

Protocol Gateway

EKI-1242PNMS

Quick Guide

v1.0

2017/10/26

1 Induction

1.1 Overview

Advantech EKI-1242PNMS is a protocol gateway that provides users with the following software features:

- Gateway function to transfer data between Modbus TCP/RTU and PROFINET
- I/O mapped command status and exception code
- WEB-based GUI for I/O data visualization
- Effortless configuration via WEB
- Dual image
- Easy backup & restore configuration via microSD card

Note. Device WEB page can be accessed only via Modbus TCP Ethernet port.

1.2 Software Specification

- System:
 - Default IP Address: 192.168.1.1
 - User name in GUI: admin
 - Password in GUI: admin
- PROFINET:
 - Class: Slave
 - Support 8 ms cyclic times
 - Support max. 64 slots
 - Support MRP Slave
- Modbus TCP/RTU:
 - Class: Scanner
 - Function Code Supported: 1, 2, 3, 4, 5, 6, 15, 16, 23
 - Max. Number of Modbus Commands: 64

2 Network Setting

The IP Settings menu allows you to select a static address or DHCP network configuration. The Static address displays the configurable settings for the static option.

To access this page, click Network Setting > IP Setting



Note: The gateway needs to be restarted before any changes will take effect.

3 Serial Setting

The Serial Setting allows for the configuration of the serial interface type, baud rate, parity, data/stop bits, and flow control for port configuration.

To access this page, click Serial Setting > Port

Parameter	Description
Type	Click the drop-down menu to select a serial interface: RS-232 RS-422 or RS-485.
Baud Rate	Enter a value to specify the baud rate. The value should conform to the current transmission speeds of connected devices when setting the baud rate
Parity	Click the drop-down menu to select the parity: None, Odd, Even, Mark or Space
Data Bits	Click the drop-down menu to select the data bits: 5, 6, 7, or 8.
Stop Bits	Click the drop-down menu to select the stop bits: 1, 1.5 or 2.
Flow Control	Click the drop-down menu to select the flow control mode:

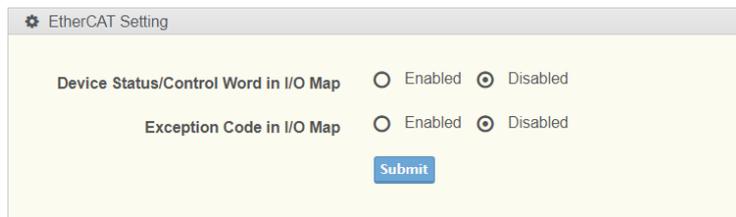
None, XOn/XOff, RTS/CTS.

4 Protocol Setting

4.1 PROFINET Setting

On the PROFINET network, the gateway transmits mapped data to PROFINET master though I/O data. The first two I/O mapped bytes in either direction can be dedicated for status/control information, and another 64 bytes of data coming from the Modbus TCP/RTU can feature the Modbus exception codes.

To access this page, click Protocol Setting > PROFINET Setting



EtherCAT Setting

Device Status/Control Word in I/O Map Enabled Disabled

Exception Code in I/O Map Enabled Disabled

Submit

4.1.1 Status/Control Word

Through the dedicated control word, the scanner on the PROFINET network starts/stops the exchange of data on the Modbus TCP/RTU network. The master on the PROFINET network can see the status of the Modbus TCP/RTU network in the corresponding status word.

The Control word is a 16-bit word used by the PROFINET network to control the gateway and subsequently also the Modbus TCP/RTU network.

Bit	Value	Description
0-1 (Least significant bit)	01b	Puts the gateway in idle state.
	10b	Puts the gateway in running state.
2-15	(reserved)	Unused

The Status word is a 16-bit word used by the gateway to report its current actual status to the PROFINET network.

Bit	Value	Description
0-1 (Least significant bit)	01b	The gateway is in idle state.
	10b	The gateway is in running state.
2-15	(reserved)	Unused

4.1.2 Exception Code

The except code feature gives the scanner on the PROFINET network the opportunity to continuously see and monitor the status of each individual Modbus request on the Modbus TCP/RTU network. It contains a byte array with 64 elements, where each byte contains an Modbus exception code as in the table below. The indexes in the exception code list correspond completely to the sequence of the Modbus Commands.

Byte 0	Byte 1	Byte 2		Byte 63
Exception code for command 0	Exception code for command 1	Exception code for command 2	...	Exception code for command 63

Standard Modbus exception codes:

Exception Code	Description
00	No error
01	Illegal function
02	Illegal data address
03	Illegal data value
04	Slave device failure
05	Acknowledge
06	Slave device busy
08	Memory parity error
0A	Gateway path unavailable
0B	Gateway target device failed to respond

Note: The gateway needs to be restarted before any changes will take effect.

