



PS00009054A03

GL20-2S485 Series Communication Module User Guide

Suzhou Inovance Technology Co., Ltd.

Add.: No.52, Tian E Dang Road, Wuzhong District,
Suzhou 215104, P.R. China

Tel: (0512) 6637 6666 Fax: (0512) 6285 6720

www.inovance.com



Preface

■ Introduction

The GL20-2S485 series 2-channel communication module supports RS485 communication mode. It can be used with AM300/AM500/AM400/AM600/AC700/AC800/Easy series PLCs and GL20 series communication interface modules such as GL20-RTU-ECT.

This guide describes the mechanical installation, electrical installation, program commissioning, and troubleshooting of the product.

■ Standards Compliance

The following table lists the certifications, directives, and standards that the product may comply with. For details about the acquired certificates, see the certification marks on the product nameplate.

Certification	Directive		Standard
CE Certification	EMC Directive	2014/30/EU	24 VDC products: EN 61131-2 220 VAC products: EN 61131-2 EN 61000-3-2 EN 61000-3-3
	LVD Directive	2014/35/EU	EN 61010-1 EN 61010-2-201
	RoHS Directive	2011/65/EU amended by (EU) 2015/863	EN IEC 63000
UL/cUL Certification	-		UL 61010-1 UL 61010-2-201 CAN/CSA-C22.2 No. 61010-1 CSA C22.2 NO. 61010-2-201
KCC Certification	-		-

Certification	Directive		Standard
EAC Certification	-		-
UKCA Certification	Safety Regulations	Electrical Equipment (Safety) Regulations 2016	EN 61010-1 EN 61010-2-201
	EMC Regulations	Electromagnetic Compatibility Regulations 2016	24 VDC products: EN 61131-2 220 VAC products: EN 61131-2 EN 61000-3-2 EN 61000-3-3
	RoHS Regulations	Directive (RoHS) Regulations 2012	EN IEC 63000

■ More Data

Name	Code	Description
GL20-RTU-ECT Series Communication Interface Module User Guide	PS00004985	Introduces the installation, wiring, and other information of the product.
GL20-RTU-ECT32 Communication Interface Module User Guide	PS00013434	Introduces the product information, installation, wiring, program commissioning, and troubleshooting of the product.
GL20-2S485 Series Communication Module User Guide (This guide)	PS00009054	Introduces the mechanical installation, electrical installation, program commissioning, and troubleshooting of the product.

■ Revision History

Date	Version	Revision
May 2025	A03	Added: Added <i>"2.1 Installation Precautions"</i> on page 17. Modified: <ul style="list-style-type: none">● Modified the software specifications in <i>"1.3 Technical Specifications"</i> on page 14.● Modified <i>"Troubleshooting"</i> on page 49.● Modified <i>"6.2 Appendix 2: Version Matching Information"</i> on page 56.
February 2024	A02	<ul style="list-style-type: none">● Modified <i>"1.2 Components"</i> on page 11.● Modified <i>"1.3 Technical Specifications"</i> on page 14.● Modified <i>"6.2 Appendix 2: Version Matching Information"</i> on page 56.
August 2023	A01	<ul style="list-style-type: none">● Modified technical specifications and programming examples.● Added version matching information.
April 2023	A00	Initial release

■ Access to the Guide

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

- Do keyword search under Service and Support at www.inovance.com.
- Scan the QR code on the product with your smart phone.
- My Inovance APP: Scan the QR code below to install the 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. You will be charged for any repair work after the warranty period expires.

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

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or 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.

Safety Precautions

■ Safety Disclaimer

1. Read and follow the safety instructions when installing, operating, and maintaining the equipment.
2. To ensure your safety and prevent damage to the equipment, follow the marks on the equipment and all the safety instructions in this guide.
3. "CAUTION", "WARNING", and "DANGER" items in the guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
4. Use this equipment according to the designated environment requirements; otherwise, a fault may occur. Malfunction or damage caused by improper use is not covered by warranty.
5. Inovance shall take no responsibility for any personal injury or property damage caused by improper use.

■ Safety Levels and Definitions



"DANGER" indicates that failure to comply with the notice will result in death or severe personal injuries.



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



"CAUTION" indicates that failure to comply with the notice may result in minor or moderate personal injury or equipment damage. Keep this user guide properly for future use and deliver it to the end user.

Control System Design



DANGER

- Provide a safety circuit outside the PLC so that the control system can still work safely once external power failure or controller fault occurs.
- Add a fuse or circuit breaker because the module may smoke or catch fire due to long-time overcurrent caused by operation above rated current or load short-circuit.



WARNING

- An emergency stop circuit, a protection circuit, a forward/reverse operation interlocked circuit, and an upper position limit and lower position limit interlocked circuit must be set in the external circuits of PLC to prevent damage to the equipment.
- To ensure safe operation, for the output signals that may cause critical accidents, use external protection circuit and safety mechanism.
- Once the CPU of the controller detects an exception in the system, all outputs may be closed. When a fault occurs in the controller circuit, the output may not be under control. Therefore, it is necessary to set up an external control circuit to ensure normal operation.
- If the output units such as relays or transistors are damaged, the output may fail to switch between ON and OFF states according to the commands.
- The PLC is designed to be used in an indoor electrical environment (overvoltage category II). The power supply must have a system-level surge protector, assuring that overvoltage due to lightning shock cannot be applied to the PLC's power supply input terminals, signal input terminals, and output terminals, to prevent damage to the equipment.

Installation



- Installation must be carried out by skilled personal who have undergone specialized electrical training and possess comprehensive electrical expertise.
- Disconnect all external power supplies of the system before disassembling the module. Failure to do so may result in electric shock, module fault, or malfunction.
- Do not use the PLC in environments with dust, greasy smoke, conductive dust, corrosive or combustible gases, exposed to high temperature, condensation, wind & rain, or subject to vibration and shock. Electric shock, fire, and malfunction may also result in damage or deterioration to the product.
- The PLC is open-type equipment that must be installed in a control cabinet with lock (cabinet housing protection > IP20). Only the skilled personnel who have undergone specialized electrical training and possess comprehensive electrical expertise can open the cabinet.



- Prevent metal filings and wire ends from dropping into ventilation holes of the PLC during installation. Failure to comply may result in fire, fault, and malfunction.
- Ensure there are no unwanted 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.

Wiring



- Wiring must be carried out by skilled personnel who have undergone specialized electrical training and possess comprehensive electrical expertise.
- Disconnect all external power supplies of the system before wiring. Failure to comply may result in electric shock, module fault, or malfunction.
- Install the terminal cover attached to the product before power-on or operation after wiring is done. Failure to comply may result in electric shock.
- 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.

Wiring



- To avoid electric shock, cut off the power supply before connecting the product to the power supply.
- The input power supply of this product must be 24 VDC. Power supplies outside $\pm 20\%$ of 24 VDC can cause severe damage to the product. Therefore, check whether the DC power supply provided by the switching-mode power supply is stable at a regular interval.

Operation and Maintenance



- Operation and maintenance must be carried out by skilled personnel who have undergone specialized electrical training and possess comprehensive electrical expertise.
- 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 assembling/disassembling the module or connecting/removing the communication cables. Failure to comply may result in electric shock or malfunction.

Safety Recommendations

- In the position where the operator directly touches the machinery part, for example, where a machinery tool is loaded/unloaded, or where a machine runs automatically, the on-site manual operating devices and any other alternative means must be carefully arranged and designed so that they are independent of the PLC and can start or terminate the automatic running of the system.
- If modification on the program is needed during system operation, use the lock function or other protective measures. Ensure that only authorized personnel can make the necessary modifications.

Disposal



- Treat the scrapped product as industrial waste. Dispose of the battery according to local laws and regulations.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

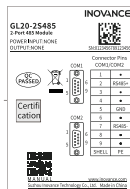
1 Product Information

1.1 Naming Rules and Nameplate

GL 20 - 2 S485

① ② ③ ④

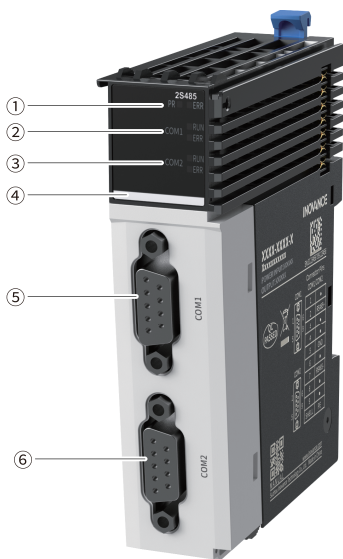
① Product Information GL: Inovance general local module	③ Number of Channels 2: Two channels
② Series Number 20: 20 series module	④ Module Type S485: Support RS485 communication mode









The data for ordering the product is shown in the following table.

Model	Description	Material Code	Applicable Model
GL20-2S485	GL20 series 2-channel RS485 module	01440456	AM300, AM500, AM400, AM600, AC700, AC800, and Easy series PLCs

1.2 Components



No.	Name	Description			
①	Signal indicator	PR (POWER +RUN)	Power/Run indicator	Yellow-green	<ul style="list-style-type: none"> ● Steady ON: The module is in normal operation. ● Flashing quickly: The module is addressed successfully. ● Flashing slowly: The module is powered on but not addressed. ● OFF: The module is not powered on or is faulty.
		ERR	Fault indicator	Red	ON: The module is faulty. For troubleshooting, see " Troubleshooting " on page 49
②	COM1 indicator	RUN	Operation indicator	Green	<ul style="list-style-type: none"> ● ON: Data communication in progress ● OFF: No data communication
		ERR	Fault indicator	Red	ON: The module is faulty. For troubleshooting, see " Troubleshooting " on page 49

No.	Name	Description			
③	COM2 indicator	RUN	Operation indicator	Green	<ul style="list-style-type: none"> ● ON: Data communication in progress ● OFF: No data communication
		ERR	Fault indicator	Red	ON: The module is faulty. For troubleshooting, see " Troubleshooting " on page 49
④	Color identification		Red: Digital output		Orange: Analog output
			Gray: Digital input		Green: Analog input
			White: Communication		Blue: Other modules
⑤	COM1 port	COM1	COM1 port for RS485 serial communication (DB9 female head)	-	-
⑥	COM2 port	COM2	COM2 port for RS485 serial communication (DB9 female head)	-	-

Note

- Flashing quickly: The indicator is on for 50 ms and off for 200 ms.
- Flashing slowly: The indicator is on for 200 ms and off for 1 s.

