

PETL-7000 DIO Series User Manual

Version 1.5, July 2011

Service and usage information for



PETL-7042



PETL-7044



PETL-7050



PETL-7051



PETL-7052



PETL-7053



PETL-7060



PETL-7065



PETL-7066



PETL-7067

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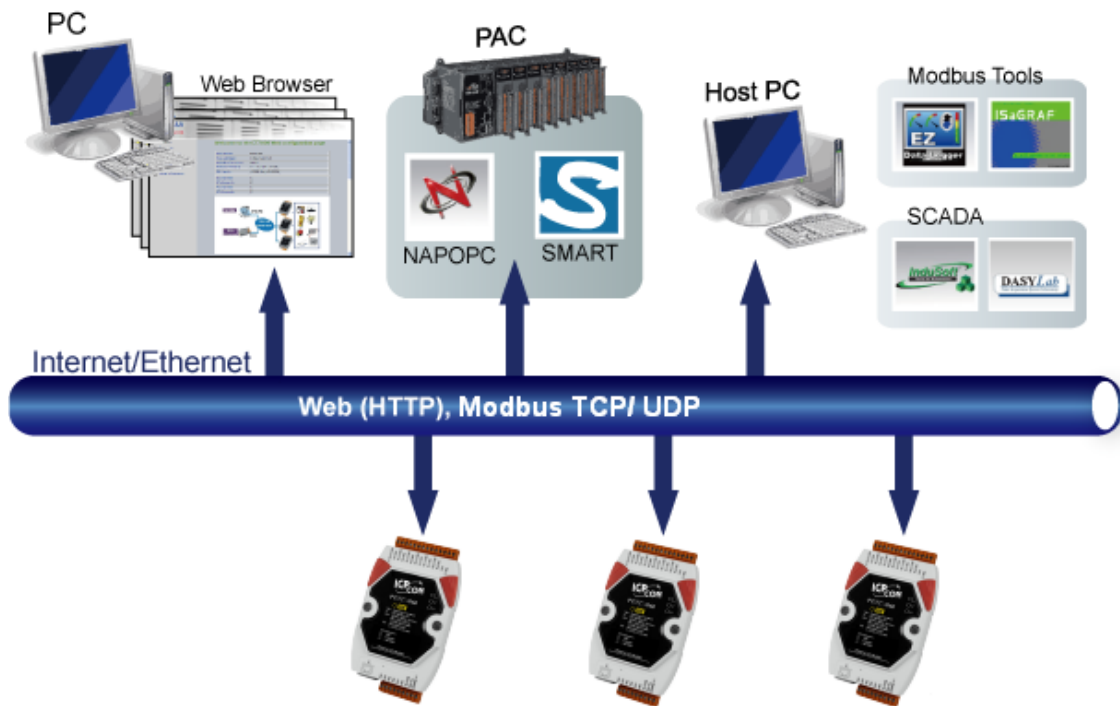
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1. Introduction



Providing networking ability and various digital I/O functions, the PETL-7000 series are IP-based Ethernet I/O monitoring and control modules. The module can be remotely controlled through a 10/100 M Ethernet network by using Modbus TCP/UDP protocol. Modbus has become a de facto standard communications protocol in industry, and is now the most commonly available means of connecting industrial electronic devices. This makes the PETL-7000 series perfect integration with the HMI, SCADA, PLC and other software systems.

1.1. Product Information

1.1.1. PETL-7000 DIO Series Modules

The PETL-7000 series Ethernet I/O modules support various I/O types, like photo-isolated digital input, relay contact, PhotoMOS relay, and open-collector output, etc. The Table below gives a description of each model.

Type	Model	Description
DC Digital Output (Open Collector)	PETL-7042	16-channel Sink Type Open Collector Isolated DO Module
DC Digital Input	PETL-7051	16-channel Isolated DI Module with 32-bit Counters
	PETL-7053	16-channel Isolated DI Module with 32-bit Counters
DC Digital Input and Output	PETL-7044	8-channel Isolated Sink Type Open Collector Output 8-channel Isolated DI Module with 32-bit Counters
	PETL-7050	6-channel Isolated Sink Type Open Collector Output 12-channel Isolated DI Module with 32-bit Counters
	PETL-7052	8-channel Isolated Source Type Open Collector Output 8-channel Isolated DI Module with 32-bit Counters
Power Relay Output	PETL-7060	6-channel Power Relay Output 6-channel Isolation DI module
	PETL-7067	8-channel Power Relay Output
PhotoMOS Relay Output	PETL-7065	6-channel PhotoMOS Relay Output Module 6-channel Isolated DI Module with 32-bit Counters
	PETL-7066	8-channel PhotoMOS Relay Output Module

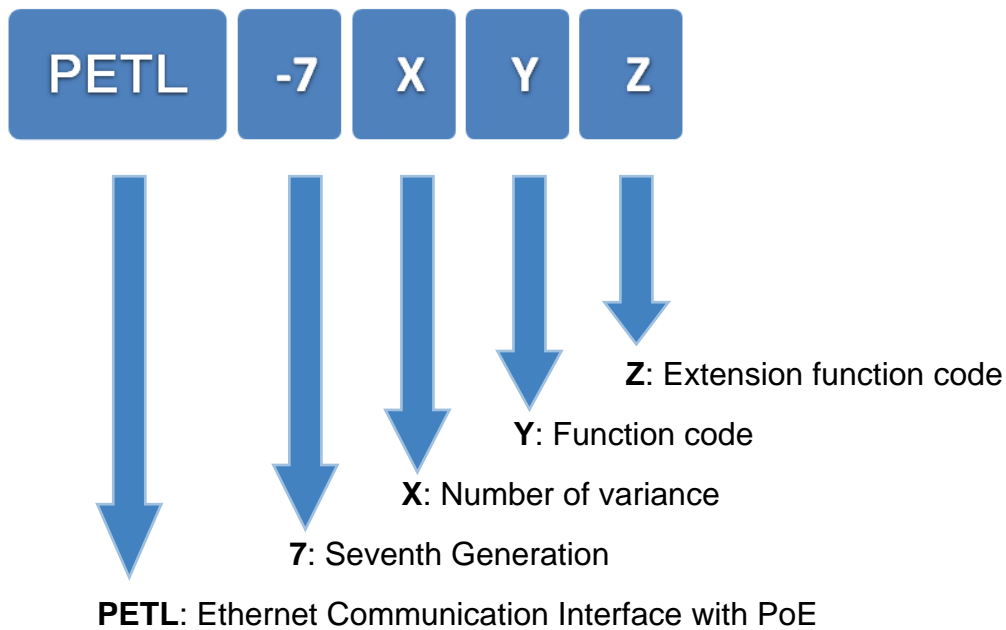
PETL-7000 Series Selection Guide:

Digital I/O						
Model	DI			DO		
	Channel	Type	Sink/Source	Channel	Type	Sink/Source
PETL-7042	-	-	-	16	Open Collector	Sink
PETL-7044	8	Wet	Sink, Source	8	Open Collector	Sink
PETL-7050	12	Wet	Sink, Source	6	Open Collector	Sink
PETL-7051	16	Wet	Sink, Source	-	-	-
PETL-7052	8	Wet	Sink, Source	8	Open Collector	Source
PETL-7053	16	Dry	Source	-	-	-

Relay Output/Digital Input							
Model	Relay Output				DI		
	Channel	Relay	Type	Max. Load Current	Channel	Type	Sink/Source
PETL-7060	6	Power Relay	Form A (SPST N.O.)	5.0 A/channel	6	Wet	Sink, Source
PETL-7065	6	PhotoMOS Relay	Form A (SPST N.O.)	1.0 A/channel	6	Wet	Sink, Source
PETL-7066	8	PhotoMOS Relay	Form A (SPST N.O.)	1.0 A/channel	-	-	-
PETL-7067	8	Power Relay	Form A (SPST N.O.)	5.0 A/channel	-	-	-

1.1.2. PETL-7000 Module Naming Convention

There are many different products available, and sometimes it is difficult to remember the specifications for any given product. However, if you take a few minutes to understand the module naming conventions, it may save you time and prevent confusion. The figure below shows how the module naming conventions work for each PETL-7000 product.



X	Y	Z
Number of Variance	4. DIO module	Number of variance
	5. DIO module	Number of variance
	6. DIO module with relay	Number of variance

1.1.3. PETL-7000 Comparison

The PETL-7000 series features true IEEE 802.3af-compliant (classification, Class 1) Power over Ethernet (PoE) functions. Now, not only is data carried through an Ethernet cable, but power is also provided. This feature makes installation of PETL-7000 series modules a piece of cake. Imagine no more unnecessary wires with only an Ethernet cable needed to take care of everything in the field.

The PETL-7000 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. The PETL-7000 series also supports the Modbus TCP/UDP protocols that enable perfect integration with SCADA software.

Industrial PoE Solutions

When using PoE devices such as the PETL-7000 series, you are able to select 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 work with both PoE and non-PoE devices simultaneously.

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

More information about the PETL-7000 series

There are two ways to supply power to PETL-7000 series modules. The first is through the Ethernet via a PoE switch; the second is through removable terminal block via an external power source. The external power supply should be in the range from +12 to 48 V_{DC}. The reason for including the second method is to provide a redundant power input feature.

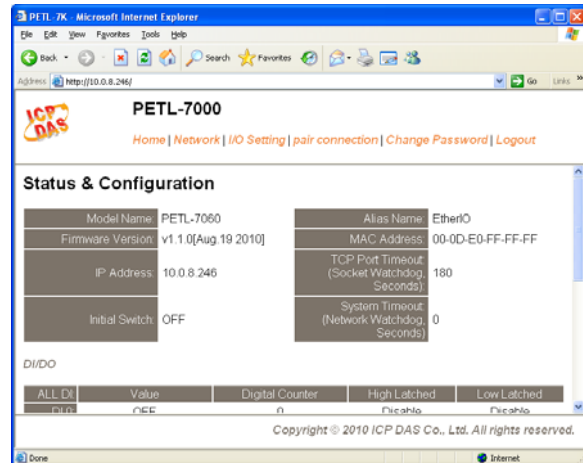
There is an LED included on the PETL-7000 series module that indicates whether the power is being supplied by the PoE switch or not.

	tPET	PETL-7000	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 (Poll/Push Mode)		Yes (Poll 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: tET = tPET without PoE.			

1.2. Features

➤ Built-in Web Server

Each PETL-7000 series module contains a built-in web server that allows users to easily configure, monitor and control the module from a remote location using a web browser.



➤ Modbus Protocol

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

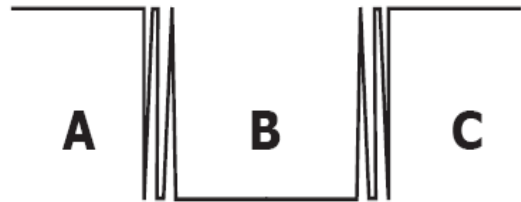
➤ Built-in Multi-function I/O

- All Digital Output modules provide:
 - A **Power-on value** (On boot up, the DO status is set to the Power-on value)
 - A **Safe value** (If Modbus TCP communication is lost for a certain period, the DO status will be set to the user-defined safe value)
 - **PWM function:** The DOs on the PETL-7000 series provide PWM (pulse generation) function. Users can set different frequency (50 or 100 Hz Max.) and duty cycle for each digital output channel. In addition, the two DO channels can work independently or simultaneously. “High Duty Cycle” describes the proportion of 'on' time to the regular interval or 'period' of time; And “Low Duty Cycle” corresponds to 'off' status. It is unnecessary to keep switching the ON/OFF from remote controller. The PETL-7000 series product reduces the complexity of the control system and enhances the timing accuracy.

- All Digital Input modules provide:

- DI channels that can also be used as 32-bit high speed (3.5 kHz) counters.

- High/Low latched status: The modules provide commands to read the latched high digital input and latched low digital input status. Following is an example to show the usefulness of the latched digital input. When we want to read the key stroke of 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 following 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: The PETL-7000 series module also provides the function of the frequency measurement; it gets the DI count in a certain time and calculates the frequency. Rather than polling by the remote host, our module can count out the frequency directly, reduce the communication delay caused by two ends and also increase the accuracy of 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.

➤ **All-in-one Module**

Various I/O components are mixed with 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 Crossover for Plug-and-play**

The 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.

➤ **Built-in Dual Watchdog**

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

The **CPU Watchdog** automatically resets it-self when the built-in firmware runs abnormally.

The **Host Watchdog** set the digital output with predefined safe-value when there is no communication between the module and host (PC or PLC) over a period of time (Watchdog timeout).

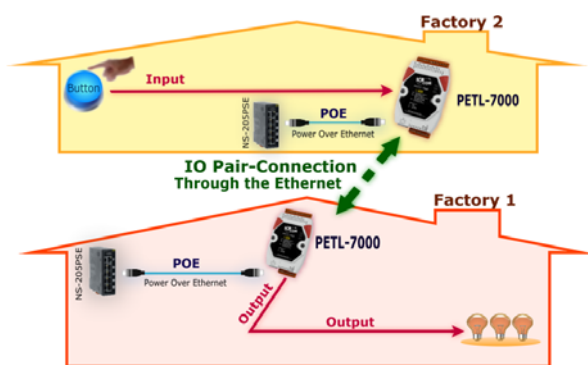


➤ **Ventilated Housing Designed to Operate Between -25 °C to +75 °C**

PETL-7000 series modules are housed within a fire retardant plastic (UL94-V0 Level) shell/case with a column-like ventilator that helps to cool the operating environment inside the shell/case and allows the PETL-7000 series module to operate at temperatures ranging from -25 °C to +75 °C.

➤ **I/O Pair-Connection**

This function is used to create a DI to DO pair through the Ethernet. Once the configuration is completed, the PETL-7000 series module can continuously poll the status of a remote DI device using the Modbus TCP protocol, and then write to local DO channels in the background.



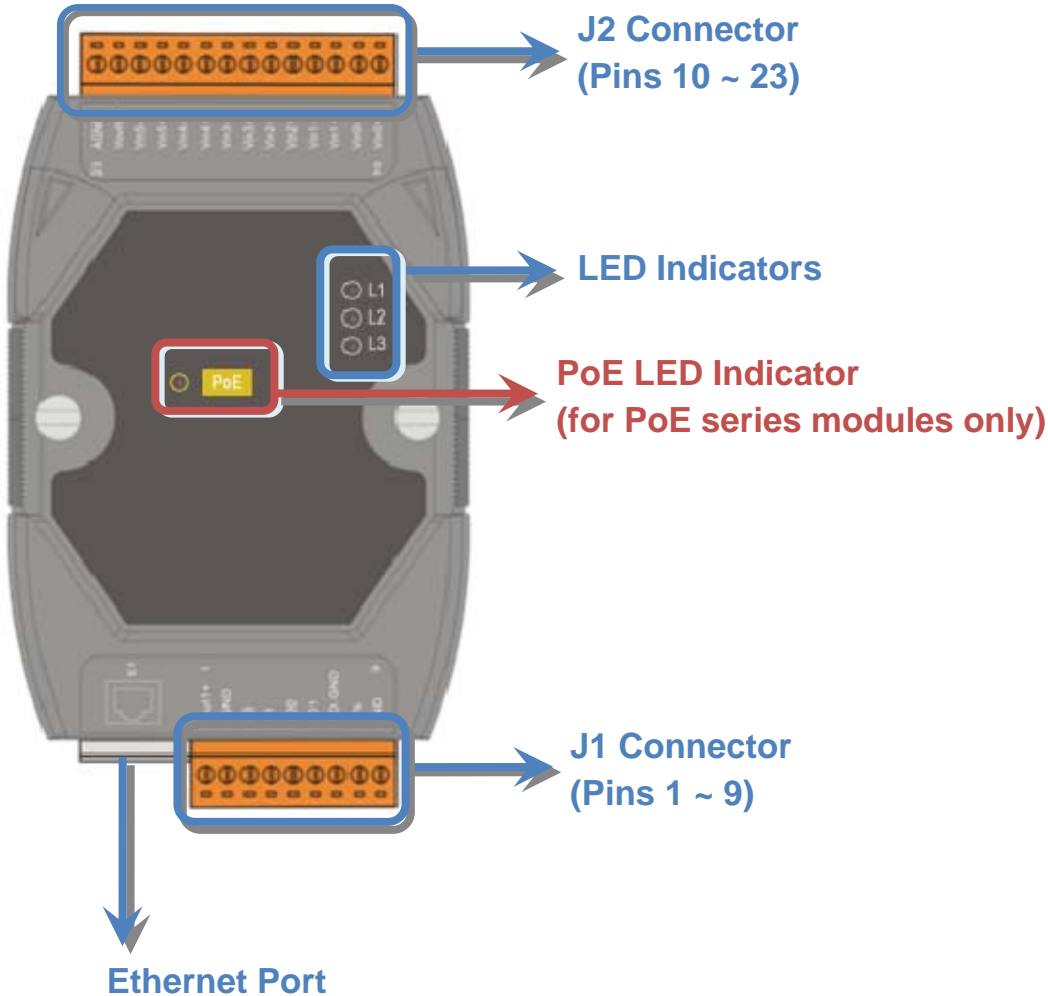
2. Hardware Information

2.1. Overview

Here is a brief overview of the PETL-7000 series module components and a description.

2.1.1. Front Panel

The front panel PETL-7000 series modules contain the Ethernet port, connectors and LEDs.



➤ J1 Connector

J1 connector depends on the type of the PETL-7000 series module.
For more detailed information regarding the pin assignments for the J1 Connector, please refer to Section [2.3. “Pin Assignments”](#)

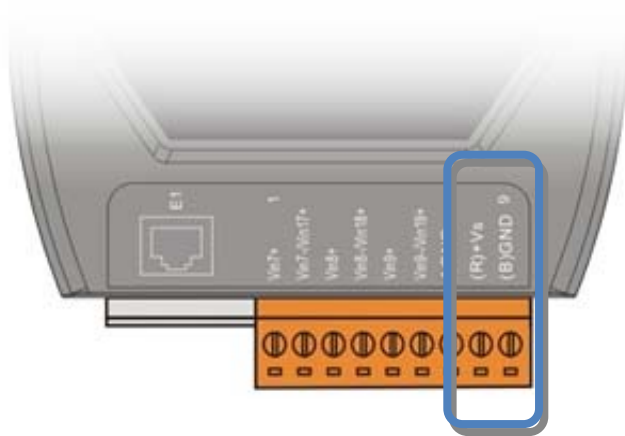
➤ J2 Connector

J2 connector depends on the type of the PETL-7000 series module.
For more detailed information regarding the pin assignments for the J2 Connector, please refer to Section [2.3. “Pin Assignments”](#)

Tips & Warnings



The definition of Pin 8 and Pin 9 applies to all types of PETL-7000 series module. The definition of the other pins depends on the particular module.



Pin number	Name	Function
8	+Vs	+12 ~ 48 V _{DC} power input
9	GND	Ground connection

➤ LED Indicators

Name	LED Action	Function
Run	Flashing	The Firmware is running
Link/ACT	ON	Ethernet link detected
	OFF	No Ethernet link detected
	Flashing	Ethernet packet received
10/100M	OFF	The speed is 10 Mbps
	ON	The speed is 100 Mbps

Tips & Warnings



If the Run LED is not flashing, the following steps should be taken:

Step 1: Switch the power off

Step 2: Check that the Init/Normal switch is in the Normal position
(Refer to Section [2.1.2. “Back Panel”](#))

Step 3: Switch the power on and double-check the LED indicators

➤ PoE LED Indicator

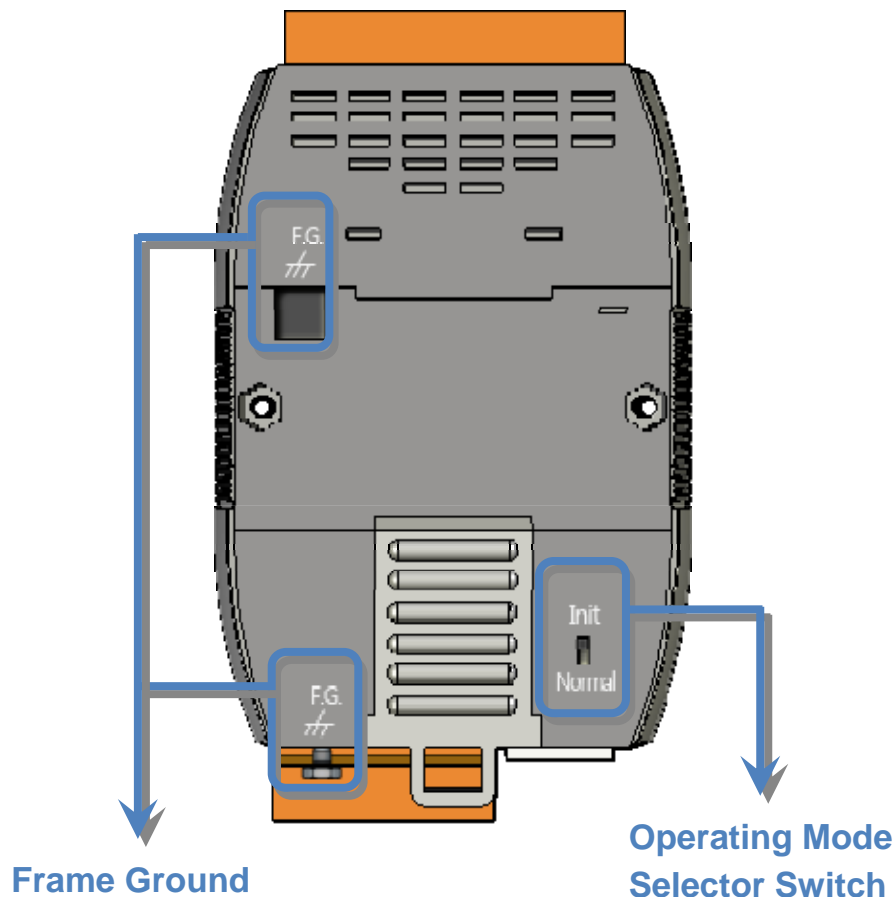
When power is supplied via PoE (Power-over-Ethernet), the PoE indicator will be on.

➤ Ethernet Port

PETL-7000 series modules are equipped with an RJ-45 jack for the Ethernet port and features networking capability. The Ethernet port can be connected using a cable with an 8-pin RJ-45 connector. Notes: The function of the Ethernet LED on RJ-45 is reserved (Function: N/A).

2.1.2. Back Panel

The back panel of PETL-7000 series modules contains the frame ground, Init Switch and the DIN-Rail mounting.



➤ Operating Mode Selector Switch

Init mode: Configuration mode

Normal mode: Firmware running mode

In PETL-7000 series modules, the selector switch should always be in the Normal position. The switch should only be moved from the Normal position to the Init position when updating the PETL-7000 firmware.

Return the switch to the Normal position after the update is complete.

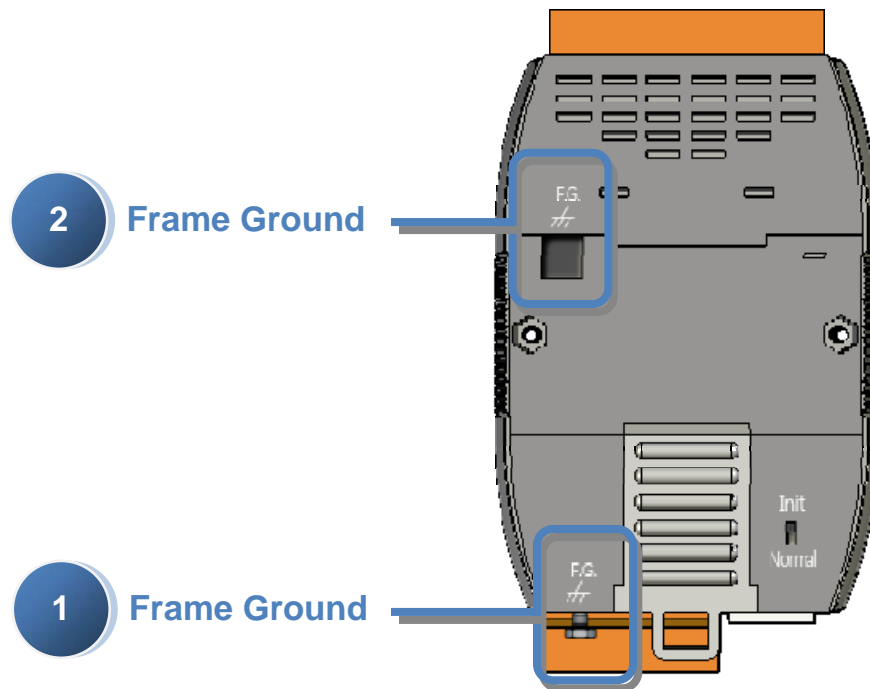
➤ Frame Ground

Electronic circuits are constantly vulnerable to Electrostatic Discharge (ESD), which become worse in a continental climate area. PETL-7000 series modules feature a new design for the frame ground, which provides a path for bypassing ESD, resulting in an enhanced ESD protection capability and ensuring that the module is more reliable.

The following options will provide a better protection for the module:

The PETL-7000 controller has a metallic board attached to the back of the plastic casing as indicated by point 1 in the figure below.

When mounted to the DIN-Rail, connect the DIN-Rail to the earth ground because the DIN-Rail is in contact with the upper frame ground as shown in the figure below, point 2.



