



MD580 Series Low-Voltage High-Performance Engineering AC Drive Communication Guide



Industrial
Automation



Intelligent
Elevator



New Energy
Vehicle



Industrial
Robot



Rail
Transit



Data code 19011708A02

Preface

Introduction

The MD580 series is a low-voltage high-performance engineering AC drive that can control three-phase AC permanent magnet synchronous motors and asynchronous motors. Adopting the high-performance vector control technology, the MD580 series features high torque output at a low speed, excellent dynamic characteristics, superior overload capabilities, and stable performance. It provides rich and powerful combined functions, such as user programmable, software monitoring, and communication bus functions, and supports multiple encoder types.

This guide describes the communication expansion card in brief, composition, size, installation, electrical connection, and parameter configuration. Figures in this guide are only for your reference.

More documents

| Document Name | Data Code | Description |
|---|--------------------------------------|--|
| MD580 Series Low-Voltage High-Performance Engineering AC Drive Hardware Guide | 19011706 (400 V) 19012181 (690 V) | This guide describes the system composition, technical specifications, components, dimensions, options (including installation accessories, cables, and peripheral electrical components), expansion cards, certifications, and standards. |
| MD580 Series Low-Voltage High-Performance Engineering AC Drive Safety Installation Guide. | 19012111 (400 V) 19012183 (690 V) | This guide describes the installation and wiring of the drive, including pre-installation preparations, unpacking and transportation, mechanical installation, and electrical installation. |
| MD580 Series Low-Voltage High-performance Engineering AC Drive Maintenance Guide | 19011705 | This guide describes the routine maintenance and component replacement. |
| MD580 Series Low-Voltage High-performance Engineering AC Drive Communication Guide | 19011708 | This guide describes the composition, size, installation, electrical connection, and parameter configuration of the communication expansion card. |

| Document Name | Data Code | Description |
|--|-----------|--|
| MD580 Series Low-voltage High-performance Engineering AC Drive Function Guide | 19011709 | This guide describes function applications, fault codes, and parameters. |
| MD580 Series Low-voltage High-performance Engineering AC Drive Commissioning Guide | 19012184 | This guide describes the parameters, troubleshooting, operating panel, commissioning software, commissioning flowchart, and commissioning procedure. |

Revision History

| Date | Version | Description |
|---------------|---------|---|
| August 2023 | A02 | <ul style="list-style-type: none"> Added section 7 EtherCAT Industrial Ethernet Communication. Added section 8 EtherNet/IP Industrial Ethernet Communication. |
| December 2022 | A01 | <ul style="list-style-type: none"> Added the communication configuration cases. Changed the expansion slot 1_7 to 1_3 for n10-00 according to the module slot position. |
| March 2022 | 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 <http://www.inovance.com>, go to Support > Download, search by keyword, and then download the PDF file.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install the app, where you can search for and download manuals.



Warranty

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. You will be charged for any repair work after the warranty period expires.

Within the warranty period, maintenance fee will be charged for the following damage:

- Damage caused by operations not following the instructions in the user 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 is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see the Product Warranty Card.

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Fundamental Safety Instructions

Safety Precautions

- This chapter presents essential safety instructions for a proper use of the equipment. Before using this product, read the user guide thoroughly and correctly understand the related safety precautions. 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 will 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.

General Safety Instructions

- 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.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.
- Users must take mechanical precautions to protect personal safety and wear protective equipment, such as anti-smashing shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

Unpacking **WARNING**

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

 **CAUTION**

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

Storage and Transportation **WARNING**

- 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.

 CAUTION

- 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.
- Avoid storing or transporting the equipment in environments with 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

 DANGER

- The equipment must be operated only by professionals with electrical knowledge. Non-professionals are not allowed.

 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 the 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 equipments with strong electromagnetic interference, such as a transformer, install a shielding equipment for the equipment to prevent malfunction.
- 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 the vibration suppression function to reduce resonance.

Wiring DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- 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 can result in 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

- Follow the proper electrostatic discharge (ESD) procedure and wear an anti-static wrist strap to perform wiring. Failure to comply may result in damage to the equipment or to the internal circuit of the product.
- 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

| |
|---|
|  DANGER |
| <ul style="list-style-type: none">• 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. |
|  WARNING |
| <ul style="list-style-type: none">• 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 |
|  DANGER |
| <ul style="list-style-type: none">• 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. |
|  WARNING |
| <ul style="list-style-type: none">• Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in personal injuries.• Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage. |
| Maintenance |
|  DANGER |
| <ul style="list-style-type: none">• Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.• Do not maintain the equipment with power ON. Failure to comply will result in an 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.• In case of a permanent magnet motor, do not touch the motor terminals immediately after power-off because the motor terminals will generate induced voltage during rotation even after the equipment power supply is off. Failure to comply will result in an electric shock. |

| |
|--|
|  WARNING <ul style="list-style-type: none"> • Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record. |
| Repair |
|  DANGER <ul style="list-style-type: none"> • Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals. • Do not repair the equipment with power ON. Failure to comply will result in an 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 <ul style="list-style-type: none"> • Submit the repair request according to the warranty agreement. • 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 <ul style="list-style-type: none"> • 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 label

For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. The following table describes the meaning of the safety labels.

| Safety label | Description |
|---|--|
|  | <ul style="list-style-type: none">• Read through the safety instructions before operating the equipment. Failure to comply may 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 List of Communication Protocols

| Supported Protocol | Communication Hardware | |
|---------------------------------|--|---|
| PROFIBUS DP | External communication expansion modules | MD580-SI-DP1 communication expansion card |
| PROFINET IO industrial Ethernet | | MD580-SI-PN1 communication expansion card |
| Modbus RTU | | MD580-SI-RS1 communication expansion card |
| CANopen | | MD580-SI-CAN1 communication expansion card |
| Modbus TCP industrial Ethernet | | MD580-SI-EM1 communication expansion card |
| EtherNet/IP industrial Ethernet | | MD580-SI-EN1 communication expansion card |
| EtherCAT industrial Ethernet | | MD580-SI-ECAT1 communication expansion card |

2 PROFIBUS DP Communication

2.1 Overview

MD580–SI-DP1, a PROFIBUS-DP fieldbus adapter module, must be used with the MD580 AC drive of Inovance and fixed in the extension slot (CN13 slot) of the AC drive. It communicates with the bus master using the PROFIBUS-DP communication protocol.

Features:

- Automatically identifies the bus baud rate; supports the communication rate ranges of 9.6 kbps to 12 Mbps.
- In the bus topology, connects up to 32 nodes (including the master) when no repeater is used, or up to 122 nodes when repeaters are used (each segment comprising 31 nodes and one repeater).
- Complies with the EMS standard EN 61800-3:2004.
- Supports DPV0 and DPV1 for data exchange with the master.
- Be powered by the AC drive, without requiring an external power supply.

2.2 Product Information

Product layout

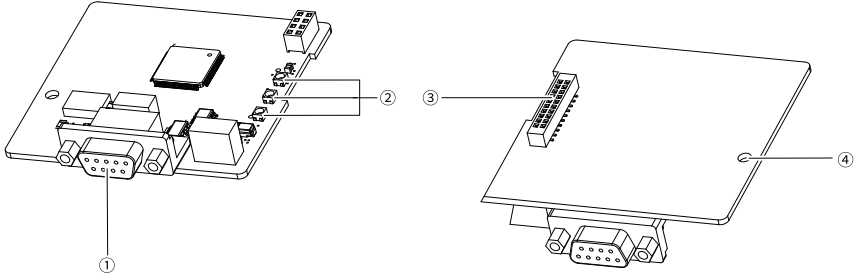
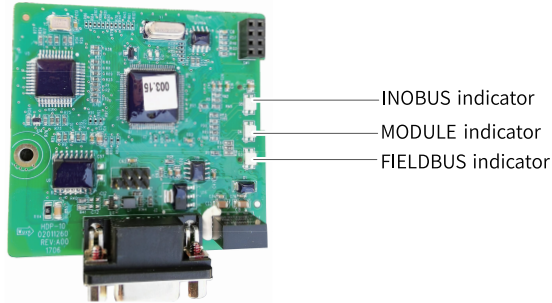


Figure 2-1 Product layout

| No. | Name | Description |
|-----|--------------------------------|---|
| ① | Bus communication terminal | It indicates the PROFIBUS DP bus communication terminal. |
| ② | Communication status indicator | It indicates the communication status of the module. |
| ③ | Slot terminal | It is used for electrical connection between the module and the MD580. |
| ④ | Screw fixing hole | It is used to fix the module to the MD580 to ensure proper PE layer connection. |

Description of indicators

The MD580-SI-DP1 module provides three status indicators to indicate bus communication faults, as described below. The following figure shows the indicator positions.



| Indicator | Color | Description |
|-----------|-----------------|---|
| INOBUS | Solid green | The communication between the module and the MD580 is normal. |
| | Flashing red | The communication between the module and the MD580 is being established or fails. |
| MODULE | Solid green | The module is normal. |
| | Solid red | The station number is invalid. |
| | Flashing red | The communication between the module and the MD580 is being established. |
| FIELDBUS | Solid green | The bus network connection is normal. |
| | Flashing green | The bus network communication is being established. |
| | Solid red | The bus network communication fails. |
| | Flashing red | Communication with the master station is lost. |
| | Flashing orange | Configurations of the slave station are incorrect. |

2.3 Installation Guide

Installation precautions

- During the installation and removal of the MD580-SI-DP1 module, ensure that the MD580 is in the power-off state. Avoid damage to the MD580-SI-DP1 module or MD580 caused by live plugging and unplugging.
- Do not drop or shock the MD580-SI-DP1 module to avoid damage to the module.
- Do not disassemble the MD580-SI-DP1 module to avoid damage to the module.
- Do not fasten with excessive torque to avoid damage to the terminal.

Tools required for installation

The following tools are required for installation:

- Phillips screwdriver, 1#
- Straight screwdriver, 1#

Tightening torque

The screws must meet the tightening torque listed below.

| Mechanical Connection | | Electrical Connection | |
|-----------------------|-------------------|-----------------------|-------------------|
| Screw | Tightening Torque | Screw | Tightening Torque |
| M3 | 1.2 N•m | M3 | 0.55 N•m |

Dimensions

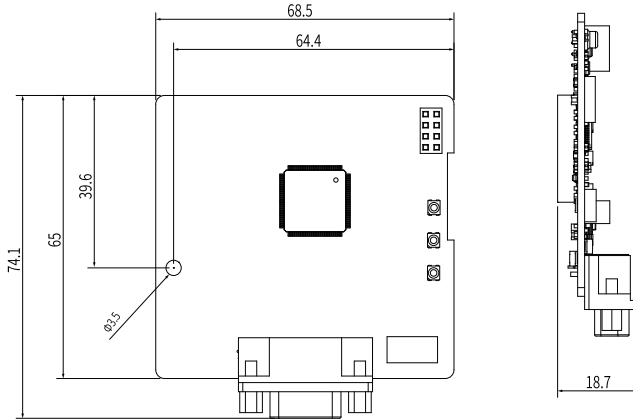
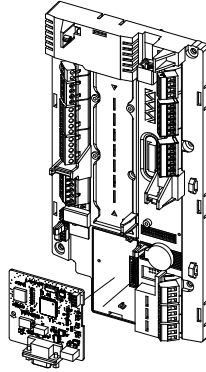


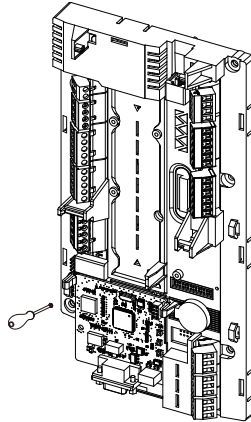
Figure 2-2 Product dimensions (mm)

The MD580–SI-DP1 module can be installed in the expansion slot of the MD580.

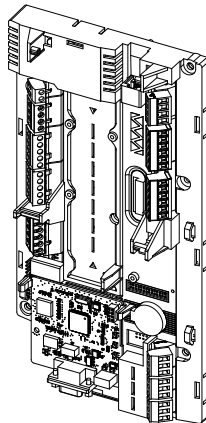
1. Install the module to the expansion slot of the MD580.



2. Press the snap-fit joint at both sides of the module inward to push the module into the slot, and fasten the grounding screw of the module by using the 1# screwdriver.



3. The installation completes.



Removal

Remove the module in a reverse way of installation.

1. Remove the grounding screw of the module by using the 1# screwdriver.
2. Press the snap-fit joint at both sides of the module inward and pull out the module.
3. Store the module properly.

2.4 Electrical Connection

Bus cable description

The following table describes the dedicated cable for the PROFIBUS DP bus.

Table 2-1 Cable specifications

| Parameter | Description |
|-------------------------|---|
| Conductor | One pair (2 x 22AWG) of single-strand copper conductors |
| Insulating sheath color | Green, red |
| Shield | Aluminum plastic tape + tinned copper braid |
| Sheath material | PVC |
| Operating temperature | -30°C to +70°C |
| Appearance | Purple |

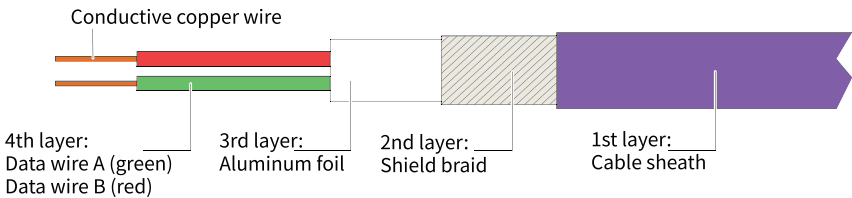


Figure 2-3 Internal layer of the bus

Bus terminal

Siemens dedicated PROFIBUS DP connector 6ES7 972-0BB12-0XA0 is recommended.

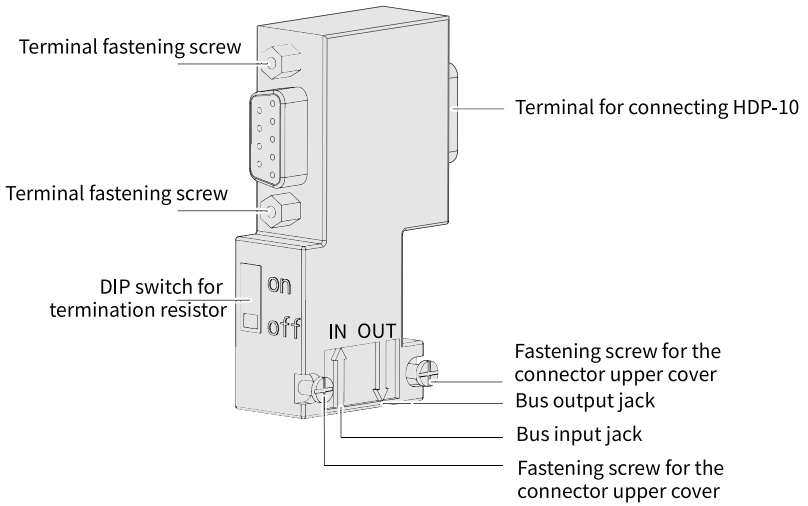


Figure 2-4 Bus connector

Bus connection procedure

1. Strip the cable sheath and reverse the length as specified in the following figure.

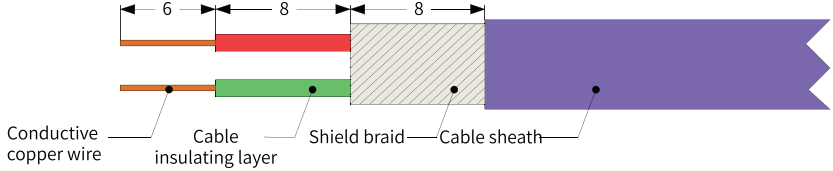
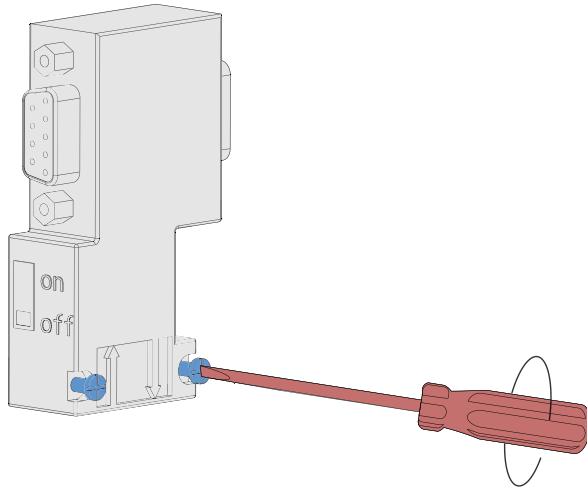
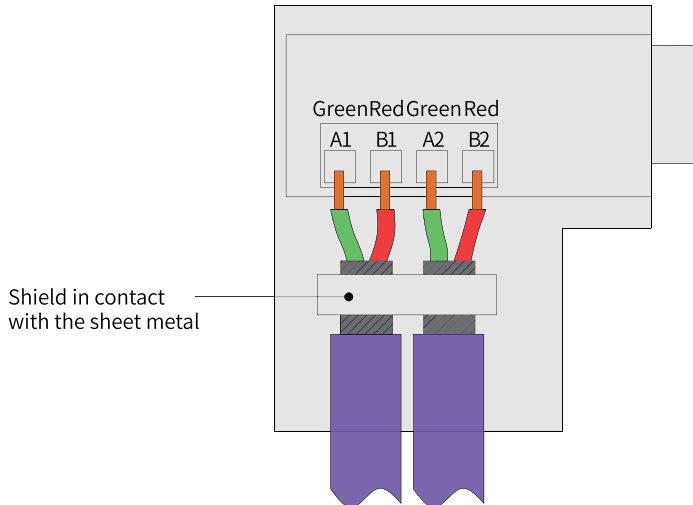


Figure 2-5 Length of each layer of the bus cable (unit: mm)

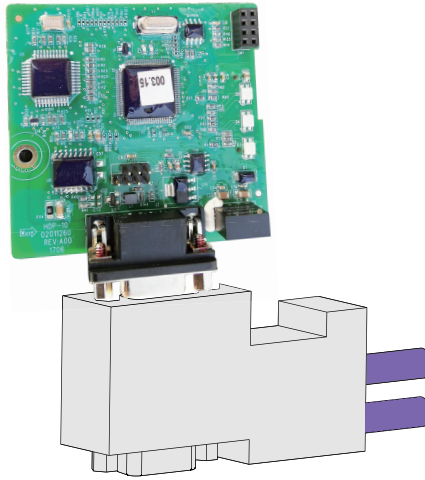
2. Open the bus connector terminal cover using the 1# straight screwdriver.



3. Secure the cable to the connector installation position using the 1# straight screwdriver. Ensure that the shield is in close contact with the shield metal sheet. Connect the green cable to the A terminal and the red cable to the B terminal, as shown in the following figure.



4. After you close the connector cover and tighten the screws on the cover, insert the connector to the DB9 port of the MD580-SI-DP1 module, and use a screwdriver to tighten the screws on both sides.



Note

When installing the PROFIBUS DP bus, ensure that the studs on both sides of the Siemens terminals are securely connected to the MD580-SI-DP1 module. Otherwise, the communication may fail or the communication quality may deteriorate.

Bus topology

- For multi-drive system connection without any repeater, connect termination resistors to the first and last AC drives, as shown in ["Figure 2-6 Multi-drive system connection without any repeater" on page 21.](#)

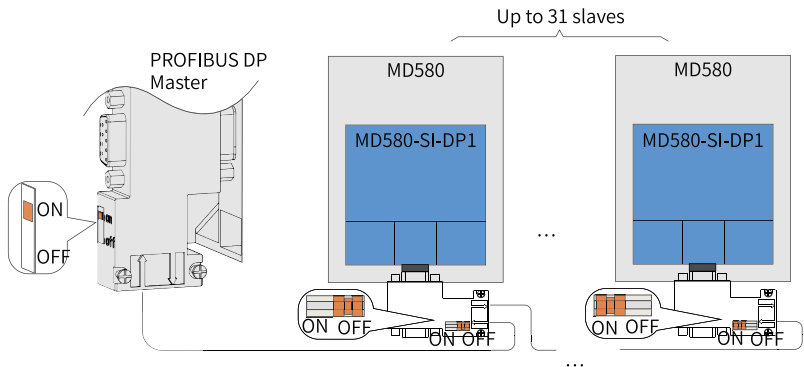


Figure 2-6 Multi-drive system connection without any repeater

- For multi-drive system connection with repeaters, connect termination resistors to the first and last AC drives, and connect the termination resistor of the repeater, as shown in "Figure 2-7 Multi-drive system connection with repeaters" on page 22.

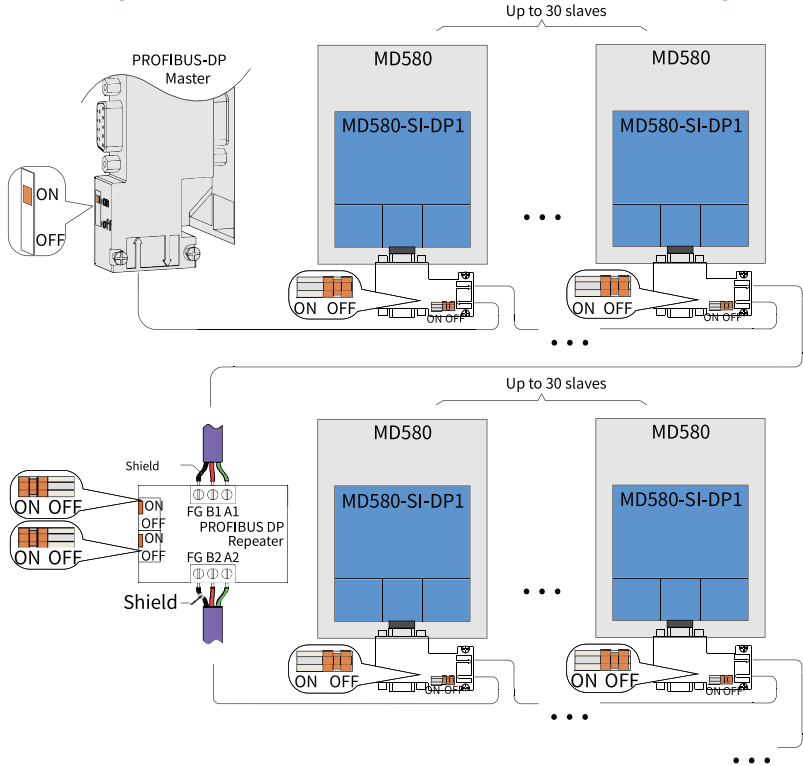


Figure 2-7 Multi-drive system connection with repeaters

Baud rate and communication distance

| | | | | | | | | |
|---------------------------|------|------|-------|-------|-----|------|------|-------|
| Baud Rate (kbps) | 9.6 | 19.2 | 93.75 | 187.5 | 500 | 1500 | 3000 | 12000 |
| Transmission Distance (m) | 1200 | 1200 | 1200 | 1200 | 400 | 200 | 100 | 100 |

Note

The transmission distances in the preceding table are distances without using any repeater.

2.5 Parameter Configuration

Parameter configuration flow

To set the MD580–SI-DP1 module, do as follows:

1. Select the parameter settings.
2. Select the bus adapter and functional module.
3. Select the fieldbus adapter A.
4. Select the bus type of the bus adapter.
5. Select the PROFIBUS DP fieldbus adapter module.

Note

You can also select the fieldbus adapter B.

Parameter configuration description

The following table describes the parameter settings of the MD580–SI-DP1 module.

| Parameter Code | Parameter Name | Default | Set Value | Description |
|----------------|---------------------------|---------|---|---|
| n2-00 | Bus type of bus adapter A | 0 | 7 | Only one of the two parameters can be set to 7. |
| n3-00 | Bus type of bus adapter B | 0 | 7 | |
| n16-00 | Expansion slot selection | 0 | 0: Disable 1: Expansion slot 1_1 2: Expansion slot 1_2 3: Expansion slot 1_3 | Select a value according to the actual need. Generally, select the value 1. |
| n16-01 | Status | 0 | 0: Offline 1: Online | - |

| Parameter Code | Parameter Name | Default | Set Value | Description |
|----------------|--------------------------------------|---------|---|---|
| n16-02 | Station number of the expansion card | 1 | 1 to 125 | Slave station number |
| n16-10 | DP data verification bit | 0 | 0: PZD1.bit10 (default) 1: Disable 2: PZD1.bit0 3: PZD1.bit1 4: PZD1.bit2 5: PZD1.bit3 6: PZD1.bit4 7: PZD1.bit5 8: PZD1.bit6 9: PZD1.bit7 10: PZD1.bit8 11: PZD1.bit9 12: PZD1.bit10 13: PZD1.bit11 14: PZD1.bit12 15: PZD1.bit13 16: PZD1.bit14 17: PZD1.bit15 | This parameter is used to verify data validity. |

Note

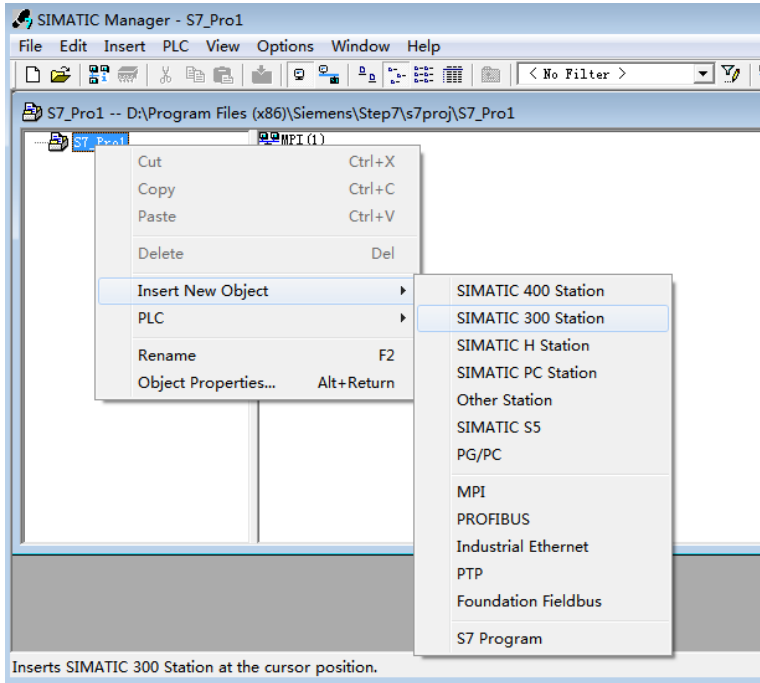
After parameters are set, you must reset the MD580 to make the settings take effect.

2.6 Configuration for PROFIBUS DP Communication Between AC Drive and S7-300

Configuring slave stations on the S7-300 master station

To use the PROFIBUS DP master station, configure the GSD file of the slave station first to add the slave station to the master station system. If the slave station already exists, skip step 2. You can obtain the GSD file from Inovance's agency or the manufacturer. The detailed procedure is as follows.

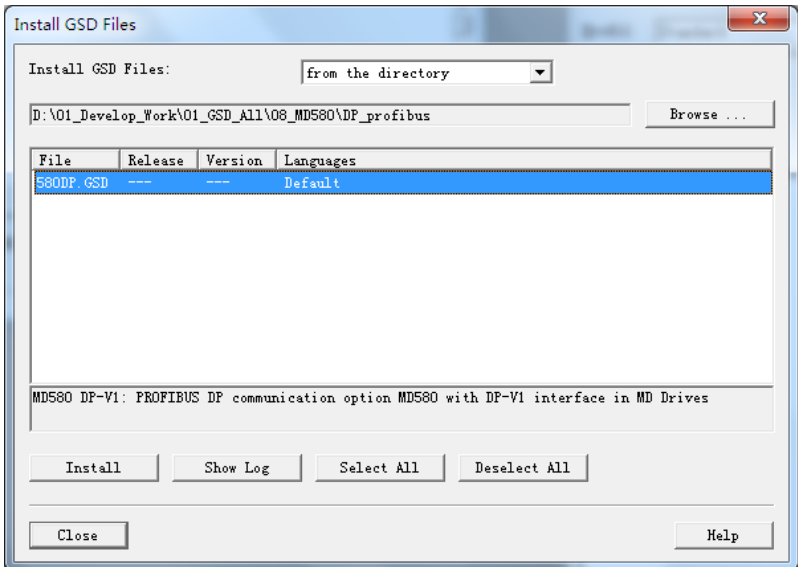
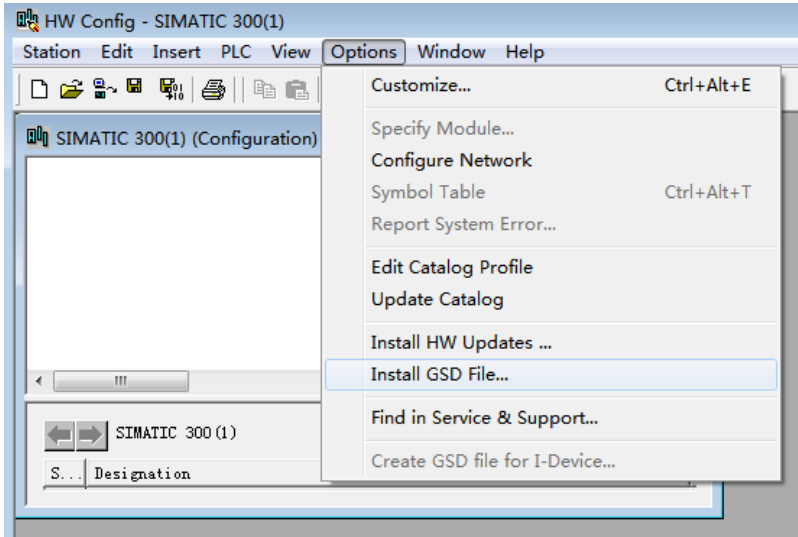
1. Open STEP 7, create a project, and add the S7-300 master station to the project.



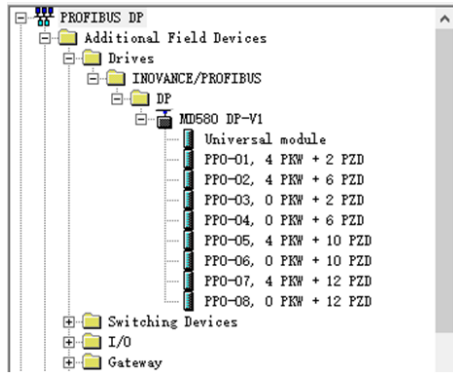
2. Double-click the hardware icon to enter the "HW Config" interface. On the "HW Config" interface, add the MD580DP.GSD file.

Note

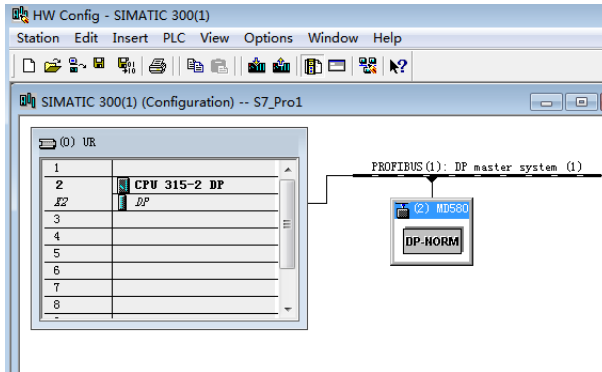
Do not store the GSD file in a Chinese path; otherwise, the GSD file may not be recognized.



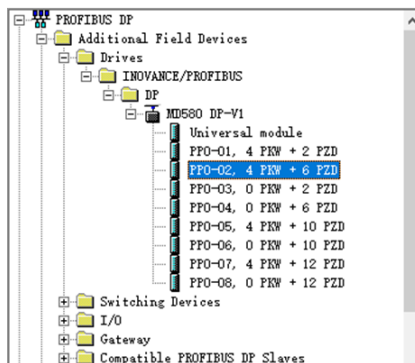
Click "Install". After the installation is complete, the PROFIBUS DP module of the MD580DP is displayed.



3. Configure the actual hardware system.



4. Configure data features of the slave station.



5. Configure the PZD.

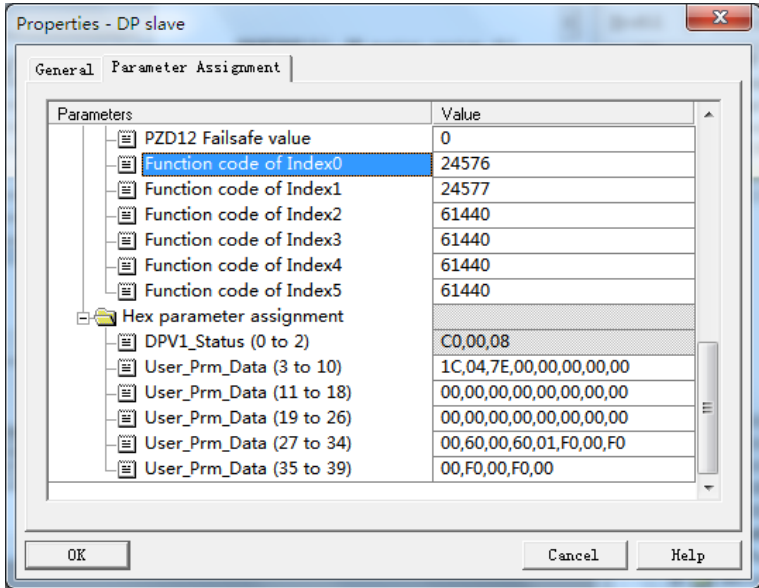
Configure the mapping address of the PZD on the MD580 as required by the AC drive.

6. Configure parameters.

After the mapping address of the PZD is configured, you also need to configure related parameters, including the handling mode upon the occurrence of a fault and the index mapping address that is non-periodically read and written.

| | |
|-------------------------|----------------------|
| DP Mode | DPV1 |
| Process Alarm | Disabled |
| Diagnostic Alarm | Disabled |
| Update Alarm | Disabled |
| Alarm Mode | Type mode |
| Prm Structure | Enabled |
| Fail Safe mode | Stop |
| PZD1 Failsafe value | Stop |
| PZD2 Failsafe value | Last Reference |
| PZD3 Failsafe value | Use fail-safe values |
| PZD4 Failsafe value | 0 |
| PZD5 Failsafe value | 0 |
| PZD6 Failsafe value | 0 |
| PZD7 Failsafe value | 0 |
| PZD8 Failsafe value | 0 |
| PZD9 Failsafe value | 0 |
| PZD10 Failsafe value | 0 |
| PZD11 Failsafe value | 0 |
| PZD12 Failsafe value | 0 |
| Function code of Index0 | 61440 |

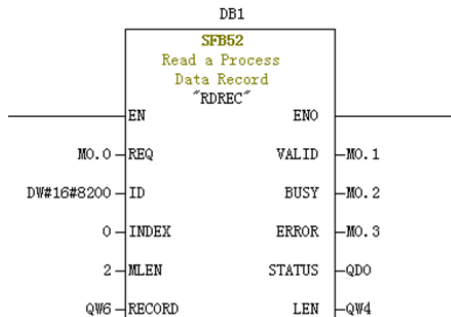
Select a value for "Fail Safe mode". The value "Stop" indicates that all data written by the PLC to the AC drive is cleared when a fault occurs. The value "Last Reference" indicates that the data remains unchanged when a fault occurs. The value "Use fail-safe values" indicates that the values of "PZDX Failsafe value" are used.



After all the preceding operations are completed, the PROFIBUS DP slave station is configured. Then, you can compile programs in the S7-300 to control the AC drive.

Non-periodic reading/writing on the slave station

To perform non-periodic reading and writing operations on the PROFIBUS DP slave station, enable the Siemens's system function modules SFB52 (for reading) and SFB53 (for writing). Create an organization block in the program, and add relevant function blocks and programs in the organization block.



After M0.0 is set, the function block reads U0-00 (Index 0 has been set to U0-00) of the AC drive No. 2 and saves it in QW6. Field definitions are as follows:

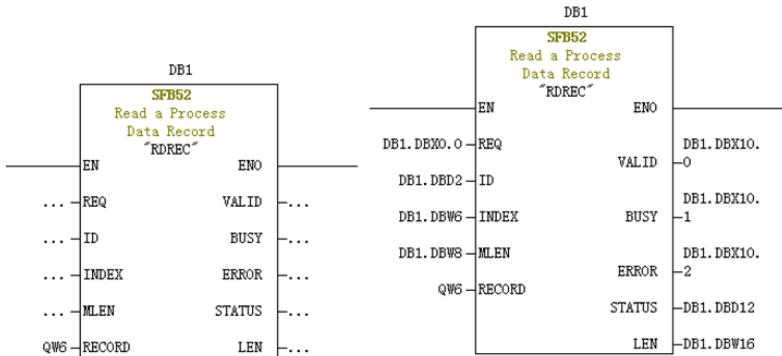
- REQ: It is used to enable or disable the function block. When it is set to 1, the function block is enabled.

