Quick Start Guide

EC Series

Version：V3.11.2

Suzhou Elite Robots

Contents

Start-up Essentials 5

Preparations 6

Confirm the installation parameters 6

Confirm the mechanical home 7

Change the language 7

Set Tool 8

Set the tool center point (TCP) 8

Set the tool payload 9

Set the payload by editing the set command 10

Change the tool number by editing the set command 10

Coordinates 11

Direction of the coordinates 11

Teach the tool coordinate 11

Teach the user coordinate 12

Establish the user coordinate by editing the set command 13

Switch to the coordinate by editing the set command 14

Specify the coordinate command (CCOOD) 14

3D view (check and align) 15

Drag and Re-perform 15

Free drag 16

Re-produce the recorded point 18

Re-peform the motion trajectory 19

Program Operation 20

Create the file folder 20

Create the program 20

Run the program file 20
Program Reservation 21
Main Program and Subprogram 22
Set the main program 22
Call the subprogram 23
Program Home 24
Motion Instructions 25
Insert the joint motion command (MOVJ) 25
Insert the linear motion command (MOVL) 26
Insert the circular motion command (MOVC) 27
Quick insertion 27
Add the blend radius 28
Change the velocity and acceleration of the motion instructions 28
Variables 29
Basic variable types 29
Modify the variable values and annotations 29
Open or close the variable P/V 31
Set the waypoint (Setjoint) 31
Calculate the variable values 31
I/O Signal 33
NPN/PNP settings (J22&J25) 33
Check the I/O signal 34
I/O Command (DOUT+wait) 34
DOUT digital input command 34
User PLC 35
Remote Control Robot 35

Control the robot by the VNC viewer 35
Web teach pendant 35
Safety Settings 36
Set the soft limit of the joint 36
Set the collision detection 36
Set the interference zone 37
Reduced mode 40
Backdrive 41
Emergency stop and safeguard stop 41
Emergency stop 44
Default connection method 45
Connecting to the external emergency stop button 45
Disabling the emergency stop button on the teach pendant 45
Safeguard stop 46
File transfer, backup and recovery 47
File transfer 47
User data backup 48
Migration backup 49
File recovery 50
JBI file backup and import 51
Script backup and update 52
PLC update 53
System Update 54
View the system version 54
Software update 55
Firmware update 56

Configure the lua scripts 59

Run lua script via the JBI commands 61

*Appendix (follow-ups) 62

Modbus slave station 62

Configure the web teach pendant 63

I/O explanation 67

Technical support 67

Start-up Essentials

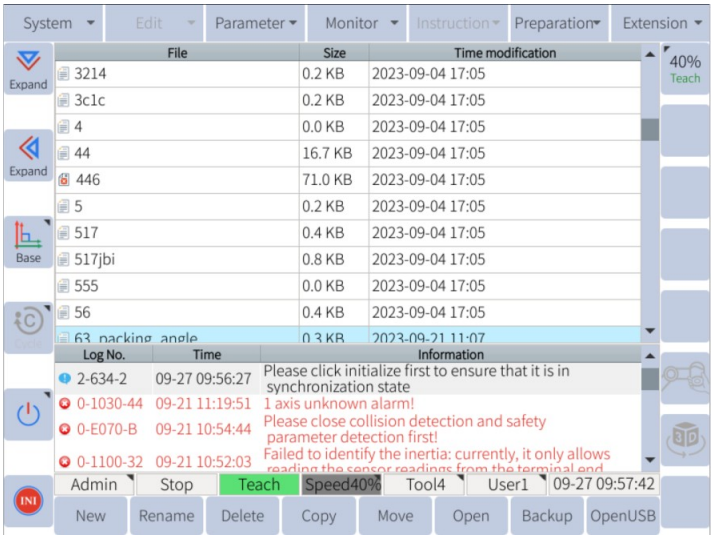
Functions: clear the alarm, initialize the robot and synchronize the data, as well as calibrate the

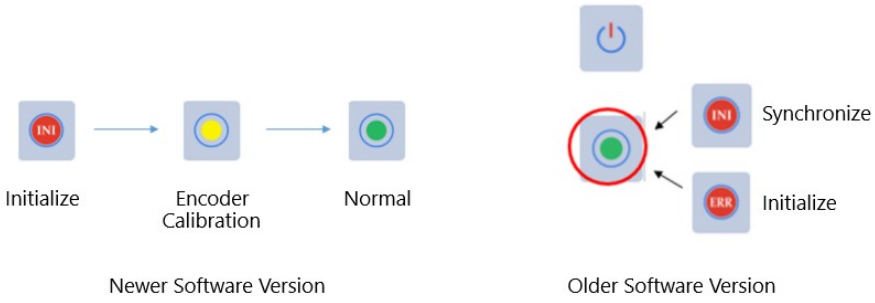
encoder to ensure that the robot can work properly.

Steps:

1. After the start-up, press the red button in the bottom-left part to clear the alarm and initialize the robot.
2. When the red button turns yellow, turn on the servo. Press the yellow button to start the encoder calibration until the yellow button turns green.

Note: Since the alarm-clear button and the sync button were not the same in the old versions, the users with the prior versions of the teach pendant need to press the sync button above to synchronize the data after clearing the alarm.





Newer Software Version

Older Software Version

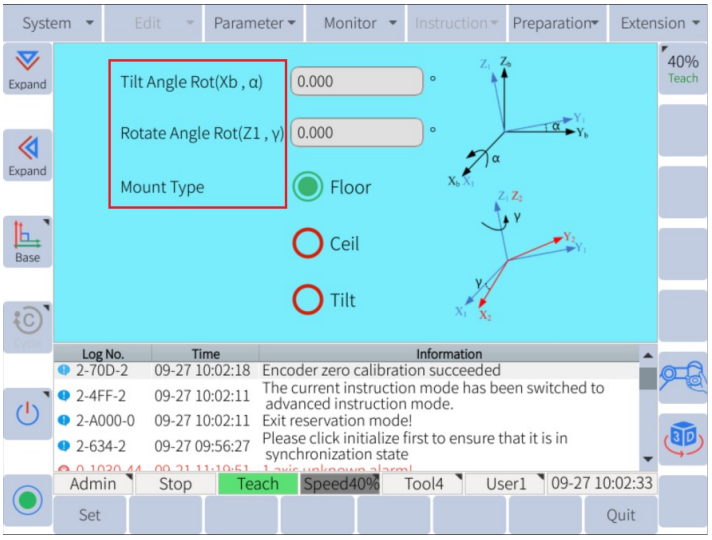
Preparations

Functions: confirm the necessary parameters to avoid something unexpected happened.

Confirm the installation parameters

Steps:

Click **Preparation -> Mount Config** and select the installation method from the mount type list. If the robot is floor-installed, please select ”Floor” as shown in the following figure. The tilt angle and rotate angle are both 0°. For other installation methods, please refer to https://bbs.elibot.cn/forum/detail/topic/142.html.



Confirm the mechanical home

Steps: Click **Preparation -> Home Position -> Mechanical Home** and check if the pulse counts of the mechanical home is same as what is in the invoice.

The robot can be moved to the zero position by pressing and holding the servo button and the home button at the bottom simultaneously.

Change the language

Functions: Currently, there are 4 languages available for the EC series robot, i.e. Chinese,

English, Japanese and Korean.

Steps: Click **System -> System Setting -> Language Setting** and select the desired language. Click the OK button and the robot will restart.

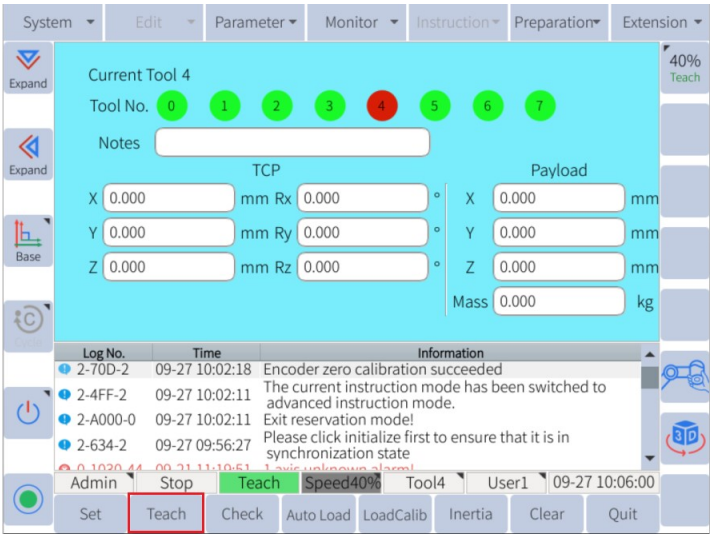
Set Tool

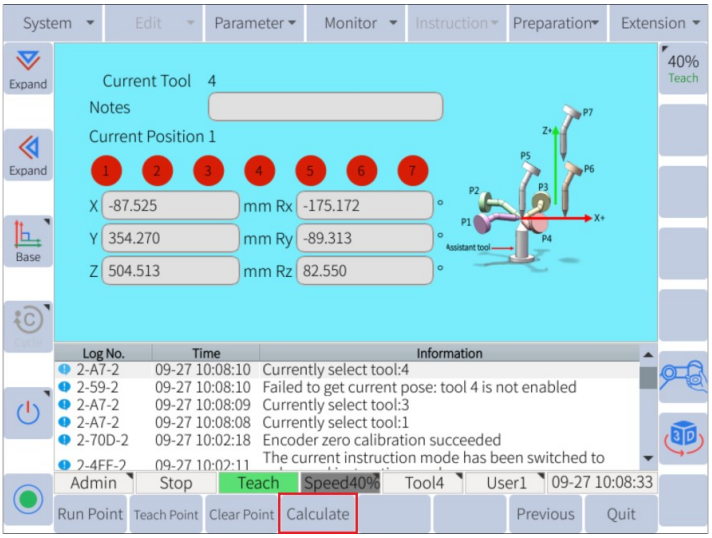
Set the tool center point (TCP)

Functions: The tool center point will be used when the robot approaches to a point in the space. Correct tool center point will help us get a full control of the robot movements.

Steps:

1. After the tool is installed in the terminal end of the robot, click **Preparation -> Tool Config**, select the tool number and click the “Teach” button. For the known tool, you can directly enter the values.
2. Or, put the tip end within the scope of the robot, click the “Teach” button. The robot will approach to the tip end in different poses with the tool (tool no. 1-4) and the point data will be recorded. Note that the “LoadCalib” button can be clicked after recording the first 4 points if the user updates the teach pendant to the new version. The users with the prior version need to teach 7 points. For more details, please refer to the Chapter “Teach the tool coordinates”.



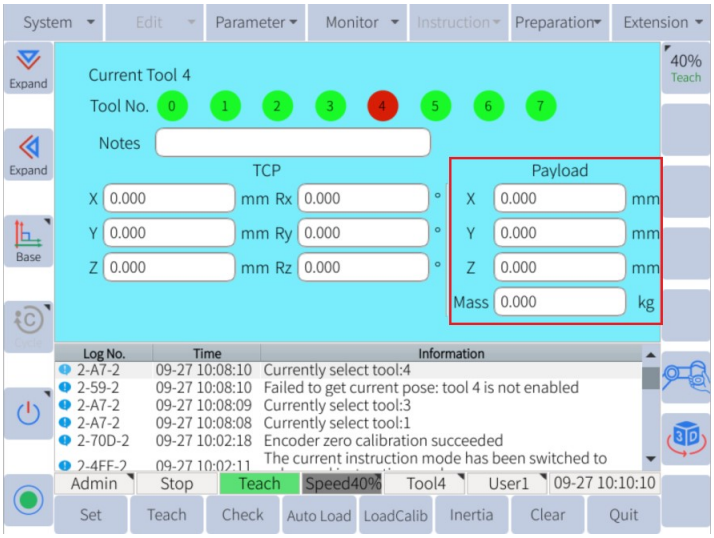


Set the tool payload

Functions: Each tool has its own center of mass. Enter the payload value and the robot will work

out the proper parameters.

Steps: After the tool is installed in the terminal end of the robot, click **Preparation -> Tool Config**, select the tool number (0-7) and fill out the values in the section marked by the red square. X， Y and Z indicate the COG (center of gravity) deviation.

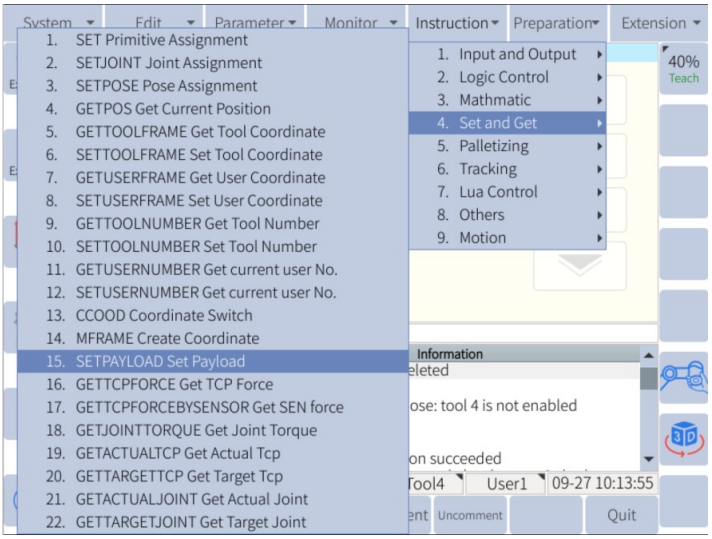


Set the payload by editing the set command

Functions: It is allowed to insert the commands in the program to set the payload. It is

unnecessary to manually switch to the tool payload settings each time.

Steps: Click **Instruction -> Set and Get -> SETPALOAD Set Payload**.

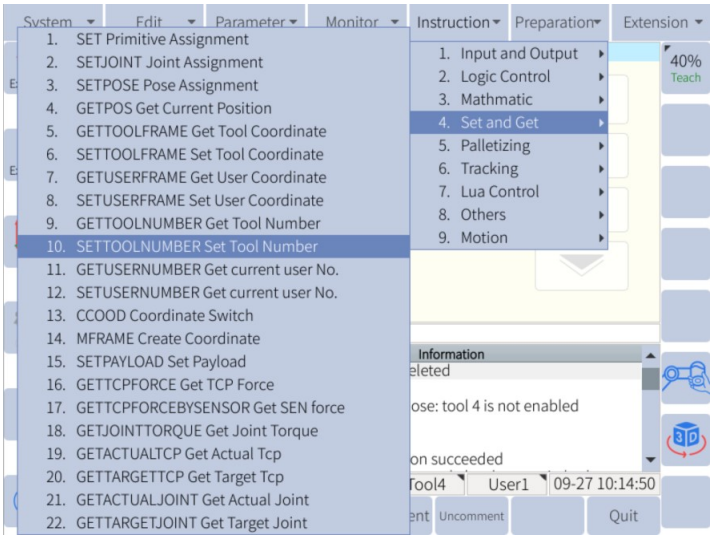


Change the tool number by editing the set command

Functions: It is allowed to insert the appropriate JBI command in the program to specify the tool

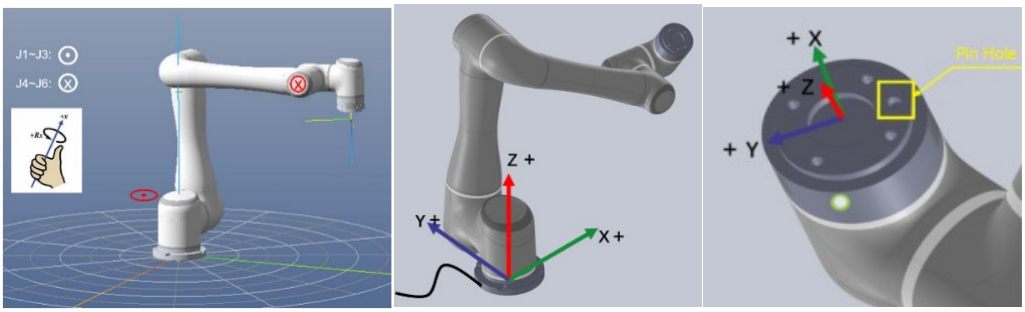
number.

Steps: Click **Instruction -> Set and Get -> SETTOOLNUMBER Set Tool Number**.



Coordinates

Direction of the coordinates



The negative direction of the outlet of the base coordinate system is the positive direction of the X axis. If the tool coordinate system is not set, the negative direction of the pin hole is the Positive direction of the Y axis by default.

The user coordinate system and the tool coordinate system are both the user-defined coordinate systems. The motion direction is not determined.

