INOVANCE

User Guide

AM600-RTU-ECT

EtherCAT Communication Module

19010639

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1. Preface

Thank you for purchasing the AM600-RTU-ECT communication module developed and manufactured independently by Inovance.

AM600-RTU-ECT is an EtherCAT bus slave expansion module used together with AM600 series medium-sized PLC main modules. Each AM600-RTU-ECT module can connect up to 16 DI/DO modules, or 8 AI/AO modules.

Please read this guide carefully before using to ensure more safe usage. This guide describes the specifications, characteristics and using methods of the AM600-RTU-ECT communication module for your reference. Please refer to the AM600 Series PLC Hardware Manual ("Hardware Manual") and the AM600 Series PLC Programming Manual to understand the use of the user program development environment and design method of the user program of the product. You can download the latest materials from www.inovance.com

2. Safety Information and Precautions

Design Information and Precautions

Please read carefully this guide and any associated guides described in this guide before performing installation, wiring, operation and inspection on this product. In addition, make sure to operate properly with adequate safety assurance.

Safety information and precautions are identified into two grades: Warning and Caution.

WARNING Indicates the improper operation which, if not avoided, may cause death or serious injury;

CAUTION Indicates the improper operation which, if not avoided, may cause moderate or minor injury, as well as equipment damage.

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During control system design

WARNING

- The safety circuit must be designed to ensure that the control system can continue working safely when external power is off or the PLC is faulty;
- In case of long-time over-current on the output circuit caused by a current exceeding the rated value or short-circuit of the load equipment, the module may smoke or get on fire. Therefore, external safety devices should be used, such as fuses or breakers.

CAUTION

- An emergency stop circuit, a protection circuit, a forward/reverse operation interlocked circuit, and a upper position limit and lower position limit interlocked circuit must be set in the external circuits of PLC to prevent damage to the machine.
- Please configure external protection circuit and safety mechanisms for output signals related to material accidents to ensure that the equipment can work safely;
- Once PLC CPU detects abnormality in the system, all outputs may be closed; however, when a fault occurs in the controller circuit, the output may not be under control. Therefore, it is necessary to design an appropriate external control circuit to ensure normal operation of the equipment;
- If the PLC's 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 indoor electrical environment (overvoltage category II). The power supply must have a system-level lightning protection device, assuring that overvoltage due to lightning shock can't be applied to the PLC's power supply input terminals, signal input terminals and output terminals and so forth, so as to avoid damage to the equipment.

During installation

WARNING

- The installation, wiring, maintenance and inspection of this product must be carried out by personnel who have received necessary electrical training and experience.
- Disconnect all external power supplies of the system before module assembly/disassembly and wiring. Failure to do so may result in electric shock, module fault or malfunction. Failure to do so may result in electric shock, module fault or malfunction.
- Do not use the PLC where there are dust, oil smoke, conductive dust, corrosive or combustible gases, or exposed to high temperature, condensation, wind & rain, or subject to vibration and impact. Electric shock, fire and malfunction may also result in damage or deterioration to the product.
- The PLC is an open-type device. To protect operators without adequate knowledge about electric devices from an electric shock, the PLC must be mounted in a control cabinet with a door lock. The casing of the cabinet must meet IP20 or above safety requirements. Only operators who have received related training about electric devices with adequate electric knowledge can open the cabinet.

CAUTION

- While handling bolt holes and connecting wires, do not let cuttings and wire crumbs fall into the PLC through ventilation holes. This may cause fire, faults and false trip;
- After a new PLC is installed, the ventilation surface of the PLC must not be covered. Otherwise, the ventilation efficiency will be lowered, causing fire, faults and false trip;
- When modules are being mounted, the modules must be securely connected to their connectors and fixed on the hooks. If a module is not mounted correctly, it may cause false trip, faults and the module to fall.

During wiring

WARNING

- The installation, wiring, maintenance and inspection of this product must be carried out by personnel who have received necessary electrical training and experience.
- Disconnect all external power supplies of the system before wiring. Failure to comply may result in electric shock, module fault or malfunction.
- The PLC can be powered on after installation and wiring. The terminal cover must be mounted before starting operations. Failure to comply may result in electric shock.
- Perform good insulation on terminals so that insulation distance between cables will not reduce after cables are connected to terminals. Failure to comply may result in electric shock or damage to the equipment.

