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19012456A01

MD580-SI-RS1 Modbus RTU Communication Expansion Card

User Guide

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Preface

■ Introduction

MD580-SI-RS1 is a new-generation fieldbus adapter module designed for the MD580 drive. It enables networking and remote control of multi-drive systems through a Modbus RTU communication network.

This guide describes the technical specifications, outline dimensions, installation, wiring, and troubleshooting of the MD580-SI-RS1 module.

■ Revision History

Revision date	Version	Description
November 2024	A01	Made minor corrections.
August 2023	A00	Initial release.

■ Access to the Guide

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

- 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 expires.

Within the warranty period, maintenance 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
- 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 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

The MD580-SI-RS1 fieldbus adapter module has the following features:

- MD580-SI-RS1 is a new-generation fieldbus adapter module designed by Inovance for the MD580 AC drive. It enables networking and remote control of multi-drive systems through a Modbus RTU communication network.
- MD580-SI-RS1 is highly compatible with different series of MD580 AC drives and MD880 series products.

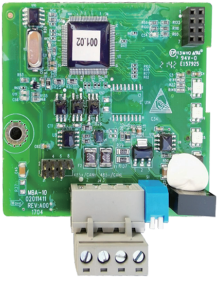


Figure 1-1 MD580-SI-RS1 communication card appearance

1.2 Applicable AC Drives

Card Model	Applicable AC Drive
MD580-SI-RS1	MD580

1.3 Technical 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	⩽ 3,000 m

Item	Description
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 standards	EN 61800-5-1:2007 EN 61800-3:2004 IEC/EN 62109-1:2010 UL508C:2002

1.4 Outline Dimensions

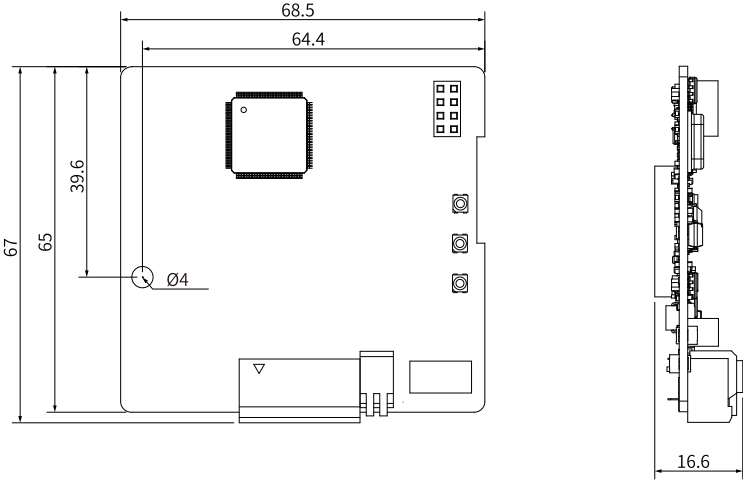


Figure 1-2 MD580-SI-RS1 card dimensions (unit: mm)

1.5 Interface Description

■ Interface layout

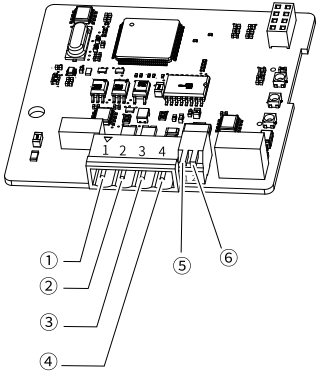


Figure 1-3 MD580-SI-RS1 card interface layout

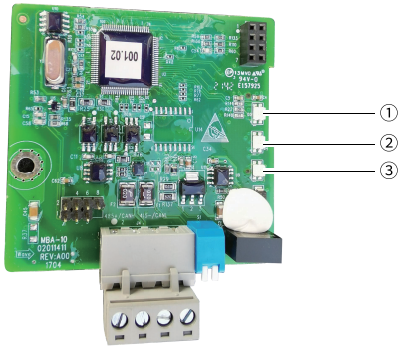
■ Interface

Table 1–1 MD580-SI-RS1 card interface function description

No.	Mark	Name	Wiring	Description
①	X1-1	SHIELD	Connecting to the shield	Recommended cable: Four-conductor shielded twisted pair cable, with a cross-sectional area of 0.3 mm^2 to 2.0 mm^2
②	X1-2	485+	Twisted pair	
③	X1-3	485-		
④	X1-4	GND	Connection recommend-ed	
⑤	S1-1	DIP switch 1	-	Termination resistor selection
⑥	S1-2	DIP switch 2	-	Valid when S1-1 and S1-2 are both set to ON.

