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Configuring Protocol Gateway: EKI-1242PNMS

- Apply with Siemens PLC

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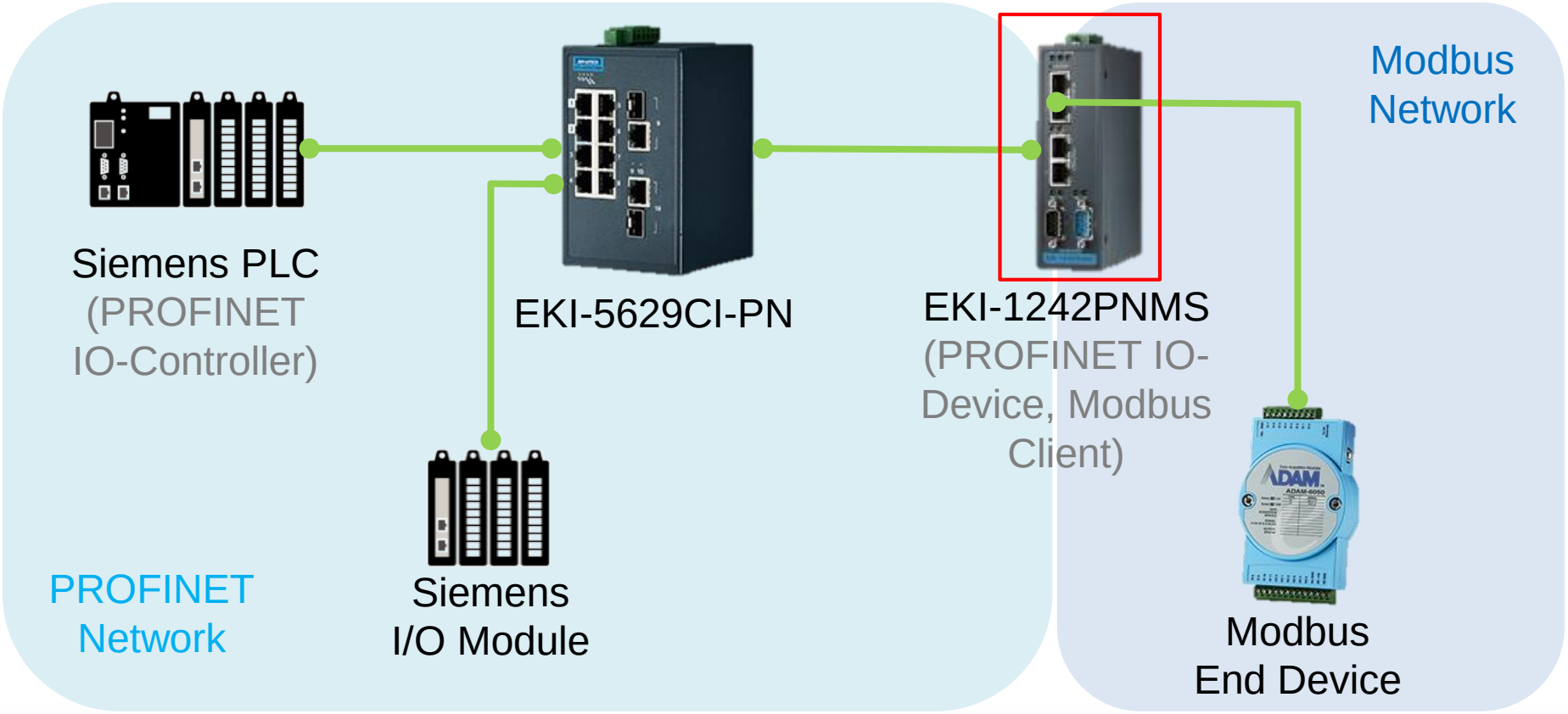
Abstract

- Purpose：This document explains how to configure PROFINET Protocol Gateway EKI-1242PNMS and apply with PLC.
- Related Software:
  TIA Portal 13
- Related products:
  EKI-1242PNMS, Siemens S-1200 PLC, Siemens I/O module and ADAM I/O module (optional)

System Overview

- EKI-1242PNMS works as a IO-Device in PROFINET network, and a Client in Modbus network regardless of TCP or RTU mode.
- Note that reverse topology is not allowed. EKI-1242PNMS cannot be IO-Controller in PROFINET network nor Modbus Server in Modbus network.



Topology

- In this document, the configuration of a sample system would be provide. The system consists of a Siemens PLC as PROFINET IO-Controller, a EKI-1242PNMS, and a Modbus TCP Server module. The configuration is to retrieve the reading data from Modbus Server module to PLC.

Siemens PLC
(PROFINET IO-Controller)

EKI-1242PNMS
(PROFINET IO-Device, Modbus Client)

Modbus TCP End Device (ModSim)
(Modbus Server)

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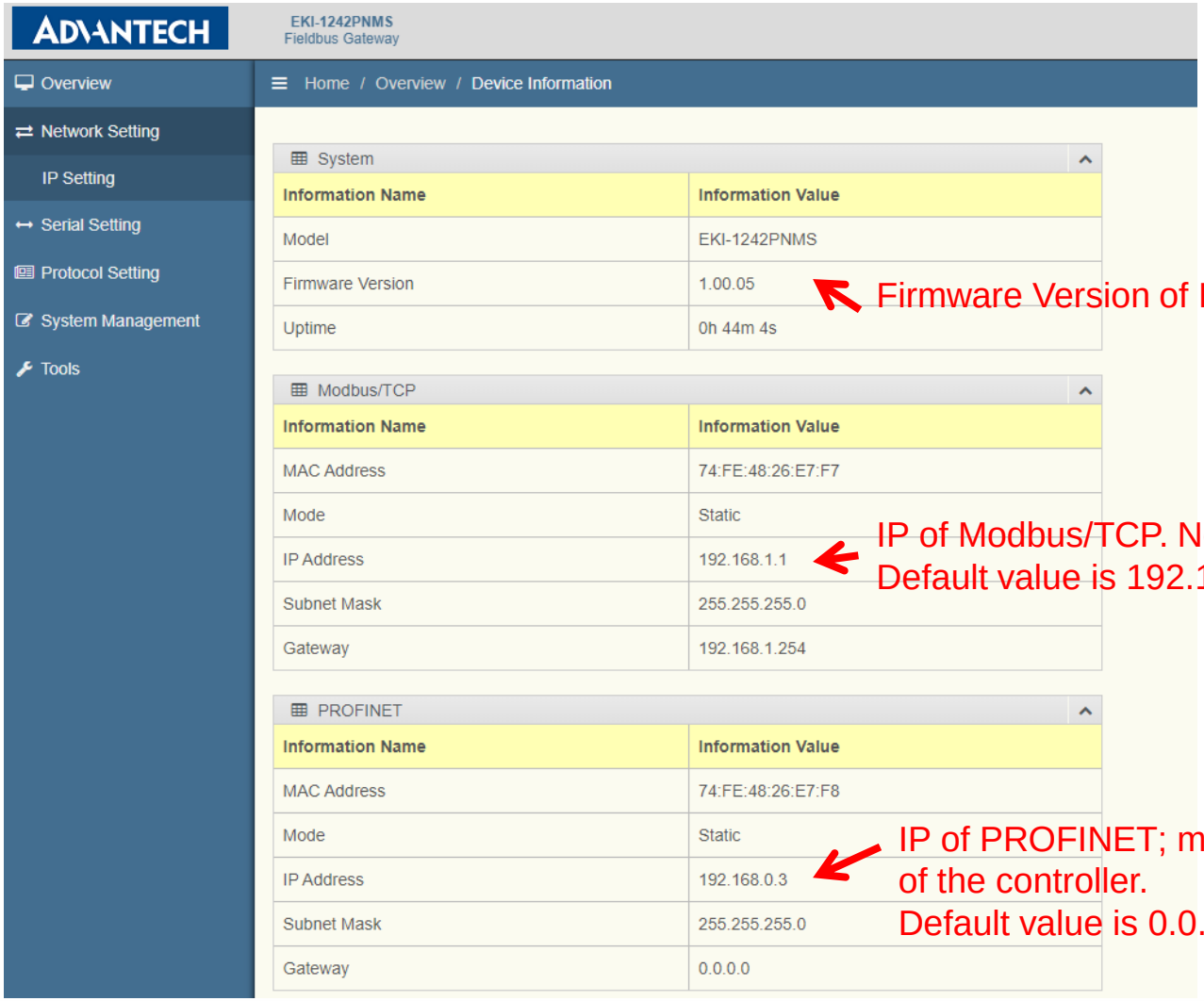
EKI-1242PNMS Setting

- Modbus/TCP, Register Reading & Writing

WebGUI Overview

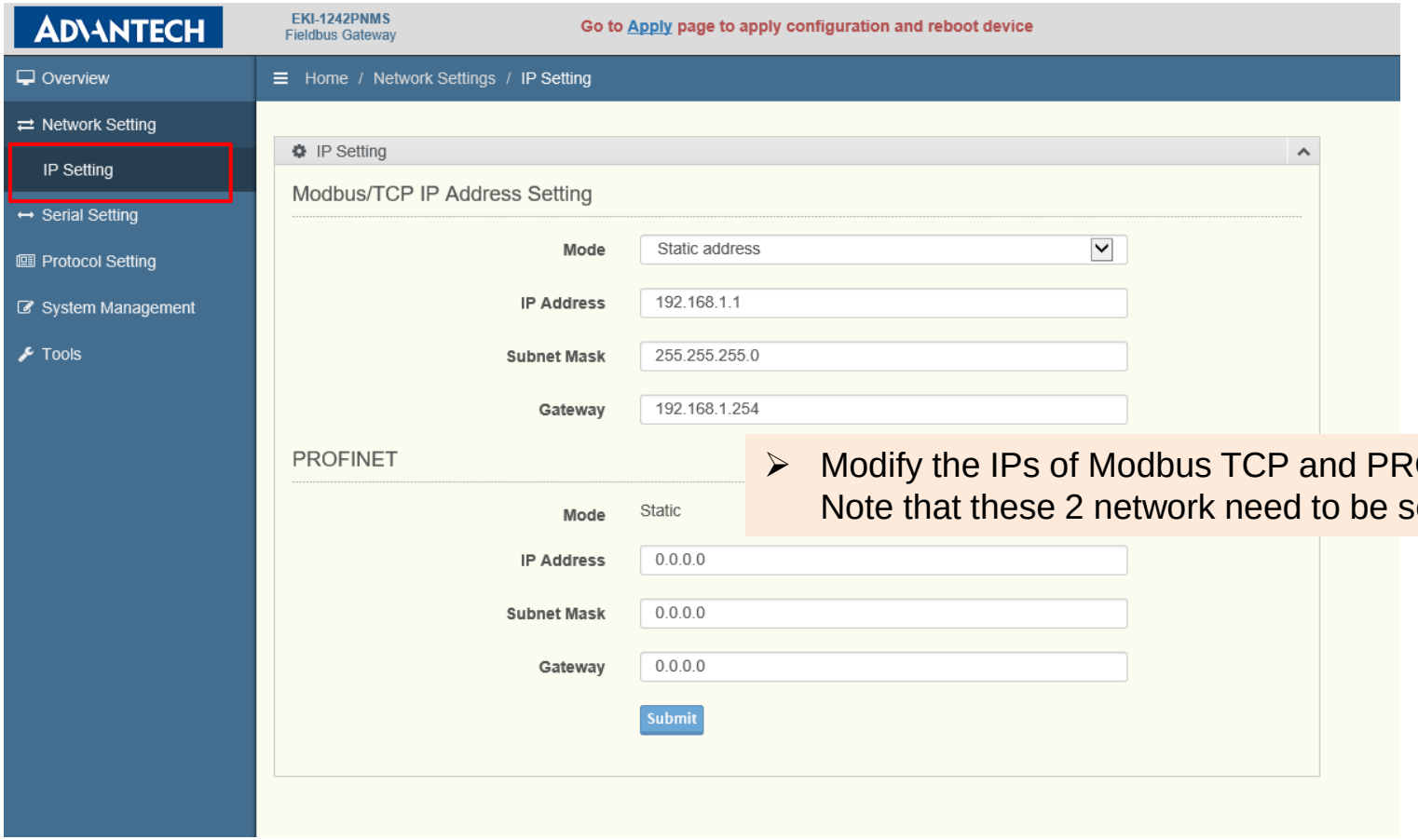


Firmware Version of EKI-1242PNMS

IP of Modbus/TCP. Normally we use this for configuration.
Default value is 192.168.1.1