CAUTION

- Prevent metal filings and wire ends from dropping into ventilation holes of the PLC at wiring. Failure to comply may result in While handling bolt holes and connecting wires, do not let cuttings and wire crumbs fall into the PLC through ventilation holes. This may cause fire, faults and false trip;
- The specifications and mounting method of external wiring must comply with the local power distribution regulations. Please see the "Wiring" chapter in the user manual;
- To ensure safety of equipment and operator, use cables with sufficient diameter and connect the cables to ground reliably.
- Wire the module correctly after making clear of the connector type. If a cable is connected to a wrong terminal, it may cause faults to the modules and external equipment;
- Tighten bolts on the terminal block in the specified torque range. If the terminal is not tight, short-circuit, fire or malfunction may be caused. If the terminal is too tight, fall-off, short-circuit, fire or malfunction may be caused.
- If the connector is used to connect with external equipment, perform correct crimping or welding with the tool specified by manufacturer. Poor connection may cause short circuit, fire or false trip;
- A label on the top of the module is to prevent foreign matters entering the module. Do not remove the label during wiring. Tear down the label before starting the system to ensure ventilation;
- Do not bundle the control and communication cables together with the main circuit or power cables or put them close to each other. The distance between them should be at least 100 mm. Otherwise, the noise may cause false trip;
- In application scenarios with serious interference, shielded cables should be used as the input or output cables of high-frequency signals to ensure the resistance to interference;

During maintenance & inspection

WARNING

- The installation, wiring, maintenance and inspection of this product must be carried out by personnel who have received necessary electrical training and experience.
- Touching terminals when the PLC is power-on may cause an electric shock or false trip;
- 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.
- All external power supplies must be disconnected from the system before modules can be disassembled or communication cables can be connected or disconnected. Failure to comply may result in electric shock or malfunction.

CAUTION

- Get acquainted with the guide and ensure safety before online modification, forcible output, and RUN/STOP operation.
- Disconnect the power supply before installing/removing the extension card.

At disposal

CAUTION

- Treat the product as ordinary industrial waste.
- The retirement of batteries should comply with the local regulations.

3. Product Information

■ Model and Nameplate

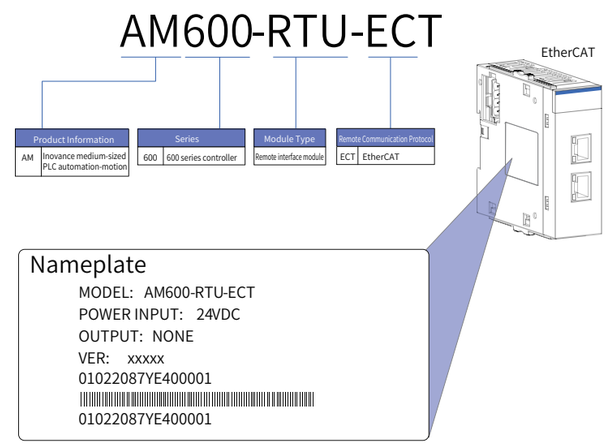

Figure 1 Description of model and nameplate

Model	Classification	Description	Applicable to
AM600-RTU-ECT	EtherCAT communication module	CANopen protocol communication interface module	AM600

■ External Interface

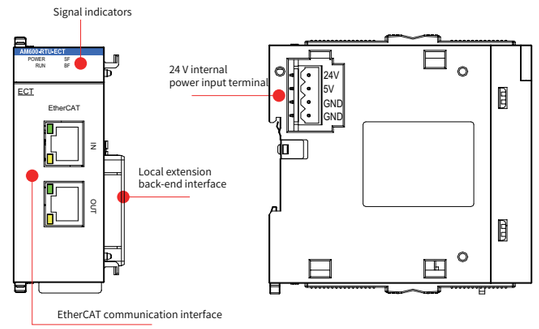

Figure 2 Diagram of EtherCAT communication module interface

No.	Interface Name	Function			
1	IN	EtherCAT input interface			
	OUT	EtherCAT output interface used to connect a back-end EtherCAT slave			
2	Signal indicators	POWER	Power indicator	Green	ON when power supply is switched on.
		RUN	Indicator	Green	ON when the module is in normal operation
		SF	Expansion bus error indicator	Red	ON when error occurs on the expansion bus
		BF	Communication error indicator	Red	ON when communication error occurs
3	Local expansion module back-end interface	Connect back-end module, not supporting hot plugging			
4	Internal 24 V power input terminal	Connect to power modules			

