

EM100

Edge Computing Application Guide

Acquire · View · Process · Report · Control



Model	Version	Date
EM100	V1.0	October 2026
Interface	http://device IP/app	
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Connect your first point, then view, process, map and report its data.

This guide explains how to configure and use EM100 edge computing. For hardware installation, wiring and operating ratings, refer to the EM100 Specification and the documentation for your expansion modules.

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1 Before You Begin

EM100 has two configuration interfaces. **Device Management** handles network configuration, system settings and device maintenance. **Edge Computing** handles data acquisition, calculations, reporting and automated control.

For first-time setup, configure the network before setting up data tasks. Save the configuration in each interface separately.

1.1 Access and Sign-in

Chrome is recommended.

Connection	Factory-default setup
Ethernet	Connect your computer directly to an EM100 Ethernet port. Set the computer's network adapter to obtain an IP address automatically
Wi-Fi	Connect to EM100-XXXX, where XXXX is the last four characters of the device SN. The default password is EM12345678. Obtain an IP address automatically

Once connected, open <http://192.168.88.1> in your browser. The default username is admin and the password is EM12345678. After signing in, click "Edge Computing" or open <http://192.168.88.1/app>.

1.2 Four Key Terms

Term	Meaning
Endpoint	A connection between EM100 and Modbus devices, such as an RS485 serial port or a TCP connection
Device	A Modbus slave connected through an acquisition endpoint. Devices are identified by their endpoint and slave address
Point	One data item, such as a temperature or running status. It may come from a polled device, expansion IO, a remote message or a calculation
Link	A TCP or MQTT connection between EM100 and a server, used for reports, remote data and downlink commands

1.3 Using This Guide

Start with the temperature acquisition example in Chapter 2, then read the sections for the functions you need. Replace the example point names, server addresses, topics and values with those for your installation.

2 Quick Start

This example reads temperature from a Modbus RTU instrument over RS485. It assumes slave address 1, 9600 baud, 8N1 and function code FC3. The register at protocol offset 0 holds a signed 16-bit integer; temperature equals the raw value multiplied by 0.1. Check these settings in the instrument manual first.

01 Connect and sign in

Connect RS485, power and the computer network as described in the EM100 and instrument wiring instructions. Sign in and open Edge Computing.

02 Create an acquisition endpoint

Open "Endpoints", add an endpoint and select "RS485 Master". Enter rs485_1 as the name, with 9600 baud, 8 data bits, parity none and 1 stop bit. Click "Save" in the dialog to confirm the endpoint.

03 Add the slave device

Open "Points → Collection", add device meter1, select rs485_1 and set the slave address to 1. Keep the default scan interval, timeout and retries: 5000 ms, 500 ms and 3. Click "Save" in the dialog.

04 Add the temperature point

Add a point under meter1 using the values below. Protocol offset 0 corresponds to address 1 in the interface.

Parameter	Example value
Point name	temp1
Function code	3
Address	1
Byte order	Int16AB
Slope	0.1
Intercept	0
Decimals	1

05 Save and check

Click "Save Config" at the top right and wait for confirmation that the configuration is saved and active. Open "Overview", filter by meter1, and check the status and update time of temp1.

Expected result — A raw instrument value of 253 appears as 25.3 in Overview. If no data appears, check the serial settings, slave address and function code. If the value is wrong, check the register address, type, byte order, slope and intercept. See page 32 for reporting and page 20 for Modbus mapping.

3 Common Operations

3.1 Save Configuration

After editing, click "Save Config" at the top right to save the configuration to the device.

Action	Result
"Save" in a dialog	Confirms changes to the current item; they are not yet saved to the device
"Save Config" at the top right	Saves the current configuration to the device and applies the changes
Refresh or close the interface	Changes not saved to the device may be lost; click "Save Config" first

An orange dot beside a navigation item indicates unsaved changes on that page.

3.2 Select Points

Click the selector beside a point field and filter by category or name. Select one point for an automation write target. For a report, select multiple points or use the header checkbox to select all filtered results, then confirm.

Writable points include onboard DO/AO and collection points that support writing.

3.3 Delete Configuration Items

Deleting an endpoint also deletes its devices and points. Deleting a device also deletes its points.

Click the item's delete button. Check the related mappings and tasks, then click "Save Config" at the top right.

3.4 Change Theme and Language

Use the theme button at the bottom left to switch between light and dark themes. Use the language button to switch between Chinese and English.

3.5 Reboot the Device

If you have changed the configuration, click "Save Config" first, then use the reboot button at the bottom left. Acquisition, reporting and other tasks are interrupted during the reboot.

3.6 Excel Import and Export

Export the edge computing configuration to Excel to back it up or edit multiple items.

01 Export the current configuration

On the device you want to configure, click "Export" at the top to download the current interface configuration as gateway-config.xlsx. Keep the original file and edit a separate copy.

02 Edit the configuration

Open the file in Excel and edit the required parameters. Copy existing rows to add items. Keep worksheet names, column headings and column order unchanged, and leave blank cells in their original positions.

Item	How to enter it
Register address	Start at 1, as in the interface
Endpoint	Use the endpoint ID from the file
Receive link	Enter link1 or link2
TCP topic	Leave it blank; keep key, type and later fields in their original columns
MQTT topic	Use a topic from the corresponding link: a publish topic for sending or a subscription topic for receiving
Enabled	Use Yes to enable or No to disable in an English workbook; Chinese workbooks use 是 and 否 respectively
Blank and 0	Enter 0 when a numeric zero is required; do not leave the cell blank

For worksheet contents, see page 49.

03 Import the file

Import replaces the entire configuration draft in the interface with the file contents. Keep all worksheets and records you need. Click "Import" and select the edited file. If errors appear, correct the file as instructed and import it again.

04 Save the configuration

Check the imported contents, click "Save Config" at the top right, and wait for confirmation that the configuration is saved and active.

4 Overview

Overview shows each point's current value, source, status and update time. Configuration counts appear at the top, with real-time point data below.

4.1 Filter Points

Filter	Use
Category	Show all points or only collection, onboard IO, remote or computed points
Device	Filter collection points by device
Data status	Show points that are normal, abnormal, pending an update or pending a save
Point search	Find a point by name

You can combine filters. Click "Clear" to remove all filters.

4.2 List and Grid

Use "Grid" to emphasize point values, or "List" to view names, sources, values, statuses and times in rows. Grid view is shown on the first visit; subsequent visits use the view saved in the current browser.



4.3 Pause Refresh

The interface normally refreshes once per second. Click "Pause Refresh" to freeze the display while you inspect the data. Acquisition, calculations, automation and reporting continue on the device. Click "Resume Refresh" when finished.

A display refresh does not mean a point has new data. For example, if a device is polled every 5 seconds and the display refreshes every second, the same value may appear between polls.

4.4 Data Status

Displayed status	Meaning	Suggested action
Not updated	No valid data has been received; a dash is shown	Wait for the first update; if it does not arrive, check the data source
Good	The most recent data update was valid	Read the value together with its update time
Collection failed	Acquisition communication or onboard IO reading failed; the previous value may remain	Check connections, communication settings and IO module status
Timeout reset	A remote point received no valid data within its timeout and now uses the reset value	Check server transmission, receive link, topic and key
Calculation error	Expression evaluation or slope/intercept conversion failed	Check the expression, input values and scaling parameters
Source error	A point referenced by a computed point has no valid data or has an abnormal status	Check the data and status of the referenced points
Invalid data	Data could not be parsed, a value is invalid, or an IO channel is unavailable	Check data format, type, range and IO channel configuration
Pending save	An automatically detected onboard IO point has unsaved configuration	Check the onboard point configuration, then click "Save Config"
Data unavailable	The interface cannot currently obtain the point status	Check the device connection and whether configuration was saved, then refresh the interface

Values during an error — An abnormal point may still show its previous value. Check the status and update time to determine whether the data is valid.

