tET/tPET I/O Series User Manual

Ethernet I/O Modules
Ver.2.4, Feb. 2024

Warranty

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

Warning

ICP DAS assumes no liability for damages consequent to 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, nor for any infringements of patents or other rights of third parties resulting from its use.

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Contact Us

If you have any questions, please feel free to contact us via email at: service@icpdas.com

Support

This manual relates to the following modules:

tET-AD2, tPET-AD2
tET-DA2, tPET- DA2
tET-P6, tPET-P6
tET-PD6, tPET-PD6
tET-C4, tPET-C4
tET-A4, tPET-A4
tET-P2C2, tPET-P2C2
tET-P2A2, tPET-P2A2
tET-P2POR2, tPET-P2POR2,
tET-PD2POR2, tPET-PD2POR2
tET-P2R2, tPET-P2R2
tET-PD2R1, tPET-PD2R1

TABLE OF CONTENTS

Packing List

The shipping package includes the following items:

tET/tPET Series Module x 1

Quick Start x 1

Note

If any of these items are missing or damaged, please contact the local distributor for more information. Save the shipping materials and cartons in case you need to ship the module in the future.

More Information

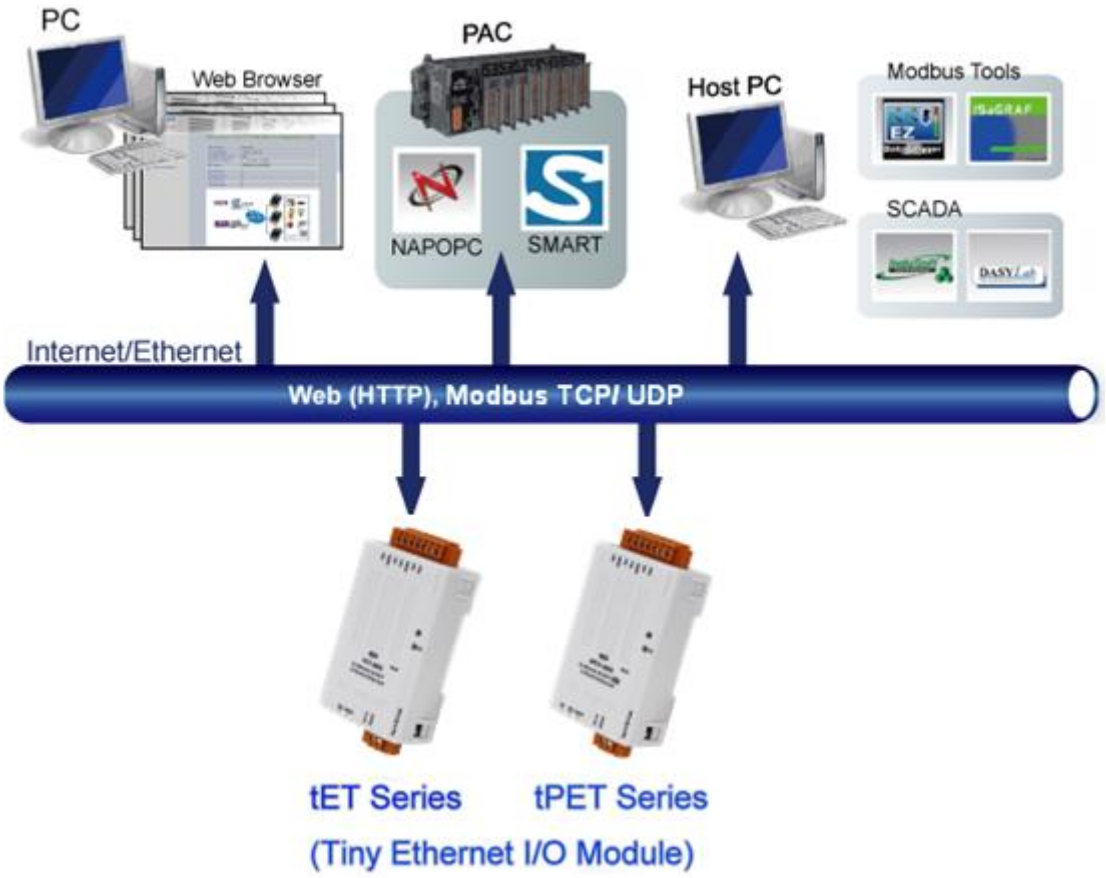
- **Documentation**
  https://www.icpdas.com/en/downloaDIndex.php?nation=US&kind1=&model=&kw=tPET

- **Firmware**
  https://www.icpdas.com/en/download/show.php?num=2632

- **Software**
  https://www.icpdas.com/en/downloaDIndex.php?nation=US&kind1=&model=&kw=eSearch

1 Introduction

The tET/tPET series of devices are Ethernet I/O monitoring and control modules that provide the networking ability and a variety of I/O functions. The modules can be remotely controlled through a 10/100M Ethernet network using the Modbus TCP/UDP protocol. Modbus has become a de facto standard communication, and is now the most commonly available means of connecting industrial electronic devices. This makes the tET/tPET series perfect for integration with HMI, SCADA, PLC and other software systems.



1.1 Product Information

1.1.1 Ethernet IO Module Series

The tET/tPET series of Ethernet I/O modules support a range of I/O formats, such as photo-isolated digital input, relay contact, PhotoMOS relay, and open-collector output, etc.

The table below provides a description of each model.

DC Analog Input	
tET-AD2	Tiny Ethernet module with Isolated 2-ch AI
tPET-AD2	Tiny PoE Ethernet module with Isolated 2-ch AI

DC Analog Input	
tET-DA2	Tiny Ethernet module with Isolated 2-ch AO
tPET-DA2	Tiny PoE Ethernet module with Isolated 2-ch AO

DC Digital Input	
tET-P6	Tiny Ethernet Module with 6-ch DI (Wet Contact)
tET-PD6	Tiny Ethernet Module with 6-ch DI (Dry Contact)
tPET-P6	Tiny PoE Ethernet Module with 6-ch DI (Wet Contact)
tPET-PD6	Tiny PoE Ethernet Module with 6-ch DI (Dry Contact)

DC Digital Output	
tET-C4	Tiny Ethernet Module with 4-ch DO (Sink, NPN)
tET-A4	Tiny Ethernet Module with 4-ch DO (Source, PNP)
tPET-C4	Tiny PoE Ethernet Module with 4-ch DO (Sink, NPN)
tPET-A4	Tiny PoE Ethernet Module with 4-ch DO (Source, PNP)

DC Digital Input and Output	
tET-P2C2	Tiny Ethernet Module with 2-ch DI and 2-ch DO (Sink, NPN)
tET-P2A2	Tiny Ethernet Module with 2-ch DI and 2-ch DO (Source, PNP)
tPET-P2C2	Tiny PoE Ethernet Module with 2-ch DI and 2-ch DO (Sink, NPN)
tPET-P2A2	Tiny PoE Ethernet Module with 2-ch DI and 2-ch DO (Source, PNP)

Power Relay Output	
tET-P2R2	Tiny Ethernet Module with 2-ch DI (Wet Contact), 2-ch Power Relay
tET-PD2R1	Tiny Ethernet Module with 2-ch DI (Dry Contact), 1-ch Power Relay
tPET-P2R2	Tiny PoE Ethernet Module with 2-ch DI (Wet Contact), 2-ch Power Relay
tPET-PD2R1	Tiny PoE Ethernet Module with 2-ch DI (Dry Contact), 1-ch Power Relay

PhotoMOS Relay Output	
tET-P2POR2	Tiny Ethernet Module with 2-ch DI (Wet Contact), 2-ch PhotoMOS Relay
tET-PD2POR2	Tiny Ethernet Module with 2-ch DI (Wet Contact), 2-ch PhotoMOS Relay
tPET-P2POR2	Tiny PoE Ethernet Module with 2-ch DI (Wet Contact), and 2-ch PhotoMOS Relay
tPET-PD2POR2	Tiny PoE Ethernet Module with 2-ch DI (Wet Contact), and 2-ch PhotoMOS Relay

1.1.2 Selection Guide

Model		I/O Specifications			Modbus TCP	MQTT	SNMP V2c
Ethernet	PoE	AI	AO	Isolation			
tET-AD2	tPET- AD2	2 (Single-end)	-	Yes	Yes	Yes	Yes
tET-DA2	tPET-DA2	-	2	Yes	Yes	Yes	Yes

Model		I/O Specifications			Modbus TCP	MQTT
Ethernet	PoE	DI	DO	Isolation		
tET-P6	tPET-P6	6-ch (Wet Contact)	-	Yes	Yes	Yes
tET-PD6	tPET-PD6	6-ch (Dry Contact)	-			
tET-C4	tPET-C4	-	4-ch (Sink)			
tET-A4	tPET-A4	-	4-ch (Source)			
tET-P2C2	tPET-P2C2	2-ch (Wet Contact)	2-ch (Sink)			
tET-P2A2	tPET-P2A2	2-ch (Wet Contact)	2-ch (Source)			
tET-P2POR2	tPET-P2POR2	2-ch (Wet Contact)	2-ch Form A PhotoMos Relay			
tET-PD2POR2	tPET-PD2POR2	2-ch (Dry Contact)	2-ch Form A PhotoMos Relay			
tET-P2R2	tPET-P2R2	2-ch (Wet Contact)	2-ch Form A Relay			
tET-PD2R1	tPET-PD2R1	2-ch (Dry Contact)	1-ch Form A Relay			

1.1.3 Comparison of tET/tPET Module

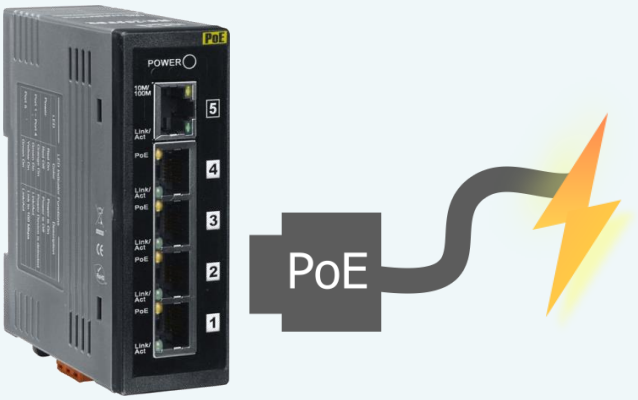
The tPET series features true IEEE 802.3af-compliant (classification, Class 1) Power over Ethernet (PoE) functions. Now, not only can data be carried through an Ethernet cable, but power can also be provided. This feature makes installation of tPET series modules a straightforward task. Imagine no more unnecessary wires with only an Ethernet cable required in order to take care of everything in the field.

The tET/tPET series also features a built-in web server that allows basic configuration, I/O monitoring and I/O control to be performed by simply using a web browser, meaning that remote control of your modules is as easy as surfing the Internet. In addition, tET/tPET series modules support the Modbus TCP/UDP, MQTT, or SNMP protocols, ensuring perfect integration with HMI, SCADA, PLC, or other software.

Industrial PoE Solutions

When using PoE devices such as the tPET series, you can incorporate the ICP DAS **"PoE"** switch, the **"NS-205PSE"**, as the power source. The NS-205PSE automatically detects any connected devices, whether they are PoE devices or not. This mechanism ensures that the NS-205PSE will function simultaneously with both PoE and non-PoE devices.

Note that when acting as a power source for a PoE device, the NS-205PSE requires a power input ranging from +46 V_{DC} to +55 V_{DC}.



More Information for tET/tPET Series Modules

All tET series modules can only be powered using a +12 V_{DC} to +48 V_{DC} power supply connected through a removable terminal block.

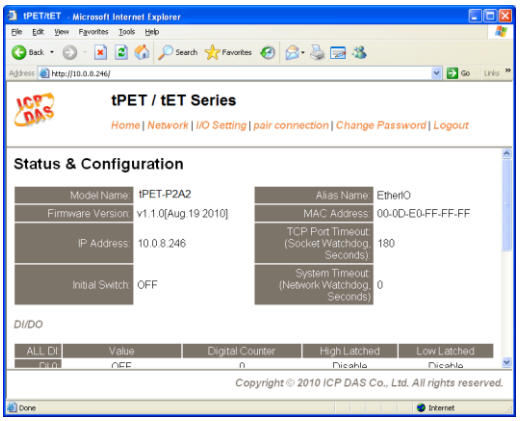
In contrast, tPET series modules offer two methods of supplying power. The first is through the Ethernet via a PoE switch; the second is through a removable terminal block via an external power source. The external power supply should be in the range of +12 V_{DC} to 48 V_{DC}. The reason for including the second method is to provide a redundant power input feature. tPET series modules also include an LED indicator that indicates whether the power is being supplied by the PoE switch or not.

Series	tPET	PET-7000
CPU	**32-bit ARM**	80186
Ethernet	10/100 M, PoE	
Modbus TCP/UDP	Yes	
Web Configuration	Yes	
Web HMI	Simplified	**Yes**
Multi-client	Yes (Max. Connections: 5)	**Yes (Max. Connections: 12)**
IP Filter	Yes (white list)	
Latched DI	Yes	
DI as Counter	**32-bit, 3.5 kHz**	32-bit, 500 Hz
Frequency Measurement	**Yes (3.5 kHz Max.)**	-
I/O Pair-connection	**Yes (Pull/Push Mode)**	Yes (Pull Mode)
PWM	**Yes (100 Hz Max.)**	-
Dual-Watchdog	Yes (CPU, Host)	Yes (Module, Host)
ESD Protection	+/- 4 kV	
Surge Protection	-	**+/- 0.5 kV**
Form Factor	**Tiny Size**	Palm Size
Remarks	**Cost-effective**	-
Note: The tET series and tPET series are similar, but only the tPET series has PoE functionality.		

1.2 Features

➢ Built-in Web Server

The tET/tPET series module can receive/send network packets efficiently by using a 32-bit MCU. Web Server is also built in to provide an intuitive web management interface that allows users to easily configure, monitor and control the module from a remote location using a web browser.



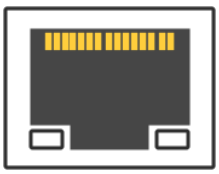
➢ Modbus TCP/UDP, MQTT, or SNMP Protocol

The Modbus TCP/UDP slave function on the Ethernet port can be used to provide data to remote SCADA software. All tET/tPET series modules support the MQTT protocol. So far, only the tPET-AD2 and tPET-DA2 support the SNMP V2c protocol.

➢ All-in-one Module

A variety of I/O components are available on multiple channels in a single module, which provides the most cost effective I/O usage and enhances the performance of I/O operations.

➢ Automatic MDI/MDI-X Detection for Plug-and-Play



The RJ-45 port supports the Auto-MDI/MDI-x feature to detect the type of the connected Ethernet device and then automatically choose the MDI or MDIX configuration. Thus, the user can use straight-through or crossover cables.

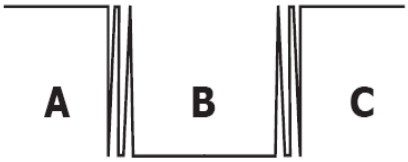
➢ Built-in Multi-Function I/O

The **DO** modules support these functions:

- **Power-on Value:** On boot up, the DO value will be set to the Power-on value.
- **Safe Value:**
  If Modbus TCP communication is lost for a specific period, the DO value will be set to the user-defined safe value.
- **A PWM (Pulse-Width Modulation) Function:**
  Each of DO channel can be set to a different frequency (50 or 100 Hz Max.) and duty cycle, also work either independently or simultaneously. The term “High Duty Cycle” describes the duration of 'ON' time in proportion to the regular interval or 'period' of time. Similarly, the term “Low Duty Cycle” corresponds to the duration of the 'OFF' time. Consequently, it is not necessary to keep switching from ON to OFF from remote a controller. In this way, the module reduces the complexity required for the control system and enhances timing accuracy.
  Note: Because of the characteristics of the relay functions, it is recommended that the PWM on modules with relay functions is not used for extended periods.

The **DI** modules support these functions:

- **Can be Used as a 32-bit High Speed Counter**
- **High/Low Latched Status Commands:**
  The modules provide commands to read the status of any digital input channels that are latched high or latched low. The following is an example that shows the usefulness of the latched digital input. If we wish to read a key stroke from a key switch connected to the digital input channel of a module, the input signal of the key stroke is a pulse signal as shown in the figure.



  If we just use the read digital input status command to read the signal and we cannot send the command during the B period due to some reasons, then we will lose the key stroke information. However, with the read latched digital input command, we can still get the key stroke information even we are not able to send command in B period.

- **Frequency Measurement:**
  This function can be used to retrieve the digital input counter value at specific times and calculates the frequency (Hz, Max. 3.5 kHz). Rather than polling via a remote host, the module can determine the frequency directly, reducing the communication delay caused by two ends and also improves the accuracy of the frequency measurement. In order to applying for more applications, this module provides 3 scan modes and 4 moving average methods for user to select the best way in their applications.

➢ Built-in Dual Watchdog

The Dual Watchdog function consists of a CPU Watchdog (for hardware functions) and a Host Watchdog (for software functions).

CPU Watchdog:

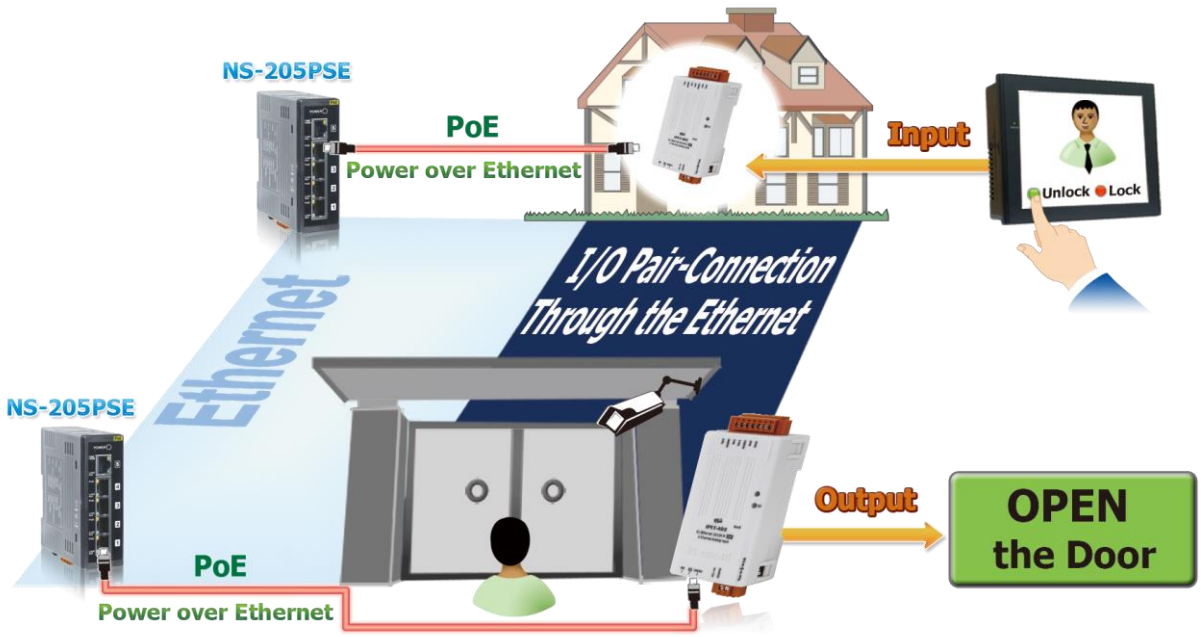
The CPU Watchdog will automatically reset it-self if the built-in firmware encounters an abnormal situation.

Host Watchdog

If there is no communication between the module and the host (PC or PLC) for a specified period of time (i.e., the Watchdog timeout), the Host Watchdog will set the digital output based on a predefined safe-value.

➢ I/O Pair-Connection

The I/O Pair-connection function is used to create a digital input to digital output pair through the Ethernet. Once the configuration is complete, the modules can continuously poll the status of a remote digital input device using the Modbus TCP protocol, and then write to the local digital output channels in the background.

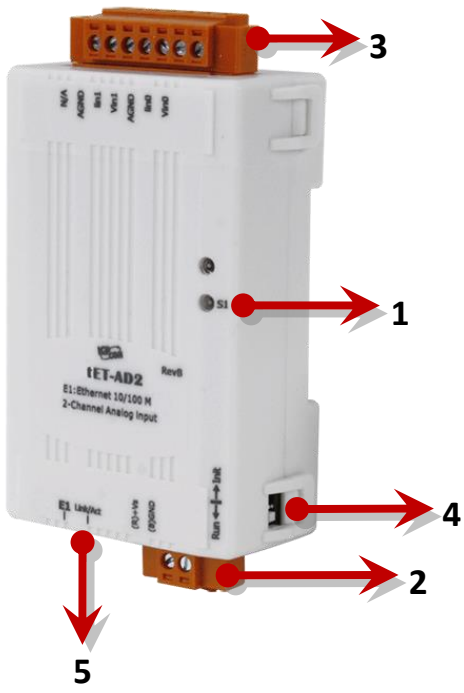


2 Hardware Information

2.1 Appearance

The components of the tET/tPET module include LED indicators, pluggable terminal blocks for power input or I/O, an operating mode switch, and an Ethernet port.

tET series



tPET series

1	System LED Indicator	4	Operating Mode Switch
2	Power Input Connector	5	Ethernet Port (PoE)
3	I/O Connector		

➢ System LED Indicator

Once power is supplied to the tET/tPET series module, the LED indicator will be illuminated as follows:

Function	S1
System running	Red light (flashing once every 3 seconds)
Firmware update in progress (0 ~ 100%)	Red light (ON)

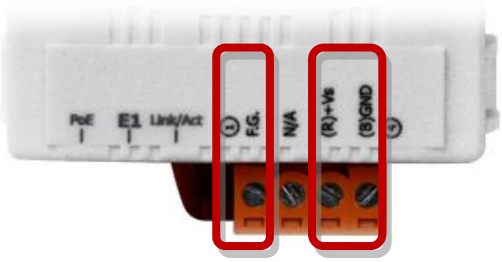
➢ Power Input Connector

The power input connector on the tET/tPET series module differs in pin assignments (4-pin or 2-pin) base on the model. For more information about pin assignments, refer to Section 2.2 "Specification and Wiring".

DC Power Input:

All tET/tPET series modules include "(R)+Vs" and "(B)GND" pins and are powered by a DC power supply.

Name	Function
(R)+Vs	+12 to +48 V_{DC} Power Input
(B)GND	Ground Connection

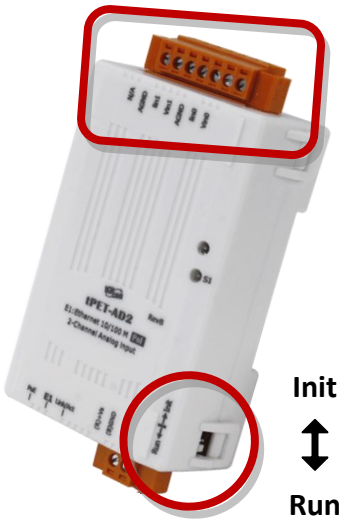


Frame Ground (F.G.):

Electronic circuits are constantly vulnerable to Electrostatic Discharge (ESD), which becomes worse in a continental climate area. The tET/tPET series modules feature a new design for the frame ground, which provides a path that bypasses ESD to prevent direct impact on hardware from ESD and environmental interference, resulting in enhanced ESD protection capability and ensuring that the module is more reliable.

➢ I/O Connector

The pin assignments for the I/O connector on the tET/tPET series module differ based on the model. For more information about pin assignments, refer to Section 2.2 “Specification and Wiring”.



➢ Operating Mode Switch

The operating mode switch on the tET/tPET series module is set to the **Run** position by default. When updating the firmware, you will need to switch to Init mode. Once the update is completed, you should switch back to Run mode.

Init mode:
For firmware update or troubleshooting. The factory presets will be loaded.

Run mode:
For normal operation. The user-defined configuration will be loaded

Note:

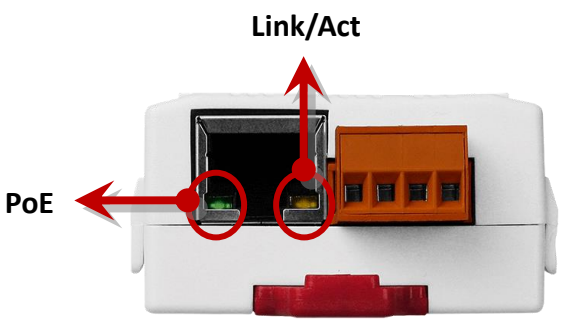
After modifying the operating mode, it is necessary to reboot the tET/tPET series modules.

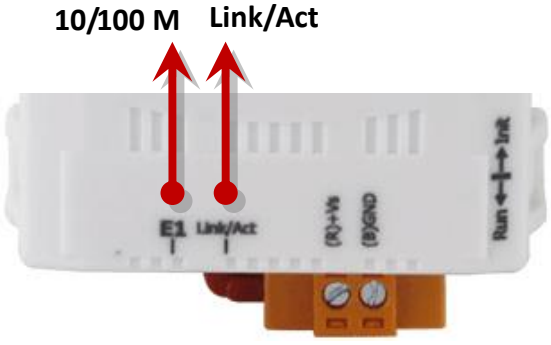
➢ Ethernet Port

The tET/tPET series module includes an RJ-45 socket that serves as a 10/100 Base-TX Ethernet standard port. When a network connection is established and network packets are received, both the Link/Act LED and the 10/100 M LED on the RJ-45 socket will light up.

Note:

PoE (Power-over-Ethernet) functionality is only available for the tPET series modules

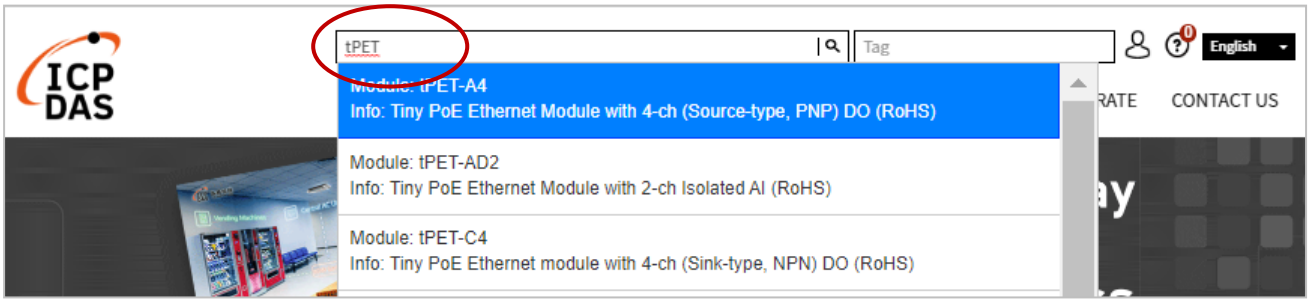




2.2 Specification and Wiring

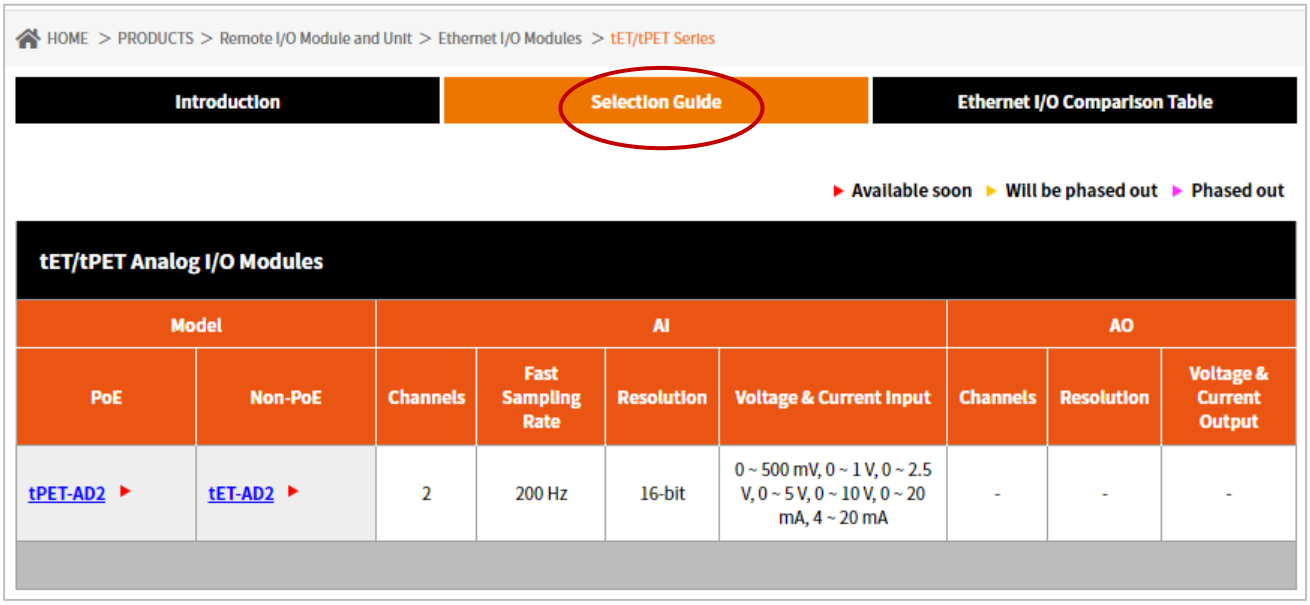
2.2.1 Product Page

The user can find out the product page on the website (https://www.icpdas.com/) by entering the model in the search bar.



2.2.2 tET/tPET Selection Guide

https://www.icpdas.com/en/product/guide+Remote__I_O__Module__and__Unit+Ethernet__I_O__Modules+tET_tPET__Series#1110



Model		AI				AO		
PoE	Non-PoE	Channels	Fast Sampling Rate	Resolution	Voltage & Current Input	Channels	Resolution	Voltage & Current Output
tPET-AD2	tET-AD2	2	200 Hz	16-bit	0 ~ 500 mV, 0 ~ 1 V, 0 ~ 2.5 V, 0 ~ 5 V, 0 ~ 10 V, 0 ~ 20 mA, 4 ~ 20 mA	-	-	-

2.2.3 Data Sheet

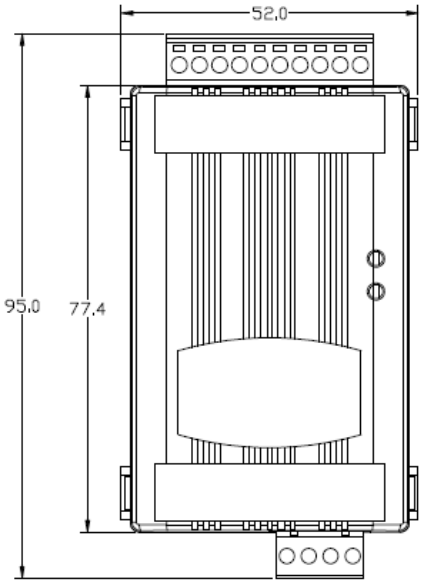
Users can also click the "Data Sheet" icon on the product webpage to view the pin assignments and wire connections.

The table listed the web link of the data sheet for tET/tPET series modules.
www.icpdas.com/web/product/download/io_and_unit/ethernet/tet_tpet/document/data_sheet/XXX.pdf

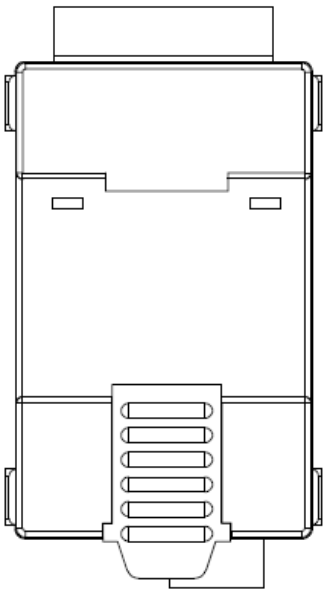
Model	Name
Analog Input Modules	
t(P)ET-AD2	tET-AD2_tPET-AD2_en.pdf
Analog Output Modules	
t(P)ET-DA2	tET DA2_tPET-DA2_en.pdf
Digital I/O Modules	
t(P)ET-P6, t(P)ET-PD6	tET-P6_tET-PD6_en.pdf
t(P)ET-A4, t(P)ET-C4	tET-A4_tET-C4_en.pdf
t(P)ET-P2A2, t(P)ET-P2C2	tET-P2A2_tET-P2C2_en.pdf
Digital Input Modules/Relay Output	
t(P)ET-P2POR2, t(P)ET-PD2POR2	tET-P2POR2_tET-PD2POR2_en.pdf
t(P)ET-P2R2, t(P)ET-PD2R1	tET-P2R2_tET-PD2R1_en.pdf

2.3 Dimensions

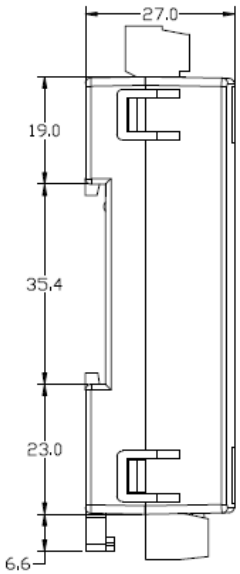
➢ The dimensions of tET/tPET series are in millimeters.



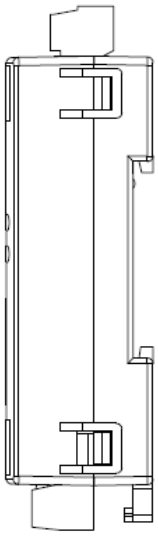
Front View



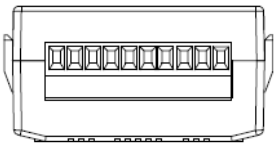
Rear View



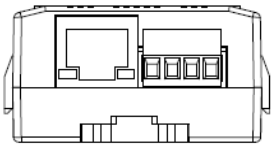
Left Side View



Right Side View



Top View



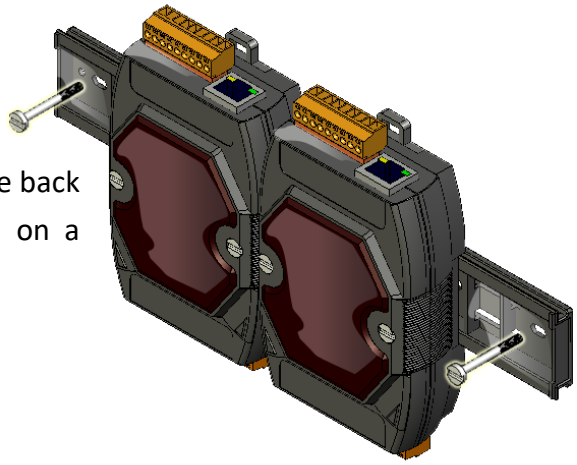
Bottom View

3 Getting Started

This chapter provides a basic overview of how to install, configure and operate your tET/tPET series module.

3.1 Mounting the Module

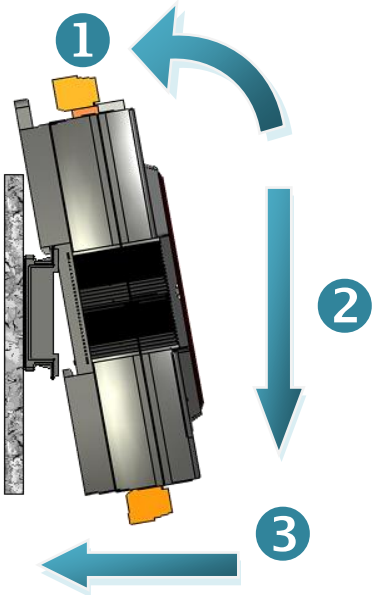
The tET/tPET series module can be mounted by attaching the back of the chassis to a standard 35 mm DIN-Rail.



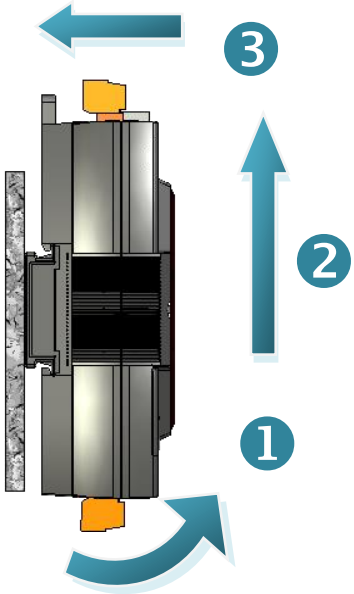
DIN-Rail Mounting

The tET/tPET series modules include simple rail clips on the back of the chassis that allow them to be reliably mounted on a DIN-Rail.

Mounting on a DIN-Rail

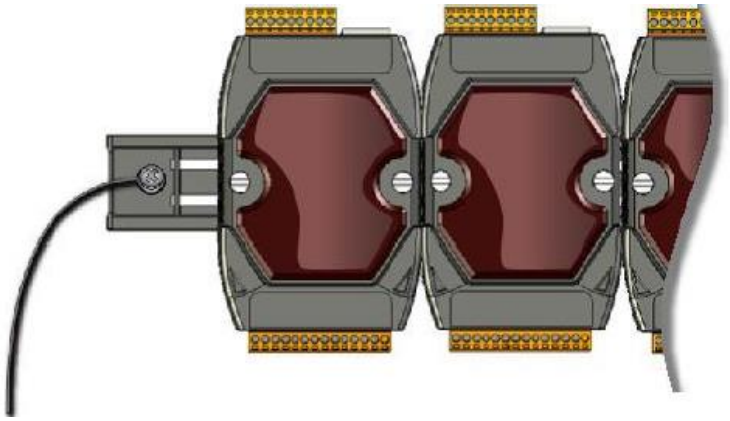


Dismounting from a DIN-Rail



Mountable DIN-Rail Models

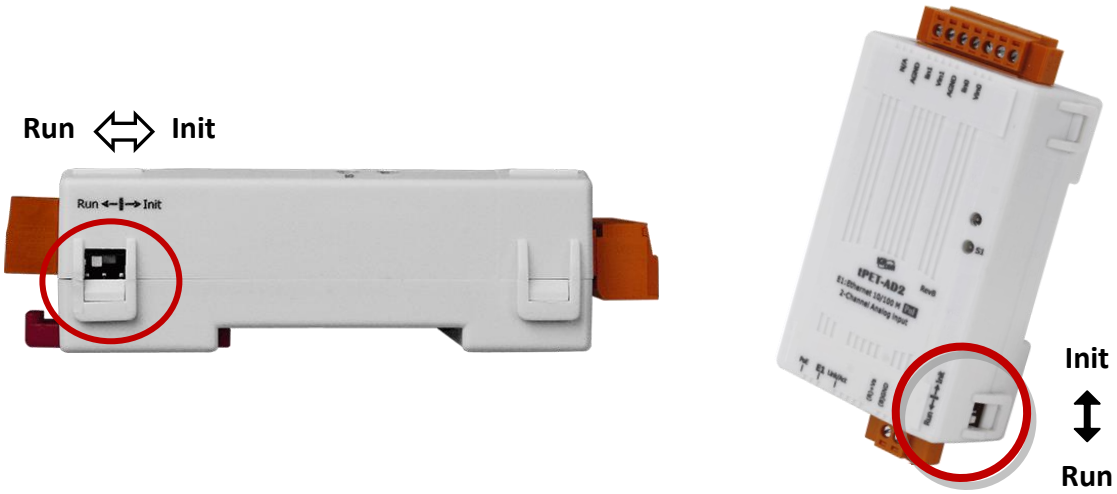
Din-Rail mounts are available in three sizes, and enable a variety of ICP DAS devices to be mounted. Each is made of stainless steel and has a ground wire attached at one end.



Part Number	Maximum Number of Modules	Dimensions
DRS-125	2	125 mm x 35 mm
DRS-240	3	240 mm x 35 mm
DRS-360	5	360 mm x 35 mm

3.2 Configuring the Operating Mode

All tET/tPET series modules feature two operating modes, which can be selected by adjusting the switch on the module. **Note that it is necessary to reboot the module after modifying the operating mode.**



Init Mode

The Init Mode should be chosen when updating the firmware or conducting troubleshooting. In this mode, the configurations of the module will be forced to the default factory settings.

Run Mode

The Run Mode is the default operating mode and should be used in most cases.

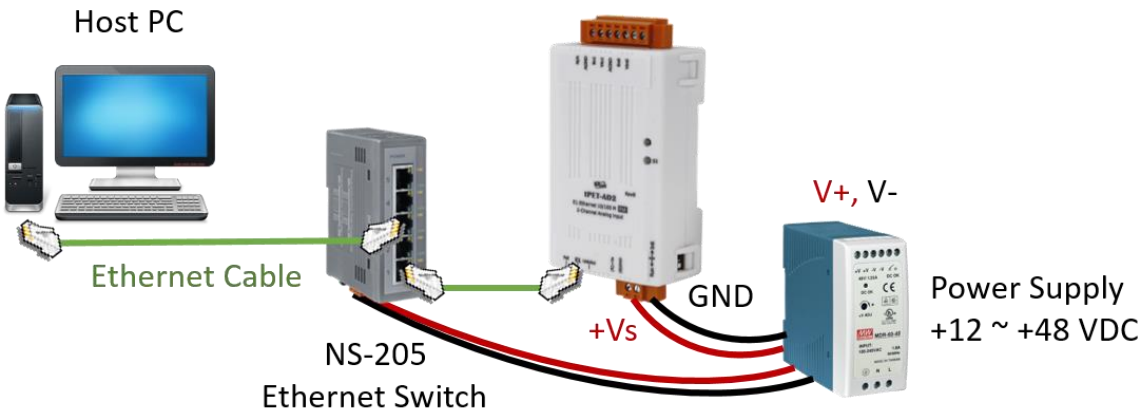
Note

1. **After updating the firmware, be sure to set the switch back to the "Run" position and reboot the module.**
2. **If the user cannot log in to the module's web server or forget the password, please refer to Appendix A to restore the factory default settings.**

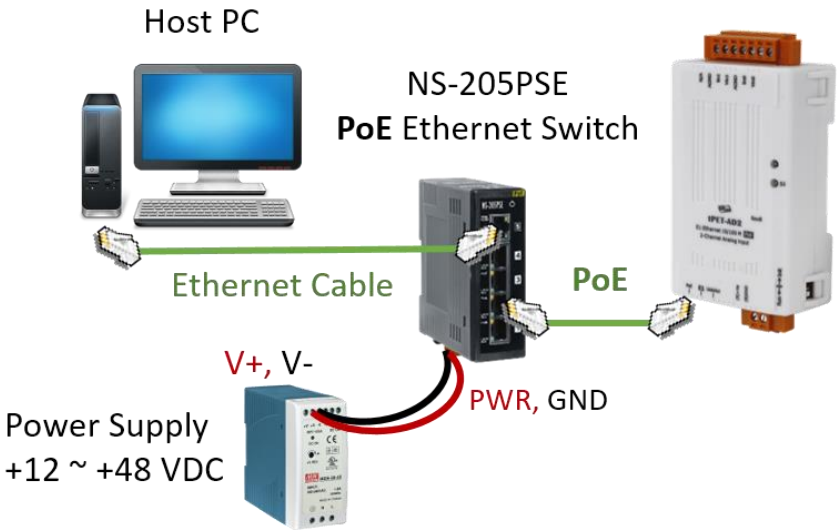
3.3 Connecting to the Network and the PC

All tET/tPET series module are equipped with an RJ-45 Ethernet port to allow connecting to an Ethernet switch/hub or a PC.

Uses Non-PoE Switch



Uses PoE Switch (for tPET only)



3.4 Configuring the Network Settings

The **eSearch Utility** is a useful tool that provides a quick and easy method of configuring the Ethernet settings for the module from a PC.

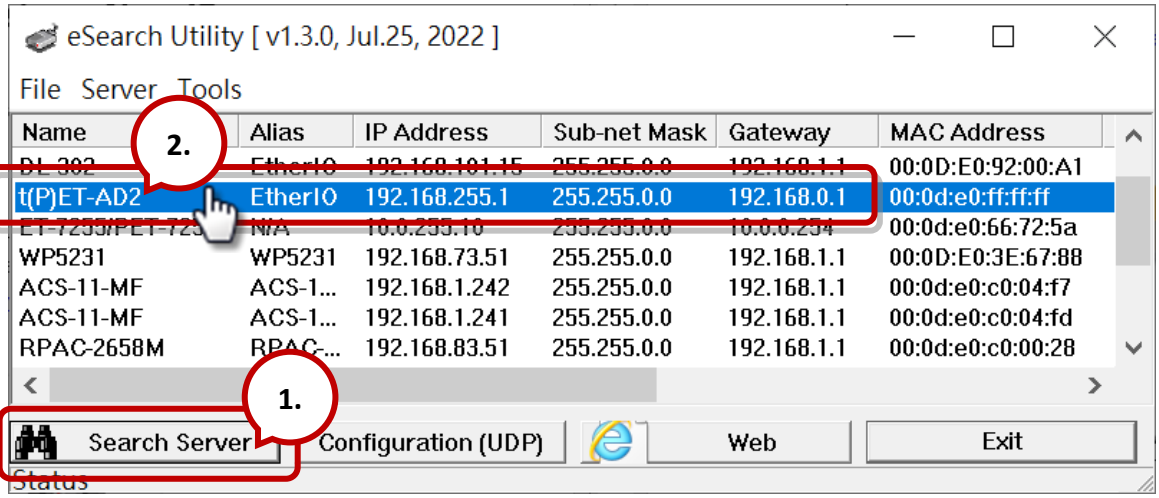
Step1. Download and install the eSearch Utility, and then open the eSearch Utility

eSearch Utility can be obtained from the ICP DAS web site at:
https://www.icpdas.com/en/download/show.php?num=1327

Step2. Click the "Search Server" button to search for your module double-click the module name to start network settings

The factory settings of the module are as follows:

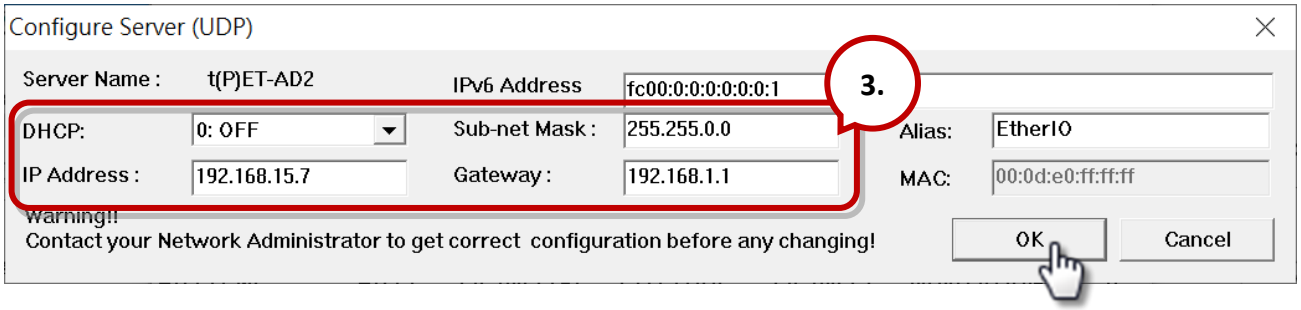
IP Address	**192.168.255.1**	**Subnet Mask**	**255.255.0.0**	**Gateway**	**192.168.0.1**



Step3. Configure the network settings and click the "OK" button

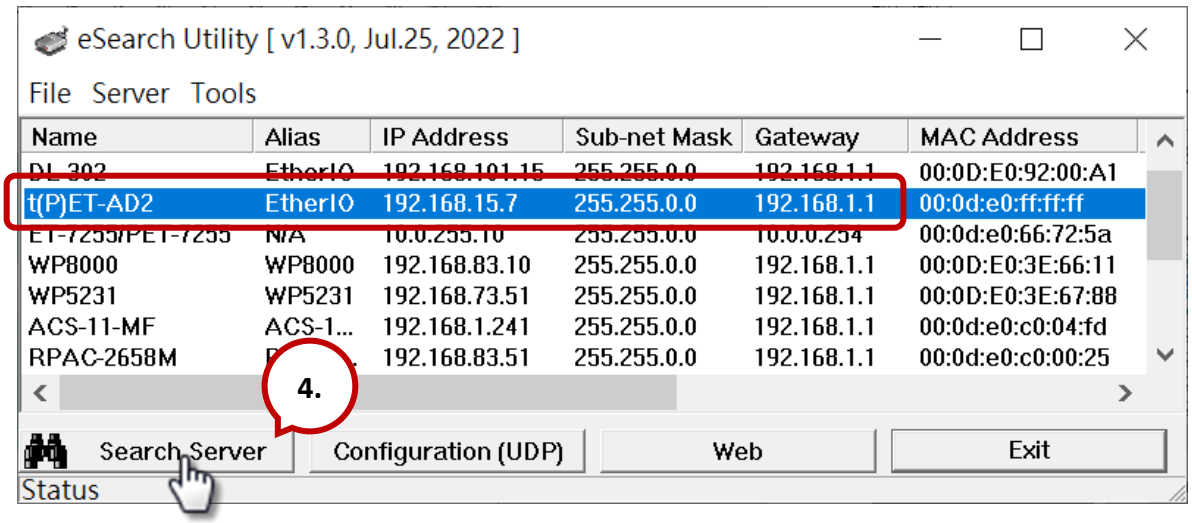
Contact your Network Administrator to obtain the correct network configuration information. Modify the network settings and click the "**OK**" button to save the changes.

Note: Make sure that the IP addresses of the PC and the module are on the same sub-network.



Step4. Search the module again and check the settings

Click the "**Search Server**" button to search the module again and check the settings are correct.



4 Web Configuration

The Ethernet I/O module has a built-in Web Server to provide an intuitive web management interface, allowing users to modify the module's settings by using a web browser.

4.1 Logging in to the Web Server

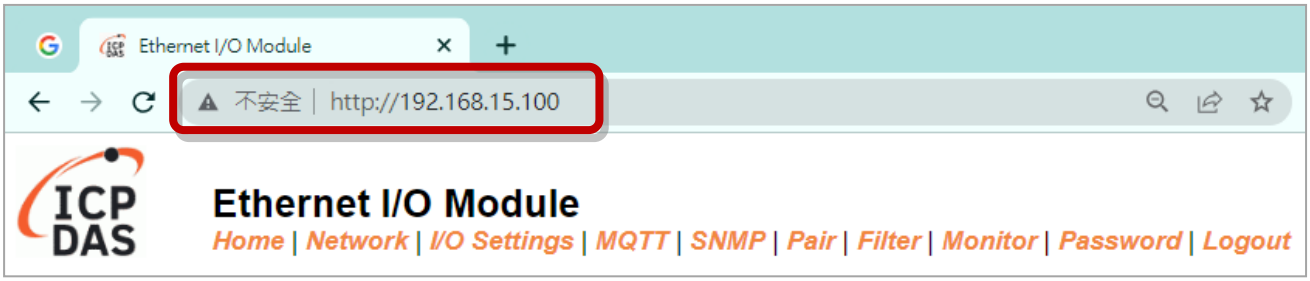
After completing the network settings, users can access the module's built-in web server from any computer that's connected to the same network. Follow these steps:

Step 1: Open a web browser

Open a standard web browser. For example, Mozilla Firefox, Google Chrome, Internet Explorer, and so on.

Step 2: Enter the IP address of the module into the address bar

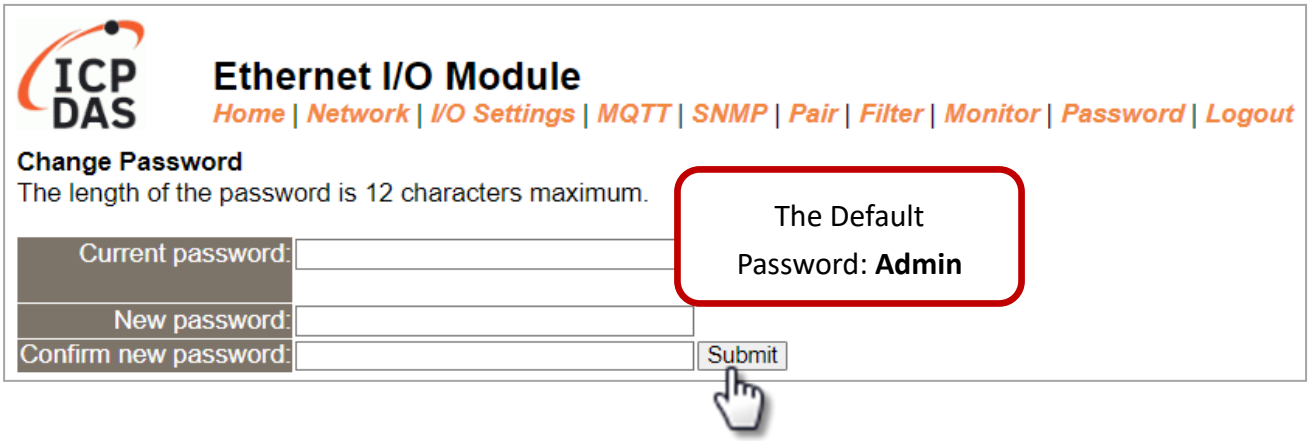
Ensure that you have correctly configured the network settings for the I/O module, or refer to Section 3.4 "Using the eSearch Utility to Assign a New IP".



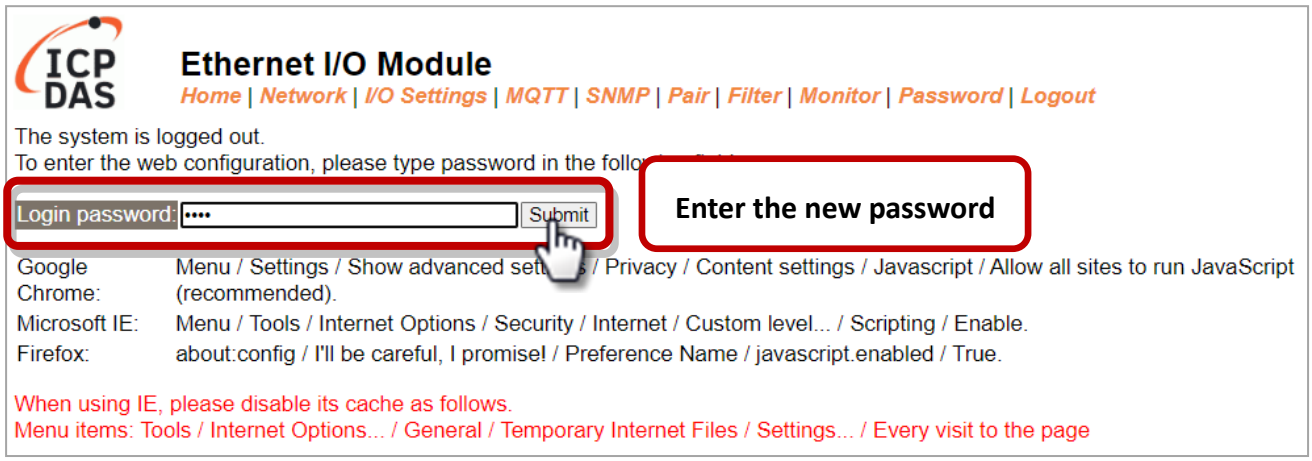
Note1: The function tab will be different depending on the I/O type of the module.
Note2: The "Sync" and "PWM" functions are only suitable for the DIO module.
Note3: The "SNMP" function is available for the tPET-AD2 and the tPET-DA2 module.

