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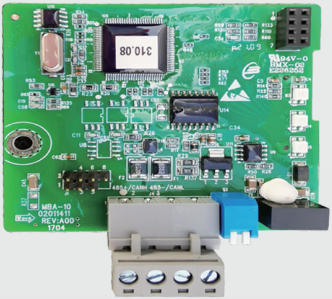

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MD580-SI-CAN1 CANopen Series Communication Expansion Card

User Guide

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Preface

■ Introduction

MD580-SI-CAN1 is a new-generation fieldbus adapter module designed for the MD580 series AC drive. It enables networking and remote control of drive systems through the CANopen fieldbus communication network.

This guide describes the technical specifications, outline dimensions, installation, wiring, and troubleshooting of the MD580-SI-CAN1 module.

■ Revision History

Date	Version	Revision
November 2024	A01	Made minor corrections.
August 2023	A00	First release.

■ Access to the Guide

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

- Do keyword search under Service and Support at *http://www.inovance.com*.
- Scan the QR code below to install My Inovance app, where you can search for and download user guides.

■ Warranty Disclaimer

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. Maintenance will be charged 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 unusual voltage
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The maintenance 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.

Table of Contents

1 Product Information

1.1 Introduction

MD580-SI-CAN1 is a new-generation fieldbus adapter module designed for the MD580 series AC drive. It enables networking and remote control of drive systems through the CANopen fieldbus communication network.

Features:

- Supports the Node Guard protocol, which enables the master to query equipment status.
- Supports the Heartbeat protocol, which enables a slave to regularly report its current status to the master.
- Supports process data object (PDO) transmission, which adopts the 16-bit type for all data.
- Supports service data object (SDO) transmission only via the accelerated transmission mechanism, where data of up to four channels is transmitted per frame.
- Supports CANIDs for all commands, which are the default values of the DS301 pre-defined connection set.
- Supports direct installation on the expansion slot of the MD580 series AC drive without external power supply.

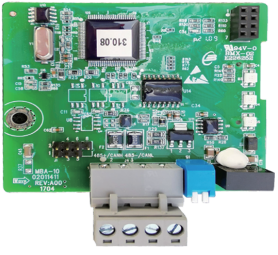


Figure 1-1 MD580-SI-CAN1 card appearance

1.2 Applicable AC Drive

Card Model	Applicable AC Drive
MD580-SI-CAN1	MD580

1.3 Technical Specifications

■ Specifications

Item	Description
Ambient temperature	-10°C to +55°C
Storage temperature	-40°C to +70°C
Relative humidity	5% to 95% RH (without condensation)
Operating environment	No corrosive gases
Installation altitude	⩽ 3000 m
Installation method	Snap-fit joint and screw tightening
Vibration	< 20 Hz: 9.8 m/s^2 (1 g) 20 Hz to 50 Hz: 5.9 m/s^2 (0.6 g)
IP rating	Enclosure IP rating: IP20
Applicable standard	EN 61800-5-1:2007 EN 61800-3:2004 IEC/EN 62109-1:2010 UL508C:2002

■ Transmission specifications

The transmission distance of the CAN bus is directly dependent on the baud rate and communication cable, as described in the following table.

Item	Technical Specification			
Transmission distance (m)	25	95	560	1100
Speed (bps)	1 M	500 K	100 K	50 K
Number of nodes	64	64	64	64
Cable size (mm^2)	0.34	0.34	0.50	0.75

1.4 Outline Dimensions

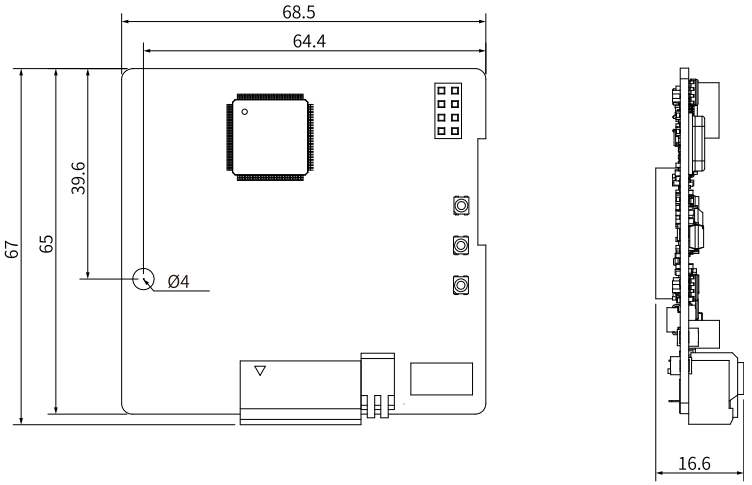


Figure 1-2 MD580-SI-CAN1 card dimensions (unit: mm)

