

MThings

User Manual

About This Manual

This manual serves the software of "MThings" which independently developed by ChangNian (Shanghai) Technology Development Co., Ltd.

Objective

The purpose of this manual is to provide readers with instructions for using the software.

Manual Usage

Please read this manual carefully before using this product. The content of the manual will be updated constantly, but it is inevitable that there will be slight discrepancies or errors. Please leave message to us by email: mthings2023@163.com.

1 Software Overview

MThings is an upper computer software based on the MODBUS protocol for industrial control operation and maintenance.

1.1 Key Features



1.2 Version differences

MThings provide two versions: **Personal Version** and **Commercial Version**. The personal version is designed for personal use, with permanent free features, no technical services, and no consequences of use. At the same time, the system built by users is prohibited from commercial use. The commercial version is aimed at industrial and commercial users, providing comprehensive features that require payment for authorization before use. Authorization is one-time and permanently effective, and after-sales technical services are provided.

Table 1 Comparison of Version Functions

Function items	Personal Edition	Commercial version
System Configuration	Up to 20 chips	Unlimited
History Data	Only one device	Unlimited
Alarm Data	Up to 10 alarm configurations	Unlimited
Data Gateway	Not supported	Unlimited
Channel Management		
Device Management		
User management		
Device Data Configuration		
Master Device		
Slave Device		
Real-time Data Curve		
Viewer		
Custom Request		
Count Message		
Assist Tools		

Similar in Every Detail

2 Installation

2.1 Download

<http://gulink.cn/download>

2.2 Install

2.2.1 Prepare

Personal computer or server.

Display resolution is recommended to be 1920*1080.

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

2.2.2 Install

1. Download software package MThings_Pack.exe;
2. Double click to start the installation, follow the step prompts and execute them in sequence;
3. Double click on the icon to start the software.

NOTICE

If it cannot run properly after installation, please enter the installation directory, double-click on the "VC_redist.x86.exe" file, and then reopen MThings.

3 Function Details

3.1 Basic concepts

3.1.1 device

Devices are communication nodes, and MThings include two types: master devices and slave devices.

Master devices: When MThings is used as a master to connect multiple slave devices, users need to create a corresponding simulation master for each slave device in the software, and different simulation master devices are distinguished by device addresses.

Slave devices: When using MThings as slave simulation data, users need to create different devices in the software based on different slave addresses.

3.1.2 Data

There are four types of **data blocks** defined in the MODBUS standard:

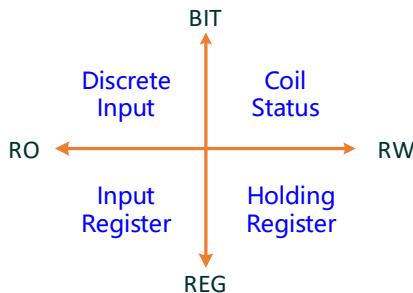
Table 2 MODBUS Data Definition

Data Block	Size	Access Type	Forward Num.	Read Function Code
Coil Status	1 Bit	RW	0	0X01
Discrete Input	1 Bit	RO	1	0X02
Holding	2 Bytes	RW	4	0X03

Register				
Input Register	2 Bytes	RO	3	0X04

Based on the size of data blocks, four types of data blocks can be divided into two types: BIT data and register (REG) data. Combined with read and write attributes, the relationship between data blocks is shown in the following figure:

Figure 1 Relationship between different data block types



Data is a specific definition within a data block, and data definitions within 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: membership data block, data name, data address, data amount, data type (protocol type), data coefficient (involved when floating point data is reshaped for transmission), byte order (involved when register data amount is 1, 2, or 4), and word order (involved when register data amount is 2, or 4).

3.1.3 Transmission type and UI type

MThings provides a user-friendly data visualization method that supports displaying message data in **actual business formats**.

The transmission type is the type defined in the MODBUS data protocol, usually dominated by integers, but often not the actual format of the

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data. Users need to recalculate in order to confirm the correctness of the data. Inadequate intuitive debugging data undoubtedly seriously affects debugging efficiency and accuracy.

MThings supports users to specify the transmission type and UI type of each data item. During debugging, 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, when the slave reports voltage data of 10.5V, the data during register transfer is 0X0069. After MThings receives the data, it multiplies the integer data by a coefficient of 0.1, and the interface presents the restored data of 10.5V.

Figure 2 Schematic diagram of intuitive visualization effect of device data



The screenshot shows the MThings software interface. At the top, there is a menu bar with icons for System, Alarm, History, Data (which is selected), Custom, Count, Assist, and About. To the right of the menu is a "Personal Version" label and several status indicators. Below the menu is a toolbar with icons for Input Data Name, search, add, delete, and other functions. The main area is a table with the following data:

ID	Name	Value	CMD	Write	Unit	Range	Block	Addr.	Qty	Bit Offset	Bit Num.
1	Output Power	60.9		Write	kW	--	Input Reg.	100	2	0	32
2	Operating Status	0		Write	--	--	Input Reg.	102	1	0	16
3	Duration	100.0		Write	Hour	--	Input Reg.	103	2	0	32
4	Day Electricity	52.3		Write	kWh	--	Input Reg.	105	2	0	32
5	All Electricity	582.9		Write	kWh	--	Input Reg.	107	2	0	32
6	Voltage(AC)	380.2		Write	V	--	Input Reg.	110	1	0	16
7	Current(AC)	90.9		Write	A	--	Input Reg.	111	1	0	16
8	Voltage(DC)	1202.4		Write	V	--	Input Reg.	112	1	0	16
9	Current(DC)	57.9		Write	A	--	Input Reg.	113	1	0	16

When inputting data configuration, MThings provides parameters including four items: transmission type, UI type, coefficient, and unit. Their introductions are:

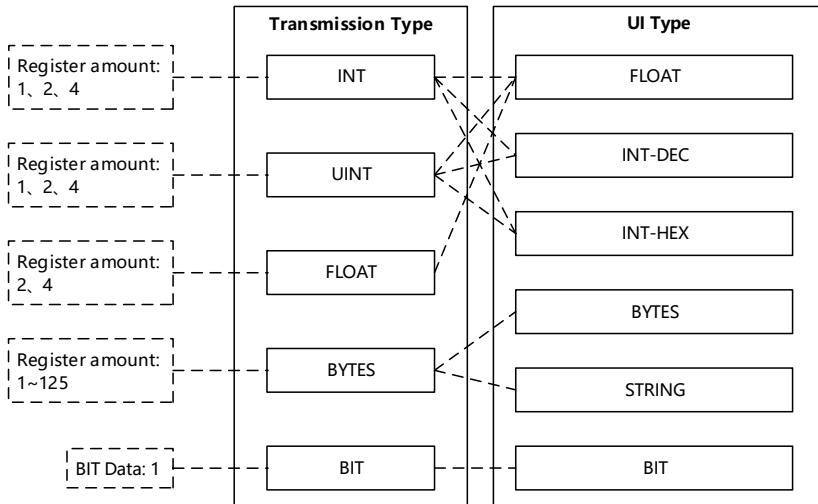
Table 3 Explanation of the introductions of configuration parameters related to data presentation

Parameter	Introduction
Transmission	Signed integer (INT), unsigned integer (UINT), floating-point (FLOAT), byte stream (BYTES), bit data

Type	(BIT)
UI Type	Decimal integer (INT-DEC), hexadecimal integer (INT-HEX), float (FLOAT), byte stream (BYTES), string (STRING), epoch second (TIME)
Ratio	If the data type presented is float and the transfer type is integer, it needs to be used in conjunction with a coefficient (Ratio). The software automatically multiplies the received data by the coefficient and converts it into float data for display.
Unit	Description of the introduction of auxiliary data, directly presented on the interface

MThings supports conversion of multiple transmission and UI types, with the corresponding relationship as follows:

Figure 3 Transfer Type and UI Type Conversion



3.1.4 Word order/Byte order

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

Byte order and word order both represent the storage mechanisms of data in the message, which are divided into two types: Big Endian and Little Endian.

In MODBUS data frames, key fields (such as register addresses) are defined as Big Endian, but the definition of the data part may vary among different manufacturers, and even the byte order definition for different data may not be unified in a certain model of device from the same manufacturer.

Based on MODBUS message byte order, **Big Endian** refers to the data with high byte first, low byte last, and **Little Endian** is opposite. For example:

01 03 04 **12 34 56 78 81 07** (Read Hold Register Response Message)

Among them, the length of the reply data is 4 Bytes. For example, the original data is 0X12345678. From the message, its byte order is **Big Endian**, and the word order is **Big Endian**.

However, when transmitting 4-byte floating-point data in MODBUS register data, some device manufacturers also provide **word order** requirements and explicitly declare that the word order is **Little Endian**. When the original data is 0X12345678, the byte stream of the transmitted message should be as follows:

01 03 04 **56 78 12 34** 66 D5

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

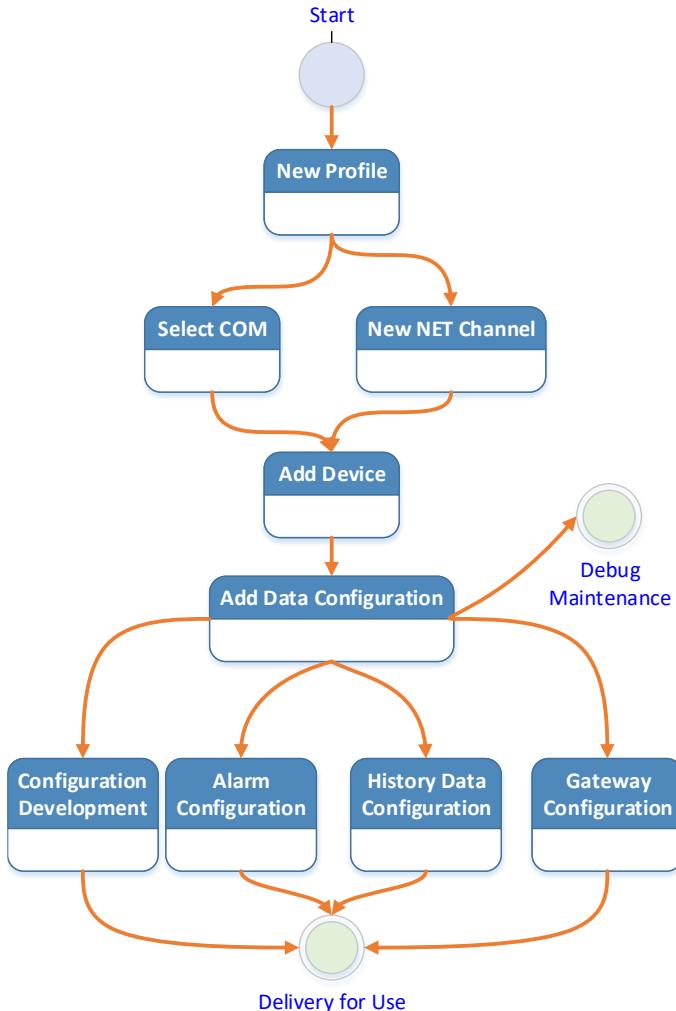
- a) Each data can be independently configured with its byte order

and word order.

- b) When the quantity of registers is 1, 2, and 4, it supports byte order configurable, covering 2, 4, and 8 bytes of data.
- c) When the quantity of registers is 2 or 4, it supports word order configurable, covering 4 or 8 bytes of data.
- d) The other quantity of registers, word order and byte order are **Big Endian** by default.

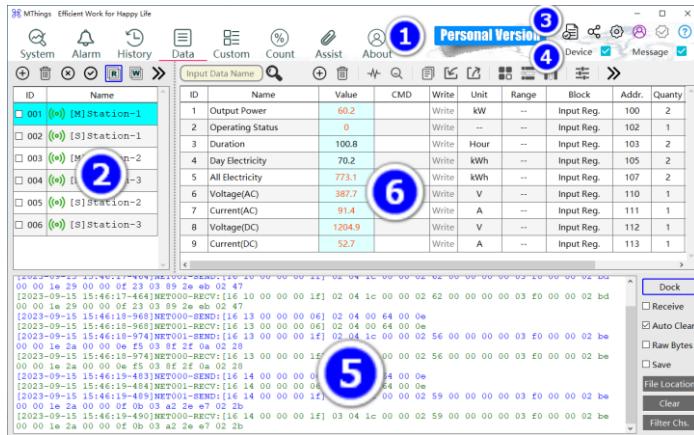
3.2 Usage Flow

Figure 4 Diagram of general software usage flow



3.3 UI Partition

Figure 5 Schematic diagram of UI Partition



1. Main Menu: used to switch to Function Page.
2. Device List: assist for "Main Menu", where users can switch to the current active device by clicking on the device name and specify the device to which the new "Function Page" belongs.
3. Auxiliary Menu: serves as the entry point for configuration file operation, channel management, system parameters, user management, license management, and other functions.
4. View Switching: used to control the display or hiding of the "Device List" and "Message Monitor" windows.
5. Message Monitor: View and manage communication messages for each link.
6. Function Page: corresponding to the "Main Menu", providing a main function operation interface.

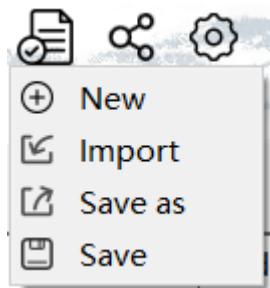
3.4 Profile Management

3.4.1 Profile Content

The profile contains complete usage configuration information, mainly including: channel list, channel parameters, device list, device advanced parameters, and data configuration.

3.4.2 Common Operations

Figure 6 Common Operations for Profile



1. **New:** Used to create a new profile, which can be used for the first time without new profile. MThings will prompt for profile storage before exiting.
2. **Import:** Switch profile through the import function.
3. **Save As:** Export and copy the current profile through the Save As operation, while switching the current profile to a new path.
4. **Save:** Timely save profile.

NOTICE

When multiple MThings software are opened and pointed to the same profile, the configuration will be repeatedly overwritten, and the final profile content will be consistent with the content of the last save operation.

WARNING

Prohibit placing profile in the software package path to avoid accidental deletion during software upgrades!

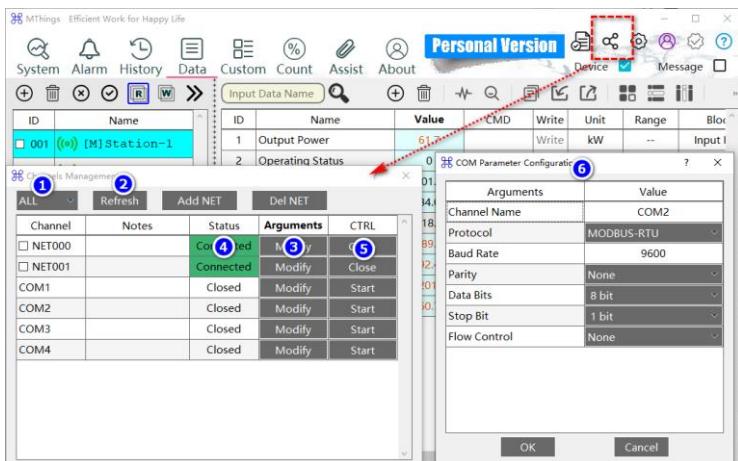
3.5 Channel Management

MThings software supports establishing communication with the target machine through serial port, TCP link, and UDP unicast, **which are collectively referred to as channels.**

Channel is a key attribute of a device, and determining the communication method of the device is a prerequisite for creating the device.

3.5.1 Serial port

Figure 7 Serial Port Operation



Enter the channel management page through "Channel" in the auxiliary menu to view the list of actual serial ports in the current computer. After MThings starts, the serial port list is automatically updated once. As shown in the above figure, the serial port related operations are as follows:

1. Select the channel types included in the filter channel list, and the interface defaults to all types. After switching to "COM", only the serial channel will be retained in the list.
2. After the software is turned on, insert the USB to RS485

module and click "Refresh" to add a new serial port to the list. If no new serial port appears, please check the module driver. When invalid serial ports appear in the link list (serial ports do not exist and there are no attached devices), click "Refresh" to remove these serial ports from the data configuration.

