



OPERATION INSTRUCTIONS

ESTUN Robot ERC3-C1 Series Control Cabinet
Operation Manual



ESTUN Robot ERC3-C1 Series Control Cabinet

Operation Manual

ECM04101-EN-04

Thank you for purchasing ESTUN robots.

Before using the robot, be sure to read the SAFETY PRECAUTION and understand the content. ESTUN is committed to prove the products. All specifications and designs are subject to change without notice.

All statements, information, and advice provided in this manual have been carefully processed, but no guarantee is given for their complete accuracy. We shall not be held liable for any direct or indirect losses arising from the use of this manual.

Users are solely responsible for the application of any products and should exercise caution when using this manual and the associated products.

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Foreword

This manual explains the usage of the ERC3-C1 control cabinet. The ERC3-C1 is a compact control cabinet.

The compatible robot types for this control cabinet are as follows:

Cabinet Model	Compatible Models
ERC3-C1-X1A4	ER3-400-SR
	ER3-500-SR
	ER6-500-SR
	ER6-600-SR
	ER6-700-SR
	ER10-500-SR
	ER10-600-SR
	ER10-600-SR/LI
	ER10-700-SR
	ER10-700-SR/LI
	ER10-800-SR
ERC3-C1-X1B4	ER20-800-SR
	ER20-800-SR
	ER20-1000-SR
	ER20-1000-SR
	ER20-800-SR/LI
	ER20-1000-SR/LI
	ER20-800-SR/HI/LI
	ER20-1000-SR/HI/LI
ERC3-C1-X1C4	ER10B-900-MI/3
	ER10B-900-MI/4
ERC3-C1-X1C4	ER50-1200-SR
ERC3-C1-X1B6	ER8-720-MI
	ER7-910-MI
	ER10-900-MI/HI
	ER10B-900-MI/HI
ERC3-C1-X1C6	ER15-1430-MI
	ER20-1200-MI

Revision History

Revision	Date	Content
01	2023.07	Initial release.
02	2023.10	Updated technical specifications and spare parts list; added new model ER10B-900-MI/HI.
03	2024.04	Updated warning and caution labels; revised Safety IO interface definitions; added method for installing expansion cards; added optional Ethernet port adapter expansion card; added ABZ expansion card port specifications; updated spare parts list.
04	2024.07	Added new control cabinet model ERC3-C1-X1C6; added new models ER15-1430-MI and ER20-1200-MI; updated “Figure 1-3 Designation”; optimizes IO wiring diagrams.



Safety Precautions

This Chapter describes the content to be observed for the safe use of the robot. Before using, be sure to read and understand the content in this Chapter.

1. Before installation, operation, maintenance, and troubleshooting, it is essential to thoroughly read and fully understand this manual and other accompanying materials. Commence usage only after acquiring complete knowledge of the equipment, safety information, and precautions.
2. The terms "Danger", "Caution", and "Warning" used in this manual supplement safety considerations and do not represent an exhaustive list of all safety requirements that must be followed.
3. We will not assume any legal liability for personal safety incidents or property losses resulting from improper product operation.
4. Companies or individuals using ESTUN Robots should familiarize themselves with the standards and laws in their respective regions or countries. Additionally, appropriate safety measures should be installed to protect personnel using the robot.

Definition of users

The users of this manual are defined as follows.

1. Operators
 - To perform the power ON/OFF operation of the robot;
 - To start the robot program from the operation panel;
 - To restore system alarm status;
 - **Must not work inside the safety fence.**
2. Programmers
 - To operate the robot;
 - To teach the robot in a safe area;
 - To perform the operations in a safe area;
 - **The above-mentioned personnel must receive training on the robot.**
3. Maintenance personnel
 - To operate the robot;
 - To teach the robot in a safe area;
 - To carry out the robot maintenance (repair, adjustment, replacement);
 - To perform the operations in a safe area;
 - **The above-mentioned personnel must receive specialist training on the robot.**

Safety Symbols

If the manual contains instructions marked as follows, users must read them carefully and follow strictly.



Symbol	Definition
 Danger	<ul style="list-style-type: none"> This symbol indicates a high potential for serious danger that could result in death or severe injury if not avoided.
 WARNING	<ul style="list-style-type: none"> This symbol indicates a moderate or low potential for danger that could result in minor or moderate injuries if not avoided.
 Caution	<ul style="list-style-type: none"> This symbol indicates potential risks that, if disregarded, could lead to equipment damage, data loss, decreased device performance, or unpredictable outcomes.
 Note	<ul style="list-style-type: none"> This symbol provides additional information to the main text, emphasizing and supplementing the content.

Safety Precautions

1. Precautions before use:

 Caution	<ul style="list-style-type: none"> Upon receiving the product, please first check whether the equipment is in good condition, and whether there is any deformation, moisture, or damage. Please unpack the product according to the specifications. Do not shake or strike the equipment violently. Check that the equipment and accessories are intact and free from damage, aging, or corrosion. after unpacking. Carefully check the quantity as per the product list and verify if the equipment documentation and accessories match the list.
 WARNING	<ul style="list-style-type: none"> Do not install if any abnormal signs such as deformation, moisture, damage, or scratches are found on the product or its accessories before use! Do not install if the received product does not match the model, quantity, or name listed on the product list! If any of these or other issues are found, do not attempt to install the product yourself! Please contact ESTUN staff promptly.

2. Handling Precautions:



- Adhere strictly to the specified storage and transportation conditions, and ensure compliance with required temperature and humidity levels.
- Protect the product from rain, strong vibrations, direct sunlight, strong magnetic fields, and strong electric fields during transportation and handling.
- Package the product according to specifications before transportation to prevent damage during transit.
- Take moisture-proof measures during handling.
- Do not transport the product mixed with harmful substances.
- Use professional handling equipment for transportation.
- Avoid vibrations, drops, or impacts to the control cabinet during handling.
- When handling the product manually, ensure a firm grip to prevent dropping and potential injuries.
- Handle the product gently and be mindful of your surroundings to prevent falls or injuries.
- When using professional equipment for handling, ensure no personnel are beneath the equipment to avoid injury from falling objects.
- Follow ESTUN's recommended methods for handling and installing the robot. Incorrect methods may cause the robot to topple, and lead to accidents.



3. Installation precautions



- Read the product instructions and safety precautions thoroughly before installation.
- Unauthorized modifications to the product are strictly prohibited.
- Do not use this control cabinet to power other equipment.
- Avoid installing the product in areas with strong electric or magnetic field interference.
- Do not remove or loosen any components or bolts without authorization.



- Installation personnel must be familiar with product installation requirements and related documentation.
- Unauthorized personnel are strictly prohibited from independently performing installation, wiring, maintenance, or any other operations on the product.
- Non-professionals are strictly prohibited from inspecting or replacing product components independently.
- Install shielding protection when using transformers or other devices that cause strong electromagnetic interference.
- Do not install the product while the power is on, as this poses an electric shock hazard.
- Ensure proper grounding of equipment at all times to avoid the risk of electric shock.

4. Precautions for operation :

- Before powering on, ensure the equipment is properly installed, and wiring is secure and meets the motor startup conditions.
- Verify that the power supply meets the equipment requirements before powering on.
- Avoid leaning against the control cabinet or randomly pressing buttons when powering on to prevent unexpected robot movements that could cause injury or equipment damage.
- Do not open the control cabinet door or protective cover after the equipment is powered on to avoid the risk of electric shock.
- After powering on, check all E-stop switches. If any are not functioning properly, stop using the equipment immediately and contact ESTUN support.
- It is strictly prohibited to replace or dismantle any equipment components while the power is on, as there is a risk of electric shock.
-  **Danger**
- Avoid touching any equipment terminals while the power is on to prevent the risk of electric shock.
- Avoid touching any equipment terminals while the power is on to prevent electric shock.
- Do not touch the equipment Casing, fan, resistors, etc., while the equipment is running to avoid the risk of burns.
- Prevent foreign objects from entering the equipment during operation to avoid damage.
- Non-professionals are strictly prohibited from performing signal detection or other professional operations on the equipment during operation, posing risks of equipment damage and personal injury.
- After powering off the control cabinet, wait at least 10 seconds before restarting to prevent controller failure.

5. Precautions for maintenance:

-  **Danger**
- Be cautious of components that generate heat, such as motors and reducers. Do not touch these parts without protection to avoid burns.
- Do not disassemble components while they are in motion to avoid injury.
- Use professional tools during maintenance. Do not use the control cabinet or robot as a ladder to prevent falls.
- Non-professionals are not allowed to repair the product.
- Read the Safety Precautions and relevant manuals carefully before maintenance.
- Disconnect the power supply before replacing or inspecting components. Do not perform maintenance with the power on.

6. Other safety precautions:



Caution

- All operators, maintenance personnel, and users must receive professional training and strictly follow product usage guidelines and safety precautions.
- Appropriate safety gear, such as helmets, safety shoes, and suitable work clothing, must be worn by all users and operators.
- All operations should be conducted in the designated safe areas.
- Even after the robot is powered off, external devices connected to it may remain active. Damaged power lines or power cables for these external devices can cause injury.
- **A CO₂ fire extinguisher should be available on site in case of a fire in the robot system.**

Warning and Caution Signs

Symbol	Description
	<p>Electric shock Attention should be paid to the danger of high voltage and electric shock at the place where this sign is affixed.</p>
	<p>High temperature Be cautious about a section where this label is affixed, as the section generates heat. If you have to inevitably touch such a section when it is hot, use a protective provision such as heat-resistant gloves.</p>
	<p>No stepping Do not step on or climb the robot as it may adversely affect the equipment, and cause the bodily injury to operators.</p>
	<p>Wounding by robot There is a danger of wounding by robot when working within the motion range of robot.</p>
	<p>No disassembly Users are prohibited from disassembling the part affixed with this sign. Disassembly shall be carried out by professionals using professional tools.</p>

Symbol	Description
	<p>Power Off Warning Label</p> <p>This label indicates that the equipment must be powered down before opening the control cabinet. Before restoring power, close the control cabinet and wait at least 15 minutes before reopening it.</p>
	<p>Injury Prevention Warning Label</p> <p>This label indicates that personal protective equipment (PPE) must be worn when opening the control cabinet or its covers. Failure to follow these precautions may result in injury or death. Refer to NFPA 70E for minimum PPE requirements.</p>

Way to Stop Robots

The robot can be stopped in the following three ways:

Stopping Method	Description	Procedure
Power-off Stop	The power-off stop disconnects the servo power source, resulting in an instantaneous robot stop. However, abruptly cutting the servo power during robot movement leads to uncontrolled deceleration.	<ul style="list-style-type: none"> Activate the alarm and disconnect the servo power, causing an immediate stop in robot motion. Pause the program execution.
Alarm Stop	The alarm stop is a method of robot cessation where, upon system alarm (excluding power-off alarms), the robot's motion is decelerated and stopped using control commands.	<ul style="list-style-type: none"> The robot system issues an alarm due to overload, failure, etc. (excluding power-off alarms); The servo system sends a "Central Stop" command, decelerating the robot's motion and pausing the program execution; Disconnect the servo power.
Hold	This method maintains servo power, and causes the robot to decelerate and stop.	<ul style="list-style-type: none"> Cause the robot to decelerate and stop, pausing program execution.



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Chapter 1 Product Information

1.1 Information on Nameplate



- Upon receiving the product, carefully verify the information on the control cabinet's outer packaging and the nameplate. Ensure that the "Control Cabinet Model" and "Product S/N" on the packaging match those on the nameplate.
- If there is any discrepancy, contact ESTUN support for verification.

