User Manual

Version 1.0.0 June 2019

iWSN-2200 series

(iWSN Wireless Data Concentrator)

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Important Information

Warranty

All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year, beginning from the date of delivery to the original purchaser.

Warning

ICP DAS assumes no liability for any damage resulting from the use of this product.ICP DAS reserves the right to change this manual at any time without notice. The information furnished by ICP DAS is believed to be accurate and reliable. However, no responsibility is assumed by ICP DAS for its use, not for any infringements of patents or other rights of third parties resulting from its use.

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Contact us

If you encounter any problems while operating this device, feel free to contact us via mail at: service@icpdas.com .We guarantee to repond within 2 working days.

1. Introduction

In response to the Internet of Things, big data analysis, industry 4.0, energy-saving and carbon-reduction requirements, ICPDAS has developed the "Industrial Wireless Sensor Network" solution. In addition to integrating current, temperature measurement and wireless transmission functions into one module, the ultra-low power consumption can be matched with acurrent transformer (hereinafter refer to CT) for inductive charging, it can meet the supply and demand balance of working power and achieve continuous uninterrupted measurement equipment parameters with suffi cient power. The setting can be completed by dip switch, which not only doesn't affect the production process, but also greatly saves system construction time and reduces maintenance costs.

iWSN-2200 series are iWSN wireless data contractors, they support one 433MHz wireless communication interface and one RS-232/RS- 485/Ethernet communication interface. Among them, the RS-232/ RS-485 interface can’t be used simultaneously. The series modules support Modbus RTU/TCP protocol slave, the main function can receive and buffer 31 iWSN sensor’s data by wireless, and user can transmit Modbus RTU/TCP commands to read the sensor’s data by RS-232/RS-485/Ethernet interface. In wireless interface, the series modules support 16 wireless channels and 8 groups ID by rotary switch and DIP switch setting, the user can easy to use the them to divide and manage the wireless network of 433MHz frequency.

1.1 Features

- **Hardware**
  - 433MHz Radio Frequency
  - 16 RF Channels
  - Supported Modbus RTU/TCP protocol (Slave)
  - Supported data buffers of 31 iWSN sensors
  - ESD Protection: +/-4kVfor contact terminal
  - Isolation: 3000 VDC DC-to-DC, 2500 Vrms using a photocoupler
  - DIN-Rail Mountable
  - Operating Temperatures: -25℃~+75℃

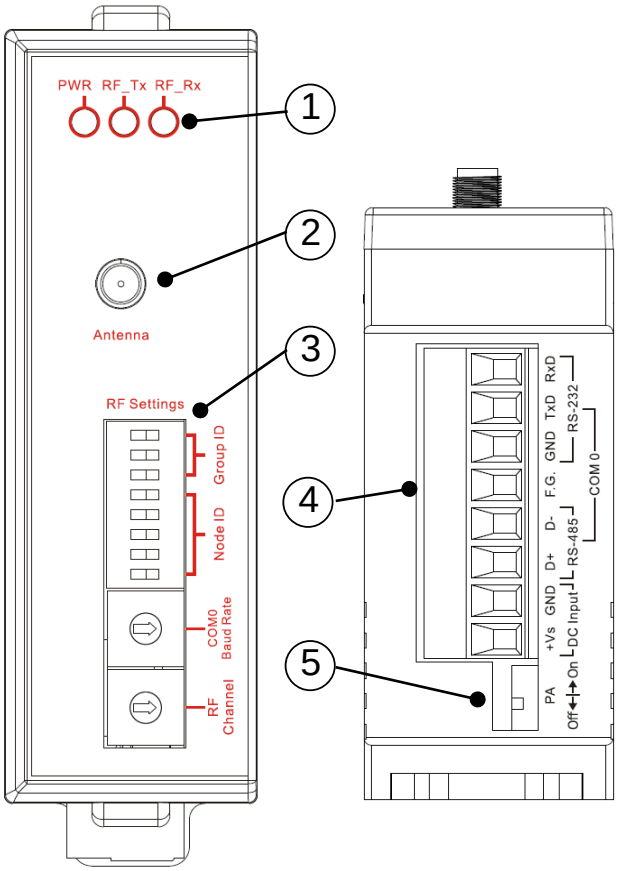
1.2 Specification

Module	iWSN-2200	iWSN-2200-E
RF Interface		
Radio Frequency	433MHz	
RF Channel	0~15 (Configured by rotary switch)	
Transmission Distance	100m (Line of sign, LoS)	
Connectivity	Max. suppout 31 iWSN wireless sensing modules	
Communication		
Interface	RS-232 x 1/ RS-485 x 1 (Cannot be used simultaneously)	Ethernet x 1
Connector	Screwed Terminal Block (TXD、RXD and GND in RS-232 / D+、D- in RS-485)	RJ-45
Protocol	Modbus RTU	Modbus TCP
Modbus address (Node ID)	1~31	
COM0 Baud Rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200bps, N81	10/100Mbps
LED Indicator		
PWR	Red x 1	
RF_Tx	Green x 1	
RF_Rx	Yellow x 1	
EMS Protection		
ESD	+/- 4kV Contact	
EFT	+/- 1kV	
Surge	+/- 1kV	
Power		
Input Voltage Range	+10 ~ +30 VDC	
Power Consumption	0.5W Max.	1W Max.
Mechanical		
Dimensions (L x W x H)	108 mm x 84 mm x 33 mm (Without antenna)	
Installation	DIN-Rail	
External Antenna		
Dimensions (L x θ)	108 mm x 10 mm	
Connector	RP-SMA Male (Plug)	
Gain	0 dBi，Omni-Directional	
Environment		
Operating Temperature	-25 ~ +75°C	
Storage Temperature	-30 ~ +80°C	
Relative Humidity	10 ~ 90% RH, Non-condensing	

2. Getting Started

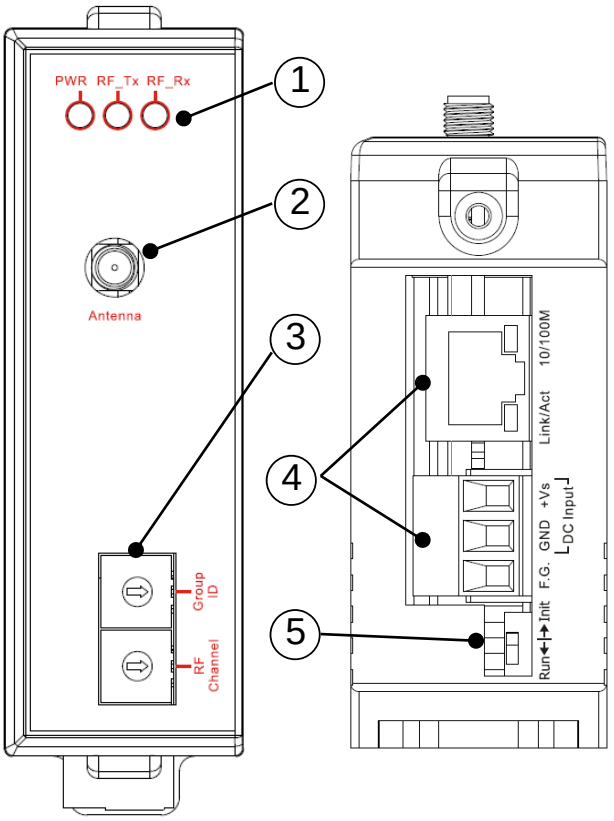
■ Appearance

iWSN-2200



Number	Instructions
1	LED indicators
2	Antenna connector (type RP-SMA)
3	DIP and rotary switch of Communication parameter setting
4	Terminal
5	DIP switch of PA

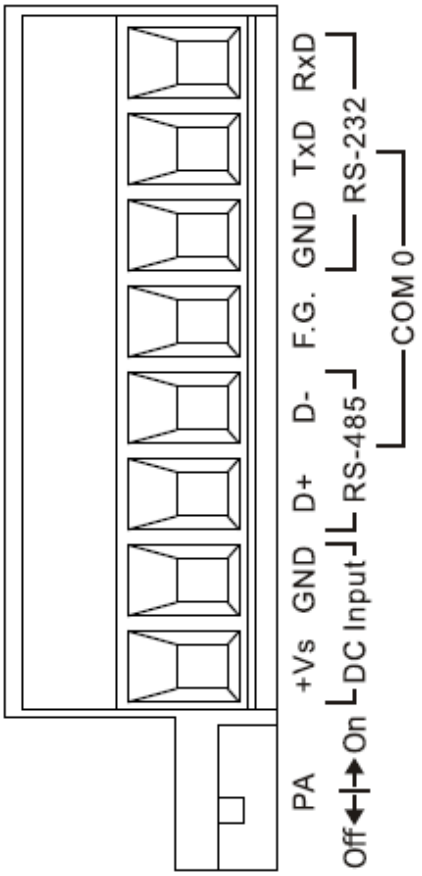
iWSN-2200-E



Number	Instructions
1	LED indicators
2	Antenna connector (type RP-SMA)
3	Rotary switch of Communication parameter setting
4	Terminal and Ethernet port (RJ-45 interface)
5	DIP switch of operation mode

■ Pin assignments

iWSN-2200



Pin	Name	Instructions
8	RxD	RS-232
7	TxD	
6	GND	
5	F.G	Shield ground
4	D-	RS-485
3	D+	
2	GND	+10V~+30VDC
1	+Vs	

Item	Instructions	
PA	ON	Maximum power of wireless output
	OFF	Normal power of wireless output

iWSN-2200-E

Number	Name	Instructions
3	+Vs	+10V~+30VDC
2	GND	Ground
1	F.G.	Shield ground

Switch	Instructions
Init	Initial mode
Run	Run mode

2.1 LED Indicator

iWSN-2200 series provides three LED indicators, including indicators for power status and RF wireless package be transmitting or receiving status. The following is an overview of the purpose and function of each LED indicator together with a description.

LED Name	LED Status	LED Description
Power (Red)	ON	The power of the module is ON.
RF_TX (Green)	Flashing	Wireless data has been transmitted.
RF_RX (Yellow)	Flashing	Wireless data has been received.

The Ethernet status indicator on iWSN-2200-E is part of the built-in RJ-45 connector, such as shown in the figure below.

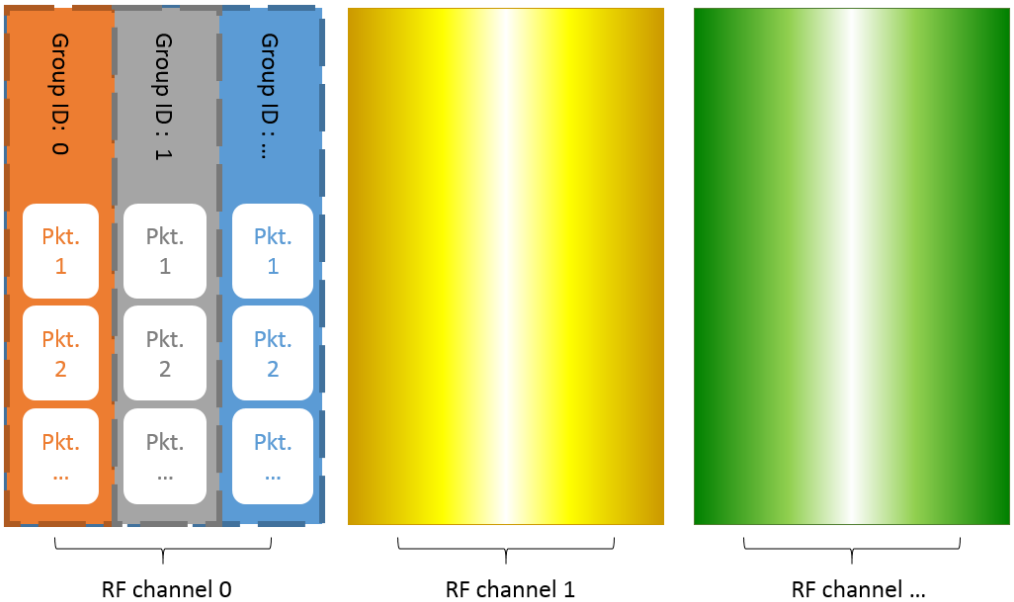
LED Name	LED Status	LED Description
10/100M	ON	100 Mbps.
	OFF	10 Mbps or Ethernet disconnected.
Link/Act	Flashing	Communicating.

2.2 Communication Parameter

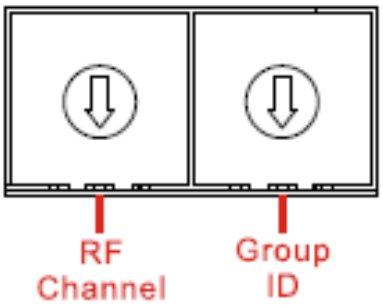
The communication parameters of iWSN-2200 series are setting by DIP switch and rotary switch. The user can set RF channel, group ID, COM0 baud rate, node ID, PA switch and initial/run mode, the description and setting of parameters as below.

1. RF channel: The channel actually used by wireless communication can be divided into 16 channels. This parameter needs to be the same in the IWSN system to communicate. (Note 1)
2. Group ID: The ID that is virtualized in the wireless channel can be divided into 7 groups. This parameter needs to be the same in the IWSN system to communicate. (Note 1)
3. COM0 baud rate: The baud rate of RS-232/RS-485. It supports 1200 to 115200(bps), and data format fix to n, 8, 1.
4. Node ID: The Modbus address of module. It support 1 to 31, and 0 is reserved. If the module uses RS485 serial connection, the ID number must not be repeated.
5. PA switch: This is the switch of the wireless signal power amplifier. iWSN-2200 can be switched to ON or OFF by DIP switch. iWSN-2200-E fixed enable this switch.
6. Initial/Run mode: This is the mode option of the iWSN-2200-E. Please refer to the description in section 2.3.

Note 1: The RF channel is similar to a highway, Group ID is similar to a lane in a highway, and the wireless data are similar to the vehicles traveling in the highway lane. That is to say, the modules with the same RF channel but different Group ID can't recognize each other's wireless packages, but the wireless packages have opportunity to collide in the air. Therefore, in order to avoid packet collisions of different groups, it is recommended to switch the wireless channel first, then switch the group number.

