

Protocol Gateway

EKI-1242EIMS

Quick Guide

v1.0

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1 Induction

1.1 Overview

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

- Gateway function to transfer data between Modbus TCP/RTU and EtherNet/IP
- I/O mapped command status and exception code
- Web-based GUI for I/O data visualization
- Effortless configuration via web
- Dual image

1.2 Software Specification

- System:
 - Default IP Address: 192.168.1.1
 - User name in GUI: admin
 - Password in GUI: admin
- EtherNet/IP:
 - Class: Adapter
 - CIP Objects Supported: Identity, Message Router, Assembly, Connection Manager, TCP/IP interface, Ethernet link
 - Max. Number of Connections:
 - ◆ Exclusive: 1
 - ◆ Input-Only: 4
 - ◆ Listen-Only: 4
 - Max. I/O Data Size:
 - ◆ Input: 496 bytes
 - ◆ Output: 496 bytes
- Modbus/TCP:
 - 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

IP Setting

Modbus/TCP IP Address Setting

Mode: Static address

IP Address: 192.168.1.1

Subnet Mask: 255.255.255.0

Gateway: 192.168.1.1

Modbus/TCP and EtherNet/IP interface use the same IP address setting

EtherNet/IP IP Address Setting

Mode: Static address

IP Address: IP Address

Subnet Mask: Subnet Mask

Gateway: Gateway

Submit

By default, Modbus TCP and EtherNet/IP interface use the same IP address settings. Unclick the checkbox to allow the two interfaces have different IP address settings. In this condition, the two IP addresses must be in different IP subnet.

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 EtherNet/IP Setting

On the EtherNet/IP network, the gateway transmits mapped data to scanner 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 network can feature the Modbus exception codes.

To access this page, click Protocol Setting > EtherNet/IP Setting

EtherNet/IP Setting

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

Exception Code in I/O Map Enabled Disabled

4.1.1 Status/Control Word

Through the dedicated control word, the scanner on the EtherNet/IP network starts/stops the exchange of data on the Modbus TCP/RTU network.

The scanner on the EtherNet/IP 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 EtherNet/IP 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 EtherNet/IP 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 EtherNet/IP 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 and EtherNet/IP. 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/TCP Setting

Index	Name	Mode	Slave ID	FC	Address/Quantity	Trigger	Scan Interval	Data Swap	I/O Map	Response Timeout	I/O Disconnect	Safe Value
<input type="radio"/> 1	ADAM-6017	TCP Slave IP Address: 192.168.1.100 Port: 502	1	3	Read Address 1, Quantity 5	Cyclic	1000	Word	Enabled	500		
<input type="radio"/> 2	ADAM-4017	RTU Serial Port: 1	2	3	Read Address 134, Quantity 2	Cyclic	1000	Word	Enabled	500		
<input type="radio"/> 3	PLC_1	TCP Slave IP Address: 192.168.1.157 Port: 502	1	6	Write Address 16, Quantity 1	Data change	1000	Word	Enabled	500	Safe Value	32772

- **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 EtherNet/IP I/O area respectively. Otherwise, Running mode is the only option.

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

- When Modbus error
- The setting is designated the action as Modbus error occurs

Value	Description
Freeze Data	Freeze with last delivering data the Modbus network
Clear Data	Clear any input entered into the data area and transmit only zeros to the EtherNet/IP scanner

- 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 **Modify** button and Modbus TCP/RTU command page will appear. To remove Modbus commands, select the specific command and then click the **Remove** 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

Mode

Slave IP Address

Port (1 - 65535)

Slave ID (1 - 247)

Function Code

Trigger

Poll Interval (10 - 1200000 ms)

Data Swap

Read Starting Address (1 - 65535)

Read Quantity (1 - 2000)

I/O Map Enabled Disabled

Response Timeout (10 - 12000 ms)

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.
Serial Port	The physical interface to 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

