Mech-Mind User' s Manual

Mech-Mind

Jun 16, 2023

Contents

If you are using an IRC5 controller, and the version of RobotWare is 6.02 or higher, please read the following content.

CHAPTER 1

ABB Setup Instructions

This section introduces the process of loading the robot master-control program onto an ABB robot.

The process consists of the following steps:

Please have a flash drive ready at hand.

1.1 Check Controller and Software Compatibility

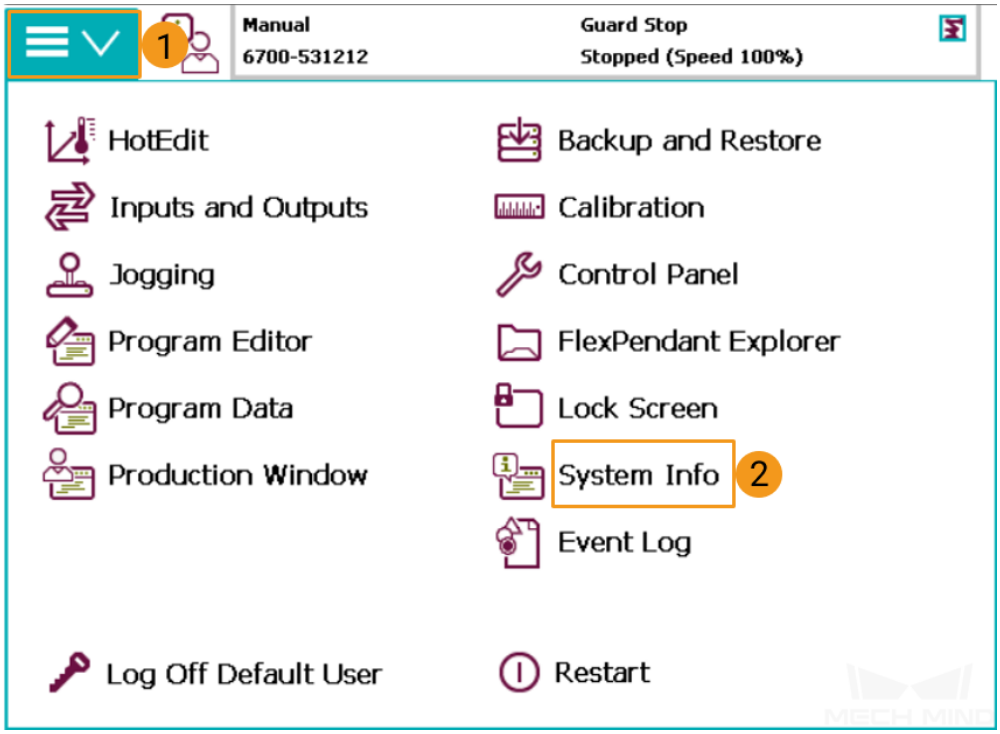
- Controller: IRC5
- Controller system software version: RobotWare 6.02 or above
- Control module options: 623-1 Multitasking and 616-1 PC Interface

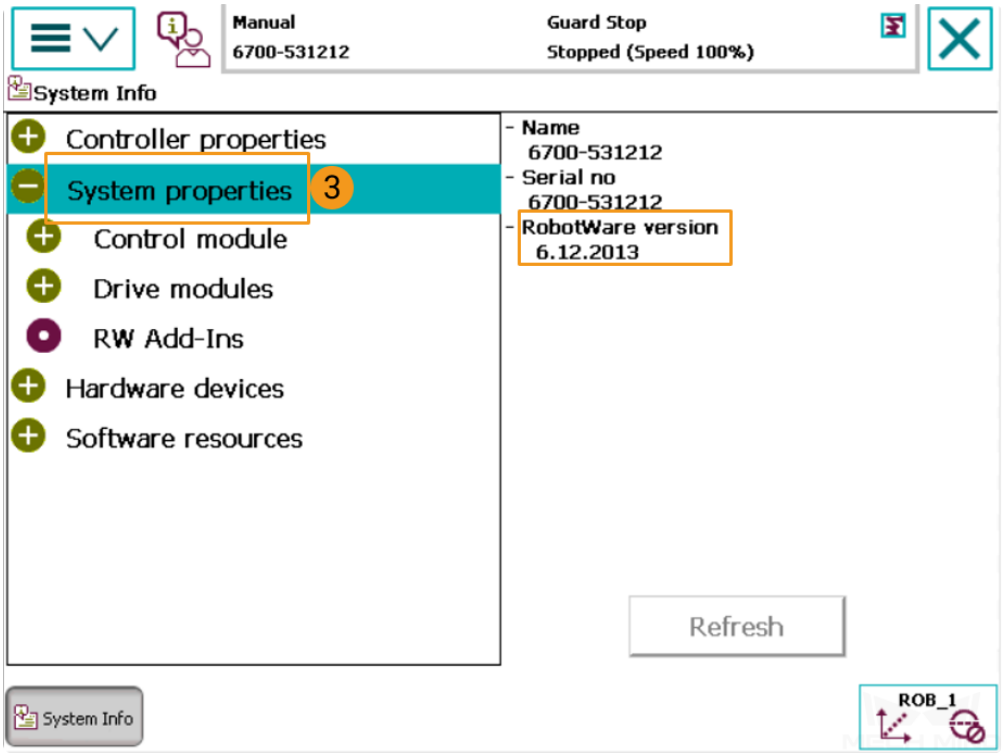
  Note: The above control module options must be installed to realize master-control of an ABB robot.

- Mech-Mind Software Suite: latest version recommended

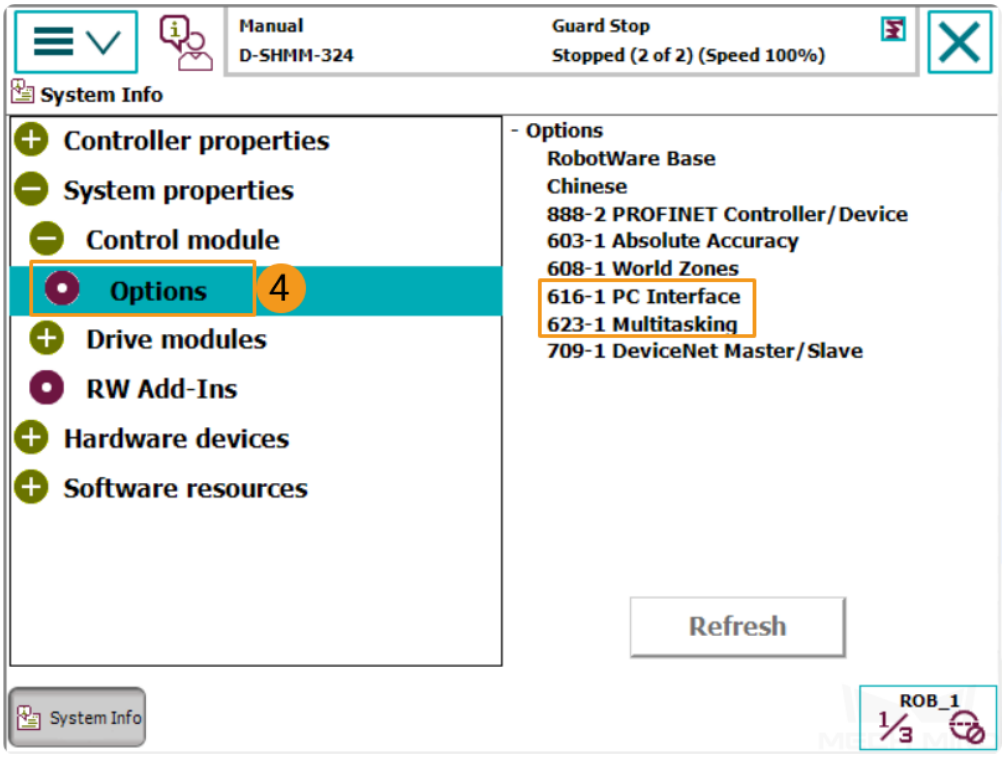
Follow the steps below to check the RobotWare version and the installed control module options.

1. Tap  and then go to *System Info*→ *System properties* to check the RobotWare version.





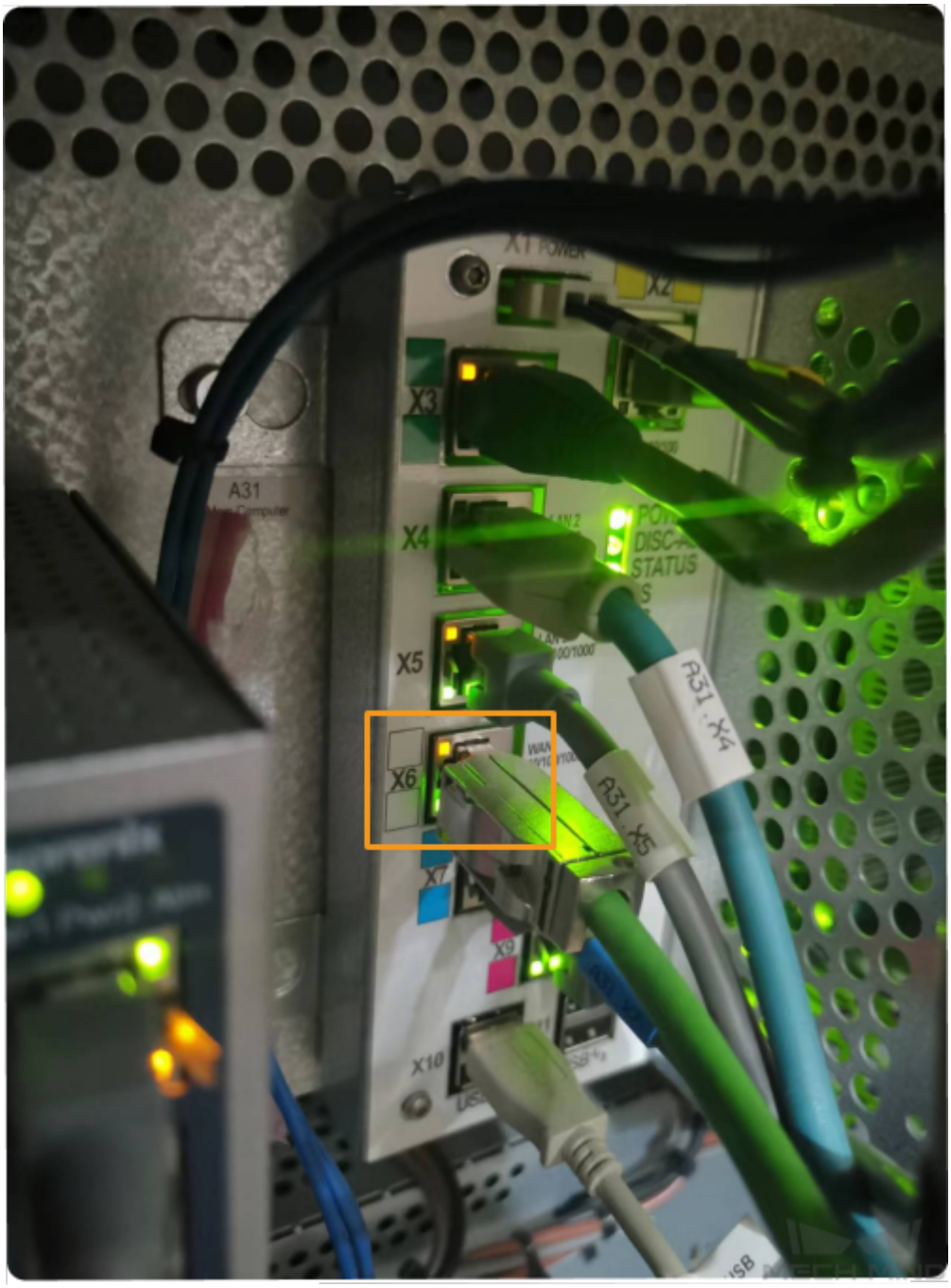
2. Go to *System properties*→ *Control Module*→ *Options* to check whether the necessary options are installed.



1.2 Set up the Network Connection

1.2.1 Hardware Connection

Plug the Ethernet cable of the IPC into the **X6 (WAN)** port of the robot controller, as shown below.



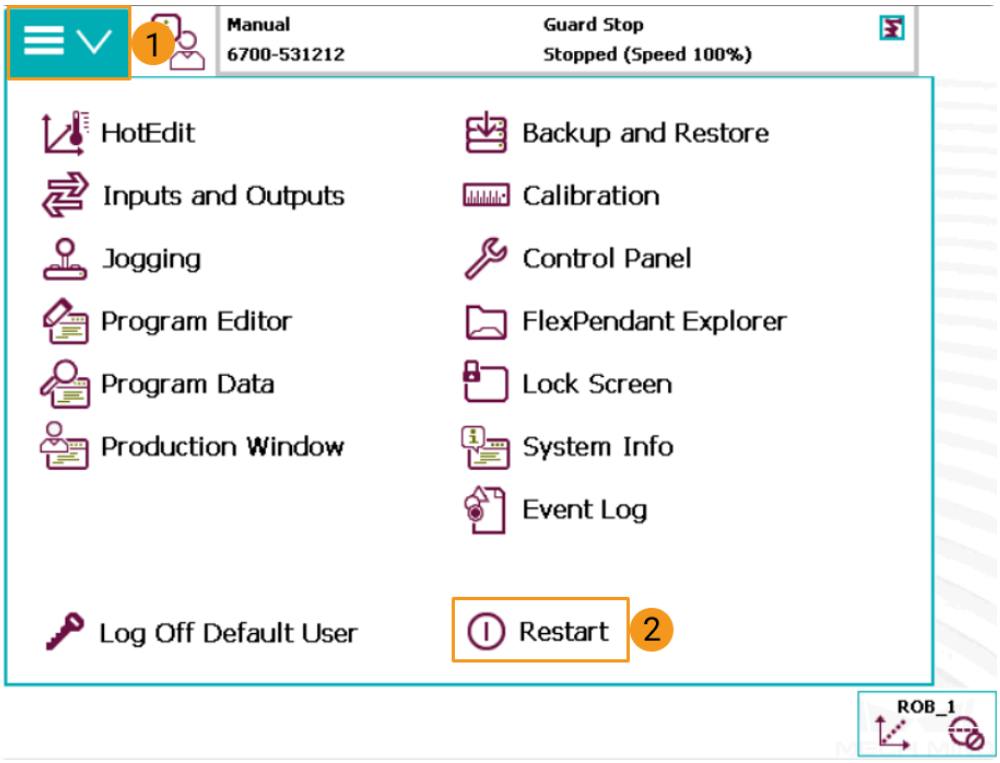
Hint: If you only need to load the master-control program via RobotStudio, you can use either LAN port or WAN port to connect the robot controller. However, in order to enable visual communication, the Ethernet cable can only be connected to the WAN port.

1.2.2 IP Configuration

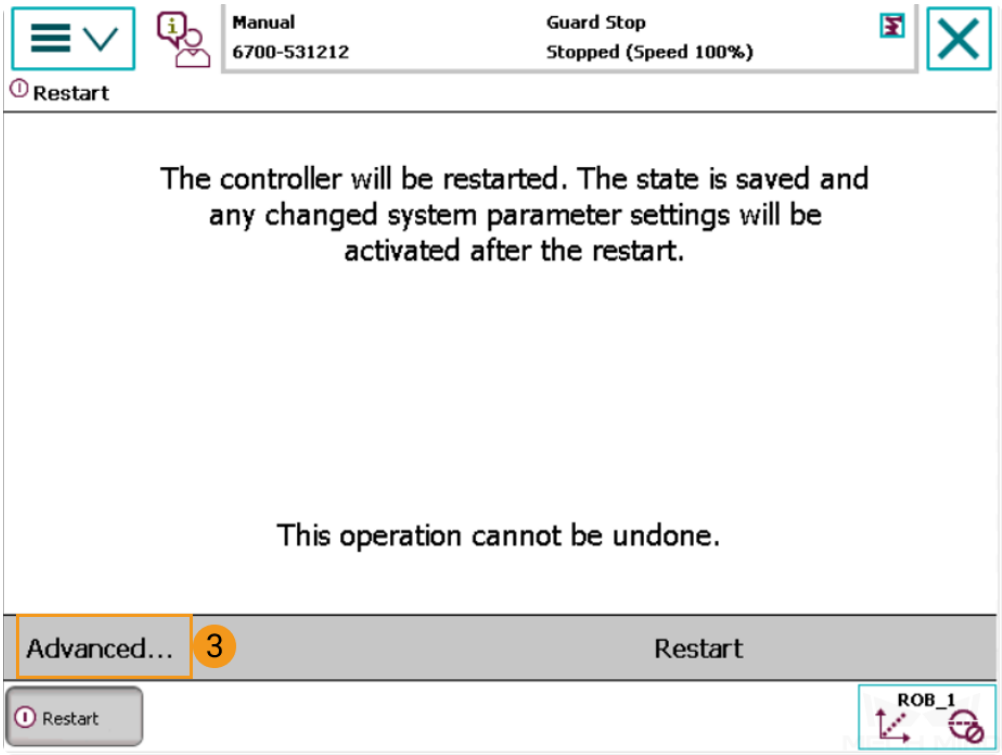
You can set the IP on the teach pendant or via RobotStudio.

- Set the IP on the teach pendant

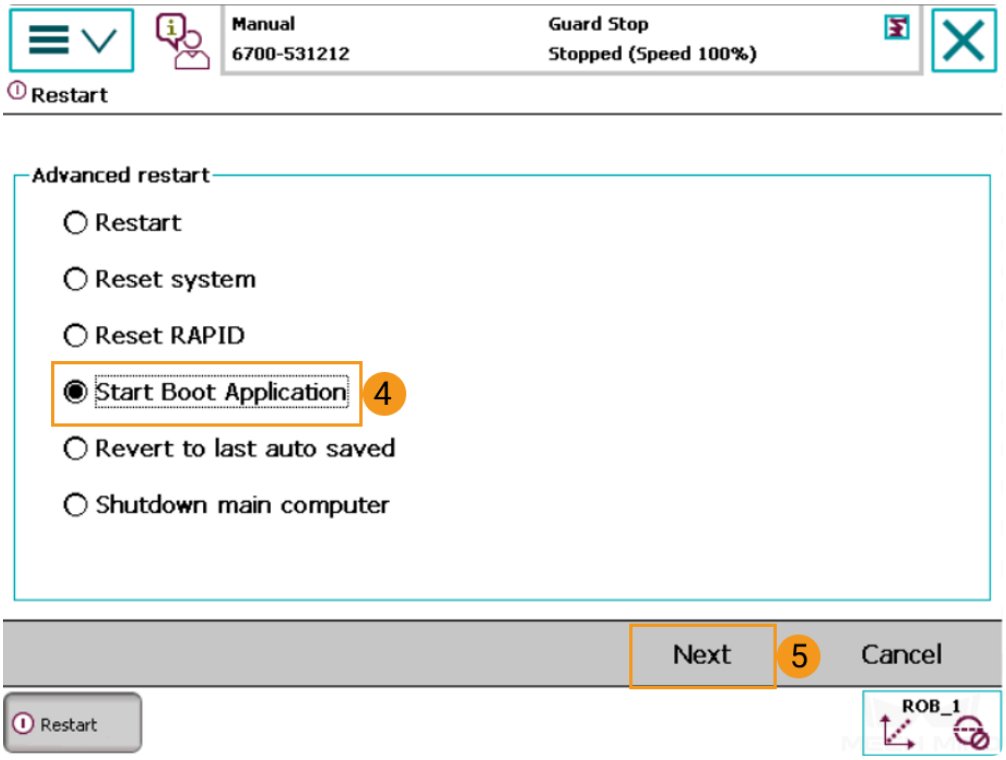
1. Tap  and select *Restart*.



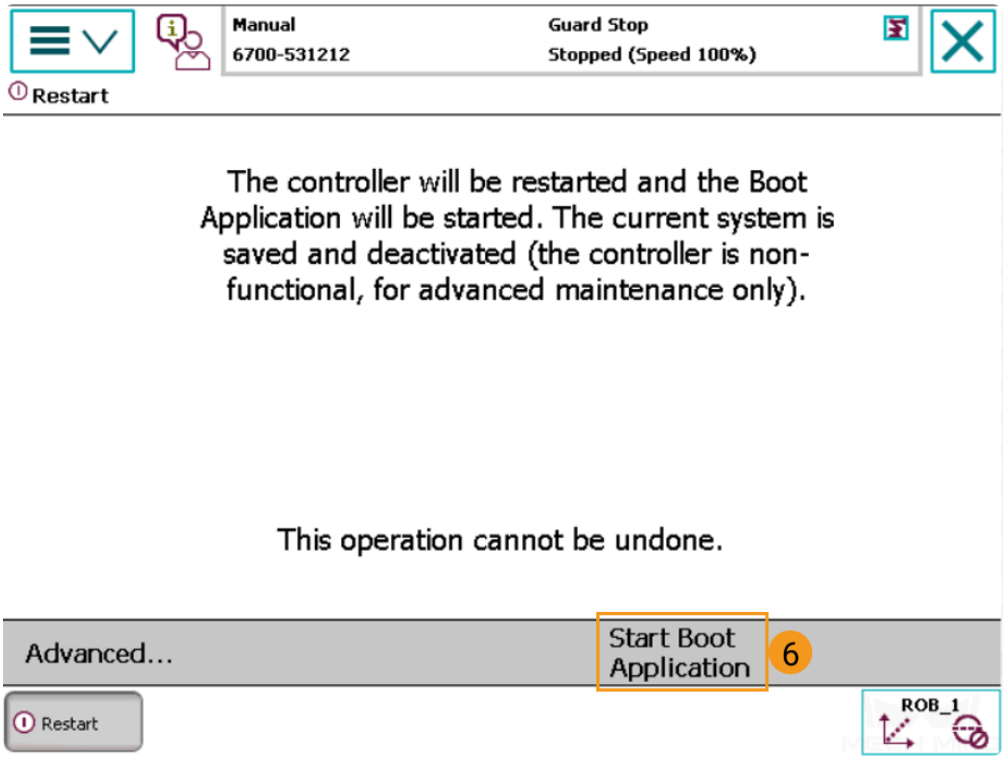
2. Select *Advanced*···



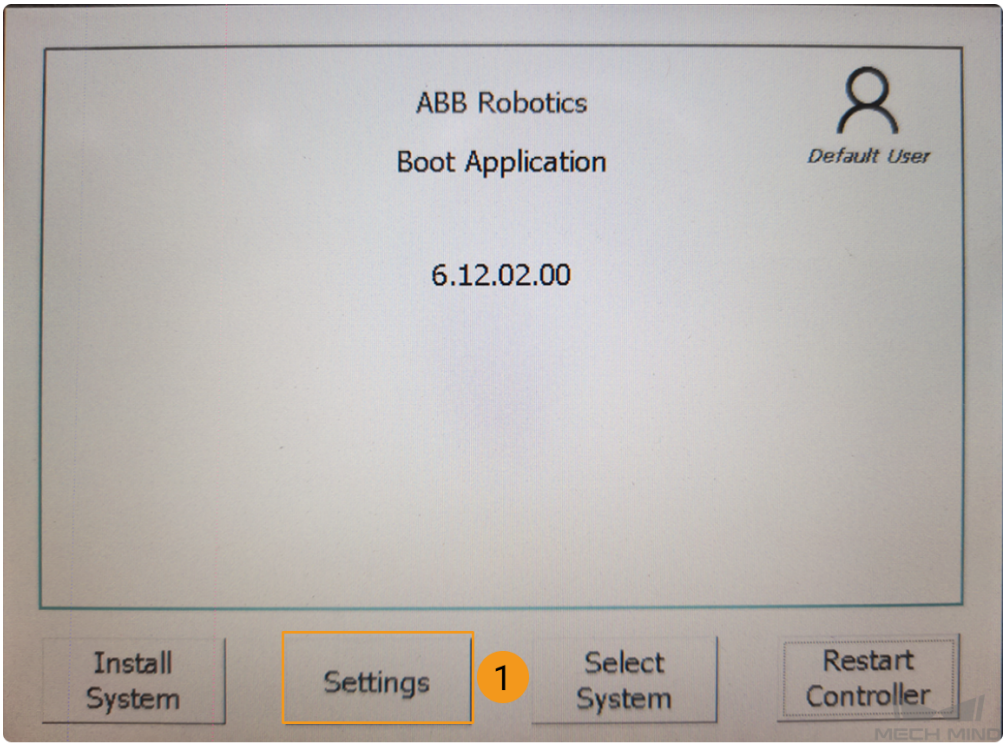
3. Select *Start Boot Application* and tap *Next*.



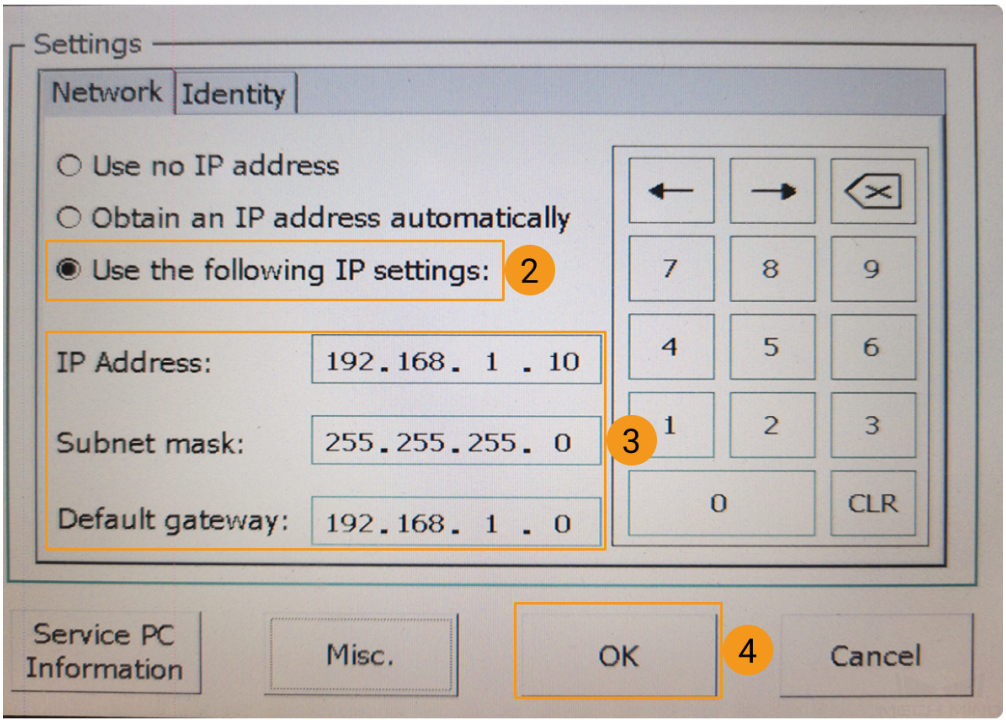
4. Select *Start Boot Application* to confirm.



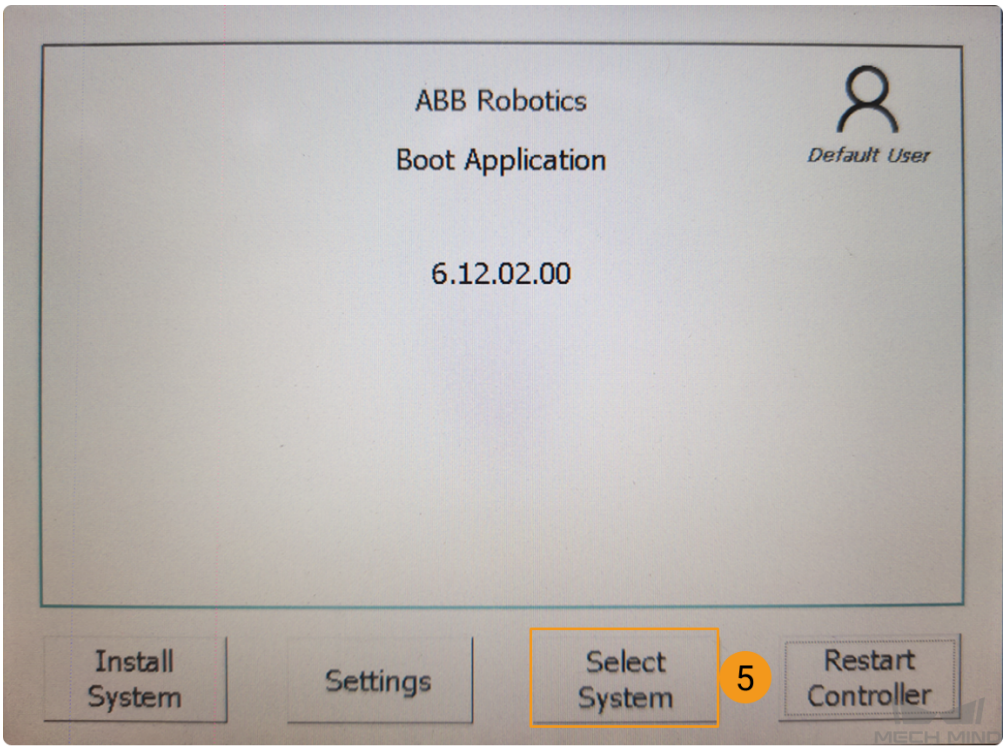
5. After restarting, you will see the interface as shown below. Tap *Settings*.



