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# SI-PN PROFINET Communication Expansion Card User Guide

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# Preface

## ■ Introduction

The SI-PN communication expansion card complies with IEC61158-5-10 and IEC61158-6-10 application layer standards, the international PROFINET Ethernet standards. This card is to be installed on the MD800 series AC drive. The AC drive converts the PROFINET protocol to the CANopen protocol, making the AC drive into a fieldbus slave controlled by the fieldbus master.

## ■ Revision History

Date	Version	Description
November 2023	A00	First release

## ■ Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version in the following ways:

- Visit [www.inovance.com](http://www.inovance.com), go to "Support" > "Download", search by keyword, and then download the PDF file.
- Scan the QR code below to install the Inovance app, and search for the MD800 series AC drive in the app to obtain this guide.



## ■ Warranty

For faults and damage incurred during normal use in the warranty period, Inovance provides free repair service. (For details of the warranty period, see the purchase order.) A maintenance fee will be charged out of the warranty period.

Even in the warranty period, a maintenance fee will be charged for repair of the following damage:

- Damage caused by operations not following the instructions in the guide
- Damage caused by fire, flood, or abnormal voltage

- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance fee will be charged according to our latest Price List if not otherwise agreed upon.

For details, see the Product Warranty Card.

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# 1 Product Information

## 1.1 Introduction

The SI-PN communication expansion card complies with IEC61158-5-10 and IEC61158-6-10 application layer standards, the international PROFINET Ethernet standards.

This card is to be installed on the MD800 series AC drive. The AC drive converts the PROFINET protocol to the CANopen protocol, making the AC drive into a fieldbus slave controlled by the fieldbus master.



Figure 1-1 SI-PN communication expansion card appearance

## 1.2 Applicable AC Drives

Card Model	Order No.	Applicable AC Drive
SI-PN	01040121	MD800

## 1.3 Technical Specifications

PN bridge function description: Comprehensive performance parameters of the PROFINET end

Item	Technical Specifications
Communication protocol	PROFINET protocol
Service supported	RT communication
Physical layer	100BASE-TX
Baud rate	100 Mbps (100Base-TX)
Duplex mode	Full duplex
Topology	Ring, linear, and star
Transmission media	Shielded Cat5e or better cable
Transmission distance	Less than 100 m between two nodes (with proper environment and cables)
Number of slaves	Up to 65535 slaves supported by the protocol (determined by PLC performance)
Frame length	40 bytes to 1,440 bytes
Process data	Maximum 1,440 bytes per Ethernet frame
Synchronization jitter of two slaves	None
Update time	Less than 1 ms for 1,000 digital inputs and outputs of 32 devices
Communication bit error ratio	Ethernet standard

## 1.4 Outline Dimensions

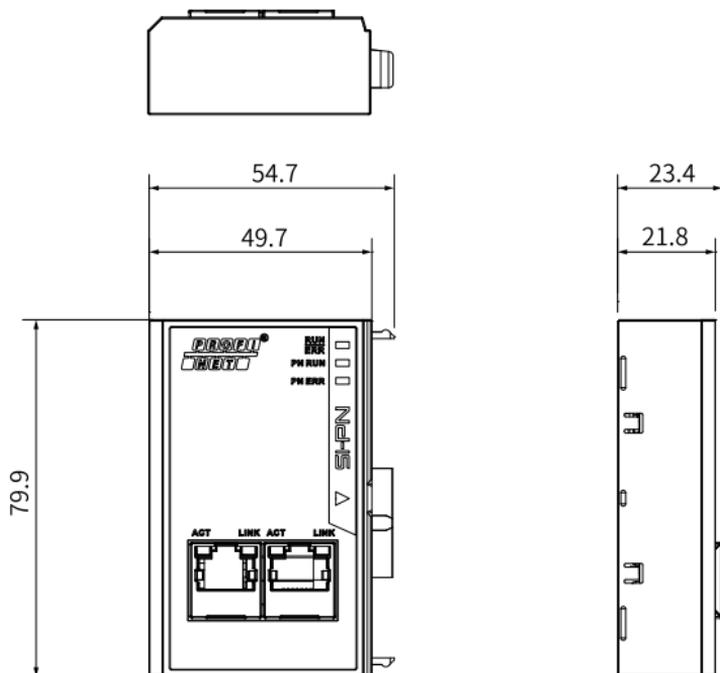


Figure 1-2 SI-PN communication expansion card dimensions (unit: mm)

## 1.5 Interface Description

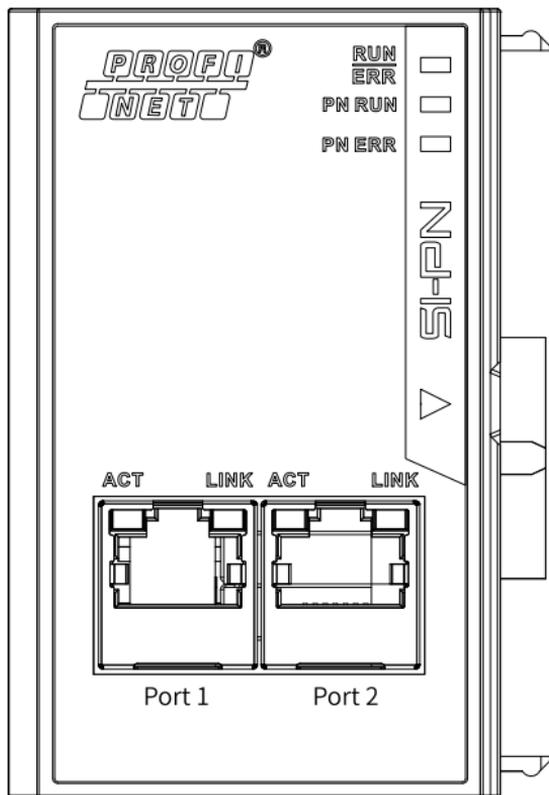


Figure 1-3 SI-PN communication expansion card interface layout

The SI-PN communication expansion card uses a standard Ethernet RJ45 socket to connect to a PROFINET master. Its pin assignment aligns with standard Ethernet pins, allowing for the use of both crossover and straight-through cables.

Table 1–1 Terminals and functions

Mark	Terminal Name	Function Description
Port1	Network port 1	<ul style="list-style-type: none"> <li>After the card is installed, Port1 is on the left and Port2 is on the right when you view them facing the RJ45 interface.</li> <li>To ensure stability, it is recommended to use the Cat5e shielded twisted pair (STP) network cable.</li> <li>For enhanced communication interference resistance, it is recommended to install the card in expansion slot 2.</li> </ul>
Port2	Network port 2	

Table 1–2 Indicators

Indicator		Status Description	Action
RUN/ERR	Green light steady ON	Communication normal	None
	Red light steady ON	Communication timeout between the SI-PN card and the node	<ul style="list-style-type: none"> <li>Restart the SI-PN card.</li> <li>Eliminate on-site interference.</li> </ul>
	Red light blinking fast (500 ms interval)	Internal communication timeout of the SI-PN card	
	Red light blinking slow (1s interval)	Communication timeout between the SI-PN card and the rectifier	
PN RUN	Steady ON	SI-PN card communication normal	None
PN ERR	Steady ON	Lost communication with the master	Check the wiring.
	Blinking	Blinking request received from the master	None

## 2 Installation Guide

- Before installation, cut off the power supply of the AC drive and wait for about 10 minutes until the charging indicator of the AC drive becomes off.
- Insert the SI-PN communication expansion card into the AC drive. Check whether the card is securely inserted to prevent the signal socket between boards from being damaged by the pulling force of the external signal cable.
- The SI-PN card does not support hot swapping.