■ Status indicators

The MD580-SI-RS1 module provides three status indicators to indicate bus communication faults. See the following table for troubleshooting instructions.



Indicator	Color	Status Description	Solution
INOBUS	Flashing in green	Establishing communication with the main control board	-
	Steady green	Normal communication with the main control board	-
	Flashing in red	Failed communication with the main control board	Check whether the MD580-SI-RS1 module is damaged.
MODULE	Flashing in green	Module initialization	-
	Steady green	Module initialization completed or operating normally	-
	Flashing in red	Module fault	Check whether the MD580-SI-RS1 module is damaged.

Indicator	Color	Status Description	Solution
FIELDBUS	Flashing in green	Module initialization	Power-on initialization
	Steady green	Bus data communication normal	-
	Flashing in red	Bus communication fault	• Check whether the n10-04 address settings are correct. • Check the RS485 communication link. • Check whether the termination resistor DIP switch settings of the MD580-SI-RS1 module are correct. For a point-to-point connection, both the master and slave need to have the termination resistor connected.

2 Installation Guide

■ Installation precautions

Power off the MD580 drive before installing the MD580-SI-RS1 module. Failure to comply may result in damage to the MD580 drive or module.

- Protect the MD580-SI-RS1 module from falling or shock to avoid damage to the module.
- Do not disassemble the MD580-SI-RS1 module. Otherwise, the module may be damaged.
- Tighten the screws according to the required torque to avoid damage or loose fastening.

■ Installation tools

The following tools are required for installation.

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

■ Tightening torque for screws and screw fasteners

The screws must be installed according to 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

■ Product structure

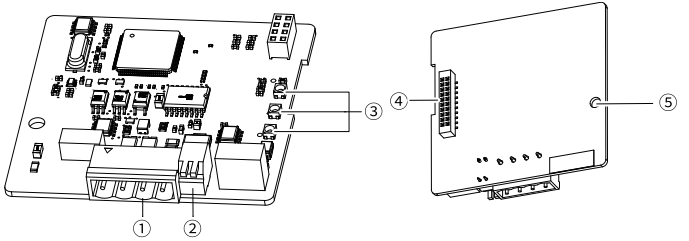


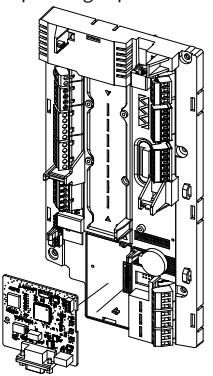
Figure 2-1 Product structure

No.	Name	Description
①	Bus communication terminal	Modbus RTU bus communication terminal
②	Resistor DIP switch	Connects/disconnects the termination resistor
③	Status indicator	Indicates module operation status
④	Slot terminal	Electrical connection between the module and the MD580
⑤	Retaining screw hole	Fastens the module to the MD580 drive and ensures proper connection of the PE layer

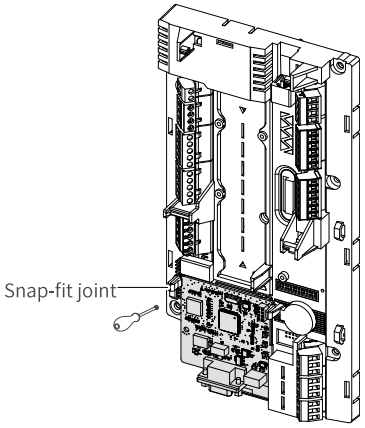
■ Installation method

The MD580–SI-RS1 module can be installed in the expansion slot of the MD580. The installation steps are as follows:

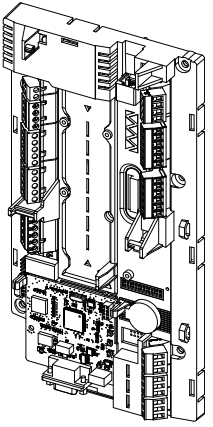
1. Place the module into the corresponding expansion slot of the MD580.



