

MThings User Manual

About this manual

This manual covers the MThings software independently developed by Changnian (Shanghai) Technology Development Co., Ltd.

Purpose

The purpose of this manual is to provide readers with how to use the software.

Manual use

Please read this manual for instructions on using this product. The content of the manual will be updated constantly, but minor discrepancies or errors may occur.

Contact us at mthings986@163.com with any questions.

1 Software overview

MThings is a data collection, equipment debugging and supervisory monitoring software for industrial sites. The software supports serial port, TCP Client, TCP Server, UDP and other communication methods, can be connected to MODBUS RTU, MODBUS ASCII, MODBUS TCP, Siemens S7, DLT645 and other protocol devices, and provides operation modes such as master, slave and local virtual device.

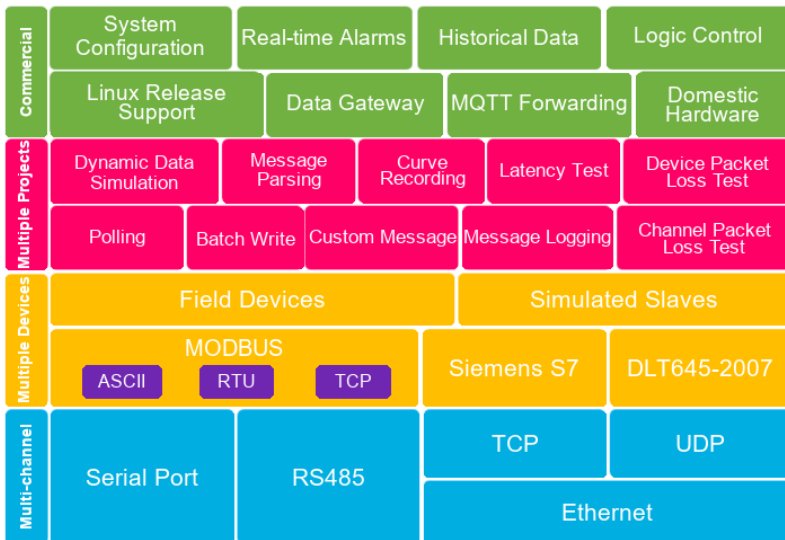
Users can configure data point address, data type, byte order, display format, unit, enumeration, grouping, batch read and write and polling parameters in the device data page, view device status and data changes in real time, and perform single point or batch read and write operations. The system has built-in functions such as real-time curves, historical curves, alarm management, system dashboards, and control processes. It can save historical data to a local SQLite database or an external network database according to the configuration cycle, and supports alarm condition judgment, alarm confirmation, recovery records, sound prompts, and pop-up reminders.

The software also provides MQTT data forwarding capabilities, which can publish device data according to topic cycles, and can also receive JSON instructions to write device data. It supports QoS, retained messages, compression / decompression and multi-connection management.

Through configuration and logic control functions, users can build equipment monitoring screens and combine mathematical operations, logical judgments, bit operations, timing, PID, Lua scripts, equipment reading and writing and other nodes to achieve visual display, linkage control and automated processing of on-site data.

The software also provides auxiliary tools such as new, open, save, recent project management, communication message window, link statistics, frame analysis, CRC / byte / time conversion of project files, and combines user permissions, authorization management, tray operation and PAD mode to meet the comprehensive needs of industrial debugging, operation monitoring, data recording and lightweight control applications.

1.1 Key functions



1.2 Edition differences

The software is divided into two editions: Personal Edition and Commercial Edition.

Personal Edition is for personal use, and its functions are permanently free. It does not provide technical services and does not bear any consequences of use. At the same time, the system built by the user is prohibited from being used for commercial purposes.

Commercial Edition is aimed at industrial and commercial users and provides comprehensive functions. It requires paid

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authorization before use. The authorization is one-time and permanent, and after-sales technical services are provided.

Items	Personal	Commercial
System configuration	✓	✓
logic control	✓	✓
historical data	Only one host device	✓
Alarm data	Up to 3 alarm configurations	✓
Gateway	✗	✓
MQTT Forwarding	Each post topic Up to 5 pieces of data	✓
Linux	✗	Custom deployment
MODBUS RTU	✓	✓
MODBUS ASCII	✓	✓
MODBUS TCP	✓	✓
Siemens S7	✓	✓
DL/T645-2007	✓	✓
Channel Management	✓	✓
Device management	✓	✓
User Management	✓	✓
Device data	✓	✓
Field Device	✓	✓
Simulated Slave	✓	✓
Real-time data curve	✓	✓
Link Count	✓	✓
Frame Test	✓	✓
Assist Tools	✓	✓

2 Download and Installation

2.1 download

Download address: <https://gulink.cn/>

2.2 Install

2.2.1 Prepare

Personal computer, industrial computer or touch screen all-in-one computer.

Monitor resolution: The recommended resolution is 1920*1080.

Supports Win7 and above, compatible with 32/64 bits.

2.2.2 Install

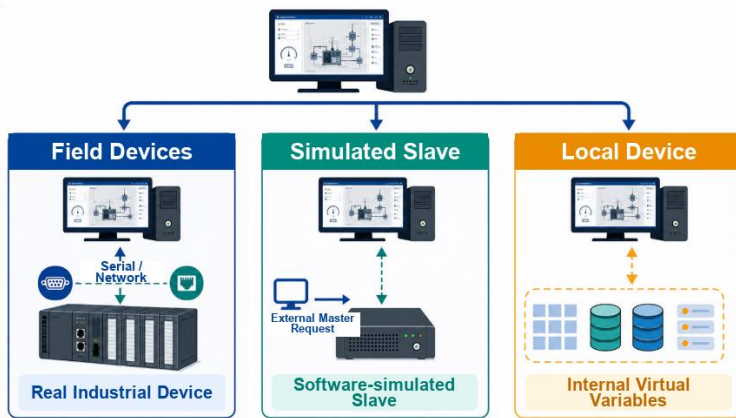
1. Download the software package MThings_Pack.exe;
2. Double-click to start the installation and follow the step-by-step instructions;
3. Double-click the icon to launch the software.

3 Function details

3.1 Basic concepts

3.1.1 Device

Devices are communication nodes and include three categories: field devices, simulated slaves, and local devices.



Field Device

Field devices refer to external industrial devices that are actively connected, read and written by the supervisory computer software as the master, such as PLC, instruments, acquisition modules, electricity meters, etc. Field devices need to be bound to a serial port or network communication link, and configure MODBUS, S7, DLT645 and other data point addresses, data types, polling cycles, timeouts and resend parameters according to the link protocol. When running, the software will collect field data according to the configuration cycle, refresh device data tables, real-time curves, alarm judgments, historical storage and MQTT reporting; users can also perform single-point or batch write operations on field devices through the interface, process control or remote instructions.

Simulated Slave

The simulated slave is a protocol slave device simulated by software on the local machine and is used to respond to communication requests from external master software or the supervisory computer. It also configures data point addresses, data types and protocol parameters, but the data source does not necessarily come from real hardware. It can be automatically generated using fixed values, linear changes, parabolas, sine waves, square waves, sequence data, etc. It can also be bound to other device data to implement data forwarding or cache mapping. simulated slaves are often used for device commissioning, protocol testing, master program verification, teaching demonstrations and system simulation in no physical environment.

Local Device

The local device is a type of virtual data device maintained internally by the software. It does not correspond to external communication ports and does not directly respond to on-site protocol messages. It is mainly used to save and manage software internal variables, calculation results, manual input values or process control intermediate quantities. Users can read and write data points of local devices just like operating ordinary device data, and use them for system dashboards, curve display, alarm judgment, history records, MQTT publishing, and data exchange between control process nodes. This device is suitable as an internal variable table, soft point, logic operation result or data bridge across functional modules.

3.1.2 Primitive and rendered types

The software provides a friendly data visualization method and supports displaying message data in actual business formats.

SRC Type is used to describe the actual encoding method of device messages or data in the memory area, that is, the underlying type used when parsing data from protocol frames or organizing data before writing to the device. It's closer to device registers, BYTEs, or the protocol data itself, such as signed integers, unsigned integers, floats, byte arrays, bits, BCD, etc.

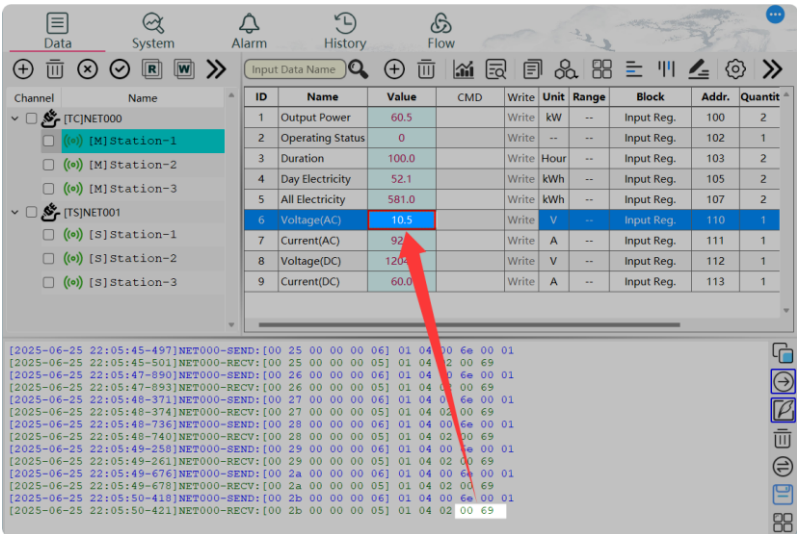
UI Type describes the form in which data is displayed, edited, judged, and interacted with in software. It is closer to the data styles that users see and use, such as float, decimal integers, hexadecimal integers, binary bits,

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bytestrings, strings, times, enumerations, etc.

The software supports users to specify the SRC Type and UI Type of each data. During the debugging process, the software automatically converts according to the configuration, and the data presented on the interface will be the true content of the data.

For example, if a slave reports 10.5 V as the register value 0x0069, MThings multiplies the integer value by a coefficient of 0.1 and displays the restored value of 10.5 V.





























TYPE CATEGORY	TYPE	FUNCTION DESCRIPTION
Src Type	INT	Parse device raw data as signed integers, suitable for data that may have negative values such as temperature, pressure, offset, etc.
Src Type	UINT	Parse device raw data as unsigned integers, suitable for non-negative data such as counts, status codes, addresses, cumulative amounts, etc.
Src Type	Float	Parse device raw data according to floating point numbers, suitable for scenarios where the device directly provides IEEE floating point values.

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Src Type	Bytes	Processed as original byte array, without conversion of numerical meaning, suitable for message fragments, encoded data, original string area, etc.
Src Type	BIT	Bit-wise data processing, suitable for coils, switches, flags, etc.
Src Type	BCD	Analyze according to BCD encoding, suitable for data stored in decimal compression encoding in electricity meters and instruments
UI Type	Float	Displayed in decimal form, can be used with decimal places, gain, and offset
UI Type	DEC Integer	Display as decimal integer
UI Type	HEX Integer	Displayed as a hexadecimal integer, suitable for status words, error codes, and mask values
UI Type	Binary	Displayed in binary form, suitable for observing the status of each bit
UI Type	Bytes	Displayed in byte string form, suitable for debugging raw data
UI Type	String	Display as string
UI Type	Epoch Sec.	Displayed as time, suitable for timestamp or device time data
UI Type	Enum	Displayed in enumerated text, mapping values to business meanings such as "run, stop, fault" etc.

When configuring data points, you should first determine the "SRC type" according to the device protocol manual. For example, when the register description is int16, uint32, float, BCD or bit address, INT, UINT, FLOAT, BCD or BIT should be selected accordingly. Choosing the wrong primitive type will lead to abnormal parsing values, such as negative numbers turning into large integers, floating point numbers appearing as meaningless values, or correct results still not being obtained after adjusting the byte order.

After determining the SRC Type, select the "UI type" according to user needs. The same raw data can be presented in different ways. For example, a UINT16 status word can be displayed in decimal, hexadecimal or binary digits; an integer status code can also be displayed as "stop/run/alarm" through enumeration, making the monitoring interface more intuitive.

SRC TYPE	ASSOCIATED UI TYPES
 Signed integer	 Float  DEC  HEX  Enum  BIT
 Unsigned integer	 Float  DEC  HEX  Enum  BIT  String  Epoch seconds
 Float	 Float
 BYTES	 BYTES  String
 BIT	 Binary number  Enum
 BCD code	 Float  DEC  Enum

3.1.3 Word order/byte order

In communication debugging, byte order is a common concept, such as local byte order and network byte order. The concept of word order also exists in the MODBUS protocol.

Both byte order and word order represent the storage mechanism of data in messages, which are divided into two types: Big-Endian and Little-Endian.

Key fields (such as register addresses) in MODBUS data frames are all defined in big-endian byte order, but the data part may be defined differently by different manufacturers. Even in a certain model of equipment from the same manufacturer, the byte order definitions for different data are not uniform.

Based on the byte ordering of MODBUS messages, big-endian byte order means that the high byte of data is first, the low byte is last, and the little-endian byte order is opposite. For example:

```
01 03 04 12 34 56 78 81 07
```

(read holding register response message)

Among them, the length of the reply data is 4Bytes. For example, the original data is 0X12345678. From the perspective of the message, the byte order is big endian and the word order is big endian.

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When MODBUS registers carry 4-byte floating-point data, some device manufacturers also specify little-endian word order. For example, if the original data is 0x12345678, the transmitted byte sequence is:

01 03 04 56 78 12 34 66 D5

In order to support better adaptation to the definition methods of data protocols from different manufacturers, the software handles the byte order and word order as follows:

Each data can be independently configured for its endianness and word order.

When the number of registers is 1, 2, or 4, it supports configurable byte order, covering 2, 4, and 8 bytes of data.

When the register data amount is 2 or 4, the word order is configurable, covering 4-byte and 8-byte data.

For data in other register data quantities, the word order and byte order default to big endian.

BYTE ORDER	REGISTER COUNT	BYTE ORDER	WORD ORDER
AB	1	Big-Endian	--
BA	1	Little-Endian	--
AB CD	2	Big-Endian	Big-Endian
BA DC	2	Little-Endian	Big-Endian
CD AB	2	Big-Endian	Little-Endian
DC BA	2	Little-Endian	Little-Endian
AB CD EF GH	4	Big-Endian	Big-Endian
BA DC FE HG	4	Little-Endian	Big-Endian
GH EF CD AB	4	Big-Endian	Little-Endian
HG FE DC BA	4	Little-Endian	Little-Endian

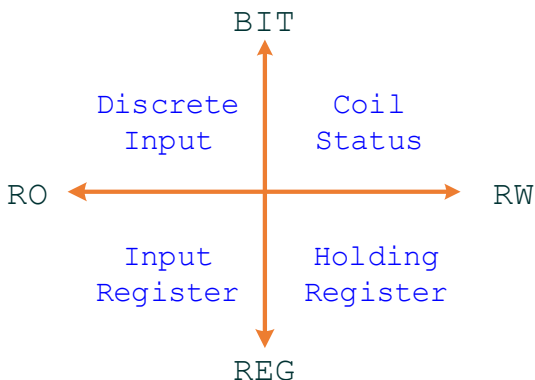
3.1.4 MODBUS data

There are 4 data block types defined in the MODBUS standard:

DATA BLOCK	UNIT LENGTH	ACCESS TYPE	LEADING NUMBER	FUNCTION CODE
coil status	1 Bit	RW	0	0X01, 0X05, 0X0F
discrete	1 Bit	RO	1	0X02

input				
holding register	2 Bytes	RW	4	0X03, 0X06, 0X10
input register	2 Bytes	RO	3	0X04

Based on the unit length of the data block, the four types of data blocks can be divided into two categories: bit (BIT) data and register (REG) data. Combined with the read and write attributes, the relationship between data blocks is as follows:



Data is the specific definition in the data block, and the data definitions in different data blocks are independent of each other. A data definition can contain multiple consecutive BIT/REG data addresses.

The attributes of a piece of data include: affiliated data block, data name, data address, data amount, data type (protocol type), data coefficient (involved when floating point data is transmitted in a shape), byte order (involved when the register data amount is 1, 2, or 4), word order (involved when the register data amount is 2, 4).

3.1.5 Siemens S7 data

Siemens S7 data is defined based on the PLC's storage area. The data areas currently supported by the software include: DB, M, I, Q, CT, and TM.

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DATA AREA	MEANING	ADDRESS COMPOSITION	TYPICAL VISIT
DB	data block	DB number + byte offset + bit offset	Readable and writable
M	Flag bit/intermediate variable area	Byte offset + bit offset	Readable and writable
I	input area	Byte offset + bit offset	read-only
Q	output area	Byte offset + bit offset	Readable and writable
CT	Counter area	Number/Offset	Depends on PLC support
TM	timer area	Number/Offset	Depends on PLC support

S7 address = data block + DB number + byte offset + number of bytes + bit offset + number of bits

CONFIGURATION ITEMS	MEANING
data block	S7 data area, optional DB, M, I, Q, CT, TM
DB No	Valid only when the data block is DB
Byte Offset	The starting byte position of the data in the current area
Bytes	The length of bytes occupied by the current data
Bit Offset	The starting bit of bit data within the starting byte

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Bit Count	The bit length occupied by the current data
Data Address	The read-only display address automatically generated by the software based on the above fields

Configuration example:

SOFTWARE CONFIGURATION	DATA ADDRESS
Data block = DB, DB number = 1, byte offset = 0, bit offset = 0, number of bits less than number of bytes * 8	DB1.DBX0.0
Data block = DB, DB number = 1, byte offset = 2, number of bytes = 1	DB1.DBB2
Data block = DB, DB number = 1, byte offset = 4, number of bytes = 2	DB1.DBW4
Data block = DB, DB number = 1, byte offset = 8, number of bytes = 4	DB1.DBD8
Data block = M, byte offset = 10, bit offset = 0, number of bits less than number of bytes * 8	M10.0
Data block=M, byte offset=20, number of bytes=2	MW20
Data block=I, byte offset=0, number of bytes=2	IW0
Data block=Q, byte offset=4, number of bytes=4	QD4
Data block = CT, byte offset = 5	C5
Data block=TM, byte offset=3	T3

3.1.6 DL/T645 data

DLT645 data is defined based on the "data identification DI" in the protocol.

DLT645 data = meter address + data identification (DI) + data length + decimal places + SRC Type + UI Type

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CONFIGURATION ITEMS	MEANING
Data Identifier	DI of DLT645, 4-byte data identifier, used to specify the meter data item to be read or written
Bytes	The data length corresponding to this DI determines how many bytes are taken during reading and writing.
Bit Offset	When bitwise data is used, it indicates the starting position in the data.
Bit Count	Bit length occupied by data
Decimals	DLT645 Decimal places used in data conversion, often used for data with decimals such as electric energy, voltage, current, etc.
Src Type	The encoding method of data in the message, such as unsigned integer, BCD code, BYTES, etc.
UI Type	Display mode in the software interface, such as floating point numbers, decimal numbers, strings, enumerations, etc.
Byte order/Word order	Sequence rules when parsing multi-byte data

Configuration example:

DATA MEANING	CONFIGURATION EXAMPLE	DESCRIPTION
Total forward active energy	Data identification 00010000H, number of bytes 4, SRC Type: BCD code, UI Type: floating point number	Read the power data of the specified DI and display it in decimal places
A phase voltage	Data identification 02010100H, the number of bytes is filled in according	The specific length and decimal places

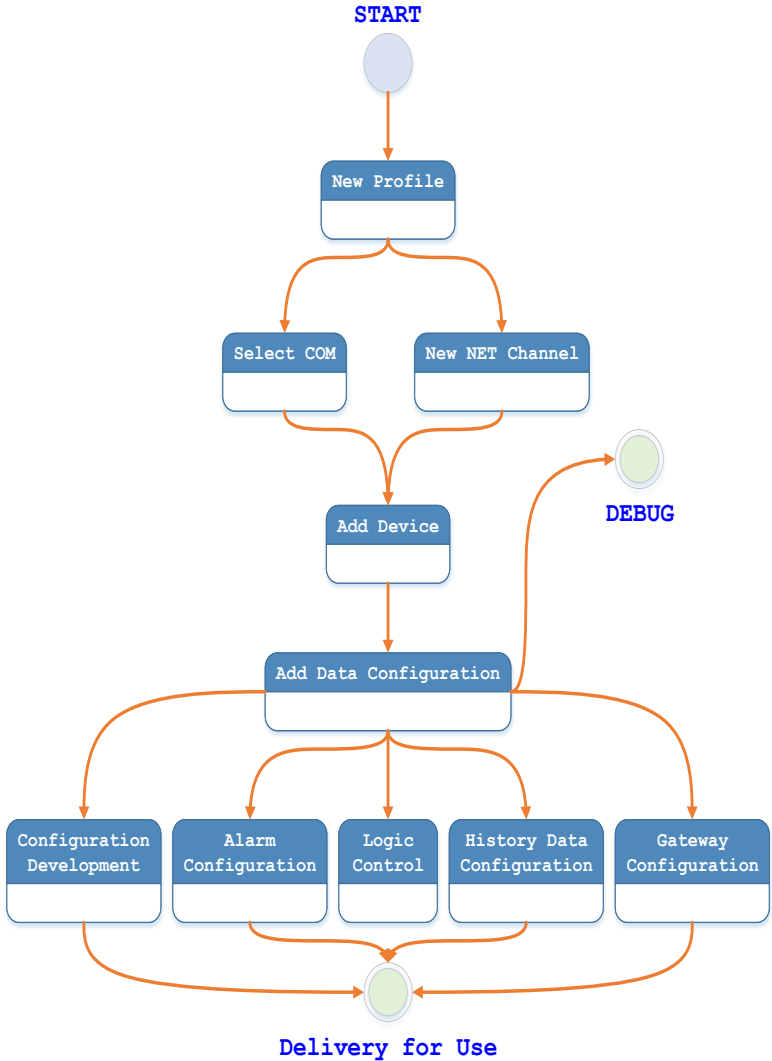
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	to the meter protocol, the SRC Type is usually BCD code or unsigned integer	are subject to the meter protocol manual.
status word	The data identifier is filled in according to the protocol, and the UI Type can be hexadecimal number, binary number or enumeration.	Suitable for displaying operating status, alarm status or switch status
original data item	The data identification is filled in according to the specification, SRC Type: BYTES, UI Type: BYTES	Used for debugging or viewing the original return content

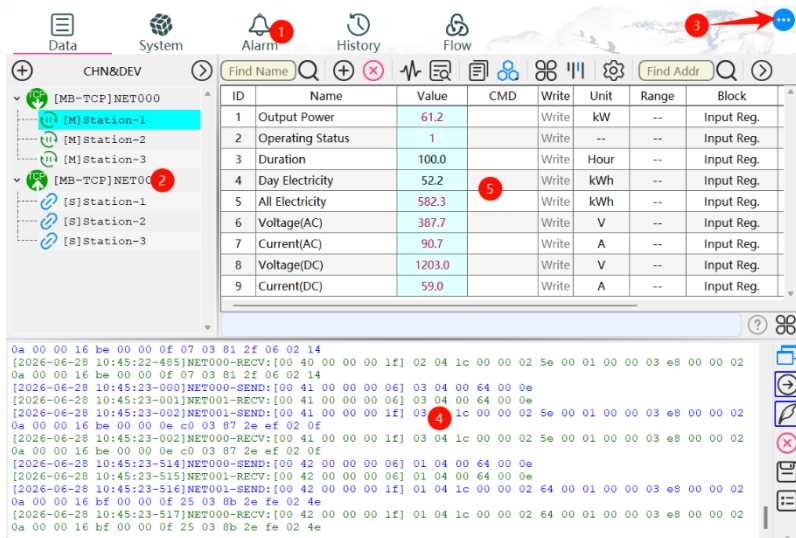
When the software reads DLT645 data, it will use the data identifier to generate a read data request; the returned message will first parse the data identifier, and then intercept the data content according to the configured "number of bytes". If the returned data identifier is inconsistent with the current configuration item, the software will not update the return value to this data item.

When writing DLT645 data, the software will convert the interface input value into message bytes according to the configured SRC Type and UI Type, and assemble it into: DI + password/operator code + data content. The password and operator code come from the advanced parameter configuration of the DLT645 device; whether writing is truly allowed depends on whether the meter itself supports the writing operation of the DI and whether the password permissions are correct.

3.2 Usage Flow



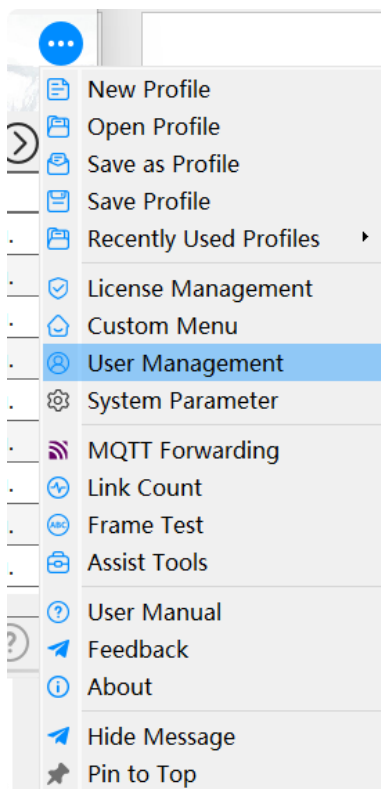
3.3 Interface function partition



- ① Main menu: used to switch to the "main function page".
- ② Channel device list: displays channel and device information, and provides channel and device management operations.
- ③ More functions: serves as the entrance to Profile operations, system parameters, user management and other functions.
- ④ Message monitoring: Check and manage the communication messages of each link.
- ⑤ Main function page: corresponds to the "main menu" and provides the main function operation interface.