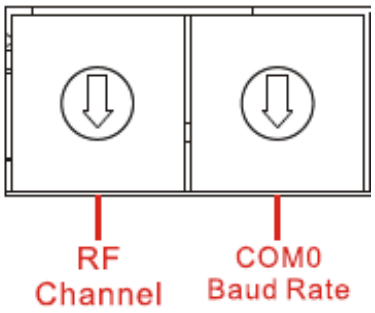


iWSN-2200-E

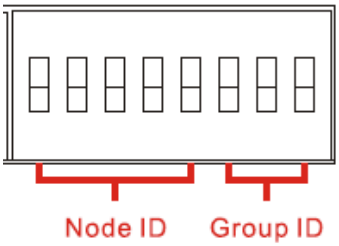


Rotary switch	Instructions
RF Channel	0 ~ F = ch 0 ~ ch F
Group ID	0 ~ 7 = GID 0 ~ GID 7 8 ~ F = 保留，固定 GID 0

iWSN-2200



Rotary switch	Instructions
COM0 Baud Rate (n, 8, 1)	0 = 115200、4 = 9600 1 = 57600、5 = 4800 2 = 38400、6 = 2400 3 = 19200、7 = 1200
RF Channel	0 ~ F = ch 0 ~ ch F



<table>
<tr><th>Name</th><th>Instructions</th></tr>
<tr><td>Group ID

■: ON
□: OFF</td><td>
<table>
<tr><td rowspan="2">Group</td><td colspan="3">Pin</td></tr>
<tr><td>6</td><td>7</td><td>8</td></tr>
<tr><td>0</td><td>□</td><td>□</td><td>□</td></tr>
<tr><td>1</td><td>■</td><td>□</td><td>□</td></tr>
<tr><td>2</td><td>□</td><td>■</td><td>□</td></tr>
<tr><td>3</td><td>■</td><td>■</td><td>□</td></tr>
<tr><td>4</td><td>□</td><td>□</td><td>■</td></tr>
<tr><td>5</td><td>■</td><td>□</td><td>■</td></tr>
<tr><td>6</td><td>□</td><td>■</td><td>■</td></tr>
<tr><td>7</td><td>■</td><td>■</td><td>■</td></tr>
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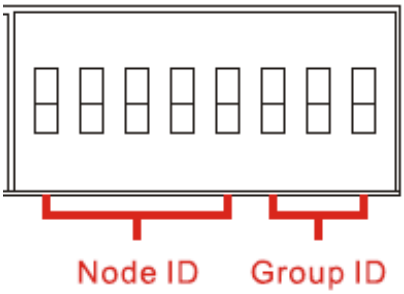


Name	Instructions
Node ID ■: ON □: OFF	

Node	Pin				
	1	2	3	4	5
0	□	□	□	□	□
1	■	□	□	□	□
2	□	■	□	□	□
3	■	■	□	□	□
4	□	□	■	□	□
5	■	□	■	□	□
6	□	■	■	□	□
7	■	■	■	□	□

Name	Instructions
Node ID ■: ON □: OFF	

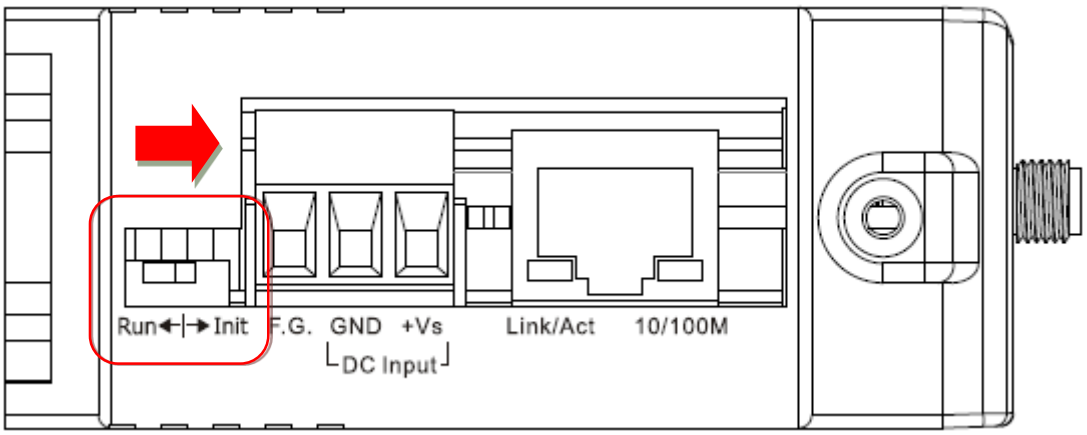
Node	Pin				
	1	2	3	4	5
8	□	□	□	■	□
9	■	□	□	■	□
10	□	■	□	■	□
11	■	■	□	■	□
12	□	□	■	■	□
13	■	□	■	■	□
14	□	■	■	■	□
15	■	■	■	■	□
16	□	□	□	□	■
17	■	□	□	□	■
18	□	■	□	□	■
19	■	■	□	□	■
20	□	□	■	□	■
21	■	□	■	□	■
22	□	■	■	□	■
23	■	■	■	□	■
24	□	□	□	■	■

Name	Instructions
Node ID ■: ON □: OFF	

Node	Pin				
	1	2	3	4	5
25	■	□	□	■	■
26	□	■	□	■	■
27	■	■	□	■	■
28	□	□	■	■	■
29	■	□	■	■	■
30	□	■	■	■	■
31	■	■	■	■	■

2.3 Initial/Run mode

This is the mode option of iWSN-2200-E, and the factory default value is run mode. The user can modify the network parameters of module are like as IP address, subnet mask and gateway, but if the user forget the setting of network parameters, can switch to initinal mode and reboot the module to use factory default value.



IP address	192.168.255.1
Subnet Mask	255.255.0.0
Gateway	192.168.0.1

3. Modbus Protocol

What is Modbus?

Modbus is a communication protocol developed by Modicon in 1979. You can also visit http://www.modbus.org to find more valuable information.

The Different versions of Modbus used today include Modbus RTU (based on serial communication interfaces such as RS485 and RS232), Modbus ASCII and Modbus TCP, which is the Modbus RTU protocol embedded into TCP packets. In practice, Modbus mainly adopts a question-and-answer communication method. The master station actively sends out the Modbus message to the slave station, and then the slave station responds to the master station according to the content of the message. The protocol is completely open and highly extended.

Modbus Message Structure

Modbus TCP and Modbus RTU are used in Ethernet and serial port (ex: RS-232/RS-485) respectively, and in front of the message, Modbus TCP is 6 bytes longer than Modbus RTU. The message structure is described in the following table.

[Modbus TCP Message]

Byte 00~05	Byte 06~11
6 bytes header	Modbus RTU message structure

[Leading 6 bytes of Modbus/TCP protocol]

Byte 00	Byte 01	Byte 02	Byte 03	Byte 04	Byte 05
Transaction Identifier		Protocol Identifier		Upper Byte	Lower Byte

- **Transaction Identifier:** Assigned by Modbus/TCP master (client).
- **Protocol Identifier:** 0.
- **Upper Byte:** 0 (since all messages are smaller than 256).
- **Lower Byte:** Number of following RTU data bytes.

[Modbus RTU message structure]

Byte 06	Byte 07	Byte 08~09	Byte 10~11
Node ID (Station Number)	Function Code	Data Field	
		Reference number (Address Mapping)	Number of points

➢ **Node ID (Station Number):** specifies the address of the receiver (Modbus/TCP slave).

The first byte in the message structure of Modbus is the receiver's address. The valid addresses are in the range of 0 to 247. Addresses 0 is used for broadcast, while addresses 1 to 247 are given to individual Modbus devices.

➢ **Function Code:** specifies the message type.

The second byte in the frame structure of the Modbus RTU is the function code. The function code describes what the slave is required to do. Valid function codes are between 1 and 255. The slave uses the same function code as the request to answer it. Only when an error occurs in the system will the highest bit of the function code is set to '1'. Hence the master will know whether the message has been transmitted correctly or not.

Code	Function	Reference (Address)
01 (0x01)	Read the Status of the Coils (Read back DOs)	0xxxx
02 (0x02)	Read the Status of the Input (Read back DIs)	1xxxx
03 (0x03)	Read the Holding Registers (Read back AOs)	4xxxx
04 (0x04)	Read the Input Register (Read back AIs)	3xxxx
05 (0x05)	Force a Single Coil (Writes DO)	0xxxx
06 (0x06)	Preset a Single Register (Writes DOs)	4xxxx
15 (0x0F)	Force Multiple Coils (Writes DOs)	0xxxx
16 (0x10)	Present Multiple Registers (Write AOs)	4xxxx

➢ **Data Field:** is the data block.

Data is transmitted in 8-, 16- and 32-bit format. The data for 16-bit registers is transmitted in high-byte first format. For example: 0x0A0B ==> 0x0A, 0x0B. The data for 32-bit registers is transmitted as two 16-bit registers, and is low-word first. For example: 0x0A0B0C0D ==> 0x0C, 0x0D, 0x0A, 0x0B.

The data field of messages sent between a master and a slave contains additional information about the action to be taken by the master or any information requested by the slave. If the master does not require this information, the data field can be empty.

Reference (Address)	Description
0xxxx	Read/Write Discrete Output or Coils A 0x reference address is used to output device data to a digital output channel.
1xxxx	Read Discrete Inputs The ON/OFF status of a 1x reference address is controlled by the corresponding digital input channel.
3xxxx	Read Input Registers A 3x reference register contains a 16-bit number received from an external source, e.g. an analog signal
4xxxx	Read/Write Output or Holding Registers A 4x register is used to store 16bits of numerical data (binary or decimal), or to send the data from the CPU to an output channel.

3.1 01(0x01) Read the Status of the Coils (Read back DOs)

This function code is used to read either the current status of the coils or the current digital output readback value.

[Request]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x01
02-03	Starting DO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Number of Points (Channels)	2 Bytes	Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x01
02	Byte Count	1 Byte	Byte Count of the Response (n = (Points+7)/8)
03	Data	n Bytes	n= 1; Byte 03 = data bit 7 to 0 n= 2; Byte 04 = data bit 15 to 8 ..... n= m; Byte m+2 = data bit(8m-1)~8(m-1)

[Error Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x81
02	Exception code	1 Byte	Refer to the Modbus Standard Specifications for more details

3.2 02(0x02) Read the Status of the Input (Read DIs)

This function code is used to read the current digital input value.

[Request]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x02
02-03	Starting DI Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Number of Points (Channels)	2 Bytes	Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x02
02	Byte Count	1 Byte	Byte Count of Response (n =(Points+7)/8)
03	Data	n Bytes	n= 1; Byte 03 = data bit 7 to 0 n= 2; Byte 04 = data bit 15 to 8 ……. , n= m; Byte m+2 = data bit(8m-1)~8(m-1)

[Error Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x82
02	Exception code	1 Byte	Refer to the Modbus Standard Specifications for more details

3.3 03(0x03) Read the Holding Registers (Readback AOs)

This function code is used to readback either the current values in the holding registers or the analog output value.

[Request]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x03
02-03	Starting AO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte, Byte 03 = low byte
04-05	Number of 16-bit Registers (Channels)	2 Bytes	Word Count Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x03
02	Byte Count	1 Byte	Byte Count of the Response (n=Points x 2 Bytes)
03~	Register Values	n Bytes	Register Value: n= 2; Byte 03 = high byte, Byte 04 = low byte ……. n= m; Byte 03 = high byte, Byte 04 = low byte ……. Byte m+1 = high byte Byte m+2 = low byte

[Error Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x83
02	Exception code	1 Byte	Refer to the Modbus Standard Specifications for more details

3.4 04(0x04) Read the Input Registers (Read AIs)

This function code is used to read either the input registers or the current analog input value.

[Request]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x04
02-03	Starting AI Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte, Byte 03 = low byte
04-05	Number of 16-bit Registers (Channels)	2 Bytes	Word Count, Byte 04 = high byte, Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x04
02	Byte Count	1 Byte	Byte Count of the Response (n=Points x 2 Bytes)
03~	Register Values	n Bytes	Register Values: n= 2; Byte 03 = high byte, Byte 04 = low byte ..... n= m; Byte 03 = high byte, Byte 04 = low byte ..... Byte m+1 = high byte Byte m+2 = low byte

[Error Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x84
02	Exception code	1 Byte	Refer to the Modbus Standard Specifications for more details.

3.5 05(0x05) Force a Single Coil (Write DO)

This function code is used to set the status of a single coil or a single digital output value.

[Request]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x05
02-03	DO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Output Value	2 Bytes	0xFF 00 sets the output to ON. 0x00 00 sets the output to OFF. All other values are invalid and will not affect the coil. Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x05
02-03	DO Address	2 Bytes	The value is the same as Bytes 02-03 of the Request
04-05	Output Value	2 Bytes	The value is the same as Bytes 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x85
02	Exception code	1 Byte	Refer to the Modbus Standard Specifications for more details.

3.6 06(0x06) Preset a Single Register (Write AO)

This function code is used to set a specific holding register to store the configuration values.

[Request]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x06
02-03	AO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte Byte 03 = low byte
04-05	Register Value	2 Bytes	Register Value Byte 04 = high byte

[Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x06
02-03	AO Address	2 Bytes	The value is the same as Bytes 02-03 of the Request
04-05	Register Value	2 Bytes	The value is the same as Bytes 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x86
02	Exception code	1 Byte	Refer to the Modbus Standard Specifications for more details.

3.7 15(0x0F) Force Multiple Coils (Write DOs)

This function code is used to set multiple coils status or write multiple digital output values.

[Request]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x0F
02-03	Starting DO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte, Byte 03 = low byte
04-05	Number of Output Channels (Points)	2 Bytes	Byte 04 = high byte, Byte 05 = low byte
06	Byte count	1 Byte	n = (Points +7)/8
07	Output value	n Bytes	A bit corresponds to a channel. A value of 1 for a bit denotes that the channel is ON, while a value of denotes that the channel is OFF. n= 1; Byte 07 = data bit 7 to 0 n= 2; Byte 08 = data bit 15 to 8 ..... n= m; Byte m+6 = data bit(8m-1)~8(m-1)

[Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x0F
02-03	Starting DO Address	2 Bytes	The value is the same as Bytes 02-03 of the Request
04-05	Number of Output Channels (Points)	2Bytes	The value is the same as Bytes 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247

01	Function code	1 Byte	0x8F
02	Exception code	1 Byte	Refer to the Modbus Standard Specifications for more details.

3.8 16(0x10) Preset Multiple Registers (Write AOs)

This function code is used to set multiple holding registers that are used to store the configuration values.

