



Chongqing Longway Control System Co.,Ltd.



LW Series EtherCAT Protocol All-in-One I/O Module User Manual

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Loway literature

Revision History

V1.0 Initial release (Aug. 28, 2023)

V1.1 Added RS485 to EtherCAT gateway description; improved digital input wiring diagrams (Dec. 25, 2023)

V1.2 Added 8DI/8DO and 4AI/4AO models; further improved wiring diagrams (Jan. 9, 2024)

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Disclaimer

The contents of this document have been reviewed and are believed to accurately reflect the described software and hardware. Nevertheless, minor discrepancies may occur, and thus complete accuracy cannot be warranted. This documentation is regularly reviewed and updated in later editions. We welcome your comments and suggestions for improvement.

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Safety Information

This manual contains safety instructions that must be observed during operation to ensure personal safety and to protect the product and connected equipment from damage. These instructions are highlighted by a triangular warning symbol preceding the text. They are classified into the following categories according to the degree of hazard:



DANGER:

Indicates an imminently hazardous situation. Failure to avoid will result in death, serious personal injury, or major property damage.



WARNING:

Indicates a potentially hazardous situation. Failure to avoid could result in death, serious personal injury, or major property damage.



CAUTION:

Used in conjunction with the safety alert symbol, indicates a potentially hazardous situation. Failure to avoid could result in minor or moderate personal injury or property damage.

NOTICE:

Used without the safety alert symbol, indicates a potentially hazardous situation. Failure to avoid could result in property damage.

NOTE:

Indicates important information related to the product or content that requires special attention within the document.

Qualified Personnel

Only qualified personnel are permitted to install, commission, and operate the system. In the context of this manual, "qualified personnel" refers to individuals who are authorized and, based on the relevant safety regulations and requirements, are competent to perform installation, commissioning, grounding, and labeling of equipment, systems, and circuits.

Scope of Application

Please note the following:



WARNING:

This device shall be used exclusively in the applications specified in the catalog or technical documentation. It may be used in conjunction with equipment, components, and devices manufactured by other companies only upon the recommendation or with the express permission of our company.

To ensure product safety and reliability, the product must be transported, stored, and installed in accordance with the applicable requirements, and must be operated with due care and maintained thoroughly.

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1 System Overview

The LW Series EtherCAT Protocol All-in-One I/O Module is a bus-universal remote I/O module independently developed by Chongqing Longway Networked Intelligent Control System Co., Ltd. It is designed to reduce costs for users, simplify wiring, and improve system reliability.

Product Composition

The LW Series all-in-one remote I/O modules adopt a building-block approach for module combination. Each complete module set consists of one communication board, with the option to configure up to two I/O boards. For standard modules, our company offers pre-assembled complete models. For customers requiring special combinations, we can provide customized models upon request. Customized models must be coordinated with our company in advance. Models that have not been confirmed with us prior to ordering may result in extended delivery lead times.

1.1 Communication Board Model

Communication Board Model	Bus Protocol	Remarks
LW-IO-001	Profinet	The communication board model is an auxiliary module identifier for module configuration reference only. It is not sold separately as an ordering code. One protocol must be selected.
LW-IO-002	EtherCAT	
LW-IO-003	ModbusTCP	

1.2 I/O Board / Power Board Selection

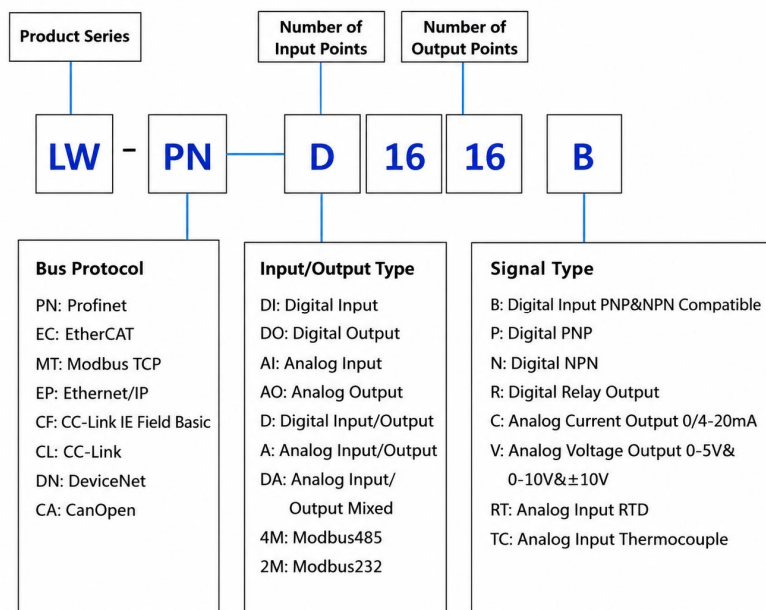
I/O Board Model	Module Type	Remarks
LW1016	16-point digital input (PNP & NPN)	I/O board models are auxiliary module identifiers for module configuration reference only. They are not sold separately as ordering codes. A complete module can accommodate up to two communication boards, and each model of communication board can be used up to twice to form
LW2016	16-point digital output (PNP) 0.5A	
LW2116	16-point digital output (NPN) 0.5A	
LW2012	12-point digital output (PNP) 4A	
LW2205	5-point relay output	
LW3305	5-point analog input RTD	
LW3408	8-point analog input TC	
LW3008	8-point analog input 0–10V & ±10V	
LW3108	8-point analog input 0/4–20mA	
LW4008	8-point analog output 0–10V & ±10V	
LW4108	8-point analog output 0/4–20mA	
LW1288P	8DI PNP & NPN + 8DO PNP	
LW1288P4	8DI PNP & NPN + 8DO PNP +	

	RS485 × 1	one complete module.
LW1288N	8DI PNP & NPN + 8DO NPN	
LW3473V	7AI + 3AO 0–10V & ±10V	
LW3444C	4AI + 4AO 0/4–20mA	
LW3444V	4AI + 4AO 0–10V & ±10V	
LW5403	3-channel Modbus RTU master communication board	
LW5406	6-channel Modbus RTU master communication board	

1.3 Example of Complete I/O Module Ordering Model Combinations

Communication Board Model (Select One)	I/O Board (Two or One Optional; Same Model May Be Selected Twice)	Complete Model	Product Description
LW-IO-001	One LW1016 and one LW2016	LW-PN-DI1616P	Profinet protocol: 16DI (PNP & NPN) + 16DO PNP
LW-IO-002	One LW1016	LW-EC-DI160B	EtherCAT protocol: 16DI (PNP & NPN)
LW-IO-003	One LW1016 and one LW3008	LW-MT-DA1680BV	Modbus TCP protocol: 16DI (PNP & NPN) + 8AI (0–5V & 0–10V & ±10V)

1.4 Complete I/O Module Naming Convention



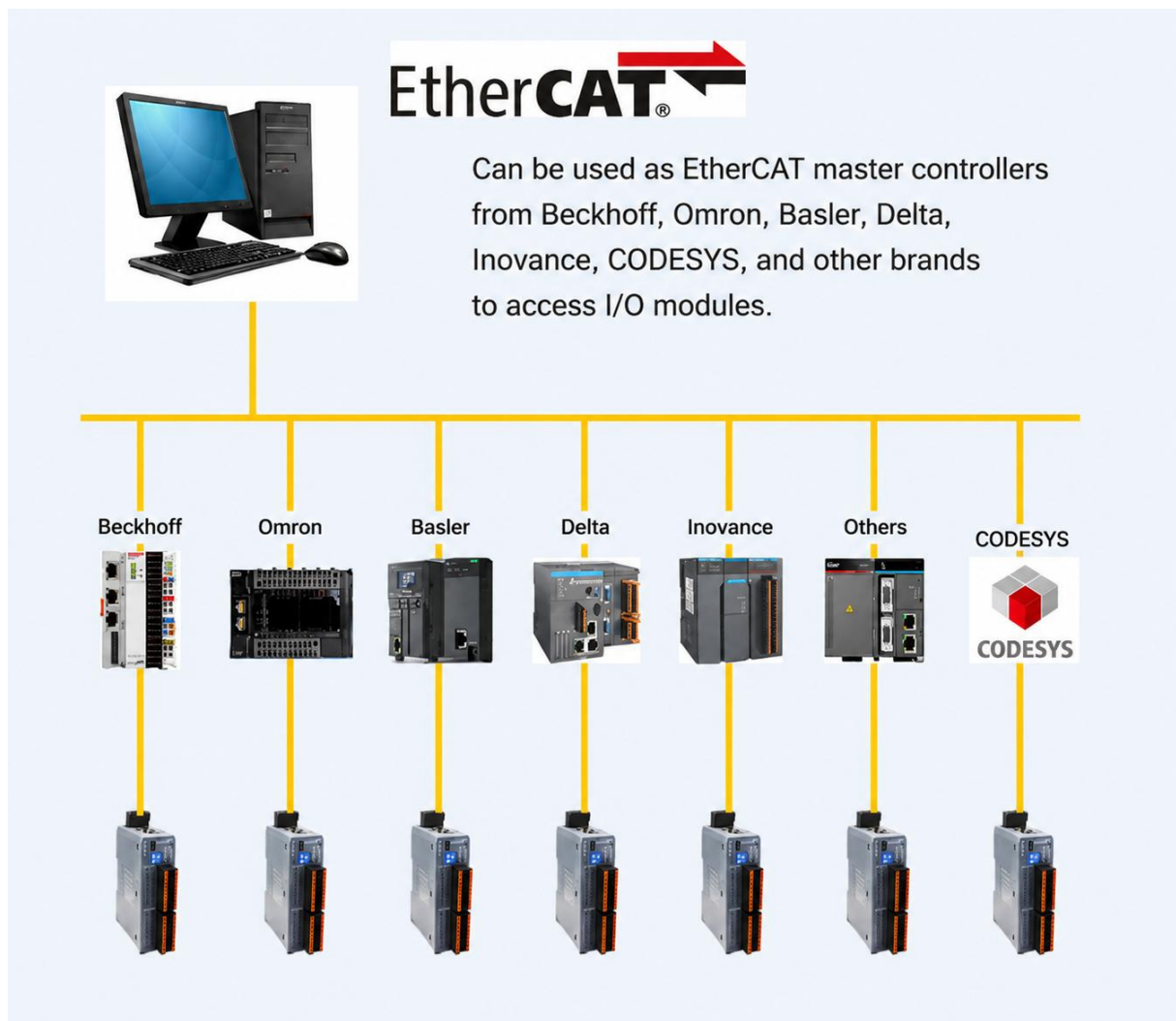
1.5 Standard Ordering Codes for Complete I/O Modules

No.	Model	Description
1	LW-EC-DI16B	16DI PNP/NPN
2	LW-EC-DI32B	32DI PNP/NPN
3	LW-EC-DO16P	16DO PNP 0.5A
4	LW-EC-DO16N	16DO NPN 0.5A
5	LW-EC-DO05R	5DO Relay
6	LW-EC-DO10R	10DO Relay
7	LW-EC-DO24P-T	24DO PNP 4A (Direct solenoid valve drive)
8	LW-EC-DO32P	32DO PNP 0.5A
9	LW-EC-DO32N	32DO NPN 0.5A
10	LW-EC-D88BP	8DI PNP/NPN + 8DO PNP 0.5A
11	LW-EC-D88BN	8DI PNP/NPN + 8DO NPN 0.5A
12	LW-EC-D1616BP	16DI PNP/NPN + 16DO PNP 0.5A
13	LW-EC-D1616BN	16DI PNP/NPN + 16DO NPN 0.5A
14	LW-EC-AI08C	8AI Current 0/4-20mA
15	LW-EC-AI08V	8AI Voltage 0-10V / $\pm 10V$
16	LW-EC-AI16C	16AI Current 0/4-20mA
17	LW-EC-AI16V	16AI Voltage 0-10V / $\pm 10V$
18	LW-EC-AO08C	8AO Current 0/4-20mA

19	LW-EC-AO08V	8AO Voltage 0–10V / $\pm 10V$
20	LW-EC-AO16C	16AO Current 0/4–20mA
21	LW-EC-AO16V	16AO Voltage 0–10V / $\pm 10V$
22	LW-EC-A44C	4AI + 4AO Current 0/4–20mA
23	LW-EC-A44V	4AI + 4AO Voltage 0–10V / $\pm 10V$
24	LW-EC-A88C	8AI + 8AO Current 0/4–20mA
25	LW-EC-A88V	8AI + 8AO Voltage 0–10V / $\pm 10V$
26	LW-EC-05RT	5AI RTD (Resistance Temperature Detector)
27	LW-EC-10RT	10AI RTD (Resistance Temperature Detector)
28	LW-EC-08TC	8AI TC (Thermocouple)
29	LW-EC-16TC	16AI TC (Thermocouple)
30	LW-EC-DA8844PC	8DI PNP/NPN + 8DO PNP, 4AI + 4AO 0/4–20mA
31	LW-EC-DA8844PV	8DI PNP/NPN + 8DO PNP, 4AI + 4AO 0–10V / $\pm 10V$
32	LW-EC-DA8844NC	8DI PNP/NPN + 8DO NPN, 4AI + 4AO 0/4–20mA
33	LW-EC-DA8844NV	8DI PNP/NPN + 8DO NPN, 4AI + 4AO 0–10V / $\pm 10V$
34	LW-EC-4MB3	3-Channel RS485 to EtherCAT Gateway
35	LW-EC-4MB6	6-Channel RS485 to EtherCAT Gateway
36	LW-EC-4MB12	12-Channel RS485 to EtherCAT Gateway

1.6 System Architecture

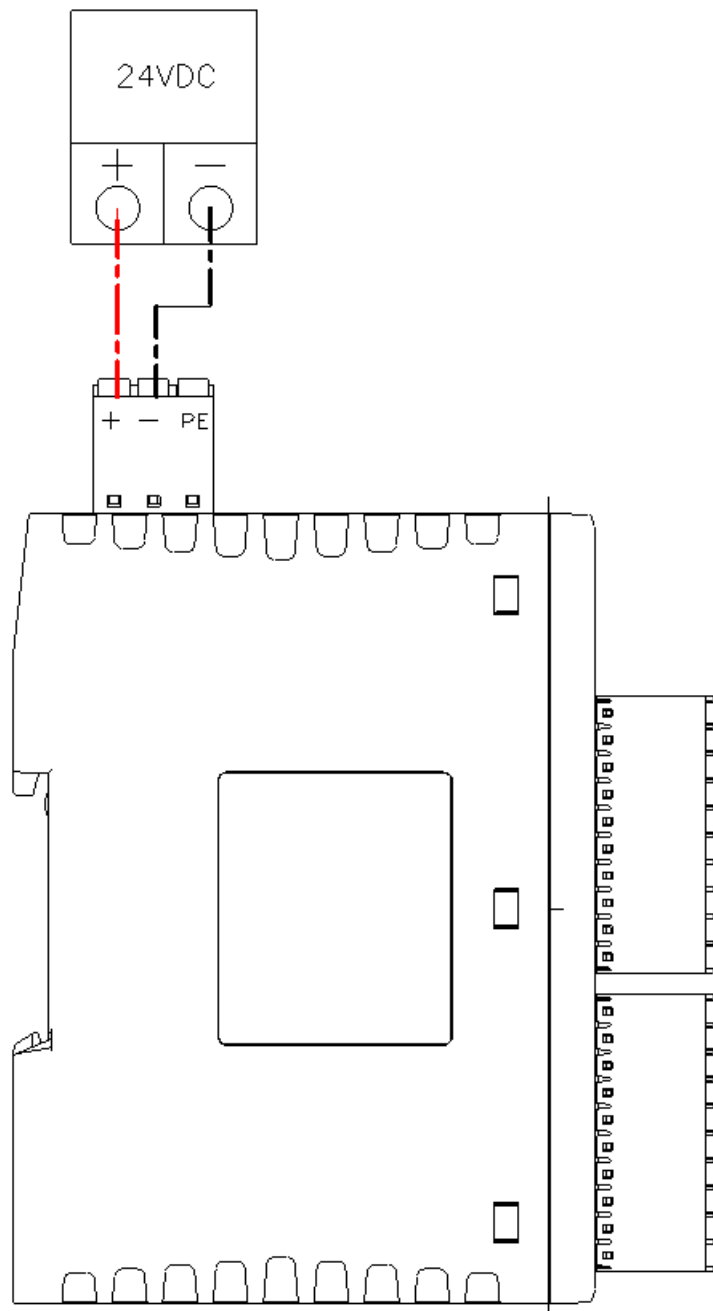
The LW-EC series all-in-one I/O modules support the EtherCAT industrial bus and are compatible with EtherCAT master controller application architectures. The system architecture is illustrated in the figure below



2 Wiring

2.1 Power Supply Wiring

NOTE: The power supply wire shall be cut to an appropriate length so that no bare conductor is visible after termination.



2.2 Wiring to the Controller

For wiring to the EtherCAT master, it is recommended to use Longway Instrument's EtherCAT dedicated connectors and cables. Standard RJ45 Ethernet cables may also be used. The module has two Ethernet ports. Plug the Ethernet cable into the IN port of the I/O module. If multiple modules need to be connected, daisy-chain them by connecting the IN and OUT ports with Ethernet cables.

2.3 Signal Wiring

The terminal blocks of the LW-EC series all-in-one I/O modules feature a tool-less (spring-cage) connection design. Operation requires only a flat-blade screwdriver. Cables of 14 AWG are recommended. To terminate a wire, first strip the insulation to an appropriate length, then press down the orange actuating lever with the screwdriver, insert the stripped wire into the opened round hole, and release the screwdriver. The wire will be automatically clamped by the spring contact.