1.5 Interface Description

■ Interface layout

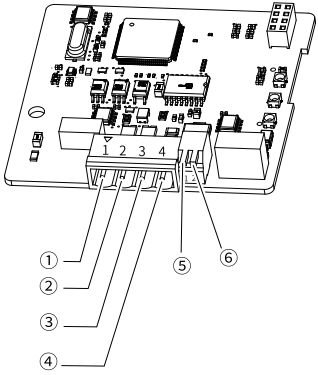


Figure 1-3 MD580-SI-CAN1 card interface layout

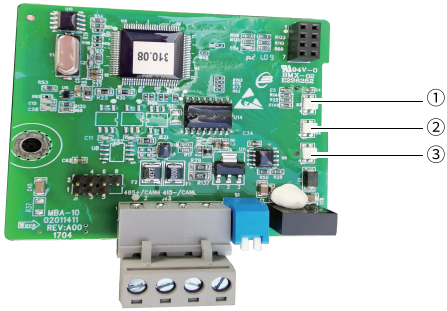
■ Interfaces

Table 1–1 MD580-SI-CAN1 card interface function description

No.	Mark	Terminal Name	Wiring	Function
①	X1-1	PE	Connecting to the shield	Recommended cable: Four-conductor shielded twisted pair (STP) cables Cross-sectional area: 0.3 mm^2 to 2.0 mm^2
②	X1-2	CANH	Twisted pair cables	
③	X1-3	CANL		
④	X1-4	CGND	Connection recommended	
⑤	S1-1	DIP switch 1	-	Termination resistor selection Valid when S1-1 and S1-2 are both set to ON.
⑥	S1-2	DIP switch 2	-	

■ Status indicators

The MD580-SI-CAN1 module uses three status indicators to indicate bus communication faults. See the following table for troubleshooting instructions.



No.	Name	Indicator Status	Description
①	INOBUS	Flashing in green	The communication between the module and the MD580 AC drive is being established.
		Steady ON in green	The communication between the module and the MD580 AC drive is normal.
②	MODULE	Steady ON in green	The module is running properly.
		Flashing in red once and turning OFF for 1 s	The CAN bus encounters a passive error alarm.
		Flashing in red twice and turning OFF for 1 s	The CANopen heartbeat times out.
		Flashing in red three times and turning OFF for 1 s	The length of the PDO received is inconsistent with the configuration.
		Flashing in red	The communication parameters are being read.
		Steady ON in red	The CAN bus is disconnected.

No.	Name	Indicator Status	Description
③	FIELDBUS	Steady ON in green	The bus is in the operational state.
		Flashing in green once and turning OFF for 1 s	The bus is in the stopped state.
		Flashing in green	The bus is in the pre-operational state.

2 Installation Instructions

■ Installation precautions

- Power off the MD580 AC drive before installing the MD580-SI-CAN1 module. Failure to comply may result in damage to the AC drive or module.
- Do not drop or impact the MD580-SI-CAN1 module to avoid damage.
- Do not disassemble the MD580-SI-CAN1 module to avoid damage.
- Tighten the screws according to the required torque to avoid damage or loose fastening.

■ Installation tools

The following tools are required for installation:

- 1# Phillips screwdriver
- 1# straight screwdriver

■ Tightening torque for screws and fasteners

The screws mentioned in this guide must be tightened according to the following torque.

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

■ Product structure

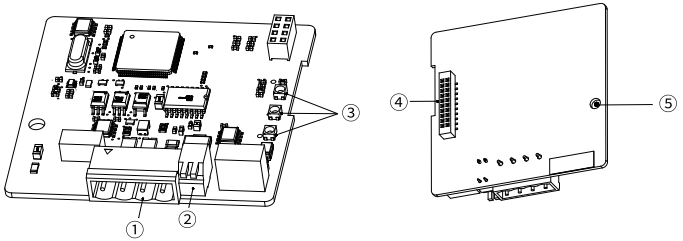


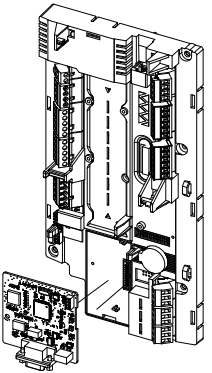
Figure 2-1 Product structure

No.	Name	Description
①	Bus communication terminal	CANopen bus communication terminal
②	Resistor DIP switch	CAN bus termination resistor
③	Status indicator	Indicates module operation status
④	Slot terminal	Electrically connects the module to the AC drive
⑤	Retaining screw hole	Tightens the module to the AC drive and ensures proper PE layer connection

