AX-EM-RCM-ET Communication Module User Manual

Thanks for choosing INVT AX series programmable controller.

The AX-EM-RCM-ET communication module is an EtherCAT communication module used in conjunction with the main modules of the AX series programmable controllers. Each AX-EM-RCM-ET module can extend 16 I/O modules.

**AX-EM-RCM-ET Communication Module User Manual** 

The manual mainly describes the specifications, features, wiring, and use methods of the module. To ensure that you use the product safety and properly and bring it into full play, read the manual carefully before the installing. For details about the user program development environments and user program design methods, see AX Series Programmable Controller Hardware User Manual and AX Series Programmable Controller Software User Manual that we

We reserve the right to continuously improve product performance, and the manual may be modified accordingly without prior notice. Please visit www.invt.com to download the latest manual version.

# 1 Safety precautions

#### 1.1 Warning signs

Sign	Name	Description	Abbreviation
A Danger	Danger	Serious physical injury or even death may occur if related requirements are not followed.	A
Marning	Warning	Physical injury or device damage may occur if related requirements are not followed.	$\triangle$

# 1.2 Delivery and installation

- Only trained and qualified electricians are allowed to perform installation, wiring, maintenance, and inspection for AX series programmable controller.
- ♦ Do not install AX series programmable controller on inflammables. In addition, prevent AX series programmable controller from contacting or adhering to inflammables.



- Install AX series programmable controller in a lockable control cabinet of at least IP20, which prevents the personnel without electrical equipment related knowledge from touching by mistake, since the mistake may result in device damage or electric shock. Only personnel who have received related electrical knowledge and equipment operation training can operate the control cabinet.
- Do not run AX series programmable controller if it is damaged or incomplete
- Do not contact AX series programmable controller with damp objects or body parts. Otherwise, electric shock may result.

# 1.3 Wiring

- Only trained and qualified electricians are allowed to perform installation, wiring, maintenance, and inspection for AX series programmable controller.
- → Fully understand the interface types, specifications, and related requirements before wiring. Otherwise, incorrect wiring will cause
- ♦ Cut off all power supplies connected to AX series programmable controller before performing wiring.



- Before power-on for running, ensure that the module terminal cover is properly installed in place after the installation and wiring are completed. This prevents the live terminal from being touched. Otherwise, physical injury, device fault or misoperation may result.
- Install proper protection components or devices for external power supply input to AX series programmable controller. This prevents the controller from being damaged due to external power supply faults, overvoltage, overcurrent, or other exceptions.

#### 1.4 Commission and running



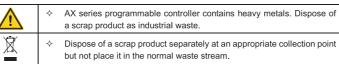
- Before power-on for running, ensure that the working environment of AX series programmable controller meets the requirements, the wiring is correct, the input power specifications meet the requirements, and the respective protection circuit has been designed to protect the controller so that the controller can run safely even if an external device
- ♦ For modules or terminals requiring external power supply, configure external safety devices such as fuses or circuit breakers to avoid damage caused due to external power supply or device fault.

## 1.5 Maintenance and component replacement



- ♦ Only trained and qualified electricians are allowed to perform maintenance, inspection, and component replacement for AX series programmable controller. Cut off all power supplies connected to AX series programmable
- controller before wiring AX series programmable controller terminals. During maintenance and component replacement, take measures to prevent conductive materials such as screws and cables from falling into the internal of AX series programmable controller.

# 1.6 Disposal



## 2 Product introduction

## 2.1 Model and nameplate

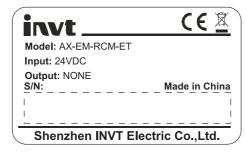


Figure 2.1 Product nameplate

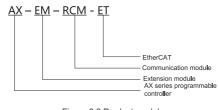


Figure 2.2 Product model

# 2.2 Product function

The AX-EM-RCM-ET module is the EtherCAT communication module of the AX series programmable controller, whose communication rate is 100Mbps and communication distance is not more than 100 meters. Each EtherCAT communication module can extend 16 I/O

#### 2.3 Structural dimensions

The structural dimensions (unit: mm) of the module are shown in the following figure.