1.3 Technical Specifications

■ Basic specifications

Item	Specification
IP rating	IP20
Dimensions (W x H x D)	24 mm x 100 mm x 75 mm
Weight	About 89 g

■ Power supply specifications

Item	Specification
Rated voltage of bus input power supply	5 VDC (4.75 VDC to 5.25 VDC)
Rated current of bus input power supply	115 mA (typical value @5 V)
Rated voltage of terminal input power supply	/
Rated current of terminal input power supply	1000 mA
Rated voltage of terminal output power supply	/
Rated current of terminal output power supply	/
Hot swap	Not supported

■ Serial port specifications

Item	Description
Input PDO data volume	Max. 60 bytes
Output PDO data volume	Max. 60 bytes
Interface type	DB9 female head
Number of channels	Two non-isolated channels
Communication interface	RS485
Communication mode	One pair of differential signals (half-duplex)
Baud rate	4800 bps, 9600 bps (default), 19200 bps, 38400 bps, 57600 bps, and 115200 bps
Data bit	7 bits or 8 bits
Start bit	1 bit
Stop bit	1 bits or 2 bits
Parity bit	Odd parity, even parity, or no parity
Communication data refresh mode	Free refresh
Number of slaves	Up to 31 slaves per port
Communication distance	The maximum communication distance is 1200 m. The higher the speed, the smaller the distance.
Isolation	Isolated
Termination resistor	Not included. External matching resistors can be added when the module is located at either end of the network.
Independent channel enable configuration	Supported
Diagnostic report function configuration	Supported

1.4 Environmental Specifications

Item	Specification
Installation/ application environment	Free from conductive dust, conductive fibers, explosive dust, flammable gases, water mist/greasy dirt, corrosive dusts/gases, strong vibration, and repetitive shock
Altitude	≤ 2,000 m
Pollution degree	2
Immunity	2 kV on power supply cable (compliant with IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC61131-2
Anti-static rating	Contact discharge +/-6 kV and air discharge +/-8 kV
Vibration resistance	<ul style="list-style-type: none"> ● Application scenario: Tested according to IEC60068-2-6, 3.5 mm amplitude from 5 Hz to 8.4 Hz; 1 g acceleration from 8.4 Hz to 200 Hz; 10 cycles per axial direction ● Transportation scenario: Tested according to IEC60068-2-64, 0.01 g²/Hz power spectral density from 5 Hz to 100 Hz; 0.001 g²/Hz power spectral density at 200 Hz; 1.14 g Grms
Shock resistance	Application/Transportation scenario: Tested according to IEC60068-2-27; 15 g peak acceleration, 11 ms pulse width, 18 cycles in total in X, Y and Z axial directions
Operating temperature/humidity	<ul style="list-style-type: none"> ● Temperature: -20°C to +55°C ● Humidity: < 95% RH (30°C), without condensation
Storage temperature/ humidity	<ul style="list-style-type: none"> ● Temperature: -20°C to +60°C ● Humidity: < 95% RH (30°C), without condensation
Transportation temperature/humidity	<ul style="list-style-type: none"> ● Temperature: -40°C to +70°C ● Humidity: < 95% RH (40°C), without condensation

2 Mechanical Installation

2.1 Installation Precautions

- Before installing or removing the module, ensure that the module is powered off.

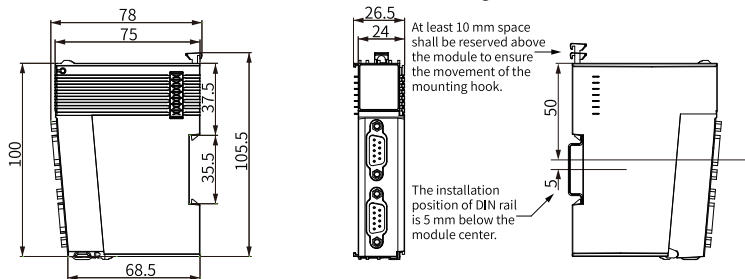


Do not hot swap the modules. Otherwise, the modules may be damaged by overcurrent or overvoltage, and the communication interface module or PLC may be subject to restart, user data loss, or corruption.

- Prevent the enclosure or terminals of the module from dropping or being impacted to avoid damage to the module.

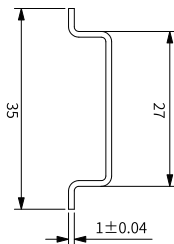
2.2 Installation Dimensions

The installation dimensions (in mm) are shown in the figure below.



2.3 Installation Method

The module is mounted onto a DIN rail according to IEC 60715 (width: 35 mm, thickness: 1 mm). The dimensions (in mm) are shown below.

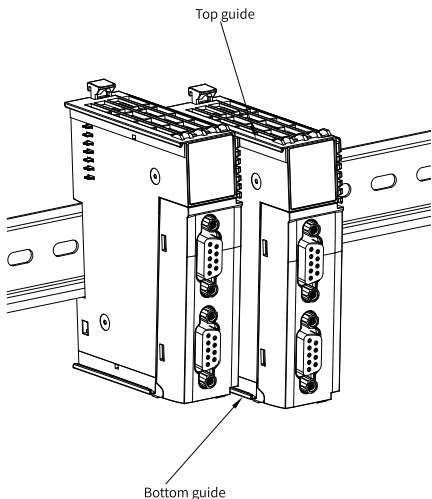


Caution

If the thickness of the DIN rail is not as required, the product cannot fit in or function properly as the DIN rail mounting hook does not work.

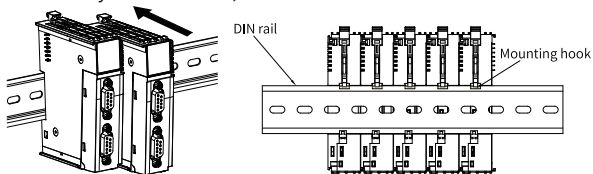
■ Installing modules side by side

Install modules side by side by sliding them along the top and bottom guide rails of adjacent modules.

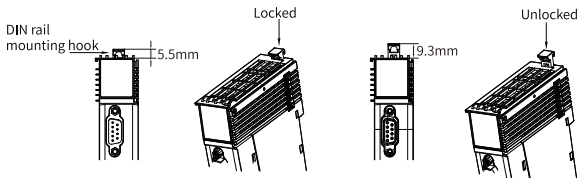


■ Installing modules onto DIN Rail

1. Align the module with the DIN rail and push the module in the direction indicated by the arrow until you hear a click, as shown below.



2. Make sure the DIN rail mounting hook of the module is locked. The locked and unlocked states of the mounting hook are shown below.



- If the mounting hook is pressed down, it is locked.
- If the mounting hook is lifted up, it is unlocked.

To lock the module to the DIN rail, press down the mounting hook.

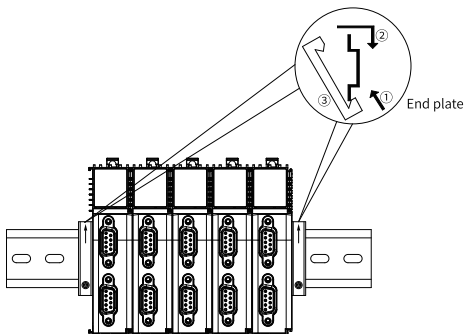


Caution

When the module is not installed on the DIN rail, keep the rail hook in locked state. A hook that kept in unlocked state for a long period of time may fail to function properly.

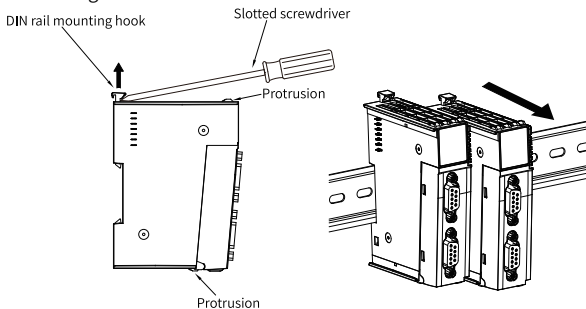
3. Install a DIN rail end plate on both sides of the PLC or the module.

To install the end plate, hook the bottom of it to the bottom of the DIN rail, rotate the end plate to hook the top of it to the top of the DIN rail, and then tighten the screw to lock the end plate in place,

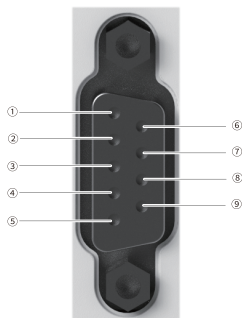


■ Removing modules

Pry the DIN rail mounting hook upwards with a tool such as a slotted screwdriver, hold the protrusions and pull the module out straight forward. Then, press down the top of the mounting hook.



3 Electrical Installation



Pin No.	Pin Signal
②	RS485+
⑦	RS485-
⑤	GND
①, ③, ④, ⑥, ⑧, ⑨	-
Enclosure	PE

4 Program Commissioning

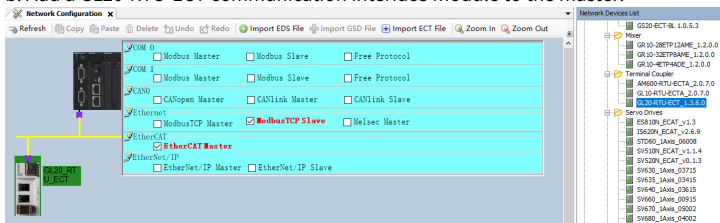
4.1 InoProShop Programming Example (AM400/AM600/AC700/AC800)

■ Configuring the GL20-2S485 module as the Modbus master

1. Add the GL20-RTU-ECT communication interface module.

a. In the left **Devices** pane, double-click **Network Configuration** and click the PLC figure in the upper left corner of the interface. Check "EtherCAT Master" to enable the PLC as an EtherCAT master.

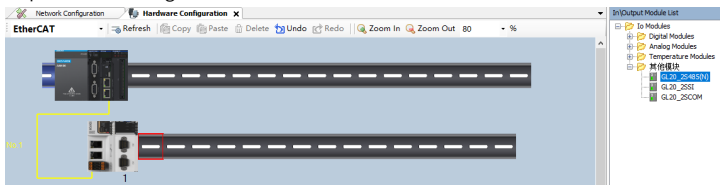
b. Add a GL20-RTU-ECT communication interface module to the master.



