



# VM-RTU-ECT Module

Manual

Stock Code: 688698

## **VM-RTU-ECT Communication Interface Module**

#### Manual

Version V1.1

Archived Date 2023-03-07

Veichi Electric Co., Ltd. provides customers with a full range of technical support, so users can reach the nearest Veichi Electric Co., Ltd. office or customer service center, or the company headquarters directly.

Veichi Electric Co.

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Veichi Electric Co.

Address: 3rd Floor, Chunsheng, Linoya Industrial Park, Tangtou 1 Road, Tangtou Community,

Shiyan, Baoan District, Shenzhen, China.

Service hotline: 400-600-0303

Company website: www.veichi.com

## **Preface**

#### ■ Profile

VM-RTU-ECT is the VM series EtherCAT communication interface module. This product supports EtherCAT communication, has automatic scanning function, and is compatible with our company and third-party EtherCAT master equipment: PLC, board, etc. One EtherCAT communication module unit can connect up to 16 VM series common IO modules. When the number of modules is greater than 16, a VM-RTU-ECT communication interface module needs to be added for power supply (for every expansion of 16 IO modules, a VM-RTU-ECT communication interface module needs to be added for power supply).

#### Version Change Log

Revision date	Version	Content
2023-3	A1.1	Minor error correction
2022-11	A1.0	First release of the manual

#### Manual Access

This manual is not shipped with the product, so users can get its PDF version in the following way:

- Log on to the official website of Veichi Electric (www.veichi.com), "Service and Support-Download", type in keywords and download.
- Scan the QR code on the product body to get the manual with mobile phone.

### Warranty Statement

If malfunctions or damage occur on the product under normal use, Veichi Electric offers 18-month warranty (from the date of shipment from the factory, subject to the bar code on the body, and in accordance with the agreements between parties if there are some). Customers will be charged if it exceeds 18 months while damages caused by the following conditions will be charged if it is within 18 months.

- Product damage caused by wrong methods against this manual.
- Product damage caused by fire, flood, or abnormal voltage.
- Product damage caused for abnormal functions against this manual.
- Product damage caused for unspecified purposes against this manual.
- Secondary damage to the product caused by force majeure (natural disasters, earthquakes, lightning strikes) factors.

The relevant service costs are calculated according to the manufacturer's standards, and if there is a contract, the contract will be handled on a priority basis. Please refer to the Product Warranty Card for detailed warranty description.

## **Safety Precaution**

#### Safety Statement

- Read and follow these safety precautions before installing, operating, and maintaining the product.
- Follow all safety precautions stated on the product's labeling and in the manual when installing, operating, and maintaining the product for personal and equipment safety.
- The "CAUTION", "WARNING" and "DANGER" items in this manual do not mean all safety precautions to be observed, but are only supplementary to safety precautions.
- This product shall be used in an environment that complies with the design specifications, otherwise it may cause malfunction, and malfunction or damage to parts caused by failure to comply with the relevant regulations are not covered by the product warranty terms.
- Veichi will not take on any legal responsibility for personal safety accidents, property damage, etc.,
   caused by unauthorized operation of the product.

### ■ Safety Level Definition

DANGER" means death or serious bodily injuries if not operated in accordance with the regulations.

"WARNING" means death or serious bodily injuries if not operated in accordance with the regulations.

"CAUTION" means minor bodily injuries or damage to the equipment if not operated in accordance with the regulations.

Keep this guide in a safe place in case it is needed, and be sure to give this manual to the end user.

## **During Control System Design**



- > Be sure to design safety circuits so that the control system will still work safely when the external power supply drops out or the programmable controller malfunctions;
- If the rated load current is exceeded or the load is short-circuited, etc., resulting in prolonged overcurrent, the module may smoke or is on fire, so safety devices such as fuses or circuit breakers shall be installed externally.



Be sure to provide emergency brake circuits, protection circuits, interlock circuits for forward and reverse operation, and upper and lower position interlock switches to prevent damage to the machine in the external circuits of the programmable controller;

- > Design external protection circuits and safety mechanisms for output signals related to major accidents for safe operation of the equipment;
- The programmable controller CPU may stop all output when it detects an abnormality in its own system; when some of the controller's circuits fail, output may turn uncontrolled. Please design suitable external control circuits in order to ensure normal operation;
- Damage to output units such as relays and transistors of programmable controllers will cause their output uncontrolled to the ON or OFF state;
- The programmable controller is designed to be used in indoor, overvoltage class II electrical environments, and its power supply system should be equipped with lightning protection to ensure that lightning overvoltage is not added to the programmable controller's power input or signal input, control output and others, so as to avoid damage to the equipment.

