iSN-81x Series User Manual

Version 1.11

Feb 2025

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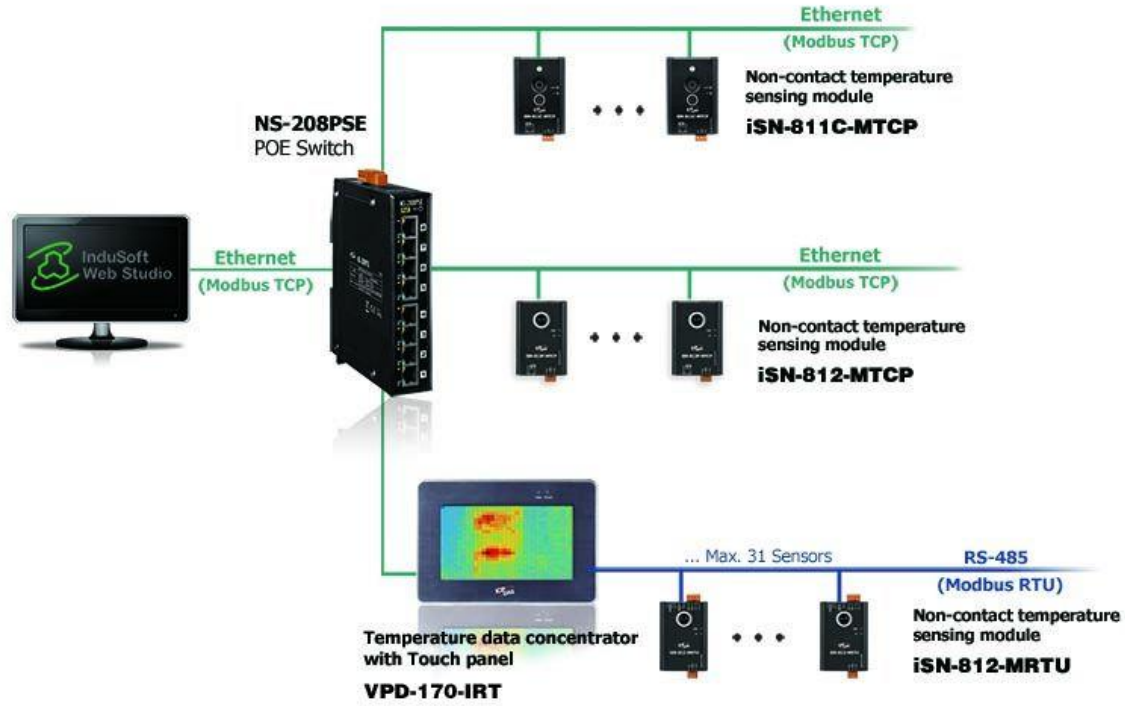
1 Introduction

1.1 Product Information

iSN-81x series is an Infrared temperature sensing module that is designed specifically for non-contact temperature measurement. The module provides a variety of temperature pixels and temperature threshold detection functions to meet various temperature measurement needs. It also provides Modbus RTU and Modbus TCP two protocols that users can put it into SCADA system very easily.



- iSN-81x series

Model	Pixel
iSN-811C-MTCP	8 x 8 = 64
iSN-812-MRTU	32 x 24 = 768
iSN-812-MTCP	32 x 24 = 768

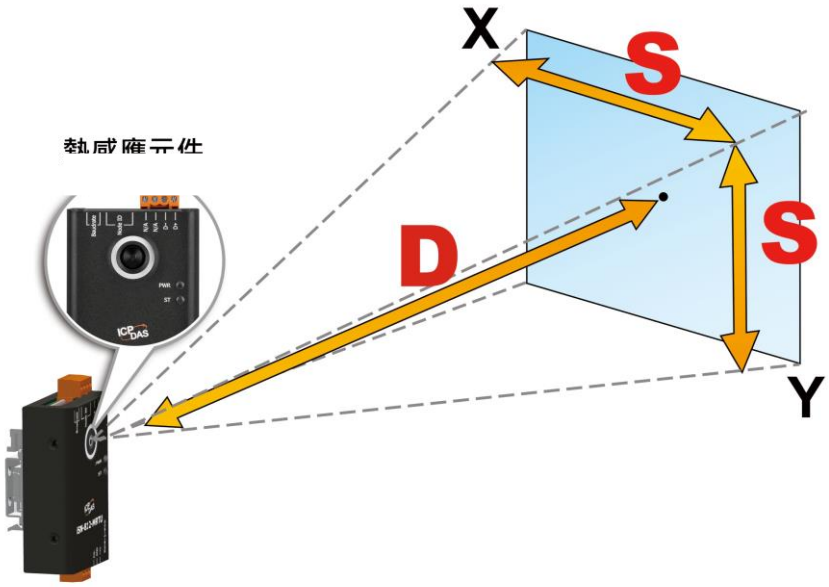
1.2 Features

- Non-Contact Temperature measurement
- Support Modbus RTU protocol for iSN-81x-MRTU series
- Support Modbus TCP, RESTful and MQTT protocols for iSN81x-MTCP series
- Web-based configuration and monitoring interface (iSN-81xMTCP series)
- Temperature threshold detection function
- Integrated thermal imaging and field image

1.3 Specifications

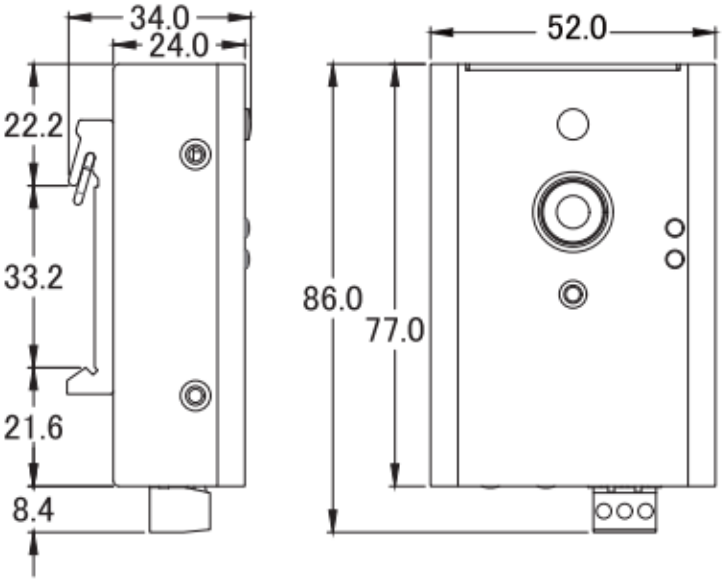
型號	iSN-812-MRTU	iSN-811C-MTCP	iSN-812-MTCP
Communication Ports			
Ports	1 x RS-485	Ethernet, IEEE 802.3af,Class 1	
Protocol	Modbus RTU	Modbus TCP / MQTT / RESTful	
Temperature Measurement			
Range	-40°C~300°C	-20°C~250°C	-40°C~300°C
Accuracy	±5°C Max	±5°C Max	±5°C Max
Resolution	0.1°C	0.1°C	0.1°C
Recommended Distance	≦2m	≦1m	≦2m
Pixel	768 (32x24)	64 (8x8)	768 (32x24)
FOV	X: 110° / D : S =1 : 2.86 Y:75° / D : S =1 : 1.53	X: 60° / D : S =1 : 1.15 Y: 60° / D : S =1 : 1.15	X: 110° / D : S =1 : 2.86 Y:75° / D : S =1 : 1.53
Motion picture (camera)			
Pixels	-	QVGA (320 x 240)	-
Fill light	-	Yes	-
Power			
Input Range	+10~+30VDC		
Consumption	1.5W	1.5W	1.5W
Mechanical			
Installation	Din-rail or magnetic(Optional), universal joint(Optional)		
Dimensions (mm)	52 x 94 x 34 (W x H x D)	52 x 86 x 34 (W x H x D)	

Environment	
Operating Temperature	-10°C ~+70℃
Storage Temperature	-20°C ~+80℃
Humidity	10~95% RH, Non-condensing