2. Add the GL20-2S485 module.

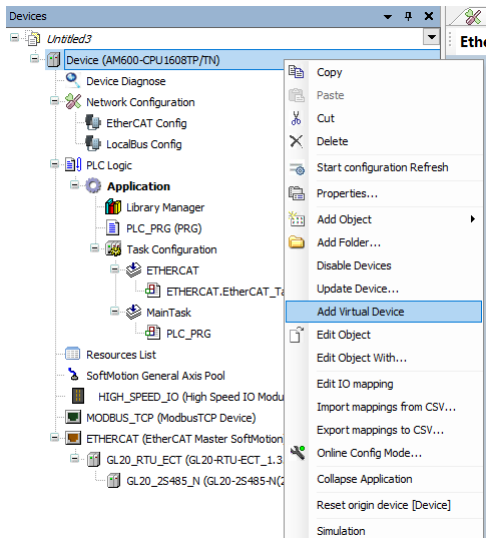
a. Double-click the GL20-RTU-ECT module figure to open the **Hardware Configuration** page.

b. In the **In/Output Module List**, double-click the GL20-2S485 module, or drag and place it to the right side of the GL20-RTU-ECT module.



3. Set the interface of the GL20-2S485 module as the Modbus master.

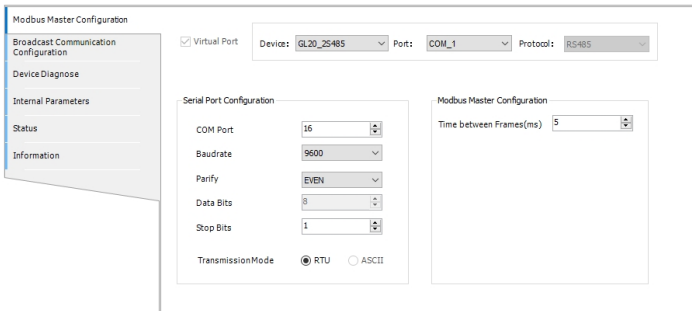
a. Right-click **Device** and select **Add Virtual Device**.



b. In the pop-up window, double-click **Modbus Master**.

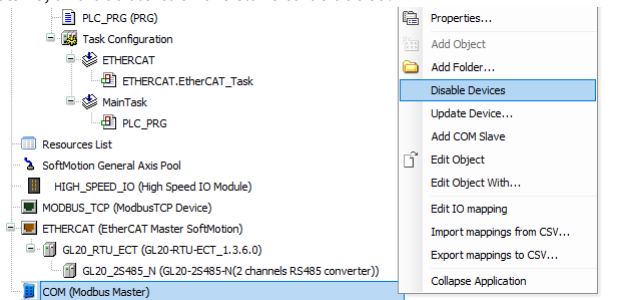
Name	Supplier	Version	Description
COM Port			
Modbus Master	inovance	00.00.00.20	
Modbus Slave	inovance	00.00.00.20	Virtual Modbus Device
Serial Free Protocol	inovance	00.00.00.20	Virtual Free Command on Serial Port of Inovance

c. Double-click **COM (Virtual Modbus Master)** to open the **Modbus Master Configuration** page.

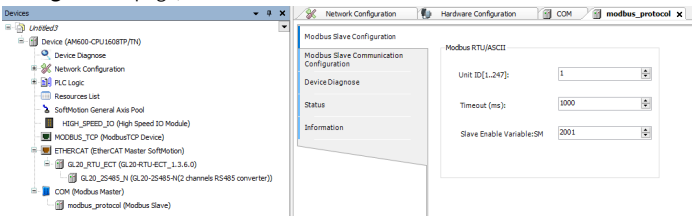


4. Add a slave to the Modbus network.

a. In the left **Devices** pane, right-click **COM (Virtual Modbus Master)**, select **Add COM Slave**, and double-click the slave to be added.



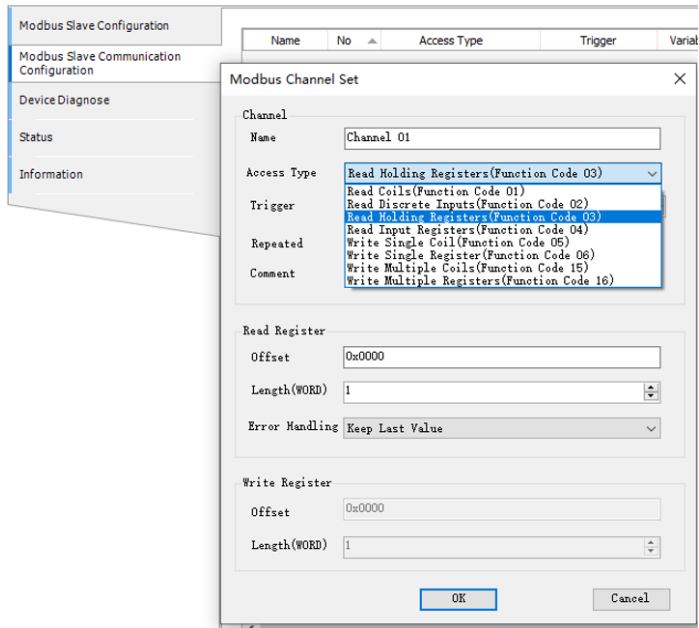
b. Double-click the added slave to set **Unit ID** and **Timeout** on the **Modbus Slave Configuration** page, as shown below.



Note

- The AM400 and AM600 series controllers have a Slave Enable Variable (such as SM1001 in the figure above). Enable this variable before running the controller.
- The AC700 and AC800 series controllers do not have such variable and can run directly.

c. On the **Modbus Slave Communication Configuration** tab, click **Add** to add Modbus commands.



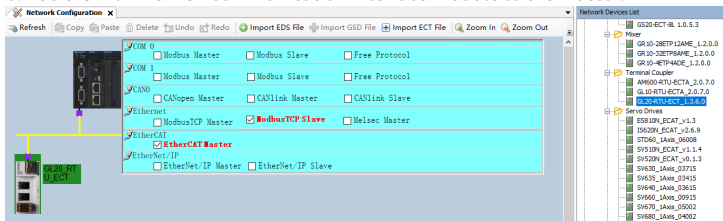
5. After successful compiling, download the project and run it.

■ Configuring the GL20-2S485 module as the Modbus slave

1. Add the GL20-RTU-ECT communication interface module.

a. In the left **Devices** pane, double-click **Network Configuration** and click the PLC figure in the upper left corner of the interface. Check "EtherCAT Master" to enable the PLC as an EtherCAT master.

b. Add a GL20-RTU-ECT communication interface module to the master.



2. Add the GL20-2S485 module.

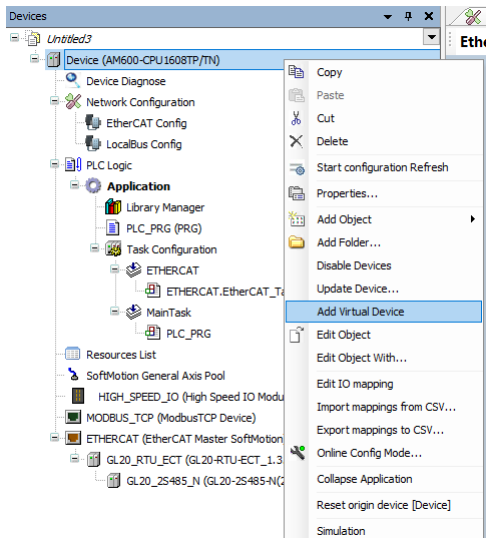
a. Double-click the GL20-RTU-ECT module figure to open the **Hardware Configuration** page.

b. In the **In\Output Module List**, double-click the GL20-2S485 module, or drag and place it to the right side of the GL20-RTU-ECT module.



3. Set the interface of the GL20-2S485 module as the Modbus slave.

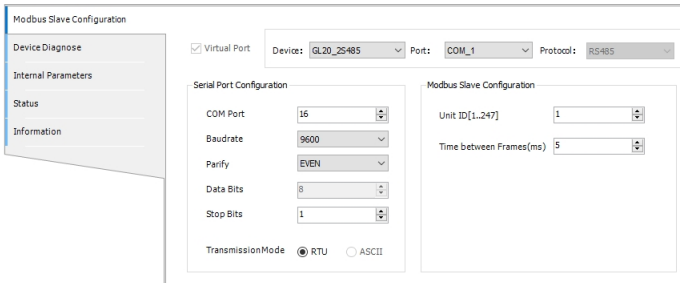
a. Right-click **Device** and select **Add Virtual Device**.



b. In the pop-up window, double-click **Modbus Slave**.

Name	Supplier	Version	Description
COM Port			
Modbus Master	inovance	00.00.00.20	
Modbus Slave	inovance	00.00.00.20	Virtual Modbus Device
Serial Free Protocol	inovance	00.00.00.20	Virtual Free Command on Serial Port of Inovance

c. In the left **Devices** pane, double-click **COM (Virtual Modbus Device)** to open the **Modbus Slave Configuration** page.



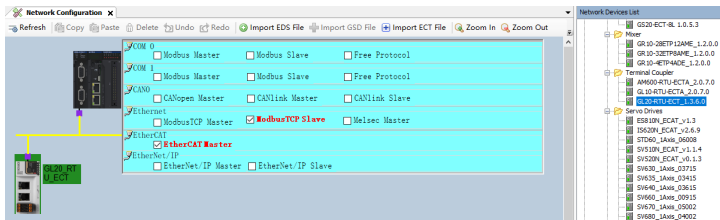
4. After successful compiling, download the project and run it.

■ Configuring the GL20-2S485 module as the serial free protocol

1. Add the GL20-RTU-ECT communication interface module.

a. In the left **Devices** pane, double-click **Network Configuration** and click the PLC figure in the upper left corner of the interface. Check "EtherCAT Master" to enable the PLC as an EtherCAT master.

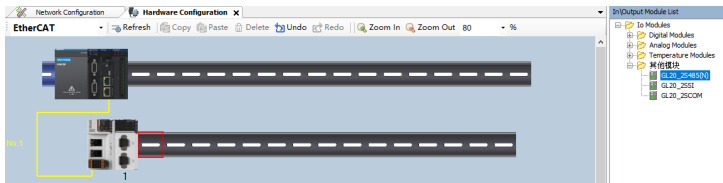
b. Add a GL20-RTU-ECT communication interface module to the master.