4.2 Modbus Setting

On the Modbus TCP/RTU network side, the gateway will act as a Modbus TCP/RTU master. The gateway provides an internal memory for data exchange between Modbus TCP/RTU and PROFINET. For each Modbus read/write command, specify the internal memory address for data exchange. For the read command, the information received from remote slave device will be updated to the specified internal memory address. For the write command, the data in the specified internal memory address will be sent to the remote slave device. The data will be used to update the remote slave device register.

To access this page, click Protocol Setting > Modbus Setting

Modbus Setting

Start-up Mode: Running

When Modbus error: Freeze Data

Submit

Modbus Commands

Allocated input size: 28 bytes output size: 21 bytes

Add Edit Delete Copy

Index	Name	Mode	Slave ID	FC	Address/Quantity	Trigger	Scan Interval	Data Swap	Response Timeout	I/O Disconnect	Safe Value
1	Command 1	RTU Serial Port: 1	1	3	Read Address 100, Quantity 2	Cyclic	1000	None	1000		
2	Command 2	TCP Slave IP Address: 192.168.1.100 Port: 502	1	16	Write Address 1000, Quantity 10	Cyclic	1000	None	1000	Freeze Data	
3	Command 3	TCP Slave IP Address: 192.168.1.50 Port: 502	1	15	Write Address 2000, Quantity 8	Data change	1000	None	1000	Safe Value	1
4	Command 4	TCP Slave IP Address: 192.168.1.40 Port: 502	5	4	Read Address 5000, Quantity 12	Cyclic	500	DoubleWord	800		

- Start-up Mode Operation Mode

The setting is designated the action of all Modbus TCP/RTU commands at system start-up stage. Please note that the setting can be selected only when Status/Control Word is mapped to the PROFINET I/O area respectively. Otherwise, Running mode is the only option.

Value	Description
Running	The Modbus TCP/RTU master starts to exchange data with the slaves as soon as possible after start-up.
Idle	The Modbus TCP/RTU master does not exchange any data with the slaves and waits for instructions via the control

word.

- **Modbus Commands Table**
A detail list of Modbus TCP/RTU commands in the configuration. The **Add**, **Edit**, **Delete** and **Copy** buttons support the Modbus command arrangement. To add a new command or modify the existing one, click the **Add** button or **Edit** button and Modbus command page will appear. To remove Modbus commands, select the specific command and then click the **Delete** button. To copy a Modbus command, select specific command and then click the **Copy** button.

Note: The gateway needs to be restarted before any changes will take effect.

4.3 Modbus Command

To communicate with remote Modbus TCP/RTU slave devices, specify the Modbus command for each slave device. Each slave device may need more than one command for communication, so you will need to input all the commands manually.

Modbus Command Setting

Name	<input type="text" value="Name"/>	
Mode	<input type="text" value="TCP"/>	
Slave IP Address	<input type="text" value="IP Address"/>	
Port	<input type="text" value="Port"/>	(1 - 65535)
Slave ID	<input type="text" value="Slave ID"/>	(1 - 247)
Function Code	<input type="text" value="06 - Write single register"/>	
Trigger	<input type="text" value="Cyclic"/>	
Poll Interval	<input type="text" value="Poll Interval"/>	(500 - 1200000 ms)
Data Swap	<input type="text" value="None"/>	
Write Starting Address	<input type="text" value="Write Starting Address"/>	(1 - 65535)
Write Quantity	<input type="text" value="Write Quantity"/>	(1 - 1)
Response Timeout	<input type="text" value="Response Timeout"/>	(10 - 12000 ms)
When EtherCAT doesn't exchange I/O	<input type="text" value="Freeze Data"/>	
Safe Value	<input type="text" value="Safe Value"/>	(0 - 65535)

Parameter	Description
Name	A name to help identify the command.
Mode	The mode of Modbus protocol, TCP or RTU. TCP: Modbus TCP communication over TCP/IP networking. RTU: Modbus RTU communication via serial port.
Slave IP Address	The IP address of remote slave device. The field is available only in TCP mode.
Serial Port	The physical interface to connect with remote Modbus RTU devices. The field is available only in RTU mode.
Port	The TCP port number of remote slave devices. The range is from 0 to 65535.
Slave ID	The Modbus slave id that this slave module will accept. The range is from 1 to 255.
Function Code	When a message is sent from a Master to a Slave device the function code field tells the slave what kind of action to perform. Below are the supported function codes: 01: Read coils 02: Read discrete inputs 03: Read holding registers 04: Read input register 05: Write single coil 06: Write single register 15: Write multiple coils 16: Write multiple registers 23: Read/Write multiple registers
Trigger	Cyclic: The read/write command is sent cyclically at the interval specified in the "Poll Interval" parameter. Data change: The data area is polled for changes at the time interval defined by Poll Interval. A write command is issued when a change in data is detected. The field is available only in Write function code.
Poll Interval	The polling interval defines how often the Modbus command shall be resent, e.g. the time cycle of a repeating command. The range is from 500 to 1,200,000 ms.