2.2. Specifications

2.2.1. System Specifications

System	
CPU	32-bit MCU
Dual Watchdog	Yes
Communication	
Ethernet Port	10/100 Base-TX (With Link, Activity LED Indicator) Automatic MDI/MDI-X 8-Pin RJ-45 x1
LED Display	
PoE	PoE On
L1	Run indicator
L2	Link/Act indicator
L3	10/100 M indicator
Mechanical	
Dimensions (W x H x D)	123 mm x 72 mm x 35 mm
Installation	DIN-Rail or Wall mounting
Environment	
Operating Temperature	-25 °C ~ +75 °C
Storage Temperature	-30 °C ~ +80 °C
Humidity	10 ~ 90% RH, non-condensing
Power Requirements	
Power Input	PoE: IEEE 802.3af, Class 1
	Terminal block: +12~ 48 V _{DC} (non-regulated)
LED Indicator	Yes
Power consumption	0.05 A @ 48 V _{DC} Max. for PETL-7060

2.2.2. I/O Specifications

2.2.2.1. PETL-7042/7044/7050

Digital Input			
Models	PETL-7042	PETL-7044	PETL-7050
Input Channels	-	8	12
Input Type (Device)	-	Wet Contact (Sink, Source)	
On Voltage Level	-	$+10 V_{DC} \sim +50 V_{DC}$	
Off Voltage Level	-	$+4 V_{DC}$ max.	
Input Impedance	-	10 k Ohm	
Counters	-	Max. Count: 4,294,967,285 (32 bits)	
	-	Max. Input Frequency: 3.5 kHz (without filter)	
	-	Min. Pulse Width: 0.15 ms	
Frequency Measurement	-	1 ~ 3.5 kHz in Mode "1000 ms" (+/-1 Hz error)	
	-	10 ~ 3.5 kHz in Mode "100 ms" (+/-10 Hz error)	
	-	0.01 ~1 Hz in Mode "Single-pulse" (+/- 0.01 Hz error)	
Overvoltage Protection	-	$+70 V_{DC}$	
Intra-module Isolation	-	3750 Vrms	

Digital Output			
Models	PETL-7042	PETL-7044	PETL-7050
Output Channels	16	8	6
Output Type (Module)	Sink, Open Collector		
Output Voltage	$+5 V_{DC} \sim +30 V_{DC}$	$+10 V_{DC} \sim +40 V_{DC}$	$+5 V_{DC} \sim +30 V_{DC}$
Max. Load Current	100 mA/channel at 25 °C	300 mA/channel at 25 °C	100 mA/channel at 25 °C
PWM	100 Hz Max. The unit of duty cycle is 1 ms, and the resolution is about 5 ms. (High/Low duty cycle range = 5 ~ 65,535 ms)		
Short Circuit Protection	Yes		
Output Isolation	3750 Vrms		

2.2.2.2. PETL-7051/7052/7053

Digital Input			
Models	PETL-7051	PETL-7052	PETL-7053
Input Channels	16	8	16
Input Type (Device)	Wet Contact (Sink, Source)		Dry Contact
On Voltage Level	+10 V _{DC} ~ +50 V _{DC}		Open
Off Voltage Level	+4 V _{DC} max.		Close to GND
Input Impedance	10 k Ohm		
Counters	Max. Count: 4,294,967,285 (32 bits)		
	Max. Input Frequency: 3.5 kHz (without filter)		
	Min. Pulse Width: 0.15 ms		
Frequency Measurement	1 ~ 3.5 kHz in Mode "1000 ms" (+/-1 Hz error)		
	10 ~ 3.5 kHz in Mode "100 ms" (+/-10 Hz error)		
	0.01 ~1 Hz in Mode "Single-pulse" (+/- 0.01 Hz error)		
Overvoltage Protection	+70 V _{DC}	-	
Effective Distance	-	500 m max.	
Intra-module Isolation	3750 Vrms		

Digital Output			
Models	PETL-7051	PETL-7052	PETL-7053
Output Channels	-	8	-
Output Type(Module)	-	Source, Open Collector	-
Output Voltage	-	+10 V _{DC} ~ +40 V _{DC}	-
Max. Load Current	-	650 mA/channel at 25 °C	-
PWM	-	100 Hz Max. The unit of duty cycle is 1 ms, and the resolution is about 5 ms. (High/Low duty cycle range = 5 ~ 65,535 ms)	-
Overvoltage Protection	-	+48 V _{DC}	-
Output Isolation	-	3750 Vrms	-

2.2.2.3. PETL-7060/7067

Digital Input		
Models	PETL-7060	PETL-7067
Input Channels	6	-
Input Type (Device)	Wet Contact (Sink, Source)	-
On Voltage Level	+10 V _{DC} ~ +50 V _{DC}	-
Off Voltage Level	+4 V _{DC} max.	-
Input Impedance	10 k Ohm	-
Counters	Max. Count: 4,294,967,285 (32 bits)	-
	Max. Input Frequency: 3.5 kHz (without filter)	-
	Min. Pulse Width: 0.15 ms	-
Frequency Measurement	1 ~ 3.5 kHz in Mode "1000 ms" (+/-1 Hz error)	-
	10 ~ 3.5 kHz in Mode "100 ms" (+/-10 Hz error)	
	0.01 ~1 Hz in Mode "Single-pulse" (+/- 0.01 Hz error)	
Overvoltage Protection	+70 V _{DC}	-
Isolation	3750 Vrms	-

Relay Output		
Models	PETL-7060	PETL-7067
Output Channels	6	8
Output Type (Module)	Power Relay, Form A (SPST N.O.)	
Output Voltage Range	250 V _{AC} /30 V _{DC}	
Max. Load Current	5.0 A/channel at 25 °C	
Operating Time	6 ms	
Release Time	3 ms	
PWM	50 Hz max. The unit of duty cycle is 1 ms, and the resolution is about 10 ms. (High/Low duty cycle range = 10 ~ 65,535 ms)	
Electrical Life (Resistive load)	VED	5 A 250 V _{AC} 30,000 ops (10 ops/minute) at 75 °C
		5 A 30 V _{DC} 70,000 ops (10 ops/minute) at 75 °C
	UL	5 A 250 V _{AC} /30 V _{DC} 6,000 ops
		3 A 250 V _{AC} /30 V _{DC} 100,000 ops
Mechanical Life	20,000,000 ops. At no load (300 ops./ minute)	
Relay Output Isolation	3000 Vrms	

Note: Because the characteristic of relay, PETL-706x series (the module with relay) are not suitable to use PWM for a long time.

2.2.2.4. PETL-7065/7066


Digital Input		
Models	PETL-7065	PETL-7066
Input Channels	6	-
Input Type (Device)	Wet Contact (Sink, Source)	-
On Voltage Level	+10 V _{DC} ~ +50 V _{DC}	-
Off Voltage Level	+4 V _{DC} max.	-
Input Impedance	10 k Ohm	-
Counters	Max. Count: 4,294,967,285 (32 bits)	-
	Max. Input Frequency: 3.5 kHz (without filter)	-
	Min. Pulse Width: 0.15 ms	-
Frequency Measurement	1 ~ 3.5 kHz in Mode "1000 ms" (+/-1 Hz error)	-
	10 ~ 3.5 kHz in Mode "100 ms" (+/-10 Hz error)	
	0.01~1 Hz in Mode "Single-pulse" (+/- 0.01 Hz error)	
Overvoltage Protection	+70 V _{DC}	-
Isolation	3750 Vrms	-

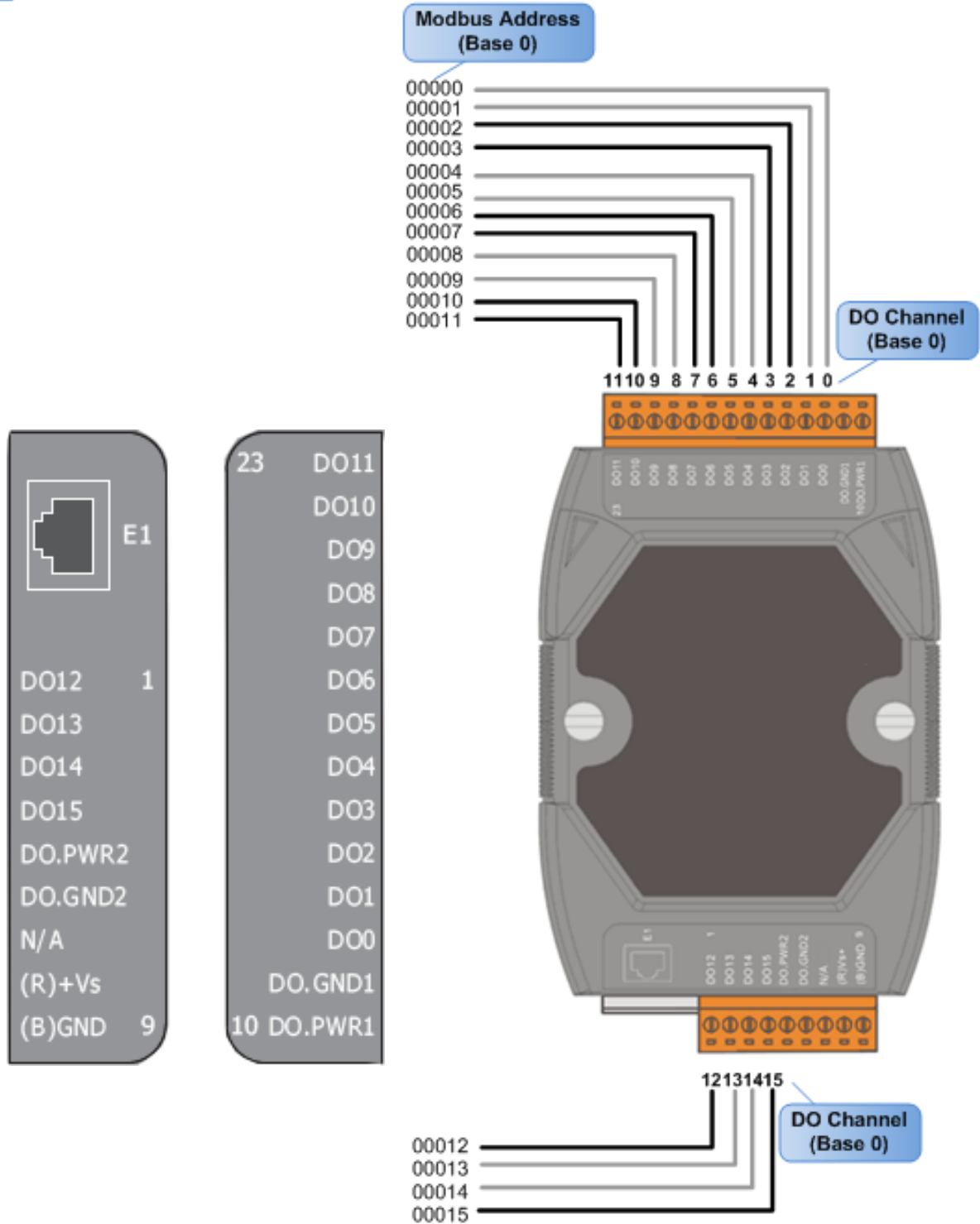
Relay Output		
Models	PETL-7065	PETL-7066
Output Channels	6	8
Output Type (Module)	PhotoMOS Relay, Form A	
Load Voltage	60 V _{DC} / V _{AC}	
Load Current	60 V/1.0 A (Operating Temperature -25°C ~ -40°C)	
	60 V/0.8 A (Operating Temperature +40°C ~ +60°C)	
	60 V/0.7 A (Operating Temperature +60°C ~ +75°C)	
PWM	50 Hz Max. The unit of duty cycle is 1 ms, and the resolution is about 10 ms. (High/Low duty cycle range = 10 ~ 65,535 ms)	
Turn ON Time	1.3 ms (Typical)	
Turn Off Time	0.1 ms (Typical)	
Relay Output Isolation	3000 Vrms	

Note: Because the characteristic of relay, PETL-706x series (the module with relay) are not suitable to use PWM for a long time.

2.3. Pin Assignments

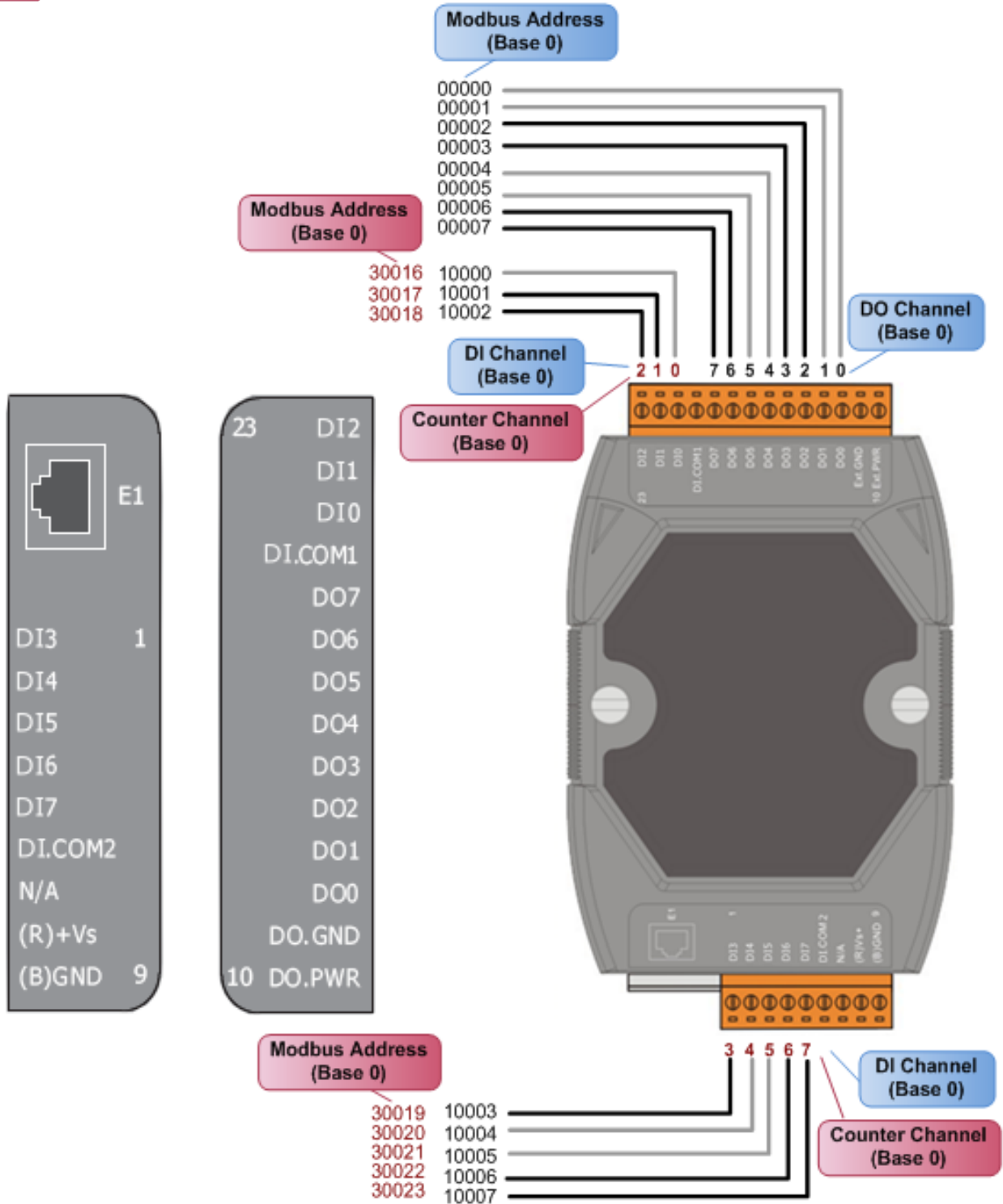
2.3.1 PETL-7042

 : I/O Address Mapping



2.3.2 PETL-7044

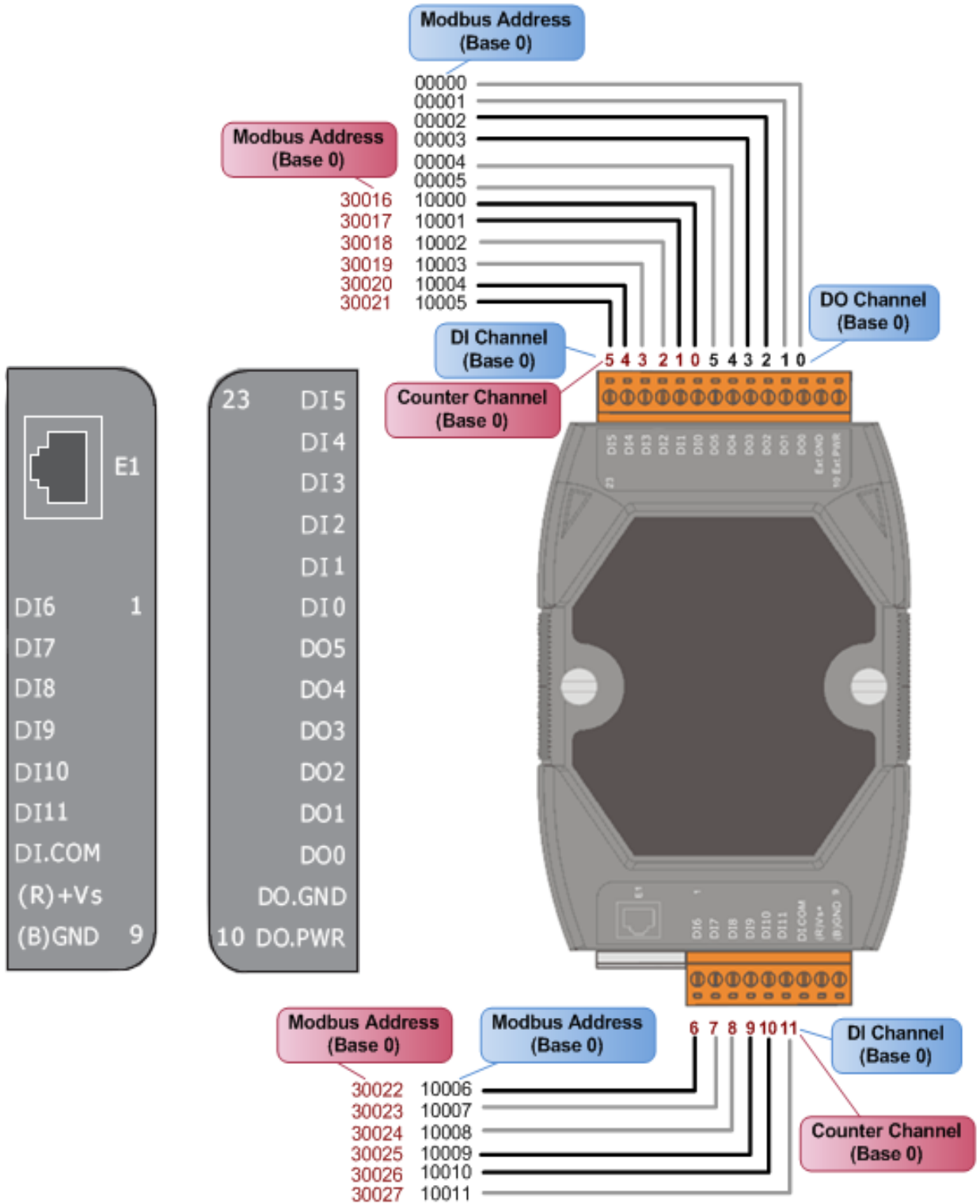
- : I/O Address Mapping
- : Counter Address Mapping