Step 3: Enter the password

For the first time to log into the web interface, the default password must be changed. Enter the factory preset password "**Admin**" and give a new password. Then, click the "**Submit**" button.



Enter the new password in the "**Login password**" field and click the "**Submit**" button to log into the web server. Also, refer the Section 4.10 "Change Password" to change the password.

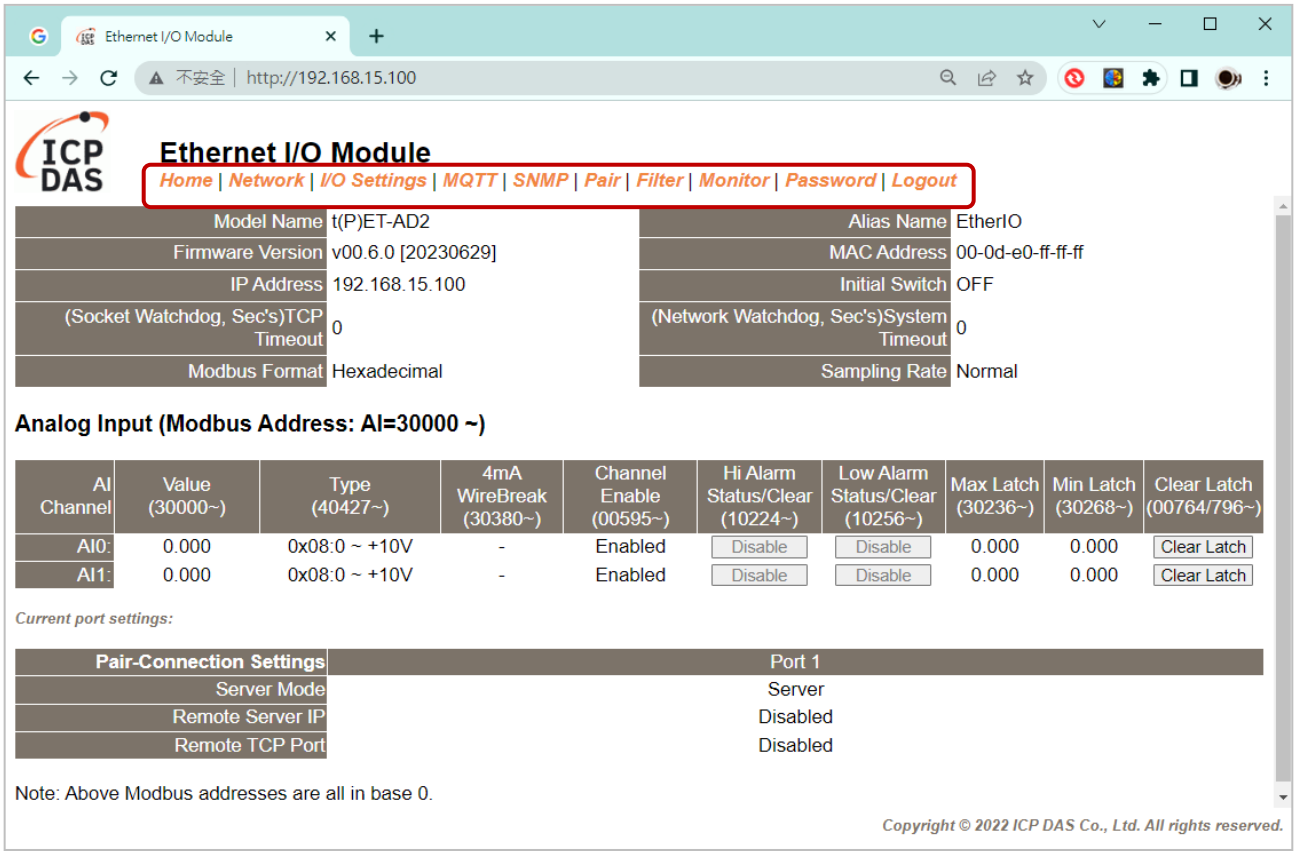


Step 4: Login to the web server

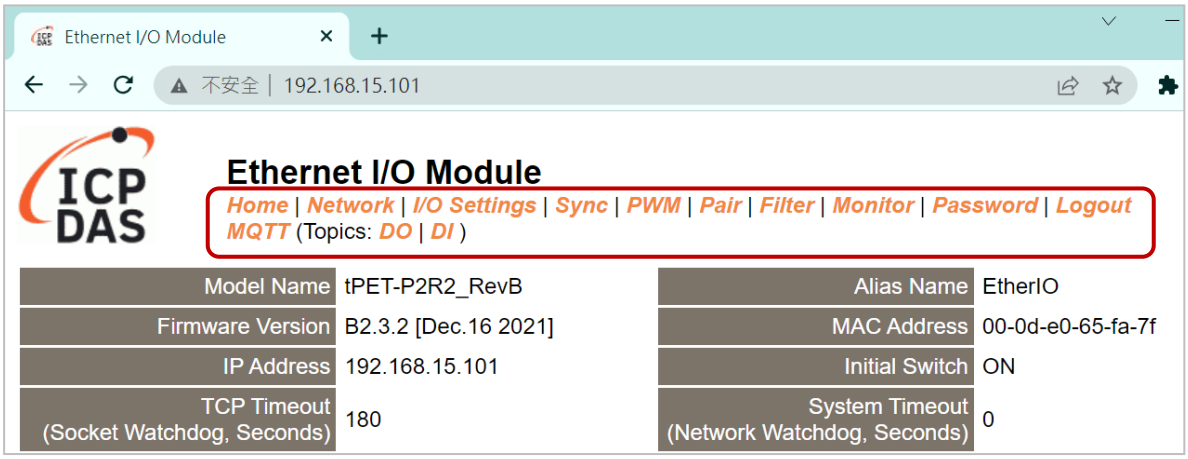
After logging into the module's web server, the **Home** page will be displayed. The function tabs will be different depending on the I/O type of the module. Refer to the screenshoots below.

For example,

Analog Input

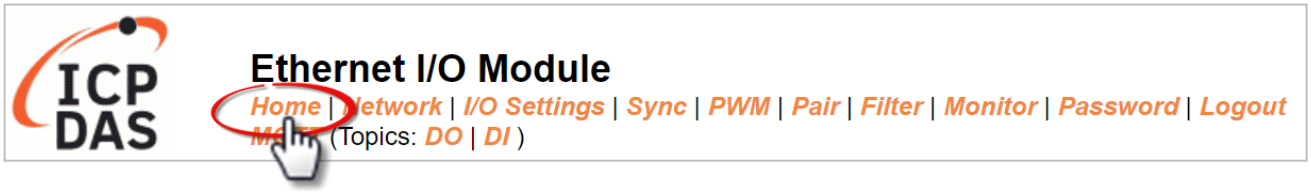


Digital Input & Output



4.2 Home

The **Home** page provides users with information about the I/O module, as detailed below.



4.2.1 Module Information

Note: After updating the firmware, the user can check the version number on this page.

Model Name	t(P)ET-AD2	Alias Name	EtherIO
Firmware Version	v00.6.0 [20230629]	MAC Address	00-0d-e0-ff-ff-ff
IP Address	192.168.15.100	Initial Switch	OFF
(Socket Watchdog, Sec's)TCP Timeout	0	(Network Watchdog, Sec's)System Timeout	0
Modbus Format	Hexadecimal	Sampling Rate	Normal

The following information that can be different according to the type of I/O module.

Items	AIO	DIO	Items	AI	AO	DIO
Model Name	O		Alias Name	O		
Firmware Version			MAC Address			
IP Address			Initial Switch			
TCP Timeout (Seconds.)			System Timeout (Seconds)			
Modbus Format	O	X	Sampling Rate	O	X	X
			Host Timeout (Safe value, Seconds)	X	O	

4.2.2 I/O Information

The following information allows users to view the status of I/O and Pair-Connection. All items will be different according to the type of I/O module.

Analog Input

Used to display AI information such as the value, type, wiring, channel, also clear the alarm or latch.

Analog Input (Modbus Address: AI=30000 ~)

AI Channel	Value (30000~)	Type (40427~)	4mA WireBreak (30380~)	Channel Enable (00595~)	Hi Alarm Status/Clear (10224~)	Low Alarm Status/Clear (10256~)	Max Latch (30236~)	Min Latch (30268~)	Clear Latch (00764/796~)
AI0:	0.000	0x08:0 ~ +10V	-	Enabled	Disable	Disable	0.000	0.000	Clear Latch
AI1:	0.000	0x08:0 ~ +10V	-	Enabled	Disable	Disable	0.000	0.000	Clear Latch

Digital Input & Digital Output

Used to display the status of the DI, or control the DO status.

Digital I/O (Modbus Address: DO=00000 to 00015, DI=10000 to 10015)

DO7 DO6 DO5 DO4 DO3 DO2 DO1 DO0

DI Channel	Value (10000)	Counter (30016) / Frequency (30064)	High Latched (10032)	Low Latched (10064)
DI0:		-	-	-
DI1:		-	-	-

Analog Output

Used to display the type, read value, power-on value, safe value, slew rate, and the status of the wiring, or set the AO value.

Analog Output (Modbus Address: AO=40000 to 40007.)

AO Channel	Type (40459~466)	AO Read (40000~007)	AO Write (40000~007)	Submit Value	Wire Break (10290)
AO0:	0x32:0 ~ +10V	4.000	0.000	Set Value	-
AO1:	0x32:0 ~ +10V	4.000	0.000	Set Value	-

AO Channel	Power On Value (40360~367)	Safe Value (40392~399)	Slew Rate (40523~530)		
AO0:	4.000	4.000	0x00:Immediate		
AO1:	4.000	4.000	0x00:Immediate		

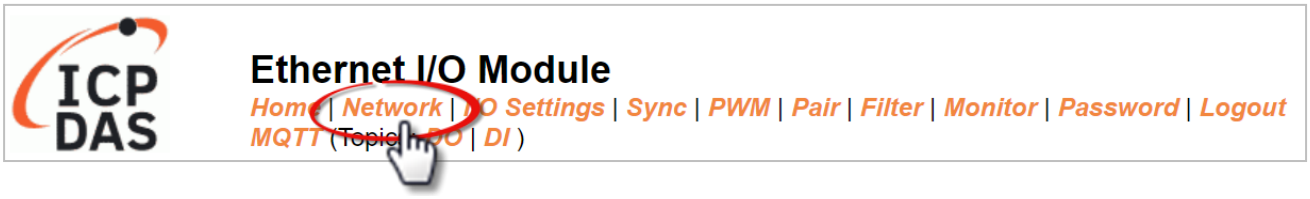
Pair-Connection

Used to display the module is in Server/Client mode or the IP address and the TCP port of the remote devide.

Current port settings:

Pair-Connection Settings	Port 1
Server Mode	Server
Remote Server IP	Disabled
Remote TCP Port	Disabled

4.3 Network



The **Network** page offers three sections, which will be described in the following chapters:

1. **IP Address:**
   Used to configure the network IP, Gateway, and MAC addresses for the module.
2. **General Settings:**
   Used to configure network settings such as the Ethernet speed, system timeout, TCP timeout, etc.
3. **Other Operations:**
   Used to restore all module settings to the factory presets, reboot the module, or update the firmware remotely.

4.3.1 IP Address

IP Address

IPv4 Address	
Address Type	Static IP
Static IPv4 Address	192 . 168 . 15 . 101
Subnet Mask	255 . 255 . 0 . 0
Default Gateway	192 . 168 . 1 . 1
MAC Address	00-0d-e0-65-fa-7f (Format: FF-FF-FF-FF-FF-FF)
IPv6 Address	
Link Local Address	fe80:0:0:0:20d:e0ff:fe65:fa7f
SLAAC Address	0:0:0:0:0:0:0:0
SLAAC Timeout (SLAAC Watchdog)	0 (30 ~ 65000 seconds, 0 = Default Disabled)
User-defined Address	fc00:0:0:0:0:0:0:1
DNS Settings	**Client Mode Only**
Auto DNS Configuration	Enable (Auto DNS Server Configuration by IPv4 DHCP. Default = Enable)
Preferred DNS Server IP	208.67.222.222 IPv4 example: 208.67.222.222, IPv6 example: 2620:119:35::35
Alternate DNS Server IP	208.67.220.220 IPv4 example: 208.67.220.220, IPv6 example: 2620:119:53::53
Modbus TCP Slave	
Local Modbus TCP port	502 (Default= 502)
Local Modbus NetID	1 (Default= 1)
Check Modbus NetID	Enable (Process messages with correct NetID only. Default = Enable)
Update Settings	

The following table provides parameter notes for the **IP Address** section:

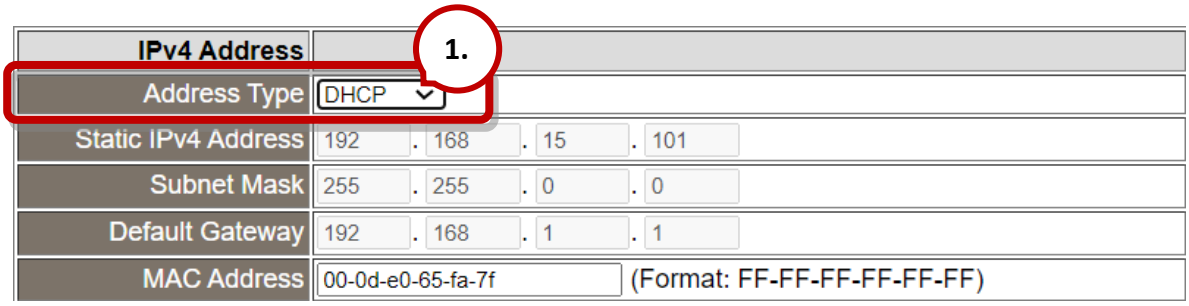
Item	Description
IPv4 Address	
Address Type	**Static IP:** If there is no DHCP server, you can manually assign a static IP address to the module. See "Manual Configuration" section for details.
	DHCP: The IP address can be automatically assigned through a DHCP server. When the module restarts, the IP address may be changed. See "Dynamic Configuration" section for details.
Static IPv4 Address	Used to set the IP address. Each module connected to the network must have a unique IP address.
Subnet Mask	Used to set the subnet mask address. The subnet mask indicates which part of the IP address is designated as the local network or subnet.
Default Gateway	Used to set the gateway address. A Gateway (or router) is a device that is used to connect an individual network to one or more additional networks.
MAC Address	Used to set the User-defined MAC address, which must be in the format FF-FF-FF-FF-FF-FF.
IPv6 Address	
Link Local Address	Each IPv6 device connected to the network must have a link-local address. The address is auto-configured by the module and is always effective in the same link layer.
SLAAC Address	The module supports Stateless Address Auto-configuration (SLAAC), which is automatically configured by a router. The default is the router's link-local address.
SLAAC Timeout (SLAAC Watchdog)	Used to set the timeout value of SLAAC. If SLAAC address is not configured within the specified time, the system will reboot and attempt to configure SLAAC address again.
User-defined Address	Used to set the module's IP address. Each module connected to the network must have a unique IP address.
DNS Settings	
Auto DNS Configuration	Enable: The DNS server's IP address can be automatically set through IPv4 DHCP. Disable: Automatically set to the preferred IP address of the DNS server.
Preferred DNS Server IP	Used to set the preferred IP address of the DNS Server.
Alternate DNS Server IP	Used to set the alternate IP address of the DNS Server.
Modbus TCP Slave	
Local Modbus TCP port	Used to set the local port of the Modbus Slave device. The default value is 502.
Local Modbus NetID	Used to set the Network ID of the Modbus slave device. The default value is 1.
Update Settings	Click this button to save the changes.

Dynamic Configuration

If a DHCP server is present on your network, you can dynamically configure a network address using the following procedure:

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

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

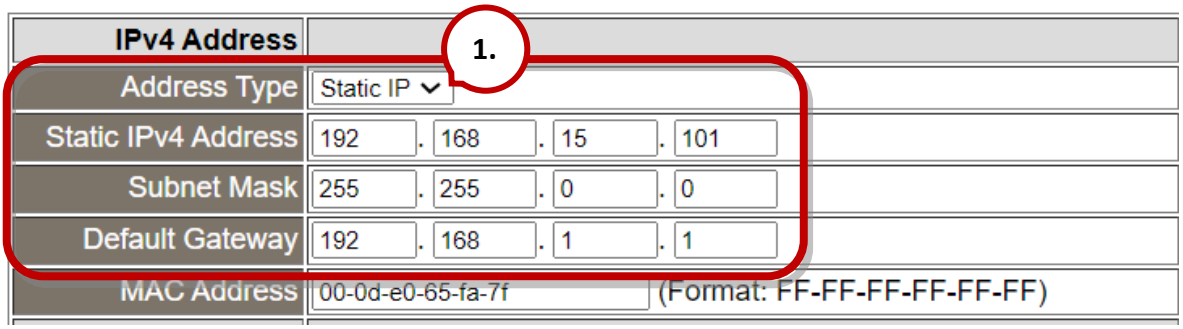


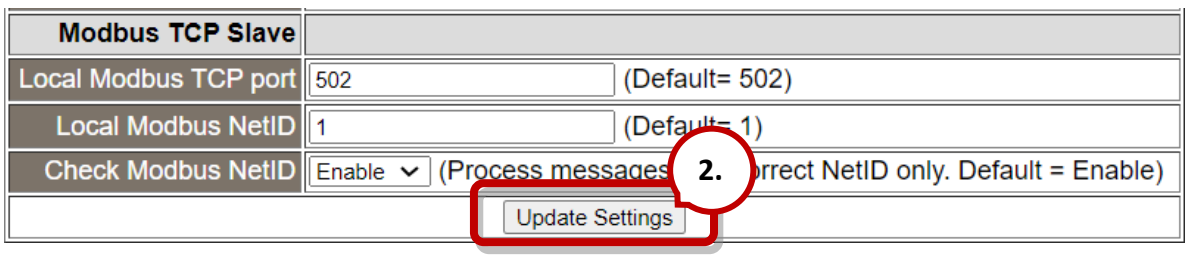
Manual Configuration

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

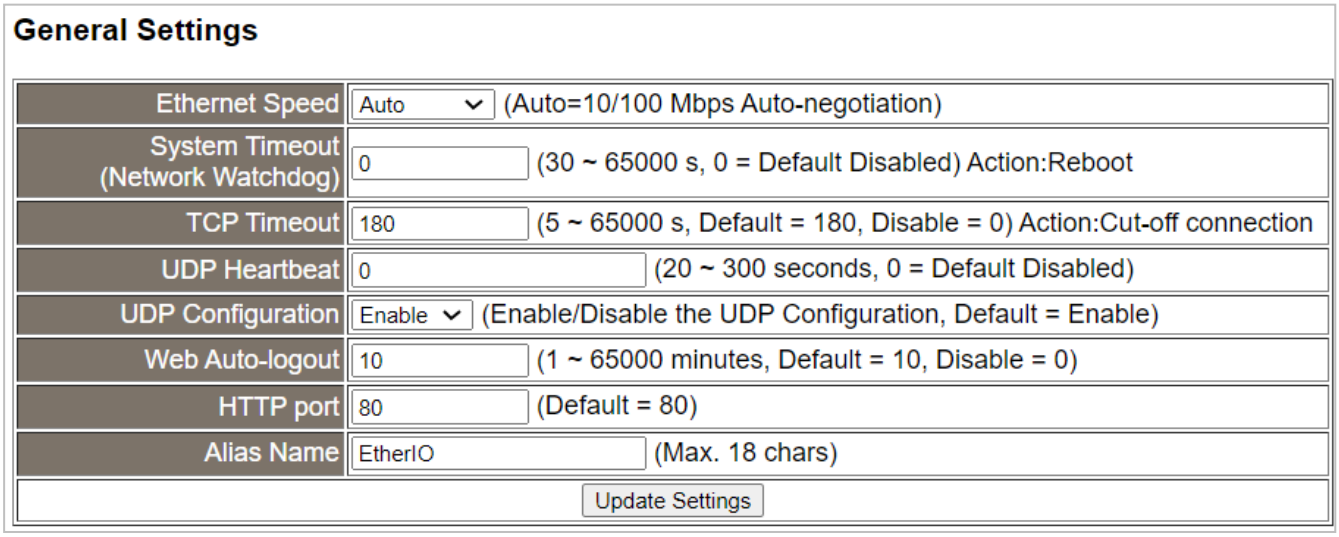
Step 1: Select **"Static IP"** from the **Address Type** drop-down menu and Enter the relevant details in the respective **network settings** fields.

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





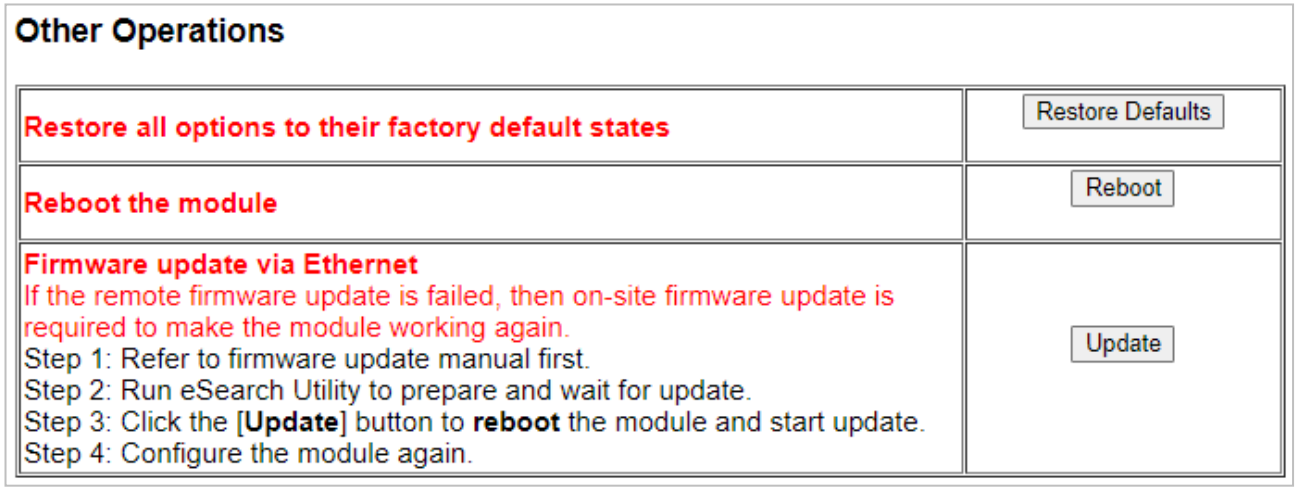
4.3.2 General Settings



The following table provides parameter notes for the **General Settings** section:

Item	Description
Ethernet Speed	Used to set the Ethernet speed. The default value is Auto (10/100 Mbps Auto-negotiation).
System Timeout (Network Watchdog)	Used to set the system timeout value. If there is no activity on the network for a certain period of time, the system will be rebooted based on the configured system timeout value.
TCP Timeout (Seconds)	Used to configure the TCP timeout value. If Modbus TCP communication is idle for a certain period of time, the system will cut off the connection.
UDP Configuration	Used to enable or disable the UDP configuration function.
Web Auto-logout	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 automatically logged out.
HTTP Port	Used to assign specific an HTTP port of the module. The module needs to be restarted when the HTTP port is changed. You need to 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” (i.e., 10.0.8.123:81).
Alias Name	Used to assign an alias name for the module to assist with easy identification.
Update Settings	Click this button to save the changes.

4.3.3 Restore Factory Defaults, Firmware Update & Reboot



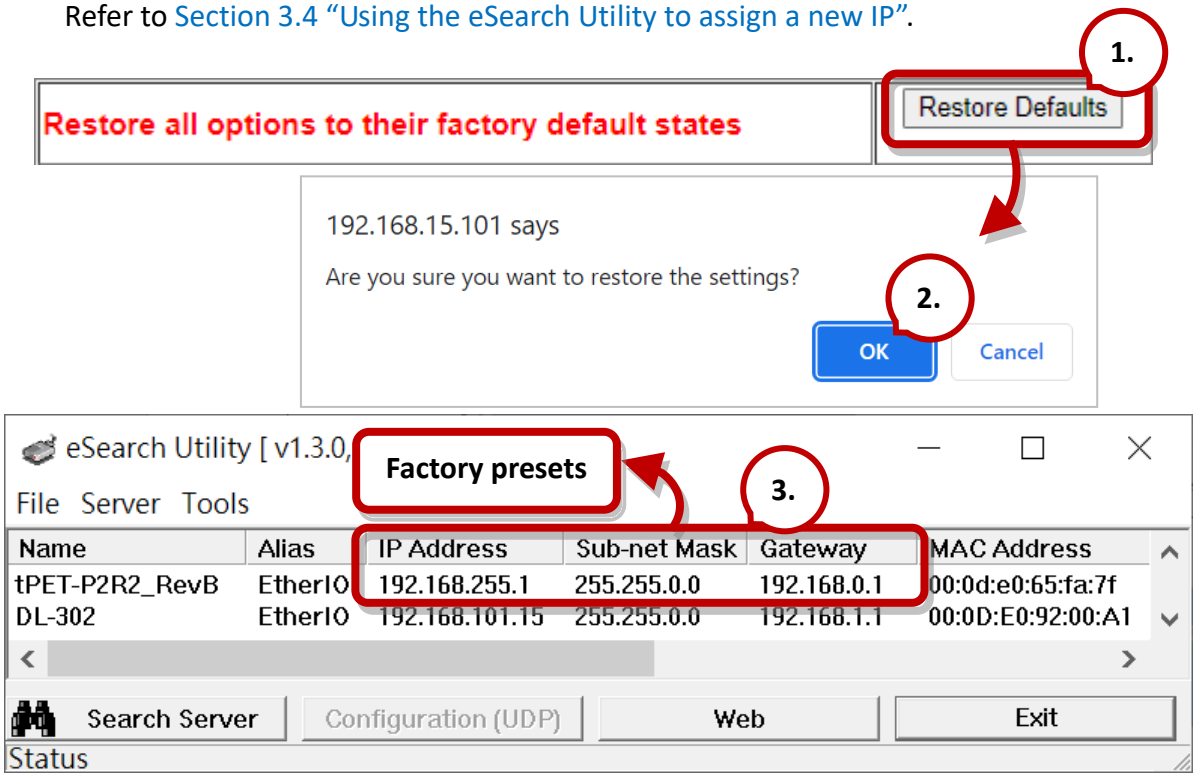
Restore all options to their factory default states

To restore all parameters of the module to their factory presets, follow the steps:

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

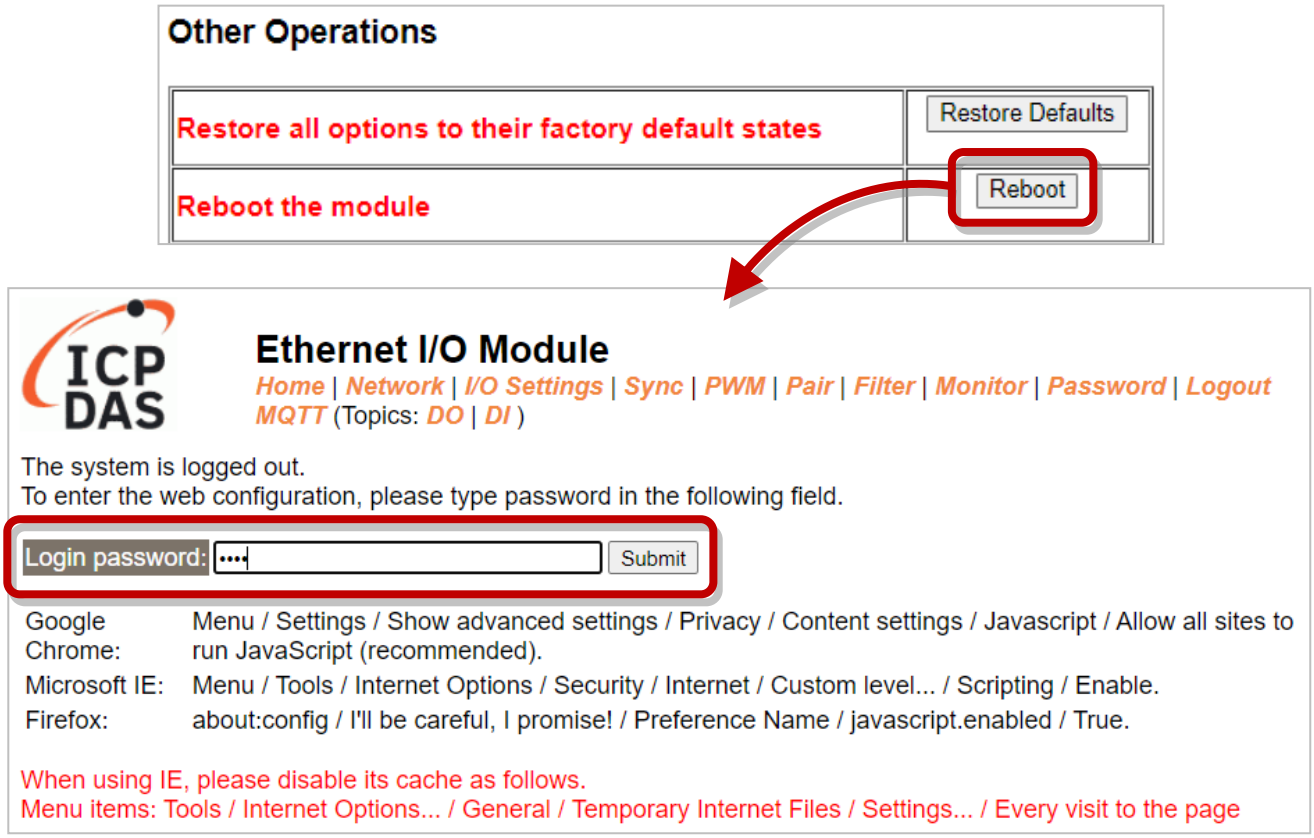
Step 2: Click the **"OK"** button in the message dialog box.

Step 3: Check whether the module has been reset to factory presets by using eSearch Utility. Refer to Section 3.4 "Using the eSearch Utility to assign a new IP".



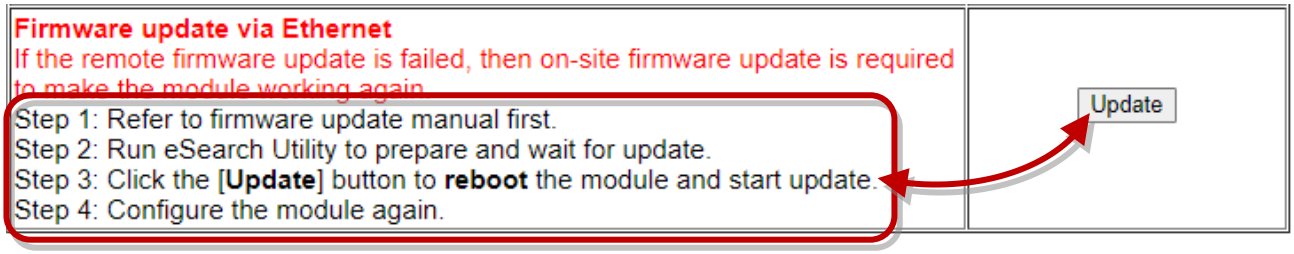
Reboot the module

The **Reboot** function can be used to remotely force the module to reboot. After that, enter the password to log into the main page.



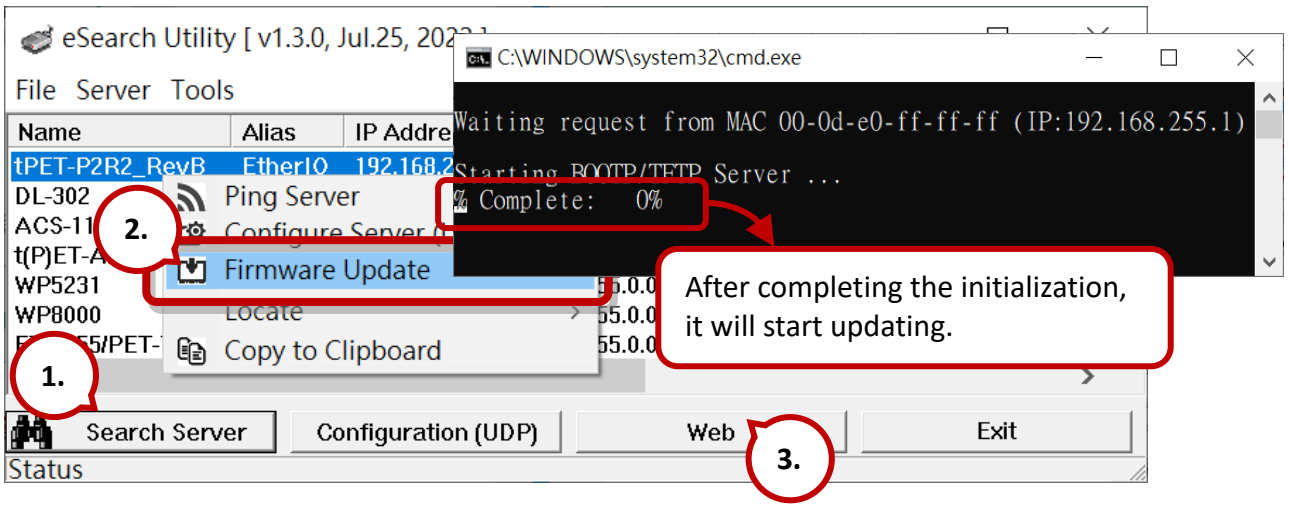
Firmware Update via Ethernet

When updating the firmware, the module requires initialization on the LAN. In the case of earlier firmware updates, users had to manually set the operating switch to "Init" and reboot the module to complete the initialization. However, with the new firmware update, users can now initiate the initialization process by clicking the "**Update**" button on the module's web interface.



1. Visit the website to download the latest firmware of the tET/tPET module. Also, refer to the "tET/tPET Firmware Update Manual" for instructions.
   https://www.icpdas.com/en/download/show.php?num=2632

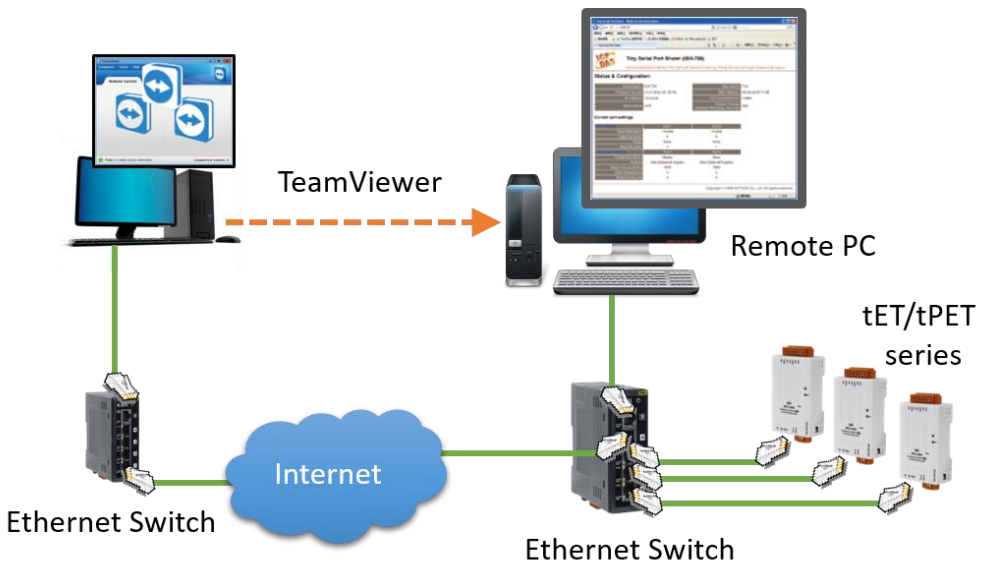
2. Run eSearch Utility to search the module and execute “Firmware Update” to start the process.



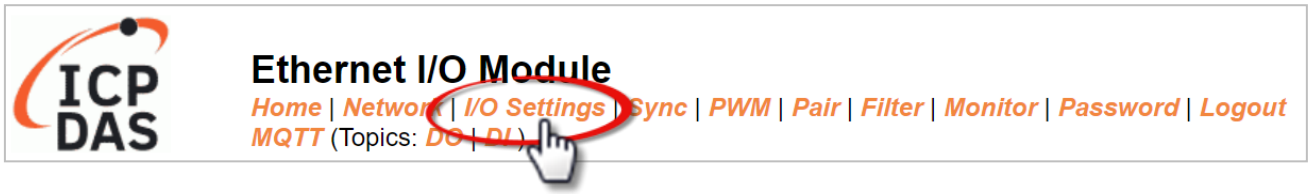
3. On the module's web interface, click the "**Update**" button to reboot the module and then start updating. Note that if the operation is unsuccessful due to the "Web Auto-logout" being enabled, simply log into the web server again.
4. After that, adjust the module’s operating switch to the “**Run**” position and reboot the module.
5. Logging into the module’s web server to verify the firmware version.

When the module is installed remotely, you can also use remote control software (such as TeamViewer) to connect to the remote PC. This allows you to initialize the module and complete the firmware update through the web interface.

Note: If the remote firmware update fails, the module might not function correctly. In such cases, please attempt the "Firmware Update" process again and manually initiate the initialization. This should restore the module to its normal state.

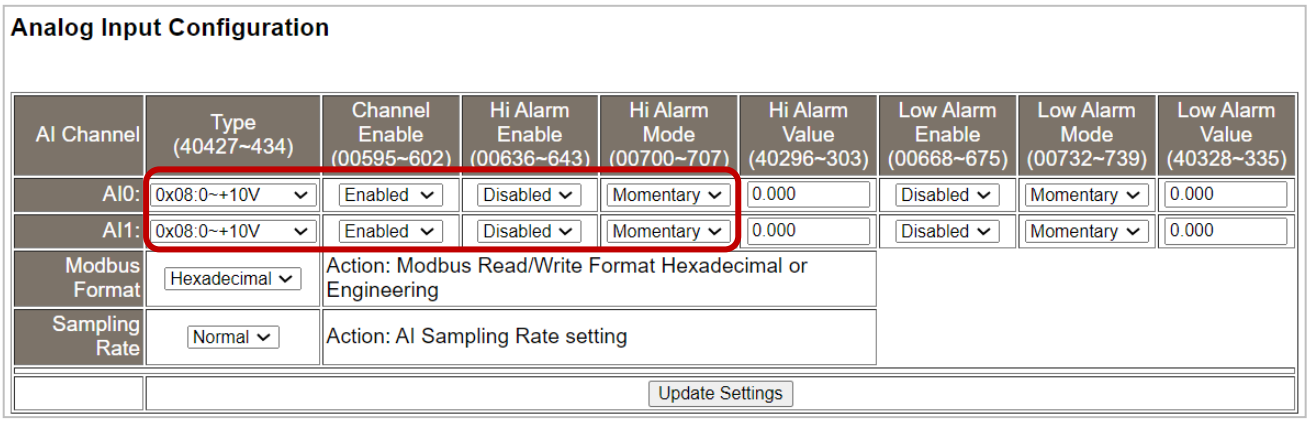


4.4 I/O Settings



The **I/O Settings** page offers sections such as **Analog Input Configuration**, **Calibration**, **DI/DO Configuration**, **DO Control**, and more, based on the I/O type. These sections enable users to configure I/O or calibration parameters. Each of these features is described as follows.

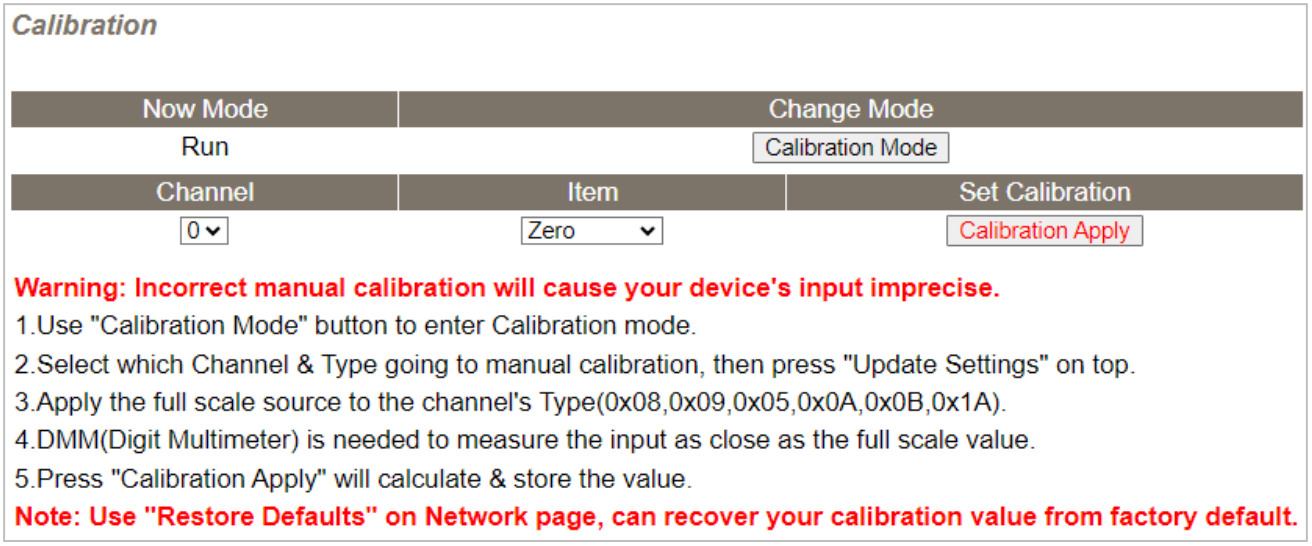
4.4.1 Analog Input Configuration



The following table provides parameter notes for the **Analog Input Configuration** section:

Item	Description
Analog Input Channel	
AI0 ~ AI1	Set the data type for each channel and whether to enable or disable it. If the alarm function is enabled and an alarm event happens. The **Momentary** mode implies that the alarm status will automatically be cleared when the AI value returns to normal. However, the **Latch** mode implies that the alarm status can only be reset by executing the Clear command.
Analog Input	
Data Format	Set the data format, e.g., Hex or Engineering.
Sampling Rates	Set the sampling rate, e.g., 20 Hz or 200 Hz.
Update Settings	Click this button to save the changes.

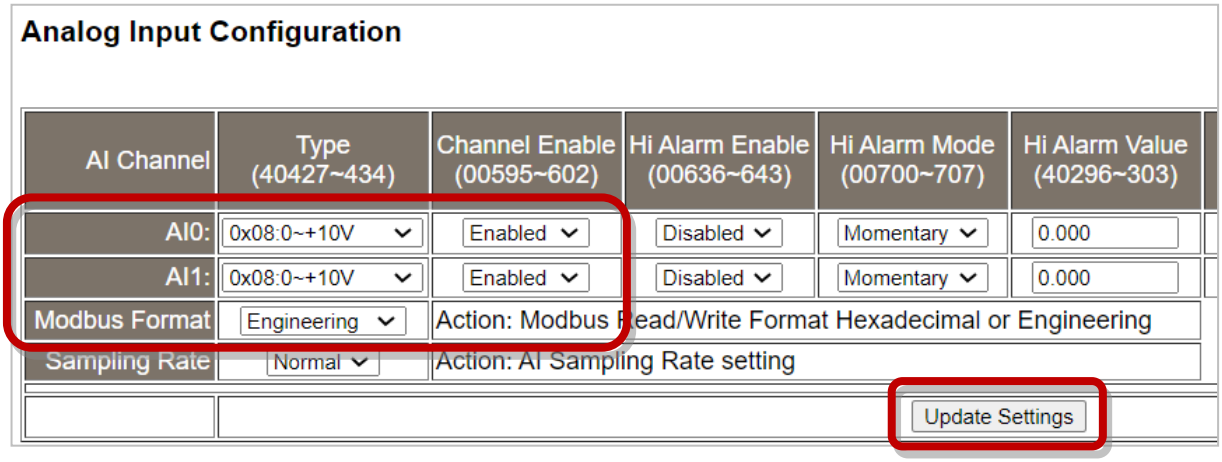
4.4.2 AI - Calibration



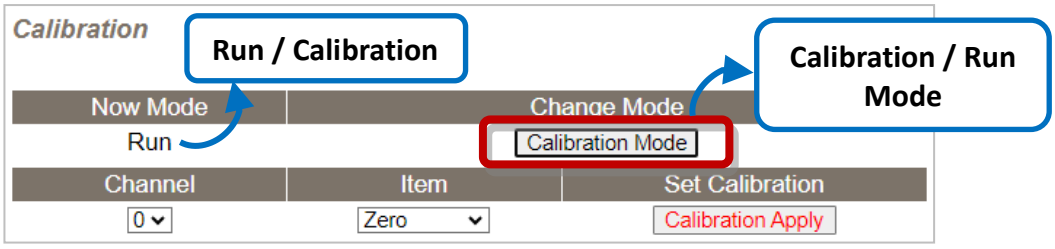
The following table provides parameter notes for the **Calibration** section:

Item	Description
Calibration	
Now Mode	Used to display the current mode
Change Mode	Click the **Calibration Mode** (or **Run Mode**) button to change the mode
Channel	Choose the AI channel for calibration
Item	Choose to use either zero calibration or span calibration
Set Calibration	Click the **Calibration Apply** button to perform calibration

Step1: In the **Analog Input Configuration** section of the **I/O Settings** page, enable the AI channel and select the type and Modbus format, then click the **Update Settings** button to save the changes.



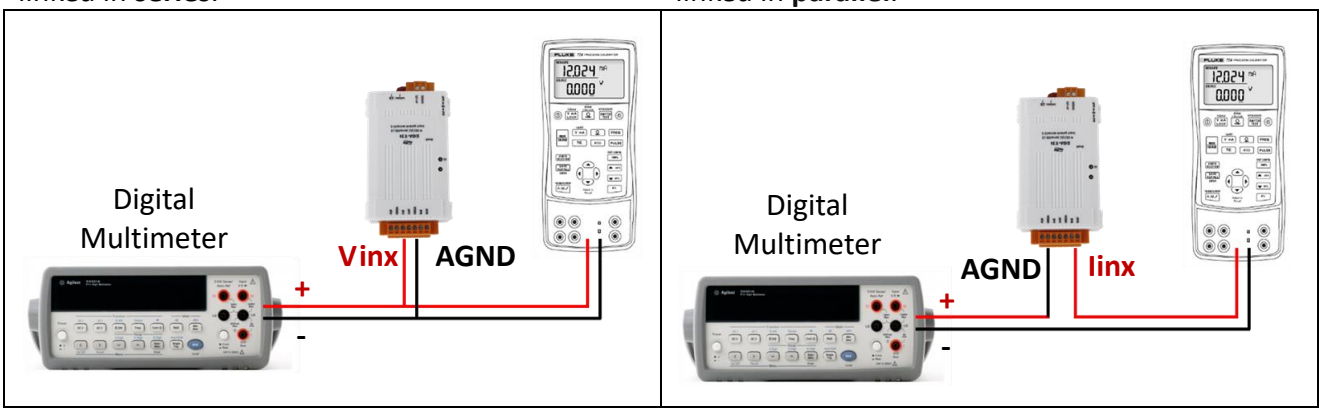
Step2: In the **Calibration** section of the **I/O Settings** page, click the **Calibration Mode** button to get into the calibration mode.

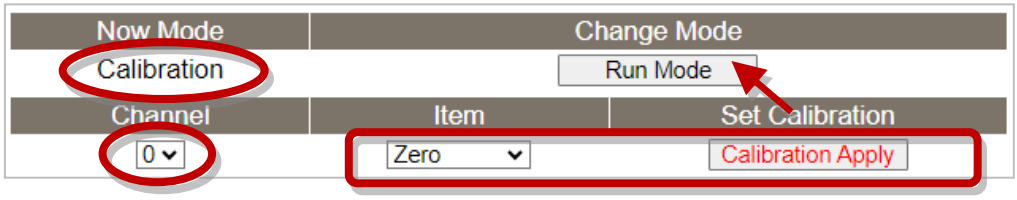


Step3: Choose a channel for calibration and link the module to a voltage source (or current source) and a multimeter. Digital Multimeter

Voltage Calibration:
The module, voltage sources, and meter are linked in **series**.

Current Calibration:
The module, current sources, and meter are linked in **parallel**.





Step4: Choose the **Zero** calibration, input voltage (or current) via a digital multimeter, and check the input value using a multimeter. Click the **Calibration Apply** button to perform the calibration.

Note: The input voltage (or current) must be as close as the min/max value. For example,

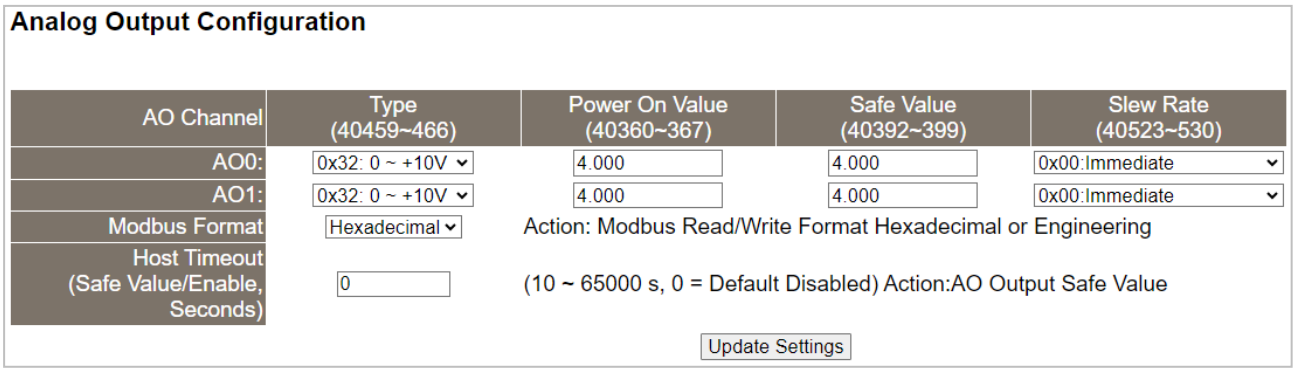
Type	**08: 0 to +10V**	**1A: 0 to +20mA**
Zero Input Value	0V	0mA
Span Input Value	10V	20mA

Step5: Follow the same way to perform **Span** calibration.

Step6: After completing the Zero and Span calibration, click the "**Run Mode**" button to back to the Run mode.

Note: The user can click the **Restore Defaults** button on the **Network** page to restore the settings to the factory defaults.

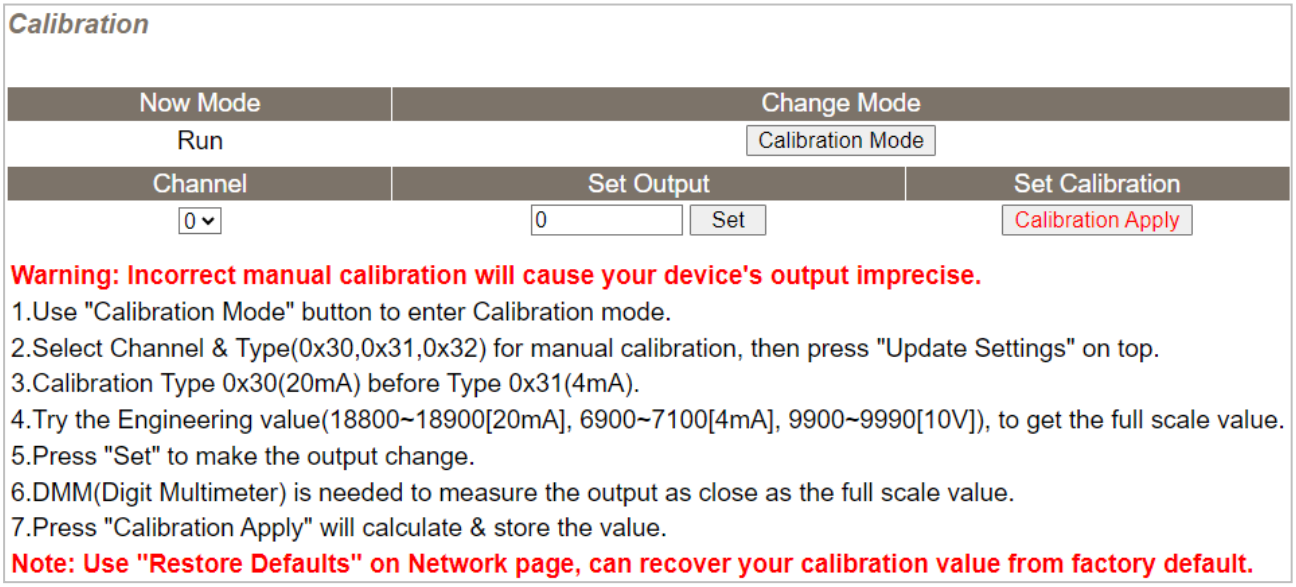
4.4.3 Analog Output Configuration



The following table provides parameter notes for the **Analog Output Configuration** section:

Item	Description
AO Channel	
AO0 ~ AO1	Set the data type, power-on value, safe value, and slew rate for each channel.
Modbus Format	Set the data format, e.g., Hex or Engineering.
Host Timeout	Set the host timeout. If there is no response within the specified time, the AO value will be set to the safe value. (0: Disabled)
Update Settings	Click this button to save the changes.

