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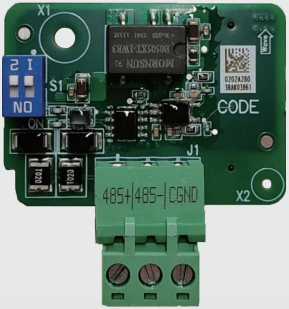

PS00014359A00

MD38TX1 Series

Isolated RS485 Communication Expansion Card

User Guide

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Preface

■ Introduction

This user guide describes the specifications, dimensions, installation, wiring, communication protocol, communication parameters, and communication examples of the MD38TX1 expansion card.

■ Revision History

Data of Revision	Version	Description
Sept 2024	A00	After the first release of the manual, the original PCBA code 02020609 is switched to 0202A280.

■ 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 the app, where you can search for and download manuals.

■ Warranty Disclaimer

Inovance provides warranty service within the warranty period (as specified in your order) for faults or damage that occur during normal operation. 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 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 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 Product Warranty Card.

Table of Contents

Fundamental Safety Instructions

■ Safety Precautions

- This chapter provides essential safety instructions for proper use of the equipment. Before operating the equipment, read through the guide and comprehend all the safety instructions. Failure to observe the safety precautions may result in serious injuries or death of personnel or device damage.
- "Danger", "Warning", and "Caution" items in this guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
- Use this product 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 usage.

■ Safety Levels and Definitions

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

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

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

■ Safety Precautions

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

- 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.

- 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 signs of bumping 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

- 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 components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injury 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.

Storage and Transportation

- 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.
- Keep the equipment in a place meeting the following conditions: 1. Away from direct sunlight. 2. Ambient temperature does not exceed the limit. 3. Relative humidity does not exceed the limit. 4. Without dramatic temperature change or water condensation. 5. Away from corrosive, flammable gases, dust, salty elements, and metal dust. 6. Away from locations with water, oil or medicinal drips. 7. Away from equipment that may generate vibration or shock.
- Avoid storing the product for more than 3 months. When the product needs to be stored for an extended period, take more strict protection and necessary inspection.
- 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.
- Do not lay the equipment one above another. Failure to comply may result in personal injury or equipment damage.

Storage and Transportation

- 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 product for more than 3 months. When the product needs to be stored for an extended period, take more strict protection and necessary inspection.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.

Installation

- The equipment can only be operated by professionals with electrical knowledge. Non-professionals are not allowed to operate on the equipment.

- The equipment can only be operated by professionals with electrical knowledge. Non-professionals are not allowed to operate on the equipment.
- Disconnect all external power supplies of the system before installing/disassembling the product. Failure to do so may result in electric shock, module fault or malfunction.

Installation

- 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 devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the product on an incombustible object such as metal and do not touch or attach the product to combustibles. Failure to comply can result in fire accident.

- Prevent metal filings and wire ends from dropping into the product during installation. Failure to comply may result in fire, fault and malfunction.
- Ensure there are no foreign matters on ventilation surface. Failure to comply may result in poor ventilation, which may cause fire, fault and malfunction.
- Ensure the module is connected to the respective connector securely and hook the module firmly. Improper installation may result in malfunction, fault or fall-off.

Installation

- Before installation, cut off the medium-voltage power supply the drive and the control power supply, and wait for at least 10 minutes until all the unit indicators turn off.
- During installation, prevent metal filings and wire ends from dropping into the product. Failure to comply may result in fire, fault and malfunction.
- Then, insert the expansion card into the drive and fasten the screws to prevent the signal socket between boards from being damaged by external signal cable tension.

- Do not install the equipment in environments with water or corrosive gas. If higher level of protection is needed, use options with higher degree of protection.
- Do not subject the equipment to combustibles. Failure to comply may result in electric shock or a fire.
- Install the product inside a cabinet with fire-proof and electrical protection. Failure to comply may result in a fire.
- Prevent intrusion of unwanted objects into the equipment. Failure to comply can result in faults and fire accidents caused by aging components.
- Do not exert strong impact on the equipment. Failure to comply may result in faults.

- 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 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

- Wiring must be carried out by personnel who have received the necessary electrical training and understood enough electrical knowledge.
- Before wiring, disconnect all the external power supplies of the system. Failure to comply may result in electric shock, module fault or malfunction.
- Insulate the cable terminals properly to ensure the insulation distance between cables will not be shortened after cables are connected to the terminal block. Failure to comply may result in electric shock or damage to the equipment.

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Before wiring, disconnect 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 an electric shock.

- The equipment can only be operated by professionals with electrical knowledge. Non-professionals are not allowed to operate on the equipment.
- Disconnect all external power supplies of the system before installing/disassembling the product. Failure to do so may result in electric shock, module fault or malfunction.

Wiring

- 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 electric shock or equipment damage.

- To prevent damage to the equipment, cut off the power supply before connecting the product to the power supply.
- 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 electric shock or equipment damage.

- Before installation, cut off the medium-voltage power supply the drive and the control power supply, and wait for at least 10 minutes until all the unit indicators turn off.
- Prevent metal filings and wire ends from dropping into the product during installation. Failure to comply may result in fire, fault and malfunction.
- Then, insert the expansion card into the drive and fasten the screws to prevent the signal socket between boards from being damaged by external signal cable tension.

Wiring

- Do not use a crossover or damaged network cable. Failure to comply may result in damage or malfunction of the operating panel.
- Do not route the power cable, network cable, and the USB cable through the same duct or bundle them together. Keep the power cable at least 30 cm away from the signal cable.
- Take proper shielding measures in the following scenarios to prevent equipment damage:
  - Locations with strong electric field or magnetic field
  - Locations with radioactive rays

- 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 can result in equipment malfunction.

Power-on

- Before power-on, check that the equipment is installed and wired properly.
- After power-on, do not disassemble any unit or component of the equipment. Failure to comply can result in electric shock.

- 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 fire accident.
- Do not open the cabinet door or protective cover of the product, touch any wiring terminal of the product, or remove any part of the product with power on. Failure to comply can result in an electric shock.

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

- 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 injury.

Operation state

- Maintenance & inspection must be carried out by personnel who have the necessary electrical training and experience.
- Do not touch the terminals while the power is on. Failure to comply may result in electric shock or malfunction.
- Disconnect all external power supplies of the system before cleaning the module or re-tightening screws on the terminal block or screws of the connector. Failure to comply may result in electric shock.
- Disconnect all external power supplies of the system before disassembling the module or connecting/disconnecting the communication cables. Failure to comply may result in electric shock or malfunction.

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

- 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.

- 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

- 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, disconnect all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- When a permanent magnet motor is used, do not touch the motor terminals immediately after power-off because the motor terminals can generate induced voltage during rotation even after the equipment power supply is off. Failure to comply will result in an electric shock.

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

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Do not use the gasoline, diluent, alcohol, acidic or alkaline detergent during cleaning to prevent product discoloration or damage.

Maintenance

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

- Do not use the gasoline, diluent, alcohol, acidic or alkaline detergent during cleaning to prevent enclosure discoloration or damage.
- Avoid scratching the LCD display by sharp objects to prevent damage to the display.

Repair

- 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 can 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.

- 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 can 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.

Repair

- 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 injury 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 operate on damaged equipment. Failure to comply may result in death, personal injury, or severe equipment damage.
- After the equipment is replaced, check the wiring and set parameters again.

- Submit the repair request according to the warranty agreement.
- 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 operate on damaged equipment. Failure to comply may severe damage.
- After the equipment is replaced, check the wiring and set parameters again.