2.3.3 PETL-7050

: I/O Address Mapping

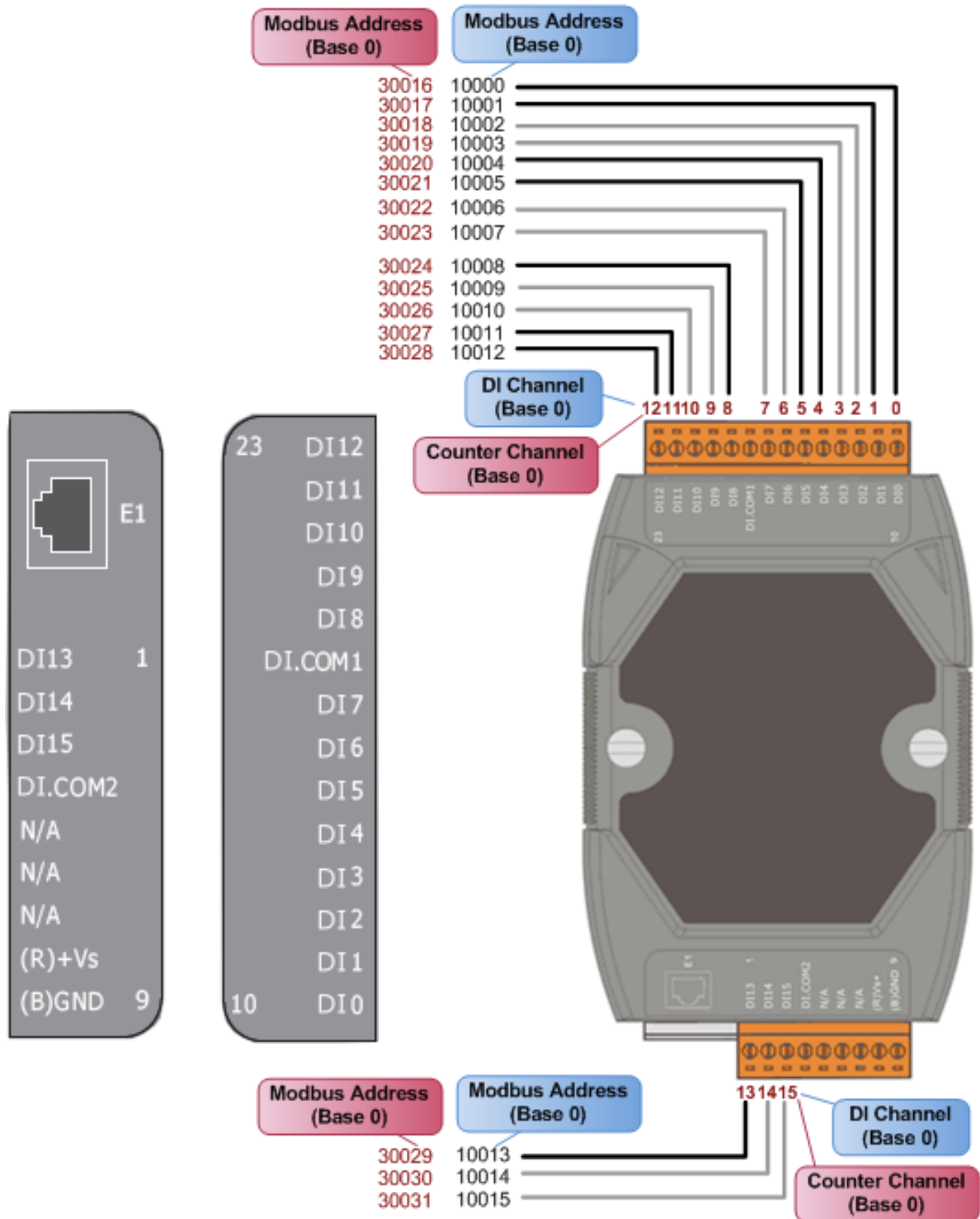
: Counter Address Mapping



2.3.4 PETL-7051

 : I/O Address Mapping

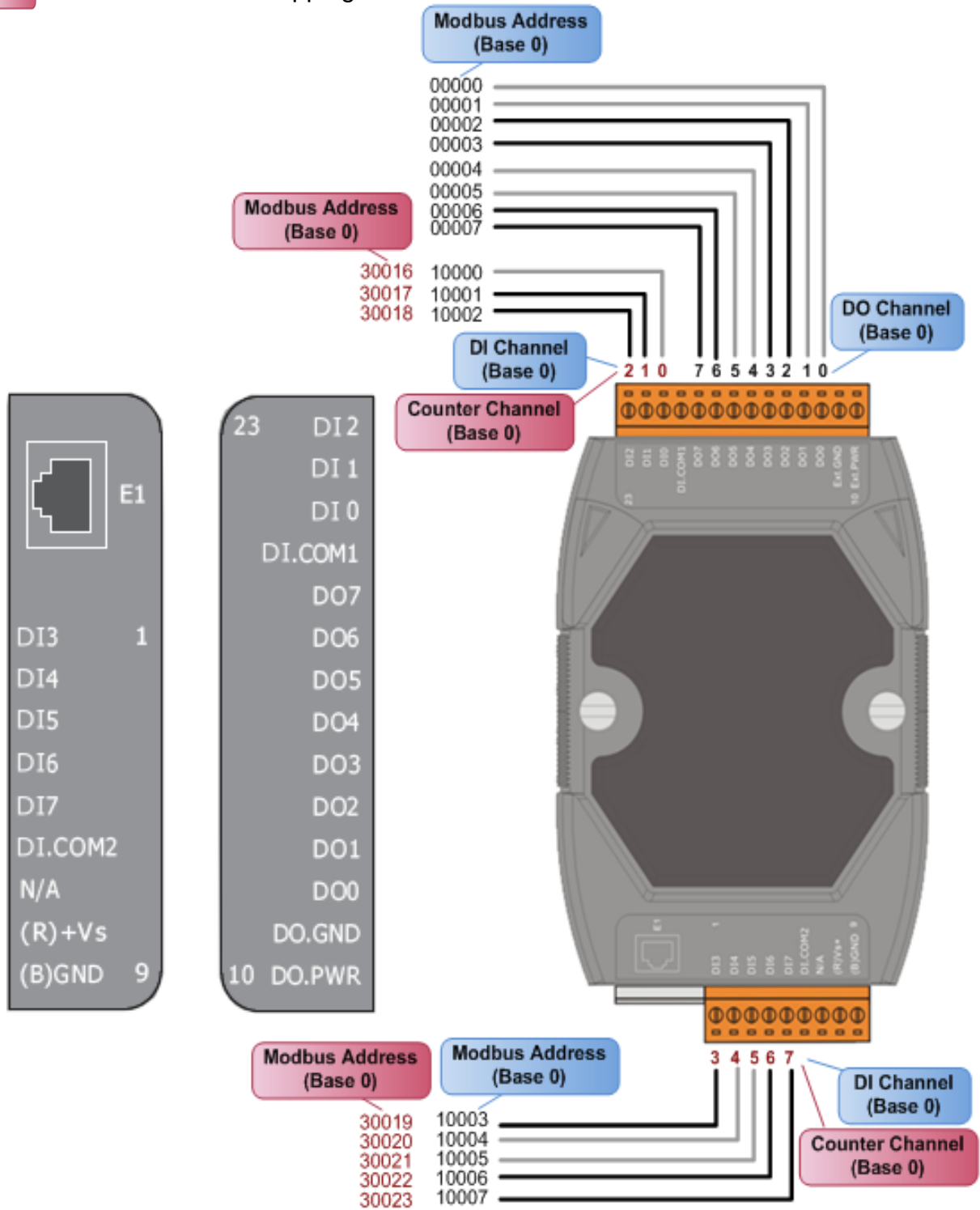
 : Counter Address Mapping



2.3.5 PETL-7052

: I/O Address Mapping

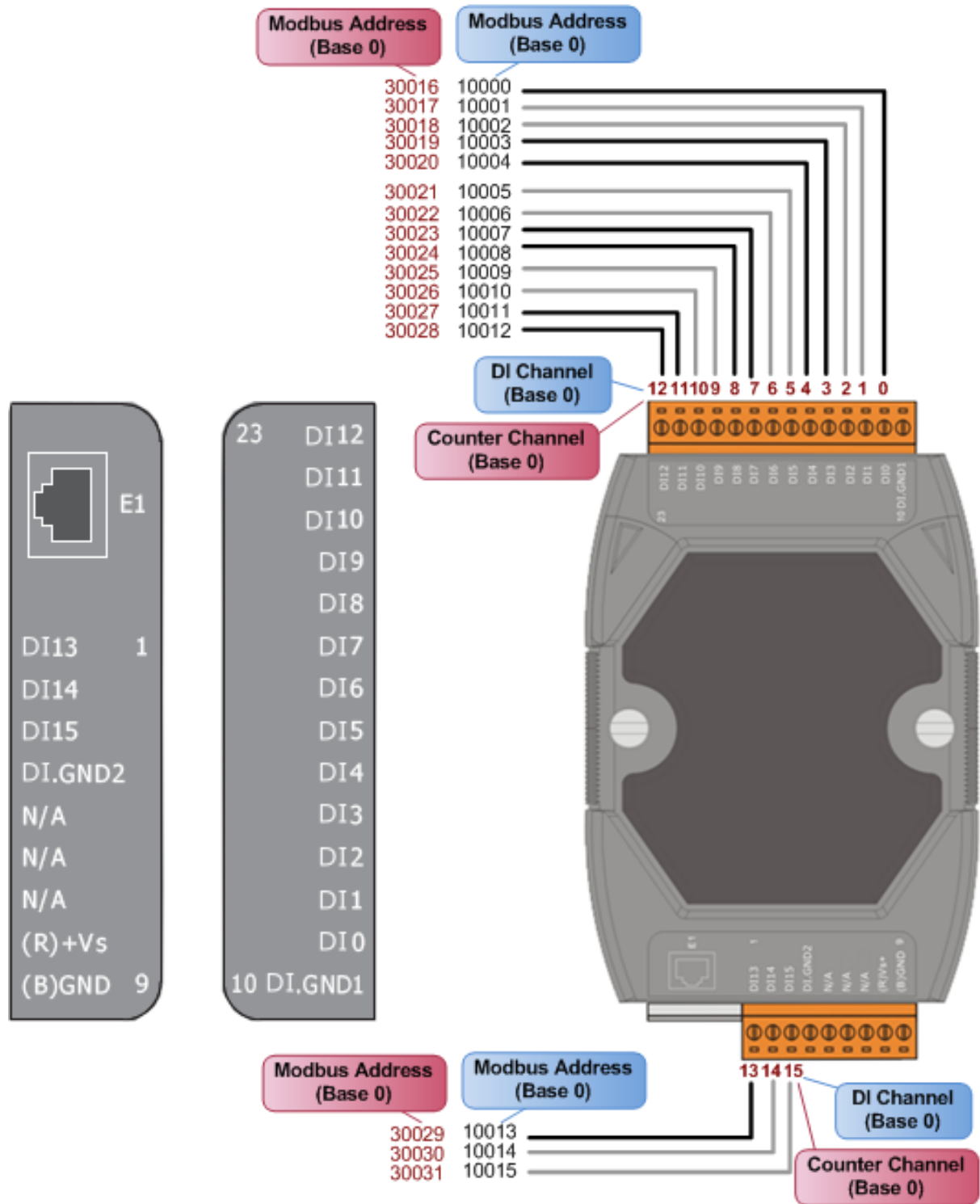
: Counter Address Mapping



2.3.6 PETL-7053

■ : I/O Address Mapping

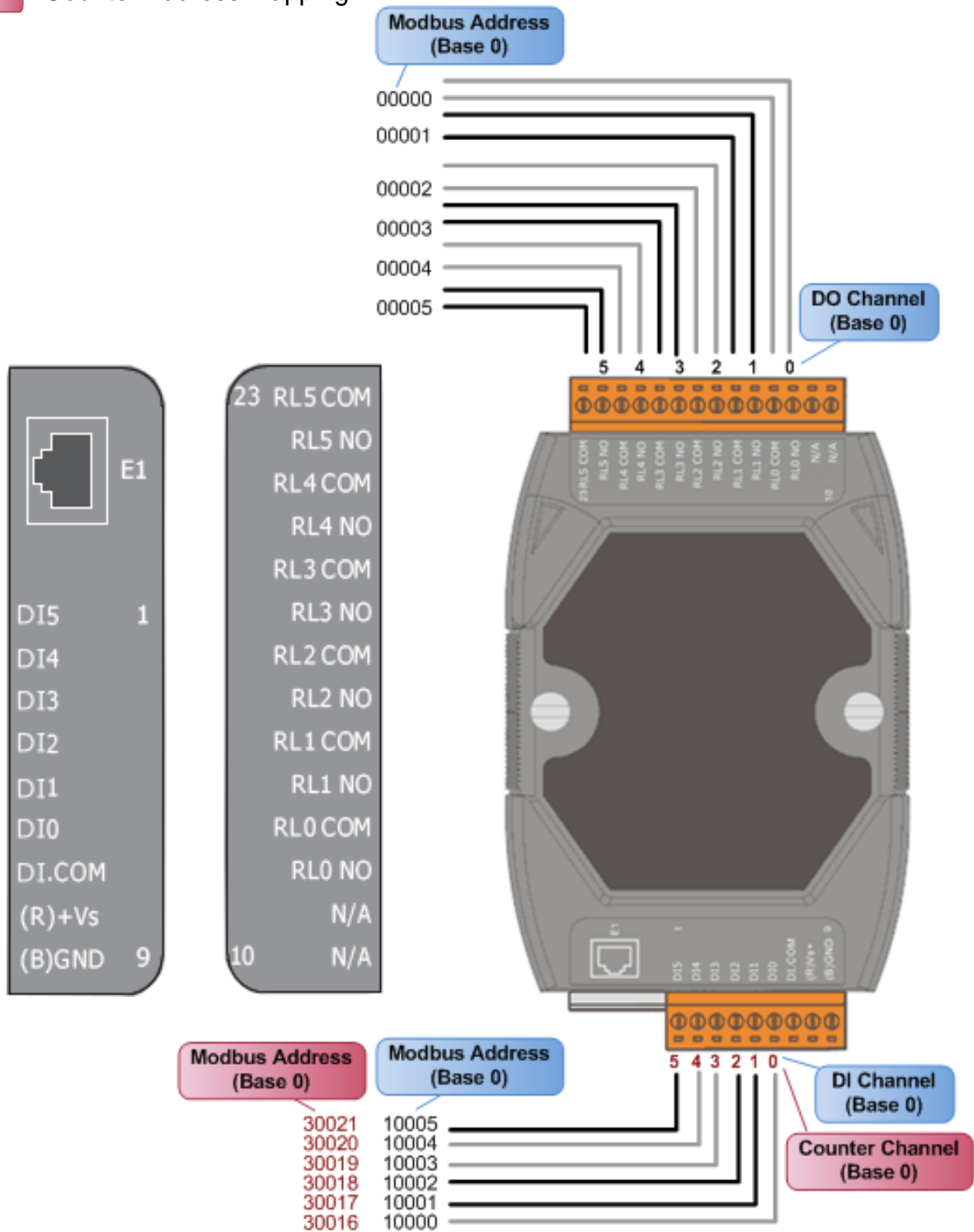
■ : Counter Address Mapping



2.3.7 PETL-7060/7065

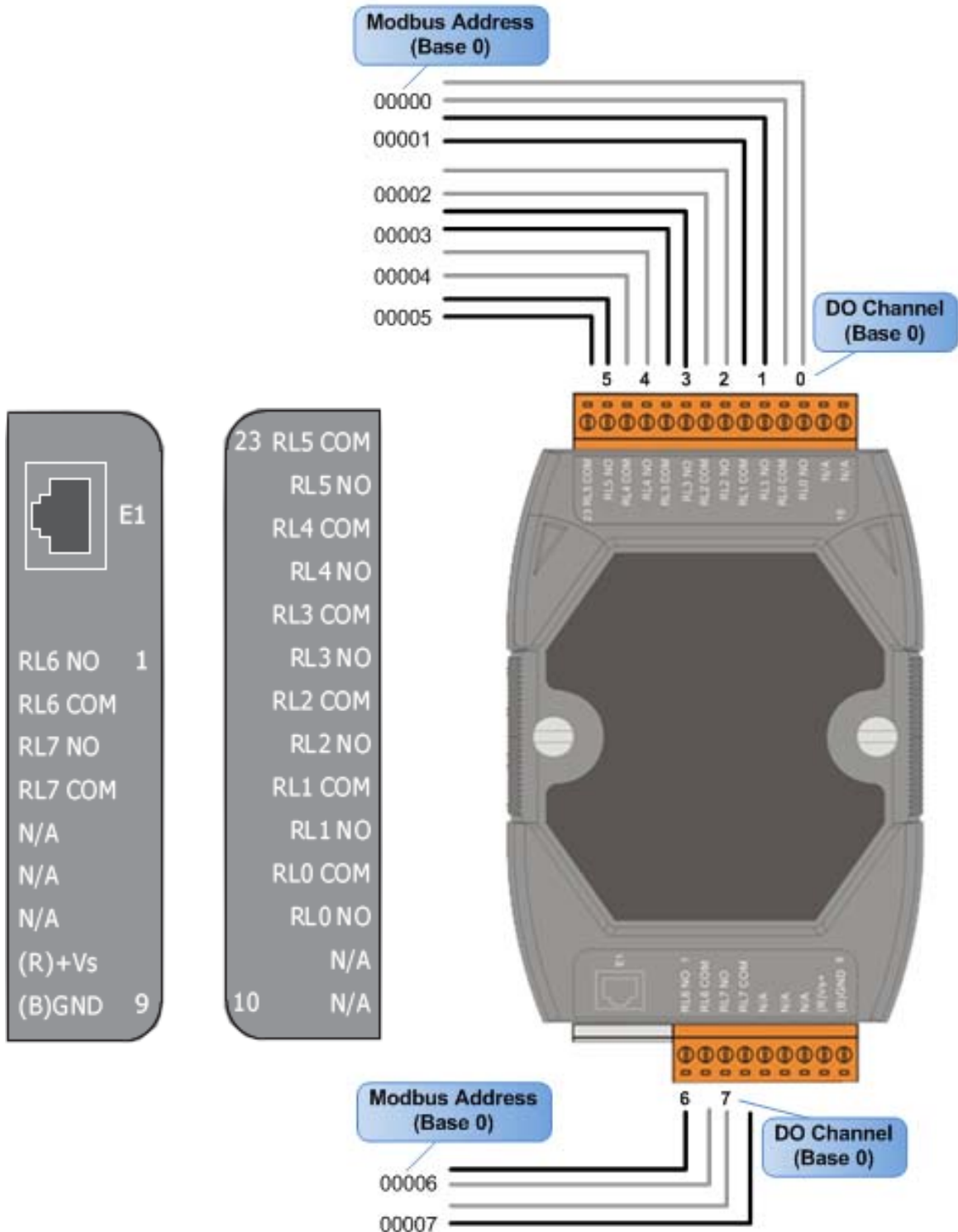
: I/O Address Mapping

: Counter Address Mapping



2.3.8 PETL-7066/7067

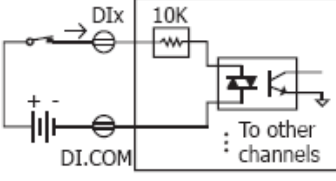
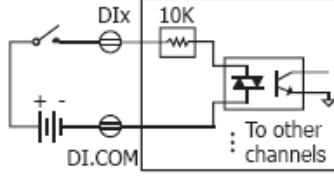
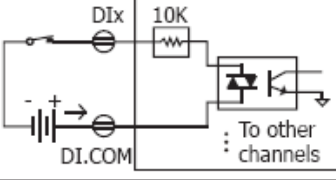
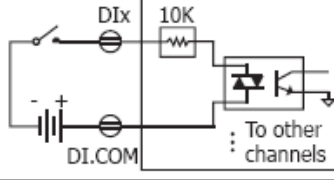
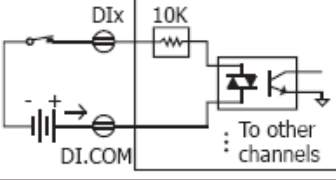
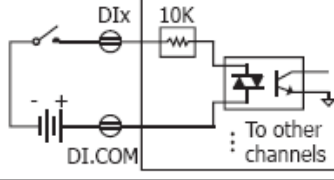
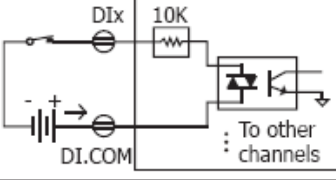
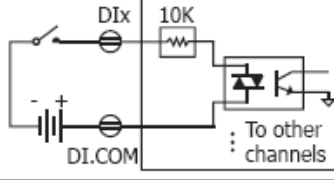
 : I/O Address Mapping



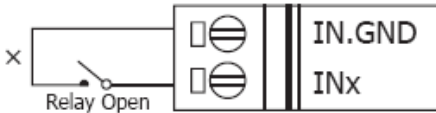
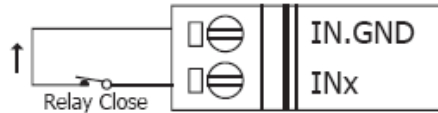
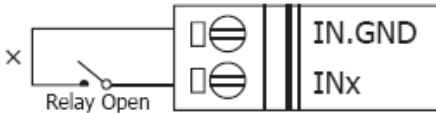
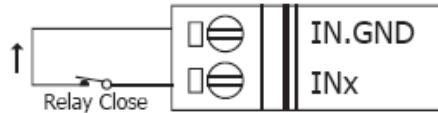
2.4. Wiring Connections

2.4.1. Input Wiring

➤ **PETL-7044/7050/7051/7052/7060/7065:**

Digital Input	Readback as 1	Readback as 0
Sink	+10 ~ +50 V _{DC} 	OPEN or <4 V _{DC} 
	+10 ~ +50 V _{DC} 	OPEN or <4 V _{DC} 
Source	+10 ~ +50 V _{DC} 	OPEN or <4 V _{DC} 
	+10 ~ +50 V _{DC} 	OPEN or <4 V _{DC} 

➤ **PETL-7053:**

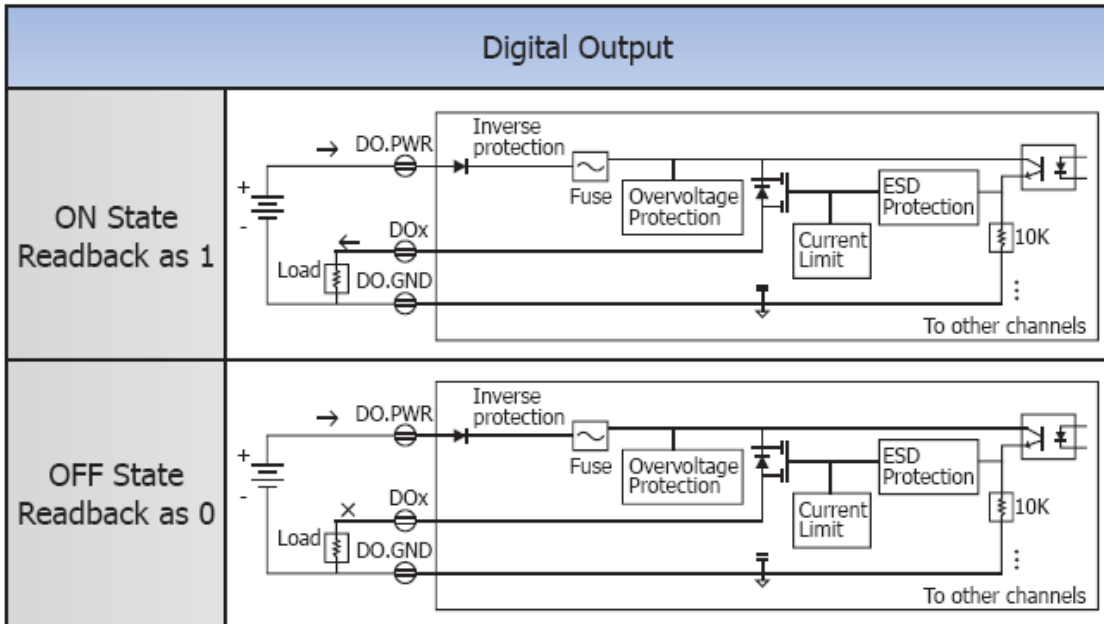
Input Type	Readback as 1	Readback as 0
Dry Contact	Relay Off 	Relay On 
	Relay Off 	Relay On 

2.4.2. Output Wiring

➤ PETL-7042/7044/7050:

Output Type	Readback as 1	Readback as 0
	Relay ON	Relay Off
Drive Relay		
Resistance Load		

➤ PETL-7052:



➤ **PETL-7060/7067:**

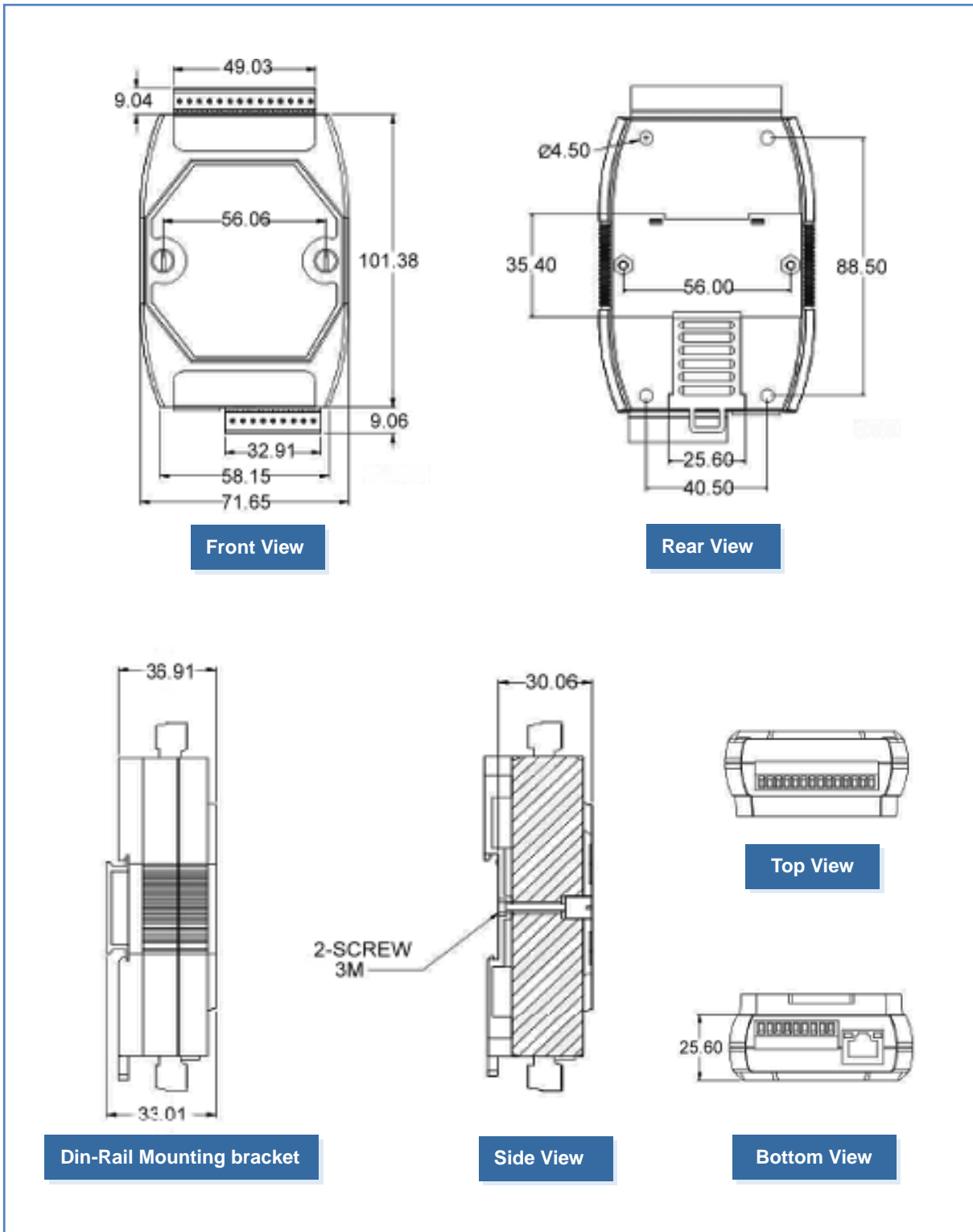
Digital Output	Readback as 1	Readback as 0
	Relay On	Relay Off
Relay Output		

➤ **PETL-7065/7066:**

Output Type	Readback as 1	Readback as 0
	Relay On	Relay Off
Form A Relay Contact		

2.5. Dimensions

All dimensions are in millimeters.



3. Getting Started

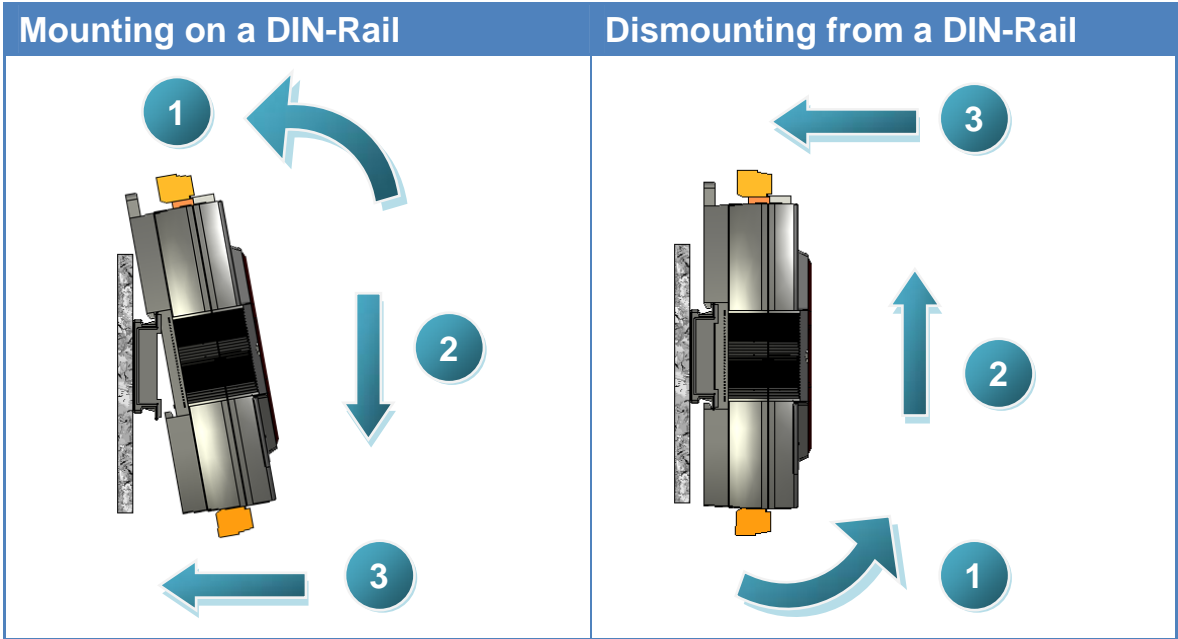
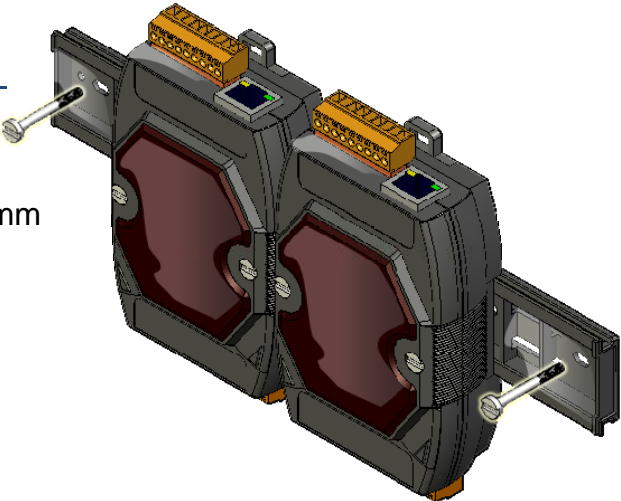
This chapter provides a basic overview of how to install, configure and operate your PETL-7000 series module.