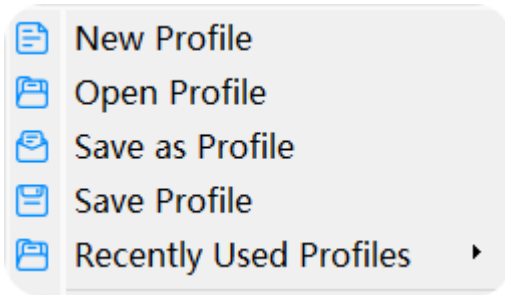
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More Functions menu contents are shown in the figure below:



3.4 Profile Management

Profile contains complete software usage process configuration information, mainly including: channel list, channel parameters, device list, advanced device parameters, and data configuration.



New Profile: Used to create a new project Profile. You do not need to create a new configuration when using it for the first time. The software will prompt you to save the configuration before exiting.

Open Profile: switch the project Profile through the import function.

Save As Profile: Save a copy of the current project configuration and switch the active project to the new file path.

Save Profile: Save the project Profile in a timely manner.

Recently Used Profiles: Quickly open recent Profiles.

NOTICE

When multiple software are opened and pointed to the same Profile, the configuration data will be overwritten repeatedly, and the final Profile content will be consistent with the content of the most recent save operation.

WARNING

It is prohibited to place Profiles in the installation directory to avoid accidental deletion during software upgrades!

3.5 System Parameter

The system parameter page provides global control parameters of the software. Users can modify them during runtime and take effect immediately. The parameter values will be saved locally.

This function page can be entered through the "System Parameters" sub-item in the More Functions menu.

The system parameters are defined as follows:

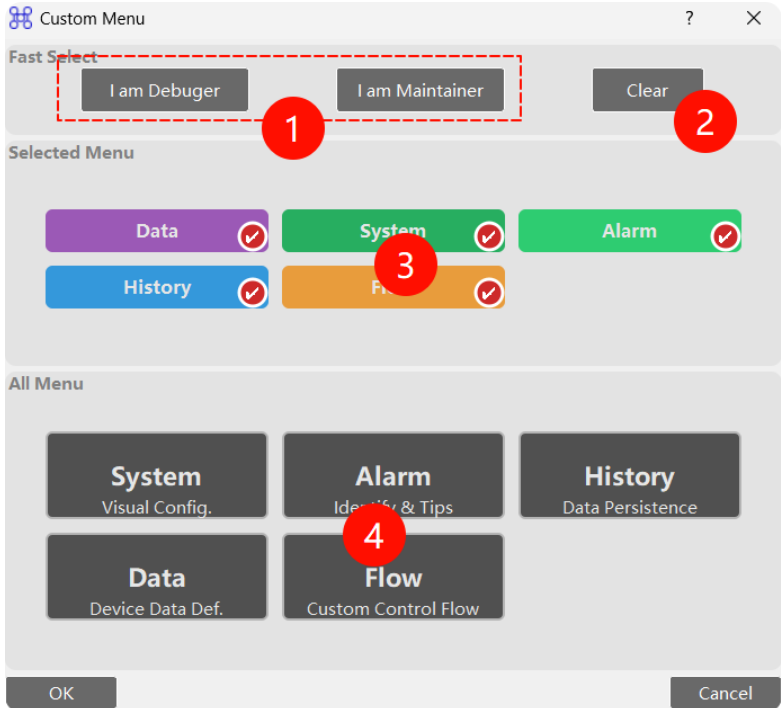
ARGUMENTS	MEANING
Language	Switch the language of the software.
Database Path	The default database path of the software is located in the installation directory. Users can specify the new database storage location through this parameter.
Refresh Data Page	Function switch, in order to avoid wasting CPU computing power resources, when the user enables the "System" page for data viewing, this switch can be used to turn off data updates on the "Data" page of all devices, but it does not affect the reception, analysis, and storage of data.
PAD Mode	When enabled, the software border is hidden, suitable for touch screen scenarios.
Hide Main Menu	Supports hiding or showing the main menu to facilitate expansion of the configuration canvas. After hiding the main menu, the "More Functions" button will be automatically hidden. To display the button, you need to click on the upper right corner area.
Minimize to Tray on Close	After enabling it, when you click the close button in the upper right corner of the window, the software will not exit the program, but will be minimized to the system tray and

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	run in the background. If you need to exit completely, you can exit through the tray icon menu.
Prevent Non-admin Exit	After enabling it, ordinary users will not be able to exit the software through the close button. Only authorized administrator accounts can perform the exit operation, which can prevent misoperation or unauthorized shutdown and ensure the continuous operation of the system.
Single-process Mode	After enabling, only one software instance is allowed to run at the same time to avoid resource usage conflicts, data anomalies, or multi-instance data out-of-synchronization problems caused by repeatedly starting multiple processes. If you want to run multiple instances, you need to turn off this mode.
Scale with Screen	Control whether the page font automatically adjusts with the system zoom ratio. When turned on, it can improve the reading experience on high-resolution screens.
Debug Log	Control whether to record debugging logs to facilitate troubleshooting and performance analysis. It is enabled by default, and it is recommended to keep it enabled unless there are special needs.
Font Family	Customize the default font used in the software interface to meet personalized display needs.
Font Size	Adjust the default font size of the software interface to adapt to different vision needs or display devices.

3.6 Custom Menu

The custom menu function allows users to customize the page content to be displayed and its order. The simple main menu helps save the software's resource usage. This function page can be entered through the "Customized Menu" sub-item in the More Functions menu.



① Used to quickly apply two preset main menu display combinations, making it easy to switch menu layouts with one click according to commonly used scenarios;

② If you need to configure the main menu combination yourself, you can first clear the currently selected menu, and then reselect the menu items that need to be displayed;

③ Display the currently selected main menu content. The order of the list is the order of the menus in the main interface;

④ Click the menu items below to add them to the display

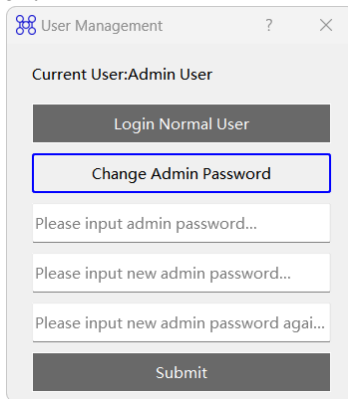
list. The order of selection will determine the display order of the final menu.

3.7 User Management

User management page provides two user types: administrators and end users. Administrators can execute all functions provided by the software, while end users are only allowed to operate some functions, debugging functions are not displayed, and they are prohibited from modifying device data, alarms, system configurations, etc.

You can enter this function page through the "User Management" sub-item in the More Functions menu.

The administrator defaults to no password. When using the software for the first time, it defaults to a passwordless administrator and allows administrators to change their own passwords. Once the administrator sets a non-empty password, the software restarts and logs in as the end user. Users need to enter the administrator password to switch to the administrator user.



The image shows a dialog box titled "User Management" with a question mark and a close button (X) in the top right corner. The dialog box has a light gray background and contains the following elements:

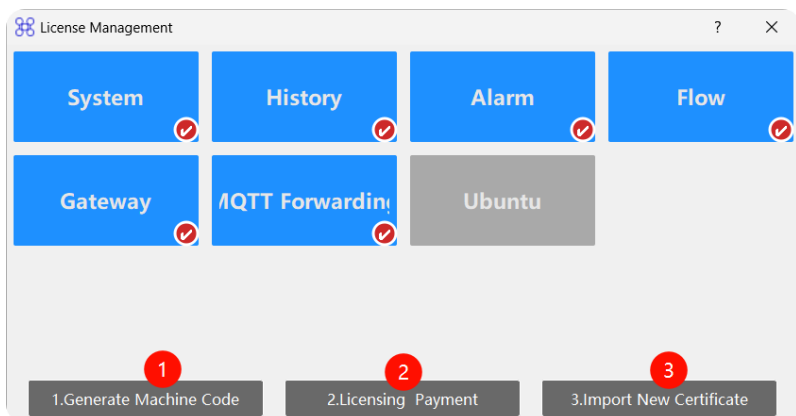
- Text: "Current User:Admin User"
- Button: "Login Normal User" (dark gray)
- Button: "Change Admin Password" (light gray with a blue border)
- Text input field: "Please input admin password..."
- Text input field: "Please input new admin password..."
- Text input field: "Please input new admin password agai..."
- Button: "Submit" (dark gray)

3.8 License Management

For commercial (paid) functions in the software, users need to obtain authorization before they can use it. Before users purchase authorization, they need to enter the authorization management page to generate a machine identification code. After obtaining the authorization certificate, enter the authorization management page to import the authorization certificate and activate commercial functions.

The authorization certificate can only be used by one running PC. If you need to expand to multiple PCs, you should purchase multiple copies in advance.

You can enter this function page through the "Authorization Management" sub-item in the More Functions menu.



① After clicking, a unique machine code is automatically generated, which can be used to purchase authorization certificates;

② Contact customer service to make payment and obtain the authorization certificate;

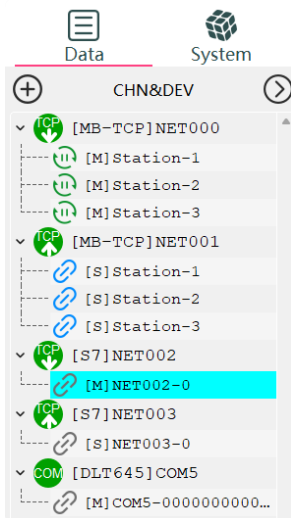
③ After obtaining the authorization certificate, click this button to import the authorization certificate.

3.9 Channel device list

The channel device list is used to centrally display and manage communication channels and device objects in the current project. It is the main entrance to device configuration, data configuration and running status viewing.

The list is organized in a "channel-device" hierarchy. The upper node represents the communication channel, such as TCP, COM, HOST and other channels, and displays the channel type, protocol type and channel name; after expanding the channel, you can view the field devices, simulation slaves or local devices attached to the channel. The identifier before the device name is used to distinguish the device role, for example, [M] represents the field device and [S] represents the simulated slave.

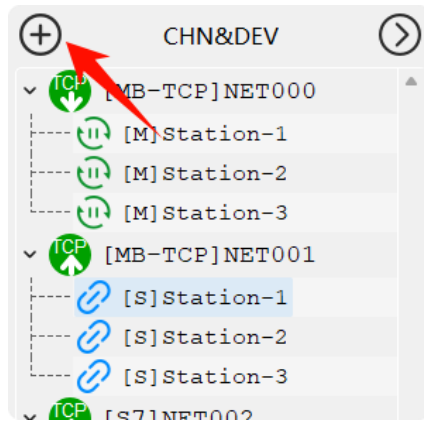
Through the device list, users can quickly check the number of channels established in the project, the protocol type used by each channel, the number of devices under the channel, and the device ownership relationship. After selecting a channel or device, you can enter corresponding parameter configuration, status viewing and other operations. The icons in the list are used to indicate both object type and connection status.



3.9.1 Add Channel

The software supports establishing communication with the target machine through serial port, TCP link, and UDP unicast. These three communication methods are collectively called channels.

This function page can be entered through the "Add Channel" sub-item of the device list menu on the data page.



3.9.2 COM

The screenshot shows a configuration window for serial ports. At the top, there are two tabs: 'COM' (highlighted in orange, with a red circle 1) and 'NET'. Below the tabs, a label 'Please select COM' is followed by a dropdown menu showing 'COM5' (with a red circle 2). Underneath, the 'COM5' configuration is shown. There are three protocol options: 'MODBUS-RTU', 'MODBUS-ASCII', and 'DL/T645-2007' (highlighted in purple, with a red circle 3). Below these are two device types: 'Field Device' (highlighted in green, with a red circle 4) and 'Simulated Slave'. The 'Field Device' section contains a table with 'Arguments' and 'Value' columns. The 'Data Bits' field has a dropdown menu with '8' selected (with a red circle 5). The 'Stop Bit' field has a dropdown menu with '1' selected. The 'Flow Control' field has radio buttons for 'None', 'Hardware', and 'Software'. The 'DTR' field has radio buttons for 'Disable' and 'Enable'. The 'Simulated Slave' section is currently empty (with a red circle 6). At the bottom right, there are two buttons: 'Add Channel' (with a red circle 7) and 'Cancel'.

Arguments	Value	Arguments	Value
Nickname			
Baud Rate	9600		
Parity	None ODD EVEN		
Data Bits	8 7		
Stop Bit	1 1.5 2		
Flow Control	None Hardware Software		
DTR	Disable Enable		

After the software is started, the serial port list is automatically updated. As shown in the figure above, the serial port related operations are as follows:

1 Select channel type

Select "Serial Channel" at the top.

If the current computer does not have valid serial port resources, this button will be disabled and cannot be operated.

2 Select serial port number

Select the actual serial port in use in the "Please select a serial port" drop-down box, such as COM5.

If the target serial port is not found, please check the serial port cable, USB-to-serial port driver or device connection status.

3 Select transport protocol

Select the corresponding type according to the field device protocol:

MODBUS-RTU, MODBUS-ASCII or DL/T645-2007.

The protocol must be consistent with the actual device or simulated object.

4 Select device type

Select whether the channel is used for "Field Device" or "Simulation Slave".

"Field device" means that the software acts as a master and actively reads or writes external devices.

"simulated slave" means that the software simulates a slave and waits for access from the external master.

5 Set serial port parameters

Fill in the baud rate, parity mode, data bits, stop bits, flow control type and DTR according to the device manual.

The serial port parameters must be completely consistent with the peer device, otherwise there will be no response, verification errors or garbled characters.

6 Confirm the transmission protocol extension parameters

If the transmission protocol has no extended parameters, this area is grayed out and remains blank.

7 Add channel

After confirming that the parameters are correct, click "Add Channel". If no new addition is required, click "Cancel" to exit.

The serial port link parameters are defined as follows:

ARGUMENTS	MEANING
Baud Rate	Supports 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200bps. If set to other values, the

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	serial port will fail to open.
Parity	Specify the data verification method in the serial port bytes
data bits	Specify the number of data bits in the serial port byte data. If the MODBUS-ASCII protocol requires the data bit to be 7Bit, please modify this parameter.
Stop bit	Specify the length of stop bits in serial port bytes
Flow Control	There is no flow control by default, and it can be modified as needed according to the actual application.
DTR	When you agree with the peer device to use hardware flow control, you need to enable DTR in the serial port parameters.

3.9.3 NET

NET004

TCP Client (2) TCP Server UDP Unicast

MODBUS-RTU MODBUS-ASCII MODBUS-TCP(Sync.)
 MODBUS-TCP(Async.) Siemens S7 (3) DL/T645-2007

Field Device (4)

Arguments	Value	Arguments	Value
Nickname		Model	Custom (5)
Local IP	--	Rack	0
Local Port	0	Slot (6)	2
Target URL/IP (5)	127.0.0.1	Local TSAP	0
Target Port	102	Remote TSAP	0
Session Key	--	Effective Remote TSAP	0X0302
Default Proxy	<input type="checkbox"/>	Max PDU	960
Reconnect Period(s)	0		
Idle Link Hold Time(s)	6000		
Min Interval(ms)	5		

Add Channel (7) Cancel

When used for the first time, there is no network channel and the user needs to create it as needed. As shown in the figure above, network-related operations are as follows:

1 Select channel type

Switch to "Network Channel" at the top and enter the network communication parameter configuration interface.

2 Select network connection method

Select TCP client, TCP server or UDP unicast according to the actual communication scenario.

The TCP client is selected in the figure, which means that the software actively connects to the target device or server.

3 Select transport protocol

Select the corresponding type according to the device protocol, such as MODBUS-RTU, MODBUS-ASCII, MODBUS-TCP (synchronous), MODBUS-TCP (asynchronous), Siemens S7 or DL/T645-2007.

4 Select device type

Select this channel for "Field Device" or "Simulated Slave".

5 Fill in the network parameters

Fill in parameters such as local IP, local port, target domain name/IP, target port, session key, default proxy, reconnection period, connection idle time, and minimum frame interval according to the actual network environment.

6 Confirm the transmission protocol extension parameters

If the transmission protocol has no extended parameters, this area is grayed out and remains blank.

7 Add channel

After confirming that the channel name, connection method, protocol type, network parameters, and protocol parameters are correct, click "Add Channel". If you do not want to save this configuration, click "Cancel" to exit.

The network channel parameters are defined as follows:

ARGUMENTS	MEANING
Reconnect Period(s)	When the link mode is selected as "TCP Client", by setting the link re-establishment period, the software can be instructed to re-establish the link at specified time intervals. In this way, short links can be simulated. The default period is 0, which represents a long link.
Idle Link Hold Time(s)	When the link mode is selected as "TCP Client" or "TCP Server", after the link is established, if there is no data interaction within the time specified by the parameters, the software will actively close the link.

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Local IP	This parameter allows the user to specify the local originating IP and does not need to be configured. The software can automatically select the best one.
Local Port	When the link mode is selected as "TCP Server" or "UDP Unicast", you need to specify the local port to bind. When the link mode is selected as "TCP Client", this parameter is used to specify the local initiation port. If there are no special requirements, just keep it as 0.
Target URL/IP	When the link mode is selected as "TCP Client", this parameter is used to specify the domain name or IP address of the server. When the link mode is selected as "UDP Unicast", this parameter is used to specify the IP address of the data sending object.
Target Port	When the link mode is selected as "TCP Client", this parameter is used to specify the binding port number of the peer (server). When the link mode is selected as "UDP Unicast", this parameter is used to specify the receiving port number of the data sending object.
Client IP	When the link mode is selected as "TCP Server", this parameter is used to specify the client IP that is allowed to access the current server. Connection requests initiated by other IP addresses will be filtered and discarded. If filtering is not required, please set this parameter to "-" or clear it.
source port	When the link mode is selected as "TCP Server", this parameter is read-only data and is used to present the connected client's initiation port number.
Min Interval (ms)	In order to avoid excessive packet interaction in the network channel, resulting in unnecessary performance

	overhead, the software sets the minimum frame interval by default. If you need to increase or decrease the data refresh rate, you can modify this parameter.
--	--

3.9.4 Transport protocol extension parameters

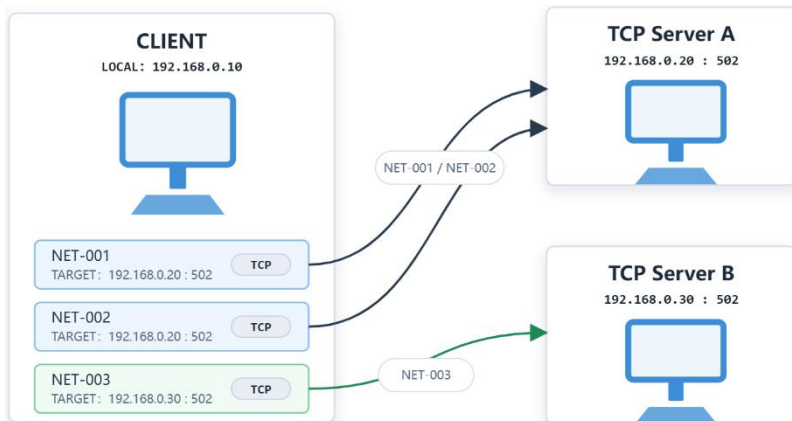
ARGUMENTS	AGREEMENT	MEANING
Char Type	MODBUS ASCII	Use this parameter to specify whether the protocol characters should be uppercase or lowercase. The default is the uppercase required by the standard protocol.
Max. Async. Requests	MODBUS TCP (async.)	This parameter can control the scale of asynchronous concurrency and adjust the number of concurrent requests.
Model	Siemens S7	Select the PLC CPU model to quickly bring out the recommended rack number, slot number, TSAP and maximum PDU parameters. Supports "custom, S7-200 SMART, S7-300, S7-400, S7-1200, S7-1500". After selecting the preset model, the software will automatically fill in the relevant parameters; after manually modifying any S7 parameter, the model will be switched to "custom".
Rack	Siemens S7	Indicates the rack where the target PLC is located, and is used to automatically calculate the actual remote TSAP when no remote TSAP is specified. The value range is 0-7. When the input exceeds the range, the software will process it as the maximum value 7; illegal input will be processed as 0. A common configuration is 0.

Slot	Siemens S7	<p>Indicates the slot where the target CPU is located, and is used to automatically calculate the actual remote TSAP when no remote TSAP is specified.</p> <p>The value range is 0-31. When the input exceeds the range, the software will process it as the maximum value 31; illegal input will be processed as 0. Common presets: SMART is 0 for S7-200, 1 for S7-1200/1500, 2 for S7-300, and 3 for S7-400.</p>
Local TSAP	Siemens S7	<p>Indicates the local S7 TSAP identification, used to establish COTP/S7 connections.</p> <p>You can enter decimal or 0x hexadecimal format, and the software will display it as 0xXXXX. When set to 0, the default value is used: when the field device is used as an S7 client, the default is 0x0100; when the simulated slave is used as an S7 server, the default is consistent with the "actual remote TSAP".</p>
Remote TSAP	Siemens S7	<p>Represents the TSAP of the peer PLC or peer S7 client.</p> <p>You can enter decimal or 0x hexadecimal format, and the software will display it as 0xXXXX. When set to 0, the software does not use this value directly, but automatically calculates the actual remote TSAP based on the rack number and slot number.</p>
Effective Remote TSAP	Siemens S7	<p>The remote TSAP preview value ultimately used by the software.</p> <p>This item is a read-only display item and cannot be edited manually. If "Remote TSAP" is not 0, the actual remote TSAP is equal to the remote TSAP; if "Remote TSAP" is 0,</p>

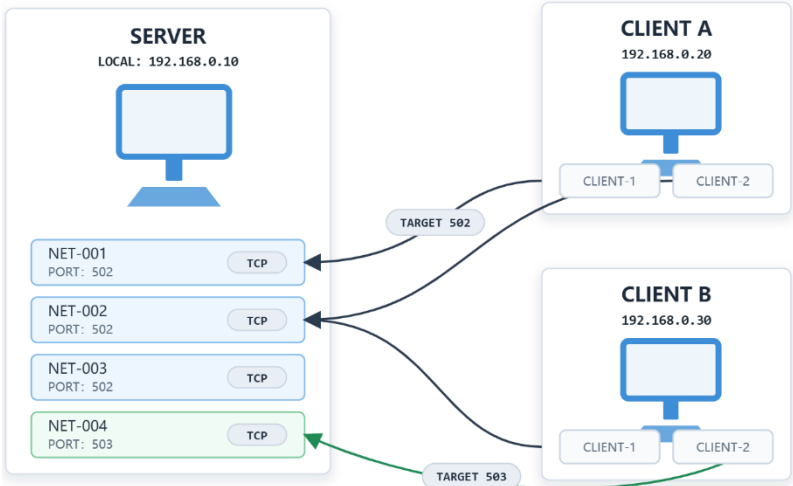
		it is automatically generated according to the formula $0x0300 + \text{rack number} \times 0x20 + \text{slot number}$. For example, when Rack=0 and Slot=2, the actual remote TSAP is 0x0302.
Max PDU	Siemens S7	Set the maximum PDU length used for S7 communication negotiation, which affects the amount of data that can be carried in a single message. The minimum valid value is 240. If the input value is less than 240, the software will automatically process it as 960. Preset values: S7-200 SMART is 240, S7-300 is 480, S7-400/S7-1200 is 960, S7-1500 is 1960. The site should be set according to the PLC support capability. If it is too large, it may cause connection or reading and writing failures.

3.9.5 Networking example

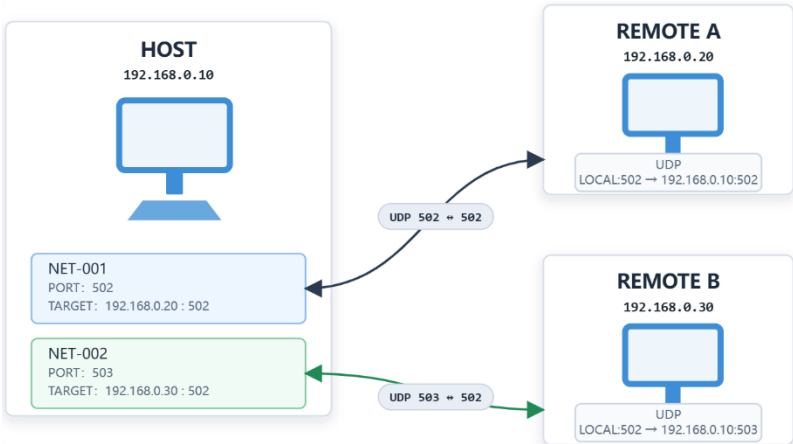
TCP client link application method is as follows:



TCP server link application method is as follows:



UDP unicast link application method is as follows:








3.9.6 View channel information



A variety of channel information visualization functions are provided in the channel device table.