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



3. The installation is completed.



■ Removal method

Follow the reverse sequence of the above installation steps for removal.

1. Disconnect all power supplies, and properly unplug all cables connected to the module.
2. Remove the grounding screw of the MD580-SI-RS1 module by using the 1# Phillips screwdriver.
3. Release the snap-fit joints on both sides of the MD580-SI-RS1 module, then pull the module outward.

3 Electrical Connection

■ Terminal wiring

For the layout and description of interface terminals, see *"1.5 Interface Description" on page 6*. The terminal wiring instructions are shown in the figure below.

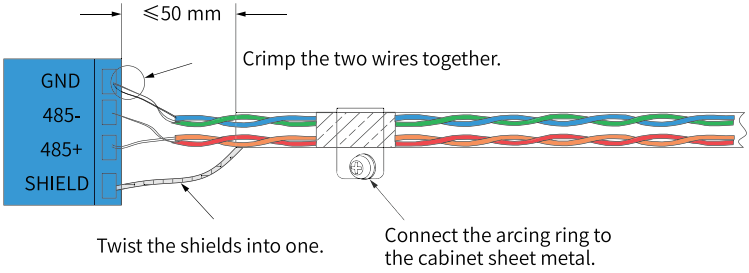
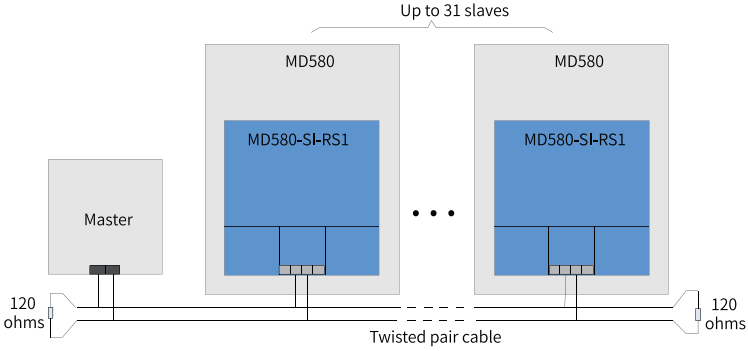


Figure 3-1 Terminal wiring

■ Bus topology

The Modbus RTU supports a maximum of 31 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. If the number of nodes on the network exceeds 31, repeaters are required.



4 Modbus RTU Communication Protocol

4.1 Overview of Communication

The Modbus serial link protocol is a master-slave protocol where only one master and one or more slaves can be present on the bus at the same time. Modbus communication is always initiated by the master. A slave does not send data unless it receives a request from the master, and slaves cannot communicate with each other. Modbus is compatible with RS232, RS485, and RS422 interfaces, with RS485 being the primary interface used in practical applications. The Modbus protocol includes two modes: RTU and ASCII. The MD580-SI-RS1 module only supports RTU.

RTU transmission mode:

Slave Address	Parameter	Data	CRC
1 byte	1 byte	Maximum 255 bytes	2 bytes

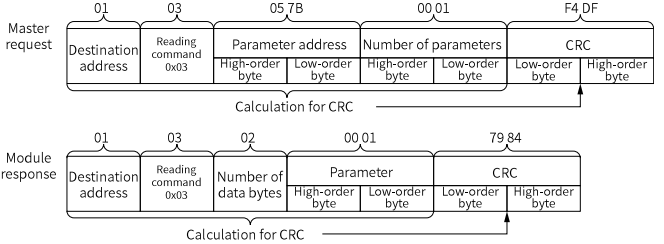
The frame format, check, and transmission mechanisms follow the standard Modbus protocol. The communication addresses in the protocol correspond to the actual communication addresses of parameters. For mapping relations between the parameters and communication addresses, see the parameter table in the relevant product software guide.

The CRC check uses CRC-16 checksum values.