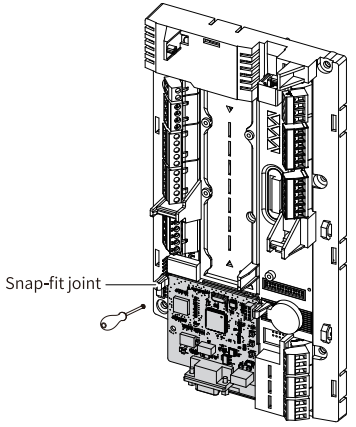
■ Installation method

The MD580-SI-CAN1 module can be inserted into the expansion slot of the MD580 AC drive. The installation steps are as follows:

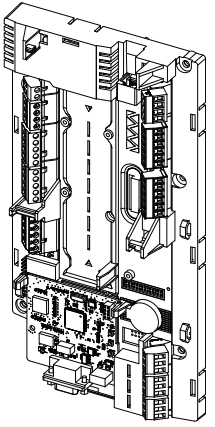
1. Align the module with the expansion slot on the MD580 AC drive.



2. Align the slot terminals of the module with the terminals on the control board and press firmly to ensure the snap-fit joints on both sides of the control board bracket securely fasten the module. Then, tighten the module's grounding screw using a #1 Phillips screwdriver.



3. The installation is completed.



- To meet the Electromagnetic Compatibility (EMC) requirements and ensure normal operation of the MD580-SI-CAN1 module, fasten the screw to ground the module reliably.
- The MD580-SI-CAN1 module and the MD580 AC drive are electrically connected at the slot. Ensure proper installation and electrical connection.

■ Removal method

Remove the module by following the steps above in reverse order.

1. Disconnect all power supplies and properly unplug all cables connected to the module.
2. Remove the grounding screw of the module using a 1# Phillips screwdriver.
3. Release the snap-fit joints on both sides of the module and pull the module outward.

3 Electrical Connection

■ Terminal Wiring

For the layout and description of interface terminals, see *"1.5 Interface Description" on page 7*. The terminal wiring instructions are shown below.

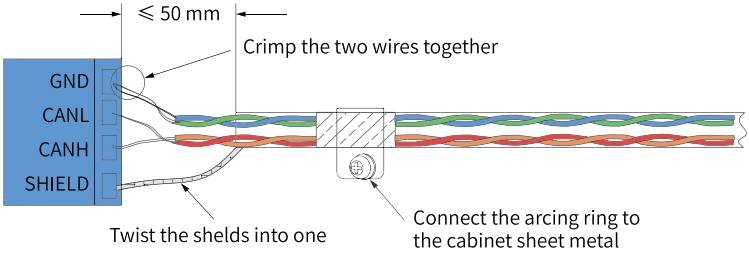


Figure 3-1 Terminal wiring

■ Bus topology

The CAN bus supports a maximum of 63 nodes (excluding the master), as shown in the following figure. The termination resistors of the master and the last node need to be set to ON.

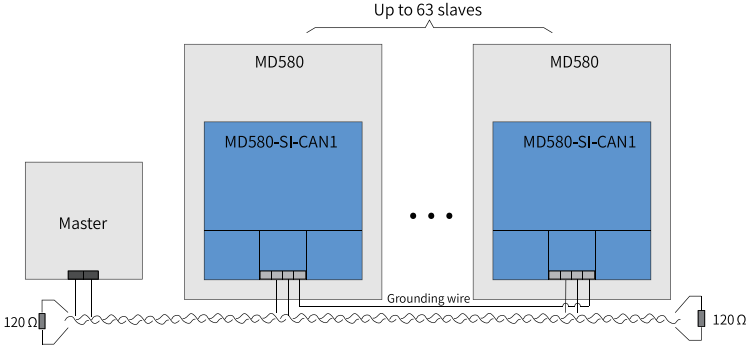


Figure 3-2 Networking diagram

■ Bus transmission distance

The transmission distance of the CAN bus is directly dependent on the baud rate and communication cable, as described in the following table.

No.	Transmission Distance	Speed	Number of Nodes	Cable Specification
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 CANopen Communication Protocol

4.1 Overview of Communication

The CANopen protocol was developed from the CAN Application Layer (CAL) in the late 1990s by CAN-in-Automation (CiA), an organization based in Nuremberg, Germany. Through multiple revisions of the CANopen protocol specifications, the stability, real-time capabilities, and interference resistance of the CANopen protocol have been further improved. Furthermore, CiA has continuously introduced device profile protocols based on the CANopen base protocol, CiA 301, promoting the rapid development and adoption of the CANopen protocol across various industries. These device profile protocols redefine the internal data meanings of CANopen or add new control logic tailored to specific application objects in different industries.