1. Channel type identification

The icon in front of the channel node is used to quickly identify the channel type and connection direction:

CHANNEL TYPE	MEANING
	TCP Client
	TCP server
	COM
	native device channel
	UDP unicast channel

Channel icon colors are used to indicate operating status:

CHANNEL STATUS	MEANING
 green	Connected or functioning normally
 red	<p>Fault</p> <p>TCP/UDP channel: connection failure, possibly due to local port conflict;</p> <p>Serial port channel: Failed to open the serial port. The reason may be that the serial port is occupied by other software or the set serial port parameters are</p>

	illegal.
 black	<p>Not connected, closed or other status</p> <p>Possible reasons:</p> <ol style="list-style-type: none"> 1. There is no equipment in the channel 2. The channel is disconnected by the opposite end 3. The channel is closed manually

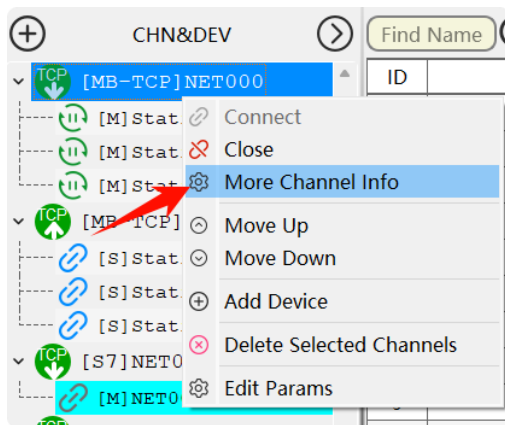
When the mouse is hovering over a channel node, the channel name and current status text will be displayed, such as "Connecting, Connected, Closed, Fault, Invalid", etc.

2. Check the subordinate equipment of the channel

After expanding the channel node, you can view the list of devices associated with the channel. The device row displays the device name, device type, device ID and station number, which is used to determine which field devices, simulation slaves or local devices a channel currently serves.

3. View more channel information

"More Channel Information" window can be opened on supported channels:



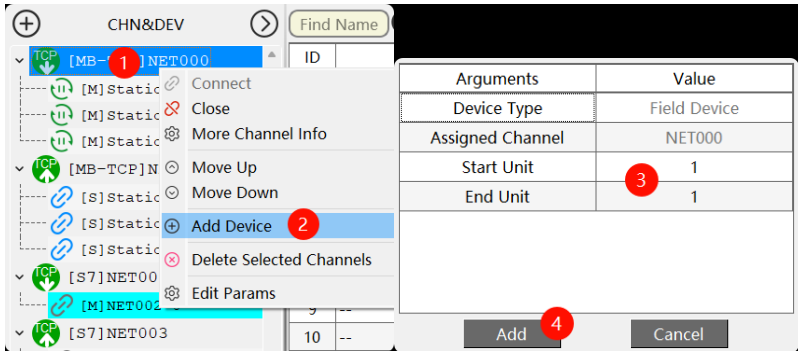
For TCP server class channels, you can view the list of currently connected clients, including client IP, local port,

client port and session ID.

For TCP client channels, you can view the current link endpoint information, including channel name, local IP, local port, target IP and target port.

If there is currently no client access to the server-side channel, a "No Client" prompt will be displayed.

3.9.7 Add Device



- 1 Select the channel to which the device belongs;
- 2 Right-click the channel name and click the "Add Device" submenu in the menu;
- 3 Set the station number of the new device;

The MODBUS device station number range is 0~255, and the starting station number should be less than or equal to the ending station number. By setting the starting station number and ending station number, multiple devices can be added at one time. If the starting station number is equal to the ending station number, it means only one device is added.

- 4 After clicking "Add", the configured device is displayed;

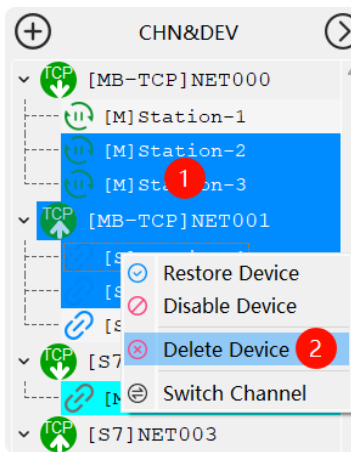
If the device station numbers to be added are scattered in multiple intervals, you can click to add multiple times.

NOTICE

If the new device station number already exists in the device list, it will not be created again.

If there is already a field device in the link, it is not allowed to add a simulated slave, and vice versa.

3.9.8 Delete Device



- 1 Select the device that needs to be removed. By dragging the mouse, multiple devices can be selected continuously.
- 2 Right-click the device name, click the "Remove Device" submenu, and confirm the deletion operation.

WARNING

Removing the device will delete all data configuration information under the device, please operate with caution! If the device is accidentally removed, please reload the project configuration and remember not to save the current configuration.

3.9.9 View device information

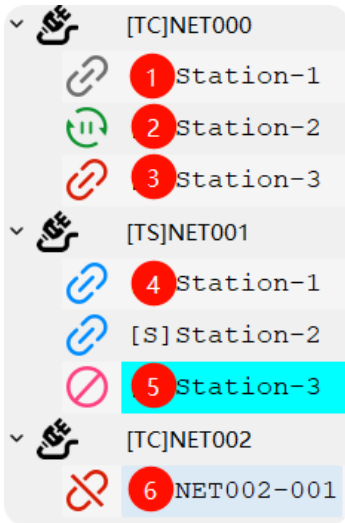


Click the ">" button, and the device list will automatically expand the page to display key information about the device: device type, device ID, and station number.

The meaning of the device name status is as follows:

DEVICE NAME STATUS	MEANING
blue background [M]COM1-001	The current device is selected
Font red [M]COM1-001	The device stops functioning, the associated link is down, or the device is disabled

Device status icon meaning:



- ① Connected, but no data reading or writing operations have been performed yet;
- ② Device polling;
- ③ Abnormal data reading and writing;
- ④ Data reading and writing are normal;
- ⑤ Device is disabled;
- ⑥ The channel is disconnected or faulty.

Format description of device default name:

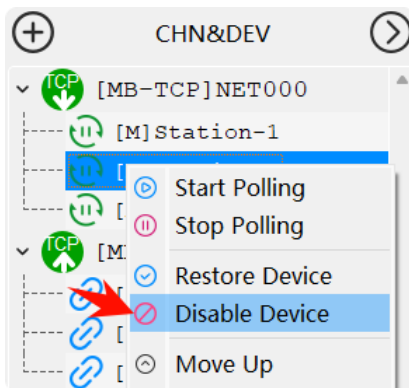


[Device Type]: Channel Device Addr.
M: Master
S: Slave

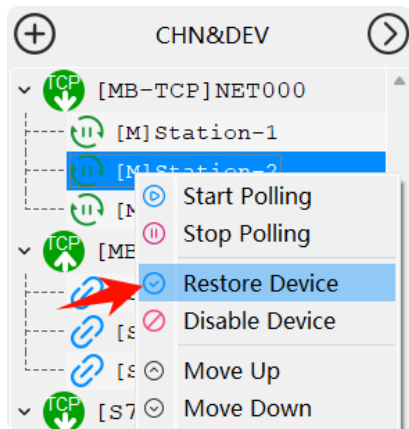
3.9.10 Device disabling and recovery

If the device needs to stop working temporarily, you can disable the device and instruct the device to stop all services and communications. The device disabling operation is often used to pause the simulation slave machine and simulate the device being offline.

Select multiple devices, right-click on any selected device and click "Disable Device".



Select multiple disabled devices, right-click on any selected device, and click "Restore Device".



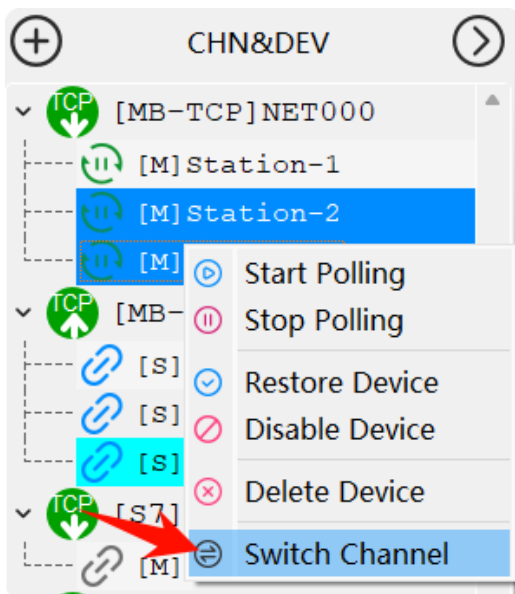
NOTICE

The device disabling operation is only used as a temporary measure. If the link to which the device belongs is disconnected and restored during the device disabling period, the device will automatically recover.

3.9.11 Channel switching

The added device can dynamically adjust the channel it belongs to, and the field device can switch the current channel it belongs to to other channels. The simulated slave supports binding to multiple channels.

Select multiple devices, right-click on any selected device and click "Switch Channel".

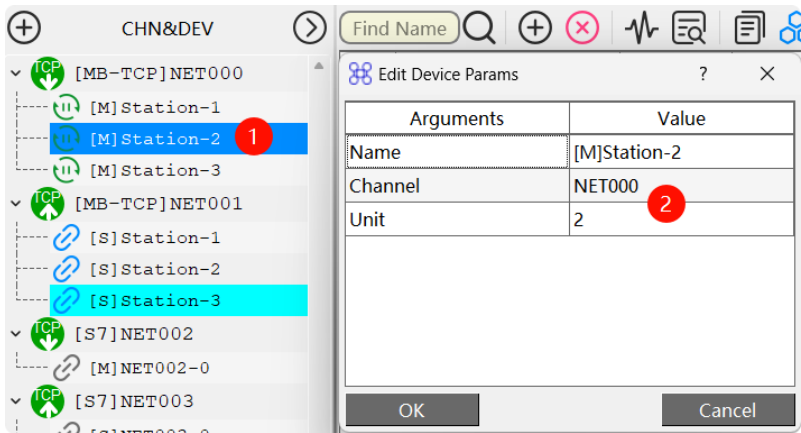


3.9.12 Modify device properties

For already created devices, it is supported to modify the key attributes of the device, including: device name, affiliated link, and station number.

By modifying the device name, users can name better tags based on custom needs.

By modifying the associated links and device addresses, users can quickly adapt to changes in the operating environment. Users can add equipment, configure data and debug on any local link in advance. During on-site debugging, they can quickly switch to the actual working link.



① Double-click the device name that needs to be modified, or operate through the right-click menu;

② The "Modify Key Parameters of Device" page will pop up, and you can modify the key attribute information of the device in the numerical column.

After the associated link and device address are changed, if the original device name is the default name, the software will automatically update the link and address fields in the default name without manually modifying the device name.

For example, the original name of the device is: [M]COM1-001. If the associated link is changed to COM2 and the address is changed to 2, after the device attributes are modified, the device name will automatically change to

[M]COM2-002.

NOTICE

Invalid device names are prohibited, and the device name is not allowed to be empty, otherwise it will prompt that the modification failed.

It is forbidden to store different device types in the same channel. If there are other device types in the new channel that is set, a modification failure will be prompted.

Duplication of device addresses is prohibited. If the set new device address already exists in the current channel, a modification failure will be prompted.

Added devices do not support modifying the device type.

If the wrong type is selected when adding a device, and a large amount of data configuration has been completed, it is recommended to export the data template under the device first, delete the wrong device, re-add the device of the correct type, and import the data template.

3.10 Device data configuration

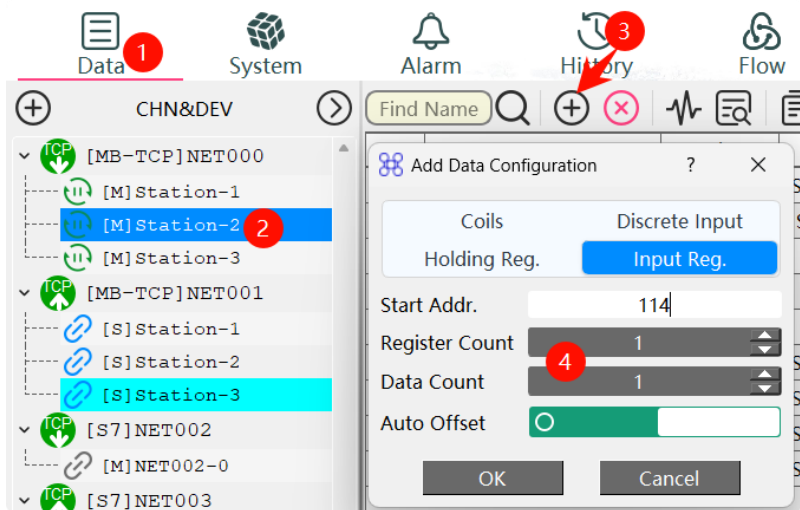
Device data configuration is to convert the MODBUS data protocol definition into software configuration. After completing the device data configuration, there is no need for manual packet grouping and data conversion. Polling and other read and write operations can be quickly initiated through simple button operations. The software supports intuitive and visual display of protocol data information, which can quickly improve debugging efficiency.

NOTICE

Before configuring device data, please confirm whether the correct device to be configured is selected in the device list on the left.

3.10.1 Add Data Configuration

Method one:



1 Click the Data menu.

2 Click the device name and select the device that requires data configuration.

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- 3 Click the Add New button.
- 4 The "New Data Configuration" page pops up. By default, one piece of data is added each time. The starting data address is the last row of data address in the current configuration + the data amount. Users can modify the number of newly added configurations, blocks and starting data addresses.

The data added by this method will be added directly to the end of the table.

Method two:

Dragging the "block" cell of any row in the table can trigger a new addition. The starting row of dragging is the template row, and the new configuration will be inserted to the end position of dragging.

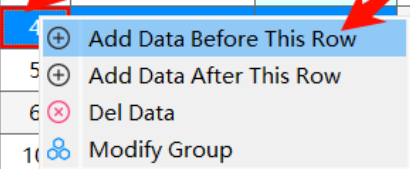
Input Data Name							
ID	Name	Value	CMD	Unit	Range	Block	Addr.
1	Output Power	62.0		kW	--	Input Reg.	100
2	Operating Status	1		--	--	Input Reg.	102
3	Duration	101.1		Hour	--	Input Reg.	103
4	Day Electricity	76.8		kWh	--	Input Reg.	105
5	All Electricity	842.4		kWh	--	Input Reg.	107
6	Voltage(AC)	392.2		V	--	Input Reg.	110
10	Day Electricity	--		kWh	--	Input Reg.	107
7	Current(AC)	93.6		A	--	Input Reg.	111
8	Voltage(DC)	1204.8		V	--	Input Reg.	112
9	Current(DC)	56.7		A	--	Input Reg.	113

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Method three:




Right-click the "Serial Number" cell and click "Add data before this row" or "Add data after this row."







ID	Name	Value	CMD
1	Output Power	62.0	
2	Operating Status	1	
3	Duration	101.1	
4			
5			
6			
10			
7	Current(AC)	93.6	
8	Voltage(DC)	1204.8	
9	Current(DC)	56.7	



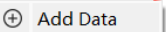
Method four:

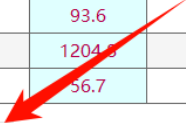
Right-click any blank area and select "Add Data".

 Data System Alarm

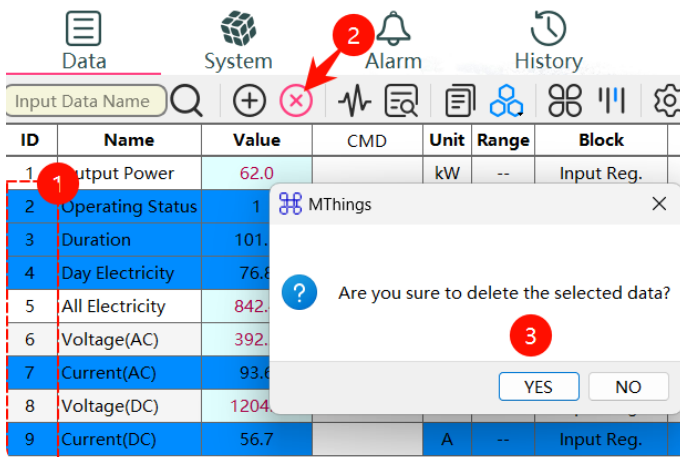


ID	Name	Value	CMD	Unit
1	Output Power	62.0		kW
2	Operating Status	1		--
3	Duration	101.1		Hour
4	Day Electricity	76.8		kWh
5	All Electricity	842.4		kWh
6	Voltage(AC)	392.2		V
7	Current(AC)	93.6		A
8	Voltage(DC)	1204.8		V
9	Current(DC)	56.7		A





3.10.2 Delete data configuration



- 1 Click the serial number column (left mouse button + Ctrl for discrete selection, left mouse button + Shift for interval selection) to select the data configuration that needs to be deleted.
- 2 Click the "Delete" button (you can also select the delete operation through the right-click menu).
- 3 Confirm the deletion operation.

WARNING

After deleting the data and clicking "Save" the Profile, the data configuration information will be lost, so please operate with caution!

3.10.3 Edit configuration items

The following table uses MODBUS as an example. For other protocols, please refer to the "Basic Concepts" chapter.

CONFIGURATION ITEMS	USAGE & CONFIGURATION METHOD
ID	Not editable, software assigns sequentially.
Name	The data name can be defined arbitrarily

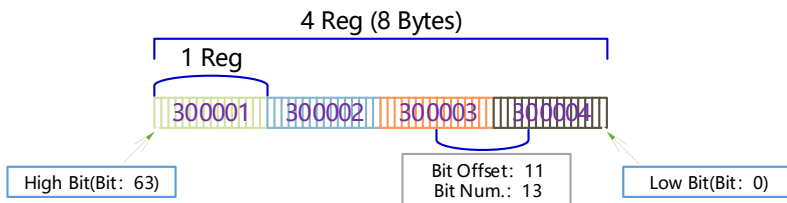
	and cannot be empty.
Value	It cannot be edited. In operation mode, double-clicking can trigger a single read operation.
CMD	Double-click to start editing and enter the write command data to be issued. If there is no background color, it means that the data does not support the issuance of write instructions.
Unit	The data unit can be defined arbitrarily.
Range	The data value range is used to assist debugging. It can be defined arbitrarily and does not participate in the verification process.
Block	Double-click the cell and select to modify the data block type. The block definition refers to the MODBUS standard protocol. Modifying the block may result in forced modification of other fields.
Addr.	The starting address of the current data item, no leading number required. Range: 0~65535. Note: Combined with the address offset in the advanced parameters, this address is a protocol (interface) address, not a transmission address. If the address offset is -1, the minimum value of the address must be greater than 0, otherwise the address is illegal.
Quantity	The number of data addresses continuously occupied by the current data item. If the data item is register data, the unit is word (2 bytes). If the data item is BIT data, the quantity is forced to 1 and cannot be modified. Must not be less than 1. If the data item is a holding register, it must not be greater than 123. If the data item is an input register, it must not be greater than 125.
Bit Offset	Used for register data. If the data item only occupies some bits in the register, this configuration is used to specify the starting offset of the occupied bits. If the data does not involve the register bits, the default value can be used for this configuration.

	Note: The bit offset is based on the completed byte order/word order conversion data, starting from the low bit of the data, and the lowest bit is 0.
Bit Count	Used for register data. If the data item only occupies some of the bits in the register, this configuration is used to specify the total number of occupied bits. If the data does not involve the register bits, the default value can be used for this configuration. The default number of register bits = number of data * 16. The number of bits of BIT data is fixed to 1. The configurable range of bits is 1~64Bit.
Gain	Used for local conversion of register data, supporting linear operations on received data, for example: rendering data = protocol shaping data * coefficient + offset. When combining other types, the coefficient is fixed to 1. Recommended setting range of coefficient: $\pm(0.000001\sim 1)$.
Offset	The same line as above
Polling	Field devices support this configuration item. When checked, this data item will participate in batch reading. Otherwise, this data item will be ignored when a batch read request is initiated.
Src Type	Double-click the cell and select to modify the data type defined in the MODBUS data protocol. Please confirm and be consistent with the protocol. Please refer to the data chapter for detailed instructions.
UI Type	Double-click the cell and then choose to modify the data type presented in the software interface to achieve more friendly data visualization. There are constraints associated with the SRC Type. For details, please refer to the data chapter.
Decimals	If the rendering type is a floating point number, this parameter takes effect, otherwise it is forced to 0.

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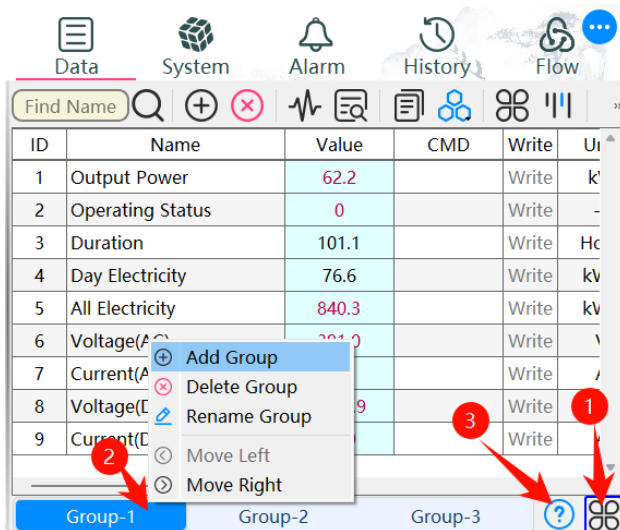
	Used to control the number of decimal points for numerical values. The range can be set from 0 to 9.
Byte Order	For register data, if the number of data is 1, 2, or 4, the byte order needs to be specified. Please refer to the MODBUS data protocol requirements. If there are no special requirements, select big endian. For other data lengths, the byte order defaults to big endian.
Word Order	For register data, if the number of data is 2 or 4, the word order needs to be specified. Please refer to the MODBUS data protocol requirements. If there are no special requirements, select big endian. For other data lengths, the word order defaults to big endian.
Interval time	Used to control the interval between read and write requests. In field device mode, this time takes effect after the response is received (timeout). In simulated slave mode, this time takes effect between request and response. If the data item is combined with other data items into one request/response, the interval time is the maximum value among them. Note: When the field device is in MODBUS-TCP asynchronous transmission mode, this parameter does not take effect.
timeout	Used for field devices to indicate the maximum allowable response delay for data read and write requests. If this time is exceeded, it will be considered a timeout and continue with the next request. If the data item is combined with other data items into one request, the timeout period shall be the maximum value among them.

An example of bit offset & number of bits is as follows:



3.10.4 Configure grouping

When there are many data configurations, different data configurations can be grouped and managed.



1 Click the "Group Browsing Mode" button to start the group view. Click again to exit the group view and view all data.

2 Right-click here to open the right-click menu and edit group information.

3 Click the "Ungrouped Data" button to see which data has no grouping information configured.

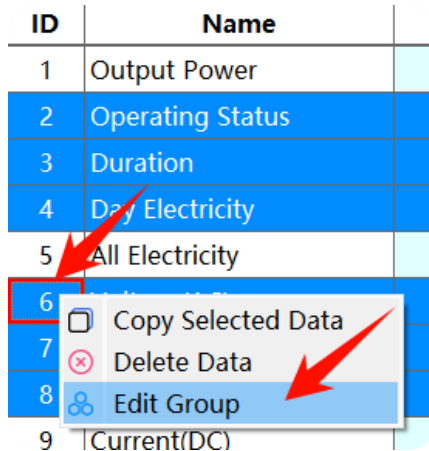
After the grouping information is set, click the serial number column, select the data rows that need to be grouped,

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and select Modify Grouping from the right-click menu.

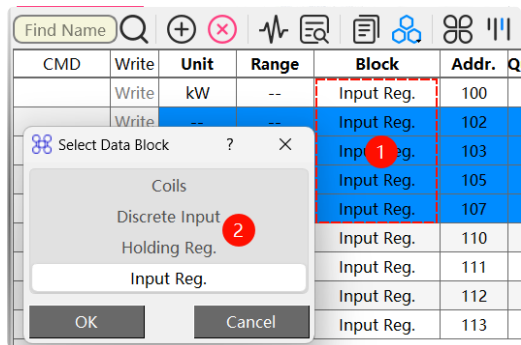
Note: A data configuration can be divided into multiple groups at the same time.

ID	Name
1	Output Power
2	Operating Status
3	Duration
4	Day Electricity
5	All Electricity
6	
7	
8	
9	Current(DC)



3.10.5 Batch editing

If you need to quickly modify multiple rows of configurations, you can use the "batch modification" function. "Serial Number", "Name", "Value" and other columns do not support this function.