	<p>15: Write multiple coils</p> <p>16: Write multiple registers</p> <p>23: Read/Write multiple registers</p>
Trigger	<p>Cyclic: The read/write command is sent cyclically at the interval specified in the “Poll Interval” parameter.</p> <p>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.</p>
Poll Interval	<p>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.</p>
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	<p>The starting Modbus register or bit to read from/write to. The range is from 1 to 65535.</p>
Read/Write Quantity	<p>Specifying how many quantities to read/write. The range is from 1 to 2000.</p>
I/O Map	<p>Enabled- It would occupy in 496 data bytes.</p> <p>Disabled – It wouldn't occupy in 496 data bytes. It allows Class3 TCP Transaction Data Access.</p>
Response Timeout	<p>The time span within which the remote Modbus device must return a response to the transaction.</p>

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

Input Mapping Overview

Input Data Byte buffer view

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000h																
0010h																
0020h																
0030h																
0040h																
0050h																
0060h																
0070h																
0080h																
0090h																
00a0h																
00b0h																

Modbus - Master

Name	Function Code	Data Size(Byte)	Byte range
Device Status		2	0 - 1
Exception code		64	2 - 65
ADAM-6017	3	10	66 - 75
ADAM-4017	3	4	76 - 79
PLC_2	23	20	80 - 99

Output Mapping Overview

Output Data Byte buffer view

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000h																
0010h																
0020h																
0030h																
0040h																
0050h																
0060h																
0070h																

EtherNet/IP - Adapter

Name	Function Code	Data Size(Byte)	Byte range
Device Control		2	0 - 1
PLC_1	6	2	2 - 3
PLC_2	23	20	4 - 23

- **Transaction Data – Follow Ethernet/IP Class 3 Data Object value**

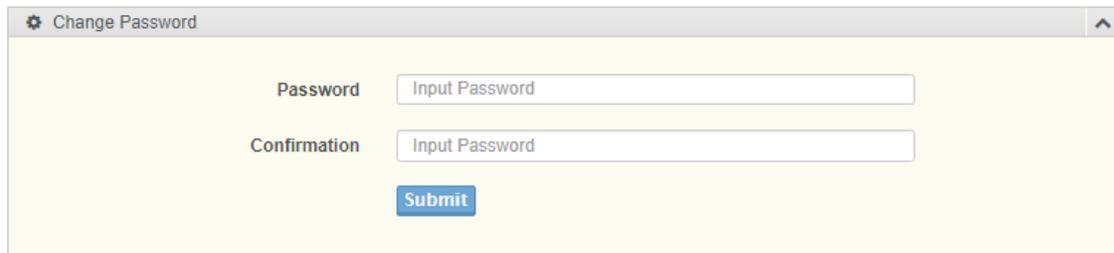
Name	Quantity	Class	Instance	Attribute	Access
status	2	168	128	4	R
control	2	168	129	4	W
exceptions	64	168	130	4	R
ADAM-6017	5	168	256	4	R
ADAM-4017	2	168	257	4	R
PLC_1	1	168	384	4	W
PLC_2	10	168	258	4	R
PLC_2	10	168	385	4	W

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.

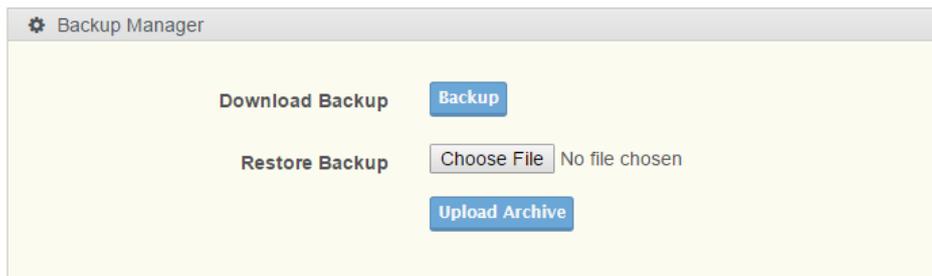


The screenshot shows a web form titled "Change Password". It contains two input fields: "Password" and "Confirmation", both with the placeholder text "Input Password". Below the input fields is a blue "Submit" button.