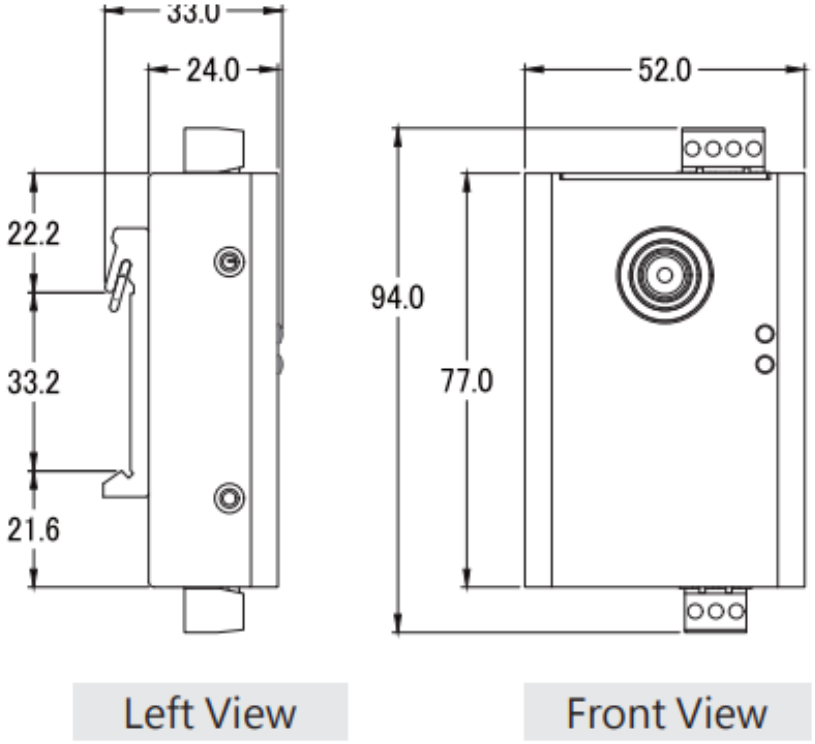


1.4 Dimensions

iSN-811C-MTCP

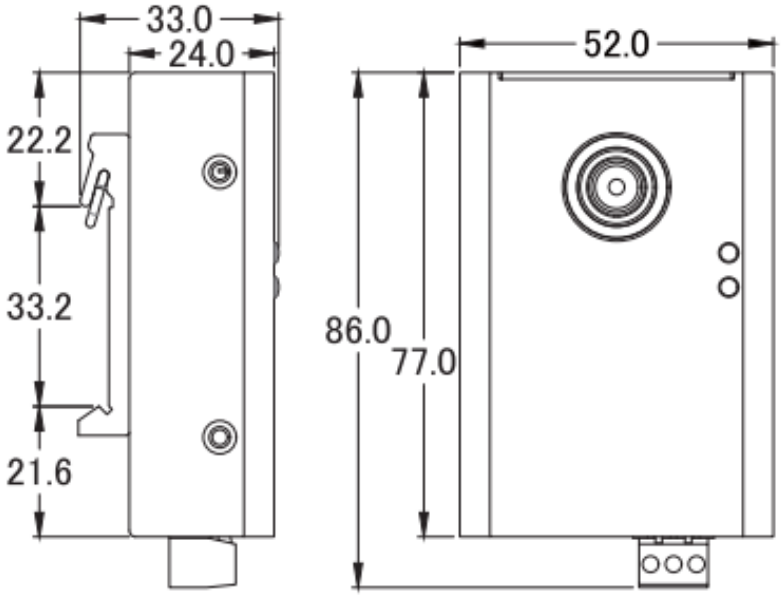


iSN-812-MRTU



Left View Front View

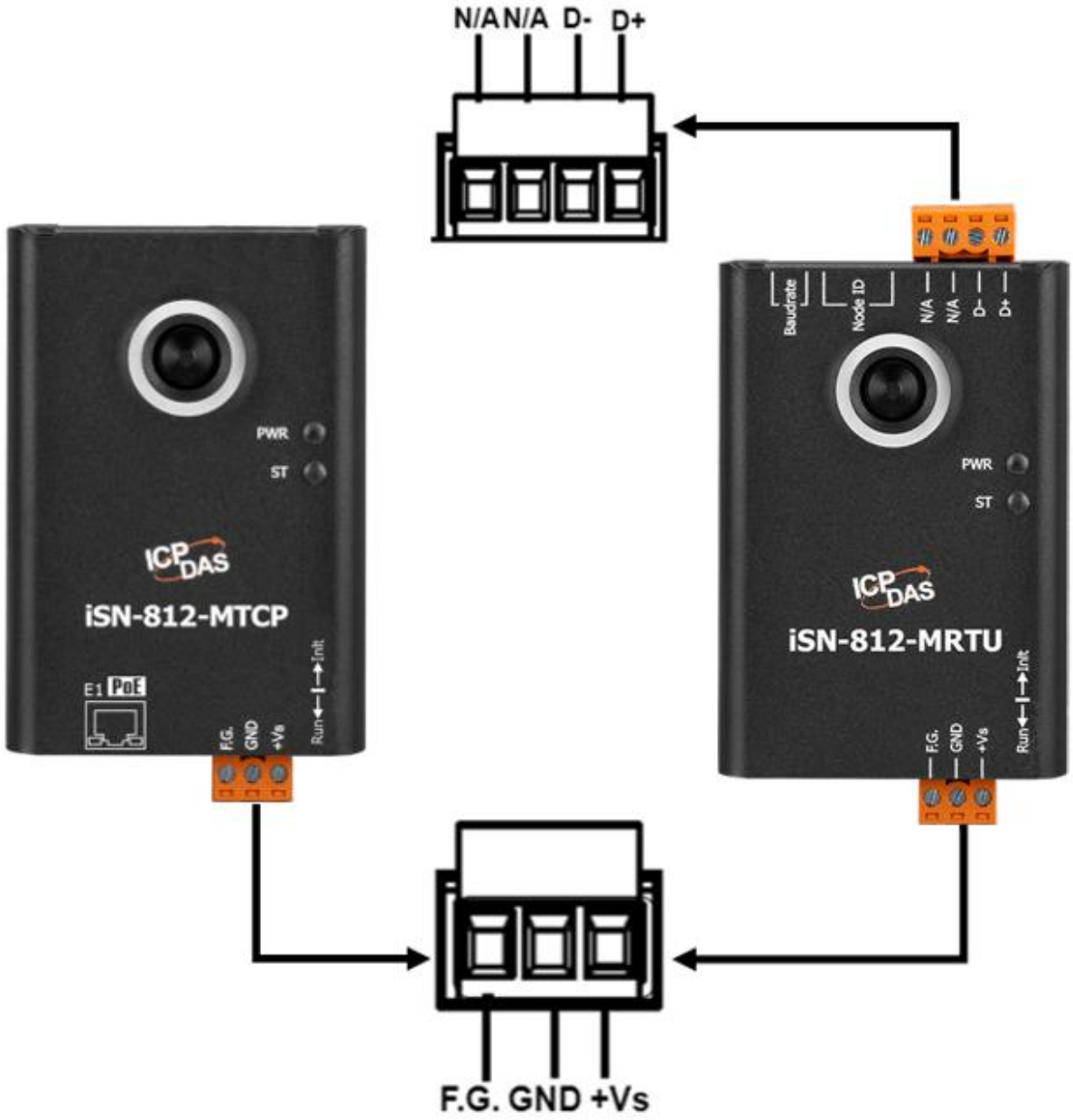
iSN-812-MTCP



Left View Front View

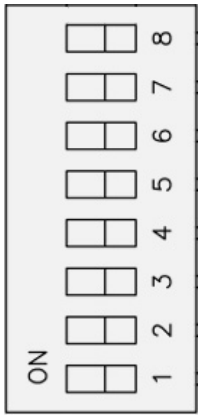
2 Configured by Hardware

2.1 Pin assignments



1. +Vs: +10~+30VDC

2.2 Dip Switch

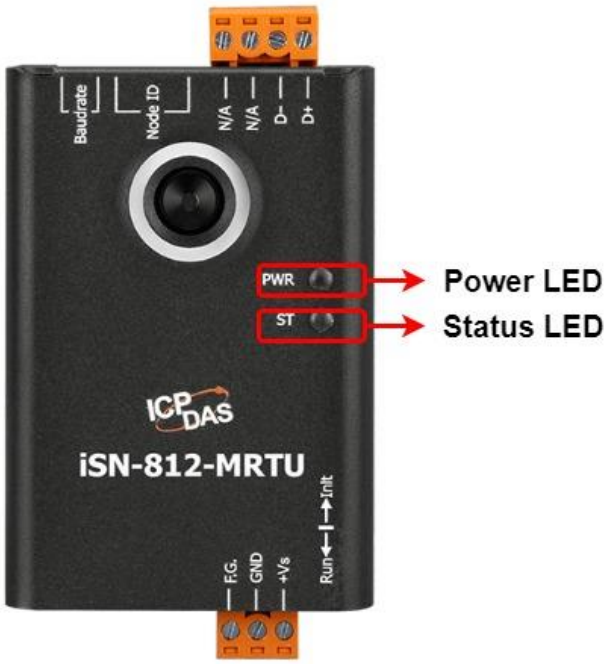
<table>
<tr><th>Switch</th><th>Pin Number</th><th>Function</th><th>Example</th></tr>
<tr><td rowspan="2"> 

*1</td><td>1~5</td><td>Modbus ID (ID range: 1~31)</td><td>
<table>
<tr><th>Modbus ID</th><th colspan="5">Switch</th></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>10</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>30</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table>
Note: 1=>ON, 0=>OFF</td></tr>
<tr><td>6~8</td><td>Baudrate *2</td><td>
<table>
<tr><th>Baudrate (bps)</th><th colspan="3">Switch</th></tr>
<tr><td></td><td>6</td><td>7</td><td>8</td></tr>
<tr><td>9600</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>19200</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>38400</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>57600</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>115200</td><td>0</td><td>0</td><td>1</td></tr>
</table>
Note: 1=>ON, 0=>OFF</td></tr>
<tr><td rowspan="2"> 
</td><td colspan="2">Init</td><td>Device works in waiting to be upload Firmware mode</td></tr>
<tr><td colspan="2">Run</td><td>Device works in normal mode</td></tr>
</table>

*1. Only for iSN-81x-MRTU series

*2. The Data format of COM Port: None Parity, 8 Data bit, 1 Stop bit. (N,8,1)

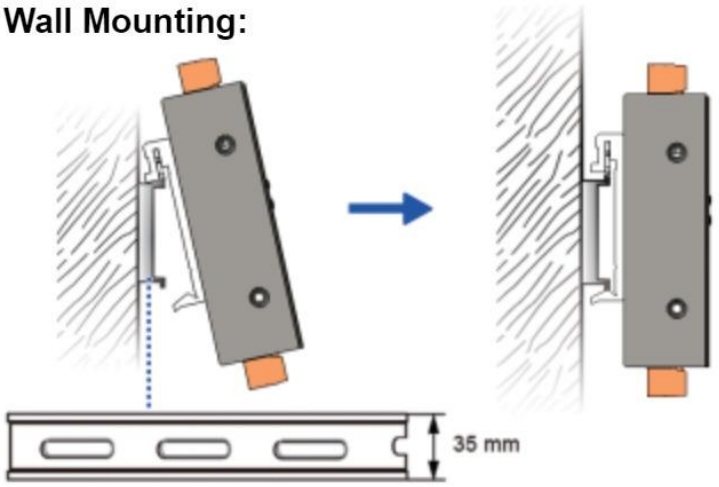
2.3 LED Indicators



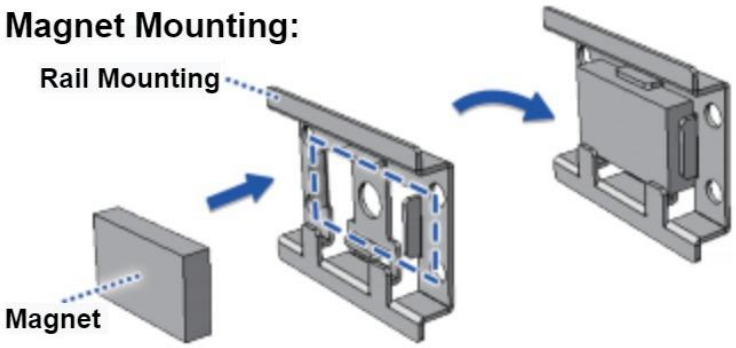
LED Status		Description
PWR	**ST**	
ON	OFF	Power supply is OK and waiting for connection
ON	ON	The connection established but transmission not yet started.
Flashing (0.05sec)	ON	Thermal data transmission (only for MTCP series)
Flashing (0.05sec)	Flashing (0.5sec)	Thermal data transmission with abnormal temperature judgment (only for MTCP series)
ON	Flashing (0.5sec)	Abnormal temperature judgment
Flashing (0.5sec)	Flashing (0.5sec)	eSearch Locate (only for MTCP series)

2.4 Installation

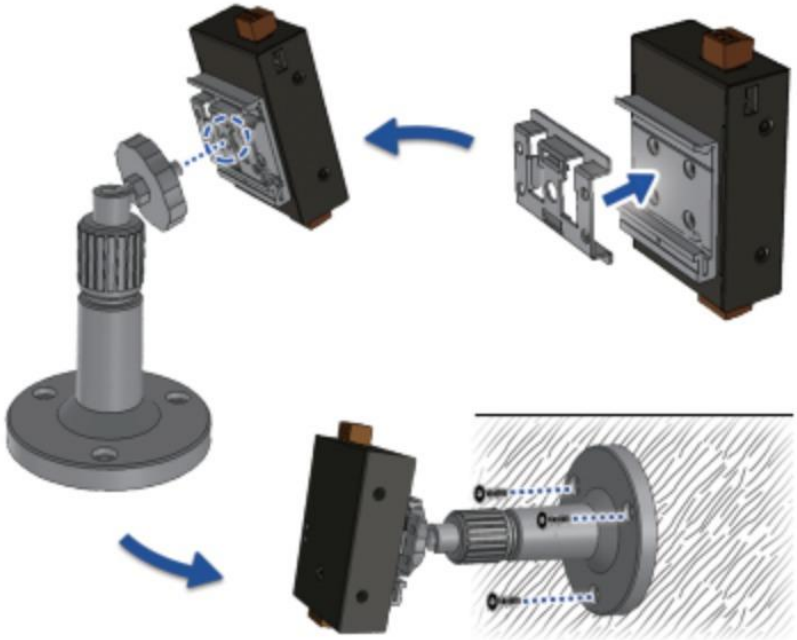
Wall Mounting:



Magnet Mounting:



Gimbal Mounting:

