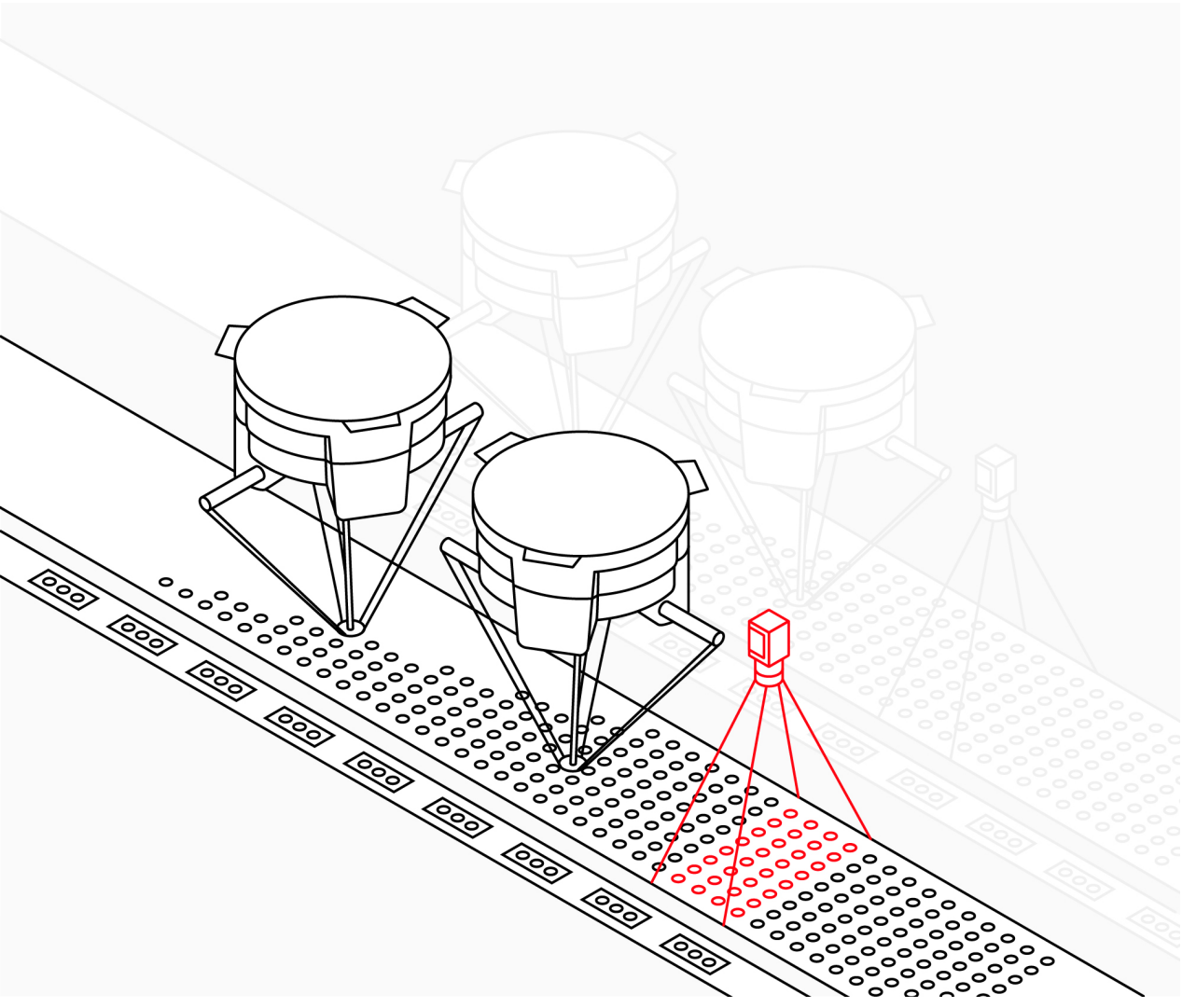
ROBOTICS

Application manual

PickMaster® Twin - Operator



Trace back information:
Workspace Main version a589
Checked in 2024-05-28
Skribenta version 5.5.019

Application manual

PickMaster® Twin - Operator Release 2.4

OmniCore and IRC5

Document ID: 3HAC069977-001

Revision: M

The information in this manual is subject to change without notice and should not be construed as a commitment by ABB. ABB assumes no responsibility for any errors that may appear in this manual.

Except as may be expressly stated anywhere in this manual, nothing herein shall be construed as any kind of guarantee or warranty by ABB for losses, damage to persons or property, fitness for a specific purpose or the like.

In no event shall ABB be liable for incidental or consequential damages arising from use of this manual and products described herein.

This manual and parts thereof must not be reproduced or copied without ABB's written permission.

Keep for future reference.

Additional copies of this manual may be obtained from ABB.

Original instructions.

Table of contents

This page is intentionally left blank

Overview of this manual

About this manual

This manual contains instructions for installation, configuration, and daily operation of PickMaster Operator.

Usage

This manual should be used during installation, configuration, and operation of a PickMaster system.

Who should read this manual?

This manual is intended for:

- Installation personnel
- Programmers
- Integrators
- Operators

Prerequisites

Any maintenance/repair/installation personnel working with an ABB robot must be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.

Disclaimer

PickMaster Operator is a robot application software that requires the user to ensure the safety of the robot or equipment during operation. If losses are caused by user negligence or improper operation, the corresponding responsibility shall be borne by the user.

Continues on next page

Continued

Cybersecurity

This product is designed to be connected to and to communicate information and data via a network interface. It is your sole responsibility to provide, and continuously ensure, a secure connection between the product and to your network or any other network (as the case may be).

You shall establish and maintain any appropriate measures (such as, but not limited to, the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB Ltd and its entities are not liable for damage and/or loss related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Note

Only qualified personnel should write or modify the script files.

It is the responsibility of the writer to make sure that the cell is safe when running with the script files.

The PickMaster Operator will use the following ports:

- 50000 (PickMaster Runtime communication)
- 9000 (Zenon event port)
- 6001 (PickMaster Runtime communication)
- 502 (For remote control with Modbus)

References

OmniCore

Reference	Document ID
Application manual - PickMaster Twin - PowerPac	*3HAC080435-001*
Product specification - PickMaster® Twin	*3HAC073650-001*
Circuit diagram - PickMaster Twin	*3HAC024480-020*
Safety manual for robot - Manipulator and IRC5 or OmniCore controller [i]	*3HAC031045-001*
Application manual - Conveyor tracking	*3HAC066561-001*
Product manual - OmniCore C30	*3HAC060860-001*
Product manual - OmniCore C90XT	*3HAC073706-001*
Operating manual - OmniCore	*3HAC065036-001*
Operating manual - Integrator's guide OmniCore	*3HAC065037-001*
Application manual - Controller software OmniCore	*3HAC066554-001*
Technical reference manual - Event logs for RobotWare 7	*3HAC042927-001*
Technical reference manual - Lubrication in gearboxes	*3HAC042927-001*

Continues on next page

Reference	Document ID
Technical reference manual - System parameters	*3HAC065041-001*

i This manual contains all safety instructions from the product manuals for the manipulators and the controllers.

IRC5

Reference	Document ID
Application manual - PickMaster Twin - PowerPac	*3HAC080435-001*
Product specification - PickMaster® Twin	*3HAC073650-001*
Circuit diagram - PickMaster Twin	*3HAC024480-020*
Operating manual - RobotStudio	*3HAC032104-001*
Application manual - Conveyor tracking	*3HAC050991-001*
Product manual - IRC5	*3HAC047136-001*
Product manual - IRC5 Panel Mounted Controller	*3HAC027707-001*
Operating manual - IRC5 with FlexPendant	*3HAC050941-001*
Operating manual - IRC5 Integrator's guide	*3HAC050940-001*
Operating manual - Troubleshooting IRC5	*3HAC020738-001*
Technical reference manual - RAPID Instructions, Functions and Data types	*3HAC050917-001*
Technical reference manual - RAPID Overview	*3HAC050947-001*
Technical reference manual - System parameters	*3HAC050948-001*

Revisions

Revision	Description
A	First edition.
B	Published in release 21A. The following updates are made in this revision: • Added information on supporting OmniCore controller. • Minor corrections. • Updated Zenon installation chapter. • Added notes for real Runtime connection. • Added Zenon license description. • Updated whole solution folder from PickMaster Powerpac is needed when importing a solution in PickMaster Operator.
C	The following updates are made in this revision: • Minor corrections.
D	Published in release 21B. The following updates are made in PMTW 1.1.1 revision: • Updated System requirements in chapter *Installing and uninstalling ABB ZENON on page 21*. • Updated installation procedure in chapter *Installing and uninstalling ABB ZENON on page 21*.

Continues on next page

Continued

Revision	Description
E	Published in release 22A. The following updates are made in PickMaster® Twin 2.0 revision: • Updated software requirements to .Net Framework 3.5 in chapter *Installing and uninstalling ABB ZENON on page 21*. • Updated preparation installation procedure in chapter *Installing and uninstalling ABB ZENON on page 21*. • Updated ABB ZENON installation procedure in chapter *Installing and uninstalling ABB ZENON on page 21*. • Added Recipe Manager function and Remote Controller signal definition. • Updated information for PickMaster® Twin 2.0 revision.
F	The following updates are made in PickMaster® Twin 2.0.1 revision: • Added RobotStudio software requirements to in chapter *System requirements on page 19*. • Updated Recipe Manager function and Remote Controller signal definition for Profinet. • Minor corrections.
G	Released with PickMaster® Twin 2.1 revision: • Supported multiple languages. • Updated user management function. • Updated PackML information. • Added PMRT login function when connecting to PMRT. • Added ProfiNet slot in Appendix. • Minor corrections.
H	Released with PickMaster® Twin 2.1.1: • Minor corrections.
J	Released with PickMaster® Twin 2.2. • Supported external sensor function. • Updated user lockout mechanism. • Updated signal definition in softPLC and Appendix. • Updated optional robot working mechanism. • Supported solution transfer function. • Supported multiple languages. • Minor corrections.
K	Released with PickMaster® Twin 2.3. • Supported auto-start function. • Updated Runtime file transfer function. • Minor corrections.
L	Released with PickMaster® Twin 2.3.1. • Changed **Recipe Manager** to **Recipe Selector**. • Supported PickMaster Recipe Manager to edit solution without PickMaster PowerPac. • Updated network setting for IPC. • Updated available permission components for new role in **Role Management**. • Changed ABB Ability to ABB Connect. • Minor corrections.

Continues on next page

Revision	Description
M	Released with PickMaster® Twin 2.4 • Added IP address updated solution in COD file for remote control with EtherNet/IP. • Updated PickMaster Twin installation procedure. • Updated PickMaster Twin Hardware connection illustration. • Updated occupied ports in Cybersecurity. • Updated Pack&Go file path default folder to C:\Program-Data\ABB\PickMaster Twin\PackedSolutions. • Updated the Terms for Client and Host. • Minor corrections.

Safety

Safety of personnel

A robot is heavy and extremely powerful regardless of its speed. A pause or long stop in movement can be followed by a fast hazardous movement. Even if a pattern of movement is predicted, a change in operation can be triggered by an external signal resulting in an unexpected movement.

Therefore, it is important that all safety regulations are followed when entering safeguarded space.

Safety regulations

Before beginning work with the robot, make sure you are familiar with the safety regulations described in the manual *Safety manual for robot - Manipulator and IRC5 or OmniCore controller*.

When using PickMaster® Twin products

- When using with PickMaster® Twin products, it is the user's responsibility to adhere to the relevant standards and safety directives. In addition, the application manuals for proper use must be observed.
- Only personnel with appropriate training and required knowledge are allowed to use PickMaster® Twin products.
- The integrator installing the PickMaster® Twin is responsible for the safety.
- Wherever possible, the auto mode of operation shall be performed with all persons outside the safeguarded space.
- An emergency stop must also be available to make sure the emergency stop function is enabled.
- PickMaster® Twin only provides Operational Stop (Program Stop). The integrator shall make sure that proper Normal Stop (machinery stop) is configured correctly in the system.
- Make sure the hazardous situation that resulted in the emergency stop condition no longer exists. Release the emergency stop button manually to remove the emergency stop condition.
- Stops for the machine is the responsibility of the integrator and must be addressed according to local legislation.
- The integrator is responsible to conduct a risk assessment of the final application.
- Sensitive body parts, such as the eyes and the larynx, must be protected by personal protective equipment (PPE).
- Protective measures should be the precondition when using PickMaster® Twin products. PickMaster® Twin does not guarantee the robot targets are always in safe zone. It is integrator's responsibility to take protection measures, like using safe-move or setting proper robot work range etc.

Continues on next page

- Safety related status and operations shall be handled on the controller and by safety rated systems. PickMaster® Twin status information shall not be used as input for safety related information and operations.
- Protective measures should be the precondition when install/adjust/replace hardware parts, for example, the camera.
- The stop functions in PickMaster® Twin can never be used to replace A-stop/E-stop or any other safety related stops.

This page is intentionally left blank

1 Introduction and installation

1.1 Introduction to PickMaster Operator

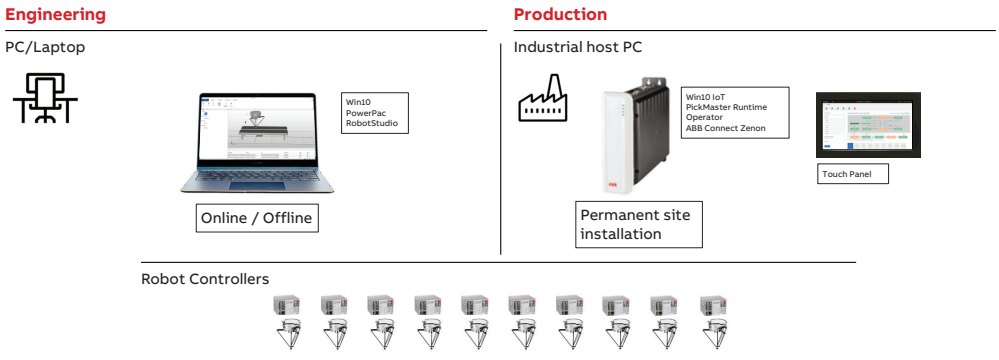
About PickMaster® Twin

PickMaster® Twin is an application product designed for vision based high speed picking of random flow products on the fly. PickMaster® Twin supports ease-of use configuration, simulation and operation of a big variation of smaller or larger line layouts composed of a multitude of robots, cameras, conveyors and fixed work areas. It is a production system that comprises all steps in the life cycle of a picking installation from proposal, engineering, commissioning, operation to maintenance and support.

PickMaster Operator can be customized for some of the following special needs:

- With the integrated vision system it can be used for full random operation on a continuously moving conveyors and for absolute accurate positioning on indexed feeders or trays.
- Without vision recognition it can be used as a tool for the efficient production with guided product flows on multiple conveyors.
- For efficient quality inspection and product categorization alone or together with the position recognition.

PickMaster® Twin is a modular product for controlling ABB robots in picking applications through the robot controller. It is configurable to perform pick and place operations of items. A vision system is used to find randomly placed items on conveyor belts or indexing static work areas. PickMaster Operator is the engineering software aimed at configuring and validating the application in offline simulation with a virtual system and in online mode directly connected to the real installation. It uses comprehensive graphical interfaces to configure powerful applications, where it can control multiple robots picking and placing sensor-detected items on different conveyor belts.



xx2100001619

PickMaster® Twin comprises the following modules:

PickMaster® PowerPac

Ease of Use software for offline and online configuration and commissioning in a visual 3D environment, powered by RobotStudio™.

Continues on next page

PickMaster® Operator

State-of-the art user interface for operating PickMaster on the shop floor, built on ABB Connect Zenon data management software.

PickMaster® Runtime

Efficient runtime operation software for orchestrating the coordination of the packaging process for a multitude of robots and conveyors including integrated vision software for precise robot guidance and quality inspection.

- Virtual Runtime: running the PickMaster process in a simulated virtual environment on a client system connected to virtual robot controllers.
- Real Runtime: running the PickMaster process in the real production installation on the Host computer connected to real robot controllers.

Note

PickMaster® Twin is delivered with different hardware configurations. For more information, see *Product specification - PickMaster® Twin*.

About PickMaster Operator

PickMaster Operator is the production interface providing intuitive control and data visualization to PickMaster Runtime. It provides modern comprehensive touch control interfaces for safe operation of a PickMaster installation with up to ten robots. PickMaster Operator is designed to run on an industrial PC with a multi-touch color panel.

The operator built on the ABB Connect Zenon platform acts as a modern local control panel to run the line. Moreover, compliant with the OMAC PackML industry standard, it is easily connected to a cell PLC through modern fieldbus communication, understanding the same commands and status as related upstream and downstream packaging machinery. It also integrates with factory control systems for reporting and optimizing production pace and overall equipment efficiency (OEE).

PickMaster Operator features

- Operational top information bar
- Graphical tile page selection
- Full user authentication management and login control
- Compliance with OMAC PackML standard and additional transparency control and status of individual robots in a PickMaster line
- Integrated soft PLC with PackML operation logics
- Two hand operation safety
- Recipe management system
- Production dashboard
- Online parameter tuning
- Customized graphical line layout
- Production control page
- Vision result display and recording

Continues on next page

About this chapter

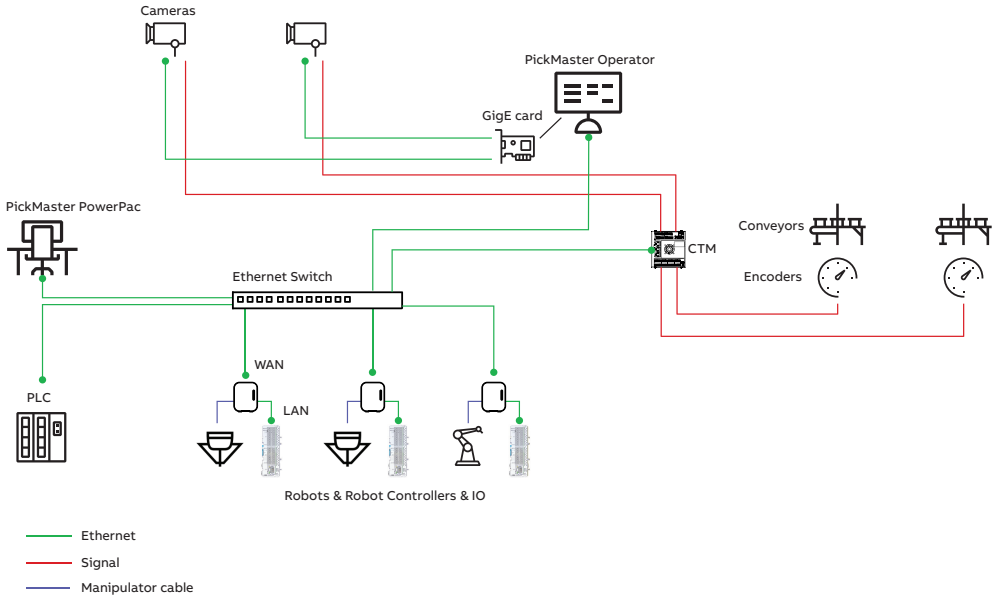
This chapter will guide you through the installation process, which consists of these steps:

- *Installing and uninstalling ABB ZENON on page 21*
- *Installing and uninstalling PickMaster Twin Host on page 39*
- *Network setting on page 41*

1.2 PickMaster® Twin Hardware connection illustration

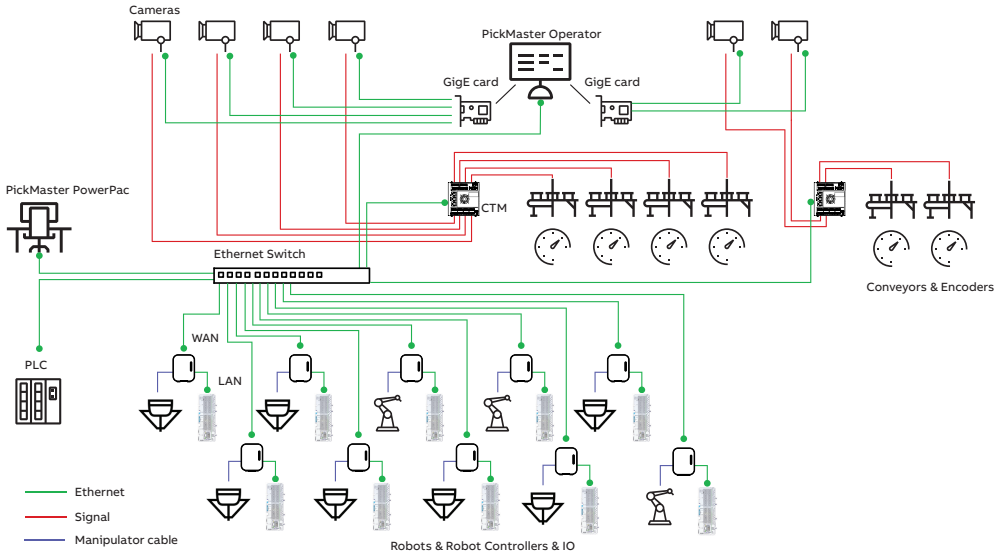
Example

The following illustration is showing an installation example with 3 robots, 2 cameras and 2 conveyors.



xx1900001746

The following illustration is showing an installation example with 10 robots, 6 cameras and 6 conveyors.



xx2400000560

1.3 System requirements

1.3.1 Hardware and software requirements

Hardware and software requirements for PickMaster Twin Client

Hardware requirements

Following are the hardware requirements:

- A log on account with administrator rights on the computer.
- CPU: 2.0 GHz or faster processor. Multicore processor is recommended.
- Memory: 8 GB RAM is the minimum requirement if running Windows 64bit edition. 16 GB or more is recommended if working with vision or heavy CAD models.
- Free disk space: 10+ GB free space, solid state drive (SSD) recommended.
- Graphics card: High-performance, DirectX 11 compatible, gaming graphics card from any of the leading vendors. For the Advanced lightning mode Direct3D feature level 10_1 or higher is required.
- Display settings: 1920 x 1080 pixels or higher resolution is recommended.
- Mouse: Three-button mouse
- If robot movement can be initiated from an external control panel then an emergency stop must also be available.

Note

When running the software, close other software that consumes a lot of memory, otherwise it will affect the software normal use.

Software requirements

Following are the software requirements:

- Windows 10 (64 bit)
- Acrobat reader
- RobotStudio 2024.2
- Omnicore with RobotWare 7.12
- IRC5 with RobotWare 6.15

Hardware and software requirements for PickMaster Twin Host

Recommended hardware

- Windows 10 (64 bit) IPC, 2GHz, 500 GBit SSD, 8 GBit RAM
- Memory: 8 GB RAM is the minimum requirement if running Windows 64bit edition. 16 GB or more is recommended if working with vision or heavy CAD models.
- Recommended 23 inches 1920x1080 multi-touch screen
- Minimum two USB slots, one Ethernet port and one free PCI Express slot for a 168 mm x 110 mm size PCIE card

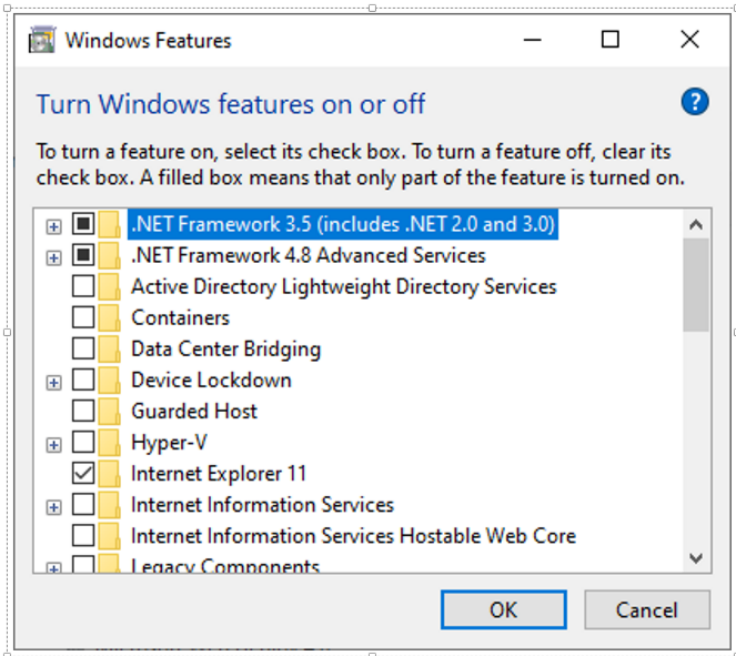
Continues on next page

1.3.1 Hardware and software requirements
Continued

- Ethernet switch (robot network)

Software requirements

- Microsoft Windows 10, 64 bit (Home, Pro, Enterprise, Education, IoT, x64 versions) for touch panel
- Environment Requirement：.Net Framework 3.5



xx2300001704

- RobotStudio 2024.2
- Omnicore with RobotWare 7.12
- IRC5 with RobotWare 6.15

1.4 Installing and uninstalling ABB ZENON

Overview

This section describes the installation process for the ABB ZENON.

Tip

The ABB ZENON 8.0 installation file is included in the Host installation package.

Note

Each ABB ZENON installation file contains at least one demo license.

This has a pre-defined duration or number of permitted starts. If these are used up, the product can continue to be used in demo mode, but production is ended after running for 10 minutes. You can find the usage period that is available in the License Manager in the License usage tab in the details of the license.

Prerequisites

To start the installation process, the following must be available:

- A computer that meets or exceeds the *System requirements on page 19*.
- A log on account with administrator rights on the computer.

Installing ABB ZENON

Preparation

Before installing ABB ZENON:

1. All current operating system updates must be installed.

   Note

   If you always use the latest version (Service Pack) of your operating system, you cannot only avoid compatibility issues but also security problems.

2. There must not be a restart pending.
3. The system requirements are checked before installation. If the requirements are not met, these will be shown on a separate page with notices on how to rectify this.
4. **Automatic Windows updates** influence the installation. If an update of the Windows operating system is carried out while the ABB ZENON setup is running, it can cause problems.

   To prevent this: Deactivate the automatic Windows update during the ABB ZENON installation and carry out the Windows update before starting the ABB ZENON installation.
5. During the installation of ABB ZENON, the ABB Multiple Network Protocol Driver (cdprotdrv.sys) is installed. To start the driver, the operating system must be restarted after installation.

Continues on next page

Tip

Installing ABB ZENON offline is recommended.

Due to the accidental network unstable issue, the online installation may be interrupted and cause problem.

Tip

The installation will take a long time.

Do not power off your computer during the installation.

Installing ABB ZENON

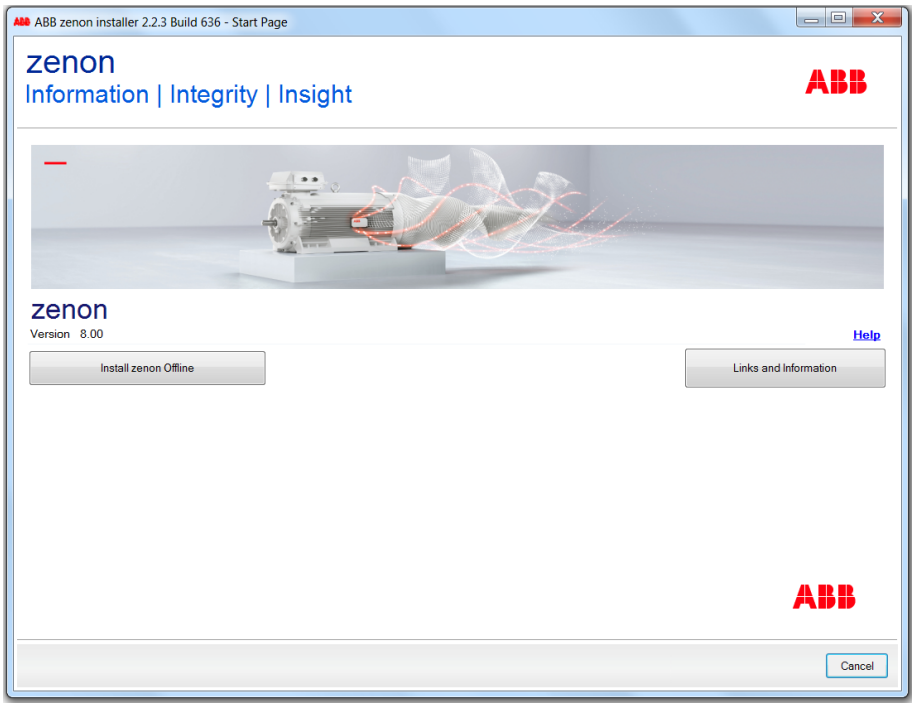
Use this procedure to install ABB ZENON offline:

1. Open the ABB ZENON installation folder in the Host installation package and run the installation file `start_menu.exe` as administrator to open the installation window.

   Note

   Install ABB ZENON from the computer directly. If install ABB ZENON from a mobile device, for example an U-disk, PickMaster Operator may fail to work during the production.

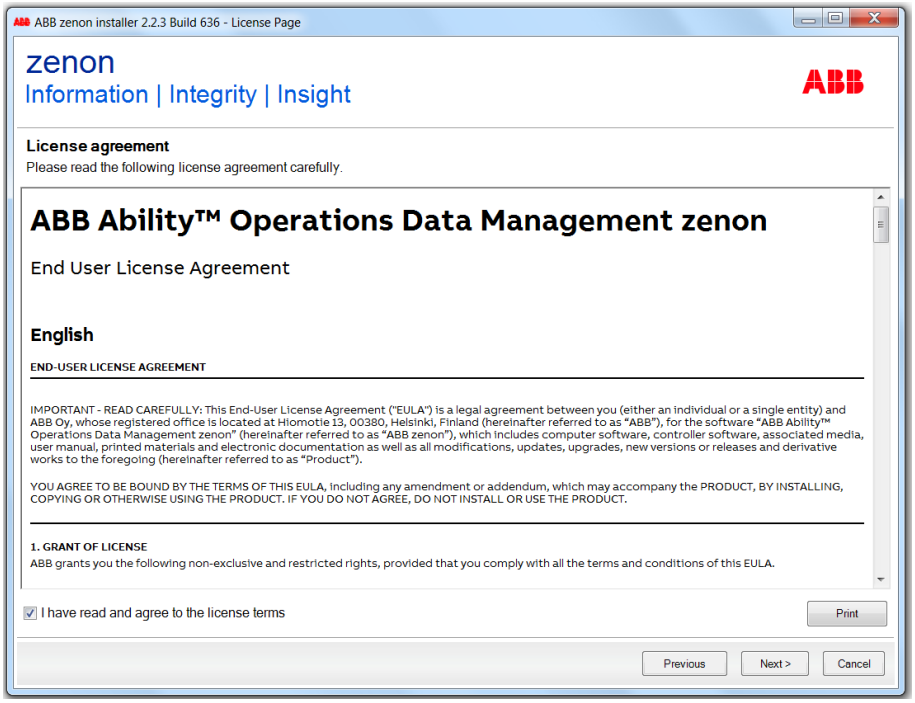
2. Choose the language.
3. Click on **Install Zenon Offline** button to show next page.



xx1900000346

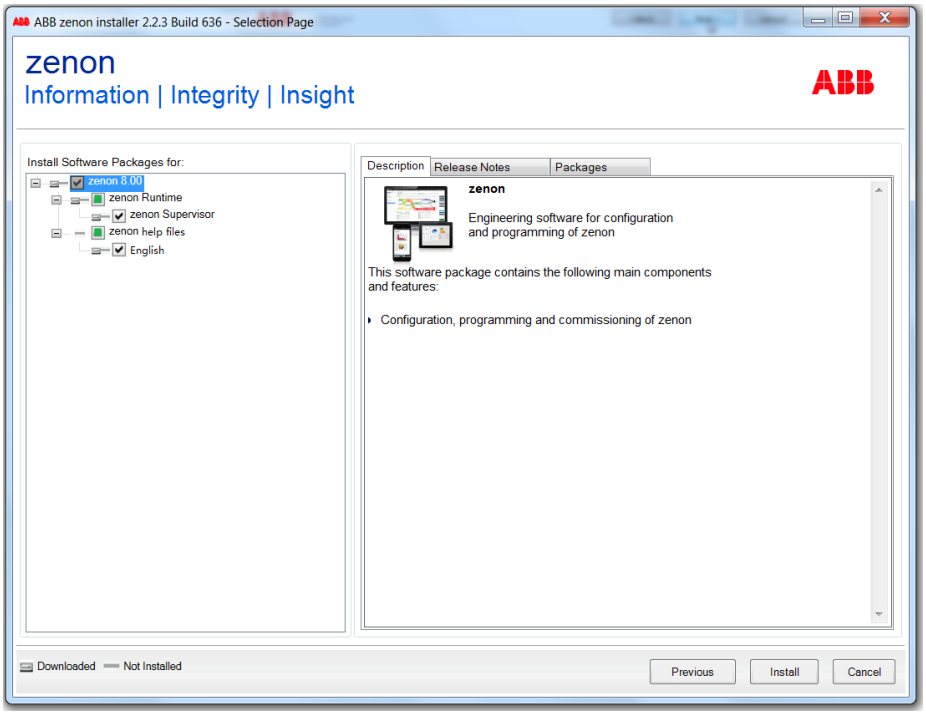
Continues on next page

4 On the pop-up following page, read the **license agreement** and accept the terms. Then click on **Next**.



xx1900001415

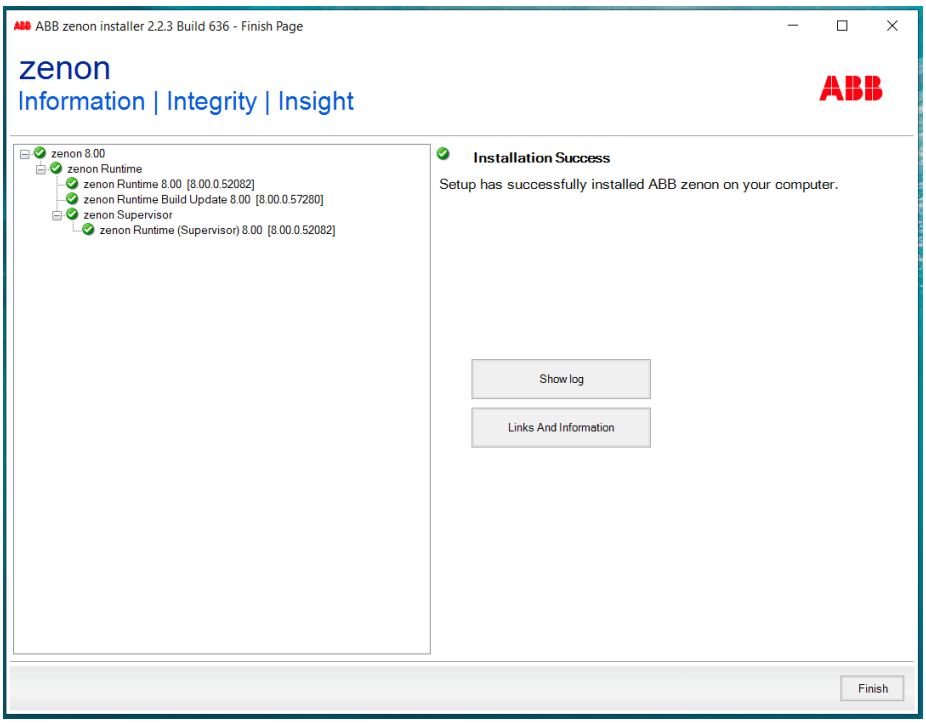
5 On the pop-up following page, confirm the installation information and click on **Install** to start the installation.



xx1900001750

Continues on next page

6 When the installation is completed, click **Finish**.



xx1900002594

Uninstalling ABB ZENON

Note

Follow the procedure to uninstall the ABB ZENON. Otherwise the ABB ZENON cannot be installed on the same computer normally.