- ID: It indicates the logic address. To specify this field, convert any bit in the Q address of the AC drive slave station to a decimal value, and set bit 15 of the value to 1. For example, after Q512 is converted to the decimal value H200, and bit 15 of H200 is set to 1, H8200 is obtained.

| Slot | DP ID ... | Order No./Mark | I Address | Q Address |
|------|-----------|-------------------------|-----------|-----------|
| 1 | 4AX | PP0-02, 4 PKW + 6 PZD | 512...519 | 512...519 |
| 2 | 6AX | → PP0-02, 4 PKW + 6 PZD | 520...531 | 520...531 |

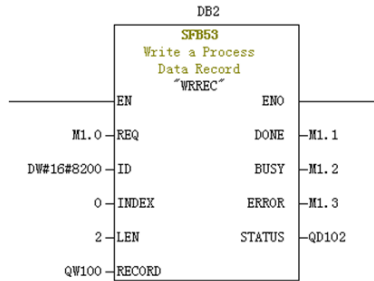
- INDEX: It is an index number ranging from 0 to 5. This field can be customized to an index mapping address of a slave station as required.
- MLEN: It indicates the maximum length of the data to be obtained. For MD580HDP, this field must be set to 2.
- RECORD: It indicates the target area of an obtained data record. This field is used to store read data when the read operation is performed and sent data when the write operation is performed.
- VALID: The new data record received and valid.
- BUSY: When the field value is ON, operations are not complete.
- ERROR: When the field value is ON, an error occurs.
- STATUS: It indicates the block status or error information.
- LEN: It indicates the obtained data record length.

During the invocation, you can customize parameters or use partial or all default parameters.



The left figure shows all the default parameters. If you want to customize parameters, set them according to the right figure. You can customize parameters or use default parameters for corresponding blocks as required. However, if multiple invocations are involved, you need to customize parameters to avoid invocation errors caused by usage of all default parameters (note: RECORD must be customized).

Periodic write operations are similar to periodic read operations. The RECORD field stores data to be written, as shown in the following figure.



Note

Before running an organization block, you need to download data blocks (above the function block with DB1 and DB2 used as examples) to the PLC. Otherwise, the DB block unloading error will be generated.

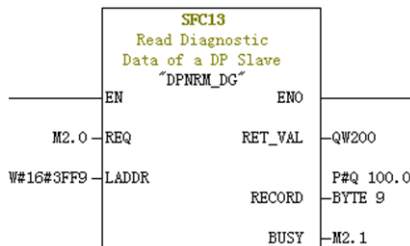
SFB53 is used to perform operations on the EEPROM. Therefore, relevant operations are invoked when necessary and relevant operations are disabled in time in the program. After the write operation is complete (M1.1 is set to 1), the program is invoked to reset M1.0, as shown in the following figure.



Execution of SFB52 and SFB53 requires invoking relevant blocks for multiple times each time. Therefore, do not invoke them when single execution is required.

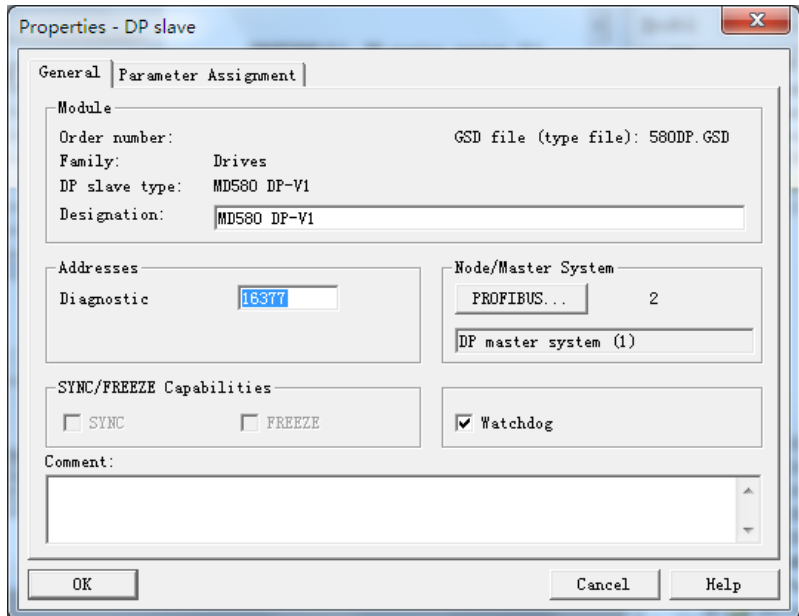
Diagnosis

You can use SFC13 in the program to obtain specific diagnosis information of each slave, as shown in the following figure.



- **REQ:** It is used to enable or disable diagnosis information reading. When this field is set to ON, diagnosis information reading is enabled.

- LADDR: It indicates the configured diagnosis address of the PROFIBUS DP slave station. The actual value is shown in the following figure. For SFC13, the address must be specified in hexadecimal.



- RET_VAL: It displays the error code (negative) when invocation errors occur or the actual transmitted data length (positive) when no error occurs.
- RECORD: It indicates the target area of the read diagnosis data. The value must be 9 bytes. Otherwise, an error is reported during invocation. Byte definitions are as follows:
 - Bytes 02: Station status
 - Byte 3: Master station number
 - Byte 4: Supplier ID (high byte)
 - Byte 5: Supplier ID (low byte)
 - Byte 6: Dedicated device diagnosis length (fixed to 3)
 - Byte 7: Dedicated device diagnosis high byte
 - Byte 8: Dedicated device diagnosis low byte
- BUSY: When this field is **1**, reading is not complete.

Dedicated device diagnosis provides AC drive fault information.

Fault description and handling

| Indicator | Status | Fault Description | Solution |
|-----------|-----------------|--|---|
| D5 | Flashing red | Handshaking between the HDP-10 module and the AC drive fails. | Check the settings of the AC drive. |
| D4 | Flashing red | Handshaking between the HDP-10 module and the AC drive fails. | Check the settings of the AC drive. |
| | Solid red | The HDP-10 module encounters a fault. | Power on the HDP-10 module again or contact the technical support engineer. |
| D3 | Flashing green | The slave station is establishing connections with the master station. | Check that the PROFIBUS DP station number is set to a value from 1 to 125. |
| | Flashing red | Communication with the master station PLC is lost. | Check that the cable and the termination resistor are correctly connected. |
| | Solid red | The master station is not found. | Check that the cable is correctly connected and that the configuration is downloaded. |
| | Flashing orange | The configuration is incorrect. | Check that the GSD configuration is correct. |

3 Modbus RTU Communication

3.1 Overview

Features of the fieldbus adaption module MD580-SI-RS1:

- MD580-SI-RS1 is a new-generation fieldbus adaption module of Inovance. It is used together with the MD580 to realize networking and remote control of the multi-drive system through the Modbus RTU communication network.
- MD580-SI-RS1 features good compatibility. It can be used with different series of MD580 AC drives, and is compatible with MD880 series products.

3.2 Product Information

Specifications

| Item | Description |
|---------------------|--|
| Ambient temperature | -10°C to +55°C |
| Storage temperature | -40°C to +70°C |
| Relative humidity | 5% to 95% RH (non-condensing) |
| Working environment | Free from corrosive gases |
| Altitude | ≤ 2000 m |
| Installation mode | Snap-fit joint and screw |
| Vibration | < 20 Hz: 9.8 m/s ² (1 g) 20 Hz to 50 Hz: 5.9 m/s ² (0.6g) |
| Housing IP rating | IP20 |
| Applicable standard | EN 61800-5-1:2007 EN 61800-3:2004 IEC/EN 62109-1:2010 UL508C:2002 |

Product layout

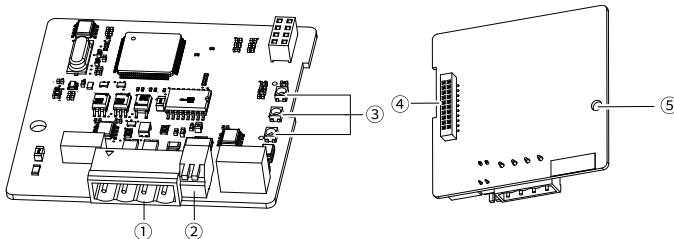
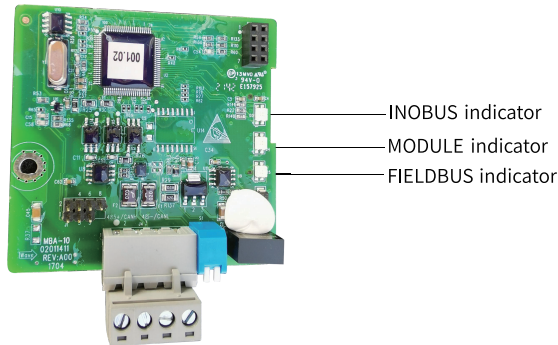


Figure 3-1 Product layout

| No. | Name | Description |
|-----|----------------------------|---|
| ① | Bus communication terminal | Modbus RTU bus communication terminal |
| ② | DIP switch | Termination resistor DIP switch |
| ③ | Status indicator | It indicates the running status of the module. |
| ④ | Slot terminal | It is used for electrical connection between the module and the MD580. |
| ⑤ | Screw fixing hole | It is used to fix the module to the MD580 to ensure proper PE layer connection. |

Description of indicators

The MD580-SI-RS1 module provides three status indicators to indicate bus communication faults, as described below. The following figure shows the indicator positions.



| Indicator | Color | State Description |
|-----------|--------------|---|
| INOBUS | Steady green | The communication between the module and the MD580 is normal. |
| | Flashing red | The communication between the module and the MD580 is being established or fails. |
| MODULE | Steady green | The module is normal. |
| | Solid red | The station number is invalid. |
| | Flashing red | The communication between the module and the MD580 is being established. |

| Indicator | Color | State Description |
|-----------|-----------------|---|
| FIELDBUS | Steady green | The bus network connection is normal. |
| | Flashing green | The bus network communication is being established. |
| | Solid red | The bus network communication fails. |
| | Flashing red | Communication with the master station is lost. |
| | Flashing orange | Configurations of the slave station are incorrect. |

3.3 Installation Guide

Installation precautions

Before installation, ensure that the MD580 is in the power-off state to prevent damage to the MD580-SI-RS1 module and MD580.

- Do not drop or shock the MD580-SI-RS1 module to avoid damage to the module.
- Do not disassemble the MD580-SI-RS1 module to avoid damage to the module.
- Tighten the screws according to the required torque to avoid damage or loose fastening.

Tools required for installation

The following tools are required for installation:

- Phillips screwdriver, 1#
- Straight screwdriver, 1#

Tightening torque

The screws must meet the tightening torque listed below.

| Mechanical Connection | | Electrical Connection | |
|-----------------------|-------------------|-----------------------|-------------------|
| Screw | Tightening Torque | Screw | Tightening Torque |
| M3 | 1.2 N•m | M3 | 0.55 N•m |

Dimensions

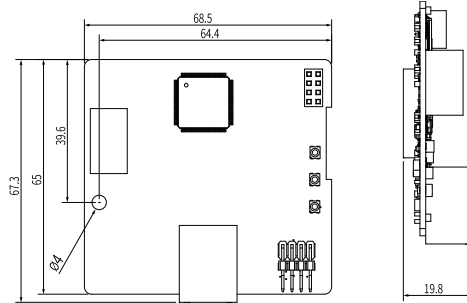


Figure 3-2 Product dimensions (in mm)

The MD580-SI-RS1 module can be installed in the expansion slot of the MD580. It is installed in the same way as the MD580-SI-DP1 module. For details, see [“2.3 Installation Guide” on page 15](#).

1. Install the module to the expansion slot of the MD580.
2. Press the snap-fit joint of the module inward to push the module into the slot, and fasten the grounding screw of the module by using the 1# screwdriver.
3. The installation completes.

Removal

Remove the module in a reverse way of installation.

1. Remove the grounding screw of the module by using the 1# screwdriver.
2. Press the snap-fit joint at the right side of the module inward and pull out the module.
3. Store the module properly.

3.4 Electrical Connection

Terminals and indicators

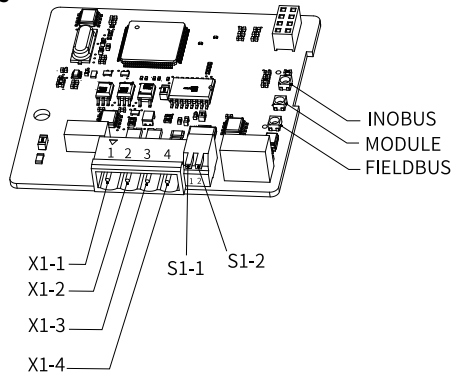


Figure 3-3 External connection diagram of MD580-SI-RS1 module

Table 3-1 Terminal description

| Terminal Pin | Name | Wiring | Description |
|--------------|--------------|------------------------------|---|
| X1-1 | SHIELD | For connection to the shield | Recommended cable: four-conductor shielded twisted pair cable Cross-sectional area: 0.3 mm ² to 2.0 mm ² |
| X1-2 | 485+ | Twisted pair | |
| X1-3 | 485- | | |
| X1-4 | GND | Connection is recommended | |
| S1-1 | DIP switch 1 | - | Termination resistor selection Valid when S1-1 and S1-2 are all set to ON |
| S1-2 | DIP switch 2 | - | |

The following figure shows the terminal wiring.

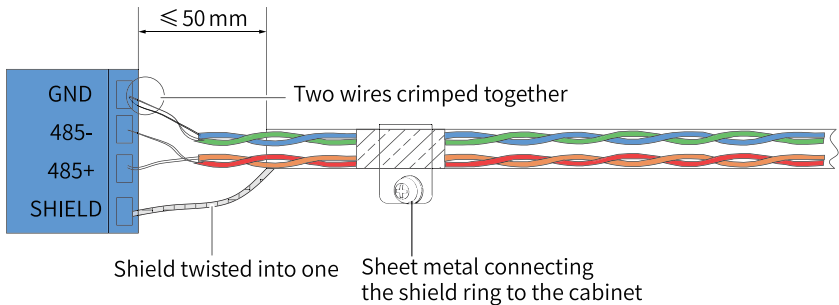
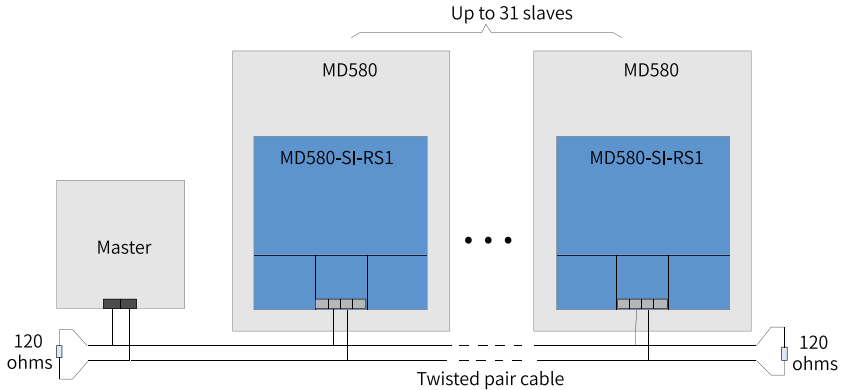


Figure 3-4 Terminal wiring

Bus topology

The Modbus RTU bus supports a maximum of 31 nodes (excluding the master). Set the termination resistors of the master and the last node to ON. The following figure shows the networking. If the number of nodes for networking exceeds 31, use a repeater.



3.5 Parameter Settings

MD580-SI-RS1 module settings

To set the MD580-SI-RS1 module, do as follows:

1. Select parameters to be set.
2. Select the bus adapter and functional module.
3. Select the fieldbus adapter A.
4. Select the bus type of the bus adapter.
5. Select the Modbus RTU mode.

Note

You can also select the fieldbus adapter B.

Parameter settings of the Modbus RTU module

Before using the MD580-SI-RS1 module, activate the Modbus RTU module through the bus adapter parameters n2-00 and n3-00, and then configure the functions of the Modbus RTU module. The following table describes the related parameters of the MD580-SI-RS1 module. The bus adapter A is used as an example.

Table 3-2 Parameter settings of the MD580-SI-RS1 module

| Parameter | Description |
|-----------|--|
| n2-00. | Select [1]Modbus RTU module from the bus adapter A. |
| n10-00 | According to the module slot, select a value from [1] Expansion slot 1_1 to [3] Expansion slot 1_3. Select a value according to the actual need. Generally, select the value [1] Expansion slot 1_1. |
| n10-02 | Set the module baud rate. The values include [0] 1200, [1] 2400, [2] 4800, [3] 9600, [4] 19200, [5] 38400, [6] 57600, and [7] 115200. |
| n10-03 | Select the format of the communication data transmitted between the module and the host controller. The values include [0] Odd parity check, [1] Even parity check, [2] No check with two stop bits, and [3] No check with one stop bit. |
| n10-04 | Set the module communication address. |
| n10-05 | Set the response delay. When the module receives data, the module responds after the time set by n10-05 expires. |
| n10-06 | Set the module communication timeout period. If the module does not receive any data within the time set by n10-06, a timeout fault will be reported. |

Note

- For details on the function of the bus adapter, see MD580 Series Low-Voltage High-Performance Engineering AC Drive Function Guide.
- After parameters are set, you must reset the MD580 to make the settings take effect.

Modbus RTU communication

The frame format, verification mechanism, and receiving and sending mechanism are based on the standard Modbus protocol.

The communication address in the protocol is the actual communication address of the parameter. For the corresponding relationship between the parameter and the communication address, refer to the parameter list of the product software guide.

CRC adopts the CRC-16 verification value.

Modbus RTU-specific parameters

For the MD580 series AC drive, the following special communication addresses are reserved for the Modbus RTU communication. Writing data to the following parameters can change the data of the corresponding connector.

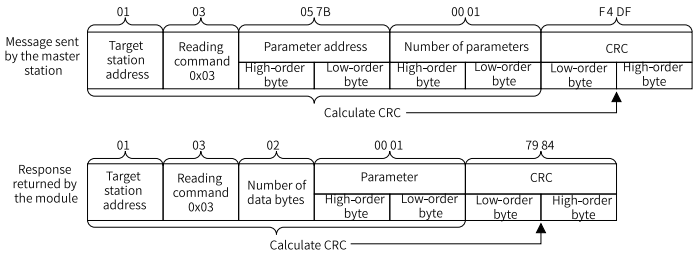
| Communication Address | Parameter Code | Parameter Name | Description |
|-----------------------|----------------|---------------------------------------|---|
| 24984 | U15-08 | Modbus communication setting value 1 | The data can be written to the parameter directly through the Modbus. |
| 24985 | U15-09 | Modbus communication setting value 2 | The data can be written to the parameter directly through the Modbus. |
| 24986 | U15-10 | Modbus communication setting value 3 | The data can be written to the parameter directly through the Modbus. |
| 24987 | U15-11 | Modbus communication setting value 4 | The data can be written to the parameter directly through the Modbus. |
| 24988 | U15-12 | Modbus communication setting value 5 | The data can be written to the parameter directly through the Modbus. |
| 24989 | U15-13 | Modbus communication setting value 6 | The data can be written to the parameter directly through the Modbus. |
| 24990 | U15-14 | Modbus communication setting value 7 | The data can be written to the parameter directly through the Modbus. |
| 24991 | U15-15 | Modbus communication setting value 8 | The data can be written to the parameter directly through the Modbus. |
| 24992 | U15-16 | Modbus communication setting value 9 | The data can be written to the parameter directly through the Modbus. |
| 24993 | U15-17 | Modbus communication setting value 10 | The data can be written to the parameter directly through the Modbus. |

| Communication Address | Parameter Code | Parameter Name | Description |
|-----------------------|----------------|--|---|
| - | U10-12 | Bit 00 of Modbus communication setting value 1 | 1. 16 bits of Modbus communication setting value 1 2. The 16 bits can be automatically generated after Modbus communication setting value 1 is written. You cannot perform write operations on the bit addresses individually. |
| - | U10-13 | Bit 01 of Modbus communication setting value 1 | |
| - | U10-14 | Bit 02 of Modbus communication setting value 1 | |
| - | U10-15 | Bit 03 of Modbus communication setting value 1 | |
| - | U10-16 | Bit 04 of Modbus communication setting value 1 | |
| - | U10-17 | Bit 05 of Modbus communication setting value 1 | |
| - | U10-18 | Bit 06 of Modbus communication setting value 1 | |
| - | U10-19 | Bit 07 of Modbus communication setting value 1 | |

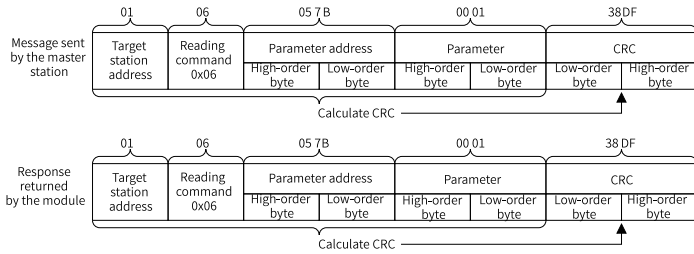
| Communication Address | Parameter Code | Parameter Name | Description |
|-----------------------|----------------|--|-------------|
| - | U10-20 | Bit 08 of Modbus communication setting value 1 | Continued |
| - | U10-21 | Bit 09 of Modbus communication setting value 1 | |
| - | U10-22 | Bit 10 of Modbus communication setting value 1 | |
| - | U10-23 | Bit 11 of Modbus communication setting value 1 | |
| - | U10-24 | Bit 12 of Modbus communication setting value 1 | |
| - | U10-25 | Bit 13 of Modbus communication setting value 1 | |
| - | U10-26 | Bit 14 of Modbus communication setting value 1 | |
| - | U10-27 | Bit 15 of Modbus communication setting value 1 | |

Modbus RTU communication example

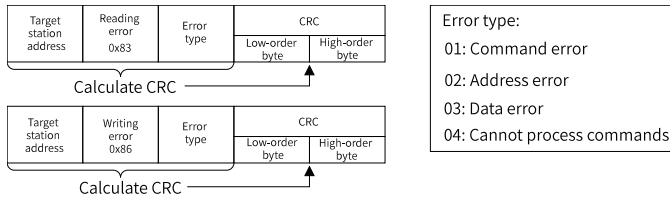
1. Use 0x03 to read n2-00 through the communication address 057BH.



2. Use 0x06 to write 1 to n2-00 through the communication address 057BH.



3. If the slave detects a communication frame error or reading/writing failure caused by other reasons, an error frame will be returned.



Using specific communication addresses to control the drive

This section takes start/stop and running speed control of the MD580 as an example to describe parameter settings used by the MD580-SI-RS1 module to control the running of the motor. If A9-00 is set to 0 (control channel 1) and A9-02 is set to 0 (reference value channel 1), the start/stop command and speed source are set based on the following table.

Table 3-3 Parameter settings for the start/stop command and speed source

| Parameter Code | Parameter Name | Value | Value Description |
|----------------|--------------------------------|---------------|---|
| n2-00 | Bus type of bus adapter | 1 | Select the Modbus RTU module for bus adapter A. |
| n10-00 | Expansion slot selection | 1 | The Modbus RTU module is installed in expansion slot 1_1. |
| n10-04 | Modbus local address | 4 | Set the address of the Modbus RTU module to 4. |
| b0-00 | Start/Stop control word source | 1 | The value description is customized. |
| b0-01 | Self-defined OFF1 source | U10-12 (2012) | Set Bit 00 of Modbus communication setting value 1 to the command source of OFF1. |
| C0-00 | Speed reference source | U15-09 (2509) | Set Modbus communication setting value 2 to the speed reference source. |

Note

- For details on the MD580, see MD580 Series Low-Voltage High-Performance Engineering AC Drive Function Guide.
 - The usage method varies with different products. For details, see the related function guide.
-

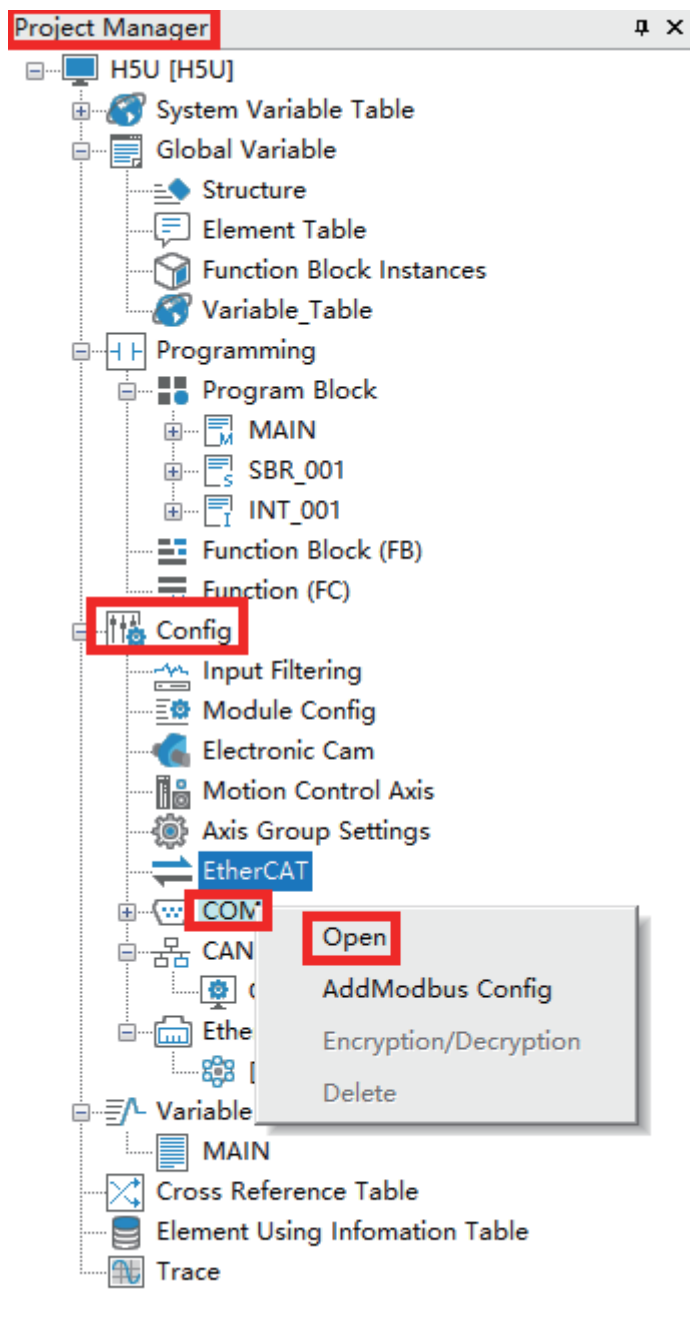
3.6 Configuration for Modbus RTU Communication Between AC Drive and H5U

Software

Log in to Inovance website <https://newweb.inovance.com/hc/serviceSupport/> download and download the H5U programming software.

Master and slave configuration

1. Open the PLC programming software AutoShop. Click "Create a new project(Ctrl +N)", select "H5U Series" from the "Series and models" drop-down list, and click "OK". Go to "Project Manager" > "Config" > "COM", and right-click "COM" and select "Open".



2. Select "MODBUS-RTU master" from the "Agreement Selection" drop-down list, set the baud rate and the data format to the same values as those for the MD580-SI-RS1, and then click "OK".

COM Communication Parameter Config

COM Settings

Agreement Selection: MODBUS-RTU master

H/W Type: RS485

Protocol Config

Baud rate: 19200

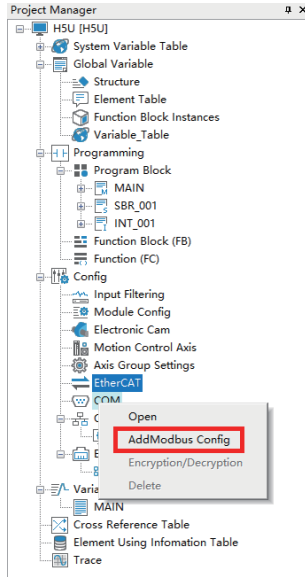
Data length: 8Bits

Parity: None

Stop bit: 2Bits

OK Cancel

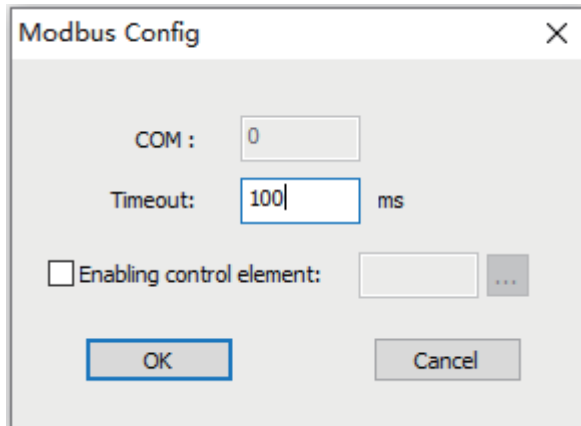
3. Right-click on "COM" and select "AddModbus Config".



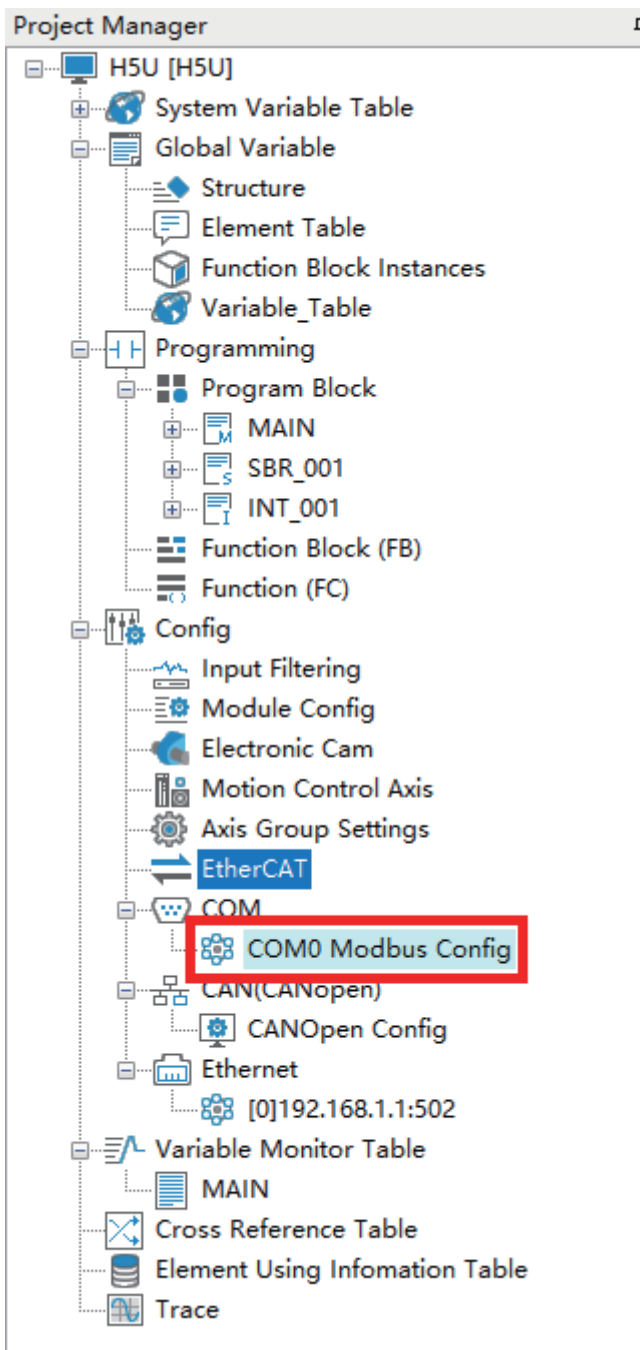
4. In the "Modbus Config" dialog box, set "Timeout" according to the baud rate. Generally, set 100 ms for the baud rate of 115200.

Note

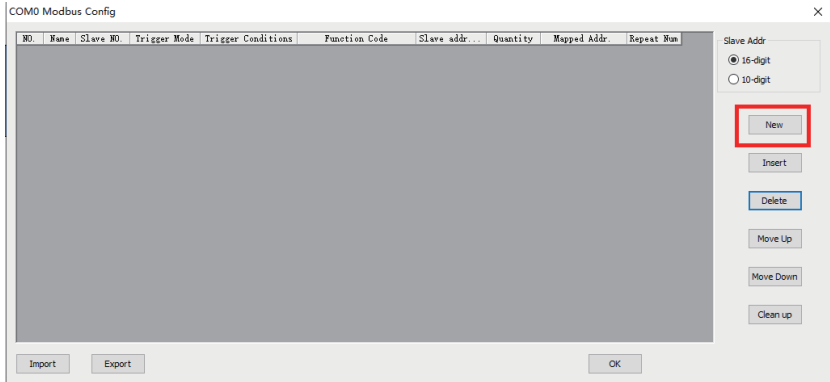
If you need to add the Modbus configuration several times, the control element can be ignored.



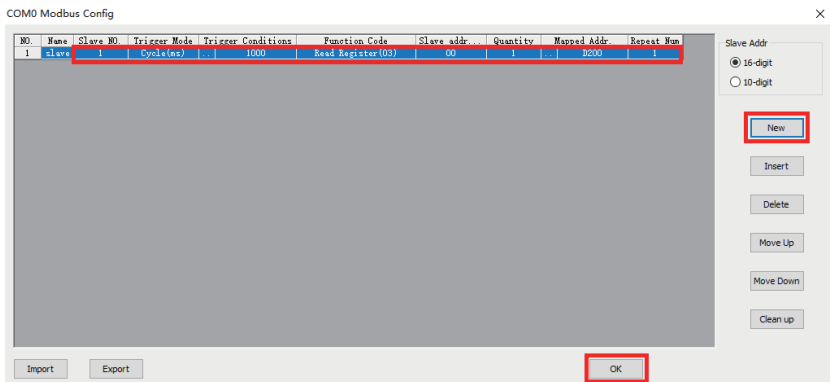
5. Double-click "COM0 Modbus Config" under "COM".





6. In the "COM0 Modbus TCP Config" dialog box, click "New".



7. Set parameters such as "Slave NO.", "Trigger Mode", "Function Code", "Slave addr. (H)", and "Quantity" to add one record. Click "New" and set related parameters to add more records. After all required records are added, click "OK".



8. After the configuration of all master and slave devices is completed, click  and then click  to download the configuration to the PLC.

4 CANopen Communication

4.1 Overview

MD580-SI-CAN1 is a new-generation fieldbus adaption module of Inovance. It is used together with the MD580 series AC drive to realize networking and remote control of the transmission system through the CANopen fieldbus communication network.

Features:

- With the Node Guard protocol supported, the master can read equipment status.
- With the Heartbeat protocol supported, the slave reports its current status to the master regularly.
- MD580-SI-CAN1 supports transmission of PDO data which is 16-bit.
- The SDO can be transmitted only via acceleration transmission mechanism. At most four channel's data can be transmitted per each frame.
- The CANIDs of all commands are default values of connections defined in CANopen DS301.
- MD580-SI-CAN1 is installed in the expansion slot of the MD580 without the external power supply.