Disposal

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

■ Safety Labels

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

Safety Label	Description
	• 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 Product Information

1.1 Introduction

MD38TX1 is designed to provide the AC drive with RS485 communication function. It adopts isolation scheme that compliant with international standard IEC61158-1 Type4. MD38TX1 can be used to control AC drive operations and parameter setting through remote serial ports.

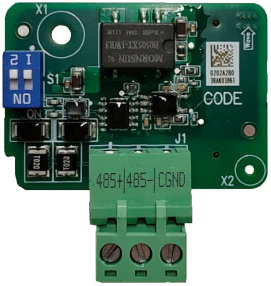


Figure 1-1 MD38TX1 card appearance

1.2 Applicable AC Drives

Card model	Card ordering code	Applicable drives
MD38TX1	01013112	MD290 MD480-PLUS MD500 MD500E MD500-PLUS MD510 MD520 CS290 CS710 IS580 ES510 ES590

1.3 Technical Specifications

The baud rate ranges from 300 bps to 115200 bps, with up to 128 nodes supported. The following table lists the maximum number of nodes and transmission distance supported by the standard RS485 circuit at different transmission rates.

Item	Specification	
Transmission distance (m)	100	1000
Rate (kbps)	115.2	19.2
Number of nodes	128	128
Cross sectional area	26AWG	26AWG

1.4 Outline Dimensions

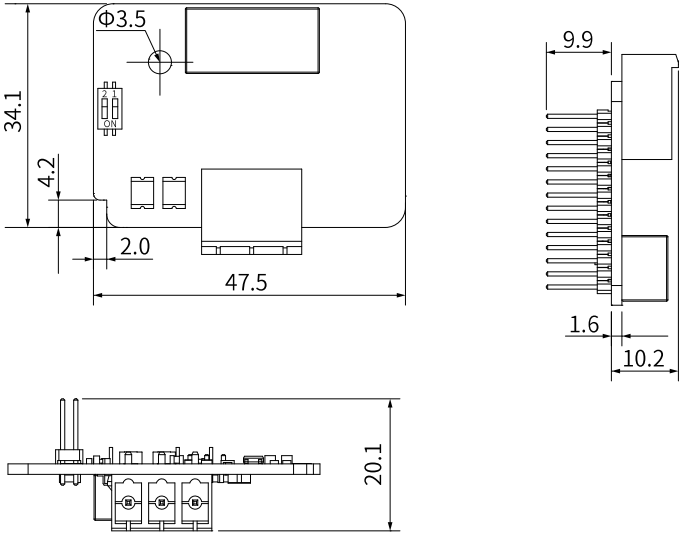


Figure 1-2 Dimensions of the MD38TX1 card (mm)

1.5 Interface Description

■ Layout of interfaces

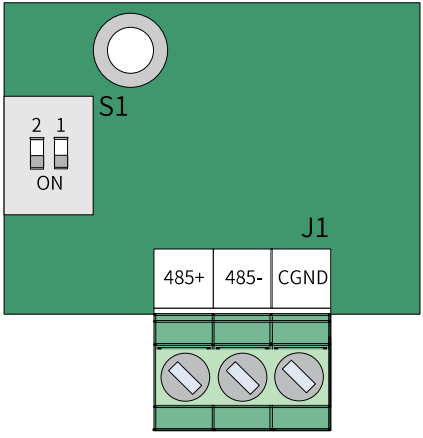


Figure 1-3 Front interfaces of MD38TX1 card

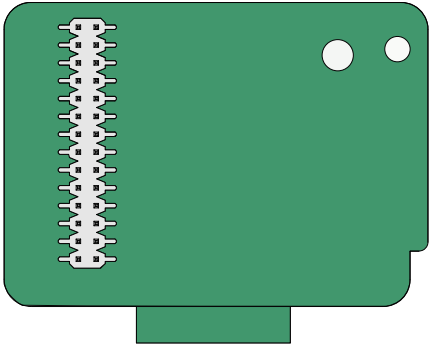
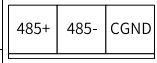


Figure 1-4 Bottom interfaces of MD38TX1 card

Note The gray blocks in the S1 terminal in Figure 1–3 represent the white bulging block in the product appearance diagram.

■ Interface description

Table 1–1 Descriptions of MD38TX1 card interfaces

Terminal Mark		Terminal Name	Description	Layout
J1	485+	RS485 communication signal (+)	RS485 communication input terminal with isolated input	
	485-	RS485 communication signal (-)	RS485 communication input terminal with isolated input	
	CGND	Reference ground of RS485 communication signal	Isolated power supply applied	

■ DIP switch description

Table 1–2 DIP switch of MD38TX1

Mark	Name	Description	DIP position
S1	RS485 communication termination resistor DIP switch	Enable the termination resistor.	
		Disable the termination resistor.	

Note

The MD38TX1 expansion card is connected through the DIP switch.

The DIP switch is set from the top view with main terminal block at the bottom. The DIP switch is subject to the silkscreen on the board.

2 Installation and Wiring

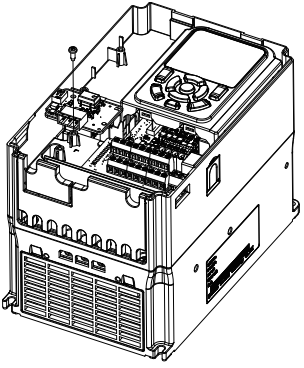
2.1 Installation

Installation instructions

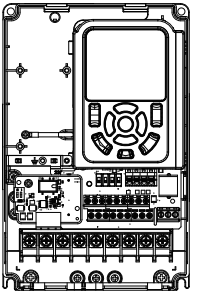
Note

Install the card only when the AC drive is completely de-energized.

1. Align the expansion card to the corresponding interface on the drive control board and positioning hole.



2. Fix it with screws.



2.2 Wiring

2.2.1 Networking Topology

In a network with one master and multiple slaves, one of the devices works as the communication master (typically a host controller, PLC, or HMI), and the other devices work as communication slaves. The master establishes communication with the slave to read or write slave parameters, whereas the slave responds to queries or communication operations from the master. Only one device can transmit data and the other can only receive data at a time.

Each communication slave has a unique slave address, which ranges from 1 to 247. The value 0 is the broadcast communication address.

■ Communication interface

The MD38TX1 communication expansion card provides the AC drive with Modbus communication function. It adopts isolation scheme with electrical parameters compliant with international standards. You can use the card as needed to control operation and parameter setting of the drive through remote serial interfaces. See *"1.5 Interface Description" on page 22* for the interface descriptions.

■ Communication networking

1. **RS485 bus topology**

   The RS485 bus topology is shown in the following figure. It is recommended to use shielded twisted pairs as the RS485 bus and use twisted pair cables to connect 485 + and 485-. Install a termination resistor with the resistance of 120 Ω at both ends

of the bus to prevent signal reflection. Connect the reference grounds of RS485 signals for all nodes together. A maximum of 128 nodes is supported and the distance between the node and the RS485 bus must be shorter than 3 m.