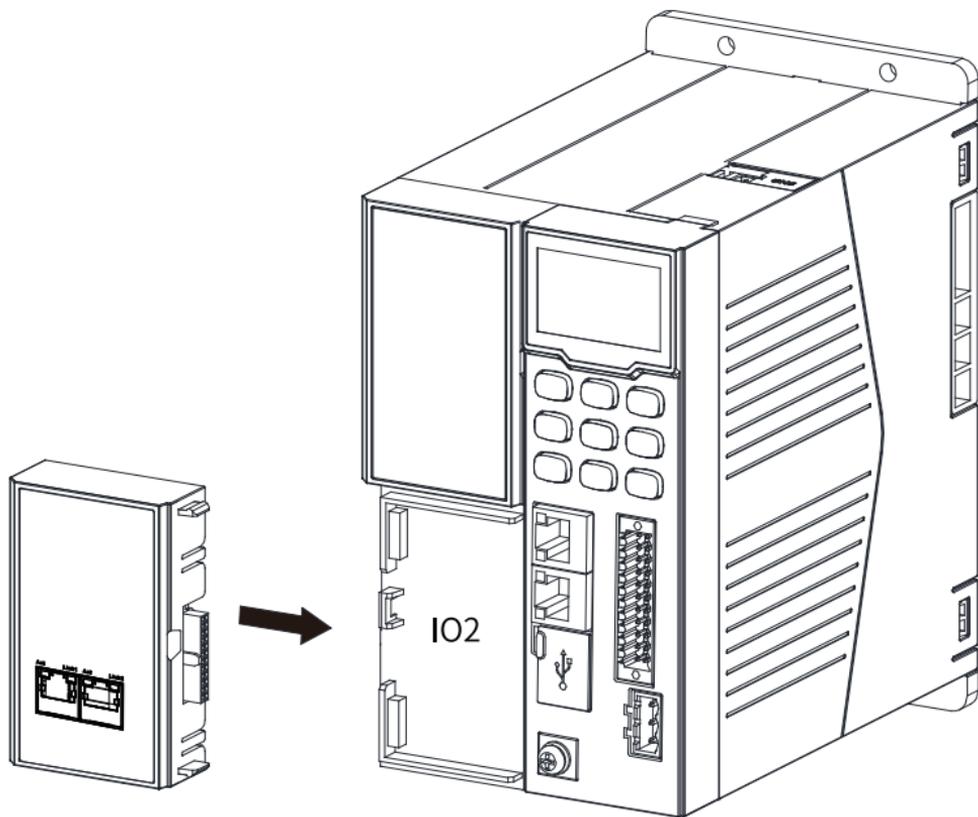


Figure 2-1 SI-PN communication expansion card

# 3 PROFINET Communication Protocol

## 3.1 Overview of Communication

The SI-PN communication expansion card can implement data exchange among up to nine CANopen nodes, including one rectifier and eight inverters.

This guide requires that the software version for the SI-PN card is 33.01 or later (the version can be queried through parameter FD-91 after then card is installed and power on), with the corresponding GSDML file named "GSDML-Vn.nn-inovance-MD800PNGATE-20xxxxx.xml" (The n.nn indicates the version number and the 20xxxxx indicates the date. Use version V2.31 dated 20201229 or a later version).

## 3.2 Data Frame Structure

Preamble	Frame start flag	Destination MAC	Source MAC	VLAN tag		Ethernet type	Frame ID	Data area				APOU status			Check					
7 bytes	1 byte	6 bytes	6 bytes	2 bytes	2 bytes	2 bytes	2 bytes	0 to 1440 bytes				0 to 40 bytes	2 bytes	2 bytes	1 byte	4 bytes				
				0x8100	VLAN_ID	0x8892		IOCS	Data	IOPS	IOCS	Data	IOPS	IOCS	Data	IOPS	Padding	Cycle counter	Data status	Transmission status

Priority	0	VLAN_ID
3 bits	(1 bit)	(12 bits)

Ethernet type	
Type	Protocol
0x0800	IP
0x0806	ARP
0x8100	VLAN
0x8892	PN

Unicast	0x800 to 0xBFFF
Multicast	0xC000 to 0xBFFF

See section 4.2.2.1 in REC61154-4-01.

**Cycle counter**  
The time base is 31.25 μs and the value is the cycle counter value.  
Used to assess data duplication, loss, and obsolescence.

**Data status:**  
Used to assess producer status, data validity/invalidity, and device diagnostic status.

**Transmission status:**  
RT mode is 0.

## 3.3 Network Topology

After communication between the SI-PN communication expansion card and the AC drive is implemented, connect the SI-PN card to the PROFINET master and configure related parameters to enable communication between the SI-PN card and the PROFINET master, implementing AC drive networking.

The PROFINET master supports bus, star, and tree topologies. Different networking modes can be implemented by using switches.