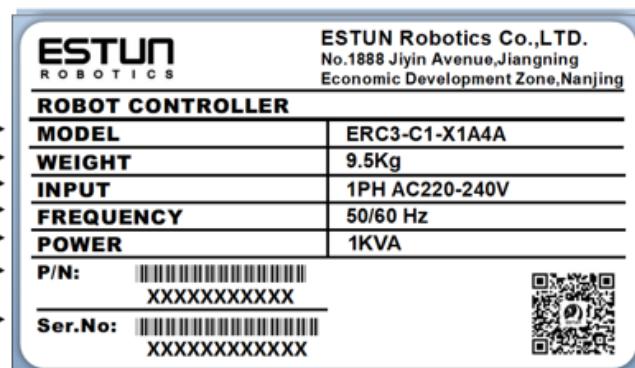


Figure 1-1 Nameplate Information for Control Cabinet

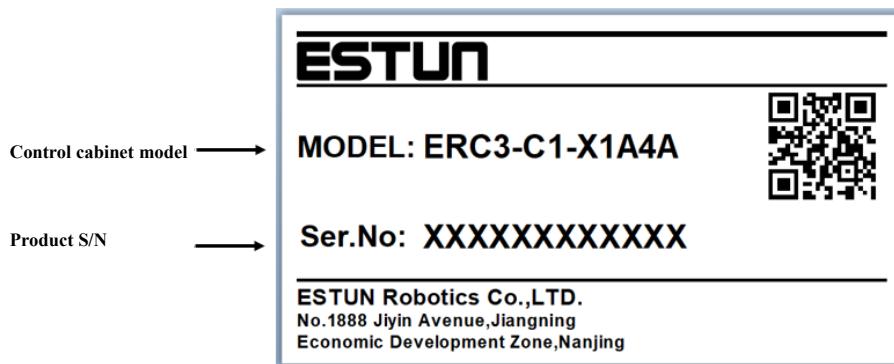


Figure 1-2 Information of Control Cabinet on Outer Packaging

1.2 Designation

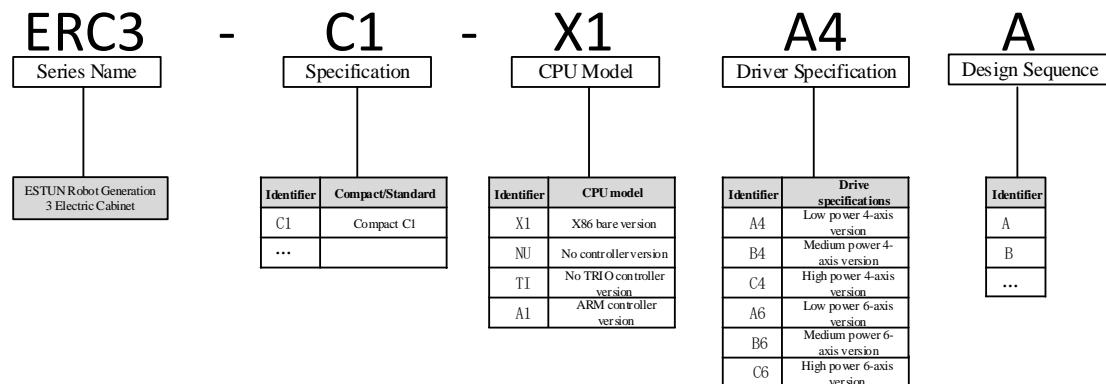


Figure 1-3 Designation

1.3 Product Dimensions

This section provides the dimensions of a single unit placed horizontally.

The height of the unit without rubber feet is 89mm, and with rubber feet is 102mm, with the feet adding 13mm in height.

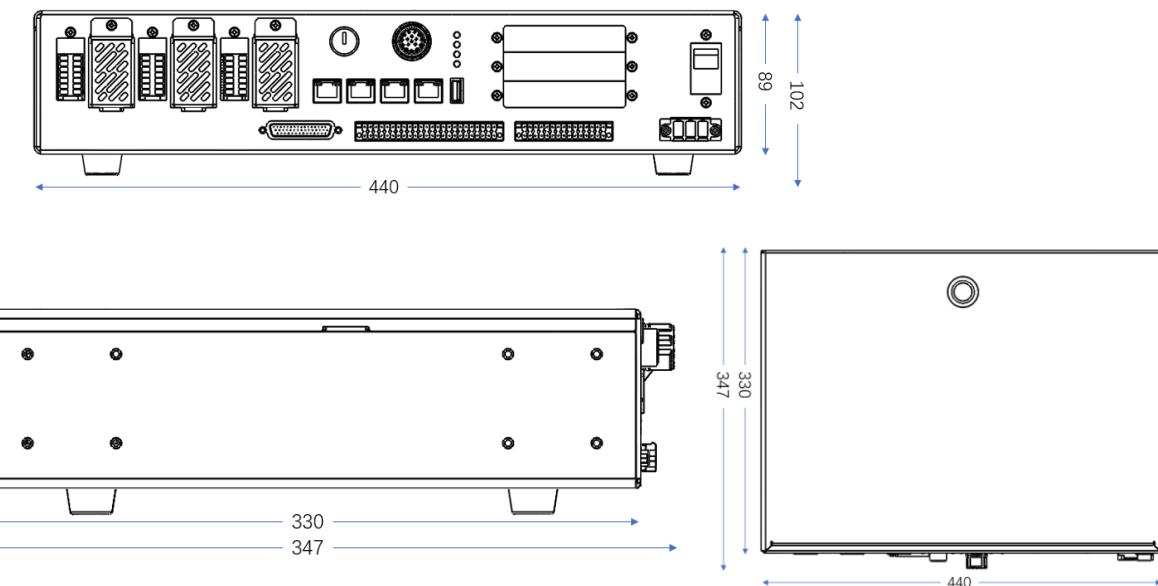


Figure 1-4 Product Dimensions

1.4 Components

External interface

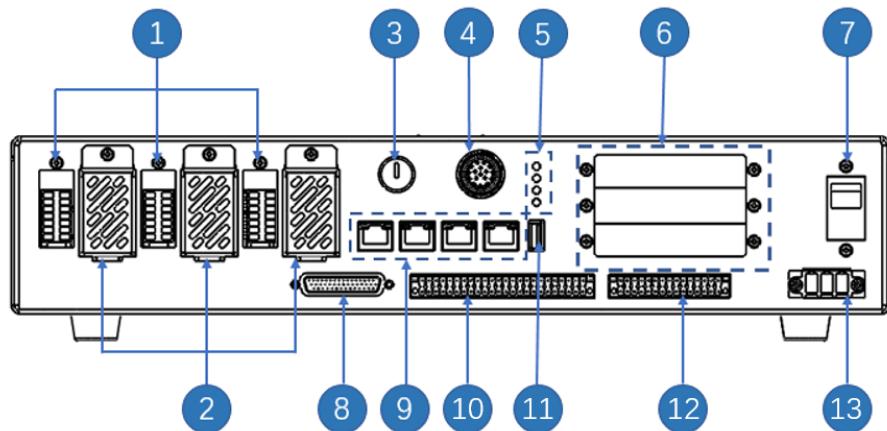


Figure 1-5 External interface

S/N	Interface name
1	Power line interface
2	Cooling air inlet
3	Mode selector switch
4	Teach pendant interface
5	LED
6	Expansion card slot (optional)
7	Power switch
8	Encoder interface
9	RJ45 interface
10	Standard IO interface
11	USB interface
12	Safety IO interface
13	Power interface

1.5 Technical Parameters

Table 1-1 Basic parameters list of control cabinet

Model	Dimensions(mm)	Self-weight (kg)	Rated power (kVA)	Reference energy consumption (kW.h)	Applicable model
	(L*W*H)				
ERC3-C1-X1A4	440*330*102	9.5	1	0.8	ER3-400-SR
					ER3-500-SR
					ER6-500-SR
					ER6-600-SR
					ER6-700-SR
					ER10-500-SR
					ER10-600-SR
					ER10-600-SR/LI
					ER10-700-SR
					ER10-700-SR/LI
					ER10-800-SR
ERC3-C1-X1B4	440*330*102	9.5	1	0.8	ER20-800-SR
					ER20-800-SR
					ER20-1000-SR
					ER20-1000-SR
					ER20-800-SR/LI
					ER20-1000-SR/LI
					ER20-800-SR/HI/LI
					ER20-1000-SR/HI/LI
					ER10B-900-MI/3
					ER10B-900-MI/4
ERC3-C1-X1C4	440*330*102	10	1.5	1.2	ER50-1200-SR
ERC3-C1-X1B6	440*330*102	10	1.2	0.96	ER8-720-MI
					ER7-910-MI
					ER10-900-MI/HI
				0.47	ER10B-900-MI/HI

ERC3-C1-X1C6	440*330*102	10	1.5	0.81	ER15-1430-MI
				0.88	ER20-1200-MI

[Note] The dimensions given in the table include the rubber foot height of 13mm.

Table 1-2 Control Cabinet Technical Specifications

Item	Spec.
Control cabinet installation environment	Ventilated, not airtight
Minimum installation range	520*410*182 (mm, L*W*H)
Number of control axes	3~6
Mains power supply for electric cabinet (way of introduction)	Single-phase AC 220V~240V, 50/60Hz
Rated power	1.5kVA
Leak current	<30mA
Ethernet	3-channel
EtherCAT	1-channel
USB	1-channel
SAFETY	Provided with e-stop, safety door, and safety light curtain functionality
System IO	6 inputs, 7 outputs
General IO	14 inputs, 13 outputs
Communication interface with peripherals	Standard: EtherCAT , Modbus TCP , TCP/IP; [Note]: Other communication protocols are optional, please consult our sales department.
Noise level	<60dB
Ambient working temperature	0°C~45°C
Storage environment	Temperature: -20°C~60°C Humidity: ≤95% RH (no condensation, no freezing)
Insulation resistance	100MΩ and above
Vibration strength	10Hz ≤ f ≤ 57Hz, amplitude 0.15mm
Shock resistance	Max 15g, duration 11ms
Altitude	Below 1,000m
EMC test standards	IEC 61000-6-2:2019 IEC 61000-6-4:2019
IP grade	IP20

Chapter 2 Transportation & Installation

2.1 Handling Procedures



You can manually handle the control cabinet. Ensure to wear safety shoes and gloves before handling.

Be aware of your surroundings to avoid any unsafe conditions and prevent falls or injuries.



Figure 2-1 Handling Diagram

2.2 Installation requirements

Environmental requirements:

- The operating environment temperature should be between 0°C and 45°C. During transportation and maintenance, the temperature range should be -20°C to 60°C.
- The relative humidity should not exceed 95%RH, and there should be no condensation.
- The installation site should have minimal dust, powder, oil fumes, and water.
- Flammable substances, corrosive liquids, and gases are not allowed in the operating area.
- The control cabinet should be installed in a low vibration or low impact energy environment (vibration below 0.5G).
- There should be no nearby electrical interference sources (e.g. gas shielded welding TIG equipment).
- There should be no potential hazards of collision with moving equipment (e.g. forklifts).
- There should be no ion or non-ion interference.

Instructions for Users:

- Please refer to the Instructions for Users and standardize your work.

Requirements for installation space:

- The installation space is shown in the figure below. Reserve the space for heat dissipation.

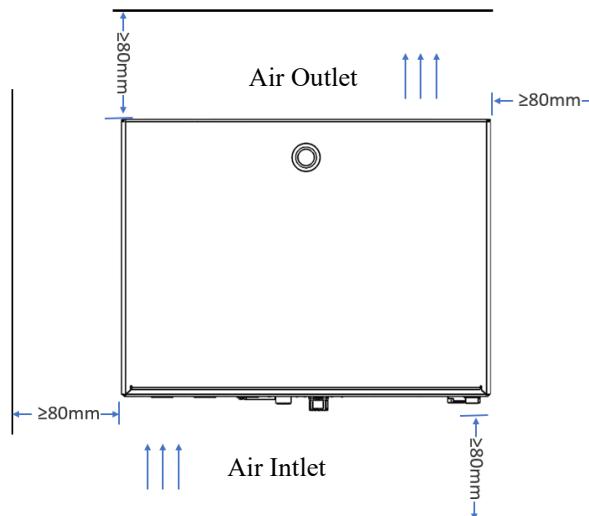


Figure 2-2 Installation Space Requirements

2.3 Installation Methods

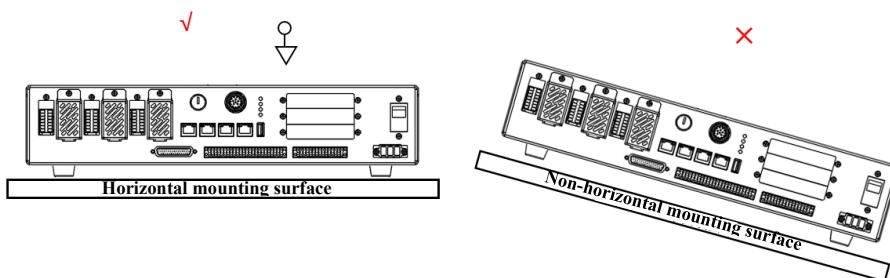
The control cabinet supports three installation methods: horizontal, vertical, and stacking up to three units.

