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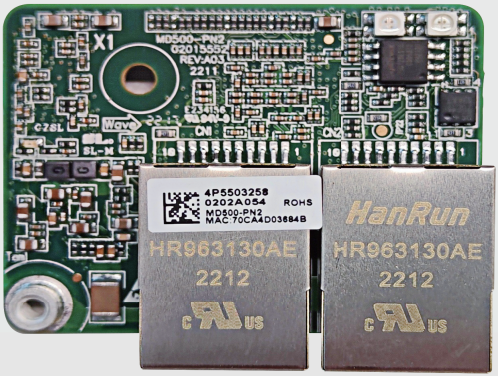

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MD500-PN2
Communication Extension Card

User Guide

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Preface

■ Introduction

This user guide describes the specifications, dimensions, installation, wiring, communication protocol, communication parameters, and communication examples of MD500-PN2 extension card.

Note

- The software version of the MD500-PN2 card must be 1.00 or later (view the version through U0-67). The corresponding GSDML file name is “GSDML-V2.31-inovance-md500pn2-20220119.xml”.
- This guide describes the use of MD500-PN2 card in MD500 series AC drives. For use of the card in other drives, contact the technical support of Inovance.

■ Revision History

Date	Version	Revision
September 2022	A00	First release

■ Document Acquisition

This guide is not delivered along with the product. You can visit *www.inovance.com* to download the PDF document.

■ Warranty

Inovance provides warranty service to the equipment within the warranty period for failure or damage that occurs under normal use. When the warranty period expires, reasonable maintenance fee will be charged. Maintenance fee will be charged for the following damage within the warranty period:

- Equipment damage caused by operations not following the instructions in the guide
- Equipment damage caused by fire, flood, or abnormal voltage
- Equipment damage caused by use beyond the designed functions
- Equipment damage caused by use beyond the specified range

- Equipment damage caused by force majeure (natural disaster, earthquake, and lightning strike) and secondary damage caused thereof

The maintenance fee is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

Table of Contents

Fundamental Safety Instructions

■ Safety Disclaimer

- This chapter presents essential safety instructions for a proper the drive and user guide equipment. Before operating the equipment, read through the guide and comprehend all the safety instructions. Failure to comply with the safety instructions may result in death, severe personal injuries, or equipment damage.
- "CAUTION", "WARNING", and "DANGER" items in the guide only indicate some of the precautions that need to be followed; they just supplement the safety precautions.
- Use this equipment according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by improper use.

■ Safety Levels and Definitions

Indicates that failure to comply with the notice can result in death or severe personal injuries.

Indicates that failure to comply with the notice may result in death or severe personal injuries.

Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage.

■ Safety Precautions

- Drawings in the guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions. Install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.

Unpacking

- Do not install the equipment if you find any sign of damage, rust, or prior use on the equipment or accessories.
- Do not install the equipment if you find any sign of water seepage or missing or damaged components.
- Do not install the equipment if you find the packing list does not conform to the equipment you received.

- Check whether the packing is intact and whether there is any sign of damage, water seepage, dampness, and deformation.
- Unpack the package by following the unpacking sequence. Do not strike the package violently.
- Check whether there is any sign of damage or rust on the surfaces of the equipment and accessories.
- Check whether the package contents are consistent with the packing list.

Storage and Transportation

- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries or equipment damage.
- Before hoisting the equipment, ensure the equipment components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is being hoisted by the hoisting equipment.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injuries or equipment damage.

- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Do not store or transport the equipment in environments exposed to water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing the equipment for more than three months. Long-term storage requires stricter protection and necessary inspections.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.

Installation

- The equipment must be operated only by professionals with electrical knowledge.

Warning

- Read through the guide and safety instructions before installation.
- Do not install this equipment in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock.
- When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or a fire.
- Do not retrofit this equipment.
- Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- When the equipment is installed in a cabinet or final assembly, a fireproof enclosure providing both electrical and mechanical protections must be provided. The IP rating must meet IEC standards and local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install an electromagnetic shielding device to prevent malfunction of the equipment.
- Install the equipment onto an incombustible object such as a metal. Keep the equipment away from combustible objects. Failure to comply will result in a fire.

Caution

- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on the top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes. Resonance may occur when the equipment operating at a constant speed executes variable speed operations.
- In this case, install the vibration-proof rubber under the motor frame or use vibration suppression function to reduce resonance.

Wiring

Danger

- Only professionals are allowed to perform installation, wiring, maintenance, inspection or parts replacement on the equipment.
- Before wiring, cut off all the power supplies of the equipment, and wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. After waiting for the designated time, measure the DC voltage in the main circuit to ensure the DC voltage is within the safe voltage range. Failure to comply will result in an electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply will result in an electric shock.
- Check that the equipment is grounded properly. Failure to comply will result in an electric shock.

Warning

- Do not connect the input power supply to the output end of the equipment. Failure to comply can result in equipment damage or even a fire.
- When connecting a drive to the motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- Fix the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may overheat or damage the connecting part, resulting in a fire.
- After wiring is done, check that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment. Failure to comply may result in an electric shock or equipment damage.

Caution

- During wiring, follow the proper electrostatic discharge (ESD) procedure and wear an antistatic wrist strap. Failure to comply can result in damage to the equipment or internal circuits.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply will result in equipment malfunction.

Power-on

- Before power-on, check that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or a fire.
- After power-on, do not open the cabinet door or protective cover of the equipment, touch any terminal, or disassemble any unit or component of the equipment. Failure to comply will result in an electric shock.

- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in personal injuries or equipment damage.
- Before power-on, check that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may result in a fire.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in death or personal injuries.

Operation

- The equipment must be operated only by professionals. Failure to comply will result in death or personal injuries.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply will result in an electric shock.

- Do not touch the equipment enclosure, fan, or resistor to sense the temperature. Failure to comply may result in burns.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage.

Maintenance

- Only professionals are allowed to perform installation, wiring, maintenance, inspection or parts replacement on the equipment.
- Do not perform maintenance on the equipment with power ON. Failure to comply can result in the risk of electric shock.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- When using a permanent magnet motor, do not touch the motor terminals immediately after power-off. This is because the motor terminals can generate inductive voltage during rotation even after the equipment is powered off. Do not touch the motor terminals to prevent the risk of electric shock.

- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Repair

- Only professionals are allowed to perform installation, wiring, maintenance, inspection or parts replacement on the equipment.
- Do not repair the equipment after power-on. Failure to comply can result in the risk of electric shock.
- Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.

Warning

- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in death, personal injuries, or equipment damage.
- When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly.
- Replace quick-wear parts of the equipment according to the replacement instructions.
- Do not use damaged equipment. Failure to comply may result in death, personal injuries, or severe equipment damage.
- After the equipment is replaced, check the wiring and set parameters again.

Disposal

Warning

- Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, personal injuries, or even death.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

■ Safety labels

For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. See the following table for descriptions of the safety labels.

Safety labels	Description
	• Read through the safety instructions before operating the equipment. Failure to comply can result in death, personal injuries, or equipment damage. • Do not touch the terminals or remove the cover with power ON or within 10 min after power-off. Failure to comply will result in an electric shock.

1 Product Information

1.1 Product Overview

The MD500-PN2 card is a fieldbus adapter card for PROFINET, which complies with PROFINET Ethernet standards. It is used to improve the communication efficiency and achieve networking function, allowing the drive to serve as the fieldbus slave to be controlled by the fieldbus master.

1.2 Applicable AC Drive

Extension card	Applicable AC Drive
MD500-PN2	MD290
	MD480
	MD480-PLUS
	MD500
	MD500-PLUS
	MD510
	MD520

This guide describes the use of MD500-PN2 card in MD500 series AC drives. For use of the card in other drives, contact the technical support of Inovance.