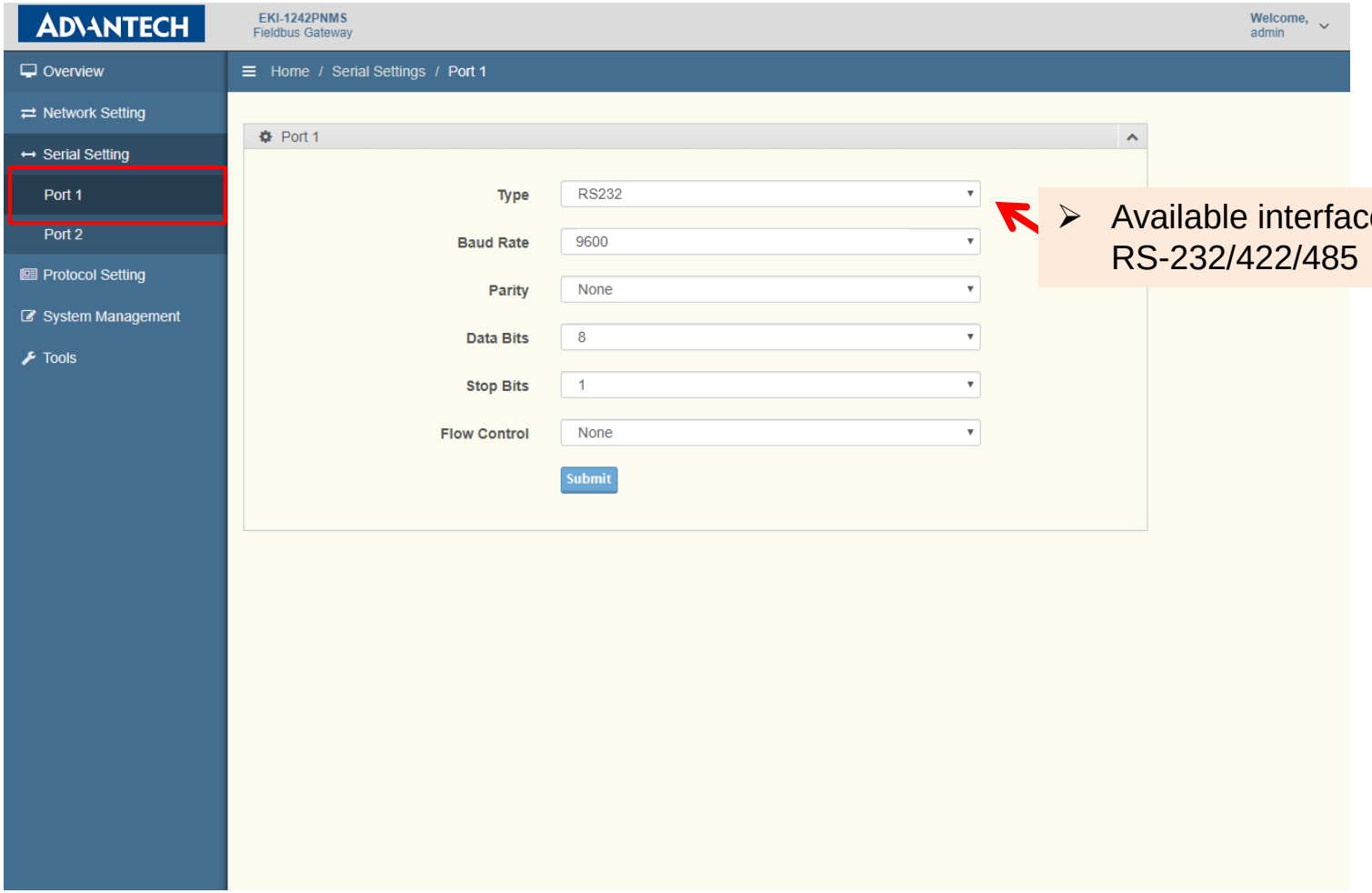
IP of PROFINET; may changed according to the settings of the controller.
Default value is 0.0.0.0

IP Setting



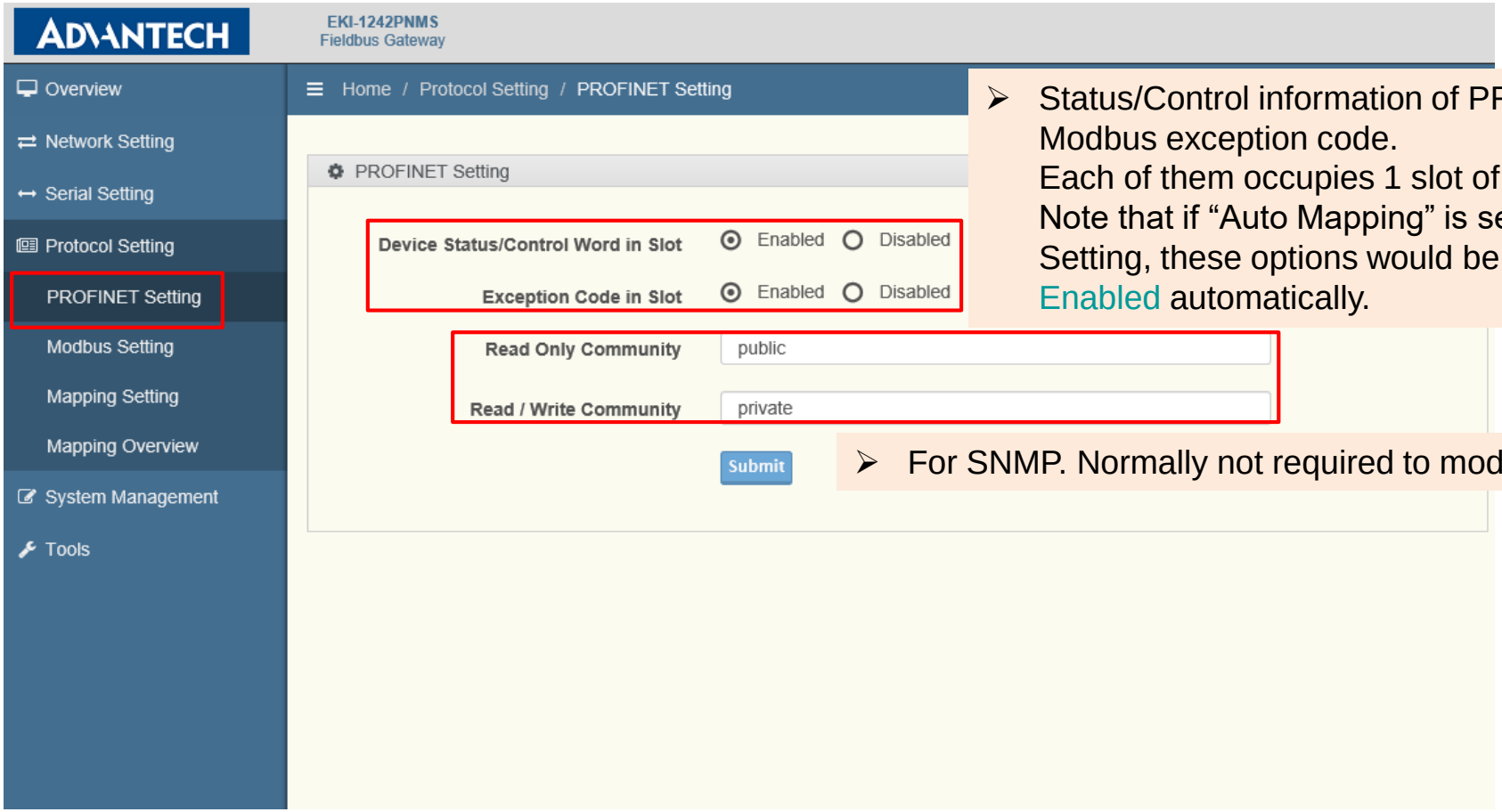
- Modify the IPs of Modbus TCP and PROFINET here.
  Note that these 2 network need to be set on different subnets.

Serial Port Setting (If Modbus/RTU Is Used)



- Available interface: RS-232/422/485

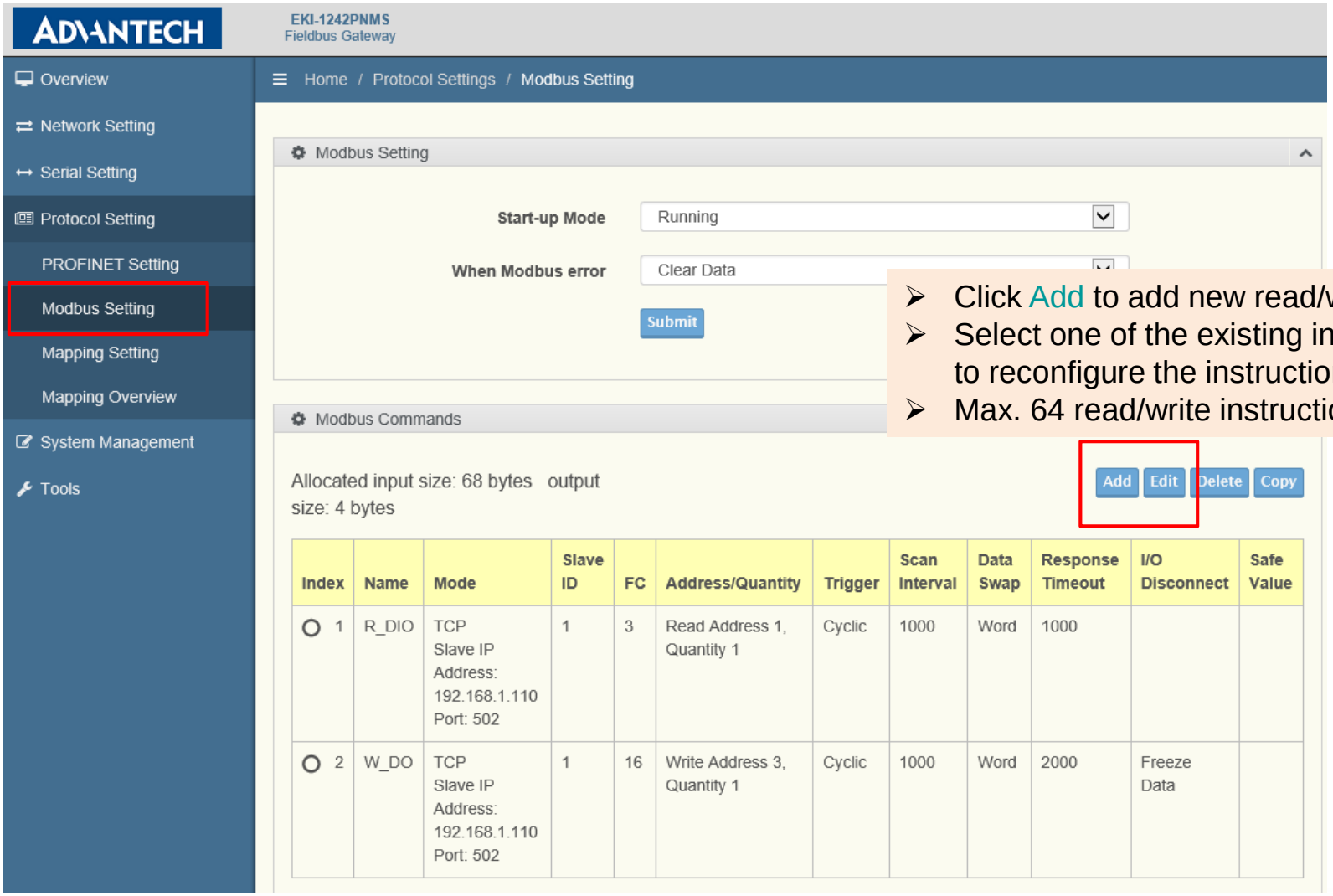
PROFINET Setting



- Status/Control information of PROFINET, and Modbus exception code.
  Each of them occupies 1 slot of PROFINET I/O.
  Note that if “Auto Mapping” is selected in Mapping Setting, these options would be changed to Enabled automatically.