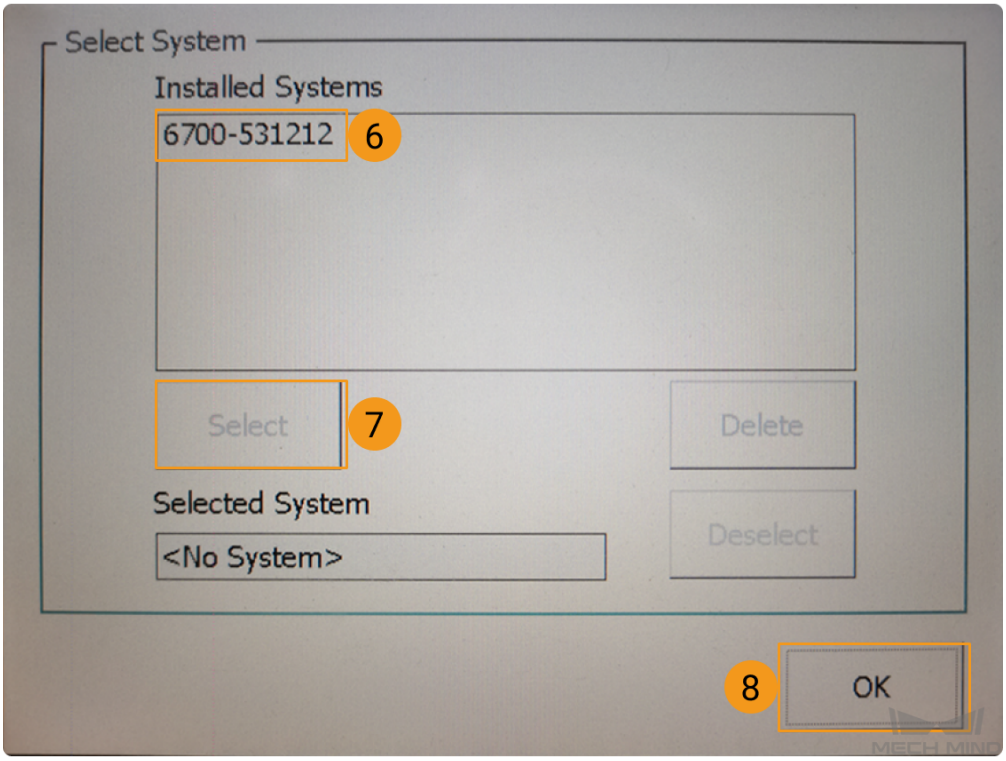
6. Select **Use the following IP settings** and configure the **IP Address**, **Subnet Mask**, and **Default gateway**. Tap *OK* after configuration.



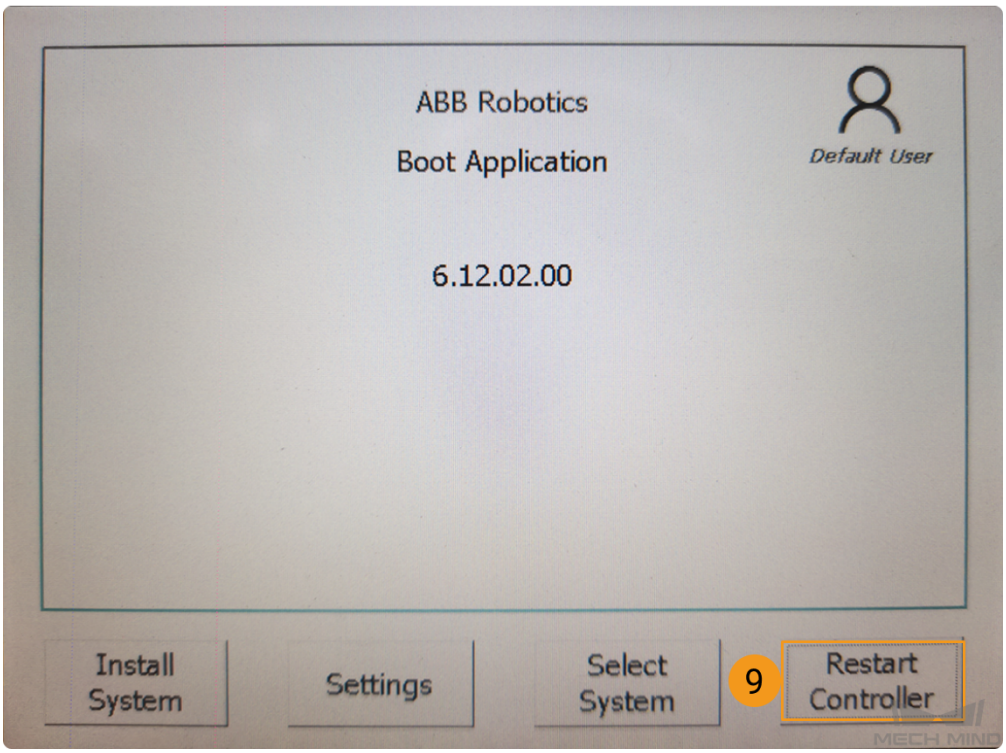
7. Tap *Select System*.



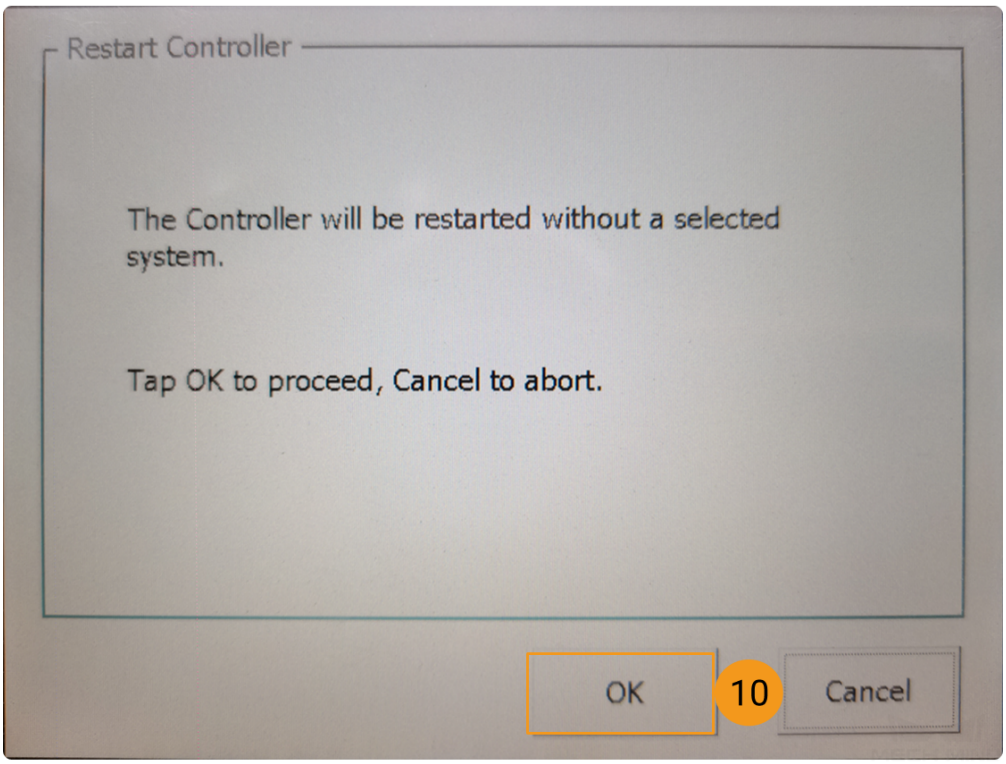
8. Select the system name in **Installed Syetems** box and then tap *Select*. Tap *OK* after configuration.



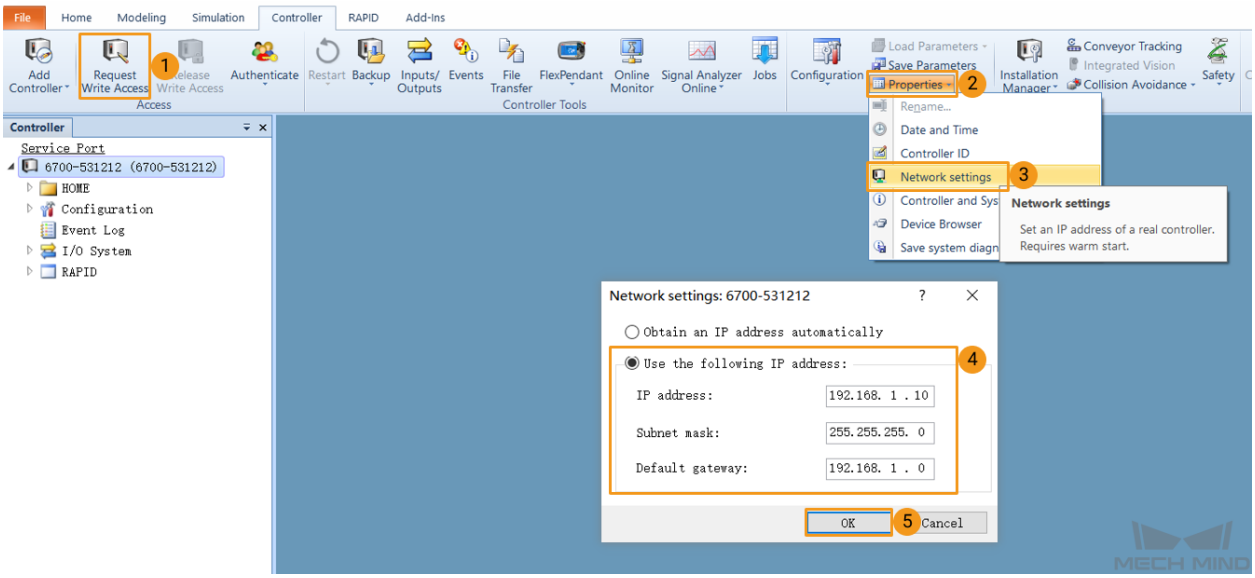
9. Select *Restart Controller*.



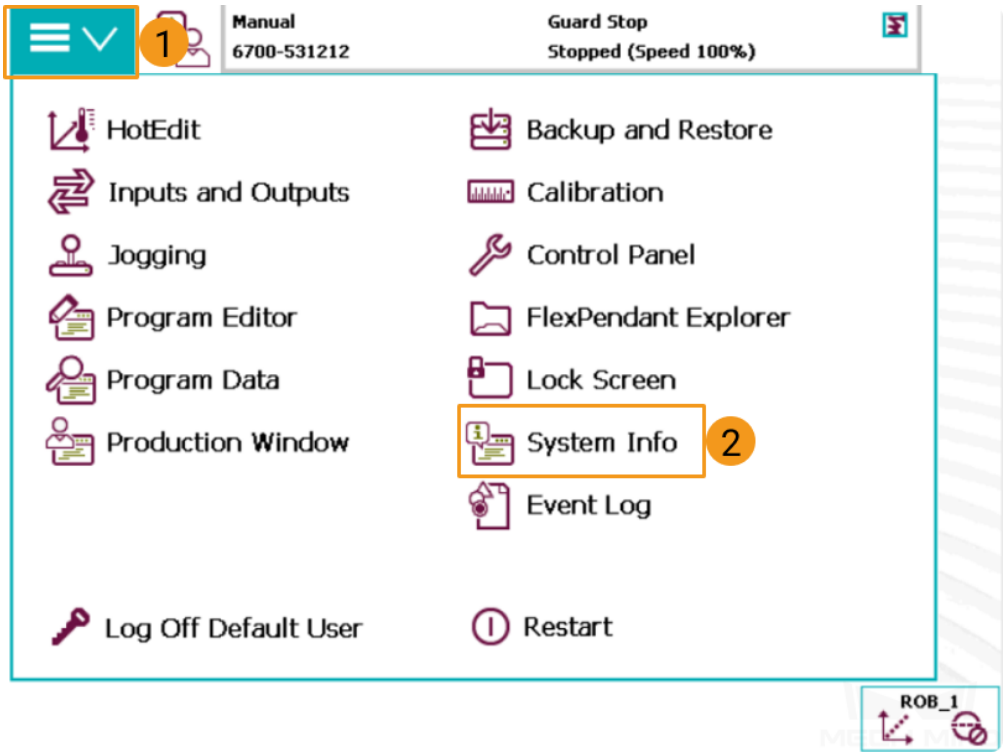
10. Tap *OK* to proceed.

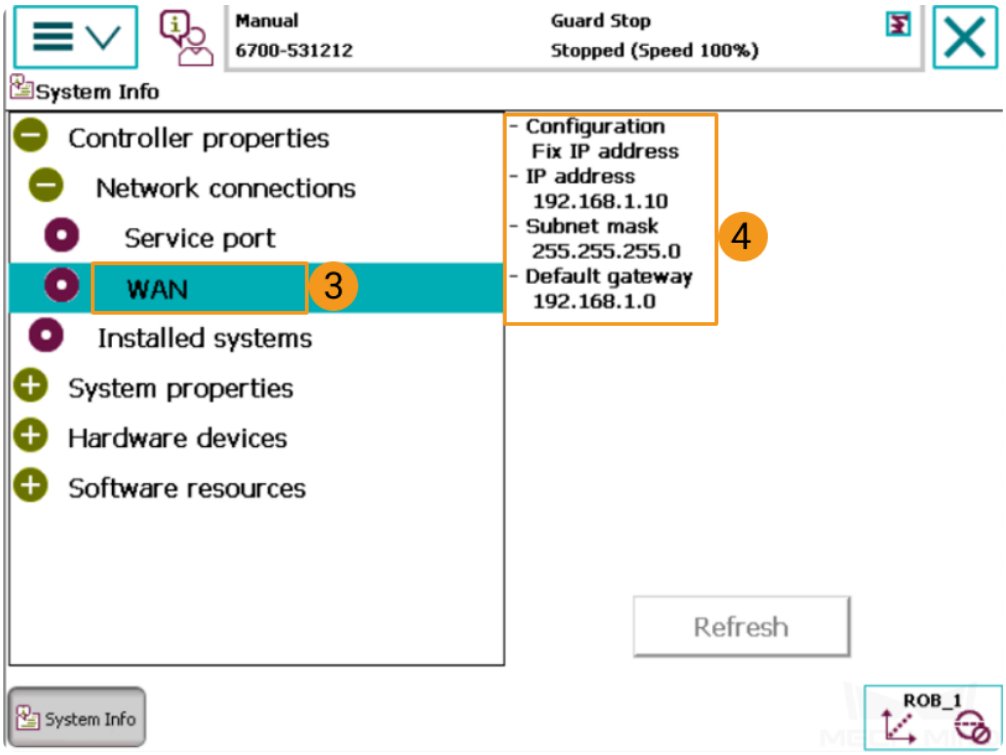


- Set the IP via RobotStudio
  1. Follow the steps as shown below to configure the robot IP, and restart the robot after configuration.



- Go to *Sytem Info*→ *Network connections*→ *WAN* to check if the IP configuration was successful after restarting.





Attention:

1. Please ensure that the Ethernet cable is connected to the **X6 (WAN)** netwrok port of the robot controller.
2. When setting the IP address, be careful not to confuse the IP address of the WAN port with the LAN port.

1.3 Load the Program Files

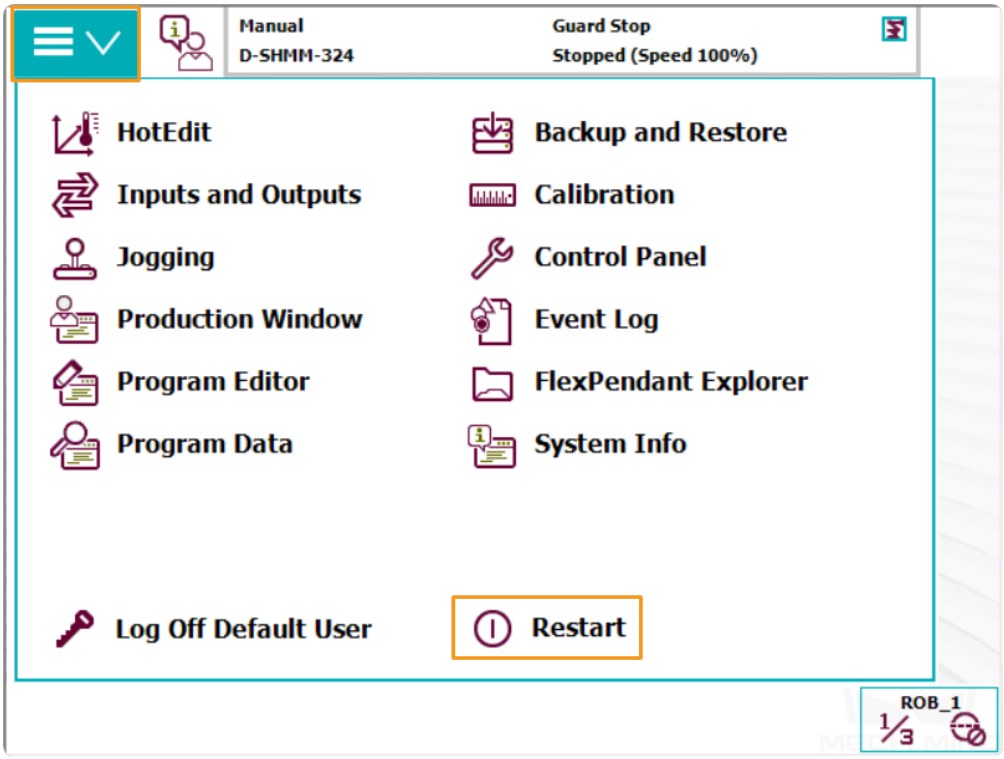
1.3.1 Preparation

Backup

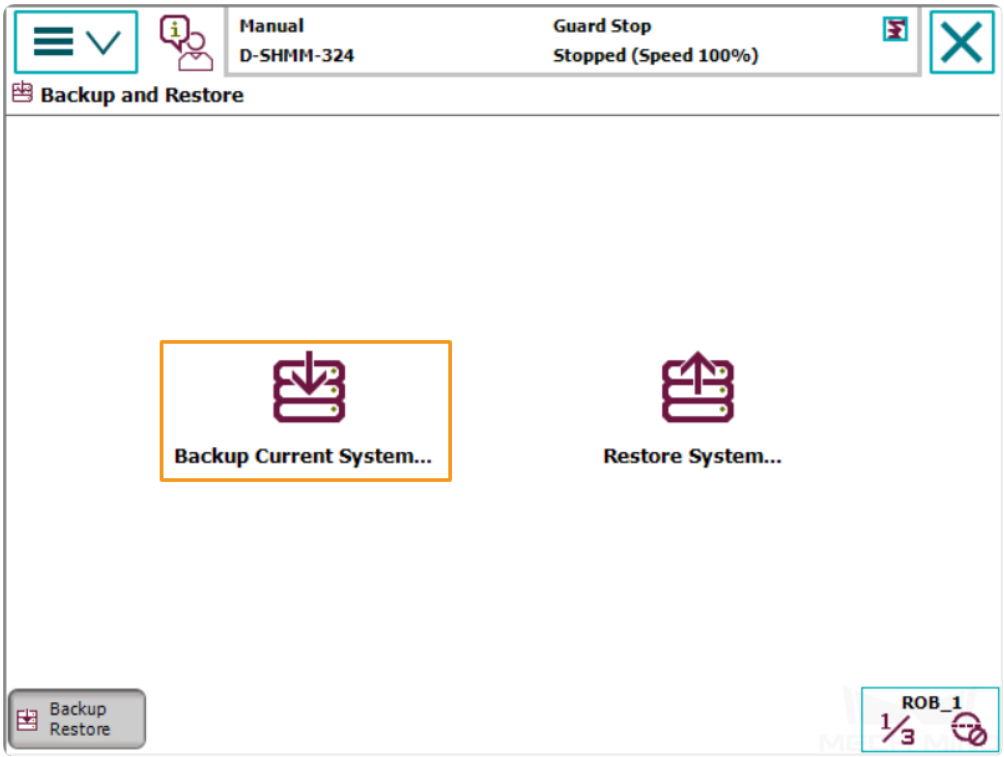
Before operating the robot, please follow the backup instructions below to back up the system. You can backup the robot system via the **teach pendant** or **RobotStudio**

- Backup on the teach pendant

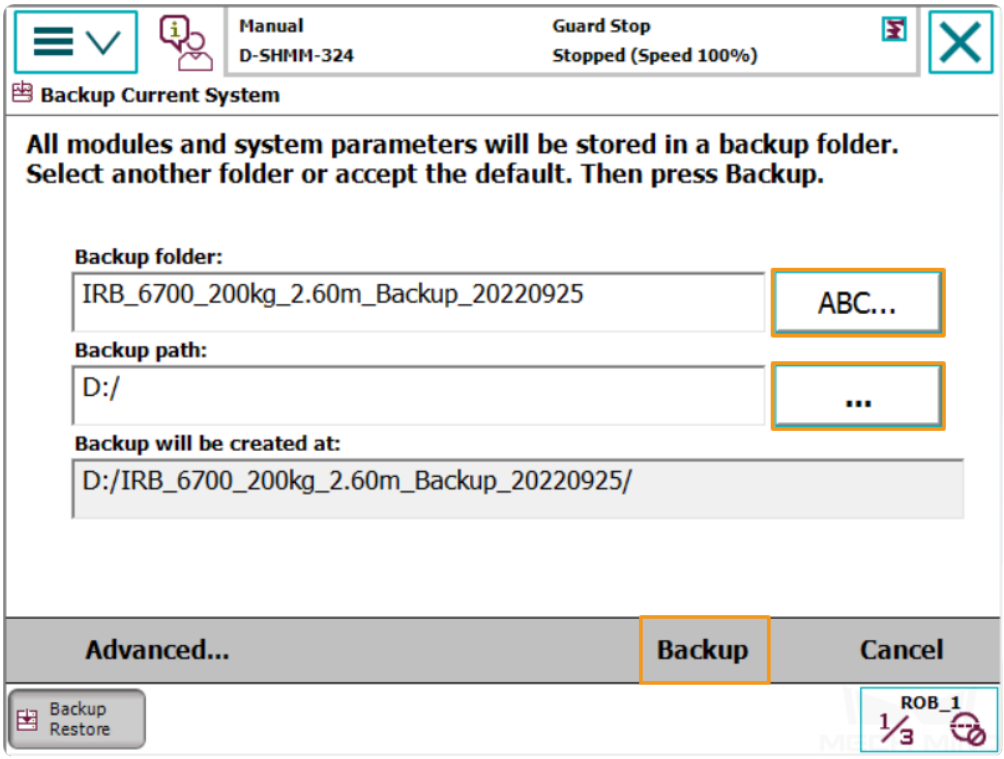
1. Go to the home page using the menu in the upper-left corner, and then select **Restart**.



2. Select **Backup Current System…**.

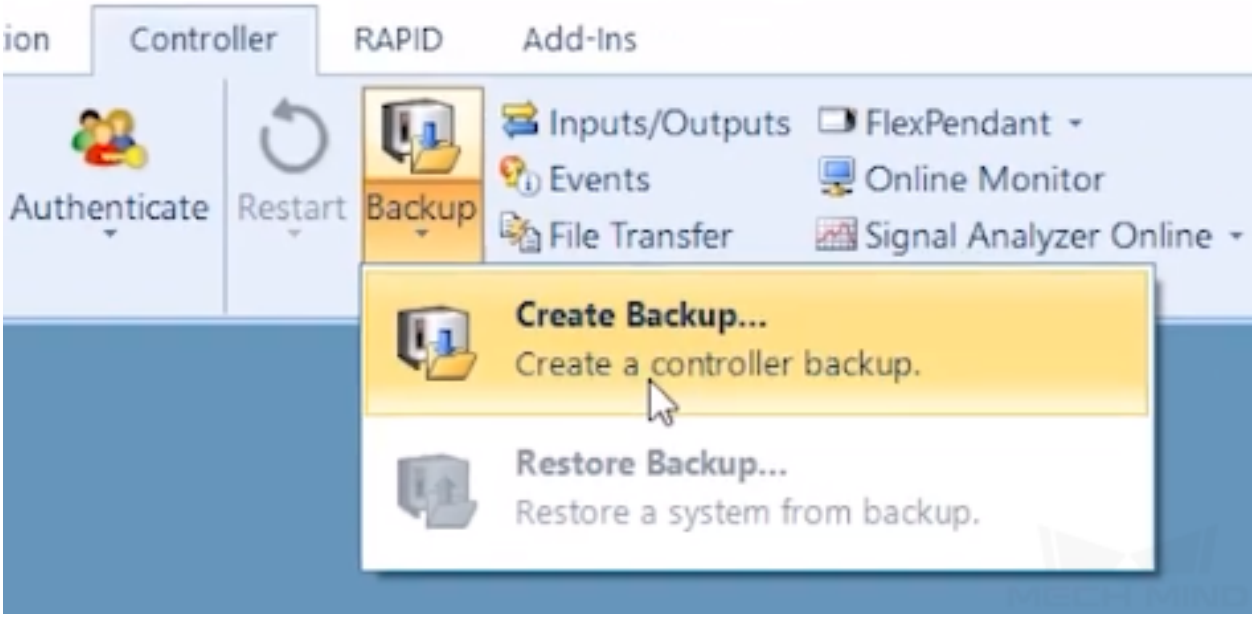


3. Specify the backup file name by pressing on *ABC*⋯, and specify the directory for saving the file by pressing ⋯. Then, press **Backup** in the lower-right to start the backup process.

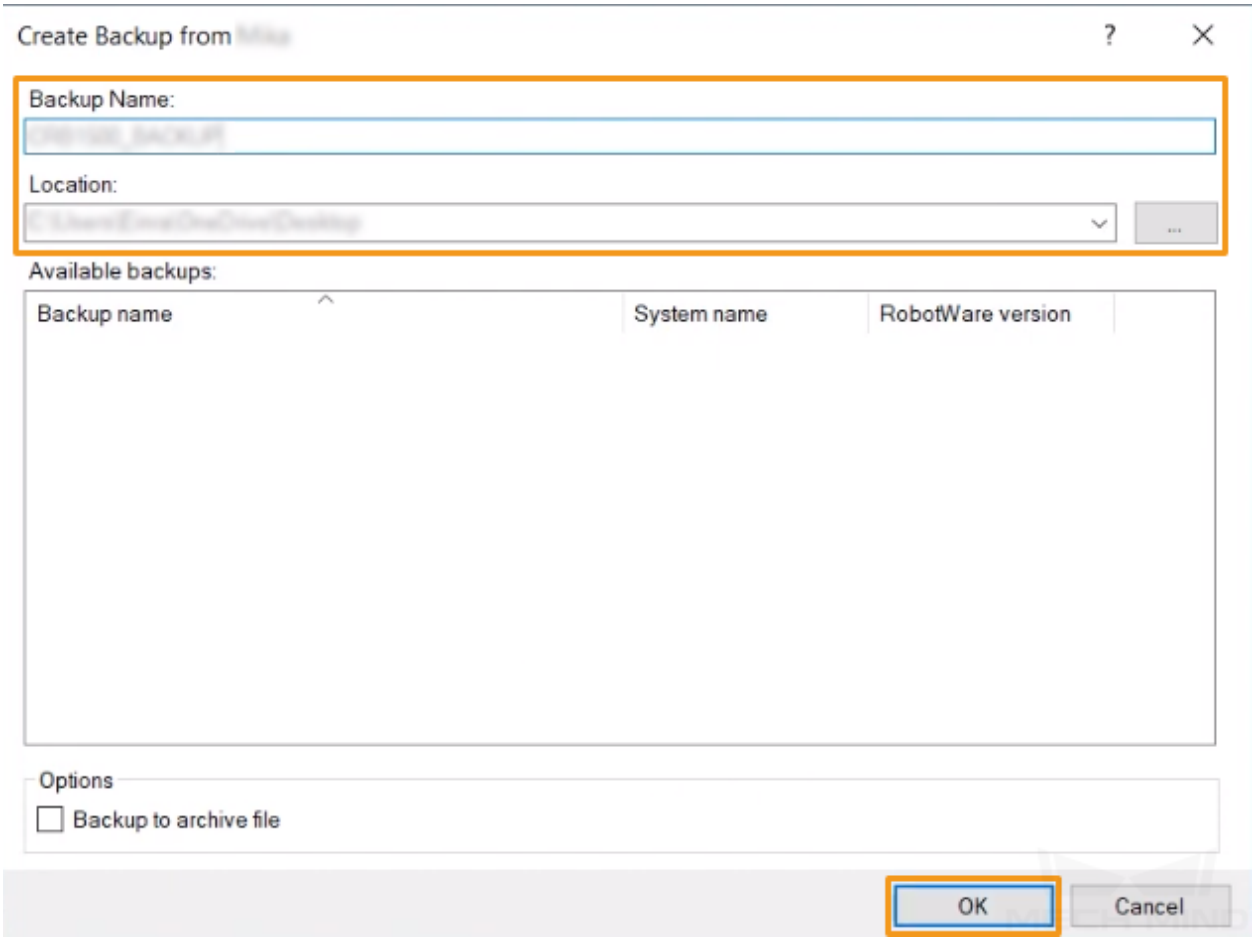


- Backup in RobotStudio

1. In the main interface of RobotStudio, select the controller you want to backup, and then select *Backup* → *Create Backup*⋯.