3. To modify the detailed parameters of the serial port, click the "Modify" button to enter the "COM Parameter Configuration" page.
4. Check the channel status, which means that it is closed, connected, or fault.
5. Manually turn on or off the serial port. When adding devices, there is no need to manually turn them on. The manual mode can be used to batch control all devices attached to the channel, causing them to start or stop.
6. Serial port parameter configuration page.

Table 4 Definition of Serial Channel Status

Channel status	Introduction
Closed	The software did not enable the serial port or was manually turned off
Connected	The software successfully opened and initialized the serial port
Fault	The software failed to open the serial port, possibly due to the serial port being occupied by other software or the set serial port parameters being illegal

Table 5 Definition of Serial Link Parameters

Parameter	Introduction

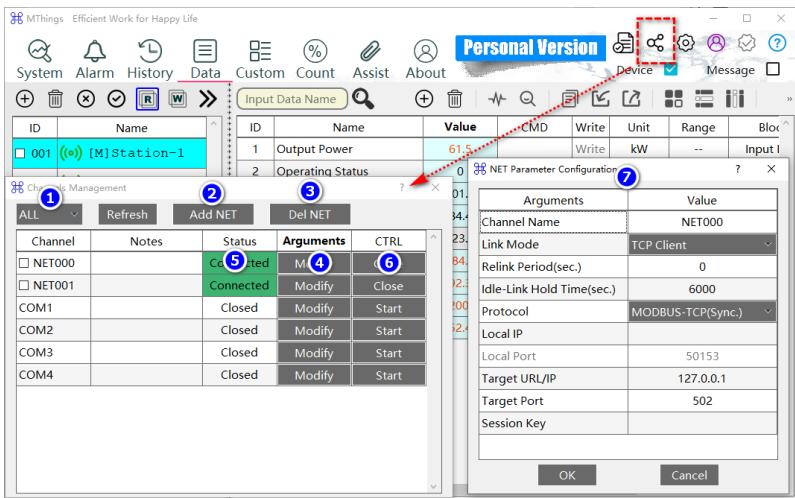
Channel Name	Operating system allocation information, cannot be modified.
Protocol	Used to specify the type of transmission protocol currently running on the serial port, which can be selected as "MODBUS-RTU" or "MODBUS-ASCII".
Char Type	When the transmission mode is selected as "MODBUS-ASCII", specify whether the protocol characters are in uppercase or lowercase using this parameter, which defaults to the uppercase method required by the standard protocol.
Baud Rate	Supports 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200bps. Setting it to another value will cause the serial port to fail to open.
Parity	Specify the data verification method in the serial port byte
Data Bits	Specify the number of data bits in the serial port byte data. If the MODBUS-ASCII protocol requires a data bit of 7Bit, please modify this parameter.
Stop Bit	Specify the length of the stop bit in the serial port byte.
Flow Control	Default no flow control, modified according to actual application needs.

NOTICE

If using a virtual serial port, the master device and slave device should use a pair of serial ports.

3.5.2 Network Channel

Figure 8 Network Channel Operations



Enter the channel management page through "Channels" in the auxiliary menu to view the list of network channels. When used for the first time, there is no network channel and users need to create it according to their needs. As shown in the above figure, the network related operations are as follows:

1. Select the channel types included in the filter channel list, and the interface defaults to all types. After switching to "NET", only network channels are retained in the list.
2. Click the "Add NET" button to create a new network channel.
3. Click "Del NET" to delete the selected network channels from the channel list, which will be synchronized to the profile.
4. Click the "Modify" button to modify network channel parameters.
5. Check the channel status, which includes: closed, connected,

- connected, and fault.
6. Manually establish or close channels. When adding devices, there is no need to manually turn them on. The manual mode can be used to batch control all devices attached to the channel, causing them to start or stop.
 7. Network channel parameter configuration page.

Table 6 Definition of Network Channel State

Channel Status	Introduction
Closed	The software is not enabled for this link; Link disconnected by peer; Link manually closed;
Connected	The network channel has been successfully linked
Connecting	TCP client: Connecting to server; TCP Server: Waiting for client access;
Fault	TCP server: Local port occupied; UDP unicast: Local port occupied;

Table 7 Definition of Network Channel Parameters

Parameter	Introduction
Channel Name	MThings are uniformly allocated and cannot be modified
Link Mode	Select the link role of MThings in the network layer, including TCP client, TCP server, and UDP unicast

Relink Period(sec.)	When the link mode is selected as "TCP client", setting the rebuild cycle can instruct MThings to rebuild the chain at a specified time interval, which can simulate short links. The default cycle is 0, representing long links.
Idle-Link Hold Time(sec.)	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 in the parameter, MThings will actively close the link.
Protocol	Used to specify the type of transmission protocol running on the current link, which can be selected from "MODBUS-RTU", "MODBUS-ASCII", "MODBUS-TCP (synchronous)", "MODBUS-TCP (asynchronous)"
Char Type	When the transmission mode is selected as "MODBUS-ASCII", this parameter specifies whether the protocol characters should be in uppercase or lowercase, with the default being the uppercase method required by the standard protocol.
Local IP	When the link mode is selected as "TCP client" or "UDP unicast", this parameter specifies the local initiator IP, which can be left unconfigured. MThings can automatically select the best option.
Local Port	When the link mode is selected as "TCP server" or "UDP unicast", it is necessary to specify the binding local port.
Target	When the link mode is selected as "TCP client", this parameter is used to specify the domain name or IP

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URL/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).
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 no filtering function is required, please set this parameter to "--" or clear it.
Client Port	When the link mode is selected as "TCP server", this parameter is read-only data used to present the connected client's initiation port number.
Max. Async. Requests	When the transmission mode is selected as "MODBUS-TCP (Asynchronous)", this parameter can control the scale of asynchronous concurrency and adjust the number of concurrent requests

Figure 9 TCP Client Link Application Method

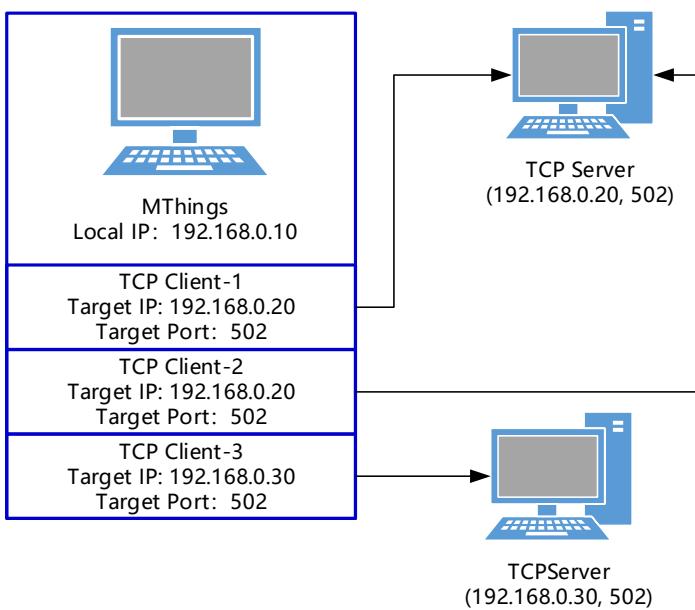
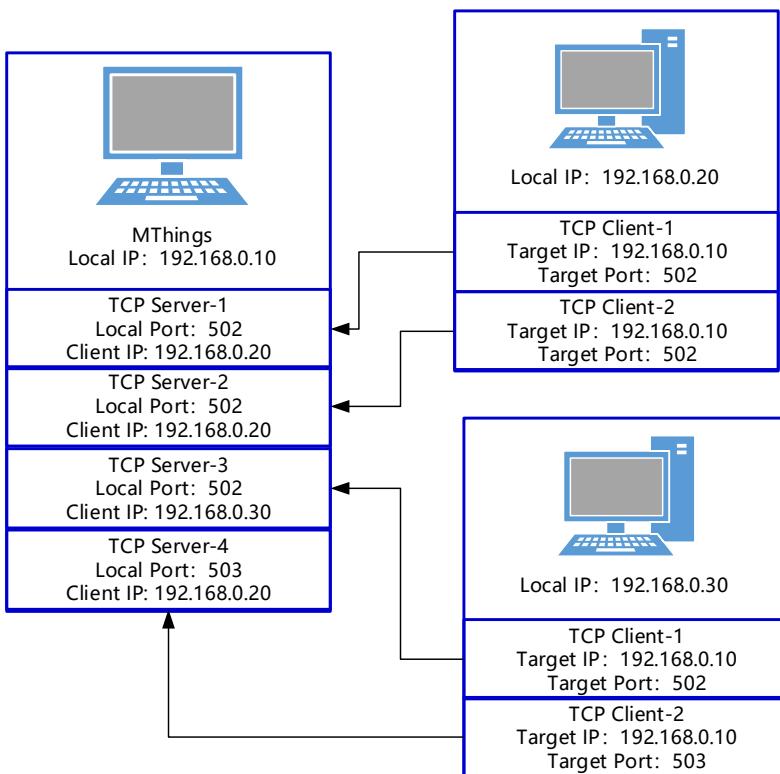
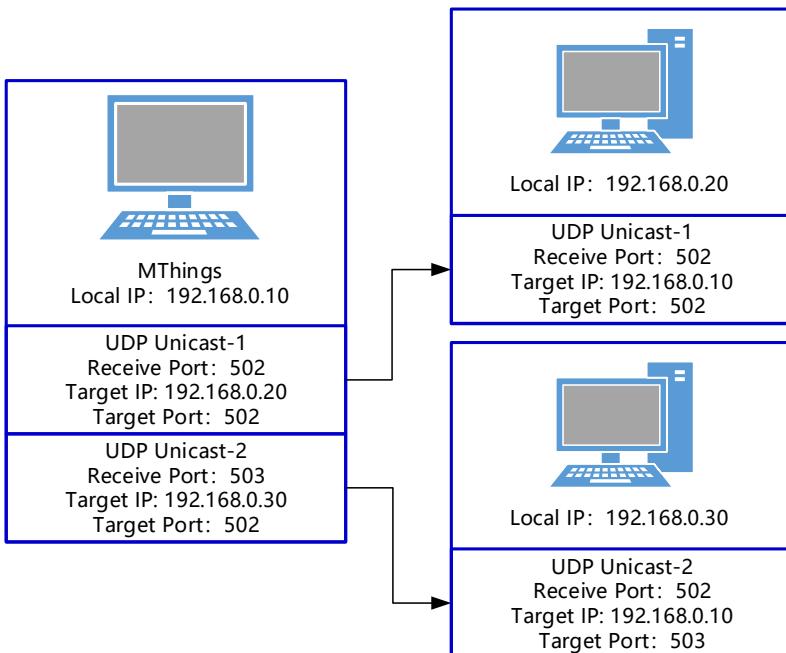


Figure 10 TCP Server Link Application Method



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Figure 11 UDP Unicast Link Application Method



3.6 System Parameter

The system parameter page provides global control parameters for MThings software, which users can modify and take effect in a timely manner during runtime. The parameter values will be saved locally.

Figure 12 System Parameter Page

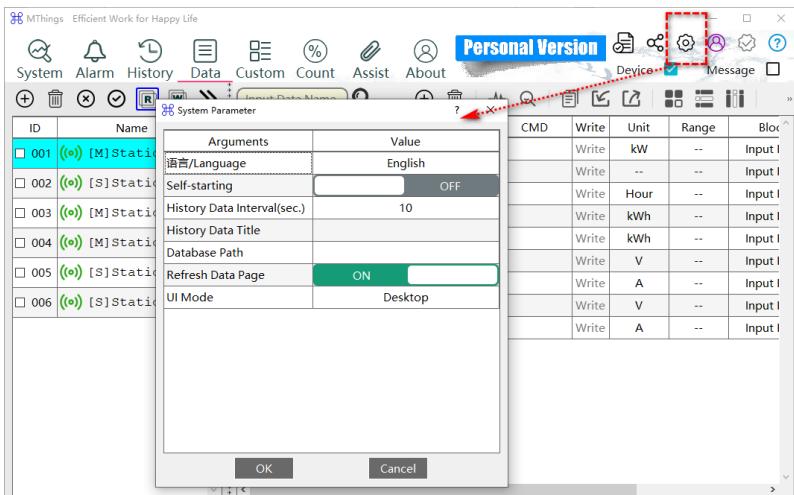


Table 8 System Parameter Definition

Parameter	Introduction
语言/Language	Change software language.
Self-starting	Function switch, used to control whether MThings automatically starts with the operating system, and is turned off by default.
History Data Interval(sec.)	The auxiliary parameter of the History Data function is used to control the interval time between historical refresh and storage.

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History Data Title	The auxiliary parameter of the History Data function. After the user configures this parameter, the header information will be printed and output together with the historical data report.
Refresh Data Page	Function switch: In order to avoid wasting CPU computing resources, when users enable the "System" page for data viewing, they can use this switch to turn off data updates on all device "Data" pages, but it does not affect the reception, parsing, and storage of data.
UI Mode	Support desktop or PAD mode, allowing software to run on different terminals with better display effects.

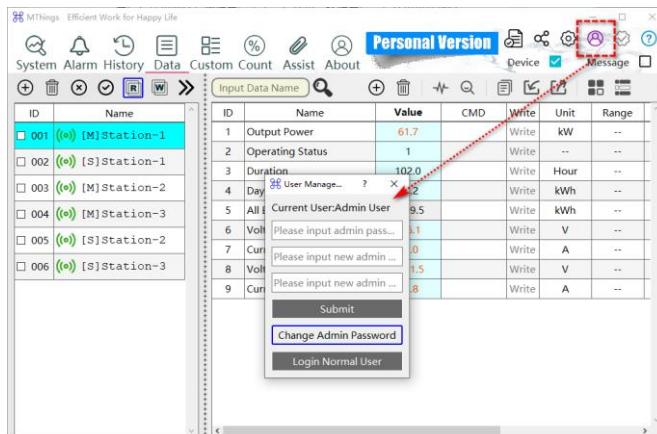
3.7 User Management

The user management page provides two types of users: **Admin User** and **Normal User**. Admin User can perform all the functions provided by MThings, and Normal User are only allowed to operate some functions without displaying debugging functions. It is prohibited for them to modify device data, alarms, system configurations, etc.

Table 9 User Permission Allocation

Page	Admin User	Normal User
System	✓	✓
History	✓	✓
Alarm	✓	✓
Data	✓	✓
Custom	✓	✗
Count	✓	✗
Asist	✓	✗
About	✓	✓

Figure 13 User Management



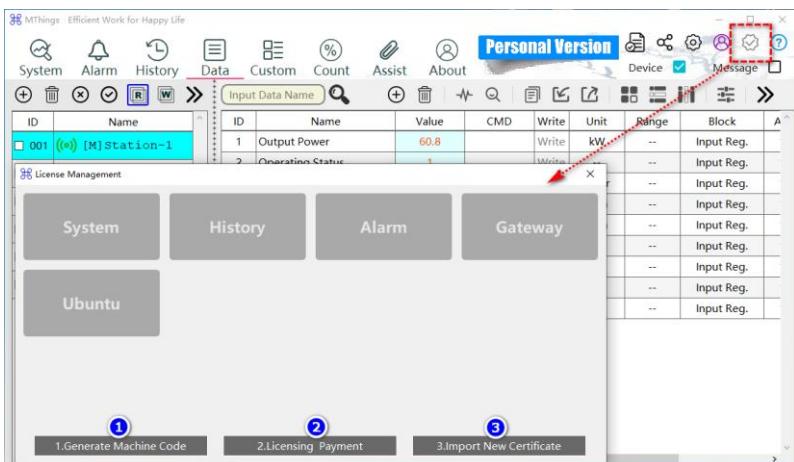
Admin User defaults to no password. MThings is defaults to Admin User for the first time, supporting Admin User to modify their own passwords. Once Admin User sets a non-empty password, MThings restarts and logs in as Normal User. Users need to enter their own Admin User password to switch to Admin User.

3.8 License Management

For the commercial features in MThings, users need to obtain authorization to use them. Before purchasing authorization, users need to enter the license management page to generate machine code. After obtaining the authorization certificate, enter the license management page to import the authorization certificate and activate commercial features.