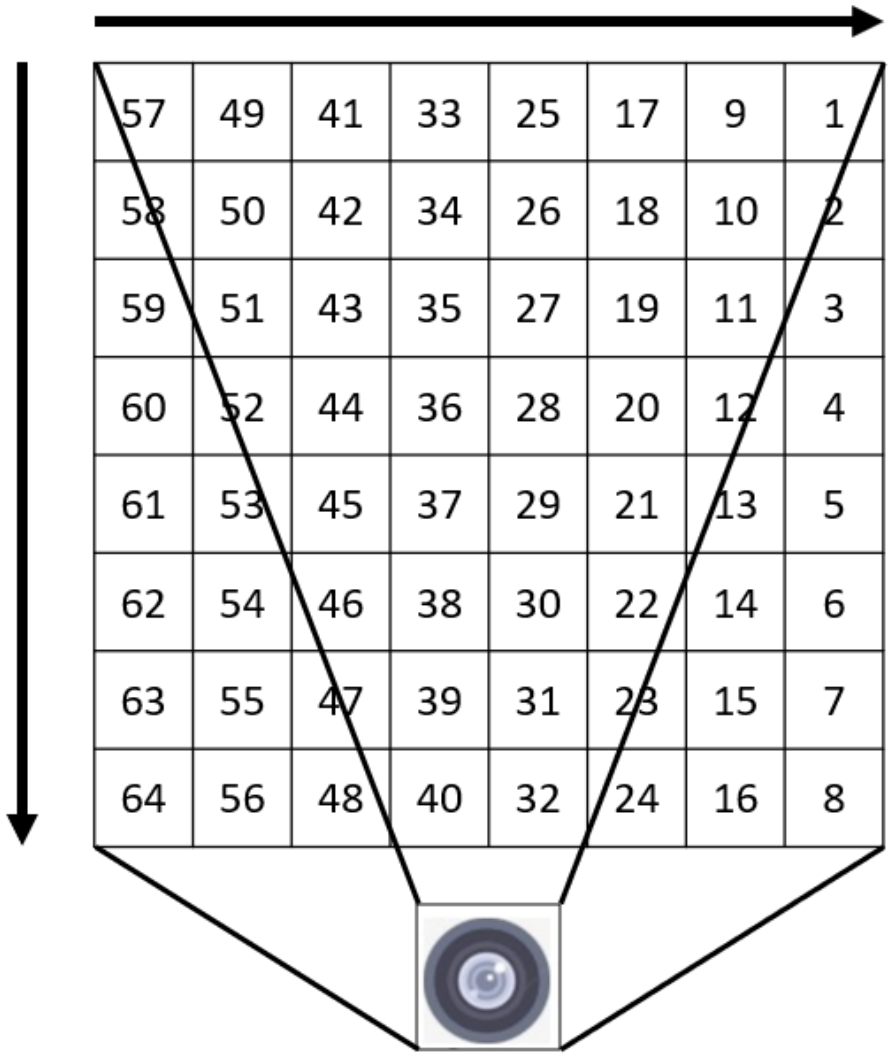


3 Temperature and other function

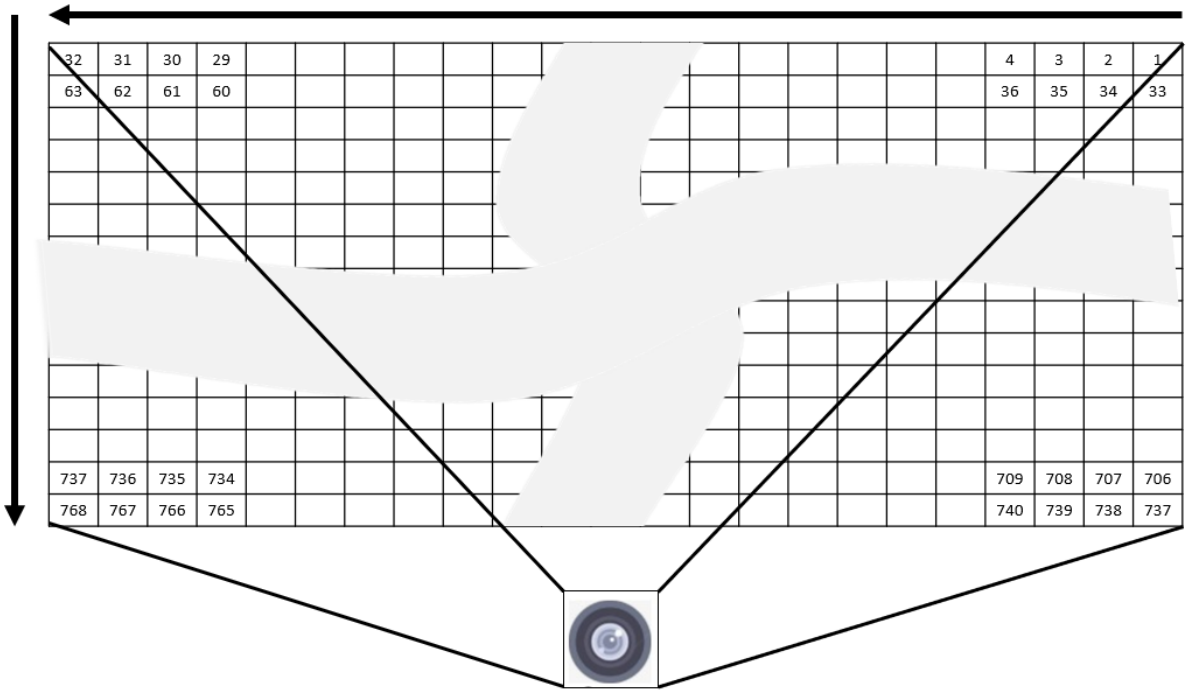
3.1 Temperature point and its coordinate

Each model has its own coordinate of the temperature point, please refer to the following content.

- iSN-811 series



- iSN-812 series



3.2 Segmentation of Measurement FOV

According the image resolution of iSN-81x series, we segment the measurement FOV to serval area. Each area has its own item, like the highest temperature, the lowest temperature, threshold value, etc.

1. The item of each area:

- The highest temperature
- The lowest temperature
- Average temperature
- Warning threshold value
- Danger threshold value
- Threshold type
- Threshold switch

2. Area distribution

- iSN-811 series

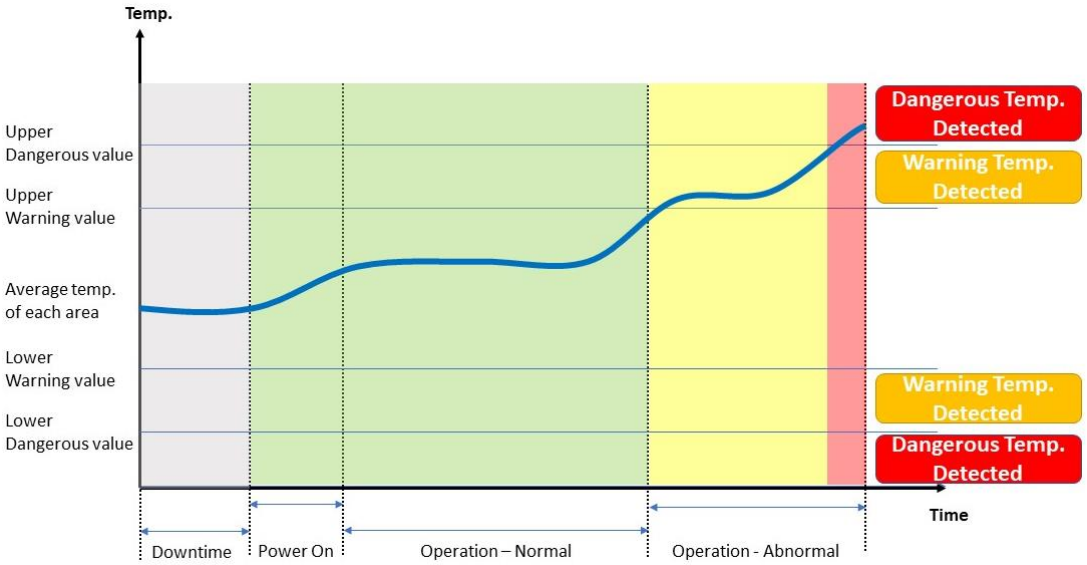
4	3	2	1
8	7	6	5
12	11	10	9
16	15	14	13

- iSN-812 series

4	3	2	1
8	7	6	5
12	11	10	9

3.3 Temperature threshold value

iSN-81x series provides two kinds of threshold value. When the average temperature of each area is higher(lower) than threshold value, iSN-81x series will show the diagnostic message and status LED will be flashing.



1. The parameter of iSN-81x series threshold value, each area has its own threshold parameter.

- Threshold switch
- Warning threshold value (Lower and Higher)
- Danger threshold value (Lower and Higher)

2. Threshold switch

- When the threshold switch of one of the area open, that area will start to check if the temperature is over than threshold value.
- Modbus address: 0
- Each area uses 1 bit.
- Modbus value: 0: close, 1: open
- example:

Modbus address	0															
Value	0xFA15															
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Bit Value	1	1	1	1	1	0	1	0	0	0	0	1	0	1	0	1
Area	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Switch	ON	ON	ON	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	ON

3. Warning threshold value (Lower)

- Unit: 0.1°C
- Modbus address: 1~16 (from area 1 to area 16)
- example:

Modbus address	2
Value (Dex)	213
Area Number	2
Warning threshold temperature	21.3°C

4. Danger threshold value (Lower)

- Unit: 0.1°C
- Modbus address: 17~32 (from area 1 to area 16)
- example:

Modbus address	24
Value (Dex)	124
Area number	8
Danger threshold temperature	12.4°C

5. Warning threshold value (Higher)

- Unit: 0.1°C
- Modbus address: 33~48 (from area 1 to area 16)
- example:

Modbus address	35
Value (Dex)	795
Area Number	3
Warning threshold temperature	79.5°C

6. Danger threshold value (Higher)

- Unit: 0.1°C
- Modbus address: 49~64 (from area 1 to area 16)
- example:

Modbus address	55
Value (Dex)	1255
Area number	7
Danger threshold temperature	125.5°C

3.4 Diagnostic message

When iSN-81x series occurs error, or the temperature is over than threshold value, iSN-81x series will show the diagnostic messages and Status LED will be blinking.

Type	Message
System diagnostics	Sensor error
Threshold setting diagnostics	Threshold value setting error
Threshold value diagnostics	Temperature is over than Warning threshold value
	Temperature is over than danger threshold value

1. Sensor error:

- Modbus address:106
- Modbus value: 0x0001
- Explanation: iSN-81x series can't read the temperature data from sensor.

2. Threshold value setting error:

- Modbus address:116
- Each area uses 1 bits
  - Value 0: Threshold **s**etting normal
  - Value 1: Threshold **s**etting abnormal. The module will turn off the threshold switch.
- Explanation: If the threshold setting is error, please check the warning threshold value and the danger threshold value match the requirement of the threshold setting.
- example:

Modbus address	116	
Value(Hex)	0x0302	
Bit	8~15	0~7
Bit Value	0x03	0x02
Area number	2, 9, 10	
Error type	Threshold **s**etting of Area 2, 9, 10 is abnormal	

3. Threshold value diagnostic message:

- Modbus address:117~118
- Each area uses 2 bits
- Modbus value:
  - 0: normal
  - 1: Temperature is over than warning threshold value
  - 2: Temperature is over than danger threshold value
- Example:

Modbus address	117															
Value	0x9845															
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Bit Value	1	0	0	1	1	0	0	0	0	1	0	0	0	1	0	1
Area	8		7		6		5		4		3		2		1	
Status	Over than danger threshold value		Over than Warning threshold value		Over than danger threshold value		Normal		Over than Warning threshold value		Normal		Over than Warning threshold value		Over than Warning threshold value	

Modbus Address	118															
Value	0x6412															
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Bit Value	0	1	1	0	0	1	0	0	0	0	0	1	0	0	1	0
Area	16		15		14		13		12		11		10		9	
Status	Over than Warning threshold value		Over than danger threshold value		Over than Warning threshold value		Normal		Normal		Over than Warning threshold value		Normal		Over than danger threshold value	

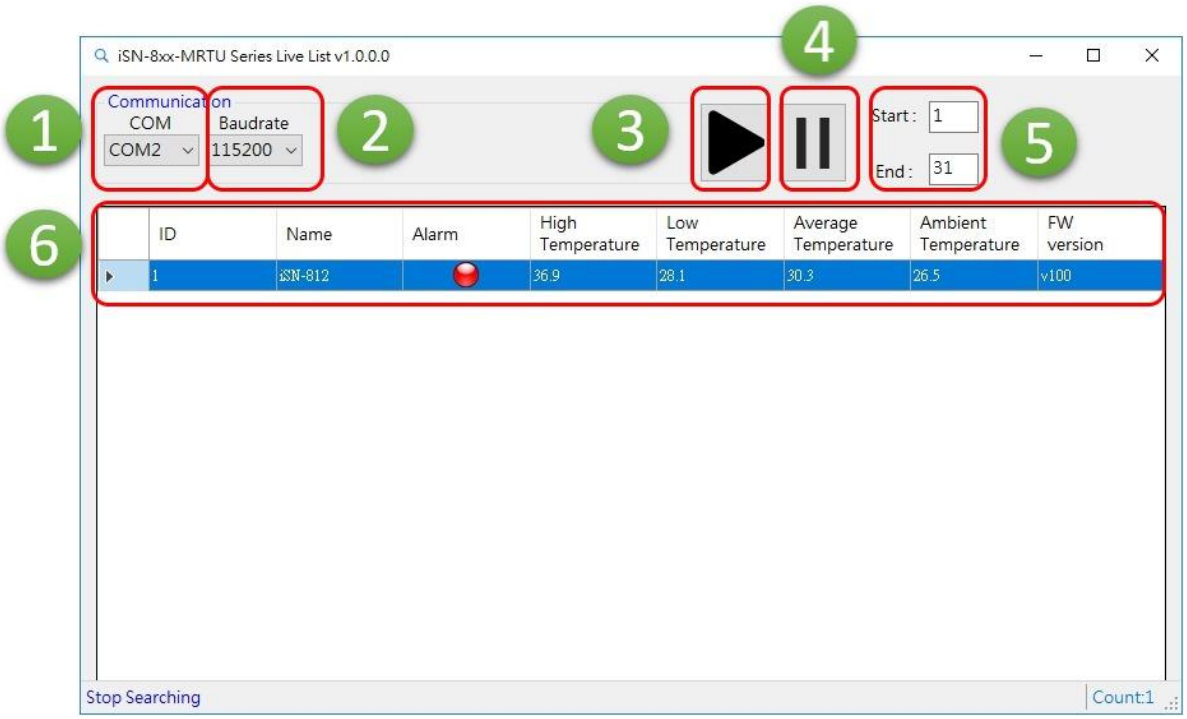
4. If you don't want iSN-81x series to shows any diagnostic messages, Set the value of Modbus address 69 to 1, and then iSN-81x series will close all diagnostic message.