Note

Return the license to release it before any uninstalling ABB ZENON work.

Otherwise the license will be occupied by the uninstalled ABB ZENON and may not be reused anymore.

If this already happened, please contact ABB.

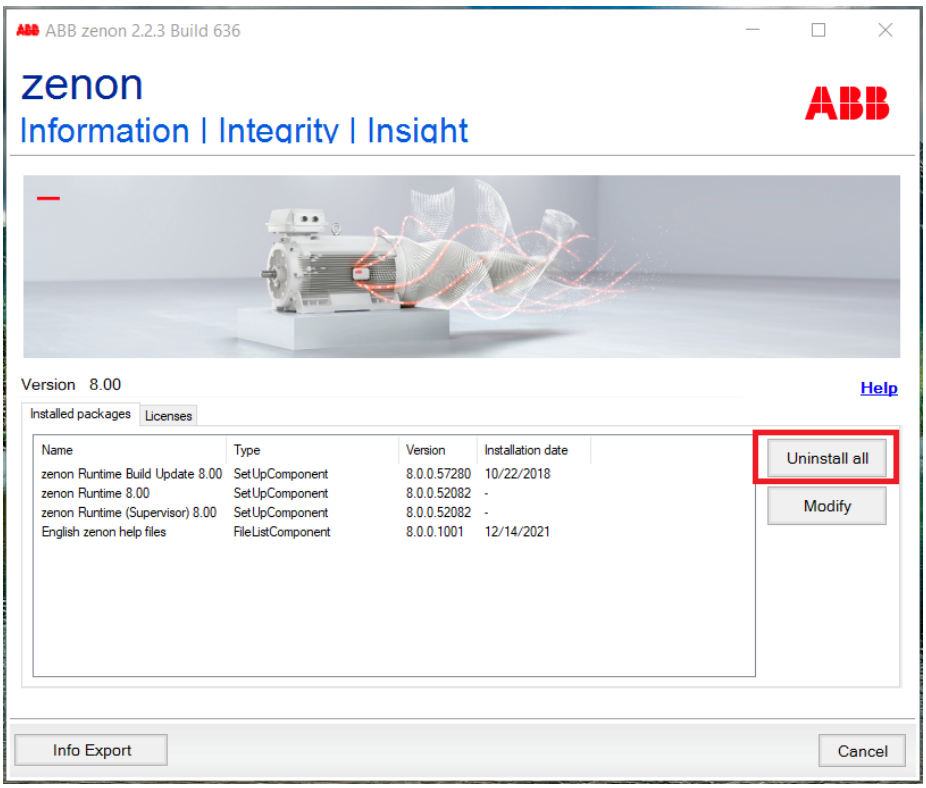
Use this procedure to uninstall ABB ZENON:

1 Start the ZENON 8.00 Installation Manager.

xx2000000311

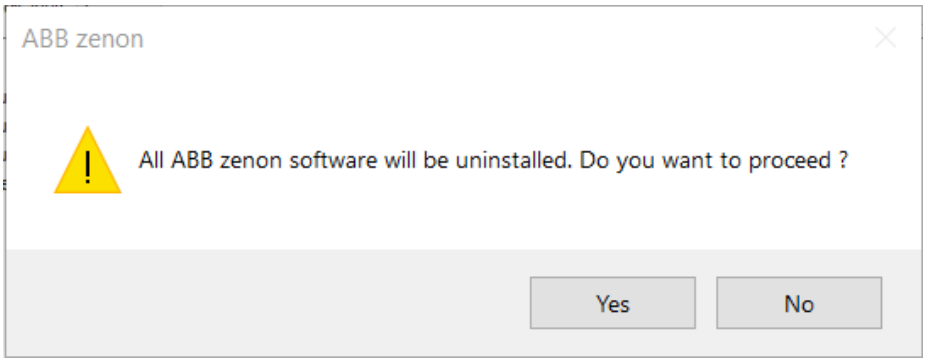
Continues on next page

2 Click **Uninstall all** on the pop-up window.



xx2000000312

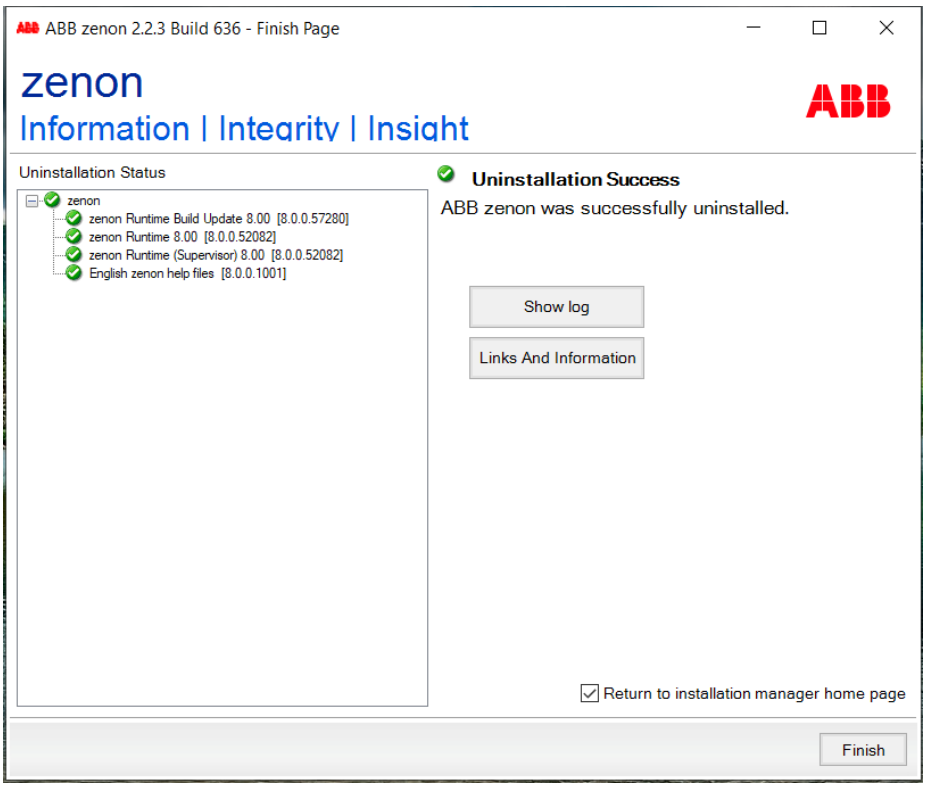
3 Click **Yes** on the pop-up dialog box.



xx2000000313

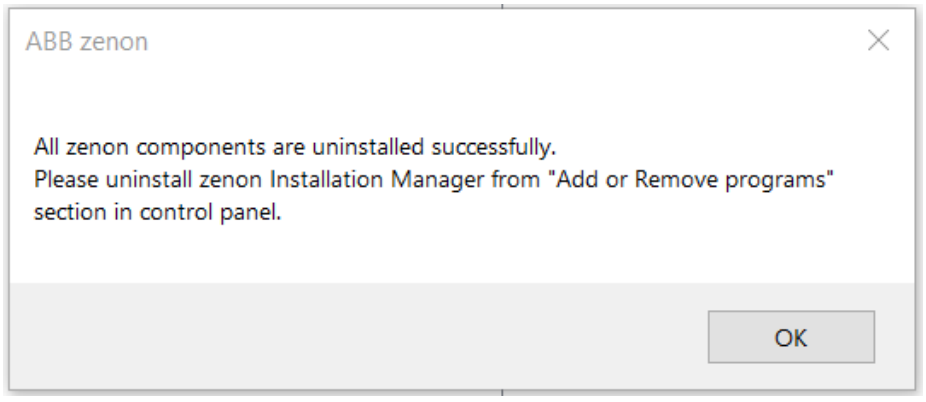
Continues on next page

4 When the uninstallation is completed, click **Finish**.



xx2200002183

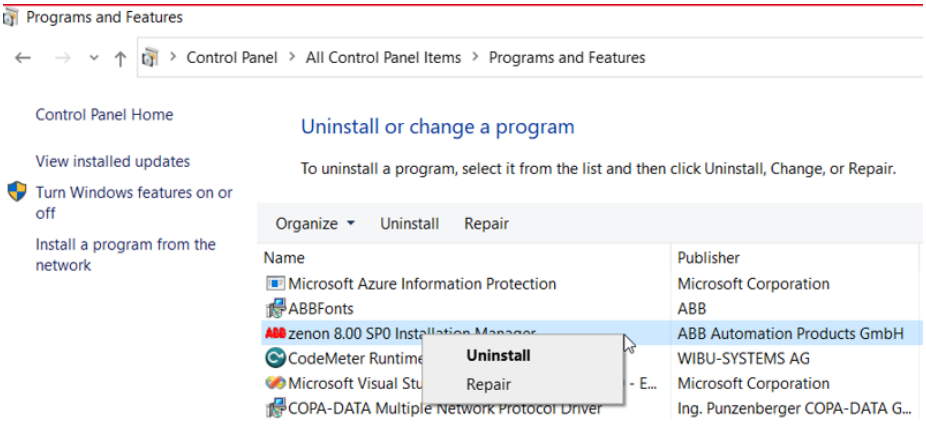
A notice to remove the ZENON 8.00 Installation Manager will pop up after clicking Finish.



xx2200002184

Continues on next page

5 Remove the ZENON 8.00 Installation Manager from the control panel.



xx2200002185

Frequent sources of error during installation

1 The virus scanner is active and blocks the installation because the scanner may take it as a virus.

   Solution: Separate the system from the network and disable the virus scanner, then execute the installation again.

2 The firewall was not configured correctly.

   Solution: Separate the system from the network and disable the firewall, then execute the installation again.

3 Erroneous SQL-installation on the system.

   Solution: Create project.

4 The ABB ZENON earlier version is not uninstalled correctly. For more details on correct uninstall method, see *Uninstalling ABB ZENON on page 24*.

   Solution: If this happens, please contact ABB.

5 Proxy configuration settings pops up during the installation.

   For the ABB internal customer, please check the proxy settings before the installation. Select “Automatic detect settings”.

The installer cannot download the package when it can’t create a valid connection to the Amazon storage.

Please start installation again after resetting. If the problem still persists, please contact the IT service.

1.5 ABB ZENON license

Introduction

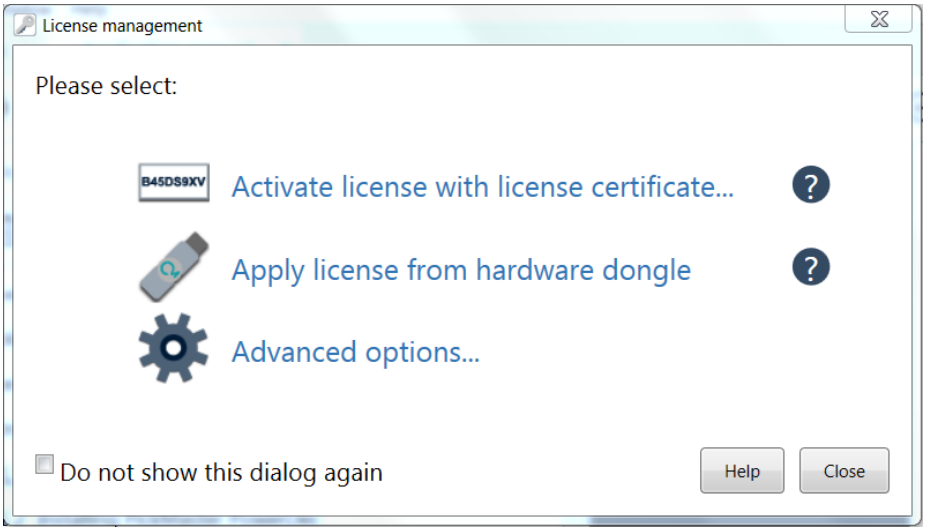
The license is enclosed in an envelope with the hardware product when it is purchased.

Access to the **License Manager** from the **License Manager** button on the user interface or the start menu of the computer.

Overview of activated license on the computer

Get an overview of the activated license with following steps:

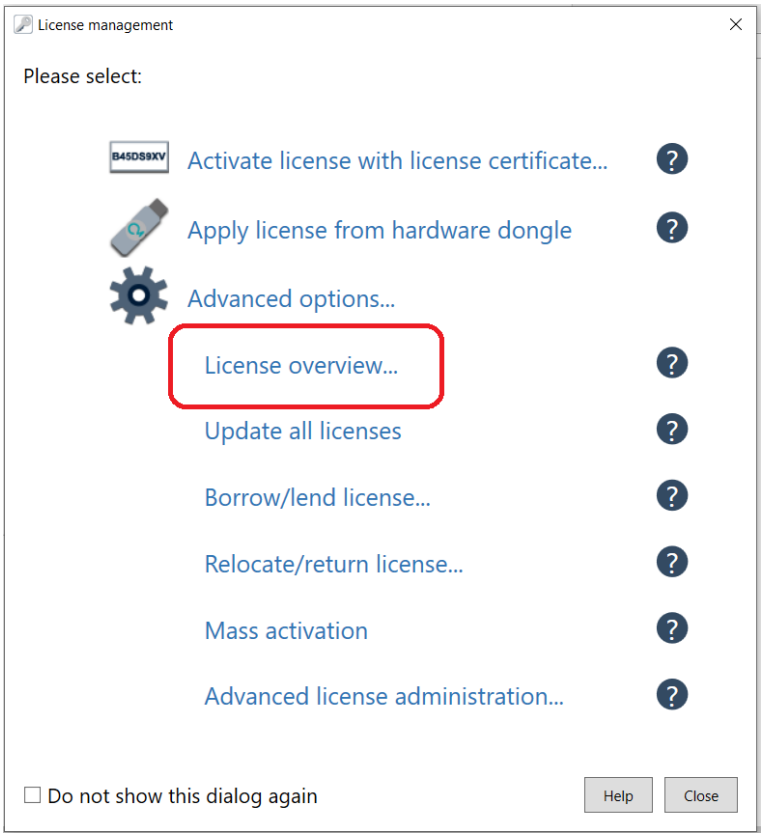
1 Open the **License Manager**.



xx1900000799

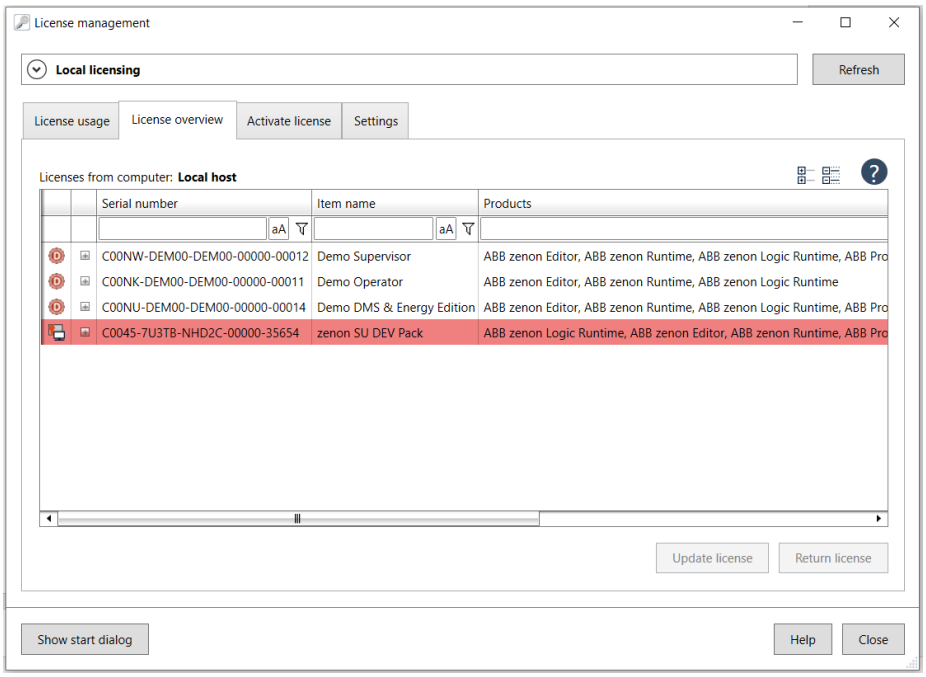
Continues on next page

2 Click on **License overview**.



xx2000000224

3 The all activated license show up in the pop-up window.



xx2000000225

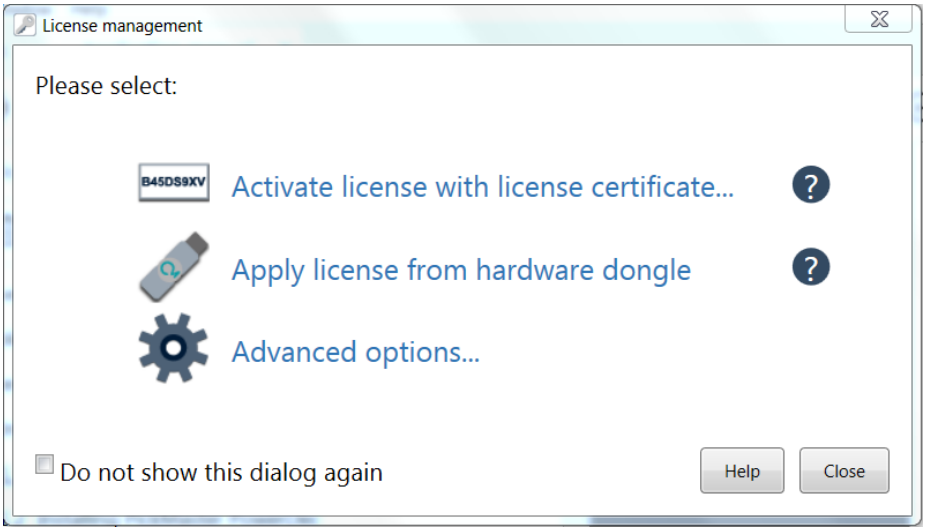
Continues on next page

Activating a license

Activating a license online

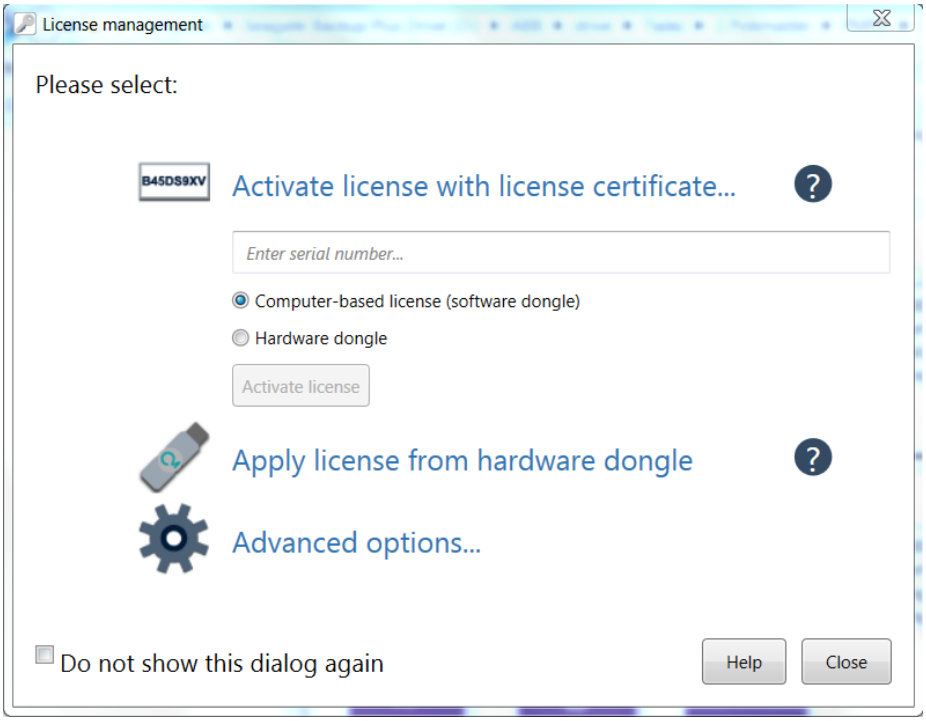
If this computer is with internet access, active the license with following steps:

1 Open the **License Manager**.



xx1900000799

2 Click on **Activate license with license certificate...** to open the *Enter serial number* text box.



xx1900000690

3 Enter a valid license for the PickMaster Operator in the text box.

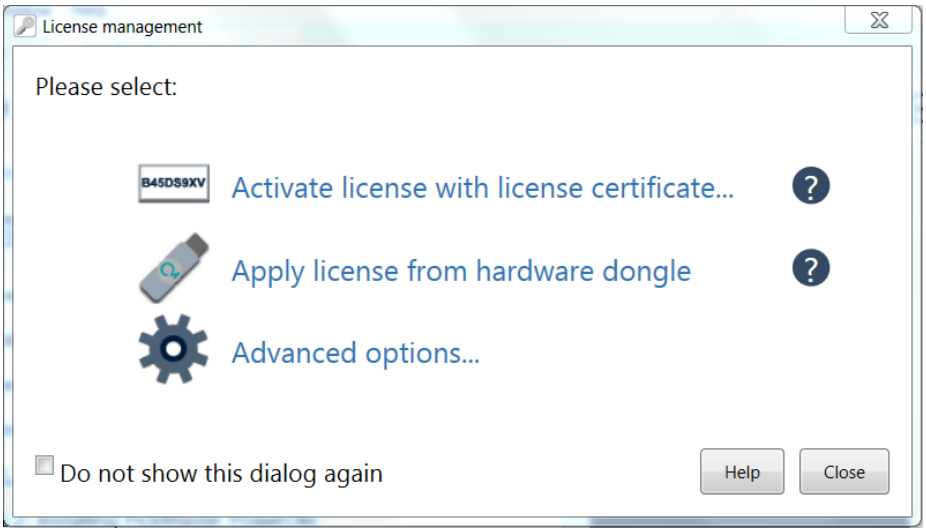
4 Click **Activate license** button.

Continues on next page

Activating a license offline

If this computer is without internet access, active the license with following steps:

1 Open the **License Manager**.

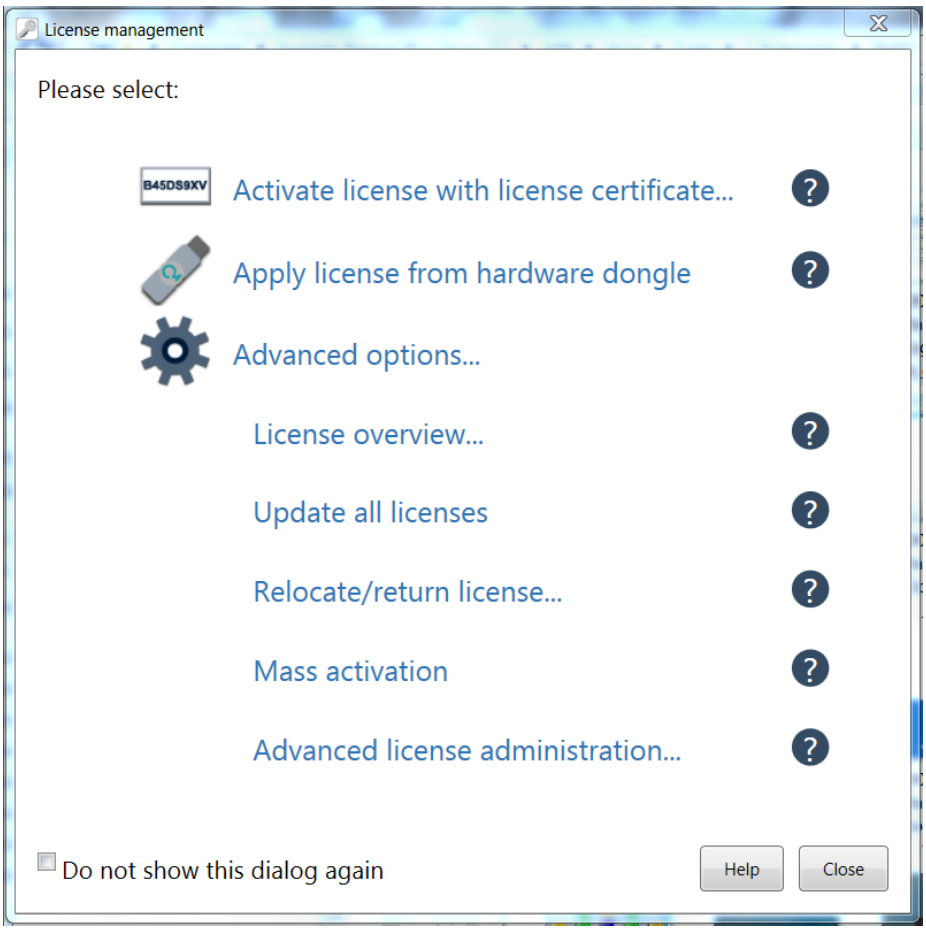


xx1900000799

Continues on next page

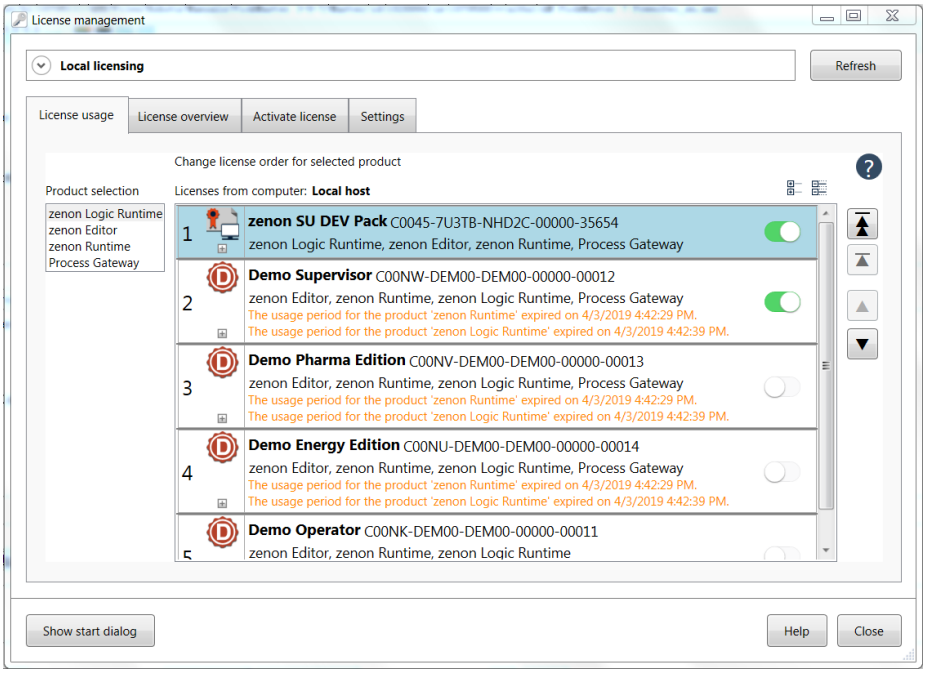
1.5 ABB ZENON license
Continued

2 Click on **Advanced options...** and then **Advanced license administration....**



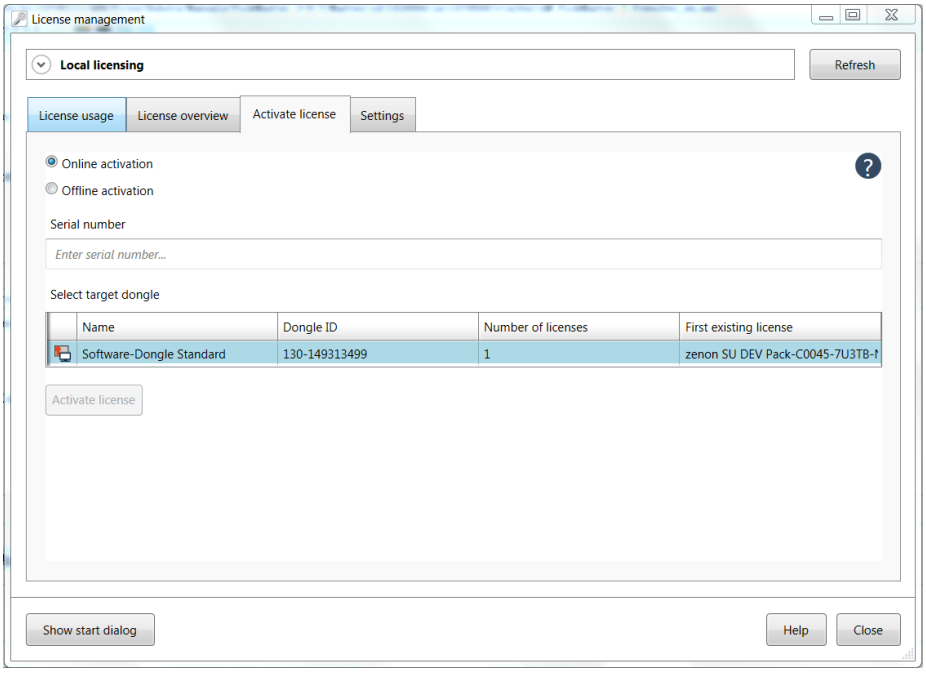
xx1900000694

Continues on next page



xx1900000691

3 Click on the **Activate license** tab.



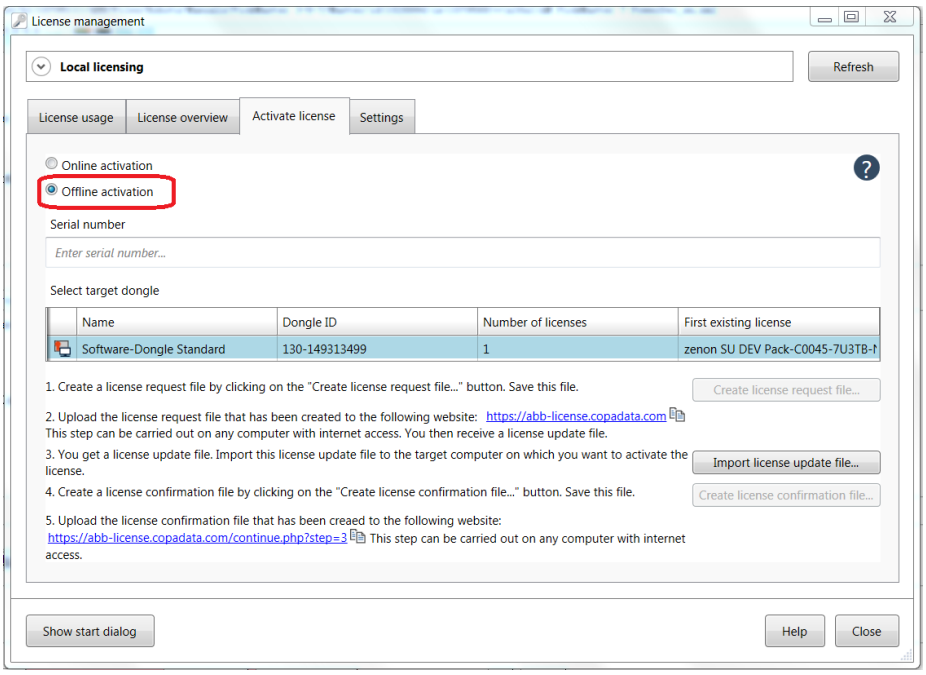
xx1900000692

Continues on next page

1.5 ABB ZENON license

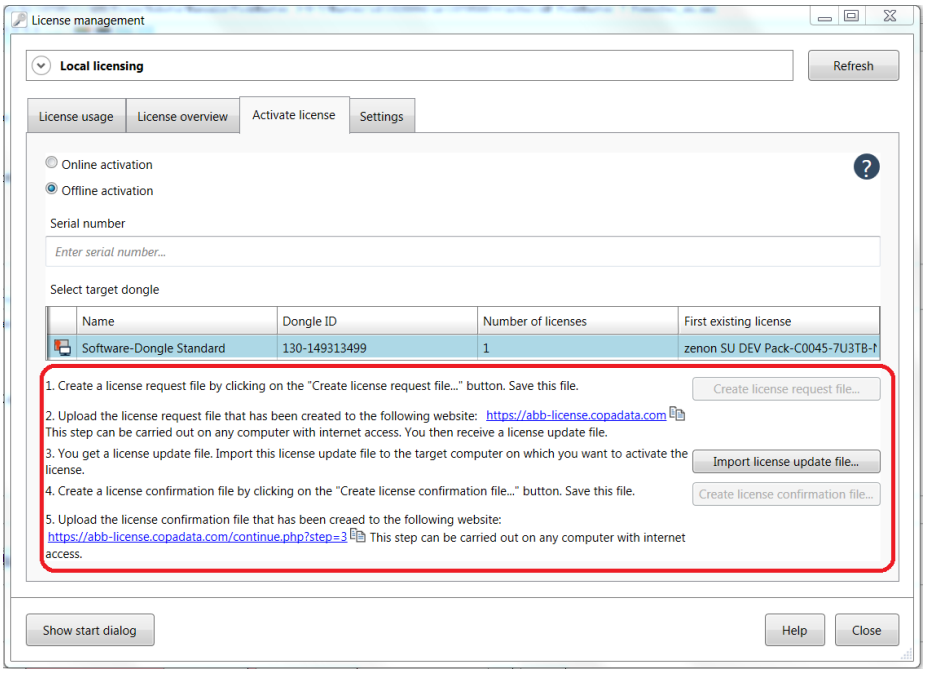
Continued

4 Click on the **Offline activation** option.



xx1900000693

5 Follow the steps to access an available license and activate it on your PickMaster Operator computer.



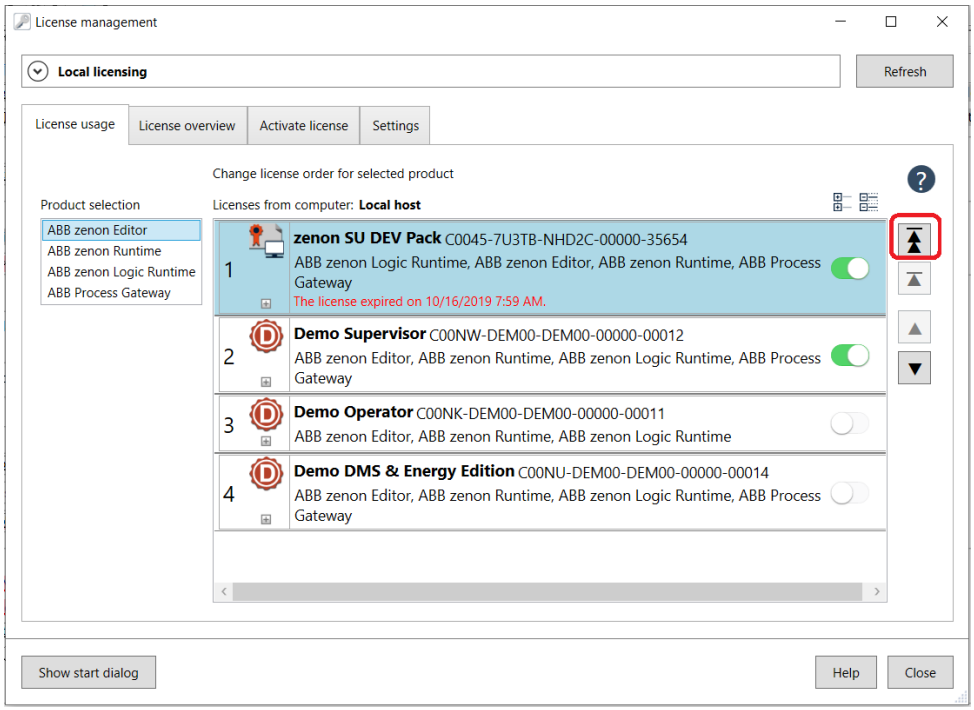
xx1900002351

Continues on next page

Note

If a valid license is already activated but the user still use the Demo license when launching PickMaster Operator, this is caused by that the license is not mentioned in the first choice.