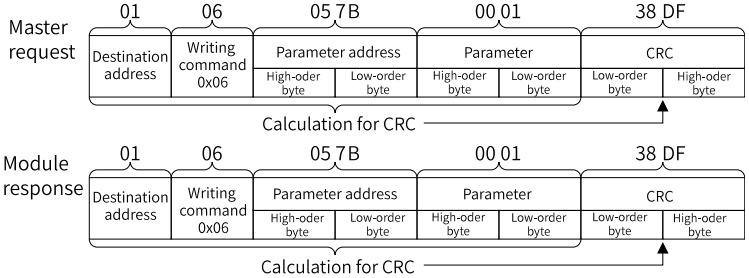
4.2 Communication Data Frame Structure

■ Modbus RTU communication example

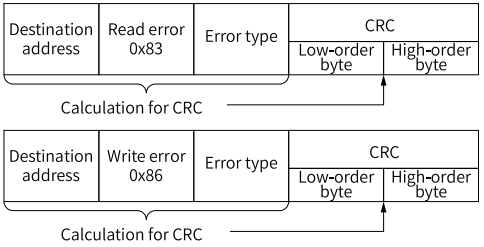
1. Reading parameter n2-00 via 0x03 (communication address: 057BH)



2. Writing a value of 1 to n2-00 via 0x06 (communication address: 057BH)



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



Error types:

01: Command code error

02: Address error

03: Data error

04: Command unprocessable

5 Parameter Configuration

■ Setting the MD580–SI-RS1 module

The setting procedure is as follows:

1. Go to the parameter settings screen.
2. Select the fieldbus adapter and function module.
3. Select the fieldbus adapter A.
4. Select the bus type for the fieldbus adapter.
5. Select the Modbus RTU module.

Note

You can also select the fieldbus adapter B.

■ Setting the Modbus RTU module parameters

Before using the MD580-SI-RS1 module, activate the Modbus RTU module through the fieldbus adapter parameters n2-00 and n3-00 of MD580, and then configure the functions of the Modbus RTU module. See the table below for the relevant parameter settings. (Using fieldbus adapter A as an example)

Table 5–1 MD580–SI-RS1 module parameter settings

Parameter	Description
n2-00	Set the fieldbus adapter A parameter to [1] (Modbus RTU module).
n10-00	Set this parameter based on the module slot position: [1] Expansion Slot 1_1 to [3] Expansion Slot 1_3. Select an expansion slot as needed. Typically, set this parameter to [1] (Expansion Slot 1_1).
n10-02	Set the module baud rate: [0] 1200, [1] 2400, [2] 4800, [3] 9600, [4] 19200, [5] 38400, [6] 57600, [7] 115200.
n10-03	Select the data format for the communication between the module and the host controller. There are four format options: [0] Even parity, [1] Odd parity, [2] No parity and two stop bits, [3] No parity and one stop bit.
n10-04	Set the module communication address.

Parameter	Description
n10-05	Set the module response delay time. The module waits for the delay time before sending a response after receiving data.
n10-06	Set the module communication timeout interval. A timeout fault is reported if the module does not receive any data within the timeout interval.

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 description

The frame format, check and transmission mechanisms follow the standard Modbus protocol.

The communication addresses in the protocol correspond to the actual communication address of the parameter. For mapping relations between the parameters and the communication addresses, see the parameter table in the relevant product software guide.

The CRC check uses CRC-16 checksum values.

■ Modbus RTU specific parameters

In the MD580 series products, the following special communication addresses are reserved for the Modbus RTU protocol. Writing data to these addresses can change the data of in the corresponding connector, as described in the following table.

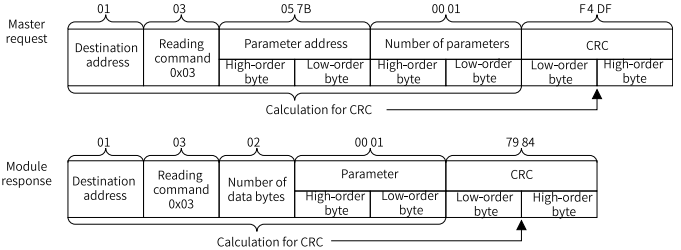
Communication Address	Write Parameter	Name	Description
24984	U15-08	Modbus communication setting value 1	Can be directly written through Modbus communication
24985	U15-09	Modbus communication setting value 2	Can be directly written through Modbus communication