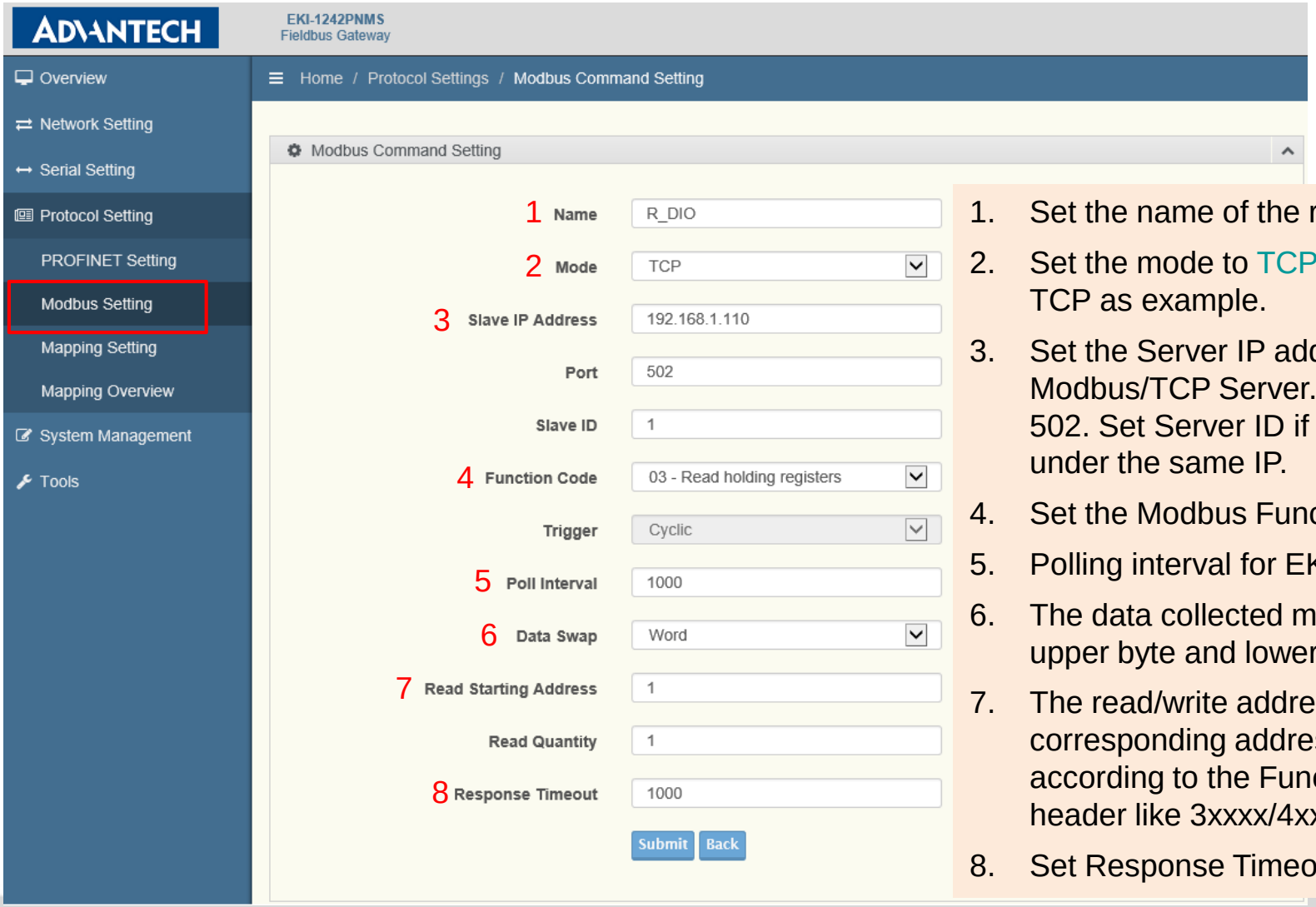
- For SNMP. Normally not required to modify them.

Modbus Setting – Adding or Editing (1/2)



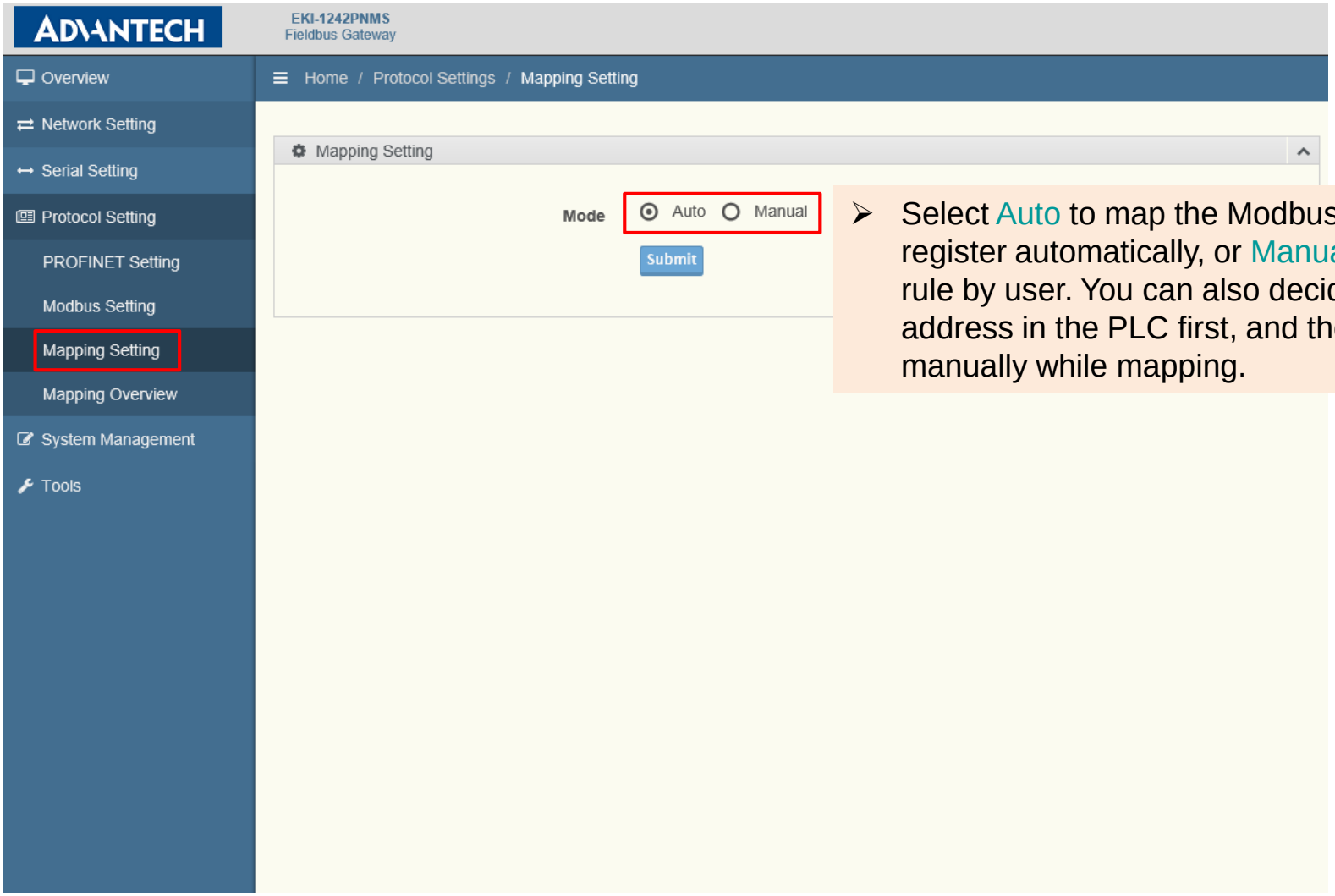
- Click Add to add new read/write Modbus command.
- Select one of the existing instruction and press Edit to reconfigure the instruction.
- Max. 64 read/write instructions in total.

Modbus Setting – Adding or Editing (2/2)



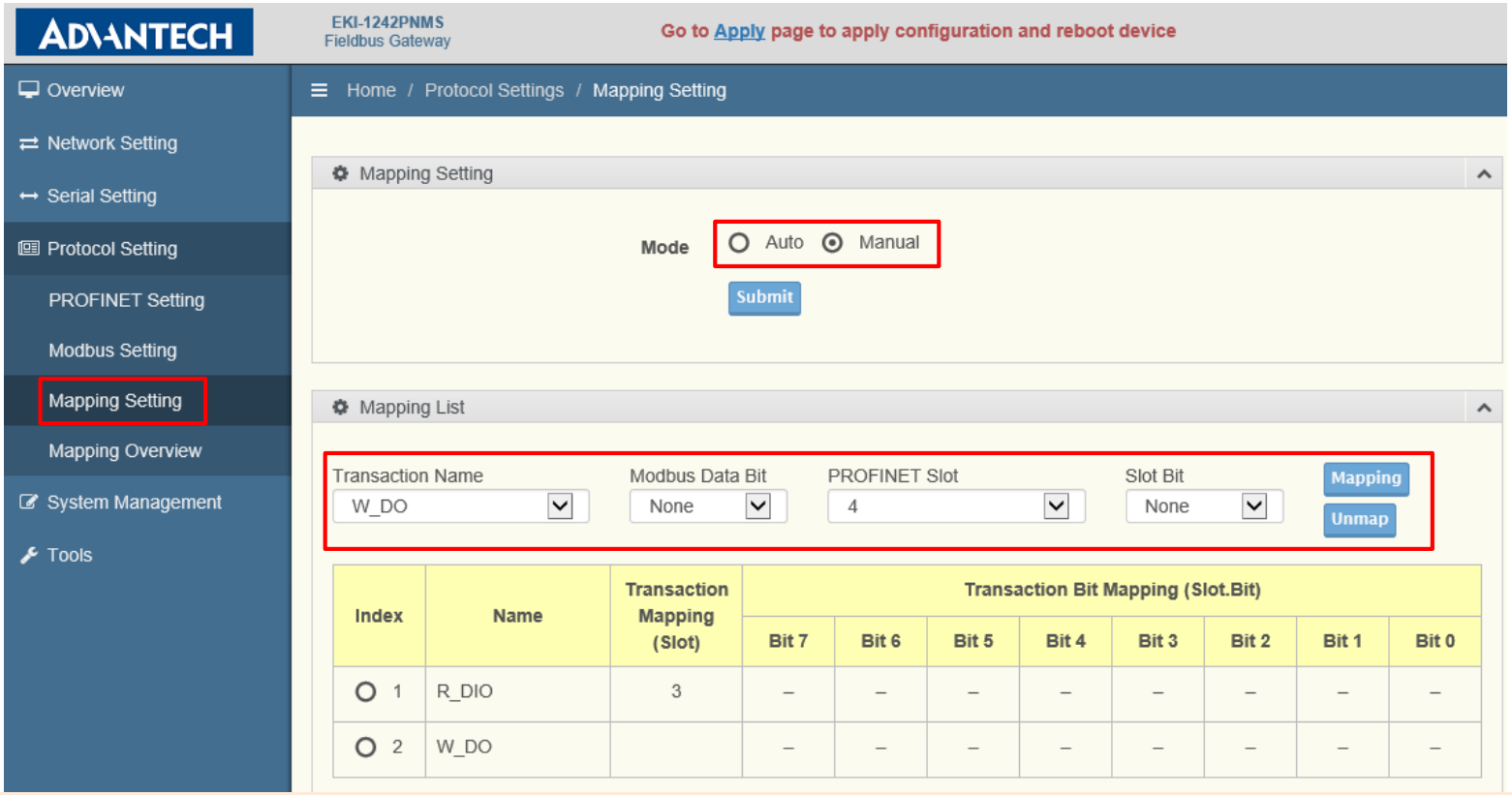
1. Set the name of the read/write instruction.
2. Set the mode to TCP or RTU. Here we take TCP as example.
3. Set the Server IP address of the Modbus/TCP Server. TCP port by default is 502. Set Server ID if more than 1 ID are under the same IP.
4. Set the Modbus Function Code.
5. Polling interval for EKI as Modbus Client.
6. The data collected may need to swap the upper byte and lower byte. Use if needed.
7. The read/write address is mapped to corresponding address automatically according to the Function Code, so the header like 3xxxx/4xxxx is not needed.
8. Set Response Timeout for End Devices.

Mapping Setting (1/2)



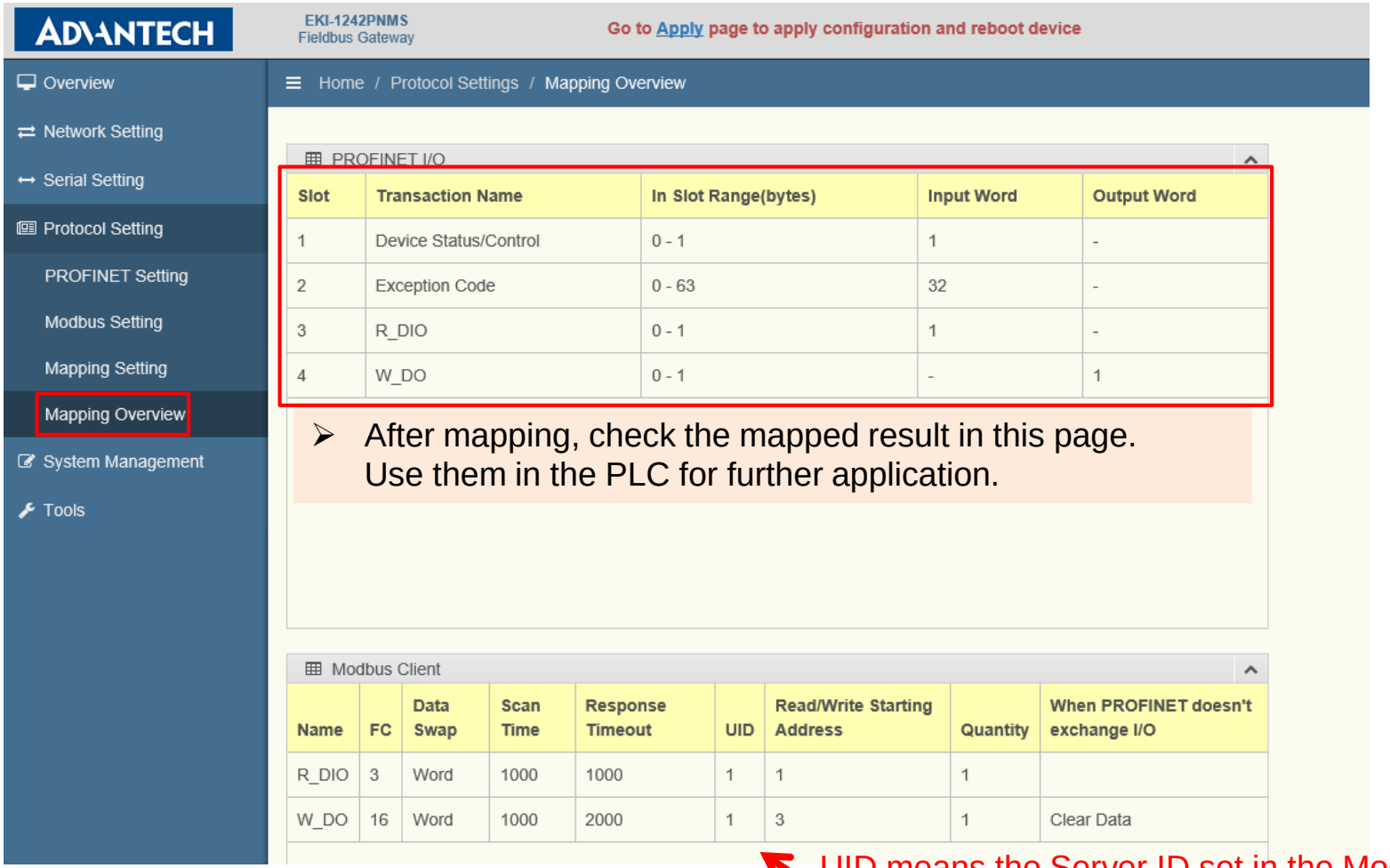
- Select Auto to map the Modbus I/O to PROFINET register automatically, or Manual to set the mapping rule by user. You can also decide the corresponding address in the PLC first, and then map them here manually while mapping.