4.2 Communication Data Frame Structure

■ CANopen pre-defined connection set

CANopen defines a mandatory default identifier (CAN-ID) allocation table. These identifiers are available in the pre-operation state and can be modified through dynamic assignment. CANopen devices must provide identifiers to the corresponding communication objects they supports. The pre-defined connection set defines four receive-PDOs, four transmit-PDOs, one SDO (occupying two CAN-IDs), one emergency object, and one node-error-control ID. It also supports NMT-Module-Control service that does not require confirmation, as well as broadcasting of SYNC objects and Time Stamp objects.

Table 4–1 Broadcast objects

Broadcast Objects in the CANopen Pre-defined Master/Slave Connection Set			
Communication Object	Parameter	COB-ID	Communication Parameter Index in OD
Network management	0000	000H	-
Synchronization object	0001	080H	1005H, 1006H, 1007H
Emergency message	0010	100H	1012H, 1013H

Table 4–2 Peer-to-Peer objects

Peer-to-Peer Objects in the CANopen Pre-defined Master/Slave Connection Set			
Communication Object	Parameter	COB-ID	Communication Parameter Index in OD
Emergency	0001	081H-0FFH	1024H, 1015H
PDO1 (transmit)	0011	181H-1FFH	1800H
RDO1 (receive)	0100	201H-27FH	1400H
TDO2 (transmit)	0101	281H-2FFH	1801H
RDO2 (receive)	0110	301H-37FH	1401H
TDO3 (transmit)	0111	381H-3FFH	1802H
RDO3 (receive)	1000	401H-47FH	1402H
TDO4 (transmit)	1001	481H-4FFH	1803H
RDO4 (receive)	1010	501H-57FH	1403H
SDO (transmit/ server)	1011	581H-5FFH	1200H
SDO (receive/client)	1100	601H-67FH	1200H
Network management fault control	1110	701H-77FH	1016H-1017H

■ SDO data

SDO is used to read and write parameters of the slave from the CANopen master. The data format sent by the master is shown in the following table. Add 1 to each parameter address in the table, whether it is read or written. For example, when writing a parameter with an address of 194, the actual operation address should be 194+1 = 195 (0x00C3).

Table 4–3 Transmit-SDOs for read operation

CAN Frame	CANopen Data	Description
COB-ID	CAN frame header	0x600 + Node-ID
DLC	Length	8
DATA0	Read command code	0x40

CAN Frame	CANopen Data	Description
DATA1	Low byte of index	High byte of parameter address
DATA2	High byte of index	0x20
DATA3	Subindex	Low byte of parameter address
DATA4	Reserved	xx
DATA5	Reserved	xx
DATA6	Reserved	xx
DATA7	Reserved	xx

Table 4–4 AC drive response to read operation

CAN Frame	CANopen Data	Description
COB-ID	CAN frame header	0x580 + Node-ID
DLC	Length	8
DATA0	Return command	Success: 0x4B; Failure: 0x80
DATA1	Low byte of index	High byte of parameter address
DATA2	High byte of index	0x20
DATA3	Subindex	Low byte of parameter address
DATA4	Low byte of data	xx
DATA5	High byte of data	xx
DATA6	Fault code	xx
DATA7	0 indicates success and others indicate a fault.	xx

Table 4–5 Transmit-SDOs for write operation

CAN Frame	CANopen Data	Description
COB-ID	CAN frame header	0x600 + Node-ID
DLC	Length	8
DATA0	Write command code	0x2B

CAN Frame	CANopen Data	Description
DATA1	Low byte of index	High byte of parameter address
DATA2	High byte of index	0x20
DATA3	Subindex	Low byte of parameter address
DATA4	Low byte of data	xx
DATA5	High byte of data	xx
DATA6	Reserved	xx
DATA7	Reserved	xx

Table 4–6 AC drive response to write operation

CAN Frame	CANopen Data	Description
COB-ID	CAN frame header	0x580 + Node-ID
DLC	Length	8
DATA0	Return command	Success: 0x60; Failure: 0x80
DATA1	Low byte of index	High byte of parameter address
DATA2	High byte of index	0x20
DATA3	Subindex	Low byte of parameter address

5 Parameter Configuration

■ Configuration procedure

To configure the module, follow the steps below:

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

■ Parameter description

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.

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1. Version information and slot position

Parameter	Name	Description
A2-29 to A2-34	Module type and software version corresponding to each expansion slot	Indicates the module type and version corresponding to each expansion slot.

