Z) and (A, B, C) when the program is executed to this line to the "work coordinate system".

Dynamic position and attitude: The content is read from the set R value as the value of the "work coordinate system".



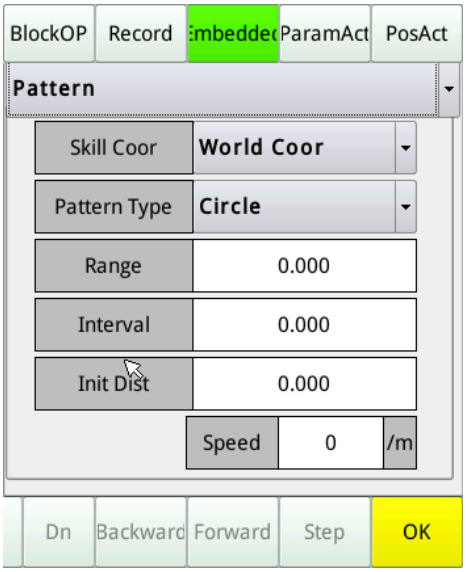
Process setting

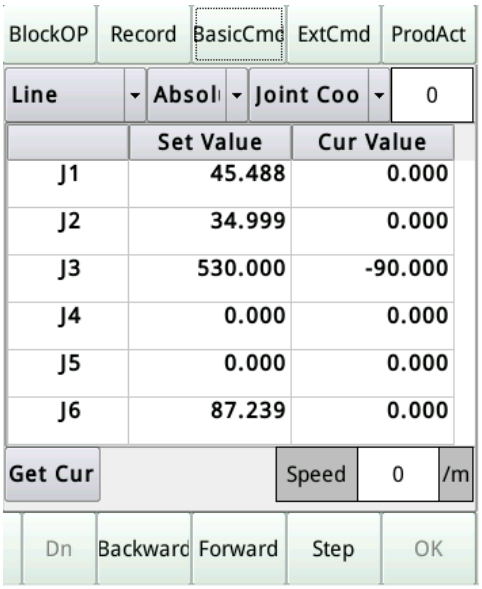
Set whether to use special movement when the path moves.

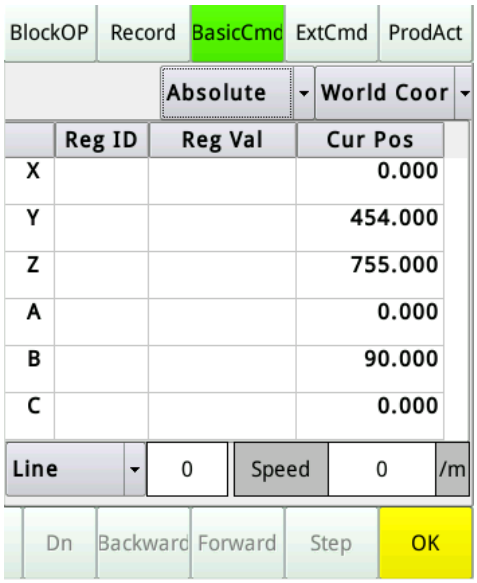
Stop process: If there is a process started, this command will generate a linear path from the process offset position to the original position.

Start process: If the process is not started, this command will generate a linear path that moves the current position to the process offset position. If the process is already enabled, this command will generate a linear path that moves the current process offset position to the new process offset position.

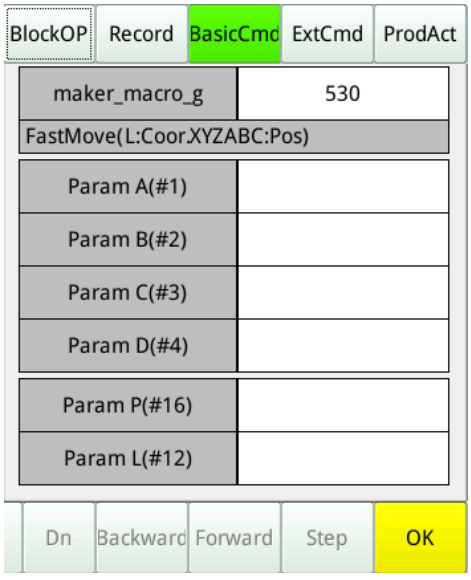
Process coordinate system: The coordinate system on which the process path is based.



Sample type: There are three types of winding, moving back and forth, moving left and right, and can be expanded according to actual needs in the future. Moving range: The swing range, that is, the maximum distance from the original path. Paragraph distance: The position of the swing is repeated after every certain paragraph distance on the path. Initial movement amount: The amount of movement at the beginning of the process when the movement distance is 0. Dynamic process: Same as Start, except that the parameters of the process are determined by the content of the R value. Note: When using this function, the actual calculated process offset value must be smaller than the “Max Range of Process” column in the “Options Page/Run”, otherwise the alarm will pop up.	
Fast, Linear, Arc transition, Arc midpoint, Arc center, Arc end Absolute/relative: The content representing the set value is either absolute to the selected coordinate system or relative to the current coordinate of the target coordinate system. Coordinate system: the coordinate system used to represent the contents of the set value Set value: XYZC Speed: If the speed is 0, it means the default moving speed. -1~-100 represents the percentage of the set speed in the debugging page. Bring in the current: Fill the current coordinates of the coordinate system into the set value according to the selected coordinate system.	

## Dynamic location World record location Absolute/relative: The content representing the set value is either absolute to the selected coordinate system or relative to the current coordinate of the target coordinate system. Coordinate system: the coordinate system used to represent the contents of the set value Number of XYZC set value: Source buffer for obtaining XYZC coordinate information. If this field is blank, it means that the previous coordinates are used. Number of speed set value: Get the source buffer number of the speed information. If it is blank, it means the default linear speed is used. The dynamic position is always in the form of a "Linear path". This command is suitable for filling the target position with the vision system or PC, and notifying the manipulator for moving.	

External command calling

Command name and description	Screen
## GM code Call G code built-in by the system or manually written by the developer to provide greater flexibility Parameter A(#1) : The first parameter to be transmitted to the G-code. Parameter B(#2) : The second parameter to be transmitted to the G-code. Parameter C(#3) : The third parameter to be transmitted to the G-code. Parameter D(#4) : The forth parameter to be transmitted to the G-code. Parameter P(#16) : The fifth parameter to be	

transmitted to the G-code. Parameter L(#12) : The sixth parameter to be transmitted to the G-code.	

