ET-7H24 Series

User Manual

Version 1.0.1, September 2021

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Edited by Anna Huang

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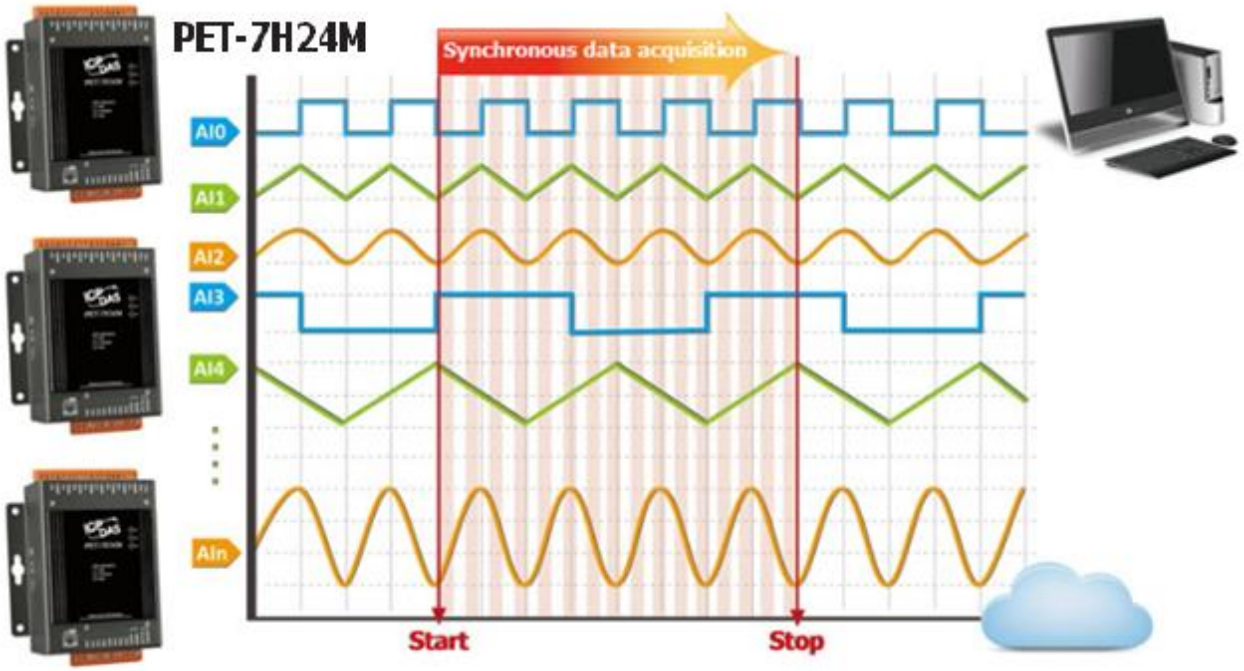
1. Introduction

The PET-7H24M is an high speed data acquisition devices built-in a Ethernet communication port for data transfer over the network and it includes 4 high-speed 24-bit differential Analog input channels analog inputs (128 KHz sample and hold for 4 channels), 2 Analog Output channels, 3 Digital Input channels, 4 Digital Output channels and 1 Encoder Input channel. The module provides a programmable input range on all analog channels, and the Digital Output can be set to output with short-circuit and over load protection. 1 Encoder Input channel can be configured as Quadrant, Pulse/Direction or CW/CCW input mode. The PET-7H24M also provides 4 kV ESD protection as well as 2500 VDC intra-module isolation. In addition, the 24-bit ADC includes built-in Sinc3 filtering to adjust the appropriate sampling rate and filter out modulator and signal noise. The PET-7H24M is not only suitable for a wide range of mobile/portable measurement applications, but also for precision signal measurement.



PET-7H24M supports more kinds of trigger modes for A/D conversion: software trigger, analog threshold trigger. The software trigger can acquire a sample whenever needed, Analog threshold trigger mode, when the analog input value is higher or lower than the set specific voltage value, it triggers, and the A/D collection of N data is started.

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1.1. Features

The PET-7H24M series family offers the most comprehensive configuration to meet specific application requirements. The following list shows the features designed to simplify installation, configuration and application.

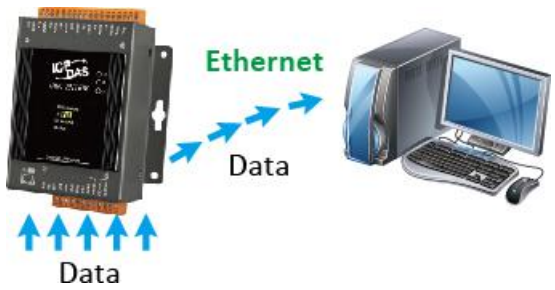
☑ Data transmission mode

The Data transmission mode sends the collected data back to the host PC in a streaming mode to achieve high-speed data collection instead of polling collection mode. With the high-speed data acquisition module, it can meet the high-speed and real-time data acquisition and analysis needs of customers.

1. Continuous transmission (Maximum sampling rate of 60 kHz per channel)

After starting A/D acquisition, data is continuously transmitted to the Host PC.

Total simultaneous sampling channels	Maximum sampling rate per channel
2 ~ 4	60 KHz



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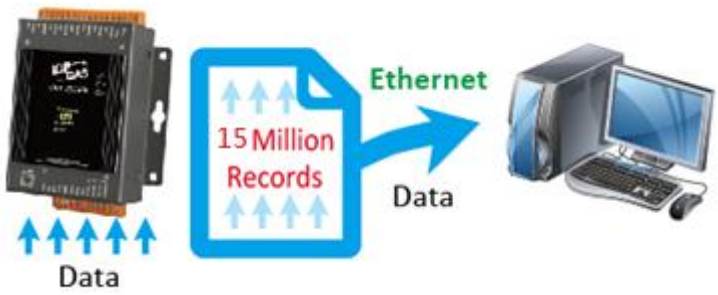
2. After collecting N data samples, the data is transferred to the Host PC (Maximum sampling rate of 128 kHz per channel)

a. After starting A/D acquisition, the data will be temporarily stored in the memory on the PET-7H24M module, and wait until a command is received from the Host PC, before transferring the collected data to the Host PC.

b. The memory capacity allows temporary storage of up to 15 million data samples, Storage time:

(b1) 62.5 seconds at a sampling rate of 60 kHz

(b2) 29.3 seconds at a sampling rate of 128 kHz



☑ A/D Trigger mode

1. Software A/D Data Acquisition mode

The A/D acquisition parameters are configured via a command from the Host PC. The continuous A/D acquisition or the acquisition of N data samples begins after the command is triggered.

2. Analog Threshold Trigger mode

The A/D acquisition parameters are configured via a command from the Host PC, When the analog input value is higher or lower than the set specific voltage value, the A/D acquisition of the N data is started.

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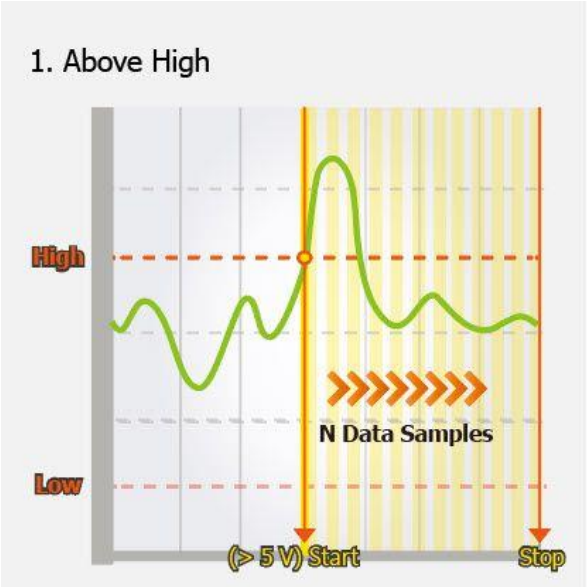
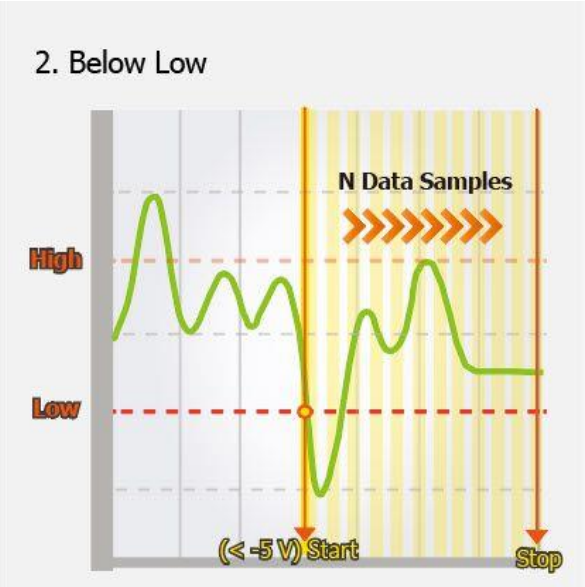
☑ Analog Threshold Trigger

Analog Threshold Trigger is triggered when the voltage signal of the specified analog input channel is higher or lower than a certain voltage setting. In addition, the user can also specify the trigger voltage level range of the input signal. Once the signal leaves the high and low level region or the signal enters the high and low level region, it is triggered to start the acquisition.

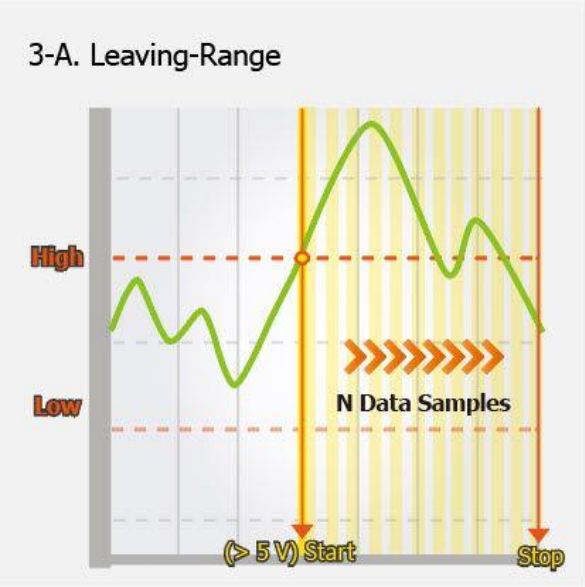
1. Above High: The signal is triggered above the high level and collects N data.

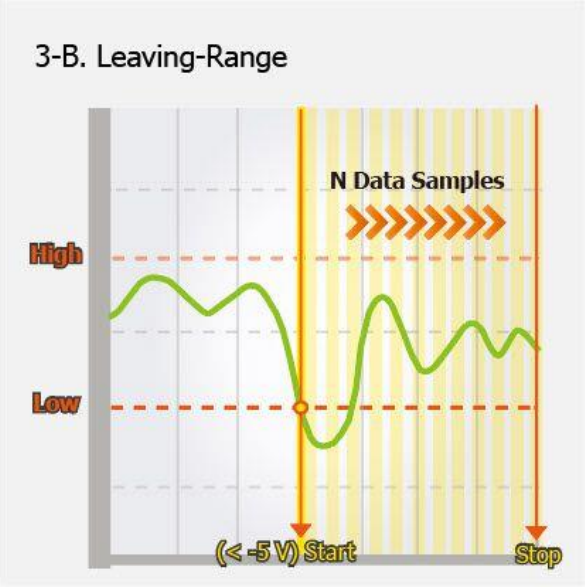
2. Below Low: The signal is triggered below the low level and collects N data





3. Leaving-Range: Trigger when the signal leaves the high and low level region, collect N data





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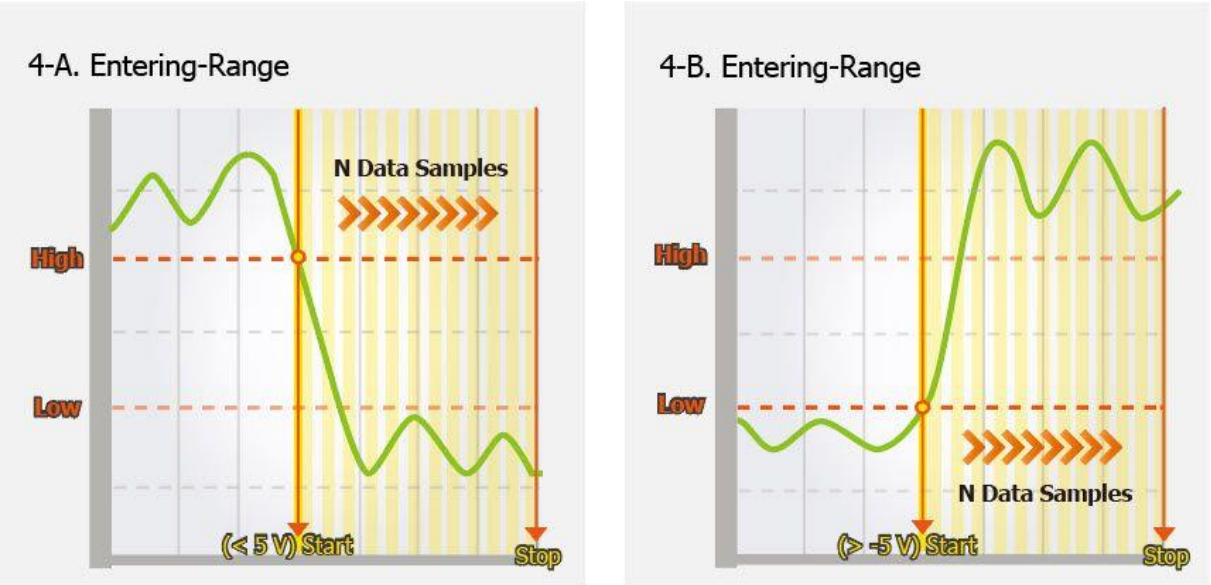
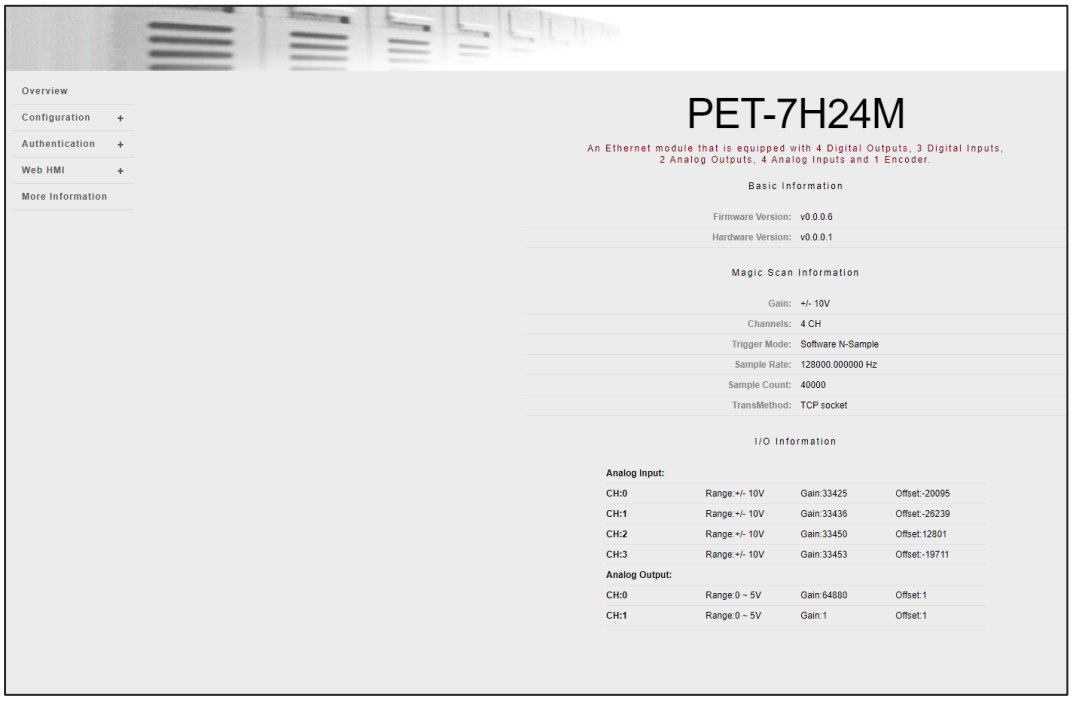
4. Entering-Range: Trigger when the signal enters the high and low level region, collect N data



☑ Built-in Web Server

Each PET-7H24M module has a built-in web server that allows users to easily configure, monitor and control the module from a remote location using a regular web browser.



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☑ Communication Security

Account and password are required when logging into the PET-7H24M web server. An IP address filter is also included, which can be used to allow or deny connections with specific IP addresses.

☑ Modbus/TCP Protocol

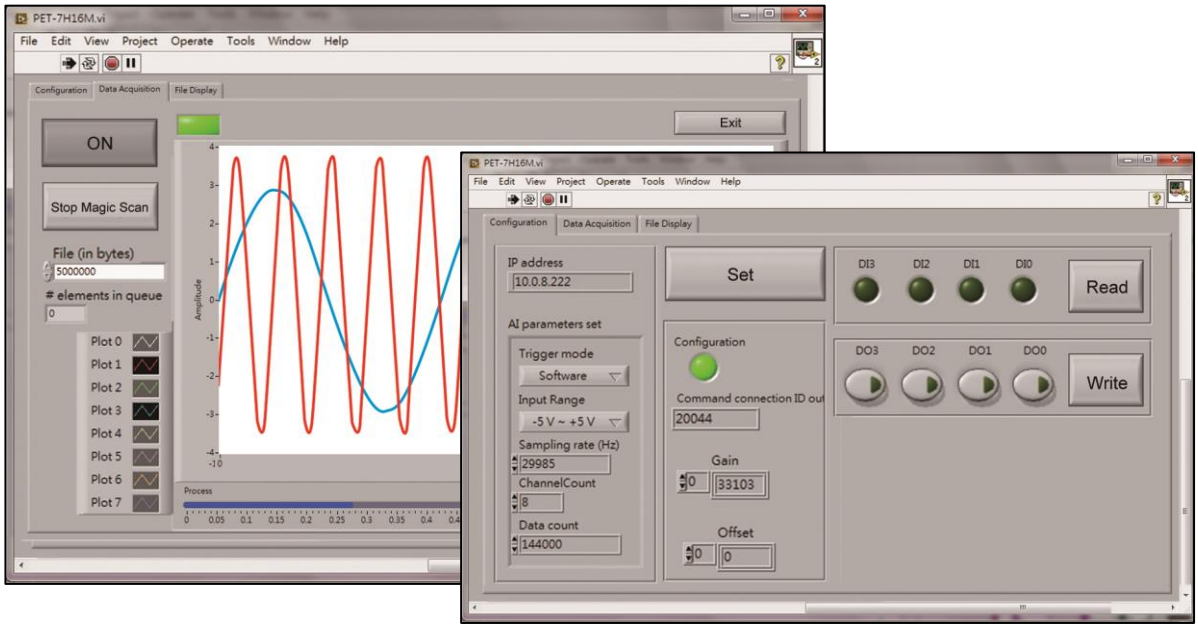
The Modbus/TCP slave function on the Ethernet port can be used to provide data to remote HMI/SCADA software built with Modbus/TCP driver.

☑ Automatic MDI / MDI-X Crossover for Plug-and-play

RJ-45 port supports automatic MDI/MDI-x that can automatically detect the type of connection to the Ethernet device without requiring special straight or crossover cables.

- Software Support
- Supported Operating Systems: Windows 7/8/10 and Linux

  - Software Compatibility
  - Microsoft VC, C#, VB.NET SDK API and Demo
  - NI LabVIEW Toolkit and Demo
  - C/C++ library and Demo for Linux



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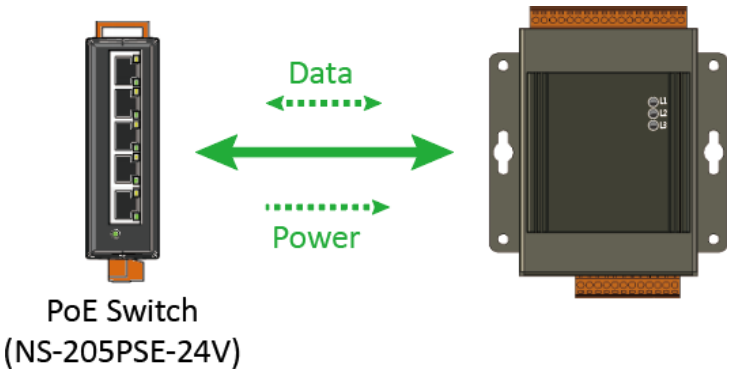
☑ Highly Reliable Under Harsh Environment

PET-7H24M is housed in a metal shell/case with a column-like ventilator that helps to cool the working environment inside the shell/case.

- Operating Temperature: -25 ~ +75 °C
- Storage Temperature: -30 ~ +80 °C
- Humidity: 10 ~ 90% RH (non-condensing)

☑ PoE

The PET-7H24M module has integrated Power-over-Ethernet (PoE), it allows power and data to be carried over a single Ethernet cable, so a device can operate solely from the power it receives through the data cable. This innovation allows greater flexibility in office design, higher efficiency in systems design, and faster turnaround time in set-up and implementation. The PET-7H24M module feature true IEEE 802.3af-compliant (classification, Class 1) Power over Ethernet (PoE) using both Ethernet pairs (Category 5 Ethernet cable). The PET-7H24M module can receive power from an auxiliary power sources like AC adapters and battery in addition to the PoE enabled network. This is a desirable feature when the total system power requirements exceed the PSE's(power sourcing equipment) load capacity. Furthermore, with the auxiliary power option, the PET-7H24M module can be used in a standard Ethernet (non-PoE) system.



When using PoE devices like PET-7H24M, you can choose ICP DAS “PoE” switch —”NS-205PSE” as the power source, NS-205PSE automatically detects the connected devices whether they are PoE devices or not. This mechanism ensures NS-205PSE to work with both PoE and non-PoE devices coordinately at the same time.

Being as a power source for PoE devices, NS-205PSE requires its power input ranging from +46 ~ +55VDC.

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1.2. Specification

The table below summarizes the specifications of the PET-7H24M.

System Software

Software	
OS	Windows 7/8/10 and Linux
Software	Windows ◦ Microsoft VC, C#, VB.NET SDK API and Demo ◦ Python Demo ◦ NI LabVIEW Toolkit and Demo Linux ◦ C/C++ library and Demo ◦ .NET library and Demo ◦ Python Demo
Utility	Configuration, graphically display and data logging

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System Specification

Communication	
Ethernet Port	1 x RJ-45, 10/100 Base-TX (Auto-negotiating, Auto MDI/MDI-X)
PoE	Yes, IEEE 802.3af,class 2
Security	ID, Password and IP Filter
Protocol	TCP Streaming (Access data by SDK library), Modbus TCP
LED Indicators	
for System Running	Yes
for Ethernet Link/Act	Yes
for POE Power	Yes
2-Way Isolation	
I/O	2500 VDC
EMS Protection	
ESD (IEC 61000-4-2)	+/-4 kV Contact for Each Terminal and +/-8 kV Air for Random Point
EFT (IEC 61000-4-4)	+/-4 kV for Power
Power	
Reverse Polarity Protection	Yes
Powered from Terminal Block	+12 ~ +48 VDC
Consumption	2.6 W (Max.)
Mechanical	
Dimensions (W x L x H)	76 mm x 120 mm x 38 mm
Installation	DIN-Rail or Wall Mounting
Enclosures	Metal
Environment	
Operating Temperature	-25 ~ +75 °C
Storage Temperature	-30 ~ +80 °C
Humidity	10 ~ 90 % RH, Non-condensing

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I/O Specification

Analog Input	
Channels	4 Differential (Simultaneously)
Resolution	24-bit
Sampling Rate	128 KS/s (Each Channel)
Bipolar Input (Programmable)	+/- 10 V, +/- 5 V, +/- 2.5 V, +/- 1.25 V, +/- 0.625 V, ±300mV ±150mV ±75mV ±40mV ±20mV
FIFO Size	4 K Sample
Accuracy	±0.01 % of FSR @ ±10 V; ±0.02 % of FSR @ ±5 V, ±2.5 V; ±0.02 % of FSR @ ±1.25V, ±0.625 V; ±0.1 % of FSR @ ±300 mV, ±150 mV; ±0.1 % of FSR @ ± 75 mV, ±40 mV; ±0.2 % of FSR @ ±20 mV
AD Trigger Mode (Programmable)	Software、Analog threshold trigger
Input Impedance	2M Ohm
Analog Output	
Channels	2 Single-ended
Type	±10 V, ±5 V, 0 ~ 5 V, 0 ~ 10 V
Resolution	12-bit
Accuracy	+/- 0.01 % of FSR @±10V, ±5V, 0~10V +/- 0.02 % of FSR @0~5V
Output Capacity	10 V @20mA
Slew Rate	0.83 V/us
Digital Input	
Channels	3
Contact	Wet Contact
Sink/Source (NPN/PNP)	Sink/Source
On Voltage Level	+5 VDC ~ 30 VDC

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Digital Input	
Off Voltage Level	2 VDC Max.
Input Impedance	10K Ohm
Isolation	2500 VDC
Digital Output	
Channels	4
Type	Isolated Open Collector
Sink/Source(NPN/PNP)	Sink
Load Voltage	+5 VDC ~ 30 VDC
Load Current	100 mA at 25°C
Short-circuit Protection	Yes
Overload Protection	1.3A
Isolation	2500 VDC
Encoder Input	
Counter	32-bit
Encoder Mode	Quadrant/CW/CCW and Pulse/Dir
Counting Rate	Quadrant Counting : 2MHz(Max.) CW/CCW : 6MHz(Max.) Pulse/Dir : 6MHz(Max.)
On Voltage Level	+3.5 ~+5 VDC
Off Voltage Level	+0.8 VDC Max.
Programmable digital filter	0.55 ~ 33.3μs (7 steps)
Isolation	2500 VDC

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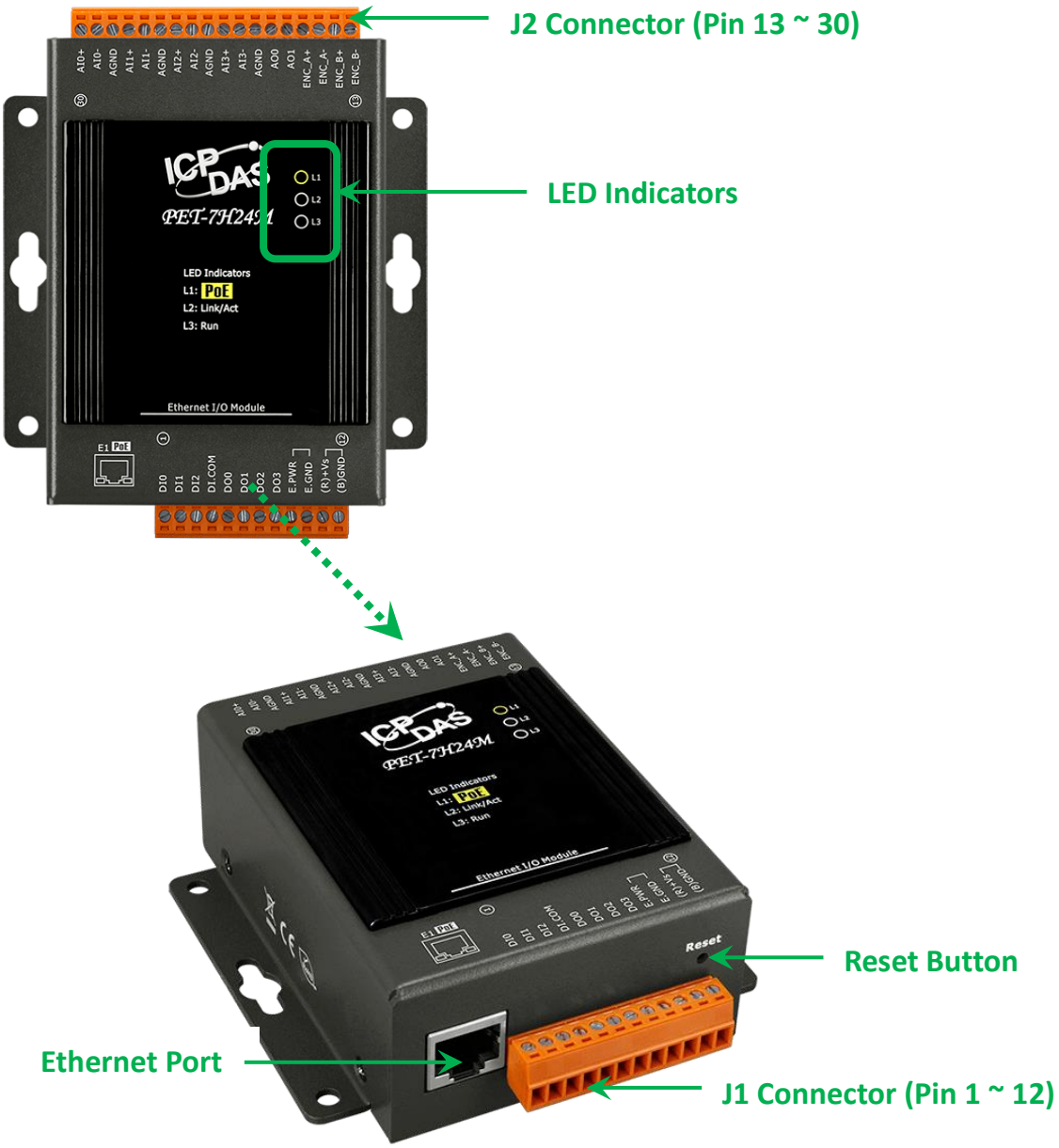
1.3. Overview

PET-7H24M is equipped with several interfaces and peripherals that can be integrated with external systems. Here is an overview of the components and its descriptions.



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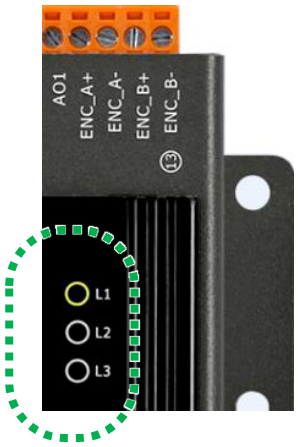
☑ LED Indicators

The PET-7H24M has 3 LED indicators shown as below.