The required tools for each method are listed below:

Installation Method	Tools Required	Description
Horizontal	Phillips screwdriver and rubber foot	
Vertical	Phillips screwdriver, mounting brackets, and necessary screws	1. Rubber feet are included and pre-installed (4 feet per unit) 2. Flat brackets for securing multiple units or for vertical installation (default option) 3. L-shaped brackets for securing the unit to the floor (default option)
Stacking (up to 3 units)	Phillips screwdriver, mounting brackets (flat and L-shaped) and necessary screws	[Note] Screws for mounting bracket (L-type or flat bracket) are M4-6

2.3.1 Horizontal installation

For standard installation scenarios, ensure the surface is flat and not deformed.



Installing steps:

Step 1 Check if the rubber feet at the bottom of the control cabinet are securely installed. In case of loosening or not installed, tighten the rubber feet using a Phillips screwdriver (rubber feet are pre-installed at the factory).

Step 2 Place the control cabinet on the installation surface as shown below to complete the horizontal installation.

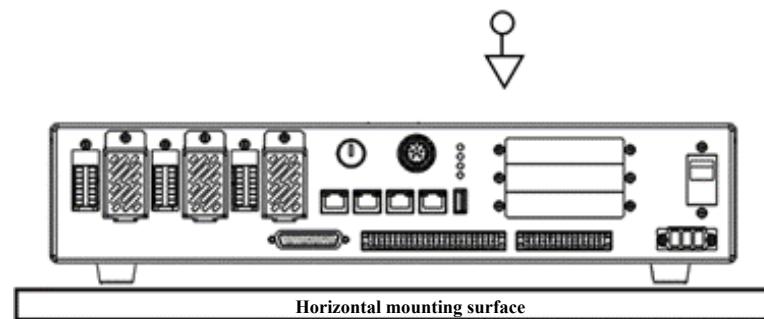
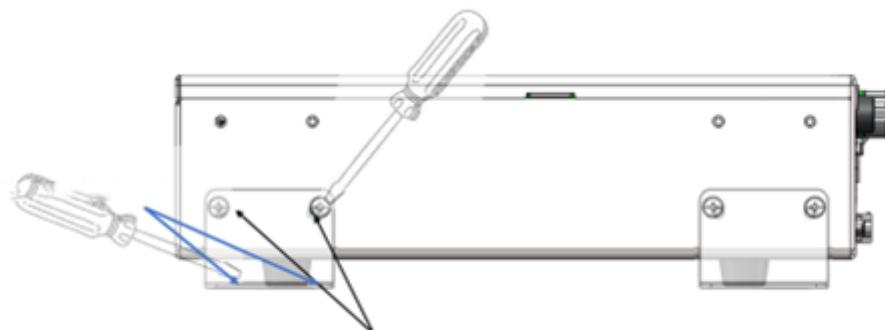


Figure 2-3 Single Unit Horizontal Installation Diagram

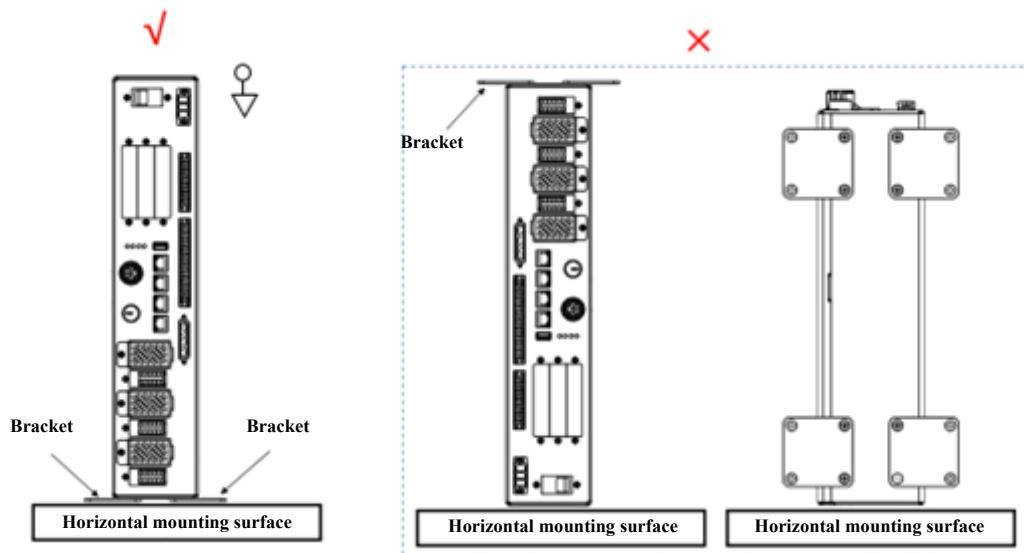
Step 3 (Optional) In severe environments (e.g. prone to vibration), use the included L-shaped brackets and screws to secure the cabinet. Install the brackets on both sides of the cabinet and fix them with screws to the mounting surface.



Tighten and secure it with the screws between the bracket and the machine with a screwdriver

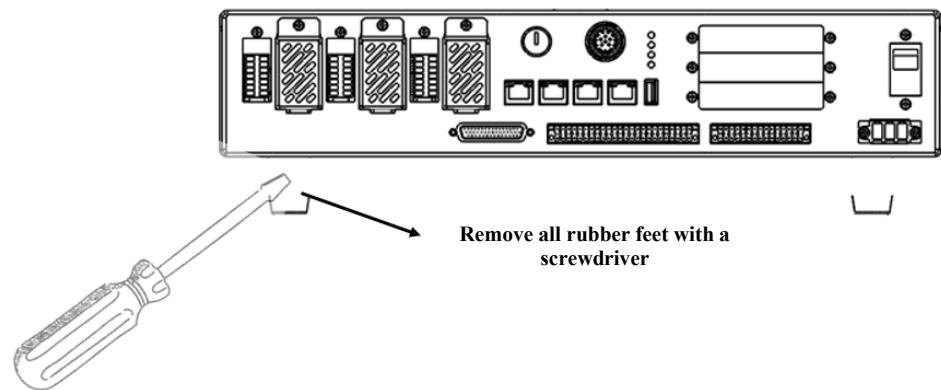
2.3.2 Vertical installation

For vertical installation scenarios, ensure the surface is flat and not deformed.

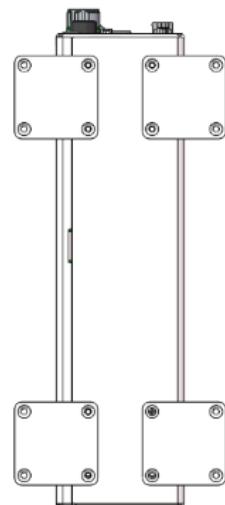


Installing steps

Step 1 Use a screwdriver to remove the screws from the four rubber feet and store the feet and screws properly.

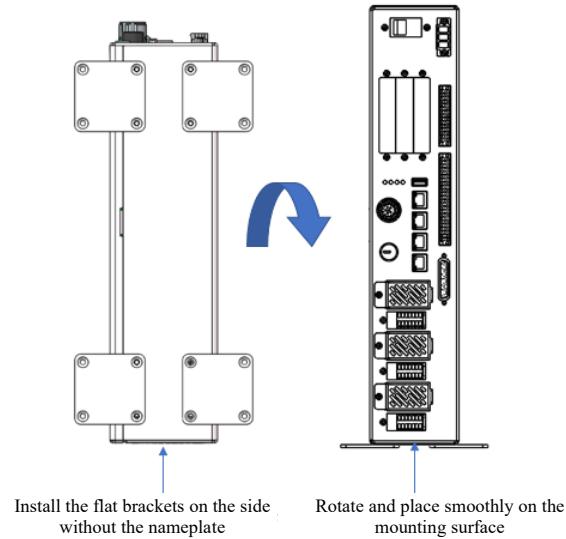


Step 2 Install the flat brackets on the side without the nameplate, as shown below.



Step 3 Rotate the cabinet toward the side with the installed brackets and place it steadily on a flat surface.

Rotate the cabinet toward the side with the installed brackets and place it steadily on the mounting surface



Step 4 Secure the brackets to the mounting surface using screws as shown in figure below, to complete the vertical installation.

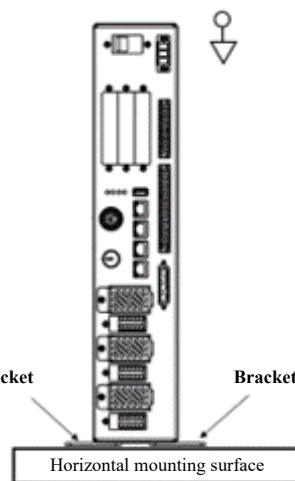


Figure 2-4 Vertical Installation Diagram

Installation Dimensions

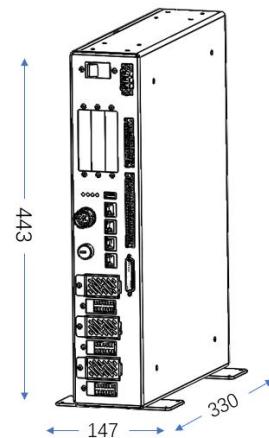
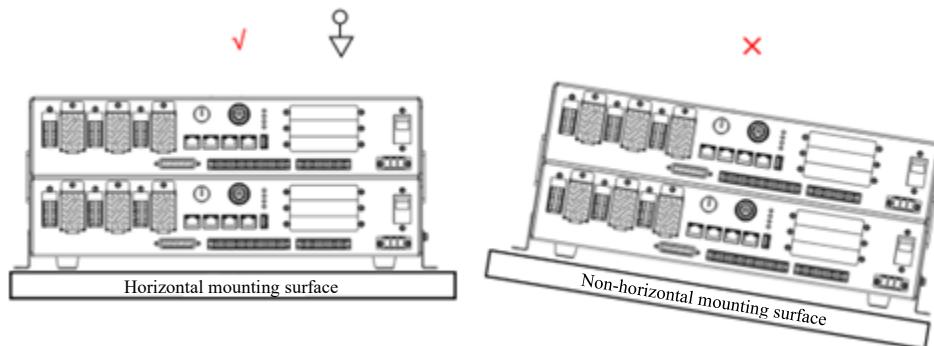


Figure 2-5 Vertical Installation Dimensions

2.3.3 Stacking installation

For stacking multiple units, ensure the surface is flat and not deformed. Stacking allows for efficient use of space. It supports up to three control cabinets.



Installing Steps

Take stacking of 2 machines as an example, and the installing steps are detailed below:

Step 1 Use a screwdriver to remove the screws from the four rubber feet of the first unit and store the feet and screws properly.

Step 2 Place the first unit neatly on top of the second unit. Use the included flat brackets and screws to secure the units on both sides, and then fasten with a screwdriver.

Step 3 Use L-shaped brackets to secure the units to the floor, and tighten them with a screwdriver.

Step 4 This completes the stacking of two units, as shown below.