1.3 Appearance and Dimensions

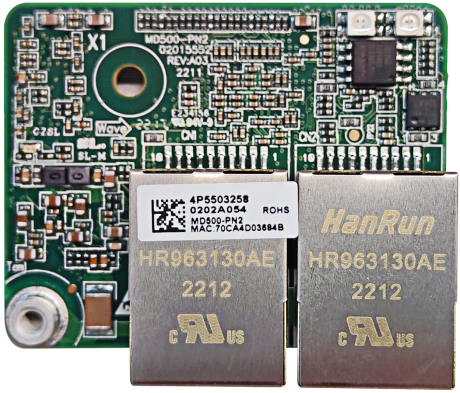


Figure 1-1 Appearance of MD500-PN2

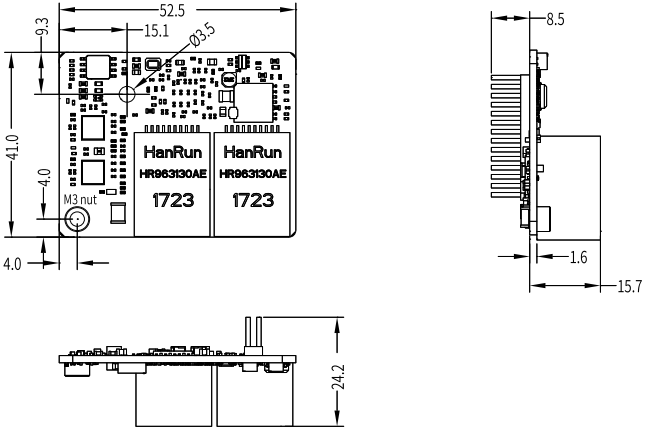


Figure 1-2 Dimensions of MD500-PN2 (mm)

1.4 Layout and Description of Interfaces

The interfaces and indicators of MD500-PN2 are as follows. The pin header J1 is used to connect the drive and locates on the back of the MD500-PN2 card. The MD500-PN2 card provides two network ports, J2 and J3, which are used to connect MD500-PN2 and the PN card (PLC).

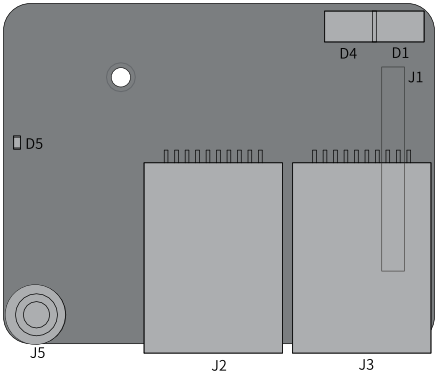


Figure 1-3 Interfaces of MD500-PN2

Table 1–1 Indicators of MD500-PN2

Symbol	Name	Function
J1	Pin header	Check whether FD-00 is 9 and FD-01 is 3.
J2	Network port	The standard Ethernet RJ45 socket is direction-insensitive and used for communication between the PN card and PN card (PLC) through J3.
J3		
D5	Power indicator	Used to indicate the status of the power supply. ON: Normal OFF: Abnormal (Check whether the card is installed properly.)
D1	PLC communication state indicator (PLCLINK)	See *"Table 1–2 " on page 15*.
D4	Drive communication state indicator (DSPLINK)	

Note

- After MD500-PN2 is installed properly, J2 is on the left and J3 on the right when viewed from an angle facing RJ45 network port.
- It is recommended to use shielded Cat 5e twisted pair cables to ensure a stable operation.

Table 1–2 Description of MD500-PN2 status indicator

Indicators		Description	Solution
DSPLINK	Solid green	Normal	None
	Solid yellow	MAC address error	Replace the PN card.
	Flashing in yellow	Drive fault	Rectify the drive fault.
	Solid red	Communication error	Set F0-28 to 1 to check whether the drive supports PN card.
	Flashing in red	Communication timeout	Check whether the software version of the drive supports the PN card and restore the drive software to default settings.
PLCLINK	Solid green	Communication normal	None
	Flashing in green	Master not found	Check the configuration and check whether the slave is assigned with a device name. Check whether the PN card is connected to the corresponding PLC.
	Solid yellow	Configuration error	Check the GSD is correct.
	Solid red	Communication loss	Check the communication line to see whether the network cable shield is in good contact.

Indicators		Description	Solution
D1 and D4	Solid red	PN card software error	Perform a power cycle and replace the PN card.

2 Installation and Wiring

2.1 Installation

The MD500-PN2 card is built into the MD500 series AC drives. Before installation, disconnect the power supply of the drive and wait for about 10 min until the charging indicator of the drive turns off. After inserting the MD500-PN2 card into the drive, fix corresponding screws to prevent the signal socket from being damaged by external signal cable. The installation diagram is shown in *"Figure 2–1 " on page 17* .

After the MD500-PN2 has been installed, connect the grounding terminals of MD500-PN2 card and the drive properly, as shown in *"Figure 2–2 " on page 18* .

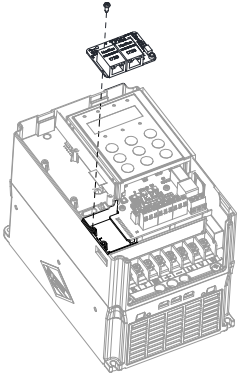


Figure 2-1 Installation of MD500-PN2 card

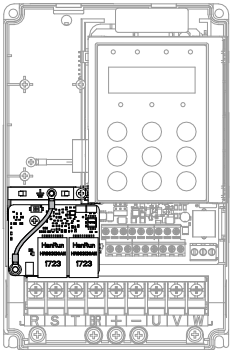


Figure 2-2 Grounding of MD500-PN2 card and the drive

Caution

Do not remove or install the card with power ON.

2.2 Wiring

2.2.1 Topology of PROFINET

PROFINET supports multiple types of topologies including the bus type, star type, and tree type. Multiple types of networking can be achieved through the switch.

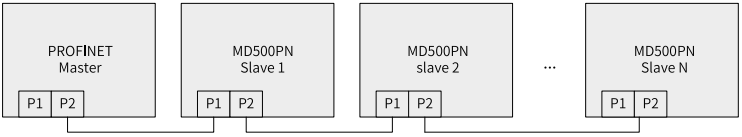


Figure 2-3 Bus-type topology

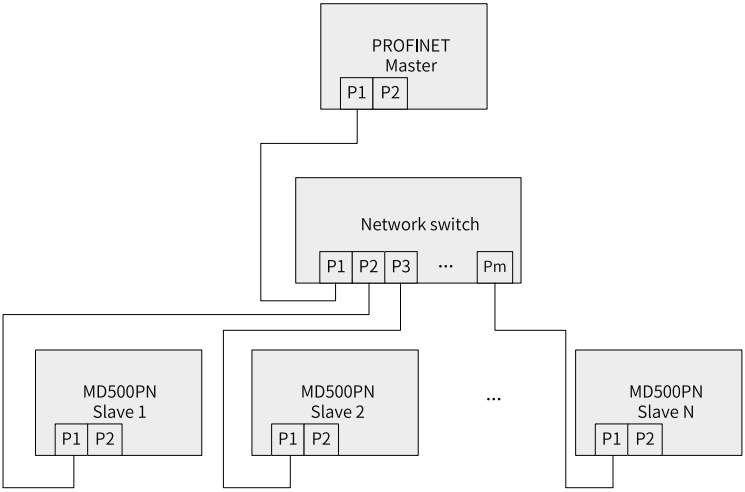


Figure 2-4 Star-type topology

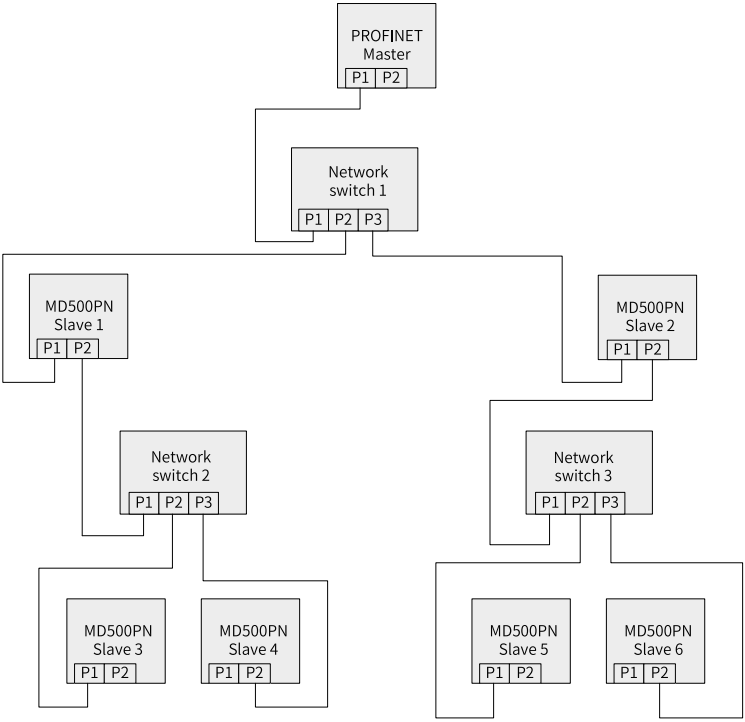


Figure 2-5 Tree-type topology

2.2.2 EMC Routing Instructions

- During commissioning on site, route communication signal cables and power cables through different routes. Failure to comply can result in communication interference.
- Connect the motor enclosure to the grounding (PE) terminal of the drive. Meanwhile, connect the grounding cable on the motor enclosure side properly. Failure to comply will result in poor grounding effect.