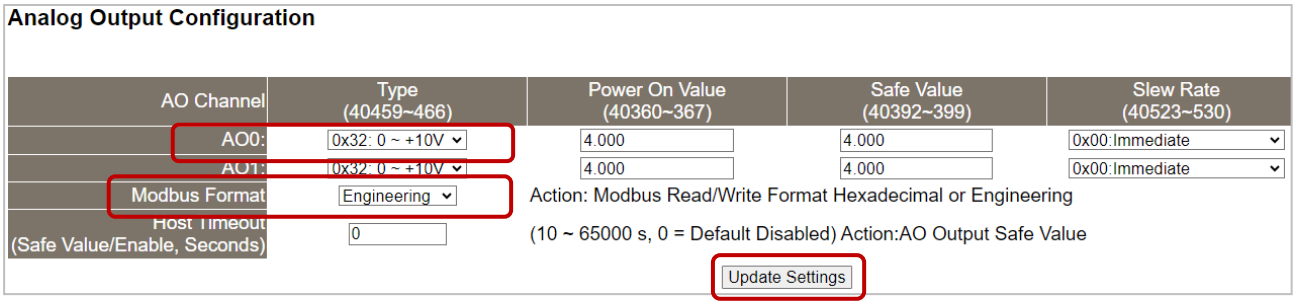
4.4.4 AO - Calibration



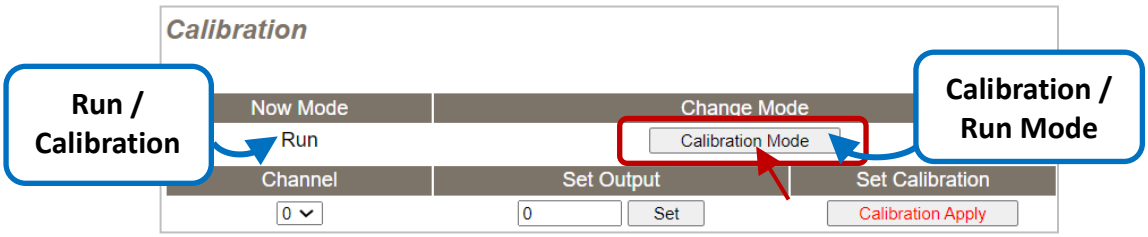
The following table provides parameter notes for the **Calibration** section:

Item	Description
Calibration	
Now Mode	Used to display the current mode
Change Mode	Click the **Calibration Mode** (or **Run Mode**) button to change the mode
Channel	Choose the AO channel for calibration
Set Output	Enter output value for the voltage/current type
Set Calibration	Click the **Calibration Apply** button to perform calibration

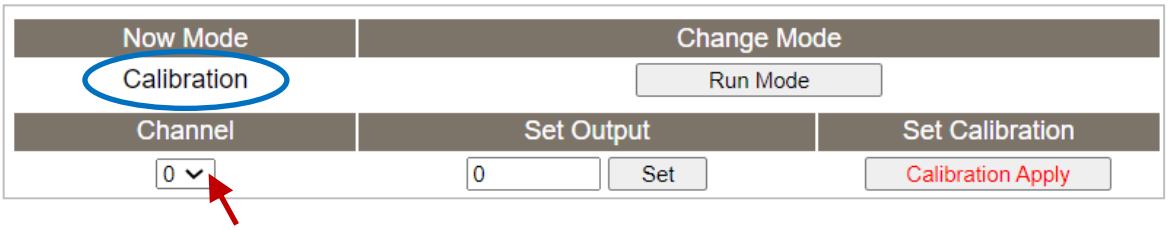
Step1: In the **Analog Output Configuration** section of the **I/O Settings** page, choose the data type and Modbus format for the selected AO channel, then click the **Update Settings** button to apply the changes.



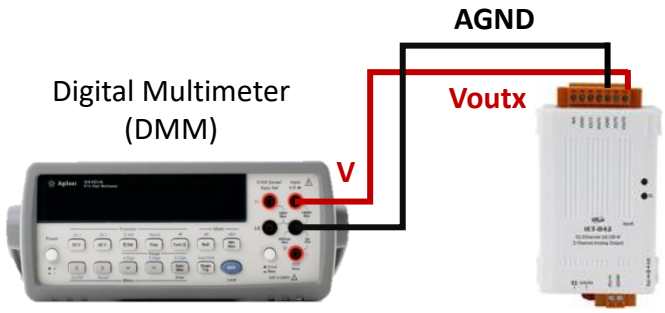
Step2: In the **Calibration** section of the **I/O Settings** page, click the **Calibration Mode** button to get into the calibration mode.



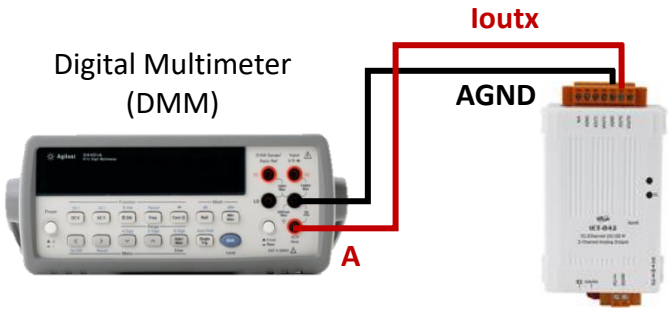
Step3: Choose a channel for calibration and link the module to the digital multimeter.



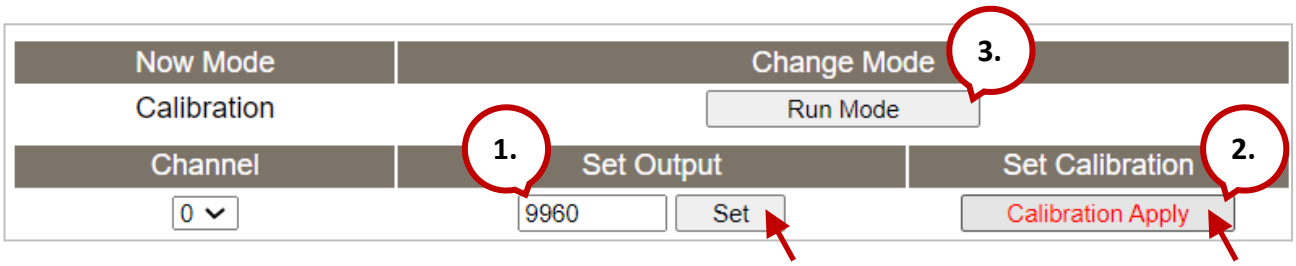
<u>Voltage Calibration</u>:
The module and digital multimeter are linked in **series**.



<u>Current Calibration</u>:
The module and digital multimeter are linked in **parallel**.



Step4: In the **Set Output** field, enter a maximum voltage (or current) value in Engineering format and click the **Set** button. Also, check the output value using a digital multimeter. Click the **Calibration Apply** button to perform the calibration.



Note: The output voltage (or current) must be very close to the full-scale value.

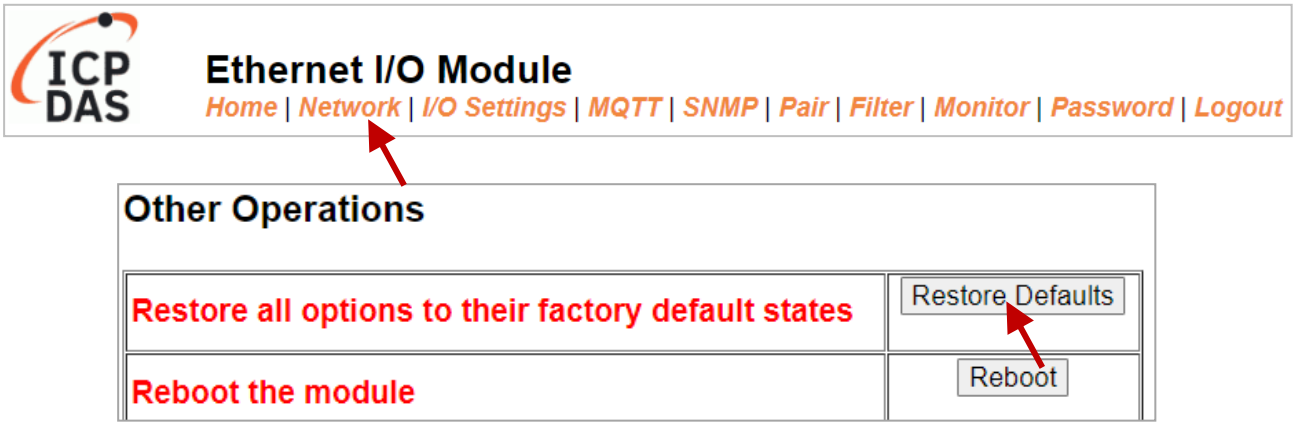
Type	+10V	+5V	4mA	20mA
Full-scale Range	9900 ~ 9990	4900 ~ 4990	6900 ~ 7100	18800 ~ 18900

For example, calibrating a 10 V output within the range of 9900 to **9990**. If the output value is set to **9990**, the voltmeter displays 10.0315V. The user can further adjust the output value (9960) to the nearest value close to 10 V, and click the **Calibration Apply** button.

Step5: After completing the calibration, click the "**Calibration (Run) Mode**" button to back to the Run mode.

Note:

If necessary, the user can click the **Restore Defaults** button on the **Network** page to restore all settings to the factory defaults.



4.4.5 DI/DO Configuration

DI/DO Configuration:

Digital Output	Modbus Address	Setting
Host/Slave Watchdog Timeout	40257	0 (10 ~ 65535 Seconds, Default= 0, Disable= 0) Outputs DO with safe-value or *PWM* when host/slave timeout.
Enable Safe Value (Enable Watchdog)	00339 - 00332	0x0 Ch 7~4( ) Ch 3~0( )
Safe Value	00274 - 00267	0x0 Ch 7~4( ) Ch 3~0( )
Power-On Value	00242 - 00235	0x0 Ch 7~4( ) Ch 3~0( )
Digital Input	**Modbus Address**	**Setting**
Enable Latched DI	00150	0 (Disable All= 0, Enable All= 1)
Clear Latched Status (High)	00032	0 (No Operation= 0, Clear All= 1)
Clear Latched Status (Low)	00033	0 (No Operation= 0, Clear All= 1)
DI Filter Level	-	0 (1 ~ 6500 ms, Default= 0, Disable= 0)
Digital Counter	**Modbus Address**	**Setting**
Enable Digital Counter	00158 - 00151	0x0 Ch 7~4( ) Ch 3~0( )
Clear Digital Counter	00041 - 00034	0x0 Ch 7~4( ) Ch 3~0( )
Preset Counter Value	40065 - 40050	Ch 07: 0 Ch 06: 0 Ch 05: 0 Ch 04: 0 Ch 03: 0 Ch 02: 0 Ch 01: 0 Ch 00: 0
Frequency Measurement (DI)	**Modbus Address**	**Setting**
Enable Frequency Measurement	00197 - 00190	0x0 Ch 7~4( ) Ch 3~0( )
Scan Mode	40150	Single pulse 1000 ms: 1 Hz ~ 3 kHz (+/- 1 Hz error). 100 ms: 100 Hz to 3 kHz (+/- 10 Hz error). Single-pulse: 0.01 Hz ~ 1 Hz (+/- 0.01 Hz error), for stable signal only. Note: ET-2254P supports counter/frequency up-to 2.5 kHz.
Moving Average	40200	1
Universal DIO	**Modbus Address**	**Setting**
Force DI/DO Mode	00299 00307 - 00300	Dynamic Static: By configuration. Dynamic: Depends on DO requests. 0xff00 Ch 7~4( ) Ch 3~0( ) (0=DO, 1=DI; for ET-2254 Only)
		Update Settings

The following table provides parameter notes for the **DI/DO Configuration** section:

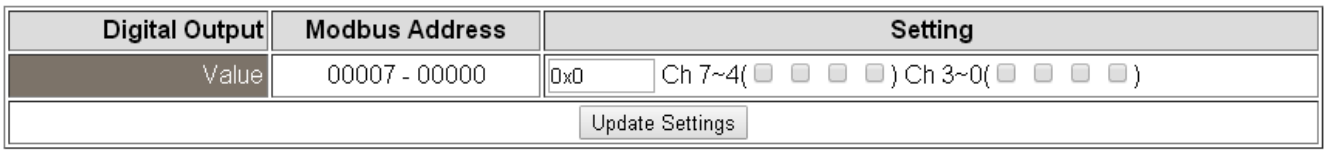
Item	Description
Digital Output	
Host/Slave Watchdog Timeout	Used to configure the Host Watchdog timeout value. If there is no Modbus TCP communication activity for the specified period (the timeout), then the Host Watchdog will activate an alarm.
Enable Safe Value (Enable Watchdog)	Used to enable the watchdog on each DO channels.

Safe Value	Used to define the DO safe value for the module. If the Host Watchdog alarm is activated, the DO will be set to the user-defined safe value.
Power-On Value	Used to define the DO Power-on value. On boot up, the DO is set to the user-defined Power-on value.
Digital Input	
Enable Latched DI	This parameter is used to enable the latch function on all DI channels. The status of the DI will be recorded if it has been flagged as either high or low. 0 = Disable All; 1 = Enable All
Clear Latched Status (High)	Used to clear the status of all high latched DI. 0 = No Operation; 1 = Clear All
Clear Latched Status (Low)	Used to clear the status of all low latched DI. 0 = No Operation; 1= Clear All
DI Filter Level	The DI filter eliminates high-frequency noise from the input and can be adjusted in a range of 1 to 6500 (ms). 0 = Disable (Default). Refer to "FAQ: What is Digital-Input Filter (DI Filter)" for more information.
Digital Counter	
Enable Digital Counter	Used to enable the digital counter on each DI channels.
Clear Digital Counter	Used to clear the values of each DI counters.
Preset Counter Value	Used to set the default value for each DI counters.
Frequency Measurement by DI	
Enable Frequency Measurement	Used to enable the frequency measurement function on each DI channels.
Scan Mode	Used to define the scan mode for the frequency measurement. **1000 ms:** It features standard update speed and standard accuracy. The acceptable frequency range for the input signal is 1 Hz to 3.5 kHz (± 1 Hz error). This mode can be used when the pulse width (signal source) contains small errors, since the measurement is based on the pulse count. **100 ms:** It features fast update speed and low accuracy. The acceptable frequency range for the input signal is 100 Hz to 3.5 kHz (± 10 Hz error). This mode can be used when the pulse width (signal source) contains small errors, since the measurement is based on the pulse count. **Single-pulse:** It is only used for stable signals and features high accuracy. The data update rate depends on the signal frequency and the acceptable signal frequency range for the input signal is 0.01 Hz to 3.5 kHz (± 0.01 Hz error). This mode can only be used when the pulse width (signal source) is stable, since the measurement is based on the width of a single pulse.

Moving Average	1 ==> No Average is used 2 ==>Uses the average of 2 continuous sample values 4 ==>Uses the average of 4 continuous sample values 8 ==>Uses the average of 8 continuous sample values
Universal DIO	
Force DI/DO Mode	**Dynamic:** Dynamic I/O types based on DO request. **Static:** Static I/O type by configuration (web or Modbus).  Used to set the Universal DIO channels to DI or DO Port. 1 ==> DI; 0 ==> DO
Update Settings	Click this button to save the changes.

4.4.6 DO Control

DO Control



The following table provides parameter notes for the **DO Control** section:

Item	Description
Set DO value	Used to manually assign a specific a value for the DO.
Update Settings	Click this button to save the changes.

4.5 Sync

On the **Sync** page, the **DIO Synchronization** section enables users to synchronize DI/DO signals, set the minimum DO switching time, and specify the DO auto-off time on the module. Each of these features will be described in more detail below.

4.5.1 DIO Synchronization

DIO Synchronization

Synchronous DIO (Local Mirror)	Modbus Address	Setting
Level Sync (DO=DI)	00403 - 00396	0x0 CH7-CH4: ☐ ☐ ☐ ☐ CH3-CH0: ☐ ☐ ☐ ☐ Set the DO state to the same as the DI state.
Rising Active (DO=ON)	00419 - 00412	0x0 CH7-CH4: ☐ ☐ ☐ ☐ CH3-CH0: ☐ ☐ ☐ ☐ Turn ON DO when DI is changed from OFF to ON.
Falling Active (DO=ON)	00435 - 00428	0x0 CH7-CH4: ☐ ☐ ☐ ☐ CH3-CH0: ☐ ☐ ☐ ☐ Turn ON DO when DI is changed from ON to OFF.
Additional Controls	**Modbus Address**	**Setting**
Min-Switching Time of DO (0 to 65535 Seconds)	40283 - 40268	DO 15: 0 DO 14: 0 DO 13: 0 DO 12: 0 DO 11: 0 DO 10: 0 DO 09: 0 DO 08: 0 DO 07: 0 DO 06: 0 DO 05: 0 DO 04: 0 DO 03: 0 DO 02: 0 DO 01: 0 DO 00: 0
Auto-off Time of DO (0 to 65535 Seconds)	40299 - 40284	DO 15: 0 DO 14: 0 DO 13: 0 DO 12: 0 DO 11: 0 DO 10: 0 DO 09: 0 DO 08: 0 DO 07: 0 DO 06: 0 DO 05: 0 DO 04: 0 DO 03: 0 DO 02: 0 DO 01: 0 DO 00: 0
Update Settings		

The following table provides parameter notes for the **DIO Synchronization** section:

Item	Description
Synchronous DIO (Local Mirror)	
Level Sync (DO = DI)	Used to enable DIO synchronization function (DO and DI synchronization).
Rising Active (DO = ON)	Used to enable rising active in Digital Input function. When the specified DI state changed from OFF to ON, the corresponding DO will be set to ON.
Falling Active (DO = ON)	Used to enable falling active in Digital Input function. When the specified DI state changed from ON to OFF, the corresponding DO will be set to ON.
Additional Controls	
Min-Switch Time of DO (0 to 65535 Seconds)	Used to set the minimum switching time between the ON and OFF state of the Digital Output. This protects some machines from being damaged by too many ON/OFF switches in a short time.
Auto-off Time of DO (0 to 65535 Seconds)	Used to set the auto-off time of the Digital Output. If the Digital Output is ON, the Digital Output will be auto-off based on the configured time value.
Update Settings	Click this button to save the changes.

4.6 PWM

On the **PWM** page, the **PWM Configuration** section allows users to enable and configure the PWM parameters for the DO module. The details are as follows.

Note: The module with Relay functionality (see Product Information) is not suitable for prolonged use of PWM (Pulse Width Modulation) due to its inherent characteristics

4.6.1 PWM Configuration

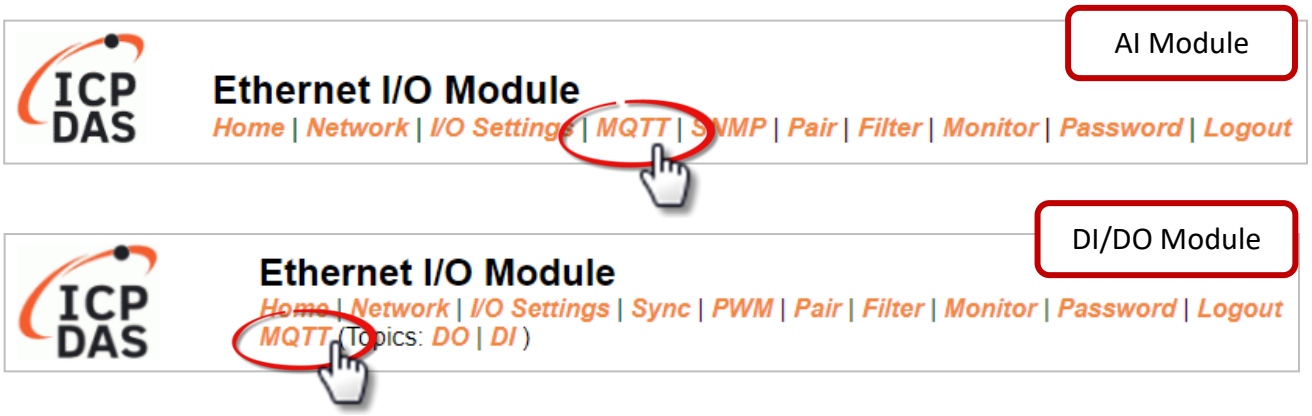
PWM Configuration:

PWM Functions	Modbus Address	Setting
Enable PWM	00107 - 00100	0x0 Ch 7~4( ) Ch 3~0( )
Enable PWM Alarm	00371 - 00364	0x0 Ch 7~4( ) Ch 3~0( ) (Activates the PWM outputs when Host/Slave Watchdog Timeout)
Duty Cycle	40115 - 40100	DO 07: (0 , 0) DO 06: (0 , 0) DO 05: (0 , 0) DO 04: (0 , 0) DO 03: (0 , 0) DO 02: (0 , 0) DO 01: (1000 , 1000) DO 00: (1000 , 1000) (High, Low: 10 ~ 65535 ms, 0= Disable)
Update Settings		

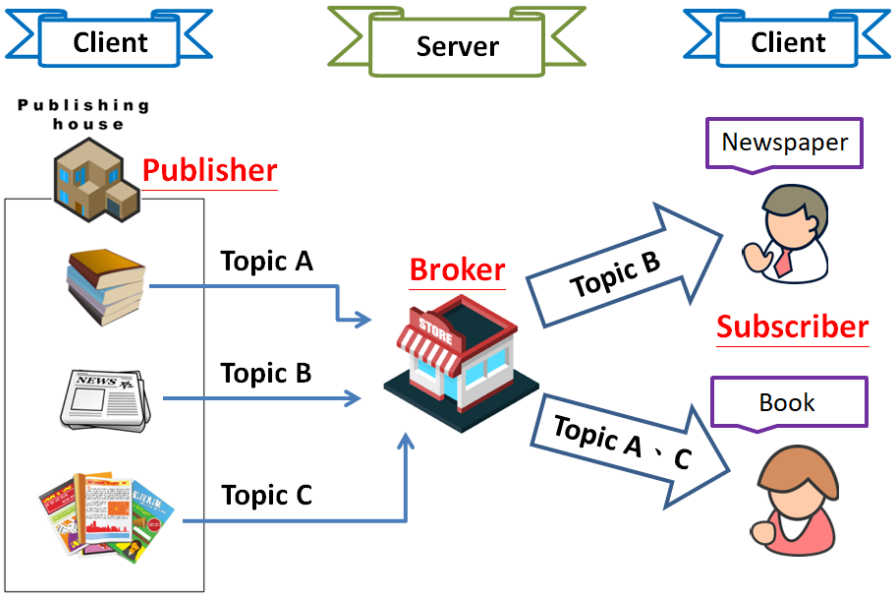
The following table provides parameter notes for the **PWM Configuration** section:

Item	Description	Defaults
Enable PWM	Used to enable the PWM output function.	0
Enable PWM Alarm	Used to enable the PWM output alarm function.	0
Duty Cycle	Two values are required for each DO channel. The first value is the high pulse width, while the second is the low pulse width. The duty cycle is in 1 ms units, and the resolution is approximately 5 ms. (5 to 65535 ms). A value of 0 will disable the duty cycle functions for that channel. Refer to "FAQ: Can tET/tPET Modules achieve a PWM Output Accuracy of less than 1 ms" for more information.	1000 (ms)
Update Settings	Click this button to save the changes.	

4.7 MQTT



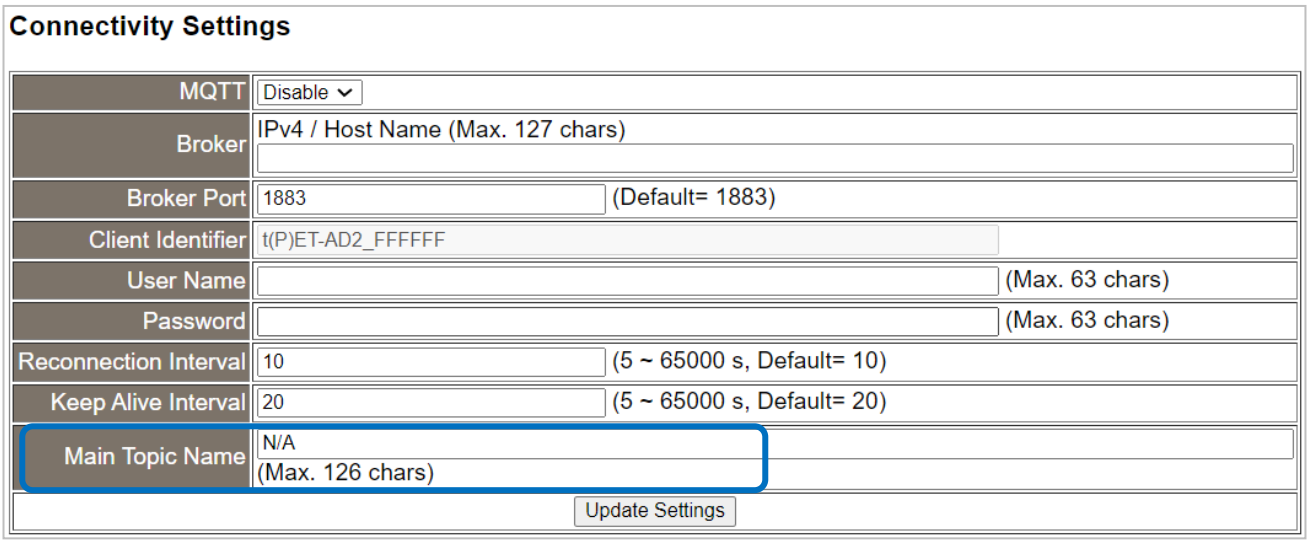
The MQTT architecture mainly consists of a server (Broker) and clients (Clients). Each MQTT Client requires a unique identifier, and the MQTT Broker identifies users based on these identifiers and records their status, such as subscribed topics and communication quality. Clicking on the **MQTT** tab opens the MQTT settings page.



MQTT is a protocol consisting of a Publish/Subscribe mechanism where the Client only needs to know the IP address of the Broker. The Publisher is responsible for sending topic messages, while the Subscriber is responsible for receiving new messages from the Broker. The Broker then acts as a central location to handle the sending and receiving of all messages between a Publisher and a Subscriber.

When the Publisher updates a message related to a specific topic, it is transmitted to the Broker, which will then send the message to all Subscribers that have subscribed to that particular topic. Neither the Publisher nor the Subscriber needs to know the status of the other.

4.7.1 Connectivity Settings

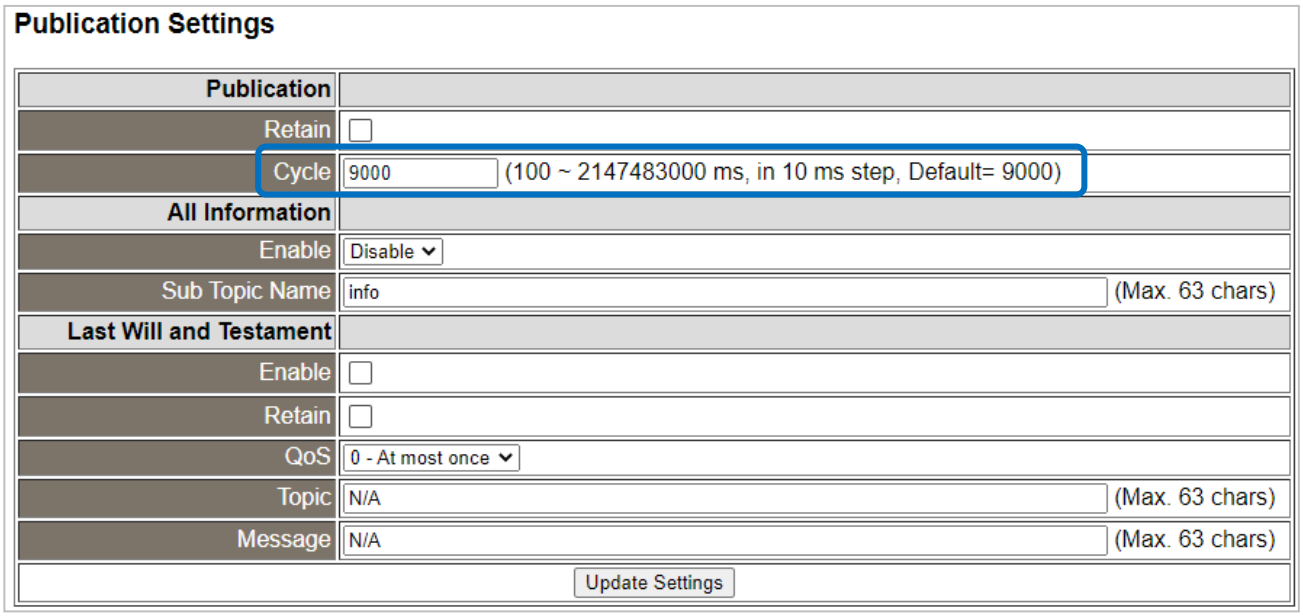


The following table provides parameter notes for the **Connectivity Settings** section:

Item	Description	Defaults
MQTT	Enables or Disables the MQTT connection function.	Disabled
Broker	The IP address or the Hostname for the MQTT broker.	N/A
Broker Port	The port number for the MQTT broker.	1883
Client Identifier	The client identifier uniquely identifies the MQTT client to the MQTT broker, and consists of the “module name”+ “_” (underscore character) + “the last 6 digits of the MAC address” and cannot be changed.	-
User Name	This parameter is used when the MQTT broker requires authentication. The length should be no more than 63 characters.	N/A
Password	This parameter is used when the MQTT broker requires authentication. The length should be no more than 63 characters.	N/A
Reconnection Interval	The time interval between attempts by the module to connect to the broker if a connection failure occurs. The valid range is 5 to 65000 seconds	10(s)

Item	Description	Defaults
Keep Alive Interval	The keep-alive mechanism is provided to ensure that both the client and the broker are alive and the connection is still open. If a Client doesn't send any messages during the Keep Alive period, it must send a PINGREQ packet to the broker to confirm its availability. The broker must reply with a PINGRESP packet to also indicate its availability. The broker will disconnect a client, which doesn't send a PINGREQ packet or any other message within one and a half times of the Keep Alive Interval. The valid range is 5 to 65000 seconds.	20(s)
Main Topic Name	The Topic Name is a combination of the Main Topic Name and the Sub Topic Name. The Main Topic Name can be empty. The same part of the Topic Names can be entered in the Main Topic Name field to improve the processing efficiency of all Topic Names. A shorter Topic Name also improves processing efficiency.	N/A
Update Setting	Click this button to save the changes.	

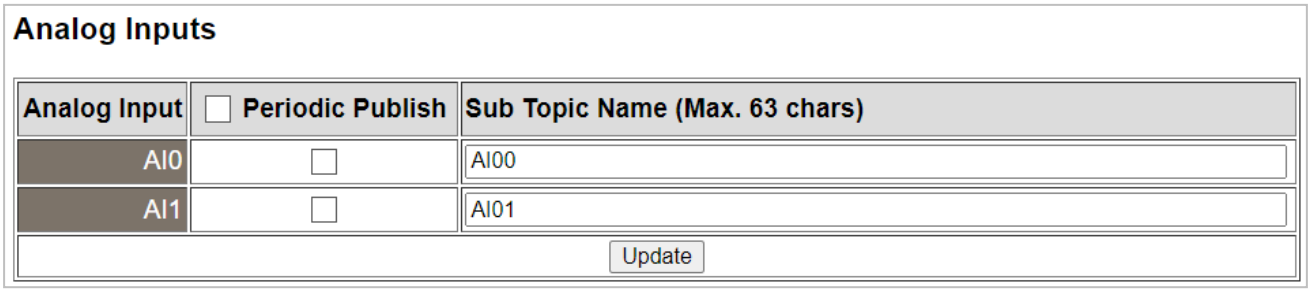
4.7.2 Publication Settings



The following table provides parameter notes for the **Publication Settings** section:

Item	Description	Defaults
Publication		
Retain	Check this option to ensure that the message is retained once it is published.	Disabled
Cycle	The time interval that the module periodically publishes data. The valid range is 100 to 2147483000 milliseconds in intervals of 10 milliseconds.	9000(ms)
All Information		
Enable	This option is used to enable or disable the All Information function. All Information adopts Periodic Publish, which includes the Module Name, the MAC address, AI values. The publishing period depends on the Cycle setting.	Disabled
Sub Topic Name	The Topic Name is a combination of the Main Topic Name and the Sub Topic Name. A shorter Topic Name improves processing efficiency.	info
Last Will and Testament		
Enable	Check this option to enable the Last Will and Testament function.	Disabled
Retain	Check this option to ensure that the Last Will and Testament message is retained once it is published.	Disabled
QoS	The QoS for the Last Will and Testament message.	0- At most once
Topic	The Topic Name for the last will and Testament message. The length should be no more than 63 characters	N/A
Message	The Last Will and Testament message. The length should be no more than 63 characters.	N/A
Update Setting	Click this button to save the changes.	

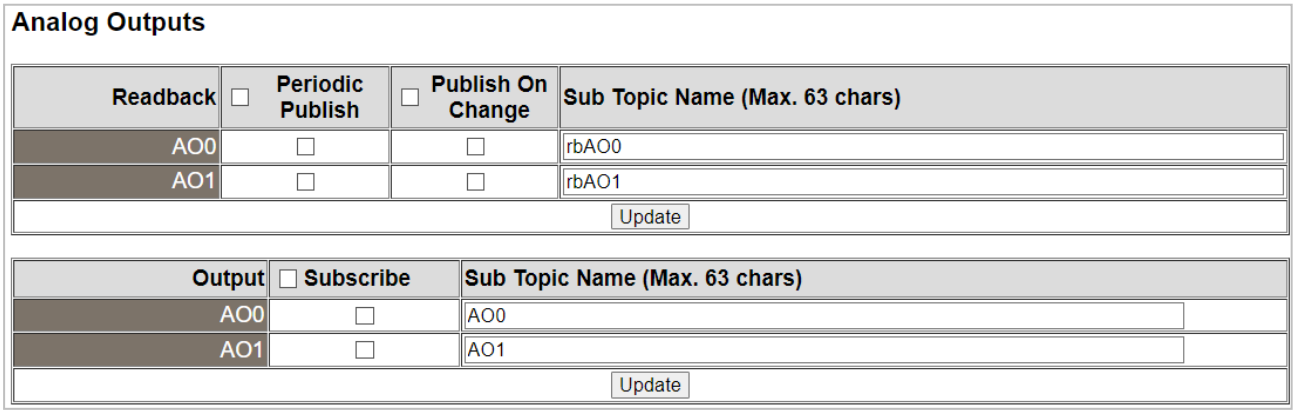
4.7.3 Analog Inputs



The following table provides parameter notes for the **Analog Inputs** section:

Item	Description	Defaults
Analog Input		
Periodic Publish	To enable or disable the Periodic Publish function. The publishing period depends on the Cycle settings. Choose the check-box to enable the function on AI channels.	Disabled
Sub Topic Name	The Topic Name is a combination of the Main Topic Name and the Sub Topic Name. A shorter Topic Name improves processing efficiency.	Corresponding AI
Update	Click this button to save the changes.	

4.7.4 Analog Outputs

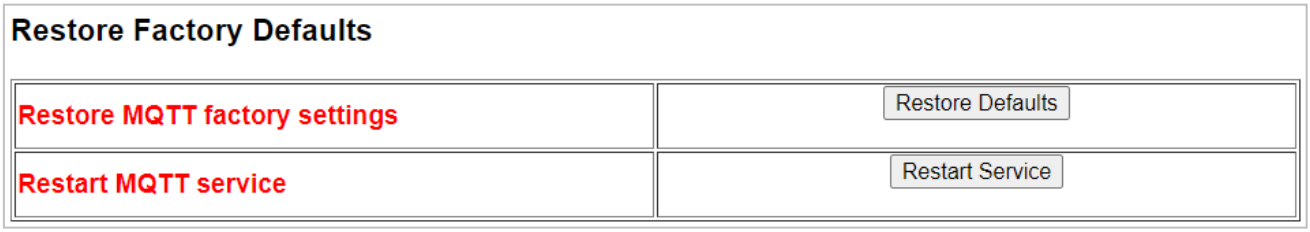


The following table provides parameter notes for the **Analog Outputs** section:

Item	Description	Defaults
Readback		
Periodic Publish	The AO value will be regularly published according to the Cycle setting. Choose the check-box to enable the function on AO channels.	Disabled

Publish On Change	AO values will be published upon a change in the value. Choose the check-box to enable the function on AO channels.	Disabled
Output		
Subscribe	To subscribe to AO topics. The user can modify the AO value by sending an MQTT message. Choose the check-box to enable the function on AO channels.	Disabled
Sub Topic Name	The Topic Name is a combination of the Main Topic Name and the Sub Topic Name. A shorter Topic Name improves processing efficiency.	Corresponding AO
Update	Click the “Update” button to save the changes.	

4.7.5 Restore Factory Defaults



The following table provides parameter notes for the **Restore Factory Defaults** section:

Item	Description
Restore MQTT factory settings	Click this button to reset all MQTT settings to the default factory settings.
Restart MQTT service	Click this button to restart the MQTT service. This function should be used to reconnect with the Broker after adjusting the MQTT settings.

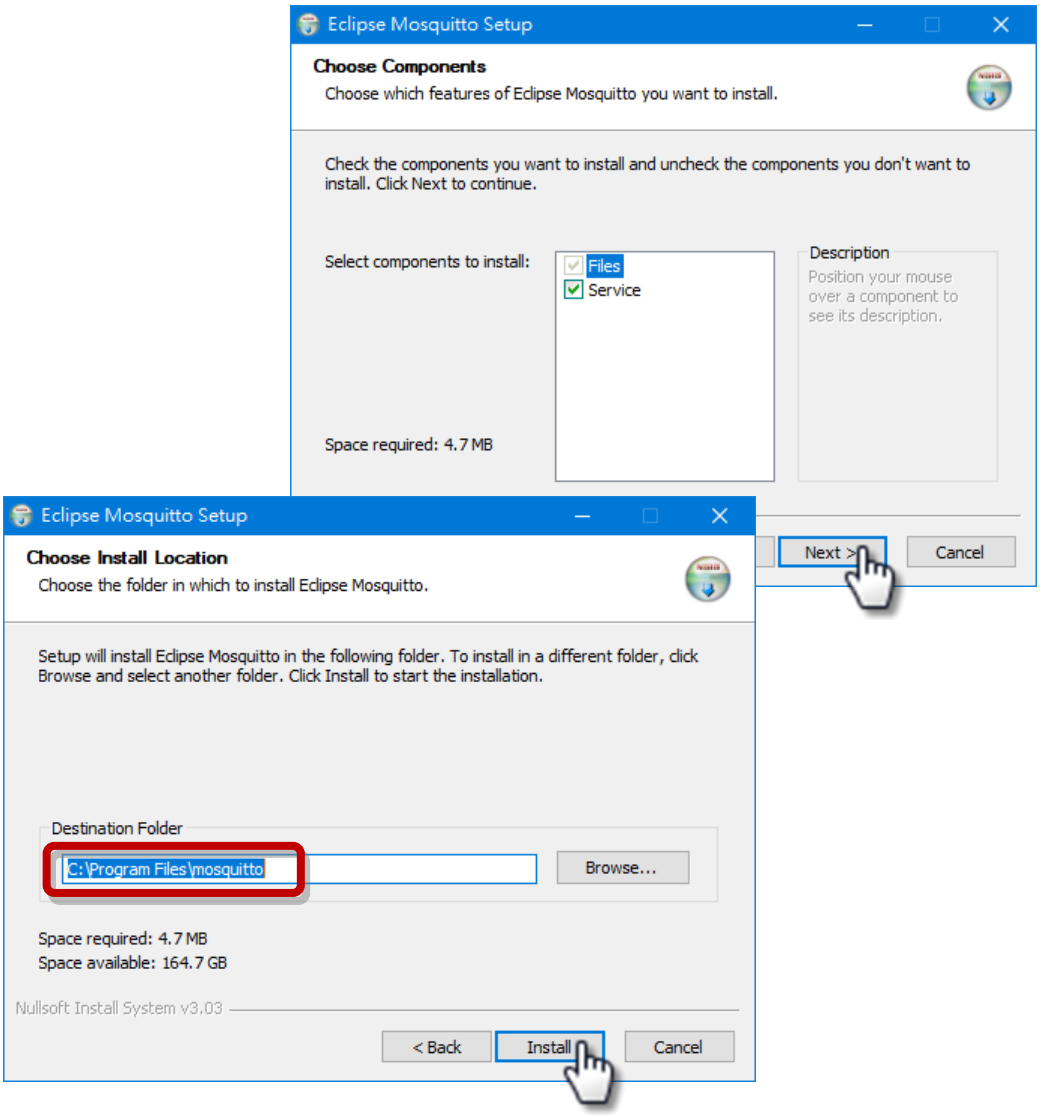
4.8 MQTT- Realization

This section described how to use the open-source software Mosquitto and MQTTX to demonstrate the usage of MQTT protocol in conjunction with the tET/tPET series module.

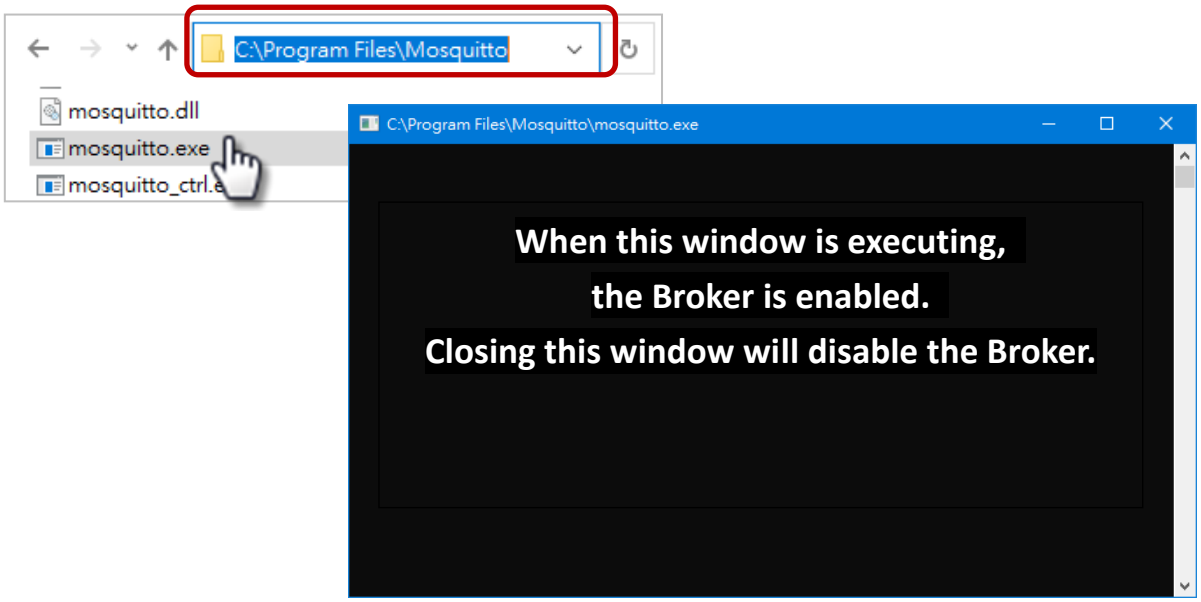
4.8.1 Set up Mosquitto

Mosquitto is an open-source software application that allows you to create an MQTT Broker and can be installed on Windows, Mac OS, Linux, etc.

Step 1 Download the Installer (V1.6.4) from the official Mosquitto website and install the application.



Step 2 Locate the "**mosquitto.exe**" file in the default installation path and double-click it to enable the Mosquitto server.

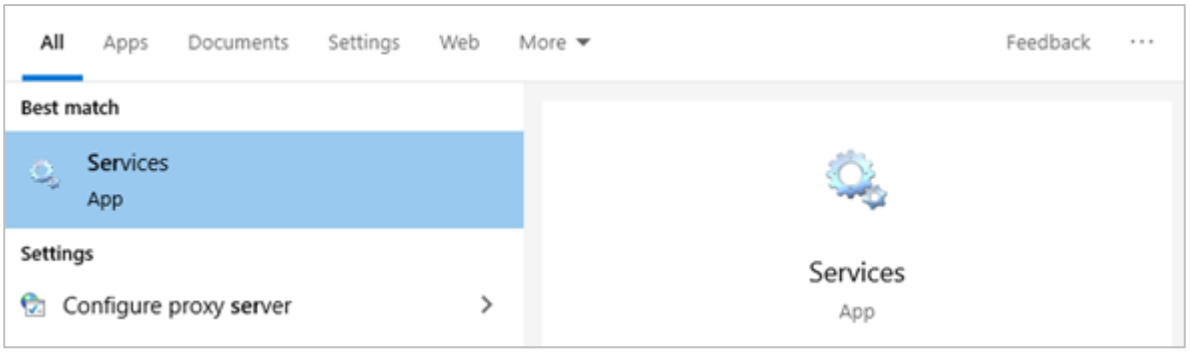


Why can't I open "mosquitto.exe" or why does it crash?

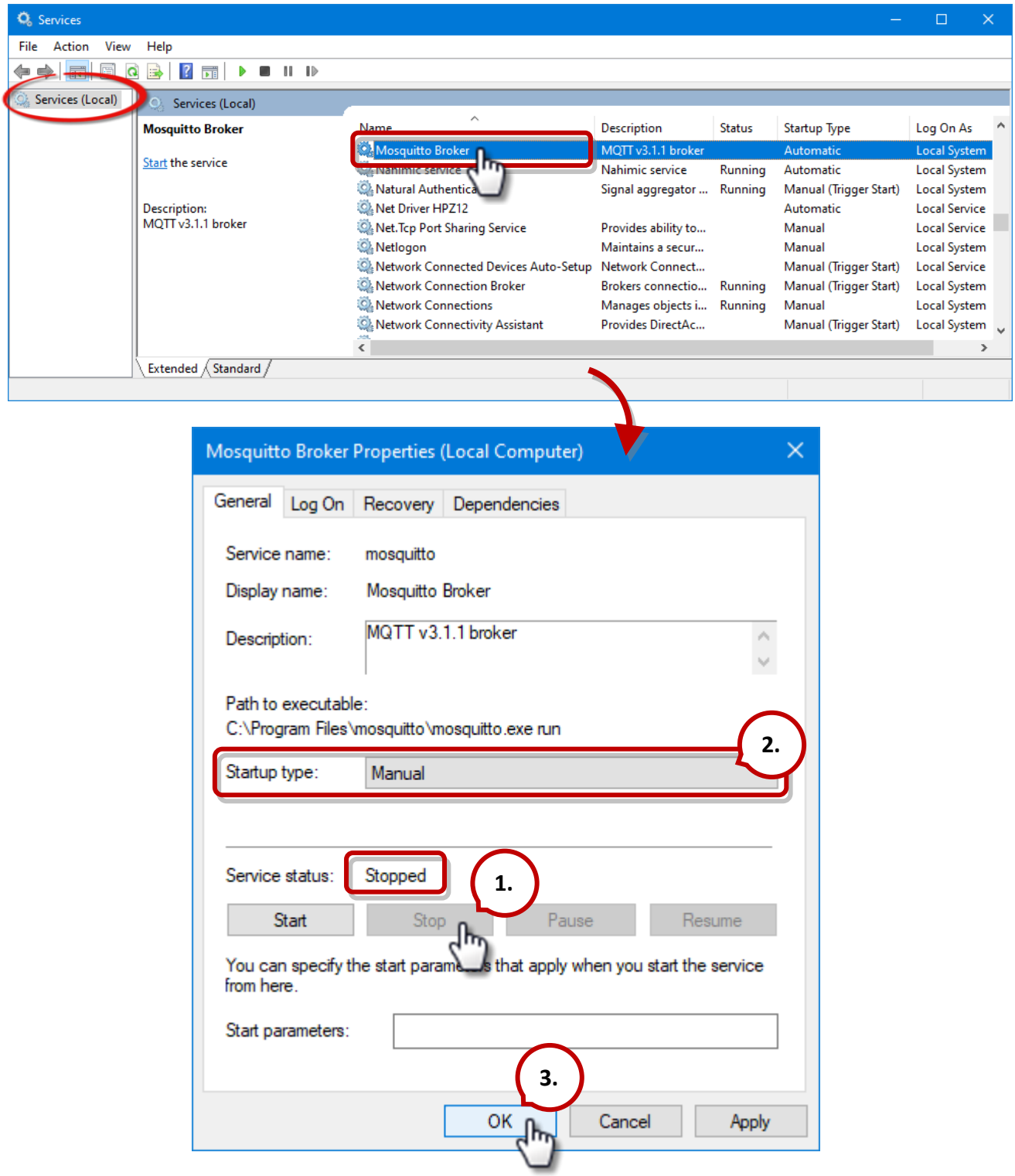
Once Mosquitto installation is done, the Broker server is automatically activated upon computer boot-up. Thus, if you try to click on the 'mosquitto.exe' file again, it's akin to attempting to enable an already active broker server, which would result in the action being prevented.

To prevent the broker from automatically opening, you can change the settings in the Windows Services application. If it is not necessary to set it, go to Step 3.

Open the **Services** application by searching for "Services" in Windows.

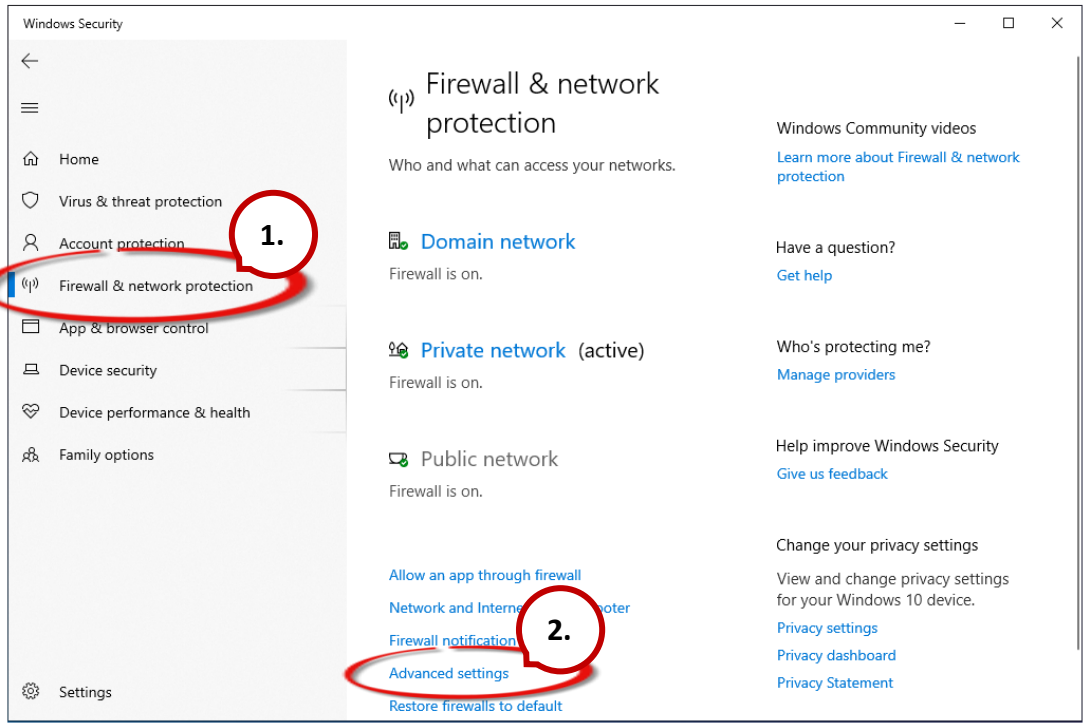


In the Services application, locate the "Mosquitto Broker" item and double-click the name to open the **Properties** dialog. Click the **Stop** button and set the **Startup type** to **Manual**. Click **OK** to save your changes.

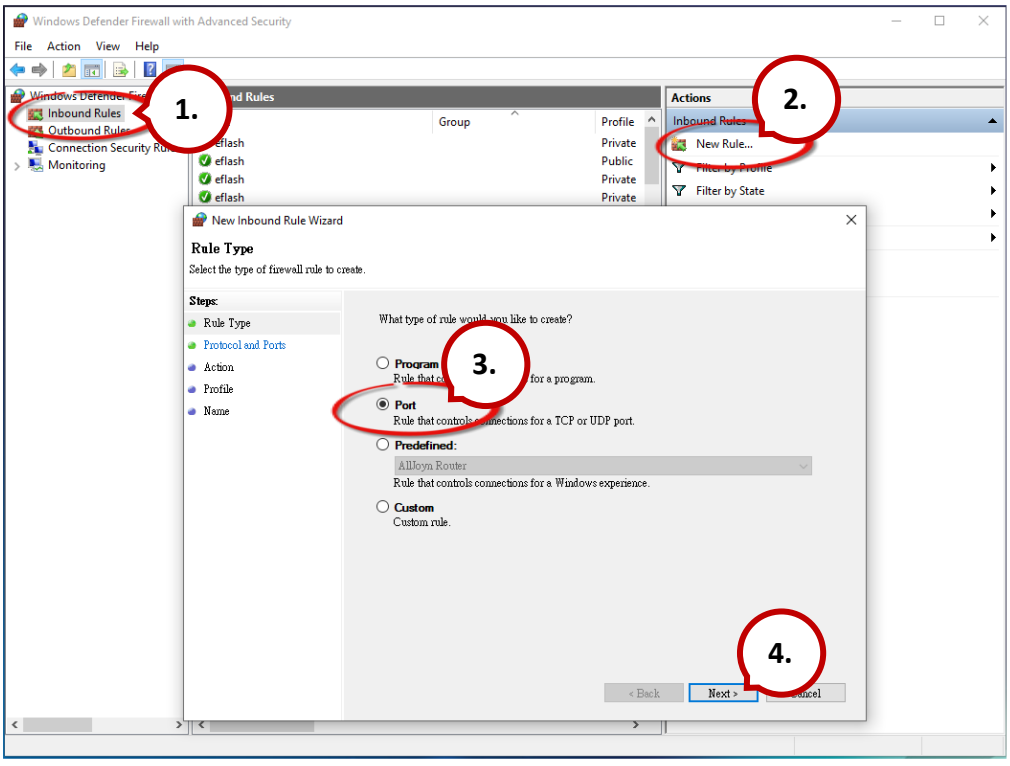


Step 3 Open Windows Port **1883** (the default Port for the MQTT).