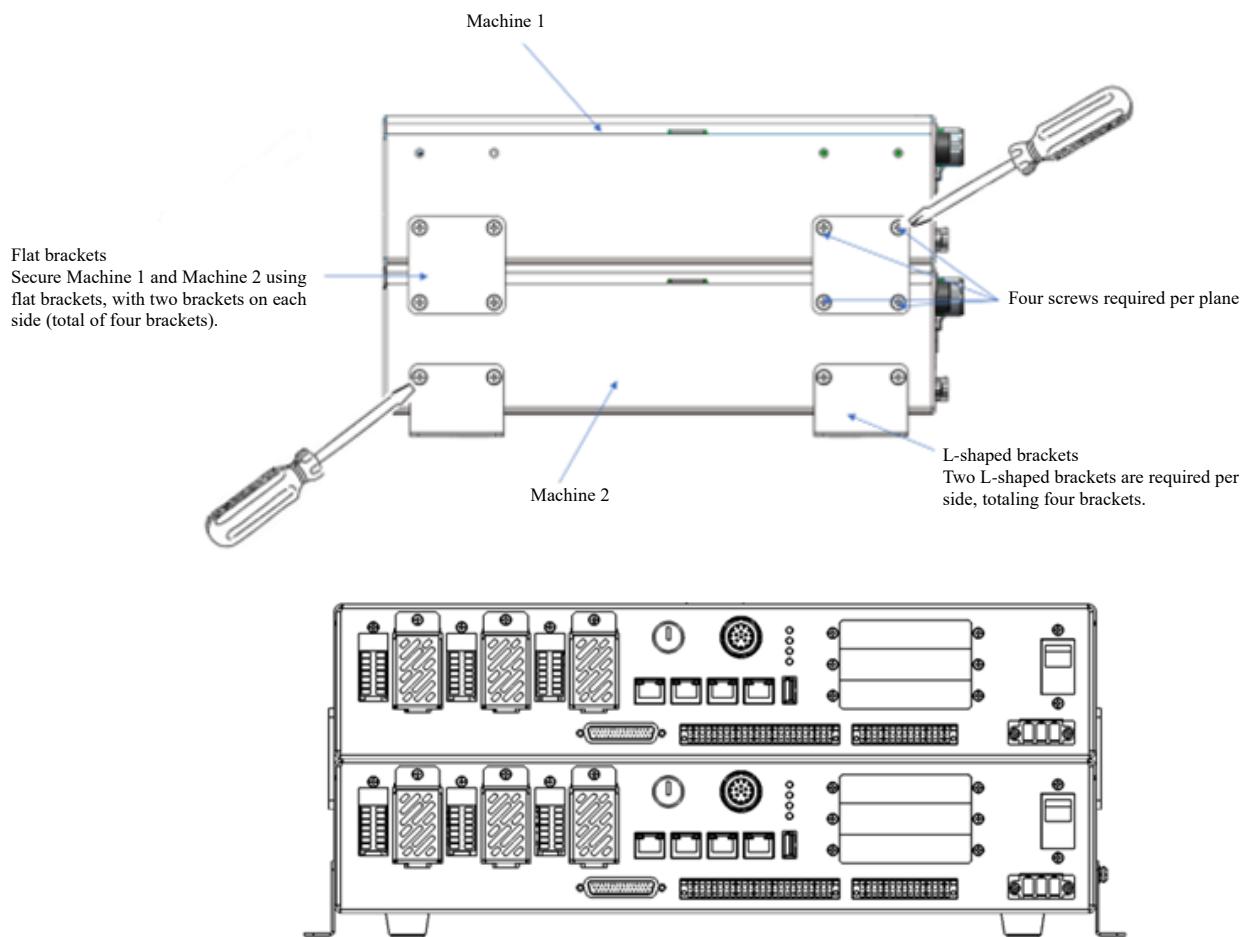


Figure 2-6 Two Units Stacking Diagram

Installation dimensions



For multiple vertical installations, fix all control cabinets together into a single unit by following the vertical installing steps.

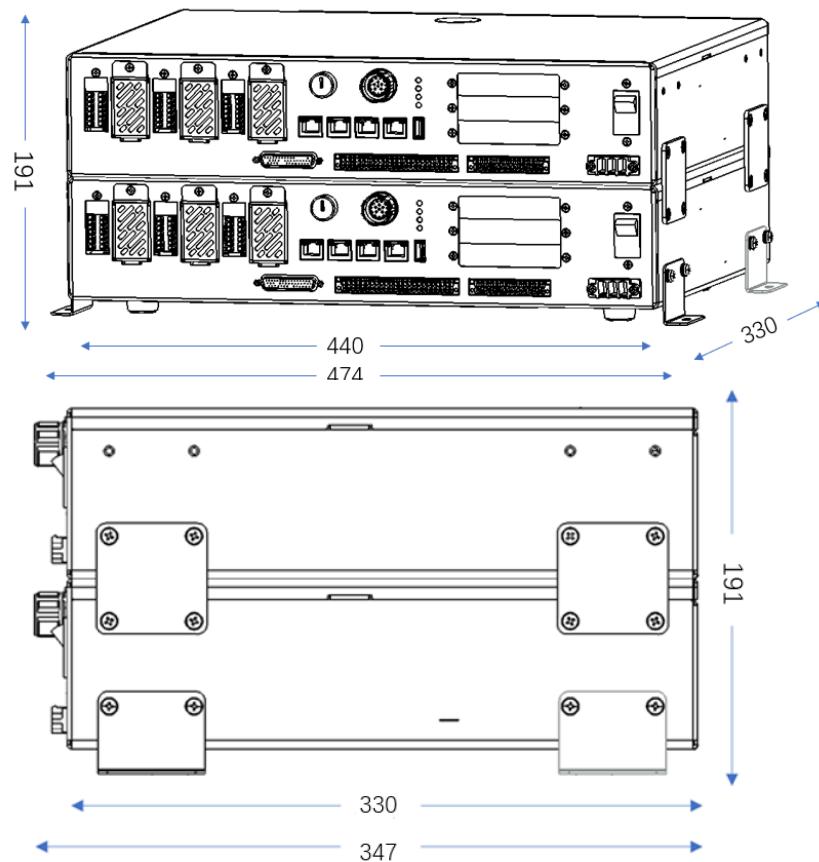


Figure 2-7 Stacking Installation Dimensions

Chapter 3 Wiring

3.1 Wiring Precautions

Installation, wiring, maintenance, and inspection of the product should only be carried out by personnel who have received training in electrical equipment, possess sufficient electrical knowledge, and are familiar with electrical safety protocols.

- Perform the wiring or inspection only by professional technicians.
 - Perform the wiring according to the rated capacity provided in the Manual.
 - Make sure that all circuit connections are securely fixed.
 - Do not touch the circuit boards directly with your hands.
 - Integrated circuit boards may experience malfunctions due to electrostatic discharge.
 - The robot's electric cabinet should not be opened or accessed by users.
 - If the customer's power supply is unstable, it is recommended for the customer to purchase additional equipment such as an UPS and connect it to the robot. This will protect the controller and ensure stable operation, avoiding the loss of system files.
 - After connecting the robot control cabinet to external devices, arrange the cables (including but not limited to IO cables, network cables) properly to avoid tripping hazards or equipment damage.
-
- The system must be electrically grounded to avoid fire, electric shock and bodily injury.
 - Turn off the main power switch prior to wiring and inspection to avoid electric shock and bodily injury.
 - Be sure to turn off the main power supply for at least 5 minutes prior wiring and inspection. There may be residual high-voltage inside the control cabinet even if power off. Therefore, never touch the power terminals.
 - The main power supply cannot be powered on when the cabinet door is not closed, this is because the safety interlock so mounted would prevent the main power supply from powering on.
 - The electric control cabinet is in E-stop mode when wiring, and any matters incurred shall be under the responsibility of users. Operation inspection shall be performed once the wiring is done.
 - Avoid frequently turning the main power on and off for the electric cabinet, and ensure that the time interval between each power cycle is at least 1 minute.
 - The robot's electric cabinet is a dedicated control device designed with power capacity considerations for only a minimal amount of external I/O requirements. Therefore, it is not allowed for users to connect external power sources, including but not limited to additional axes, and definitely not to connect power strips. Doing so may result in fault alarms or even cause a fire in the electric cabinet.

Before connecting the power line of the robot control cabinet to the grid terminal, it is recommended to connect it to a circuit breaker or disconnector first to prevent short circuits from affecting other equipment. The power supply wiring diagram for the robot control cabinet is shown below:

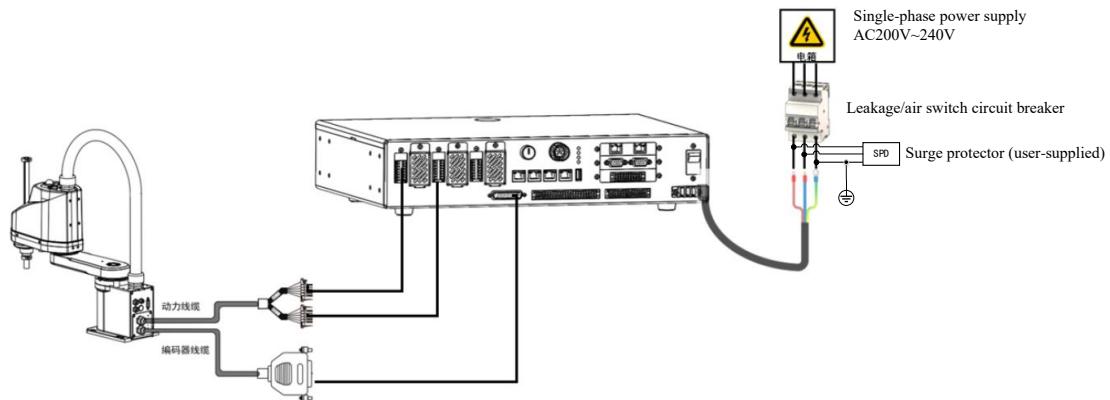


Figure 3-1 Single Control Cabinet Power Wiring Diagram

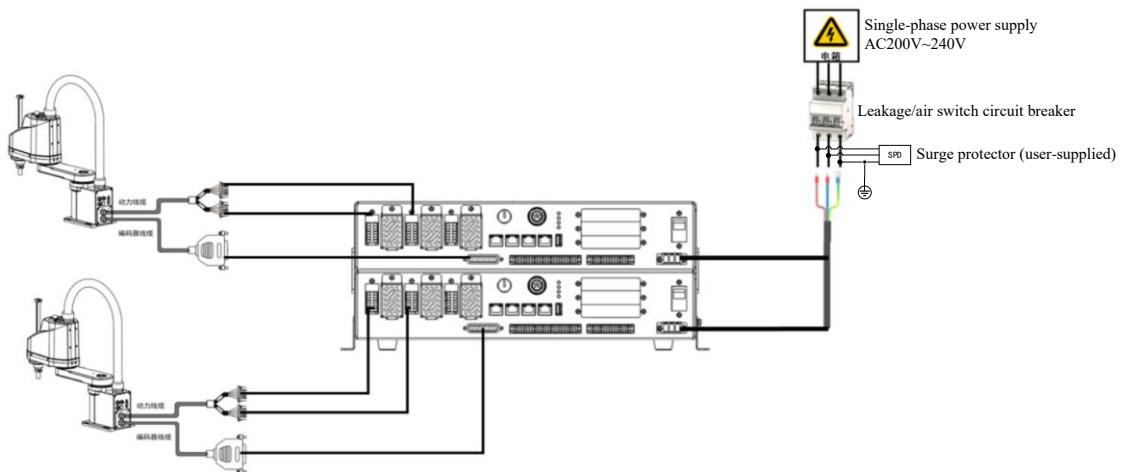


Figure 3-2 Two Control Cabinets Connected in Parallel to One Circuit Breaker

3.1.1 Selection of circuit breaker/air switch

The robot's motion trajectory involves a repetitive acceleration-deceleration process. As a result, the control cabinet experiences repetitive instances of high transient current in its input. This imposes specific requirements on the rated current and type of upstream circuit breakers or disconnectors. Additionally, being a frequency-controlled industrial device, the design and operational principles of the robot control cabinet inherently lead to a certain level of leakage current.