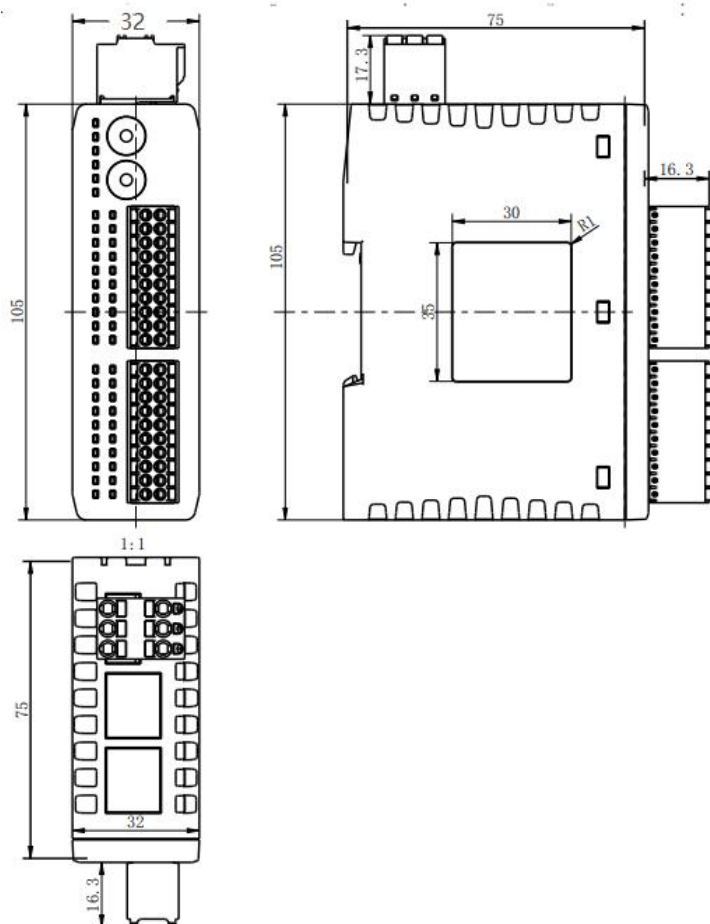
Signal wires should not be overly thick; it is recommended to use wires with a cross-section of 0.75 mm² or less.

The recommended stripping length is 10 mm. A stripping length of less than 9 mm may result in improper clamping of the signal wire.

NOTE: Ensure that the polarity of the power supply is not reversed, as doing so may cause the module to malfunction or become damaged. Do not insert or remove modules or signal wires while the system is powered on.

3 Installation, Removal and Dimensions

The LW series all-in-one remote I/O modules feature a DIN-rail mounting design and can be easily installed onto a standard 35 mm DIN rail. The terminal blocks are designed with tool-less (spring-cage) connection technology, which significantly reduces installation and wiring effort while improving connection reliability. All terminal blocks are pluggable, allowing modules to be replaced without rewiring—simply detach the terminal block and reattach it to the replacement module.



3.1 Module Installation

Hang the module onto the upper edge of the DIN rail and position it properly on the rail. Then press firmly on the lower section of the module to snap it securely onto the DIN rail.

3.2 Removal

3.2.1 First, unplug all terminal blocks from the module. Then insert a flat-blade screwdriver into the DIN-rail retaining clip, pry it gently, and lift the module off the rail.

3.2.2 The module features pluggable terminal blocks. If only the module needs to be replaced, simply unplug the terminal blocks, insert the screwdriver into the DIN-rail retaining clip, and remove the module.

4 Module Description

4.1 EtherCAT Interface

4.1.1 Module Interface and General Parameters

Name	EtherCAT Interface
Interface Parameters	
Supported Slave Stations	Depends on the master station
Data Transmission Medium	Ethernet CAT5 cable
Connection Method	2 × RJ45
Transmission Rate	100 Mb/s
Transmission Distance	100 m (station- to- station distance)
Electrical Isolation	Yes
Technical Parameters	
DIP Switch	Firmware upgrade
Rated Voltage	24 VDC
Type-C Interface	Used for firmware upgrade or module parameter configuration
Scan Cycle	< 3 ms
Number of EC Ports	2
Network Failure Auto- Recovery	3 s
Channel Status Indicator	Green LED
Dimensions	93 × 32 × 122 mm (W × H × D)
Weight	Approx. 150 g
Protection Rating	IP20
Operating Temperature	−10 to 70 °C
Storage Temperature	−20 to 80 °C
Relative Humidity	95 %, non- condensing
Certification	CE

4.1.2 Status LEDs

No.	LED	Color	Description	Operating Status
1	PW	Green	System power	Steady on
2	PN	Green	Run indicator	Steady on
3	ER	Red	Error indicator	Off
4	MT	Green	System maintenance	Off

4.1.3 Fault Diagnosis

If the PW power LED is not illuminated, check whether the power supply wiring is properly connected.

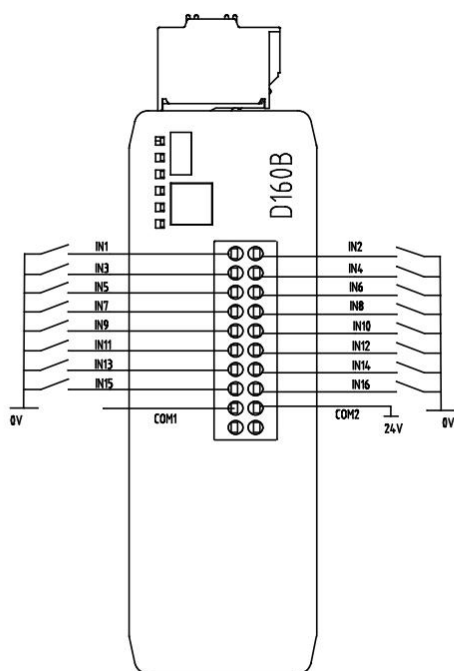
If the PN LED is flashing, this indicates normal communication. If it is off, a communication fault has occurred. At the same time, if the ER LED is lit, this indicates that the slave module has not established a successful connection with the master station. If this occurs during initial startup, verify that the configuration software project topology matches the actual physical topology. If this occurs during normal operation, check whether the communication cables are intact and properly connected.

4.2 Digital Input Module

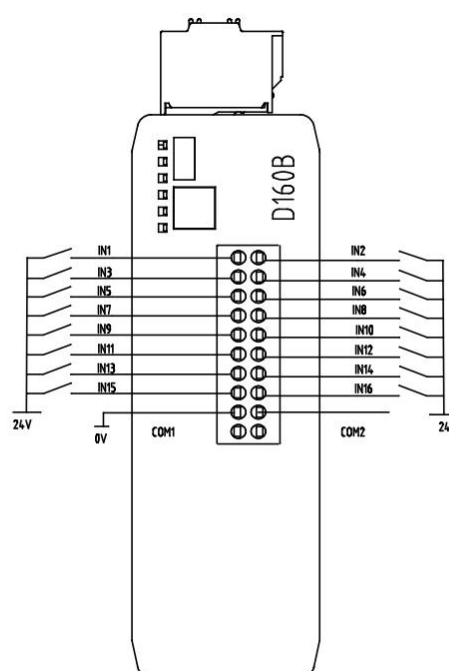
4.2.1 LW-EC-DI16B Parameter Specifications

Model	LW-EC-DI16B	
Name	Digital Input Module (PNP & NPN Compatible)	
Number of Channels	16	
Input Signal Type	PNP	NPN
Rated Input Voltage	24V DC ($\pm 20\%$)	0V DC ($\pm 3V$)
Logic "1" Signal	15–30V	0–3V
Logic "0" Signal	0–3V	15–30V
Input Current	3mA	
Isolation Withstand Voltage	500V	
Isolation Method	Optocoupler isolation	

Module Wiring Diagram:



D160B 16DI
NPN模式

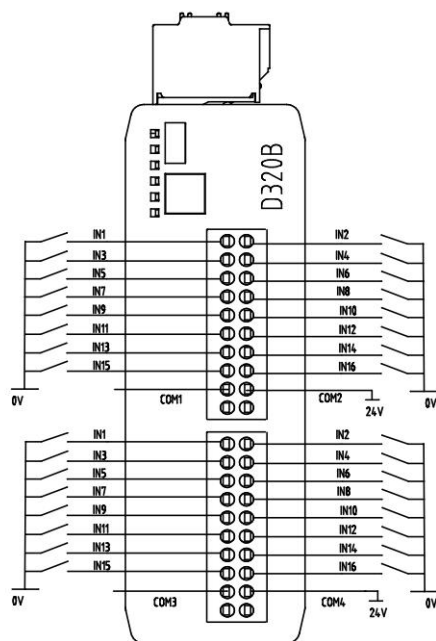


D160B 16DI
PNP模式

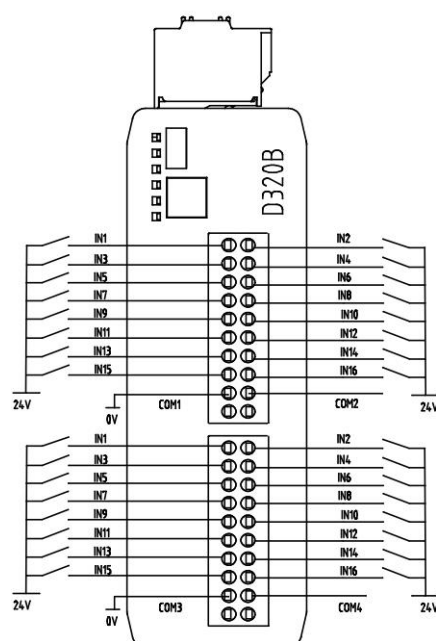
4.2.2 LW-EC-DI32B Parameter Specifications

Model	LW-EC-DI32B	
Name	Digital Input Module (PNP & NPN Compatible)	
Number of Channels	32	
Input Signal Type	PNP	NPN
Rated Input Voltage	24V DC ($\pm 20\%$)	0V DC ($\pm 3V$)
Logic "1" Signal	15–30V	0–3V
Logic "0" Signal	0–3V	15–30V
Signal Selection	Each group of 16 channels can be independently configured as PNP or NPN input	
Input Current	3mA	
Isolation Withstand	500V	
Isolation Method	Optocoupler isolation	

Module Wiring Diagram:



D320B 32DI
NPN模式



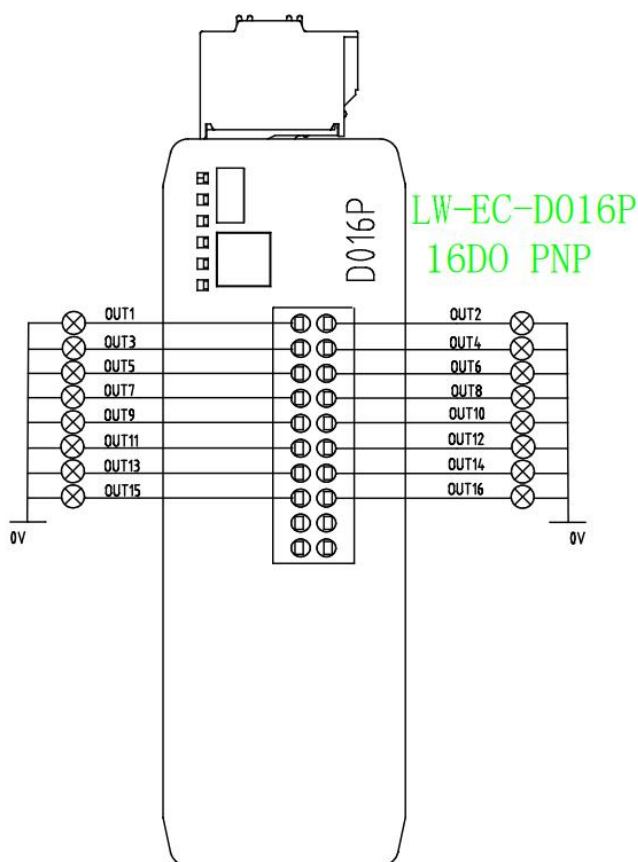
D320B 32DI
PNP模式

4.3 Digital Output Module

4.3.1 LW-EC-DO16P Parameter Specifications

Model	LW-EC-DO16P
Name	Digital Output Module
Number of Channels	16
Output Signal Type	PNP
Rated Output Voltage	24V DC ($\pm 20\%$)
Drive Current	500mA
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature
Load Type	Resistive load, inductive load
Isolation Withstand	500V
Isolation Method	Optocoupler isolation

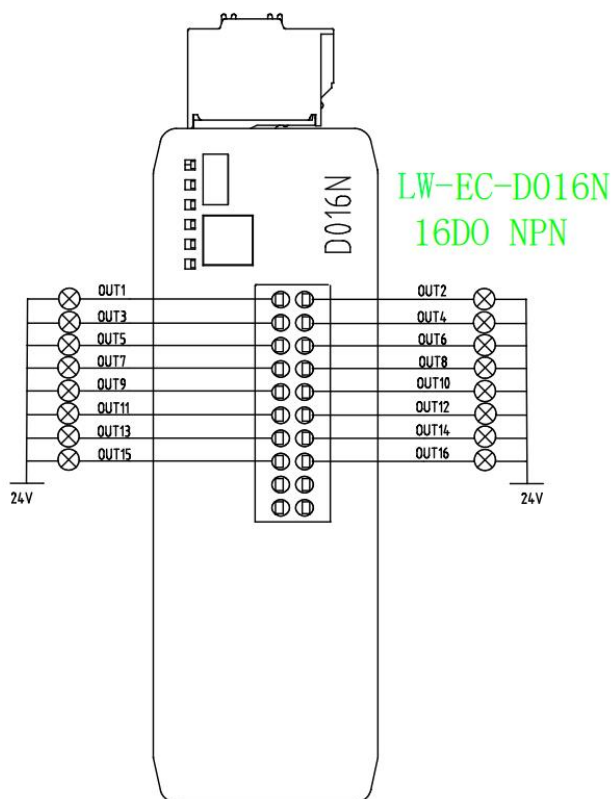
Module Wiring Diagram:



4.3.2 LW-EC-D016N Parameter Specifications

Model	LW-EC-D016N
Name	Digital Output Module
Number of Channels	16
Output Signal Type	NPN
Rated Output Voltage	0V DC ($\pm 3V$)
Drive Current	0.5A
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature protection
Load Type	Resistive load, inductive load
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation

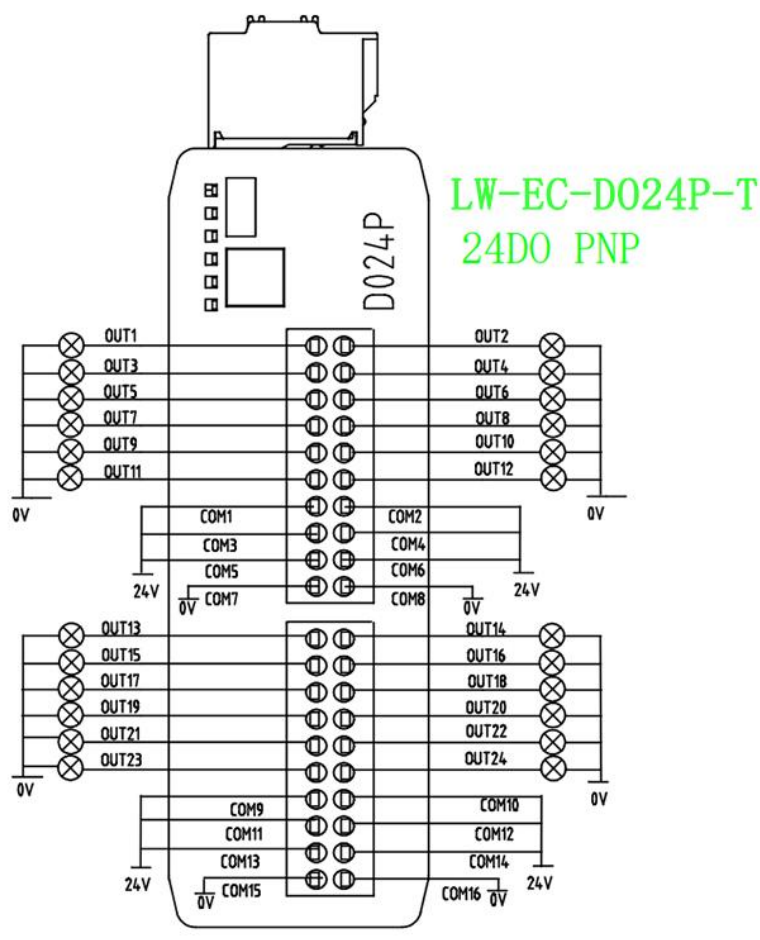
Module Wiring Diagram:



4.3.3 LW-EC-DO24P-T Parameter Specifications

Model	LW-EC-DO24P-T
Name	Digital Output Module
Number of Channels	24
Output Signal Type	PNP
Rated Output Voltage	24V DC ($\pm 20\%$)
Drive Current	4A
Fault Protection	Short-circuit protection
Load Type	Resistive load, inductive load
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation

Module Wiring Diagram:

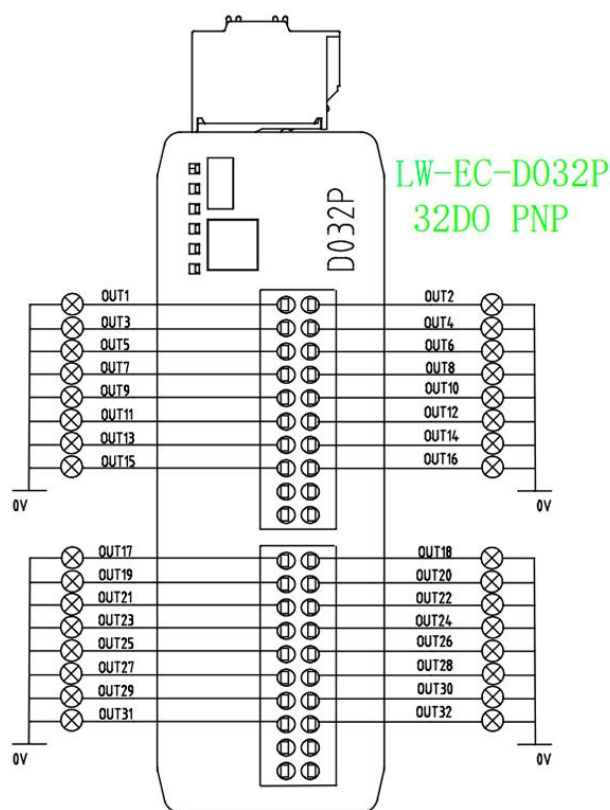


4.3.4 LW-EC-DO32P Parameter Specifications

Model	LW-EC-DO32P
Name	Digital Output Module
Number of Channels	32
Output Signal Type	PNP
Rated Output Voltage	24V DC ($\pm 20\%$)
Drive Current	0.5A
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature protection
Load Type	Resistive load, inductive load
Isolation Withstand Voltage	500V