4.2 Product Information

Specifications

| Item | Description |
|-----------------------|---------------------------|
| Operating temperature | -10°C to +55°C |
| Storage temperature | -40°C to +70°C |
| Environment humidity | 5% to 95%, non-condensing |
| Working environment | Free from corrosive gases |
| Installation mode | Snap-fit joint and screw |
| IP rating | IP20 |
| Ventilation method | Natural air cooling |

Product layout

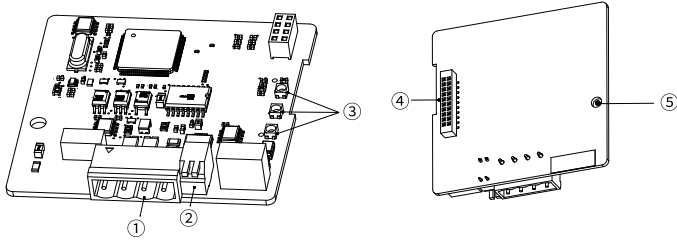
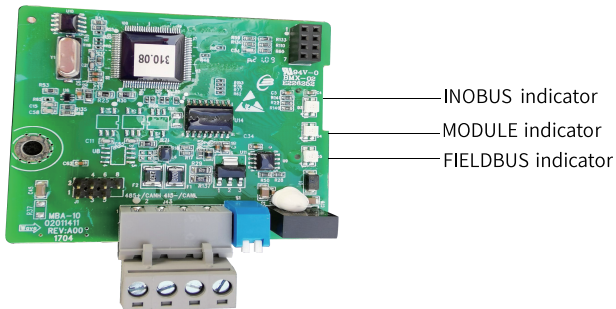


Figure 4-1 Product layout

| No. | Name | Description |
|-----|----------------------------|---|
| ① | Bus communication terminal | CANOpen bus communication terminal |
| ② | Resistor DIP switch | CAN bus termination resistor |
| ③ | Status indicator | It displays the running status of the module. |
| ④ | Slot terminal | It is used for electrical connection between the module and the MD580. |
| ⑤ | Screw fixing hole | It is used to fix the module to the MD580 to ensure proper PE layer connection. |

Description of indicators

The MD580-SI-CAN1 module provides three status indicators to indicate bus communication faults, as described below. The following figure shows the indicator positions.



| Function | Color | Fault Description |
|----------|---|--|
| INOBUS | Flashing green | The communication between the module and the MD580 is being established. |
| | Solid green | The communication between the module and the MD580 is normal. |
| MODULE | Solid green | The module is running properly. |
| | The indicator flashes red once and goes off for 1s and repeats the status. | The CAN bus encounters a passive error. |
| | The indicator flashes red twice and goes off for 1s and repeats the status. | The CANopen heartbeat message times out. |
| | The indicator flashes red three times and goes off for 1s and repeats the status. | The length of the PDO received is inconsistent with the configuration. |
| | Flashing red | The communication parameter is being read. |
| | Solid red | The CAN bus is disconnected. |
| FIELDBUS | Solid green | The bus is in the running state. |
| | The indicator flashes green once and goes off for 1s and repeats the status. | The bus is in the stop state. |
| | Flashing green | The bus is in the pre-running state. |

4.3 Installation Guide

Installation precautions

- Before installation, ensure that the MD580 is in the power-off state to prevent damage to the MD580–SI-CAN1 module and MD580.
- Do not drop or shock the MD580–SI-CAN1 module to avoid damage to the module.
- Do not disassemble the MD580–SI-CAN1 module to avoid damage to the module.
- Tighten the screws according to the required torque to avoid damage or loose fastening.

Tools required for installation

The following tools are required for installation:

- Phillips screwdriver, 1#
- Straight screwdriver, 1#

Tightening torque

The screws must meet the tightening torque listed below.

| Mechanical Connection | | Electrical Connection | |
|-----------------------|-------------------|-----------------------|-------------------|
| Screw | Tightening Torque | Screw | Tightening Torque |
| M3 | 1.2 N•m | M3 | 0.55 N•m |

Dimensions

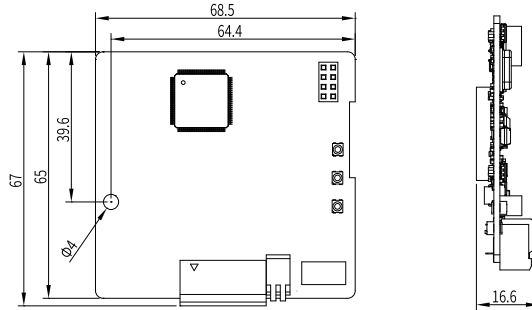


Figure 4-2 Product dimensions (mm)

Installation

The MD580–SI–CAN1 module can be installed in the expansion slot of the MD580. It is installed in the same way as the MD580–SI–DP1 module. For details, see [“2.3 Installation Guide” on page 15](#).

1. Install the module to the expansion slot of the MD580.
2. Press the snap-fit joint of the module inward to push the module into the slot, and fasten the grounding screw of the module by using the 1# screwdriver.
3. The installation completes.

Note

- To meet EMC requirements and for reliable operation of the MD580–SI–CAN1 module, tighten the screws to ensure reliable grounding.
- Ensure that the MD580–SI–CAN1 module is installed properly in the expansion slot of the MD580 for electrical connection.

Removal

Remove the module in a reverse way of installation.

1. Remove the grounding screw of the module by using the 1# screwdriver.
2. Press the snap-fit joint at the right side of the module inward and pull out the module.
3. Store the module properly.

4.4 Electrical Connection

Terminals and indicators

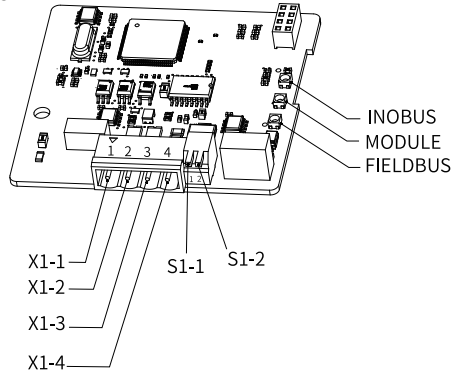


Figure 4-3 External connection diagram of MD580-SI-CAN1 module

Table 4-1 Terminal description

| Terminal Pin | Name | Wiring | Description |
|--------------|--------------|------------------------------|---|
| X1-1 | PE | For connection to the shield | Recommended cable: four-conductor shielded twisted pair cable Cross-sectional area: 0.3 mm ² to 2.0 mm ² |
| X1-2 | CANH | Twisted pair | |
| X1-3 | CANL | | |
| X1-4 | CGND | Connection is recommended | |
| S1-1 | DIP switch 1 | / | Termination resistor selection |
| S1-2 | DIP switch 2 | / | Valid when S1-1 and S1-2 are all set to ON |

The following figure shows the terminal wiring.

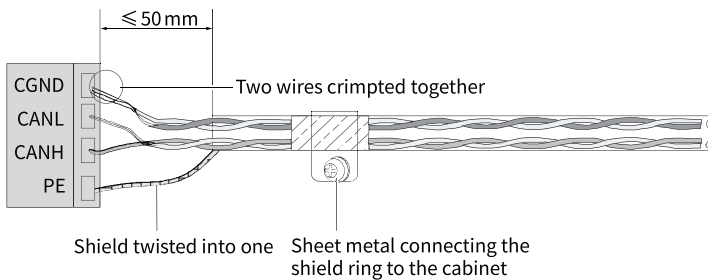


Figure 4-4 Terminal wiring

Bus topology

The CAN bus supports a maximum of 63 nodes (excluding the master). The following figure shows the networking. Set the termination resistors of the master and the last node to ON.

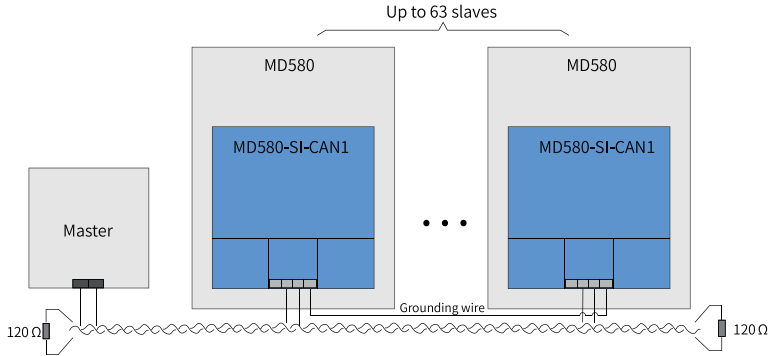


Figure 4-5 Networking diagram

Bus transmission distance

The transmission distance of CAN bus is directly dependent on the baud rate and communication cable. The following table shows the mapping between the maximum transmission distance of CAN bus and the baud rate.

| No. | Transmission Distance | Rate | Number of Nodes | Cable Diameter |
|-----|-----------------------|----------|-----------------|----------------------|
| 1 | 25 m | 1 Mbps | 64 | 0.34 mm ² |
| 2 | 95 m | 500 kbps | 64 | 0.34 mm ² |
| 3 | 560 m | 100 kbps | 64 | 0.50 mm ² |
| 4 | 1100 m | 50 kbps | 64 | 0.75 mm ² |

4.5 Parameter Settings

MD580-SI-CAN1 module configuration

To configure the module, do as follows:

1. Check the slot of the CANopen module by parameters in A2 group.
2. Set the correct slot where the CANopen module is located in n12-00.
3. Set the correct station number, baud rate, and communication timeout period in parameters in n12 group.
4. Set n2-00 or n3-00 to 3 to select the CANopen module.
5. Set the input and output data in parameters in n2 group.
6. Power on the MD580 again.

Parameters of the MD580-SI-CAN1 module

Note

This guide describes parameters related to the MD580-SI-CAN1 card for the MD580. For other MD580 parameters, see the MD580 Series Low-Voltage High-Performance Engineering AC Drive Function Guide.

1. Version and slot view

| Parameter Code | Parameter Name | Description |
|----------------|---|--|
| A2-29 to A2-34 | Expansion card slot type and software version | These parameters are used to view the expansion card slot type and software version. |

2. Basic parameter settings of the MD580-SI-CAN1 module

| Parameter Code | Parameter Name | Description |
|----------------|---------------------------------|--|
| n12-00 | Expansion slot selection | This parameter indicates the expansion slot where the module is located. 0: Disable 1: Extension slot 1_1 2: Extension slot 1_2 3: Extension slot 1_3 Select a value according to the actual need. Generally, select the value 1. |
| n12-01 | Module status | This parameter displays the status of the module in the expansion slot. 0: Offline 1: Online |
| n12-02 | CANopen node address | This parameter indicates the local node address. The valid range is from 1 to 63. The value 0 indicates an invalid address. |
| n12-03 | CANopen communication baud rate | This parameter indicates the CANopen communication baud rate. 0: 20 kbps 1: 50 kbps 2: 100 kbps 3: 125 kbps 4: 250 kbps 5: 500 kbps 6: 1 Mbps |

3. Bus adapter parameters

The MD580 supports two bus adapters, namely, bus adapter A and bus adapter B, which are used to process the interactive data between the MD580 and the MD580-SI-CAN1 module. The two bus adapters are independent from each other. You can connect the MD580-SI-CAN1 module to any bus adapter.

Table 4-2 Parameters of bus adapter A

| Parameter Code | Parameter Name | Description |
|------------------|---|---|
| n2-00 | Bus type of bus adapter | This parameter is used to select the communication module type of bus adapter A. 3: CANopen module |
| n2-04 to n2-19 | Process data output (16) | This parameter sets the source of the data sent by the MD580-SI-CAN1 module. |
| n2-20 to n2-35 | Process data output base value (16) | This parameter sets the per unit base value of the data sent by the MD580-SI-CAN1 module. |
| n2-36 to n2-51 | Process data input base value (16) | This parameter sets the per unit base value of the data received by the MD580-SI-CAN1 module. |
| n2-52 to n2-67 | Process data output data (16) | This parameter displays the data sent by the MD580-SI-CAN1 module. |
| n2-68 to n2-83 | Process data input data (16) | This parameter displays the original data received by the MD580-SI-CAN1 module. |
| U15-18 to U15-53 | Process data received by bus adapter A (16) | This parameter displays the data received by the MD580-SI-CAN1 module after the per unit conversion. Parameters configured through the connector can be used for MD580 control. |
| U0-48 to U0-63 | Process data 1 received by bus adapter A | This parameter displays the status of each bit of process data 1 received by bus adapter A |

Table 4-3 Parameters of bus adapter B

| Parameter Code | Parameter Name | Description |
|----------------|--------------------------|---|
| n3-00 | Bus type of bus adapter | This parameter is used to select the communication module type of bus adapter B. 3: CANopen module |
| n3-04 to n3-19 | Process data output (16) | This parameter sets the source of the data sent by the MD580-SI-CAN1 module. |

| Parameter Code | Parameter Name | Description |
|------------------|---|---|
| n3-20 to n3-35 | Process data output base value (16) | This parameter sets the per unit base value of the data sent by the MD580-SI-CAN1 module. |
| n3-36 to n3-51 | Process data input base value (16) | This parameter sets the per unit base value of the data received by the MD580-SI-CAN1 module. |
| n3-52 to n3-67 | Process data output data (16) | This parameter displays the data sent by the MD580-SI-CAN1 module. |
| n3-68 to n3-83 | Process data input data (16) | This parameter displays the original data received by the MD580-SI-CAN1 module. |
| U15-54 to U15-69 | Process data received by bus adapter B (16) | This parameter displays the data received by the MD580-SI-CAN1 module after the per unit conversion. The data can be used to control the MD580. |
| U0-64 to U0-79 | Process data 1 received by bus adapter B | This parameter displays the status of each bit of process data 1 received by bus adapter B. |

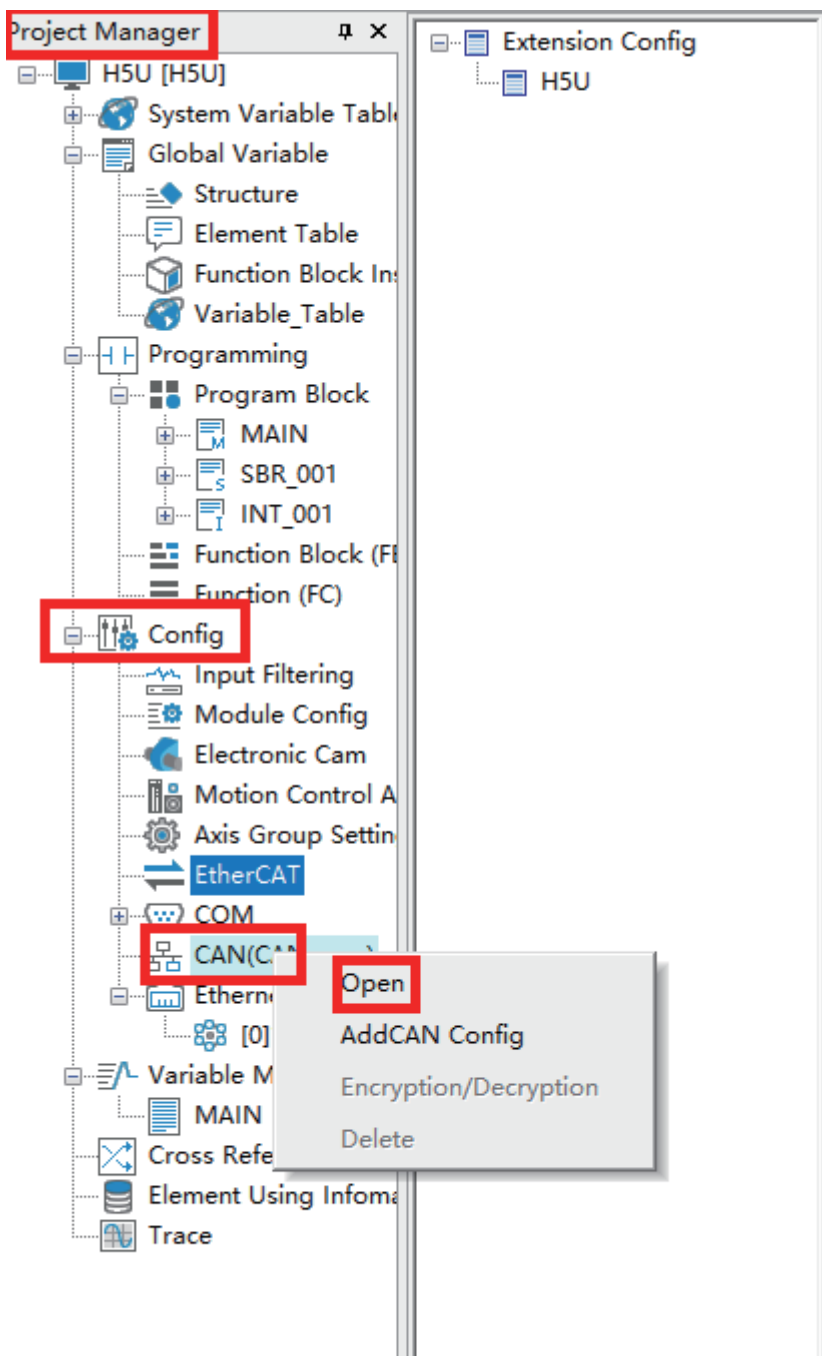
4.6 Configuration for CANopen Communication Between AC Drive and H5U

Software

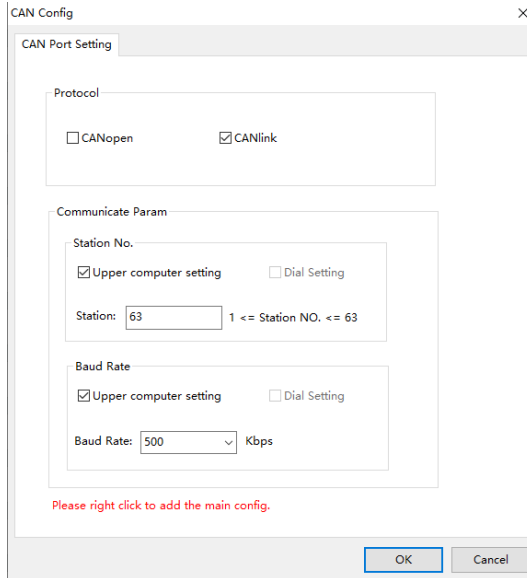
Log in to Inovance website <https://newweb.inovance.com/hc/serviceSupport/> download and download the H5U programming software.


Master and slave configuration

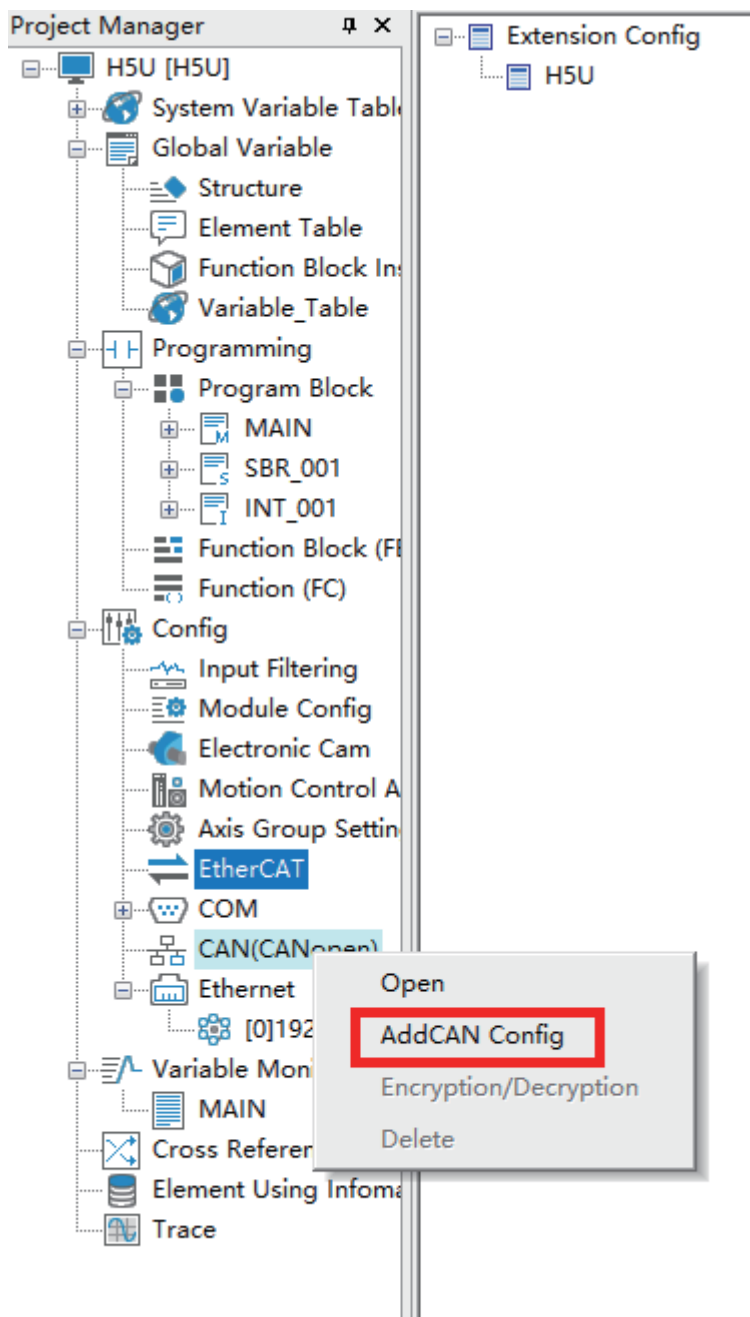
1. Open the PLC programming software AutoShop. Click "Create a new project(Ctrl +N)", select "H5U Series" from the "Series and models" drop-down list, and click "OK". Go to "Project Manager" > "Config" > "CAN(CANLink)", and right-click on "CAN(CANLink)" and select "Open".



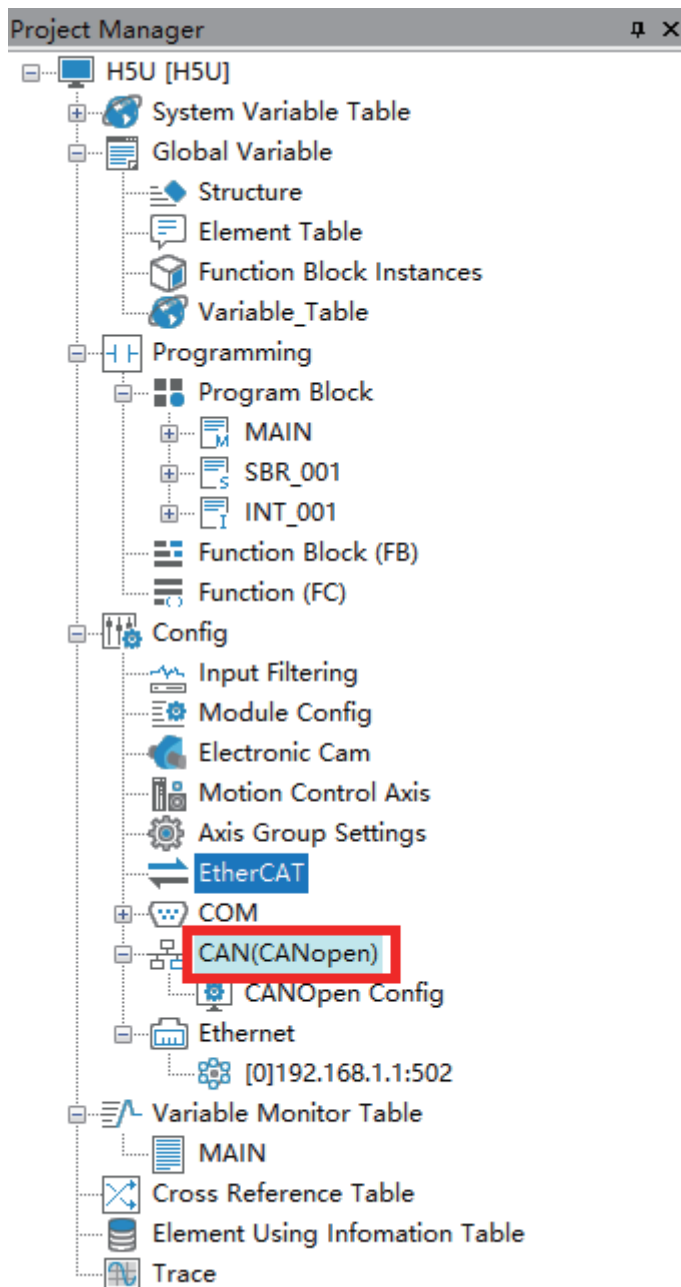
2. In the "CAN Config" dialog box, set the protocol to "CANopen", set station No. and baud rate, and click "OK". Note that the baud rate must be set to the same value as that for the MD580-SI-CAN1.



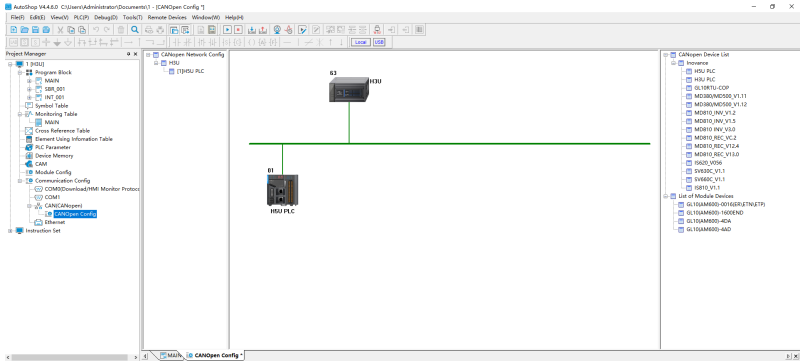
3. "CAN(CANopen)"  CAN(CANopen) is displayed.



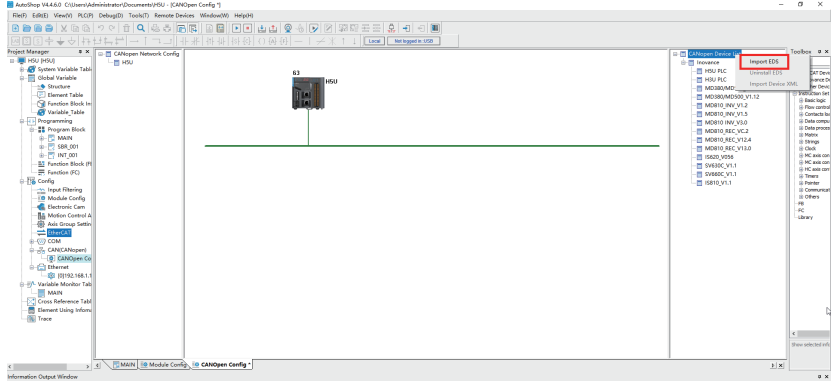
4. Right-click "CAN(CANopen)" and select **AddCAN Config**.



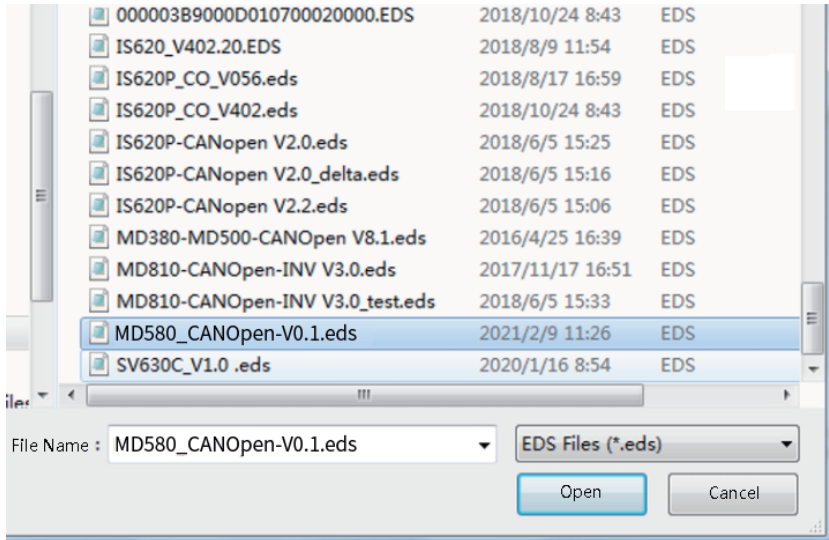
5. Double-click  CAN(CANopen).



6. If there are related devices under **CANopen Device List**, skip this step. If no, right-click **CANopen Device List** and select **Import EDS**.



7. Select the required EDS file, and click "Open".



- After importing the EDS file to `CANopen Device List`, an error will occur if the installation fails. No message occurs if the installation succeeds.
- In the middle pane, go to "CANopen Network Config" > "H5U", and double-click "H5U". In the "Master Information" tab, select "Enable Heartbeat Production" and set "Production Time(ms)".

Note

If you want to use the synchronization mode, you must enable the synchronization function and set the synchronization cycle on the interface.

H5U ×

Master Information **Network State**

Network Management

Node ID: 63

Baud Rate(bit/s): 500Kbps

The program is running prohibited SDO, NMT access Ignore any errors continue to configure SDO

Synchronous

Enable Synchronous Production

COB-ID: 16# 80

Synchronization Cycle(ms): 200

Window Length(ms): 0

Heartbeat

Enable Heartbeat Production

Production Time(ms): 300

SDO Timeout

Timeout: 500 ms

Node Status Monitor

Enable Site Monitor

Monitor Register Start Address(D):

Automatic Allocation PDO Map Register

Automatic Allocation

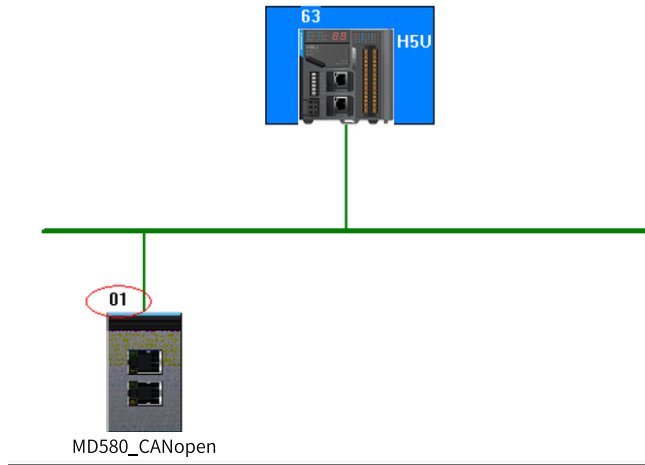
Slaves receives the map registers start address (D): 7000

Slaves send the map register start address(D): 7400

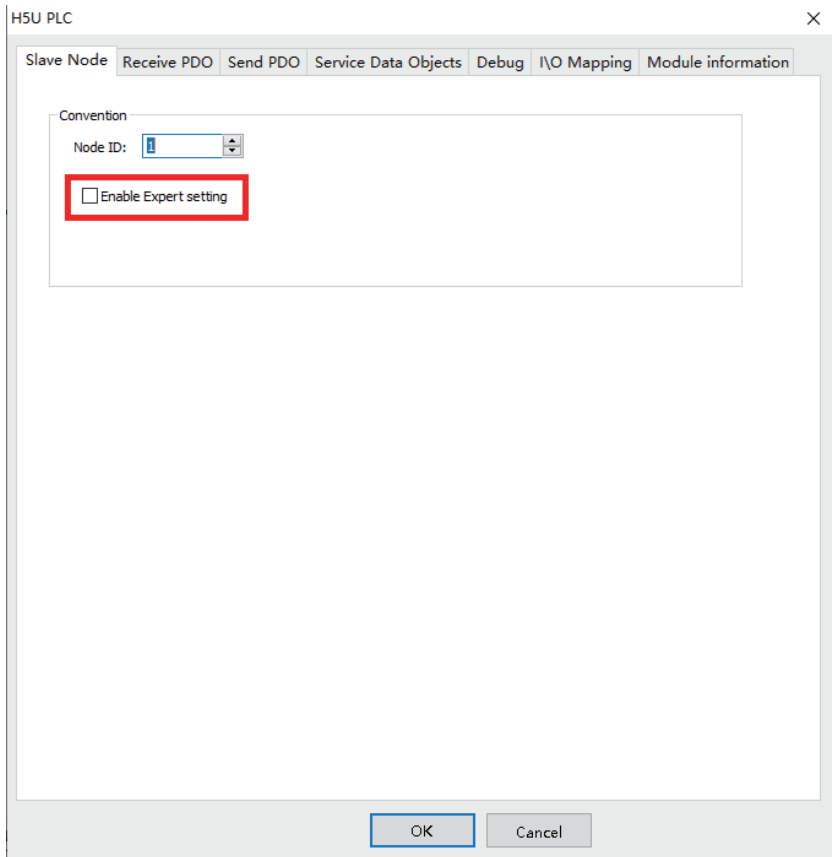
Reset PDO Map register

OK Cancel

10. In the middle topology structure, double-click a slave station to add it to the CANopen network.



11. In the "Slave Node" tab, set the node ID and select "Enable Expert setting".



12. Click "Change heartbeat consumer properties".

H5U PLC

Slave Node Receive PDO Send PDO Service Data Objects Debug I/O Mapping Module information

Convention

Node ID: 1

Enable Expert setting

Ignore error and continue configuring SDO Create All SDO

Not Initialized Factory Setting

Error Control

Enable Node Protection

Guard Time(ms): 200

Life Cycle Factor: 3

Enable Heartbeat

Production Time(ms): 300

Change heartbeat consumer properties

Enable Sync Generator

COB-ID: 16# 80

Synchronization Cycle(ms): 200

Window Length(ms): 0

Emergency Message

COB-ID: 16# 81

Inspect When Restart

Check Supplier ID Check Product ID Check Version

OK Cancel

13. Under "heartbeat protection node", select the node to be monitored, select the "Enable" check box, and click "OK". Both the master station and the slave station can be monitored. Generally, select the master station to be monitored.

Heartbeat Properties

| Enable | heartbeat protection node | heartbeat consumption time |
|-------------------------------------|---------------------------|----------------------------|
| <input checked="" type="checkbox"/> | 2 | 750 |
| <input type="checkbox"/> | | |
| <input type="checkbox"/> | | |
| <input type="checkbox"/> | | |
| <input type="checkbox"/> | | |
| <input type="checkbox"/> | | |

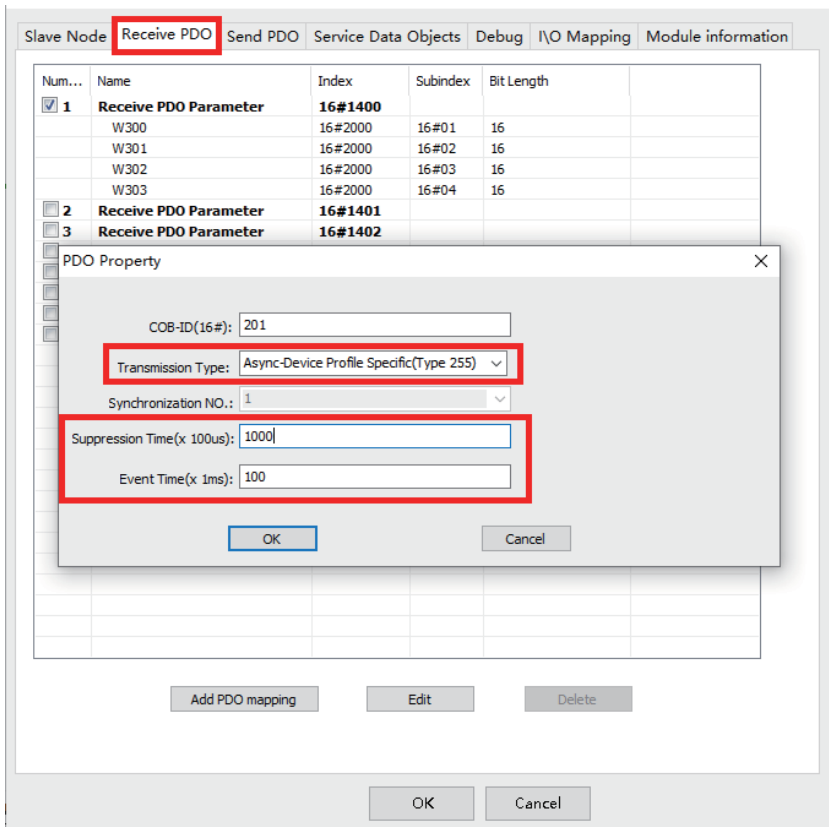
OK

Cancel

Note

You must follow the preceding operations to enable the heartbeat monitoring function. Otherwise, the slave station fails to report an error even if it is disconnected.

14. Click the "Receive PDO" tab. Double-click a PDO. In the "PDO Property" dialog box, set "Transmission Type", set "Suppression Time(x 100us)" and "Event Time(x 1ms)" to "100", and click "OK". If you set the transmission type to the synchronization mode, you only need to set "Synchronization NO.". The value 100 ms means that one frame of RPDO1 data is sent per 100 ms.



15. Add, edit, or delete mapping objects for each RPDO. You can add at most four mapping objects for one RPDO.

5 Modbus TCP Industrial Ethernet Communication

5.1 Overview

The Modbus TCP Industrial Ethernet adapter module (MD580–SI-EM1 for short) meets international Modbus TCP Industrial Ethernet standards. The module is used on the MD580 series AC drive, so that the AC drive can work as a server on the Modbus TCP Industrial Ethernet and be controlled by a Modbus TCP Industrial Ethernet client. This effectively improves system communication efficiency and enriches the networking functions of the MD580 series AC drive.

Features:

- Supports switch networking.
- Does not support IP address allocation using DPCH.
- Supports the minimum HMBT communication period of 6 ms.
- Supports reading of up to 124 parameters per time.
- Supports connection of up to two Modbus TCP clients. The minimum communication period is doubled to 12ms when two clients are connected.
- Supports up to 100 m node-to-node transmission distance.