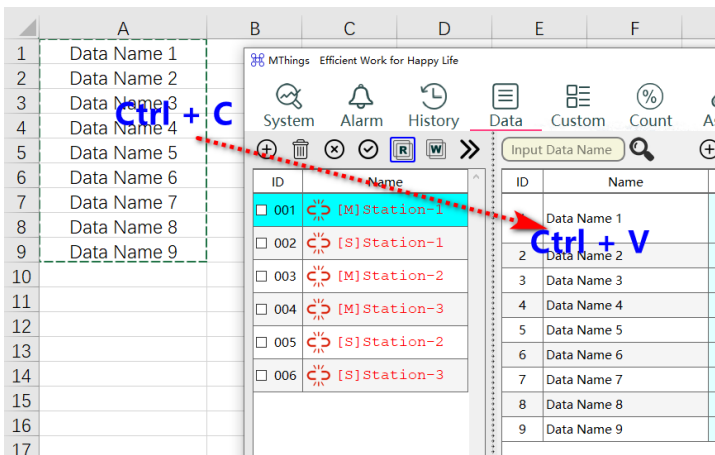
① Use the Shift key combination to continuously select multiple parameters, or the Ctrl key combination to discretely select parameter items that need to be modified. Right-click the menu and

click "Batch Modify".

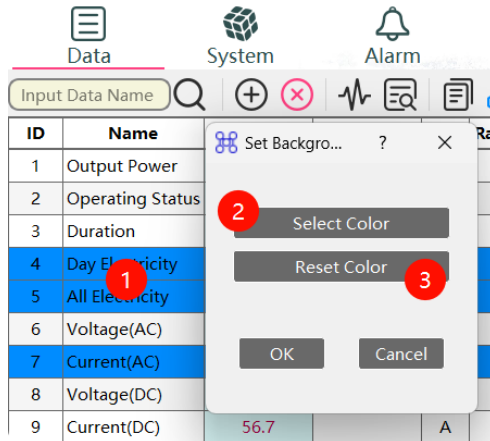
2 Set or select new parameters.

3.10.6 One-click modification

If you need to quickly edit the "name", "unit", "address", "quantity", "bit offset", "number of digits", "coefficient", "offset" and "range" of the data configuration, the software supports users to copy multiple rows of Excel data and paste them to the specified location rows in the data configuration table.



3.10.7 Mark data background color



- 1 Click the "name" cell of the data that needs to be marked with a background color, right-click the menu and select "Set Background Color" to display the "Set Data Name Background Color" page.
- 2 Click the "Select Color" button to select a custom background color.
- 3 Click the "Reset Color" button to restore the background to its original color.

3.10.8 Manual data sorting

You can change the position of the data configuration row by dragging the "address" cell of the data.

注意

Supports dragging down or up anywhere.

The data configuration row is added to the row above the drag stop row.

If you need to drag to the last row, drag the configuration row to a blank space in the table.

3.10.9 One-click data sorting

ID	Name	Value	CMD	Unit	Range	Block	Addr.
1	Output Power	62.0		kW	--	Input Reg.	100
2	Operating Status	1		--	--	Input Reg.	102
3	Duration	10					103
4	Day Electricity	7					105
5	All Electricity	8					107
6	Voltage(AC)	38					110
7	Current(AC)	9					111
8	Voltage(DC)	12					112
9	Current(DC)	5					113

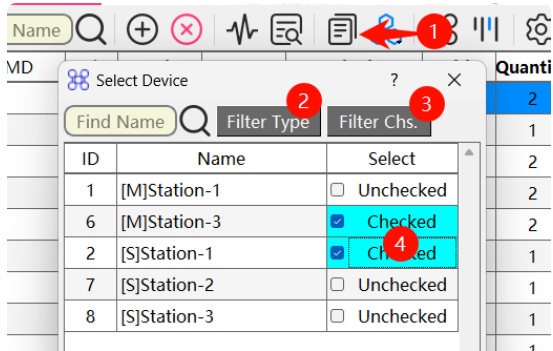
Double-click the "Address" list header to complete the one-click sorting function. One-click sorting rules:

- Sort the data blocks, in order: coil status, discrete input, holding register, input register.
- Within the same data block, sort from smallest to largest with the "data starting address" as the reference.
- When the data starting addresses are the same, they are sorted from small to large using the "bit offset" as a reference.
- When the bit offsets are the same, sort from small to large based on the "number of bits".

3.10.10 One-click synchronization data configuration

When multiple devices follow the same data protocol, if the data configuration of one of the devices has been completed,

the current device data configuration can be completely copied to other selected devices through the copy operation.



① Click the "Copy configuration to other devices" icon button to enter the "Select Device" page.

② If there are many devices, you can click the "Type Filter" button to select field devices or simulated slaves.

③ If there are many devices, you can click the "Link Filter" button to filter the devices under some links.

④ Select the device whose data configuration needs to be copied.

NOTICE

Field devices and simulated slaves can copy data configurations from each other.

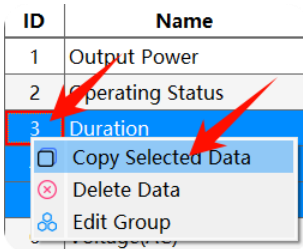
WARNING

Copying data configuration will overwrite the existing configuration of the target device, please operate with caution!

3.10.11 Copy data configuration

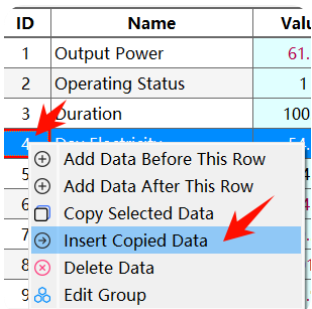
A specified range of data configurations can be copied between devices of the same type, eliminating the trouble of repeated settings.

ID	Name
1	Output Power
2	Operating Status
3	Duration

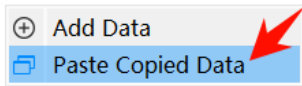


Select the data rows to be copied (continuous or discrete selection is supported), right-click on 'Copy Selected Data Configuration'.

ID	Name	Val
1	Output Power	61.
2	Operating Status	1
3	Duration	100



Switch to the target device data page, select the row to be inserted, right-click, and select 'Insert Copy Data Configuration' to complete the operation.

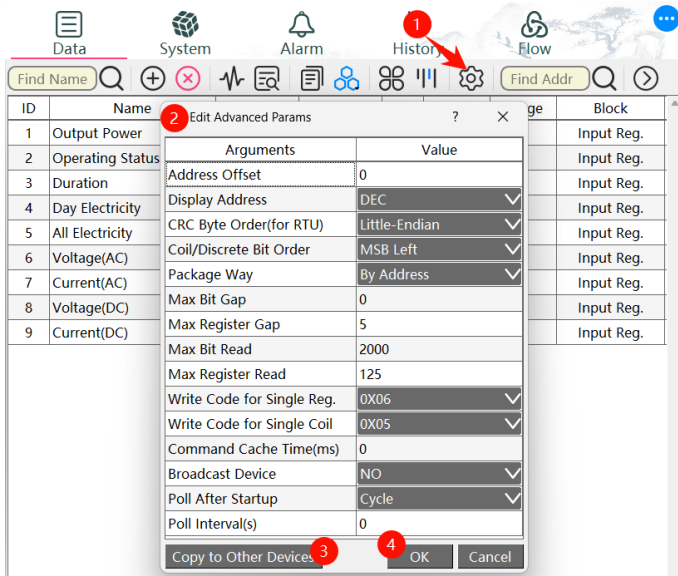


+	Add Data
📄	Paste Copied Data

If you want to append the copied configuration to the end of the table, right-click in the blank area and select 'Paste Copied Data Configuration'.

3.10.12 Advanced parameter settings

The software provides advanced parameter configuration of the device and is used to control public functions related to reading and writing the device.



- 1 Click the "Advanced Parameter Configuration" icon to enter the page.
- 2 Display the corresponding parameters in the "Advanced Parameter Configuration" page.
- 3 Click "Synchronize to other devices" to copy all advanced parameters of the current device to the selected device.
- 4 Click the "OK" button to complete and save the advanced parameters.

The advanced parameters of the device are defined as follows:

ARGUMENTS	USAGE & CONFIGURATION METHOD
Address Offset	Message data address = protocol

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	<p>(interface) data address + address offset.</p> <p>The default is 0. When modifying, please carefully confirm the protocol requirements.</p>
Display Address	<p>Used to specify the data address display format, you can select "decimal" or "hexadecimal". When "Hex" is selected, the address format is XXXXH. When editing the hexadecimal address, you do not need to carry the suffix H, and the software will automatically complete it.</p>
CRC Byte Order(for RTU)	<p>In order to adapt to non-standard protocols, this parameter can be used to specify the CRC byte order in the RTU message. The default is "little endian".</p>
Coil/Discrete Bit Order	<p>In order to adapt to non-standard protocols, this parameter can be used to specify the packaging method of continuous bits during the coil/discrete reading and writing process. The default is "high bit on the left".</p>
Read data packet mode	<p>Only used for field devices, this parameter instructs the device how to package data from multiple adjacent addresses when making batch read and write requests.</p> <p>The default is "item by item", that is, a separate request is made for reading and writing each row of data.</p> <p>"Sort by address size" means automatic grouping, and continuous address grouping is performed from small to large register addresses.</p> <p>"Sort by list order" means automatic grouping, and continuous address grouping is performed in the order in the interface table.</p>
Max Bit Gap	<p>Only used for field devices, this parameter indicates the maximum address interval allowed when reading BIT data</p>

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	<p>request packets.</p> <p>When BIT data is written in batches, no address gaps are allowed.</p>
Max Register Gap	<p>For field devices only, this parameter indicates the maximum address interval allowed when packetizing read register data requests.</p> <p>When REG data is written in batches, no address gaps are allowed.</p>
Max Bit Read	<p>Only used for field devices, this parameter indicates the maximum address space allowed when making a read BIT data request package.</p>
Max Register Read	<p>For field devices only, this parameter indicates the maximum address space allowed when packetizing read register data requests.</p>
Write Code for Single Reg.	<p>Only used for field equipment and adapted to the special requirements of non-standard equipment.</p> <p>By default, the 0X06 function code is used to request a write request for a single holding register in accordance with the standard requirements.</p>
Write Code for Single Coil	<p>Only used for field equipment and adapted to the special requirements of non-standard equipment.</p> <p>By default, the 0X05 function code is used to request a write request for a single coil status in accordance with the standard requirements.</p>
Command Cache Time (ms)	<p>This parameter is used to specify how long the software will cache multiple write instructions locally, and then issue them in batches after the timeout. The core function is to merge high-frequency write requests, reduce the number of communication interactions, and reduce bus load and device pressure.</p> <p>It can be flexibly adjusted according to</p>

	<p>real-time requirements. Setting 0 means turning off the cache function and sending it immediately. The minimum resolution of this parameter is 100ms.</p>
Broadcast Device	<p>Only used for field devices, used to indicate whether the current device is a broadcast device. If Yes is selected, all requests issued by this device will not wait for response messages.</p> <p>Note: Only applicable to field devices whose link is a serial port.</p>
broadcast address-1	<p>Only used for emulating slave machines, used to indicate the broadcast address, the default is 0.</p> <p>Note: When the transmission mode of the simulated slave is MODBUS-TCP (synchronous or asynchronous), the broadcast address means that all slaves need to process the address request, but do not need to reply (reply by the broadcast address device).</p> <p>Note: If address 0 is required in MODBUS-TCP transmission mode and does not involve broadcast requirements, it is recommended to modify the parameters to other addresses.</p>
broadcast address-2	<p>Same as above</p>
Poll After Startup	<p>Only used for field devices, used to indicate whether to start polling operation when the device link is established or the device resumes operation.</p>
Polling interval (seconds)	<p>Only used for field devices, used to set the minimum time interval between two consecutive polls of device data. Properly setting this value can effectively reduce system load and avoid resource waste or device response delays caused by frequent polling.</p>

NOTICE

Advanced device parameters can be copied to other devices.

3.10.13 Analog Scaling

After the analog sensor data is converted into MODBUS register data (raw readings) through the gateway, coefficient offset conversion is required to obtain the actual value. This function provides a simple conversion tool. Users only need to enter the original reading range and actual value range, and then configure the corresponding coefficients and offsets with one click.

Channel	Gain	Offset	Decimals
1	0.1	0	1
2	1	0	0
3	0.1	0	1
4	0.1	0	1

⚙️ Analog Scaling

In the data configuration interface, place the cursor in any cell in the "Coefficient" or "Offset" column, right-click to bring up the menu and click "Range Conversion".

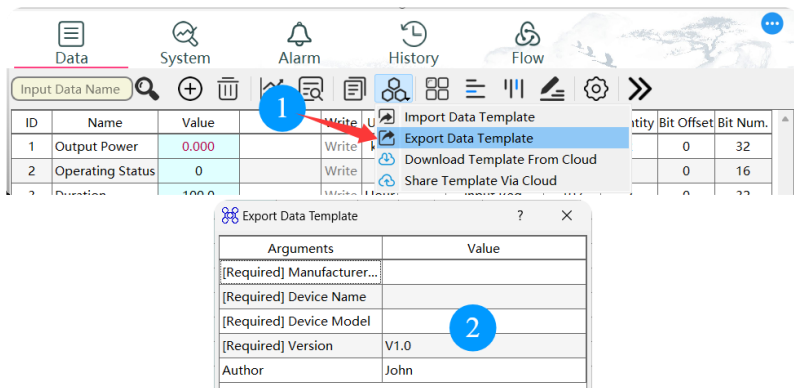
	Min Value	Max Value
Raw Value	0	65535
Scaled Value	0	100

OK
Cancel

Follow the page prompts to fill in the upper and lower limits of the "original reading" and the corresponding upper and lower limits of the "actual value", click "OK", and the software will automatically calculate the coefficients and offsets and update the configuration.


3.10.14 Export data configuration template

The workload of data configuration in MODBUS is huge. In order to facilitate the transfer and sharing of data configuration, the software supports the function of exporting data templates, making it independent of the specific debugging environment, links, equipment and other differentiating factors. Sharees can quickly set up their own debugging environment through data templates without having to reconfigure the data again.

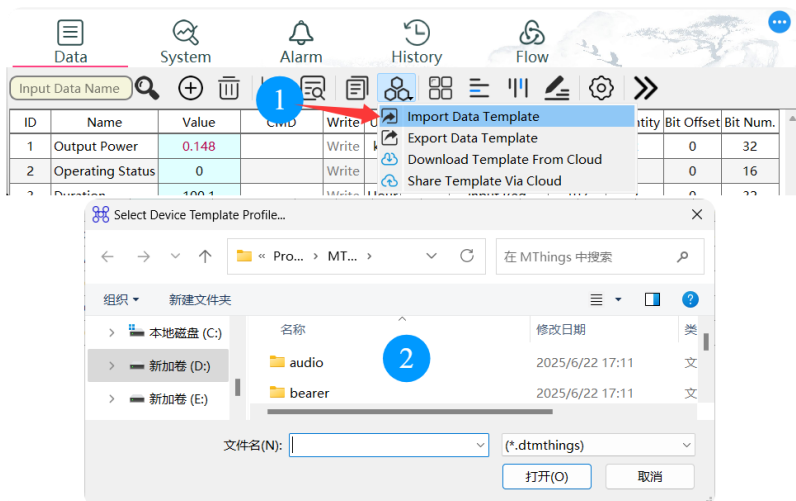


- 1 Click the "Export Device Template" menu item to enter the "Export Device Data Configuration" page.
- 2 Fill in the additional information necessary to fill in the data template.

The exported data template file shows:

 [Master]FACTORY_DEVICE_MODEL_V1.0.dtmthings

3.10.15 Import data configuration template



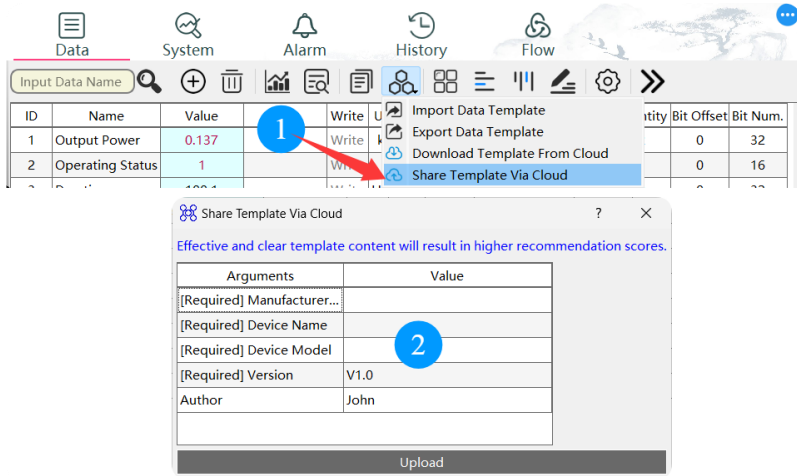
Click the "Import Device Data Template" menu item to enter the "Select Device Configuration Template File" page and select the data template file.

NOTICE

Field devices and simulated slaves can import each other's data templates, but it is recommended to carefully confirm the differences between the data configurations of the two device types before operation.

3.10.16 Upload data configuration template

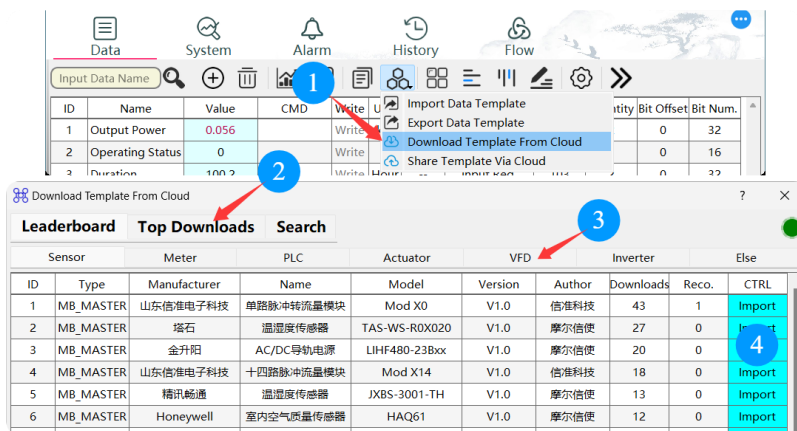
In order to achieve a more convenient configuration sharing function, the software supports users to upload device data configuration to the cloud server and make it available for download by other users.



① Click the "Cloud Shared Data Template" menu item to enter the "Cloud Shared Data Template" page.

② Fill in the additional information necessary to fill in the data template.

3.10.17 Download data configuration template



① Click the "Cloud Download Data Template" menu item to enter the "Cloud Download Data Template" page.

- 2 Select how to view the data template.
- 3 Select the device type to which the data template belongs.
- 4 Click the "Import" button to download and replace the current device data configuration.

3.11 Field device data operations

3.11.1 Read device data

ID	Name	Value	CMD	Unit
1	Output Power	62.0		kW
2	Operating Status	0		--
3	Duration	100.1		Hour
4	Day Electricity	53.4		kWh
5	All Electricity	594.4		kWh
6	Voltage(AC)	386.1		V
7	Current(AC)	90.3		A
8	Voltage(DC)	1203.5		V
9	Current(DC)	56.9		A

① Double-click the "Value" cell of the row whose data needs to be read.

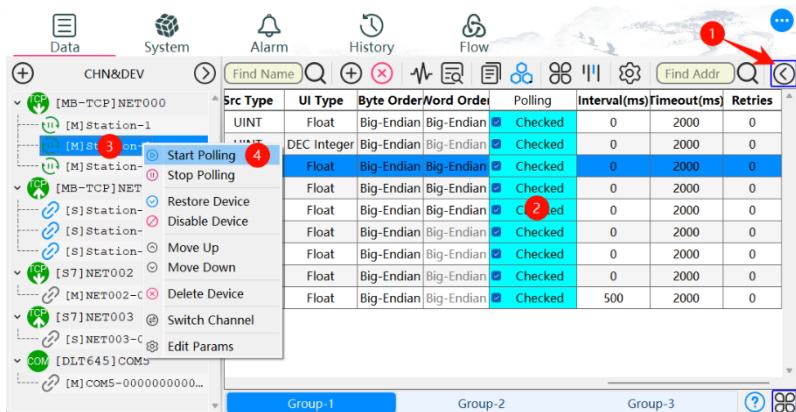
② Double-click the "Value" header to read all rows of data at a time.

NOTICE

When the device is disabled or the link is down, a single read will not be initiated successfully.

A single operation is not only for a single register. If the data consists of multiple consecutive registers, a single operation is also supported.

3.11.2 Polling device data



- ① Click the "More parameter columns" button
- ② Confirm and check the data that needs to be polled;
- ③ Select the device to be polled, you can select multiple consecutively;
- ④ Click the "Start Polling" button to start polling, click the "Stop Polling" button to stop polling.

NOTICE

If you want the device to start polling immediately after startup, you can modify "Poll immediately after startup" in the device advanced parameters.

If you need to change the polling data range, re-check the "Polling" data combination. After the parameters related to device "polling" are changed, polling needs to be restarted to take effect.

When the device is disabled or the link is down, polling will not start successfully.

3.11.3 Send write command to device

ID	Name	Value	CMD	Unit	Range	Block
1	Output Power	--	20.2	kW	--	Holding Reg.
2	Operating Status	--	30.6			
3	Duration	--				Holding Reg.
4	Day Electricity	--	55.8	kWh	--	Holding Reg.
5	All Electricity	600.7		kWh	--	Input Reg.
6	Voltage(AC)	384.1		V	--	Input Reg.

- ① Double-click to edit the "Instruction" cell and enter the target value of the distributed data;
- ② Select the data row to be written, right-click the menu, and click "Issue Write Instruction" to immediately issue the write data instruction;

NOTICE

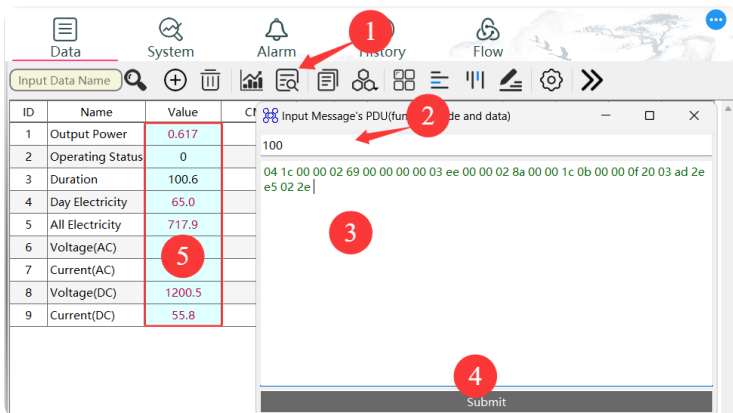
This operation is supported only by the coil status and holding registers.

When the device is disabled or the link is down, the write function will not be successfully initiated.

The write data operation does not refer to a single register. If the data consists of multiple consecutive registers, a single operation is also supported.

3.11.4 Parse Frame

In order to facilitate the analysis of the response message for reading data and the request message for writing data, the software supports mapping the BIT and register data in the original message to the data table based on the existing device data configuration, eliminating the user's byte-by-byte analysis and calculation work, and allowing the user to intuitively view the content of the transmitted data.



① Click the "Parse Message" button to open the parse message input page.

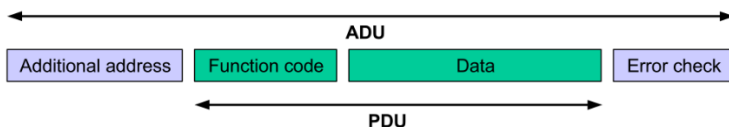
② If the original message is a read data response message, the starting data address (message transmission address, subject to the content of the request frame) needs to be entered, otherwise it does not need to be entered.

③ Enter the original message PDU, remove the header part of the original message, and start from the function code.

④ Click the Submit button.

⑤ View the parsed data.

The PDU definition is as follows:



3.11.5 Data/address lookup

When the number of data configuration rows is large and the user needs to quickly locate a certain data row, the table can be quickly scrolled to the specified position by searching for the data name or register address.

ID	Name	Value	CMD	Write	Unit	Range	Block	Addr.	Quant
1	Output Power	61.4		Write	kW	--	Input Reg.	100	2
2	Operating Status	1		Write	--	--	Input Reg.	102	1
3	Duration	101.4		Write	Hour	--	Input Reg.	103	2
4	Day Electricity	84.2		Write	kWh	--	Input Reg.	105	2
5	All Electricity	921.1		Write	kWh	--	Input Reg.	107	2
6	Voltage(AC)	391.6		Write	V	--	Input Reg.	110	1
7	Current(AC)	93.4		Write	A	--	Input Reg.	111	1
8	Voltage(DC)	1204.6		Write	V	--	Input Reg.	112	1
9	Current(DC)	52.1		Write	A	--	Input Reg.	113	1

- 1 Enter some keywords in the name of the data to be found (case-sensitive).
- 2 Enter the register address of the data to be found (exact match).
- 3 After clicking the data name search button, the matching name cells will be highlighted.
- 4 After clicking the data address search button, the matching address cells will be highlighted.