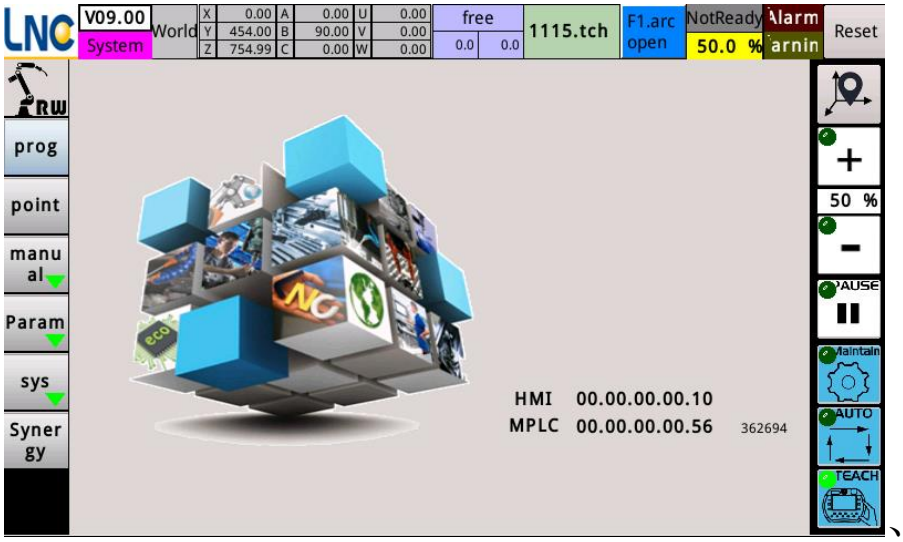
Process package of built-in instructions

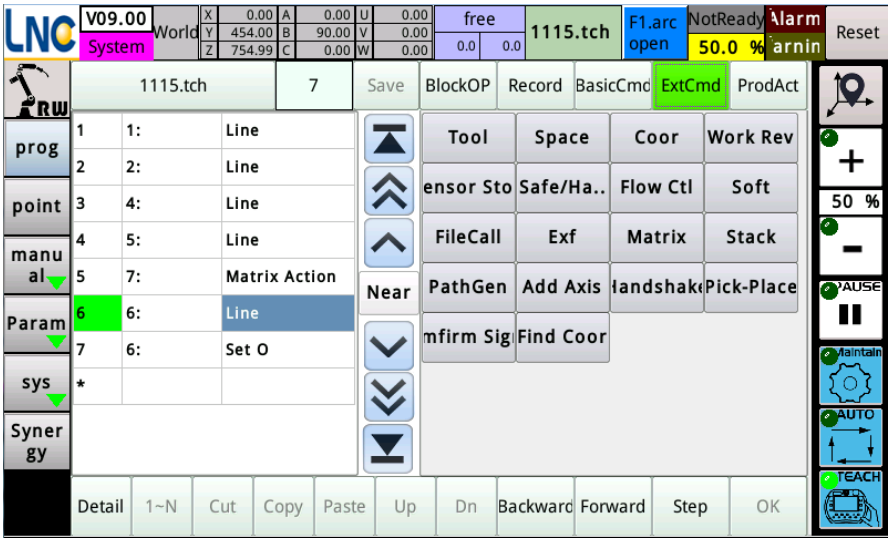
Six practical command process packages are available in the built-in command

External Files	Program list	You can call a program file selected in the list page by numbering.
	Calling O files	Can call a file generated in variety of types, including the O files generated by the sample page. The program page uses O files exported by the block operation. O files generated by external CAM software. But the O files generated by the establishment of the motor files are excluded
	Program list	The calling calls the corresponding program according to the storage location of program.
Drawing files	Load drawing files	Load the drawing files in the list of drawing files into the data of drawing files.
	Drawing edging	Based on the current data of drawing files, the path calculation of the edging class is performed and run. (Running without path direction with the tool tip follow up).
	Drawing cutting	Based on the current data of drawing files, the path calculation of the cutting class is performed and run. (Running without path direction with the tool tip follow up).
	Rotary polishing	According to the current data of drawing files, the path of the robot clamping workpiece for polishing is calculated and operated.
Tool parameters	Default tools	Apply the parameters of one of the four sets of tools preset in the tool page as the location of the cuspidal points of tools.
	Any tools	Fill in any tool parameter values yourself to define the location of the new tool's cuspidal points
IO-related	Sensing stop (world coordinates)	The relative position of the movement is defined by the world coordinates, and if the set signal is triggered during the movement, the motion is stopped.
	Sensing stop (work coordinates)	The relative position of the movement is defined by the work coordinates, and if the set signal is triggered during the movement, the motion is stopped.
	Sensing stop (tool coordinates)	The relative position of the movement is defined by the tool coordinates, and if the set signal is triggered during

		the movement, the motion is stopped.
	Issue a warning if "Wait I" timeout	Run the "Wait I" command, if it exceeds the set time, an alarm will be issued.
Security point	Inspection of world security point	Check if the current location is at the world security point of the command. If not, an alert will be issued. This command is usually written in the first line of the program to prevent the risk of collision when the position is incorrect at startup.
	Inspection of joint security point	Check if the current location is at the joint security point of the command. If not, an alert will be issued. This command is usually written in the first line of the program to prevent the risk of collision when the position is incorrect at startup.
	World security point	Move straight to the specified world security point position. This command is usually added to the last line of the program to match the security insoection of the first line of the program for circular operation.
	Joint security point	The joint moves to the specified joint security point position. This command is usually added to the last line of the program to match the security insoection of the first line of the program for circular operation.
Matrix stack	Stack motion	A stack motion is performed with the settings of the stack page.
	Stack reset	Reset of stack motion is performed with the settings of the stack page.
	Stack completion	Completion of stack motion is performed with the settings of the stack page.
	Matrix motion	A matrix motion is performed with the settings of the matrix page.
	Matrix reset	Reset of matrix motion is performed with the settings of the matrix page.
	Matrix completion	Completion of matrix motion is performed with the settings of the matrix page.