Select the activated license and click the up button to bring the activated license to the first choice of the license.



xx2000000239

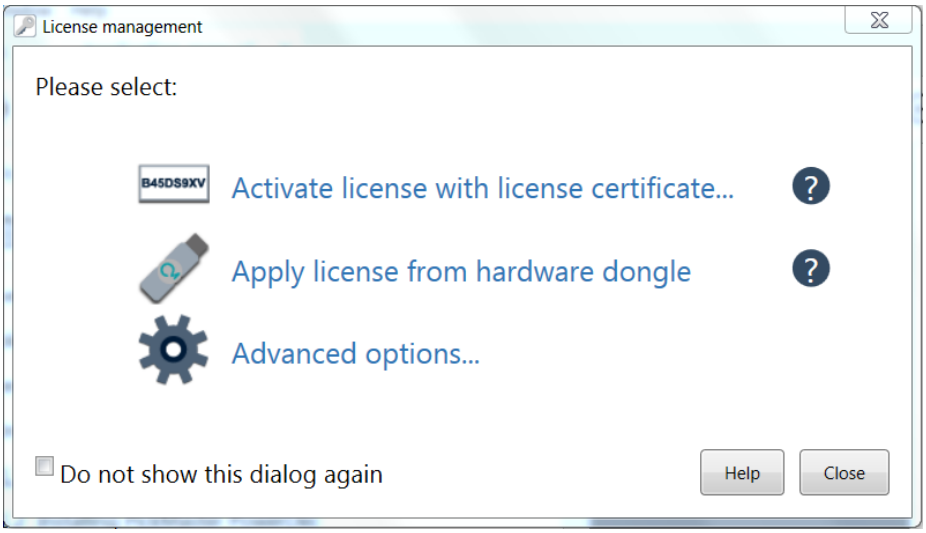
Retuning a license

When a license need to be released from one computer, return it first. During the validity period, it's allowed to activate the returned license on another proper computer.

Continues on next page

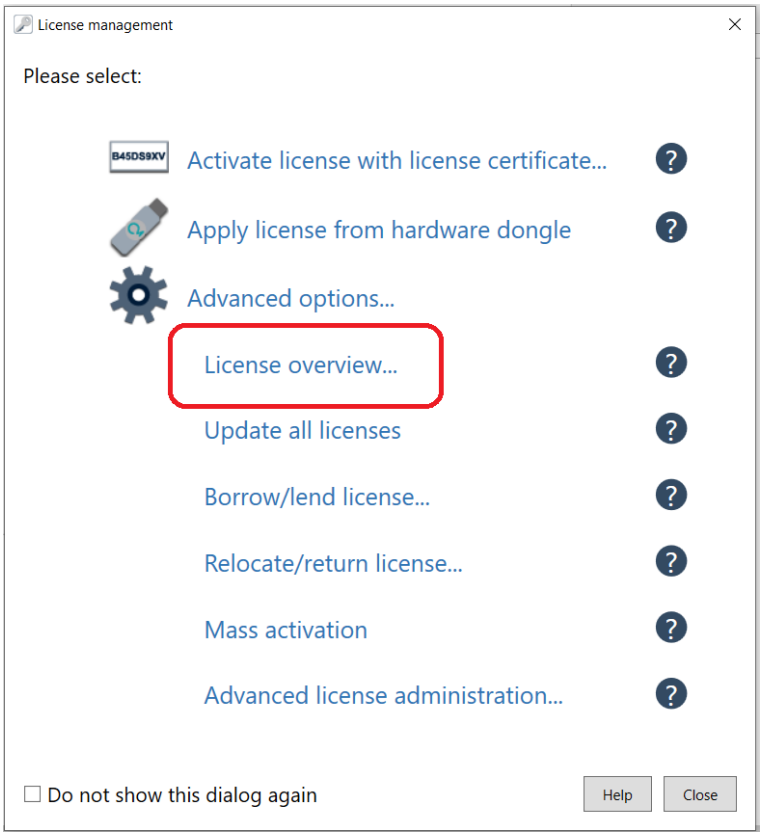
Return a license with the following steps:

1 Open the **License Manager**.



xx1900000799

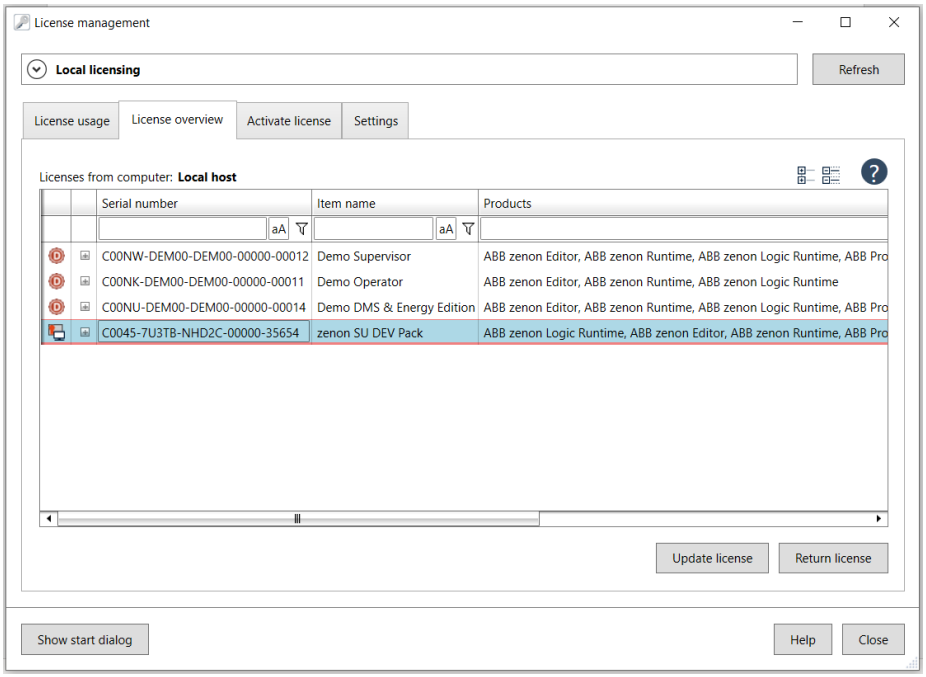
2 Click on **License overview**.



xx2000000224

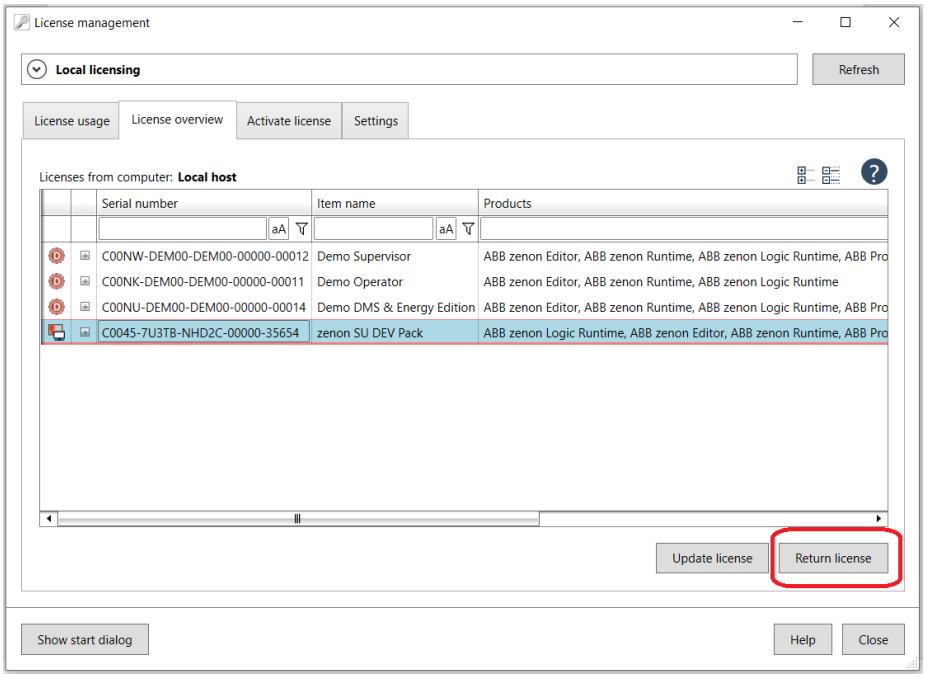
Continues on next page

3 Click on the license to be returned.



xx2000000227

4 Click on **Return License**.



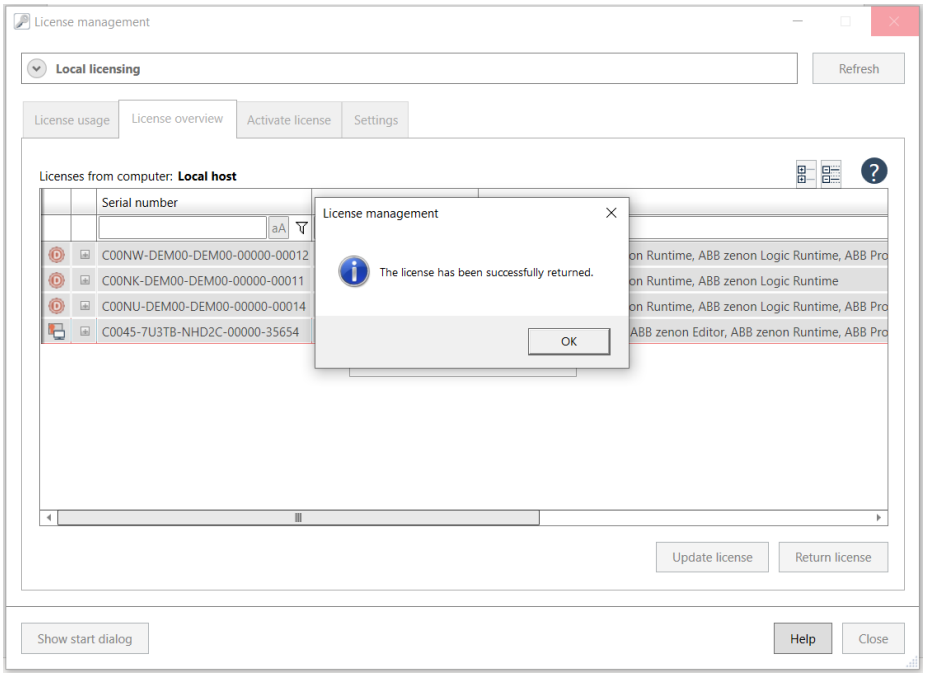
xx2000000228

Continues on next page

1.5 ABB ZENON license

Continued

5 Click **OK** when the license is successfully returned.



xx2000000229

Note

Return the license to release it before any uninstalling ABB ZENON work.

Otherwise the license will be occupied by the uninstalled ABB ZENON and may not be reused anymore.

If this already happened, please contact ABB.

1.6 Installing and uninstalling PickMaster Twin Host

Overview

This section describes the installation process for the PickMaster Twin Host.

The PickMaster Twin Host contains the PickMaster Operator and real Runtime for production.

Prerequisites

To start the installation process, the following must be available:

- A computer with ABB ZENON installed.
- A computer that meets or exceeds the *System requirements on page 19*.
- A log on account with administrator rights on the computer.
- PickMaster Twin Host installation package
- A license certificate

> **Note**
>
> The PickMaster Twin Client and PickMaster Twin Host are not recommended to be installed on a same PC.

Installing PickMaster Twin Host

Use the following procedure to install the PickMaster Twin Host:

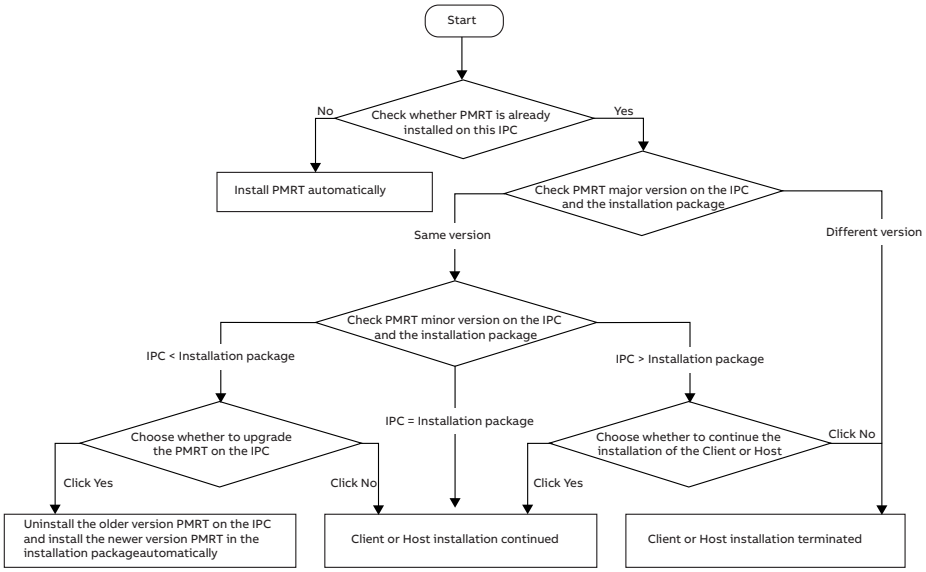
1. Browse to the PickMaster Twin Host installation package and double-click `Setup.exe`.

   The installation starts.
2. Click **Next**.
3. Read the **license agreement** and accept the terms.
4. Click **Next**.
5. PickMaster Twin Client will check whether the **Congnex vision driver** is already installed on this computer automatically.

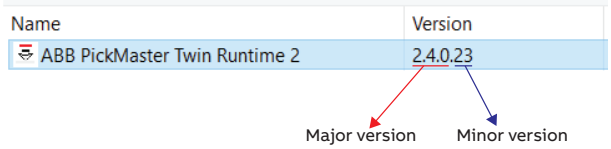
   If not, it will install the **Congnex vision driver** automatically.

Continues on next page

6 PickMaster Twin Client will check to install the PickMaster Runtime according to the following flowchart.



xx2400000341



xx2400000342

7 If installation is continued, click **Next**.

8 Click **Next** to start the installation.

9 When the installation is complete, choose to restart the computer now or later and click **Finish**.

Uninstalling PickMaster Twin Host

Use this procedure to uninstall PickMaster Twin Host:

1 Right click and select **Uninstall** on PickMaster Twin Host in the control panel.

2 If needed, select the **Uninstall Cognex drivers** checkbox to uninstall the cognex drivers on the computer.

3 Click **Next**.

4 Click **Yes** to start the uninstallation.

> **Note**
>
> If only PickMaster Twin Host is existing on the IPC, PickMaster Runtime will be uninstalled automatically at the same time.
>
> If PickMaster Twin Client and PickMaster Twin Host are both existing on the IPC, PickMaster Runtime will not be uninstalled.

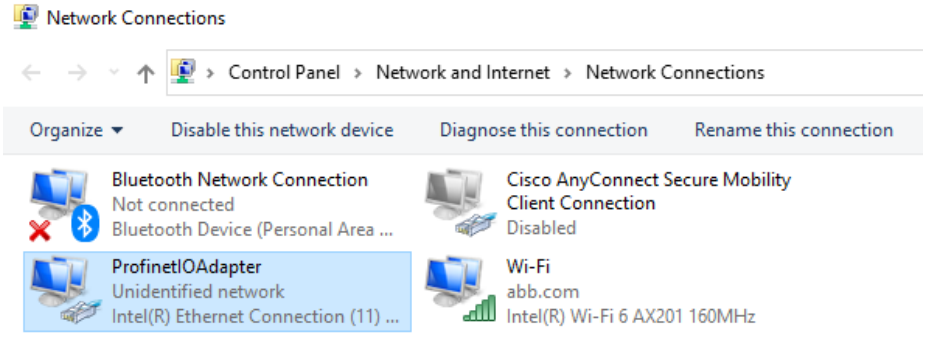
5 When the uninstallation is completed, click **Finish**.

1.7 Network setting

Configuring the IPC network

The following procedure is recommended to modify the computer network configuration which camera is connected to:

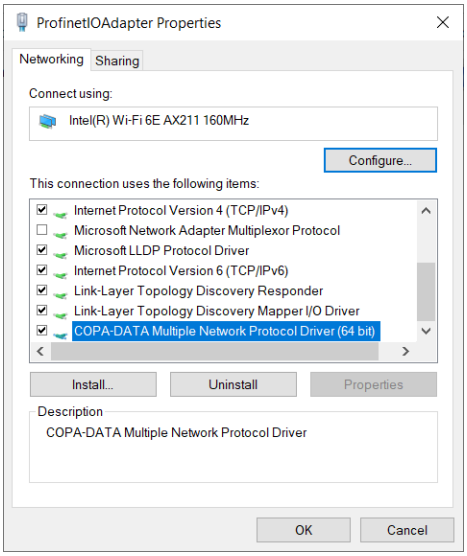
1 Open the **Network Connections** setting page, right click on the network you are currently using for connecting PickMaster Operator and rename the network name to "ProfinetIOAdapter".



xx1900001504

2 Open the property window of the "ProfinetIOAdapter" and make sure that the following protocols or drivers are selected:

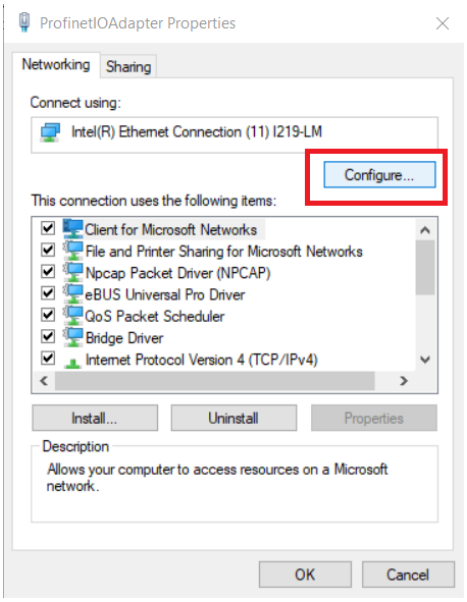
- **eBUS Universal Pro Driver**
- **COPA-DATA Multiple Network Protocol Driver (64 bit)**
- **Internet Protocol Version 4(TCP/IPv4)**



xx2300001722

Continues on next page

3 Click **Configure** and then choose the **Advanced** tab.



xx2200002067

4 Modify the following properties as necessary:
   - Select the **Jumbo Packet** property and choose the highest possible value in the dialog box.
   - In the **Networking** tab, clear all the check boxes listed under **This connection uses the following items** except for **eBUS Universal Pro Driver and Internet Protocol Version 4 (TCP/IpV4)**.
5 In addition, Cognex recommends you modify the following properties for this network connection, which may or may not be grouped together with the previous properties:
   - Change the **Receive Buffers** property and choose the highest possible value in its **Value** list.
   - Change the **Interrupt Moderation Rate** property to **Extreme** in its **Value** list.
6 Click **OK**.

Refer to the embedded Questions and Answers of the Gig Vision Configuration Tool for more details on what system properties you should modify as necessary.

Configuring the host computer IP address (COD file) for remote control over EtherNet/IP

Note

If the IP address in the COD file is not matched with host computer IP address, the remote control over EtherNet/IP can not be used.

Continues on next page

The following procedure is recommended to modify the host computer IP address for remote control over EtherNet/IP:

1. Contact ABB for support with the request to update the IP address for Ethernet/IP. Please state the correct IP address of the network adapter named “ProfinetIOAdapter” on the host computer in the case.
2. A new file named “STRATONRT.COD” with the correct IP address will be returned.
3. Replace the old “STRATONRT.COD” in the path “`C:\Program Files (x86)\ABB\PickMaster Twin 2\PickMaster Twin Host 2\PickMaster Operator\PMPDRT\RT\FILES\straton\PACK_ML`” by the new “STRATONRT.COD” file that returned.
4. Start the PMOP again, select “EtherNet/IP” fieldbus, enable remote control and verify that the communication is functioning.
5. If the communication is OK, close the case, else ask for more support.

Note

The COD file needs to be updated for each new version of PickMaster Twin Operator.

1.8 Accessing the user interface

Overview

This chapter describes the procedures before login.

> **Note**
>
> After installed PickMaster Twin Client and PickMaster Twin Host on different PC as recommended, there will be two real Runtime available but only the one connected to controller or camera should be used. This is the one that user should connect PickMaster Operator with and login.
>
> The real Runtime on Host PC and Client PC are identical but the one on Host is for production. Robot controllers and cameras should also be connected to this one.

Prerequisites

To start the PickMaster Operator, the following must be available:

- ABB ZENON must have been installed to the computer.
- PickMaster Operator must have been installed to the computer.
- A log on account with administrator rights on the computer.

Opening PickMaster Operator

Use this procedure to start PickMaster Operator:

1. Double click the `PickMaster Operator` file to open the **Welcome to ABB PickMaster** window.

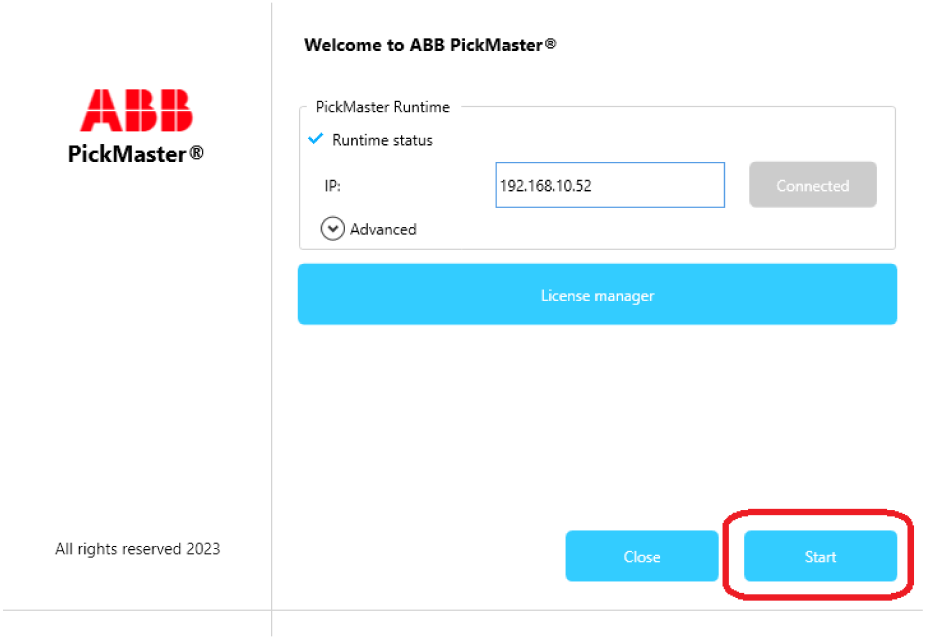
xx1900001506

2. Enter the IP address of the PickMaster Runtime which need to be connected.

> **Tip**
>
> Check the IPv4 address of the computer which the PickMaster Runtime is installed on.

> **Note**
>
> Loopback address is NOT allowed to use as the PickMaster Runtime IP address, for example 127.0.0.1.
>
> Loopback address will cause errors in vision function.

Continues on next page



xx1900001507

3 If needed, click **Advance** to open the setting view for Runtime user and language.

Tip

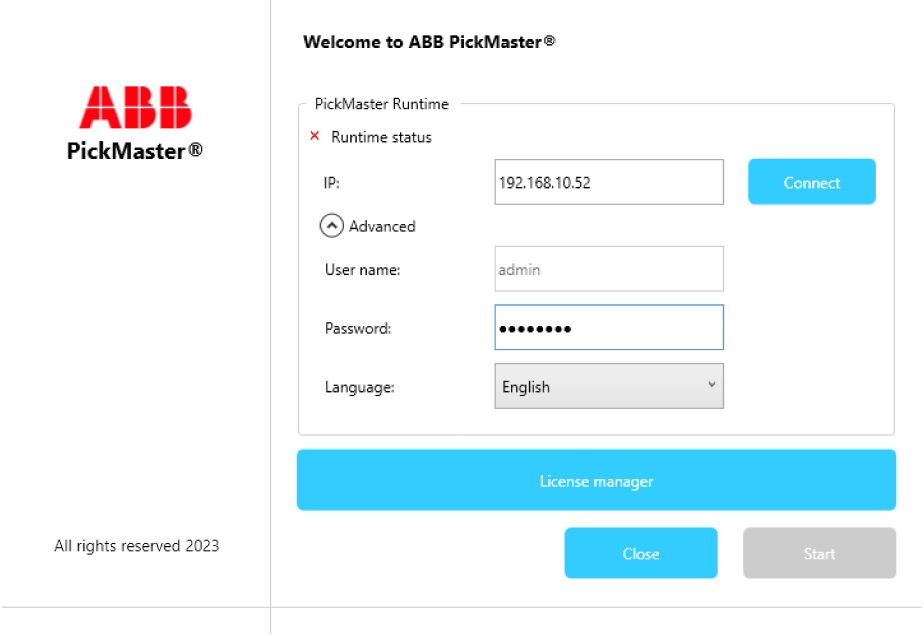
The default Runtime user name and password is the credential for connecting the PickMaster Runtime by `https` protocol.

Default Username: `admin` with Password: `password`

Note

The user should change the password of the default user account for higher Cyber Security.

Continues on next page

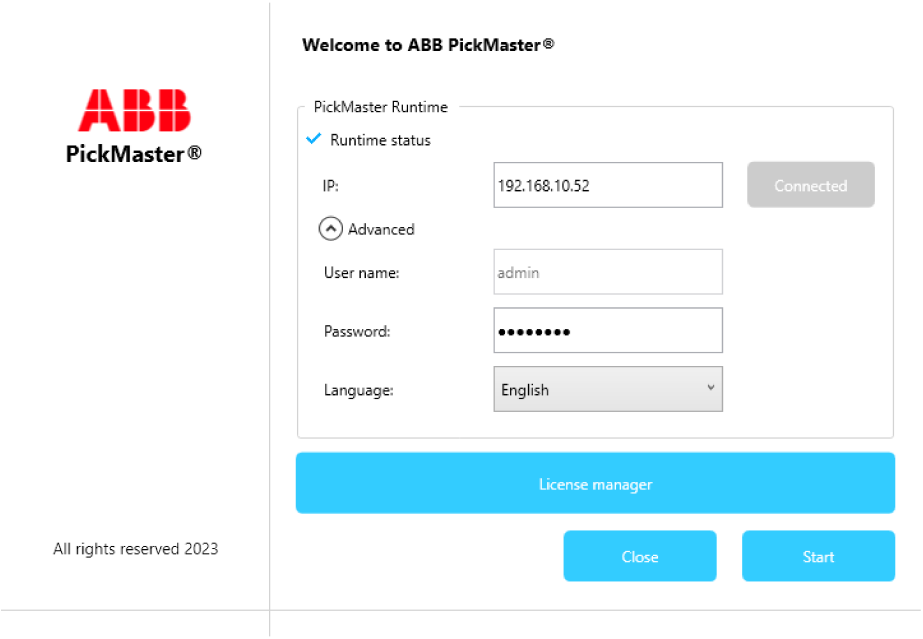


xx2200002005

4 Click **Connect** button.

> **Note**
>
> When the **SSL** dialog box pops up during the first operation of the PickMaster Operator, click **Yes**.
>
> Otherwise the PickMaster Operator cannot work normally.
>
> For more information, see chapter *Self-signing certificate* in *Application manual - PickMaster® Twin - PowerPac*.

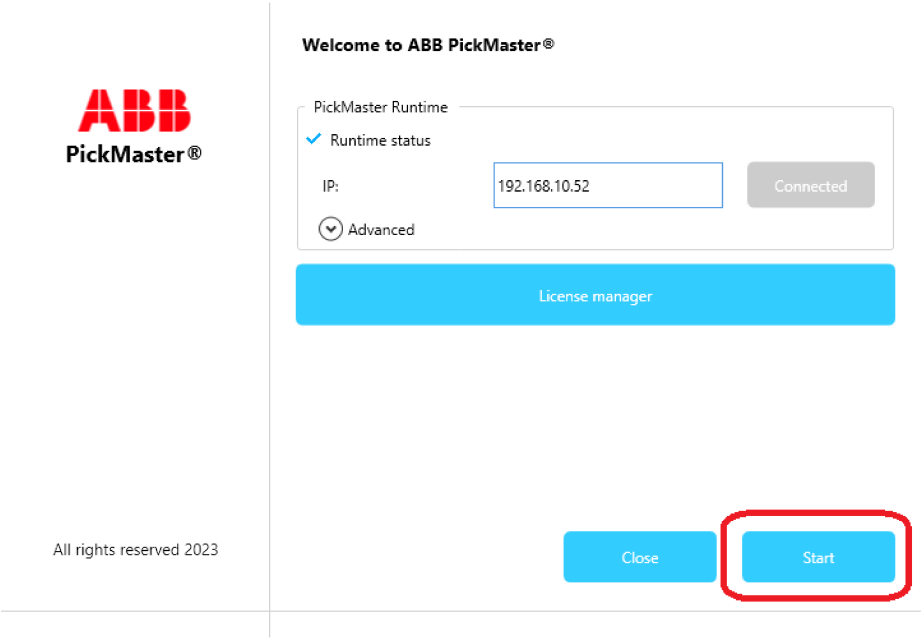
Continues on next page



xx2200002006

5 Click the **License Manager** button to open the **License Management** window. For more detail on activating the license, see *ABB ZENON license on page 28*.

6 Click **Start** button to open the login interface.



xx1900001508

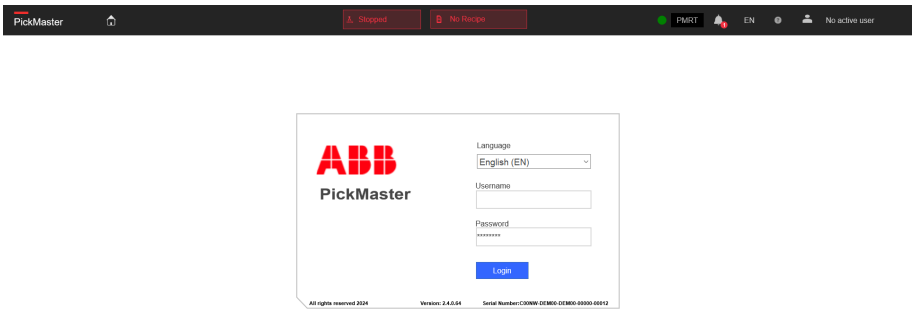
Continues on next page

Note

If the user meets any problem when building connection between PickMaster Operator and real Runtime, please check from below possible reasons:

a Using a Host account that is not administrator;
b Firewall blocking;
c VPN interference;
d Host IP address incorrect;
e The network name not renamed to "ProfinetIOAdapter".

7 Login with an effective user account.



xx1900000783

Tip

A default user and password have been created for each role.

Administrator Username: `admin` with Password: `password`

Note

The Username and Password are case sensitive.

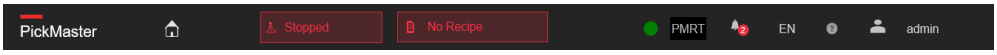
Note

To enhance the security of the user account, user lockout logic is used in PickMaster Operator.

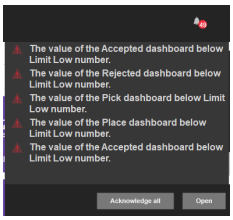
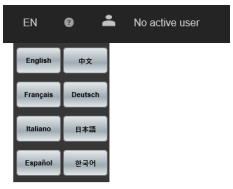
2 PickMaster Operator main navigation bar

Structure of the main navigation bar

The PickMaster Operator main navigation bar provides a series of basic functions.

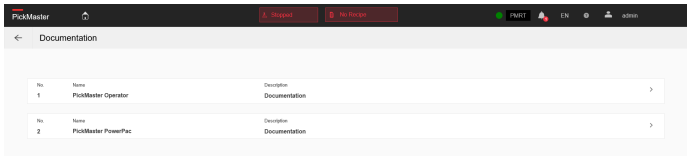
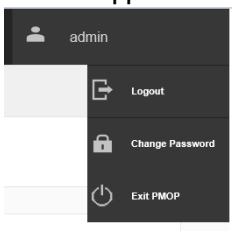


xx1900000321

ID	Object	Description
1	**Home Page** icon	Go back to the main page when you open any page.
2	Status indicator	Shows the status of the production.
3	Recipe indicator	Shows the recipe in use. **No recipe**: No recipe is loaded or the selected recipe has errors. **Recipe Loaded**: Recipe is loaded and no errors. For more information, see *Recipe Settings on page 73*.
4	**PMRT** indicator	Shows the connection status of **PMRT** and PickMaster Operator. • Green: PickMaster Operator is connected with **PMRT**. • Red: PickMaster Operator is not connected with **PMRT**.
5	Bell icon	Shows the alarm messages.  xx1900000324
6	Language	Change the language. Available languages: • English • Simplified Chinese • German • Italian • Spanish • Japanese • French • Korean  xx1900000322

Continues on next page

Continued

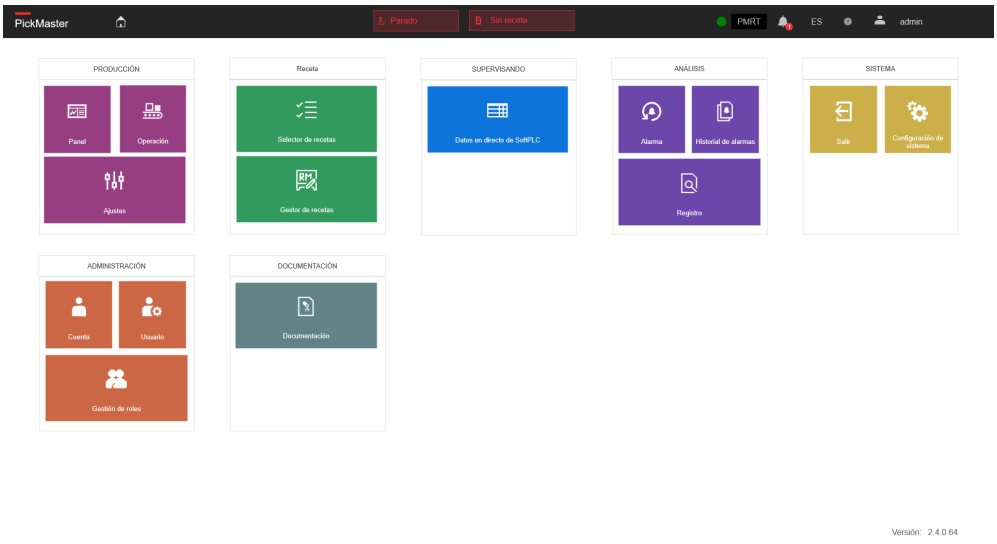
ID	Object	Description
7	Help	Link to the related manual of the PickMaster Operator and PickMaster® PowerPac.  xx2000000368
8	Login	Log in, log out, manage PickMaster Operator user password and exit application.  xx1900000323

3 PickMaster Operator page groups

3.1 Overview

Overview

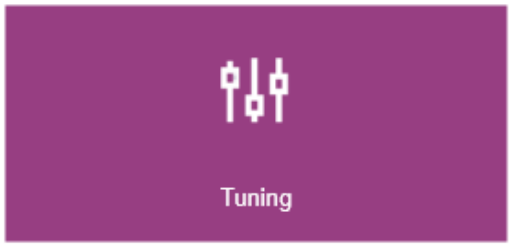
The following figure shows the PickMaster Operator main page.