NOTICE

If there are multiple matches, the user can click the search button multiple times, and the search function will continue to traverse other rows of the table and identify matching items.

The search scope only includes the "Name" column.

3.11.6 Data filtering

The data page provides a variety of information filtering methods to facilitate users to focus on key information faster and better.

The screenshot shows the MThings Data page interface. At the top, there are navigation tabs: Data, System, Alarm, History, and Flow. Below these is a toolbar with various icons for filtering and navigation. A table below the toolbar displays data with columns: ID, Name, Value, CMD, Unit, Range, Block, Addr., and Qty. Red circles and arrows highlight the 'Filter Block' button (a pair of scissors icon) and the 'Filter Column' button (a list icon) in the toolbar. The table contains three rows of data.

ID	Name	Value	CMD	Unit	Range	Block	Addr.	Qty
1	Output Power	--	20.2	kW	--	Holding Reg.	100	
2	Operating Status	--	30.6	--	--	Holding Reg.	102	
3	Duration	--		Hour	--	Holding Reg.	103	

① Click the "Filter Block" button to hide/show the specified data block type.

② Click the "Filter Column" button to hide/show specified table columns.

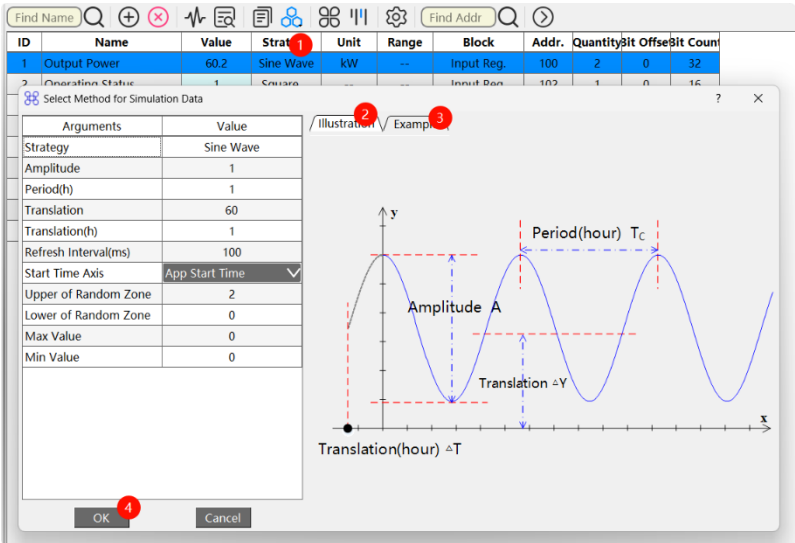
NOTICE

The filtering block operation is only a temporary operation. After restarting the software, all blocks will be displayed again.

The filter column operation will store the Profile, and the last selected show/hide state will be maintained after restarting the software.

3.12 Simulate slave device data operations

The reply process of simulated slave device data does not need to be manually triggered. After receiving the host request, the software automatically packages a reply. The simulated slave also supports data curves and parsed messages. Please refer to the previous chapter for the operation method.



- ① Double-click the "Strategy" cell that requires simulated data to open the "Select Simulated Data Method" page.
- ② Before configuring the simulation data method, refer to the different curve descriptions.
- ③ After configuring the simulation data method, refer to the sample curve.
- ④ Click Apply to take effect for the simulated data method.

NOTICE

You can drag the "numeric" cells in one row to the "numeric" cells in another row to realize quick copying of simulation data configuration.

The simulated data method parameters are defined as follows:

ARGUMENTS	USAGE & CONFIGURATION METHOD
Strategy	Define simulation method, default is fixed value
Refresh Interval (ms)	The interval between value updates. During the interval, the value remains unchanged.
Start Time Axis	Defines the origin position of the curve's timeline.
Random interval upper and lower bounds	Based on the existing curve values, when a valid random interval is defined, the random numbers within the range are superimposed. If the upper and lower limits are the same, it means there is no randomness.
Maximum value/minimum value	Based on the existing curve values, when the effective extreme value range is defined, the curve values will be constrained within this range, which can generally be used to cut peaks and fill valleys in curves. If the maximum and minimum values are the same, it means the function is turned off.

The slave data policy configuration is as follows:

STRATEGY	USAGE & CONFIGURATION METHOD
Fixed value/straight line/parabola /sine/square wave	Refer to the instructions in the software interface

Preset Data	Line breaks are used as intervals between each piece of data; Supports copying entire column data from excel to the data window; When the refresh interval is set to 0, the host's request is replied to in a row-by-row loop; When the software restarts, data recovery will be reset.
association mode	Correlate any data from other field devices to consolidate key information and forward it to northbound devices.

3.13 Real-time data curve

The software provides a powerful and free millisecond-level real-time data curve function. The real-time data curve is a container for multiple data curves. One curve is a legend:

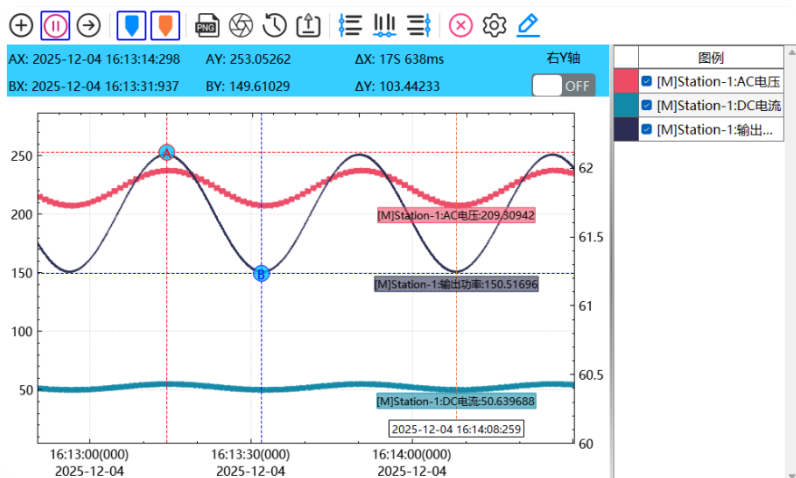
- Parallel collection and graphical presentation of up to 50 channels of data streams;
- Equipped with a millisecond-level response engine to ensure industrial-grade real-time requirements;
- Continuous and stable operation for 24 hours to meet long-term monitoring needs;
- Dual Y-axis display architecture supports independent configuration of main/secondary coordinate axes;
- Coordinate axis range adaptive;
- Dynamic cursor: Provides bidirectional positioning in time domain/value domain;
- Reference line: Supports comparing legend values with vertical slices at time points;
- Quick screenshot: generate PNG high-definition images with one click;
- Data archiving: supports CSV standard format export;
- Data playback: Supports importing CSV data to analyze

past data;

3.13.1 Operation entrance

ID	Name	Value	Unit	Range	Block	Addr.
1	Output Power	61.5	kW	--	Input Reg.	100
2	Operating Status	0	--	--	Input Reg.	102
3	Duration	100.1	Hour	--	Input Reg.	103
4	Day Electricity	54.0	kWh	--	Input Reg.	105

3.13.2 Curve view



The curve view includes a toolbar, a legend display area, and a data curve (legend) list. The legend list on the right contains the legends in the displayed state, and the front color block is the same color as the curve. The legend display area can display multiple legends and their parameters at the same time. The legend is associated with the left Y-axis by default, and part of the legend can also be associated with the right Y-axis through configuration.

Check the operation method as follows:

- The user can press and hold the left mouse button

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anywhere in the legend display area and drag the legend display area in any direction.

- The user can control the magnification or reduction of the legend display area through the mouse wheel at any position in the legend display area.
- Users can click anywhere on the curve to display detailed information about the data points in the curve.
- Users can click on the coordinate axis to enlarge or reduce the range of a single axis.

3.13.3 Add data curve (legend)

The screenshot shows the 'Real-time Curve Viewer' application window. The 'Select Device Data' dialog is open, displaying a graph on the left and two tables on the right. The graph shows a red curve for 'Output Power' and a green curve for 'Station-1 Current'. The 'Device List' table has 8 rows, with row 1 selected. The 'Data' table has 9 rows, with row 1 selected. The 'Legend' panel on the far right shows 'Output Power' and 'Station-1:Current(...)'. The toolbar at the top contains various icons, with the 'Add' button (a plus sign) highlighted by a red circle and arrow labeled '1'. The 'Device List' table is highlighted by a red box labeled '2'. The 'Data' table is highlighted by a red box labeled '3'.

ID	Device List
1	[M]Station-1
2	[S]Station-1
5	[M]Station-2
6	[S]Station-2
7	[S]Station-2
8	[S]Station-3

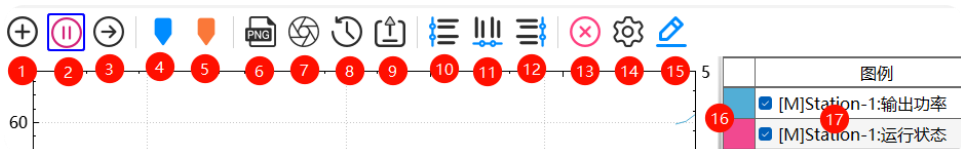
ID	Data	Select
1	Output Power	<input checked="" type="checkbox"/> Checked
2	Operating Status	<input type="checkbox"/> Unchecked
3	Duration	<input type="checkbox"/> Unchecked
4	Day Electricity	<input type="checkbox"/> Unchecked
5	All Electricity	<input type="checkbox"/> Unchecked
6	Voltage(AC)	<input type="checkbox"/> Unchecked
7	Current(AC)	<input type="checkbox"/> Unchecked
8	Voltage(DC)	<input type="checkbox"/> Unchecked
9	Current(DC)	<input checked="" type="checkbox"/> Checked

1 Click the "Add" button in the toolbar to open the device data selection page.

2 Select the device to which the data belongs.

3 Select data.

3.13.4 Toolbar description



- ① Add legend;
- ② Start/stop real-time data recording;
- ③ After enabling, the latest data is always displayed on the far right of the timeline;
- ④ Start the cursor function;
- ⑤ Start the reference line function;
- ⑥ Take a screenshot and save it as a PNG file;
- ⑦ Take screenshot to pasteboard;
- ⑧ Playback data files;
- ⑨ Export the data of all legends and save them as csv files;
- ⑩ Edit the left Y-axis parameters;
- ⑪ Display the timeline parameters and fine-tune the timeline range;
- ⑫ Edit the right Y-axis parameters;
- ⑬ Clear all legend data with one click;
- ⑭ Edit advanced parameters;
- ⑮ Edit legend parameters;
- ⑯ Legend color can be modified by double-clicking;
- ⑰ Historical data curve legend list, click the legend name to highlight it.

3.13.5 Coordinate axis parameter description

ARGUMENTS	USAGE & CONFIGURATION METHOD
Auto Range	Controls whether the Y-axis automatically adjusts along with the curve data range.
Max Value	When "Range Adaptation" is turned off, you can manually set the upper limit of the Y-

	axis range.
Min Value	When "Range Adaptation" is turned off, you can manually set the lower limit of the Y-axis range.
Alarm Line-1	Switch
Line-1 Value	The dotted line is displayed on the curve display according to the set value.
Alarm Line-2	Switch
Line-2 Value	The dotted line is displayed on the curve display according to the set value.

3.13.6 Advanced parameter description

ARGUMENTS	USAGE & CONFIGURATION METHOD
Refresh Mode	<p>Can be set to "read cache" or "active push" mode;</p> <p>Read cache: Read all legend cache data synchronously at one time according to the set "refresh interval" to ensure that all data is updated at the same time;</p> <p>Active push: The software background updates the legend immediately after obtaining the data, which can maximize data fidelity, but the data of different legends may be distributed at different times.</p>
Refresh Intv. (ms)	Controls the curve display data refresh interval.
Maximum duration (hours)	Controls the maximum retention time of all data in the curve. After this time is exceeded, the curve data will be automatically removed.
Window duration (seconds)	Specifies the length of time the timeline can display, which should be less than the Maximum Duration parameter.

3.13.7 Data playback format requirements

A	B	C	D	E	F
Time	Data1	Time	Data2	Time	Data3
2025-04-04 18:53:21.464	56.4	2025-04-04 18:53:21.464	386.1	2025-04-04 18:53:21.464	91
2025-04-04 18:53:21.603	56.1	2025-04-04 18:53:21.603	381.4	2025-04-04 18:53:21.603	91.8
2025-04-04 18:53:21.804	56.5	2025-04-04 18:53:21.804	383.6	2025-04-04 18:53:21.804	90.9
2025-04-04 18:53:22.007	56.1	2025-04-04 18:53:22.007	386.9	2025-04-04 18:53:22.007	91.3
2025-04-04 18:53:22.210	55.5	2025-04-04 18:53:22.210	382.8	2025-04-04 18:53:22.210	91.8
2025-04-04 18:53:22.416	56.3	2025-04-04 18:53:22.416	388.1	2025-04-04 18:53:22.416	91.3
2025-04-04 18:53:22.619	55.2	2025-04-04 18:53:22.619	386.7	2025-04-04 18:53:22.619	92.1

The supported data playback file requirements are as follows:

- The first line should contain the title, and valid data starts from the second line;
- Column data should be: timestamp, data, timestamp, data...;
- The timestamp format should be: "yyyy-MM-dd hh:mm:ss:zzz".

3.14 Channel message management

Channel messages are important debugging information, and the software provides rich and friendly methods for message management.

3.14.1 View channel messages

The software does not open the message browsing window by default. You need to enter the "More Functions" menu and click the "Display Messages" submenu, then the message window will be embedded at the bottom of the software window.

The screenshot shows the MThings interface with a table of input registers and a dropdown menu. A red arrow points from the 'Display Message' option in the menu to the table.

Age	Block	Addr.	Quantity	Bit Offset	Bit
-	Input Reg.	100	2	0	
-	Input Reg.	102	1	0	
-	Input Reg.	103	2	0	
-	Input Reg.	105	2	0	
-	Input Reg.	107	2	0	
-	Input Reg.	110	1	0	
-	Input Reg.	111	1	0	
-	Input Reg.	112	1	0	
-	Input Reg.	113	1	0	

- New Profile
- Open Profile
- Save as Profile
- Save Profile
- Recently Used Profiles
- License Management
- Custom Menu
- User Management
- System Parameter
- MQTT Forwarding
- Link Count
- Frame Test
- Assist Tools
- User Manual
- Feedback
- About
- Display Message**
- Pin to Top

Click the "Dock" button and the message page will pop up as an independent window. It can generally be used in computer multi-screen scenarios, and debugging operations and message browsing do not affect each other.

The screenshot shows a list of messages in hexadecimal format. A red arrow points to the 'Dock' button (represented by a blue square icon) in the right-hand toolbar.

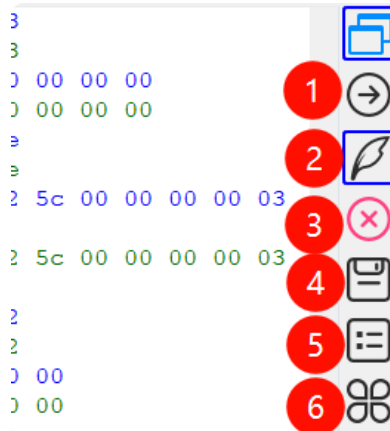
```

t 00 00 02 3d 00 00 18 db 00 00 0f 2a 03 9c 2e e5
t 00 00 02 3d 00 00 18 db 00 00 0f 2a 03 9c 2e e5
t 00 00 02 3d 00 00 18 db 00 00 0f 27 03 89 2f 12
t 00 00 02 3d 00 00 18 db 00 00 0f 27 03 89 2f 12
t 00 00 02 3d 00 00 18 db 00 00 0f 26 03 8c 2e fa
t 00 00 02 3d 00 00 18 db 00 00 0f 26 03 8c 2e fa
    
```

Message colors are defined as follows:

COLOR	MEANING
blue	Send message normally
green	Receive messages normally
red	Abnormal message
Purple	Link status events

3.14.2 Common operating instructions



- 1 Click the "Receive" button to start or close message reception.
- 2 The software turns on the message coloring function by default. If the message update frequency is greater than 2000 messages/second, it is recommended to turn off this function to avoid software overload.
- 3 Click the "Clear Now" button to clear all messages in the message window.
- 4 If you need to store the message, click this button and select the storage path. The software will immediately start creating the message file

and start saving the data (updated every 10 seconds). If you click the button again, the message storage function will be deemed to be closed.

⑤ Based on visualization, the software performs partial processing and conversion for MODBUS-ASCII and MODBUS-TCP. If needed during the debugging process, you can check "Original BYTES" to view the original binary BYTES message.

⑥ Click the "Filter Links" button and specify some links to filter the link messages that you don't care about yet.

NOTICE

After filtering the link, the filtered messages will not be saved.

Scheduled clearing or manual clearing will not affect the saved data.

3.14.3 Serial port capture

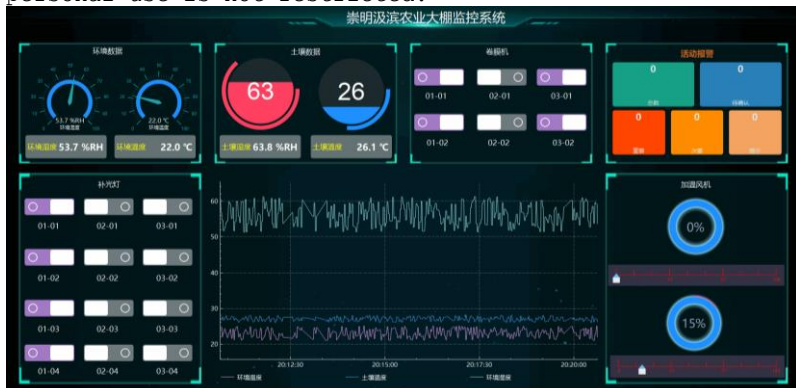
If you need to capture serial port packets, just create any field device in the target serial port link. No device data configuration is required. Enter the link message window to view all data received by the monitored serial port.

NOTICE

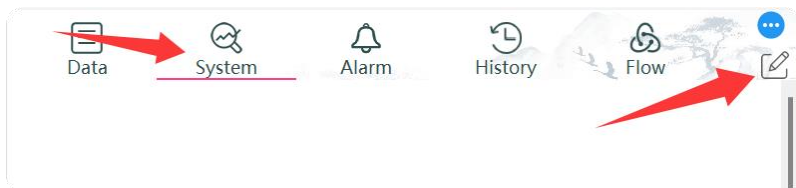
It is not recommended to use this software to capture serial port packets. It is recommended to choose a general serial port tool.

3.15 System data

The system data page provides configuration functions, allowing users to perform flexible and intuitive data display and operations based on existing device data. This function requires authorization before commercial use, and personal use is not restricted.



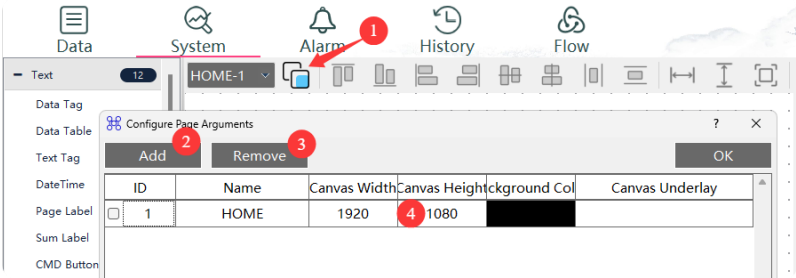
3.15.1 Enter or exit configuration editing



After entering the system page, click the edit button on the right to immediately start or exit configuration editing.

3.15.2 Page configuration

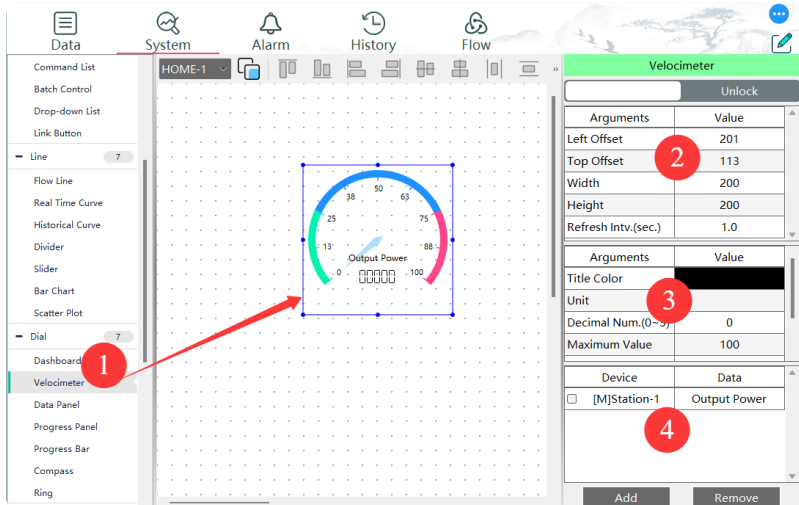
After entering configuration editing, users can manage page parameters.



- 1 Click to open the "Manage Page Information" dialog box.
- 2 Add new page.
- 3 Delete the selected page. After selecting and deleting all, the first page will be retained.
- 4 Double-click to modify page parameters.

PAGE PARAMETERS	USAGE & CONFIGURATION METHOD
Background Color	If the canvas has no basemap, you can double-click this parameter to fill it with a uniform background color.
Canvas Width	Controls the display area width of the canvas. The value is the same as the resolution unit.
Canvas Height	Controls the height of the display area of the canvas. The value is the same as the resolution unit.
Canvas Underlay	Set a user-defined base map, double-click the parameter area, and select the base map path. The image should be in .png image format. It is recommended that the base image resolution be consistent with the width and height of the canvas.

3.15.3 Add graphic controls



- 1 After selecting the graphic control type from the left menu bar, drag it into the canvas;
- 2 Set "basic parameters", including location, size, and data update cycle;
- 3 Set "extended parameters". Different control types have different extended parameters;
- 4 Add "content data", that is, associate the control with one or more device data. Some controls do not need to be associated with device data.

3.15.4 Modify graphic controls

After entering configuration editing, a blue wireframe will appear after clicking on an existing graphic control. The user can quickly modify the size of the graphic control by dragging the mouse.

Global shortcut operations include:

- Select all controls: Ctrl+A
- Cancel last operation: Ctrl+Z

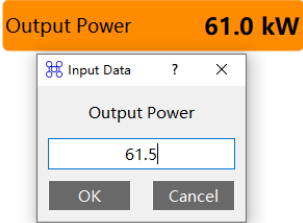
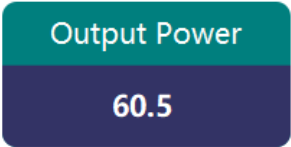



- Copy component: Ctrl+C
- Delete components: Delete button

Users can quickly adjust the size, position, alignment, etc. of graphics through the image below.