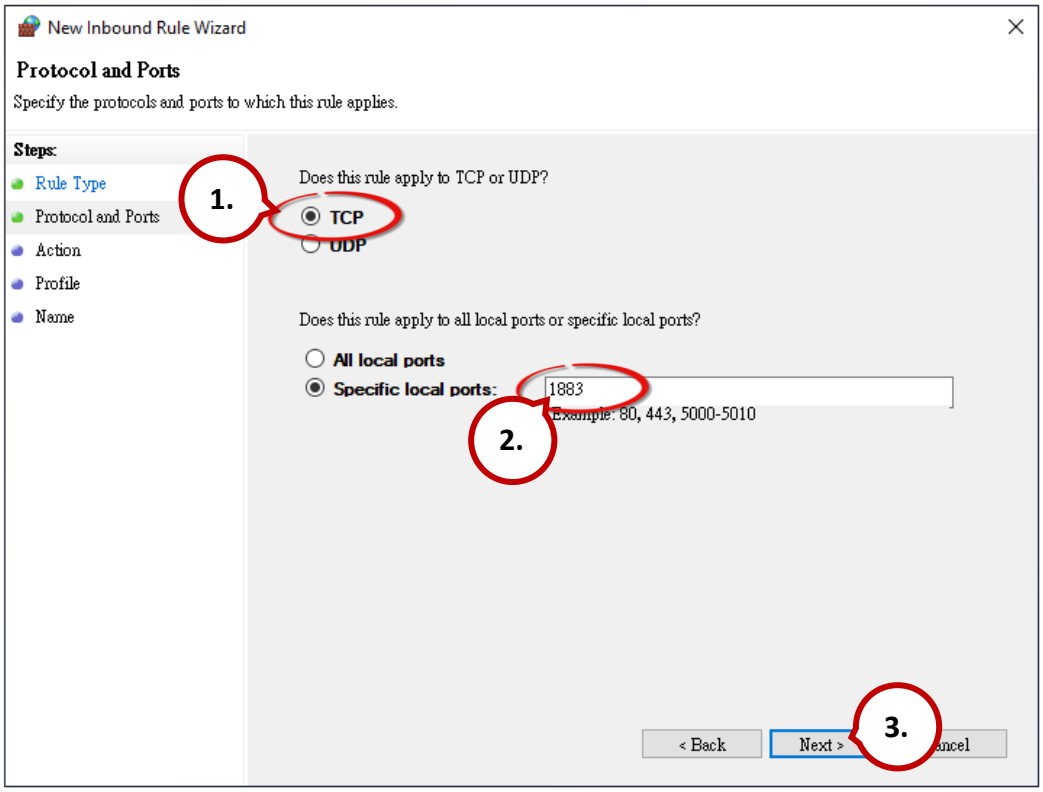
3.1 Open the **Advanced Settings** section of the Windows Firewall.



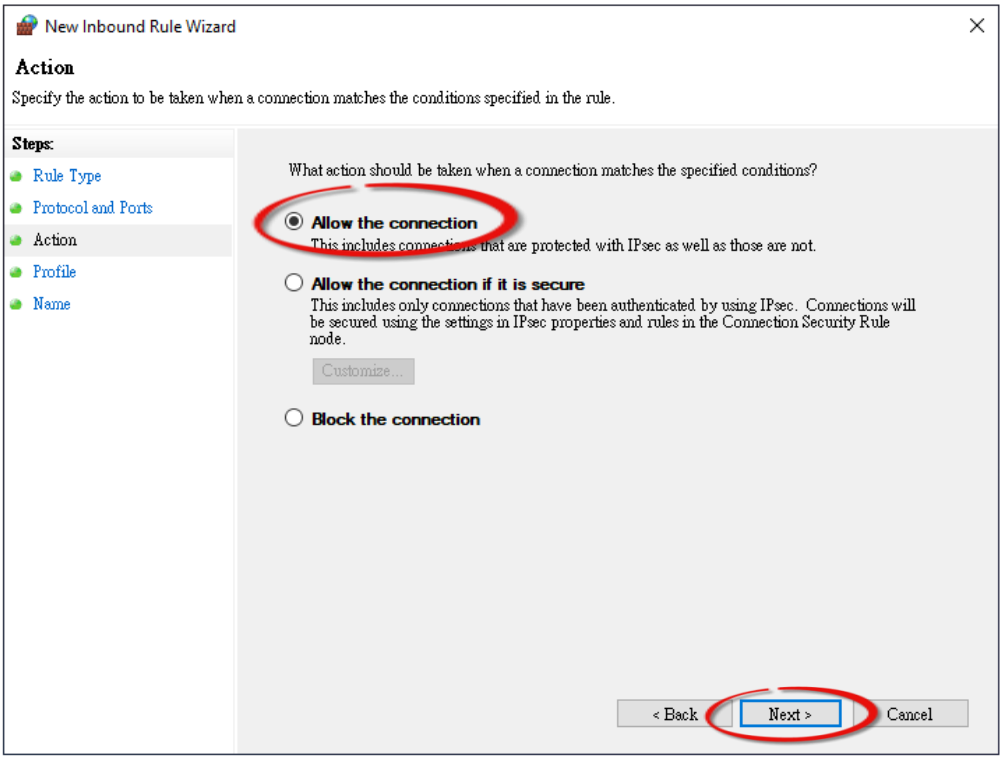
3.2 Add a new rule. Click **Inbound Rules** and **New Rule**, and then select the **Port** option. Click the **Next** button to continue.



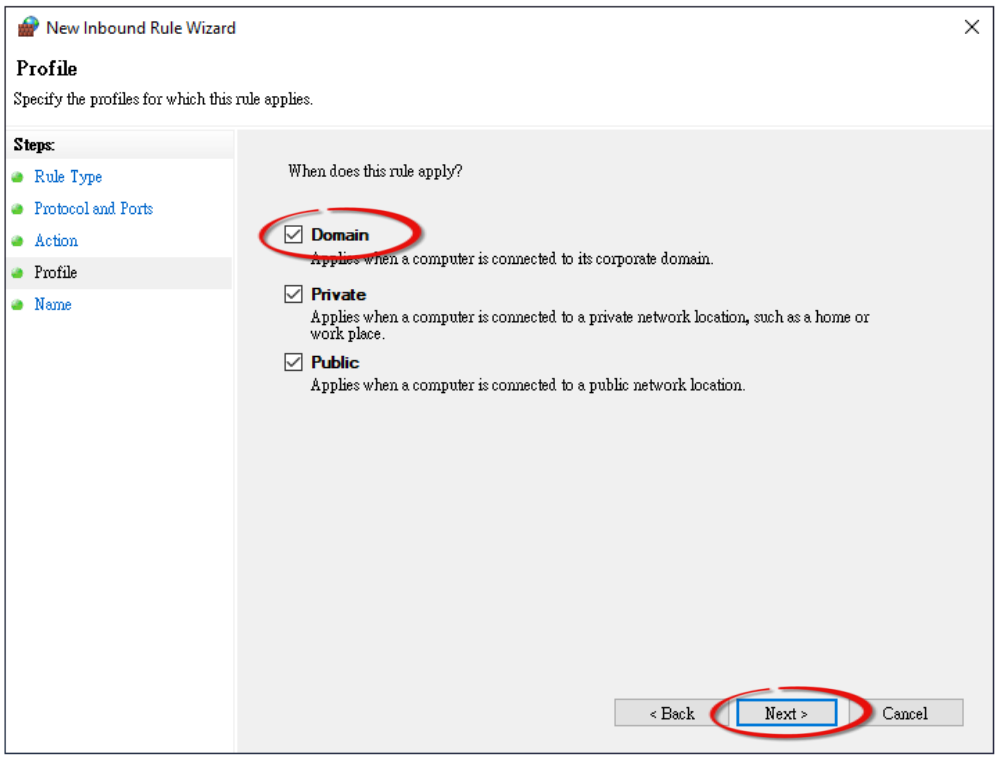
3.3 Select the **TCP** option and then select **Specific local ports** and enter the value **1883**. Click the **Next** button to continue.



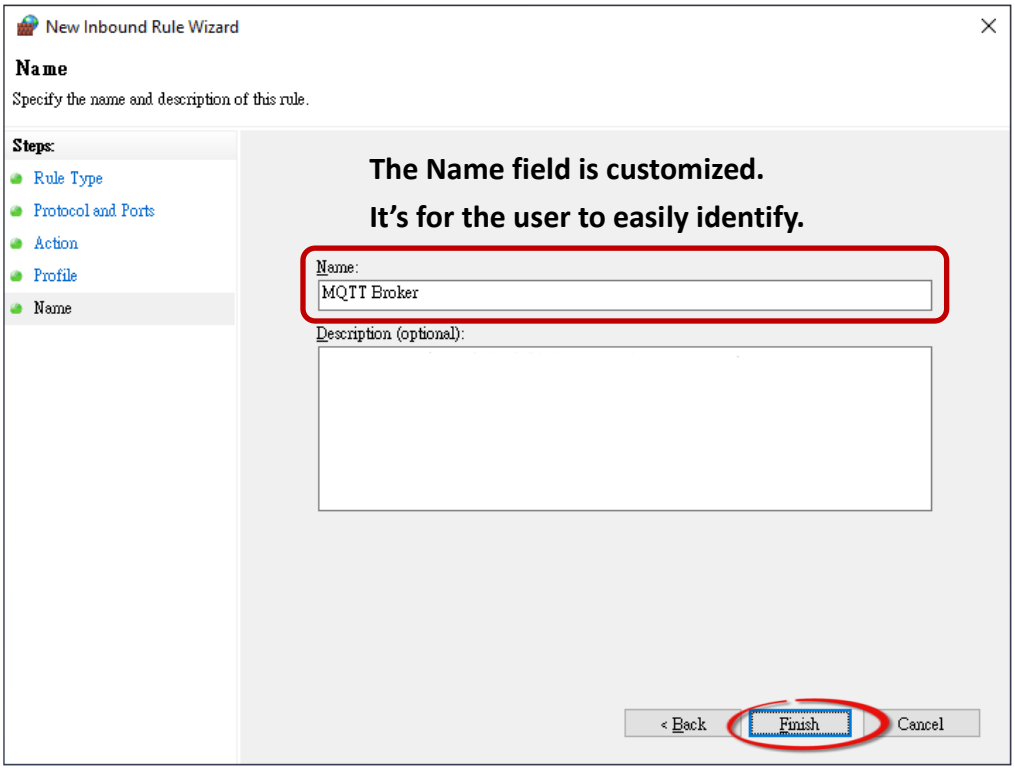
3.4 Select the **Allow the connection** option and then click the **Next** button to continue.



3.5 Select the **Domain** checkbox and click the **Next** button to continue.



3.6 Enter the name of the rule and then click the **Finish** button to create the rule. Enter the notes if desired.



4.8.2 MQTTX Instructions

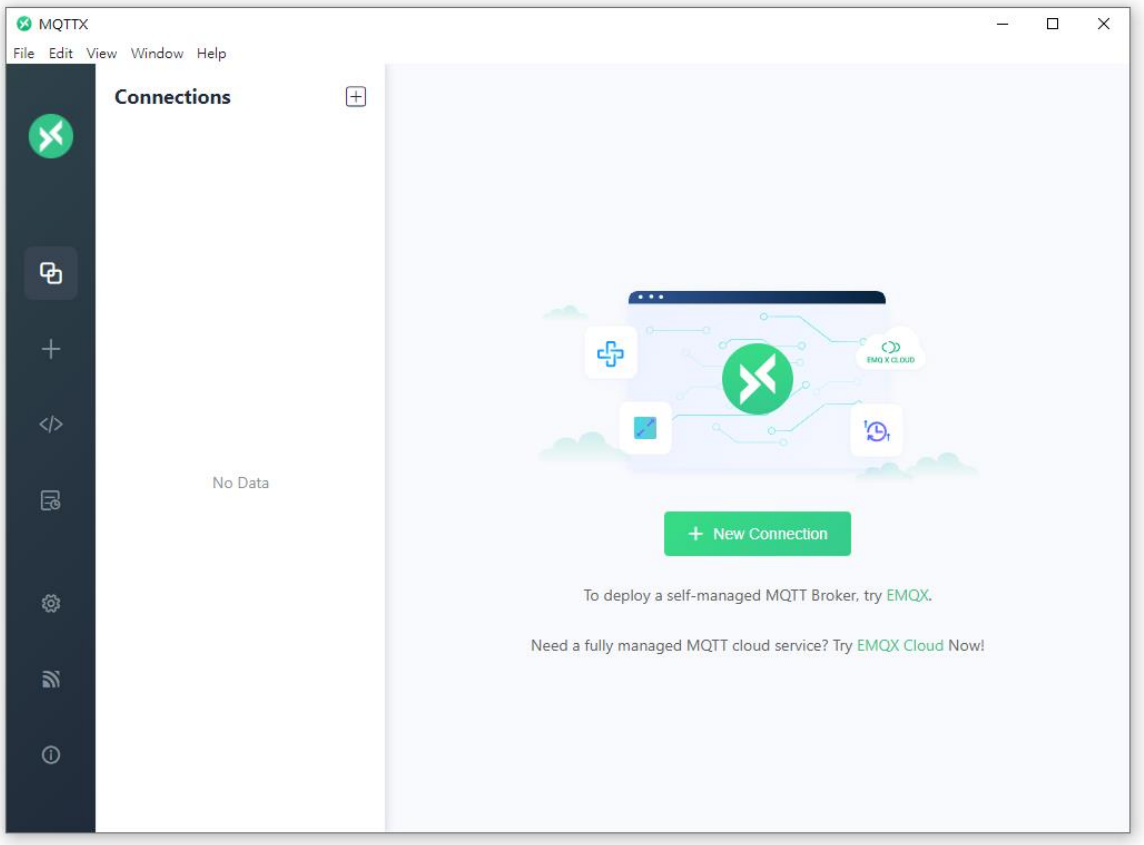
MQTTX is an open source, cross-platform MQTT 5.0 desktop client originally developed by EMQ, which can run on macOS, Linux and Windows.

Step1 Install MQTTX

Download and execute the installation file (V1.9.4) from the MQTTX website (https://mqttx.app/).

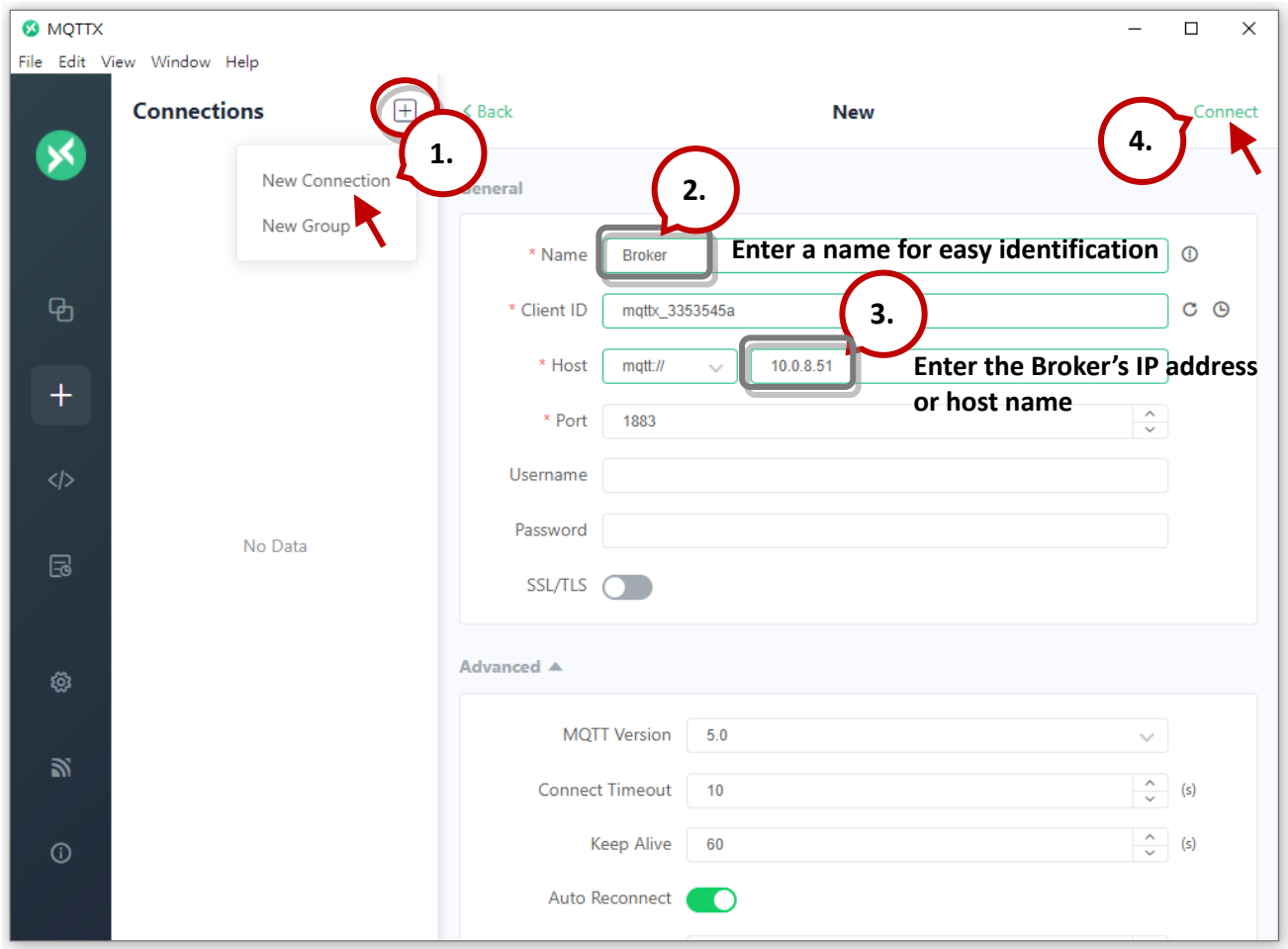
Step2 Open MQTTX

After the installation is complete, MQTTX will be automatically opened, and the user can also double-click the shortcut on the desktop to open the software.

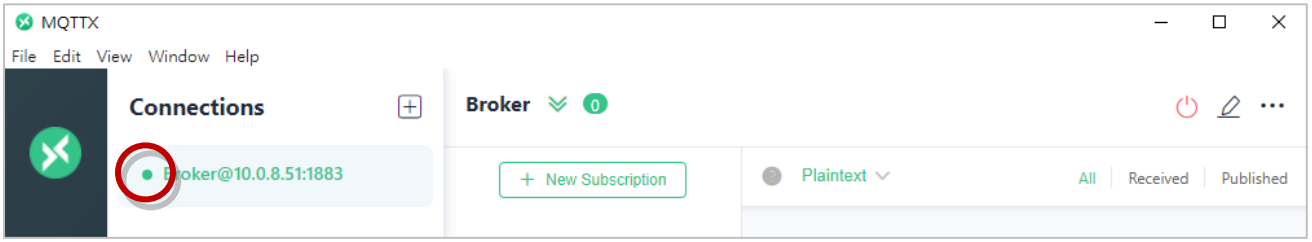


Step3 Establish a connection

1. Click "**+**" and then click **New Connection** to establish a connection.
2. Enter the Broker name and IP address , and then click the **Connect** button.
   (Refer to the Connectivity Settings)



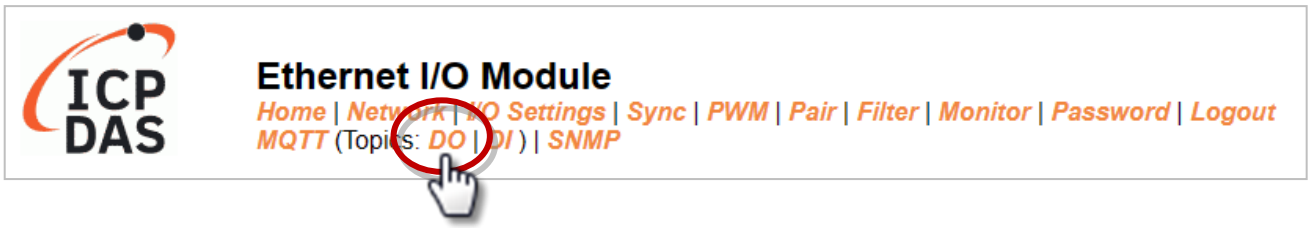
Step4 If the connection is available, the green light will be displayed.



Note: If the connection is unavailable, check to see if the version of the Mosquitto Broker is **1.6.4** (see C:\Program Files\mosquitto\ChangeLog.txt), and refer to "Set up Mosquitto".

4.8.3 MQTT - DO Example

The topic name of MQTT is composed of Main Topic Name (e.g., ICPDAS/, refer to Connectivity Settings) and Sub Topic Name (e.g., do_all), which can be set on the **MQTT - DO** page.



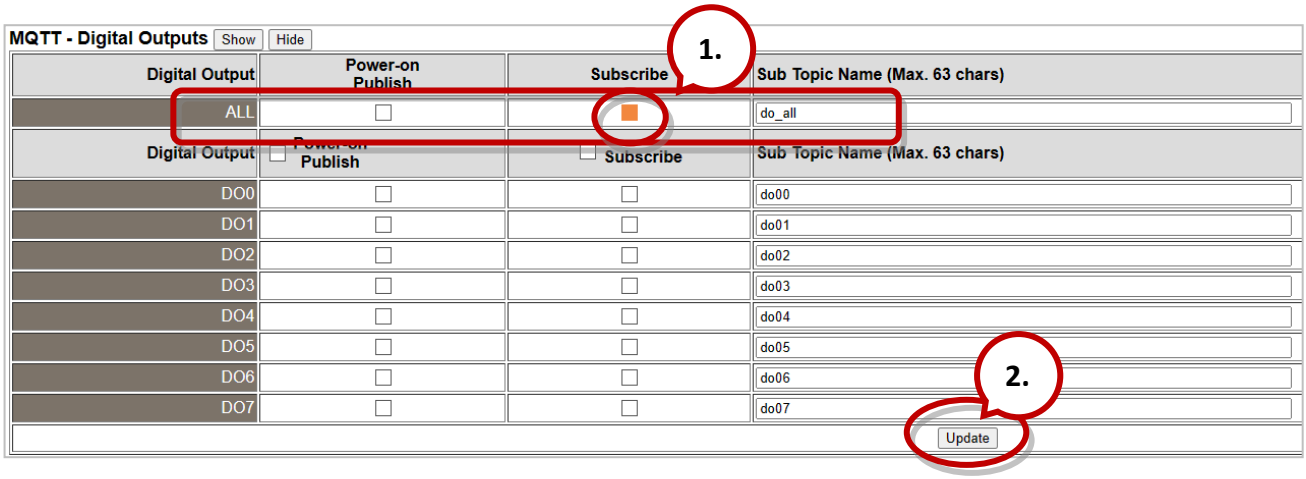
The MQTT – DO page provides the following functions:

Function	Description
Subscribe	Used to subscribe to the topic. The DO statuses can be changed through MQTT messages
Power-on Publish	The DO statuses will be published upon module power-up
State-Change Publish	The DO statuses will be published whenever it changes.
Periodic Publish	The DO statuses will be published periodically, based on the Cycle settings.

MQTT DO – Subscribe

Users can choose to enable/disable single-channel (DO0, DO1, etc.) or multi-channel (ALL) for topics operations. It is recommended to use multi-channel operations to reduce network traffic and to disable unused topics to reduce unnecessary processing and improve operational efficiency.

Step1 Log in to the module's Web Server, and click the Subscribe option for the "**do_all**" on the **MQTT - "DO"** page to enable the function. After that, click **Update** to save the changes.

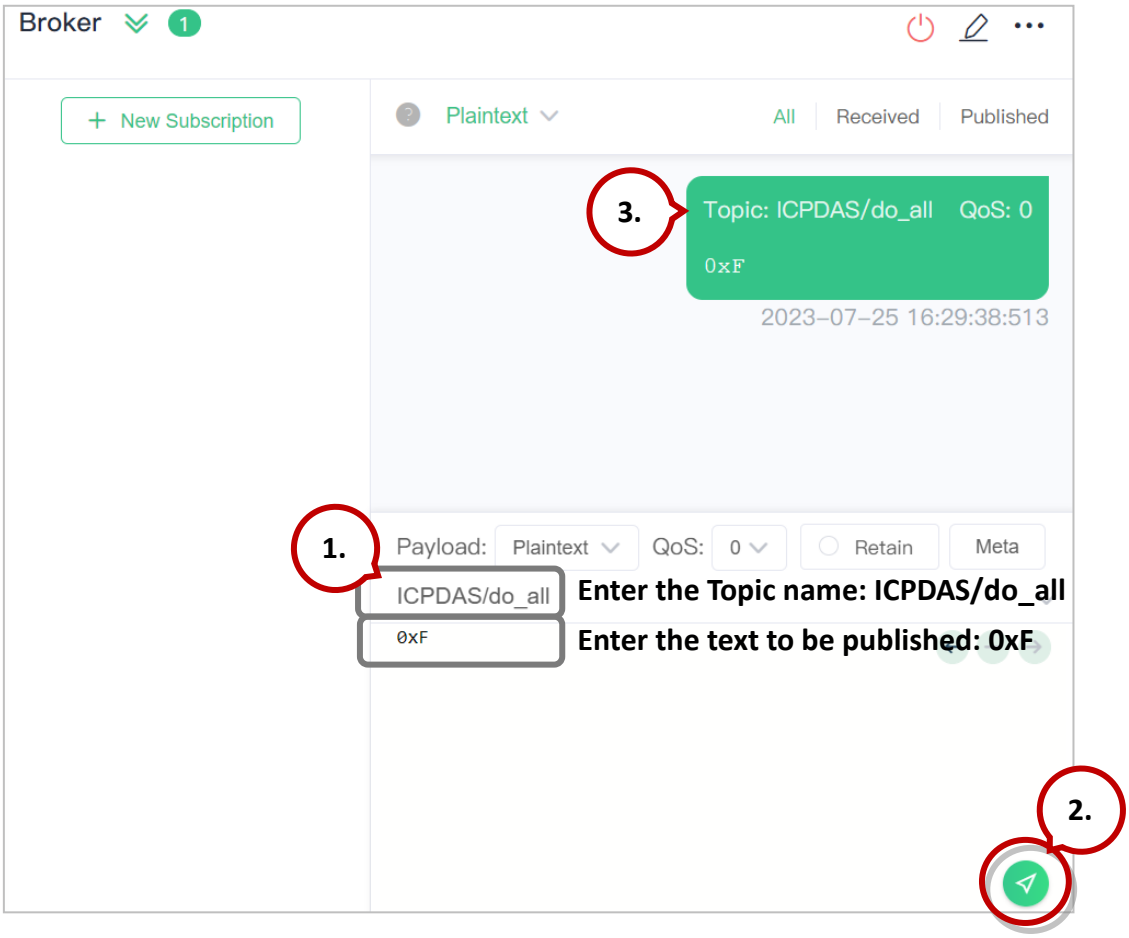


Step2 Make sure that the **MQTT** function has been enabled on the **MQTT** page, and the Broker's IP address and the Main Topic Name have been set (refer to Connectivity Settings).

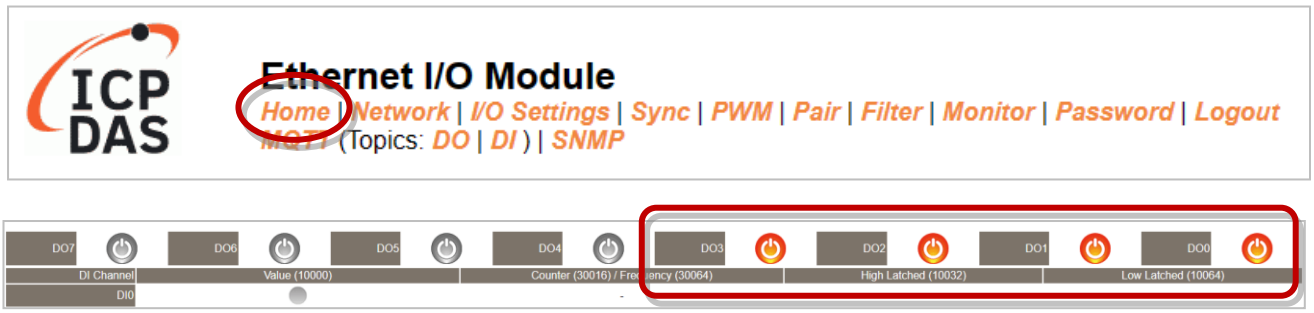
Connectivity Settings

MQTT	Enable
Broker	IPv4 / Host Name (Max. 127 chars) 10.0.8.51
Broker Port	1883 (Default= 1883)
Client Identifier	tPET-P2R2_RevB_65FA7F
User Name	(Max. 63 chars)
Password	(Max. 63 chars)
Reconnection Interval	10 (5 ~ 65000 s, Default= 10)
Keep Alive Interval	20 (5 ~ 65000 s, Default= 20)
Main Topic Name	ICPDAS/ (Max. 126 chars)
	Update Settings

Step3 Enter the message (e.g., 0xF) to be published for the "**ICPDAS/do_all**" topic, and click the button on the right corner to send the message.



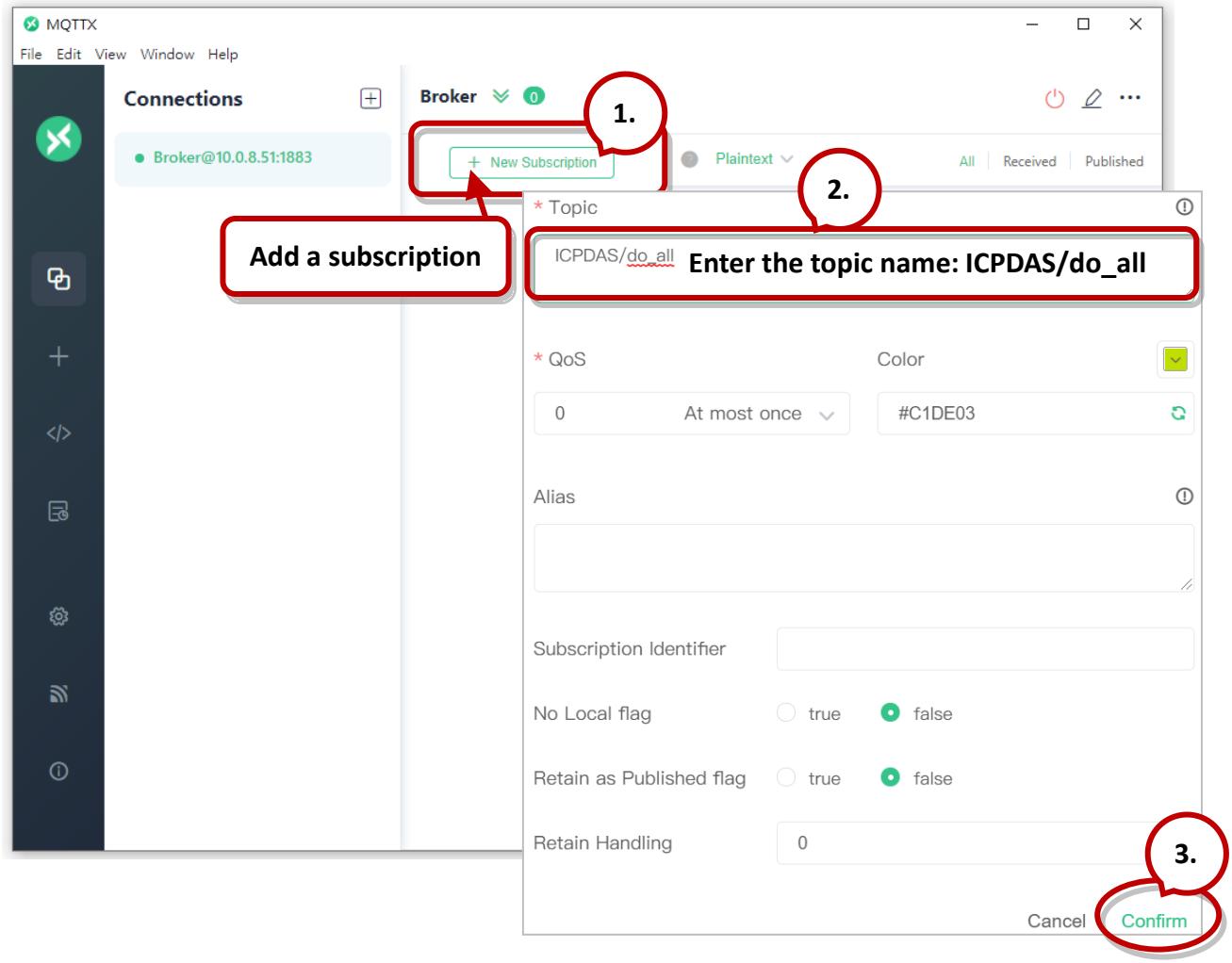
Step 4 The user can check whether the DO status is correct on the **Home** page.



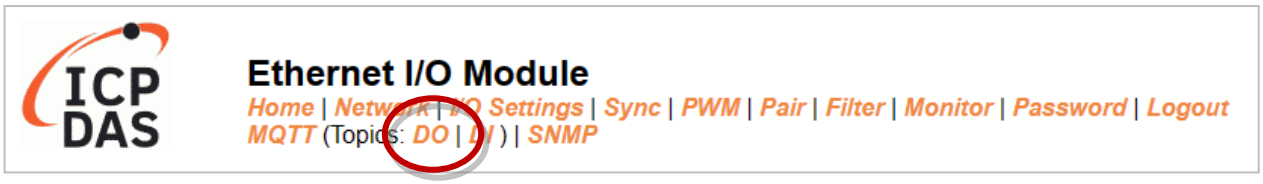
The message "0Xf" indicates DO 0-3 = ON, DO 4-7 = OFF

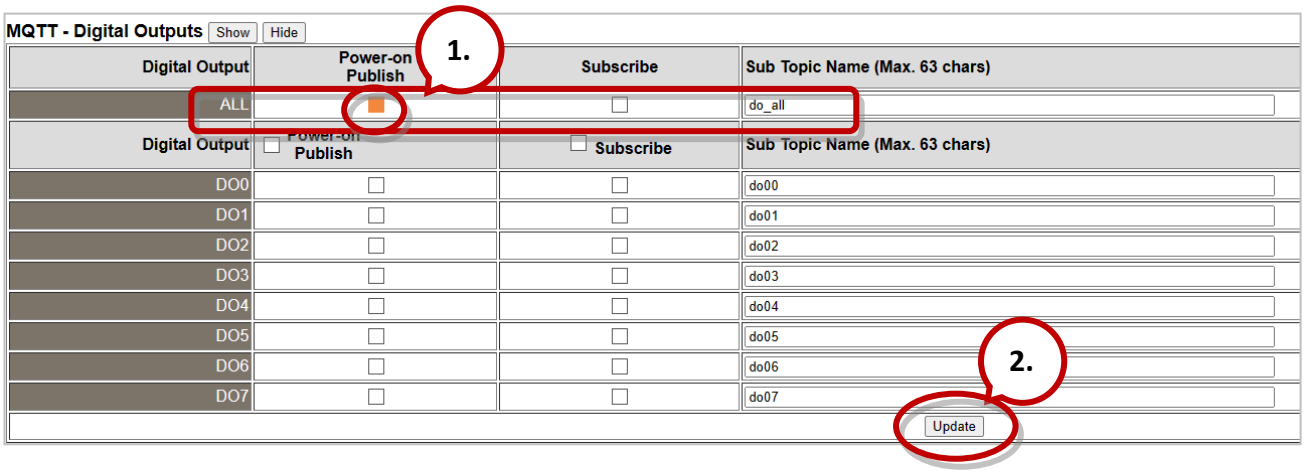
MQTT DO – Power on Publish

Step1 Make sure that the Mosquitto Broker is enabled, and the MQTTX is connected. In this example, the topic is "**ICPDAS/do_all**".

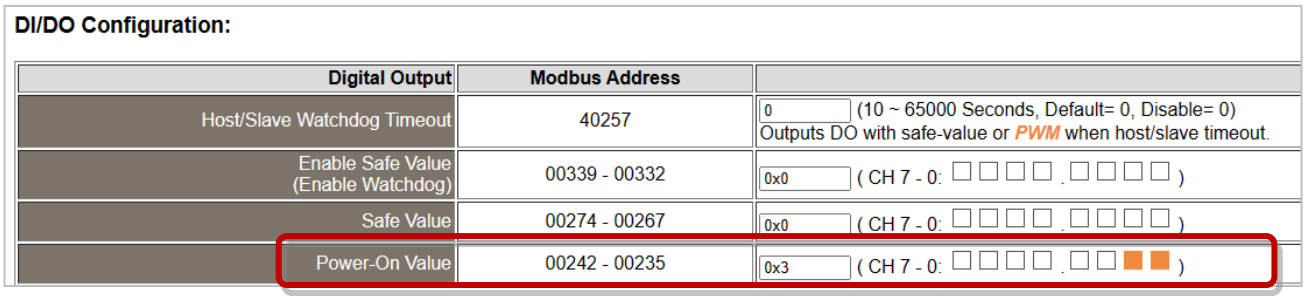


Step2 Log in to the module's Web Server, and click the **Power-on Publish** option for the "**do_all**" on the **MQTT - "DO"** page to enable the function. After that, click Update to save the changes.



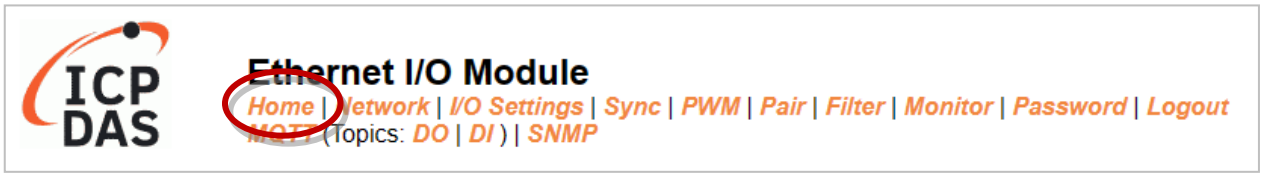


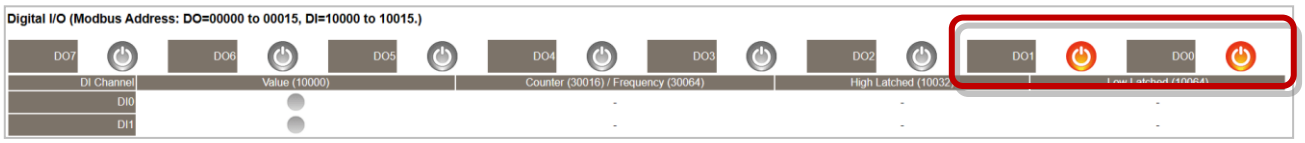
Step3 On the **I/O Settings** page, set the DO power-on value, and then click **Update Setting** to update the settings.



The DO0, DO1 will be set to ON when the module starts.

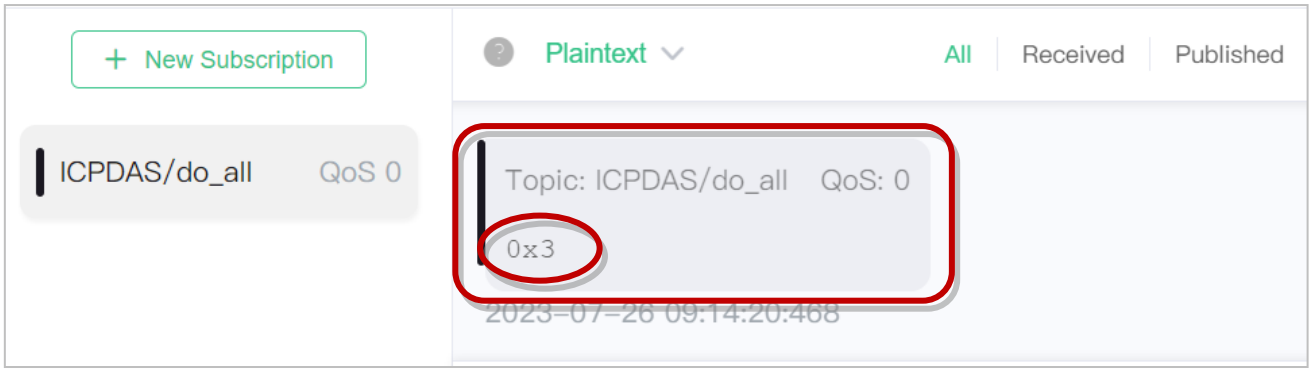
Step4 After the module boots, the DO value will be set to the predefined power-on value.





The DO0, DO1 will be set to ON after rebooting the module.

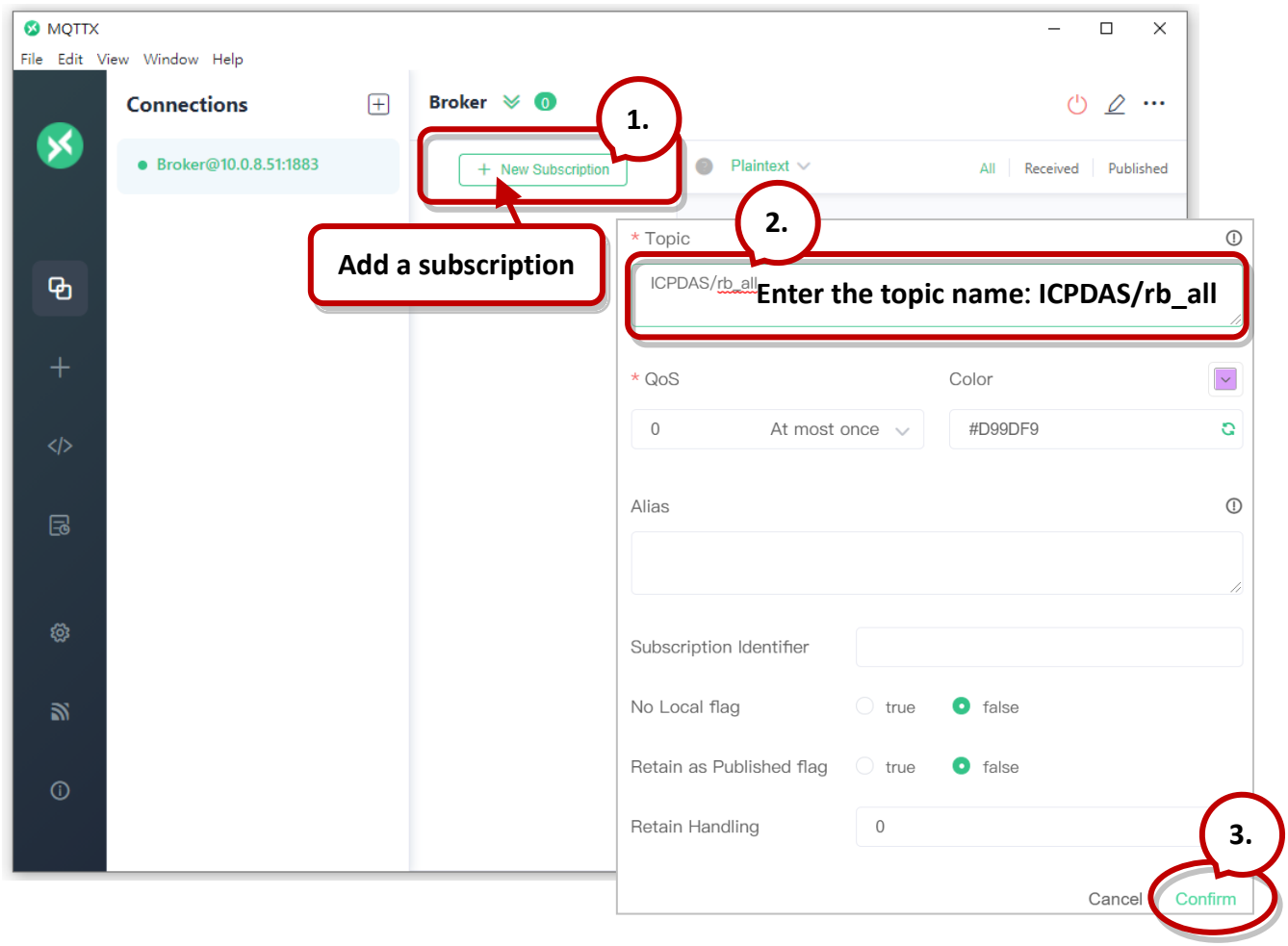
In addition, users can check the received DO values in MQTTX.



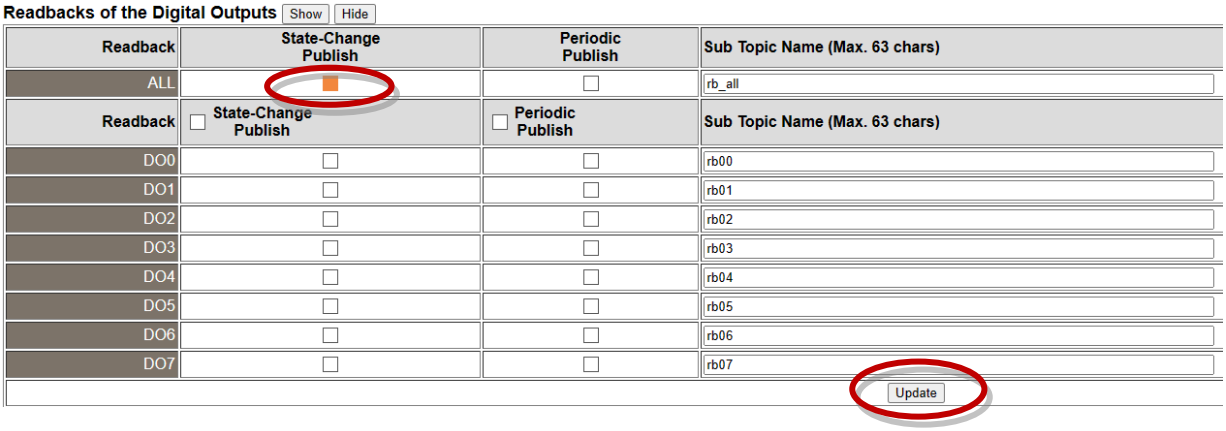
"0x3" indicates DO0 to DO1 are "ON" and the others are "OFF"

MQTT DO – State Change Publish

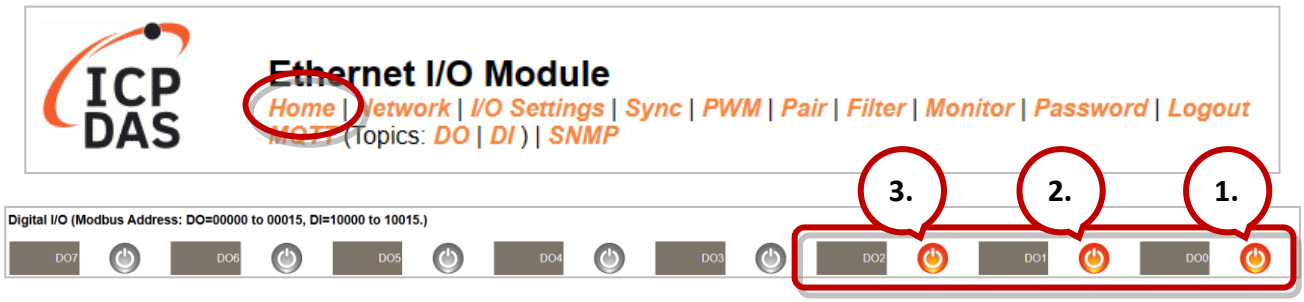
Step1 Make sure that the Mosquitto Broker is enabled, and the MQTTX is connected. In this example, the topic is "**ICPDAS/rb_all**".



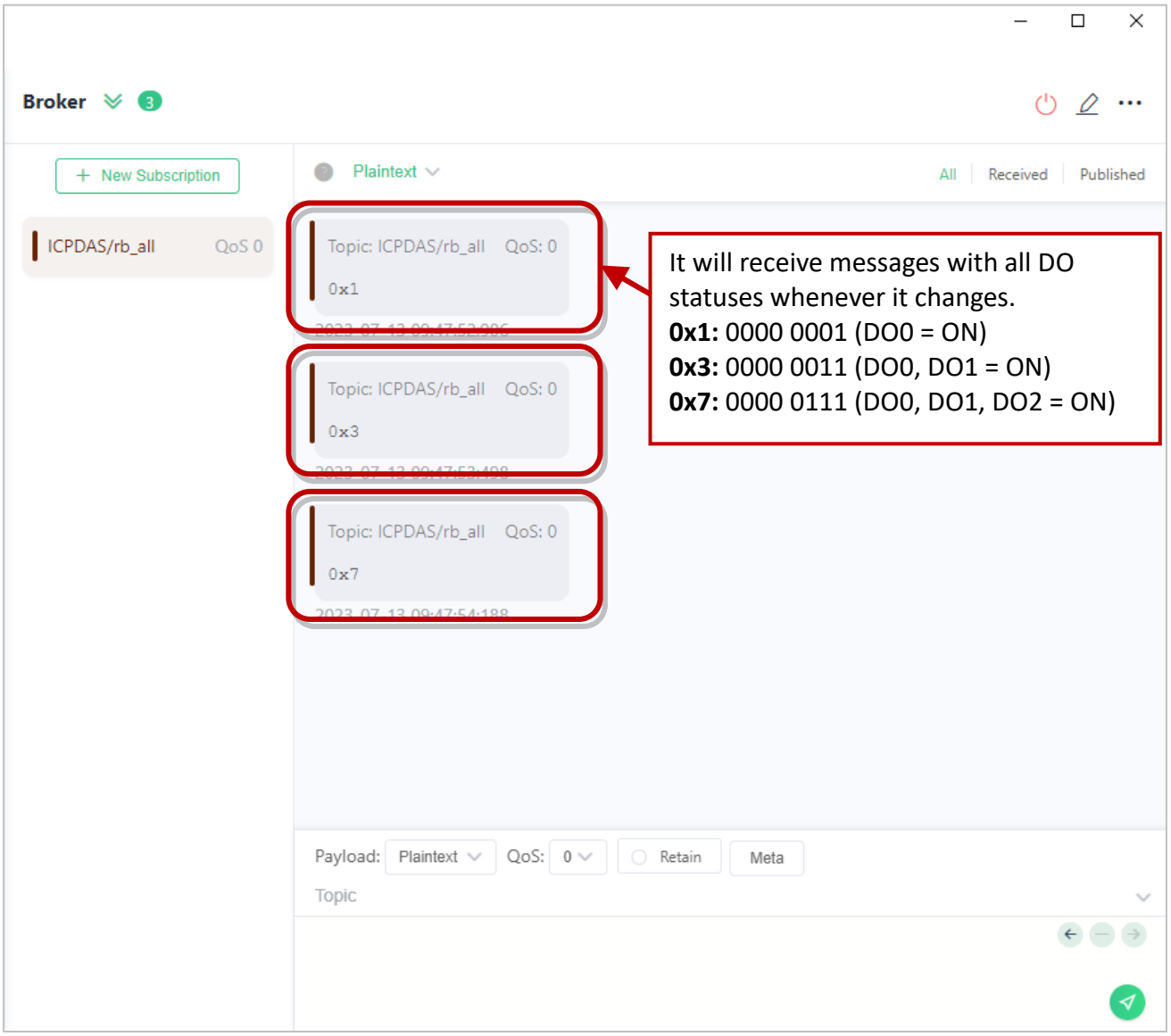
Step2 Log in to the module's Web Server, and click the **State-Change Publish** option for the "**rb_all**" on the **MQTT - "DO"** page to enable the function. After that, click **Update** to save the changes.



Step3 On the **Home** page, set the DO0 to DO2 to “ON” in sequence.

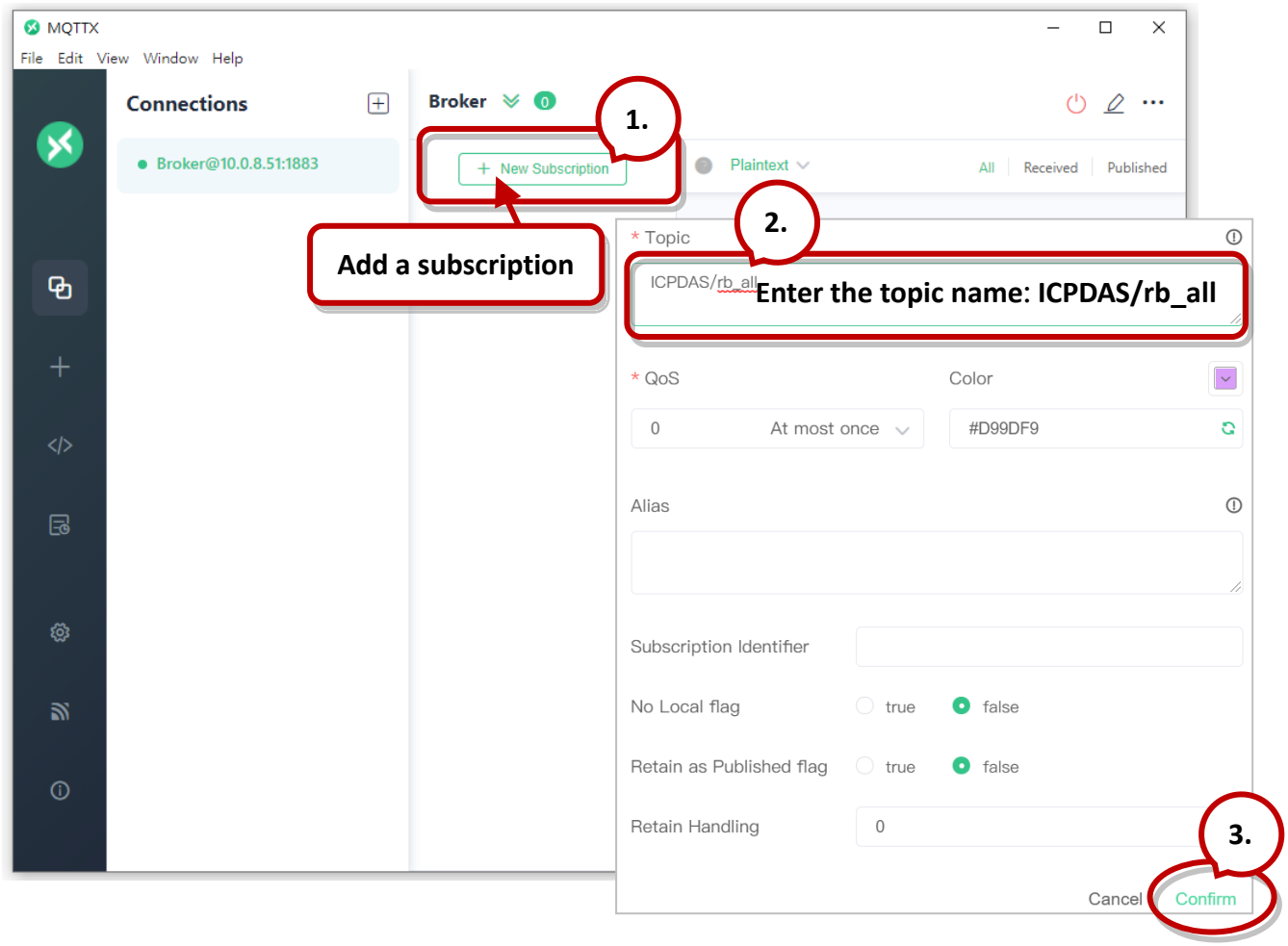


Step4 The user can verify the received messages within the MQTTX window.