5.2 Product Information

Specifications

| Item | Description |
|-----------------------|---------------------------|
| Operating temperature | -10°C to +55°C |
| Storage temperature | -40°C to +70°C |
| Environment humidity | 5% to 95%, non-condensing |
| Working environment | Free from corrosive gases |
| Installation mode | Snap-fit joint and screw |
| IP rating | IP20 |
| Ventilation method | Natural air cooling |

Product layout

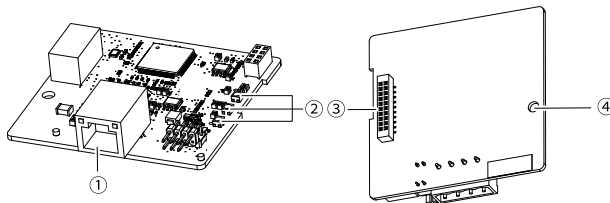
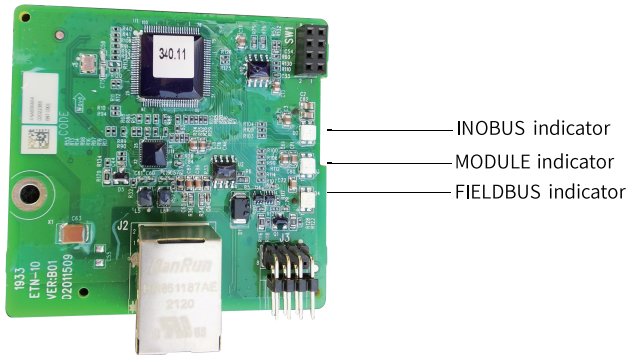


Figure 5-1 Product layout

| No. | Name | Description |
|-----|--|---|
| ① | Modbus TCP communication terminal (X1) | Communication terminal 1 |
| ② | Status indicator | It indicates the running status of the module and bus. |
| ③ | Slot terminal | It is used for electrical connection between the module and the MD580. |
| ④ | Screw fixing hole | It is used to fix the module to the MD580 to ensure proper PE layer connection. |

Description of indicators

The MD580-SI-EM1 module provides three status indicators to indicate bus communication faults, as described below. The following figure shows the indicator positions.



| Indicator | Status | Fault Description | Solution |
|-----------|-----------------|--|--|
| INOBUS | Flashing green | Handshaking between the module and the MD580 fails. | Check that only one of n2-00 or n3-00 is set to 9. |
| | | | Check that n18-00 is set properly. |
| | | | Check that the module socket is intact. |
| MODULE | Flashing green | The protocol stack is starting. | Please wait. |
| | Flashing red | The MAC address is incorrect. | The MD580-SI-EM1 module does not have the MAC address. Change the module. |
| | Solid red | Protocol stack startup times out. | Power on the module again or replace the module. |
| | Flashing orange | MD580 parameters are set incorrectly or obtaining the IP address fails. | Set the correct card slot in the background to activate the ModbusTCP card and power on the module again. |
| FIELDBUS | Solid green | The module has established TCP connections with the MD580, but no data is exchanged. | No Modbus TCP command is sent. |
| | Flashing orange | Abnormal response | Modbus TCP operations are abnormal, such as reading illegal address. Adjust the PLC according to the error code. |
| | Flashing red | Obtaining the INOBUS response times out. | Power on the module again. |

5.3 Installation Guide

Installation precautions

Before installation or removal, ensure that the module is powered off to prevent damage to the module.

- Do not drop or shock the MD580-SI-EM1 module to avoid damage to the module.
- Do not disassemble the MD580-SI-EM1 module to avoid damage to the module.
- Tighten the screws according to the required torque to avoid damage or loose fastening.

Tightening torque

The screws must meet the tightening torque listed below.

Table 5-1 Tightening torque of the grounding screw

| Screw | Tightening Torque |
|-------|-------------------|
| M3 | 0.55 N•m |

Dimensions

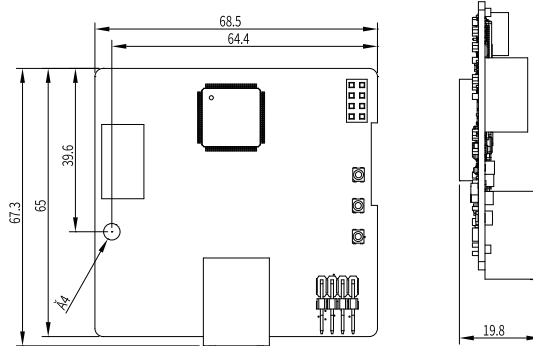


Figure 5-2 Product dimensions (mm)

The MD580-SI-EM1 module can be installed in the expansion slot of the MD580.

It is installed in the same way as the MD580-SI-DP1 module. For details, see "[2.3 Installation Guide](#)" on page 15.

1. Install the module to the expansion slot of the MD580.
2. Press the snap-fit joint at both sides of the module inward to push the module into the slot, and fasten the grounding screw of the module by using the 1# screwdriver.
3. The installation completes.

Removal

1. Disconnect all power supplies, and unplug all cables connected to the module.
2. Remove the grounding screw of the module by using the Phillips screwdriver.
3. Press the snap-fit joint at both sides of the module inward and pull out the module.

Note

To meet EMC requirements and for reliable operation of the module, tighten the screws to ensure reliable grounding.

Ensure that the MD580-SI-EM1 module is installed properly in the expansion slot of the MD580 for electrical connection.

The maintenance work must be done by professional personnel.

5.4 Electrical Connection

The MD580-SI-EM1 uses a standard Ethernet RJ45 socket for connection to the PC background. The pin signal definitions are the same as those of the standard Ethernet pins. It supports both crossover and straight-through cabling modes.

Single-module electrical connection

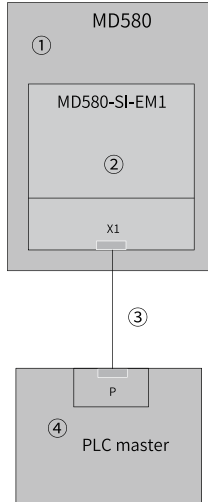


Figure 5-3 Single-module electrical connection diagram

| No. | Name |
|-----|---|
| ① | MD580 AC drive |
| ② | MD580-SI-EM1 Industrial Ethernet module |
| ③ | Network cable |
| ④ | PC master |

Multi-module electrical connection

Up to 253 slaves are supported.

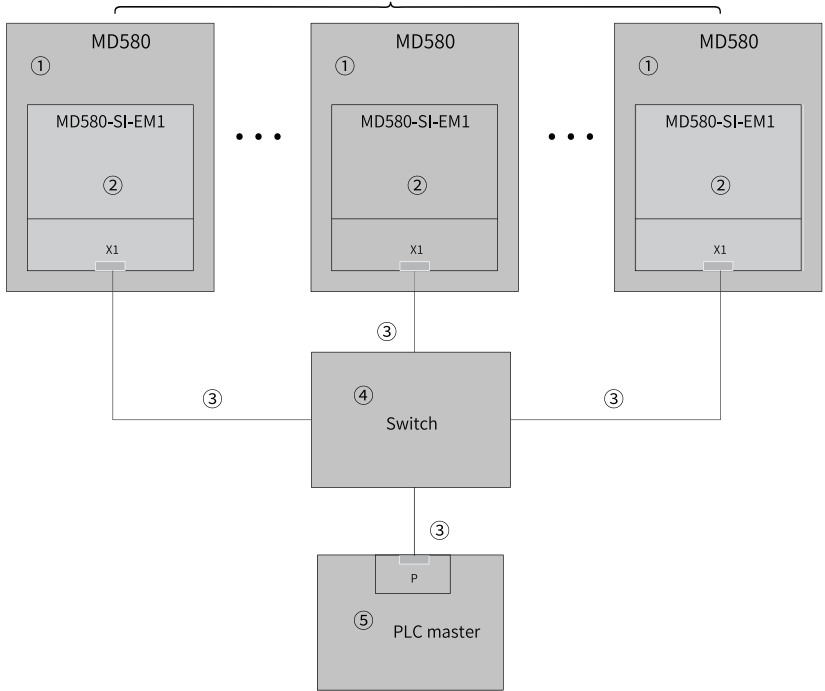


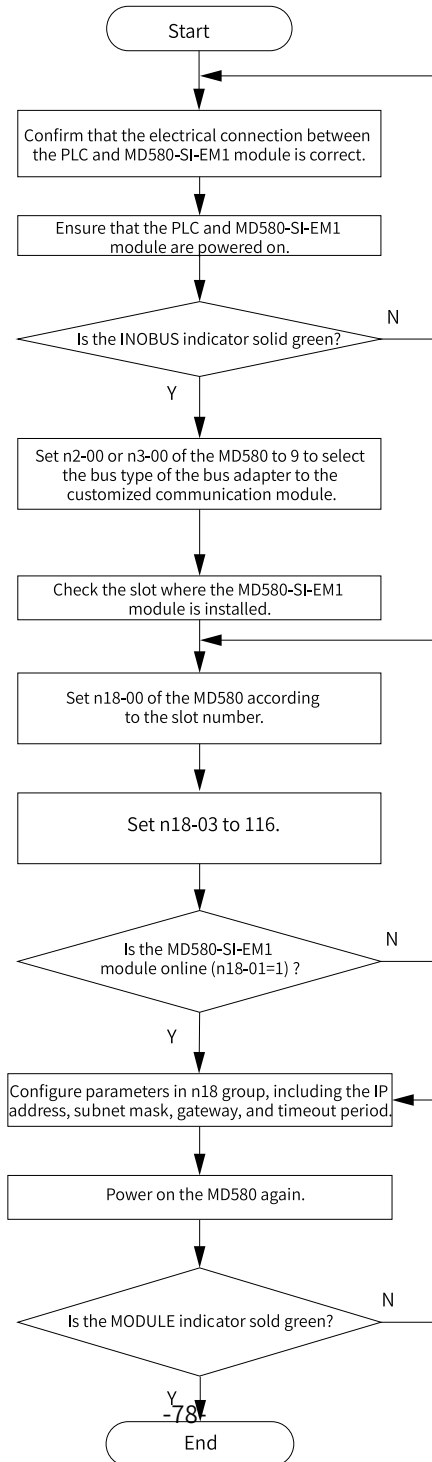
Figure 5-4 Multi-module electrical connection diagram

| No. | Name |
|-----|---|
| ① | MD580 AC drive |
| ② | MD580-SI-EM1 Industrial Ethernet module |
| ③ | Network cable |
| ④ | Switch |
| ⑤ | PC master |

5.5 Parameter Settings

Parameter configuration flow

After installing the MD580-SI-EM1 module to the MD580, you must complete communication configurations to enable the module to communicate with the MD580.



Parameter Setting

| Parameter Code | Parameter Name | Default | Set Value | Description |
|------------------|---|---------|---|---|
| n2-00 | Bus type of bus adapter A | 0 | 9 | Only one of the two parameters can be set to 9. |
| n3-00 | Bus type of bus adapter B | 0 | 9 | |
| n18-00 | Expansion slot selection | 0 | 0: Disable 1: Extension slot 1_1 2: Extension slot 1_2 3: Extension slot 1_3 | Select a value according to the actual need. Generally, select the value 1. |
| n18-01 | Status | 0 | 0: Offline 1: Online | - |
| n18-02 | Expansion module type | 0 | - | This parameter indicates the expansion module type. |
| n18-03 | Customized communication module ID | 0 | - | This parameter is determined by n18-02. |
| n18-11 to n18-13 | Customized communication card parameters 1-3 | 0 | 0 to 255 | Reserved communication card parameters 1-3 |
| n18-14 to n18-17 | Customized communication card parameter 4-7 | 0 | 0 to 255 | This parameter specifies the IP address of the Modbus TCP communication. Set the value according to the actual need. |
| n18-18 to n18-21 | Customized communication card parameters 9-12 | 0 | 0 to 255 | This parameter specifies the subnet mask of the Modbus TCP communication. Set the value according to the actual need. |

| Parameter Code | Parameter Name | Default | Set Value | Description |
|------------------|--|---------|-----------|---|
| n18-22 to n18-25 | Customized communication card parameters 13-16 | 0 | 0 to 255 | This parameter specifies the gateway of the Modbus TCP communication. Set the value according to the actual need. |
| n18-27 | Customized communication card parameter 18 | 0 | 0 to 255 | This parameter specifies the timeout period for receiving the Modbus TCP data in the unit of 100 ms. The value 0 indicates to disable timeout function. Set the value according to the actual need. |

IP address configuration example

The MD580-SI-EM1 module does not require a station number. Each MD580-SI-EM1 module has a unique MAC address and IP address for identification.

IP address configuration example

| Parameter Code | Parameter Name | Default | Type |
|----------------|--|---------|-------------|
| n18-14 | Customized communication card parameter 4 | 192 | IP address |
| n18-15 | Customized communication card parameter 5 | 168 | |
| n18-16 | Customized communication card parameter 6 | 0 | |
| n18-17 | Customized communication card parameter 7 | 2 | |
| n18-18 | Customized communication card parameter 8 | 255 | Subnet mask |
| n18-19 | Customized communication card parameter 9 | 255 | |
| n18-20 | Customized communication card parameter 10 | 255 | |
| n18-21 | Customized communication card parameter 11 | 0 | |
| n18-22 | Customized communication card parameter 12 | 192 | Gateway |
| n18-23 | Customized communication card parameter 13 | 168 | |
| n18-24 | Customized communication card parameter 14 | 0 | |
| n18-25 | Customized communication card parameter 15 | 1 | |

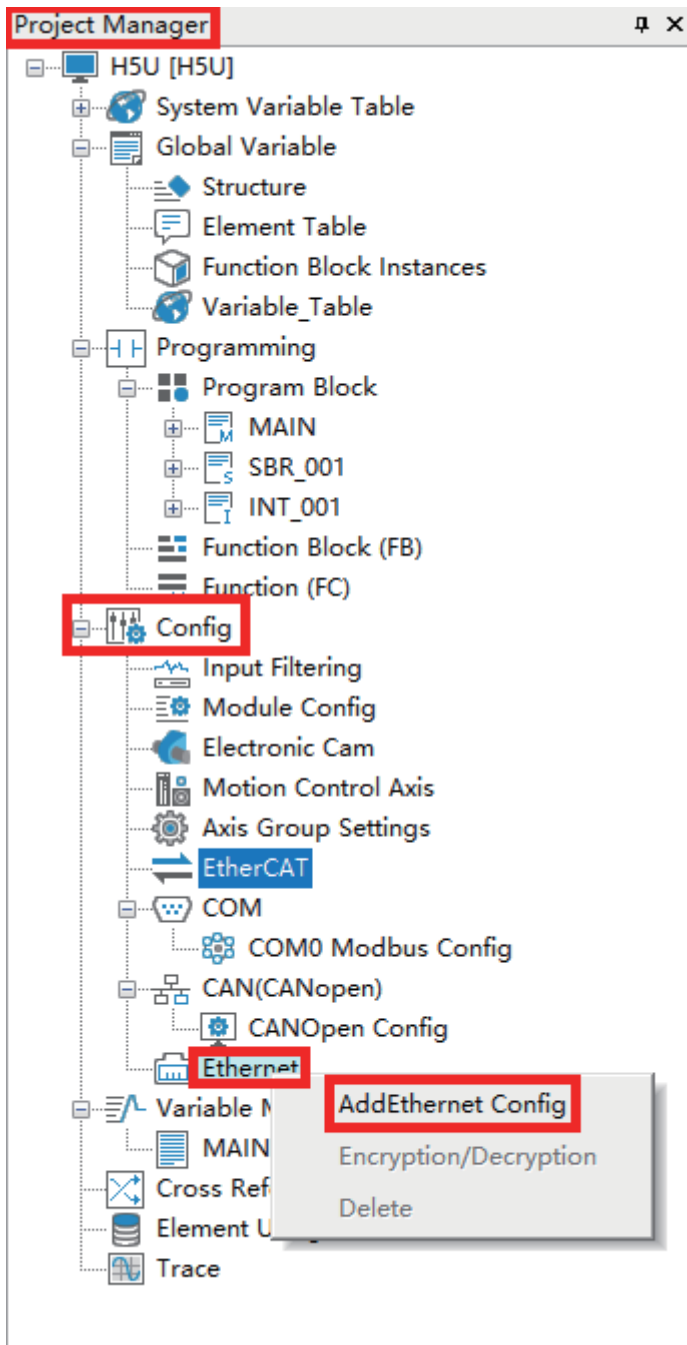
5.6 Configuration for RS485 Communication Between AC Drive and H5U

Software

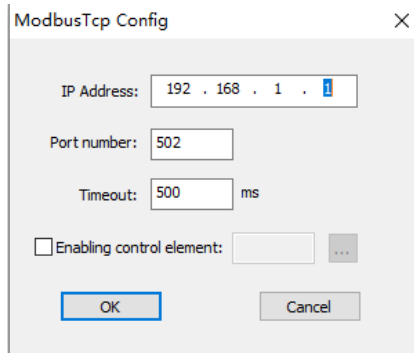
Log in to Inovance website <https://newweb.inovance.com/hc/serviceSupport/> download and download the H5U programming software.


Master and slave configuration

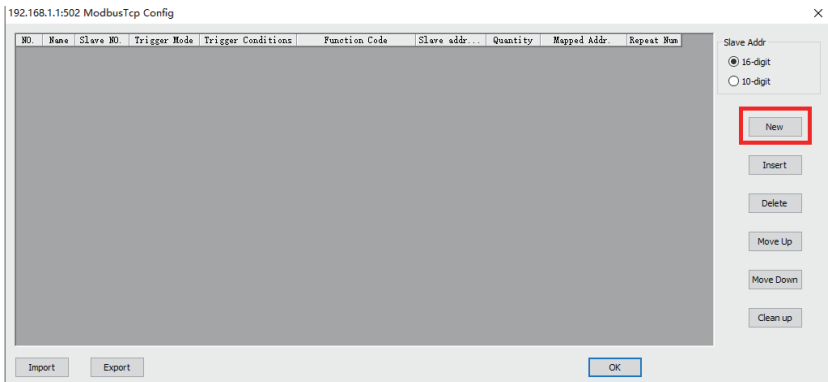
1. Open the PLC programming software AutoShop. Click "Create a new project(Ctrl +N)", select "H5U Series" from the "Series and models" drop-down list, and click "OK". Go to "Project Manager" > "Config" > "Ethernet", and right-click "Ethernet" and select "AddEthernet Config".



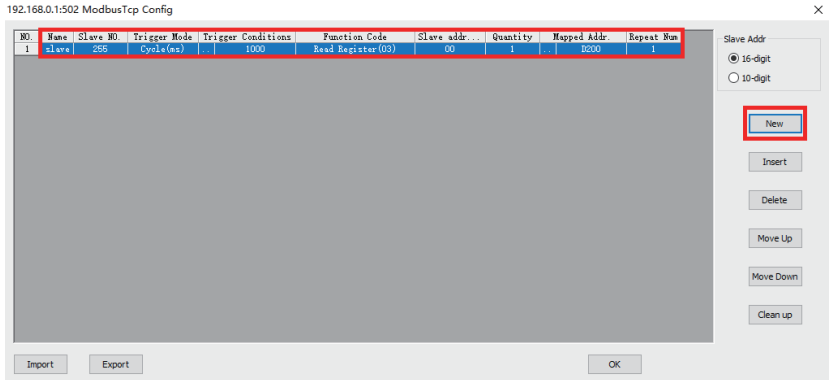
- In the "ModbusTcp Config" dialog box, set the IP address, and click "OK." Note that the set IP address must be in the same network segment as the IP address of the MD580-SI-EM1 card (the first three nodes are the same).





- To configure the Modbus information, double click  [0]192.168.0.1:502 (the set IP address in the preceding step).
- In the "Modbus TCP Config" dialog box, click "New".



- Set parameters such as "Trigger Mode", "Function Code", and "Quantity" to add one record. Click "New" and set related parameters to add more records. After all required records are added, click "OK".



6. After the configuration of all master and slave devices is completed, click  and then click  to download the configuration to the PLC.

6 PROFINET IO Industrial Ethernet Communication

6.1 Overview

The PROFINET I/O Industrial Ethernet adapter module (MD580-SI-PN1 for short) meets international PROFINET I/O Industrial Ethernet standards. The module is used on the MD580 series AC drive, so that the AC drive can work as a slave on the PROFINET I/O Industrial Ethernet and be controlled by a PROFINET I/O Industrial Ethernet master. This effectively improves system communication efficiency and enriches the networking functions of the MD580 series AC drive.

Features:

- Supports up to 100 Mbit/s bus communication rate. The communication period is short.
- Provides flexible networking and supports almost all types of topologies: chain, bus, tree, and star.
- Uses a distributed clock and exchanges data using a pure-hardware mechanism, effectively the timing accuracy of data exchange.
- Supports direct installation in the extension slot of the MD580 AC drive without requiring an external power supply, which is convenient.

6.2 Product Information

Specifications

| Item | Description |
|-----------------------|---------------------------|
| Operating temperature | -10°C to +55°C |
| Storage temperature | -40°C to +70°C |
| Environment humidity | 5% to 95%, non-condensing |
| Working environment | Free from corrosive gases |
| Installation mode | Snap-fit joint and screw |
| IP rating | IP20 |
| Ventilation method | Natural air cooling |

Product description

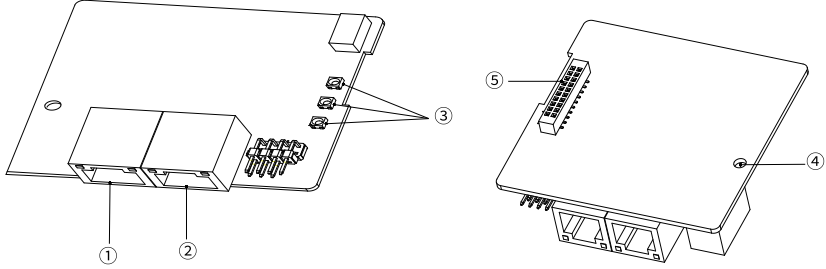
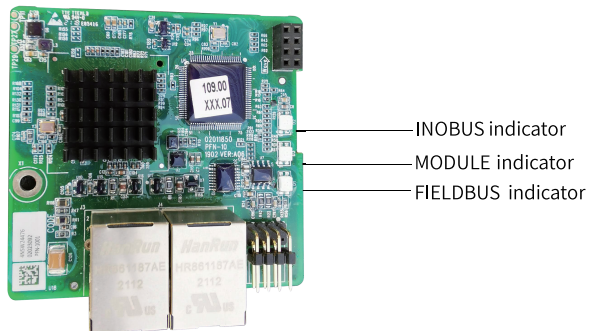


Figure 6-1 Product layout

| No. | Name | Description |
|-----|---------------------------------------|---|
| ① | PROFINET IO communication terminal X1 | Communication terminal 1 |
| ② | PROFINET IO communication terminal X2 | Communication terminal 2 |
| ③ | Status indicator | It indicates the running status of the module and bus. |
| ④ | Screw fixing hole | It is used to fix the module to the MD580 to ensure proper PE layer connection. |
| ⑤ | Slot terminal | It is used for electrical connection between the module and the MD580. |

Description of indicators

The MD580-SI-PN1 module provides three status indicators to indicate bus communication faults, as described below. The following figure shows the indicator positions.



| Indicator | Status | Fault Description | Solution |
|-----------|-------------------|---|---|
| INOBUS | Blinking in green | Handshaking between the module and the MD580 fails. | Check that only one of n1-00 or n2-00 is set to 8. Check that n17-00 is set properly. Check that the module socket is intact. |
| MODULE | Flashing green | The protocol stack is starting. | Please wait. |
| | Flashing red | The MAC address is incorrect. | The MD580-SI-PN1 module does not have the MAC address. Change the module. |
| | Solid red | The protocol stack startup times out. | Power on the module again or replace the module. |
| | Solid orange | MD580 parameters are set incorrectly. | Set the correct card slot in the background to activate the PN card. Set the station number to a non-zero value. |
| FIELDBUS | Flashing red | The master is not found. | Check that the cable is correctly connected. Check that the slave is configured. Check that a device name is assigned to the slave. |
| | Solid red | Communication with the master is lost. | Check that the cable is correctly connected. |
| | Flashing orange | Configuration error | Check that the GSDML configuration is correct. |

6.3 Installation Guide

Installation precautions

- Before installation or removal, ensure that the module is powered off to prevent damage to the module.
- Do not drop or shock the MD580-SI-PN1 module to avoid damage to the module.
- Do not disassemble the MD580-SI-PN1 module to avoid damage to the module.
- Tighten the screws according to the required torque to avoid damage or loose fastening.

Tightening torque

The screws must meet the tightening torque listed below.

Table 6-1 Tightening torque of the grounding screw

| Screw | Tightening Torque |
|-------|-------------------|
| M3 | 0.55 N•m |

Dimensions

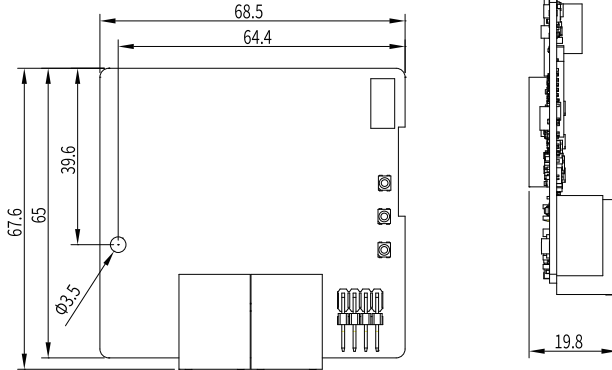


Figure 6-2 Product dimensions (mm)

The MD580-SI-PN1 module can be installed in the expansion slot of the MD580.

It is installed in the same way as the MD580-SI-DP1 module. For details, see ["2.3 Installation Guide" on page 15](#).

1. Install the module to the expansion slot of the MD580.
2. Press the snap-fit joint at both sides of the module inward to push the module into the slot, and fasten the grounding screw of the module by using the 1# screwdriver.
3. The installation completes.

Removal

1. Disconnect all power supplies, and unplug all cables connected to the module.
2. Remove the grounding screw of the module by using the Phillips screwdriver.
3. Press the snap-fit joint at both sides of the module inward and pull out the module.

Note

- To meet EMC requirements and for reliable operation of the module, tighten the screws to ensure reliable grounding.
- Ensure that the MD580-SI-PN1 module is installed properly in the expansion slot of the MD580 for electrical connection.
- The maintenance work must be done by professional personnel.

6.4 Electrical Connection

The MD580-SI-PN1 uses a standard Ethernet RJ45 socket for connection to a PROFINET master. The pin signal definitions are the same as those of the standard Ethernet pins. It supports both crossover and straight-through cabling modes.

Electrical connection for chain networking

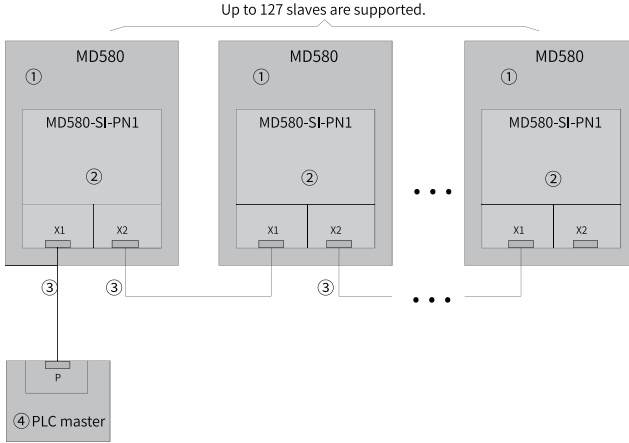


Figure 6-3 Electrical connection diagram for chain networking

| No. | Name |
|-----|---|
| ① | MD580 AC drive |
| ② | MD580-SI-PN1 Industrial Ethernet module |
| ③ | Network cable |
| ④ | PLC master |

Electrical connection for star networking

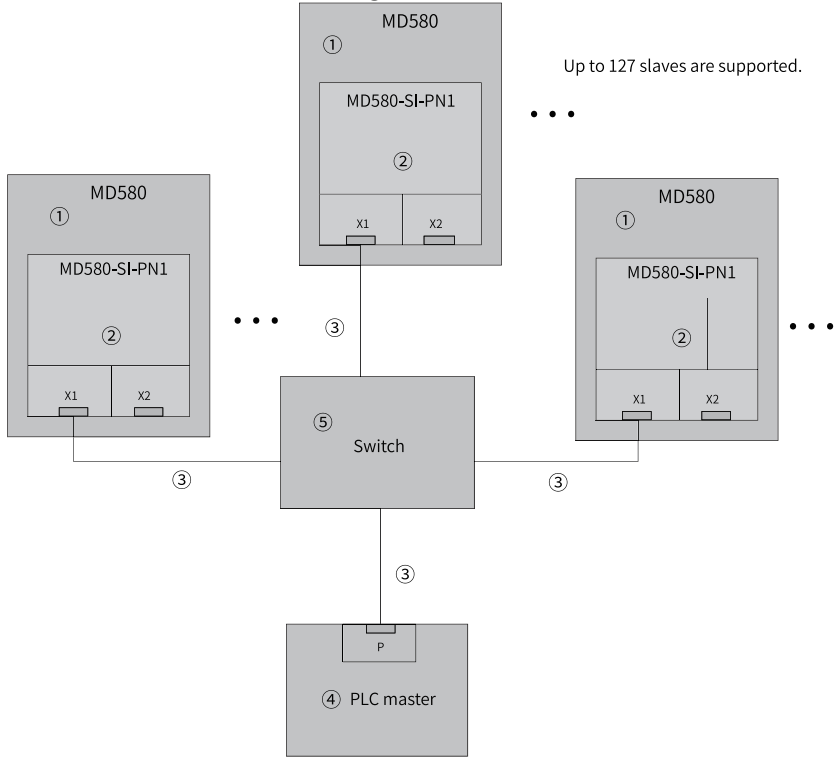


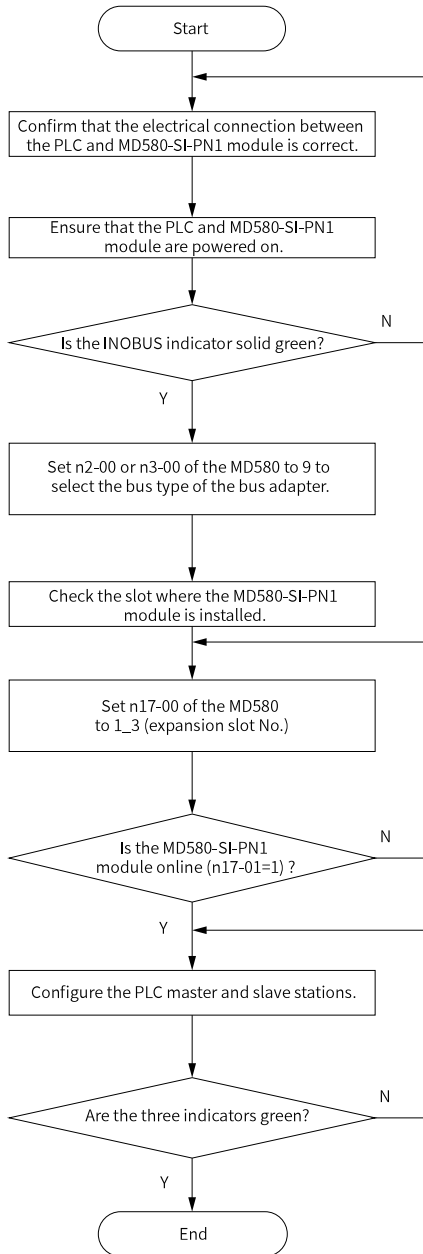
Figure 6-4 Electrical connection diagram for star networking

| No. | Name |
|-----|---|
| ① | MD580 AC drive |
| ② | MD580-SI-PN1 Industrial Ethernet module |
| ③ | Network cable |
| ④ | PLC master |
| ⑤ | Switch |

6.5 Parameter Settings

Parameter configuration flow

After installing the MD580-SI-PN1 module to the MD580, you must complete communication configurations to enable the module to communicate with the MD580.



Parameter configuration description

| Parameter Code | Parameter Name | Default | Set Value | Description |
|----------------|---------------------------|---------|---|---|
| n2-00 | Bus type of bus adapter A | 0 | 8 | Only one of the two parameters can be set to 8. |
| n3-00 | Bus type of bus adapter B | 0 | 8 | |
| n17-00 | Expansion slot selection | 0 | 0: Disable 1: Extension slot 1_1 2: Extension slot 1_2 3: Extension slot 1_3 | Select a value according to the actual need. Generally, select the value 1. |
| n17-01 | Status | 0 | 0: Offline 1: Online | - |

MAC address

The MD580-SI-PN1 module does not require a station number. Each MD580-SI-PN1 module has a unique MAC address for PLC identification.

You can view the MAC address through the parameter of the MD580 (see the appendix for the specific analysis method). In addition, the module supports the flashing function of the host controller, such as the LED flashing function of the TIA portal. The Module and Fieldbus indicators of the MD580-SI-PN1 module will flash three times simultaneously for indication.

Appendix

You can view the MD580 parameters through the background software or other methods. Make sure the MD580-SI-PN1 module is powered on and both the INOBUS and MODULE indicators are solid green.

You can view the MAC address through parameters of the MD580.

1. The parameters corresponding to MAC addresses include n17-03, n17-04, and n17-05.
2. The parameter is displayed in hexadecimal.

Example:

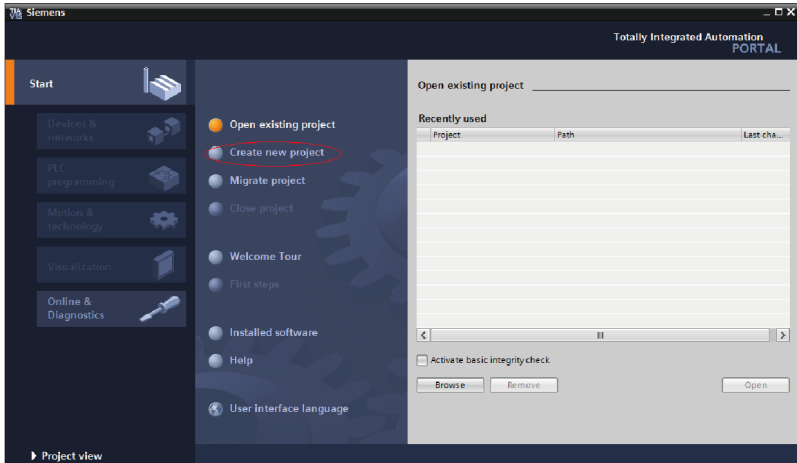
| | | | |
|-------------------|-------------------|-----------------|-----------------|
| Parameter | n17-03 | n17-04 | n17-05 |
| Parameter Display | n17-03 = 0x70CA | n17-04 = 0x4DFE | n17-05 = 0x0133 |
| MAC Address | 70-CA-4D-FE-01-33 | | |

6.6 Configuration for PROFINET IO Communication Between AC Drive and S7-300

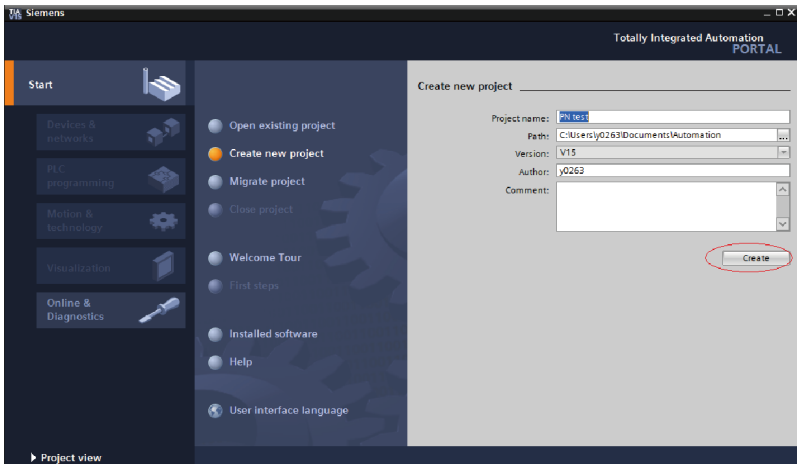
Configuring slave stations on the S7-300 master station

To add a slave station to the master station system, configure the GSDML file of the slave station. The GSDML file can be obtained from an Inovance agent or manufacturer. To configure the slave station, do as follows:

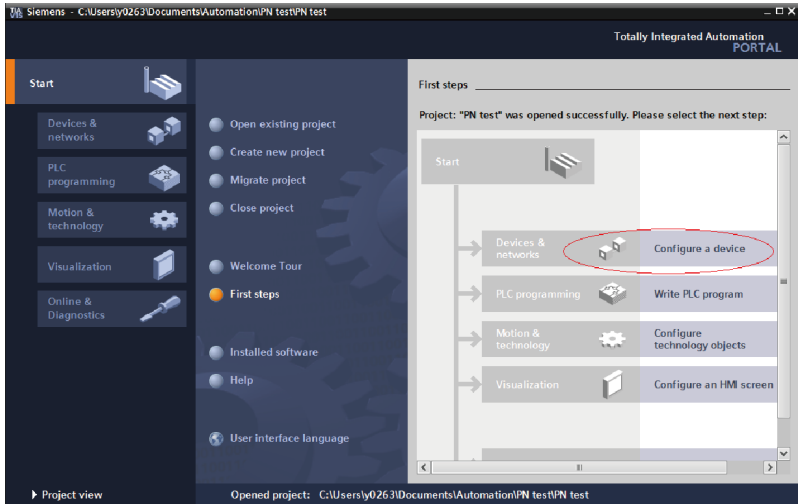
1. Double-click the Totally Integrated Automation (TIA) Portal.



