XControl Programming Platform
User Manual

Adveco

Contents

1. Overview

XControl is a tool designed for programming of the XNC Edge Controller. The product is compatible with a variety of terminal devices and supports online/offline simulation. It features built-in specialized algorithm blocks and offers excellent compatibility with standard third-party devices, enabling unified programming.

Pls Contact your local sales representative to obtain a license and installation package.

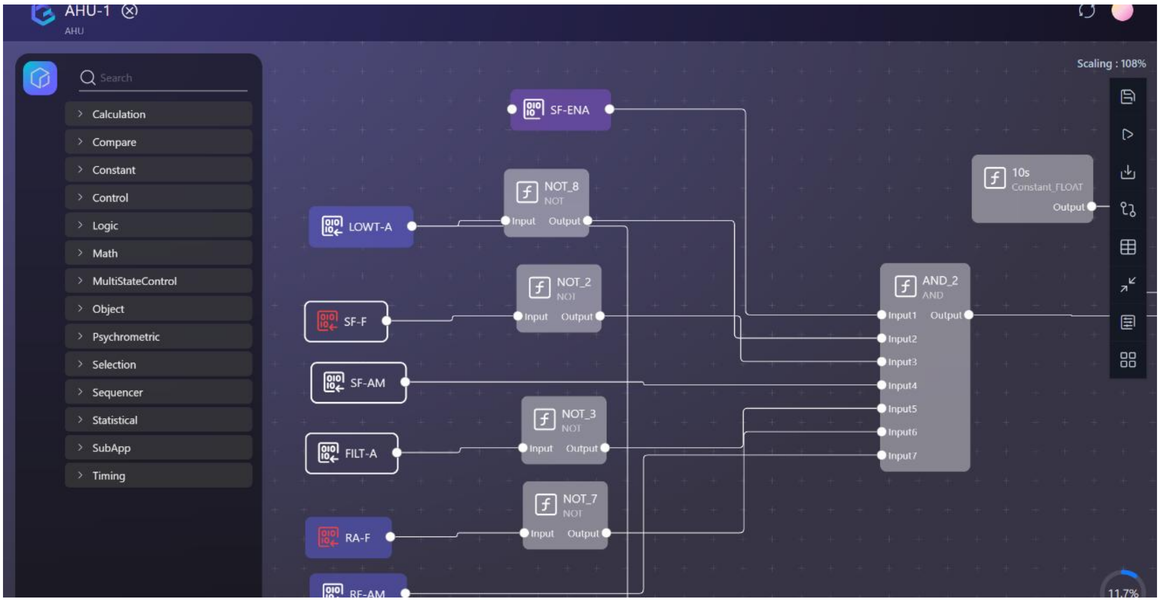


Figure 1.1.1

2. Installation and Startup

2.1. Installation and registration

The XControl programming tool is easy to install. After installation, double-click the application

to launch the XControl configuration tool. Upon initial use, the following dialog window will be displayed.

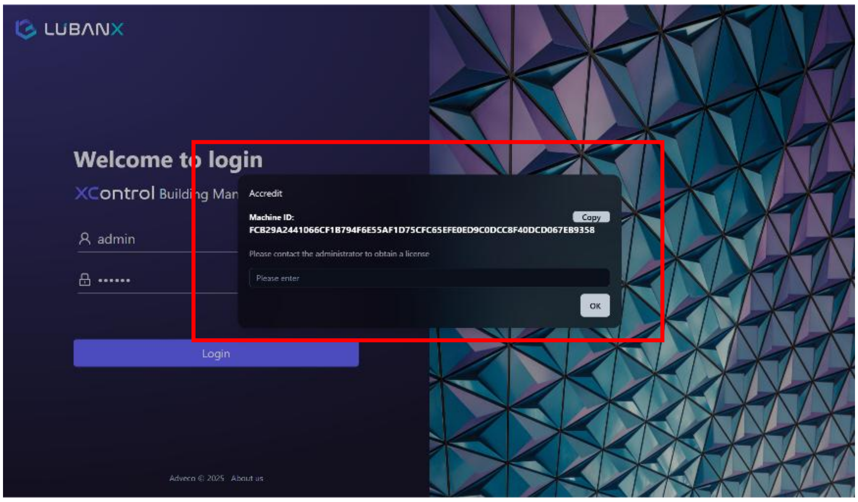


Figure 2.1.1

You are requested to submit your "Machine ID" to local sales representative. The license will be issued base on the "Machine ID". Once you enter the license and click "Confirm", then the registration is completed.

2.2. Instructions

The XNC Pro series controllers come with the built-in XControl programming tool, which can be accessed directly by combining the device's IP address with port number 9860, consistent with the functions of the desktop version of the XControl programming tool. For example, if the XNC Pro series controller is assigned the IP address 192.168.1.1, when the computer and the XNC Pro controller are on the same network, the XControl programming tool can be accessed via 192.168.1.1:9860.

The built-in XControl programming tool in the XNC Pro series only supports online simulation, with the simulation target limited to the device itself and its subordinate devices. Cross-device simulation is not supported.

All controllers in the XNC series support logic programming and program downloading operations through the client-based XControl.

2.3. Login

After the program startup, the login page will be shown (Figure 2.3.1). For the initial login, the default administrator account can be used.

- Username: admin.
- Password: 123456.

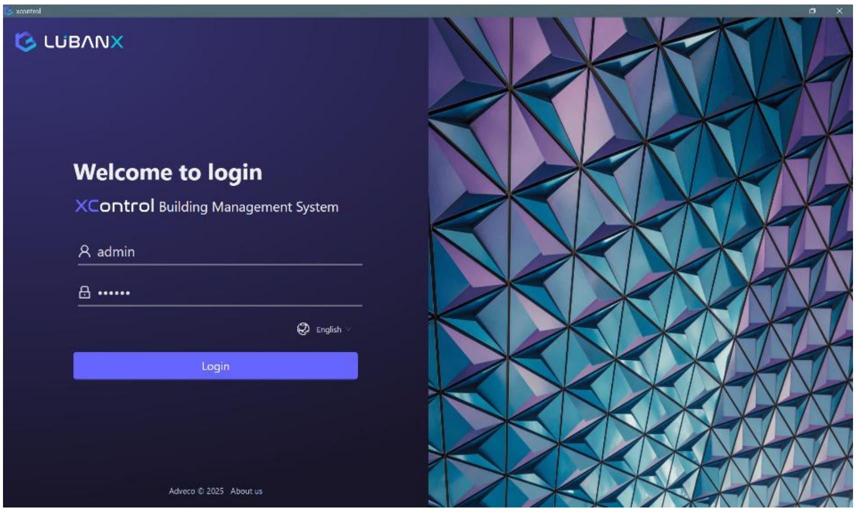


Figure 2.3.1

XControl supports multiple languages, including Chinese and English. Users can select the software language in the upper-right corner of the login button, as shown in Figure 2.3.2:

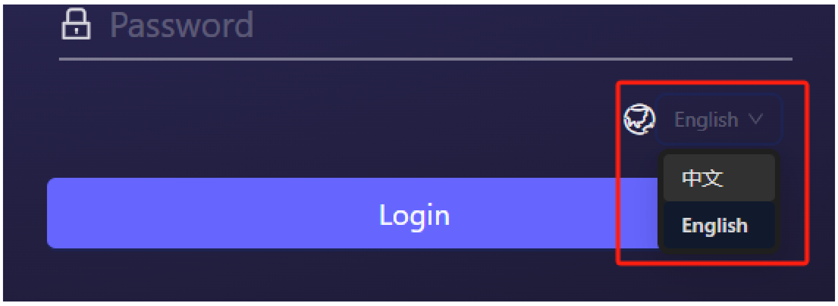


Figure 2.3.2

3. Project Management

3.1. Basic Settings

After logging in, the main page **(Project Management)** will be displayed, as shown in Figure 3.1.1 below:

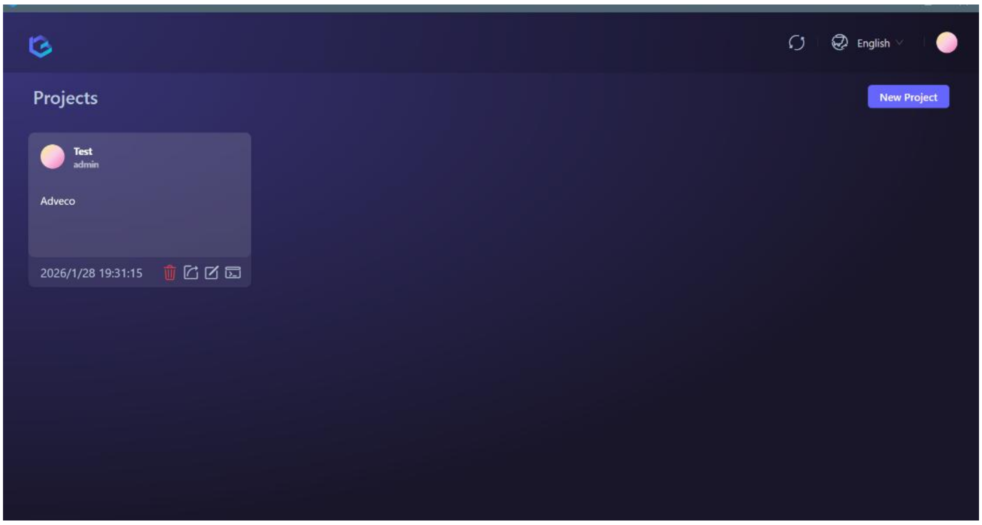


Figure 3.1.1

3.1.1. Homepage

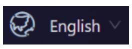
The LUBAN icon in the upper-left corner of the page  serves as the **return button**. Clicking this icon on any page within the XControl programming tool will take you directly back to the project management page.

If you click this button to navigate from the logic editing page, please be sure to click the **Save button** in the upper-right corner of the logic editing page first. Otherwise, any edits made on the page will not be saved.

3.1.2. Refresh

The button on the left side of the upper-right corner  is the **refresh button**, which is used to reload the current page.

3.1.3. Language Switching

The language switch button 

is located on the right side of the upper right corner of the page and is used to switch the current language in use.

3.1.4. User information Management

The icon on the right side of the upper-right corner is the **User information icon**. It displays the currently logged-in username and provides access to basic user settings, as shown in the figure 3.1.2 below:

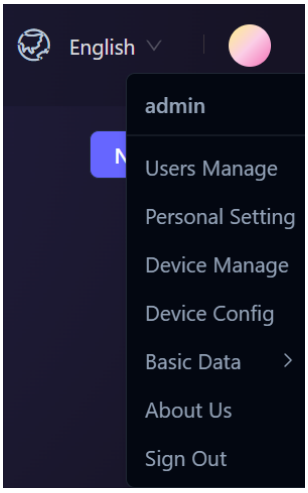


Figure 3.1.2

3.1.5. User Manage

This page is designed for **creating new users** and **managing registered users**, as shown in the figure below:

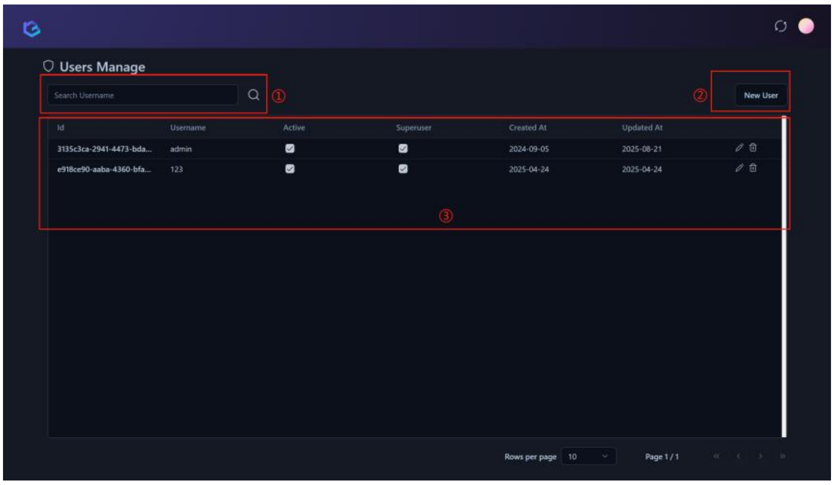


Figure 3.1.3

- Search Function: Enter keywords to quickly retrieve relevant user information, as indicated by Red Box 1 in Figure 3.1.3.
- Create New User: Click the "New User" button (shown in Red Box 2 in Figure 3.1.3) to open the dialog box for creating a user. The following settings are required:
  - Username
  - Password
  - Confirm Password
  - Activation status (Enabled/Disabled)
  - Superuser privileges (Yes/No)

  See Figure 3.1.4 below for reference:

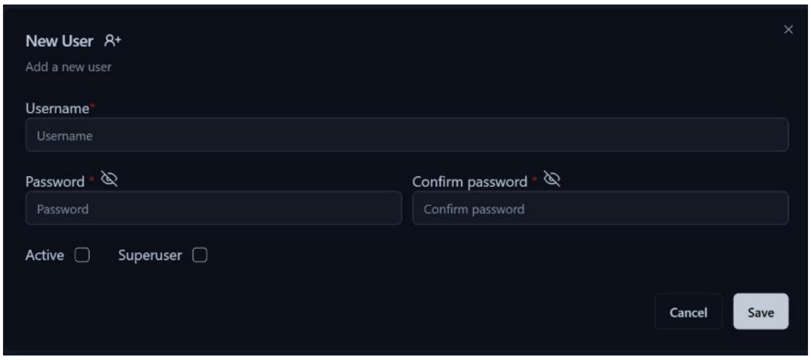


Figure 3.1.4

- User List: Displays a list of all current users and supports modification and deletion, as shown in Red Box 3 in Figure 3.1.3.