Introduction to welding process





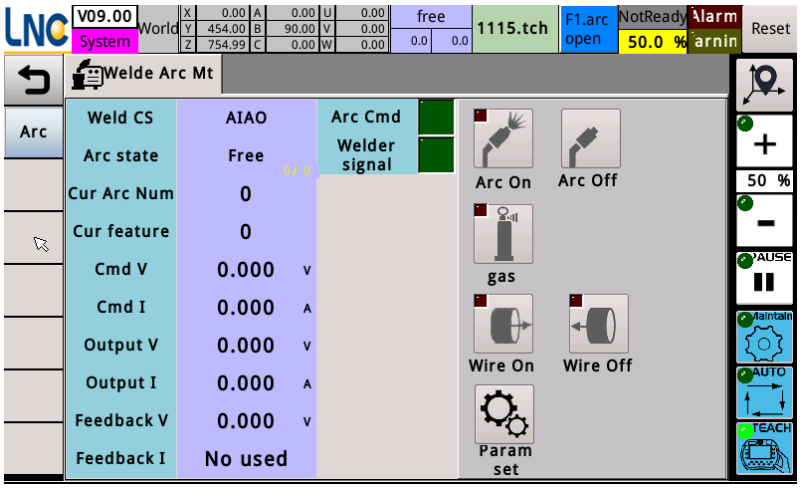
The parameter process includes a variety of welding process packages: torch output, arc welding, swing welding, tungsten inert gas welding and subscribe package!

Monitoring

It can be used to monitor the magnitude of the command voltage and current and the output voltage and current, as well as the output and input of the signal during the welding process.

Manual

In the maintenance mode, you can click on the arc, gas, wire feeding, and wire drawing! Make sure the signal is correct!



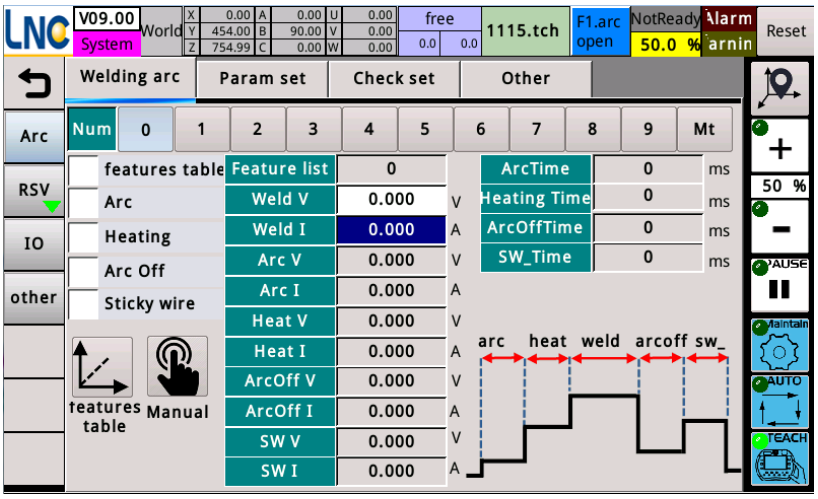
Parameters

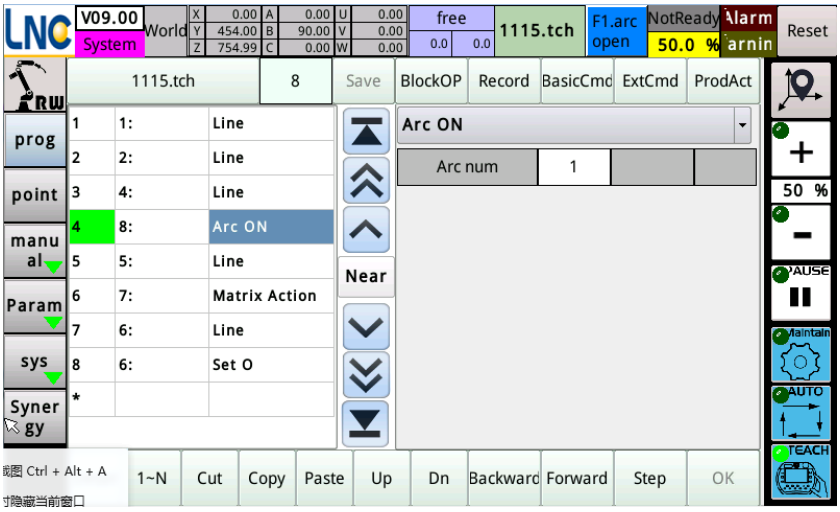
Divided into arc welding parameters, appointed parameters, welding IO parameters, and others!

Among them, arc welding is divided into welding sequence, arc welding parameter setting, output setting!

1. Welding sequence

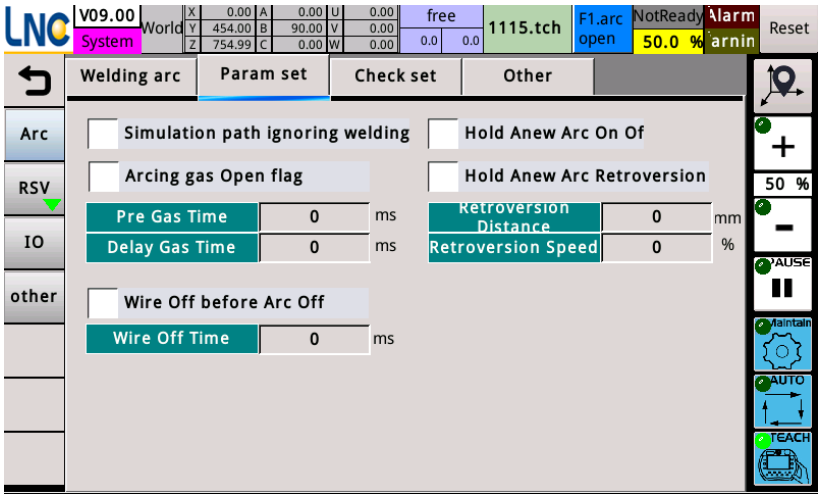
There are 10 sets of arc welding sequences and can be manually selected by the customer in the program. The parameter settings refer to the settings on the following pictures.





Switch the arc welding process according to different welding materials and environments.