Isolation Method	Optocoupler isolation
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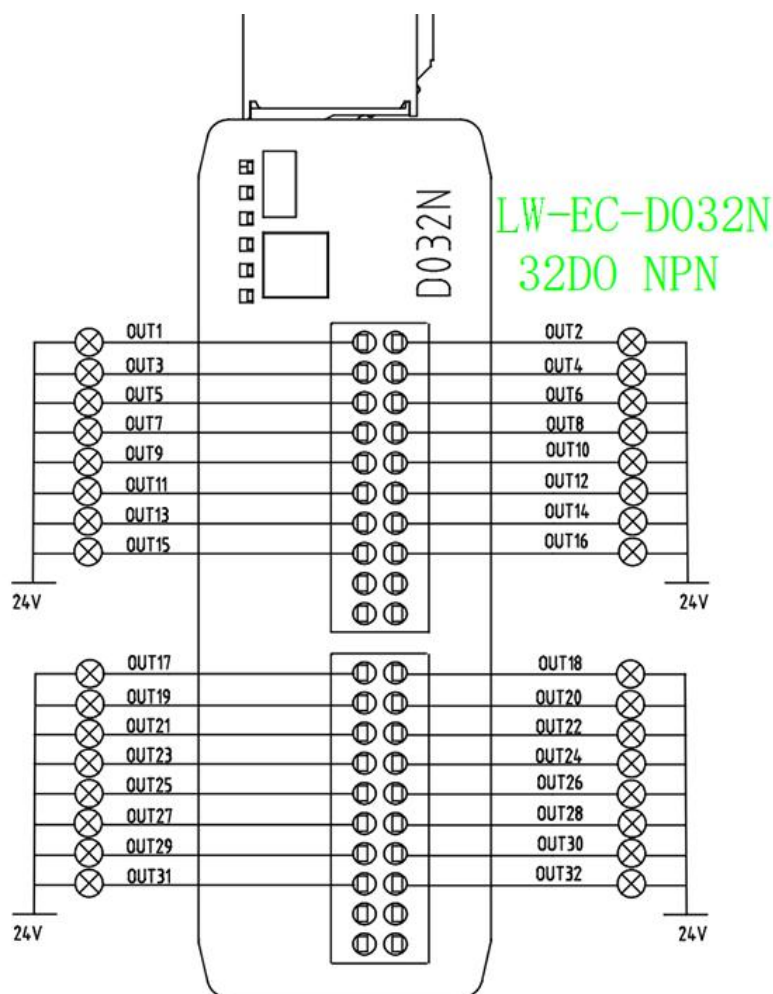
Module Wiring Diagram:



4.3.5 LW-EC-DO32N Parameter Specifications

Model	LW-EC-DO32N
Name	Digital Output Module
Number of Channels	32
Output Signal Type	NPN
Rated Output Voltage	0V DC ($\pm 3V$)
Drive Current	0.5A
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature protection
Load Type	Resistive load, inductive load
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation

Module Wiring Diagram:

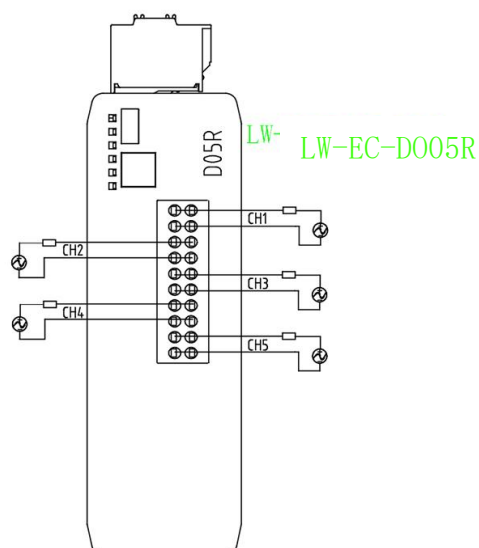


4.3.6 LW-EC-DO05R Parameter Specifications

Model	LW-EC-DO05R
Name	Digital Output Module
Number of Channels	5
Output Signal Type	Relay
Contact Form	1H (SPST-NO)
Contact Resistance	$\leq 100 \text{ m}\Omega$ (at 1A 6VDC)
Contact Material	AgSnO ₂ , AgNi
Contact Load (Resistive)	5A 250VAC / 30VDC
Max. Switching Voltage	250VAC / 125VDC (at 0.3A)
Max. Switching Current	5A

Max. Switching Power	1250VA / 150W
Minimum Load	5VDC 10mA
Mechanical Endurance	2×10^7 operations
Electrical Endurance	1×10^5 operations (AgNi, 3A 250VAC/30VDC, resistive load, 85°C, 1s ON / 9s OFF), 5×10^4 operations (AgNi, 5A 250VAC/30VDC, resistive load, room temperature, 1s ON / 9s OFF)
Load Type	Resistive load, inductive load, lamp load
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation

Module Wiring Diagram:

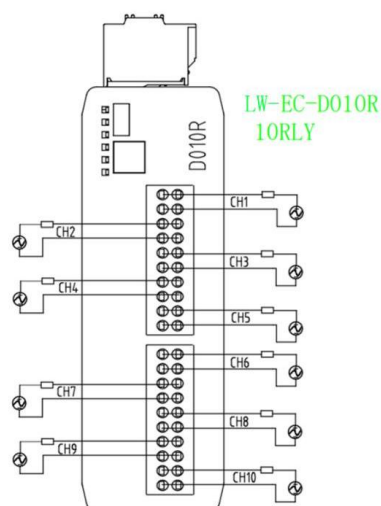


4.3.7 LW-EC-DO10R Parameter Specifications

Model	LW-EC-DO10R
Name	Digital Output Module
Number of Channels	10
Output Signal Type	Relay
Contact Form	1H (SPST-NO)
Contact Resistance	$\leq 100 \text{ m}\Omega$ (at 1A 6VDC)
Contact Material	AgSnO ₂ , AgNi
Contact Load (Resistive)	5A 250VAC / 30VDC
Max. Switching Voltage	250VAC / 125VDC (at 0.3A)

Max. Switching Current	5A
Max. Switching Power	1250VA / 150W
Minimum Load	5VDC 10mA
Mechanical Endurance	2×10^7 operations
Electrical Endurance	1×10^5 operations (AgNi, 3A 250VAC/30VDC, resistive load, 85°C, 1s ON / 9s OFF), 5×10^4 operations (AgNi, 5A 250VAC/30VDC, resistive load, room temperature, 1s ON / 9s OFF)
Load Type	Resistive load, inductive load, lamp load
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation

Module Wiring Diagram:



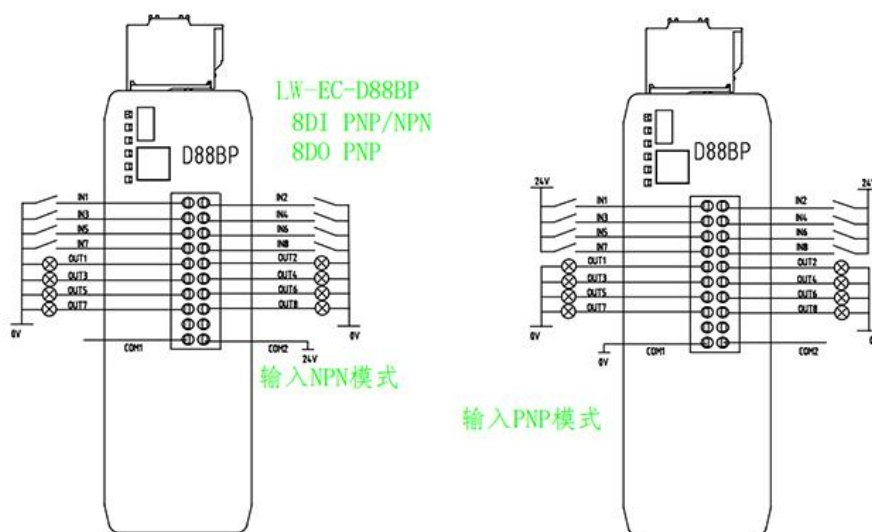
4.4 Digital Input/Output Module

4.4.1 LW-EC-D88BP Parameter Specifications

Model	LW-EC-D88BP
Name	Digital Input/Output Module (8DI + 8DO)
Number of Input Channels	8
Input Signal Type	PNP & NPN
Rated Input Voltage	24V DC ($\pm 20\%$)
Logic "1" Signal	15–30V
Logic "0" Signal	0–3V

Input Current	3mA
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation
Number of Output Channels	8
Output Signal Type	PNP
Rated Output Voltage	24V DC ($\pm 20\%$)
Drive Current	0.5A
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature protection
Load Type	Resistive load, inductive load
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation

Module Wiring Diagram:

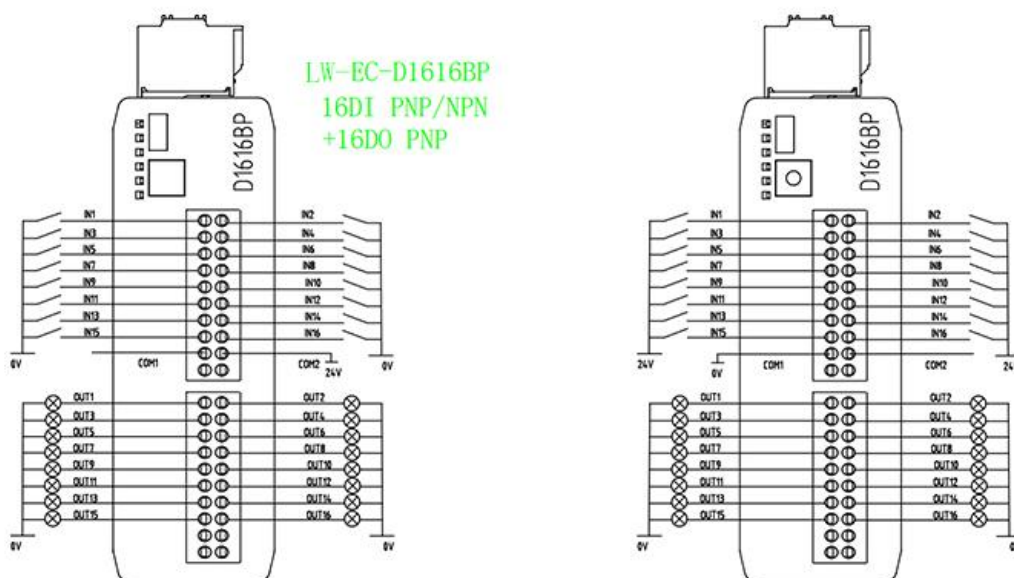


4.4.2 LW-EC-D1616BP Parameter Specifications

Model	LW-EC-D1616BP
Name	Digital Input/Output Module (16DI + 16DO)
Number of Input	16
Input Signal Type	PNP & NPN
Rated Input	24V DC ($\pm 20\%$)
Logic "1" Signal	15–30V
Logic "0" Signal	0–3V

Input Current	3mA
Isolation Withstand	500V
Isolation Method	Optocoupler isolation
Number of Output	16
Output Signal	PNP
Rated Output	24V DC ($\pm 20\%$)
Drive Current	0.5A
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature protection
Load Type	Resistive load, inductive load
Isolation Withstand	500V
Isolation Method	Optocoupler isolation

Module Wiring Diagram:

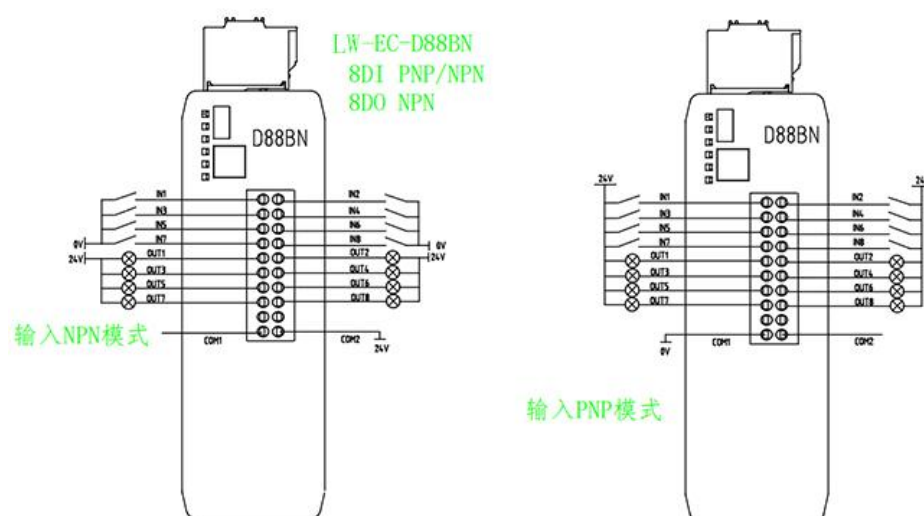


4.4.3 LW-EC-D88BN Parameter Specifications

Model	LW-EC-D88BN
Name	Digital Input/Output Module (8DI + 8DO)
Number of Input Channels	8
Input Signal Type	PNP & NPN
Rated Input Voltage	24V DC ($\pm 20\%$)
Logic "1" Signal	15–30V

Logic "0" Signal	0–3V
Input Current	3mA
Isolation Withstand	500V
Isolation Method	Optocoupler isolation
Number of Output	8
Output Signal Type	NPN
Rated Output Voltage	0V DC ($\pm 3V$)
Drive Current	0.5A
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature protection
Load Type	Resistive load, inductive load
Isolation Withstand	500V
Isolation Method	Optocoupler isolation

Module Wiring Diagram:

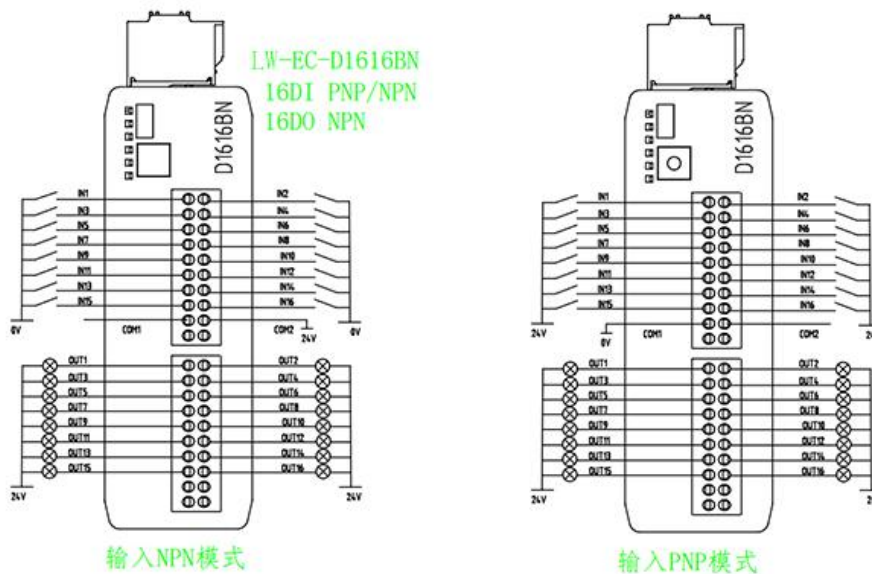


4.4.4 LW-EC-D1616BN Parameter Specifications

Model	LW-EC-D1616BN
Name	Digital Input/Output Module (16DI + 16DO)
Number of Input Channels	16
Input Signal Type	PNP & NPN
Rated Input Voltage	24V DC ($\pm 20\%$)

Logic "1" Signal	15–30V
Logic "0" Signal	0–3V
Input Current	3mA
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation
Number of Output Channels	16
Output Signal Type	NPN
Rated Output Voltage	0V DC ($\pm 3V$)
Drive Current	0.5A
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature protection
Load Type	Resistive load, inductive load
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation

Module Wiring Diagram:



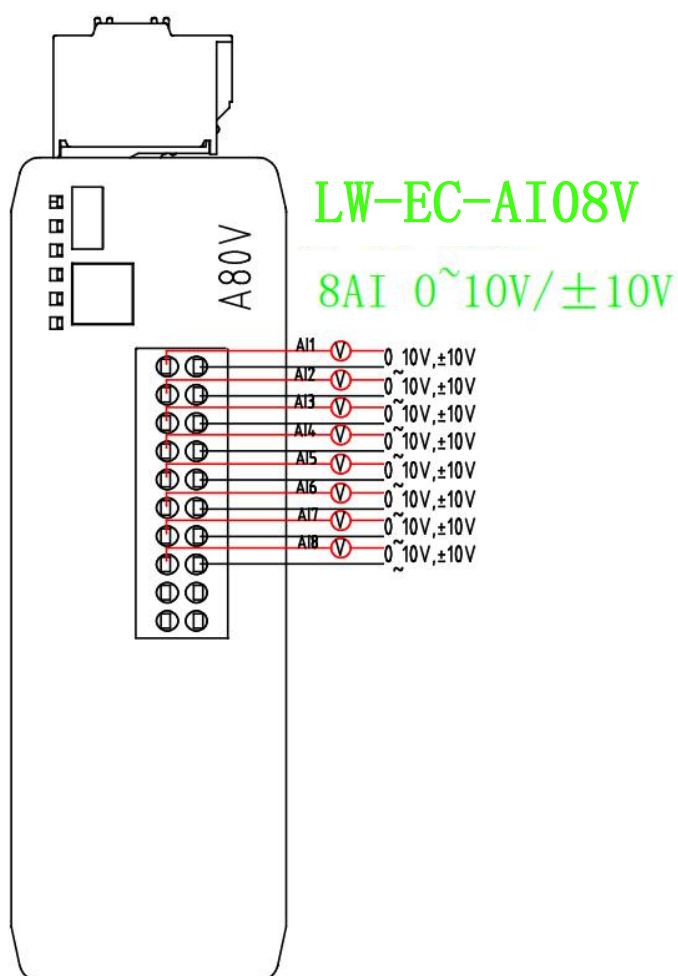
4.5 Analog Input Module

4.5.1 LW-EC-AI08V Parameter Specifications

Model	LW-EC-AI08V
Name	Voltage Input Module
Number of Channels	8

Input Type	0–10V / ± 10 V
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	–32768 to +32767
Input Signal Accuracy	$\pm 0.1\%$