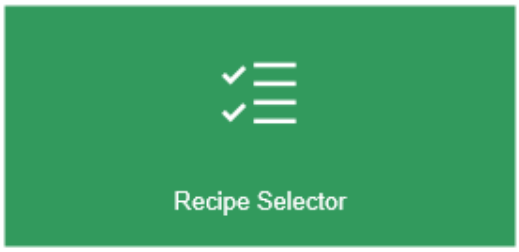
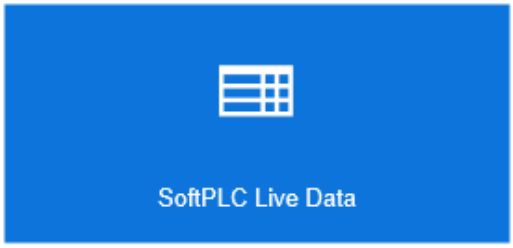
xx1900000320

Continues on next page

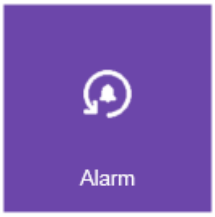
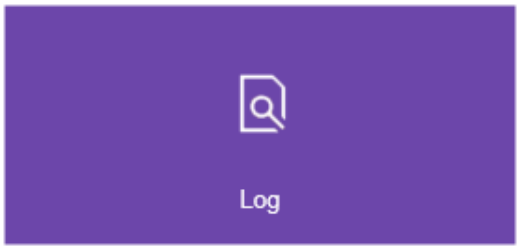
Elements on the page groups

Group	Menu	Description
PRODUCTION	Dashboard	 xx1900000325 Shows the status of the robots. For detailed description, see *Dashboard on page 57*.
	Operation	 xx1900000326 Send commands from PickMaster Operator and reflect the states of PackML in PickMaster Operator. For detailed description, see *Operation on page 58*.
	Tuning	 xx1900000327 Adjust recipe parameters during operation. For detailed description, see *Tuning on page 64*.

Continues on next page

Group	Menu	Description
RECIPES	Recipe Selector	 xx1900000328 Choose a recipe. For detailed description, see *Recipe Selector on page 72*.
	Recipe Manager	 xx2300002057 Open the add-in PickMaster Recipe Manager. For detailed description, see *Recipe Manager on page 75*.
MONITORING	SoftPLC Live Data	 xx1900000790 Monitor the live data of the softPLC. For detailed description, see *SoftPLC Live Data on page 76*.

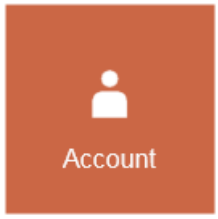
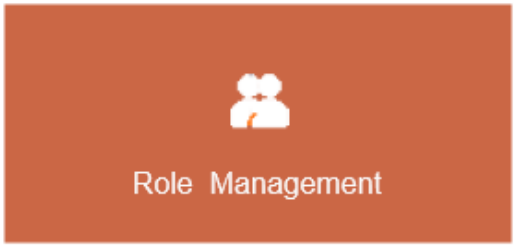
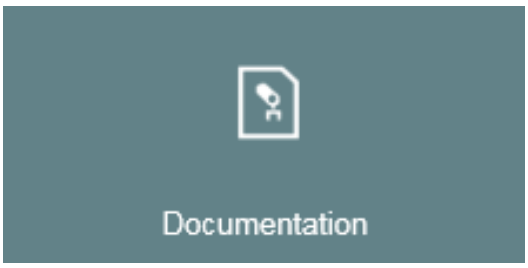
Continues on next page

Group	Menu	Description
ANALYSIS	Alarm	 xx1900000791 Monitor the alarms that are not acknowledged. For detailed description, see *Alarm on page 88*.
	Alarm History	 xx1900000792 Monitor all the alarms. **Tip** The acknowledged alarms are in black color and the un-acknowledged alarms are in red color. For detailed description, see *Alarm history on page 88*.
	Log	 xx1900000793 Monitor all the operations that happened. For detailed description, see *Log on page 89*.

Continues on next page

Group	Menu	Description
SYSTEM	Exit Runtime	 xx1900000329 Exit the PickMaster Operator. For detailed description, see *Exit on page 90*.
	System Setup	 xx1900000330 Import solutions. For detailed description, see *System Setup on page 90*.

Continues on next page

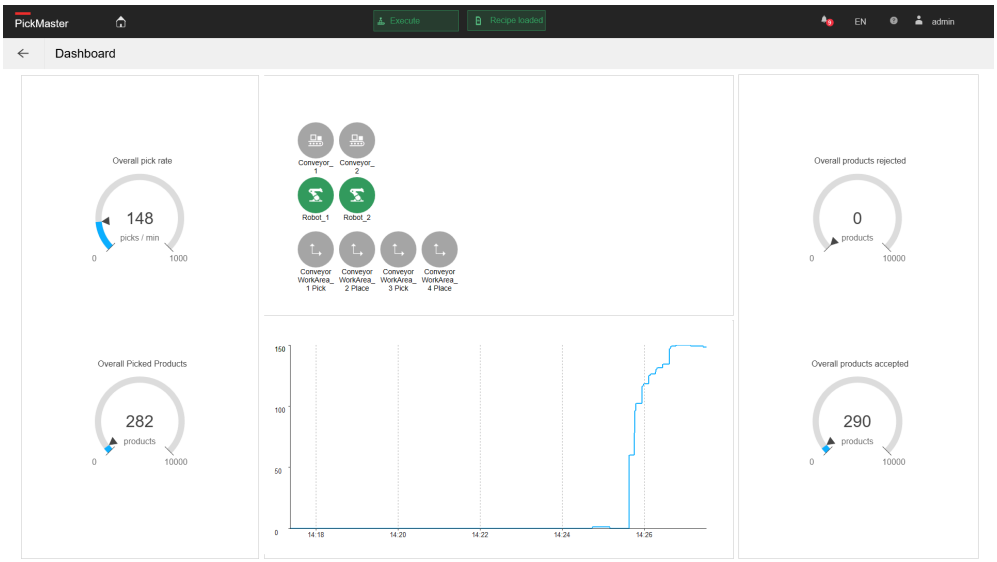
Group	Menu	Description
ADMINISTRATOR	Account	 xx1900000331 Manage the account in use. For detailed description, see *Account on page 97*.
	User Management	 xx1900000332 Manage the users. For detailed description, see *User Management on page 102*.
	Role Management	 xx1900000333 Manage the roles. For detailed description, see *Role Management on page 97*.
DOCUMENTATION	PickMaster	 xx1900000334 Open the related documents. For detailed description, see *PickMaster on page 105*.

3.2 PRODUCTION group

Dashboard

Overview

Dashboard allows you to show the layout of the solution, the quantity and status of the components in the solution, the status of the robots and the live data of pick/place rate.



xx1900000335

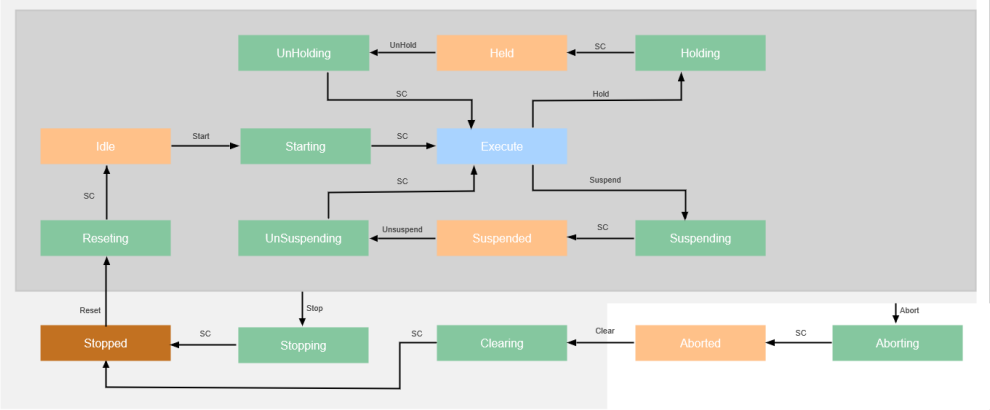
Parameter	Description
Overall pick rate	The pick rate for all robots in current solution.
Overall Picked Products	The total number of the picked products in current solution.
Overall products rejected	The total number of the rejected products in current solution.
Overall products accepted	The total number of the accepted products in current solution.
2D Layout	Shows all equipment in current solution.
Trend	Shows the trend of the overall pick rate.

Continues on next page

Operation

What is PackML?

PickMaster® Twin includes an internal SoftPLC, which controls a state machine following the PackML standard according to OMAC (Organization for Machine Automation and Control: omac.org). PackML stands for Packaging machine language and it defines a unified way of operating packaging machinery as well as the inter-machinery communication.



xx1900000796

- A transition State (Green in picture) is a state that holds a process until certain conditions are met.
- A Wait State (Orange in picture) - A stable state used to identify that a unit/machine has achieved a defined set of conditions.
- Dual state (Blue) - The unit/machine is in a stable acting state - unit/machine is producing; but in case of batch production, it can be a transition state.

The states in orange and blue are stable states, i.e. they can be valid for a longer period of time. The states in green are states that are only valid for a certain period of time and transfer to the next state without intervention from an operator. The transition is automatically done if the state is complete (SC = State Complete).

Shown above is the full state diagram with the state Execute (in blue) the producing state. The loop under-neath, via Suspended, is a waiting loop for material to be worked upon. The loop above, via Held, is the loop where the operator holds the system out of the producing state.

After all products are made, the producing state Execute is left via Complete, and ready for a new production order.

At power on, the state Stopped is valid. After a Reset it moves to the state Idle via Resetting.

Issuing ‘Start’ gets the unit to ‘Execute’ via ‘Starting’.

Continues on next page

The PackML state diagram leaves its normal loop via either Abort or Stop. The Abort is coupled to the error handling from every state. The Stop is for the operator interface.

PackML state diagram

	State Commands									State Complete
Current State	Start	Reset	Hold	Unhold	Suspend	UnSuspend	Clear	Stop	Abort	
IDLE	STARTING							STOPPING	ABORTING	
STARTING								STOPPING	ABORTING	EXECUTE
EXECUTE			HOLDING		SUSPENDING			STOPPING	ABORTING	COMPLETING
COMPLETING								STOPPING	ABORTING	
COMPLETE		RESETTING						STOPPING	ABORTING	
RESETTING								STOPPING	ABORTING	
HOLDING								STOPPING	ABORTING	
HELD				UNHOLDING				STOPPING	ABORTING	
UNHOLDING								STOPPING	ABORTING	
SUSPENDING								STOPPING	ABORTING	
SUSPENDED						UNSUSPENDING		STOPPING	ABORTING	
UNSUSPENDING								STOPPING	ABORTING	
STOPPING									ABORTING	
STOPPED		RESETTING							ABORTING	
ABORTING										
ABORTED							CLEARING			
CLEANING									ABORTING	

Continues on next page

Actions for each command

Command	Step 1: Active state	Step 2: PickMaster actions	Step 3: Robot and controller actions	Step 4: Expected command result	Step 5: Expected active state
Reset	Resetting	Create line and project files; Initiate vision; Start vision; Initiate robots (position sources, pipes, RAPID program, etc).	Controller Motors ON; Robots move to Safe position.	Controller Motors on; Init vision finished; Init robots finished.	Idle
Start	Starting	Start robots.	Running pickplace routine	Robots is in running state.	Execute
Stop	Stopping	Stop vision; Stop robots; Stop project; Close project.	Moving to safe positions	Robots stopped; Project stopped and closed.	Stopped
Hold	Holding	Hold robots.	Executing holding operation Robots; stopped in HOLD position.	Robots reached hold position.	Held
Unhold	UnHolding	Start robot to pick/place.	Restarting pick or place	Robots is running.	Execute
Suspend	Suspending	Suspend robots.	Executing Suspending operation; Robots stopped in SUSPEND position.	Robots reached suspend position.	Suspended
UnSuspend	UnSuspending	Start robot ready to pick/place.	Restarting pick or place	Robots is running.	Execute
Abort	Aborting	Stop vision; Stop robots; Stop project.	Moving to safe positions	Robots stopped in safe position.	Aborted
Clear	Clearing	Close project.	Stopped in safe position	Close project completed.	Stopped

Self-diagnosis processing PackML state

Mandatory robot command result when PML is Execute				
Robot command (UI buttons or remote commands)	**Production State**	**Optional Robot**	**Other Mandatory Robot**	**Remark**
Pause	Holding	Pause in Safe position	Pause in Safe position	/
Stop	Holding	Pause in Safe position	Pause in Safe position	/
Start (not allowed)	/	/	/	/
AutoStop (A-stop)	Holding	Pause in Safe position	Pause in Safe position	/
E-stop	Stopping	Stop	Stop	/

Continues on next page

Optional robot command result when PML is Execute, with mandatory robot				
Robot command (UI buttons or remote commands)	**Production State**	**Other Optional Robot**	**Mandatory Robot**	**Remark**
Pause	no effect	no effect	no effect	Only the commanded robot is influenced
Stop	no effect	no effect	no effect	
Start(after robot stopped or paused)	no effect	no effect	no effect	
AutoStop (A-stop)	no effect	no effect	no effect	
E-stop	no effect	no effect	no effect	

Optional robot command result for the robot except the last robot when PML is Execute, All robots are optional			
Robot command (UI buttons or remote commands)	**Production State**	**Other Optional Robot**	**Remark**
Pause	no effect	no effect	Only the commanded robot is influenced
Stop	no effect	no effect	
Start(after robot stopped or paused)	no effect	no effect	
AutoStop (A-stop)	no effect	no effect	
E-stop	Stopping	Stop	

Optional robot command result for the the last robot when PML is Execute, All robots are optional			
Robot command (UI buttons or remote commands)	**Production State**	**Other Optional Robot**	**Remark**
Pause	Holding	no effect	Only the commanded robot is influenced
Stop	Holding	no effect	
Start(after robot stopped or paused)	no effect	no effect	
AutoStop (A-stop)	Holding	no effect	
E-stop	Stopping	Stop	

When Mandatory robot enters stop state (not E-stop)		
PML states when robot stop happens	**PML state reactions**	**Remark**
Restting/Idle	PackML automatically go to stopping	
Starting/Un-Holding/Un-suspending	Stay in current state	Other robots will be started and PML state goes to Execute, at this moment it fulfills the condition to go to Held, then PML goes to Held.
Holding/Suspending/Held/Suspended/Aborting/Aborted/Clearing/Stopping/stopped	Do nothing	/
Execute	PackML automatically go to Holding	/

Continues on next page

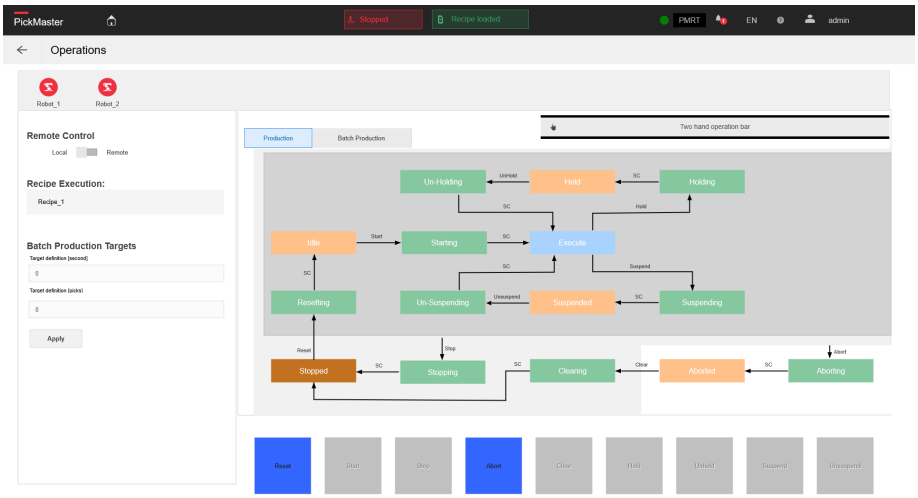
PackML for PickMaster Operator

This function is used to send commands from PickMaster Operator and reflect the states of PackML in PickMaster Operator.

Note

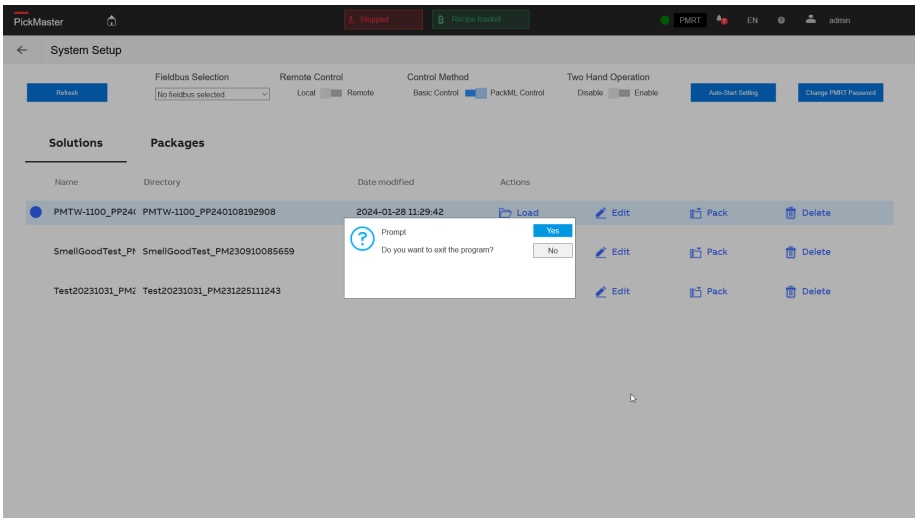
Reinstall the ABB ZENON when the following phenomenon occurs:

1 The PackML page is partially disappeared.



xx2200002116

2 This error message pops up when the PackML is already stopped.



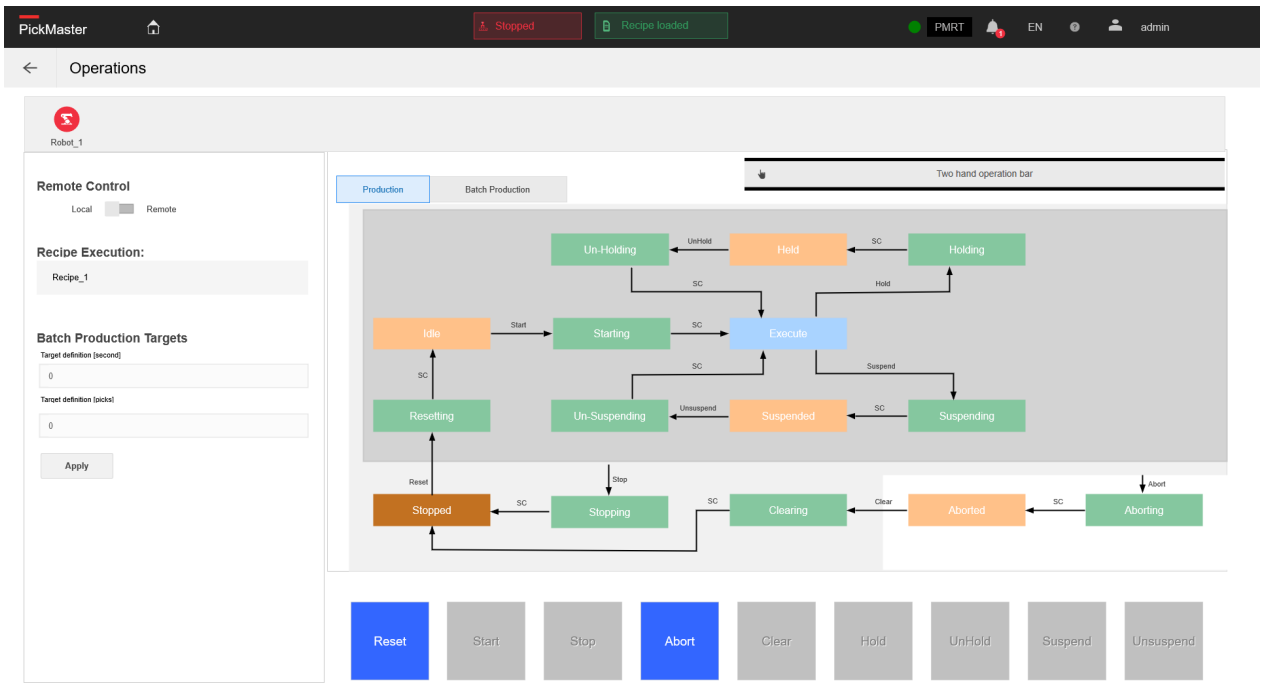
xx2200002117

For more information, see *Installing and uninstalling ABB ZENON on page 21*.

Continues on next page

Production

Production is the basic operation of the state machine.



xx1900000336

Batch production

Batch production is the basic operation with the complete operation of the state machine.

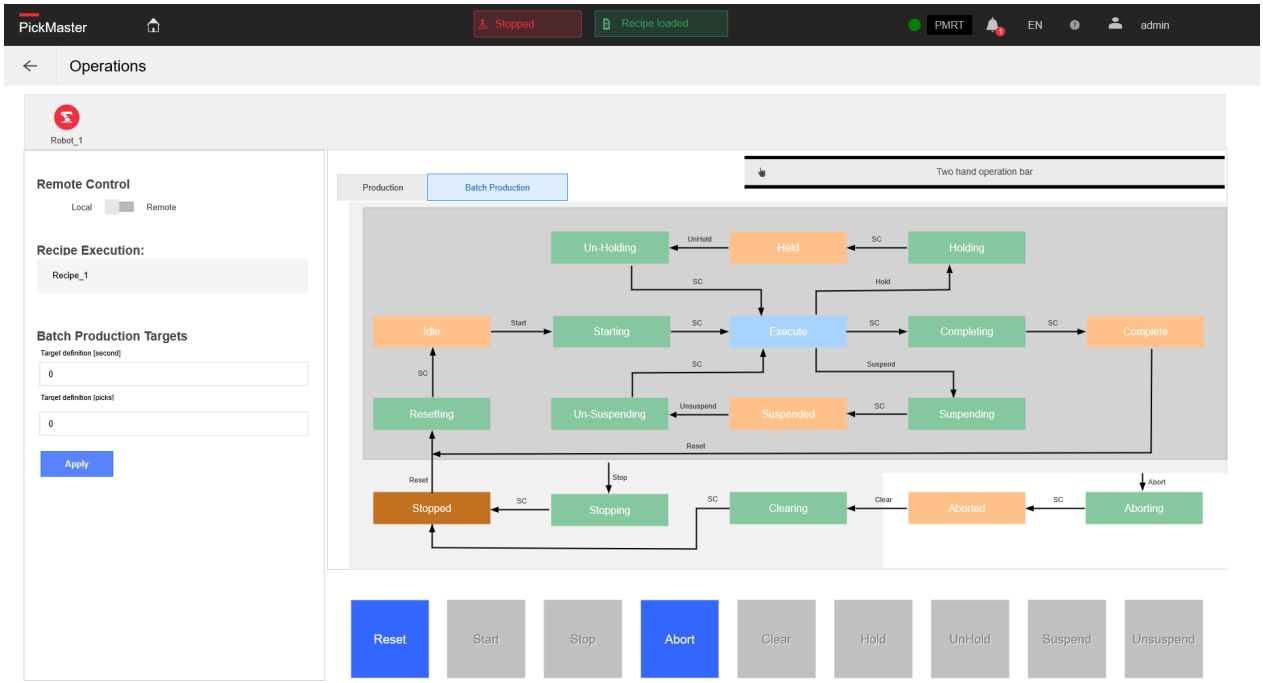
Pick Number or **Pick Time** can be set as the judgment condition. If the set condition is reached, the system will enter the **Complete** process automatically.

Note

If need to use the batch production function in remote control mode, the **Pick Number** or **Pick Time** need to be set before changing to remote control mode.

Or the batch production function cannot be used.

Continues on next page

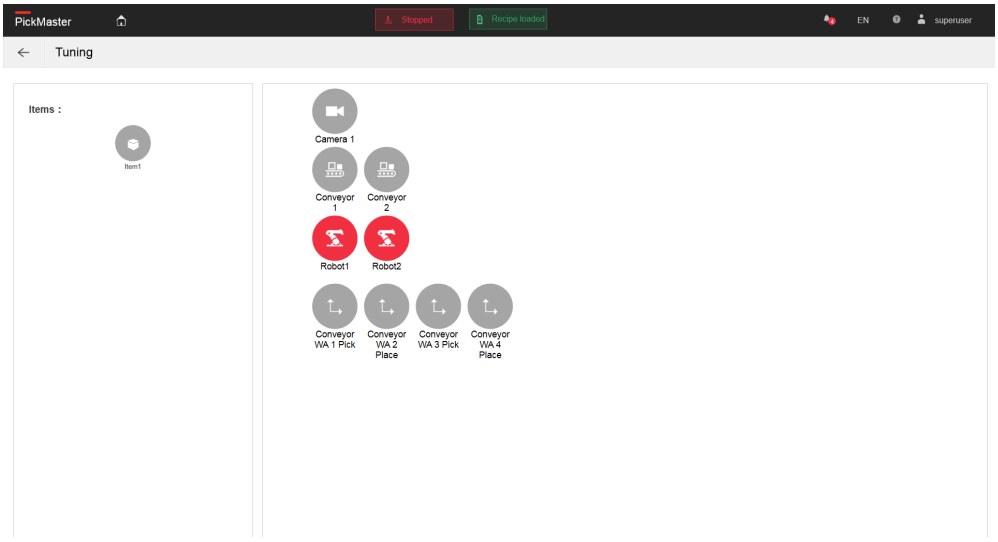


xx1900000965

Tuning

Overview

This function is used to change the parameters of the conveyors, robot and items during operation, such as positions, speed, offset and timing.

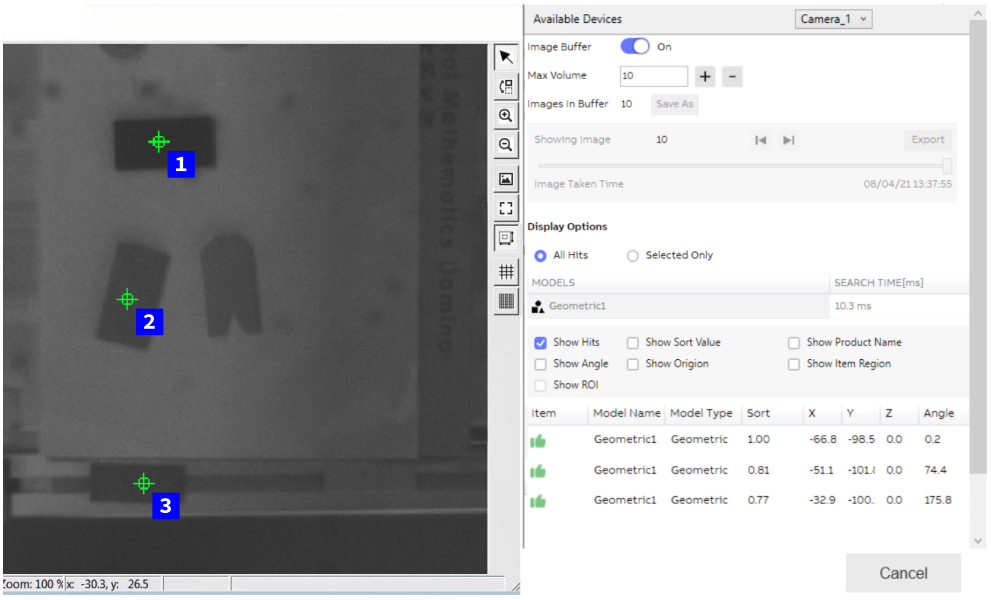


xx1900000786

Click on the icon to open the tuning windows. Clicking the camera icon opens the detail vision window, which displays the camera images with the object hits. The

Continues on next page

images and results can be recorded and saved to a file for later analysis with the PickMaster Vision Viewer.



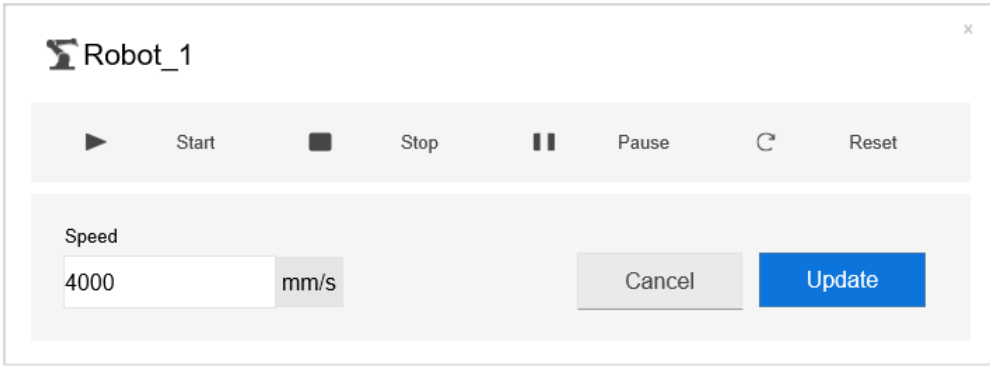
xx2100000697

Tip

For item tuning, the tuning value only affects the new generated item targets. The tuning value will not be effective on the recognized item targets in the queue.

For the work area and robot tuning, the tuning value will be effective immediately.

Tuning the robot



xx1900000966

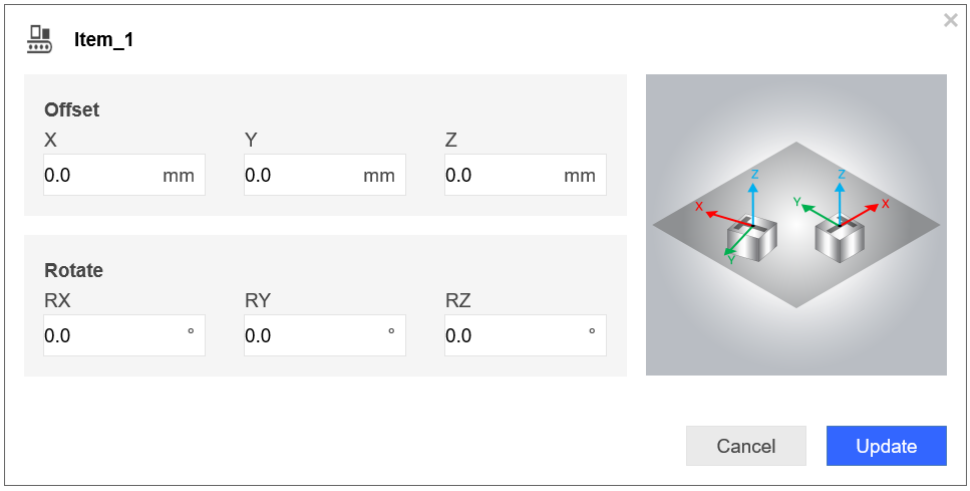
Item	Description
Start	Start the selected robot.
Stop	Stop the selected robot. A robot stop empties all targets in the position queue. At a re-start after a stop, the robot waits until new targets are generated from the position source.

Continues on next page

3.2 PRODUCTION group
Continued

Item	Description
Pause	Pause the selected robot. A robot pause keeps all targets in the position queue. At a re-start after a pause, the robot resumes operation immediately with the next target in the queue.
Reset	Reset the selected robot from emergency stop activated.
Speed	Change the speed of the selected robot in `mm/s`. **Note** When the data in the tuning is updated, it will be saved to the recipe.

Tuning the item



xx1900000968

	Description
OffsetX	Set the location of the gripper when doing the picking and placing operation in X direction.
OffsetY	Set the location of the gripper when doing the picking and placing operation in Y direction.
OffsetZ	Set the location of the gripper when doing the picking and placing operation in Z direction.
RotateRX	Set the angle of the gripper when doing the picking and placing operation in X direction. **Note** The angle cannot be out of the physical limits. Otherwise the robot will not work normally. For example, trying to rotate the gripper of an IRB 360 robot in X or Y direction will cause an error. Redo the simulation after the error occurred.

Continues on next page

	Description
RotateRY	Set the angle of the gripper when doing the picking and placing operation in Y direction. **Note** The angle cannot be out of the physical limits. Otherwise the robot will not work normally. For example, trying to rotate the gripper of an IRB 360 robot in X or Y direction will cause an error. Redo the simulation after the error occurred.
RotateRZ	Set the angle of the gripper when doing the picking and placing operation in Z direction. **Note** The angle cannot be out of the physical limits. Otherwise the robot will not work normally.

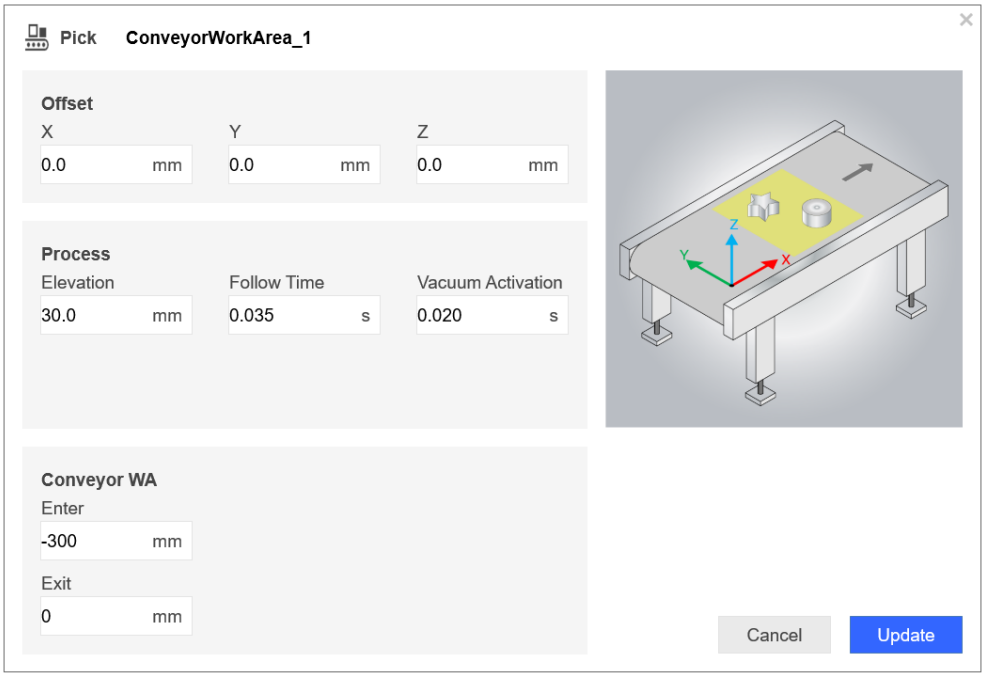
Note

When adjusting the angles, IRB 360 does not support adjusting the angles in the X and Y direction.

Note

When the data in the tuning is updated, it will be saved to the recipe.