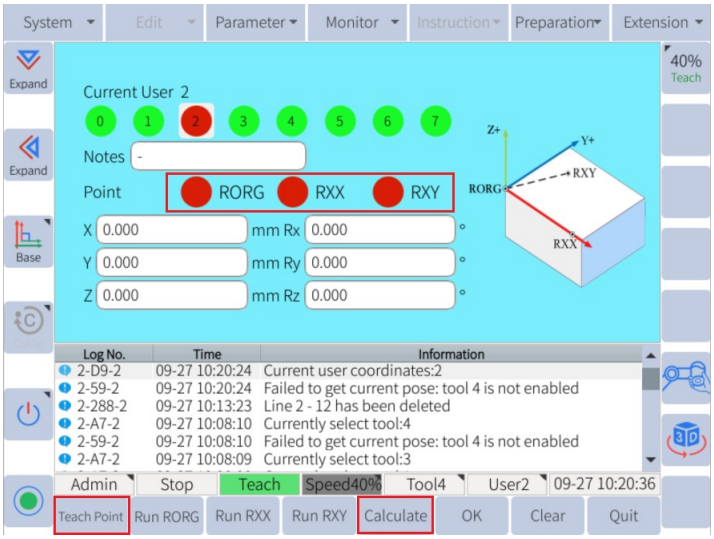
Teach the tool coordinate

Functions: The tool coordinate, a cartesian coordinate, indicates the tool center point (TCP) and the tool pose. The tool coordinate is established on the TCP as the orignal point and the direction of the tool mounted is set to the Z axis. The robot will move along the tool direction or around the TCP after setting the tool coordinate. The TCP is the center point of the flange by default. **Steps:** Teach with the help of 7-point calibration. Click **Preparation -> Tool Config**, select the tool number (0-7) and click the “Teach” button after setting the payload. The first 4 points are used to set the TCP (refer to the Chapter TCP). The 5th point is the coordinate home. Move the robot along the positive direction of the X axis and record the 6th point. Move the robot along the positive direction of the Z axis (the target tool working direction) and record the 7th point.

Teach the user coordinate

Functions: The user coordinate is set for the easy parallel displacement of the robot and can be different in different operation platforms.

Steps: Teach with the 3-point calibration. At first, select the user coordinate (0-7) and then move the robot to 3 different positions, i.e. RORG, RXX and RXY. RORG is the origin of the coordinate system. RXX is a point on the X axis. RXY is a point in the XY plane of the user coordinate.



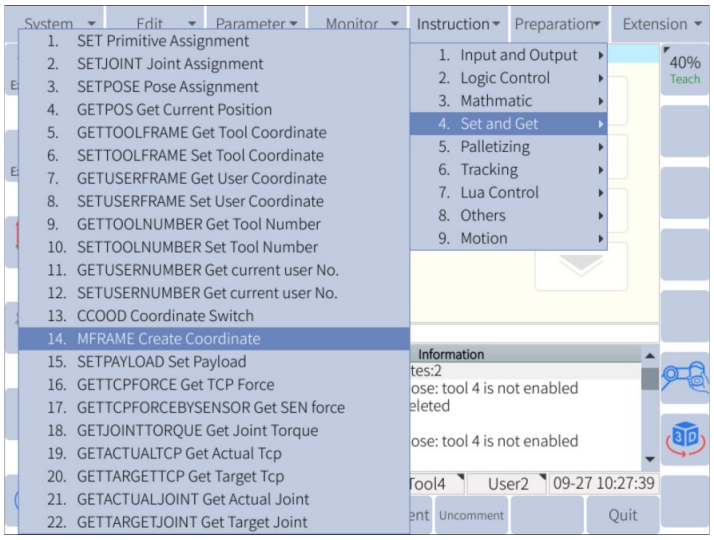
Establish the user coordinate by editing the set command

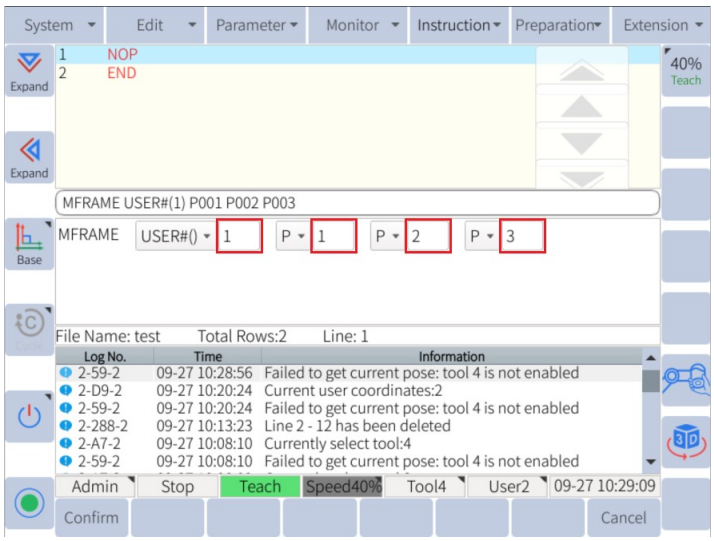
Functions: The user coordinate can be established by editing the JBI commands.

Steps: Click **Instruction -> Set and Get-> MFRAME Create Coordinate** USER# ()

joint #1 joint #2 joint #3

Take MFRAME USER# (1) P1 P2 P3 as the example. P1 indicates RORG. P2 indicates RXX. P3 indicates RXY. Work out and set to the user coordinate 1.





Switch to the coordinate by editing the set command

Functions: From the V3.9.0 on, the current coordinate can be specified in the JBI program.

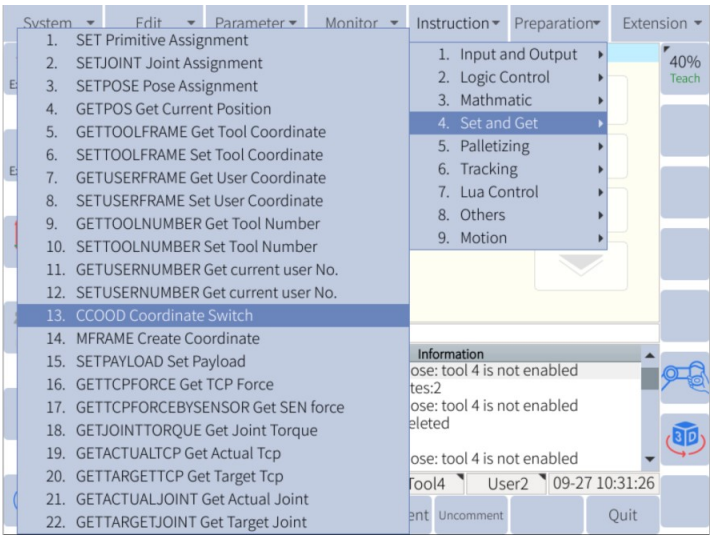
Steps: Click **Instruction -> Set and Get-> SETUSERNUMBER Set User Number**, the number range

is 0-7 (i.e.coordinate 1-7)

Specify the coordinate command (CCOOD)

Functions: In the JBI program, specify the coordinate to switch from the base coordinate to the joint coordinate.

Steps: Click **Instruction -> Set and Get-> CCOOD Coordinate Switch**, and select the desired coordinate.



3D view (check and align)

Functions: The 3D view is mainly used to display the robot motions in the jog mode and during the running program. Click the “Align the base” button to parallel the tool coordinate system with the base coordinate system. Click the “Align the user” button to parallel the tool coordinate system with the user coordinate system. The user can enter the display in the following way.

Steps:

The user can enter the display by clicking the second-to-last 3D shortcut  on the right side of the teach pendant screen. To exit the display, click the shortcut again. Press and hold the servo button in the back of the teach pendant and the gray characters “Align the base” and “Align the user” will turn black. The user can click the buttons as required, as shown in the following figures.

Drag and Re-perform

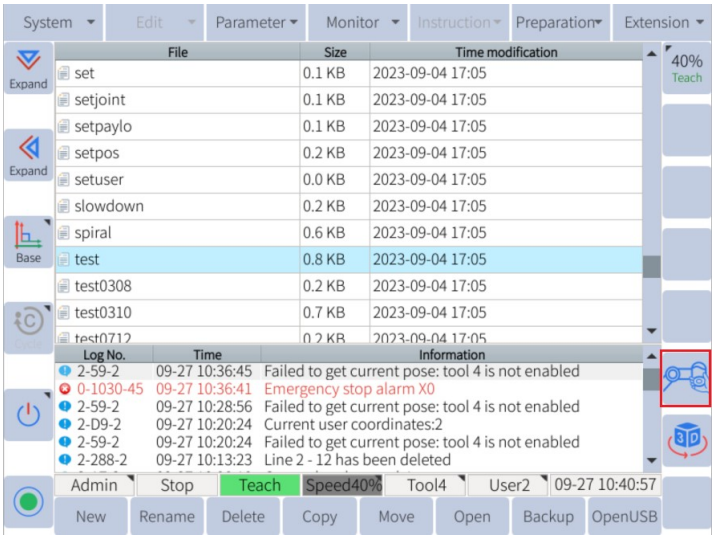
Free drag

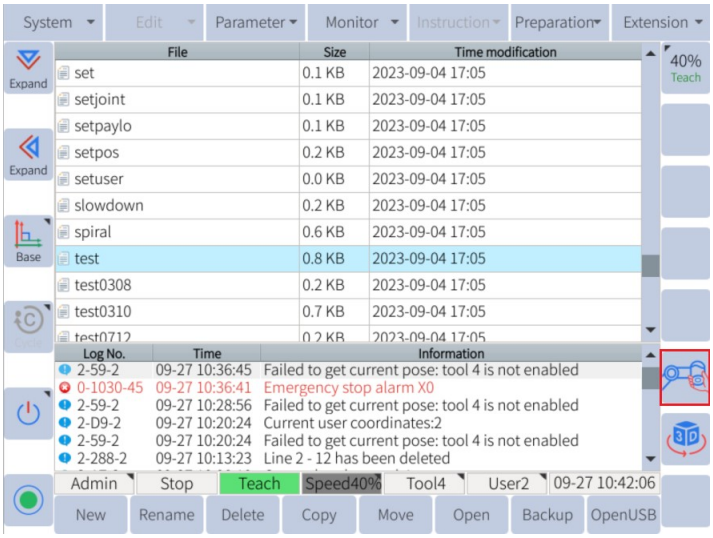
Functions: The robot can be manually moved to the target point.

Steps:

1. Press and hold the blue hand guiding button in the flange terminal and guide the robot to the specified position. To stop hand guiding, simply release the blue button.

2. In case that the parameters including the tool payload are set properly, click the icon configured as “drag” (marked by the red square) and click the “OK” button. The user can freely drag the robot when the button turns red. To exit the free drag mode, click the button again (the button color changes from red to blue).



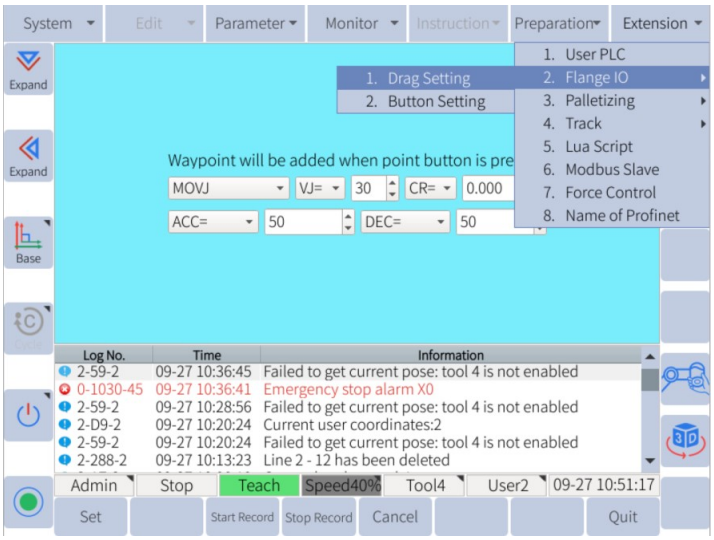

System
Edit
Parameter
Monitor
Instruction
Preparation
Extension
Expand
Expand
Base
File
Size
Time modification
set 0.1 KB 2023-09-04 17:05
setjoint 0.1 KB 2023-09-04 17:05
setpaylo 0.1 KB 2023-09-04 17:05
setpos 0.2 KB 2023-09-04 17:05
setuser 0.0 KB 2023-09-04 17:05
slowdown 0.2 KB 2023-09-04 17:05
spiral 0.6 KB 2023-09-04 17:05
test 0.8 KB 2023-09-04 17:05
test0308 0.2 KB 2023-09-04 17:05
test0310 0.7 KB 2023-09-04 17:05
40%
Teach
Log No.
Time
Information
2-59-2 09-27 10:36:45 Failed to get current pose: tool 4 is not enabled
0-1030-45 09-27 10:36:41 Emergency stop alarm X0
2-59-2 09-27 10:28:56 Failed to get current pose: tool 4 is not enabled
2-D9-2 09-27 10:20:24 Current user coordinates:2
2-59-2 09-27 10:20:24 Failed to get current pose: tool 4 is not enabled
2-288-2 09-27 10:13:23 Line 2 - 12 has been deleted
Admin
Stop
Teach
Speed40%
Tool4
User2
09-27 10:42:06
New
Rename
Delete
Copy
Move
Open
Backup
OpenUSB

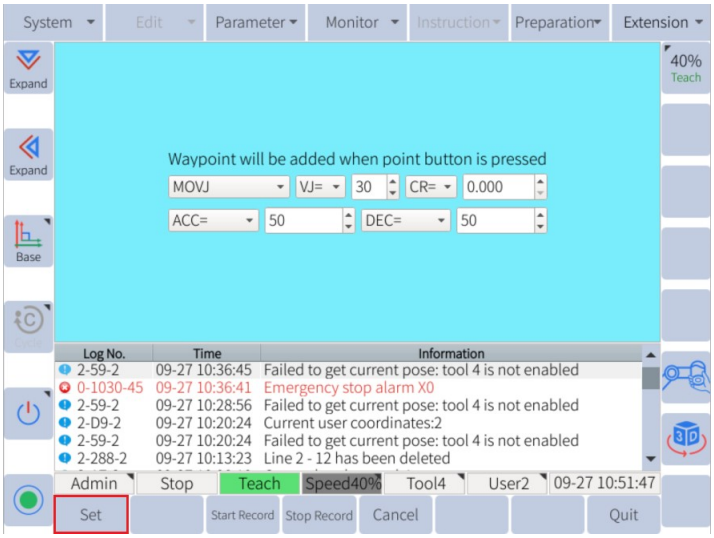
Re-produce the recorded point

Functions: Users can quickly switch to drag mode and record points through the buttons located on the end effector. The file created using this method can be called from another program using the CALL instruction, or it can be run as a stand-alone program.

Steps:

1. Click **Extension -> Flange IO -> Drag Setting.**
2. Enter the parameters, click the “Set” button and then click the “Start Record” button.
3. Press and hold the blue hand guiding button in the flange terminal and guide the robot to the specified position.
4. Click the “Record” button (default: green button) in the flange IO and the system will prompt “Current record points”.
5. Repeat the step 3 and 4 to record other points.
6. After finishing the point recording, click the “Record stop” button.
7. Enter the file name and click “OK”.





***Re-peform the motion trajectory**

Functions: Users can re-perform the motion trajectory.

Steps:

1. Click **Preparation -> Hand Drag** to enter the drag teaching interface.
2. Enabling dragging: The user can click the “Enable drag” button at the bottom or click the icon configured as ”drag” () in the right side to enable the drag mode. After the click, the drag enable status light will turn green.
3. Click the “Start recording” button to start drag recording, which can record up to 20 minutes.
4. After dragging is finished, click the “Stop recording” button.
5. Enter a file name and click “OK”. Note that the file cannot be opened. You can use the “MOVEDRAG” JBI command to open the file and reproduce the drag track.

Note: When the force control status is green, the user can perform normal dragging, collision detection and use the safety restriction function. When the force control status is red, the above functions are not available.

Program Operation

Create the file folder

Functions: Create the JBI file folder

Steps: Click **New -> Folder** and name it.

Create the program

Functions: Create the JBI file

Steps: Click **New -> File** and name it. You can insert the commands after opening the file.

Run the program file

Steps: After the program is complete, please switch to the PLAY mode, adjust the speed ratio (suggestion: commissioning at the low speed), select the loop mode and click the yellow servo button in the right to power on the robot. The green button indicates that the program runs. Click the red button once and the program pauses. Click the red button twice and the program stops. (Note that it depends on the parameters settings.)

Program Reservation

Functions: In the remote mode, the scheduled program can be executed via the external device
after setting the user PLC.