Module Wiring Diagram:

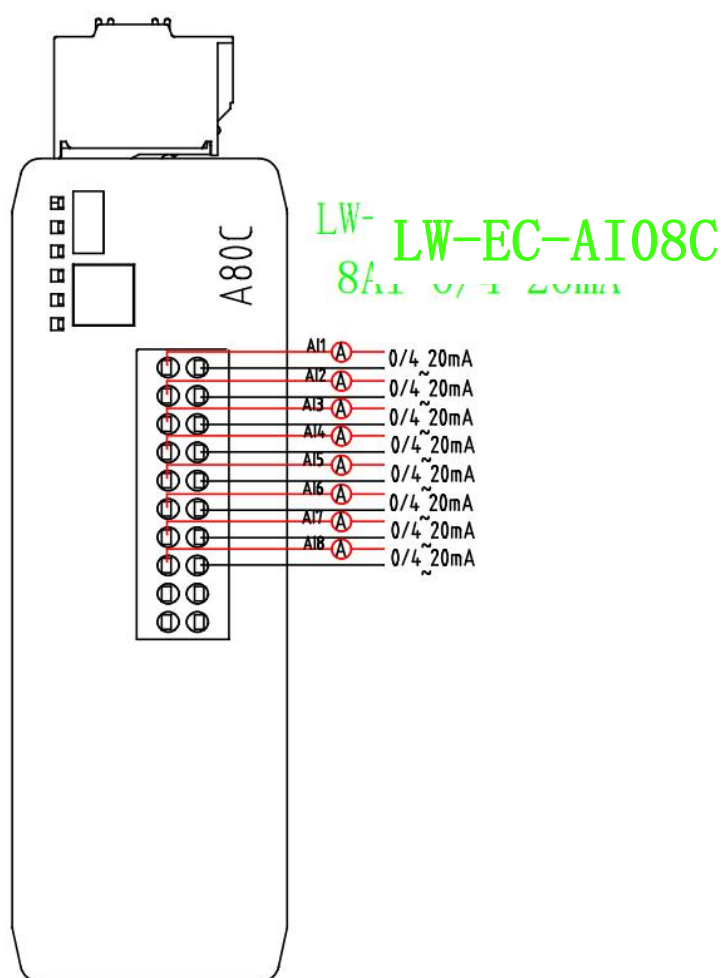


4.5.2 LW-EC-AI08C Parameter Specifications

Model	LW-EC-AI08C
Name	Current Input Module
Number of Channels	8

Input Type	0/4–20mA
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	0 to 32767
Input Signal Accuracy	±0.1%
Sensor Connection	Supports 4-wire transmitters; (2-wire transmitters are also supported but require an external DC 24V power supply)

Module Wiring Diagram:

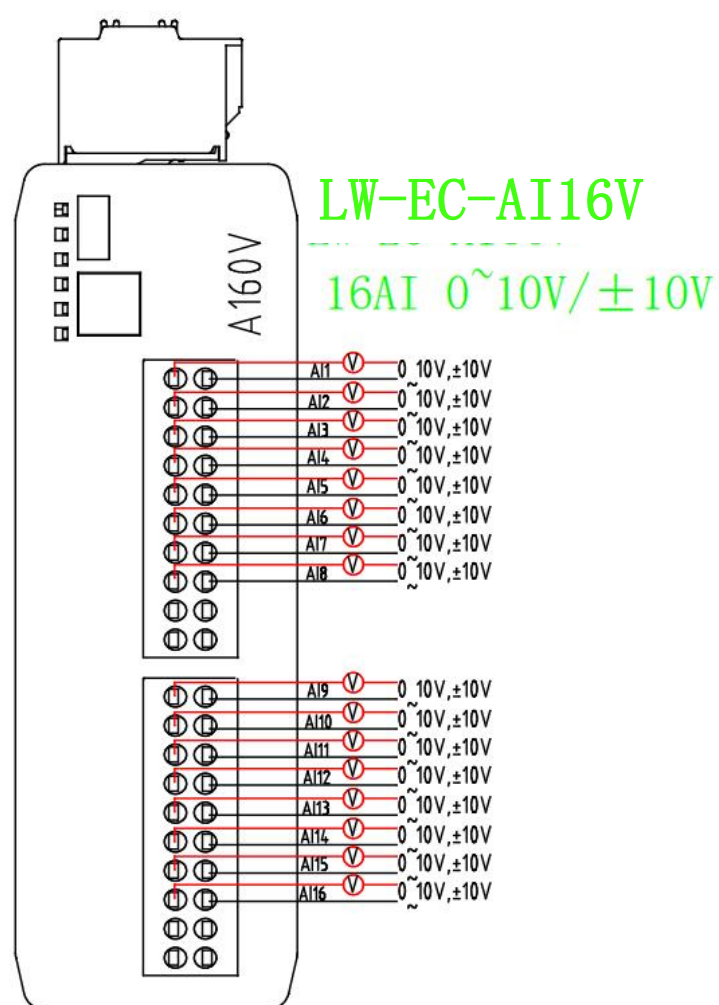


4.5.3 LW-EC-AI16V Parameter Specifications

Model	LW-EC-AI16V
Name	Voltage Input Module

Number of Channels	16
Input Type	0–10V / ± 10 V
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	–32768 to +32767
Input Signal Accuracy	$\pm 0.1\%$

Module Wiring Diagram:

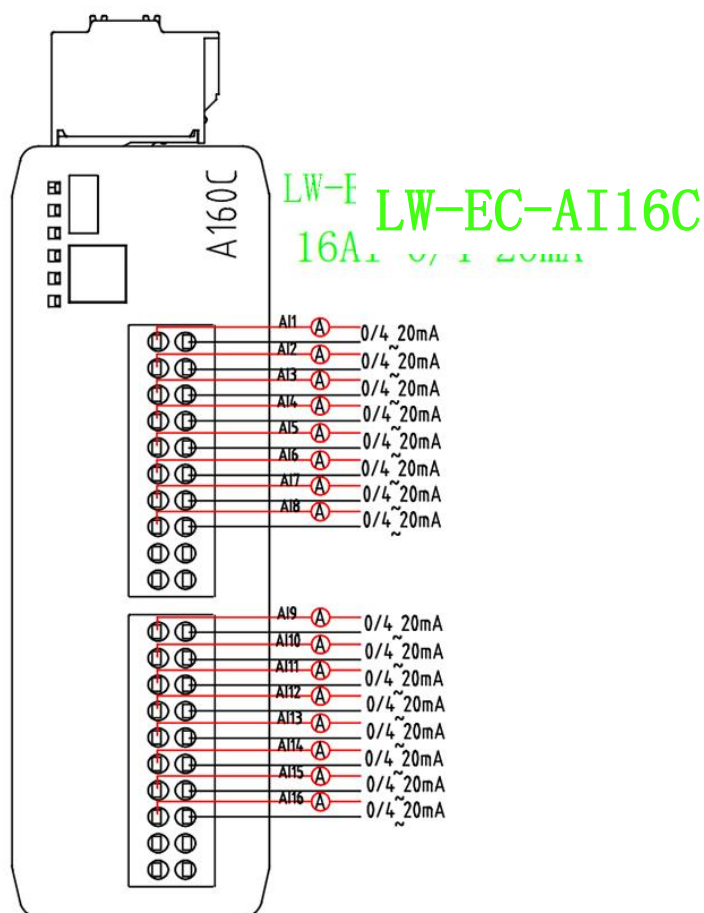


4.5.4 LW-EC-AI16C Parameter Specifications

Model	LW-EC-AI16C
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Name	Current Input Module
Number of Channels	16
Input Type	0/4–20mA
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	0 to 32767
Input Signal Accuracy	±0.1%
Sensor Connection	Supports 4-wire transmitters; (2-wire transmitters are also supported but require an external DC 24V power supply)

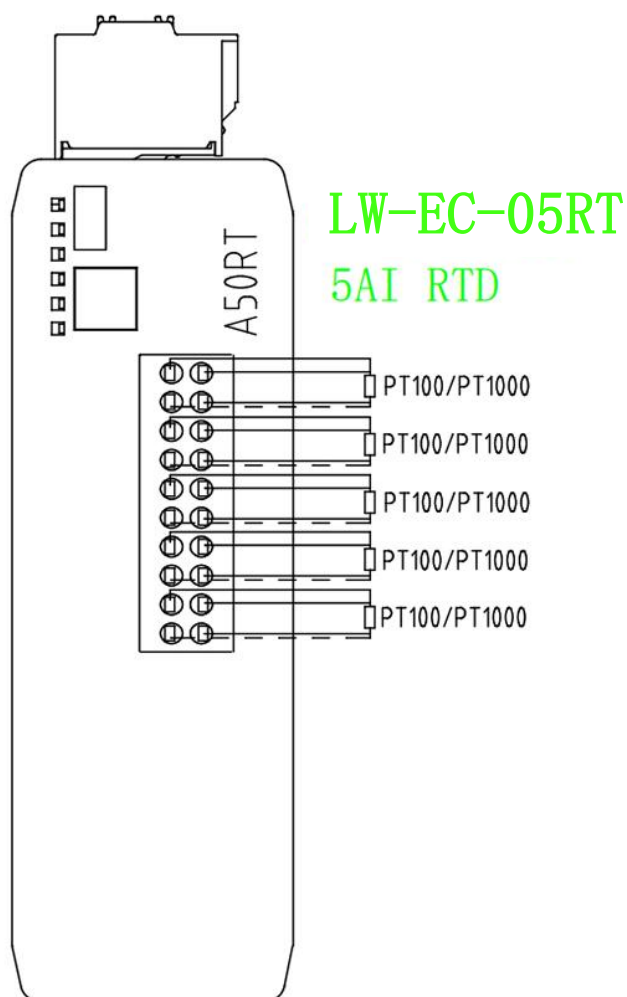
Module Wiring Diagram:



4.5.5 LW-EC-05RT Parameter Specifications

Model	LW-EC-05RT
Name	RTD Input Module
Number of Channels	5
Input Type	Cu50, Pt100, etc., or 0–1k Ω signal
Resolution	16-bit
Conversion Time	250 ms
Input Signal Accuracy	$\pm 0.1\%$
Sensor Connection	3-wire

Module Wiring Diagram:



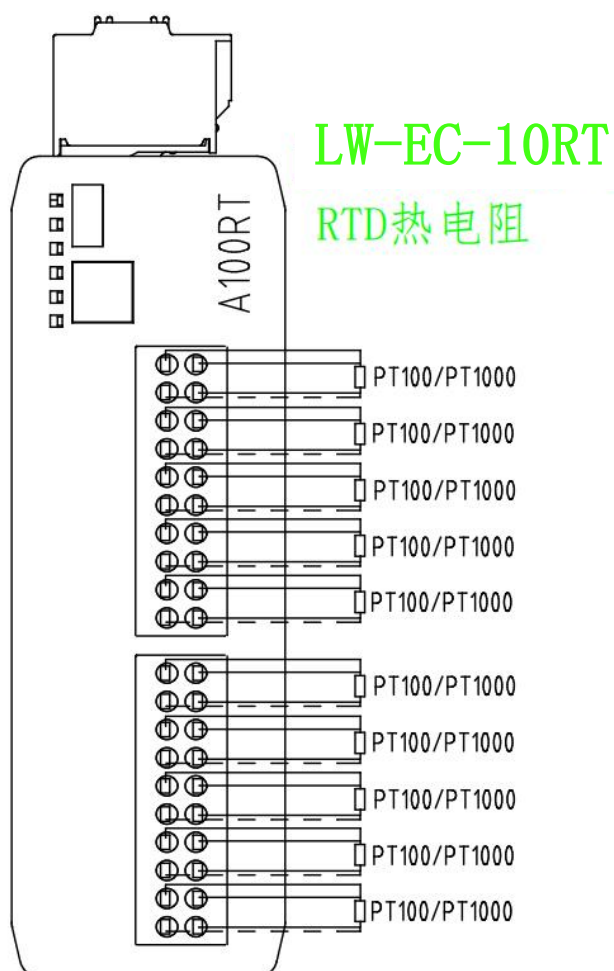
4.5.6 LW-EC-10RT Parameter Specifications

<https://lowayinstrument.com/>

023-62603500

Model	LW-EC-10RT
Name	RTD Input Module
Number of Channels	10
Input Type	Cu50, Pt100, etc., or 0–1k Ω signal
Resolution	16-bit
Conversion Time	250 ms
Input Signal Accuracy	$\pm 0.1\%$
Sensor Connection	3-wire

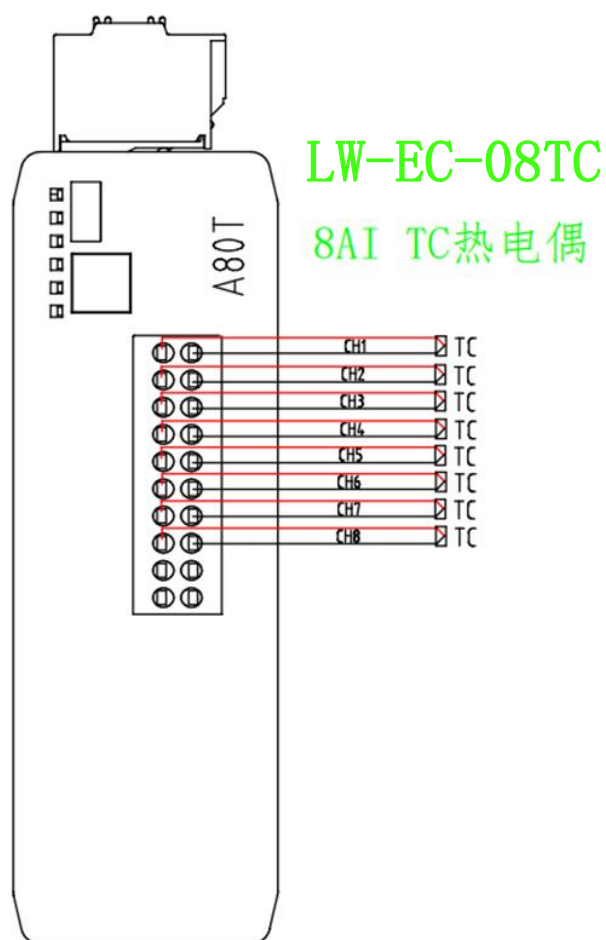
Module Wiring Diagram:



4.5.7 LW-EC-08TC Parameter Specifications

Model	LW-EC-08TC
Name	Thermocouple Input Module (TC)
Number of Channels	8
Input Type	K, J, T, E, N, S, R, B
Resolution	16-bit
Conversion Time	250 ms
Input Signal Accuracy	±0.1%
Sensor Connection	2-wire

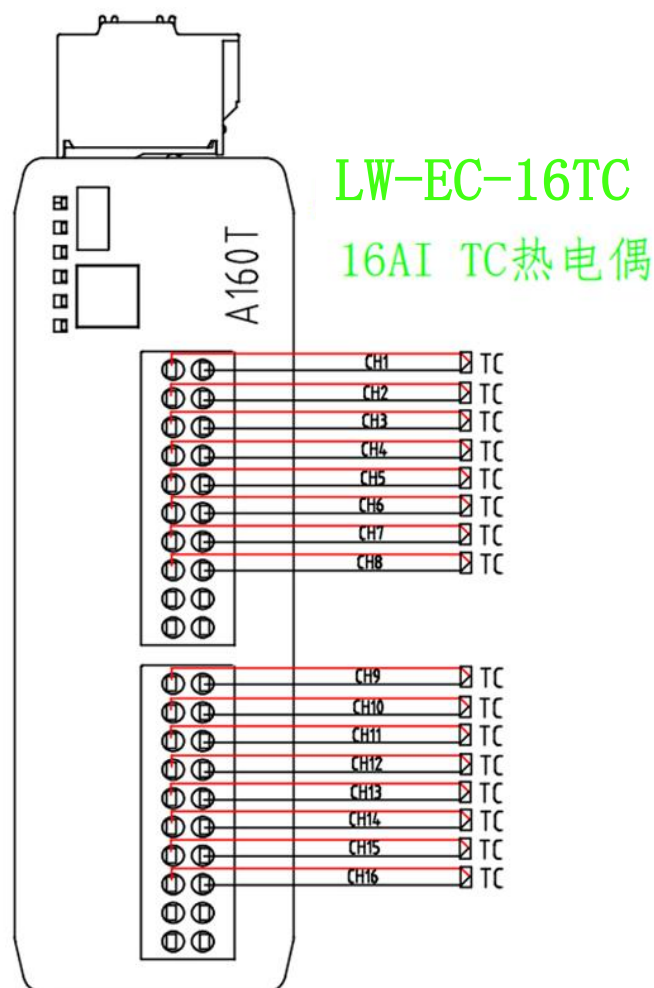
Module Wiring Diagram:



4.5.8 LW-EC-16TC Parameter Specifications

Model	LW-EC-16TC
Name	Thermocouple Input Module (TC)
Number of Channels	16
Input Type	K, J, T, E, N, S, R, B
Resolution	16-bit
Conversion Time	250 ms
Input Signal Accuracy	$\pm 0.1\%$
Sensor Connection	2-wire

Module Wiring Diagram:

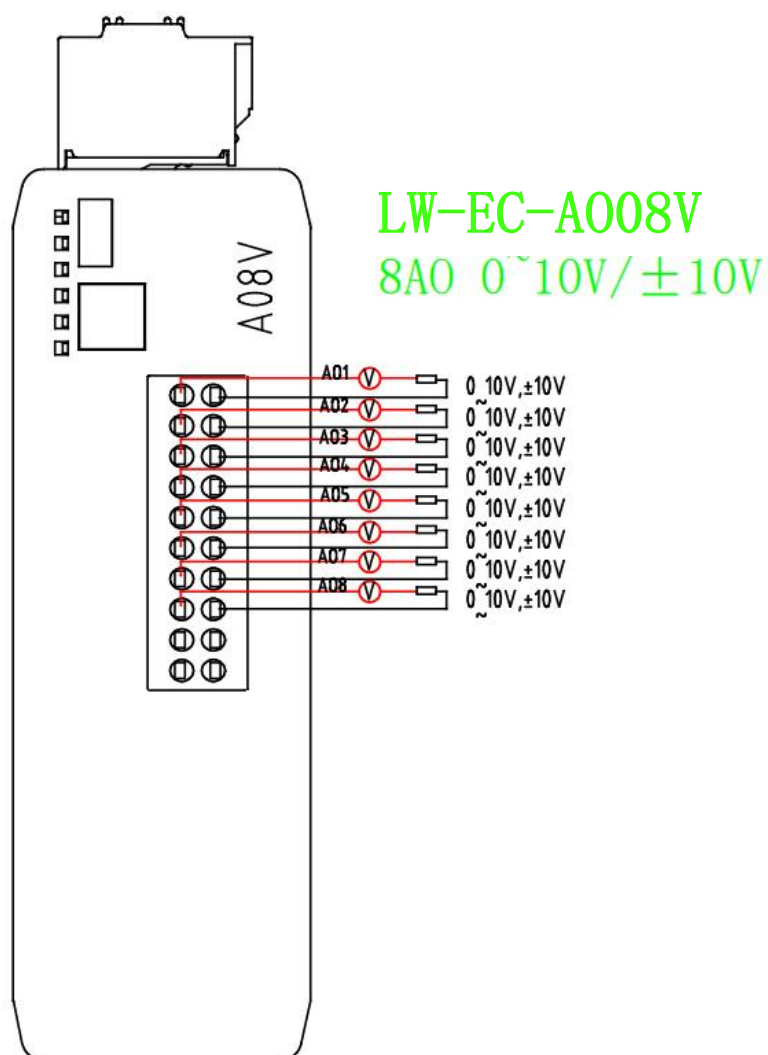


4.6 Analog Output Module

4.6.1 LW-EC-AO08V Parameter Specifications

Model	LW-EC-AO08V
Name	Voltage Output Module
Number of Channels	8
Output Type	0–10V / ± 10 V
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	–32768 to +32767
Output Signal Accuracy	$\pm 0.1\%$

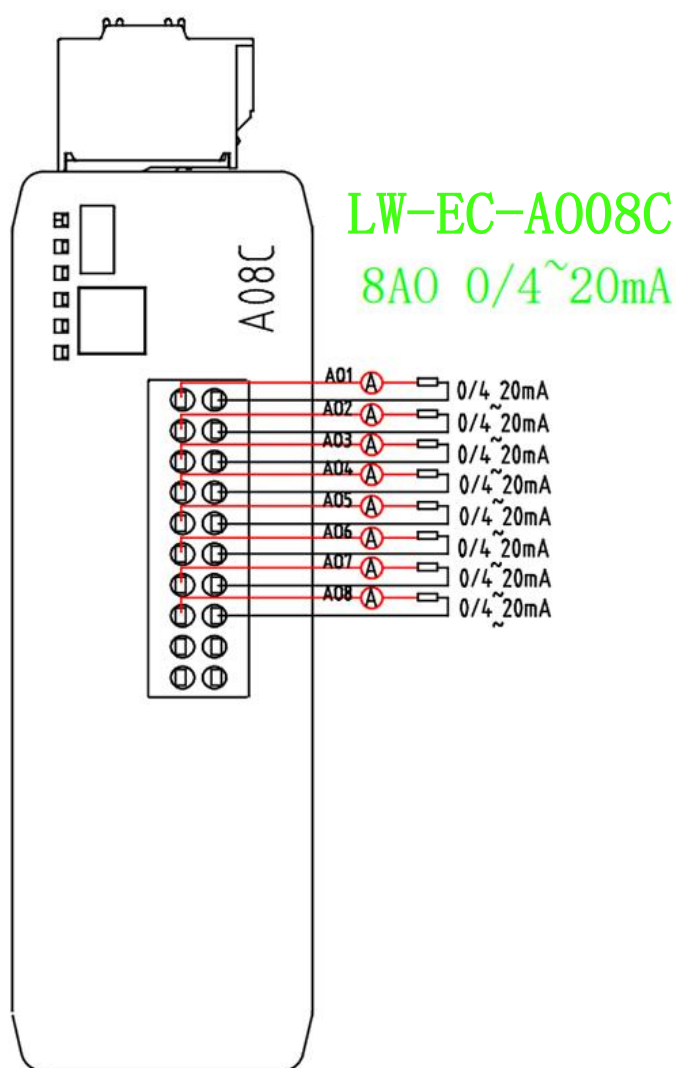
Module Wiring Diagram:



4.6.2 LW-EC-AO08C Parameter Specifications

Model	LW-EC-AO08C
Name	Current Output Module
Number of Channels	8
Output Type	0/4-20mA
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	0 to 32767
Output Signal Accuracy	±0.1%

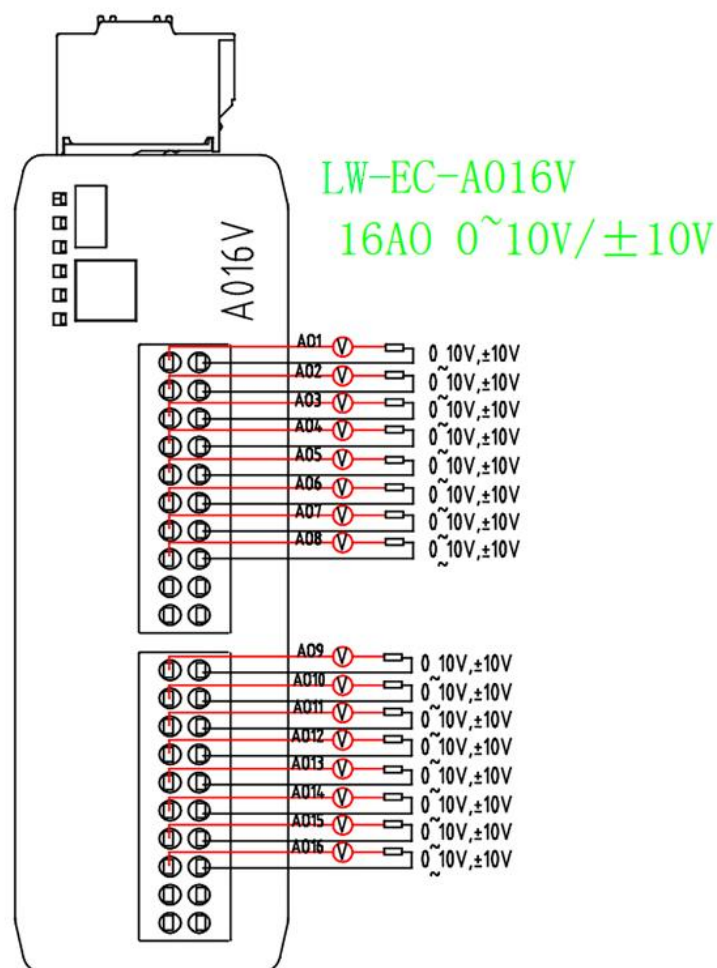
Module Wiring Diagram:



4.6.3 LW-EC-AO16V Parameter Specifications

Model	LW-EC-AO16V
Name	Voltage Output Module
Number of Channels	16
Output Type	0–10V / $\pm 10V$
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	–32768 to +32767
Output Signal Accuracy	$\pm 0.1\%$

Module Wiring Diagram:

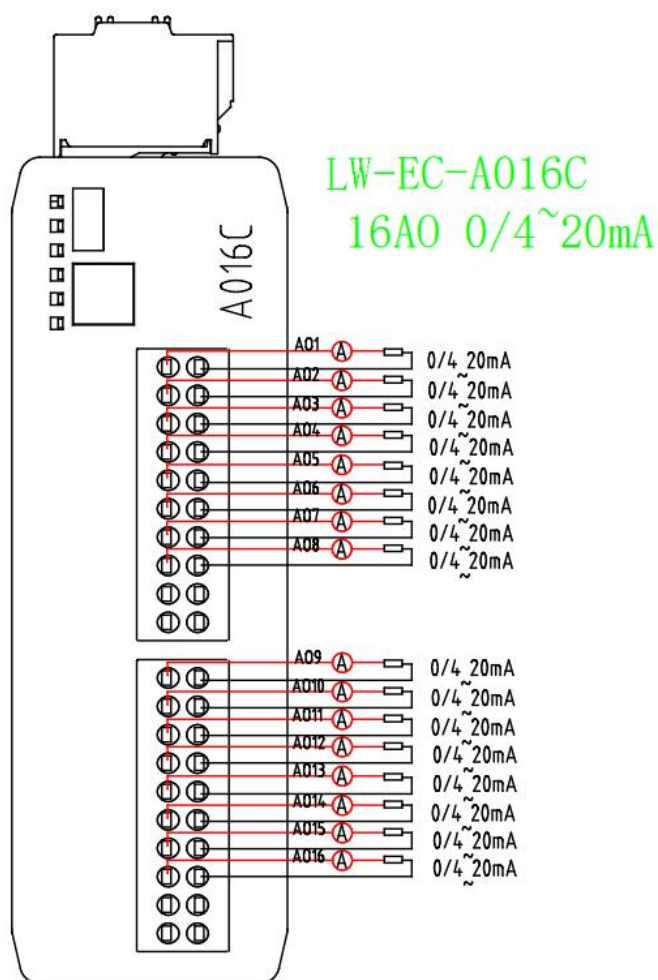


4.6.4 LW-EC-AO16C Parameter Specifications

Model	LW-EC-AO16C
Name	Current Output Module
Number of Channels	16
Output Type	0/4-20mA
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	0 to 32767

Output Signal Accuracy	$\pm 0.1\%$
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Module Wiring Diagram:



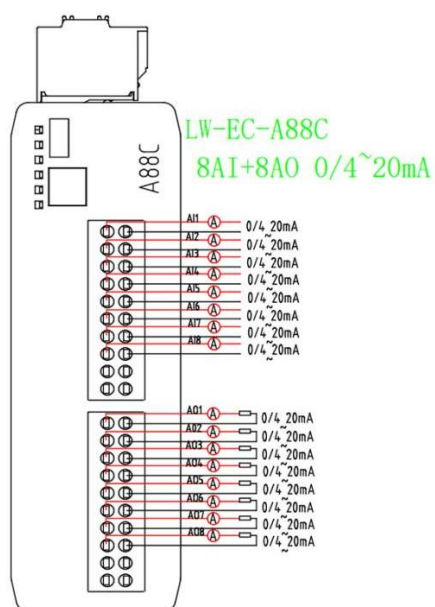
4.7 Analog Input/Output Module

4.7.1 LW-EC-A88C Parameter Specifications

Model	LW-EC-A88C
Name	Current Input/Output Module (8AI + 8AO)
Number of Input	8
Input Type	0/4–20mA
Resolution	16-bit
Conversion Time	1 ms

Full-Scale Range (Data)	0 to 32767
Input Signal Accuracy	$\pm 0.1\%$
Sensor Connection	Supports 4-wire transmitters; (2-wire transmitters are also supported but require an external DC 24V power supply)
Number of Output	8
Output Type	0/4–20mA
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data)	0 to 32767
Output Signal Accuracy	$\pm 0.1\%$

Module Wiring Diagram:

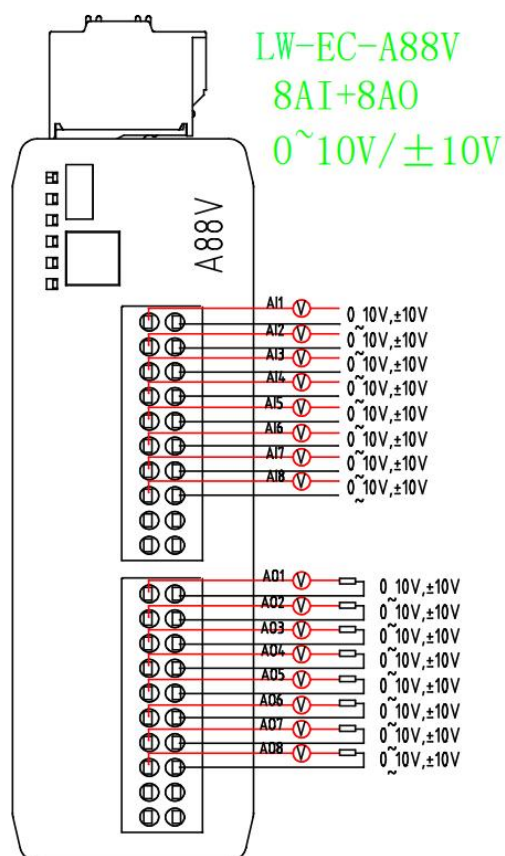


Model	LW-EC-A88V
Name	Voltage Input/Output Module (8AI + 8AO)
Number of Input Channels	8
Input Type	0–10V / $\pm 10V$
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	–32768 to +32767

Input Signal Accuracy	$\pm 0.1\%$
Number of Output Channels	8
Output Type	0–10V / $\pm 10V$
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	–32768 to +32767
Output Signal Accuracy	$\pm 0.1\%$

4.7.2 LW-EC-A88V Parameter Specifications

Module Wiring Diagram:



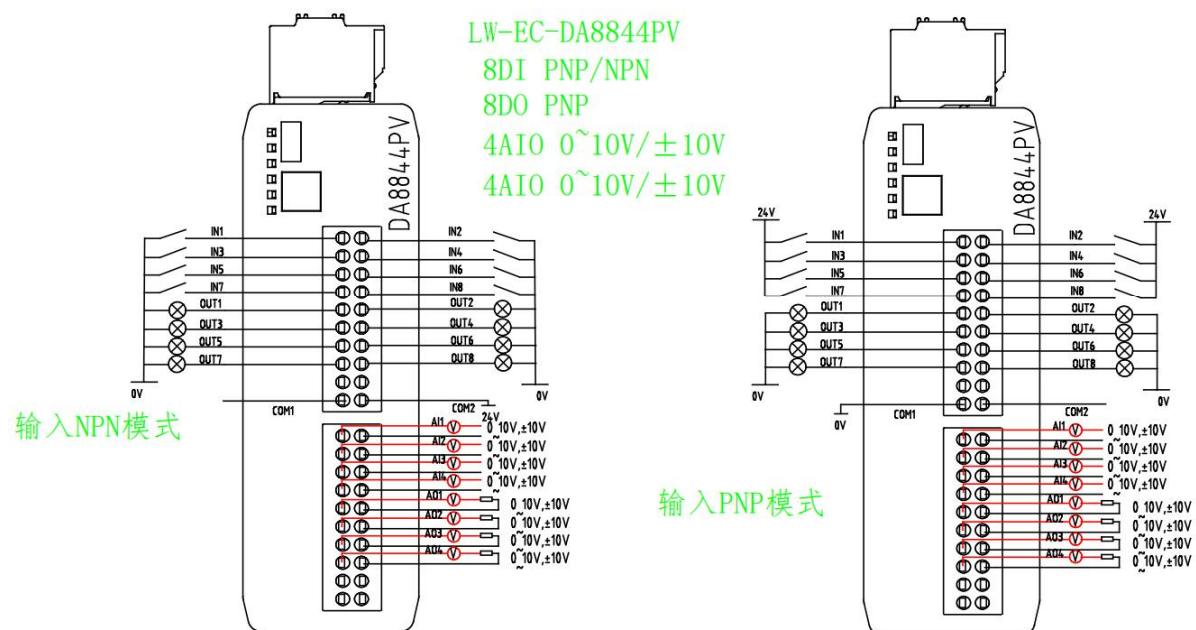
4.8 Digital and Analog Mixed I/O Module

4.8.1 LW-EC-DA8844PV Parameter Specifications

Model	LW-EC-DA8844PV
Name	Digital Input/Output Module (8DI + 8DO)
Number of Input Channels	8
Input Signal Type	PNP & NPN

Rated Input Voltage	24V DC ($\pm 20\%$)
Logic "1" Signal	15–30V
Logic "0" Signal	0–3V
Input Current	3mA
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation
Number of Output Channels	8
Output Signal Type	PNP
Rated Output Voltage	24V DC ($\pm 20\%$)
Drive Current	0.5A
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature
Load Type	Resistive load, inductive load
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation
Number of Output Channels	8
Number of Input Channels	4
Input Type	0–10V / $\pm 10V$
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	–32768 to +32767
Input Signal Accuracy	$\pm 0.1\%$
Number of Output Channels	4
Output Type	0–10V / $\pm 10V$
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	–32768 to +32767
Output Signal Accuracy	$\pm 0.1\%$

LW-EC-DA8844PV Module Wiring Diagram:

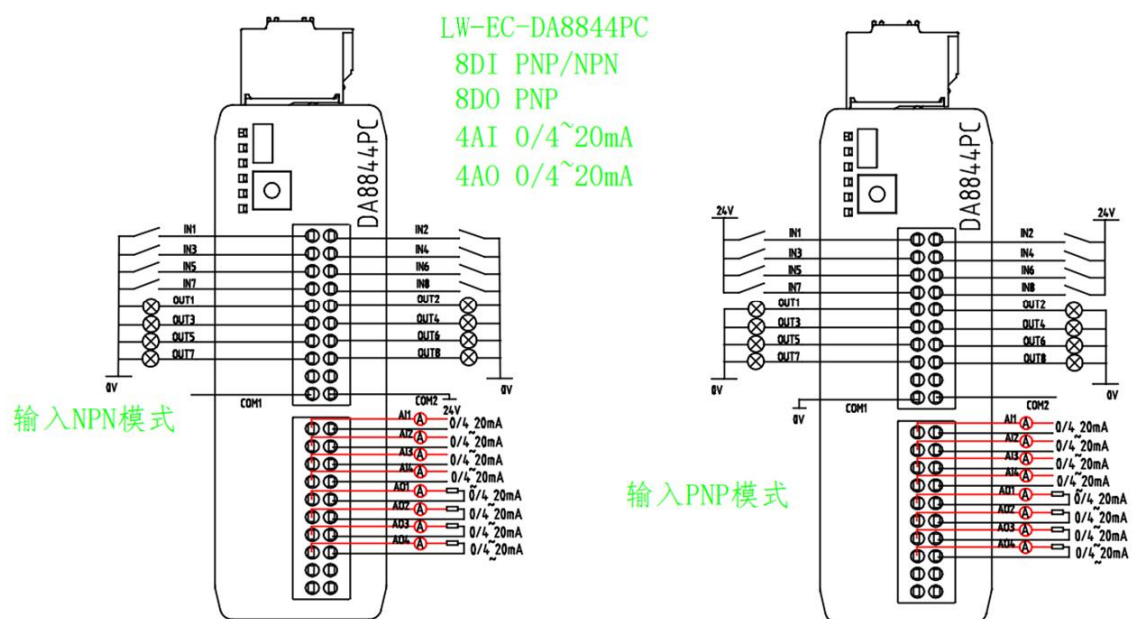


4.8.2 LW-EC-DA8844PC Parameter Specifications

Model	LW-EC-DA8844PC
Name	Digital Input/Output Module (8DI + 8DO)
Number of Input Channels	8
Input Signal Type	PNP & NPN
Rated Input Voltage	24V DC ($\pm 20\%$)
Logic "1" Signal	15–30V
Logic "0" Signal	0–3V
Input Current	3mA
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation
Number of Output Channels	8
Output Signal Type	PNP
Rated Output Voltage	24V DC ($\pm 20\%$)
Drive Current	0.5A
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature protection
Load Type	Resistive load, inductive load
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation
Number of Output Channels	8
Number of Input Channels	4
Input Type	0/4–20mA
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	0 to 32767
Input Signal Accuracy	$\pm 0.1\%$
Sensor Connection	Supports 4-wire transmitters; (2-wire transmitters are also supported but require an external DC 24V power supply)
Number of Output Channels	4
Output Type	0/4–20mA
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	0 to 32767

Output Signal Accuracy	$\pm 0.1\%$
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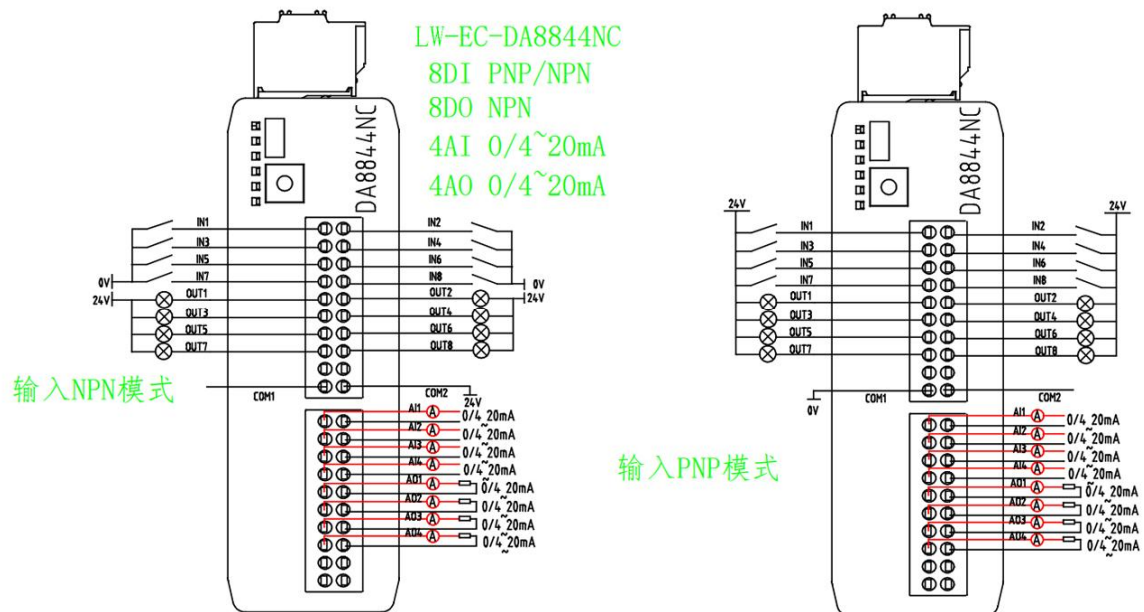
LW-EC-DA8844PC Module Wiring Diagram:



4.8.3 LW-EC-DA8844NC Parameter Specifications

Model	LW-EC-DA8844NC
Name	Digital Input/Output Module (8DI + 8DO)
Number of Input Channels	8
Input Signal Type	PNP & NPN
Rated Input Voltage	24V DC ($\pm 20\%$)
Logic "1" Signal	15–30V
Logic "0" Signal	0–3V
Input Current	3mA
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation
Number of Output Channels	8
Output Signal Type	NPN
Rated Output Voltage	0V DC ($\pm 3V$)
Drive Current	0.5A
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature
Load Type	Resistive load, inductive load
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation
Name	Analog Specifications (4AI + 4AO, Current Type)
Number of Input Channels	4
Input Type	0/4–20mA
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	0 to 32767
Input Signal Accuracy	$\pm 0.1\%$
Sensor Connection	Supports 4-wire transmitters; (2-wire transmitters are also
Number of Output Channels	4
Output Type	0/4–20mA
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	0 to 32767
Output Signal Accuracy	$\pm 0.1\%$

LW-EC-DA8844NC Module Wiring Diagram:

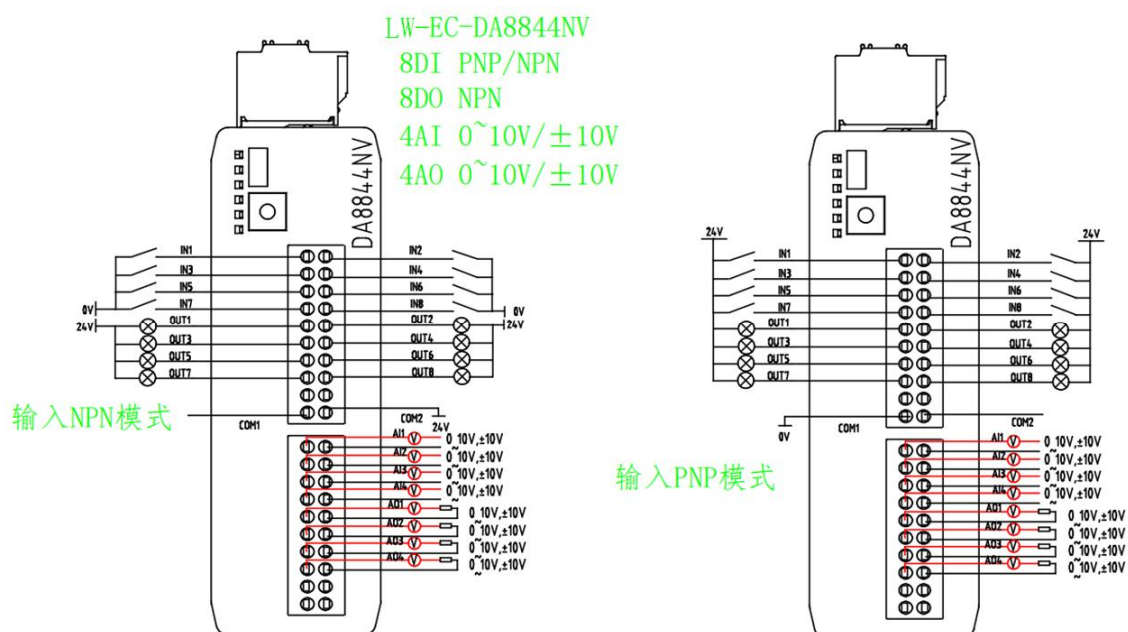


4.8.4 LW-EC-DA8844NV Parameter Specifications

Model	LW-EC-DA8844NV
Name	Digital Input/Output Module (8DI + 8DO)
Number of Input Channels	8
Input Signal Type	PNP & NPN
Rated Input Voltage	24V DC ($\pm 20\%$)
Logic "1" Signal	15–30V
Logic "0" Signal	0–3V
Input Current	3mA
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation
Number of Output Channels	8
Output Signal Type	NPN
Rated Output Voltage	0V DC ($\pm 3V$)
Drive Current	0.5A
Fault Protection	Short-circuit protection, short-circuit alarm, over-temperature protection
Load Type	Resistive load, inductive load
Isolation Withstand Voltage	500V
Isolation Method	Optocoupler isolation
Name	Analog Specifications (4AI + 4AO, Voltage Type)
Number of Input Channels	4
Input Type	0–10V / $\pm 10V$
Resolution	16-bit
Conversion Time	1 ms
Full-Scale Range (Data Word)	–32768 to +32767
Input Signal Accuracy	$\pm 0.1\%$
Number of Output Channels	4
Output Type	0–10V / $\pm 10V$
Resolution	16-bit
Conversion Time	1 ms

Full-Scale Range (Data Word)	-32768 to +32767
Output Signal Accuracy	±0.1%

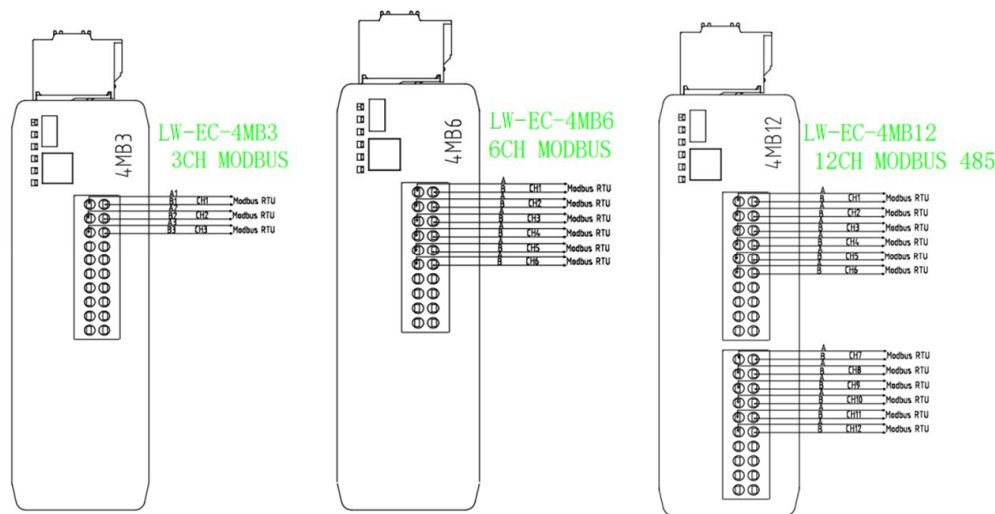
LW-EC-DA8844NV Module Wiring Diagram:



4.8.5 LW-EC-4MB3\4MB6\4MB12 Industrial Gateway Parameter Specifications

Model	LW-EC-4MB3	LW-EC-4MB6	LW-EC-4MB12
Name	RS485 to EtherCAT Gateway		
Number of Channels	3 independent RS485	6 independent RS485	12 independent RS485
Recommended RS485 Devices per Channel	8	8	8
Recommended RS485 Devices per Gateway	24	48	64
Communication Rate	Up to 115200 bps		
Communication Protocol	Modbus		
Configuration Method	Configuration via configuration tool		
Channel Status Indicator	Green LED		
Dimensions	93 × 32 × 122 mm (W × H × D)		
Weight	Approx. 150 g		
Protection Rating	IP20		
Operating Temperature	-10 to 70 °C		
Storage Temperature	-20 to 80 °C		
Relative Humidity	95 %, non-condensing		
Certification	CE		

Module Wiring Diagram:

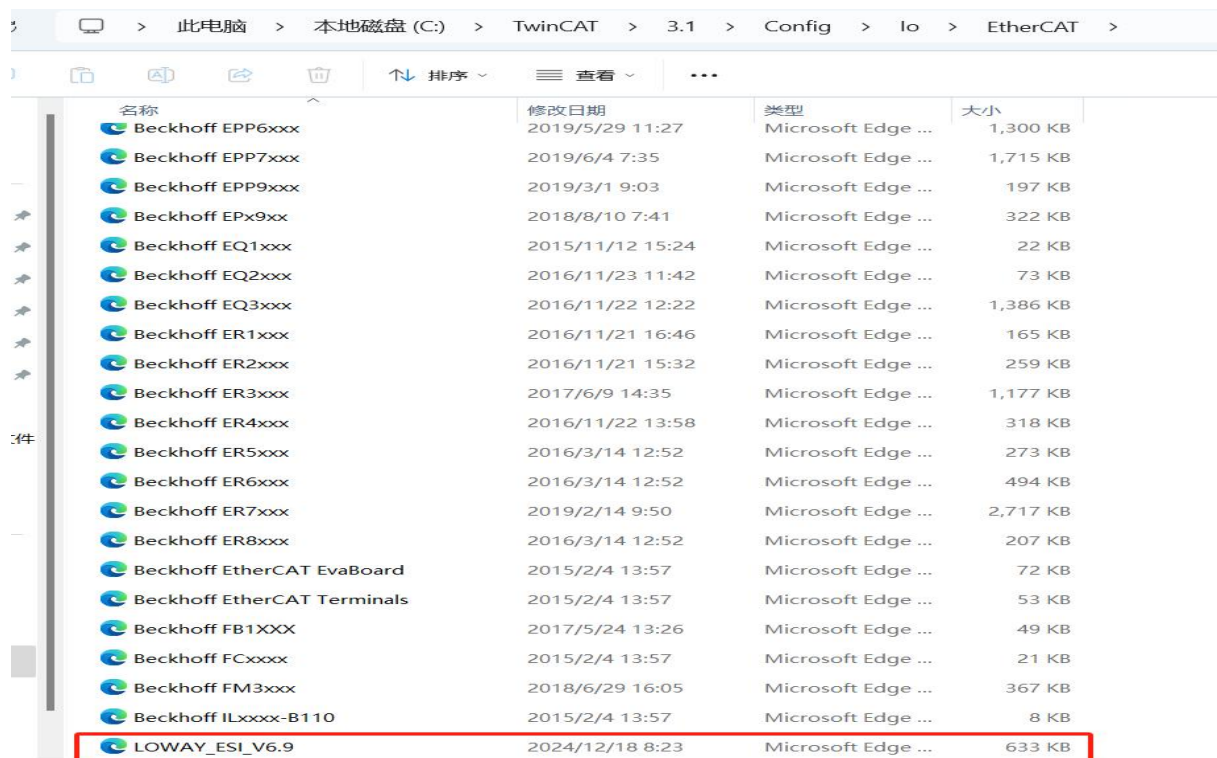


5 Application of I/O Modules in the LW-inCAT3 Software Environment

5.1 Adding the EtherCAT Device Description File

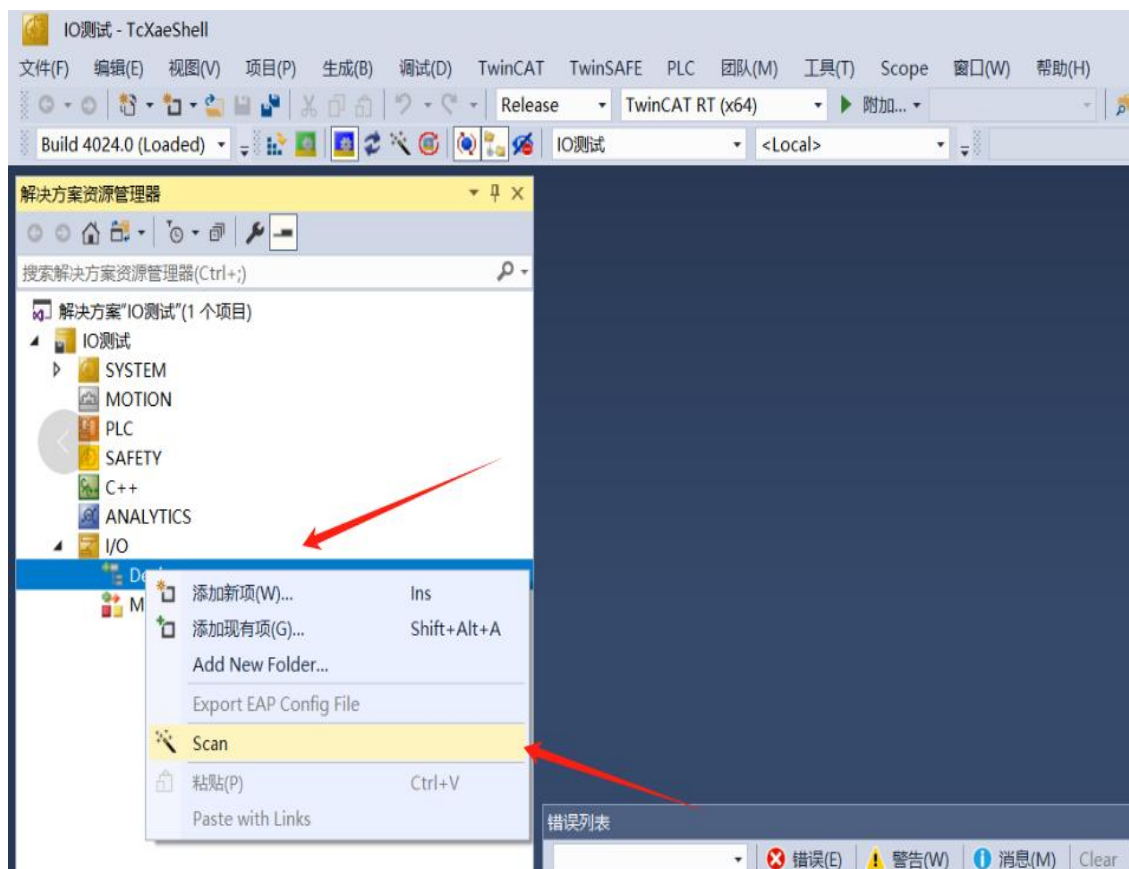
Copy the ESI configuration file LW-EC_ESI_V6.9.xml to the TwinCAT installation directory:

C:\TwinCAT\3.1\Config\Io\EtherCAT.