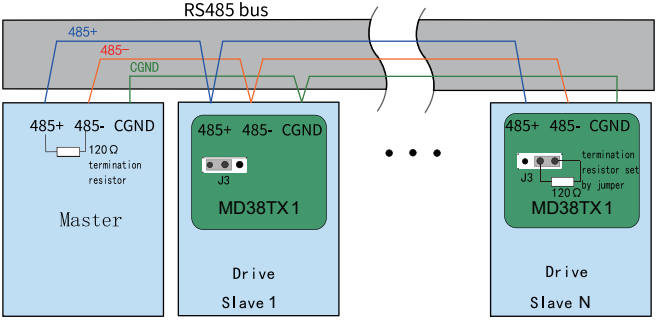


Figure 2-1 RS485 bus topology

2. **Multi-node connection mode**

When the number of nodes is large, the RS485 bus must be daisy-chained. If branch connection is required, the cable length between the bus and the node must be as short as possible and not longer than 3 m. Star-type topology is prohibited. The following figures show the common bus topology.

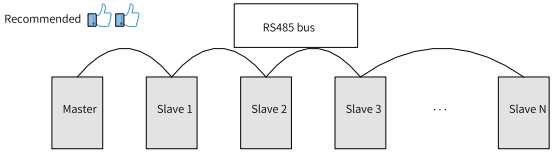


Figure 2-2 Daisy chain topology

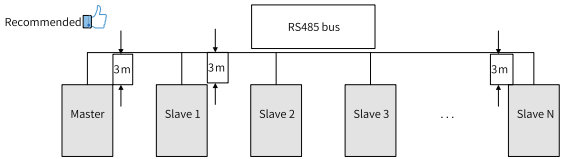


Figure 2-3 Branch topology

Note It is recommended that the branch be kept lower than or equal to 3 m.

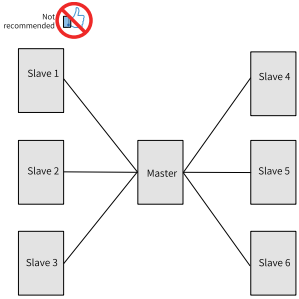


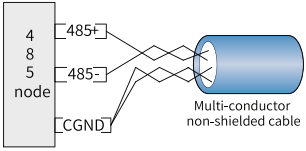
Figure 2-4 Star-type topology (prohibited)

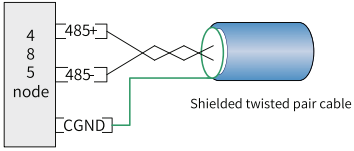
3. **Terminal wiring**

- Terminal wiring for nodes with CGND

  The MD38TX1 communication expansion card has three cables, which are connected to the 485+, 485-, and CGND terminals respectively. Check that the RS485 bus on site contains three cables and the wiring terminals are connected correctly. For use of shielded cables, connect the shield to the CGND terminal. Do not connect the shield to any other part (including enclosure on site and the grounding terminal of the device) except the CGND terminal.

  Due to cable attenuation, use AGW26 or thicker cables if the connection length is longer than 3 m. Always use twisted pair cables to connect 485+ and 485–.



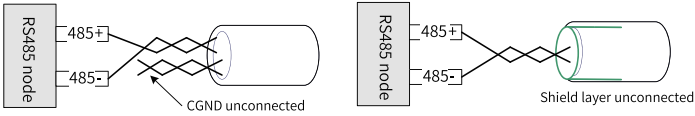


  The following two types of cables are recommended as terminal wiring materials:

- Recommended cable 1: Multi-conductor twisted pair cables
  Connect one twisted pair to 485+ and 485-, and twist the remaining conductors together to connect to CGND.
- Recommended cable 2: Shielded twisted pair cables
  Connect the twisted pair to 485+ and 485– and connect the shield to CGND. When the shielded cable is used as the connecting cable, connect the shield only to CGND. Do not connect the shield to ground.

- Terminal wiring for nodes without CGND

  For nodes without CGND, do not connect CGND or the shield to the PE terminal of the node directly. Do as follows:



  - Method 1: Check whether another port on this node shares a common reference ground with the RS485 circuit. If yes, connect the CGND cable (shield) of the bus directly to the pin.
  - Method 2: Find the reference ground of the RS485 circuit on the node board and connect the drain wire to CGND or the shield.
  - Method 3: If the reference ground of the RS485 circuit cannot be found, keep the CGND cable or the shield unconnected and use an extra grounding cable to connect this node to the PE terminal of other nodes.

■ Transmission distance

The following table lists the maximum number of nodes and transmission distance supported by the standard RS485 circuit at different transmission rates.

Table 2–1 Maximum number of nodes and transmission distance

Transmission distance (m)	Rate (kbps)	Number of Nodes	Cable Specification
100	115.2	128	26AWG
1000	19.2	128	26AWG

3 Parameter Configuration

Table 3–1 Modbus communication parameters

Param.	Product series	Name	Default	Value range	Descriptions
F0-28	MD290	Serial port commu-nication protocol selection	0	0: Modbus protocol 1: PROFIBUS-DP, CANopen, PROFINET, or EtherCAT	The CANlink protocol is valid all the time.

Param.	Product series	Name	Default	Value range	Descriptions
FD-00	MD290	Commu-nication baud rate	5005	Ones: Modbus baud rate 0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps Tens: PROFIBUS-DP 0: 115200 bps 1: 208300 bps 2: 256000 bps 3: 512000 bps Hundreds: Reserved Thousands: CANlink baud rate 0: 20 kbps 1: 50 kbps 2: 100 kbps 3: 125 kbps 4: 250 kbps 5: 500 kbps 6: 1 Mbps	This parameter is used to set transmission speed between host controller and AC drive. Note that the baud rate of the host controller must be the same as that of the AC drive. Otherwise, communication will fail. The higher the baud rate, the faster the communication speed.

Param.	Product series	Name	Default	Value range	Descriptions
FD-00	MD480-PLUS	Baud rate	6005	Ones: Modbus baud rate 0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps	This parameter is used to set transmission speed between host computer and AC drive. The higher the baud rate, the faster the communication speed. Note that the baud rate of the host controller must be the same as that of the AC drive. Otherwise, communication will fail.
	MD500	Baud rate	6005		
	MD500-PLUS	RS485 baud rate	5		

Param.	Product series	Name	Default	Value range	Descriptions
FD-00	MD500E	Commu-nication baud rate	5005	Ones: Modbus baud rate 0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps	This parameter is used to set transmission speed between host computer and AC drive. The higher the baud rate, the faster the communication speed. Note that the baud rate of the host controller must be the same as that of the AC drive. Otherwise, communication will fail.
	MD510	Baud rate	5005	(Continued) 8: 57600 bps 9: 115200 bps	(Continued)

Param.	Product series	Name	Default	Value range	Descriptions
FD-00	MD520	RS485 baud rate	5005	Ones: Modbus 0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps Tens: Reserved Hundreds: Reserved Thousands: CAN baud rate 0: 20 1: 50 2: 100 3: 125 4: 250 5: 500 6: 1 M	This parameter defines the speed of data transmitted between the host controller and the AC drive. The higher the baud rate, the faster the communication speed. Note that the baud rate of the host controller must be the same as that of the AC drive. Otherwise, communication will fail.
	IS580	Baud rate	5	0: 300 bps 1: 600 bps 2: 1200 bps 3: 2400 bps 4: 4800 bps 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps	
	ES510	Baud rate	5		
	ES590	Baud rate	5		