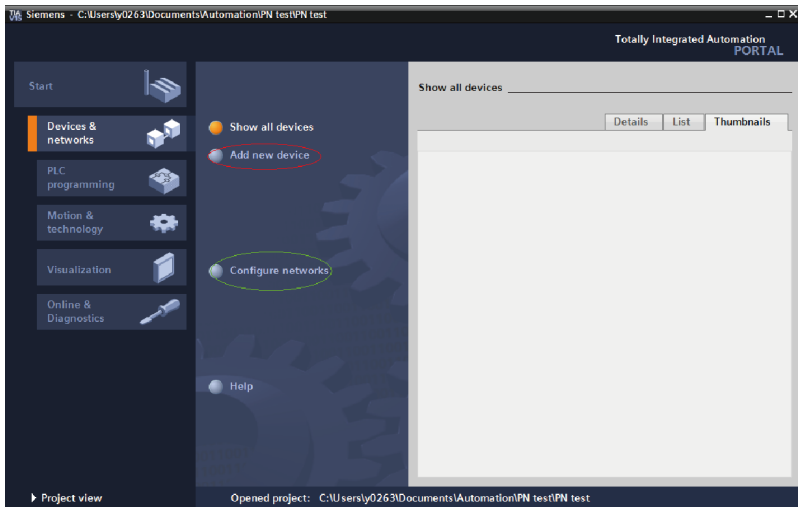
Click "Create new project", enter a project name and storage path, and click "Create".



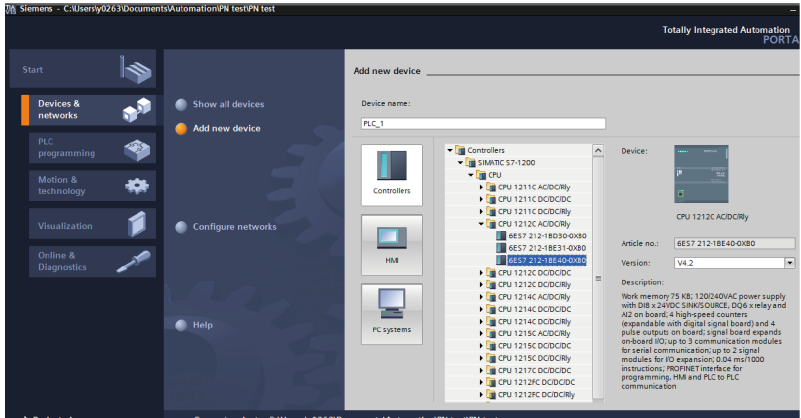
Click "Configure a device".



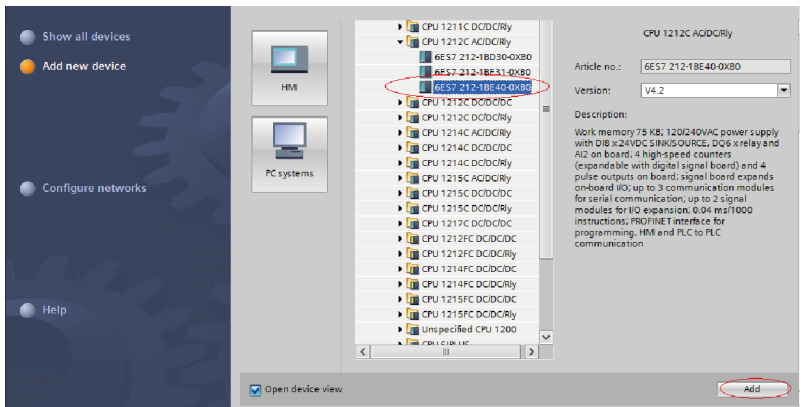
- For a new project, click "Add new device".
- For an existing project, click "Configure networks".



Select a PLC on the displayed page. Ensure that the article number is correct and select the firmware version for the PLC to avoid a download failure.

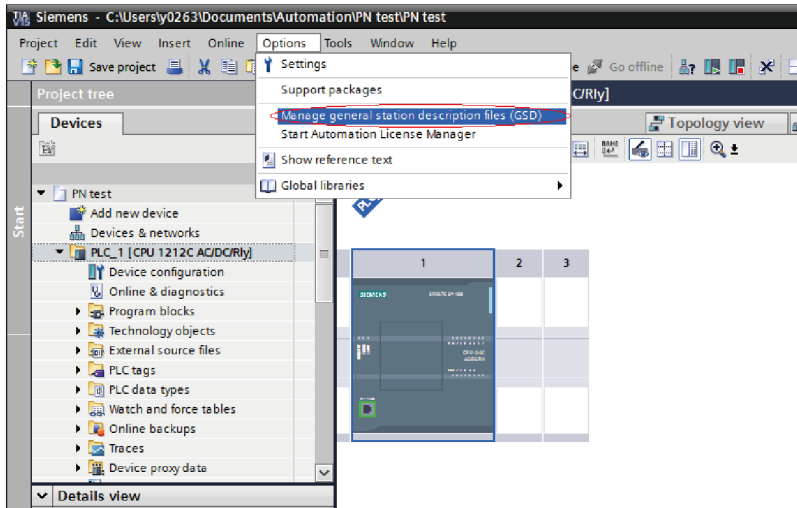


Click "Add" or double-click the selected master station.

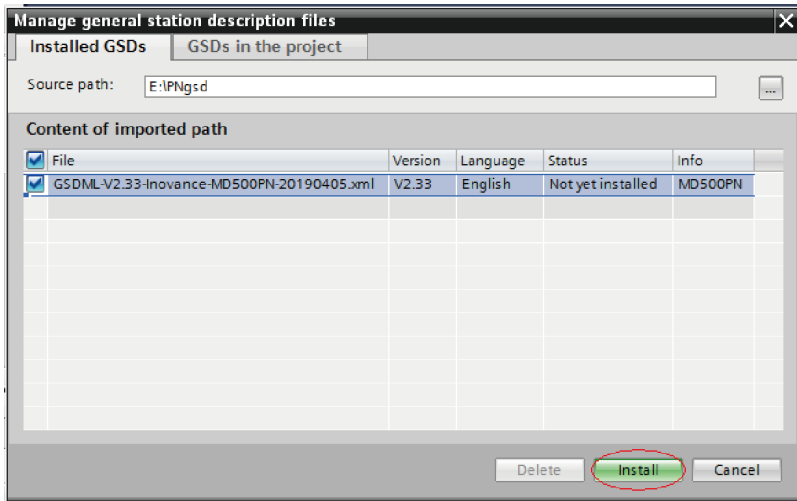


The master station has been established.

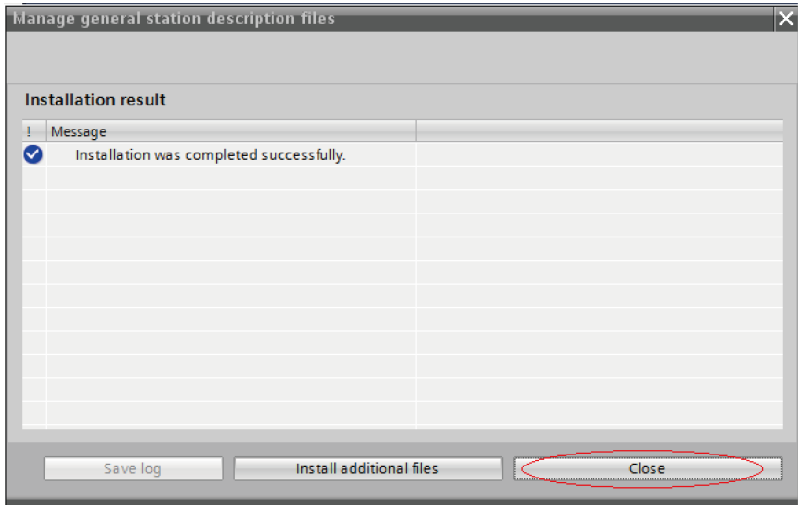
- (Optional) To install the GSDML file, Choose "Options" > "Manage general description files (GSD)".



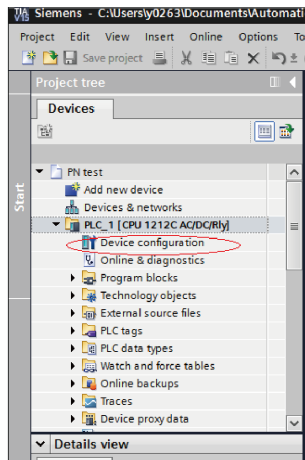
Select an English storage path for the GSDML file, select the GSDML file to be installed, and click "Install".



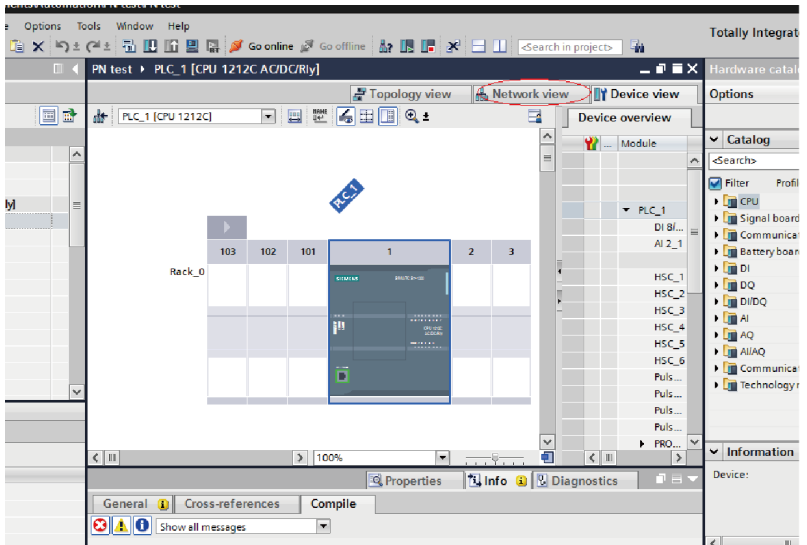
After the successful installation message is displayed, click "Close".



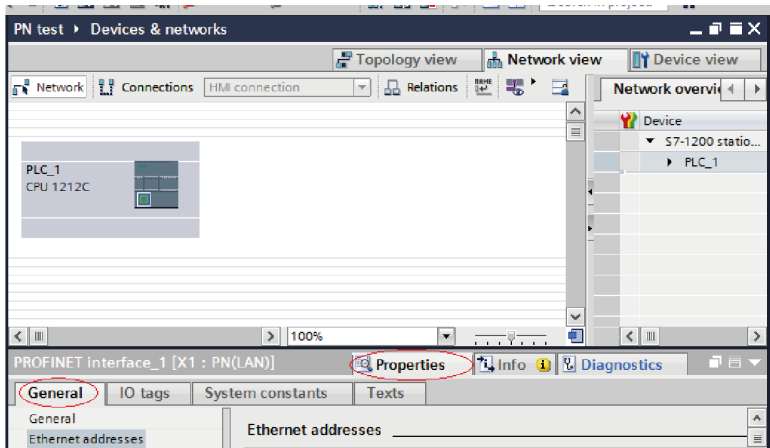
3. Configure the slave station.
Click "Device configuration".



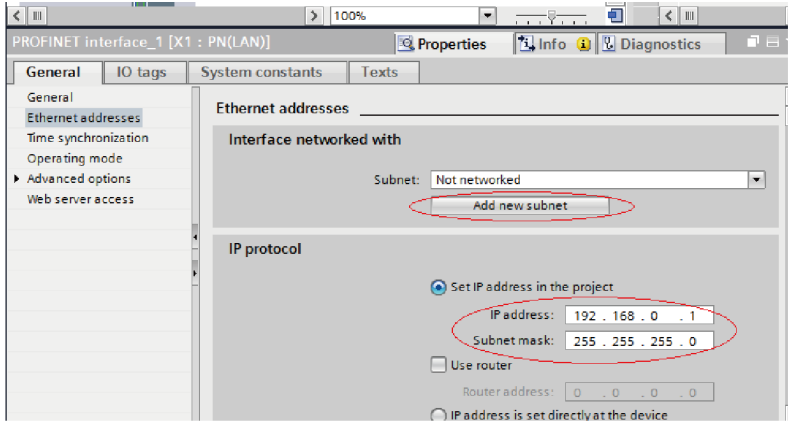
Click "Network view".



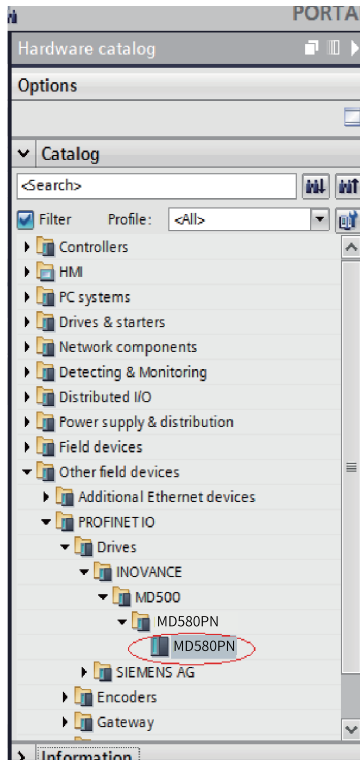
Select the Ethernet interface of the PLC, and choose "Properties" > "General".



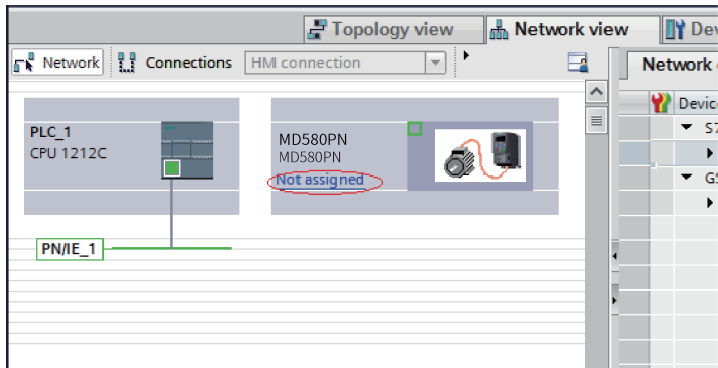
Set the IP address and subnet mask of the PLC, and click "Add new subnet".



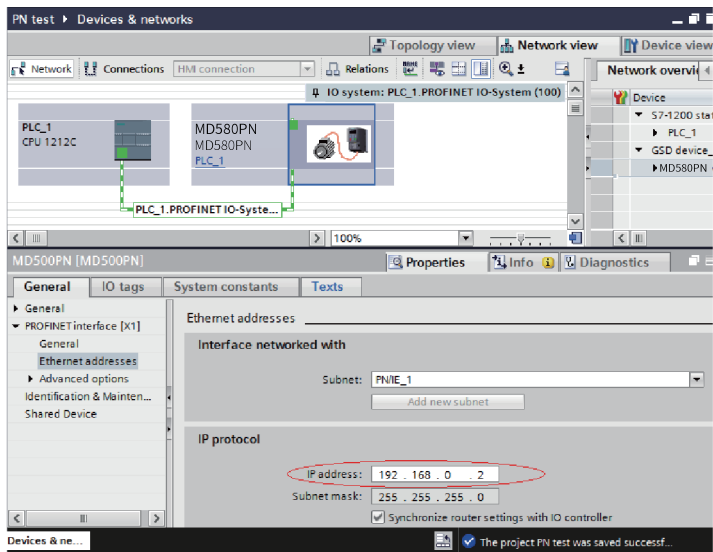
Locate MD580 under the "Hardware catalog" pane, and double-click "MD580PN".



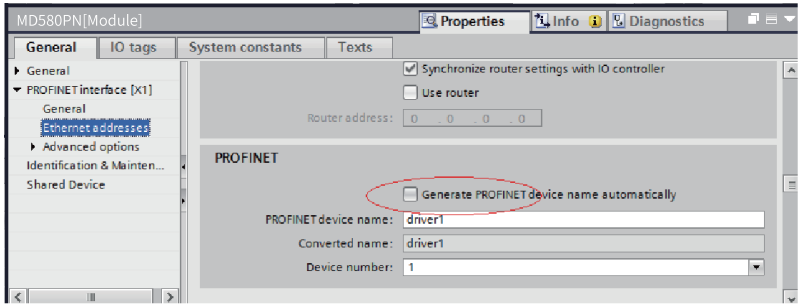
Click "Not assigned" to select the master station system for the slave station.



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

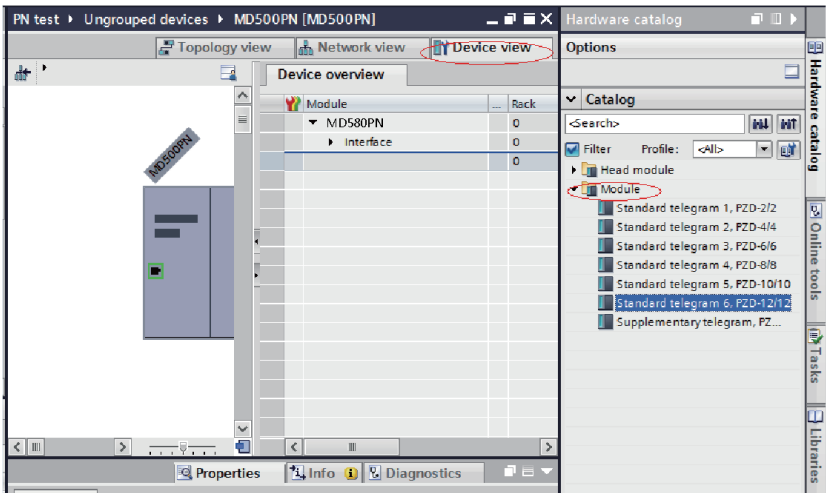


Scroll down the interface to locate the "PROFINET" area. Clear "Generate PROFINET device name automatically", and name the slave device in the "PROFINET device name" text box. Alternatively, select "Generate PROFINET device name automatically" to enable the system to generate a device name automatically.



4. Configure data features of the slave station.

Select the slave station and switch to the "Device view" tab. Under "Hardware catalog", click "Module", and double-click the data length configured to the slave station.

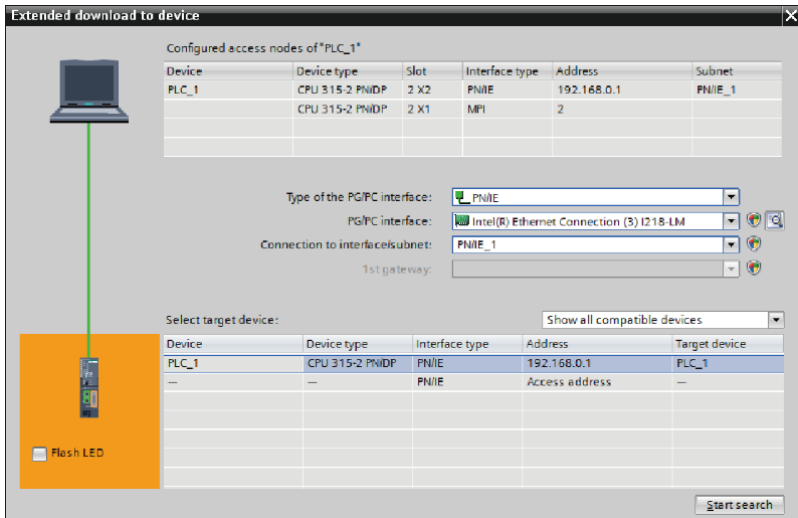


Switch to the "Network view" tab. If more stations need to be added, repeat the preceding steps. If the configuration is the same, select and copy a configured slave and modify the IP address and device name.

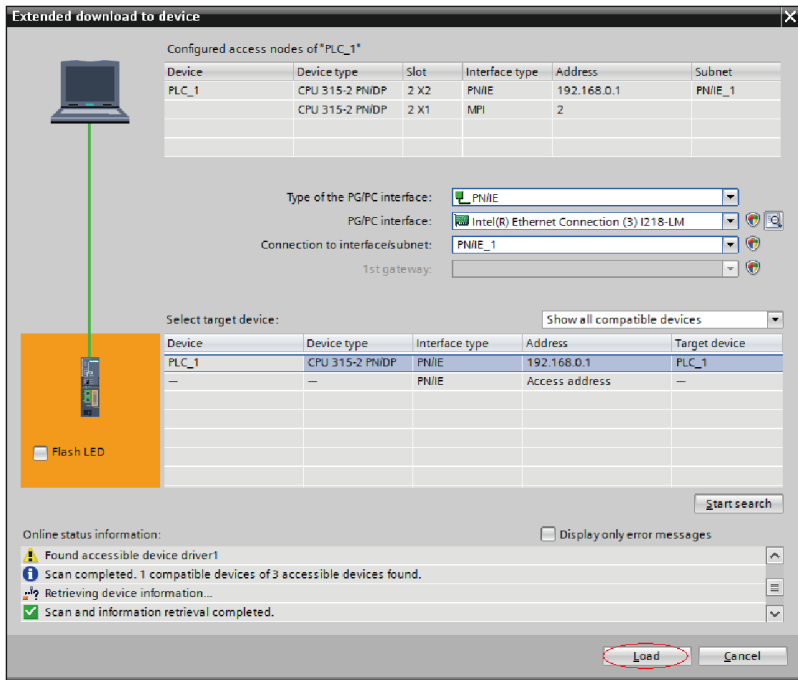
5. Configure the mapping address of the PZD in n1 or n2 group on the MD580.

6. Download the configuration.

Save the network configuration. Set the IP address of the PC to the same network segment as that of the PLC. (Note that the IP address of the PC must be different from that of the slave station in the configuration. You can also enable the function of automatic IP address distribution for the PC.) Then, start compiling, click "Load", select the interface, and click "Start search".

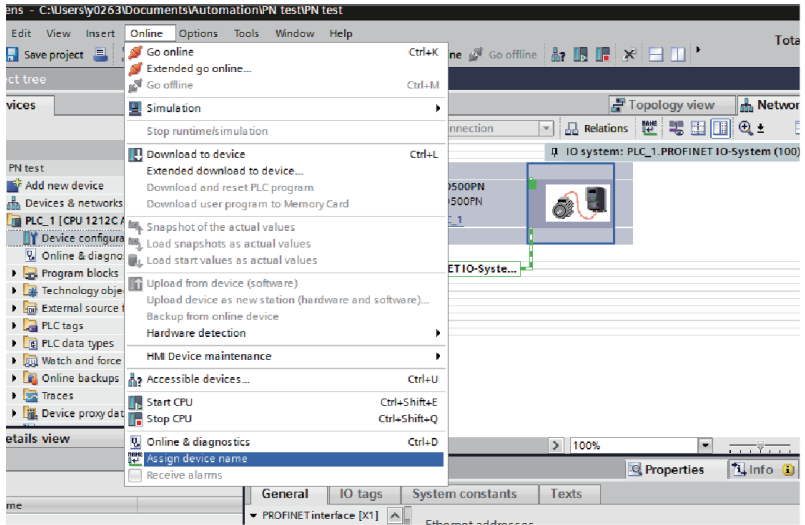


In the searched result, select the PLC, and click "Load". A message indicating successful load will appear.

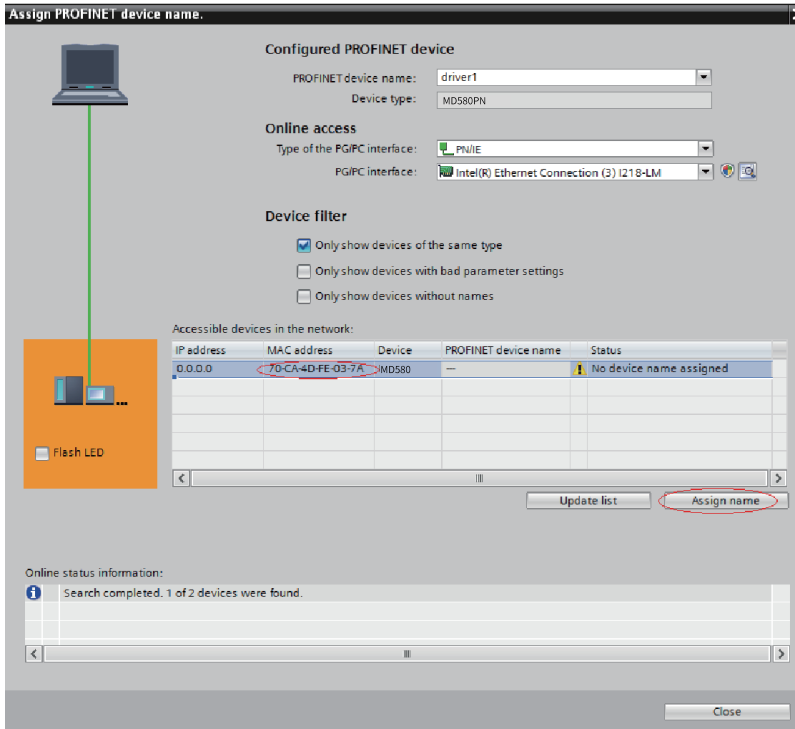


7. Assign a device name.

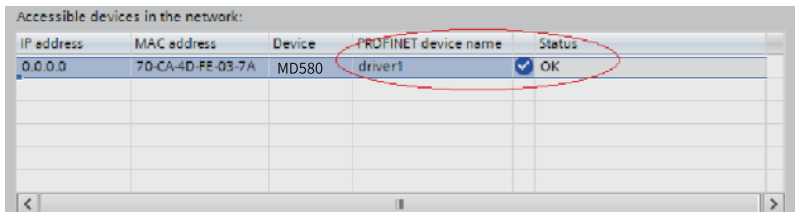
After loading is complete, assign device names for slave stations without names. Select a slave station, and choose "Online" > "Assign device name".



On the displayed page, devices of the same type are listed. Search for the slave station by n17 group or select the slave station based on its unique MAC address. The MAC address of the HPFN-10 is marked on its housing. Then, click "Assign name".



If information similar to the following figure is displayed, the device name is assigned successfully. The displayed PROFINET device name in the following figure must be consistent with that displayed in the preceding figure. After assigning the device name, close the interface or select another device for "PROFINET device name" to assign device names for other stations.



The slave station will save the assigned name after receiving it. Because the MAC address is inconvenient for use, the master station identifies each slave station based on its device name. A device name of the slave station is bound to the MAC address during device name assignment.

Note

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

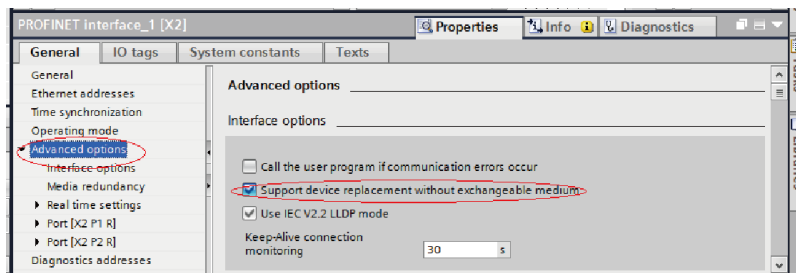
After all the preceding operations are complete, the PROFINET slave station is configured. You can compile programs in the PLC to control the AC drive.

Note

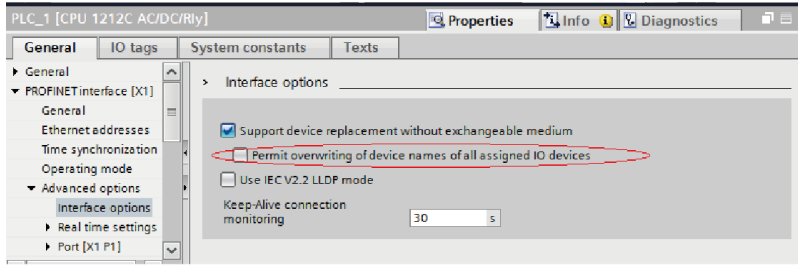
Read/write operations on the slave through the PLC are similar to those on the PROFIBUS DP slave through the S7-300.

Replacing the faulty device

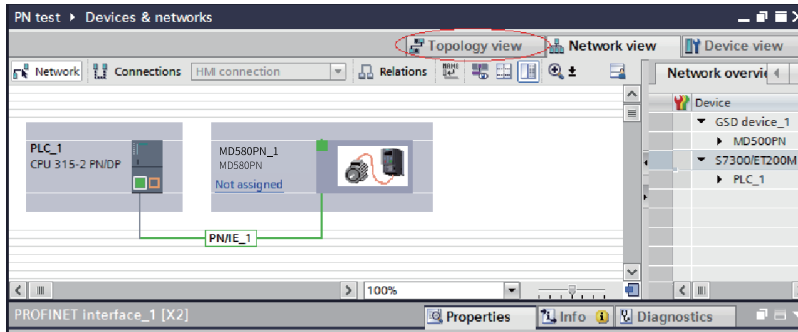
- Open PORTAL, and select the PROFINET interface of the master station in the hardware configuration. Go to "Properties" > "General" > "Advanced options", and select "Support device replacement without exchangeable medium".



For the S7-1200 or S7-1500 PLC, the check box "Permit overwriting of device names of all assigned IO devices" is provided. If this check box is selected, the second prerequisite for directly replacing the card can be ignored.

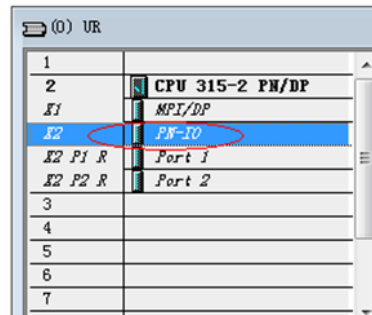


Click the "Topology view" tab.

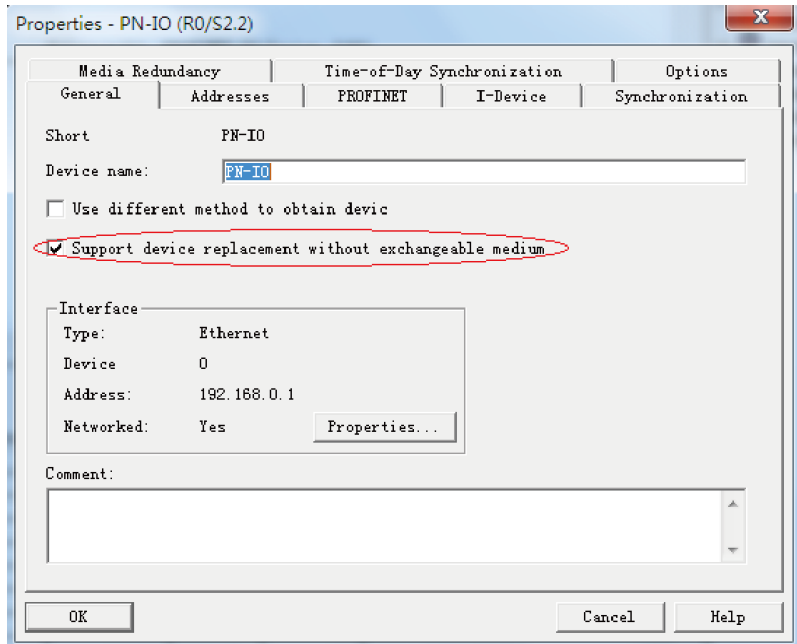


After completing the topology, start compiling and download it to the PLC.

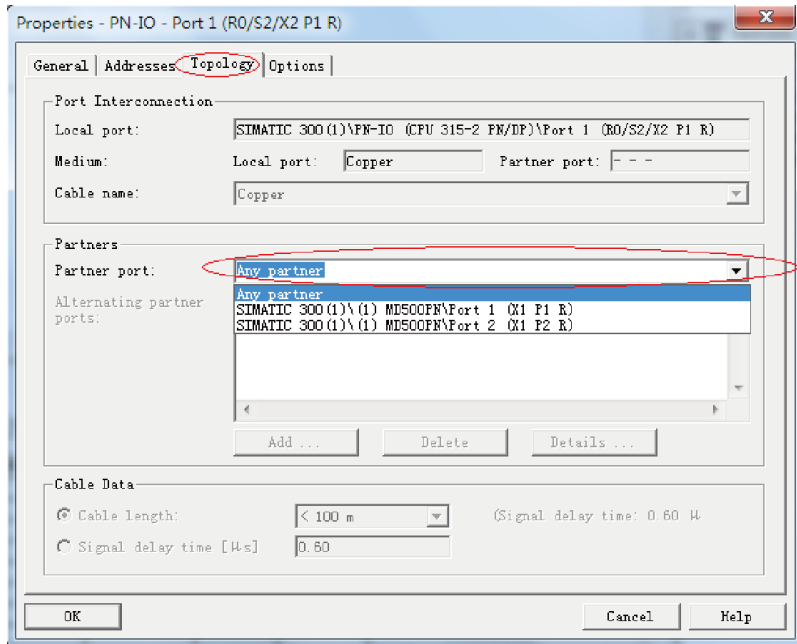
- Enable "Support device replacement without exchangeable medium" and set the topology in STEP 7.
In the hardware configuration, double-click "PN-IO".



In the "General" tab, select "Support device replacement without exchangeable medium", and click "OK".



According to the actual network connections, double-click "Port 1" or "Port 2" of the PLC. Click the "Topology" tab, select the port of the slave station connected to the PLC from the "Partner port" drop-down list box, and click "OK".



Click the port of the slave station to set the topology. The operations are similar to the preceding steps. After setting all connected ports, start compiling and download the configuration to the PLC.

Note

- After completing the preceding configuration, perform the following operations when any slave station needs to be replaced: 1) Disconnect the old station from the network and remove it. 2) Install a new station to which no device name is assigned to the same position as the old station. For the S7-1200 and S7-1500, the requirement that a new station does not have a name can be omitted. 3) Connect the new station to the network using the original cable. 4) Power on the new station. The PLC assigns a device name to the new station automatically.
- Ensure that the wiring mode and the topology are consistent with the original mode and topology.

7 EtherCAT Industrial Ethernet Communication

7.1 Overview

The MD580-SI-EtherCAT industrial Ethernet bus module conforms to common EtherCAT industrial Ethernet standards. The module is mainly used together with the MD580 series AC drive. With the module, the MD580 can serve as the EtherCAT slave station and can be controlled by the EtherCAT master station. This effectively improves the communication efficiency and enriches the networking function of the MD580.

Features:

- It passes the Conformance Test Tool (CTT) test.
- It supports up to 16 RXPDOs and 16 TXPDOs, and supports dynamic configuration of PDOs.
- The DC synchronous clock mode is supported.
- The CoE protocol (PDO+SDO) is supported.
- A minimum of the communication cycle of 125 us is supported.
- It supports various topology structures, including chain, bus, tree, and star types.
- The module is installed in the slot of the communication expansion card (CN13) without the external power supply.