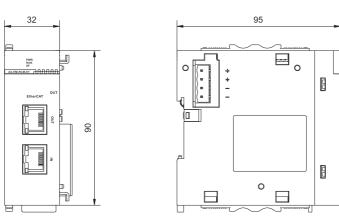


Figure 2.3 Mounting dimensions

### 3 Interfaces

#### 3.1 Interface appearance

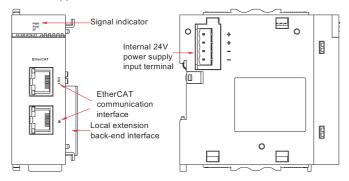


Figure 3.1 Interface distribution

#### 3.2 Interface definition

Interface	Function			
Signal indicator	POWER	Power indicator	Green	It is on when the
Signal indicator	FOWER	rowel indicator	Green	power supply is

Interface Function connected It is on when the RUN Running indicator module is operated normally It is on when error Expansion bus error SF occurs to the indicator expansion bus EtherCAT communication IN: EtherCAT input port OUT: EtherCAT output port, connecting the back-end EtherCAT interface ave station Local extension module Connect the back-end module, disallowing hot swapping back-end interface nternal 24V power supply Connect power supply module input terminal

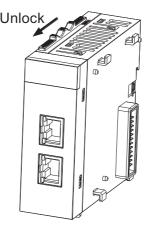
# 4 Installation and wiring

Using modular design, the AX series programmable controller is easy to install and maintain. As for the EtherCAT communication module, the main connection objects are the power supply module. CPU module. extension I/O module, and other EtherCAT slave station module.

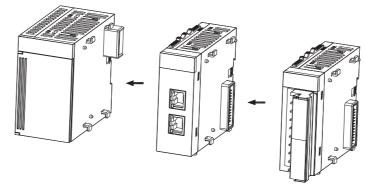
The EtherCAT communication module is directly connected to the CPU module and other EtherCAT slave station modules by using the network cables, while the EtherCAT communication module is connected to the power supply module and I/O module by using the module-provided connection interfaces and snap-fits.

# 4.1 Installation steps

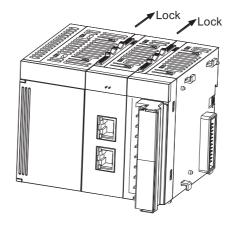
Step 1: Slide the snap-fit on the EtherCAT communication module in the direction shown in the following figure.



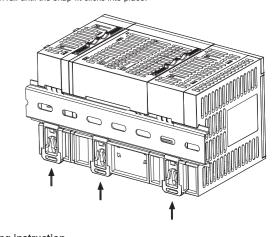
Step 2: Align the EtherCAT communication module with the power supply module back-end connector for interlocking



Step 3: Slide the snap-fit in the direction shown in the following figure to connect and lock the two modules



Step 4: As for standard DIN rail installation, hook the respective module into the standard installation rail until the snap-fit clicks into place.



# 4.2 Wiring instruction

For user wiring requirements, see the wiring diagram as below

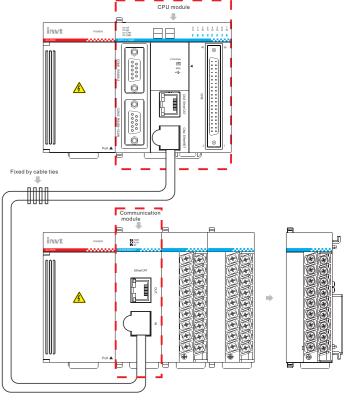


Figure 4.1 Wiring diagram

## Notes:

1. When you connect the network cable, you shall hold the crystal head with the cable and insert it into the RJ45 network port of the communication module until you can hear a "snap" sound. When you remove the installed network cable, you shall press the tail mechanism of the crystal head so as to pull out the connector from the module horizontally.

2. Please use the shielded twisted pairs in more than Category 5e with ironclad molding cable. INVT optional network cables are recommended.

Optional accessories	Model	Specifications	Material number
Shielded cable for communication	AX-L3-20	Shielded cable for EtherCAT communication, two meters	67004-00036
Shielded cable for communication	AX-L3-50	Shielded cable for EtherCAT communication, five meters	67004-00037

If you make the communication cables by yourself, the signal pins of the cables shall be distributed as below

Pin	Signal	Signal direction	Signal description
1	TD+	Output	Data transmission+
2	TD-	Output	Data transmission-
3	RD+	Input	Data receiving+
4		-	Do not use
5		1	Do not use
6	RD_	Input	Data receiving-
7		ı	Do not use
8		-	Do not use

The self-made communication cables shall meet the following requirements:

- Length requirements: FastEthernet technology confirms that the length of the cable between devices cannot exceed 100 meters when you use the EtherCAT bus. If the cable exceeds 100 meters, signal will be attenuated so as to result in abnormal communication.
- > Technical requirements: The communication cables you use must pass the conductivity test 100%, without short circuit, opened circuit, dislocation or poor contact.
- 3. In order to avoid the influence of other tensions on the communication cable and ensure the stability of the communication, please fix the cable near the side of the device before conducting EtherCAT communication.