Mapping Setting (2/2)



- If Manual is selected, configure the mapping rules in Mapping List.
- Choose the name set previously in Modbus Setting, and map them to PROFINET slot. Bits should be mapped only when the function code communicates by Coil.
- PROFINET Slot already been assigned will not show up in the drop down list.

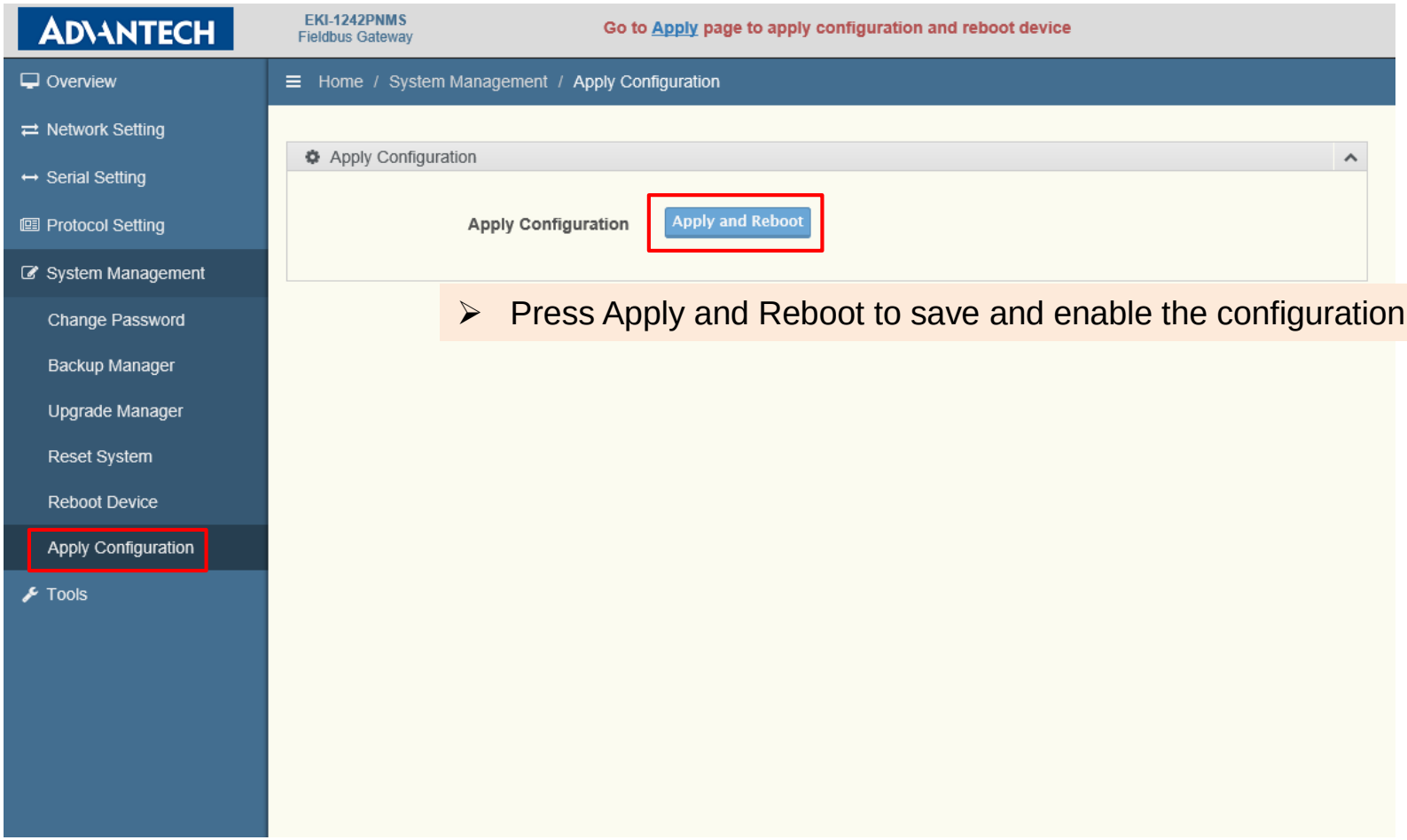
Mapping Overview



- After mapping, check the mapped result in this page. Use them in the PLC for further application.

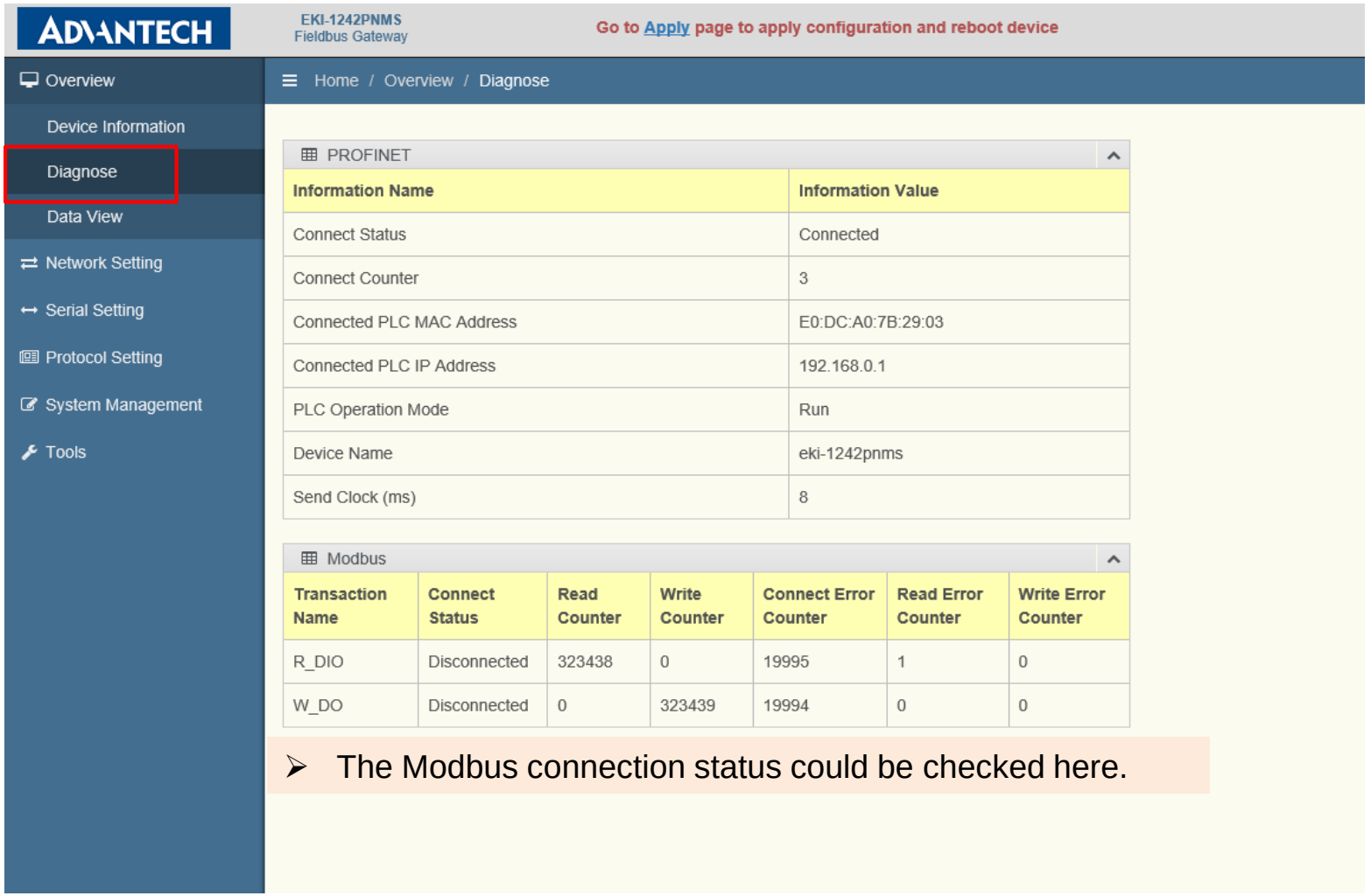
UID means the Server ID set in the Modbus Setting.

Apply Configuration



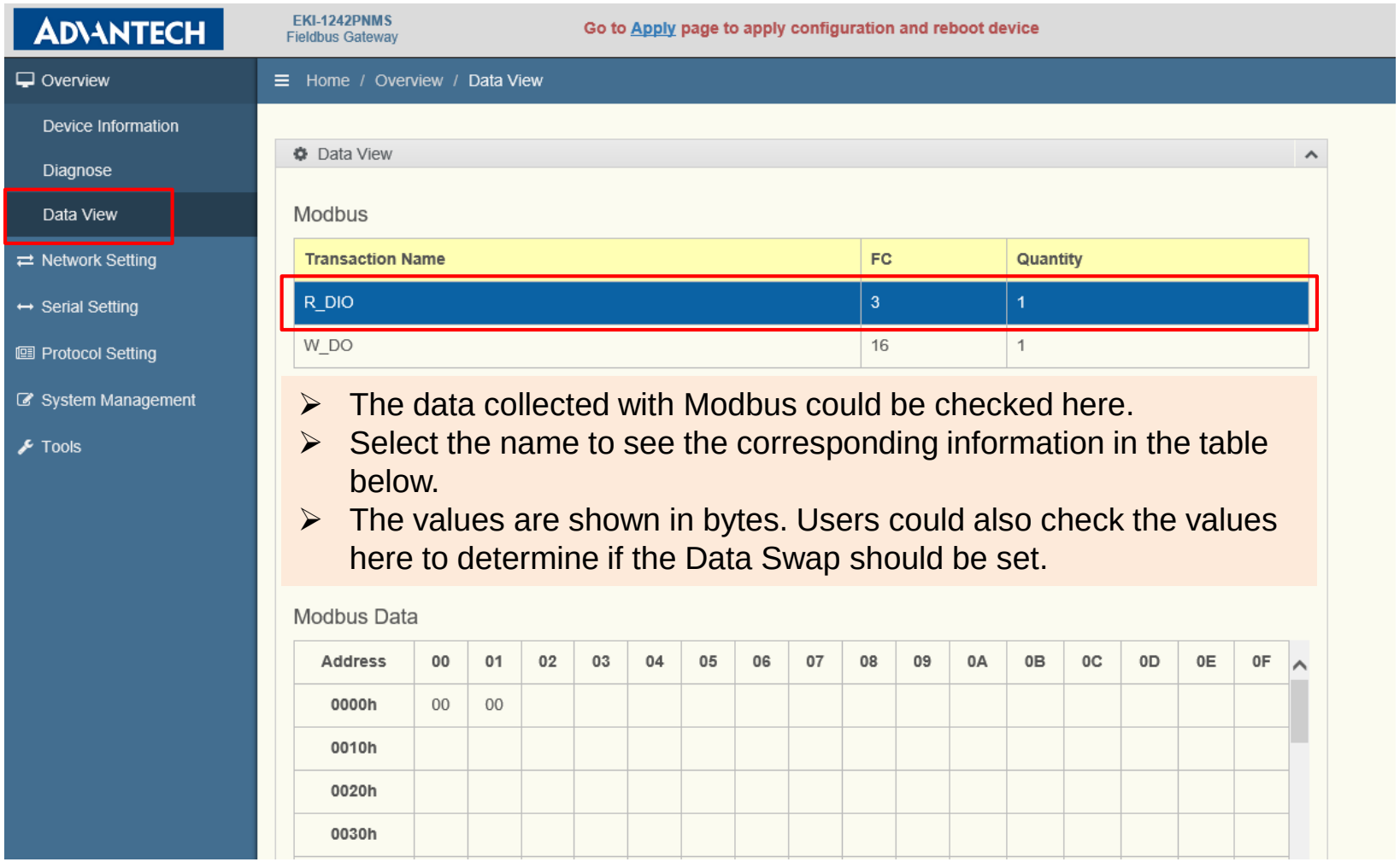
- Press Apply and Reboot to save and enable the configuration.