4 iSN-8xx_Tool Utility

iSN-8xx_Tool Utility is used for iSN-81x-MRTU series. LiveList Utility can quickly search iSN-81x-MRTU,and IR_Configurtaion Utility can read iSN-81x-MRTU series temperature data and display it by thermography, and record the temperature data for a while, etc.

4.1 LiveList.exe :

- Function: Search iSN-81x-MRTU



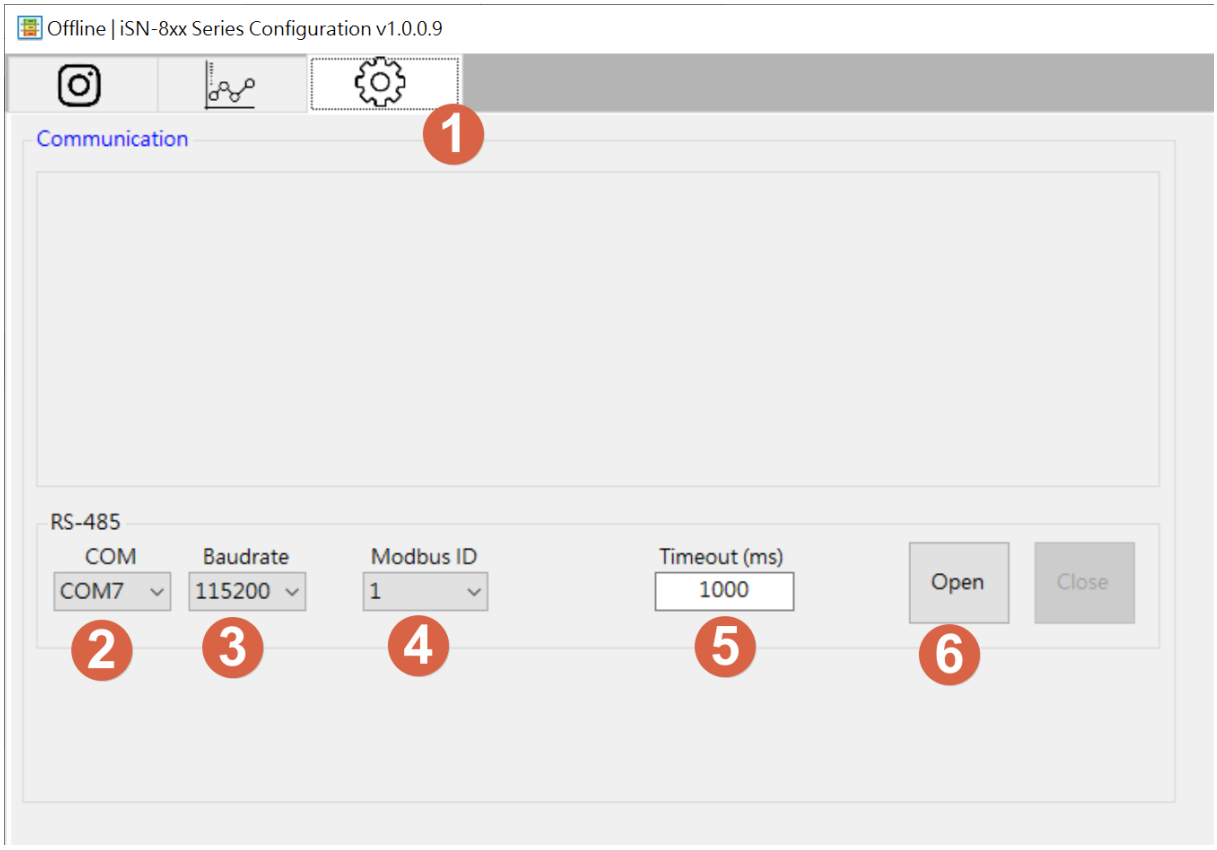
1. Set COM Port
2. Set Baudrate
3.  Start search
4.  Stop search
5. Start: start address of device ID, End: End address of device ID
6. iSN-81x-MRTU's status:

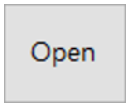
- ID : iSN-81x-MRTU's Modbus ID
- Name: iSN-81x-MRTU's model

- Alarm:  No diagnostic message,  iSN-81x-MRTU has diagnostic message
- High Temperature: iSN-81x-MRTU’s the highest temperature
- Low Temperature: iSN-81x-MRTU’s the lowest temperature
- Average Temperature: iSN-81x-MRTU’s average temperature
- Ambient Temperature: Sensor temperature
- FW version: Firmware version

4.2 IR_Configurtaion.exe : Communication Setting

- Function: Communication setting between iSN-81x-MRTU series and PC



1. Setting icon 
2. Set Com Port
3. Set Baudrate
4. Set iSN-81x-MRTU's Modbus ID
5. Set Timeout
6. Start communication 

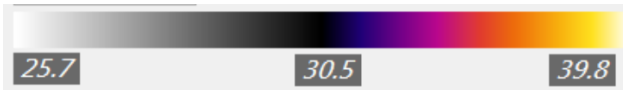
4.3 IR_Configurtaion.exe : Heatmap and area status

- Function: shows the temperature of each area and the heatmap.

1. Heatmap and area status icon 
2. Image control toolbar:
   - Mirroring 
   - Rotation 
   - Transparency 
   - Save Image 

- Interval of auto save Image(seconds) 

3. Heatmap setting:
   - Image update 

   - Heatmap color scale range 

   - Autorange:

     If checked, the measured maximum and minimum temperatures are used to represent the colour scale.

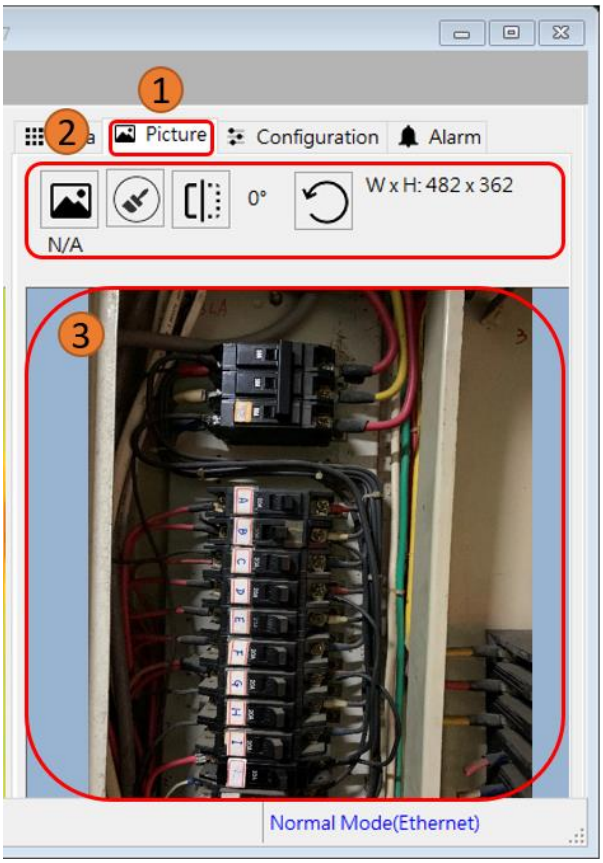
     If unchecked, you can customise the maximum and minimum temperatures to indicate the colour scale.
   - Set Highest temperature mark 
   - Palette: Used to change the image of Heatmap. 

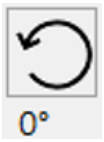
4. Show heatmap
5. Area status page
6. Show the data of the selected area:
   - High: The highest temperature of the selected area
   - Low: The lowest temperature of the selected area
   - Avg: Average temperature of the selected area
   - Low Dg: Lower Dangerous threshold value
   - Low Wn: Lower Warning threshold value
   - High Wn: Higher Warning threshold value
   - High Dg: Higher Dangerous threshold value

7. Show each area status:
   - Gray: The threshold switch of this area is close.
   - Red: The temperature of this area is over than warning threshold value.
   - Yellow: The temperature of this area is over than warning threshold value.
   - Green: The temperature of this area is normal.

4.4 IR_Configurtaion.exe : Import Image

- Function: More realize the temperature distribution by actual picture

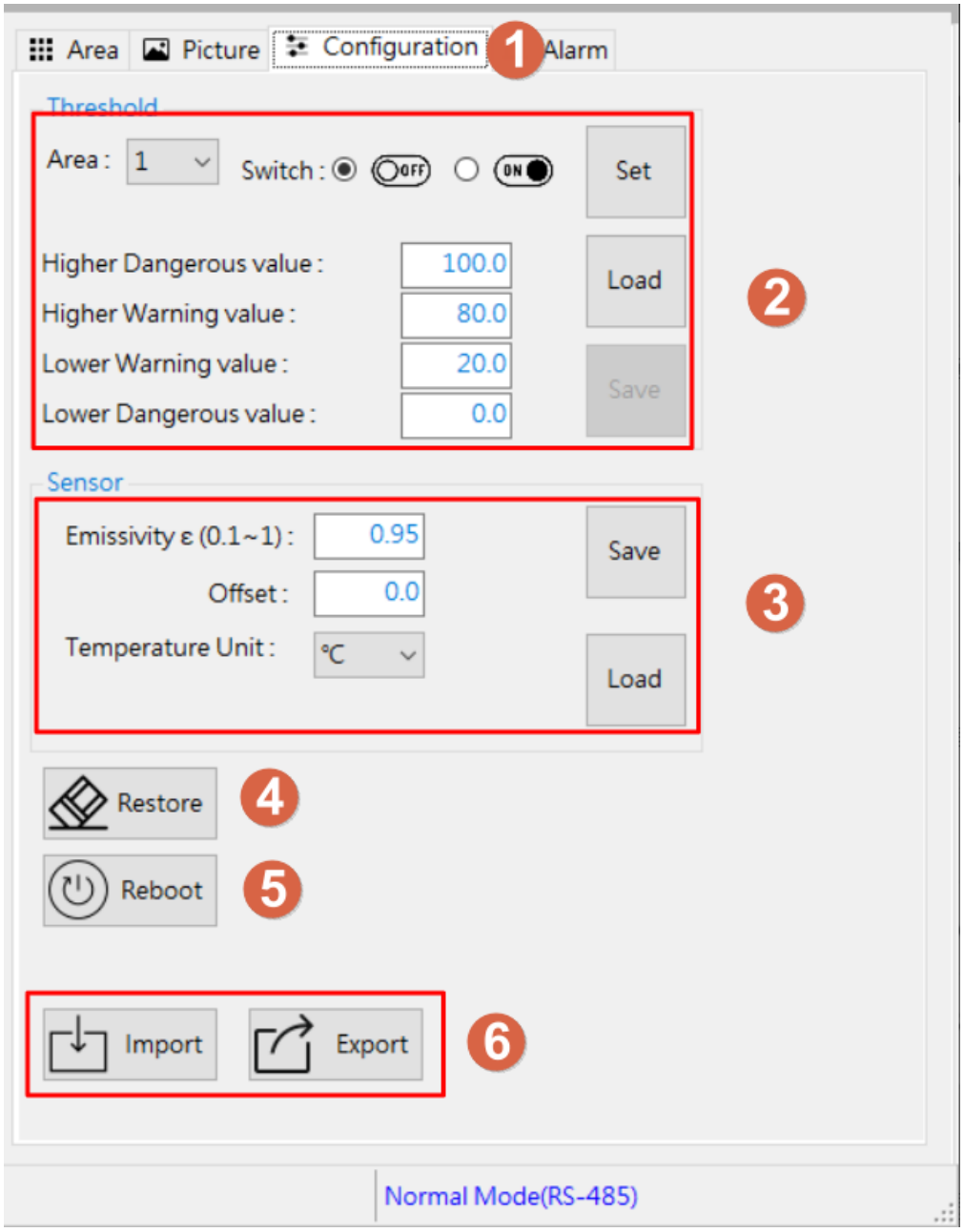


1. Background image page
2. Background image toolbar:
   - Import 
   - Clear 
   - Mirroring 
   - Rotation 

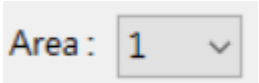
3. Imported background image

4.5 IR_Configurtaion.exe : Parameter setting

- Function: Modify and read iSN-81x-MRTU's parameters



1. Setting parameter page
2. Threshold value setting:

- Select area 

- Threshold switch 

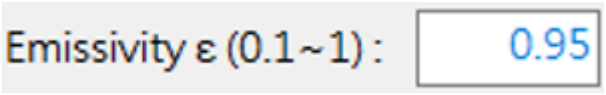
- Threshold type

- Higher Dangerous threshold value: Unit:0.1℃
- Higher Warning threshold value: Unit:0.1℃
- Lower Warning threshold value: Unit:0.1℃
- Lower Dangerous threshold value: Unit:0.1℃
- Temporary threshold settings: Press 