LED Indicator		LED Action	Meaning
L1	PoE	ON	When unit power is supplied via PoE.
L2	Link/ACT	ON	Ethernet link detected
		OFF	No Ethernet link detected
		Flashing	Ethernet packet received
L3	RUN	Flashing	Firmware is running

Tips & Warnings

If the Run LED does not display the information as above, the following steps should be taken:

Step 1: Switch the power off

Step 2: Switch the power on and double-check the LED indicators

☑ Ethernet Port

The PET-7H24M has an Ethernet port that can be connected to a computer or device via an Ethernet cable.

The L2 indicators display the status of the Ethernet port.

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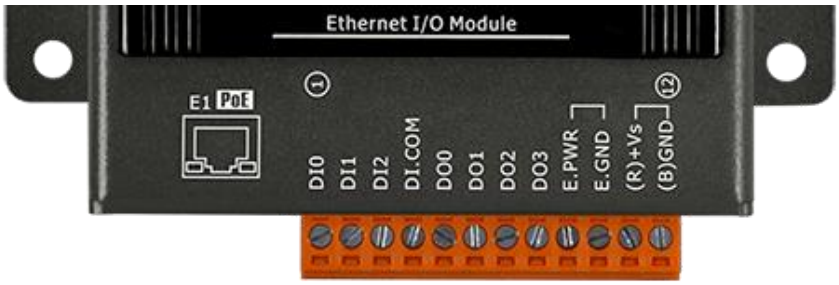
☑ JP1 Connector

The JP1 connector has 12 pins arranged in 1 row. For more detailed information regarding the pin assignments of the J1 Connector, please refer to “1.2. Specification”

The pin assignments of the connector are as follows:



Signal	Direction	Description
DI0 ~ DI2	Input	Digital Input channels 0 to 3.
DI.COM	-	Common source
DO0 ~ DO3	Output	Digital Output channels 0 to 3.
DGND	-	Digital Ground.
E.PWR	-	External power for Digital Output
E.GND	-	External Ground for Digital Output
(R) +Vs	(R) +Vs	Power Input (+12 ~ +48 VDC)
(B) GND	(B) GND	

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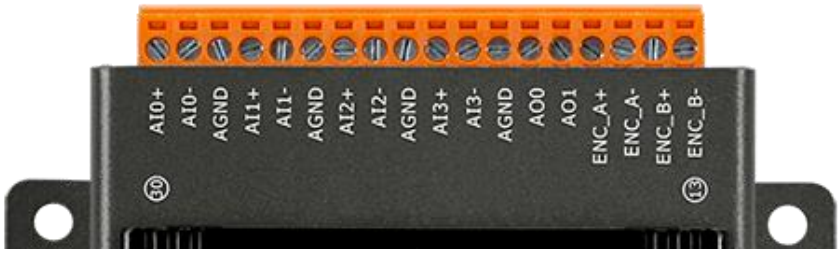
☑ JP2 Connector

The JP2 connector has 18 pins arranged in 1 row. For more detailed information regarding the pin assignments of the J2 Connector, please refer to “1.2. Specification”

The pin assignments of the connector are as follows:



Signal	Direction	Description
AI0+ ~ AI3+	Input	Analog Input channels 0 to 3.
AI0- ~ AI3-		
AGND	-	Analog Input Ground.
AO0 ~ AO1	Output	Analog Output channels 0 to 1.
ENC_A+ ENC_B+	Input	Encoder input
ENC_A- ENC_B-		

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☑ Reset Button

The Reset button provides user with a quick and easy way to resort the default setting.

Press the Reset button continuously for 5 seconds, and then release it. The device will restore to factory default settings.

The table below lists the default settings after pressing reset button.

Network Settings

Data Item	Factory Default Settings
IP	192.168.255.1
Gateway	192.168.0.1
Mask	255.255.0.0
DHCP	Disable

Gain/offset value of AI calibration

Factory Default Setting
Original factory calibration value

Account Management

Factory Default Setting
A default user account consists of an account name “Admin” and a password “Admin”.

Accessible IP Settings

Factory Default Setting
Empty, there is no limit to allow any outgoing access.

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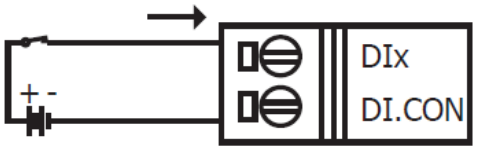
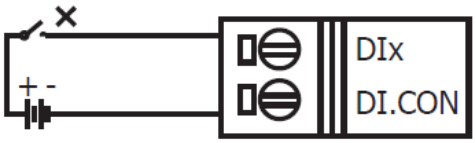
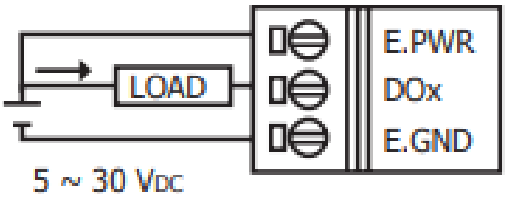
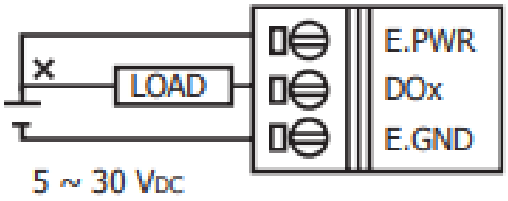
1.4. Wiring Diagram

The wiring diagram of the PET-7H24M is illustrated on the following figure.

☑ Analog Input/output

Analog Input (Voltage)	Analog Output (Voltage)

☑ Digital Input/output, Counter

Digital Input/Counter	ON State Readback as 1	OFF State Readback as 0
Wet Contact (Sink)		
Digital Output	**ON State Readback as 1**	**OFF State Readback as 0**
Open Collector (Sink)		

Tips & Warnings

When using DO, if the module is powered on again, ensure that the external power supply for the DO is also restarted and its power delivery is delayed by approximately 1–2 seconds to prevent unexpected DO outputs during the module's startup process.

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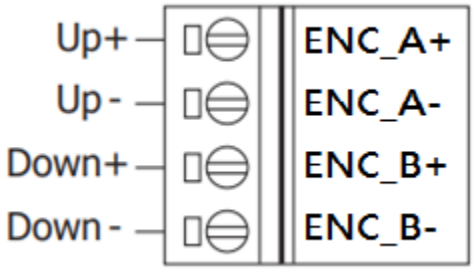
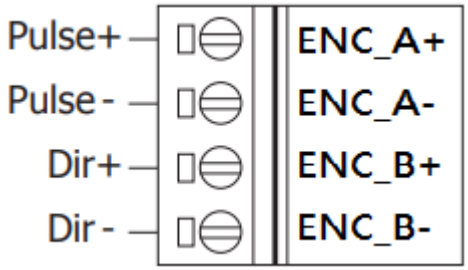
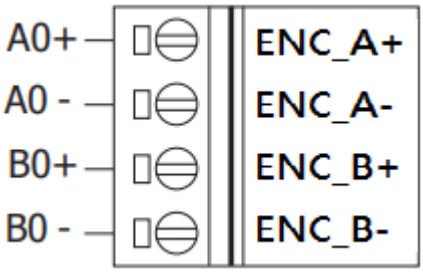
☑ Encoder Input

Encoder Type	
Up/Down	
Dir/Pulse	
A/B Phase	

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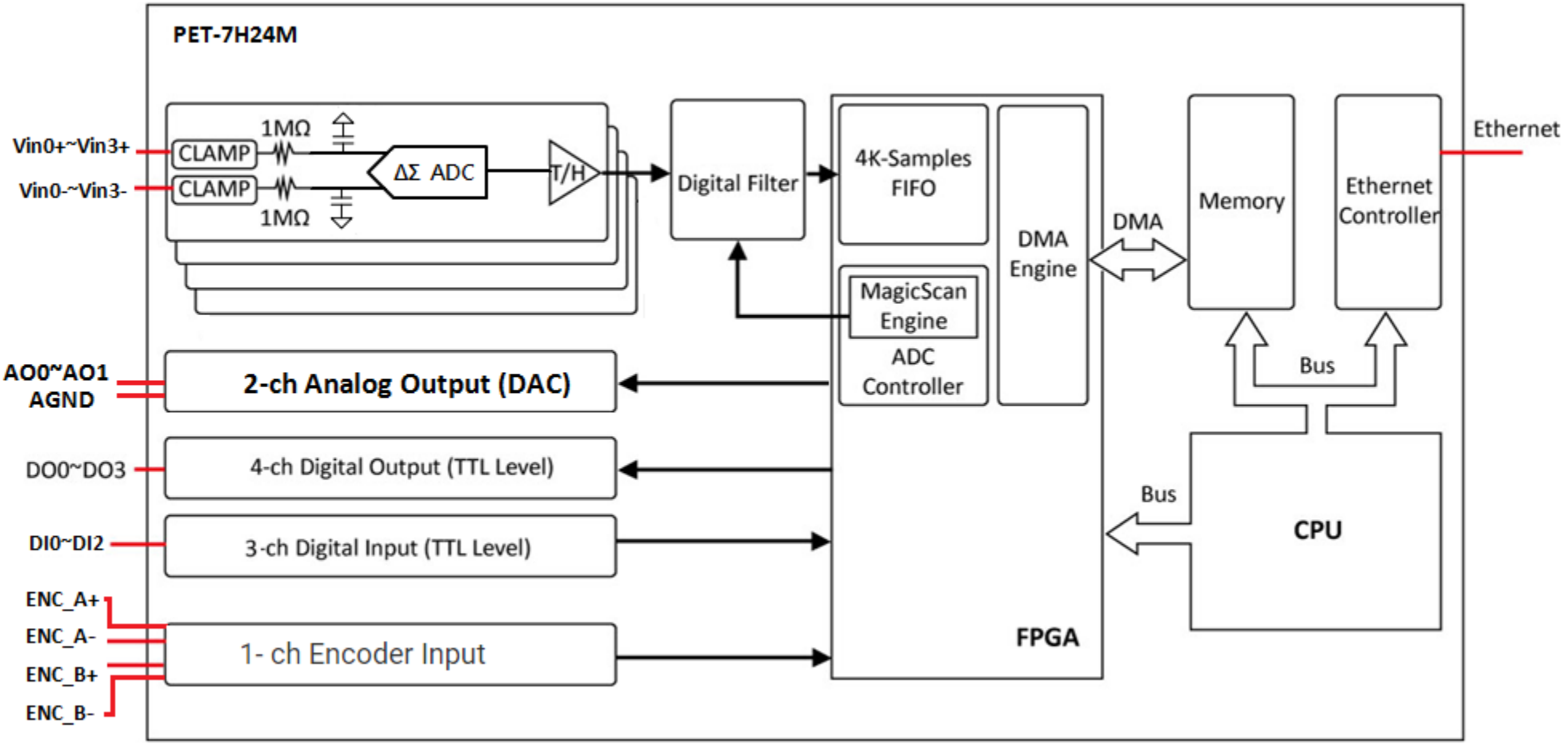
1.5. Block Diagram

PET-7H24M functions are illustrated in the block diagram shown here.



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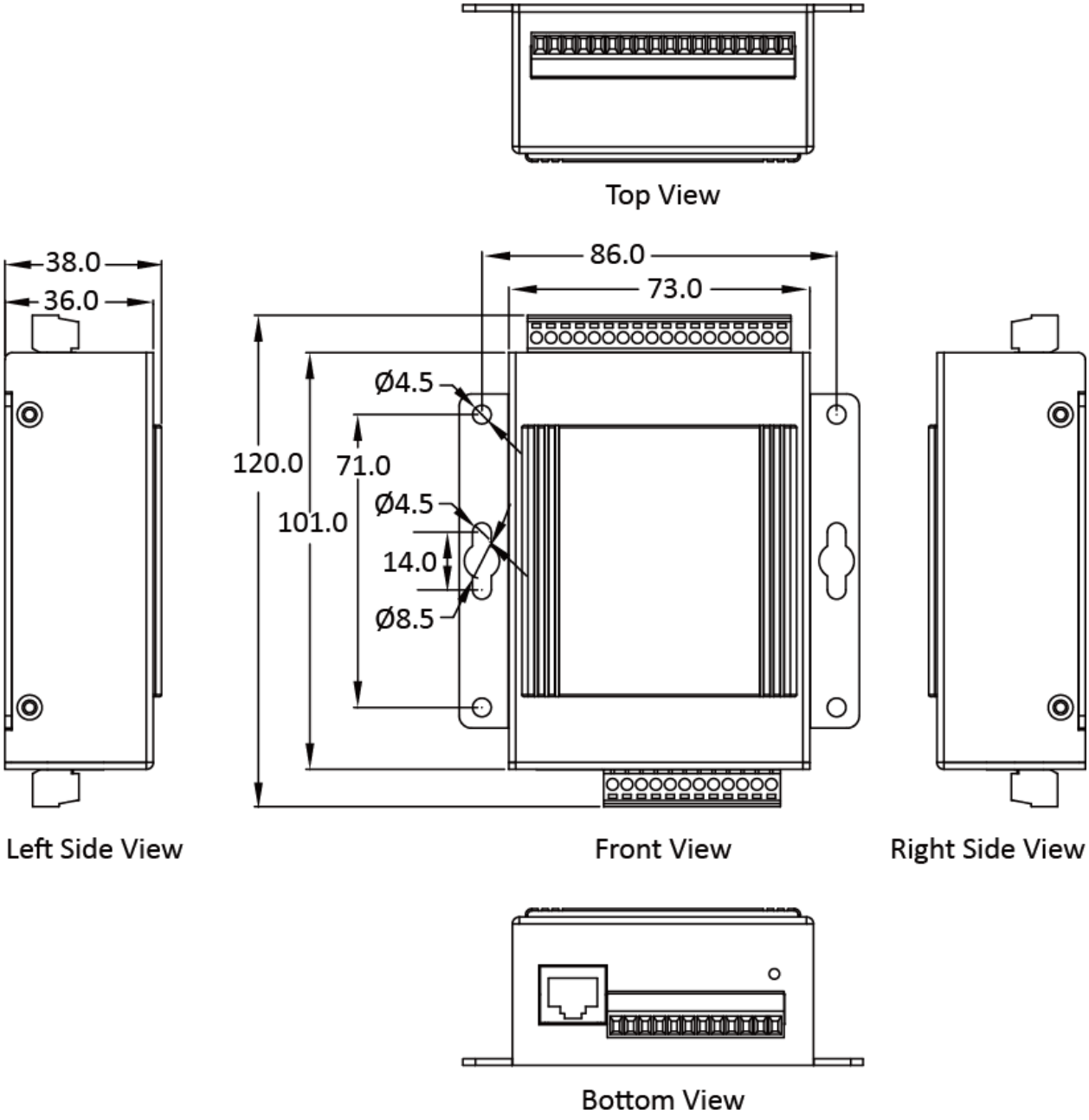
1.6. Dimension

The diagrams below provide the dimensions of the PET-7H24M to use in defining your enclosure specifications. All dimensions are in millimeters.



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2. Getting Started

If you are a new user, begin with this chapter, it includes a guided tour that provides a basic overview of installing, configuring and using the PET-7H24M.

Before starting any task, please check the package contents. If any of the following package contents are missing or damaged, contact your dealer on distributor.

PET-7H24M

Quick Start Guide

2.4 mm Screw Driver

Before you work with the PET-7H24M, you should have a basic understanding of hardware specification, such as the dimensions, the usable input-voltage range of the power supply, and the type of communication interfaces.

For more information about the hardware details, please refer to “1.2. Specification”
For more information about the hardware dimensions, please refer to “1.6. Dimension”

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2.1. Mounting the Hardware

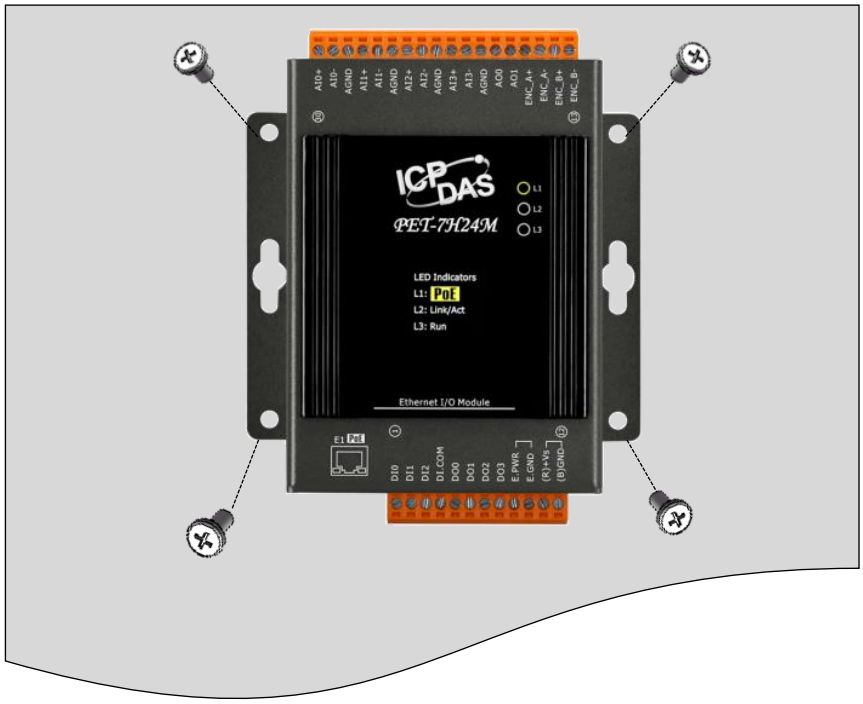
The PET-7H24M can be mounted either on a wall/panel or a Din-Rail.

2.1.1. Mounting PET-7h24M on a Wall/Panel

The PET-7H24M can be mounted directly to a wall/panel.

i. Use the included screws and a screw driver to attach the PET-7H24M to the wall/panel

ii. Fasten the screws securely



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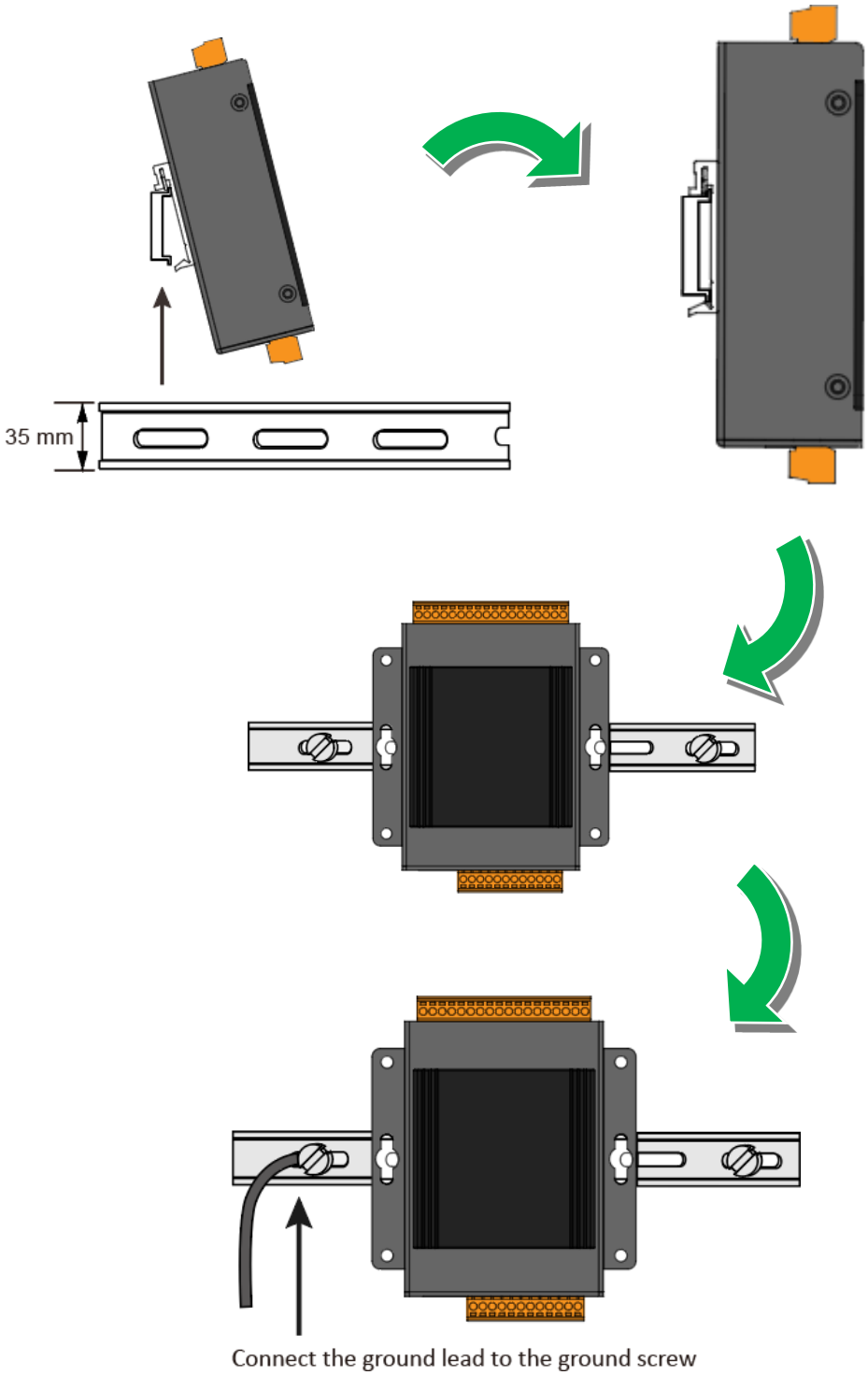
2.1.2. Mounting PET-7H24M onto a DIN-Rail

The PET-7H24M has simple rail clips for mounting reliably on a standard 35 mm DIN rail.



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2.2. Deploying a Basic PET-7H24M System

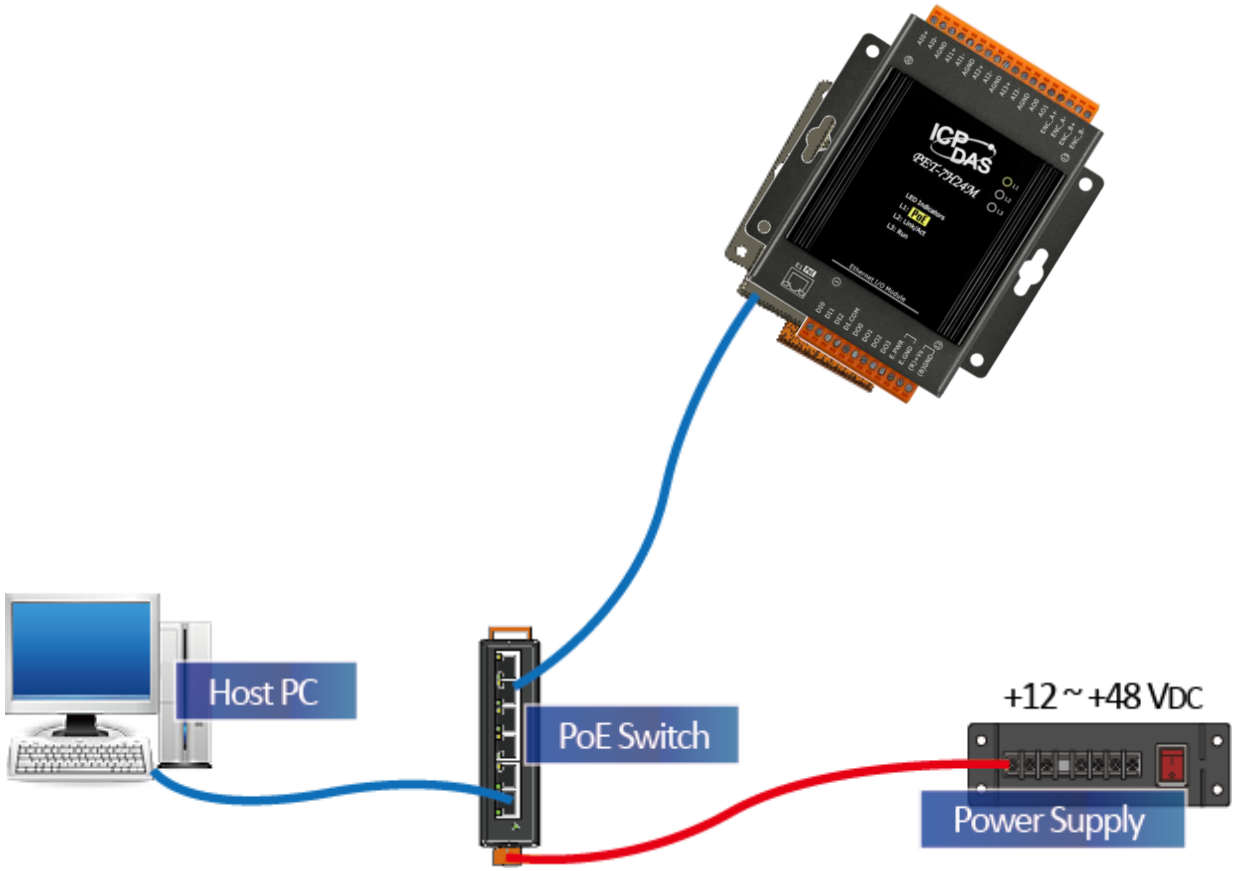
Here is a simple application for using the PET-7H24M that is shown below.

There are two ways for the PET-7H24M module getting the power. One is through Ethernet by a PoE switch; the other is as usual through wiring by an external power. External power should range from +12 VDC to 48 VDC. The reason we keep the second way is because it might be useful if someday or somehow you have different applications. PET-7H24M module is equipped with a LED, which indicates whether the power is supplied by a PoE switch.

☑ PoE

i. Connect PC to the Ethernet port via the PoE switch.

ii. Connect the power supply to the PoE switch, which supplies power to the PET-7H24M.



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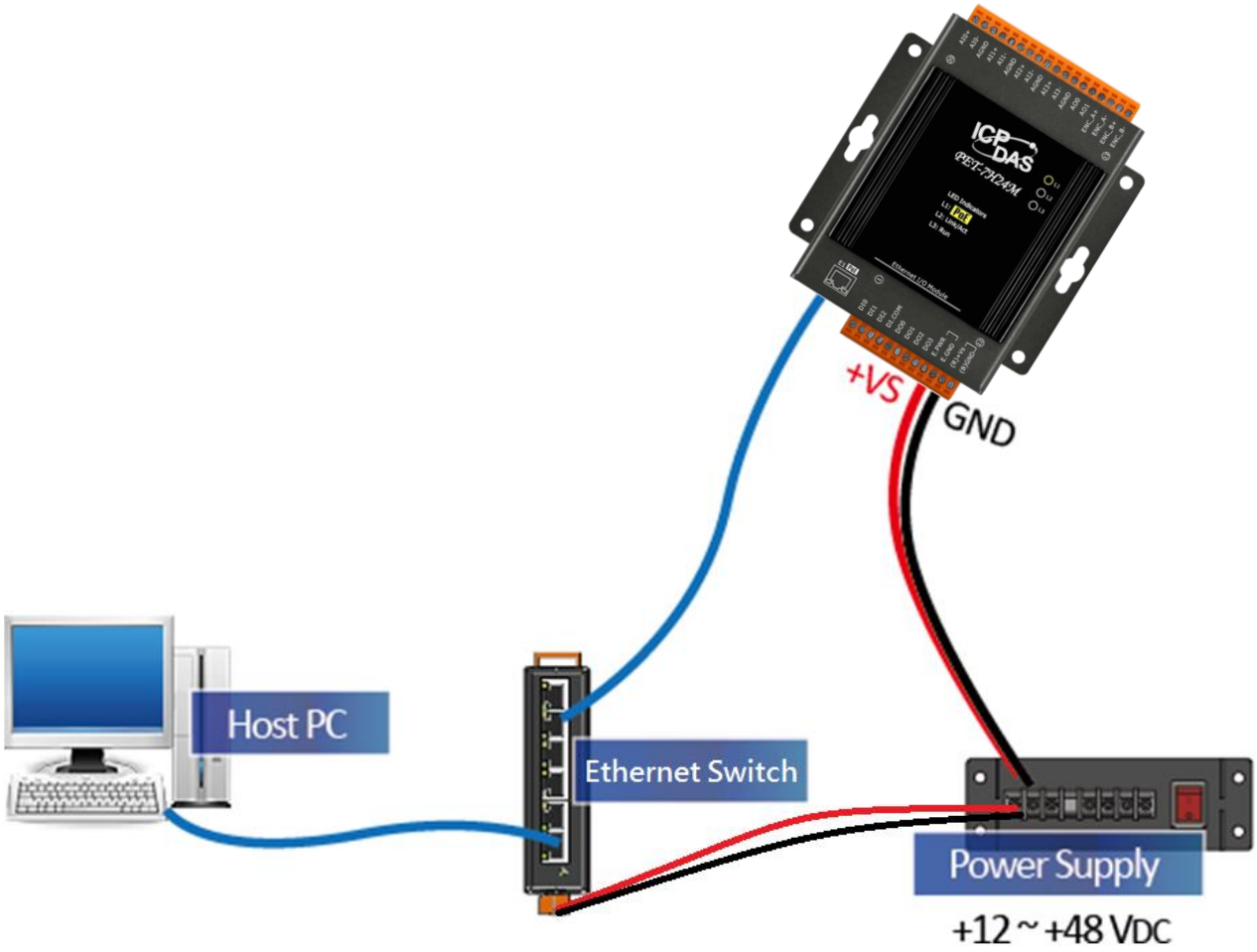
☑ External Power supply

i. Connect PC to the Ethernet port via the Ethernet switch.

ii. Connect the power supply to the switch and PET-7H24M.



Tips & Warnings

Network: connections with fewer switches between the PC and the HSDAQ device(s) can improve AI acquisition performance. It is recommended to connect the PC and the HSDAQ device(s) to the same switch/hub.

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2.3. Installing the HSDAQ Utility

The HSDAQ Utility is a useful tool that provides a quick and easy way to update firmware, configure Ethernet settings, and download files to PET-7H24M from PC.
Refer to chapter 4.2. HSDAQ Utility for more details.