3.1.6. Personal Settings

On this page, you can **c**hange the current user's password and modify the default avatar, as shown in Figure 3.1.5 below:

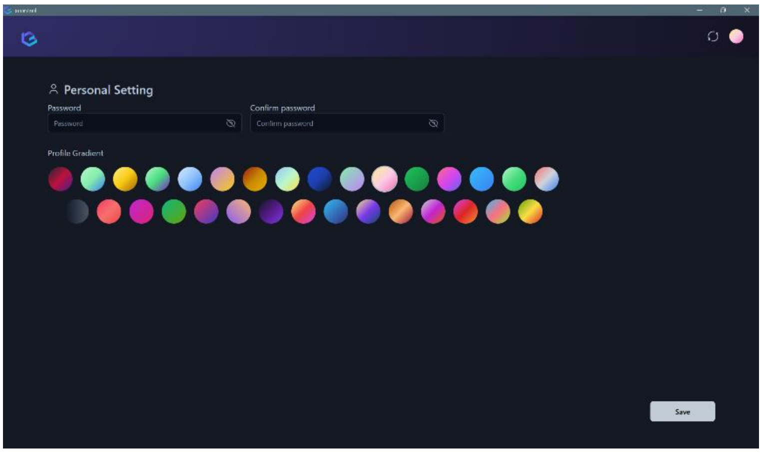


Figure 3.1.5

3.1.7. Devices List

Used to search the device list. Click "Search" in the search window to begin the search immediately. It will scan for BACnet devices on the network segment where the computer's local connection is located, as shown in Figure 3.1.6:

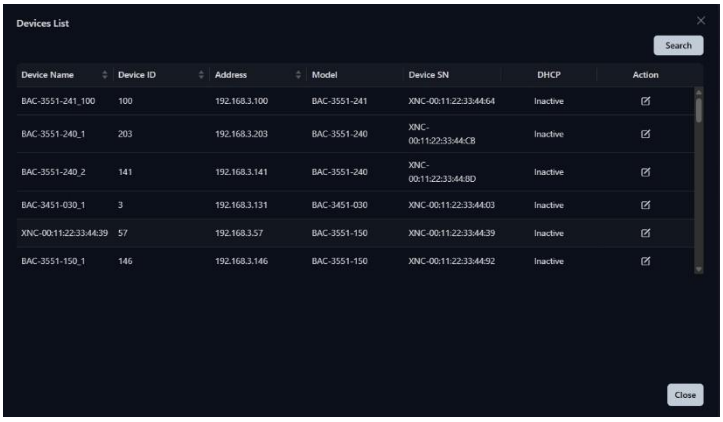


Figure 3.1.6

3.1.8. Basic Data: Enum Data

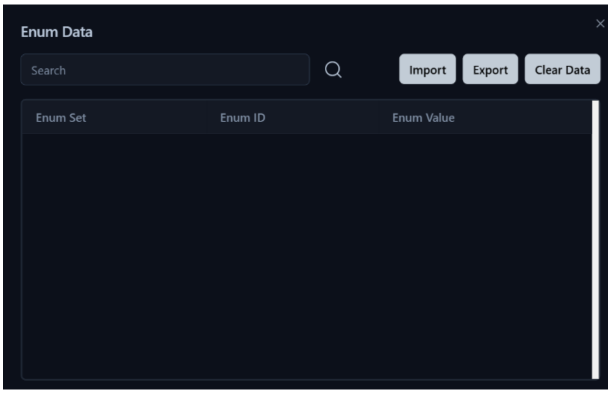


Figure 3.1.7

The specific steps to configure status text for multi-state points are as follows:

1. Click "Export" in the upper-right corner, select a path, and save the document.
2. Open the exported document and configure parameters according to the requirements. Fill in the text definitions for multi-state points in the document (e.g., the text to display when the value is 0, 1, 2, etc.), then save the document.
3. Return to XControl, click "Import" in the upper-right corner to complete the text configuration, as shown in Figure 3.1.8:

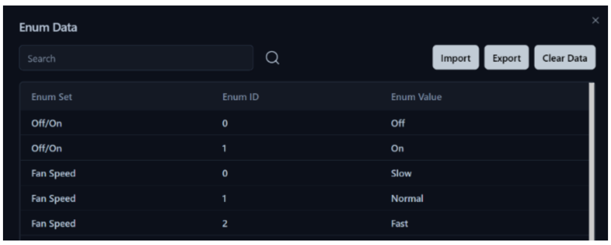


Figure 3.1.8

3.1.9. About Us

Displays the XControl software and built-in UI/XNC/XNODE versions.

Figure 3.1.9

3.1.10. Logout

Exit the current login session.

3.2. New Project

3.2.1. Create New Project

- Click the "New Project" button in the upper-right corner to open the menu (Red Box in Figure 3.2.1).

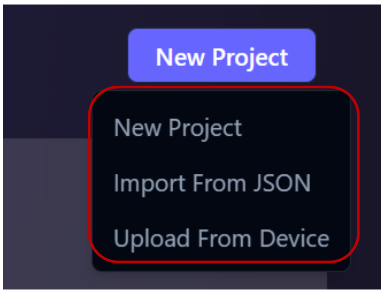


Figure 3.2.1

- Click the "New Project" button to open the creation window (Figure 3.2.2). Fill in the following details:

- Name: Project name (required). It is recommended to name it after the main controller ID.
- Description: Project description (optional). Additional notes about the project.
- Save: “Save”button.

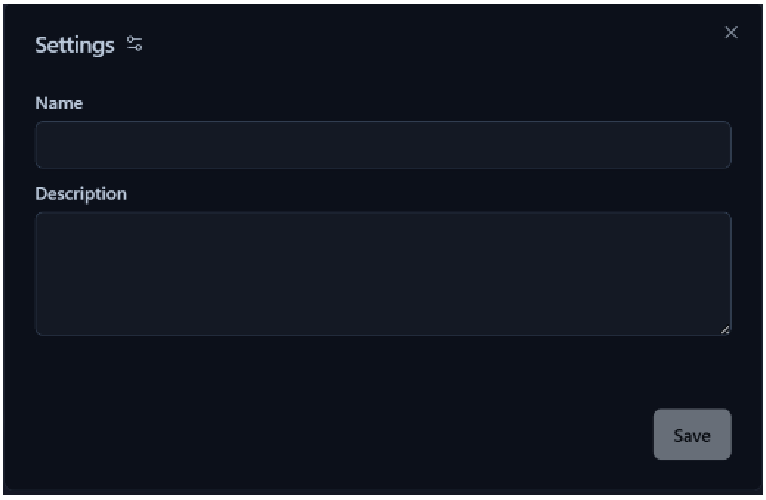


Figure 3.2.2

3.2.2. Import projects from JSON

1. Click the “Import from JSON” button to open the file selection dialog.
2. Select the file and click the "Open" button to complete the import, as shown in Figure 3.2.3 below:

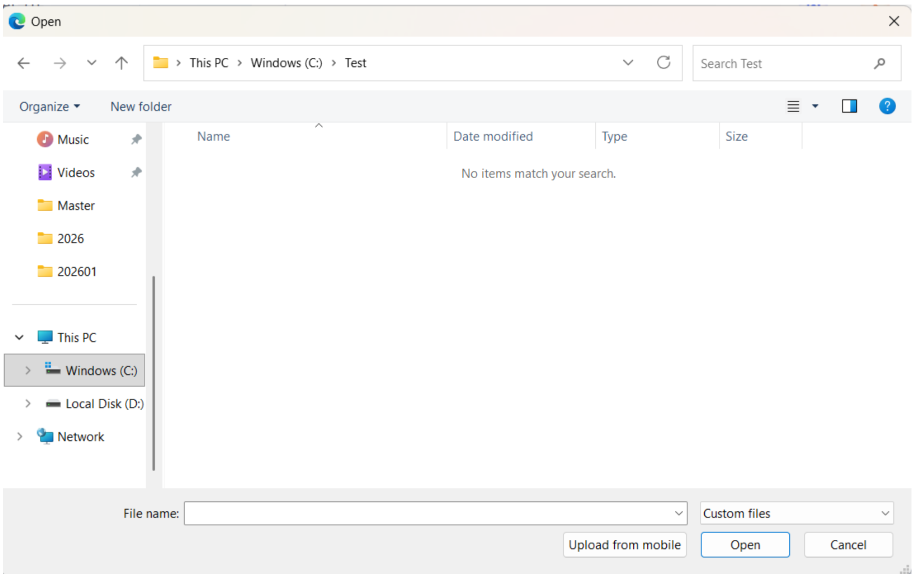


Figure 3.2.3

3. When importing a project, the import time will be appended to the project name for distinction.

3.2.3. Upload from Device

1. Click the “Upload from Device” button to open the corresponding window, as shown in Figure 3.2.4:

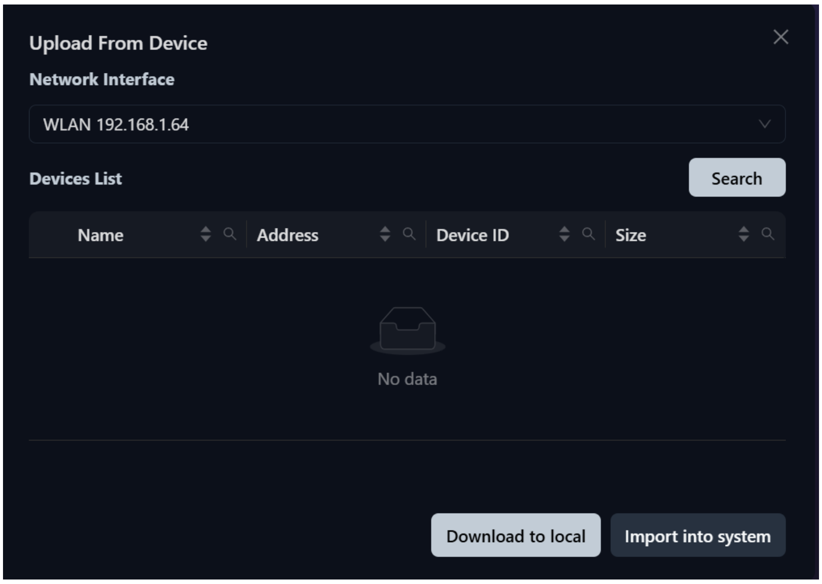


Figure 3.2.4

2. Select the network interface from the dropdown menu , as shown in Figure 3.2.5:

Figure 3.2.5

3. Click the "Search" button. Devices found on the network will be displayed in a list. Select the corresponding device and proceed with the upload, as shown in Figure 3.2.6:

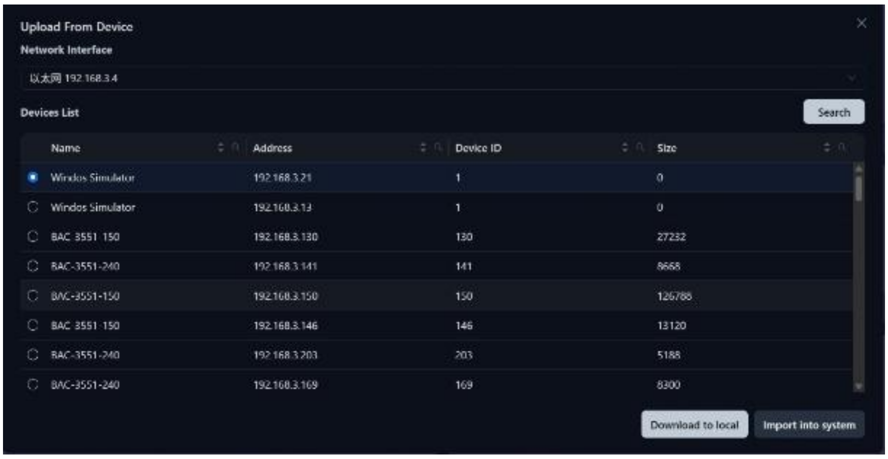


Figure 3.2.6

- Download to Local: Download the project from the device to the local computer.
- Import into System: Imports the project from the device into the XControl software.

3.3. Project Management

After a new project is created, it will be displayed on the page as shown in the red box in Figure 3.3.1. The project object displays the project name, project description, the time of project creation or content updates, and relevant project management functions, as illustrated in Figure 3.3.2:

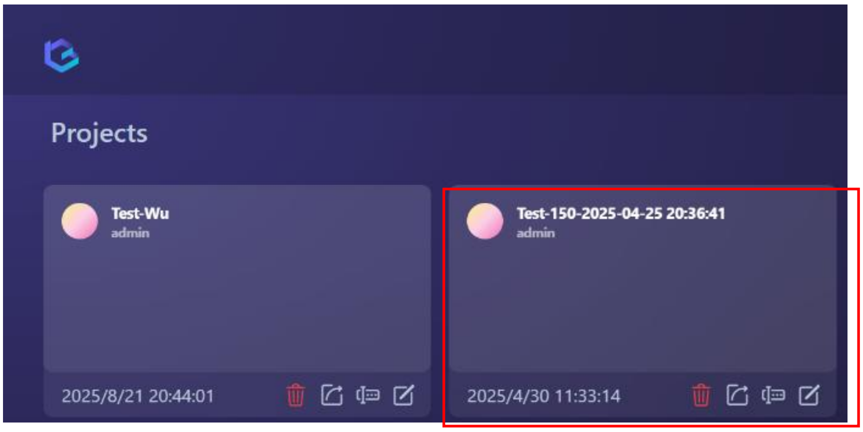


Figure 3.3.1

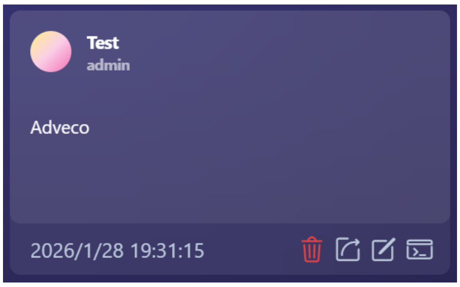


Figure 3.3.2

3.3.1. Delete

To delete a project, click the "Delete" button.The Delete window will pop up, as shown in Figure 3.3.3:

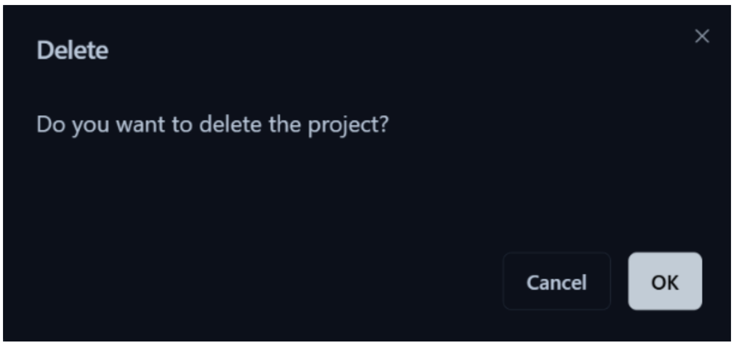


Figure 3.3.3

3.3.2. Export

Click the "Export" button, and a confirmation window will pop up , as shown in Figure 3.3.4:

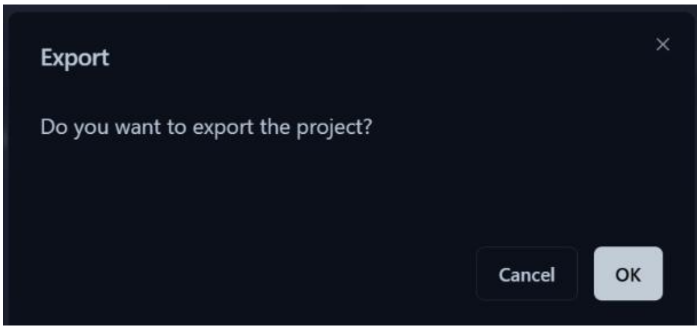


Figure 3.3.4

After clicking the "OK" button, a dialog box will appear. Select the save path and define the file name. A file with a ".json" extension will be generated and saved to the selected folder, as shown in Figure 3.3.5:

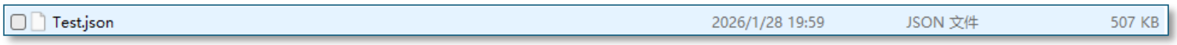


Figure 3.3.5

3.3.3. Edit

Click the "Edit" button , and Settings window will pop up, as shown in Figure 3.3.6:

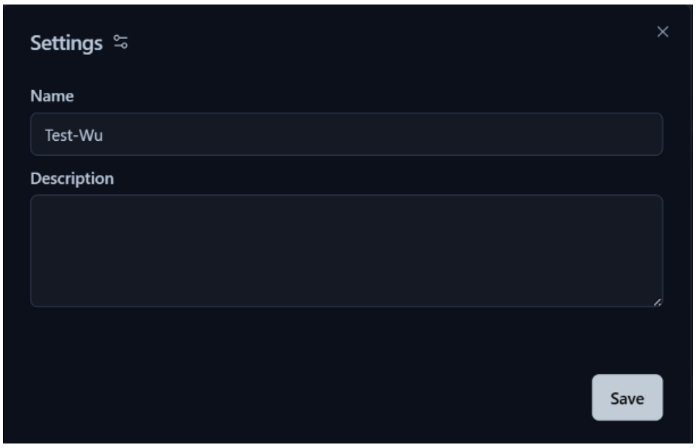


Figure 3.3.6

3.3.4. Application

Click the "Application" button to access the Device Management page, where you can build the program's device structure.