■ General Specifications

Item	Specifications
Power supply specifications	24 VDC (20.4 VDC to 28.8 VDC) (–15% to +20%)
Communication protocol	EtherCAT industrial real-time bus protocol
Maximum communication speed	Ethernet 100 Mbps

Item	Specifications
Network interface/Network Cable	Standard Ethernet interface and standard Ethernet cable (enhanced category 5 network cable) with a cable length of not more than 100 m
Station number range	1 to 125, the internal address is automatically arranged in the network bus connection sequence
Expandability of subsequent I/O modules	Can expand up to 16 I/O modules. The actual number and configuration depend on each module's power consumption

■ Specific Performance Indexes Reached Are Shown in the Following Table:

Item	Specifications
Communication protocol	EtherCAT protocol
Service supported	CoE (PDO, SDO)
Minimum synchronization period of 6-axis cam	1250 us (TYP)
Synchronization mode	Servo uses a DC- distributed clock. I/O uses I/O synchronization.
Physical layer	100BASE-TX
Baud rate	100 Mbit/s (100Base-TX)
Duplex mode	Full duplex
Topological structure	Linear topological structure
Transmission medium	For the network cable, refer to the "Wiring" section.
Transmission distance	Less than 100 M between two nodes
Number of slaves	Up to 125
EtherCAT frame length	44 to 1498 bytes
Process data	Single Ethernet frame up to 1486 bytes
Synchronization jitter of two slaves	< 1 us
Refresh time	1000 digital inputs/outputs: approximately 30 us About 100 us for 32 servo axes

4. Mechanical Design Reference

■ Mounting Dimensions

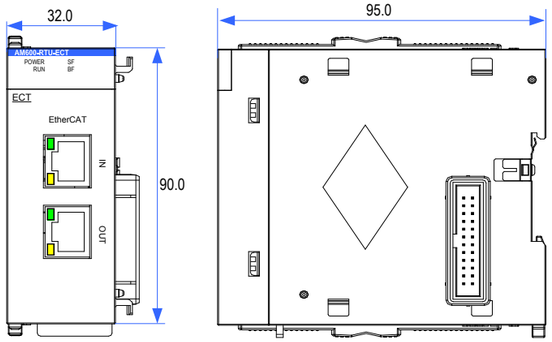

Figure 3 Mounting dimensions (in mm)

5. Electrical Design Reference

■ EtherCAT Communication Interface Description

The EtherCAT bus uses a standard RJ45 network interface and a standard connector.

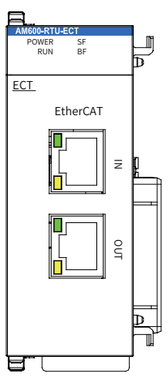

Figure 4 Terminal arrangement of the digital output module

■ Wiring

◆ Network cable preparing

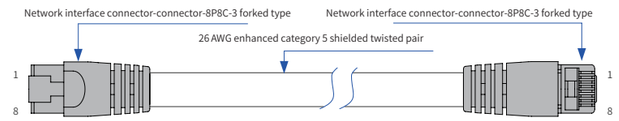

Figure 5 Requirements for EtherCAT network cable preparing

◆ Signal pin assignment

Pin	Signal	Signal Direction	Signal Description
1	TD+	Output	Data transfer+
2	TD-	Output	Data transfer-
3	RD+	Input	Data receive+
4	--	--	Disabled
5	--	--	Disabled
6	RD-	Input	Data receive–
7	--	--	Disabled
8	--	--	Disabled

◆ Length requirements:

FastEthernet technology demonstrates the cable length between devices shall not exceed 100 m when the EtherCAT bus is used. Otherwise, it will cause signal attenuation, affecting normal communication.

◆ Technical requirements:

There is no evidence of short circuit, open circuit, displacement and poor contact during the 100% continuity test.

The EtherCAT bus uses shielded cables to perform network data transfer. Cables with the following specifications are recommended:

Item	Specifications
Cable type	Elastic crossover cable, S-FTP, enhanced category 5
Standards compliance	EIA/TIA568A, EN50173, ISO/IEC11801 EIA/TI Abulletin TSB, EIA/TIA SB40-A&TSB36
Conductor cross-section	AWG26
Conductor type	Twisted pair
Line pair	4

■ Communication Connection

1) Connection of RJ45 network cable

◆ Hold and insert the connector with cable into the RJ45 interface of the communication module until a clicking sound is made.