- It is recommended to use shielded cable. Connect the shield to the grounding terminal (PE) of the drive.
- Read the communication state through the status indicator on the card. See *"Table 1–2 " on page 15* for details.

3 Communication

3.1 PROFINET Communication Protocol

■ Data transmission format

The MD500-PN2 communication card transmits in different formats with different PZD length as needed. You can set the function corresponding to each PZD in the configuration.

Functions supported by each data format are as follows.

Data Type	Data Length	Function
Standard telegram 1	PZD-2/2	AC drive commands, frequency setting; AC drive status, reading of operating frequency
Standard telegram 2	PZD-4/4	AC drive commands, frequency setting; Cyclical writing of two function parameters; AC drive status, reading of operating frequency; Cyclical reading of two function parameters
Standard telegram 3	PZD-6/6	AC drive commands, frequency setting; Cyclical writing of four function parameters; AC drive status, reading of operating frequency; Cyclical reading of four function parameters

Data Type	Data Length	Function
Standard telegram 4	PZD-8/8	AC drive commands, frequency setting; Cyclical writing of six function parameters; AC drive status, reading of operating frequency; Cyclical reading of six function parameters
Standard telegram 5	PZD-10/10	AC drive commands, frequency setting; Cyclical writing of eight function parameters; AC drive status, reading of operating frequency; Cyclical reading of eight function parameters
Standard telegram 6	PZD-12/12	AC drive commands, frequency setting; Cyclical writing of ten function parameters; AC drive status, reading of operating frequency; Cyclical reading of ten function parameters
Supplementary telegram	PZD-2/6	AC drive commands, frequency setting; AC drive status, reading of operating frequency; Cyclical reading of four function parameters

■ Description of data in PZD area

The master can modify and read the AC drive data in real time and exchanges data cyclically through the data in PZD area. The communication address of the data is configured by the drive directly. Detailed functions are as follows:

- AC drive control commands, target frequency set in real time
- Current AC drive status, real-time reading of operating frequency
- Real-time exchange of function parameters and monitoring parameters between the drive and PROFINET master.

The PZD process data is mainly used for data exchange between the master and the drive. The exchange data is shown below.

PZD area for data sent by the master		
AC drive commands	AC drive target frequency	Real-time change of AC drive function parameters
PZD1	PZD2	PZD3 to PZD12

PZD area for response data from the drive		
AC drive status	AC drive operating frequency	Real-time reading of function parameters
PZD1	PZD2	PZD3 to PZD12

■ Description for data sent by the master

PZD for data sent by the master		
PZD1	AC drive command word (command source set to “Communication”)	
	01: Forward run 02: Reverse run 03: Forward jog 04: Reverse jog	05: Coast to stop 06: Stop as defined by F6-10 07: Fault reset
PZD2	Target frequency of the drive (frequency source set to “Communication”), ranging from reverse frequency upper limit (negative) to forward frequency upper limit (decimal places included, such as 2000 corresponding to 20.00 Hz of the drive) When the target frequency reference exceeds the limit, the frequency upper limit applies.	
PZD3 to PZD12	The function parameter value modified in real time will not be written to EEPROM. FE-02...FE-11 correspond to PZD3...PZD12 respectively. The mapping set manually in group FE is invalid.	

■ Response data

PZD for response data from the drive	
PZD1	Operating states of the drive The operating states of the drive are as follows, as defined by bit: Bit 0: 0-Stopped; 1-Operational Bit 1: 0-Forward run; 1- Reverse run Bit 2: 0-No fault; 1- Fault Bit 3: 0-Operating frequency not reached; 1-Operating frequency reached Bit 4 to bit 7: Reserved Bit 8 to bit 15: Drive fault code
PZD2	Operating frequency of the drive (unit: 0.01 Hz) The actual operating frequency of the drive will be returned. The value returned is a 16-bit signed integer.
PZD3 to PZD12	Real-time reading of function parameter values (groups F and A) and monitoring parameters (group U) FE-22...FE-31 correspond to PZD3...PZD12 respectively. The mapping set manually in group FE is invalid.

3.2 Communication Parameters

■ Communication card setting

The communication configuration varies with the drives, as shown below.

- AC drive communication card setting (See MD500, MD290, MD480, MD510, and MD520 series drives for model information.)
- MD500-PN2 can communicate with the drive only after F0-28 is set to 1.

Parameter	Name	Value Range	Value	Meaning
F0-28	Serial port communication protocol	0: Modbus protocol 1: Network bridge protocol	1	The serial port communication protocol is set as special communication card network bridge.

- AC drive communication card setting (See MD500-PLUS and MD480-PLUS series drives for model information.)
- MD500-PN2 can communicate with the drive only after FD-00 is set to 9 (baud rate: 115200 bps) and FD-01 is set to 3 (No check (8-N-1)).

■ Parameters related to control through communication

Parameter	Name	Value Range		Decimal Address
U3-16	Frequency setting	-Max. frequency to +Max. frequency 0.01 Hz		29456
U3-17	Control command	0001: Forward run 0002: Reverse run 0003: Forward jog 0004: Reverse jog	0005: Coast to stop 0006: Decelerate to stop 0007: Fault reset	29457
U3-18	DO control	Bit 0: DO1 output control Bit 1: DO2 output control Bit2: RELAY1 output control Bit3: RELAY2 output control Bit 4: FMR output control	Bit 5: VDO1 Bit 6: VDO2 Bit 7: VDO3 Bit 8: VDO4 Bit 9: VDO5	29458
U3-19	AO1 control	0 to 7FFF represent 0% to 100%.		29459
U3-20	AO2 control	0 to 7FFF represent 0% to 100%.		29460
U3-21	FMP control	0 to 7FFF represent 0% to 100%.		29461
U3-22	Reserved	Reserved		
U3-23	Speed control	Signed, 1 rpm		29463

When MD500-PN2 communication card is used, the PZD1 being written is mapped to U3-17 and PZD2 to U3-16 by default. If a command or frequency cannot be written to the drive but PZD3...PZD12 can be written, with F0-02 set to 2 and F0-03 set to 9, then you can check whether FE-00 is U3-17 and FE-01 is U3-16. If not, change them to correct values.

■ Parameters related to monitoring through communication

Parameter	Name	Unit	Decimal address
U0-00	Operating frequency (Hz)	0.01 Hz	28672
U0-01	Frequency setpoint (Hz)	0.01 Hz	28673
U0-02	Bus voltage (V)	0.1 V	28674
U0-03	Output voltage (V)	1 V	28675
U0-04	Output current (A)	0.01 A	28676
U0-05	Output power (kW)	0.1 kW	28677
U0-06	Output torque (%)	0.10%	28678
U0-07	DI state	1	28679
U0-08	DO state	1	28680
U0-09	AI1 voltage (V)	0.01 V	28681
U0-10	AI2 voltage (V)	0.01 V	28682
U0-11	AI3 voltage (V)	0.01 V	28683
U0-12	Counting value	1	28684
U0-13	Length value	1	28685
U0-14	Load speed display	100.00%	2868600.00%
U0-15	PID setting	1	28687
U0-16	PID feedback	1	28688
U0-17	PLC stage	1	28689
U0-18	Pulse input frequency (Hz)	0.01 kHz	28690
U0-19	Feedback speed (Hz)	0.01 Hz	28691

Parameter	Name	Unit	Decimal address
U0-20	Remaining operating time	0.1 min	28692
U0-21	Uncalibrated AI1 voltage	0.001 V	2869300.00%
U0-22	Uncalibrated AI2 voltage	0.001 V	28694
U0-23	Uncalibrated AI3 voltage	0.001 V	28695
U0-24	Linear speed	1 m/min	28696
U0-25	Current power-on time	1 min	28697
U0-26	Current operating time	0.1 min	28698
U0-27	Pulse input frequency	1 Hz	28699
U0-28	Reference value set through communication	0.01%	28700
U0-29	Encoder feedback speed	0.01 Hz	28701
U0-30	Display of main frequency X	0.01 Hz	28702
U0-31	Display of auxiliary frequency Y	0.01 Hz	28703
U0-32	View any register address value	1	28704
U0-33	Synchronous motor rotor position	0.1°	2870500.00%
U0-34	Motor temperature	1°C	2870600.00%
U0-35	Target torque	0.10%	28707
U0-36	Resolver position	1	28708
U0-37	Power factor angle	0.1°	28709

Parameter	Name	Unit	Decimal address
U0-38	ABZ position	1	28710
U0-39	Target voltage of separated V/f	1 V	28711
U0-40	Output voltage of separated V/f	1 V	28712
U0-41	DI status display	1	28713
U0-42	DO status display	1	28714
U0-43	DI status display 1	1	28715
U0-44	DI status display 2	1	28716
U0-45	Fault information	1	28717
U0-58	Z signal counter	1	28730
U0-59	Frequency reference (%)	0.01%	28731
U0-60	Operating frequency (%)	0.01%	28732
U0-61	AC drive status	1	28733
U0-62	Current fault code	1	28734
U0-63	Operating frequency after drooping control	0.01 Hz	38375
U0-64	Current back EMF	0.1 V	28736
U0-65	Reserved	-	-
U0-66	Extension card model	100: CANopen 200: PROFIBUS-DP 300: CANlink 400: Profinet 500: EtherCAT	28738
U0-67	Extension card version	0.01	28739
U0-68	AC drive status	1	28740
U0-69	Operating frequency (Hz)	0.01 Hz	28741

Parameter	Name	Unit	Decimal address
U0-70	Motor speed	1 rpm	28742
U0-71	Output current	0.1 A	28743

When MD500-PN2 communication card is used, the PZD1 being read is mapped to U0-68 and PZD2 to U0-69 by default. If the status or operating frequency cannot be read but PZD3...PZD12 can be read, you can check whether FE-20 is U0-68 and FE-21 is U0-69. If not, change them to correct values.