4. Device Management

After clicking "Application", you will access the Device Management page, as shown in Figure 4.1.1:

- Device List Area: Includes XNC series controllers, I/O modules, as well as generic BACnet/Modbus/OPC UA devices.
- Device and Topology Design Area: The canvas for designing the device structure.
- Function Button Area: Including functions such as Save, Firmware Upgrade, Search Device, and Device List. The current canvas zoom level is displayed above these buttons.

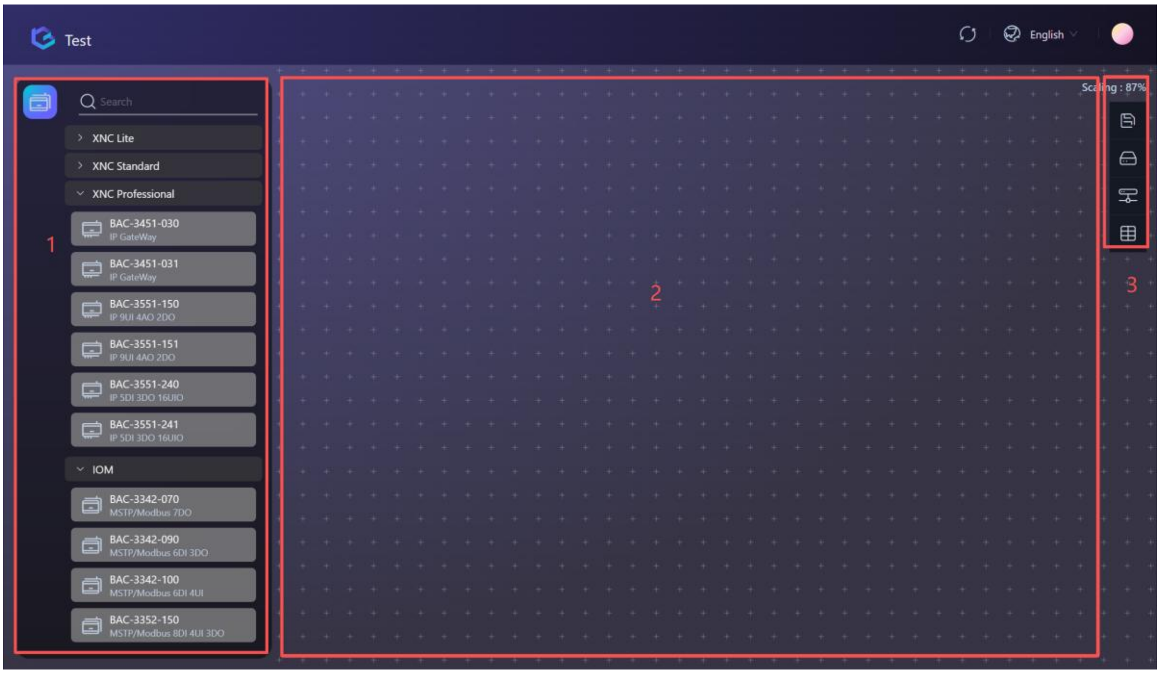


Figure 4.1.1

4.1. Adding Devices

To add a device, simply drag and drop the required device from the list to the canvas on the right, as shown in Figure 4.1.2. After being placed on the canvas, devices can be freely moved by dragging.

Connections between devices can be established in two ways:

- Click and drag between matching communication ports on different devices.
- Sequentially click on two matching communication ports (one on each device).

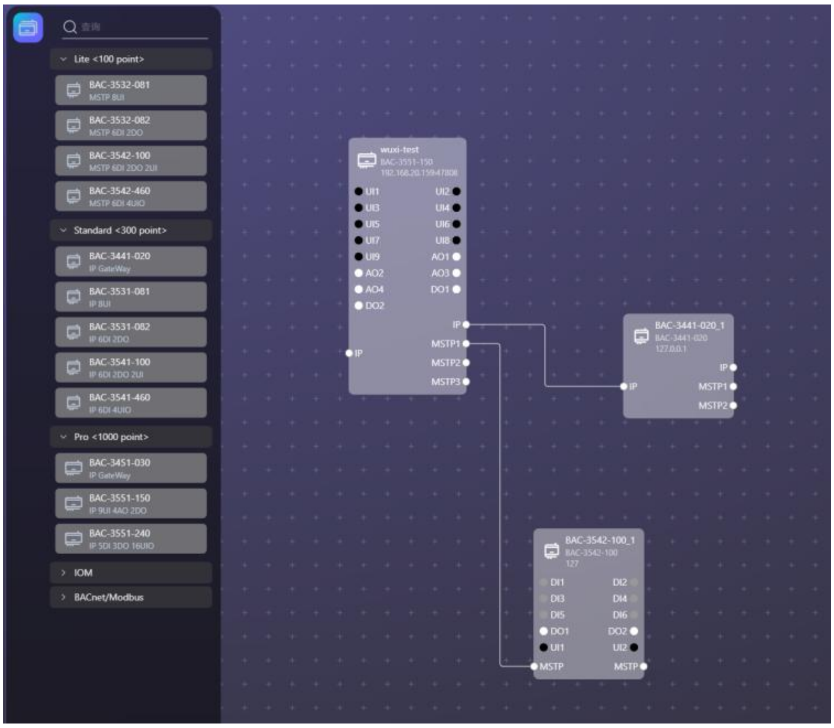


Figure 4.1.2

On the left side of Figure 4.1.2 are network devices, while the right side shows both network and bus devices. Communication points (BACnet IP, BACnet MSTP, or Modbus) can be connected to matching communication points on other devices via drag-and-drop.

On the canvas, configured modules display the device name and device address (IP or bus address). The point type is shown below the module. If an actual point has been bound, the name of the bound point will be displayed below the point type; otherwise, this field remains blank.

4.2. Device Configuration

On the Device Management page, clicking on any module will reveal the property settings icons above it. If the device is an BACnet MSTP device, this icon will have only three options; if it is an IP device, there will be four icons, as shown in Figure 4.2.1, the specific functions are as follows.

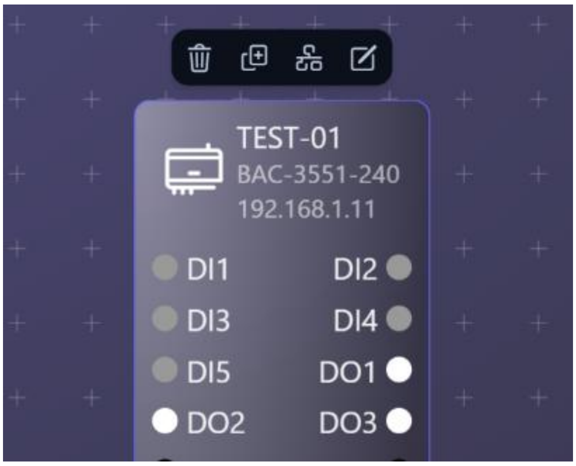


Figure 4.2.1

4.2.1. Delete

Clicking "Delete"  prompts a confirmation dialog. Upon confirmation, the module is removed, and any configured points or logic associated with it will be lost.

4.2.2. Copy

Clicking "Copy"  opens a dialog to specify the number of copies (maximum 20 per operation).

4.2.3. Modify IP (IP Devices Only)

Clicking "Modify IP"  opens a dialog to enter the new IP address, as shown in Figure 4.2.2. After entering, click "OK" to apply.

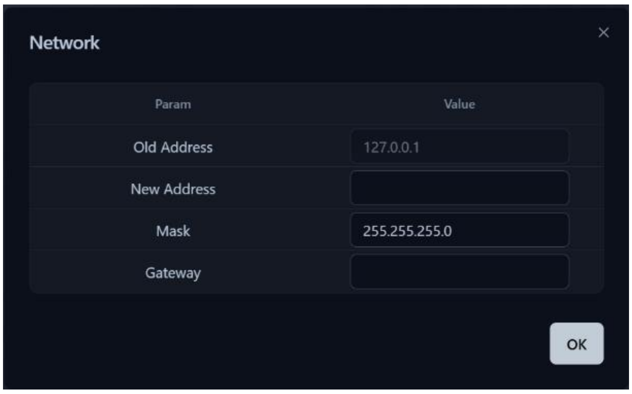


Figure 4.2.2

4.2.4. Edit

Clicking the "Edit"  button will open the Device Configuration window, as shown in Figure 4.2.3. The basic properties within the window are as follows:

- ID: Automatically generated unique device identifier.
- Name: Device name. The newly created device object automatically generates a Name that can be modified.
- X Button: Closes the window.
- Save: Saves changes.

Figure 4.2.3

4.2.4.1. Property

- Address: For network devices, enter the device's IP address in the value text box; for bus devices, enter the device's MAC bus address in the value text box. Note: If the actual address set on the device's dial is greater than 127, the address entered for a bus device should be the value obtained by subtracting 127 from the dial setting address. For example, if the dial setting address is 130, enter 3 here.
- Bluetooth Address: For bus-type programmable controllers, the Bluetooth address needs to be configured for wireless debugging, as shown in Figure 4.2.4:

Figure 4.2.4

- Double-click the value field next to the Bluetooth address. This will search for and display a list of nearby Bluetooth devices. The list can be refreshed. After selecting the correct device, click 'OK' to confirm, as shown in Figure 4.2.5:

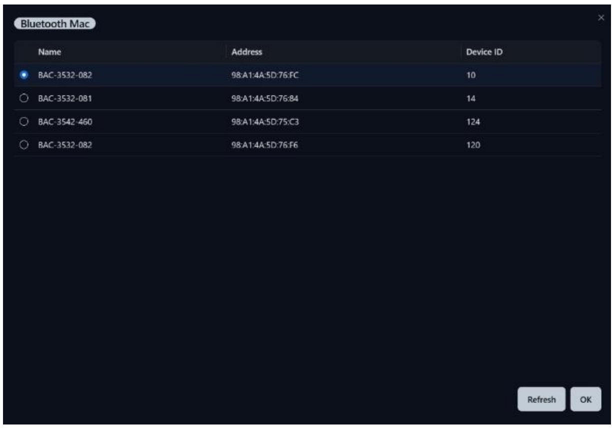


Figure 4.2.5

4.2.4.2. Points

- **Point**: Displays point types and corresponding IDs,, which must match the point channel on the device.
- **Value**: This field is used to select the specific point. Click the dropdown button to expand the point menu for selection. The "X" button on the right clears the selected point, as shown in Figure 4.2.6:

Figure 4.2.6

4.2.4.3. Configuration

Parameter settings used to configure the communication method and its parameters for the bus interface.

- Routing Function

Default is OFF. When enabled, the network number of the IP link must be specified (if multiple devices have routing enabled simultaneously, the network configuration is as shown in Figure

4.2.7:

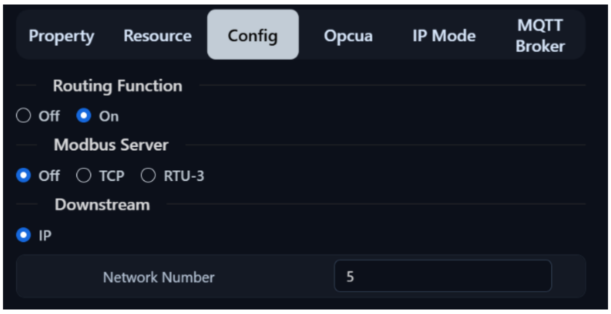


Figure 4.2.7

- Modbus Server

Modbus Server (Pro Series only) is disabled by default.

When "TCP" is selected, the Pro module will act as a Modbus TCP Server and be discoverable by other devices or platforms.

When "RTU-3" is selected, the Pro module will act as a Modbus RTU Slave and be discoverable by other devices or platforms. In this case, the Pro module's Fieldbus 3 port will be occupied, and parameters such as Baud Rate, Data Bits, Stop Bits, and Parity must be configured, as shown in Figure 4.2.8:

Figure 4.2.8

- Downstream

Downstream represents the communication protocol for data from other devices (e.g., expansion modules, thermostats, flow meters, etc.) entering this controller, as shown in Figure 4.2.9:

Figure 4.2.9

- Communication Protocol

BACnet MSTP: The baud rate option is displayed below. Select the corresponding baud rate parameter via the dropdown menu, as shown in Figure 4.2.10:

Figure 4.2.10

Modbus RTU: It displays four configurable parameters: Baud Rate, Data Bits, Stop Bits, and Parity. Each parameter can be set by selecting the corresponding value from a dropdown menu, as shown in Figure 4.2.11:

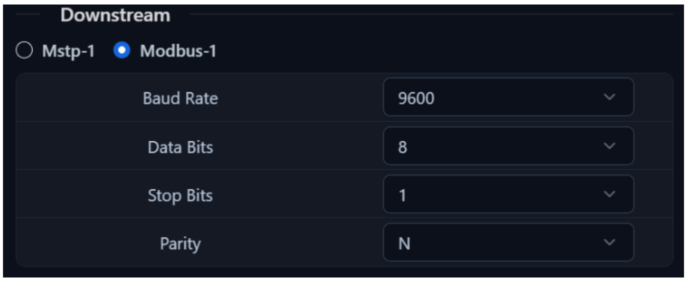


Figure 4.2.11

Note: The configuration for I/O modules is the same as for XNC devices. For I/O modules, the 8th position of the DIP switch indicates the communication protocol type. When using Modbus communication, set the 8th switch to OFF; when using BACnet communication, set the 8th switch to ON. The software configuration and the DIP switch setting must match.

4.2.4.4. OPC UA

Disabled by default. When enabled, the Pro controller will act as an OPC UA Server and be discoverable by other devices or platforms. Supports two authentication types: Anonymous and Username.