[Request]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x10
02-03	Starting AO Address	2 Bytes	Refer to the Modbus address depends on your slave device for more details. Byte 02 = high byte, Byte 03 = low byte
04-05	Number of 16-bit Registers (Channels)	2 Bytes	Word Count , Byte 04 = high byte, Byte 05 = low byte
06	Byte Count	1 Byte	n =Points x 2 Bytes
07	Register Values	n Bytes	Register Values. n= 2; Byte 03 = high byte, Byte 04 = low byte ..... n= m; Byte 03 = high byte, Byte 04 = low byte..... Byte m+1 = high byte, Byte m+2 = low byte

[Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x10
02-03	Starting AO Address	2 Bytes	The value is the same as Bytes 02-03 of the Request
04-05	Number of 16-bit Registers (Channels)	2 Bytes	The value is the same as Bytes 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Node ID (Station Number)	1 Byte	1 ~ 247
01	Function code	1 Byte	0x90
02	Exception code	1 Byte	Refer to the Modbus Standard Specifications

			for more details.

3.9 Modbus Address Mapping Table

[Note 1]: The high byte of protocol address is node ID, and the low byte of protocol address is address mapping. In protocaol address, the 0 is mean iWSN-2200, and the 1 to 31 are mean iWSN-11xxx. For example, 0x1E41 in protocol address is mean the node ID of iWSN-11xxx is 0x1E (decimal is 30), and 0x41 is mean the address storaged AC current of CT0. That is mean 0x1E41 = 7745(Base0, Protocol address) = 47746(Base1, PLC address) = the AC current of CT0 be measured by iWSN-11xxx's node ID is 30.

[Note 2]: The length of the data that can be polled to iWSN-2200 at one time is up to 72 words (Uint16/int16).

PLC address (Base1)	Protocol address (Base0)	Function code	Property	Data type	Description	Remarks
40001 30001	0 (0x0000)	03, 04	R	Uint16	The firmware version of iWSN-2200.	[High byte] Reserved, fix 0x00. [Low byte] The value divided by 10 is the version. Ex: 11/10=1.1=version 1.1.
40002 30002	1 (0x0001)	03, 04	R	Uint16	The module name of iWSN-2200	Value ranges 0~65535. Value 2200(0x0898): iWSN-2200. Other values: reserved.
40003 30003	2 (0x0002)	03, 04,	R	Uint16	The temperature unit of iWSN-2200。	Value 0x0000: Celsius (℃). Value 0x0001: Fahrenheit (℉).

						Other values: reserved.
40004 30004	3 (0x0003)	03, 04	R	Uint16	The wireless linking status of iWSN-1xxxx, high word, node ID 31 to 16. [Note] About wireless disconnection check value please refer to PLC address 40007~40008.	Bit15~bit0 corresponds to node ID 31 to 16. 1: Good Linking。 0: Disconnecting link.
40005 30005	4 (0x0004)	03, 04	R	Uint16	The wireless linking status of iWSN-1xxxx, low word, node ID 15 to 1. [Note] About wireless disconnection check value please refer to PLC address 40007~40008.	Bit15~bit1 corresponds to node ID 15 to 1. Bit0: fix 1. 1: Good Linking。 0: Disconnecting link.
40006 30006	5 (0x0005)	06	W	Uint16	Reboot iWSN-2200.	0x0001: Reboot。 Other values: reserved.

40007 30007	6 (0x0006)	03, 04, 06	R, W	Uint16	[High word] iWSN-11xxx wireless disconnection check value. The iWSN-2200 will follow the RF transmission duty cycle of iWSN-11xxx to check whether the RF package be receiving, if iWSN-2200 receive RF packages loss counter over than this value, then iWSN-2200 will judge to wireless disconnection.	Value ranges 1~4294967295 (0x00000001~0xFFFFFFFF), unit: times. [Read] Default 8640 (0x000021C0)。 [Write] After writing, the reboot takes effect.
40008 30008	7 (0x0007)	03, 04, 06	R, W	Uint16	[Low word] iWSN-11xxx wireless disconnection check value. The iWSN-2200 will follow the RF transmission duty cycle	

					of iWSN-11xxx to check whether the RF package be receiving, if iWSN-2200 receive RF packages loss counter over than this value, then iWSN-2200 will judge to wireless disconnection.	
40009 30009	8 (0x0008)	03, 04, 06	R, W	Uint16	The threshold with low battery power alarm of iWSN-11xxx. If the battery power of iWSN-11xxx lower than this value, then the data of battery power will add low battery alarm.	[High byte] Reserved, fix 0. [Low byte] Value range 1~100 (0x01~0x64), unit: Percent (%). [Read] Default 20 (0x14)。 [Write] After writing, the reboot takes effect.

PLC address (Base1)	Procotol address (Base 0)	Function Code	Property	Data type	Description	Remarks	iWSN-11xxx Node ID
40322~40330 30322~30330	321~329 (0x0141~ 0x0149)	03, 04	R	Uint16	The CT current of channel 0 to channel 8.	The value divided by 10 is amps (A).	1
40331 30331	330 (0x014A)	03, 04	R	Uint16	The status of CT。	Bit8~bit0 corresponds to channel 8 to 0. Value 0 is mean the channel is good. Value 1 is mean the channel is bad. Ex: 4162 (0x1042) = 0000 0000 0100 0010 mean channel 1 and 6 are bad, other channels are good.	
40332 30332	331 (0x014B)	03, 04	R	Uint16	[High byte] Automatic response time period.	(Bit7~Bit6) 00: Bit0~Bit5 mean the unit is second. 01: Bit0~Bit5 mean the unit is minute.	

						10: Bit0~Bit5 mean the unit is hour. 11: Reserved.	
						(Bit5~Bit0) Refer the unit of Bit7 and Bit6 to define the time scale. Value 1 to 63: Mean 1~63 unit of time. Value 0: Reserved.	
					[Low byte] The receiving signal strength of iWSN-2200.	Value ranges 0~255. The higher the value, the better the signal.	
40333 30333	332 (0x014C)	03, 04	R	Uint16	[High byte] The firmware version of iWSN-1xxxx.	Value ranges 10~255. Ex: value 10 = v1.00, value 254 = v25.40.	
					[Low byte] The serial number of wireless package。	Value ranges 0~15.	

40334 30334	333 (0x014D)	03, 04	R	Uint16	[High byte] The module code of iWSN-1xxxx.	Value ranges 0~255. Value 0: iWSN-1110X. Value 1: iWSN-1120X. Value 2: iWSN-1210X. Value 100: iWSN-1131. Value 101: iWSN-1121-DI. Other values: reserved.	
					[Low byte] The module code of extension module.	Value ranges 0~255. Value 00 (0x00): iWSN-750。 Value 32 (0x20): iWSN-757。 Value 255 (0xFF): No extension module. Other values: reserved.	
40335 30335	334 (0x014E)	03, 04	R	Uint16	The power percent of battery. [Note] The threshold please refer to PLC address 40009.	[High byte] Bit0: The power whether less than threshold (default is 20%). Value 1 = Yes, value 0 = No. Bit1~bit7: Reserved, fix 0.	
						[Low byte] The value is mean percent	

						(%).	
40336 30336	335 (0x014F)	03, 04	R	Uint16	The channel numbers of CT.	Value ranges 0~9.	
40337 30337	336 (0x0150)	03, 04	R	Uint16	CT types.	Bit8~bit0 corresponds to channel 8 to 0. Value 0: Spilt CT of current type with 3000:1. Value 1: Rogowski coil of voltage type with 1000A:124.8mVac.	
40338 30338	337 (0x0151)	03, 04	R	Uint16	The numbers of temperature channel.	Value ranges 0~9.	
40339 30339	338 (0x0152)	03, 04	R	Uint16	The status of temperature channel.	Bit15~bit0 corresponds to channel 15 to 0. Value 0: measuring status is good. Value 1: measuring status is bad.	
40340 30340	339 (0x0153)	03, 04	R	Uint16	The alarm of temperature channel.	Bit15~bit0 corresponds to channel 15 to 0. Value 0: No alarm.	

						Value 1: Temperature continuous rise alarm.	
40341~40347 30341~30347	340~346 (0x0154~ 0x015A)	03, 04	R	Int16	The temperature of channel 0 to channel 6.	The value divided by 10 is Celsius (℃).	
40348 30348	347 (0x015B)	03, 04	R	Uint16	The numbers of DI channel.	Value ranges 0~16.	
40349 30349	348 (0x015C)	03, 04	R	Uint16	DI status, DI 15 to DI 0.	Bit15~bit0 corresponds to DI 15 to 0. Value 0: Low voltage level. Value 1: High voltage level.	
40350~40358 30350~30358	349~357 (0x015D~ 0x0165)	03, 04, 06	R, W	Int16	CT current offset value of channel 0~channel 8. (The offset unit is 0.1 amps and the range is -3276.8 amps to 3276.7 amps.)	Value 1 (0x0001) mean +0.1 amps. Value -1 (0xFFFF) mean -0.1 amps.	
40359~40365 30359~30365	358~364 (0x0166~ 0x016C)	03, 04, 06	R, W	Int16	Temperature offset value of channel 0~channel 6. (The offset unit is 0.1 and the range is -3276.8 to	Value 1 (0x0001) mean +0.1. Value -1 (0xFFFF) mean -0.1.	

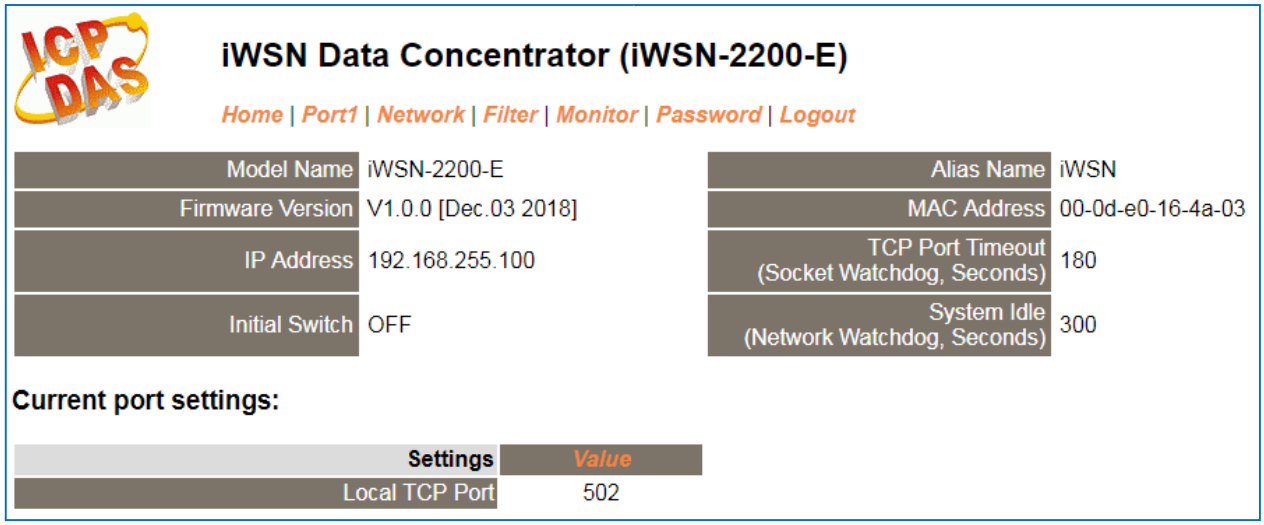
					3276.7) [Note] Temperature unit be refer to PLC address 40003.		
40513~40768 30513~30768	512~767 (0x0200~ 0x02FF)	03, 04	R	Word	Same with iWSN-11xxx node ID 1。	Same with iWSN-11xxx node ID 1。	2
40769~41024 30769~31024	768~1023 (0x0300~ 0x03FF)	03, 04	R	Word	Same with iWSN-11xxx node ID 1。	Same with iWSN-11xxx node ID 1。	3
41025~41280 31025~31280	1024~1279 (0x0400~ 0x04FF)	03, 04	R	Word	Same with iWSN-11xxx node ID 1。	Same with iWSN-11xxx node ID 1。	4
41281~41536 31281~31536	1280~1535 (0x0500~ 0x05FF)	03, 04	R	Word	Same with iWSN-11xxx node ID 1。	Same with iWSN-11xxx node ID 1。	5
47681~47936 37681~37936	7680~7935 (0x1E00~ 0x1EFF)	03, 04	R	Word	Same with iWSN-11xxx node ID 1。	Same with iWSN-11xxx node ID 1。	30
47937~48192 37937~38192	7936~8191 (0x1F00~	03, 04	R	Word	Same with iWSN-11xxx node ID 1。	Same with iWSN-11xxx node ID 1。	31

	0x1FFF)						

4. iWSN-2200-E Web Configuration

When the Ethernet of iWSN-2200-E has been correctly configured and is functioning normally on the network, the IP address, TCP Port setting ca be retrieved or modified using either the eSearch Utility, or via standard web browser.

The following picture is the main screen of the web page settings. At the top of the screen is a function button, including: Home, Port1, Network, Filter, Monitor, Password, Logout and other configuration pages, below the screen is the content or parameters of each configuration page. We will explain how to set up the iWSN-2200-E module through the web page.



Note: The supported browsers are:

- Windows Edge 14 with newer versions.
- Windows IE 9/10/11。
- Google Chrome 55 with newer versions.
- Mozilla Firefox 50 with newer versions.
- Apple Safari 9.1 with newer versions.
- Opera 42 with newer versions.

4.1 Logging in to the Web Server

The embedded iWSN-2200-E web server can be accessed from any computer that has an Internet connection, and the step as below.