4.5 Decimals and Display Precision

"Decimals" sets the precision used to display a value. For example, 99.99 is displayed as 100 with 0 decimal places and as 99.99 with 2. Changing this setting does not change the actual point value.

Change the point's "Decimals" setting under "Points", then click "Save Config" to apply it.

5 Acquisition and Points

5.1 Endpoints

Select an endpoint type for your connection and purpose, then follow the corresponding section below.

Endpoint type	Purpose	EM100 role
RS485 Master	Read data from external devices over RS485	Modbus RTU master
TCP Master	Read data from external devices over the network	Modbus TCP client / master
RS485 Slave	Let an external master read or write EM100 points over RS485	Modbus RTU slave
TCP Slave	Let an external master read or write EM100 points over the network	Modbus TCP server / slave

You can configure up to 5 endpoints: 1 RS485 endpoint and up to 4 TCP master/slave endpoints combined. The RS485 port can be a master or a slave, but not both.

5.1.1 RS485 Master

Read data from Modbus RTU slaves, such as instruments and sensors, over RS485.

01 Add an endpoint

Open "Endpoints", click "+ Add Endpoint", enter a name and select "RS485 Master".

02 Enter communication settings

Match the serial settings to the device being polled, using the fields below.

Parameter	Description
Serial	Select UART1
Baud Rate	Match the polled device's baud rate; default 9600
Data Bits	Match the polled device's data bits; default 8
Parity	Match the polled device's parity; default none
Stop Bits	Match the polled device's stop bits; default 1

03 Set the acquisition options

For initial setup, keep the defaults. Use the table below if adjustments are needed.

Parameter	Description
Degrade	When enabled, switch to the Degrade Period after the configured number of consecutive failed acquisition cycles
Consecutive Failures	Failed acquisition cycles required to enter reduced polling; default 1, counted once per cycle
Degrade Period	Polling interval after degradation; default 60 seconds. The original scan interval resumes after one fully successful acquisition cycle
Min Write Interval	Minimum time between writes on the same endpoint; default 1000 ms
Group Gap Threshold	Points on the same device with the same function code can be read together. The default allowed address gap is 8; set 0 to merge only contiguous addresses

If a combined read fails, set "Group Gap Threshold" to 0. Contiguous addresses will be read together; non-contiguous addresses will be read separately.

04 Save and add collection points

Click "Save" in the dialog, continue in "Collection" (Section 5.2), then click "Save Config".

5.1.2 TCP Master

Connect to a Modbus TCP slave over the network to read device data.

01 Add an endpoint

Open "Endpoints", click "+ Add Endpoint", enter a name and select "TCP Master".

02 Enter communication settings

Enter the IP address and port configured on the device being polled.

Parameter	Description
Remote IP	Enter the IP address of the device being polled
Remote Port	Enter the device's service port. The common port is 502; use the port configured on that device

03 Set the acquisition options

For initial setup, keep the defaults. Use the table below if adjustments are needed.

Parameter	Description
Degrade	When enabled, switch to the Degrade Period after the configured number of consecutive failed acquisition cycles
Consecutive Failures	Failed acquisition cycles required to enter reduced polling; default 1, counted once per cycle
Degrade Period	Polling interval after degradation; default 60 seconds. The original scan interval resumes after one fully successful acquisition cycle
Min Write Interval	Minimum time between writes on the same endpoint; default 1000 ms
Group Gap Threshold	Points on the same device with the same function code can be read together. The default allowed address gap is 8; set 0 to merge only contiguous addresses

If a combined read fails, set "Group Gap Threshold" to 0. Contiguous addresses will be read together; non-contiguous addresses will be read separately.

04 Save and add collection points

Click "Save" in the dialog, continue in "Collection" (Section 5.2), then click "Save Config".

After TCP connects, check point statuses and update times in Overview to confirm that data is being acquired.

5.1.3 RS485 Slave

Let an external Modbus RTU master read or write EM100 points over RS485.

01 Add an endpoint

Open "Endpoints", click "+ Add Endpoint", enter a name and select "RS485 Slave".

02 Enter communication settings

Match the serial settings to the external master, using the fields below.

Parameter	Description
Serial	Select UART1
Baud Rate	Match the external master's baud rate; default 9600
Data Bits	Match the external master's data bits; default 8
Parity	Match the external master's parity; default none
Stop Bits	Match the external master's stop bits; default 1
Local Slave Address	Set the EM100 slave address from 1-247; the external master must use the same address

03 Save and configure mapping

Click "Save" in the dialog, configure point addresses in "Mapping" (Chapter 6), then click "Save Config".

5.1.4 TCP Slave

Let an external Modbus TCP master read or write EM100 points over the network.

01 Add an endpoint

Open "Endpoints", click "+ Add Endpoint", enter a name and select "TCP Slave".

02 Enter communication settings

Set the listening port used by the external master.

Parameter	Description
Listen Port	Set the EM100 listening port. The external master connects using the EM100 IP address and this port

03 Save and configure mapping

Click "Save" in the dialog, configure point addresses in "Mapping" (Chapter 6), then click "Save Config".

5.2 Collection Points

5.2.1 Add a Device

Open "Collection" and click "+ Add Device". Enter a device name, select an acquisition endpoint and enter the slave address. Each device on the same endpoint must have a different slave address.

The image shows a web-based dialog box titled "Add Device" with a close button (X) in the top right corner. The dialog contains several input fields:

- Device Name ***: A text input field with the placeholder text "e.g. Temp/Humidity Sensor".
- Endpoint ***: A dropdown menu currently showing "rs485_1".
- Slave Address ***: A text input field with the placeholder text "1-247, decimal".
- Scan Interval(ms)**: A text input field with the value "5000".
- Timeout(ms)**: A text input field with the value "500".
- Retries**: A text input field with the value "3".

 At the bottom right of the dialog, there are two buttons: "Cancel" and "Save".

Figure 5-1 Add Device

Parameter	Meaning
Scan Interval	Target interval between data reads. Default 5000 ms; range 1000-3600000 ms
Timeout	Maximum wait for one response. Default 500 ms; range 10-5000 ms
Retries	Additional attempts after a failed read. Default 3; range 0-5. Set 0 for no retries

After a read fails, EM100 tries again as specified by "Retries". If all attempts fail, that acquisition cycle counts as one failure. "Consecutive Failures" counts consecutive failed acquisition cycles.

Increase "Timeout" for slow devices. Increase "Scan Interval" when polling many devices. Large data reads or retries may make the actual update interval longer than the configured scan interval.

Click "Save" in the dialog, then add points to the device.

5.2.2 Add Points

Expand the device and click "+ Add Point". Use the device manual to fill in the following parameters.

01 Enter the point name

Use a recognizable name such as temp1. Point names must be unique across all points.

02 Select the function code and data type

Select the function code from the device manual. In "Byte Order", select the corresponding data type and byte sequence.

Function	Use	Data type	Write access
FC1	Coils	Bool	Writable
FC2	Discrete inputs	Bool	Read only
FC3	Holding registers	16/32-bit integer, float or Bool, as required by the instrument	Writable
FC4	Input registers	16/32-bit integer, float or Bool, as required by the instrument	Read only

For FC3/FC4 with Bool, a whole-register value of 0 means false; any nonzero value means true. Individual bits cannot be selected. See page 46 for types and byte order.

03 Enter the register address

Register addresses in the EM100 interface and Excel start at 1. If the device manual uses addresses starting at 0, add 1. If it already starts at 1, enter the address directly.