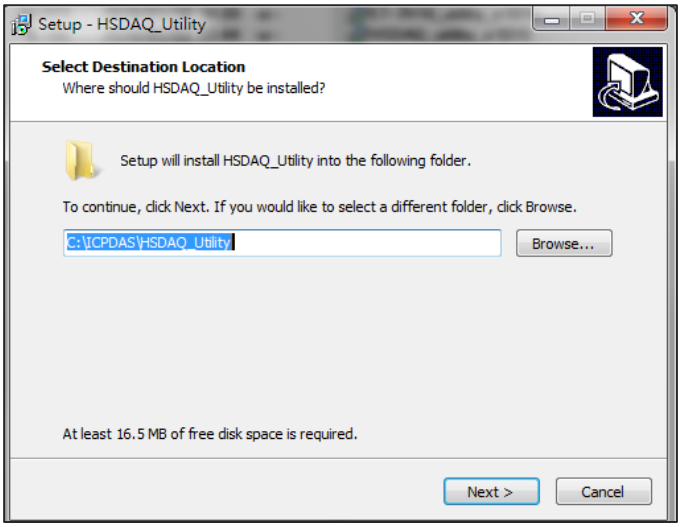
Step1: Get the HSDAQ Utility tool

The HSDAQ Utility can be obtained from the following link:

http://www.icpdas.com/en/download/show.php?num=2327

Step 2: Follow the prompts to complete the installation

After the installation has been completed, there will be a new short-cut for HSDAQ Utility on the desktop.



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2.4. Using HSDAQ Utility to Assign an IP Address

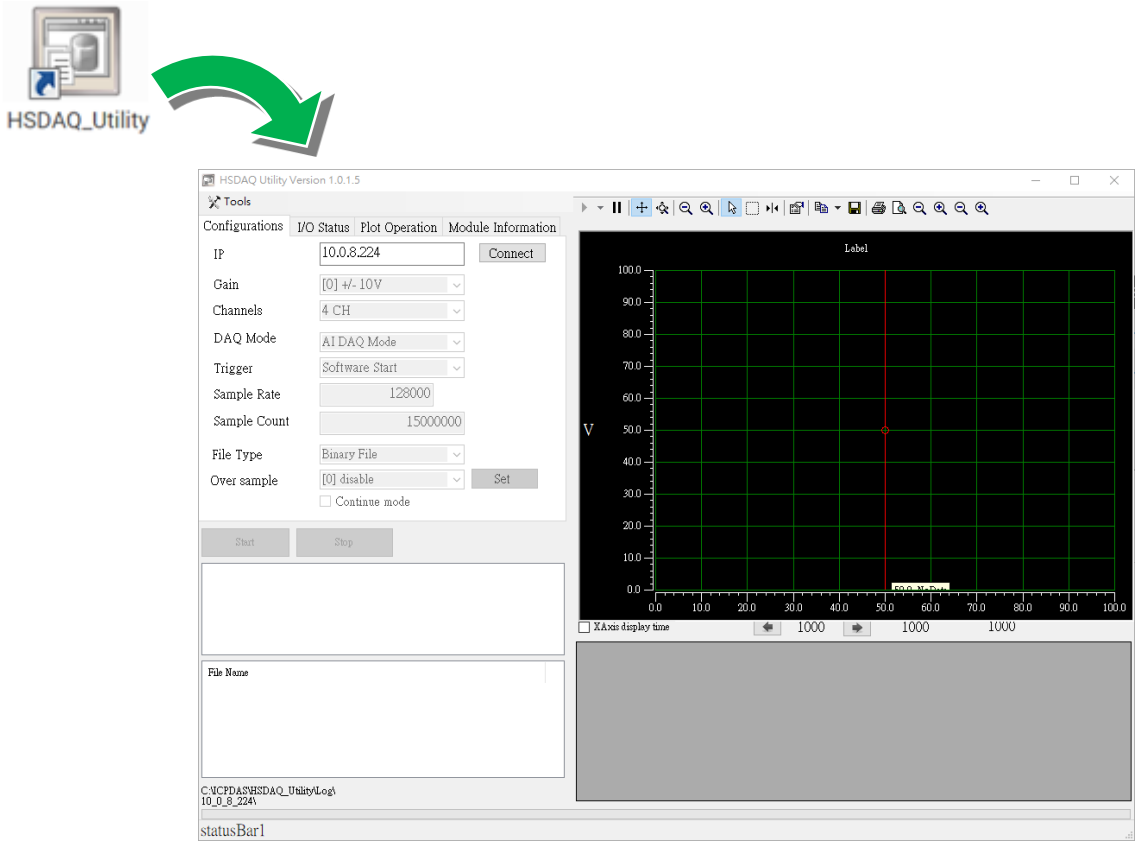
The PET-7H24M is an Ethernet device, which comes with a default IP address, therefore, you must first assign a new IP address to the PET-7H24M.

The factory default IP settings are as follows:

Item	Default
IP Address	192.168.255.1
Subnet Mask	255.255.0.0
Gateway	192.168.0.1

Step 1: Run the HSDAQ Utility

Double-click the HSDAQ Utility shortcut on your desktop.



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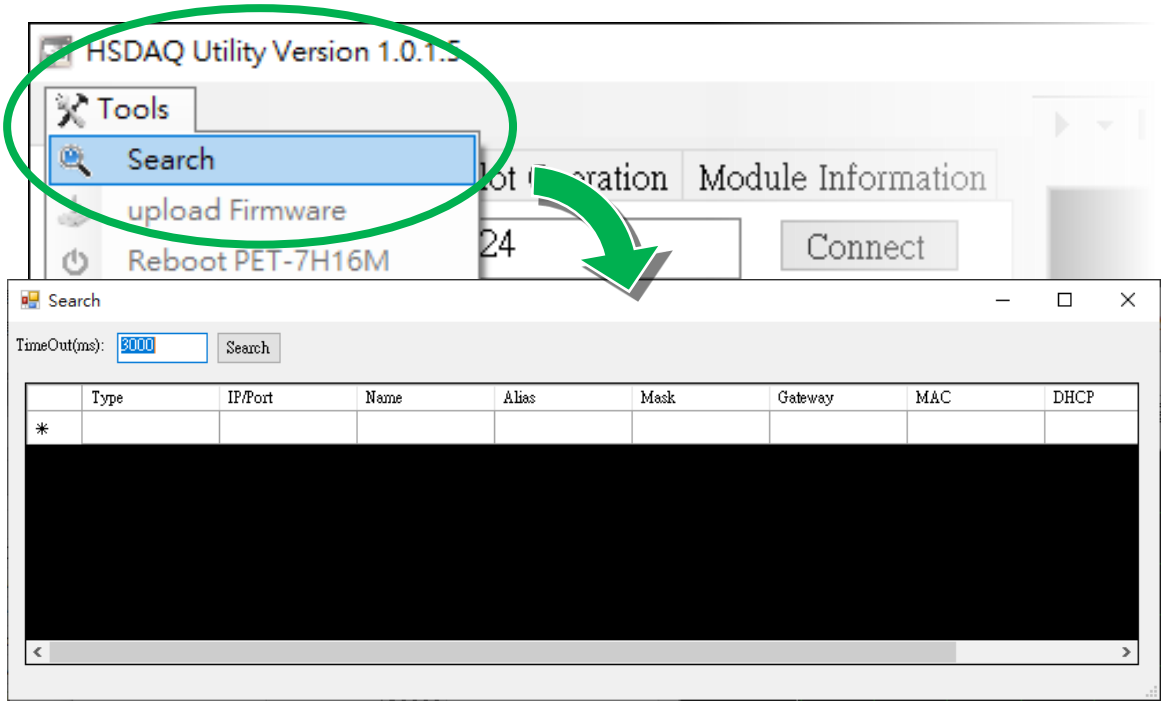
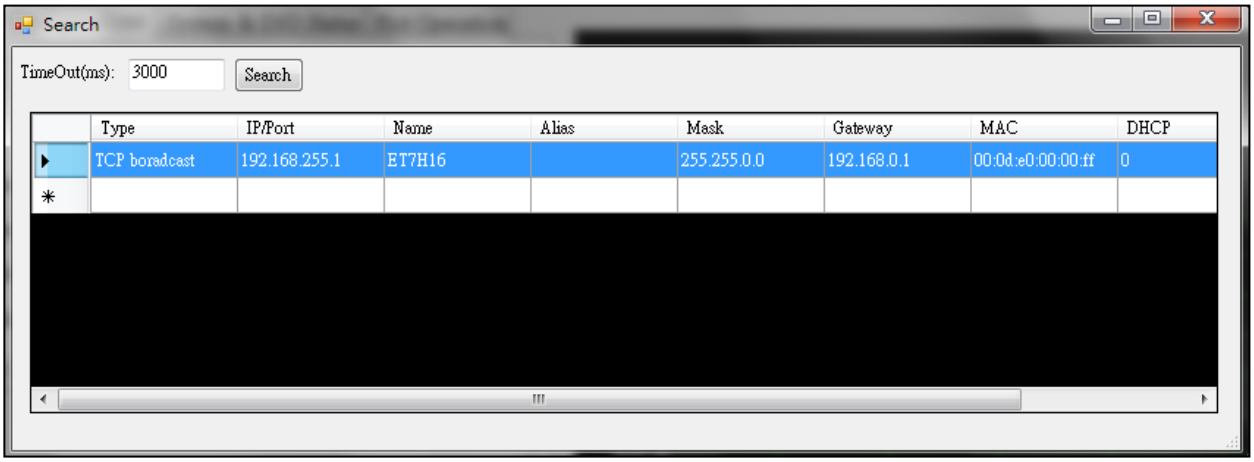
Step 2: Press choose “Search” from the “Tools” menu

After choosing Search from Tools menu, that will search all of the PET-7H24M modules on your network.



Step 3: Choose the field “192.168.255.1” and then choose “IP setting” from the toolbar

Choose default value “192.168.255.1” for fields in the list and double-click.



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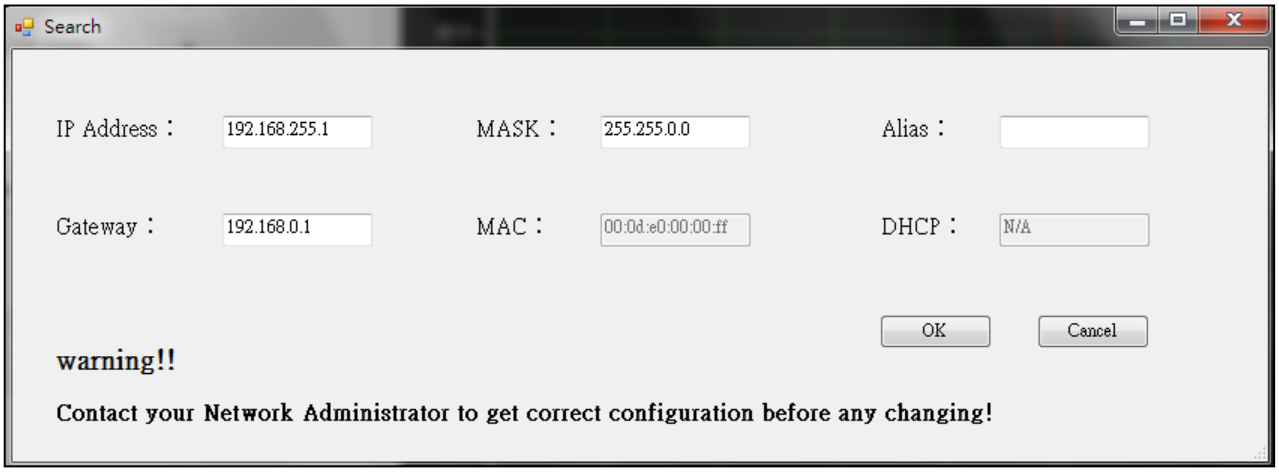
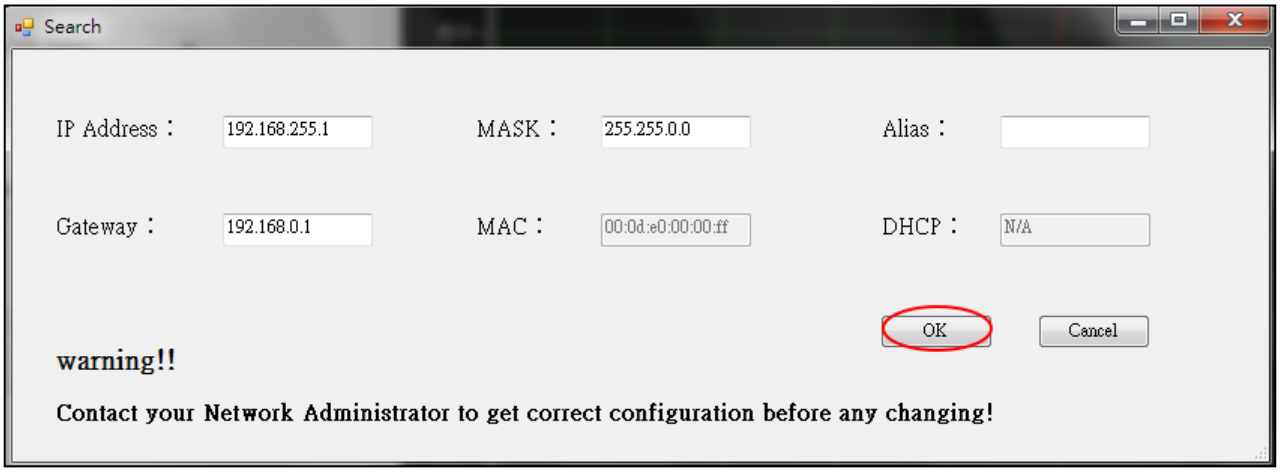
Step 4: Assign a new IP address and then choose “Set” button

You only can manually assign an IP address.



Step 5: Click “OK” button

When the setup is completed, click the "OK" button.



Step 6: Wait for PET-7H24M reboot

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3. Operation

Once connected to the network, the PET-7H24M module can be remotely accessed and configured through software from anywhere on the network and the sampling data only can be acquired by software over Ethernet. So far, the device doesn't operate as a stand-along data logger.
The only one connection at a time is allowed to acquire data from PET-7H24M.

The software mode continuously sends the collected data back to the PC in a streaming mode to achieve high-speed data collection instead of polling collection mode. With the high-speed data acquisition module, it can meet the high-speed and real-time data acquisition and analysis needs of customers

There are two different data acquisition modes and several trigger modes of analog input operation.

The following chart shows the acquisition and trigger modes and their operation frequency of each combination.

Trigger \ Acquisition	Continuous	N Sample
Software AD	20~60KHz	60 kHz ~ 128 KHz
Analog Threshold Trigger	-	20 Hz ~ 128 KHz

Tips & Warnings

Maximum 15,000,000 records in N Sample Mode

62.5 sec (60 KHz), 29.3 sec (128 KHz) of 15,000,000 records in software AD trigger.

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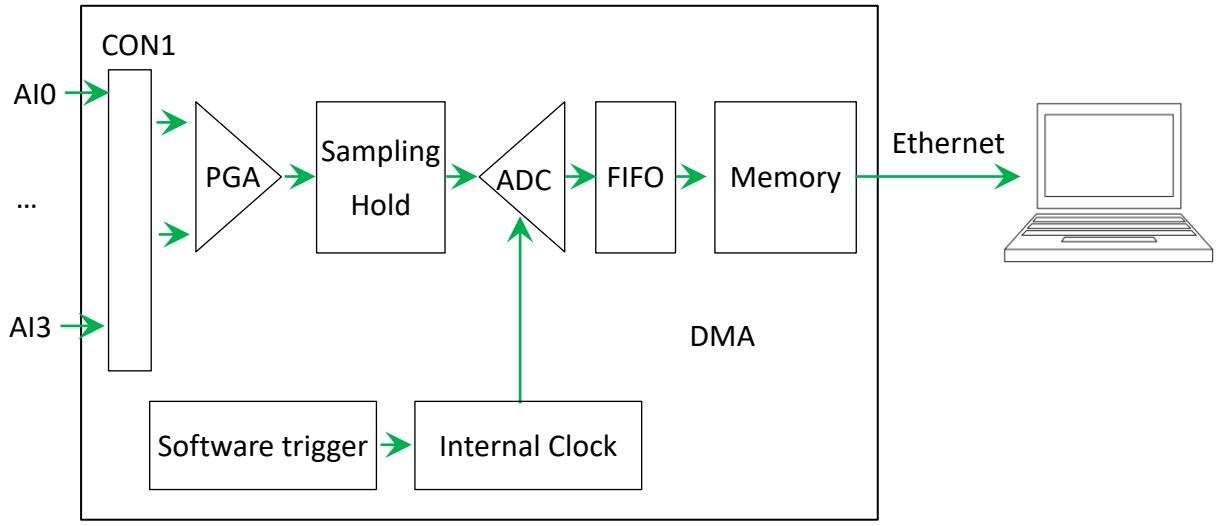
3.1. Continuous Acquisition

3.1.1. Software AD Trigger

In continuous acquisition and software AD trigger, Send a start command from PC over the Ethernet to PET-7H24M to start the AD conversion. The analog input value is continuously acquired and converted to digital data. The data accumulated to a network packet size returns to the PC. The process of acquiring data is continuous until a stop command is sent over the Ethernet. The sample rate can range from 20 to 60K Hz on local networks. (Lower over the Internet or wireless networks).

There are parameters below that need to be specified:

- Sampling rate (20~60KHz)
- Scan channels
- The trigger mode is software AD trigger



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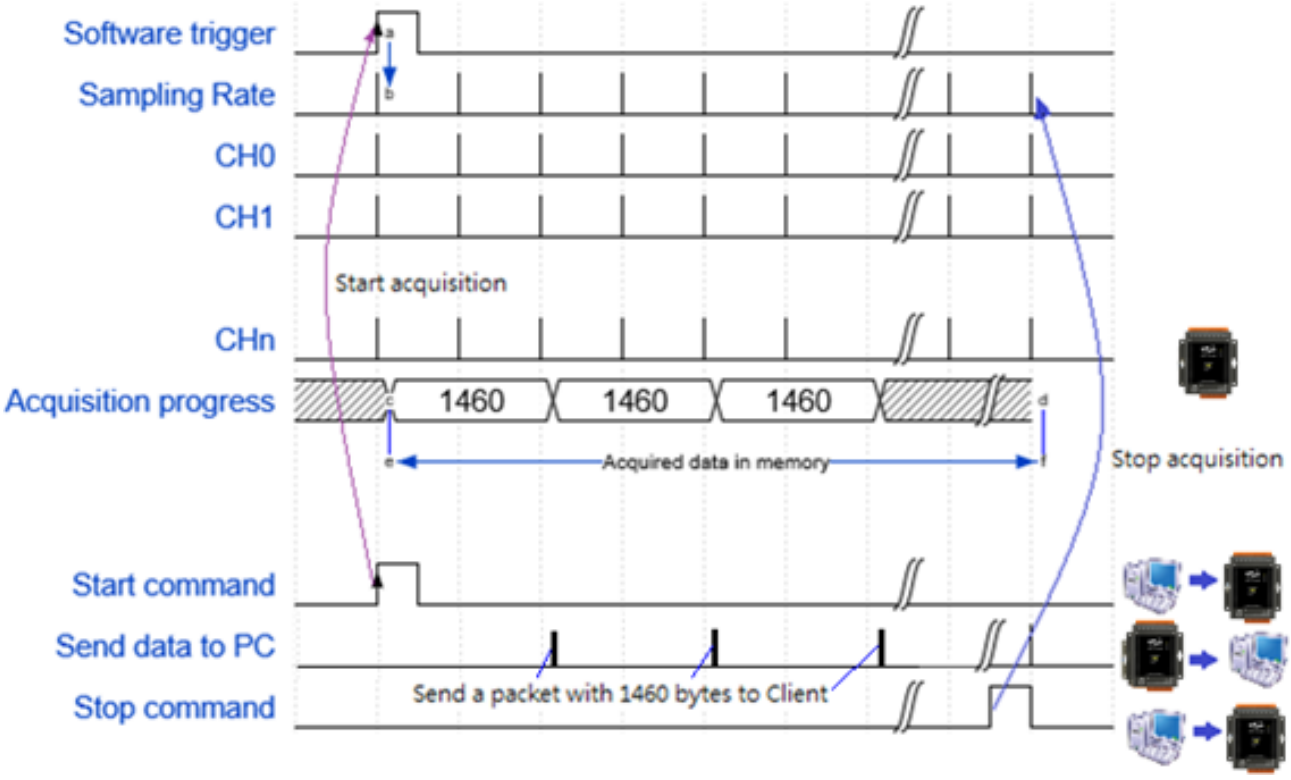

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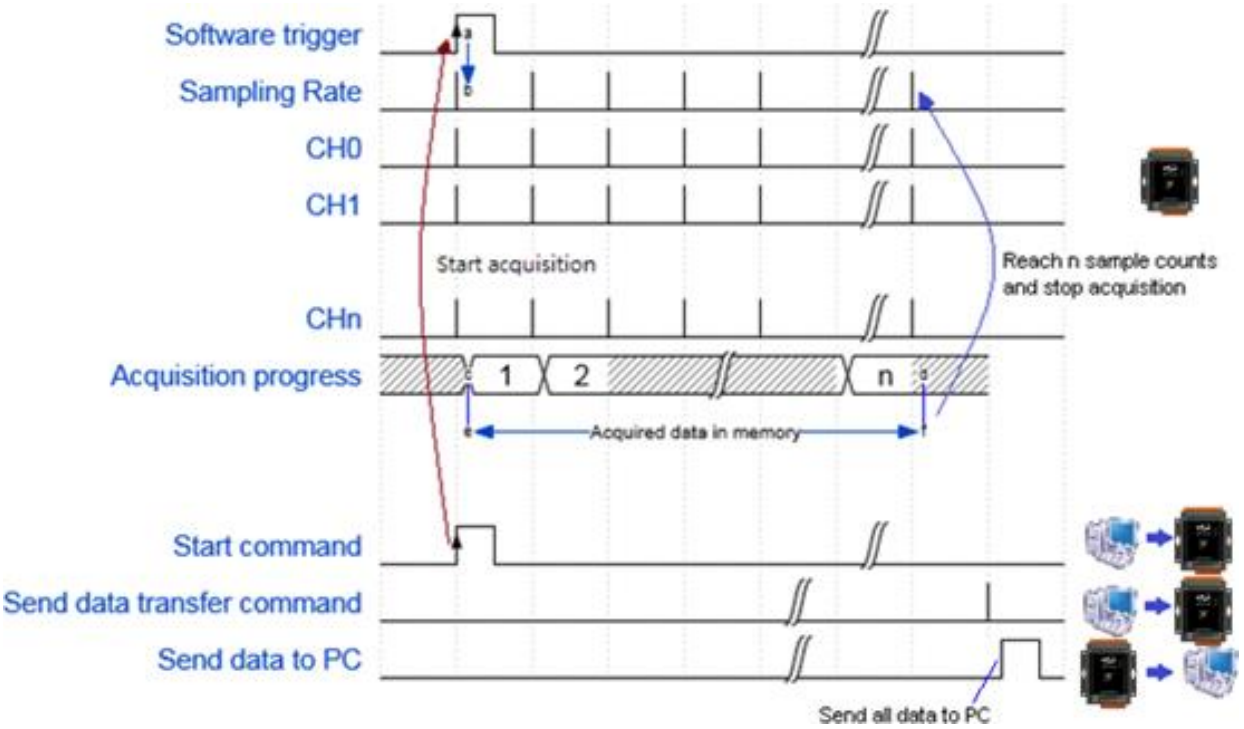
3.2. N Sample Acquisition

3.2.1. Software AD Trigger

In N sample acquisition and software AD trigger, Send a start command from PC over the Ethernet to PET-7H24M to start the AD conversion. The analog input value is continuously acquired and converted to digital data until the total number of samples reaches. Send a command to get the all acquisition data over the Ethernet.
The sample rate can range from 20 Hz to 128K Hz.

There are some parameters that need to be specified:

- Sampling rate
- Scan channels
- Sampling Count (Maximum 15,000,000 records)
- The trigger mode sets to the software AD trigger.



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3.2.2. Analog Threshold Trigger

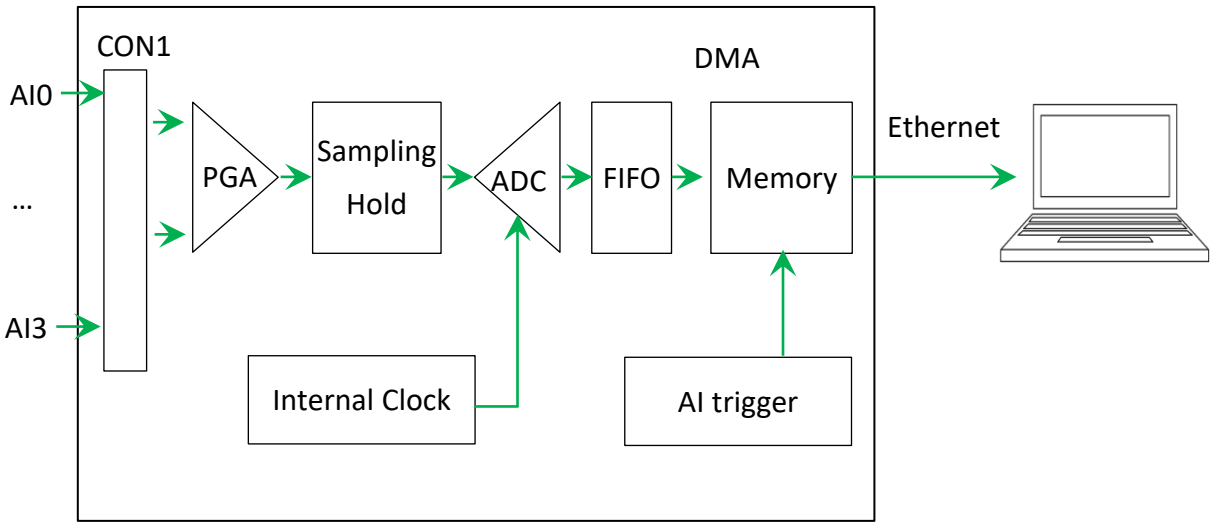
The analog threshold trigger is triggered when the input voltage signal is above or below a certain voltage setting. In addition, the analog trigger can be used to detect the instantaneous change in a continuous voltage signal. The user can specify the trigger voltage level range of the input signal. Once the range is exceeded or the voltage level is entered, the data is triggered to start collecting data.

Analog threshold trigger conditions:

- Higher than the set voltage
- Lower than the set voltage
- Enter the set voltage range
- Leaving the set voltage range

There are some parameters that need to be specified:

- Sampling rate (20~128KHz)
- Scan channels
- Sampling Count (Maximum 15,000,000 records)
- Set the high or low level voltage value
- Trigger mode set to analog threshold trigger



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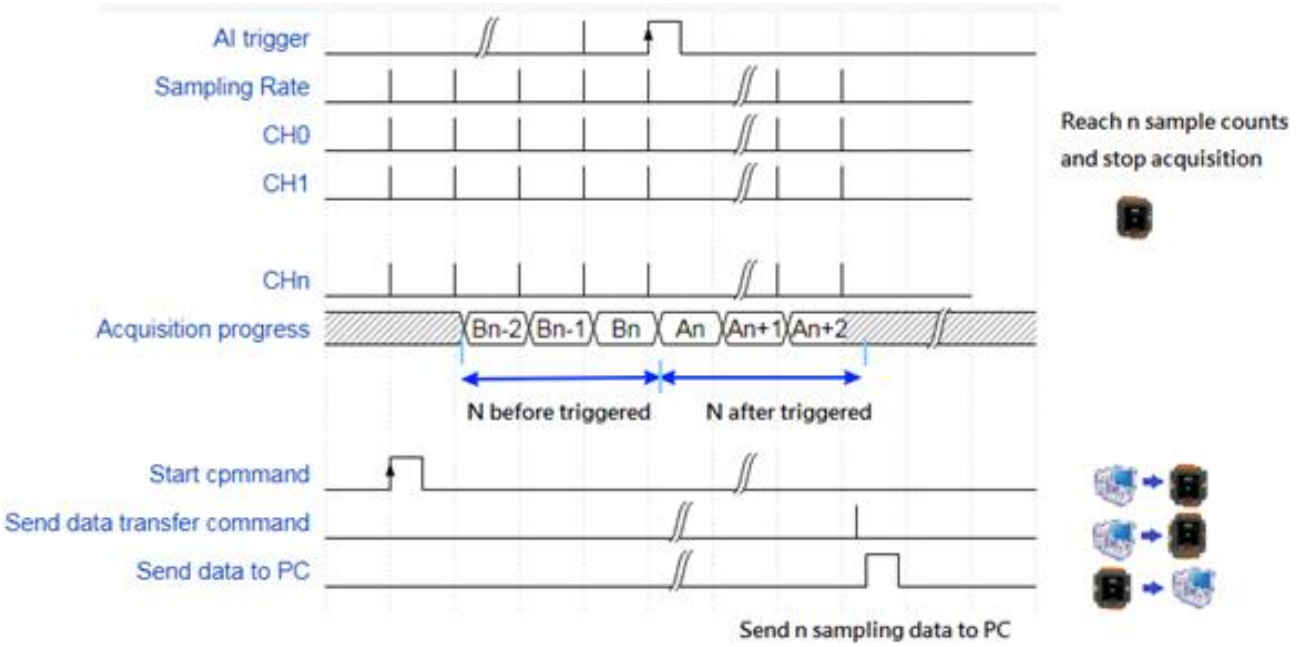

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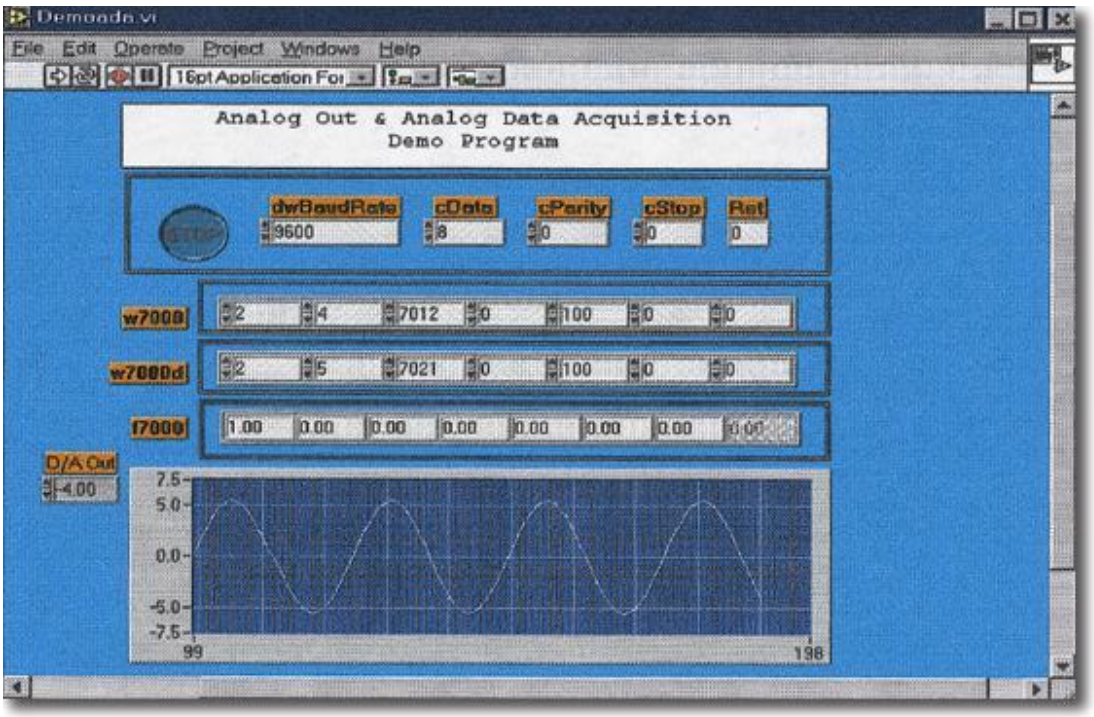
4. Tools and SDKs

PET-7H24M supports a number of external tools to aid in developing your applications

4.1. LabVIEW



LabVIEW is the best way to acquire, analyze, and present data. LabVIEW delivers a graphical development environment that can be used to quickly build data acquisition quickly, instrumentation and control systems, boosting productivity and saving development time. With LabVIEW, it is possible to quickly create user interfaces that enable interactive control of software systems. To specify your system functionality, simply assemble block diagram – a natural design notation for scientists and engineers.