2. Basic parameters

Parameter	Name	Description
n12-00	Expansion slot	Indicates the expansion slot where the module is located. 0: Disable 1: Expansion slot 1_1 2: Expansion slot 1_2 3: Expansion slot 1_3 **Note**: Select an expansion slot as needed. This parameter is typically set to 1, indicating the expansion_ slot 1_1.
n12-01	Module online status	Indicates whether the module in the slot set in n12-00 is online. 0: Offline 1: Online
n12-02	CANopen node address	Indicates the local node address. The valid range is 1 to 63. 0 indicates an invalid address.
n12-03	CANopen communication baud rate	Indicates the baud rate of CAN network communication. 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 AC drive supports bus adapter A and bus adapter B, which are used to process data exchange between the AC drive and the module. The two bus adapters are independent from each other and either of them can be connected to the MD580-SI-CAN1 module.

Table 5–1 Parameters of bus adapter A

Parameter	Name	Description
n2-00	Bus type for fieldbus adapter	Selects the communication module type associated with bus adapter A. 3: CANopen module
n2-04 to n2-19	PDO output (16)	Sets the source of the data sent by the module.
n2-20 to n2-35	PDO output base value (16)	Sets the per unit base value of the data sent by the module.
n2-36 to n2-51	PDO input base value (16)	Sets the per unit base value of the data received by the module.
n2-52 to n2-67	PDO output data (16)	Displays the data sent by the module.
n2-68 to n2-83	PDO input data (16)	Displays the original data received by the module.
U15-18 to U15-33	Receive-PDO of bus adapter A (16)	Displays the data received by the module after the per unit conversion. The data can be configured by connector parameters and used to control the MD580 AC drive.
U0-48 to U0-63	Bit0 to bit15 of the receive-PDO 1 of bus adapter A	Displays the bit status of receive-PDO 1 of bus adapter A.

Table 5–2 Parameters of bus adapter B

Parameter	Name	Description
n3-00	Bus type for fieldbus adapter	Selects the communication module type associated with bus adapter B. 3: CANopen module
n3-04 to n3-19	PDO output (16)	Sets the source of the data sent by the module.
n3-20 to n3-35	PDO output base value (16)	Sets the per unit base value of the data sent by the module.
n3-36 to n3-51	PDO input base value (16)	Sets the per unit base value of the data received by the module.

Parameter	Name	Description
n3-52 to n3-67	PDO output data (16)	Displays the data sent by the module.
n3-68 to n3-83	PDO input data (16)	Displays the original data received by the module.
U15-34 to U15-49	Receive-PDO of bus adapter B (16)	Displays the data received by the module after the per unit conversion. The data can be used to control the MD580 AC drive.
U0-64 to U0-79	Bit0 to bit15 of the receive-PDO 1 of bus adapter B	Displays the bit status of receive-PDO 1 of bus adapter B.

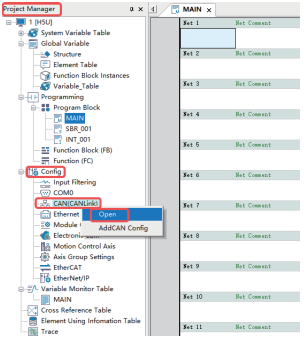
6 Communication Example

■ Software acquisition

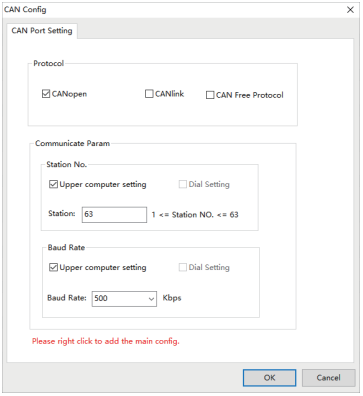
Download the AutoShop software for H5U programming from the Inovance official website at https://www.inovance.com.

■ Master and slave configuration

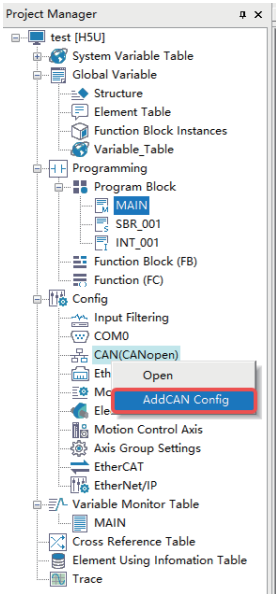
1. Open AutoShop. Select **File** > **New Project**. In the pop-up window, set **Series and models** to "H5U" and click **OK**. In the left **Project Manager** pane, right-click **CAN (CANLink)** under **Config** and click **Open**.



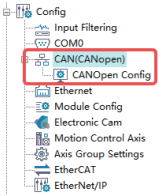
2. In the pop-up **CAN Config** window, set the **Protocol**, **Station No.** and **Baud Rate**, and click **OK**. Note that the baud rate must be consistent to that of the MD580-SI-CAN1 module.