Param.	Product series	Name	Default	Value range	Descriptions
FD-01	MD290	Modbus data format	0	0: No parity check: data format <8, N, 2> 1: Even parity check: data format <8, E, 1> 2: Odd parity: data format <8, O, 1> 3: No check: data format <8, N, 1>	Note that the data format of the host controller must be the same as that of the AC drive. Otherwise, communication fails.
	MD480-PLUS	Data format	0		
	MD500	Data format	0		
	MD500-PLUS	RS485 data format	0		
	MD500E	Data format	0		
	MD510	Data format	0		
FD-01	MD520	RS485 data format	0	0: No check (8-N-2) 1: Even parity check (8-E-1) 2: Odd parity check (8-O-1) 3: No check (8-N-1) 4: No check (7-N-2) 5: Even parity check (7-E-1) 6: Odd parity check (7-O-1) 7: No check (7-N-1) (valid for Modbus)	Same as above
FD-01	IS580	Data format	0	0: No check (8-N-2) 1: Even parity check (8-E-1) 2: Odd parity check (8-O-1) 3: No check (8-N-1)	Same as above

Param.	Product series	Name	Default	Value range	Descriptions
FD-01	ES510	Data format	0	0: No check (8-N-2) 1: Even check 2: Odd check 3: No check (8-N-1)	Same as above
	ES590	Data format	0		
FD-02	MD290	Local address	1	0: Broadcast address 1 to 247 (valid for Modbus)	When it is set to 0 (Broadcast address), the broadcasting function of the host controller is activated. The address must be unique (except the broadcast address), which is the basis for point-to-point communication between the host controller and the drive.
	MD480-PLUS	Local address	1	1–247 (0 is the broadcast address.)	
FD-02	MD500	Local address	1	1–247 (0 is the broadcast address.)	When the local address is set to 0 (broadcast address), the drive communicates with the host controller in the broadcast mode. The address must be unique (except the broadcast address), which is the basis for point-to-point communication between the host controller and the drive.
	MD500-PLUS	Local address	1	1–247 (0 is the broadcast address.)	
	MD500E	Local address	1	1–247 (0 is the broadcast address.)	
	MD510	Local address	1	1–247 (0 is the broadcast address.)	
	MD520	Local address	1	1–247 (0 is the broadcast address.)	
	IS580	Local address	1	1–247 (0 is the broadcast address.)	
	ES510	Local address	1	0 to 247	
	ES590	Local address	1	0 to 247	

Param.	Product series	Name	Default	Value range	Descriptions
FD-03	MD290	Modbus response delay	2 ms	0 ms to 20 ms	Response delay defines the interval from when the AC drive finishes receiving data to when it sends data to the host controller. If the response delay is shorter than the system processing time, the system processing time prevails. If the response delay is longer than the system processing time, the AC drive will send data to the host controller only after the system finishes data processing and the response delay expires.
	MD480-PLUS	Response delay	2 ms	0 ms to 20 ms	
	MD500	Response delay	2 ms	0 ms to 20 ms	
	MD500-PLUS	RS485 response delay	2 ms	0 ms to 20 ms (valid for Modbus)	
	MD500E	Response delay	2 ms	0 ms to 20 ms	
	MD510	Response delay	2 ms	0 ms to 20 ms	
	MD520	RS485 response delay	2 ms	0 ms to 20 ms (valid for Modbus)	
	IS580	Response delay	2 ms	0 ms to 20 ms	
	ES510	Response delay	2 ms	0 ms to 20 ms	
	ES590	Response delay	2 ms	0 ms to 20 ms	

Param.	Product series	Name	Default	Value range	Descriptions
FD-04	MD290	Modbus commu-nication interrupt detection time	0	0.0 (Invalid) 0.1s to 60.0s (valid for Modbus)	When this parameter is set to 0.0s, the communication timeout time parameter is inactive. If this parameter is set to a valid value, when the drive does not receive the communication signal within the time set in this parameter, Err16 will be reported. Generally, set it to 0.0s. In applications with continuous communication, you can use this parameter to monitor the communication status.

Param.	Product series	Name	Default	Value range	Descriptions
FD-04	MD480-PLUS	Communication timeout time	0.0s	0.0 (Invalid) 0.1s to 60.0s	When this parameter is set to 0.0s, the communication timeout time parameter is inactive. If this parameter is set to a valid value, when the drive does not receive the communication signal within the time set in this parameter, Err16 will be reported. Generally, set it to 0.0s. In applications with continuous communication, you can use this parameter to monitor the communication status.
	MD500	Communication timeout time	0.0s	0.0 (Invalid) 0.1s to 60.0s	
	MD500-PLUS	Communication timeout time	0.0s	0.1s to 60.0s	
	MD500E	Communication timeout time	0.0s	0.0 (Invalid) 0.1s to 60.0s	
	MD510	Communication timeout time	0.0s	0.0 (Invalid) 0.1s to 60.0s	When this parameter is set to 0.0s, the communication timeout time parameter is inactive. If this parameter is set to a valid value, when the drive does not receive the communication signal within the time set in this parameter, Err16 will be reported. Generally, set it to 0.0s. In applications with continuous communication, you can use this parameter to monitor the communication status.
	MD520	Communication timeout time	0.0	0.1s to 60.0s	
	IS580	Communication timeout time	0.0s	0.0 (Invalid) 0.1s to 60.0s	
	ES510	Communication timeout time	0.0s	0.0 to 60.0	
	ES590	Communication timeout time	0.0s	0.0 to 60.0	

Param.	Product series	Name	Default	Value range	Descriptions
FD-05	MD480-PLUS	Communication protocol	0	0: Non-standard Modbus-RTU protocol 1: Standard Modbus-RTU protocol	If Fd-05 is set to 0, when the data is read, the number of bytes returned by the slave is one byte more than that returned by the standard Modbus protocol. If Fd-05 is set to 1, the standard Modbus protocol applies.
	MD500	Communication protocol	0	0: Non-standard Modbus-RTU protocol 1: Standard Modbus-RTU protocol	

Param,	Product series	Name	De-fault	Value Range	Description
bd.00	CS290	Baud rate	5	5 to 9	Used to set the data transmission rate between the host controller and the drive during Modbus communication. Note that the baud rate of the host controller must be the same as that of the AC drive. Otherwise, communication will fail. The higher the baud rate, the faster the communication speed.
	CS710	Baud rate	5	5 to 9	Used to set the data transmission rate between the host controller and the drive during Modbus communication. Note that the baud rate of the host controller must be the same as that of the AC drive. Otherwise, communication will fail. The higher the baud rate, the faster the communication speed. 5: 9600 bps 6: 19200 bps 7: 38400 bps 8: 57600 bps 9: 115200 bps

Param,	Product series	Name	De-fault	Value Range	Description
bd.01	CS290	Data format	0	0 to 3	Used to select the AC drive data format during Modbus communication. Note that the data format of the host controller must be the same as that of the drive. Otherwise, communication fails. 0: No parity check: data format <8, N, 2> 1: Even parity check: Data format <8, E, 1> 2: Odd parity: data format <8, O, 1> 3: No check: data format <8, N, 1>
	CS710	Data format	0	0 to 3	
bd.02	CS290	Local address	1	0 to 247	When the local address is set to 0 (broadcast address), the drive communicates with the host controller in broadcast mode. The address must be unique (except the broadcast address), which is the basis for point-to-point communication between the host controller and the drive.
	CS710	Local address	1	0 to 247	
bd.03	CS290	Communication card communication response delay	2 ms	0 ms to 20 ms	Used to set the time that the AC drive waits before sending data to the host controller after it finishes receiving data. If the response delay is shorter than the system processing time, the system processing time prevails. If the response delay is longer than the system processing time, the drive will send data to the host controller only after the system finishes data processing and the response delay expires. This parameter is active only in RS485 communication.
	CS710	Expansion card communication response delay	2 ms	0 ms to 20 ms	

Param,	Product series	Name	De-fault	Value Range	Description
bd.04	CS290	Expan-sion card commu-nication timeout time	0.0 ms	0.0 to 60.0	If the communication interval exceeds the value of this parameter, the drive reports error 48#. Generally, set it to 0.0s. In a continuous communication system, you can monitor the communication state by setting this parameter. If this parameter is set to 0, error 48# (communication error) is hiden. This parameter is active only in Modbus, PROFIBUS-DP, and CANopen communication modes.
	CS710	Expan-sion card commu-nication timeout time	0.0 ms	0.0 to 60.0	
bd.07	CS290	Expan-sion card selection	0	0 to 1	0: Modbus communication 1: Profibus-DP/CANopen card
	CS710	Expan-sion card selection	0	0 to 2	0: Modbus communication 1: Profibus-DP communication 2: CANopen communication/Profinet communication Different communication modes require different expansion cards.