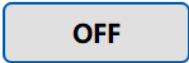




- 1 Adjust the upper alignment of the selected control
- 2 Adjust the bottom alignment of the selected control
- 3 Adjust the left alignment of the selected control
- 4 Adjust the right alignment of the selected control
- 5 Adjust the selected control to be horizontally centered
- 6 Adjust the selected control to be vertically centered
- 7 Adjust the horizontal distribution of selected controls
- 8 Adjust the vertical distribution of selected controls
- 9 Adjust the selected controls to have the same width and direction
- 10 Adjust the selected control settings to the same narrow direction
- 11 Adjust the selected control to set the same height and width of the control
- 12 Put the selected control layer on top
- 13 Send the selected control layer to the bottom
- 14 Select the control in the canvas, click copy and the same control will appear
- 15 Select the control in the canvas to delete



3.15.5 Control description

Name	renderings	Function description								
Data View										
Data Tag		<p>Display data name, value, unit;</p> <p>After double-clicking, edit the value and issue the command;</p> <p>Supports multiple name and value layout methods.</p>								
Data Panel		<p>Display data name, value, unit;</p>								
Data Table	<table border="1" data-bbox="238 705 570 879"> <tr> <td>Output Power (kW)</td> <td>60.6</td> </tr> <tr> <td>Duration (Hour)</td> <td>102.5</td> </tr> <tr> <td>Operating Status</td> <td>1</td> </tr> <tr> <td>Day Electricity (kWh)</td> <td>109.6</td> </tr> </table>	Output Power (kW)	60.6	Duration (Hour)	102.5	Operating Status	1	Day Electricity (kWh)	109.6	<p>Display data from multiple different devices.</p>
Output Power (kW)	60.6									
Duration (Hour)	102.5									
Operating Status	1									
Day Electricity (kWh)	109.6									
Static Text	<p>abc...</p>	<p>Display static text information;</p> <p>Font size and color can be set.</p>								
daytime period		<p>Display local time;</p> <p>Supports time synchronization to devices.</p>								
arithmetic sum		<p>Supports counting multiple device data at the same time and calculating their arithmetic sum;</p> <p>Supports redefining data names, units, etc.</p>								
Status LED		<p>Two-color status light;</p> <p>Can associate bit data or register data;</p> <p>Supports flashing after</p>								

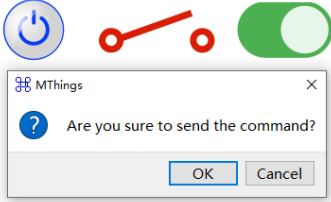
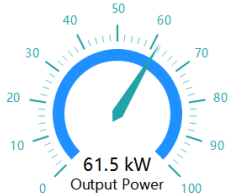
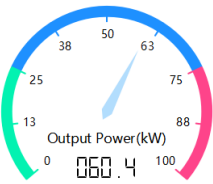


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		activation and specified frequency.																																
Status Tag		Supports up to 6 different states Customizable status value																																
Device Status	[M]Station-1 	Display the communication status of the devices in the associated device list.																																
Input Control																																		
Switch Button		Show activation and deactivation status; control development instructions;																																
Command Button		Issue fixed instructions with one click;																																
Reset Button		Press to trigger the command, release to return to normal, suitable for jogging, emergency stop and other scenarios.																																
Command Sequencing Table	<table border="1"> <thead> <tr> <th>Name</th> <th>Value</th> <th>CMD</th> <th>Interval(ms)</th> </tr> </thead> <tbody> <tr> <td>Day Electricity (kWh)</td> <td>53.0</td> <td></td> <td>0</td> </tr> <tr> <td>All Electricity (kWh)</td> <td>591.0</td> <td></td> <td>0</td> </tr> <tr> <td>Voltage(AC) (V)</td> <td>382.0</td> <td></td> <td>0</td> </tr> <tr> <td>Current(AC) (A)</td> <td>90.5</td> <td></td> <td>0</td> </tr> <tr> <td>Voltage(DC) (V)</td> <td>1204.4</td> <td></td> <td>0</td> </tr> <tr> <td>Current(DC) (A)</td> <td>52.3</td> <td></td> <td>0</td> </tr> <tr> <td colspan="2">Single Send</td> <td colspan="2">Cycle Send</td> </tr> </tbody> </table>	Name	Value	CMD	Interval(ms)	Day Electricity (kWh)	53.0		0	All Electricity (kWh)	591.0		0	Voltage(AC) (V)	382.0		0	Current(AC) (A)	90.5		0	Voltage(DC) (V)	1204.4		0	Current(DC) (A)	52.3		0	Single Send		Cycle Send		Issue multiple preset instructions with different data in one click; Support cross-device operation; Supports single and cyclic batch write operations; Customizable interval time; Various data command values can be customized; You can view the current value.
Name	Value	CMD	Interval(ms)																															
Day Electricity (kWh)	53.0		0																															
All Electricity (kWh)	591.0		0																															
Voltage(AC) (V)	382.0		0																															
Current(AC) (A)	90.5		0																															
Voltage(DC) (V)	1204.4		0																															
Current(DC) (A)	52.3		0																															
Single Send		Cycle Send																																

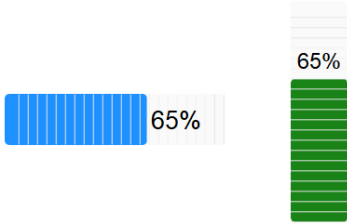
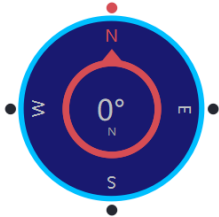
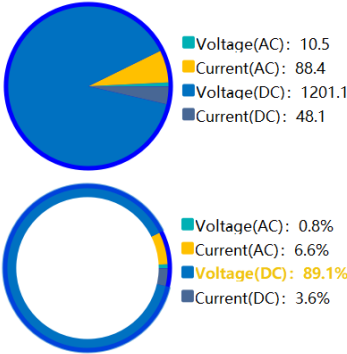

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<p>Batch Parameter Table</p>	<table border="1"> <thead> <tr> <th>Name</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>Output Power (kW)</td> <td>60.3</td> </tr> <tr> <td>Operating Status</td> <td>1</td> </tr> <tr> <td>Duration (Hour)</td> <td>100.1</td> </tr> <tr> <td>Day Electricity (kWh)</td> <td>53.3</td> </tr> <tr> <td>All Electricity (kWh)</td> <td>593.3</td> </tr> </tbody> </table> <p style="text-align: center; background-color: #007bff; color: white; padding: 2px;">Apply</p>	Name	Value	Output Power (kW)	60.3	Operating Status	1	Duration (Hour)	100.1	Day Electricity (kWh)	53.3	All Electricity (kWh)	593.3	<p>Send multiple parameters with one click, double-click to modify parameter values, ensure that parameter instructions are sent simultaneously, and try to package them together.</p>
Name	Value													
Output Power (kW)	60.3													
Operating Status	1													
Duration (Hour)	100.1													
Day Electricity (kWh)	53.3													
All Electricity (kWh)	593.3													
<p>Batch Control</p>	<p style="text-align: center; background-color: #007bff; color: white; padding: 5px; border-radius: 5px;">BACH CMD 20</p>	<p>Issue the same command to multiple different parameters with one click; Support cross-device operation; The command value can be customized.</p>												
<p>Dropdown List</p>	<div style="border: 1px solid #ccc; padding: 5px; background-color: #e0e0e0;"> <p style="background-color: #28a745; color: white; padding: 2px;">OFF-1 ▼</p> <hr/> <p style="background-color: #007bff; color: white; padding: 2px;">ON-0</p> <hr/> <p style="background-color: #fff; padding: 2px;">OFF-1</p> </div>	<p>Issue instructions in the form of a drop-down list; Only data of type enumeration is supported.</p>												
<p>Slider</p>	<div style="text-align: center;">  </div> <div style="border: 1px solid #ccc; padding: 5px; background-color: #e0e0e0; margin-top: 5px;"> <p style="font-size: small; margin: 0;">MThings</p> <p style="font-size: x-small; margin: 0;">? Are you sure to send the command?(85)</p> <p style="text-align: right; margin: 0;"> <input type="button" value="OK"/> <input type="button" value="Cancel"/> </p> </div>	<p>Use sliders to quickly adjust numerical parameters; Support floating point instructions; The control background and value color can be customized.</p>												
<p>Switch</p>	<div style="text-align: center; margin-bottom: 5px;">  </div> <div style="border: 1px solid #ccc; padding: 5px; background-color: #e0e0e0; margin-top: 5px;"> <p style="font-size: small; margin: 0;">MThings</p> <p style="font-size: x-small; margin: 0;">? Are you sure to send the command?</p> <p style="text-align: right; margin: 0;"> <input type="button" value="OK"/> <input type="button" value="Cancel"/> </p> </div>	<p>Visually display status quantities; Users can manually trigger the release of switch status; Supports custom status values (non-0/1).</p>												

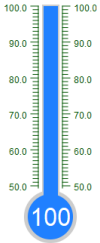
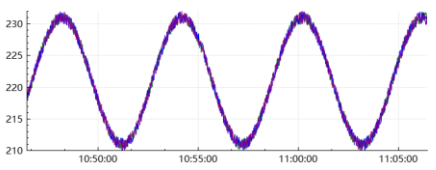
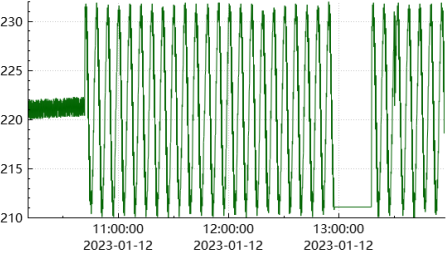
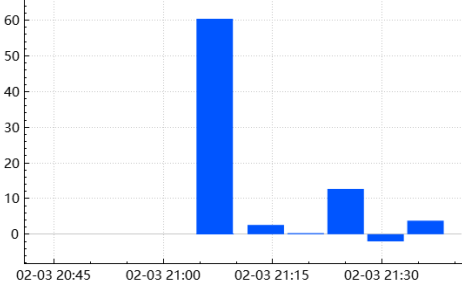
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<p>Image Switch</p>		<p>Visually display status quantities; Various switch styles; Users can manually trigger the release of switch status; Supports custom status values (non-0/1).</p>
<p>Gauges</p>		
<p>Dashboard</p>		<p>Visually display numerical names, values, and units; Supports adjustment range, display accuracy, and unit; Supports modifying numerical color.</p>
<p>Speedometer</p>		<p>Visually display numerical names, values, and units; Supports adjusting range and unit; Supports modifying numerical color; LCD code presents integer data.</p>
<p>Value Gauge</p>		<p>Visually display the absolute value of data and its percentage; Support adjusting the actual data range; Support numerical cross-border warning.</p>
<p>Progress Gauge</p>		<p>Visually display the relative range percentage of data; Supports adjusting actual data range.</p>

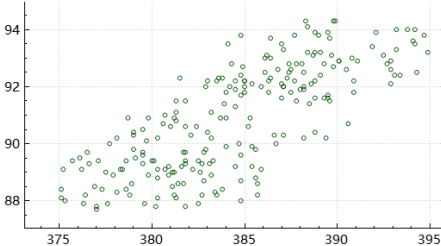
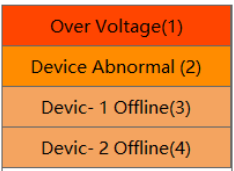
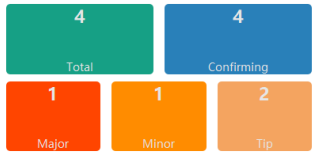

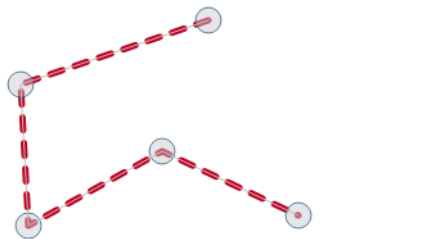
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<p>Progress Bar</p>		<p>Customizable value range Can display absolute or relative values Support numerical cross-border warning</p>
<p>Compass</p>		<p>Visually display angle data (0~360); Floating point data is supported.</p>
<p>Ring</p>	 <ul style="list-style-type: none"> Voltage(AC): 10.5 Current(AC): 88.4 Voltage(DC): 1201.1 Current(DC): 48.1 <ul style="list-style-type: none"> Voltage(AC): 0.8% Current(AC): 6.6% Voltage(DC): 89.1% Current(DC): 3.6% 	<p>Visually compare the numerical ratios of multiple pieces of data Customizable title</p>
<p>Battery</p>		<p>Display remaining power data; Supports defining data range and refresh step; Supports defining alert values and automatically matching alert colors.</p>

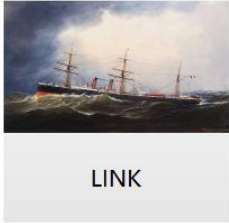
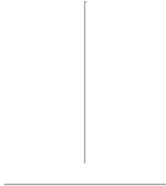

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<p>Thermometer</p>		<p>Visually display temperature data; Support custom range; Support negative temperature; Support floating point numbers; Supports modifying scale color.</p>
<p>Trend Chart</p>		
<p>Real-Time Curve</p>		<p>Display curves of up to 3 sets of data at the same time; Supports modifying the display time range; Maximum 24H data can be displayed; Supports modifying curve and coordinate axis colors.</p>
<p>Historical Curve</p>		<p>Display a historical data curve; Supports modifying the display time range; A maximum of 180 days of data can be displayed; Supports modifying curve and coordinate axis colors.</p>
<p>Bar Chart</p>		<p>Set the data refresh period to control the statistical interval of the column chart Customizable data span time Customizable column chart colors</p>

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<p>Scatter Plot</p>		<p>Show the relationship between two pieces of data; The two pieces of data correspond to the X\Y axis respectively;</p>
<p>Alarm Events</p>		
<p>Alarm Summary</p>		<p>The window displays all active alarms; Support dynamic change display.</p>
<p>Alarm Statistics</p>		<p>Display key statistical data of activity alarms; Automatically associate alarm function.</p>
<p>Page Layout</p>		
<p>Page Tabs</p>		<p>By clicking on different page labels, you can switch to different interface information displays.</p>
<p>Flow Line</p>		<p>Based on the basemap pipeline, add dynamic flow effects; Supports adjusting line color and width; Support multiple breakpoints; Supports associated device data to trigger flow or stillness.</p>

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Link Button		Supports uploading custom pictures as button icons, and jumping to the specified link after clicking. It is suitable for personalized navigation menus, brand cooperation portals, or visual classification guidance.
Divider		The dividing line for classified display of auxiliary controls.
Underlay Image		Used to partially increase picture display; Supports importing images from any local path; Supports commonly used image file formats.

3.16 Historical data

The historical data page provides the functions of persistent storage, display, printing, and export of device data, supports the generation of independent data files on a daily basis, and summarizes statistical information. This function requires authorization before use.

3.16.1 Add device data to be stored

The screenshot shows the 'Historical' page interface. At the top, there are navigation icons for Data, System, Alarm, History, and Flow. Below these is a menu bar with 'All Channels' and '[M]Station-1' selected. A red arrow points to the '+' button in the menu bar. The main area displays a table of historical data with columns: ID, Date/Time, Output Power, Duration, Day Electricity, All Electricity, Voltage(AC), Current(AC), Voltage(DC), and Current(DC). A dialog box titled 'Select Device Data' is open, showing a 'Device List' and a 'Data' list. The 'Device List' has '[M]Station-1' selected. The 'Data' list has checkboxes for 'Checked' next to 'Output Power', 'Operating Status', 'Duration', 'Day Electricity', 'All Electricity', 'Voltage(AC)', 'Current(AC)', 'Voltage(DC)', and 'Current(DC)'. Red circles and arrows indicate the steps: 1. Click the '+' button in the menu bar. 2. Select '[M]Station-1' in the device list. 3. Check the checkboxes for the data items to be stored. 4. Click the 'OK' button at the bottom of the dialog.

1 Click the "Add" button in the menu bar of the historical data page;

2 Select the device in the device list;

3 Check the device data items to be stored;

4 Click the OK button.

NOTICE

Avoid frequently modifying the storage configuration. It is recommended that the historical data storage function be enabled after the data configuration is debugged and stabilized.

Any changes in configuration related to historical data require restarting the software!

3.16.2 Common operations

ID	Date/Time	Output Power	Dur: 2h	Day Electricity	All Electricity	Vol: 5e(AC)	Cur: 7e(AC)	Volta: 9e(DC)	Curr
885	2026-06-28 10:59:34	61.8	100.2	57.6	638.9	386	89.8	1203.3	
884	2026-06-28 10:59:33	61.4	100.2	57.6	638.8	381.2	91.8	1201.3	
883	2026-06-28 10:59:32	61.4	100.2	57.6	638.8	381.2	91.8	1201.3	
882	2026-06-28 10:59:31	61.9	100.2	57.5	638.7	387.5	91.7	1202.5	

- ① Switch devices and view different data tables;
- ② Refresh the historical data display table. The background historical data will not actively update the table on the page. If you stay on the current page for a long time, you need to manually click the "Refresh" button to view the latest historical data records.
- ③ Switch the date for historical data refresh. In order to avoid loading too much data at the same time, only one day of data is loaded in the historical data display table at a time.
- ④ Filter time period, the filtering results will affect the data range of "Data Summary" and "Report Printing".
- ⑤ Filter the data columns that need to be presented.
- ⑥ Display summary information of historical data, and the software automatically calculates the

"maximum value", "minimum value" and "average value" of each loaded historical data.

- 7 View historical data curves;
- 8 Export historical data, you can customize the date range, and export data for multiple consecutive days from multiple devices at one time;
- 9 Print loaded historical data. Users can choose to print data columns, paper types and other information.
- 10 Modify historical data parameters, including storage interval, etc.
- 11 Historical data display table page turning and jumping functions.

3.16.3 NetDB Storage

This function implements the core configuration module for remote data interaction with various network databases. It is used to establish a stable connection between the software and the remote database server and realize real-time storage and synchronization of data.

The screenshot shows the MThings software interface with the 'History' tab selected. A 'Network DB Login' dialog box is open, displaying the following configuration parameters:

Arguments	Value
NetDB Storage	
DB Type	MYSQL
Host	192.168.3.99
Port	3306
Database Name	testdb
Username	root
Password	123456
Timeout(ms)	2000

Below the dialog box, a table displays historical data with columns: ID, Date/Time, Output Power, Duration, Day Electricity, All Electricity, Voltage(AC), Current(AC), Voltage(DC), and Current. The table contains 15 rows of data.

1. Preparation before configuration

- Confirm that the target database service has started

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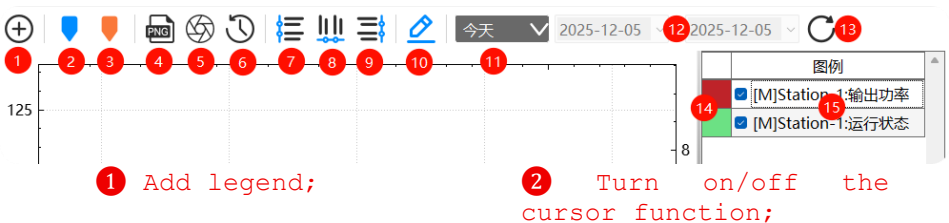
normally and the database has been created;

- Confirm that the database server IP and port are not blocked by the firewall, and the account has read and write permissions for the database;

2. Parameter configuration steps

- Enable network database: Click the "Network Database" switch in the interface, switch it to the on state, and activate all configuration items below;
- Select the database type: In the "Database Type" drop-down box, select the correct data type;
- Fill in the server information: Enter the database server IP in the "Host Address" column, and enter the access port in the "Port" column. After switching the database type, the default parameters of the response will be automatically filled in;
- Fill in the database account information: enter the target database name in "Database Name", enter the login account in "User Name", and enter the corresponding account password in "Password";
- Set the connection timeout: The "Timeout (ms)" column specifies the connection timeout (can be adjusted according to network stability, if the network is poor, it can be increased appropriately);
- Test connection: Click the "Test Connection" button below, the software will automatically verify the configuration parameters, and wait for the prompt that the connection is successful;
- Save the configuration: After the test connection passes, click the "OK" button to complete the network database configuration and save it; if the test fails, you need to check the parameters and retest.

3.16.4 Historical Data Curve



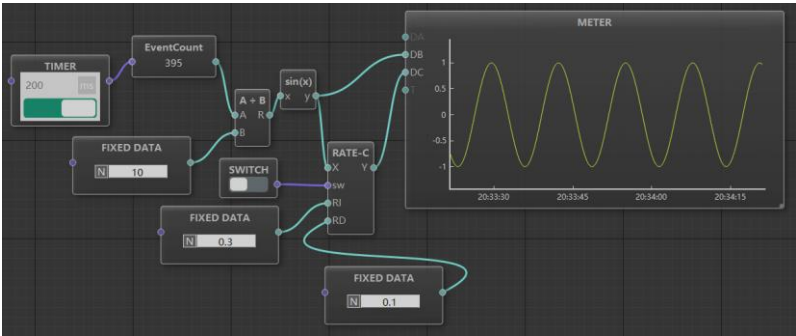
- 3 Turn on/off the reference line function;
- 4 Take a screenshot and save it as a PNG file;
- 5 Take screenshot to pasteboard;
- 6 Playback data files;
- 7 Edit left Y-axis parameters;
- 8 Display timeline parameters and support fine-tuning the timeline range;
- 9 Edit the right Y-axis parameters;
- 10 Edit legend parameters;
- 11 Switch the time range of historical data curve drawing;
- 12 When selecting a custom time period, modify the specific date here;
- 13 Manually refresh curve data;
- 14 Legend color can be modified by double-clicking;
- 15 Historical data curve legend list, click the legend name to highlight it.

3.17 Logic Control

The logic control function adopts an intuitive visual building block construction method, allowing users to easily implement complex data calculation and processing, control algorithm design, control algorithm simulation and verification, cross-device data synchronization, and digital and analog signal processing and other real-time control tasks at industrial sites.

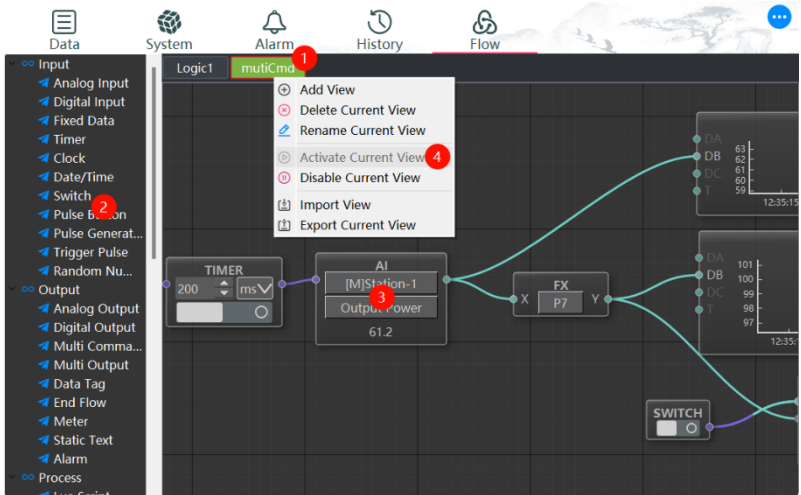
The logic control function simplifies the design process of the control flow in the form of component cross-link diagram. Under this framework, each component is equipped with input and output interfaces, so that different components can be flexibly connected through these interfaces to achieve smooth transmission of analog and digital quantities. Users can build the entire control system more intuitively and conveniently.

The picture below is a simple example:



The component provides an input interface (left side) and an output interface (right side). The interface types are divided into digital interfaces and analog interfaces. Different types of interfaces cannot be directly connected.

3.17.1 Basic operating procedures



- 1 Select an existing logical view at the top, or right-click the tab bar and select "New View".
- 2 Select the component from the left, press and drag it to the target location on the canvas.
- 3 Logic flow editing, drag lines from output ports to compatible input ports.
- 4 After completion, right-click the current label and select "Activate Current View", and the logical process will run immediately.