Tuning the work area

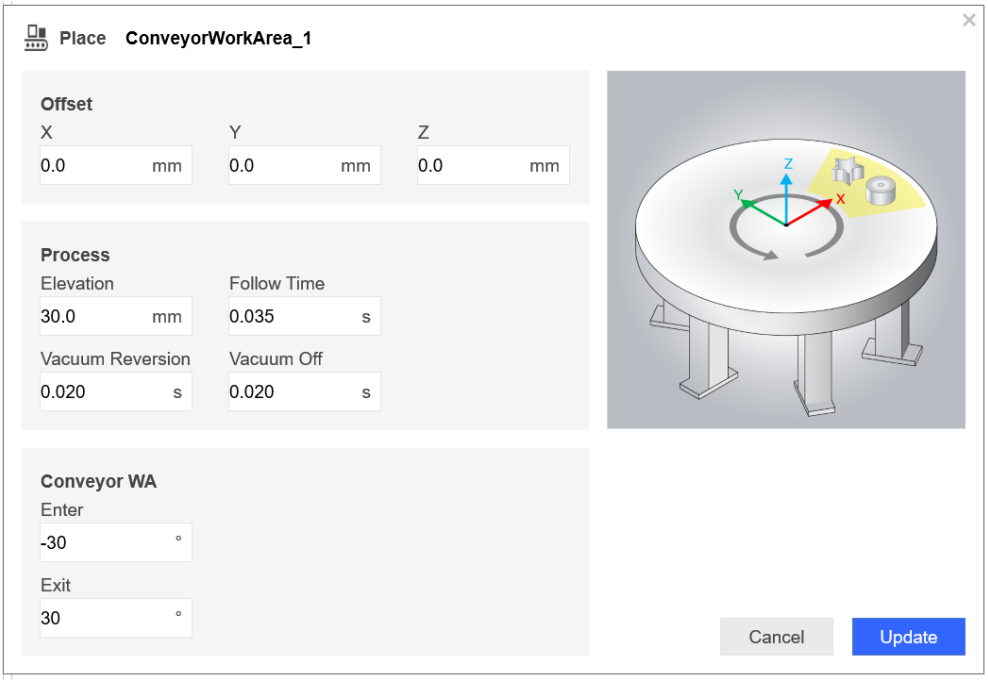


xx2000000199

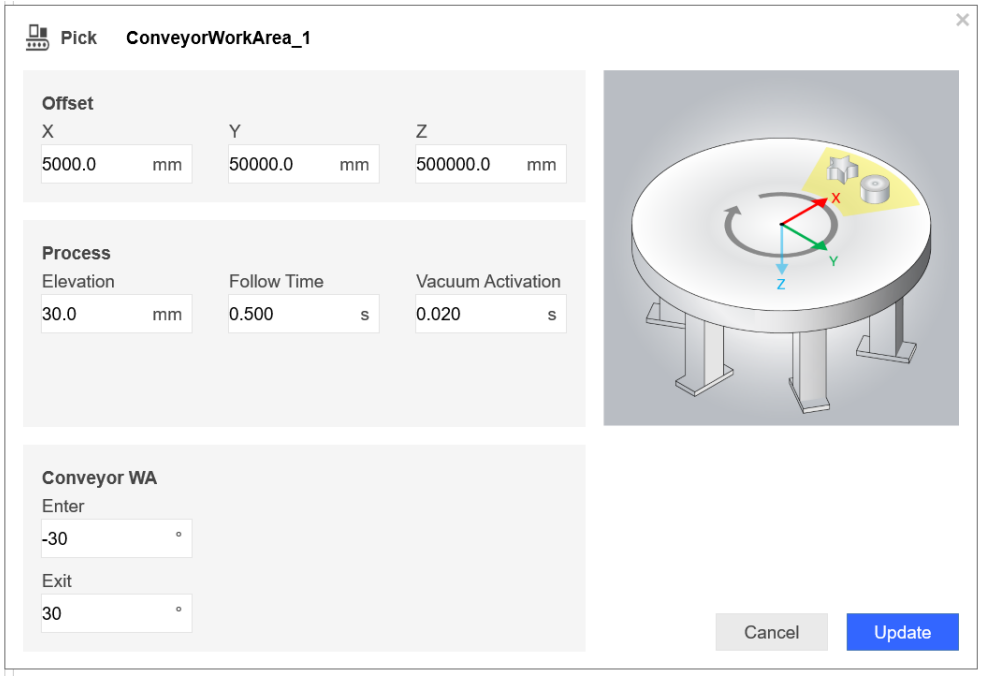
Continues on next page

3.2 PRODUCTION group

Continued

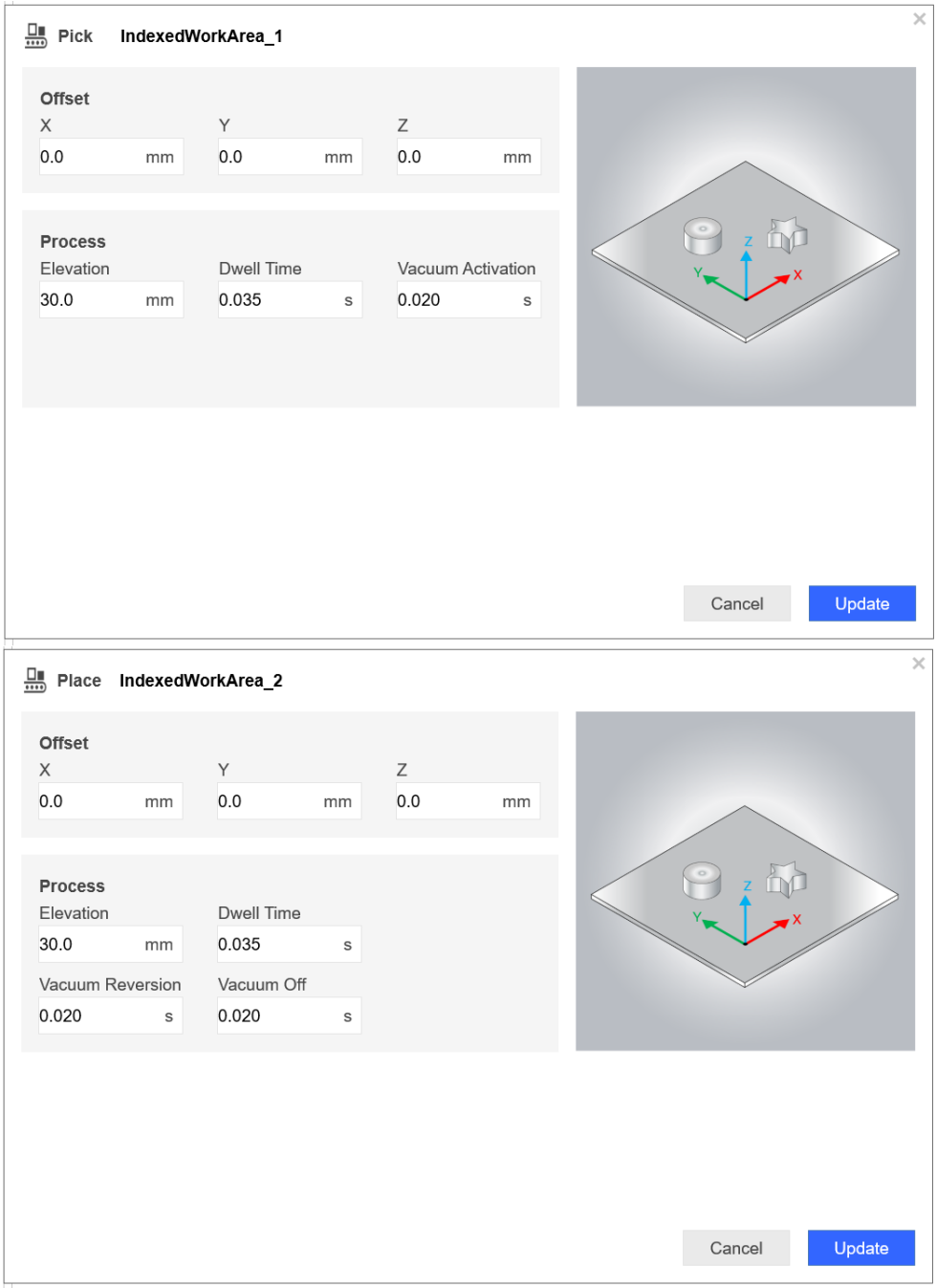


xx2400000784



xx2400000785

Continues on next page



xx2400000786

	Description
OffsetX[mm]	Tune the position of the work area along the X direction when running simulation or production. Tuning the position of the work area along the X direction is equivalent to offsetting the conveyor base frame along the X direction.
OffsetY[mm]	Tune the position of the work area along the Y direction when running simulation or production. Tuning the position of the work area along the Y direction is equivalent to offsetting the conveyor base frame along the Y direction.
OffsetZ[mm]	Tune the position of the work area along the Z direction when running simulation or production. Tuning the position of the work area along the Z direction is equivalent to offsetting the conveyor base frame along the Z direction.

Continues on next page

3.2 PRODUCTION group
Continued

	Description
Enter[mm][i]/[degree][ii]	**Enter** is the limit from where the robot starts to execute item targets on the work area. The distance is calculated in millimeters from the center of the robot. The range is positive if the limit is beyond the center of the robot, relative to the moving direction of the conveyor. Make sure that the enter limit can be reached by the robot. For more details, see *Available Work Areas*.
Exit[mm][i]/[degree][ii]	**Exit** is the limit from where the robot considers an item target as lost on the work area. The distance is calculated in millimeters from the center of the robot. The range is positive if the limit is beyond the center of the robot, relative to the moving direction of the conveyor. When the tracked item passes beyond this limit it will be dropped. This limit must be chosen well within the maximum reach of the robot. The robot must be able to reach this position from an arbitrary position in the robot's working area before the position is out of reach. For more details, see *Available Work Areas*.
Elevation[mm]	**Elevation** is the distance, in negative z-direction relative to the tool, from where the robot approaches the item target.
Follow Time[s]/Dwell Time[s]	**Follow Time**/**Dwell Time** is the time the robot is in the pick/place position. If the conveyor is moving during the pick/place time, the robot will track along the conveyor to keep the relative position on the moving conveyor.
Vacuum Activation[s]	**Vacuum Activation** is the time in seconds before the middle of the corner path of the approaching position, when the vacuum I/O should be set. If a negative value is entered, the vacuum I/O will be set the time after the middle of the corner path. This value is only valid for work areas of type **Pick**. **Note** Vacuum activation does not affect the picking of items in simulation. Items are attached to the picking tool using `SimAttach` events, for example, in the Pick Routine.
Vacuum Reversion[s]	**Vacuum Reversion** is the time in seconds before the half place time in the place position, when the blow I/O should be set. If a negative value is entered, the blow I/O will be set the time after the half place time in the place position. This value is only valid for work areas of type **Place**. **Note** Vacuum reversion does not affect the placing of items in simulation. Items are detached from the picking tool using `SimDetach` events, for example, in the Place Routine.
Vacuum Off[s]	**Vacuum Off** is the time in seconds after the half place time in the place position, when the blow I/O should be reset. If a negative value is entered, the blow I/O will be reset the time before the half place time in the place position. This value is only valid for work areas of type **Place**. **Note** Vacuum Off does not affect the placing of items in simulation. Items are detached from the picking tool using **SimDetach** events, for example, in the Place Routine.

Continues on next page

	Description
Y Max[i]**/Radius Max**[ii]	**Note** To enable this function, you need to select the **Use Start/Stop** checkbox for this function in the recipe configuration page. **Note** The **Y Max/Radius Max** function in the **Tuning** window has a slight delay. If there is any update for this value, you need to wait a while to see the results. **Y Max/Radius Max** is the limit from where robot considers an item target as lost on the work area in End Y.The distance is calculated in millimeter from the center of the robot. The range is positive if the limit is beyond the center of the robot, relative to the moving vertical direction of the conveyor. Make sure that the **Y Max/Radius Max** can be reached by the robot. If the y coordinate value of the item's position is greater than the**Y Max/Radius Max**, the robot will not grab the item. So when the tracked item passes beyond this limit it will be dropped. This limit must be chosen well within the maximum reach of the robot. For more details, see *Available Work Areas*.
Y Min[i]**/Radius Min**[ii]	**Note** To enable this function, you need to select the **Use Start/Stop** checkbox for this function in the recipe configuration page. **Note** The **Y Min/Radius Min** function in the **Tuning** window has a slight delay. If there is any update for this value, you need to wait a while to see the results. **Y Min/Radius Min** is the limit from where robot starts to execute item targets on the work area in Start Y. The distance is calculated in millimeter from the center of the robot. The range is positive if the limit is beyond the center of the robot, relative to the moving vertical direction of the conveyor. For more details, see *Available Work Areas*.

i Only available when the conveyor is linear conveyor.
ii Only available when the conveyor is circular conveyor.

Note

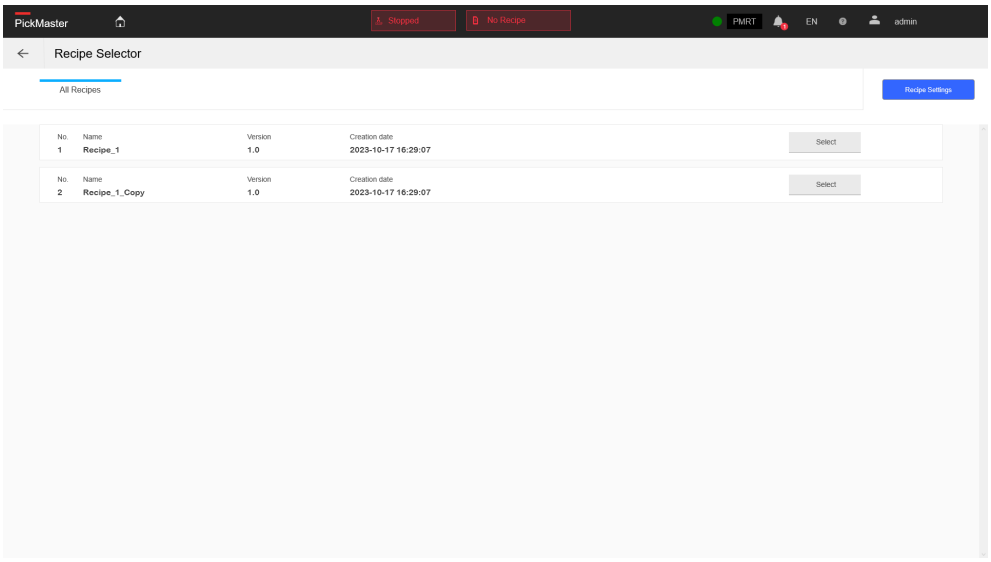
When the data in the tuning is updated, it will be saved to the recipe.

3.3 RECIPES group

Recipe Selector

Overview

This function is used to select the working recipe.



xx1900000337

Click on the **Select** to activate the recipe you need.

Recipe checking before loading

When PickMaster Operator loading the selected recipe, it will check whether the recipe is valid or not.

If the following errors pop up, the recipe cannot be selected:

- `{0} lack(s) valid distribution. Please check in PMPP!`

  Tip

  Make sure that at least there is one group valid distribution setting under **Item distribution Accept** or **Reject** for all available items.

- `{0} lack(s) real controller setting. Please check in PMPP!`

  Tip

  Make sure that at least one real controller has been selected for the controller which need to run the production.

Continues on next page

If the following warning pops up, the recipe may NOT work correctly:

- `{0} use(s) default signal type and lack(s) customized signal type setting. Please check in PMPP!`

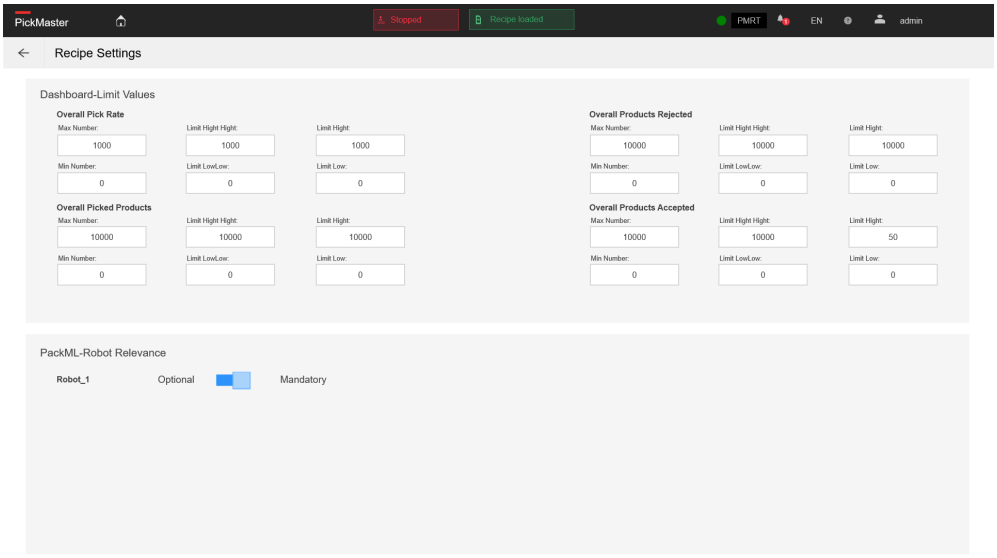
> **Tip**
>
> Make sure that it is NOT set as **Default** signal type for the work areas which need to run the production.

> **Tip**
>
> When running production with a specific recipe in PickMaster Powerpac, it will check whether the recipe is valid or not.

When the recipe is selected, the selected recipe will be highlighted as pink.

Recipe Settings

Click on the **Recipe Settings** to open the recipe settings window.



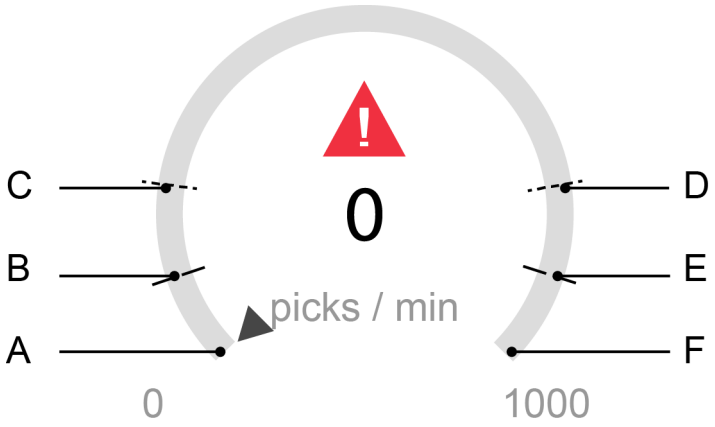
xx1900000689

Parameter		Description
Dashboard-Limit Values	Overall pick rate	The pick rate for all robots in current solution.
	Overall Picked Products	The total number of the picked products in current solution.
	Overall products rejected	The total number of the rejected products in current solution.
	Overall products accepted	The total number of the accepted products in current solution.

Continues on next page

3.3 RECIPES group
Continued

Parameter		Description
PackML-Robot Relevance	Optional	The robot is optional for this production. If this robot stops, it will not influent the other robots and the production.
	Mandatory	The robot is mandatory for this production. If this robot stops, it will stop the whole production.



xx1900000695

	Parameter	Description
A	Min Number	The lowest value of the dashboard.
B	LimitLowLow	Extreme low value: if the data is lower than this limit, there will be an alarm on the screen and the color of the real time data will be red.
C	LimitLow	Early warning for low value: if the data is lower than this limit, there will be an alarm on the screen and the color of the real time data will be red.
D	LimitHight	Early warning for high value: if the data is higher than this limit, there will be an alarm on the screen and the color of the real time data will be orange
E	LimitHightHight	Extreme high value: if the data is higher than this limit, there will be an alarm on the screen and the color of the real time data will be red.
F	Max Number	The highest value of the dashboard.

Tip

Please set the parameters according to the actual situation of the system, then the warning on the dial has practical significance.

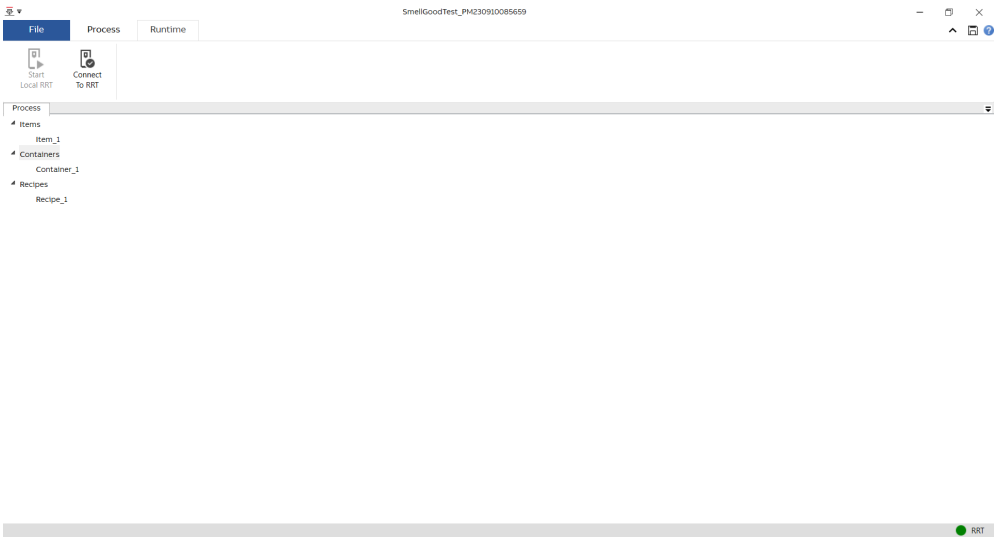
Only when the data is between **LimitLow** and **LimitHight**, the robot works normally. The color for the real time data will be blue.

Continues on next page

Recipe Manager

Overview

This function is used to open the solution with PickMaster Recipe Manager.



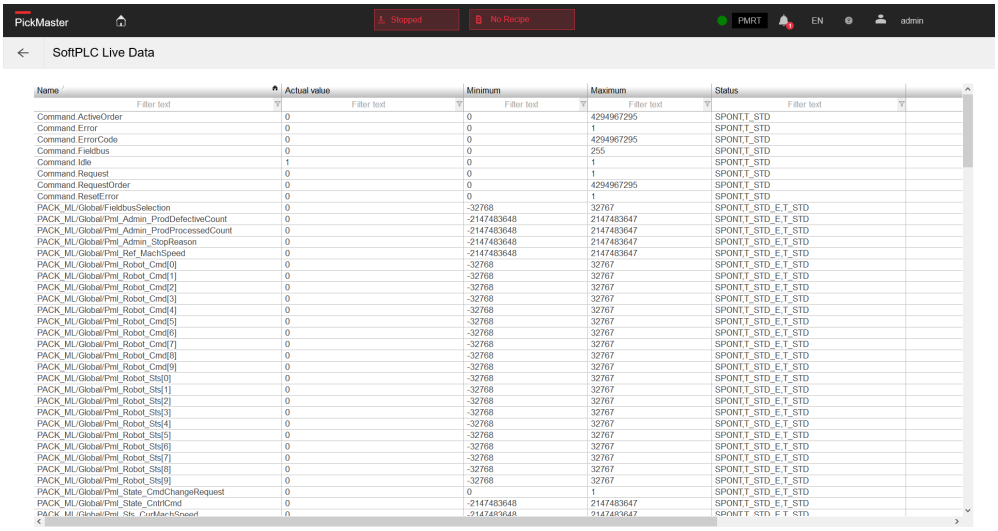
xx2300002056

3.4 MONITORING group

SoftPLC Live Data

This function is used to monitor the live data of the softPLC.

SoftPLC is a real-time multitasking control kernel running on industrial PC. It has both the characteristics of all hard PLCs and its own characteristics, namely an open architecture system. In PMTW, the softPLC live data represents the fieldbus signal list used in current station.



xx1900000795

Continues on next page

3.4.1 Signals and definition

Overview

All the signals are defined according to the definition of the smallest order Packtag from the standard **ANSI** / **ISA-TR88.00.02-2015** chapter 7.5 Tag details, Table 7 PackTags Minimum required for information / machine monitoring and Table8 PackTags Minimum required for supervisory control.

Tip

To get the specific address for a signal in the data package, see the *Appendix on page 129* (*EtherNet/IP signal definition on page 129*, *Modbus signal definition on page 132* and *PROFINET signal definition on page 135*) according to the predefined signal name.

Common signals

The common signals are used for data exchange between PickMaster Operator, Runtime and the remote device.

PACK_ML/Global/FieldbusSelection

The selected remote control mode is EtherNet IP, Modbus or Profinet. Modbus is 1, Profinet is 2 and EtherNet/IP is 4.

Predefined signal name: Modbus, PROFINET, EtherNet/IP

PMOP_HeartBeat

Data Type: Bool

Value: **0 - False**; **1 - True**

The circle time of the signal HeartBeat's pulse is one second. The value turns per 500 ms.

If the signal HeartBeat turns correctly, means that the PickMaster Operator is running correctly.

Predefined signal name: HeartBeat

PMOP_PMRTConnected

Data Type: Bool

Value: **0 - False**; **1 - True**

When the PickMaster Operator is correctly connected to **PMRT**, the signal PMRTConnected will turn to **1**; if the connection between the PickMaster Operator and **PMRT** is disconnected, the signal PMRTConnected will turn to **0**.

Predefined signal name: PMRTConnected

Continues on next page

3.4.1 Signals and definition
Continued

Recipe setting signals

The recipe setting signals are used for recipe controlling or related data exchanging, for example switching the recipe.

Command.ActiveOrder

Data Type: INT (32bit)

Value: **101 - Recipe switching**

Command name	Description
Recipe switching	Switches to other recipes in current solution.

The ActiveOrder indicates the current executing activity order in PickMaster Operator.

Predefined signal name: ActiveOrder

Command.RequestOrder

Data Type: INT (32bit)

Value: **101 - Recipe switching**

The RequestOrder is the activity order which need to be executed.

Predefined signal name: RequestOrder

Command.Request

Data Type: Bool

Value: **0 - False**; **1 - True**

Set the signal Request as **1 - True** to trigger the PickMaster Operator to execute the command from the remote controller.

Predefined signal name: Request

Command.Error

Data Type: Bool

Value: **0 - False**; **1 - True**

When PickMaster Operator's processing runs incorrectly, this signal Error will turn to **1**. For example, PickMaster Operator received invalid command from the remote controller.

When signal Error is turned to **1**, PickMaster Operator will be occupied and cannot execute any new commands from the remote controller.

Predefined signal name: Error

Command.ErrorCode

Data Type: INT (32bit)

The ErrorCode indicates the specific error when signal Error turns to **1**. The numerical values are in the table below are reserved.

Predefined signal name: ErrorCode

ErrorCode	Name	Description
10001	InvalidRequestOrder	Request Command Order Code is not existed.

Continues on next page

ErrorCode	Name	Description
10002	NotAllowedCommand	Command is not allowed. For example, the recipe can't be switched when PickMaster Operator not in stopped status.
10003	InternalError	
10004	LoadTuningDataError	
10005	SaveTuningDataError	
20001	InvalidRecipeID	RecipeID is not existed.
20002	InvalidWAID	WAID is not existed.
20003	InvalidItemID	ItemID is not existed.
20004	InvalidRobotID	RobotID is not existed.
20005	InvalidCameraID	CameraID is not existed.
20011	InvalidRecipeData	
20012	InvalidWAData	WAType is not set correctly.
20013	InvalidItemData	
20014	InvalidRobotData	
20015	InvalidCameraData	

Command.ResetError

Data Type: Bool

Value: **0 - False**; **1 - True**

When signal ResetError is set as **1**, the signal Error will be reset to **0**.

Set ResetError as **1** to clean up the errors and restore the remote control function with the remote controller.

Predefined signal name: ResetError

Command.Idle

Data Type: Bool

Value: **0 - False**; **1 - True**

PickMaster Operator can execute the command from the remote controller only when the Idle signal is **0**.

When PickMaster Operator is executing the commands, the Idle signal will turn to **1**.

When PickMaster Operator completes the received commands, the Idle signal will turn back to **0**.

Predefined signal name: Idle

RecipeIDList

Data Type: INT (32bit)

The RecipeIDList indicates the all recipe index ID list in current solution.

For the specific index ID information, see the `.csv` file in the solution folder which is the same name with the solution.

Predefined signal name: RecipeIDList[0]...

Continues on next page

3.4.1 Signals and definition
Continued

CurrentRecipeID

Data Type: INT (32bit)

The CurrentRecipeID indicates the current recipe index ID.

For the specific index ID information, see the `.csv` file in the solution folder which is the same name with the solution.

Predefined signal name: CurrentRecipeID

RequestRecipeID

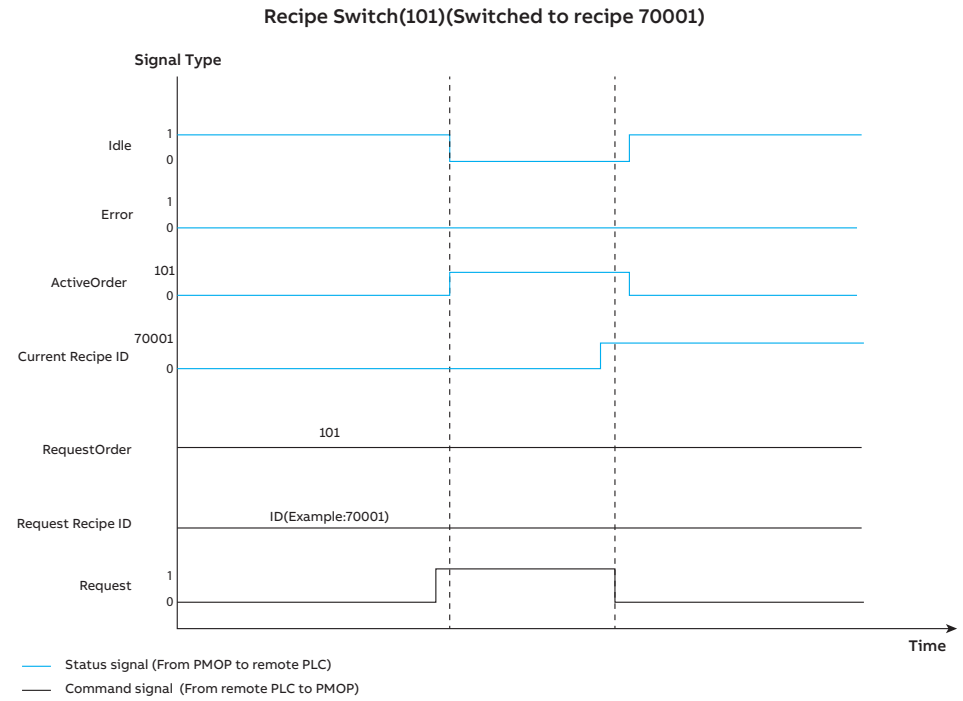
Data Type: INT (32bit)

The RequestRecipeID indicates the recipe index ID that is desired to be changed to.

For the specific index ID information, see the `.csv` file in the solution folder which is the same name with the solution.

Predefined signal name: RequestRecipeID

Remote recipe setting example signal sequence diagram



xx2300000980

PackML setting signals

The PackML setting signals are used for solution PackML controlling or related data exchanging, for example starting the solution, stopping the solution and so on.

PACK_ML/Global/Pml_Sts_StateCurrent -> UnitName.Status.StateCurrent

Data Type: INT (32bit)

Tag Descriptor: Current State Number

Continues on next page

The StateCurrent status tag specifies the current state in the current unit mode of the unit machine. The numerical values are in the table below are reserved.

Predefined signal name: StateCurrent

0	Undefined
1	Clearing
2	Stopped
3	Starting
4	Idle
5	Suspended
6	Execute
7	Stopping
8	Aborting
9	Aborted
10	Holding
11	Held
12	UnHolding
13	Suspending
14	Unsuspending
15	Resetting
16	Completing
17	Complete

PACK_ML/Global/Pml_State_CntrlCmd -> UnitName.Command.CntrlCmd

Data Type: INT (32bit)

Tag Descriptor: Control Command

The tag holds the value of the command that provides the state command to drive a state change in the Base State Model, this tag is typically manipulated locally. Local processing of this tag can be combined with remote or local machine conditions to drive the state model from Wait state to a Transient state. This tag can be set by a local or remote source. All values in the table below are reserved.

Predefined signal name: CntrlCmd

0	Undefined
1	Reset
2	Start
3	Stop
4	Hold
5	Unhold
6	Suspend
7	Unsuspend
8	Abort
9	Clear

Continues on next page

3.4.1 Signals and definition
Continued

PACK_ML/Global/Pml_State_CmdChangeRequest -> UnitName.Command.CmdChangeRequest

Data Type: Bool

Tag Descriptor: State Change Request

Value: **0 - False**; **1 - True**

This CmdChangeRequest bit will command the machine to proceed to change the state to the target state. The tag can be used to condition when a change of state can occur. The target state will be one of the states in the base state model.

The request for changing state machine command in the remote command. The command can only take effect when the command is set as **True**.

Predefined signal name: CmdChangeRequest

PACK_ML/Global/Pml_Sts_UnitModeCurrent -> UnitName.Status.UnitModeCurrent

Data Type: INT (32bit)

Tag Descriptor: Unit Mode in current use.

Value: **1 - Production**; **4 - Batch production**

Predefined signal name: UnitModeCurrent

PACK_ML/Global/Pml_UnitModeCurrent -> UnitName.Command.UnitModeCurrent

Data Type: INT (32bit)

Value: **1 - Production**; **4 - Batch production**

Tag Descriptor: Unit Mode is desired to be changed to.

Predefined signal name: UnitMode

PACK_ML/Global/Pml_UnitModeChangeRequest -> UnitName.Command.UnitModeChangeRequest

Data Type: Bool

Tag Descriptor: Request Unit Mode Change

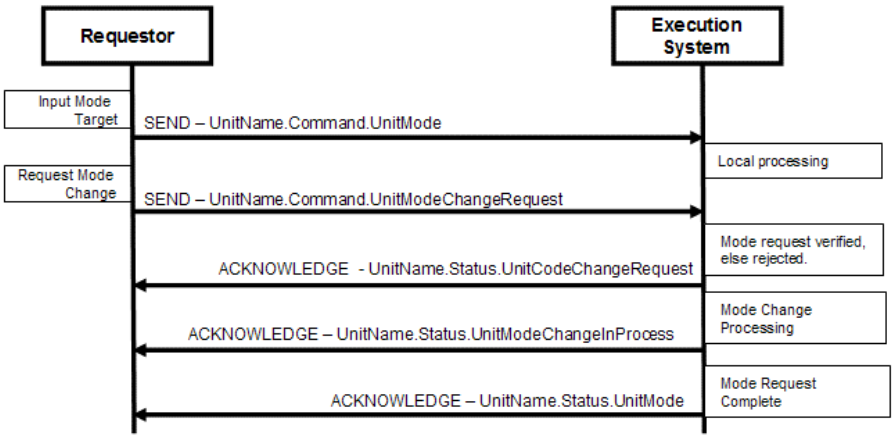
Value: **0 - False**; **1 - True**

When a unit mode request takes place a numerical value must be present in the Command.UnitMode tag to change the unit mode. Local processing and conditioning of the requested mode change is necessary in order to accept, reject, or condition the timing of the change request.

The request for changing the unit mode in the remote command. The changed working mode can only take effect when the change request is set as **True**.