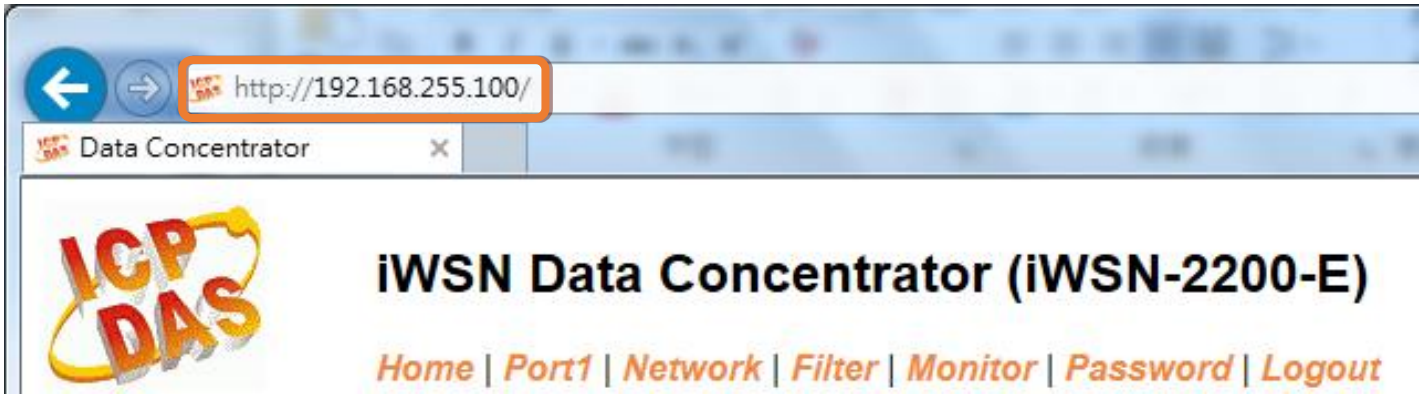
Step 1: Open a new browser window

Open a web browser, for example, Google Chrome, Firefox or Internet Explorer, which are reliable and popular Internet browsers that can be used to configure iWSN-2200-E module.

Note that if you intend to use Internet Explorer, ensure that the cache function is disabled in order to prevent browser access errors.

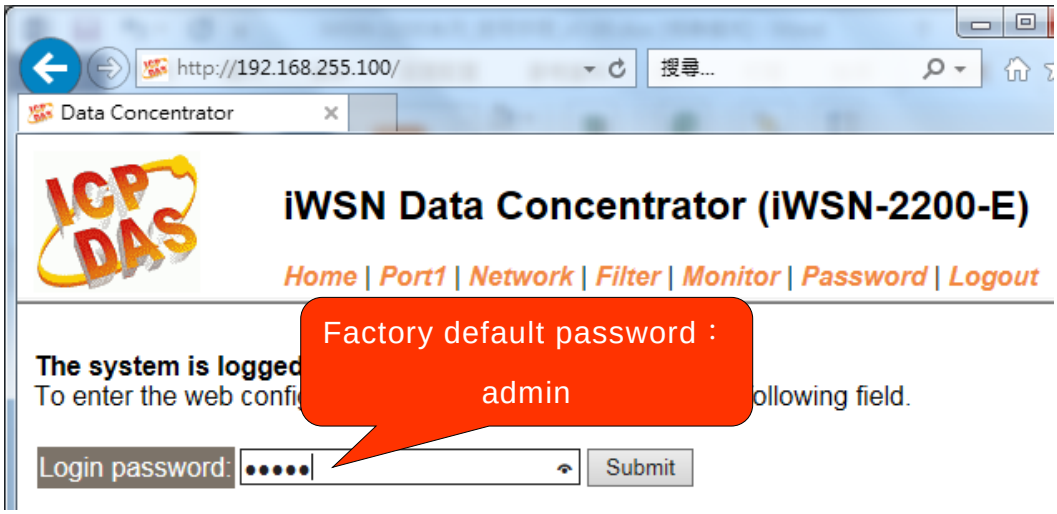
Step 2: Enter the URL for the iWSN-2200-E web server

Ensure that you have correctly configured the network settings for the iWSN-2200-E module (refer to Chapter 5 “Getting Started” for detailed instructions), and then enter the URL for the iWSN-2200-E web server in the address bar of the browser.



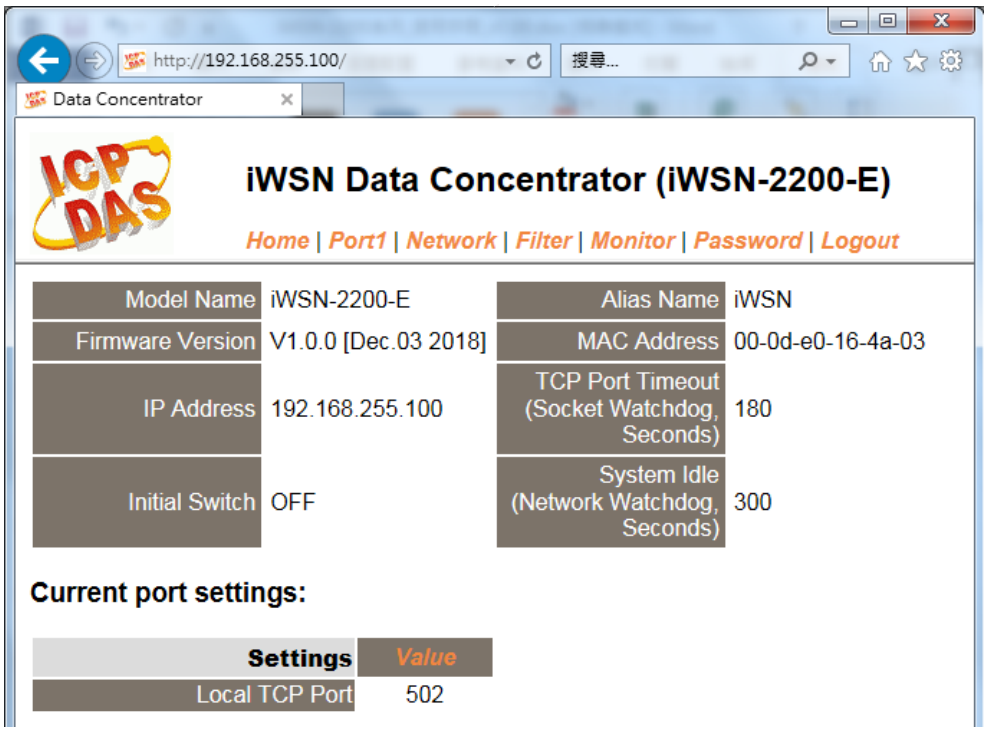
Step 3: Enter the Password

After the main login page is displayed, enter a password (the factory default password is **"admin"**), and then click the **"Submit"** button to continue.



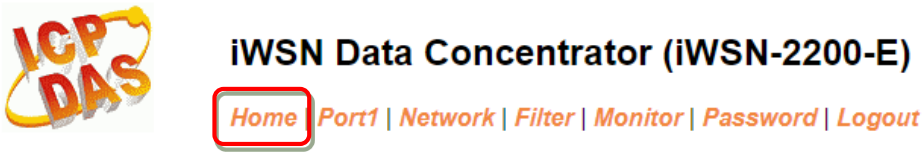
Step 4: Log in to the Web Server

After logging into the web server, the main page will be displayed.



4.2 Home Page

The **Home** link connects to the main page, which contains two parts.



The first part of this page provides basic information about the hardware and software. The software and hardware information section includes information related to the Model Name, the current Firmware version, the IP Address, the current position of the Initial Switch, the Alias, the MAC Address, and the TCP Port, and the System Timeout values. **If you update the firmware for the iWSN-2200-E module, this page can be used to check the version information**.

The lower section provides information related to the port settings.

Current port settings:

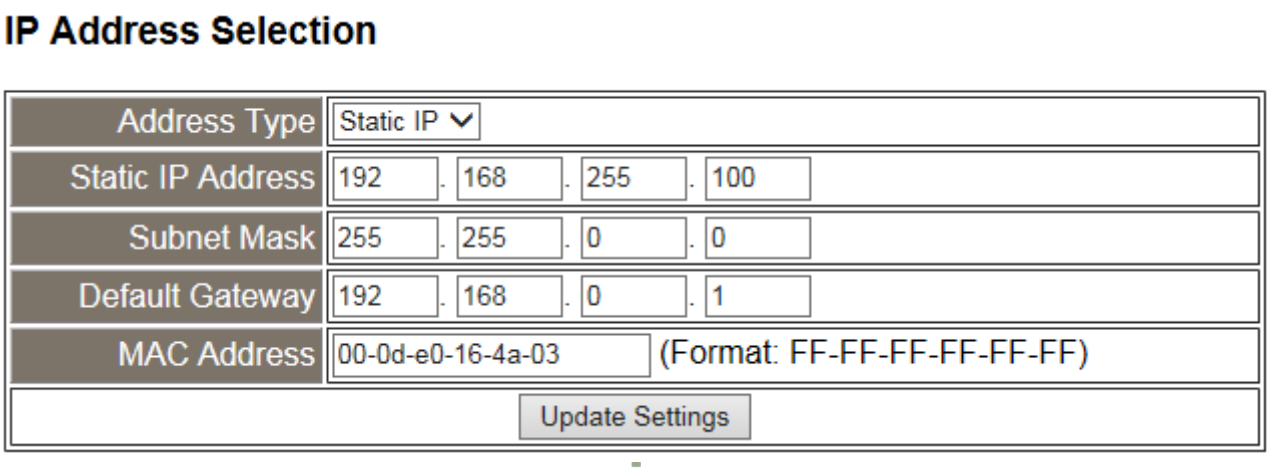
Settings	Value
Local TCP Port	502

4.3 Network Page

After clicking the **Network** tab, the **Network** page will be displayed, allowing you to verify the current settings, configure the IP Address, and the general parameters, and restore the default settings for the module, each of which will be described in more detail below.

4.3.1 IP Address Selection

The **Address Type**, **Static IP Address**, **Subnet Mask** and **Default Gateway values** are the most important network settings and should always correspond to the LAN configuration. If they do not match, the module will not operate correctly. If the settings are changed while the module is operating, any connection currently in use will be lost and an error will occur



A detailed description of the settings parameter is given the next page.

➢The following is an overview of the parameters contained in the **IP Address Selection** section:

Item	Description
Address Type	**Static IP:** If no DHCP server is installed on the network, the network settings can be configured manually. Refer to Section "Manual Configuration" for more details.
	DHCP: The Dynamic Host Configuration Protocol (DHCP) is a network application protocol that automatically assigns an IP address to each device. Refer to Section "Dynamic Configuration" for more details.
Static IP Address	Each module connected to the network must have its own unique IP address. This parameter is used to assign a specific IP address.
Subnet Mask	This parameter is used to assign the subnet mask for the module. The subnet mask indicates which portion of the IP address is used to identify the local network or subnet.
Default Gateway	This parameter is used to assign the IP Address of the Gateway to be used by the module. A Gateway (or router) is a device that is used to connect an individual network to one or more additional networks.
MAC Address	This parameter is used to set a user-defined MAC address, which must be in the format FF-FF-FF-FF-FF-FF.
Update Setting	Click this button to save the revised settings to the module.

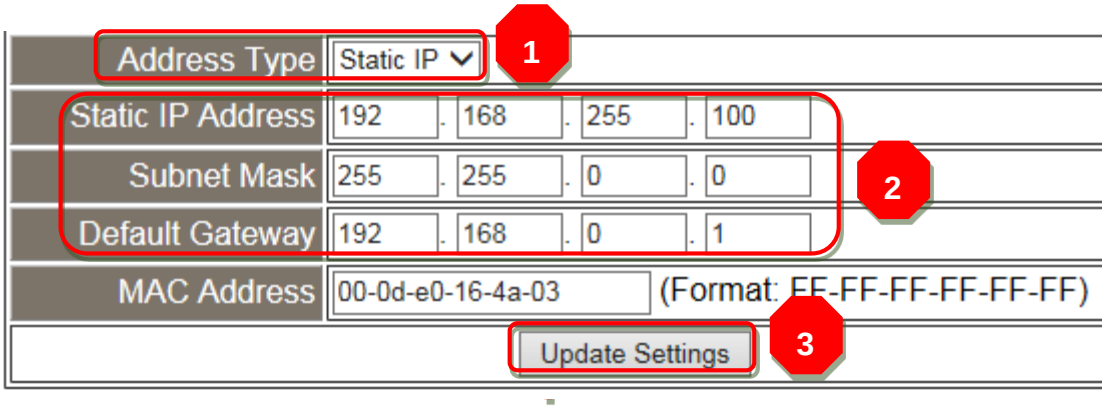
Manual Configuration

When using manual configuration, the network settings should be assigned in the following manner:

Step 1: Select the **"Static IP"** option from the **"Address Type"** drop-down menu.

Step 2: Enter the relevant details in the respective network settings fields.

Step 3: Click the **"Update Settings"** button to complete the configuration.