3.1. Mounting the Module

The PETL-7000 module can be mounted by attaching the bottom of the chassis to a DIN-Rail, the wall or if can be piggybacked to another module.

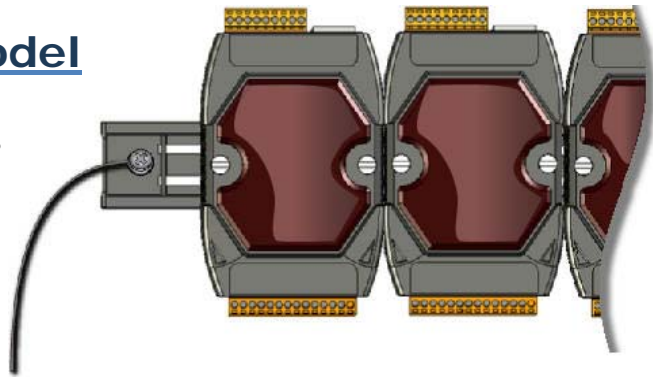
➤ DIN-Rail mounting

The PETL-7000 module contains simple rail clips to enable it to be reliably mounted on a standard 35 mm DIN rail.



Din-Rail Mountable Model

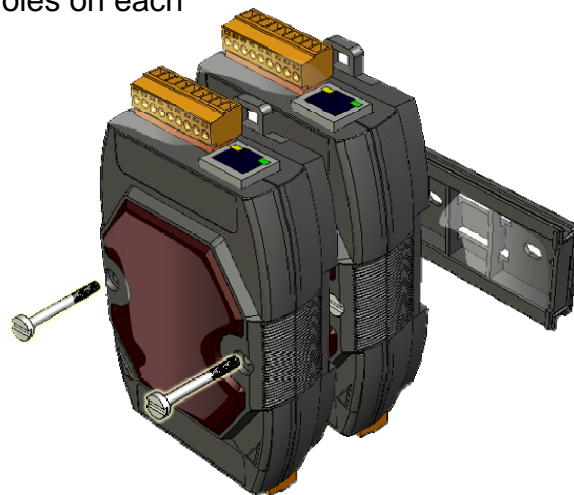
There are three Din-Rail versions available that enable a variety of ICP DAS devices to be mounted. Each is made of stainless steel and has a ground wire attached at one end.



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

➤ Piggyback Mounting

PETL-7000 series modules contain holes on each side to enable piggyback mounting.

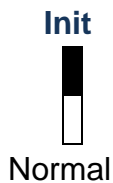


3.2. Configuring the Boot Mode

All PETL-7000 series modules have two operating modes that can be selected using the switch mechanism incorporated on the chassis.

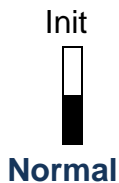
➤ Init Mode

Init Mode should only be selected when updating the firmware or troubleshooting.



➤ Normal Mode

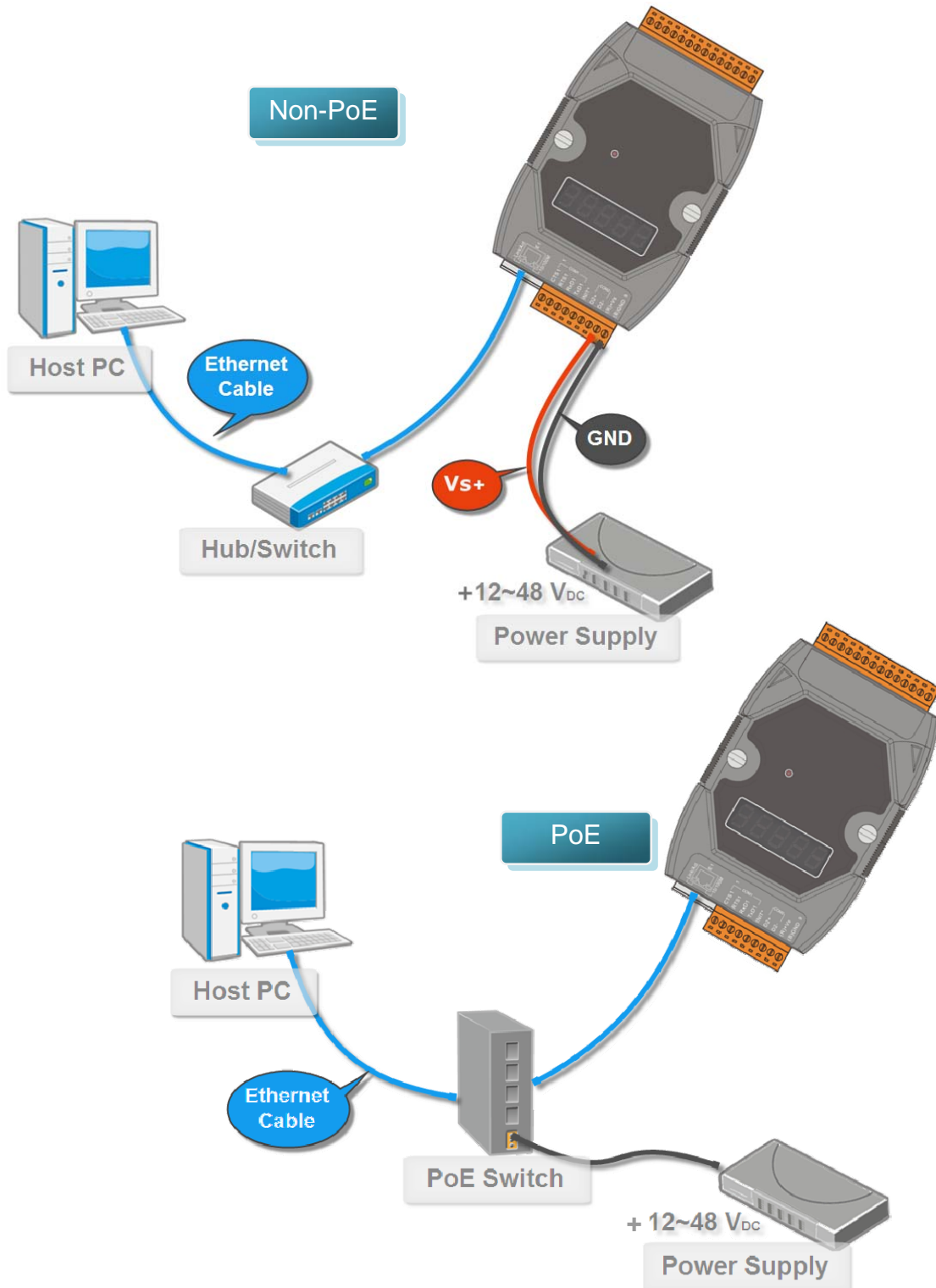
Normal Mode is the default operating mode and the mode that should be selected most of the time.



Note: Be sure to return the switch to the Normal position after any firmware update is complete.

3.3. Connecting to Network, PC and Power

All PETL-7000 series modules are equipped with an RJ-45 Ethernet port to allow connection to an Ethernet hub/switch or PC.



3.4. Using eSearch Utility to assign a new IP

The eSearch Utility is a useful tool that provides a quick and easy method of configuring the Ethernet settings for PETL-7000 series modules from a PC.

Step 1: Get the eSearch Utility tool

The eSearch Utility can be obtained either from the companion CD or from our FTP site:

CD:\Napdos\Software\eSearch\

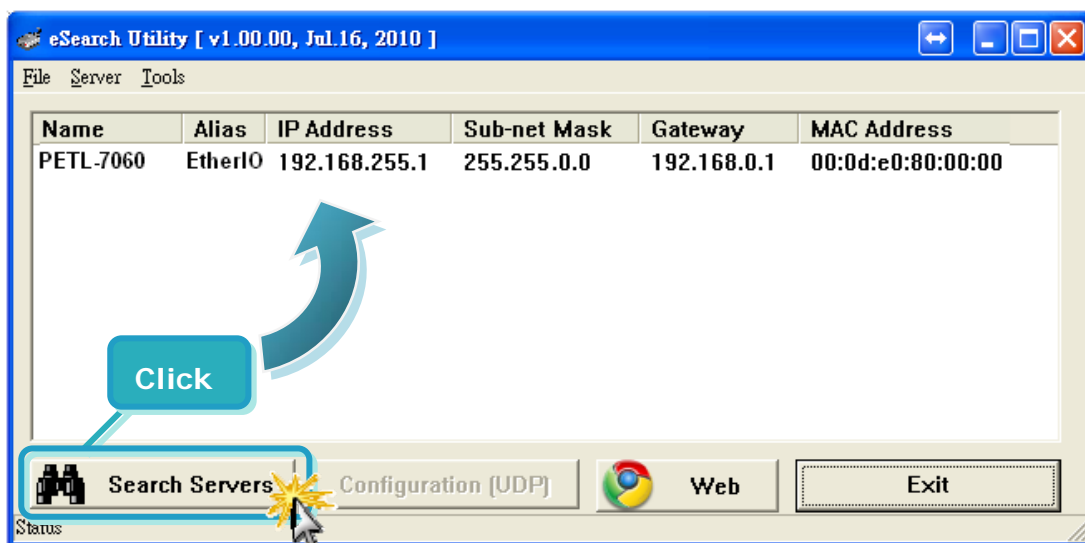
<ftp://ftp.icpdas.com/pub/cd/6000cd/napdos/software/eSearch/>

Step 2: Run the eSearch Utility

Double-click the eSearch Utility.



Step 3: Click the “Search Servers” button to search for your PETL-7000 module

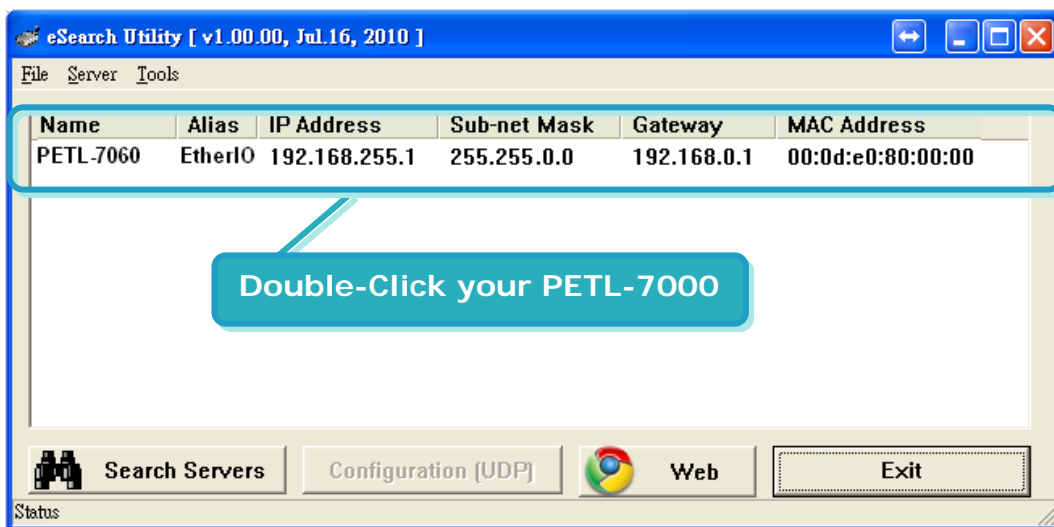


Step 4: Double-Click your PETL-7000 to configure the settings.

PETL-7000 series modules are IP-based devices that may not be suitable for your network using a default IP address. Therefore, you must first assign a new IP address to the PETL-7000 module depending on your network settings.

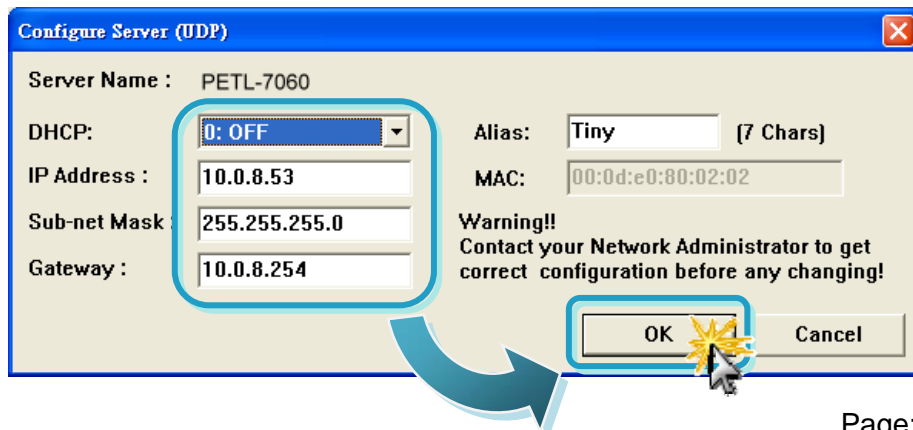
The factory default IP settings are as follows:

Item	Default
IP Address	192.168.255.1
Subnet Mask	255.255.0.0
Gateway	192.168.0.1



Step 5: Assign a new IP address and then click the “OK” button

Contact your Network Administrator to obtain the correct network configuration. Modify the network settings and then click the “OK” button. The PETL-7000 series module will use the new settings immediately.



4. Web Configuration

All PETL-7000 series modules contain an advanced web configuration system that provides I/O accessibility to the PETL-7000 module via a web browser.

Logging in to the PETL-7000 Web Server

You can login to the PETL-7000 web server from any computer that has Internet access capability.

Step 1: Open a browser

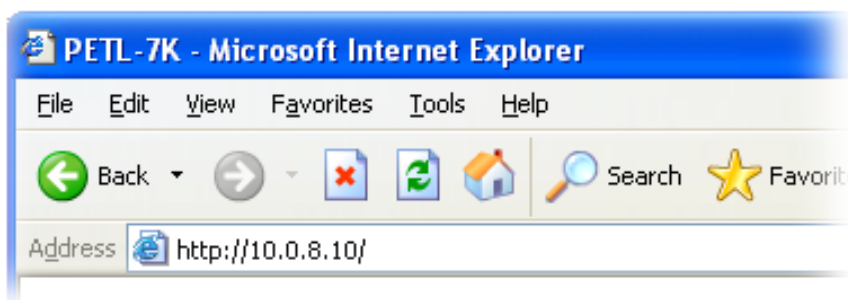
For example, Mozilla Firefox, Google Chrome and Internet Explorer are reliable and popular internet browsers that can be used to configure PETL-7000 series modules.



If using IE, please disable its cache to avoid browser accessing error. The detail settings steps refer to “Appendix: A”.

Step 2: Enter the URL address of the PETL-7000

Make sure you have correctly configured the network settings of the PETL-7000 module, or refer to Section 3.4 “Using eSearch Utility to Assign a New IP”.

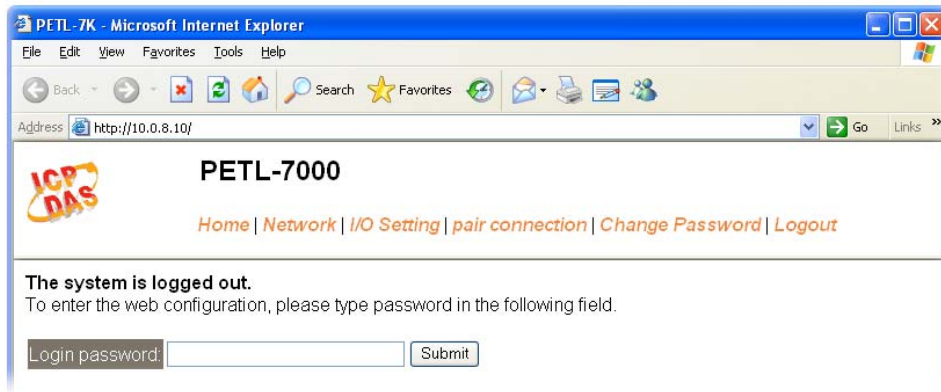


Step 3: Enter the Password

After entering the IP address, the login dialog page will prompt you to enter a password.

The factory default password is as follows:

Item	Default
Login password	Admin



Step 4: Login to the PETL-7000 web server

After logging into the PETL-7000 web server, the main page will be displayed.

Status & Configuration

Model Name:	PETL-7060	Alias Name:	EtherIO
Firmware Version:	v1.1.0[Aug.19 2010]	MAC Address:	00-0D-E0-FF-FF-FF
IP Address:	10.0.8.246	TCP Port Timeout: (Socket Watchdog, Seconds):	180
Initial Switch:	OFF	System Timeout: (Network Watchdog, Seconds)	0

DI/DO

ALL DI:	Value	Digital Counter	High Latched	Low Latched
DI 0:	OFF	0	Disable	Disable
DI 1:	OFF	0	Disable	Disable
DI 2:	-	-	-	-
DI 3:	-	-	-	-

4.1. Home page

The Home tab links to the main page, which is divided in to three parts.



The first part of the page provides basic information about the PETL-7000 hardware and software.

Status & Configuration

Model Name:	PETL-7060	Alias Name:	EtherIO
Firmware Version:	v1.1.0[Aug.19 2010]	MAC Address:	00-0D-E0-FF-FF-FF
IP Address:	10.0.8.246	TCP Port Timeout: (Socket Watchdog, Seconds):	180
Initial Switch:	OFF	System Timeout: (Network Watchdog, Seconds)	0

The second part provides information about the status of the I/O.

DI/DO

ALL DI:	Value	Digital Counter	High Latched	Low Latched											
DI 0:	OFF	0	Disable	Disable											
DI 1:	OFF	0	Disable	Disable											
DI 2:	-	-	-	-											
DI 3:	-	-	-	-											
DI 4:	-	-	-	-											
DI 5:	-	-	-	-											
DI 6:	-	-	-	-											
DI 7:	-	-	-	-											
DO7	-	DO6	-	DO5	-	DO4	-	DO3	-	DO2	-	DO1	OFF	DO0	OFF

The third part provides the status of the I/O pair-connections.

Current port settings:

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

4.2. Network Settings



PETL-7000

[Home](#) [Network](#) [I/O Settings](#) [PWM](#) [Pair Connection](#) [Filter](#) [Change Password](#) [Logout](#)

4.2.1. Network and Miscellaneous Settings

Check the Model name and the software information

Network and Miscellaneous Settings

Model Name:	PETL-7060	Alias Name:	EtherIO
Firmware Version:	v1.1.0[Aug.19 2010]	MAC Address:	00-0D-E0-FF-FF-FF
IP Address:	10.0.8.246	TCP Port Timeout: (Socket Watchdog, Seconds):	180
Initial Switch:	OFF	System Timeout: (Network Watchdog, Seconds)	0

The software information includes the following data items:

Model Name, Firmware version, IP Address, Initial Switch, Alias Name, MAC Address, TCP Port Timeout and System Timeout.

After updating the PETL-7000 firmware, you can check the PETL-7000 software version information from this page.

4.2.2. IP Address Selection

IP Address Selection

Address Type:	<input type="text" value="Static IP"/>
Static IP Address:	<input type="text" value="192"/> <input type="text" value="168"/> <input type="text" value="255"/> <input type="text" value="1"/>
Subnet Mask:	<input type="text" value="255"/> <input type="text" value="255"/> <input type="text" value="0"/> <input type="text" value="0"/>
Default Gateway:	<input type="text" value="192"/> <input type="text" value="168"/> <input type="text" value="0"/> <input type="text" value="1"/>
Alias Name:	<input type="text" value="EtherIO"/> (Max. 18 chars)
MAC Address:	<input type="text" value="00-0D-E0-FF-FF-FF"/> (Format: FF-FF-FF-FF-FF-FF)
Local TCP port:	<input type="text" value="502"/> (Default: 502)
Local Modbus Net ID:	<input type="text" value="1"/> (Default: 1)
<input type="button" value="Update Settings"/>	

■ Item Descriptions:

Item	Description
Address Type	Static IP: If you don't have a DHCP server in your network, you can configure the network settings manually. Please refer to the section “4.2.2.2 Manually Configuration”
	DHCP/AutoIP: Dynamic Host Configuration Protocol (DHCP) is a network application protocol that automatically assigns an IP address to each device. Please refer to the section “4.2.2.1 Dynamic Configuration”
Static IP Address	Each PETL-7000 on the network must have a unique IP address. This item used to assign specific IP address.
Subnet Mask	The subnet mask indicates which portion of the IP address is used to identify the local network or subnet.
Default Gateway	A gateway (or router) is a system that is used to connect an individual network with one or more additional networks.
Alias Name	Each PETL-7000 can be allocated a unique alias name so that it can be identified the network.
MAC Address	The User-defined MAC address.
Local TCP port	Default is 502
Local Modbus Net ID	Default is 1
Update Settings	Click this button to save the new settings to the PETL-7000.

4.2.2.1. Dynamic Configuration

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

Step 1: Select “DHCP/ AutoIP” as the address type

Step 2: Click the “Update Settings” button to finish the configuration

The screenshot shows a configuration form with the following fields and values:

- Address Type: DHCP/AutoIP (highlighted with a blue box and a circled '1')
- Static IP Address: 192 . 168 . 255 . 1
- Subnet Mask: 255 . 255 . 0 . 0
- Default Gateway: 192 . 168 . 0 . 1
- Alias Name: EtherIO (Max. 18 chars)
- MAC Address: 00-0D-E0-FF-FF-FF (Format: FF-FF-FF-FF-FF-FF)
- Local TCP port: 502 (Default: 502)
- Local Modbus Net ID: 1 (Default: 1)
- Update Settings button (highlighted with a blue box and a circled '2')

4.2.2.2. Manual Configuration

When using manual configuration, you have to assign all the network settings in the following manner:

Step 1: Select the “**Static IP**” as the address type

Step 2: Enter the appropriate **network settings**

Step 3: Click the “**Update Settings**” button to finish configuration

Address Type:	Static IP	1
Static IP Address:	10 . 0 . 8 . 100	2
Subnet Mask:	255 . 255 . 255 . 0	
Default Gateway:	10 . 0 . 8 . 254	
Alias Name:	Etherl0	(Max. 18 chars)
MAC Address:	00-0D-E0-FF-FF-FF	(Format: FF-FF-FF-FF-FF-FF)
Local TCP port:	502	(Default: 502)
Local Modbus Net ID:	1	(Default: 1)
Update Settings		3

4.2.3. General Configuration Settings

The General Configuration Settings provides the following functions:

General Configuration Settings

System Timeout (Network Watchdog)	0	(30 ~ 65535 Seconds, Default: 0, Disable: 0)
TCP Timeout (seconds)	180	(1 ~ 65535 seconds, Default= 180, Disable= 0)
Web Auto-logout	10	(1 ~ 65535 minutes, Default: 10, Disable: 0)
Update Settings		

■ Item Descriptions:

Item	Description
System Timeout (Network Watchdog)	If no network communication occurs for a certain period, the system will be rebooted based on the configured system timeout value.
TCP Timeout (Seconds)	If Modbus TCP communication is lost for a certain period, the system will cut off the connection.
Web Auto-logout	If there is no action for a certain period in the web server, user account will be logout.
Update Settings	Click this button to save the new settings to the PETL-7000.

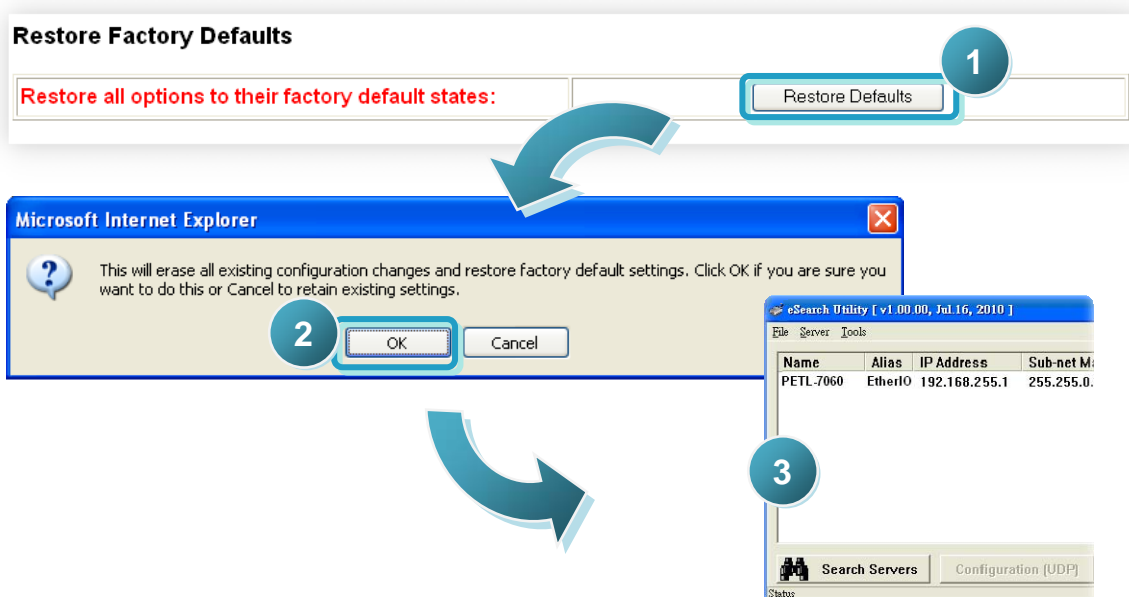
4.2.4. Restore Factory Defaults

To reset the settings to their factory default, follow these 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 PETL-7000 module is reset to factory default settings for use with the eSearch Utility. Refer to the Section [3.4 Using eSearch Utility to assign a new IP](#)”.