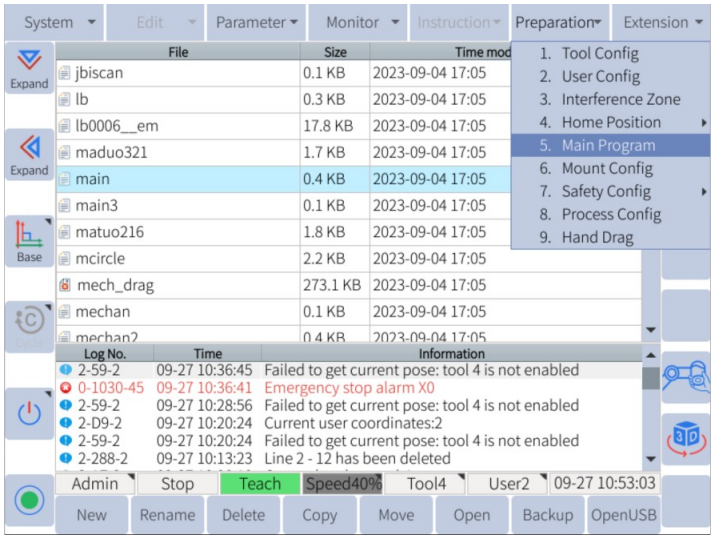
Steps:

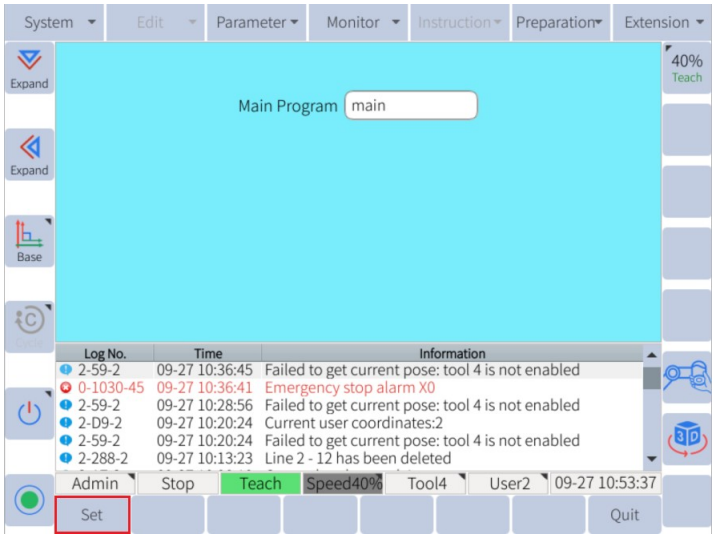
1. Click **Preparation -> Process Config -> Reservation** to enter the program reservation interface. After the setting, the robot will automatically restart.
2. Set the scheduled program and open the JBI files (max. 8) to be reserved.
3. Set the user PLC and call the scheduled program (S9-S16).
4. Switch to the REMOTE mode and turn on the servo.
5. Use the S26 PLC signal to clear the booking queue.
6. M408-M415 correspond the running statuses of the scheduled programs 1-8. For instance, it indicates that the scheduled program 1 is running when we set the M408 to 1.

Main Program and Subprogram

Set the main program

Steps: Click **Preparation -> Main Program** and select the file (test.jbi). Click the "Set" button and a hint dialogue will pop up. Click "OK" and set the file (test.jbi) to the main program.

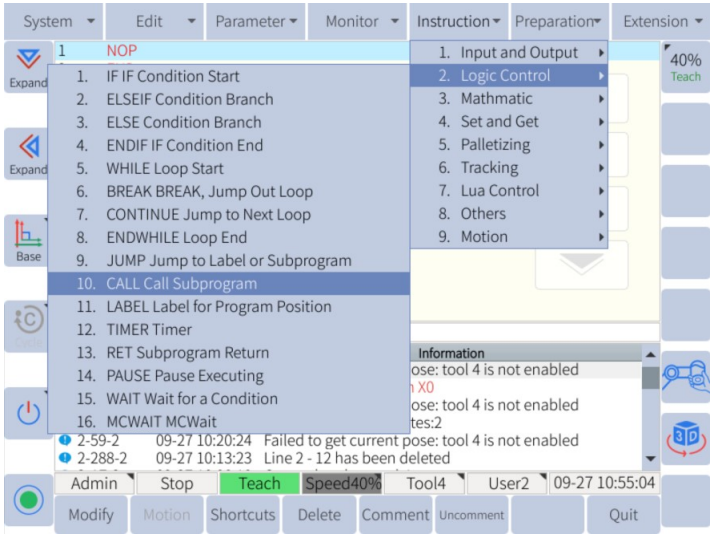


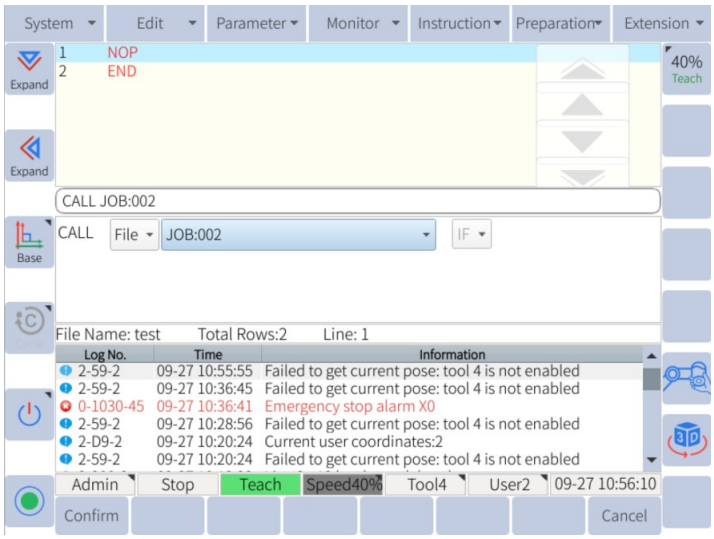


Call the subprogram

Functions: The user can call the subprograms in the main program. The relationship between the main program and the subprogram will be cleared after the emergency stop.

Steps: Click **Instruction -> Logic Control -> CALL Call Subprogram** and select the corresponding program (JOB) as the subprogram. The user can set the IF conditions as required.





Program Home

Functions: The program home is the initial position of the program. It can prevent interference with peripheral devices by ensuring that the manipulator starts from a known position.

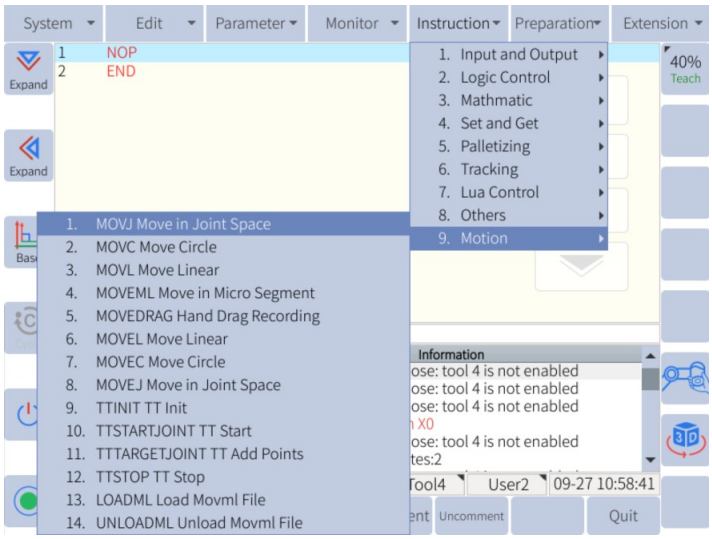
Steps: Move the robot to the desired program home. Click **Preparation -> Home Position -> Program Home**, press the “Set” button and move the robot to the desired program home. When the robot is located at the program home, the value of the virtual output M401 is 1.

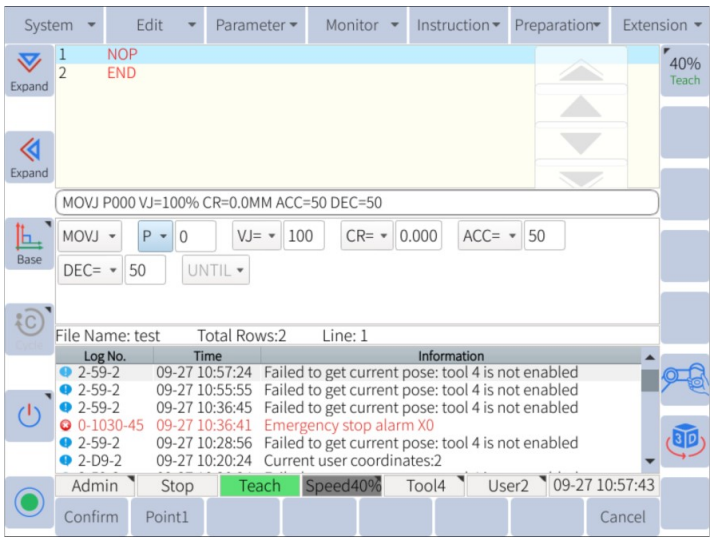
Motion Instructions

Insert the joint motion command (MOVJ)

Functions: Insert the MOVJ instruction in the JBI script to start the joint movement. Note that the joint motion speed is the fastest in the common movements.

Steps: Click **Instruction -> Motion -> MOVJ Move in Joint Space**, VJ is the max. speed of the joint motion, CR is the blend radius, ACC/DEC indicate the acceleration and the deceleration, UNTIL is the condition for the execution of the motion instruction. The user can specify the position via editing the variable P. If it is not specified, the current position is implicitly assigned.

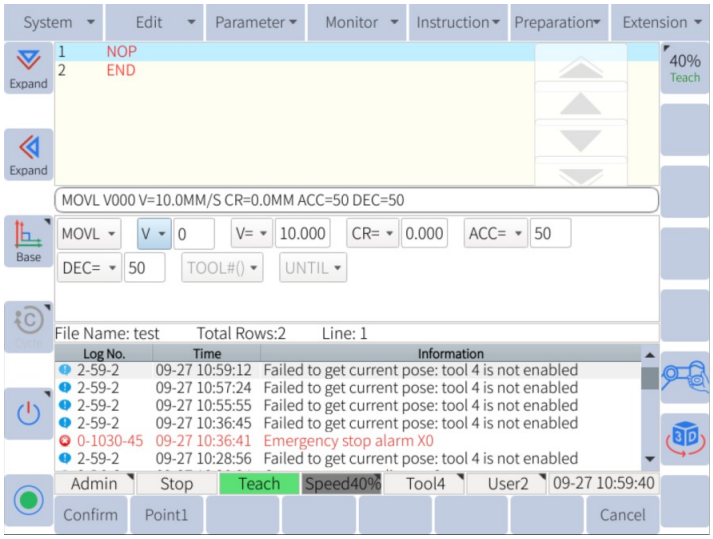




Insert the linear motion command (MOVL)

Functions: Insert the MOVL instruction in the JBI script to move the TCP of the robot along a straight line to the target point.

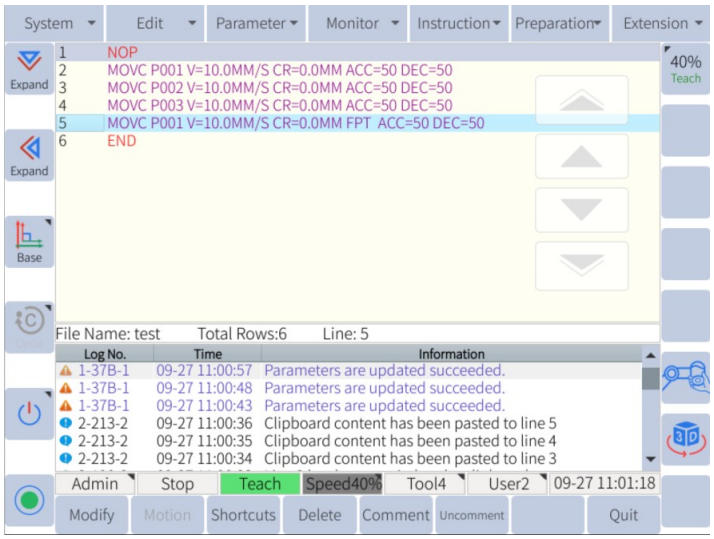
Steps: Click **Instruction -> Motion -> MOVL Move Linear**, V is the speed of the TCP, CR is the blend radius, ACC/DEC indicate the acceleration and the deceleration, UNTIL is the condition for the execution of the motion instruction. The user can bind the tools and specify the position via editing the variable V/P. If it is not specified, the current position is implicitly assigned.



Insert the circular motion command (MOVC)

Functions: Insert the MOVC instruction in the JBI script to move the TCP of the robot along an arc to the target point.

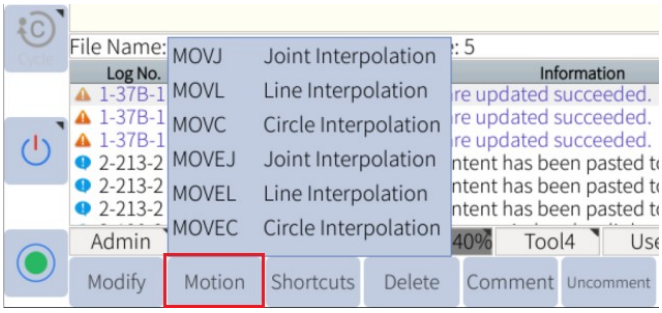
Steps: Click **Instruction -> Motion -> MOVC Move Circle**, it will complete a segment of circular path movement with the three MOVC instructions. For a full circular path movement, the four MOVC instructions are suggested. FTP is the end point of the arc. Please select the 4th instruction, as shown in the following figure. Draw a circle with the point P001, P002 and P003. The end point of the full circle is P001. Therefore, the 5th instruction is FPT.



Quick insertion

Functions: In addition, the motion instructions can be quickly inserted in the JBI editing interface.

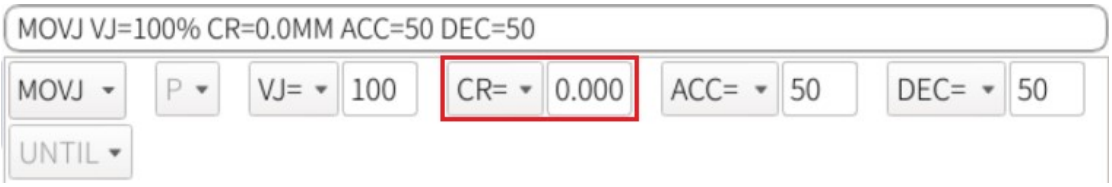
Steps: Press and hold the enable button and the “Motion” in the bottom will change from gray to black. Click the “Motion” button and insert the MOV/MOVE motion instructions.



Add the blend radius

Functions: When the blend radius is 0, the robot arrives at the target point exactly. When the blend radius is greater than 0, the robot will not stop in the target point and it will moves very smoothly and efficiently.

Steps: Normally, the CR is less than the half of the distance between two different points when executing the motion instructions. To prevent errors, the motion instructions in the first and last row are suggested 0.



Change the velocity and acceleration of the motion instructions

Steps: Select the instruction lines of changing the speed, acceleration and deceleration and click the “Modify” button below to modify the VJ/V/ACC/DEC. In addition, the user can click the speed

ratio in the right side of the interface to set the actual speed. To accelerate or decelerate, please

click the V+/V- button in the right side of the interface.

Variables

Basic variable types

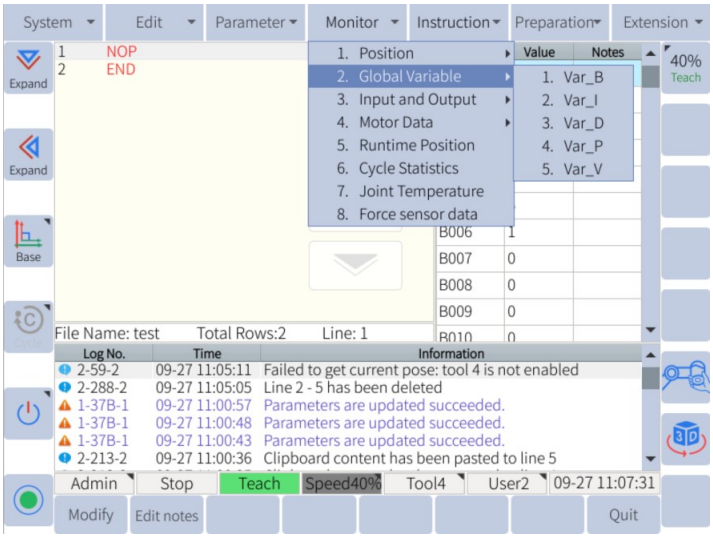
Functions: The variables can be used to store the values/points.