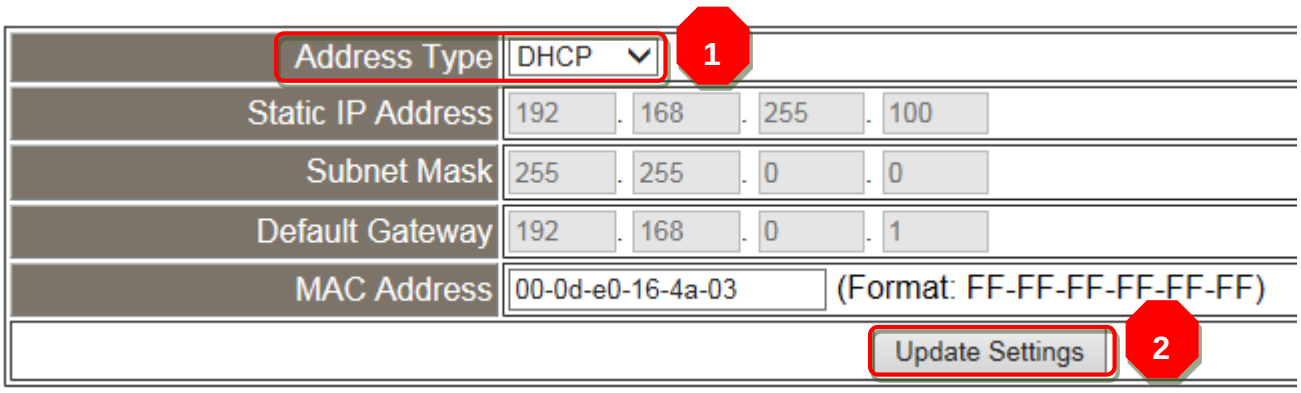


Dynamic Configuration

Dynamic configuration is very easy to perform. If a DHCP server is connected to you network, a network address can be dynamically configured by using the following procedure:

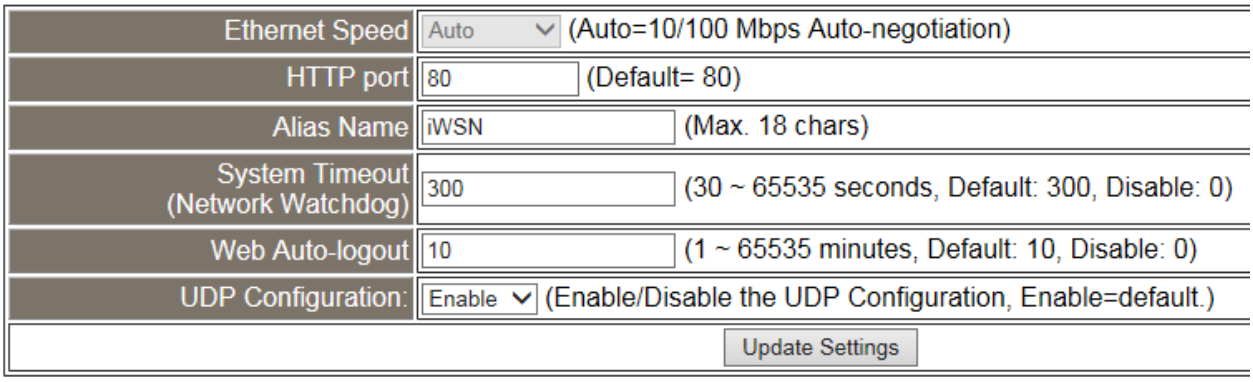
Step 1: Select the **"DHCP"** option from the **"Address Type"** drop-down menu.

Step 2: Click the **"Update Settings"** button to complete the configuration.



4.3.2 General Settings

General Settings



➢The following is an overview of the parameters contained in the **General Settings** section:

Item	Description	Default
Ethernet Speed	This parameter is used to set the Ethernet speed. The default value is Auto (Auto = 10/100 Mbps Auto-negotiation).	Auto
HTTP Port	This parameter is used to assign specific a HTTP port of module. The module needs to be restarted when the HTTP port is changed. You need manually type the new HTTP port in the address bar of the browser. The default is 80. For example: if the HTTP port is set to 81, then enter the “IP address: HTTP port” (10.0.8.123:81).	80
Alias Name	This parameter is used to assign an alias for each module to assist with easy identification.	iWSN
System Timeout (Network Watchdog)	This parameter is used to configure the system timeout value. If there is no activity on the network for a specific period of time, the system will be rebooted based on the configured system timeout value. Timeout value range: 30 to 65535 (seconds);	300

	Disable = 0;	
Web Auto-logout	This parameter is used to configure the automatic logout value. If there is no activity on the web server for a certain period of time, the current user account will be automatically logged out. Range: 1 to 65535 (minutes); Disable = 0.	10
UDP Configuration	This parameter is used to enable or disable UDP configuration function.	1
Update Settings	Click this button to save the revised settings to the module.	

4.3.3 Modbus Settings

Modbus Settings

Gateway Net ID	255 (Default: 255) Note: This is reserved for gateway, NOT for slave devices.
Protocol Exception	1 (Default: 1, Disable: 0, Enable: 1) Reports exception 0x41 when slave response is invalid Modbus message.
CRC Exception	1 (Default: 1) 0: Gateway returns raw data including CRC when CRC error. 1: Gateway reports exception 0x43 when CRC error. 2: Gateway drops packet when CRC error.
Timeout Exception	1 (Default: 1, Disable: 0, Enable: 1) Gateway reports exception 0x0B for slave no response, and 0x4B for data timeout.
Busy Exception	1 (Default: 1, Disable: 0, Enable: 1) Gateway reports exception 0x06 when queued requests are full.
Check TCP Header	1 (Default: 1, Disable: 0, Enable: 1) Drops packet when Modbus TCP header (protocol ID, length) is wrong.
Update Settings	

➢ The following is an overview of the parameters contained in the **Modbus Settings** section:

Item	Description	Default
Gateway Net ID	This is reserved for gateway. (Not used to set the slave device)	255
Protocol Exception	This parameter is used to enable or disable whether the slave response is checked for compatibility with the Modbus RTU format. If the slave response is an invalid Modbus message, a 0x41 exception code will be reported. Enable =1; Disable = 0.	1
CRC Exception	This parameter is used to enable or disable whether the validity of the RTU/ASCII CRC of the slave response is checked. 0 = Returns the raw data, including the CRC, if a CRC error occurs; 1 = Reports a 0x43 exception code if a CRC	1

	error occurs; 2 = Drops the packet if a CRC error occurs.	
Timeout Exception	This parameter is used to enable or disable whether a slave/data timeout exception error is reported by the Gateway. If There is no response from a slave device, a 0x0B exception error will be reported. If serial data is being received, a 0x4B exception will be reported. Enable =1; Disable = 0.	1

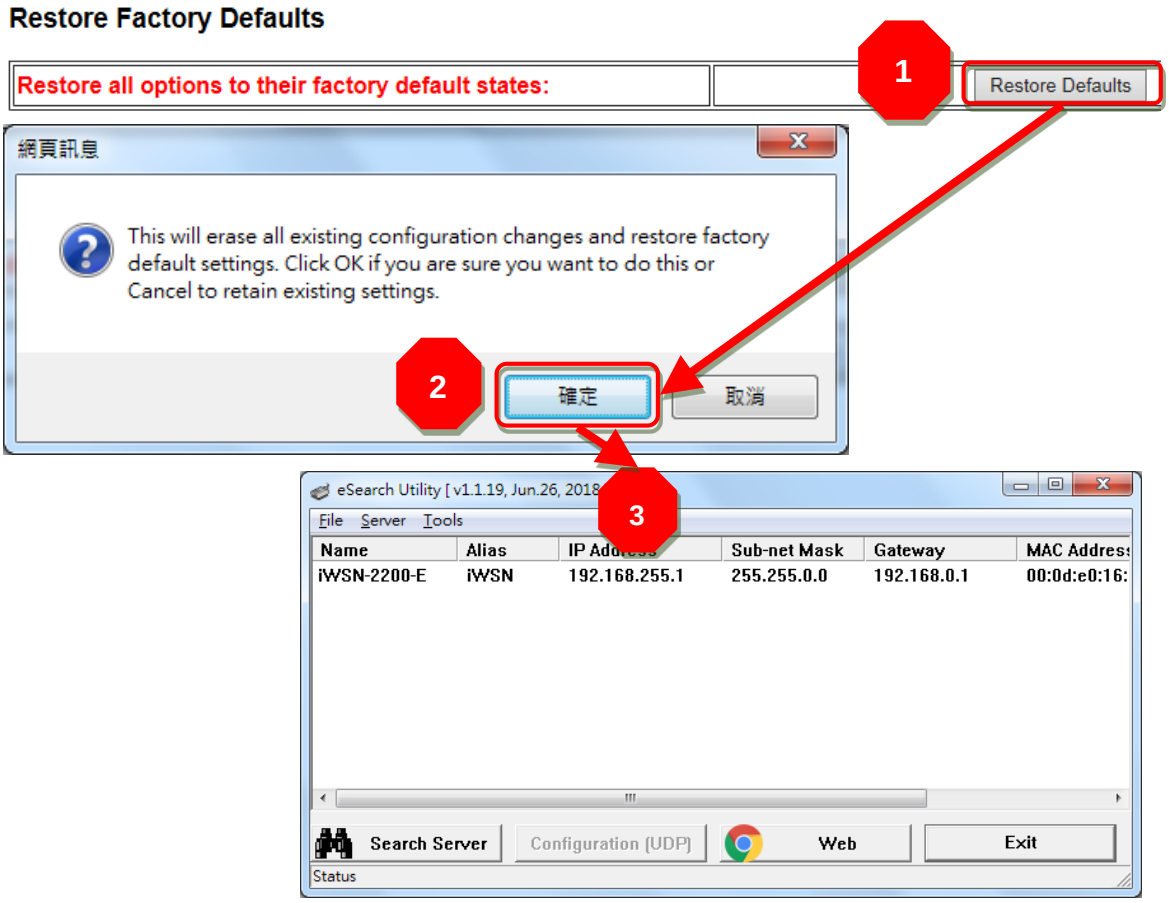
4.3.4 Restore Factory Defaults

Use the following procedure to reset all parameters to their original factory default settings:

Step 1: Click the **"Restore Defaults"** button to reset the configuration.

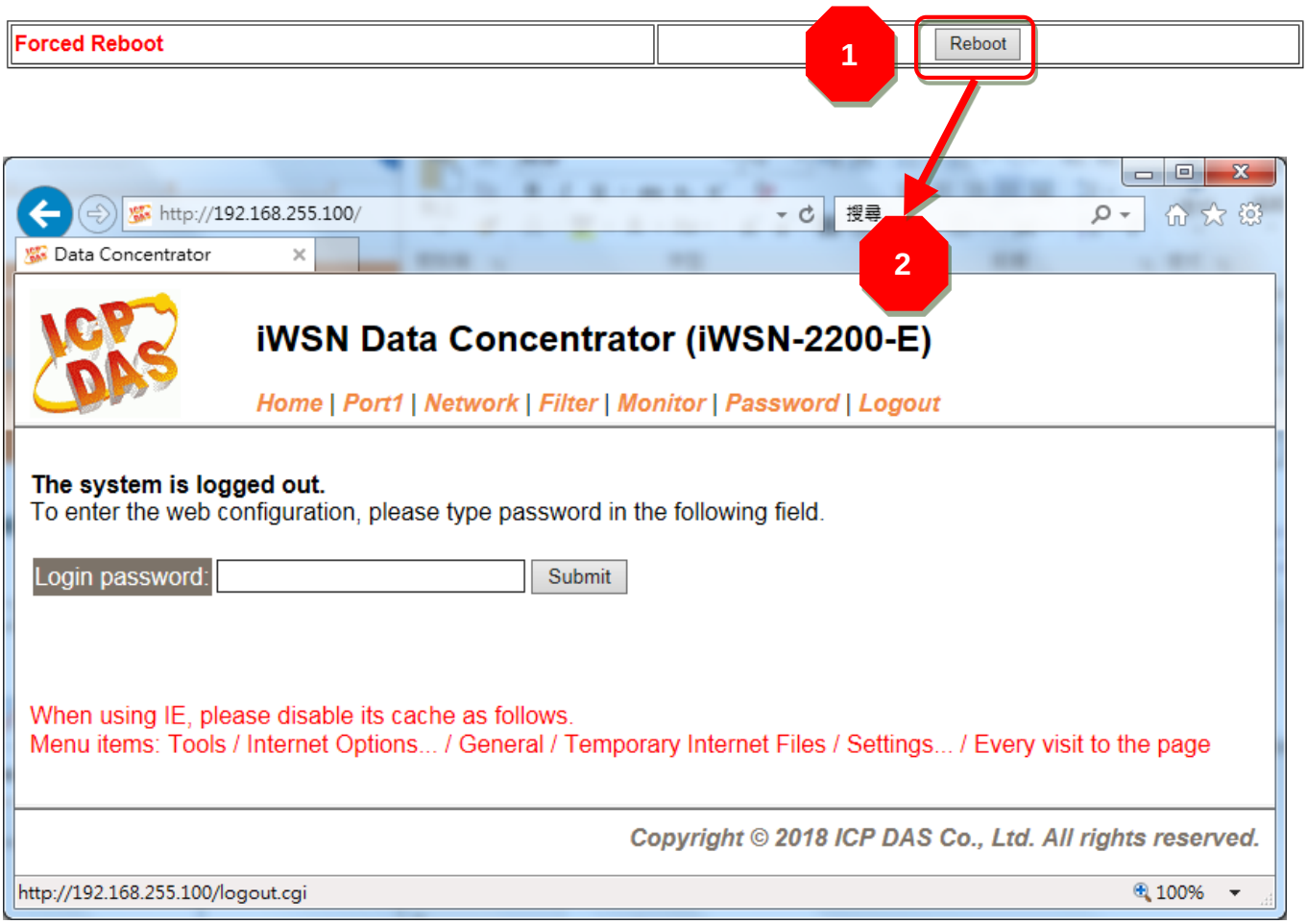
Step 2: Click the **"OK"** button in the message dialog box.

Step 3: Check whether the module has been reset to the original factory default settings for use with the eSearch Utility. Refer to Chapter 5 "Getting Started" for more details.



Default setting			
Network Setting		Basic Setting	
IP Address	192.168.255.1	Alias Name	iWSN
Gateway Address	192.168.0.1		
Subnet Mask	255.255.0.0		
DHCP	Disabled		

The **Forced Reboot** function: can be used to force the module to reboot or to remotely reboot the device. After the module has rebooted, the original login screen will be displayed requesting that you enter your Login Password before continuing.

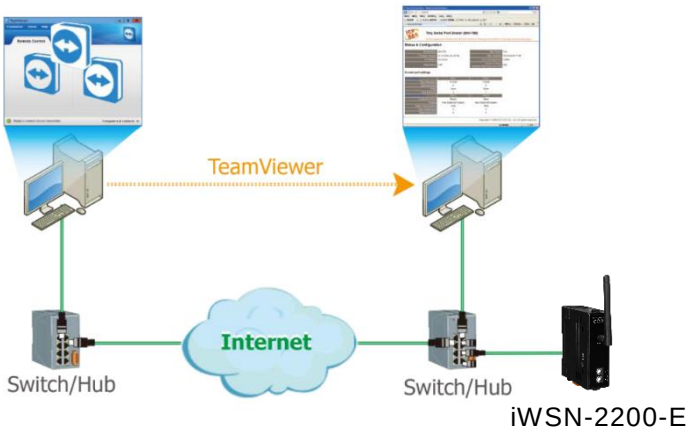


4.3.5 Update by Ethernet

Update by Ethernet

If the remote firmware update is failed, then the traditional firmware update (on-site) is required to make the module working again. Step 1: Refer to firmware update manaul first. Step 2: Run eSearch Utility to prepare and wait for update. Step 3: Click the [**Update**] button to **reboot** the module and start update. Step 4: Configure the module again.	Update

Firmware update requires initialization and local network operations. Traditional firmware update requires adjusting the Init/Run Switch and reboots the module manually for the initialization of firmware update, while new firmware allows user to initialize the module via web interface without adjusting the hardware switch. Initialization via web is useful when module is installed in remote site and can be accessed by a remote PC via TeamViewer.