The authorization certificate is limited to one computer only. If users need to extend multiple computers, users should purchase multiple copies in advance.

Figure 14 License management



1. After clicking, a unique machine code will be automatically generated, which can be used to purchase authorization certificates;
2. Obtain authorization certificate after payment;
3. After obtaining the authorization certificate, click this button to import the authorization certificate.

WARNING

Reinstallation of the system, disk replacement, and other behaviors may cause changes in the key identification information of the system, resulting in invalid authorization and the need to repurchase the authorization.

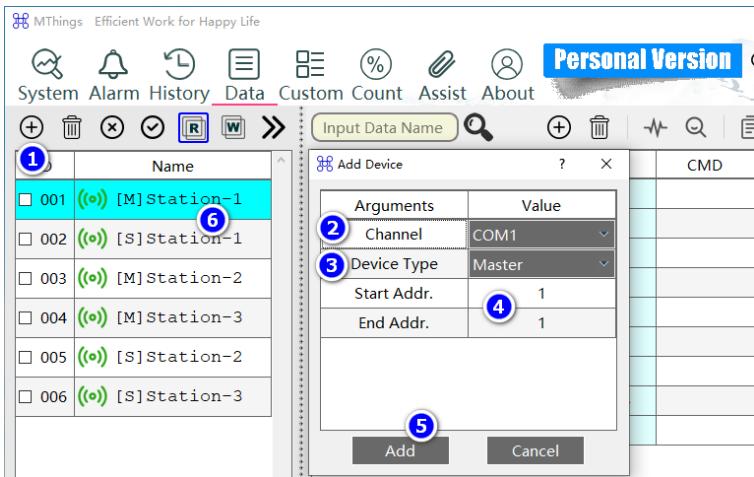
The operating system that cannot obtain the key identification information of the system normally will not be able to generate machine codes and thus cannot obtain authorization.

3.9 Device Management

Device is the foundation for all MThings functions. Through this device integration method, MThings has the ability to debug multiple devices, protocols, and channels.

3.9.1 Add device

Figure 15 Schematic diagram of adding device



1. Add device entry;
2. Select the channel where the added device is located;
3. Select the device type for adding the device;
4. Select the address to adding the device;
5. After clicking "Add", the configured devices will be displayed in [06].
6. Click the "Add" button.
7. The new device will appear in the device list.

The device address range is 0-255, and the starting address should be less than or equal to the ending address. By setting the start address and end address, it is supported to add multiple devices at once. If the start address equals the end address, it means only one device will be added.

If the device addresses to be added are scattered across multiple intervals, user can add multiple times.

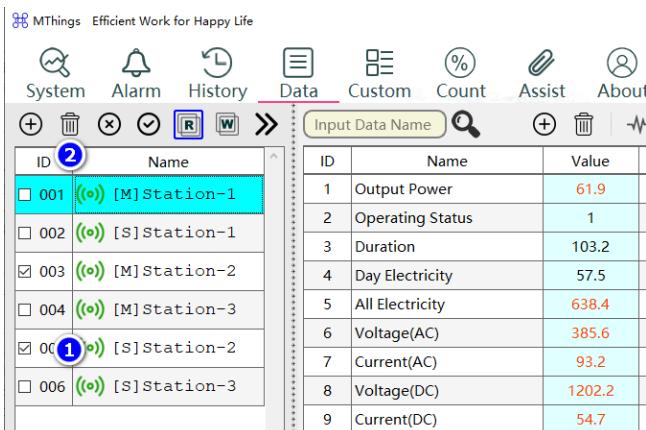
NOTICE

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

If one master device already exists in the channel, it is not allowed to add a slave device, and vice versa.

3.9.2 Remove Device

Figure 16 Schematic diagram of removing device



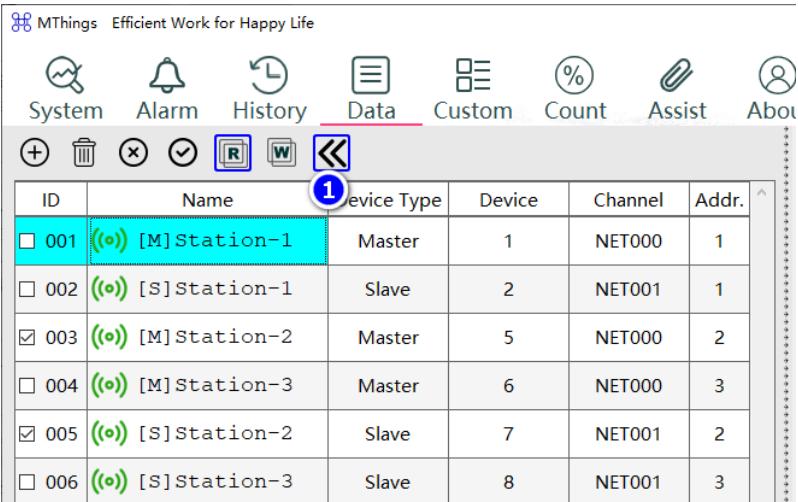
1. Check the devices that need to be removed.
2. Click the "Remove" button.

WARNING

Removing the device will delete all data configuration 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 profile.

3.9.3 View Device Information

Figure 17 Schematic diagram for viewing device information



ID	Name	Device Type	Device	Channel	Addr.
<input type="checkbox"/> 001	([M] Station-1)	Master	1	NET000	1
<input type="checkbox"/> 002	([S] Station-1)	Slave	2	NET001	1
<input checked="" type="checkbox"/> 003	([M] Station-2)	Master	5	NET000	2
<input type="checkbox"/> 004	([M] Station-3)	Master	6	NET000	3
<input checked="" type="checkbox"/> 005	([S] Station-2)	Slave	7	NET001	2
<input type="checkbox"/> 006	([S] Station-3)	Slave	8	NET001	3

1. Click the ">>" button to automatically expand the device list page, displaying the key information such as device type, device ID, channel, and device address.

Table 10 Device Name Status Introduction

Device Name Status	Introduction
[M] COM1-001 Blue background	The current device is selected
[M] COM1-001 Font red	The device stops running. The channel which device belongs is disconnected, or the device is disabled.

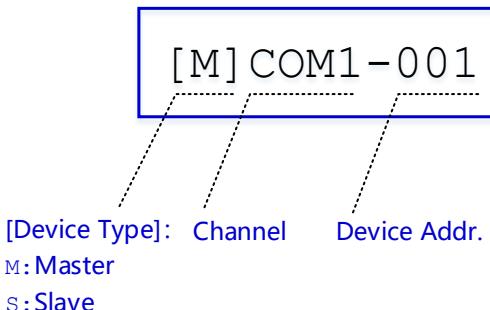
Figure 18 Introduction of Device Status

<input type="checkbox"/> 001	([M] Station-1)
<input type="checkbox"/> 002	([S] Station 1)
<input type="checkbox"/> 003	([M] Station 2)
<input type="checkbox"/> 004	([M] Station 3)
<input type="checkbox"/> 005	([S] Station 4)
<input type="checkbox"/> 006	([S] Station-3)
<input type="checkbox"/> 007	([M] NET002-5)

1. Connected, but no data read or write operations;
2. Connected, but there are data read and write exceptions;
3. Connected, data read and write normal;
4. The device is disabled;
5. The channel which the device belongs is abnormal.

After adding a device, MThings assigns a default name with the following format description:

Figure 19 Introduction of Default Device Name Format



3.9.4 Disable Device

If the device needs to temporarily stop working, it can be disabled and instructed to stop all business and communication. The disable operation is commonly used to pause the simulation slave, which can simulate device disconnection.

Figure 20 Schematic diagram for Disable Device

The screenshot shows the MThings software interface with the following details:

Top Bar: MThings Efficient Work for Happy Life, System, Alarm, History, Data (highlighted), Custom, Count.

Toolbar: +, Delete, Search, Input Data Name.

Table View (Left):

ID	Name
001	(o) [M] Station-1
002	(o) [S] Station-1
003	(o) [M] Station-2
004	(o) [M] Station-3
005	(x) [S] Station-2
006	(o) [S] Station-3

Detail View (Right):

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

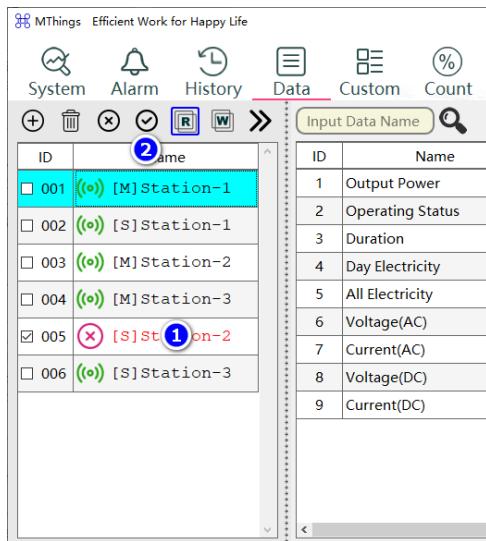
1. Check the devices that need to be disabled, double-click on the header "ID" to select all.
2. Click the "Disable Device" button. After the device is successfully disabled, the font color of the device name changes to red.

NOTICE

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

3.9.5 Restore Device

Figure 21 Schematic diagram of Restore Device



1. Check the device that needs to be restored, double-click on the header "ID" to select all.
2. Click the "Restore Device" button. After the device is successfully restored, the font color of the device name is restored to black.

NOTICE

If the link to the device that needs to be restored has been closed, click "Restore" and the device name will remain in red. Once the link state to which it belongs is restored to "Connected", the device will also be automatically restored.

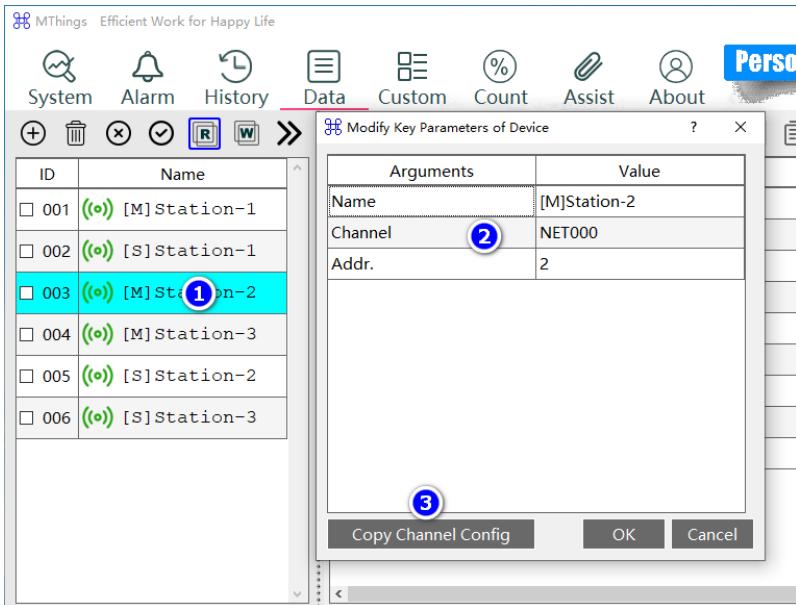
3.9.6 Modify Key Parameters of Device

For the devices that have been added, it supports modifying their key parameters, including device name, link, and device address.

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

By modifying the channel and device address, users can quickly adapt to the new running environment. Users can add devices, configure data, and debug on local channel in advance. During on-site debugging, they can quickly switch to the actual working channel.

Figure 22 Schematic diagram of modifying key parameters of device



1. Double click on the device row that needs to be modified.
2. The "Modify Key Parameters of Device" page pops up, where user can modify the key parameters.

3. To synchronize the channel changed to other devices, click the "Copy Channel Config" button, select the device that needs to copy the new channel information, and the software will automatically modify the channel of the specified devices.

After the channel and device address are changed, if the device name remains the default name assigned by the software, the software will automatically replace the channel and address fields in the default name without manually modifying the device name.

For example, if the original name of the device is **[M] COM1-001**, the channel is changed to COM2, the address is changed to 2, the device name will automatically change to **[M] COM2-002** after the device parameters modification is completed.

NOTICE

The device name cannot be empty and must be globally unique, otherwise it will prompt modification failure.

If the new affiliation channel already has other device types, it will prompt modification failure.

If the new device address already exists on the channel, it will prompt modification failure.

The added device does not support modifying the device type.

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

3.10 Configure Device Data

Device data configuration is the process of converting MODBUS data protocol definitions into MThings configurations. After completing the device data configuration, there is no need for manual packaging and data conversion, and simple button operations can quickly initiate polling, batch reading and writing, and single reading and writing. MThings supports intuitive and visual display of protocol data information, which can quickly improve debugging efficiency.

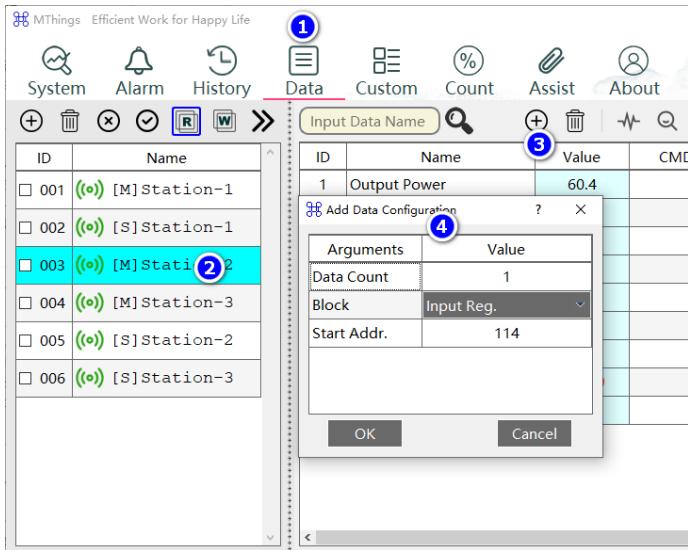
NOTICE

Before configuring device data, please confirm whether the correct device to be configured has been selected in the device list.

3.10.1 Add Data Configuration

Method 1:

Figure 23 Schematic diagram of adding data configuration



1. Click on the "Data" menu.
2. Click on the device name and select the device that requires data configuration.
3. Click on the "Add" button.
4. The "Add Data Configuration" page pops up. By default, one new piece of data is added each time. The starting data address is "data address" + "data quantity" of the last row in the current configuration. Users can modify "Data Count" to assign the number of new configurations.

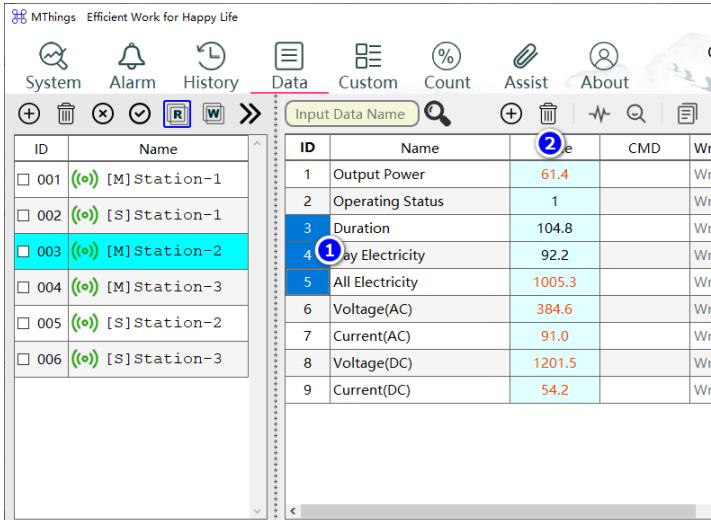
The new data added by this method will be directly added to the bottom of the table.

Method 2:

Users can drag any "Block" cell from existing data configurations in the table. The starting row of the drag is the template row, and the new configuration will be inserted to the end position of the drag.

3.10.2 Delete Data Configuration

Figure 24 Schematic diagram of deleting data configuration



1. Click on the ID column, select the data configuration that needs to be deleted, and double-click on the header "ID" to select or deselect all.
2. Click the "Del Data" button.