7.2 Product Information

Specifications

| Item | Description |
|-------------------------------|---------------------------------|
| Operating ambient temperature | -10°C to +55°C |
| Storage ambient temperature | -40°C to +70°C |
| Ambient humidity | 5% RH to 95% RH, non-condensing |
| Working environment | Free from corrosive gases |
| Installation mode | Snap-fit joint and screw |
| IP rating | IP20 |
| Heat dissipation | Natural ventilation |

Product components

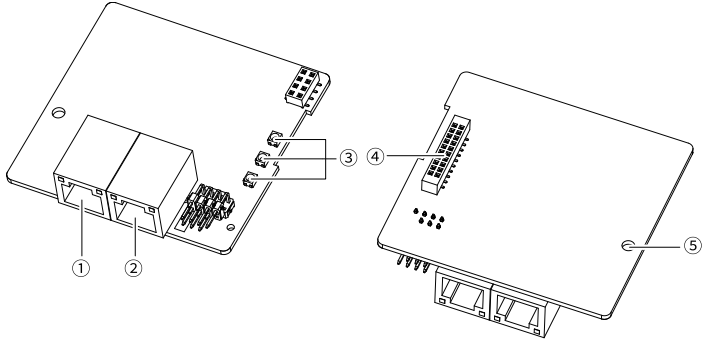


Figure 7-1 Product components

| No. | Name | Description |
|-----|------------------------------------|---|
| ① | EtherCAT communication terminal X1 | Communication input terminal |
| ② | EtherCAT communication terminal X2 | Communication output terminal |
| ③ | Status indicator | The indicators indicate running status of the module and bus. |
| ④ | Slot terminal | It is used for electrical connection between the module and the MD580. |
| ⑤ | Screw fixing hole | It is used to fix the module to the MD580 to ensure proper PE layer connection. |

Description of indicators

The MD580-SI-EtherCAT1 module provides three status indicators to indicate bus communication faults, as described below. The following figure shows the indicator positions.



| Indicator | Status | Fault | Solutions |
|-----------|-------------------------------------|---|---|
| INOBUS | Flashing green | Communication with the HCU times out or internal communication times out. | Check whether the HCU is powered on and check the connection between the expansion card and the HCU. |
| MODULE | Solid orange | XML information of the EEPROM is checked and updated. | EEPROM initialization will be performed upon the first power-on. |
| | Flashing red once per 100 ms | EEPROM loading error | Power off and then power on the device again. If the problem persists, contact the technical support engineers. |
| | Flashing red twice per 200 ms | Hardware initialization error | Check whether the downloaded ESI file is correct or contact the technical support engineers. |
| | Flashing red three times per 200 ms | Slave state switchover fails. | Check the communication configuration parameters. |
| | Solid red | Bus disconnected | Check the communication cable. Make the master switch the slave to the OP state. |
| | Off | The expansion card is not activated. | <ul style="list-style-type: none"> • Check whether communication between the expansion card and the HCU is normal. • Check whether n14-00 is set correctly. • Check whether n1-00 (bus adapter type) is set correctly. |

| Indicator | Status | Fault | Solutions |
|-----------|-------------|---------------------------------------|---|
| FIELDBUS | Off | The expansion card is not activated. | <ul style="list-style-type: none"> • Check whether communication between the expansion card and the HCU is normal. • Check the communication cable. • Check whether the master network configuration is correct. |
| | Solid green | Communication with the HCU is normal. | - |

7.3 Installation Guide

Installation precautions

- Before installation or removal, ensure that the module is powered off to prevent damage to the module.
- Do not drop or shock the MD580-SI-EtherCAT module to avoid damage to the module.
- Do not disassemble the MD580-SI-EtherCAT module to avoid damage to the module.
- Tighten the screws according to the required torque to avoid damage or loose fastening.

Tightening torque

The screws must be installed according to the tightening torque listed below.

Table 7-1 Tightening torque of the grounding screw

| Screw | Tightening Torque |
|-------|-------------------|
| M3 | 0.55 N·m |

Dimensions

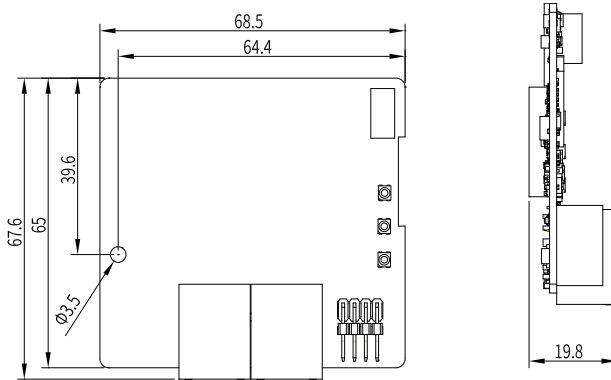


Figure 7-2 Product dimensions (mm)

Installation

The MD580-SI-EtherCAT module can be installed in the expansion slot of the MD580. It is installed in the same way as the MD580-SI-DP1 module. For details, see ["2.3 Installation Guide" on page 15](#).

1. Install the module to the expansion slot of the MD580.
2. Press the snap-fit joint of the module inward to push the module into the slot, and fasten the grounding screw of the module by using the 1# screwdriver.
3. The installation completes.

Removal

1. Disconnect all power supplies, and unplug all cables connected to the module.
2. Remove the grounding screw of the module by using the Phillips screwdriver.
3. Press the snap-fit joint at the right side of the module inward and pull out the module.

Note

- To meet EMC requirements and for reliable operation of the module, tighten the screws to ensure reliable grounding.
 - Ensure that the MD580-SI-EtherCAT module is installed properly in the expansion slot of the MD580 for electrical connection.
 - The maintenance work must be done by professional personnel.
-

7.4 Electrical Connection

EtherCAT supports various topology structures, including chain, bus, tree, and star types. This section describes the chain and star types.

Chain networking

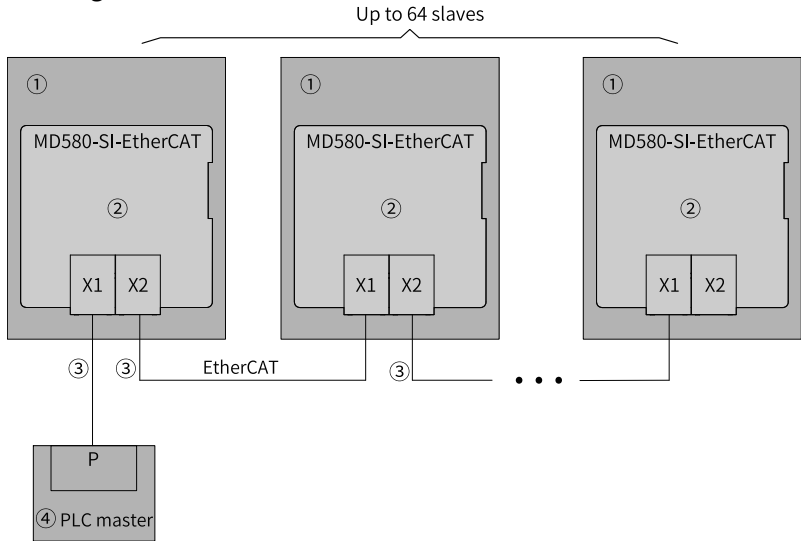


Figure 7-3 Chain networking topology

Table 7-2 Description of chain networking topology

| No. | Name |
|-----|---|
| ① | MD580 AC drive |
| ② | MD580-SI-EtherCAT industrial Ethernet module |
| ③ | Network cable (It is recommended to use shielded twisted pair Cat 5 Ethernet cable, and the registered jack used for crimping must have a metal shell for grounding shield protection.) |
| ④ | PLC master |

Star networking

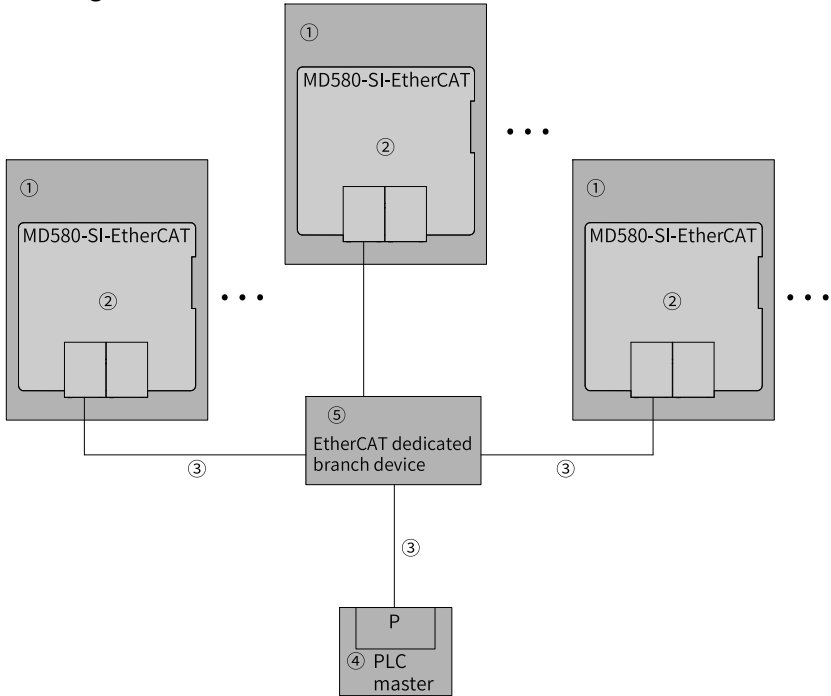


Figure 7-4 Chain networking topology

Table 7-3 Description of star networking topology

| No. | Name |
|-----|--|
| ① | MD580 AC drive |
| ② | MD580-SI-EtherCAT industrial Ethernet module |
| ③ | Network cable (It is recommended to use shielded twisted pair Cat 5e Ethernet cable, and the registered jack used for crimping must have a metal shell for grounding shield protection.) |
| ④ | PLC master |
| ⑤ | EtherCAT dedicated branch device |

7.5 Parameter Configuration

Parameter configuration flow

To set the MD580-SI-EtherCAT module, do as follows:

1. Select parameters to be set.
2. Check the slot of the module by parameters in A2 group.

3. Set the correct slot where the module is located in n14-00.
4. Select the fieldbus adapter A.
5. Select the bus type of the bus adapter (n2-00 = 5). If fieldbus adapter B is selected, set n3-00 = 5.
6. Power on the MD580 again.

Note

You can also select the fieldbus adapter B in step 4.

Table 7-4 Parameters of the MD580-SI-EtherCAT module

| Parameter Code | Parameter Name | Default | Set Value | Description |
|----------------|---|---------|---|--|
| n2-00 | Bus type for fieldbus adapter A | 0 | 5: EtherCAT module | Set either n2-00 or n3-00. Do not set n2-00 and n3-00 to the same value. |
| n3-00 | Bus type for fieldbus adapter B | 0 | 5: EtherCAT module | |
| n14-00 | Expansion slot | 0 | 0: Disable 1: Expansion slot 1_1 2: Expansion slot 1_2 3: Expansion slot 1_3 | Select the expansion slot according to the actual need. |
| n14-01 | Status | 0 | 0: Offline 1: Online | - |
| n14-02 | EtherCAT slave name | 1 | 0 to 65535 | - |
| n14-03 | EtherCAT slave alias | 1 | 0 to 65535 | - |
| n14-04 | Number of times for synchronization interruption signal loss allowed by the EtherCAT module | 4 | 4 to 20 | - |
| n14-06 | Alias setup function switch | 1 | 0: n14-03 1: Host controller | - |
| n14-11 | Number of reception errors over port 1_0 | 0 | 0 to 65535 | - |
| n14-12 | Number of invalid frames over port 1_0 | 0 | 0 to 65535 | - |
| n14-13 | Maximum number of transmission errors over port 1_0 | 0 | 0 to 65535 | - |

| Parameter Code | Parameter Name | Default | Set Value | Description |
|----------------|-------------------------------------|---------|------------|-------------|
| n14-14 | PDI and processing unit error count | 0 | 0 to 65535 | - |
| n14-15 | Number of lost links over port 1_0 | 0 | 0 to 65535 | - |
| n14-16 | Synchronization signal loss count | 0 | 0 to 65535 | - |
| n14-17 | Application layer fault code | 0 | 0 to 65535 | - |
| n14-18 | State machine and port link state | 0 | 0 to 65535 | - |

7.6 Communication Protocol

7.6.1 Introduction to EtherCAT

EtherCAT, short for EtherNet Control Automation Technology, is a real-time Ethernet technology proposed by German Beckhoff. EtherCAT is based on standard Ethernet frame transmission, with a capacity of up to 1486 bytes per frame. This makes EtherCAT excellent in terms of the amount of data it can transfer.

- EtherCAT supports various topological structures including star, line, tree, and daisy chain types. It also supports various types of cables, optical fibers, and other communication media topologies and their combinations. This enables flexible and convenient equipment connection and wiring.
- EtherCAT supports hot swap, ensuring flexible connections between devices.
- EtherCAT supports a maximum of 65535 slave devices. Therefore, no switches are required on the EtherCAT network. EtherCAT data can be transferred to each slave through topology between devices.

7.6.2 PDO Data

The MD580 transmits data according to the selected transmission format of PZD with different length. The types of transmission formats supported depend on the xml file. The MD580 supports a maximum of 16 parameters to be written periodically, and a maximum of 16 parameters to be read periodically. You can add or delete parameters to be written or read in the device configuration as required.

7.6.3 SDO Data

EtherCAT service data object (SDO) is used to transfer non-cyclic data, such as communication parameter configuration and servo drive running parameter configuration.

The CANopen over EtherCAT (CoE) service types include: emergency message, SDO request, SDO response, TxPDO, RxPDO, remote TxPDO transmit request, remote RxPDO transmit request, and SDO information.

The SDO data can be used to read or write a single parameter of the MD580.

7.7 Application Instances

7.7.1 Networking Description

The PLC used in this section is the AM600-CPU1608TN of Inovance. The programming software of the PLC is the InoProShop of Inovance, and the commissioning software of the MD580 is the InoDriveStudio of Inovance. The two software can be obtained from the Inovance official website <https://www.inovance.com>.

Connect devices according to the following figure to complete networking. Set the SOP-20 to the USB relay mode.

Note

AM600-CPU1608TN provides two Ethernet ports. CN4 is used for EtherCAT communication.

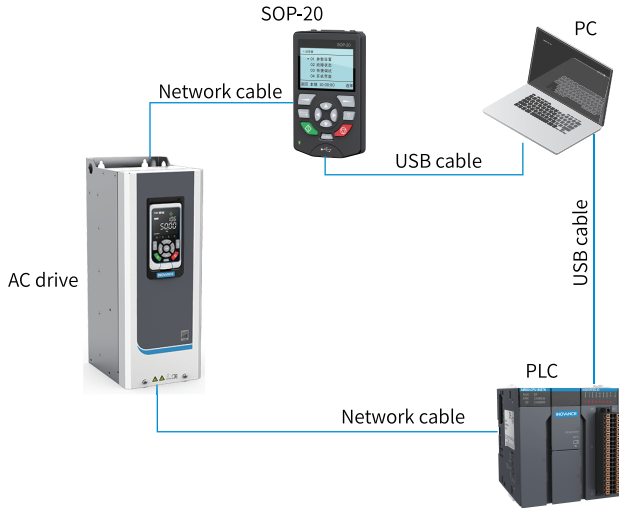
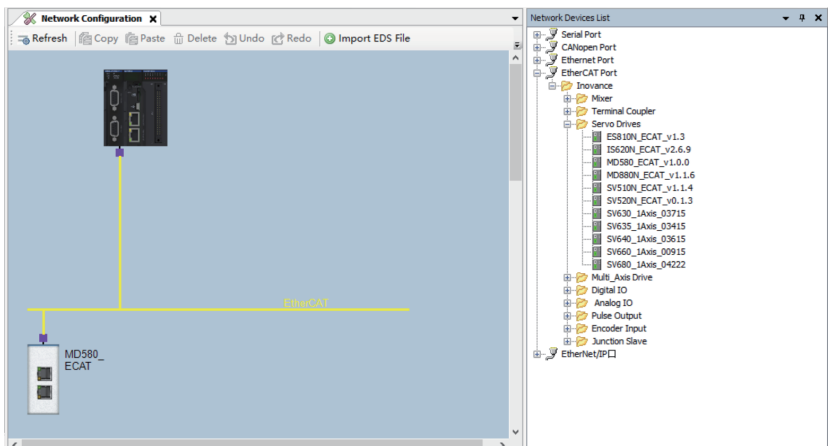


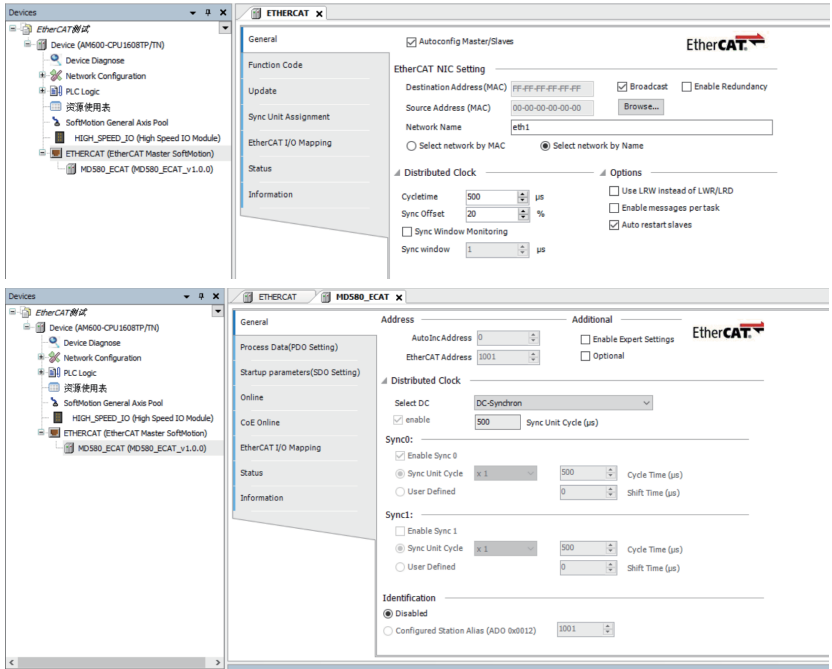
Figure 7-5 EtherCAT networking between the MD580 and the AM600

7.7.2 PLC Configuration

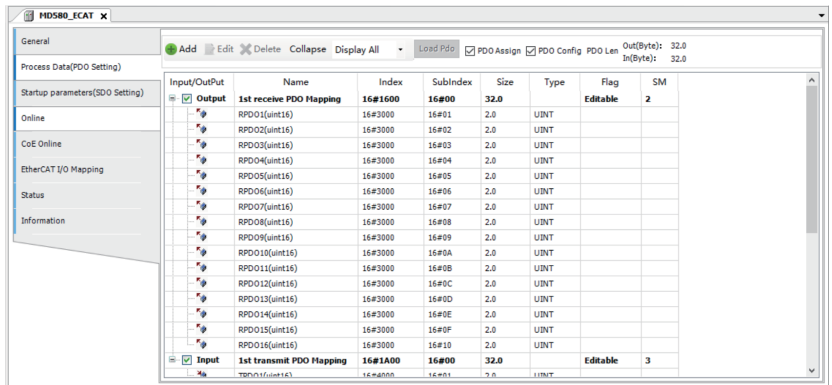
1. Create a project.
2. Select the PLC type.
3. Set the AM600 to the EtherCAT master.
4. Install the XML file of the MD580 on the EtherCAT master. You can obtain the XML file from Inovance's agency or Inovace.
5. After installation, MD580_ECATOR appears in the "Network Device List" pane. Drag MD580_ECATOR and drop it on the "Network Configuration" tab.



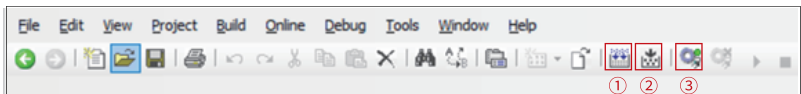
6. On the "General" tab, use default settings of parameters for the master and slave.



7. Configure the PDO. By default, 16 parameters are written and 16 parameters are read periodically. You can add or reduce parameters as required. The MD580 supports a maximum of 16 parameters to be read or written periodically.



8. After all settings are complete, download the settings to the PLC.

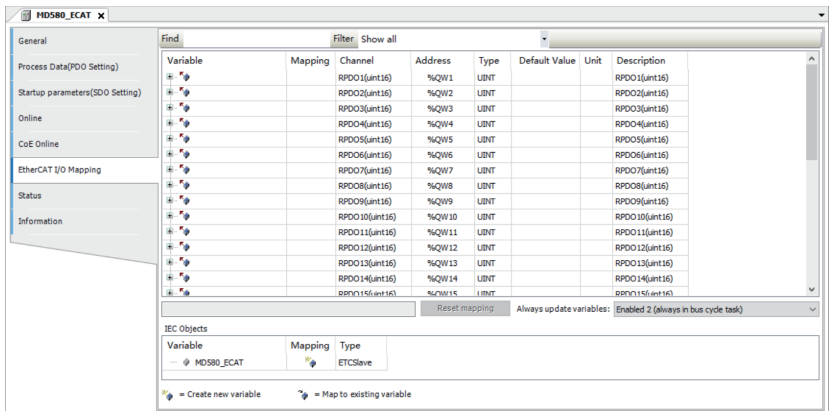


Note

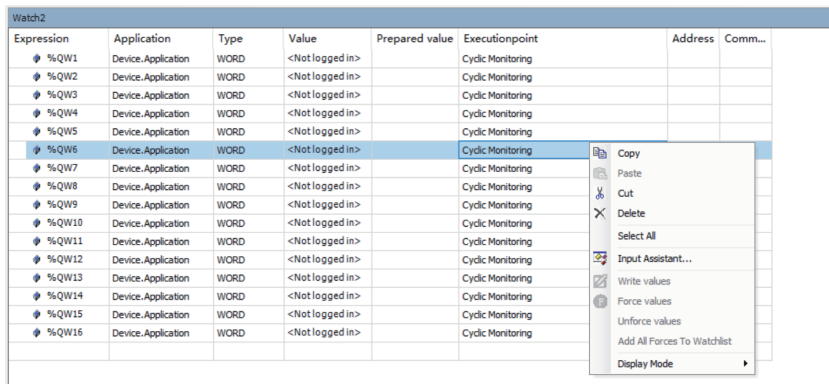
- ①: Check programs.
- ②: Compile
- ③: Download

7.7.3 Overview of Process Data Configuration

1. After the PLC configuration is downloaded to the PLC, verify the transmission of process data, that is, check whether data can be send and received between the MD580 and the PLC. On the PLC, addresses IW1 to IW16 and QW1 to QW16 are monitored. IW1 to IW16 and QW1 to QW16 are I/O address mappings of EtherCAT process data in the PLC.



2. Add addresses IW1 to IW16 and QW1 to QW16 to the monitoring table.
3. The PLC writes process data to the MD580.



MD580---[Parameter list]---->n2[FBA-A] x

Parameter group
 Custom parameter group
 Modified parameters
 All parameters
 A[System]
 b[Control command]
 C[Setpoint]
 d[Motor parameter]
 E[Motor control]
 F[I/O]
 H[Diagnostic]
 L[Application function]
 n[Communication and Extension]
 n0[InoLink]
 n1[On board Modbus RTU]
 n2[FBA-A]
 n3[FBA-B]
 n5[Encoder]
 n6[reserved]
 n10[Modbus RTU]
 n12[CANOpen]
 n14[EtherCat]
 n16[Profibus-DP]
 n17[ProfiNet IO]
 n18[Custom comm.]
 n19[EtherNet/IP]
 o[Technology]
 U[Connector]

| 功能码 | 名称 | 当前值 |
|-------|---------------------------------------|--------|
| n2-57 | [Process data output 6] Data display | 0x1000 |
| n2-58 | [Process data output 7] Data display | 0x1000 |
| n2-59 | [Process data output 8] Data display | 0x1000 |
| n2-60 | [Process data output 9] Data display | 0x1000 |
| n2-61 | [Process data output 10] Data display | 0x1000 |
| n2-62 | [Process data output 11] Data display | 0x1000 |
| n2-63 | [Process data output 12] Data display | 0x1000 |
| n2-64 | [Process data output 13] Data display | 0x1000 |
| n2-65 | [Process data output 14] Data display | 0x1000 |
| n2-66 | [Process data output 15] Data display | 0x1000 |
| n2-67 | [Process data output 16] Data display | 0x1000 |
| n2-68 | [Process data input 1] Data display | 0x0001 |
| n2-69 | [Process data input 2] Data display | 0x0002 |
| n2-70 | [Process data input 3] Data display | 0x0003 |
| n2-71 | [Process data input 4] Data display | 0x0004 |
| n2-72 | [Process data input 5] Data display | 0x0005 |
| n2-73 | [Process data input 6] Data display | 0x0006 |
| n2-74 | [Process data input 7] Data display | 0x0007 |
| n2-75 | [Process data input 8] Data display | 0x0008 |
| n2-76 | [Process data input 9] Data display | 0x0009 |
| n2-77 | [Process data input 10] Data display | 0x0011 |
| n2-78 | [Process data input 11] Data display | 0x0022 |
| n2-79 | [Process data input 12] Data display | 0x0033 |
| n2-80 | [Process data input 13] Data display | 0x0044 |
| n2-81 | [Process data input 14] Data display | 0x0055 |
| n2-82 | [Process data input 15] Data display | 0x0066 |
| n2-83 | [Process data input 16] Data display | 0x0077 |

4. The MD580 writes the process data to the PLC for configuration through n2-04 to n2-19. The constant set value 2 is 100%, corresponding to 16#1000.

MD580---[Parameter list]---->n2[FBA-A] x

Parameter group
 Custom parameter group
 Modified parameters
 All parameters
 A[System]
 b[Control command]
 C[Setpoint]
 d[Motor parameter]
 E[Motor control]
 F[I/O]
 H[Diagnostic]
 L[Application function]
 n[Communication and Extension]
 n0[InoLink]
 n1[On board Modbus RTU]
 n2[FBA-A]
 n3[FBA-B]
 n5[Encoder]
 n6[reserved]
 n10[Modbus RTU]
 n12[CANOpen]
 n14[EtherCat]
 n16[Profibus-DP]
 n17[ProfiNet IO]

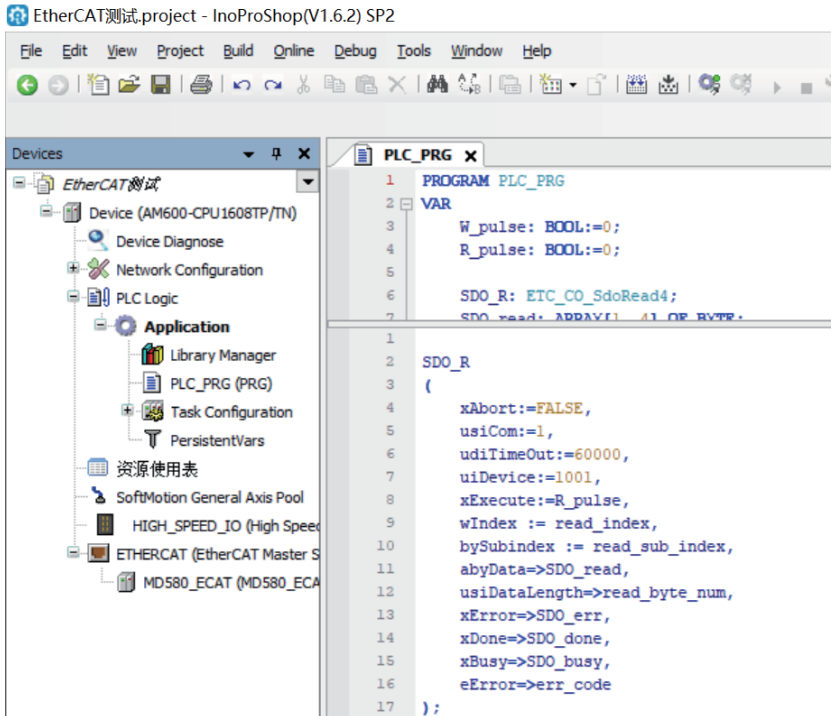
| 功能码 | 名称 | 当前值 |
|-------|--|-------------------|
| n2-00 | [FBA-A] Bus type | 1[Modbus RTU] |
| n2-01 | [FBA-A] Comm. wire breakage meas. delay | 0.10 |
| n2-02 | [FBA-A] Comm. mode selection | 0[Standard] |
| n2-03 | Continuous CRC error meas. setpoint | 0 |
| n2-04 | Process data output 1 | U6-01[FIX_WORD 2] |
| n2-05 | Process data output 2 | U6-01[FIX_WORD 2] |
| n2-06 | Process data output 3 | U6-01[FIX_WORD 2] |
| n2-07 | Process data output 4 | U6-01[FIX_WORD 2] |
| n2-08 | Process data output 5 | U6-01[FIX_WORD 2] |
| n2-09 | Process data output 6 | U6-01[FIX_WORD 2] |
| n2-10 | Process data output 7 | U6-01[FIX_WORD 2] |
| n2-11 | Process data output 8 | U6-01[FIX_WORD 2] |
| n2-12 | Process data output 9 | U6-01[FIX_WORD 2] |
| n2-13 | Process data output 10 | U6-01[FIX_WORD 2] |
| n2-14 | Process data output 11 | U6-01[FIX_WORD 2] |
| n2-15 | Process data output 12 | U6-01[FIX_WORD 2] |
| n2-16 | Process data output 13 | U6-01[FIX_WORD 2] |
| n2-17 | Process data output 14 | U6-01[FIX_WORD 2] |
| n2-18 | Process data output 15 | U6-01[FIX_WORD 2] |
| n2-19 | Process data output 16 | U6-01[FIX_WORD 2] |
| n2-20 | [Process data output 1] Comm. base value | 0 |
| n2-21 | [Process data output 2] Comm. base value | 0 |

| 功能码 | 名称 | 当前值 |
|-------|--|--------|
| n2-50 | [Process data input 15] Comm. base value | 0 |
| n2-51 | [Process data input 16] Comm. base value | 0 |
| n2-52 | [Process data output 1] Data display | 0x1000 |
| n2-53 | [Process data output 2] Data display | 0x1000 |
| n2-54 | [Process data output 3] Data display | 0x1000 |
| n2-55 | [Process data output 4] Data display | 0x1000 |
| n2-56 | [Process data output 5] Data display | 0x1000 |
| n2-57 | [Process data output 6] Data display | 0x1000 |
| n2-58 | [Process data output 7] Data display | 0x1000 |
| n2-59 | [Process data output 8] Data display | 0x1000 |
| n2-60 | [Process data output 9] Data display | 0x1000 |
| n2-61 | [Process data output 10] Data display | 0x1000 |
| n2-62 | [Process data output 11] Data display | 0x1000 |
| n2-63 | [Process data output 12] Data display | 0x1000 |
| n2-64 | [Process data output 13] Data display | 0x1000 |
| n2-65 | [Process data output 14] Data display | 0x1000 |
| n2-66 | [Process data output 15] Data display | 0x1000 |
| n2-67 | [Process data output 16] Data display | 0x1000 |
| n2-68 | [Process data input 1] Data display | 0x0001 |
| n2-69 | [Process data input 2] Data display | 0x0002 |
| n2-70 | [Process data input 3] Data display | 0x0003 |
| n2-71 | [Process data input 4] Data display | 0x0004 |

7.7.4 Reading and Writing Parameters by SDO

This section takes reading C6-11 and writing C6-12 of the MD580 by SDO as examples. The addresses of the C6-11 and C6-12 are 1355 and 1356, respectively.

1. Program in the PLC.



2. Read the C6-11 by SDO.

Variables related to the reading operation are defined as follows:

```

W_pulse: BOOL:=0;
R_pulse: BOOL:=0;

SDO_R: ETC_CO_SdoRead4;
SDO_read: ARRAY[1..4] OF BYTE;
read_byte_num: BYTE:=10#2;
SDO_err: BOOL;
SDO_done: BOOL;
SDO_busy: BOOL;
err_code: ETC_CO_ERROR;
read_index: WORD:=16#2000;
read_sub_index: BYTE:=10#192;

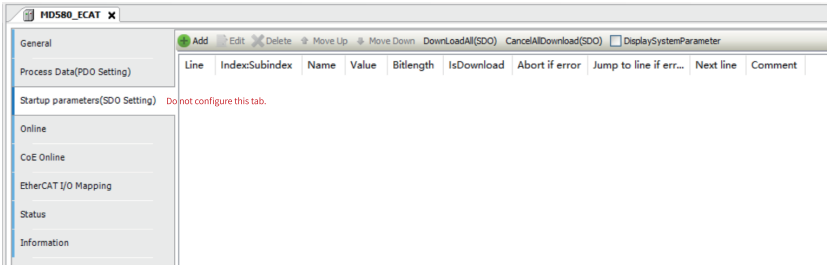
```

The reading method is implemented as follows: Add 1 to the register address, the index is $0x20$ + high bytes, and the sub-index is low bytes. For example, to read the address 1355, add 1 to the address, that is $1355+1=1356$ ($0x054C$), the index is $0x2005$, and the sub-index is $0x4C$. `uiDevice` specifies the EtherCAT address (for example, 1001) of the slave configured on the master.

```
SDO_R
(
    xAbort:=FALSE,
    usiCom:=1,
    udiTimeOut:=60000,
    uiDevice:=1001,
    xExecute:=R_pulse,
    wIndex := read_index,
    bySubindex := read_sub_index,
    abyData=>SDO_read,
    usiDataLength=>read_byte_num,
    xError=>SDO_err,
    xDone=>SDO_done,
    xBusy=>SDO_busy,
    eError=>err_code
);
```

Note

When the PLC is used for SDO reading and writing, do not configure read and write addresses in the startup parameters of the slave station (SDO settings). Otherwise, the writer program cannot execute read and write operations.