Data Swap	<p>Decides in what order the different bytes of the received/transmitted data shall be sent on the network.</p> <p>None: Don't need to swap</p> <p>Word: 0x01, 0x02 becomes 0x02, 0x01</p> <p>Double Word: 0x01, 0x02, 0x03, 0x04 becomes 0x04, 0x03, 0x02, 0x01</p> <p>Note:</p> <ol style="list-style-type: none"> 1) When function code is 1, 2, 5, or 15, None is the only option. 2) When function code is 6, only None and Word are the options. 3) When function code is 3, 4, 16, or 23, the number of Quantity must be even.
Read/Write Starting Address	The starting Modbus register or bit to read from/write to. The range is from 1 to 65535.
Read/Write Quantity	Specifying how many quantities to read/write. The range is from 1 to 2000.
Response Timeout	The time span within which the remote Modbus device must return a response to the transaction.
When PROFINET doesn't exchange I/O	<p>In I/O mapped write transaction, when PROFINET does not exchange I/O:</p> <p>Clear data to Modbus server: Transmits only zeros.</p> <p>Freeze data to Modbus server: Repeat the last stored data.</p> <p>Write safe value: The value to transmit for each element.</p> <p>Stop: The transmission of any and all data to the Modbus server is halted.</p>
Safe Value	The value to transmit for each Modbus server when PROFINET doesn't exchange I/O.

Note: The gateway needs to be restarted before any changes will take effect.

4.4 Mapping Overview

The gateway provides an internal memory for data exchange between Modbus TCP/RTU and PROFINET network. After finishing the protocol settings, go to the Mapping Overview page and check if the data mapping is correct.

The I/O mapped data will always be presented according to the following priority

order:

- **Input Data**
Data from the Modbus TCP/RTU network to the PROFINET network.
 - Status word (optional)
 - Exception code (optional)
 - Input data
- **Output data**
Data from the PROFINET network to the Modbus TCP/RTU network.
 - Control word (optional)
 - Output data

Slot	Transaction Name	In Slot Range(bytes)	Input Word	Output Word
1	Device Status/Control	0 - 1	1	1
2	Exception Code	0 - 63	32	-
3	Command 1	0 - 3	2	-
4	Command 2	0 - 19	-	10
5	Command 3	0 - 0	-	1
6	Command 4	0 - 23	12	-

Name	FC	Data Swap	Scan Time	Response Timeout	UID	Read/Write Starting Address	Quantity	When PROFINET doesn't exchange I/O
Command 1	3	None	1000	1000	1	100	2	
Command 2	16	None	1000	1000	1	1000	10	Freeze Data
Command 3	15	None	1000	1000	1	2000	8	Safe Value
Command 4	4	DoubleWord	500	800	5	5000	12	

- **PROFINET I/O Table will be mapping to module in Step 7 (TIA Portal)**
 - Index of the Module
 - Size of the Module in bytes
 - Size of the Module in words
 - The read/write capability of the Module

Slot	Transaction Name	In Slot Range(bytes)	Input Word	Output Word
1	Device Status/Control	0 - 1	1	1
2	Exception Code	0 - 63	32	-
3	Command 1	0 - 3	2	-
4	Command 2	0 - 19	-	10
5	Command 3	0 - 0	-	1
6	Command 4	0 - 23	12	-

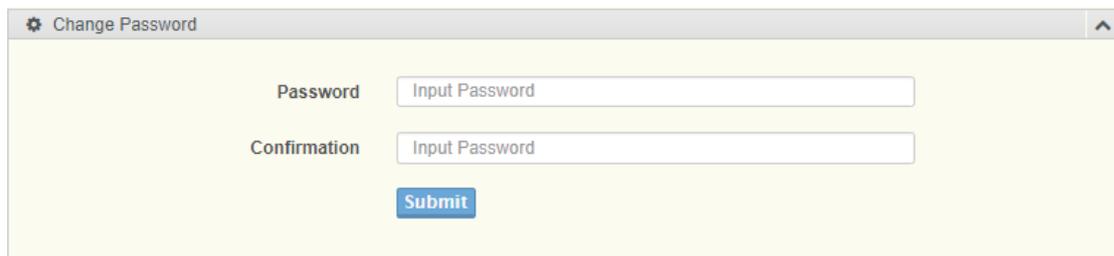
To access this page, click Protocol Setting > Mapping Overview.