WARNING

After deleting the data and clicking "Save" the profile, the data configuration will be lost. Please operate with caution!

3.10.3 Edit Configuration Item

Table 11 Instructions of Configuration Item

Items	Instructions
ID	Not editable, software assigned in sequence.
Name	Data name, can be defined arbitrarily and cannot be empty.
Value	Not editable, in operation mode, double-click to trigger a single read operation.
CMD	Double click and start editing. Enter the data for the write command to be issued. If there is no background color, it means that the data does not support write commands.
Write	When in operation mode, double-click triggers to send write instructions.
Unit	Data unit, can be defined arbitrarily.
Range	The data value range is used to assist debugging, can be defined arbitrarily, and does not participate in the verification process.
Block	Double click on the cell and select to modify the data block type. The block definition refers to the MODBUS standard protocol. Modifying the block may cause other fields to be forcibly modified.
Addr.	<p>The starting address of the current data, without the forward derivative.</p> <p>Range: 0-65535.</p> <p>Note: Combined with the address offset in the</p>

	advanced parameters, this address is the protocol address, not the transmission address. If the address offset is -1, the minimum value of this address must be greater than 0, otherwise the address is illegal.
Quanty	The number of data addresses continuously occupied by the current data. If the data is register, the unit is words (2 bytes). If the data is BIT, the quantity is mandatory to be 1 and cannot be modified.
Bit Offset	Not less than 1. If the data is a holding register, it must not exceed 123. If the data item is input register, it must not exceed 125. Used for register data, if a data only occupies a portion of the register' s bits, this configuration is used to specify the starting offset of the occupied bits. If the data does not involve 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, with the lowest bit being 0.
Bit Num.	Used for register data, such as data items occupying only a portion of the register' s bits, which are configured to specify the total number of bits occupied. If the data does not involve register bits, the default value can be used for this configuration. The default value for the number of bits in a register is

the **Quantity of Data * 16**.

The number of bits in BIT data is fixed to 1.

The number of bits can be configured from 1 to 64Bit.

Ratio	Used for local conversion of register data, supporting linear operations on received data, such as: Displayed Data = Received data * Ratio + Offsets . Recommended range for Ratio : ± (0.000001~1).
Offsets	Same description with previous row.
Polling	The master device supports this item. After checking, this data participates in polling. Otherwise, when start polling request, this data will be ignored.
Batch Write	The master device supports this item. After checking, this data participates in batch writing. Otherwise, when initiating a batch writing request, this data will be ignored. The coil status and hold register data can be checked, and read-only data is not supported.
Curve	After checking, the data is added to the real time data curve page and the value is continuously recorded in the curve. When the UI type of data is Byte stream (BYTES), String (STRING), or Time, adding it as a curve is not supported.
Save	After checking, the current data value will be stored periodically and can be viewed in History Data . Note: This item takes effect after restarting.
Trans. Type	Double click on the cell and select the data type defined in the MODBUS data protocol. Please confirm and keep it consistent with the protocol. Please refer

	<p>to the data section for detailed instructions.</p>
UI Type	<p>For achieving more user-friendly data visualization, Users can double click on the cell and select the data type for display in UI. There are constraints associated with the trans. type. Please refer to the data section for detailed instructions.</p>
Decimal	<p>If the UI Type is float, this item takes effect, otherwise it is forced to be 0.</p> <p>It used to control the number of decimal points in numerical values, with a range of 0 to 9.</p>
Byte Order	<p>Used for register data, such as when the Quantity of data is 1, 2, or 4, byte order needs to be specified. Please refer to the MODBUS data protocol requirements. If there are no special requirements, choose the big endian.</p> <p>When it comes to other data Quantity, the byte order is assumed to be big Endian.</p>
Word Order	<p>Used for register data, such as when the Quantity of data is 2 or 4, word order needs to be specified. Please refer to the MODBUS data protocol requirements. If there are no special requirements, choose the big Endian.</p> <p>When it comes to other data Quantity, the word order defaults to the big Endian.</p>
Interval(ms)	<p>Used to control the interval time between read and write requests.</p> <p>In master device, this time takes effect after receiving a</p>

response (or timeout).

In slave device, this time takes effect between the request and response.

If a data is merged with other data into one request/response, the interval time is taken as the maximum value among them.

Note: When the protocol of master device is MODBUS-TCP (asynchronous), this item does not take effect.

Timeout(ms)

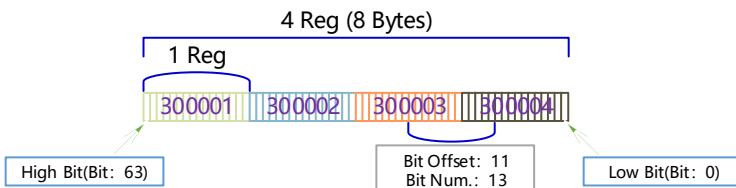
This item indicates the maximum allowable response delay for data read and write requests in the master device. If this time is exceeded, it will be considered a timeout event and the next request will continue.

If a data is merged with other data into one request, the timeout time is taken as the maximum value among them.

Retry

This item indicates whether it is necessary to resend data and the number of times it should be resend after the data read and write request times out. When the default setting is 0, it means no resend.

Figure 25 Example of Bit Offset



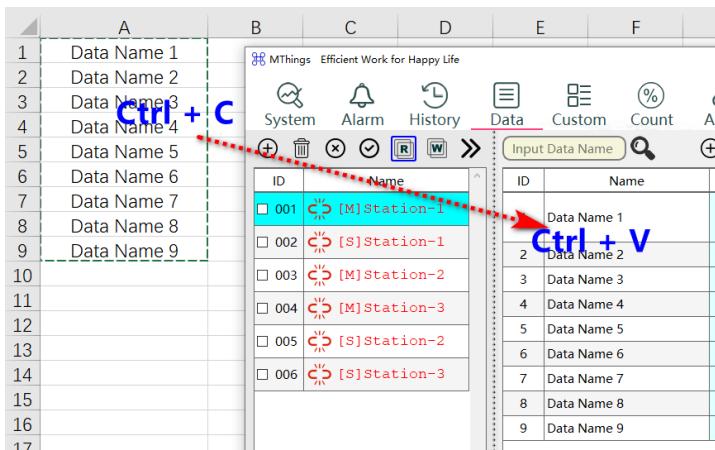
WARNING

If too much data is selected with curve, and the data has high-frequency refresh for a long time, it will lead to a continuous increase in computer memory. It is recommended to associate data curve with caution.

3.10.4 Batch Edit Configuration

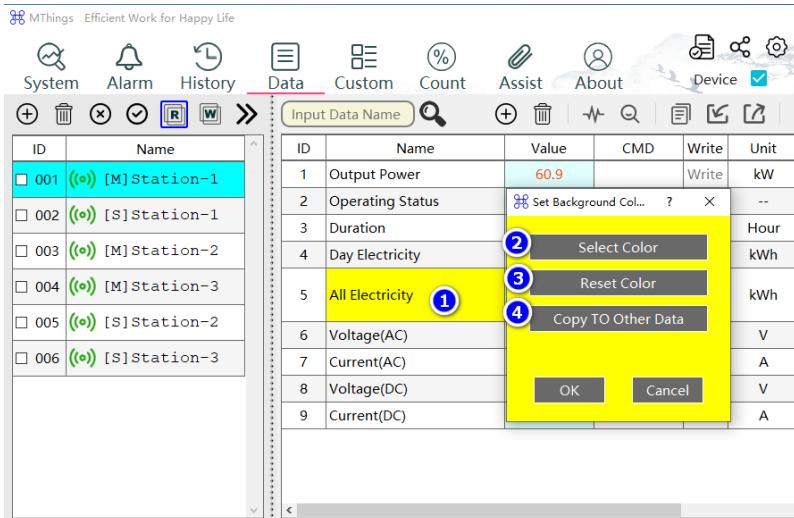
In order to quickly edit the "Name", "Unit", "Addr.", "Quantity", "Bit Offset", "Bit Num.", "Ratio", "Offsets", "Range" of data configuration, MThings supports users to copy multiple rows of Excel data and paste them to the specified location in the data configuration table.

Figure 26 Example of Batch Fill Configuration



3.10.5 Change Background Color for Data

Figure 27 Schematic diagram of background color for data



1. **Long press** the "Name" cell that needs to be marked **with a** background color, and the "Set Background Color" page will pop up.
2. Click the "Select Color" button and select a custom background color.
3. Click the "Reset Color" button to restore the background to its original color.
4. Click the "Copy to Other Data" button to copy the selected background color to other data.

3.10.6 Sort Data by Manual

User can change the row position of the data configuration by dragging and dropping the "Addr." cell of the data.

NOTICE

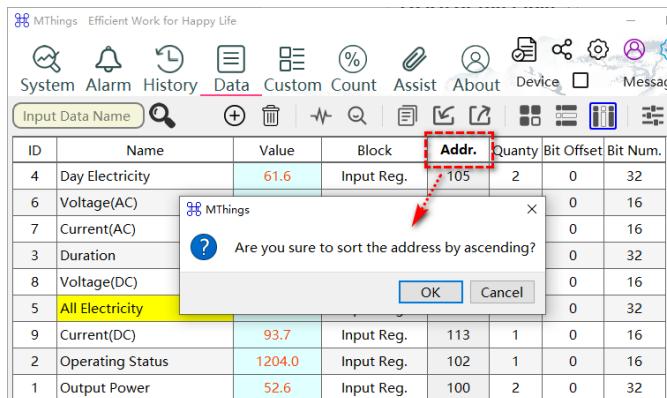
Supports dragging down or up from any position.

The data configuration row will be added to the previous row of the drag stop row.

To drag to the end row, drag the configuration row to the blank space of the table.

3.10.7 Sort Data by One-click

Figure 28 Schematic diagram of one click data sorting



1. **Double click** on the column header of "Addr." to complete the sorting function.

Rules:

- Sort the data blocks in order of coil status, discrete input, hold register, and input register.
- Within the same data block, sort by small to large using the "Addr." as a reference.
- When the multiple data **addresses** are the same, it is sorted

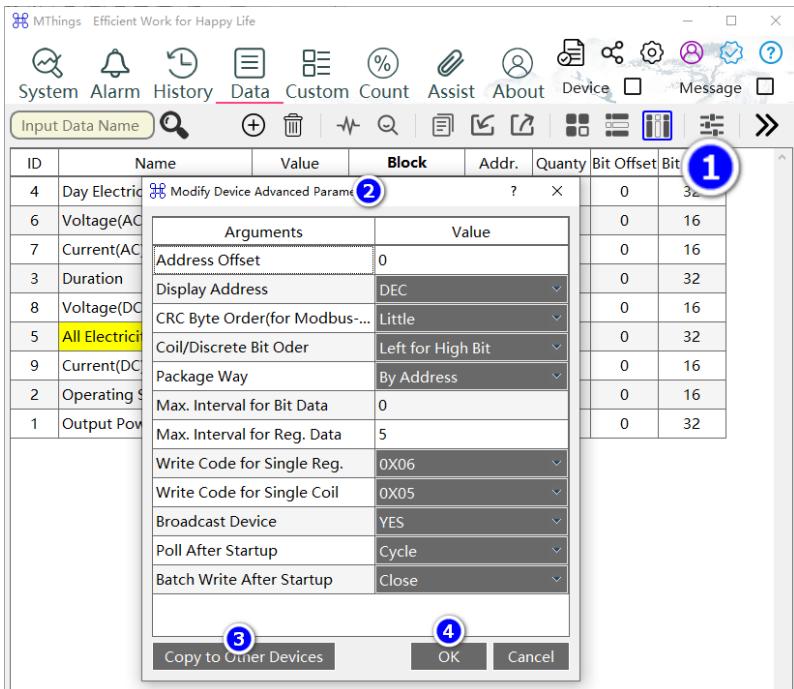
from small to large using "Bit Offset" as a reference.

- When the multiple **Bit Offset** is the same, it is sorted from small to large using "Bit Num." as a reference.

3.10.8 Modify Device Advanced Parameters

MThings provides advanced parameters for devices, used to control common functions related to device reading and writing.

Figure 29 Schematic diagram of device advanced parameters



1. Click on the "Modify Device Advanced Parameter" icon to enter the page.
2. Modify the corresponding parameters on the page.

3. Click "Copy 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.

Table 12 Definition of Device Advanced Parameters

Items	Instructions
Address Offset	Message data address = "Addr." + address offset. The default is 0. Please carefully confirm the protocol requirements when making modifications.
Display Address	Used to specify the data address display format, which can be selected as "DEC" or "HEX". When selecting "HEX", the address format is XXXXH. When editing hexadecimal addresses, the suffix "H" may not be carried, and the software will automatically complete it.
CRC Byte Order (for RTU)	To adapt to non-standard protocols, this parameter allows user to specify the CRC byte order in the RTU message, which defaults to little endian.
Coil/Discrete Bit Order	To adapt to non-standard protocols, this parameter allows user to specify the packaging method of continuous bits during the reading and writing process of the coil/discrete quantity, with the default being " Left for High Bit".
Package Way	Only valid for the master device, this parameter indicates how the device packages data from multiple adjacent addresses when making batch

	<p>read and write requests.</p> <p>The default is "By Line", which means that each row of data has a separate request for reading and writing.</p> <p>"By Address" means automatic packet, and continuous address grouping is performed by register address from small to large.</p> <p>"By List Order" means automatic packaging, and consecutive addresses grouping is performed by the order shown in table.</p>
Max. Interval for Bit Data	Only valid for the master device, this parameter indicates the maximum address interval allowed when performing read BIT data request packet grouping.
	When batch writing BIT data, no address interval is allowed.
Max. Interval for Reg. Data	Only valid for the master device, this parameter indicates the maximum address interval allowed when performing a read register data request packet.
	When batch writing REG data, no address interval is allowed.
Write Code for Single Reg.	Only valid for the master device, and adapting to special requirements of non-standard devices.
Write Code for	Only valid for the master device, and adapting to

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Single Coil	special requirements of non-standard devices. By default, write requests for individual coil status are requested using the 0X05 function code according to standard requirements.	
Broadcast Device	Only valid for the master device, to indicate whether the current device is a broadcast device. If selected, all requests issued by the device will not wait for response messages. Note: Only applicable to the device whose channel is serial port.	
Broadcast Addr.-1	Only valid for the slave device, used to indicate the broadcast address, defaults to 0. Note: When the protocol of the slave is MODBUS-TCP (synchronous or asynchronous), the broadcast address represents that all slaves need to process the address request, but do not need to reply (replied by the broadcast address device). Note: If the MODBUS-TCP requires the use of the 0 address and does not involve broadcast requirements, it is recommended to modify the parameter to a different address.	
Broadcast Addr.-2	Ditto	
Poll After Startup	Only valid for the slave device, to indicate whether to initiate a single or cyclic batch read operation when the device link is established or the device resumes.	
Batch	Write	Only valid for the slave device, to indicate whether

After Startup to initiate a single or cyclic batch write operation when the device link is established or the device resumes.

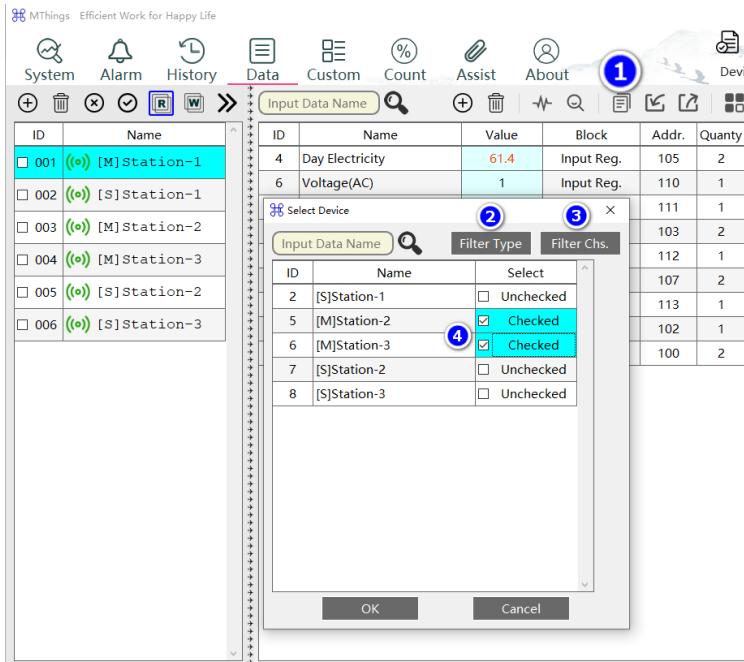
NOTICE

Advanced device parameters can be copied to other devices.