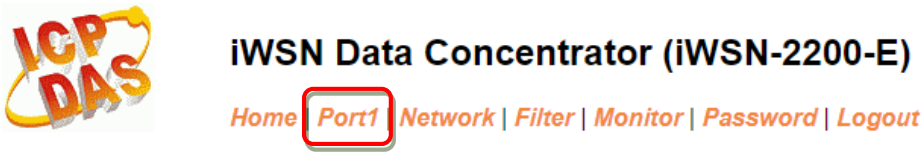


Note: If the remote firmware update is failed, then the traditional firmware update (Local) is required to make the module working again.

For detailed information regarding how to use this function to update the Firmware for the module, refer to the **iWSN-2200-E_Firmware_Update_Manual_vxxx.pdf**. The download address is shown below:

http://ftp.icpdas.com.tw/pub/cd/usbcd/napdos/iWSN/iWSN-2200/firmware

4.4 Port Page

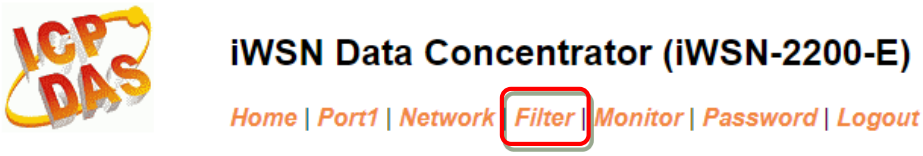


After clicking the **Port1** tab, the local tcp port settings page will be displayed as below picture.

Settings:

Settings	Current	Updated	Comment
Local TCP Port	502	502 Submit	Default: 502

4.5 Filter Page



The **Accessible IP (filter is disabled when all zero) Settings** page is used to query or edit the IP Filter List. The IP Filter List restricts the access of packets based on the IP header. If one or more IP address are saved to the IP Filter table, only clients whose IP is specified in the IP Filter List can access the module.

Accessible IP (filter is disabled when all zero):

IP Filter List	IP Address
IP0:	0.0.0.0
IP1:	0.0.0.0
IP2:	0.0.0.0
IP3:	0.0.0.0
IP4:	0.0.0.0

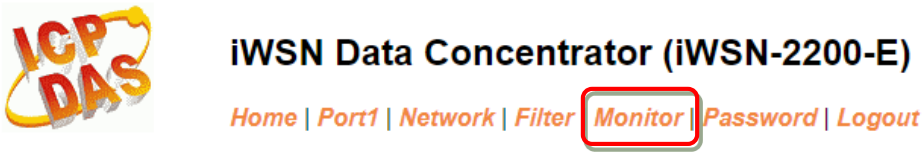
Add . . . To The List
Delete IP# (Number: 0 ~ 4)
Delete ALL
Save Configuration (finish)
submit

Note: Remember to include the IP address of your configuration computer.

➢ The following is an overview of the parameters contained in the **Accessible IP** section:

Item	Description
Add “IP” to the list	Add an IP address to the IP Filter List.
Delete IP# “Number”	Delete a specific IP# (Number = 0 to 4) address from the IP Filter List.
Delete All	Delete all items from the IP Filter List.
Save Configuration (finish)	Save a new IP Filter List to the Flash memory.
Submit	Click this button to save the revised settings to the module.

4.6 Monitor Page



After clicking the **Monitor** tab, the Current Connection Status page will be displayed showing detailed information regarding the current status of the serial port connection settings for the module.

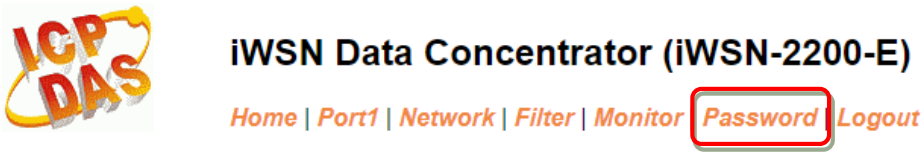
Current Connection Status:

Port Number	Port 1
Application Mode	Server
Connected IP1:	0.0.0.0
IP2:	0.0.0.0
IP3:	0.0.0.0
IP4:	0.0.0.0
Available Connections:	32
Queued MB Requests:	0
Busy Error:	-
First Error (Hex):	0,0,0
Last Error (Hex):	0,0,0

Clear Last Error

Note:
1. Click here for error codes and descriptions.
2. The "**Busy Error**" can happen when too many Modbus requests are queued and waiting for process. Set a larger timeout and scan-time value on all master software (clients) for fixing this problem.

4.7 Password Page



After clicking the **Password** tab, the **Change Password** page will be displayed.

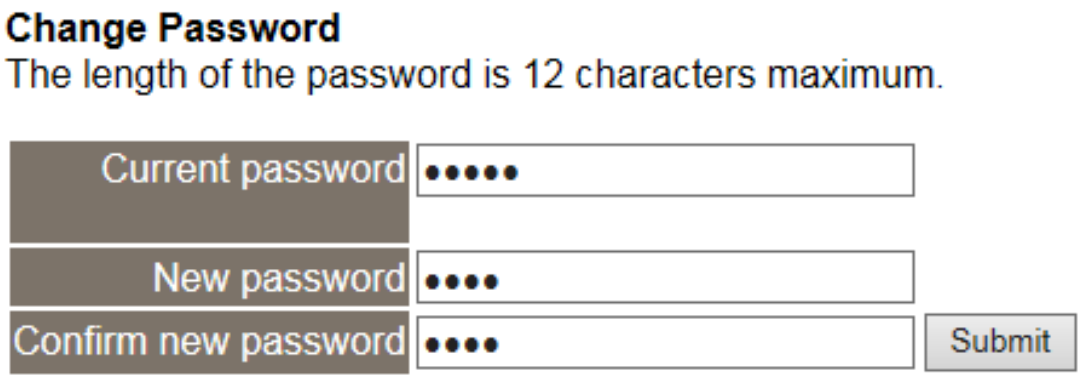
To change a password, first enter the old password in the **"Current password"** field (use the default password "**admin"**) and then enter a **new password** in the **"New password"** field. Re-enter the new password in the **"Confirm new password"** field, and then click the "**Submit**" button to update the password.

Step 1: Keyin the current passwork in **"Current password"** field. (Note: For the first time to change the password, please enter the factory default password admin in this field.)

Step 2: Keyin the new passwork in **"New password"** field. (Please keyin a number from 1 to 12 characters or an English word)

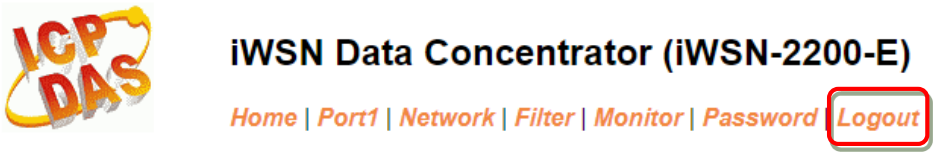
Step 3: Keyin the new password again in **"Confirm new password"** field.

Step 4: Click **"Submit"** button to save the new setting and change the password.

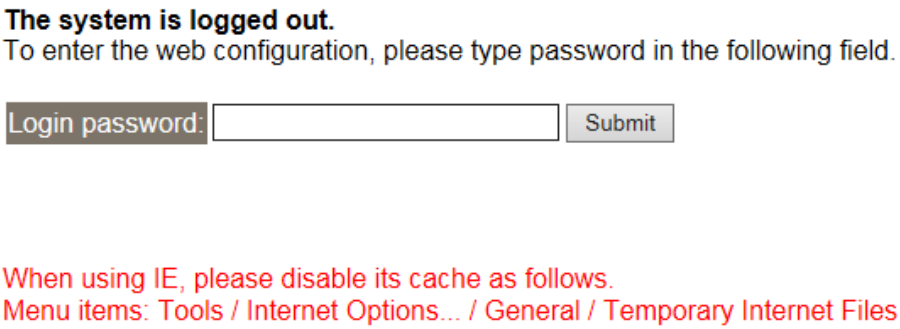


Note: If you forgot password, please refer to Section A1. How do I restore the web password for the module to the factory default password?

4.8 Logout Page



After clicking the **Logout** tab, you will be immediately logged out from the system and be returned to the login page.



5. Getting Started

This chapter provides detailed information about the “Self-Test” process, which is used to confirm the series module is operating correctly. Before beginning the “Self-Test” process, the wiring test, Ethernet configuration and search/Modbus utility driver installation procedures must first be fully completed. Follow the procedure described below:

- **iWSN-2200-E**

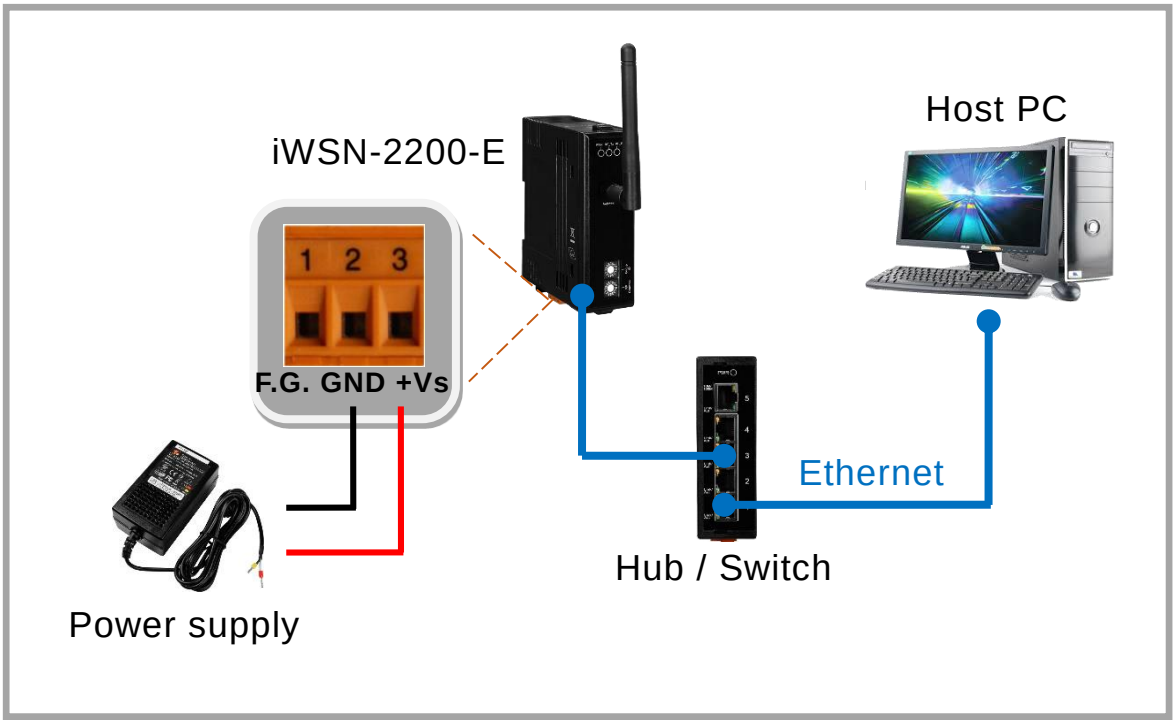
  A. Connecting the Power and Host PC

  I. Ensure that the network settings on your PC are configured correctly.

  II. Ensure that the Windows firewall or any Anti-Virus firewall software is correctly configured or temporarily disable these functions; otherwise the “Search Servers” function in the eSearch Utility may not work as required. You may need to contact your System Administrator for more details of how to do this.

  III. Check that the Init/Run switch is in the “Run” position.

  IV. Connect both the module and the Host computer to the same sub-network or the same Ethernet Switch, and then supply power (+12 to +30 VDC) to the module.