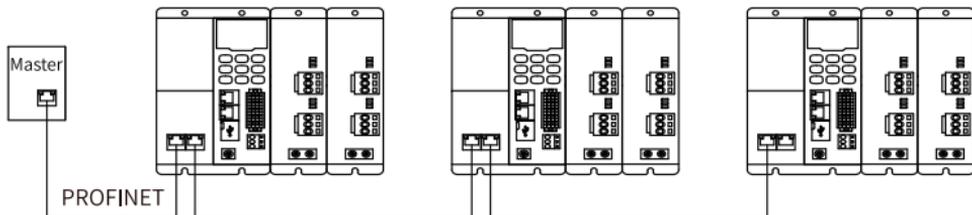


Figure 3-1 Bus topology

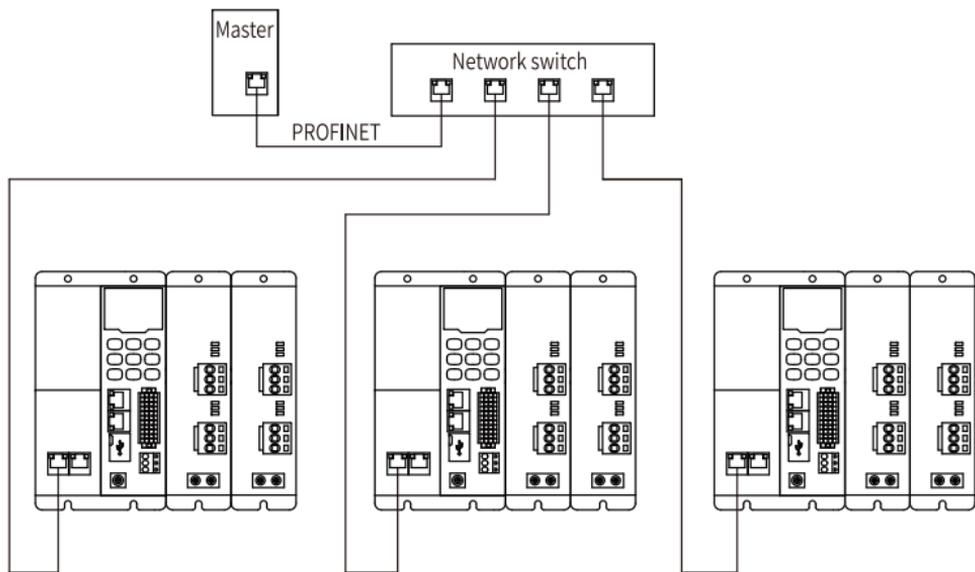


Figure 3-2 Star topology

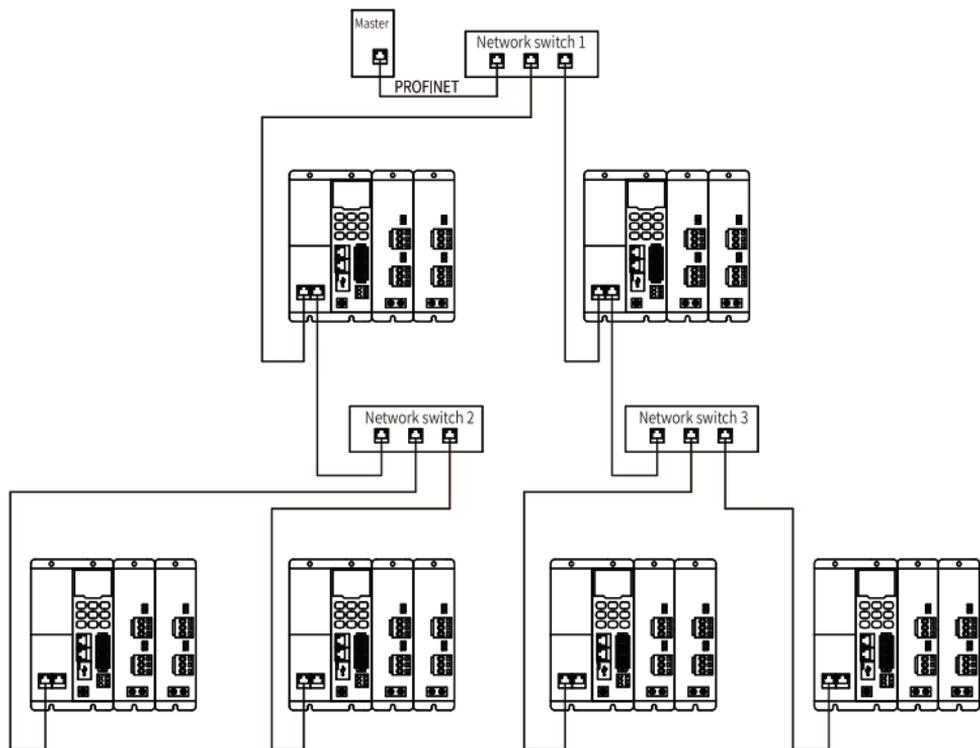


Figure 3-3 Tree topology

### 3.4 Data in PZD Area

The PZD area enables the master to modify or read AC drive data in real time and exchange data with the AC drive cyclically. The PZD area is used to:

- Set the AC drive control command or frequency reference in real time.
- Read the AC drive status or operation frequency in real time.
- Exchange function parameter data and monitoring parameter data between the AC drive and the PROFINET master in real time.

By default, PZD1 is mapped to the control word and PZD2 is mapped to the frequency reference in writing. PZD1 is mapped to the status word and PZD2 is mapped to the operation frequency in reading. If these default mappings are not used, manual configuration is required. The following table lists the exchanged data.

Table 3-1 Exchanged data

PZD Area in Master Request			PZD Area in AC Drive Response		
PZD1	PZD2	PZD3 to PZD16	PZD1	PZD2	PZD3 to PZD16
Control word (U3-17)	Frequency reference (U3-16)	Real-time modification of AC drive function parameters	Status word (U0-68)	Operation frequency (U0-00)	Real-time reading of AC drive function parameters

Table 3-2 Data description

PZD Area in Master Request		PZD Area in AC Drive Response	
PZD1	<p>AC drive command word (valid when the command source is set to communication, that is, F0-02 = 2)</p> <p>Bit 0: Stop according to the stop mode specified by F6-10</p> <p>Bit 1: Forward running</p> <p>Bit 2: Reverse running</p> <p>Bit 3: Forward jog</p> <p>Bit 4: Reverse jog</p> <p>Bit 5: Coast to stop</p> <p>Bit 6: Decelerate to stop</p> <p>Bit 7: Fault reset</p>	PZD1	<p>AC drive operation status</p> <p>Bit 0: 0: Stopped; 1: Running</p> <p>Bit 1: 0: Forward running; 1: Reverse running</p> <p>Bit 2: 0: No fault; 1: Faulty</p> <p>Bit 3: 0: Frequency reference not reached; 1: Frequency reference reached</p> <p>Bits 4 to 7: Reserved</p> <p>Bits 8 to 15: Fault code</p>
PZD2	<p>AC drive target frequency (valid when the frequency source is set to communication, that is, F0-03 = 9)</p> <p>Set the unit of written data to Hz or RPM through parameter F8-64.</p> <p>When F8-64 is set to 0, the unit of written data is Hz. The number of decimal places is consistent with that defined by F0-22. For example, if the decimal value 1000 is written, the frequency reference is 10.00 Hz when F0-22 is set to 2.</p> <p>When F8-64 is set to 1, the unit of written data is RPM. For example, if the decimal value 1000 is written, the frequency reference is 1000 RPM.</p>	PZD2	<p>AC drive operation frequency (unit: 0.01 Hz)</p> <p>The current AC drive operation frequency is indicated by 16-bit signed data in the response.</p>

PZD Area in Master Request		PZD Area in AC Drive Response	
PZD3 to PZD16	Real-time modification of function parameters, without being written into EEPROM	PZD3 to PZD16	Real-time reading of function parameters

## 4 Parameter Configuration

### ■ Settings of the SI-PN communication expansion card for AC drive

After installing the SI-PN communication expansion card on the AC drive, set the rectifier parameter FD-10 to 3. Then, reboot the system to enable the communication card mode.

Rectifier Parameter	Description
FD-10	1: CANopen 2: CANlink 3: Communication card mode

### ■ Rectifier parameters for communication monitoring

Parameters such as slave online status can be monitored through rectifier parameters.

Rectifier Parameter	Description
FD-51	Slave communication inhibit time
FD-52	Number of online slaves
FD-53	Online status of stations 1 to 15. Bit 1 represents station 1, and so on.
FD-54	Online status of stations 16 to 31. Bit 0 represents station 16, and so on.
FD-61	Highest two bytes of the MAC address
FD-62	Middle two bytes of the MAC address
FD-63	Lowest two bytes of the MAC address
FD-91	PN card version

### ■ Rectifier parameter for auxiliary communication function

#### ● Startup with slave mismatch

Use case: When a slave in the network fails to come online, but you want to start the network without modifying the PLC configuration and program, set FD-50 to 1.

Rectifier Parameter	Description
FD-50	0: Communication error E16.74 is reported when the number of slaves in the PLC configuration is inconsistent with the actual number of slaves in the network. 1: No communication error is reported when the number of slaves in the PLC configuration is inconsistent with the actual number of slaves in the network.

Modification of the rectifier parameter takes effect after the system is reboot.



## Caution

This function is auxiliary and does not resolve faults (such as E16.74). Enable this function only after completing the commissioning process. Do not commission the network while this function is enabled.

- Communication timeout function

Set the following rectifier parameter to configure the communication timeout interval for the SI-PN card. With this parameter configured successfully, the communication network will stop after the timeout interval expires.

Rectifier Parameter	Description
FD-55	SI-PN card communication timeout interval (unit: ms)

Modification of the rectifier parameter takes effect after the system is reboot.

# 5 Communication Settings Example

## 5.1 Configuration Settings

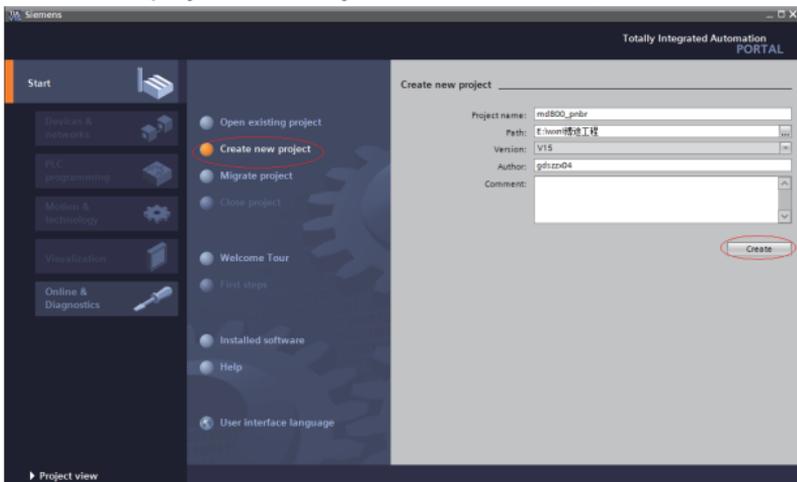
Before using the PROFINET master, you need to configure the GSDML file of the slave to add the corresponding slave device to the system of the master. If the file exists, skip step 2. You can obtain the GSDML file from Inovance or its agent.

If you are using a 200 SMART ST&SR series master, first update the PLC firmware version to 2.05 or later.