#### Installation



- > Only maintenance professionals with adequate electrical knowledge and training related to electrical equipment should carry on installation work;
- When removing or installing a module, the external power supply to the system must be completely disconnected beforehand. Failure to fully disconnect the power supply may result in electric shock or module malfunction and misoperation;
- Do not use the programmable controller in the following places: places with dust, grease, conductive dust, corrosive gases, flammable gases; places exposed to high temperature, condensation, wind and rain; and places subject to vibration and shock. Electric shock, fire, and misuse can also cause damage and deterioration to the product;
- Programmable controllers are open type devices, please install them in control cabinets with door locks (protection of the control cabinet housing > IP20), and only operators who have been trained with sufficient electrical knowledge about equipment shall open the control cabinets.



- Avoid metal shavings and wire ends falling into the ventilation holes of the controller during installation, which may cause fire, malfunction, and misoperation;
- Ensure that there is no foreign matter on its ventilation surface after installation, otherwise it may lead to poor heat dissipation, which may cause fire, malfunction, and misoperation;
- Connect the modules tightly to their respective connectors and lock the module connection hooks securely. Improper installation of the module may result in malfunction, malfunction and disconnection.

#### Wiring

## DANGER :

- > Wiring of this product should only be carried out by specialized maintenance personnel with adequate electrical knowledge and training related to electrical equipment;
- During wiring, the external supply power to the system must be fully disconnected in advance. Failure to do so may result in electric shock or equipment failure or malfunction;
- The terminal cover supplied with the product must be installed before power-up and operation. Failure to install the terminal cover may result in electric shock;
- The cable terminals should be well insulated to ensure that the insulation distance between the cables is not reduced after the cables are installed in the terminal block. Failure to do so may result in electric shock or equipment damage.



- To avoid electric shock, disconnect the power supply before connecting the power supply to this product;
- The input power supply of this product is DC24V, if the supplied power is not within ±20% of DC24V, this product will be seriously damaged. Therefore, please check whether the DC power supply provided by the switching power supply is stable or not regularly.

#### Maintenance



- > Only specialized maintenance personnel with adequate electrical knowledge and training related to electrical equipment shall carry out the operational maintenance of the product;
- When cleaning the module or re-tightening the bolts on the terminal strip or connectors, the external power supply to the system must be completely disconnected. Failure to do so may result in electric shock;
- When disassembling a module or making connections to or removing communication cables, the external supply power to the system must first be completely disconnected. Failure to fully disconnect may result in electric shock or malfunction.

#### Safety Recommendations

- Please consider the manual installation or other spare methods that are separate from PLC to stop or start the system when there are mechanical parts that will be touched directly by operators like position of loading/unloading tools or parts with auto running function.
- > If it is necessary to modify the programs while the system is in operation, please consider to add locks or other safeguards to ensure that only authorized personnel can make the necessary modifications.

## **Scrapping**



- Dispose of this product as industrial waste, and the batteries should be handled separately in accordance with local laws and regulations;
- > Dispose of equipment and products in accordance with industrial waste disposal standards to avoid environmental pollution.

## 1 Product Information

## 1.1 Naming Rules and Nameplate Description

<u>VM – RTU – ECT</u>

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2

Product information

0

VM: Veichi Slimline Series IO Module

① IO input channel

RTU: Remote Interface Module

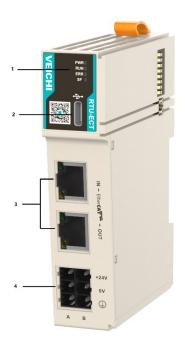
② Agreement type

ECT: EtherCAT

PN: ProfiNET



## 1.2 Component Description



No.	Interface	Function definition			
		PWR	Power indicator	Green	Lights up when power is turned on
			Run indicator	Off	ECT module is in INIT state
				Flashing (green))	ECT module in Pre-operation state
		RUN		Single flash (green))	ECT module in Safe-operation state
				On (green)	ECT module in Operation state
1	Signal indicator		ERR Communication error indicator	Off	EtherCAT communication in normal state
		ERR		Flashing (red)	The EtherCAT communication then receives a state transition command that cannot be executed
				Single flash (red)	Network disconnection, ECT module synchronization error
				Dual flash (red)	A watchdog error occurred in EtherCAT communication
		SF	Module error indicator	Off	The equipment is in order
				Single	An error in the extension module

				flash (red)	
				Flashing (red)	Configuration error
2	Type-C interface	For single board software upgrade			
3	EtherCAT interface	IN: EtherCAT input port			
		OUT: EtherCAT output port for connecting a back-end EtherCAT slave			
4	24V power supply	Module power input terminals			

