User Manual

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GW-2493M

BACnet/IP Server to Modbus TCP Client Gateway

Written by Johney

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1. General Information

1.1 BACnet/IP

BACnet is a communications protocol for building automation and control networks. It is an ASHRAE, ANSI, and ISO standard protocol. BACnet was designed to allow communication of building automation and control systems for applications such as heating, ventilating, and air-conditioning control, lighting control, access control, and fire detection systems and their associated equipment. The protocol provides mechanisms for computerized building automation devices to exchange information, regardless of the particular building service they perform.

BACnet/IP is based on Ethernet and used UDP to transmit BACnet network packets (NPDU). Messages are transmitted such as Who-is and Who-has through broadcast feature of UDP. The feature allows that the user could search for device information without knowing the actual location of the device.

1.2 Modbus

Modbus protocol mainly has two versions RTU and TCP. RTU can be realized through COM interface and TCP can be realized through Ethernet. These two protocols are commonly used in industrial control and automation industry.

Modbus RTU is used to transmit and exchange data via RS-485. It's a serial communication between master and slave. Every slave has a unique address to identify. Users could implement communication through using different function codes.

MODBUS TCP is a variant of MODBUS RTU. MODBUS messages are passed in an "Intranet" or "Internet" environment by using the TCP/IP protocol. The most common use of this protocol is to connect PLCs and gateways to other simple fieldbus or I/O networks via Ethernet.

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1.3 About GW-2493M

GW-2493M is a BACnet/IP Server to Modbus TCP Client Gateway. It allows BACnet client application to accesse Modbus TCP devices via GW-2493M module. The BACnet/IP protocol is used to relay and exchange information between building devices. GW-2493M contains a large number of BACnet objects (AI, AO, AV, BI, BO, BV, MSI, MSO, MSV) gives you flexibility in mapping Modbus TCP registers to any combination of BACnet objects. Multiple BIBBs (DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B,…etc.) are supported. All the data transfer is configurable using a standard web browser.

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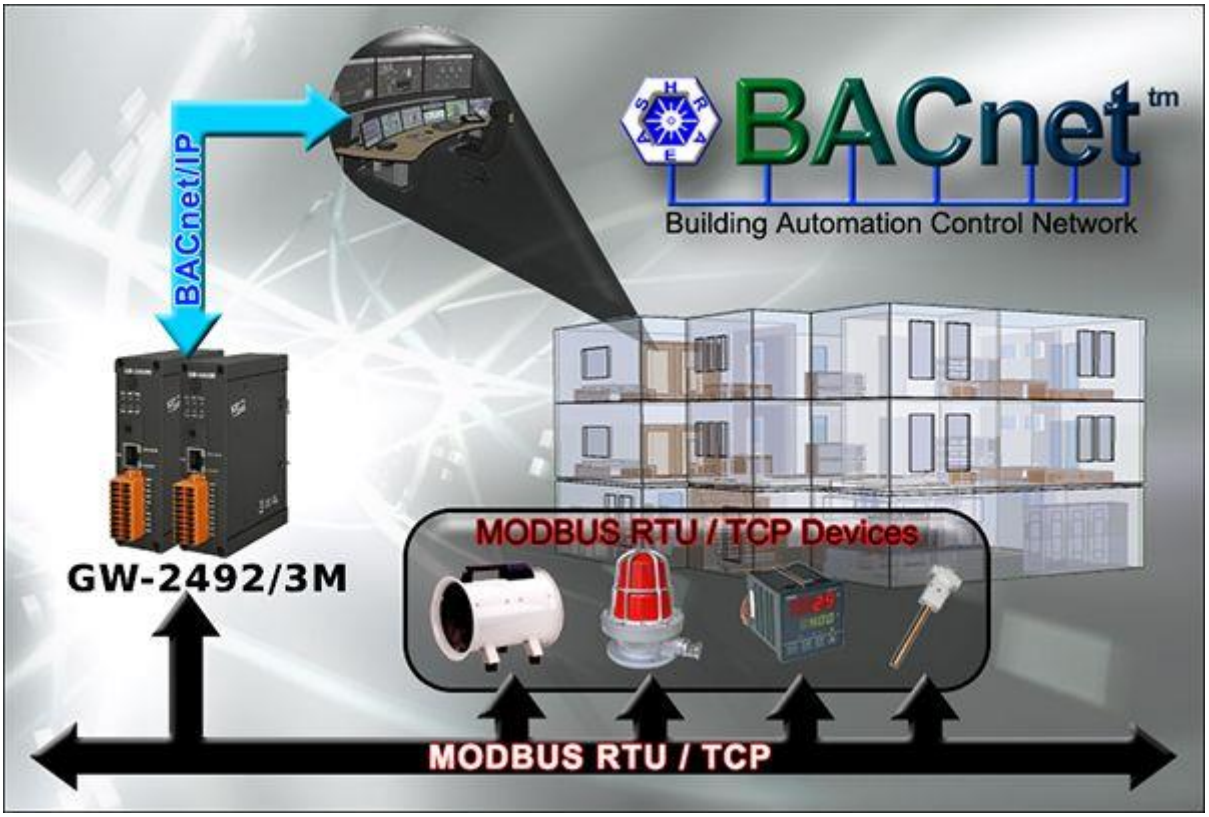
1.4 Features

- Read/Write Modbus registers via BACnet objects
- Configurable BACnet/IP Server
- Configurable Modbus TCP Client
- Supports BACnet AI, AO, AV, BI, BO, BV, MSI, MSO, MSV Object Types
- Supports Modbus discrete inputs, coils, input registers and holding registers
- Supports up to 180* DI, 180* DO, 180* AI and 180* AO to transfer to BACnet Objects
- Simple data translation allows you to manipulate data as it passes between protocol



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1.5 Specifications

1.5.1 GW-2493M (BACnet/IP Server to Modbus TCP Client Gateway)

Ethernet	
Controller	10/100Base-TX Ethernet Controller (Auto-negotiating, Auto_MDIX)
Connector	RJ-45 with Ethernet indictor
Protocol	BACnet/IP Server
Max. Connections	8
BIBBS	DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B
Modbus	Modbus TCP Clients (Max. 32)
Power	
Protection	Power reverse polarity protection
EMS Protection	ESD, Surge, EFT
Supply Voltage	+10 VDC ~ +30 VDC
Consumption	5 W @ 24 VDC
LED Indicator	
LED (Round)	Power (1), BACnet MS/TP Status (1), BACnet MS/TP Net(1), Modbus TCP TxD / RxD / Link (3)
Ethernet LED	Ethernet LED Ethernet Status (RJ-45) (2)
Mechanism	
Installation	DIN-Rail
Casing	Metal
Dimensions	33 x 120 x 116 mm (W x L x H)
Environment	
Operating Temp.	-25℃ ~ +75℃
Storage Temp.	-30℃ ~ +85℃
Humidity	10 ~ 90% RH, non-condensing

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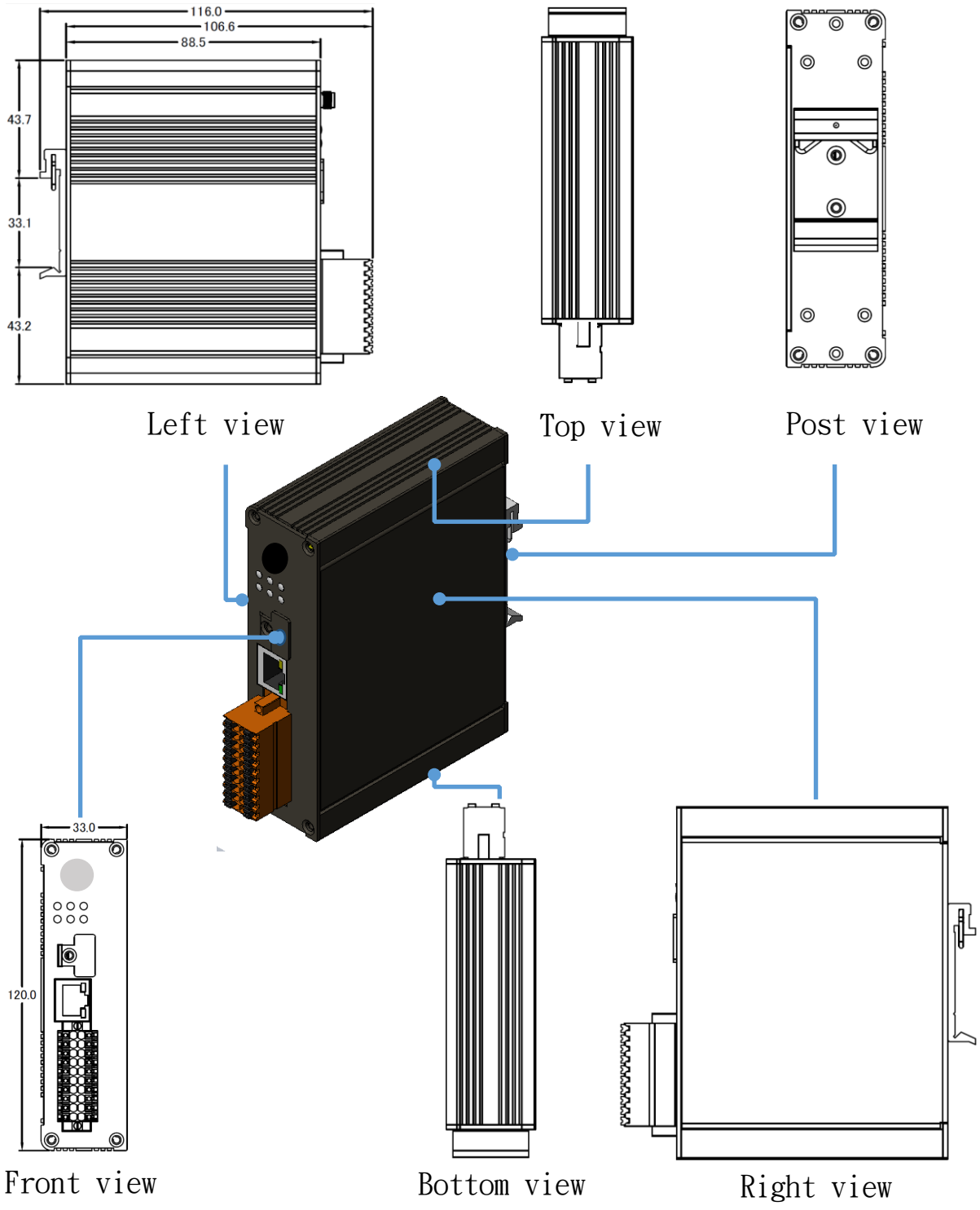
2. Hardware

2.1 Size (Unit : mm)



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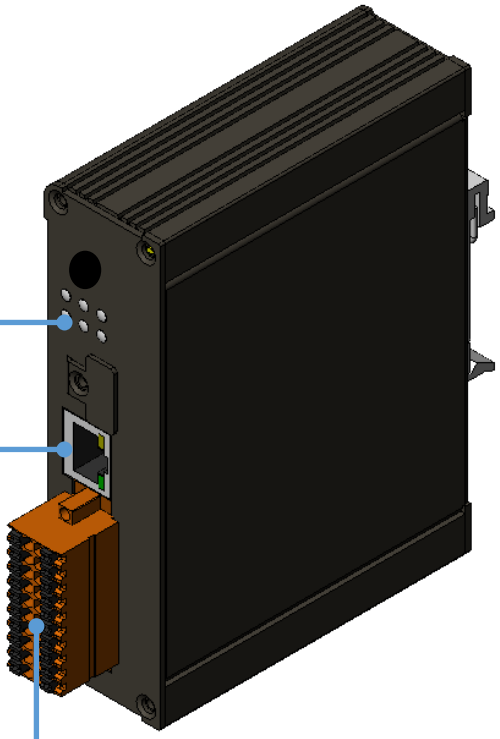
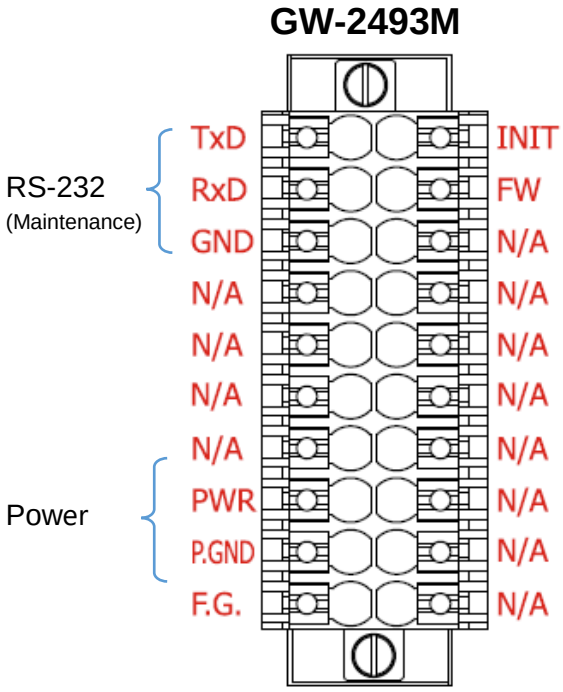
2.2 Appearance



The GW-2493M is equipped with a RJ45 port for Ethernet LAN connection. When 100BASE-TX is operating, the 10/100M LED is lit orange. When an Ethernet link is detected and an Ethernet packet is received, the Link/Act LED is lit green. The Modbus TCP use the same RJ45 port with difference TCP port from BACnet/IP.