Note See related user guides for PDZ definition of other types of drives.

3.3 Communication Examples

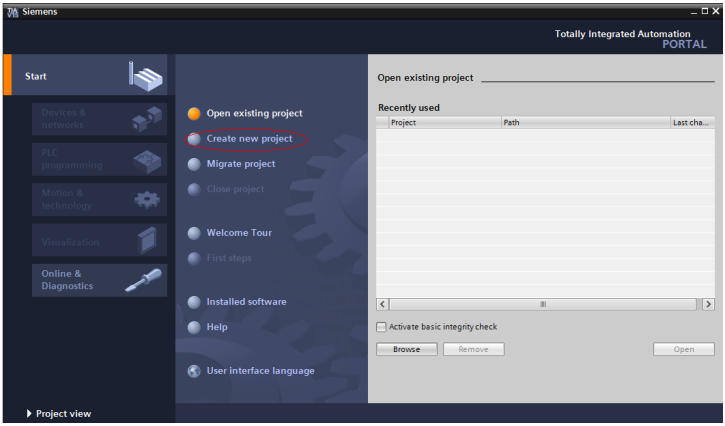
The MD500-PN2 card allows you to configure slaves in S7-1200 master, but it does not support MRP (Media Redundancy Protocol).

3.3.1 Configuring the Slave in S7-1200 Master

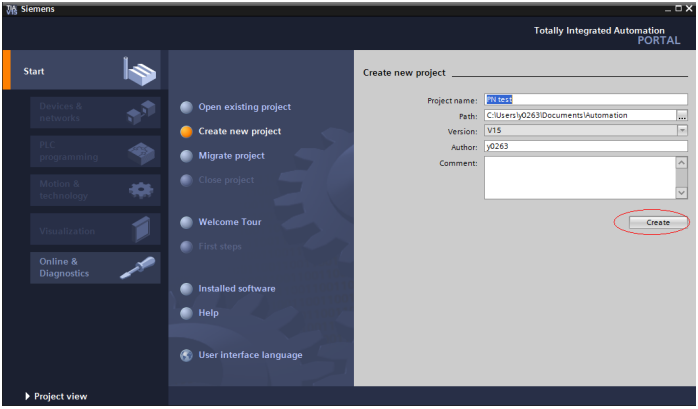
Configure the GSDML file of the slave first for use in Profinet master. This is to allow the corresponding slave device to be added to the master system. If the GSDML file already exists, skip step 2. The GSDML file can be obtained from Inovance agent or the manufacturer.

See the following for detailed steps:

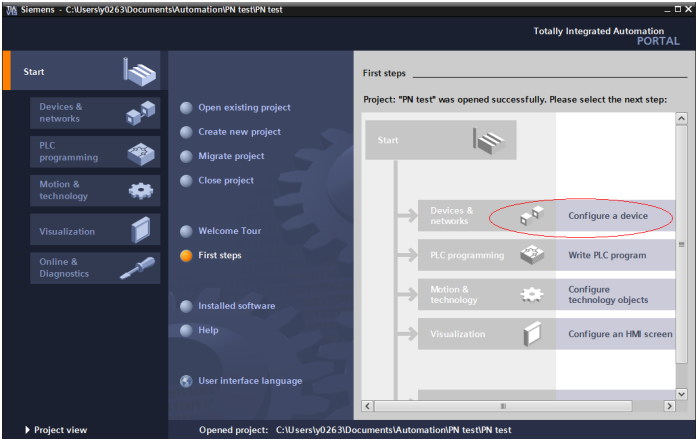
1. Create a project in PORTAL and add S7–1200 slave in the project. Then double click on the TIA portal software to trigger the following interface.



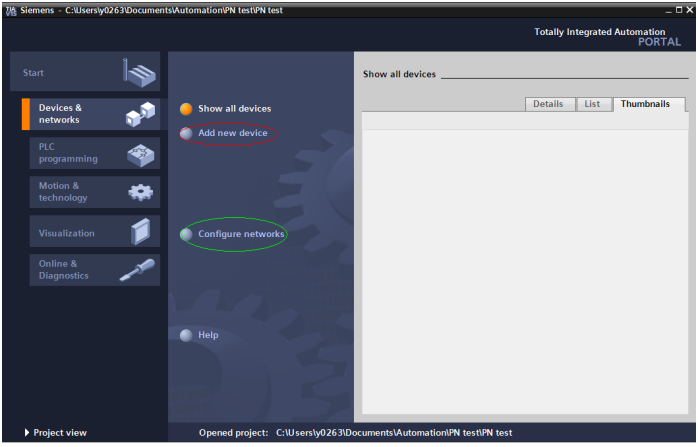
a. Select "Creat new project" in the preceding figure, set the project name and directory for storage, then click “Create”.



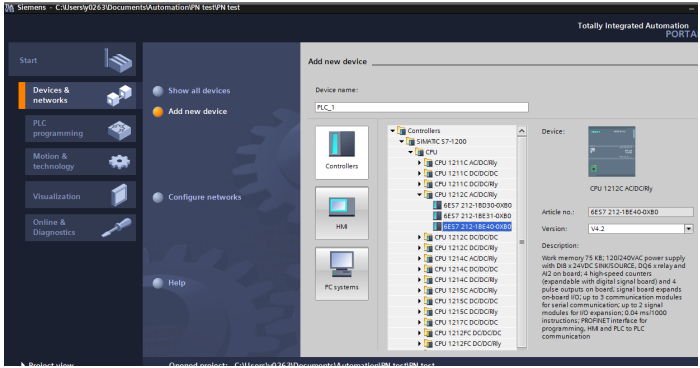
b. Select “Configure a device”, as shown below.



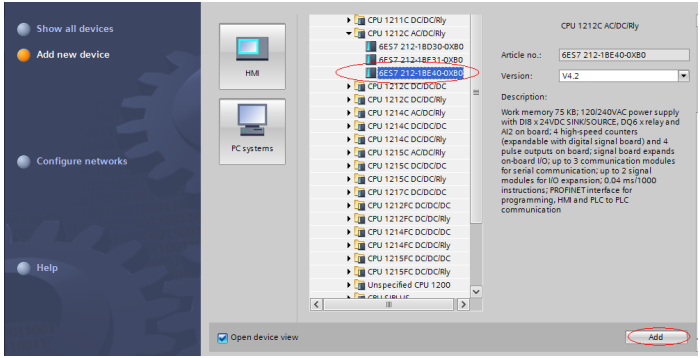
c. For new projects, click “Add new device” in the following figure. For previous projects, click “Configure networks” directly.



d. Select the PLC in the interface displayed. Note that the PLC selected should match the order. Then select the firmware version of the PLC. Wrong version can lead to download failure.

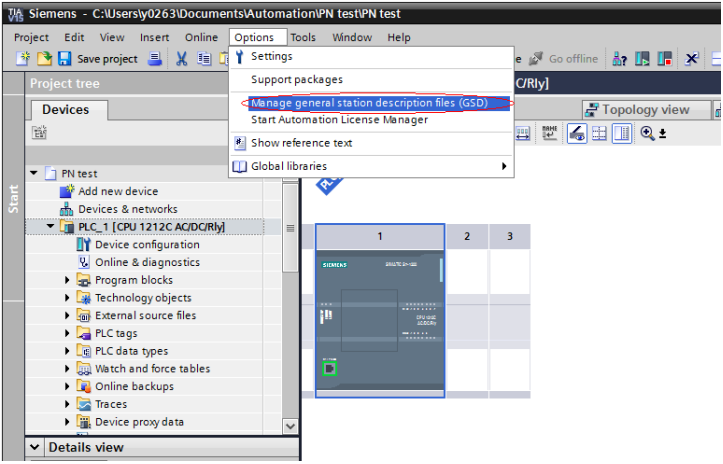


e. After selecting the PLC and firmware version, click “Add” or double click on this PLC directly, as shown below.