2. In the pop-up window, click *OK* after confirming the backup name and location.



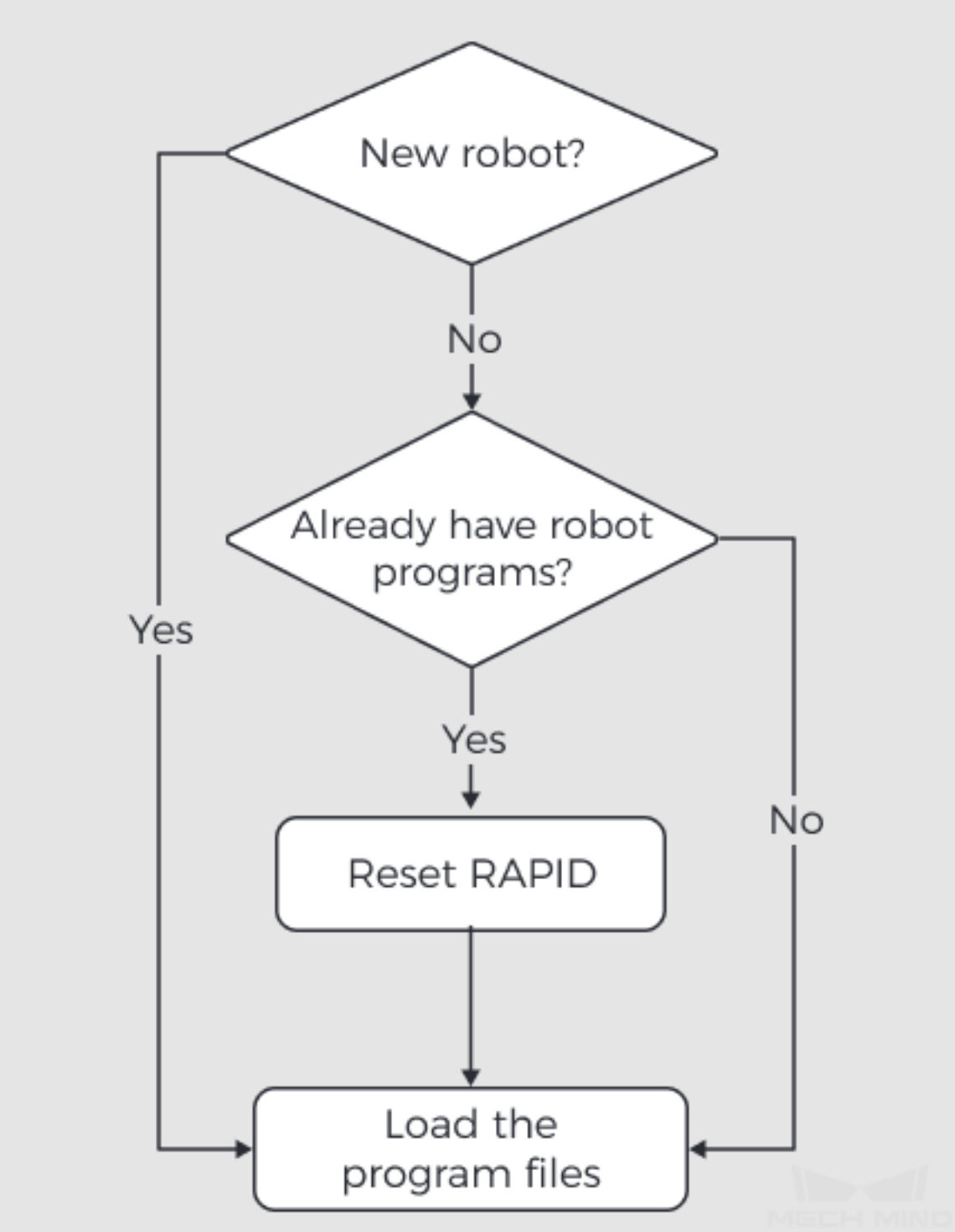
1.3.2 Reset

Note: Two reset options are provided: **Reset system** and **Reset RAPID**.

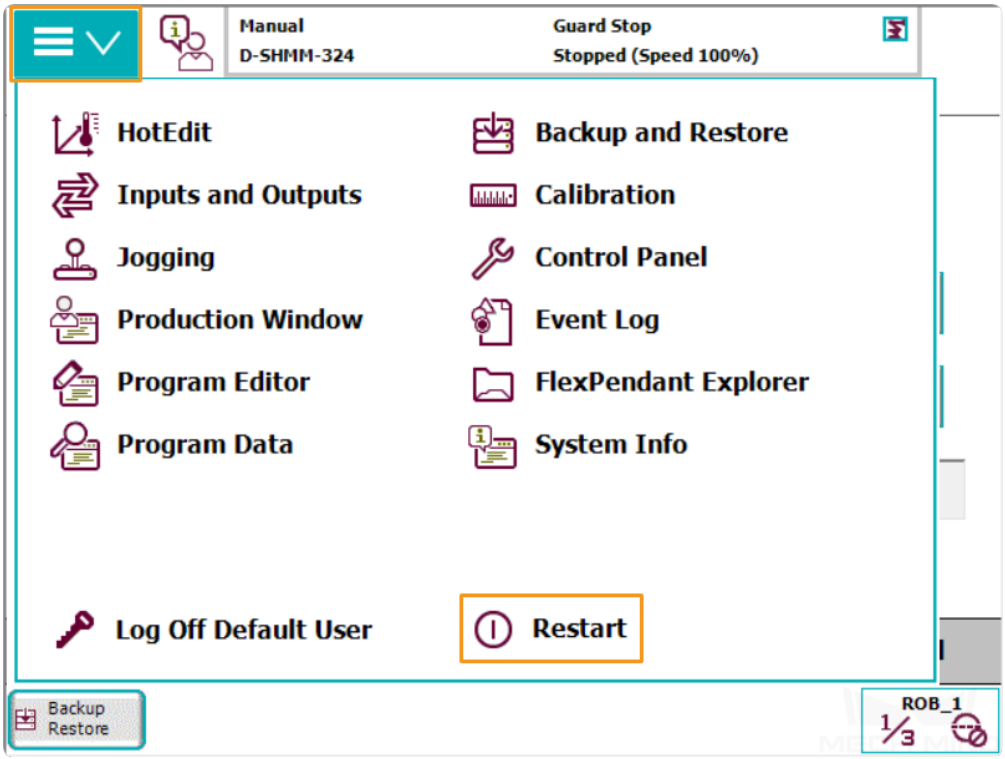
- **Reset system** discards all system parameter settings and changes made to RAPID programs, as well as DI/DO signal configurations. If I/O unit or other communication devices are used, these must be reconfigured after resetting the system.
- **Reset RAPID** only discards changes made to RAPID programs, and system parameter settings are kept. You do not need to re-load the config files after resetting RAPID.

Attention: Please make sure you have backed up the system before resetting.

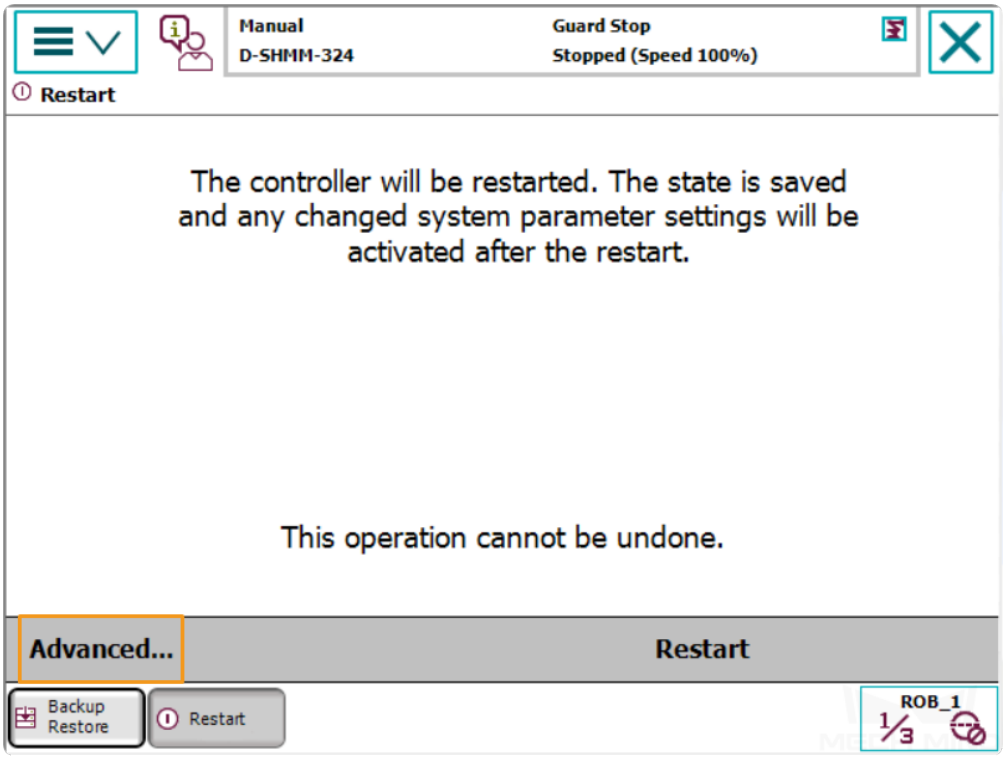
Determine if you need to reset RAPID according to the following figure.



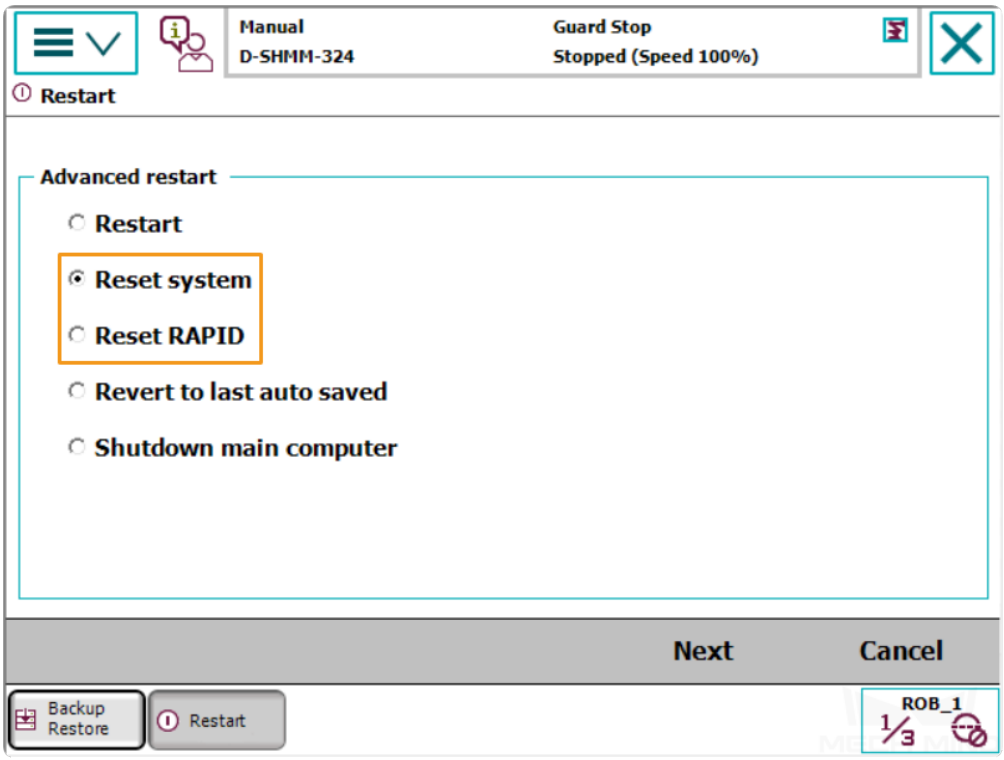
1. Go to the home page using the menu in the upper-left corner, and then select **Restart**.



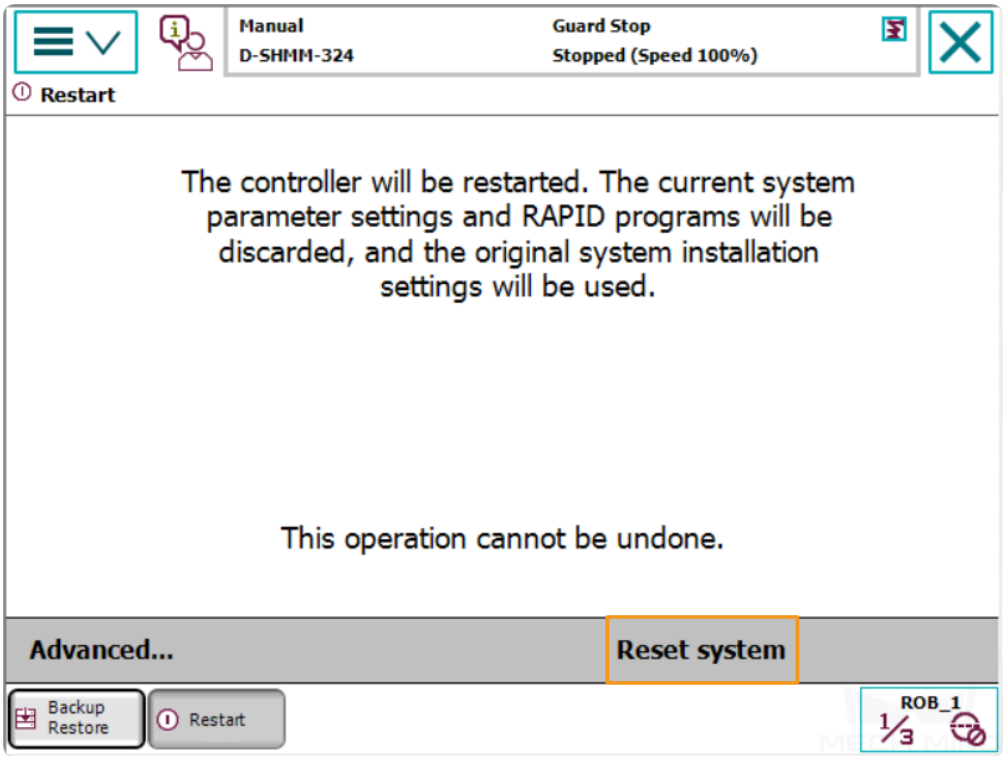
2. Select **Advanced⋯** in the lower-left.



3. Select either **Reset system** or **Reset RAPID** according to your needs, and then press **Next** in the lower-right.



4. Press **Reset system** or **Reset RAPID** in the lower-right, depending on your selection in the previous step, to start the reset process.



1.3.3 Prepare the Files

1. Copy the program files into a USB flash drive. Please locate the folder where Mech-Mind Software Suite is installed and the files are stored in `XXXX/Mech-Center-xxx/Robot_Server/Robot_FullControl/abb/server on ABB`.
2. The config file should be compatible with the I/O Unit in use. Please choose the right config file according to the table below:

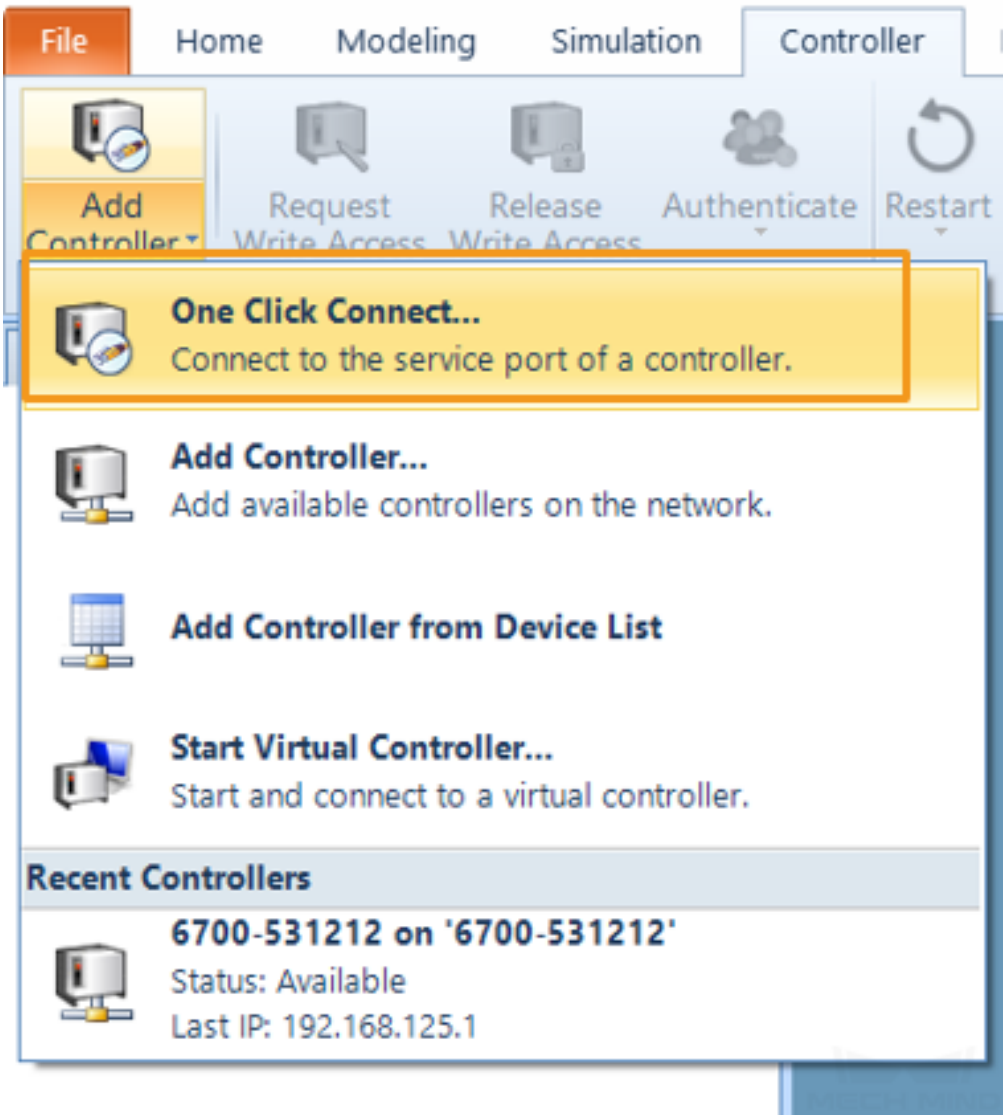
I/O Unit	config file
DSQC 652	D652.cfg, SYS.cfg
DSQC 1030	DSQC1030.cfg, SYS.cfg
Other I/O Units or the program is only used for auto-calibration	EIO.cfg, SYS.cfg

3. The files in the MM folder are robot program modules.

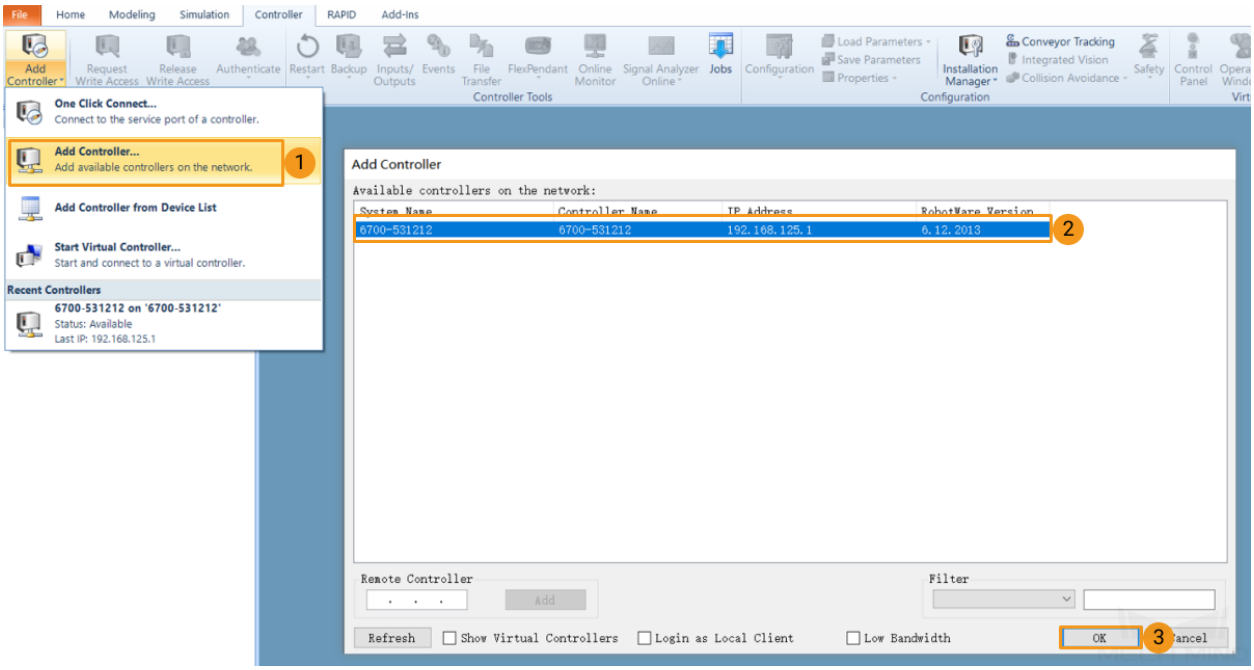
1.3.4 Load the Files to the Robot

Note: Before proceeding, please make sure that the robot is in the manual mode.

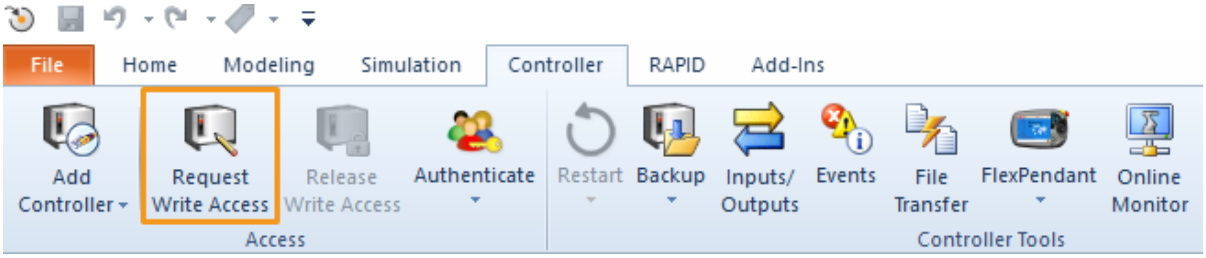
1. Open RobotStudio on the IPC and connect to the controller.
    - If the robot controller is connected via the LAN port, click **One Click Connect⋯**.



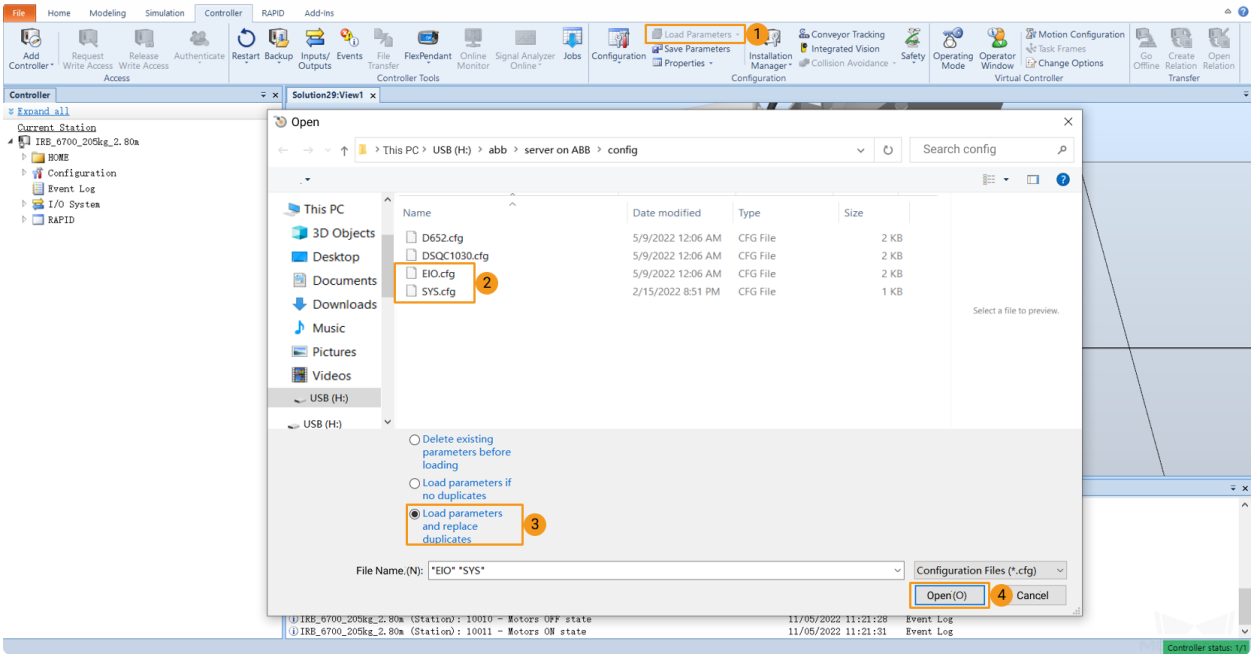
    - If the robot controller is connected via the WAN port or a switch, click *Add Controller* and then select the controller and click *OK*.