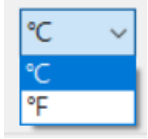
to keep the setting after single zone is set, and press 

after all zones are set.
- Load threshold setting from the module 

- Save threshold settings to the module 

3. Measuring parameter setting:
- Emissivity setting 

- Offset value setting 

- Temperature unit 

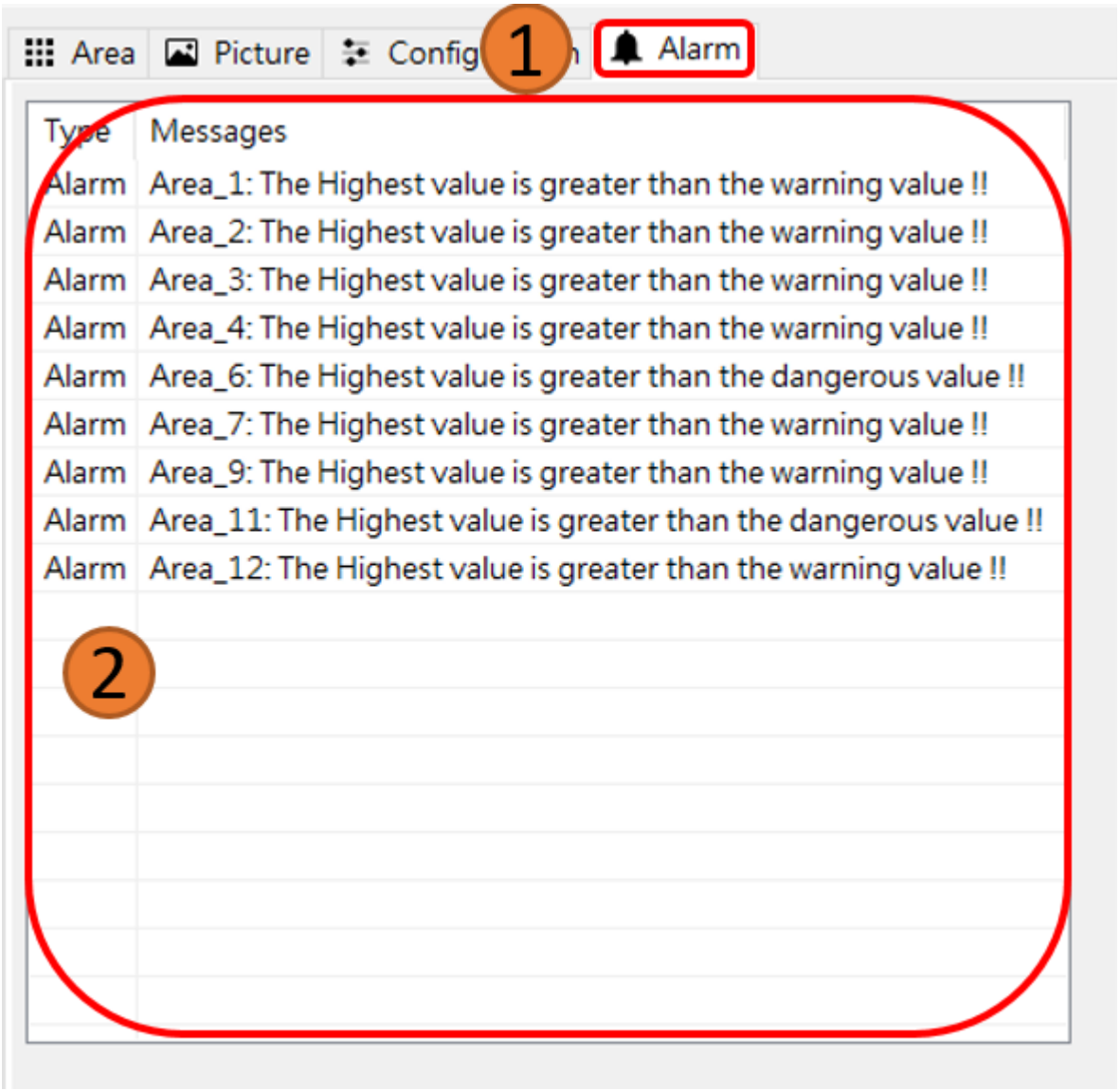
- Save to the module 

- Load from the module 

4. Restore factory defaults
5. Reboot the module
6. Import or Export all settings about the module

4.6 IR_Configurtaion.exe : Diagnostic message

- Function: Show the diagnostic message



1. Diagnostic message page
2. Show diagnostic message of the module

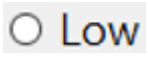
4.7 IR_Configurtaion.exe : Temperature data logger

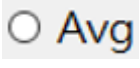
- Function: Save and record the temperature data

1. Temperature data logger icon 
2. Chart Operation Toolbar:
   - Tracking resume 
   - Tracking pause 
   - Axes scroll 
   - Axes zoom 

- Zoom-out 
- Zoom-in 
- Select 
- Zoom-box 
- Data-cursor 
- Copy 
- Save 
- Print 
- Preview 

3. Show the temperature data of the selected area
4. Set the chart visible
5. Interval of auto save csv file
6. Select the area
7. Select the temperature type:
   - The highest temperature in area 

   - The lowest temperature in area 

   - Average temperature in area 

8. After selecting this item, utility will save the temperature data to csv file:

- File path: the place which deposit iSN-8xx_Tool Utility\iSN-8xx_Tool\ThermalData
- Save file:
  - Year/Month/Day_Area.csv : Temperature and threshold setting and diagnostic message of each area.
  - Year/Month/Day _Raw.csv : All temperature data of all temperature point.

5 Web Interface

The iSN-81x-MTCP provides a web page function that allows users to configure communication protocols, IR sensor, etc. The web page interface also provides real-time thermal image and trend chart to immediately monitor the temperature distribution in the field.

5.1 Web Login:

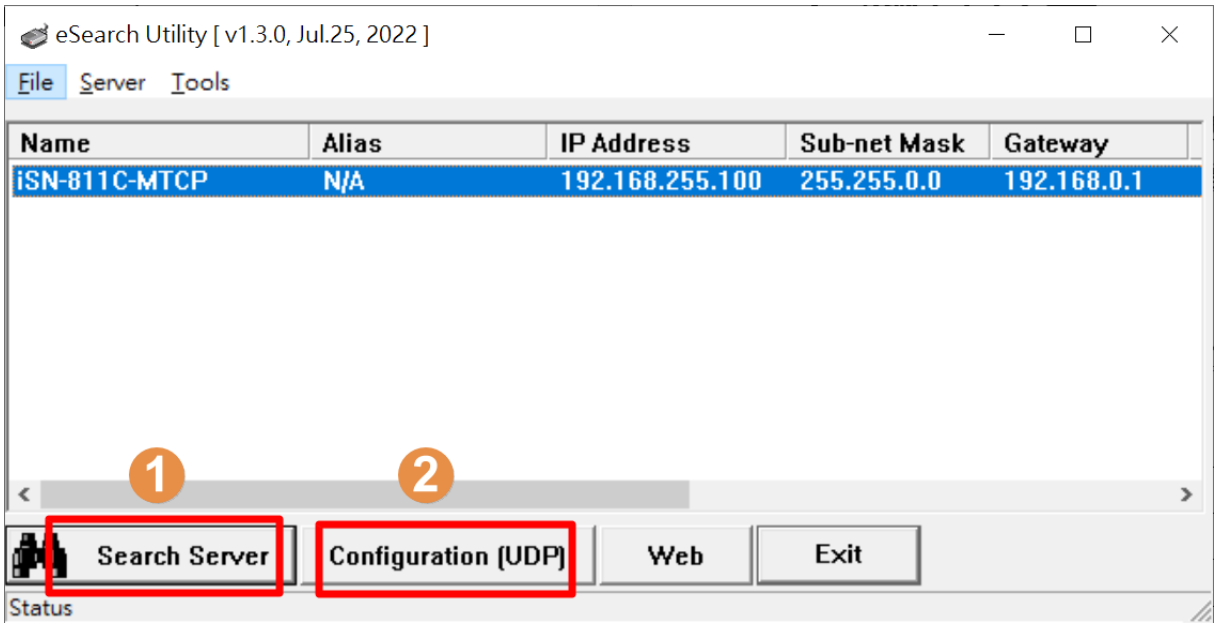
- The factory default settings for the network parameters are as follows

IP	192.168.255.100
Mask	255.255.0.0
Gateway	192.168.255.254

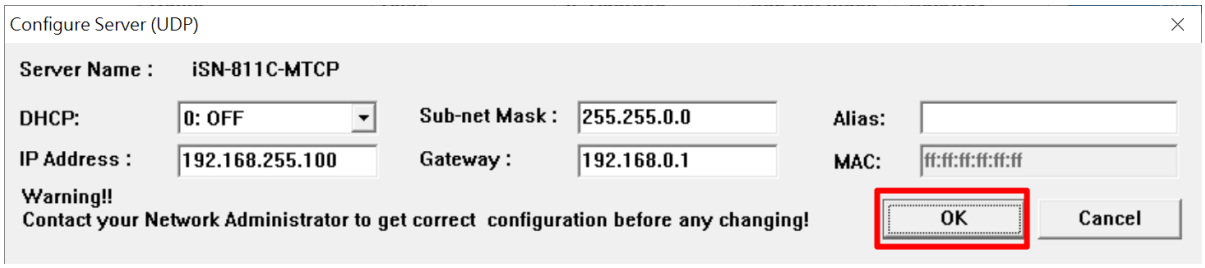
- If you don't know the IP address of the module, you can download the eSearch Utility and follow the steps below to search and modify it.

Step 1 Click [Search Servers] button to search iSN-81x-MTCP

Step 2 Select [iSN-81x-MTCP] and click [Configuration UDP]

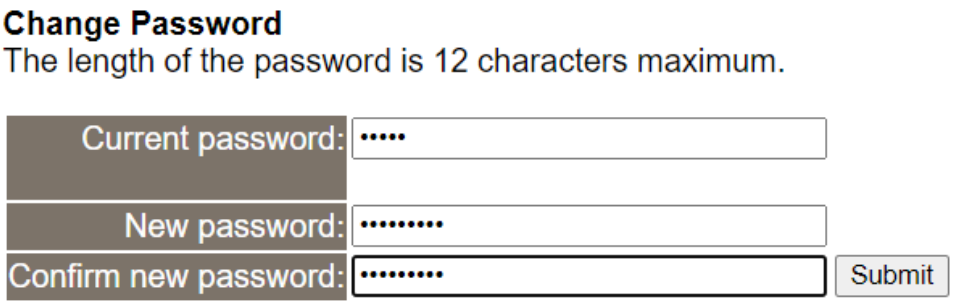


Step 3 Adjust the network parameter settings and click the [OK] button to modify the network parameters.