- If "Anonymous" is selected, no other information needs to be filled in, as shown in Figure 4.2.12:

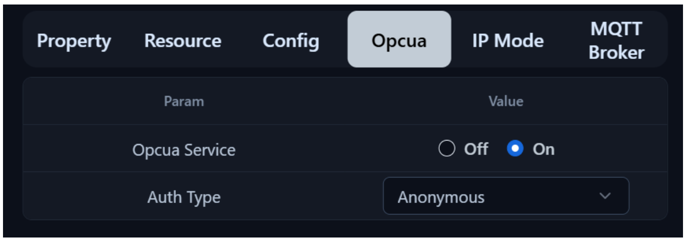


Figure 4.2.12

- If "Username" is selected, Username, Password, Certificate, and Private Key must be configured, as shown in Figure 4.2.13:

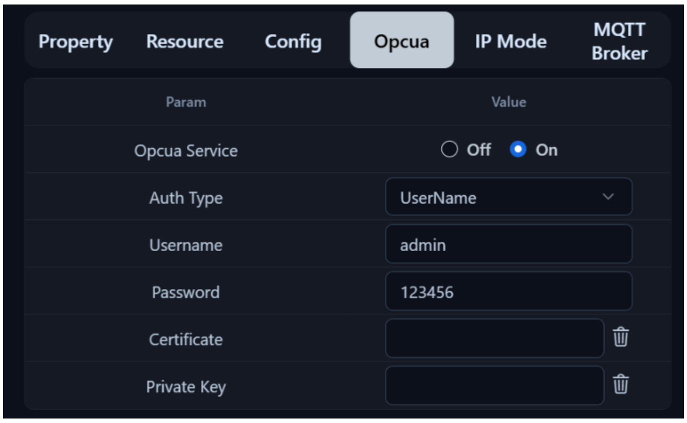


Figure 4.2.13

4.2.4.5. IP Mode

Default is "Normal" Mode. Other selectable modes are "Foreign Device" Mode and "BBMD" (BACnet Broadcast Management Device) Mode.

- FD (Foreign Device) Mode:

  BBMD Address: IP Address + Port Number

  Life Time: 30 – 32400

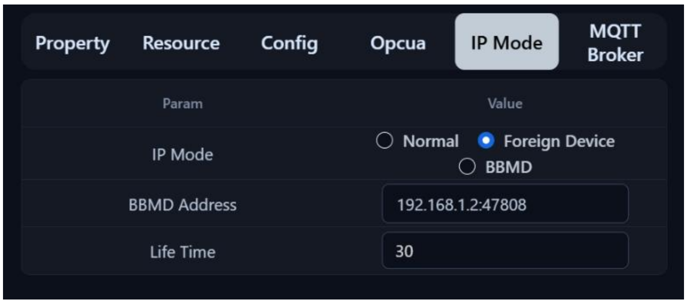


Figure 4.2.14

- BBMD (BACnet Broadcast Management Device) Mode

  Click the + button in the figure to customize the broadcast list. An edit window pops up where you can choose between "IP" and "Hostname", as shown in Figure 4.2.15:

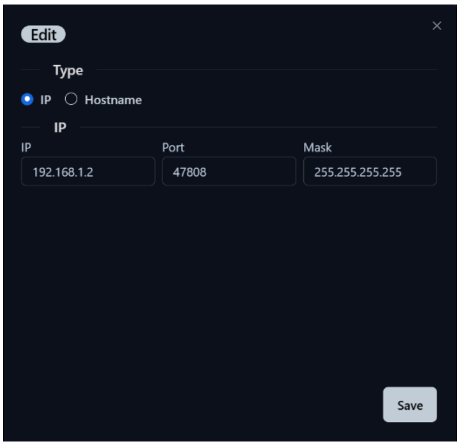


Figure 4.2.15

If "IP" is selected, IP Address, Port, and Subnet Mask must be filled in, as shown in Figure 4.2.16:

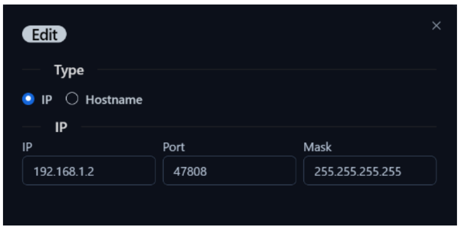


Figure 4.2.16

If "Hostname" is selected, the Hostname must be filled in, as shown in Figure 4.2.17:

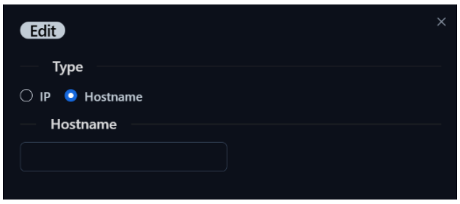


Figure 4.2.17

4.2.4.6. MQTT Broker

Disabled by default. Can be set to "IP" Mode or "Domain Name" Mode. When enabled, the device will report data based on the information configured in the MQTT Broker settings.

- When "IP" Mode is selected, as shown in Figure 4.2.18:

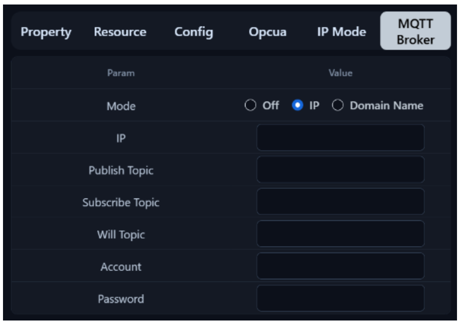


Figure 4.2.18

- When "Domain Name" Mode is selected, as shown in Figure 4.2.19:

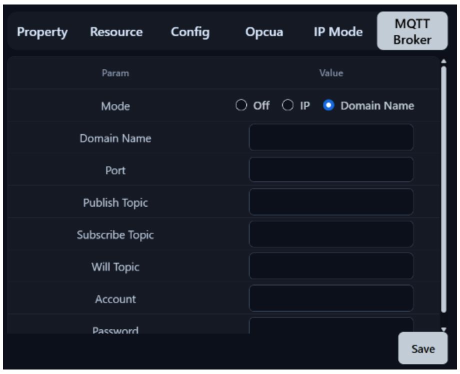


Figure 4.2.19

4.3. Third-Party Devices

4.3.1. Modbus Devices

Used to configure third-party Modbus devices, as shown in the figure below. The device name and device type are displayed on the object; the communication point (Modbus) can be connected to the same communication point of other devices via drag-and-drop , as shown in Figure 4.3.1:

- Delete: Remove the device.
- Duplicate: copy the device.
- Edit: Modify the address settings.

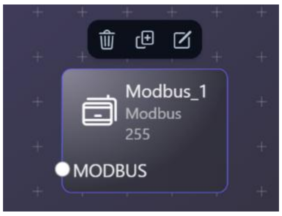


Figure 4.3.1

Clicking the Edit “button” will open the device configuration window. The basic properties within the window are as follows:

- ID: Device ID. A newly created device object will be automatically assigned a unique ID that will not be same.
- Name: Device name. A newly created device object will be automatically assigned a name, which can be modified.
- Property: Device address configuration, i.e., the bus address of the device, as shown in Figure 4.3.2:

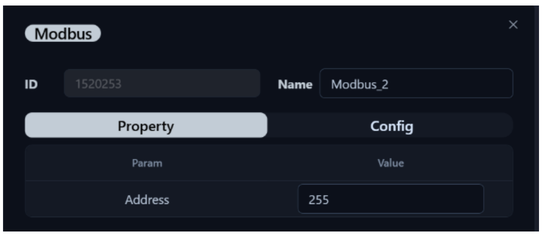


Figure 4.3.2

- Configuration: Configure the Modbus type (supports both Modbus RTU and Modbus TCP). When the IP mode is selected, it is Modbus TCP, and the device IP address should be entered in the address field. When the Modbus mode is selected, it is Modbus RTU, and the device's MAC address should be entered in the address field.
- X Button: Close the window.
- Save: Save changes.

4.3.2. BACnet MS/TP & IP Devices

Used to configure third-party BACnet MS/TP and IP devices , as shown in Figure 4.3.3. The object displays the device name and type. Communication points (IP or MSTP) can be connected to other devices by dragging to matching communication points.

- Delete: Remove the object.
- Duplicate: copy the device.
- Edit: Modify the address settings.

Figure 4.3.3

Clicking the "Edit" button opens the device configuration window. The basic properties within the window are as follows:

- ID: The device ID. A newly created device object will automatically generate a unique ID that will not be duplicated.
- Name: The device name. A newly created device object will automatically generate a name, which can be modified.
- Property: The address field is used for device address configuration, including IP devices and filed bus devices. For IP devices, enter the IP address followed by port 47808. For filed bus devices, simply enter the device bus address, as shown in Figure 4.3.4:

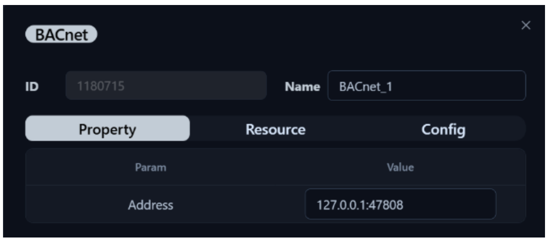


Figure 4.3.4

- Points: Device point resources for adding corresponding points. Click "Add Point" in the upper-left corner of the tab to add points, as shown in Figure 4.3.5:

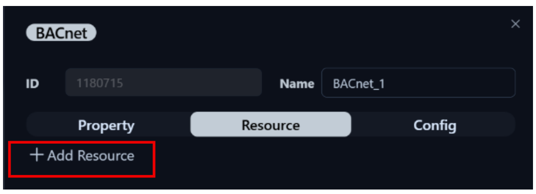


Figure 4.3.5

Note: When using third-party devices for logic editing, only the required points need to be added; the remaining points can still be discovered within the system. However, the device name and the names of points that have been edited in XControl will lose their original names and be overwritten by the names defined in XControl. Points that have not been edited in XControl will retain their original names.

- Configuration: Used to configure whether the device communicates upstream as a BACnet IP device or a BACnet MS/TP device. The selection determines the channel used for connecting to the uplink module, as shown in Figure 4.3.6:

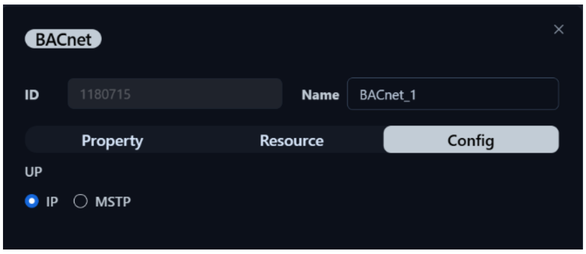


Figure 4.3.6

- X Button: Close the window.
- Save: Save change.

4.3.3. OPC UA Devices

Used to configure third-party devices using the OPC UA protocol.

- Property: Enter the device address. Based on the OPC UA device's security policy, message security mode, and authentication type, select the corresponding options and fill in the information, as shown in Figure 4.3.7:

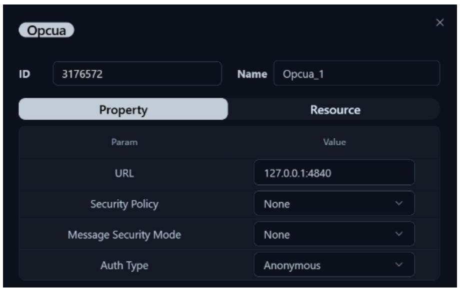


Figure 4.3.7

After completing the information entry, switch to the Points interface. Click the Points List, as shown in Figure 4.3.8:

Figure 4.3.8

- Resource: If the information is filled in correctly, the point information within the device can be searched on the current interface. Select the required points and add them for subsequent logic programming, as shown in Figure 4.3.9:

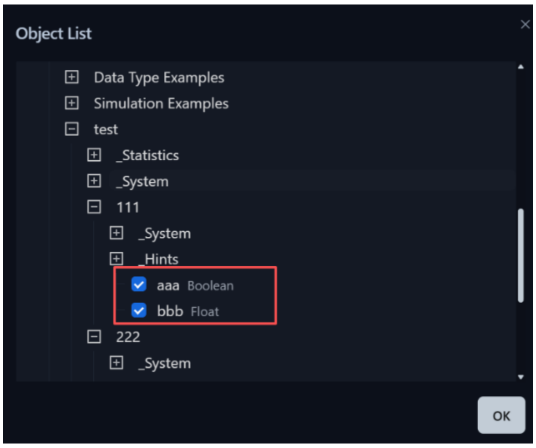


Figure 4.3.9

4.4. Device Management Function

The management buttons are located at the upper right corner of the page, as shown in Figure 4.4.1. The specific functions are as follows:

- Save: Save the information on the Device Management page.
- Upgrade: Batch update device firmware.
- Search Device: Used to search for BACnet IP devices and quickly add devices and points.
- Device List: Displays the device list of the current program, allowing for quick positioning on the canvas.

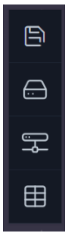


Figure 4.4.1

4.4.1. Save

After modifying content on the current page, click "Save" to apply changes. A confirmation message will appear in the lower-left corner, as shown in Figure 4.4.2:

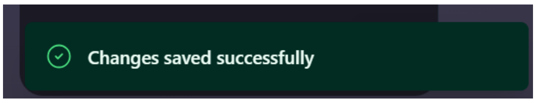


Figure 4.4.2

4.4.2. Upgrade

Clicking the "Upgrade" button opens the firmware upgrade window, as shown in Figure 4.4.3:

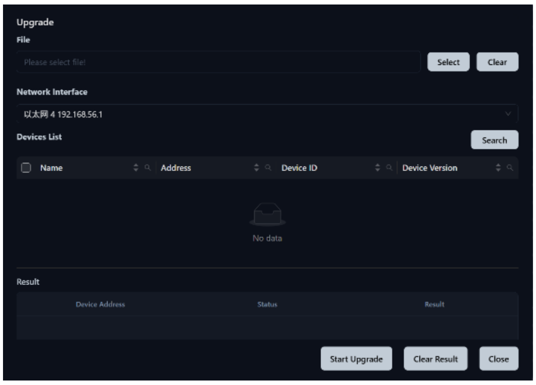


Figure 4.4.3

- File: Firmware file path. Click the "Select" button to choose the corresponding file. If an incorrect file is selected, click the "Clear" button to remove it.
- Network Interface: Select the device upgrade method. For IP devices, choose "WLAN + IP Address" or "Ethernet + IP Address". For bus devices, select "Bluetooth". XNC Pro modules are upgraded via the web page XControl, and "eth0 + IP Address" will be displayed here.

  A maximum of 10 modules can be upgraded simultaneously.
- Device List: Click "Search" to scan all BACnet IP addresses in the system. Select devices by checking the boxes, then click "Start Upgrade."
- Results: Displays the upgrade operation results.
- Start Upgrade: Initiates the upgrade for selected devices.
- Clear Results: Clears the results table.
- Close: Closes the window.