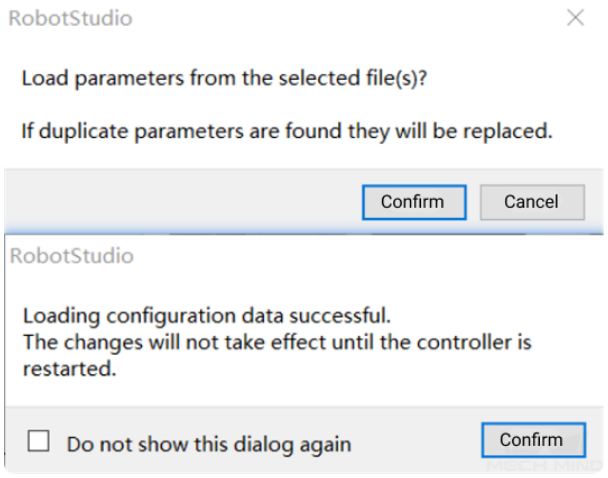


2. Request write access: click **Request Write Acess** in RobotStudio, and press *Grant* on the teach pendant.

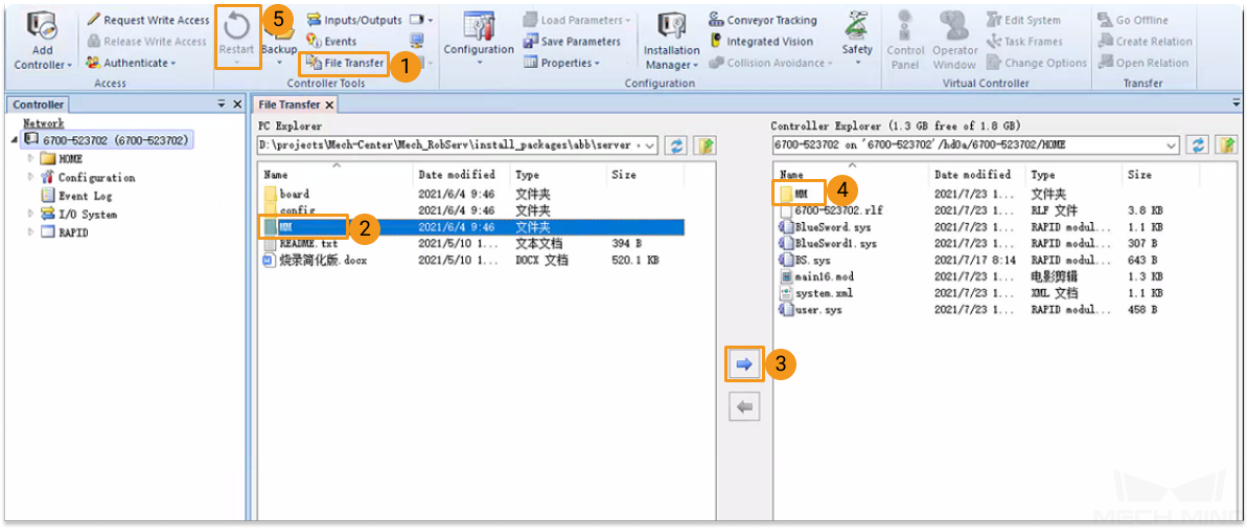


3. Import the config files as shown below. Click *Confirm* in the pop-up windows.

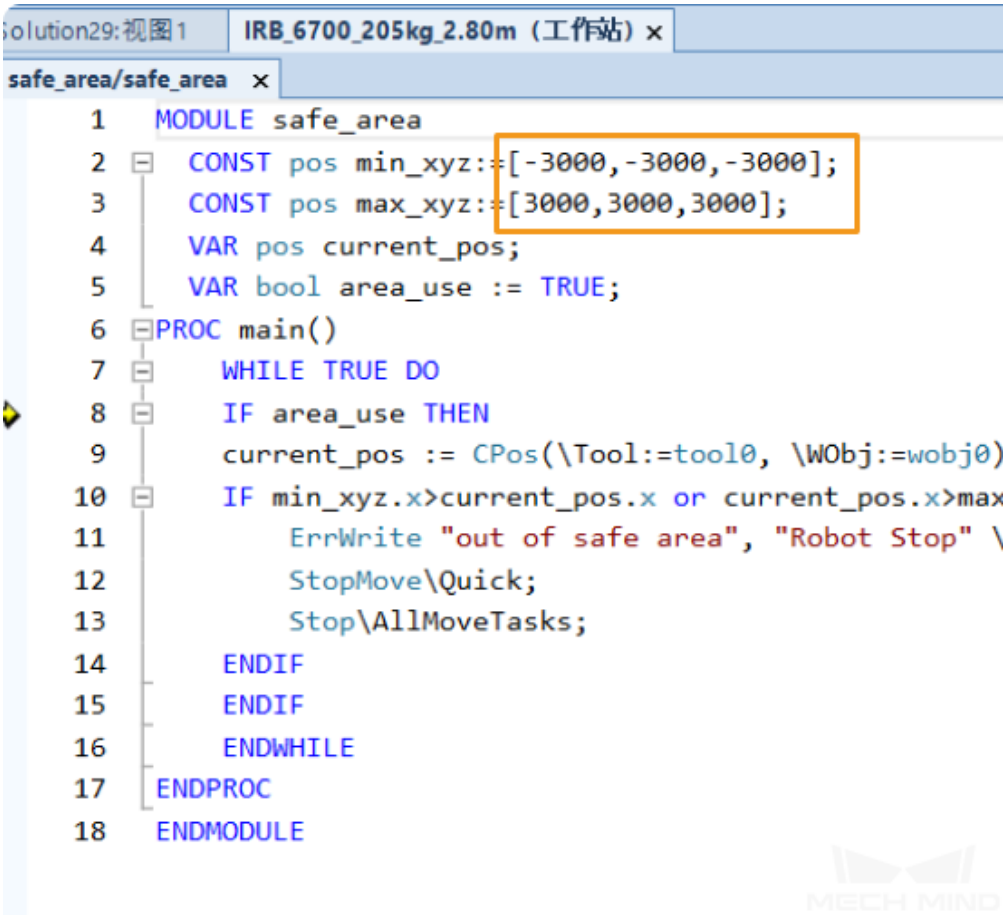




4. Copy the whole **MM** folder and paste it to the **HOME** directory of the robot system, as shown below. Restart the controller to complete loading the program files.



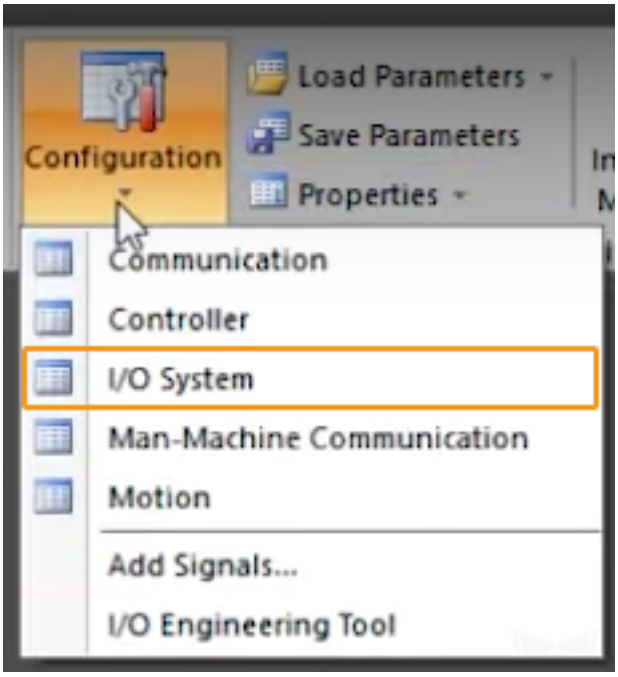
5. Modify the safe zone threshold (in mm) in the **safe_area.mod** program according to the actual on-site work space of the robot.



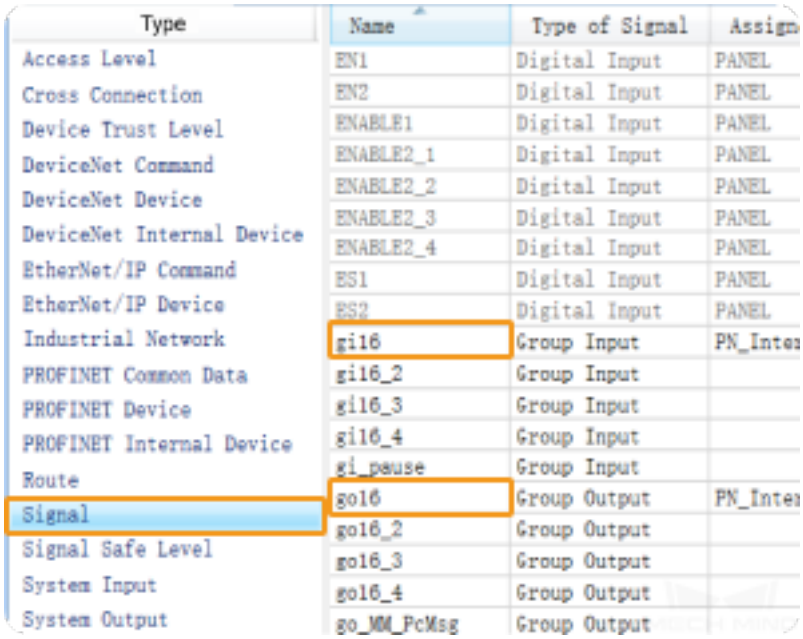
1.3.5 Configure I/O System

If an I/O unit other than DSQC 652 or DSQC 1030 is used, you should configure the robot I/O system after loading the program. Please follow the steps below to proceed:

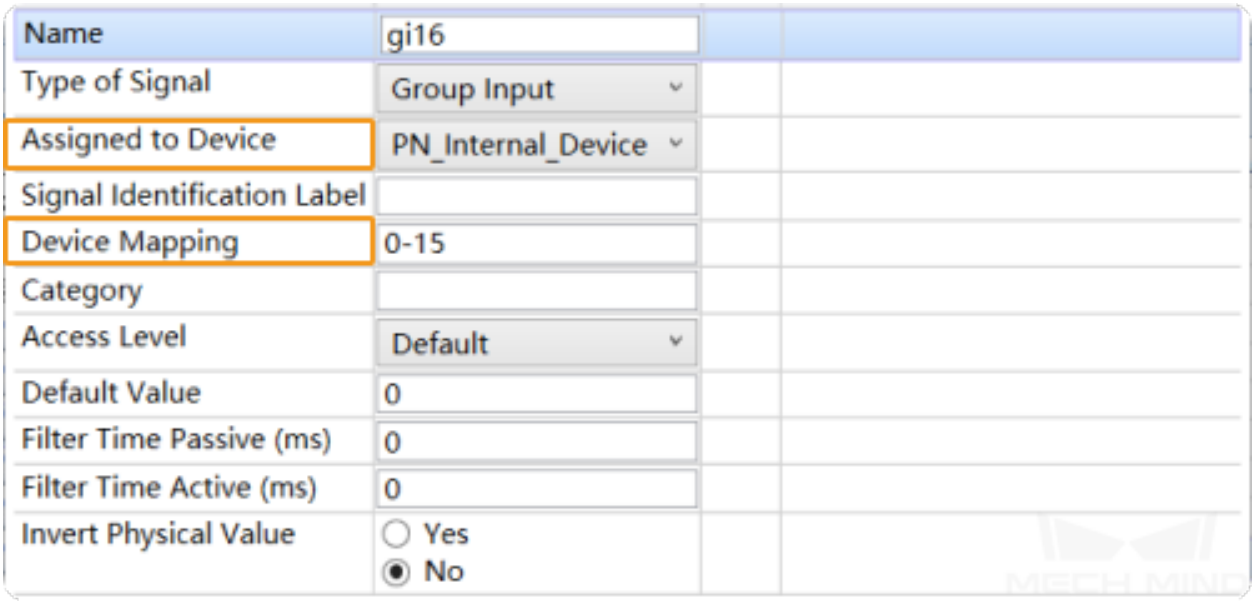
1. In the main interface of RobotStudio, select *Configuration* → *IO System*.



2. Locate and click **Signal** in the **Type** column, locate **gi16** and **go16** in the **Name** column on the right, and then double-click to enter the edit window.



3. After confirming the corresponding devices and device mapping, modify the values of **Assigned to Device** and **Device Mapping** for **gi16** and **go16** respectively.

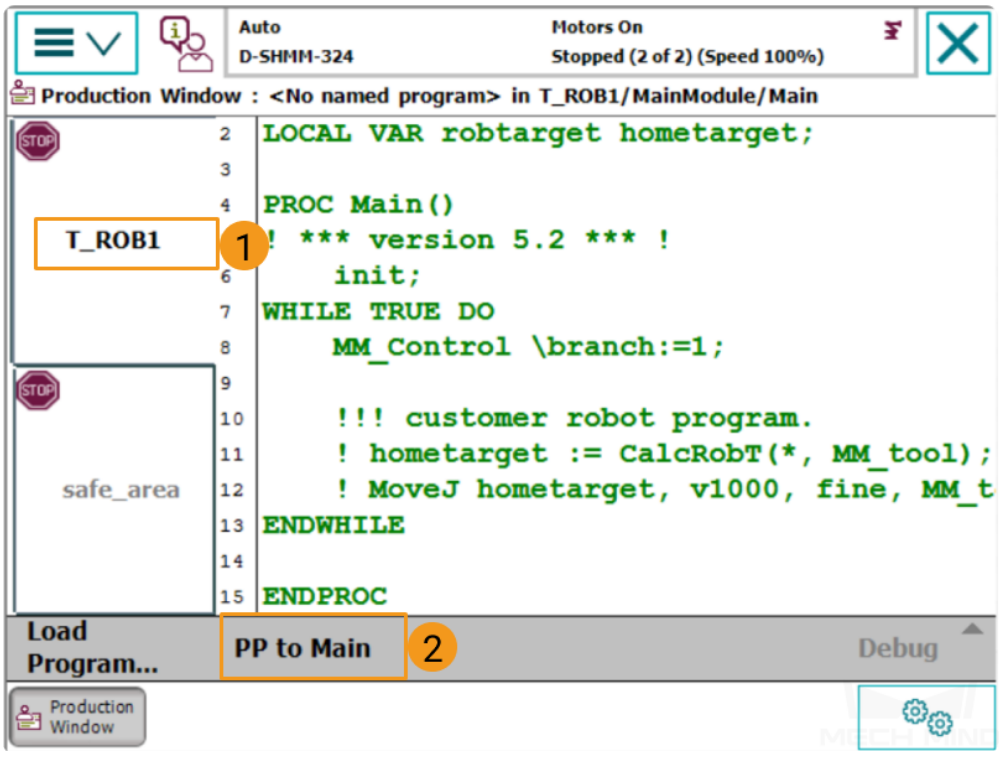


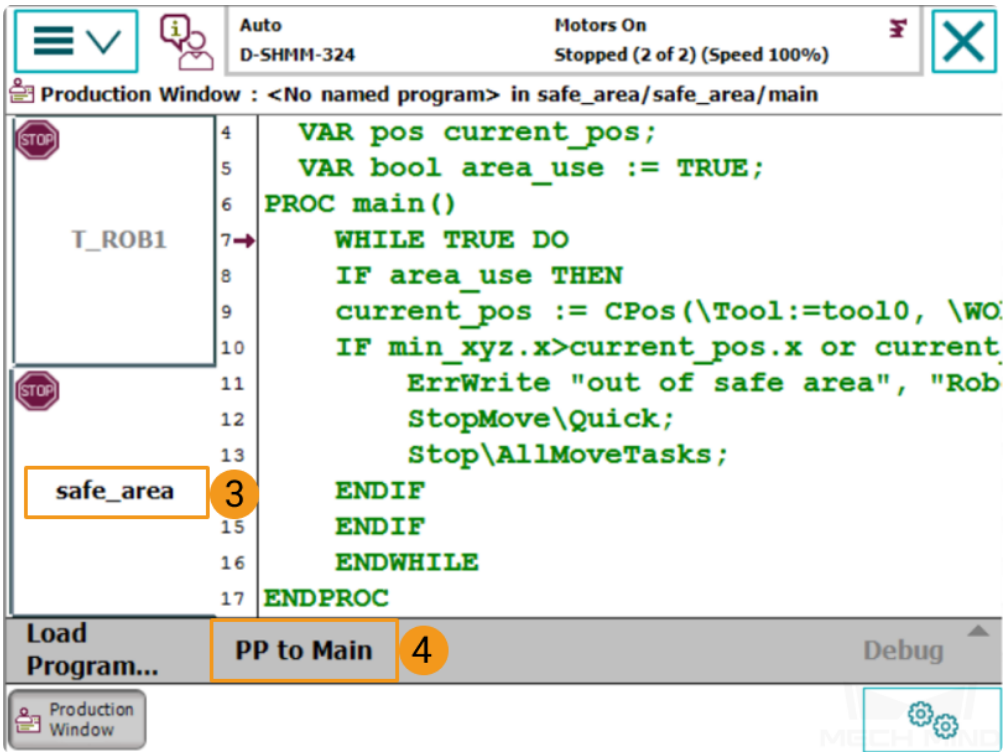
Name	go16
Type of Signal	Group Output
Assigned to Device	PN_Internal_Device
Signal Identification Label	
Device Mapping	0-15
Category	
Access Level	Default
Default Value	0
Invert Physical Value	○ Yes ◉ No
Safe Level	DefaultSafeLevel

4. After the configuration, click *OK*. Then restart the controller to make the changes take effect.

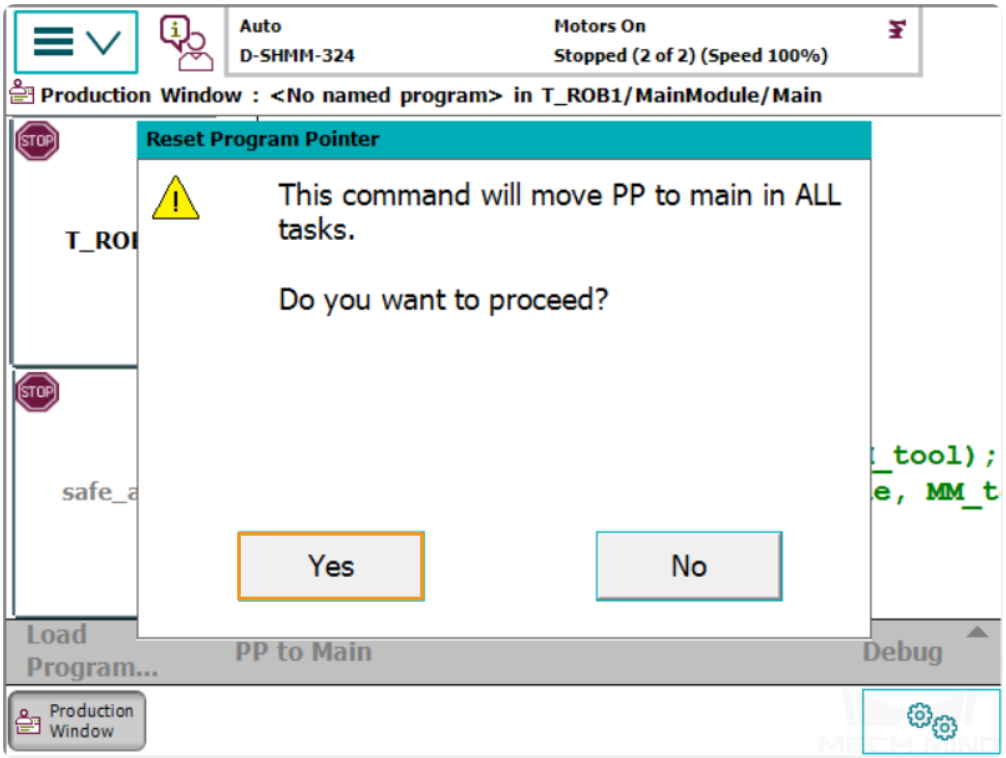
1.3.6 Run the Program

1. Move the PP of tasks **T_ROB1** and **safe_area** to Main respectively.

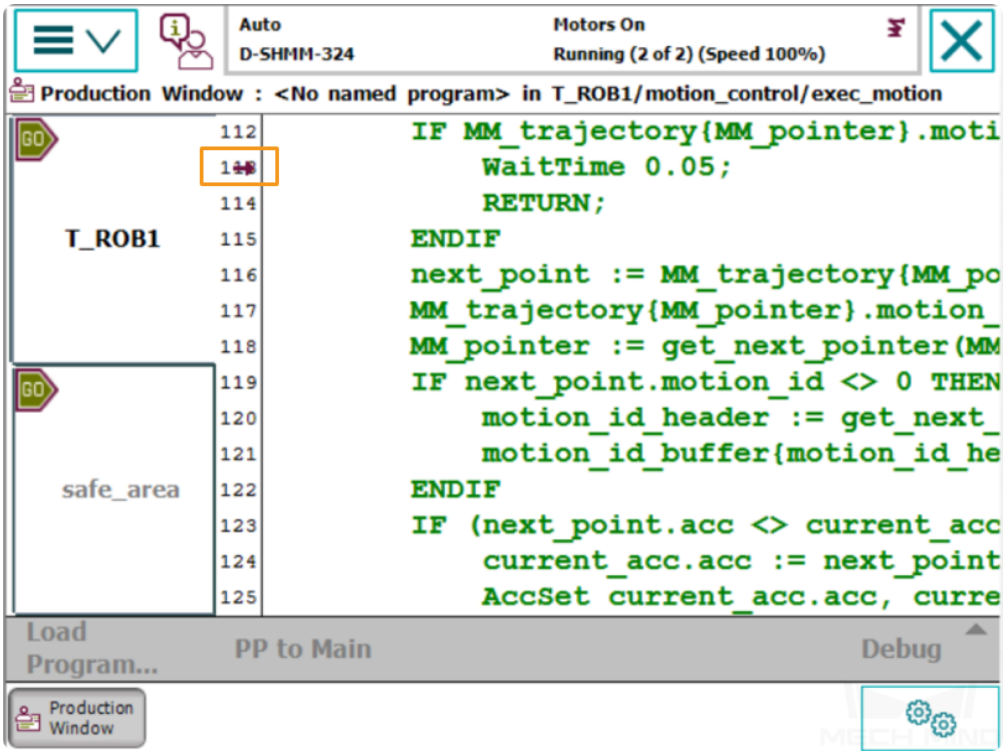




2. After selecting *PP to Main*, if a window as shown below pops up, please tap *Yes* to confirm.



3. Run the program manually or automatically. The program pointer is shown below.



1.4 Test Robot Connection

1.5 Troubleshooting

If the program has been loaded but the robot cannot be connected successfully, please check whether the following requirements have been met.

- IPC end:
  1. The firewall is turned off.
  2. The IPC can communicate with the robot IP address with the ping command in the command prompt.
  3. There is no interference from any antivirus software.
  4. Two network ports of the IPC belong to different subnets and there is no conflict.
  5. If the IPC is connected via a router, there is no interference from other network cables.
- Robot end:

1. The Ethernet cable is connected to the WAN port of the controller properly.
2. The robot IP address is set correctly. Please ensure that the set IP address is that of the WAN port instead of others.
3. You have run the program on the robot end.

CHAPTER 2

ABB Program Description

2.1 Program Module

Program Module	Description
motion_server	Background program used to receive data from Mech-Center
status_server	Background program used to send data of robot pose, signal, and status
motion_control	Foreground program used to guide the robot to move
pause_control	Program used to pause
MainModule	Main program
mm	Program data used to define the master-control program

2.2 Signal

Support 64 D/I and D/O signals in maximum. Support 16 D/I and D/O signals when loading the program files by default.

D/O	go16	go16_2	go16_3	go16_4
D/I	gi16	gi16_2	gi16_3	gi16_4

If you are using an OmniCore controller, and the version of RobotWare is 7.3 or higher, please read the following content.