Communication Address	Write Parameter	Name	Description
24986	U15-10	Modbus communication setting value 3	Can be directly written through Modbus communication
24987	U15-11	Modbus communication setting value 4	Can be directly written through Modbus communication
24988	U15-12	Modbus communication setting value 5	Can be directly written through Modbus communication
24989	U15-13	Modbus communication setting value 6	Can be directly written through Modbus communication
24990	U15-14	Modbus communication setting value 7	Can be directly written through Modbus communication
24991	U15-15	Modbus communication setting value 8	Can be directly written through Modbus communication
24992	U15-16	Modbus communication setting value 9	Can be directly written through Modbus communication
24993	U15-17	Modbus communication setting value 10	Can be directly written through Modbus communication
-	U10-12	Bit 00 of Modbus communication setting value 1	1. 16 bits of Modbus communication setting value 1. 2. The 16 bits are generated automatically when Modbus communication setting value 1 is written. These bits cannot be written 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	

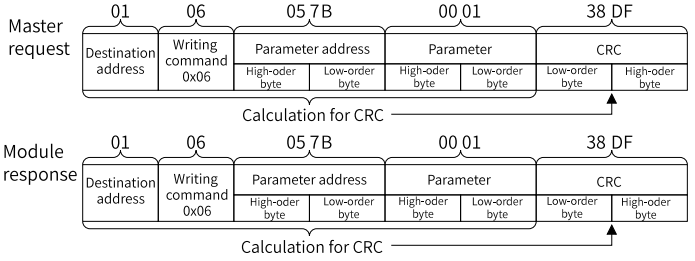
Communication Address	Write Parameter	Name	Description
-	U10-17	Bit 05 of Modbus communication setting value 1	Same as above
-	U10-18	Bit 06 of Modbus communication setting value 1	
-	U10-19	Bit 07 of Modbus communication setting value 1	
-	U10-20	Bit 08 of Modbus communication setting value 1	
-	U10-21	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

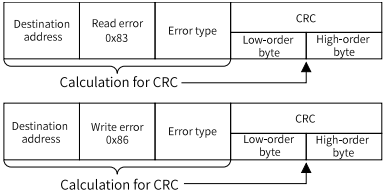
1. Reading parameter n2-00 via 0x03 (communication address: 057BH)



2. Writing a value of 1 to n2-00 via 0x06 (communication address: 057BH)



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



Error type:

01: Command error

02: Address error

03: Data error

04: Cannot process commands

■ 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 (setting value channel 1) is set, the start/stop command and speed source are set based on the following table.

Table 5–2 Start/stop command and speed source parameter settings

Parameter	Name	Setting Value	Description
n2-00	Bus type for the fieldbus adapter	1	Select the Modbus RTU module for fieldbus adapter A.
n10-00	Expansion slot	1	Install the Modbus RTU module 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	Set the parameter (group b0) as required.
b0-01	Custom OFF1 source	U10-12 (2012)	Set Bit 00 of Modbus communication setting value 1 to the command source of OFF1.
C0-00	Main reference selection in speed control	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.

6 Communication Examples

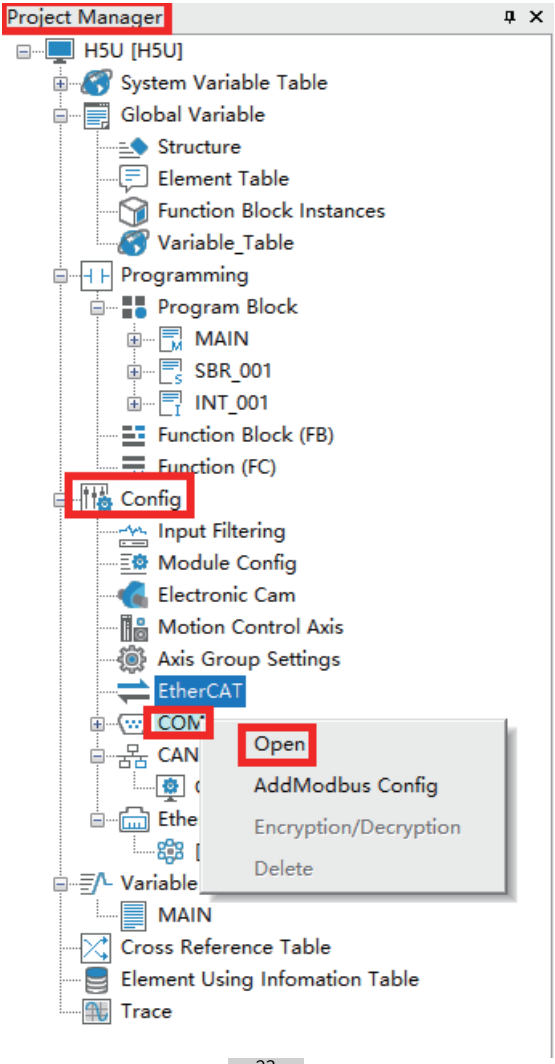
The configuration example for Modbus RTU Communication Between AC Drive and H5U is as follows:

■ Software acquisition

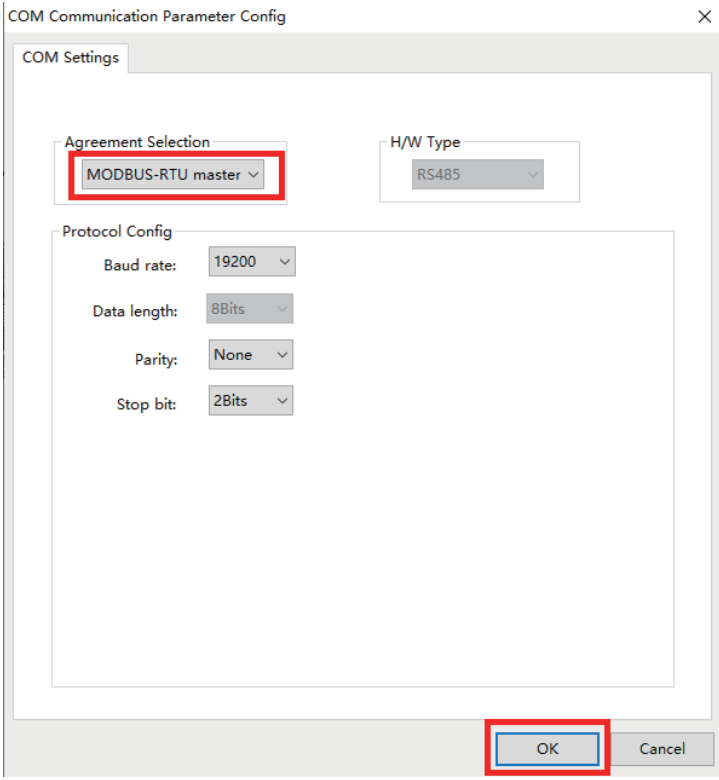
Log in to the Inovance official website (https://newweb.inovance.com/hc/serviceSupport/download) to obtain the H5U programming software.

■ Master and slave configuration

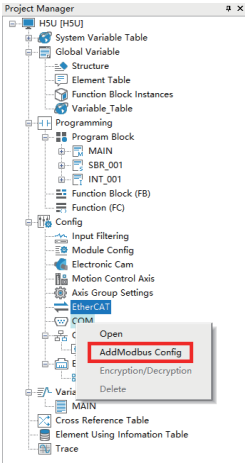
1. Open AutoShop, click "New Project", confirm that "Series and models" is set to "H5U Series", then click "OK" to enter the programming interface. Go to "Project Manager" > "Config" > "COM0", right-click and select "Open", as shown in the following figure.


Project Manager
H5U [H5U]
System Variable Table
Global Variable
Structure
Element Table
Function Block Instances
Variable_Table
Programming
Program Block
MAIN
SBR_001
INT_001
Function Block (FB)
Function (FC)
Config
Input Filtering
Module Config
Electronic Cam
Motion Control Axis
Axis Group Settings
EtherCAT
COM
CAN
Ethe
Variable
MAIN
Cross Reference Table
Element Using Infomation Table
Trace
Open
AddModbus Config
Encryption/Decryption
Delete

2. Select "Modbus-RTU master" as the protocol and set the baud rate and data format to match the configuration on the MD580-SI-RS1. Then, click "OK".



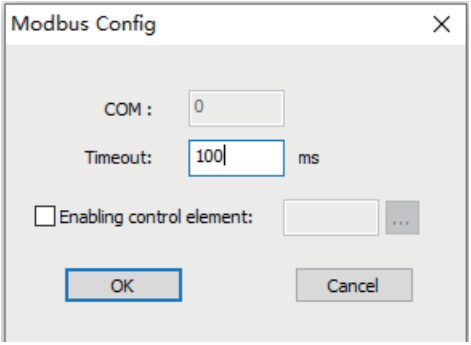
3. Add Modbus configuration: Right-click on "COM0" and select "AddModbus Config".