4.4.3. Search Device

Click the "Search Device" button to open the device search interface, which supports searching for BACnet IP devices, as shown in Figure 4.4.4:

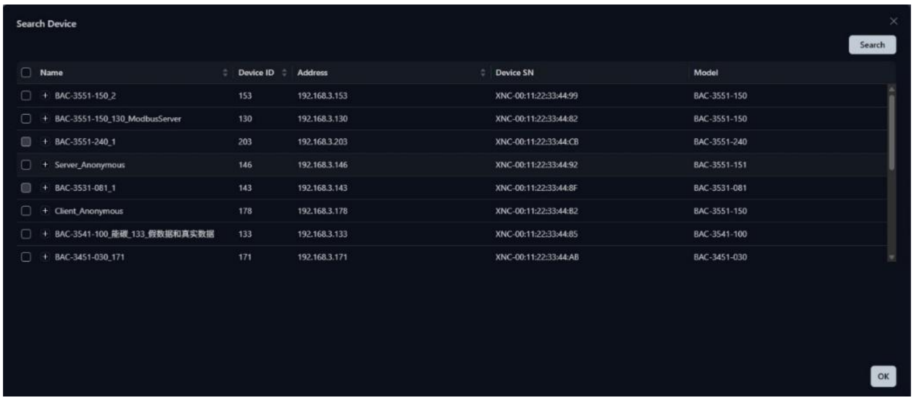


Figure 4.4.4

Click the "+" button in front of a device to see Fieldbus devices discovered through the Ethernet port, as shown in Figure 4.4.5:

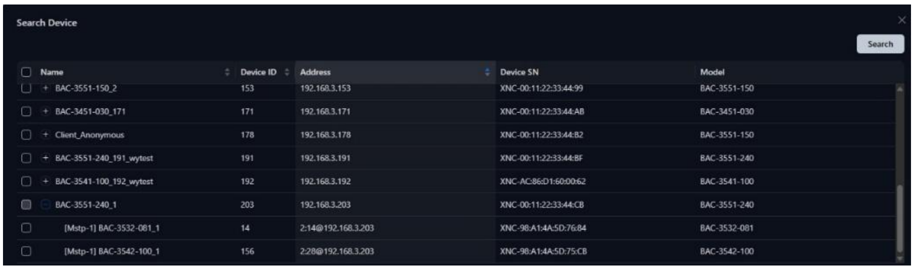


Figure 4.4.5

Check the devices you wish to add. After clicking "OK", the devices will be automatically added to the canvas on the Device Management page, as shown in Figure 4.4.6:

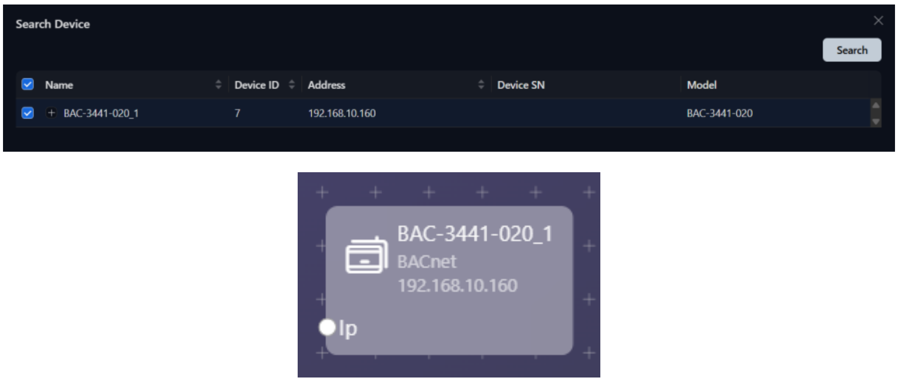


Figure 4.4.6

Once the device is added to the canvas, you can click the edit button above the device to enter the Points interface. Click "Search" in the Points List to locate points within the device. Check the required points and add them, as shown in Figure 4.4.7:

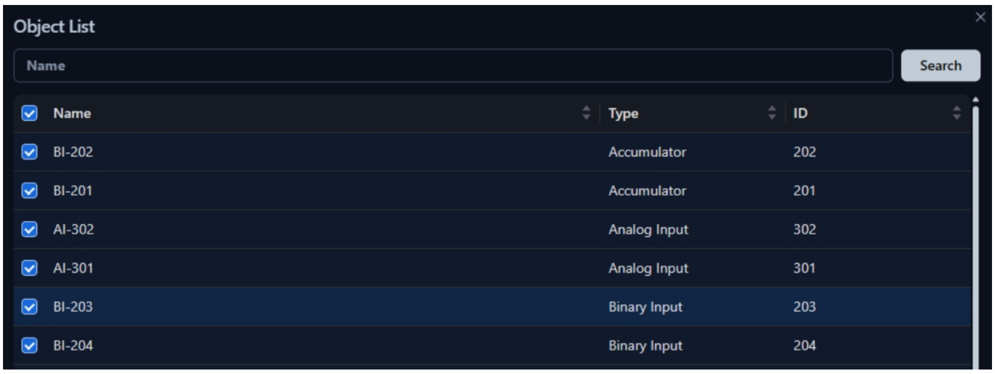


Figure 4.4.7

4.4.4. Device List

Click the "Device List" button to open the Device List interface. When the device layout is complex, you can filter devices by entering device information in this interface. Selecting a device will locate it on the canvas for subsequent editing operations, as shown in Figure 4.4.8:

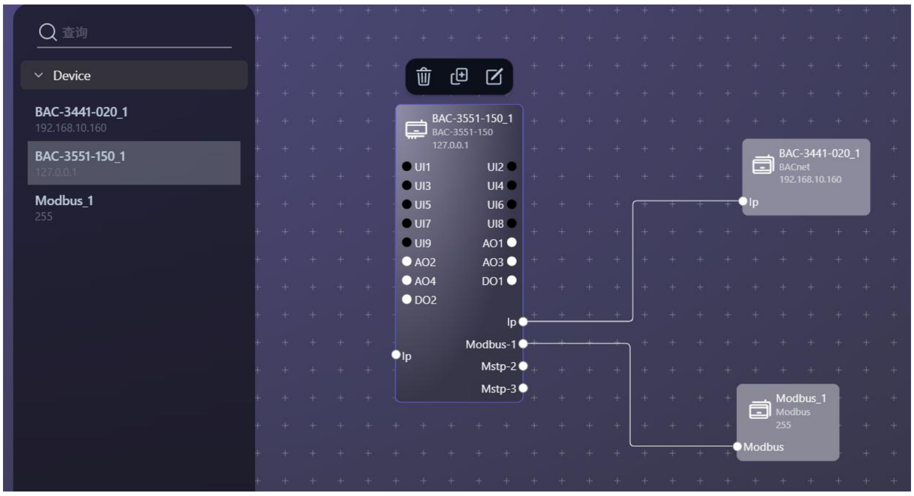

查询
Device
BAC-3441-020_1
192.168.10.160
BAC-3551-150_1
127.0.0.1
Modbus_1
255
BAC-3551-150_1
BAC-3551-150
127.0.0.1
UI1
UI2
UI3
UI4
UI5
UI6
UI7
UI8
UI9
AO1
AO2
AO3
AO4
DO1
DO2
Ip
Modbus-1
Ip
Mstp-2
Mstp-3
BAC-3441-020_1
BACnet
192.168.10.160
Ip
Modbus_1
Modbus
255
Modbus

Figure 4.4.8

5. Logic Management

5.1. Main Page

Double-clicking on a module device will open the Logic Management Page (Point and Logic Management) , as shown in Figure 5.1.1. The page consists of five sections:

1. Device Information: Displays the device type and project name.
2. Function blocks: Lists logic and point blocks.
3. Applications: Save, Start Simulation (including Offline/Online), Add Mapping (add points from other controllers or devices), Show Mapping Information (display the mapping path of each point), Fold All (expand/collapse logic blocks), Statistics (count of each logic block type), and Minimap.
4. Logic Design Canvas: Workspace for logic design.
5. Point Statistics: Displays the ratio of used points to total supported points and the firmware version of the downloaded project.

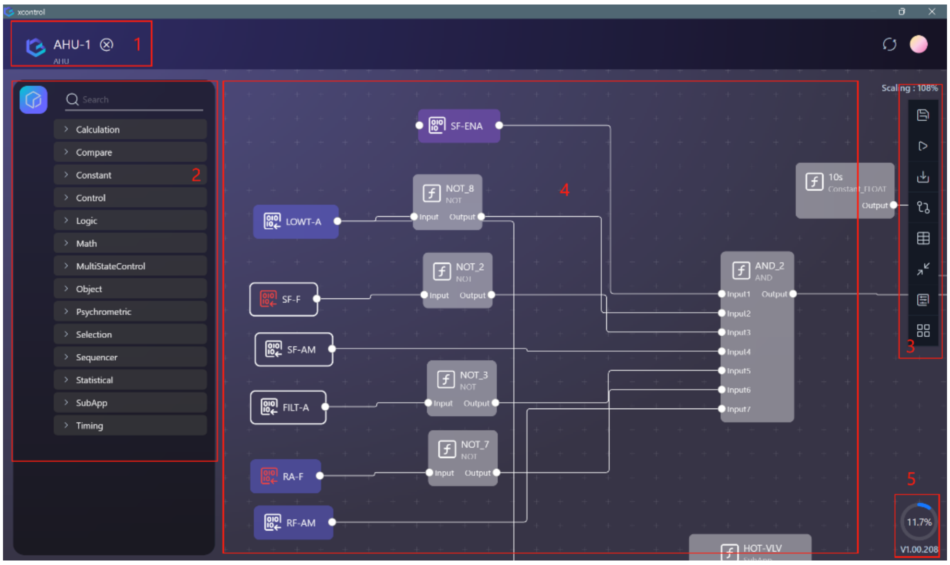


Figure 5.1.1

5.1.1. Device Information

- LUBAN Icon: Click to return to the project management homepage. This function is consistent across all pages.
- Information Area: Displays the device name (top) and project name (bottom).
- X Icon: Exits the Point and Logic Programming page and returns to the Device Management page. Remember to save before exiting, as shown in Figure 5.1.2.

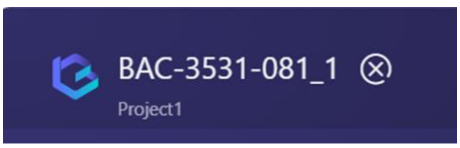


Figure 5.1.2

5.1.2. Function blocks

The menu on the left can be expanded to show the corresponding function blocks. You can add a function block to the canvas by clicking and dragging it. The search bar at the top allows you to filter function blocks by name, as shown in Figure 5.1.3.

There are three methods for connecting wires between function blocks:

Three methods for connecting function blocks:

- Click and drag between parameter points of the same data type.
- Click two parameter points of the same data type sequentially.
- Double-click connection lines to add labels or hide them.

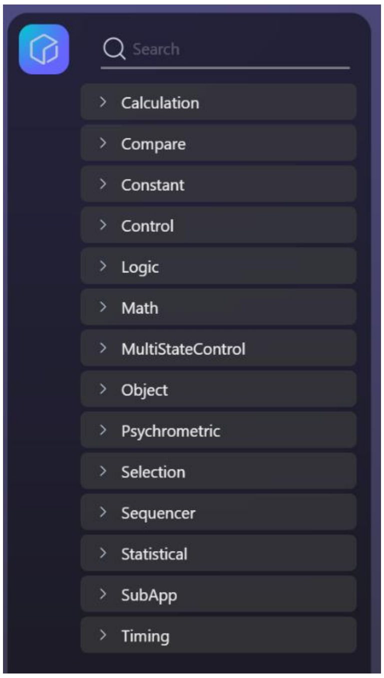


Figure 5.1.3

5.1.3. Applications

Functional buttons, as shown in Figure 5.1.4:

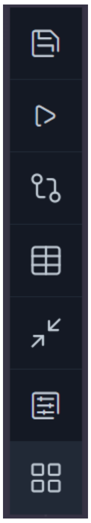


Figure 5.1.4

Detailed Functions:

- Save: Saves the application. The save result is displayed in the lower-left corner, as shown in Figure 5.1.5. It is recommended to save after making any modifications to prevent data loss upon unsaved exit.

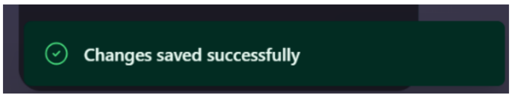


Figure 5.1.5

- Start Simulation: After the application design is completed, proceed with simulation. The simulation results will be displayed in the notification area in the lower-left corner, e.g., simulation failure, as shown in Figure 5.1.6:

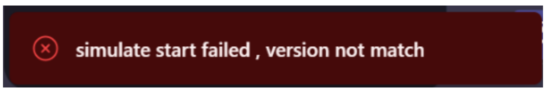


Figure 5.1.6

If the current program version matches the version in the controller, you can proceed directly with the simulation, as shown in Figure 5.1.7. Additionally, you can double-click the green value to modify the simulated value through a pop-up window, as shown in Figure 5.1.8:

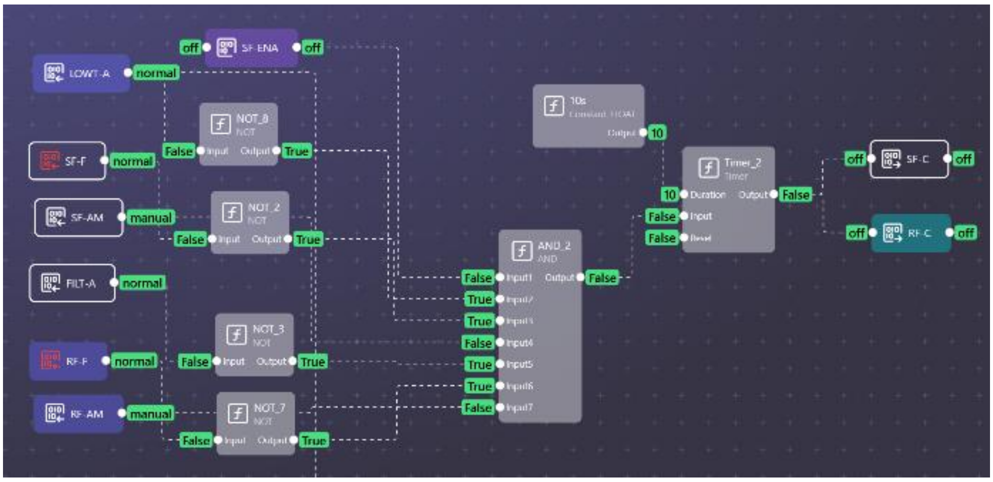


Figure 5.1.7

Figure 5.1.8

If an alarm event exists for a point, the point icon will be displayed in red, as shown in Figure 5.1.9:

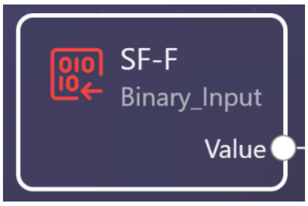


Figure 5.1.9

- Add Mapping: Clicking the button will open a pop-up window. The device dropdown menu allows you to select the device for which point creation and mapping are required.
  - ◆ XNC Devices: You can select the hardware points to be created by checking the corresponding boxes. Click the revealed corresponding point type to proceed. If it is an AI point, you must also select the signal type for the channel reception to complete the point creation on the device, as shown in Figure 5.1.10:

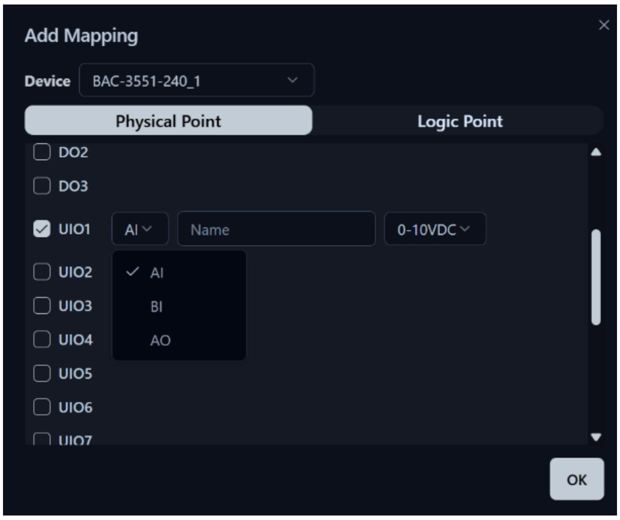


Figure 5.1.10

◆ BACnet Third-Party Devices: All points added in section 4.3.2 are available for selection here. Check the desired points, then click the corresponding point type and signal type that appear to complete point creation, as shown in Figure 5.1.11:

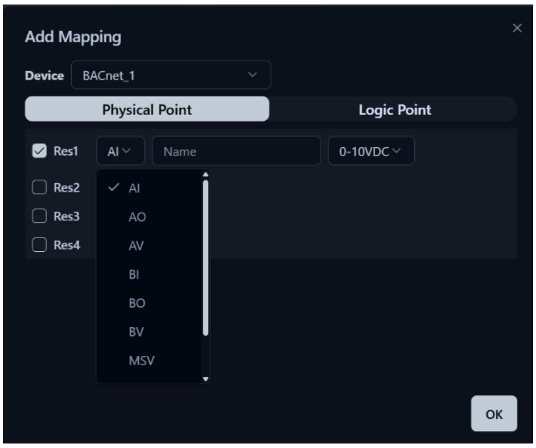


Figure 5.1.11

◆ Modbus Devices: Modbus Devices: After selecting a Modbus device, you can quickly create points on this page. Click the "+" button and complete the attribute configuration to finish creation, as shown in Figure 5.1.12:

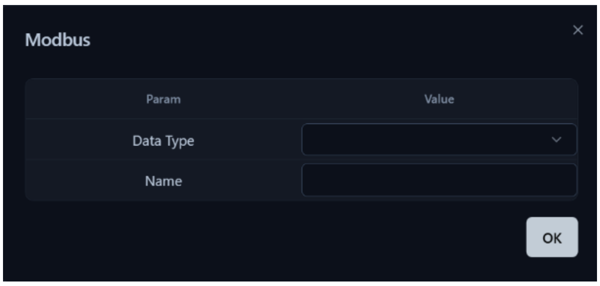


Figure 5.1.12

The list of available points varies depending on the selection here, and the subsequent parameter settings that appear will also differ. The meanings of all parameters are listed below:

- Name: Point name (≤30 characters).
- Mode: Signal type (4-20mA, 0-10V DC, resistance, etc.).
- Register Type: Coils, Digital Input, Input Registers, Holding Registers.
- Register Address: Refers to the address in the protocol address table. Address offset must be considered, which may require adding or subtracting 1.
- Byte Order: Data transmission sequence (refer to protocol address table).
- Scaling Factor: Whether the numerical value needs to be scaled down or up by a factor of 10 (i.e., decimal point shift).
- Offset: Measurement value adjustment.

After a point is added, the buttons next to it are **Edit**, **Delete**, and **Copy**, as shown in Figure 5.1.13:

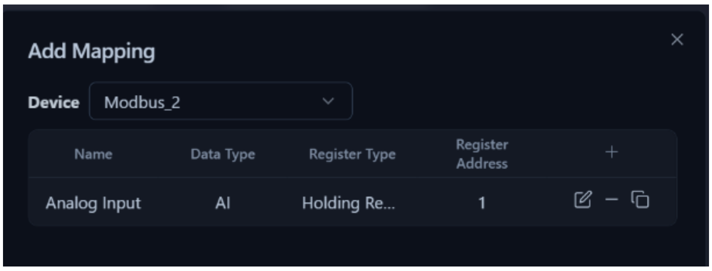


Figure 5.1.13

- Show Mapping Info: Displays all points and their mappings in the device, categorized as: ①Module: function blocks in use. ②Unmap: Unmapped points. ③Controller-named folders: Points mapped to controllers. Click any object to locate it on the canvas, as shown in Figure 5.1.14.
  Clicking any object in the mapping information allows quick navigation to that object on the canvas.

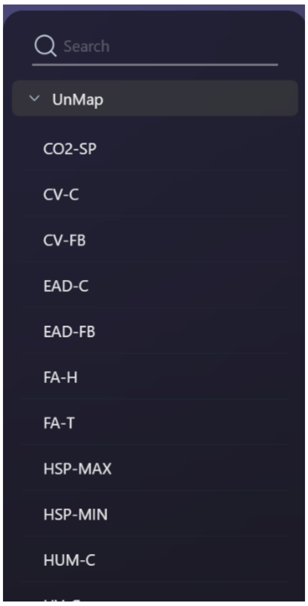


Figure 5.1.14

- Fold All: Toggles between simplified and detailed modes for all function blocks , as shown in Figure 5.1.15:

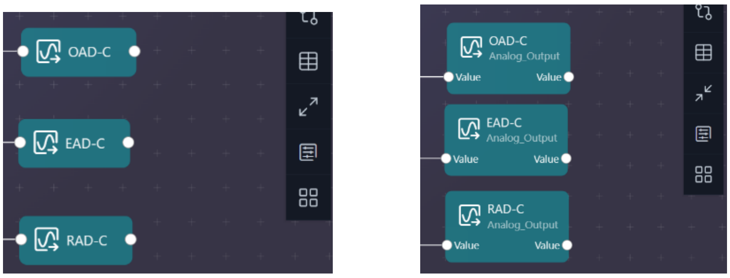


Figure 5.1.15

- Statistics: Displays counts of all function blocks types in the device, as shown in Figure 5.1.16:

Figure 5.1.16

- Minimap: Shows a thumbnail overview of all canvas objects , as shown in Figure 5.1.17:

Figure 5.1.17

5.1.4. Logic Design Canvas

Drag function blocks onto the canvas and connect channels via mouse drag to complete logic design, as shown in Figure 5.1.18:

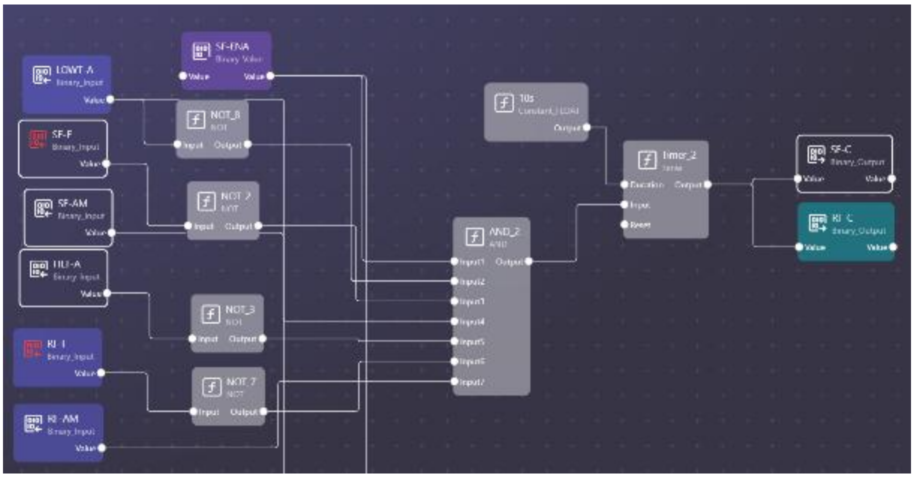


Figure 5.1.18

5.2. Point Configuration

Drag points from the left panel folder and double-click to open the configuration interface for property settings.

5.2.1. Analog Input

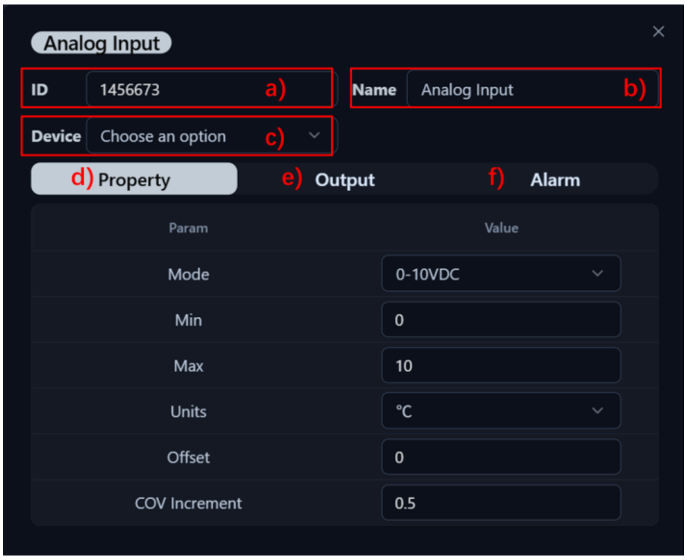


Figure 5.2.1

a. **ID**: The BACnet ID of the point. It can be modified but must be unique.

b. **Name**: Point name (supports Chinese, ≤30 characters).

c. **Device**: Select target controller and mapped channel from dropdown.

d. **Property**: Configure signal type (0-10VDC, 4-20mA standard signals; PT1000, 10K-NTC, NICKEL resistance signals), range, unit, offset, and COV increment.

e. **Output**: Enable/disable output channel connection (default: enabled).

f. **Alarm**: Configure alarm thresholds. Add alarms to points, including setting point alarm intervals.

5.2.2. Binary Input

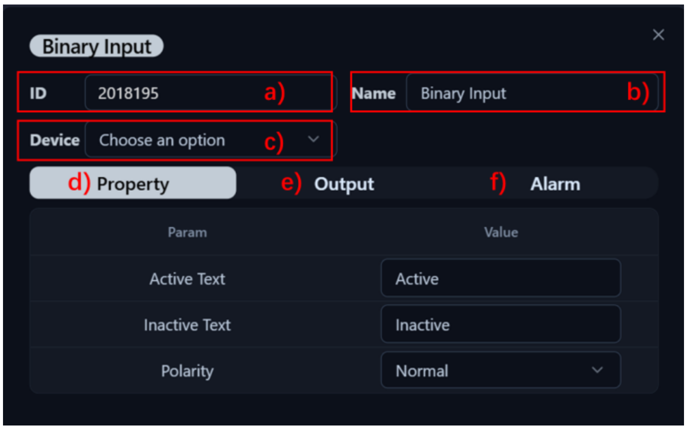


Figure 5.2.2

a. **ID**: The BACnet ID of the point. It can be modified but must be unique.

b. **Name**: Point name (≤30 characters).

c. **Device**: Select controller and channel.

d. **Property**: Set active/inactive state text (for 1/0 values); configure polarity (normal/inverted display).

e. **Output**: Enable/disable output channel (default: enabled).

f. **Alarm**: Not configurable. Add alarms to points, including setting point alarm intervals.

5.2.3. Analog Output

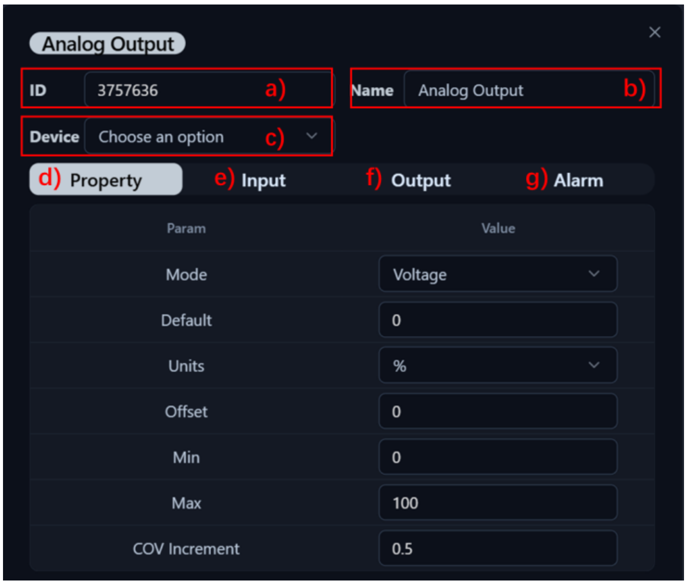


Figure 5.2.3

a. **ID**: The BACnet ID of the point. It can be modified but must be unique.

b. **Name**: Point name (≤30 characters).

c. **Device**: Select controller and channel.

d. **Property**: Signal type (0-10VDC voltage, 4-20mA current), default value, range, unit, offset, COV increment.

e. **Input**: Enable/disable input channel (default: output enabled).

f. **Output**: Enable/disable output channel (default: enabled).

g. **Alarm**: Not configurable. Add alarms to points, including setting point alarm intervals.

5.2.4. Binary Output

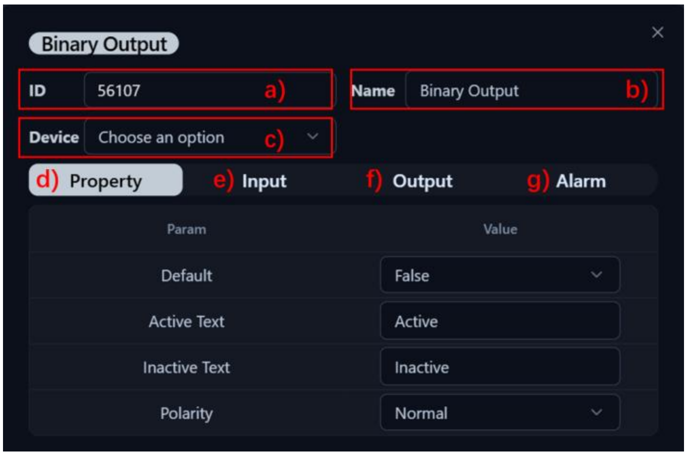


Figure 5.2.4

a. **ID**: The BACnet ID of the point. It can be modified but must be unique.

b. **Name**: Point name (≤30 characters).

c. **Device**: Select controller and channel.

d. **Property**: Active/inactive state text; polarity configuration.

e. **Input**: Enable/disable input channel (default: output enabled).

f. **Output**: Enable/disable output channel (default: enabled).

g. **Alarm**: Not configurable. Add alarms to points, including setting point alarm intervals.

5.2.5. Analog Value

Figure 5.2.5

a. **ID**: The BACnet ID of the point. It can be modified but must be unique.

b. **Name**: Point name (≤30 characters).

c. **Device**: Select controller and channel.

d. **Property**: Default value, unit, COV increment.

e. **Input/Output**: Enable/disable channels (default: output enabled).

f. **Alarm**: Not configurable. Add alarms to points, including setting point alarm intervals.

5.2.6. Binary Value

Figure 5.2.6

a. **ID**: The BACnet ID of the point. It can be modified but must be unique.

b. **Name**: Point name (≤30 characters).

c. **Device**: Select controller and channel.

d. **Property**: Active/inactive state text.

e. **Input/Output**: Enable/disable channels (default: output enabled).

f. **Alarm**: Not configurable. Add alarms to points, including setting point alarm intervals.