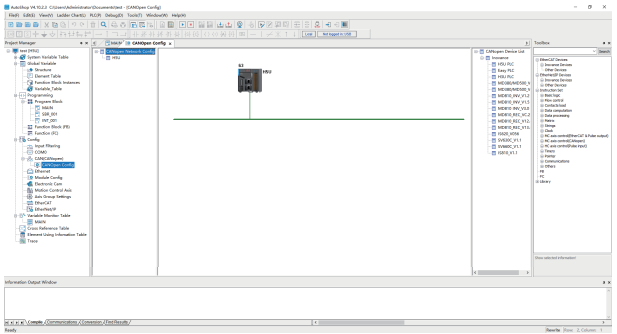
3. After configuration, **CAN(CANLink)** changes to CAN(CANopen) , as shown below.



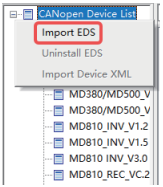
4. Right-click **CAN(CANopen)** and select **AddCAN Config**.



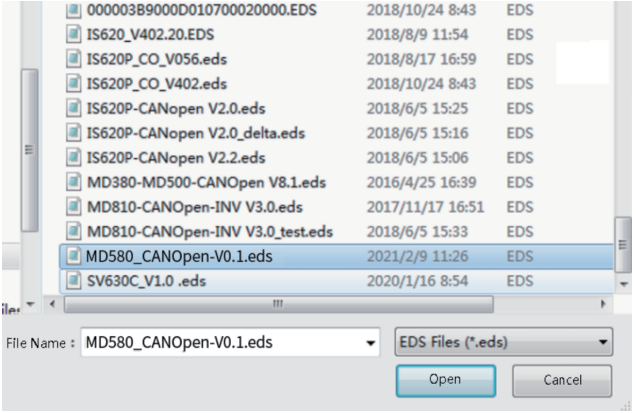
5. Double-click **CANOpen Config** to open the main configuration interface.



6. Install an EDS file: Check for the corresponding device in the right **CANopen Device List**. If such a device exists, skip this step. If not, right-click **CANopen Device List** and select **Import EDS**.



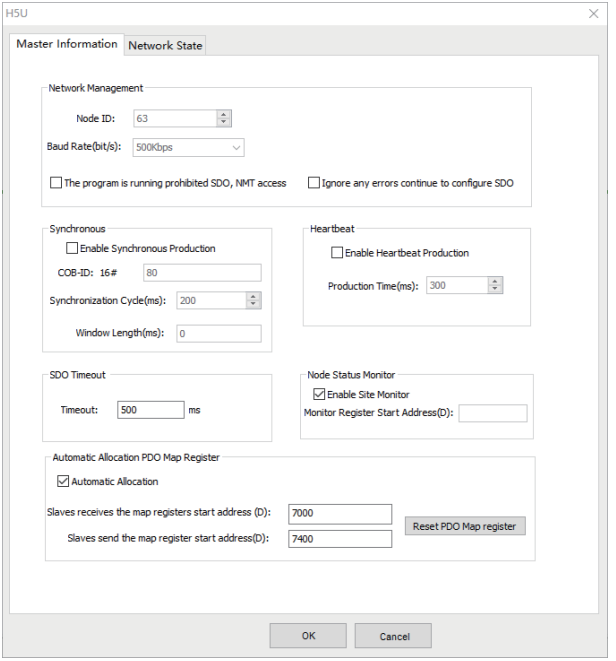
7. Select the EDS file to be installed and click **Open**.



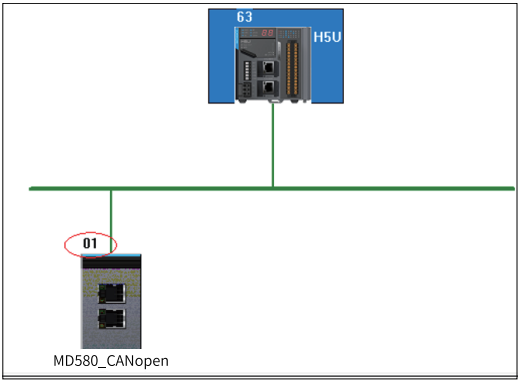
8. After importing the EDS file to **CANopen Device List**, an error will occur if the installation fails (no message for successful installation).
9. Configure the master: Double-click the H5U master in the main screen to open the **Master Information** window, where you can configure functions such as node status monitor, synchronization, and heartbeat. This example demonstrates how to configure the heartbeat function.