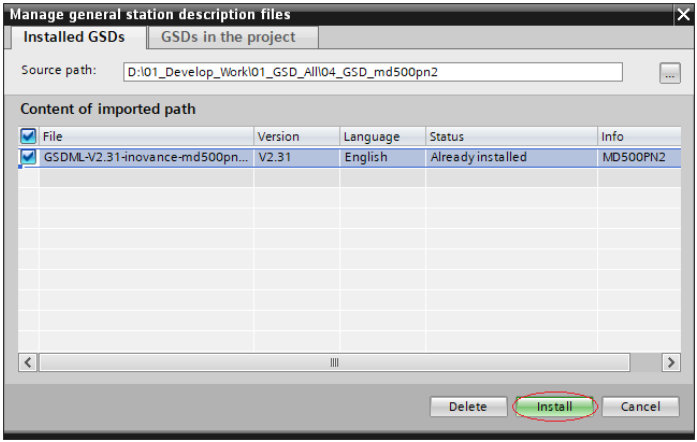


The master has been set up.

2. Install the GSDML file. If the GSDML file has not been installed, select “Manage general station description files (GSD)” under “Options” to install the GSDML file.



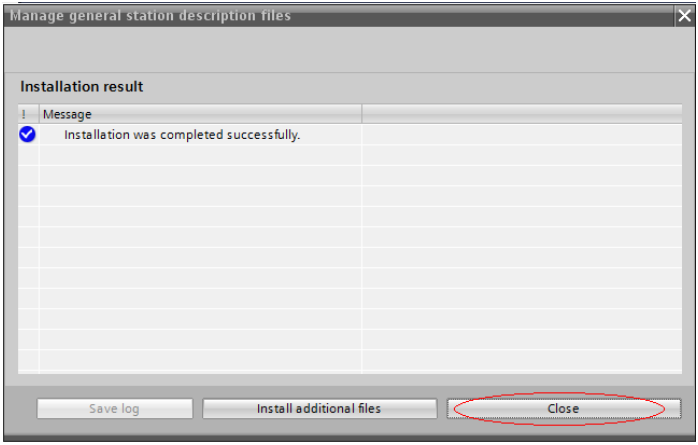
a. Select the directory for saving the GSDML file, check the GSDML to be installed, and then click “Install”.



Caution

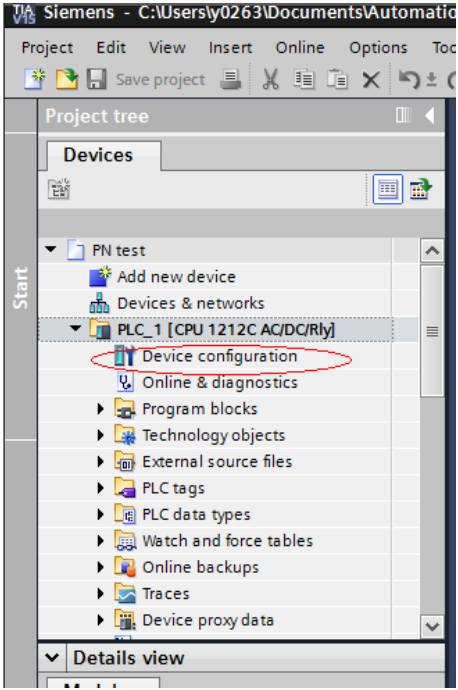
The GSDML file name varies with the AC drive series. For details, see the corresponding user guide.

b. Select “Close” when installation has been completed.

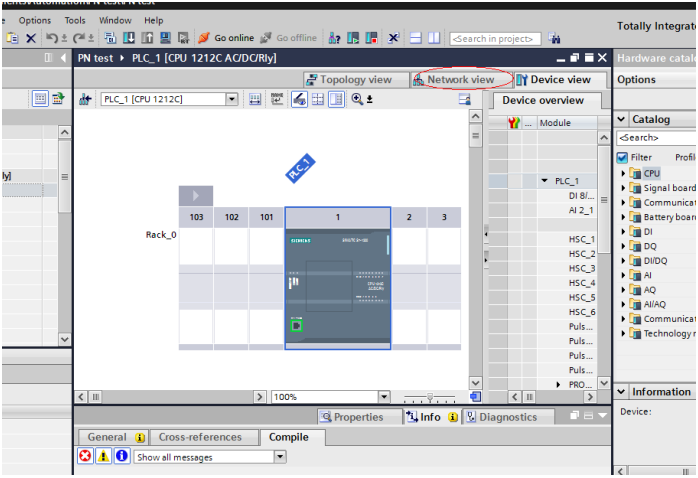


3. Configuring slaves

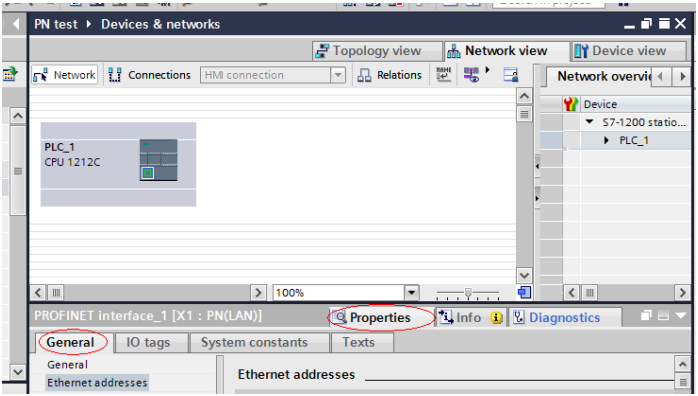
a. Click “Device configuration” in the interface.



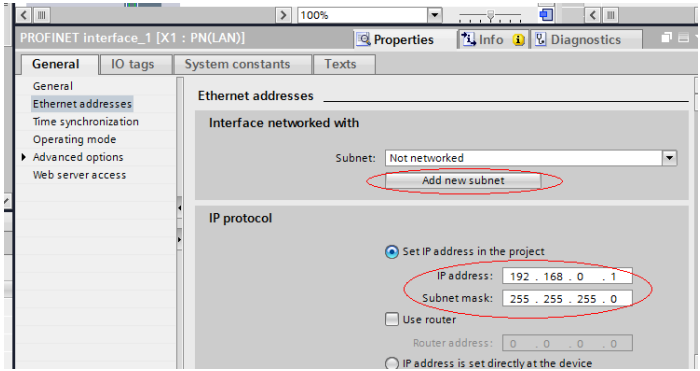
b. Switch to “Network view”.



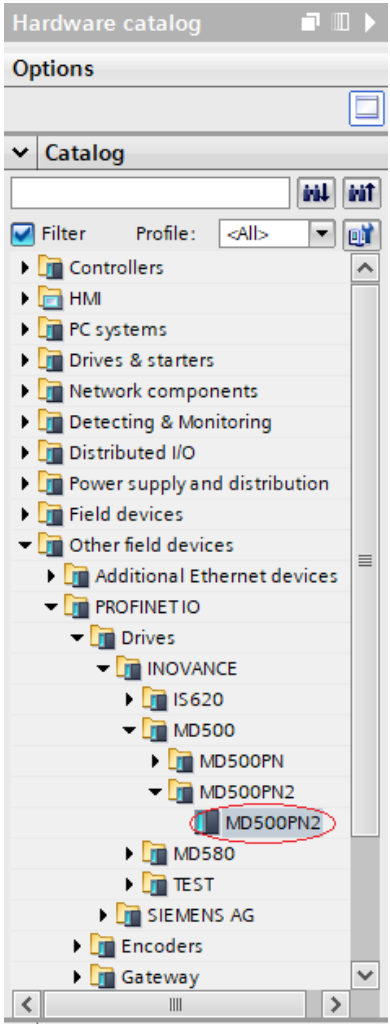
c. Select the Ethernet port of PLC and switch to “Properties” > “General”.