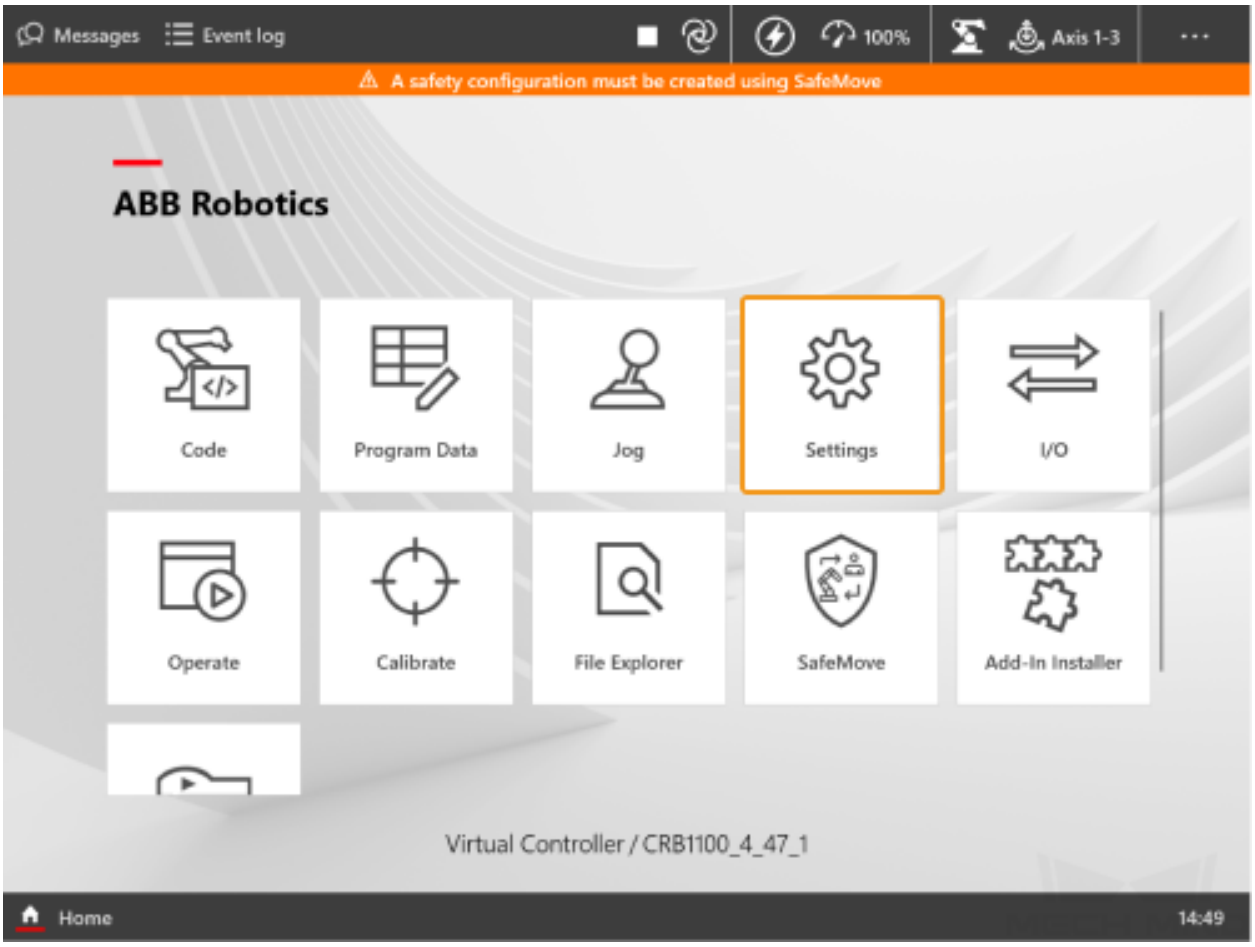
CHAPTER 3

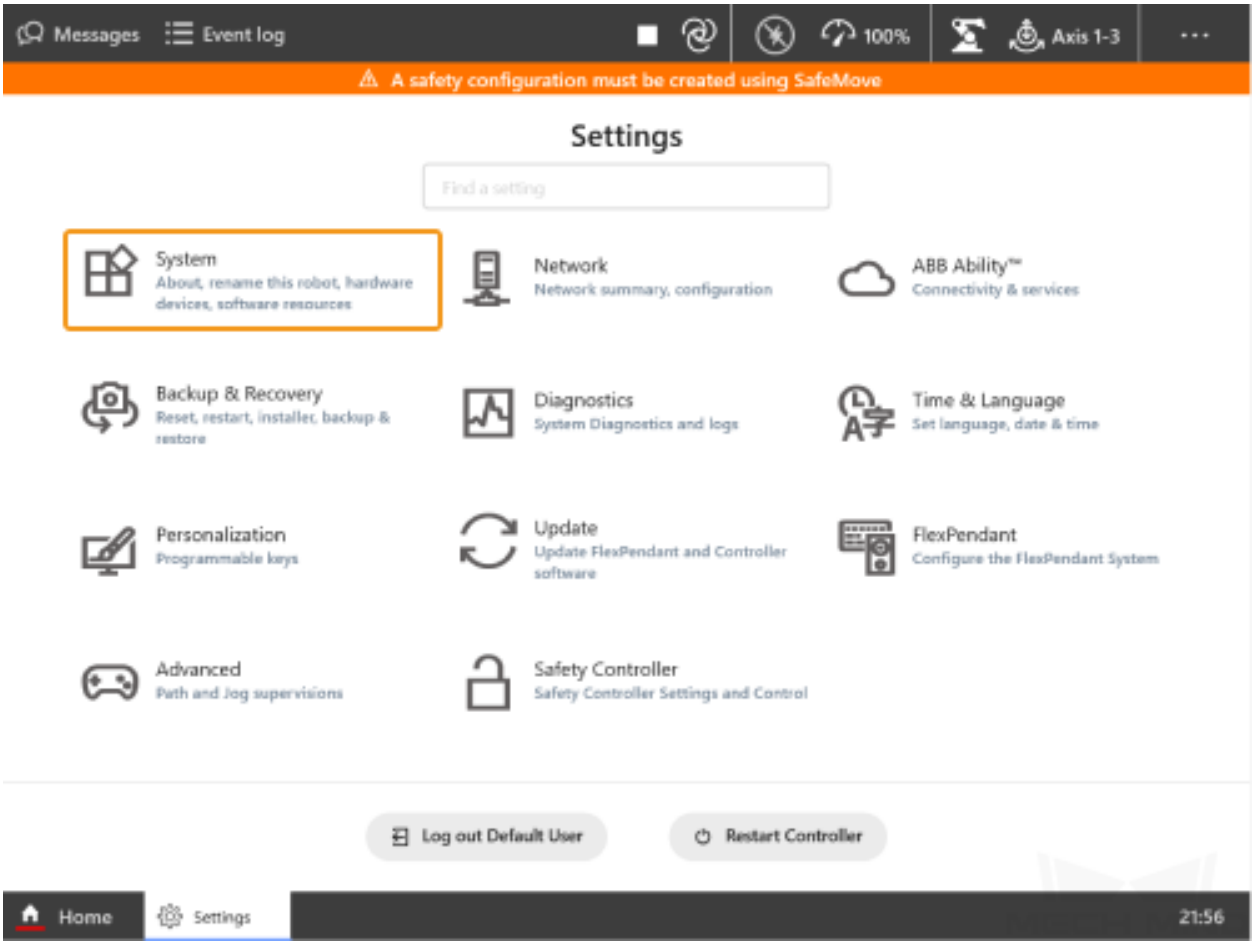
RobotWare7 Setup Instructions

3.1 Check Controller and Software Compatibility

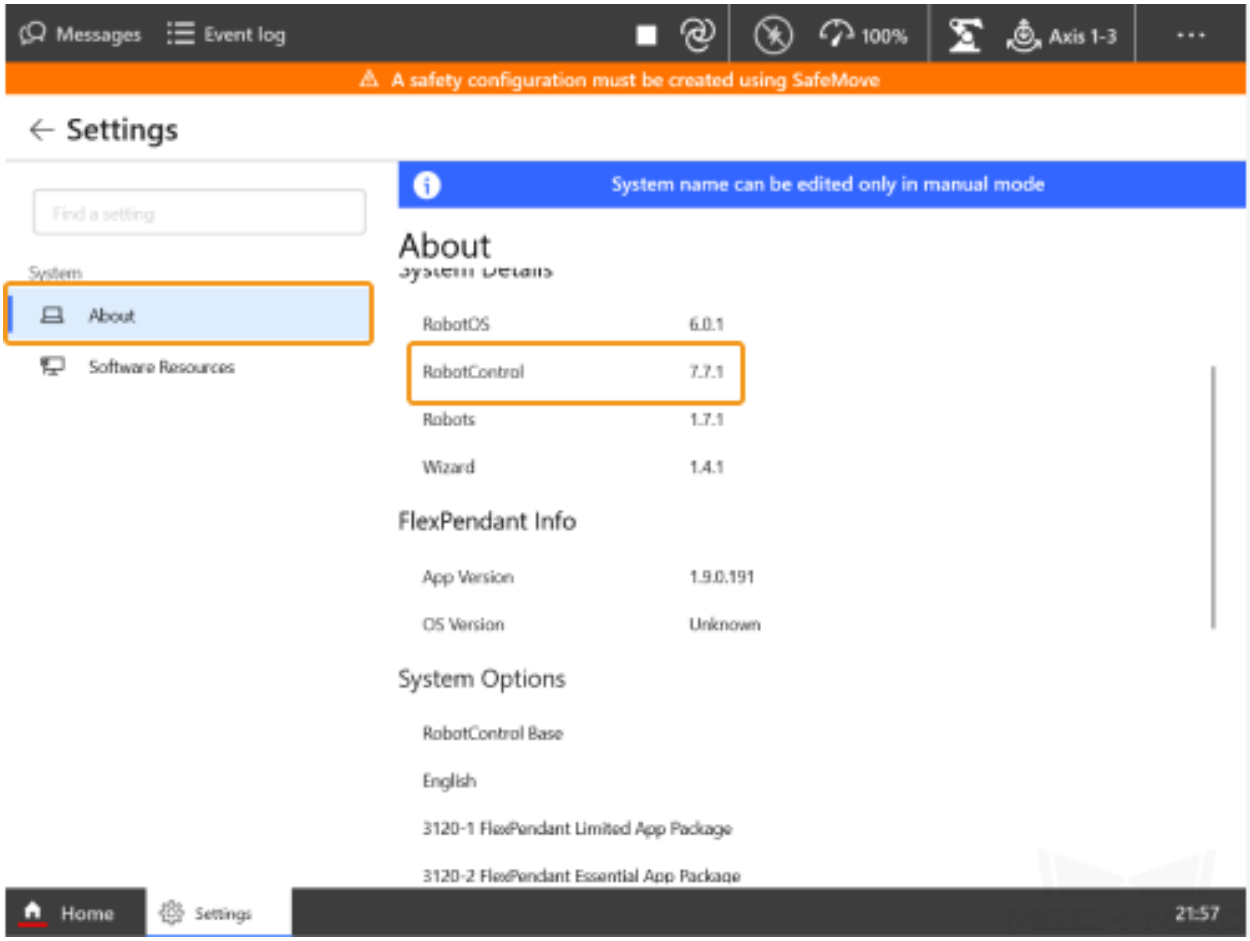
- Controller: OmniCore.
- Controller system software version: RobotWare 7.3 or higher
- Control module option: 3114-1 Multitasking

In the Home interface of the teach pendant, tap *Settings* → *System* to check the RobotWare version.

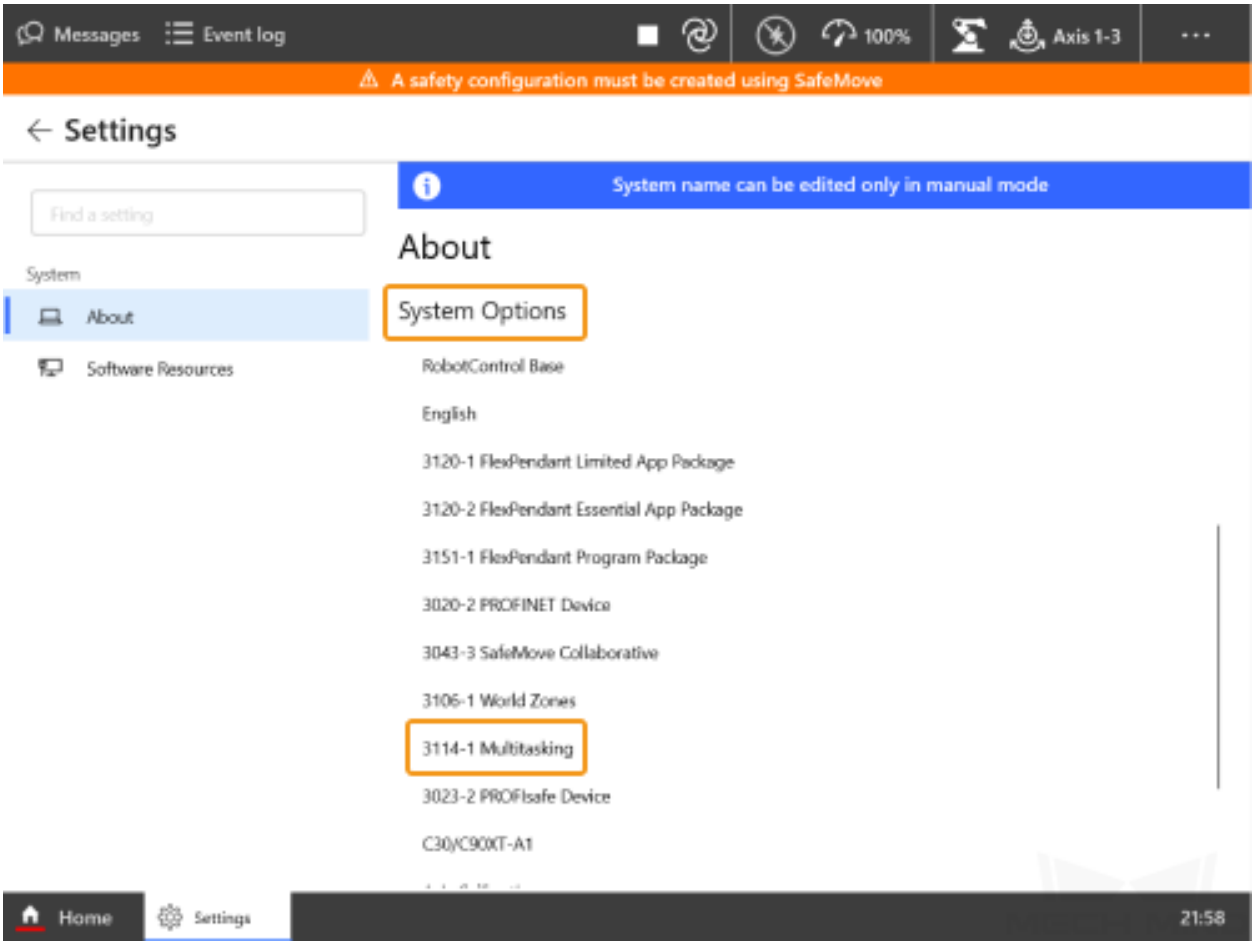




Tap *About* and you can confirm the RobotWare version in **System Details**.



Check whether 3114-1 Multitasking is in the **System Options**.

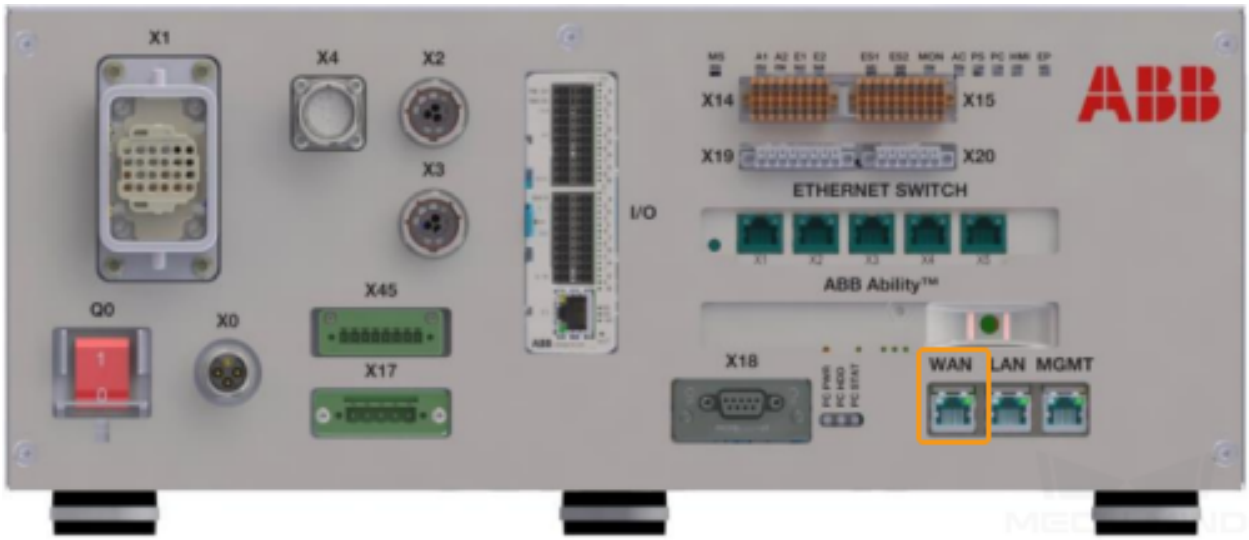


Attention: The robot cannot be connected via Master-control if the system version does not meet the requirement.

3.2 Set up the Network Connection

3.2.1 Hardware Connection

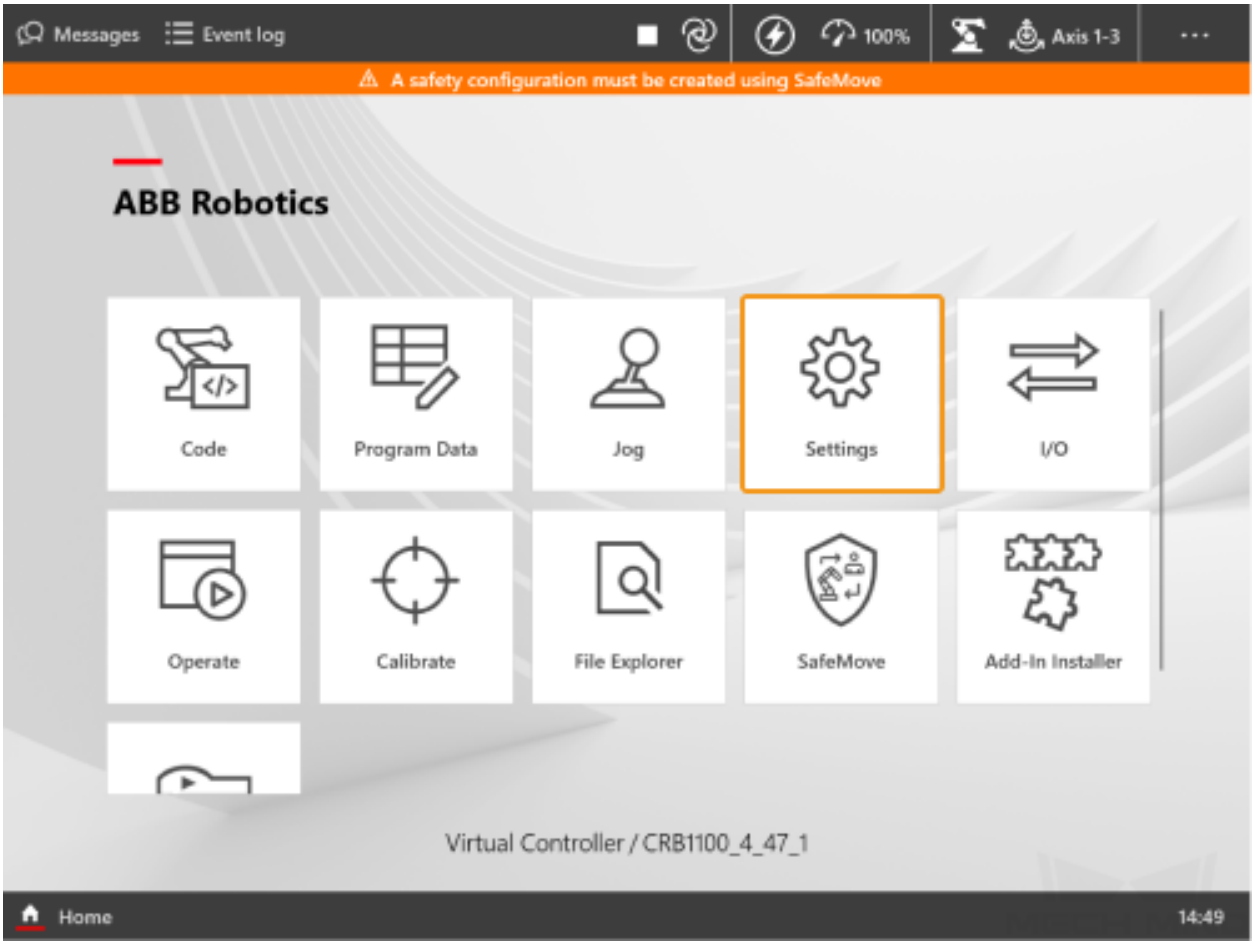
Plug the Ethernet cable of the IPC into the **WAN** port of the robot controller, as shown below.

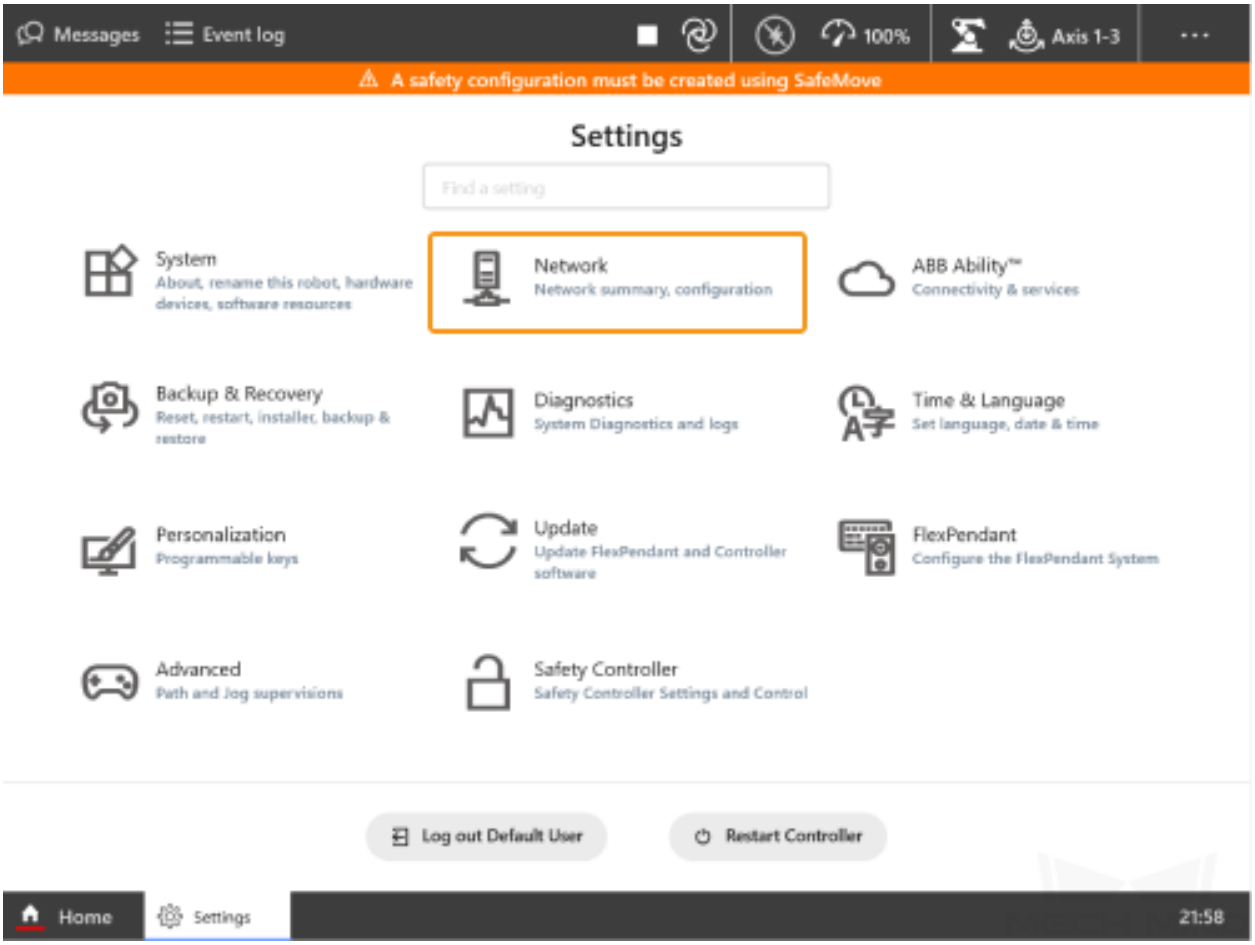


3.2.2 IP Configuration

In the Home interface of the teach pendant, select *Settings* → *Network* → *Public Network*.

Select **Use the following IP address**, and enter the **IP Address**, **Subnet Mask**, **Default Getaway**. The IP address of the robot should be in the same subnet as that of the IPC.


Messages
Event log
100%
Axis 1-3
A safety configuration must be created using SafeMove
ABB Robotics
Code
Program Data
Jog
Settings
I/O
Operate
Calibrate
File Explorer
SafeMove
Add-In Installer
Virtual Controller / CRB1100_4_47_1
Home
14:49



Attention: The Ethernet cable must be connected to the WAN port. When setting the IP, be careful to distinguish between the robot IP address of the WAN port and that of the LAN port.

3.3 Load the Program Files

3.3.1 Prepare the Files

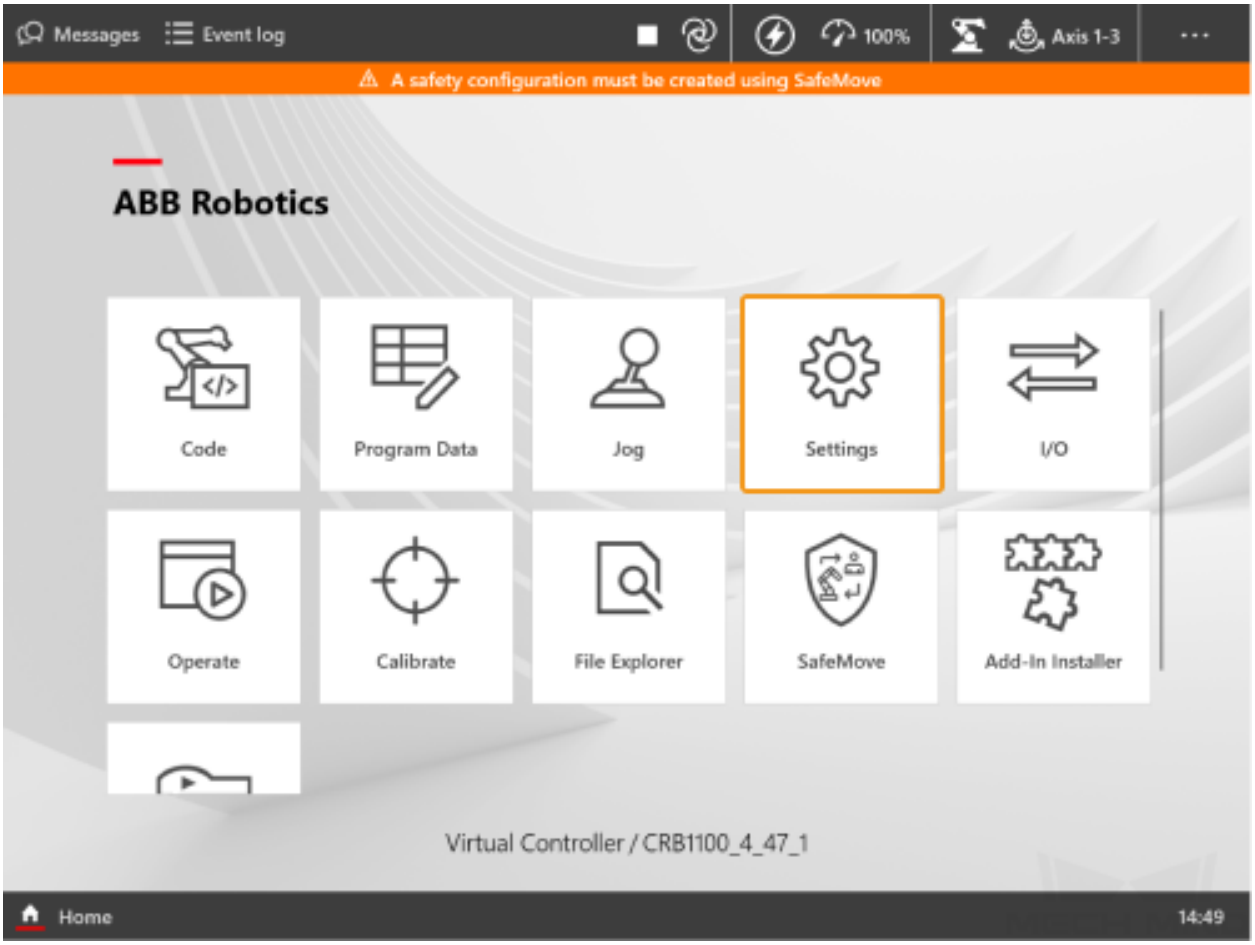
Copy the program files into a USB flash drive. Please locate the folder where Mech-Mind Software Suite is installed and the files are stored in `Mech-Center-xxx/Robot_Server/Robot_FullControl/abb/server on ABB`.

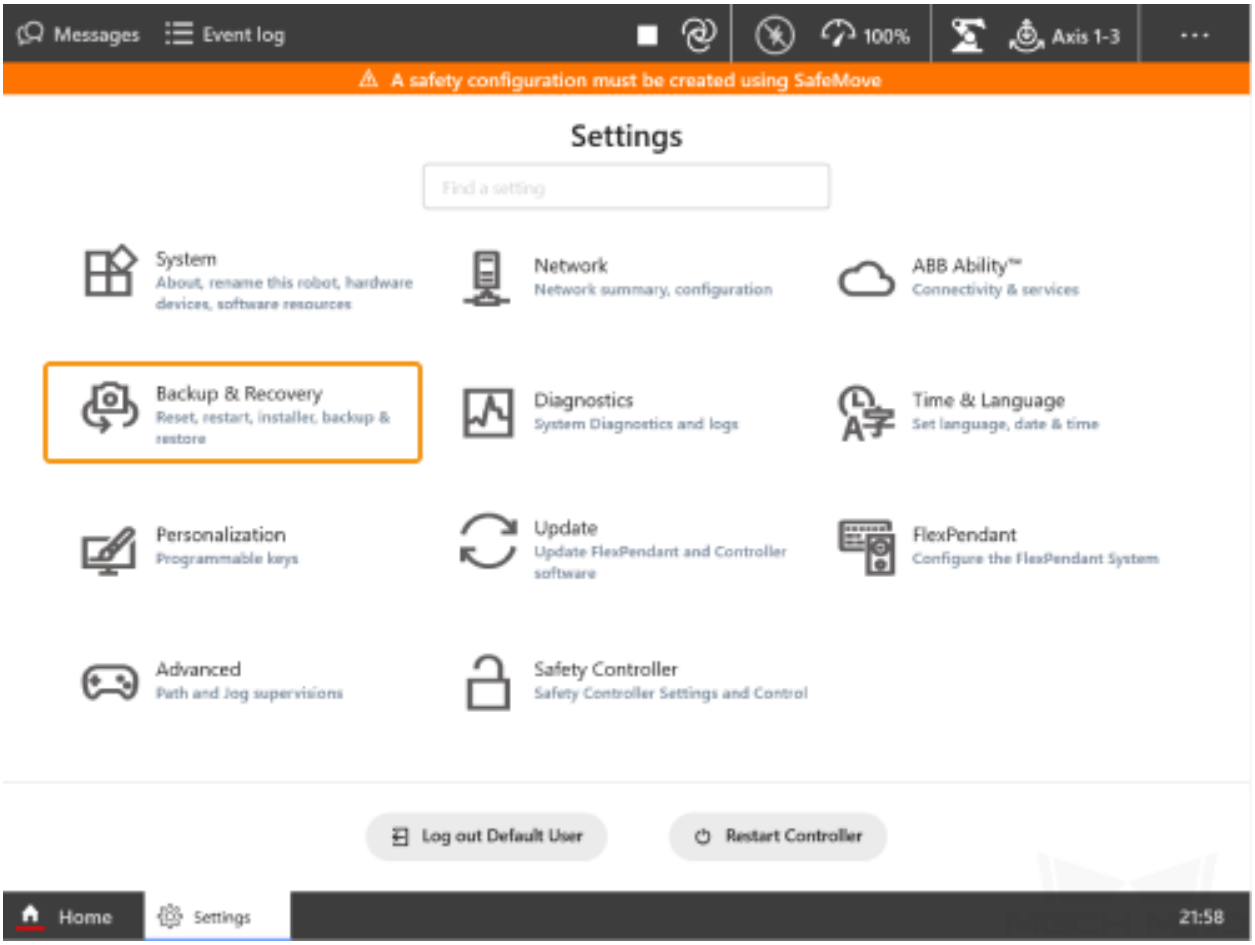
Folder	Description
config_robware7	Robot configuration file that defines the signals required by the Master-control, the auto-loaded module, and task types
MM_robware7	The robot program module

3.3.2 Backup

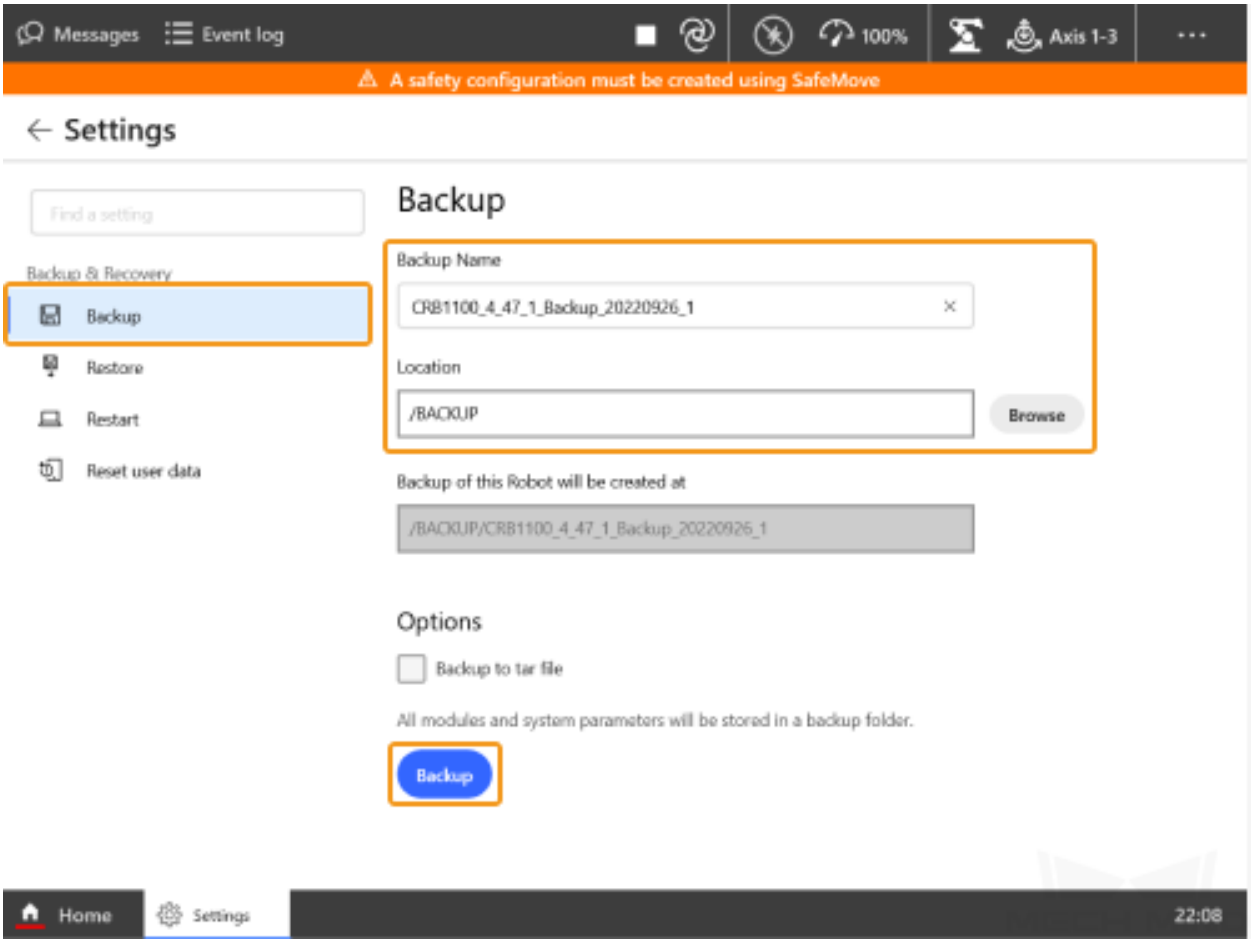
Before operating the robot, please follow the backup instructions below to back up the system so that the robot system can be recovered if a misoperation occurs.