Note

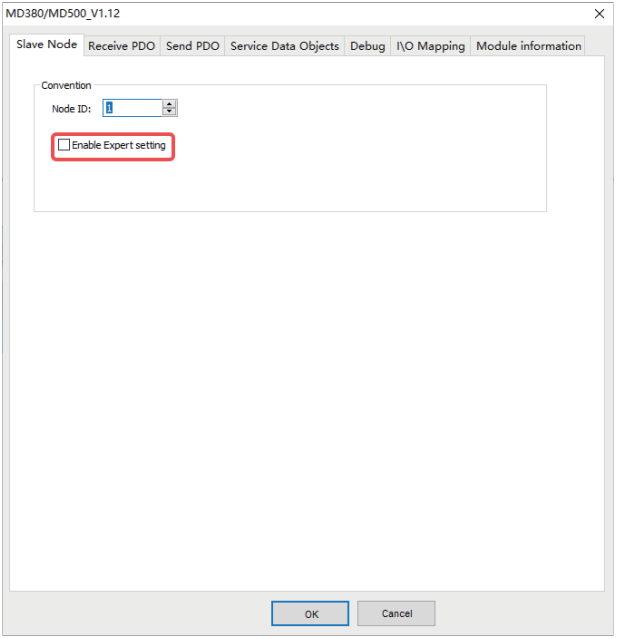
If you want to use the synchronization mode, you must enable the synchronization function and set the synchronization cycle on the interface.



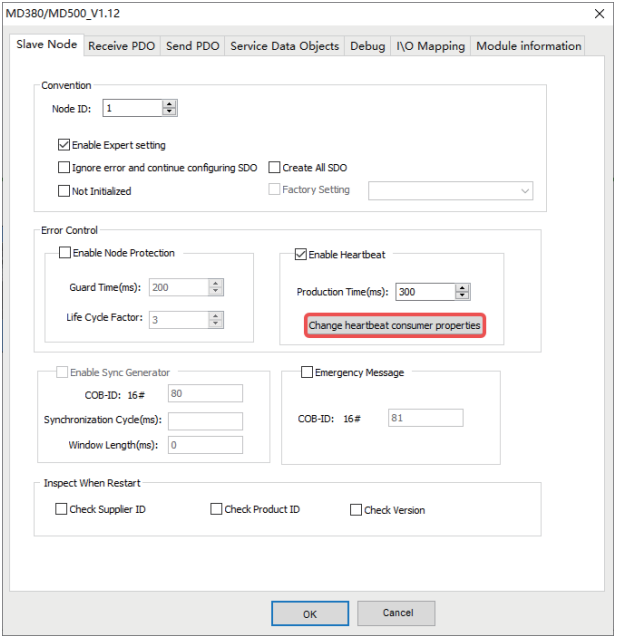
10. Configure the slave: Double-click the corresponding device in the **CANopen Device List** to add a slave to the CANopen network. The number marked in the following figure is the slave number.



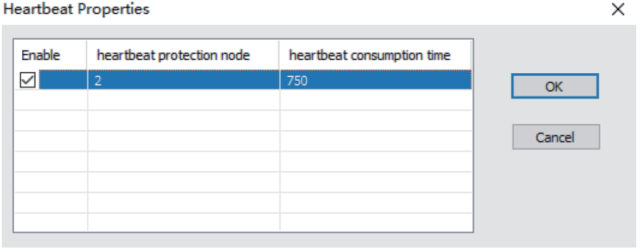
11. Double-click the slave to open the slave configuration window, where you can modify the **Node ID** of the slave according to actual settings and select **Enable Expert setting**.



12. Click **Change heartbeat consumer properties**.



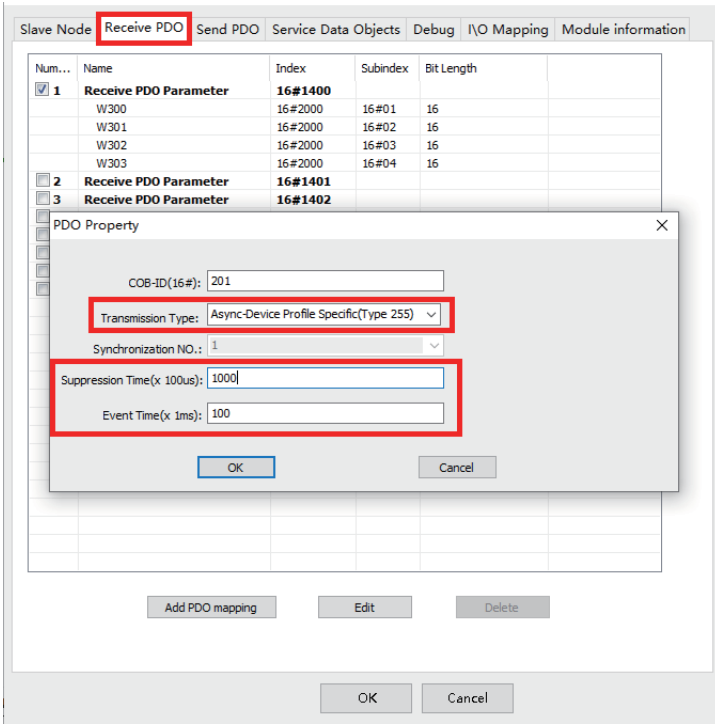
13. In the pop-up **Heartbeat Properties** window, select the node to be monitored in the **heartbeat protection node** drop-down list (usually the master, but can also be a slave). Check the corresponding **Enable** box, and click **OK**.