Connection Confirmation – Diagnose

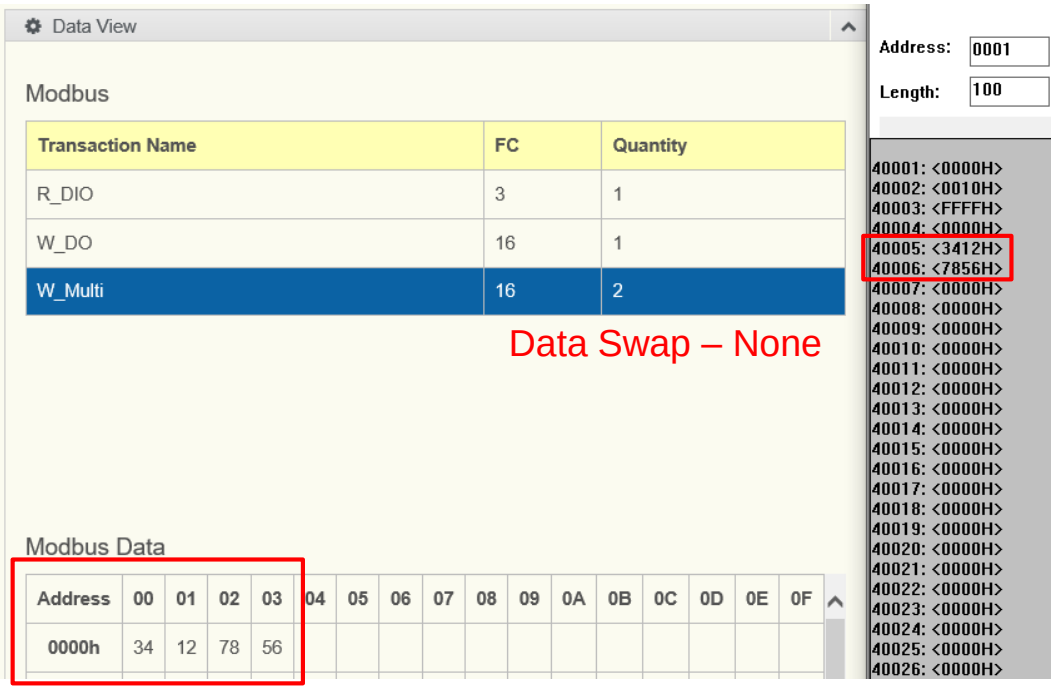


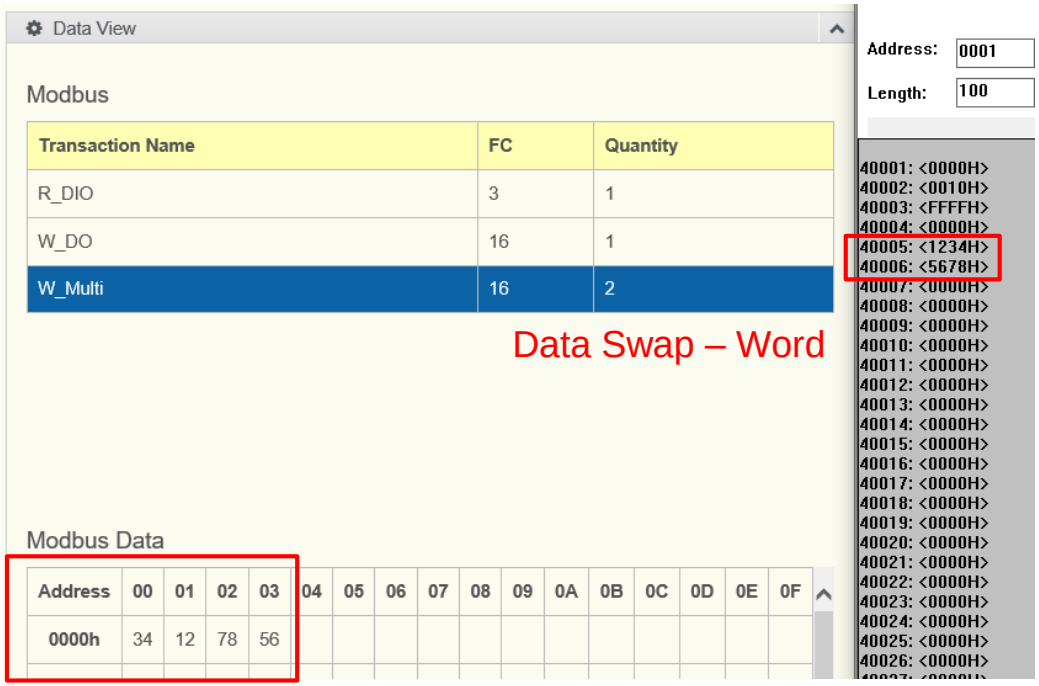
- The Modbus connection status could be checked here.

Connection Confirmation – Data View (1/2)



Connection Confirmation – Data View (2/2)

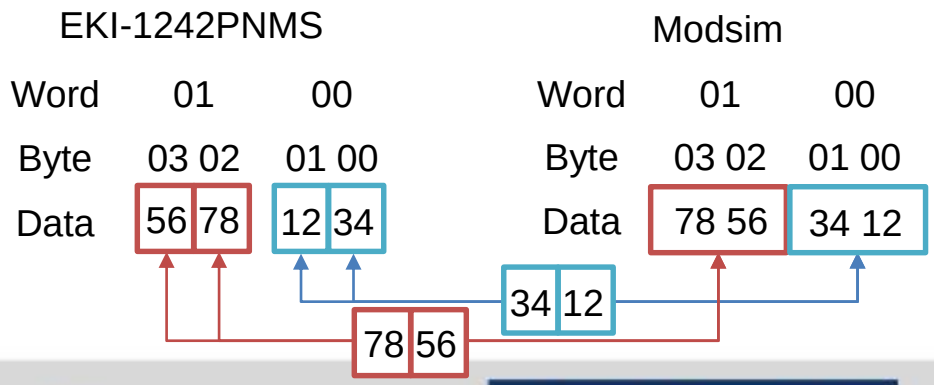




For example, the write data from PLC is 1234H and 5678H for register 5~6 with FC16.

If the data swap (word) is not set, the Modbus data wrote to ModSim became 3412 and 7856.

This is because Modbus transmits data by byte and start from lower byte, but Modsim takes them as words. This end up cause the high and low bytes swapped. To solve this, set Data Swap to make the sequence correct.



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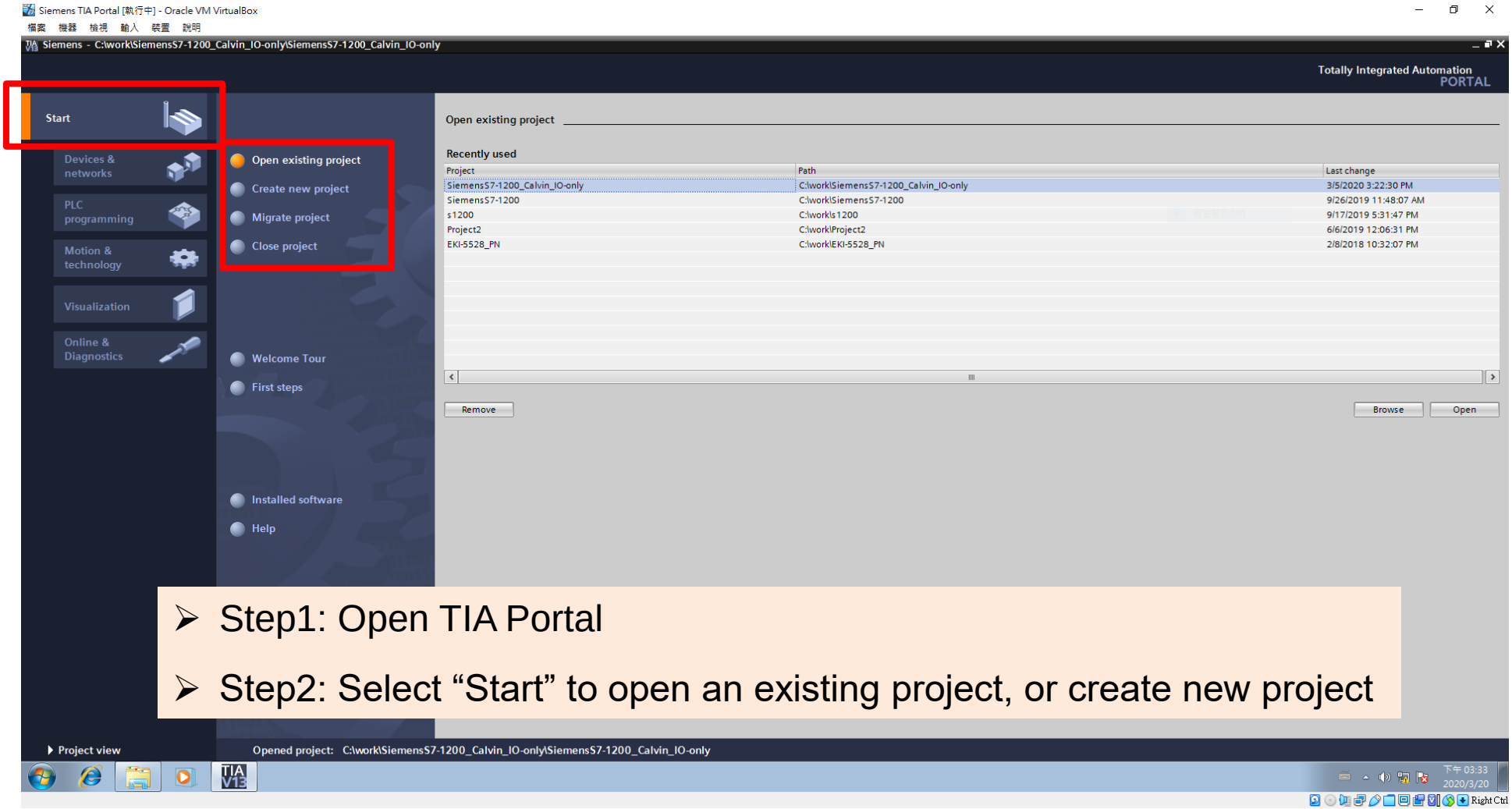
PLC (TIA Portal) Setting

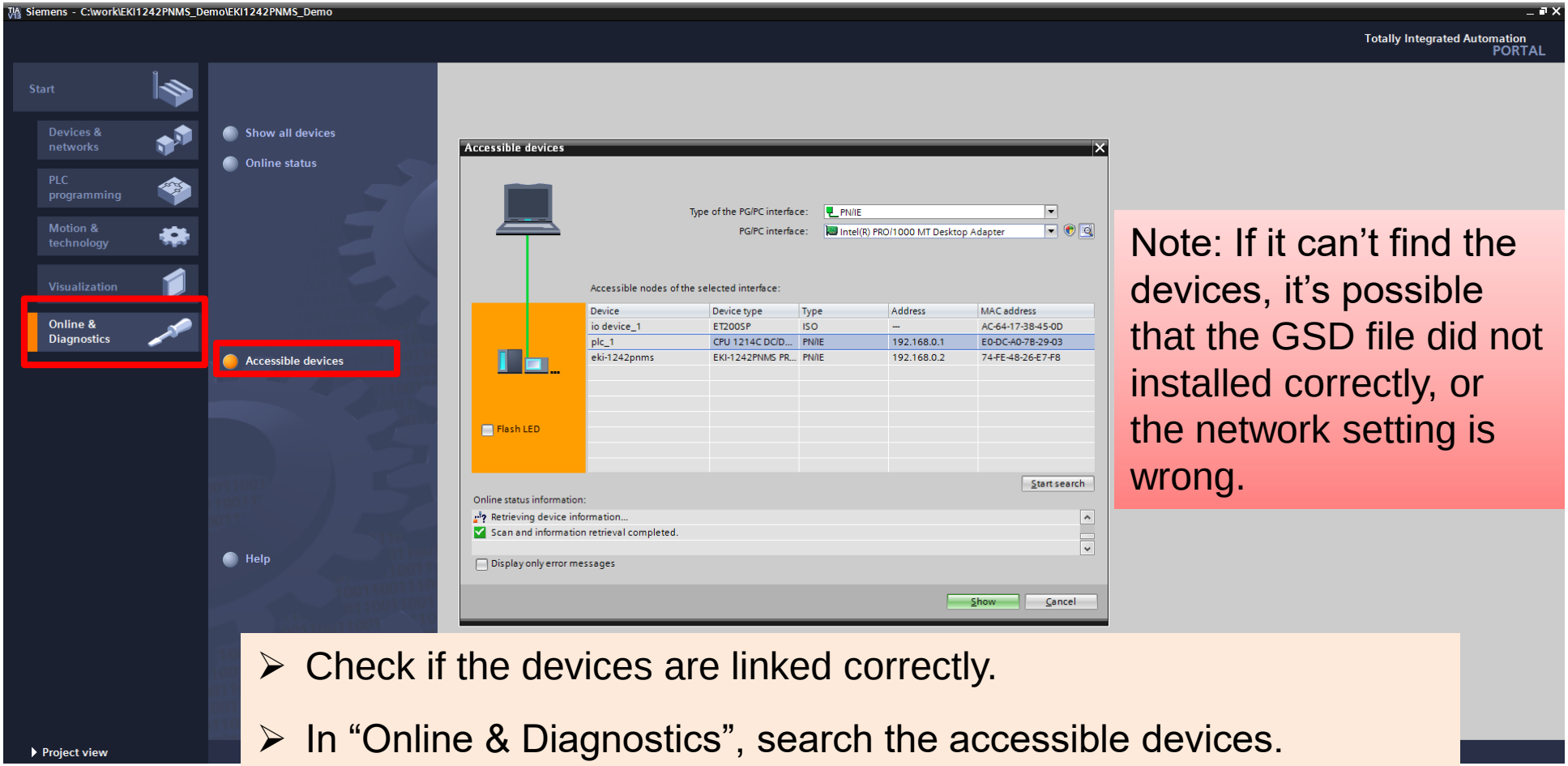
- Network Configuration, I/O Mapping

PLC TIA Portal Setting



- Step1: Open TIA Portal
- Step2: Select “Start” to open an existing project, or create new project