The document containing the detailed instructions for linking to the PET-7H24M using the Modbus protocol is located on the shipped
https://www.icpdas.com/en/download/show.php?num=2327

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4.2. HSDAQ Utility

HSDAQ Utility is used to graphically display and easily data logging for ET-7H24 module.

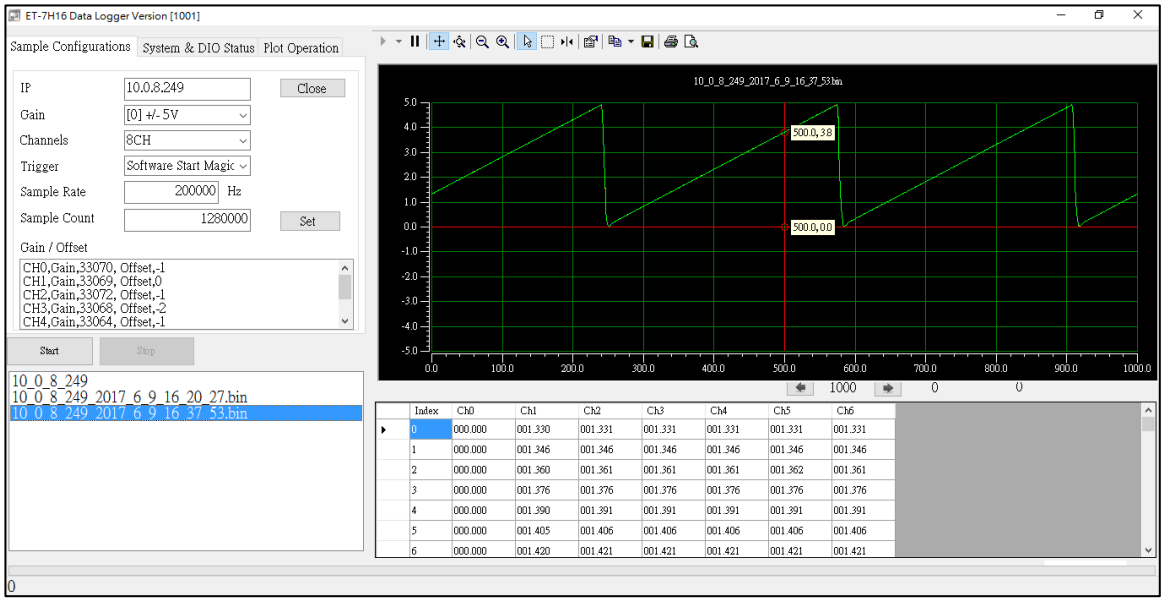
HSDAQ Utility tool as ET-7H24 Data Logger

ET-7H24 Data Logger provides a single ET-7H24 connect as Data Logger function.

1.When connect to ET-7H24, it will get the parameters of gain and offset for calibration, they are used to calibrate the raw data from ET-7H24.

2.It also gets the configurations for sampling, set the new configurations for application then start, it will begin to get the sampling data from ET-7H24 and save the data to files.

3.After finish sampling data or stop data logger, it can show the sampling result as plot view.



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System requirement

Minimum system requirements for HSDAQ Utility are given below:

- 266MHz 32-bit(x86) or 64-bit(x64) processor
- 64 MB of system memory
- Support for Super VGA graphics
- At least 20 MB of available space (Need more)
- Microsoft Windows 7 or later(32-bit or 64-bit Windows Operating System)

Operating system of Windows requirement

- 32-bit (x86) 64-bit (x64)
- Microsoft Windows 7 32-bit / Microsoft Windows 7 64-bit
- Microsoft Windows 8 32-bit / Microsoft Windows 8 64-bit
- Microsoft Windows 10 32-bit / Microsoft Windows 10 64-bit

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4.3. SDK API

This chapter provides a brief overview of ET-7H24 APIs that have been designed for ET-7H24. ET-7H24 SDK library supports 32/64 bit Windows 2003/Vista/7/8/10.

Get the latest version of ET-7H24 SDK library at the location below.
The latest version of the installation package from the following link:
http://www.icpdas.com/en/download/show.php?num=2326

File	Description
HSDaq.dll	Used for VC programs
HSDaqNet.dll	Used for .Net programs

Before using HSDAQ.dll & HSDAQNet.dll, you must install HSDAQ_SDK_package.exe to use the dll correctly. The program and SDK get the same path. Need to restart the computer after installation. For installation steps, please refer to "HSDAQ API Reference Manual".
For full usage information regarding the description, prototype and the arguments of the functions, please refer to the “HSDAQ API Reference Manual”
https://www.icpdas.com/en/download/show.php?num=427

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5. Web Application

The PET-7H24M contains an advanced web configuration system that provides users with access PET-7H24M applications through a standard web browser.

Tips & Warnings

The web page function is only suitable for configuration settings. Do not enable this TCP communication when the module is acquitting the data via Ethernet.

Logging in to the PET-7H24M Web site

You can log in to the PET-7H24M web site from any computer that has Internet access.

Step 1 : Open a browser

In several browsers, Mozilla Firefox and Internet Explorer are both reliable and popular Internet browsers.

Step 2: Type the URL address of the PET-7H24M

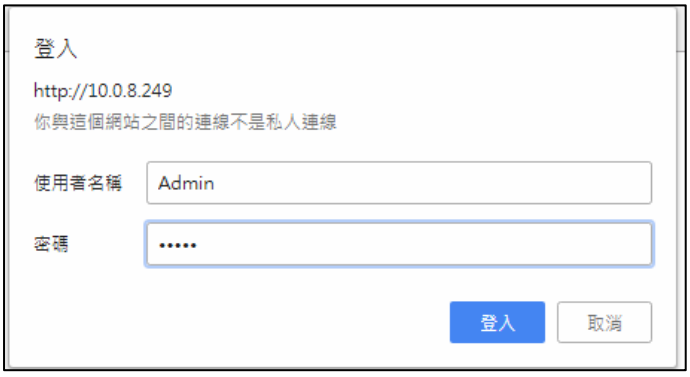
If you haven't changed the default IP address of the PET-7H24M, please refer section "2.4. Using HSDAQ Utility to Assign an IP address" to configure it.

Step 3: Fill out the User name and Password

After entering the IP address, the login dialog box will appear and prompt you to enter your username and password.

The factory default user name and password are as follows:

Item	Default
User name	Admin
Password	Admin



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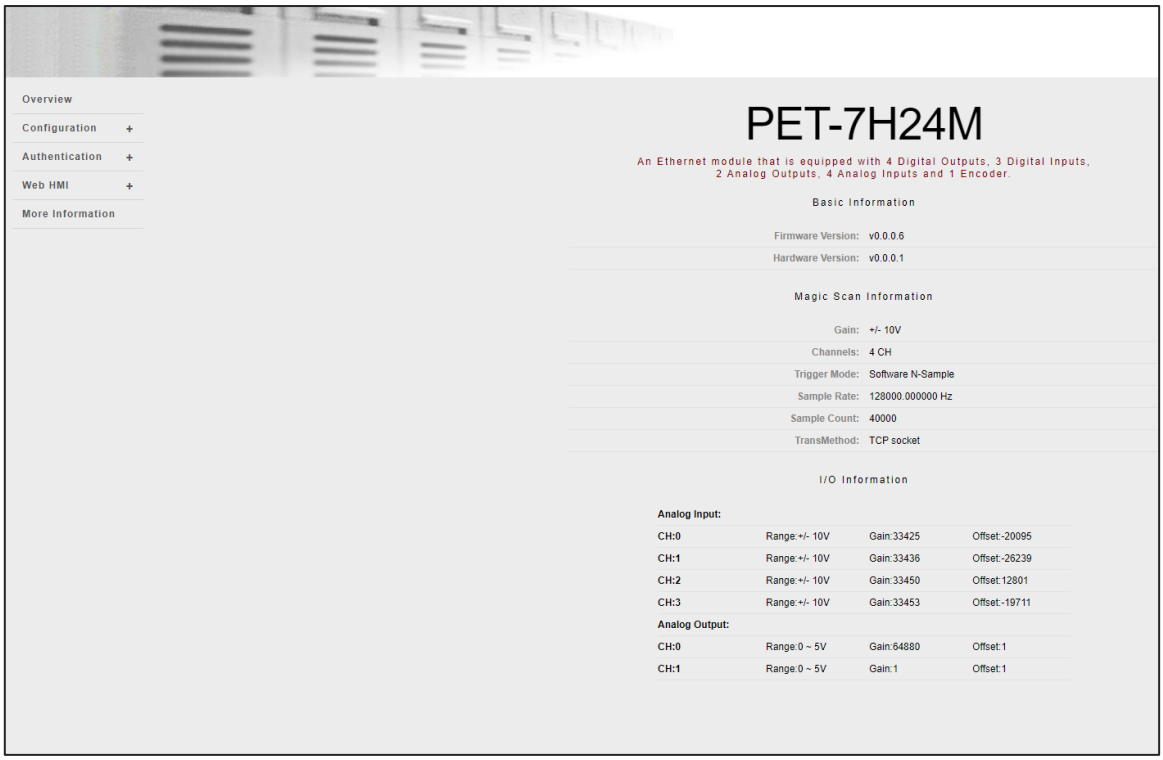
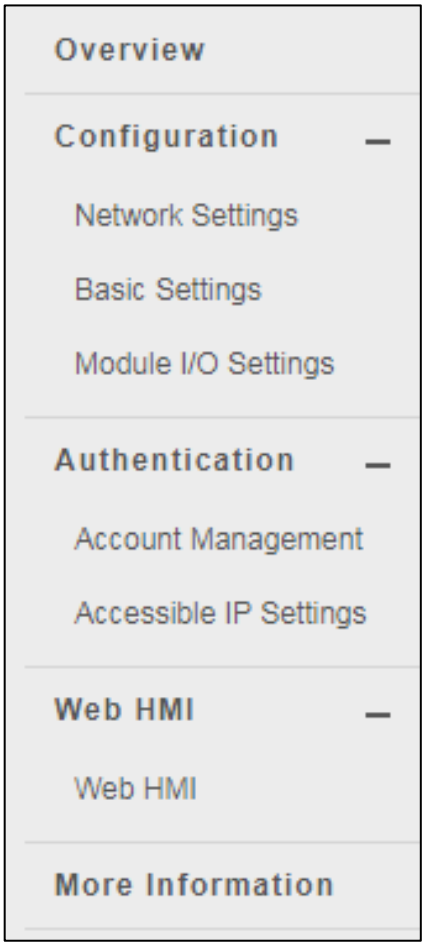
Step 4: Welcome to PET-7H24M web site

After logging into the PET-7H24M web site, the welcome page will appear.



This site serves several functions. You can easily access these functions through the menu on the left side.

The Overview of the Main menu provides a brief introduction and explanation of this site.



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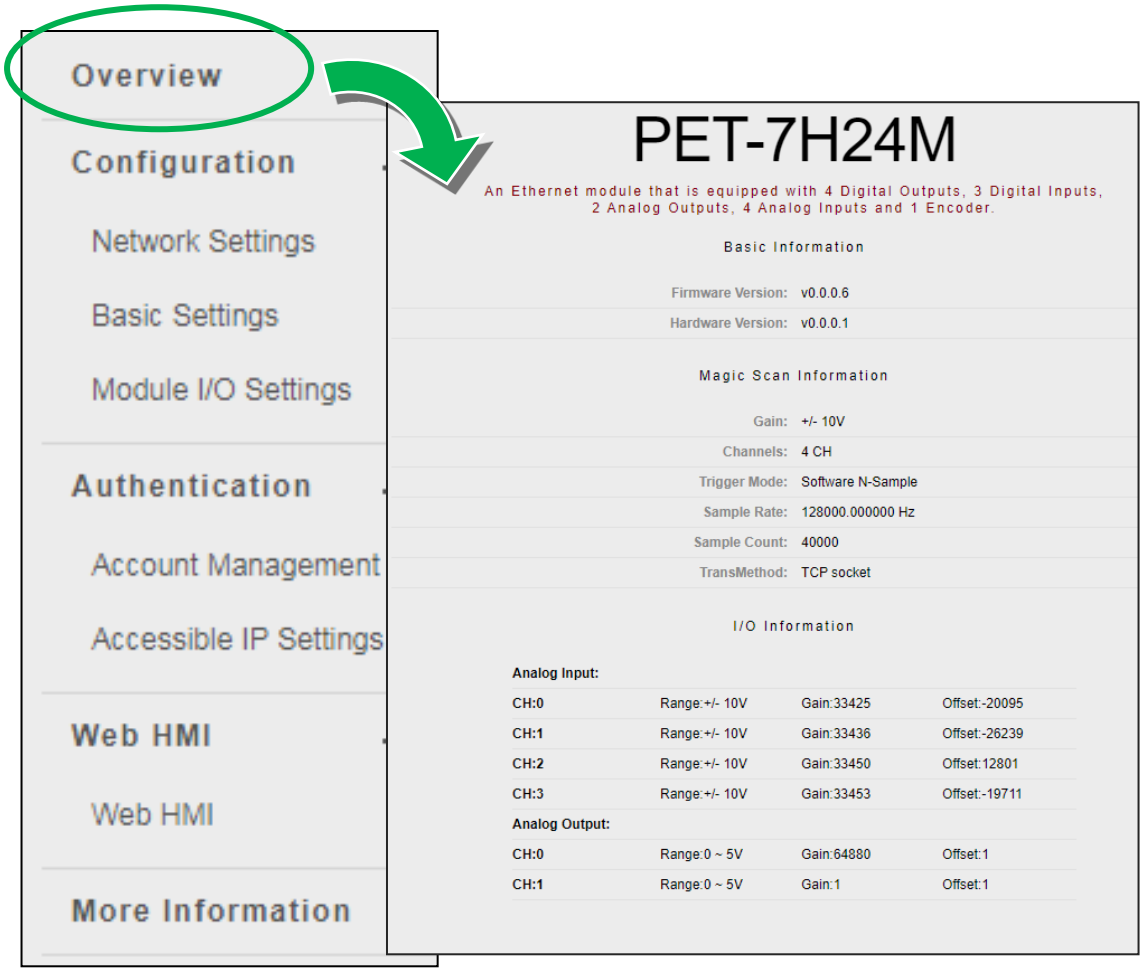
5.1. Overview

The Overview links to the welcome page that provides functions to monitor necessary system information of PET-7H24M. The information is the most important note of version control for upgrading system.



This page provides basic information about the PET-7H24M.

- Firmware Ver: Current firmware version
- Hardware Version ： Current hardmware version
- Gain: Current input type
- Channels: Current trigger channels
- Trigger mode: Current trigger mode
- Sample Rate: Current sample rate
- TransMethod: Current transfer method
- Sample Count: Current sample count

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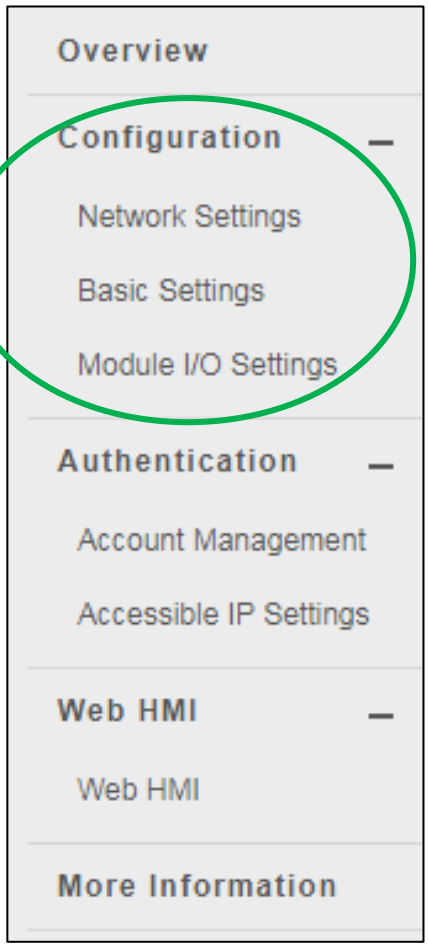
5.2. Configuration

The Configuration menu consists of the following menu:



- **Network Settings**: This menu links to the Network Settings page that allows you to access the IP settings.

- **Basic Settings**: This menu links to the Basic Settings page that allows you to configure the basic information of this site.

- **Module I/O Settings**: This menu links to the Common Functions page that allows you to configure the settings of the Modbus

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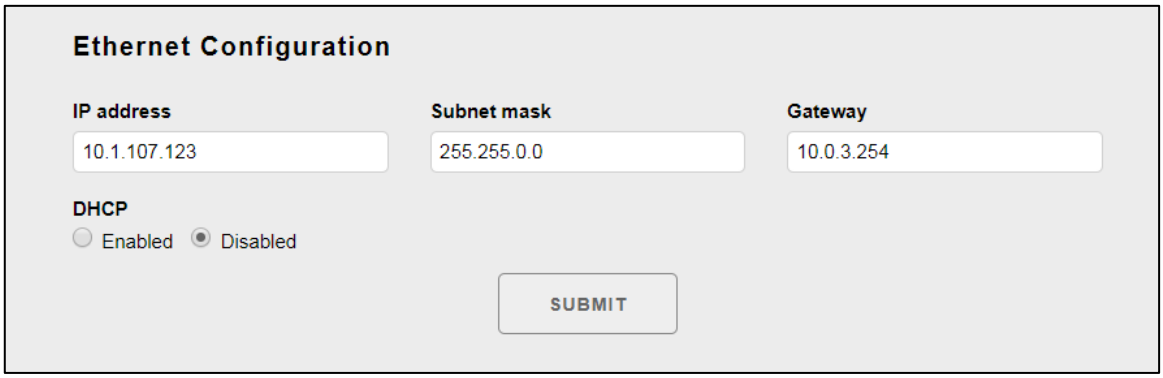
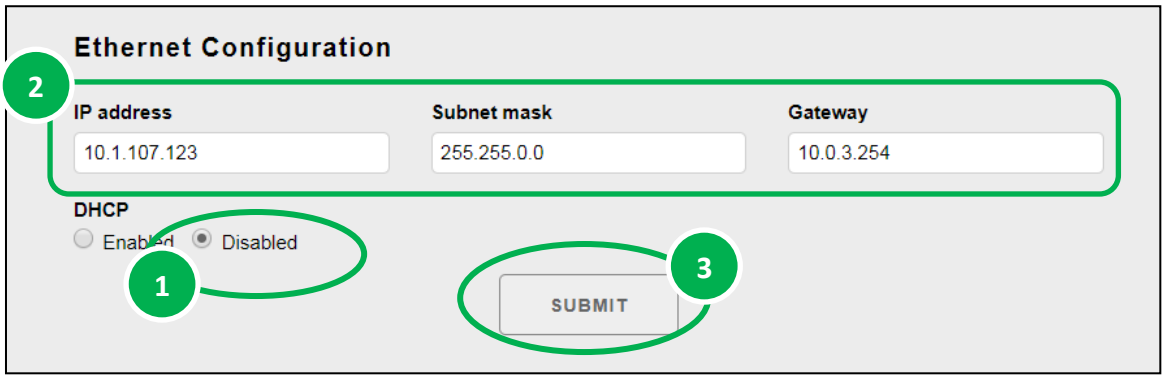
5.2.1. Network Settings

The Network Settings page provides functions to configure either DHCP (Roaming) or manually configured (Static) network settings.



Manually Configured Network Settings

1. Disable the DHCP
2. Assign an IP address
3. Click **SUBMIT** to finished configuring the network settings



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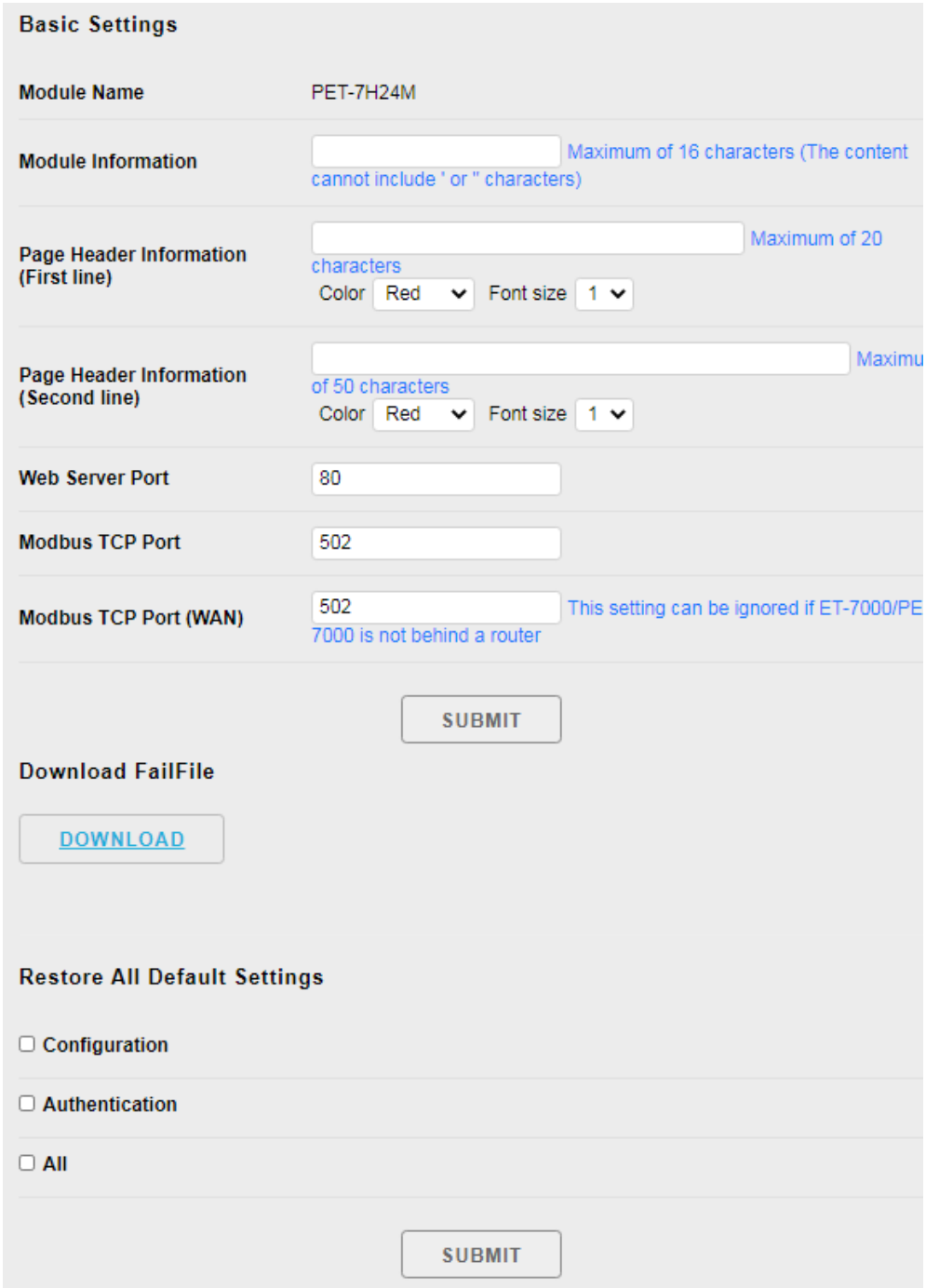
5.2.2. Basic Settings

The Basic Settings page provides the following functions:

- Configure the module information
- Configure the web site information
- Reset all settings to default



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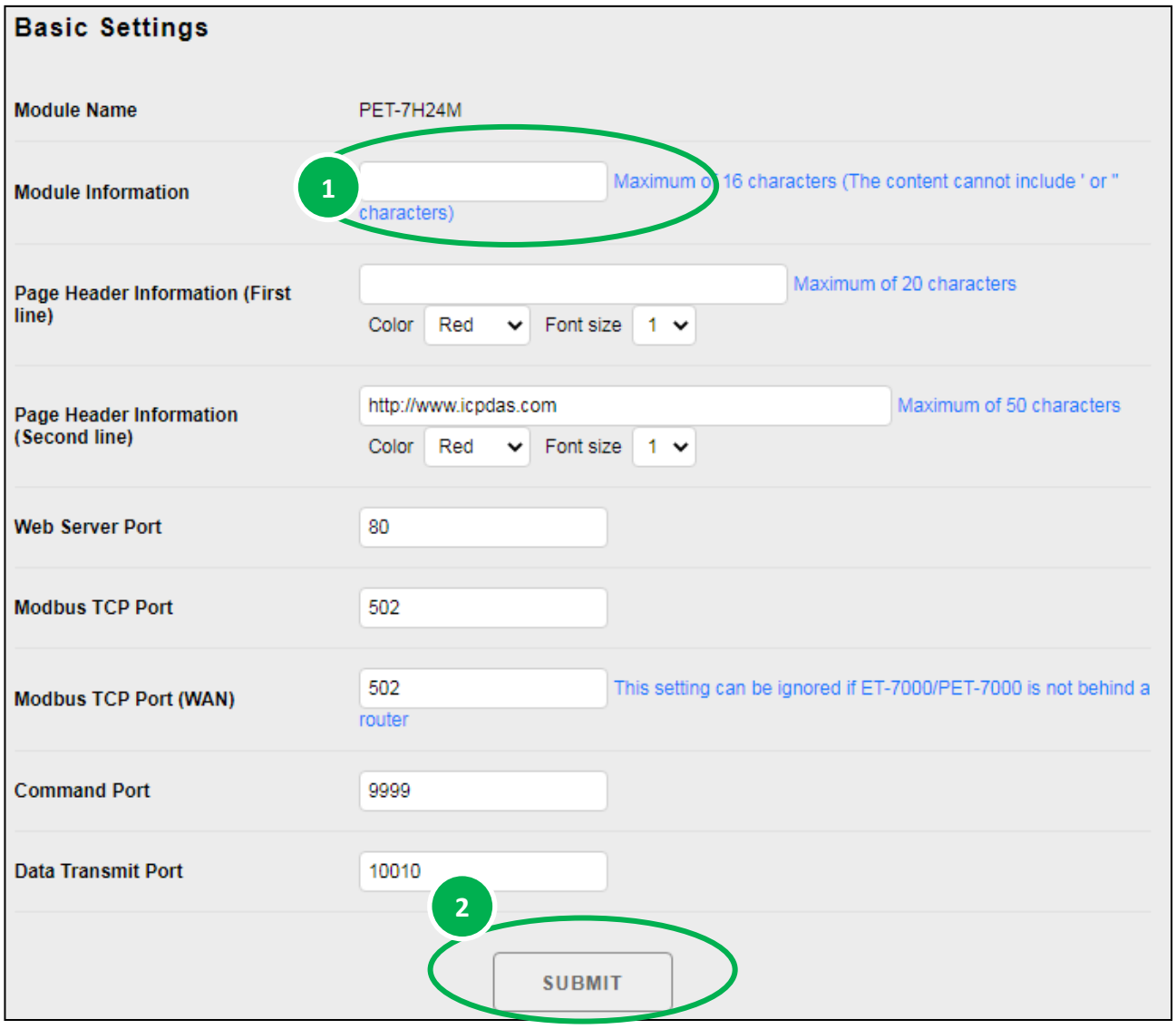
5.2.2.1. Configuring the Module Information

The module information includes the following data items:

- Module Name: The name of the module that can be modified. It has an initial value depending on the name of the module.
- Module Information: The module information indicates the name of the alias that is used to identify the module.