4 Isolated RS485 Communication Protocol

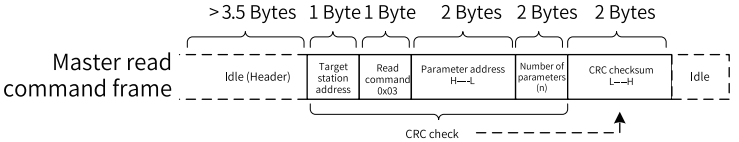
4.1 Introduction

The MD38TX1 expansion card adopts RS485 communication interface to be used together with AC drives. You can carry out centralized control by using a PC or PLC. Through the RS485 communication protocol, you can also set the operation commands, modify or read parameters, and read the operating status and fault information of the drive.

The drive supports the Modbus-RTU and Modbus-ASCII slave communication protocol. These protocols define the content and format of messages transmitted during serial communication. If the slave encounters an error upon receiving a message or fails to complete the action required by the master, it responds with a fault message to the master.

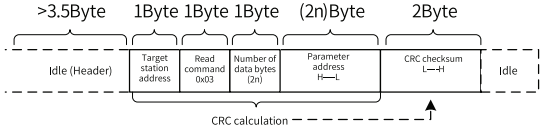
4.2 Communication Data Frame Structure

The following figure shows the communication data format of the Modbus-RTU protocol. The drive supports reading or writing only word type parameters only, and does not support reading or writing of bytes or bits. The read operation command is 0x03, the write operation command is 0x06, and the multi-data write operation command is 0x10.

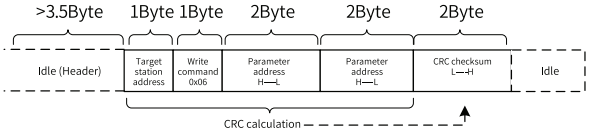


In theory, the host controller can read or write a maximum of 12 consecutive parameters. However, these parameters must be in the same group. Otherwise, a response error occurs.

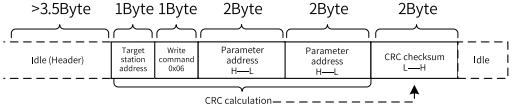
Slave read response frame



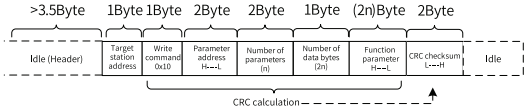
Master write command frame



Slave write response frame

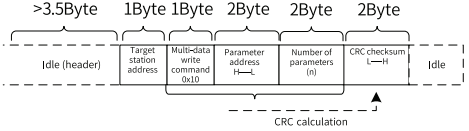


Master multi-data write command frames



A maximum of 12 consecutive parameters can be read or written.

Slave multi-data write response frames



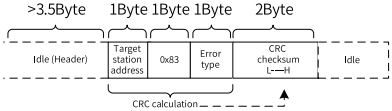
If the slave detects a communication frame error or a reading/writing failure caused by other reasons, an error frame will be returned.

Note

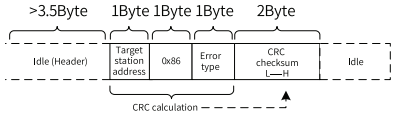
No response is returned for CRC check error.

The command for a reading error responded by the slave is 0x83. The command for a writing error responded by the slave is 0x86. The command for a multi-data write error responded by the slave is 0x90.

Slave read response error frame



Slave write response error frame



Error type:
01: Command code error
02: Address error
03: Data error
04: Command cannot be processed

Slave multi-data write response error frame

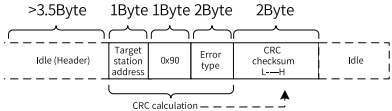


Table 4–1 Data frame fields

Header (START)	Idle time longer than the time for transmitting 3.5 bytes
Slave address (ADR)	Communication address: 1 to 247
Command code (CMD)	03: Read slave parameters 06: Write slave parameters 10: Read/Write multiple slave parameters
Parameter address (H)	Internal parameter address of the drive are in hexadecimal format, which are divided into parameter type and non-parameter type (such as running status parameters and running commands). See the address definition for details. Low-order bytes follow high-order bytes during transmission.
Parameter address (L)	
Number of parameters (H)	Indicates the number of parameters read in this frame. 1 indicates that one parameter is read. Low-order bytes follow high-order bytes during transmission. Only one parameter can be modified at a time. This field does not exist.
Number of parameters (L)	

Number of data bytes	Data length, which is twice the number of parameters
Data (H)	Response data or data to be written (Low-order bytes follow high-order bytes during transmission.)
Data (L)	
CRC low-order bit	Detection value: CRC16 check value High-order bytes follow low-order bytes during transmission. For the calculation method, see the following descriptions of CRC.
CRC high-order bit	
END	Idle time equal to the time for transmitting 3.5 bytes

CRC check:

The cyclical redundancy check (CRC) adopts the RTU frame format. A Modbus message includes a CRC-based error check field. The CRC field checks the content of the entire message. The CRC field contains two bytes, including a 16-bit binary value. It is added to the message after being calculated by the transmission device. The reception device recalculates a CRC value in the message, and compares the calculated value with the CRC value in the received CRC field. If the two CRC values are different, transmission errors occur.

The CRC is firstly saved to 0xFFFF. Then a procedure is invoked to process the consecutive 8-bit byte in the message and the value in the register. Only the 8-bit data in each character is valid for the CRC. The start bit, stop bit and the parity bit do not apply to the CRC.

During generation of CRC, each eight-bit byte is in exclusive or (XOR) with the content in the register. The result is shifted to the least significant bit (LSB), and 0 is filled in the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB is 1, the register then performs XOR with a preset value. If the LSB is 0, no XOR is performed. Repeat this process eight times. After this process is repeated eight times, the next eight-bit byte is in XOR with the register's current value, and the process repeats for eight more shifts as described above. The final value of the register is the CRC value after all the bytes in the message have been applied.

The CRC is added to a message from the low-order byte to the high-order byte. A simple function for the CRC is as follows:

```
unsigned int crc_chk_value（unsigned char *data_value,unsigned char length）

{

unsigned int crc_value=0xFFFF;
unsigned int crc_chk_value (unsigned char *data_value,unsigned char length)
{
unsigned int crc_value=0xFFFF;
    int i;
    while (length–)
      {
          crc_value^=*data_value++;
           for (i=0;i<8;i++)
          {
                if (crc_value&0x0001)
                    {
                      crc_value= (crc_value>>1) ^0xa001;
                }
                else
                {
                      crc_value=crc_value>>1;
                }
          }
    }
return (crc_value);
 }
```

Definition of communication parameter addresses:

The parameters can be read and written (except those which cannot be changed because they are only for factory use or monitoring).