1. Select *Settings* → *Backup & Recovery* in the Home interface.

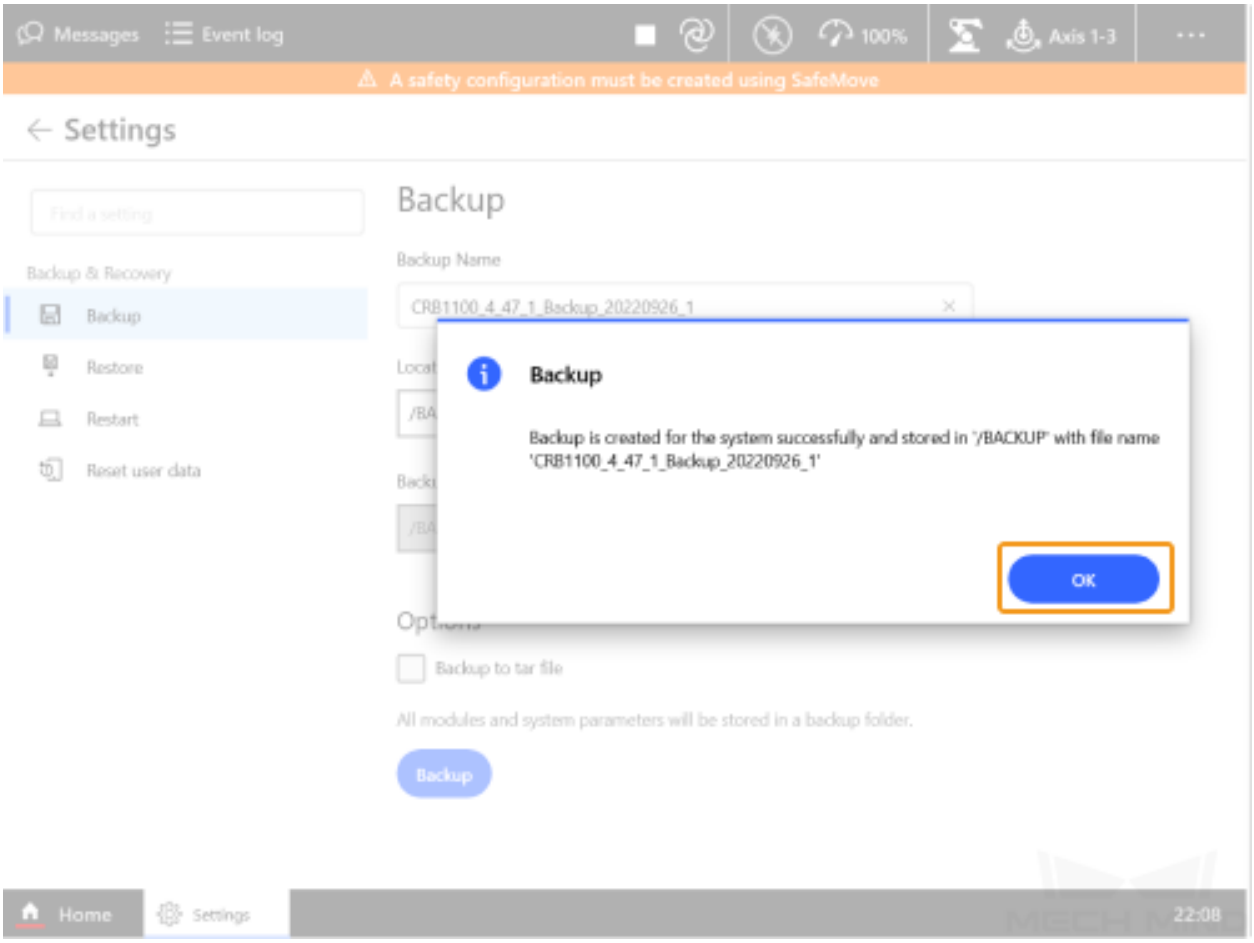




2. In the Backup window, modify the Backup Name and Location and then tap *Backup*.



3. Click *OK* in the pop-up window to complete the backup.



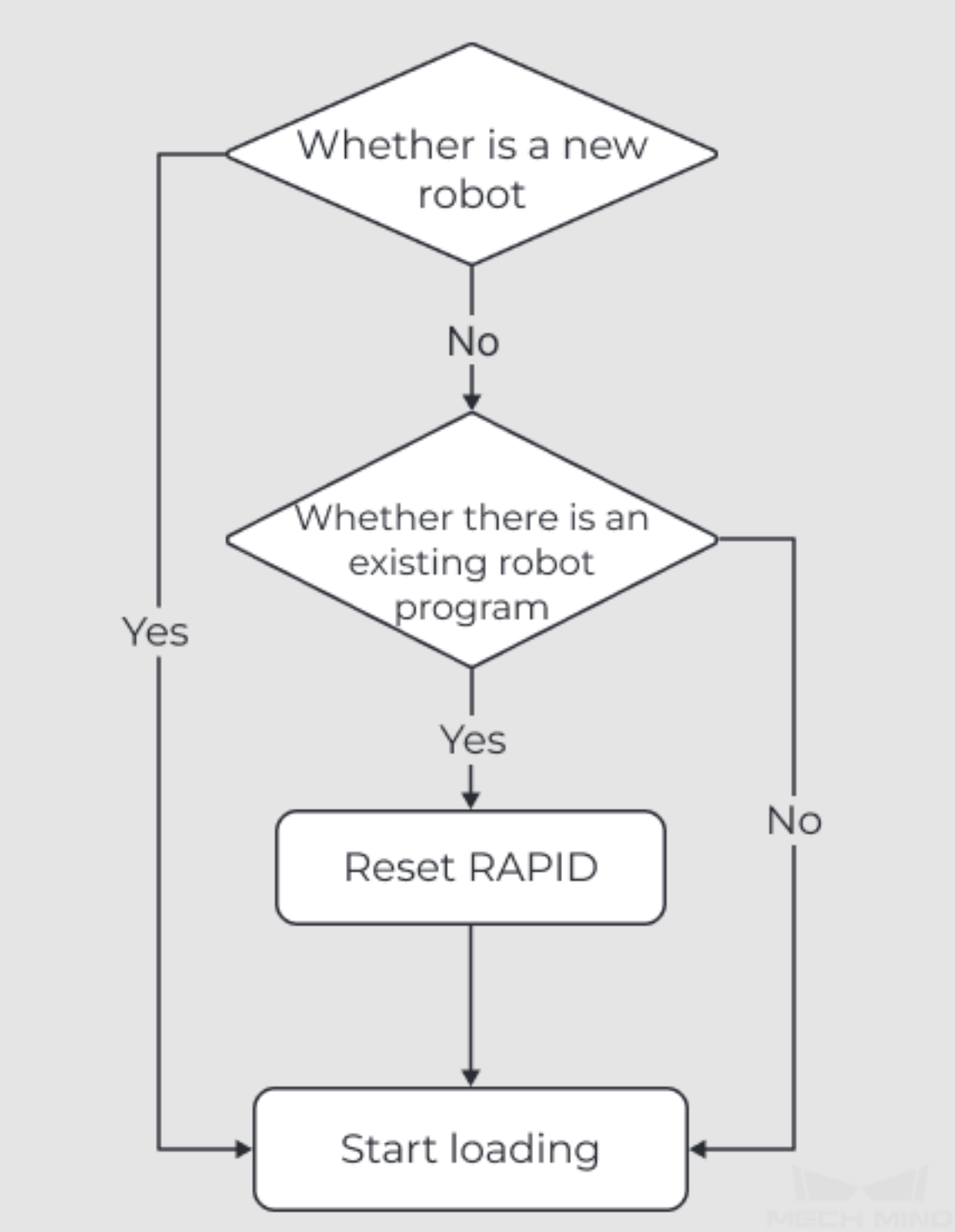
3.3.3 Reset

Note: There are two types of resets, which are **resetting the system** and **resetting RAPID**.

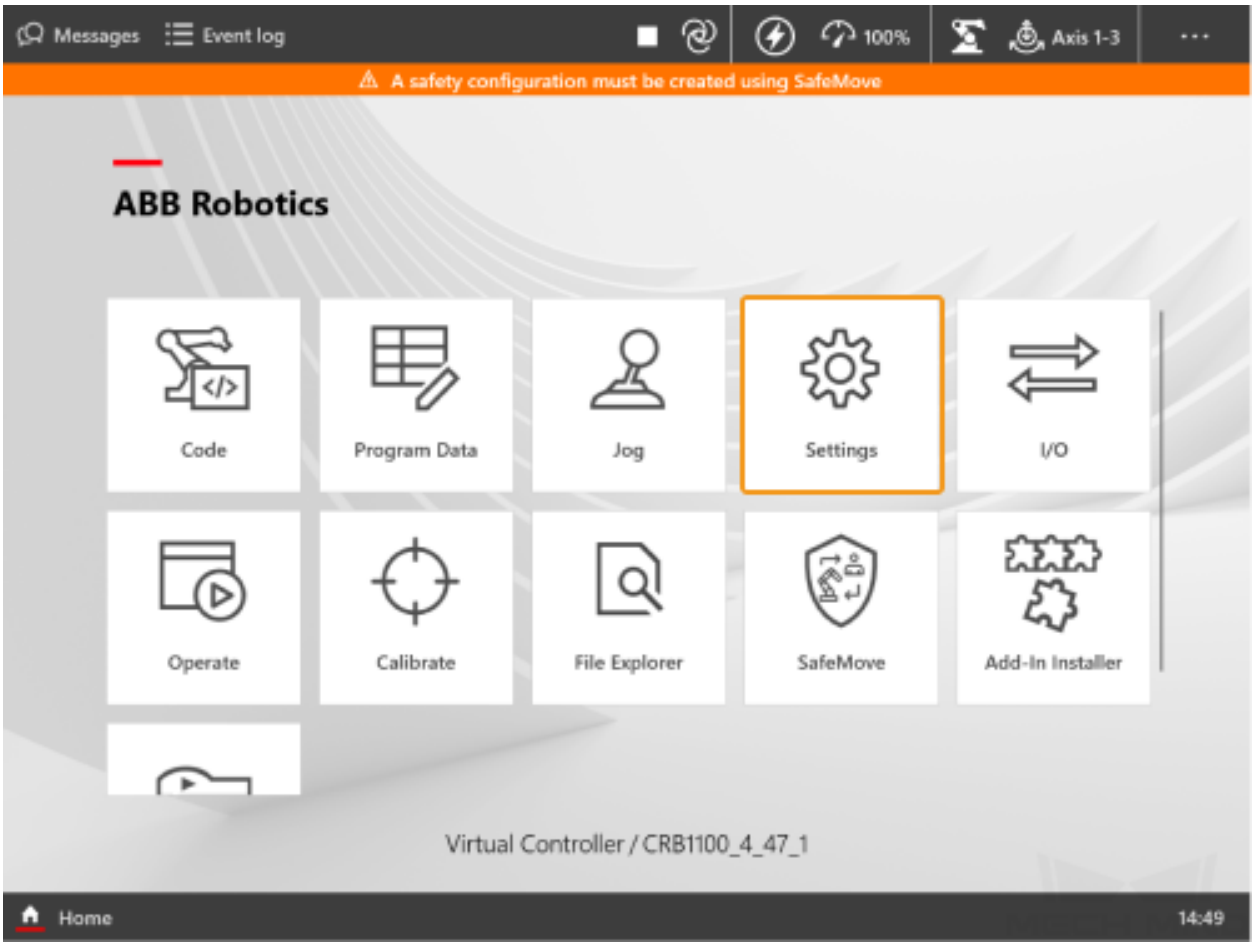
- **Resetting the system** will restore the default system parameters and RAPID program, and the I/O configuration will be reset too. If a communication board or other communication devices are used, they should be re-configured after the system is reset.
- **Resetting RAPID** will delete the current RAPID program and data, while the system parameter settings will be retained.

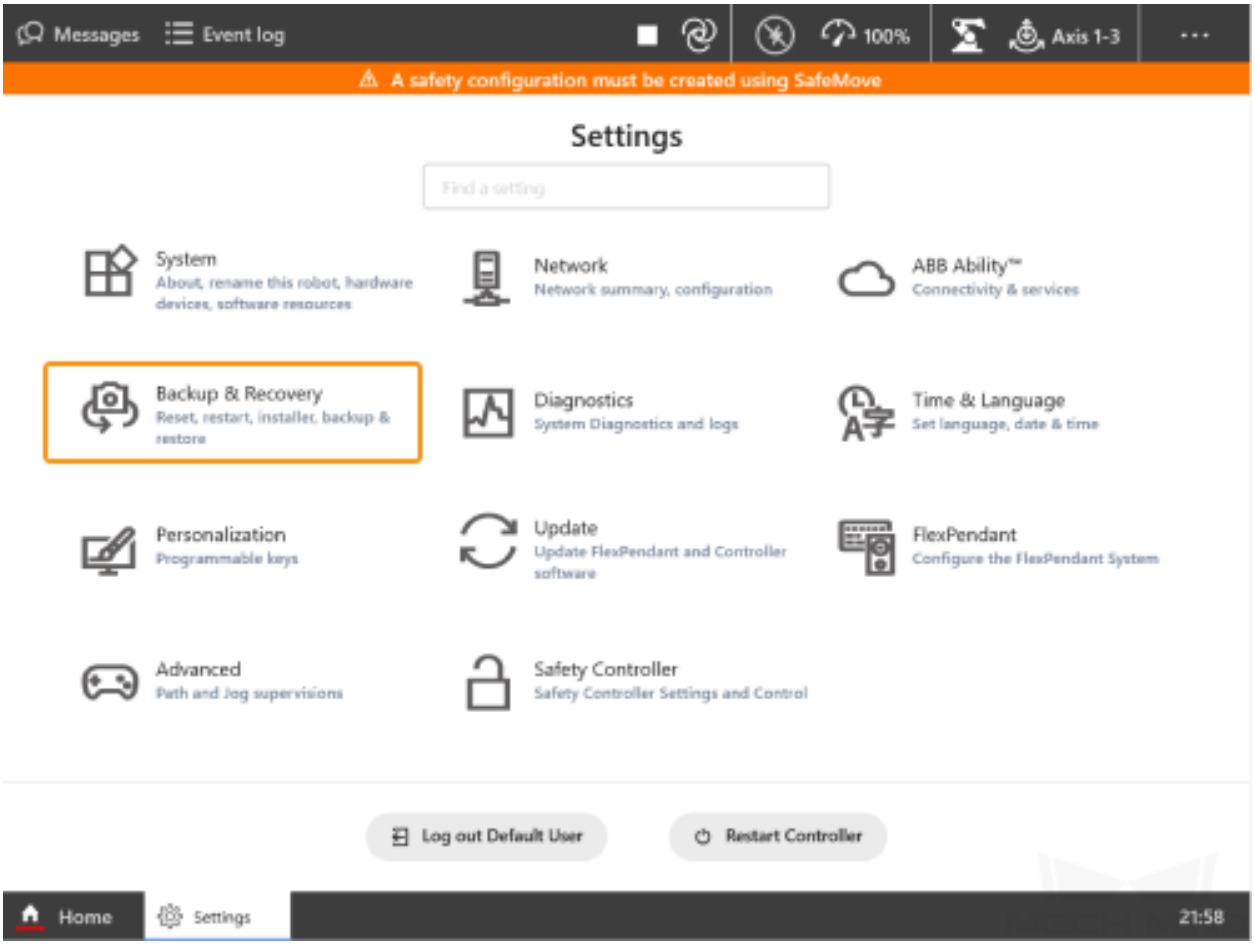
Reset RAPID

Please determine whether you should **reset RAPID** according to the following flowchart.

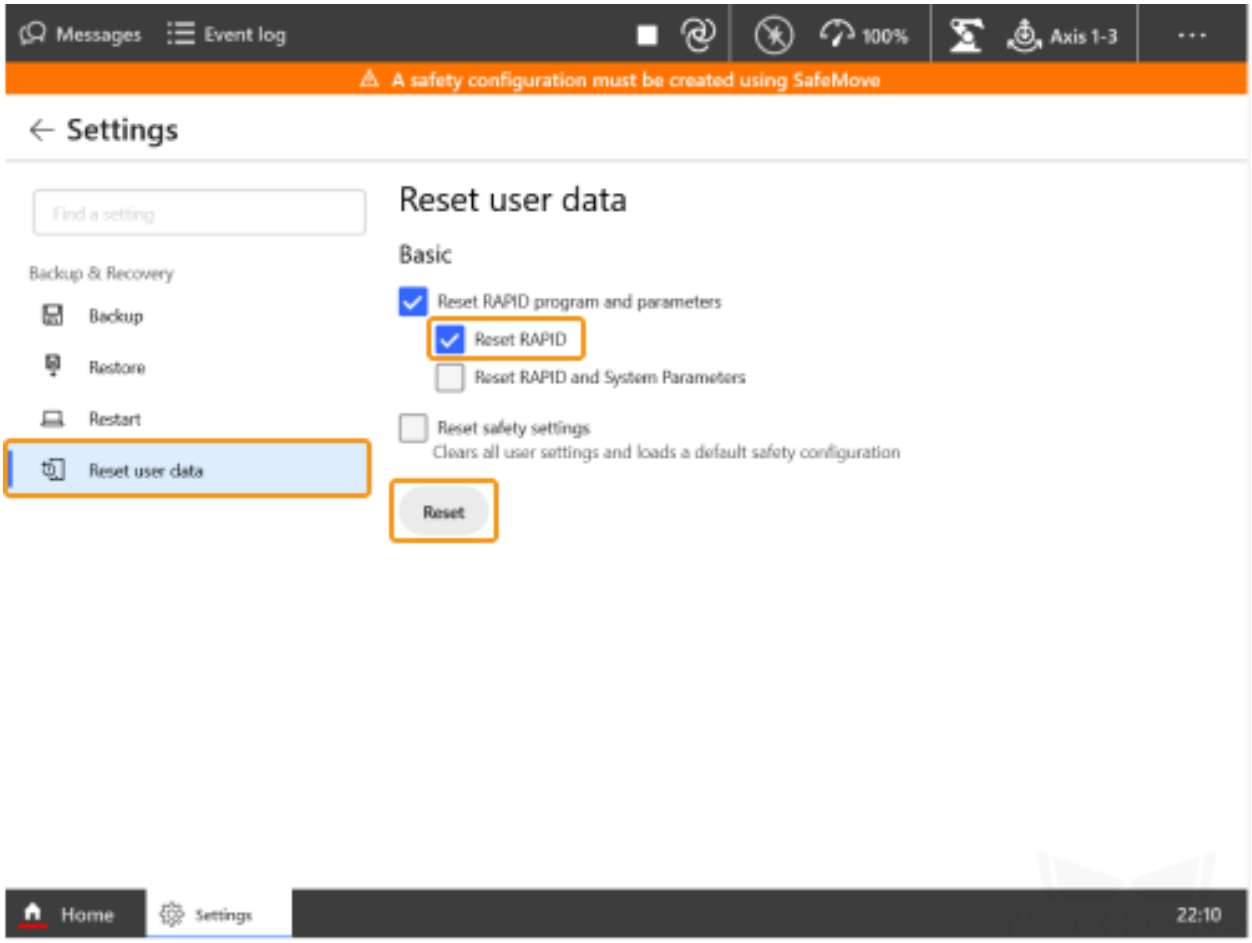


1. Select *Settings* → *Backup & Recovery* in the Home interface.

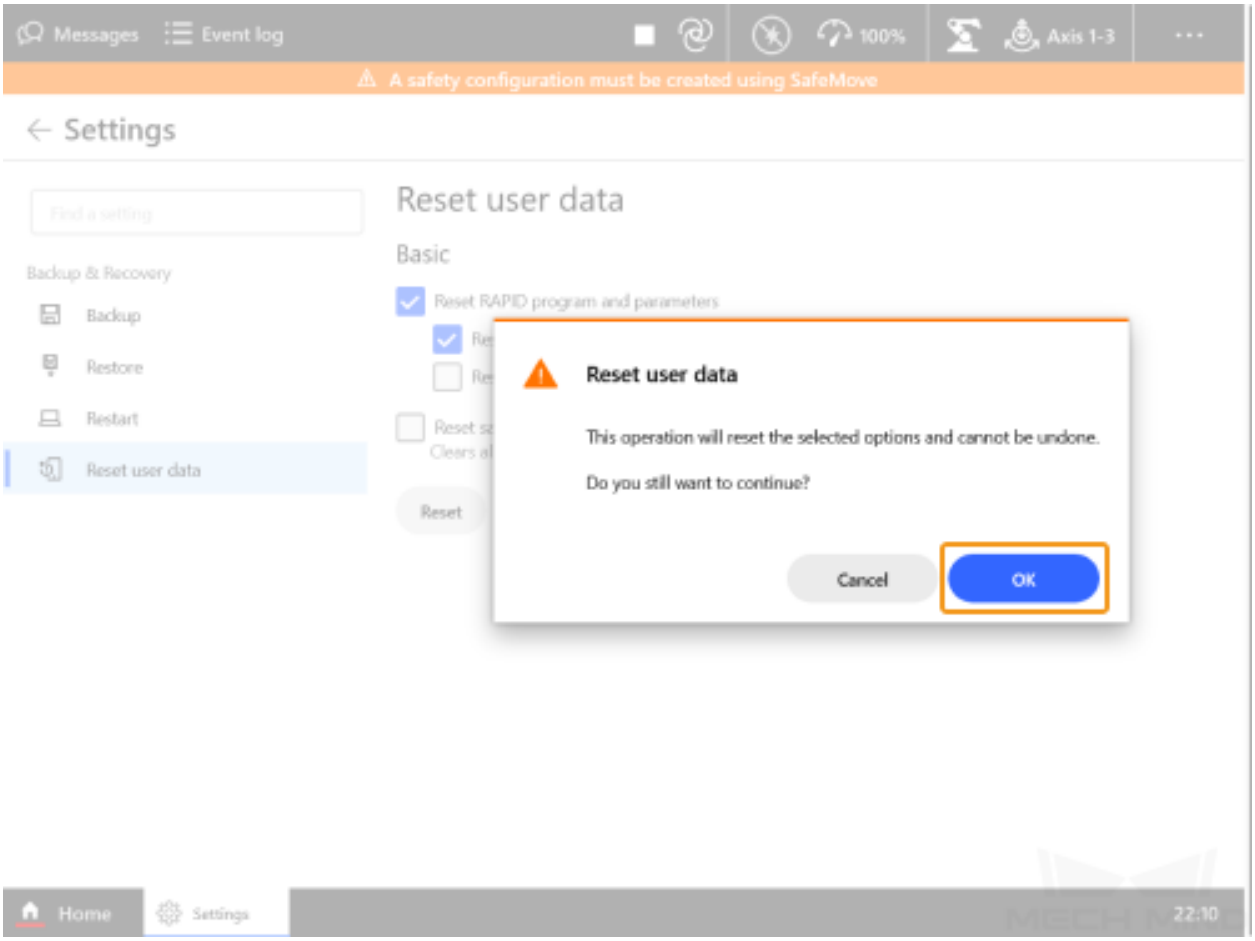




2. In the **Reset user data** window, select **Reset RAPID**, and then tap *Reset*.

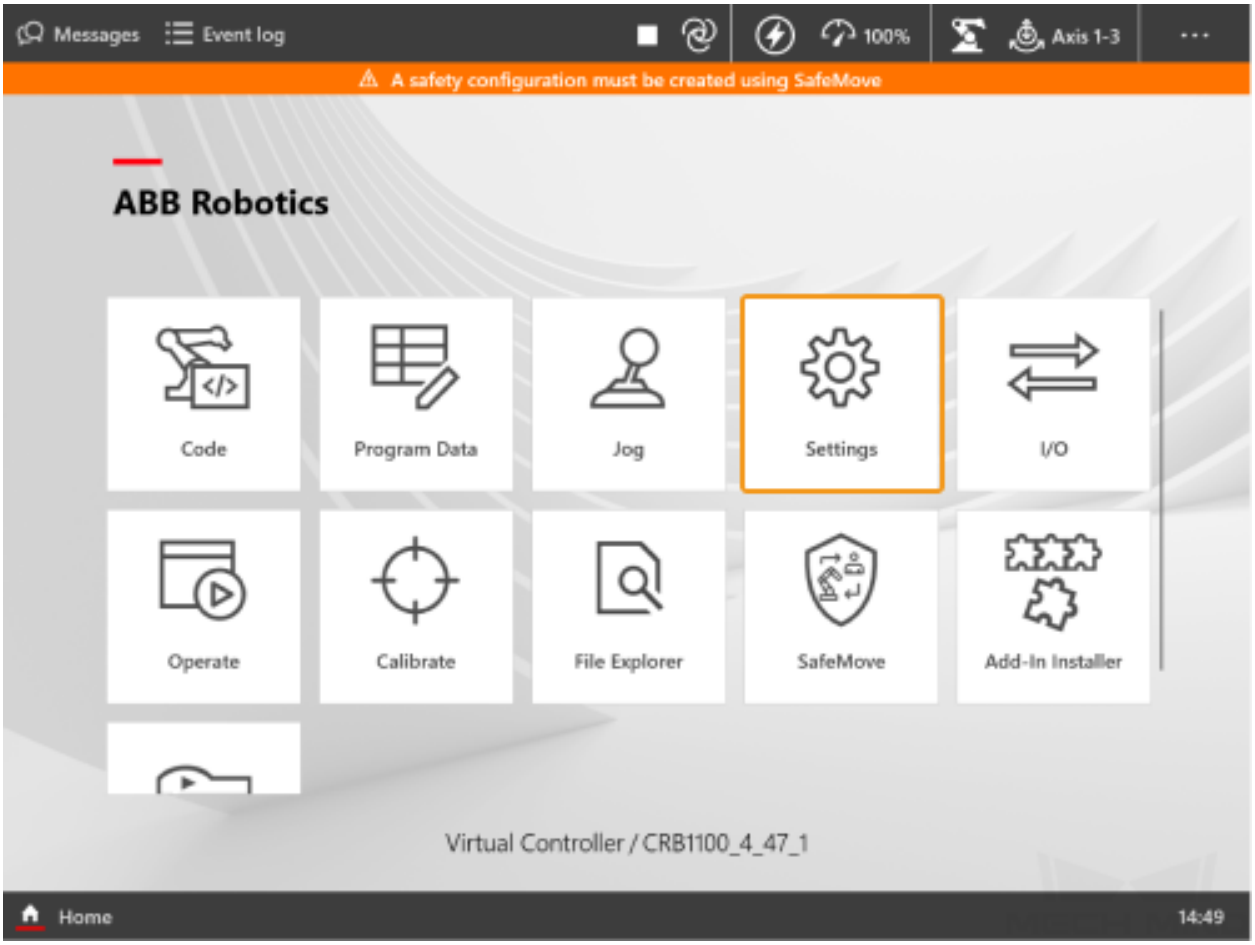


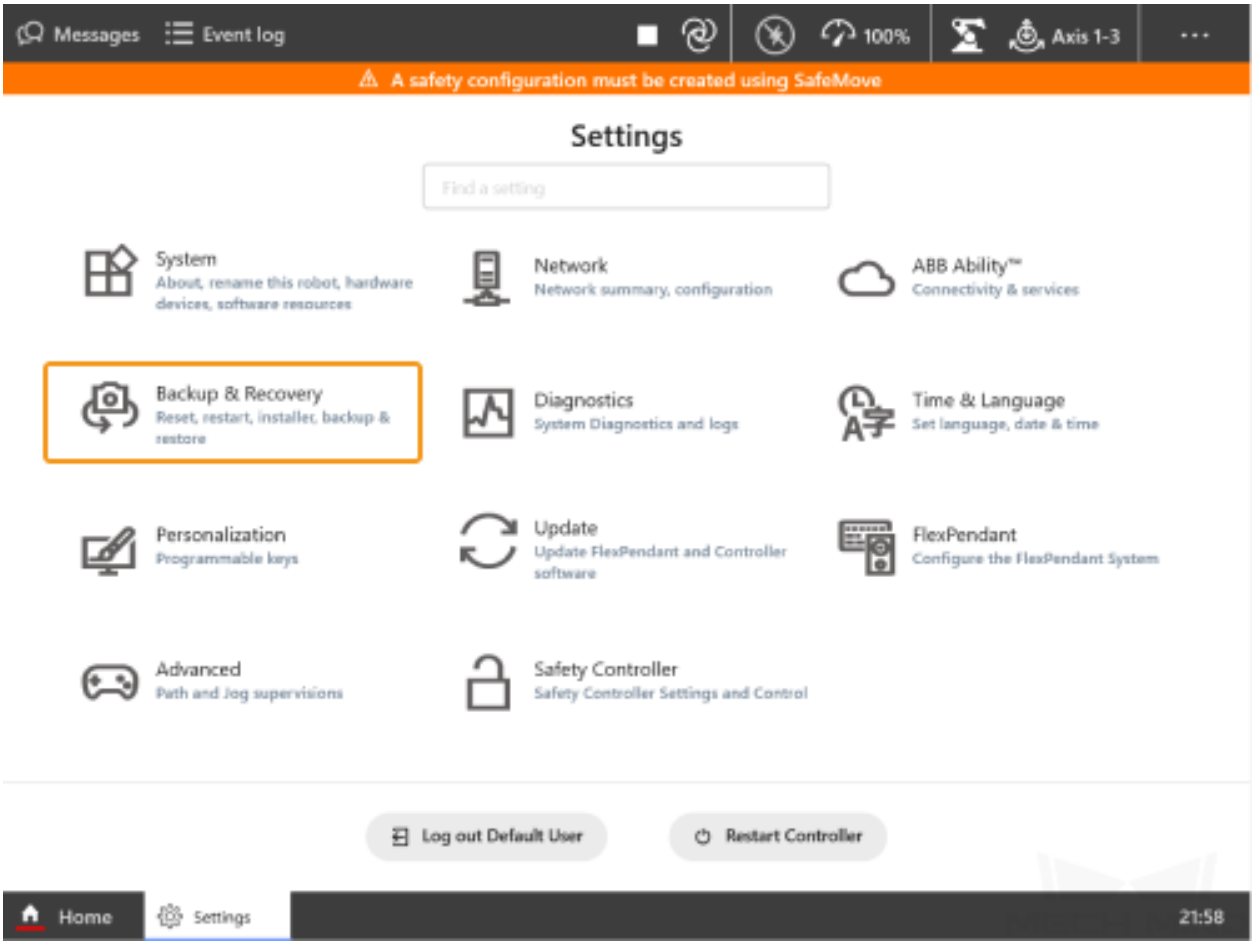
3. Click *OK* in the pop-up window.