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2.3 LED Indicator

There are six LEDs to indicate the various states of the GW-2493M. The following is the illustration of these six LEDs.

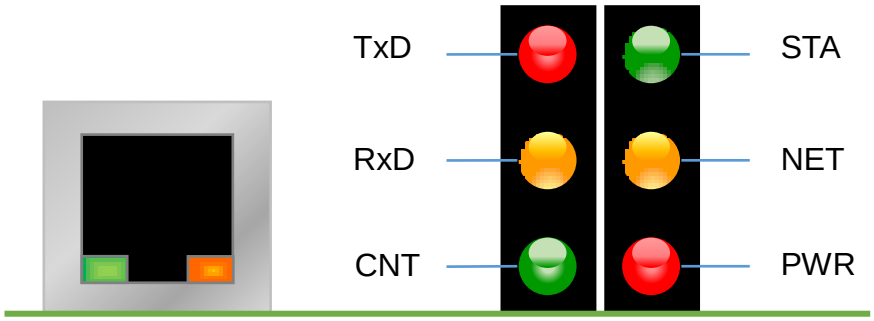

Figure 2.1 LED position of the GW-2493M

LED Name	GW-2493M Status	LED Status
ALL LEDs	FW Updating Mode	LED will be twinkled sequentially.
	FW Initial Mode	LED will be twinkled per 500ms.
PWR (Module)	Power On	On
	Power Failure	Off
NET (BACnet/IP)	Connected by least one client	On
	No clients connect	Blink per 200 ms
STA (BACnet/IP)	Communication OK	On
	Communication Failure	Blink per 200 ms
CNT (Modbus)	Connect to least one device	On
	No devices are connected	Blink per 200 ms
RxD (Modbus)	Data reception	On
	No Data reception	Off
TxD (Modbus)	Data transmission	On
	No Data reception	Off

Table 2.1 LED indication of the GW-2493M

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3. Getting Started With GW-2493M

This chapter mainly describes the operation process of the GW-2493M.

3.1 Wiring Preparation

Before setting up the GW-2493M, please complete the necessary preparation about wiring.

Please follow Figure 2.1 wiring diagram, to wire the following items:

1. Power Supply : +10 VDC ~ +30 VDC
2. Ethernet：Connect the GW-2493M with PC directly. Or let the GW-2493M and PC connect with the same Ethernet Switch/Hub.
3. INIT：Special purpose. Don’t care it this time.
4. FW：Special purpose. Don’t care it this time.

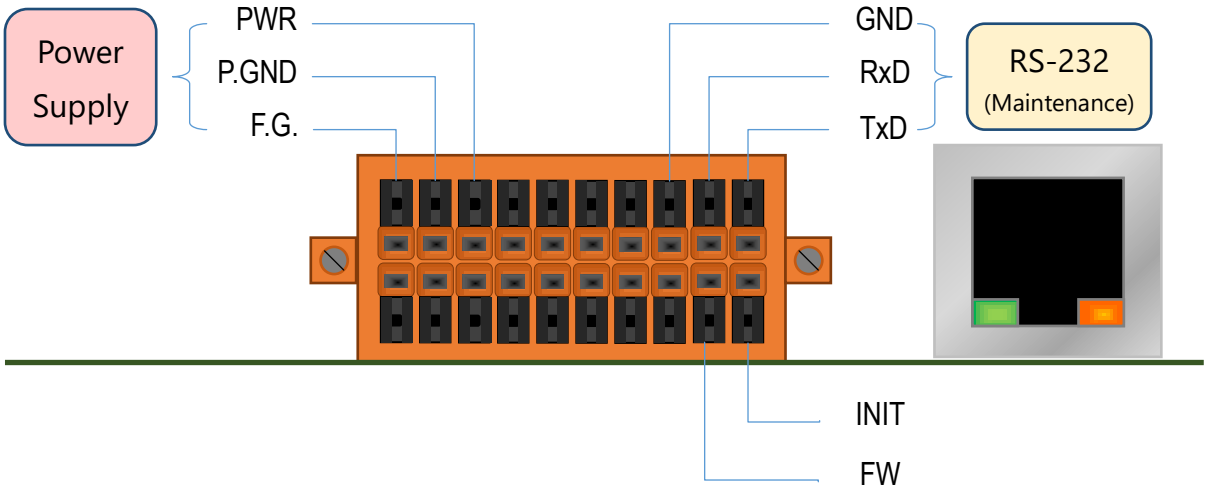

Figure 3.1 GW-2493M Wiring Diagram

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3.2 GW-2493M Web Configuration

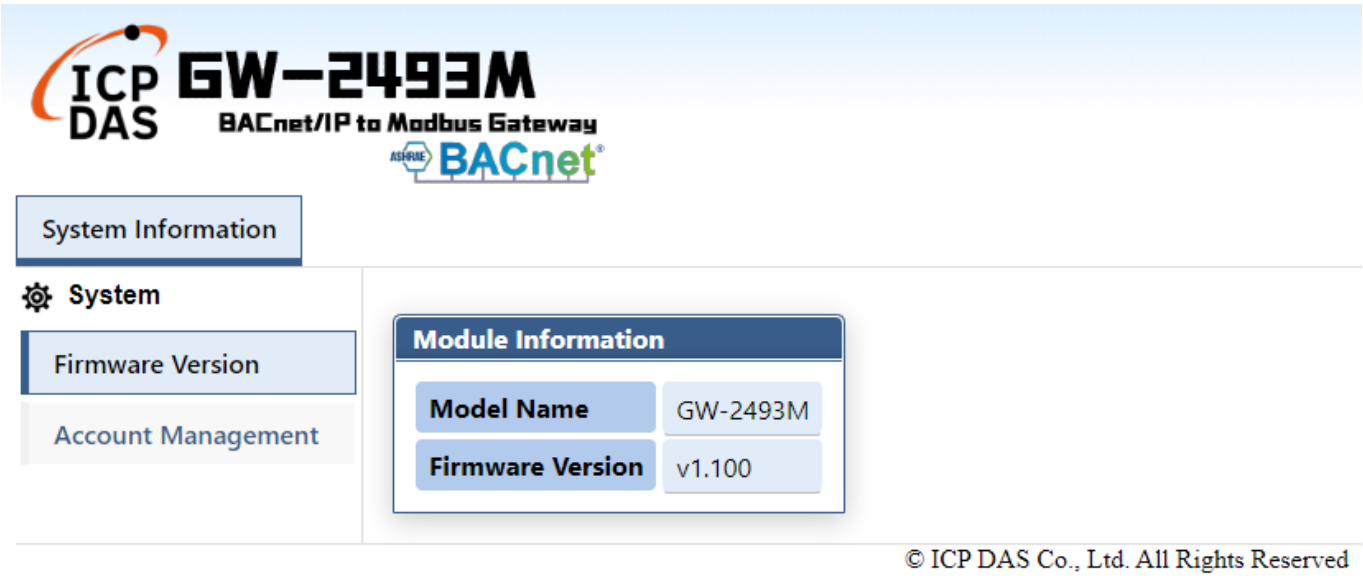
Please follow those steps to configure the GW-2493M via web browser.

Step0：

Use the default account “admin” and the password “admin” to enter the main setting page.

Step1：

The firmware version is shown on the web.



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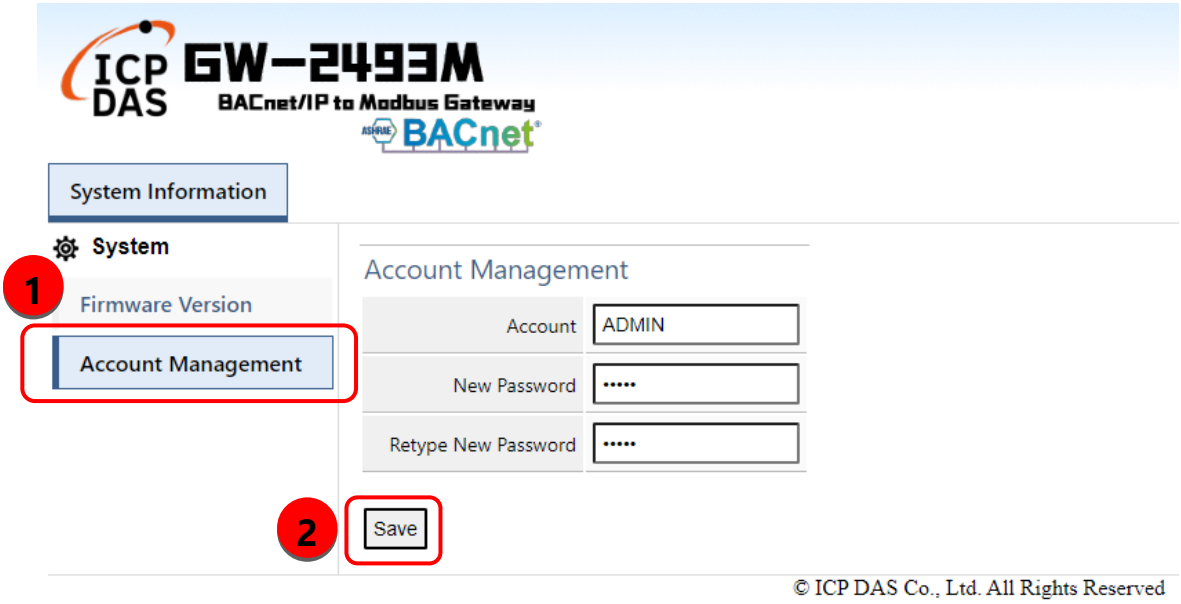
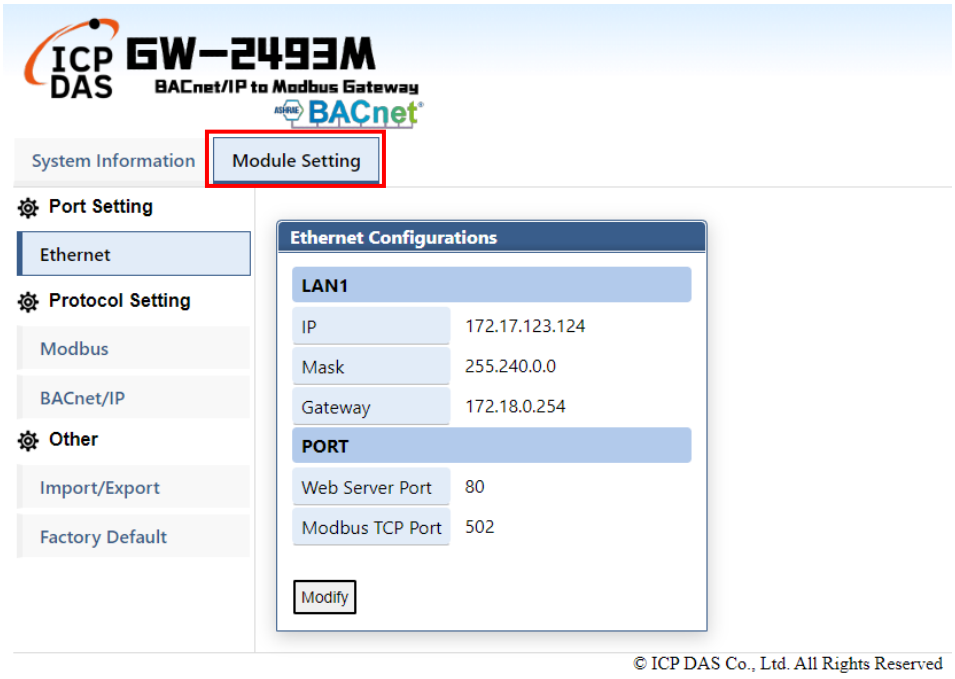
Step2：

The GW-2493M is based on the information security law. Users need to change account and password for the first time before using it.