■ The table below lists the factory default settings:

Data Item	Factory Default Settings
Network Settings	
IP	192.168.255.1
Gateway	192.168.0.1
Mask	255.255.0.0
DHCP	Disabled
Basic Settings	
Module Name	Depends on the module name
Alias Name	EtherIO

4.3. I/O Settings



PETL-7000

Home | Network | **I/O Settings** | PWM | Pair Connection | Filter | Change Password | Logout

4.3.1. DO Control

DO control

Set DO value	<input type="text" value="0x0"/>	bit 7~4(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>)	bit 3~0(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>)
<input type="button" value="Update Settings"/>			

■ Item Descriptions:

Item	Description
Set DO value	User can set certain value to DO manually
Update Settings	Click this button to save the new settings to the PETL-7000.

4.3.2. DI/DO Configuration

Host Watchdog Timeout (seconds)	<input type="text" value="0"/>	(5 ~ 65535 Seconds, Default= 0, Disable= 0)
Safe Value for DO	<input type="text" value="0x0"/>	bit 7~4(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>) bit 3~0(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>)
Power-On Value for DO	<input type="text" value="0x0"/>	bit 7~4(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>) bit 3~0(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>)
Enable High Speed Digital Counter	<input type="text" value="0x0"/>	bit 7~4(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>) bit 3~0(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>)
Clear High Speed Digital Counter	<input type="text" value="0x0"/>	bit 7~4(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>) bit 3~0(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>)
Preset Value for High Speed Digital Counter	<input type="text" value="0"/> DI7 <input type="text" value="0"/> DI6 <input type="text" value="0"/> DI5 <input type="text" value="0"/> DI4 <input type="text" value="0"/> DI3 <input type="text" value="0"/> DI2 <input type="text" value="0"/> DI1 <input type="text" value="0"/> DI0	
Enable DI Frequency Measurement	<input type="text" value="0x0"/>	bit 7~4(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>) bit 3~0(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>) (Scan Mode <input type="text" value="1000 ms"/>) (Moving AVG. <input type="text" value="1"/>)
Enable all Latched Value for DI	<input type="text" value="0"/>	(Disable: 0 ; Enable: 1)
Clear All DI Latched Status (High)	<input type="text" value="0"/>	(Disable: 0 ; Enable: 1)
Clear All DI Latched Status (Low)	<input type="text" value="0"/>	(Disable: 0 ; Enable: 1)
<input type="button" value="Update Settings"/>		

■ Item Descriptions:

Item	Description
Host Watchdog Timeout (Seconds)	If Modbus TCP communication is lost for a certain period, the safe value will be set.
Safe Value for DO	If Modbus TCP communication is lost for a certain period, the DO status will be set to the user defined safe value.
Power-On value for DO	On boot up, the DO status is set to the Power-on value.
Enable high speed digital counter	Set the counters to enable.
Clear high speed digital counter	Clear the all values of all counters.
Preset value for high speed digital counter	Sets the default values for the counters.
Enable DI frequency measurement	Set the frequency measurement to enable.
	Scan Mode: 1000 ms ==> 1 ~ 3.5 kHz, (+/- 1 Hz error) 100 ms ==> 10 ~ 3.5 kHz, (+/- 10 Hz error) Single-pulse ==> 0.01 ~ 1 Hz, (+/- 0.01 Hz error) Moving Average: 1 ==> No Average 2 ==> The average of 2 continuous sample values 4 ==> The average of 4 continuous sample values 8 ==> The average of 8 continuous sample values
Enable all latched value for DI	Set the latched status to enable.
Clear all DI latched status (high)	Clear the high latched status of all counters.
Clear all DI latched status (low)	Clear the low latched status of all counters.
Update Settings	Click this button to save the new settings to the PETL-7000.

4.4. PWM Setting

4.4.1. PWM Configuration



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PWM Configuration:

Enable PWM	<input type="text" value="0x0"/> bit 7~4(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>) bit 3~0(<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>)
Duty Cycle (High , Low)	(<input type="text" value="1000"/> , <input type="text" value="1000"/>)D00
	(<input type="text" value="1000"/> , <input type="text" value="1000"/>)D01
	(<input type="text" value="1000"/> , <input type="text" value="1000"/>)D02
	(<input type="text" value="1000"/> , <input type="text" value="1000"/>)D03
	(<input type="text" value="1000"/> , <input type="text" value="1000"/>)D04
	(<input type="text" value="1000"/> , <input type="text" value="1000"/>)D05
	(<input type="text" value="0"/> , <input type="text" value="0"/>)D06
	(<input type="text" value="0"/> , <input type="text" value="0"/>)D07
<input type="button" value="Update Settings"/>	

■ Item Descriptions:

Item	Description	Default
Enable PWM	Set the PWM to enable.	0
Duty Cycle	These are 2 parameters each DO channel. The first parameter is the high pulse width, while the second word is the low pulse width. The unit is 1 ms, and the resolution is about 5 ms. (5~65535 ms)	1000 (ms)

Note: Because the characteristic of relay, PETL-706X series (the module with relay) are not suitable to use PWM for a long time.

4.5. I/O Pair-Connection



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4.5.1. Settings

The I/O pair-connection function is a particular feature of PETL-7000 series modules that can enable a pair of DI-to-DO connections via the Modbus TCP (Ethernet).

Settings:

I/O Pair-Connection Settings		Current	Updated
Pair Mode:	Disabled	Disabled	Disable <input type="button" value="v"/>
Remote Server IP:	Disabled	10 . 1 . 120 . 53	<input type="text" value="10"/> . <input type="text" value="1"/> . <input type="text" value="120"/> . <input type="text" value="53"/>
Remote TCP Port:	Disabled	502	<input type="text" value="502"/> (Default: 502)
Connection Timeout:	5000	5000	<input type="text" value="5000"/> (Default: 5000 ms)
Reconnect Interval:	10000	10000	<input type="text" value="10000"/> (Default: 10000 ms)
Remote Net ID:	1	1	<input type="text" value="1"/> (Default: 1)
Scan Time:	1000	1000	<input type="text" value="1000"/> (Default: 1000 ms)
Remote DI to Local DO		Current	Updated (Poll Mode)
Local DO Address:	0	0	<input type="text" value="0"/> (Default: 0)
Remote DI Address:	0	0	<input type="text" value="0"/> (Default: 0)
Remote DI Count:	0	0	<input type="text" value="0"/> (For Local DO)
Local DI to Remote DO		Current	Updated (Push Mode) <input type="button" value="ICP"/> <input type="button" value="v"/>
Local DI Address:	0	0	<input type="text" value="0"/> (Default: 0)
Remote DO Address:	0	0	<input type="text" value="0"/> (Default: 0)
Local DI Count:	0	0	<input type="text" value="0"/> (For Remote DO)
Force Update Time:	60	60	<input type="text" value="60"/> (Default: 60 s)

■ Item Descriptions:

Item	Description	Default
I/O Pair-Connection Settings		
Pair Mode	Enable/Disable the I/O pair-connection	Disabled
	Range: -	
Remote Server IP	The IP address of the remote device	0
	Range:-	
Remote TCP Port	The Port number of the remote device	502
	Range: 0~65535	
Connection Timeout	The maximum time period before abandoning an attempt to establish a connection	5000
	Range: 1000~42949672965 ms	
Reconnect Interval	The interval time of reconnect	10000 ms
Remote Net ID	Modbus Net ID of remote device	1
	Range: 1~247	
Scan Time	The Time period required to establish communication	1000
	Range: 1000~42949672965 ms	
Remote DI to Local DO (Poll mode)		
Local DO Address	The DO base address of the local DO register that will be mapped to the remote DI device.	0
	Range: Depends on the type of PETL-7000 module	
Remote DI Address	The DI base address of the Remote DI device that will be mapped to the local DO register	0
	Range: Depends on the type of remote device	
Remote DI count	The DI count that is mapped from the base address	0
	Range: 1~255	
Local DI to Remote DO (Push Mode)		
Mode	TCP/UDP	TCP
Local DI Address	The DI base address of local DI register that will be mapped to the remote DO device.	0
	Range: Depend on the PETL-7000	
Remote DO Address	The DO base address of the Remote DO device that will be mapped to the local DI register	0
	Range: Depends on the type of remote device	
Local DI count	The DI count that is mapped from the base address	0
	Range: 1~255	
Force Update Time	The interval time to force pushing	60 s

4.6 Filter



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4.6.1 Filter Settings

This filter settings page is used to query or edit IP filter list. The IP filter list restricts the access of packets based on the IP header. If one or more IP address are saved into the IP filter table, only clients whose IP is specified in the IP filter list can access the PETL-7000 series module.

Filter Settings:

IP Filter List	IP Address
IP1:	0.0.0.0
IP2:	0.0.0.0
IP3:	0.0.0.0
IP4:	0.0.0.0
IP5:	0.0.0.0

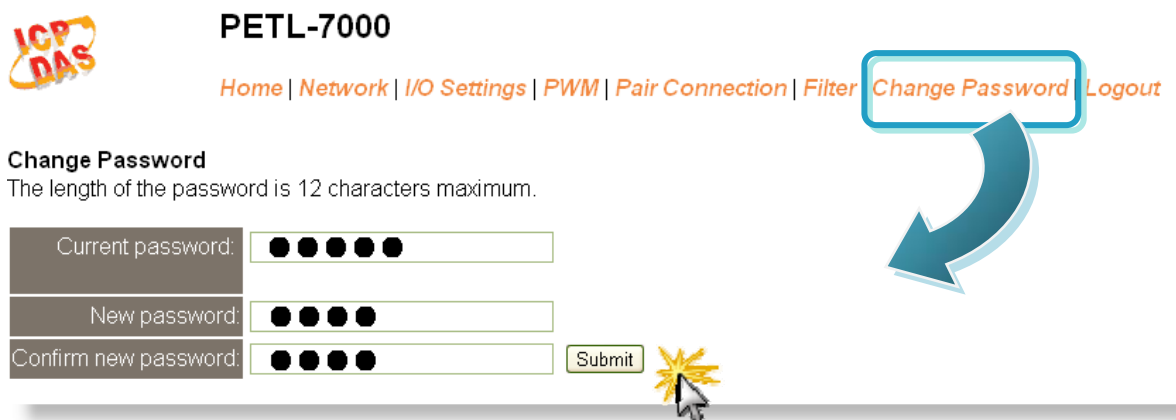
Add . . . To The List
 Delete IP#
 Delete ALL
 Save to Flash

■ Item Descriptions:

Item	Description
Add "IP" to the list	Adds an IP address to the IP filter list
Delete IP # "number"	Deletes IP# from the IP filter list
Delete All	Deletes all items from the IP filter list
Save to Flash	Save a new IP filter list to the Flash.
Submit	Click this button to save the new settings to the PETL-7000.

4.7 Change Password

To change a password, first enter the old password (default is **Admin**) in the “**Current password**” field and then enters a new password in the “**New password**” field. Re-enter the new password in the “**Confirm new password**” field, and then click the “**Submit**” button to update your password.



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Change Password
The length of the password is 12 characters maximum.

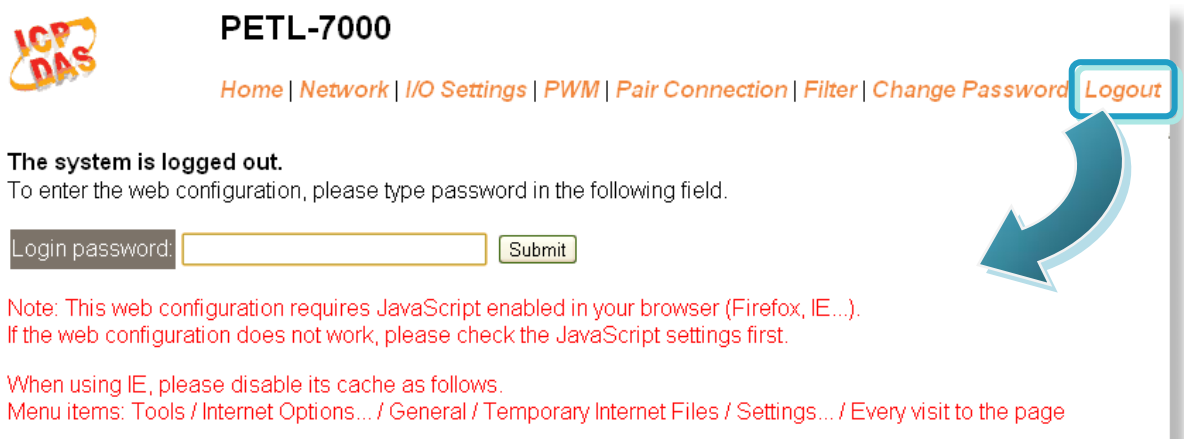
Current password:

New password:

Confirm new password:

4.8 Logout

Click the “**Logout**” tab to log out from the system and return to the login page.



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The system is logged out.
To enter the web configuration, please type password in the following field.

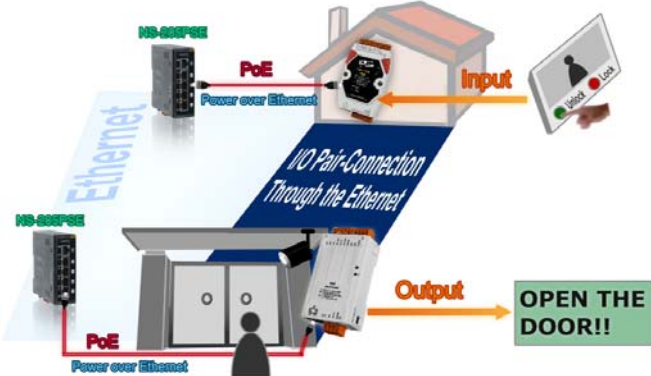
Login password:

Note: This web configuration requires JavaScript enabled in your browser (Firefox, IE...).
If the web configuration does not work, please check the JavaScript settings first.

When using IE, please disable its cache as follows.
Menu items: Tools / Internet Options... / General / Temporary Internet Files / Settings... / Every visit to the page

5. I/O Pair-Connection Applications

The PETL-7000 series module can be used to create DI to DO pair-connect through the Ethernet. Once the configuration is completed, the modules can poll the status of the local DI channels and then use the Modbus/TCP protocol to continuously write to a remote DO device in the background. It's useful when connecting digital I/O devices that do not themselves have Ethernet capability.

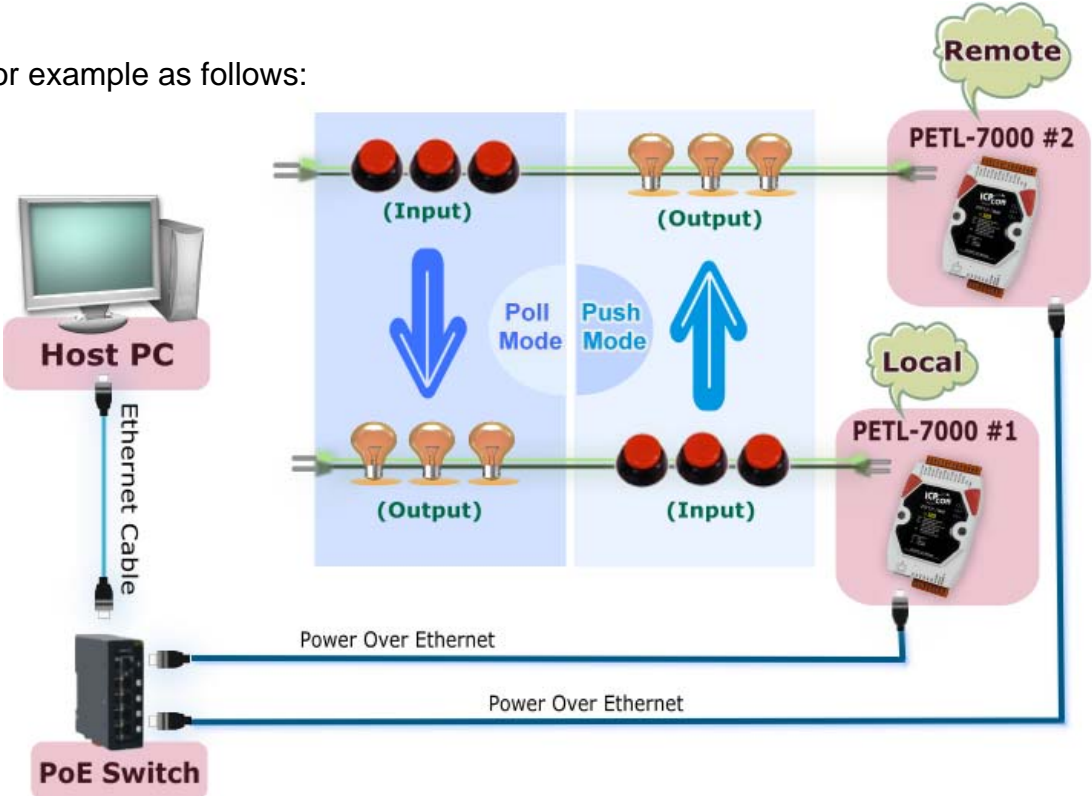


Please refer to the following steps to set I/O pair-connection function:

Step 1: Connecting to a network, PC and Power

Confirm that the PETL-7000 series modules are functioning correctly. Refer to [Section 3. Getting Started](#) for more details.

For example as follows:



Step 2: Connecting Ethernet Settings

Contact your Network Administrator to obtain a correct and functioning network configuration (such as **IP/Mask/Gateway details**) for PETL-7000 series modules. Please also refer to [Section 3.4 Using eSearch Utility to assign a new IP](#).

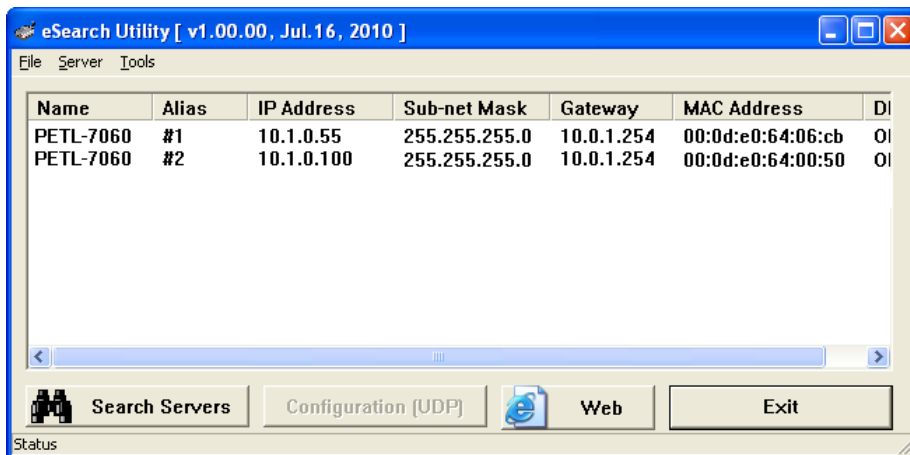


Figure 5-1

Step 3: Connecting I/O Pair-Connection on Web Server

■ Push Mode

- 1 Select your **PETL-7000 #1** and click **“Web”** button on the eSearch Utility to launch the browser program for connecting to the web server.
- 2 Enter the password (**default: Admin**) in the Login password field, and then click the **“Submit”** button to enter the configuration page.

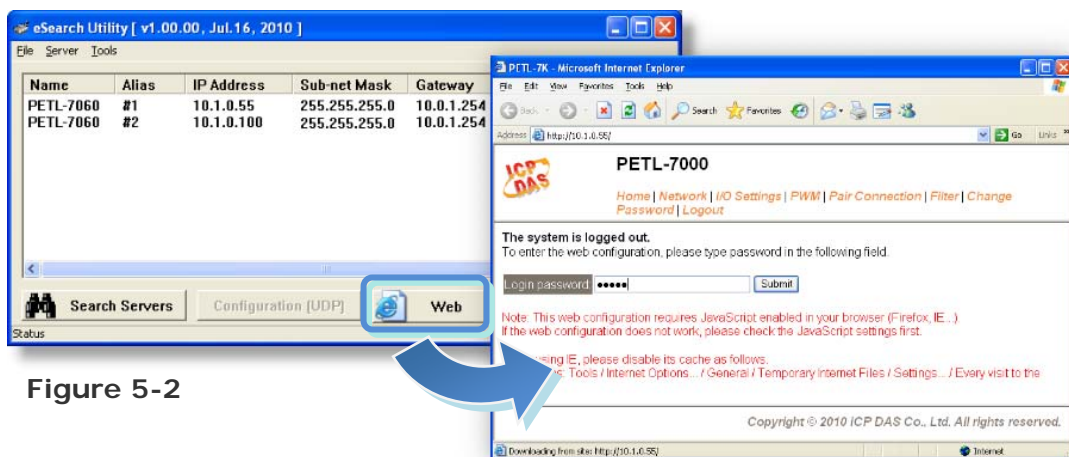


Figure 5-2

- 3 Click the **“Pair Connection”** link to enter the settings page.

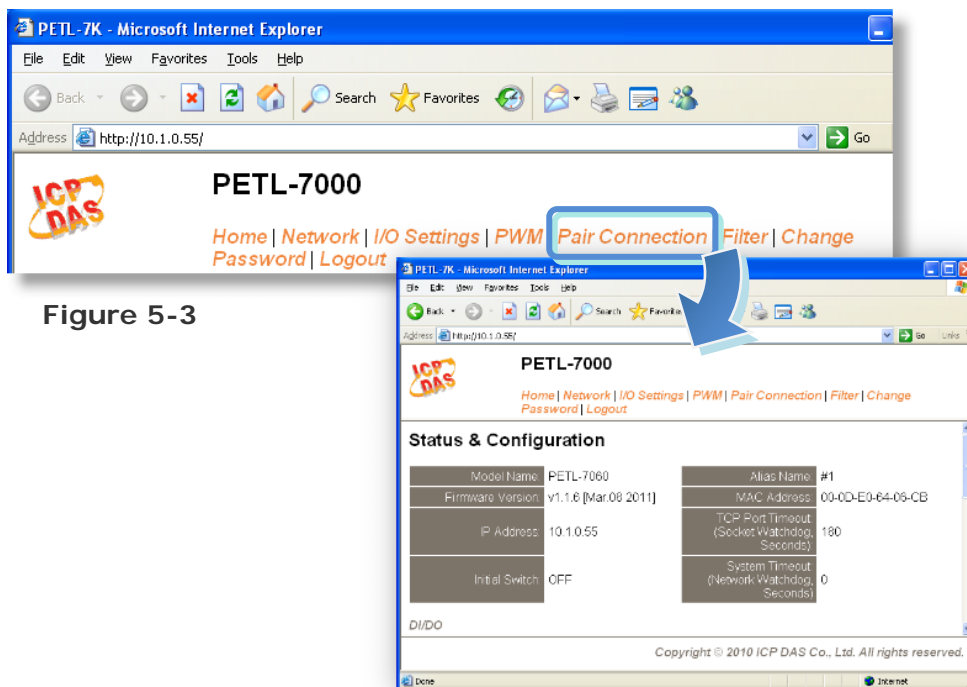


Figure 5-3

- 4 Select the **“Enable”** option from the **“Pair Mode”** drop down options.
- 5 Type the **IP address of the PETL-7000 #2** in **“Remote Server IP”** field.
- 6 Type the **TCP Port of the PETL-7000 #2** in **“Remote TCP Port”** field.

Settings:

I/O Pair-Connection Settings	Current	Updated
Pair Mode:	Disabled	Enable <input type="button" value="v"/>
Remote Server IP:	Disabled	10 . 1 . 0 . 100
Remote TCP Port:	Disabled	502 (Default: 502)
Connection Timeout:	5000	5000 (Default: 5000 ms)
Reconnect Interval:	10000	10000 (Default: 10000 ms)
Remote Net ID:	1	1 (Default: 1)
Scan Time:	1000	1000 (Default: 1000 ms)

Figure 5-4

- 7 Type a **DI Count number for the PETL-7000 #1** in the “**Local DI Count**” field.
For example, we set “3” in the “Local DI Count” field. This means the DI x3 of PETL-7000 #1 are mapped to DO x3 of PETL-7000 #2.
- 8 Click the “**Submit**” button to complete the configuration.

Remote DI to Local DO		Current	Updated (Poll Mode)
Local DO Address:	0	0	<input type="text" value="0"/> (Default: 0)
Remote DI Address:	0	0	<input type="text" value="0"/> (Default: 0)
Remote DI Count:	0	0	<input type="text" value="0"/> (For Local DO)
Local DI to Remote DO		Current	Updated (Push Mode) TCP <input type="button" value="v"/>
Local DI Address:	0	0	<input type="text" value="0"/> (Default: 0)
Remote DO Address:	0	0	<input type="text" value="0"/> (Default: 0)
Local DI Count:	0	3	<input type="text" value="3"/> (For Remote DO)
Force Update Time:	60	60	<input type="text" value="60"/> (Default: 60 s)




Figure 5-5

■ Poll Mode

- 1 Select your **PETL-7000 #1** and click “**Web**” button on the eSearch Utility to launch the browser program for connecting to the web server.
- 2 Enter the password (**default: Admin**) in the Login password field, and then click the “**Submit**” button to enter the configuration page.
- 3 Click the “**Pair Connection**” link to enter the settings page.
- 4 Select the “**Enable**” option from the “**Pair Mode**” drop down options.
- 5 Type the **IP address of the PETL-7000 #2** in “**Remote Server IP**” field.
- 6 Type the **TCP Port of the PETL-7000 #2** in “**Remote TCP Port**” field.