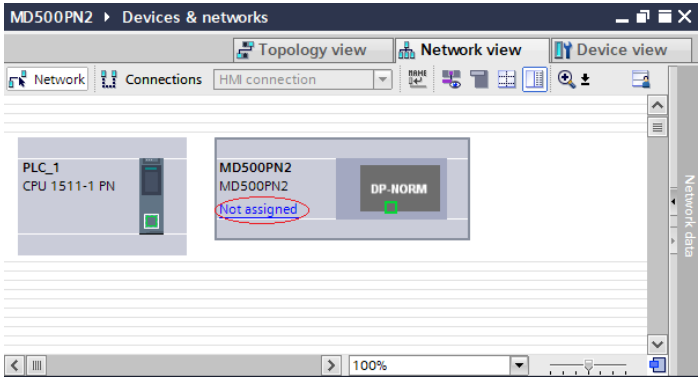
d. Set the IP address and subnet mask of the PLC and then click “Add new subnet”.



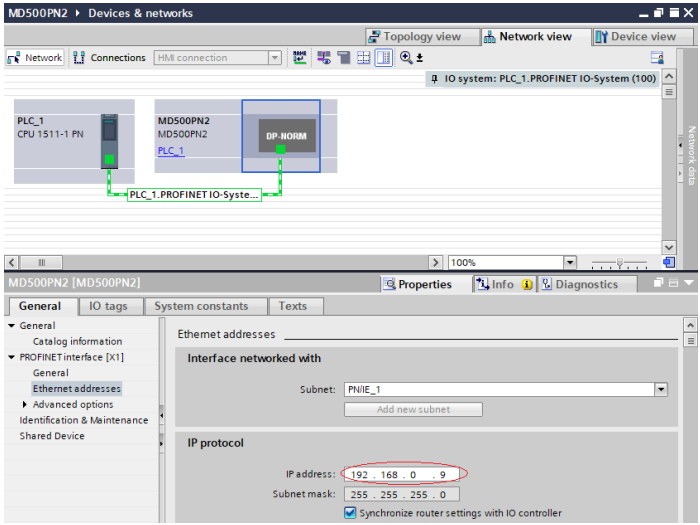
e. Find MD500 in the “Catalog” and double-click “MD500PN2”.


Hardware catalog
Options
Catalog
Filter
Profile:
<All>
Controllers
HMI
PC systems
Drives & starters
Network components
Detecting & Monitoring
Distributed I/O
Power supply and distribution
Field devices
Other field devices
Additional Ethernet devices
PROFINET IO
Drives
INOVANCE
IS620
MD500
MD500PN
MD500PN2
MD500PN2
MD580
TEST
SIEMENS AG
Encoders
Gateway

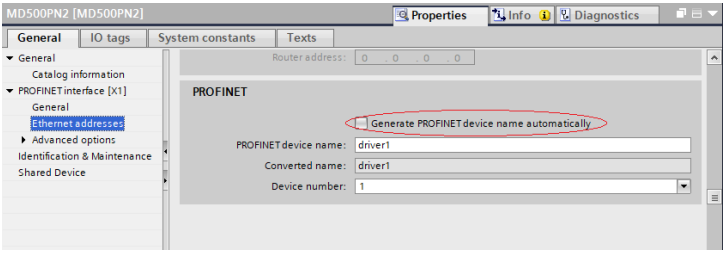
f. Click “Not assigned” and select the master system to be connected to the slave.



g. Select the slave and set the IP address in “Properties” > “General” > “PROFINET interface [X1]” > “Ethernet addresses”.

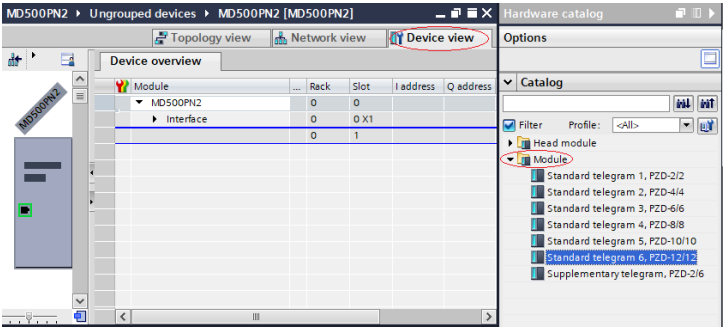


Deselect “Generate PROFINET device name automatically” under “PROFINET” and enter the slave device name in “PROFINET device name” (or you can check “Generate PROFINET device name automatically” to let the system generate the device name automatically).



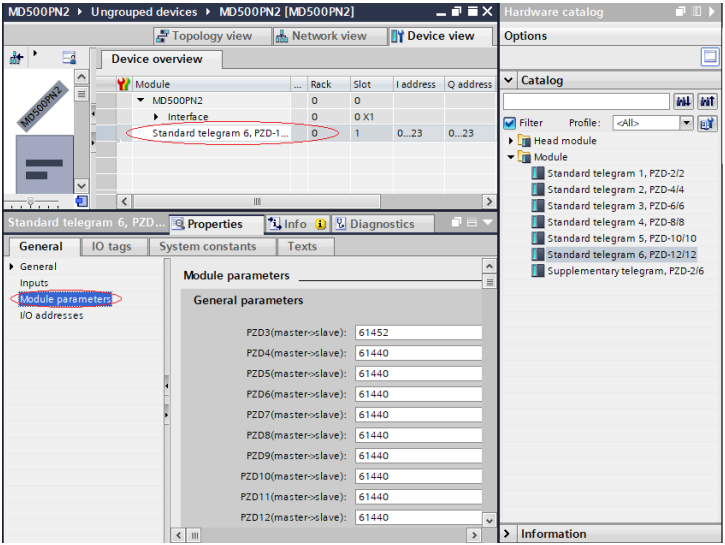
4. Configuring data characteristics of the slave

Select the slave and switch to “Device view”, then double click on the data length needed in “Hardware catalog” > “Module”.



5. Configuring PZD

PZD1 and PZD2 have already been configured, which cannot be changed by users. PZD3 to PZD12, which are used for cyclic data exchange, can be defined by users and can be set in hardware configuration.



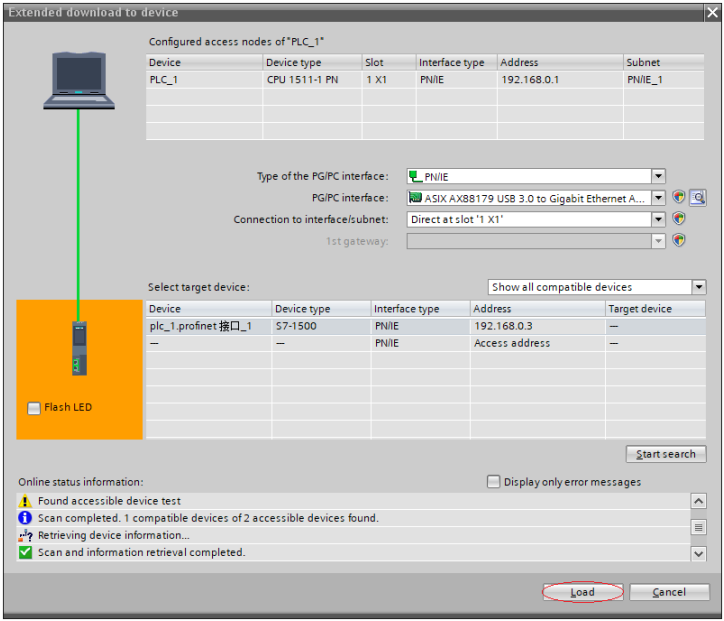
PZDx (master > slave) represents the slave address written by the master. PZDx (slave > master) represent the slave address read by the master. The settable PZD range is PZD3 to PZD12 (related to the message type selected), which is displayed in decimal. For example, to set PZD3 (master > slave) to F0-12, fill in 61452 in the value field.

The default value of all the PZD is F0-00 (61440 in decimal). To use the PZD not used before, you can use the default value. The PZD mapping relationship must be set separately for each slave as needed. If all the slaves share the same mapping relationship, select a slave that has been set and press Ctrl+C, and then select the PROFINET bus in the configuration and press Ctrl+V to modify the device name and IP address directly.

Switch back to “Network view”. To add more stations, repeat the preceding steps. If configurations are the same, select the slave directly and copy the configurations, and then change the IP address and device name (Note: The device name must be unique.).

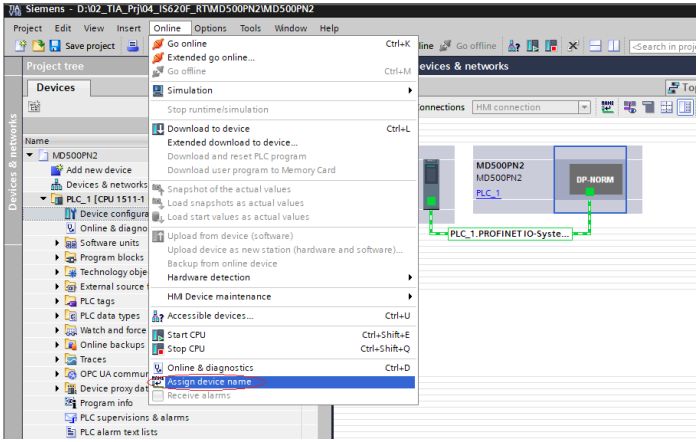
6. Downloading the configuration

Save the configuration network that has been configured properly, and then set the IP address of the PC to the same network segment as the PLC (Note: The IP address must be unique. You can set PC to the IP address assigned automatically). Next, start compiling and click “Load”, and then select interfaces and click “Start search”.