2. Add the GL20-2S485 module.

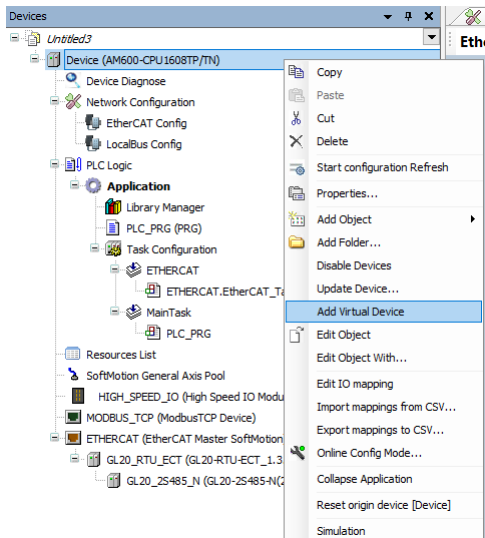
a. Double-click the GL20-RTU-ECT module figure to open the **Hardware Configuration** page.

b. In the **In\Output Module List**, double-click the GL20-2S485 module, or drag and place it to the right side of the GL20-RTU-ECT module.



3. Set the interface of the GL20-2S485 module as the serial free protocol.

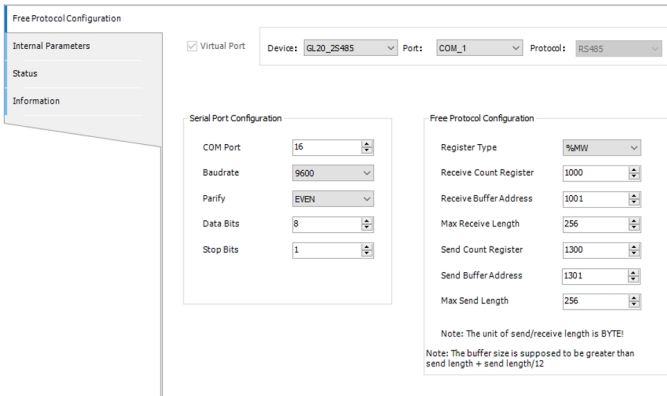
a. Right-click **Device** and select **Add Virtual Device**.



b. In the pop-up window, double-click **Serial Free Protocol**.

Name	Supplier	Version	Description
COM Port			
Modbus Master	inovance	00.00.00.20	
Modbus Slave	inovance	00.00.00.20	Virtual Modbus Device
Serial Free Protocol	inovance	00.00.00.20	Virtual Free Command on Serial Port of Inovance

c. In the left **Devices** pane, double-click **COM (Virtual Free Protocol Serial Port)** to open the **Free Protocol Configuration** page.



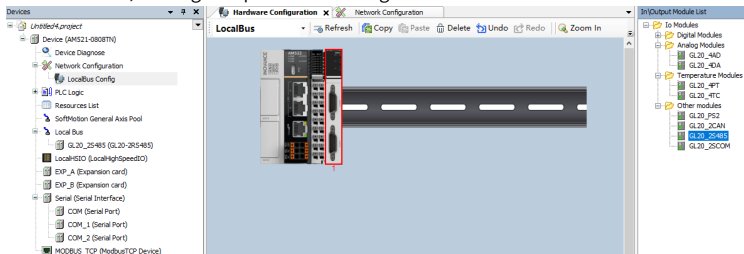
4. After successful compiling, download the project and run it.

4.2 InoProShop Programming Example (AM300/AM500)

4.2.1 Adding GL20-2S485 Locally (AM300/AM500)

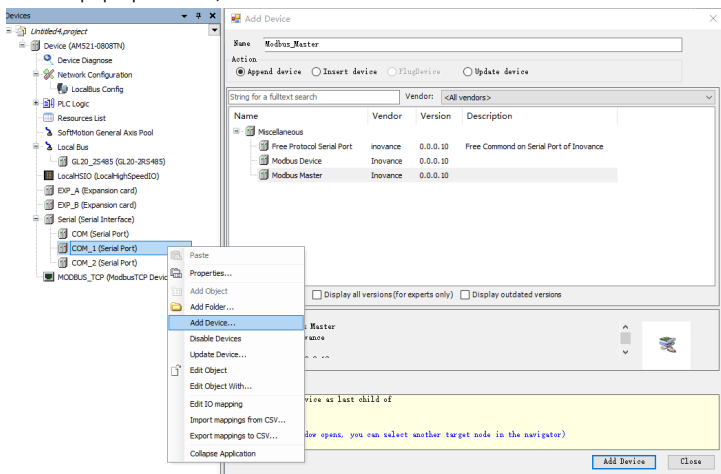
■ Adding the GL20-2S485 module

In the left **Devices** pane, double-click **LocalBus Config** to open the **Hardware Configuration** interface. In the right **In\Output Module List**, double-click the GL20-2S485 module, or drag and place it to the right side of the PLC.

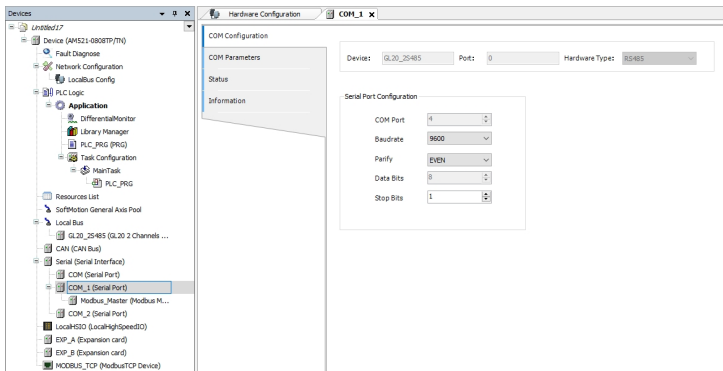


■ Configuring the GL20-2S485 module as the Modbus master

1. Set the interface of the GL20-2S485 module as the Modbus master.
 - a. After adding the GL20-2S485 module, two COM ports will be automatically generated in the left **Devices** pane: COM_1 (Serial Port) and COM_2 (Serial Port).
 - b. To configure COM_1 (Serial Port) as the master, right-click **COM_1 (Serial Port)** in the left **Devices** pane and select **Add Device**.
 - c. In the pop-up window, select **Modbus Master** and click **Add Device**.

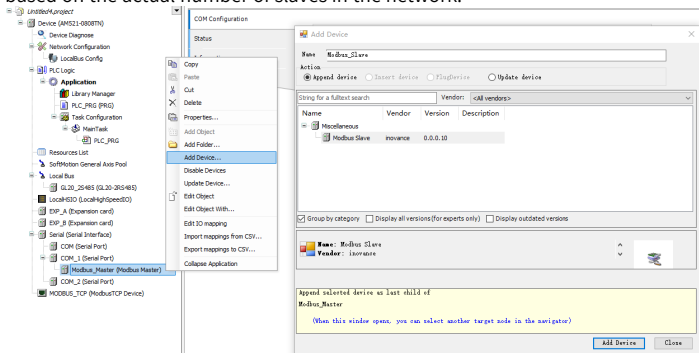


2. In the left **Devices** pane, double-click **COM_1 (Serial Port)** to open the **COM Configuration** page, where you can configure the serial port settings for the master of COM_1 port.

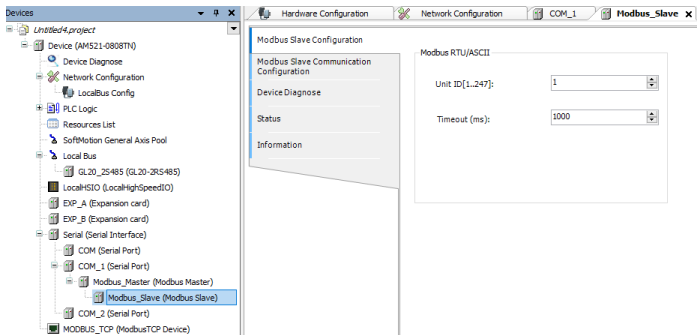


3. Add a slave to the Modbus network.

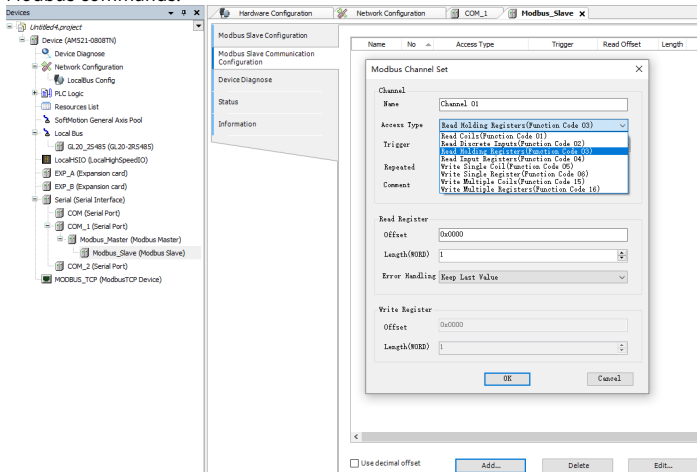
- In the left **Devices** pane, right-click **Modbus_Master** and select **Add Device**.
- In the pop-up window, select **Modbus Slave** and click **Add Device**. Add slaves based on the actual number of slaves in the network.



- In the left **Devices** pane, double-click the added slave to set the **Unit ID** and **Timeout** on the **Modbus Slave Configuration** page.



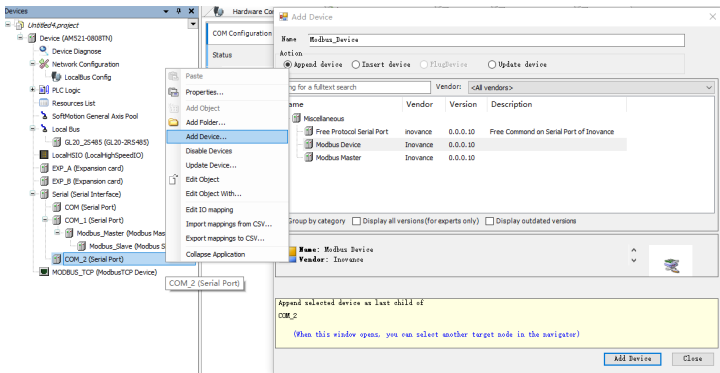
d. On the **Modbus Slave Communication Configuration** tab, click **Add** to add Modbus commands.