V. Verify that the Power (PWR) LED indicator (red) of module is ON.

B. Installed eSearch Utility software

I. Downloaded the **eSearch Utility** and installed according to the installation instructions. The eSearch Utility can be obtained from the ICP DAS web site. The location of the download addresses is shown below:

http://ftp.icpdas.com/pub/cd/tinymodules/napdos/software/esearch/

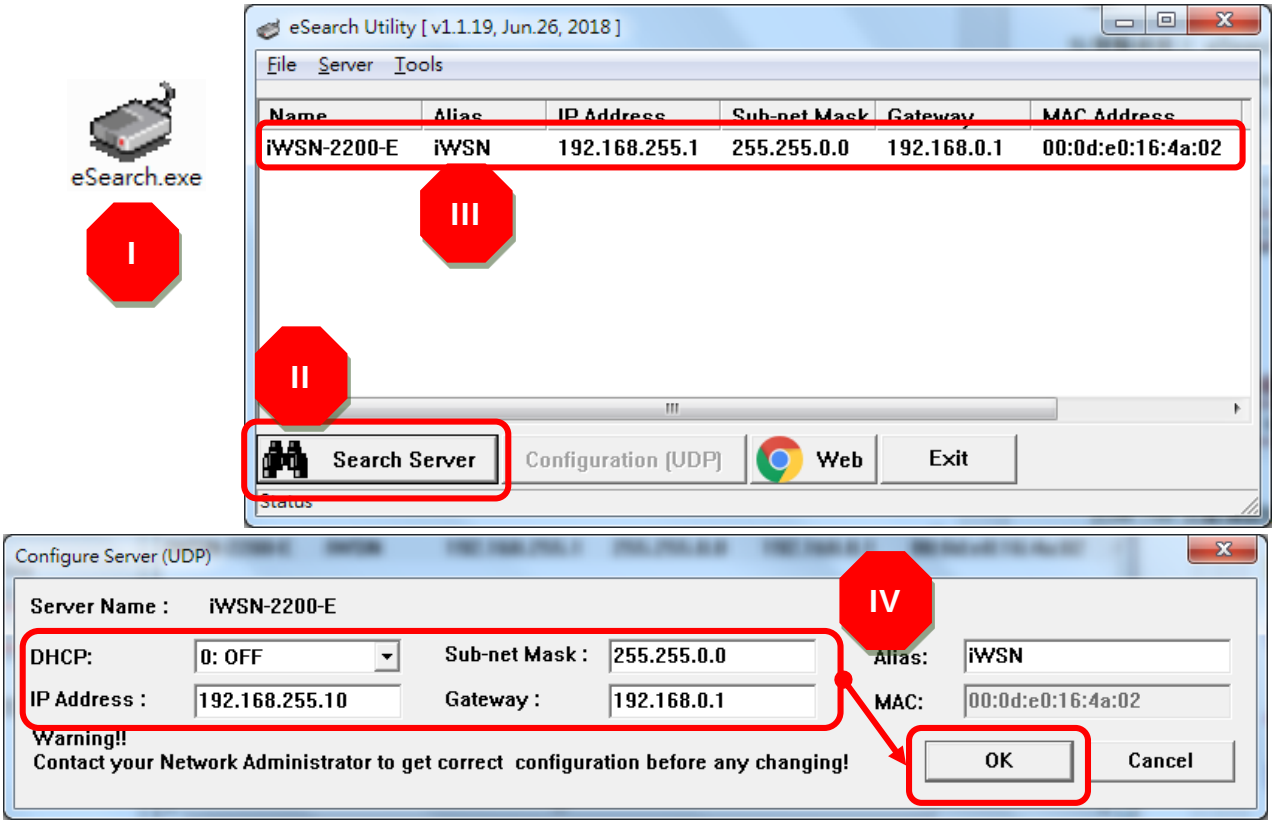
C. Configuring Network Setting

I. Double click the eSearch Utility shortcut on the desktop.

II. Click the **"Search Servers"** button to search your module.

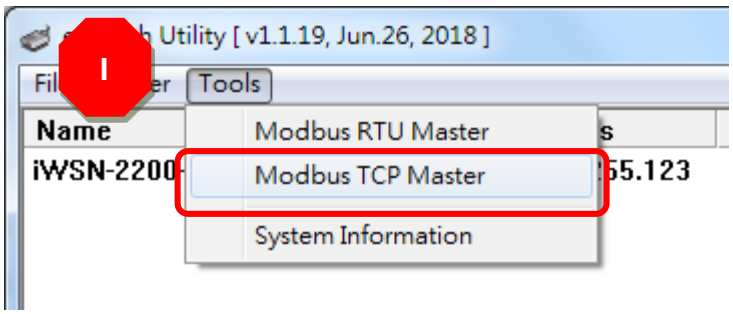
III. Once the search process is complete, double-click the name of the module to open the **"Configure Server"** dialog box.

IV. Enter the network settings information, including the **IP, Mask and Gateway addresses**, and then click **"OK"** button. The new settings for the module will take effect within 2 seconds. If you don't know the correct network configuration information, contact your Network Administrator to obtain the details.



D. Self-Test

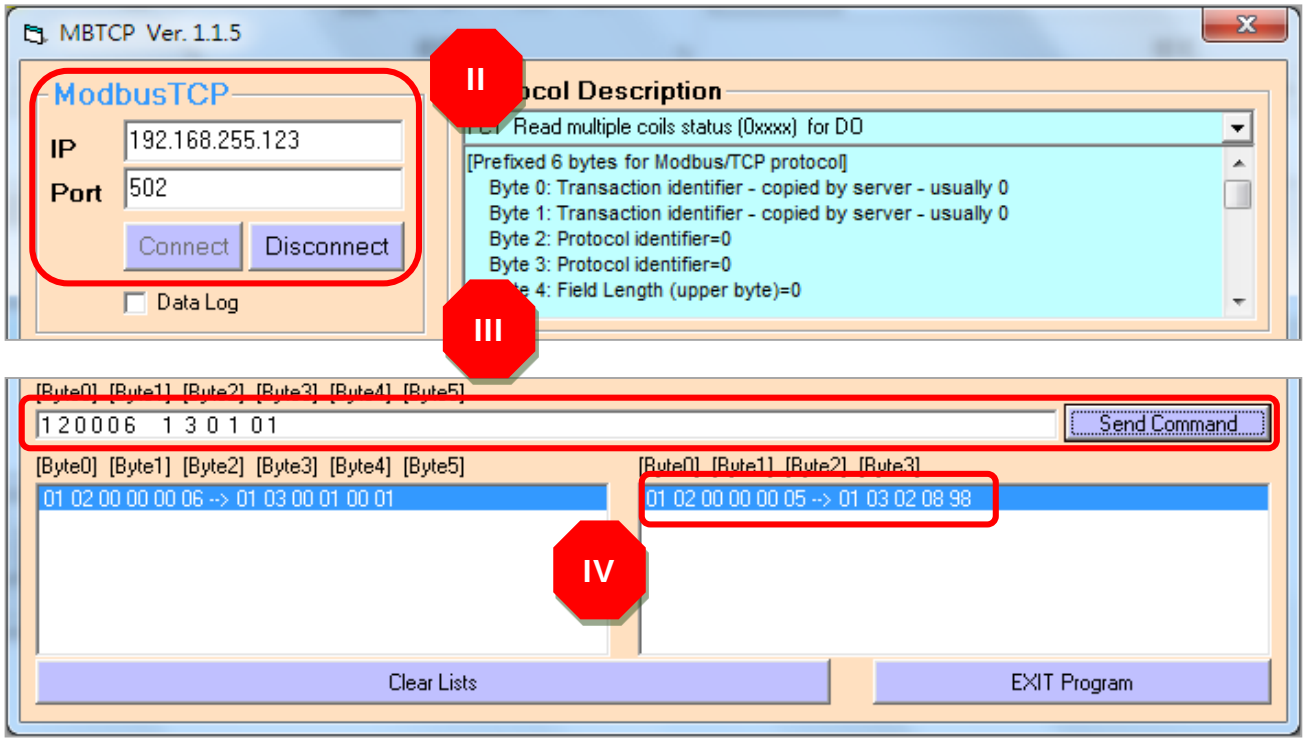
I. The eSearch Utility have supply a test software, the user can click **"Tools"** → **"Modbus TCP Master"** to open Modbus TCP Master Utility.



II. Key in the IP address of module in Modbus TCP Master, and then click **"Connect"** button to connect the module.

III. Key in Modbus command such as: 1 2 0 0 0 6 1 3 0 1 0 1 in command field, and then click **"Send command"** button.

IV. If the response messages such as 01 03 02 08 98 is correct, and the 08 98 is mean as 0x0898 (Hexadecimal) = 2200 (Decimal) that mean test successfully.



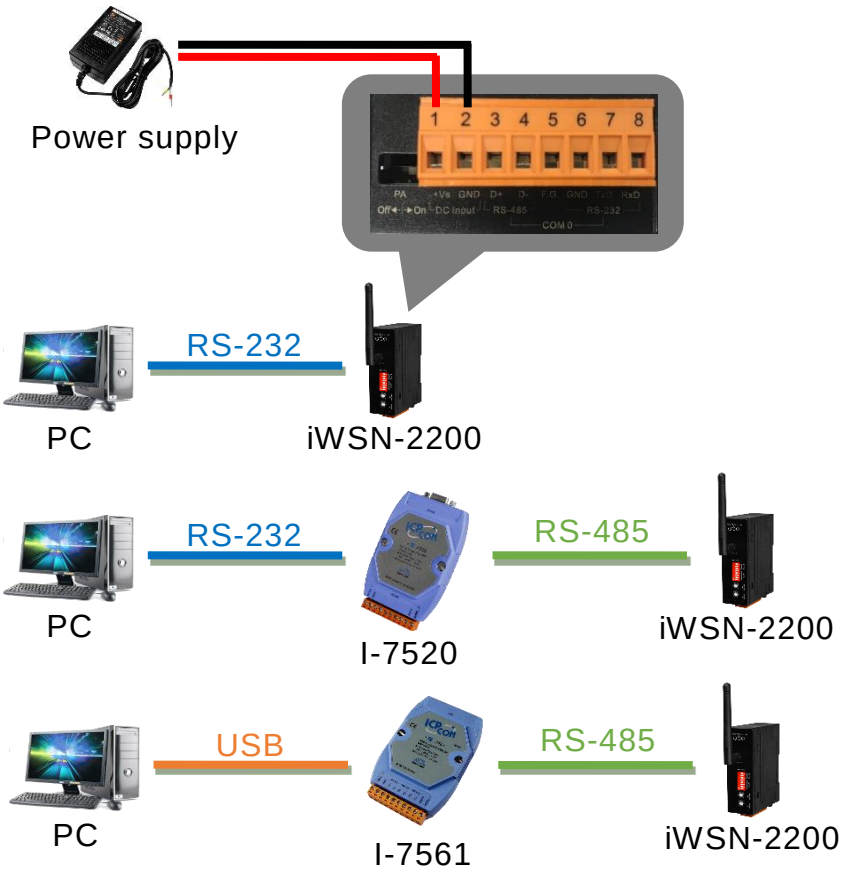
- **iWSN-2200**

  A. Setting Rotary and DIP switch

  Please refer section 2.2 "Communication Parameter" to adjust COM0 baud rate and Node ID. For example, COM0 baud rate is 115200, n, 8, 1, and Node ID is 1.

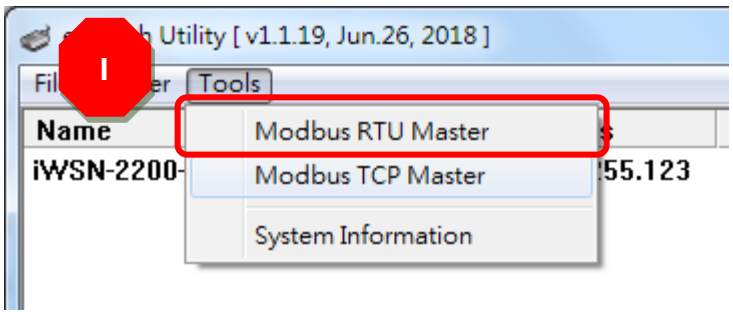
  B. Connecting the Power and Host PC

  Supplying +10~+30VDC power to module, and connect RS-232 to host PC. Or using RS-232 to RS-485 / USB to RS-485 converter to connect to host PC.



C. Self-Test

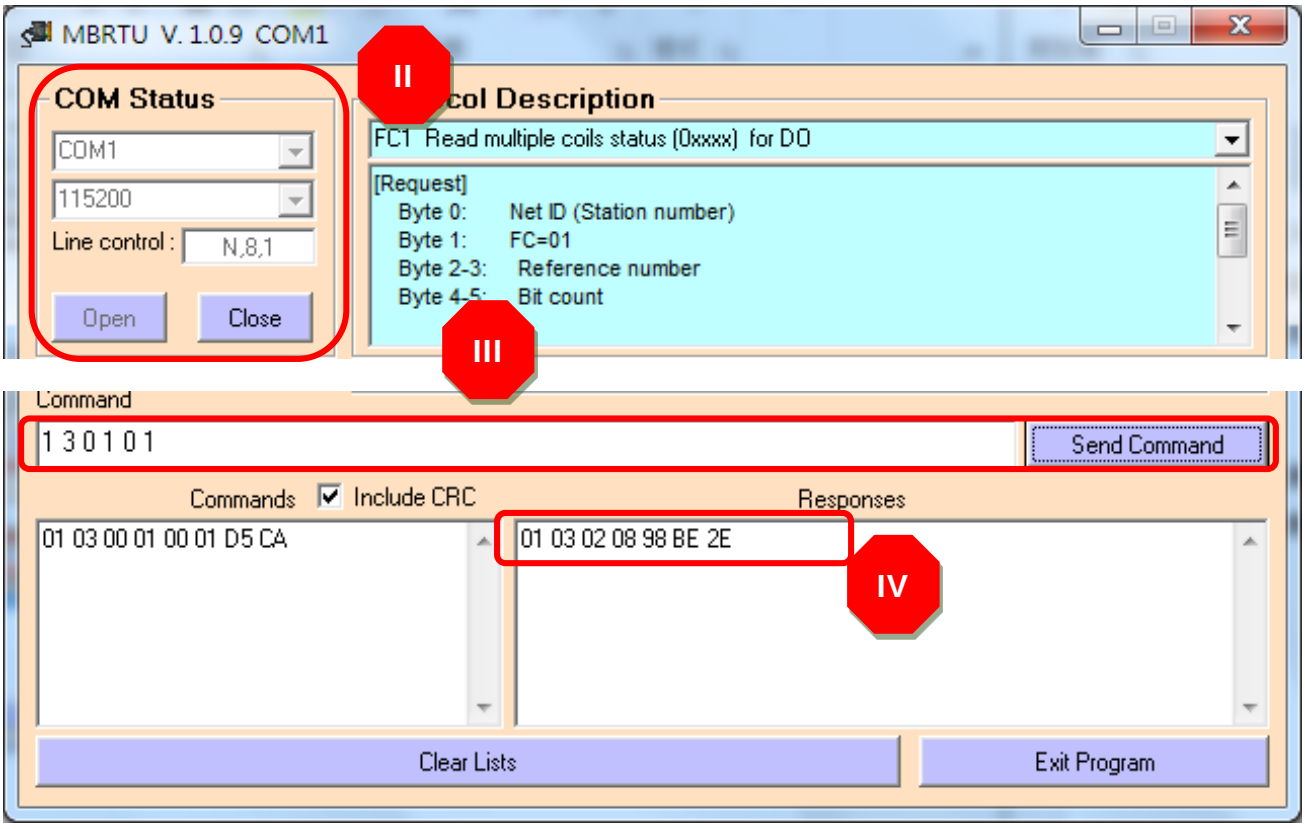
I. The eSearch Utility have supply a test software, the user can click **“Tools”** → **”Modbus RTU Master”** to open Modbus RTU Master Utility.



II. Selecting COM port and baud rate, and click “Open” button to connect the module in Modbus RTU Master Utility.

III. Keyin Modbus command such as 1 3 0 1 0 1 in command field, and then click **“Send command”** button.

IV. If the response messages such as 01 03 02 08 98 is correct, and the 08 98 is mean as 0x0898 (Hexadecimal) = 2200 (Decimal) that mean test successfully.