3.10.9 Copy Data Configuration

When multiple devices follow the same MODBUS data protocol, if the data configuration of one device has been completed, the current device data configuration can be fully copied to other selected devices through the copy operation.

Figure 30 Schematic diagram of copying data configuration



1. Click the "Copy Configuration to Other Devices" icon button to enter the "Select Device" page.
2. If there are many devices, user can click the "Filter Type" button to select the master or slave.
3. If there are many devices, user can click the "Filter Chs." button to filter the devices under some channels.

4. Select the device that needs to copy data configuration.

NOTICE

The master and slave device can copy data configurations from each other.

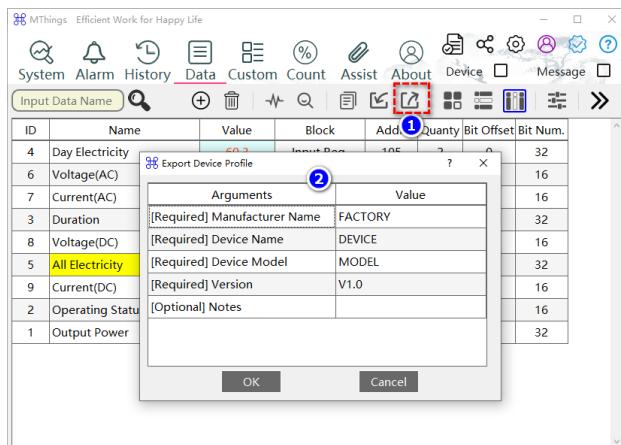
WARNING

Copying data configuration will overwrite the existing configuration of the target device. Please operate with caution!

3.10.10 Create and Export Data Templates

The workload of data configuration is enormous. In order to facilitate the sharing of data configuration, MThings supports creating and exporting data templates, which are independent of specific running environments, channels, devices, and other differentiated factors. Shared users can quickly build their own profile through data templates without reconfigure the data.

Figure 31 Schematic diagram of creating and exporting data templates



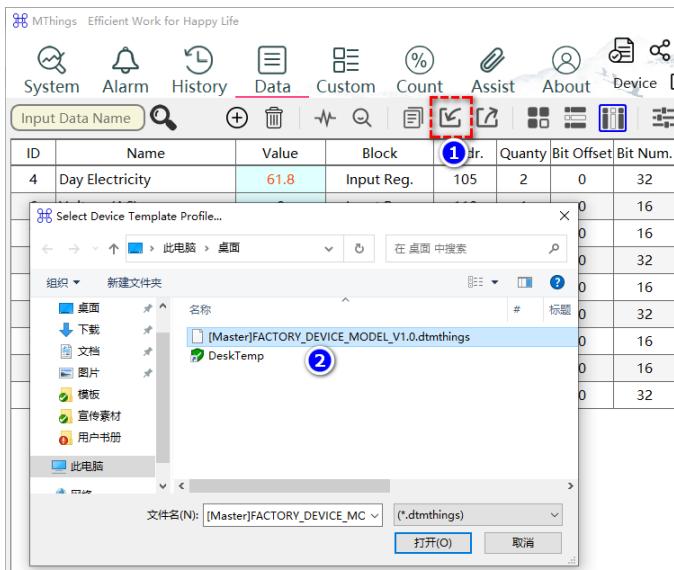
1. Click the "Export Data Template" icon button to enter the "Export Device Profile" page.
2. Input the necessary additional information for the data template.

Figure 32 Schematic diagram of exported data template

 [Master]FACTORY_DEVICE_MODEL_V1.0.dtmthings

3.10.11 Import Data Template

Figure 33 Schematic diagram of importing data templates



1. Click the "Import Data Template" icon button to enter the "Select Device Configuration Profile" page.
 2. Select a data template file.

NOTICE

The master and slave can import data templates each other, but it is recommended to carefully confirm the differences in data configurations between the two device types before operation.

3.11 Master Device Data Operations

3.11.1 Single Data Reading

Figure 34 Schematic diagram of single data reading

ID	Name
001	(M) [M] Station-1
002	(S) [S] Station-1
003	(M) [M] Station-2
004	(M) [M] Station-3
005	(S) [S] Station-2
006	(S) [S] Station-3

ID	Name	Value	Block
4	Day Electricity	62.1	Input Reg.
6	Voltage(AC)	0	Input Reg.
7	Current(AC)	103.0	Input Reg.
3	Duration	52.5	Input Reg.
8	Voltage(DC)	51	Input Reg.
5	All Electricity	389.1	Input Reg.
9	Current(DC)	93.5	Input Reg.
2	Operating Status	1200.6	Input Reg.
1	Output Power	60.7	Input Reg.

1. Double click on the "Value" cell where the data row needs to be read.
2. Double click on the column header of "Value" to achieve a single batch reading of all row data.

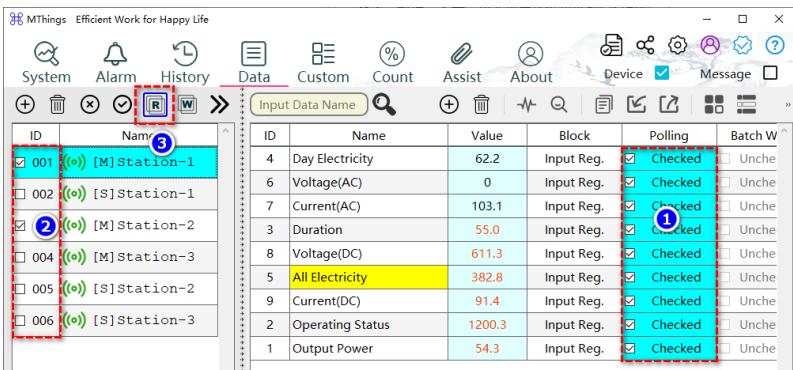
NOTICE

When the device is disabled or the channel is closed, it will not be able to successfully start a single reading.

The single operation is not limited to a single register, as the data composed of multiple consecutive registers also supports this operation.

3.11.2 Data Polling

Figure 35 Schematic diagram of data polling



1. Confirm and check the data that needs to be polled;
2. Check the devices that need to be polled;
3. Click the "Start Polling" button to start polling, and click the button again to stop polling.

NOTICE

If user want the device to start polling immediately after startup, user can modify the " Poll After Startup" option in the device' s advanced parameters.

If user need to change the data range for polling, check the "Polling" again. After the parameter changed, a restart poll is required to take effect.

When the device is disabled or the channel is closed, it will not be able to successfully start polling.

3.11.3 Single Data Writing

Figure 36 Schematic diagram of single data writing

ID	Name	Value	CMD	Write	Unit
4	Day Electricity	59.7	100	Write	kWh
6	Voltage(AC)	1	(1)	Write	V
7	Current(AC)	103.6		Write	A
3	Duration	65.4		Write	Hour
8	Voltage(DC)	721.9		Write	V
5	All Electricity	389.0		Write	kWh
9	Current(DC)	92.9		Write	A
2	Operating Status	1202.7		Write	--
1	Output Power	55.1		Write	kW

1. **Double click** to trigger the editing of the "CMD" cell and enter the target value for the data to be written;
2. **Double click** the write button to immediately send the write data command;
If the CMD modification is prepared for batch data writing, step 2 can be ignored.

NOTICE

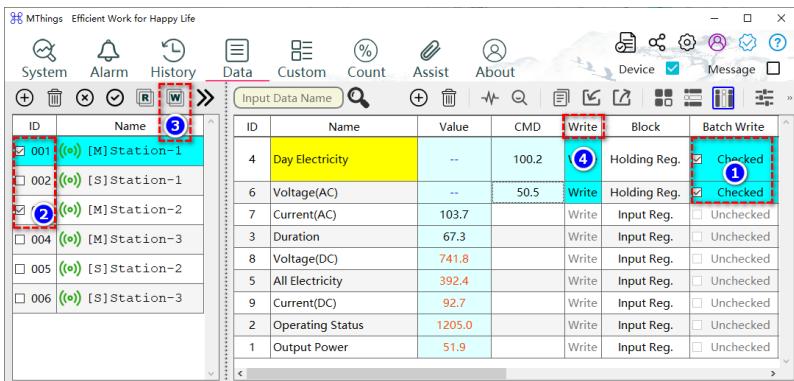
Only the coil state and hold registers support this operation.

When the device is disabled or the channel is closed, it will not be able to successfully start a single writing.

A single operation is not limited to a single register, as the data composed of multiple consecutive registers also supports this operation.

3.11.4 Batch Data Writing

Figure 37 Schematic diagram of batch data writing



1. Check the data required for batch writing;
2. Check the devices required for batch writing;
3. Click the "Start Cycle Writing" button to start batch writing, and click the button again to stop writing.

Double click on the "Write" column header (as shown in number 4 in the figure), and the software will immediately send a single batch writing command for all data.

NOTICE

Only the coil state and hold registers support this operation.

If user want the device to start batch writing immediately after startup, user can modify the "Batch Write After Startup" option in the device' s advanced parameters.

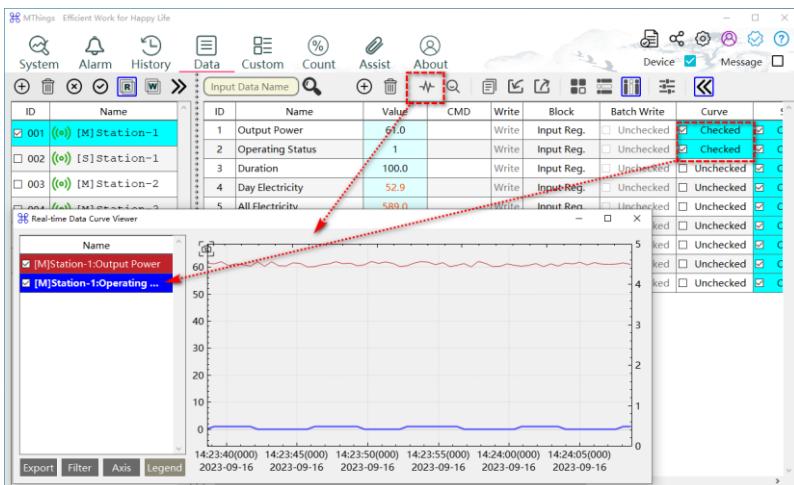
When the device is disabled or the channel is closed, it will not be able to successfully start batch writing.

After the parameters related to "Batch Write" of the device change, it is necessary to restart the batch data writing operation to take effect.

3.11.5 View Data Curves

If the curve item is selected in the data configuration and the data has been read for a period of time, user can enter the "Real-time Data Curve Viewer" to view the changes in data values.

Figure 38 Schematic diagram of viewing data curve



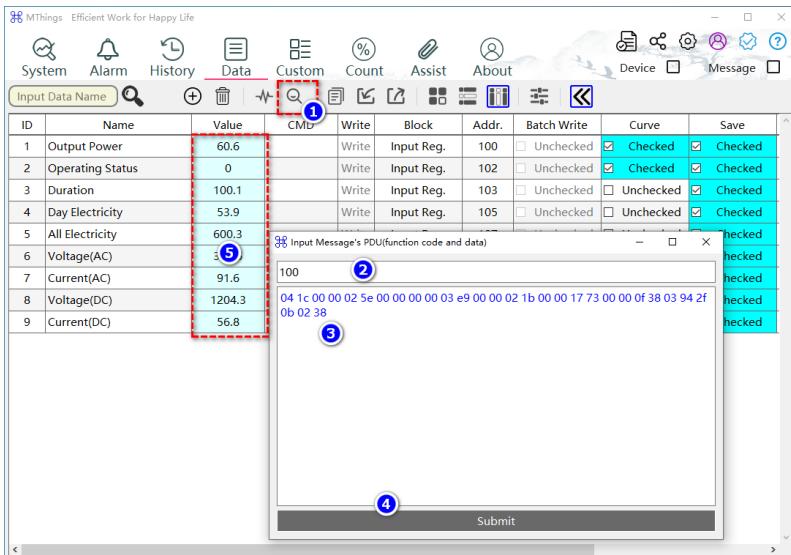
NOTICE

If curve data is selected during the polling process, it is necessary to restart the polling, otherwise the data curve cannot be viewed!

3.11.6 Parse Frame

In order to facilitate the analysis of response frame for reading data and request frame for writing data, MThings supports mapping BIT and register data from the original message to a data table based on existing device data configuration, eliminating the work for users to analyze data byte by byte, and user can view of the transmission data content.

Figure 39 Schematic diagram of parsing message



1. Click the "Parse Frame" button to open the Parse Message page.
2. If the original frame is a read data response frame, the starting data address (transmission address, based on the request frame content) needs to be input, otherwise it can be left blank.
3. Enter the original frame PDU, remove the header from the original message, and start with the function code.

4. Click the “Submit” button.
5. View the parsed data.

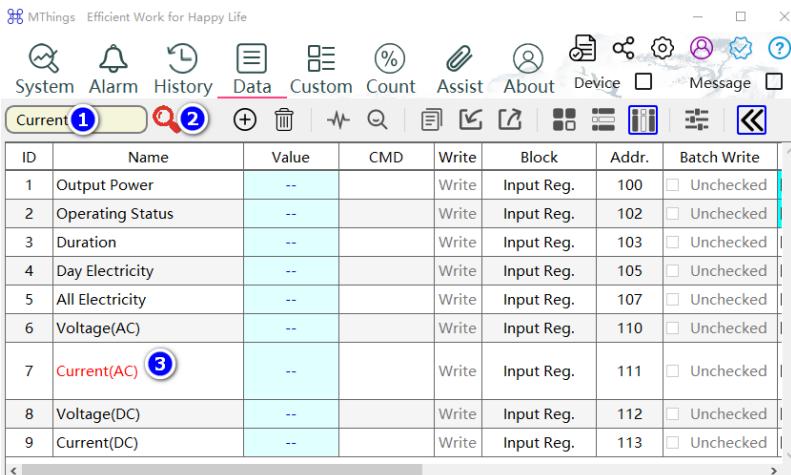
Figure 40 PDU Definition



3.11.7 Search Data

When there are many rows in the data table and users need to quickly locate a certain data row, they can quickly scroll the table to the specified position by searching for the data name.

Figure 41 Schematic diagram of data search operation



1. Enter some keywords in the name of the data to be searched (case sensitive).
2. Click the search button.

3. If there is a match, the table will automatically scroll to the corresponding position, and the data name font will be highlighted in red.

Due to the large amount of information in each row, it is necessary to drag the scroll bar horizontally when viewing information. To facilitate information viewing, the data row can be raised as follows:

Figure 42 Schematic diagram of widening row height operation

ID	Name	Value	CMD	Write	Block
1	Output Power	--		Write	Input Reg.
2	Operating Status	--		Write	Input Reg.
3	Duration	--		Write	Input Reg.
②	Day Electricity	--		Write	Input Reg.
5	All Electricity	--		Write	Input Reg.
6	Voltage(AC)	--		Write	Input Reg.
7	Current(AC)	--		Write	Input Reg.
8	Voltage(DC)	--		Write	Input Reg.
9	Current(DC)	--		Write	Input Reg.

1. Click in the "Name" cell to increase the current row height.
2. Click in the "ID" cell to cancel the current row height.

NOTICE

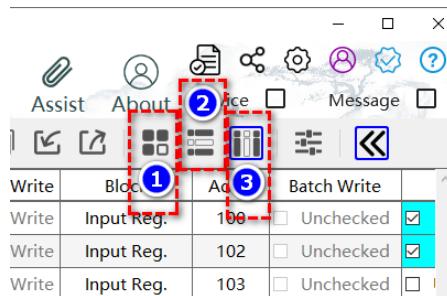
If there are multiple matches, the user can click the search button multiple times, and the search function will continue to traverse other rows of the table and identify the matching items.