The examples below assume that the device manual gives zero-based protocol addresses:

Example point	Function	Device protocol address	EM100 address
Coil status	FC1	0	1
Digital input status	FC2	1	2
Temperature (holding register)	FC3	10	11
Pressure (input register)	FC4	20	21

These addresses are examples; use the device manual for actual settings. If the manual uses a holding-register number such as 40001, normally select FC3 and enter address 1.

Address range — Addresses for 16-bit data and individual bits range from 1-65536. A 32-bit value uses two consecutive registers, so its starting address cannot exceed 65535.

04 Set scaling and decimal places

Point value = raw value × slope + intercept. For example, raw value 253, slope 0.1 and intercept 0 give a point value of 25.3. The defaults, slope 1 and intercept 0, leave the value unchanged.

Decimals sets display and reporting precision from 0-9 places. When writing to a writable point, EM100 reverses the scaling formula to obtain the raw value. A slope of 0 prevents this calculation; the resulting raw value must also fit the selected data type.

5.2.3 Save and Check

Click "Save Config" at the top right and wait for confirmation that it is saved and active. Open "Overview", filter by device, and check point statuses and values. Verify a few points before adding more in bulk.

5.3 Onboard IO

5.3.1 Check the Channels

After connecting an expansion IO module, configure it in Device Management. Then open "Points → Onboard IO" to view the detected channels.

Channel	Meaning	Write access
DI	Digital input: on/off state	Read only
DO	Digital output: output channel state	Writable
AI	Analog input: measured value	Read only
AO	Analog output: output value	Writable

Check that the DI, DO, AI and AO counts match the installed modules. Newly detected channels may show "Pending save".

5.3.2 Configure Points

Enter a unique point name of up to 31 UTF-8 bytes. For use in expressions or report templates, names such as temp1, pump_run and valve_out are recommended.

AI/AO points support slope, intercept and decimals settings. Refer to the expansion module documentation for supported signal types and ranges.

5.3.3 Save and Check

Click "Save Config" at the top right and wait for confirmation that it is saved and active. Then check point statuses and values in "Overview".

When testing DO/AO, check channel feedback, module status and the connected equipment. Confirm that the output is as expected and the channel assignment is correct.

To reset a DO/AO output automatically after a set duration, see the pulse settings on page 26.

Replacing an expansion module — Recheck the channel count and point configuration, along with mappings, automation and report tasks that use these points. Click "Save Config" after making changes.

5.4 Remote Points

Remote points receive JSON data from a server. They can be used in calculations, automation conditions, reports and Modbus mappings. Remote points are read only.

5.4.1 Configure the Receive Link

Open "Northbound → Links" and configure and enable a TCP or MQTT link. For MQTT, add a subscription topic for the incoming data. See Section 8.1 for connection settings and TCP receive limitations.

5.4.2 Add and Configure Points

Open "Points → Remote", click "+ Add Point" and fill in the fields below.

Parameter	What to enter
Point name	Enter a unique point name
Receive Link	For TCP, select the link receiving the data. For MQTT, select a subscription topic on that link

Parameter	What to enter
key	Enter the field to read. For example, to receive the value 25.3 from {"temp":25.3}, enter temp
Type	Select int, float or bool; accepted formats are listed below
Slope	Multiply the received value by this factor first; default 1
Intercept	Add this value after multiplying by the slope; default 0
Decimals	Decimal places for display and JSON reporting, from 0-9. Set 0 to round fractional values to integers
Timeout	If no valid data arrives within this time, use the reset value and show Timeout reset. Set 0 seconds to disable automatic reset
Reset Value	Value used by the remote point after a timeout

key reads only top-level JSON fields. A name such as data.temp cannot be used to read nested data.

Slope, intercept and decimals apply to int and float; leave them unused for bool. Slope 1 and intercept 0 leave numeric values unchanged.

Type	Accepted data	Rejected examples
int	JSON number, such as 25	"25"
float	JSON number, such as 25.3	"25.3"
bool	true, false, or numeric 1 and 0	"1", "true", 2, -1, 0.5

If the field is missing or its type does not match, the point is not updated and its timeout timer is not restarted.

5.4.3 Save and Verify

For temperature and running status, add the two points below. Keep the default slope and intercept for temp_remote. Select the same TCP link or MQTT subscription topic for both points.

Point name	key	Type	Decimals
temp_remote	temp	float	2
run_remote	run	bool	Not required

Click "Save Config" at the top right and wait for confirmation that it is saved and active. Send the following data over the selected TCP link, or publish it to the selected MQTT subscription topic:

```
{"temp":25.30,"run":1}
```

In "Overview", confirm that temp_remote shows 25.30 and run_remote shows true. Change run to 0 and send again; run_remote should show false.

5.5 Computed Points

Computed points use expressions to process existing point values, for example to convert units, add values or limit a range. Calculation results are read only.

5.5.1 Prepare the Source Points

Confirm that the source points exist and have a Good status in "Overview". Point names used in expressions must start with an English letter or underscore; later characters may be letters, digits or underscores, as in temp1 or pump_run.

Names made only of digits cannot be used directly in expressions. For example, 1 is treated as a number, not as a reference to a point named 1.

5.5.2 Add a Point and Enter an Expression

Open "Points → Computed", click "+ Add Computed Point", and enter a unique name and an expression. Use point names directly in the expression, without braces.

Goal	Example expression
Add two points	temp1 + temp2
Celsius to Fahrenheit	temp1 * 1.8 + 32
Limit the result to 0-100	min(max(temp1, 0), 100)
Absolute difference	abs(temp1 - temp2)

Supported syntax includes +, -, *, /, %, ^, parentheses and the sqrt, abs, pow, log, min and max functions. Each expression can contain up to 127 UTF-8 bytes and reference up to 8 different points.

A computed point cannot reference itself, directly or through other computed points. For example, if computed point A uses B, B cannot also use A.

For functions and operator precedence, see page 47.

5.5.3 Save and Check

Correct the expression using the validation messages. Click "Save Config" at the top right and wait for confirmation that it is saved and active. Check the result and status in "Overview".

For example, with expression $\text{temp1} + \text{temp2}$, $\text{temp1} = 20$ and $\text{temp2} = 30$ should produce 50.

Displayed status	What to check
Calculation error	Check the expression and input values, for example division by 0 or the square root of a negative number
Source error	Check the referenced point statuses, then verify the result after they return to normal

6 Mapping

Mapping allows Modbus masters, such as PLCs, to read or write EM100 points. EM100 can collect data from several instruments and make it available to an external master through one address map.

For example, EM100 reads temperature from three instruments connected via RS485. Map the three temperature points as int16 values to EM100 input registers. Each point uses one address:

Instrument slave address	Instrument temperature register	EM100 mapping address
1	11	1
2	21	2
3	31	3

The PLC can read EM100 addresses 1–3 in one FC4 request to obtain all three temperatures, without accessing each instrument separately.

6.1 Before You Start

In Overview, confirm that the points to be mapped have valid data. Add an RS485 Slave or TCP Slave endpoint to match the master's connection, enter its communication settings, and click Save in the dialog. See Section 5.1 for setup instructions.

All slave endpoints share the same address map. You do not need to configure a separate map for each endpoint.

6.2 Add and Configure Mappings

Open Mapping. Click Auto Map to generate a map and then adjust it, or add mappings manually to match the master's requirements. The four areas are listed below.

Mapping area	Data type	Access
FC1 Coils	Boolean (0 or 1)	Read/write
FC2 Discrete Inputs	Boolean (0 or 1)	Read only
FC3 Holding Registers	int16, int32, float	Read/write
FC4 Input Registers	int16, int32, float	Read only

Write targets in FC1 and FC3 must also be writable points: onboard DO/AO or FC1/FC3 collection points.

6.2.1 Automatic Mapping

If mappings already exist, export a backup first. Auto Map replaces the entire map, so existing addresses may change.

The system assigns areas and data types as shown below. Within each area, onboard IO points come first, followed by other points. Addresses are assigned consecutively from 1. You can then change the types and addresses.