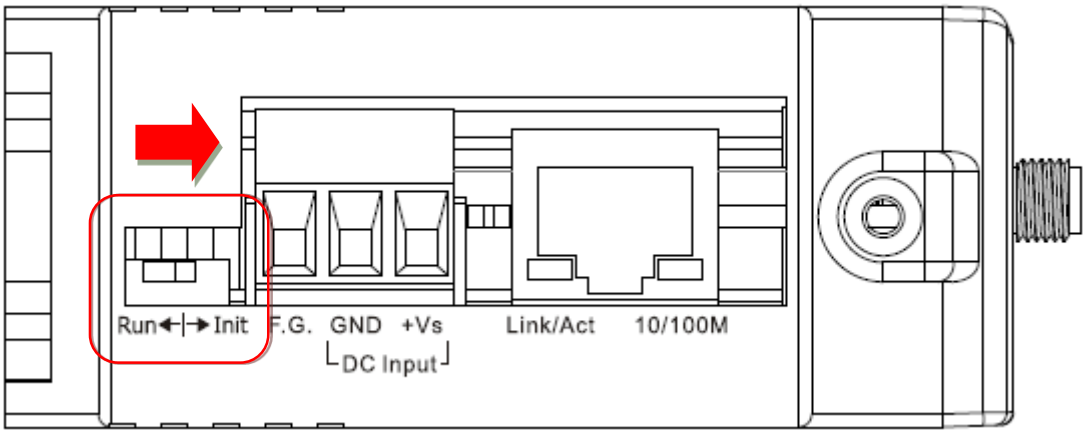
Appendix A: Troubleshooting

A1. How do I restore the web password for the module to the factory default password?

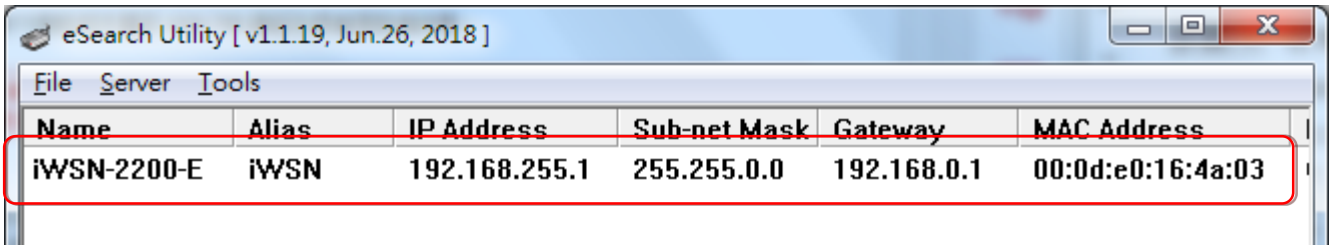
Please refer the describtion as below to reboot iWSN-2200-E to fatory default values.

Note: Be aware that ALL settings will be restored to the factory default values after the module is rebooted.

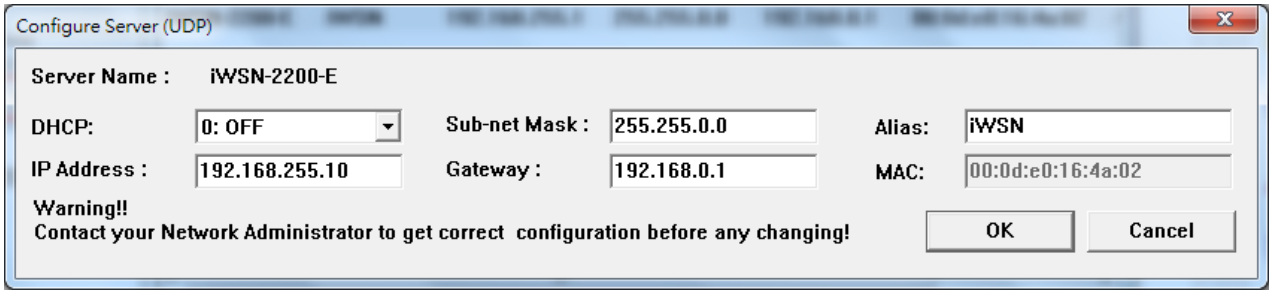
Step 1: Locate the Init/Run switch that can be found on the right-hand side of the module and set it to the **"Init"** position. Reboot the module to **load factory default settings** including default web password.



Step 2: Execute either the eSearch Utility to search for any modules connected to the network. Verify that the module has been reset to the original factory default settings. For example, the module should be shown as having the default IP address, which is 192.168.255.1.

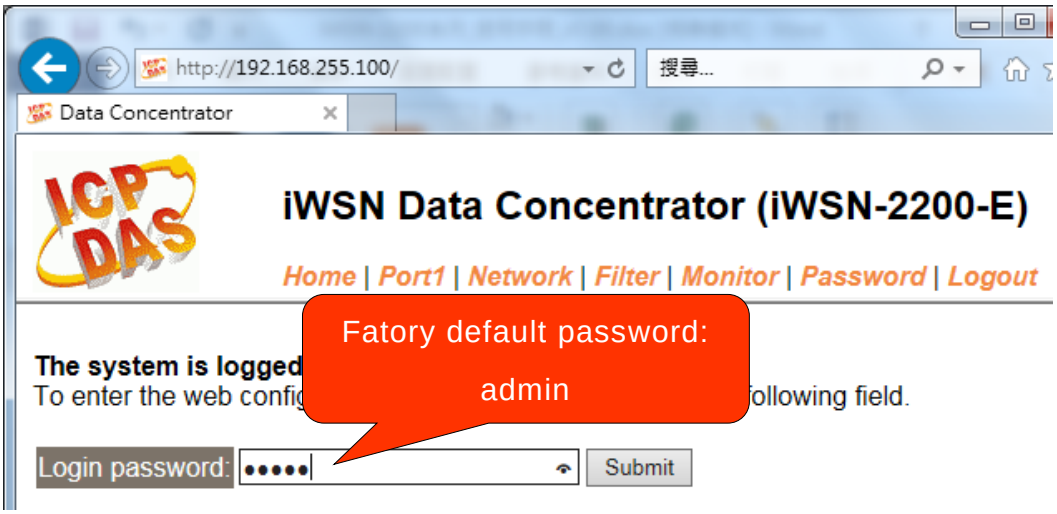


Step 3: Double-click the name of the module to open the Configure Server (UDP) dialog box, and modify the basic settings as necessary, e.g., the IP, Mask and Gateway addresses, and then click the **"OK"** button to **save the new settings**.



Step 4: Reset the Init/Run switch on the module to the **"Run"** position and reboot the device.

Step 5: Log in to the web configuration pages for the module, using the default web password, **"admin"**.



Appendix B: Glossary

1. ARP (Address Resolution Protocol)

The Address Resolution Protocol (ARP) is a telecommunication protocol that is used to convert an IP address to a physical address, such as an Ethernet address.

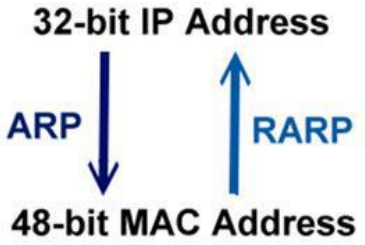
Consider two machines A and B that share the same physical network. Each has an assigned IP address IPA and IPB, and a MAC address, MAC_A and MAC_B. The goal is to devise a low-level software application that hides the MAC addresses and allows higher-level programs to work only with the IP addresses. Ultimately, however, communication must be carried out by the physical networks using whatever MAC address scheme the hardware supplies.

Suppose machine A wants to send a packet to machine B across a physical network to which they are both attached, but A only has the Internet address for B, IP_B. The question arises: how does A map that address to the MAC address for B, MAC_B?

ARP provides a method of dynamically mapping 32-bit IP address to the corresponding 48-bit MAC address. The term dynamic is used since the mapping is performed automatically and is normally not a concern for either the application user or the system administrator.

2. RARP (Reverse Address Resolution Protocol)

RARP provides a method of dynamically mapping 48-bit MAC address to the corresponding 32-bit IP address. RARP has now been replaced by the Bootstrap Protocol (BOOTP) and the modern Dynamic Host Configuration Protocol (DHCP).



3. Clients and Servers

The client-server paradigm uses the direction of initiation to categorize whether a program is a client or server. In general, an application that initiates peer-to-peer communication is called a client. End users usually invoke client programs when they use network services.

By comparison, a server is any program that waits for incoming requests from a client program. The server receives a request from a client, performs the necessary action sand returns the result to the client.

4. Ethernet

The term Ethernet generally refers to a standard published in 1982 by Digital Equipment Corp., Intel Corp. and Xerox Corp. Ethernet is the most popular physical layer Local Area Network (LAN) technology in use today.

5. Firmware

Firmware is an embedded software program or set of instructions programmed on a device that provides the necessary instructions for how the device communicated with other computer hardware, and is located or stored in a semi-permanent storage area, e.g., ROM, EEPROM, or Flash memory. Firmware can often be updated by downloading a file from the manufacturer's web site or FTP.

6. ICMP (Internet Control Message Protocol)

ICMP provides a method of communicating between the Internet Protocol software on one machine and the corresponding software on another. It allows a gateway to send error or control messages to other gateways, or allows a host to diagnose problems with the network communication.

7. Internet

Physically, the Internet is a collection of packet switching networks interconnected by gateways that together with the TCP/IP protocol, allows them to perform logically as a single, large and virtual network. The Internet recognizes hosts using 32-bit IP address.

8. IP (Internet Protocol) Address

Each interface on the Internet must have a unique IP address (also called an Internet address). These addresses are 32-bit numbers, and are normally written as four decimal numbers, one for each byte of the address for example “192.168.41.1”. This is called dotted-decimal notation.

9. Subnet Mask

A Subnet mask, often simply called the “Mask”, is a 32-bit number that masks and IP address, and divides the IP address into the network address and the host address. Given its own IP address and its subnet mask, a host can determine whether a TCP/IP packet is destined for a host that is (1) on its own subnet, or (2) on a different network. If (1), the packet will be delivered directly; otherwise it, will be delivered via a gateway or a router.

10. Gateway

Computers that interconnect two networks and pass packets from one to the other are called Internet Gateways or Internet Routers. Gateways route packets that are based on the destination network, rather than the destination host.

11. MAC (Media Access Control) Address

To allow a computer to determine which packets are meant for it, each device attached to an Ethernet network is assigned a 48-bit integer known as its MAC address (also called the Ethernet address, the hardware address or the physical address). A MAC address is normally written as eight hexadecimal numbers, for example “**00:71:88: AF: 12:3e:0f:01**”. Ethernet hardware manufacturers purchase blocks of MAC addresses and assign them in sequence as they manufacture Ethernet interface hardware. Thus, no two hardware interfaces can have the same MAC address.

12. Packet

A packet is the unit of data sent across a physical network. It consists of a series of bits containing data and control information, including the source and the destination node (host) address, and is formatted for transmission from one node to another.

13. Ping

Ping is a network administration utility used to test the whether a host on an Internet network is active, and to measure the round-trip time for messages sent from the originating host to a destination computer. Ping operates by sending an ICMP echo request message to a host, expecting an ICMP echo reply to be returned. Normally, if a host cannot be pinged, Telnet or FTP cannot be used to connect to the host. Conversely, if Telnet or FTP cannot be used to connect to a host, Ping is often the starting point to determine the nature of the problem.

14. Socket

Each TCP segment contains a source and destination port number that can be used to identify the sending and receiving application. These two values, along with the source and destination IP addresses in the IP header, uniquely identify each connection. The combination of an IP address and a port number is called a socket.

15. TCP (Transmission Control Protocol)

TCP is a set of rules used in combination with the Internet Protocol to send data in the form of message units between computers over the Internet. TCP provides a reliable flow of data between two hosts and is associated with tasks such as dividing the data passed to it from an application into appropriately sized chunks for the network layer below, acknowledging received packets, setting timeouts to make certain that the other end acknowledges packets that are sent, and so on.

16. TCP/IP

The Transmission Control Protocol (TCP) and the Internet Protocol (IP) is standard network protocols that are almost always implemented and used together in a formation are known as TCP/IP. TCP/IP can be used to communicate across any set of interconnected networks.

17. UDP (User Datagram Protocol)

UDP is an internet protocol that provides a much simpler service to the application layer as it only sends packets of data from one host to another, but there is no guarantee that the packets will reach the destination host. UDP is suitable for purposes where error checking and correction is either not necessary or is performed in the application.

Appendix C: Exception Codes

If an exception occurs during Modbus communication, the slave device will return an Exception Code in the response message. The following is an explanation of the Exception Codes:

- Exception Codes list:

Code	Name & Description
0x01	ILLEGAL FUNCTION
	Indicates that the function code received in the query is not an allowable action for the slave. If not an allowable action for the slave. If a Poll Program Complete command was issued, this code indicates that no program function
0x02	ILLEGAL DATA ADDRESS
	Indicates that the data address received in the query is not an allowable address for the slave.
0x03	ILLEGAL DATA VALUE
	Indicates that a value contained in the query data field is not an allowable value for the slave.
0x04	SLAVE DEVICE FAILURE
	Indicates that an unrecoverable error occurred while the slave was attempting to perform the requested action.
0x05	ACKNOWLEDGE
	Indicates that the slave has accepted the request and is processing it, but it will take an extended period of time to do so. This response is returned to prevent a timeout error from occurring in the master. The master can issue a Poll Program Complete message later to determine whether the processing is complete.
0x06	SLAVE DEVICE BUSY
	Indicates that the slave is engaged in processing a long–duration program command. The master should retransmit the message later when the slave is free.
0x07	NEGATIVE ACKNOWLEDGE
	Indicates that the extended file area failed to pass a consistency check, and the slave cannot perform the program function received in the query. This code is returned when a programming request using function code 13 or 14 decimal was unsuccessful. The master should request diagnostic or error information from the slave.
0x08	MEMORY PARITY ERROR
	The slave attempted to read extended memory, but detected a parity error in the memory. The master can retry the request, but service may be required on the slave device.

Appendix D: Revision History

This chapter provides revision history information to this document.

The table below shows the revision history.

Revision	Date	Description
1.0.0	June. 2019	First release.