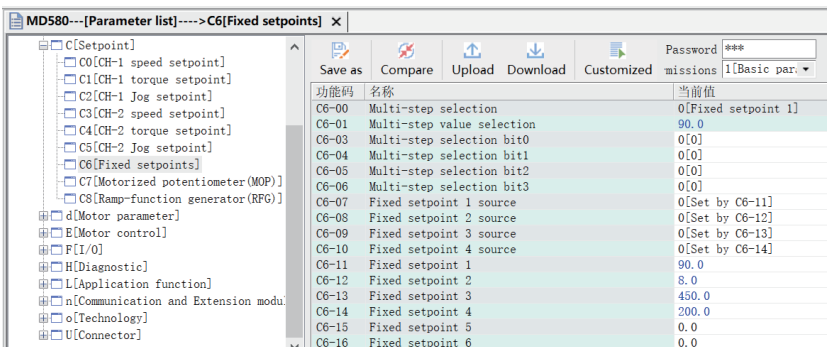


Perform operations in the monitoring table. When data is ready, a read operation is triggered, as shown in the following figure. The value of the C6-11 that is read is 16#0384, corresponding to 10#900. C6-11 is read successfully.

| | | | | |
|------------------------|--------------------|----------------------|---------|---|
| PLC_PRG.R_pulse | Device.Application | BOOL | TRUE | ① |
| PLC_PRG.read_index | Device.Application | WORD | 16#2005 | |
| PLC_PRG.read_sub_index | Device.Application | BYTE | 16#4C | |
| PLC_PRG.SDO_read | Device.Application | ARRAY [1..4] OF BYTE | | |
| SDO_read[1] | | BYTE | 16#84 | ② |
| SDO_read[2] | | BYTE | 16#03 | ③ |
| SDO_read[3] | | BYTE | 16#00 | |
| SDO_read[4] | | BYTE | 16#00 | ④ |
| PLC_PRG.read_byte_num | Device.Application | BYTE | 16#02 | |

Note

- ①: When the data is ready, write the data to TRUE.
- ②: Low-order byte of read data
- ③: High-order byte of read data
- ④: Bytes of the read data



3. Write the C6-12 by SDO.

Variables related to the writing operation are defined as follows:

```

SDO_W: ETC_CO_SdoWrite4;
SDO_write_para: ARRAY[1..4] OF BYTE;
write_byte_num: BYTE:=2;
SDO_write_err: BOOL;
SDO_write_done: BOOL;
SDO_write_busy: BOOL;
SDO_write_err_code: ETC_CO_ERROR;
write_index: WORD:=16#2000;
write_sub_index: BYTE:=193;

wIndex: INT;
bySubindex: BYTE;
abyData: ARRAY [1..4] OF BYTE;
usiDataLength: BYTE;
xError: INT;
xDone: INT;
xBusy: INT;
eError: INT;
xExecute: INT;
    
```

The writing method is implemented as follows: Add 1 to the register address, the index is 0x20 + high bytes, and the sub-index is low bytes. For example, to write the address 1356, add 1 to the address, that is 1356+1=1357 (0x054D), the index is 0x2005, and the sub-index is 0x4D. uiDevice specifies the EtherCAT address (for example, 1001) of the slave configured on the master.

```

SDO_W
(
  xAbort:=FALSE,
  usiCom:=1,
  udiTimeOut:=60000,
  uiDevice:=1001,
  xExecute:=W_pulse,
  wIndex := write_index,
  bySubindex := write_sub_index,
  abyData:=SDO_write_para,
  usiDataLength:=write_byte_num,
  xError->SDO_write_err,
  xDone->SDO_write_done,
  xBusy->SDO_write_busy,
  eError->SDO_write_err_code
);
    
```

Perform operations in the monitoring table. When data is ready, a write operation is triggered, as shown in the following figure. The value of the C6-12 that is written is 16#0FA0, corresponding to 10#4000. C6-12 is written successfully.

| Watch3 | | | | | |
|------------------------|--------------------|----------------------|---------|----------------|-------------------|
| Expression | Application | Type | Value | Prepared value | Executionpoint |
| PLC_PRG.R_pulse | Device.Application | BOOL | TRUE | | Cyclic Monitoring |
| PLC_PRG.read_index | Device.Application | WORD | 16#2005 | | Cyclic Monitoring |
| PLC_PRG.read_sub_index | Device.Application | BYTE | 16#4D | | Cyclic Monitoring |
| PLC_PRG.SDO_read | Device.Application | ARRAY [1..4] OF BYTE | | | Cyclic Monitoring |
| SDO_read[1] | | BYTE | 16#00 | | Cyclic Monitoring |
| SDO_read[2] | | BYTE | 16#00 | | Cyclic Monitoring |
| SDO_read[3] | | BYTE | 16#00 | | Cyclic Monitoring |
| SDO_read[4] | | BYTE | 16#00 | | Cyclic Monitoring |
| PLC_PRG.read_byte_num | Device.Application | BYTE | 16#00 | | Cyclic Monitoring |

The screenshot shows the MD580 parameter list interface. The left pane displays a tree view of parameters, with 'C6[Fixed setpoints]' selected. The right pane shows a table of parameters with columns for '功能码' (Function Code), '名称' (Name), and '当前值' (Current Value). The table lists parameters C6-00 through C6-16, including multi-step selections, fixed setpoint sources, and fixed setpoint values.

| 功能码 | 名称 | 当前值 |
|-------|----------------------------|---------------------|
| C6-00 | Multi-step selection | 0[Fixed setpoint 1] |
| C6-01 | Multi-step value selection | 90.0 |
| C6-03 | Multi-step selection bit0 | 0[0] |
| C6-04 | Multi-step selection bit1 | 0[0] |
| C6-05 | Multi-step selection bit2 | 0[0] |
| C6-06 | Multi-step selection bit3 | 0[0] |
| C6-07 | Fixed setpoint 1 source | 0[Set by C6-11] |
| C6-08 | Fixed setpoint 2 source | 0[Set by C6-12] |
| C6-09 | Fixed setpoint 3 source | 0[Set by C6-13] |
| C6-10 | Fixed setpoint 4 source | 0[Set by C6-14] |
| C6-11 | Fixed setpoint 1 | 90.0 |
| C6-12 | Fixed setpoint 2 | 400.0 |
| C6-13 | Fixed setpoint 3 | 450.0 |
| C6-14 | Fixed setpoint 4 | 200.0 |
| C6-15 | Fixed setpoint 5 | 0.0 |
| C6-16 | Fixed setpoint 6 | 0.0 |

7.8 Solutions to Abnormality

The module provides three status indicators to indicate bus communication faults, as described below.

| Indicator | Color | State Description | Solutions |
|-----------|-------------------------------------|---|---|
| INOBUS | Flashing green | Communication with the HCU times out or internal communication times out. | Check whether the HCU is powered on and check the connection between the expansion card and the HCU. |
| MODULE | Solid orange | XML information of the EEPROM is checked and updated. | EEPROM initialization will be performed upon the first power-on. |
| | Flashing red once per 100 ms | EEPROM loading error | Power off and then power on the device again. If the problem persists, contact the technical support engineers. |
| | Flashing red twice per 200 ms | Hardware initialization error | Check whether the downloaded ESI file is correct or contact the technical support engineers. |
| | Flashing red three times per 200 ms | Slave state switchover fails. | Check the communication configuration parameters. |
| | Solid red | Bus disconnected | Check the communication cable. Make the master switch over to the slave and enable the slave to enter the OP state. |
| | Off | The expansion card is not activated. | <ul style="list-style-type: none"> • Check whether communication between the expansion card and the HCU is normal. • Check whether n14-00 is set correctly. • Check whether n1-00 (bus adapter type) is set correctly. |
| FIELDBUS | Off | The expansion card is not activated. | <ul style="list-style-type: none"> • Check whether communication between the expansion card and the HCU is normal. • Check the communication cable. • Check whether the master network configuration is correct. |
| | Solid green | Communication with the HCU is normal. | - |

8 EtherNet/IP Industrial Ethernet Communication

8.1 Overview

The MD580-EN1 is an EtherNet/IP fieldbus module that complies with EtherNet/IP bus standards. It features high efficiency, flexible topology, and easy operation. The MD580-EN1 is installed on the MD580. When used together with the MD580-SI-EN1 module, the MD580 can serve as the EtherNet/IP adapter to be controlled by the EtherNet/IP scanner. This improves the communication efficiency and enriches the networking functions of the MD580.

Features:

- It supports various types of topology structures with the switch.
- It supports full duplex networks with the bandwidth of 100 MHz.
- It can be used together with the InoDriveStudio to implement commissioning functions.
- It is powered by the MD580 without external power supply required.
- A minimum of the communication cycle of 1 ms is supported.

8.2 Product information

8.3 Installation Guide

Installation precautions

- Before installation or removal, ensure that the module is powered off to prevent damage to the module.
- Protect the MD580-SI-EN1 module from falling or impact to avoid damage to the module.
- Do not disassemble the MD580-SI-EN1 module to avoid damage to the module.
- Tighten the screws according to the required torque to avoid damage or loose fastening.

Tightening torque

The screws must be installed according to the tightening torque listed below.

Table 8-1 Tightening torque of the grounding screw

| Screw | Tightening Torque |
|-------|-------------------|
| M3 | 0.55 N·m |

Dimensions

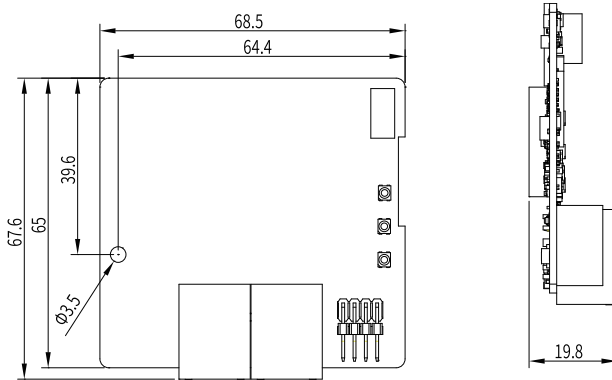


Figure 8-1 Product dimensions (mm)

Installing on the MD580

The MD580-SI-EN1 module can be installed in the expansion slot of the MD580.

It is installed in the same way as the MD580-SI-DP1 module. For details, see ["2.3 Installation Guide" on page 15](#).

1. Install the module to the expansion slot of the MD580.
2. Press the snap-fit joint of the module inward to push the module into the slot, and fasten the grounding screw of the module by using the 1# screwdriver.
3. The installation completes.

Removal

1. Disconnect all power supplies, and unplug all cables connected to the module.
2. Remove the grounding screw of the module by using the Phillips screwdriver.
3. Press the snap-fit joint at the right side of the module inward and pull out the module.

Note

- To meet EMC requirements and for reliable operation of the module, tighten the screws to ensure reliable grounding.
 - Ensure that the MD580-SI-EN1 module is installed properly in the expansion slot of the MD580 for electrical connection.
 - The maintenance work must be done by professional personnel.
-

8.4 Electrical Connection

Ethernet/IP supports various topology structures, including bus, star, and tree types. Diversified networking modes can be implemented by using switches.

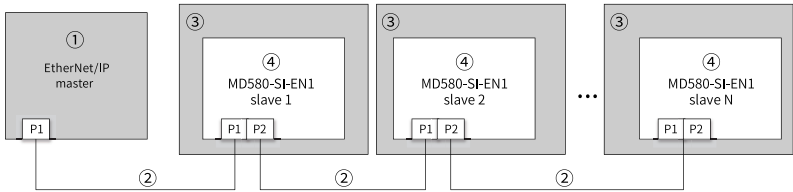


Figure 8-2 Bus topology

| No. | Name |
|-----|---|
| ① | Ethernet/IP master |
| ② | Network cable |
| ③ | MD580 AC drive |
| ④ | MD580-SI-EN1 communication expansion card |

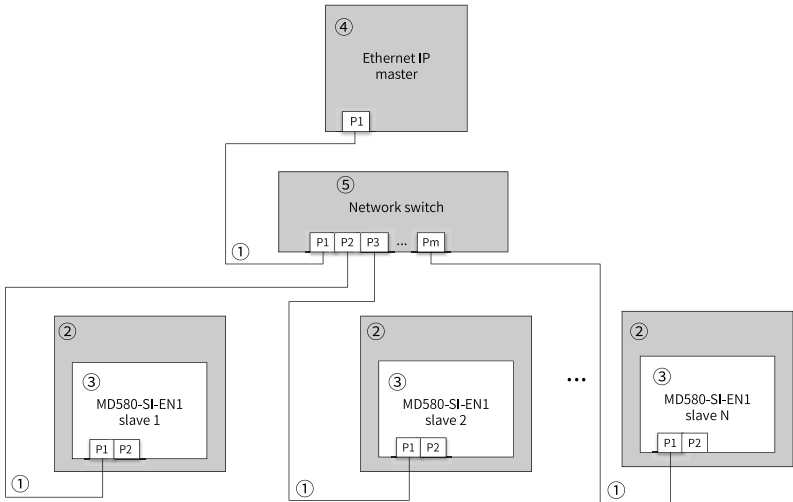


Figure 8-3 Star-type topology

| No. | Name |
|-----|---|
| ① | Network cable |
| ② | MD580 AC drive |
| ③ | MD580-SI-EN1 communication expansion card |
| ④ | Ethernet/IP master |
| ⑤ | Switch |

8.5 EtherNet/IP Communication Protocol

8.5.1 I/O Messages

The MD580-SI-EN1 expansion card supports 32 I/O messages for data transmission, of which 16 messages sent from the master to to slave and 16 messages are sent from the slave the to master.

The I/O messages enable the master to modify and read AC drive data in real time and perform periodic data exchange. The data communication addresses are directly configured by the AC drive. The specific functions are as follows:

real-time data exchange of function parameters and monitoring parameters between the AC drive and the master. Monitoring parameters can be configured through the AC drive. The I/O message is used for periodic data exchange between the master and the AC drive, as described in the following table.

| Data Flow | Description | Message |
|--|--|-----------------------------|
| I/O messages (O->T) sent by the master | AC drive parameters are modified in real-time. | Output I/O messages 0 to 15 |
| I/O messages (T->O) returned by the AC drive | AC drive parameters are read in real-time. | Input I/O messages 0 to 15 |

8.5.2 Data Sent by the Master Station

The following table describes the data sent by the master station.

| I/O Message Data Sent by the Master Station | |
|---|---|
| I/O message 0 to I/O message 15 | You can configure the data according to actual conditions. For details about the configuration, see the I/O message data configuration. |

8.5.3 Data Responded by the AC Drive

The following table describes the data returned by the AC drive.

| I/O Messages Data Returned by the AC Drive | |
|--|--|
| I/O message 0 to I/O message 15 | You can configure U group connectors to I/O messages 0 to I/O messages 15 according to actual conditions. For details about the configuration, see the I/O message data configuration. |

8.6 Parameter Description

8.6.1 Communication Card Type Settings

After the AC drive is powered on, you need to set n19-00 (expansion card slot selection). Generally, expansion card slot 1_1 is selected by default, so that the MD580-SI-EN1 card can properly communicate with the AC drive.

| Parameter Code | Parameter Name | Value Range | Value | Description |
|----------------|---------------------------------|-------------|-----------------|--------------------------------------|
| n2-00 | Bus type for fieldbus adapter A | 0 to 10 | 10: EtherNet/IP | The bus type is EtherNet/IP. |
| n19-00 | Expansion card slot selection | 0 to 3 | 1 | Expansion card slot 1_1 is selected. |

8.6.2 IP Address Setting of MD500-SI-EN1 Card

Set the following parameter of the expansion card.

| Parameter Code | Parameter Name | Value | Description |
|------------------|--------------------------------|-------------------------|--|
| n19-02 | DHCP enable | 0: Disable 1: Enable | It defines the DHCP function of the EtherNet/IP expansion card. After the DHCP function is enabled, the following configured IP addresses are invalid. |
| n19-03 to n19-06 | Expansion card IP address | 0 to 253 | It defines the IP address of the EtherNet/IP expansion card. |
| n19-07 to n19-10 | Expansion card subnet mask | 0 to 255 | It defines the subnet mask of the EtherNet/IP expansion card. |
| n19-11 to n19-15 | Expansion card gateway address | 0 to 255 | It defines the gateway address of the EtherNet/IP expansion card. |

The IP address can be a static IP address or DHCP dynamic IP address.

- The DHCP mode is set by n19-02.
- The static IP address is set by n19-03 to n19-06.

For example, to set the static IP address to 192.168.0.11, the subnet mask to 255.255.255.0, and the gateway to 192.168.0.1, configure parameters as follows.

| Parameter Code | Parameter Name | Value |
|----------------|---|-------|
| n19-02 | DHCP enable | 0 |
| n19-03 | Most significant byte of the IP address | 192 |
| n19-04 | Second most significant byte of the IP address | 168 |
| n19-05 | Third byte of the IP address | 0 |
| n19-06 | Least significant byte of the IP address | 11 |
| n19-07 | Most significant byte of the subnet mask | 255 |
| n19-08 | Second most significant byte of the subnet mask | 255 |
| n19-09 | Third byte of the subnet mask | 255 |
| n19-10 | Least significant byte of the subnet mask | 0 |
| n19-11 | Most significant byte of the gateway | 192 |
| n19-12 | Second most significant byte of the gateway | 168 |
| n19-13 | Third byte of the gateway | 0 |
| n19-14 | Least significant byte of the gateway | 1 |

When using the DHCP BOOTP function, you can check the MAC address by the following ways:

- Viewing the label information on the expansion card.
- Viewing corresponding parameters of the AC drive.

Note

By default, after the card is powered on, parameters n19-15 to n19-20 will display the corresponding MAC address.

The expansion card also supports the IP address conflict detection function. When the IP address of this card is the same as that of another device in the network, the red indicator D6 becomes steady on, and fault 83 is reported.

The IP address conflict is detected in the following three scenarios.

| No. | Scenario | Symptom | Solution |
|-----|--|---|--|
| 1 | Both devices support IP address conflict detection. The two devices are powered on or connected to the network in sequence. | <ul style="list-style-type: none"> • If two devices are adjacent to each other, both devices can detect IP address conflict. • If two devices are not adjacent to each other, the device that is powered on or connected to the network later can detect IP address conflict. | Check the IP address conflict and modify the duplicate IP address. |
| 2 | Both devices support IP address conflict detection. The two devices are powered on or connected to the network at the same time. | Both devices can detect IP address conflict at the same time. | |
| 3 | One device supports IP conflict detection, whereas the other device does not support IP conflict detection. | No matter which device is powered on first, the device that does not support IP address conflict detection will be assigned with the IP address, while the device that supports IP address conflict detection will detect IP address conflict. | |

Note

- The expansion card detects IP address conflict upon power-on and IP address assignment by DHCP in the active mode, and then detects IP address conflict in the passive mode.
- IP address assignment by using the DHCP function will fail if an assignment conflict occurs during the process.

8.6.3 Expansion Card Parameters

| Parameter Code | Parameter Name | Unit | Description |
|----------------|--|------|--|
| A2-29 | Expansion card type | 1 | Type of the expansion card installed in the slot |
| A2-30 | Expansion card version | 1 | Software version of the expansion card |
| n19-15 | First byte of the MAC address of the expansion card | 1 | MAC address of the expansion card |
| n19-16 | Second byte of the MAC address of the expansion card | 1 | MAC address of the expansion card |
| n19-17 | Third byte of the MAC address of the expansion card | 1 | MAC address of the expansion card |
| n19-18 | Fourth byte of the MAC address of the expansion card | 1 | MAC address of the expansion card |
| n19-19 | Fifth byte of the MAC address of the expansion card | 1 | MAC address of the expansion card |
| n19-20 | Sixth byte of the MAC address of the expansion card | 1 | MAC address of the expansion card |

8.6.4 AC Drive Start via Field Bus

Before configuring AC drive parameters, set the motor basic parameters, control method, control mode, and encoder. After settings, perform motor auto-tuning. For details, see *MD580 Series Low-voltage High-performance Engineering AC Drive Commissioning Guide*. After the commissioning procedure described in the commissioning guide is completed, check whether the parameters in the following table are set.

Table 8–2 Parameters for start by the InoDriveStudio or operating panel

| Parameter Code | Parameter Name | Default | Description |
|----------------|-----------------------------|---------|-----------------------------|
| A9-00 | Command channel selection | 0 | Select command channel 1. |
| A9-02 | Reference channel selection | 0 | Select reference channel 1. |

| Parameter Code | Parameter Name | Default | Description |
|----------------|-------------------------------------|---------|---|
| A9-04 | Motor data group selection 0 source | 0 | Select the first group of motor parameters. |
| A9-05 | Motor data group selection 1 source | 0 | |
| E0-00 | Control mode | 2 | V/f control mode |
| E0-01 | Control method | 0 | Speed control |
| E1-00 | Start mode | 0 | Direct start |
| E1-27 | OFF1 stop mode | 1 | Decelerate to stop |
| E3-00 | V/f mode selection | 0 | V/f curve |
| E3-01 | V/f curve selection | 0 | Linear V/f |
| C8-04 | RFG selection 1 | 0 | Select RFG 1 acceleration/ deceleration time. |
| C8-05 | RFG selection 2 | 0 | |
| C8-08 | RFG 1 acceleration time | 20 | RFG 1 acceleration time of 20s |
| C8-09 | RFG 1 deceleration time | 20 | RFG 1 deceleration time of 20s |

When using the field bus communication method to start the drive, determine a protocol for data interaction with the host controller and set parameters according to the protocol. The field bus adapter A is configured as the EtherNet/IP bus to start the equipment, which is used as an example in the section.

The following table describes the data sent by the host controller to the MD580.

| Data | Definition | Description |
|------|-----------------|--|
| PZD1 | Control word | For details, see " Table 8-3 PZD1 control word definition " on page 139. The preceding table is only an example. You can adjust definitions of each bit of PZD1 as required. |
| PZD2 | Speed reference | The speed ramp is determined by PLC. 4096 represents 100% of the motor rated frequency. |

Table 8-3 PZD1 control word definition

| Bit | Description |
|-------|---|
| Bit 0 | 0: Stop 1: Brake apply and start when bit 0 is set from 0 to 1 |
| Bit 1 | 0: Coast to stop 1: Necessary running conditions |
| Bit 2 | 0: Quick stop 1: Necessary running conditions |

| Bit | Description |
|-----------------|---|
| Bit 3 | 0: Blocking output 1: Operation enable |
| Bit 4 | 0: Disabled 1: Fault reset valid when bit 4 is set from 0 to 1 |
| Bit 5 to bit 15 | Reserved |

PZD2 speed reference configuration

| Parameter Code | Parameter Name | Value | Description |
|----------------|------------------------------|---------------|--|
| A9-00 | Command channel source | 0 | Select command channel 1. |
| A9-02 | Reference channel selection | 0 | Select reference channel 1. |
| C0-00 | Main speed control reference | U15-19 (2519) | Select PZD2 of the fieldbus adapter A as the speed reference source. |

Output of bit-to-word function 1 for status word

| Parameter Code | Parameter Name | Value | Description |
|----------------|--|--------------|-----------------------------|
| L10-10 | Bit-to-word module A enable | 1 | Enable |
| L10-11 | Bit 00 selection of bit-to-word module A | U1-12 (1112) | Ready to switch on |
| L10-12 | Bit 01 selection of bit-to-word module A | U1-13 (1113) | Ready to run |
| L10-13 | Bit 02 selection of bit-to-word module A | U1-14 (1114) | Running |
| L10-14 | Bit 03 selection of bit-to-word module A | U1-15 (1115) | Fault activated |
| L10-15 | Bit 04 selection of bit-to-word module A | 0 | - |
| L10-16 | Bit 05 selection of bit-to-word module A | 0 | - |
| L10-17 | Bit 06 selection of bit-to-word module A | 0 | - |
| L10-18 | Bit 07 selection of bit-to-word module A | U1-19 (1119) | Alarm/minor fault activated |
| L10-19 | Bit 08 selection of bit-to-word module A | 0 | - |
| L10-20 | Bit 09 selection of bit-to-word module A | 0 | - |

| Parameter Code | Parameter Name | Value | Description |
|----------------|--|-------|---|
| L10-21 | Bit 10 selection of bit-to-word module A | 0 | - |
| L10-22 | Bit 11 selection of bit-to-word module A | 0 | - |
| L10-23 | Bit 12 selection of bit-to-word module A | 0 | - |
| L10-24 | Bit 13 selection of bit-to-word module A | 0 | - |
| L10-25 | Bit 14 selection of bit-to-word module A | 0 | - |
| L10-26 | Bit 15 selection of bit-to-word module A | 0 | - |
| L10-88 | Positive and negative logic selection for bit-to-word module A | 0 | Bit 0 to bit 15 input of bit-to-word module A takes effect based on positive logic. |

The following table describes the data sent by the MD580 to the host controller.

| Data | Definition | Description |
|------|----------------|--|
| PZD1 | Status word 1 | For details, see the status word definition table. |
| PZD2 | DC bus voltage | 1000 indicates voltage of 100.0 V . |

Table 8–4 Status word definition

| Bit | Description |
|-----------------|--|
| Bit 0 | 0: Not ready to switch on 1: Ready to switch on |
| Bit 1 | 0: Not ready to run 1: Ready to run |
| Bit 2 | 0: Not operating 1: Operating |
| Bit 3 | 0: No fault 1: Fault activated |
| Bit 4 to bit 6 | Reserved |
| Bit 7 | 0: No alarm 1: Alarm activated |
| Bit 8 to bit 15 | Reserved |

Fieldbus adapter A configuration

| Parameter Code | Parameter Name | Value | Description |
|----------------|--|-------------------|--|
| n2-00 | Bus type of bus adapter | 10 | The bus adapter A is defined as the EtherNet/IP type. |
| n2-01 | Communication disconnection detection delay | 1.00 | A communication failure is reported one second after communication interruption. |
| n2-02 | Communication mode for fieldbus adapter | 0 [Standard mode] | Abnormalities and faults of the fieldbus adapter communication card are detected by default. |
| n2-03 | Detection setting for continuous CRC check errors in communication | 0 | The fieldbus adapter receives data without CRC. |
| n2-04 | Process data output 1 | U6-20 (1620) | Use the bit-to-word function module A to configure status words. |
| n2-05 | Process data output 2 | U5-05 (1505) | It indicates the DC bus voltage (100 ms filtering) |
| n2-20 | Communication base value for process data output 1 | 0 | The base value conversion is not required. |
| n2-21 | Communication base value for process data output 2 | 0 | The base value conversion is not required. |
| n2-36 | Communication base value for process data input 1 | 0 | The base value conversion is not required. |
| n2-37 | Communication base value for process data input 2 | 0 | The base value conversion is not required. |
| n19 - 00 | Expansion card slot selection | 0 to 3 | 1 |

PZD 1 control word configuration

| Parameter Code | Parameter Name | Value | Description |
|----------------|--------------------------------|--------------|--|
| b0-00 | Start/Stop control word source | 1 | The parameter (group b0) is set as required. |
| b0-01 | Self-defined OFF1 source | U0-48 (1048) | Select bit 0 of PZD1 for the bus adapter A as the OFF1 command source. |

| Parameter Code | Parameter Name | Value | Description |
|----------------|--|--------------|---|
| b0-02 | Self-defined OFF2 source 1 | U0-49 (1049) | Select bit 1 of PZD1 for the bus adapter A as the OFF2 command source. |
| b0-03 | Self-defined OFF3 source 1 | U0-50 (1050) | Select bit 2 of PZD1 for the bus adapter A as the OFF3 command source. |
| b0-04 | User-defined running permission command source | U0-51 (1051) | Select bit 3 of PZD1 for the fieldbus adapter A as the running permission command source. |
| b0-05 | User-defined fault reset command source 1 | U0-55 (1055) | Select bit 4 of PZD1 for the bus adapter A as the fault reset command source. |

Note

For the PZD1 control word sent by the host controller, user-defined OFF2 source, user-defined OFF3 source 1, user-defined running permission command source are invalid. That is, the corresponding bit is set to 1. At this time, the AC drive is ready for startup, and the AC drive status machine can be viewed through U5-50. When the AC drive is in the state of ready for startup, the value of OFF1 changes from 0 to 1 to send the start command. When the AC drive is in the running state, the value of OFF1 changes from 1 to 0 to send the stop command.

Take ["Table 8-3 PZD1 control word definition" on page 139](#) as an example.

1. The host controller sends PZD1=0x0E.
2. After the AC drive is in the ready to run state, the host controller sends PZD1=0x0F to start the AC drive.
3. When the AC drive is running, the host controller sends PZD1=0x0E to stop the AC drive.

For detailed start/stop commands and stop modes, see *MD580 Series Low-Voltage High-performance Engineering AC Drive Commissioning Guide*.

8.7 Application Instances

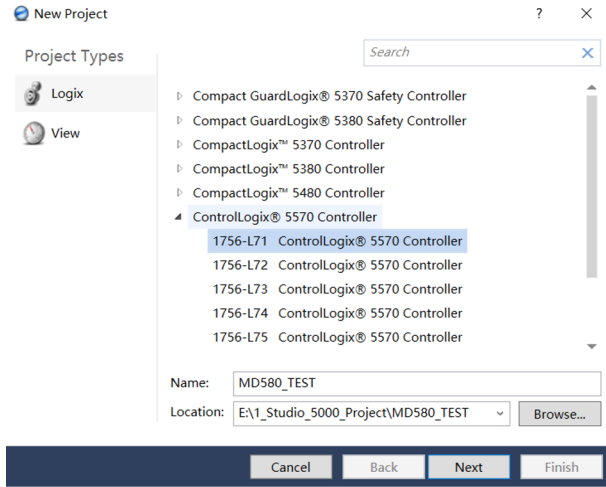
8.7.1 Master 1769-L71 Using the MD580-SI-EN1 Card

In this section, version Studio5000-32.00.00 is used, the master is 1769-L71, and the IP address and other information have been configured in advance according to the user guide. Both network ports on the expansion card are available. To use the expansion card, set n19-00 to 1.



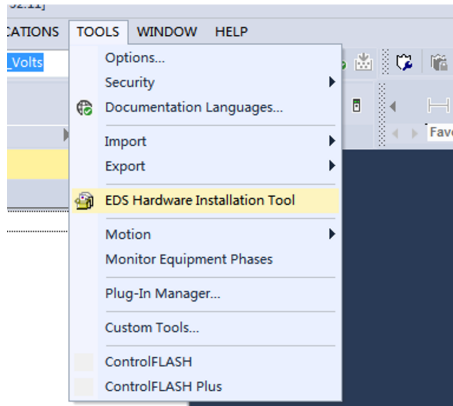
1. Create a project.

Open Studio 5000 and create a project. Select "1756-L71 ControlLogix® 5570 Controller" under "ControlLogix® 5570 Controller" as the controller model.

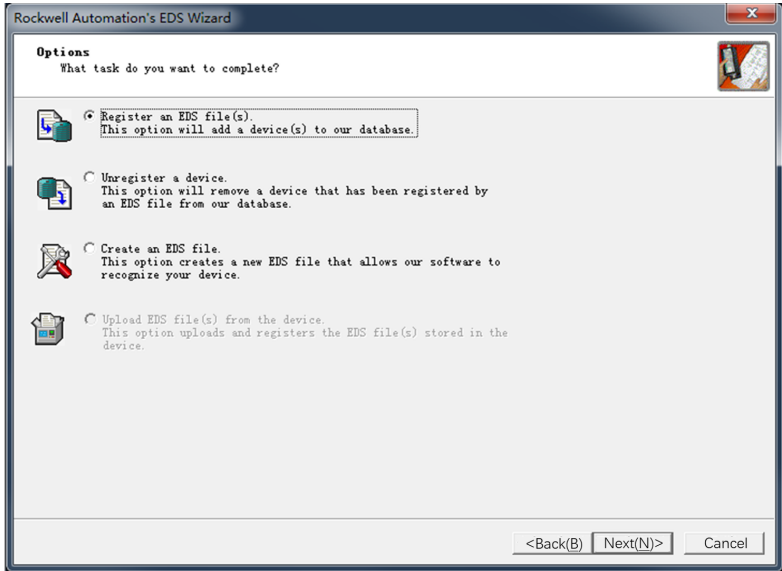


2. Import the EDS file

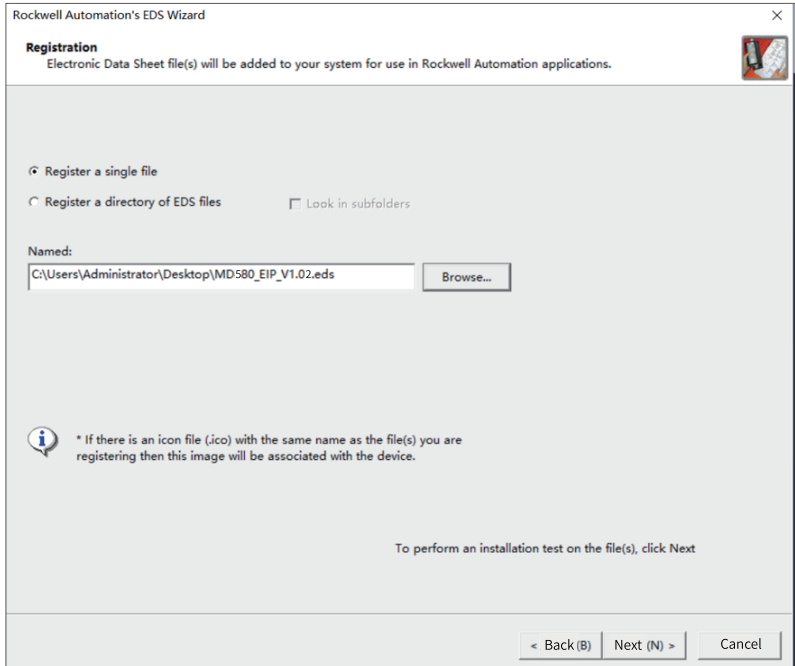
- a. Go to "Tools" > "EDS Hardware Installation Tool".



- b. Select "Register an EDS file(s)", and click "Next".



c. Select the EDS file stored in your computer and click "Next".



d. Keep clicking "Next" until the "Finish" button appears. Then click "Finish".

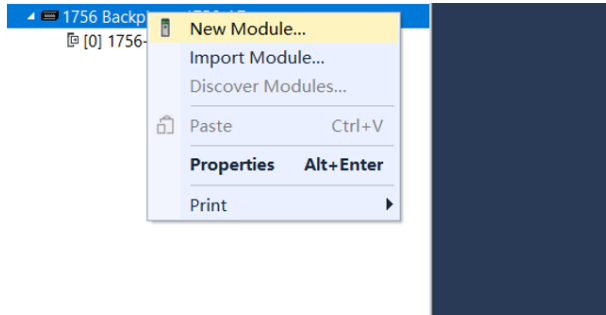
3. Set the IP address for the MD580_EN1 card. Take a static IP address as an example.

For example, to set the static IP address to 192.168.0.11, the subnet mask to 255.255.255.0, and the gateway to 192.168.0.1, set n19-02 to n19-14 of the AC drive on the background software according to the following table.

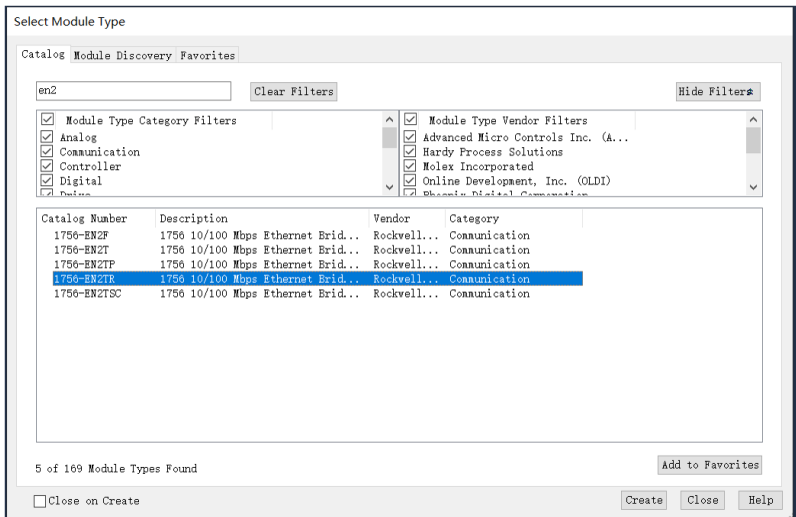
| Parameter Code | Parameter Name | Value |
|----------------|---|-------|
| n19-02 | DHCP enable | 0 |
| n19-03 | Most significant byte of the IP address | 192 |
| n19-04 | Second most significant byte of the IP address | 168 |
| n19-05 | Third byte of the IP address | 0 |
| n19-06 | Least significant byte of the IP address | 11 |
| n19-07 | Most significant byte of the subnet mask | 255 |
| n19-08 | Second most significant byte of the subnet mask | 255 |
| n19-09 | Third byte of the subnet mask | 255 |
| n19-10 | Least significant byte of the subnet mask | 0 |
| n19-11 | Most significant byte of the gateway | 192 |
| n19-12 | Second most significant byte of the gateway | 168 |
| n19-13 | Third byte of the gateway | 0 |
| n19-14 | Least significant byte of the gateway | 1 |

4. Create a project on the Studio 5000.

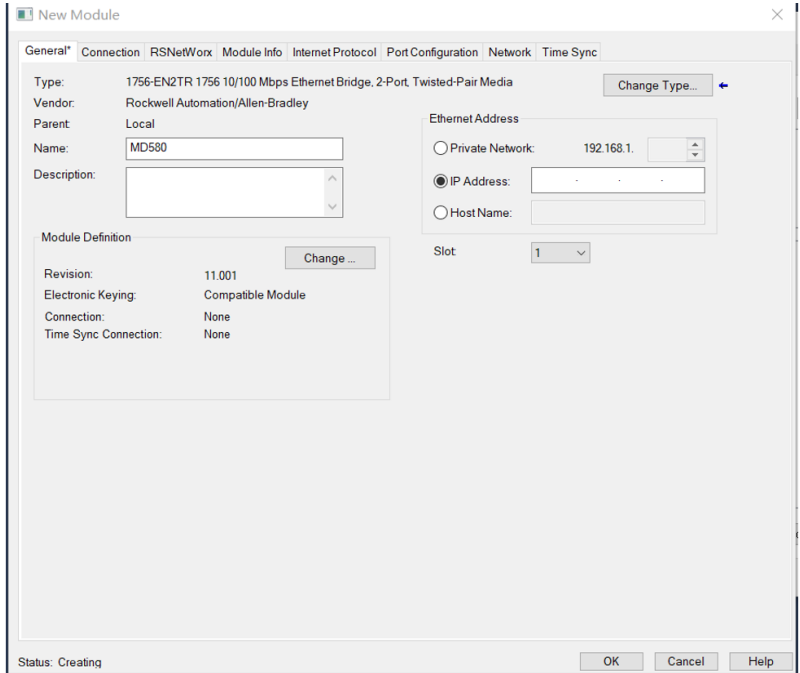
- a. In the left pane, right-click "1756 Backplane" and select "New Module".



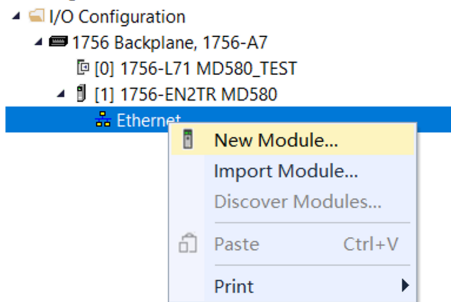
b. Enter "en2" to perform search, and select "1756-EN2TR" in the result list.



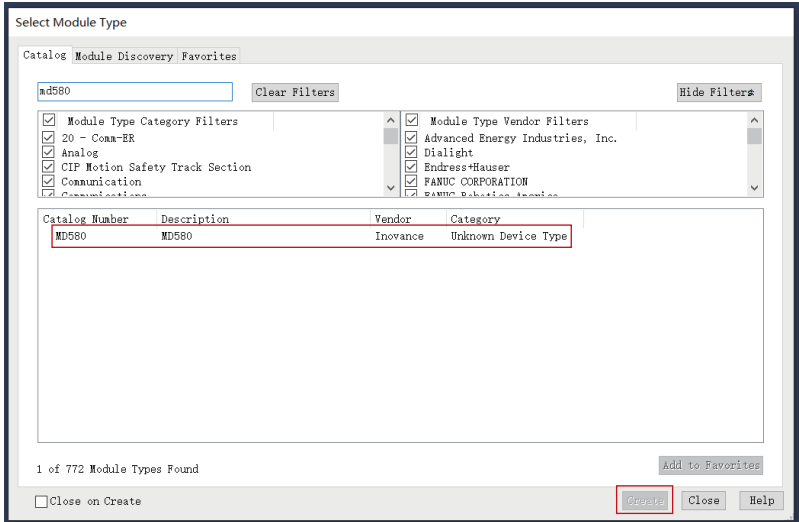
c. Click "Create", enter a name in "Name", and click "OK".