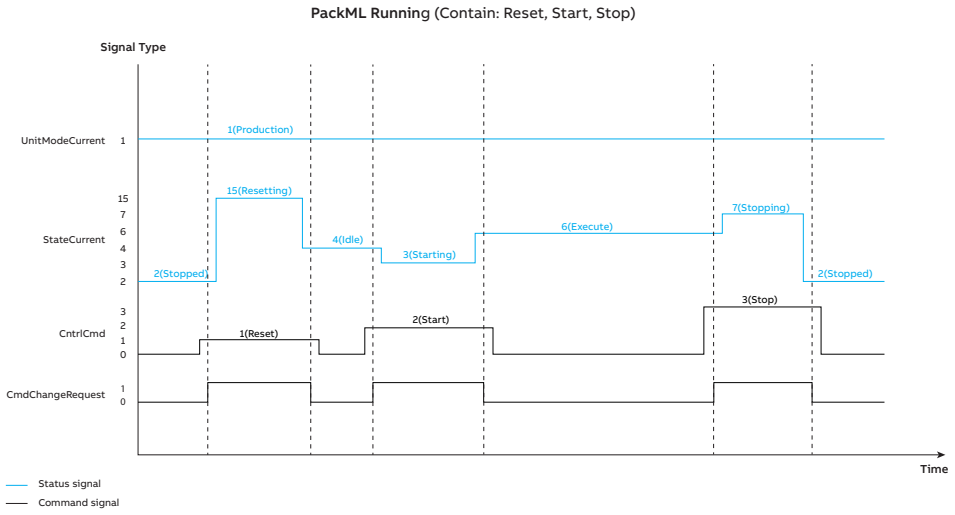
Continues on next page

Predefined signal name: UnitModeChangeRequest



xx1900000964

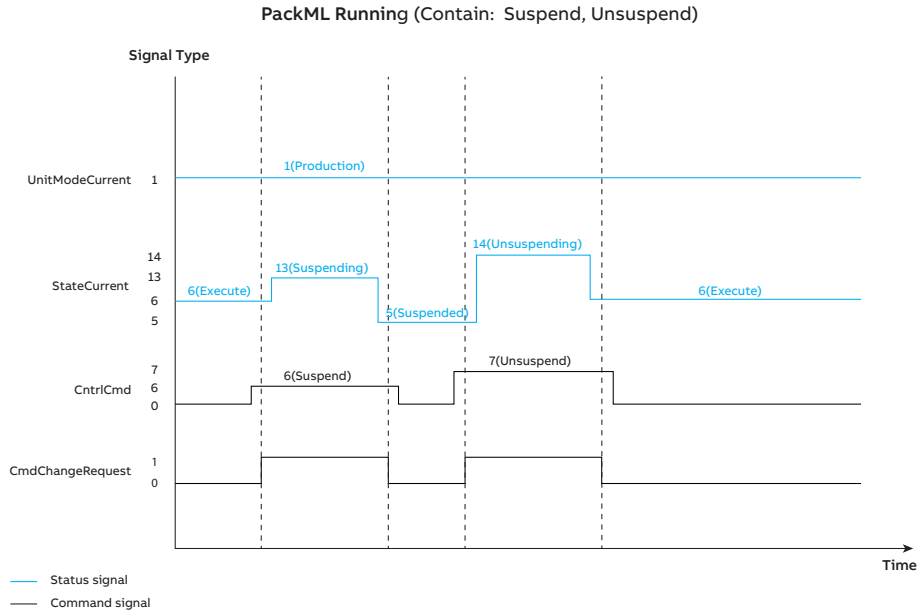
Remote PackML setting example signal sequence diagram



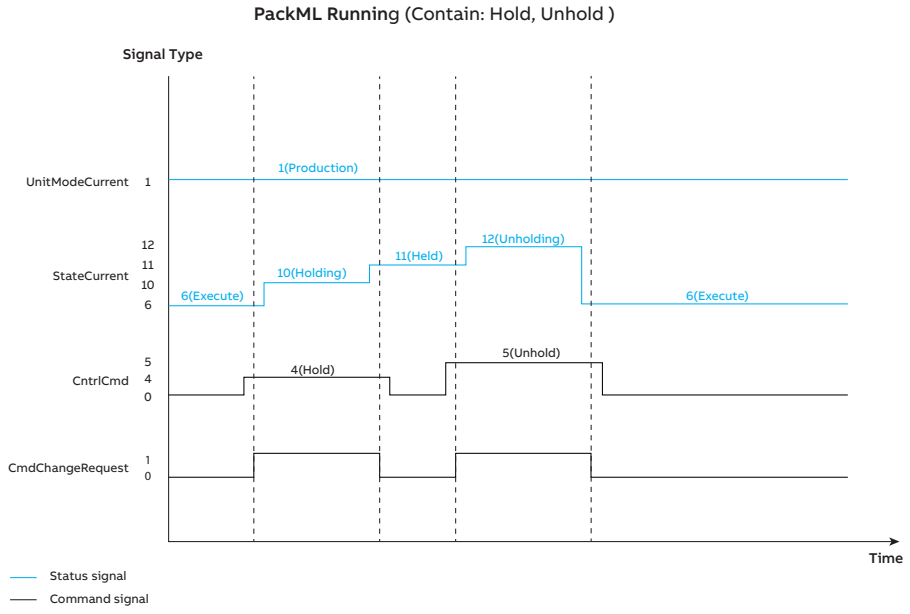
xx2300000983

Continues on next page

3.4.1 Signals and definition
Continued



xx2300000984



xx2300000985

Continues on next page

Single robot setting signals

The single robot setting signals are used for single robot controlling or related data exchanging, for example starting a specific robot, stopping a specific robot and so on.

PACK_ML/Global/Pml_Robot_Sts[0-9]

The status of the 10 robots.

Predefined signal name: RobotStatus[0-9]

Value	Robot status
0	NO_ROBOTID
2	PROJ_STOPPED
7	PROJ_CLOSED
17	IDLE
18	INIT RAPID
19	CLEARALL START
20	INIT QUEUES
21	RUNNING
22	PAUSED
23	RAPID STOPPED
24	CLEARALL STOP
25	RAPID STOPPED PAUSING
26	HELD
27	SUSPENDED

PACK_ML/Global/Pml_Robot_Cmd[0-9]

The command for the 10 robots. The predefined signal name is RobotCmd[0-9].

Value: **1 - Start**; **2 - Pause**; **3 - Reset**; **4 - Stop**

Predefined signal name: RobotCmd[0-9]

Single robot command availability with PackML in different states

The commands for single robot control is only valid when PackML in specific states. See the following command availability table.

Note

When doing the remote control to change signal robot status, the command from the remote device should be sent according to the command availability table.

Otherwise the remote control function cannot work normally.

PackML states (StateCurrent)\ Signal Robot Command (RobotCmd[0-9])	Start (1)	Pause (2)	Reset (3)	Stop (4)
Resetting (15)	Disable	Disable	Enable (only for RW6)	Disable

Continues on next page

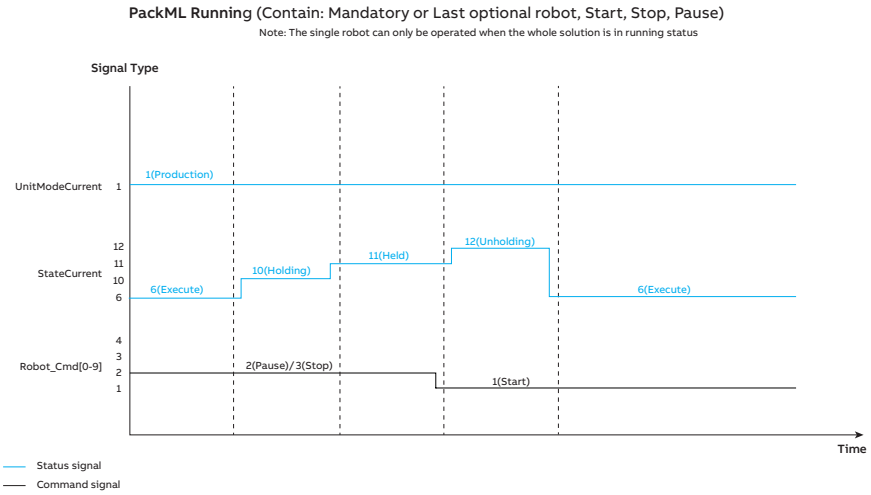
3.4.1 Signals and definition

Continued

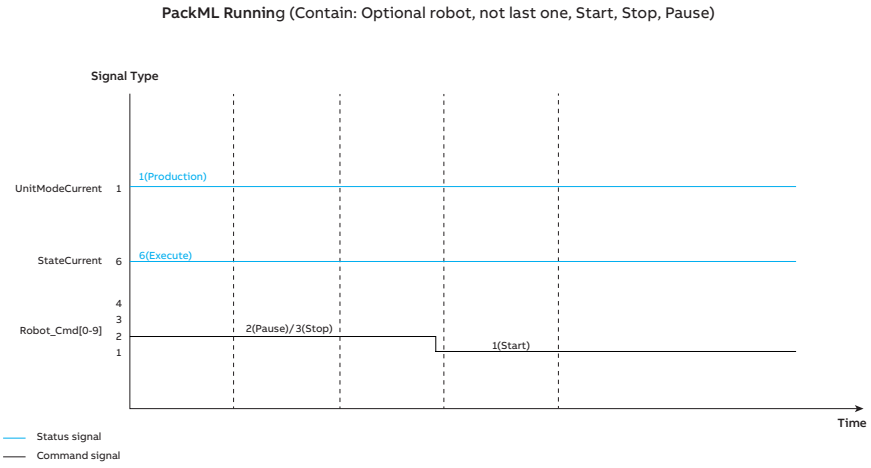
PackML states (StateCurrent)\ Signal Robot Command (RobotCmd[0-9])	Start (1)	Pause (2)	Reset (3)	Stop (4)
Idle (4)	Disable	Disable	Disable	Disable
Starting (3)	Enable (when the robot is not running)	Disable	Disable	Disable
Execute (6)	Disable (for mandatory robot); Enable (for optional robot when it is stopped or paused)	Enable (when the robot is not paused and not stopped)	Disable	Enable (when the robot is not stopped)
Holding (10)	Disable	Enable (when the robot is not paused)	Disable	Enable (when the robot is not stopped)
Held (11)	Enable (if all robots are optional)	Disable	Enable (only for RW6)	Disable
UnHolding (12)	Enable (when the robot is not running)	Disable	Enable (only for RW6)	Disable
Suspending (13)	Disable	Enable (when the robot is not paused)	Disable	Enable (when the robot is not stopped)
UnSuspending (14)	Enable (when the robot is not running)	Disable	Enable (only for RW6)	Disable
Aborting (8)	Disable	Disable	Disable	Enable (when the robot is not stopped)
Aborted (9)	Disable	Disable	Enable (only for RW6)	Disable
Clearing (1)	Disable	Disable	Disable	Disable
Stopping (7)	Disable	Disable	Enable (only for RW6)	Enable (when the robot is not stopped)
Stopped (2)	Disable	Disable	Disable	Disable
Completing (16)	Disable	Disable	Enable (only for RW6)	Enable(when the robot is not stopped)
Complete (17)	Disable	Disable	Disable	Disable

Continues on next page

Single robot setting example signal sequence diagram



xx2300000987



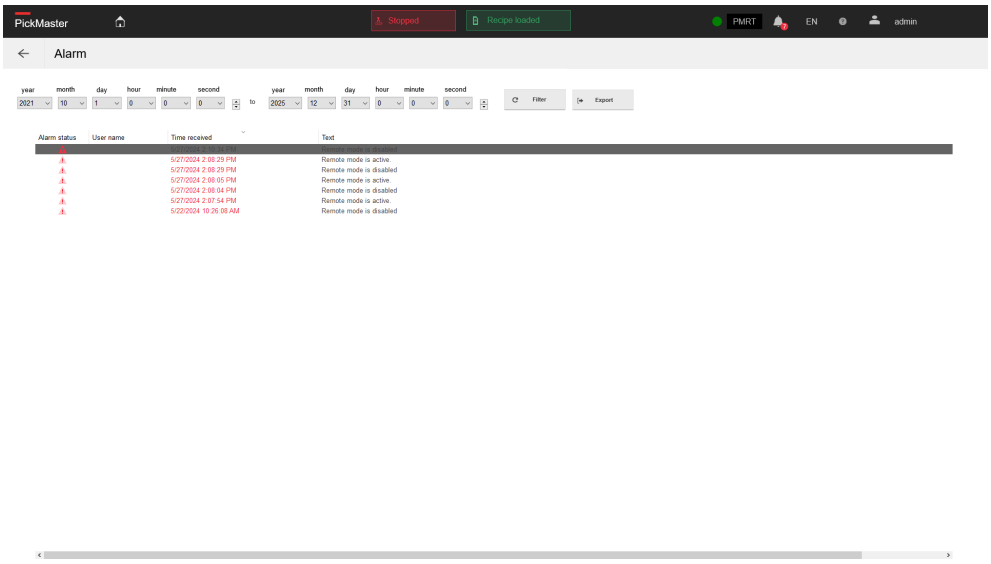
xx2300000986

3.5 ANALYSIS group

Alarm

This function is used to show the alarms which are not acknowledged for the user.

The alarms in **Alarm** are not acknowledged. If you double-click an alarm information, the alarm information will disappear in the **Alarm** page;

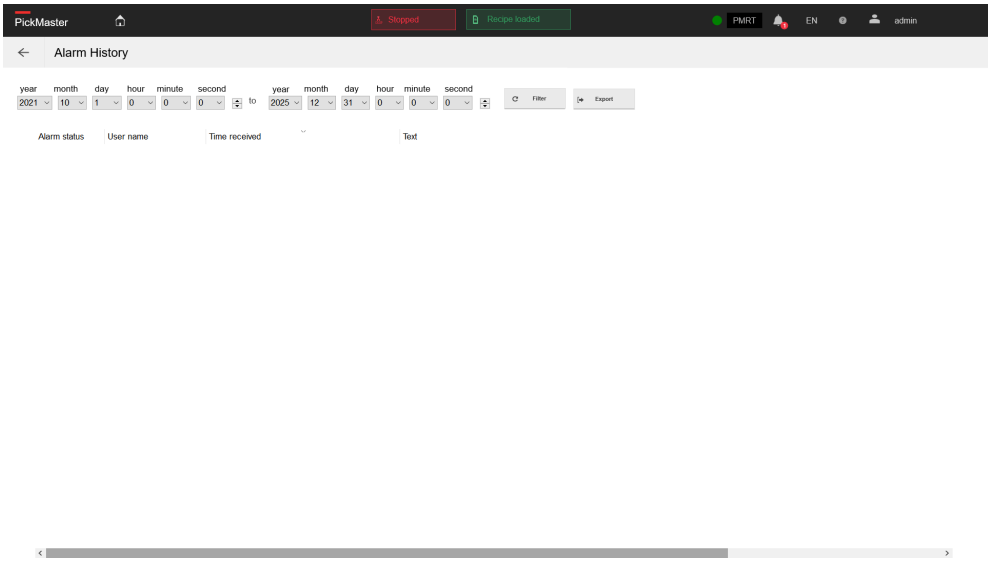


xx1900000697

Alarm history

This function is used to show all alarms for the user.

The alarm history page contains all the alarm information. If it is acknowledged, it is in black; if it is not acknowledged, it is in red.

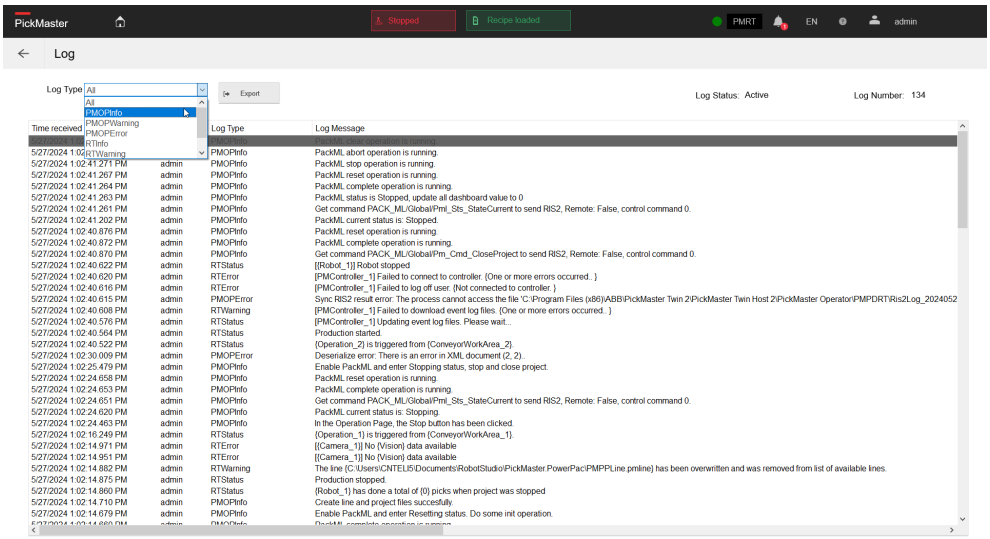


xx1900000698

Continues on next page

Log

This function is used to show the logs for the user. Logs can be exported with **Export** button.



xx1900000699

Tip

The 0000 in the user column means that no user is logged on.

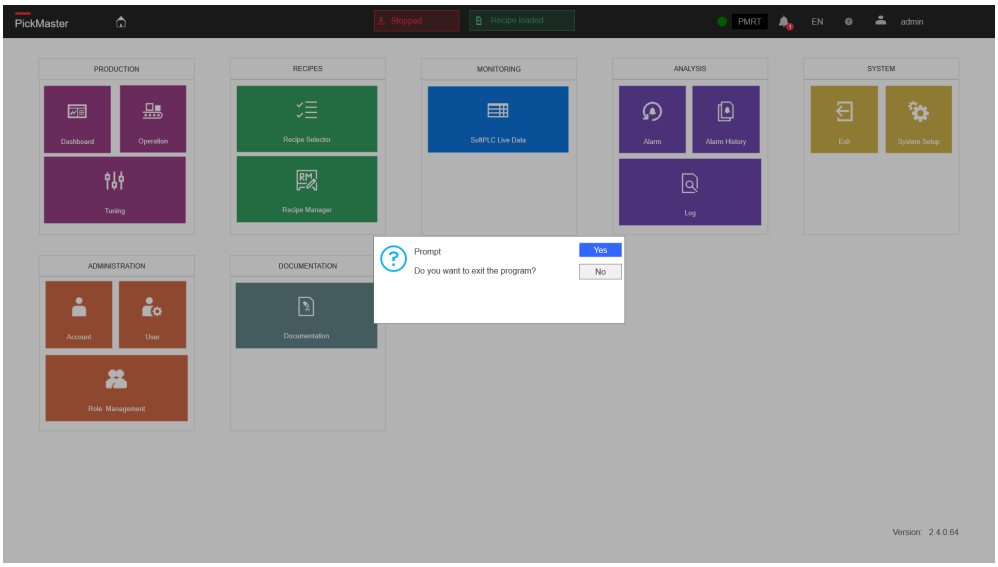
Item	Description
PMOPInfo	The logs for the PickMaster Operator.
PMOPWarning	The warnings for the PickMaster Operator.
PMOPError	The errors for the PickMaster Operator.
RTInfo	The logs for the PickMaster Runtime.
RTWarning	The warnings for the PickMaster Runtime.
RTError	The errors for the PickMaster Runtime.
RTStatus	The status of the PickMaster Runtime.

3.6 SYSTEM group

Exit

Overview

This function is used to exit the PickMaster Operator.

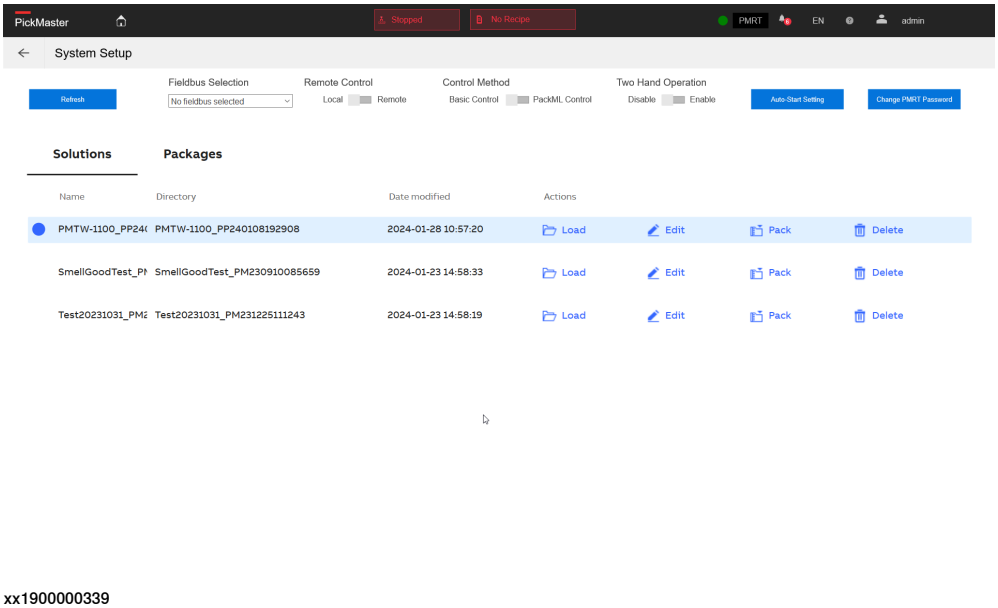


xx1900000338

System Setup

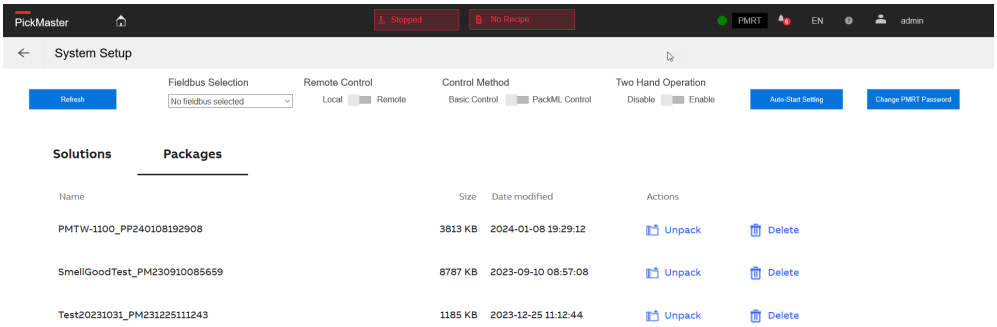
Overview

This function is used to load solutions and enable the PackML for selected solution.



xx1900000339

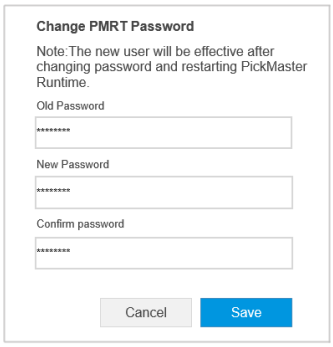
Continues on next page



xx1900000688

Function	Description
Refresh	Refresh to get the latest solution and package list from the default folder. **Tip** The files uploaded from PickMaster Twin Client **Runtime file transfer** will only show up after the refreshing. **Tip** Default folder: • **Pack&Go** file: `C:\ProgramData\ABB\PickMaster Twin\PackedSolutions`
Fieldbus Selection	Select the fieldbus mode: • EtherNet/IP • Modbus • Profinet
Remote Control	Enable/disable the remote control function with EtherNet/IP, Modbus or Profinet. **Note** The PLC with CatMod or Profinet need to be configured correspondingly to support the remote control. For more detail information, refer to the *Remote Control*.
Control Method	Enable/disable the **PackML** function. Only when the **PackML control** option is selected, the PackML flow in the **Operation** window is available. When the **Basic control** option is selected, the PackML function will be disabled.

Continues on next page

Function	Description
Two hand operation	Enable/disable the **Two hand operation** function. When the **Two hand operation** function is enabled, you need to hold the **Two hand operation** button during the operation. **Note** Multi-touch screen is a prerequisite for the **Two hand operation** function.
Change PMRT Password	Change the password for login the **PMRT**(User name: admin).  xx2200001991 • **Old Password**: input the old password. • **New Password**: input the new password. • **Confirm Password**: input the new password again. **Note** Restart the **PMRT** after changed the password to effect the new password.
Auto-Start Setting	Allows you to enable/disable the auto-start function and pre-define the user account used for auto-start. When the auto-start function is enabled, the PickMaster Operator will start and login with the predefined user account automatically. Default auto-start Username: `default user` with Password: `password` **Note** Any account can be used for **Auto-Start**. The user should be aware of that when set the auto-start with a higher level account, any auto-logged user on this device will have higher level authority.
Solutions page	Shows the available solution list. The following actions are available for the solutions in the list. • **Load**: Load the selected solution. • **Edit**: Open the selected solution with PickMaster Recipe Manager. • **Pack**: Pack the selected solution to a `.rspag` file. A suffix is added to the name containing "OP", date and time. • **Delete**: Delete the selected solution. .

Continues on next page

Function	Description
Package page	Shows the **Pack&Go** files list in the default folder. The following actions are available for the **Pack&Go** files in the list. • **Unpack**: Unpack the selected **Pack&Go** file. • **Delete**: Delete the **Pack&Go** file from `C:\ProgramData\ABB\PickMaster Twin\PackedSolutions`.

Procedure

Use the following procedures to load a solution that has been upload from PickMaster PowerPac:

1. Go to the **System Setup** page.
2. Click on the **Refresh** button.
3. If used **Pack&Go** file, go to **Package** page and click **Unpack** button for the desired **Pack&Go** file.
4. On **Solutions** page, click **Load** button for the desired solution.
5. Wait until the solution is totally loaded.
6. If need, click on the **Control Method** button to enable/disable the **PackML** function.
7. If need, click on the **Two hand operation** button to enable/disable the **Two hand operation** function.

Tip

Default folder:

- **Pack&Go** file: `C:\ProgramData\ABB\PickMaster Twin\PackedSolutions`

Remote control

Overview

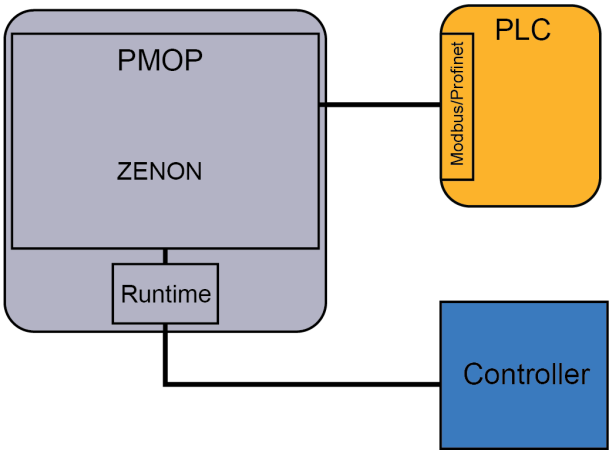
Remote control is that the remote control terminal, such as PLC, can send or read the corresponding PackTag through the industrial bus to control the PickMaster Operator.

PickMaster Operator supports the following buses:

- EtherNet/IP
- Modbus
- Profinet

Continues on next page

3.6 SYSTEM group
Continued



xx2000000230

Note

The firewall setting on the Host computer may cause the failure that connects to PickMaster Operator through the fieldbus.

Prerequisites

To work with the remote control, the following requirements must be fulfilled:

- Format of the PackTags (Communication Directive) must meet the **ANSI/ISA-TR88.00.02-2015** standard.
- The remote control terminal and the PickMaster Operator are in the same LAN.

Format of the PackTags

Machine Implementation Guide chapter 11.PACKTAGS, Table 19 Minimum PackTags.

PackTag type	PackTag	Example of end user term	Datatype	TR 88.00.02 Minimum tags	End user Minimum tags	Available
Status	StateCurrent	State	INT(32)	x	x	x
Status	UnitModeCurrent	Mode	INT(32)	x	x	x
Status	MachSpeed	Nominal Speed	REAL	x	x	
Status	CurMachSpeed	Current Speed	REAL	x	x	
Status	EquipmentInterlock.Blocked	Blockage	BIT	x	x	
Status	EquipmentInterlock.Starved	Starvation	BIT	x	x	
Status	Parameter [#]	Machine data/parameter	Array Structure		x	Robot state
Status	Parameter[#].ID	Parameter ID	INT(32)		x	
Status	Parameter[#].Name	Name of parameter	STRING		x	
Status	Parameter[#].Unit	Unit of measure	STRING[5]		x	
Status	Parameter[#].Value	Value of parameter	User Defined		x	

Continues on next page

PackTag type	PackTag	Example of end user term	Datatype	TR 88.00.02 Minimum tags	End user Minimum tags	Available
Status	RemoteInterface.Parameter[#]	Additional production data	Structure		x	
Status	RemoteInterface.Parameter[#].ID	Parameter ID	INT(32)		x	
Status	RemoteInterface.Parameter[#].Name	Name of parameter	STRING		x	
Status	RemoteInterface.Parameter[#].Unit	Unit of measure	STRING[5]		x	
Status	RemoteInterface.Parameter[#].Value	Value of parameter	REAL		x	
Admin	Warning[#]	Warning	Array Structure		x	
Admin	Warning[#].Trigger	Trigger			x	
Admin	Warning[#].ID	ID	Int (32bit)		x	
Admin	Warning[#].Value	Value	Int (32bit)		x	
Admin	ProdDefectiveCount	OEE.Bad count	INT(32)	x	x	
Admin	ProdProcessedCount	OEE.Total count	INT(32)	x	x	Total Pick number
Admin	StopReason.ID	Event and stop reason	INT(32)	x	x	
Admin	StopReason.Value	Detailed Error Information	INT(32)		x	
Command	CntrlCmd	Command	INT(32)	x	x	x
Command	Parameter [#]	Machine data/parameter	Array Structure		x	Robot command
Command	Parameter[#].ID	Parameter ID	INT(32)		x	
Command	Parameter[#].Name	Name of parameter	STRING		x	
Command	Parameter[#].Unit	Unit of measure	STRING[5]		x	
Command	Parameter[#].Value	Value of parameter	User Defined		x	
Command	RemoteInterface.Parameter[#]	Additional Production data	Array Structure		x	
Command	RemoteInterface.Parameter[#].ID	Parameter ID	INT(32)		x	
Command	RemoteInterface.Parameter[#].Name	Name of parameter	STRING		x	
Command	RemoteInterface.Parameter[#].Unit	Unit of measure	STRING[5]		x	
Command	RemoteInterface.Parameter[#].Value	Value of parameter	REAL		x	
Command	UnitMode	Mode	INT(32)	x	x	x
Command	UnitModeChangeRequest	Change mode	BOOL	x	x	x
Command	MachSpeed	Mach Speed	REAL	x	x	

Continues on next page

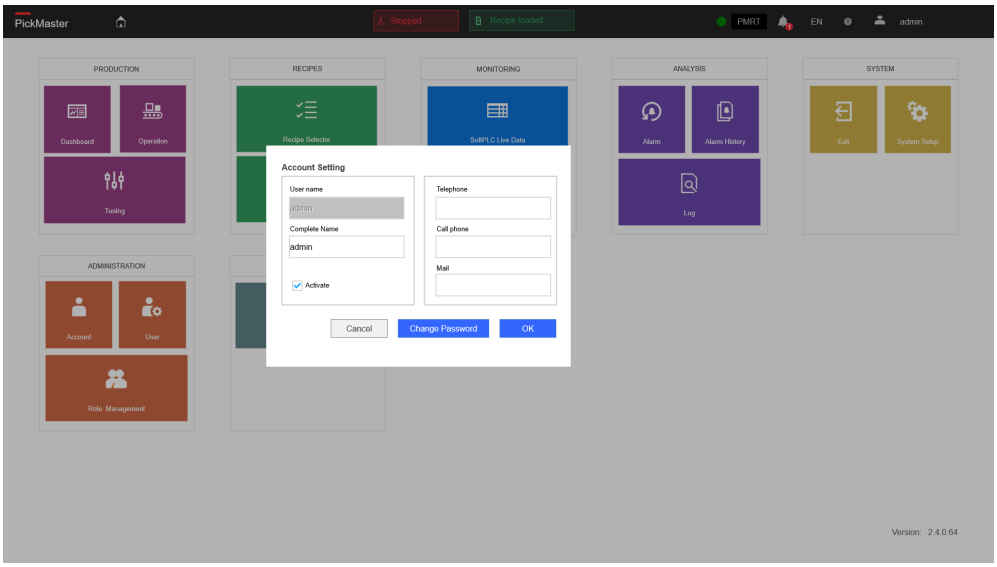
3.6 SYSTEM group
Continued

PackTag type	PackTag	Example of end user term	Datatype	TR 88.00.02 Minimum tags	End user Minimum tags	Available
Command	CmdChangeRequest	Change command	BOOL	x	x	x

3.7 ADMINISTRATOR group

Account

This function is used to modify the information for the active account.



xx1900000340

Role Management

Overview

This function is used to manage the roles for PickMaster Operator. Add new roles or delete existing roles are available.

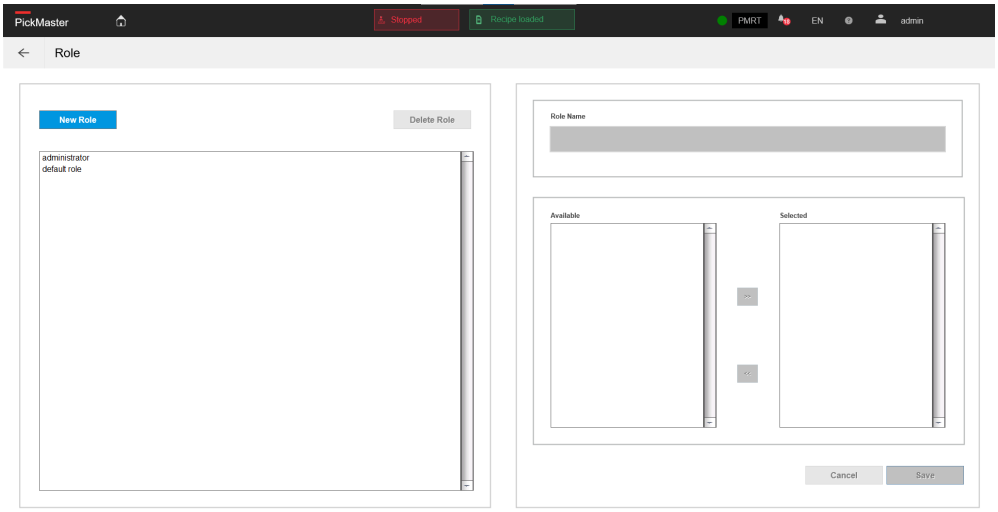
PickMaster Twin provides one default role:

- administrator, contains all authorities.
- default role, contains **0-Default level** authority. The user with default role can only open and check the parameters in PickMaster Operator, no operation is allowed.

Continues on next page

3.7 ADMINISTRATOR group

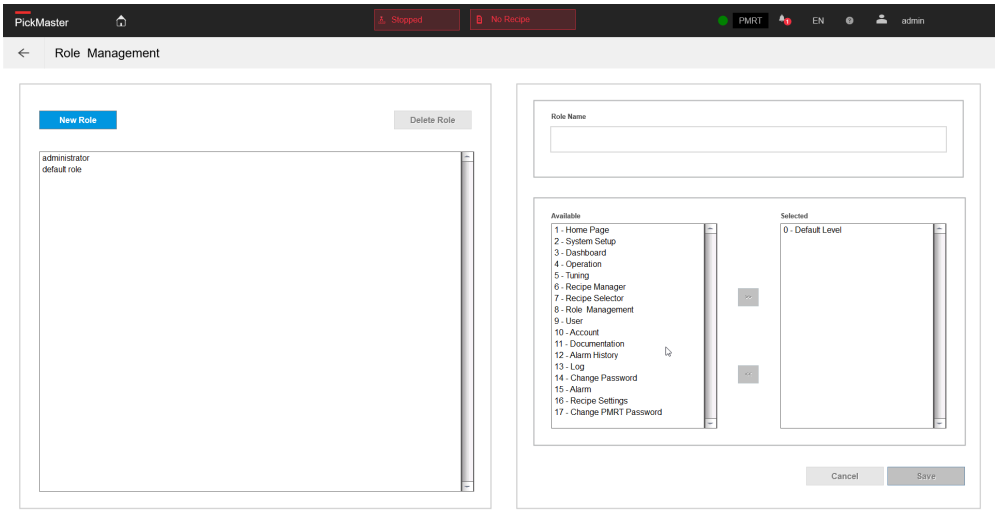
Continued



xx1900000342

Function	Description
New role	Create a new role.
Delete role	Delete a role.