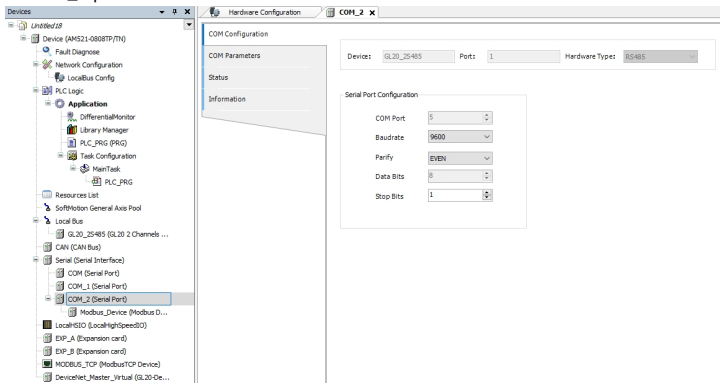
■ Configuring the GL20-2S485 module as the Modbus slave

1. Set the interface of the GL20-2S485 module as the Modbus slave.

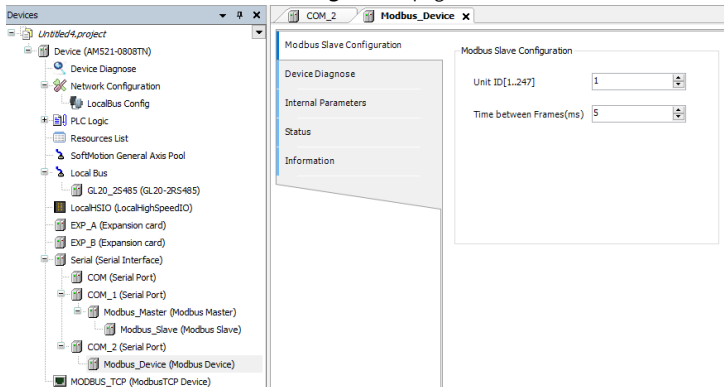
- After adding the GL20-2S485 module, two COM ports will be automatically generated in the left **Devices** pane: COM_1 (Serial Port) and COM_2 (Serial Port).
- To configure COM_2 (Serial Port) as the slave, right-click **COM_2 (Serial Port)** in the left **Devices** pane and select **Add Device**.
- In the pop-up window, select **Modbus Device** and click **Add Device**.



- In the left **Devices** pane, double-click **COM_2 (Serial Port)** to open the **COM Configuration** page, where you can configure the serial port settings for the slave of COM_2 port.

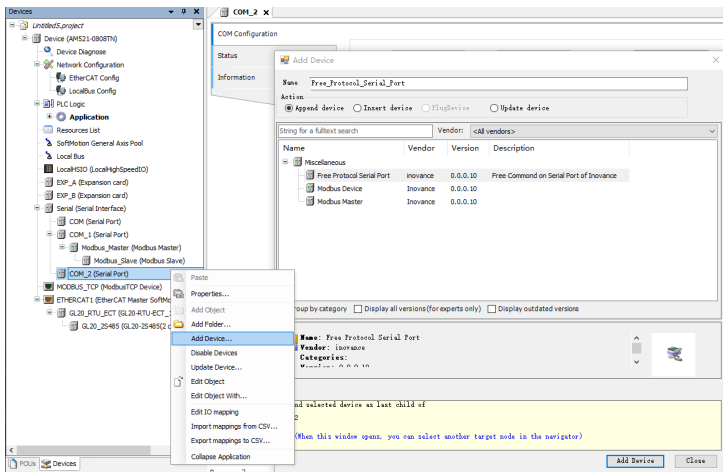


3. In the left **Devices** pane, double-click **Modbus_Device** to set the **Unit ID** and **Timeout** on the **Modbus Slave Configuration** page.

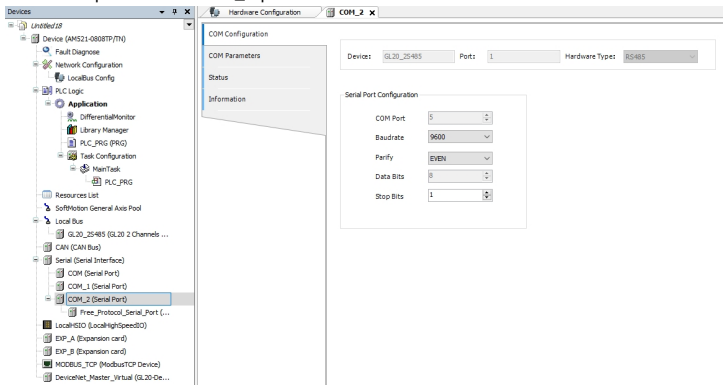


■ Configuring the GL20-2S485 module as the serial free protocol

1. Set the interface of the GL20-2S485 module as the Modbus serial free protocol.
 - a. After adding the GL20-2S485 module, two COM ports will be automatically generated in the left **Devices** pane: COM_1 (Serial Port) and COM_2 (Serial Port).
 - b. To configure COM_2 (Serial Port) as the serial free protocol, right-click **COM_2 (Serial Port)** in the left **Devices** pane and select **Add Device**.
 - c. In the pop-up window, select **Free Protocol Serial Port** and click **Add Device**.

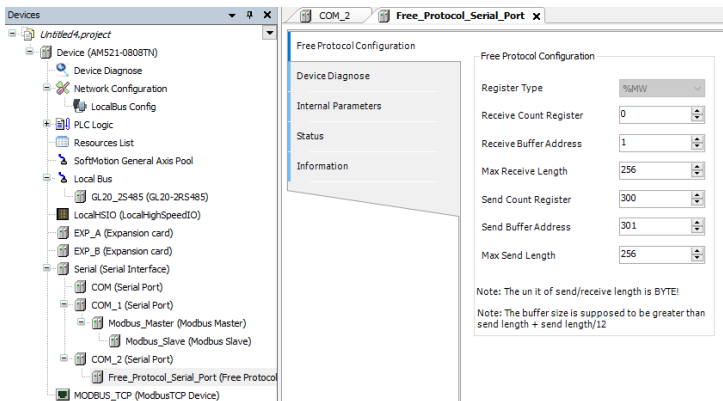


- In the left **Devices** pane, double-click **COM_2 (Serial Port)** to open the **COM Configuration** page, where you can configure the communication settings for the serial free protocol of COM_2 port.



- Configure the free protocol in the Modbus network

In the left **Devices** pane, double-click **Free_Protocol_Serial_Port** to open the **Free Protocol Configuration** page, where you can configure the free protocol.



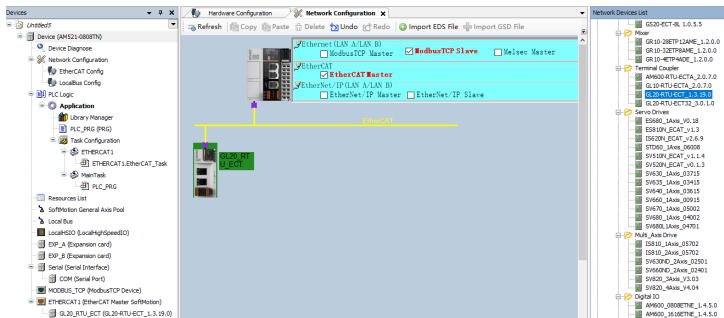
4.2.2 Adding GL20-2S485 Remotely (AM500)

■ Adding the GL20-2S485 module

● Method 1

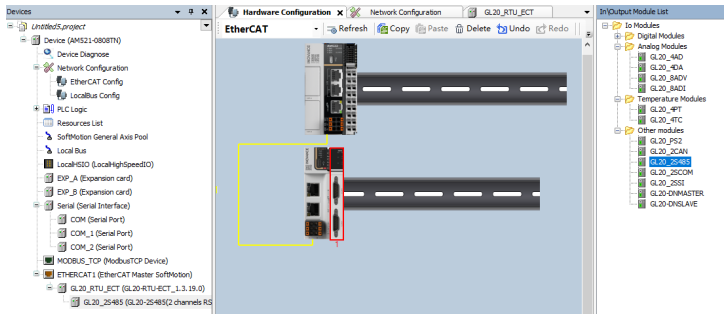
1. Add the GL20-RTU-ECT communication interface module.

- In the left **Devices** pane, double-click **Network Configuration** and click the PLC figure in the upper left corner of the interface. Check "EtherCAT Master" to enable the PLC as an EtherCAT master.
- In the **Network Devices List**, double-click or drag "GL20-RTU-ECT_x.x.x.x" to add the module.



2. Add the GL20-2S485 module.

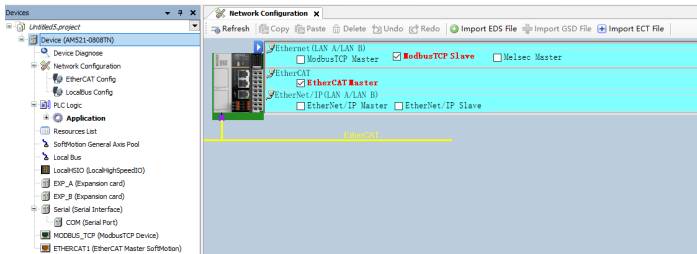
- In the left **Devices** pane, double-click **EtherCAT Config** to open the **Hardware Configuration** interface.
- In the **In/Output Module List**, double-click the GL20-2S485 module, or drag and place it to the right side of the GL20-RTU-ECT module.



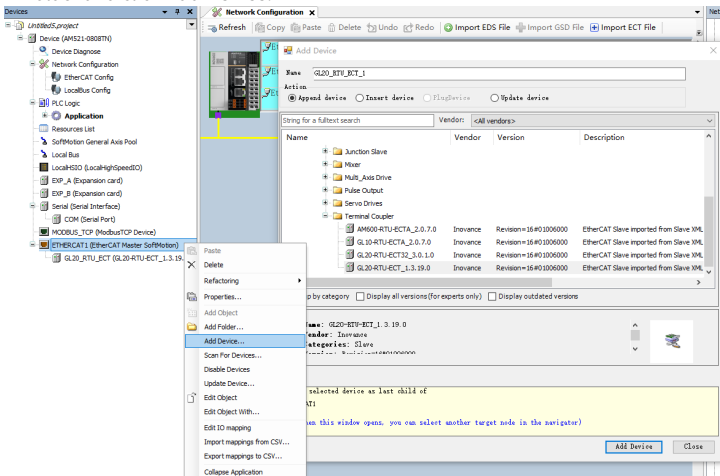
● Method 2

1. Add the GL20-RTU-ECT communication interface module.

- In the left **Devices** pane, double-click **Network Configuration** and click the PLC figure in the upper left corner of the interface. Check "EtherCAT Master" to enable the PLC as an EtherCAT master.