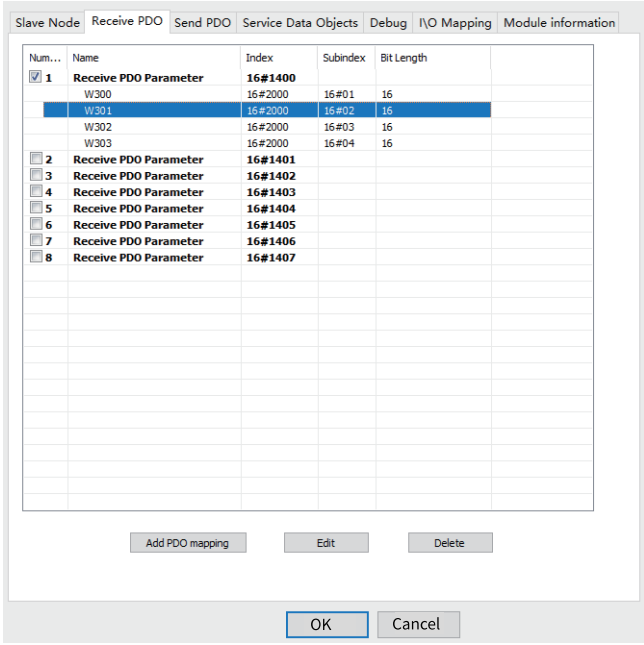
Note

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. Configure POD: Switch to the **Receive PDO** tab, double-click the corresponding PDO to open the **PDO Property** window. You can set PDO **Transmission Type**, **Suppression Time**, and **Event Time** (for synchronous mode, you only need to set **Synchronization NO.**). In this example, both the **Suppression Time** and **Event Time** are set to 100 ms, indicating that one RPDO1 is sent every 100 ms.



15. Under a PDO item, you can add, modify, or delete mapping objects for the PDO (at most four mapping objects for one PDO). You can also select an empty PDO and add mapping objects for it.



16. After configuring the receive PDO, follow the same steps to configure the send PDO.

Note

You can repeat step 10 to step 16 to configure more slaves.

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17. Download configuration: After the configuration of all master and slaves is completed, download the configuration to the PLC. Click  for compilation and then click  for download.

7 Troubleshooting

The MD580-SI-CAN1 communication card uses three status indicators to indicate bus communication faults. See the following table for troubleshooting instructions.

Indicator	Color	Status Description	Solution
INOBUS	Flashing in green	The communication between the module and the main control board is being established.	-
	Steady ON in green	The communication between the module and the main control board is normal.	-

Indicator	Color	Status Description	Solution
MODULE	Steady ON in green	The module is running properly.	-
	Flashing in red once and turning OFF for 1 s	The CAN bus encounters a passive error alarm.	• Check whether n12-00 is set correctly. • Check whether n1-00 (bus adapter type) is set correctly. • Check the CANopen communication link.
	Flashing in red twice and turning OFF for 1 s	The CANopen heartbeat message times out.	Check whether the heartbeat message sent by the master is normal.
	Flashing in red three times and turning OFF for 1 s	The length of the PDO received is inconsistent with the configuration.	Check whether the RPDO and TPDO lengths of the module are set correctly.
	Flashing in red	The communication parameters are being read.	Check whether the communication baud rate and slave address of the module are set correctly.
	Steady ON in red	The CAN bus is disconnected.	• Check the CANopen communication link. • Check whether the termination resistor DIP switch of the module are set correctly. For a point-to-point connection, both the master and slave need to have the termination resistor connected.

Indicator	Color	Status Description	Solution
FIELDBUS	Steady ON in green	The bus is in the operational state.	-
	Flashing in green once and turning OFF for 1 s	The bus is in the stopped state.	• Check the CANopen communication link. • The master is not running. Check the master configuration.
	Flashing in green	The bus is in the pre-operational state.	• Check the CANopen communication link. • The master is not running. Check the master configuration.