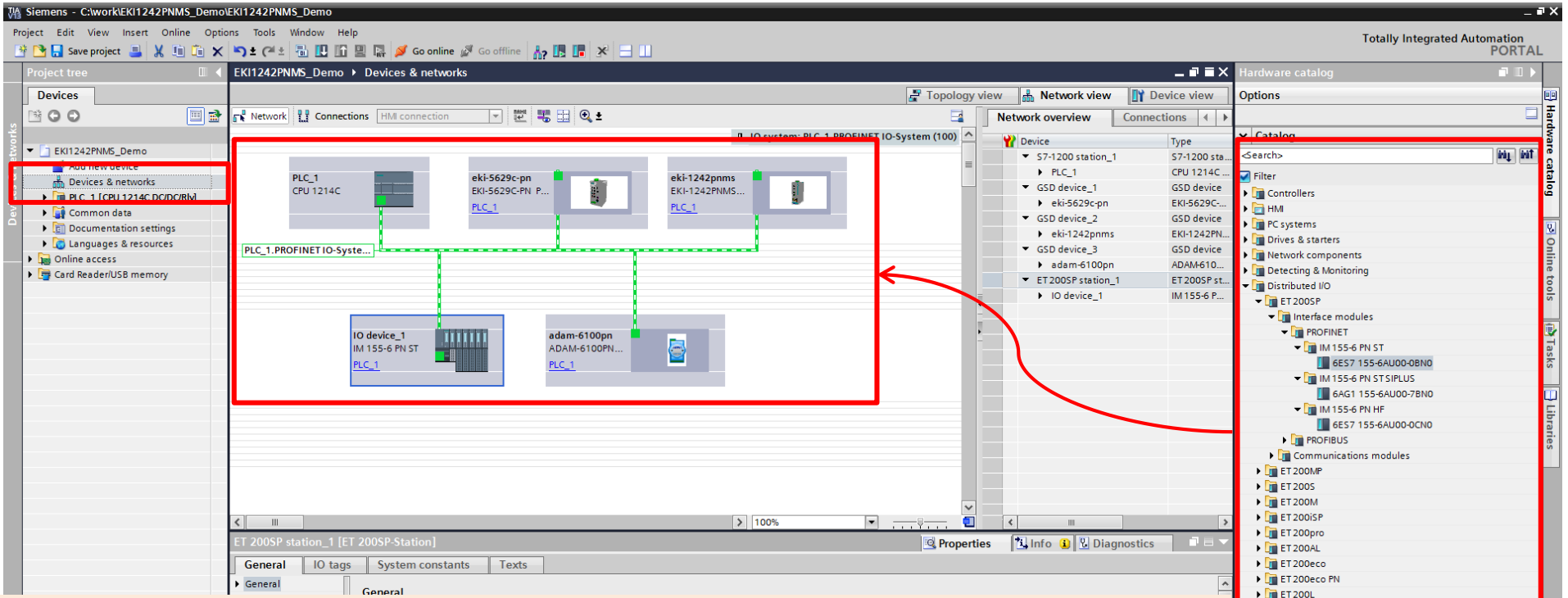
Check the Accessible Devices



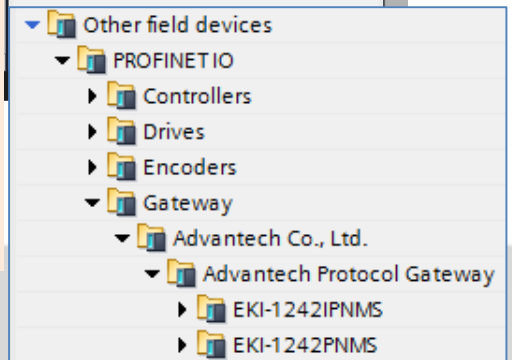
Note: If it can't find the devices, it's possible that the GSD file did not installed correctly, or the network setting is wrong.

- Check if the devices are linked correctly.
- In "Online & Diagnostics", search the accessible devices.

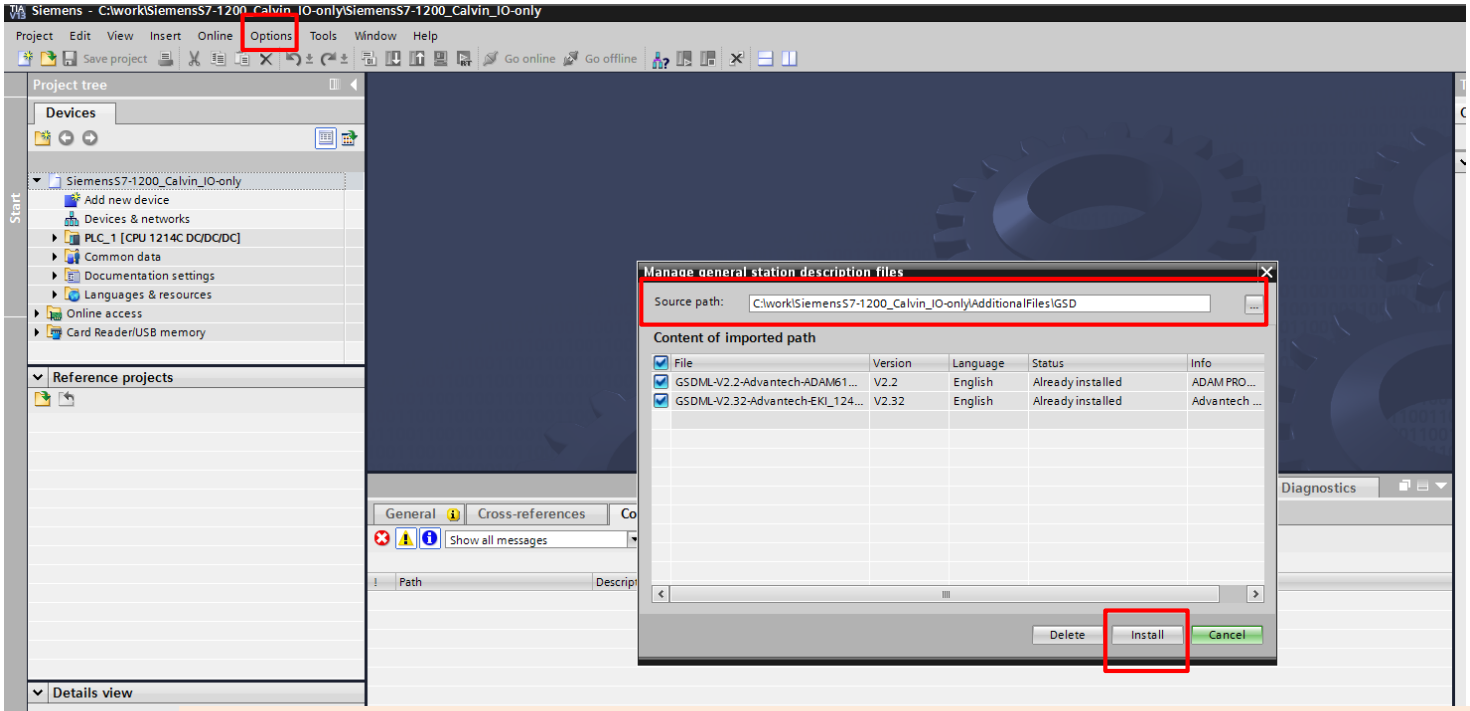
Network Configuration



- Back to Project View → Go to Devices & networks page.
- Drag the needed model from the catalog to deploy them, and assign them with the PLC network.
- EKI-1242PNMS Could be found in path “Other Field Device → PROFINET IO → Gateway → Advantech Co., Ltd.”.

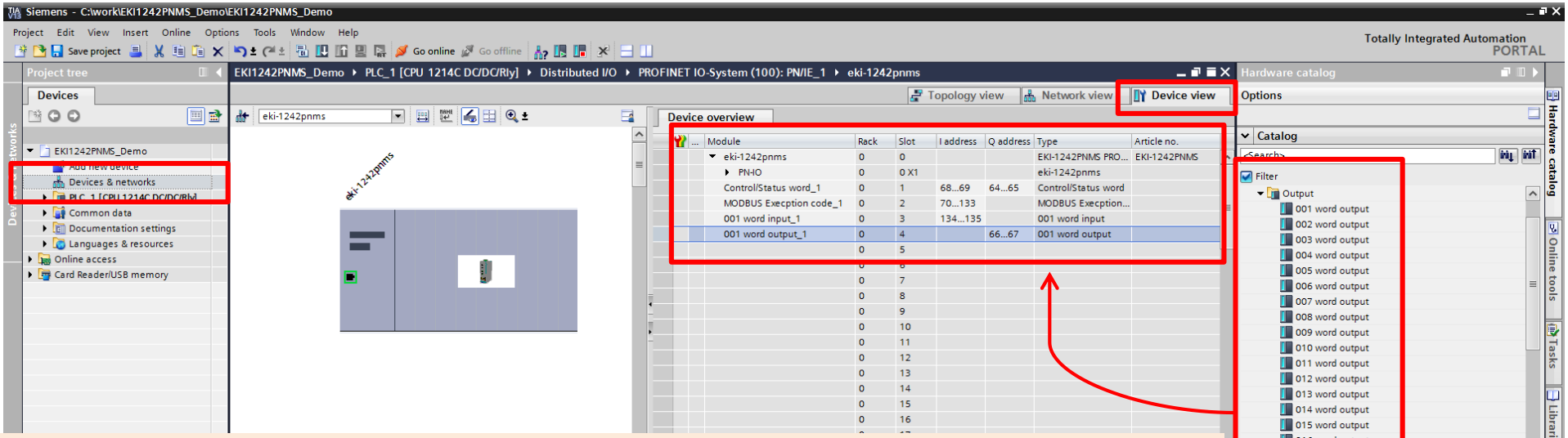


GSD File Installation (If Necessary)



- If the required model cannot be found in the catalog, install it manually.
- In Project View, Go to “Options → Manage general station description files (GSD)”. Select the source path where the GSD files to be installed, and check the checkbox of them. Press Install to install them.

Define the I/O Mapping



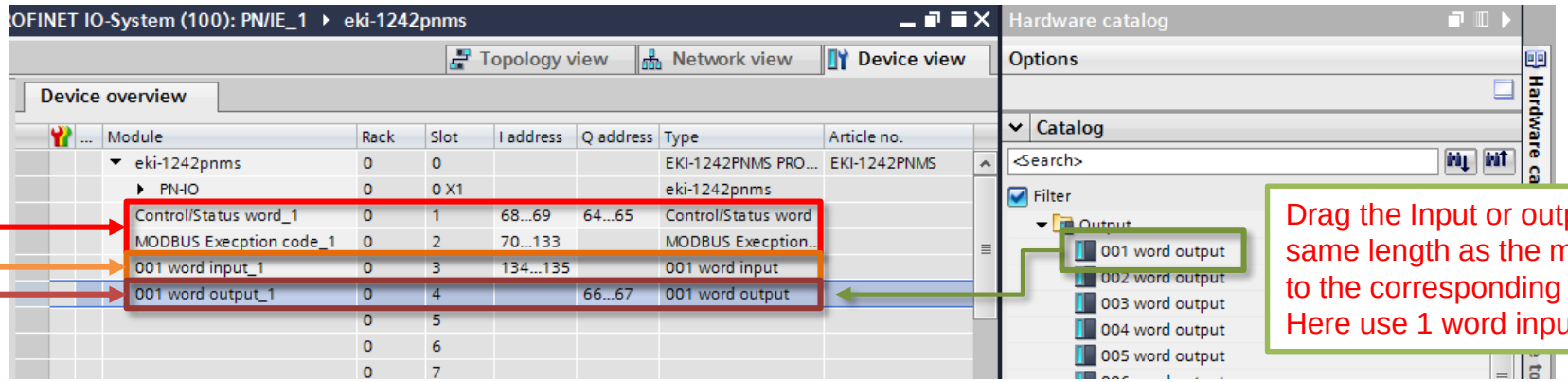
- Go to Devices & networks page, and double click the device to be configured. The window will switch to Device View.
- Set the input and output data the same as those already mapped in EKI-1242PNMS. Drag the matched number of word from the catalog into the corresponding slot.
- The input (I address) and output (Q address) are defined automatically when words are placed. This could be changed manually if not suitable.
- Since it only accept data format in word (16bit), please carefully arrange the reading and writing ranges for Modbus.