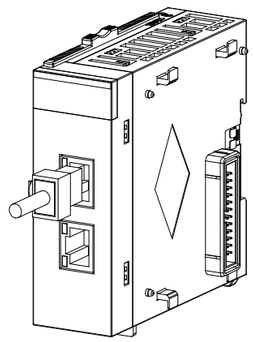

Figure 6 Diagram of network cable connection

◆ Disassembly procedures: Hold the connector tail mechanism to pull out the connector along a horizontal direction with the module.

2) Ethernet cable requirements:

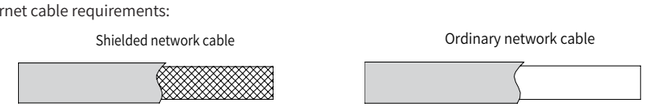

Figure 7 Ethernet cable requirements

Please use enhanced category 5 shielded twisted pair with iron case molding line.

3) Requirements for securing communication cable

To avoid the influence on the communication cable due to other stresses and ensure the stability of

communication, please secure the cable near the equipment before EtherCAT communication, as shown in the following figure:

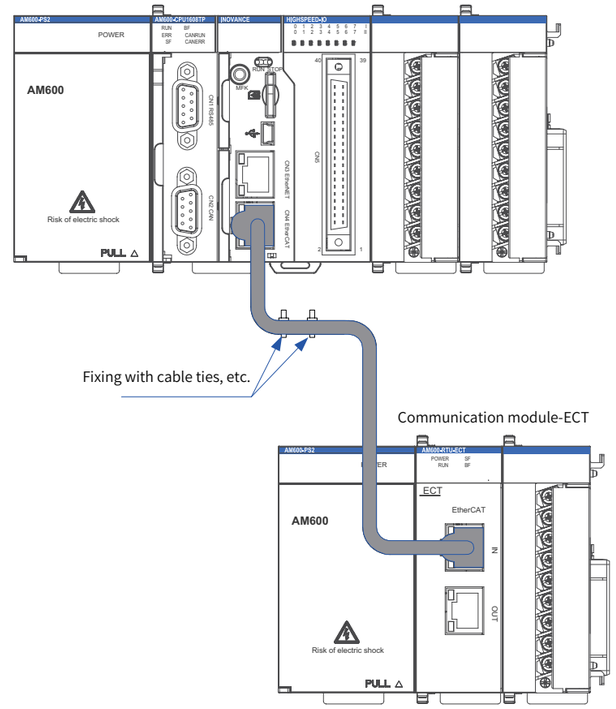

Figure 8 Communication cable must be secured near the equipment

■ Fault Indication and Countermeasures for EtherCAT Remote Communication Expansion Module

◆ EtherCAT slave:

LED Indicators		Description	Solution
SF	BF		
OFF	Flashing	There is no data exchange between the EtherCAT master and slave.	Check configurations and parameter allocation; Check the communication address; Check whether the network specifications and length are consistent with the regulations.
OFF	ON	There is no connection between the EtherCAT master and slave.	Check whether the connector is correctly inserted; Check whether the network cable is damaged; Restart the power supply.
ON	Flashing	Preset configurations are not fully consistent with actual configurations. There is no data exchange between the master and slave.	Check the slave address and slave configurations. Check whether the module is lost and fails or any unconfigured module exists.

INOVANCE Warranty Agreement

1) Inovance provides an 18-month free warranty to the equipment itself from the date of manufacturing for the failure or damage under normal use conditions.
2) Within the warranty period, maintenance will be charged for the damage caused by the following reasons:
   a. Improper use or repair/modification without prior permission
   b. Fire, flood, abnormal voltage, natural disasters and secondary disasters
   c. Hardware damage caused by dropping or transportation after procurement
   d. Operations not following the user instructions
   e. Damage out of the equipment (for example, external device factors)
3) The maintenance fee is charged according to the latest Maintenance Price List of Inovance.
4) If there is any problem during the service, contact Inovance's agent or Inovance directly.
5) Inovance reserves the rights for explanation of this agreement.

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