Point type	Automatic mapping area	Default data type
Onboard DO; FC1 collection points	FC1 Coils	Bit
Onboard DI; FC2 collection points; bool remote points	FC2 Discrete Inputs	Bit
Onboard AO	FC3 Holding Registers	int16
Onboard AI	FC4 Input Registers	int16
FC3 collection points	FC3 Holding Registers	Based on the collection data type
FC4 collection points	FC4 Input Registers	Based on the collection data type
int remote points	FC4 Input Registers	int32
float remote points; computed points	FC4 Input Registers	float

Collection points using 16-bit integers default to int16; 32-bit integers default to int32; floating-point values default to float. Numeric points with a slope other than 1 or an intercept other than 0 are automatically mapped as float.

Onboard IO points are ordered by channel number. Other points are ordered by name, with numbers sorted as 1, 2, 10.

6.2.2 Manual Mapping

Click + Add in the required area, select a point, and enter its address. For FC3 and FC4, also select a data type. Choose float to retain decimal values, or int16/int32 according to the integer range.

Data type	Suitable values	Registers used
int16	Integers from -32768 to 32767	1
int32	Integers from -2147483648 to 2147483647	2
float	Values with a fractional part	2

Addresses start at 1; do not enter 0. int32 and float use two consecutive registers, so the next point must start after both. Each FC1 or FC2 point uses one bit address.

Addresses must not overlap within an area. Different areas may use the same address: for example, FC3 address 1 and FC4 address 1 can coexist. The following table shows an example.

Point	Area	Type	Start address	Address range
temp1	FC4	float	1	1-2
count1	FC4	int32	3	3-4
status1	FC4	int16	5	5
DO1	FC1	Bit	1	1

The maximum address is 65536 for bits and int16. The maximum start address for int32 and float is 65535.

Mapping uses AB byte order for 16-bit data and ABCD for 32-bit data. The master must use the same order for reading and writing. This is independent of each collection point's byte order.

6.3 Save and Verify a Read

This example reads a temperature over Modbus TCP. Assume that temp1 already has valid data and the TCP Slave endpoint listens on port 502.

01 Map the temperature point

Add temp1 in FC4 Input Registers, select float, and enter address 1. The point uses addresses 1-2. If this mapping already exists, check its settings.

02 Save the configuration

Click Save Config at the top right and wait for confirmation that the configuration has been saved and applied.

03 Configure the external master

Connect the master to EM100 and enter the following read settings.

Master setting	Value in this example
Device IP	The actual IP address of EM100
Port	502, matching the TCP Slave endpoint's listen port
Slave address (Unit ID)	1
Function code	FC4
Start address	Enter 1 for a 1-based master or 0 for a 0-based master

Master setting	Value in this example
Read quantity	2 registers
Data type	float (32-bit floating point)
Byte order	ABCD

04 Check the value

For example, if temp1 is 25.3, the master should display approximately 25.3 as a floating-point value. Overview uses the point's Decimals setting, so the two displays may show different numbers of decimal places.

Also check the point's status in Overview. When a point has an error, the master may still read its previous value.

6.4 Write from an External Master

Map a writable point to FC1 Coils or FC3 Holding Registers and save the configuration. Select the write method according to the mapping area and data type.

Write target	Master write method
FC1 Coils	FC5 for one coil; FC15 for multiple coils
FC3, int16	FC6 for one register; FC16 is also supported
FC3, int32 or float	Use FC16 to write both registers in one request, starting at the mapped address

Before writing, check the address, data type, value range, and byte order. Do not split an int32 or float write into two single-register requests. After writing, check the point feedback and actual output.

6.5 Change or Delete Mappings

Edit a row to change its point, type, or address. Click × at the end of a row to delete that mapping, or Clear at the top right of an area to delete all mappings in that area. Deleting a mapping does not delete the point.

Click Save Config after making changes. If an address or data type changes, update the external master's settings as well.

7 Automation

Automation writes point values or triggers reports when specified conditions or times are reached. First choose when to run: when a condition is met, at a fixed interval, or at a set time each day. Then configure the action.

7.1 Prepare and Add an Automation

Configure the required points and confirm valid data in Overview. To trigger a report, first configure the send link and report task. See Sections 8.1 and 8.2.

Open Automation, click + Add Automation, and enter a descriptive name. Each automation must have a unique name.

7.2 Set the Trigger Mode

Trigger mode	When it runs
Event (when condition met)	Evaluates point values and runs when the condition is met
Periodic (fixed interval)	Runs at the specified interval without point conditions
Daily (fixed time)	Runs at the specified time each day without point conditions

7.2.1 Event

Under Conditions, select a point and comparison operator, then enter a comparison value. For example, `temp1 >= 30` is true when the temperature reaches or exceeds 30. For Boolean points, use 1 for true and 0 for false. Collection, onboard IO, remote, and computed points can all be used in conditions.

Select an Execution mode. Both modes are subject to the Minimum execution interval below.

Execution mode	How it works
Once when condition becomes true	Runs once when the condition changes from false to true; it runs again only after the condition becomes false and then true again
Repeat while condition stays true	Runs once when the condition becomes true, then checks it at each Repeat interval; runs if still true and stops if false

Setting	What to enter
Repeat interval (seconds)	Used only for Repeat while condition stays true; enter an integer from 1-3600, default 1
Minimum execution interval (seconds)	Enter an integer from 0-3600, default 1; triggers within this interval after the last execution are skipped and are not queued; 0 disables the limit

Set the Minimum execution interval no longer than the Repeat interval to avoid skipping repeat actions. After a failed action, another trigger within the minimum interval is also skipped.

Click + Add Condition to add conditions, up to 8 per automation. AND requires both conditions to be true; OR requires either one. Conditions are evaluated in order from the first row. For example, A OR B AND C is evaluated as (A OR B) AND C.

Floating-point comparisons use the actual point value. For fluctuating values, use greater-than, less-than, or range conditions rather than exact equality.

All condition points must have valid data and a normal status, even with OR. A first received value of 0 is valid data. An initial value before any data has been received is not evaluated.

If any condition point has an error, new actions stop. When all points recover, the conditions are checked again. If true, the action runs once and repeat mode resumes at its interval, still subject to the minimum execution interval. Actions missed during the error are not replayed.

Changes to a point's value or validity trigger a new check. Repeat execution uses an independent timer and does not require the value to change. Data validity and conditions are checked before every execution.

7.2.2 Periodic

Select Periodic (fixed interval) and enter an integer from 1-3600 in Period Interval(s), default 60. For example, 60 runs the action every 60 seconds.

7.2.3 Daily

Select Daily (fixed time) and enter a time in 24-hour format. For example, 08:00 runs the action once each day at 8 a.m. according to the device clock.

Daily tasks require NTP to be enabled and synchronized. Set NTP under System → Basic Settings in the device management interface, confirm successful synchronization, and check the time zone.

7.3 Set the Action

7.3.1 Set Point

Select Set Point as the Action and complete the settings below. Before testing an output, confirm the connected equipment and its permitted operating range.

Setting	What to enter
Target Point	Select onboard DO/AO or a writable FC1/FC3 collection point
Write Value	The value to write when the action runs; for Boolean points, use 1 for on and 0 for off
Duration(s, optional)	Enter an integer from 1-3600 to apply the reset value after this duration; 0 or blank disables automatic reset
Reset Value (optional)	The value to restore after the duration; for example, enter 0 to turn a DO output off

Duration defaults to 60 seconds; change it as needed. An output that automatically resets after a duration is called a pulse. If the same point is pulsed again, its timer restarts and the reset is postponed.

If an event condition becomes false or a condition point has an error, no new actions run. An existing pulse still resets when its timer expires. If pulses repeat more frequently than their duration, the output may stay active until the final pulse expires.