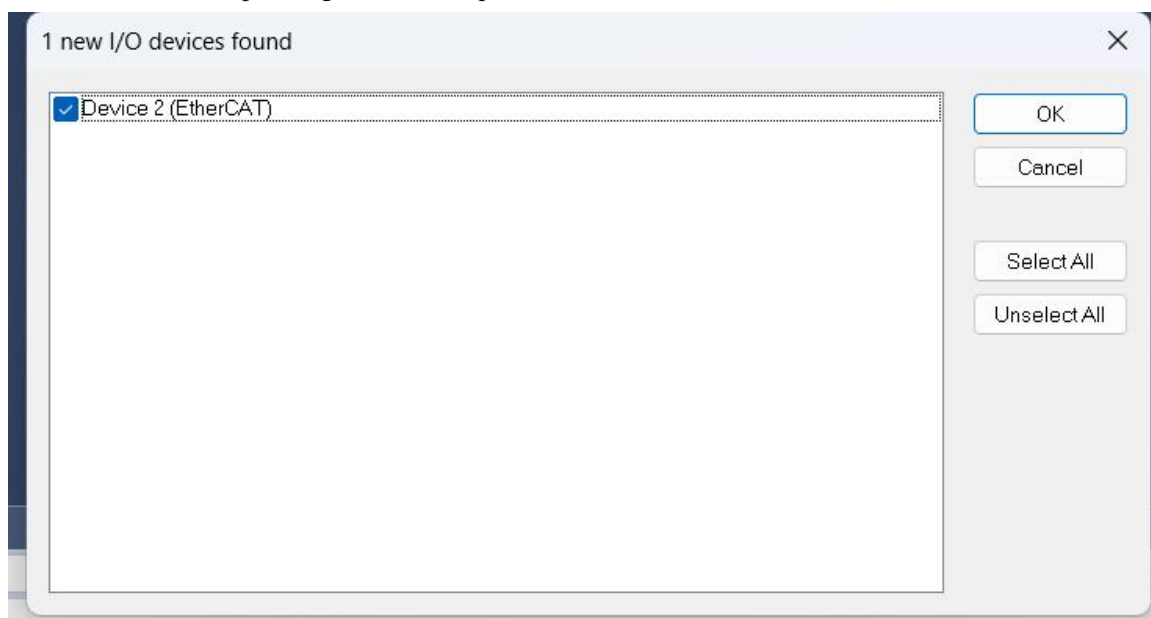


5.2 Adding Devices

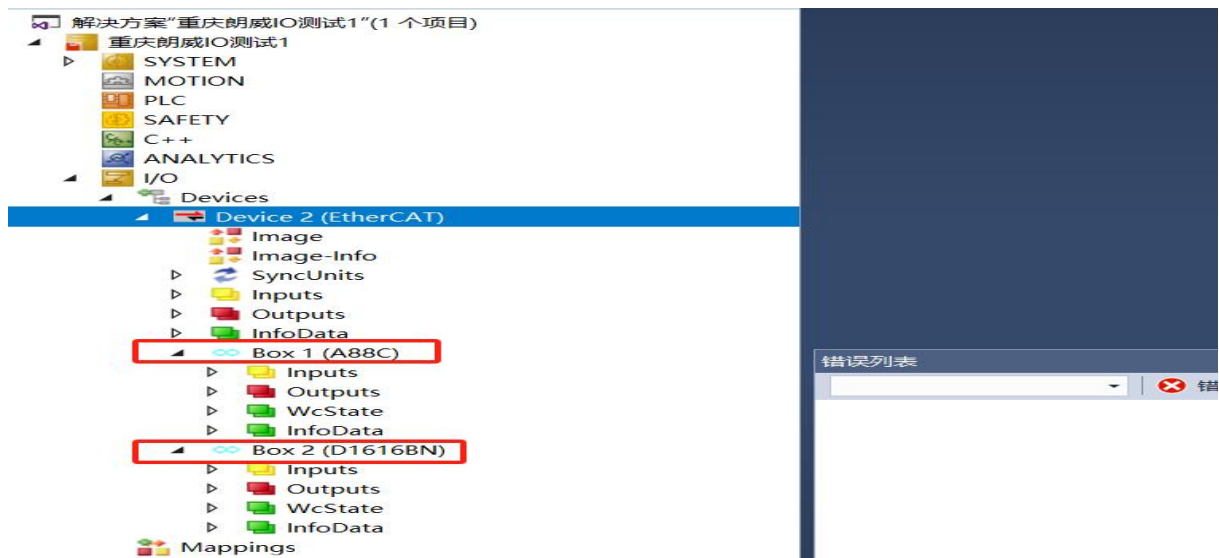
1. Click I/O > Devices, right-click and select Scan to scan for slave devices.



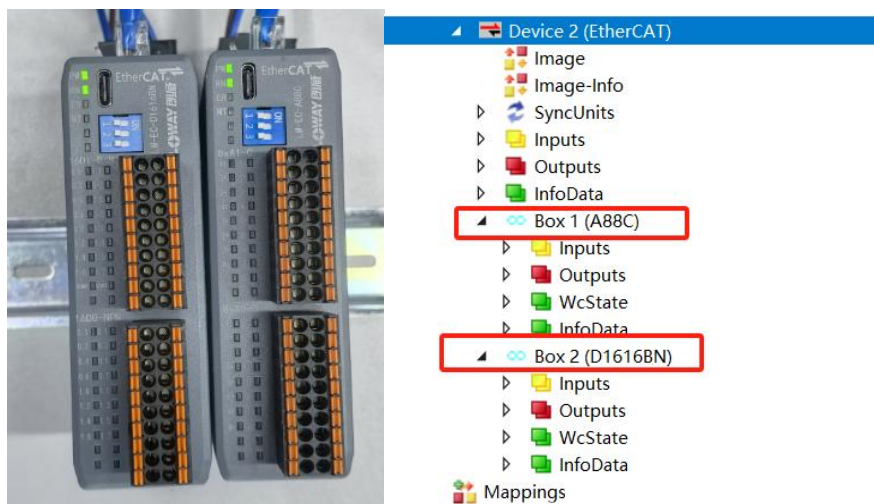
2. Select the corresponding network adapter and click "OK".



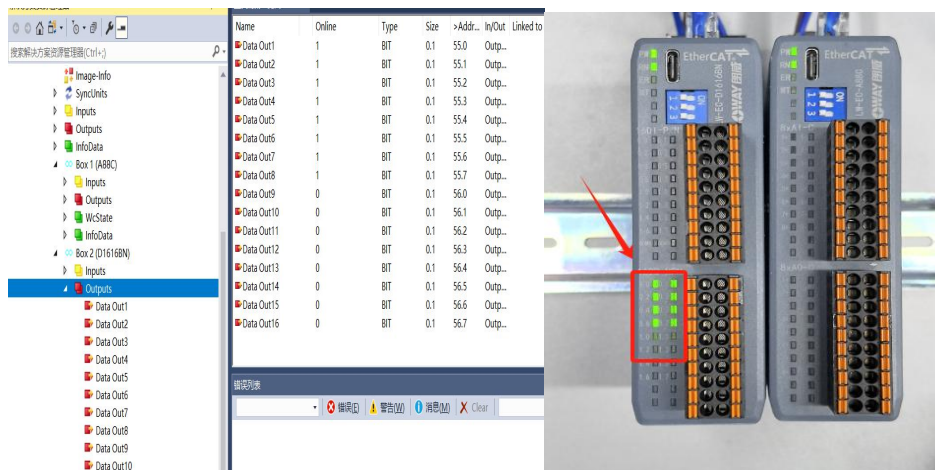
3. As shown in the figure below, two I/O modules, LW-EC-ABBC and LW1616BN, have been successfully scanned.



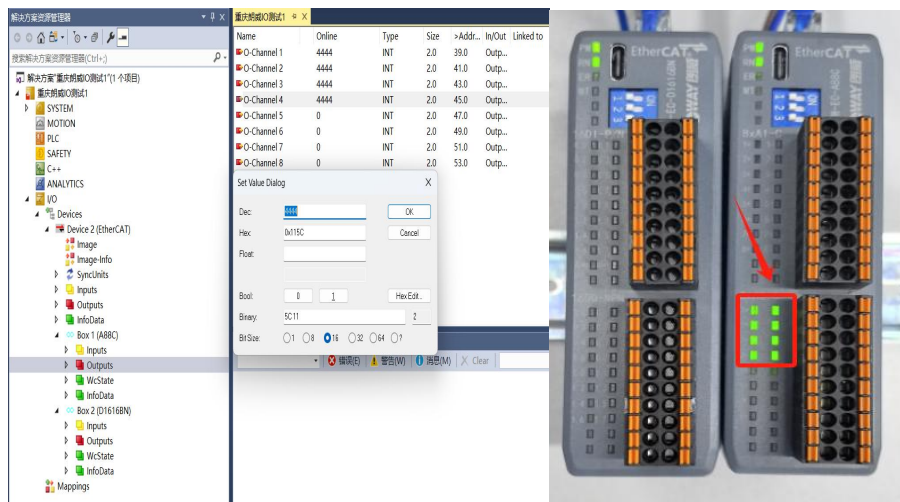
4. After completing the above steps, all connected modules will be scanned and can be directly operated via TwinCAT.



5. Right-click the output point Outputs under the corresponding LW-EC-D1616BN module. You can control the digital outputs by specifying values.



6. Right-click the output point Outputs under the corresponding LW-EC-A88C module. You can control the analog outputs by specifying values.

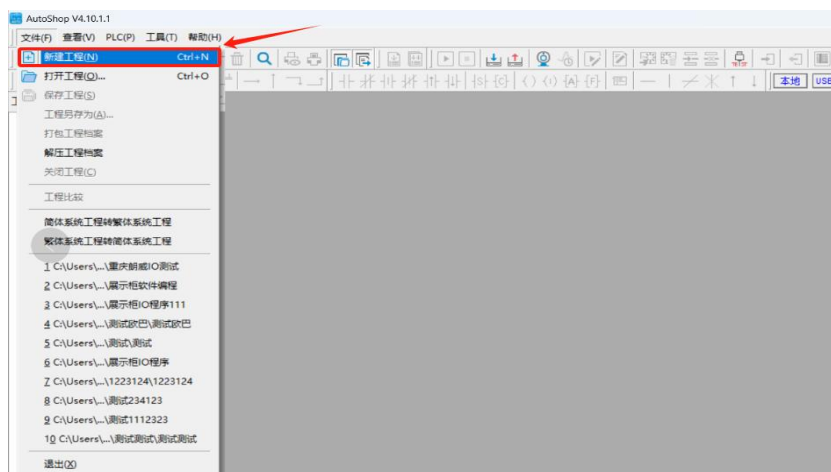


6 Application of I/O Modules in the Inovance AutoShop Programming Software Environment

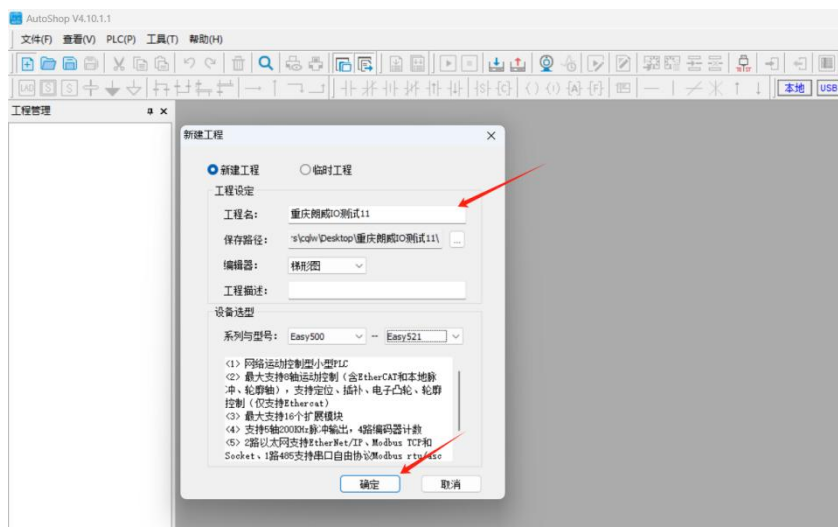
Use the Inovance PLC 521 for EtherCAT communication, with the I/O modules LW-EC-D1616BN (digital input/output module) and LW-EC-A88C (analog input/output module) for configuration.



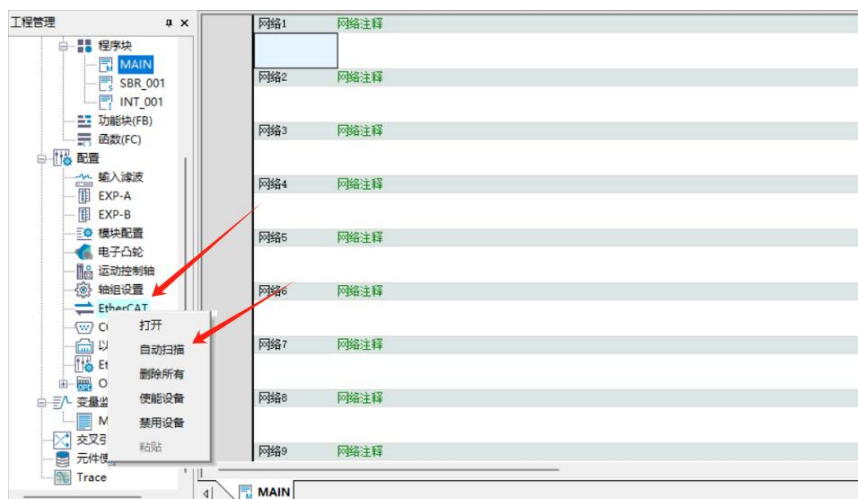
1. Create a new project.



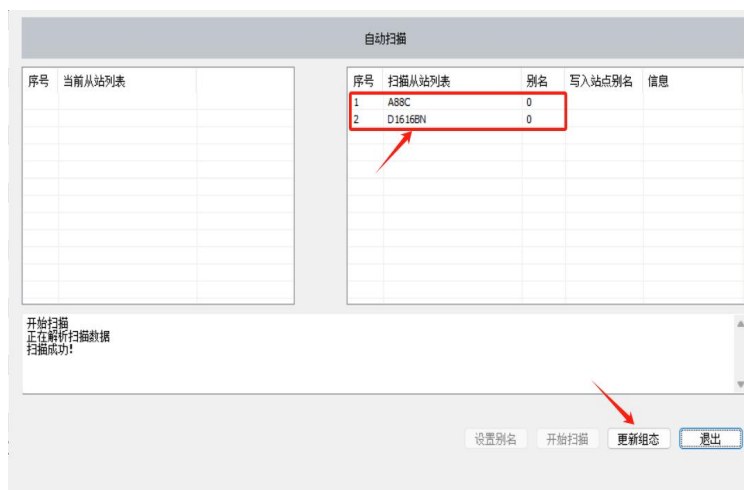
2. Edit the project name and select the corresponding PLC model.



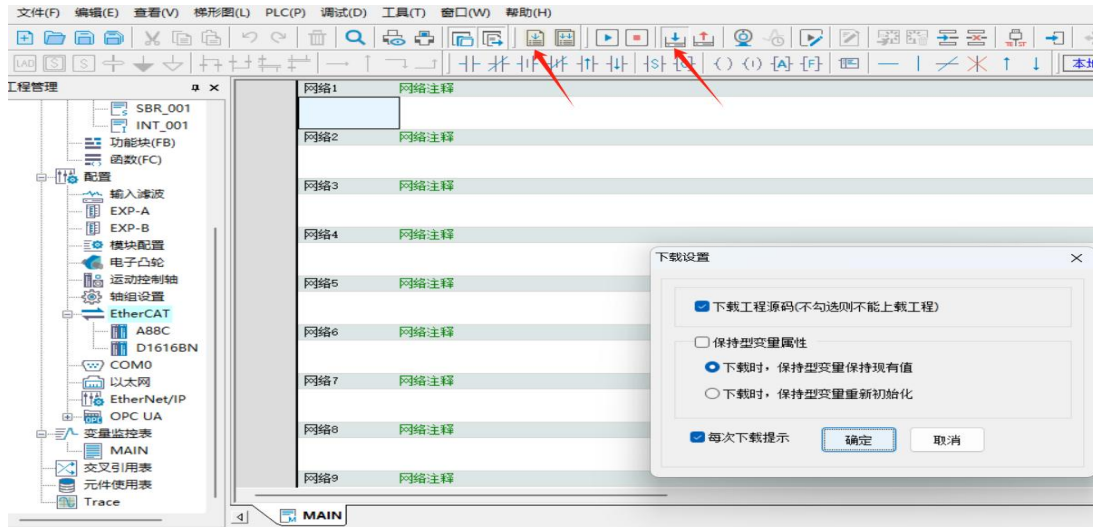
3、In the project management directory, locate EtherCAT under Configuration, right-click and select Auto Scan.