Step 4 Click [Search Servers] button again to check if the network parameters are modified successfully.

- Type the module IP address to login in web browser (recommended to use edge / Chrome / Firefox).
- You need to change your password when you login for the first time, and click the [Submit] button to change it
  - The factory default password: admin

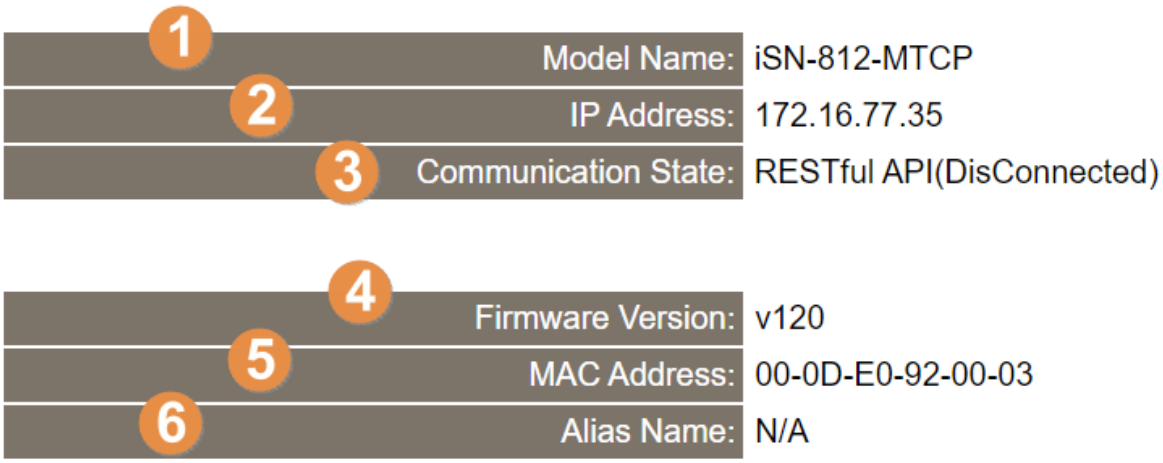


- At the top of the page is the function menu, which is described as follows

  - Home: Main Page, Module login
  - Settings: IP, communication protocol, Factory Restore...etc.
  - Sensor: Emissivity, Offset Value, Area Threshold, etc.
  - HeatMap: Thermal image, temperature status of each area
  - Chart: Temperature Trend Chart of each area
  - Calibration: Adjustment of temperature offset value, calculation of sensing range
  - Password: Password Change
  - Logout: Module logout

5.2 [Home] page:

- Provide module information, module login function



1. Model Name: The name of module
2. IP Address: Current IP address of module
3. Communication state: Communication protocol and connection state
4. Firmware version: Current version of module
5. MAC Address: MAC address of module
6. Alias Name: Alias name of module, you can modify it at [Settings] page
7. This means that the module has not been logged in yet
8. This means that the module has been logged in

5.3 [Settings] page:

- Function: Set IP, protocols and restore factory... etc.
- This page requires login to update settings.

IP Address Settings

Device IP Settings	Current	Updated	Comment
1 Address Type:	Static IP	Static IP	Dynamic or Static IP(Default)
2 Static IP Address:	172.16.77.35	172.16.77.35	Default= 192.168.255.100
3 Subnet Mask:	255.240.0.0	255.240.0.0	Default= 255.255.0.0
4 Gateway:	172.18.0.254	172.18.0.254	Default= 192.168.255.254
Update Settings			

1. **Address Type**: ”Static IP” or ”DHCP”
2. **Static IP Address**: IP can be set when Address Type is Static IP.
3. **Subnet Mask**: Subnet Mask can be set when Address Type is Static IP.
4. **Gateway**: Getway can be set when Address Type is Static IP.

Communication Settings

Provide Modbus TCP Server, RESTful client, MQTT client protocols, please refer to Section 6.2 for Modbus TCP register table; RESUful and MQTT will send JSON format message to server or MQTT Broker, the JSON format is as follows.

Modbus TCP: Module is Modbus TCP server, waiting for Modbus TCP client to connect.
RESTful: Module is a RESTful client that actively connects to the server and sends JSON data.
MQTT: Module is an MQTT client that actively connects to the broker and sends JSON data.

JSON Format:

```
{
  "macno": MAC address, //MAC address of module
  "model": Model Name, //The name of module
  "irdata": temperature data, //Temperature per pixel
  "shift": Shift value, //iSN-811C-MTCP only
  "image": image data // Camera's base64 image data, iSN-811C-MTCP
only
}
```

Fill light:

iSN-811C-MTCP provide fill light. It can enhance image quality by turning on the fill light in dark places.

Camera	Current	Updated	Comment
Fill light:	OFF	OFF	The fill light helped to improve the contrast of the image

Modbus TCP

Modbus register table please refer to section 6.2

Communication	Current	New	Comment
Mode:	Modbus TCP	Modbus TCP	Modbus TCP(Default), RESTful API or MQTT
1 Server port:	502	502	Default= 502
		Update Settings	

1. **Server port**: The Modbus TCP Server's port number

RESTful API

Communication	Current	New	Comment
Mode:	RESTful API	RESTful API	Modbus TCP(Default), RESTful API or MQTT
1 Server URI:	192.168.1.1	192.168.1.1	e.g. www.server.com or 19.168.255.1 Default= 192.168.255.1 http://ServerURI/restapi-icpdas/
2 Server port:	80	80	Default= 80
3 [POST] Interval:	2	2	2 ~ 600 seconds, 2=default
4 DataSet:	irdata+image	irdata+image	Select the type of data to be transferred

API: http://192.168.1.1:80/restapi-icpdas/
JSON Format: { "macno": MAC number
"model": model name
"irdata": temperature data
"shift": shift data(used to align the image with the irdata)
"image": image data
}

1. **Server URI**: The server's IP address or URL，add /restapi-icpdas/ to the end of the URI, e.g. http://ServerURI/restapi-icpdas/
2. **Server port**: The server's port number
3. **[POST] Interval**: The interval between each JSON message sent, Unit:second
4. **DataSet:** iSN-811C-MTCP only. Select whether or not the JSON data content contains temperature and image.

MQTT

Communication	Current	New	Comment
Mode:	RESTful API	MQTT client	Modbus TCP(Default), RESTful API or MQTT
1 Broker URI:	192.168.255.1	192.168.255.1	e.g. www.server.com or 19.168.255.1 Default= 192.168.255.1
2 Broker port:	1883	1883	Default= 1883
3 Reconnection interval:	10	10	10 ~ 120 seconds, 10=default
4 Keep alive interval:	30	30	10 ~ 120 seconds, 30=default
5 [Publish] interval:	10	10	10 ~ 120 seconds, 10=default
6 QoS:	0	0	0 – At most once 1 – At least once 2 – Exactly once 0=default
7 Last Will:	Disable	Disable	Enable/Disable Last Will
8 Authentication:	Disable	Enable	Enable/Disable Authentication
9 User Name:	icpdas	icpdas	(Max. 32 chars)
10 Password:	icpdas	icpdas	(Max. 32 chars)
11 DataSet:	irdata+image	irdata+image	Select the type of data to be transferred

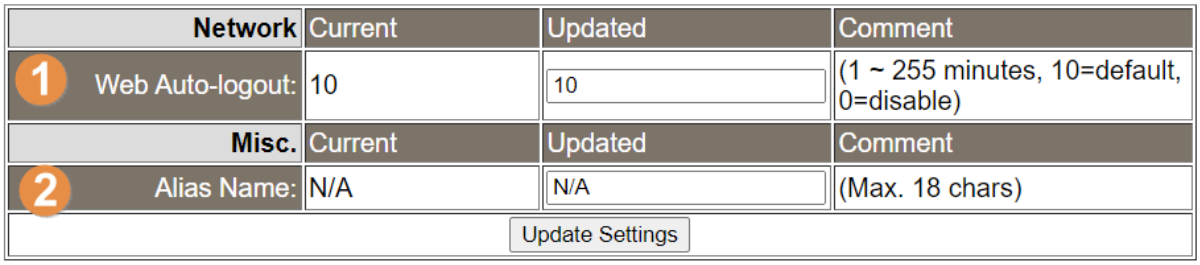
1. **Broker URI**: The MQTT broker's IP address
2. **Broker port**: The MQTT broker's port number
3. **Reconnection interval**: In the event of a connection failure, how long does the module wait before attempting to reconnect to the Broker? Unit:second
4. **Keep alive interval**: The Keep-alive mechanism ensures the availability of both the Client and the Broker for communication purposes. If the Client has no message to send within the specified Keep Alive Interval, it is required to send a PINGREQ packet to the Broker, while the Broker must reply with a PINGRESP packet. If the Client fails to send a PINGREQ or any other message within 1.5 times the Keep Alive Interval, the Broker will disconnect from the Client Unit:second
5. **[Publish] interval**: The interval between each JSON message sent, Unit:second
6. **QoS**: 0 – At most once: Send the message only once
   1 – At least once: Send the message at least once
   2 – Exactly once: Make sure the message is delivered
7. **Last Will**: The Last Will and Testament (LWT) function notifies other clients when a client disconnects abnormally. The module can retain the Last Will (LWT) message on the Broker. If the module unexpectedly disconnects, the Broker will send the LWT message to all clients that have subscribed to this Offline topic
8. **Authtication**: In certain cases, the MQTT Broker may require the Client to provide authentication through an account and password
9. **User Name**: Username for MQTT broker authentication

10. **Password**: Password for MQTT broker authentication
11. **DataSet:** iSN-811C-MTCP only. Select whether or not the JSON data content contains temperature and image.

Note:

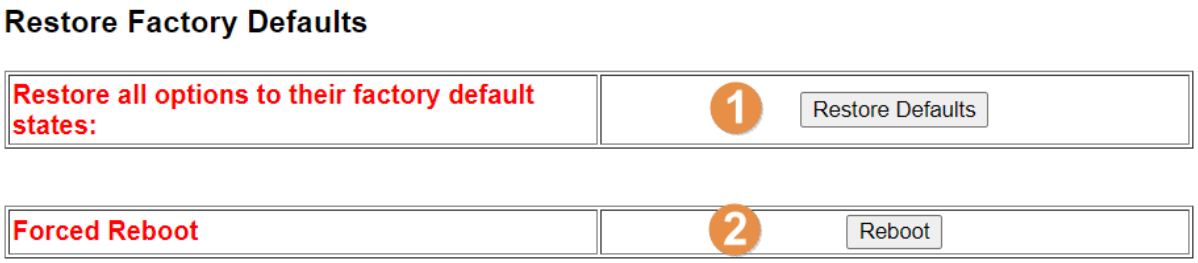
- *Client ID: It is composed of the module name, the underline character, and the last 6 digits of the MAC address, and cannot be modified, e.g. ISN812_920003*
- *Publish Topic: Fixed to IR/Temp/Client ID, e.g. IR/Temp/ISN812_920003*
- *Topic of LWT: Fixed to "offline"*
- *Message of LWT: Fixed to "offline msg"*
- *QoS of LWT: Fixed to "0"*

General Settings



1. Web Auto-logout: If the timeout , you will be automatically logged out from the website.
2. Alias Name: Setting the alias name of module