I/O Mapping Relationship

PROFINET I/O

Slot	Transaction Name	In Slot Range(bytes)	Input Word	Output Word
1	Device Status/Control	0 - 1	1	-
2	Exception Code	0 - 63	32	-
3	R_DIO	0 - 1	1	-
4	W_DO	0 - 1	-	1

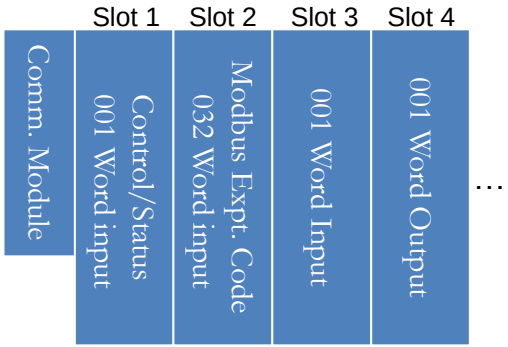
- As what we mentioned in previous slide, the I/O mapping results on the EKI-1242PNMS should be applied in the PLC.
- By default the Control/Status and the Modbus Exception Code are Enabled, and always occupy the 1st and 2nd slot when Enabled. Thus, you can see the Slot 1 & 2 are them.
- Mapping result on EKI-1242PNMS has a “1 word input” in slot 3, and a “1 word output” in slot 4. Drag the input/output item with the same length to the Slot position on the PLC.

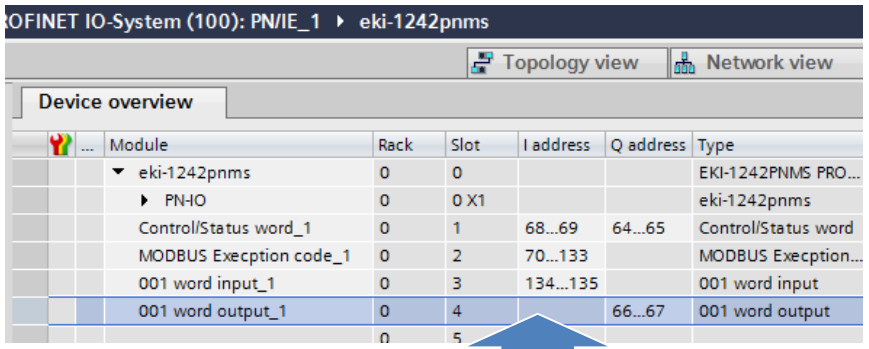


Meaning of the I/O Mapping

Profinet IO on PLC

The format is the same as a regular Profinet I/O station.
Each Slot is an extra module attached to the main communication module.





	Module	Rack	Slot	I address	Q address	Type
	eki-1242pnms	0	0			EKI-1242PNMS PRO...
	PN-IO	0	0 X1			eki-1242pnms
	Control/Status word_1	0	1	68...69	64...65	Control/Status word
	MODBUS Execption code_1	0	2	70...133		MODBUS Execption...
	001 word input_1	0	3	134...135		001 word input
	001 word output_1	0	4		66...67	001 word output
		0	5			

Profinet I/O Station

Profinet I/O Mapping Results on EKI-1242PNMS

Slot 1. **Device Status/Control** (If Enabled). 1 word Input.
Slot 2. **Modbus Exception Code** (If Enabled). 32 words Input.
Slot 3. **Input, 1 word.**
Slot 4. **Output, 1 word.**

- If the Status/Control and Modbus Exception Code are Disabled, the mapped result of the Modbus Commands will be moved upward. ex. R_DIO became Slot 1, and W_DO became Slot 2.

PROFINET I/O

Slot	Transaction Name	In Slot Range(bytes)	Input Word	Output Word
1	Device Status/Control	0 - 1	1	-
2	Exception Code	0 - 63	32	-
3	R_DIO	0 - 1	1	-
4	W_DO	0 - 1	-	1

Modbus Entry

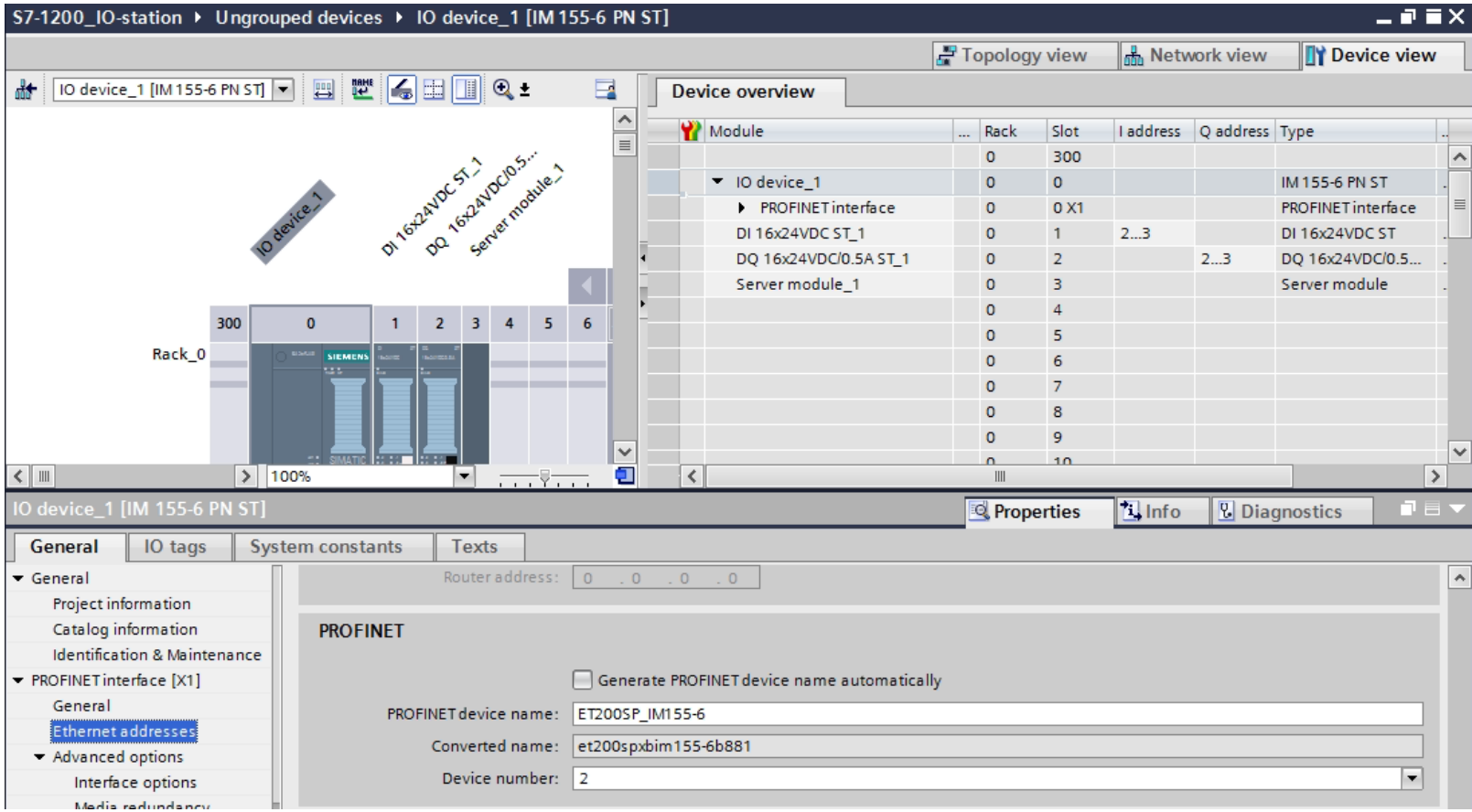
1. **Input, 1 word.** Read start from 1, quantity 1
2. **Output, 1 word.** Write start from 1, quantity 1

Index	Name	Mode	Slave ID	FC	Address/Quantity
1	R_DIO	TCP Slave IP Address: 192.168.1.110 Port: 502	1	3	Read Address 1, Quantity 1
2	W_DO	TCP Slave IP Address: 192.168.1.110 Port: 502	1	16	Write Address 3, Quantity 1

EKI-1242PNMS

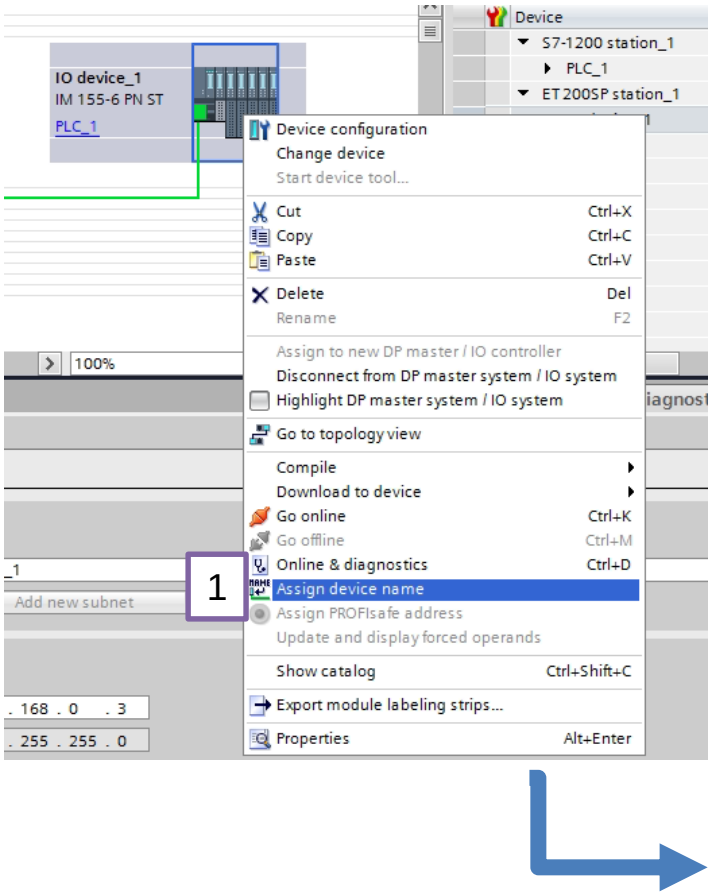
Naming of the Device

- Every device should have a unique name within the network. The PLC will look for its partner according to this name.
- To check the name: go to Device View, and double click on the device. Then, you can find the “PROFINET” part in Ethernet address option.
- By default, TIA Portal will generate a name automatically for each device.
- To manually assign a name for the device, uncheck the Auto-naming, and key-in the PROFINET device name.



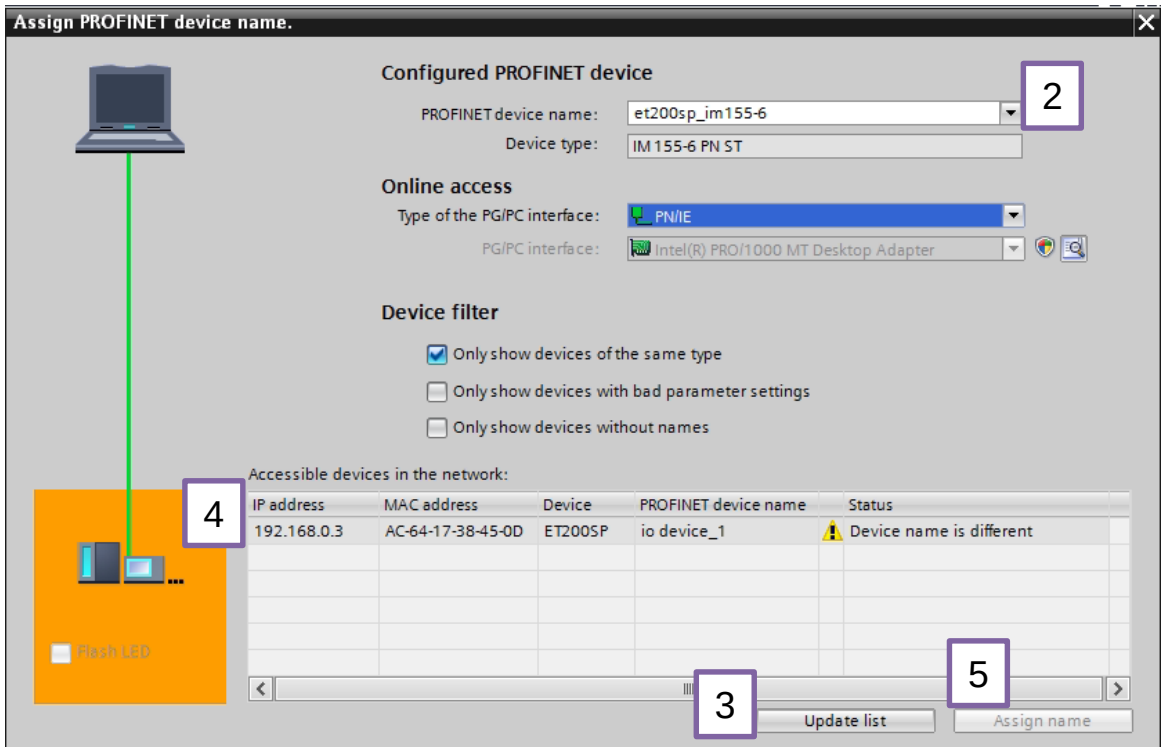
- Actual name shown in the packet if captured by Wireshark, would be the Converted Name.