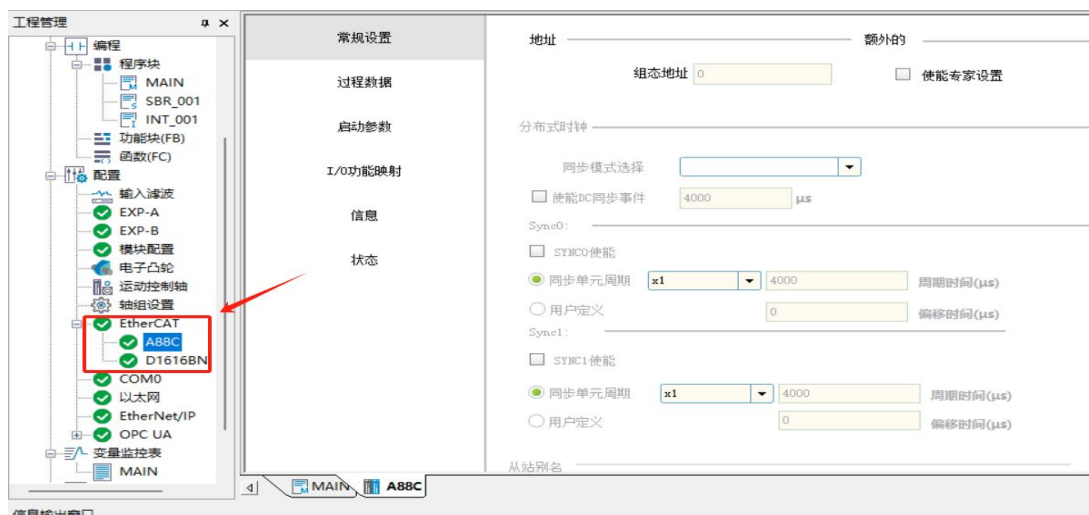
4、Update the configuration for the I/O modules found in the auto scan.



5、After the auto scan is completed, compile, download, and monitor the PLC.



6、Go online.



7、Data reading: LW-EC-ABBC analog input/output data. First, select Process Data to view the corresponding input/output channels of the I/O module:

0-Channel 1 to 0-Channel 8 are analog output channels.

I-Channel 1 to I-Channel 8 are input channels.

	输入/输出	名字	索引	子索引	长度	标志	SM	类型
过程数据	☒ 输出	Outputs	16#1601	16#00	16.0	F	2	
启动参数	输出	O-Channel 1	16#7001	16#1	2.0			INT
I/O功能映射	输出	O-Channel 2	16#7001	16#2	2.0			INT
信息	输出	O-Channel 3	16#7001	16#3	2.0			INT
状态	输出	O-Channel 4	16#7001	16#4	2.0			INT
	输出	O-Channel 5	16#7001	16#5	2.0			INT
	输出	O-Channel 6	16#7001	16#6	2.0			INT
	输出	O-Channel 7	16#7001	16#7	2.0			INT
	输出	O-Channel 8	16#7001	16#8	2.0			INT
	☒ 输入	Inputs	16#1A01	16#00	16.0	F	3	
	输入	I-Channel 1	16#6001	16#1	2.0			INT
	输入	I-Channel 2	16#6001	16#2	2.0			INT
	输入	I-Channel 3	16#6001	16#3	2.0			INT
	输入	I-Channel 4	16#6001	16#4	2.0			INT
	输入	I-Channel 5	16#6001	16#5	2.0			INT
	输入	I-Channel 6	16#6001	16#6	2.0			INT
	输入	I-Channel 7	16#6001	16#7	2.0			INT
	输入	I-Channel 8	16#6001	16#8	2.0			INT

Click the I/O Mapping function. For 0-Channel 1 to 0-Channel 8, assign custom values.

常规设置

过程数据

启动参数

I/O功能映射

信息

状态

☒ 十六进制显示当前值

变量	通道	类型	当前值
_IQ1_0	O-Channel 1	INT	0x29A
_IQ1_1	O-Channel 2	INT	0x29A
_IQ1_2	O-Channel 3	INT	0x29A
_IQ1_3		INT	0x0
_IQ1_4		INT	0x0
_IQ1_5		INT	0x0
_IQ1_6		INT	0x0
_IQ1_7		INT	0x0
_IQ1_8		INT	0x0
_IQ1_9		INT	0x0
_IQ1_10		INT	0x0
_IQ1_11		INT	0x0
_IQ1_12		INT	0x0
_IQ1_13		INT	0x0
_IQ1_14		INT	0x0
_IQ1_15		INT	0x0

写入元件

位软元件:

强制 ON 强制 OFF 强制 ON/OFF 取反

字软元件:

数据类型: 16位整数 显示格式: 十进制

值: 设置 关闭

7 Application of Modbus RS485 to EtherCAT Gateway Module

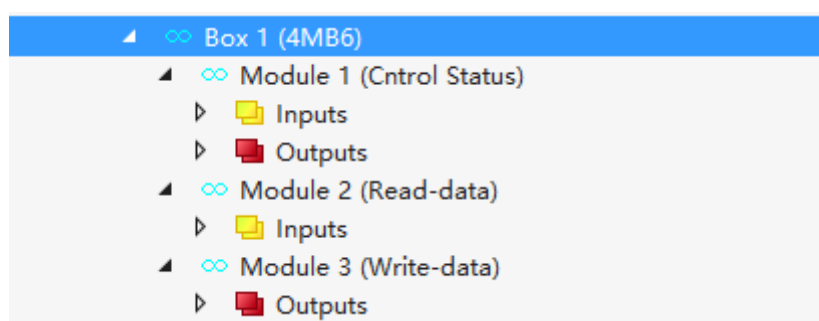
7.1 Serial Communication Interface

– Interface connector: 20-pin pluggable terminal block

Figure	Item	Pin	Description
	1	A1	Channel 1 RS485 +
	2	B1	Channel 1 RS485 –
	3	A2	Channel 2 RS485 +
	4	B2	Channel 2 RS485 –
	5	A3	Channel 3 RS485 +
	6	B3	Channel 3 RS485 –
	7	A4	Channel 4 RS485 +
	8	B4	Channel 4 RS485 –
	9	A5	Channel 5 RS485 +
	10	B5	Channel 5 RS485 –
	11	A6	Channel 6 RS485 +
	12	B6	Channel 6 RS485 –
	...	A7...A12	Channels 7–12 RS485
	...	B7...B12	Channels 7–12 RS485

If the RS485 communication distance is long, a 120 Ω terminating resistor should be added.

7.2 Data Mapping

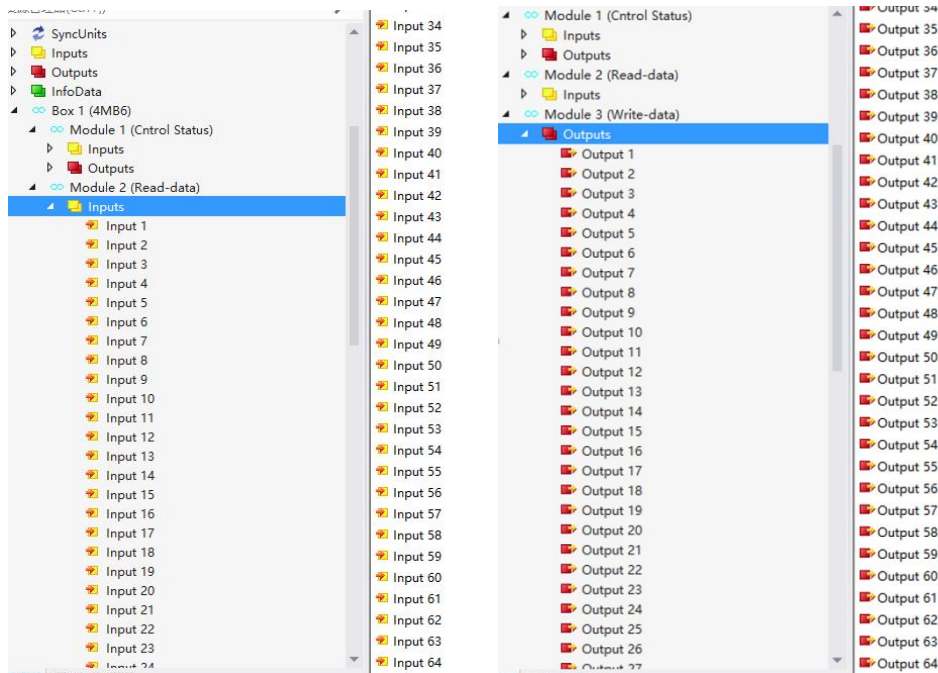


The LW-EC-4MB6 contains 3 submodules:

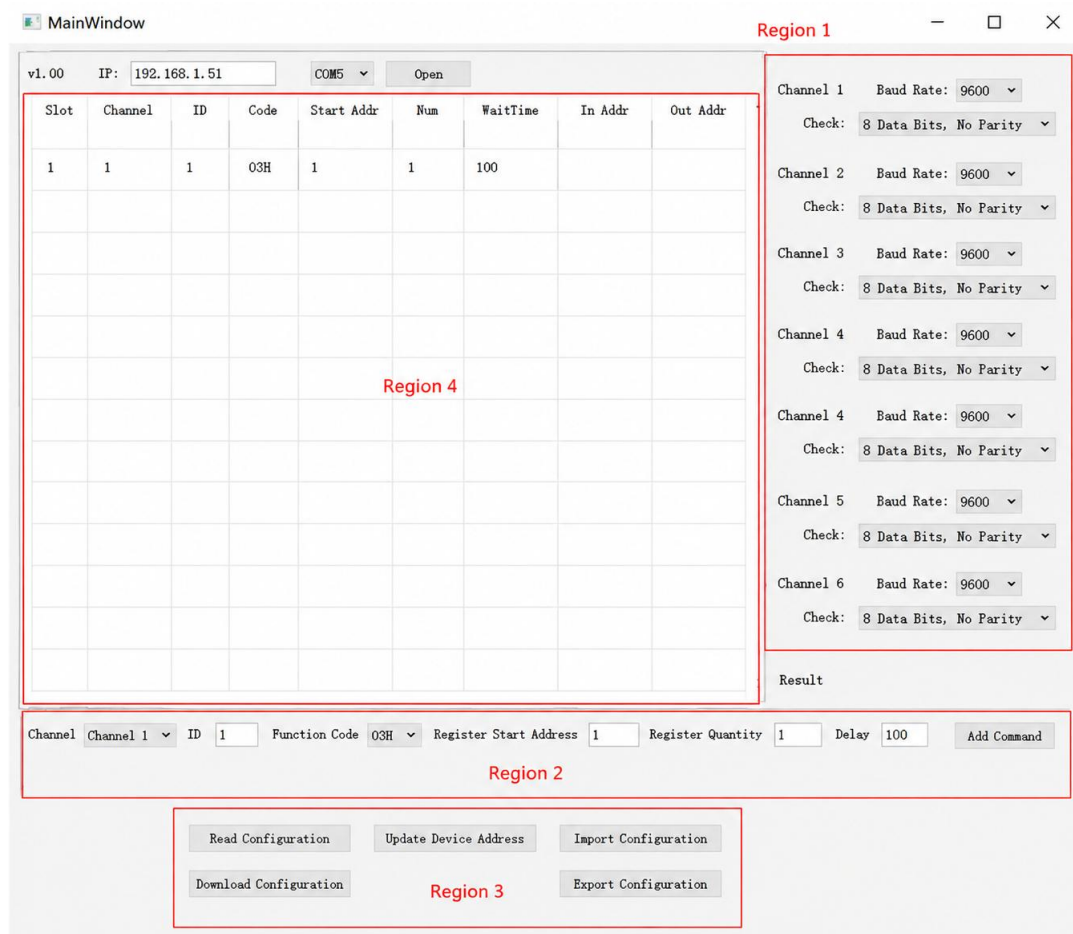
Control Status: Control and status data, with 64 bits each for input and output. Each bit corresponds to one instruction. The input bits are used to monitor the communication status of the instruction. If the slave station communicates normally, the bit is 0; if communication fails for 10 consecutive attempts, the bit is set to 1. The output bits are used to control the single-write function. If a single-write is required for a specific instruction, it can be configured as rising-edge triggered via the corresponding control bit.

Read-data: Read data mapping area. The data read from the slave stations is mapped to this area, with a length of 64 words.

Write-data: Write data mapping area. The data to be written to the slave stations is mapped to this area, with a length of 64 words.



7.3 Parameter Configuration



Area 1: Configure the baud rate and parity for the 6 channels.

Area 2: Add instructions. First configure the instruction parameters in this area, then click "Add Instruction" to add the instruction to Area 4. A total of 64 instructions can be added.

After all instructions have been added, click "Download Configuration" in Area 3. This will download the channel parameters from Area 2 and the instruction parameters from Area 4 to the 4MB6 module.

Update Address Mapping: Click the "Update Address Mapping" button. The data mapping relationships for all instructions in Area 4 will be recalculated. As shown in the figure below, the data read by the first 03H instruction will be mapped to input1, and the data read by the 13th 04H instruction will be mapped to input6.

The 7th 06H instruction will write output4 to the slave station.

Slot	Channel	ID	Code	Start Addr	Num	WaitTime	In Addr	Out Addr
1	1	1	03H	1	1	100	1	
2	1	1	06H	1	1	100		1
3	1	1	02H	1	1	100	2	
4	1	1	04H	1	1	100	3	
5	1	1	10H	1	1	100		2
6	1	1	06H	1	1	100		3
7	1	1	06H	1	1	100		4
8	1	1	06H	1	1	100		5
9	1	1	06H	1	1	100		6
10	1	1	06H	1	1	100		7
11	1	1	03H	1	1	100	4	
12	1	1	03H	1	1	100	5	
13	1	1	03H	1	1	100	6	
14	1	1	03H	1	1	100	7	

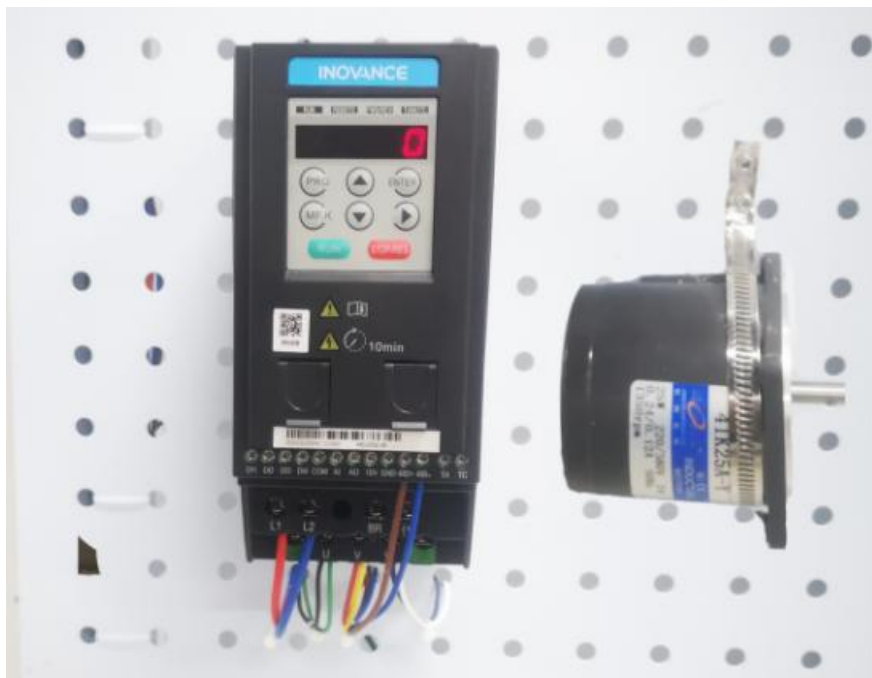
Channel: Channel 1, ID: 1, Function Code: 03H, Register Start Address: 1, Register Quantity: 1, Delay: 100, Add Command

Buttons: Read Configuration, Update Device Address, Import Configuration, Download Configuration, Export Configuration

Import Configuration / Export Configuration: The parameters edited in the configuration tool can be saved to a file via "Export Configuration  cfg1.xml", and can also be read from the file and displayed in the configuration tool via "Import Configuration".

1.3 Example 1: Monitoring a Variable Frequency Drive with RS485

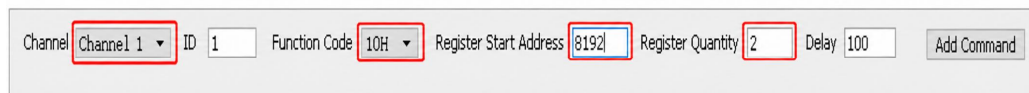
Interface



Step 1: Configure the RS485-related parameters of the variable frequency drive (VFD). Set the control and frequency source selection to be given via communication, and record parameters such as the device ID and baud rate.

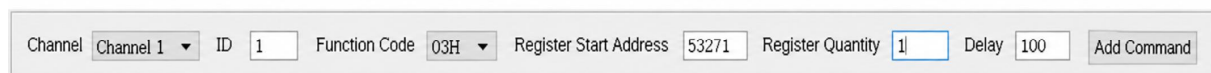
Register Name	Register Address (Hex)	Register Address (Dec)	Description
Control Word	2000	8192	1 = Forward run, 9 = Reverse run, 3 = Stop, 4 = Free stop
Frequency Setpoint	2001	8193	Setpoint value = Frequency $\times$ 100
Status Word	D017	53271	Bit 0: Start/Stop status
Actual Frequency	D000	53248	Monitored value = Frequency $\times$ 100

Step 2: Add VFD read status instructions. Since the status and actual frequency register addresses are not contiguous, two separate instructions are required.



The screenshot shows a configuration interface for adding a command. The fields are: Channel (Channel 1), ID (1), Function Code (10H), Register Start Address (8192), Register Quantity (2), Delay (100), and an Add Command button. Red boxes highlight the Channel, Function Code, Register Start Address, and Register Quantity fields.

The VFD is connected to the first RS485 channel, so select Channel 1. The Control Word and Frequency Setpoint addresses are contiguous, so use the 10H instruction to write multiple registers. Set the number of registers to write to 2, and leave the default delay time of 100 ms. Click "Add Instruction".



The screenshot shows the same configuration interface. The fields are: Channel (Channel 1), ID (1), Function Code (03H), Register Start Address (53271), Register Quantity (1), Delay (100), and an Add Command button. The Register Quantity field is highlighted with a blue box.

For the Status Word, use the 03H instruction to read holding registers. Set the starting address to 53271, the number of registers to 1, and click "Add Instruction".



The screenshot shows the same configuration interface. The fields are: Channel (Channel 1), ID (1), Function Code (03H), Register Start Address (53248), Register Quantity (1), Delay (100), and an Add Command button. The Register Start Address field is highlighted with a blue box.

Similarly, add an instruction to read the Actual Frequency.

Step 3: Download the configuration and update the address mapping.

Use the default baud rate of 9600 with No parity.

[illegible]

Step 4: Restart the module to establish communication with the master station.

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