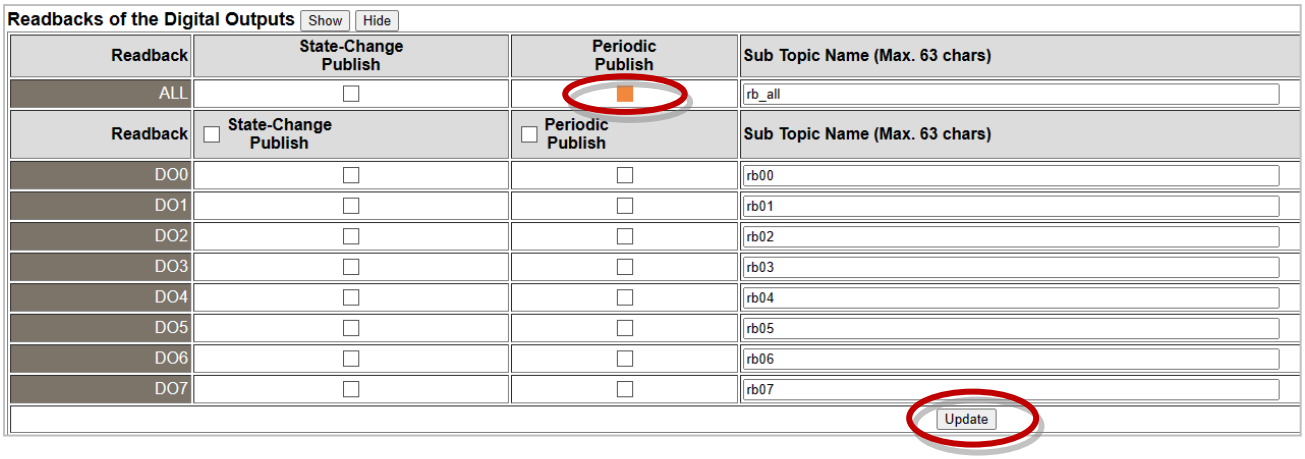


MQTT DO – Periodic Publish

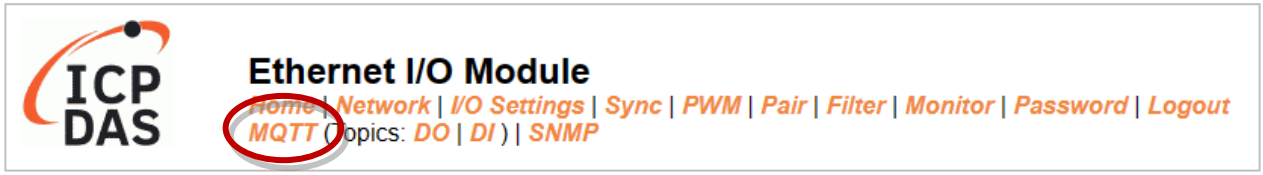
Step1 Make sure that the Mosquitto Broker is enabled, and the MQTTX is connected. In this example, the topic is "**ICPDAS/rb_all** ".

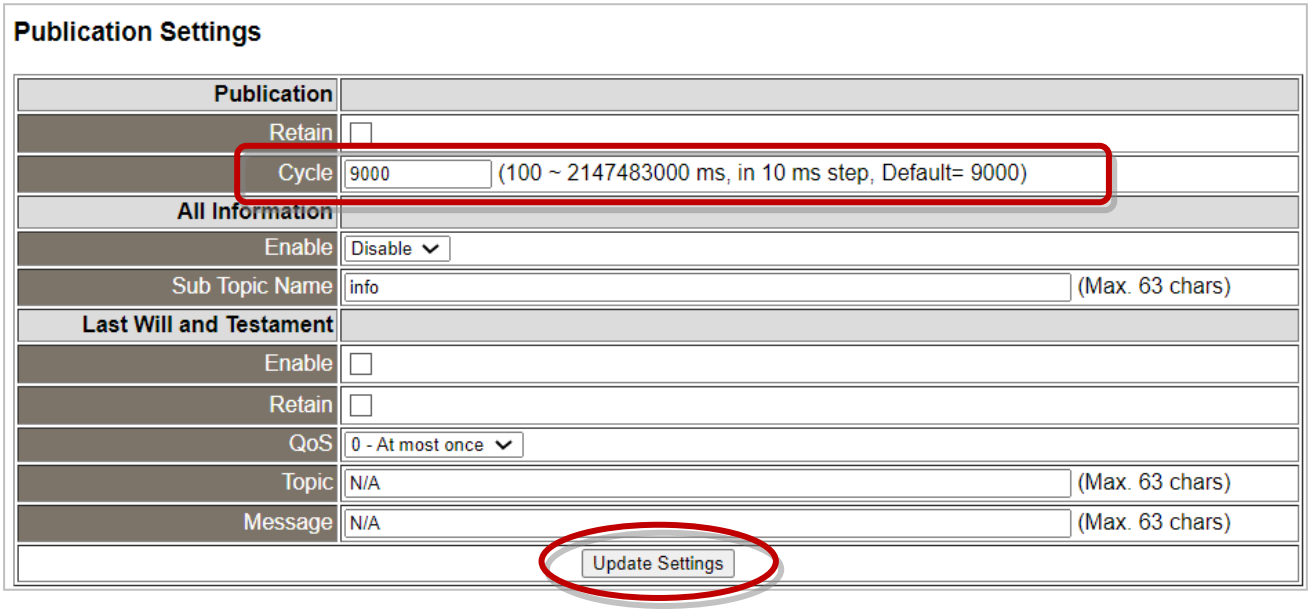


Step2 Log in to the module's Web Server, and click the **Periodic Publish** option for the "**rb_all**" on the **MQTT - "DO"** page to enable the function. After that, click **Update** to save the changes.

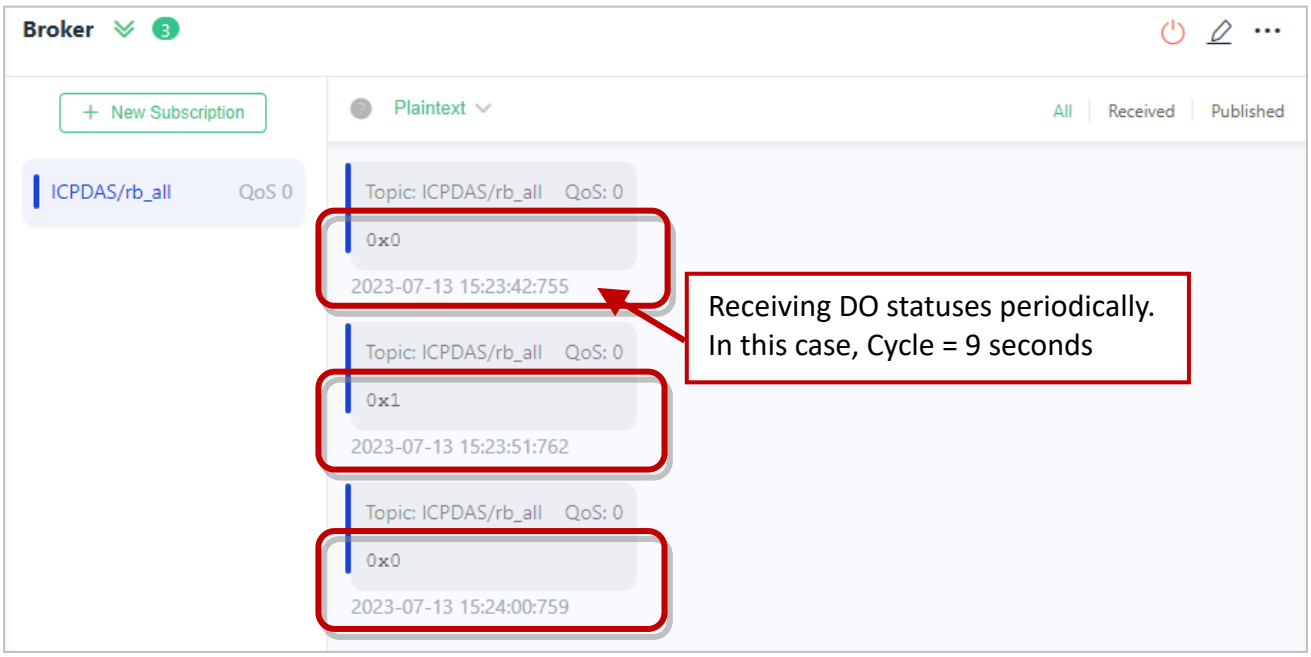


Step3 Go to the **MQTT** page, set the message publishing cycle (Cycle), and click "**Update Setting**" to save the changes.



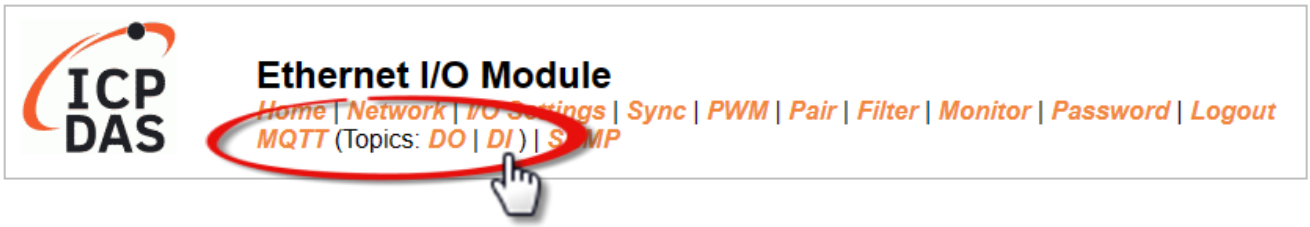


Step4 The user can verify the received messages within the MQTTX window.



4.8.4 MQTT - DI Example

The topic name of MQTT is composed of Main Topic Name (e.g., ICPDAS/, refer to Connectivity Settings) and Sub Topic Name (e.g., di_all), which can be set on the **MQTT - DI** page.



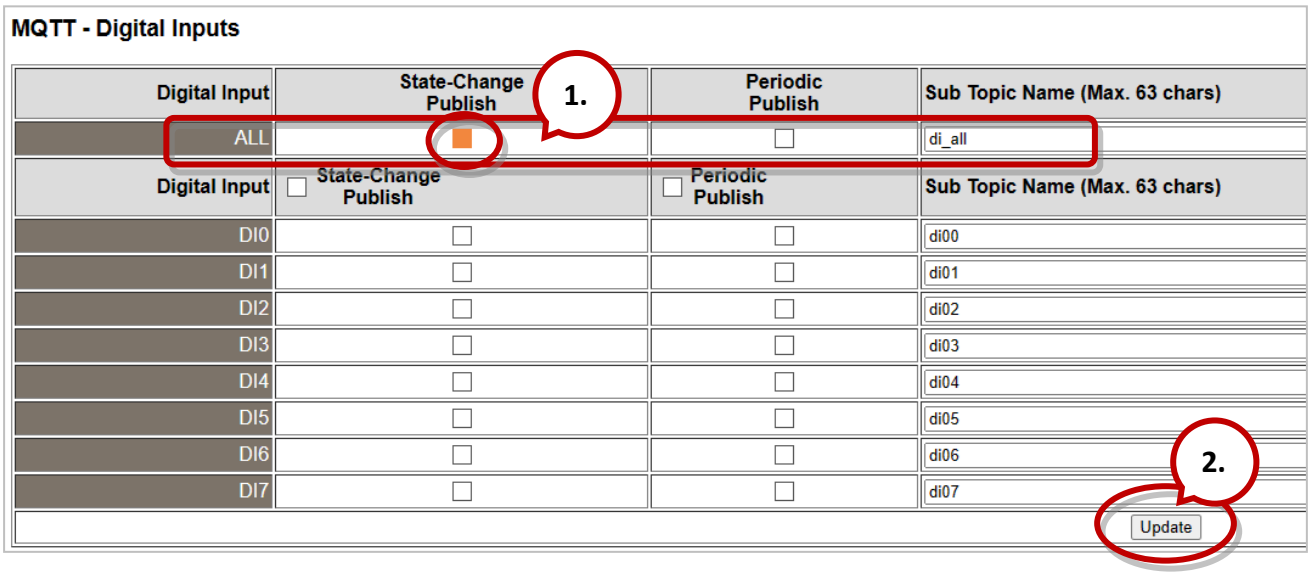
The MQTT – DI page provides the following functions:

Function	Description
State-Change Publish	The message will be published when the DI state changes.
Periodic Publish	The DI status is published periodically, and the release cycle is determined by the Cycle setting.

MQTT DI – State Change Publish

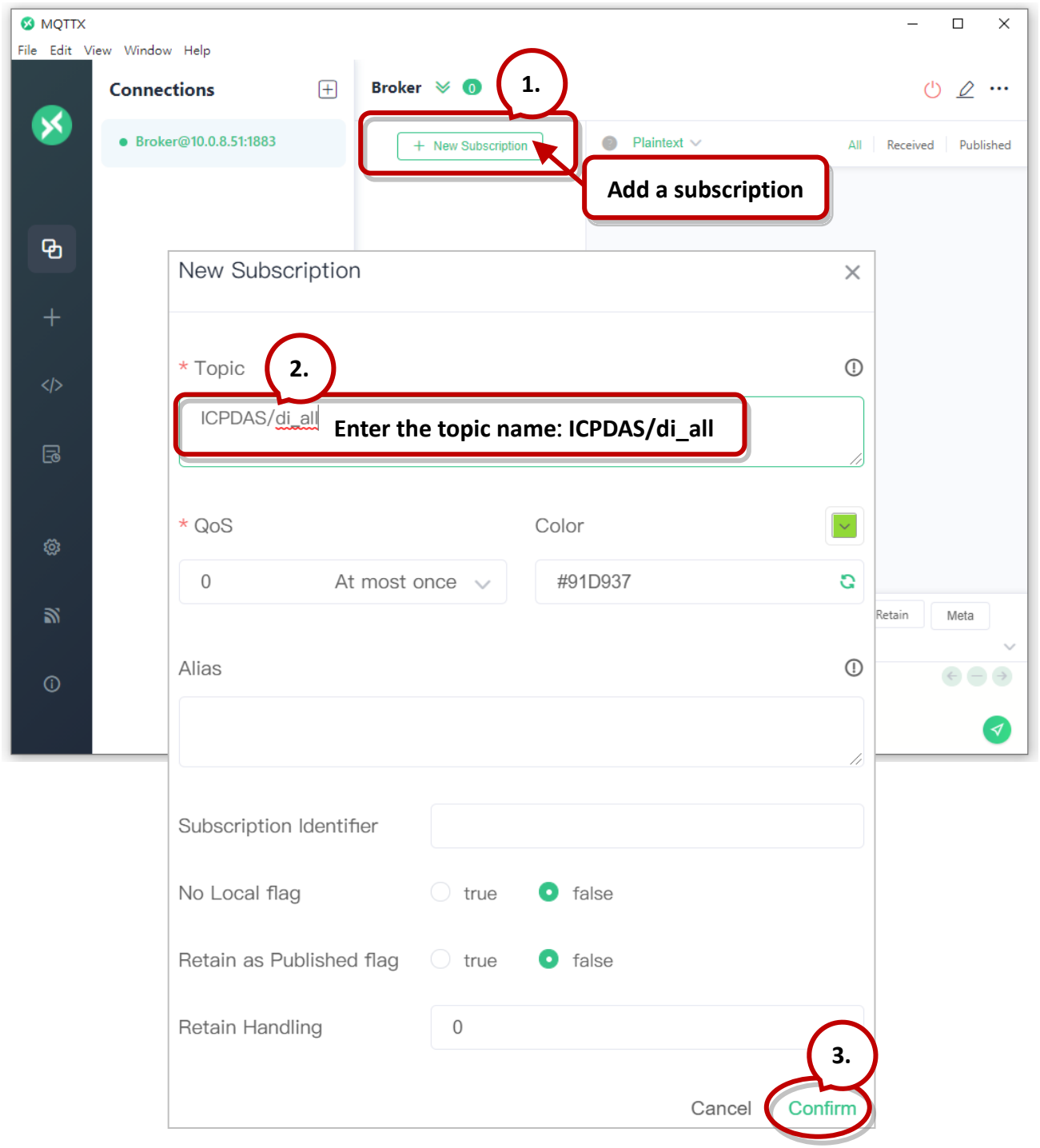
Users can choose to enable/disable single-channel (DI0, DI1, etc.) or multi-channel (ALL) for topics operations. It is recommended to use multi-channel operations to reduce network traffic and to disable unused topics to reduce unnecessary processing and improve operational efficiency.

Step1 On the **MQTT - DI** page, click the **State-Change Publish** for the "**di_all**" to enable this function. After that, click **Update** to save the changes.



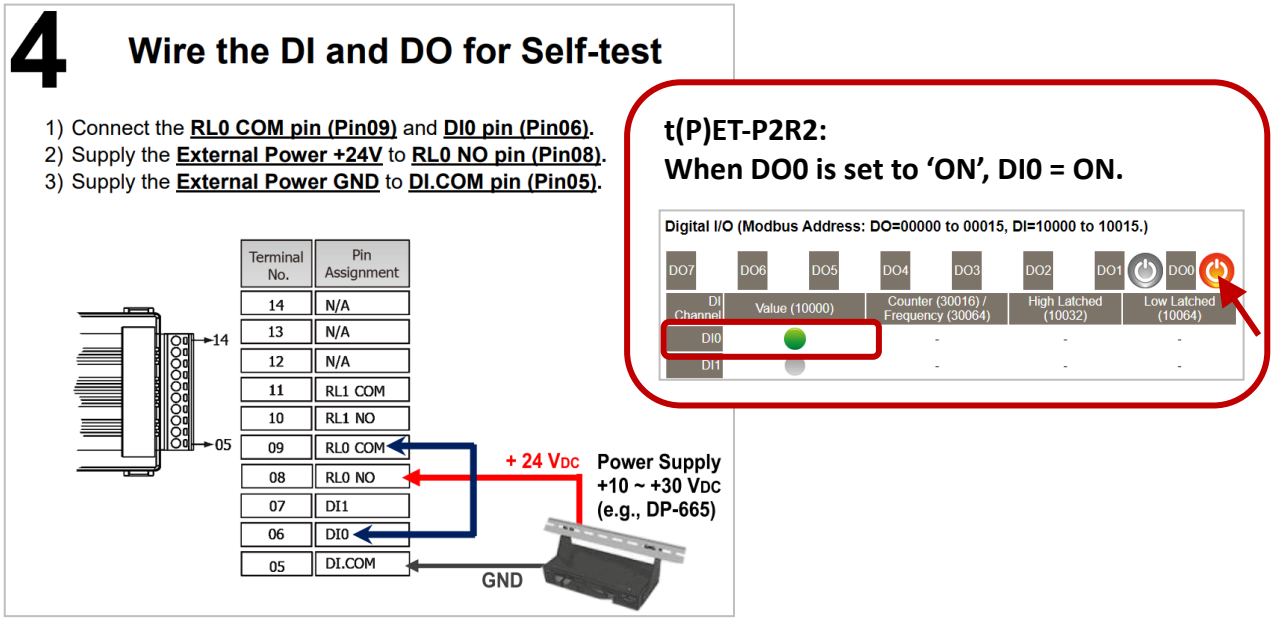
Digital Input	State-Change Publish	Periodic Publish	Sub Topic Name (Max. 63 chars)
ALL	☐	☐	di_all
Digital Input	☐ State-Change Publish	☐ Periodic Publish	Sub Topic Name (Max. 63 chars)
DI0	☐	☐	di00
DI1	☐	☐	di01
DI2	☐	☐	di02
DI3	☐	☐	di03
DI4	☐	☐	di04
DI5	☐	☐	di05
DI6	☐	☐	di06
DI7	☐	☐	di07

Step2 Make sure that the **Mosquitto Broker** is enabled, and the **MQTTX** is connected. In this example, the topic is "**ICPDAS/di_all**".

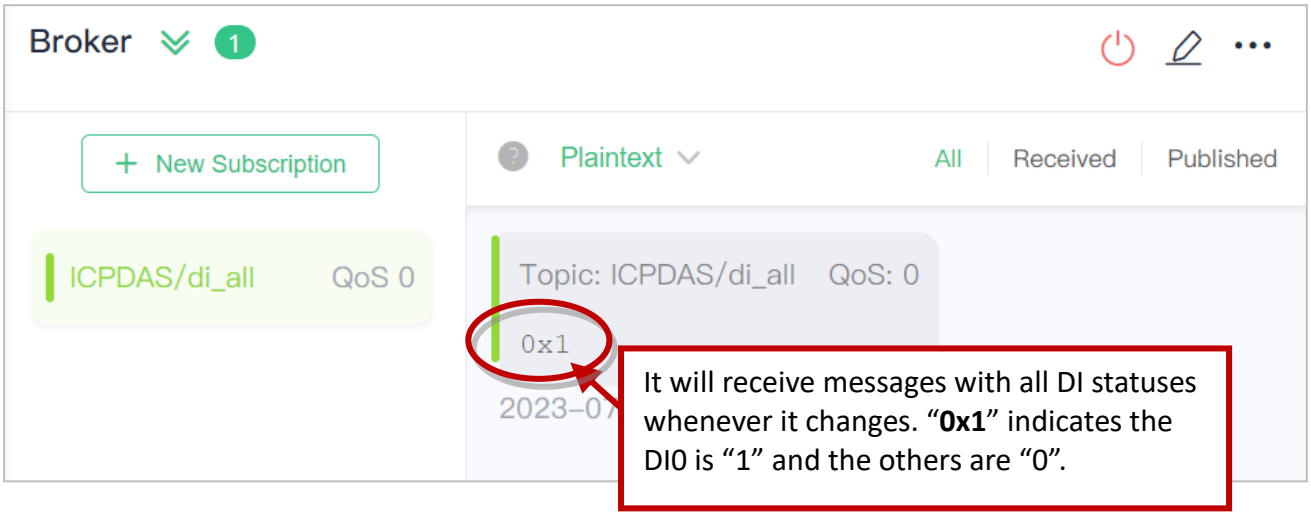


Step3 Changing the external signal causes the DI status to change, and the MQTT message will be sent from the module.

The user ca refer to t(P)ET series Quick Start to wire the I/O for testing purposes.
https://www.icpdas.com/en/download/show.php?num=2635

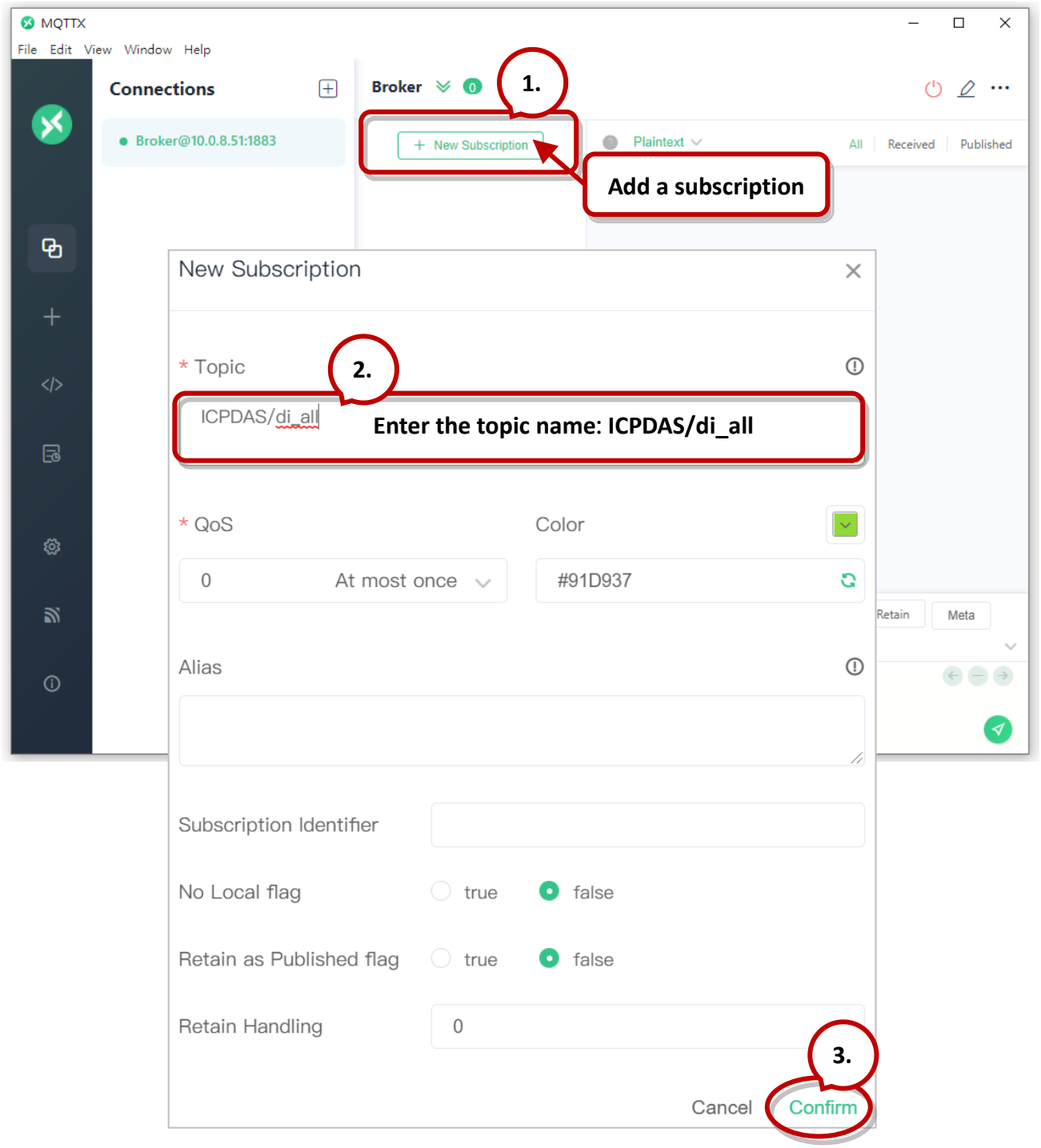


Step5. **Step 4** The user can verify the received messages within the MQTTX window.

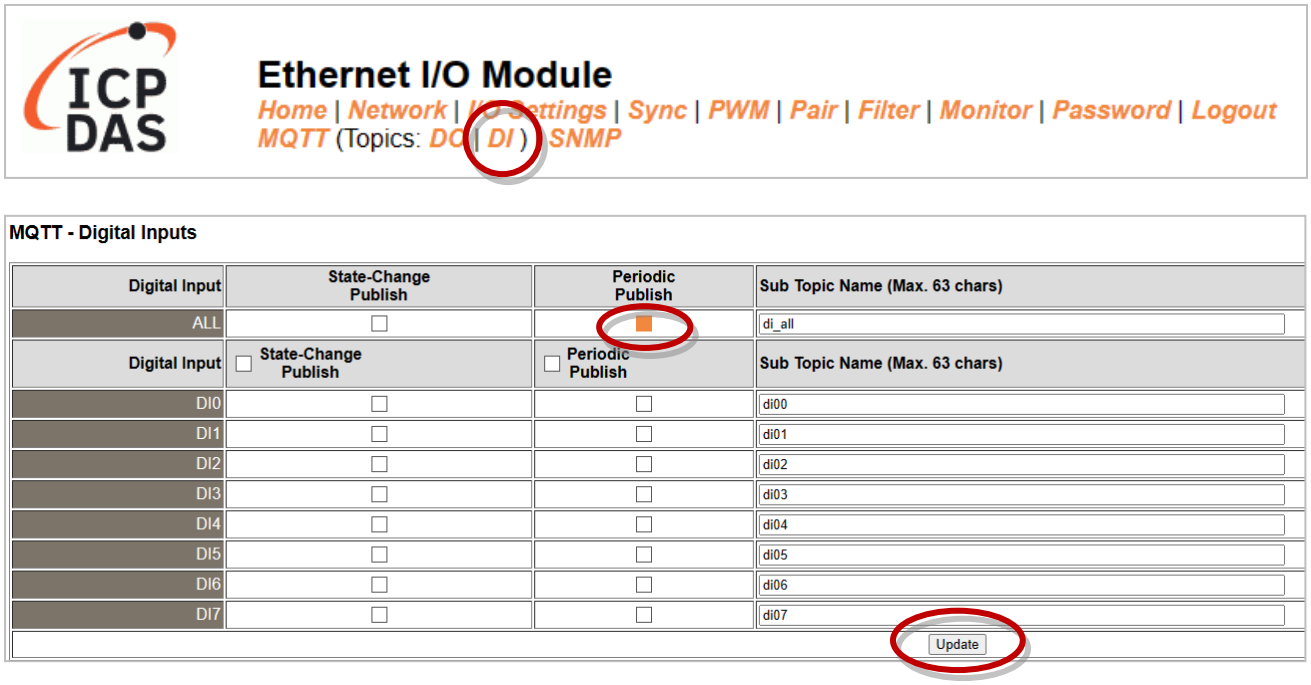


MQTT DI – Periodic Publish

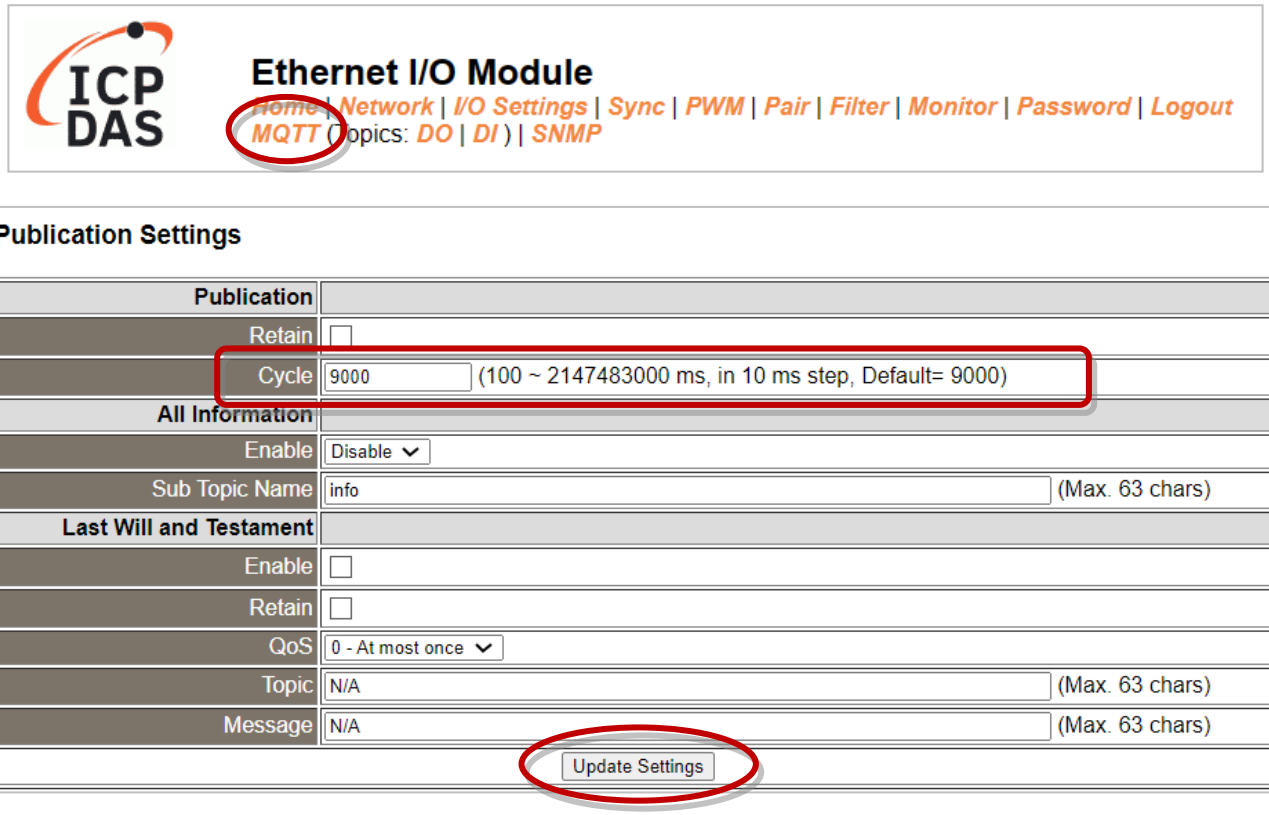
Step6. **Step 1** Make sure that the Mosquitto Broker is enabled, and the MQTTX is connected. In this example, the topic is "**ICPDAS/di_all**".



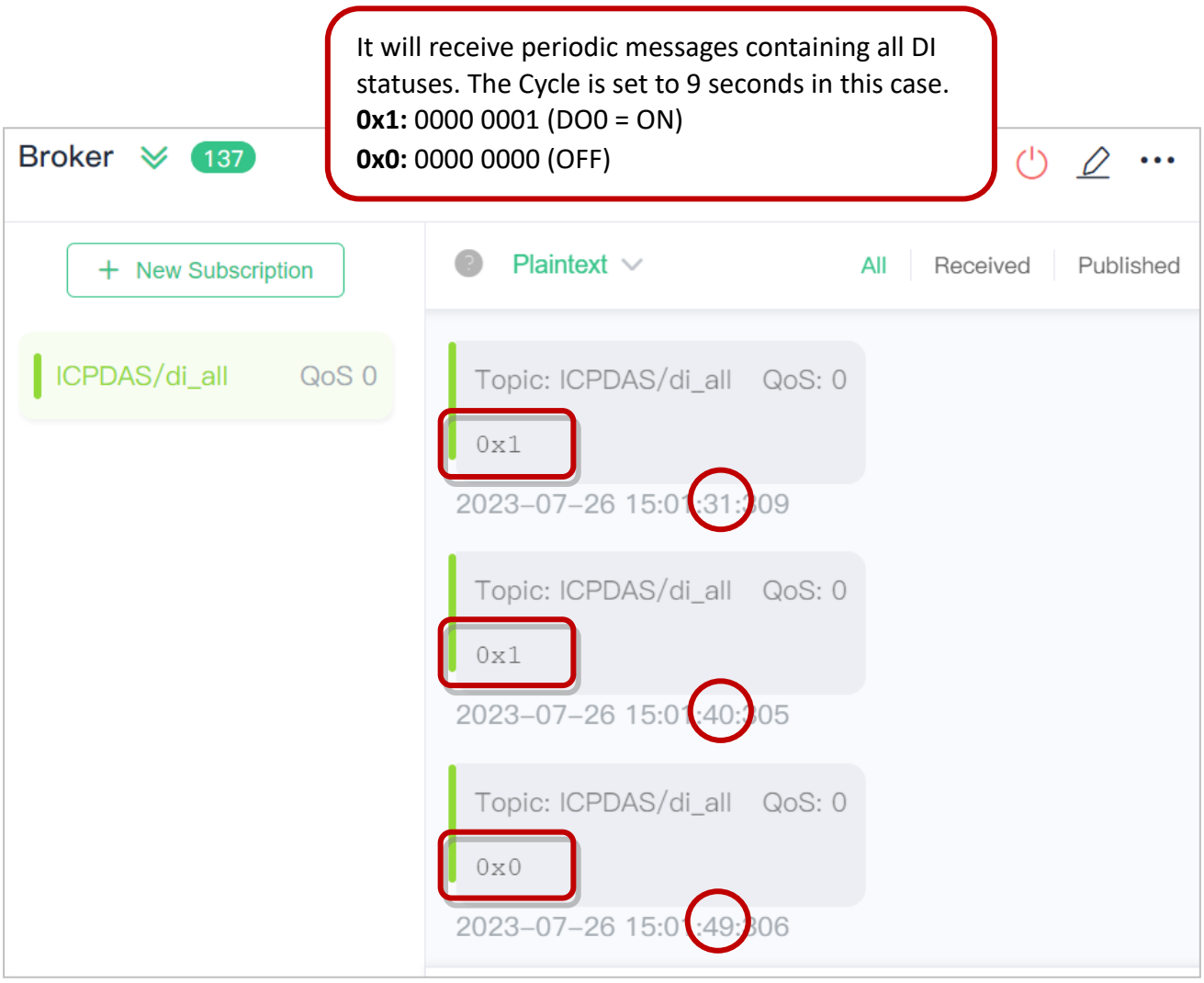
Step7. **Step2** Log in to the module's Web Server, and click the **Periodic Publish** option for the "**di_all**" on the **MQTT - "DI"** page to enable the function. After that, click **Update** to save the changes.



Step3 Go to the **MQTT** page, set the message publishing cycle (Cycle), and click "**Update Setting**" to save the changes.



Step8. **Step 4** The user can verify the received messages within the MQTTX window.



4.9 SNMP

The "SNMP" page provides the function for the module to send module information and I/O information to the SNMP Network Management Software or device to help administrators to monitor the status of the module in real time. If the Trap function is enabled, the module can actively send messages to the SNMP manager to keep track of data when the I/O status of the module changes or restarts. **Note: The supported MIB-II management items are sysContact, sysLocation, sysDescr, and sysName.**

4.9.1 SNMP Agent Configuration

SNMP v2c Agent Configuration

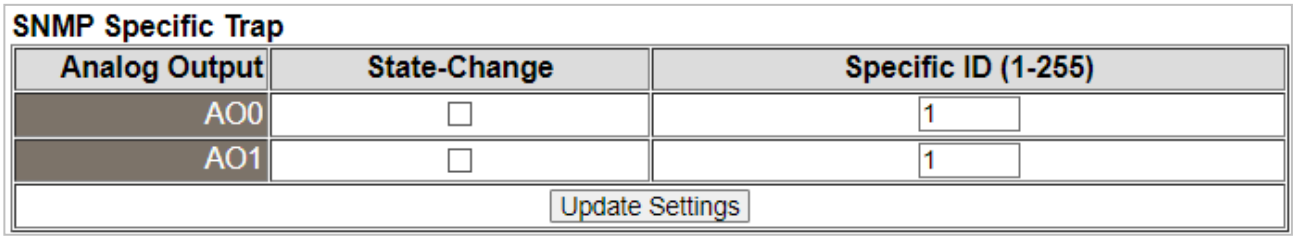
System Info	Setting	
Contact	User	(Max. 47 chars)
Location	Site	(Max. 47 chars)
Description	EtherIO	(Max. 47 chars)
Name	Device	(Max. 47 chars)
Function	**Setting**	
Read-Only Community	public	(Max. 47 chars, example: public)
Read-Write Community	private	(Max. 47 chars, example: private)
Trap Community	public	(Max. 47 chars, example: public)
Manager / Trap IP #1	0.0.0.0	(IPv4/v6 Address, example: 10.0.8.123, fe80:0:0:0:a8ee:dc07:1cda:5678)
Manager / Trap IP #2	0.0.0.0	
Generic Trap	☐ Cold Start, ☐ Warm Start	
Enable SNMP	☐ Check to enable. (Default disabled)	
Update Settings		

The following table provides parameter notes for the **SNMP v2c Agent Configuration** section:

Item	Description	Defaults
System Info		
Contact	The SNMP server's contact person	User
Location	The server's location	Site
Description	The description of the device displayed on the Server	EtherIO
Name	The name of the device displayed on the Server	Device

Item	Description	Defaults
Function		
Read-Only Community	Set the community name for read-only on the module	public
Read-Write Community	Set the community name for read-write on the module	private
Trap Community	Set the community name for the trap on the module	public
Manager / Trap IP #1	Set the IP address of Trap IP #1	0.0.0.0
Manager / Trap IP #2	Set the IP address of Trap IP #2	0.0.0.0
Generic Trap	Select to enable the Cold Start or Warm Start function	Disabled
Enable SNMP	Select the box to enable the SNMP communication function and deselect to disable it	Disabled
Update Settings	After saving the settings, **also reboot the module to take effect**	

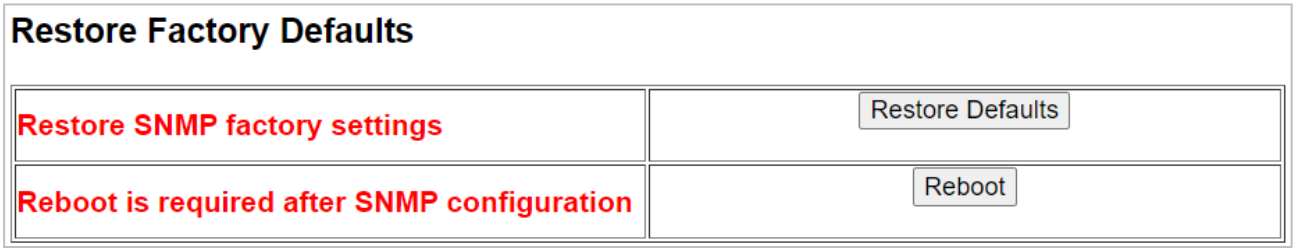
4.9.2 SNMP Specific Trap



The following table provides parameter notes for the **SNMP Specific Trap – AO** section:

Item	Description
Analog Output	
AO0 ~ AO1	Each DI channel has a specific Trap. Check the box to enable the Trap function for that DI channel. “Specific ID” is the ID number set for individual channel
Update Settings	After clicking the “Update Settings” button to save the changes, also **reboot the module for the changes to take effect.**

4.9.3 Restore Factory Defaults



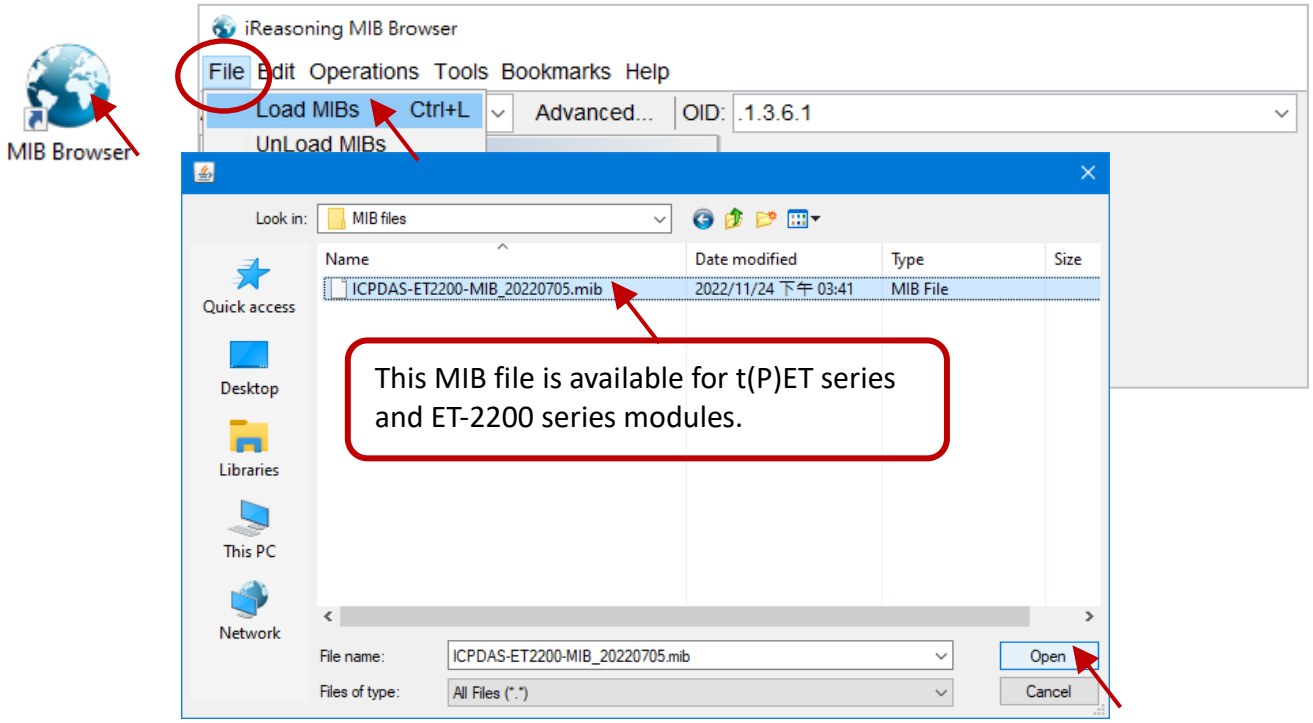
The following table provides parameter notes for the **Restore Factory Defaults** section:

Item	Description
Restore SNMP factory settings	Click the ““Restore Defaults” button to reset all SNMP settings to the default factory settings.
Reboot is required after SNMP configuration	After completing the SNMP settings, not only click the **Update Settings** button to save them, but also click the **Reboot** button to reboot the module.

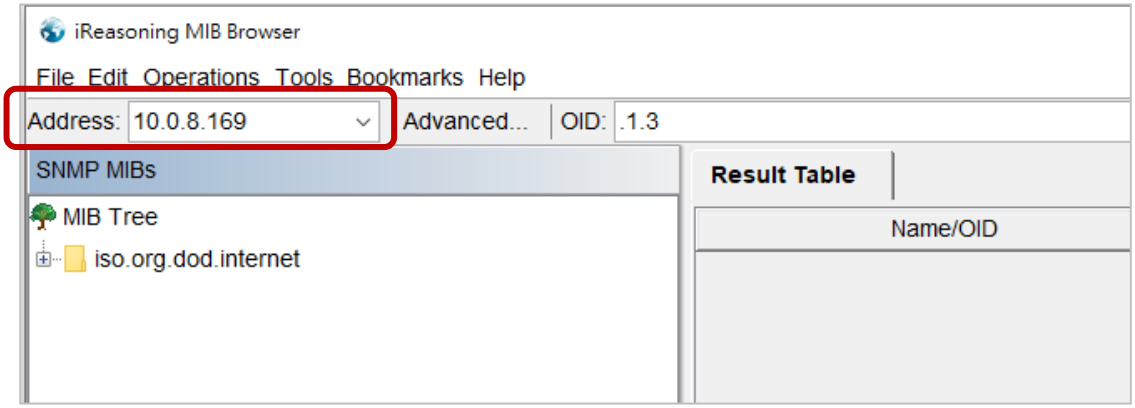
4.9.4 SNMP I/O Example

In this article, we use **iReasoning MIB Browser** as an example. Please download the installer (V14) from its official website and run the installer. http://www.ireasoning.com/mibbrowser.shtml

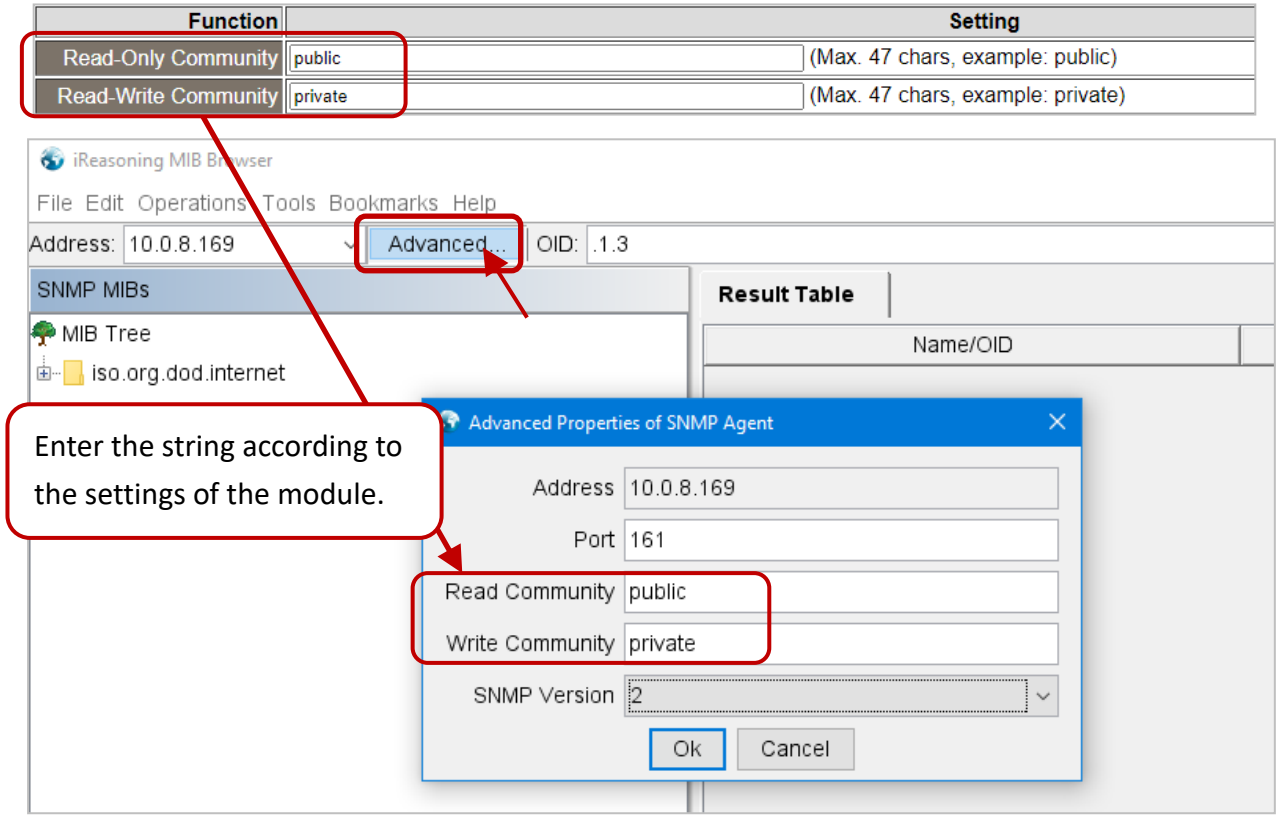
Step 1 Start the **iReasoning MIB Browser**. Click the **File** > **Load MIBs** on the menu bar and click the MIB file of the module (e.g. ICPDAS-ET2200-MIB_20220705.mib), then click the **Open** button to open it.



Step 2 Enter the IP address of the module in the **Address** field.

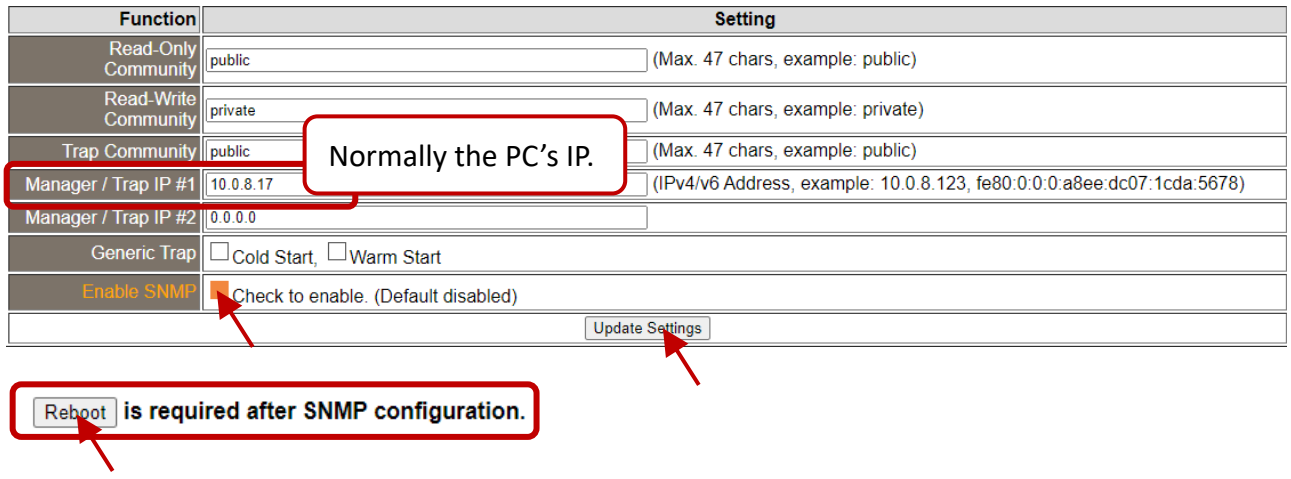


Step 3 Click "**Advanced…**" to set the parameters of the SNMP agent. Enter the string in the **Read/Write Community** fields according to the **Read-Only Community / Read-Write Community** settings of the module. If these strings are different on both sides, the agent will not work correctly.



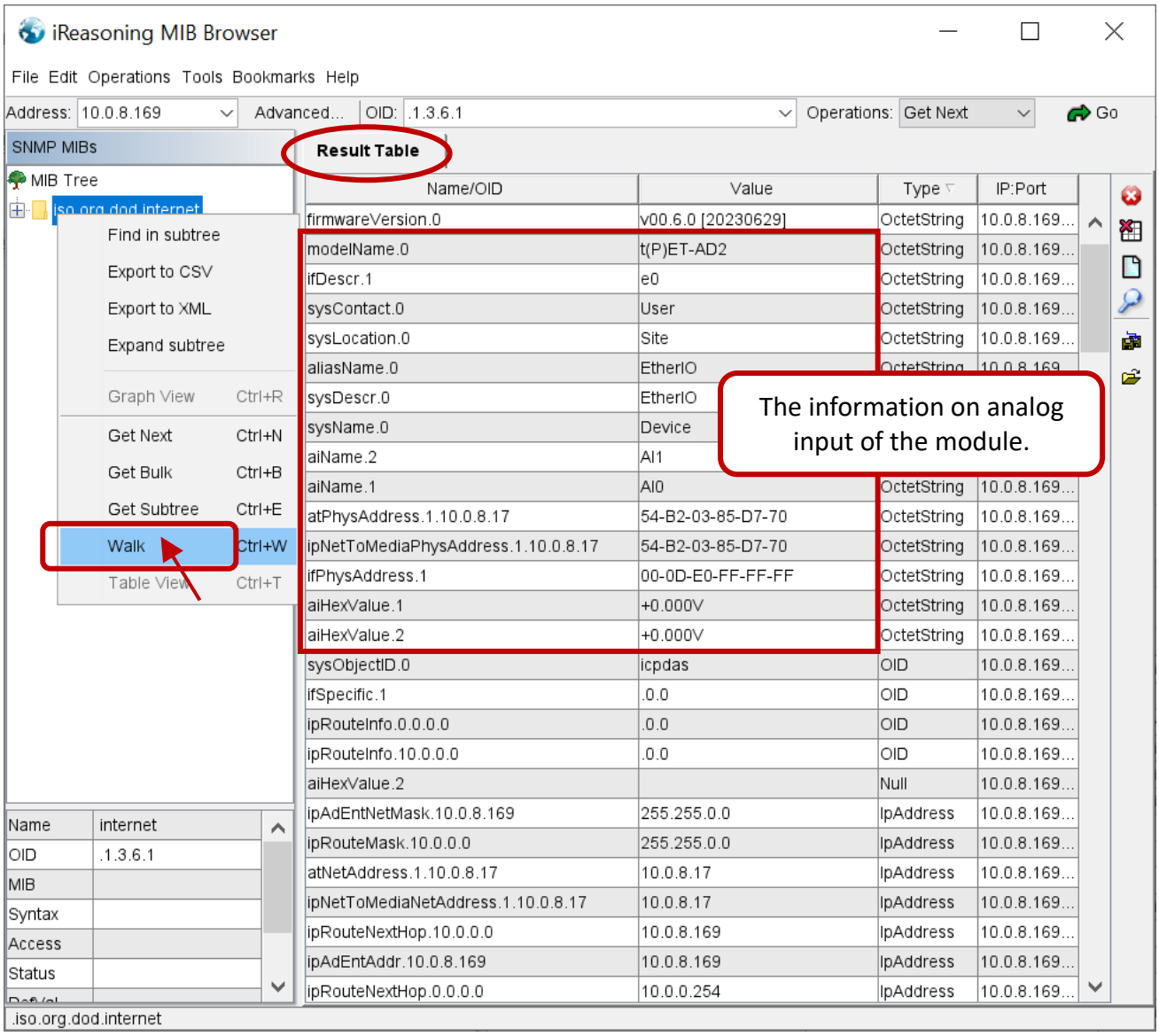
Note: If the **Write Community** field is not set, a Timeout error will occur during execution.