5 Communication Example

5.1 Configuration of RS485 Communication Between Drive and H5U

■ Software acquisition and hardware connection

The following takes MD520 series AC drive as an example.

1. Log in to Inovance website *www.inovance.com* and download the H5U programming software.
2. Connect 485+ and 485- on the H5U to 485+ and 485- on the drive, as shown in the following figure.

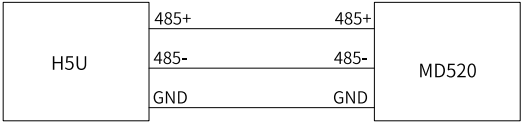


Figure 5-1 Connecting communication interfaces

■ Master and slave configuration

1. Open AutoShop, click **New Project**, check that **Series and models** is **H5U**, and click **OK** to enter the programming interface.
2. Click COM in the left pane to go to the PLC configuration interface, select the protocol and data format, and click **OK**.

3. Click COM , then click **Add Modbus Config** and **OK**.

   COM
   COM0 Modbus Config is displayed. Double-click COM0 Modbus Config , and click **Add** on the displayed interface.

   You can perform operations on a variable of the AC drive each time you click **Add**.

4. Write operation: After clicking **Add**, select the **Slave NO.** and **Trigger Mode** (typically **Cycle**).

NO.	Name	Slave NO.	Trigger Mode	Trigger Conditions	Function Code	Slave addr...	Quantity	Mapped Addr.	Repeat Num
1	slave	1	Cycle(ms)	1000	Write Register(16)	1000	1	D0	1

   As shown in the preceding figure, **Slave NO.** is **1**, indicating that the operation will be performed on slave 1. Set **Trigger Mode** to **Cycle** and **Function Code** to **Write Register**; otherwise, the write operation will fail. The internal variables of the AC drive are all 16-bit data. Therefore, set **Quantity** to **1**. If **Quantity** is set to **2**, the write operation will fail.

5. Read operation: After clicking **Add**, select the **Slave NO.** and **Trigger Mode** (typically **Cycle**).

NO.	Name	Slave NO.	Trigger Mode	Trigger Conditions	Function Code	Slave addr...	Quantity	Mapped Addr.	Repeat Num
1	slave	1	Cycle(ms)	1000	Write Register(16)	1000	1	D0	1
2	slave	1	Cycle(ms)	1000	Write Register(16)	2000	1	D2	1
3	slave	1	Cycle(ms)	1000	Read Register(03)	7002	1	D300	1
4	slave	1	Cycle(ms)	1000	Read Register(03)	7003	1	D302	1

As shown in the preceding figure, **Slave NO.** is **1**, indicating that the operation will be performed on slave 1. Set **Trigger Mode** to **Cycle** and **Function Code** to **Read Register**; otherwise, the read operation will fail. The internal variables of the AC drive are all 16-bit data. Therefore, set **Quantity** to **1**. If **Quantity** is set to **2**, the read operation will fail.

After the read and write operation settings, click **OK** to return to the programming interface.

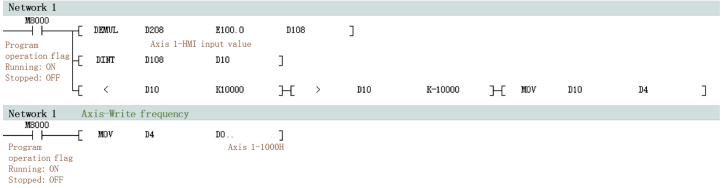
■ Examples

1. Write the frequency (F0-03 is set to 9).

   Data conversion: Multiply the required frequency (a) by 100 to obtain an integer, and then write the integer to 1000H.

   The following figure shows the configuration and the program.

Function Code	Slave address (H)	Quantity	Mapped Address	Repeat Number
Write Register (16)	1000	1	.. D0	1



2. Start or stop the AC drive (F0-02 is set to 2).

   Assign a value to the D component corresponding to the station address 2000H to control forward running, reverse running, and stop of the AC drive through communication. 2000H is defined as follows:

   1: Run in forward direction; 2: Run in reverse direction; 3: Jog in forward direction; 4: Jog in reverse direction; 5: Coast to stop; 6: Decelerate to stop; 7: Reset upon fault

   The following figure shows the configuration and the program.

Function Code	Slave addr...	Quantity	Mapped Addr.
Write Register(16)	2000	1 ..	D2

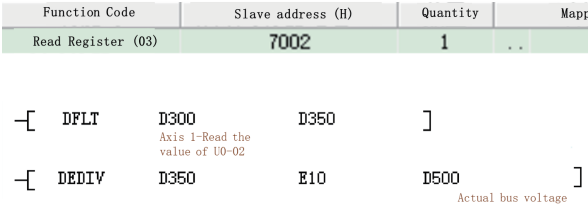
The PLC soft component address corresponding to 2000H is D2. Therefore, to control the AC drive to run in forward direction through communication, write 1 to D2. Similarly, to control the AC drive to decelerate to stop, set D2 to 6.

3. Read the bus voltage.

Based on the conversion rule, convert the bus voltage U0-02 to 7002 (convert U in the high-order 2 bits to 7, and convert the low-order 2 bits to a hexadecimal equivalent). The actual bus voltage is the read bus voltage (a) divided by 10. According to the communication configuration, the D component address of the bus voltage is D300. Convert D300 to a floating-point number and then divide this value by 10.

The following figure shows the configuration and the program.

Function Code	Slave address (H)	Quantity	Mapped Address
Read Register (03)	7002	1 ..	D300

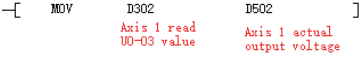


4. Read the output voltage.

Convert the output voltage U0-03 to 7003 based on the conversion rule. The read value is the actual output voltage. According to the communication configuration, you only need to move the value of D302 to another D component (or not).

The following figure shows the configuration and the program.

Function Code	Slave addr...	Quantity	Mapped Addr.
Read Register(03)	7003	1 ..	D302

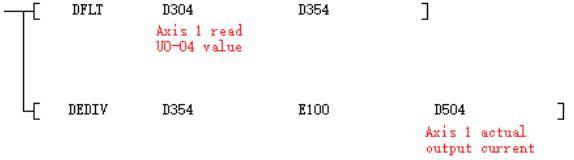


5. Read the output current.

Convert the output current address U0-04 to 7004 based on the conversion rule. The actual output current is the read output current divided by 100.

The following figure shows the configuration and the program.

Function Code	Slave addr...	Quantity	Mapped Addr.
Read Register(03)	7004	1	D304



6. Read the AC drive state.

Read 3000H to directly obtain the current state of the AC drive (1: Running in forward direction; 2: Running in reverse direction; 3: Stopped).

The following figure shows the configuration and the program.

Function Code	Slave addr...	Quantity	Mapped Addr.
Read Register(03)	3000	1	D308

7. Read the DI state.

According to the conversion rule, convert the DI state U007 to 7007. Convert the read value into a binary value. The LSB indicates DI1, the second bit indicates DI2, and so on.

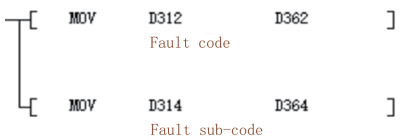
Function Code	Slave addr...	Quantity	Mapped Addr.
Read Register(03)	7007	1	D310

8. Read the fault code.

Convert the fault code U0-62 to 703E and convert the fault subcode U0-46 to 702D based on the conversion rule.

The following figure shows the configuration and the program.