2. Parameter setting



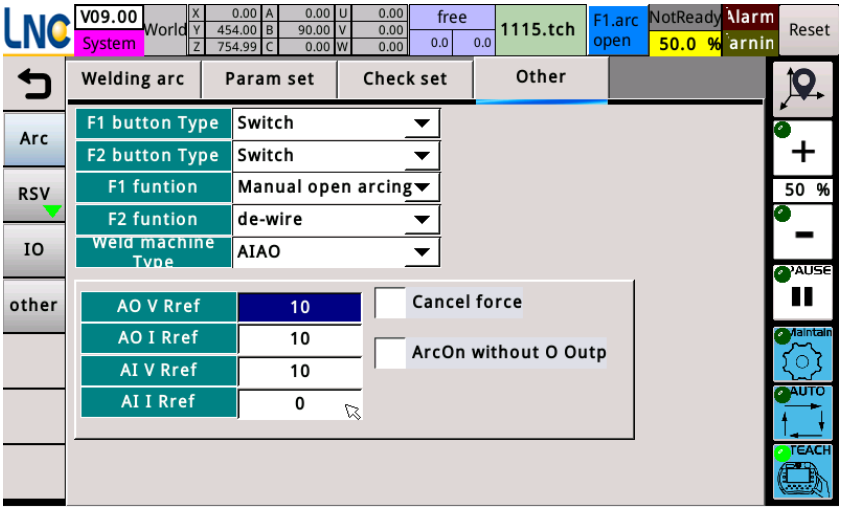
You can set the arc monitoring time, arc monitoring time, welding interruption, etc.!

Arc monitoring time: The time from the controller to send an arc signal to the system receiving the arc from the welding machine! If the system does not receive the success of arcing during this time, the system will issue an alarm of arcing failure!

Arc monitoring time: The time when the controller sends out the arc command and disconnects the arcing signal! If the arcing success signal persists, the system triggers the arcing failure!

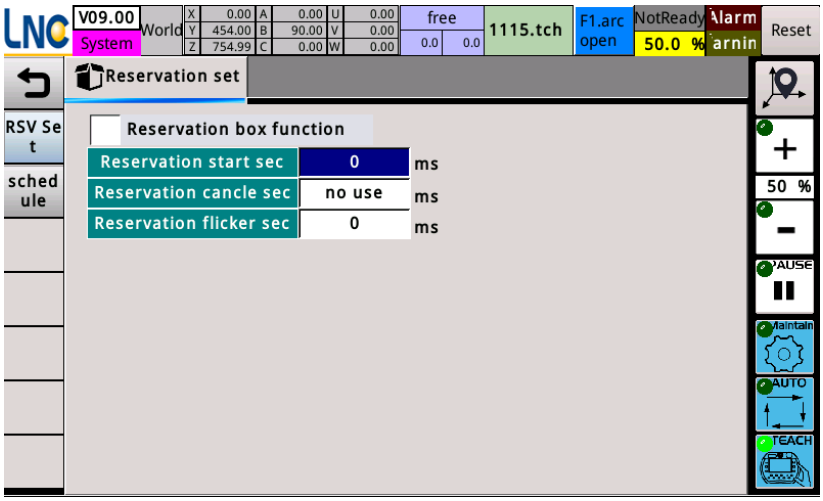
Monitoring time of welding interruption: After the value is successfully arcing, the system will issue the arcing command during this period, but after the arcing success signal is disconnected for more than the set time due to external reasons, the system will trigger the signal monitoring error in welding!

3. Define the functions and button forms of F1 F2! Set the number corresponding to the welding analog quantity!

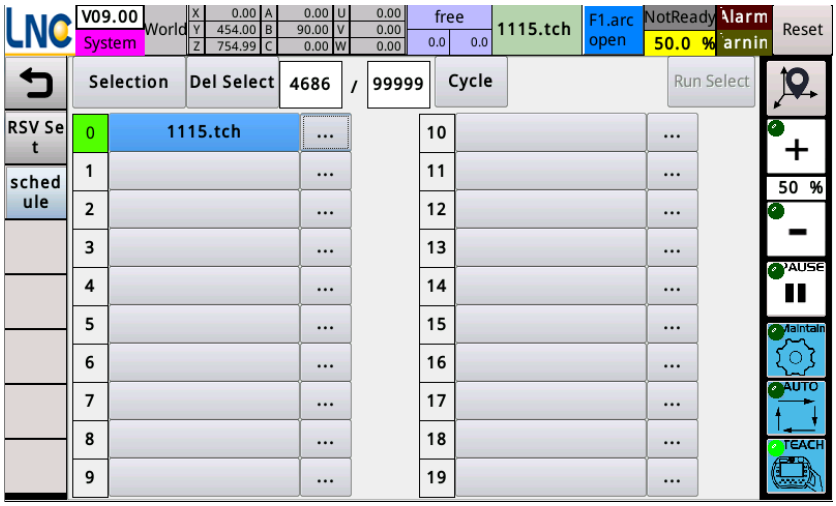


4. Appointed setting

The appointed setting refers to the start time of the function starting and the signal of appointed button.