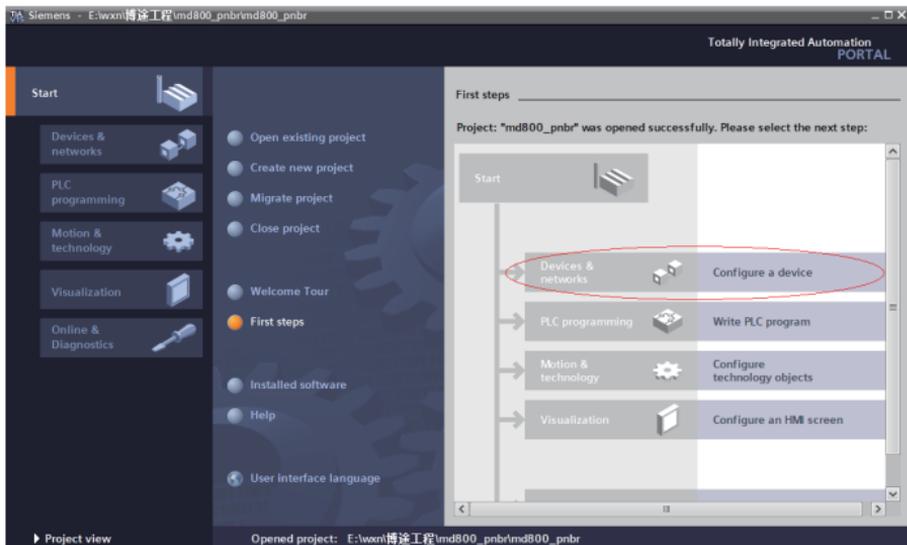
The steps are as follows.

### 1. Create a project.

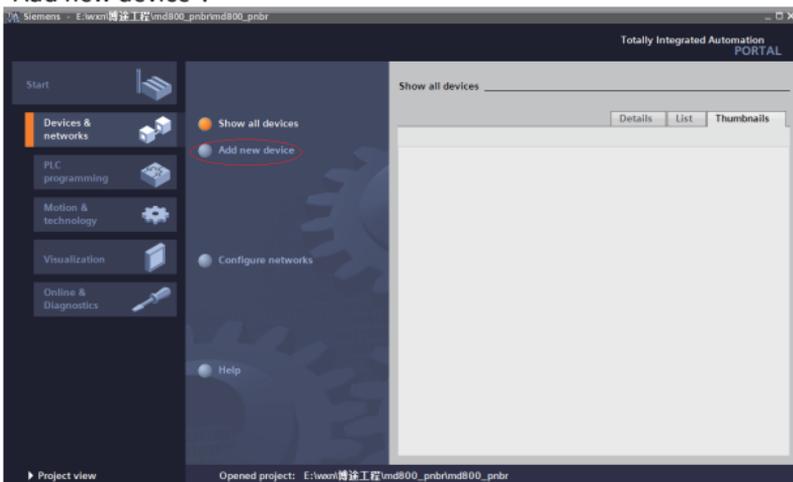
- a. Click "Create new project", set "Project name" and "Path", and click "Create".



- b. Click "Configure a device", as shown in the following figure.

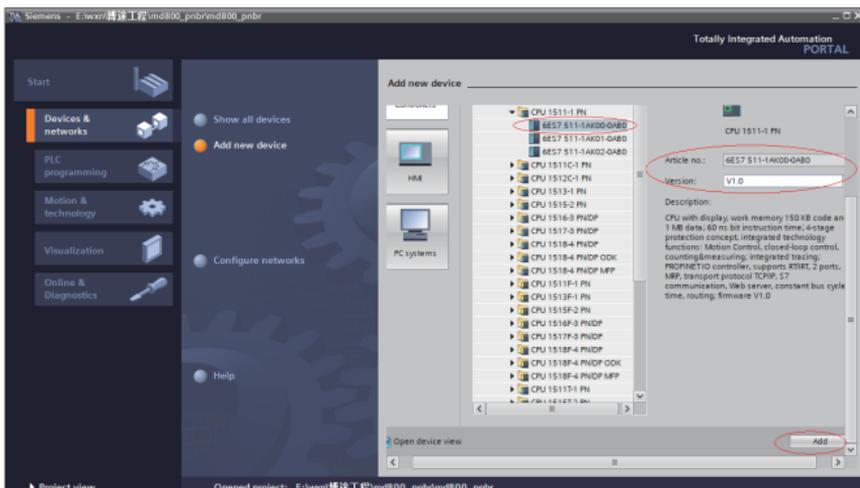


c. Click "Add new device".

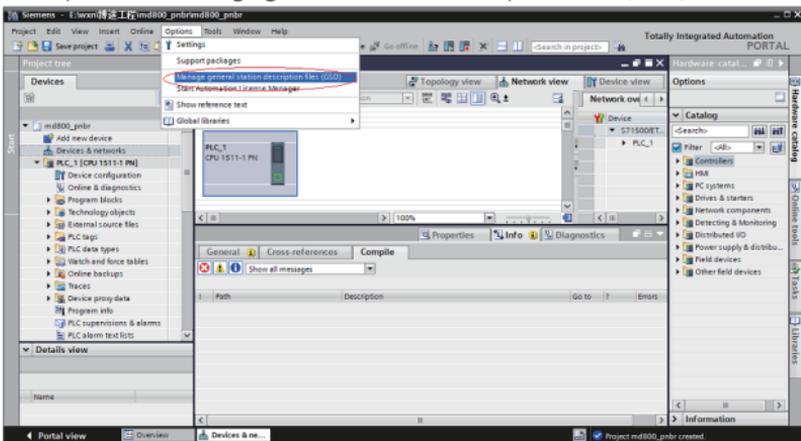


d. In the pop-up window, select a PLC and its firmware version based on the order number. Click "Add" or directly double-click the master. The master is established.

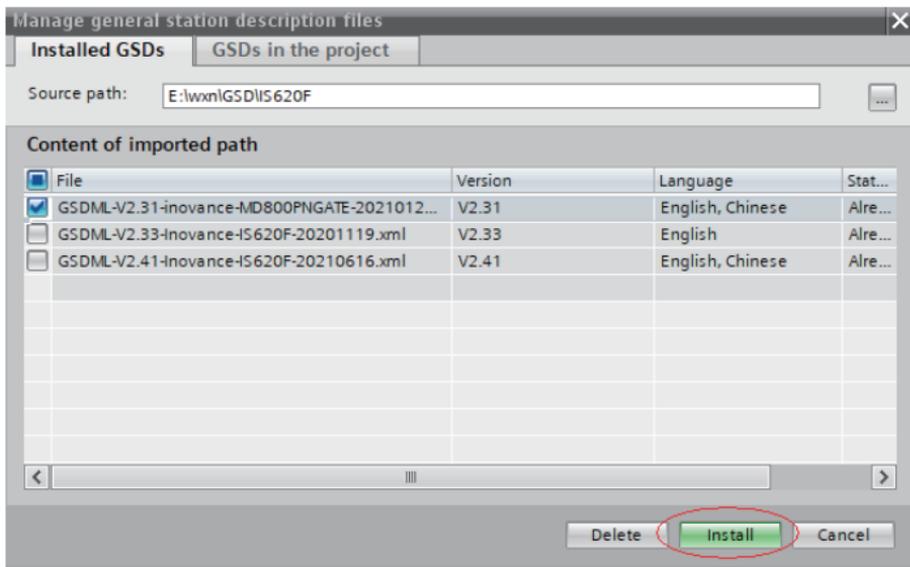
Note: When selecting the PLC, ensure the order number matches to avoid download failures.



2. Install a GSD file (Skip this step if the GSDML file has been installed).
  - a. Choose "Options" > "Mange general station description files (GSD)".