Step3：

Please reflash the web page and login again with new account and password. “Module Setting” page will appear. Users could set the IP of the module.



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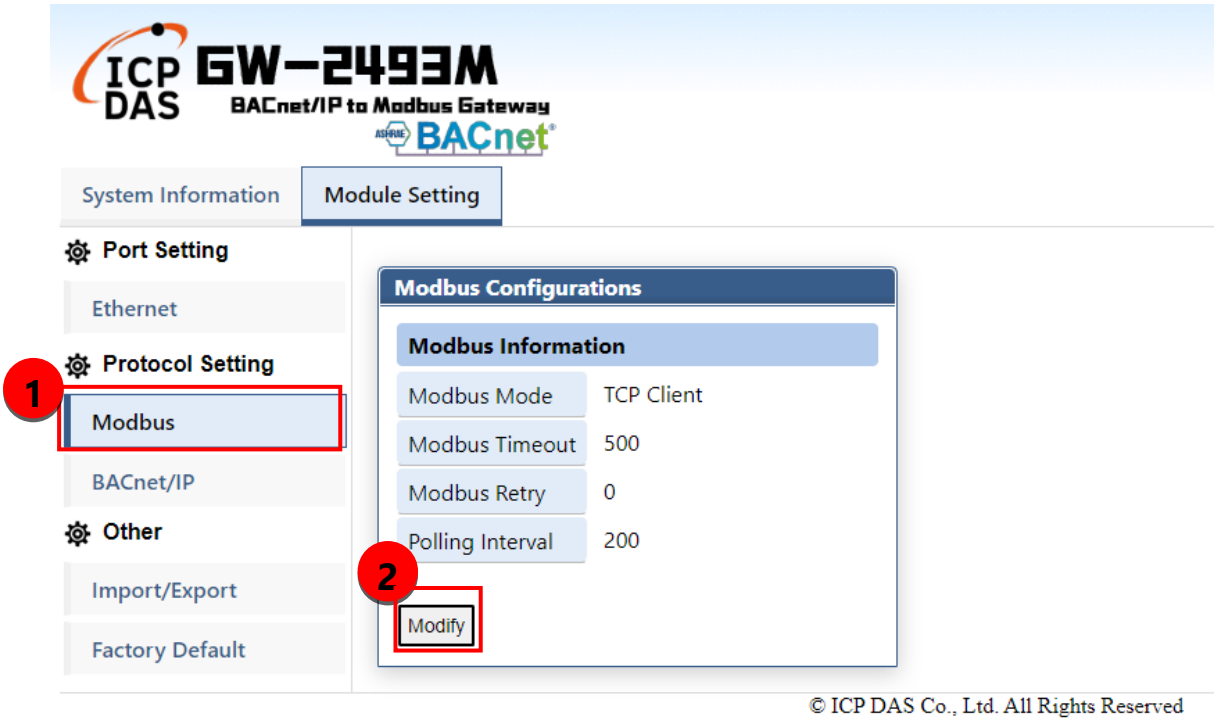
Step4-1：

Press “Modify” to configure the parameters of Modbus in the Modbus page.



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Step4-2：

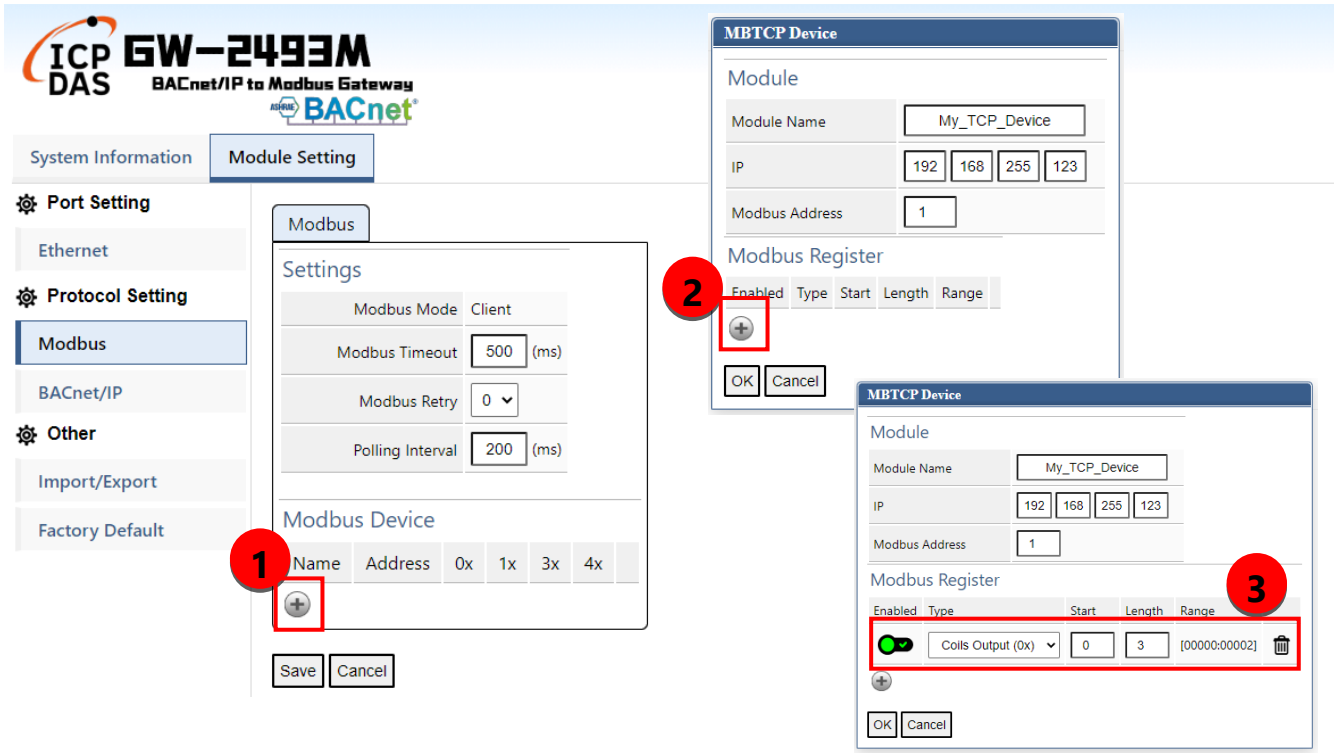
(1) Press “+” button to add a Modbus TCP node.

(2) After editing “Modbus Name” and “IP Address”, press “+” button to add Modbus registers.

(3) Press “+” button to add Modbus function codes and registers range.

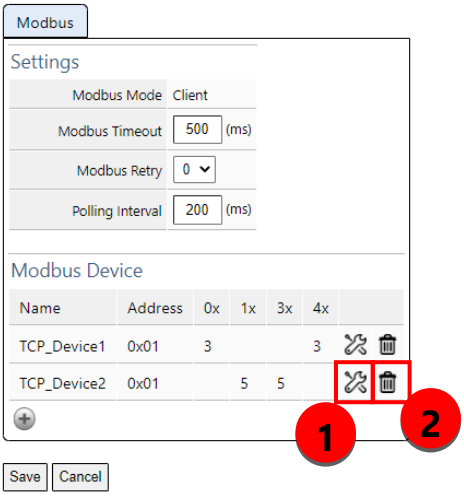
(4) Finally, the users need to press “save” to save all Modbus configuration into the GW-2493M.

(5) The users need to restart the GW-2493M to make configuration work.



(1) Press the icon to edit a Modbus registers of that node

(2) Press the icon to delete that Modbus node.



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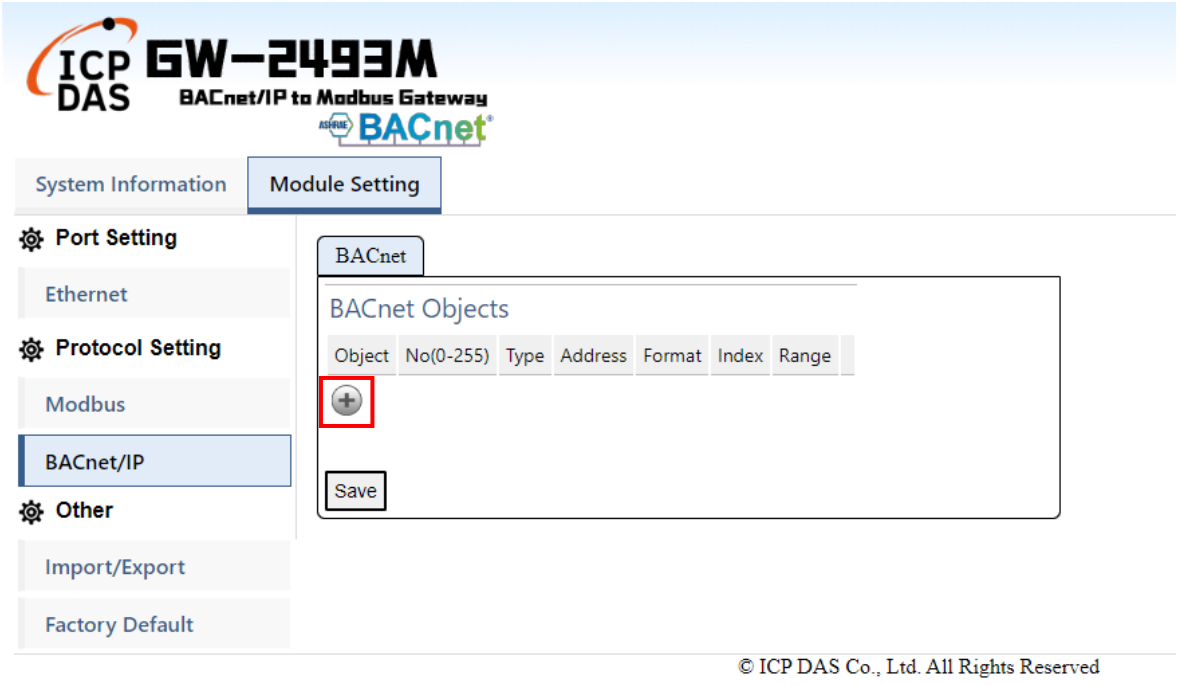
Step5：

Press “+” button to add a BACnet object.



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(1) The “Object” field is BACnet object which support AI/AO/AV/BI/BO/BV/MI/MO/MV.

(2) The “No” field is the serial number of the BACnet object. If you have AI*3 and AO*4, you need assign the No as AI-**0**, AI-**1**, AI-**2**, AO-**0**, AO-**1**, AO-**2**, AO-**3**.

(3) The “Type” field is the Modbus register type. The common configuration is shown below.

BACnet BO object maps to Modbus Coil Output(0x)

BACnet BI object maps to Modbus Input Status(1x)

BACnet AO object maps to Modbus Holding Register(4x)

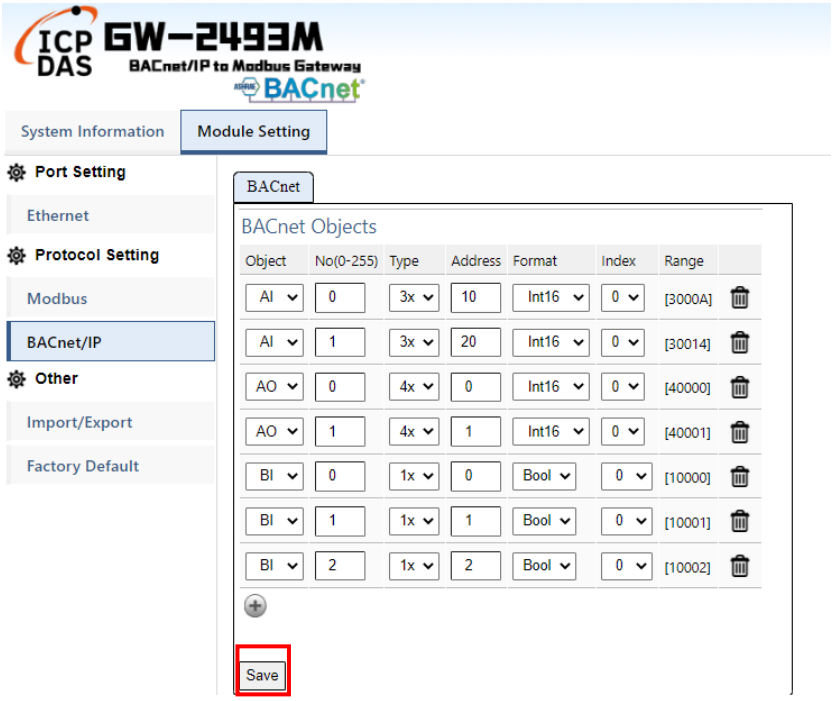
BACnet AI object maps to Modbus Input Register(3x)

(4) The “Address” field is the start address of the Integrated Modbus Register (Note1).