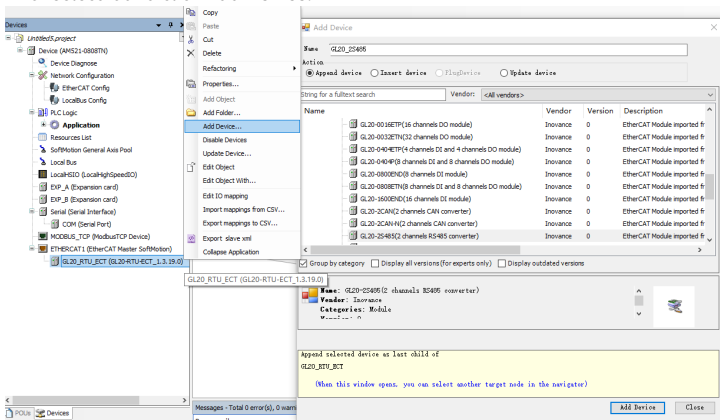
- b. After EtherCAT master is enabled, EtherCAT1 (EtherCAT Master SoftMotion) is automatically added to the **Devices** pane.
- c. Right-click **EtherCAT1 (EtherCAT Master SoftMotion)** and select **Add Device**. In the pop-up window, select "GL20-RTU-ECT_x.x.x.x" in the "Terminal Coupler" folder and click **Add Device**.



2. Add the GL20-2S485 module.

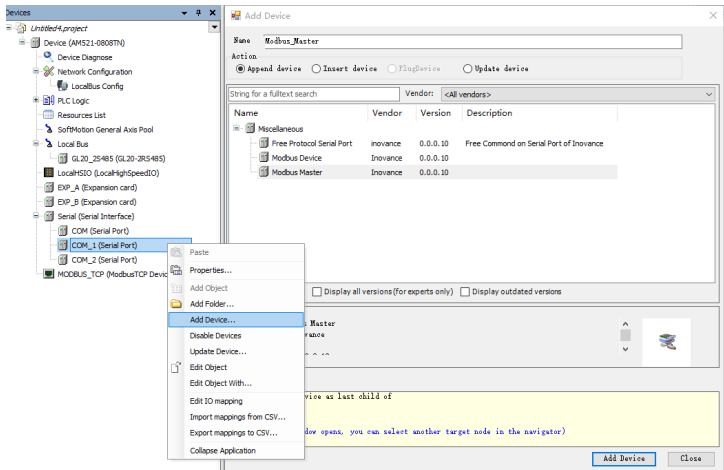
- a. In the left **Devices** pane, right-click **GL20_RTU_ECT** and select **Add Device**.

- b. In the pop-up window, double-click "GL20-2S485 (2 channels RS485 converter)", or select it and click **Add Device**.

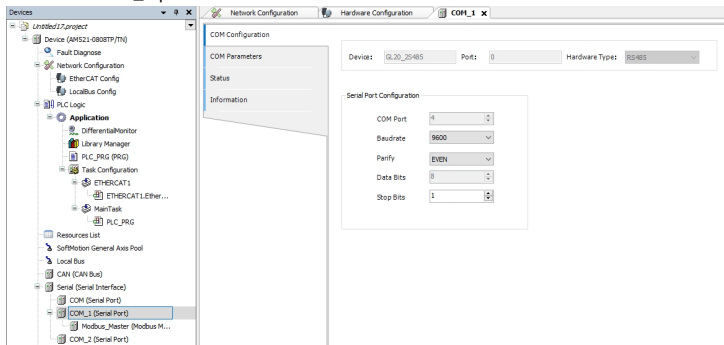


■ Configuring the GL20-2S485 module as the Modbus master

1. Set the interface of the GL20-2S485 module as the Modbus master.
 - a. After adding the GL20-RTU-ECT communication interface module and the GL20-2S485 module, two COM ports will be automatically generated in the left **Devices** pane: COM_1 (Serial Port) and COM_2 (Serial Port).
 - b. To configure COM_1 (Serial Port) as the master, right-click **COM_1 (Serial Port)** in the left **DEVICES** pane and select **Add Device**.
 - c. In the pop-up window, select **Modbus Master** and click **Add Device**.

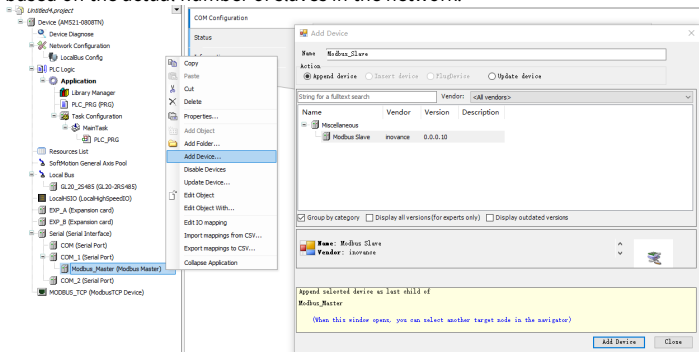


- In the left **Devices** pane, double-click **COM_1 (Serial Port)** to open the **COM Configuration** page, where you can configure the serial port settings for the master of COM_1 port.

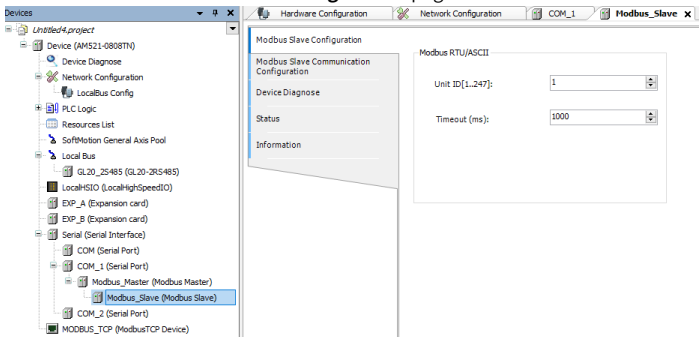


- Add a slave to the Modbus network.
 - In the left **Devices** pane, right-click **Modbus_Master** and select **Add Device**.

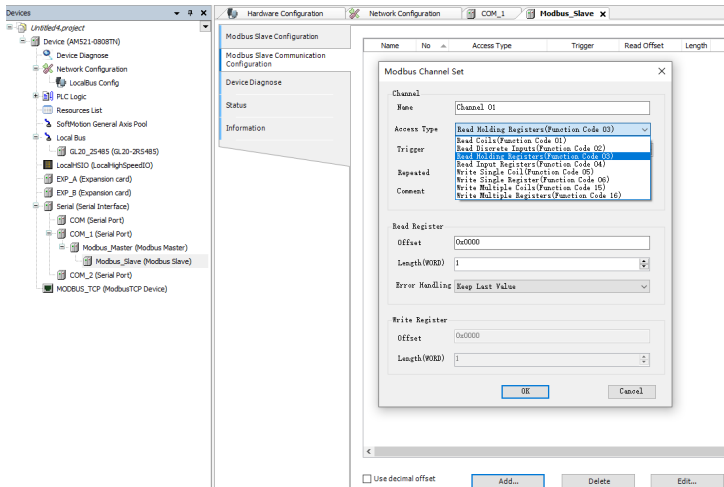
- b. In the pop-up window, select **Modbus Slave** and click **Add Device**. Add slaves based on the actual number of slaves in the network.



- c. In the left **Devices** pane, double-click the added slave to set the **Unit ID** and **Timeout** on the **Modbus Slave Configuration** page.

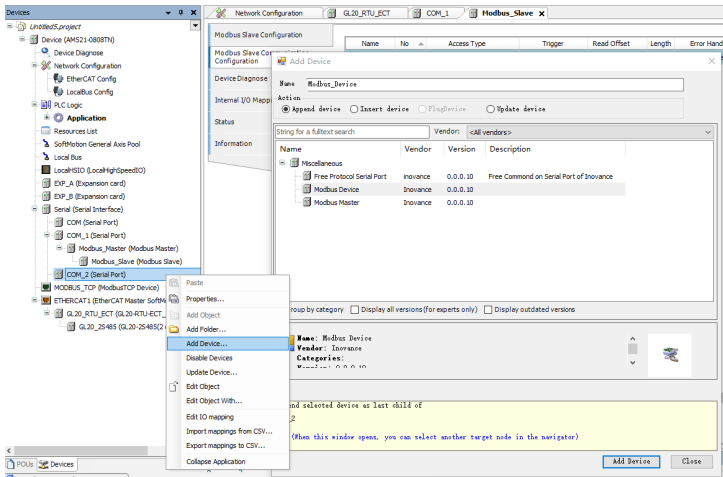


- d. On the **Modbus Slave Communication Configuration** tab, click **Add** to add Modbus commands.