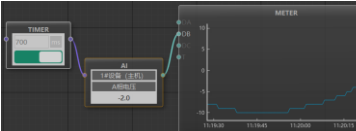
3.17.2 Global shortcut operations

OPERATE	SHORTCUT KEY	OPERATE	SHORTCUT KEY
Multiple component selections	Shift+mouse frame selection	Quickly copy components	Ctrl+D
Select all components	Ctrl+A	Remove component	Delete button

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Cancel last operation	Ctrl+Z	Cancel component selection	Esc key
Copy Chips	Ctrl+C	Zoom canvas	mouse wheel
Paste components	Ctrl+V		

3.17.3 Component introduction

Name	Component function	interface	Type	Interface function
Input				
Analog Input (AI)	Obtain real-time data collected by the device and import the logical process to support digital drive refresh	[Input] signal trigger	digital quantity	Trigger once, refresh once
		[Output]Analog	Analog quantity	Analog device data
Digital Input (DI)		[Input] signal trigger	digital quantity	Trigger once, refresh once
		[Output]Semaphore	digital quantity	Digital device data (0, 1)
Fixed Data (FIXED DATA)	Components can provide necessary fixed values, such as coefficients, parameters, etc., to other components. After the user changes the input defocus, it will take effect immediately. Click the name area below to modify the label name.	[Input] signal trigger	digital quantity	Trigger once, refresh once
		[Output]Analog	Analog quantity	fixed value set by user


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Name	Component function	interface	Type	Interface function
Timer (TIMER)	This component generally serves as the starting point of logic control and provides specified period (interval) trigger signals. The unit can be switched to milliseconds, seconds, minutes, hours, and days.	[Input] Start switch	digital quantity	Used for group control timer; High level is start; Low level means off;
		[Output] signal trigger	digital quantity	Periodic trigger signal
Clock (CLOCK)	This component supports single triggering at a specified date and time, and cyclic triggering at a specified time and interval of days.	[Input] Start switch	digital quantity	High level is start; Low level means off;
		[Output] signal trigger	digital quantity	Periodic trigger signal
Date/Time (DATE_TIME)	This component supports input of current system time data.	[Output]Y	Analog quantity	Year
		[Output]M	Analog quantity	moon
		[Output]D	Analog quantity	day
		[output]h	Analog quantity	hour
		[output]m	Analog quantity	point

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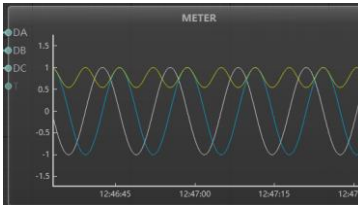
Name	Component function	interface	Type	Interface function
		[output]s	Analog quantity	Second
Switch (SWITCH)	This component continuously outputs a high-level or low-level digital quantity according to the user's manual operation.	[Output] switching signal	digital quantity	User assigned to high and low level signals
Pulse Button (BTN-P)	This component provides user operation buttons and supports users to manually trigger pulse signals (low->high->low), and the high level duration can be set.	[input]T	Analog quantity	High level duration Unit: ms; Range: >10ms; Default: 100ms.
		[Output]Y	digital quantity	high level pulse signal
		[Input]S	digital quantity	Set initial level (High: 1, Low: 0)
Pulse Generator (GEN-P)	This component provides pulse generation function, and users can customize the pulse shape and obtain highly customized pulse signals.	[Input]N	Analog quantity	Set the number of output high and low levels 2~10000
		[Input]HT	Analog quantity	High level duration 1~100000ms
		[Input]LT	Analog quantity	Low level duration 1~100000ms
		[input]X	digital quantity	start signal

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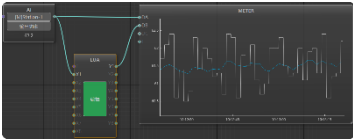
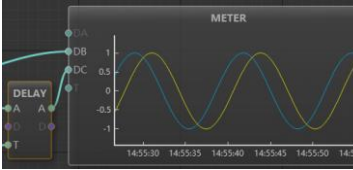
Name	Component function	interface	Type	Interface function
			ty	
		[Output]Y	digital quantity	pulse signal
Trigger Pulse (TP)	<p>This component sequentially generates rising and falling edge pulse waveforms based on the trigger input.</p> 	[input]X	digital quantity	trigger signal
		[Output]Y	digital quantity	pulse signal
Random Number (RAND)	<p>This component is used to generate random integers, with an output range of 0-10000.</p> 	[input]X	digital quantity	trigger signal
		[Output]Y	Analog quantity	random integer
Output				
Analog Output (AO)	<p>Write device command data in analog/digital form</p> 	[Output]Analog	Analog quantity	fixed value set by user
		[Input]Analog command	Analog quantity	Analog Device Instructions
Digital Output (DO)		[Input] enable switch	digital quantity	Execute write instructions after enabling

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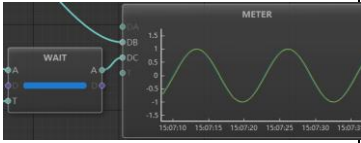
Name	Component function	interface	Type	Interface function
		[Input]Digital command	digital quantity	Digital device instructions
Data Tag (TAG)	Receive and display the value of an analog quantity.	[Input] data	Analog quantity	Receive the analog quantity to be displayed
End Flow (END)	The display indicates that the current branch has ended and there is no operation.	[Input]END	Analog quantity	No processing
Meter (METER)	Supports continuous wave recording of multi-channel analog data, the time axis range can be set, and the vertical axis range is automatically adjusted according to the value. Resizable window size.	[Input]DA	Analog quantity	A road data, color: white
		[Input]DB	Analog quantity	B road data, color: blue
		[Input]DC	Analog quantity	C road data, color: yellow
		[input]T	Analog quantity	The time span of the timeline Unit: seconds Default: 60 seconds Range: 1~6000 seconds
Static Text (TEXT)	Used to mark the information that needs to be explained in the logic control process. Double-click to modify the content.	None	/	/
Alarm	Used to visualize exceptions identified by digital quantities in control processes.	[Input] trigger signal	digital quantity	High level: red mark Low level: clear red



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Name	Component function	interface	Type	Interface function
Process				
Lua Script (LUA)	<p>This component is used to load and execute custom Lua script functions and can implement highly customized algorithms.</p> 	[input]T	digital quantity	Synchronous trigger signal, once connected, script execution is driven only by this trigger signal.
		[Input]X1-X8	Analog quantity	Script entry function input data
		[Output]Y1-Y8	Analog quantity	Script entry function output data
Delay (DELAY)	<p>Control the input data completion time offset according to the set delay time.</p> 	[Input]A	Analog quantity	Analog quantity to be processed
		[Input]D	digital quantity	Amount of numbers to be processed
		[input]T	Analog quantity	Offset time parameters Unit: ms Default: 0 ms Range: 10-6000ms
		[Output]A	Analog quantity	Processed analog quantity
		[Output]D	digital quantity	Processed digital quantity
Wait	According to the set waiting time,	[Input]A	Analog	Analog quantity to

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Name	Component function	interface	Type	Interface function
(WAIT)	<p>the current processing flow is suspended until the waiting time is over, and the component automatically forwards the input data (latest) to the output interface. This component can be used to sample and filter high-frequency data. The waiting time should not be close to or greater than the timer period.</p> 		quantity	be processed
		[Input]D	digital quantity	Amount of numbers to be processed
		[input]T	Analog quantity	Waiting time parameters Unit: ms Default: 0 ms Range: 10~6000ms
		[Output]A	Analog quantity	Processed analog quantity
Event Count (Event Count)	Count the number of input signal triggers and update the results to the output interface	[Input] signal trigger	digital quantity	Regardless of whether the level is high or low, it will be counted
		[Output] Count results	Analog quantity	Number of times it was triggered
Accumulator (ADD-UP)	Starting from 0, the data triggered by each input interface is accumulated.	[Input]Input data	Analog quantity /	
		[Output] Accumulated results	Analog quantity /	
Data Mux (DATA-MUX)	Provides multiple analog signal inputs and outputs the most	[Input]/[Output]	Analog quantity /	

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Name	Component function	interface	Type	Interface function
	recently triggered analog signal.		ty	
Bit Mux (BIT-MUX)	Provides multiple digital signal inputs and outputs the most recently triggered digital signal.	[Input]/[Output]	digital quantity	/
Data Buffer (BUFFER)	Provides analog data caching function, which is updated to the output interface according to the function switch status.	[input]X	Analog quantity	Analog data to be cached
		[input]sw	digital quantity	Output switch
		[Output]Y	Analog quantity	Output analog data
DAC	Digital-to-analog conversion, convert digital quantities into analog quantities	[Input]Digital signal	digital quantity	Amount of numbers to be processed
		[Output]Simulation data	Analog quantity	0, 1
ADC	Analog-to-digital conversion, convert analog quantities into digital quantities, where non-0 values correspond to True, and 0 values correspond to False	[Input]Simulation data	Analog quantity	Analog quantity to be processed
		[Output]Digital signal	digital quantity	True \ False
High Selector (>H)	Continuously identify three analog inputs and refresh the maximum value to the output interface. There is at least one valid input.	[Input]X1	Analog quantity	/
		[Input]X2	Analog	/

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Name	Component function	interface	Type	Interface function
			quantity	
		[Input]X3	Analog quantity	/
		[Output]Y	Analog quantity	/
Low Selector (>L)	<p>Continuously identify three analog inputs and refresh the minimum value to the output interface. There is at least one valid input.</p>	[Input]X1	Analog quantity	/
		[Input]X2	Analog quantity	/
		[Input]X3	Analog quantity	/
		[Output]Y	Analog quantity	/
Median Selector (MED)	<p>Continuously identify three analog inputs and refresh the intermediate value to the output interface. All three channels must have valid inputs at the same time, otherwise there will be no output.</p>	[Input]X1	Analog quantity	/
		[Input]X2	Analog quantity	/
		[Input]X3	Analog quantity	/
		[Output]Y	Analog quantity	/
Analog Switch	One digital switch controls two	[input]sw	digita	

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Name	Component function	interface	Type	Interface function
(SW-A)	input analog quantities and outputs analog quantities: sw=0: Y=X1 sw=1: Y=X2		1 quantity	
		[Input]X1	Analog quantity /	
		[Input]X2	Analog quantity /	
		[Output]Y	Analog quantity /	
Digital Switch (SW-D)	One digital switch controls two input digital quantities and outputs digital quantities: sw=0: Y=X1 sw=1: Y=X2	[input]sw	digital quantity	
		[Input]X1	digital quantity /	
		[Input]X2	digital quantity /	
		[Output]Y	digital quantity /	
Set Priority (SET-P)	Components respond to input signals according to predetermined "set signal" precedence rules. Even if a lower priority "reset signal" exists at the same time, the component ensures that the	[Input]S	digital quantity	Set signal
		[input]R	digital quantity	reset signal

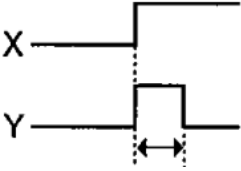
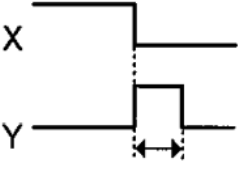
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Name	Component function	interface	Type	Interface function																
	signals are output in order of importance to ensure the safety of the process.		quantity																	
	<table border="1"> <thead> <tr> <th>S</th> <th>R</th> <th>Y</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>Keep</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	S	R	Y	0	0	Keep	0	1	0	1	0	1	1	1	1	[Output]Y	digital quantity	Output signal	
S	R	Y																		
0	0	Keep																		
0	1	0																		
1	0	1																		
1	1	1																		
RESet Priority (RESET-P)	Components respond to input signals according to predetermined "set signal" precedence rules. Even if a lower priority "reset signal" exists at the same time, the component ensures that the signals are output in order of importance to ensure the safety of the process.	[Input]S	digital quantity	Set signal																
		[input]R	digital quantity	reset signal																
		<table border="1"> <thead> <tr> <th>S</th> <th>R</th> <th>Y</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>Keep</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> </tr> </tbody> </table>	S	R	Y	0	0	Keep	0	1	0	1	0	1	1	1	0	[Output]Y	digital quantity	Output signal
		S	R	Y																
0	0	Keep																		
0	1	0																		
1	0	1																		
1	1	0																		
On Delay (DELAY-ON)	Detect the input digital quantity X, identify the rising edge (0->1), and delay the output rising edge according to the set time T. If the input digital quantity does not maintain a high level within the T time, no rising edge will be output.	[input]T	Analog quantity	Delay time Unit: ms Default value: invalid Range: 0~6000ms																
		[input]X	digital quantity	/																
		[Output]Y	digital quantity	/																

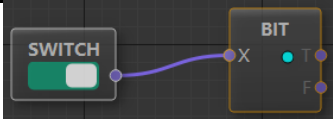
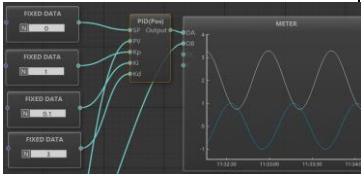
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Name	Component function	interface	Type	Interface function
Off Delay (DELAY-OFF)	<p>Detect the input digital quantity X, identify the falling edge (1->0), and delay the output of the falling edge according to the set time T. If the input digital quantity does not remain low within the T time, no falling edge will be output.</p>	[input]T	Analog quantity	Delay time Unit: ms Default value: invalid Range: 0~6000ms
		[input]X	digital quantity /	
		[Output]Y	digital quantity /	
delayed clearing (DELAY-C)	<p>Detect the input digital quantity X, identify the rising edge (0->1), and the output immediately follows the rising edge. According to the set time T, the falling edge is output after expiration. If the input signal has a falling edge within T time, the falling edge will be output immediately.</p>	[input]T	Analog quantity	Delay time Unit: ms Default value: invalid Range: 0~6000ms
		[input]X	digital quantity	
		[Output]Y	digital quantity	

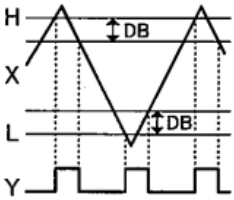
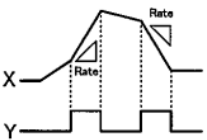
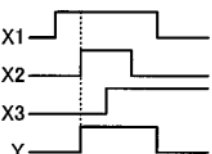
MThings User Manual

Name	Component function	interface	Type	Interface function
Trigger On (RISE-P)	<p>Detect the input digital quantity X, identify the rising edge (0->1), and immediately output a level pulse signal. The pulse duration is consistent with the set time T.</p> 	[input]T	Analog quantity	pulse duration Unit: ms Default value: invalid Range: 0~6000ms
		[input]X	digital quantity	/
		[Output]Y	digital quantity	/
Trigger Off (FALL-P)	<p>Detect the input digital quantity X, identify the falling edge (1->0), and immediately output a level pulse signal. The pulse duration is consistent with the set time T.</p> 	[input]T	Analog quantity	pulse duration Unit: ms Default value: invalid Range: 0~6000ms
		[input]X	digital quantity	/
		[Output]Y	digital quantity	/
Check Bit (BIT)	<p>Detect the input digital quantity X, visually identify the high and low level status of the signal, and provide two (T, F) digital outputs.</p>	[input]X	digital quantity	Enter digital quantity
		[Output]T	digital quantity	When X=1, T=1;

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Name	Component function	interface	Type	Interface function
			ty	
		[Output]F	digital quantity	When X=0, F=0;
Advanced				
Positional PID (PID(Pos)) Incremental PID (PID(Incr))	<p>The positional PID controller adjusts the control amount by calculating the current value of the deviation, while the incremental PID controller adjusts the control amount by calculating the increment of the deviation.</p> 	[Input]SP	Analog quantity	control target value
		[Input]PV	Analog quantity	Sampling value/feedback value should be connected to an "analog input"
		[Input]Kp	Analog quantity	proportional gain
		[input]Ki	Analog quantity	integral gain
		[Input]Kd	Analog quantity	Differential gain
		[Output]Output	Analog quantity	The setting value should be connected to an "analog output"
Over Limit (H/L)	According to the set analog upper limit, lower limit, and dead zone parameters, determine whether an analog input exceeds the limit. If it exceeds the limit, output a high-level digital quantity (1),	[Input]H	Analog quantity	Set upper limit
		[Input]L	Analog quantity	Set lower limit value

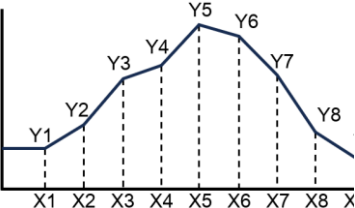
MThings User Manual

Name	Component function	interface	Type	Interface function
	<p>otherwise, output a low-level digital quantity (0).</p> 	[Input]DB	Analog quantity	Set dead zone value
		[input]X	Analog quantity	Analog quantity to be determined
		[Output]Y	digital quantity	Judgment result
Rate Change (RATE-M)	<p>Determine whether the change rate of one analog quantity is greater than the set value.</p> <p>The change rate includes rise rate and fall rate, unit: 1/second.</p> 	[input]R	Analog quantity	Set rate of change
		[input]X	Analog quantity	Analog quantity to be determined
		[Output]Y	digital quantity	Yes, output high level (1) No, output low level (0)
Redundancy Control (M/N)	<p>By setting the total number of digital inputs N and the number of activations M, multi-channel digital redundant control can be achieved.</p> 	[Input]X1~X6	digital quantity	The user can specify the number of valid digital input channels N
		[Output]Y	digital quantity	When channel M is high level at the same time, it outputs high level, otherwise it outputs low level.
Limiter (LIMITER)	<p>According to the set upper and lower limits of the amplitude, control the input analog quantity</p>	[Input]H	Analog quantity	Set upper limit

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Name	Component function	interface	Type	Interface function
	<p>so that the output data peaks and valleys are filled.</p>	[Input]L	Analog quantity	Set lower limit value
		[input]X	Analog quantity	Analog quantity to be processed
		[Output]Y	Analog quantity	Processed analog quantity
Ramp Controller (RATE-C)	<p>In order to ensure that the change rate of the output variable remains within a predetermined range, the change rate of the input analog quantity is limited to prevent the system from overshooting or instability due to rapid changes, thereby protecting the system from the impact of sharp changes and ensuring smooth and stable operation of the system.</p>	[input]X	Analog quantity	Analog quantity to be processed
		[Input]RI	Analog quantity	Set maximum rising rate (1/second)
		[Input]RD	Analog quantity	Set maximum drop rate (1/second)
		[input]sw	digital quantity	enable switch
		[Output]Y	Analog quantity	Processed analog quantity
Polyline (FX)	<p>This component allows for greater flexibility in adjusting the output for more refined and personalized control. Components are linearly mapped by being predefined to a set of coordinate points (Xn, Yn). During operation, the component searches for the corresponding Y value in the</p>	[input]X	Analog quantity	Analog quantity to be processed
		[Output]Y	Analog quantity	Y value mapped from polyline When $X < X_1$, $Y = Y_1$; When $X > X_9$, $Y = Y_9$;

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Name	Component function	interface	Type	Interface function
	<p>preset polyline based on the input analog quantity X, thereby dynamically generating control instructions.</p> 			

Logic Gate

AND,	logic gate processing	[Input]X1	digital quantity /	
or (OR),	AND $Y = X1 \text{ AND } X2$	[Input]X2	digital quantity /	
Not (NOT),	Or $Y = X1 \text{ OR } X2$			
Exclusive OR (XOR)	NOT $Y = \text{NOT } X1$ XOR $Y = X1 \text{ XOR } X2$	[Output]Y	digital quantity /	

Calculation

Number sum (A+B)		[Input]A	Analog quantity /	
Digital difference (A-B)	Analog basic computing components	[Input]B	Analog quantity /	
Numeric product (AxB)				
Digital Quotient (A÷B)		[Output]R	Analog quantity /	

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Name	Component function	interface	Type	Interface function
Impression taking (plastic surgery) (A%B)	Find the remainder operation: R = A % B	[Input]A	Analog quantity	/
		[Input]B	Analog quantity	/
		[Output]R	Analog quantity	/
Modulo (floating point) (mod(A,B))	Find the remainder operation: R = mod(A, B)	[Input]A	Analog quantity	/
		[Input]B	Analog quantity	/
		[Output]R	Analog quantity	/
ABS (ABS)	y = abs(x)	[input]x	Analog quantity	/
		[output]y	Analog quantity	/
Rounding (ROUND)	Floating point data rounding operation supports "truncation", "rounding", "rounding up" and "rounding down".	[input]x	Analog quantity	/
		[output]y	Analog quantity	/
Negate (-X)	y = -x	[input]x	Analog quantity	/

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Name	Component function	interface	Type	Interface function
		[output]y	Analog quantity	/
Sine function (sin)		[input]x	Analog quantity	radian
Cosine function (cos)	For trigonometric function operations, the inputs are all radian data.			
tangent function (tan)		[output]y	Analog quantity	real numbers
Cotangent function (cot)				
arcsine function (asin)		[input]x	Analog quantity	real numbers
Arc cosine function (acos)	Inverse trigonometric function operation, the inputs are all real numbers.			
Arctangent function (atan)		[output]y	Analog quantity	radian
square root (sqrt)	$y = \sqrt{x}$	[input]x	Analog quantity	/
		[output]y	Analog quantity	/
Exponential function (A^B)	$R = A^B$	[Input]A	Analog quantity	/
		[Input]B	Analog quantity	/
		[Output]R	Analog	/

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Name	Component function	interface	Type	Interface function
			quantity	
Logarithmic function (log)	$R = \log_A B$	[Input]A	Analog quantity	/
		[Input]B	Analog quantity	/
		[Output]R	Analog quantity	/
log(x, y) (log10)	$y = \log_{10} x$	[input]x	Analog quantity	/
		[output]y	Analog quantity	/
ln(x)	$y = \log_e x$ or $y = \ln(x)$	[input]x	Analog quantity	/
		[output]y	Analog quantity	/

Relation

Comparator (>)	Compare two analog values and give two digital results. Generally used for control flow branch processing.	[Input]A	Analog quantity	/
		[Input]B	Analog quantity	/
		[Output]T	digital quantity	When A>B, T=1;

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Name	Component function	interface	Type	Interface function
			ty	
		[Output]F	digital quantity	When $A \leq B$, $F=0$;
Comparator (\geq)	Compare two analog values and give two digital results. Generally used for control flow branch processing.	[Input]A	Analog quantity	/
		[Input]B	Analog quantity	/
		[Output]T	digital quantity	When $A \geq B$, $T=1$;
		[Output]F	digital quantity	When $A < B$, $F=0$;
Comparator ($=$)	Compare two analog values and give two digital results. Generally used for control flow branch processing.	[Input]A	Analog quantity	/
		[Input]B	Analog quantity	/
		[Output]T	digital quantity	When $A = B$, $T=1$;
		[Output]F	digital quantity	When $A \neq B$, $F=0$;

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Name	Component function	interface	Type	Interface function
Comparator (Between)	Compare three analog values and give two digital results. Generally used for control flow branch processing.	[Input]A	Analog quantity	/
		[Input]B	Analog quantity	/
		[Input]C	Analog quantity	/
		[Output]T	digital quantity	When $A \leq C \leq B$, $T=1$;
		[Output]F	digital quantity	When $C < A$, $C > B$, $F=0$;

3.18 Gateway

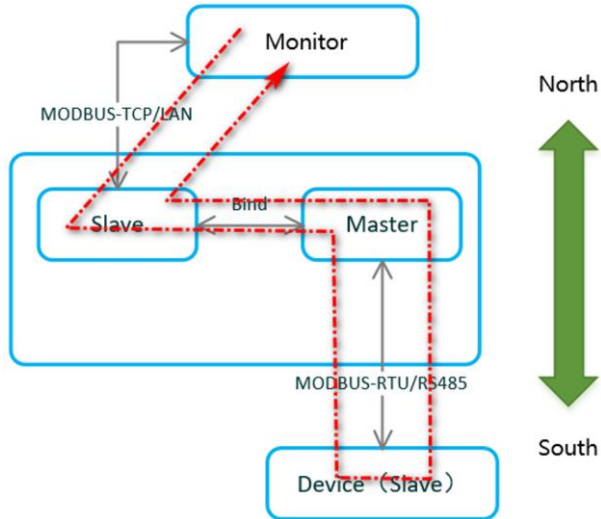
The data gateway function provides protocol conversion and data aggregation functions, which can realize bidirectional conversion of different channel types, protocol types, device addresses, register addresses, data blocks, data types, and data lengths. This function requires authorization before use.

The software supports two modes to implement the data gateway function, namely: transparent transmission mode and cache mode.

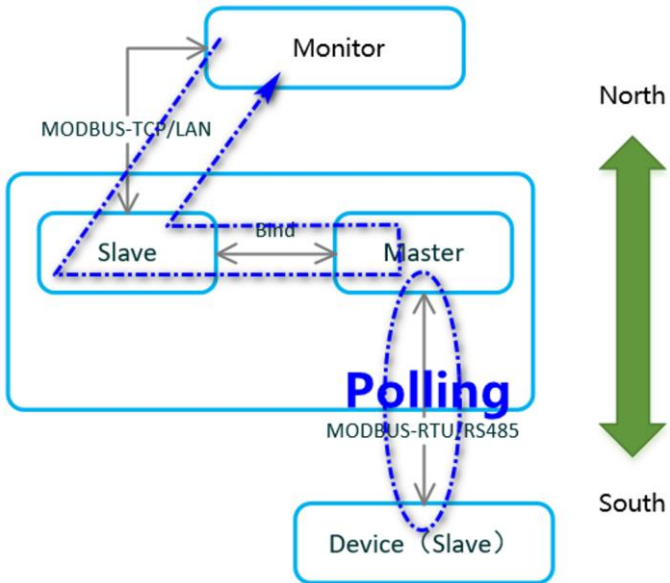
The transparent transmission mode is simple to configure, but the delay in the whole process is larger than that in the northbound direction. The cache mode uses the polling function of the field device itself to directly respond to northbound requests, which can decouple northbound and southbound facilities. The northbound remote monitoring software can achieve more efficient asynchronous communication.

With the help of the "association mode" in the simulated slave data, multiple southbound device data can be aggregated into a northbound simulated slave, which can significantly reduce the number of requests for northbound remote monitoring software and improve polling efficiency. In this mode, a wider range of data conversion capabilities can be achieved. For configuration instructions, refer to: Chapter 3.11.

The data flow in transparent transmission mode is as follows:



The cache mode data flow is as follows:

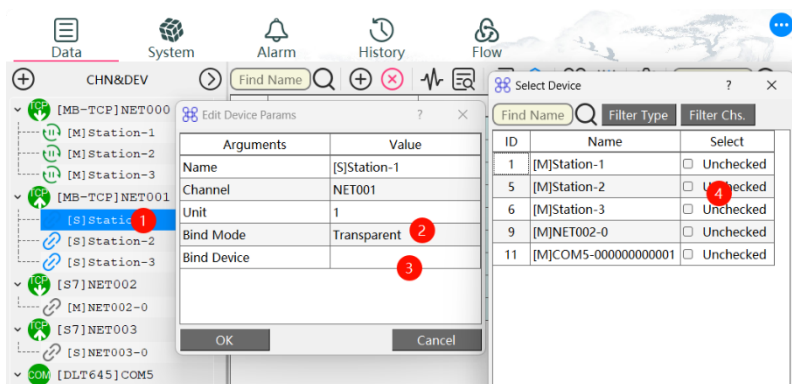


3.18.1 Transparent transmission mode application

The software supports the association of two different devices (simulation slave and field device) through transparent transmission mode to realize channel, protocol, and device address conversion functions.

Preparation:

- 1) Create a field device and connect to the southbound serial port device;
- 2) Create a new network link to connect to the northbound software;
- 3) Based on the new network link, a new simulated slave is added;



1 Double-click the newly created slave device.

2 Double-click the binding mode and select the transparent

transmission mode.

3 Double-click to bind the device.

4 Select the bound device.

After device association and link establishment, the northbound "remote monitoring software" can use Ethernet to access the southbound serial device.