Function Code	Slave address (H)	Quantity	Master Buffer Area Address
Read Register (03)	703E	1	D312
Read Register (03)	702D	1	D314



■ Common faults and solutions

Mandatory inspection items:

1. Check whether other pins instead of 485+ and 485- are connected.
2. Check whether the communication rate defined by FD-00 of the MD520 is consistent with that of the host controller.
3. Check whether the data format defined by FD-01 of the MD520 is consistent with that of the host controller.
4. Check whether the communication address defined by FD-02 (local address) of each device is unique to avoid conflicts caused by duplicated local addresses.

Table 5–1 Common faults and solutions

Common faults	Solution
Failure to write frequency	1. Check F0-03 to confirm that the address in the configuration table is correct. When F0-03 is 0, the address is the address of F0-08; when F0-03 is 9, the address is 1000H or 7310H. 2. Check whether the termination resistor is connected. If not, switch on the termination resistor and then power on the AC drive again.
Failure to start the drive	1. Check that F0-02 is set to 2 (0: Operating panel; 1: Terminal; 2: Communication). 2. Check whether the termination resistor is connected. If not, switch on the termination resistor and then power on the AC drive again.
Unstable connection	1. Ensure stable connection on PLC side. 2. Check that wiring on the AC drive end is reliable. 3. Check that signal cables are routed away from power cables.
Incorrect reading value	1. Ensure that the address configured is correct. 2. Ensure that data conversion is performed. 3. Ensure that the D element is not occupied.

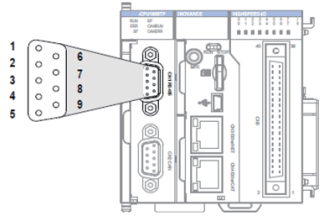
5.2 Configuration of RS485 Communication Between the Drive and AM600

The following section describes how to configure the AM600 series PLC to control the drive to run forward or reversely.

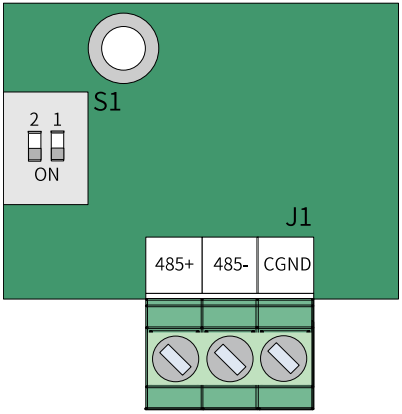
■ Hardware connection

Interfaces:

- The AM600 provides two RS485 ports. The two RS485 channels share the same DB9 interface. For details, see the following figure.

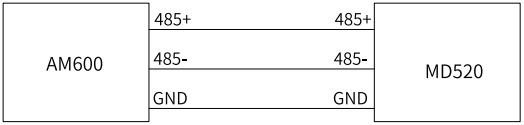
RS485 port on CPU module	Pin	Channel	Assignment	Function
	1	COM0 (RS485)	RS485-	Negative signal of the RS485 differential pair of COM0
	2		RS485+	Positive signal of the RS485 differential pair of COM0
	5		GND0	Power ground of COM0
	6	COM1 (RS485)	RS485-	Negative signal of the RS485 differential pair of COM1
	9		RS485+	Positive signal of the RS485 differential pair of COM1
	3		GND1	Power ground of COM1

- The drive supports one RS485 port, which is located on the MD38TX1 communication card, as shown in the following figure.



Hardware connection procedure:

1. Take COM1 as an example. Connect one end of the network cable to CN1 of the AM600 through the DB9 terminal. Strip the other end of the cable, connect the 485 +, 485-, and GND0 wires to the 485+, 485-, and GND terminals of the AC drive, respectively, as shown in the following figure.



2. Set the two DIP switches of S1 on the expansion card to the “ON" position.

■ Configuration on the drive side

Set the following parameters on the AC drive. Set F0-02 to 2 (set the command source to communication), and set F0-03 to 9 (set the main frequency source to communication).

Ones position of FD-00 = 5

FD-01 = 0

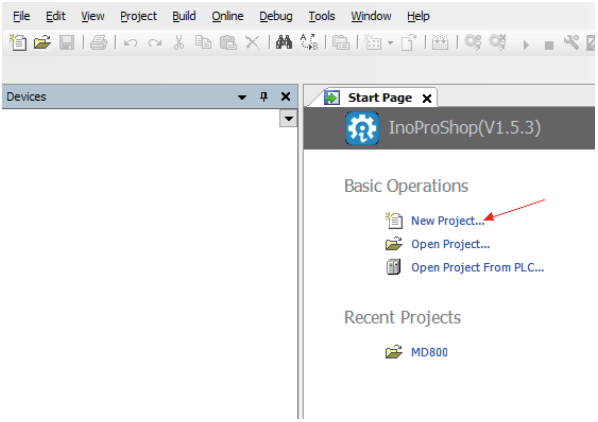
FD-03 = 2

FD-04 = 0.0

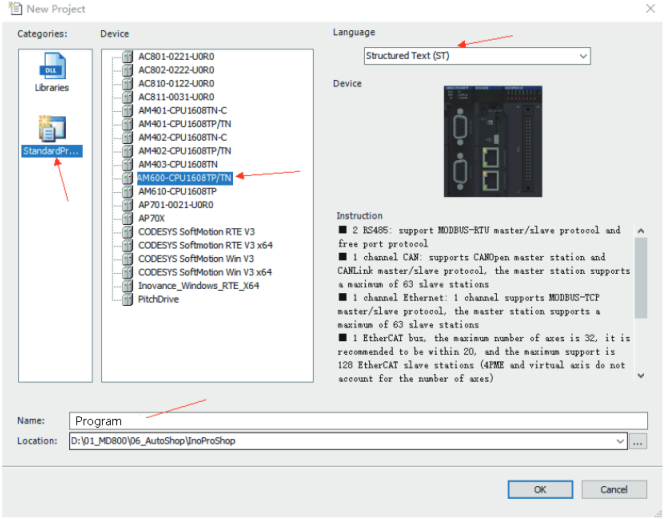
Record the address of FD-02, which is the station number of the AC drive.

■ Configuration on the PLC side

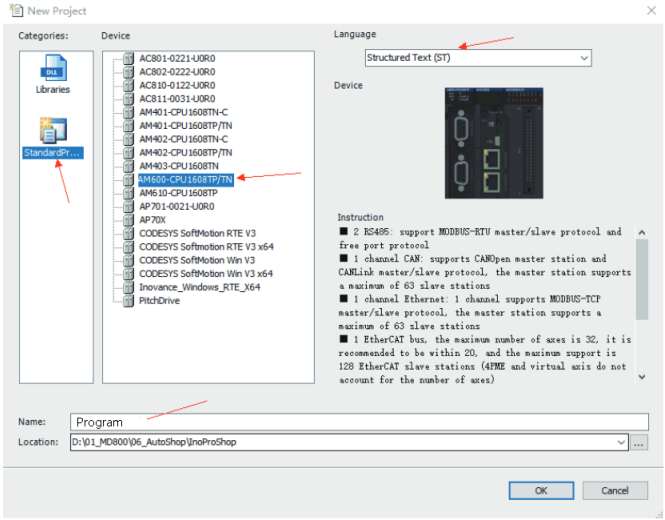
1. Connect the PC and PLC through a network cable or USB, open InoProShop, and create a new project.