## 1.3 Specification

## 1.3.1 Power Specification

Item	Specification		
Rated voltage of terminal input voltage	24V DC (20.4V DC~28.8V DC)		
Rated current of terminal input power	0.6A (Typical value at 24V)		
Rated voltage of bus output power supply	5V DC (4.75V DC~5.25V DC)		
Rated current of bus output power supply	2A (Typical at 5V)		
Power supply output derating	85% derating at 55°C operation (output current up to 1.7A) or 10°C derating at 2A output		
Isolate	Non-isolated (internal use, isolated from each other and from the external power supply of other modules)		
Power protection	Overcurrent protection, anti-reverse connection protection, surge absorption		

## 1.3.2 Software Specification

Item	Specification
	ECT supports alias access, and ECT supports site alias setting in the
Alias access	background. However, the extension module connected behind ECT does
	not support alias access and setting. Range: 1~65535
Number of input PDO	Maximum 1024 bytes
Number of output PDO	Maximum 1024 bytes
Input mailbox size	Maximum 256 bytes
Output mailbox size	Maximum 256 bytes

## 1.3.3 Environmental Regulation

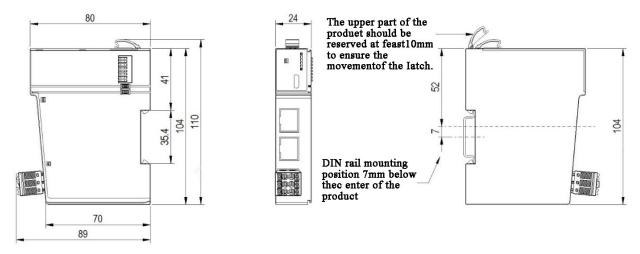
Item	Specification
Ambient working temperature	-20°C~55°C
Ambient working humidity	Relative humidity less than 95% RH without condensation
Atmosphere	Ensure no corrosive gases
Ambient storage temperature	-20°C to 60°C (relative humidity less than 90% RH without condensation)
Power supply output derating	85% derating at 55°C operation (output current up to 1.7A) or 10°C
	derating at 2A output
Altitude	Below 2000 meters (80kPa)
Pollution level	Level 2
Immunity	Power cord 2Kv (IEC 61000-4-4)
Overvoltage category	II
EMC anti-interference grade	Zone B, IEC61131-2
	IEC 60068-2-6 5Hz~8.4Hz, amplitude 3.5 mm, 8.4Hz~150 Hz,
Vibration	acceleration 9.8 m/s2 , 100 minutes in each direction of X, Y and Z
	(10 cycles of 10 minutes each, total 100 minutes)
Impact resistance	IEC 60068-2-27, 9.8m/s2, 11ms, X/Y/Z, 3 times in each of the 3 axes
impact resistance	and 6 directions

## 2 Mechanical Installation

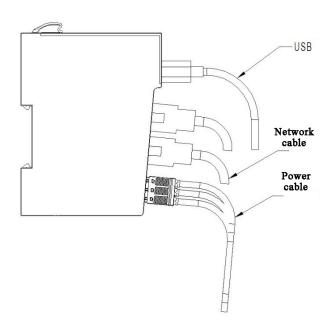
## 2.1 Mounting Dimensions

### 2.1.1 Module

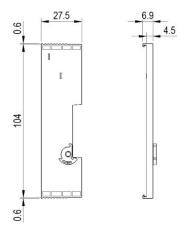
Mounting dimension information is shown below in (mm):



### 2.1.2 Connection Cables



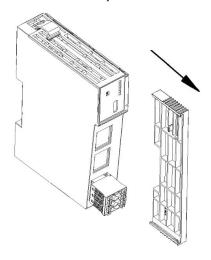
## 2.1.3 Tailgate



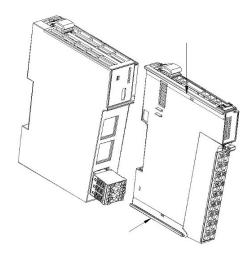
## 2.2 Installation

### 2.2.1 Inter-module Installation

Inter-module assemblies are slide-mounted via the top and bottom rails.