1. Selection of circuit breaker/air switch with leakage protector

- It is recommended to configure each robot control cabinet with a separate 10A, D-type circuit breaker or air switch. The leakage protector should have a sensitivity current of $\geq 30\text{mA}$ and be of type B residual current device (RCD).
- If two robot control cabinets share one circuit breaker or air switch, use a 20A, D-type circuit breaker or air switch with a leakage protector of $\geq 30\text{mA}$ sensitivity current. No other electrical equipment should be connected under this leakage protector to prevent additional leakage currents that could cause a total leakage current above 30mA and result in a trip.
- If connecting multiple devices under one circuit breaker or air switch with a leakage protector, the current value and leakage current protection value of the air switch or circuit breaker should be multiplied based on the configuration value of a single unit.

2. Selection of circuit breaker/air switch without leakage protector

- a) It is recommended to configure each robot control cabinet with a separate 10A, D-type air switch or circuit breaker.
- b) If two robot control cabinets share one air switch or circuit breaker, use a 20A, D-type air switch or circuit breaker.
- c) When connecting multiple devices under one circuit breaker or air switch, multiply the current value of the circuit breaker or air switch based on the configuration value of a single unit.

3.1.2 Power Cable Selection

ESTUN control cabinets are not equipped with input power cables. Users need to provide their wiring or purchase from ESTUN. When choosing cables, comply with the relevant safety standards. The recommended cable specifications are as follows.

Model	Wire Gauge	
	AWG	Cross-sectional Area (mm ²)
ERC3-C1-X1A4		
ERC3-C1-X1B4		
ERC3-C1-X1C4	13	2.5
ERC3-C1-X1B6		
ERC3-C1-X1C6		

3.2 External Interface Description

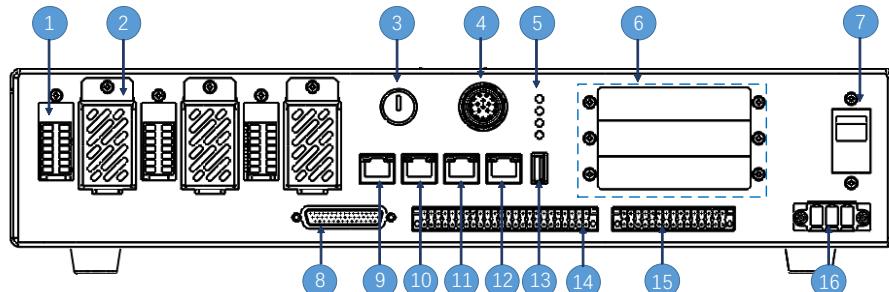


Figure 3-3 External Interfaces

S/N	Name	Description
1	Power line interface	Motor power cable interface for each axis of the robot. One interface corresponds to 2 axes (3 interfaces for 6 axes; 2 interfaces for 4 axes).
2	Air cooling inlet	The air cooling inlet of control cabinet, can be fitted with filter cotton (optional)
3	Mode selector switch	The key switch for robot control mode: Left rotation for Auto mode, right rotation for Manual mode
4	Teach pendant interface	Cable interface for the robot's teach pendant.
5	LED	System status indication (refer to LED instructions).

S/N	Name	Description
6	Expansion card slots 1, 2, 3	<p>Expansion card interfaces</p> <p>Users can select and install different types of expansion cards according to their needs. The types of expansion cards include:</p> <ul style="list-style-type: none"> • 16-channel digital input expansion card • 16-channel NPN type digital output expansion card • 16-channel PNP type digital output expansion card • ABZ expansion card • Ethernet port conversion expansion card <p>For specific configurations of expansion cards and installation methods, refer to "4.1 Instructions for Expansion Card Slots".</p>
7	Power switch	Power switch for the robot control cabinet, used to turn the power ON/OFF.
8	Encoder interface	Motor encoder cable interface for each axis of the robot, used to collect robot position signals. Connects to the robot body using dedicated cables.
9	Ethernet1 interface	Connects to Ethernet slaves, acting as a virtual teach pendant interface
10	EtherCAT interface	Connects to EtherCAT slaves, used for connecting external servo axes or other IO modules
11	Ethernet2 interface	Connects to Ethernet slaves
12	Ethernet3 interface	Connects to Ethernet slaves, used for connecting to the VNC interface
13	USB interface	Used for controller data transmission or connecting peripherals
14	Standard IO interface	<p>Standard user DI/DO provided by the control cabinet, used for signal connection between external devices and the control cabinet</p> <p>System IO consists of 6 DI and 7 DO, while user IO consists of 14 DI and 13 DO.</p>
15	Safety IO interface	Used for connecting external safety signals such as E-stop and safety door signals
16	Power interface	Single-phase AC 220V power input from the external power grid

3.3 Connection Diagram

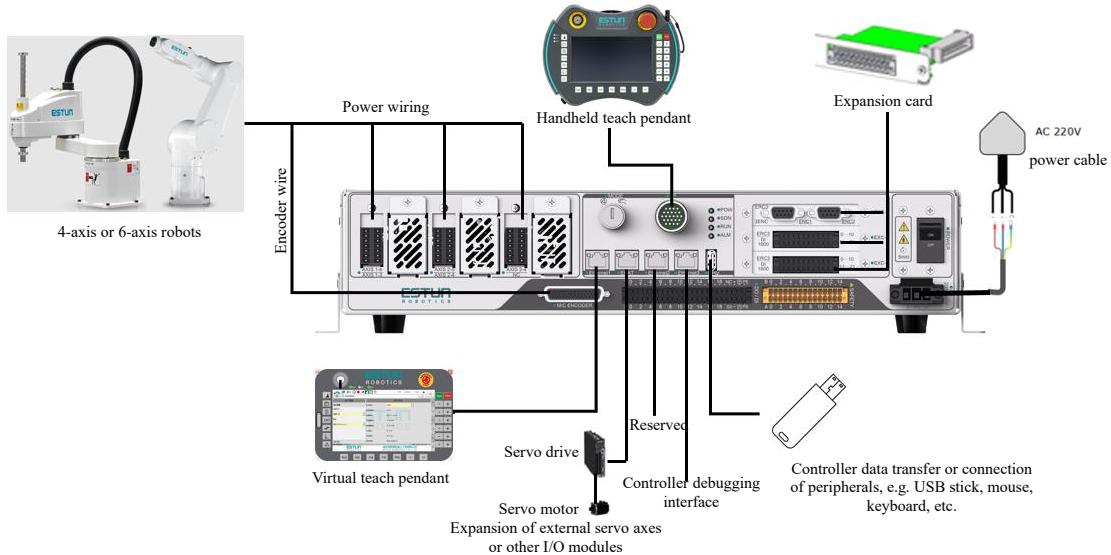


Figure 3-4 Connection Diagram

3.4 Power supply wiring

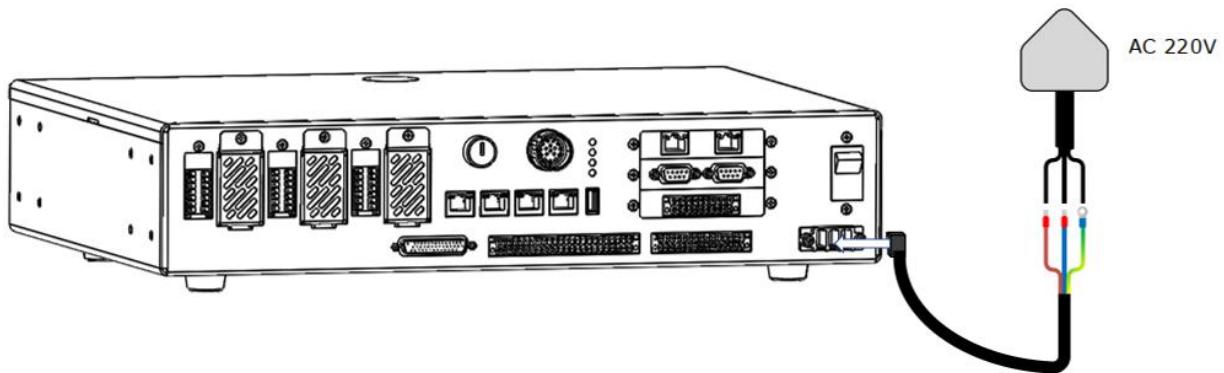


Figure 3-5 Power Supply Wiring Diagram

The control cabinet uses single-phase AC 220V power. Follow the diagram below for power line preparation and correct wiring.

Diagram	Pin	Color	Description
	L	Brown	Single-phase power wiring
	N	Blue	
	PE	Blue-green	Safe ground wiring

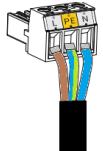
Wiring steps:

Check the markings and precautions on the control cabinet power input terminal and wiring terminal before wiring. Strictly adhere to relevant operating standards.

Step 1 Take out the input terminals from the accessory kit.



Step 2 Insert the three wires of the power line into the input terminal according to the terminal markings (from left to right: L/PE/N), and tighten securely.



Step 3 After completing the power line connection, insert the input terminals into the power input terminal on the control cabinet.



When wiring the power supply, strictly follow the L/PE/N sequence to avoid misconnection, which could lead to short circuits and electric shock hazards.

3.5 LED Explanation

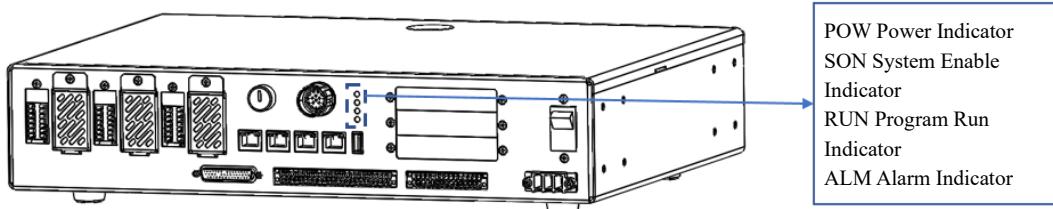


Figure 3-6 LED Illustration

There are four LEDs on the control cabinet representing different operational states, with the following explanations:

LED Name	Status	Explanation
Power (POW)	● POW	OFF: Control cabinet is not powered or malfunctioning.
	● POW	Flash: Control cabinet is powered.
	● POW	ON: Main power is connected for the control cabinet.
System Enable (S-ON)	● S-ON	OFF: System is not enabled.
	● S-ON	ON: System is enabled or in running state.
Program Run (RUN)	● RUN	OFF: No program is running.
	● RUN	ON: Program is running.
Alarm (ALM)	● ALM	OFF: No alarm is triggered by the system.
	● ALM	ON: Alarm has been triggered by the system.

3.6 Power Wiring

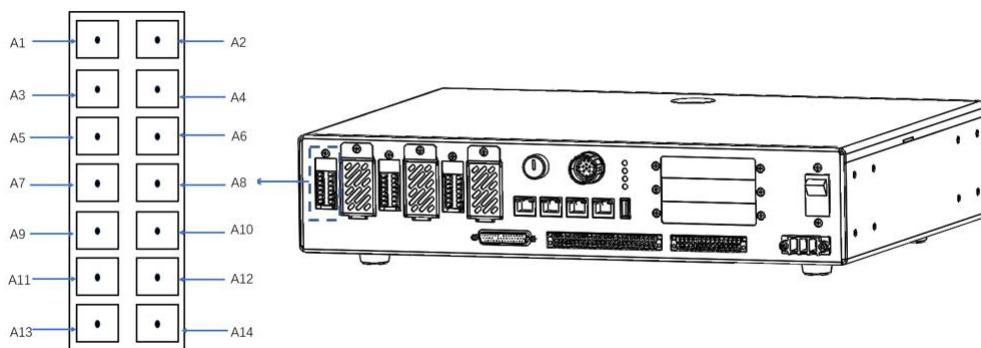


Figure 3-7 Power Wiring Interface Diagram

3.6.1 Power line interface explanation

The encoder and power cables connecting the mechanical body and the controller have connection markings. Please connect the cables according to the markings of Axis1&6, Axis2&5, Axis3&4 (or Axis1&3, Axis2&4), and do not connect them incorrectly, as this may cause damage, which may prevent the robot system from working properly, and may also cause serious safety problems.