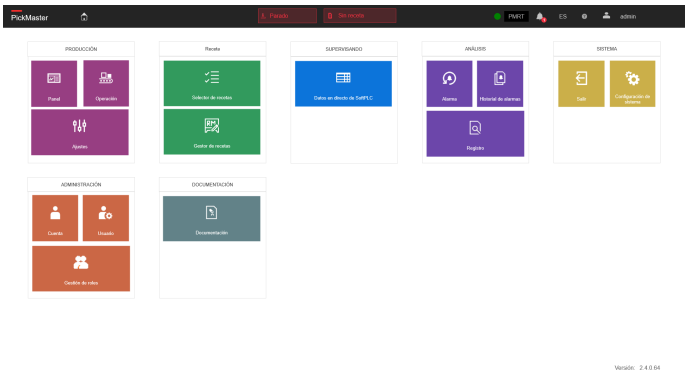
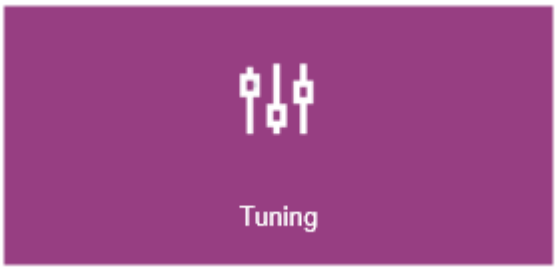
New role



xx1900000345

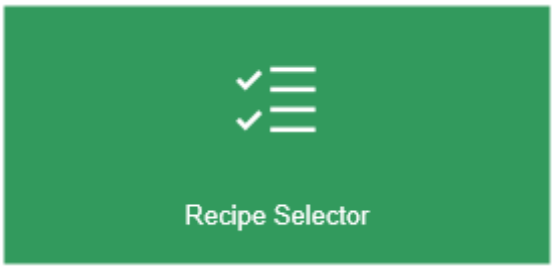
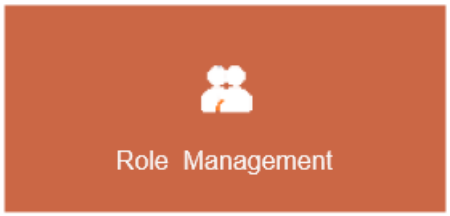
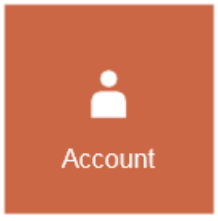
Group	Description
Role name	Enter the name for a new role.
Available	Choose the authority for the new role.
Selected	Shows the chosen authority for the new role.
Save	Save the changes.
Cancel	Discard the changes.

Continues on next page

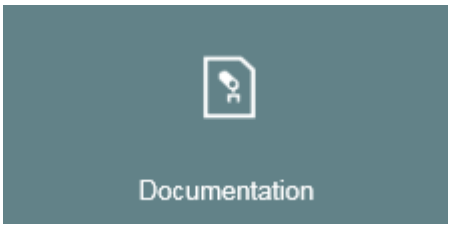
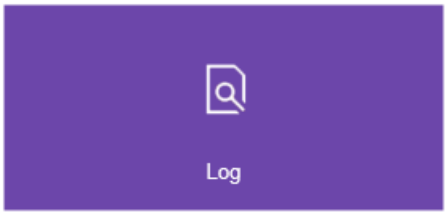
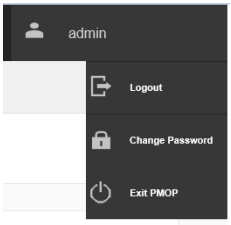
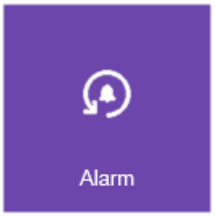
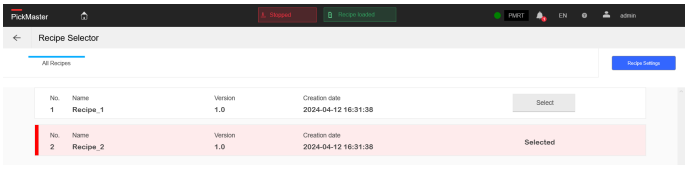
Available permission	Description
1.Home Page	 xx1900000320
2.System Setup	 xx1900000330
3.Dashboard	 xx1900000325
4.Operation	 xx1900000326
5.Tuning	 xx1900000327

Continues on next page

3.7 ADMINISTRATOR group
Continued

Available permission	Description
6.Recipe Manager	 xx2300002057
7.Recipe Selector	 xx1900000328
8.Role Management	 xx1900000333
9.User	 xx1900000332
10.Account	 xx1900000331

Continues on next page

Available permission	Description
11.Documentation	 xx1900000334
12.Alarm History	 xx1900000792
13.Log	 xx1900000793
14.ChangePassword	 xx1900000323
15.Alarm	 xx1900000791
16.Recipe Settings	 xx1900002556
17.ChangePMRTPassword	 xx2300002058

Continues on next page

User Management

Overview

This function is used to manage the users and roles.

PickMaster Operator provides two types of users:

- **Administrator**

  The users whose User Type is **Administrator** can add, delete or edit other users, and can add, delete or edit roles.

  The default user of User Type administrator contains:

  - admin

- **Power User**

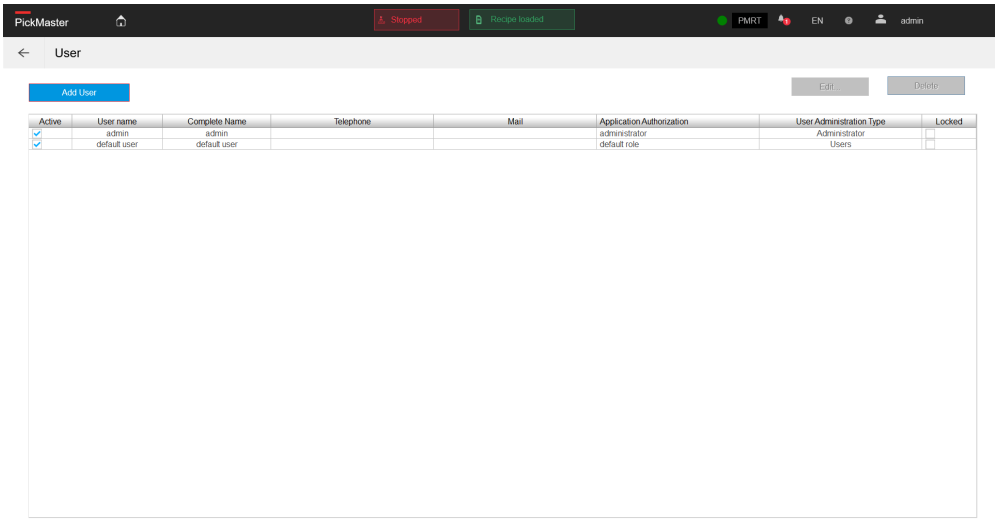
  The users whose User Type is **Power User** can add, delete or edit other users, and can add, delete or edit roles, except the **Administrator** role or user.

- **Users**

  The users whose User Type is **User** are not authorized to add or delete other users, and they are not authorized to add or delete roles.

  The default user of User Type user contains:

  - default user



xx1900000341

Function	Description
Add user	Add a new user.
Edit	Edit an existed user.
Delete	Delete an existed user.

Group	Description
Active	Active the selected user.
User name	Shows the name of the user.

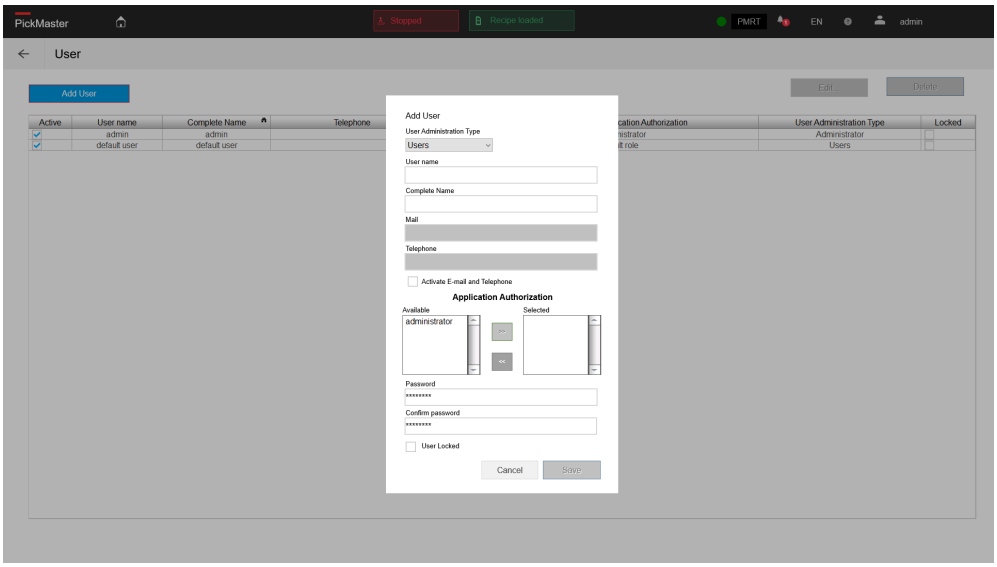
Continues on next page

Group	Description
Complete name	Shows the complete name of the user.
Telephone	Shows the telephone of the user.
Mail	Shows the mail of the user.
Application Authorization	Shows the roles of the user. **Note** Available role: • administrator
User Administration type	Shows the type of the user.
Locked	Active/unactive the selected user.

New user

Note

When a new user is added, change the password to active the new user account.



xx1900000344

Group	Description
User Administration type	Select the type of the user. • **Administrator**:The highest level in the three user type. Can carry out all administration tasks. • **Power Users**: The medium level in the three user type. Can create and edit users. • **Users**: The Lowest level in the three user type. Can carry out actions according to the authorization levels they have been assigned.
User name	Enter the name of the new user.
Complete name	Enter the complete name of the new user.
Mail	Enter the mail of the new user.

Continues on next page

3.7 ADMINISTRATOR group
Continued

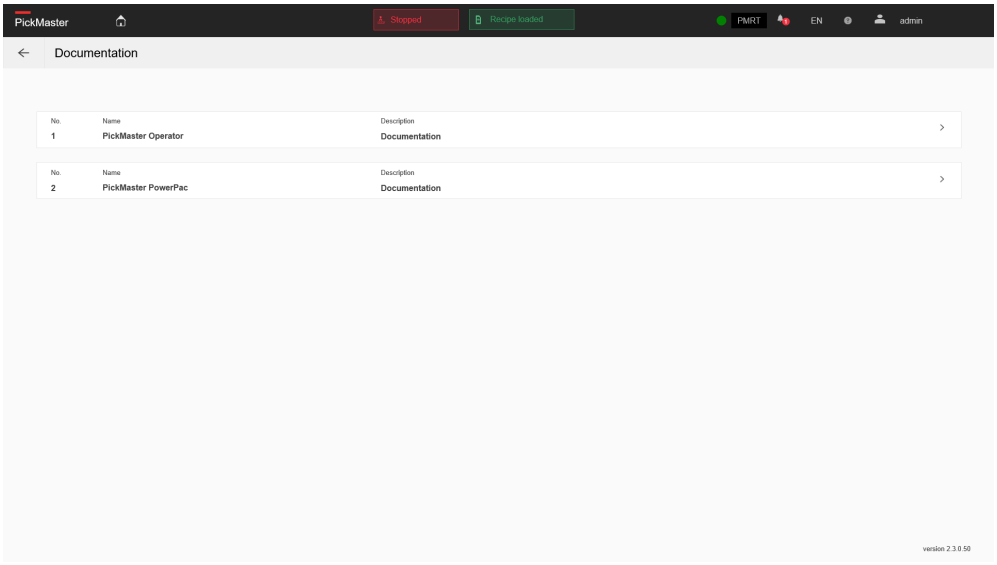
Group	Description
Telephone	Enter the telephone of the new user.
Active E-mail and Telephone	Active the E-mail and telephone of the new user.
Authorization	Choose the authority from the available list to the selected list.
Password	Enter a password for the new user.
Confirm Password	Confirm the password for the new user.
User Locked	Disable the new user.

3.8 DOCUMENTATION group

PickMaster

Overview

This function is used to open the related documentation.



xx1900000343

This page is intentionally left blank

4 PickMaster Operator workflow

4.1 About the workflow

Overview

This chapter describes examples step-by-step to guide you how to work with the PickMaster Operator.

Note

For most scenarios, you are recommended to follow the workflow from start to finish, even though other sequences maybe possible.

4.2 Production

Opening PickMaster Operator

Use this procedure to start PickMaster Operator:

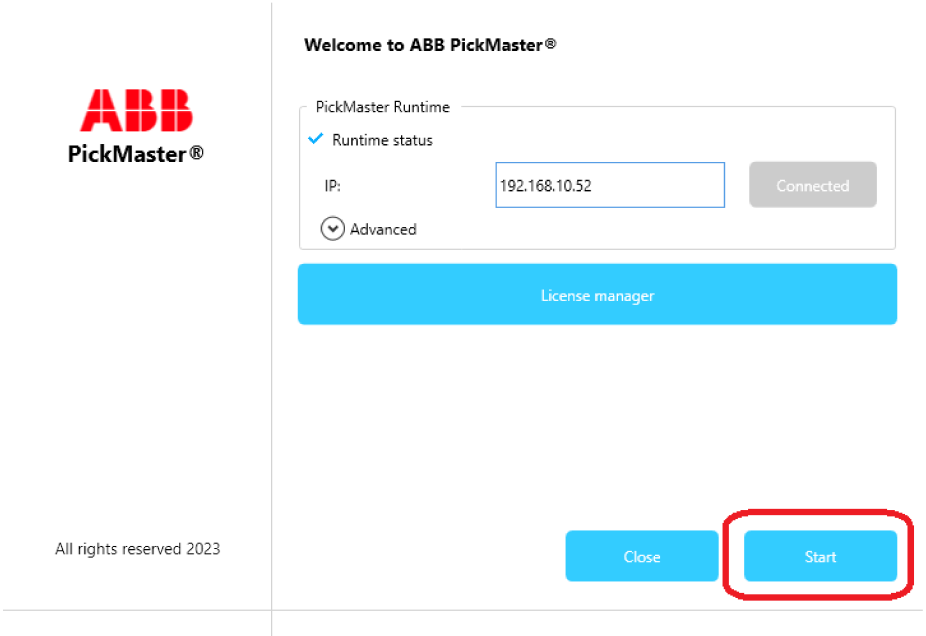
1 Double click the `PickMaster Operator` file to open the **Welcome to ABB PickMaster** window.

xx1900001506

2 Enter the IP address of the PickMaster Runtime which need to be connected.

> **Tip**
>
> Check the IPv4 address of the computer which the PickMaster Runtime is installed on.

> **Note**
>
> Loopback address is NOT allowed to use as the PickMaster Runtime IP address, for example 127.0.0.1.
>
> Loopback address will cause errors in vision function.



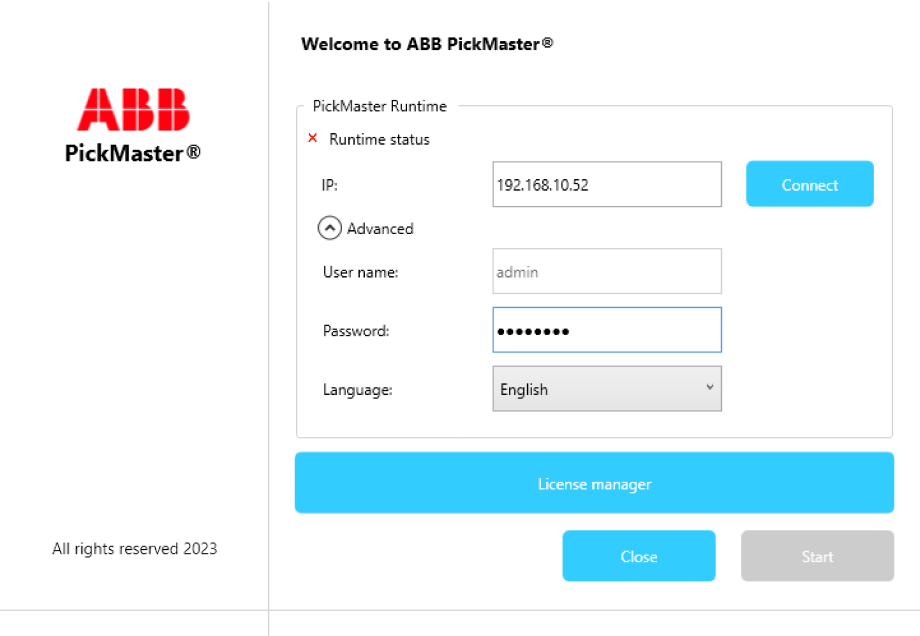
xx1900001507

Continues on next page

3 If needed, click **Advance** to open the setting view for Runtime user and language.

> **Tip**
>
> The default Runtime user name and password is the credential for connecting the PickMaster Runtime by `https` protocol.
>
> Default Username: `admin` with Password: `password`

> **Note**
>
> The user should change the password of the default user account for higher Cyber Security.

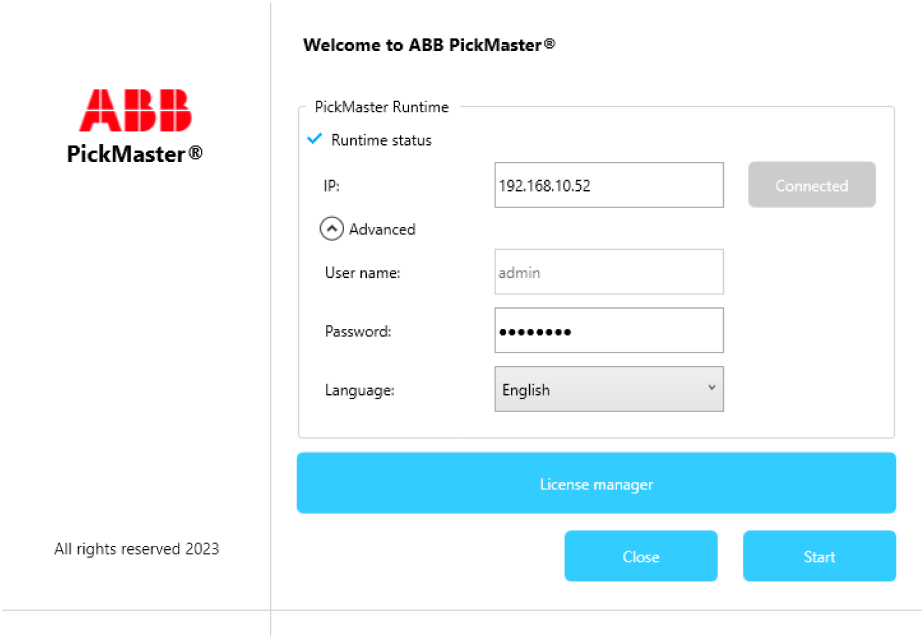


xx2200002005

4 Click **Connect** button.

> **Note**
>
> When the **SSL** dialog box pops up during the first operation of the PickMaster Operator, click **Yes**.
>
> Otherwise the PickMaster Operator cannot work normally.
>
> For more information, see chapter *Self-signing certificate* in *Application manual - PickMaster® Twin - PowerPac*.

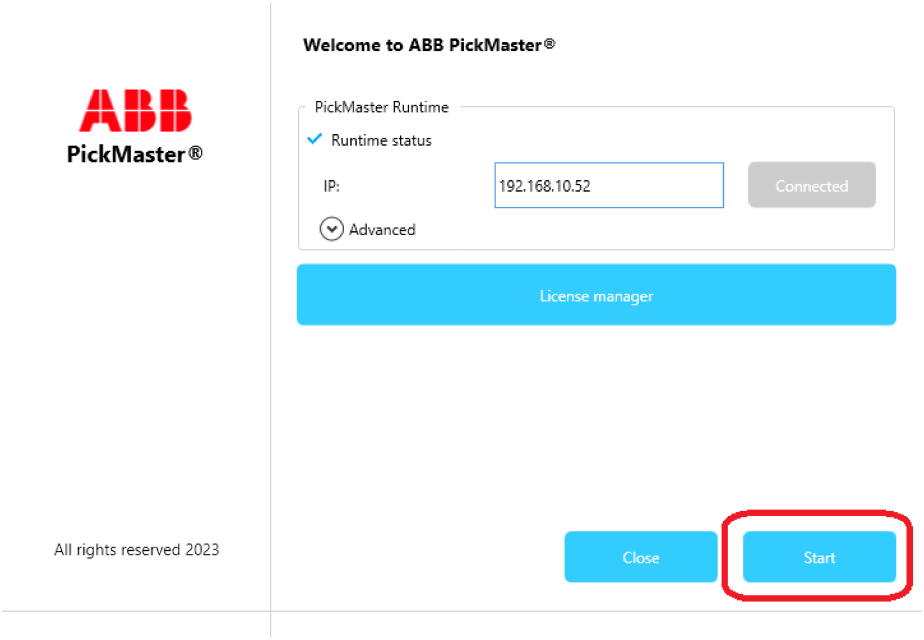
Continues on next page



xx2200002006

5 Click the **License Manager** button to open the **License Management** window. For more detail on activating the license, see *ABB ZENON license on page 28*.

6 Click **Start** button to open the login interface.



xx1900001508

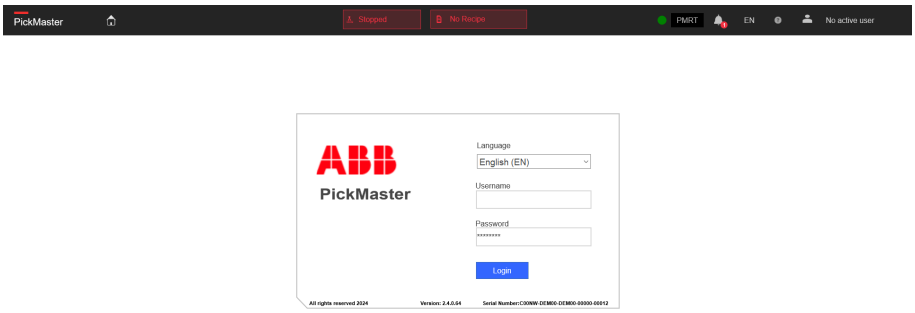
Continues on next page

Note

If the user meets any problem when building connection between PickMaster Operator and real Runtime, please check from below possible reasons:

a Using a Host account that is not administrator;
b Firewall blocking;
c VPN interference;
d Host IP address incorrect;
e The network name not renamed to "ProfinetIOAdapter".

7 Login with an effective user account.



xx1900000783

Tip

A default user and password have been created for each role.
Administrator Username: `admin` with Password: `password`

Note

The Username and Password are case sensitive.

Note

To enhance the security of the user account, user lockout logic is used in PickMaster Operator.

Loading solution

Use this procedure to load the solution:

1 In PickMaster Operator main page, click **System Setup**.

Continues on next page

2 Copy the desired **Pack&Go** file to the default folder.

> **Tip**
>
> Default folder:
> - **Pack&Go file:** `C:\ProgramData\ABB\PickMaster Twin\PackedSolutions`

3 Click on the **Refresh** button.

4 If used **Pack&Go** file, go to **Package** page and click **Unpack** button for the desired **Pack&Go** file

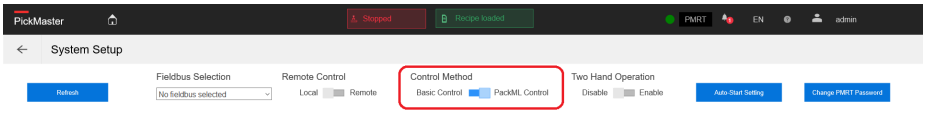
5 On **Solutions** page, click **Load** button for the desired solution.

6 Wait until the solution is totally loaded.

7 If need, click on the **Control Method** button to enable/disable the **PackML** function.

Only when the **Enable PackML** function is selected, the **PackML** flow in the operation can be available.

> **Tip**
>
> Only when the **Enable PackML** function is selected, the PackML flow in the operation can be available.



xx1900001510

8 If need, click on the **Two hand operation** button to enable/disable the **Two hand operation** function.

Selecting recipe

Use this procedure to select the recipe:

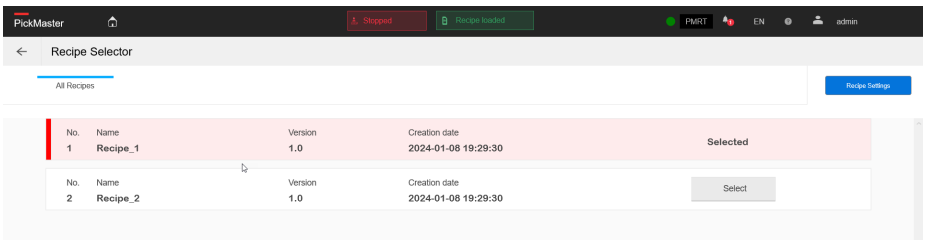
1 In PickMaster Operator main page, click **Recipe Selector**.

2 Click on the **Select** button to activate the recipe you need.

> **Note**
>
> If any errors or warnings pop up, see *Recipe checking before loading on page 72*.

Continues on next page

When the recipe is selected, the selected recipe will be highlighted as pink.

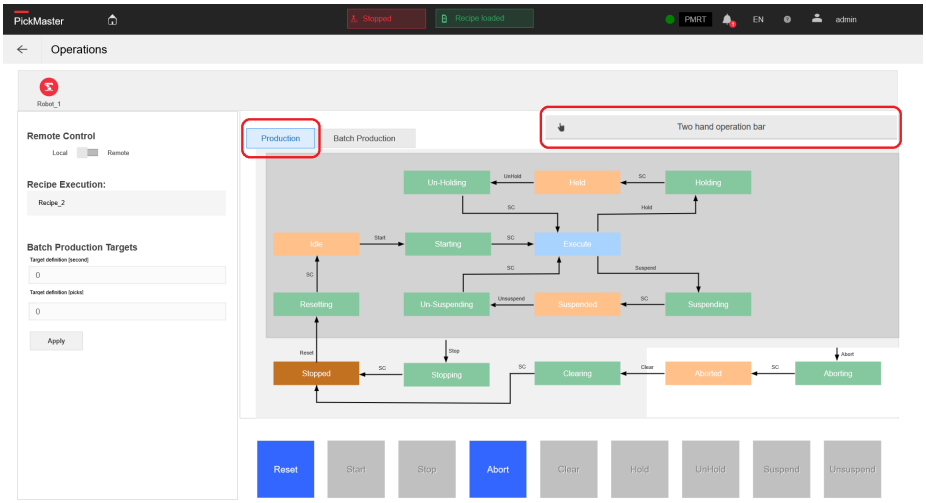


xx1900000794

Starting production

Use this procedure to start the production:

1. In PickMaster Operator main page, click **Operation**.
2. Choose the **Production**.
3. Hold the **Two Hand Operation bar** button to enable the operation.



xx1900001514

4. Click on the **Reset** button and then **Start** button to start the production.

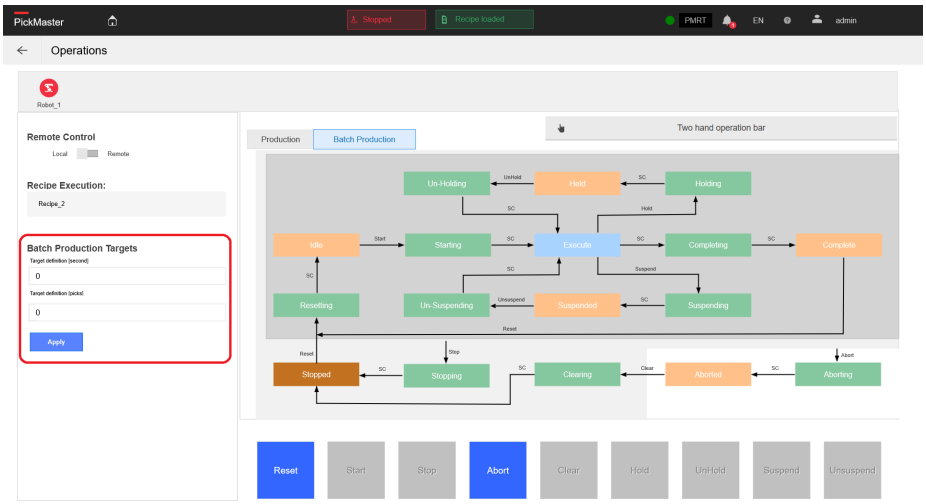
4.3 Batch production

Starting batch production

Use this procedure to start the production:

1. In PickMaster Operator main page, click **Operation**.
2. Choose the **Batch Production**.
3. If needed, hold the **Two Hand Operation bar** to enable the operation.
4. Enter the target time or counts for the Batch Production in the **Batch Production targets** text box.

> **Note**
>
> Pick time and Pick number are alternative. When one is fulfilled, the other input box will be grayed out.



xx1900001517

5. Click the **Apply** button.
6. Click the **Reset** button and then **Start** button to start the production.

> **Note**
>
> When the conditions are met, the state machine will jump to the **Completing** state, and it will stop the operation. And finally jump to the **Stopped** state.

4.4 Remote control

Tip

The reader for this chapter should have the basic knowledge of automatic control.

Continues on next page

4.4.1 Enabling Remote control

How to enable Remote control

This section describes how to enable the **Remote control** in PickMaster Operator.

Users can choose the appropriate fieldbus connection according to their requirements.

1 In PickMaster Operator main page, click **System Setup**.

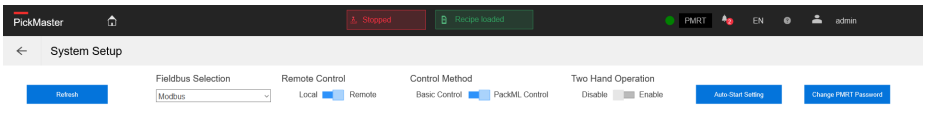
2 Select **EtherNet IP**/ **Modbus**/ **Profinet** in **Fieldbus Selection** drop-down list.

> **Note**
>
> For more information about **EtherNet IP**/ **Modbus**/ **Profinet** signals, see *Appendix on page 129*.

> **Note**
>
> If **Profinet** is used, the user needs to obtain the GSDML files under `C:\ProgramData\ABB\zenon800\straton\GSDML` folder.

3 Select the **Control Method** as **PackML Control** to enable the **PackML** function.

4 Enable **Remote Control** function.

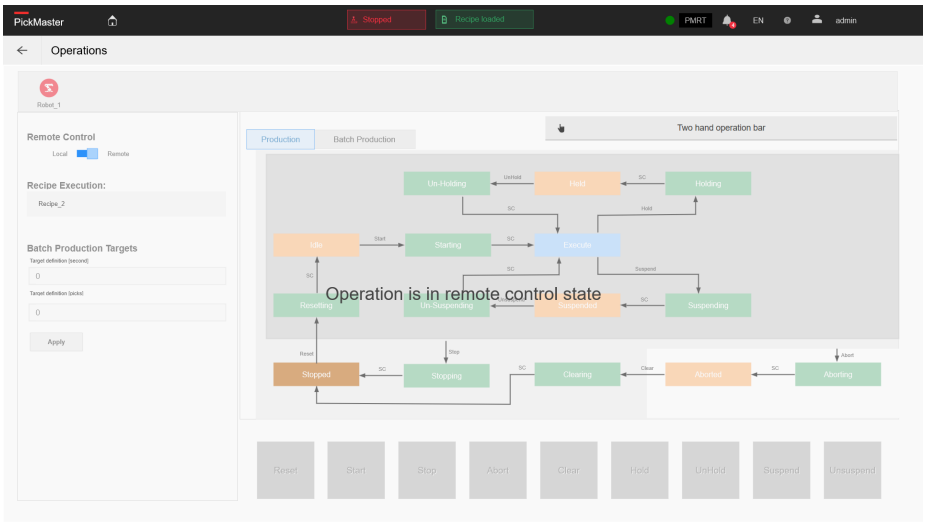


xx2000000145

5 Back to PickMaster Operator main page, click **Operation**.

The user cannot control the production from the **Operation** page.

All commands are from the remote controller.



xx2000000146

Continues on next page

This **SoftPLC Live Data** page shows the parameters which reflect the real data of the selected fieldbus signal.

The data structure of the following Packtag is based on the data structure defined by the previous Packtag (see *Format of the PackTags on page 94*). Users can refer to the following Packtag data structure when using Modbus for remote control.

Configuring Remote control signal

For more information on configuring **Remote control** signal, see *Signals and definition on page 77* and *Appendix on page 129*.

4.4.2 Examples

Remote control - Basic function - PackML

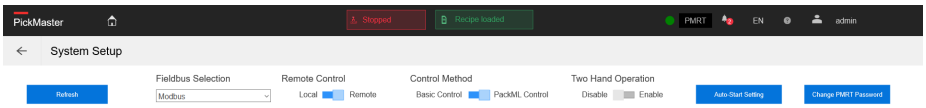
This section describes an example for some basic function of **Remote control**.

1 Open PickMaster Operator and load solution.

2 In PickMaster Operator main page, click **System Setup**.

3 Select **EtherNet IP**/ **Modbus**/ **Profinet** in **Fieldbus Selection** drop-down list.

4 Enable **Remote Control** function.



xx2000000145

5 Send the command from the remote control equipment to PickMaster Operator.

6 Set the **UnitMode** to **1** (1=Production/4=Batch Production) and **UnitModeChangeRequest** from **0** to **1**.

> **Tip**
>
> For more details about the signal information, see *PACK_ML/Global/Pml_UnitModeChangeRequest -> UnitName.Command.UnitModeChangeRequest on page 82*.

7 Check **UnitModeCurrent**:

- If **UnitModeCurrent**=1, it means that PickMaster Operator now is in Production mode.
- If **UnitModeCurrent**=4, it means that PickMaster Operator now is in Batch Production mode.

8 Set the **CntrlCmd** to **1** (1=Reset) and **CmdChangeRequest** from **0** to **1** to trigger the PickMaster Operator preparing for production.

> **Tip**
>
> For more details about the signal information, see *PACK_ML/Global/Pml_State_CmdChangeRequest -> UnitName.Command.CmdChangeRequest on page 82*.

Continues on next page

9 Check PickMaster Operator current state by **StateCurrent**=15 and change to **StateCurrent**=4.

> **Tip**
>
> For more details about the signal information, see *PACK_ML/Global/Pml_Sts_StateCurrent -> UnitName.Status.StateCurrent on page 80*.

10 Set the **CntrlCmd** to **2** (2=Start) and **CmdChangeRequest** from **0** to **1** to trigger the PickMaster Operator running production.

> **Tip**
>
> For more details about the signal information, see *PACK_ML/Global/Pml_State_CntrlCmd -> UnitName.Command.CntrlCmd on page 81*.

11 Check PickMaster Operator current state by **StateCurrent**=3 (Starting) then **StateCurrent**=6 (Execute) which means that production is running.

> **Tip**
>
> For more details about the signal information, see *PACK_ML/Global/Pml_Sts_StateCurrent -> UnitName.Status.StateCurrent on page 80*.

12 Set the **CntrlCmd** to **3** (3=Stop) and **CmdChangeRequest** from **0** to **1** to trigger the PickMaster Operator to stop the production.

> **Tip**
>
> For more details about the signal information, see *PACK_ML/Global/Pml_State_CmdChangeRequest -> UnitName.Command.CmdChangeRequest on page 82*.

13 Check PickMaster Operator current state by **StateCurrent**=7 and change to **StateCurrent**=2 which means that production is stopped.

> **Tip**
>
> For more details about the signal information, see *PACK_ML/Global/Pml_Sts_StateCurrent -> UnitName.Status.StateCurrent on page 80*.