The search scope only includes the "Name" column.

3.11.8 Filter Data

The data page provides multiple filtering methods, making it easier for users to focus on key information faster and better.

Figure 43 Schematic diagram of data filtering



1. Click the “Filter Data Blocks” button to hide/show the specified data block type.
2. Click the “Filter Rows” button to hide/show the specified table rows.
3. Click the “Filter Columns” button to hide/show the specified table columns.

NOTICE

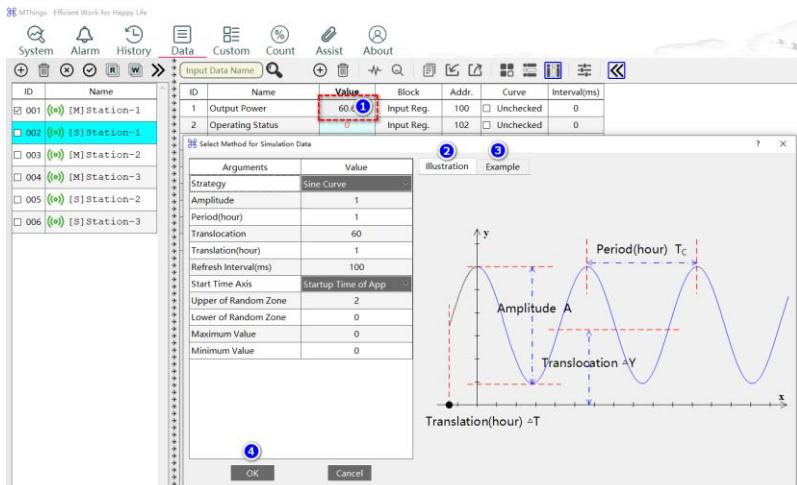
The block filtering operation is only a temporary operation. After restarting the software, all blocks will be redisplayed.

The filter row and filter column operations will store the configuration file, and after restarting the software, it will maintain the last selected display/hide state.

3.12 Slave Device Data Operations

The simulating response of slave device does not need to be manually triggered. After receiving a request from the master, the software will automatically package and reply. The simulation slave also supports data curves and parsing messages, and the operation method can refer to the previous chapter.

Figure 44 Schematic diagram of preset simulation data method



1. **Double click** on the "Value" cell that requires simulation data to open the "Select Method for Simulation Data" page.
2. Before configuring simulation data methods, user can refer to different strategy descriptions.
3. After configuring the simulation data method, user can refer to the example curve.
4. Click "OK" to active the simulation data method.

NOTICE

User can drag and drop one row of "Value" cells to another row of "Value" cells to quickly copy simulated data configuration.

Table 13 Parameter Definition of Simulation Data Method

Items	Instructions
Strategy	Define simulation method, default to fixed value
Refresh Interval(ms)	The interval between updates, during which the values remain unchanged.
Start Time Axis	Define the origin position of the curve timeline.
Upper/Lower of Random Zone	Based on the existing values, when a valid random interval is defined, the random numbers within the range are superimposed. The upper and lower limits are the same, indicating no randomness.
Maximum/Minimum Value	Based on the existing values, when defining an effective range, the values will be constrained within this range and can generally be used for curve peak shaving and valley filling. If the maximum and minimum values are the same, it means that the function is turned off.

Table 14 Slave Data Strategy Configuration

Strategy	Instructions
Fixed Value / Line /	Refer to the instructions in the software.

Parabola / Sine Curve / Square Wave

Preset Data

- Each data is separated by a newline character;
- Support copying entire columns of data from Excel to the data window;
- When the refresh interval is set to 0, reply to the master requests row by row;
- When the software restarts, the data reply will reset.

Bind Mode

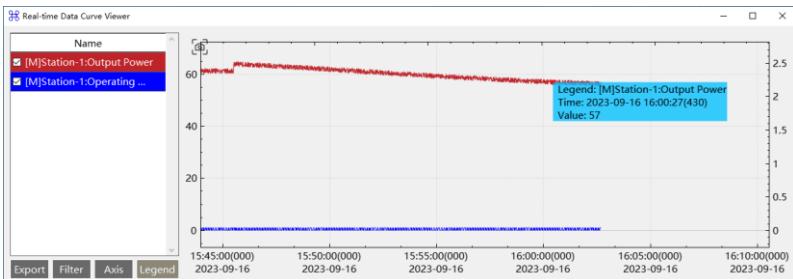
Associate any data from other master for integrating critical information and forwarding it to northbound devices.

3.13 Real-time Data Curve

Real-time data curves are containers for multiple data curves. A curve is a legend, and the displayer provides functions such as legend customization, data statistics, and export.

3.13.1 View Curve

Figure 45 Schematic diagram of curve viewing



The curve view includes a list of data curves (legends) and a legend display area. The list of legends on the left contains legends, with the background color consistent with the curve color. Legend display area can display multiple legends simultaneously. Different legends are associated with the left Y-axis by default, and some legends can also be associated with the right Y-axis through configuration.

The operation method for viewing is as follows:

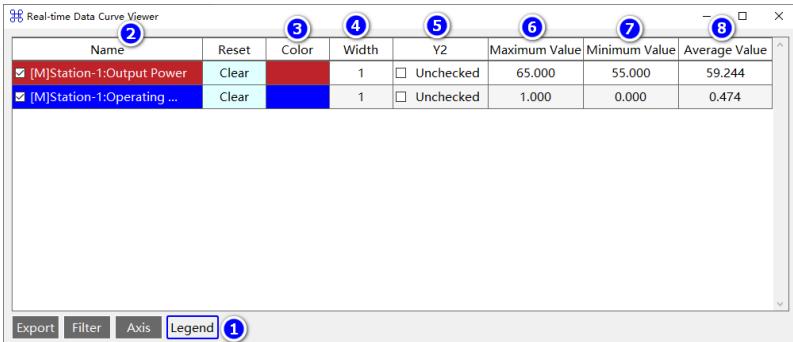
1. Users can drag the legend display area in any direction by holding down the left mouse button at any position in the legend display area.
2. Users can zoom in or out of the legend display area by using the mouse scroll wheel at any position in the legend display area.
3. Users can click anywhere in the curve to display detailed

information about data points in the curve.

4. Users can click on the axis to zoom in or out with the single axis range.

3.13.2 Maintenance Legend

Figure 46 Schematic diagram of maintenance legend



1. Click the “Legend” button to open the legend editing page.
2. Click to control whether the curve legend is displayed.
3. Double click to modify the current color of the curve legend.
4. Double click to modify the line width of the curve legend.
5. Check to associate the legend with the right Y-axis.
6. Non editable, the curve data statistics result is displayed as the maximum value.
7. Non editable, the curve data statistics result is displayed as the minimum value.
8. Non editable, curve data statistics results are displayed as averages.

3.13.3 Axis management

The data curve displayer supports multiple modes to view data curves, including normal mode, fixed mode, and oscilloscope mode.

In normal mode, the timeline length is fixed, the end time is fixed as the MThings start time, and the start time is automatically pushed forward and backward based on the "Maximum Duration" parameter;

In fixed mode, the timeline range remains unchanged after being specified by the user;

In the oscilloscope mode, the length of the timeline is specified by the user, and the end time is fixed as the current time.

Figure 47 Coordinate Axis Parameters

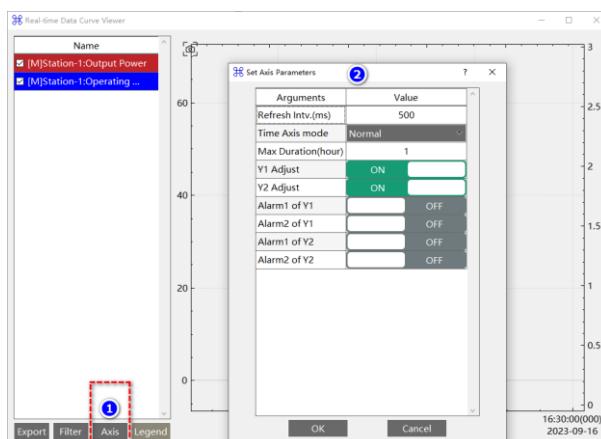


Table 15 Definition of Axis Parameters

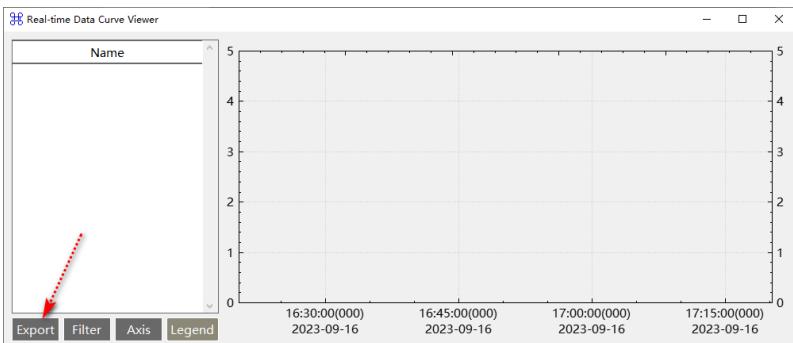
Items	Instructions
Refresh Intv. (ms)	Control the refresh interval time of curve display data.
Time Axis mode	Switch the timeline display mode.
Max Duration(hour)	The maximum duration time for all data in

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	the curve. Over the duration, the curve data will be automatically removed.
Window Duration(sec.)	Effective in the "oscilloscope" mode of the timeline, specify the length of the timeline that can be displayed, which should be less than the " Max Duration(hour)" parameter.
Y1 Adjust	Control whether the left Y-axis automatically adjusts with the curve data range.
Y2 Adjust	Control whether the right Y-axis automatically adjusts with the curve data range.
Alarm1 of Y1	The switch for left Y-axis warning line 1
SetValue1 of Y1	Display warning line on the curve display according to the set values
Alarm2 of Y1	The switch for left Y-axis warning line 2
SetValue2 of Y1	Display warning line on the curve display according to the set values
Alarm1 of Y2	The switch for right Y-axis warning line 1
SetValue1 of Y2	Display warning line on the curve display according to the set values
Alarm2 of Y2	The switch for right Y-axis warning line 2
SetValue2 of Y2	Display warning line on the curve display according to the set values

3.13.4 Export Data

Figure 48 Export Data Schematic



1. Click the “Export” button and select the export data storage path.

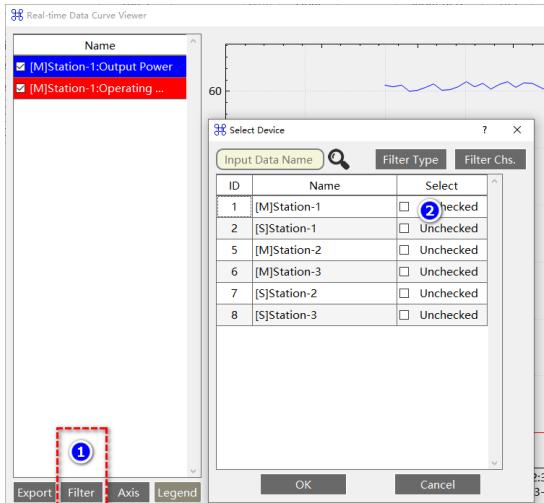
NOTICE

The data export file contains all curve data in CSV format and can be opened directly using Excel.

3.13.5 Filter devices

If there are too many data curves, in order to facilitate viewing all data curves under the same device, the device filtering function can be used to hide data curves (legends) that do not need to be viewed temporarily.

Figure 49 Schematic diagram of filtering device



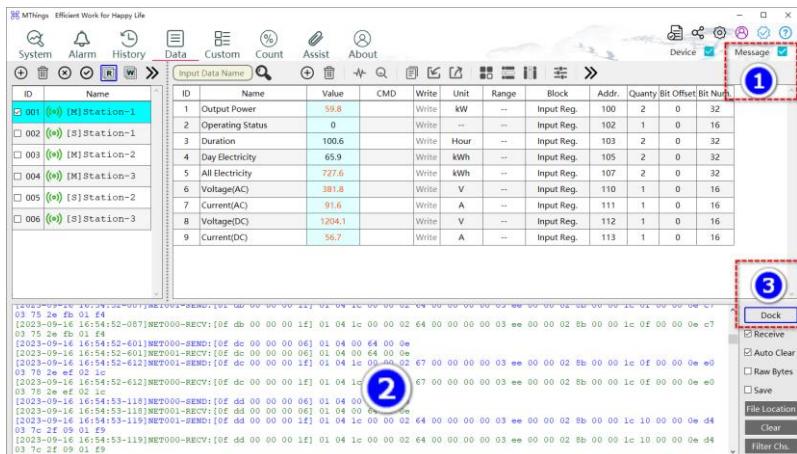
1. Click the “Filter” button to open “Select Device” page.
2. Select the device whose data curve needs to be displayed.

3.14 Message Management

As an important debugging information, MThings provides abundant and user-friendly method for message management.

3.14.1 View Messages

Figure 50 Schematic diagram of viewing messages



1. The software does not open the message monitor by default. If "Message" is checked, the message window will be embedded below the software window.
 2. View the message window.
 3. Click the "Dock" button, and the message page will pop up as a separate window. It can generally be used in multi-screen scenarios, and debugging operations and message browsing do not affect each other.

Table 16 Definition of Message Colors

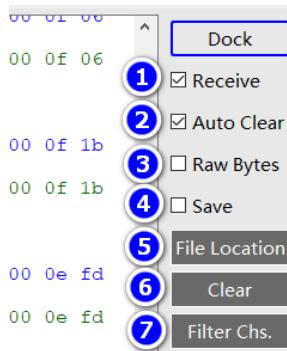
Color	Introduction
Blue	Sending messages normally
Green	Receive messages normally
Red	Abnormal message
Purple	Channel Event

NOTICE

For the convenience of user identification, if MODBUS-TCP message is received, including sending sequence number, protocol type, and data length, MBAP will be placed as the header in a pair of "[]" when the message is displayed.

3.14.2 Message Control

Figure 51 Schematic diagram of message control



1. The software starts by default and receives all channel messages. After checking "Receive", message reception can be started or closed.
2. After message reception is enabled, the software defaults to the "timed clear" function. The window will automatically clear every 2000 records in the message window to prevent high-speed messages from occupying too much computer memory. Click "Auto Clear" to turn on or off the timed clear function.
3. Based on visualization, the software performs partial conversion for MODBUS-ASCII and MODBUS-TCP. If necessary during debugging, user can check "Raw Bytes" to view the original binary byte stream message.
4. After receiving the message, it is not saved to the disk by default. If user need to store it, user can check "Save" and the software will immediately start creating the message file and starting data storage (with 10 second update period).
5. The default path for message storage is the desktop. If user need to modify it, click the "File Location" button and select a

- new message file path.
6. Click the "Clear" button to clear all messages in the message window.
 7. Click the "Filter Chs." button to specify some channels to filter messages which are not currently concerned.

NOTICE

After filtering the channels, the filtered message will not be saved.

The clearing operation will not affect the storage of data.

3.14.3 Capture Serial Port Message

To capture serial port message, user can create master device from the target serial port channel, without data configuration. Enter the message window to view all data received.

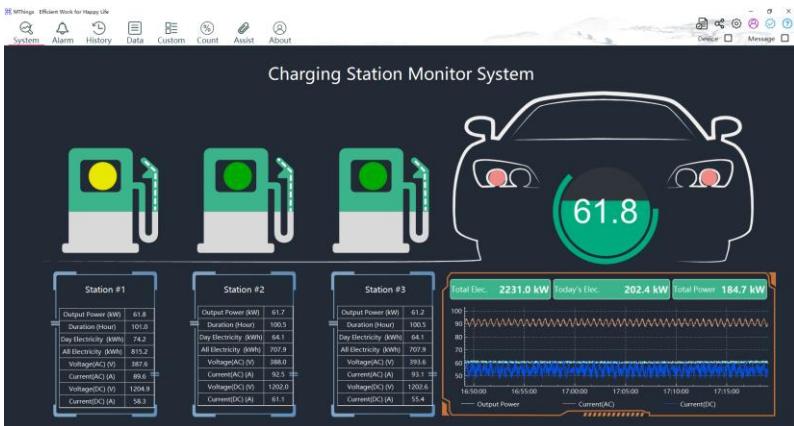
NOTICE

It is not recommended to use MThings to capture serial port message. It is recommended to choose the universal serial port tool.