ERC3-C1-X1A4/B4 Small/Medium Power 4-Axis Power Interface

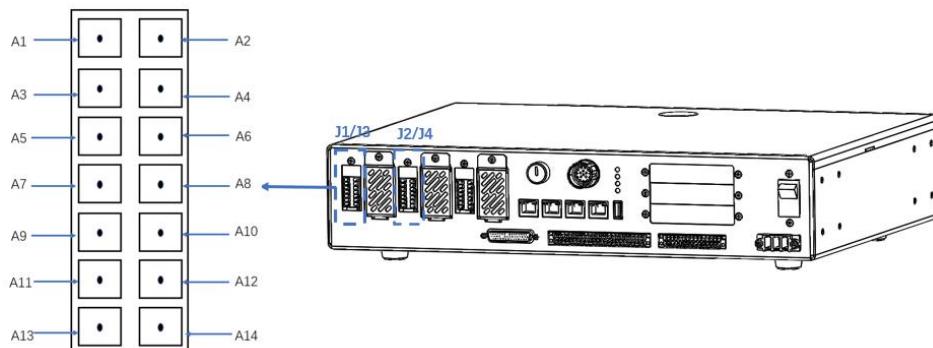


Figure 3-8 ERC3-C1-X1A4/B4 power interface

Interface Illustration	Pin	Definition	Description	Pin	Definition	Description
	A1	U1	Axis-J1 motor power line	A3	U3	Axis-J3 motor power line
	A2	V1		A5	V3	
	A4	W1		A6	W3	
	A7	/	Not defined	A8	/	Not defined
	A9	PE	Protective ground wire	A10	LT+	Body LED
	A11	BK_+1	Axis-J1 Brake wire positive terminal	A12	24V_BK	24V brake power supply positive terminal
	A13	BK_+3	Axis-J3 Brake wire positive terminal	A14	GND_BK	Brake power supply/ brake wire negative terminal

Interface Illustration	Pin	Definition	Description	Pin	Definition	Description
	B1	U2	Axis-J2 motor power line	B3	U4	Axis-J4 motor power line
	B2	V2		B5	V4	
	B4	W2		B6	W4	
	B7	/	Not defined	B8	/	Not defined
	B9	PE	Protective ground wire	B10	LT+	Body LED
	B11	BK_+2	Axis-J2 Brake wire positive terminal	B12	24V_BK	24V brake power supply positive terminal
	B13	BK_+4	Axis-J4 Brake wire positive terminal	B14	GND_BK	Brake power supply/ brake wire negative terminal

ERC3-C1-X1C4 High-Power 4-Axis Power Interface

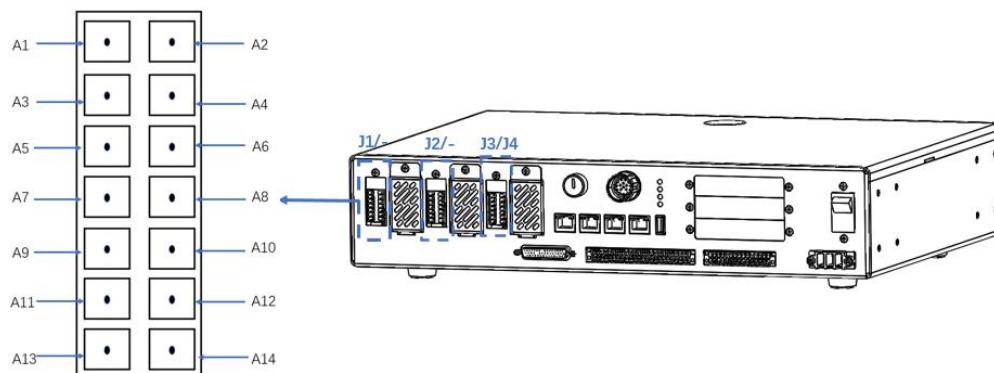
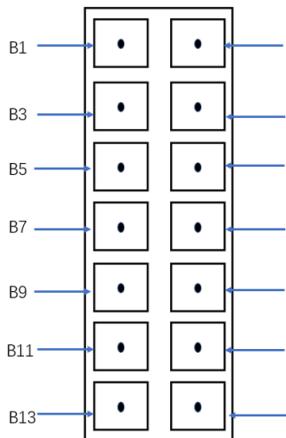
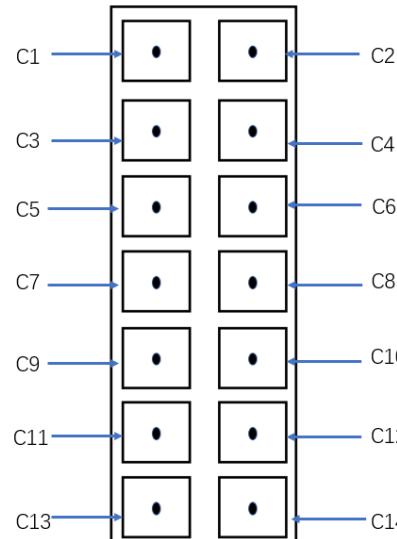


Figure 3.9 ERC3-C1-X1C4 power interface

Interface Illustration	Pin	Definition	Description	Pin	Definition	Description
	A1	U1	Axis-J1 motor power line	A3	Not defined	/
	A2	V1		A5	Not defined	
	A4	W1		A6	Not defined	
	A7	/	Not defined	A8	/	Not defined
	A9	PE	Protective ground wire	A10	LT+	Body LED
	A11	BK_+1	Axis-J1 Brake wire positive terminal	A12	24V_BK	24V brake power supply positive terminal
	A13	Not defined	/	A14	GND_BK	Brake power supply/ brake wire negative terminal

Interface Illustration	Pin	Definition	Description	Pin	Definition	Description
	B1	U2	Axis-J2 motor power line	B3	Not defined	/
	B2	V2		B5	Not defined	
	B4	W2		B6	Not defined	
	B7	/	Not defined	B8	/	Not defined
	B9	PE	Protective ground wire	B10	LT+	Body LED
	B11	BK_+2	Axis-J2 Brake wire positive terminal	B12	24V_BK	24V brake power supply positive terminal
	B13	Not defined	/	B14	GND_BK	Brake power supply/ brake wire negative terminal
Interface Illustration	Pin	Definition	Description	Pin	Definition	Description
	C1	U3	Axis-J3 motor power line	C3	U4	Axis-J4 motor power line
	C2	V3		C5	V4	
	C4	W3		C6	W4	
	C7	/	Not defined	C8	/	Not defined
	C9	PE	Protective ground wire	C10	LT+	Body LED
	C11	BK_+3	Axis-J3 Brake wire	C12	24V_BK	24V brake power supply positive terminal
	C13	BK_+4	Axis-J4 brake wire	C14	GND_BK	Brake power supply/ brake wire negative terminal

ERC3-C1-X1B6 Medium Power 6-Axis Power Interface

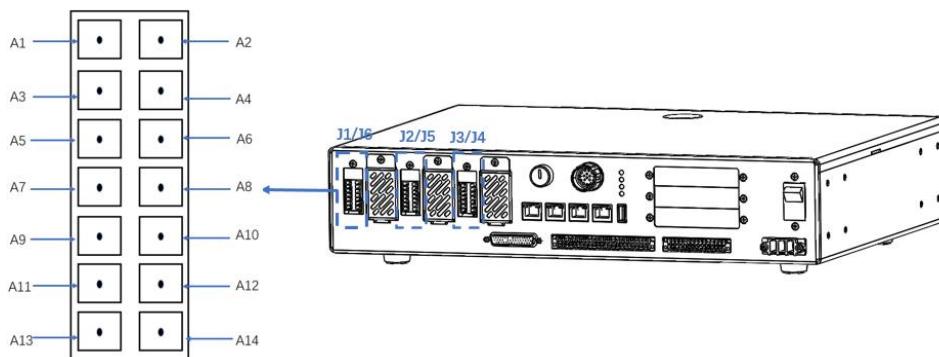


Figure 3-10 ERC3-C1-X1B6 power interface

Interface Illustration	Pin	Definition	Description	Pin	Definition	Description
	A1	U1	Axis-J1 motor power line	A3	U6	Axis-J6 motor power line
	A2	V1		A5	V6	
	A4	W1		A6	W6	
	A7	/	Not defined	A8	/	Not defined
	A9	PE	Protective ground wire	A10	LT+	Body LED
	A11	BK_+1	Axis-J1 Brake wire positive terminal	A12	24V_BK	24V brake power supply positive terminal
	A13	BK_+6	Axis-J6 brake wire positive terminal	A14	GND_BK	Brake power supply/ brake wire negative terminal
Interface Illustration	Pin	Definition	Description	Pin	Definition	Description
	B1	U2	Axis-J2 motor power line	B3	U5	Axis-J5 motor power line
	B2	V2		B5	V5	
	B4	W2		B6	W5	
	B7	/	Not defined	B8	/	Not defined
	B9	PE	Protective ground wire	B10	LT+	Body LED
	B11	BK_+2	Axis-J2 brake wire positive terminal	B12	24V_BK	24V brake power supply positive terminal
	B13	BK_+5	Axis-J5 brake wire positive terminal	B14	GND_BK	Brake power supply/ brake wire negative terminal
Interface Illustration	Pin	Definition	Description	Pin	Definition	Description
	C1	U3	Axis-J3 motor power line	C3	U4	Axis-J4 motor power line
	C2	V3		C5	V4	
	C4	W3		C6	W4	
	C7	/	Not defined	C8	/	Not defined
	C9	PE	Protective ground wire	C10	LT+	Body LED
	C11	BK_+3	Axis-J3 brake wire positive terminal	C12	24V_BK	24V brake power supply positive terminal
	C13	BK_+4	Axis-J4 brake wire positive terminal	C14	GND_BK	Brake power supply/ brake wire negative terminal

ERC3-C1-X1C6 High-Power 6-Axis Power Interface

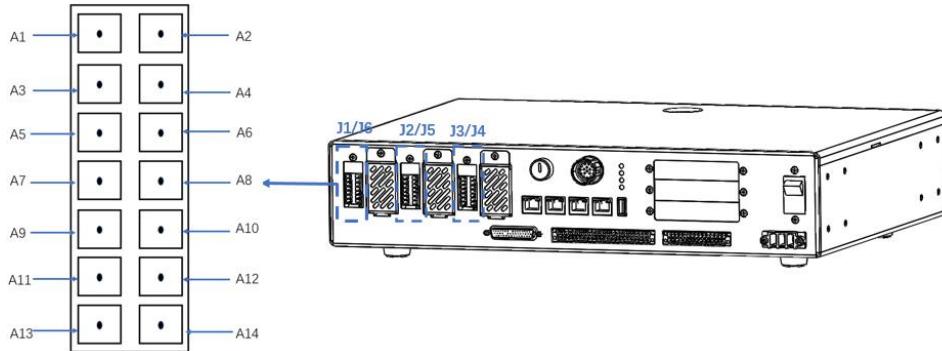


Figure 3-11 ERC3-C1-X1B6 power interface

Interface Illustration	Pin	Definition	Description	Pin	Definition	Description
 A1 → J1/J6 A2 → J2/J5 A3 → J3/J4 A4 → J1/J6 A5 → J2/J5 A6 → J3/J4	A1	U1	Axis-J1 motor power line	A3	U6	Axis-J6 motor power line
	A2	V1		A5	V6	
	A4	W1		A6	W6	
	A7	/		A8	/	
	A9	PE		A10	LT+	
	A11	BK_+1		A12	24V_BK	
 A1 → J1/J6 A2 → J2/J5 A3 → J3/J4 A4 → J1/J6 A5 → J2/J5 A6 → J3/J4	A11	Axis-J1 Brake wire positive terminal		A13	BK_+6	
	A13	BK_+6		A14	GND_BK	Brake power supply/ brake wire negative terminal
Interface Illustration	Pin	Definition	Description	Pin	Definition	Description
 B1 → J1/J6 B2 → J2/J5 B3 → J3/J4 B4 → J1/J6 B5 → J2/J5 B6 → J3/J4	B1	U2	Axis-J2 motor power line	B3	U5	Axis-J5 motor power line
	B2	V2		B5	V5	
	B4	W2		B6	W5	
	B7	/		B8	/	
	B9	PE		B10	LT+	
	B11	BK_+2		B12	24V_BK	
 B1 → J1/J6 B2 → J2/J5 B3 → J3/J4 B4 → J1/J6 B5 → J2/J5 B6 → J3/J4	B13	BK_+5		B14	GND_BK	Brake power supply/ brake wire negative terminal