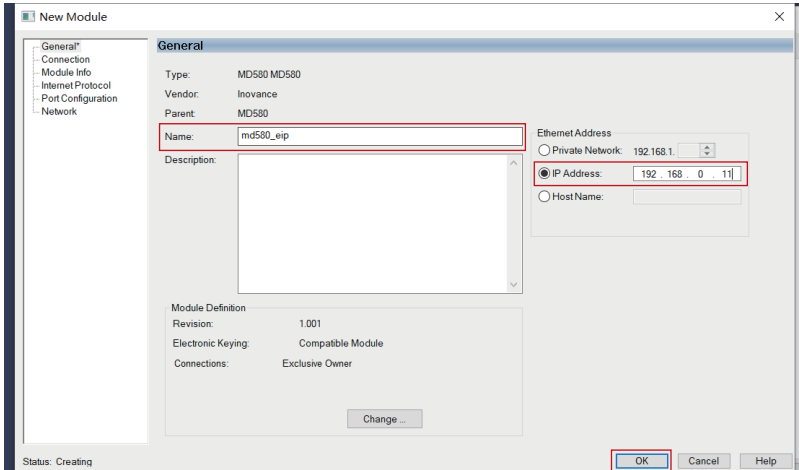
5. On the added device list, right-click "Ethernet" and select "New Module".



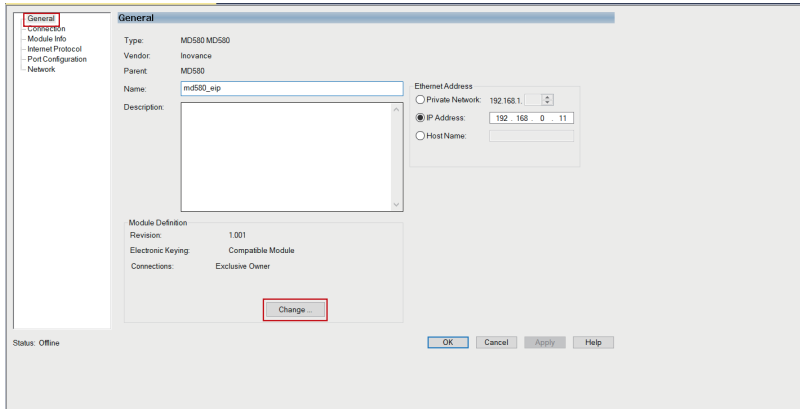
a. Locate "MD580" and click "Create".



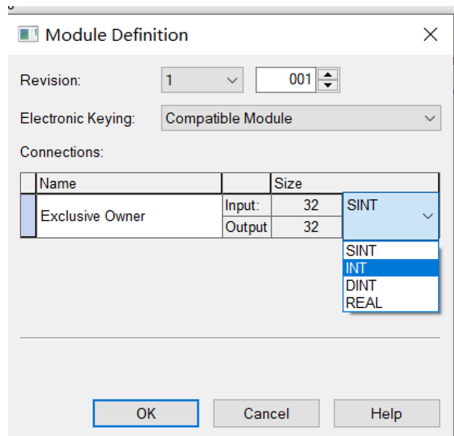
- b. On the displayed configuration interface, enter the configured IP address and specify the name.



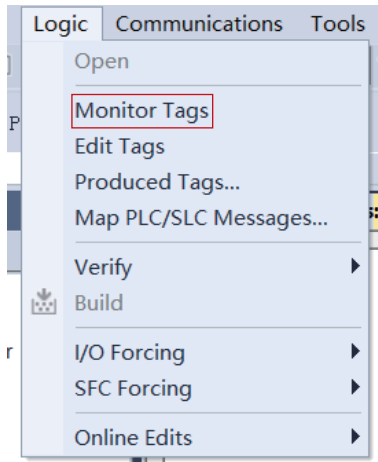
- c. Double-click the added md580_eip. In the displayed interface, click "General", and then click "Change".



- d. Select "INT" from the "SINT" drop-down list, click "OK", and click "Yes" to ignore the warning.



- e. Choose "Logic" > "Monitor Tags".



f. Unfold "md580_eip:O.Data", and select "Hex" in the "Style" column.

| Name | Value | Force Mask | Style | Data Type | Description |
|----------------------|-------|------------|-------|-----------|-------------|
| md580_eip:O.Data | (-) | (-) | Hex | SINT[32] | |
| md580_eip:O.Data[0] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[1] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[2] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[3] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[4] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[5] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[6] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[7] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[8] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[9] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[10] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[11] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[12] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[13] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[14] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[15] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[16] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[17] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[18] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[19] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[20] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[21] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[22] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[23] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[24] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[25] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[26] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[27] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[28] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[29] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[30] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[31] | 16#00 | | Hex | SINT | |
| md580_eip:O.Data[32] | 16#00 | | Hex | SINT | |

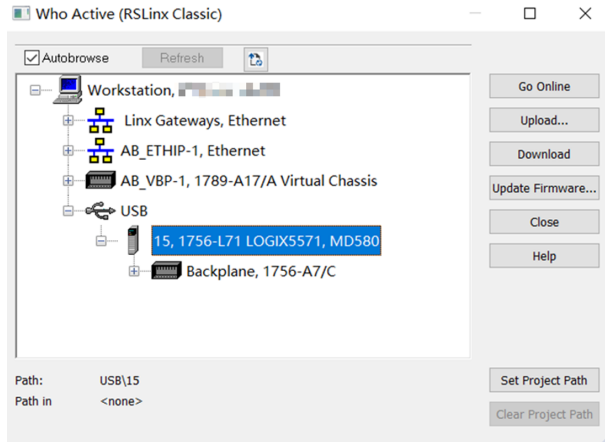
The parameters under "md580_eip:O.Data" are related to PDO mappings. Every two parameters form a group. Data 0 to data 23 are I/O message mappings (T->O). You can configure other fields as required.

md580_en1:I.Data and md580:O.Data are I/O data during transmission. Values written to O.Data are actually written into the parameters corresponding to the configured mappings. The parameter configured by I/O message mapping (T->O) [0] is uploaded to I.Data regularly.

g. After the configuration is complete, click the button marked with the red square in the figure below to search for the device.

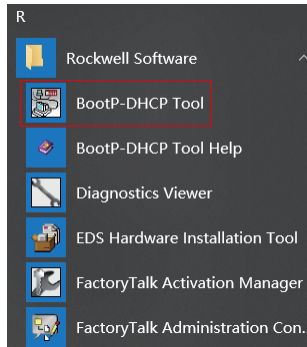


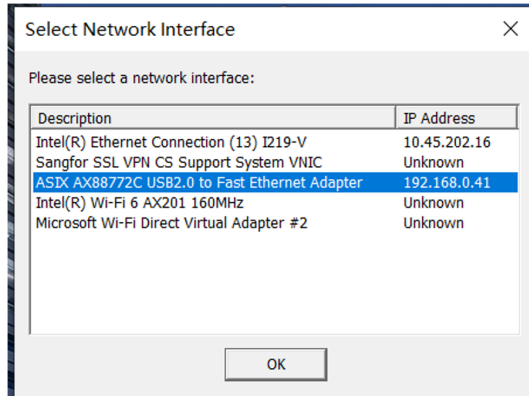
In this example, USB is used to connect the device. Select the device and click "Download" to download the code to the PLC.



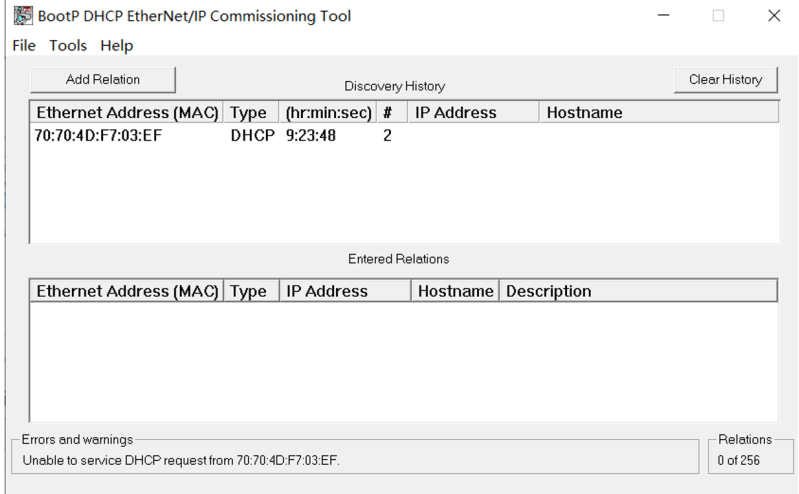
6. Use the DHCP function.

- a. Set n19-02 to 1 to enable the DHCP function, power on the AC drive again, and connect the PC and AC drive to the same network. On the start menu, select "BootP-DHCP Tool", and then select the network card.

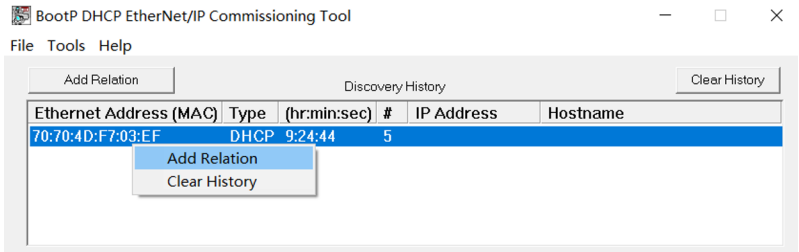




b. After power-on, find the device request in the BootP DHCP EtherNet/IP Commissioning Tool.



c. Right-click the request and select "Add Relation".



d. Set the IP address and click "OK".

New Entry ×

Server IP Address:

Client Address (MAC):

Client IP Address:

Hostname:

Description:

e. Select the device and click "Enable BOOTP/DHCP".

| Ethernet Address (MAC) | Type | IP Address | Hostname | Description |
|------------------------|------|--------------|----------|-------------|
| 70:70:4D:F7:03:EF | | 192.168.0.11 | | |

Errors and warnings
Listening for connected devices...

Relations
1 of 256

f. Wait for completion.

Note

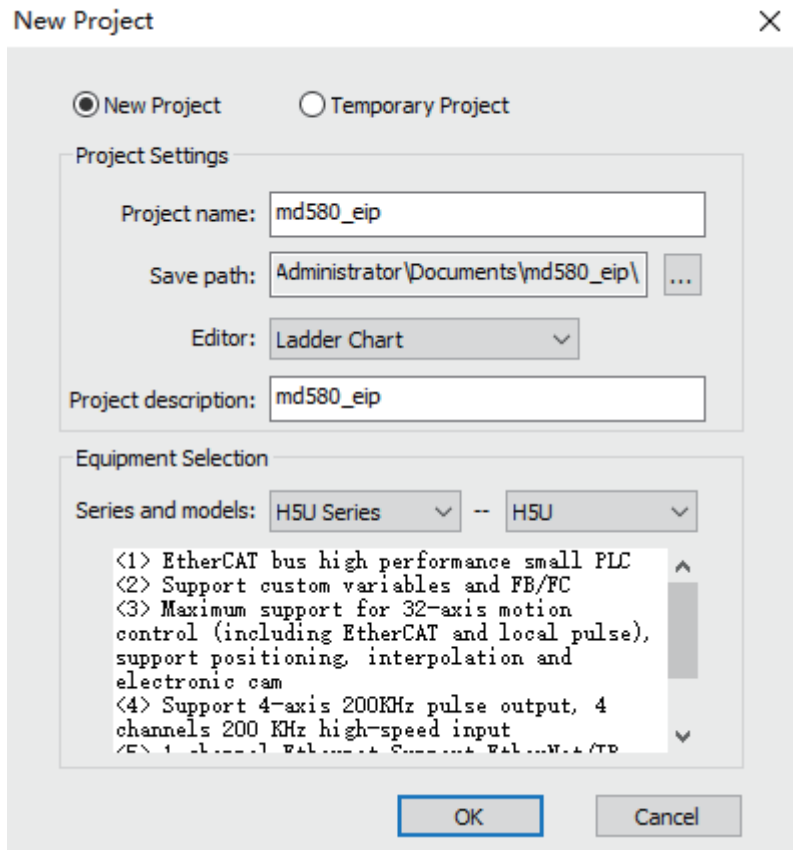
After DHCP is configured, the IP address obtained through DHCP is written to n19-03 to n19-14. If DHCP is no longer needed, you need to set parameter n19-02 to 0 to disable DHCP. Otherwise, DHCP will be used to configure IP addresses each time you power on the device.

8.7.2 Master H5U Using the MD580-SI-EN1 Card

In this section, AutoShop V4.7.9.0 is used, and the master is H5U-1614MTD. n19-00, IP addresses, and other information have been configured in advance according to the user guide. The left and right sides of the EIP card can be used.

1. Create a project.

Open the AutoShop, create and name a project, and select the H5U series as the device type.

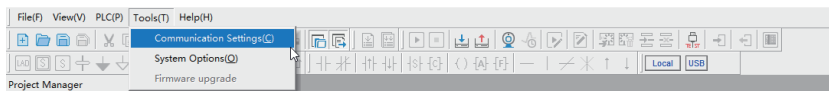


- Set the IP address for the expansion card. Take a static IP address as an example. For example, to set the static IP address to 192.168.0.11, the subnet mask to 255.255.255.0, and the gateway to 192.168.0.1, set n19-02 to n19-14 of the AC drive on the background software according to the following table.

| Parameter Code | Parameter Name | Value |
|----------------|--|-------|
| n19-02 | DHCP enable | 0 |
| n19-03 | Most significant byte of the IP address | 192 |
| n19-04 | Second most significant byte of the IP address | 168 |
| n19-05 | Third byte of the IP address | 0 |

| Parameter Code | Parameter Name | Value |
|----------------|---|-------|
| n19-06 | Least significant byte of the IP address | 11 |
| n19-07 | Most significant byte of the subnet mask | 255 |
| n19-08 | Second most significant byte of the subnet mask | 255 |
| n19-09 | Third byte of the subnet mask | 255 |
| n19-10 | Least significant byte of the subnet mask | 0 |
| n19-11 | Most significant byte of the gateway | 192 |
| n19-12 | Second most significant byte of the gateway | 168 |
| n19-13 | Third byte of the gateway | 0 |
| n19-14 | Least significant byte of the gateway | 1 |

On the AutoShop, click the tool menu, and select "Communication Settings(C)". Take "USB" as an example of the communication type. Click "Test" to determine whether the PLC can be connected.



Communication Settings X

PLC Communication Settings

Communication type:

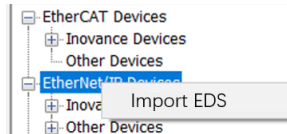
Device IP:

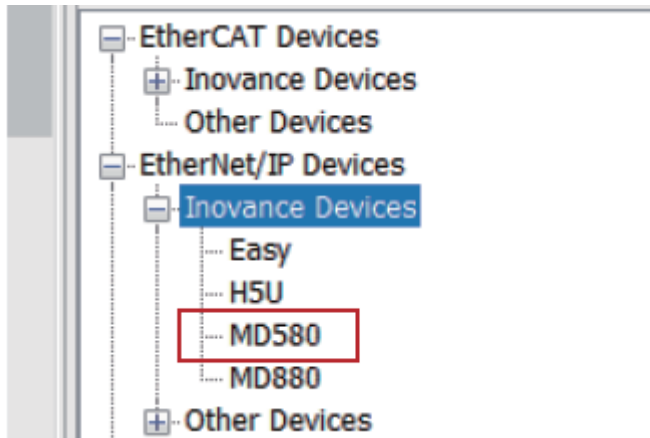
Device name:

Search PLC

| NO. | IP Address | Model | Device Name | MAC Address |
|-----|------------|-------|-------------|-------------|
| | | | | |

3. Take "USB" as an example of the communication type. Click "Test" to determine whether the PLC can be connected.
 In the right tool box, right-click "EtherNet/IP Device" and select "Import EDS".
 Double-click the displayed "MD580".





4. Configure the slave parameters.

Enter the configured static IP address in the "IP address" text box.

| | | |
|-------------------------|--------------------|---|
| General | Address Settings | |
| Connections | IP Address | 192.168.1.2 |
| Server Tag | EtherNet/IP | |
| Assembly | Electronic Keying | |
| Ethernet/IP I/O Mapping | Keying Options: | <input type="radio"/> Compatible Module <input checked="" type="radio"/> Exact Match <input type="radio"/> Disable Keying |
| Information | Vendor ID | 1660 |
| Status | Device Type | 150 |
| | Product Code | 1 |
| | Major Revision | 1 |
| | Minor Revision | 1 |

5. Configure the EtherNet/IP I/O mappings according to actual conditions, and compile and download to the PLC.

Debug(D) Tools(T) Window(W) Help(H)

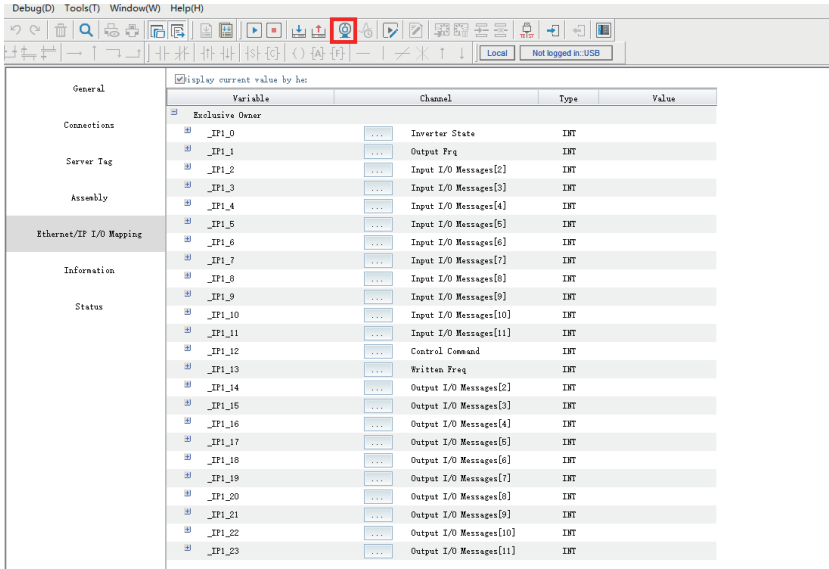
Display current value by hex

| Variable | Channel | Type | Value |
|-----------------|-------------------------|------|-------|
| Exclusive Owner | | | |
| _IP1_0 | Inverter State | INT | |
| _IP1_1 | Output Frq | INT | |
| _IP1_2 | Input I/O Messages[2] | INT | |
| _IP1_3 | Input I/O Messages[3] | INT | |
| _IP1_4 | Input I/O Messages[4] | INT | |
| _IP1_5 | Input I/O Messages[5] | INT | |
| _IP1_6 | Input I/O Messages[6] | INT | |
| _IP1_7 | Input I/O Messages[7] | INT | |
| _IP1_8 | Input I/O Messages[8] | INT | |
| _IP1_9 | Input I/O Messages[9] | INT | |
| _IP1_10 | Input I/O Messages[10] | INT | |
| _IP1_11 | Input I/O Messages[11] | INT | |
| _IP1_12 | Control Command | INT | |
| _IP1_13 | Written Frq | INT | |
| _IP1_14 | Output I/O Messages[2] | INT | |
| _IP1_15 | Output I/O Messages[3] | INT | |
| _IP1_16 | Output I/O Messages[4] | INT | |
| _IP1_17 | Output I/O Messages[5] | INT | |
| _IP1_18 | Output I/O Messages[6] | INT | |
| _IP1_19 | Output I/O Messages[7] | INT | |
| _IP1_20 | Output I/O Messages[8] | INT | |
| _IP1_21 | Output I/O Messages[9] | INT | |
| _IP1_22 | Output I/O Messages[10] | INT | |
| _IP1_23 | Output I/O Messages[11] | INT | |

Debug(D) Tools(T) Window(W) Help(H)

Display current value by hex

| Variable | Channel | Type | Value |
|-----------------|-------------------------|------|-------|
| Exclusive Owner | | | |
| _IP1_0 | Inverter State | INT | |
| _IP1_1 | Output Frq | INT | |
| _IP1_2 | Input I/O Messages[2] | INT | |
| _IP1_3 | Input I/O Messages[3] | INT | |
| _IP1_4 | Input I/O Messages[4] | INT | |
| _IP1_5 | Input I/O Messages[5] | INT | |
| _IP1_6 | Input I/O Messages[6] | INT | |
| _IP1_7 | Input I/O Messages[7] | INT | |
| _IP1_8 | Input I/O Messages[8] | INT | |
| _IP1_9 | Input I/O Messages[9] | INT | |
| _IP1_10 | Input I/O Messages[10] | INT | |
| _IP1_11 | Input I/O Messages[11] | INT | |
| _IP1_12 | Control Command | INT | |
| _IP1_13 | Written Frq | INT | |
| _IP1_14 | Output I/O Messages[2] | INT | |
| _IP1_15 | Output I/O Messages[3] | INT | |
| _IP1_16 | Output I/O Messages[4] | INT | |
| _IP1_17 | Output I/O Messages[5] | INT | |
| _IP1_18 | Output I/O Messages[6] | INT | |
| _IP1_19 | Output I/O Messages[7] | INT | |
| _IP1_20 | Output I/O Messages[8] | INT | |
| _IP1_21 | Output I/O Messages[9] | INT | |
| _IP1_22 | Output I/O Messages[10] | INT | |
| _IP1_23 | Output I/O Messages[11] | INT | |



8.7.3 Master AC810 Using the MD580-SI-EN1 Card

In this section, the InoProShop (V1.7.3) and AC810 are used.

1. Configure parameters of the MD580-SI-EN1 card, such as the IP address, gateway, and subnet mask.

Before connecting to the AC810 master station, set parameters such as the IP address, gateway, and mask on the InoDriveStudio. If DHCP is used, use the BOOTP to assign IP addresses.

Take a static IP address as an example.

- The static IP address is 192.168.0.11, the subnet mask is 255.255.255.0, and the gateway is 192.168.0.1. On the InoDriveStudio, set n19-02 to n19-14 of the AC drive according to the following table.

| Parameter Code | Description | Value |
|----------------|--|-------|
| n19-02 | DHCP enable | 0 |
| n19-03 | Most significant byte of the IP address | 192 |
| n19-04 | Second most significant byte of the IP address | 168 |
| n19-05 | Third byte of the IP address | 0 |

| Parameter Code | Description | Value |
|----------------|---|-------|
| n19-06 | Least significant byte of the IP address | 11 |
| n19-07 | Most significant byte of the subnet mask | 255 |
| n19-08 | Second most significant byte of the subnet mask | 255 |
| n19-09 | Third byte of the subnet mask | 255 |
| n19-10 | Least significant byte of the subnet mask | 0 |
| n19-11 | Most significant byte of the gateway | 192 |
| n19-12 | Second most significant byte of the gateway | 168 |
| n19-13 | Third byte of the gateway | 0 |
| n19-14 | Least significant byte of the gateway | 1 |

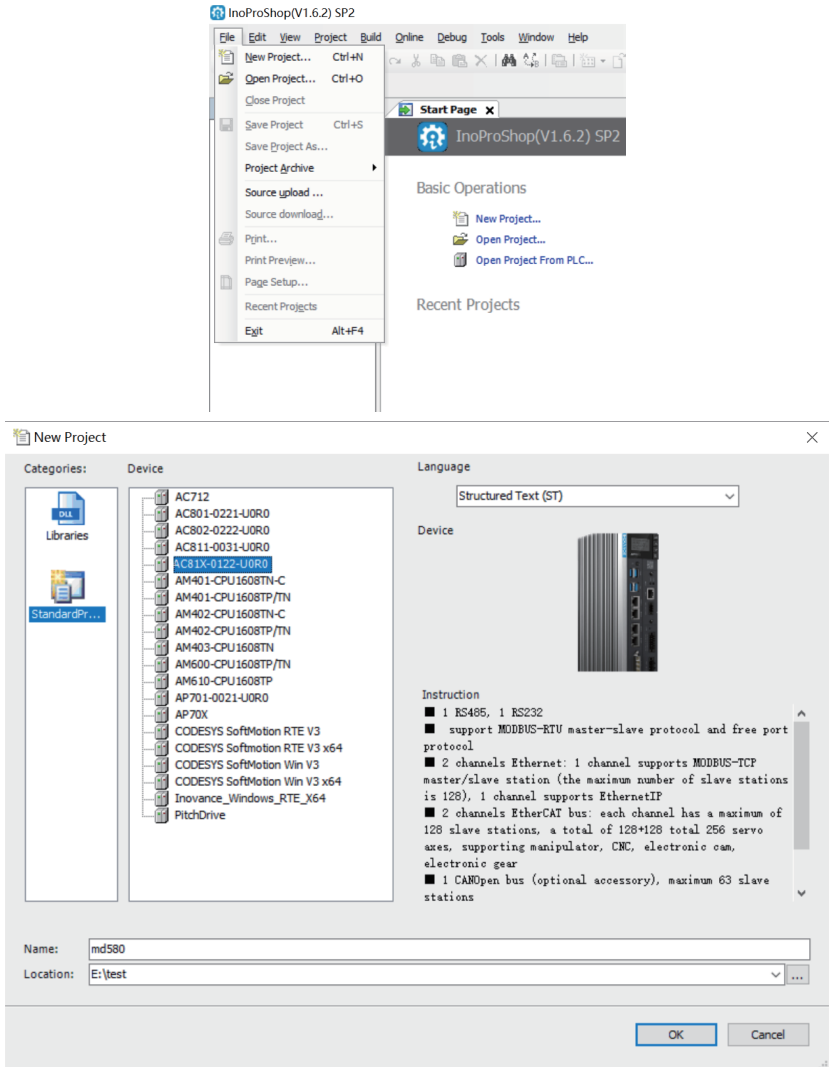
- Connect the MD580-SI-EN1 card to the LAN port A of the AC810, and connect the AC810 to the PC.

Note

The AC810 provides only LAN ports A and B and supports the EtherNet/IP protocol.

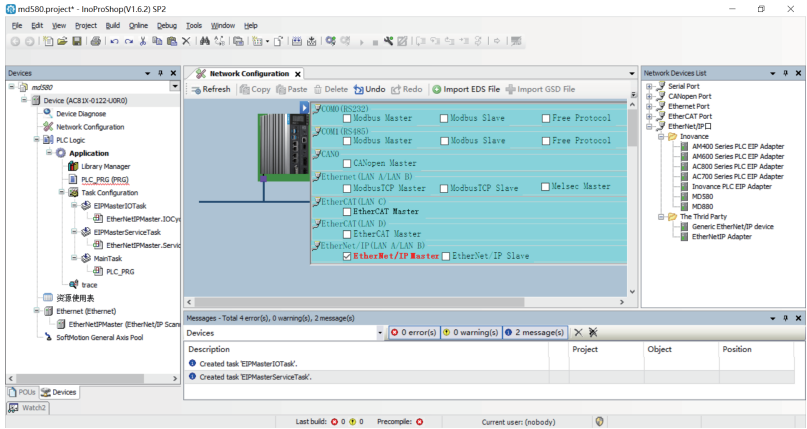
2. Create a project.

Open the InoProShop and create a project. Select "AC81X-0122-U0R0" in the "Device" pane.



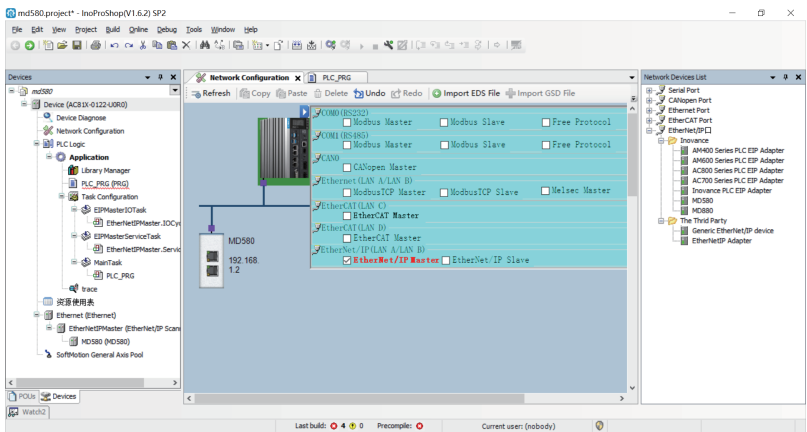
3. Import the EDS file and add a slave.

- a. Click "Network Configuration" in the left "Devices" pane. On the "Network Configuration" tab, click "Import EDS File", and then import the EDS file of the MD580-SI-EN1 card. Click the PLC, select "EtherNet/IP Master" for the network port of the connected device. Double-click the MD580 on the right device list to import the device. Because the MD580-SI-EN1 card is connected to the LAN port A, configure LAN port A as the EtherNet/IP master.

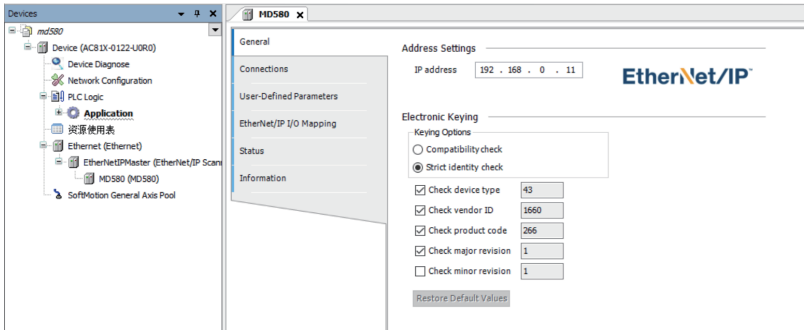


b. Add the slave and configure the slave parameters.

On the "Devices" pane, right-click "EtherNetIPMaster_A(EtherNet/IP Scanner)" and select the device adding option, or on the "Network Device List" pane, double-click "MD580". The MD580-SI-EN1 card is added.

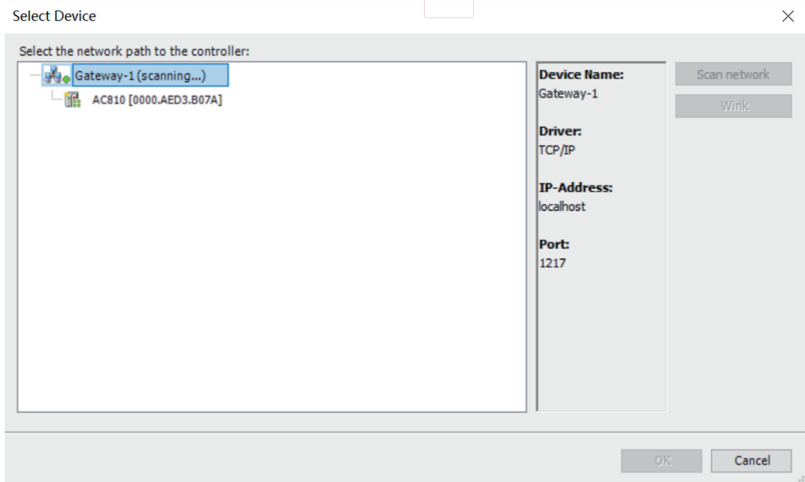
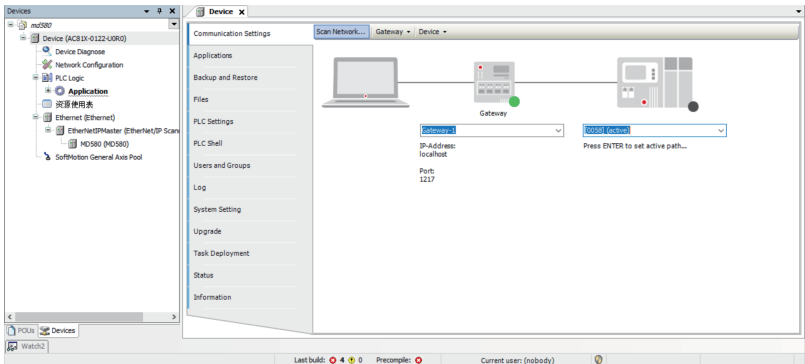


Configure the IP address (for example, 192.168.0.11) for the MD580-SI-EN1 card. The IP address must be the same as that configured on the InoDriveStudio.

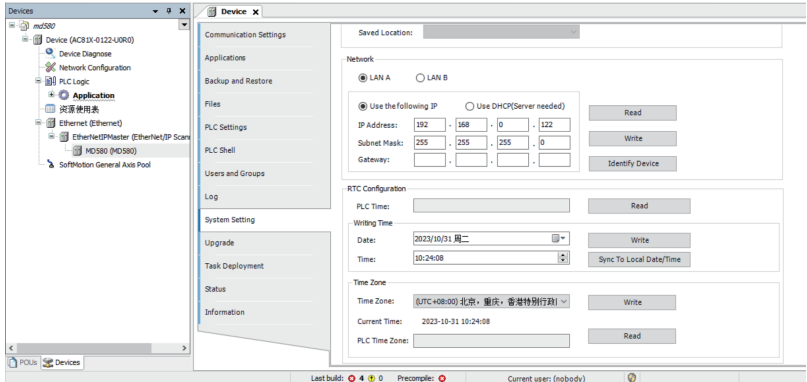


4. Configure the IP address for the master.

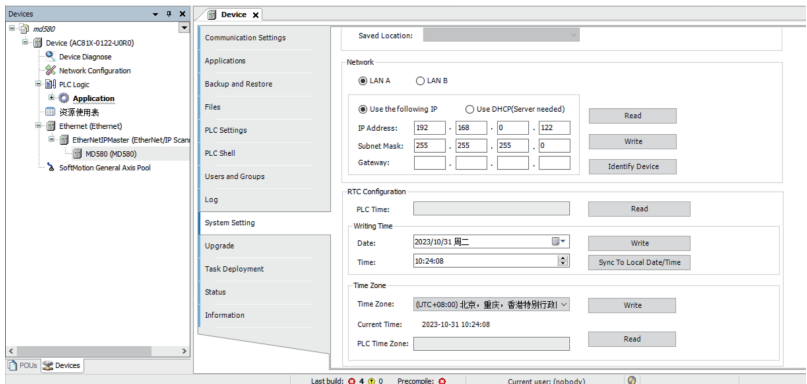
- a. Double-click "Device(AC81X-0122-U0R0)" in the left pane. On the "Communication Settings" tab, click "Scan Network", and then select AC810 in the scanned device list.



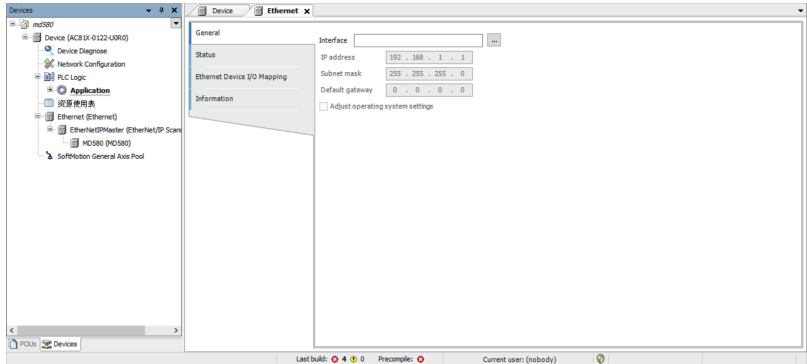
- b. To configure the IP address (LAN port A as an example) of the master, double-click "Device" in the left pane. On the "Device" tab, click "System Setting", and then click "Read" to obtain the master IP address.



Change the IP address of the master to the same network segment as the configured IP address of the slave. As the network segment is 192.168.0.X, change the IP address of the master to 192.168.0.122, and then click "Write".

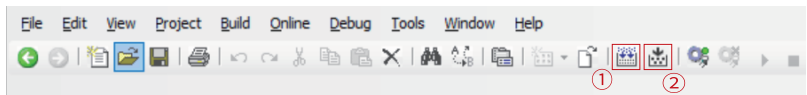


- c. Select the IP address of the master. Double-click "Ethernet_A(Ethernet)" in the left pane. On the "Ethernet" tab, click "General". Click "..." after "Interface", select the configured IP address of the LAN port A.



5. Compile and run.

- a. Click the compiling key and then click the login key.



Note

- ①: Compiling
- ②: Login

- b. Click the start key to start the master.

On the slave side, after the original red triangle icon changes to the green cycle icon, communication is successfully.



6. View and configure the process data.

In the left "Devices" pane, double-click "MD580". Click "EtherNet/IP I/O mapping" to view the process data. You can configure the process data as required.



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