To configure the module information

1. Enter the Module information
2. Click **SUBMIT** to finish configuring the module information



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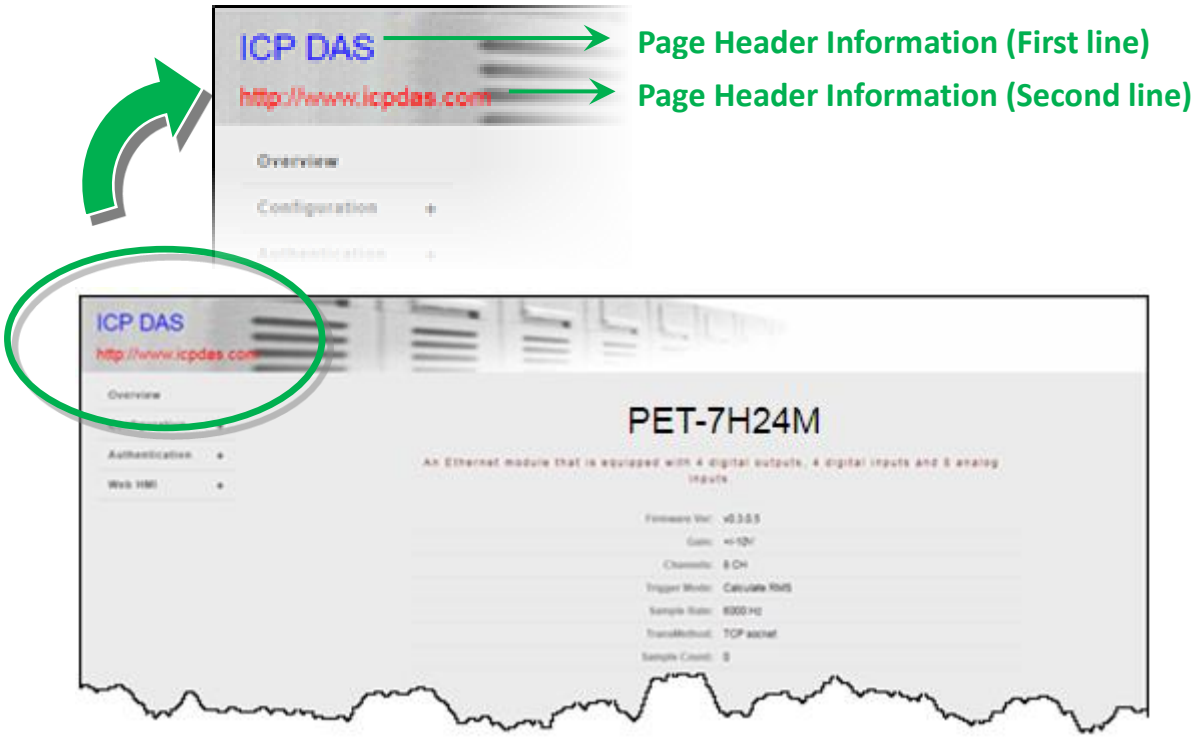
5.2.2.2. Configuring the Web site Information

The module information includes the following data items:

- **Page Header Information** (First line) and **Page Header Information** (Second line): The title of the website that can be modified; you can view the title information in the top-left corner. The title information can be determined as follows:



- Web Server TCP Port: A port number of the TCP/IP port. By default, TCP/IP uses port 80.

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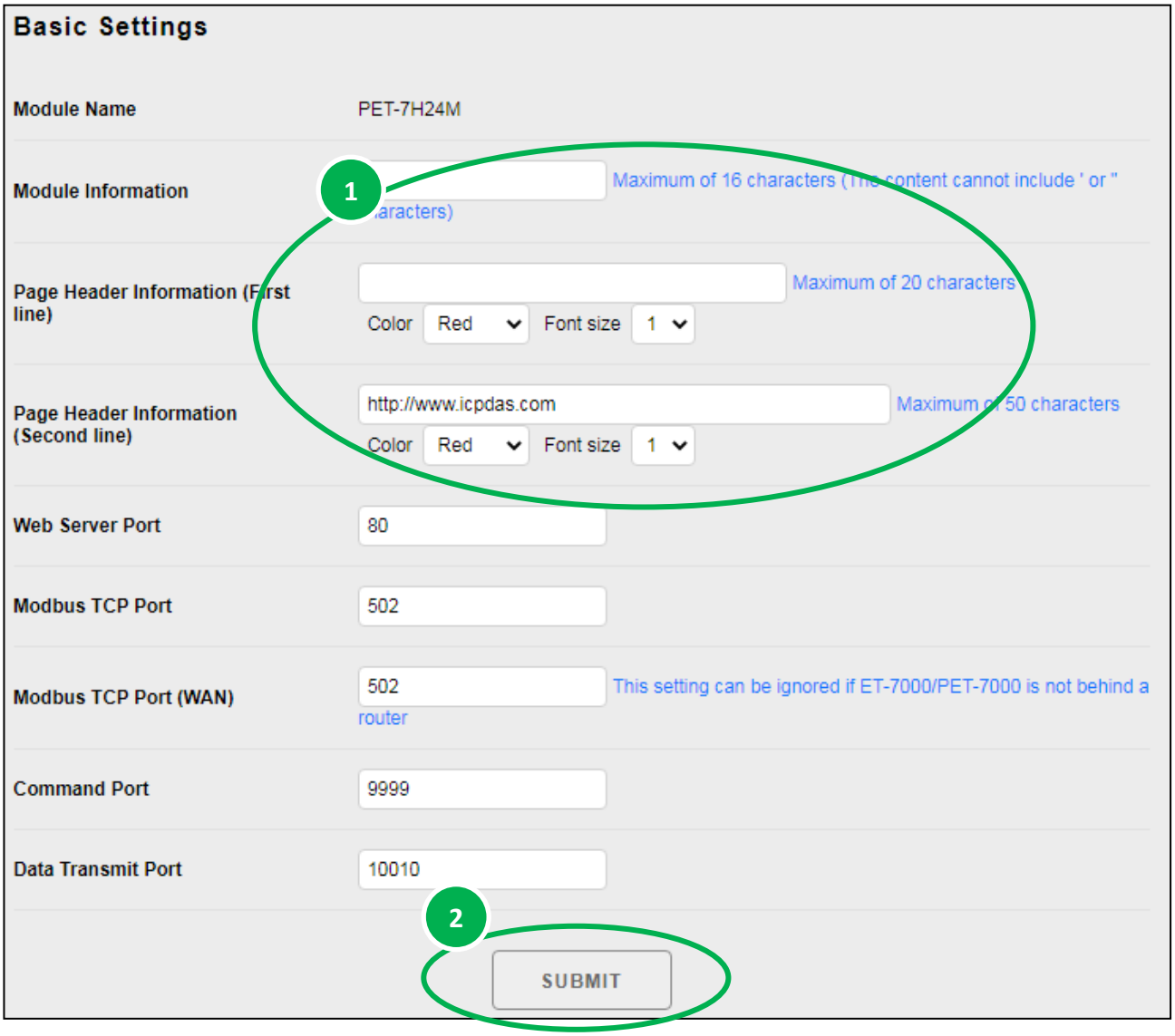
To configure the web site information

1. Enter the web site information
2. Click **SUBMIT** to finish configuring the module information



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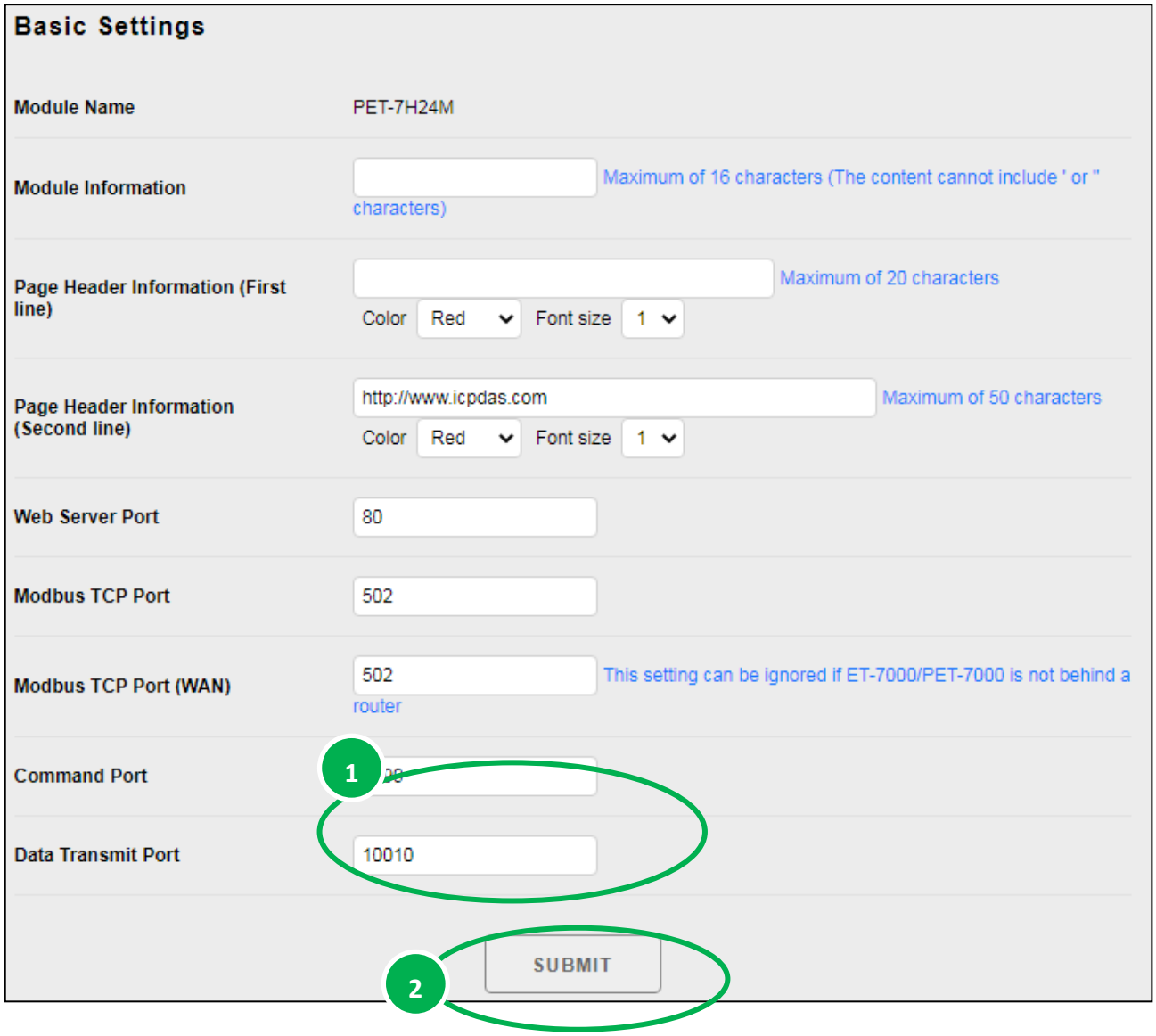
5.2.2.3. Command Port and Data Transmit port

The user can change or check the currently used Command port and data transmit port.
Command port default value is 9999
Data Transmit port default value is 10010

If the ports 9999 and 10010 have been restricted by the firewall, they can be changed into the ports allowed by the firewall against the Basic Settings page.



For the use of API after port replacement, please refer to the “HS_Device_Create()” section in the API manual linked below.
https://www.icpdas.com/en/download/show.php?num=2599

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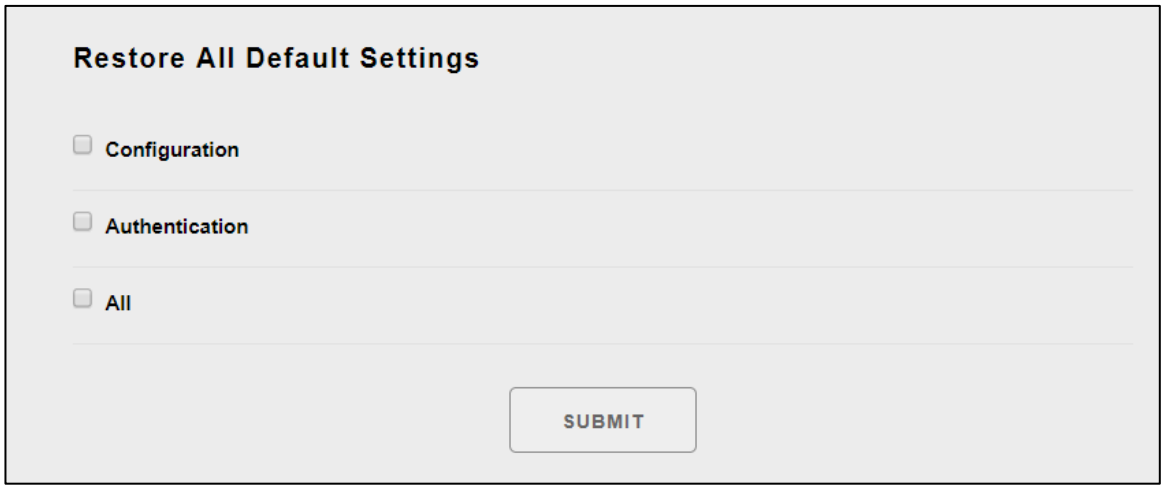
5.2.2.4. Resetting All Settings to the Factory Default

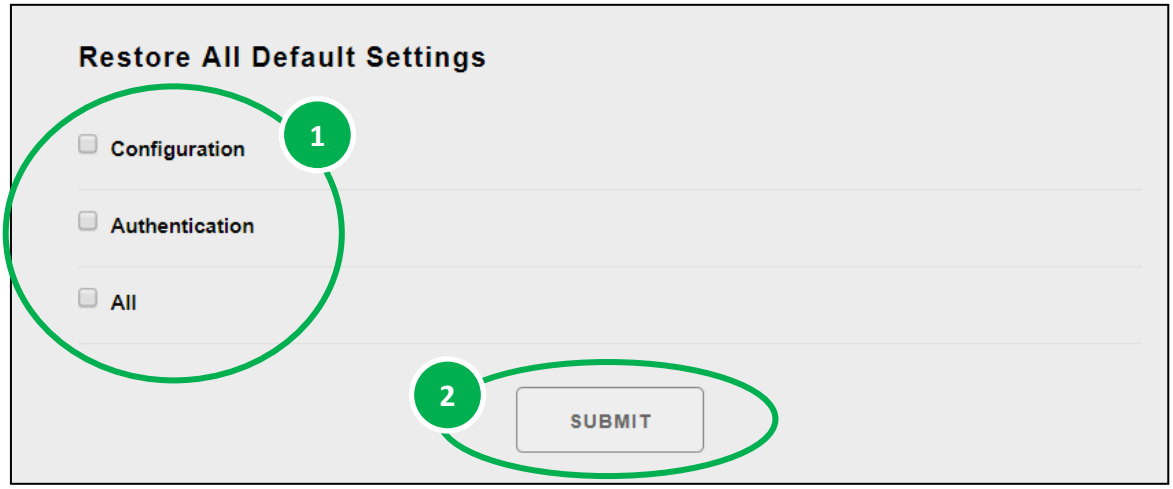
According to the menu selection of this web, the reset function can be divided into the following categories. You can use this function to reset the settings to their factory default.

- Configuration
- Authentication
- All



To reset the settings to their factory default

1. Enable the reset selection
2. Click **SUBMIT** to finish resetting the settings to their factory default



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Factory Default Settings for Configuration Menu

The table below lists the factory default settings of the configuration menu.

Network Settings

Data Item	Factory Default Settings
IP	192.168.255.1
Gateway	192.168.0.1
Mask	255.255.0.0
DHCP	Disable

Basic Settings

Data Item	Factory Default Setting
Module Name	Depending on the module name
Module Information	Empty
Top page Information (First line)	ICP DAS
Top page Information (Second line)	http://www.icpdas.com
More Information URL	https://www.icpdas.com/en/product/PET-7H24M
Web Server TCP Port	80

Factory Default Settings for Authentication Menu

The table below lists the factory default settings of the Authentication menu.

Account Management

Factory Default Setting
A default user account consists of an account name “Admin” and a password “Admin”.

Accessible IP Settings

Factory Default Setting
Empty, there is no limit to allow any outgoing access.

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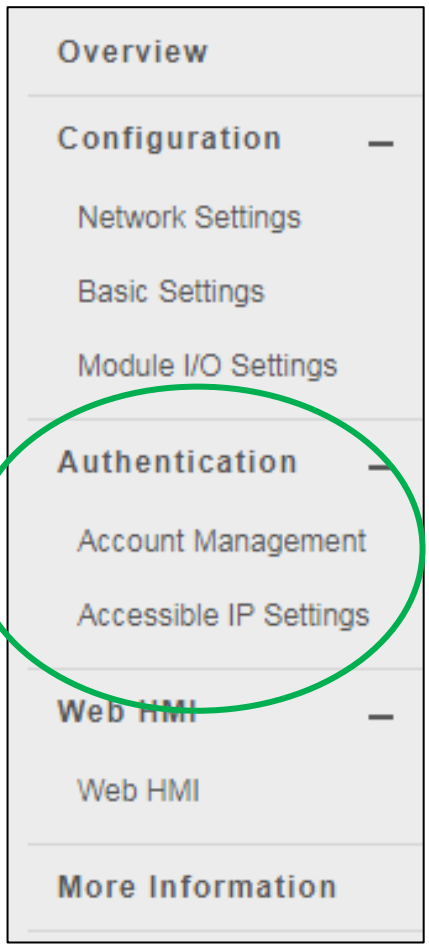
5.3. Authentication



The **Authentication** menu consists of the following menu:

- **Account Management**: This menu links to the Privilege management page that allows you to manage the user accounts and their privileges.
- **Accessible IP Settings**: This menu links to the IP filter Settings page that allow you to control access to the web site

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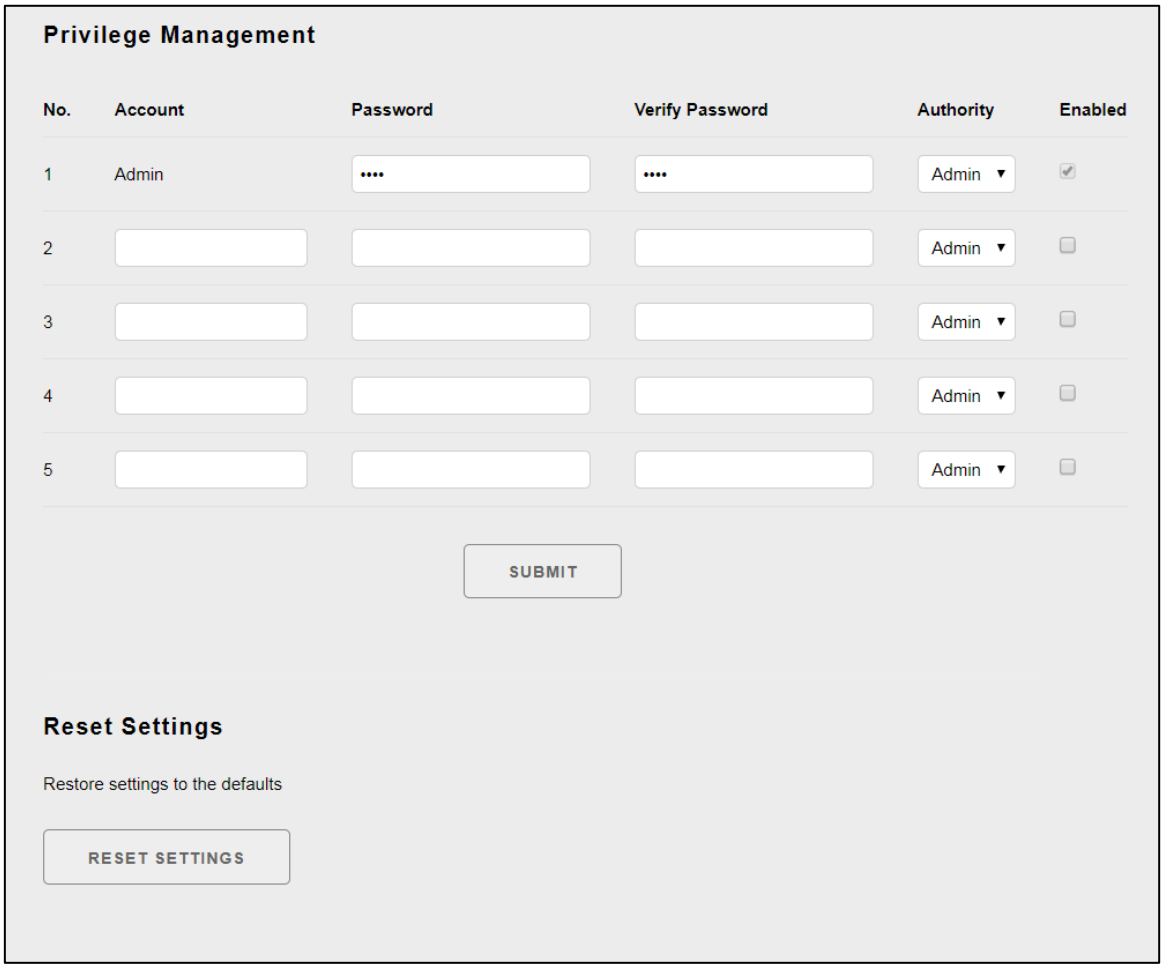
5.3.1. Account Management

The Basic Settings page provides the following functions:

- Configure the user accounts
- Load the factory default user account



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5.3.1.1. Configuring the user accounts

The PET-7H24M web site supports up to 5 user accounts.

- A built-in administrator account

  The built-in Administrator is basically a setup and disaster recovery account that can be deleted. You can change the administrator account's password.
- Four user-defined accounts

Each user account consists of

- **An account name**: Specifies the name of This can be your name or another alias
- **A password**: The system will ask you to type this in twice to ensure it is correct.
- **The authority**: that determines what operations the user is allowed to perform.

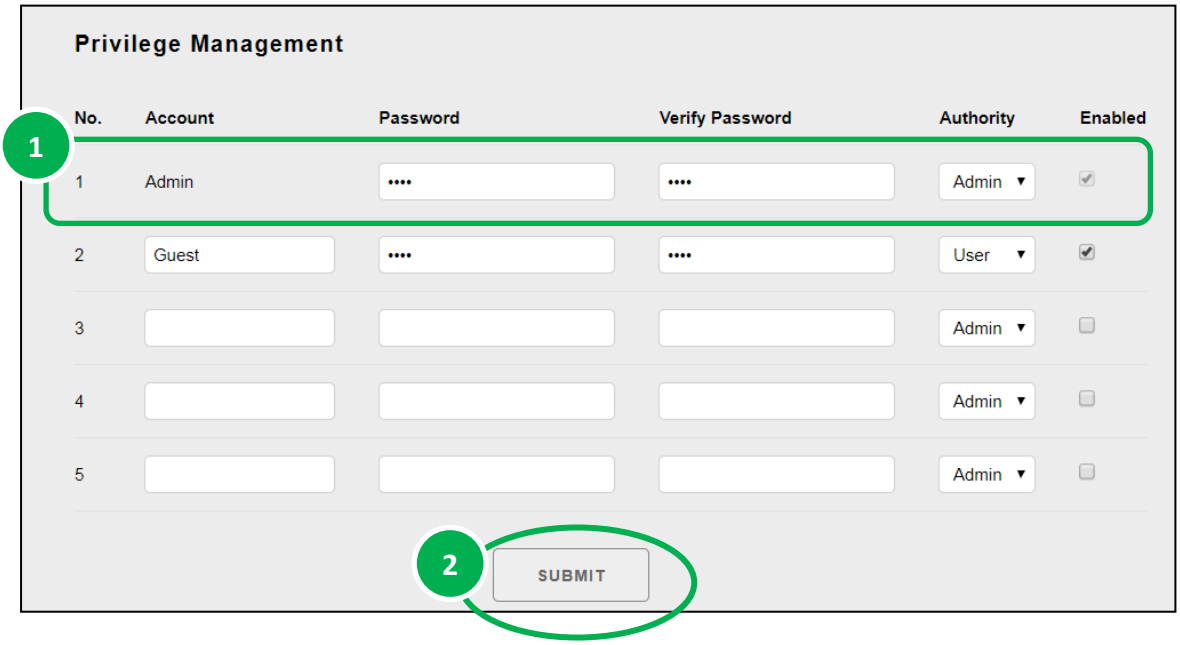
The authority has the following roles to determine what operations the user is allowed to perform.

- **Admin**: Enables access to all PET-7H24M website features, functions, and commands.
- **User**: Enables limited access to PET-7H24M website features, functions, and commands. In general, operators cannot change configuration settings.

To Create an User Account

When you create user accounts, you can Enable or Disable user accounts.

1. Enter the user account information, and then select the enable checkbox
2. Click SUBMIT to finish configuring the user accounts



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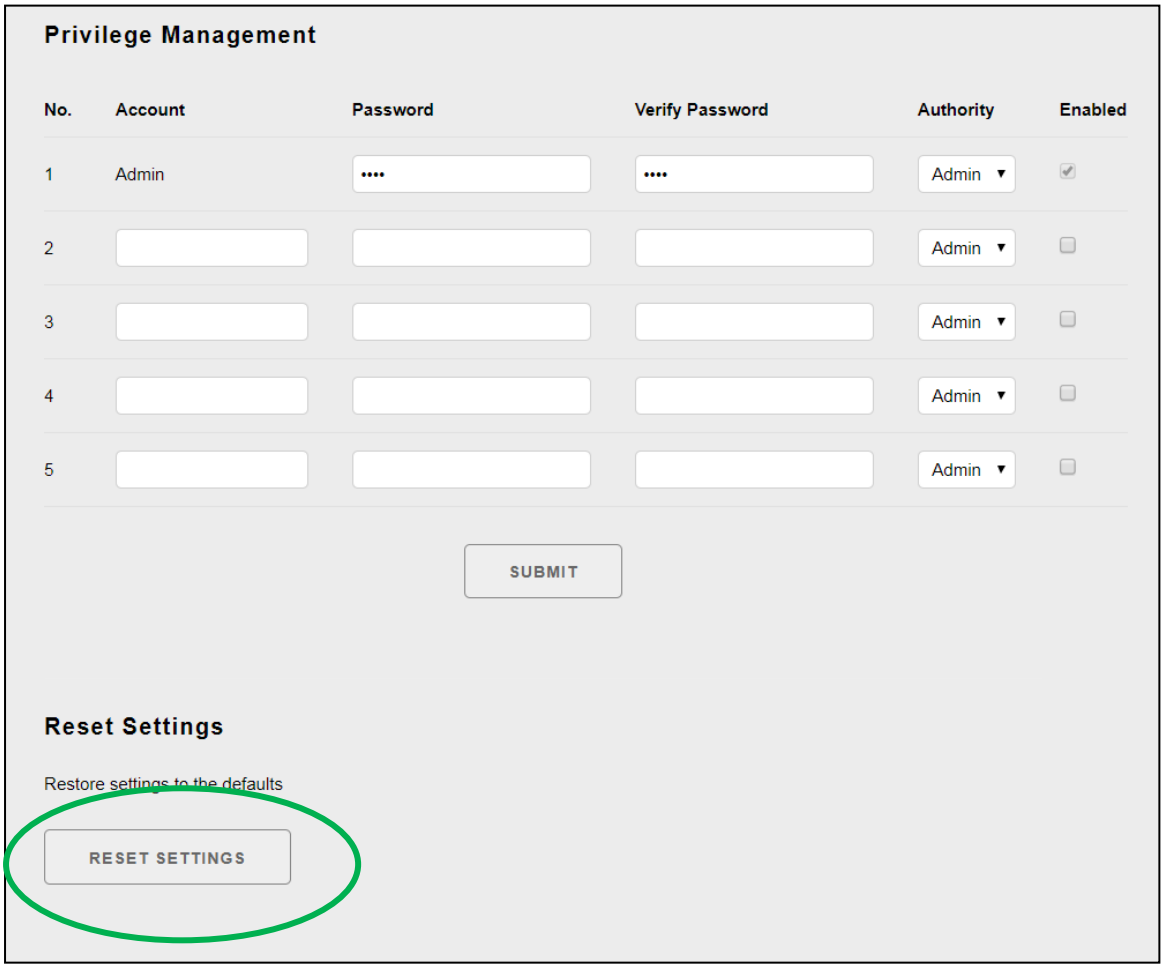
5.3.1.2. Loading the factory default user accounts

The PET-7H24M has a built-in administrator account named Admin that is created when it is installed by default. The default account cannot be deleted.

Click **RESET SETTINGS** to configure the user account to the factory default settings.