Global Variable	Local Variable	Variable Type	Range	Number
B	**LB**	unsigned integer	0~2147483647	B000-B255
I	**LI**	integer	-32767~32767	I000-I255
D	**LD**	float	-10^9~10^9	D000-D255
P(joint)	**LP**	joint coordinate {J1,J2,J3,J4,J5,J6}	{±360°, ±360°, ±165°, ±360°, ±360°, ±360°}	P000-P255
V(pose)	**LV**	Cartesian coordinate {x, y, z, rx, ry, rz}	{±R, ±R, ±R, ±3.14, ±3.14, ±3.14}	V000-V255
M		boolean	0, 1	M000-M1535

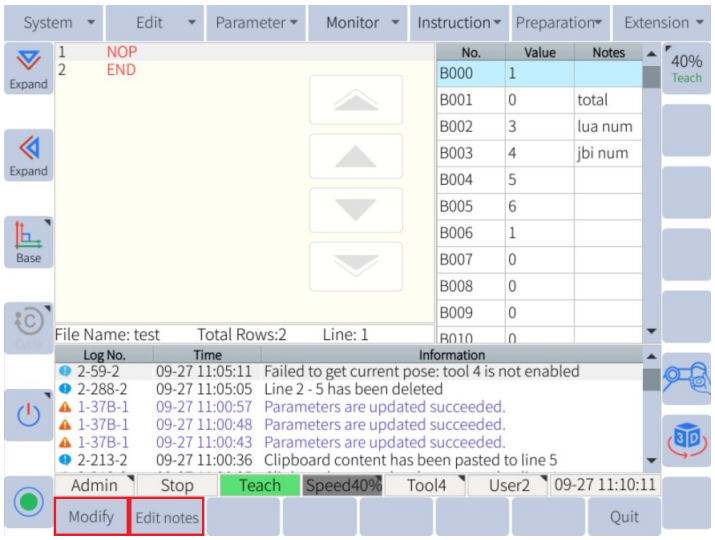
Modify the variable values and annotations

Functions: The variables can be used to store the values/points.

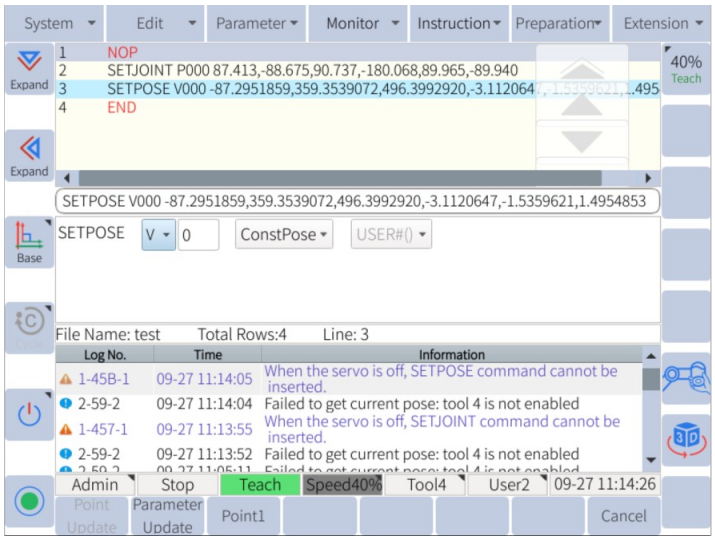
Steps: Click **Monitor -> Global Variable**.



The variable B/I/D can be modified by clicking the “Modify” or the “Edit notes” button in the bottom-left part.



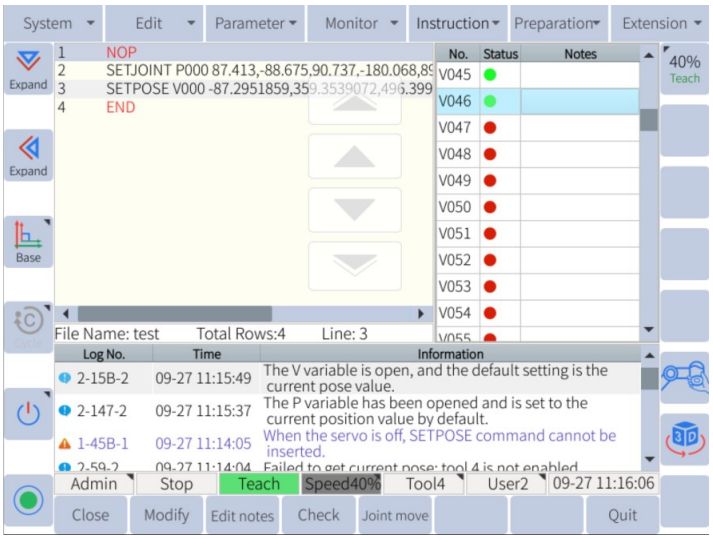
The variable P can be set by editing the SETJOINT instruction. It can also be modified or set to be the current point by clicking the “Modify” button, so can the variable V.



Open or close the variable P/V

Functions: The variable P/V can be used/modified only when they are opened. The color red indicates close and the color green indicates open.

Steps: Click **Monitor -> Global Variable -> Var_P/Var_V** and click the "Open/Close" button in the bottom left part. Note that the values of the variable P/V will be changed to the current values by default.



Set the waypoint (Setjoint)

Functions: Since that the values are changed when opening/closing the variable P, it is easier to record the points with the SETJOINT command, thus ensuring that the points will be correct at runtime.

Steps: Click **Instruction -> Set and Get -> SETJOINT Joint Assignment**, select the correct variable P and move the robot to the target point. Press and hold the yellow servo button in the back of the teach pendant to power on the robot. Click the "Point Update" button.

Calculate the variable values

Functions: Compute the variables (add/subtract/multiply/divide)

ADD Addition: Variable 1 adds variable 2, the sum will be saved into the variable 1. After

switching to the base/user coordinates with CCOOD instruction, the robot can move at a pre-set distance on the axis when executing the ADD Addition instruction.

SUB Subtraction: Variable 1 subtracts variable 2, the result will be saved into the variable 1.

MUL Multiplication: Variable 1 multiplies variable 2, the product will be saved into the variable 1.

DIV Division: Variable 1 divides variable 2, the result will be saved into the variable 1.

Steps:

ADD Addition ADD variable#1 variable#2

SUB Subtraction SUB variable#1 variable#2

MUL Multiplication MUL variable#1 variable#2

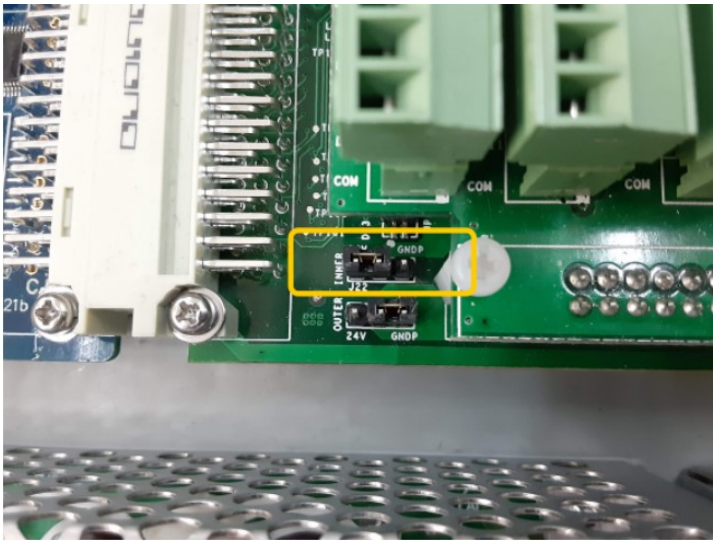
DIV Division DIV variable#1 variable#2

I/O Signal

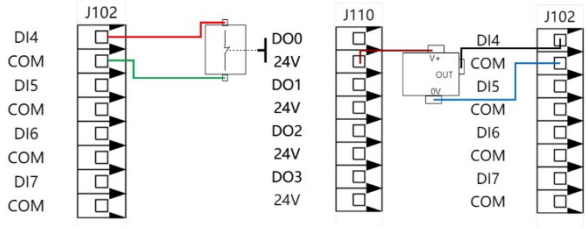
NPN/PNP settings (J22&J25)

Functions: The digital inputs may be configured to two input modes, incl. NPN and PNP. The digital inputs can be configured to NPN or PNP by changing the jumper on terminal J22 or J25. Note that the digital inputs of the EC series can be configured to NPN by default and cannot be modified.

Steps: The terminal J22 is as shown in the following figure.



Input type	J22 connection method	J25 connection method	Remarks
high level effective	GNDP	24V	2/3 wire sensor
		GNDP	only connect to three-wire sensor
low level effective	24V	24V	2/3 wire sensor
		GNDP	only connect to three-wire sensor



Check the I/O signal

Steps: Click **Monitor -> Input and Output** to select one of them (Digital Input/Digital Output/Virtual Input/Virtual Output/Analog Input/Analog Output) as required.

I/O Command (DOUT+wait)

DOUT digital input command

Functions: Set the conditions with the help of the WAIT command.

Steps: In the DOUT command, select WAIT and add the conditions.

Example:

DIN B001 IN#(1)

→ Read the input signal X001 and assign it to the variable B001

DIN I002 IGH#(2)

→ Read the input signals from X008 to X011, convert them to decimals and assign them to the variable I002

DIN D003 IG#(3)

→ Read the input signals from X024 to X031 and assign them to the variable D003

DOUT OT# (1) ON

→ Set the digital output signal Y001 to “ON”

DOUT OGH#(1) 14

→ Read the number 14, convert it to the decimal (i.e. 14=1110) and assign the values of the last 4 numbers to Y004-Y007 (Y004=0,Y005=1,Y006=1,Y007=1)

For more details, please visit：https://www.youtube.com/watch?v=9XfL72dmIp4

User PLC

EC supports the mainstream bus communication incl. Profinet, EthernetIP, as well as the mainstream PLC communication like Keyence, Siemens and so on.
EC series has the built-in user PLC for the easy connection to the external devices and control the robots. The user PLC program always runs in the background. The PLC uses ladder logic, which is a graphical programming language. Each line is called a rung and the PLC executes one rung at a time, starting from the top to the bottom. Once all the ladder's rungs have been executed, the PLC program returns to the top rung and executes the program line by line again. The PLC supports up to 200 lines or rungs.
Steps: Click **Extension -> User PLC**

Remote Control Robot

Control the robot by the VNC viewer

Steps: Download and install the VNC viewer, ensure that the computer and the robot are in the same network segment and click the top left corner of the VNC viewer.
Click **File -> Connection**.
Enter the IP address of the robot in the line "VNC server" and click "OK". Double click the dialogue box and enter the password (333333).

Web teach pendant

Functions: The web teach pendant can be used to monitor the connected robot.

Steps: For more details, please refer to the Chapter Web Teach Pendant Configuration.

Safety Settings

Set the soft limit of the joint

Functions: Limits may be placed on how far each joint of the robot can rotate. The max. joint limit is +360° and the min. joint limit is -360°.

Steps: Click **Parameter -> Soft Limit**, and select the axis limits to be modified.

Set the collision detection

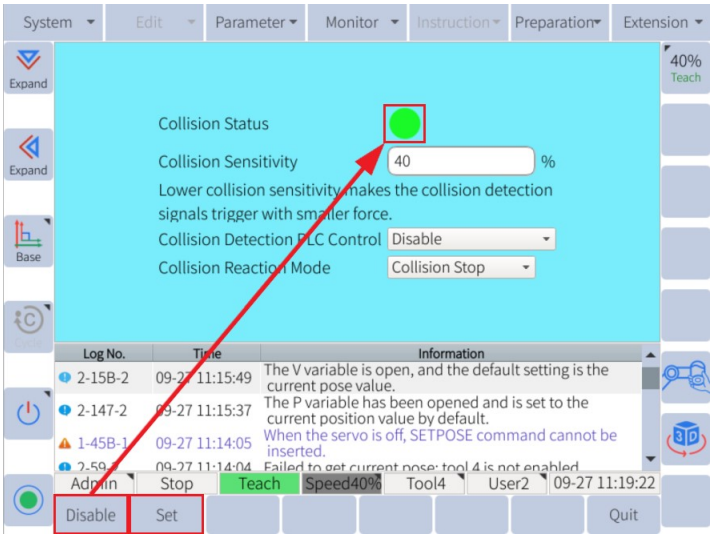
Functions: The collision detection acts to reduce the impact force on the robot, thus preventing the robot or the external devices from damage. When the robot detects the collision, it will immediately stop. Please be careful to operate the robot when the collision detection is activated.

Steps: Click **Preparation -> Safety Config -> Collision Detection** to enable/disable the detection.

Click the “Enable” or the ”Disable” button in the sub-menu. The range of the collision sensitivity is

10%-100%. The greater the collision sensitivity is, the larger the impact force detected is. Click

the “Set” button to save the new settings of the collision detection.



Set the interference zone

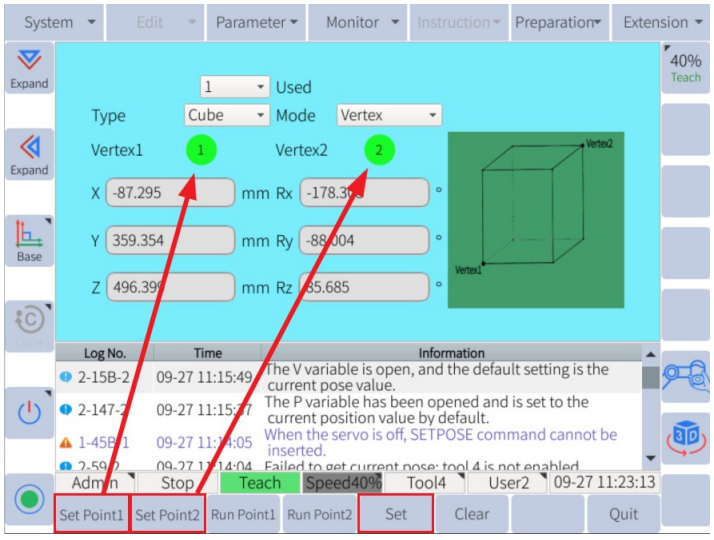
Functions: The interference area can be set by the user. It is a function that prevents interference between multiple robots or the robots and the peripheral devices. The user can set max. 16 interference zones. There are two types of the interference areas, i.e. cubic interference area and joint interference area. The output signals of the interference areas 1-16 correspond to the virtual outputs M440-M455. If the TCP moves to a designated area, or a joint enters a certain range, the signal will remain HIGH. When it leaves the interfernece area, it will return to LOW. If it is necessary to output the signal to the external device, please modify the PLC program and map the corresponding virtual output to the actual output Y.

Steps:

A. Cubic interference zone

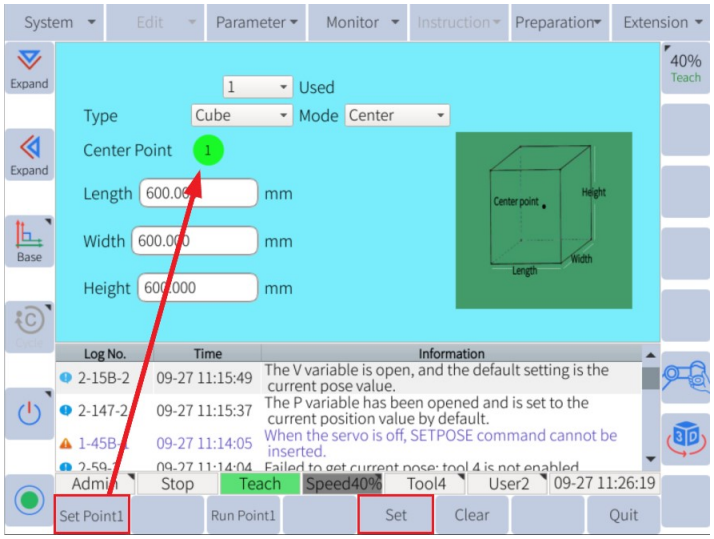
a) Corner to corner:

1. Click **Preparation -> Interference Zone**
2. Select “Cube” from the “Type” list and “Vertex” from the “Mode” list
3. Select “Vertex1” and move the robot to the position of vertex 1 of the cube and click the ”Set Point1” button in the sub-menu
4. Select “Vertex2” and move the robot to the position of vertex 2 of the cube with the axis jog buttons and click the “Set Point2” button in the sub-menu
5. Click the “Set” button in the sub-menu and the interference zone is set successfully



b) Center with dimensions:

1. Click **Preparation -> Interference Zone**
2. Select “Cube” from the “Type” list and “Center” from the “Mode” list
3. Select “Center Point” and move the robot to the center point of the cube with the axis jog buttons and click the “Set Point1” button in the sub-menu
4. Enter the length, width and height of the target cube
5. Click the “Set” button in the sub menu and the interference zone is set successfully.