Writes to collection points are also subject to the endpoint's Min Write Interval. Communication errors may cause a write or reset to fail. Check the point feedback and actual output after operation.

Pending pulse timers are not retained when configuration is reapplied or the device restarts. Check the relevant outputs before and after these operations.

7.3.2 Trigger Report

Select Trigger Report as the Action, then choose a configured and enabled Report Task. The action sends data using that task's points, format, and send link. Disabled tasks do not send data.

The report task's own periodic, change, or daily rules remain active. Account for reports sent by those rules when checking the automation's results.

7.4 Save and Check

Click Save in the dialog. In the automation list, check that the rule's Enable switch is on. Then click Save Config at the top right and wait for confirmation that the configuration has been saved and applied.

For Set Point actions, check point feedback and the actual output. For Trigger Report actions, check the received data on the server. Click Save Config again after changing a rule or its Enable switch.

Failed actions are not automatically retried. Subsequent executions follow the configured trigger mode. Event actions still check their conditions and execution intervals.

7.5 Examples

7.5.1 Report While Temperature Remains High

Assume that temperature point temp1 exists and enabled report task alarm_report can send successfully. Add an automation with the following settings.

Setting	Value in this example
Name	temp_alarm
Trigger Mode	Event (when condition met)
Condition point	temp1
Comparison operator	>=
Comparison value	30
Execution mode	Repeat while condition stays true
Repeat interval (seconds)	10
Minimum execution interval (seconds)	1
Action	Trigger Report
Report Task	alarm_report

Save and enable the rule as described in Section 7.4. When temp1 first reaches or exceeds 30, one report is triggered. While the condition remains true, another report is triggered every 10 seconds. Reporting stops below 30 or if the point has an error. This works even when the collection interval is 5 seconds and the value does not change.

7.5.2 Reset an Output After 10 Seconds

Assume that DI1 and DO1 exist and both start at 0. To turn DO1 on when DI1 becomes 1 and turn it off 10 seconds later, use the following settings. Replace the point names with those in your configuration.

Setting	Value in this example
Name	pulse_do1
Trigger Mode	Event (when condition met)
Condition point	DI1
Comparison operator	==
Comparison value	1
Execution mode	Once when condition becomes true
Minimum execution interval (seconds)	1
Action	Set Point
Target Point	DO1
Write Value	1
Duration(s)	10
Reset Value	0

Save and enable the rule as described in Section 7.4. When DI1 changes from 0 to 1, DO1 becomes 1 and returns to 0 after 10 seconds. It does not repeat while DI1 stays at 1. It runs again after DI1 returns to 0 and then becomes 1.

For example, if DI1 changes from 0 to 1 again 5 seconds after the first pulse, DO1's reset timer restarts. DO1 then resets 15 seconds after the first pulse began.

8 Northbound Communication

8.1 Link Configuration

Northbound links connect EM100 to servers for sending reports and receiving remote data and downlink commands. EM100 provides Link 1 and Link 2. Each can use TCP or MQTT independently. Choose the protocol required by the server and follow the corresponding instructions.

8.1.1 TCP Link

EM100 acts as a TCP client and initiates the connection to the server. Start the server's listener and confirm that it accepts EM100 connections before configuring the link. TCP links do not use topics.

01 Select and enable a link

Open Northbound → Links, choose Link 1 or Link 2, turn on Enable, and select TCP.

02 Enter the connection settings

Enter the server address and port. You can start with the default connection timeout and reconnect interval.

Setting	What to enter
Remote IP/Host	The server's IP address or domain name
Remote Port	The port on which the server is listening
Connect Timeout(ms)	Maximum time to establish one connection, default 5000 ms
Reconnect Interval(s)	Time between connection attempts after a failure, default 10 seconds

03 Set heartbeat and registration packets if required

If the server requires a periodic heartbeat, enter the packet content and interval. Set Heartbeat Interval to 0 to disable heartbeats. Leave Register Packet blank if it is not required.

Setting	What to enter
Heartbeat Packet	Content agreed with the server, sent at the specified interval
Heartbeat Interval(s)	Default 60 seconds; 0 disables heartbeats; packet content is required for values greater than 0

Setting	What to enter
Register Packet	Content agreed with the server, sent once after each successful connection
HEX / ASCII	Use hexadecimal bytes such as 01 02 03 for HEX, or text for ASCII

04 Save and check the connection

Click Save Config at the top right. After the configuration takes effect, check that the link shows Connected. See Section 8.1.3 for connection statuses.

Registration packets, heartbeats, and reports share the same TCP connection. The server must distinguish them and parse complete messages. A single receive operation does not necessarily contain one complete message.

For remote data and downlink commands received over TCP, EM100 currently handles only one complete JSON object per receive operation. It discards messages split across receives or multiple messages received together; it does not reassemble or separate them. Sending one message at a time does not guarantee the same boundaries at the receiver.

8.1.2 MQTT Link

MQTT uses topics to send and receive data. Publish topics are used for reports; subscribe topics are used for remote data and downlink commands. Prepare the MQTT broker address, port, and any required credentials before configuring the link.

01 Select and enable a link

Open Northbound → Links, choose Link 1 or Link 2, turn on Enable, and select MQTT.

02 Enter the broker settings

Enter the details provided by the server administrator. Standard MQTT connections are supported; TLS-encrypted connections are not supported.

Setting	What to enter
Broker Host	The MQTT broker's IP address or domain name
Broker Port	The broker port, default 1883
Client ID	Uses the device SN if blank; each connection to the same broker must have a unique ID
Username	The assigned username; may be blank if anonymous access is allowed

Setting	What to enter
Password	The account password; may be blank if anonymous access is allowed
Keepalive(s)	Maintains the connection, default 60 seconds; adjust to the broker's requirements
Clean Session	Enabled by default to clear the old session on connection; disable if the broker requires session persistence

03 Add publish or subscribe topics

Add topics to the appropriate list and select QoS. Each link supports up to 8 publish topics and 8 subscribe topics. Add only those you need.

Direction	Example topic	Purpose
Publish	/device/data	Send report data
Subscribe	/device/input	Receive remote point data
Subscribe	/device/control	Receive downlink commands

QoS can be 0, 1, or 2. It controls message delivery assurance; choose the level required by the broker.

Topics must be unique within each link's publish list and within its subscribe list. Topic names are case-sensitive. The same topic may appear in both lists or on different links. If sending and receiving on the same topic, distinguish data from commands to avoid unintended actions.

Select a publish topic for reporting, and a subscribe topic for remote points or downlink commands. The server's topic must match exactly, including case and hierarchy. Enter full subscribe topic names; do not use + or # wildcards.

04 Save and check the connection

Click Save Config at the top right. After the configuration takes effect, check that the link shows Connected. Then follow Sections 8.2 and 8.3 for reports or commands, or Section 5.4 for remote points.

8.1.3 Connection Status

Status	Meaning	What to check
Connected	A connection to the server is established	Configure the required tasks and check the actual data sent and received
Connecting	A connection attempt is in progress	Wait for the result; if it persists, check the server and network
Disconnected	No connection to the server is established	Check the server address, port, network, and MQTT credentials
Disabled	The link's Enable switch is off	Turn it on if needed, then click Save Config

8.2 Data Reporting

Report tasks send point values to a server over TCP or MQTT. They can run periodically, on value changes, at specified times, or when triggered by automation.

8.2.1 Prepare and Add a Task

Configure the send link and confirm in Overview that the required points are updating normally. For MQTT, add a publish topic to the link and have the server subscribe to the same topic.

Open Northbound → Reporting, click + Add Report, and enter a unique task name.

8.2.2 Set the Report Rules

Select the required rules. Periodic, Change, and Time rules can be enabled together. A report is triggered when any enabled rule is met.