3.15 System Page

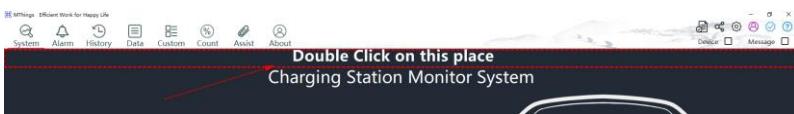
The system page provides configuration functions, supporting users to flexibly and intuitively display data based on existing device data. This function needs to be authorized before use.

Figure 52 Schematic diagram of System Page



3.15.1 Start Configuration Editing

Figure 53 Schematic diagram of starting configuration editing



3.15.2 Exit Configuration Editing

Double click on the system data canvas brow again to exit configuration editing.

3.15.3 Overall Parameters

After starting configuration editing, the "Configure Page Argument" page

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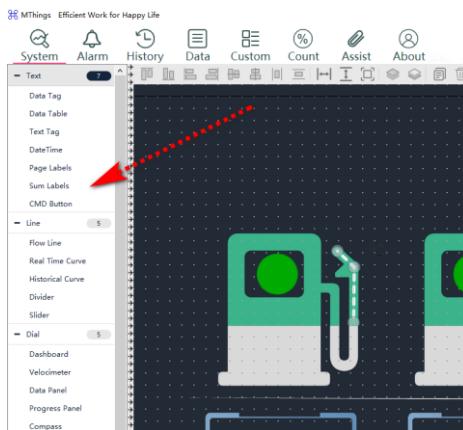
will automatically pop up, allowing users to modify the overall parameters.

Table 17 Overall Parameter Definition

Items	Instructions
Title Name	Control the title content which display in the central position of the canvas eyebrow.
Background Color	If the canvas has no underlay image, user can double-click this parameter to fill in background color.
Canvas Width	Control the width of the display area on the canvas. Its unit are the same as the display resolution.
Canvas Height	Control the height of the display area on the canvas. Its unit are the same as the display resolution.
Canvas Underlay	<p>Set up a user-defined large background image, double-click the parameter area, and select the image path. The image should be in “.Png” format.</p> <p>It is recommended that the resolution of the image be consistent with the width and height of the canvas.</p>

3.15.4 Add Chips

Figure 54 Adding Chips



Adding chips requires four steps:

The first step is to select the chip type from the left menu bar and **drag it onto the canvas**;

Step 2, set the "basic parameters", including the page to which the Affiliated Page, position, size, and Refresh Intv. (sec.);

Step 3, set "extension parameters", which vary for different chips types;

Step 4, add "content data", which means that the chip is associated with one or more device data, but some chips do not need to be associated with any device data.

3.15.5 Modify Chips

After entering configuration editing, a blue wireframe will appear when an existing chip is clicked. Users can quickly modify the size of the chip by dragging it with the mouse.

Users can quickly adjust the size, position, alignment, and other aspects

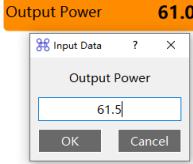
of the chips using the following method.

Figure 55 Modifying graphical controls

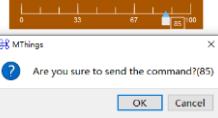
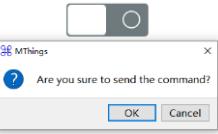
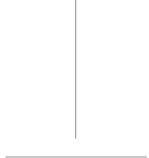
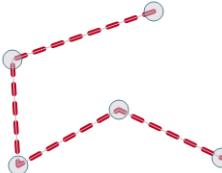


1. Align Top with selected chips.
2. Align Bottom with selected chips.
3. Align Left with selected chips.
4. Align Right with selected chips.
5. Align Horizontally with selected chips.
6. Align Vertically with selected chips.
7. Distribution Horizontally with selected chips.
8. Distribution Vertically with selected chips.
9. Make the same width with selected chips.
10. Make the same height with selected chips.
11. Make the same width and height with selected chips.
12. Place the selected chips to the top level.
13. Place the selected chips to the bottom level.
14. Copy the new chips from selected chips.
15. Delete the selected chips.

3.15.6 Chips Description

Type	Renderings	Description								
Data Tag	 <ul style="list-style-type: none"> Display data name, value, and unit; After double clicking, edit the value and send writing CMD; Multiple layout way. 									
Text Tag	abc...	<ul style="list-style-type: none"> Display static text information; Font size and color can be set. 								
Data Table	<table border="1"> <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	<ul style="list-style-type: none"> Display data from multiple different devices.
Output Power (kW)	60.6									
Duration (Hour)	102.5									
Operating Status	1									
Day Electricity (kWh)	109.6									
Date Time	2023-09-16 18:52:58	<ul style="list-style-type: none"> Display local time; Support time synchronization with devices. 								
Sum Label		<ul style="list-style-type: none"> Simultaneous statistic the data from multiple devices and calculate their arithmetic sum; Redefine data names, units, etc. 								
Status LED	Operating Status 	<ul style="list-style-type: none"> Dual color status light; Can be associated with bit data or register data; Flashing after activation and specify frequency. 								
CMD Button		<ul style="list-style-type: none"> One-click to send fixed commands; Customizable styles. 								
Page Label		<ul style="list-style-type: none"> User can switch between different page by clicking on different page labels. 								

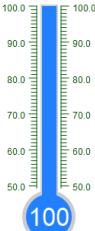
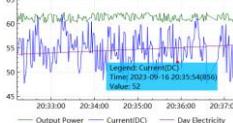
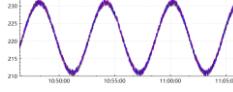
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Slider		<ul style="list-style-type: none"> ➤ Quickly adjust data value using a slider; ➤ Supports float data; ➤ Customize background and color.
Device Status		<ul style="list-style-type: none"> ➤ Display the communication status of devices in the device list.
Switch		<ul style="list-style-type: none"> ➤ Display status data; ➤ Users can manually trigger the switch status; ➤ Customize status values (non 0/1).
Divider		<ul style="list-style-type: none"> ➤ Dividing lines for auxiliary chips classification display.
Flow Line		<ul style="list-style-type: none"> ➤ Add dynamic flow based on the underlay image; ➤ Customize line color and width; ➤ Support multiple points; ➤ Trigger flow or quiescence by device data.
Battery		<ul style="list-style-type: none"> ➤ Display remaining electricity data; ➤ Customize data range and refresh step size; ➤ Customize alert values and automatically matching alert colors.

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Pic. Switch		<ul style="list-style-type: none"> ➢ Display status data; ➢ Multiple switch styles; ➢ Users can manually trigger the switch status; ➢ Customize status values (non 0/1).
Dashboard		<ul style="list-style-type: none"> ➢ Display data names, values, and units; ➢ Customize range, display accuracy, units, value colors.
Velocimeter		<ul style="list-style-type: none"> ➢ Display data names, values, and units; ➢ Customize value color, range and unit; ➢ Presents data by LCD style.
Data Panel		<ul style="list-style-type: none"> ➢ Display the data value and percentage of data; ➢ Customize the data range; ➢ Support out of range warning.
Progress Panel		<ul style="list-style-type: none"> ➢ Display the percentage of data; ➢ Customize the data range.
Compass		<ul style="list-style-type: none"> ➢ Display angle data (0-360); ➢ Supports float data.

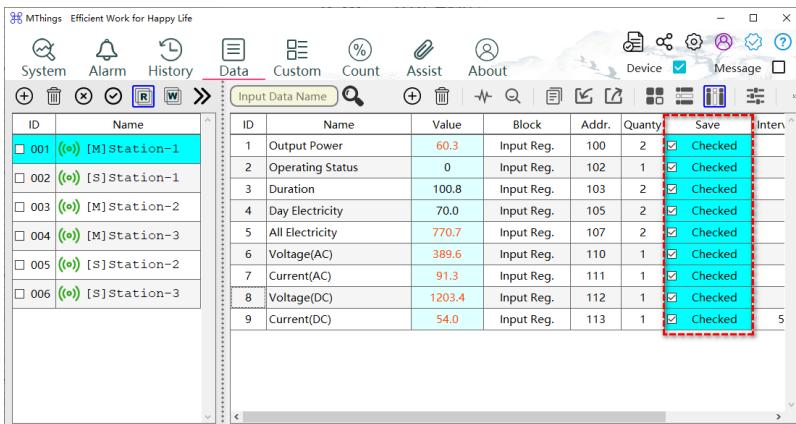
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Thermometer		<ul style="list-style-type: none"> ➤ Display temperature data; ➤ Customize ranges, scale color; ➤ Supports negative temperature; ➤ Supports float data; 						
Underlay		<ul style="list-style-type: none"> ➤ Used for locally adding image for display; ➤ Import images from any local path; ➤ Supports many image file formats. 						
Real Time Curve		<ul style="list-style-type: none"> ➤ Simultaneously display curves for up to three sets of data; ➤ Customize the display time range; ➤ Display up to 24 hours of data; ➤ Customize curves and axis colors. 						
Historical Curve		<ul style="list-style-type: none"> ➤ Display one history data curve; ➤ Customize the display time range; ➤ Display data for up to 180 days; ➤ Customize curves and axis colors. 						
Alarm Summary	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: orange; padding: 5px;">Over Voltage(1)</td> </tr> <tr> <td style="background-color: orange; padding: 5px;">Device Abnormal (2)</td> </tr> <tr> <td style="background-color: orange; padding: 5px;">Devic- 1 Offline(3)</td> </tr> <tr> <td style="background-color: orange; padding: 5px;">Devic- 2 Offline(4)</td> </tr> </table>	Over Voltage(1)	Device Abnormal (2)	Devic- 1 Offline(3)	Devic- 2 Offline(4)	<ul style="list-style-type: none"> ➤ Display all active alarms in the window; ➤ Dynamic update. 		
Over Voltage(1)								
Device Abnormal (2)								
Devic- 1 Offline(3)								
Devic- 2 Offline(4)								
Alarm Statistics	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: green; padding: 5px; text-align: center;">4 Total</td> <td style="background-color: blue; padding: 5px; text-align: center;">4 Confirming</td> </tr> <tr> <td style="background-color: orange; padding: 5px; text-align: center;">1 Major</td> <td style="background-color: orange; padding: 5px; text-align: center;">1 Minor</td> </tr> <tr> <td style="background-color: orange; padding: 5px; text-align: center;">2 Tip</td> <td></td> </tr> </table>	4 Total	4 Confirming	1 Major	1 Minor	2 Tip		<ul style="list-style-type: none"> ➤ Display key statistical of active alarms; ➤ Automatic associate alarm data.
4 Total	4 Confirming							
1 Major	1 Minor							
2 Tip								

3.16 History Data

For device data, **History Data** provides persistent storage, display, printing, and export functions, support the daily generation of independent data files, and calculate data summary information. This function requires authorization before use.

Figure 56 Schematic diagram of associated device data storage



The operation of History Data is strongly related to device data. Users need to check "Save" in the "Data" page for the data to be stored.

To avoid repeated operations during user configuration, user need to **restart MThings** after configuring History Data.

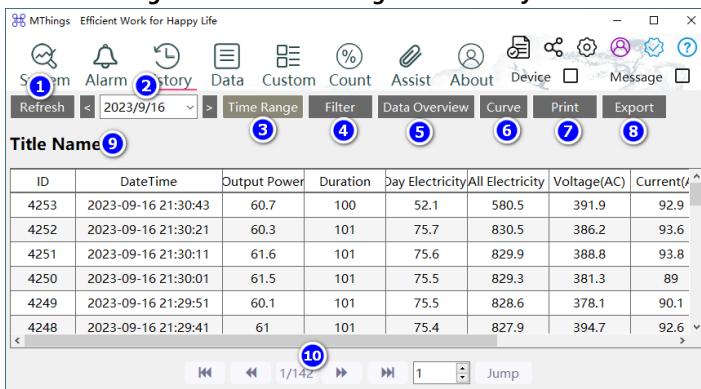
NOTICE

To avoid frequent modifications to storage configurations, it is recommended to enable History Data function after stable data configuration.

Changes in History Data configurations require software restart!

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Figure 57 Schematic diagram of History Data



1. Refresh History Data display table. History Data will not actively update the tables on the page. If user stay on the current page for a long time, user need to manually click the "Refresh" button to view the latest records.
2. Switch the date of History Data. To avoid loading too much data at the same time, History Data display table only loads data within one day at a time.
3. Filter the period, the filtering results will affect the data range of "Data Overview", "Print", and "Export".
4. Filter the data columns that need to be presented.
5. Calculate the "maximum", "minimum", and "average" of the loaded History Data.
6. View History Data in a Curve Mode.
7. Print the loaded History Data, and users can choose print information such as data columns and paper types.
8. Export the loaded History Data in CSV format.
9. Display History Data title, if set to blank in system parameters,

it will not be displayed.

10. Flip and jump History Data display table page.

3.17 Data Gateway

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

MThings supports two modes for data gateway: transparent mode and cache mode.

The transparent mode is simple configuration, but the delay is greater in the north direction, which is constrained by the south direction. The cache mode utilizes the polling function to directly respond to northbound requests, decoupling north-south facilities, and achieving more efficient asynchronous communication with northbound monitor.

By the "Bind Mode" in the slave device, it is possible to aggregate multiple device data into a single slave device, significantly reducing the number of requests for northbound monitor and improving polling efficiency. This mode can achieve a wider range of data conversion capabilities. Refer to Chapter 3.11 for configuration instructions.

The data flow diagrams in both modes are as follows:

Figure 58 Schematic diagram of transparent mode

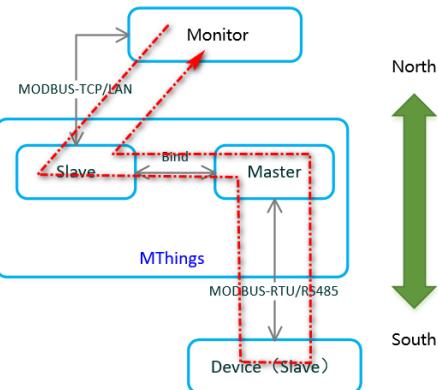
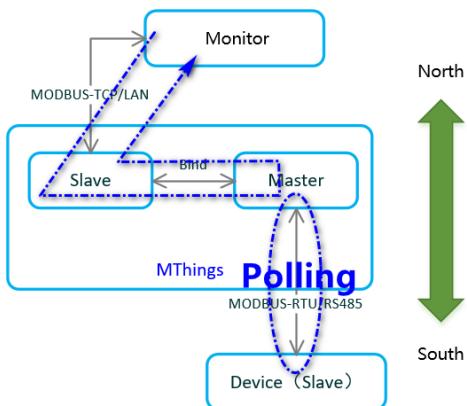


Figure 59 Schematic diagram of cache mode



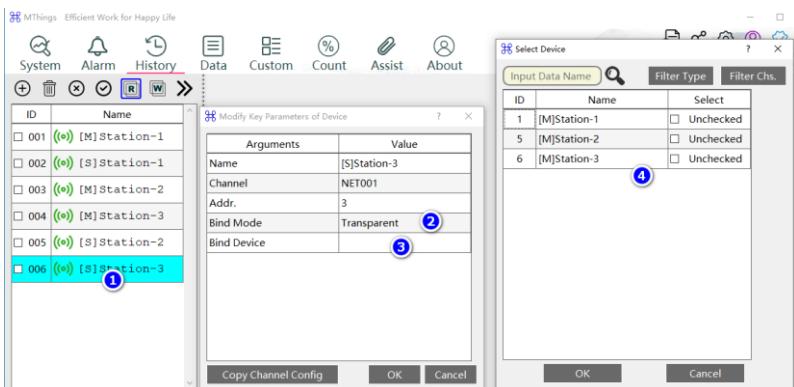
3.17.1 Transparent Mode

MThings supports the association of two different devices (master and slave) through transparent mode to achieve translation for channel, protocol, and device address.