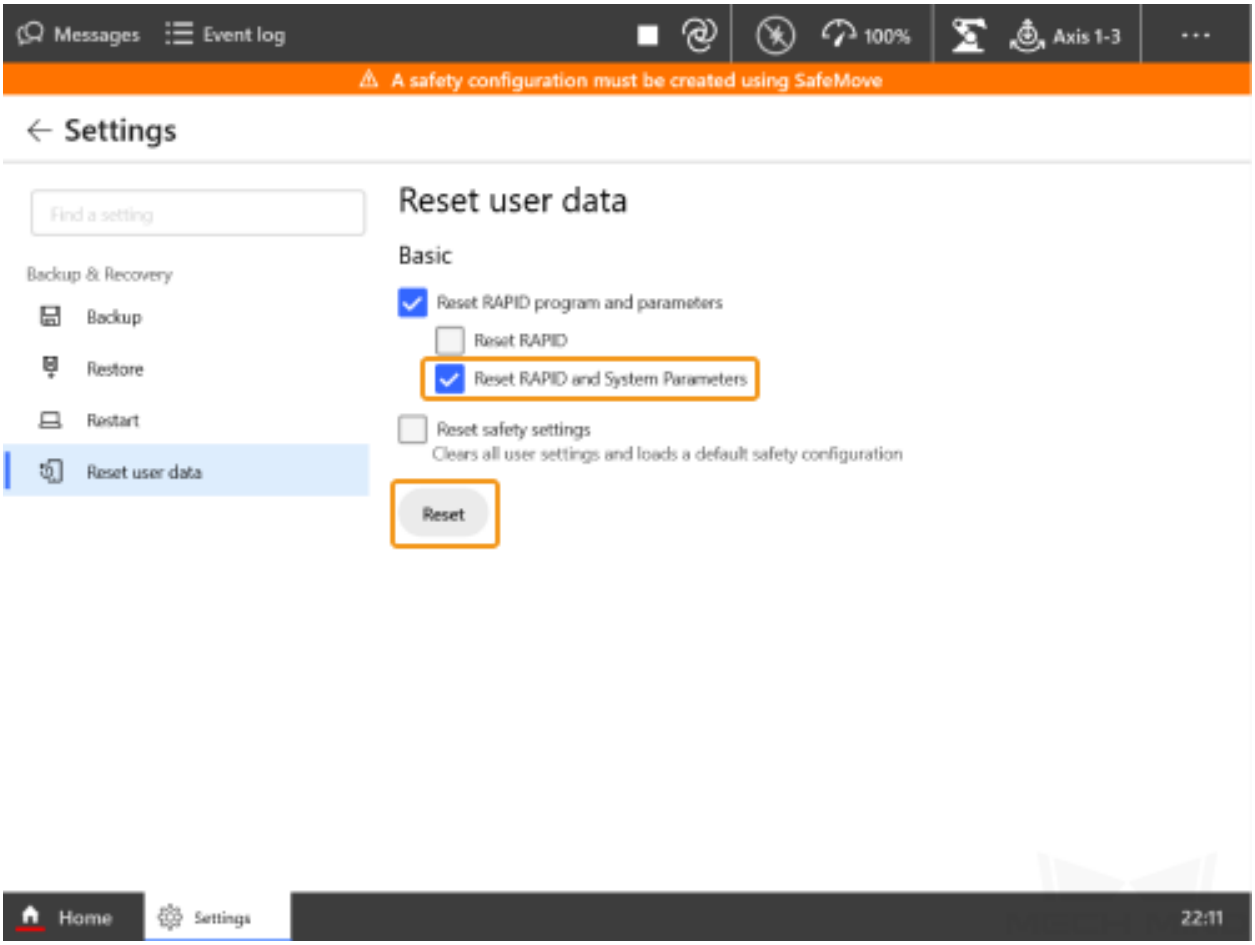
Reset the System (use with caution)

1. Select *Settings* → *Backup & Recovery* in the Home interface.

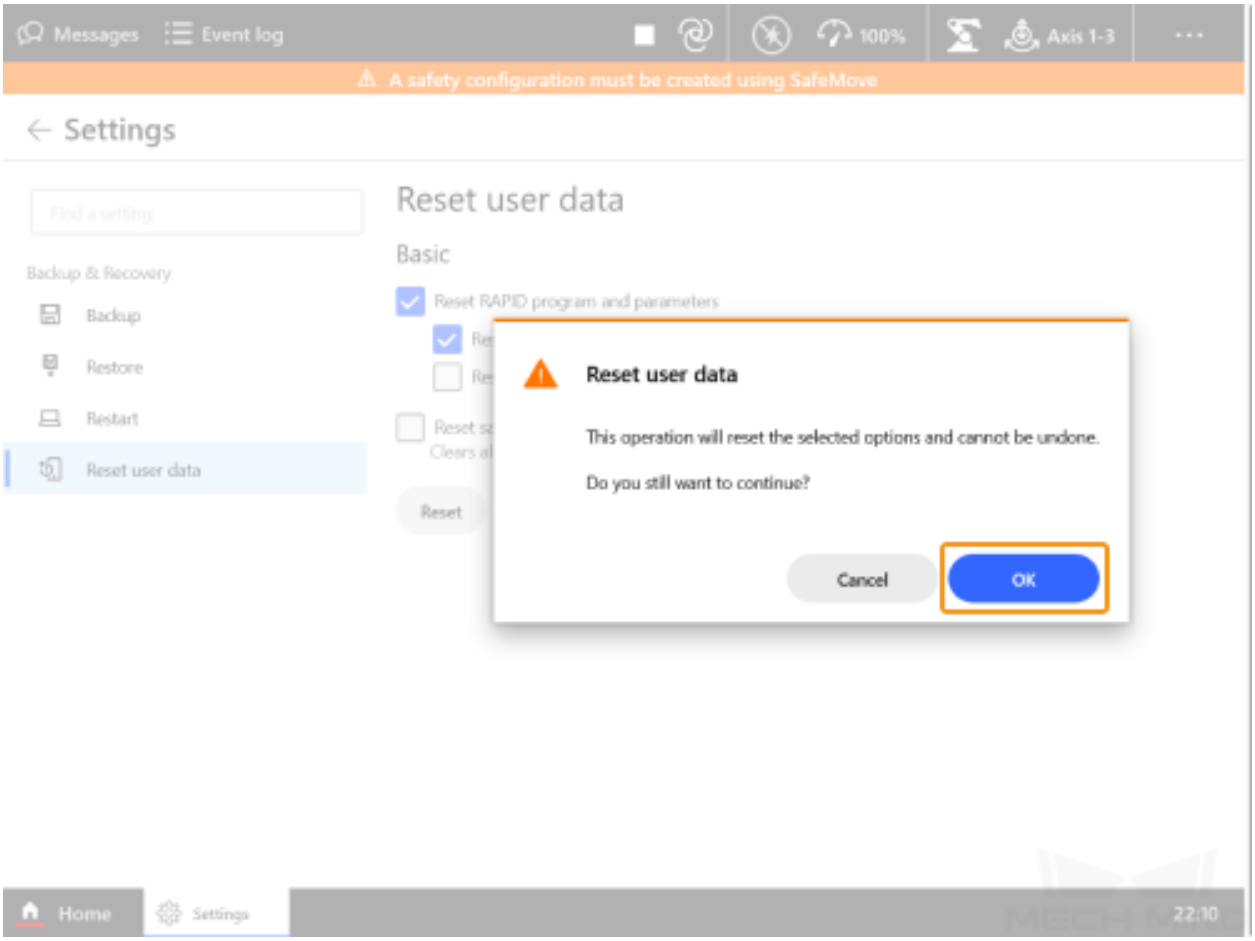

Messages
Event log
100%
Axis 1-3
A safety configuration must be created using SafeMove
ABB Robotics
Code
Program Data
Jog
Settings
I/O
Operate
Calibrate
File Explorer
SafeMove
Add-In Installer
Virtual Controller / CRB1100_4_47_1
Home
14:49



2. In the **Reset user data** window, select **Reset RAPID and System Parameters**, and then tap *Reset*.

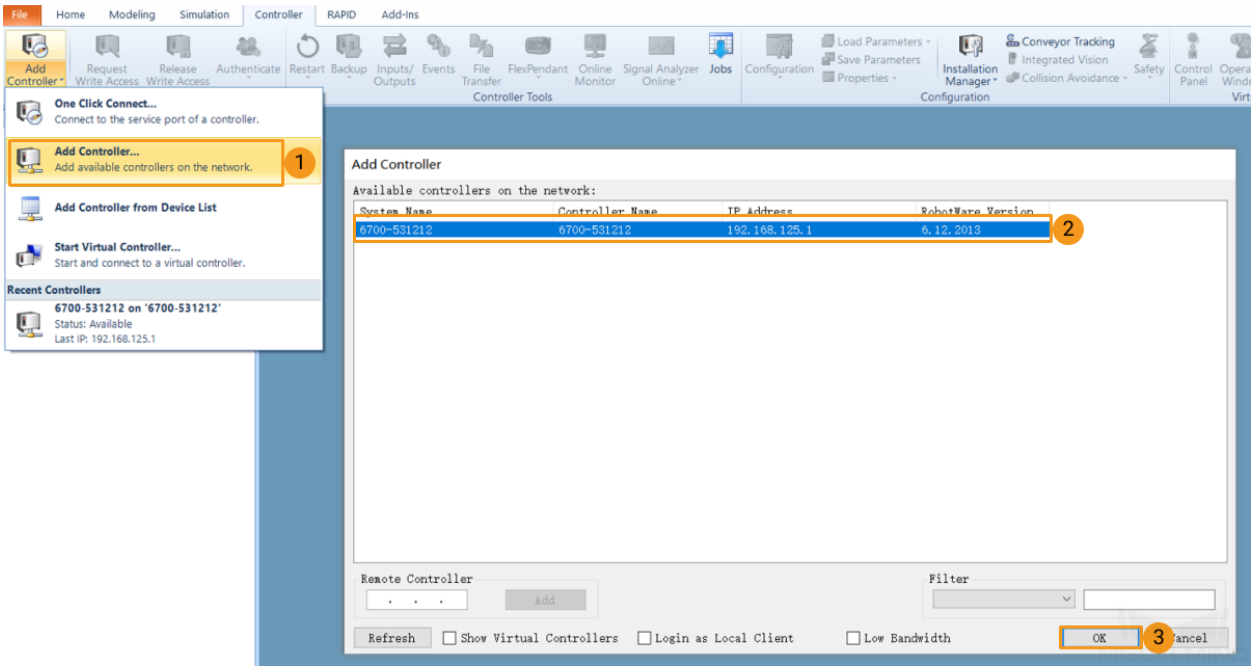


3. Click *OK* in the pop-up window.



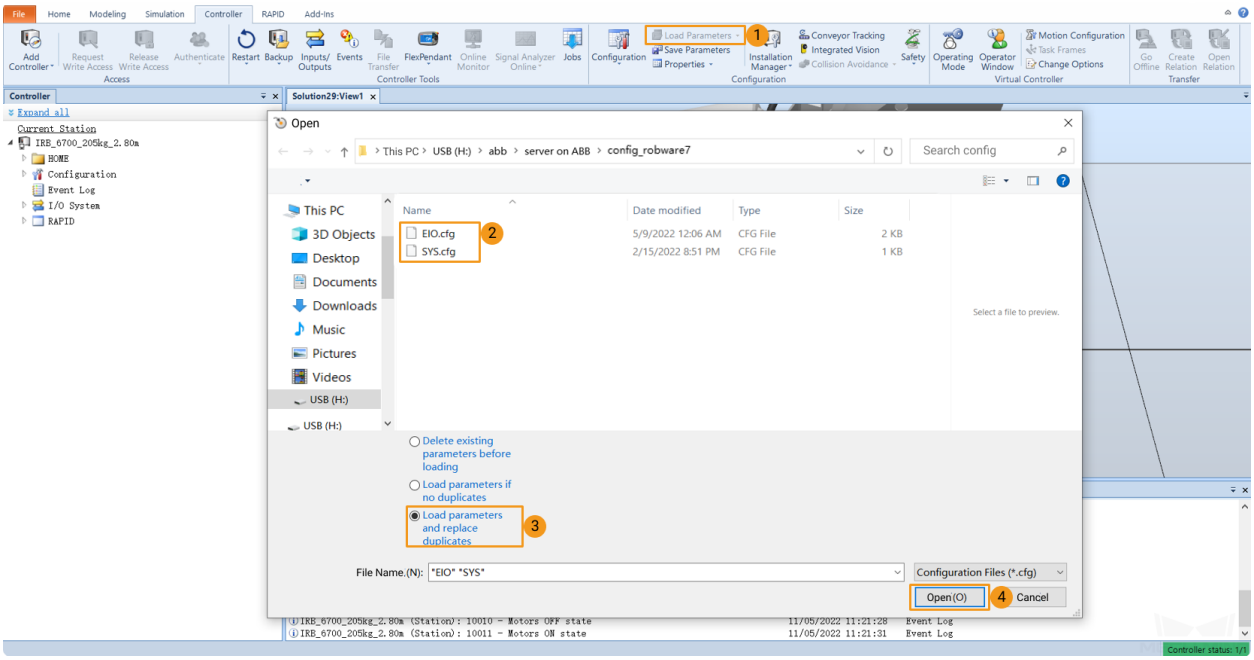
3.3.4 Load the Files to the Robot

1. Open RobotStudio, since the Ethernet cable is connected to the WAN port of the controller, click *Add Controller* and then select the controller and click *OK*. After the controller is added successfully, the controller management port will be connected automatically.

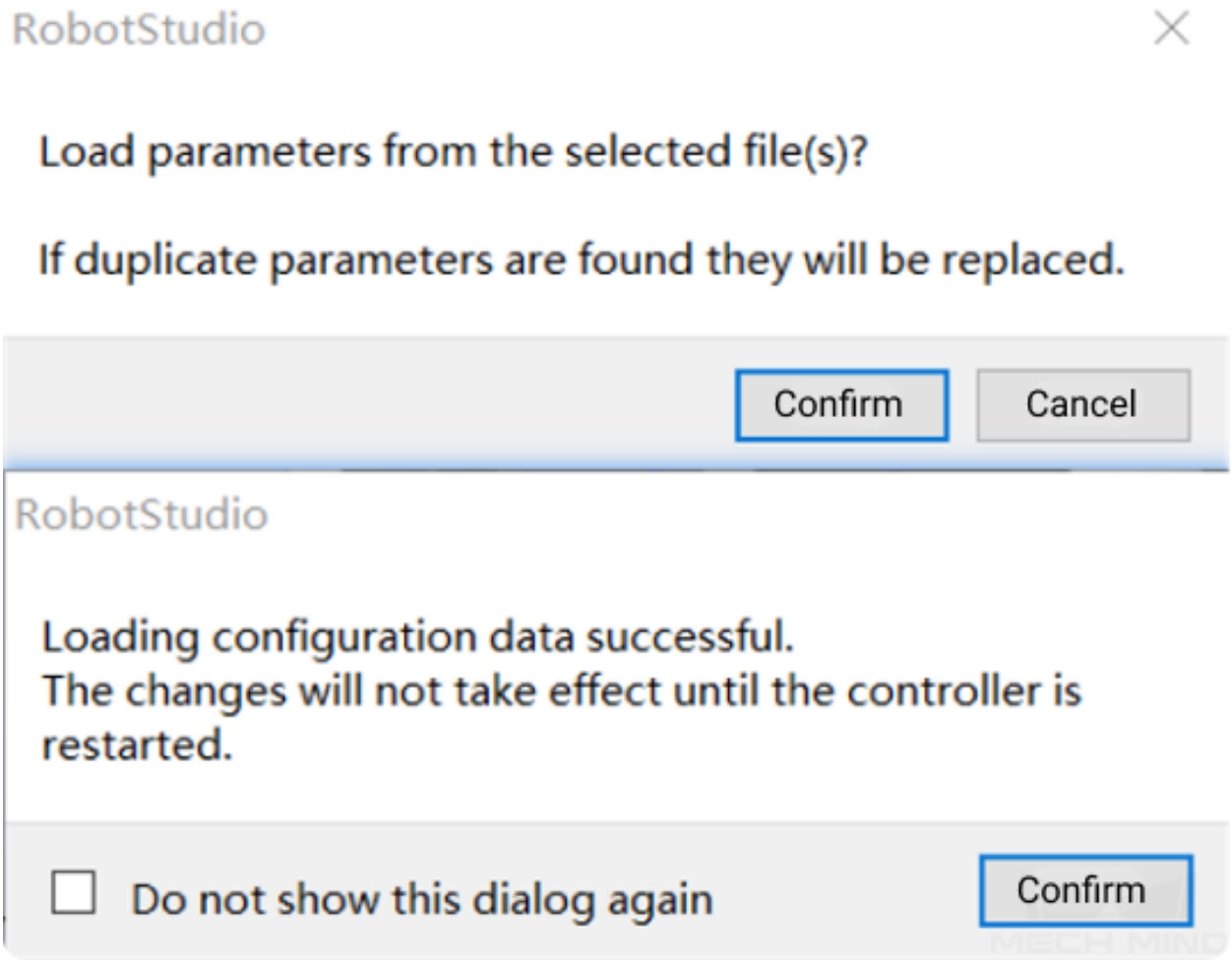


2. Import the two configuration files in the config_robware7 folder as shown below.

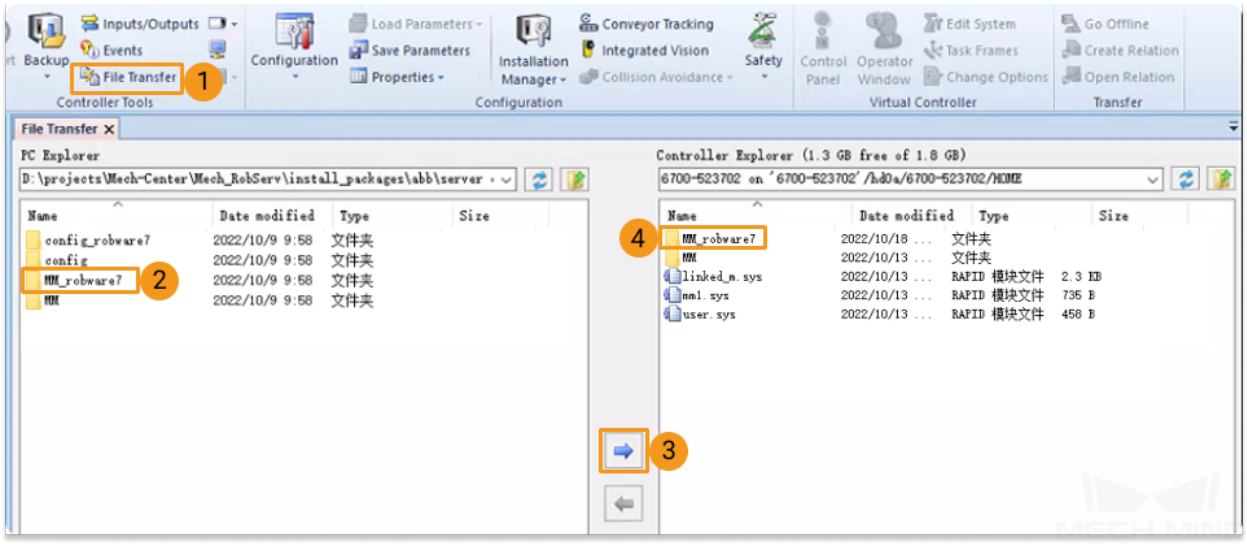
Tip: You can select multiple files by pressing the `Ctrl` key and the left mouse button.



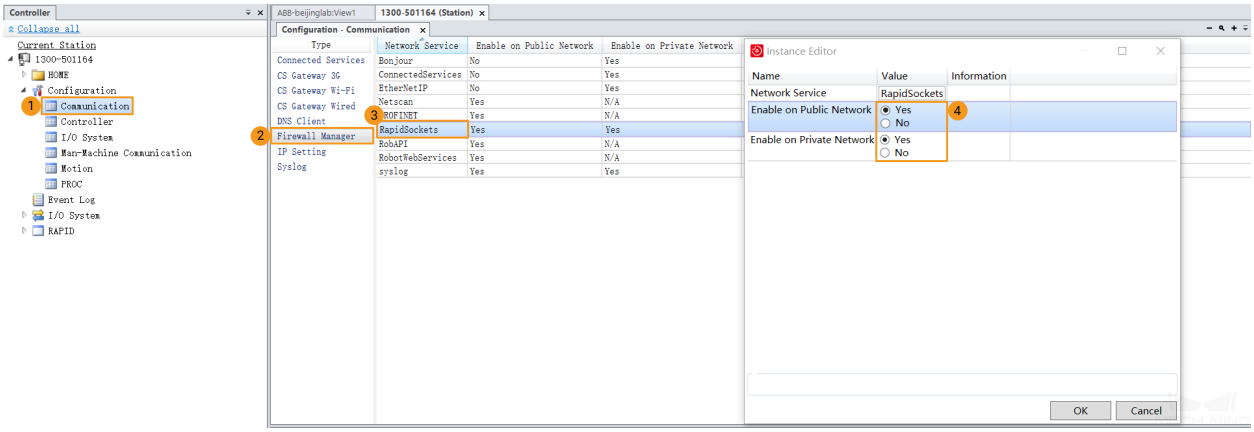
3. Select *Confirm* in the pop-up windows.



4. Follow the steps as shown in the figure below to copy the entire **MM_robware7** folder and paste it to the **HOME** directory of the robot system.

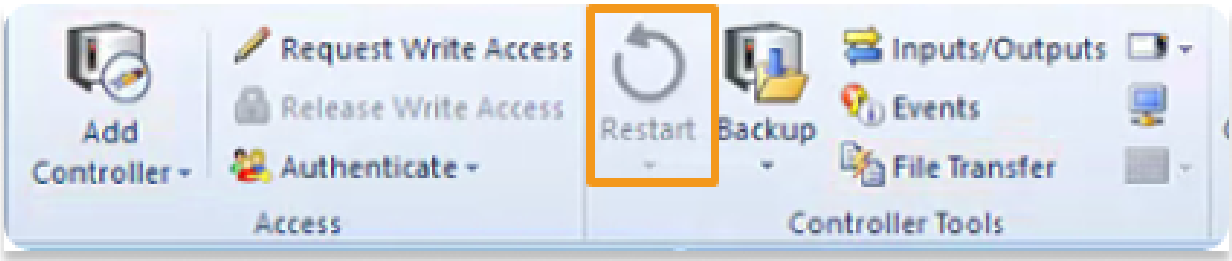


5. Follow the steps as shown in the figure below to enable the RapidSockets network service.



6. Modify the safe zone threshold (in mm) in the **safe_area.mod** program according to the actual on-site work space of the robot.