(5) The “Format” field is the data format which support bool/int16/uint16/int32/uint32/float.

(6) The “Index” field is reserved.

(7) The “Range” field is the exact Modbus address of the register.



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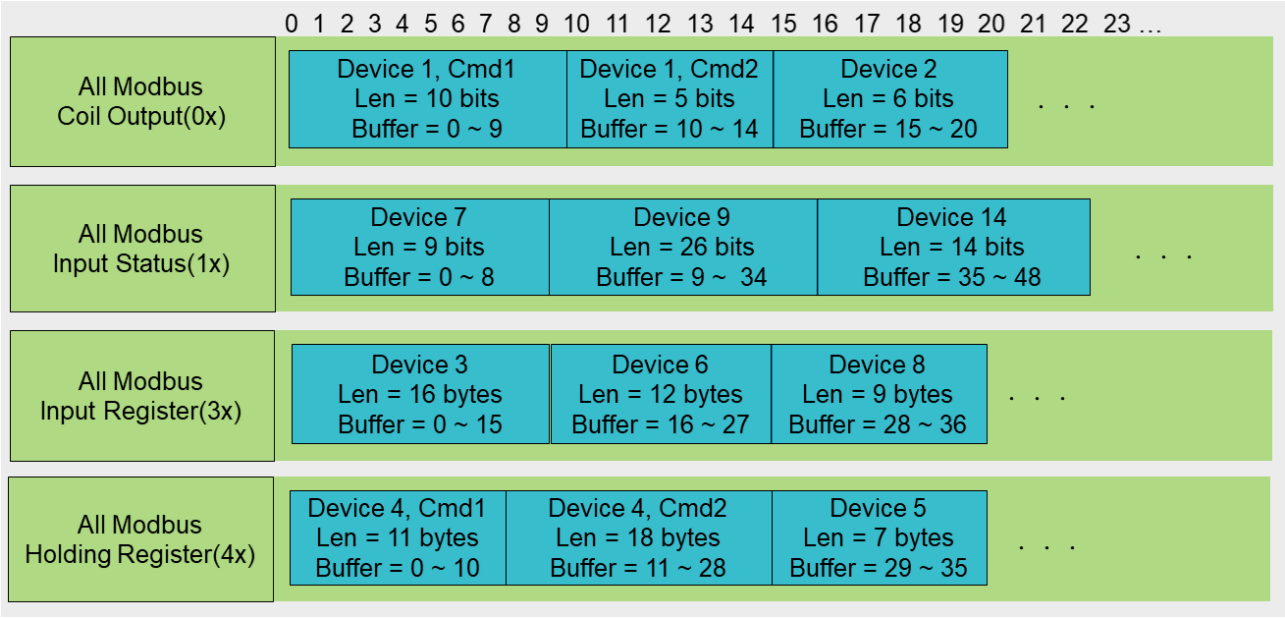
Note 1.

In the GW-2493M, all remote Modbus data which come from different remote Modbus TCP devices will be integrated by their register type. It means that all remote Coil Output data will be putted into a Coil Output integrated buffer. All remote Input Status data will be putted into an Input Status integrated buffer. There are also have Holding Register integrated buffer and Input Register integrated buffer in the GW-2493M. They ware integrated as the illustration shown below.



The BACnet object will read or wirte the data from those integrated buffers. Those Modbus data with the same type will be ordered by the Modbus Configuration Index in the integrated buffer. The first configuration Modbus command will be in the first address of the buffer. The order was shown below.

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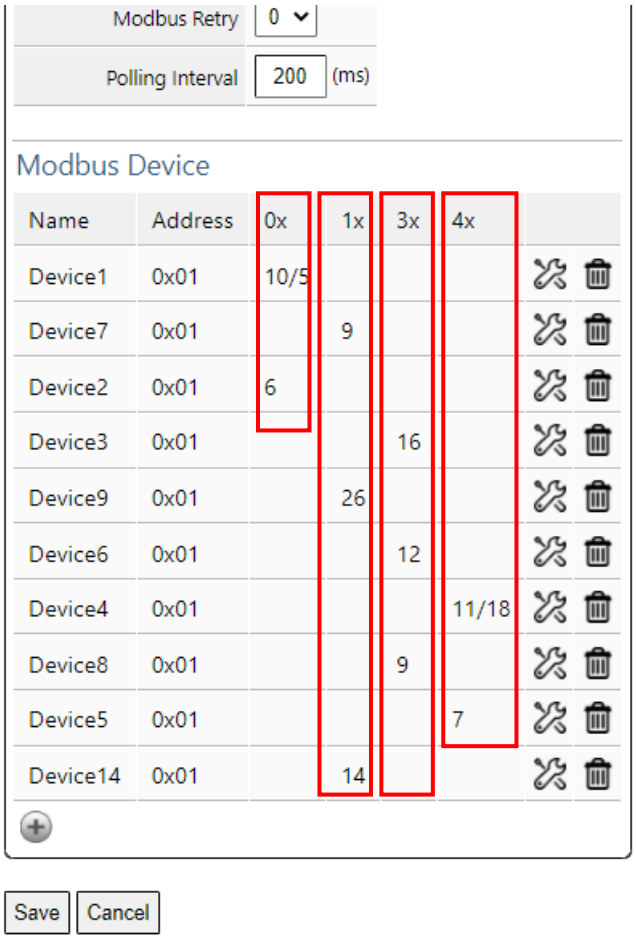

For example by the illustration in Holding Register(4x), the Device4 and command 1 is the smallest ID and the smallest command index. The Device4 and command 1 occupies the first address of the Holding Register buffer. The “Address” field of the BACnet object means that the address in those integrated buffers. For example by the illustration, if the address of the BACnet “BO” object is 11, it means that the data of the “BO” object comes from the second bit of the Device 1 and command 2 in the Coil Output buffer. If the address of the BACnet “AO” object(int16) is 7, it means that the output data of the “AO” object(int16) will be written to the 8-th words of Device 4 and command 1 in the Holding Register buffer.

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3.3 Import/Export Configuration

(1)Export All Configurations to CSV file:

The GW-2493M supports export function to write all configurations into a csv file..

(2)Import All Configurations from CSV file :

The users could import all configurations from a CSV file. It is convinient to move all configurations from one GW-2493M to another one. Firstly, the users select the CSV file. And then, they can press “Import” button to import configurations into the GW-2493M modules.

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3.4 How to restore default Account/Password

If the users have forgotten the login information, they can follow the steps to restore default login information.

(1) Short the “INIT” and “GND” pin of GW-2493M and turn on the power.

(2) The GW-2493M will restore the login information.

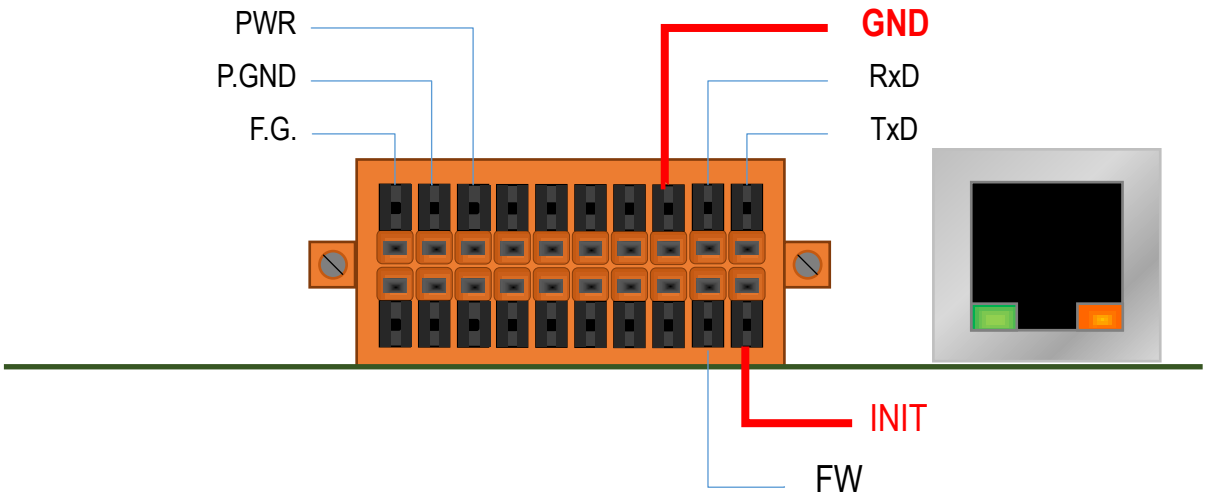
IP : 192.168.255.1

Mask : 255. 255. 0 .0

Gateway: 192.168.0.1

Login Account: admin

Login Password: admin



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3.5 How to update the firmware

The GW-2493M can update the firmware via a software tool (Windows) by the following:

1) Download the latest version of the firmware program and update Tool (FW_Update_Tool) on the GW-2493M product page and store it in a computer that you want to connect to the GW-2493M.

- **Update Tool:** Please refers to ->

  https://www.icpdas.com/en/download/show.php?num=7824&model=GW-2493M

2) Short the “FW” and “GND” pin of the GW-2493M and turn on the power. When the six LEDs of the GW-2493M turn blinking alternately, the GW-2493M is successfully entered the firmware updating mode.

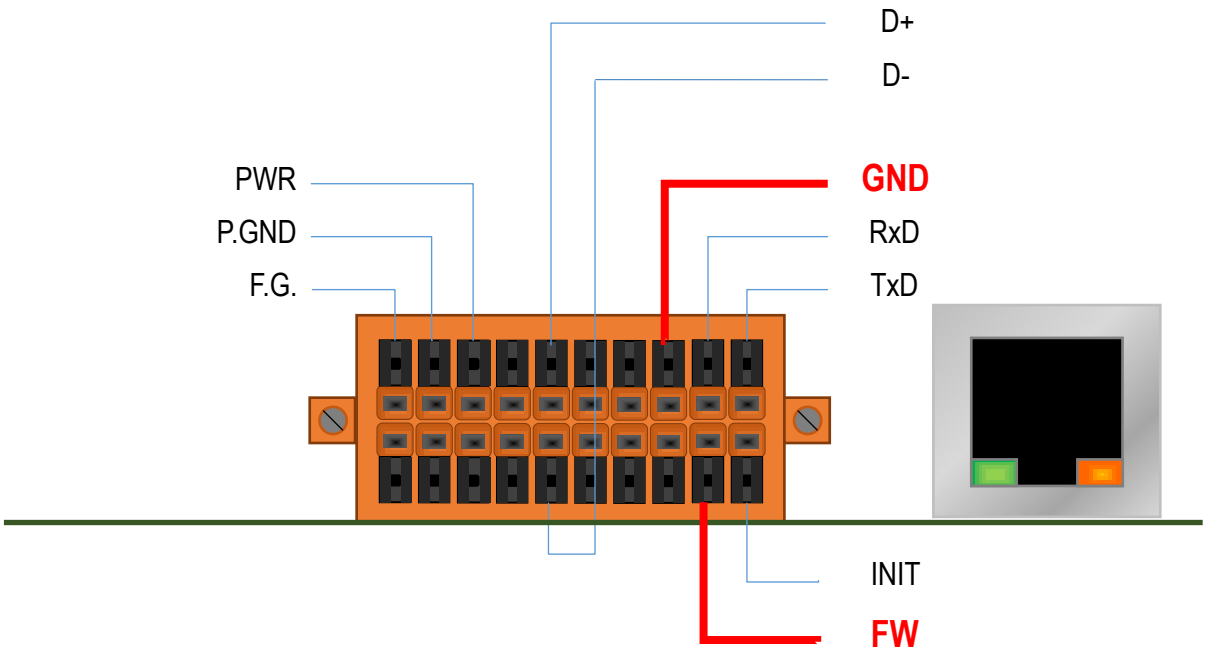

Figure 3.2 GW-2493M FW & GND Pin

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3) Execute “FW_Update_Tool.exe” with the administrator privileges ( ) and follow the steps as Figure 3.3:

In "Download Interface", select a network port for connecting to the GW-2493M.

In "Firmware Path", select the latest firmware update file (GW_2493M_xxxx.fw).

In "Firmware Update", click “Update” to start the firmware updating.