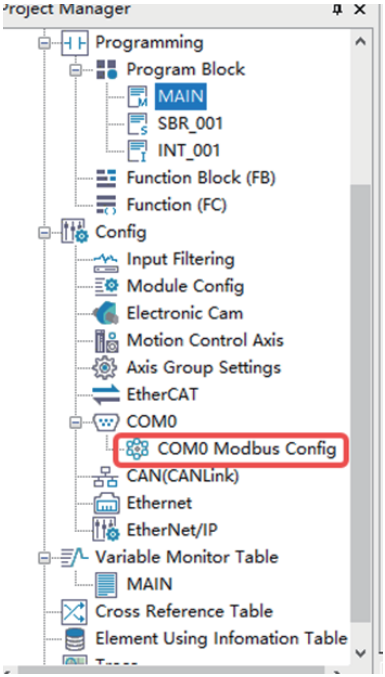
4. In the pop-up window, set "Timeout" (typically 100 ms for a baud rate of 115200).

Note

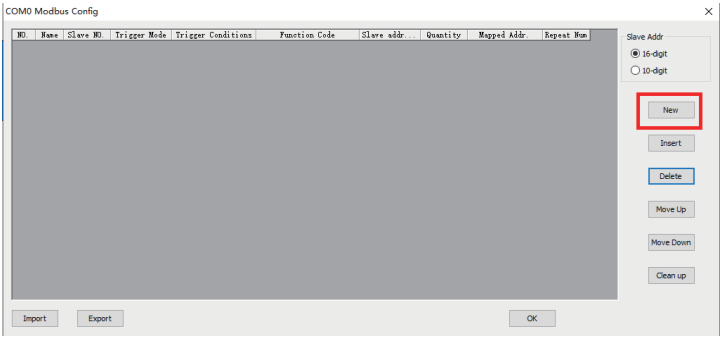
If you need to add the Modbus configuration several times, the control element can be ignored.



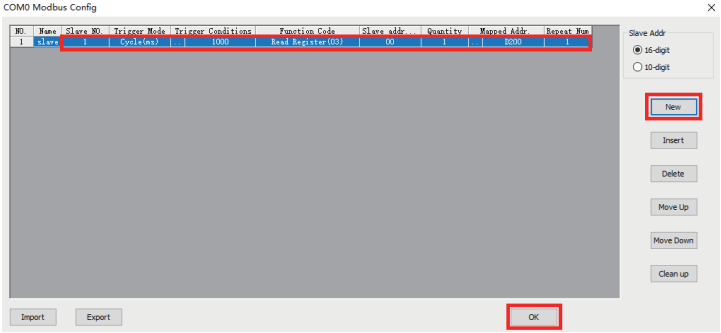
5. Double-click "COM0 Modbus Config" under "COM0" as shown below.



6. In the "COM0 Modbus Config" screen, click "New".



7. Edit the properties, such as "Slave NO.", "Trigger Mode", "Function Code", "Slave addr. (H)", and "Quantity". After completing one entry, you can continue to add more entries. You can also edit different slaves together.



8. Download configuration: Once all the master and slave settings are completed, the configuration needs to be downloaded to the PLC. Click  for complilation first, and then click  for download.

7 Troubleshooting

The MD580-SI-RS1 communication card module 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	Establishing communication with the main control board	-
	Steady green	Normal communication with the main control board	-
	Flashing in red	Failed communication with the main control board	Check whether the MD580-SI-RS1 module is damaged.
MODULE	Flashing in green	Module initialization	-
	Steady green	Module initialization completed or operating normally	-
	Flashing in red	Module fault	Check whether the MD580-SI-RS1 module is damaged.

Indicator	Color	Status Description	Solution
FIELDBUS	Flashing in green	Module initialization	Power-on initialization
	Steady green	Bus data communication normal	-
	Flashing in red	Bus communication fault	• Check whether the n10-04 address settings are correct. • Check the RS485 communication link. • Check whether the termination resistor DIP switch settings of the MD580-SI-RS1 module are correct. For a point-to-point connection, both the master and slave need to have the termination resistor connected.