5 System Management

5.1 Change Password

The Change Password page allows you to modify the password of the gateway.

To access this page, click System Management > Change Password.

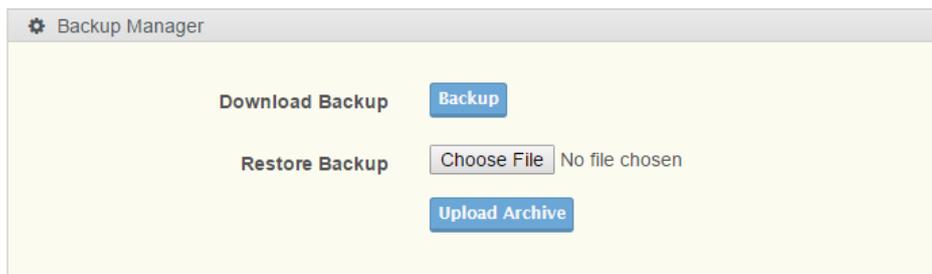


The screenshot shows a web interface titled "Change Password". It features two input fields: "Password" and "Confirmation", both containing the placeholder text "Input Password". Below the fields is a blue "Submit" button.

5.2 Backup Manager

The Backup Manager page allows you to backup configuration from gateway or restore configuration file to gateway.

To access this page, click System Management > Backup Manager.

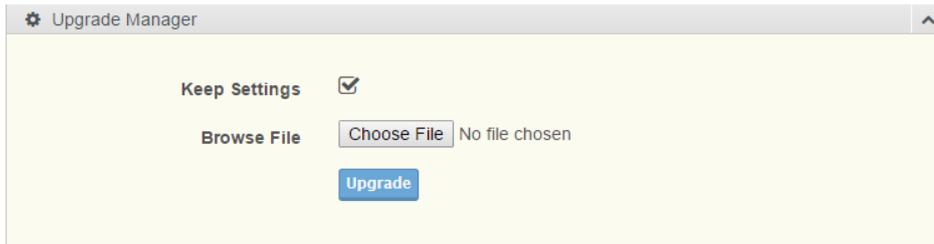


The screenshot shows a web interface titled "Backup Manager". It has two main sections: "Download Backup" with a blue "Backup" button, and "Restore Backup" with a "Choose File" button (showing "No file chosen") and a blue "Upload Archive" button below it.

5.3 Upgrade Manager

The Upgrade Manager page allows you to upgrade firmware image. Currently, the function Keep Settings is unworkable.

To access this page, click System Management > Upgrade Manager.



5.4 Reset System

Click Restore to Defaults button to have all configuration parameters reset to their factory default values. All changes that have been made will be lost. Reset settings take effect after a system reboot.

To access this page, click System Management > Reset System.



5.5 Reboot Device

Click Reboot Device button to reboot the gateway. Any configuration changes you have made since the last time you issued a apply configuration will be lost.

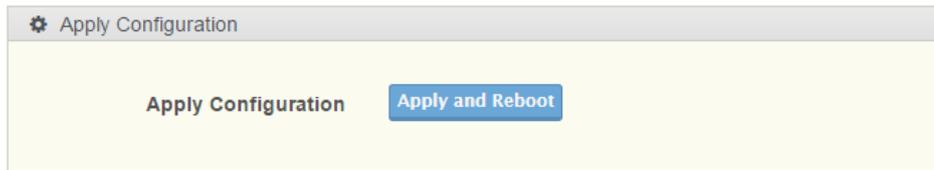
To access this page, click System Management > Reboot Device.



5.6 Apply Configuration

Click Apply and Reboot button to have configuration changes you have made to be saved across a system reboot.

To access this page, click System Management > Apply Configuration.