5.2 Backup Manager

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

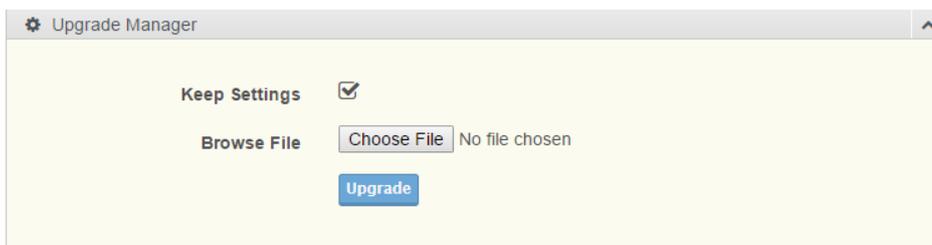
To access this page, click System Management > Backup Manager.



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.

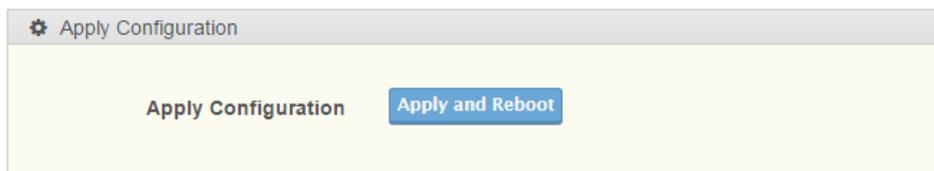
To access this page, click System Management > Reboot Device.



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.



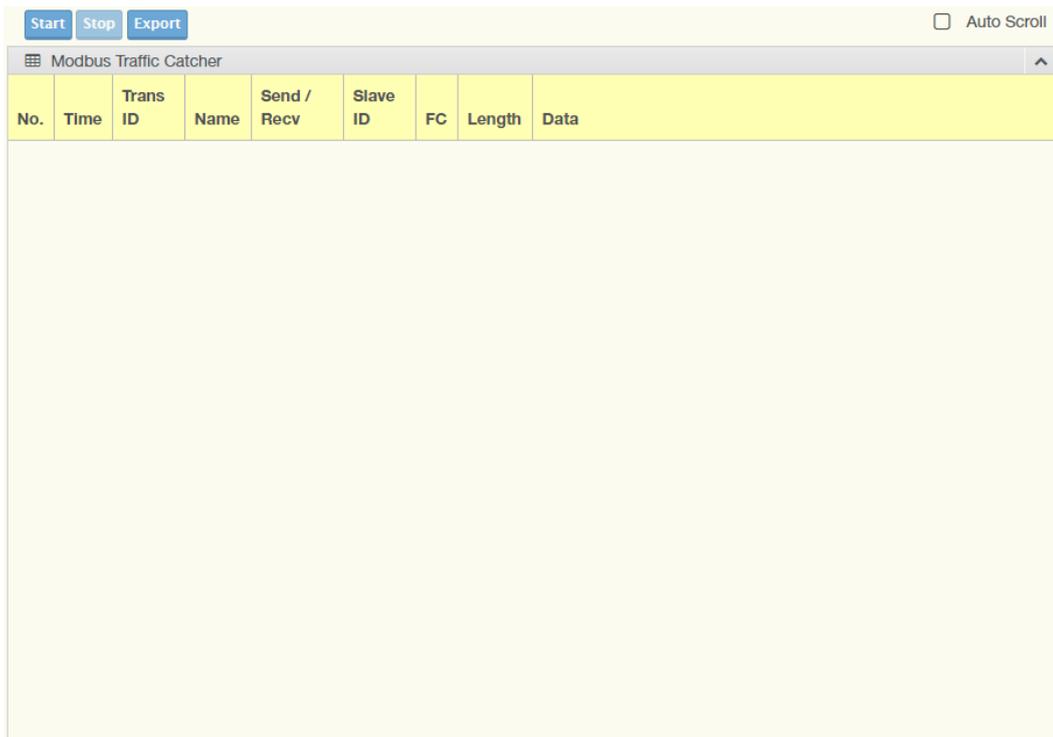
Please note that changes made to the configuration will not be saved and used by the gateway until they have been applied and system reboot. Remember to apply the configuration in order for changes to take effect. As soon as you have submitted data to the configuration but not yet applied it, you will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