Rule	How to configure it
Periodic	Set the Report Interval to an integer from 1-3600 seconds; reports are sent even if values do not change
Change	Enter a Deadband of 0 or a positive number for each monitored point in the Point Table; when any point reaches its threshold, the entire task is reported
Time	Select hourly, quarter-hourly, every minute, or a fixed time; quarter-hourly means minutes 00, 15, 30, and 45 of each hour; a fixed time runs once a day; NTP must be synchronized first, as described in Section 7.2.3

Deadband compares the current value with its change baseline. An increase or decrease reaching the threshold triggers a report. A value of 0 reports any change.

Change rule example — Set Deadband to 1. The first temperature reading of 25 becomes the baseline without triggering a change report. A change to 25.5 does not trigger a report; a change to 26 does, and sets the baseline to 26. Periodic and daily reports do not change this baseline.

Each point has its own baseline. A trigger updates only that point's baseline, without waiting for server confirmation. Enable Periodic as well if you need regular updates.

8.2.3 Select Points and the Send Link

Click + Add Point, select the required points in the picker, and confirm. For many points, filter the list first and use the header checkbox to select all. If Change is enabled, enter each point's Deadband in the Point Table.

The default format reports every point in the Point Table. A custom format reports the fields in its template. To trigger a report when a point changes, that point must be included in the Point Table.

Choose the destination under Send Link. For TCP, select the link. For MQTT, select a publish topic under the required link.

8.2.4 Set the Report Format

Leave the template blank to report current values using point names as field names. Use a custom template to rename fields, add a device identifier, or create nested JSON.

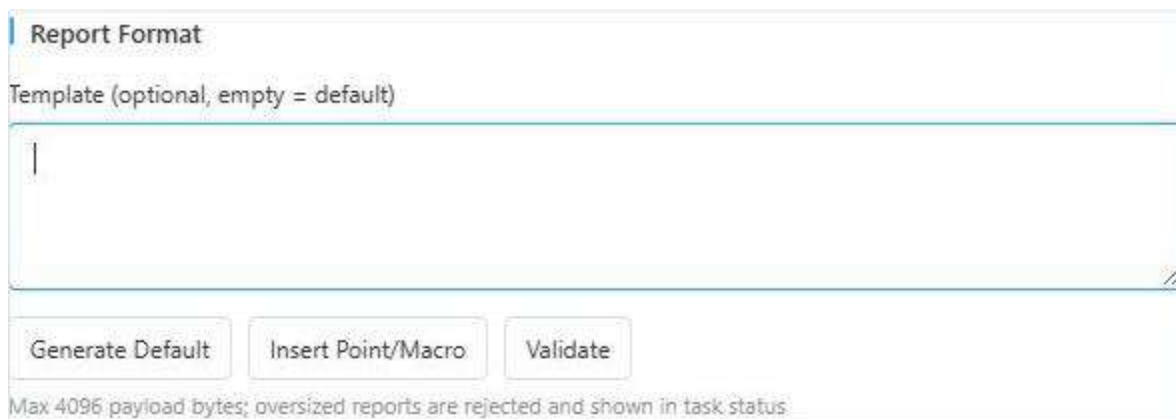
The screenshot shows a web interface for configuring the report format. At the top is a tab labeled "Report Format". Below it is a text input field with the placeholder text "Template (optional, empty = default)". The input field is currently empty. Below the input field are three buttons: "Generate Default", "Insert Point/Macro", and "Validate". At the bottom of the form, there is a small text note: "Max 4096 payload bytes; oversized reports are rejected and shown in task status".

Figure 8-1 Report format

Click Generate Default, then edit the template to match the server's requirements. {temp1} inserts the current value of point temp1; {SYS_SN} inserts the device SN.

Button	Function
Generate Default	Creates a template from the selected points; asks for confirmation before replacing an existing template
Insert Point/Macro	Place the cursor inside the JSON object where a field is needed, then select a point or macro; inserts the field name, placeholder, and required commas; the field name can be edited
Validate	Checks template syntax; correct any errors shown

If you add or remove points after generating the template, update the template too. Click Validate after editing.

For example, use the following template to name the temperature field temperature and the operating-state field running, both inside a data object:

```
{
  "sn": "{SYS_SN}",
  "data": {
    "temperature": {temp1},
    "running": {run1}
  }
}
```

If the device SN is E100_DEMO, temp1 is 25.30, and run1 is true, the server receives:

```
{"sn":"E100_DEMO","data":{"temperature":25.30,"running":true}}
```

You can keep indentation and line breaks while editing. Unnecessary JSON whitespace is removed before transmission. Spaces inside strings are preserved.

An unquoted point placeholder produces a number or Boolean. A quoted placeholder produces a string. The examples below assume temp1 is 25.30 and run1 is true. Each row shows one field; place it inside a JSON object's braces.

Template field	Received field	Data type
"value": {temp1}	"value": 25.30	Number
"value": "{temp1}"	"value": "25.30"	String

Template field	Received field	Data type
"value": {run1}	"value": true	Boolean
"value": "Temperature: {temp1}°C"	"value": "Temperature: 25.30°C"	String

Before the first successful reading — After startup or a configuration reload, Modbus collection points report null until their first successful reading. If that first reading is 0, they report 0 normally. null is a JSON null value and has no quotes.

If a string references a collection point that has not yet been read successfully, the entire string field also becomes null. For example, {"value": "{temp1}"} produces {"value": null}. If a later read fails after a successful reading, the last value may continue to be reported.

Item	Requirements
Referenced point name	Use letters, digits, and underscores in placeholders; numeric-only names are supported, for example {1} refers to point 1; point names can contain up to 31 UTF-8 bytes
Decimals	Reports use the point's decimals setting; for a value of 99.99, 0 decimal places reports 100 and 2 reports 99.99
Template length	Up to 4096 bytes; non-ASCII characters may use multiple bytes
Message length	Up to 4096 bytes after placeholder substitution, measured before whitespace removal; an oversized message is not sent or split automatically

Near the size limit, reduce the fields or divide them among tasks. Check message length using the largest values the points may reach.

8.2.5 Save and Check

Click Save in the dialog and check the task in the list. New tasks are enabled by default. Confirm that Enable is on, then click Save Config at the top right. After the configuration takes effect, check the received data on the server.

Status	Meaning	What to check
Waiting	No report payload has been generated yet	Check Enable, whether the configuration has taken effect, and whether a report rule has been met
Payload ready	The report payload has been generated	Confirm receipt on the server and check its fields and values
Disconnected	The send link is not connected to the server	Check the server address, port, network, and MQTT credentials
Too large, not sent	The generated message exceeds 4096 bytes	Reduce the fields or divide them among tasks
Payload invalid, not sent	A valid payload could not be generated	Check the template and referenced points

Payload ready confirms that the payload was generated. Check the server to confirm delivery. After editing a task, click Save in the dialog and then Save Config at the top right.

8.2.6 Disable and Resume

Turn off Enable in the task list and click Save Config to disable a task while keeping its settings. Periodic, change, daily, and automation triggers will no longer run the task.

To resume, turn Enable on and save the configuration. Reporting resumes under the configured rules; data from the disabled period is not replayed. Data sent before disabling took effect may still reach the server.

8.2.7 Example

This example reports temperature and operating state every 5 seconds. Confirm that temp1 is numeric with 2 decimal places, run1 is bool, and both update normally in Overview. Enable MQTT Link 1, add publish topic /device/data, and have the server subscribe to the same topic.

Add a report task with the following settings:

Setting	Value in this example
Task Name	report_demo
Report Rules	Select Periodic only
Report Interval(s)	5

Setting	Value in this example
Point Table	Add temp1 and run1
Send Link	Publish topic /device/data under Link 1
Report template	Leave blank to use the default format

Save and enable the task as described in Section 8.2.5. If temp1 is 25.30 and run1 is true, the server receives the following every 5 seconds:

```
{"temp1":25.30,"run1":true}
```

For TCP, choose a connected TCP link as the send link and check data on its server. The other settings are the same.