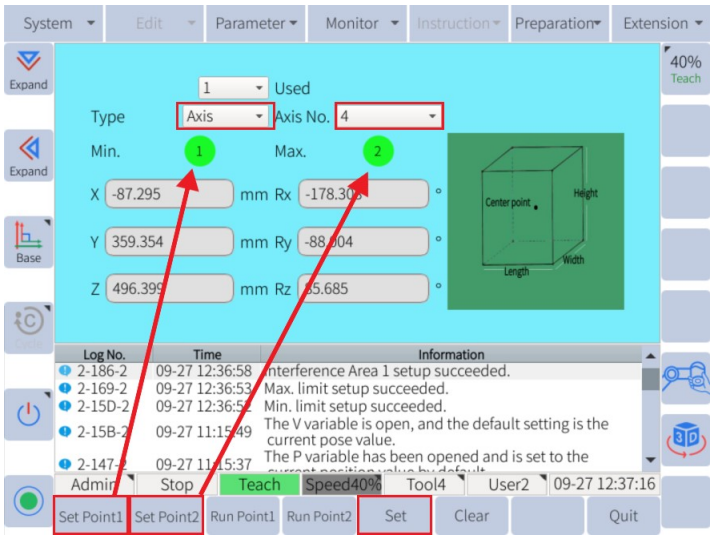


B. Joint interference zone:

Functions: The axis interference area is a function that determines whether the current position of each axis lies within a specified range and outputs the signal. Once the maximum and the minimum joint angles have been set for the positive and negative directions of a specific joint, a signal will indicates whether the current position of the joint is inside or outside this range and its state will be output as a signal. (ON: inside; OFF: outside)

Steps:

1. Click **Preparation -> Interference Zone**
2. Select “Axis” from the “Type” list and select the desired axis number
3. Select “Min.” and press the axis jog button to rotate the joint to the min. target angle in the joint coordinate, click the “Set Point1” button in the sub-menu
4. Select “Max.” and press the axis jog button to rotate the joint to the max. target angle, click the “Set Point2” button in the sub-menu
5. Click the “Set” button in the sub-menu and the interference zone is set successfully.



Reduced mode

Reduced parameter

Functions: After entering the reduced mode, the robot runs in accordance with the parameters of the reduced mode.

Steps: Click **Preparation -> Safety Config -> Safety Limit** and enter the values in the reduced mode.

Reduced mode triggered by the signal

Functions: The reduced mode can be triggered by the external signal.

Steps: Edit and set the input signal, S17 and S18 in the user PLC. Among them, S17 and S18 are used to trigger the reduced mode.

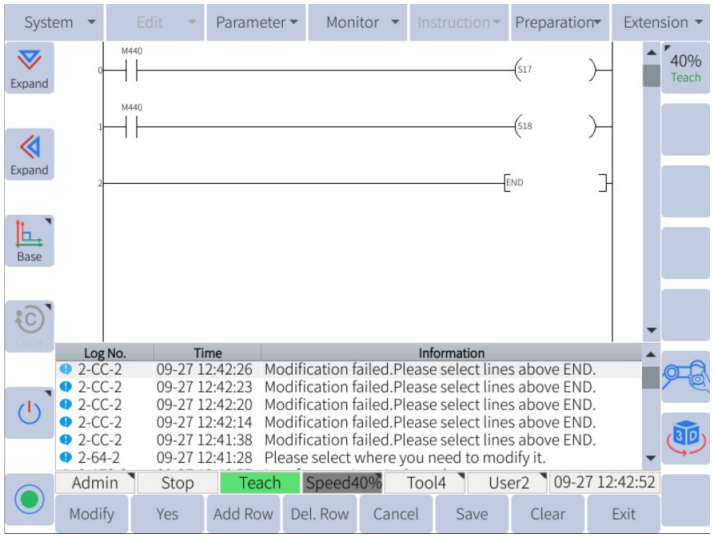
Reduced mode triggered by the interference zone

Functions: When the robot gets in/out the selected interference zone, it will run according to the reduced mode that has already been set.

Steps:

1. Set the target interference zone (refer to the Chapter Interference Zone).
2. Set the reduced parameters (refer to the Chapter Reduced Parameters).
3. Set the user PLC, the reduced mode can be triggered when either S17 or S18 is valid.

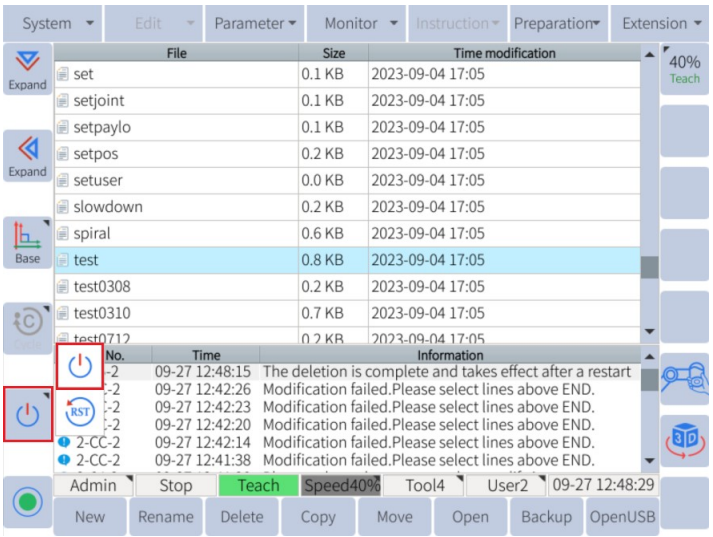
Refer to the following figure: set when the robot enters to the reduced mode (it enters to the reduced mode when the robot is in the interference zone 1)

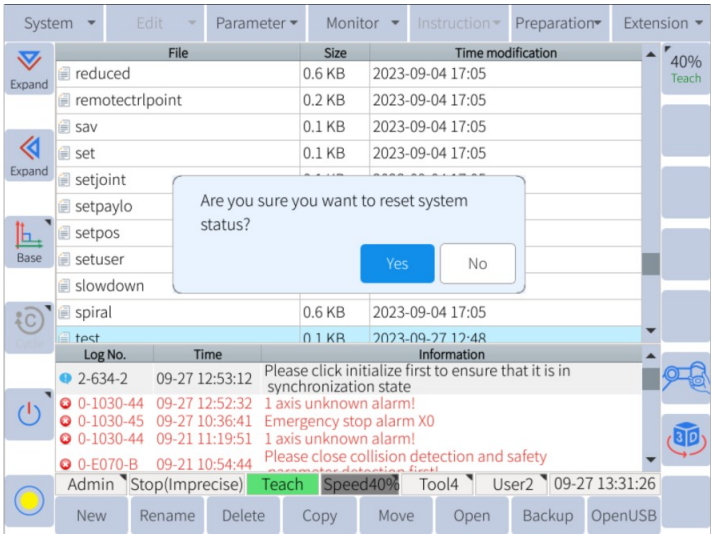


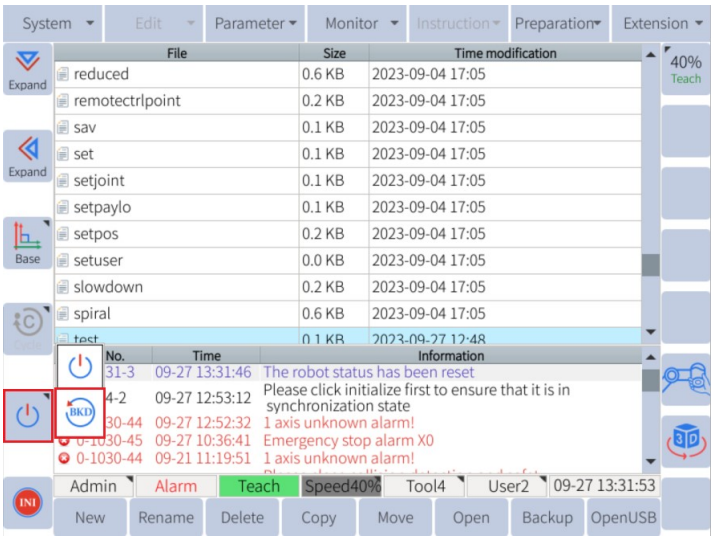
Back Drive

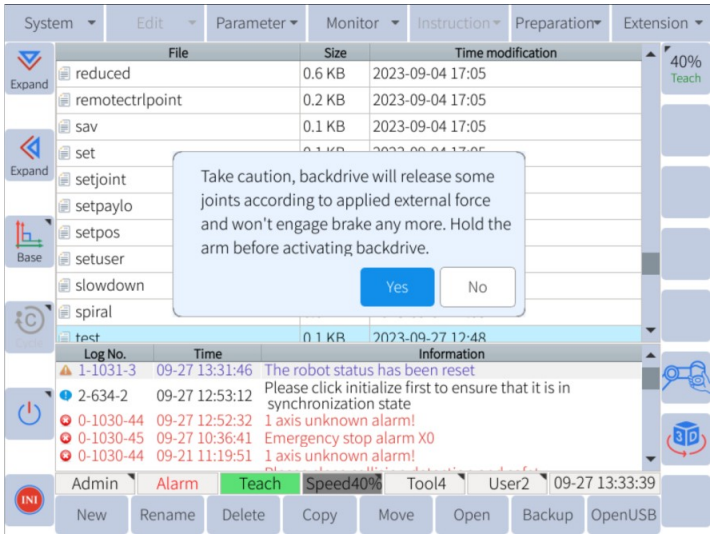
Functions: The reverse drive mode is mainly used to manually move the robot to a safety position after power-on. For instance, the power-on exceeds the soft limit, the brake cannot be released by itself for encoder calibration, or some joints cannot be moved.

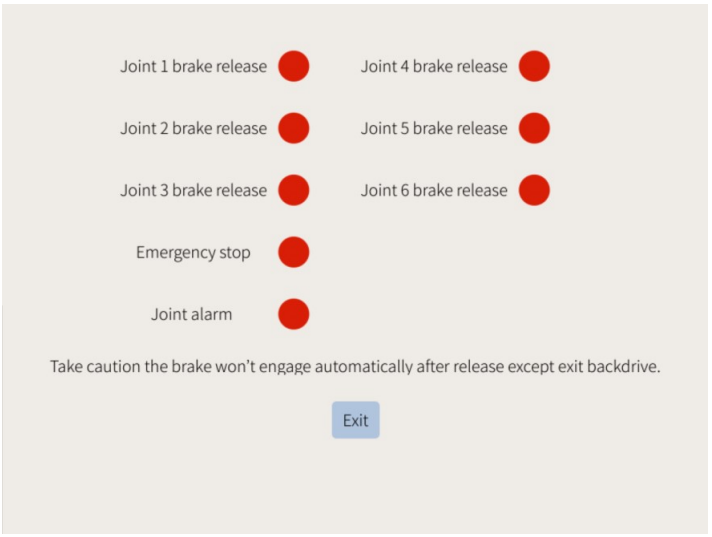
Steps: Hold the robot, click  and  , then click "OK", afterwards click  again and choose  to enter Back Drive mode. You can slightly drag the joint and release the holding brake (the indicator is red when the holding brake is closed and the indicator is green when the holding brake is open) until the robot arrives at the safety position. To exit the reverse drive mode, click the "Quit" button. Please make sure that the payload is set correctly. Please firmly hold the robot.




System
Edit
Parameter
Monitor
Instruction
Preparation
Extension
Expand
Base
File
Size
Time modification
reduced 0.6 KB 2023-09-04 17:05
remotectrlpoint 0.2 KB 2023-09-04 17:05
sav 0.1 KB 2023-09-04 17:05
set 0.1 KB 2023-09-04 17:05
setjoint
setpaylo
setpos
setuser
slowdown
spiral 0.6 KB 2023-09-04 17:05
test
Are you sure you want to reset system status?
Yes
No
40%
Teach
Log No.
Time
Information
2-634-2 09-27 12:53:12 Please click initialize first to ensure that it is in synchronization state
0-1030-44 09-27 12:52:32 1 axis unknown alarm!
0-1030-45 09-27 10:36:41 Emergency stop alarm X0
0-1030-44 09-21 11:19:51 1 axis unknown alarm!
0-E070-B 09-21 10:54:44 Please close collision detection and safety
Admin
Stop(Imprecise)
Teach
Speed40%
Tool4
User2
09-27 13:31:26
New
Rename
Delete
Copy
Move
Open
Backup
OpenUSB


System
Edit
Parameter
Monitor
Instruction
Preparation
Extension
Expand
Base
File
Size
Time modification
reduced 0.6 KB 2023-09-04 17:05
remotectrlpoint 0.2 KB 2023-09-04 17:05
sav 0.1 KB 2023-09-04 17:05
set 0.1 KB 2023-09-04 17:05
setjoint 0.1 KB 2023-09-04 17:05
setpaylo 0.1 KB 2023-09-04 17:05
setpos 0.2 KB 2023-09-04 17:05
setuser 0.0 KB 2023-09-04 17:05
slowdown 0.2 KB 2023-09-04 17:05
spiral 0.6 KB 2023-09-04 17:05
test
BKD
40%
Teach
No.
Time
Information
31-3 09-27 13:31:46 The robot status has been reset
4-2 09-27 12:53:12 Please click initialize first to ensure that it is in synchronization state
30-44 09-27 12:52:32 1 axis unknown alarm!
0-1030-45 09-27 10:36:41 Emergency stop alarm X0
0-1030-44 09-21 11:19:51 1 axis unknown alarm!
Admin
Alarm
Teach
Speed40%
Tool4
User2
09-27 13:31:53
New
Rename
Delete
Copy
Move
Open
Backup
OpenUSB


System
Edit
Parameter
Monitor
Instruction
Preparation
Extension
Expand
Base
File
Size
Time modification
reduced 0.6 KB 2023-09-04 17:05
remotectrlpoint 0.2 KB 2023-09-04 17:05
sav 0.1 KB 2023-09-04 17:05
set
setjoint
setpaylo
setpos
setuser
slowdown
spiral
test 0.1 KB 2023-09-27 12:48
Take caution, backdrive will release some joints according to applied external force and won't engage brake any more. Hold the arm before activating backdrive.
Yes
No
40%
Teach
Log No.
Time
Information
1-1031-3 09-27 13:31:46 The robot status has been reset
2-634-2 09-27 12:53:12 Please click initialize first to ensure that it is in synchronization state
0-1030-44 09-27 12:52:32 1 axis unknown alarm!
0-1030-45 09-27 10:36:41 Emergency stop alarm X0
0-1030-44 09-21 11:19:51 1 axis unknown alarm!
Admin
Alarm
Teach
Speed40%
Tool4
User2
09-27 13:33:39
New
Rename
Delete
Copy
Move
Open
Backup
OpenUSB


Joint 1 brake release
Joint 4 brake release
Joint 2 brake release
Joint 5 brake release
Joint 3 brake release
Joint 6 brake release
Emergency stop
Joint alarm
Take caution the brake won't engage automatically after release except exit backdrive.
Exit

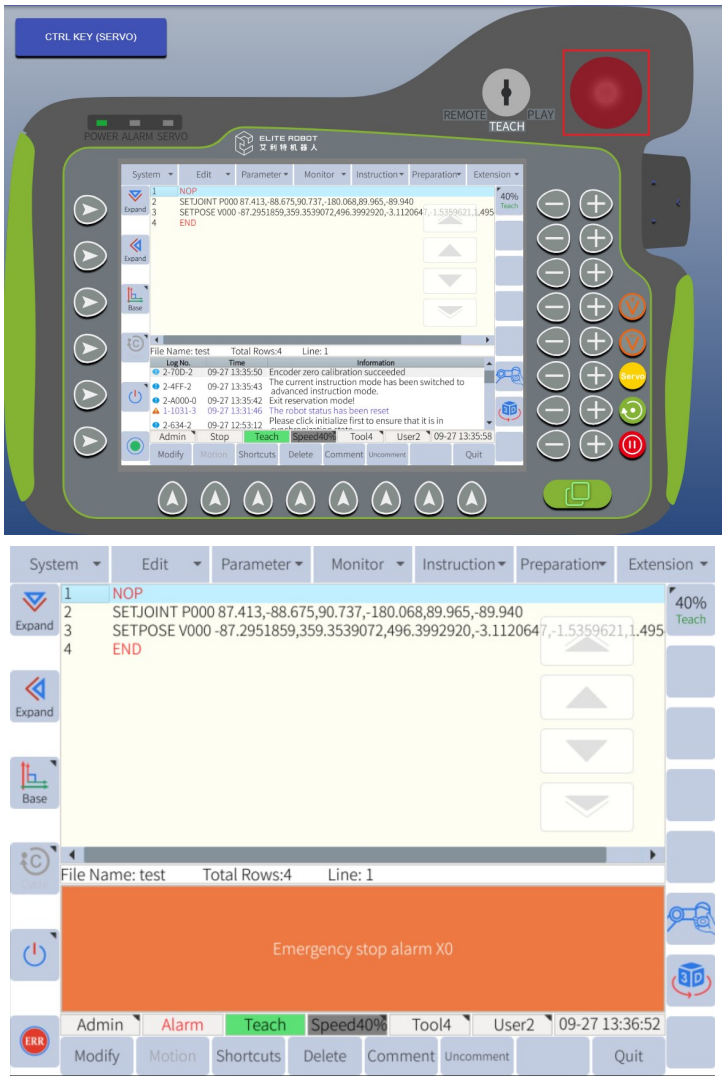
Emergency stop and safeguard stop

Emergency stop

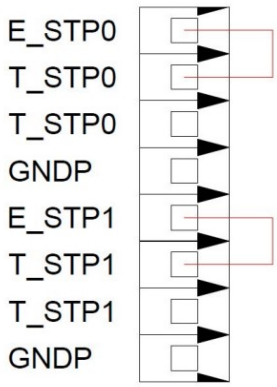
Functions: In the event of an emergency, the user may press the emergency stop button to stop the robot.