Interface Illustration	Pin	Definition	Description	Pin	Definition	Description
	C1	U3	Axis-J3 motor power line	C3	U4	Axis-J4 motor power line
	C2	V3		C5	V4	
	C4	W3		C6	W4	
	C7	/		C8	/	Not defined
	C9	PE		C10	LT+	Body LED
	C11	BK_+3		C12	24V_BK	24V brake power supply positive terminal
	C13	BK_+4		C14	GND_BK	Brake power supply/ brake wire negative terminal

3.6.2 Power line wiring

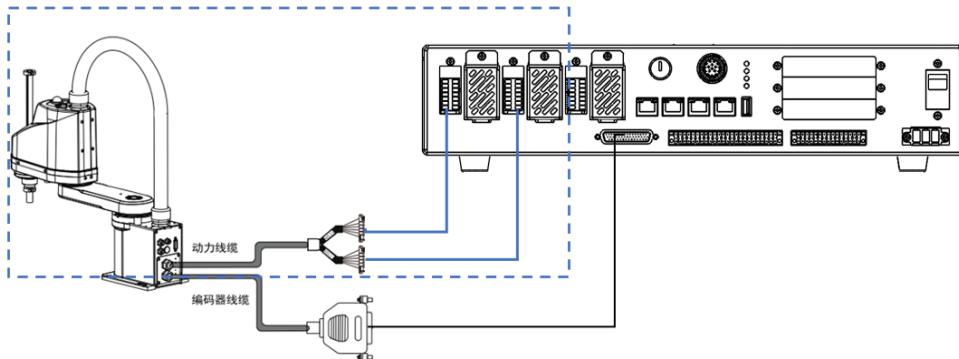


Figure 3-12 Small/Medium Power 4-Axis Robot Power Wiring (ERC3-C1-X1C4, ERC3-C1-X1B4)

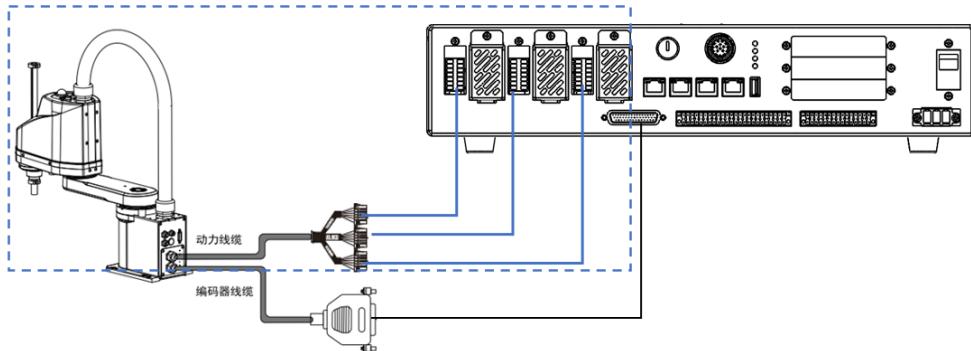


Figure 3-13 6-Axis/High-Power 4-Axis Robot Power Wiring (ERC3-C1-X1C4, ERC3-C1-X1B6, ERC3-C1-X1C6)

3.7 Encoder wiring

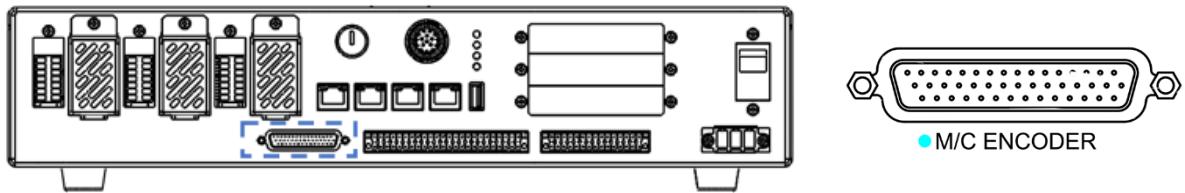


Figure 3-14 Encoder Interface

3.7.1 Connection diagram

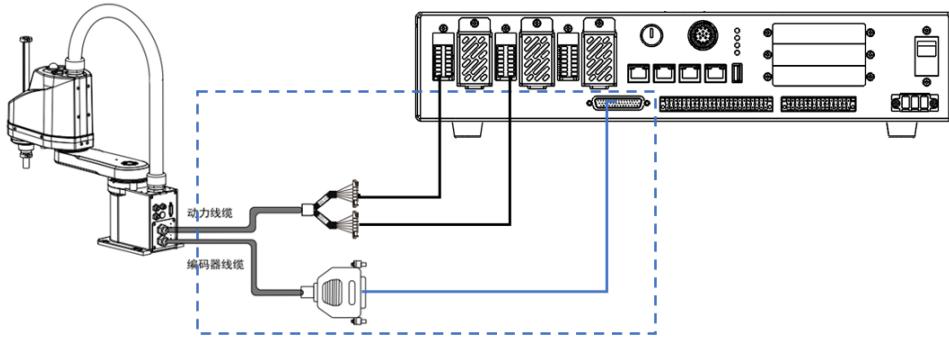


Figure 3-15 Encoder Wiring Diagram

3.7.2 Encoder interface explanation

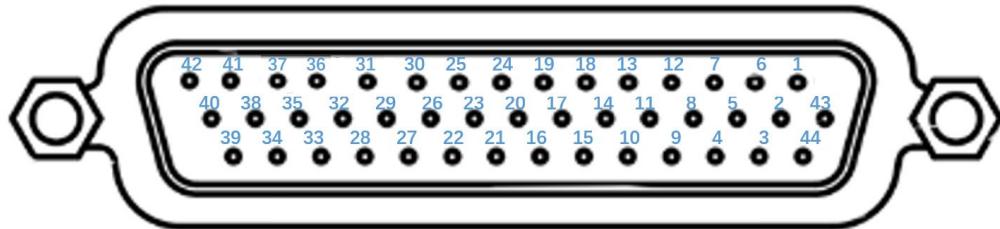


Figure 3-16 Encoder Interface Explanation

Pin	Definition	Description	Pin	Definition	Description
1	S1 +	J1-axis motor encoder wiring	19	S4 +	J4-axis motor encoder wiring
2	S1 -		20	S4 -	
3	VCC_ENC_J1		21	VCC_ENC_J4	
4	GND_ENC_J1		22	GND_ENC_J4	
5	CLK1+		23	CLK4+	
6	CLK1-		24	CLK4-	
7	S6 +	J6-axis motor encoder wiring	25	S5 +	J5-axis motor encoder wiring
8	S6 -		26	S5 -	
9	VCC_ENC_J6		27	VCC_ENC_J5	
10	GND_ENC_J6		28	GND_ENC_J5	

Pin	Definition	Description	Pin	Definition	Description
11	CLK6+	J3-axis motor encoder wiring	29	CLK5+	J2-axis motor encoder wiring
12	CLK6-		30	CLK5-	
13	S3 +		31	S2 +	
14	S3 -		32	S2 -	
15	VCC_ENC_J3		33	VCC_ENC_J2	
16	GND_ENC_J3		34	GND_ENC_J2	
17	CLK3+		35	CLK2+	
18	CLK3-		36	CLK2-	
37-42	NC	/	/	/	/

3.8 Teach pendant wiring

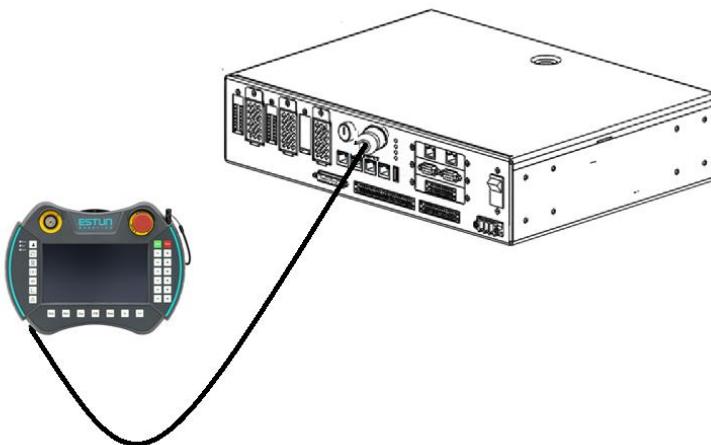


Figure 3-17 Teach Pendant Wiring Diagram

3.8.1 Precautions for using teach pendant

1. Handle with care and avoid dropping, throwing, or striking the teach pendant, as this may cause damage or malfunction. When not in use, hang it on the dedicated holder to prevent accidental dropping;
2. Do not use sharp objects such as screws, knives, or pen tips to operate the touch screen. This may damage the touch screen. Use your fingers or a stylus pen to operate the touch screen;
3. When no USB devices are connected, make sure to cover the USB ports with protective caps to avoid exposing them to dust, which could cause interruptions or failures;
4. When using USB plugs, do not apply excessive force. Normal use is sufficient;
5. If the USB is not recognized, unplug the USB drive, power off, and then plug it back in after powering on;
6. When using the E-stop button or key, do not apply excessive force. Normal use is sufficient;
7. The power-on time is 40 S for the system to start up properly. Do not power off prematurely to avoid file loss;
8. Connect or disconnect the teach pendant when the control cabinet is powered off. It is prohibited to connect or disconnect the teach pendant while the control cabinet is powered on, as this may result in damage to the controller or the teach pendant.
9. When storing cables, do not place them under heavy machinery to avoid crushing, cutting, or pulling them apart;
10. Follow our defined wiring guidelines to avoid connection errors and potential issues;
11. The teach pendant is not explosion-proof. Do not use it in explosive environments or work units;
12. Keep the teach pendant away from water, oil, and similar environments;

13. The ERC3-C1 control cabinet is only compatible with the T76 model of teach pendant and cannot be paired with the T72 model.

14. To release the E-stop, lift the E-stop button upward or rotate the button to release it. Avoid excessive rotation or pausing during rotation, as this may cause abnormal dual-channel detection of the system, and trigger alarm codes A112/A113. In the event of abnormal alarms A112/A113 during non-routine operations, manually clear the alarm for normal operation.

15. To correctly use the teach pendant push button, support the bottom of the teach pendant with the palm of the left hand and simultaneously press the middle position of the teach pendant with two fingers of the left hand. For ease of operation, the push button is designed as a rectangle. Using only one finger to apply force at the upper or lower end of the rectangle may result in failure to close one set of contacts, triggering alarm codes A11A/A11B. In the event of alarms A11A/A11B during non-routine operations, manually clear the alarm for normal operation.

16. When switching between Manual and Auto modes using the mode switch on the control cabinet, do not pause in the middle position during the switch. The middle position of the mode switch is the critical point for mechanical contact closure. Pausing at this position may cause alarm codes A116/A117. In the event of abnormal alarms A116/A117 during non-routine operations, manually clear the alarm for normal operation.

17. If frequent switching between manual and automatic modes is required during testing, wait for 5 seconds after switching from manual to automatic mode for the system self-check to complete before switching back to manual mode. Rapid and frequent switching between manual and automatic modes may cause alarm code A1F due to incomplete self-checks. This is a normal phenomenon, and power cycling will resolve the issue.