Restore Factory Defaults

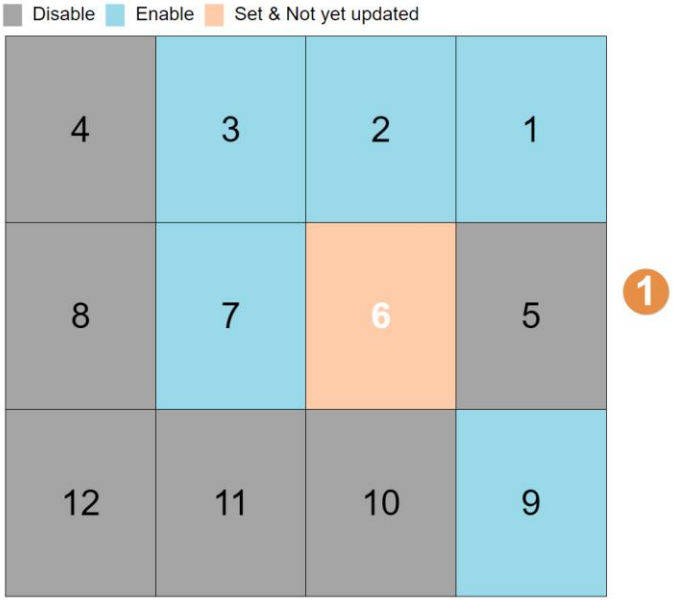


1. Restore Defaults: Restore factory default settings
2. Reboot: Module Reboot

5.4 [Sensor] page:

- Function: Setting the emissivity, offset value, and threshold for each temperature area
- This page requires login to update settings

IR Sensor Settings



Threshold Area #06	Current	New	Comment	Settings
2 Switch:	Enable	Enable	Enable/Disable this area	7 Set
3 Lower Dangerous value (LD):	0	0	Lower limit of dangerous value Value range:-3000~3000, Default= 0 e.g. Value: 1075 -> 107.5℃	
4 Lower Warning value (LW):	200	300	Lower limit of warning value Value range:-3000~3000, Default= 0 e.g. Value: 905 -> 90.5℃	
5 Higher Warning value (HW):	800	800	Higher limit of warning value Value range:-3000~3000, Default= 0 e.g. Value: 905 -> 90.5℃	
6 Higher Dangerous value (HD):	1000	1000	Higher limit of dangerous value Value range:-3000~3000, Default= 0 e.g. Value: 1075 -> 107.5℃	

Sensor	Current	New	Comment
8 Offset:	0	0	Meaturing temp.+Offset(Default= 0)= actual temp. Unit: 0.1°C e.g. 173->17.3°C
9 Emissivity:	95	95	Value range:10~100(Emissivity: 0.1~1.0), Default= 95 e.g. Value: 15 ->emissivity: 0.15

1. Show the threshold switching status of each area.

   : Temperature threshold detection is not enabled for the area.

   : Temperature threshold detection is enabled for the area.

   : The area's settings have been modified but not yet updated

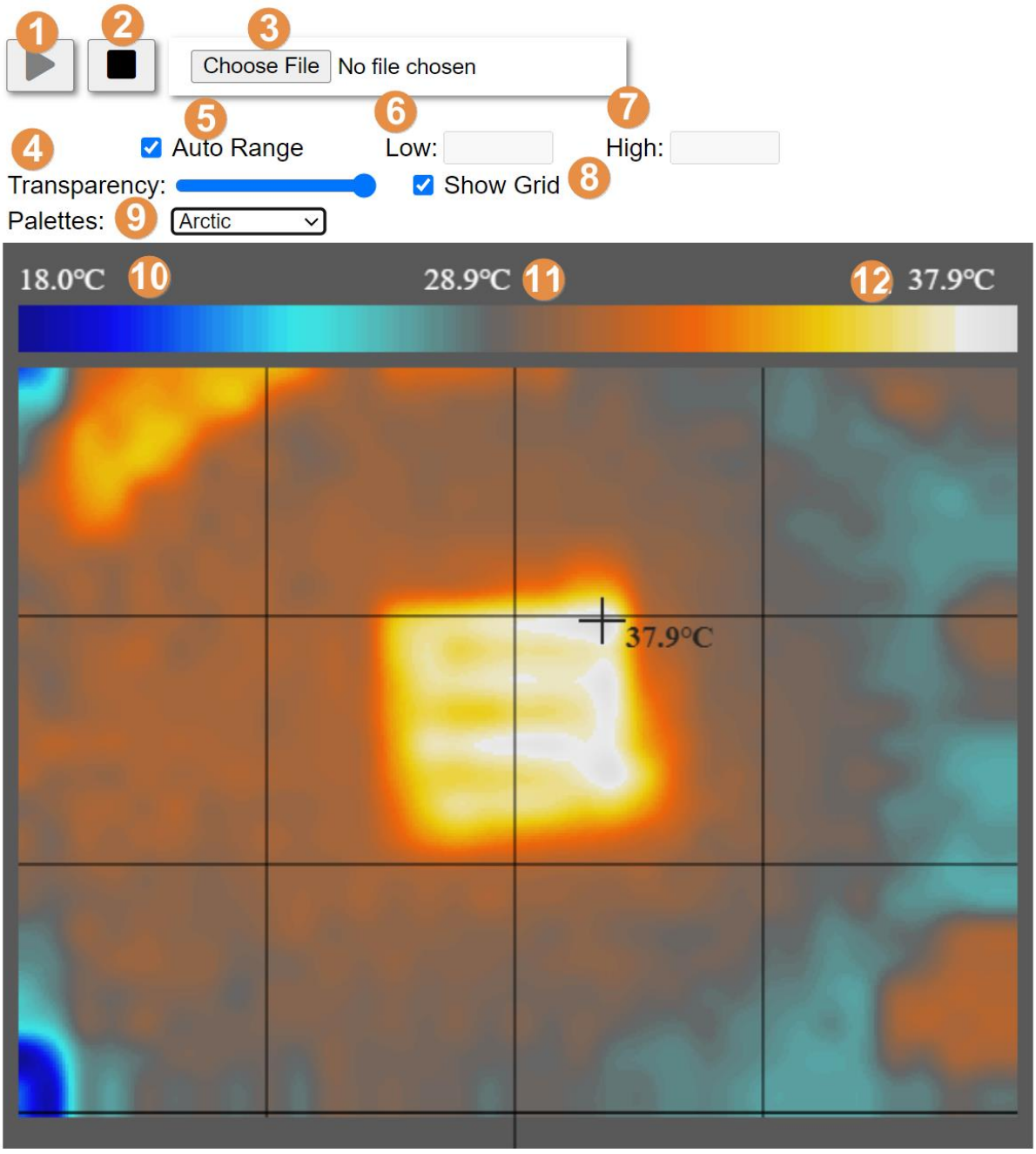
2. **Switch**: Temperature threshold switch for the area
3. **Lower Dangerous value**: Threshold dangerous value, Unit:0.1℃
4. **Lower Warning value**: Threshold warning value, Unit:0.1℃
5. **Higher Warning value**: Threshold warning value, Unit:0.1℃
6. **Higher Dangerous value**: Threshold dangerous value, Unit:0.1℃
7. **Set:**
8. **Offset**: Temperature offset value, Unit:0.1℃
9. **Emissivity**: Emissivity of the object to be measured

Refer to Section 3.3 for a description of the temperature thresholds.

5.5 [HeatMap] page:

- Function: Displays a thermal image and temperature thresholds for each area

HeatMap



1. Enable the thermal image display
2. Disable the thermal image display
3. **Choose File**: You can take a photo of the measurement area and add it to the thermal image as a background photo, which will give you a clearer picture of the

temperature distribution. iSN-812-MTCP only.

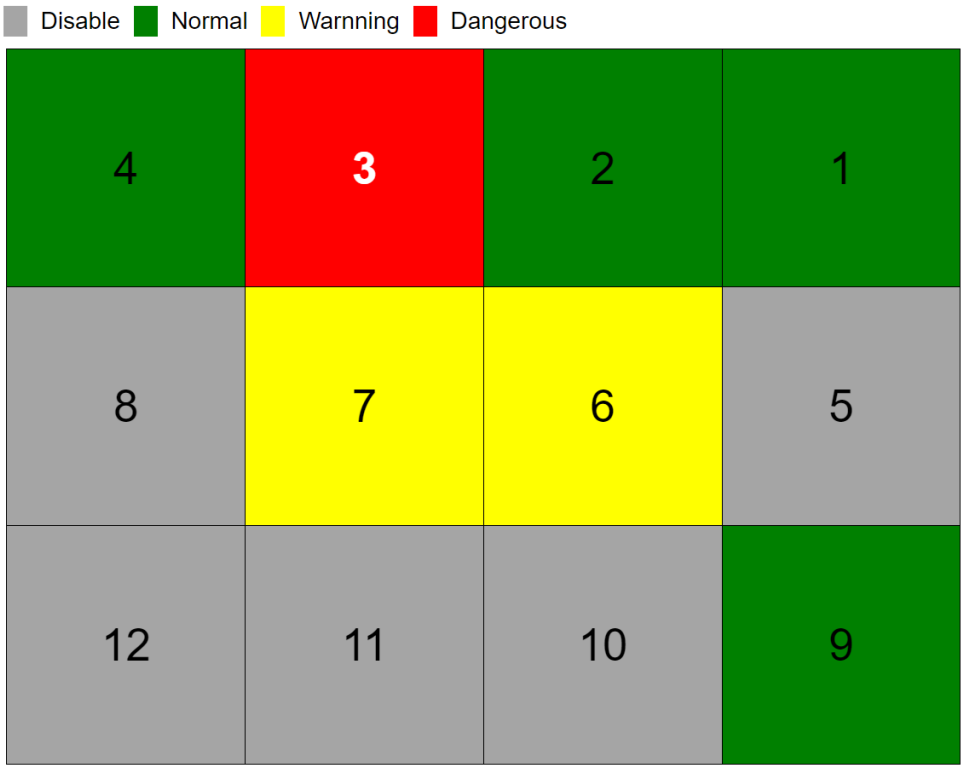
4. **Transparency**: Thermal image transparency, if you have added a background photo, lowering the transparency will give you a better idea of the temperature distribution.

   Below is a heatmap with a background photo and reduced transparency.

5. **Auto Range**:
   [Enable]: Thermal images will be plotted with the highest and lowest temperatures in the measurement range.
   [Disable]: Thermal images will be plotted at the Bottom and Top temperatures, making it easy to compare the differences between different objects using the same temperature range.
6. **Bottom**: Used to set the minimum temperature on the screen when Auto Range is disable
7. **Top**: Used to set the maximum temperature on the screen when Auto Range is disable
8. **Show Grid**: Show area grid if checked
9. **Palettes**: Different color palettes for easy identification of the measurement object.
10. The lowest temperature within the current measurement range
11. The average temperature within the current measurement range
12. The highest temperature within the current measurement range

Area Status

#3				
Low Dg	Low Wn	High Wn	High Dg	AvgT
0.0	20.0	25.0	26.0	26.6

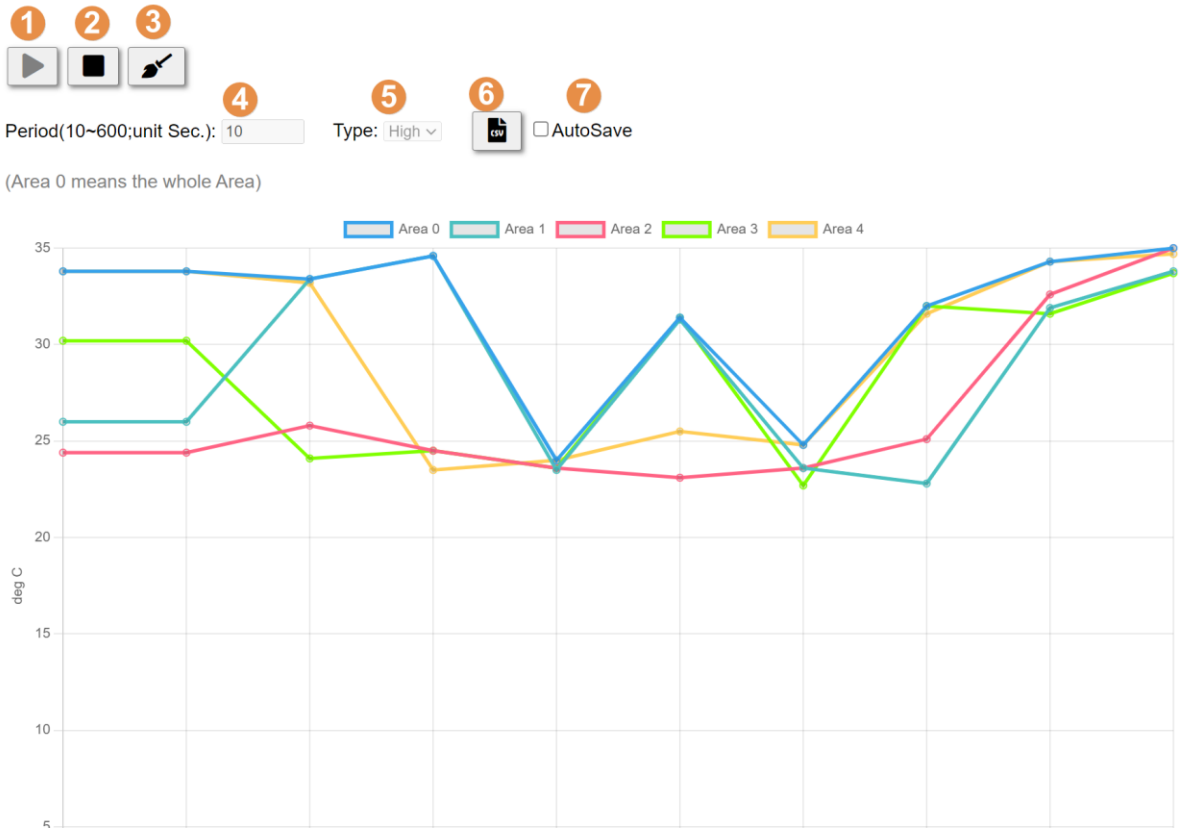


- Shows the status of the temperature thresholds for each temperature area.
- iSN-812-MTCP divided into 12 areas, iSN-811C-MTCP divided into 4 areas
- Gray: Indicates that the temperature threshold is not enabled for the area.
- Green: Indicates that the temperature status of the area is normal
- Yellow: Indicates that the temperature status of the area has exceeded the waring value.
- Red: Indicates that the temperature status of the area exceeds the dangerous value.