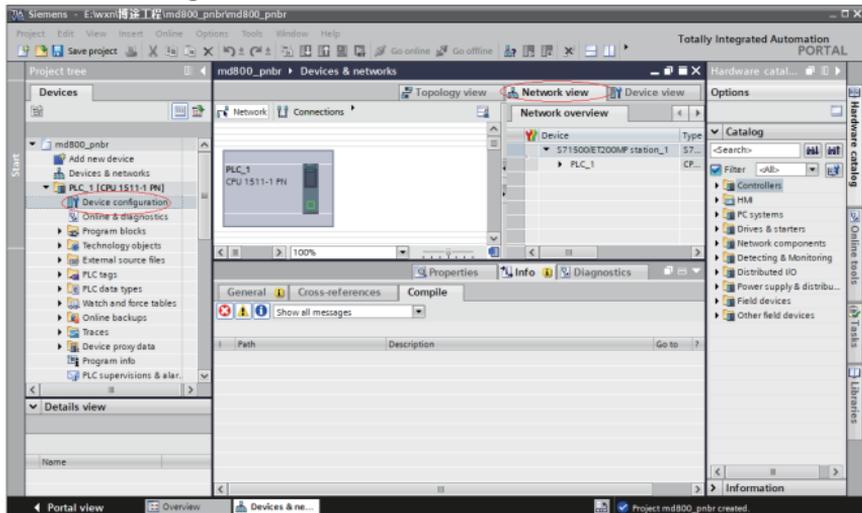
- b. Select a path (which must not contain any Chinese character) for storing the GSDML file, select the GSDML file to be installed, and click "Install".



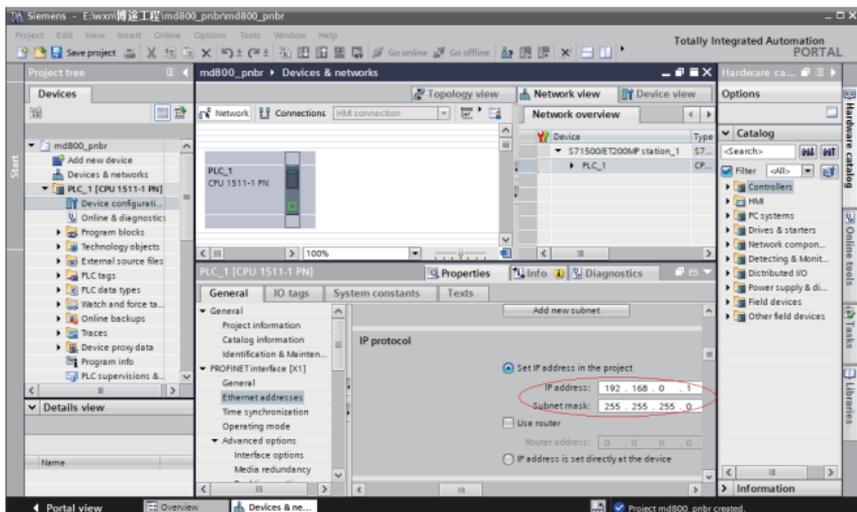
Wait until the installation is completed, and click "Close".

### 3. Establish a network.

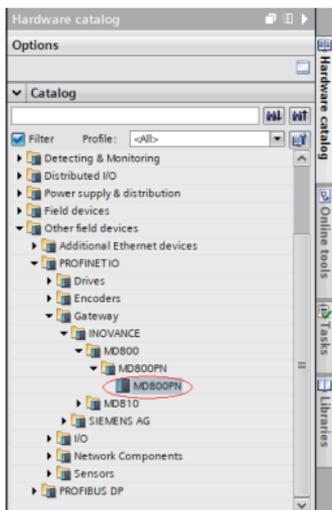
#### a. Click "Device configuration". Select "Network view".



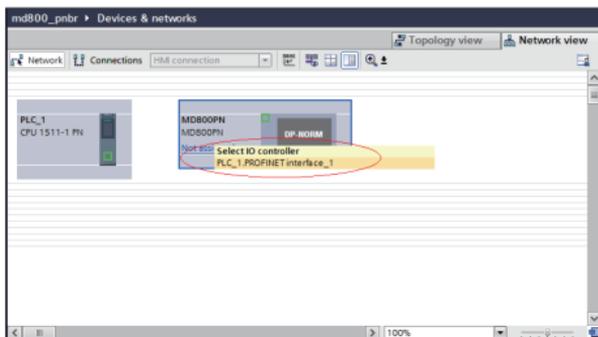
#### b. Select the Ethernet port of the PLC, choose "Properties" > "General", and set the IP address and subnet mask of the PLC master station.



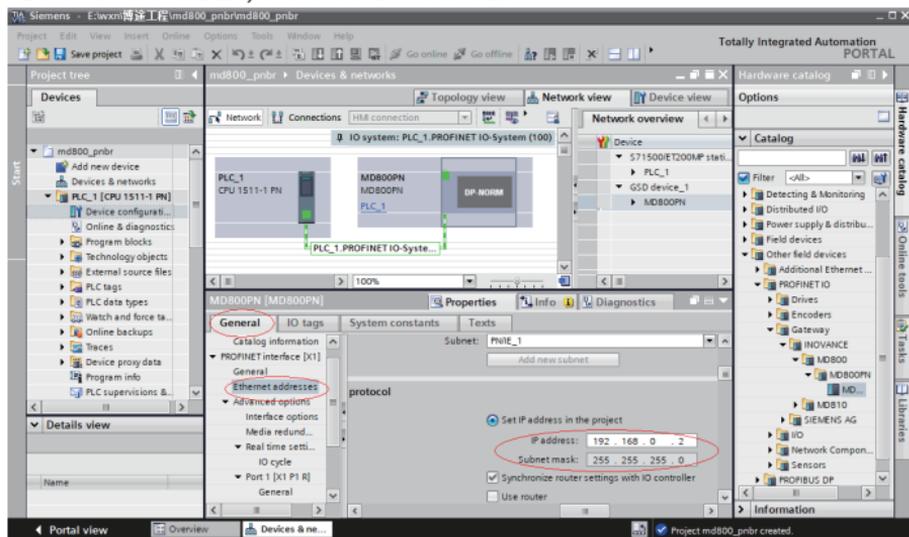
c. In the "Hardware catalog" on the right, navigate to "MD800" and double-click "MD800PN".



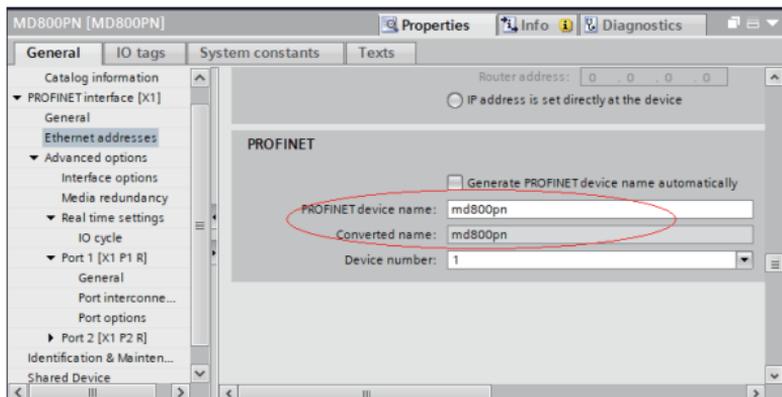
d. Click "Not assigned" and select a master system for the slave.



- e. Select the slave, choose "Properties" > "General" > "PROFINET interface [X1]" > "Ethernet addresses", and set the IP address.



- f. Scroll down the screen to the "PROFINET" section. Deselect "Generate PROFINET device name automatically" and enter a name in the "PROFINET device name" field. (Alternatively, you can keep the option selected to allow the system to generate a device name automatically.)



#### 4. Configure a CANopen slave.

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## Note

Process of configuring the SI-PN communication expansion card:

1. Double-click or drag a rectifier or inverter from the module list to add a slave.
2. Configure mapping relations for the slave.
3. Configure process data for the slave.

To configure multiple inverters that have the same settings as an existing inverter, you can simply copy the inverter, without the need to repeat the process above.

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#### a. Add a slave.

Select a slave and switch to the "Device view". Navigate to "Hardware catalog" > "Module" and you can find two module options: "Rectifier Device" and "MD800 Device". Double-click a module to add it to the "Device overview" list.