NOTICE

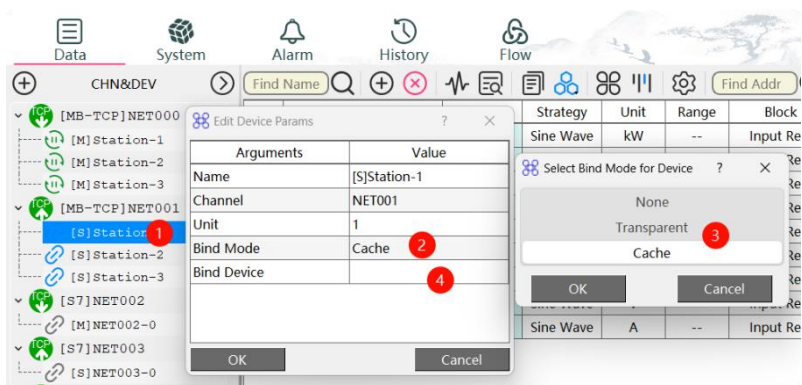
The slave in transparent transmission mode does not need to configure device data.

3.18.2 Cache mode application

The software supports the association of two different devices (simulation slave and field device) through cache mode to realize channel, protocol, and device address translation functions.

Preparation:

- 1) Create a field device and connect to the southbound serial port device;
- 2) Create a new network link to connect to the northbound software;
- 3) Based on the new network link, a new simulated slave is added;



1 Double-click the slave device.

2 Double-click the binding mode.

3 Select cache mode and save.

4 Bind the device that needs to forward data externally.

NOTICE

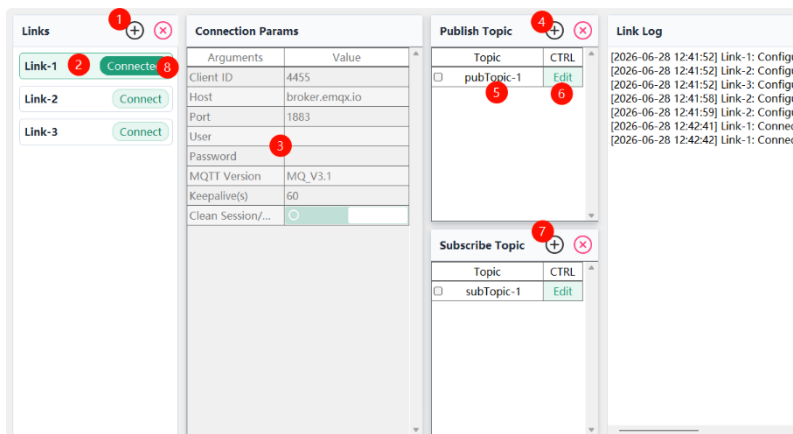
The slave in cache mode does not need to configure device data, but its associated field device should configure valid data and initiate polling.

In cache mode, if the request data of the northbound monitoring software exceeds the configuration of the southbound device, 0 will be automatically added.

3.19 MQTT Forwarding

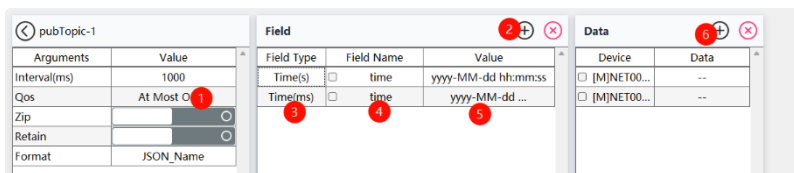
For the data collection and instruction transmission needs of IoT devices, the MQTT forwarding function provides functions such as multi-link, multi-topic, multi-device, long link, multi-version compatibility, JSON serialization, custom reporting (interval, data), ZIP compression, subscription and publishing dual channels, etc., to achieve efficient conversion of the full range of MQTT and MODBUS protocols.

You can enter this function page through the "MQTT forwarding" sub-item in the More Functions menu.



- ① Add or remove links. double-click to modify.
- ② Link list, double-click to modify the link name.
- ③ MQTT link parameters.
- ④ Add or remove publishing topics.
- ⑤ Publish topic name, double-click to modify.
- ⑥ Configure the publishing topic parameter entrance.
- ⑦ Add or remove subscription topics.
- ⑧ Start or close the MQTT link.

The MQTT publishing topic configuration is as follows:



① Modify the key parameters of the published topic.

② Add or remove custom fields.

③ Double-click to modify the field type.

④ Double-click to modify the field name.

⑤ Double-click to modify the field value.

⑥ Add or remove device data.

The publishing topic data format (JSON data name) is as follows:

```
{
  "datas": [
    {
      "device": "[M]Station-1",
      "name": "运行状态",
      "value": "0"
    },
    {
      "device": "[M]Station-2",
      "name": "运行状态",
      "value": "0"
    }
  ],
  "time": "2024-04-06 20:43:56"
}
```

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The publishing topic data format (JSON data address) is as follows:

```
{
  "datas": [
    {
      "addr": "102",
      "device": "[M]Station-1",
      "type": "3",
      "value": "0"
    },
    {
      "addr": "102",
      "device": "[M]Station-2",
      "type": "3",
      "value": "0"
    }
  ],
  "time": "2024-04-06 20:43:06"
}
```

The subscription topic data format (JSON data name) is as follows:

```
{
  "cmd": [
    {
      "devicename": "[M]COM1-001",
      "dataName": "Data1",
      "value" : "45.5789"
    }
  ]
}
```

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The subscription topic data format (JSON data address) is as follows:

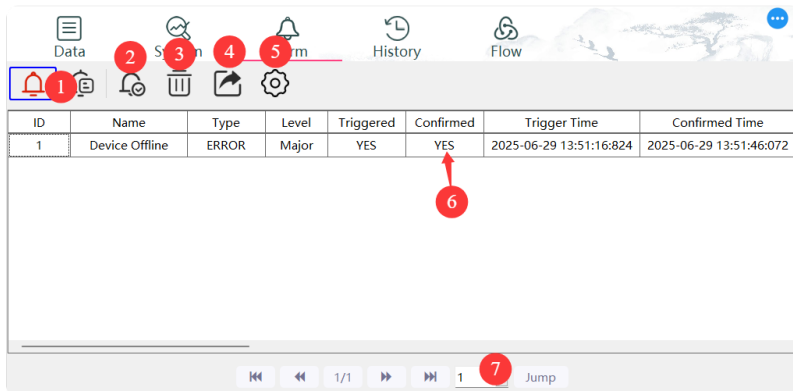
```
{
  "cmd": [
    {
      "devicename": "[M]COM1-001",
      "dataType": "2",
      "dataAddr": "0",
      "value": "45.5789"
    }
  ]
}
```

The data types are defined as follows:

DATA BLOCK	DATATYPE
coil status	0
discrete input	1
holding register	2
input register	3

3.20 Alarm data

The alarm data page provides device alarm generation, storage, configuration, display, export functions, and voice prompts. It supports multi-condition and cross-device generation of alarm information. Reference standards: "IEC 62682:2014", "GB/T 41261-2022 Process Industry Alarm System Management". This function requires authorization before use.



① Switch the alarm record type. Active alarms are divided into two categories: "confirmation required" and "confirmation not required". Active alarm records that need to be confirmed must be restored and confirmed before they can be converted into historical alarms.

② Maintain the alarm configuration portal.

③ Clear all alarm records with one click.

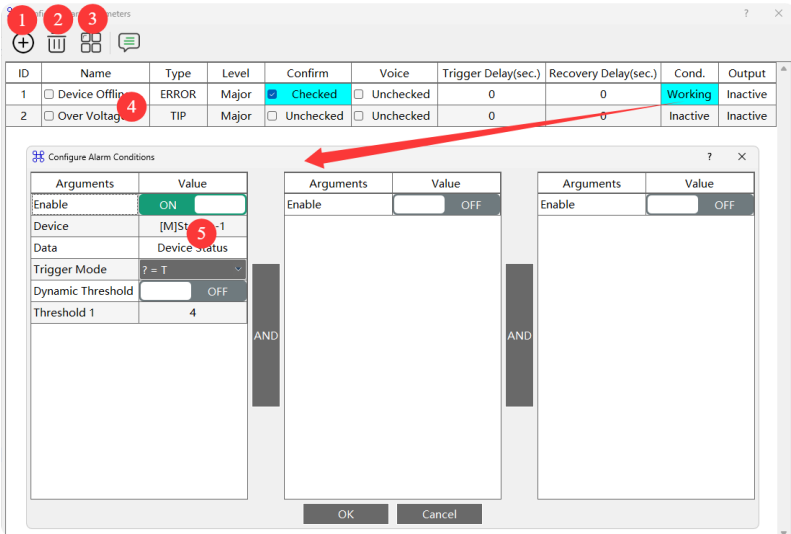
④ Confirm all active alarms that need to be acknowledged with one click.

⑤ Export all alarm records in csv format.

⑥ Double-click to confirm an active alarm record.

⑦ Alarm data display table page turning and jumping functions.

The alarm configuration function is as follows:



- 1 Add an alarm configuration.
- 2 Remove the selected alarm configuration.
- 3 Edit alarm types to classify different alarm configurations.
- 4 Double-click to edit the alarm conditions.
- 5 Alarm condition configuration dialog box.

The alarm information configuration table parameters are defined as follows:

ARGUMENTS	USAGE & CONFIGURATION METHOD
Name	Specify the alarm name.
Type	According to the pre-configured alarm type table, select the type of the current configuration.
Level	Optional: important, minor, reminder.

Voice Prompt	After checking the option, different voice prompts will be issued according to the fault level.
Manual Confirm	Specify whether the current alarm configuration requires user confirmation.
Generation delay (seconds)	To prevent alarm jitter, set the alarm generation delay. Only when the alarm conditions are continuously established within this time period can active alarm records be generated.
Recovery delay (seconds)	To prevent alarm jitter, set the alarm recovery delay. The active alarm can be marked as recovered only if the alarm condition continues to be untrue within this time period.
Condition 1	Alarm triggering condition 1
Relation	Logical relationship between alarm triggering conditions 1 and 2
Condition 2	Alarm trigger condition 2
Relation	The logical relationship between alarm triggering conditions 2 and 3
Condition 3	Alarm triggering condition 3

The alarm condition configuration table parameters are defined as follows:

ARGUMENTS	USAGE & CONFIGURATION METHOD
Enable	After enabling this trigger condition, turn on this switch.
Device	Select the associated device.
Data	Select associated device data.
Trigger Mode	Select the trigger type, optional: greater than, greater than or equal to, equal to, not equal to, less than or equal to, less

	than, between, and not between.
Dynamic Threshold	Turn on the switch to select other device data as the threshold
Target Device 1	Select device as threshold 1
Target Data 1	Select data as threshold 1
Target Device 2	Select device as threshold 2
Target Data 2	Select data as threshold 2
Threshold 1	Conditional judgment threshold matching the triggering method.
Hysteresis 1	The hysteresis width when the condition is not met. It does not take effect in the "equal to" or "not equal to" trigger mode.
Threshold 2	Only applies to "between" and "not between" triggering modes.
Hysteresis 2	Only applies to "between" and "not between" triggering modes.

3.20.1 Add device abnormality alarm

Equipment abnormality alarms are a key mechanism to maintain system security and stable operation. It can monitor the status of equipment in real time and issue an alarm immediately if an abnormality is detected, allowing operators to respond quickly and take necessary measures to prevent failures, reduce downtime, and avoid potential safety risks.

The device status values are defined as follows:

VALUE	MEANING
0	Device idle

1	Device communicating
2	Device data abnormality
3	Device is disabled
4	Device link abnormality

The device abnormality alarm configuration is as follows:

The screenshot shows the MThings Alarm Configuration interface. At the top, there is a navigation bar with icons for Data, System, Alarm (highlighted), History, and Flow. Below the navigation bar is a table of active alarms. One alarm is selected, opening a "Configure Alarm Parameters" dialog box. This dialog box contains a table for alarm parameters and three "Configure Alarm Conditions" sections. Red circles 1-4 mark key actions: 1. Clicking the "Configure" button in the top bar; 2. Clicking the "+" button in the "Configure Alarm Parameters" dialog; 3. Selecting "Device Status" in the "Data" dropdown; 4. Entering "4" in the "Threshold 1" field.

① Click the alarm "Configure" button to enter the alarm parameter configuration page.

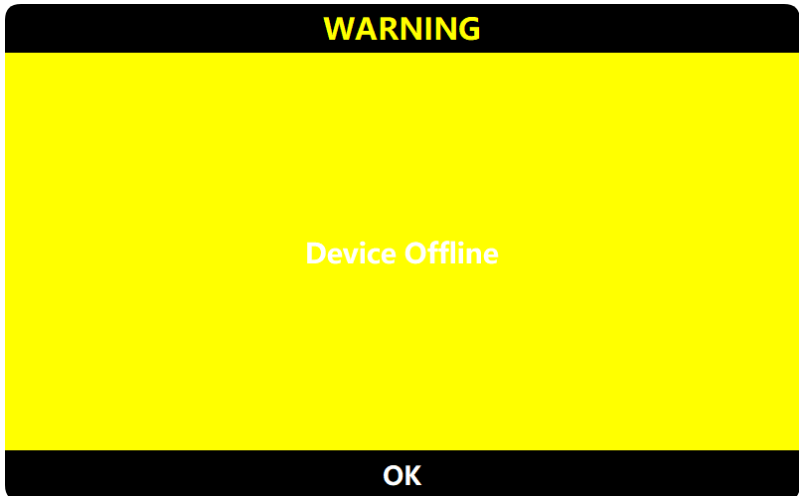
② Add an alarm configuration, define various parameters of device abnormal alarm, double-click the condition cell to start configuring alarm conditions.

③ After double-clicking, select the "Device Status" data.

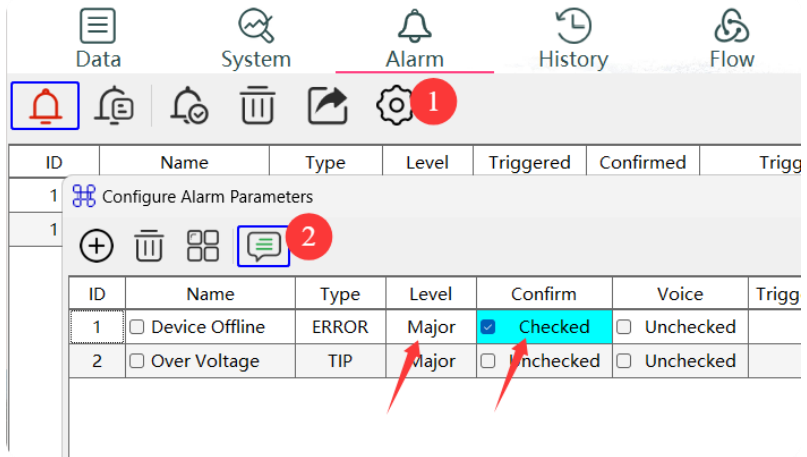
④ Select "=?=T" as the trigger method, and enter 4 as the threshold (device link abnormality).

3.20.2 Pop-up Alarm

The alarm pop-up window is an intuitive and efficient user interface element. It automatically pops up when an important alarm that requires manual confirmation is detected during the running of the software, ensuring that users can receive key information in a timely manner and avoid potential risks and errors. Alarm pop-ups will interrupt users' normal operations and force users to pay attention to and respond to these urgent or important prompts.



The instructions for enabling the alarm pop-up window are as follows:



- ① Click the alarm "Configure" button to enter the alarm parameter configuration page.
- ② Click the "Alarm pop-up window" option to enable or disable the pop-up window function.

3.21 Frame Test

The software supports users to send customized messages based on the created field devices, and the messages must comply with the MODBUS protocol requirements.

Users only need to fill in the PDU part of the message, and the software automatically adapts to the protocol type used by the device, adds the beginning and end of the message, and finally sends the complete message.

The message test function supports statistics on message request delay time and continuous curve monitoring of delay time, which can be used to observe the performance and reliability of the slave machine.

This function page can be entered through the "Message Test" sub-item in the More Functions menu.

NOTICE

The message test function only serves field devices and can use standard function codes or customized function codes.

Before performing the message test operation, please confirm whether the current target device is correct.

ID	Name	PDU of Frame	Delay(ms)	Timeout(ms)	Interval(ms)	Delay Curve
7	Test1	04 00 64 00 02	10	11	12	<input checked="" type="checkbox"/> 13
2	Test2	04 00 32 00 02	0	5000	0	<input type="checkbox"/> Unchecked

- 1 Switch devices.
- 2 Click the "New" button to create a new message test request line.
- 3 Click the "Remove" button to delete the checked message test request information row.
- 4 Click the "Curve" button to open the "Real-time Data Curve Display" to view the delay time curve data.
- 5 Click the "Send" button to send the checked message test request information.
- 6 If you need to send in a loop, check "Send in a loop".
- 7 Used to enter custom message PDU.
- 8 Displays the delay time between the message test request and response, which cannot be edited.
- 9 You can configure the timeout period for the current line's message test request, that is, the maximum allowed reply time range. If this time is exceeded, the request is deemed to have timed out.
- 10 You can configure the waiting time after the end of the message test & response of the current line.

The next request can be initiated only after the interval ends.

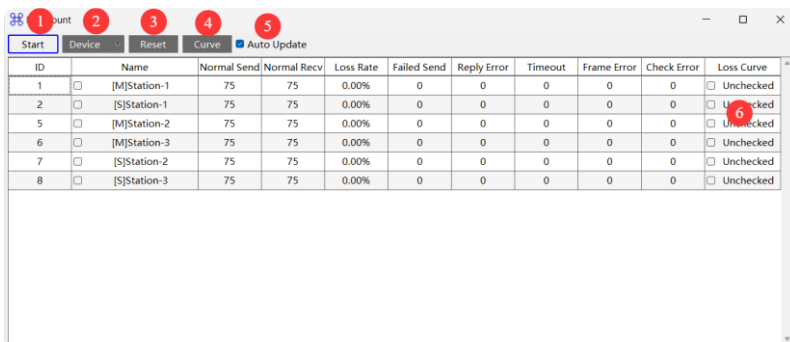
① After selecting, the software will monitor the delay time of the message test request in this line as the data curve for a long time.

3.22 Packet statistics

The software supports field devices and simulated slave devices to synchronize statistics on message interaction data during the communication interaction process.

- By identifying various sending and receiving situations, the packet loss rate can be accurately counted and abnormal types can be subdivided.
- Supports continuous curve monitoring of packet loss numbers for users to identify packet loss patterns.
- Supports statistics in two different dimensions: channel and device. You can view the total data under the link at the same time, and you can also view the statistics of each device.

This function page can be entered through the "Link Statistics" sub-item in the More Functions menu.



① When the software starts, the statistics function is turned off by default. You need to click the "Start" button to start the statistics function.

② Used to switch the dimensions of statistical results, divided into devices and links. When you select a device, the statistical data list contains statistical results for all communication devices. When you select a link, the statistics list contains statistical results for all communication links.

- ③ Click the "Reset" button to reset all statistics to 0 and start counting again.
- ④ Click the "Curve" button to open the "Real-time Data Curve Display" to view the packet loss curve.
- ⑤ Check "Auto Refresh", the data in the table will be continuously refreshed, otherwise, the data in the table will be temporarily refreshed.
- ⑥ Select the object that requires continuous curve monitoring of packet loss.

The statistical data items are defined as follows:

DATA	MEANING
Send OK	Successfully sent to link
Recv OK	Receive normal host request or slave reply data
Loss Rate	Only for field devices Packet loss rate (%) = $100 * (\text{normal sending} - \text{normal receiving} - \text{abnormal response}) / \text{normal sending}$
Send Failed	Data cannot be sent due to link abnormality
Reply Error	The slave replies with an exception frame (request function code + 0X80)
Timeout	No normal response frame received from slave
Frame Error	The received data cannot be parsed normally
Check Error	The received message has the following verification error: CRC, LRC, frame number, protocol type

NOTICE

There must be device communication packets during the statistics process, and statistics during the packet capture process are not supported.

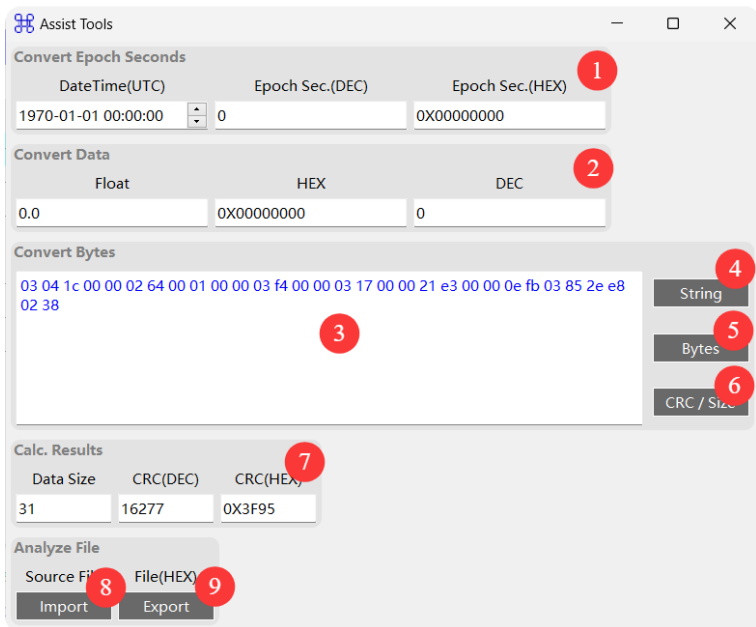
If abnormal packets appear in the link and the address of the device to which they belong cannot be identified, such abnormal packets will be classified as "other" devices.

It is recommended that original messages be stored synchronously during the statistics process to facilitate problem analysis.

3.23 Accessibility gadgets

The software provides a number of auxiliary tools to help with advanced packet data analysis.

You can enter this function page through the "Accessibility" sub-item in the More Functions menu.



1 The conversion between epoch seconds and standard time (UTC) supports respective modifications and automatic synchronization.

2 Different types of numerical conversions support respective modifications and automatic synchronization.

3 BYTES processing function, input the BYTES or string to be analyzed.

4 BYTES processing function, click the "String" button to convert the input code stream into string format. For example, the code stream "31 32 33 34 35 36 37 38 39 30" can be converted into "1234567890".

5 BYTES processing function, click the "Code Stream" button to convert the input string into a code stream. For example, the string "1234567890"

can be converted into "31 32 33 34 35 36 37 38 39 30".

⑥ With the BYTES processing function, click the "CRC/Size" button to statistically calculate the CRC16 and byte number of the code stream data. The results are displayed below.

⑦ Display the binary calculation results of the code stream and imported files.

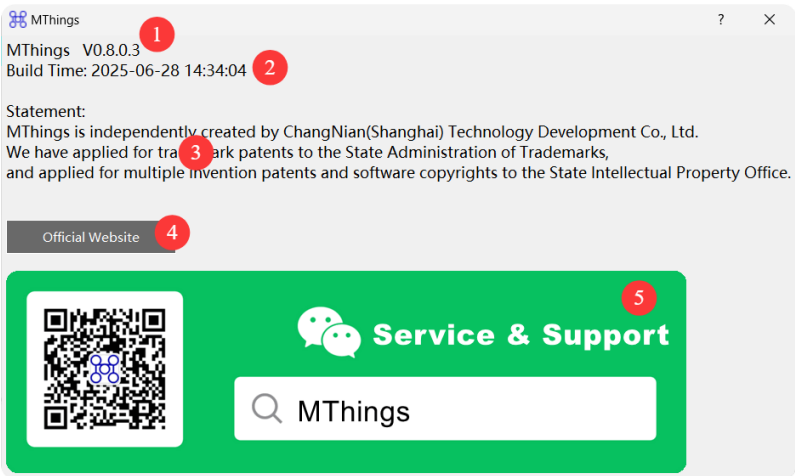
⑧ File analysis function, click the "Import" button to import a binary file. The software will analyze the byte length of the file and the total CRC16 of the file. The results are displayed above.

⑨ File analysis function, click the "Export" button, the software will convert the imported binary source file into a code stream text file.

3.24 about

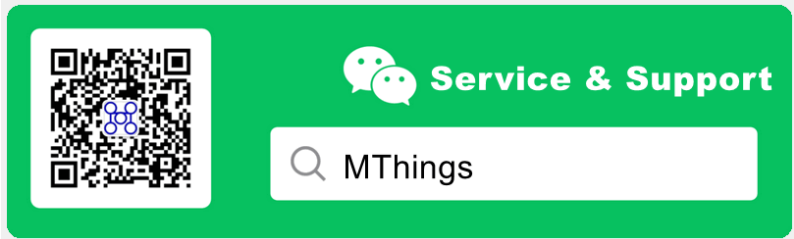
The About page mainly provides software version information, change records, copyright statements, and contact information.

You can enter this function page through the "About Us" sub-item in the More Functions menu.



- 1 Current version number of the software, key information for problem feedback.
- 2 The build time of the current version of the software and key information for problem feedback.
- 3 Copyright Notice.
- 4 Click the "Contact Us" button to open the official website of the software.
- 5 If you need to communicate with feedback and obtain software release information as soon as possible, please refer to the contact information in the picture.

4 Contact Us



Email: mthings986@163.com

Official website: gulink.cn

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