Refer to Section 3.3 for a description of the temperature thresholds.

5.6 [Chart] page:

- Function: Temperature trend charts for each area



1. Enable temperature trend charts
2. Disable temperature trend charts
3. Clear temperature trend charts
4. Set the period time for trend charts, Unit:second
5. **Type**: Set the temperature type, highest/lowest/average
6.  : Save the current temperature data as a CSV file.
7. **AutoSave**: If checked, it will save the temperature data to csv file

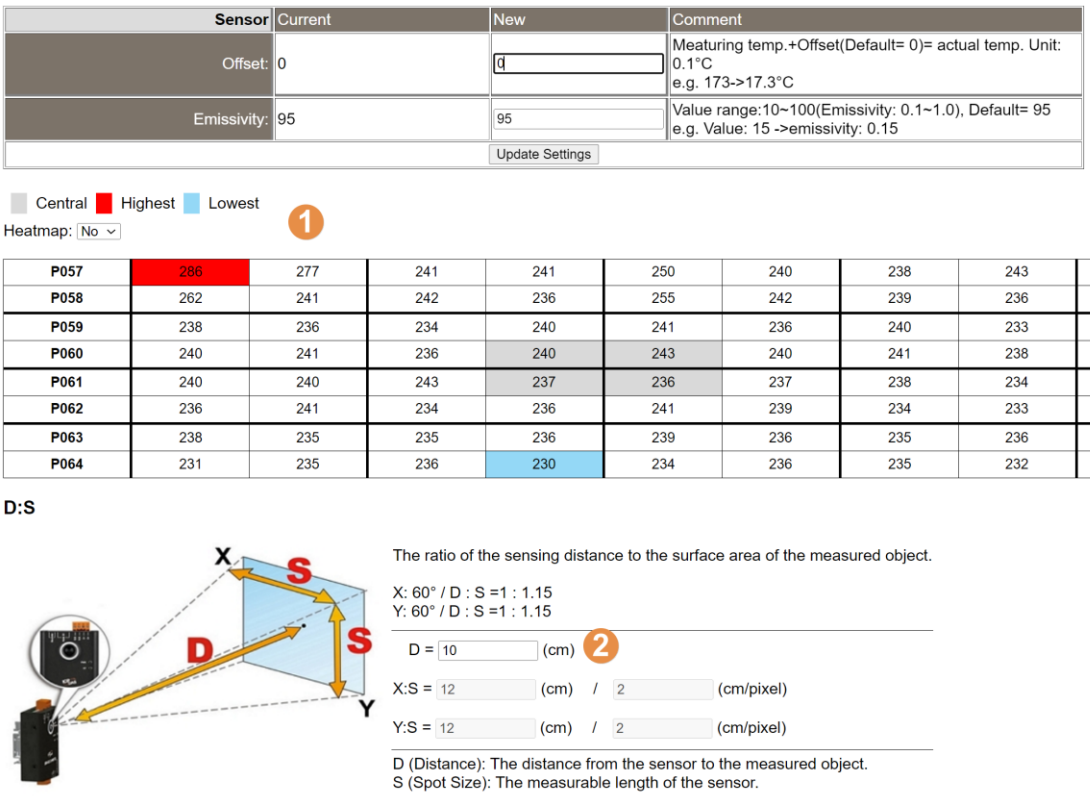
CSV file name Format

■ YYYYMMDDhhmm_Area.csv : Temperature and threshold setting and diagnostic message of each area.

■ YYYYMMDDhhmm_Raw.csv : All temperature data of all temperature point.

5.7 [Calibration] page:

- Function: Used to assist in adjusting temperature offset values, emissivity, and calculating sensing ranges.



Sensor	Current	New	Comment
Offset:	0	0	Meaturing temp.+Offset(Default= 0)= actual temp. Unit: 0.1°C e.g. 173->17.3°C
Emissivity:	95	95	Value range:10~100(Emissivity: 0.1~1.0), Default= 95 e.g. Value: 15 ->emissivity: 0.15
		Update Settings	

Central Highest Lowest

Heatmap: No

1

P057	286	277	241	241	250	240	238	243	P001
P058	262	241	242	236	255	242	239	236	P002
P059	238	236	234	240	241	236	240	233	P003
P060	240	241	236	240	243	240	241	238	P004
P061	240	240	243	237	236	237	238	234	P005
P062	236	241	234	236	241	239	234	233	P006
P063	238	235	235	236	239	236	235	236	P007
P064	231	235	236	230	234	236	235	232	P008

D:S

The ratio of the sensing distance to the surface area of the measured object.

X: 60° / D : S =1 : 1.15
Y: 60° / D : S =1 : 1.15

D = 10 (cm) 2

X:S = 12 (cm) / 2 (cm/pixel)

Y:S = 12 (cm) / 2 (cm/pixel)

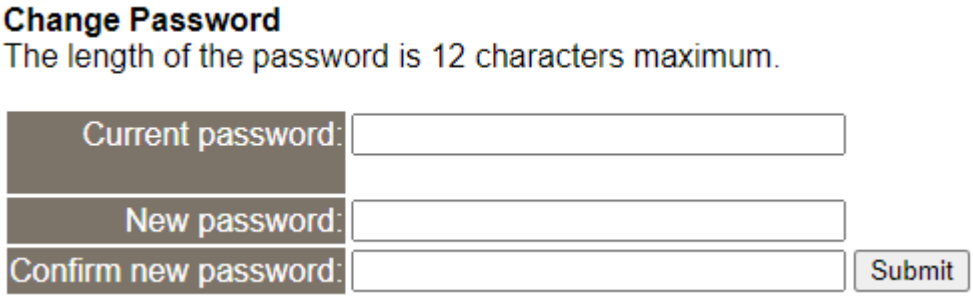
D (Distance): The distance from the sensor to the measured object.
S (Spot Size): The measurable length of the sensor.

1. Shows the temperature of each pixel, and can use the central temperature to help adjust the temperature offset value
2. **D**: The distance from the sensor to the measured object
   X:S: Calculate the length of the X-axis that can be sensed via D.
   Y:S: Calculate the length of the Y-axis that can be sensed via D.

5.8 [Password] page:

- Function: Change password

Enter your current password and then enter a new one.



5.9 [Logout] page:

- Function: Log out of the web interface, click it to log out and jump to the [Home] page.

5.10 Forget password:

- Function: What to do if you forget your password and cannot log in to website

Step 1 Switch to [Init] position

Step 2 The module IP and web password will be temporarily changed as follows

IP	192.168.255.100
Mask	255.255.0.0
Gateway	192.168.255.254
Temporary Password	default

Step 3 Use temporary password and refer to Section 5.8 to reset a new password.

6 Modbus Command

6.1 Function code

Modbus master can use the following function code to read or write data to iSN-81x series. FC 3 and FC4 can read data from registers. FC6 and FC16 can write data to the register.

Function Code	Description
3	Read multiple registers
4	Read multiple registers
6	Write Single register
16	Write multiple registers

6.2 Modbus Register Table

Modbus address (Decimal)	Function	R/W	Data length	Explanation
Modbus Holding Registers (4xxxx, 0 based)				
0	Threshold switch of each area	R/W	1 word	0: Close, 1: Open Each area uses 1 bit
1~16	Lower Warning threshold value of each area	R/W	16 words	Each area uses 1 word Unit: 0.1°C e.g. Value: 515->51.5°C
17~32	Lower Danger threshold value of each area	R/W	16 words	Each area uses 1 word Unit: 0.1°C e.g. Value: 515->51.5°C
33~48	Higher Warning threshold value of each area	R/W	16 words	Each area uses 1 word Unit: 0.1°C e.g. Value: 515->51.5°C
49~64	Higher Danger threshold value of each area	R/W	16 words	Each area uses 1 word Unit: 0.1°C e.g. Value: 515->51.5°C
65	Offset value	R/W	1 word	Measuring temperature+ Offset value= actual temperature Unit: 0.1°C e.g. 173->17.3°C
66	Emissivity	R/W	1 word	Value range:10~100 (Emissivity: 0.1~1.0) When the value is over than value range, emissivity is 0.95. e.g. Value: 15 ->emissivity: 0.15
67	Temperature unit	R/W	1 word	0: degree C 1: degree F
68	Device reset	R/W	1 word	0: Idle

				1: Reset 128: Restore Factory Default
69	The switch of diagnostic message	R/W	1 word	0: Open, 1: Close
70~99	X	X	X	Reserve
100~102	MAC Address	R	3 words	Only TCP devices have these setting, RTU devices reserve.
103	NetID	R	1 word	Value:1~31 Only RTU devices have these setting, TCP devices reserve.
104	Baudrate (bps)	R	1 word	960: 9600 bps 1920: 19200 bps 3840: 38400 bps 5760: 57600 bps 11520: 115200 bps Only RTU devices have these setting, TCP devices reserve.
105	Firmware version	R	1 word	Value: 235 -> Ver. 23.5
106	System diagnostic message	R	1 word	0: normal 1: sensor error
107~115	X	X	X	Reserve
116	Threshold setting diagnostic	R	1 word	Each area uses 1 bits 0: normal 1: abnormal
117~118	Threshold diagnostic message	R	2 words	Each area uses 2 bits 0: normal 1: over warning value 2: over danger value
119	Pixel	R	1 word	64/768, etc.
120	Device model	R	1 word	811/812, etc.
121	Sensor temperature (TA)	R	1 word	Unit: 0.1°C e.g. Value: 515->51.5°C
122	Central temperature	R	1 word	Unit: 0.1°C

				e.g. Value: 515->51.5°C
123	Average temperature	R	1 word	Unit: 0.1°C e.g. Value: 515->51.5°C
124	The highest temperature	R	1 word	Unit: 0.1°C ex: Value: 515->51.5°C
125	The highest temperature point	R	1 word	
126	The lowest temperature	R	1 word	Unit: 0.1°C e.g. Value: 515->51.5°C
127	The lowest temperature Point	R	1 word	
128~143	The highest temperature of each area	R	16 words	Each area uses 1 word Unit: 0.1°C e.g. Value: 515->51.5°C
144~159	The lowest temperature of each area	R	16 words	Each area uses 1 word Unit: 0.1°C e.g. Value: 515->51.5°C
160~175	Average temperature of each area	R	16 words	Each area uses 1 word Unit: 0.1°C e.g. Value: 515->51.5°C
176~1199	All temperature (TO)	R	Max 1024 Words	Each temperature point uses 1 word Unit: 0.1°C e.g. Value: 515->51.5°C