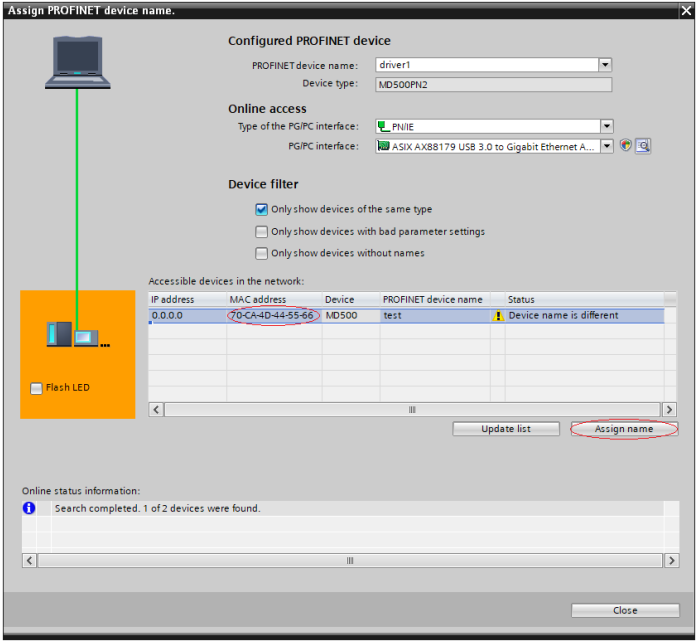


7. Assigning device name

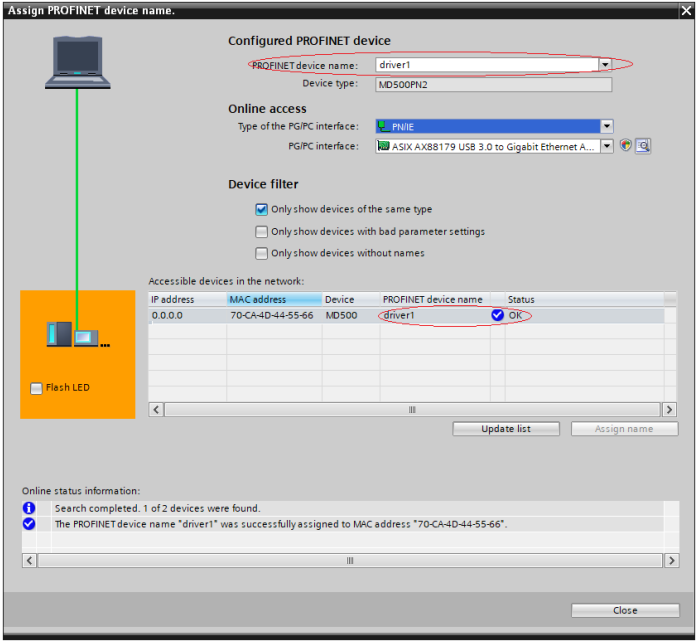
a. After downloading, assign names to slaves without a name. Select the slave and click “Online” > “Assign device name” (or select the slave and click the context menu).



b. The same type of devices will be displayed. Select the slave without a name. Each slave is assigned with a unique MAC address. When the same type of devices are present in the same network, differentiate the devices based on the MAC address. The MAC address of the MD500-PN2 card is on the product enclosure. Click “Assign name”.



c. When the following information displays, it indicates the device name has been written. The “PROFINET device name” displayed must be the same as that in the “Configured PROFINET device”. When the slaves of the device are assigned properly, close or select other names in the pull-down menu of “PROFINET device name” to continue assigning names to other slaves.



The slave saves the name assigned and the master identifies each slave based on the device name assigned. As the MAC address is hard to identify, the device name assigned is the combination of the device name and the MAC address.

Caution

- Each device name can be assigned to only one slave in the network.
- After modifying the device name of a station in the configuration, device name assignment must be performed again. (For any exception, see "Troubleshooting".)
- After modifying the IP address, you only need to download the modified configuration to the PLC to validate it. Name assignment is not required.

The preceding steps are all the operations related to PROFINET slaves. Then you can write corresponding programs in the PLC to control the drives. The R/W operation performed by the PLC on the slaves are similar to PROFIBUS-DP.

To ensure proper operation of the PLC, add function blocks OB82, 83, 86, and 122. The contents of the function block can be empty or filled in as needed.

4 Troubleshooting

4.1 Troubleshooting

The following fault may occur when the drive is configured with MD500-PN2 card.

<table>
<tr><th colspan="2">Description</th><th>Solution</th></tr>
<tr><td colspan="2">After the drive is powered on, only indicator D4 lights up, it indicates the communication between the PN card and the drive has not been established.</td><td>1. Check whether F0-28 is set to 1.
2. Check the drive type.
3. Check whether the drive software version supports MD500PN2.</td></tr>
<tr><td colspan="2">After the drive is powered on, indicator D5 lights up and indicator D4 lights up in yellow.</td><td>An MAC error occurs, replace the PN card.</td></tr>
<tr><td rowspan="2">Connection is unavailable when configuration is downloaded.</td><td>After configuration is downloaded, indicators D5 and D4 keep ON in green, and indicator D1 blinks in green.</td><td>1. Check whether cables are connected properly.
2. Check whether the upstream PN node operates properly.
3. Check whether a device name is assigned to this node through PLC.
4. Check whether the GSDML used by configuration is correct.</td></tr>
<tr><td>After configuration is downloaded, indicators D5 and D4 keep ON in green, and indicator D1 blinks in yellow.</td><td>1. Check whether the GSD used is correct.
2. Check whether the PZD mapping relation is set correctly. The device-specific parameters of STEP7 and PORTAL can be decimal only. You need to convert the parameter to a decimal. For example, the decimal value for FC-11 is 64523 (0xFC0B in hexadecimal). If parameters not supported by the drive are written, connection is unavailable. Note that PZD mapping does not support addresses like H2000 and H8000 in Modbus.</td></tr>
</table>

Description		Solution
After connection is done, all the indicators on the PLC are in green, but data cannot be written or read in the drive.	All the data cannot be written or read.	Check whether the operation address is correct. If the I address of this station is 520 to 531, Q address is 520 to 531 (Note that I and Q addresses may not start from the same number.), then the PZD1 data written to the drive is saved in QW520, and PZD2 is saved in QW 522. (If the PLC is S7-300 and S7-400, use PQW.) If SFC15 is used, check whether RET_VAL of SFC15 block is 0. If not, a calling error occurs. In this case, rectify the error first before calling this function block.
	PZD3 and above can be written. PZD1 or PZD2 cannot be written or read.	Check whether F0-02 is set to 2 and F0-03 is set to 9. Check whether the command setpoint or frequency setpoint is active. The command setpoint is active in the range of 1 to 7. The frequency setpoint is active in the range of -F0-10 to +F0-10. Setpoints beyond these ranges cannot be written. Check whether FE-00 is U3-17 and FE-01 is U3-16. If not, rectify them or restore default settings.
	PZD1 and PZD2 can be written or read. PZD3 or above cannot be written or read.	Check whether the message type supports this PZD. Check whether “device-specific parameters” are set properly (View corresponding parameters in group FE to check whether they are written to the mapping correctly.).
	-	Check whether one PZD is assigned with values repetitively in the same logic relation (Test whether the value sent by PLC is correct in this logic relation.).
The drive reports ERR16 after communication is connected and this fault cannot be cleared, but indicator D1 of the PN card is normal,		View the PLC user program to check whether the eight high bits of PZD1 data written to the drive are 0. If not, modify them. The PZD1 command in this guide refers to the value instead of the bit.

Note

When the status word returned cannot display the fault status, monitor the status through OB82 or write the variation value to a certain address of the drive and read the value returned.

When the slave node is faulty, you can replace MD500-PN2 card directly, without the need for re-configuration.