4) When the update is completed, “Update OK” will be displayed in the “FW_Update_Tool” window to indicate that the firmware updating is successful. Next, remove the short connection between FW and GND, and reboot the power supply, then check the current firmware version on the Web interface.

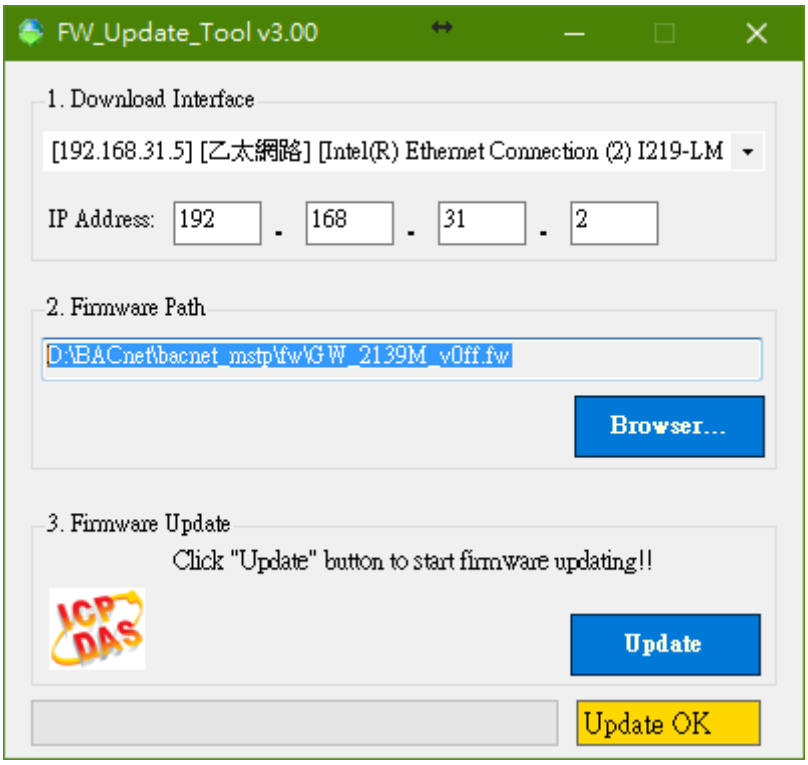

Figure 3.3 FW_Update_Tool firmware update steps

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4. GW-249xM Software Utility

The built-in webpage in the GW-2493M can set all kinds of parameters and export the parameters to CSV file for saving easily. ICP DAS also provides the PC version of the utility, which is mainly for generating bulk BACnet objects, and can import the CSV parameter file from the previous GW-2493M into the utility for adding and further editing the objects. In addition, it is also possible to export the parameters into CSV file, which can be imported into other GW-2493M products. This chapter introduces the functions of the GW-249xM utility, how to generate bulk BACnet objects, and how to export and import the web page profiles (CSV files).This utility is applicable to both GW-2492M and GW-2493M products. The download link of the GW-249xM utility is as follows:
https://www.icpdas.com/en/download/show.php?num=7823&model=GW-2493M

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4.1 GW-249xM Utility Overview and Summary

Figure 4.1 below shows the full picture of the utility. The software provides convenient import and export functions, and kindly divides the parameter settings into three tabs, namely "Ethernet & Serial", "Modbus Devices" and "BACnet Objects" to categorize the complex parameters into easy-to-understand groups. Among them are below.

(1) 【Ethernet&Serial】 Sets the BACnet IP, serial parameters and BACnet ID.

(2) 【Modbus Devices】Set the Modbus devices and registers that GW-2493M polls.

(3) 【BACnet Objects】Set the BACnet objects of GW-2493M.

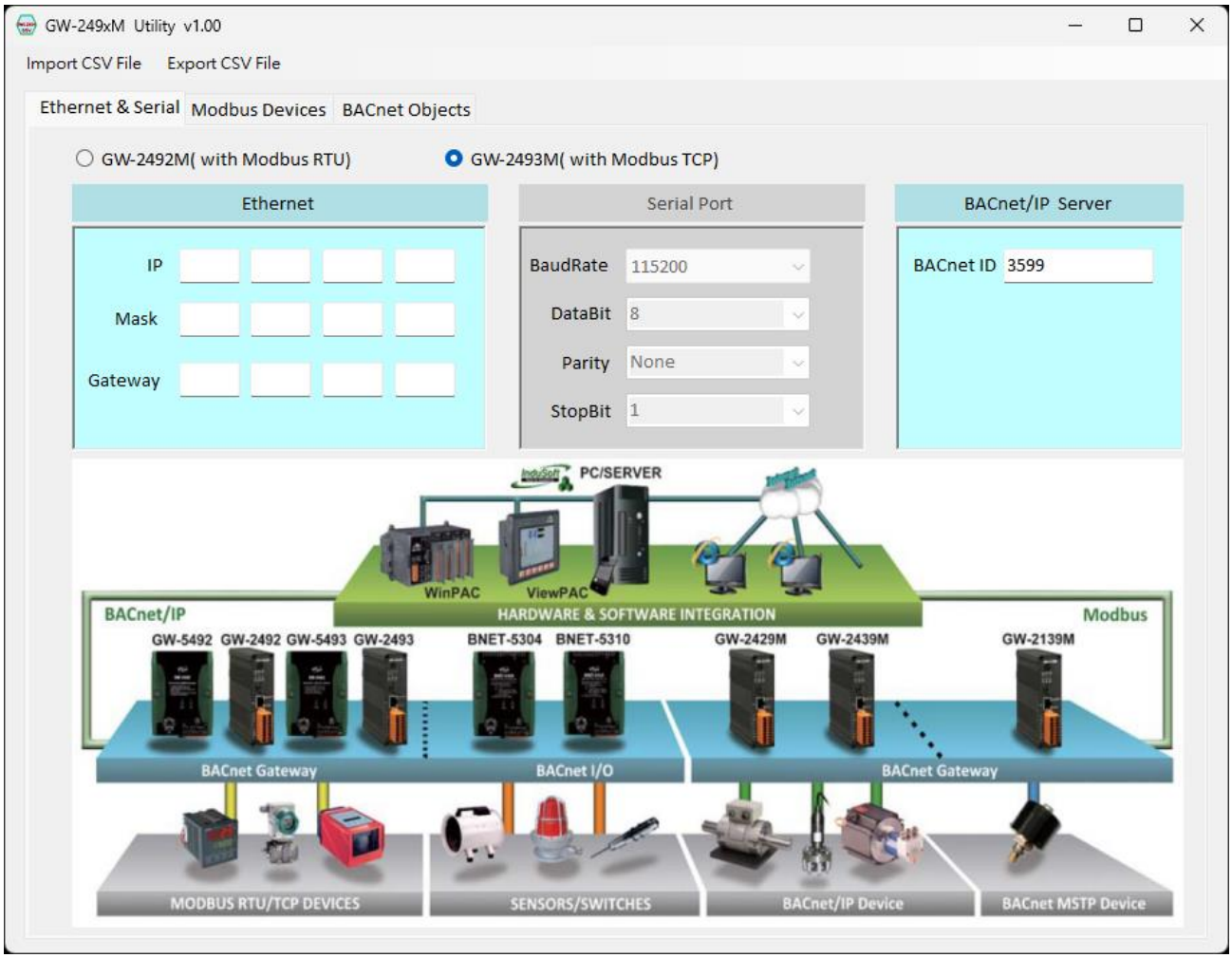

Figure 4.1 Overview of the GW-249xM Utility

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4.2 Importing and Exporting CSV Files by Utility

If you already have a GW-2493M module, you can follow the instructions in Chapter 3 of this manual. You can login to the built-in webpage in the GW-2493M to set the relevant parameters and export the CSV file from the webpage for safekeeping. After getting the CSV file of GW-2493M, you can import it into this utility to read the content, and if you need to modify the content, you can also modify it in this utility. Finish modifcation, you can save the file and then import it to another GW-2493M product in the future.

If you don't have a GW-2493M product and don't have its CSV file, this utility can directly generate the related settings and immediately save the settings as a CSV file. You can transfer the CSV file to the GW-2493M product by "Import/Export" on the webpage.

1. Import method: Select the specified CSV file to import.

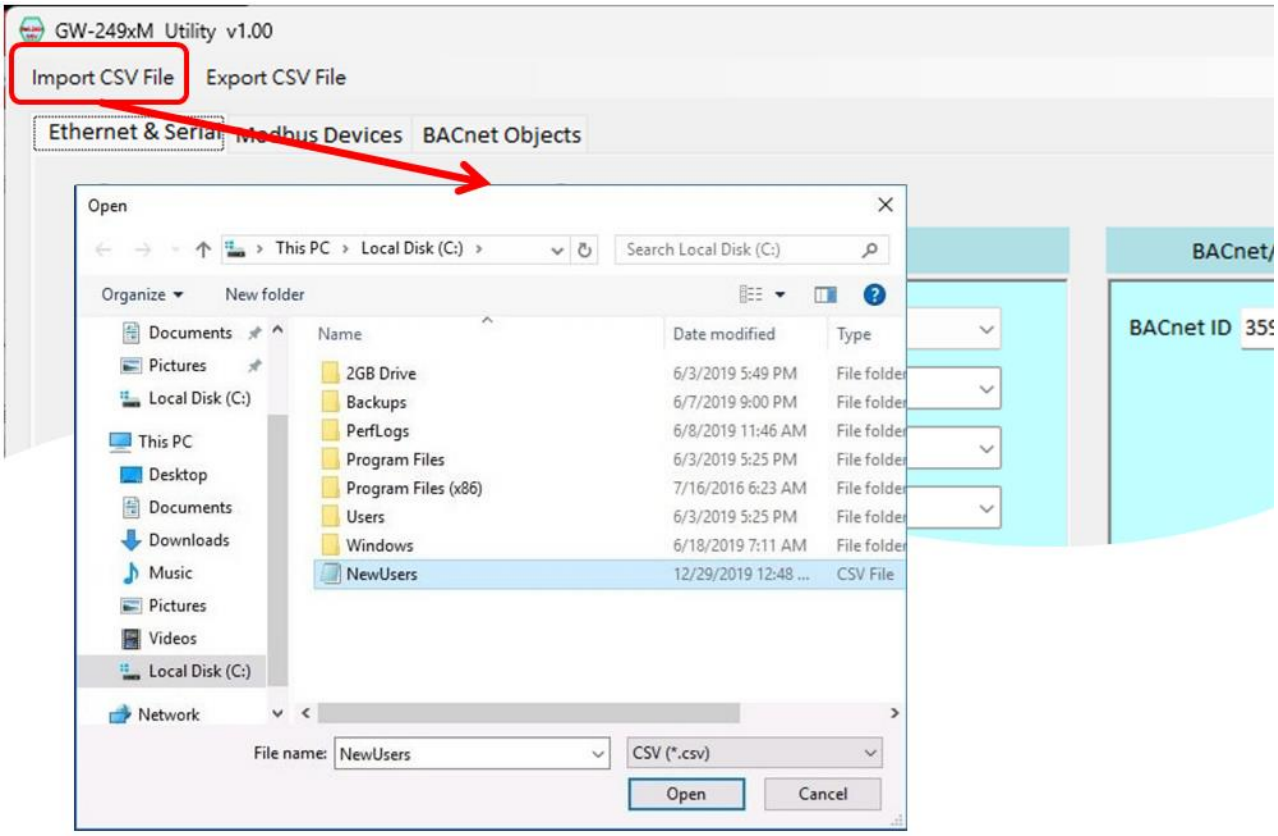

Figure 4.2 Import CSV File

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2. Export method:Save all setting to the specified CSV file.