Modules shall be installed on a well-grounded metal bracket and ensure that the metal dome at the bottom of the module is in good contact with the bracket.

#### 5 Technical parameters

# 5.1 General specification

Item	Specification
Power supply specification	24VDC (-15%-+20%)
Communication protocol	EtherCAT industrial real-time bus protocol
Communication rate	100Mbps
Transmission medium	Standard Ethernet cable (Category 5e), and the length of the cable cannot exceed 100 meters
Station number	1–125, the internal address is automatically distributed based on the connection sequence of the network bus.
I/O extension capacity	16 I/O modules

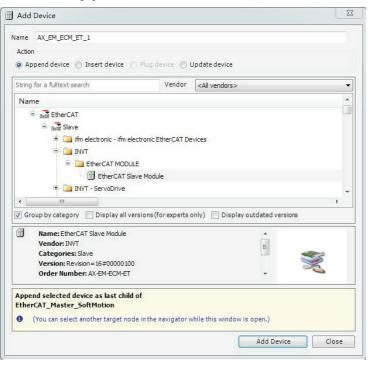
#### 5.2 Performance indexes

Item	Specification
Duplex mode	Full duplex
Synchronization method	DC synchronization is adopted in servo applications, and input and output synchronization is used in I/O applications.
6-axis cam min. synchronization interval	1ms
Topology structure	Linear topology
Transmission distance	Distance between two nodes less than 100 meters
Process data	Single Ethernet frame is up to 1486 bytes
Synchronization shake between two slave stations	Within 1us
Refresh time	Refresh time of 1000 digital inputs/outputs is 30us, and refresh time of 32 servo applications is 100us.
Configuration method	Manually load the configuration file

# 6 Application instance

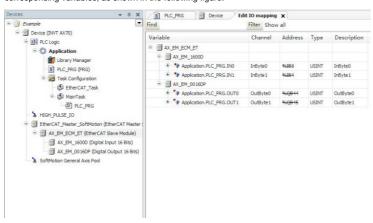
For instance, extend one AX-EM-RCM-ET module, extend one AX-EM-1600D module and one AX-EM-0016DP following the AX-EM-RCM-ET module, and use the AX70-C-1608P module as the main module. The instructions are as follows.

1. Create a new project on the CODESYS upper PC, and add the device description file (EtherCAT Slave Module) corresponding to the AX-EM-RCM-ET module in the project, as shown in the following figure.

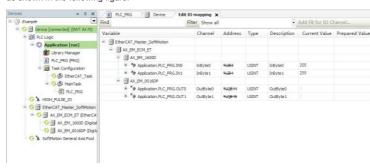


2. Right-click AX-EM-ECM-ET in the Device bar, add AX\_EM\_1600D and AX\_EM\_0016DP in

turn. Program by using ST programming language, define the mapping variables of each channel, and assign the state of the channel corresponding to the mapping variables to the corresponding variables, as shown in the following figure:



3. After the program is compiled successfully, you can log in to the device, and run the program, as shown in the following figure.



#### 7 Pre-startup check and preventive maintenance

#### 7.1 Pre-startup check

If you have completed the wiring, ensure the following aspects before starting the module to work:

- 1. The crystal head has been inserted correctly.
- 2. The network cable is not damaged.
- 3. The specification and length of the network cable are consistent with the requirements in the manual.
- 4. The communication address, configuration and parameter settings are correct.

# 7.2 Preventive maintenance

- 1. Clean the programmable controller regularly, and ensure good ventilation and heat dissipation conditions for the controller.
- 2. Formulate maintenance instructions and regularly test the controller.
- 3. Regularly check the wiring and terminals to ensure that they are securely fastened.

Customer Service Center (China), Shenzhen INVT Electric Co., Ltd.

Address: INVT Guangming Technology Building, Songbai Road, Matian, Guangming District,

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