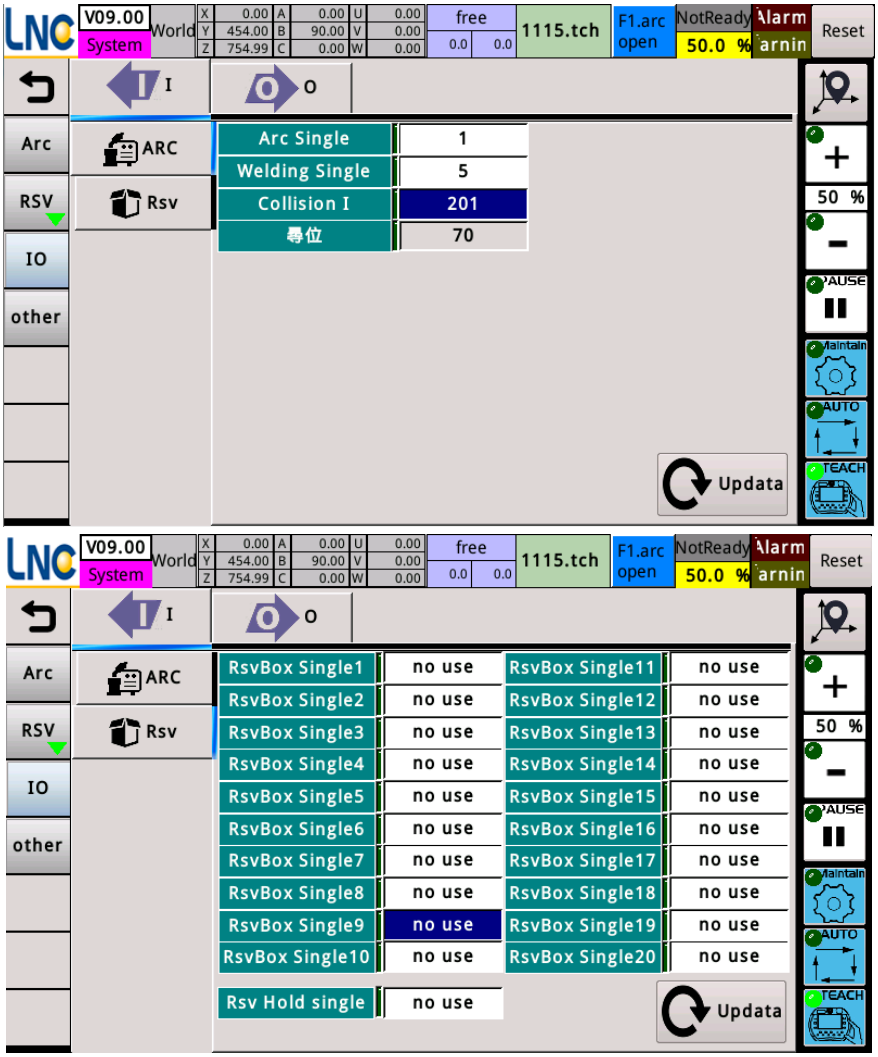


Schedule is the position of placement of the subroutine of the appointed program! A total of 20 program locations are available for placement.

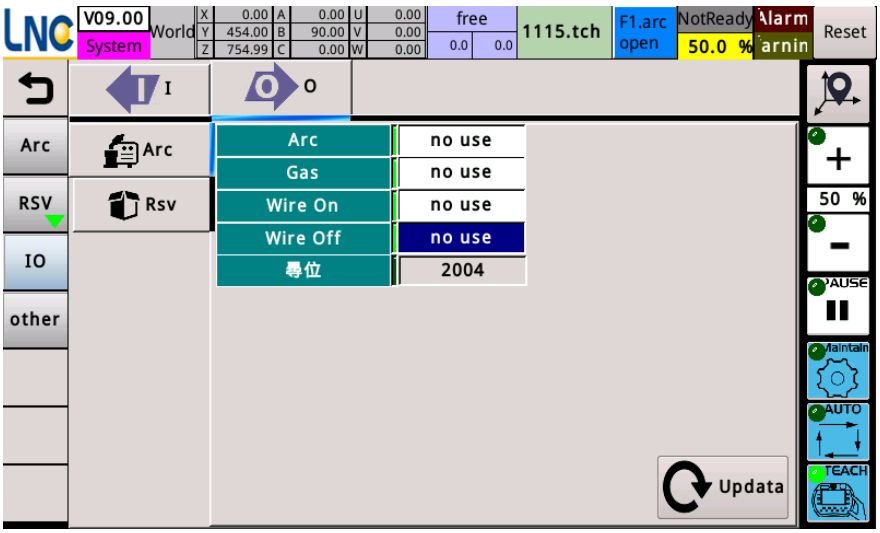


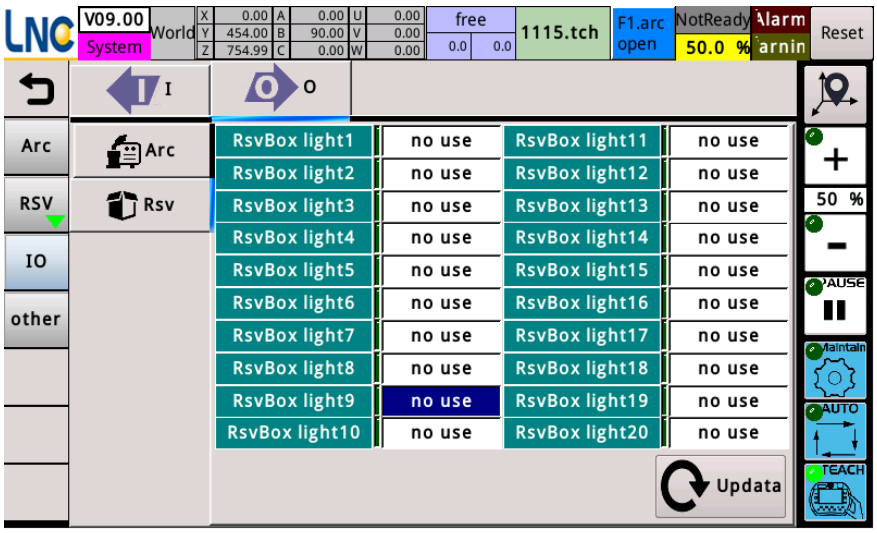
Welding IO

Point I: soft number of arcing success signal and torch collision point I number and point I number of the appointed box

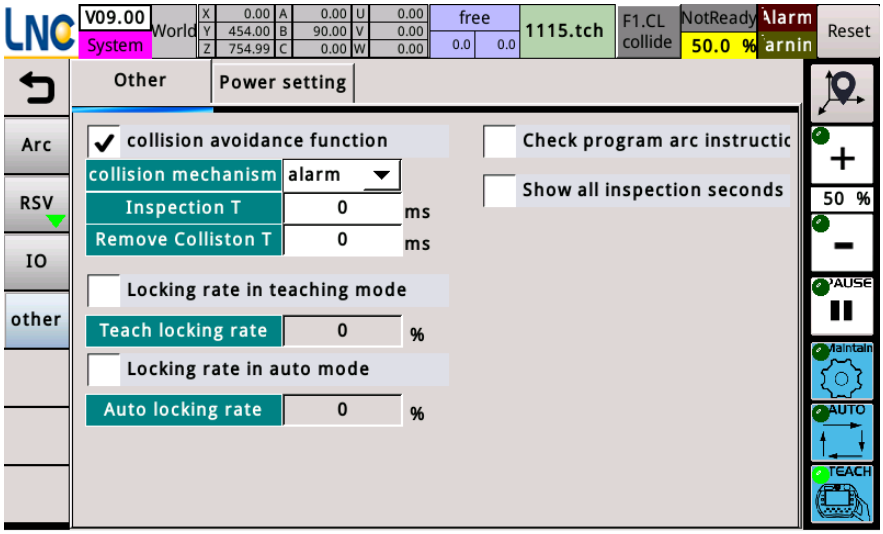


Point O: arcing gas wire feeding and the output of the starting light of appointed box





Others: Turn on the anti-collision function and the handling mechanism after anti-collision!