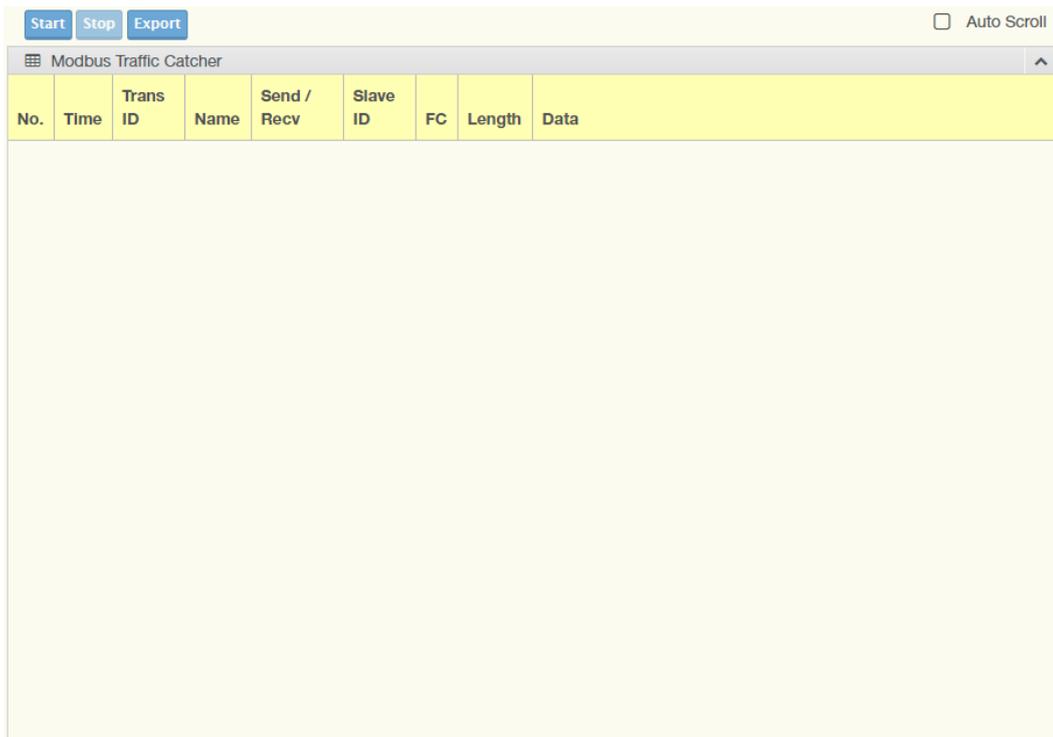
Please note that changes made to the configuration will not be saved and used by the gateway until they have been applied and system reboot. Remember to apply the configuration in order for changes to take effect. As soon as you have submitted data to the configuration but not yet applied it, you will see the box below at the top of the web pages:

Go to [Apply](#) page to apply configuration and reboot device

6 Tools

6.1 Modbus Traffic Catcher

The Modbus Traffic Catcher page shows only data sent and received by Modbus. To access this page, click **Tools > Modbus Traffic Catcher**.



The following table describes the items in the previous figure.

Item	Description
Start	Click Start to start capturing the data.
Stop	Click Stop to stop capturing the data.
Export	Click Export to export and download the captured data.
Auto Scroll	Check the option to cycle through all of the data screens automatically while start capturing data.

7 microSD Card Functionality

The EKI-1242PNMS provides user with an easy way to backup/copy/replacement/deployment. The gateway is equipped with a microSD card slot. User can plug in a microSD card to backup data including the system configuration setting, GSD files, and system data log.

- **Backup the configuration of the gateway with a new microSD card**
 1. Format the microSD card as FAT32 or exFAT file system through a PC.
 2. Power off the gateway and insert the microSD card (ensure that the microSD

card is empty).

3. Power on the gateway. The settings of gateway will be copied to the microSD card /config/<Model Name>.cfg.
4. Manually configure the gateway via WEB, and all the stored changes will copy to the microSD card for synchronization.

- **Restore the gateway with a microSD card containing a configuration file**

1. Power on the gateway, and insert the microSD card.
2. Press reset button over 10 seconds to reboot the gateway.
3. The configuration file stored in the microSD card (/config/<Model Name>.cfg) will automatically copy to the gateway.

- **Malfunctioning gateway replacement**

1. Replace the malfunctioning gateway with a new gateway.
2. Pull out the microSD card from malfunctioning gateway and insert the microSD card into the new gateway.
3. Power on the new gateway.
4. The configuration file stored on the microSD card will automatically copy to the new gateway.

- **microSD card writing failure**

The following circumstances may cause the microSD card to experience a writing failure:

1. The file system of microSD card is not FAT32 file system,
2. The microSD card has less than 20 Mbytes of free space remaining.
3. The microSD card is write-protected.
4. The file system is corrupted.
5. The microSD card is damage.

The gateway will halt for the above events, accompanied by a flashing Status LED.

8 Hardware Default Button

- **Reset configuration to factory default:**
Press and hold Default button for 10 seconds.
- **System reboot:**
Press and hold Default button for 2 seconds.

Do NOT power off the gateway when loading default settings.