5.2.7. Integer Value

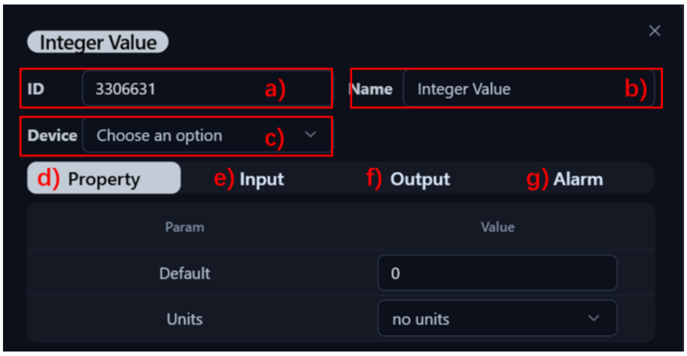


Figure 5.2.7

a. **ID**: The BACnet ID of the point. It can be modified but must be unique.

b. **Name**: Point name (≤30 characters).

c. **Device**: For Modbus devices, shows additional "Modbus" tab (hides default value).

d. **Property**: Unit configuration.

e. **Output**: Enable/disable output channel (default: enabled).

f. **Modbus Settings**: Register type, address, byte order, gain, offset (Figure 5.2.8):

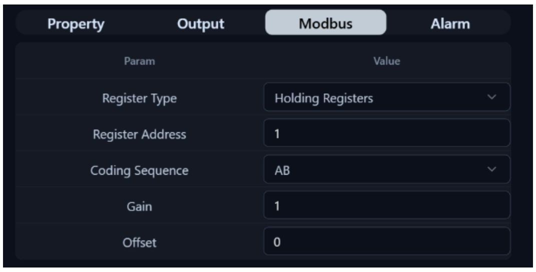


Figure 5.2.8

g. **Alarm**: Not configurable. Add alarms to points, including setting point alarm intervals.

5.2.8. Multi-State Value

Figure 5.2.9

a. **ID**: The BACnet ID of the point. It can be modified but must be unique.

b. **Name**: Point name (≤30 characters).

c. **Device**: Select controller and channel.

d. **Property**: State text labels, default value.

e. **Input/Output**: Enable/disable channels (default: output enabled).

f. **Alarm**: Not configurable. Add alarms to points, including setting point alarm intervals.

5.2.9. Accumulator

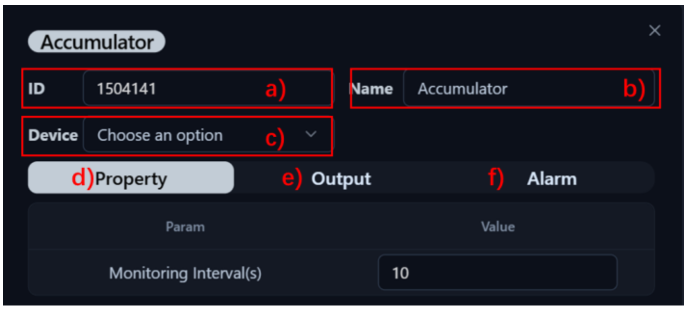


Figure 5.2.10

a. **ID**: The BACnet ID of the point. It can be modified but must be unique.

b. **Name**: Point name (≤30 characters).

c. **Device**: Select controller and channel.

d. **Property**: Monitoring interval.

e. **Output**: Enable/disable output channel (default: enabled).

f. **Alarm**: Not configurable. Add alarms to points, including setting point alarm intervals.

5.3. Logic Programming

5.3.1. Calculation

- Line Segment: Polyline with customizable vertices (Figure 5.3.1).

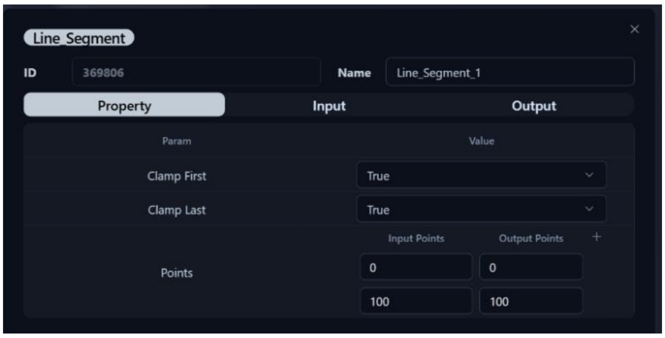


Figure 5.3.1

- Span: Single line segment defined by two coordinates (Figure 5.3.2).

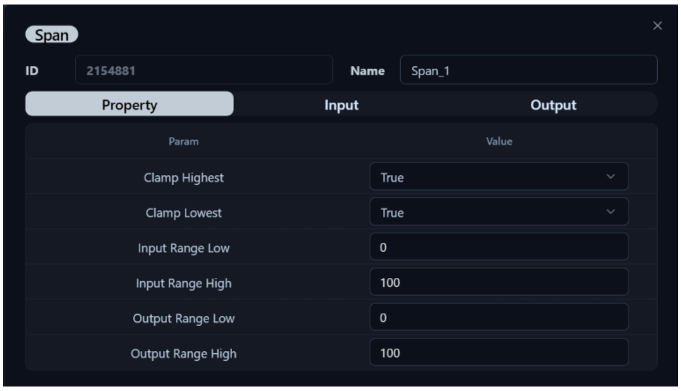


Figure 5.3.2

- Totalization Analog: Time-based accumulation of analog values.
- Totalization Event BOOL/ENUM: Counts BOOL/ENUM state transitions.
- Totalization Runtime BOOL/ENUM: Tracks duration of reference states.

5.3.2. Comparison

- Equal: Returns TRUE for matching BOOL/ENUM/Float inputs.
- Greater Than: Requires Input1 > Input2 to return TRUE. For hysteresis, reverts to FALSE when Input1 ≤ (Input2 - Differential).
- Greater Than or Equal: Returns TRUE when Input1 ≥ Input2. For hysteresis, reverts to FALSE when Input1 < (Input2 - Differential).
- Less Than: Returns TRUE when Input1 < Input2. Reverts to FALSE when Input1 ≥ (Input2 + Differential).
- Less Than or Equal: Returns TRUE when Input1 ≤ Input2. Reverts to FALSE when

Input1 > (Input2 + Differential).

- Not Equal: Returns TRUE for mismatched BOOL/ENUM/Float inputs.

5.3.3. Constants

- Configurable constant values for BOOL, ENUM, and FLOAT types.

5.3.4. Control: PID Block

Performs PID calculations to minimize deviation between Process Variable (PV) and Setpoint.

Key Parameters:

  - Disable: Whether to disable this module.
  - Deadband: Sets the Deadband. This value defines a band (+/- DB/2) centered on the Setpoint where the error is considered to be zero.
  - DirectActive: Indicates the action direction of the PID (True=Direct Acting, False=Reverse Acting).
  - HighLimit/LowLimit: Output clamping values.
  - DerivativeTime: 0.1-100 sec.
  - Reset Tuning: When Reset Tuning is set to True, it causes the PID to reset to the values of the Proportional Band and Integral Time parameters.
  - When Reset Tuning is False, the PID operates normally.
  - AdaptiveTuning: Enables self-tuning.
  - StartupVal: Initial output value.
  - Process Range: Indicates the magnitude of the range that the Process Variable traverses when the PID's Output changes between its minimum and maximum values.
  - Proportional Band: Sets the initial value for the proportional band. It is the amount of change in the Process Variable that produces a full-scale change (High Limit - Low Limit) in the Present Value.
  - Interval: Sets the time interval between normal PID algorithm executions.
  - Integral Time: Sets the initial integral time. This value is the time required for the integral action to exert an effect on the controller output equivalent to that of the proportional term for a constant error.

5.3.5. Logic

- AND: Output=1 only if all inputs=1.
- NOT: Inverts input.
- OR: Output=1 if any input=1.
- XOR: Output=1 for unequal inputs (supports cascading).

The number of inputs can be displayed or hidden through the function block property settings, up to 16.

- SET_RESET:

SET=1 → PV=1;RESET=1 → PV=0;Both=0 → PV maintains state.Typical application: Pump control for sumps/tanks.

- TOGGLE: Toggles PV state on rising edge of Input1.
- Reliability Check: Validates input data integrity (BOOL/ENUM/FLOAT).
- Reliability Merge: Manages data transmission reliability flags.

5.3.6. Math

Includes:

- Arithmetic (+, -, ×, ÷).
- Trigonometric (sin, cos, tan).
- Statistical (avg, min, max, std dev).
- Exponential/logarithmic.
- Bitwise operations.

5.3.7. Multi-Stage Control (MSC)

Sequences multi-stage equipment (e.g., heat pumps, electric heaters).

5.3.8. Object

All supported point types:

- AI (Analog Input)
- AO (Analog Output)
- AV (Analog Value)
- BI (Binary Input)
- BO (Binary Output)
- BV (Binary Value)
- MSV (Multi-State Value)
- ACC (Accumulator)
- Integer Value

5.3.9. Psychrometric

- Psychrometric: Computes dew point, absolute humidity, enthalpy from dry-bulb temp & RH.
- Relative Humidity: Calculates RH from wet-bulb/dry-bulb temps.
- Wet Bulb: Derives wet-bulb temp from dew point/dry-bulb/RH.

5.3.10. Selection

After connecting the mode to the point, you can define the mode-point value/state corresponding to each input, and through the mode's value/state, you can determine which input channel the output is equal to.

- MUX IO Bool Mode Bool

Mode channel is connected to the Bool point, and Input/Output is the Bool point.

- MUX IO Bool Mode Enum

Mode channel is connected to the Enum point, and Input/Output is the Bool point.

- MUX IO Enum Mode Bool

Mode channel is connected to the Bool point, and Input/Output is the Enum point.

- MUX IO Enum Mode Enum

Mode channel is connected to the Enum point, and Input/Output is the Enum point.

- MUX IO Float Mode Bool

Mode channel is connected to the Bool point, and Input/Output is the Float point.

- MUX IO Float Mode Enum

Mode channel is connected to the Enum point, and Input/Output is the Float point.

5.3.11. Sequencer

- Multi-device sequencer, according to the input, device ranking, addition and subtraction settings to confirm the number of open devices, the device ranking is generally to count the running time of the equipment. It is generally used for the start and stop of water pumps, chillers and cooling towers in the group control of chillers.
- Support sequencing between up to 16 devices. You can ensure the security of device switching time and switching devices by defining Min On Time, Min Off Time, Inter-Stage On Delay, and Inter-Stage Off Delay.

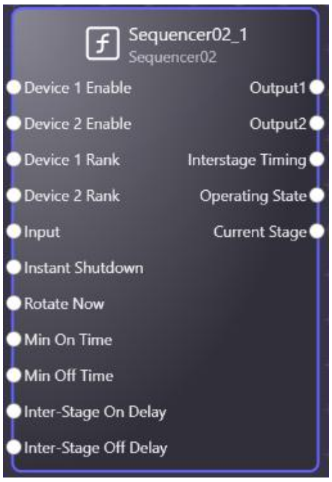


Figure 5.3.3

5.3.12. SpecialObject

NOTE:XNC Pro Series Only!

- Calendar: Defines time periods for Schedule reference.

- Notification: Configures alarm distribution lists.

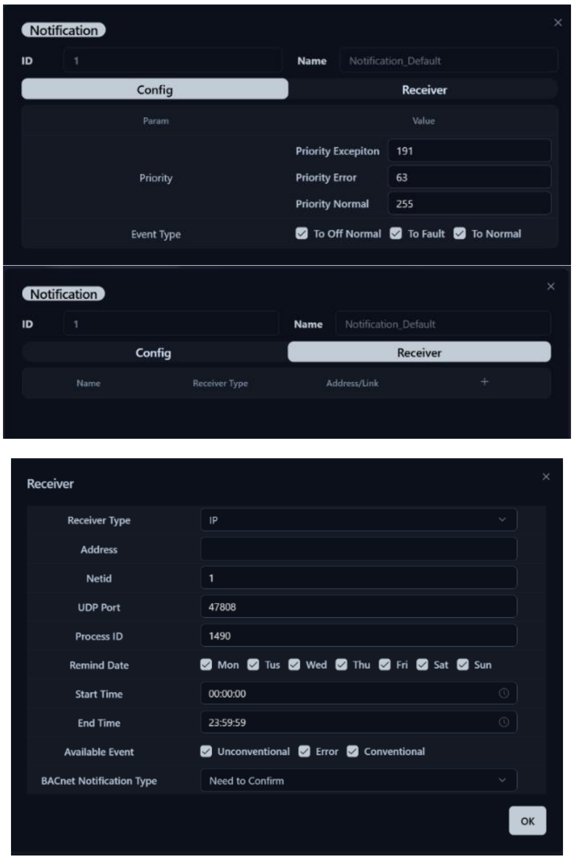


Figure 5.3.4

- Schedule:Time-based command execution, as shown in Figure 5.3.5:

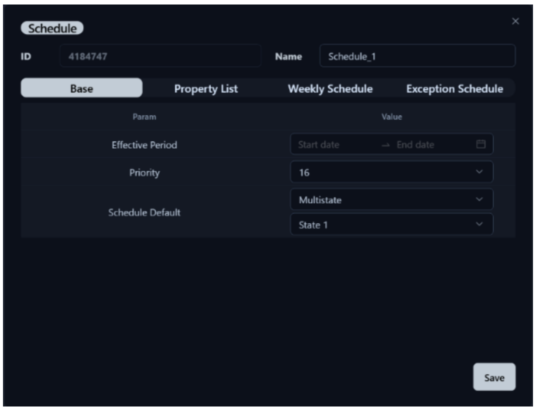


Figure 5.3.5

- ◆ Basic page: You can modify the name, you can set the timesheet validity date period, command sending priority, and the default value of the output content, as shown in Figure 5.3.6:

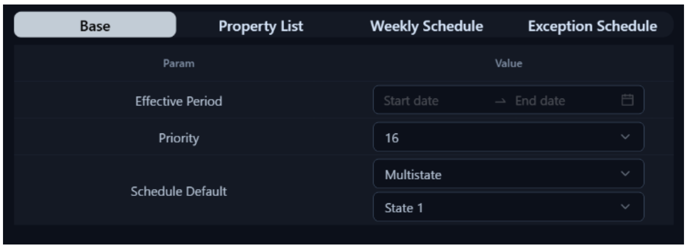


Figure 5.3.6

Date: it can be empty, and if the date is empty, it means that the schedule is always valid.

Priority: Priority levels (1-16, 1=highest).

Output: Default value, within the effective date, the default value will be sent once a day at 0:00 schedule.