Preparation:

- 1) Create a master device in MThings and connect it to serial port device;
- 2) Create a new network channel in MThings to connect with northbound monitor;
- 3) Add slave device based on the new network channel;

Figure 60 Device Configuration in Transparent Mode



1. **Double click** on the slave device.
2. **Double click** on the binding mode and select the transparent mode.
3. **Double click** on the bind device.
4. Select the bind device.

After device association, the remote monitor can use Ethernet to access the devices from serial port through MThings.

NOTICE

The slave device in transparent mode may not be configured with device data.

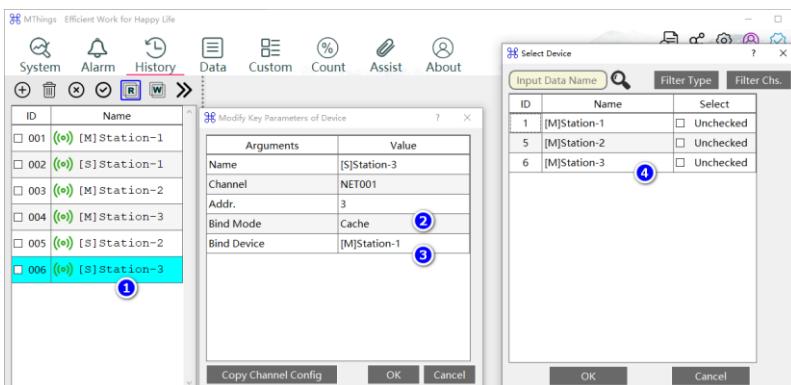
3.17.2 Cache Mode

MThings supports the association of two different devices (master and slave) through cache mode to achieve translation for channel, protocol, and device address.

Preparation:

- 1) Create a master device in MThings and connect it to serial port device;
- 2) Create a new network channel in MThings to connect with northbound monitor;
- 3) Add slave device based on the new network channel;

Figure 61 Cache Mode Configuration and Device Binding



1. **Double click** on the slave device.
2. **Double click** on the bind mode and select the cache mode.
3. **Double click** on the bind device.
4. Select the bind device.

NOTICE

The slave in cache mode may not configure device data, but its associated master device should configure valid data and start polling.

In cache mode, if the request data of the northbound software exceeds the configuration of the southbound device, it will automatically fill in 0.

3.18 Alarm Data

Alarm Data page provides multiple functions, including alarm generation, storage, configuration, display, export, voice prompts, and supports the generation across multiple conditions and devices. The reference standards include "IEC 62682:2014" and "GB/T 41261-2022 Process Industrial Alarm System Management". This function requires authorization before use.

Figure 62 Schematic diagram of alarm data

The screenshot shows the 'Alarm' tab selected in the top navigation bar. A table displays four active alarm records. The columns are labeled: ID, Name, Type, Level, Triggered, Confirmed, and Trigger Time. The data is as follows:

ID	Name	Type	Level	Triggered	Confirmed	Trigger Time
1	Over Voltage		Major	NO	NO	2023-09-16 20:28:34
2	Device Abnormal		Minor	NO	NO	2023-09-16 20:28:34
3	Device- 1 Offline		Tip	NO	NO	2023-09-16 20:28:34
4	Device- 2 Offline		Tip	NO	NO	2023-09-16 20:28:34

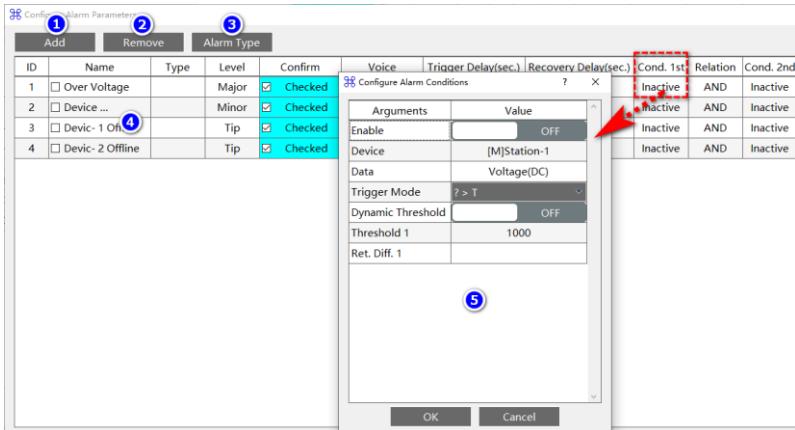
Callouts numbered 1 through 7 point to specific UI elements:

- Active Alarm (button)
- History Alarm (button)
- Type (column header)
- Triggered (column header)
- Confirmed (column header)
- Icon in the 'Confirmed' column for row 3
- Page navigation buttons (Back, Forward, Jump)

- Switching alarm record types, active alarms are divided into two types: "need to confirm" and "no need to confirm". Active alarm records that need to be confirmed must have been restored and confirmed before they can be converted into history alarms.
- Modify alarm configuration.
- Clear all alarm records with one-click.

4. Confirm all active alarms that need to be confirmed with one-click.
5. Export all alarm records in CSV format.
6. After double clicking, confirm a certain active alarm record.
7. Flip and jump alarm display table page

Figure 63 Schematic diagram of alarm configuration



1. Add alarm configuration.
2. Remove the selected alarm configuration.
3. Edit alarm types to classify different alarm configurations.
4. Alarm configuration record table.
5. Alarm condition configuration dialog box.

Table 18 Definition of Alarm Configuration Parameter

Items	Instructions
Name	Specify the alarm name.

Type	Select the type of current row based on the pre-configured alarm types.
Level	Optional: Major, Minor, Tip.
Voice	After checking the option, different voice prompts will be issued based on the alarm level.
Confirm	Specify whether the current alarm requires user confirmation.
Trigger Delay (sec.)	To prevent alarm jitter, set an alarm trigger delay, and generate active alarm records only after the alarm conditions are established within that time period.
Recovery Delay (sec.)	To prevent alarm jitter, set an alarm recovery delay, the active alarm be marked as recovered, only after the alarm condition persists for that time period.
Cond. 1st	Alarm triggering condition 1st.
Relation	The logical relationship between alarm triggering conditions 1st and 2nd.
Cond. 2nd	Alarm triggering condition 2nd.
Relation	The logical relationship between alarm triggering conditions 2nd and 3rd.
Cond. 3rd	Alarm triggering condition 3rd.

Table 19 Definition of Alarm Condition Parameter

Items	Instructions
Enable	After turning on this switch, enable this trigger

	condition.
Device	Select the associated device for judgment value.
Data	Select the associated device data for judgment value.
Trigger Mode	Select the trigger type, which can be 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
Des. Device 1	Select device as threshold 1
Des. Data 1	Select data as threshold 1
	Select device as threshold 2
Des. Device 2	Only applies to the "between" and "not between" Trigger Mode .
	Select data as threshold 2
Des. Data 2	Only applies to the "between" and "not between" Trigger Mode .
Threshold 1	The condition threshold matched with the triggering method.
Ret. Diff. 1	The amplitude of the deviation when the conditions are not met. The Trigger Mode of "equal to" and "not equal to" does not take effect.
Threshold 2	Only applies to the "between" and "not between"

Trigger Mode.

Ret. Diff. 2

Only applies to the "between" and "not between"
Trigger Mode.

3.19 Custom Request

MThings supports users to send custom messages based on the master device, which must comply with the MODBUS protocol requirements.

Users only need to fill in the PDU section of the message, and MThings automatically adapts to the protocol type used by the device, adding the beginning and end of the message, and finally sending the complete message.

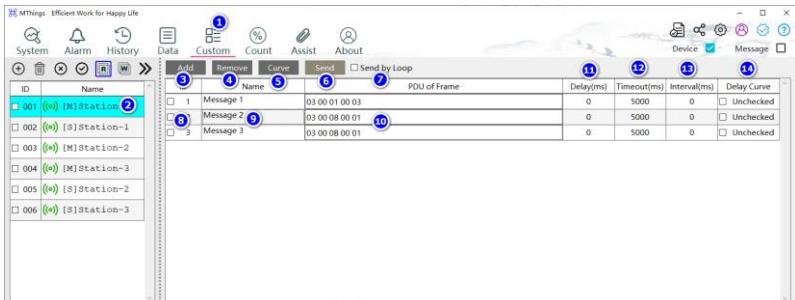
The MThings custom function supports statistical packet request delay time and continuous curve monitoring delay time, which can be used to observe the performance and reliability of the slave.

NOTICE

The custom request function only serves the master and can use standard or custom function codes.

Before customizing the request operation, please confirm whether the current device is correct in the device list on the left.

Figure 64 Schematic diagram of custom request



1. Click on the "Custom" in main menu to enter the custom

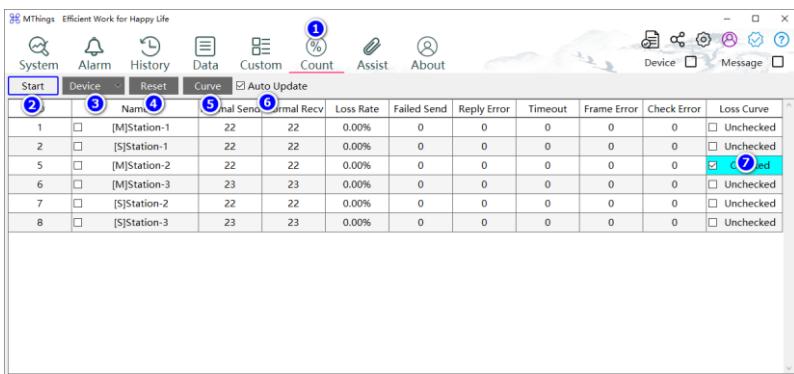
- request page.
2. Click and select master device.
 3. Click the "Add" button to create a new custom request row.
 4. Click the "Remove" button to delete the selected custom request row.
 5. Click the "Curve" button to open the "Real-time Data Curve Viewer" to view the delay time curve data.
 6. Click the "Send" button to send the selected row of custom request.
 7. If user need to send in a loop, check "Send by Loop".
 8. Select rows for "Remove", "Send".
 9. Name for one row of custom message.
 10. Input PDU of custom message.
 11. Display the delay time between custom requests and responses, which cannot be edited.
 12. The timeout period for custom requests on the current row can be configured, which is the maximum allowed reply time. Exceeding this time will result in a request timeout.
 13. The custom request and response interval for the current line can be configured, and the next request can only be initiated after the interval has ended.
 14. After checking, the software will monitor the delay time of the custom request for this row as a long-term data curve.

3.20 Count Message

MThings supports statistics of message between master and slave devices during communication.

1. By distinguishing various transmission and reception situations, accurately calculating packet loss rates and segmenting anomaly types.
2. Support curve monitoring of packet loss numbers for users to identify packet loss patterns.
3. Support count in different way: channel and device. User can view the total data under the channel and the statistical data of each device at the same time.

Figure 65 Schematic diagram of count message



1. Click on the "Count" in main menu to enter the count message page.
2. When the software starts, this function is turned off by default, and user need to click the "Start" button to start it.
3. Switch the count way, divided into device and channel. When

selecting device, the data table includes the results of all devices. When selecting channel, the data table includes the results of all channels.

4. Click the "Reset" button, all count data will be reset to 0, and a recount will begin.
5. Click the "Curve" button to open the "Real-time Data Curve Viewer" to view the loss packets curve.
6. Check "Auto Update" to continuously refresh the data in the table. Otherwise, the data in the table will be temporarily refreshed.
7. Select the object that requires continuous curve monitoring of loss packets.

Table 20 Definition of Count Message Table

Items	Instructions
Normal Send	Successfully send message.
Normal Recv	Received normal master request or slave reply. Only applicable to master.
Loss Rate	$\text{Loss Rate (\%)} = 100 * (\text{Normal Send} - \text{Normal Recv} - \text{Reply Error}) / \text{Normal Send}$
Failed Send	Due to abnormal channel, data cannot be sent out.
Reply Error	Slave replies abnormal frames (function code+0X80)
Timeout	No normal response frame received from the slave.
Frame Error	The received data cannot be parsed properly.
Check Error	The received message has the following verification error: CRC, LRC, frame number, protocol type.

NOTICE

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

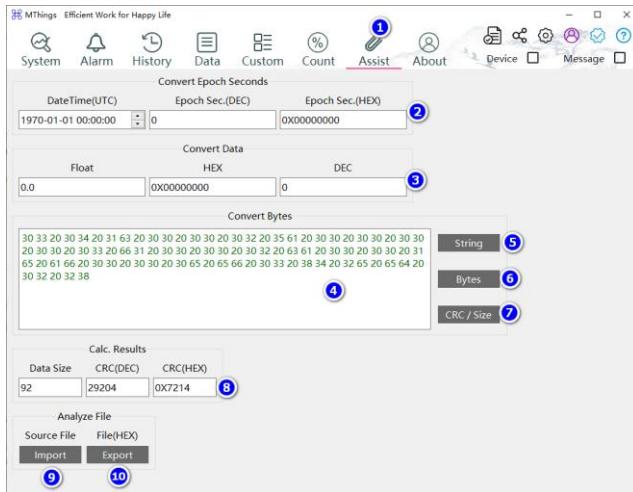
If an abnormal message appears in the channel and its device address cannot be identified, such abnormal messages will be classified as "other" devices.

It is recommended to store the original message during the count process for problem analysis.

3.21 Assist

MThings provides multiple tools to assist in advanced data analysis.

Figure 66 Schematic diagram of tools



1. Click on the "Assist" in main menu to enter the tools page.
2. The conversion between epoch seconds and standard time (UTC) supports individual modifications and automatic synchronization.
3. Different types of numerical conversions, support individual modifications and automatic synchronization.
4. Input the byte stream or string to be analyzed.
5. Click the "String" button to convert the input stream into string format. For example, "31 32 33 34 35 36 37 38 39 30" can be converted to "1234567890".
6. Click the "Bytes" button to convert the input string into byte stream. For example, the string "1234567890" can be

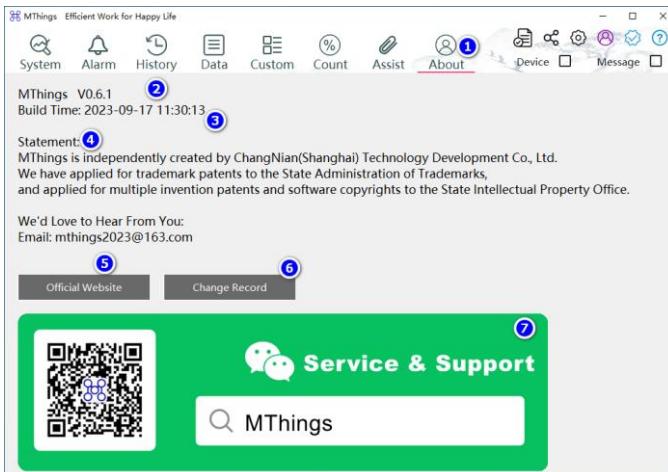
converted to "31 32 33 34 35 36 37 38 39 30".

7. Click the "CRC/Size" button to calculate the number of CRC16 and bytes number, and the results are displayed below.
8. Display the calculation results of the byte stream and imported files.
9. Click the "Import" button to import a binary file. The software will analyze the byte length and total CRC16 of the file, and the results will be displayed above.
10. Click the "Export" button, and the software will convert the imported file into HEX stream file.

3.22 About

About page provides software version, change records, copyright notices, and contact information.

Figure 67 Schematic diagram of About page



1. Click on the "About" in main menu to enter the About page.
2. Current version, key information for problem feedback.
3. Current version build time, key information for problem feedback.
4. Copyright Notice.
5. Click the button to view Official Website.
6. Click the button to view the records of changes in historical versions.
7. If user need to communicate feedback and obtain information as soon as possible, please contact me by Webchat.

4 Contact Us

Email: mthings2023@163.com

Official Website: [gulink.cn\en](http://gulink.cn/en)

ChangNian (Shanghai) Technology Development Co., Ltd



Service & Support



MThings

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