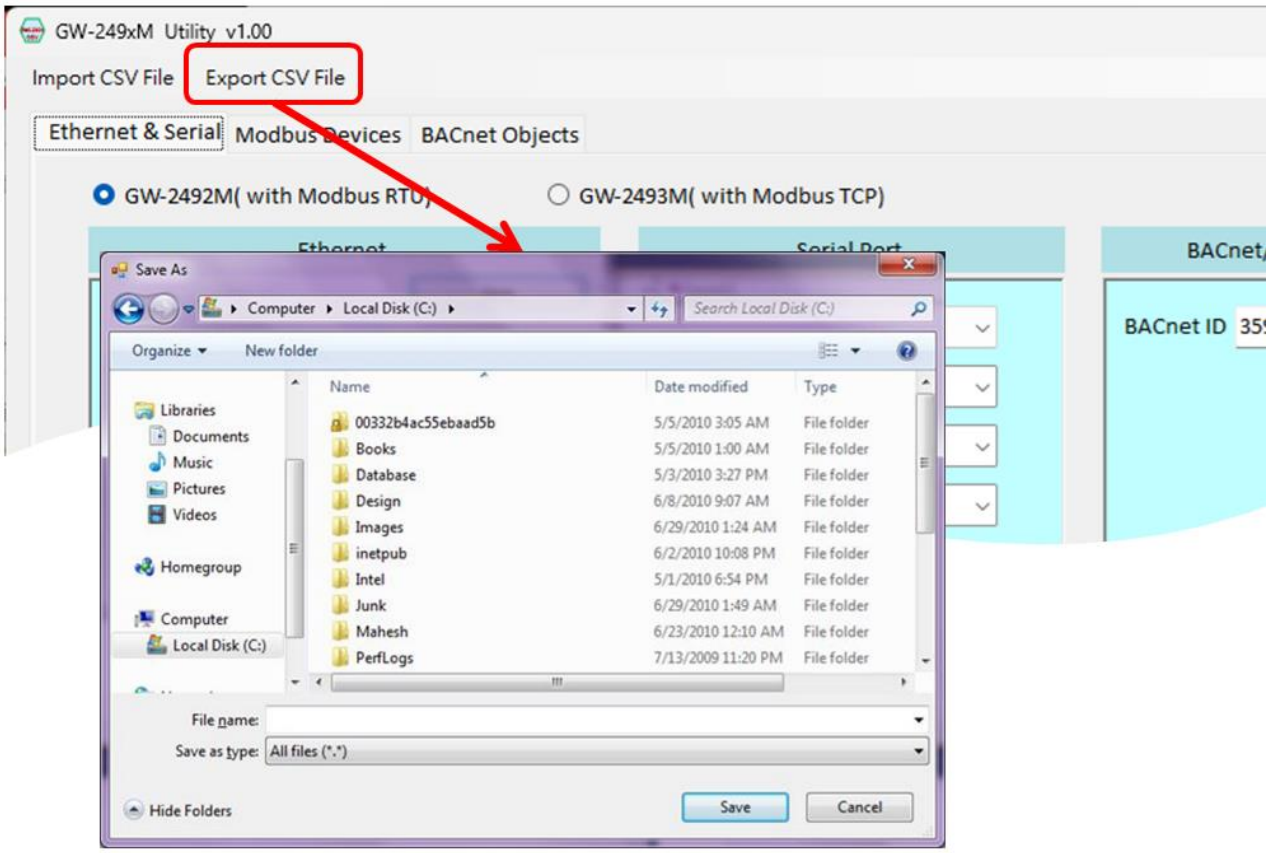

Figure 4.3 Export CSV file

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4.3 Ethernet IP/Serial Port/BACnet ID Configuration

There are also ethernet IP and serial port parameters in the built-in webpage of the product. The ethernet IP in this utility means the IP address of BACnet/IP. However, the serial parameter is for GW-2492M product, it is not necessary to set or edit in GW-2493M, and the serial communication can be set only when user selects GW-2492M on the radio button.

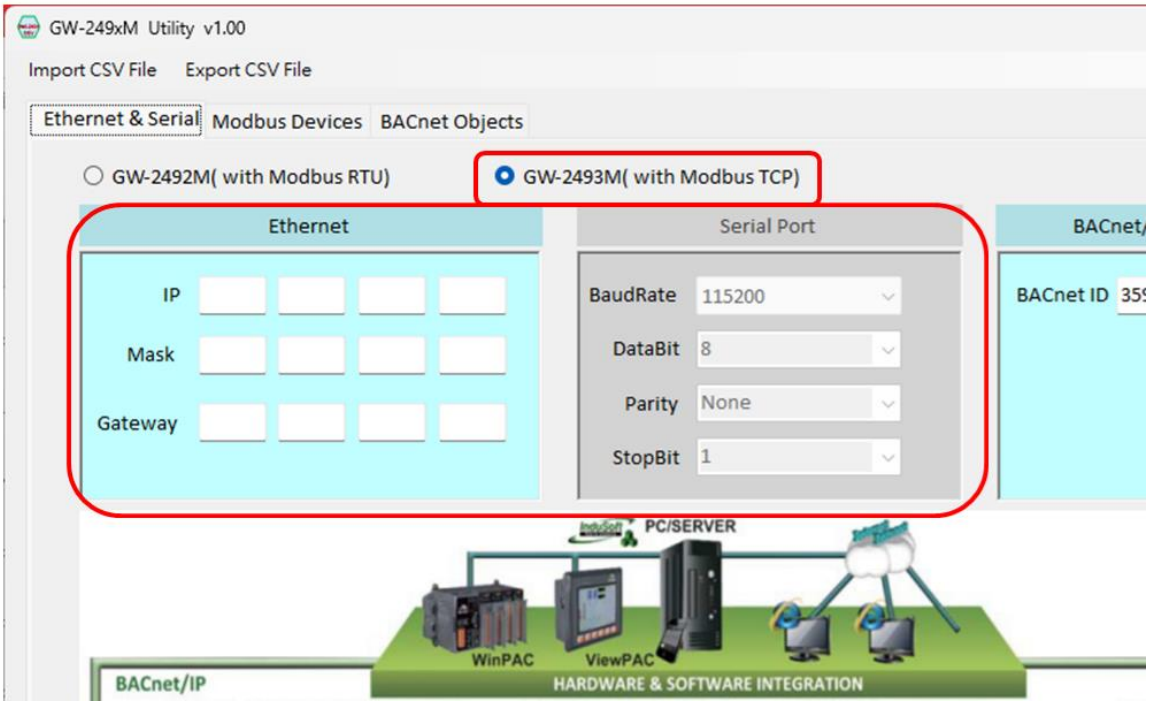

Figure 4.4 The Ethernet IP and Serial Port paramaters

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This utility has a BACnet ID parameter. It means that you can change the BACnet ID value by yourself. Please set it between 0 and 4194302, the default value is 3599.

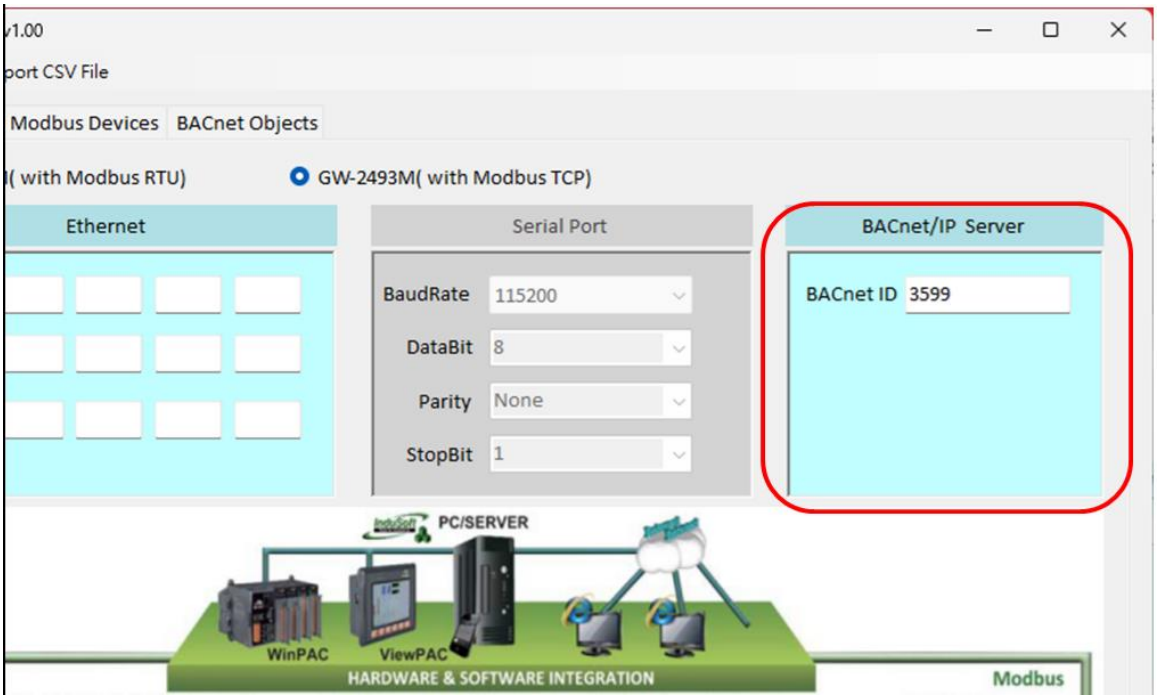

Figure 4.5 BACnet ID Configuration

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4.4 Modbus TCP Configuration in the GW-2493M

The GW-2493M acts as a Modbus TCP client and can access up to 32 Modbus TCP server devices. Therefore, the 【Modbus Devices】 page of this utility is mainly for editing remote Modbus TCP server information, as follows.

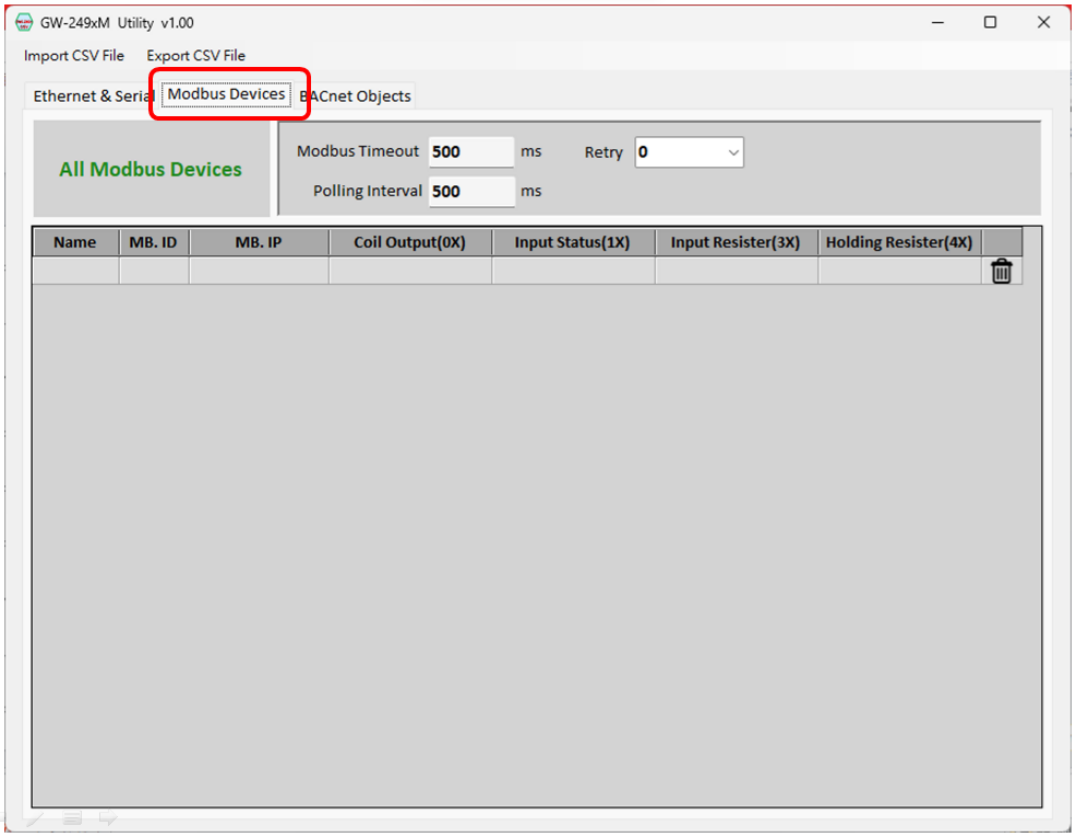

Figure 4.6 the 【Modbus Devices】 page

The GW-2493M module actively polls all Modbus TCP server devices and uses the same Timeout/PollingInterval/Retry parameters. These parameters will affect the performance of the GW-2493M in collecting Modbus TCP server information, so please set it according to the actual situation.

- “Modbus Timeout” indicates the maximum time to wait for the slave device to respond. Please set it according to the actual requirement.
- “Polling Interval” indicates the interval time between each poll. The time that can leave the communication network idle. Please set it according to the actual requirement.
- “Retry” indicates the number of times the slave device will be repeatedly queried when it has not responded for more than the timeout period. Please set it according to the actual demand.

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When the Modbus Devies table already has some Modbus devices and needs to delete a record, the user can click the small trash can icon on the right side of the record, it will delete the record. If users need to add a Modbus TCP server device, users can click the blank data row in the table as shown in Figure 4.7 below.