Step 4 Enter the IP address of **iReasoning MIB Browser** in the **Manager/Trap IP #1** field and enable the SNMP function, then click **Update Settings** to save the changes, and finally click the **Reboot** button to reboot the module.



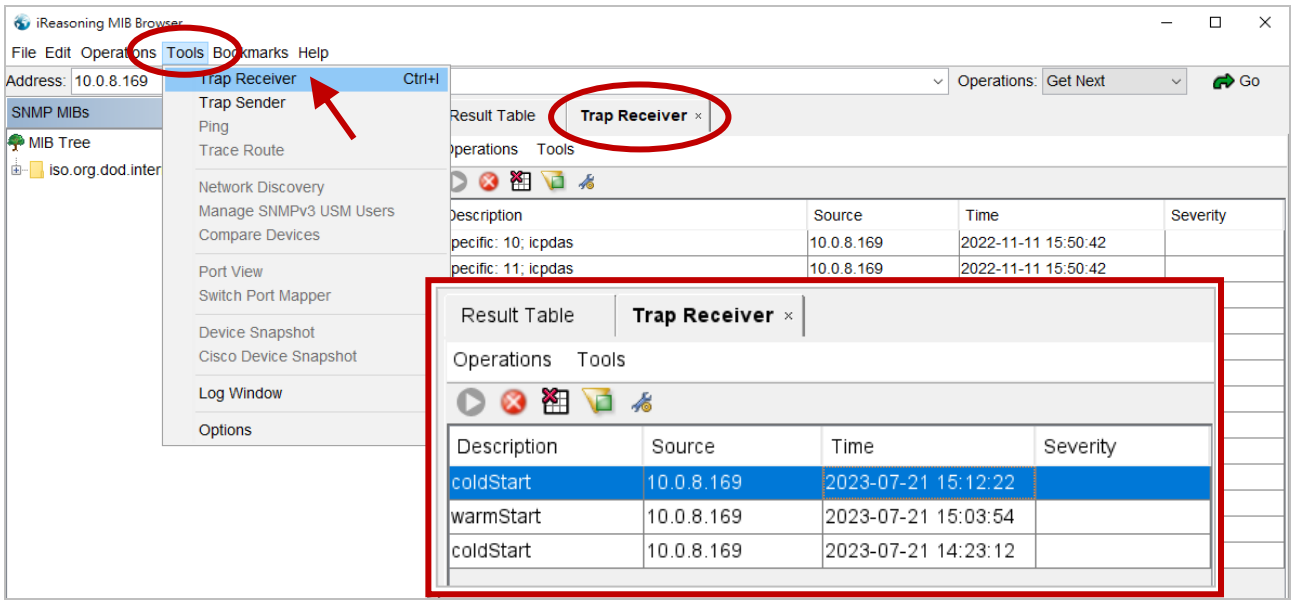
Read the information of the tET/tPET – the Walk command

To do: Right-click the **iso.org.dod. internet** folder on the left side and click **Walk** to display the information of the tET/tPET in the **Result Table**.



4.9.5 SNMP Trap Example

Step 1 Click **Tools → Trap Receiver** on the menu bar to display the window for receiving the Trap messages.

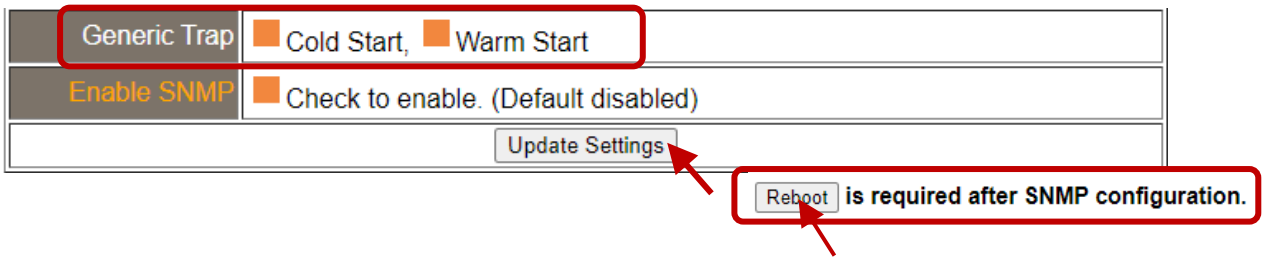


Step 2 The types of traps received from the module for alarms are as follows:

1. **Cold Start Trap:**
   After the module's power is completely shut down and then restarted, it will send a Trap message indicating a "Cold Start".

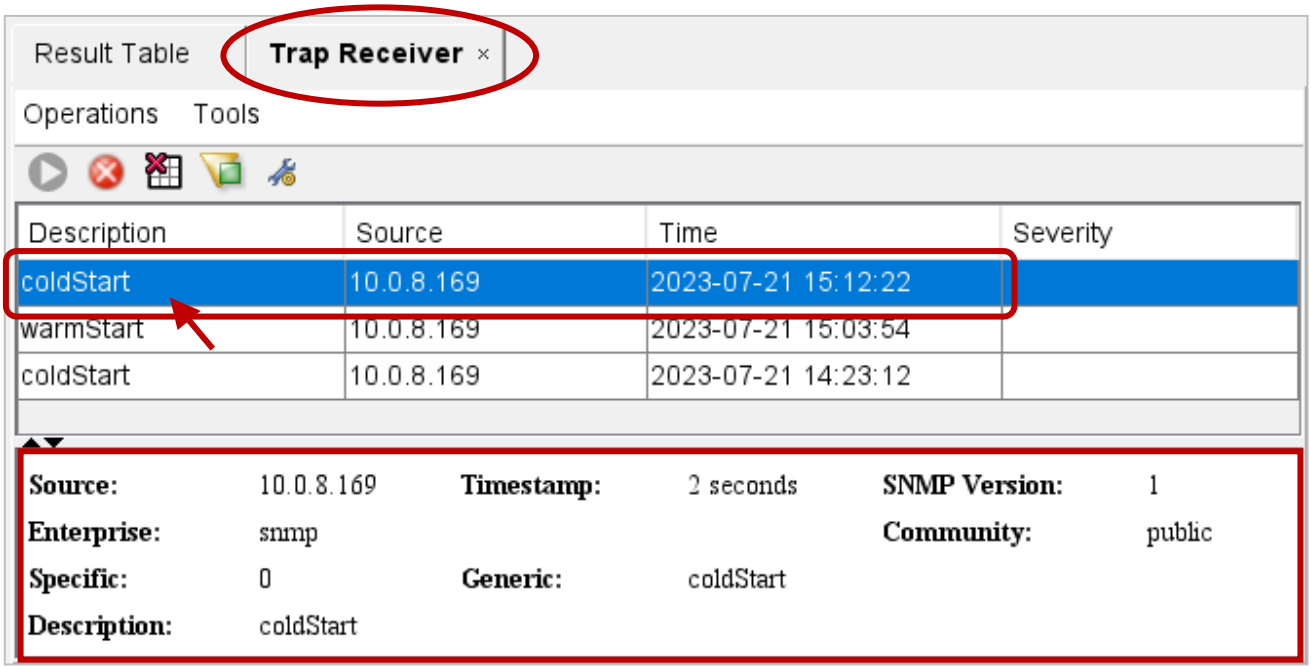
2. **Warm Start Trap:**
   The Warm Start Trap will be sent when the module restarts without turning off the power. For example, the reboot command or the watchdog mechanism.

Note: The Cold Start or Warm Start Trap function can be enabled on the SNMP page. Then, reboot the module if any changed.



3. **Specific Trap (I/O State-Change):**
   After enabling the specified I/O channel, if the I/O data changes (e.g., ON/OFF or value change), a Trap message with a Specific ID, source IP, and time will be sent. This makes it easier to analyze the cause of the alarm and handle it appropriately.

Click the Trap message to view the details



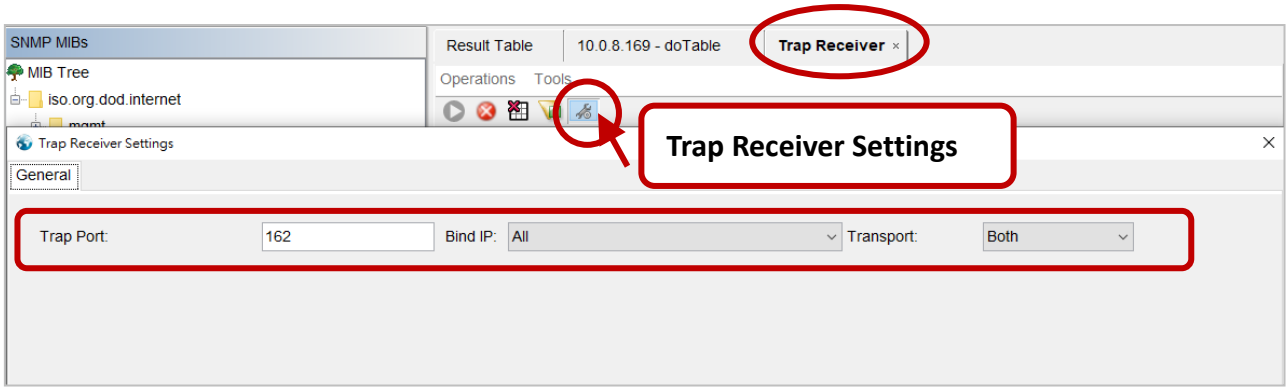
項目	說明
Source	The IP address of the device that sending the SNMP trap.
Timestamp	How much time has passed after the module starts
SNMP Version	The version of SNMP
Enterprise	The name of the enterprise
Community	SNMP community name according to the **Trap Community** setting
Specific	Specific ID
Generic	Generic ID
Name	The generic name for the Trap
Value	The I/O channel and status value of the module (e.g., 0 = OFF, 1 = ON, or an AI value)

4.9.6 SNMP Problem Solving

Unable to receive the Trap message from the device

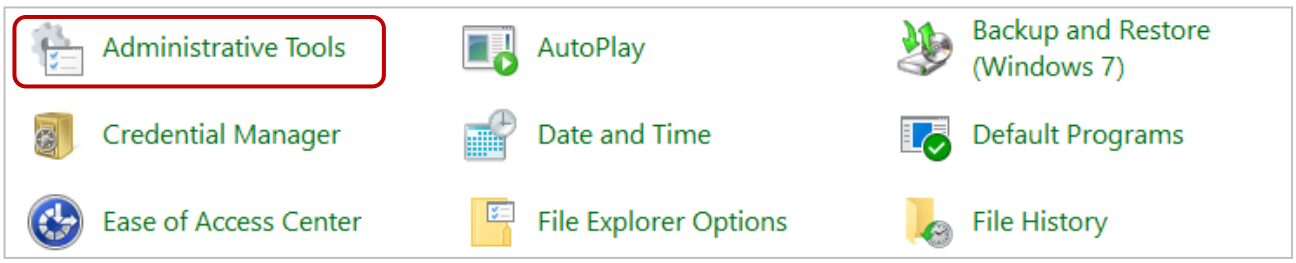
1. Check the setting of the Windows firewall or the Anti-virus software. These functions can be disabled during the testing.

2. Check the setting of the Trap port. Using iReasoning MIB Browser as an example, click the **Trap Receiver Settings** button on the **Trap Receiver** page to open the window. Then, confirm the Trap Port, Bind IP, and Transport settings. The module uses the default Trap port 162 according to the SNMP specification.

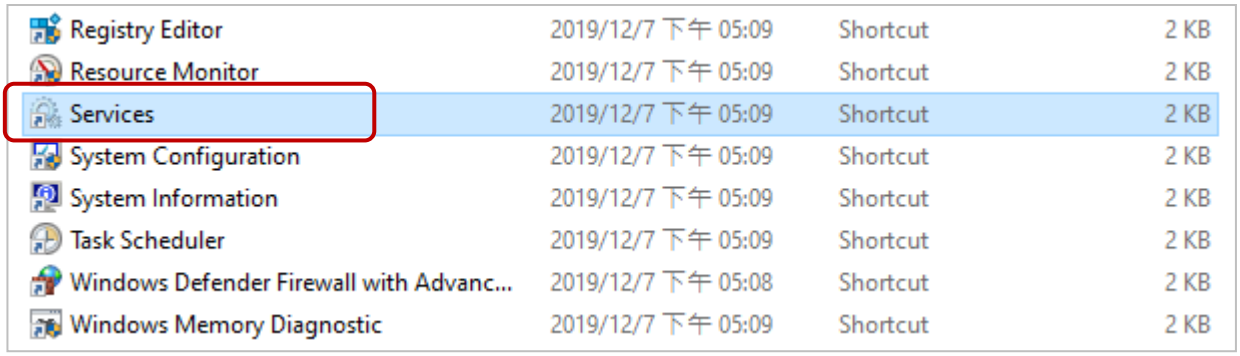


3. Disable Windows SNMP Trap Service.
   Note:
   The configuration screen may be different depending on the Windows version. The following screens are on Windows 10.

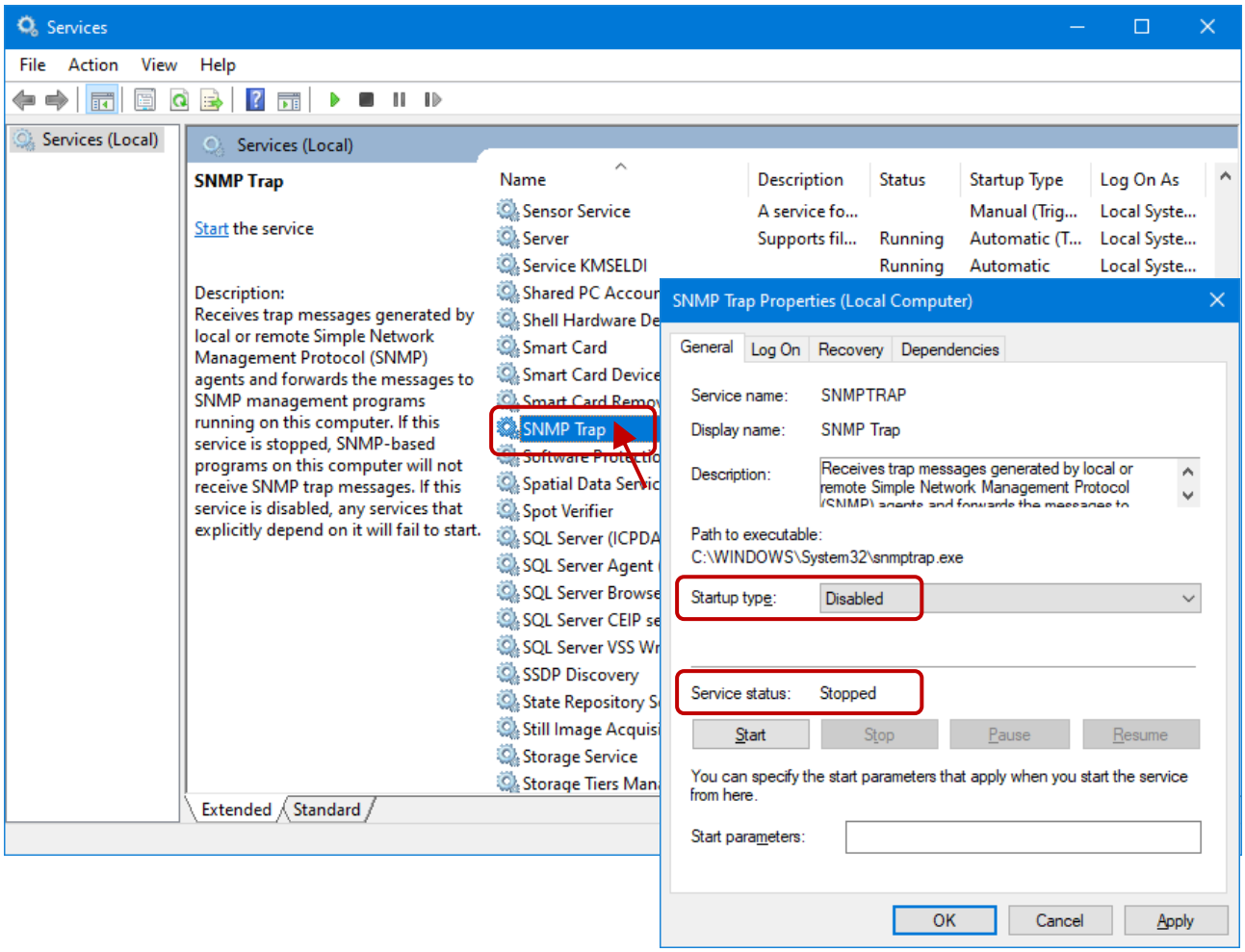
Step 1 Open the **Control Panel** window and click **Administrative Tools**.



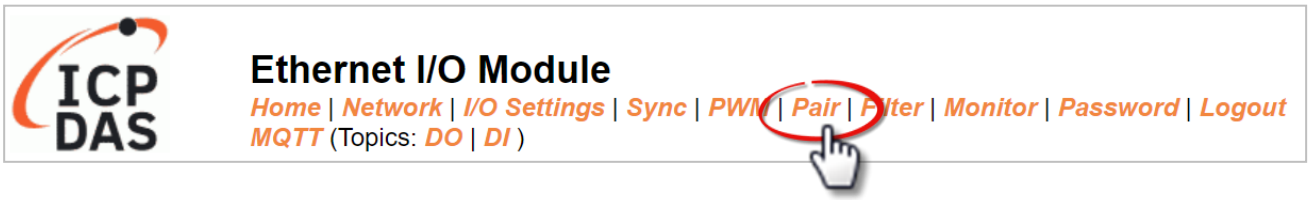
Step 2 Double-click the **Services** icon.



Step 3 Double-click the **SNMP Trap** and confirm the **Startup type** is set to "**Disabled"** and the **Service status** is set to "**Stopped"**.



4.10 Pair Connection



On the **Pair** page, within the **Pair Connection Settings** section, users can enable and configure the pair-connection function of the I/O module using Modbus TCP. This allows for the establishment of logic connections between Local and remote I/O, as explained below.

4.10.1 Pair-Connection Settings

Note: The configuration iteams varies based on the I/O type.

Pair-Connection Settings:

Submit 1-2

#	Enable Mode	Remote IPv4 / IPv6 / Host Name (Max. 127 chars)	Remote Port	Net ID	Scan Time (ms)	AI Address	AO Address	Network Protocol
01	PUSH	0.0.0.0	502	1	1000	0	0	TCPv4
02	PUSH	0.0.0.0	502	1	1000	0	0	TCPv4

Note:
Only Support TCP PUSH Mode = Local AI to Remote AO. Data Format must be Engineering

Pair-Connection Settings: | Submit 1-8 | 9-16 |

#	Enable Mode	Remote IPv4 / IPv6 / Host Name (Max. 127 chars) : Port	Net ID	Scan Time (ms)	IO Count	Local IO Address	Remote IO Address	Network Protocol
01	PULL	:502	1	1000	1	0x:Coil C 0	0x:Coil C 0	TCPv4
02	PULL	:502	1	1000	1	0x:Coil C 0	0x:Coil C 0	TCPv4
03	PULL	:502	1	1000	1	0x:Coil C 0	0x:Coil C 0	TCPv4
04	PULL	:502	1	1000	1	0x:Coil C 0	0x:Coil C 0	TCPv4
05	PULL	:502	1	1000	1	0x:Coil C 0	0x:Coil C 0	TCPv4
06	PULL	:502	1	1000	1	0x:Coil C 0	0x:Coil C 0	TCPv4
07	PULL	:502	1	1000	1	0x:Coil C 0	0x:Coil C 0	TCPv4
08	PULL	:502	1	1000	1	0x:Coil C 0	0x:Coil C 0	TCPv4

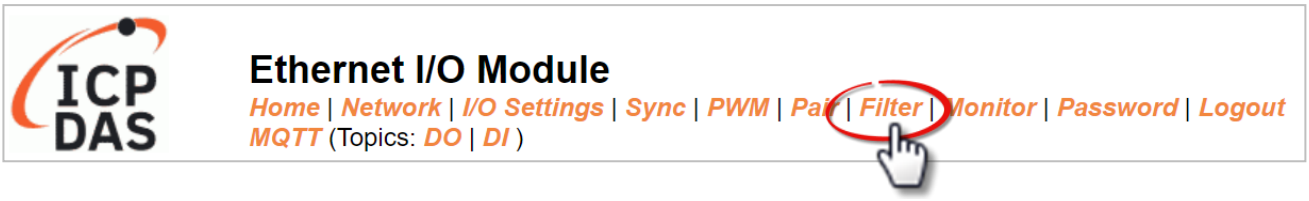
Note:
PULL Mode = Remote to Local
PUSH Mode = Local to Remote
Pair-connection is disabled if the IO Count is 0 (no data)

IO Address (base 0): 0 - 65535, no leading 0x/1x/3x/4x.

The following table provides parameter notes for the **Pair-Connection Settings** section:

Item		Description	Defaults
Enable Mode		Used to enable or disable the Client (Master) function and select either **PULL** or **PUSH** mode. **PULL Mode**: To read the remote AI (or DI) and write to the local AO (or DO). **PUSH Mode**: To read the local AI (or DI) and write to the remote AO (or DO).	Disable
Remote IP		Used to set the IP address or the hostname of the remote module. Before entering the Host Name, ensure that the correct DNS has been set on the Network page.	0
Remote Port		Used to set the TCP port number of the remote device. The valid range is 0 - 65535.	502
Net ID		Used to set the Modbus Net ID of the remote device. The valid range is 1 - 247.	1
Scan Time		In "**PULL**" mode, the module will update its I/O data based on the specified scan time. In **"PUSH"** mode, If the local DI/AI changes, the module will immediately update the remote DO/AO. Furthermore, even if the local DI/AI remains unchanged throughout the scan time, the module will still update the remote DO/AO. The valid range is 1000 to 42949672965 (ms)	1000 ms
AIO	AI Address	Used to specify the starting address of the analog input.	0
	AO Address	Used to specify the starting address of the analog output.	0
DIO	DI Count	Used to specify how many DI/DO channels are mapped.	0
	Local IO Address	Used to select the DI or DO type for the Local site and to enter the starting address. Shared memory is only available for DIO series modules: The DIO (Bit) addresses range from 3000 to 7094 The AIO (Register) addresses range from 3000 to 3254 DI, DO, AI, and AO data all share a common memory block. If various types of I/O data are written to the same address, they will overwrite one another. To learn more, refer to Section 5.5 Shared Memory.	0
	Remote IO Address	Used to select the DI or DO type for the Remote site and to enter the starting address.	0
Network Protocol (TCP/UDP)		Used to set the type of Modbus protocol to be used and can be **TCPv4/TCPv6** or **UDPv4/ UDPv6**	TCPv4
Submit		Click this button to save the changes.	

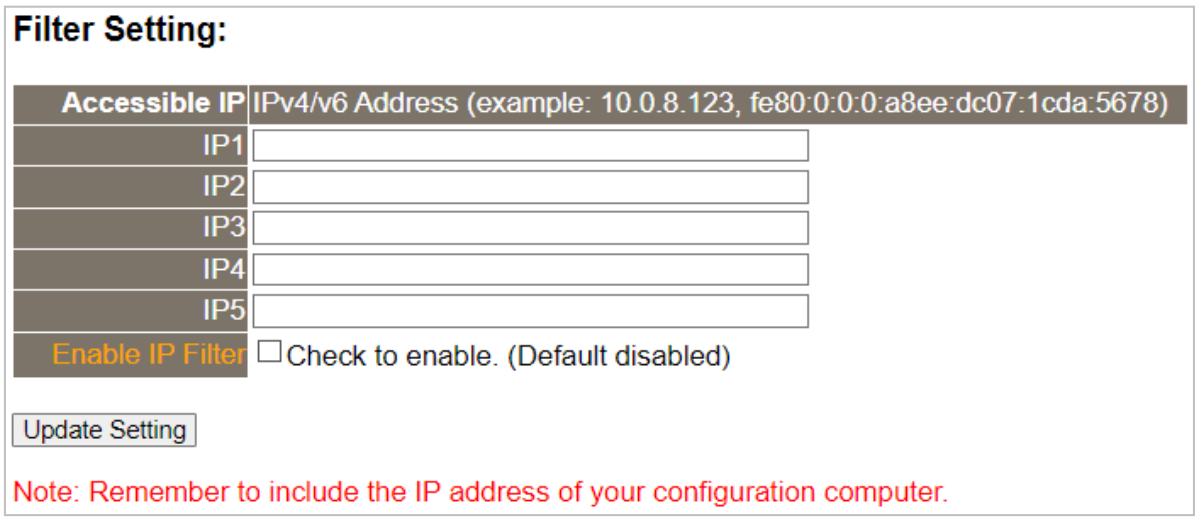
4.11 Filter



On the **Filter** page, the **Filter Settings** section allows users to enable and configure the IP filter list for the module, as explained below.

4.11.1 Filter Settings

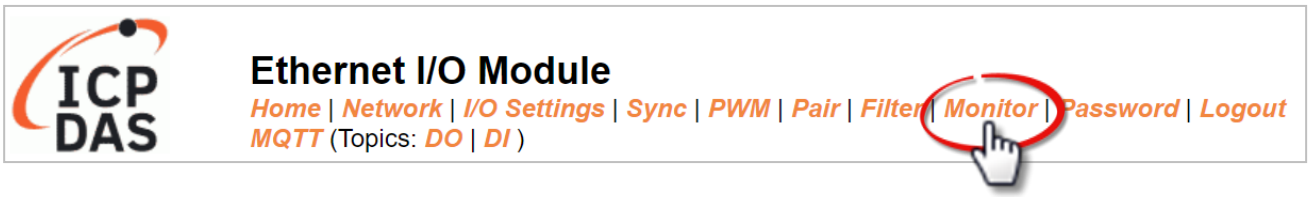
This function can be used to query or edit the IP filter list for the module. Only Clients whose IP address is specified in the list will be able to access the module.



The following table provides parameter notes for the **Filter Settings** section:

Item	Description
IP1 ~ IP5	Enter the accessible IP address (IPv4 or IPv6). Note that remember to enter the IP address of the PC used to configure the module.
Enable IP Filter	Check the item to enable the function (Defaults: Disabled).
Update Settings	Click this button to save the changes.

4.12 Monitor



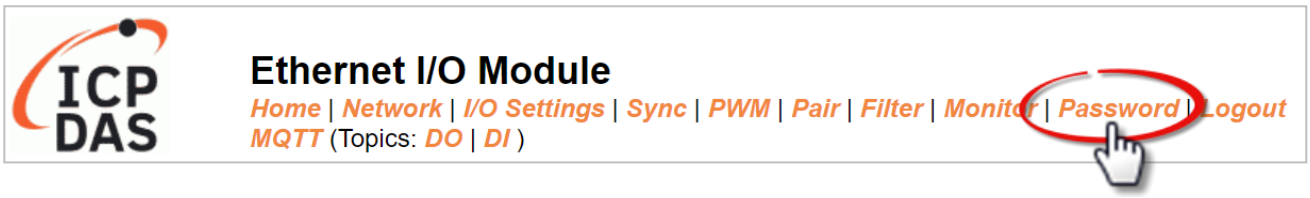
On the **Monitor** page, the **Current Connection Status** section enables users to observe the real-time status of the network connection for the module

Current Connection Status:

Server Mode	Connected IP	Server Mode	Connected IP
IP1	-	IP2	-
IP3	-	IP4	-
IP5	-	IP6	-
IP7	-	IP8	-
IP9	-	IP10	-
IP11	-	IP12	-
Available Connections	32		

Client Mode	Remote IP	Connection State	Query State	Last Query Time	Host Name
IP1	-	-	-	-	-
IP2	-	-	-	-	-
IP3	-	-	-	-	-
IP4	-	-	-	-	-
IP5	-	-	-	-	-
IP6	-	-	-	-	-
Client Mode	Remote IP	Connection State	Query State	Last Query Time	Host Name
IP7	-	-	-	-	-
IP8	-	-	-	-	-
IP9	-	-	-	-	-
IP10	-	-	-	-	-
IP11	-	-	-	-	-
IP12	-	-	-	-	-

4.13 Change Password



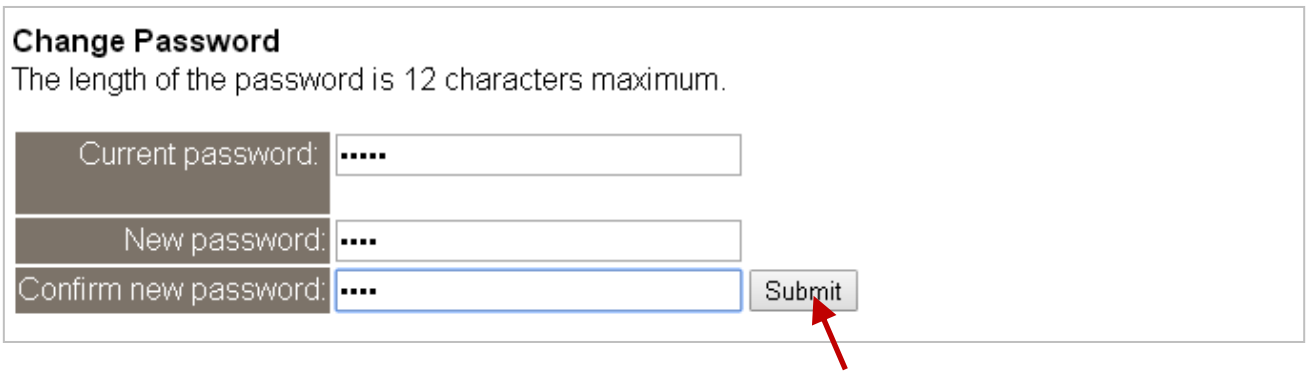
On the **Password** page, the **Change Password** section enables users to modify the login password for the module's web server. The steps are outlined below.

Step1: Enter your old password in the the **Current password** field. When initially logging into the web server, the user is required to change the factory default password (Admin).

Step2: Enter the new password in the **New password** field. Please use 1 to 12 digits or English characters.

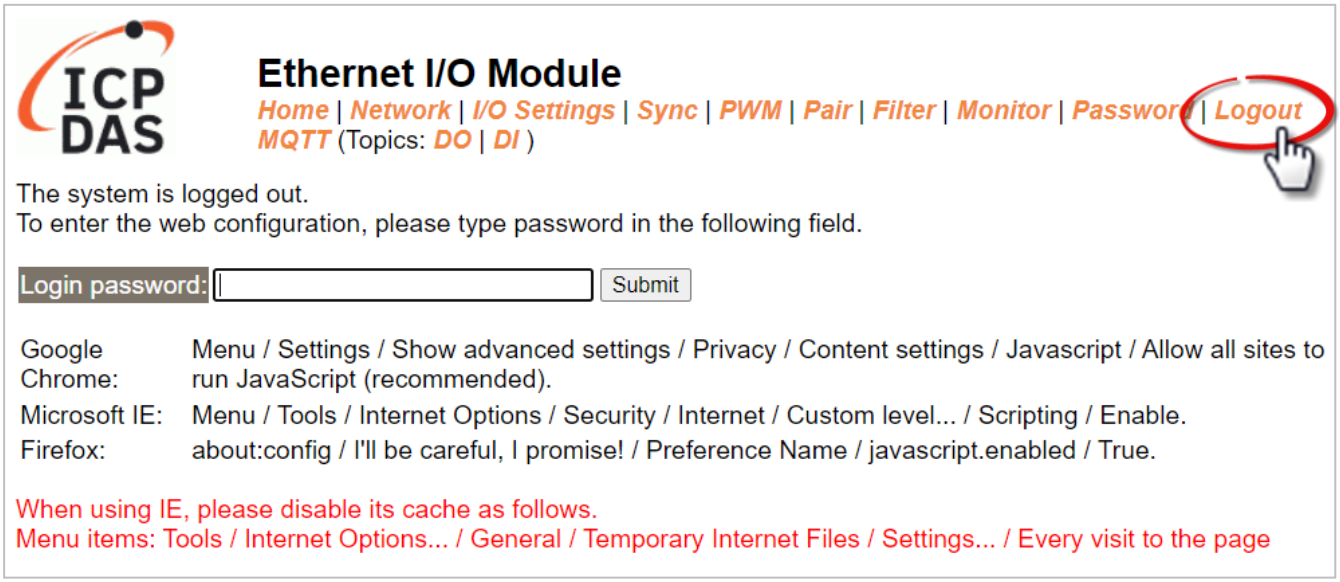
Step3: Re-enter the new password in the **Confirm new password** field to confirm.

Step4: Click the **Submit** button to update the password.



4.14 Logout

Click on the **Logout** tab to sign out from the module's web server and return to the login page.



5 I/O Pair Connection Applications

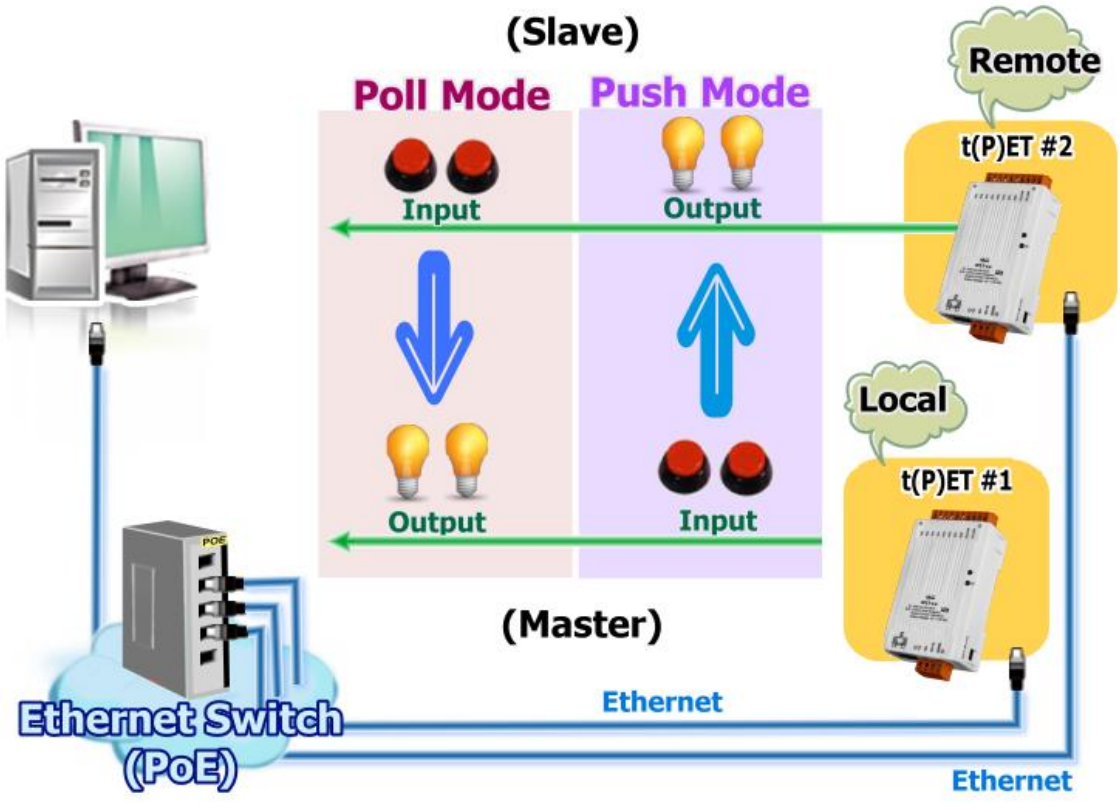
The tET/tPET series modules can establish remote logical I/O connections via Ethernet. After configuring the settings, it becomes possible to continuously read the DI status of the local (or remote) module and then write it to the DO of the remote (or local) module. This function is useful when connecting DI/DO modules that have no Ethernet functionality.

To configure the Pair-Connection function, please consult the following chapters.

5.1 Set a Single Module to Pull/Push Mode (DI/DO)

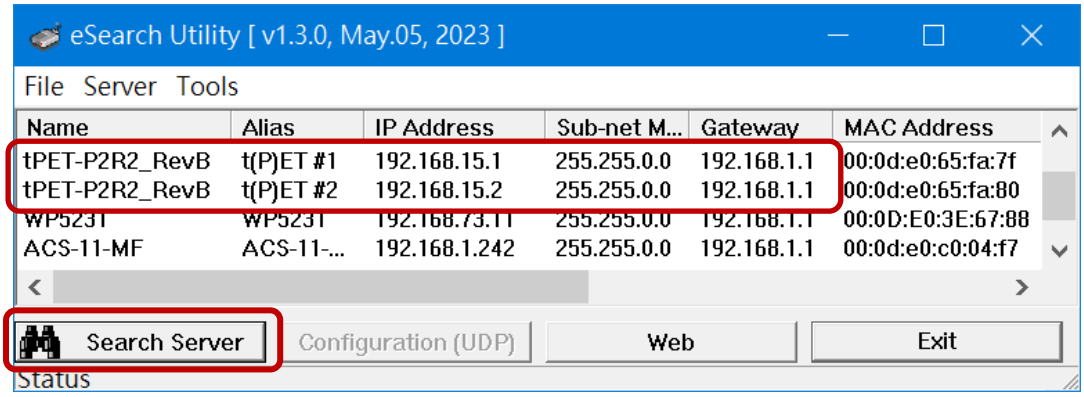
➢ Step 1: Connect the Module to the Network, PC, and Power Supply

Confirm that the tET/tPET series modules are functioning correctly. Refer to Chapter 3. "Getting Started" for more details. Here is the schematic diagram for this example, utilizing the tPET-P2R2 module.



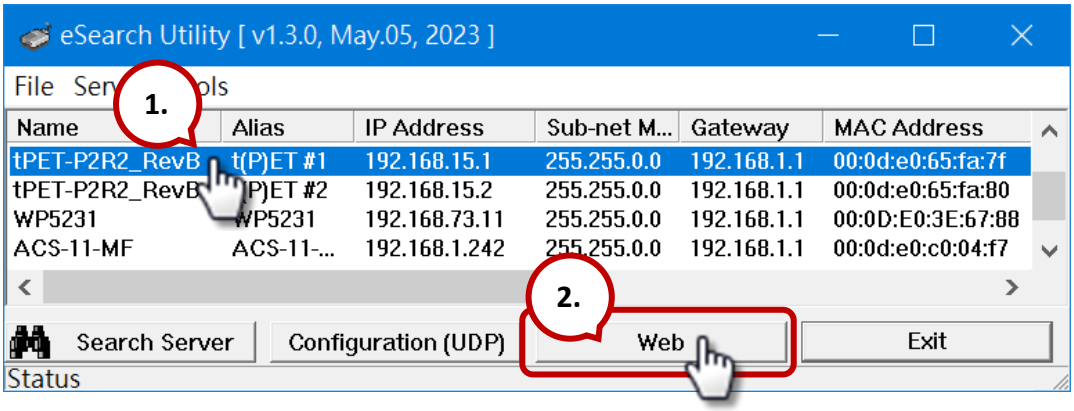
➢ Step 2: Configure the Ethernet Settings

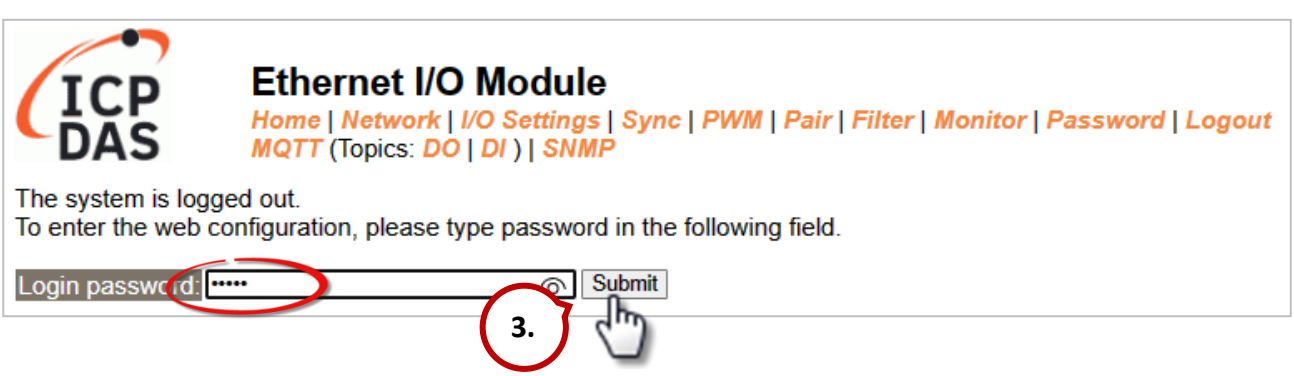
Contact your network administrator to get the correct network configuration information (e.g., IP/Mask/Gateway) needed to set up I/O modules. For more instructions, refer to Section 3.4 "Using the eSearch Utility to assign a new IP" .



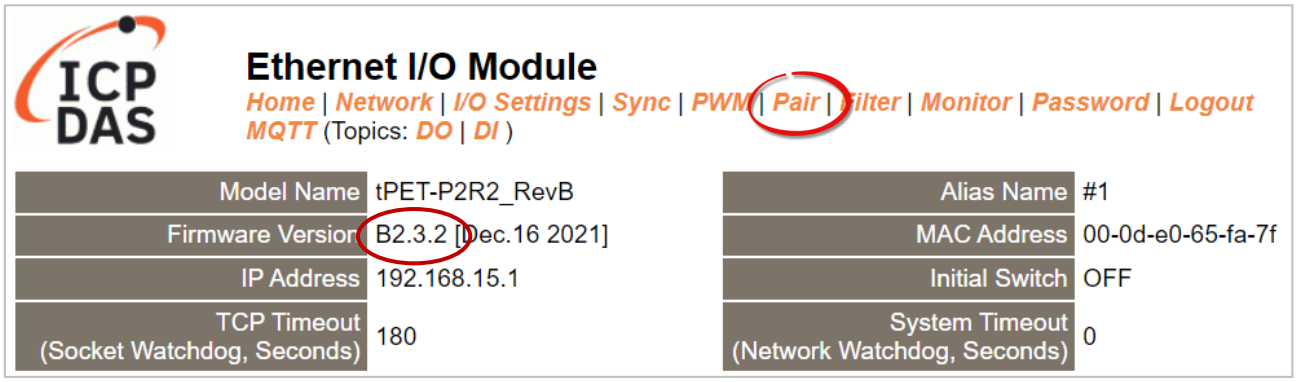
➢ Step 3: Log into the tET/tPET Web Server

1. Choose the **t(P)ET** module within the eSearch Utility and then click the "**Web**" button to open the login webpage.
2. Enter the password in the **Login password** field **(Defaults: "Admin")** and click the **"Submit"** button to log into the Web Server.





3. Click the **"Pair"** tab to display the configuration page.

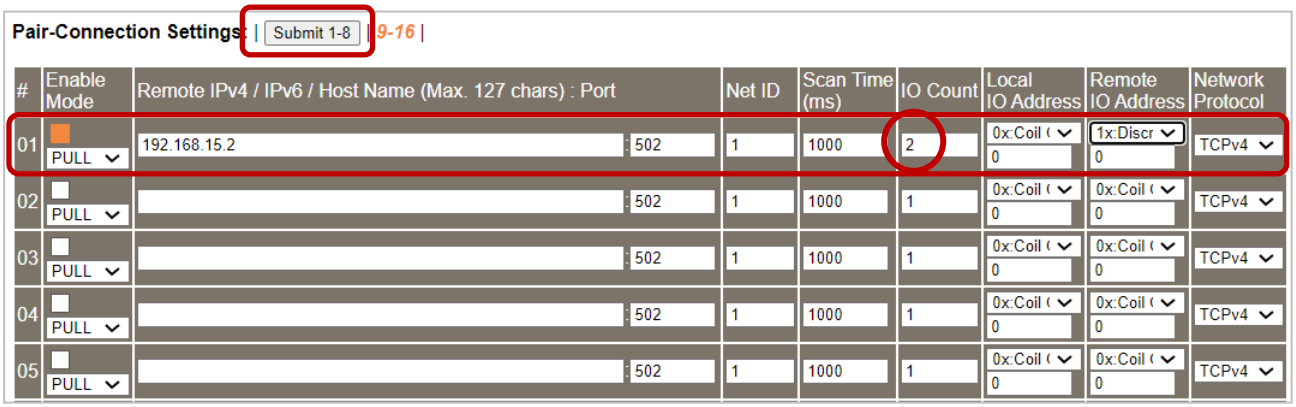


5.1.1 Pull Mode

1. In the **Pair-Connection Setting** section, choose **PULL** and check the box in the **Enable Mode** field to enable this mode.
2. In the **Remote IP… : Port** fields, enter the IP address and TCP Port of the remote **t(P)ET #2** module.
3. In the **IO Count** field, enter the mapped quantity for DI and DO.

> For example, the **PULL Mode (Remote** DI to **Local** DO) configuration:
> Enter "**2**" in the "**IO Count**" field and "**0**" in both the **Local/Remote IO Address** fields. This means **DI0 and DI1** of **t(P)ET #2** module correspond to **DO0 and DO1** of **t(P)ET #1** module.

4. In the **Local IO Address** field, select "0x: Coil Output…" and enter the starting **DO** address.
   In the **Remote IO Address** field, select "1x: Discrete Input.." and enter the starting **DI** address.
5. Choose the Modbus protocol (e.g., **TCPv4**) from the **Network Protocol** drop-down menu.
6. Click the "**Submit…**" button to complete the configuration.

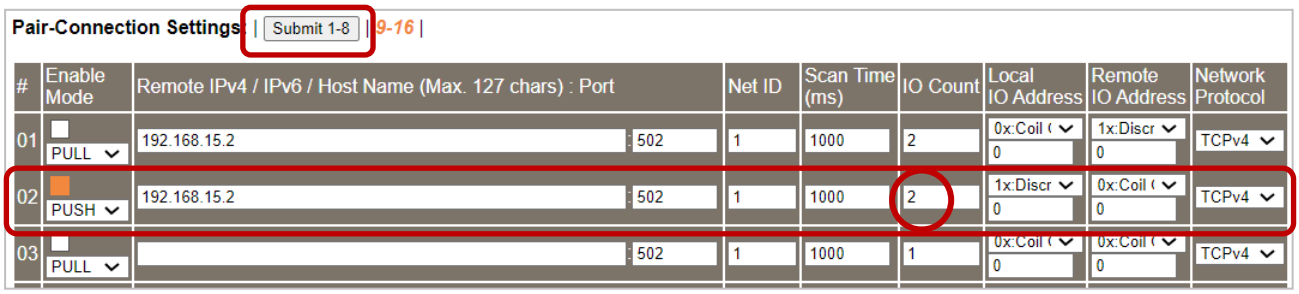


5.1.2 Push Mode

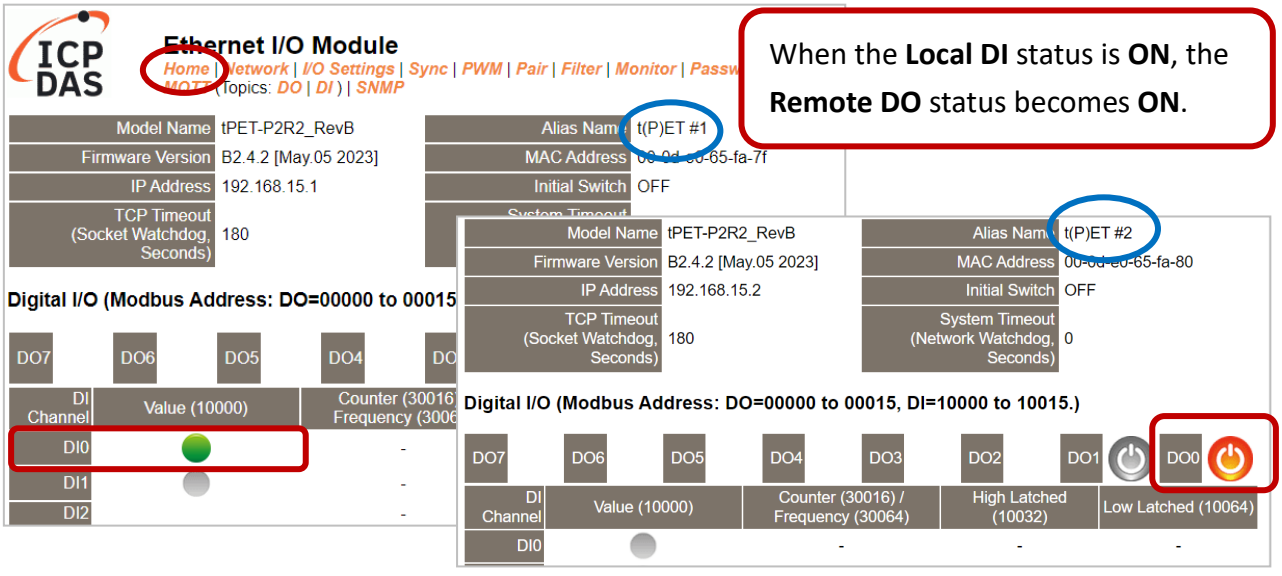
1. In the **Pair-Connection Setting** section, choose **PUSH** and check the box in the **Enable Mode** field to enable this mode.
2. In the **Remote IP… : Port** fields, enter the IP address and the TCP Port of the remote **t(P)ET #2** module
3. In the **IO Count** field, enter the mapped quantity for DI and DO.

> For example, the **PUSH Mode (Local** DI to **Remote** DO) configuration:
> Enter "**2**" in the **IO Count** field and "**0**" in both the **Local/Remote IO Address** fields. This means **DI0 and DI1** of **t(P)ET #1** module correspond to **DO0 and DO1** of **t(P)ET #2** module.

4. In the **Local IO Address** field, select "1x: Discrete Input.." and enter the starting **DI** address.
   In the **Remote IO Address** field, select "0x: Coil Output…" and enter the starting **DO** address.
5. Choose the Modbus protocol (e.g., **TCPv4**) from the **Network Protocol** drop-down menu.
6. Click the "**Submit…**" button to complete the configuration.



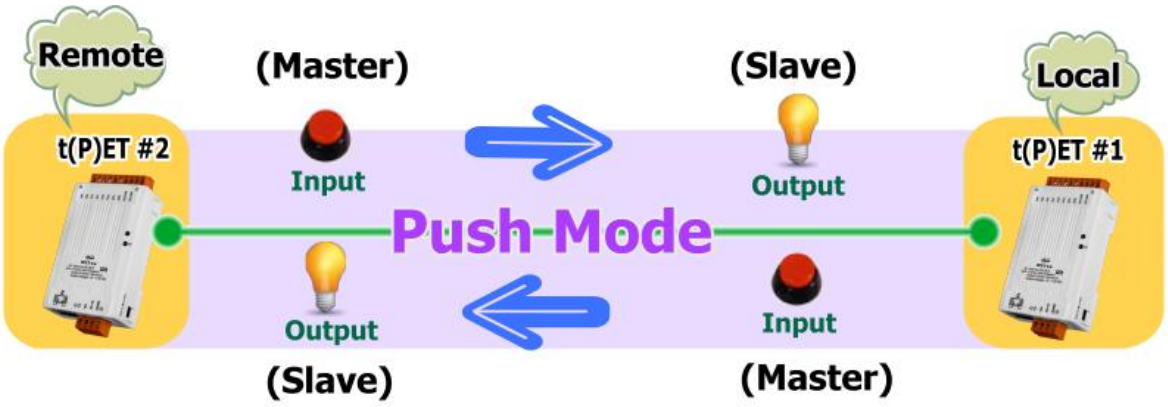
The user can test this function on the **Home** page. Also, refer to specific tPET Quick Start for the I/O wiring.



5.2 Set Two Modules to Push Mode (Local DI to Remote DO)

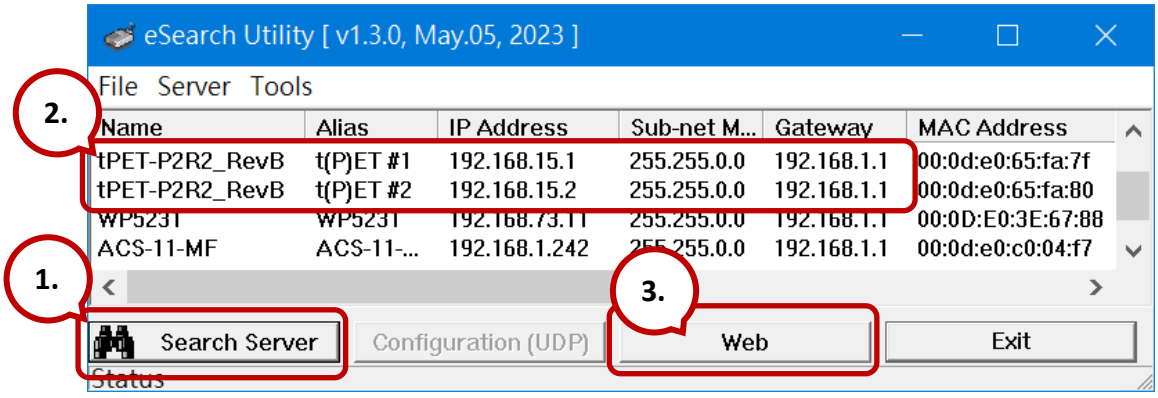
➢ Step 1: Connect the Module to the Network, PC, and Power Supply

Confirm that the tET/tPET series modules are functioning correctly. Refer to Chapter 3. "Getting Started" for more details. Here is the schematic diagram for this example, utilizing the tPET-P2R2 module.