(Refer to **Figures 5-2~5-4** for illustrations of how to perform the above steps.)

- 7 Type a **DI Count** number for the **PETL-7000 #2** in the “**Remote DI Count**” field. For example, we set “**3**” in the “**Remote DI Count**” field. This means the **DI x3** of **PETL-7000 #2** are mapped to **DO x3** of **PETL-7000 #1**.
- 8 Click the “**Submit**” button to complete the configuration.

Remote DI to Local DO		Current	Updated (Poll Mode)
Local DO Address:	0	0	(Default: 0)
Remote DI Address:	0	0	(Default: 0)
Remote DI Count:	0	3	(For Local DO)
Local DI to Remote DO		Current	Updated (Push Mode) TCP
Local DI Address:	0	0	(Default: 0)
Remote DO Address:	0	0	(Default: 0)
Local DI Count:	0	0	(For Remote DO)
Force Update Time:	60	60	(Default: 60 s)


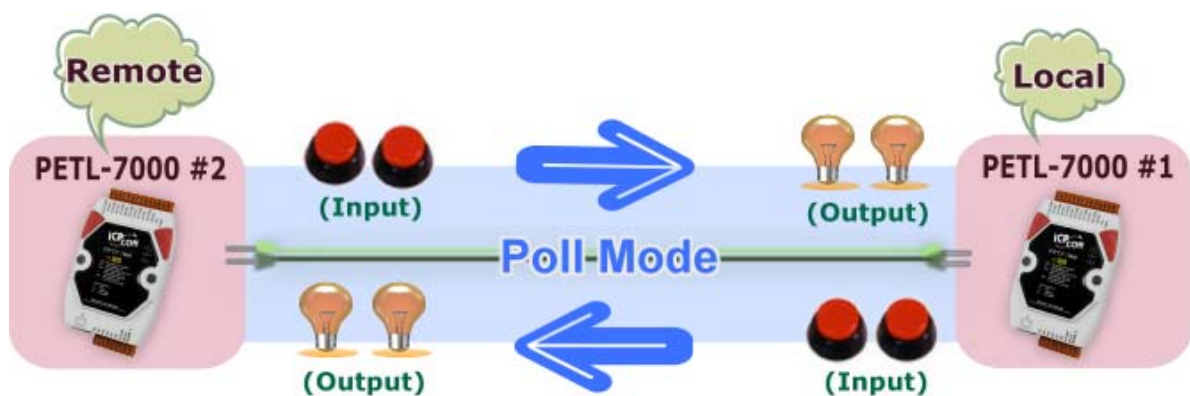
Submit 

Figure 5-6

5.1 Two Ethernet I/O Modules for Poll Mode (One to One)



Step 1: Connecting I/O Pair-Connection on PETL-7000 #1

- 1 Select your **PETL-7000 #1** and click **“Web”** button on the eSearch Utility to launch the browser program for connecting to the web server.
- 2 Enter the password (**default: Admin**) in the Login password field, and then click the **“Submit”** button to enter the configuration page.
- 3 Click the **“Pair Connection”** link to enter the settings page.
- 4 Select the **“Enable”** option from the **“Pair Mode”** drop down options.
- 5 Type the **IP address of the PETL-7000 #2** in **“Remote Server IP”** field.
- 6 Type the **TCP Port of the PETL-7000 #2** in **“Remote TCP Port”** field.

(Refer to **Figures 5-2~5-4** for illustrations of how to perform the above steps.)

- 7 Type a **DI Count number for the PETL-7000 #2** in the **“Remote DI Count”** field. *For example, we set **“2”** in the **“Remote DI Count”** field. This means the **DI x2 of PETL-7000 #2** are mapped to **DO x2 of PETL-7000 #1**.*
- 8 Click the **“Submit”** button to complete the configuration.

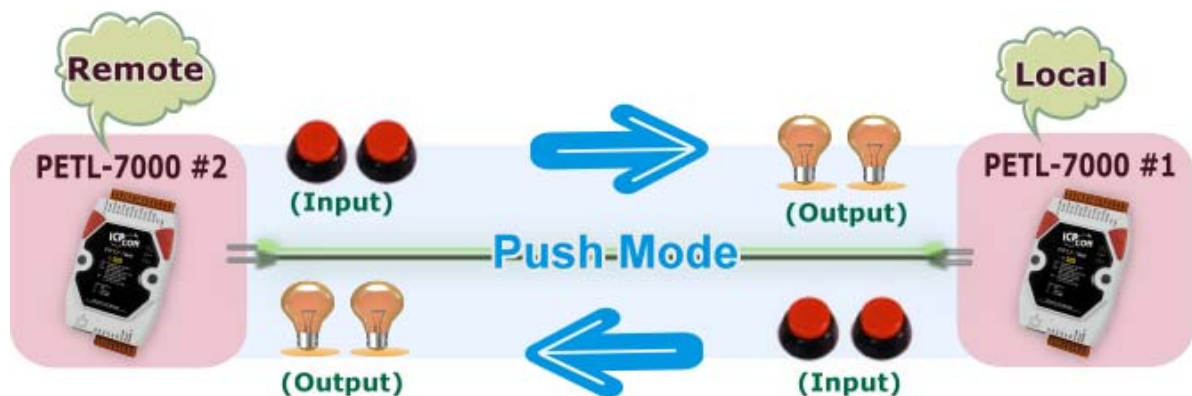
Remote DI to Local DO	Current	Updated (Poll Mode)
Local DO Address:	0	<input type="text" value="0"/> (Default: 0)
Remote DI Address:	0	<input type="text" value="0"/> (Default: 0)
Remote DI Count:	0	<input style="border: 2px solid blue;" type="text" value="2"/> (For Local DO)
Local DI to Remote DO	Current	Updated (Push Mode) TCP ▼
Local DI Address:	0	<input type="text" value="0"/> (Default: 0)
Remote DO Address:	0	<input type="text" value="0"/> (Default: 0)
Local DI Count:	0	<input type="text" value="0"/> (For Remote DO)
Force Update Time:	60	<input type="text" value="60"/> (Default: 60 s)

Figure 5-7

Step 2: Connecting I/O Pair-Connection on PETL-7000 #2

- 1 Select your **PETL-7000 #2** and click “**Web**” button on the eSearch Utility to launch the browser program for connecting to the web server.
- 2 Enter the password (**default: Admin**) in the Login password field, and then click the “**Submit**” button to enter the configuration page.
- 3 Click the “**Pair Connection**” link to enter the settings page.
- 4 Select the “**Enable**” option from the “**Pair Mode**” drop down options.
- 5 Type the **IP address of the PETL-7000 #1** in “**Remote Server IP**” field.
- 6 Type the **TCP Port of the PETL-7000 #1** in “**Remote TCP Port**” field.
(Refer to **Figures 5-2~5-4** for illustrations of how to perform the above steps.)
- 7 Type a **DI Count number for the PETL-7000 #1** in the “**Remote DI Count**” field.
For example, we set “2” in the “Remote DI Count” field. This means the DI x2 of PETL-7000 #1 are mapped to DO x2 of PETL-7000 #2, refer to Figures 5-7 for illustrations.
- 8 Click the “**Submit**” button to complete the configuration.

5.2 Two Ethernet I/O Modules for Push Mode (One to One)



Step 1: Connecting I/O Pair-Connection on PETL-7000 #1

- 1 Select your **PETL-7000 #1** and click **“Web”** button on the eSearch Utility to launch the browser program for connecting to the web server.
- 2 Enter the password (**default: Admin**) in the Login password field, and then click the **“Submit”** button to enter the configuration page.
- 3 Click the **“Pair Connection”** link to enter the settings page.
- 4 Select the **“Enable”** option from the **“Pair Mode”** drop down options.
- 5 Type the **IP address of the PETL-7000 #2** in **“Remote Server IP”** field.
- 6 Type the **TCP Port of the PETL-7000 #2** in **“Remote TCP Port”** field.

(Refer to **Figures 5-2~5-4** for illustrations of how to perform the above steps.)

- 7 Type a **DI Count number for the PETL-7000 #1** in the **“Local DI Count”** field.
*For example, we set “2” in the “Local DI Count” field. This means the **DI x2 of PETL-7000 #1** are mapped to **DO x2 of PETL-7000 #2**.*
- 8 Click the **“Submit”** button to complete the configuration.

Remote DI to Local DO		Current	Updated (Poll Mode)
Local DO Address:	0	0	<input type="text"/> (Default: 0)
Remote DI Address:	0	0	<input type="text"/> (Default: 0)
Remote DI Count:	0	0	<input type="text"/> (For Local DO)
Local DI to Remote DO		Current	Updated (Push Mode) TCP
Local DI Address:	0	0	<input type="text"/> (Default: 0)
Remote DO Address:	0	0	<input type="text"/> (Default: 0)
Local DI Count:	2	2	<input type="text"/> (For Remote DO)
Force Update Time:	60	60	<input type="text"/> (Default: 60 s)




Figure 5-8

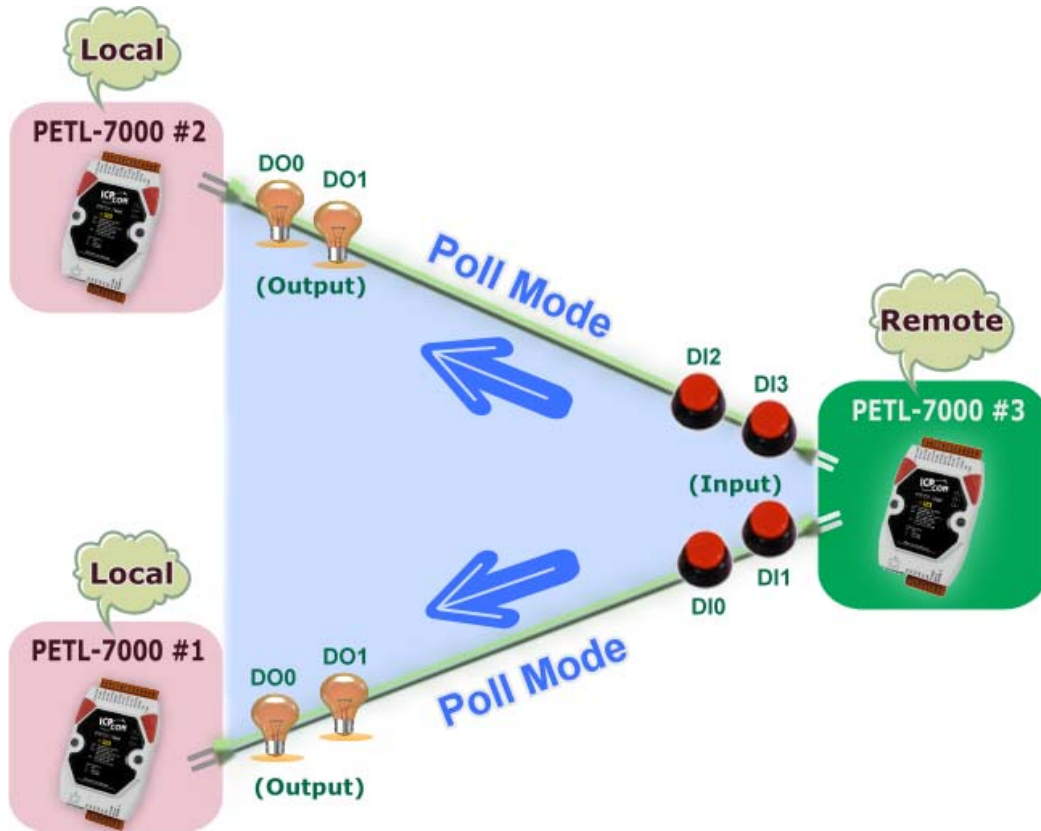
Step 2: Connecting I/O Pair-Connection on PETL-7000 #2

- 1 Select your **PETL-7000 #2** and click “**Web**” button on the eSearch Utility to launch the browser program for connecting to the web server.
- 2 Enter the password (**default: Admin**) in the Login password field, and then click the “**Submit**” button to enter the configuration page.
- 3 Click the “**Pair Connection**” link to enter the settings page.
- 4 Select the “**Enable**” option from the “**Pair Mode**” drop down options.
- 5 Type the **IP address of the PETL-7000 #1** in “**Remote Server IP**” field.
- 6 Type the **TCP Port of the PETL-7000 #1** in “**Remote TCP Port**” field.

(Refer to **Figures 5-2~5-4** for illustrations of how to perform the above steps.)

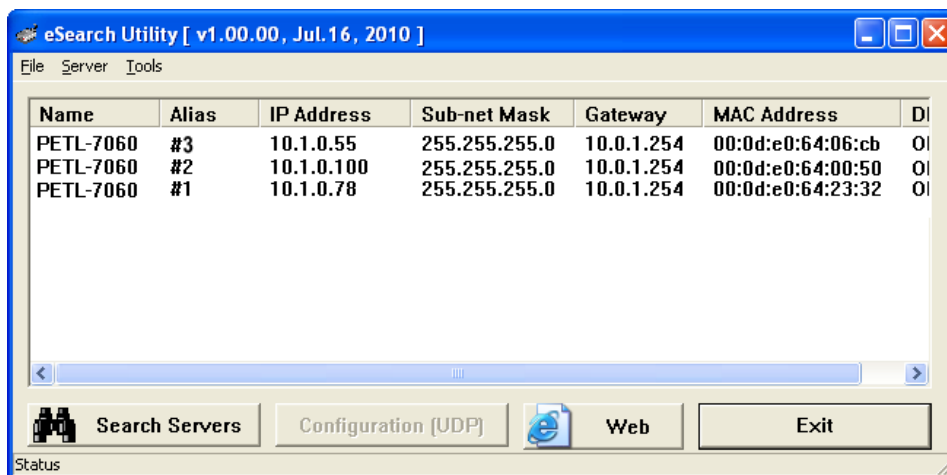
- 7 Type a **DI Count number for the PETL-7000 #2** in the “**Local DI Count**” field.
For example, we set “1” in the “Local DI Count” field. This means the DI x2 of PETL-7000 #2 are mapped to DO x2 of PETL-7000 #1, refer to Figures 5-8 for illustrations.
- 8 Click the “**Submit**” button to complete the configuration.

5.3 Multi Ethernet I/O Modules for Poll Mode (Multi to One)



Step 1: Connecting I/O Pair-Connection on PETL-7000 #1

1. Configuring Ethernet settings for PETL-7000 #1, PETL-7000 #2 and PETL-7000 #3. Please also refer to [Section 3.4 Using eSearch Utility to assign a new IP](#).



Figures 5-9

- 2 Select your **PETL-7000 #1** and click **“Web”** button on the eSearch Utility to launch the browser program for connecting to the web server.
- 3 Enter the password (**default: Admin**) in the Login password field, and then click the **“Submit”** button to enter the configuration page.
- 4 Click the **“Pair Connection”** link to enter the settings page.
(Refer to **Figures 5-2~5-3** for illustrations of how to perform the above steps.)
- 5 Select the **“Enable”** option from the **“Pair Mode”** drop down options.
- 6 Type the **IP address of the PETL-7000 #3** in **“Remote Server IP”** field.
- 7 Type the **TCP Port of the PETL-7000 #3** in **“Remote TCP Port”** field.

Settings:

I/O Pair-Connection Settings	Current	Updated
Pair Mode:	Disabled	Enable <input type="button" value="v"/>
Remote Server IP:	Disabled	10 . 1 . 0 . 55
Remote TCP Port:	Disabled	502 (Default: 502)
Connection Timeout:	5000	5000 (Default: 5000 ms)

Figure 5-10

- 8 Type a **DI Address for the PETL-7000 #3** in the **“Remote DI Address”** field.
For example, we set “0” in the “Remote DI Address” field. This means the DI address from DI0 to DI1 of PETL-7000 #3 are mapped to DO x2 of PETL-7000 #1.
- 9 Type a **DI Count number for the PETL-7000 #3** in the **“Remote DI Count”** field.
For example, we set “2” in the “Remote DI Count” field. This means the DI x2 of PETL-7000 #3 are mapped to DO x2 of PETL-7000 #1.
- 10 Click the **“Submit”** button to complete the configuration.

Remote DI to Local DO	Current	Updated (Poll Mode)
Local DO Address:	0	0 (Default: 0)
Remote DI Address:	0	0 (Default: 0)
Remote DI Count:	0	2 (For Local DO)
Local DI to Remote DO	Current	Updated (Push Mode) <input type="button" value="v"/>
Local DI Address:	0	0 (Default: 0)
Remote DO Address:	0	0 (Default: 0)
Local DI Count:	0	0 (For Remote DO)
Force Update Time:	60	60 (Default: 60 s)




Figure 5-11

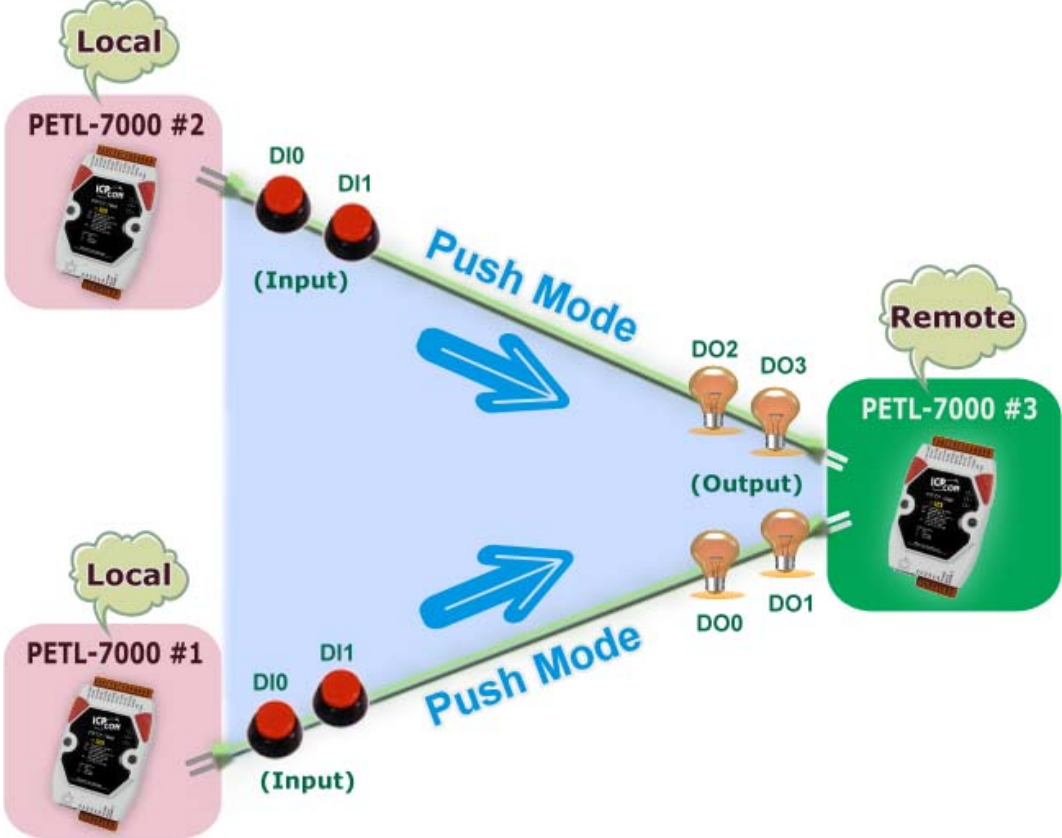
Step 2: Connecting I/O Pair-Connection on PETL-7000 #2

- 1 Select your **PETL-7000 #2** and click **“Web”** button on the eSearch Utility to launch the browser program for connecting to the web server.
- 2 Enter the password (**default: Admin**) in the Login password field, and then click the **“Submit”** button to enter the configuration page.
- 3 Click the **“Pair Connection”** link to enter the settings page.
- 4 Select the **“Enable”** option from the **“Pair Mode”** drop down options.
- 5 Type the **IP address of the PETL-7000 #3** in **“Remote Server IP”** field.
- 6 Type the **TCP Port of the PETL-7000 #3** in **“Remote TCP Port”** field.
(Refer to **Figures 5-2~5-3** and **Figures 5-9~5-10** for illustrations of how to perform the above steps.)
- 7 Type a **DI Address for the PETL-7000 #3** in the **“Remote DI Address”** field.
For example, we set “2” in the “Remote DI Address” field. This means the DI address from DI2 to DI3 of PETL-7000 #3 are mapped to DO x2 of PETL-7000 #2.
- 8 Type a **DI Count number for the PETL-7000 #3** in the **“Remote DI Count”** field.
For example, we set “2” in the “Remote DI Count” field. This means the DI x2 of PETL-7000 #3 are mapped to DO x2 of PETL-7000 #2.
- 9 Click the **“Submit”** button to complete the configuration.

Remote DI to Local DO		Current	Updated (Poll Mode)
Local DO Address:	0		0 (Default: 0)
Remote DI Address:	0		2 (Default: 0)
Remote DI Count:	0		2 (For Local DO)
Local DI to Remote DO		Current	Updated (Push Mode) TCP
Local DI Address:	0		0 (Default: 0)
Remote DO Address:	0		0 (Default: 0)
Local DI Count:	0		0 (For Remote DO)
Force Update Time:	60		60 (Default: 60 s)

Figure 5-12

5.4 Multi Ethernet I/O Modules for Push Mode (Multi to One)



Step 1: Connecting I/O Pair-Connection on PETL-7000 #1

1. Configuring Ethernet settings for PETL-7000 #1, PETL-7000 #2 and PETL-7000 #3.

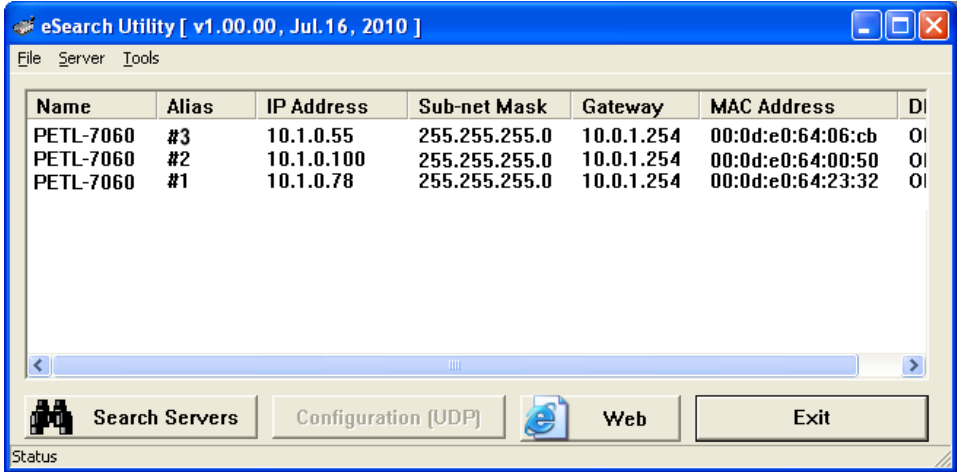


Figure 5-13

- 2 Select your **PETL-7000 #1** and click **“Web”** button on the eSearch Utility to launch the browser program for connecting to the web server.
- 3 Enter the password (**default: Admin**) in the Login password field, and then click the **“Submit”** button to enter the configuration page.
- 4 Click the **“Pair Connection”** link to enter the settings page.
(Refer to **Figures 5-2~5-3** for illustrations of how to perform the above steps.)
- 5 Select the **“Enable”** option from the **“Pair Mode”** drop down options.
- 6 Type the **IP address of the PETL-7000 #3** in **“Remote Server IP”** field.
- 7 Type the **TCP Port of the PETL-7000 #3** in **“Remote TCP Port”** field.

Settings:

I/O Pair-Connection Settings	Current	Updated
Pair Mode:	Disabled	Enable <input type="button" value="v"/>
Remote Server IP:	Disabled	10 . 1 . 0 . 55
Remote TCP Port:	Disabled	502 (Default: 502)
Connection Timeout:	5000	5000 (Default: 5000 ms)

Figure 5-14

- 8 Type a **DO Address for the PETL-7000 #3** in the **“Remote DO Address”** field.
For example, we set “0” in the “Remote DO Address” field. This means the DO address from DO0 to DO1 of PETL-7000 #3 are mapped to DI x2 of PETL-7000 #1.
- 9 Type a **DI Count number for the PETL-7000 #1** in the **“Local DI Count”** field.
For example, we set “2” in the “Local DI Count” field. This means the DI x2 of PETL-7000 #1 are mapped to DO x2 of PETL-7000 #3.
- 10 Click the **“Submit”** button to complete the configuration.

Remote DI to Local DO	Current	Updated (Poll Mode)
Local DO Address:	0	0 (Default: 0)
Remote DI Address:	0	0 (Default: 0)
Remote DI Count:	0	0 (For Local DO)
Local DI to Remote DO	Current	Updated (Push Mode) <input type="button" value="v"/>
Local DI Address:	0	0 (Default: 0)
Remote DO Address:	0	0 (Default: 0)
Local DI Count:	0	2 (For Remote DO)
Force Update Time:	60	60 (Default: 60 s)




Figure 5-15

Step 2: Connecting I/O Pair-Connection on PETL-7000 #2

- 1 Select your **PETL-7000 #2** and click “**Web**” button on the eSearch Utility to launch the browser program for connecting to the web server.
- 2 Enter the password (**default: Admin**) in the Login password field, and then click the “**Submit**” button to enter the configuration page.
- 3 Click the “**Pair Connection**” link to enter the settings page.
- 4 Select the “**Enable**” option from the “**Pair Mode**” drop down options.
- 5 Type the **IP address of the PETL-7000 #3** in “**Remote Server IP**” field.
- 6 Type the **TCP Port of the PETL-7000 #3** in “**Remote TCP Port**” field.