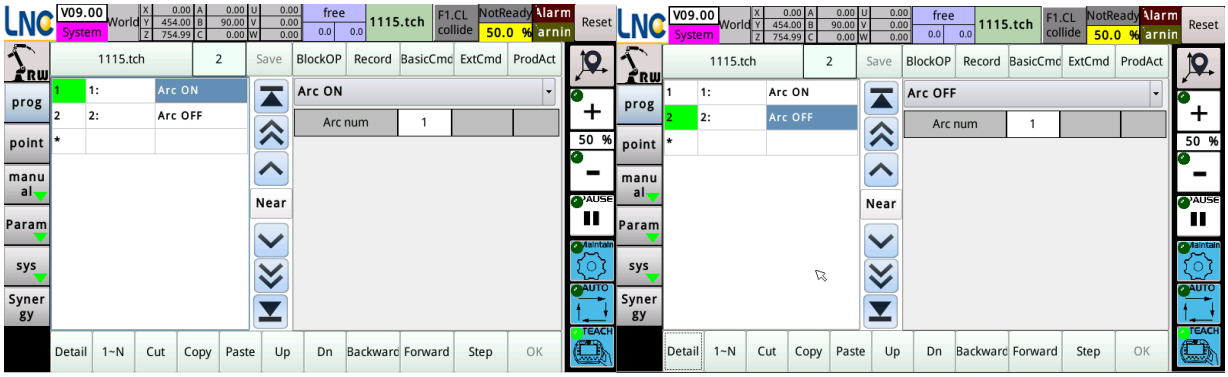
You can set the collision mechanism here: alarm warning pause

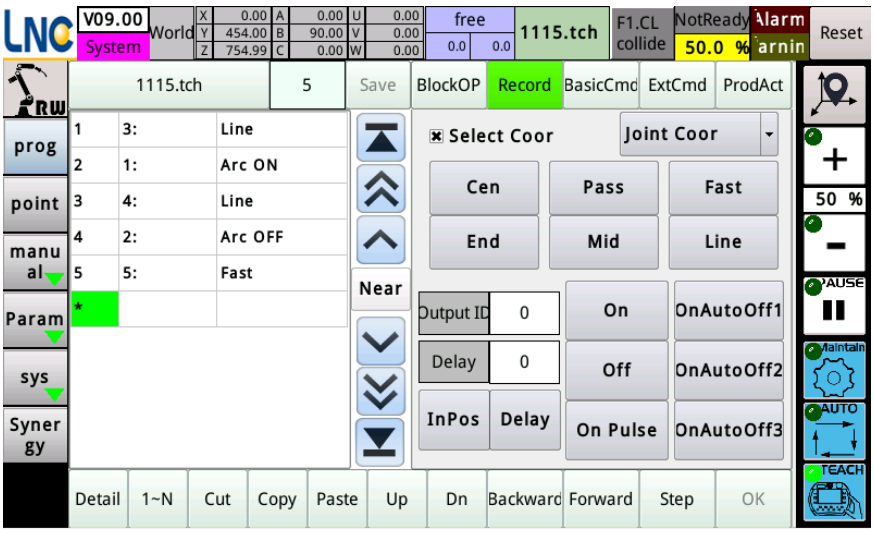
Collision detection time: collision signal duration in milliseconds

Release the alarm time: Click F1 to temporarily release the collision alarm. If the collision alarm still exists during this time, the system will continue to alarm!

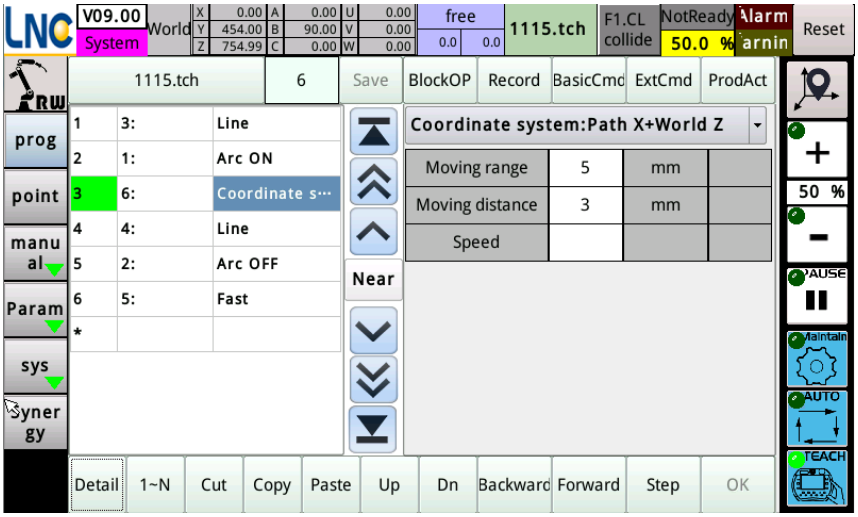
Program examples

1. General welding procedures

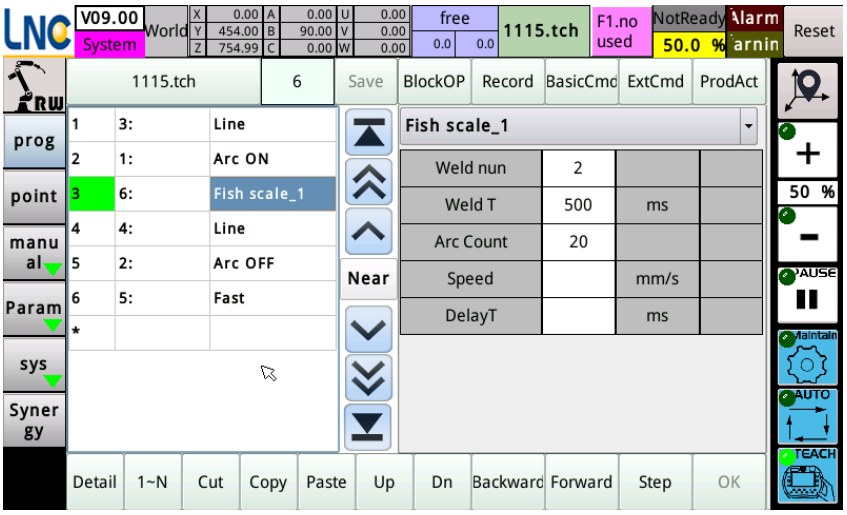




Examples of swing welding:

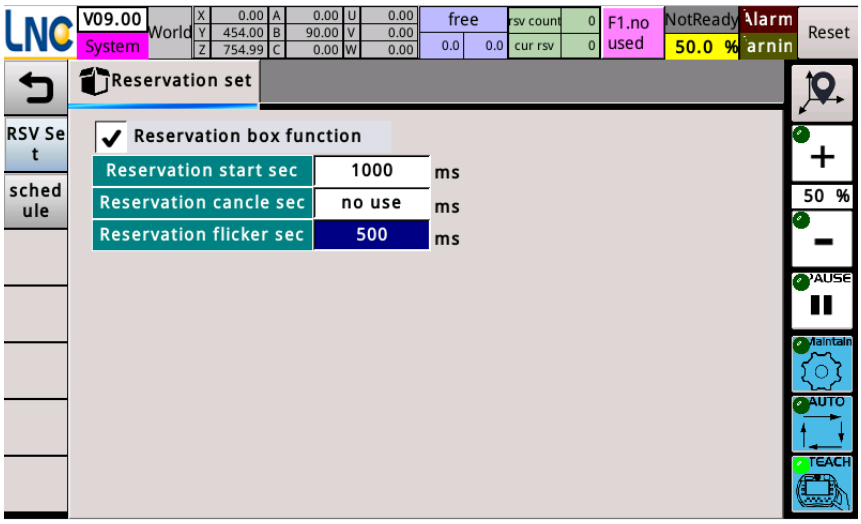


Examples of tungsten inert gas:

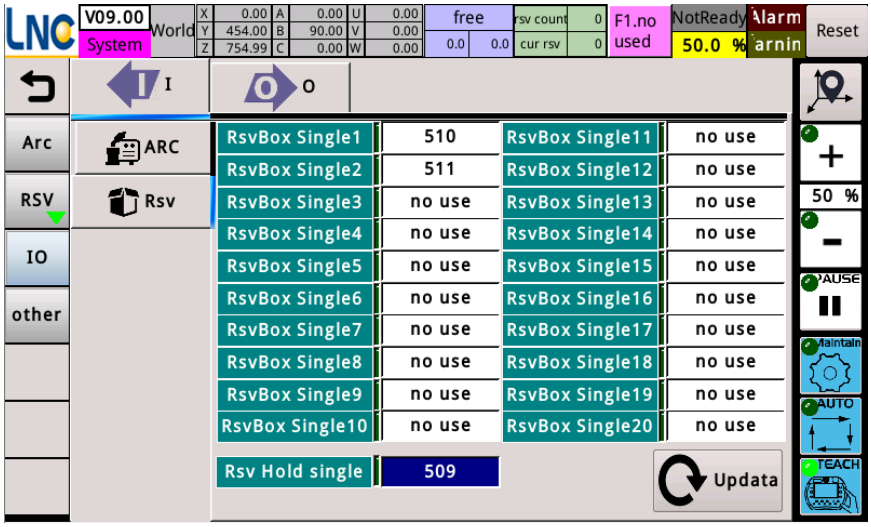


Appointed welding settings:

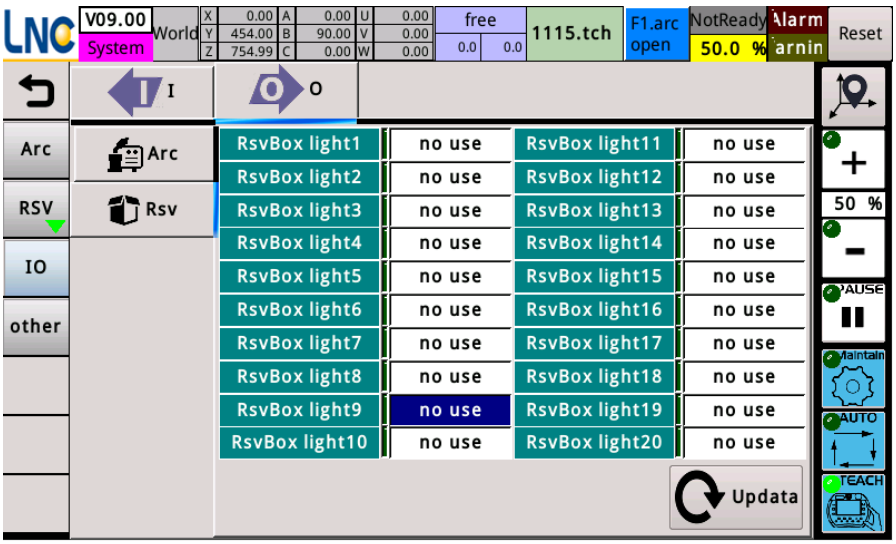
1. Set startup of appointment



2. Start the point I and pause signal of the appointed program!

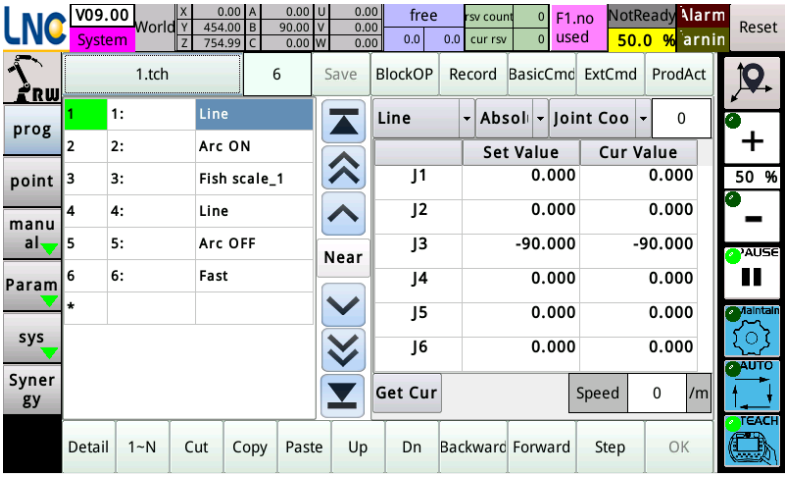


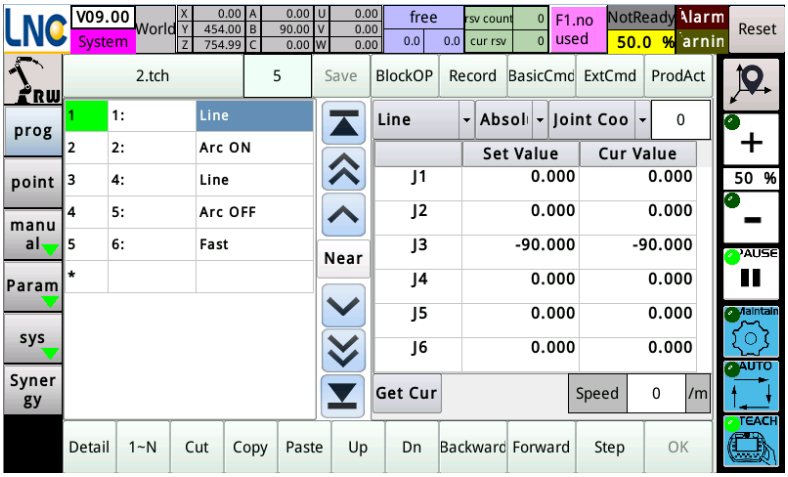
3. For the setting of the appointed light, set the corresponding output point O as required!