- Reference page: Here you can add the timetable effective object, click the sign in the figure below, all the point objects in the module will appear, add them to the list, support up to 50-point objects, as shown in Figure 5.3.7:

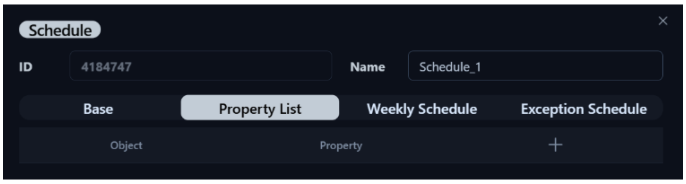


Figure 5.3.7

- Weekly plan page: This page can add a weekly plan schedule, click the sign, add the mode, time point and value to be sent, and the specific plan will be displayed after adding, as shown in Figure 5.3.8:

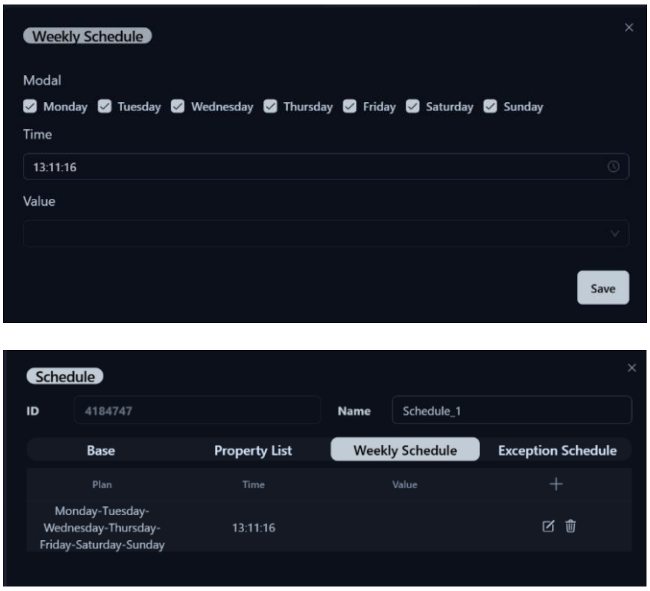


Figure 5.3.8

- Special Schedule Page: This page allows you to add a weekly schedule, click the symbol, add the mode, time, and value to send, as shown in Figure 5.3.9:

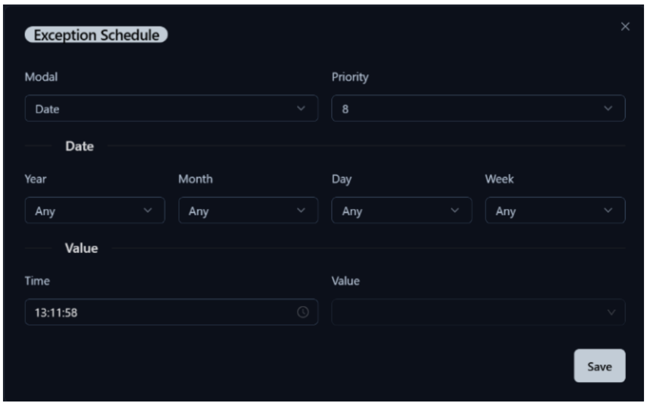


Figure 5.3.9

The priority of the special plan is higher than that of the weekly plan, and the special plan takes precedence over the weekly plan regardless of the priority.

- Trend Log

Trends are used to record changes in important data, and at each set point in time, the current value of the current point in time is recorded, and finally a change curve is formed. Managers can observe trends to view the operating status of equipment. Drag out the trend object and double-click the block to pop up the property box, as shown in Figure 5.3.10:

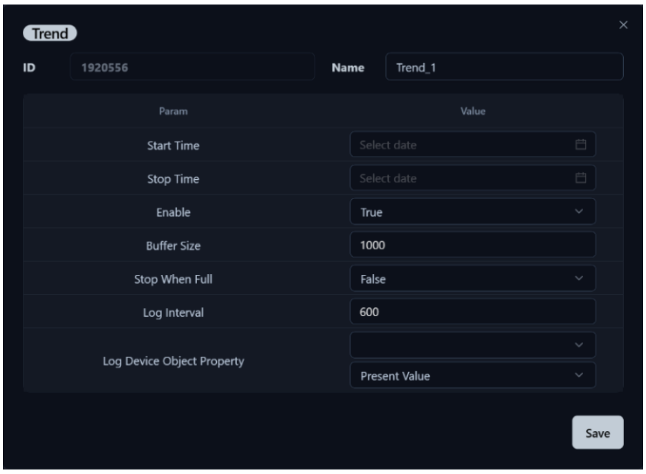


Figure 5.3.10

- Name: The name of the trend.
- Start and end time: fill in as needed, if not filled, it means it will always be valid.
- Enable: Default true, if modified to false, the trend will stop recording.
- Buffer size: The number of records for this trend is 1000 by default and 10000 by default.
- Stop when full: false by default, if the cache size is 1000, when the 1000 entries are full, the 1001st value will be recorded, and the first record will be deleted. If you change it to true, it will no longer be recorded when the 1000 items are saved.
- Interval: 600s by default, that is, once every 10 minutes.

- Reference Object: Select the point object to record.

5.3.13. Statistical

Calculates min/max/avg/median/std dev for up to 16 inputs.

5.3.14. SubApp

Sub_App,Nested logic blocks with I/O mapping, as shown in Figure 5.3.11:

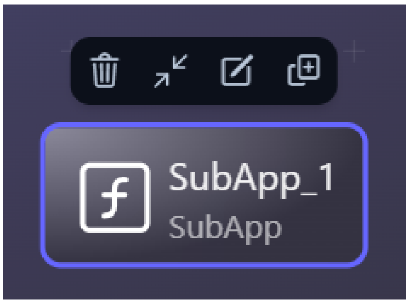


Figure 5.3.11

- Delete: Deletes the object, including the points and logic in the subapp.
- Collapsed: Can be folded or unfolded.
- Logic: After double-clicking the block, enter the edit page, you can edit the program.

The input and output used by the subapp editing logic need to use the objects in the subapp folder, so that it can be connected to the points established by the first-layer logic after saving, as shown in Figure 5.3.12:

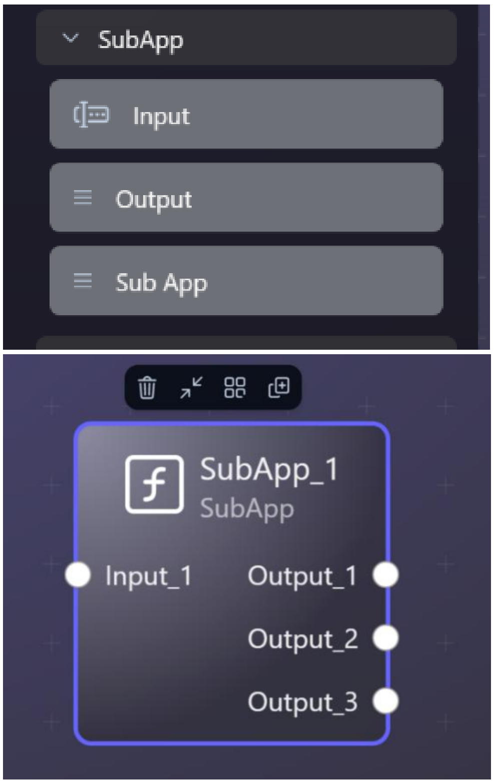


Figure 5.3.12

- Copy: Copy the subroutine, and the points and logic in the subprogram will also be copied.

5.3.15. Timing

- Latch（Similar to SET_RESET）

When Input1=1, the output PV is 1. When Input2=1, the output PV is 0. When Input1 and Input2 are both 0, the PV value remains unchanged. If Input1 and Input2 are both 1, the output PV is 0. It is generally used for the control of water collection wells and water tanks, stopping pumps at high levels and opening pumps at low levels.

- Rate Limite

The function of this block can be referenced using the stepping formula: Step = Rate Limit * Period / 60. When Limit Active is False, after entering the Input value, the block starts and the output equals the Input value. When Limit Active is True, after entering the Input value, the block starts and the output equals the Startup Value, and the output value will incrementally increase or decrease, approaching the Input value until it becomes the same as the Input value.

- Timer

◆ Input: Switching input signal.

◆ Duration: Set time or period (duration), unit second, range 1s to 3888000s (45 days).

◆ Reset: Reset command.

Double-click to enter the property settings page, as shown in Figure 5.3.13:

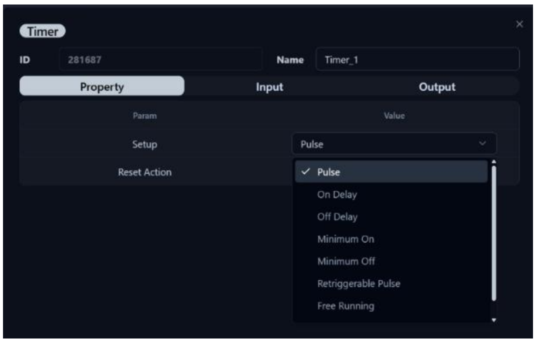


Figure 5.3.13

◆ Pulse: When the input is from 0-1, PV=1 is delayed for a period of time and then PV=0.

◆ On Delay: Delay on command.

◆ Off Delay: Delay off command.

◆ Minimum On: The PV can be 0 after a minimum period of time.

◆ Minimum Off: The PV can be 1 after a minimum period of time.

◆ Retriggerable Pulse: Similar to Pulse, but re-timed each time input from 0-1.

◆ Free Running: Continuously output pulsed square waves.

◆ One Shot: When input from 0-1, PV=1 is delayed for a period of time and PV=0 is maintained.

- Reset Operation: When resetting from 1-0, the output action mode.

5.4. Alarm Management

Add alarms to points on the configuration page of each point, double-click the point and click the alarm page, as shown in Figure 5.4.1:

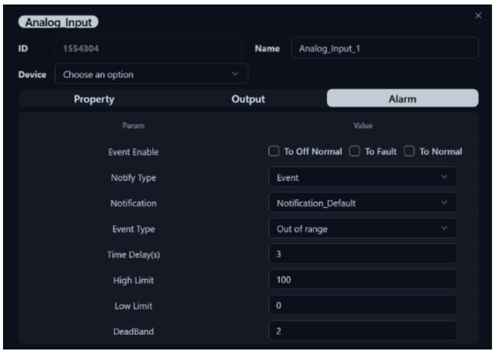


Figure 5.4.1

- Monitoring event type: three options, to off normal/to fault/to normal. If the analog quantity exceeds the normal interval or the digital quantity is equal to the state set, it is to off normal, and the point returns to the normal interval and normal state, that is, to normal. The to fault function is not yet complete.
- Reminder type: Event or alarm, fill in as needed.
- Notification object: The default Notification_Default, i.e. Notification mentioned in 5.3.12.
- Event type: Simulators support two types: out of range and change of value, and the default out of range is out. There are two types of numeric quantities: change of state and command failure. State quantity support: change of state. ACC support: Unsigned range (out of range). Integer support: change of value and Signed out of range.
- Delay time: 3s by default.
- Upper / lower limit: 100/0 by default, high limit if exceeded by upper limit, low limit if exceeded lower limit.
- Deadband: default 2, avoid frequent changes in point value alarms.
- State Type: The default state type of the numeric quantity is binary value, and the state type of the state quantity is unsigned value.
- Status set: Select the corresponding state, if the point matches the current state, an alarm will be generated.
- Increment: Set the trigger threshold for value changes, and trigger an alarm if the threshold is exceeded.
- Feedback object: Set the comparison object for state changes.
- Feedback Attribute: Set the comparison attribute for state changes.

6. Online/Offline Simulation

XControl supports both online simulation and offline simulation. Online simulation refers to real-time simulation of the point status of the controller, while offline simulation refers to conducting simulated operations within the software independently of the actual module devices.

The method for both online simulation and offline simulation is the same: the "Start Simulation" button on the right side of the Logic Management page. The difference lies in the controller's IP or MAC address settings. For offline simulation, set the controller's IP address to 127.0.0.1 or its MAC address to 127. For online simulation, set the controller's IP address or MAC address to its actual address. Additionally, connect the current computer to the controller for online simulation to occur.

6.1. Online Simulation

On the Device Management page, configure the real IP address of the device that needs to be simulated and commission, and then click Save to save it, as shown in Figure 6.1.1:

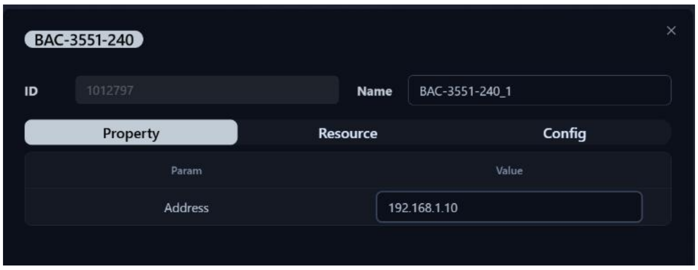


Figure 6.1.1

Go to the logic management page, save the logic that needs to be simulated and commission to the device, and click the Start Simulation button to start the simulation, as shown in Figure 6.1.2:

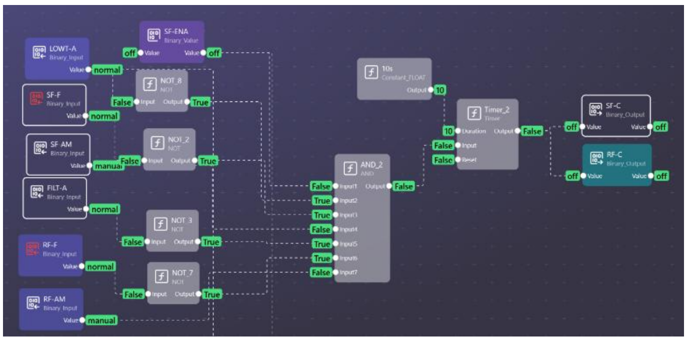


Figure 6.1.2

Red N/A:Indicates that the point's value could not be retrieved. Hovering the mouse over the red indicator will display the reason for the failed retrieval, as shown in Figure 6.1.3:

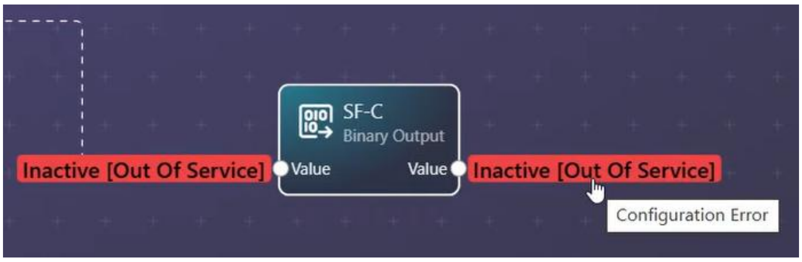


Figure 6.1.3

Green value: indicates the value of successfully obtaining the point.

Double-click the green value on the point side, you can modify the corresponding value in simulation mode, and write the corresponding value in the pop-up box, as shown in Figure 6.1.4:

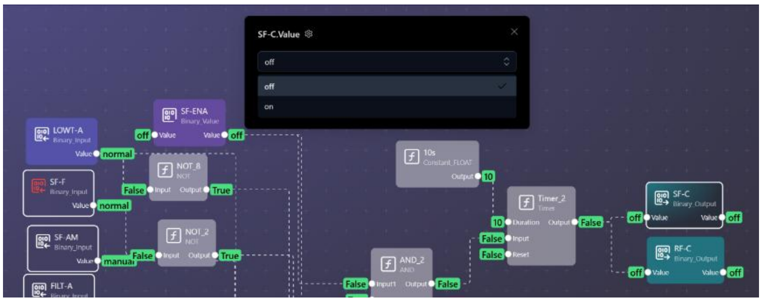


Figure 6.1.4

Note: The function blocks' position cannot be moved during the simulation process; If the number of function blocks is adjusted or the attribute values of the function blocks are modified during the editing process, you need to save it again before it can be simulated again.

6.2. Offline Simulation

To perform offline simulation, you must first enter the Device Management page. If it is an IP device, modify the IP address to 127.0.0.1 and save. If it is a bus device, modify the MAC address to 127 and save. Then double-click to enter the Logic Management page and click the Simulation button directly to start the simulation.

Subsequent simulation operations are the same as for online simulation.

7. Additional Notes

The following is supplemented with the point mapping and configuration logic between master and slave devices:

1. The master device can be directly mapped and configured from unconfigured hardware points in the device.
2. The master device can also map and use hardware points configured from the slave device, but the configuration properties of that point cannot be modified.

This manual applies to system version Ver2.0.00 and earlier.

YQAM-24013 2026.01 Rev. D