➢ Step 2: Configure the Ethernet Settings

Contact your network administrator to get the correct network configuration information (e.g., IP/Mask/Gateway) needed to set up I/O modules. For more instructions, refer to Section 3.4 "Using the eSearch Utility to assign a new IP" .



➢ Step 3: Log into the tET/tPET Web Server

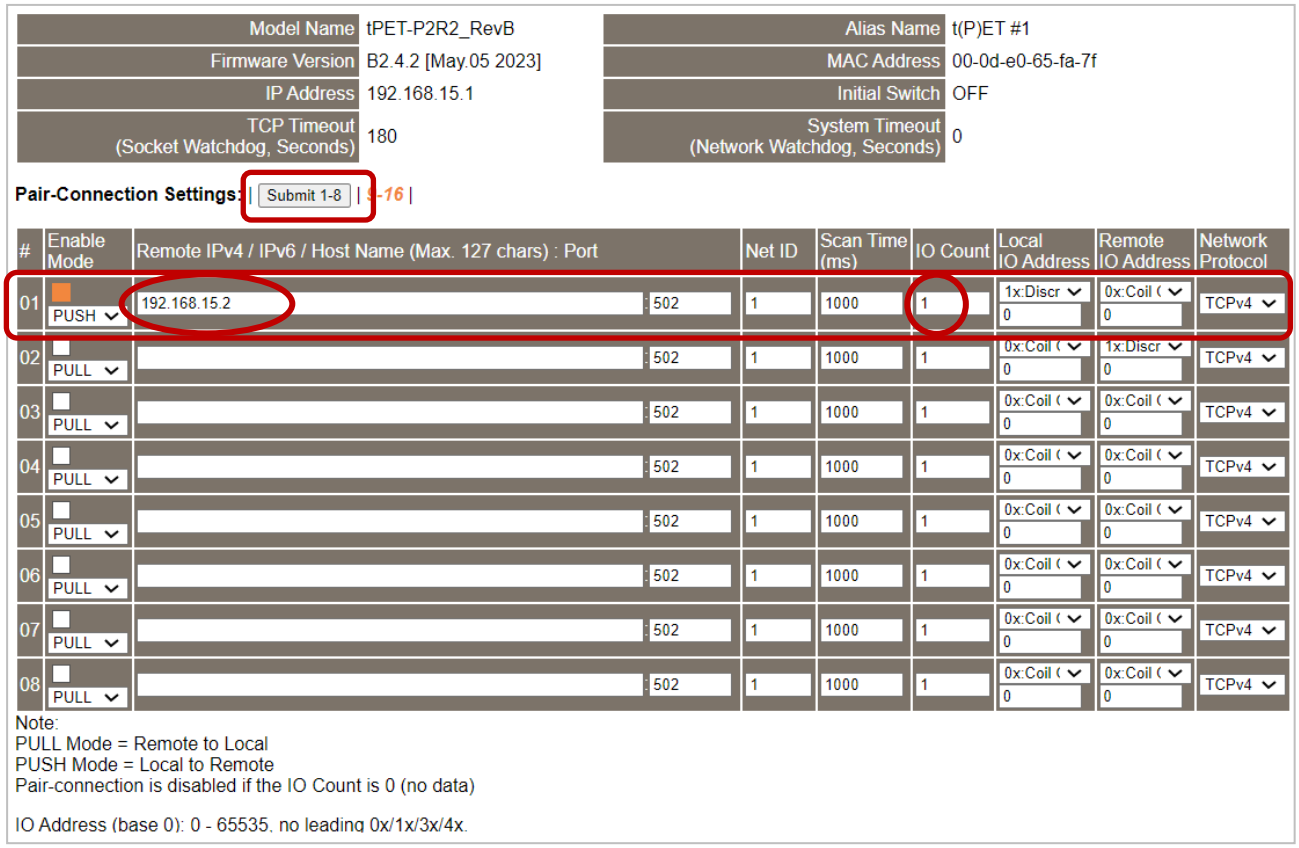
1. Choose the **t(P)ET #1 or t(P)ET #2** module within the eSearch Utility and then click the "**Web**" button to open the login webpage.
2. Enter the password in the **Login password** field **(Defaults: "Admin")** and click the **"Submit"** button to log into the Web Server. (See Section 5.1 – Step3)

➢ Step 4-1: Configure the Pair-Connection for the tET/tPET #1 (Push Mode)

1. Click the **Pair** tab to display the configuration page.
2. In the **Pair-Connection Setting** section, choose **PUSH** and check the box in the **Enable Mode** field to enable this mode.
3. In the **Remote IP… : Port** fields, enter the IP address and the TCP Port of the remote **t(P)ET #2** module
4. In the **IO Count** field, enter the mapped quantity for DI and DO.

> For example, the **PUSH Mode** (**Local** DI to **Remote** DO) configuration:
> Enter "**1**" in the **IO Count** field and "**0**" in both the **Local/Remote IO Address** fields.
> This means **DI0** of **t(P)ET #1** module correspond to **DO0** of **t(P)ET #2** module.

5. In the **Local IO Address** field, select "1x: Discrete Input.." and enter the starting **DI** address.
   In the **Remote IO Address** field, select "0x: Coil Output…" and enter the starting **DO** address.
6. Choose the Modbus protocol (e.g., **TCPv4**) from the **Network Protocol** drop-down menu.
7. Click the "**Submit…**" button to complete the configuration.



Model Name	tPET-P2R2_RevB	Alias Name	t(P)ET #1
Firmware Version	B2.4.2 [May.05 2023]	MAC Address	00-0d-e0-65-fa-7f
IP Address	192.168.15.1	Initial Switch	OFF
TCP Timeout (Socket Watchdog, Seconds)	180	System Timeout (Network Watchdog, Seconds)	0

Pair-Connection Settings: | Submit 1-8 | 9-16 |

#	Enable Mode	Remote IPv4 / IPv6 / Host Name (Max. 127 chars) : Port	Net ID	Scan Time (ms)	IO Count	Local IO Address	Remote IO Address	Network Protocol
01	PUSH	192.168.15.2 : 502	1	1000	1	1x:Discr 0	0x:Coil (0	TCPv4
02	PULL	: 502	1	1000	1	0x:Coil (0	1x:Discr 0	TCPv4
03	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
04	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
05	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
06	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
07	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
08	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4

Note:
PULL Mode = Remote to Local
PUSH Mode = Local to Remote
Pair-connection is disabled if the IO Count is 0 (no data)

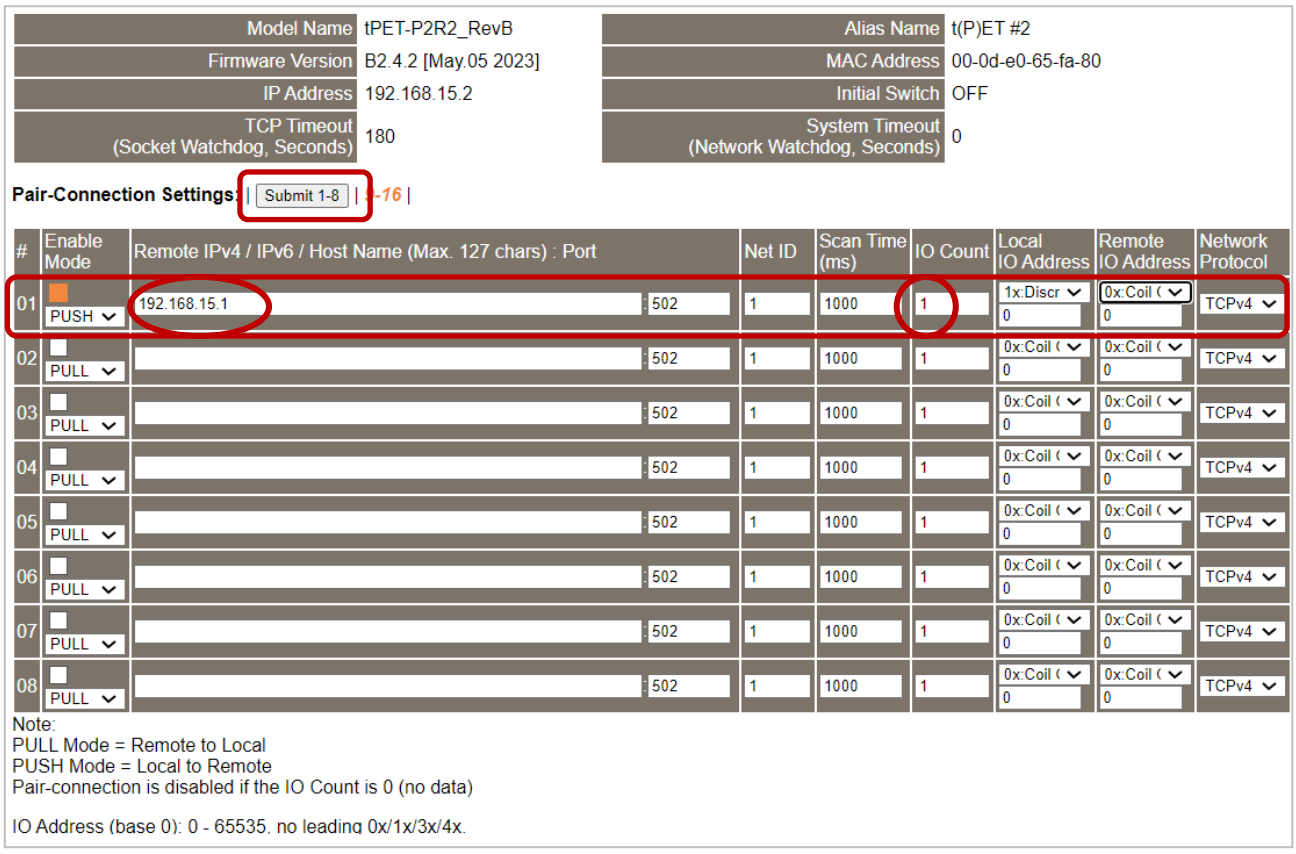
IO Address (base 0): 0 - 65535, no leading 0x/1x/3x/4x.

➢ Step 4-2: Configure the Pair-Connection for the tET/tPET #2 (Push Mode)

1. Click the **Pair** tab to display the configuration page.
2. In the **Pair-Connection Setting** section, choose **PUSH** and check the box in the **Enable Mode** field to enable this mode.
3. In the **Remote IP… : Port** fields, enter the IP address and the TCP Port of the remote **t(P)ET #1** module.
4. In the **IO Count** field, enter the mapped quantity for DI and DO.

> For example, the **PUSH Mode (Local** DI to **Remote** DO) configuration:
> Enter "**1**" in the **IO Count** field and "**0**" in both the **Local/Remote IO Address** fields.
> This means **DI0** of **t(P)ET #2** module correspond to **DO0** of **t(P)ET #1** module.

5. In the **Local IO Address** field, select "1x: Discrete Input.." and enter the starting **DI** address.
   In the **Remote IO Address** field, select "0x: Coil Output…" and enter the starting **DO** address.
6. Choose the Modbus protocol (e.g., **TCPv4**) from the **Network Protocol** drop-down menu.
7. Click the "**Submit…**" button to complete the configuration.



Model Name	tPET-P2R2_RevB	Alias Name	t(P)ET #2
Firmware Version	B2.4.2 [May.05 2023]	MAC Address	00-0d-e0-65-fa-80
IP Address	192.168.15.2	Initial Switch	OFF
TCP Timeout (Socket Watchdog, Seconds)	180	System Timeout (Network Watchdog, Seconds)	0

Pair-Connection Settings | Submit 1-8 | 9-16 |

#	Enable Mode	Remote IPv4 / IPv6 / Host Name (Max. 127 chars) : Port	Net ID	Scan Time (ms)	IO Count	Local IO Address	Remote IO Address	Network Protocol
01	PUSH	192.168.15.1 : 502	1	1000	1	1x:Discr 0	0x:Coil (0	TCPv4
02	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
03	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
04	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
05	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
06	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
07	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
08	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4

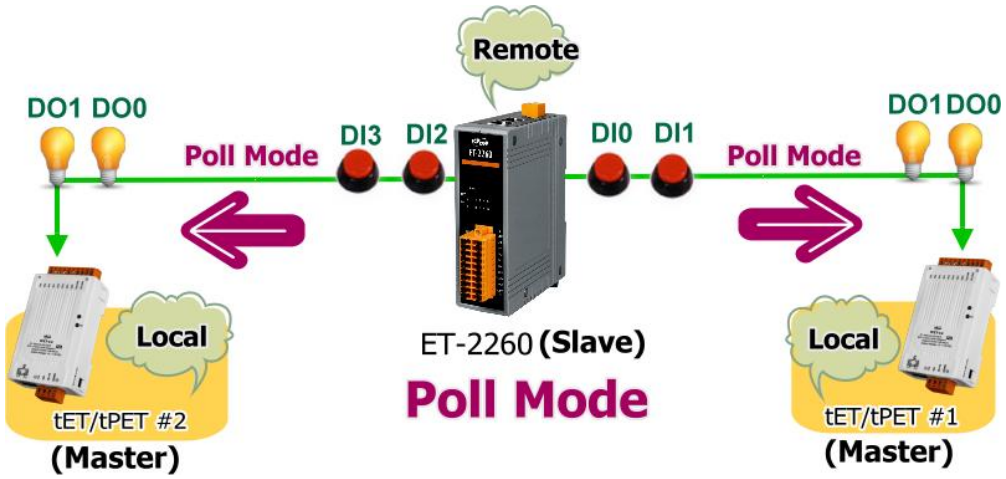
Note:
PULL Mode = Remote to Local
PUSH Mode = Local to Remote
Pair-connection is disabled if the IO Count is 0 (no data)

IO Address (base 0): 0 - 65535, no leading 0x/1x/3x/4x.

5.3 Set Two Modules to PULL Mode (Remote DI to 2-Local DO)

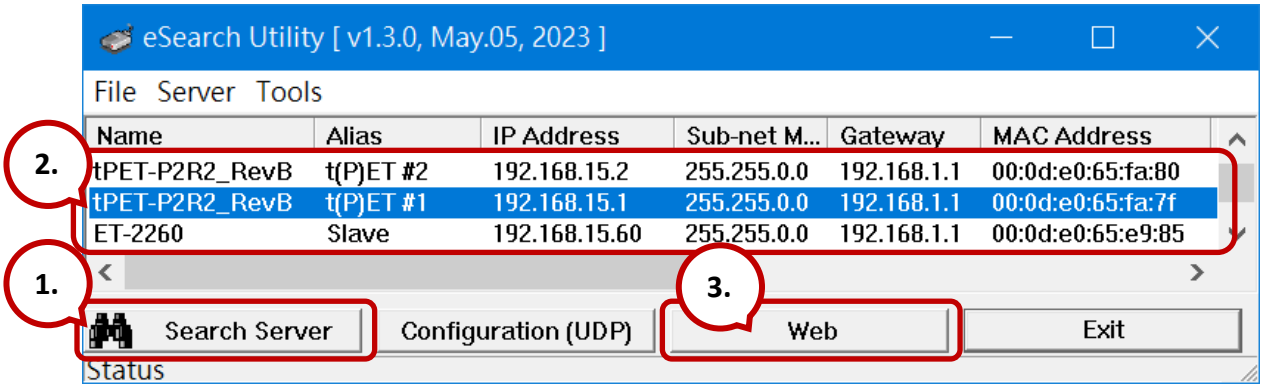
➢ Step 1: Connect the Module to the Network, PC, and Power Supply

Confirm that the tET/tPET series modules are functioning correctly. Refer to Chapter 3. "Getting Started" for more details. Here is the schematic diagram for this example, utilizing the tPET-P2R2 and ET-2260 modules.



➢ Step 2: Configure the Ethernet Settings

Contact your network administrator to get the correct network configuration information (e.g., IP/Mask/Gateway) needed to set up I/O modules. For more instructions, refer to Section 3.4 "Using the eSearch Utility to assign a new IP" .



➢ Step 3: Log into the Module's Web Server

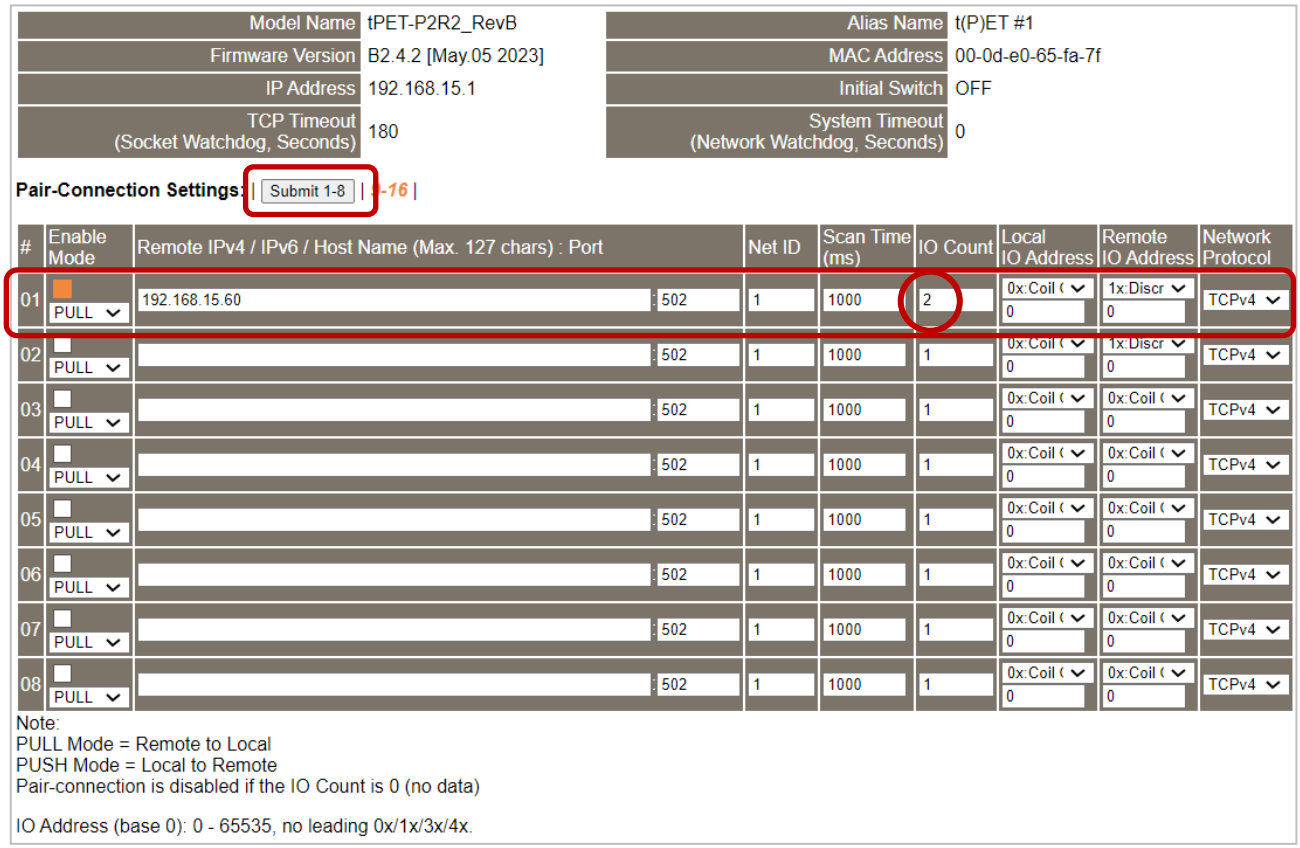
1. Choose the **t(P)ET #1/#2 or ET-2260** module within the eSearch Utility and then click the "**Web**" button to open the login webpage.
2. Enter the password in the **Login password** field **(Defaults: "Admin")** and click the **"Submit"** button to log into the Web Server. (See Section 5.1 – Step3)

➢ Step 4-1: Configure the Pair-Connection for the tET/tPET #1 (Pull Mode)

1. Click the **Pair** tab to display the configuration page.
2. In the **Pair-Connection Setting** section, choose **PULL** and check the box in the **Enable Mode** field to enable this mode.
3. In the **Remote IP… : Port** fields, enter the IP address and the TCP Port of the remote **ET-2260** module
4. In the **IO Count** field, enter the mapped quantity for DI and DO.

> For example, the **PULL Mode (Remote** DI to **Local** DO) configuration:
> Enter "**2**" in the "**IO Count**" field and "**0**" in both the **Local/Remote IO Address** fields. This means **DI0 and DI1** of **ET-2260** module correspond to **DO0 and DO1** of **t(P)ET #1** module.

5. In the **Local IO Address** field, select "0x: Coil Output…" and enter the starting **DO** address.
   In the **Remote IO Address** field, select "1x: Discrete Input.." and enter the starting **DI** address.
6. Choose the Modbus protocol (e.g., **TCPv4**) from the **Network Protocol** drop-down menu.
7. Click the "**Submit…**" button to complete the configuration.



Model Name	tPET-P2R2_RevB	Alias Name	t(P)ET #1
Firmware Version	B2.4.2 [May.05 2023]	MAC Address	00-0d-e0-65-fa-7f
IP Address	192.168.15.1	Initial Switch	OFF
TCP Timeout (Socket Watchdog, Seconds)	180	System Timeout (Network Watchdog, Seconds)	0

Pair-Connection Settings: | Submit 1-8 | 9-16 |

#	Enable Mode	Remote IPv4 / IPv6 / Host Name (Max. 127 chars) : Port	Net ID	Scan Time (ms)	IO Count	Local IO Address	Remote IO Address	Network Protocol
01	PULL	192.168.15.60 : 502	1	1000	2	0x:Coil (0	1x:Discr 0	TCPv4
02	PULL	: 502	1	1000	1	0x:Coil (0	1x:Discr 0	TCPv4
03	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
04	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
05	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
06	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
07	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
08	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4

Note:
PULL Mode = Remote to Local
PUSH Mode = Local to Remote
Pair-connection is disabled if the IO Count is 0 (no data)

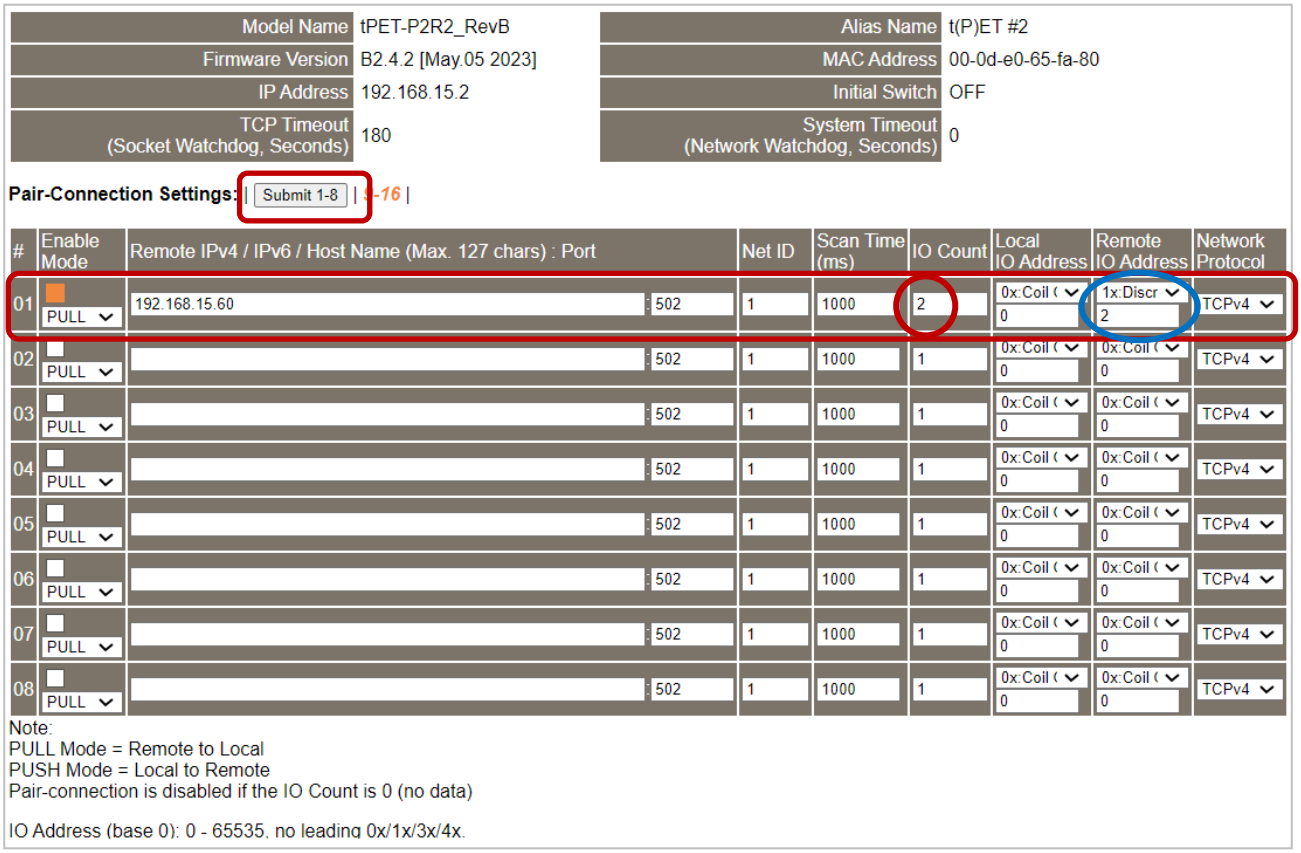
IO Address (base 0): 0 - 65535, no leading 0x/1x/3x/4x.

➢ Step 4-2: Configure the Pair-Connection for the tET/tPET #2 (Pull Mode)

1. Click the **Pair** tab to display the configuration page.
2. In the **Pair-Connection Setting** section, choose **PULL** and check the box in the **Enable Mode** field to enable this mode.
3. In the **Remote IP… : Port** fields, enter the IP address and the TCP Port of the remote **ET-2260** module
4. In the **IO Count** field, enter the mapped quantity for DI and DO.

> For example, the **PULL Mode (Remote** DI to **Local** DO) configuration:
> Enter "**2**" in the "**IO Count**" field and "**0** / **2**" in the **Local/Remote IO Address** fields. This means **DI2 and DI3** of **ET-2260** module correspond to **DO0 and DO1** of **t(P)ET #2** module.

5. In the **Local IO Address** field, select "0x: Coil Output…" and enter the starting **DO** address.
   In the **Remote IO Address** field, select "1x: Discrete Input.." and enter the starting **DI** address.
6. Choose the Modbus protocol (e.g., **TCPv4**) from the **Network Protocol** drop-down menu.
7. Click the "**Submit…**" button to complete the configuration.



Model Name	tPET-P2R2_RevB	Alias Name	t(P)ET #2
Firmware Version	B2.4.2 [May.05 2023]	MAC Address	00-0d-e0-65-fa-80
IP Address	192.168.15.2	Initial Switch	OFF
TCP Timeout (Socket Watchdog, Seconds)	180	System Timeout (Network Watchdog, Seconds)	0

Pair-Connection Settings: | Submit 1-8 | 9-16 |

#	Enable Mode	Remote IPv4 / IPv6 / Host Name (Max. 127 chars) : Port	Net ID	Scan Time (ms)	IO Count	Local IO Address	Remote IO Address	Network Protocol
01	PULL	192.168.15.60 : 502	1	1000	2	0x:Coil (0	1x:Discr (2	TCPv4
02	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
03	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
04	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
05	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
06	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
07	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
08	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4

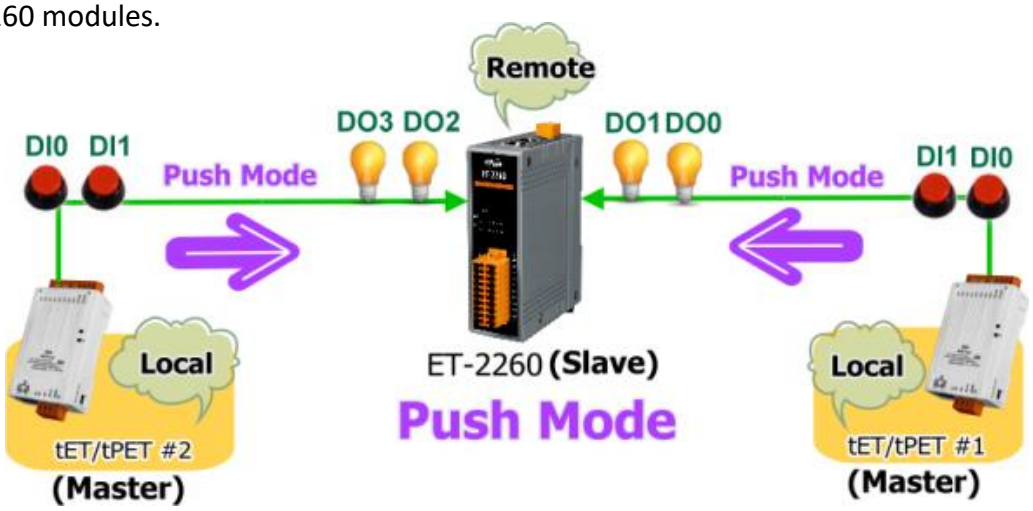
Note:
PULL Mode = Remote to Local
PUSH Mode = Local to Remote
Pair-connection is disabled if the IO Count is 0 (no data)

IO Address (base 0): 0 - 65535, no leading 0x/1x/3x/4x.

5.4 Set Two Modules to Push Mode (2-Local DI to Remote DO)

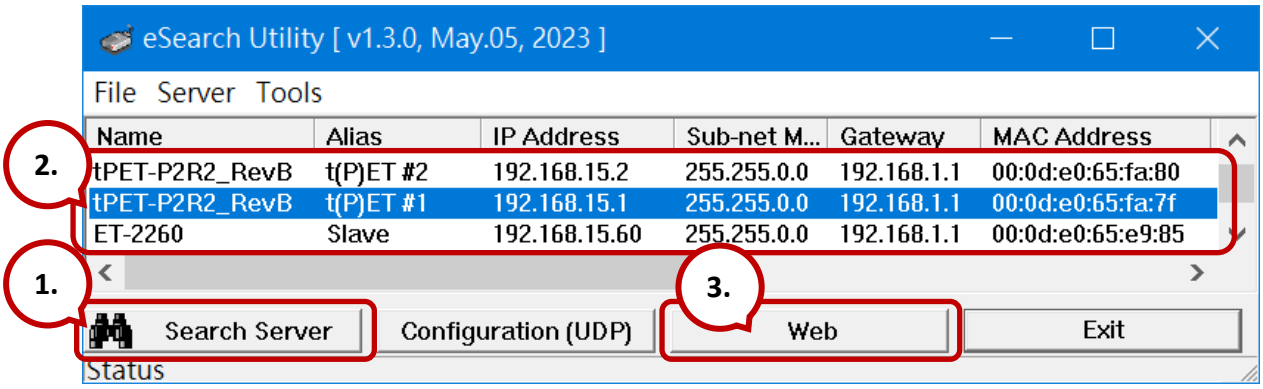
➢ Step 1: Connect the Module to the Network, PC, and Power Supply

Confirm that the tET/tPET series modules are functioning correctly. Refer to Chapter 3. "Getting Started" for more details. Here is the schematic diagram for this example, utilizing the tPET-P2R2 and ET-2260 modules.



➢ Step 2: Configure the Ethernet Settings

Contact your network administrator to get the correct network configuration information (e.g., IP/Mask/Gateway) needed to set up I/O modules. For more instructions, refer to Section 3.4 "Using the eSearch Utility to assign a new IP" .



➢ Step 3: Log into the Module's Web Server

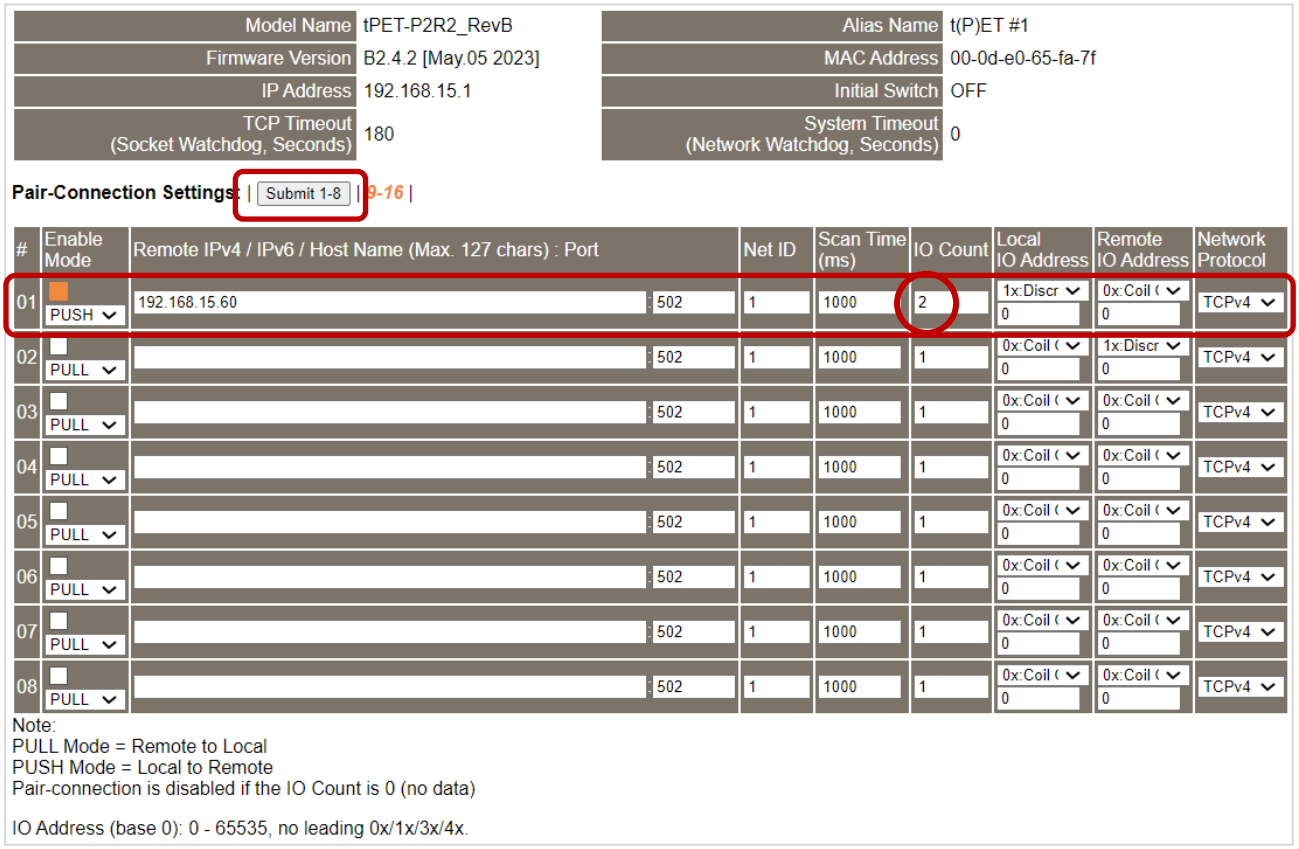
1. Choose the **t(P)ET #1/#2 or ET-2260** module within the eSearch Utility and then click the "**Web**" button to open the login webpage.
2. Enter the password in the **Login password** field **(Defaults: "Admin")** and click the **"Submit"** button to log into the Web Server. (See Section 5.1 – Step3)

➢ Step 4-1: Configure the Pair-Connection for the tET/tPET #1 (Push Mode)

1. Click the **Pair** tab to display the configuration page.
2. In the **Pair-Connection Setting** section, choose **PUSH** and check the box in the **Enable Mode** field to enable this mode.
3. In the **Remote IP… : Port** fields, enter the IP address and the TCP Port of the remote **ET-2260** module
4. In the **IO Count** field, enter the mapped quantity for DI and DO.

> For example, the **PUSH Mode** (**Local** DI to **Remote** DO) configuration:
> Enter "**2**" in the "**IO Count**" field and "**0**" in both the **Local/Remote IO Address** fields. This means **DI0 and DI1** of **t(P)ET #1** module correspond to **DO0 and DO1** of **ET-2260** module.

5. In the **Local IO Address** field, select "1x: Discrete Input.." and enter the starting **DI** address.
   In the **Remote IO Address** field, select "0x: Coil Output…" and enter the starting **DO** address.
6. Choose the Modbus protocol (e.g., **TCPv4**) from the **Network Protocol** drop-down menu.
7. Click the "**Submit…**" button to complete the configuration.



Model Name	tPET-P2R2_RevB	Alias Name	t(P)ET #1
Firmware Version	B2.4.2 [May.05 2023]	MAC Address	00-0d-e0-65-fa-7f
IP Address	192.168.15.1	Initial Switch	OFF
TCP Timeout (Socket Watchdog, Seconds)	180	System Timeout (Network Watchdog, Seconds)	0

Pair-Connection Settings: | Submit 1-8 | 9-16 |

#	Enable Mode	Remote IPv4 / IPv6 / Host Name (Max. 127 chars) : Port	Net ID	Scan Time (ms)	IO Count	Local IO Address	Remote IO Address	Network Protocol
01	PUSH	192.168.15.60 : 502	1	1000	2	1x:Discr 0	0x:Coil (0	TCPv4
02	PULL	: 502	1	1000	1	0x:Coil (0	1x:Discr 0	TCPv4
03	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
04	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
05	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
06	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
07	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
08	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4

Note:
PULL Mode = Remote to Local
PUSH Mode = Local to Remote
Pair-connection is disabled if the IO Count is 0 (no data)

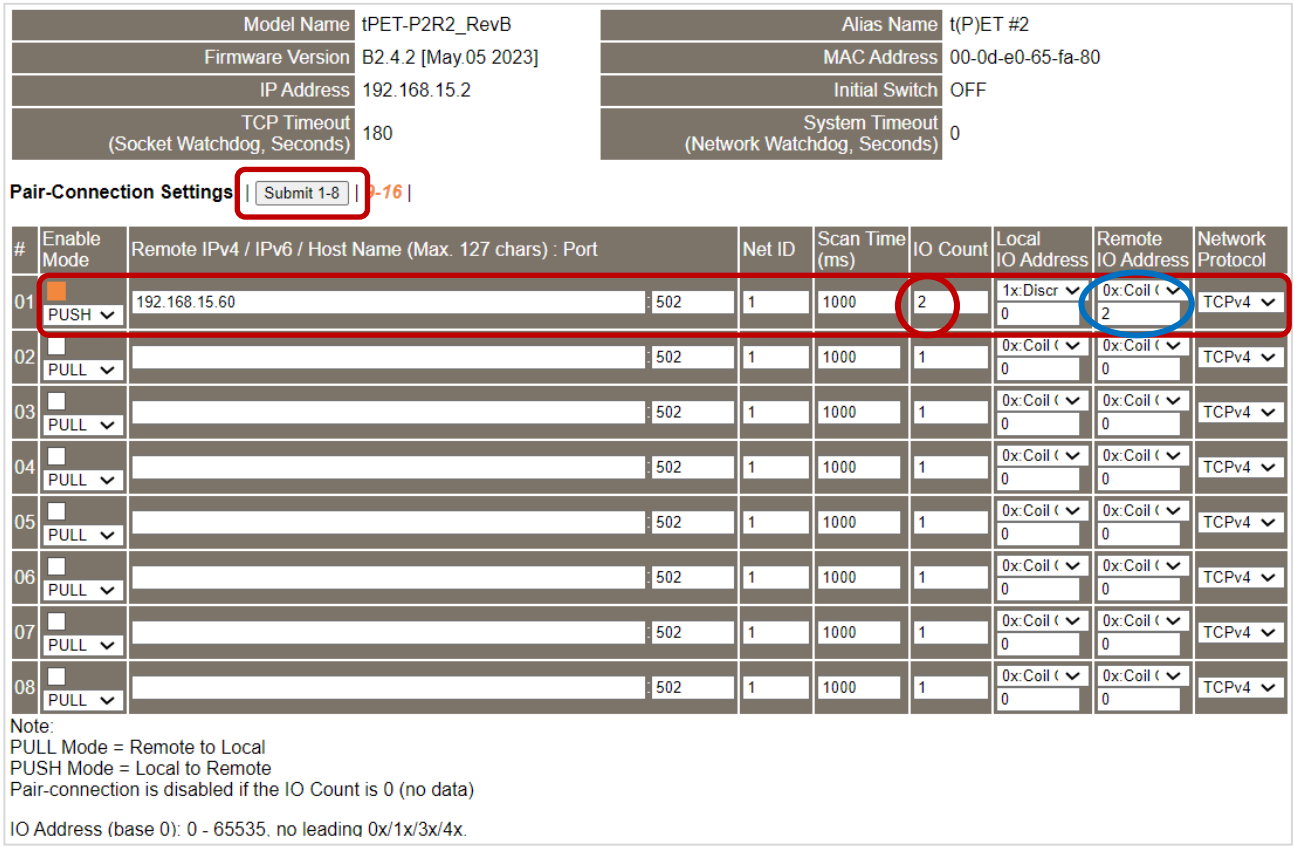
IO Address (base 0): 0 - 65535, no leading 0x/1x/3x/4x.

➢ Step 4-2: Configure the Pair-Connection for the tET/tPET #2 (Push Mode)

1. Click the **Pair** tab to display the configuration page.
2. In the **Pair-Connection Setting** section, choose **PUSH** and check the box in the **Enable Mode** field to enable this mode.
3. In the **Remote IP… : Port** fields, enter the IP address and the TCP Port of the remote **ET-2260** module
4. In the **IO Count** field, enter the mapped quantity for DI and DO.

> For example, the **PUSH Mode (Local** DI to **Remote** DO**)** configuration:
> Enter "**2**" in the "**IO Count**" field and "**0** / **2**" in the **Local/Remote IO Address** fields. This means **DI0 and DI1** of **t(P)ET #1** module correspond to **DO2 and DO3** of **ET-2260** module.

5. In the **Local IO Address** field, select "1x: Discrete Input.." and enter the starting **DI** address.
   In the **Remote IO Address** field, select "0x: Coil Output…" and enter the starting **DO** address.
6. Choose the Modbus protocol (e.g., **TCPv4**) from the **Network Protocol** drop-down menu.
7. Click the "**Submit…**" button to complete the configuration.



Model Name	tPET-P2R2_RevB	Alias Name	t(P)ET #2
Firmware Version	B2.4.2 [May.05 2023]	MAC Address	00-0d-e0-65-fa-80
IP Address	192.168.15.2	Initial Switch	OFF
TCP Timeout (Socket Watchdog, Seconds)	180	System Timeout (Network Watchdog, Seconds)	0

Pair-Connection Settings | Submit 1-8 | 9-16 |

#	Enable Mode	Remote IPv4 / IPv6 / Host Name (Max. 127 chars) : Port	Net ID	Scan Time (ms)	IO Count	Local IO Address	Remote IO Address	Network Protocol
01	PUSH	192.168.15.60 : 502	1	1000	2	1x:Discr 0	0x:Coil (2	TCPv4
02	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
03	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
04	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
05	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
06	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
07	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4
08	PULL	: 502	1	1000	1	0x:Coil (0	0x:Coil (0	TCPv4

Note:
PULL Mode = Remote to Local
PUSH Mode = Local to Remote
Pair-connection is disabled if the IO Count is 0 (no data)

IO Address (base 0): 0 - 65535, no leading 0x/1x/3x/4x.

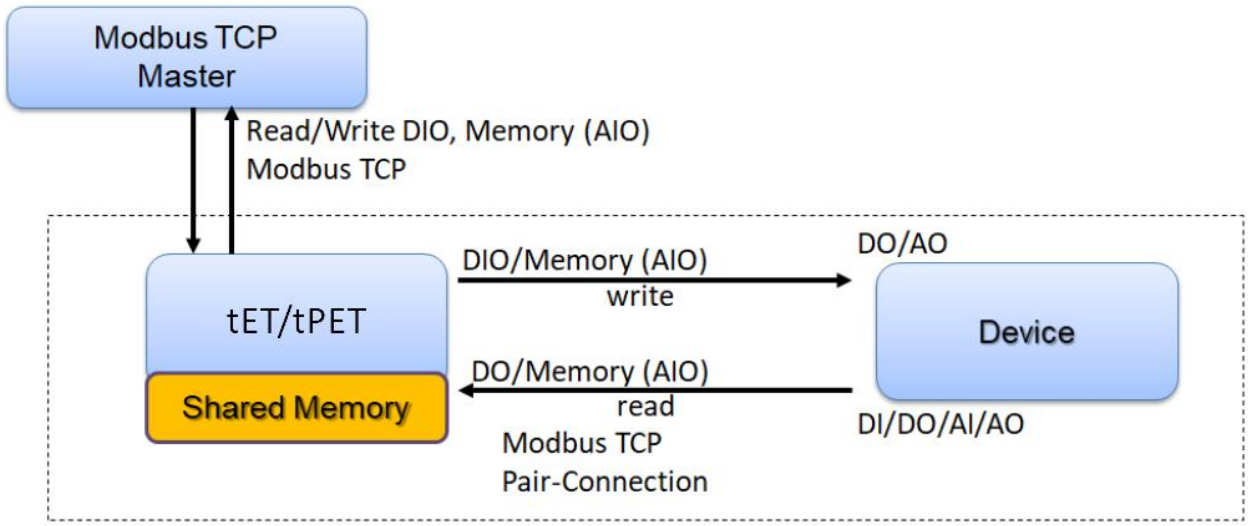
5.5 Shared Memory

The tET/tPET DIO series add a 512-byte shared memory which can be used as a tiny data concentrator to store both the AIO and DIO data (256 Registers or 4096-bit shared single memory).

Shared memory used with the Pair-Connection function can effectively lower the host load. It can also perform Bits/Registers data exchange, i.e., read data from the remote device and store them in the memory or output signals from the memory to the remote device.

Note:

Shared memory is only available for the firmware v2.4.2 and later. The older version is not supported.



5.5.1 Address Mapping for Shared Memory

Shared Memory Register Name	3x, 4x (AIO) Register Address	Mapping (=)	Shared Memory Bit Name	0x, 1x (DIO) Bit Address
Register 0	3000	← →	Bit 0 ... Bit 15	3000 ... 3015
Register 1	3001	← →	Bit 16 ... Bit 31	3016 ... 3031
Register 2	3002	← →	Bit 32 ... Bit 47	3032 ... 3047
Register 3	3003	← →	Bit 48 ... Bit 63	3048 ... 3063
Register 4	3004	← →	Bit 64 ... Bit 79	3064 ... 3079
Register 5	3005	← →	Bit 80 ... Bit 95	3080 ... 3095
Register 6	3006	← →	Bit 96 ... Bit 111	3096 ... 3111
Register 7	3007	← →	Bit 112 ... Bit 127	3112 ... 3127
Register 8	3008	← →	Bit 128 ... Bit 143	3128 ... 3143
Register 9	3009	← →	Bit 144 ... Bit 159	3144 .. 3159
Register 10	3010	← →	Bit 160 ... Bit 175	3160 ... 3175
...				

Note: All DI, DO, AI, and AO signals shared a single memory space. The storage address starts at 3000.

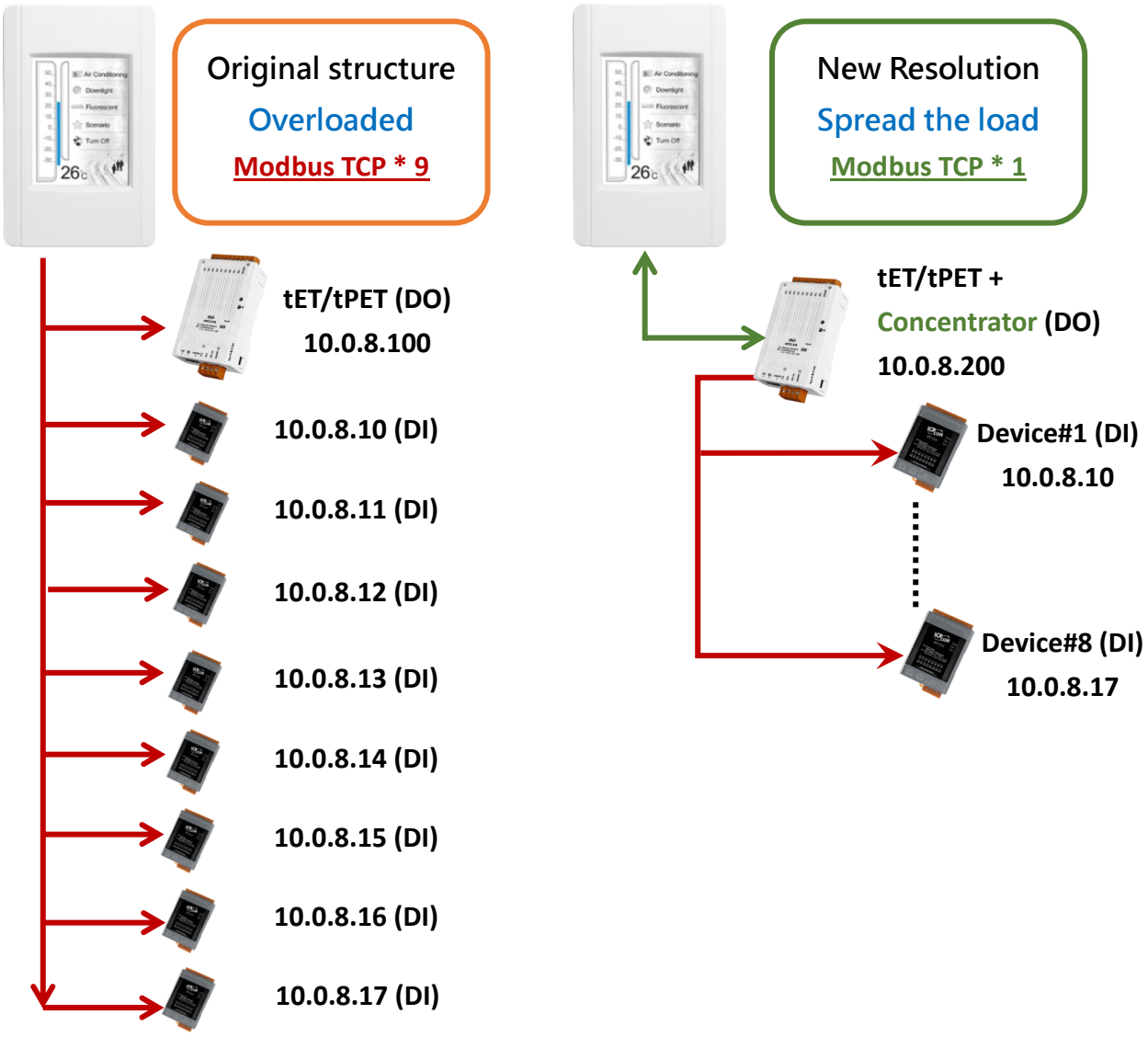
Writing **16** bits of DI/DO data to addresses **3000 – 3015** is equivalent to writing **one** 16-bit AI/AO register to the address **3000**.

Writing **16** bits of DI/DO data to addresses **3016 – 3031** is equivalent to writing **one** 16-bit AI/AO register to the address **3001**.

The correspondence of addresses is as follows, using the division to take the quotient and remove the remainder.

AIO_Address = (DIO_Address – 3000) / 16 + 3000

5.5.2 Application of Spreading the Load



The original architecture on the left does not use the data concentrator feature, the host has to connect with all devices to exchange data (9 Modbus TCP connections in this case), and more devices will make the host overloaded.

The new architecture on the right uses the data concentrator feature on the tET/tPET series DIO module. The Pair-connection function supports up to 16 IP connections. The host can obtain the signals written in the data concentrator from Device#1 - #8 by connecting to the tET/tPET series DIO module. The number of Modbus TCP connections to the host is reduced from 9 to 1, which can effectively spread the load.

Host	tET/tPET + Concentrator IP	Remote IP (Slave #1-8)	IO Address (Shared Memory)
	10.0.8.200	10.0.8.10	3000...3015
		10.0.8.11	3016...3031
		10.0.8.12	3032...3047
		10.0.8.13	3048...3063
		10.0.8.14	3064...3079
		10.0.8.15	3080...3095
		10.0.8.16	3096...3111
		10.0.8.17	3112...3127

Refer to Chapter 5 - I/O Pair Connection Application for detailed configuration

1. Click **Enable Mode** and choose the **PULL** mode (Remote DI to Local DO) to enable this function (#01 ~ #08).
2. In the **Remote IP… : Port** field, enter the IP address and TCP port (502) of remote modules (Slave #1-8). In the **IO Count** field, enter the number of mapped DI (e.g., 16).
   In the **Local IO Address** field, select "0x: Coil Output…" and enter the starting address of the shared memory.
   In the **Remote IO Address** field, select "1x: Discrete Input…" and enter the starting **DI** address.
3. In Shared Memory, the host computer has the option to use either Bit or Register addresses to poll tET/tPET, and both approaches can read the same data. Accessing a Register is equivalent to accessing 16 bits.