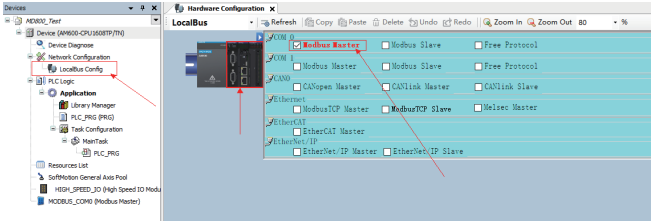
2. Click **Standard Project**, change the project name and location, and click **OK**.



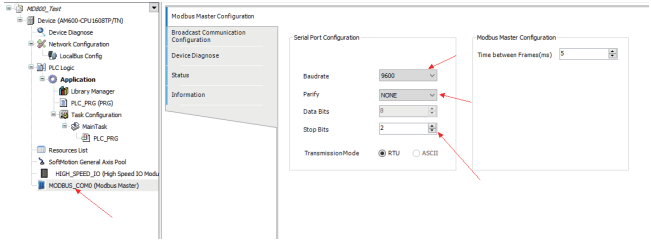
3. Select **AM600-CPU1608TP/TN**, select **Structured Text (ST)** from the **Language** drop-down list, and click **OK**.



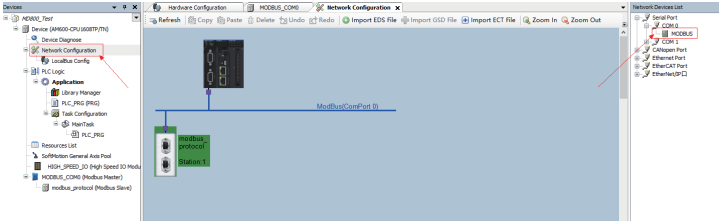
4. Click LocalBus Config and then click to select a CPU module. In hardware connection, the RS485 cable of the COM0 is connected to the RS485 terminal of the MD520. Therefore, select the Modbus master station of the serial port 0.



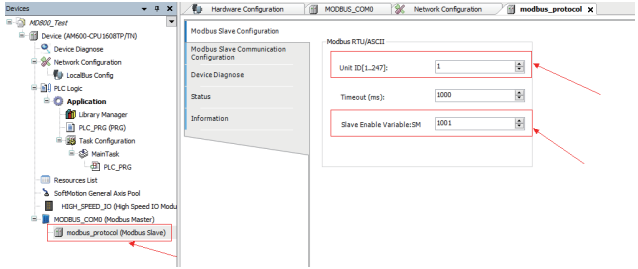
5. Click **Modbus_COM0** in the left pane, and set the baud rate, parity, and stop bit according to the settings of FD-01.



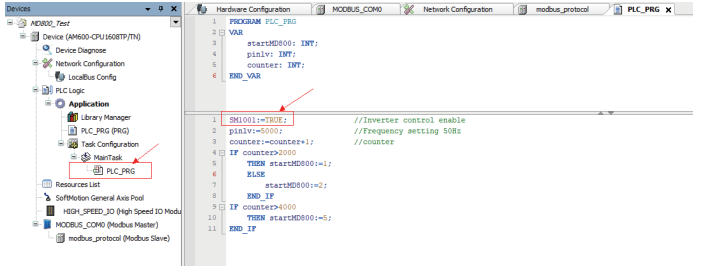
6. Double-click **Network Configuration** in the left pane. Choose **Serial Port** > **COM 0** in the right pane, and double-click **MODBUS**. A new slave is displayed on the Modbus bus in the center of the interface. If there are multiple slaves, click **MODBUS** multiple times to generate multiple slaves.



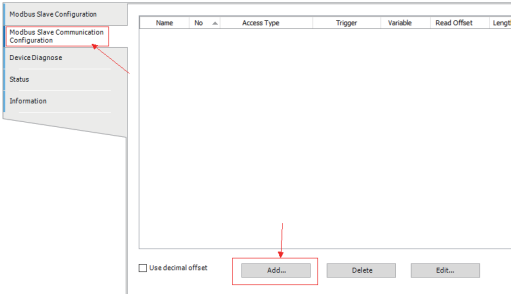
7. Double-click the new Modbus slave station and set its number, which must be same as the station number of the AC drive set by Fd-02. Record the value of **Slave Enable Variable**.



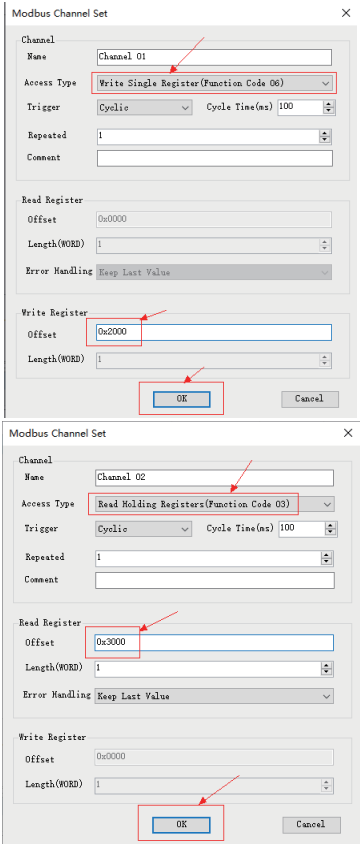
8. Compile the PLC program as follows: Enable the slave enable variable. Set the frequency of the AC drive to 50 Hz. Make the PLC run for 4000 scanning cycles. During the first 2000 scanning cycles, make the PLC control the AC drive to run in the forward direction, and during the last 2000 scanning cycles, make the PLC control the AC drive to run in the reverse direction. Make the PLC control the AC drive to decelerate to stop. Note that the slave enable variable must be enabled.



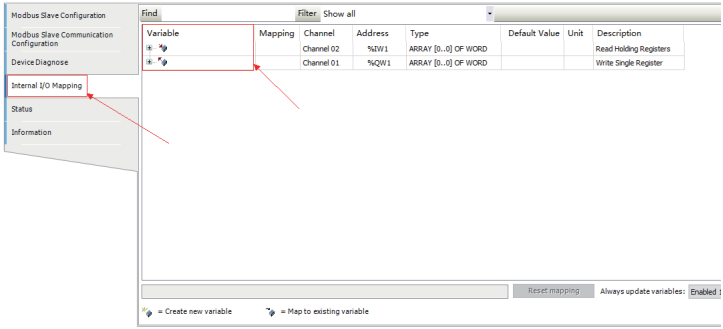
9. Add configuration information on the **Modbus Slave Communication Configuration** tab.



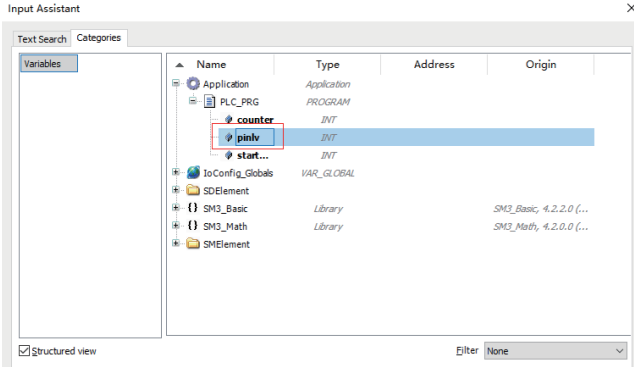
10. Configure the register in the displayed dialog box. The control word reading address of the AC drive is 3000H, the writing address is 2000H, and the frequency address is 1000H.



11. On the **Internal I/O Mapping** tab, map the variable of the PLC to the address of the AC drive.



12. Select the variable to be mapped.



13. Compile the program to check whether there are errors. If no error is found, log in to the PLC, download the program, and click the **Execute** button to execute the program.