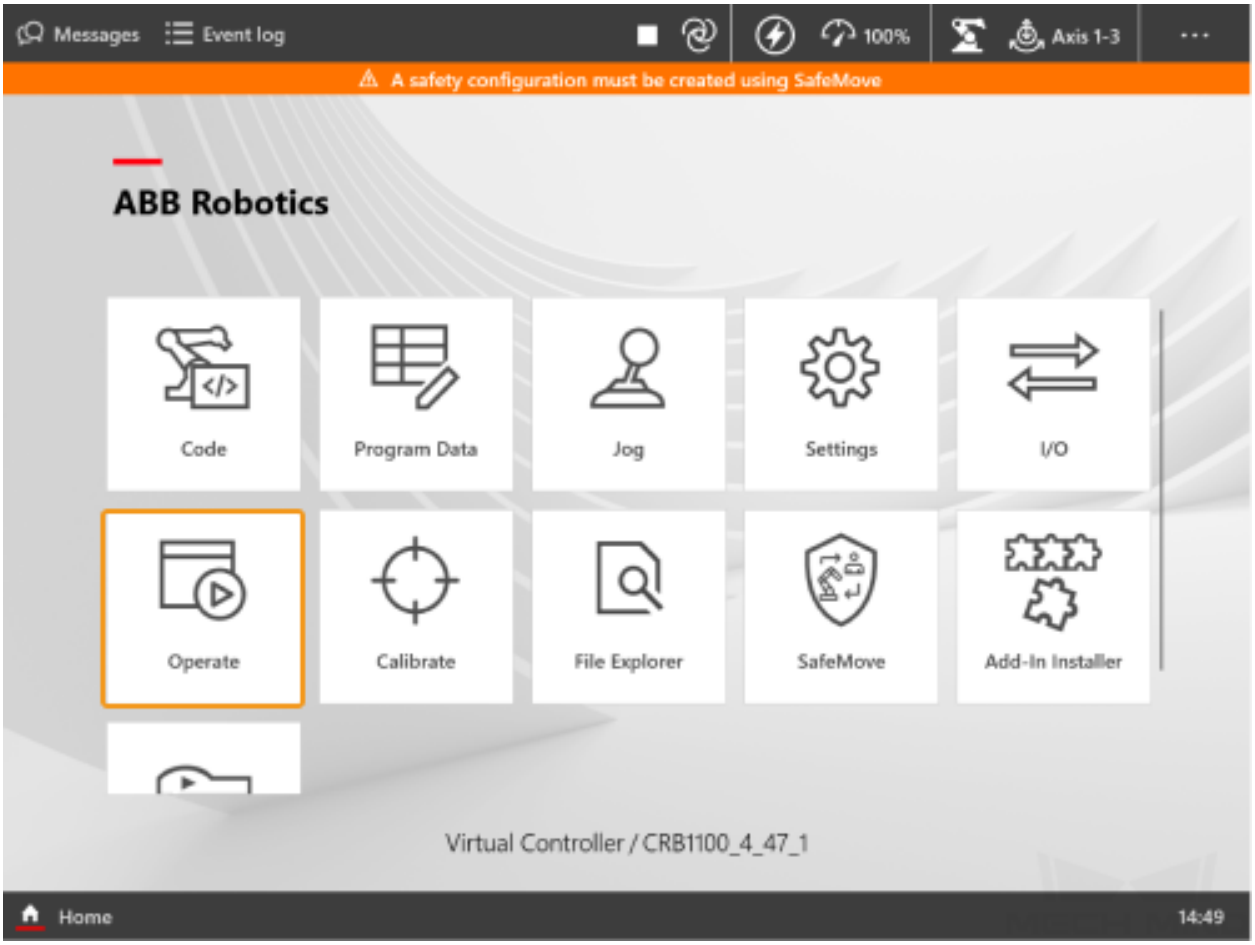
7. Click *Restart* to complete loading the program files.



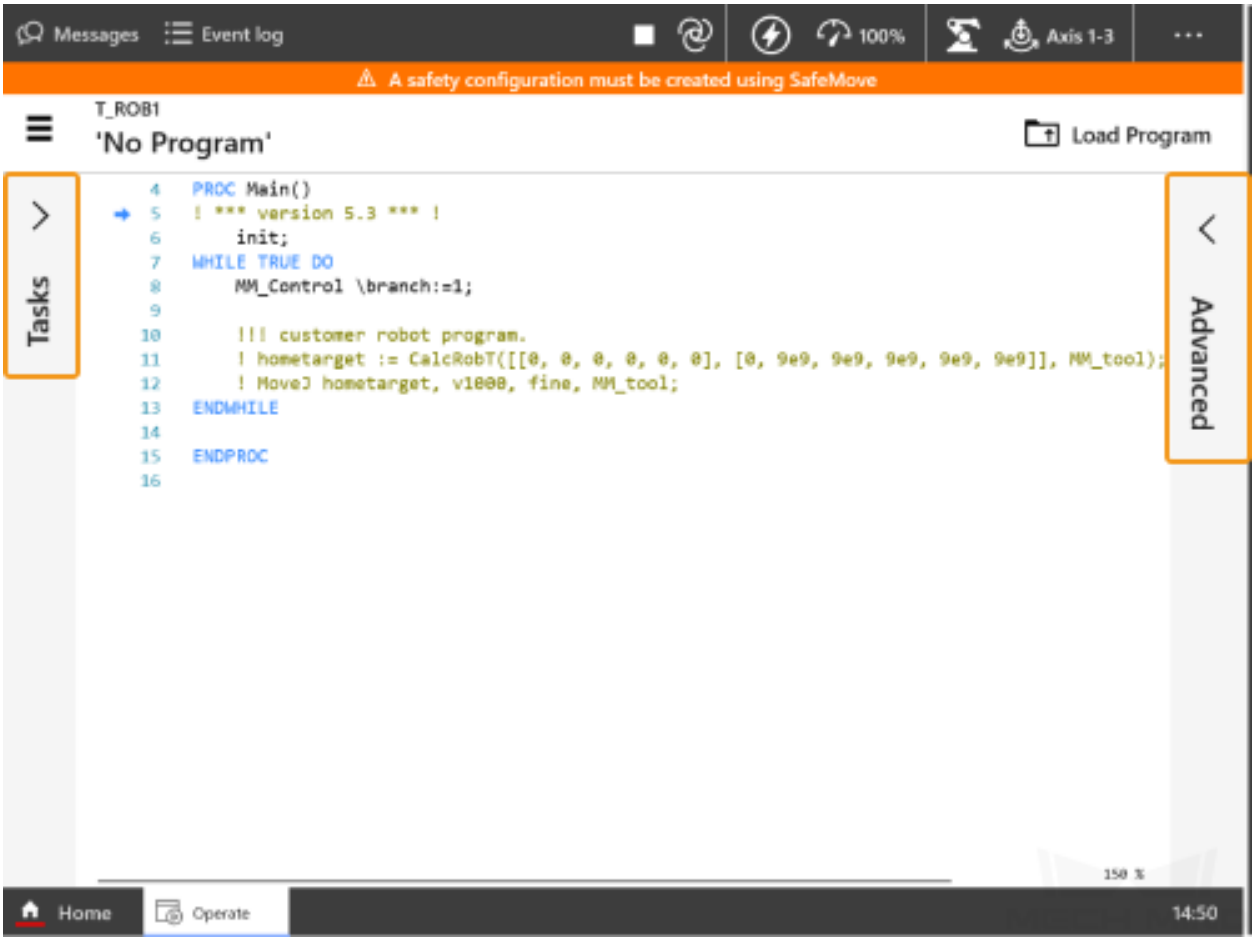
3.4 Run the Program

Reset the Program Pointer

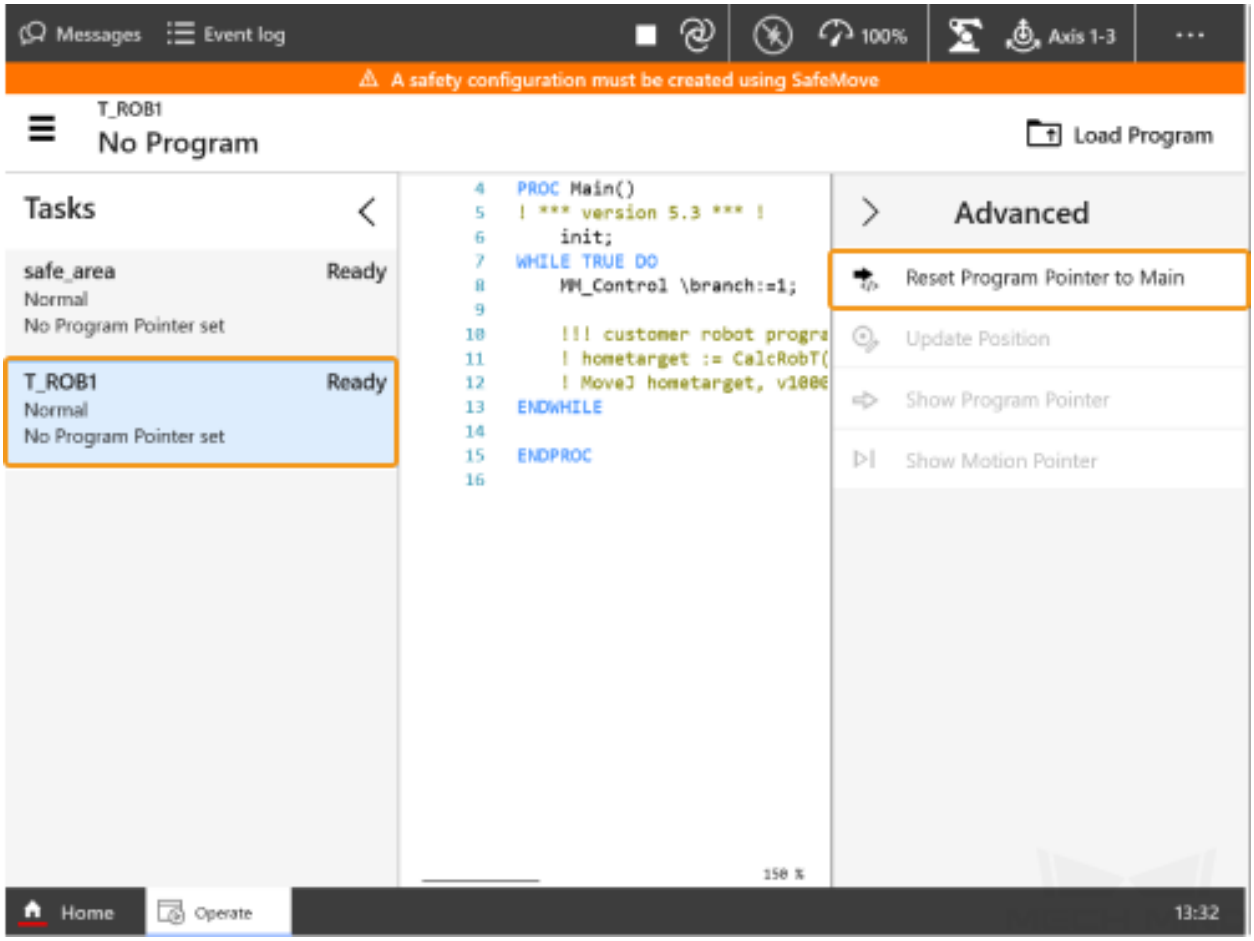
1. In the Home interface, tap *Operate*.



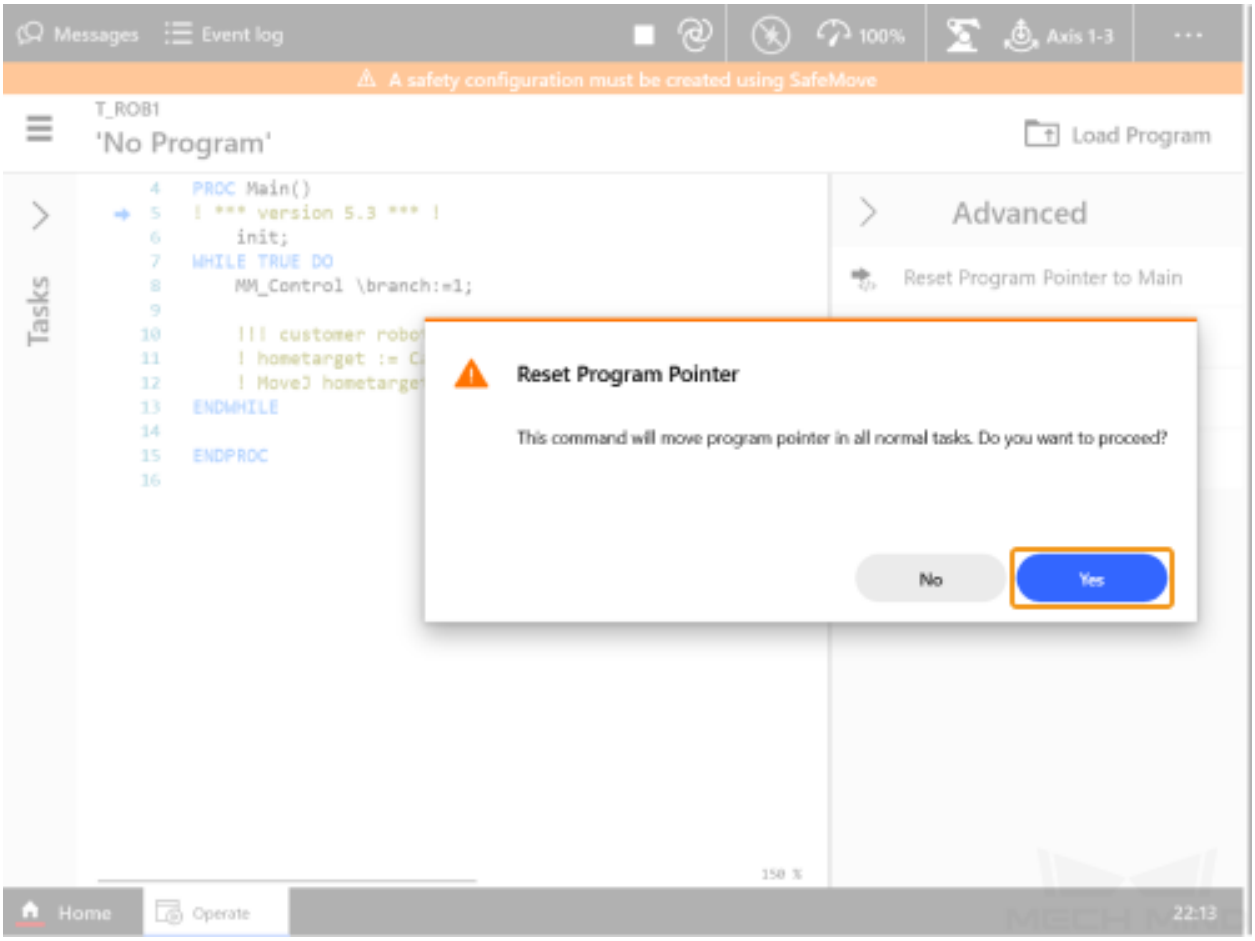
2. Tap *Tasks* on the left and the list of tasks will be expanded. Tap *Advanced* on the right and the advanced settings will appear.



3. In the list of tasks, select T_ROB1, and select *Reset Program Pointer to Main*.

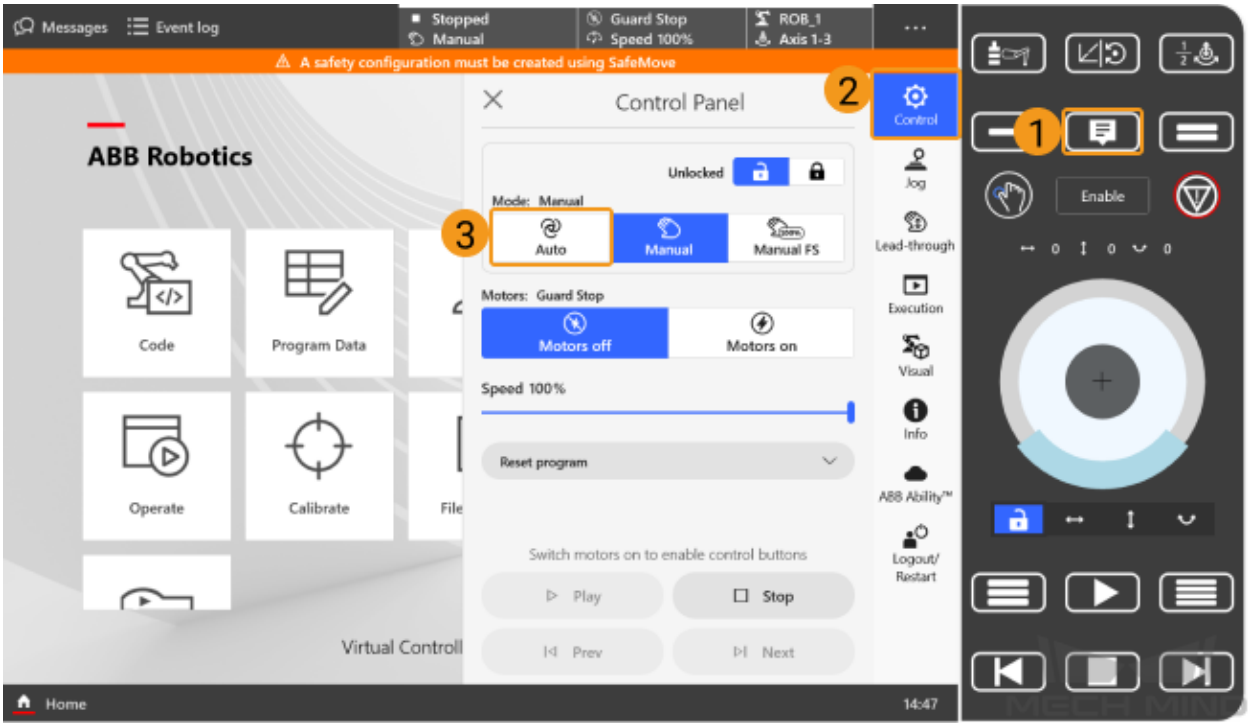


4. Select *Yes* in the pop-up window.

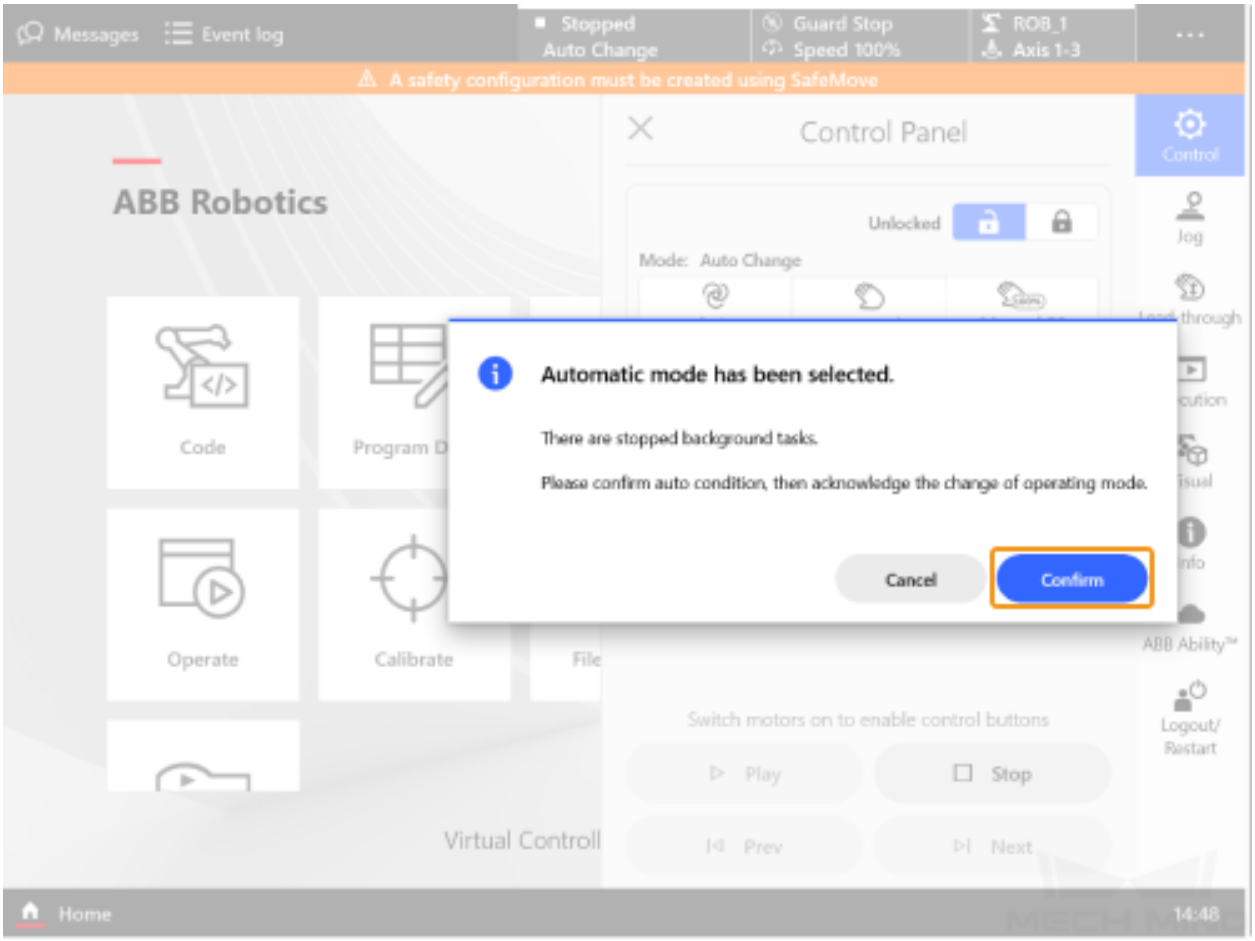


Run the Program

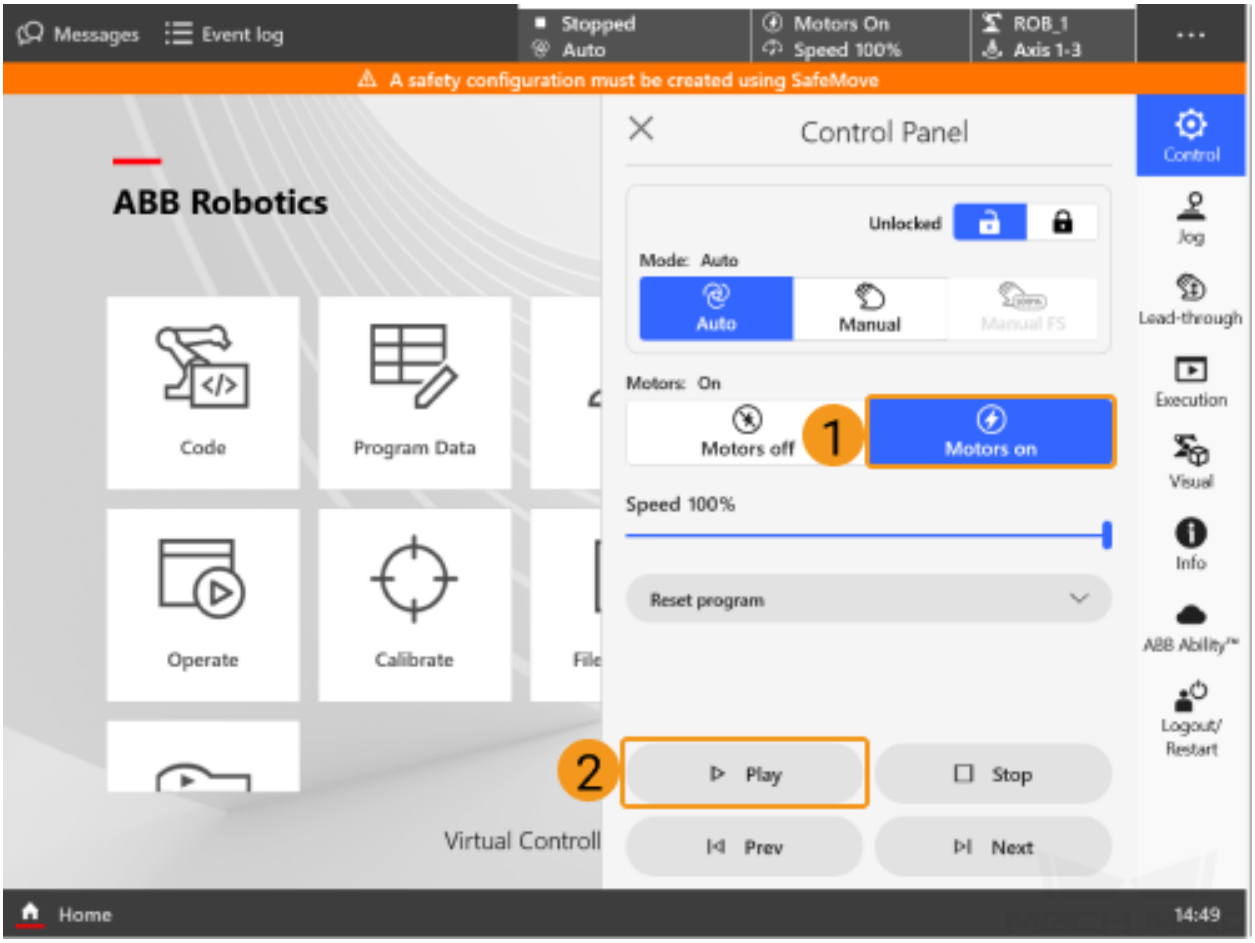
1. Tap  to open the **Control Panel**, and select *Control* → *Auto*.



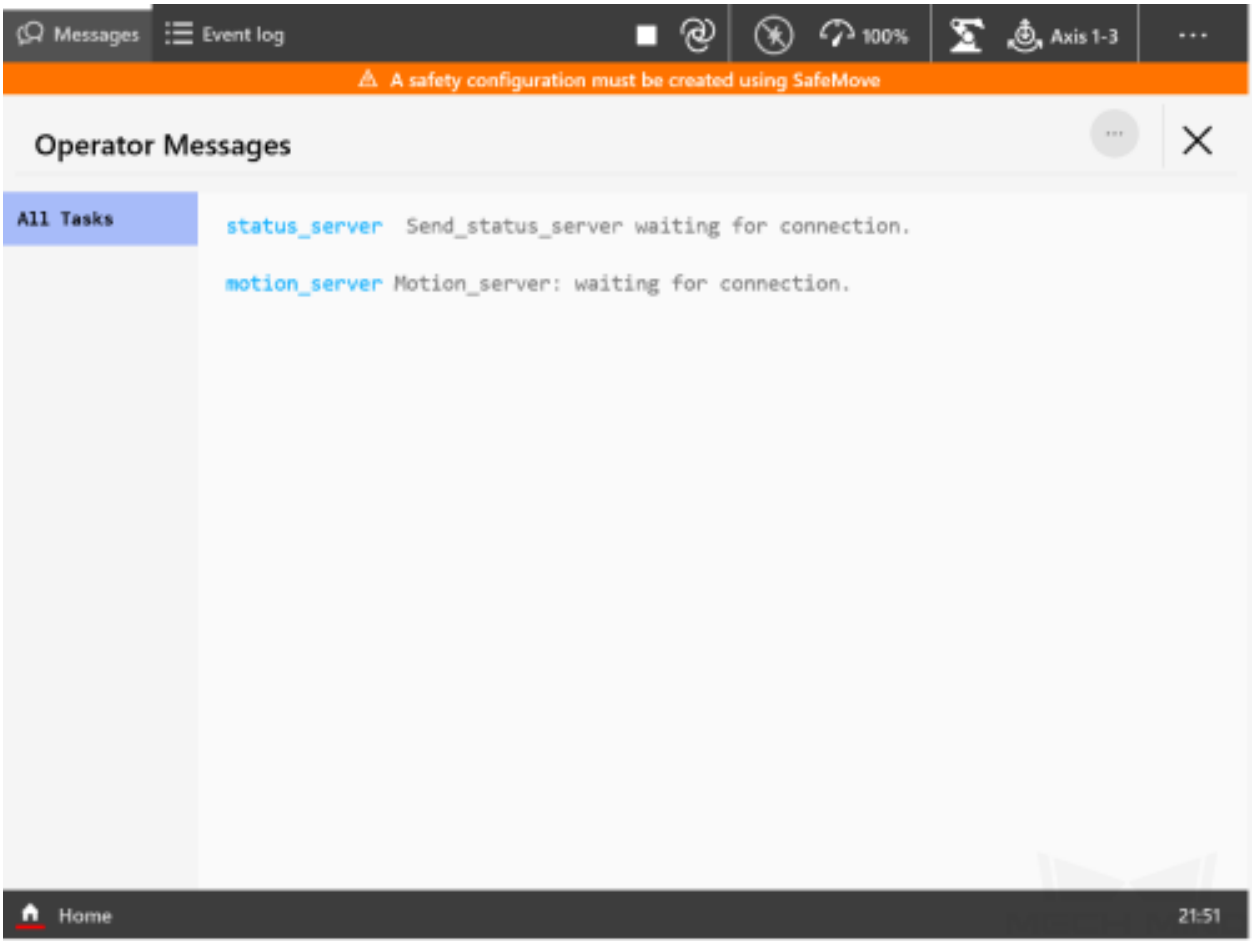
2. Select *Confirm* in the pop-up window.



3. Select *Motors on* → *Play* to run the program.



4. Tap *Messages* in the upper left corner to view the Operator Messages. If messages as shown below appear, the program has been successfully loaded on the robot end.



3.5 Test Robot Connection

3.6 Troubleshooting

If the program has been loaded but the robot cannot be connected successfully, please check whether the following requirements have been met.

- IPC end:
  1. The firewall is turned off.
  2. The IPC can communicate with the robot IP address with the ping command in the command prompt.
  3. There is no interference from any antivirus software.
  4. Two network ports of the IPC belong to different subnets and there is no conflict.

5. If the IPC is connected via a router, there is no interference from other network cables.

- Robot end:
  1. The Ethernet cable is connected to the WAN port of the controller properly.
  2. The robot IP address is set correctly. Please ensure that the set IP address is that of the WAN port instead of others.
  3. You have run the program on the robot end.