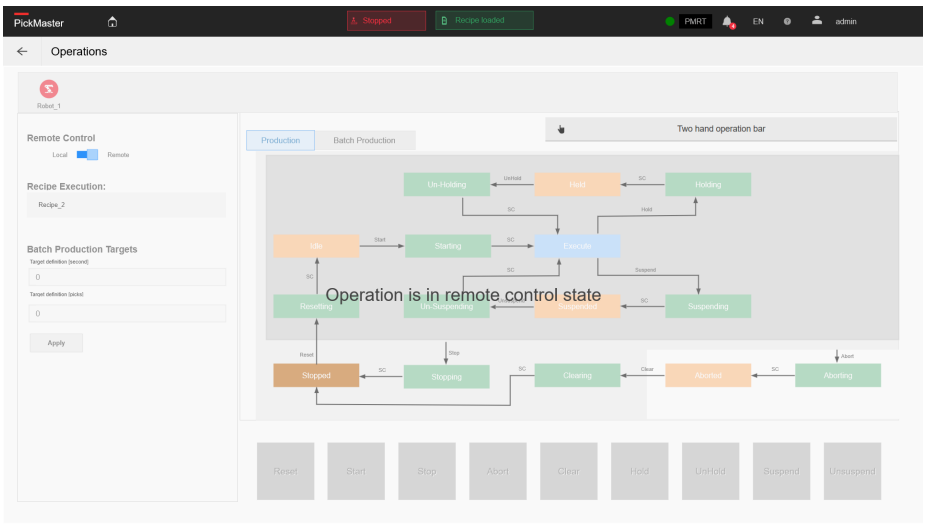
14 Back to PickMaster Operator main page, click **Operation**.

The user cannot control the production from the **Operation** page.

Continues on next page

4.4.2 Examples
Continued

All commands are from the remote control equipment.



xx2000000146

The data structure of the following Packtag is based on the data structure defined by the previous Packtag (see *Format of the PackTags on page 94*). Users can refer to the following Packtag data structure when using Modbus for remote control.

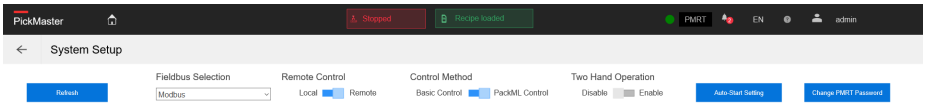
Note

Besides the Fieldbus logic interface listed in the Appendix, any other Fieldbus protocol will be invalid in PickMaster Operator. For example, ModbusRTU, Modbus_Energy or the Modbus process gateway are all invalid.

Remote control - Recipe switch

This section describes an example for the recipe switch function of **Remote control**.

1 Open PickMaster Operator and load solution.
2 In PickMaster Operator main page, click **System Setup**.
3 Select **EtherNet IP**/ **Modbus**/ **Profinet** in **Fieldbus Selection** drop-down list.
4 Enable **Remote Control** function.



xx2000000145

5 Check the **Idle** signal in **ScadaToRemote** window is **1**.

Continues on next page

If the idle signal is 1, it means that the PickMaster Operator can receive remote command. The **ScadaToRemote** window will show current recipe ID and recipe ID list.

> **Note**
>
> The maximum number of the items in the recipe ID list for **EtherNet IP**/**Modbus** is 150.
>
> The maximum number of the items in the recipe ID list for **Profinet** is 50.

6 Set **RequestRecipeID** as request (For example 70001) and the **RequestOrder** to 101 in **RemoteToScada** window.

> **Tip**
>
> 101 is the job number for remote recipe switch.

7 Set the command **Request** signal from **0** to **1** in **RemoteToScada** window. This can trigger the PickMaster Operator to switch the recipe by **RecipeRequestID**. The PickMaster Operator only monitors the rising edge of the command **Request** signal.

> **Note**
>
> After the PickMaster Operator received the command **Request** signal, the recipe in PickMaster Operator will switch accordingly and the **Idle** signal in **ScadaToRemote** window will change back to **0**.

8 If need to switch the recipe again, set the command **Request** signal from **1** to **0** and repeat step 5 to 8.

> **Note**
>
> If any error raised, PickMaster Operator will send an error signal and error code to the remote control equipment.
>
> The error signal must be reset before sending any other command to PickMaster Operator. Reset the PickMaster Operator error by sending a pulse signal of **ResetError** from the remote control equipment.

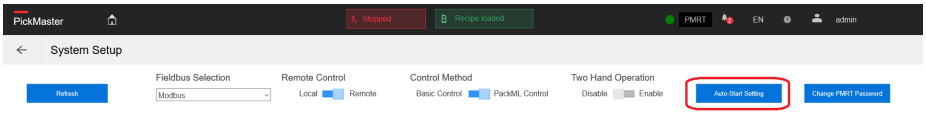
4.5 Auto-start

4.5.1 Enabling Auto-Start

How to enable Auto-Start

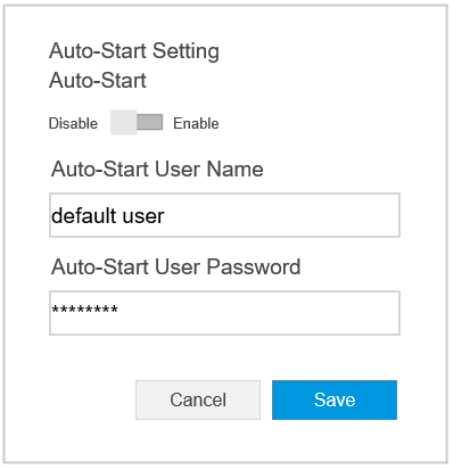
This section describes how to enable the **Auto-Start** in PickMaster Operator.

1. In PickMaster Operator main page, click **System Setup**.
2. Click on **Auto-Start Setting** button.



xx2300001585

3. Enable **Auto-Start** function.



xx2300001586

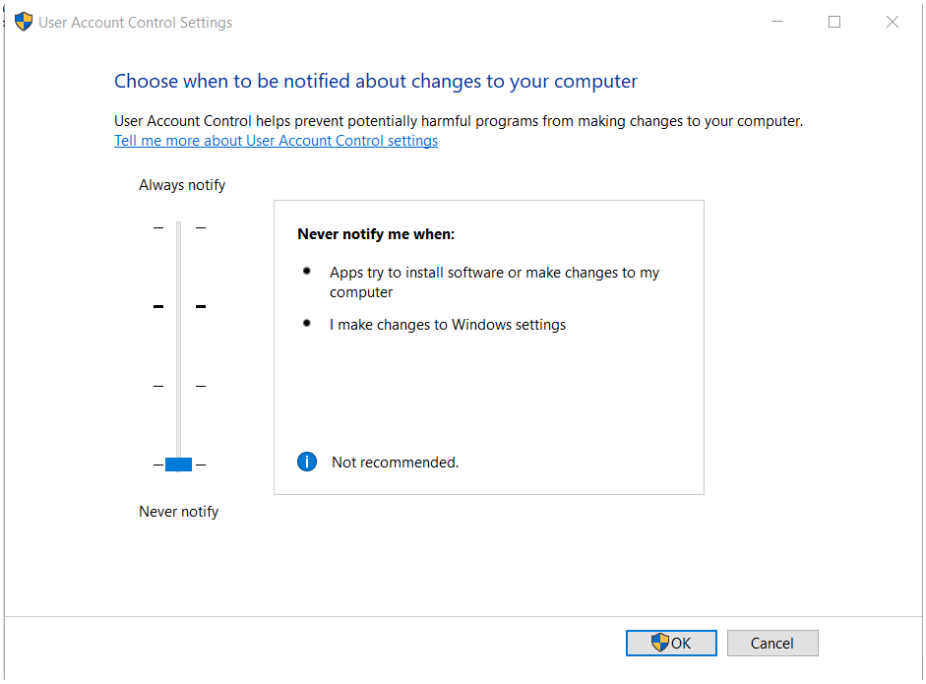
4. Enter the user name and password of the user account that will be used as the auto-start account.

> **Tip**
>
> The predefined default user account only contains **0-Default level** authority. Any operation is not allowed to do by the predefined default user.

5. Click **Save** to apply the change to PickMaster Operator.
6. Open *Run* program on the computer and input `shell:startup` to open the default folder for auto-start.
7. Copy PickMaster Operator shortcut to the default folder for auto-start.

Continues on next page

8 Change the level of **User Account Control Settings** to **Never notify** of the computer.



xx2300001494

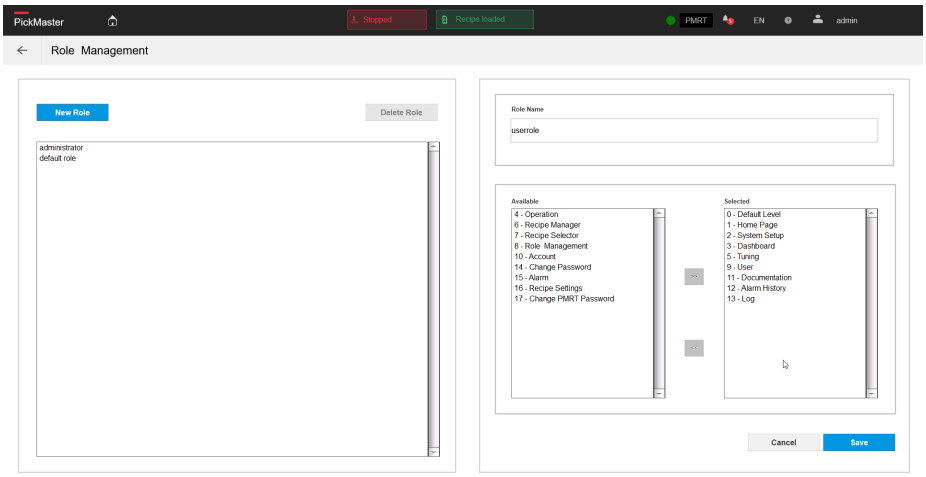
After the setting, the PickMaster Operator will start and login with the entered user account automatically when the computer is restarted next time.

4.6 Adding a new user with new role

Adding a new role

Use this procedure to add a new role:

1. In PickMaster Operator main page, click **Role Management**.
2. Click **New Role**.
3. Enter the role name as **userrole**.
4. Add the following functions for the new role from the available list to selected list.
   - Default Level
   - Home Page
   - System Setup
   - Dashboard
   - Tuning
   - User
   - Documentation
   - Log
   - Alarm
5. Click **Save**.



xx1900002599

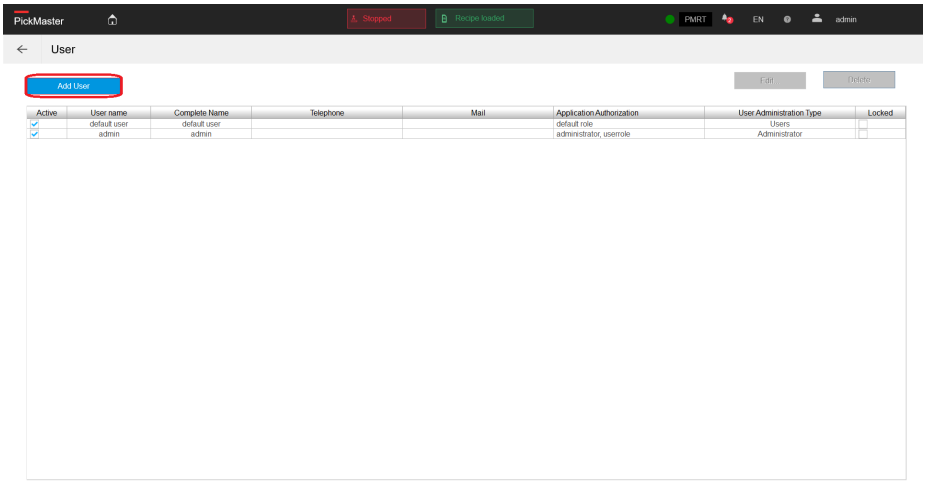
Adding a new user

Use this procedure to add a new role:

1. In PickMaster Operator main page, click **User**.

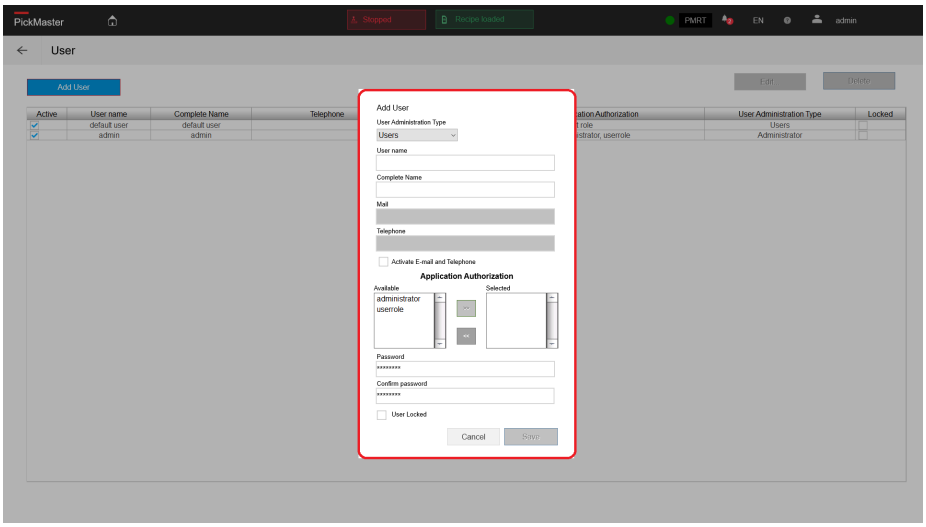
Continues on next page

2 Click **Add User**.



xx2000000191

The new user page will pop up.

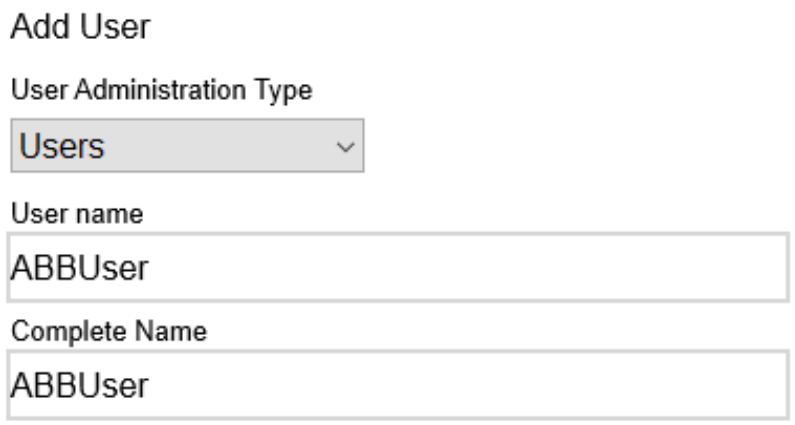


xx2000000137

3 Select the **User Administration Type** as **Users**.

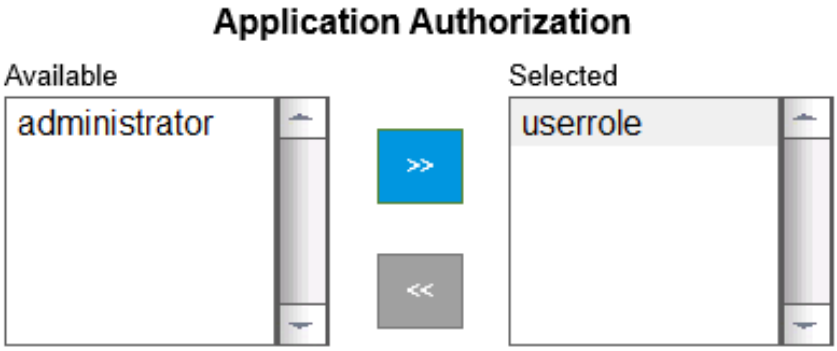
Continues on next page

4 Enter the user name and the complete name as **ABBUser**.



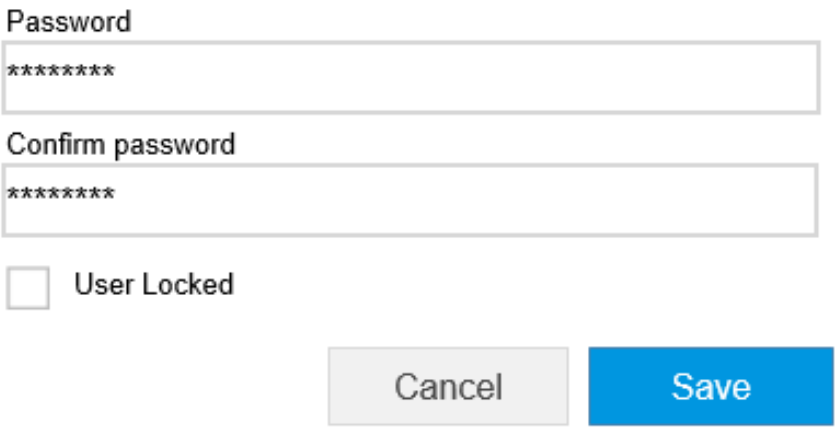
xx2000000138

5 Select the authorization for the new user from the available list to selected list.



xx2000000139

6 Enter the password for new user and confirm it.



xx2000000140

Continues on next page

> **Note**
>
> If **User Locked** is selected, the new created user will not be able to login.

7 Click **Save**.

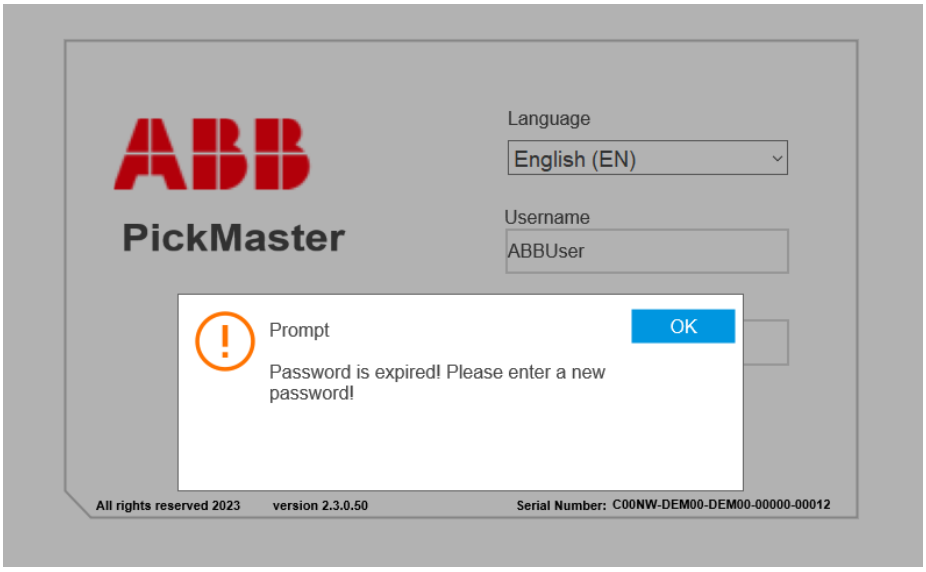
The new user will show up in the user list.

8 Logout current user.

9 Login with the new user.

> **Note**
>
> The first time when you log in with the new created user, you will be prompted to the password expired page. You need to change the password to active the new user.

When you click **Login**, this page will show up.

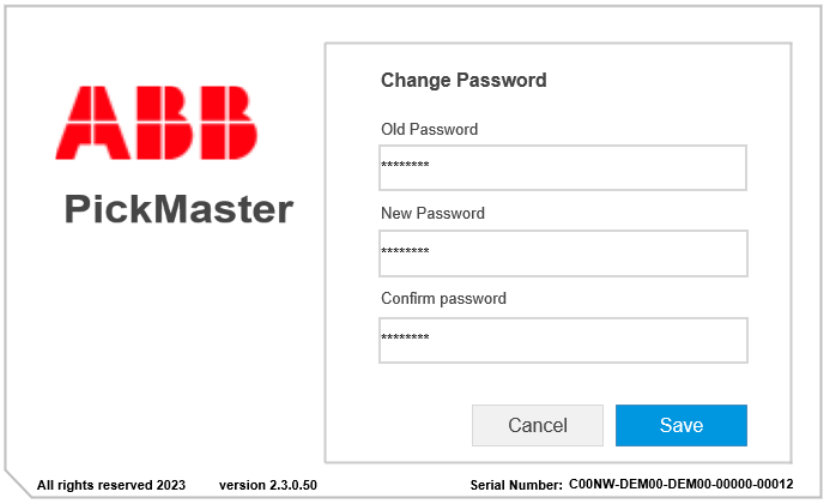


xx2000000195

Continues on next page

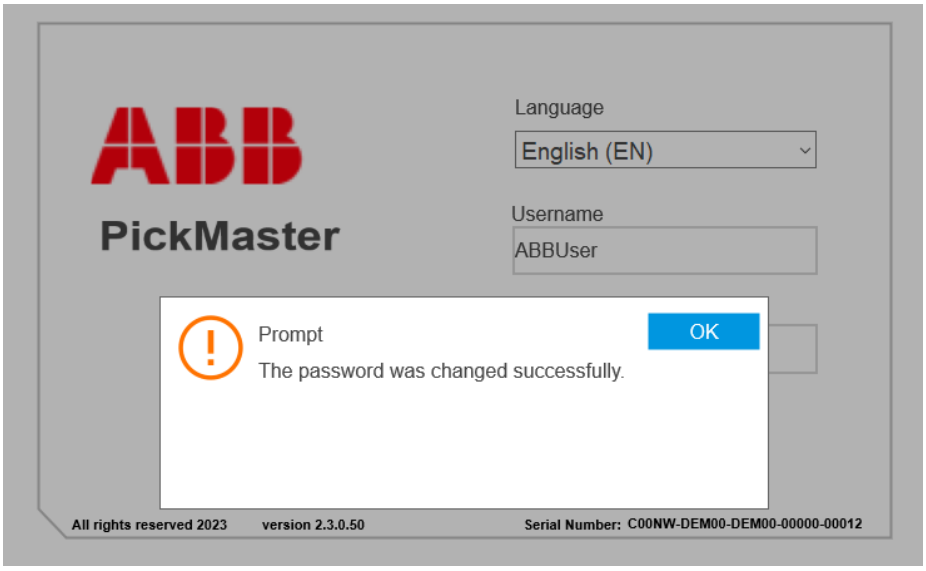
4.6 Adding a new user with new role
Continued

10 Change the password and click **Save**.



xx2000000196

When the password is changed successfully, the following page will show up.



xx2200000578

11 Login with the new user and the new password.

When you login successfully, the selected functions will be available.

5 Appendix

5.1 EtherNet/IP signal definition

Tip

For more detail information on the signal definition, see *Signals and definition on page 77*.

EtherNet/IP Instance

Data	Name	Messaging	Type	Instance	Class	Size	Description
ScadaToRemote	PMOPToRemote	implicit	Inputs	101		496	Current, Command, RecipeID
ScadaToRemote	PMOPToRemoteRecipeIDList1	explicit	Inputs	113	3	400	RecipeIDList[0]-[99]
ScadaToRemote	PMOPToRemoteRecipeIDList2	explicit	Inputs	114	3	200	RecipeIDList[100]-[149]
RemoteToScada	RemoteToPMOP	implicit	Outputs	201		496	Current, Command, RecipeID

Essential information for EtherNet/IP device configuration

Name	Value
Connected to Industrial Network	EtherNet/IP
Address	The IP address of the Host computer. **Note** The default IP address that is preset internally in the PickMaster Operator in the COD file is 192.168.1.11, which needs to be matched with the host computer IP address. If they are not matched, the COD file needs to be changed according to the host computer IP address. For more detailed information, see *Configuring the host computer IP address (COD file) for remote control over EtherNet/IP on page 42*.
Vendor ID	0
Device Type	0
Product Code	0
Output Assembly	201
Input Assembly	101
Output Size (bytes)	496
Input Size (bytes)	496

Continues on next page

5.1 EtherNet/IP signal definition

Continued

PMOP to Remote

Instance	Byte	Bit	Signal	Type
101	0		UnitModeCurrent	int32
101	4		StateCurrent	int32
101	28		RobotStatus[0]	int16
101	30		RobotStatus[1]	int16
101	32		RobotStatus[2]	int16
101	34		RobotStatus[3]	int16
101	36		RobotStatus[4]	int16
101	38		RobotStatus[5]	int16
101	40		RobotStatus[6]	int16
101	42		RobotStatus[7]	int16
101	44		RobotStatus[8]	int16
101	46		RobotStatus[9]	int16
101	64	0	Idle	bool
101	64	1	Error	bool
101	64	2	PMRTConnected	bool
101	64	3	HeartBeat	bool
101	64	4		
101	64	5		
101	64	6		
101	64	7		
101	66	0	Modbus	bool
101	66	1	PROFINET	bool
101	66	2	EtherNet/IP	bool
101	66	3		
101	66	4		
101	66	5		
101	66	6		
101	66	7		
101	68		ActiveOrder	uint32
101	72		ErrorCode	uint32
101	128		CurrentRecipeID	uint32
113	0		RecipeIDList[0]	uint32
113	…		RecipeIDList[…]	uint32
113	396		RecipeIDList[99]	uint32
114	0		RecipeIDList[100]	uint32
114	…		RecipeIDList[…]	uint32

Continues on next page

Instance	Byte	Bit	Signal	Type
114	196		RecipeIDList[149]	uint32

Remote to PMOP

Instance	Byte	Bit	Signal	Type
201	0		UnitMode	int32
201	4		CntrlCmd	int32
201	12		RobotCmd[0]	int16
201	14		RobotCmd[1]	int16
201	16		RobotCmd[2]	int16
201	18		RobotCmd[3]	int16
201	20		RobotCmd[4]	int16
201	22		RobotCmd[5]	int16
201	24		RobotCmd[6]	int16
201	26		RobotCmd[7]	int16
201	28		RobotCmd[8]	int16
201	30		RobotCmd[9]	int16
201	32	0	UnitModeChangeRequest	bool
201	32	1	CmdChangeRequest	bool
201	32	2		
201	32	3		
201	32	4		
201	32	5		
201	32	6		
201	32	7		
201	64	0	Request	bool
201	64	1	ResetError	bool
201	64	2		
201	64	3		
201	64	4		
201	64	5		
201	64	6		
201	64	7		
201	68		RequestOrder	uint32
201	128		RequestRecipeID	uint32

5.2 Modbus signal definition

Tip

For more detail information on the signal definition, see *Signals and definition on page 77*.

Essential information for Modbus device configuration

Name	Value
Connected to Industrial Network	Modbus
Address	The IP address will be acquired automatically from the Host computer network which is name as "ProfinetIOAdapter".
Port	502

PMOP to Remote (Input Registers)

Register	Bit	Signal	Type
0		UnitModeCurrent	int32
2		StateCurrent	int32
14		RobotStatus[1]	int16
15		RobotStatus[2]	int16
16		RobotStatus[3]	int16
17		RobotStatus[4]	int16
18		RobotStatus[5]	int16
19		RobotStatus[6]	int16
21		RobotStatus[7]	int16
22		RobotStatus[8]	int16
23		RobotStatus[9]	int16
26	0	Idle	bool
26	1	Error	bool
26	2	PMRTConnected	bool
26	3	HeartBeat	bool
26	4		
26	5		
26	6		
26	7		
26	8		
26	9		
26	10		
26	11		

Continues on next page

Register	Bit	Signal	Type
26	12		
26	13		
26	14		
26	15		
27	0	Modbus	bool
27	1	PROFINET	bool
27	2	EtherNet/IP	bool
27	3		
27	4		
27	5		
27	6		
27	7		
27	8		
27	9		
27	10		
27	11		
27	12		
27	13		
27	14		
27	15		
28		ActiveOrder	uint32
30		ErrorCode	uint32
32		CurrentRecipeID	uint32
34		RecipeIDList[0]	uint32
…		RecipeIDList[…]	uint32
332		RecipeIDList[149]	uint32

Remote to PMOP (Holding Registers)

Register	Bit	Signal	Type
0		UnitMode	int32
2		CntrlCmd	int32
6		RobotCmd[0]	int16
7		RobotCmd[1]	int16
8		RobotCmd[2]	int16
9		RobotCmd[3]	int16
10		RobotCmd[4]	int16
11		RobotCmd[5]	int16
12		RobotCmd[6]	int16

Continues on next page

5.2 Modbus signal definition

Continued

Register	Bit	Signal	Type
13		RobotCmd[7]	int16
14		RobotCmd[8]	int16
15		RobotCmd[9]	int16
16	0	UnitModeChangeRequest	bool
16	1	CmdChangeRequest	bool
16	2		
16	3		
16	4		
16	5		
16	6		
16	7		
16	8		
16	9		
16	10		
16	11		
16	12		
16	13		
16	14		
16	15		
17	0	Request	bool
17	1	ResetError	bool
17	2		
17	3		
17	4		
17	5		
17	6		
17	7		
17	8		
17	9		
17	10		
17	11		
17	12		
17	13		
17	14		
17	15		
18		RequestOrder	uint32
20		RequestRecipeID	uint32

5.3 PROFINET signal definition

Tip

For more detail information on the signal definition, see *Signals and definition on page 77*.

Essential information for PROFINET device configuration

Name	Value
Connected to Industrial Network	PROFINET
Address	The IP address will be acquired automatically from the Host computer network which is name as "ProfinetIOAdapter".
Name	straton-profinetio-device

PROFINET Slot

Slot	Name	Type
1	Input 32 bit - DINT	ScadaToRemote
2	Input 32 bit - DINT	ScadaToRemote
3	Input 32 bit - DINT	ScadaToRemote
4	Input 32 bit - DINT	ScadaToRemote
5	Input 32 bit - DINT	ScadaToRemote
6	Input 32 bit - DINT	ScadaToRemote
7	Input 32 bit - DINT	ScadaToRemote
8	Input 16 bit - INT	ScadaToRemote
9	Input 16 bit - INT	ScadaToRemote
10	Input 16 bit - INT	ScadaToRemote
11	Input 16 bit - INT	ScadaToRemote
12	Input 16 bit - INT	ScadaToRemote
13	Input 16 bit - INT	ScadaToRemote
14	Input 16 bit - INT	ScadaToRemote
15	Input 16 bit - INT	ScadaToRemote
16	Input 16 bit - INT	ScadaToRemote
17	Input 16 bit - INT	ScadaToRemote
18	Input 8 bit - USINT	ScadaToRemote
19	Output 32 bit - DINT	RemoteToScada
20	Output 32 bit - DINT	RemoteToScada
21	Output 32 bit - DINT	RemoteToScada
22	Output 16 bit - INT	RemoteToScada
23	Output 16 bit - INT	RemoteToScada

Continues on next page

Slot	Name	Type
24	Output 16 bit - INT	RemoteToScada
25	Output 16 bit - INT	RemoteToScada
26	Output 16 bit - INT	RemoteToScada
27	Output 16 bit - INT	RemoteToScada
28	Output 16 bit - INT	RemoteToScada
29	Output 16 bit - INT	RemoteToScada
30	Output 16 bit - INT	RemoteToScada
31	Output 16 bit - INT	RemoteToScada
32	Output 8 bit - USINT	RemoteToScada
33	Input 16 bit - UINT	ScadaToRemote
34	Input 16 bit - UINT	ScadaToRemote
35	Input 32 bit - UDINT	ScadaToRemote
36	Input 32 bit - UDINT	ScadaToRemote
37	Input 32 bit - UDINT	ScadaToRemote
38	Output 16 bit - UINT	RemoteToScada
39	Output 32 bit - UDINT	RemoteToScada
40	Output 32 bit - UDINT	RemoteToScada
41	Input STRING - 255 byte	ScadaToRemote

PMOP to Remote

Slot	Subslot	Module	Bit	Signal	Type
1	1	DINT		UnitModeCurrent	int32
2	1	DINT		StateCurrent	int32
8	1	INT		RobotStatus[0]	int16
9	1	INT		RobotStatus[1]	int16
10	1	INT		RobotStatus[2]	int16
11	1	INT		RobotStatus[3]	int16
12	1	INT		RobotStatus[4]	int16
13	1	INT		RobotStatus[5]	int16
14	1	INT		RobotStatus[6]	int16
15	1	INT		RobotStatus[7]	int16
16	1	INT		RobotStatus[8]	int16
17	1	INT		RobotStatus[9]	int16
33	1	UINT	0	Idle	bool
33	1	UINT	1	Error	bool
33	1	UINT	2	PMRTConnected	bool
33	1	UINT	3	HeartBeat	bool
33	1	UINT	4		

Continues on next page

Slot	Subslot	Module	Bit	Signal	Type
33	1	UINT	5		
33	1	UINT	6		
33	1	UINT	7		
33	1	UINT	8		
33	1	UINT	9		
33	1	UINT	10		
33	1	UINT	11		
33	1	UINT	12		
33	1	UINT	13		
33	1	UINT	14		
33	1	UINT	15		
34	1	UINT	0	Modbus	bool
34	1	UINT	1	PROFINET	bool
34	1	UINT	2	EtherNet/IP	bool
34	1	UINT	3		
34	1	UINT	4		
34	1	UINT	5		
34	1	UINT	6		
34	1	UINT	7		
34	1	UINT	8		
34	1	UINT	9		
34	1	UINT	10		
34	1	UINT	11		
34	1	UINT	12		
34	1	UINT	13		
34	1	UINT	14		
34	1	UINT	15		
35	1	UDINT		ActiveOrder	uint32
36	1	UDINT		ErrorCode	uint32
37	1	UDINT		CurrentRecipeID	uint32
41	1	STRING 255byte	0	RecipeIDList[0]	uint32
…	1	STRING 255byte	…	RecipeIDList[…]	uint32
41	1	STRING 255byte	196	RecipeIDList[49]	uint32

Continues on next page

Remote to PMOP

Slot	Subslot	Module	Bit	Signal	Type
19	1	DINT		UnitMode	int32
20	1	DINT		CntrlCmd	int32
22	1	INT		Robot Cmd [0]	int16
23	1	INT		Robot Cmd [1]	int16
24	1	INT		Robot Cmd [2]	int16
25	1	INT		Robot Cmd [3]	int16
26	1	INT		Robot Cmd [4]	int16
27	1	INT		Robot Cmd [5]	int16
28	1	INT		Robot Cmd [6]	int16
29	1	INT		Robot Cmd [7]	int16
30	1	INT		Robot Cmd [8]	int16
31	1	INT		Robot Cmd [9]	int16
32	1	USINT	0	UnitModeChangeRequest	bool
32	1	USINT	1	CmdChangeRequest	bool
32	1	USINT	2		
32	1	USINT	3		
32	1	USINT	4		
32	1	USINT	5		
32	1	USINT	6		
32	1	USINT	7		
38	1	UINT	0	Request	bool
38	1	UINT	1	ResetError	bool
38	1	UINT	2		
38	1	UINT	3		
38	1	UINT	4		
38	1	UINT	5		
38	1	UINT	6		
38	1	UINT	7		
38	1	UINT	8		
38	1	UINT	9		
38	1	UINT	10		
38	1	UINT	11		
38	1	UINT	12		
38	1	UINT	13		
38	1	UINT	14		
38	1	UINT	15		

Continues on next page

Slot	Subslot	Module	Bit	Signal	Type
39	1	UDINT		RequestOrder	uint32
40	1	UDINT		RequestRecipeID	uint32

ABB AB
Robotics & Discrete Automation
S-721 68 VÄSTERÅS, Sweden
Telephone +46 10-732 50 00

ABB AS
Robotics & Discrete Automation
Nordlysvegen 7, N-4340 BRYNE, Norway
Box 265, N-4349 BRYNE, Norway
Telephone: +47 22 87 2000

ABB Engineering (Shanghai) Ltd.
Robotics & Discrete Automation
No. 4528 Kangxin Highway
PuDong New District
SHANGHAI 201319, China
Telephone: +86 21 6105 6666

ABB Inc.
Robotics & Discrete Automation
1250 Brown Road
Auburn Hills, MI 48326
USA
Telephone: +1 248 391 9000

abb.com/robotics

3HAC069977-001, Rev M, en