Note: When the emergency stop button is pressed, the robot may fall a short distance.

Steps: Press the red button in the top right corner of the teach pendant and the button will be in the lock state. To unlock, twist the button in the clockwise direction and pull it up. In case that the user is pinched by the robot, to help get him/her off the hook, please immediately cut off the power by pressing the emergency stop button. If it is necessary to disable the emergency stop button on the teach pendant or that connected externally, refer to the following wiring diagram.

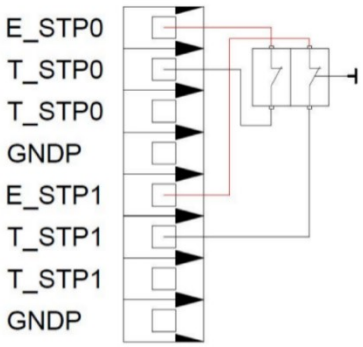


Default connection method

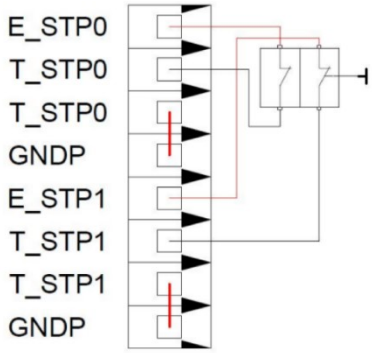


Connecting to the external emergency stop button

Steps: Connect E_STOP0 and the nearest T_STP0 (i.e. J106: 1>2PIN) to the channel interface (0) of the external emergency stop. Connect T_STP0 and GNDP (i.e. J106: 3>4PIN) to the interface of the short circuit. Connect E_STOP1 and the neares T_STP1 (i.e. J106: 5>6PIN) to the channel interface (1) of the external emergency stop. Connect T_STP1 and the GNDP (i.e. J106: 7>8PIN) to the interface of the short circuit.



Disabling the emergency stop button on the teach pendant

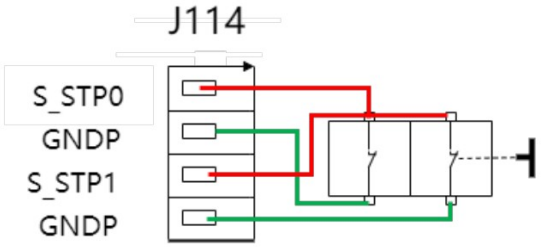


Safeguard stop

Functions: The safeguard stop will pause the running program. The paused program will continue to run only when the user presses the green play button by default. The safeguard stop can be configured to automatically reset when the signal is LOW.

Steps: The following figure shows an example of how basic safeguard stop eauipment is set up.

The robot may (if configured) resume motion automatically when the safeguard signal is re-established. Do not use the configuration if the signal can be re-established from inside the safety perimeter.



File transfer, backup and recovery

File transfer

Steps: Transfer the file with a USB flash disk. Copy the file to be transferred in a folder named “rbctrl” located in the root directory of the USB flash disk. Insert the USB flash disk into the USB interface on the controller. Click **System -> File Recovery -> JBI File Import** and select one file to import.

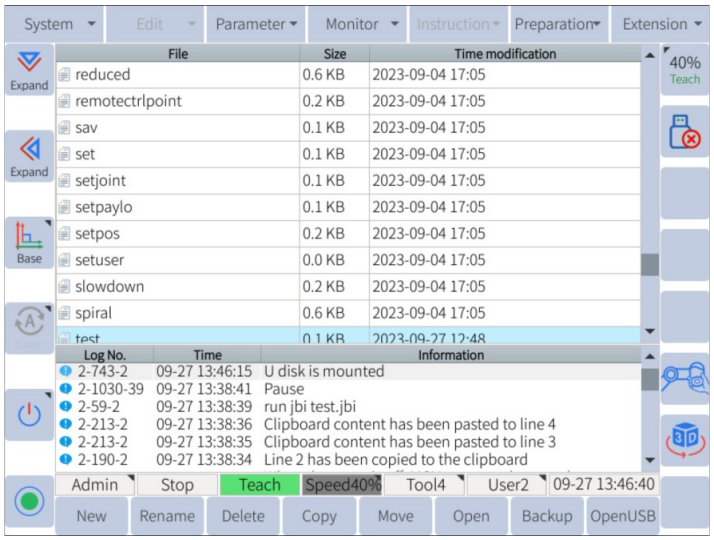
Transfer the file online. Visit the web teach pendant, enter the user name and the password. Click “File Management” in the top part to select “Upload/Download File”. Double click the file name to make changes.

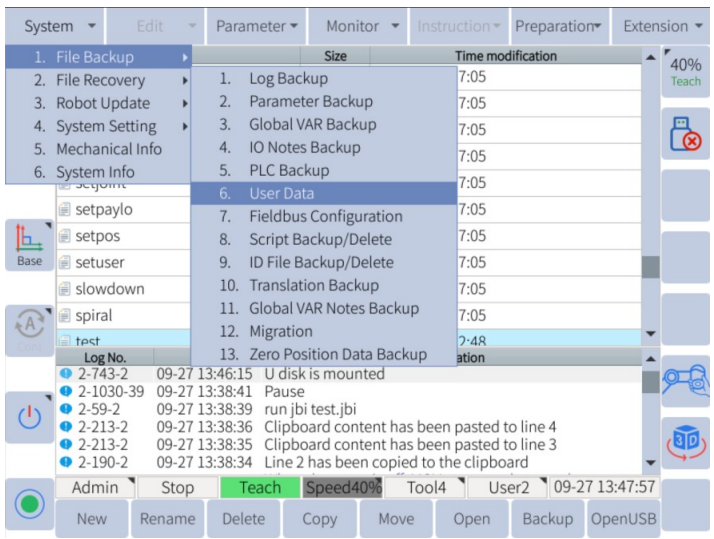
Transfer the file via a software that supports SFTP. Refer to https://bbs.elibot.cn/forum/detail/topic/42.html

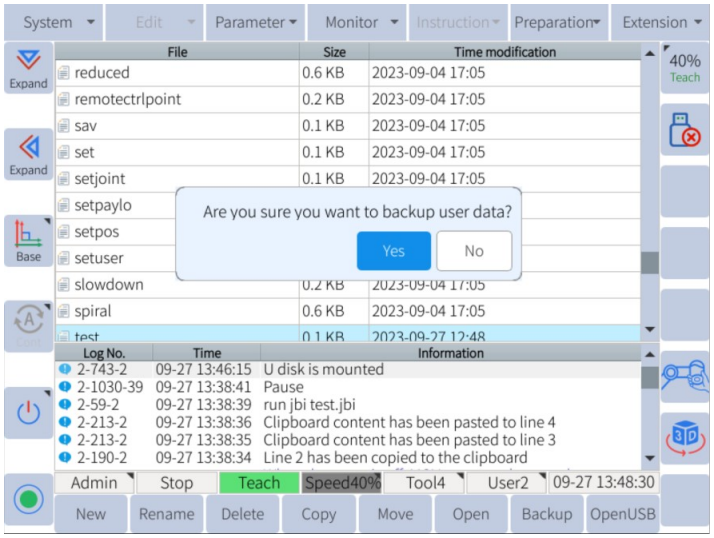
User data backup

Functions: Include parameter backup, IO annotation backup and PLC backup. In addition, the user can backup all program files, user coordinate files, tool coordinate files, process files, screenshots and others. Note that the user data backup excludes the data backup about the mechanical zero position.

Steps: Insert the USB flash disk into the USB interface on the controller. Click **System -> File Backup -> User Data**. After the backup is complete, a message prompts that “User Data Backup Succeeded”. The user can remove the USB flash disk now. The backup data will be automatically saved in the file folder named “rbctrl”. (If there isn’t a file folder named “rbctrl”, it will be automatically created when backing up the data.)



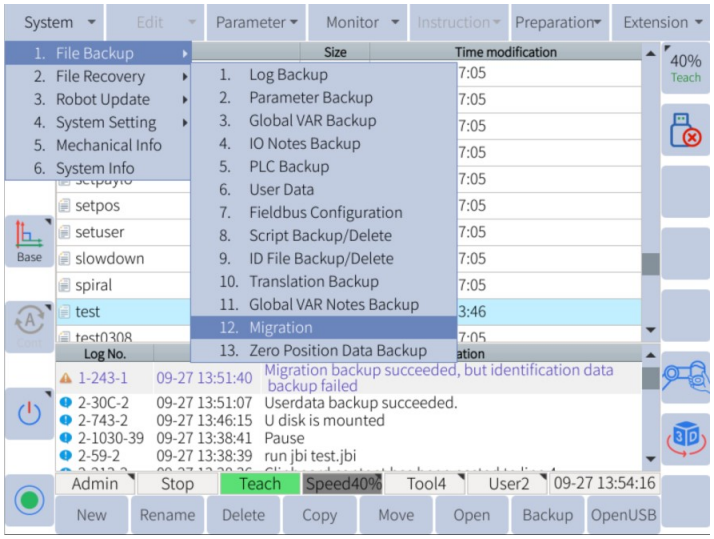




Migration Backup

Functions: Migration Backup is the most complete data backup, incl. user data backup, zero data and lap information backup, variable data backup and so on. Since it includes the zero data backup, please do not recover the migration backup of the robot A back to the robot B.

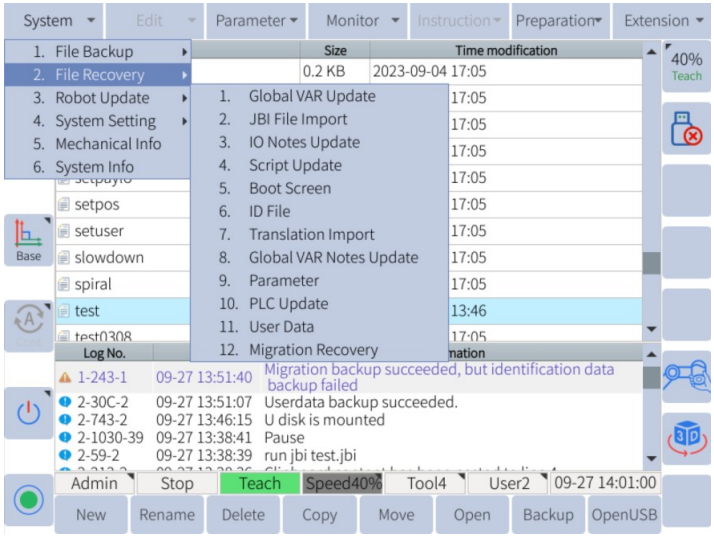
Steps: Insert the USB flash disk into the USB interface on the controller. Click **System -> File Backup- > Migration**. After the backup is complete, a message prompts that “Migration Backup Succeeded”. The user can remove the USB flash disk now. The backup data will be automatically saved in the file folder named “rbctrl”. (If there isn’t a file folder named “rbctrl”, it will be automatically created when backing up the data.)



File recovery

Functions: The file recovery is used to recover the backed up data and import the JBI/LUA files.

Steps: Copy the data to be imported into the file folder named “rbctrl” located in the root directory of the USB flash disk. Insert the USB flash disk into the USB interface on the controller. Click **System -> File Recovery** to select the file to be recovered.



JBI file backup and import

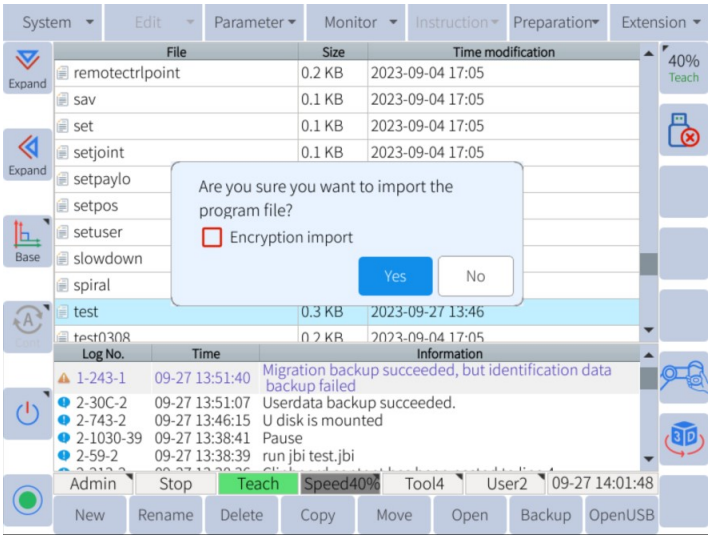
Functions: Backup and import the JBI program files**.**

Steps:

Backup: Insert the USB flash disk into the USB interface on the controller. Select the program to

be backed up and click “backup”. The program will be saved in the USB flash disk.

Import: Insert the USB flash disk into the USB interface on the controller. Click the “Open USB” button and the existing programs will appear. Select the program to be imported and click the “USB to local” button in the bottom left part. After the click, the file is successfully imported and the JBI file will be saved in the file folder named “rbctrl” located in the root directory of the USB flash disk (If there isn’t a file folder named “rbctrl”, please create one.). Insert the USB flash disk into the USB interface on the controller and click **System -> File Recovery -> JBI File Import**. Click “Yes” and the JBI file will be successfully imported. Note that the file import can be encrypted and the encryption is irreversible.



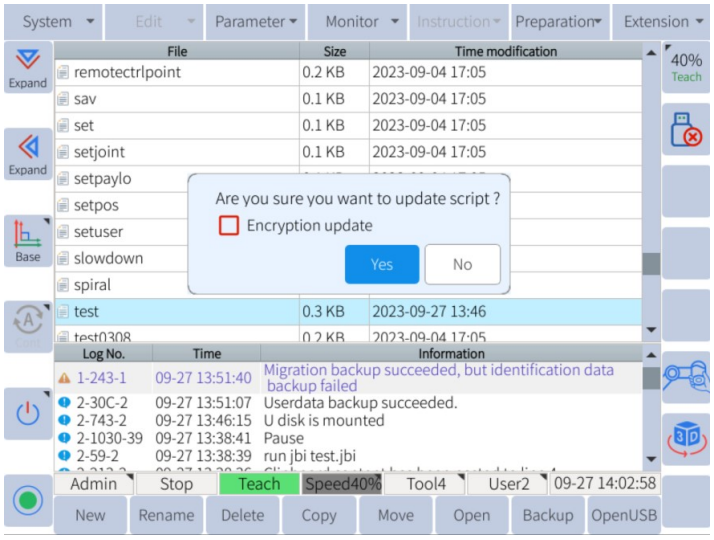
Script backup and update

Functions: Backup and import Lua script files.

Steps:

Backup: Insert the USB flash disk into the USB interface on the controller. Click **System -> File Backup -> Script Backup** and click “Backup”. A message prompts that the script is successfully backed up. The backed up script is saved in the rbctrl/luadir.

Update: Save the Lua file in the file folder named “luadir” located in the root directory of the USB flash disk (if there isn’t a file folder named “luadir”, please create one.). Insert the USB flash disk into the USB interface on the controller. Click System -> File Recovery -> Script Update and click “Yes”. A message prompts that the script is successfully updated. Note that the file import can be encrypted and the encryption is irreversible.



PLC update

Functions: For the new version (A23 board), it is unnecessary to update the system PLC separately. The user can copy the user PLC of the robot A to the robot B. For the A22 board, before the software update, click **System -> File Back -> PLC Backup** to back up. After the update is complete, click **System -> File Recovery -> PLC Update** to update.