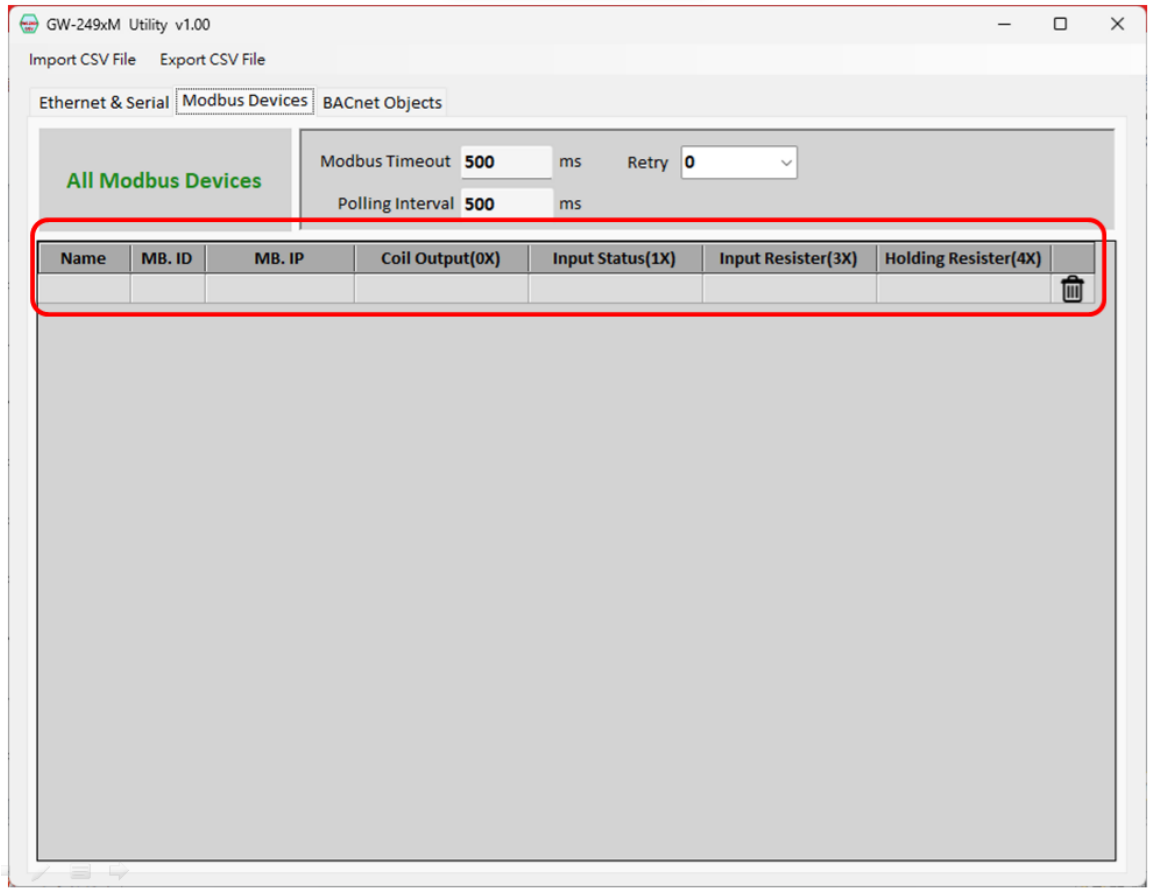

Figure 4.7 Create Modbus TCP server item

After clicking the blank data row, a dialog will appear, as shown in Figure 4.8 below.

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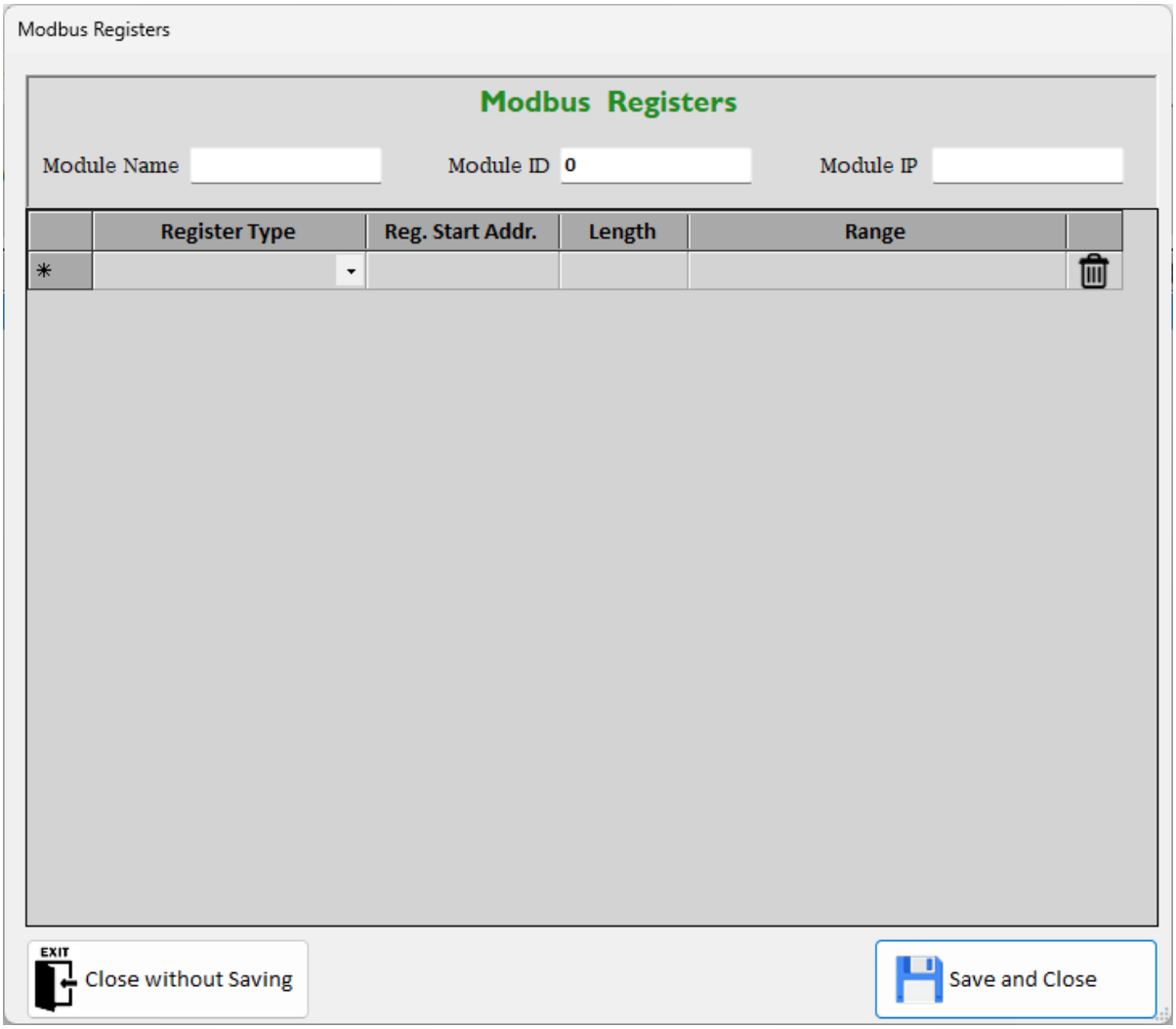

Figure 4.8 Modbus Registers Dialog

When a new Modbus TCP server device is added, there will be some information that needs to be set, including the device name and ID, etc.

- “Modbus Name” is used to indicate the name of the server device, which is convenient to identify those server devices.
- “Module ID” means the Modbus ID of the server device.
- “Module IP” means the Ethernet IP of the server device.

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Then users need to add a new Modbus register. Regardless of whether there is any data in the Modbus Registers table or not, when users want to add a new Modbus register, click on the blank data row, as shown in Figure 4.9 below.

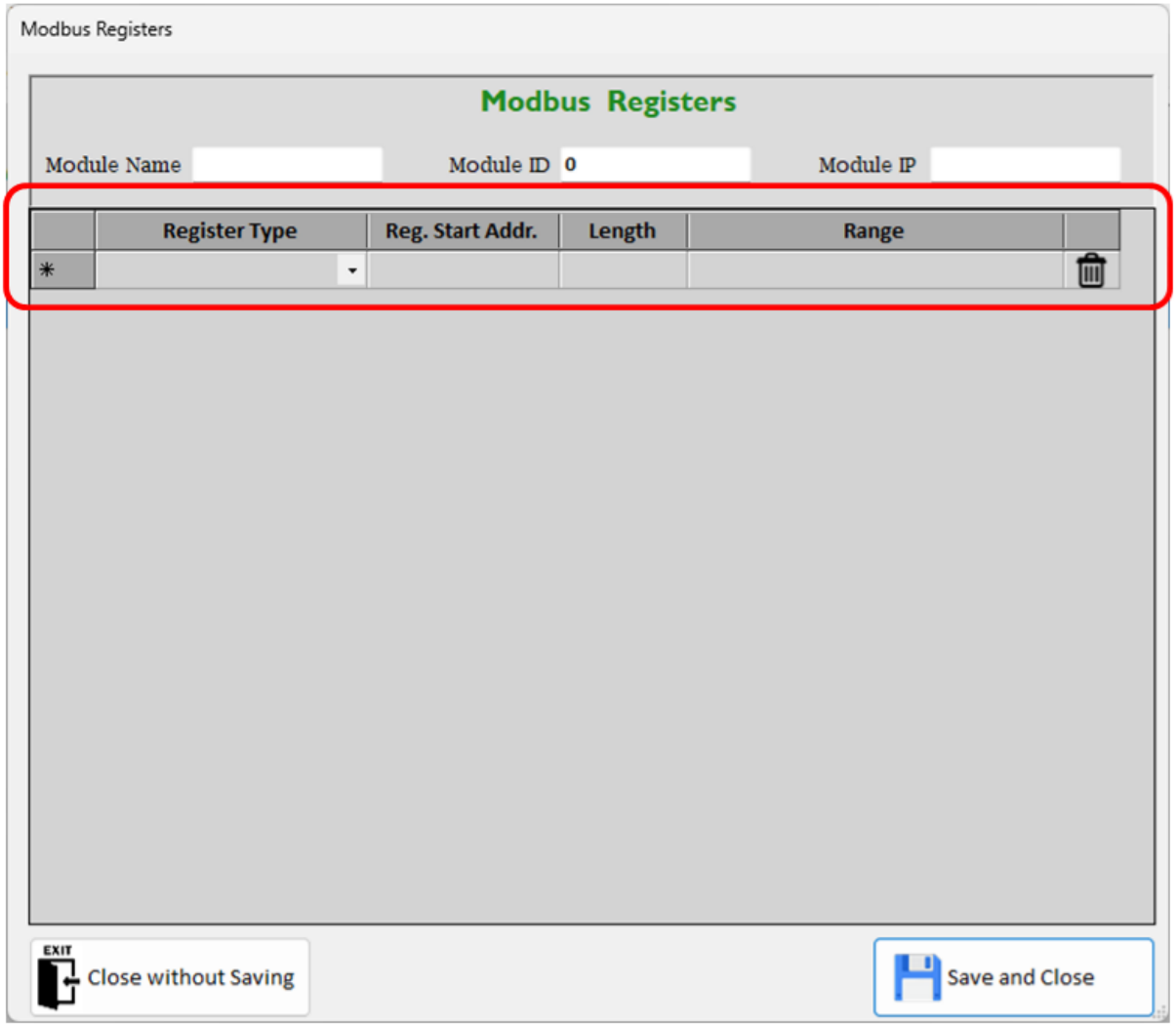

Figure 4.9 Modbus Registers Dialog---Create a register item

The following information is required for the new Modbus registers.

- "Register Type"indicates the Modbus register type. The item supports the following four Modbus register types.。
  1. Coil Output (0X)
  2. Input Status (1X)
  3. Holding Regitster (4X)
  4. Input Register (3X)
- "Reg. Start Addr." means the start address of the Modbus register.

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- “Length” indicates the amount of the register.
- “Range” indicates the Modbus register range. This field calculates the range automatically and the user does not need to input it.
- “Trash-CAN icon” When it is necessary to delete a record, you can click on the small trash can icon on the right side of the record, and it will delete the record.

When all Modbus registers have been inputted and you are sure you want to save them, click "Save and Close" button to save the input information and leave this screen. If you don't save them, click "Close without saving" button to ignore any information and leave this screen.