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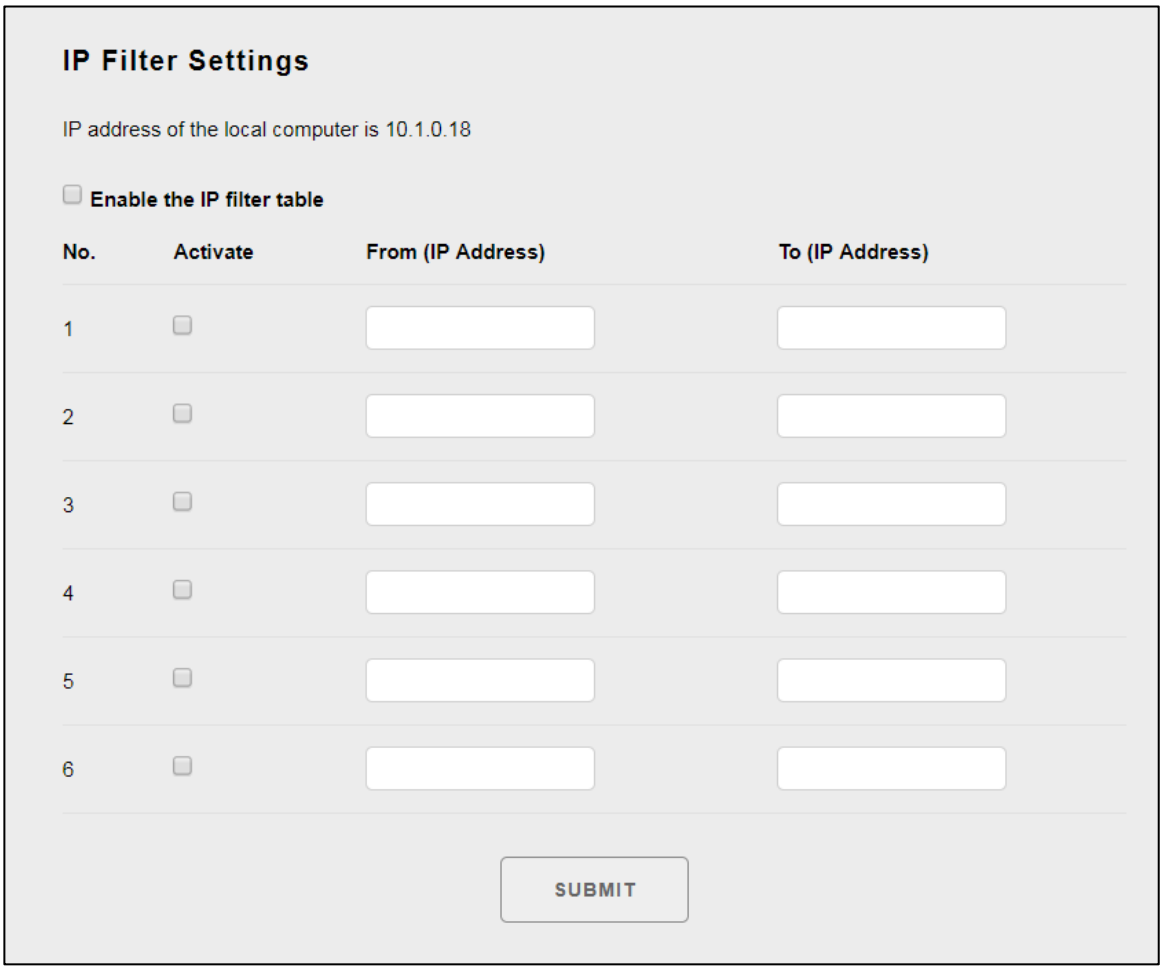
5.3.2. Accessible IP Settings

The IP filter Settings page provides the following functions:

- **Configure IP filtering**



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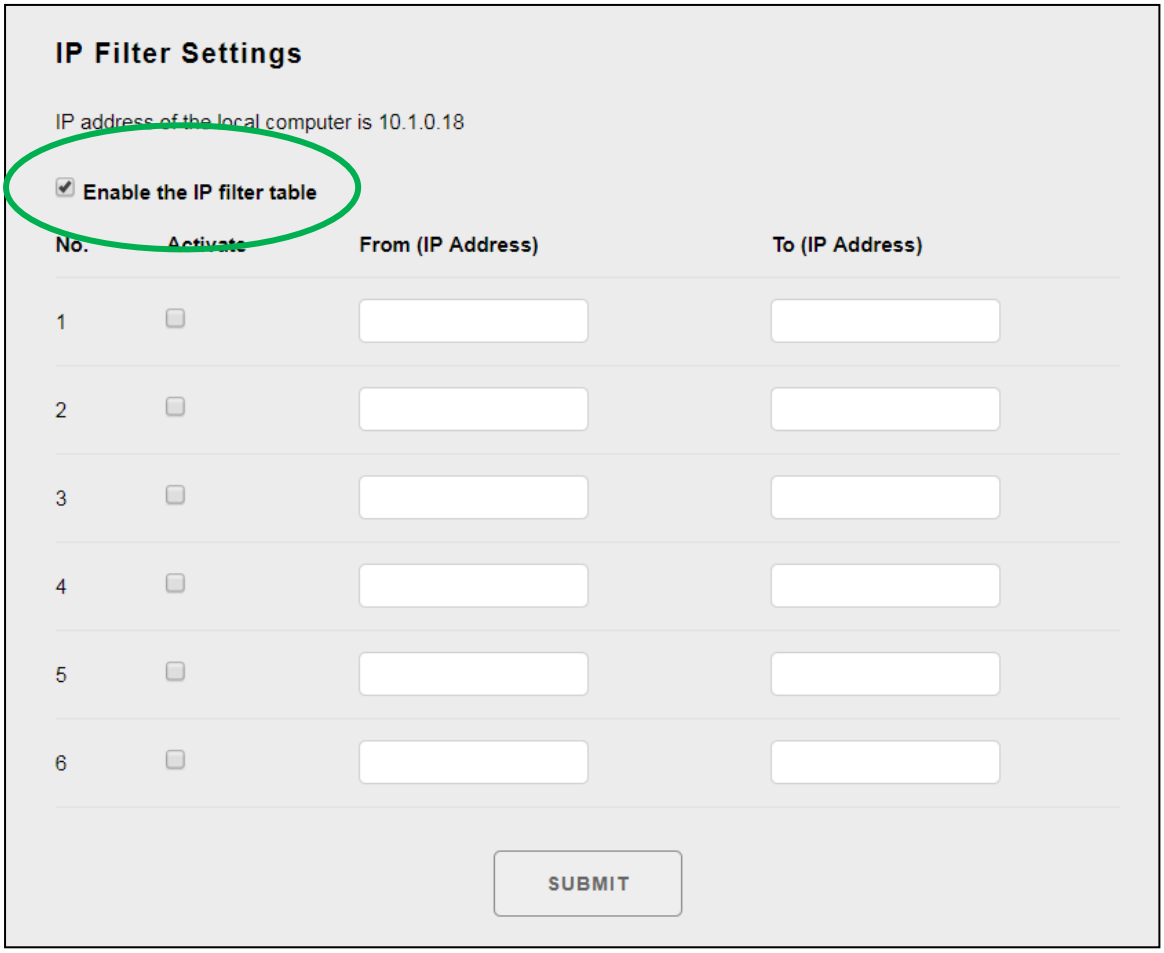
To Configure the IP filter

The PET-7H24M with an IP filter that enables you to restrict or grant user access based an IP filter list you create.

The filter can be enabled or disable by selecting the Enable the IP filter table checkbox



Tips & Warnings

By default, there is no limit to allow any outgoing access.

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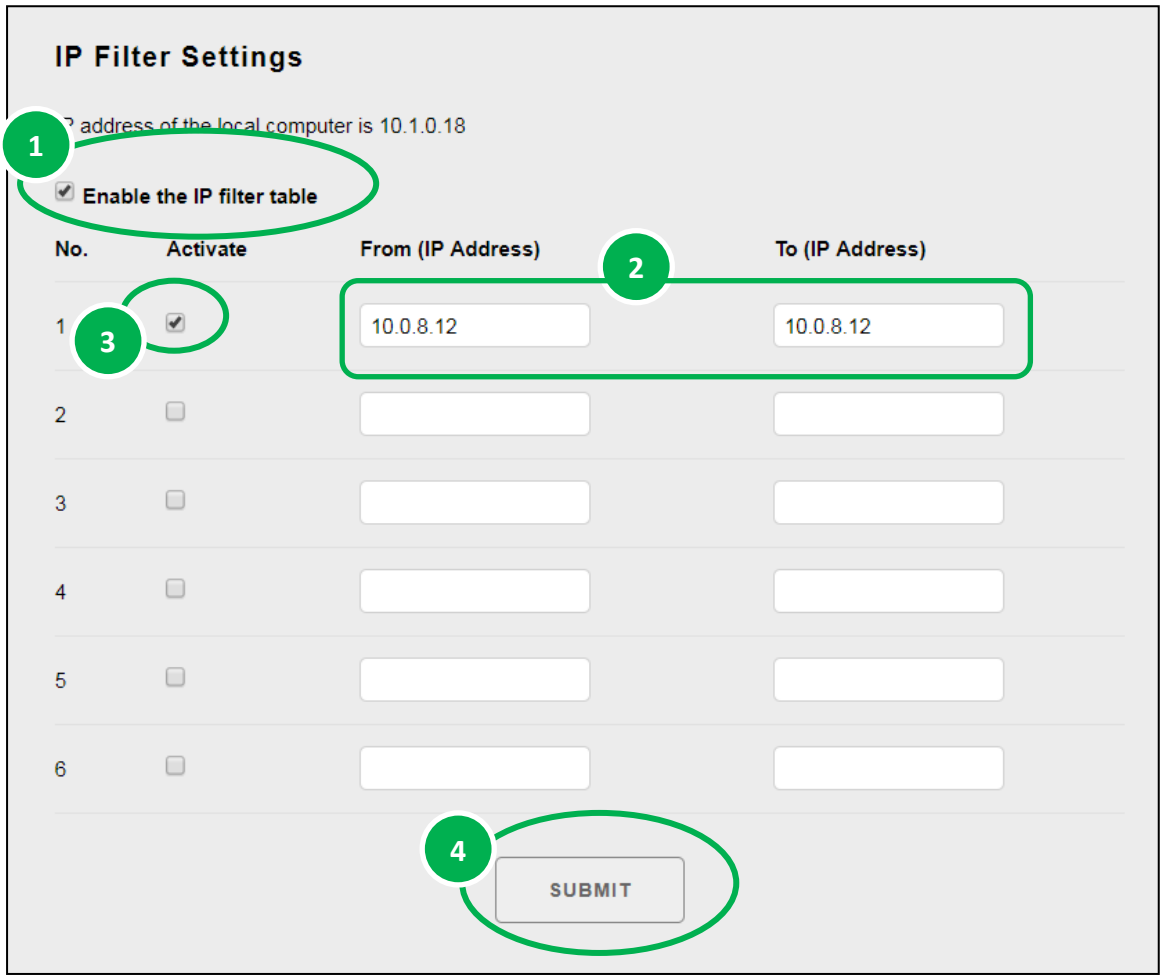
Here we provide two basic methods for configuring the IP filter.

Method 1 : Allows access from a single IP address

1. Select the **Enable the IP filter table**
2. Enter the same IP address in the **From (IP Address)** and **To (IP Address)**
3. Select the **Active** the rule checkbox
4. Click **SUBMIT** to finish configuring the list of IP filter



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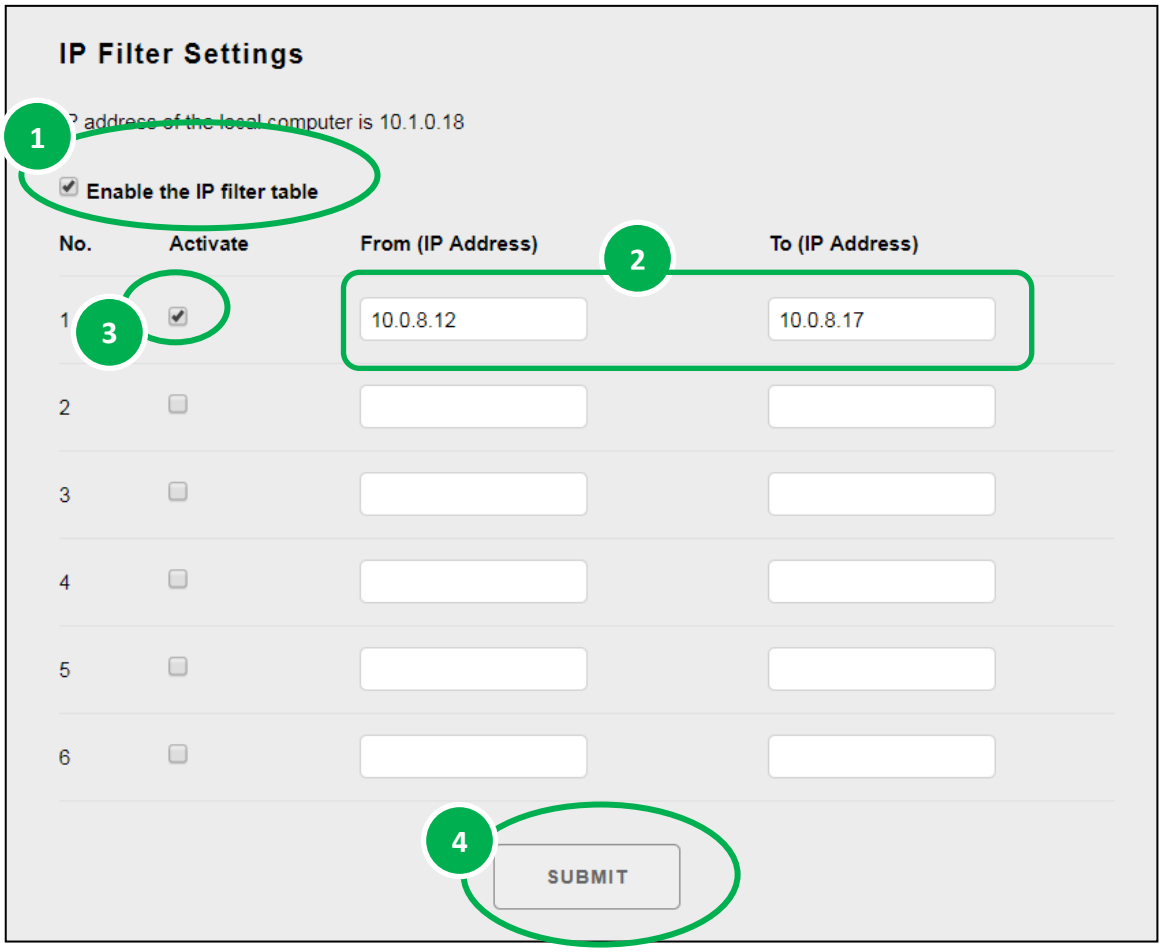
Method 2: Allow access from a group of IP addresses

1. Select the **Enable the IP filter table**
2. Enter a range of IP addresses in the **From (IP Address)** and **To (IP Address)**
3. Select the **Active** the rule checkbox
4. Click **SUBMIT** to finish configuring the IP filter list



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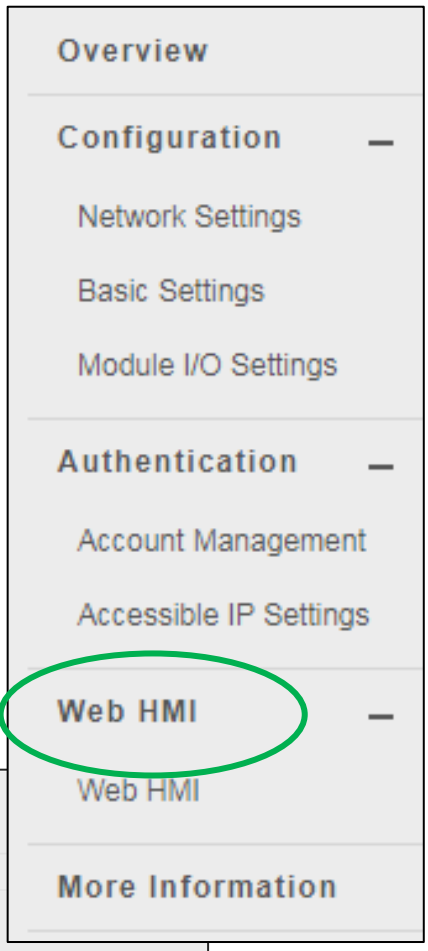
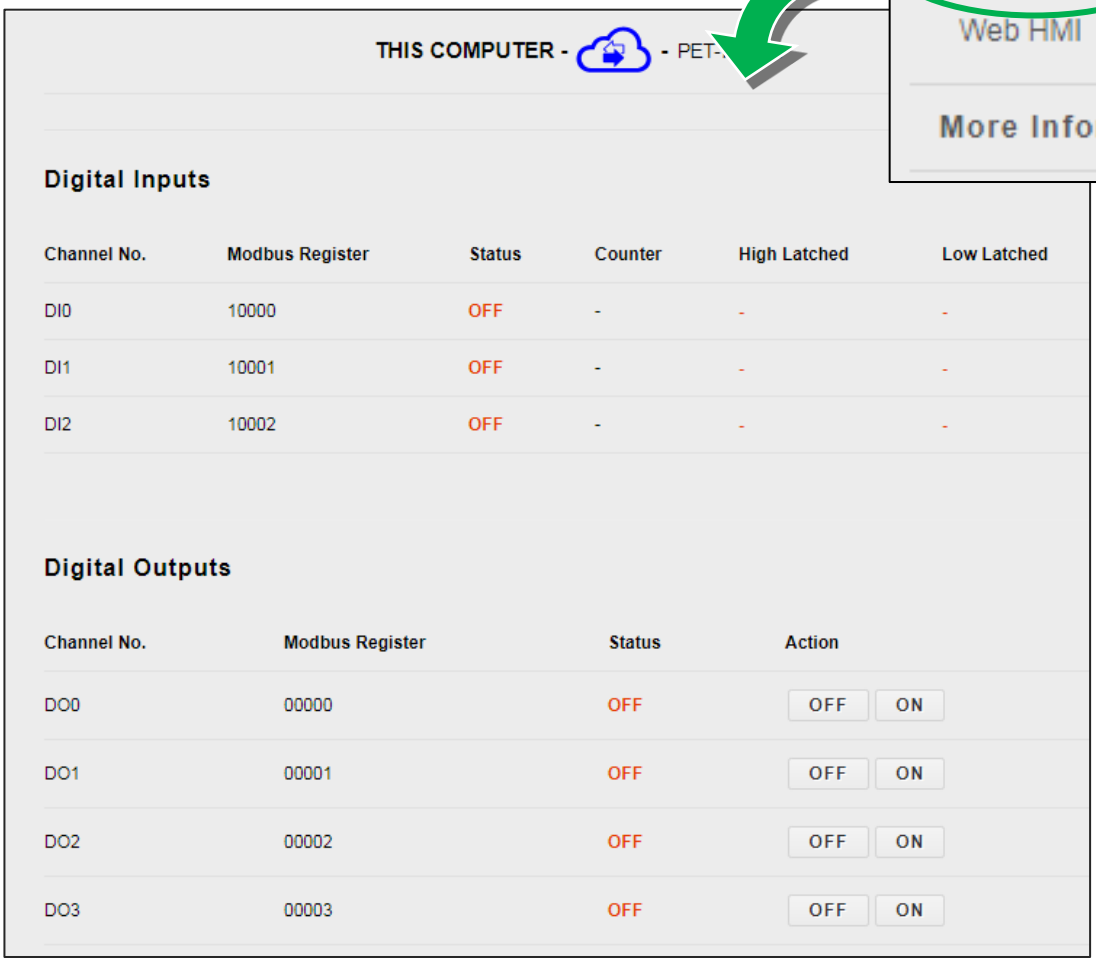
5.4. Web HMI



The Web HMI menu consists of the following menu:

- **Web HMI**: This menu links to the I/O monitor page that allows you to monitor and control the I/O status on PET-7H24M module remotely.

By default, this page displays summary information about I/O channels that are classified according to the module type.



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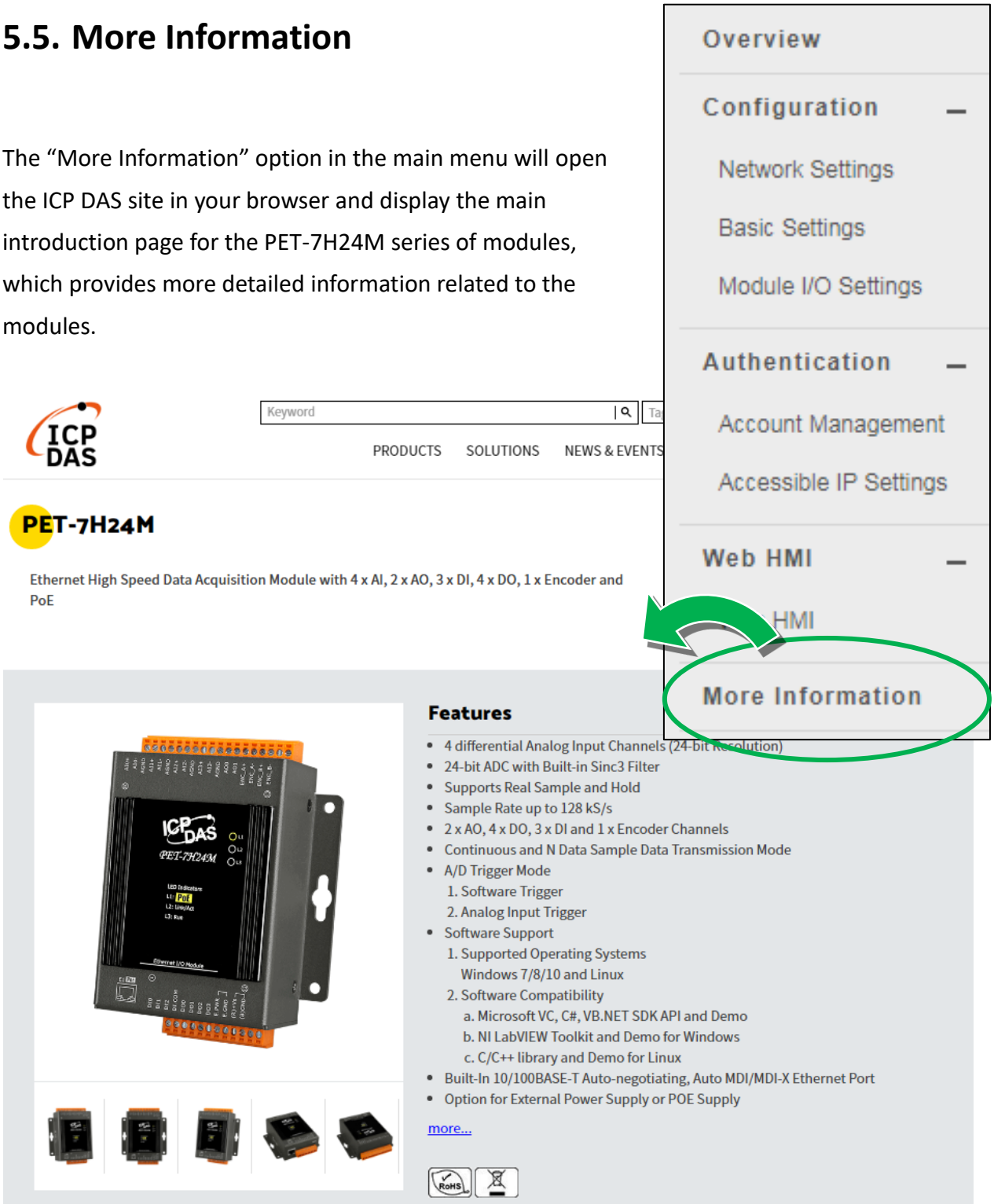
5.5. More Information

The “More Information” option in the main menu will open the ICP DAS site in your browser and display the main introduction page for the PET-7H24M series of modules, which provides more detailed information related to the modules.



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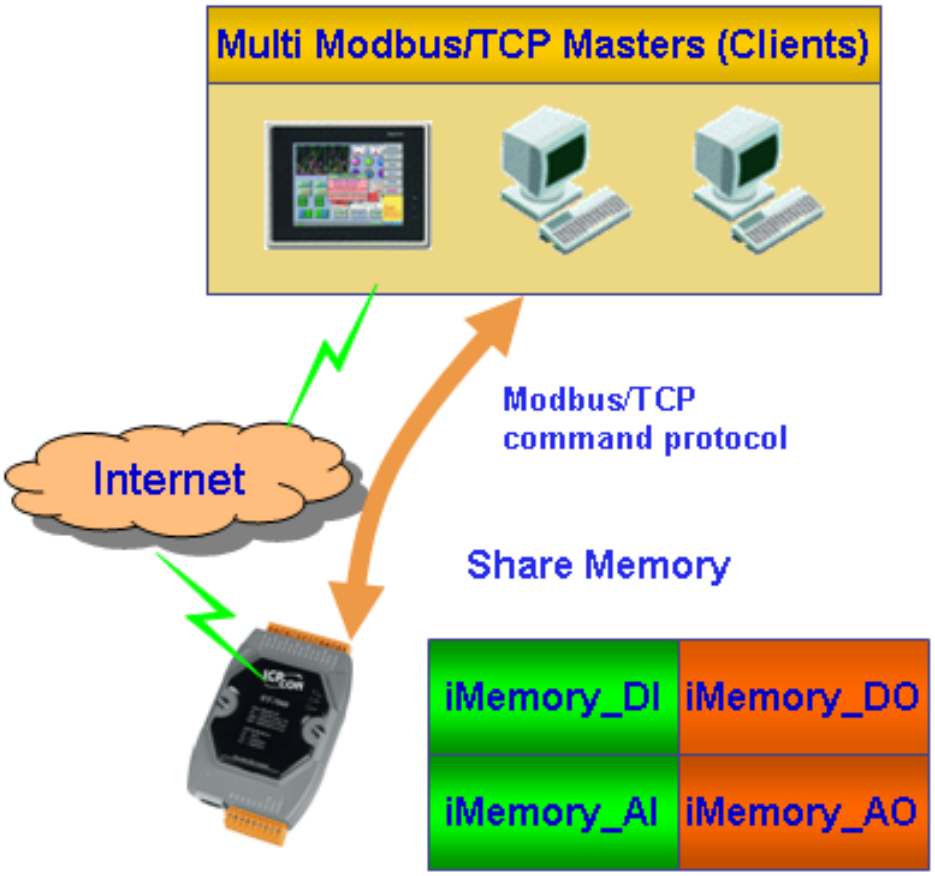
6. Modbus Application

The PET-7H24M is a Modbus device that allows you to access terminals data via Ethernet and communicates using a master-slave technique in which only one device (the master) can initiate transactions (called queries). The other devices (slaves) respond by supplying the requested data to the master, or by taking the action requested in the query.



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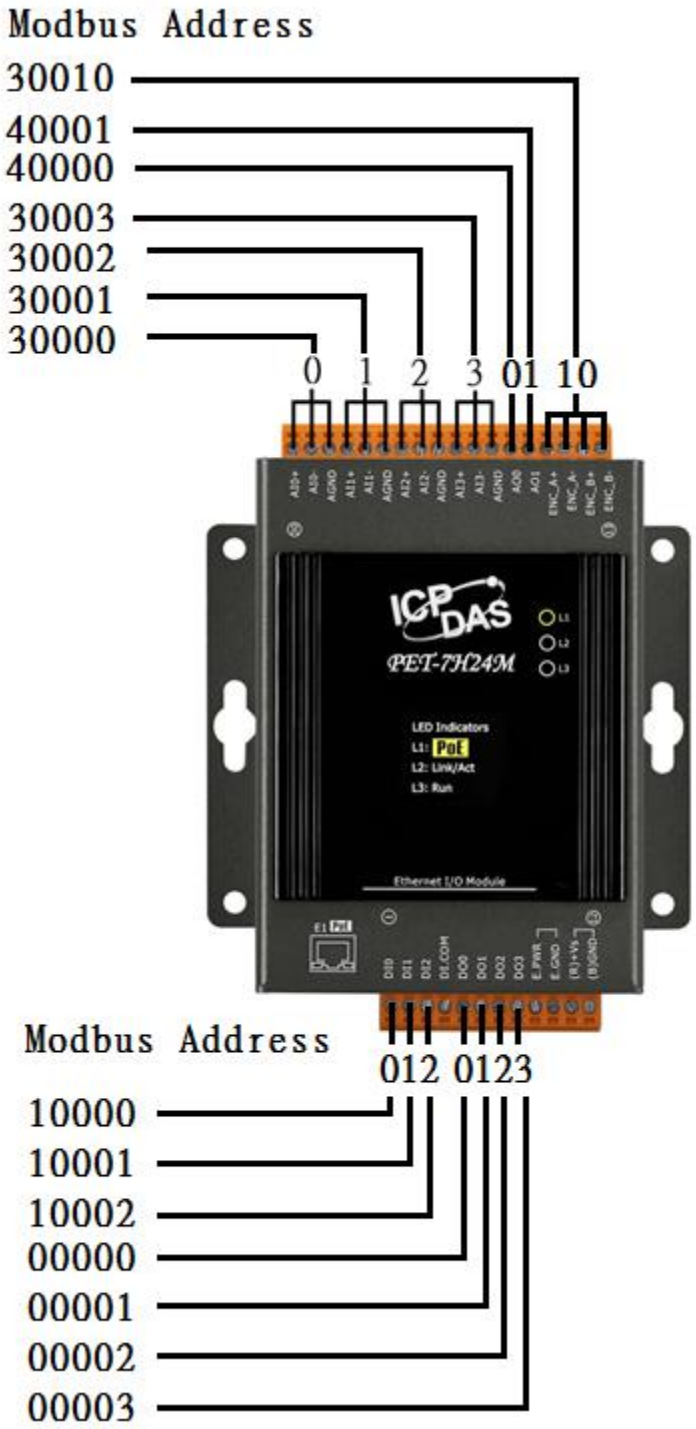
Register Map

Modbus devices usually include a Register Map. Modbus functions operate on register map registers to monitor, configure, and control module I/O. The users should refer to the register map for the PET-7H24M to gain a better understanding of its operation.