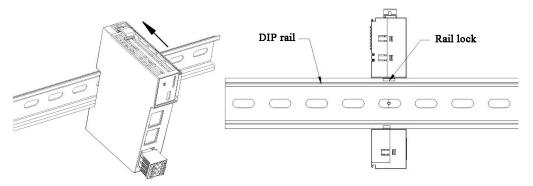


Inter-module assemblies are slide-mounted via the top and bottom rails of the modules, as shown below.



### 2.2.2 Rail Installation

DIN rail mounting is adopted here. When installing, align the module with the DIN rail and press the snap until there is a clear click sound. As shown in the figure below.



Note: Once the module is installed, the latch needs to be pressed down by hand to ensure it is in place.

## 3 Electrical Installation

#### 3.1 Cable Selection

### 3.1.1 Communication-related Wiring

EtherCAT bus communication adopts shielded network cable for network data transmission, without short circuit, misalignment and poor contact phenomenon; the length of the cable between the devices should not exceed 100m, beyond the length of the signal attenuation, affecting the normal communication. The following specifications are recommended:

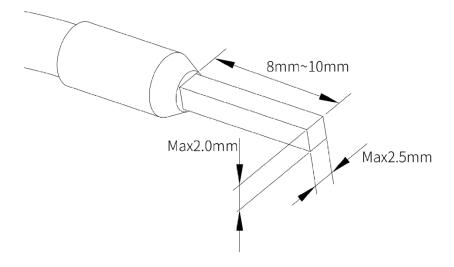
Item	Specification
Cable type	Flexible crossover cable, S-FTP, Category 5 cable
Criteria met	EIA/TIA568A, EN50173, ISO/IEC11801 EIA/TI Abulletin TSB, EIA/TIA SB40-A&TSB36
Wire cross-section	AWG26
Wire type	AWG26
Pair of lines	4

## 3.1.2 Power-related Wiring

The wire lug diameters in the following table are for reference only, and can be reasonably calculated and separately adjusted according to actual use.

Matching material name	Matching material name		
······································	National standard/mm2	American standard/AWG	
	0.3	22	
	0.5	20	
Tube lugs	0.75	18	
	1.0	18	
	1.5	16	

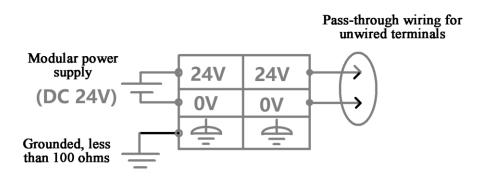
If other tubular lugs are used, crimp them to the stranded wire in the shape and size required as shown below.



## 3.1.3 External Interface Specification

Port type	Interface name	Cable/Maximum length	Functional definition	User terminal	Performance indicator
EtherCAT interface	EtherCAT	Shielded network cable/100 meters	EtherCAT communication interface	RJ45 network port*2	100Mbps (100BaseTX)
Power	24V input	3-core unshielded cable/20 meters	24V power input	6PIN pluggable terminal	24V/1A

## 3.2 User Terminal Wiring



## 4 Troubleshooting

### 4.1 Indicator Light Diagnostic

LED indicator		Meaning	Solution
RUN	Off	No connection between EtherCAT master and slave.	Checking the configuration and parameter assignment; Check the communication address; Checking network cable specifications and lengths for consistency with regulations.
	Flash	The EtherCAT slave is in a state other than OP.	Check the slave configuration for missing or faulty modules or unconfigured modules.
BF	Flash	No data is exchanged between EtherCAT master and slave; EtherCAT communication received an inexecutable state transition command; ECTA module synchronization error; A watchdog error occurred in EtherCAT communication.	Check that the crystal head has been inserted correctly; Checking that the network cable is not damaged; Restarting the power supply; Checking that the PDO configuration is correct.
SF	Flash	Configuration error; Module error.	Check that the upper unit configuration and the module configuration are consistent;  Check that the module is not disturbed.