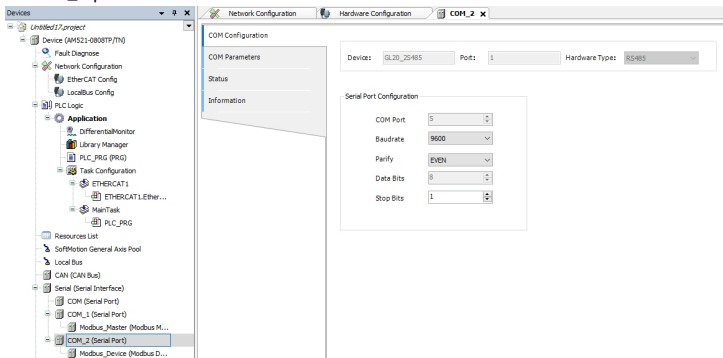


■ Configuring the GL20-2S485 module as the Modbus slave

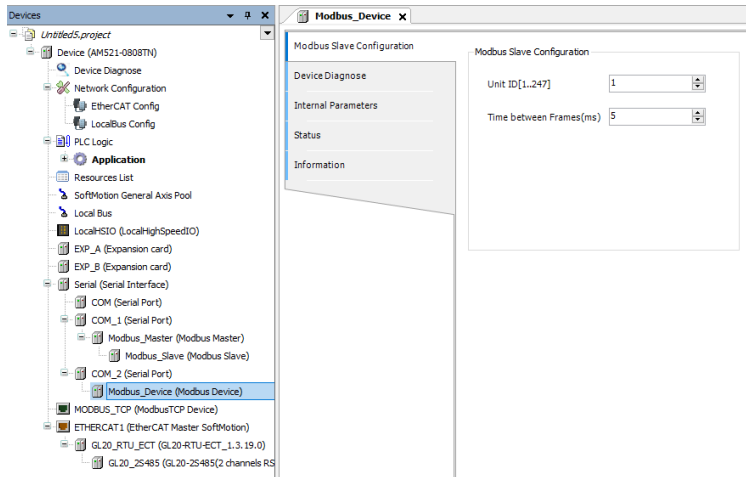
1. Set the interface of the GL20-2S485 module as the Modbus slave.
 - a. After adding the GL20-RTU-ECT communication interface module and the GL20-2S485 module, two COM ports will be automatically generated in the left **Devices** pane: COM_1 (Serial Port) and COM_2 (Serial Port).
 - b. To configure COM_2 (Serial Port) as the slave, right-click **COM_2 (Serial Port)** in the left **Devices** pane and select **Add Device**.
 - c. In the pop-up window, select **Modbus Device** and click **Add Device**.



2. In the left **Devices** pane, double-click **COM_2 (Serial Port)** to open the **COM Configuration** page, where you can configure the serial port settings for the slave of COM_2 port.

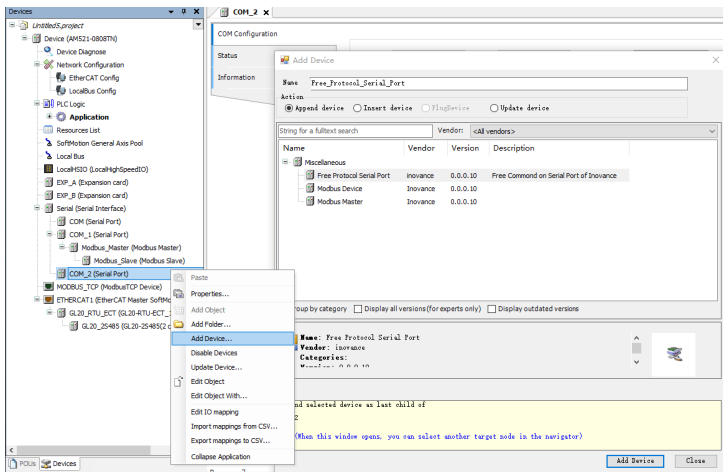


3. In the left **Devices** pane, double-click **Modbus_Device** to set the **Unit ID** and **Timeout** on the **Modbus Slave Setting** page.

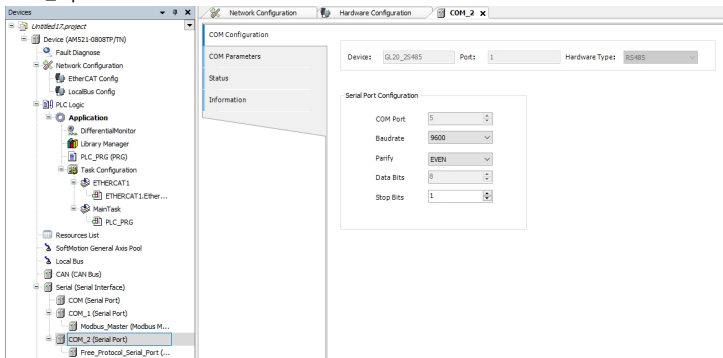


■ Configuring the GL20-2S485 module as the serial free protocol

1. Set the interface of the GL20-RS485 module as the Modbus serial free protocol.
 - a. After adding the GL20-RTU-ECT communication interface module and the GL20-2S485 module, two COM ports will be automatically generated in the left **Devices** pane: COM_1 (Serial Port) and COM_2 (Serial Port).
 - b. To configure COM_2 (Serial Port) as the serial free protocol, right-click **COM_2 (Serial Port)** in the left **Devices** pane and select **Add Device**.
 - c. In the pop-up window, double-click **Serial Free Protocol**.



2. In the left **Devices** pane, double-click **COM_2 (Serial Port)** to open the **COM** page, where you can configure the communication settings for the serial free protocol of COM_2 port.



3. Configure the free protocol in the Modbus network

In the left **Devices** pane, double-click **Free_Protocol_Serial_Port** to open the **Free Protocol Configuration** page, where you can configure the free protocol.

Devices

Untitled5_project

- Device (AM521-0808TH)
 - Device Diagnose
- Network Configuration
 - EtherCAT Config
 - LocalBus Config
- PLC Logic
 - Application
- Resources List
- SoftMotion General Axis Pool
- Local Bus
 - LocalHSIO (LocalHighSpeedIO)
 - EXP_A (Expansion card)
 - EXP_B (Expansion card)
- Serial (Serial Interface)
 - COM (Serial Port)
 - COM_1 (Serial Port)
 - Modbus_Master (Modbus Master)
 - Modbus_Slave (Modbus Slave)
 - COM_2 (Serial Port)
 - Free_Protocol_Serial_Port (Free Protocol Serial Port)
- MODBUS_TCP (ModbusTCP Device)
- ETHERCAT1 (EtherCAT Master SoftMotion)
 - GL20_RTU_ECT (GL20-RTU-ECT_1.3.19.0)
 - GL20_2S485 (GL20-2S485(2 channels RS485 converter))

Free Protocol Configuration

Free Protocol Configuration

Register Type: %MW

Receive Count Register: 0

Receive Buffer Address: 1

Max Receive Length: 256

Send Count Register: 300

Send Buffer Address: 301

Max Send Length: 256

Note: The unit of send/receive length is BYTE!

Note: The buffer size is supposed to be greater than send length + send length/12

5 Troubleshooting

When the ERR indicator of the module or the COM port is ON, it indicates that the module or the corresponding COM port is faulty. The module reports a fault code, which can be obtained through the diagnostic data object dictionary value in the **CoE Online** interface, as shown below.

General	<input checked="" type="checkbox"/> Read this page <input type="checkbox"/> Auto Update <input checked="" type="radio"/> Offline from ESI file <input type="radio"/> Online from device				
Process Data(PDO Setting)	Index:Subindex	Name	Flags	Type	Value
Startup parameters(SDO Setting)	16#1000:16#00	Device type	RO	UDINT	
Online	16#1001:16#00	Error Register	RO	USINT	
	16#1008:16#00	Device Name	RO	STRING(15)	
	16#100A:16#00	Software version	RO	STRING(13)	
CoE Online	* 16#1018:16#00	Identity	RO	USINT	
Device Diagnosis	* 16#1C00:16#00	Sync manager type	RO	USINT	
EtherCAT I/O Mapping	* 16#1C12:16#00	RxPDO assign	RO	USINT	
EtherCAT IEC Objects	* 16#1C13:16#00	TxPDO assign	RO	USINT	
	* 16#1C32:16#00	SM output parameter	RO	USINT	
	* 16#1C33:16#00	SM input parameter	RO	USINT	
Status	* 16#3010:16#00	Port 0 error counter	RO	USINT	
	* 16#3011:16#00	Port 1 error counter	RO	USINT	
Information	* 16#3012:16#00	ESC error counter	RO	USINT	
	* 16#3016:16#00	Station address	RO	USINT	

For the module in slot n ($n = 0$ to 31), the object dictionary definition for index $0xA000 + 0x40 * n$ is shown in the table below.

Index	0xA000+0x40*n: Module Diagnosis Information				
Sub-index	Name	Data Type	Access Mode	Mapping	Default Value
1	Module fault code	UINT	RO	Not supported	0
2	RS485-0 fault code	UINT	RO	Not supported	0
3	RS485-1 fault code	UINT	RO	Not supported	0
4	Channel 0 faulty frame counter	UINT	RO	RO	0
5	Channel 1 faulty frame counter	UINT	RO	Not supported	0
6	Channel 0 frame error segment number value	UINT	RO	Not supported	0

Index	0xA000+0x40*n: Module Diagnosis Information				
Sub-index	Name	Data Type	Access Mode	Mapping	Default Value
7	Channel 1 frame error segment number value	UINT	RO	Not supported	0
8	Reserve diagnosis information	UINT	RO	RO	0

■ Module fault code

Code	Description	Solution
0x5003	The isolated power supply of the module is faulty.	Check the isolated power supply of the module.

■ Channel fault code

- The parameters are incorrectly configured for the channels of the module.

Code	Description	Solution
0x2010	The baud rate of the channel is incorrectly configured.	Check the configured parameters.
0x2011	The communication mode of the channel is incorrectly configured.	
0x2012	The data bit-related parameters of the channel is incorrectly configured.	
0x2013	The data packet size of the channel is incorrectly configured.	
0x2014	The message interval of the channel is incorrectly configured.	
0x2015	The sending buffer of the channel is incorrectly configured.	
0x2016	The receiving buffer of the channel is incorrectly configured.	

For example, when the module detects that the baud rate of the RS485-1 channel is incorrectly configured, the object dictionary 0xA000 subindex 3 is displayed as 0x2010.

- Channel communication data fault code

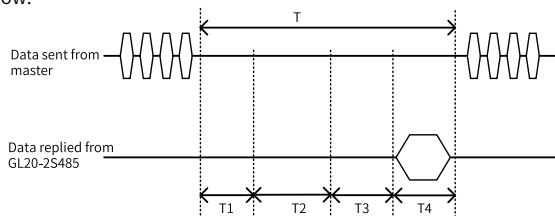
Code	Description	Solution
0x6010	The sending buffer of the channel is full.	Decrease the length of data sent from the module, or increase the sending interval or baud rate.
0x6011	The receiving buffer of the channel is full.	Decrease the length of data sent to the module or increase the sending interval.
0x6012	The receiving frame counter value of the channel is faulty.	Check the counter value of the frames written to the module on the EtherCAT bus.
0x6013	The receiving frame segment number of the channel is faulty.	Check the segment number of the frames written to the module on the EtherCAT bus.
0x6014	Noise detected on the module channel	Check if there is noise interference on the corresponding serial port.
0x6015	Parity bit error detected on the module channel	Check if the parity bit parameters of the serial ports are configured consistently.