Steps:

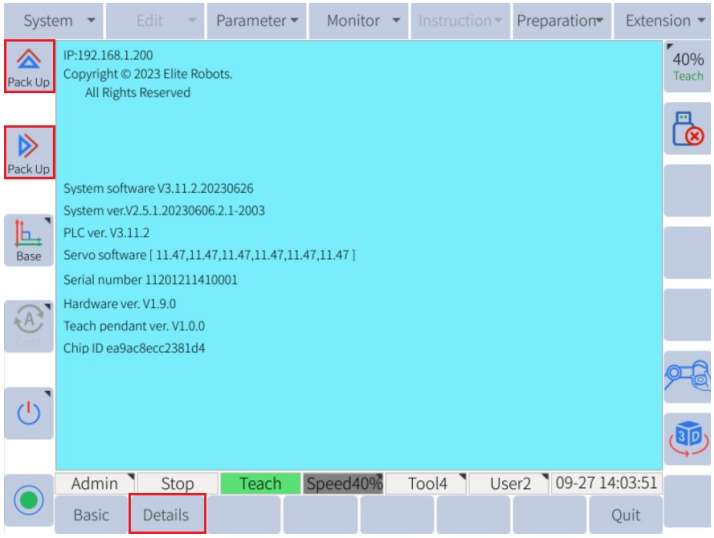
Copy user PLC: After editing and saving the user PLC in the robot A (the robot will automatically restart when saving the user PLC), click **System -> File Backup -> PLC Backup** to back up the user PLC to the USB flash disk. Insert the USB flash disk into the USB interface on the controller. Click **System -> File Recovery -> PLC Update** on the robot B to update the user PLC.

Update system PLC (A22): Download the plc.dat file from the ELITE Robot website or forum. Click **System -> File Recovery -> PLC Update**. Select “System PLC” and click “Yes”. Note that the PLC update must be performed after the software update is complete.

System Update

View the system version

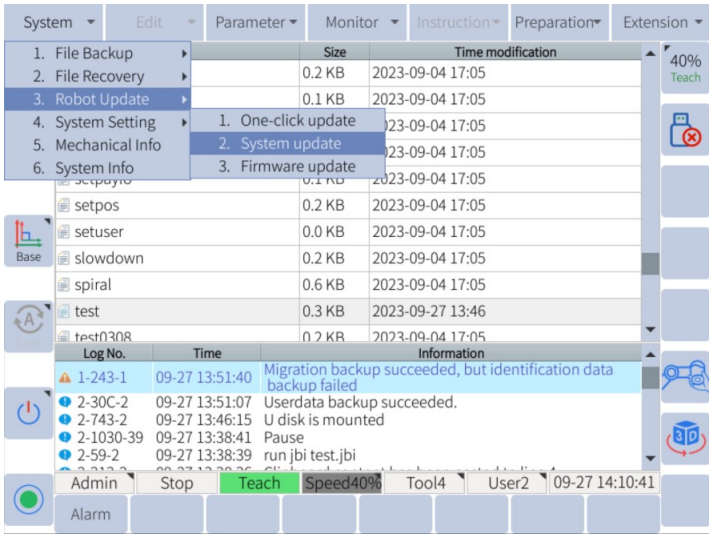
Steps: Click **System -> System Info** and the information about the system version will appear on the display. Click “Details” at the bottom. The EC series robot update includes the system update and the firmware update. The system update refers to the controller update and the firmware update refers to the servo software update.

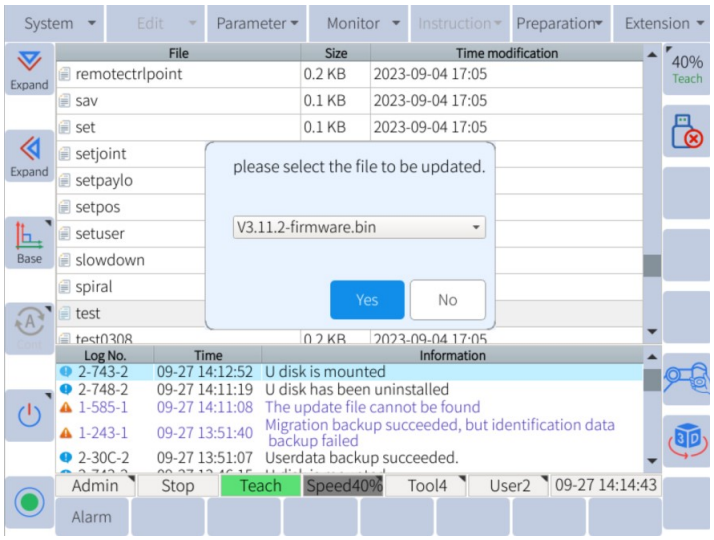


Software update

Steps:

1. Move the robot to the zero position and take a photo or take a screenshot of the mechanical home page before the system update.
2. Prepare a USB flash disk and copy the update file “firmware.bin” into the root directory.
3. Insert the USB flash disk into the USB interface on the controller.
4. Click **System -> File Backup -> User Data** to back up the user data.
5. Click **System -> Robot Update -> System Update,** click “Yes” and wait for a few minutes.
6. After the software update is complete and the teach pendant restarts, please check if the zero position is the same as that before the update.



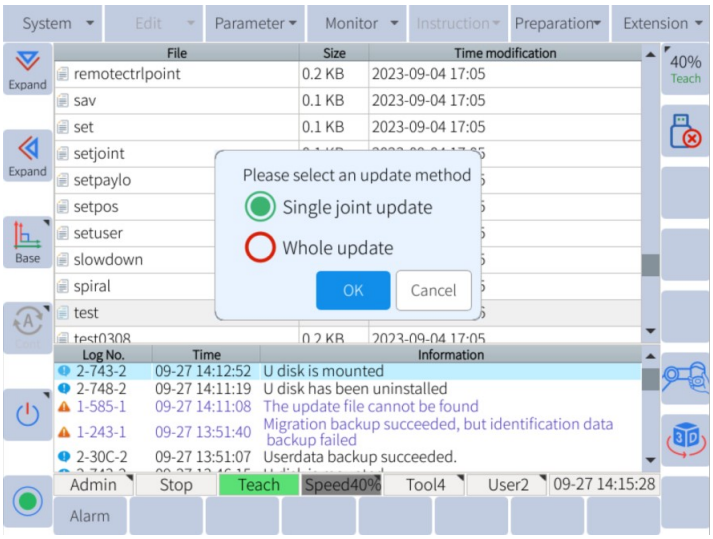


Firmware update

Functions: Upgrade the servo**.**

Steps:

1. Create a file folder named “rbctrl” in the root directory of the USB flash disk and copy the firmware update file into the file folder named “rbctrl”
2. Insert the USB flash disk into the USB interface on the collaborative robot and the USB icon will appear in the right side of the teach pendant screen
3. Click **System -> Robot Update -> Firmware Update** and a dialogue box of the message “Please select an update method” will pop up.



4. Select “Single joint update”. Please make sure that the file with the suffix “.bin” must be consistent in the robot type and the joint size. Click the “Set” button every time when selecting the update file for an axis until all updates of the axes are complete.

   For the robot EC63, select:

   Axis 1, Axis 2 and Axis 3: “j20_xxxxxxxx.bin” file

   Axis 4, Axis 5 and Axis 6: “j14_xxxxxxxx.bin” file

   For the robot EC66, select:

   Axis 1 and Axis 2: “j25_xxxxxxxx.bin” file

   Axis 3: “j20_xxxxxxxx.bin” file

Axis 4, Axis 5 and Axis 6: “j14_xxxxxxxx.bin” file

For the robot EC612, select:

Axis 1 and Axis 2: “j32_xxxxxxxx.bin” file

Axis 3: “j25_xxxxxxxx.bin” file

Axis 4, axis 5 and axis 6: “j17_xxxxxxxx.bin” file

For the robot EC616, select:

Axis 1 and Axis 2: “j32_xxxxxxxx.bin” file

Axis 3: “j25_xxxxxxxx.bin” file

Axis 4, Axis 5 and Axis 6: “j17_xxxxxxxx.bin” file

For the robot EC64-19, select:

Axis 1 and Axis 2: “j32_xxxxxxxx.bin” file

Axis 3: “j25_xxxxxxxx.bin” file

Axis 4, Axis 5 and Axis 6: “j17_xxxxxxxx.bin” file

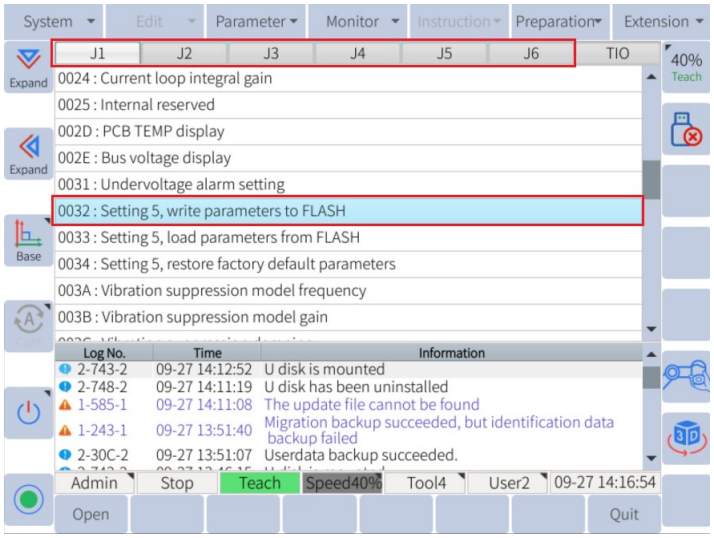
For the robot EC68, select:

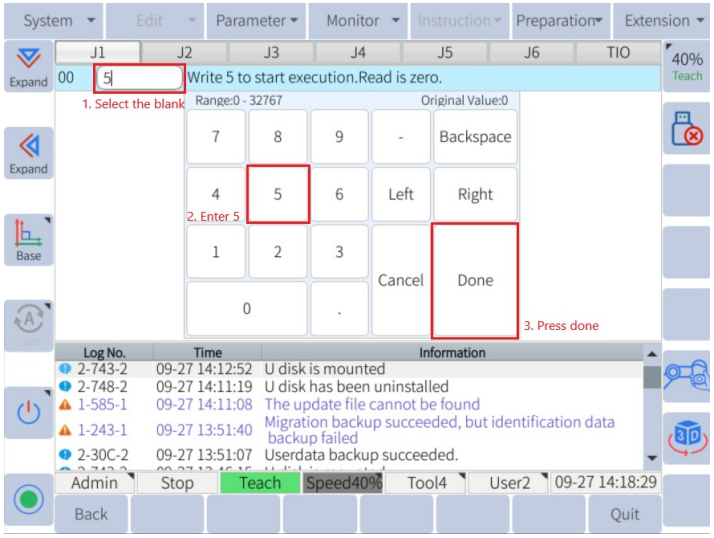
Axis 1 and Axis 2: “j25_xxxxxxxx.bin” file

Axis 3: “j20_xxxxxxxx.bin” file

Axis 4, Axis 5 and Axis 6: “j14_xxxxxxxx.bin” file

5. Select “Whole update”, please select the file with the suffix “ .esu”, click the “Set” button and wait for the update to complete.
6. Power off and restart after completing the update.
7. After the update, click Parameter -> Joint Servo to find the parameter 0032 in each joint (J1-J6). Set it to 5 and write the parameter into FLASH.





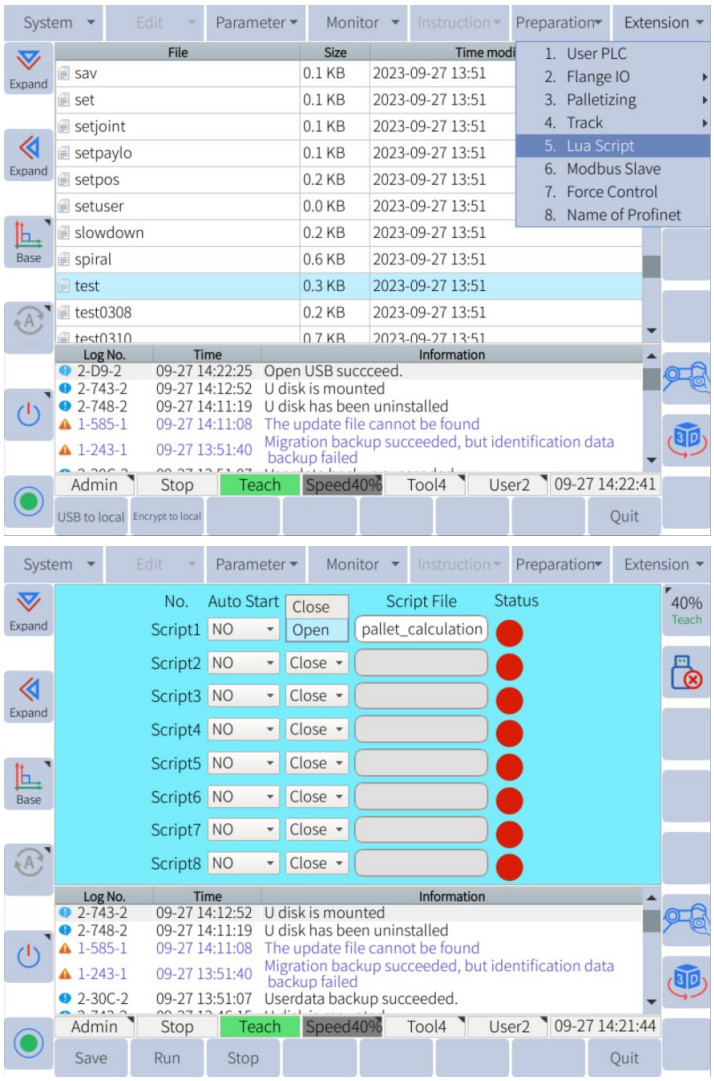
One-click Update

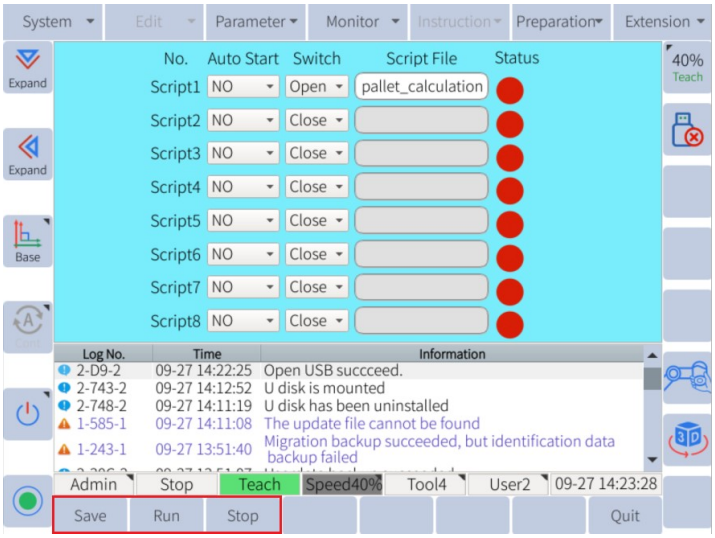
Functions: The user can also perform the one-click update as required, incl. System update and firmware update.

Steps: Copy the file “xxxxxEC_UpdateAll.bin” in the USB flash disk. Click Robot Update -> One-click Update and a dialogue box with the message “Please select the file to be updated” will pop up. Then please click “Yes”.

Configure the lua scripts

Steps: Import the Lua script into the robot. Click Extension -> Lua Script. There are 8 total indices that can be assigned a Lua script. After the Lua script is imported to the local, click the box under the “Script File” column and select the desired script from the list that appears. To run the desired Lua scripts, click on the drop-down menu in the “Switch” column and select “Open”. Click “Save” in the sub-menu, then click “Run” and all scripts with the drop down showing “Open” will run. To stop the running scripts, click “Stop” in the sub-menu. Please enter the sleep command in the first line of Lua. For more information about the Lua scripts, please refer to the Lua scripting manual on the ELITE Robot website.