8.3 Downlink Commands

Downlink commands write JSON field values sent by a server to specified points. Use them to control outputs or change writable collection point values.

8.3.1 Prepare and Add a Task

Configure and enable a TCP or MQTT link. For MQTT, add a subscribe topic for commands. Targets must be onboard DO/AO or writable collection points. See Section 8.1.1 for TCP receive limitations.

Open Northbound → Commands, click + Add Task, and enter a unique task name. Under Receive Link, select a TCP link or a subscribe topic under an MQTT link.

8.3.2 Set the Parse Template

Choose a method based on whether the server's field names match the target point names. The examples use output point DO1; replace it with your actual point name.

Server field name	EM100 parse template	Server message
Matches the point name	Leave blank	{"DO1":true}
Differs from the point name	{"start":"{DO1}"}	{"start":true}

Both methods write true to DO1. In the template, start is the server's field name and "{DO1}" identifies the target point. The true sent by the server is the value to write.

You can enter `{"start":""}`, place the cursor between the value's quotes, then click Insert Point and select DO1. This produces `{"start":"{DO1}"}`. Click Validate afterward.

Item	Requirements
Parse template	Use a flat JSON object with quoted target placeholders as field values, such as <code>"{DO1}"</code> ; maximum 255 bytes
Server message	Use a flat JSON object with numeric or Boolean command values, such as 100 or true; do not quote values; strings such as "1" and "true" are not supported

8.3.3 Save and Verify

Click Save in the dialog, then Save Config at the top right. After the configuration takes effect, send a command from the server. For TCP, use the selected link's connection. For MQTT, publish to the selected subscribe topic.

For example, set the parse template to `{"start":"{DO1}"}`. Send `{"start":true}` from the server and check DO1 feedback in Overview and the actual output. Send `{"start":false}` and check that DO1 turns off.

Connected in the task list confirms only the connection. Check point feedback and the actual output to confirm command execution. Fields in a multi-field message are processed individually, so some writes may succeed while others fail. Failed writes are not automatically retried.

9 Troubleshooting

9.1 Interface and Configuration

Problem	Checks and actions
Cannot open the interface	Check the computer-to-device network connection and device IP; open the device management interface, sign in, and enter the edge computing interface
No points in Overview after configuration	Confirm that Save Config has taken effect, then clear the Overview filters; if onboard IO shows Pending save, check its configuration and save
Link not bound after Excel import	Check link1/link2 and column positions; leave topic blank for TCP; use publish topics for MQTT reports and subscribe topics for remote points and commands; correct, reimport, and save
Name already exists	Check for a duplicate record name; when editing the same record, its original name may be retained

9.2 Points and Mapping

Problem	Checks and actions
Modbus collection fails	Check wiring or the network, then communication settings, slave address, function code, and register address; increase Timeout for a slow device
TCP collection is connected but points do not update	Check whether the slave responds to Modbus requests, then review point status and update time; collection intervals are longer in degraded mode
Value is clearly incorrect	Check register address, data type, byte order, slope, and intercept in that order; the data type must match the instrument manual
99.99 is displayed as 100	A Decimals setting of 0 displays an integer; set it to 2 and save the configuration to display 99.99
Remote point does not update	Check the receive connection and MQTT subscribe topic, then match the top-level JSON field name to key and check the value type
Remote bool point does not recognize a value	Send true, false, numeric 1, or numeric 0 without quotes; other numbers and strings are not supported

Problem	Checks and actions
External master cannot read a mapped point	Check the slave endpoint's communication settings, function code, mapping address, and read quantity; for RS485, also check EM100's slave address
Mapped value differs from Overview	Check the mapping type and the master's decoding type; int32 and float use two registers in ABCD byte order; Overview is also affected by Decimals

9.3 Reporting and Downlink Commands

Problem	Checks and actions
Report task does not send	Confirm that the task is enabled and the configuration has taken effect; check rules, send link, and task status; for MQTT, also check the publish topic
Payload ready but nothing received	Check the link and server receive log; for MQTT, check the receiver's subscription and permissions; for TCP, parse complete messages
Collection point reports null	After startup or a configuration reload, null is reported until the first successful reading; check collection status, then check reports after a successful read
A point added to the template does not trigger change reports	Add it to the task's Point Table, enable Change, and set its Deadband; editing the template alone does not add a change trigger
Command sent but output does not respond	Check the receive link and MQTT subscribe topic, then message fields and parse template; values must be numbers or Booleans and targets must be writable; finally check output communication and the actual output

9.4 Automation

Problem	Checks and actions
Condition stays true but action runs only once	Select Repeat while condition stays true and set the Repeat interval
Condition is true but action does not run	Confirm that the rule is enabled, the configuration has taken effect, and all condition points are valid; check conditions and AND/OR order, the minimum interval, action target, and communication; for reporting, confirm that the report task is enabled
Pulse output does not reset	Check Duration: blank or 0 disables automatic reset; with a positive duration, repeated triggers postpone the reset; if no repeat trigger occurs, check the reset write and output communication

Appendix A Limits and Ranges

This appendix lists configuration limits, text lengths, and parameter ranges. New-entry default is the value shown when adding an item. Required fields that are blank must be completed for your equipment.

A.1 Configuration Limits

Item	Maximum
All points	512, including collection, onboard IO, remote, and computed points
Endpoints	5: one RS485 endpoint and up to 4 TCP Master/Slave endpoints combined
Northbound links	2, each with up to 8 publish topics and 8 subscribe topics
Automations, report tasks, command tasks	32 of each
Conditions per automation	8
Points referenced per expression	8 distinct points
Mappings	512; register addresses must not overlap within the same area

For large configurations, verify a small group of points before adding more. Actual collection and control response times also depend on collection intervals, network quality, and device response speed.

A.2 Text Lengths

Lengths are measured in UTF-8 bytes. An English letter or digit uses 1 byte; a common Chinese character usually uses 3 bytes.

Field	Maximum bytes
Point, device, automation, report task, or command task name	31
Endpoint display name	63
Remote point key	63
MQTT topic	127
Computed expression	127
Report template; report data	4096 each

Field	Maximum bytes
Received JSON data (remote data and downlink commands)	1024
Downlink command parse template	255
Northbound server IP/domain	63
MQTT Client ID, username, password	31 each

A.3 Endpoint Parameters

Setting	Range or options	New-entry default
Baud Rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	9600
Data Bits	7 or 8	8
Parity	none, odd, even	none
Stop Bits	1 or 2	1
Local Slave Address (RS485 Slave)	1-247	Blank; required
Remote Port (TCP Master)	1-65535	Blank; required
Listen Port (TCP Slave)	1-65535	Blank; required
Min Write Interval	100-10000 ms	1000 ms
Group Gap Threshold	0-65535 registers	8
Consecutive Failures	1-100	1
Degrade Period	1-86400 seconds	60 seconds

Serial settings apply to RS485 endpoints. Min Write Interval, Group Gap Threshold, and degrade settings apply to master endpoints.