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0xxxx address table

Begin address	Points	Description	Registers per Point	Range	Access Type
0	4	Digital Out	1	0 = off 1 = on	R/W
34	1	The data order of long(Signed 32-bit) value to Modbus register	1	0: low WORD, high WORD 1: high WORD, low WORD	R/W
36	1	Reset the I/O settings to the factory default state	1	1: Reset	W (Pulse)
40	1	Set the AI Data format	1	0: 2's comp HEX 1: Engineering unit	R/W
41	1	Set the AO Data format	1	0: 2's comp HEX 1: Engineering unit	R/W
45	1	Set the XOR mode for the encoder A	1	0: ENC_A disable xor 1: ENC_A enable xor	R/W
46	1	Set the XOR mode for the encoder B	1	0: ENC_B disable xor 1: ENC_B enable xor	R/W
56	1	Write 1 to clear counter	1	1	W
112	1	Reboot the module	1	1: Reboot	W (Pulse)

1xxxx address table

Begin address	Points	Description	Registers per Point	Range	Access Type
0	3	Digital input value	1	0 = off 1 = on	R

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3xxxx address table

Begin address	Points	Description	Registers per Point	Range	Access Type
0	4	Analog Input	Signed 32-bit	-2147483648 ~ 2147483647 (0x80000000 ~ 0x7FFFFFFF)	R
8	1	Encoder value	Signed 32-bit	-2147483648 ~ 2147483647 (0x80000000 ~ 0x7FFFFFFF)	R
80	1	Number of the DI channel	word	0 ~ 65535	R
81	1	Number of the DO channel	word	0 ~ 65535	R
82	1	Number of the AI channel	word	0 ~ 65535	R
83	1	Number of the AO channel	word	0 ~ 65535	R
84	1	Number of the Encoder channel	word	0 ~ 65535	R
90	1	OS image version	word	0 ~ 65535	R
91	1	Firmware version	word	0 ~ 65535	R
92	1	ET7H24 Library version	word	0 ~ 65535	R
94	1	TCP library version	word	0 ~ 65535	R
95	1	Web server library version	word	0 ~ 65535	R
100	1	Read module name	word	0 ~ 65535	R

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4xxxx address table

Begin address	Points	Description	Registers per Point	Range	Access Type
0	2	AO value CH0 : 0000 CH1 : 0001	Short	00000 to 65535 (0x0000 to 0xFFFF)	R/W
32	1	Set AI type	word	[0] +/- 10V [1] +/- 5V [2] +/- 2.5V [3] +/- 1.25V [4] +/- 0.625V [5] +/- 0.3V [6] +/- 0.15V [7] +/- 0.075V [8] +/- 0.04V [9] +/- 0.02V	R/W
40	1	Set AO type	word	0: 0V~ 5V 1: 0V~ 10V 2: +/- 5V 3: +/- 10V	R/W
41	1	Set the encoder mode	word	0: Disable 1: CW/CCW 2: DIR/PLS 3: A/B Phase	R/W
42	1	Set the Low pass filter for the encoder channel	word	0: 4MHz (No low pass filter) 1: 3.6MHz 2: 1.8MHz 3: 950KHz 4: 480KHz 5: 240KHz 6: 120KHz 7: 60KHz 8: 30KHz	R/W

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Begin address	Points	Description	Registers per Point	Range	Access Type
50	1	Read the boot count of the module Can only read the value or clear the value	word	1 to 65535	R/W
51	1	Read module restart status	word	1: Power-on 2: Watchdog 3: Software Restart Command	
60	1	Read the module Modbus NetID The factory default value is 1 when the settings are set to the factory default values	word	0 ~ 65535	R

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7. Updates

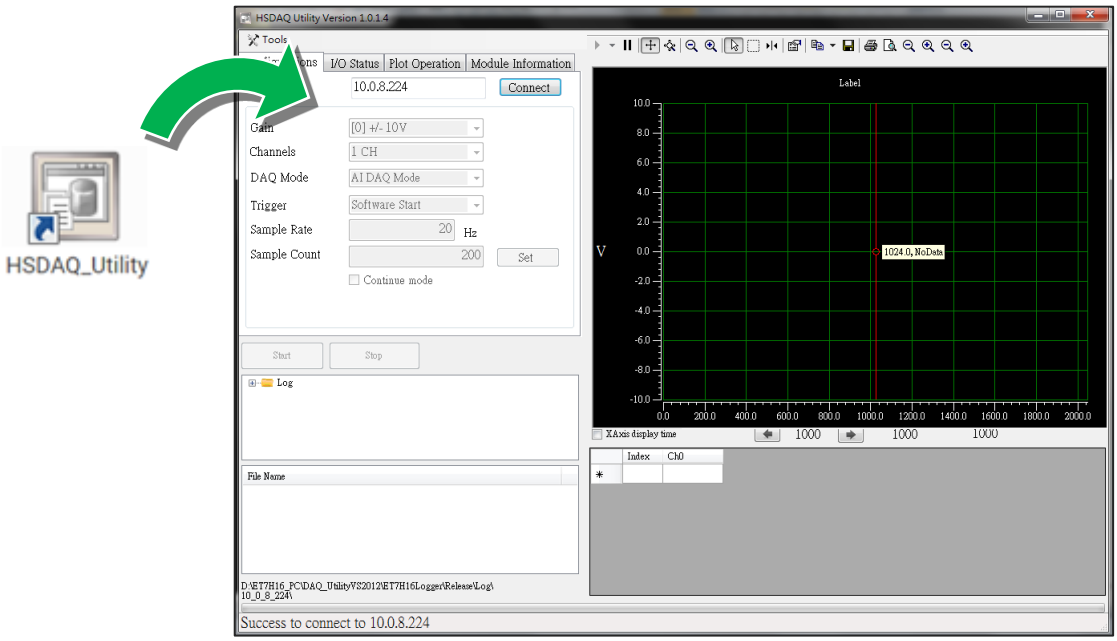
The firmware is stored in flash memory and can be updated to fix functionality issues or add additional features, so we advise you to periodically check the ICP DAS web site for the latest updates.

Step 1: Get the latest version of the firmware and the autoexec.bat file

The latest version of the PET-7H24M firmware and autoexec.bat file can be obtained from: http://www.icpdas.com/en/download/show.php?num=2941&model=PET-7H24M

Step 2: Run the HSDAQ Utility

Double-click the HSDAQ Utility shortcut on your desktop.



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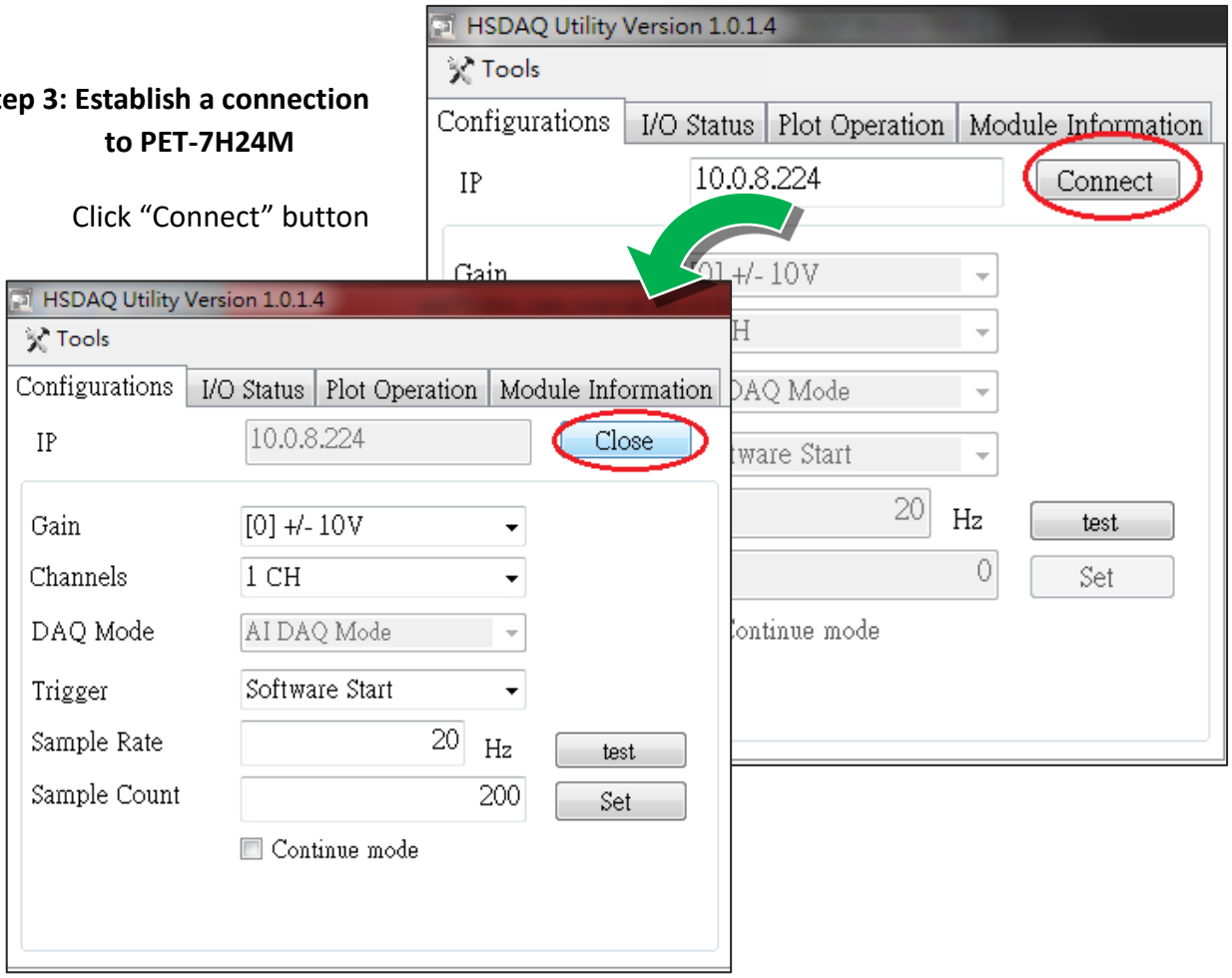
Step 3: Establish a connection to PET-7H24M

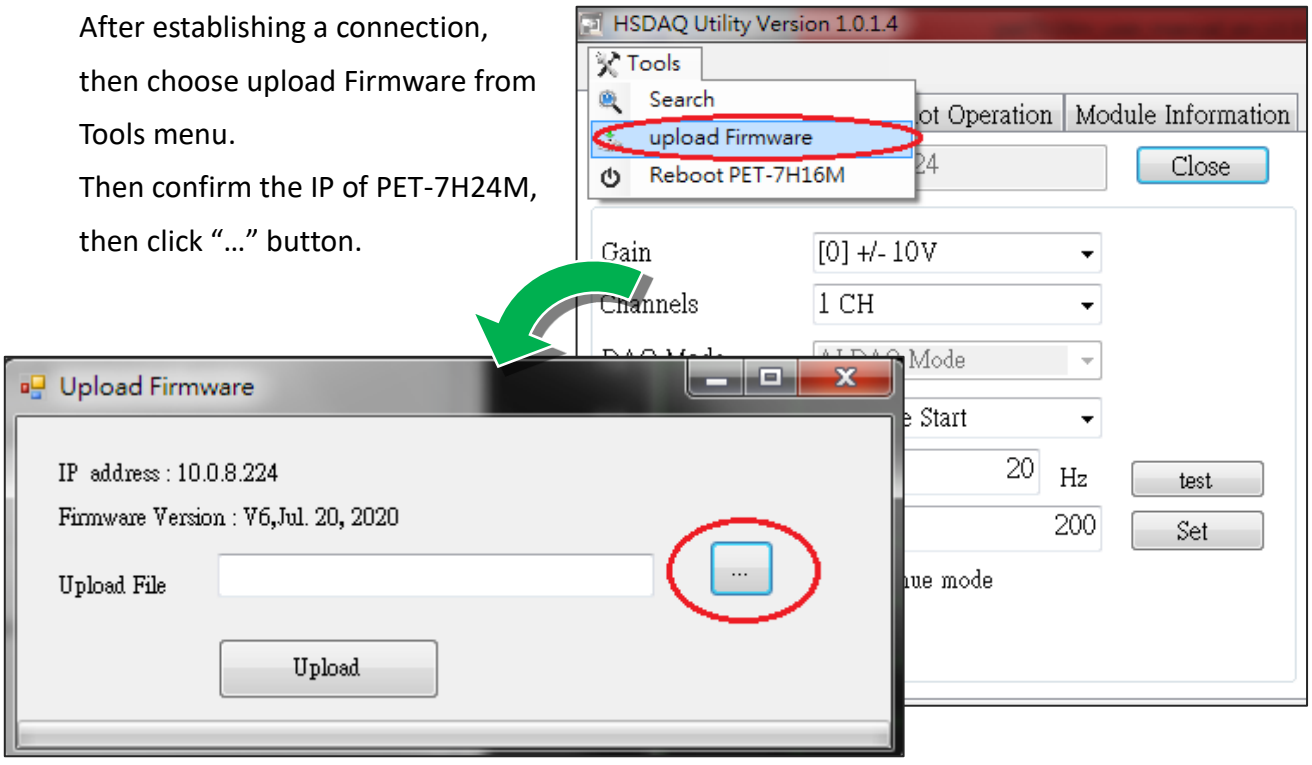
Click “Connect” button



Step 4: Choose “Erase Disk” from the “Command” menu

After establishing a connection, then choose upload Firmware from Tools menu.

Then confirm the IP of PET-7H24M, then click “…” button.



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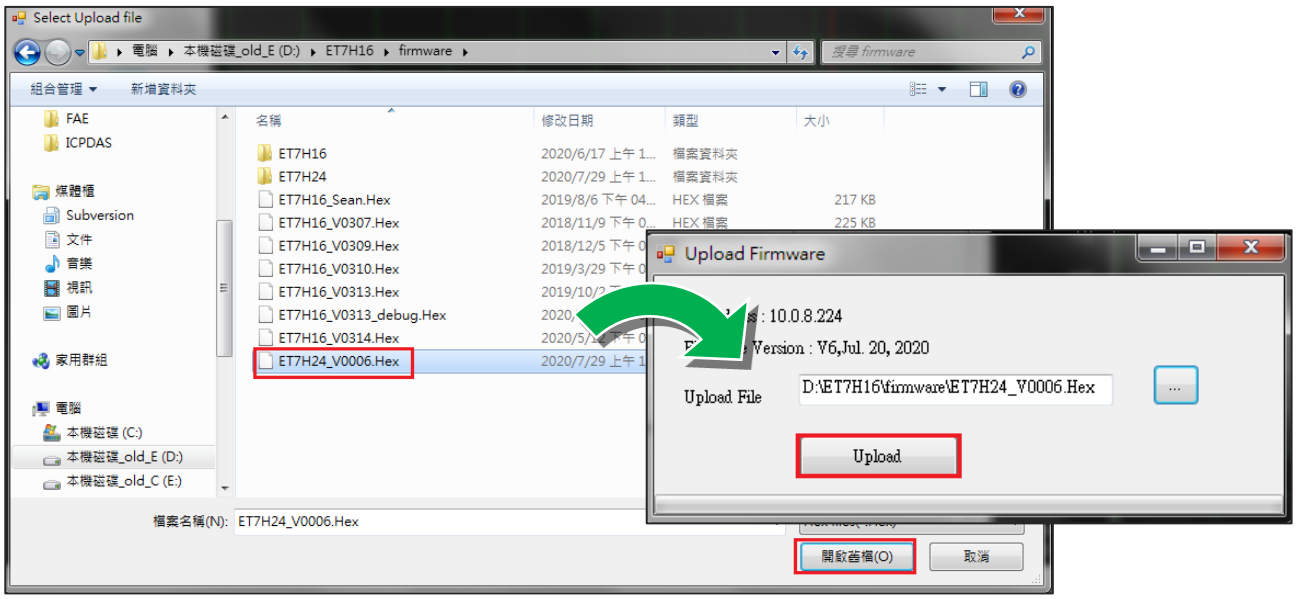
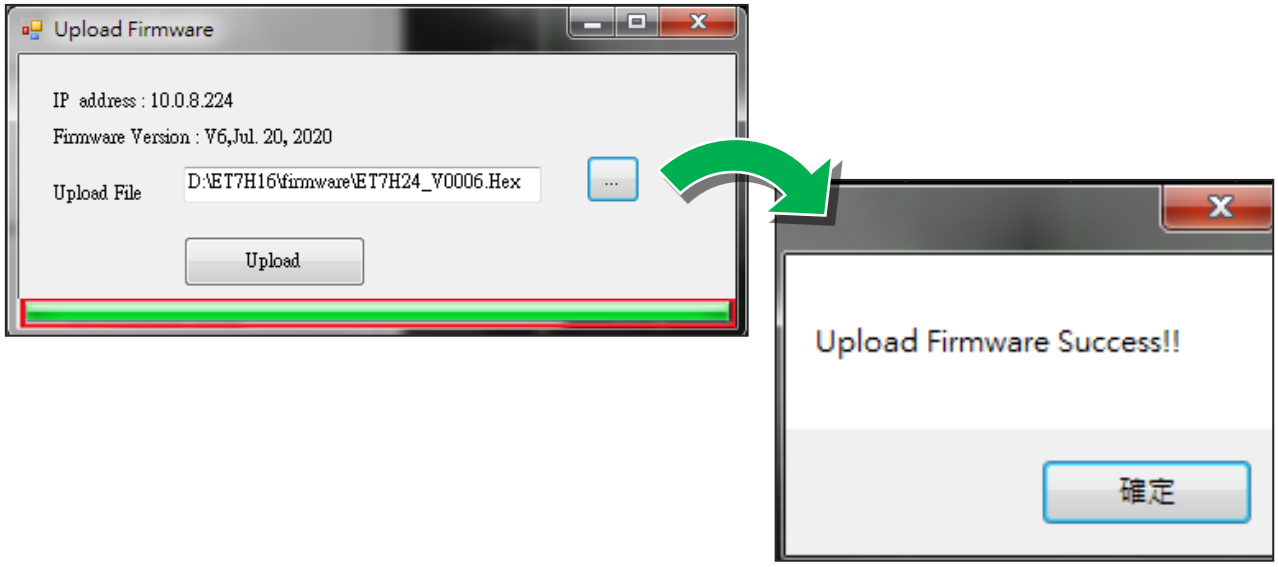
Step 5: Choose the ET7H24_VXXXX.hex to upload

Select ET7H24_VXXXX.hex to upload, then click "Open File" and then click "Upload".



Step 6: End of upload

After uploading the file, the progress bar will be as shown below..



Tips & Warnings

You have to reboot the PET-7H24M after uploading the firmware.

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8. Calibration

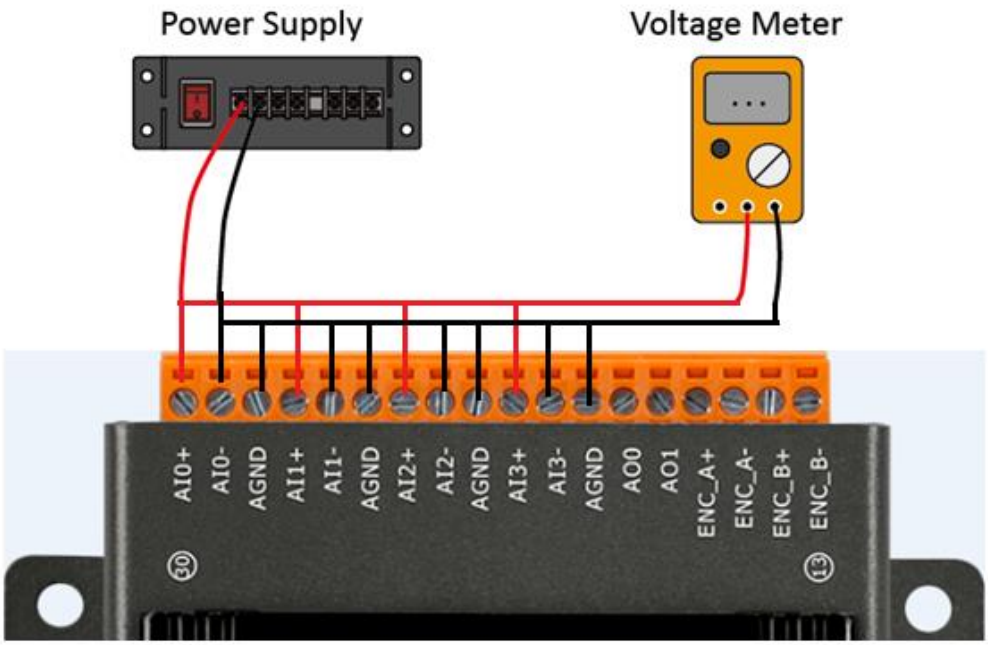
When shipped from the factory, PET-7H24M is already fully calibrated, including the calibration coefficients that are stored in the onboard EEPROM. For a more precise application of voltages in the field, the procedure described below provides a method that allows the board installed in a specific system to be calibrated so that the correct voltages can be achieved for the field connection. This calibration allows the effects of voltage drops caused by IR loss in the cable and/or the connector to be eliminated.

At first the user has to prepare the equipment for calibration

- Precise multi-meter (The more precise meter is better)
- Stable power supply

The calibration procedure will be described in detail in the following.

Connect the AI channels to the meter and power supply, as shown below:



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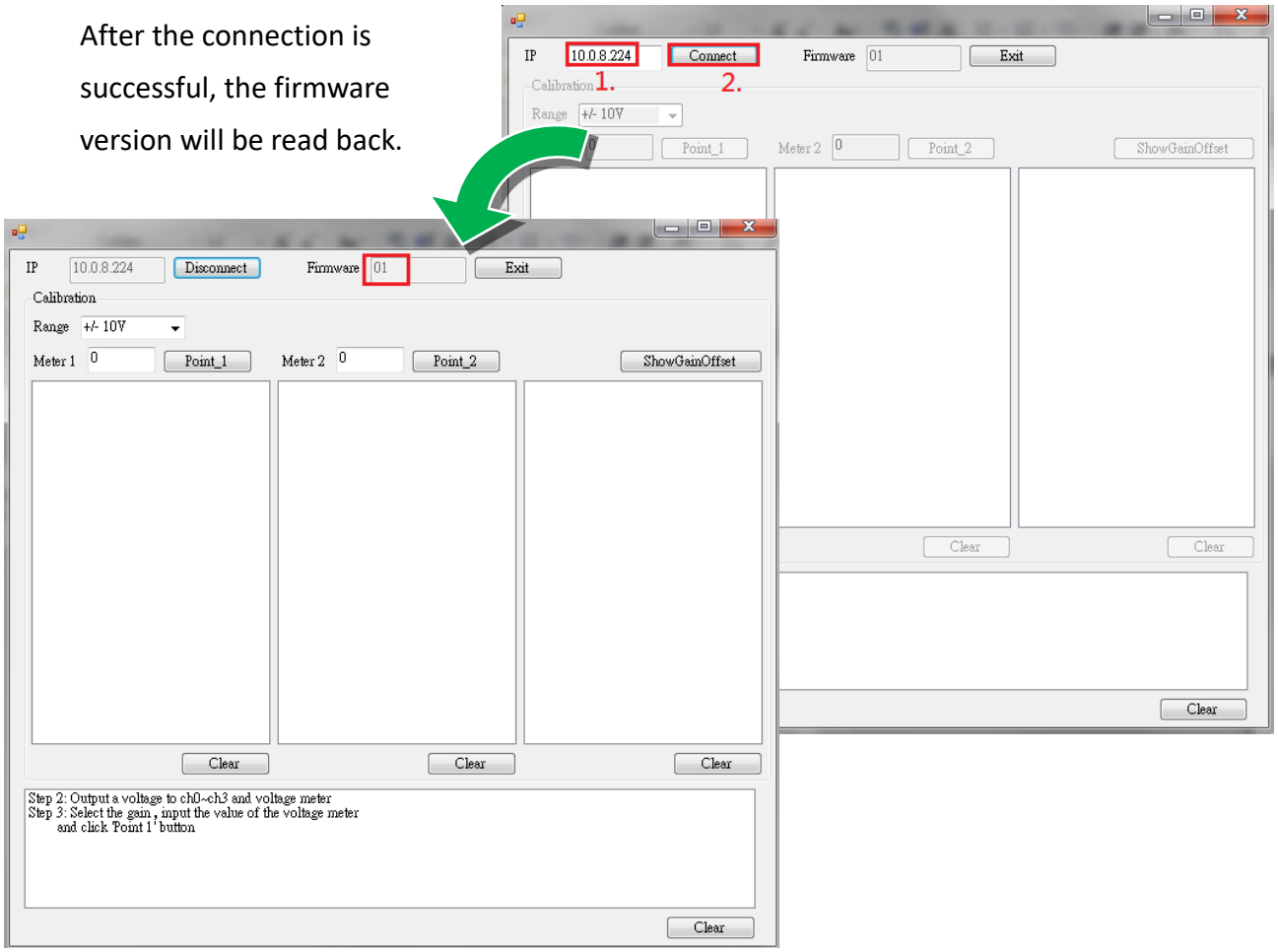
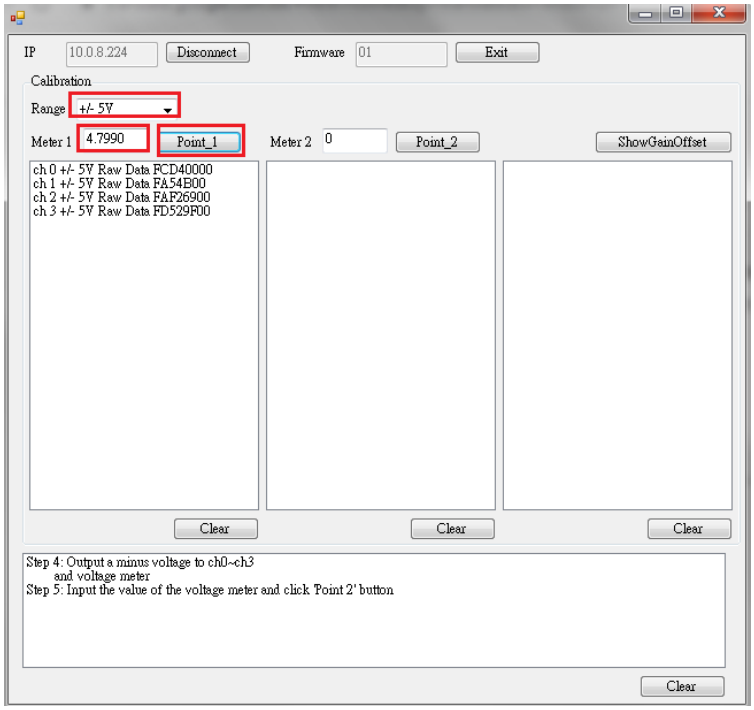
Step 1: Entering the IP and Port, and click Connect

After the connection is successful, the firmware version will be read back.



Step 2：Output voltage 4.8V to ch0 ~ ch3 and the meter, and select +/-5V in Gain combo box.

Enter the value reading from the meter in Meter 1 textbox (the following example is 4.7990)



Tips & Warnings

The range of output voltage is 5V~0V and it's better to output voltage value near to 5V.

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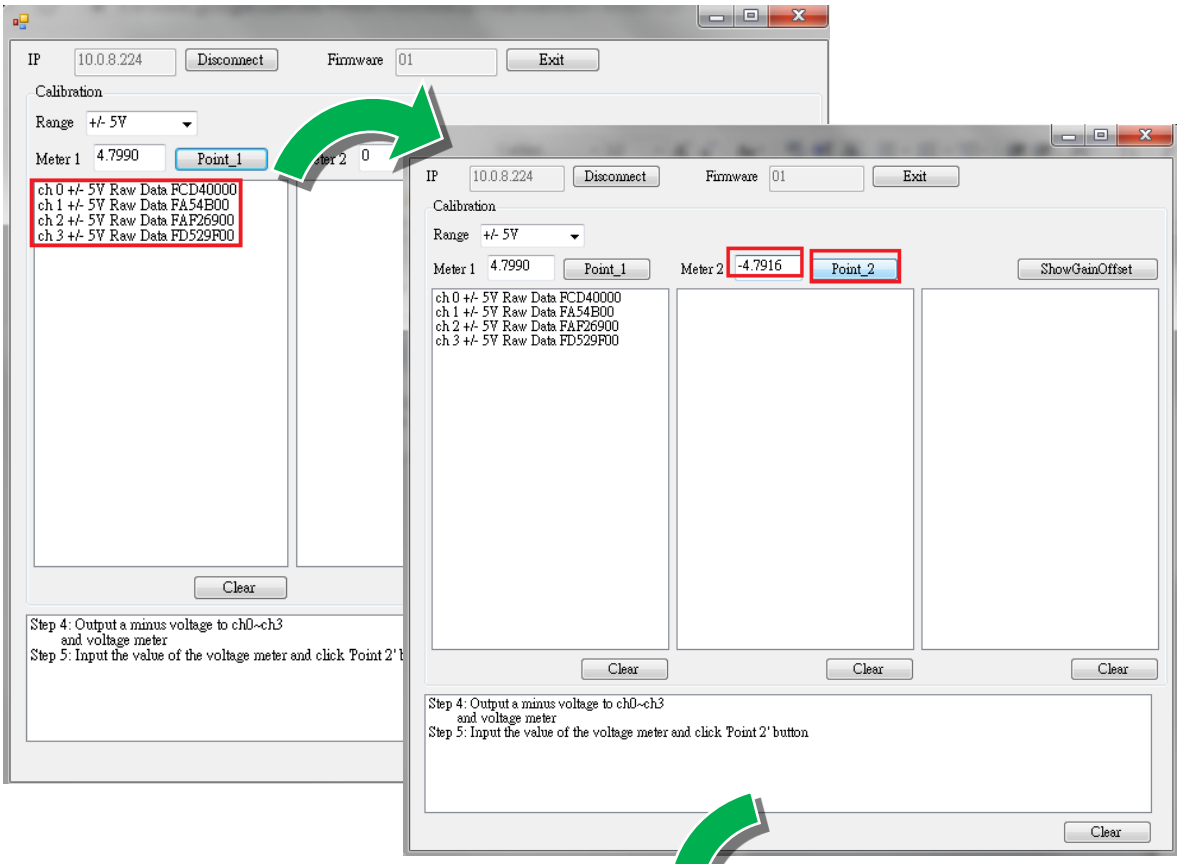
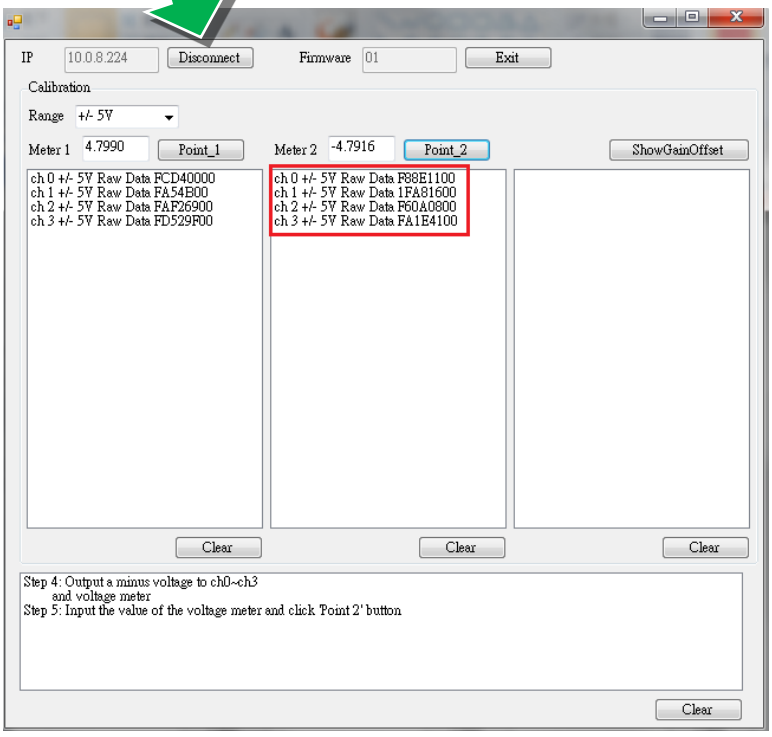
Step 3: Click Point_1 button and get the raw data of each channel as following

Step 4：Output a voltage, -4.8V to ch0 ~ ch3 and the meter, enter the value reading from meter in Meter 2 textbox (the following example is -4.7916)



Step 5: Click Point_2 button and get the raw data of each channel as following(And write the corrected value into EEPROM)



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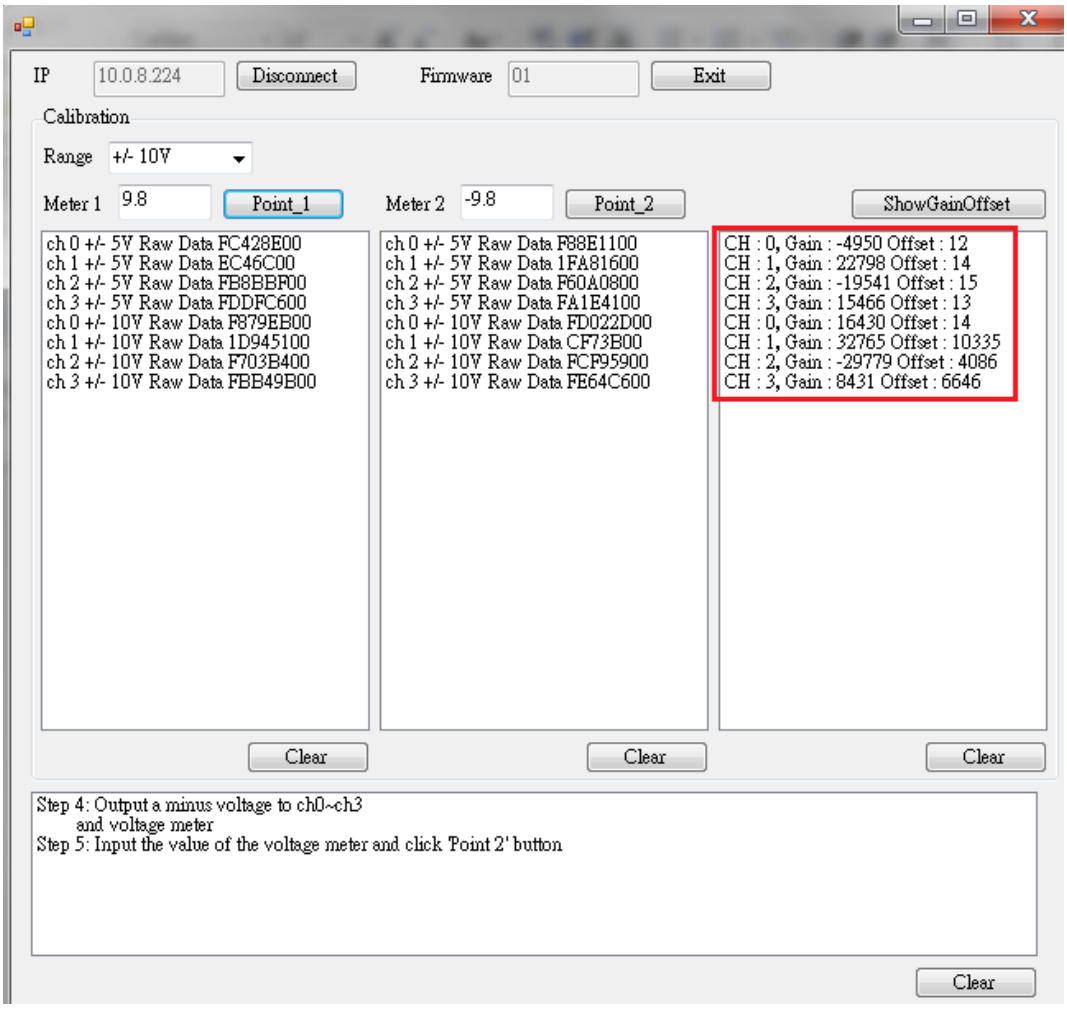
Step 6: Select +/- 10V in Gain combo box

Step 7: Repeat the Step2 ~ Step5, and the upper limit voltage outputs 9.8V in Step 2 and the lower limit voltage outputs -9.8V in Step 5

The calculated Gain Offset will be stored in the EEPROM. After pressing "point_1" and then pressing "point_2", the calibration is completed

Step 8: After completing the calibration, click on ShowGainOffset button to read Gain and Offset value



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Appendix

A. 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.

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

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

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☑ 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)

Transaction identifier = Assigned by the Modbus/TCP master (client)

Protocol identifier = 0

Length field (upper byte) = 0 (since all messages are smaller than 256)

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

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

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.