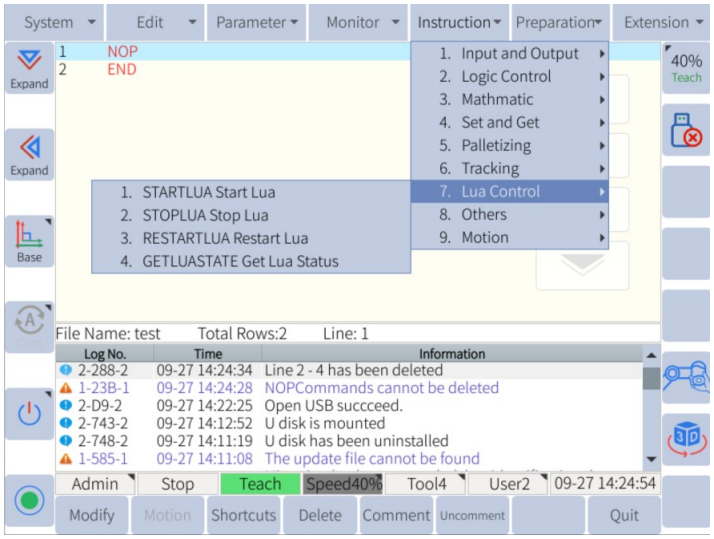


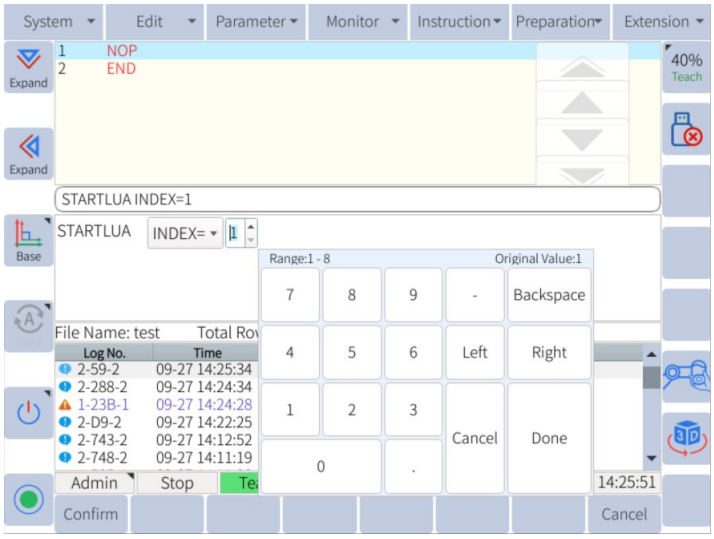

System
Edit
Parameter
Monitor
Instruction
Preparation
Extension
Expand
Expand
Base
No.
Auto Start
Switch
Script File
Status
Script1 NO Open pallet_calculation
Script2 NO Close
Script3 NO Close
Script4 NO Close
Script5 NO Close
Script6 NO Close
Script7 NO Close
Script8 NO Close
40%
Teach
Log No.
Time
Information
2-D9-2 09-27 14:22:25 Open USB succeed.
2-743-2 09-27 14:12:52 U disk is mounted
2-748-2 09-27 14:11:19 U disk has been uninstalled
1-585-1 09-27 14:11:08 The update file cannot be found
1-243-1 09-27 13:51:40 Migration backup succeeded, but identification data backup failed
Admin
Stop
Teach
Speed40%
Tool4
User2
09-27 14:23:28
Save
Run
Stop
Quit

Run Lua script via the JBI commands

Functions: What mentioned above is to run the Lua scripts manually. The user can also run or stop the specified Lua script via the JBI commands.

Steps: In the JBI editing interface, click **Instruction -> Lua Control** and select STARTLUA (run the specified Lua script), STOPLUA (stop the specified Lua script), RESETLUA (reload and run the specified Lua script) or GETLUASTATE (get the running status of the specified Lua script).

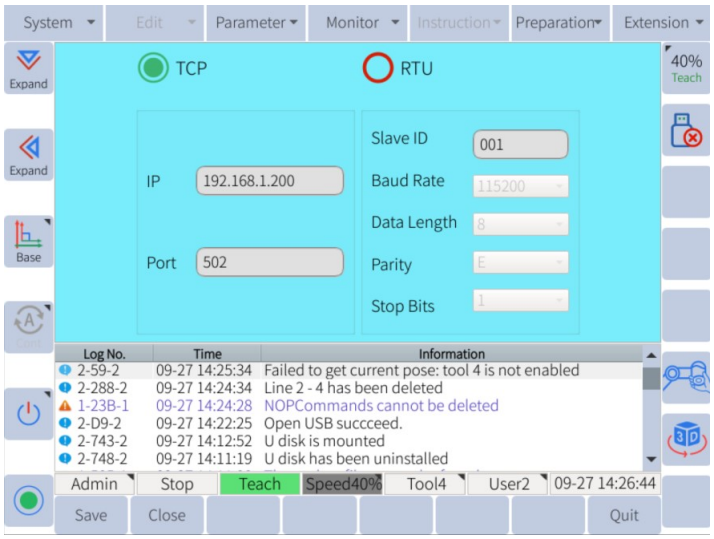




*Appendix (follow-ups)

Modbus slave station

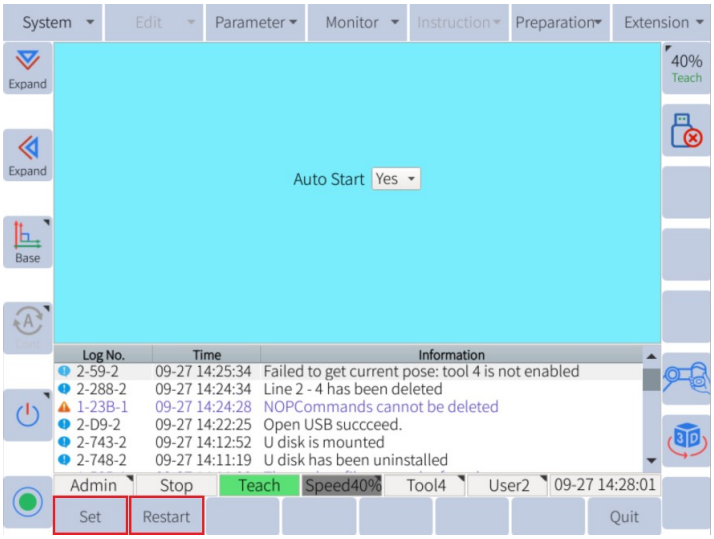
Functions: The user can select Modbus RTU or Modbus TCP as required. Modbus RTU uses the RS485 interface, which requires the user to configure the slave ID, baud rate, number of bits, parity and stop bits. Modbus TCP uses the ethernet port at the top of the controller. Only the IP address of the Modbus TCP settings can be modified. The default port for Modbus TCP is 502. The IP address can only be modified from the network configuration page. To modify the IP address, netmask and gateway, please click **System -> System Setting -> Network Setting**.



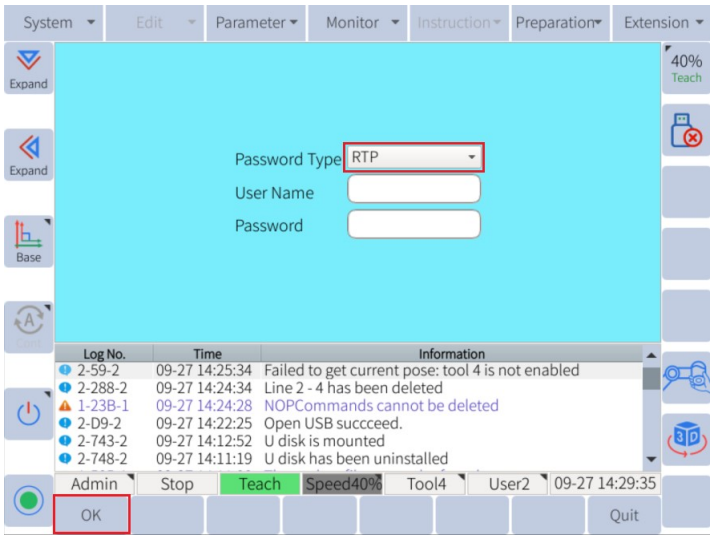
Steps: Click **Extension -> Modbus Slave** and select TCP/RTU. Set the parameters as required.

Configure the web teach pendant

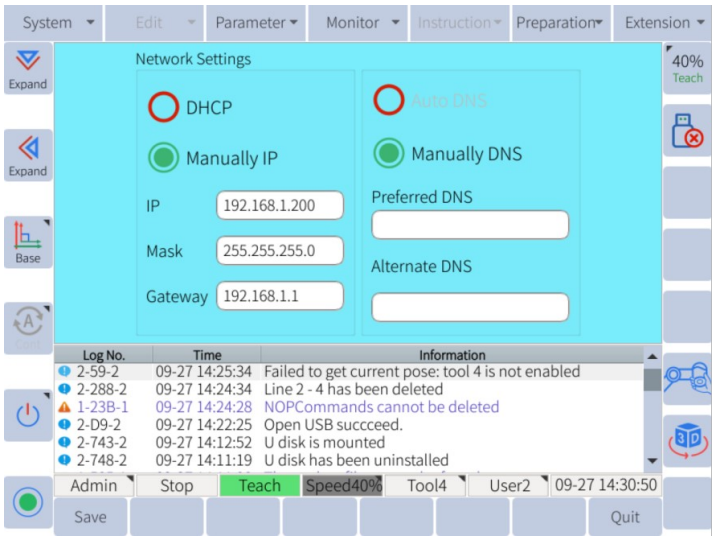
1. Configure the VNC: Click **System -> System Setting -> VNC Setting**. Select "Yes" from the drop-down list of "Auto Start" and click the "Set" button. Click the "Restart" button to start the VNC.



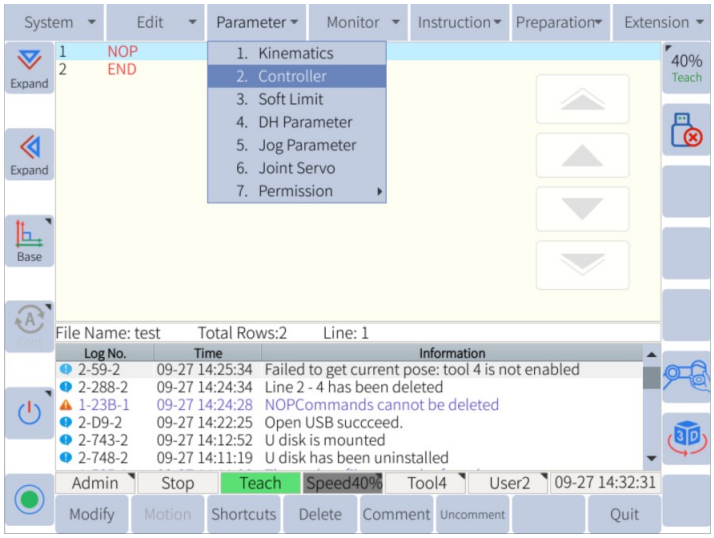
2. Set the username and the password. Click **System -> System Setting -> Remote Password**, select "RTP" from the type list. Enter the username and password, which is used to log in the website.

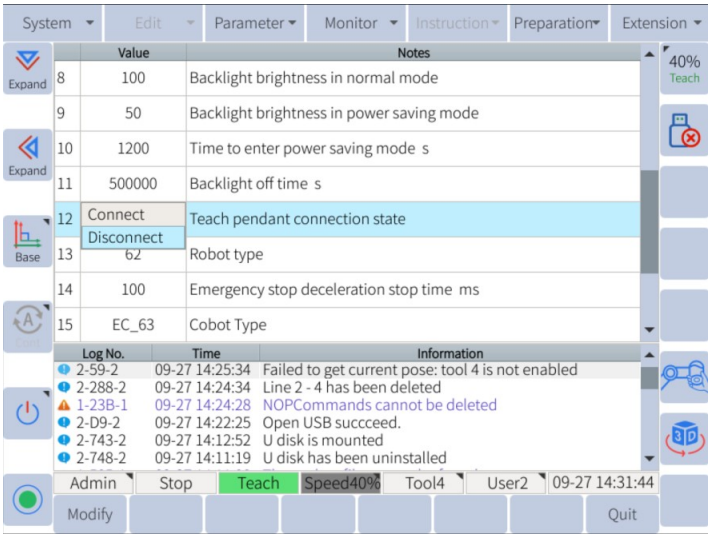


3. View the IP address. Click **System -> System Setting -> Network Setting** to view the IP address of the robot.

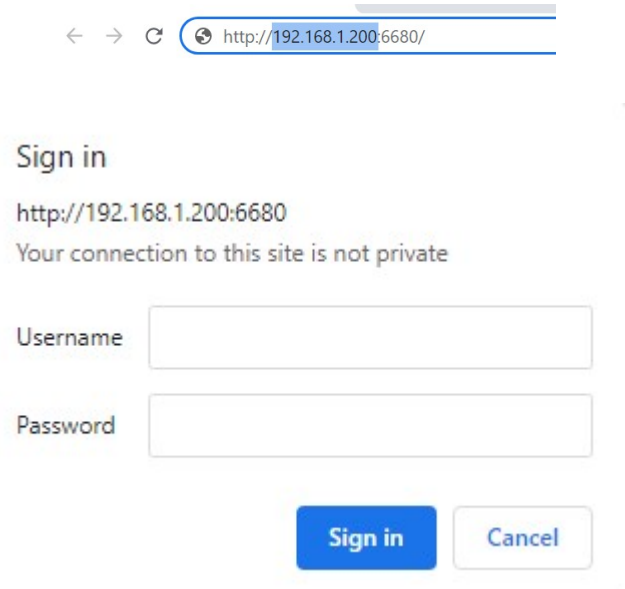


4. Set the controller. Click **Parameter -> Controller**. Simply press the scroll wheel in toward the teach pendant and move down to the line “Connect: Teach pendant connection state”. Click the “Modify” button and select “Disconnect” from the drop-down list. The teach pendant is disconnected now.





5. Remove the teach pendant. Disconnect the teach pendant from the robot power supply. Note that the external emergency stop button must be connected while not using the emergency stop device. After the removal, press the switch button again to restart the robot and then the robot can be controlled remotely through the web pages.
6. Visit the website. The user can visit the website through browser to remotely control the robot. Open a browser and enter the URL (http:// IP address of the current device:6680/). Press the “Enter” button and enter the user name and password. Click the “Sign in” button.



7. The user can perform the following operations in the teach pendant view.

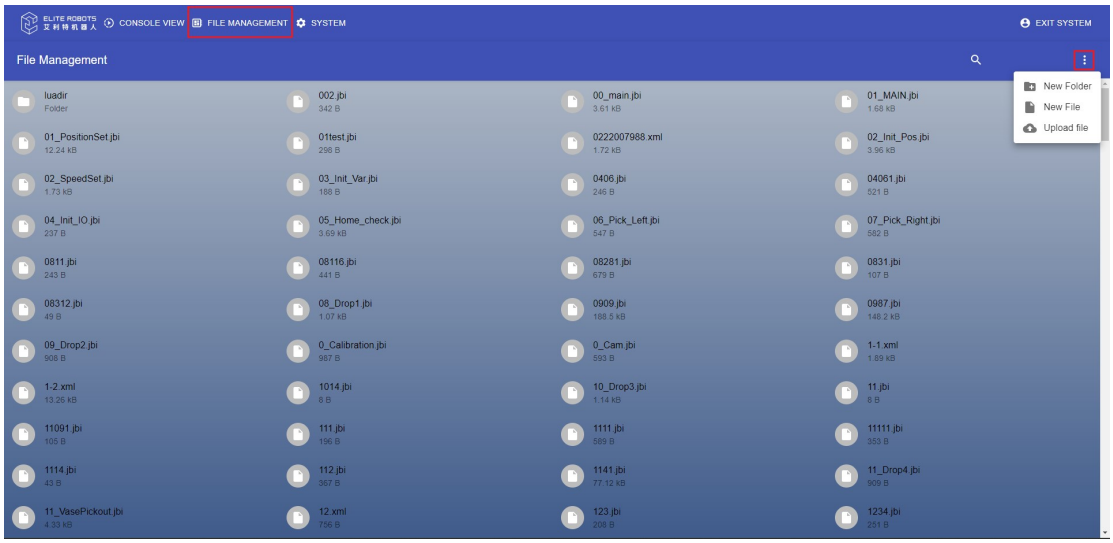
   Simulate the actual teach pendant: simulate the actual teach pendant screen through the virtual screen and operate the robot; observe the robot status through the virtual LED; click the button on the real teach pendant through the virtual buttons; set to PLAY, REMOTE or TEACH mode through the virtual key bit. In the TEACH mode, press the CTRL button on the real teach pendant or the CTRL (servo) virtual button to enable or disable the servo.

   The user can perform the following operations in the robot view.

   Observe the real-time state of the physical robot; clear the movement trajectory of the robot; simulate to rotate the physical robot by dragging the virtual robot with the mouse left button; simulate to translate the physical robot by dragging the virtual robot with the mouse right button.

   File management: In the TEACH mode, the user can click “File Management” in the upper menu bar to enter the “File Management” interface. Click the upper right button menu to create a file folder/file and upload a file, as shown in the following figure. Note that filename suffix can only be .jbi and .lua. After selecting the files, click the mouse right button to open/move/rename/delete the files.

The user can edit the files online by double clicking the files with the suffix of .jbi and .lua.



I/O explanation

Please refer to the Section 14.1 A IO Instructions for use in the EC series user manual of Elite robots.

Technical support

a. Official website – download center

b. Elite college https://space.bilibili.com/548925152/channel/collectiondetail?sid=476458

c. Technical documents：https://bbs.elibot.cn/

d. Technical support: Service@elibot.com