## 4.2 Mapping Register Usage and Diagnostics

## 4.2.1 Device Control Register

The Device Control registers are mainly registers that control how the local expansion bus Vbus operates after an error. With register values other than 0x5445 and 0x5450, the Vbus stops after an error and no longer controls the expansion module and refreshes the lamps;

Manually write 0x5445 to the Vbus for reset function;

When writing 0x5450 all the time, the Vbus automatically resets, automatically reconnects and switches to normal operation after an error.

Note: Vbus Reset Note: After reset, no module matching verification is performed on the master, users

are required to check the Vbus Status register to see if the Vbus module ID matches the configured module of the master and operates correctly to the normal communication state;

Processor register	Value	Description
Device control	0x5445	VBUS enters the reset state when the value is written in the error stop state, and restarts when a value of 0 is written.  Note: Holding at 0x5445 stays in reset state, Bit15~8 of VbusStatus are invalid.
	0x5450	When this value is maintained, it is automatically reset after an error and automatically connected.
	Else	Auto connect on power up, stop on error.

## 4.2.2 Vbus Status Register

The Vbus Status register is mainly the current communication status and error status of the local expansion bus.

Vbus status	State description
Bit15~12	0x2: Vbus slave no response alarm
	0x4: Vbus write expansion module process data error
	0x6: Vbus read expansion module process data error
	0x8: Error in Vbus reading expansion module ID
	0xa: Error in parameter of Vbus operation expansion module
Bit11~8	0~15: Error expansion module slot number
Bit7~4	Reserved
Bit3~0	Current Vbus operation status
	0: Initialization, scanning of the slot for expansion modules;
	1: Identify the expansion module type, version number, and version date for each
	slot;
	2: Establishing communication for each slot;
	3: Normal operation of communication.

## 4.2.3 Fault ID Register

The Fault ID register is mainly an expansion module reporting status register. Multiple simultaneous alarms can only display the alarm status of one of them.

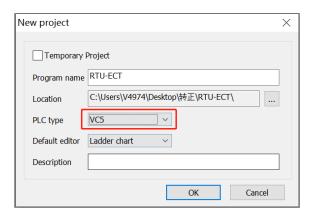
When the high alarm is invalid, the slot number of the module in error may be any value.

Fault ID	State description
Bit15~12	Reserved
Bit11	Expansion Module Over Temperature Alarm
Bit10	Expansion module overflow alarm
Bit9	Extension module overrun alarm
Bit8	Expansion Module Disconnection Alarm
Bit7~4	Reserved
Bit3~0	0~15: Error expansion module slot number

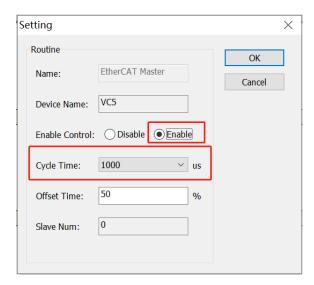
## **5 Module Programming Example**

#### 5.1 Veichi Auto Studio with VC5

### 5.1.1 Create A New Project

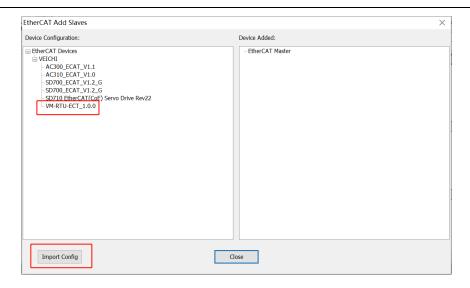


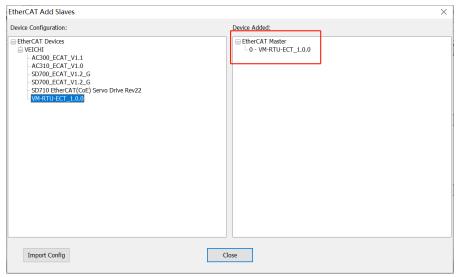
### 5.1.2 Configure EtherCAT Task



## 5.1.3 Import the xml File

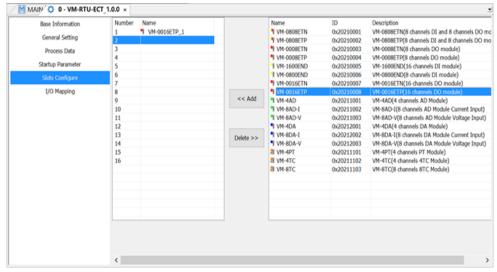
Import the current latest version of VM-RTU-ECT $_1.0.0.xml$  description file and double click to add it to the device:





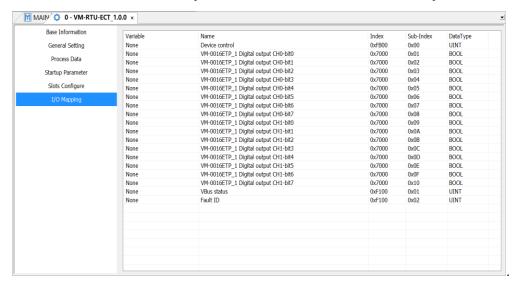
### 5.1.4 Slot Configuration

At present, VC5 needs to configure the slot for the device first, and the configuration of the expansion module and the sequence need to be consistent with the physical object, otherwise there will be an alarm and a prompt that the configuration does not match what is connected.

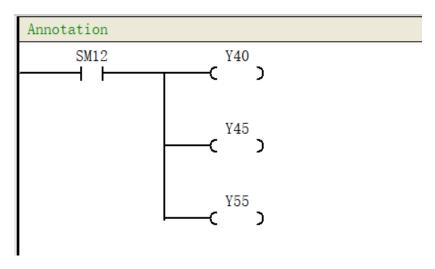


### 5.1.5 IO Mapping

VC5 default setting is no mapping, so it is necessary to map the registers that will be controlled and monitored to the soft components before actual use, otherwise users can't operate on them



#### 5.1.6 Write User Programs



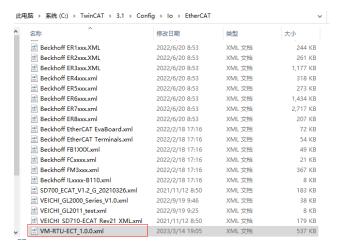
#### 5.1.7 Compile Download Run

Compile without error, download and run it.

## 5.2 Simple Commissioning with Beckhoff TwinCAT

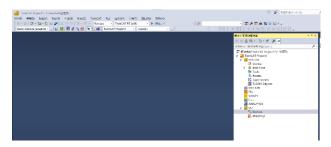
#### 5.2.1 Import the xml File

Copy the current latest version of VM-RTU-ECT\_1.0.0.xml description file to the TwinCAT installation directory under TwinCAT\3.1\Config\Io\EtherCAT.



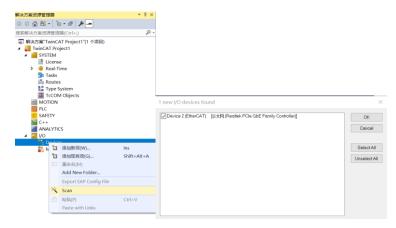
## 5.2.2 Create A New TwinCAT Project

Open TwinCAT software to create a new TwinCAT project.



#### 5.2.3 Scan the Devices

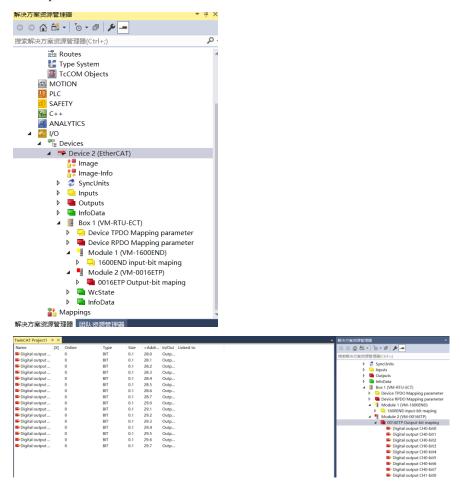
Ensure that the device is scanned with the VM-RTU-ECT connected, and follow the pop-up confirmation to make it run to OP.



**Note:** A new installation of TwinCAT software requires the installation of the real-time network card driver before this step.

### 5.2.4 IO Monitoring and Commissioning

As shown in the figure below, scan to the device VM-RTU-ECT coupler below a 1600END and a 0016ETP expansion module respectively, you can carry out IO monitoring and debugging its input and output.



### **VEICHI**

#### SUZHOU VEICHI ELECTRIC Co.,Ltd.

Address:No.1000 Songjia road, Wuzhong Economic and Technological Development Zone, Suzhou Phone: \*86-512-6617 1988 Facebook:https://www.facebook.com/veichiglobal/Whatsapp: +86-138 2881 8903 E-mail:overseas@veichi.com Web:https://www.veichi.org/



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