(Refer to **Figures 5-2~5-3** and **Figures 5-13~5-14** for illustrations of how to perform the above steps.)

- 7 Type a **DO Address for the PETL-7000 #3** in the “**Remote DO Address**” field. *For example, we set “2” in the “Remote DO Address” field. This means the DO address from DO2 to DO3 of PETL-7000 #3 are mapped to DI x2 of PETL-7000 #2.*
- 8 Type a **DI Count number for the PETL-7000 #2** in the “**Local DI Count**” field. *For example, we set “2” in the “Local DI Count” field. This means the DI x2 of PETL-7000 #2 are mapped to DO x2 of PETL-7000 #3.*
- 9 Click the “**Submit**” button to complete the configuration.

Remote DI to Local DO		Current	Updated (Poll Mode)
Local DO Address:	0		<input type="text" value="0"/> (Default: 0)
Remote DI Address:	0		<input type="text" value="0"/> (Default: 0)
Remote DI Count:	0		<input type="text" value="0"/> (For Local DO)
Local DI to Remote DO		Current	Updated (Push Mode) TCP <input type="button" value="v"/>
Local DI Address:	0		<input type="text" value="0"/> (Default: 0)
Remote DO Address:	0		<input type="text" value="2"/> (Default: 0)
Local DI Count:	0		<input type="text" value="2"/> (For Remote DO)
Force Update Time:	60		<input type="text" value="60"/> (Default: 60 s)


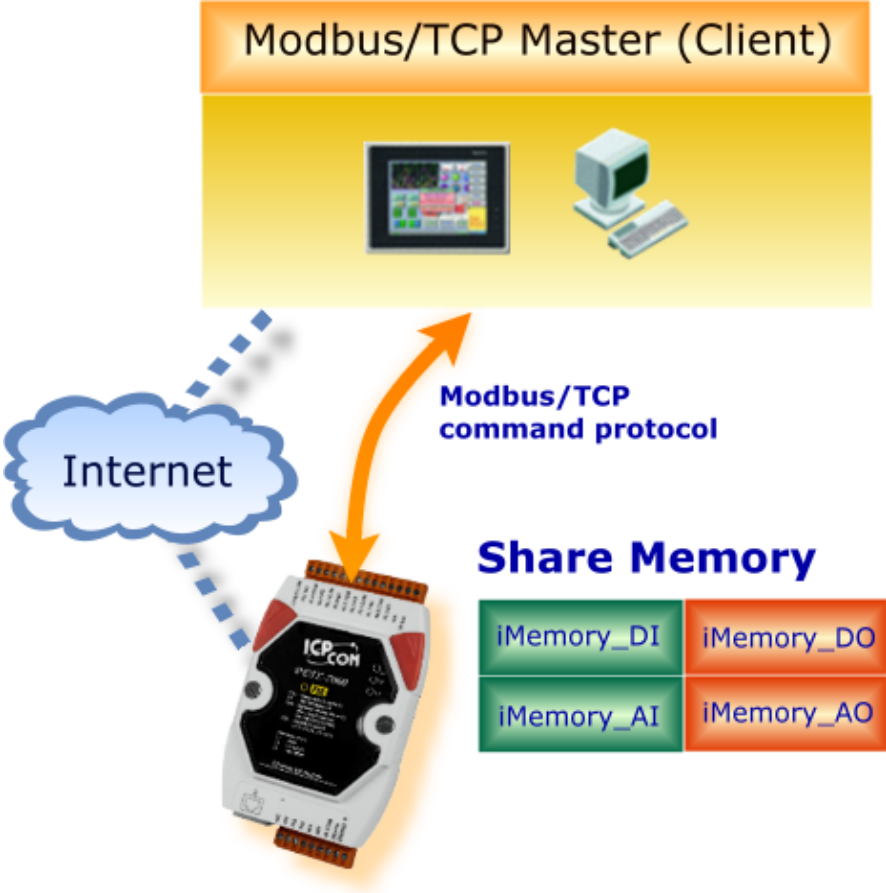


Figure 5-16

6. Modbus Information

The PETL-7000 series is an IP-based Modbus I/O device that allows you to remotely control DI/DO terminals via an Ethernet. It uses a master-slave communication technique in which only one device (the master) can initiate a transaction (called queries), while other devices (slaves) respond the requested data to the master, or by taking the action requested in the query.



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

6.1. What is Modbus TCP/IP?

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

The Different versions of Modbus used today include Modbus RTU (based on serial communication interfaces such as RS485 and RS232), Modbus ASCII and Modbus TCP, which is the Modbus RTU protocol embedded into TCP packets.

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 reliable. The master queries the slave and the slave responds with the 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 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.

Modbus/TCP Message Structure

Byte 00~05	Byte 06~11
6-byte header	RTU Data

Leading 6 bytes of Modbus/TCP protocol:

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 Modbus/TCP master (client)

Protocol identifier = 0

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

Length field (lower byte) = Number of following RTU data bytes

RTU Data Structure

Byte 06	Byte 07	Byte 08-09	Byte 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 Modbus structure of the Modbus RTU is the receiver's address. The Valid addresses are in the range of 0 to 247. Addresses 0 is used for broadcast, while addresses 1 to 247 are given to individual Modbus devices.

■ Function Code

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

Section	Code	Function	Reference (Address)
6.2.1	01 (0x01)	Read Coils status (Readback DOs)	0xxxx
6.2.2	02 (0x02)	Read Input Status (Read DIs)	1xxxx
6.2.3	03 (0x03)	Read Holding Registers (Readback AOs)	4xxxx
6.2.4	04 (0x04)	Read Input Registers (Read AIs)	3xxxx
6.2.5	05 (0x05)	Force Single Coil (Write DO)	0xxxx
6.2.6	06 (0x06)	Preset Single Register (Write AO)	4xxxx
6.2.7	15 (0x0F)	Force Multiple Coils (Write DOs)	0xxxx
6.2.8	16 (0x10)	Preset Multiple Registers (Write AOs)	4xxxx

■ Data

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

6.2.1. 01 (0x01) Read Coils Status (Readback DOs)

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

[Request]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1~247
01	Function code	1 Byte	0x01
02-03	Starting DO address	2 Bytes	Refer to Modbus Address Table for PETL-7000 series. (Sec. 6.3 Modbus Register Map) Byte 02 = high byte Byte 03 = low byte
04-05	Number of points (channels)	2 Bytes	Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x01
02	Byte Count	1 Byte	Byte count of response ($n = (\text{Points}+7)/8$)
03	Data	n Byte	n= 1; Byte 03 = data bit 7~0 n= 2; Byte 04 = data bit 15~8 n= m; Byte m+2 = data bit (8m-1)~ 8(m-1)

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x81
02	Exception code	1 Byte	Refer to Modbus Standard Specification for more details

■ *For example: function 01 (0x01), Readback DOs*

	[Leading 6 bytes]	[Request]
Command:	<u>01 02 00 00 00 06</u>	<u>01 01 00 00 00 05</u>
	[Leading 6 bytes]	[Response]
Response:	<u>01 02 00 00 00 04</u>	<u>01 01 01 1F</u>
Reads digital output value		

Descriptions as follows:

Command:	
	[Leading 6 bytes]
Byte 00-03:	01 02 00 00 (Message number)
Byte 04-05:	00 06 (Number of remaining bytes in this frame)
	[Request]
Byte 00	: 01 (Net ID)
Byte 01	: 01 (Function Code)
Byte 02-03:	00 00 (Starting DO address)
Byte 04-05:	00 05 (Number of points)

Response:	
	[Leading 6 bytes]
Byte 00-03:	01 02 00 00 (Message number)
Byte 04-05:	00 04 (Number of remaining bytes in this frame)
	[Response]
Byte 00:	01 (Net ID)
Byte 01:	01 (Function Code)
Byte 02:	01 (Byte count of response)
Byte 03:	1F (DO4~DO0 Value)

6.2.2. 02 (0x02) Read Input Status (Read DIs)

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

[Request]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x02
02-03	Starting DI address	2 Bytes	Refer to Modbus Address table for PETL-7000 series. (Sec. 6.3 Modbus Register Map) Byte 02 = high byte Byte 03 = low byte
04-05	Number of points (channels)	2 Bytes	Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x02
02	Byte Count	1 Byte	Byte count of response ($n = (\text{Points} + 7) / 8$)
03	Data	n Byte	n= 1; Byte 03 = data bit 7~0 n= 2; Byte 04 = data bit 15~8 n= m; Byte m+2 = data bit (8m-1)~ 8(m-1)

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x82
02	Exception code	1 Byte	Refer to Modbus Standard Specification for more details

■ *For example: function 02 (0x02), Read DIs*

	[Leading 6 bytes]	[Request]
Command:	<u>01 02 00 00 00 06</u>	<u>01 02 00 00 00 04</u>
	[Leading 6 bytes]	[Response]
Response:	<u>01 02 00 00 00 04</u>	<u>01 02 01 0F</u>
Reads digital input value		

Descriptions as follows:

Command:	
	[Leading 6 bytes]
Byte 00-03:	01 02 00 00 (Message number)
Byte 04-05:	00 06 (Number of remaining bytes in this frame)
[Request]	
Byte 00	: 01 (Net ID)
Byte 01	: 02 (Function Code)
Byte 02-03:	00 00 (Starting DI address)
Byte 04-05:	00 04 (Number of points)

Response:	
	[Leading 6 bytes]
Byte 00-03:	01 02 00 00 (Message number)
Byte 04-05:	00 04 (Number of remaining bytes in this frame)
[Response]	
Byte 00:	01 (Net ID)
Byte 01:	02 (Function Code)
Byte 02:	01 (Byte count of response)
Byte 03:	0F (DI3~DIO Value)

6.2.3. 03 (0x03) Read Holding Registers (Readback AOs)

This function code is used to readback the holding registers or the analog output value. These registers are also used to store the preset value of digital counter, host watch dog timer, module name and TCP timeout, etc.

[Request]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x03
02-03	Starting AO address	2 Bytes	Refer to Modbus Address Table for PETL-7000 series. (Sec. 6.3 Modbus Register Map) Byte 02 = high byte Byte 03 = low byte
04-05	Number of 16-bit registers (channels)	2 Bytes	Word count Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x03
02	Byte Count	1 Byte	Byte count of response (n = Points x 2 Bytes)
03~	Register values	n Bytes	Register values n= 2; Byte 03 = high byte Byte 04 = low byte n= m; Byte 03 = high byte Byte 04 = low byte Byte m+1 = high byte Byte m+2 = low byte

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x83
02	Exception code	1 Byte	Refer to Modbus Standard Specification for more details

■ *For example: function 03 (0x03), Readback AOs*

	[Leading 6 bytes]	[Request]
Command:	<u>01 02 00 00 00 06</u>	<u>01 03 01 03 00 02</u>
	[Leading 6 bytes]	[Response]
Response:	<u>01 02 00 00 00 07</u>	<u>01 03 04 70 60 00 00</u>
Reads module's name for PETL-7060		

Descriptions as follows:

Command:
[Leading 6 bytes]
Byte 00-03: 01 02 00 00 (Message number)
Byte 04-05: 00 06 (Number of remaining bytes in this frame)
[Request]
Byte 00 : 01 (Net ID)
Byte 01 : 03 (Function Code)
Byte 02-03: 01 03 (Starting AO Address)
Byte 04-05: 00 02 (Number of 16-bit registers)

Response:
[Leading 6 bytes]
Byte 00-03: 01 02 00 00 (Message number)
Byte 04-05: 00 07 (Number of remaining bytes in this frame)
[Response]
Byte 00: 01 (Net ID)
Byte 01: 03 (Function Code)
Byte 02: 04 (Byte count of response)
Byte 03-04: 70 60 (Low word of module name)
Byte 05-06: 00 00 (High word of module name)

6.2.4. 04 (0x04) Read Input Registers (Read AIs)

This function code is used to read the input registers or the current analog input value. These registers are also used to store the current value of digital counter, number of DI channels and number of DO channels, etc.

[Request]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x04
02-03	Starting AI address	2 Bytes	Refer to Modbus Address Table for PETL-7000 series. (Sec. 6.3 Modbus Register Map) Byte 02 = high byte Byte 03 = low byte
04-05	Number of 16-bit registers (channels)	2 Bytes	Word count Byte 04 = high byte Byte 05 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x04
02	Byte Count	1 Byte	Byte count of response (n = Points x 2 Bytes)
03~	Register values	n Byte	Register values n= 2; Byte 03 = high byte Byte 04 = low byte n= m; Byte 03 = high byte Byte 04 = low byte Byte m+1 = high byte Byte m+2 = low byte

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x84
02	Exception code	1 Byte	Refer to Modbus Standard Specification for more details

■ *For example: function 04 (0x04), Read AIs*

	[Leading 6 bytes]	[Request]
Command:	<u>01 02 00 00 00 06</u>	<u>01 04 00 64 00 01</u>
	[Leading 6 bytes]	[Response]
Response:	<u>01 02 00 00 00 05</u>	<u>01 04 02 00 06</u>

Reads number of DI channels for PETL-7060

Descriptions as follows:

Command:
[Leading 6 bytes]
Byte 00-03: 01 02 00 00 (Message number)
Byte 04-05: 00 06 (Number of remaining bytes in this frame)
[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 remaining bytes in this frame)
[Response]
Byte 00: 01 (Net ID)
Byte 01: 04 (Function Code)
Byte 02: 02 (Byte count of response)
Byte 03-04: 00 06 (Number of DI channels of PETL-7060)

6.2.5. 05 (0x05) Force Single Coil (Write DO)

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

[Request]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x05
02-03	DO Address	2 Bytes	Refer to Modbus Address Table for PETL-7000 series. (Sec. 6.3 Modbus Register Map) Byte 02 = high byte Byte 03 = low byte
04-05	Output value	2 Bytes	0xFF 00 set the output to ON. 0x00 00 set the output to OFF. All other values are illegal and will not affect the coil. Byte 04 = high byte Byte 05 = low byte

[Response]

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

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x85
02	Exception code	1 Byte	Refer to Modbus Standard Specification for more details

■ *For example: function 05 (0x05), Write DO*

	[Leading 6 bytes]	[Request]
Command:	<u>01 02 00 00 00 06</u>	<u>01 05 00 02 FF 00</u>

	[Leading 6 bytes]	[Response]
Response:	<u>01 02 00 00 00 06</u>	<u>01 05 00 02 FF 00</u>

Sets the DO2 to ON

Descriptions as follows:

Command:

[Leading 6 bytes]

Byte 00-03: 01 02 00 00 (Message number)

Byte 04-05: 00 06 (Number of remaining bytes in this frame)

[Request]

Byte 00 : 01 (Net ID)

Byte 01 : 05 (Function Code)

Byte 02-03: 00 02 (DO address)

Byte 04-05: FF 00 (Set the output to ON)

Response:

[Leading 6 bytes]

Byte 00-03: 01 02 00 00 (Message number)

Byte 04-05: 00 06 (Number of remaining bytes in this frame)

[Response]

Byte 00 : 01 (Net ID)

Byte 01 : 05 (Function Code)

Byte 02-03: 00 02 (DO address)

Byte 04-05: FF 00 (Set the output to ON)

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

This function code is used to set one of the holding registers that are used to store the configuration value of the module.

[Request]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x06
02-03	AO Address	2 Bytes	Refer to Modbus Address Table for PETL-7000 series. (Sec. 6.3 Modbus Register Map) Byte 02 = high byte Byte 03 = low byte
04-05	Register value	2 Bytes	Register value Byte 04 = high byte Byte 05 = low byte

[Response]

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

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x86
02	Exception code	1 Byte	Refer to Modbus Standard Specification for more details

■ *For example: function 06 (0x06), Write AO*

	[Leading 6 bytes]	[Request]
Command:	<u>01 02 00 00 00 06</u>	<u>01 06 01 08 00 3C</u>

	[Leading 6 bytes]	[Response]
Response:	<u>01 02 00 00 00 06</u>	<u>01 06 01 08 00 3C</u>

Sets the system timeout to 60 seconds

Descriptions as follows:

Command:

[Leading 6 bytes]

Byte 00-03: 01 02 00 00 (Message number)

Byte 04-05: 00 06 (Number of remaining bytes in this frame)

[Request]

Byte 00 : 01 (Net ID)

Byte 01 : 06 (Function Code)

Byte 02-03: 01 08 (AO Address)

Byte 04-05: 00 3C (Set the 60 seconds)

Response:

[Leading 6 bytes]

Byte 00-03: 01 02 00 00 (Message number)

Byte 04-05: 00 06 (Number of remaining bytes in this frame)

[Response]

Byte 00 : 01 (Net ID)

Byte 01 : 06 (Function Code)

Byte 02-03: 01 08 (AO Address)

Byte 04-05: 00 3C (Set the 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 value.

[Request]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x0F
02-03	Starting DO address	2 Bytes	Refer to Modbus Address Table for PETL-7000 series. (Sec. 6.3 Modbus Register Map) Byte 02 = high byte Byte 03 = low byte
04-05	Number of output channels (Points)	2 Bytes	Byte 04 = high byte Byte 05 = low byte
06	Byte count	1 Byte	$n = (\text{Points} + 7) / 8$
07	Output value	n Byte	A bit corresponds to a channel. Value 1 for a bit denotes the channel is ON, while the value 0 is OFF. n= 1; Byte 07 = data bit 7 ~ 0 n= 2; Byte 08 = data bit 15 ~ 8 n= m; Byte m+6 = data bit (8m-1)~ 8(m-1)

[Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x0F
02-03	Starting DO address	2 Bytes	The value is the same as Byte 02-03 of the Request
04-05	Number of output channels (Points)	2 Bytes	The value is the same as Byte 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x8F
02	Exception code	1 Byte	Refer to Modbus Standard Specification for more details

■ *For example: function 15 (0x0F), Write DOs*

	[Leading 6 bytes]	[Request]
Command:	<u>01 02 00 00 00 08</u>	<u>01 0F 01 0B 00 03 01 07</u>

	[Leading 6 bytes]	[Response]
Response:	<u>01 02 00 00 00 06</u>	<u>01 0F 01 0B 00 03</u>

Sets Safe value (DO0-DO2)

Descriptions as follows:

Command:

[Leading 6 bytes]

Byte 00-03: 01 02 00 00 (Message number)

Byte 04-05: 00 08 (Number of remaining bytes in this frame)

[Request]

Byte 00 : 01 (Net ID)

Byte 01 : 0F (Function Code)

Byte 02-03: 01 0B (Starting DO address)

Byte 04-05: 00 03 (Number of output channels)

Byte 06 : 01 (Byte count)

Byte 07 : 07 (Output value)

Response:

[Leading 6 bytes]

Byte 00-03: 01 02 00 00 (Message number)

Byte 04-05: 00 06 (Number of remaining bytes in this frame)

[Response]

Byte 00 : 01 (Net ID)

Byte 01 : 0F (Function Code)

Byte 02-03: 01 0B (Starting DO address)

Byte 04-05: 00 03 (Number of output 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 value of the module.

[Request]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x10
02-03	Starting AO address	2 Bytes	Refer to Modbus Address Table for PETL-7000 series. (Sec. 6.3 Modbus Register Map) Byte 02 = high byte Byte 03 = low byte
04-05	Number of 16-bit registers (channels)	2 Bytes	Word count Byte 04 = high byte Byte 05 = low byte
06	Byte Count	1 Byte	Byte count of the following data (n =Points x 2 Bytes)
07	Register values	n Bytes	Register values n= 2; Byte 03 = high byte Byte 04 = low byte n= m; Byte 03 = high byte Byte 04 = low byte Byte m+1 = high byte Byte m+2 = low byte

[Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x10
02-03	Starting AO address	2 Byte	The value is the same as Byte 02-03 of the Request
04-05	Number of 16-bit registers (channels)	2 Byte	The value is the same as Byte 04-05 of the Request

[Error Response]

Byte	Description	Size	Value
00	Net ID (Station number)	1 Byte	1-247
01	Function code	1 Byte	0x90
02	Exception code	1 Byte	Refer to Modbus Standard Specification for more details

■ *For example: function 16 (0x10), Write AOs*

	[Leading 6 bytes]	[Request]
Command:	<u>01 02 00 00 00 0B</u>	<u>01 10 00 32 00 01 02 03 E8 00 00</u>

	[Leading 6 bytes]	[Response]
Response:	<u>01 02 00 00 00 06</u>	<u>01 10 00 32 00 01</u>

Sets Preset value for digital counter

Descriptions as follows:

Command:

[Leading 6 bytes]

Byte 00-03: 01 02 00 00 (Message number)

Byte 04-05: 00 0B (Number of remaining bytes in this frame)

[Request]

Byte 00 : 01 (Net ID)

Byte 01 : 10 (Function Code)

Byte 02-03: 00 32 (Starting AO Address)

Byte 04-05: 00 01 (Number of 16-bit registers)

Byte 06 : 02 (Byte count)

Byte 07-10: 03 E8 00 00 (Preset value for digital counter)

Response:

[Leading 6 bytes]

Byte 00-03: 01 02 00 00 (Message number)

Byte 04-05: 00 06 (Number of remaining bytes in this frame)

[Response]

Byte 00 : 01 (Net ID)

Byte 01 : 10 (Function Code)

Byte 02-03: 00 32 (Starting AO Address)

Byte 04-05: 00 01 (Word Count)

■ Data Field

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

For more detail of Address Mapping (Reference number), refer to [6.3 Modbus Register Map](#).

6.3. Modbus Register Map

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

6.3.1. Common Functions

- **0xxxx: DO address (base 0)**

Begin address	Points	Description	Bits per Point	Range	Access Type
127 (0x7F)	1	Recovers all web default settings	1	1 = recover	W (Pulse)
128 (0x80)	1	Default ID settings	1	1 = recover	W (Pulse)
133 (0x85)	1	Reboots the PETL-7000 module	1	1 = reboot	W (Pulse)
Remarks	"W": Write				

- **3xxxx: AI address (base 0)**

Begin address	Points	Description	Bits per Point	Range	Access Type
151 (0x97)	1	Firmware version	16	123 denotes that the version=1.2.3	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)**

Begin address	Points	Description	Bits per Point	Range	Access Type
255 (0xFF)	1	CPU reset status	16	1 = at Power-on 2 = by the WDT 3 = by the reset command	R/W
257 (0x101)	1	Set host watch dog timer	16	<5: Disabled 5~65535: Enabled (units: seconds) (Default=0) When the PETL-7000 module loses communication with host PC for more than the period defined in the WDT settings, DO channels will revert to their safe values and the host WDT events counter will increase 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	Set TCP timeout	16	<5: Disabled 5~65535: Enabled (units: second) (default=0)	R/W/F
264 (0x108)	1	Set System timeout	16	<30: Disabled 30~65535: Enabled (unit: second) (default=0)	R/W/F
Remarks	"R": Read; "W": Write; "F": Setting is recorded in flash as default.				

6.3.2. Specific Functions

The nDI and nDO parameters of each model used in the following Modbus address tables are shown as follows:

Model name	Number of DO channels (nDO)	Number of DI channels (nDI)
PETL-7042	16	0
PETL-7044	8	8
PETL-7050	6	12
PETL-7051	0	16
PETL-7052	8	8
PETL-7053	0	16
PETL-7060	6	6
PETL-7065	6	6
PETL-7066	8	0
PETL-7067	8	0

- **0xxxx: DO address (base 0)**

Begin address	Points	Description	Bits per Point	Range	Access Type
0 (0x00)	1~nDO	Digital Output	1	0 = Off 1 = On	R/W
32 (0x20)	1	Clear all DI latched status (high)	1	1 = Clear	W
33 (0x21)	1	Clear all DI latched status (low)	1	1 = Clear	W
34 (0x22)	1~nDI	Clear high speed digital counter	1	1 = Clear	W
60 (0x3C)	1	Save specific data to Flash (The access type of some register are labeled by "E")	1	1 = Clear	W
100 (0x64)	1~nDO	Enable DO PWM	1	0 = Off 1 = On (Default= 0)	R/W/E
150 (0x96)	1	Enable all DI latched status (high/low)	1	0 = Disable 1 = Enable (Default= 0)	R/W/F
151 (0x97)	1~nDI	Enable high speed digital counter	1	0 = Disable 1 = Enable (Default= 0)	R/W/F
190 (0xBE)	1~nDI	Enable DI frequency measurement	1	0 = Disable 1 = Enable (Default= 0)	R/W/F
235 (0xEB)	1~nDO	Power-on value for DO	1	0 = Off 1 = On (Default= 0)	R/W/F

267 (0x10B)	1~nDO	Safe value for DO	1	0 = Off 1 = On (Default= 0)	R/W/F
Remarks	"R": Read; "W": Write; "F": Setting is recorded in flash as default. "E": After writing DO[60] register, the data will be stored in flash.				

Note: Because the characteristic of relay, PETL-706x series (the module with relay) are not suitable to use PWM for a long time.

- **1xxxx: DI address (base 0)**

Begin address	Points	Description	Bits per Point	Range	Access Type
0 (0x00)	1~nDI	Digital Input status	1	0 = Off 1 = On	R
32 (0x20)	1~nDI	Digital latched status (high)	1	0 = no 1 = latched	R
64 (0x40)	1~nDI	Digital latched status (low)	1	0 = no 1 = latched	R
Remarks	"R": Read				

- **3xxxx: AI address (base 0)**

Begin address	Points	Description	Bits per Point	Value	Access Type
16 (0x10)	1~nDI	Value of digital counter	32	0~4294967296	R
64 (0x40)	1~nDI	Value of DI frequency	32	0~3500000	R
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				

Note: Each 32-bit point occupies two 16-bit registers, and has address offset 2. The second point is at begin-address +2, and so on.