For example, when the module detects that the sending buffer of the RS485-1 channel is full, the object dictionary 0xA000 subindex 3 displays as 0x6010. When the module detects that the TXPDO data frame counter of the RS485-1 channel is not continuous, the object dictionary 0xA000 subindex 3 is displayed as 0x6012, and the subindex 5 displays the expected counter value calculated by the module.

6 Appendix

6.1 Appendix 1: Response Time for GL20-2SCOM Module as a Virtual Slave

When the GL20-2SCOM module is used as a remote virtual slave through the GL20-RTU-ECT communication interface module, a specific response time (T) is required to process commands from the master. To ensure normal response, the command interval must be longer than T. The response time (T) consists of T1, T2, T3, and T4, as shown below.



- T1: The time for the module to transmit the data received by the serial port to the PLC
- T2: The time for the PLC to process the received data and send a response frame
- T3: The time for the response frame to be transmitted to the module
- T4: The time for the module to send the received response frame through the serial port

Recommended command interval

When the GL20-2SCOM module is used as a virtual slave and the interval for Modbus response frames (hereinafter referred to as frame interval) is 1 ms, the interval for commands sent by the master must exceed the following values in different EtherCAT cycles (hereinafter referred to as ECT cycle).

- When the length of data sent by the module through the serial port is 255:

ECT Cycle \Baud Rate	115200 bps	57600 bps	38400 bps	19200 bps	9600 bps
1 ms	50 ms	70 ms	100 ms	160 ms	300 ms
2 ms	75 ms	95 ms	125 ms	185 ms	325 ms
4 ms	115 ms	135 ms	165 ms	225 ms	365 ms

6 ms	160 ms	180 ms	210 ms	270 ms	410 ms
8 ms	205 ms	225 ms	255 ms	315 ms	455 ms
10 ms	245 ms	265 ms	295 ms	355 ms	495 ms

- When the length of data sent by the module through the serial port is 125:

ECT Cycle \Baud Rate	115200 bps	57600 bps	38400 bps	19200 bps	9600 bps
1 ms	35 ms	50 ms	60 ms	90 ms	165 ms
2 ms	60 ms	75 ms	85 ms	115 ms	190 ms
4 ms	100 ms	115 ms	125 ms	145 ms	230 ms
6 ms	145 ms	160 ms	170 ms	200 ms	285 ms
8 ms	190 ms	205 ms	215 ms	245 ms	330 ms
10 ms	230 ms	245 ms	255 ms	285 ms	370 ms

- When the length of data sent by the module through the serial port is 65:

ECT Cycle \Baud Rate	115200 bps	57600 bps	38400 bps	19200 bps	9600 bps
1 ms	30 ms	40 ms	45 ms	60 ms	100 ms
2 ms	55 ms	65 ms	70 ms	85 ms	130 ms
4 ms	95 ms	105 ms	120 ms	115 ms	170 ms
6 ms	140 ms	150 ms	155 ms	170 ms	225 ms
8 ms	185 ms	195 ms	200 ms	215 ms	270 ms
10 ms	225 ms	235 ms	240 ms	255 ms	310 ms

- When the length of data sent by the module through the serial port is 8:

ECT Cycle \Baud Rate	115200 bps	57600 bps	38400 bps	19200 bps	9600 bps
1 ms	25 ms	30 ms	30 ms	30 ms	35 ms
2 ms	50 ms	55 ms	55 ms	55 ms	60 ms
4 ms	90 ms	95 ms	95 ms	95 ms	100 ms
6 ms	135 ms	140 ms	140 ms	140 ms	145 ms
8 ms	180 ms	185 ms	185 ms	185 ms	190 ms
10 ms	220 ms	225 ms	225 ms	225 ms	230 ms

Note

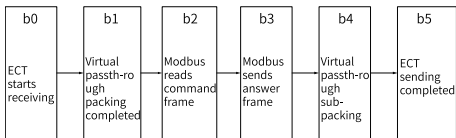
- The above table shows the response time when the baud rate is between 9600 and 115200 and the time consumed for frame splitting and frame combining is the maximum. If there are strict and precise requirements for response time, it should be calculated according to data length, times of frame splitting and actual baud rate according to the following calculation formula.
- When the ECT period is between two adjacent values, look up the table according to the larger one. For example, if the ECT period is 5 ms, look up the table according to 6 ms.
- For frame interval of a different value, add the difference between the current value and the different value to the current lookup result. For example, if the frame interval is 5 ms, the baud rate is 115200, the ECT period is 1 ms and the response data length is 255, the response time should be at least $(50 \text{ ms} + 4 \text{ ms}) = 54 \text{ ms}$.
- When ECT period is more than 10 ms, please calculate the response time according to the following calculation formula.

Response time calculation formula

Response time (T) = $12 \times$ ECT cycle + Frame interval + Frame segmentation and reassembly time + Serial port transmission time

Time calculation for each stage

- T1 is determined by the ECT cycle. Data from the GL20-2SCOM module is first transmitted via the local bus to the GL20-RTU-ECT module, which then transmits the data to the PLC over EtherCAT. Max. T1 = $5 \times$ ECT cycle.
- T2 is determined by the ECT cycle and the frame interval. The process is shown below.



Frame interval: b2 to b3

Max. T2 = 5 × ECT cycle + frame interval.

- T3 is determined by the ECT cycle. Max. T3 = 2 × ECT cycle.
- T4 is the time (in ms) for the module to send the received response frame through the serial port. The calculation formula is as follows:

$$T4 = \left(\left(\frac{\text{Number of bits in 1 byte}}{\text{x number of bytes}} \right) \times 1000 \right) \div \text{Baud rate}$$

Assuming 8 bytes of data is transmitted at a baud rate of 115200 with 1 start bit, 1 stop bit, 8 data bits, and even parity, the value of T4 is:

$$T4 = ((11 \times 8) \times 1000) \div 115200 = 0.7639 \text{ ms}$$

- Frame segmentation and reassembly time

Each ECT cycle allows only 24 bytes of data exchange between a port of the module and the PLC master. If a frame contains over 24 bytes of data, it needs to be segmented or reassembled for transmission.

- Frame segmentation time calculation

If a command frame contains over 24 bytes of data, the module needs to segment the frame for transmission to the PLC master. This leads to an additional fragmentation time to T1: for X bytes of data, the frame fragmentation time is the smallest integer greater than X/24 times the ECT cycle. For example, a frame containing 255 bytes of data needs to be segmented into 11 frames (255/24 = 10.625), which takes a fragmentation time of 11 ECT cycles.

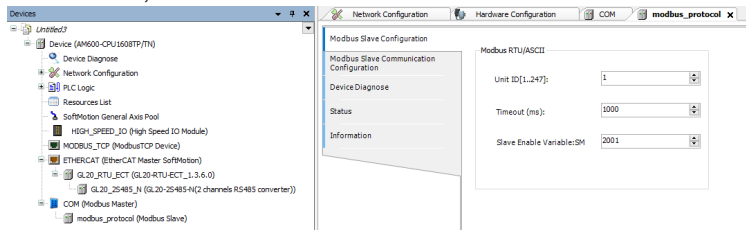
- Frame reassembly time calculation

If a response frame contains over 24 bytes of data, the PLC master needs to segment the frame for transmission to the module. Then, the module needs to reassemble all segments before sending them to the serial port. This leads to an additional reassembly time to T3: for Y bytes of data, the frame reassembly time is smallest integer greater than Y/24 times the ECT cycle. For example, a frame containing 255 bytes of data needs to be segmented into 11 frames (255/24 = 10.625) and then reassembled, which takes a reassembly time of 11 ECT cycles.

The calculation of the response time (T) involves either frame segmentation or reassembly time. For example, when reading from multiple registers, the time for reassembling the response frame is included. When writing to multiple registers, the time for segmenting the command frame is included.

Timeout configuration for the Modbus master

When an Inovance medium-sized PLC is used as the master, the **Timeout** parameter (that is, the interval of frames sent by the Modbus master) on the **Modbus Slave Configuration** interface should be set larger than the response time of the module as the virtual slave, as shown below.



6.2 Appendix 2: Version Matching Information

Contact Inovance technical support to obtain the firmware of GL20-2S485 module and the firmware of communication interface module. XML files and the AutoShop/InoProShop software can be downloaded from the software and debugging tools tab on the GL20 series product page at <https://www.inovance.com>. The following table describes the version matching information.

■ Locally adapted PLCs

Name	Firmware Version	XML/GSD File Version	AutoShop/ InoProShop Version
GL20-2S485 module (this module)	Board software: 1.1.8.5 and later	-	<ul style="list-style-type: none">● AutoShop: V4.8.2.3 and later● InoProShop: V1.7.3 SP4 and later
Easy series PLC	V6.1.0.1 and later	-	AutoShop: V4.8.2.3 and later
AM300/AM500 PLC	V1.2.0.0 and later	-	InoProShop: V1.7.3 SP6 and later
AM780-N PLC	V1.10.0.0 and later	-	InoProShop: V1.7.3 SP4 and later

■ Remotely adapted PLCs

Name	Firmware Version	XML/GSD File Version	AutoShop/ InoProShop Version
GL20-2S485 module (this module)	Board software: 1.1.8.5 and later	-	<ul style="list-style-type: none"> ● AutoShop: V4.8.2.3 and later ● InoProShop: V1.7.2 SP2 and later
Communication interface module	<ul style="list-style-type: none"> ● GL20-RTU-ECT: Board software 2.4.18.0 and later ● GL20-RTU-ECT32: Board software 2.5.9.0 and later 	<ul style="list-style-type: none"> ● GL20-RTU-ECT: 3.11.0 and later ● GL20-RTU-ECT32: 3.0.2.0 and later 	<ul style="list-style-type: none"> ● AutoShop: V4.8.2.3 and later ● InoProShop: V1.7.3 SP2 and later
AM300/AM500 PLC	V1.2.0.0 and later	-	InoProShop: V1.7.3 SP6 and later
AM400/AM600 PLC	V1.40.2.0 and later	-	InoProShop: V1.7.3 SP2 and later
AC series PLC	V1.26.3.0 and later	-	InoProShop: V1.7.3 SP5 and later
AM780 PLC	V1.10.0.0 and later	-	InoProShop: V1.7.3 SP4 and later