The screenshot shows the 'Device overview' table with the following data:

Module	Rack	Slot	I address	Q address	Type
MD800PN	0	0			MD800PN
Interface	0	0 X1			MD800PN
Rectifier Device_1	0	1			Rectifier Device
Mapping Table IN	0	1 1			Mapping Table IN
Mapping Table OUT	0	1 2			Mapping Table OUT
Input 28 Byte	0	1 3	0...27		Input 28 Byte
Output No Data	0	1 4			Output No Data
MD800 Device_1	0	2			MD800 Device
Mapping Table IN	0	2 1			Mapping Table IN
Mapping Table OUT	0	2 2			Mapping Table OUT
Input 04 Byte	0	2 3	28...31		Input 04 Byte
Output 04 Byte	0	2 4		0...3	Output 04 Byte
MD800 Device_2	0	3			MD800 Device
Mapping Table IN	0	3 1			Mapping Table IN
Mapping Table OUT	0	3 2			Mapping Table OUT
Input 04 Byte	0	3 3	32...35		Input 04 Byte
Output 04 Byte	0	3 4		4...7	Output 04 Byte
MD800 Device_3	0	4			MD800 Device
Mapping Table IN	0	4 1			Mapping Table IN
Mapping Table OUT	0	4 2			Mapping Table OUT
Input 04 Byte	0	4 3	36...39		Input 04 Byte
Output 04 Byte	0	4 4		8...11	Output 04 Byte
MD800 Device_4	0	5			MD800 Device

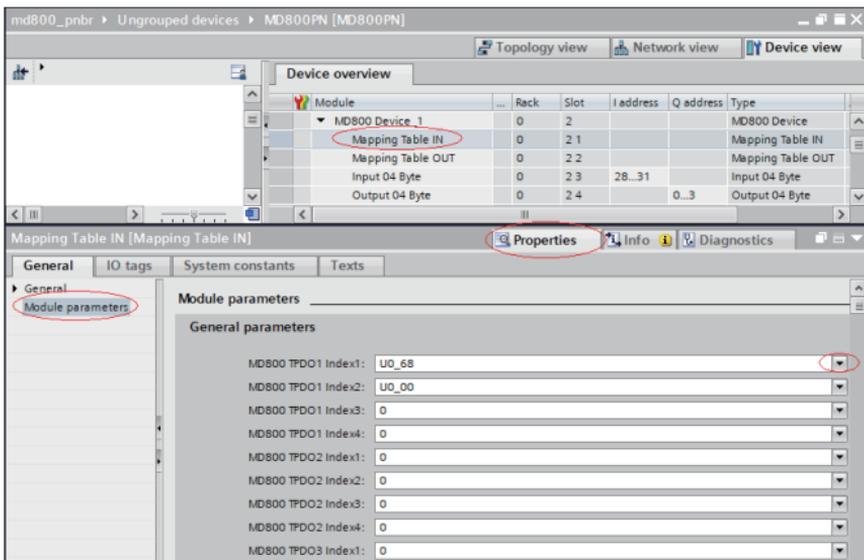
The 'Catalog' pane on the right shows a tree structure with 'Module' selected and circled in red. The tree includes 'Head module', 'Module', 'MD800 Device', 'Rectifier Device', and 'Submodules'.

## Note

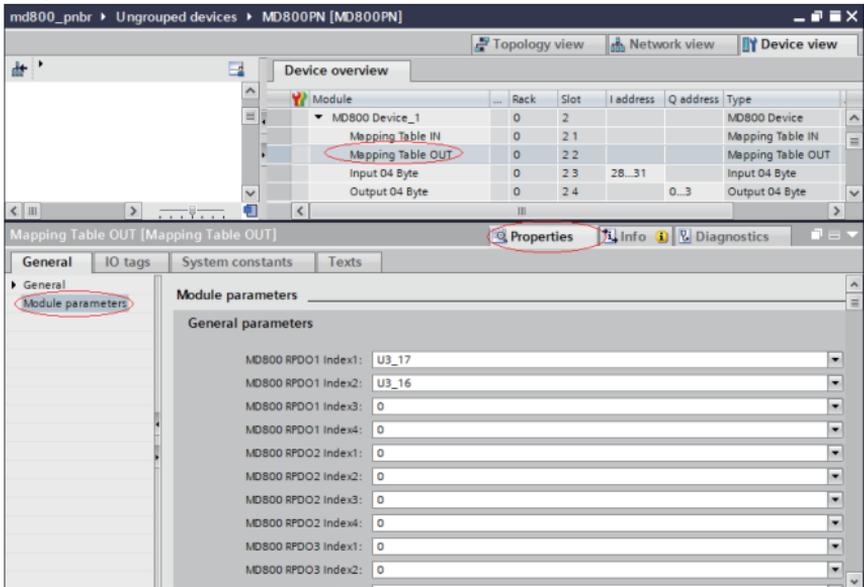
- The types and number of modules configured must match the devices in the actual network.
- For rectifiers, select "Rectifier Device". Even if there is no process data for rectifiers, you must add a "Rectifier Device".
- For inverters, select "MD800 Device". "MD800 Device\_1" corresponds to inverter 1, "MD800 Device\_2" corresponds to inverter 2, and so on.

### b. Configure mapping relations.

- 1). Select "Mapping Table IN". Navigate to "Properties" > "General" > "Module parameters". Set TPDO data mapping relations for the slave by using the drop-down lists.



- 2). Select "Mapping Table OUT". Navigate to "Properties" > "General" > "Module parameters". Set RPDO data mapping relations for the slave by using the drop-down lists.



---

## Note

- Slot 1 (Mapping Table IN) corresponds to the mapping of TDPO data, which is data from the slave to the master. Slot 2 (Mapping Table OUT) corresponds to the mapping of RDPO data, which is data from the master to the slave.
  - Each slave supports a maximum of four TPDOs and four RPDOs. The mapping relations for the same PDO need to be consecutive.
  - For unused PDOs, the mapping relation defaults to 0.
  - Each mapping relation corresponds to a 16-bit parameter, representing two bytes of data.
- 

### c. Configure process data.

Select the module in the "Device overview" list. Navigate to "Hardware catalog" > "Submodules" and you can find three directories: "Empty", "Input", and "Output". They are used to set the process data lengths of the module. In the "Output" directory, set the length of process data from the master to the slave. In the "Input" directory, set the length of process data from the slave to the master. If any process data is not needed, add configurations in the "Empty" directory.

The screenshot shows the 'Hardware catalog' window in SIMATIC Manager. The 'Device overview' table is as follows:

Module	Rack	Slot	I address	Q address	Type	Article num...
Interface	0	0 X1			MD800PN	
Rectifier Device_1	0	1			Rectifier Device	
Mapping Table IN	0	1.1			Mapping Table IN	
Mapping Table OUT	0	1.2			Mapping Table OUT	
Input 28 Byte	0	1.3	0...27		Input 28 Byte	
Output No Data	0	1.4			Output No Data	
MD800 Device_1	0	2			MD800 Device	
Mapping Table IN	0	2.1			Mapping Table IN	
Mapping Table OUT	0	2.2			Mapping Table OUT	
Input 04 Byte	0	2.3	28...31		Input 04 Byte	
Output 04 Byte	0	2.4		0...3	Output 04 Byte	
MD800 Device_2	0	3			MD800 Device	
Mapping Table IN	0	3.1			Mapping Table IN	
Mapping Table OUT	0	3.2			Mapping Table OUT	
Input 04 Byte	0	3.3	32...35		Input 04 Byte	
Output 04 Byte	0	3.4		4...7	Output 04 Byte	
MD800 Device_3	0	4			MD800 Device	
Mapping Table IN	0	4.1			Mapping Table IN	
Mapping Table OUT	0	4.2			Mapping Table OUT	
Input 04 Byte	0	4.3	36...39		Input 04 Byte	
Output 04 Byte	0	4.4		8...11	Output 04 Byte	
MD800 Device_4	0	5			MD800 Device	
Mapping Table IN	0	5.1			Mapping Table IN	

The 'Catalog' pane on the right shows the following structure:

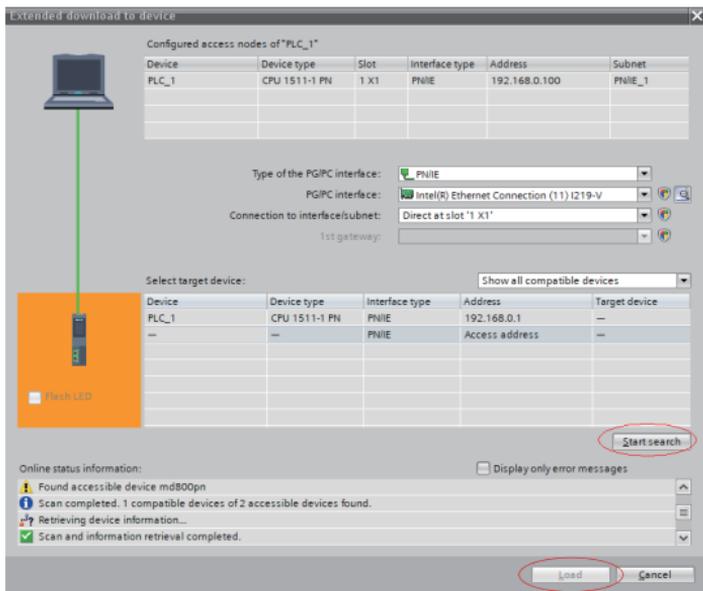
- Filter Profile: <All>
- Head module
- Module
  - Submodules
    - Empty
    - Input No Data
    - Output No Data
    - Input
      - Output

## Note

- Slot 3 corresponds to Input data. The length of Input data must match the length of the mapping relations configured in Slot 1 (Mapping Table IN). Slot 4 corresponds to Output data. The length of Output data must match the length of the mapping relations configured in Slot 2 (Mapping Table OUT). For example, if there are five mapping relations configured in Mapping Table IN, insert "Input 10 Byte" in Slot 3. If there are seven mapping relations configured in Mapping Table OUT, insert "Output 14 Byte" in Slot 4.
- If a station does not have Input or Output data, insert "Input No Data" or "Output No Data" in the corresponding slot.

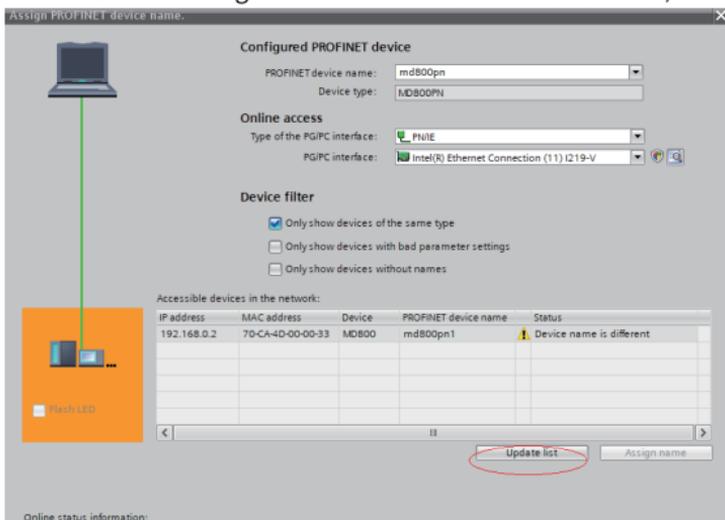
### d. Load the project.

After the configuration is completed, save the project. Set the IP address of the PC to be in the same network segment as the PLC. (Avoid IP address conflicts with the slaves in the configuration. Alternatively, you can allow automatic IP address allocation for the PC.) Then, compile the configuration, click "Load", select an interface, and click "Start search".

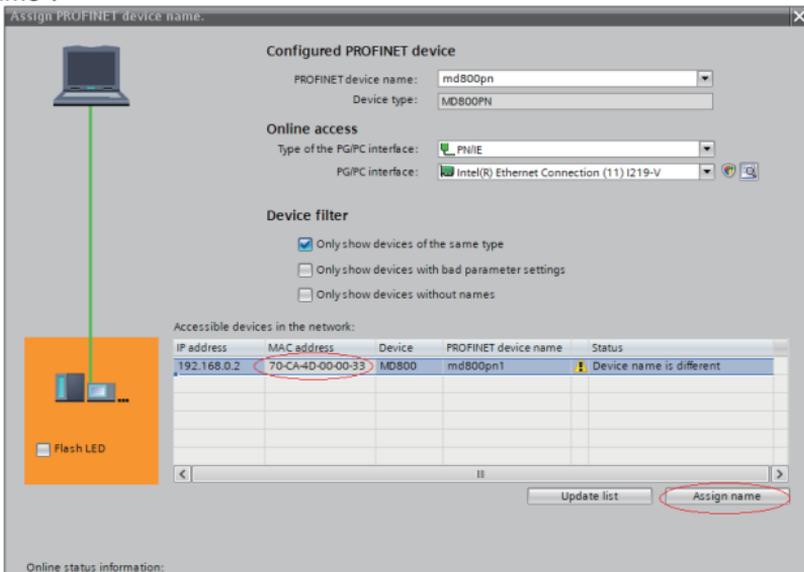


e. Assign a device name.

- 1). After the loading, you need to assign device names for slaves not named. Select a slave, and choose "Online" > "Assign device name" (or right-click the slave and choose "Assign device name" in the shortcut menu).

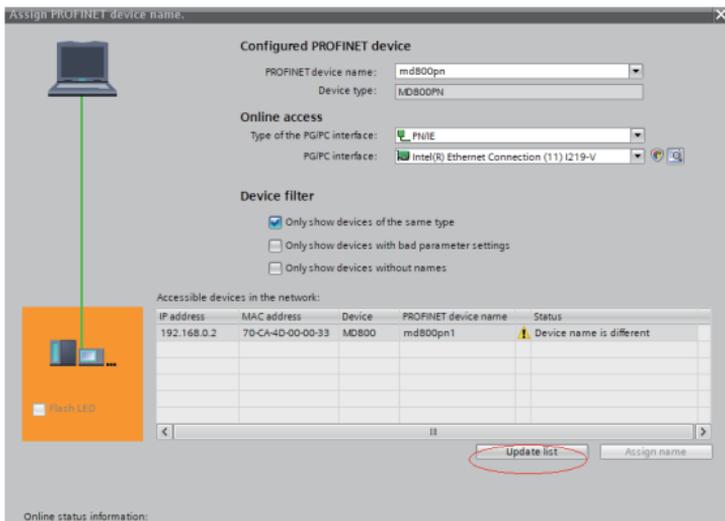


- 2). From the accessible nodes in the network, select the slave to be named (differentiate the slaves based on their MAC addresses), and click "Assign name".



The following screen indicates successful device name writing. The displayed device name must be consistent with the name under "Configured PROFINET device" shown in the preceding figure. After assigning the device name, close the window or select another device from the "PROFINET device name" drop-down list to assign names for other devices.

The slave will save the assigned name, and the master identifies each slave based on the device name. (The MAC address is not intuitive to use. The process of assigning a device name is actually binding the device name with the MAC address.)



## Note

- Each device name can be assigned to only one slave in the network.
- After you modify a device name in the configuration, it is necessary to re-assign the name.
- After you modify an IP address, you only need to load the modified configuration to the PLC for the modification to take effect. Name re-assignment is not required.
- Once all the preceding steps are completed, you can write programs in the PLC to control the AC drive.

## 5.2 MRP Function and Settings

### MRP overview

The standard Media Redundancy Protocol (MRP) is an IEC62439-2 based protocol that provides a typical reconstruction time of 200 ms and supports up to 50 devices in each ring network.

Basic rules of MRP:

- Nodes within the ring network must support and enable the MRP protocol.

- All devices must be interconnected through the ring network ports.
- All devices within the ring network belong to the same redundancy domain.
- A single ring network can connect up to 50 devices. Exceeding this limit will result in a reconstruction time exceeding 200 ms.
- Only one device within the ring network can serve as the ring manager, while all other devices are ring clients.

## ■ MRP settings

1. Select the PLC port. Navigate to "Properties" > "Media redundancy". Set "Media redundancy role" to "Manager", and check the "Ring port 1" and "Ring port 2" parameters.