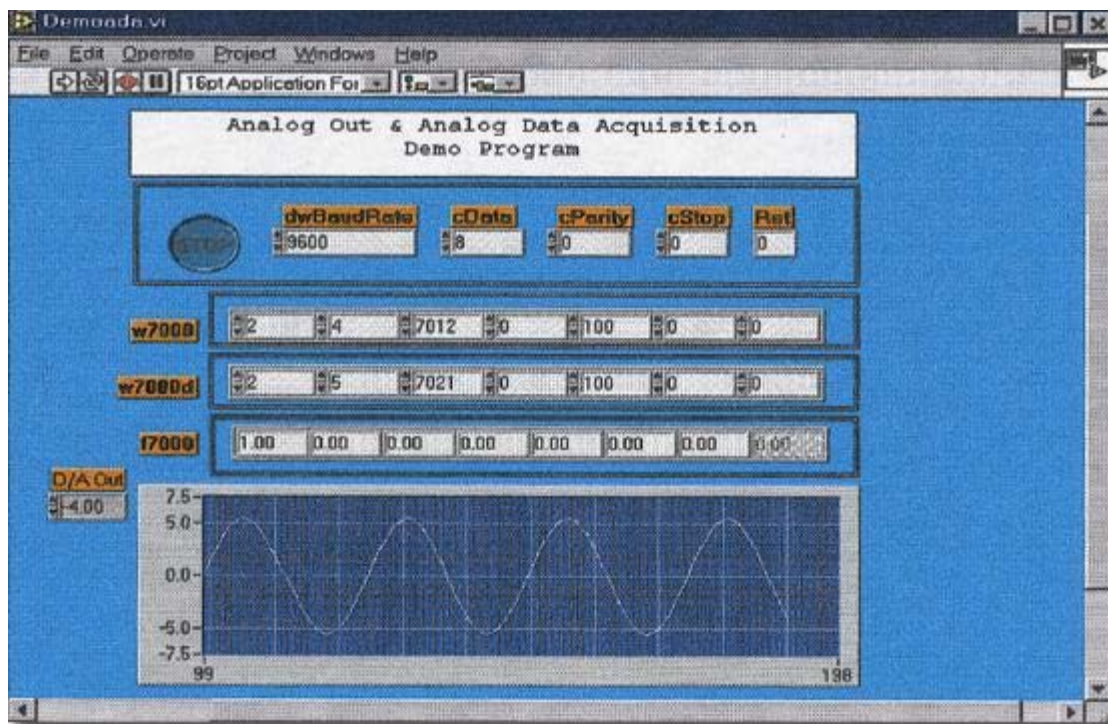
• **4xxxx: AO address (base 0)**

Begin address	Points	Description	Bits per Point	Range	Access Type
50 (0x32)	1~nDI	Preset value for the high speed digital counter	32	0~4294967296	R/W/E
100 (0x64)	1~nDO	Duty cycle The first word (16-bit register) is the high pulse width, while the second word is the low pulse width. The unit is 1 ms, and the resolution is about 5 ms.	32	First word 5~65535 ms; Second word 5~65535 ms;	R/W/E
150 (0x64)	1~nDO	Scan mode	16	1000 = 1000 ms 100 = 100 ms 2000 = Single pulse	R/W/F
200 (0x64)	1~nDO	Moving average	16	1=No average 2=Average 2 values 4= Average 4 values 8= Average 8 values	R/W/F
Remarks	<p>“R”: Read; “W”: Write; “F”: Setting is recorded in flash as default. “E”: After writing DO[60] register, the data will be stored in flash.</p>				

Note: Each 32-bit point occupies two 16-bit registers, and has address offset 2. The second point is at begin-address +2, and so on.

7. Related Tools

7.1. 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 for linking LabVIEW to the PETL-7000 using the Modbus protocol is located at:

CD:\NAPDOS\PET7000_ET7000\Document\Application\LabVIEW\

ftp://ftp.icpdas.com/pub/cd/6000cd/napdos/pet7000_et7000/document/application/labview/

7.2. OPC Server

OPC (OLE for Process Control) is 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.

There are many different mechanisms 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, e.g. power generation, water systems, the oil industry, and the chemical, and automobile industry. Different fields require different functions, but they all have the same common features:

- ✓ Graphical interface
- ✓ Process mimicking
- ✓ Real time and historic trend data
- ✓ Alarm system
- ✓ Data acquisition and recording
- ✓ Data analysis
- ✓ Report generator

➤ **Accessing the PETL-7000 module**

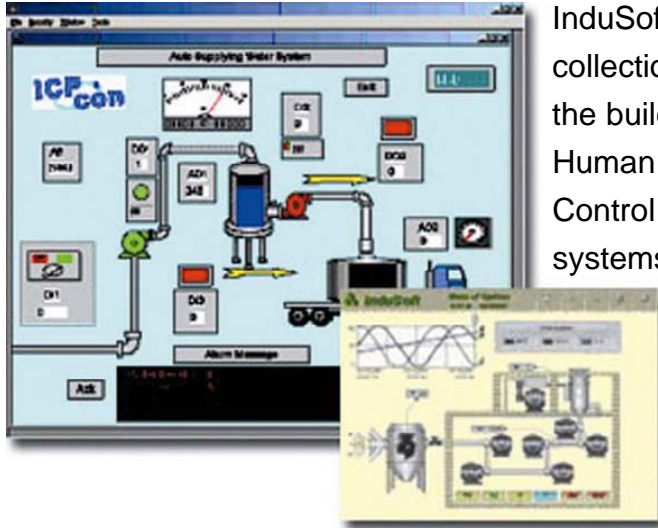
SCADA software is able to access PETL-7000 devices using the Modbus communication protocol without the need for other software drivers.

➤ **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, 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 PETL-7000 series modules using the Modbus TCP protocol.

7.3.1. InduSoft



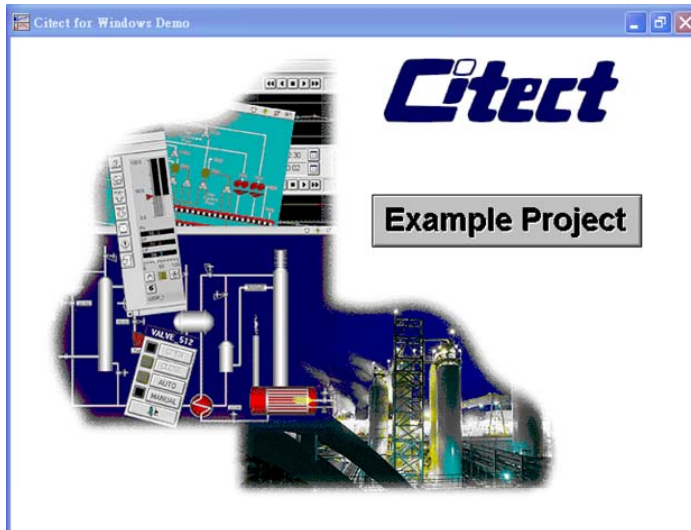
InduSoft Web Studio is a powerful, integrated collection of automation tools that includes all the building blocks needed to develop modern Human Machine Interfaces (HMI), Supervisory Control and Data Acquisition (SCADA) systems, and embedded instrumentation and control applications. InduSoft Web Studio's 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 document describing how to link InduSoft to the PETL-7000 module using the Modbus protocol is located at:

CD:\NAPDOS\PET7000_ET7000\Document\Application\InduSoft\

ftp://ftp.icpdas.com/pub/cd/6000cd/napdos/pet7000_et7000/document/application/induoft/

7.3.2. Citect



CitectSCADA 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 PETL-7000 module using the Modbus protocol is located on

CD:\NAPDOS\PET7000\Document\Application\Citect\

<ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/petl-7000/document/application/citect/>

7.3.3. iFix



The document describing how to link iFix to the PETL-7000 module using the Modbus protocol is located at:

CD:\NAPDOS\PET7000_ET7000\Document\Application\iFix\

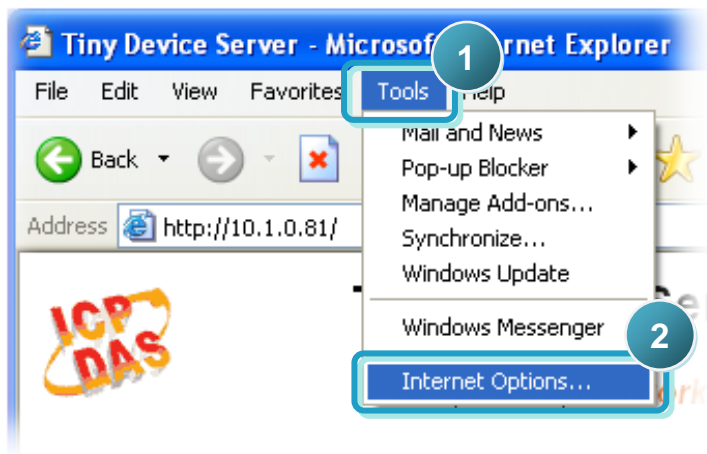
ftp://ftp.icpdas.com/pub/cd/6000cd/napdos/pet7000_et7000/document/application/ifix/

Appendix

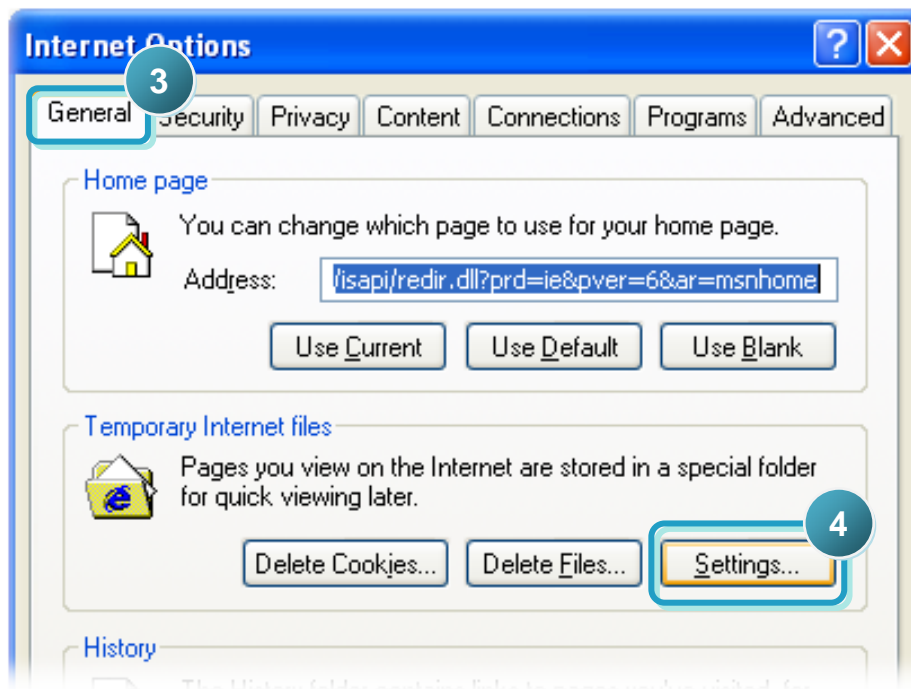
A. How to avoid browser access error that causes a blank page to be displayed when using IE.

Disable the IE cache in the following manner:

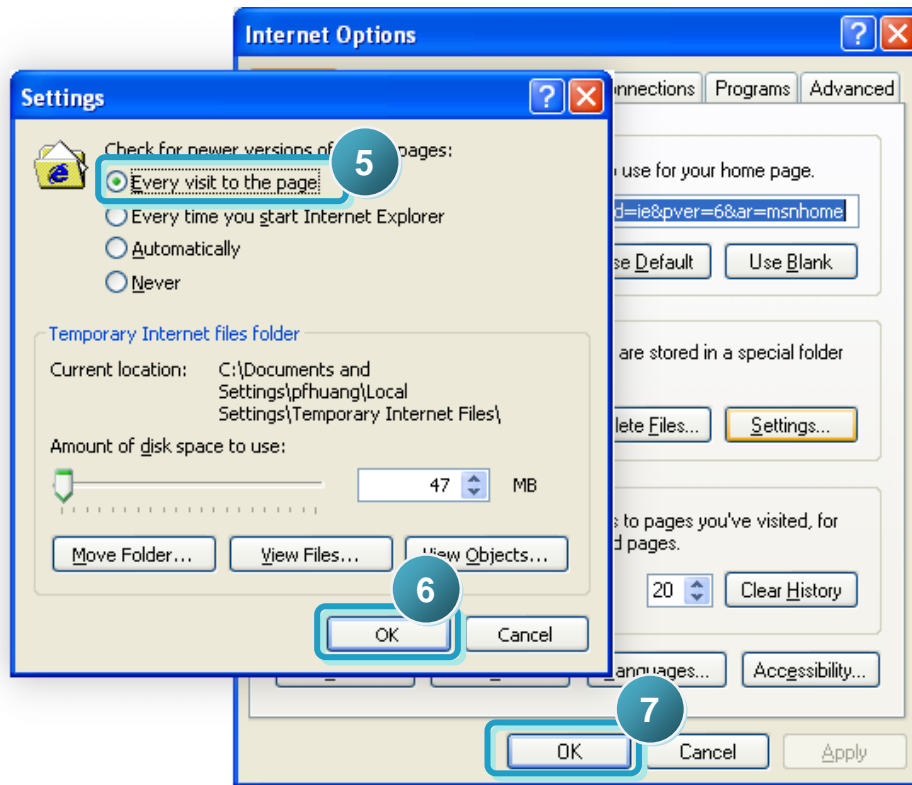
Step 1: Click **“Tools”** >> **“Internet Options...”**.



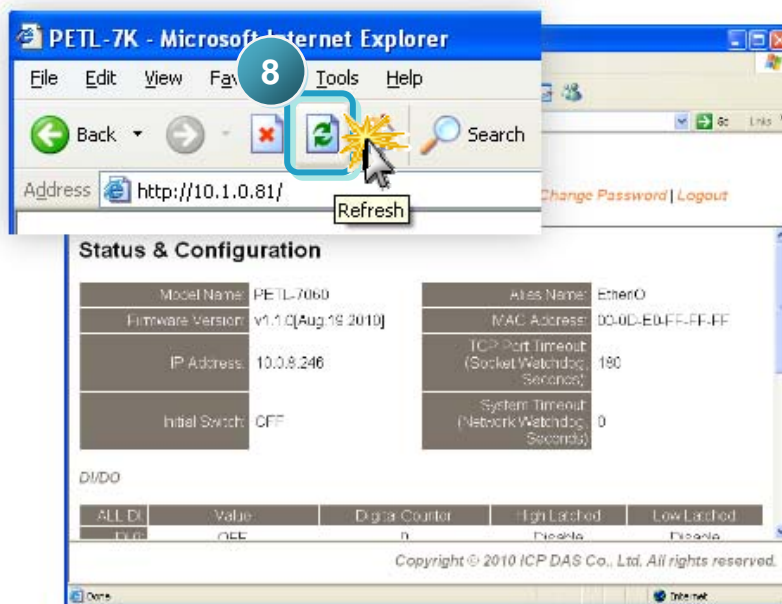
Step 2: Click the **“General”** tab and then click the **“Settings...”** button in the Temporary Internet files frame of the Internet Options dialog.



Step 3: Click the “Every visit to the page” option and then click the “OK” button in both Settings dialog and Internet Options dialog.



Step 4: Click the “Refresh” button to press F5 on your keyboard to refresh the PETL-7000 web server, or re-open IE.



B. Firmware Updates via the Ethernet

Introduction

The PETL-7000 supports firmware updates across an Ethernet network via the BOOTP/TFTP protocol. The PETL-7000 module (network client) uses the BOOTP protocol to obtain an IP address from the eflash.exe utility program (configuration server), and then uses the TFTP protocol to transfer the firmware image from the eflash.exe (server) to the PETL-7000 (client) module.

The code (in the boot loader) used to update the firmware image is not part of the firmware itself. Thus, users can update the firmware even if the built-in version is corrupted or does not exist. If the firmware update fails, the update procedures simply need to be run again.

The PETL-7000 module has a built-in flash protection feature that prohibits any modification to the firmware in the flash. Before updating the firmware, the “**Init Switch**” must be set to the “**Init**” state and then power-on reset is performed on the PETL-7000 to disable the flash protection. Since the flash becomes writable, the firmware can be remotely updated via the Ethernet network.

Mode	Flash Protection	Firmware Update	Configuration
Initial	No	Yes	Factory
Run	Yes	No	User-Defined

Notes:

1. Ensure that the network settings of your computer are correctly configured or the update procedures via the Ethernet network may not work properly.
2. The eflash.exe program may not start correctly if there is another TFTP server running on the same computer.
3. RFC-951 defines the BOOTP (Bootstrap Protocol, uses UDP Ports 67 and 68).
4. RFC-1350 defines the TFTP (Trivial File Transfer Protocol, uses UDP Port 69).

Procedure for updating Firmware via the Ethernet

1. Connect the PETL-7000 module to the same HUB or the same sub-network as your PC. Do not connect it to either a router or the Internet as it may cause the update to fail.
2. Run the eSearch Utility to search for the PETL-7000 module and take note of its IP and MAC addresses.

Name	Alias	IP Address	Sub-net Mask	Gateway	MAC Address
PETL-7060	EtherIO	10.0.8.3	255.255.255.0	10.0.8.254	00:0d:e0:80:02:02

If the above IP address does not work correctly (for example, it does not respond to a ping command), contact your network administrator to obtain a valid IP address for the PETL-7000 module.

3. Create an “**update.bat**” file in the firmware folder (for example, C:\PETL7K). Enter the following eflash.exe command strings in the file.

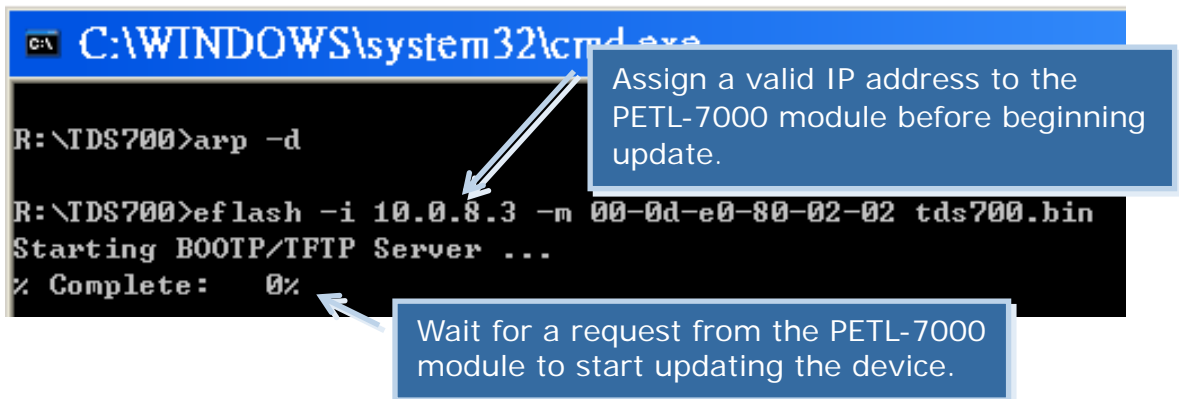
```
eflash -i [IP address] -m [MAC address] [Firmware Name]  
pause
```

The “**pause**” command ensures that the DOS box remains open so that you can then check the result and press “**Enter**” to close it later.

For example, of assign the IP address 10.0.8.3 to the PETL-7000 module that has a MAC of address of 00.0d.e0:80:02:02. The IP address assigned to the PETL-7000 module can be the same as that assigned by the DHCP (since it works), or it can be another valid IP address that is in the same sub-network and is not in conflict with other devices.

```
eflash -i 10.0.8.3 -m 00-0d-e0-80-02-02 ETL7K.dat  
pause
```

4. Double-click the **update.bat** file you just created above on a Windows 2000/XP/2003 system to begin waiting for an update request from the PETL-7000 module.

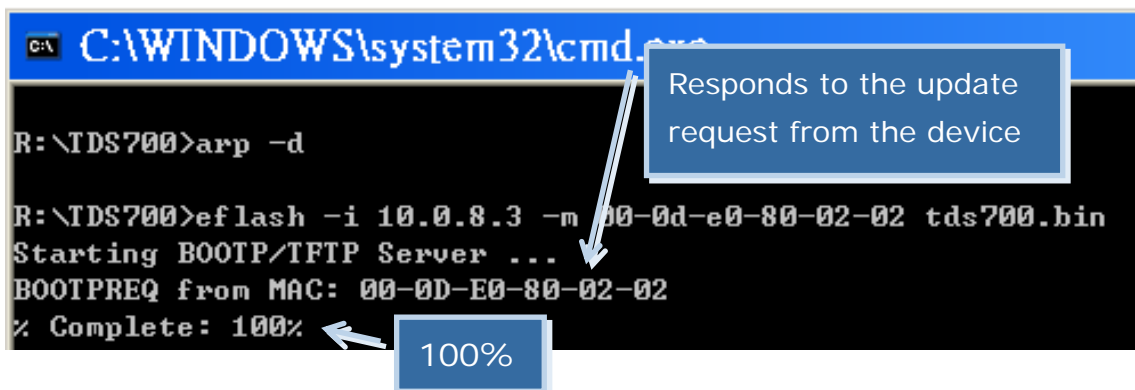


```
C:\WINDOWS\system32\cmd.exe
R:\TDS700>arp -d
R:\TDS700>eflash -i 10.0.8.3 -m 00-0d-e0-80-02-02 tds700.bin
Starting BOOTP/TFTP Server ...
% Complete: 0%
```

Assign a valid IP address to the PETL-7000 module before beginning update.

Wait for a request from the PETL-7000 module to start updating the device.

5. Set the "**Init Switch**" of the PETL-7000 module to the in "**Init**" position.
6. Reboot the PETL-7000 module in init mode to initial the update request.



```
C:\WINDOWS\system32\cmd.exe
R:\TDS700>arp -d
R:\TDS700>eflash -i 10.0.8.3 -m 00-0d-e0-80-02-02 tds700.bin
Starting BOOTP/TFTP Server ...
BOOTPREQ from MAC: 00-0D-E0-80-02-02
% Complete: 100%
```

Responds to the update request from the device

100%

7. Set the "**Init Switch**" to the "**Run**" position once the update is finished, when the complete rate shows "**100%**".
8. Reboot the PETL-7000 module so that it is running in normal mode.

- Run the eSearch Utility to search for the PETL-7000 module again to check that it is now working.

If any problem causes the firmware not to work, for example, the module cannot be found by searching or the system LED is always off, download a new firmware image from our website and then update the module again.

- Log in to the web configuration for the PETL-7000 module to check the firmware version/date (the default password is “**Admin**”).

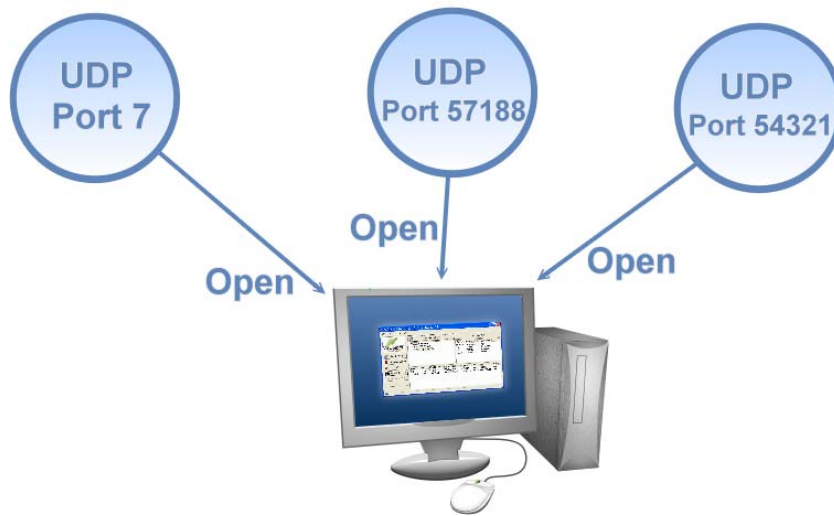
The screenshot shows the web configuration interface for the PETL-7000 module. At the top left is the ICP DAS logo. The title is "PETL-7000". Below the title are navigation links: Home | Network | I/O Setting | pair connection | Change Password | Logout. The main section is titled "Status & Configuration". It contains two columns of configuration items:

Model Name:	PETL-7060	Alias Name:	EtherIO
Firmware Version:	v1.1.0[Aug.19 2010]	MAC Address:	00-0D-E0-FF-FF-FF
IP Address:	10.0.8.246	TCP Port Timeout: (Socket Watchdog, Seconds):	180
Initial Switch:	OFF	System Timeout: (Network Watchdog, Seconds):	0

Below this is a section titled "DI/DO" with a table:

ALL DI	Value	Digital Counter	High Latched	Low Latched
DI 0:	OFF	0	Disable	Disable
DI 1:	OFF	0	Disable	Disable
DI 2:	-	-	-	-
DI 3:	-	-	-	-

C. Why cannot computer ping or search the PETL-7000 series module?



The computer can make a communication with the module through some specific ports. Please confirm with your network administrator that UDP Port 7, Port 57188 and Port 54321 can't be denying by network device.

About the detailed information of TCP/UDP port refers to following table:

■ TCP Port:

Port Number	Description
80	HTTP (HyperText Transport Protocol)
502	Modbus Data Port

■ UDP Port:

Port Number	Description
7	Echo (Ping)
57188	Request of UDP search
54321	Response of UDP search