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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

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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.

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B. Analog Input Type and Data Format Table

Type Code	Input Range	Data Format	+F.S	-F.S
00	-10 to +10V	Engineering Unit	+10000000	-10000000
		2's comp HEX	7FFFFFFFh	80000000h
01	-5 to +5V	Engineering Unit	+05000000	-05000000
		2's comp HEX	7FFFFFFFh	80000000h
02	- 2.5V ~ + 2.5V	Engineering Unit	+02500000	-02500000
		2's comp HEX	7FFFFFFFh	80000000h
03	- 1.25V ~ + 1.25V	Engineering Unit	+01250000	-01250000
		2's comp HEX	7FFFFFFFh	80000000h
04	- 625mV ~ + 625mV	Engineering Unit	+00625000	-00625000
		2's comp HEX	7FFFFFFFh	80000000h
05	- 300mV ~ + 300mV	Engineering Unit	+00300000	-00300000
		2's comp HEX	7FFFFFFFh	80000000h
06	- 150mV ~ + 150mV	Engineering Unit	+00150000	-00150000
		2's comp HEX	7FFFFFFFh	80000000h
07	- 75mV ~ + 75mV	Engineering Unit	+00075000	-00075000
		2's comp HEX	7FFFFFFFh	80000000h
08	- 40mV ~ + 40mV	Engineering Unit	+00040000	-00040000
		2's comp HEX	7FFFFFFFh	80000000h
09	- 20mV ~ + 20mV	Engineering Unit	+00020000	-00020000
		2's comp HEX	7FFFFFFFh	80000000h

Engineering:

The value gets from the software is 100000 times of the real value.

2' s Complement (Hex):

The value usually displayed as hexadecimal format on the document or the software. For example, "1460h" or "E000h" (the "h" refers to hexadecimal). The value gets from the software can be converted to the real value by using the following formula.

For example

Type Code 06: The value gets from the software is 1526830688 (INT32 Dec.) or 5B019660h (Hex.) which means the real value is 106.65 mV.

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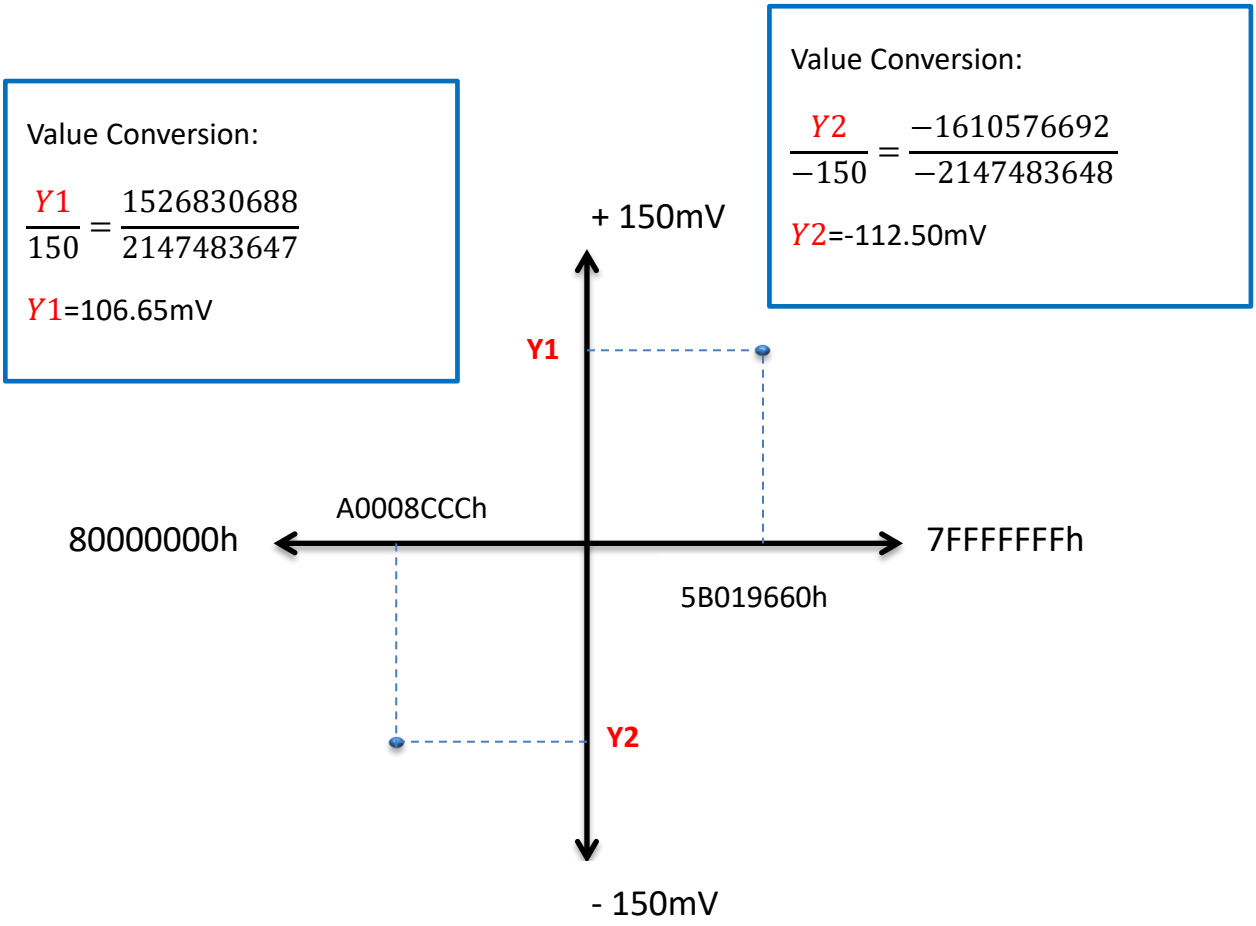
Type Code 06: The value gets from the software is -1610576692 (INT32 Dec.) or A0008CCCh (Hex.) which means the real value is -112.50 mV.



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C. Analog Output Type and Data Format Table

Type Code	Input Range	Data Format	+F.S	-F.S
00	0V ~ 5V	Engineering Unit	+5000	0
		2's comp HEX	FFFFh	0000h
01	0V ~ 10V	Engineering Unit	+10000	0
		2's comp HEX	FFFFh	0000h
02	-5 to +5V	Engineering Unit	+5000	-5000
		2's comp HEX	7FFFh	8000h
03	-10 to +10V	Engineering Unit	+10000	-10000
		2's comp HEX	7FFFh	8000h

Engineering:

The value gets from the software is 1000 times of the real value.

2' s Complement (Hex):

The value usually displayed as hexadecimal format on the document or the software.

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D. Troubleshooting

A number of common problems are easy to diagnose and fix if you know the cause.

Symptom/Problem	Possible cause	Solution
The Run LED doesn't light	Internal power has failed	Return the module for repair.
The Run LED indicator is ON (light), but not flashing.	The module has possibly crashed.	Reboot the module
Cannot communicate via the Ethernet port, but the PET-7H24M is still operating.	The IP/Mask/Gateway address isn't within the IP address range of the LAN.	Change the IP/Mask/Gateway address to match the LAN, or ask the MIS administrator for assistance.
	The IP address has restricted by the IP filter settings	Check the IP filter setting using the Web configuration.
	There are more than 30 TCP/IP connections.	Reboot the module.
Able to explore the web page through port 80 using a web browser, but Modbus/TCP program cannot access the module through port 502.	Port 502 has been restricted by the firewall.	Consult your MIS administrator for assistance.
Modbus/TCP program can access the module through port 502, but Web browser cannot explore the web page through port 80 using a web browser.	The Port 502 has restricted by the firewall.	Consult your MIS administrator for assistance.
	The Web Configuration function has been disabled. (Shown on the Basic Settings page)	Enable the Web Configuration function using either the SMMI or the console.
	The Web server TCP port has been changed from port 80 (Shown on the Basic Settings page)	Change the TCP port to 80 or reconnect the PET-7H24M using the specific TCP port.

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E. ADC Actual Sampling Rate

The sampling rate of Analog Input channel of PET-7H24M ranges from 20 Hz to 128K Hz. ADC chip is the acquisition rate obtained through a 16MHz base frequency and three frequency dividers. Not every acquisition rate can be divided. The actual acquisition rate is shown in the figure below.

Items	Sample Rate (Hz)	Items	Sample Rate (Hz)	Items	Sample Rate (Hz)	Items	Sample Rate (Hz)
1	20.40815163	44	228.57142639	87	800	131	3657.142822
2	23.80951881	45	243.80946350	88	819.2000122	132	4000
3	27.77777100	46	250.00000000	89	853.333313	133	4063.490967
4	28.57142830	47	253.96818542	90	870.7477417	134	4096
5	33.33333206	48	256.00000000	91	888.888916	135	4266.666504
6	35.71428680	49	266.66659546	92	914.2857056	136	4571.428711
7	40.81630325	50	284.44436646	93	975.237854	137	4740.739746
8	41.66666794	51	285.71429443	94	1000	138	5120
9	47.61903763	52	292.57144165	95	1015.872742	139	5333.333496
10	50.00000000	53	296.29623413	96	1024	140	5688.887695
11	55.55554199	54	304.76190186	97	1066.666626	141	6095.238281
12	57.14285660	55	320.00000000	98	1137.777466	142	6400
13	62.50000000	56	326.53042603	99	1142.857178	143	6826.666504
14	66.66664886	57	333.33334351	100	1185.184937	144	7111.111328
15	71.42857361	58	341.333252	101	1219.047607	145	8000
16	80.00000000	59	355.555481	102	1280	146	8533.333008
17	81.63260651	60	365.7142944	103	1306.121704	147	9142.857422
18	83.33333588	61	380.9523926	104	1333.333374	148	9481.479492
19	95.23807526	62	400	105	1365.333008	149	10240
20	100.00000000	63	409.6000061	106	1422.221924	150	10666.66699

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21	104.48973083	64	417.9589233	107	1462.857178	151	12190.47656
22	108.84346771	65	426.6666565	108	1523.80957	152	12800
23	111.1110839	66	435.3738709	109	1600	153	14222.22266
24	114.28571320	67	444.4443359	110	1706.666626	154	16000
25	121.90473175	68	457.1428528	111	1741.495483	155	17066.66602
26	125.00000000	69	487.618927	112	1777.777832	156	18285.71484
27	126.98409271	70	500	113	1828.571411	157	20480
28	133.33329773	71	507.9363709	114	2000	158	21333.33398
29	142.85714722	72	512	115	2031.745483	159	25600
30	146.28572083	73	533.333313	116	2048	160	28444.44531
31	148.14811707	74	568.8887329	117	2133.333252	161	32000
32	152.38095093	75	571.4285889	118	2275.554932	162	42666.66797
33	160.00000000	76	585.1428833	119	2285.714355	163	64000
34	163.26521301	77	592.5924683	120	2370.369873	164	85333.33594
35	166.66667175	78	609.5238037	121	2438.095215	165	128000.
36	170.66667175	79	640	122	2560		
37	182.85714722	80	653.0608521	123	2612.243408		
38	190.47615051	81	666.666687	124	2666.666748		
39	200.00000000	82	682.6665039	125	2844.444336		
40	204.80000305	83	711.1109619	126	2925.714355		
41	208.97946167	84	731.4281006	127	3047.619141		
42	213.33332825	85	731.4285889	128	3200		
43	217.68693542	86	761.9047852	129	3413.333252		

Tips & Warnings

First use HS_SetAIScanParam function to set the sampling rate, and then use HS_GetAIScanParam function to get the actual available sampling rate of the module response as shown in the above table.

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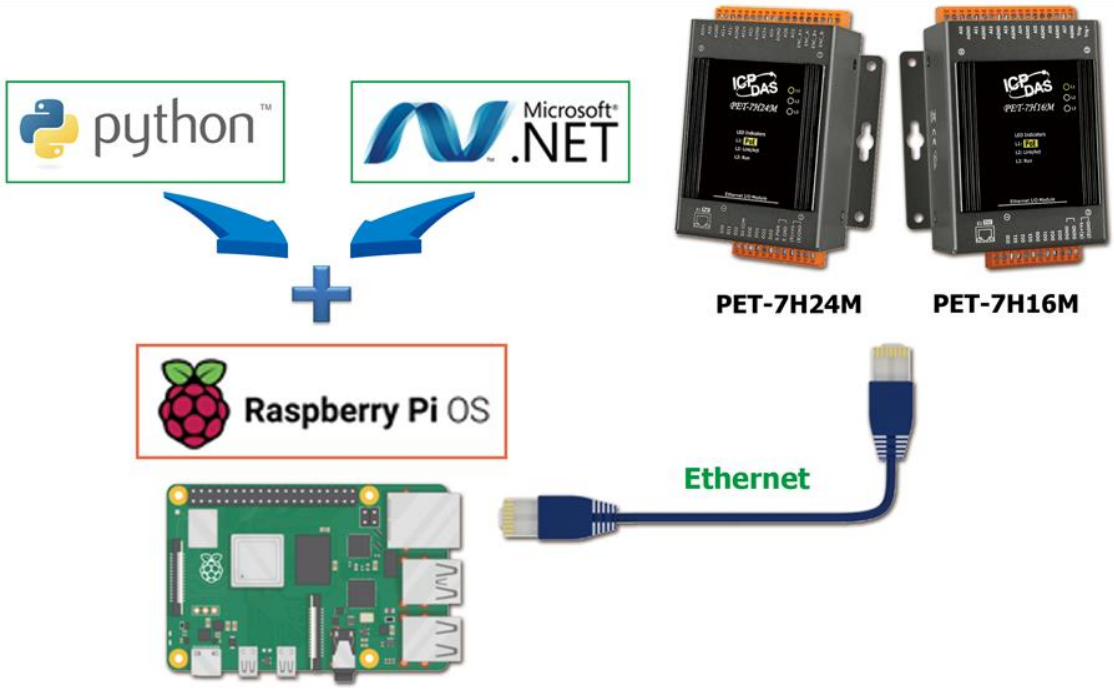
F. Application

F.1. Raspberry Pi Application

The Raspberry Pi open hardware creates diversified and customized applications in the age of Internet of Things. With python (the most popular development tool for the IoT) or Microsoft's cross-platform development tool .Net, it can provide products and various services more quickly. Raspberry Pi users use the python/.Net library and sample programs provided by the ICP DAS high-speed data acquisition module platform to connect to the PET-7H16M/PET-7H24M to collect high-speed data for data analysis and IoT applications.



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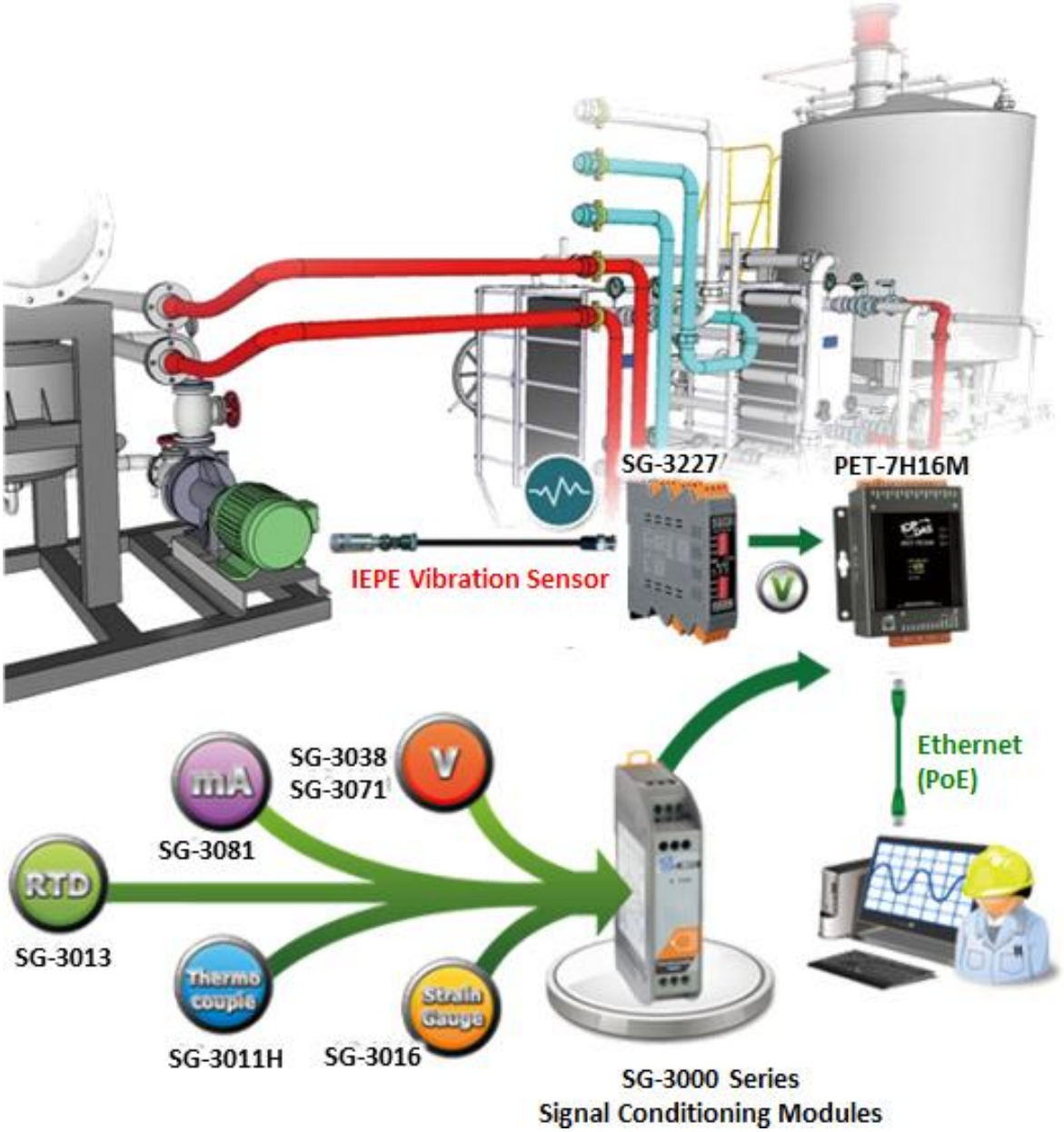
F.2. Temperature, vibration, strain high speed measurement application

The SG-3000 Series Signal Conditioning Module can be connected to a variety of sensors for current, voltage, thermocouple, resistance temperature sensor (RTD), strain gauge (Strain Gauge), accelerometer Different input signals such as (IEPE Accelerometer) are filtered, isolated, amplified, and converted into an analog voltage or current output in the general measurement range. PET-7H16M/PET-7H24M plus SG-3000 series signal conditioning module will not only monitor voltage, current, temperature, strain, vibration and other diversified signals, but also collect real-time data from different regions and transmit it to the central management system via Ethernet.



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Models	SG-3011/H	SG-3013	SG-3016	SG-3227
Analog Input				
Channels	1			2
Signal	Thermocouple	RTD	Strain Gauge	IEPE Signal Conditioner
Type	J, K, T, E, R, S, B, N, C, L, M, L2	Pt100 Ni120 Pt100	±10 mV, ±20 mV, ±30 mV, ±50mV, ±100mV	IEPE Current: 2 mA, 4 mA, 6 mA, 10 mA ± 5% AC Signal Gain: 1, 10, 100 ± 2% High Pass Filter: 10 Hz Low Pass Filter: x1, x10 : 80 kHz; x100 : 50 kHz
Analog Output				
Channels	1			2
Signal	0 ~ 10 V, 0 ~ 20 mA	0 ~ 5 V, 0 ~ 10 V, 0 ~ 20 mA, 4 ~ 20 mA	±5 V, ±10 V, 0 ~ 5 V, 0 ~ 10 V, 0 ~ 20 mA	AC Couple: ±10 V, DC Couple: 1~28 V

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Models	SG-3011/H	SG-3013	SG-3016	SG-3227
Others				
Applications	◦ HVAC/Air conditioning control ◦ Petrochemical industry ◦ Electronic/semiconductor equipment ◦ Water treatment equipment ◦ Pot/heating industry ◦ Hot pressing mold	◦ VOC Combustion control ◦ Corrosive temperature measurement ◦ Air/oil pressure machine ◦ Solar production equipment ◦ Desalination equipm2ent	◦ Vehicle material research ◦ Equipment construction ◦ Boat, bridge structure ◦ Building structure monitoring	◦ Building structure ◦ Equipment safety detection ◦ Mechanical vibration measurement ◦ Structural vibration analysis measurement ◦ Vibration reduction test ◦ Machine rigidity test

For more information, please click the link to the right. SG-3000 Series

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F.3. High voltage and high current high speed measurement application

DN-800 series is a Voltage Attenuator and Current Transformer designed for used in high-voltage and high-current applications. The high-voltage and high-current can be converted into ±10 Vpp attenuated signal, and PET-7H16M/PET-7H24M is able to read the ±10 VDC signals via DN-800 series.

By using DN-800 series and PET-7H16M/PET-7H24M, the power data of all kinds of machines and AC/DC motors can be high-speed measured and retrieved, and then the analyzed data can be quickly used to develop a model to build a failure warning system.

Models		Input Channel	Input Type	Input Range	CT Type	Cable	Output
	DNM-831I-100V-50A	1 x Voltage, 1 x Current	AC/DC	±100 Vpp, ±50 A	Clip-on Ø21 mm	1.5 m/2.5 m	±10 Vpp
	DNM-831I-100V-200A			±100 Vpp, ±200 A			
	DNM-831I-100V-500A			±100 Vpp, ±500 A			
	DNM-831I-100V-1000A			±100 Vpp, ±1000 A	Clip-on Ø40.5 mm	1.5 m	
	DNM-831I-100V-2000A			±100 Vpp, ±2000 A			

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Models		Input Channel	Input Type	Input Range	CT Type	Cable	Output
	DNM-844-50A	4 x Current	AC/DC	±50 A	Clip-on Ø21 mm	1.5 m/2.5 m	±10 Vpp
	DNM-844-200A			±200 A			
	DNM-844-500A			±500 A			
	DNM-844-1000A			±1000 A	Clip-on Ø40.5 mm	1.5 m	
	DNM-844-2000A			±2000 A			
	DN-843VI-600V	3 x Voltage		±600 Vpp	-	-	
	DN-848VI-10V	8 x Voltage		±10 Vpp			
	DN-848VI-80V			±80 Vpp			
	DN-848VI-150V			±150 Vpp			
	DN-843I-CT-1	3 x Current		±1 A	Solid Core (Closed)	-	±1.6 Vpp
	DN-843I-CT-10			±10 A			±10 Vpp
	DN-843I-CT-20			±20 A			
	DN-843I-CT-50			±50 A			±4 Vpp

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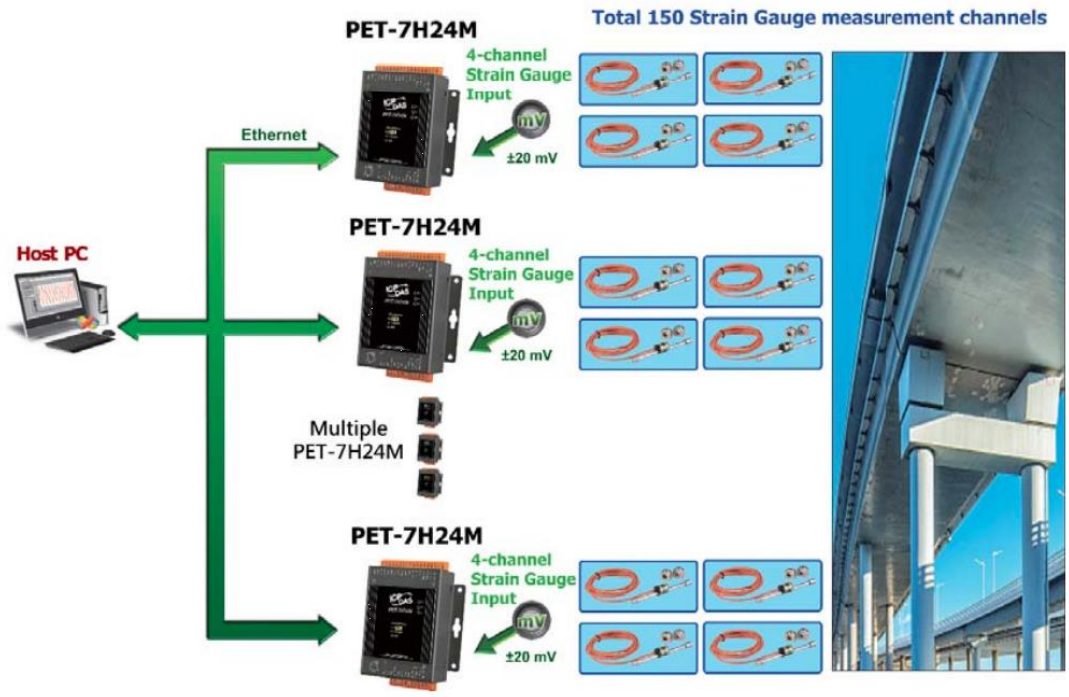
F.4. Distributed remote multi-channel strain gauge monitoring application



Strain gauges have been used for stress and strain monitoring of bridges, pipelines, railway tracks, etc. for some time. PET-7H24M has high precision (+/- 20mV range is ±0.2% of FSR) and a variety of low voltage (mV) input ranges, and each AI channel has a maximum acquisition speed of 128kHz, allowing faster and accurate real-time measurement of multiple channels value change of the strain gauge. In this case, 150 strain gauges are measured. The acquisition rate of each channel needs to be greater than 100Hz. Each strain gauge +/- 20mV is output to one AI channel of PET-7H24M, and one PET-7H24M is used for every four channels, totaling 38 sets PET-7H24M. (The excitation voltage of the strain gauge is supplied by an external circuit)

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G. Revision History

This chapter provides revision history information to this document.

The table below shows the revision history.

Revision	Date	Description
1.0.0	August 2020	Initial issue
1.0.1	September 2021	Update Modbus Register Map Update the description of Appendix A Add Appendix C. Analog Output Type and Data Format Table Add Appendix E. ADC Actual Sampling Rate Add Appendix F. Application

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