A.4 Northbound TCP Link Parameters

Setting	Range	New-entry default
Remote Port	1-65535	Blank; required
Connect Timeout	100-10000 ms	5000 ms
Reconnect Interval	1-60 seconds	10 seconds
Heartbeat Interval	0-65535 seconds; 0 disables heartbeats	60 seconds

A.5 MQTT Link Parameters

Setting	Range or options	New-entry default
Broker Port	1-65535	1883
Keepalive	1-65535 seconds	60 seconds
QoS	0, 1, 2	0

A.6 Collection Device Parameters

Setting	Range	New-entry default
Slave Address	1-247	Blank; required
Scan Interval	1000-3600000 ms	5000 ms
Timeout	10-5000 ms	500 ms
Retries	0-5	3

A.7 Point Parameters

Setting	Range	New-entry default
Remote point timeout	0-3600 seconds; 0 disables timeout reset	60 seconds
Slope	Within the 32-bit floating-point range	1
Intercept	Within the 32-bit floating-point range	0
Decimals	Integer from 0-9	0

Slope and Intercept apply to collection points, onboard analog points, and numeric remote points. Decimals affects display and reporting without changing the underlying point value.

A.8 Report Task Parameters

Setting	Range	New-entry default
Report period	Integer from 1-3600 seconds	5 seconds

A.9 Automation Parameters

Setting	Range	New-entry default
Repeat interval	Integer from 1-3600 seconds	1 second
Minimum execution interval	Integer from 0-3600 seconds; 0 disables the frequency limit	1 second
Period Interval	Integer from 1-3600 seconds	60 seconds
Duration	Integer from 0-3600 seconds; blank or 0 disables automatic reset	60 seconds

Repeat interval and Minimum execution interval apply to event triggers. Period Interval applies to periodic triggers. Duration applies to Set Point actions.

Appendix B Data Types

B.1 Collection Data Types

Data type	Addresses used	Range or meaning
Bool (FC1, FC2)	1 bit address	false or true
Bool (FC3, FC4)	1 register	false if the register is 0; true if nonzero
Int16	1 register	-32768 to 32767
UInt16	1 register	0 to 65535
Int32	2 registers	-2147483648 to 2147483647
UInt32	2 registers	0 to 4294967295
Float	2 registers	32-bit floating point; select according to the instrument manual

This table applies to collection points. Remote bool points accept true, false, numeric 0, or numeric 1. See Section 5.4.

FC3 and FC4 mappings support int16, int32, and float. Choose a type that covers the value range. See Section 6.2.1 for remote point automatic mapping. If values exceed the selected type's range, change the type or scaling.

B.2 Byte Order

A, B, C, and D represent the four bytes of a 32-bit value, from most to least significant. For the hexadecimal value 12 34 56 78, the receive order is:

Byte-order suffix	Received byte sequence	Meaning
ABCD	12 34 56 78	Most significant byte first
CDAB	56 78 12 34	Registers swapped
BADC	34 12 78 56	Bytes swapped within each register
DCBA	78 56 34 12	All four bytes reversed

16-bit types use AB or BA, such as Int16AB or Int16BA. Follow the instrument manual and verify the result with a known value. Mapping uses fixed ABCD order for multi-register values.

Appendix C Expressions and System Macros

C.1 Computed Expressions

Computed expressions support the following operators and functions. Numbers in the examples may be replaced with point names.

Syntax	Function	Example and result
+	Addition	$2+3 = 5$
-	Subtraction	$5-2 = 3$
*	Multiplication	$2*3 = 6$
/	Division; divisor must not be 0	$6/2 = 3$
%	Remainder; divisor must not be 0	$5\%2 = 1$
x^y	x raised to the power y	$2^3 = 8$
sqrt(x)	Square root; x must be at least 0	sqrt(9) = 3
abs(x)	Absolute value	abs(-3) = 3
pow(x,y)	x raised to the power y	pow(2,3) = 8
log(x)	Natural logarithm; x must be greater than 0	log(1) = 0
min(x,y)	Smaller of two values	min(2,3) = 2
max(x,y)	Larger of two values	max(2,3) = 3

Exponentiation takes precedence over a preceding minus sign: $-2^2 = -4$. Chained powers are evaluated right to left: $2^3^2 = 512$. Use parentheses to make the order clear in complex expressions.

C.2 Report Template System Macros

System macros add device information and time to reports. Click Insert Point/Macro and select a macro to insert a complete field. Macros are inserted as strings by default. Synchronize the device clock before using time macros.

System macro	Reported content
{SYS_VERSION}	Device firmware version
{SYS_SN}	Device SN
{SYS_IMEI}	Cellular module IMEI
{SYS_ICCID}	Current SIM card ICCID
{SYS_LOCALTIME}	Local time in YYYY-MM-DD HH:mm:ss format
{SYS_UTCTIME}	UTC time in YYYY-MM-DD HH:mm:ss format
{SYS_TIMESTAMP}	Unix timestamp in seconds

For example, this template reports the device SN, local time, and temp1 value.

```
{"sn":"{SYS_SN}","time":"{SYS_LOCALTIME}","temp":{temp1}}
```

C.3 Point References

Where used	Example	How it works
Computed expression	temp1 * 0.1	Enter the point name directly
Report template	{"temp":{temp1}}	Use {point_name} to insert a value; see Section 8.2.4 for other formats
Downlink command parse template	{"start":"{DO1}"}	Quote the target placeholder; see Section 8.3.2 for the server message format

Appendix D Excel Configuration Reference

Use this appendix when editing configuration worksheets in Excel. See Section 3.6 for export, import, and saving. Follow the headers in the file exported by the device. Do not change worksheet names, headers, or column order.

D.1 Worksheets and Settings

Worksheet	Contents	What to check
Endpoints	Endpoints	Endpoint ID, type, and communication settings
Collection	Collection devices and points	Parent endpoint, slave address, function code, register address, and data type
Onboard IO	Onboard IO points	Point-to-channel assignments
Remote	Remote points	Receive link, MQTT subscribe topic, key, and data type
Computed	Computed points	Referenced point names and circular references
Mapping	Mappings	Function code, data type, and address; no address overlap within an area
Automation	Automations	Enable, trigger mode, execution mode, action target, and intervals
Links	Northbound links	Enable, protocol, server settings, and publish/subscribe topics
Reports	Report tasks	Enable, rules, Point Table, send link, MQTT publish topic, and template
Commands	Downlink commands	Receive link, MQTT subscribe topic, and parse template

D.2 Special Field Examples

Use standard ASCII colons and semicolons as shown below. Replace point names, topics, and times with your actual settings.

Worksheet	Column	Example	Meaning
Reports	Point Table	temp1:0;temp2:0.5	Deadband is 0 for temp1 and 0.5 for temp2
Reports	Rules	period;change	Enable both periodic and change rules
Reports	Rules	time	Enable scheduled reporting; enter the schedule in Time Logic
Reports	Time Logic	hourly	Report on the hour
Reports	Time Logic	quarterly	Report at minutes 00, 15, 30, and 45 of each hour
Reports	Time Logic	minutely	Report at the start of every minute
Reports	Time Logic	fixed:08:00	Report once daily at 08:00
Links	pub	/device/data:0	Publish topic /device/data with QoS 0
Links	sub	/device/input:1	Subscribe topic /device/input with QoS 1

Separate multiple entries in Rules, Time Logic, Point Table, or pub/sub with semicolons. For example, hourly;fixed:08:30 reports on the hour and daily at 08:30. Each schedule type may appear only once in Time Logic.

D.3 Automation Options

Column	Value	Interface option
Trigger	event	Event
Trigger	period	Periodic
Trigger	daily	Daily
Execution mode	once	Once when condition becomes true
Execution mode	repeat	Repeat while condition stays true

Execution mode applies to event triggers. For repeat, enter whole seconds in Repeat interval (seconds). Enter Minimum execution interval (seconds) separately. Follow the exported format for other fields.

D.4 Links and Addresses

Field	Requirement
Link	Enter link1 or link2 and confirm that the link is enabled
topic	Leave blank for TCP; for MQTT, use publish topics for reports and subscribe topics for remote points and commands
Register address	Starts at 1; 32-bit data uses two consecutive registers

Configuration files may contain usernames and passwords. Remove unrelated sensitive information before sharing a file. To restore a configuration, use a backup from the target device.