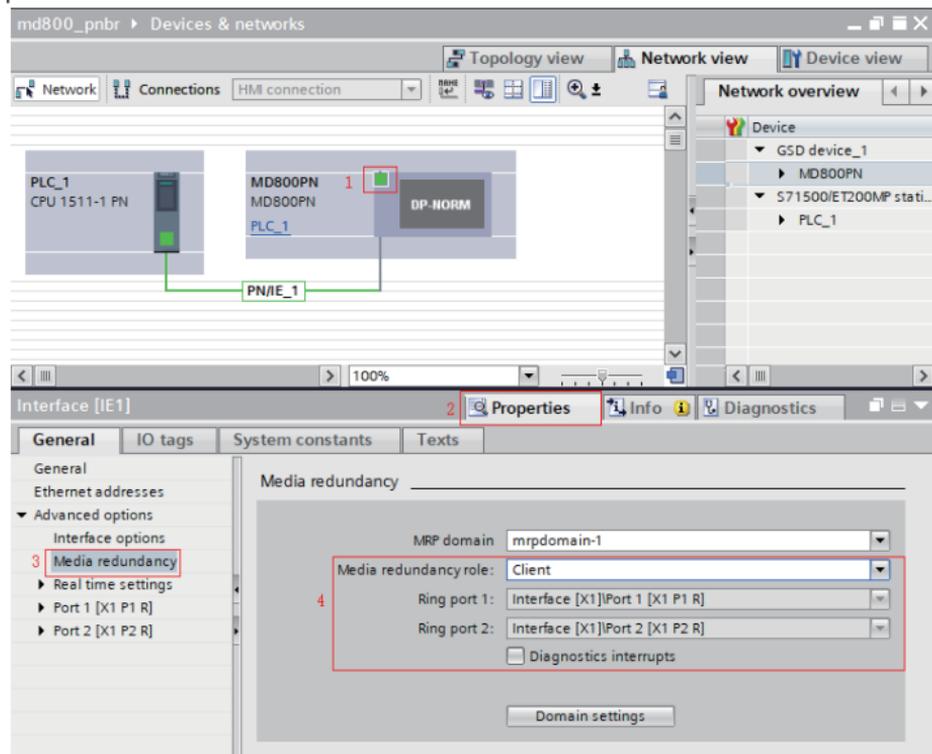
The screenshot displays the SIMATIC Manager interface for configuring a PROFINET interface. The main window shows a network diagram with a PLC\_1 (CPU 1511-1 PN) and an MD800PN (MD800PN DP-NORM) connected via a PN/IE\_1 interface. A red box labeled '1' highlights the PN/IE\_1 interface in the diagram.

The bottom pane shows the 'PROFINET interface\_1 [X1]' properties. A red box labeled '2' highlights the 'Properties' tab. The 'Media redundancy' sub-tab is active, showing the following settings:

- MRP domain: mrpdomain-1
- Media redundancy role: Manager (auto) (highlighted with a red box labeled '4')
- Ring port 1: PROFINET interface\_1 [X1]Port\_1 [X1 P1 R]
- Ring port 2: PROFINET interface\_1 [X1]Port\_2 [X1 P2 R]
- Diagnostics interrupts
- Domain settings button

The left sidebar shows the 'Advanced options' menu, with 'Media redundancy' highlighted by a red box labeled '3'.

2. Select the I/O device port. Navigate to "Properties" > "Media redundancy". Set "Media redundancy role" to "Client", and check the "Ring port 1" and "Ring port 2" parameters.



3. MRP provides a typical reconstruction time of 200 ms and supports up to 50 devices in each ring network. To ensure uninterrupted PROFINET communication during ring network reconstruction, adjust the PROFINET watchdog time of the I/O device to be greater than 200 ms. Specifically, select the I/O device port. Navigate to "Properties" > "IO cycle". Set "Update time" to an appropriate value to ensure that the "Watchdog time" is greater than 200 ms.

md800\_pnbr ▶ Devices & networks

Topology view | Network view | Device view

Network | Connections | HMI connection

PLC\_1  
CPU 1511-1 PN

MD800PN  
MD800PN  
PLC\_1

DP-NORM

PN/IE\_1

100%

Network overview

- Device
  - GSD device\_1
    - MD800PN
    - S7 1500/ET200MP stati...
      - PLC\_1

Interface [IE1]

2 Properties | Info | Diagnostics

General | IO tags | System constants | Texts

General

- Ethernet addresses
- Advanced options
  - Interface options
  - Media redundancy
  - Real time settings
    - 3 IO cycle
    - ▶ Port 1 [X1 P1 R]
    - ▶ Port 2 [X1 P2 R]

IO cycle

Update time

- Calculate update time automatically
- Set update time manually
- Update time: 128.000 ms
- Adapt update time when send clock changes

Watchdog time

Accepted update cycles without IO data: 3

5 Watchdog time: 384.000 ms

# 6 Troubleshooting

## 6.1 Communication Faults

When the communication function is configured incorrectly, both the PLC and rectifier panel will display an error. You can troubleshoot faults based on diagnosis information from the PLC and rectifier panel.

The following table describes the fault codes of the rectifier module.

Table 6-1 Fault codes of the rectifier module

Fault Code	Cause	Action	Reset Method
E16.71	Master offline during communication card operation	Check for poor contact between the communication card and the PLC. Make sure that they are properly connected.	Automatic reset if FD-06 is set to 1 Manual reset if FD-06 is set to 0
E16.72	Internal slave offline during communication card operation	Check for poor contact between the communication card and the rectifier. Make sure that they are properly connected.	
None	Slave application alarming	Identify which slave is alarming and resolve the AC drive fault. (Only displayed on the PLC)	
E16.74	Configuration error (configured axis missing)	Check whether the configured slave exists. Ensure that "startup with slave mismatch" is disabled (rectifier parameter FD-50).	
E16.75	Inconsistency between inverter process data and mapping relations	Check whether the number of PDOs match the number of mapping relations in the inverter configuration. Make sure that they match.	
E16.76	Inconsistency between rectifier process data and mapping relations	Check whether the number of PDOs match the number of mapping relations in the rectifier configuration. Make sure that they match.	

## 6.2 PLC Diagnosis Information

The following table lists mapping between the PLC diagnosis information and fault codes.

Fault Code	Diagnosis Information
E16.72	slave station lost error
E16.74	lack of matched slave
E16.75	CANopen slave communication objects error
E16.76	communication objects error of PN to CANopen bridge

You can locate and view the current error messages through the diagnostic function of the PLC background. Choose Online & diagnostics→Diagnostics buffer and then view the detailed diagnosis information. As shown in the figure below, slot 2.4 (corresponding to drive unit 1) has an error indicating that the process data of drive unit 1 does not match the mapping.

The screenshot displays the SIMATIC Manager interface. On the left, the 'Project tree' shows the 'md800\_pnbr' project with 'PLC\_1 [CPU 1511-1 PN]' selected. The 'Online & diagnostics' menu is open, and 'Diagnostics buffer' is selected. The main window shows a list of events with the following details:

Time	Event ID	Description
10/15/2021 1:51:01.330 PM	1	Communication initiated request: WARM RESTART - CPU changes from...
10/15/2021 1:51:01.314 PM	2	Communication initiated request: WARM RESTART - CPU changes from...
10/15/2021 1:50:59.816 PM	3	canopen slave communication objects error - canopen slave commun...
10/15/2021 1:50:59.809 PM	4	canopen slave communication objects error - canopen slave commun...
10/15/2021 1:50:52.739 PM	5	Communication initiated request: STOP - CPU changes from RUN to ST...
10/15/2021 1:48:54.858 PM	6	IO device failure -
10/15/2021 1:45:46.157 PM	7	Follow-on operating mode change - CPU changes from STARTUP to RU...
10/15/2021 1:45:46.154 PM	8	Event ID: 16# 02:39CB
10/15/2021 1:44:46.192 PM	9	Follow-on operating mode change - CPU changes from STOP to START...

The 'Details on event' section for event 3 is expanded, showing:

- Details on event: 3 of 511 (Event ID: 16# 561A:12C0)
- Module: md800pn / MD800 Device\_1.Output 04 Byte
- Rack/slot: Rack 0 / Slot 2.4
- Description: Error: canopen slave communication objects error - canopen slave communication object error on Output channel 2 MD800PN / MD800 Device\_1.Output 04 Byte
- Help on event: check the communication objects in slots and in FuncCode of slave  
check the communication objects in slots and in FuncCode of slave