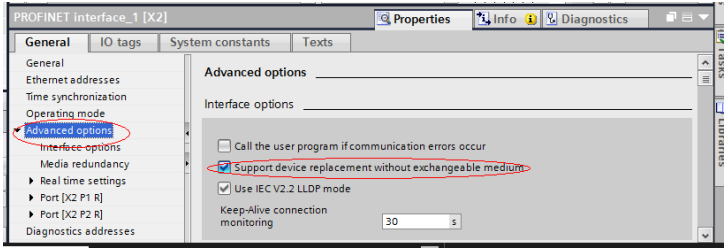
The pre-conditions for the MD500-PN2 card to be replaced directly are as follows:

- The device to be replaced and the device used for replacement are both MD500-PN2 communication card.
- The MD500-PN2 card used for replacement has never being assigned with any device name.
- The topology network has been set during PLC configuration.
- "Support device replacement without exchangeable medium" has been checked during PLC configuration.

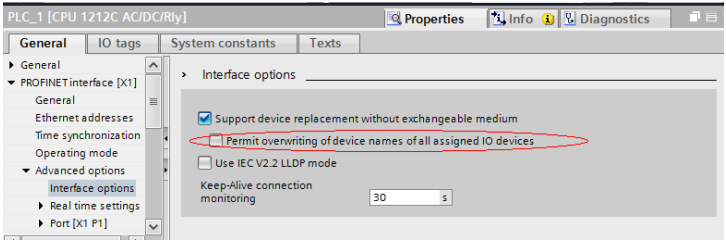
To replace MD500-PN2 card directly, you need to perform corresponding settings during configuration. Settings in STEP7 and PORTAL are different.

■ Setting "Support device replacement without exchangeable medium" and topology in PORTAL

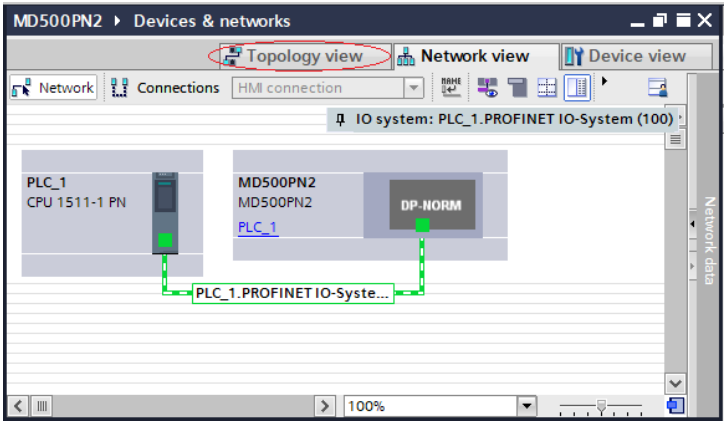
1. Select the PROFINET interface of the master in hardware configuration of PORTAL, and then check "Support device replacement without exchaneable medium" under "Properties", as shown below.



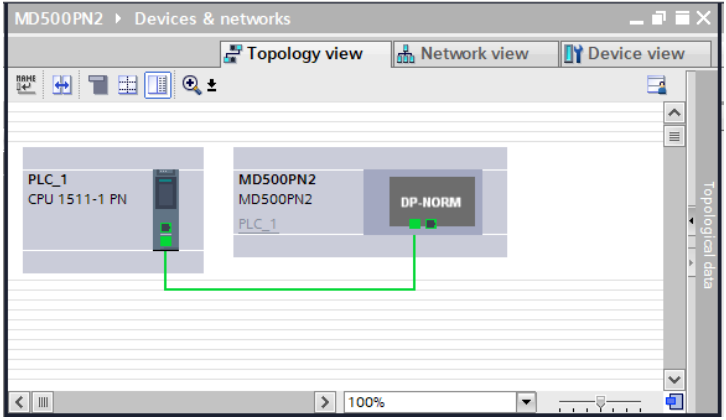
2. If the PLC used is S7-1200 and S7-1500, you can also check “Permit overwriting of device name of all assigned IO devices”.



3. Switch to “Topology view”, as shown below.



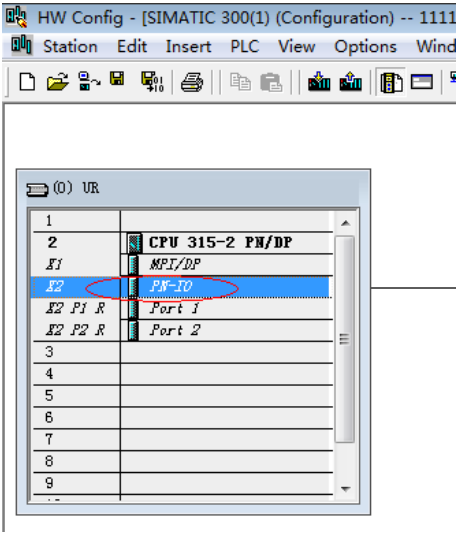
4. In Topology view, keep the port clicked on and then move the mouse to the port of the other device connected to this port, and then release the mouse. Note that the network connection must be the same as the actual devices. Wrong topology can lead to replacement failure or even communication error (for MD500-PN2, P1 is on the left and P2 on the right when viewed from an angle facing RJ45.)



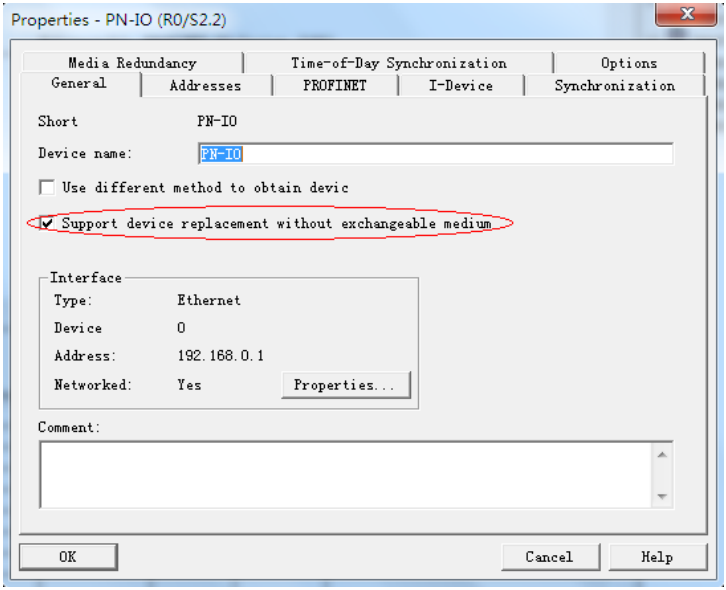
5. After connecting all the topologies, compile and download them to the PLC.

■ Setting “Support device replacement without exchangeable medium” and topology in STEP7

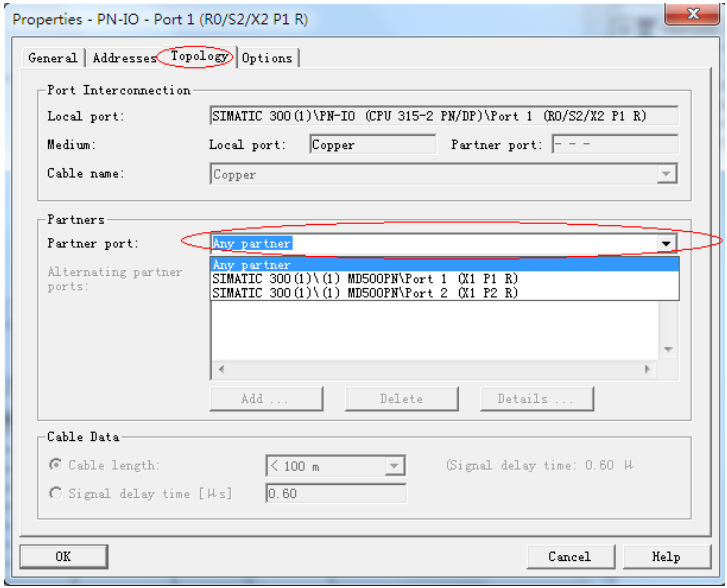
1. Double-click “PN-IO” in hardware configuration, as shown below.



2. Check “Support device replacement without exchaneable medium” and click “OK”.



3. Double-click “Port 1” or “Port 2” of the PLC based on actual network connection. Then switch to “Topology” and select the slave port to be connected to the PLC in the pull-down menu of “Partner port”, and click “OK” (“Any partner” applies by default, which must be changed to the port connected actually).



4. Then click the corresponding slave port to set topology, which is the same as PLC. After all the ports are set, compile and download it to PLC.
5. When you need to replace a certain slave after preceding configurations are done, disconnect this slave from the network and install the new device which has not been assigned with device name to the original position (use S7-1200 or S7-1500 and check “Permit overwriting of device names of all assigned IO devices”). Connect the network based on the original wiring mode (The network must be connected in the same mode as the topology and the original device), power on the slave, and the PLC will assign the device name to the device connected automatically.