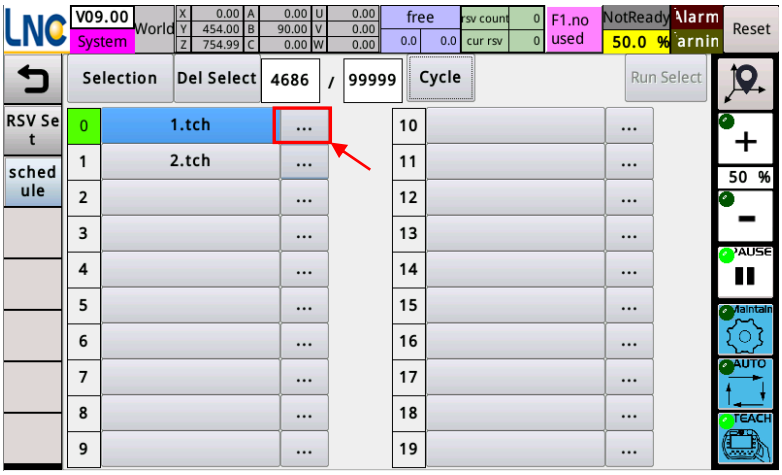
4. Addition of appointed subroutine

1、Program 1 and program 2 are also established in the program.

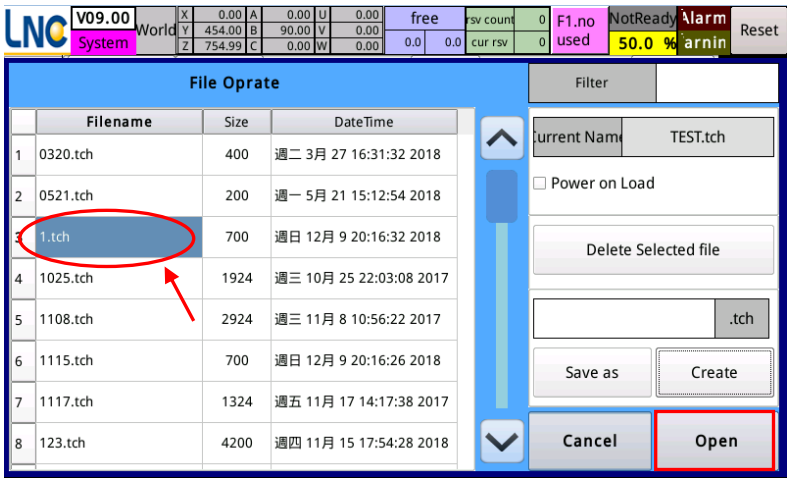




2、Add programs 1 and 2 to the appointed program!



Click here



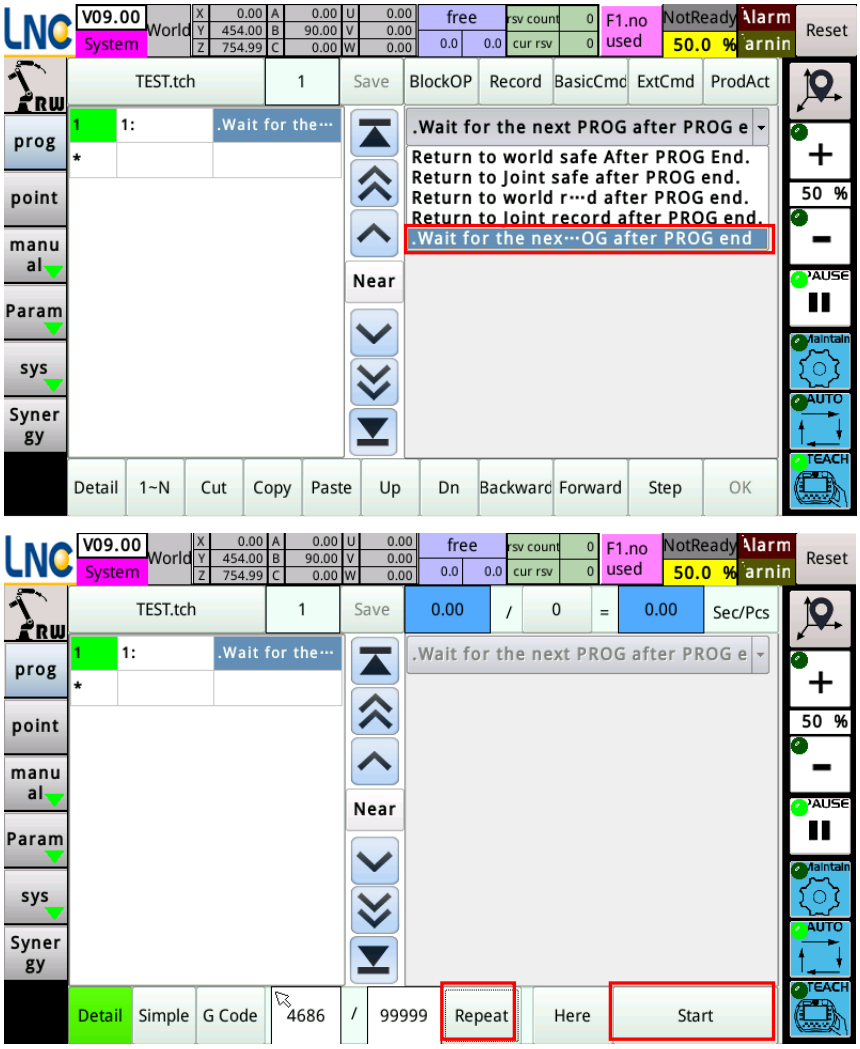
1 Click on the programmed program

2 After selecting, click Start

The program will enter the appointment schedule

By analogy, the same is true for program 2!

3. Create the main program: Click on the appointed process, click on the picture and click OK! Then start automatic mode, click repeat and click start!



After that, the system will perform welding according to the order of clicking on the appointed box!