Assign Name for the Device



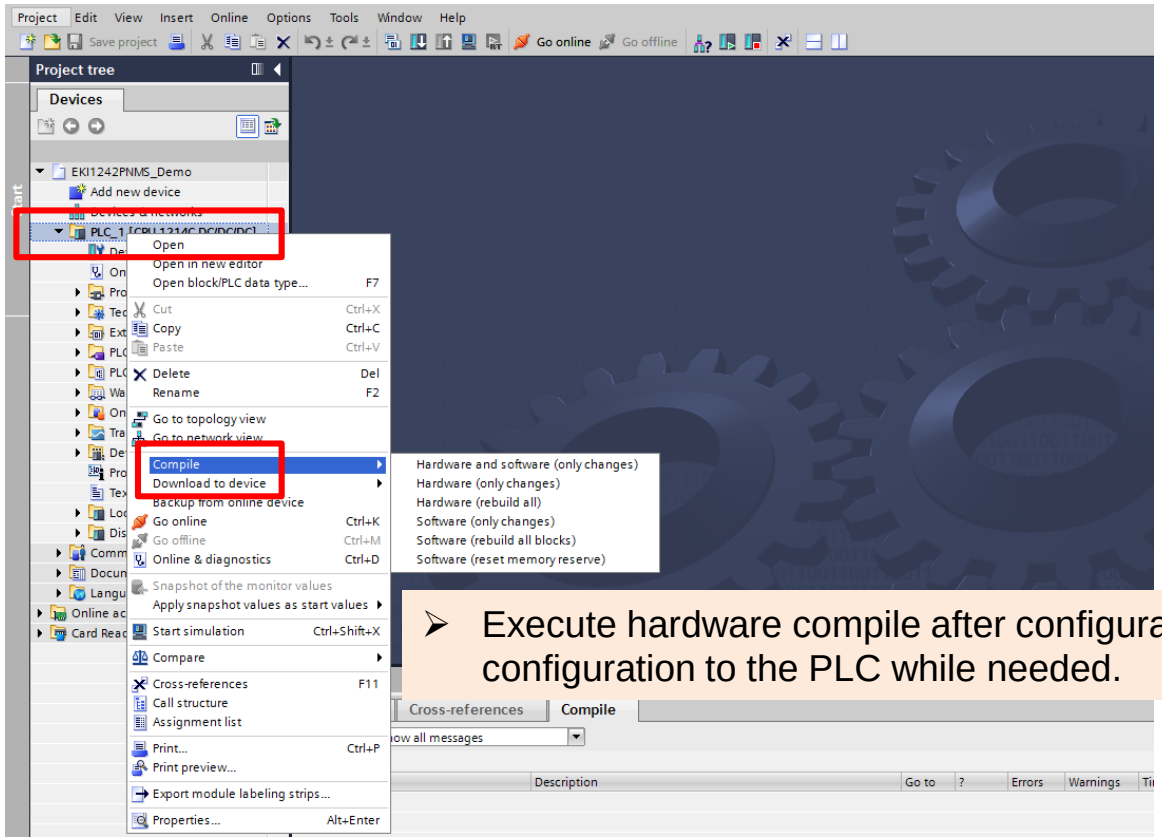
Back to Network View。

1. For the device to assign name, right click on its icon for Assign device name.
2. Select the name to be assigned from the drop-down list.
3. Click the Update List to search for the device with the same Device Type as selected. (Here is I/O station – only the same device type will be listed)
4. Select the target device found, and click Assign name.
5. TIA Portal will change the target device name to the selected one.



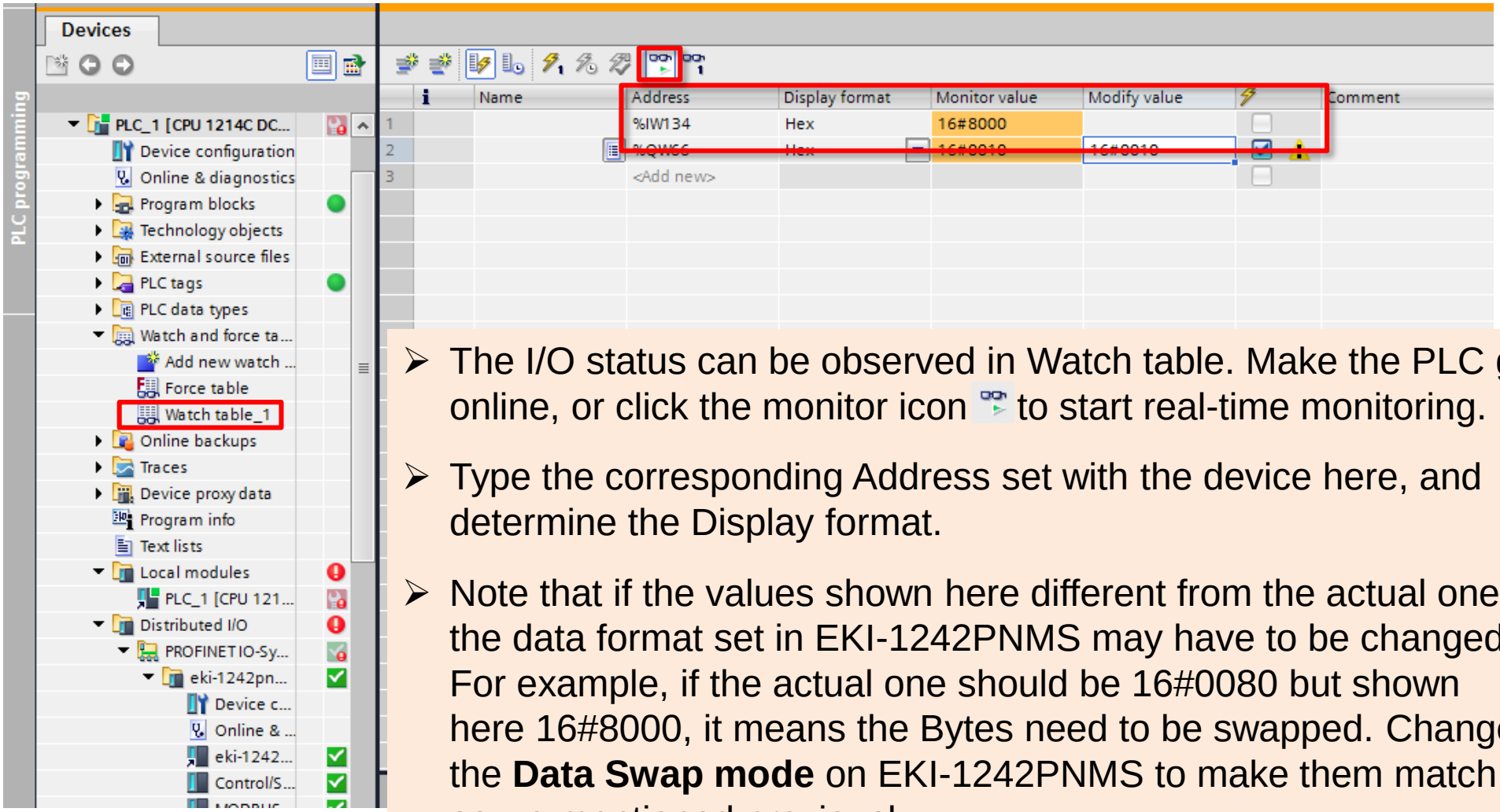
- PLC will show error, if the target device was correctly connected before but now re-assigned the name. This is because the name stored in the PLC no longer exist.

Compile After Configuration



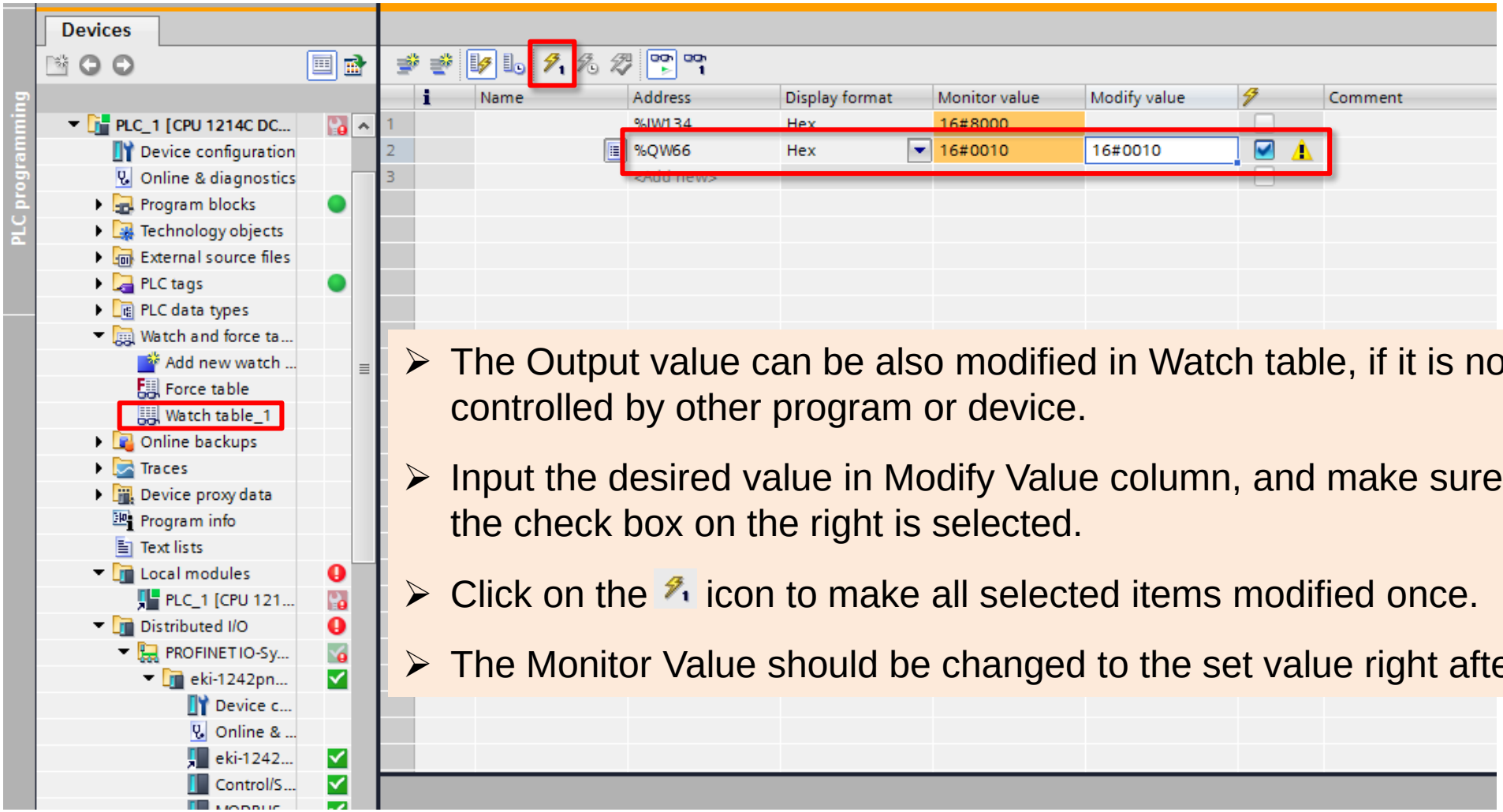
- Execute hardware compile after configuration, and download the configuration to the PLC while needed.

IO Status in Watch Table



- The I/O status can be observed in Watch table. Make the PLC go online, or click the monitor icon to start real-time monitoring.
- Type the corresponding Address set with the device here, and determine the Display format.
- Note that if the values shown here different from the actual one, the data format set in EKI-1242PNMS may have to be changed. For example, if the actual one should be 16#0080 but shown here 16#8000, it means the Bytes need to be swapped. Change the **Data Swap mode** on EKI-1242PNMS to make them match, as we mentioned previously.

Change the Output in Watch Table



- The Output value can be also modified in Watch table, if it is not controlled by other program or device.
- Input the desired value in Modify Value column, and make sure the check box on the right is selected.
- Click on the icon to make all selected items modified once.
- The Monitor Value should be changed to the set value right after.

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