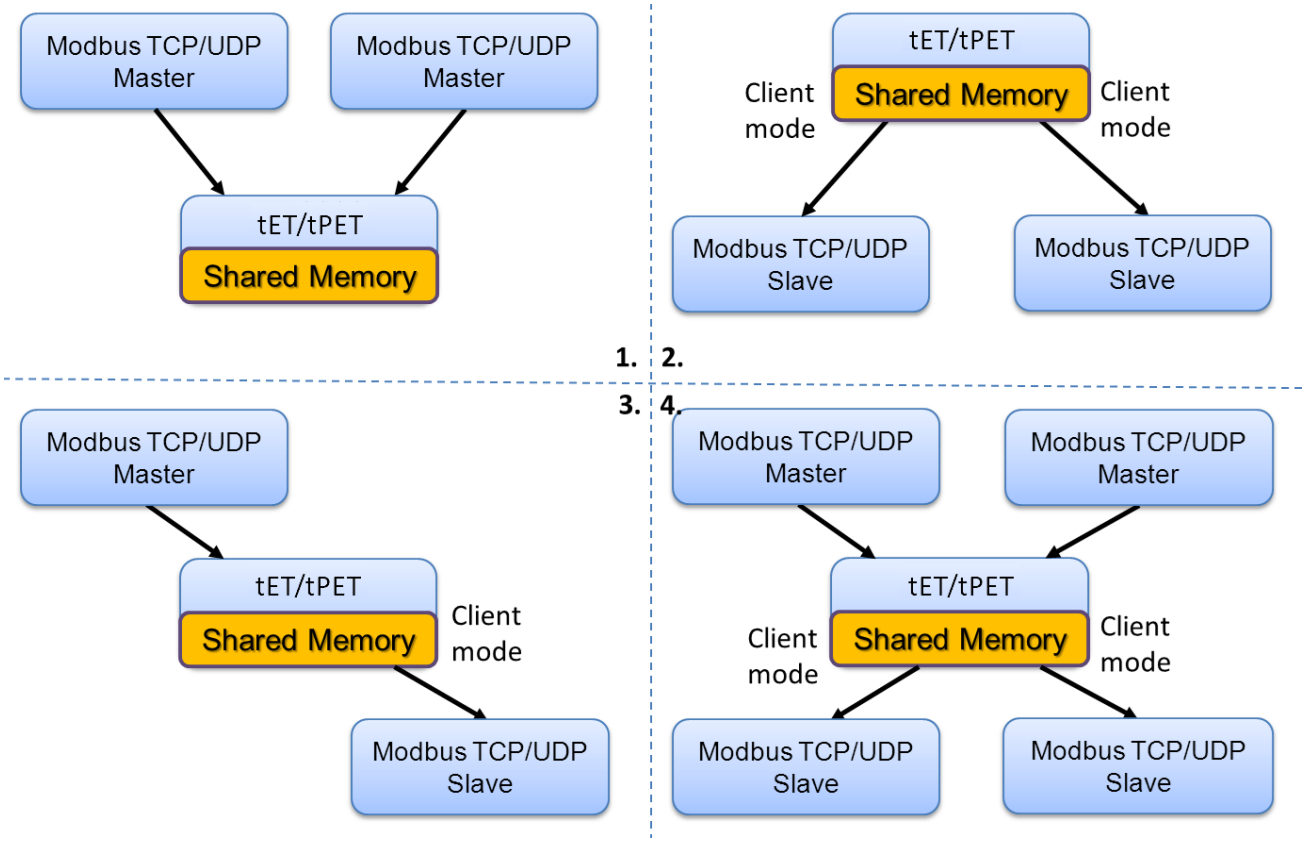
Pair-Connection Settings: | Submit 1-8 | *9-16* |

#	Enable Mode	Remote IPv4 / IPv6 / Host Name (Max. 127 chars) : Port	Net ID	Scan Time (ms)	IO Count	Local IO Address	Remote IO Address	Network Protocol
01	PULL	10.0.8.10 : 502	1	1000	16	0x:Coil O… 3000	1x:Discre… 0	TCPv4
02	PULL	10.0.8.11 : 502	1	1000	16	0x:Coil O… 3016	1x:Discre… 0	TCPv4
03	PULL	10.0.8.12 : 502	1	1000	16	0x:Coil O… 3032	1x:Discre… 0	TCPv4
04	PULL	10.0.8.13 : 502	1	1000	16	0x:Coil O… 3048	1x:Discre… 0	TCPv4
05	PULL	10.0.8.14 : 502	1	1000	16	0x:Coil O… 3064	1x:Discre… 0	TCPv4
06	PULL	10.0.8.15 : 502	1	1000	16	0x:Coil O… 3080	1x:Discre… 0	TCPv4
07	PULL	10.0.8.16 : 502	1	1000	16	0x:Coil O… 3096	1x:Discre… 0	TCPv4
08	PULL	10.0.8.17 : 502	1	1000	16	0x:Coil O… 3112	1x:Discre… 0	TCPv4

Note:
PULL Mode = Remote to Local
PUSH Mode = Local to Remote
Pair-connection is disabled if the IO Count is 0 (no data)

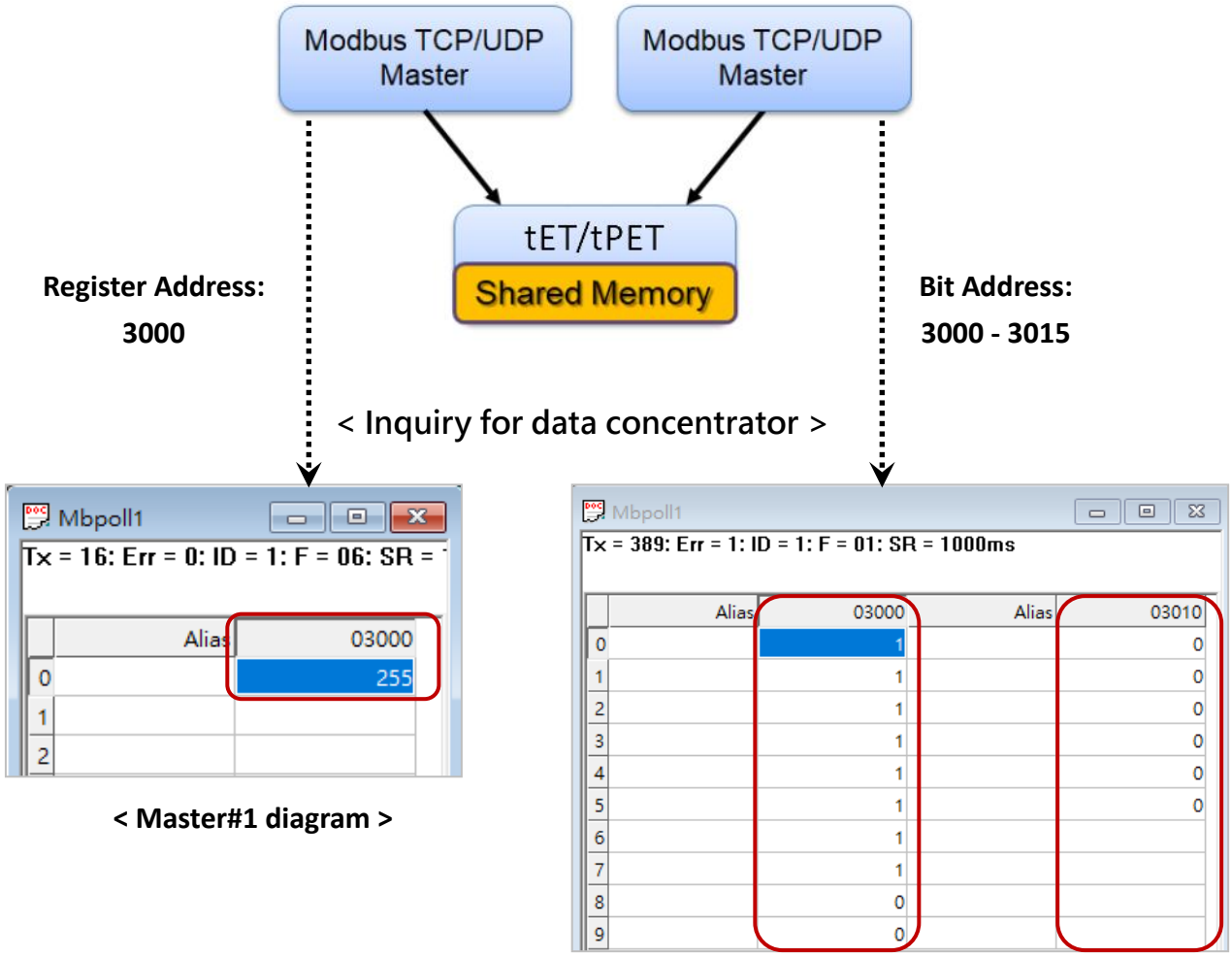
IO Address (base 0): 0 - 65535, no leading 0x/1x/3x/4x.

5.5.3 Master/Slave/MTCP/MUDP Data Exchange



1. Two hosts can exchange data via shared memory.
2. With the Pair-connection function, two Slave devices can also exchange data via shared memory.
3. With the Pair-connection function, the host can indirectly control the Slave device via the shared memory.
4. Shared memory can be used as a concentrator for multiple hosts and Slave devices to exchange data.

5.5.4 Bits / Registers Data Exchange



< Master#1 diagram >

< Master#2 diagram >

Generally, the device cannot exchange the Bit and Register data directly, but this can achieve by using the shared memory of tET/tPET as a concentrator.

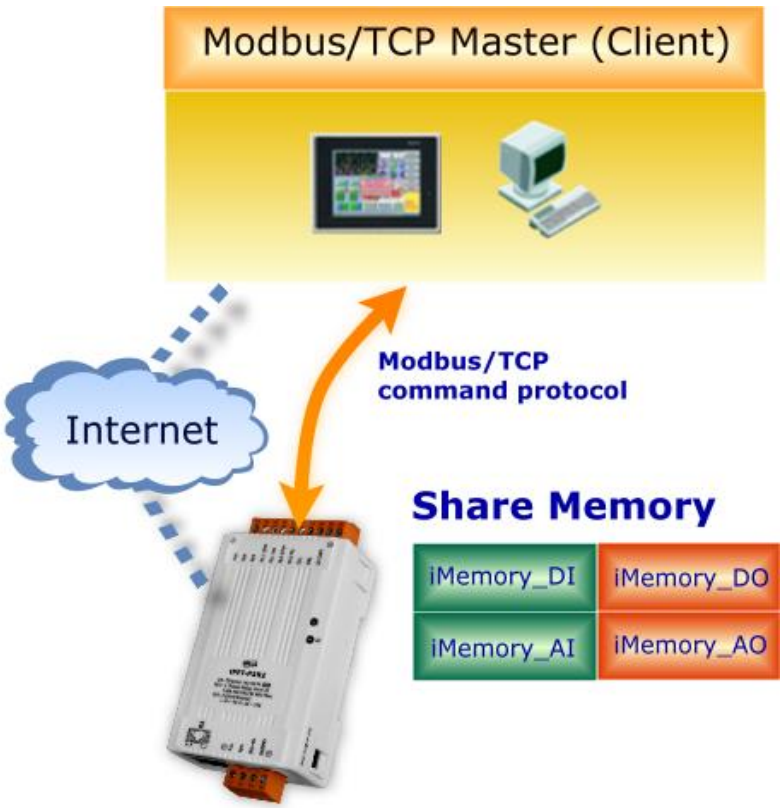
As the diagram above, the Modbus Master#1 writes data **255 (0X00FF)** to the shared memory with a Register address **3000**. The Modbus Master#2 reads data from the shared memory with Bit addresses 3015 to 3000 and gets the result **0000 0000 1111 1111**.

The data stored in shared memory can be read with the Bit or Register address.

6 Modbus Information

The tET/tPET series is a family of IP-based Modbus I/O devices that allow you to remotely control DI/DO terminals via an Ethernet connection and uses a master-slave communication technique in which only one device (the master) can initiate a transaction (called queries), while other devices (slaves) respond by either supplying the requested data to the master, or by taking the action requested in the query.

Most SCADA (Supervisory Control and Data Acquisition) and HMI software, such as Citect (Schneider Electric), ICONICS, iFIX, InduSoft, Intouch, Entivity Studio, Entivity Live, Entivity VLC, Trace Mode, Wizcon (ElUTIONS), and Wonderware, etc. can be used to easily integrate serial devices via the Modbus protocol.



6.1 What is Modbus TCP/IP?

Modbus is a communication protocol that was developed by Modicon Inc. in 1979, and was originally designed for use with Modicon controllers. Detailed information regarding the Modbus protocol can be found at: http://www.modbus.org.

The different versions of the Modbus protocol used today include Modbus RTU, which is based on serial communication interfaces such as RS-485 and RS-232, Modbus ASCII and Modbus TCP, which uses the Modbus RTU protocol embedded into TCP packets.

Modbus TCP is an internet protocol. The protocol embeds a Modbus frame into a TCP frame so that a connection oriented approach is obtained, thereby making it more reliable. The master queries the slave and the slave responds with a reply. The protocol is open and, hence, highly scalable.

6.2 Modbus Message Structure

Modbus devices communicate using a master-slave (client-server) technique in which only one device (the master/client) can initiate transactions (called queries). The other devices (slaves/servers) respond by either supplying the requested data to the master, or by taking the action requested in the query.

A query from a master will consist of a slave address (or broadcast address), a function code defining the requested action, any required data, and an error checking field. A response from a slave consists of fields confirming the action taken, any data to be returned, and an error checking field.

➢ The Modbus/TCP Message Structure

Compared to Modbus RTU, the message structure of Modbus TCP includes an additional 6 bytes, as follows.

Bytes 00 - 05	Bytes 06 - 11
6-byte header	RTU Data

➢ The Leading 6 bytes of a Modbus/TCP Protocol Query

Byte 00	Byte 01	Byte 02	Byte 03	Byte 04	Byte 05
Transaction identifier		Protocol identifier		Length Field (upper byte)	Length Field (lower byte)

1) **Transaction identifier** = Assigned by the Modbus/TCP Master (Client)
2) **Protocol identifier** = 0
3) **Length field (upper byte)** = 0 (since all messages are smaller than 256)
4) **Length field (lower byte)** = The number of following RTU data bytes

➢ RTU Data Structure

Byte 06	Byte 07	Bytes 08-09	Bytes 10-11
Net ID (Station Number)	Function Code	Data Field	
		Reference Number (Address Mapping)	Number of Points

1) **Net ID** specifies the address of the receiver (Modbus/TCP slave).
2) **Function Code** specifies the message type.
3) **Data Field** is the data block.

1) Net ID (Station Number)

The first byte in the frame structure of a Modbus RTU query is the receiver's address. Availed address is in the range of 0 to 247. Address 0 is used for general broadcast, while addresses 1 to 247 are given to individual Modbus devices.

2) Function Code

The second byte in the frame structure of a Modbus RTU query is the function code, which describes what the slave device is required to do. Valid function codes are between 1 and 255. To answer the query, the slave device uses the same function code as contained in the request. The highest bit of the function code will only be set to '1' if an error occurs in the system. In this way, 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 (Readback DOs)	0xxxx
02 (0x02)	Read the Status of the Input(Reads DIs)	1xxxx
03 (0x03)	Read the Holding Registers (Readback AOs)	4xxxx
04 (0x04)	Read the Input Registers (Reads AIs)	3xxxx
05 (0x05)	Force a Single Coil (Writes DO)	0xxxx
06 (0x06)	Preset a Single Register (Writes AO)	4xxxx
15 (0x0F)	Force Multiple Coils (Writes DOs)	0xxxx
16 (0x10)	Preset Multiple Registers (Writes AOs)	4xxxx

3) Data Field

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 Outputs 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.

Note:

For more details on Address Mapping, refer to the "Modbus Register Table".

6.2.1 01(0x01) Read the Status of the Coils (Readback DOs)

This function code is used to read either the current status of the coils or the current digital output readback value from the tET/tPET module.

[Request]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x01
02-03	Starting DO Address	2	Refer to the Modbus Address Table. Byte 02 = high byte ; Byte 03 = low byte
04-05	Points (Channels)	2	Byte 04 = high byte ; Byte 05 = low byte

* Size: Byte

[Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x01
02	Byte Count	1	Byte Count of data (n = (Points+7)/8)
03	Data	n	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) to 8(m-1)

[Error Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x81
02	Exception Code	1	Refer to the Modbus Standard Specifications for more details

Example: Function 01 (0x01), Readback DOs

Reads the **digital** output value

Command:	**[Leading 6 bytes]**	**[Request]**
	01 02 00 00 00 06	01 01 00 00 00 02
Response:	**[Leading 6 bytes]**	**[Response]**
	01 02 00 00 00 04	01 01 01 03

Here is the comprehensive explanation of Modbus Commands and Responses:

Command:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message number)
	Byte 04-05	00 06 (Number of bytes used for the request)
	[Request]	
	Byte 00	01 (Net ID)
	Byte 01	01 (Function Code)
	Byte 02-03	00 00 (Starting DO Address)
	Byte 04-05	00 02 (Channels)

Response:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message Number)
	Byte 04-05	00 04 (Number of bytes used for the response)
	[Response]	
	Byte 00	01 (Net ID)
	Byte 01	01 (Function Code)
	Byte 02	01 (Byte Count of data)
	Byte 03	03 (Value for DO1 to DO0)

6.2.2 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	Net ID	1	1 to 247
01	Function Code	1	0x02
02-03	Starting DI Address	2	Refer to the Modbus Address Table. Byte 02 = high byte ; Byte 03 = low byte
04-05	Number of Points (Channels)	2	Byte 04 = high byte ; Byte 05 = low byte

*** Size: Byte**

[Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x02
02	Byte Count	1	Byte Count of data (n =(Points+7)/8)
03	Data	n	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) to 8(m-1)

[Error Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x82
02	Exception Code	1	Refer to the Modbus Standard Specifications for more details

Example: Function 02 (0x02), Read DIs

Reads the digital input value

Command:	[Leading 6 bytes]	[Request]
	01 02 00 00 00 06	01 02 00 00 00 02
Response:	[Leading 6 bytes]	[Response]
	01 02 00 00 00 04	01 02 01 03

Here is the comprehensive explanation of Modbus Commands and Responses:

Command:	[Leading 6 bytes]	
	Byte 00-03	01 02 00 00 (Message number)
	Byte 04-05	00 06 (Number of bytes used for the request)
	[Request]	
	Byte 00	01 (Net ID)
	Byte 01	02 (Function Code)
	Bytes 02-03	00 00 (Starting DI Address)
	Bytes 04-05	00 02 (Number of Points)

Response:	[Leading 6 bytes]	
	Byte 00-03	01 02 00 00 (Message Number)
	Byte 04-05	00 04 (Number of bytes used for the response)
	[Response]	
	Byte 00	01 (Net ID)
	Byte 01	02 (Function Code)
	Byte 02	01 (Byte Count of data)
	Byte 03	03 (Value for DI1 to DI0)

6.2.3 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 from the tET/tPET module. These registers are also used to store the preset values for the digital counter, the host watchdog timer, the module name and the TCP timeout, etc.

[Request]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x03
02-03	Starting AO Address	2	Refer to the Modbus Register Table. Byte 02 = high byte ; Byte 03 = low byte
04-05	Number of 16-bit Registers (Channels)	2	Word Count Byte 04 = high byte ; Byte 05 = low byte

* Size: Byte

[Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x03
02	Byte Count	1	Byte Count of data (n=Points x 2 Bytes)

03	Data	n	n= 2;
			Byte 03 = high byte; Byte 04 = low byte
			.....
			n= m;
			Byte m+1 = high byte
			Byte m+2 = low byte

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x83
02	Exception Code	1	Refer to the Modbus Standard Specifications for more details

Example: Function 03 (0x03), Read AOs

Reads the name of the module for the tPET-P2A2.

Command:	**[Leading 6 bytes]**	**[Request]**
	01 02 00 00 00 06	01 03 01 03 00 02
Response:	**[Leading 6 bytes]**	**[Response]**
	01 02 00 00 00 07	01 03 0450 32 41 32

Here is the comprehensive explanation of Modbus Commands and Responses:

Command:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message number)
	Byte 04-05	00 06 (Number of bytes used for the request)
	[Request]	
	Byte 00	01 (Net ID)
	Byte 01	03 (Function Code)
	Byte 02-03	01 03 (Starting AO Address)
	Byte 04-05	00 02 (Channels)

Response:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message Number)
	Byte 04-05	00 07 (Number of bytes used for the response)
	[Response]	
	Byte 00	01 (Net ID)
	Byte 01	03 (Function Code)
	Byte 02	04 (Byte Count of data)
	Byte 03-04	50 32 (The low word for the module name: The ASCII code "0x50, 0x32" represents the characters "P" and "2")
	Byte 05-06	41 32 (The high word for the module name: The ASCII code "0x41, 0x32" represents the characters "A" and "2")

6.2.4 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 from the tET/tPET module. These registers are also used to store the current value for the digital counter, the number of DI channels and the number of DO channels, etc.

[Request]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x04
02-03	Starting AI Address	2	Refer to the Modbus Address Table. Byte 02 = high byte ; Byte 03 = low byte
04-05	Number of 16-bit Registers (Channels)	2	Word Count Byte 04 = high byte ; Byte 05 = low byte

* Size: Byte

[Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x04
02	Byte Count	1	Byte Count of data (n=Points x 2 Bytes)

03	Register Values	n	n= 2;
			Byte 03 = high byte; Byte 04 = low byte
			.....
			n= m;
			Byte m+1 = high byte;
			Byte m+2 = low byte

[Error Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x84
02	Exception Code	1	Refer to the Modbus Standard Specifications for more details

Example: Function 04 (0x04), Read AIs

Reads the number of the DI channels on the tPET-P2A2.

Command:	**[Leading 6 bytes]**	**[Request]**
	01 02 00 00 00 06	01 04 00 64 00 01
Response:	**[Leading 6 bytes]**	**[Response]**
	01 02 00 00 00 05	01 04 02 00 02

Here is the comprehensive explanation of Modbus Commands and Responses:

Command:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message number)
	Byte 04-05	00 06 (Number of bytes used for the request)
	[Request]	
	Byte 00	01 (Net ID)
	Byte 01	04 (Function Code)
	Byte 02-03	00 64 (Starting AI Address)
	Byte 04-05	00 01 (Number of 16-bit Registers)

Response:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message Number)
	Byte 04-05	00 05 (Number of bytes used for the response)
	[Response]	
	Byte 00	01 (Net ID)
	Byte 01	04 (Function Code)
	Byte 02	02 (Byte Count of data)
	Byte 03-04	00 02 (Number of DI Channels on the tPET-P2A2)

6.2.5 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 for the tET/tPET module.

[Request]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x05
02-03	DO Address	2	Refer to the Modbus Address Table. Byte 02 = high byte ; Byte 03 = low byte
04-05	Output Value	2	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

* Size: Byte

[Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x05
02	DO Address	2	The value is the same as Bytes 02-03 of the Request
03	Output Value	2	The value is the same as Bytes 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x85
02	Exception Code	1	Refer to the Modbus Standard Specifications for more details

Example: Function 05 (0x05), Write DO

Sets Channel DO1 to ON.

Command:	**[Leading 6 bytes]**	**[Request]**
	01 02 00 00 00 06	01 05 00 01 FF 00
Response:	**[Leading 6 bytes]**	**[Response]**
	01 02 00 00 00 06	01 05 00 01 FF 00

Here is the comprehensive explanation of Modbus Commands and Responses:

Command:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message number)
	Byte 04-05	00 06 (Number of bytes used for the request)
	[Request]	
	Byte 00	01 (Net ID)
	Byte 01	05 (Function Code)
	Byte 02-03	00 00 (DO Address)
	Byte 04-05	FF 00 (Sets the output to ON)

Response:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message Number)
	Byte 04-05	00 06 (Number of bytes used for the response)
	[Response]	
	Byte 00	01 (Net ID)
	Byte 01	05 (Function Code)
	Bytes 02-03	00 01 (DO Address)
	Bytes 04-05	FF 00 (The DO has been set to ON)

6.2.6 06(0x06) Preset a Single Register (Write AO)

This function code is used to set a specific holding register to store the configuration values for the tET/tPET module.

[Request]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x06
02-03	AO Address	2	Refer to the Modbus Address Table. Byte 02 = high byte ; Byte 03 = low byte
04-05	Register Value	2	Byte 04 = high byte ; Byte 05 = low byte

* Size: Byte

[Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x06
02	AO Address	2	The value is the same as Bytes 02-03 of the Request
03	Register Value	2	The value is the same as Bytes 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x86
02	Exception Code	1	Refer to the Modbus Standard Specifications for more details

Example: Function 06 (0x06), Write AO

Sets the system timeout to 60 seconds.

Command:	**[Leading 6 bytes]**	**[Request]**
	01 02 00 00 00 06	01 06 01 08 00 3C
Response:	**[Leading 6 bytes]**	**[Response]**
	01 02 00 00 00 06	01 06 01 08 00 3C

Here is the comprehensive explanation of Modbus Commands and Responses:

Command:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message number)
	Byte 04-05	00 06 (Number of bytes used for the request)
	[Request]	
	Byte 00	01 (Net ID)
	Byte 01	06 (Function Code)
	Byte 02-03	01 08 (AO Address)
	Byte 04-05	00 3C (Sets the system timeout to 60 seconds)

Response:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message Number)
	Byte 04-05	00 06 (Number of bytes used for the response)
	[Response]	
	Byte 00	01 (Net ID)
	Byte 01	06 (Function Code)
	Bytes 02-03	01 08 (AO Address)
	Bytes 04-05	00 3C (The system timeout has been set to 60 seconds)

6.2.7 15(0x0F) Force Multiple Coils (Write DOs)

This function code is used to set multiple coils status or write multiple digital output values for the tET/tPET module.

[Request] (* Size: Byte)

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x0F
02-03	Starting DO Address	2	Refer to the Modbus Address Table. Byte 02 = high byte ; Byte 03 = low byte
04-05	Number of Output Channels (Points)	2	Byte 04 = high byte ; Byte 05 = low byte
06	Byte count	1	n = (Points +7)/8
07	Output Value	n	One bit corresponds to a single channel. (1: ON ; 0: 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) to 8(m-1)

[Response]

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

[Error Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x8F
02	Exception Code	1	Refer to the Modbus Standard Specifications for more details

Example: Function 15 (0x0F), Write Dos

Sets the safe value (DO0 – DO1).

Command:	**[Leading 6 bytes]**	**[Request]**
	01 02 00 00 00 08	01 0F 01 0B 00 02 01 03
Response:	**[Leading 6 bytes]**	**[Response]**
	01 02 00 00 00 06	01 0F 01 0B 00 02

Here is the comprehensive explanation of Modbus Commands and Responses:

Command:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message number)
	Byte 04-05	00 08 (Number of bytes used for the request)
	[Request]	
	Byte 00	01 (Net ID)
	Byte 01	0F (Function Code)
	Bytes 02-03	01 0B (Starting DO Address)
	Bytes 04-05	00 02 (Number of Output Channels)
	Byte 06	01 (Byte Count)
	Byte 07	03 (Output Value)

Response:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message Number)
	Byte 04-05	00 04 (Number of bytes used for the response)
	[Response]	
	Byte 00	01 (Net ID)
	Byte 01	0F (Function Code)
	Bytes 02-03	01 0B (Starting DO Address)
	Bytes 04-05	00 02 (Number of Input Channels)

6.2.8 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 for the tET/tPET module.

[Request] (* Size: Byte)

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x10
02-03	Starting AO Address	2	Refer to the Modbus Address Table. Byte 02 = high byte ; Byte 03 = low byte
04-05	Number of 16-bit Registers (Channels)	2	Word Count. Byte 04 = high byte ; Byte 05 = low byte
06	Byte Count	1	n =Points x 2 Bytes

07	Register Values	n	n= 2;
			Byte 03 = high byte; Byte 04 = low byte
			.....
			n= m;
			Byte m+1 = high byte; Byte m+2 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID	1	1 to 247
01	Function Code	1	0x05
02-03	Starting AO Address	2	The value is the same as Bytes 02-03 of the Request
04-05	Number of 16-bit Registers (Channels)	2	The value is the same as Bytes 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station Number)	1	1 to 247
01	Function Code	1	0x90
02	Exception Code	1	Refer to the Modbus Standard Specifications for more details

Example: Function 16 (0x10), Write AOs

Sets the Preset value for the digital counter.

Command:	**[Leading 6 bytes]**	**[Request]**
	01 02 00 00 00 08	01 10 00 32 00 01 02 03 E8 00 00
Response:	**[Leading 6 bytes]**	**[Response]**
	01 02 00 00 00 06	01 10 00 32 00 01

Here is the comprehensive explanation of Modbus Commands and Responses:

Command:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message number)
	Byte 04-05	00 0B (Number of bytes used for the request)
	[Request]	
	Byte 00	01 (Net ID)
	Byte 01	10 (Function Code)
	Bytes 02-03	00 32 (Starting AO Address)
	Bytes 04-05	00 01 (Number of 16-bit Registers)
	Byte 06	02 (Byte Count)
	Bytes 07-10	03 E8 00 00 (Preset Value for the digital counter)

Response:	**[Leading 6 bytes]**	
	Byte 00-03	01 02 00 00 (Message Number)
	Byte 04-05	00 06 (Number of bytes used for the response)
	[Response]	
	Byte 00	01 (Net ID)
	Byte 01	10 (Function Code)
	Bytes 02-03	00 32 (Starting AO address)
	Bytes 04-05	00 01 (Word Count)

6.3 Modbus Register Table (For DI/DO Module)

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

6.3.1 Common Functions

➢ **0xxxx: DO Address (Base 0)**

Starting Address	Points	Description	Bits per Point	Range	Access Type
127 (0x7F)	1	Restores all default web settings	1	1 = Restore	W (Pulse)
128 (0x80)	1	Default ID Settings	1	1 = Restore	W (Pulse)
133 (0x85)	1	Reboots the tET/tPET module	1	1 = Reboot	W (Pulse)
Remarks	"**W**" : Write				

➢ **3xxxx: AI address (Base 0)**

Starting Address	Points	Description	Bits per Point	Range	Access Type
151 (0x97)	1	Firmware Version	16	"123" stands for "v1.2.3"	R
158 (0x9E)	1	Modbus Communication Status	16	0 = No Error 1 = Timeout	R
160 (0xA0)	1	Pair-Connection Status	16	0 = Normal 1 = Timeout 2 = Disconnected	R
Remarks	"**R**" : Read				

➢ 4xxxx: AO Address (Base 0)

Starting Address	Points	Description	Bits per Point	Range	Access Type
255 (0xFF)	1	CPU Reset Status	16	1 = Reset at Power-on 2 = Reset by the WDT 3 = Reset using the reset command	R/W
257 (0x101)	1	Sets the Host Watchdog Timer (WDT)	16	**< 5:** Disabled **5 to 65535:** Enabled (Units: seconds; Defaults: 0) If the tET/tPET module loses communication with the host PC for more than the period defined in the WDT settings, the DO channels will revert to their safe values and the Host WDT Events Counter will be increased by one.	R/W/F
258 (0x102)	1	Host WDT Events	16	Denotes how many Host WDT Events have occurred since the last CPU reset	R/W
259 (0x103)	1	Module Name	16	Module Name	R
263 (0x107)	1	Sets the TCP Timeout Value	16	**< 5:** Disabled **5 to 65535:** Enabled (Units: seconds; Defaults: 0)	R/W/F
264 (0x108)	1	Sets the System Timeout Value	16	**< 30:** Disabled **30 to 65535:** Enabled (Units: seconds; Defaults: 0)	R/W/F
Remarks	**"R"** : Read; **"W"** : Write; **"F"** : Setting is recorded in flash as default. * **Warning:** Frequent writing to the Flash can cause it to become corrupt.				

6.3.2 Specific Functions

The table below lists the nDI and nDO parameters used in the Modbus address table, representing the number of channels for each tPET series module.

Model Name		(nDO) Number of DO Channels	(nDI) Number of DI Channels
Non-PoE	PoE		
tET-P6	tPET-P6	0	6
tET-PD6	tPET-PD6		
tET-C4	tPET-C4	4	0
tET-A4	tPET-A4		
tET-P2C2	tPET-P2C2	2	2
tET-P2A2	tPET-P2A2		
tET-P2POR2	tPET-P2POR2		
tET-PD2POR2	tPET-PD2POR2		
tET-P2R2	tPET-P2R2		
tET-PD2R1	tPET-PD2R1	1	2

➢ **0xxxx: DO address (Base 0)**

Starting Address	Points	Description	Bits per Point	Range	Access Type
0 (0x00)	1 to nDO	Digital Output Channels	1	0 = Off 1 = On	R/W
32 (0x20)	1	Clears the status of all high latched DI Channels	1	1 = Clear	W
33 (0x21)	1	Clears the status of all low latched DI Channels	1	1 = Clear	W
34 (0x22)	1 to nDI	Clears the high speed digital counter for all DI Channels	1	1 = Clear	W
60 (0x3C)	1	Saves specific data to Flash (The access type for some registers is labeled with an "**E**")	1	0 = Off 1 = On	W
100 (0x64)	1 to nDO	Enables the PWM for all DO Channels	1	0 = Off 1 = On (Default= 0)	R/W

Starting Address	Points	Description	Bits per Point	Range	Access Type
150 (0x96)	1	Enables the high and low latches for all DI Channels	1	0 = Disable 1 = Enable (Default= 0)	R/W/F
151 (0x97)	1 to nDI	Enables the high speed digital counter for all DI Channels	1	0 = Disable 1 = Enable (Default= 0)	R/W/F
190 (0xBE)	1 to nDI	Enables frequency measurement for all DI Channels	1	0 = Disable 1 = Enable (Default= 0)	R/W/F
235 (0xEB)	1 to nDO	Sets the Power-on value for all DO Channels	1	0 = Off 1 = On (Default= 0)	R/W/F
267 (0x10B)	1 to 1DO	Sets the Safe value for all DO Channels	1	0 = Off 1 = On (Default= 0)	R/W/F
Remarks	"**R**" : Read "**W**" : Write "**F**" : Settings are recorded in flash by default "**E**" : After writing DO[60] register, the data will be stored in flash. * **Warning:** Frequency writing to the Flash can cause it to become corrupt.				

Note

Because of the inherent traits of relays, modules equipped with relay functions are not well-suited for prolonged utilization of PWM functions.

➢ 1xxxx: DI address (Base 0)

Starting Address	Points	Description	Bits per Point	Range	Access Type
0 (0x00)	1 to nDI	The status of all Digital Input Channels	1	0 = Off 1 = On	R
32 (0x20)	1 to nDI	The status of all high latched DI Channels	1	0 = None 1 = Latched	R
64 (0x40)	1 to nDI	The status of all low latched DI Channels	1	0 = None 1 = Latched	R
Remarks	"**R**" : Read				

➢ 3xxxx: AI Address (Base 0)

Starting Address	Points	Description	Bits per Point	Value	Access Type
16 (0x10)	1 to nDI	The Digital Counter Value	32	0 to 4294967296	R
64 (0x40)	1 to nDI	The frequency Value * 1,000. (Note: The Client must first divide the value by 1,000.)	32	0 to 4294967296	R

Note:

The "**DI Counter (0x10)**" and "**DI Frequency (0x40)**" that the records data as **32-bit** value and is transmitted as two 16-bit registers. Consequently, the register address has an offset of 2, i.e., the address of the second channel will be at starting-address +2, and so on.

Example: Reads the 6DI Counter on the tPET-P6.

	[Leading 6 bytes]	[Request]
Command:	01 02 00 00 00 06	01 04 00 **10** 00 **0C**

Starting Address

6 channels * 2 registers = 12

The user can refer to "FAQ: How do I read DI Counter for the tET/tPET Series Modules correctly" for more detailed information.

100 (0x64)	1	Number of DI Channels	16	nDI	R
110 (0x6E)	1	Number of DO Channels	16	nDO	R
121 (0x79)	1	Number of high-speed counters	16	nDI	R
Remarks	"**R**" : Read				

➢ 4xxxx: AO Address (Base 0)

Starting Address	Points	Description	Bits per Point	Range	Access Type
50 (0x32)	1 to nDI	The preset value for the high speed digital counter	32	0 to 4294967296	R/W/E

Note:

"**Preset DI Counter Value (0x32)**" that the records data as **32-bit** value and is transmitted as two 16-bit registers. Consequently, the register address has an offset of 2, i.e., the address of the second channel will be at starting-address +2, and so on.

Example: Reads the preset value of 6DI Counter on the tPET-P6.

	[Leading 6 bytes]	[Request]
Command:	01 02 00 00 00 06	01 04 00 32 00 0C

Starting Address

6 channel * 2 register = 12

The user can refer to "FAQ: How do I read DI Counter for the tET/tPET Series Modules correctly" for more detailed information.

100 (0x64)	1 to nDO	The duty cycle for the DO PWM. The first word (16-bit register) is the high pulse width, while the second word is the low pulse width. The units rein ms, and the resolution is about 10 ms.	32	0 to 65535; 0 to 65535;	R/W/E
150 (0x64)	1 to nDO	The Scan mode for the DI frequency measurement. Refer to Section "DI/DO Configuration" for more details.	16	1000 = 1000ms 100 = 100ms 2000 = Single pulse	R/W/F

Starting Address	Points	Description	Bits per Point	Range	Access Type
200 (0x64)	1 to nDO	The moving average of the DI frequency measurement.	16	1= No average 2= Average 2 values 4= Average 4 values 8= Average 8 values	R/W/F
268 (0x10C)	1 to nDO	The Min-Switching Time for all DO Channels	16	1 to 65535 second	R/W/F
284 (0x11C)	1 to nDO	The Auto-off Time for all DO Channels	16	1 to 65535 second	R/W/F
Remarks	"**R**" : Read "**W**" : Write "**F**" : Settings are recorded in flash by default "**E**" : After writing the DO[60] register, the data will be stored in flash. * **Warning:** Frequent writing to the Flash can cause it to become corrupt.				

6.4 Modbus Register Table (For AI Module)

Coils (0xxxx)

Register		Points	Description	Settings	Attribute	Factory Value
DEC	HEX					
00162 : 00163	00A2 : 00A3	2	Clear 1-ch historical AI max. value	1: Clear	W	-
00194 : 00195	00C2 : 00C3	2	Clear 1-ch historical AI min. value	1: Clear	W	-
00226	00E2	1	Reset the IO settings to the factory default state	1: Reset	W	-
00233	00E9	1	Reboot the module	1: Reboot	W	-
00595 : 00596	0253 : 0254	2	Enable/Disable the AI function	0: Disable 1: Enable	R/W/E	1
00628	0274	1	Set the AI sampling rate	0: Normal mode (20 Hz) 1: Fast mode (200 Hz)	R/W/E	0
00631	0277	1	Set the AI data format	0: Hexadecimal format 1: Engineering unit	R/W/E	0
00632	0278	1	Reset the AI calibration to the factory settings	1: Reset	W	-
00634	027A	1	Clear all historical AI max. values	1: Clear	W	-
00635	027B	1	Clear all historical AI min. values	1: Clear	W	-
00636 : 00637	027C : 027D	2	Enable/Disable the AI high alarm function	0: Disable 1: Enable	R/W/E	0
00668 : 00669	029C : 029D	2	Enable/Disable the AI low alarm function	0: Disable 1: Enable	R/W/E	0
00700 : 00701	02BC : 02BD	2	Set the AI high alarm mode	0: Momentary mode 1: Latching mode	R/W/E	0
00732 : 00733	02DC : 02DD	2	Set the AI low alarm mode	0: Momentary mode 1: Latching mode	R/W/E	0
00764 : 00765	02FC : 2FD	2	Clear the AI high alarm status	1: Clear	W	-
00796 : 00797	031C : 31D	2	Clear the AI low alarm status	1: Clear	W	-
00830	033E	1	Enable/Disable the AI calibration	0: Disable 1: Enable	R/W	-

Register		Points	Description	Settings	Attribute	Factory Value
DEC	HEX					
00831	033F	1	Zero calibration for the channel 0	1: Set	W	-
00832	0340	1	Span/Gain calibration for the channel 0 ~ 7	1: Set	W	-

Discrete Inputs (1xxxx)

Register		Points	Description	Settings	Attribute
DEC	HEX				
10224: 10225	00E0: 00E1	2	Read AI high alarm status. When the AI value is higher than the high alarm value, the status becomes 1.	0: Normal 1: Alarmed	R
10256: 10257	0100: 0101	2	Read AI low alarm status. When the AI value is lower than the low alarm value, the status becomes 1.	0: Normal 1: Alarmed	R

Input Register (3xxxx)

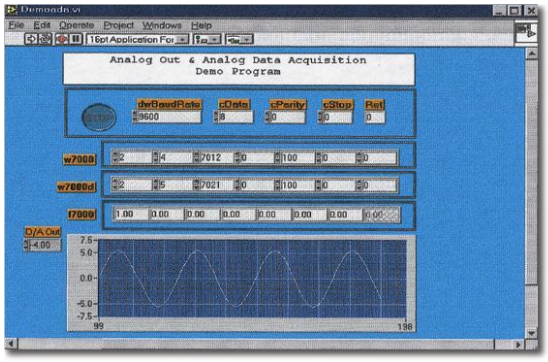
Register		Points	No. Per Point	Description	Settings	Attribute
DEC	HEX					
30000: 30001	0000: 0001	2	1	AI value	-32768 to 32767 (0x0000 to 0xFFFF)	R
30236: 30237	00EC: 00ED	2	1	AI historical max. value	-32768 to 32767 (0x0000 to 0xFFFF)	R
30268: 30269	010C: 010D	2	1	AI historical min. value	-32768 to 32767 (0x0000 to 0xFFFF)	R
30320	0140	1	1	Number of the AI channel	2	R
30351	015F	1	1	Firmware version	0x123 means version 1.2.3	R
30360	0168	1	1	Communication state of the pair-connection	0: Normal <0: Failed	R
30380: 30381	017C: 017D	2	1	Open wire detection (For 4 ~ 20 mA only)	0: Normal 1: Wire break	R

Holding Register (4xxxx)

Register		Points	No. Per Point	Description	Data Format	Attribute	Factory Value
DEC	HEX						
40271	010F	1	1	Set the module identification (Modbus NetID)	0 to 255	R/W/E	1
40296: 40297	0128: 0129	2	1	Set the AI high alarm value	-32768 to 32767 (0x0000 to 0xFFFF)	R/W/E	32767 (0x7FFF)
40328: 40329	0148: 0149	2	1	Set the AI low alarm value	-32768 to 32767 (0x0000 to 0xFFFF)	R/W/E	-32768 (0x8000)
40427: 40428	01AB: 01AC	2	1	Set the AI range	0x05: 0 ~ 2.5 V 0x07: 4 ~ 20 mA 0x08: 0 ~ 10 V 0x09: 0 ~ 5 V 0x0A: 0 ~ 1 V 0x0B: 0 ~ 500 mV 0x1A: 0 ~ 20 mA	R/W/E	0x08
40555	022B	1	1	Read the module reset status	1: Power-on 2: Module Watchdog 3: Software Reset Command	R	-
40556	022C	1	1	Read the boot count of the module. The value resets to 0 when the user performs a factory reset.	1 to 32767	R	-
40559	022F	1	1	Read the module name	0x5002	R	-

7 Related Tools

7.1 LabVIEW



LabVIEW is a system-design platform and development environment and is ideal for acquiring, analyzing, and presenting data. LabVIEW provides a graphical development environment that allows you to drag and drop pre-built objects to quickly create data acquisition, instrumentation and control systems, thereby boosting productivity and reducing development time. LabVIEW makes it possible to quickly create user interfaces that enable interactive control of software systems then specify the functionality of your system, by simply assembling a block diagram, which is a natural design notation for scientists and engineers.

A document that describes how to link LabVIEW to a tET/tPET device using the Modbus protocol can be found at:
http://www.icpdas.com/en/download/show.php?num=1029

7.2 OPC Server

OPC (OLE for Process Control) was the first standard resulting from the collaboration of a number of leading worldwide automation suppliers working in cooperation with Microsoft. Originally based on Microsoft's OLE COM (Component Object Model) and DCOM (Distributed Component Object Model) technologies, the specification defines a standard set of objects, interfaces and methods for use in process control and manufacturing automation applications to facilitate interoperability.

A wide range of different mechanisms are provided by various vendors that allow access to a variety of devices via specific applications. However, if an OPC server is provided for the device, other applications will also be able to access the device via the OPC interface.

7.3 SCADA

SCADA stands for Supervisor Control and Data Acquisition and is a PC-based production automation and control system.

SCADA is widely used in many fields, including power generation, water systems, the oil industry, the chemical, and the automobile industry. Different fields require different functions, but they all have the same common requirements:

- ✓ Graphical interface
- ✓ Process mimicking
- ✓ Real-time and historical trend data
- ✓ Alarm systems
- ✓ Data acquisition and recording
- ✓ Data analysis
- ✓ Report generation

Accessing the tET/tPET Series Module

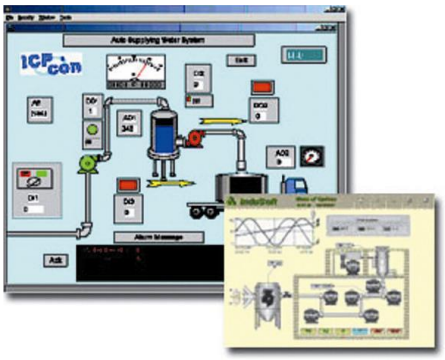
SCADA software is able to access tET/tPET series devices using the Modbus communication protocol without the need for other software drivers.

Popular SCADA Software

Some of the more popular SCADA software includes **Citect, ICONICS, iFIX, InduSoft, Intouch, Entivity Studio, Entivity Live, Entivity VLC, Trace Mode, Wizcon, and Wonderware**, etc.

In the following sections, three popular brands of SCADA software are introduced, together with detailed instructions of how to use them to communicate with tET/tPET series modules using the Modbus TCP protocol.

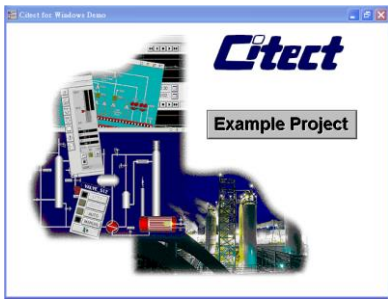
➢ InduSoft



InduSoft Web Studio is a powerful, integrated collection of automation tools that includes all the building blocks needed to develop modern Human Machine Interfaces (HMI), Supervisory Control and Data Acquisition (SCADA) systems, and embedded instrumentation and control applications. InduSoft Web Studio's application runs in native Windows NT, 2000, XP, CE and CE .NET environments and conforms to industry standards such as Microsoft .NET, OPC, DDE, ODBC, XML, and ActiveX.

The related information about InduSoft is located at:
http://www.icpdas.com/en/product/guide+Software+InduSoft+InduSoft

➢ Citect



Citect SCADA is a fully integrated Human Machine Interface (HMI) / SCADA solution that enables users to increase return on assets by delivering a highly scalable, reliable control and monitoring system. Easy-to-use configuration tools and powerful features enable the rapid development and deployment of solutions for applications of any size.

The document describing how to link Citect to the tET/tPET module using the Modbus protocol is located on:
http://www.icpdas.com/en/product/guide+Software+Development__Tools+Modbus__Tool#1150

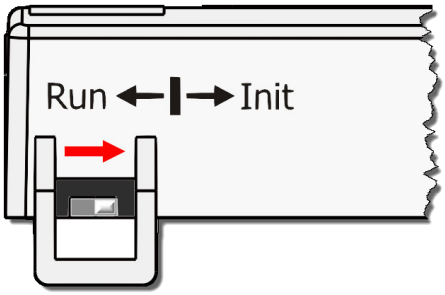
Appendix A: Troubleshooting

A: How can I Factory Reset the Module (Password: Admin)?

If the module encounters an anomaly and you cannot access the module's web server for configuration, or if you have forgotten the login password, you can perform a factory reset of the module. **Please note that after completing the following steps, all of your customized settings will be erased**

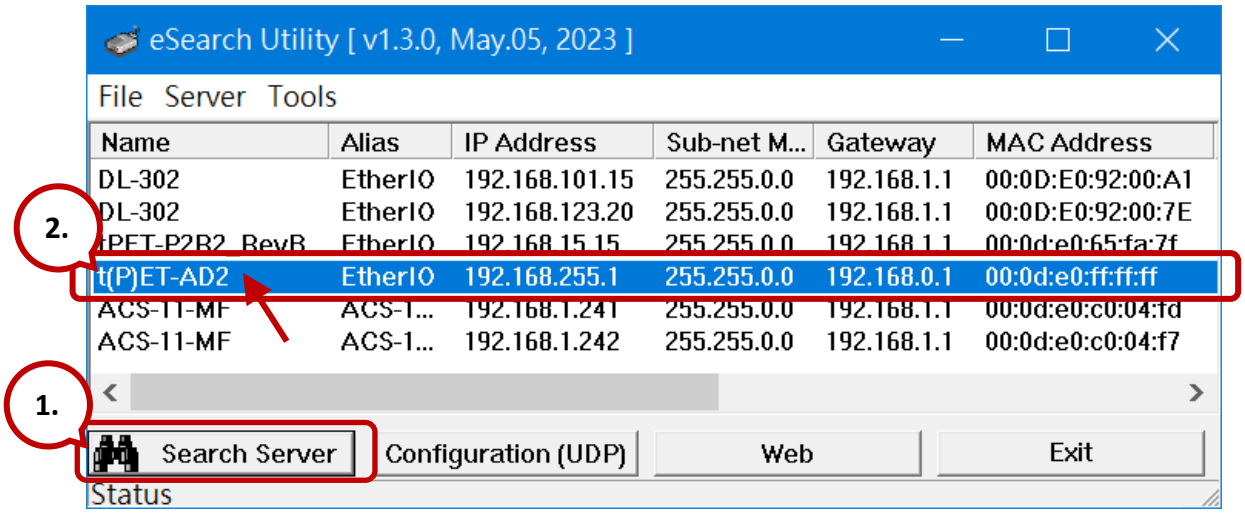
Step 1

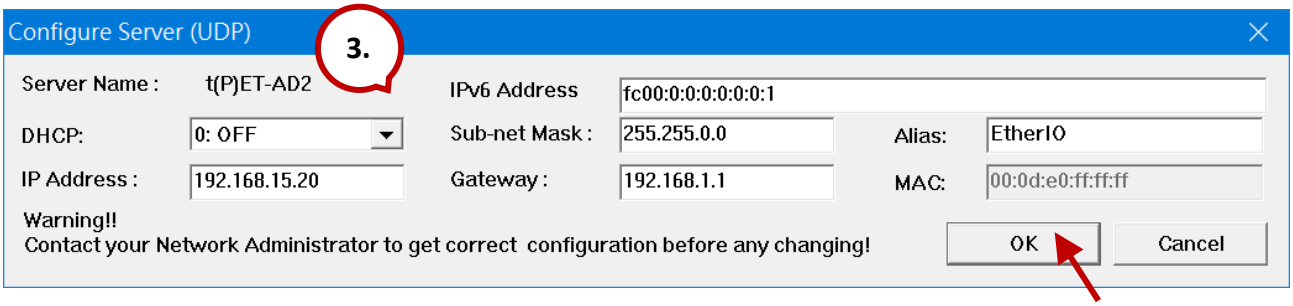
Adjust the Init/Run switch to the "Init" mode and reboot the module to load factory settings, including the default web password.

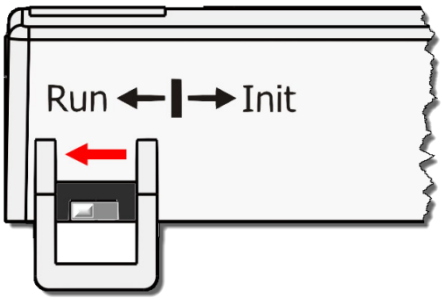


Step 2

Execute the eSearch Utility to verify that the module has been reset to the factory settings. For example, the default IP address is “192.168.255.1”. And then, modify the network settings (e.g., the IP, Mask, and Gateway addresses) and click the **"OK"** button.





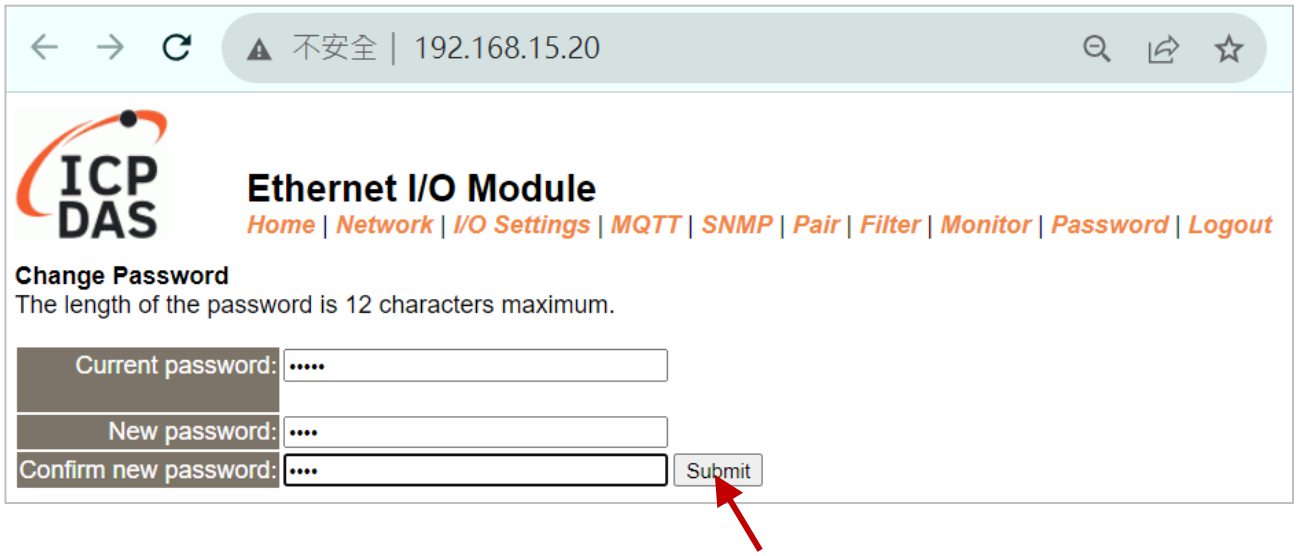


Step 3

Adjust the Init/Run switch back to the **"Run"** mode and reboot the module.

Step 4

Log in to the tET/tPET web server. Enter the factory password **"Admin"** and specify the new password, and then click the **Submit** button to save the settings.



Appendix B: Revision History

This chapter provides revision history information to this document.

The table below shows the revision history.

Revision	Date	Description
2.4	Jan. 2024	1. Add information about tET/tPET-DA2. Related chapters: 1.1, 1.2, 2.2.3, 4.2.2 4.4.3 Analog Output Configuration, 4.4.4 AO - Calibration 4.7.4 Analog Output, 4.9.2 SNMP Specific Trap, 4.9.3 Restore Factory Defaults
2.4	Sep. 2023	1. Remove information about PETL-7060 (Phased out) 2. Add information about tET/tPET-AD2 3. Add Section 4.4.2 Calibration (for AI modules) 4. Add Sections 4.7 MQTT, 4.8 MQTT- Realization, 4.9 SNMP 5. Add Section 5.5 Shared Memory
2.3	Jun. 2020	Updated the related links of official website.
2.2.1	Mar. 2018	Remove the package CD
2.2	Aug. 2017	1. Update the information about the Firmware Version v1.4.6 [Jun.16, 2017] in Chapter 4 Web Configuration. 2. Add Appendix A: Troubleshooting. 3. Add Appendix B: Revision History.
1.6	Jul. 2013	1. Add the software and hardware information about the tET/tPET-PD6. 2. Add the software and hardware information about the tET/tPET-PD2POR2. 3. Add the software and hardware information about the tET/tPET-PD2R1.
1.0	Mar. 2011	Initial issue