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4.5 BACnet Object Configuration

The GW-2493M acts as a BACnet/IP Server, which can accept the request from BACnet/IP Client and be retrieved the data of each object. Therefore, the BACnet Objects page of this utility is mainly for editing BACnet objects as shown below.

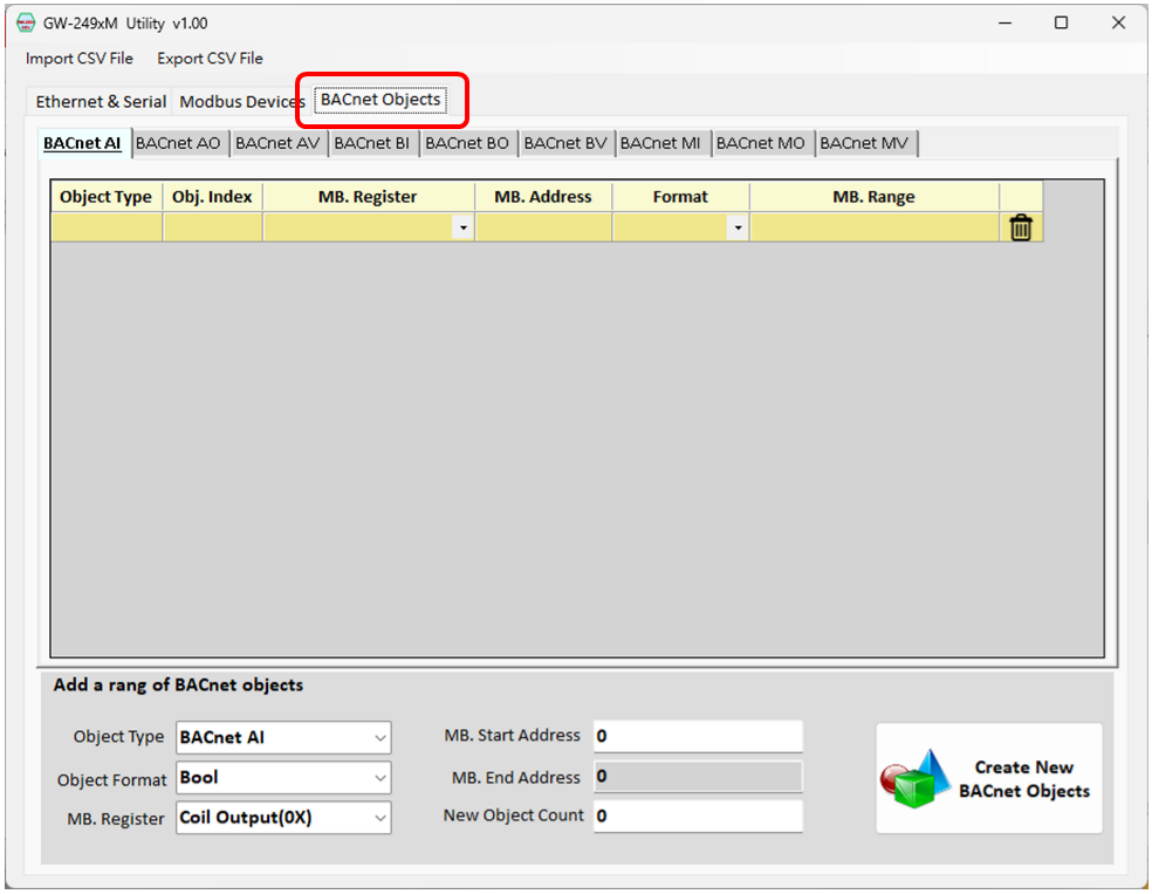

Figure 4.10 BACnet Objects Page

The GW-2493M module supports 9 types of BACnet/IP objects, and you can configure the object's real-time data mapping from which register of the Modbus. When the BACnet Objects table is already partially available and a record needs to be deleted, click on the small trash can icon on the right side of the record and it will delete the record. If the user wants to add a new BACnet Object, the user can click the blank row as shown in Figure 4.11 below.

Below is a description of the fields.

- "Object Type" indicates the type of the BACnet object. This field is automatically generated according to the page of the object, so users do not need to enter it.
- "Obj. Index" indicates the ranking within the object type, which is the running number of

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this object. This field will automatically generate consecutive running numbers. The users do not need to enter it.

- “MB. Register”indicates the Modbus register type to which the object corresponds. The following four Modbus register types are supported.
  1. Coil Output (0X)
  2. Input Status (1X)
  3. Holding Regitster (4X)
  4. Input Register (3X)
- “MB.Address”indicates the start address of the Modbus registers which the object corresponds.
- “Format” indicates the data type of the object and supports the following six data types。
  1. Bool (Boolean)
  2. Uint16 (16-bit unsigned integer)
  3. Int16 (16-bit signed integer)
  4. Uint32 (32-bit unsigned integer)
  5. Int32 (32-bit signed integer)
  6. Float (Single-precision floating point numbers)
- “MB. Range” indicates the range of Modbus registers to which the object corresponds. This field automatically generates a continuous sequence number so that the user does not have to enter it.

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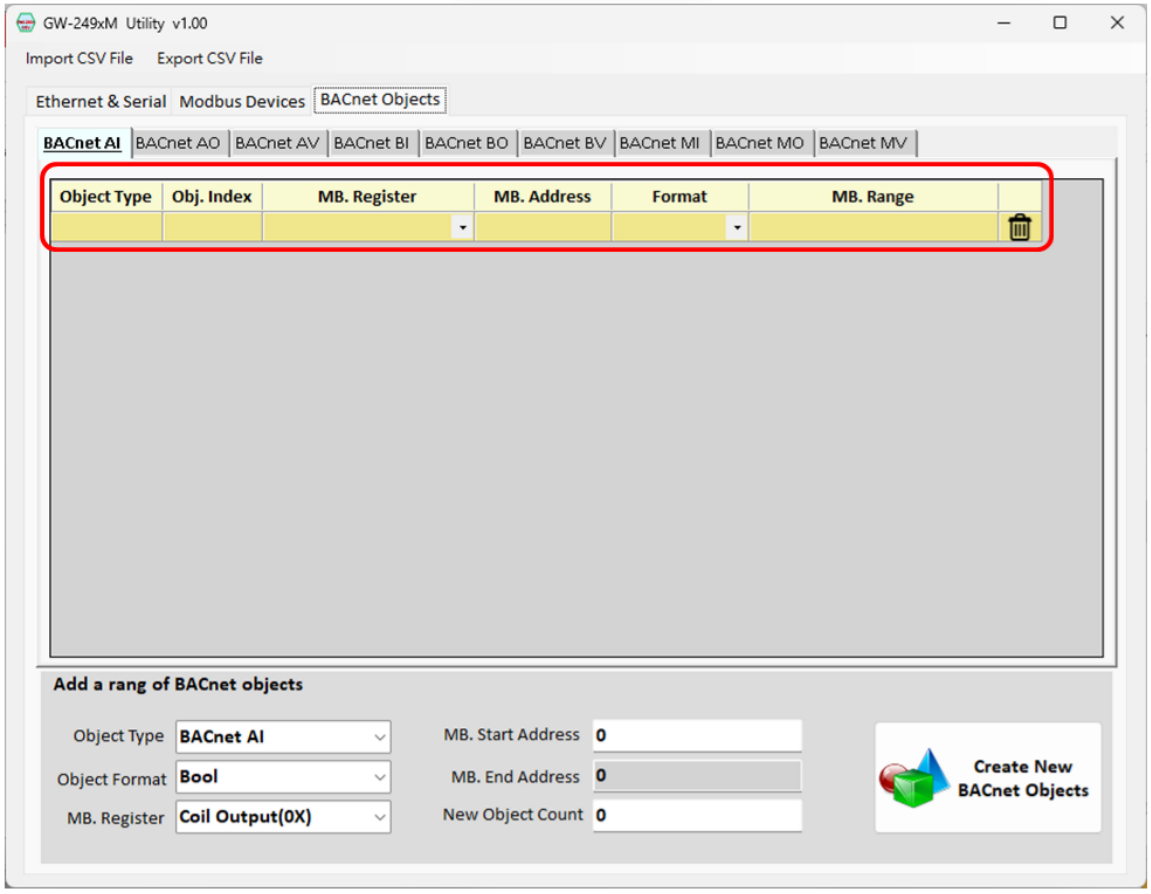

Figure 4.11 BACnet Objects page--- Create a new object

If users need to generate a mass number of consecutive objects, they can use "Add a range of BACnet objects" at the bottom of the page, as shown in Figure 4.12 below.

The following are descriptions of the fields and buttons.

- “Object Type” indicates the type of BACnet objects to be added. Please select the objects you want to produce according to your needs.
- “Format”indicates the data type of the BACnet object. Select the data type according to your requirement.
- “MB. Register” indicates the Modbus register type for the BACnet object. Select the Modbus register type according to your requirement.
- “MB.Start Address”indicates the Modbus register start address for the first BACnet object.
- “MB.End Address”represents the address of the last corresponding Modbus register. This field will be calculated automatically according to the number of objects. Users do not need to enter it.

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- “New Object Count” indicates how many BACnet objects are to be generated. Please enter a positive integer.

Once the above fields have been entered, click the "Create New BACnet Objects" button to create a large number of consecutive BACnet objects at once.

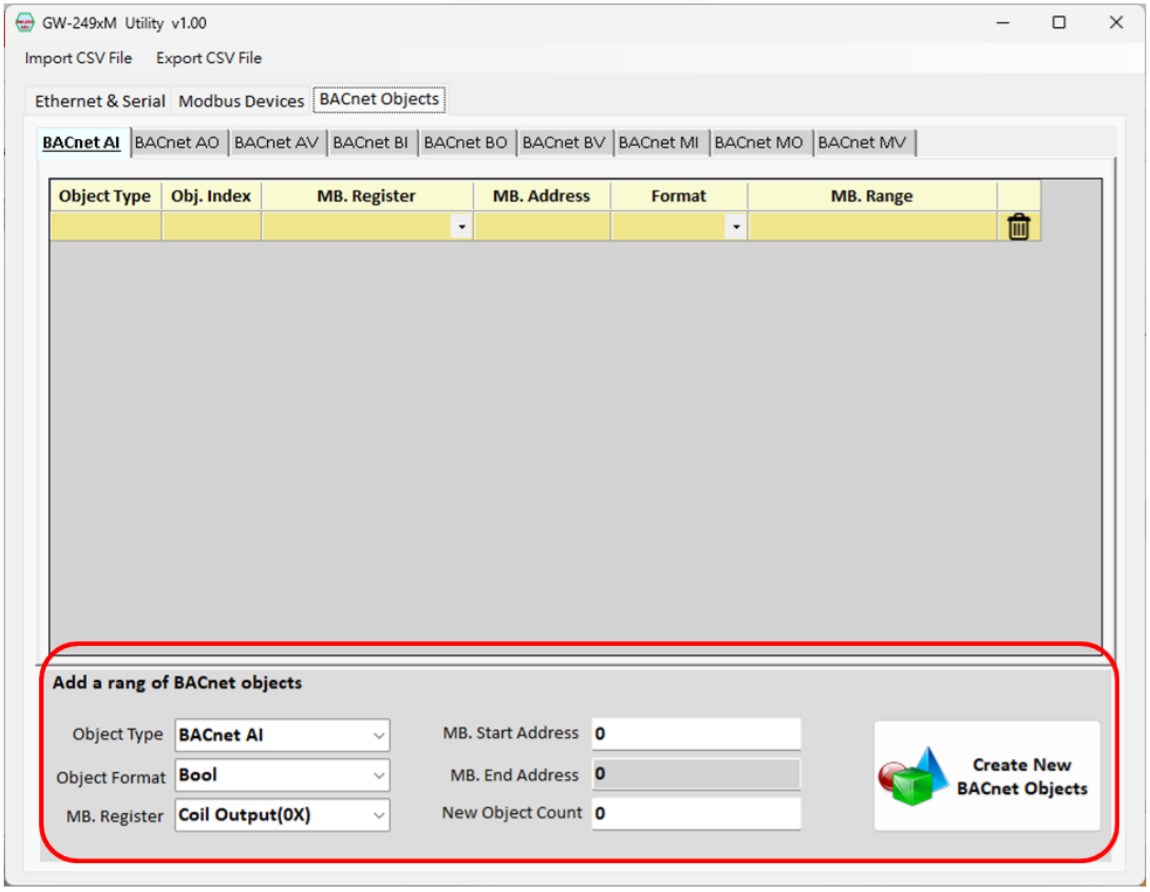

Figure 4.12 BACnet Objects page--- Create a mass number of objects

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