18. In manual mode, if frequent pressing of the teach pendant button is required, wait for 5 seconds after pressing the button before releasing it, to allow time for the system self-check to complete. Rapid and frequent switching between Manual and Auto modes may cause alarm code A1F due to incomplete self-checks. This is a normal phenomenon, and power cycling will resolve the issue

3.8.2 Teach pendant interface description

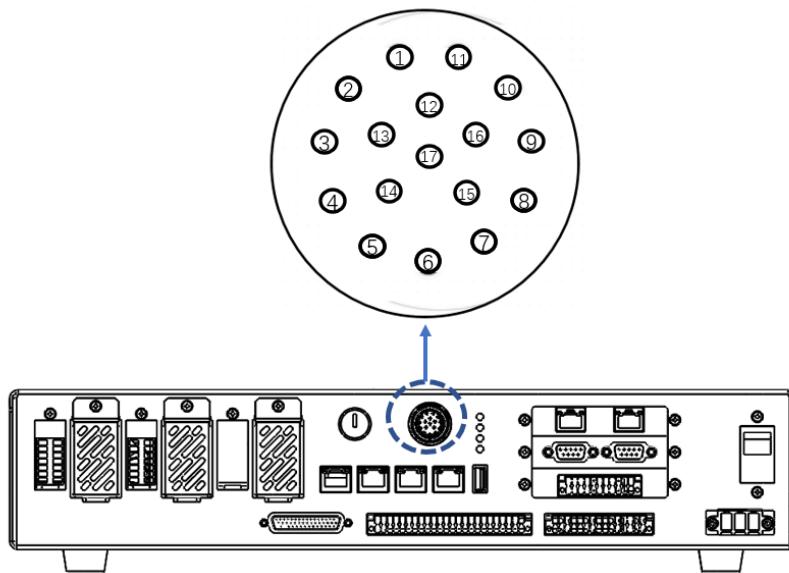


Figure 3-18 Teach Pendant Interface Description

Table 3-1 Teach Pendant Pin Descriptions

Pin	Definition	Description	Pin	Definition	Description
1	TP_24V	Teach pendant 24V power supply pin	10	TP_SEL1	/
2	TP_0V	Teach pendant 0V pin	11	TP_SEL2	/
3	TP_ES1+	E-stop 1+	12	TP_EN2+	Teach pendant enable 2+
4	TP_ES1-	E-stop 1-	13	TP_TX+	Teach pendant EtherNet transfer data+
5	TP_ES2+	E-stop 2+	14	TP_RX-	Teach pendant EtherNet transfer data-
6	TP_ES2-	E-stop 2-	15	TP_RX+	Teach pendant EtherNet transfer data+

Pin	Definition	Description	Pin	Definition	Description
7	TP_EN1+	Teach pendant enable 1+	16	TP_RX-	Teach pendant EtherNet transfer data-
8	TP_EN1-	Teach pendant enable 1-	17	TP_EN2-	Teach pendant enable 2-
9	24V-IO	24V power supply pin	/	/	/

3.8.3 Teach pendant specifications

Name	Details
Processor	A40I Quad-core 1.2GHz, DDRIII 512M
Memory/storage	EMMC 8G
LCD screen	TFT 7 Inch 800*480
Touch screen	4-wire resistive screen
Operating system	Linux
External USB	2.0*1
LED	LEDs: 3
Communication	Ethernet (100M)
Accessories	E-stop; Key switch (two gears); Enable switch (three positions)
Display color quality	16-bit color
Power consumption	24V 1A
Adapter power model	DC24V 1A or higher
Casing material/color	ABS/PC; BLACK/GRAY
Operating environment	Operating temperature: -10°C~50°C
Storage temperature	-20°C~60°C

3.8.4 Appearance of teach pendant

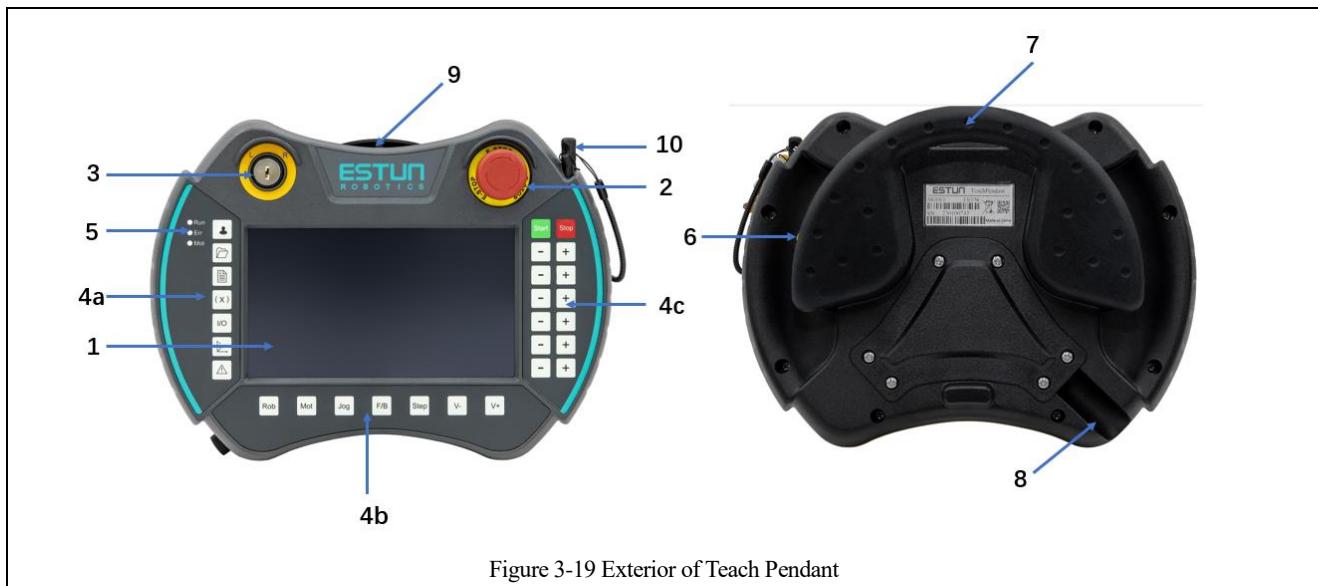


Table 3-2 Exterior of Teach Pendant

S/N	Description
1	Display
2	E-stop Button
3	Mode Selector Switch
4a, 4b, 4c	Global Function Button
5	Status LED
6	Enable Switch
7	Suspension Handle
8	Cable Access Area
9	USB Slot
10	Stylus Pen

3.9 IO Wiring

This section provides an overview of the DI/DO interfaces of the standard control cabinet, which includes 20 DIs and 20 DOs by default. The system occupies 6 DIs (X0~X5) and 7 DOs (Y0~Y6), while the user can define the usage of the remaining 14 DIs (X6~X19) and 13 DOs (Y7~Y19).

If there are insufficient inputs and outputs, the IO can be expanded using an expansion card, as described in the [\(Optional\) Expansion Cards](#) section.



Figure 3-20 Standard IO Connector

3.9.1 DI wiring

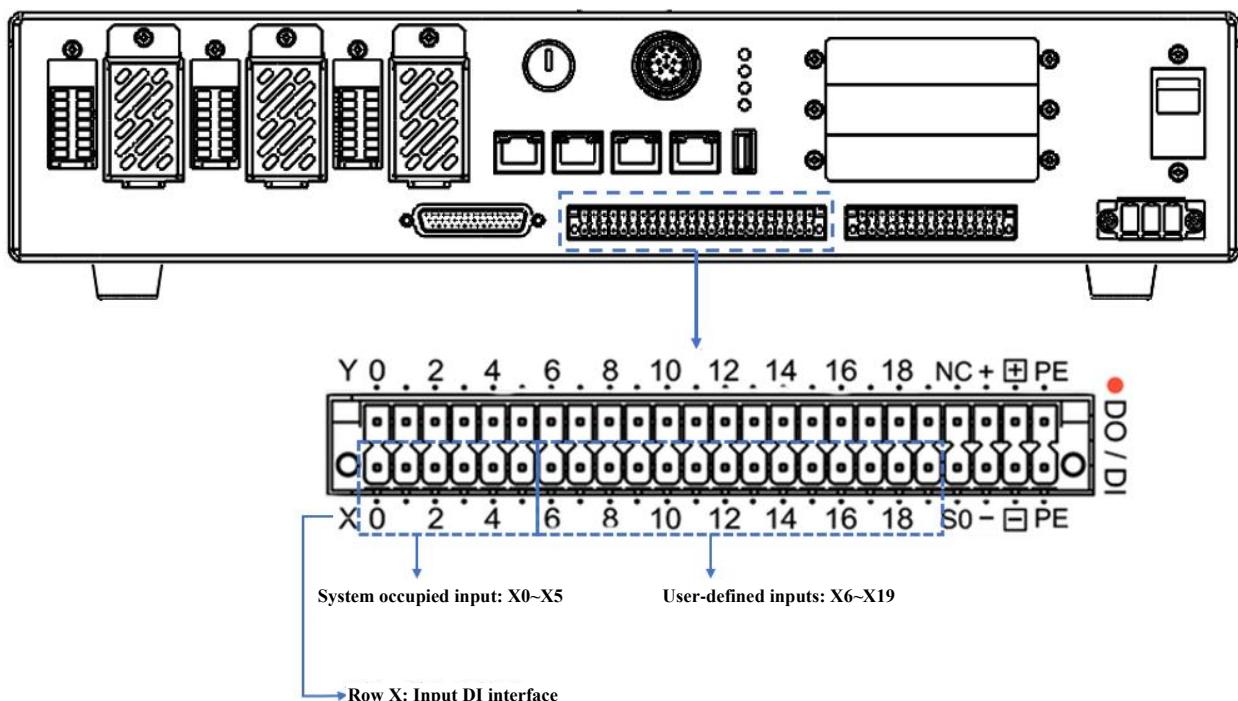


Figure 3-21 DI Interface

DI Port Specifications

Item	Spec.
Number of input channels	20 channels (standard) System occupied inputs: 6 channels, X0~X5 User-defined inputs: 14 channels, X6~X19
Input connection method	Crimp type terminal
Input voltage range	19.2~28.8VDC
Input current (24VDC)	Approximately 4.85mA
Max. input voltage	30VDC
ON voltage	18~30VDC
OFF voltage	0~5VDC
Max. input signal frequency	1kHZ
Input impedance	> 4.7K
Isolation method	Opto-coupler isolation
DI type	NPN/PNP

DI Interface Definitions

Pin	Definition	Teach Pendant Label	Description	Remarks
X0	Special pin: Pause	Teach Pendant DI3	DI_remoteStop	Pause robot program in remote mode with

Pin	Definition	Teach Pendant Label	Description	Remarks
				high-level trigger
X1	Special pin: Alarm reset	Teach Pendant DI7	DI_remoteResetErr	Reset robot alarm on rising edge in remote mode
X2	Special pin: Run	Teach Pendant DI6	DI_remoteStart	Run robot program on rising edge in remote mode
X3	Special pin: Spare	/	/	Reserved, not available to users.
X4	Special pin: Reload the self-starting program	Teach Pendant DI9	DI_remoteLoadProg	Reload auto-start program in remote mode
X5	Special pin: Exit	Teach Pendant DI10	DI_exitCycle	Exit current program in remote mode, jump to specified line in main program
X6	General input 6	Teach Pendant DI11	/	/
X7	General input 7	Teach Pendant DI12	/	/
X8	General input 8	Teach Pendant DI13	/	/
X9	General input 9	Teach Pendant DI14	/	/
X10	General input 10	Teach Pendant DI15	/	/
X11	General input 11	Teach Pendant DI16	/	/
X12	General input 12	Teach Pendant DI17	/	/
X13	General input 13	Teach Pendant DI18	/	/
X14	General input 14	Teach Pendant DI19	/	/
X15	General input 15	Teach Pendant DI20	/	/
X16	General input 16	Teach Pendant DI21	/	/
X17	General input 17	Teach Pendant DI22	/	/
X18	General input 18	Teach Pendant DI23	/	/
X19	General input 19	Teach Pendant DI24	/	/
S0	X0-X19 common	/	/	
-	0V_E, 0V for external input power	/	/	/
<input checked="" type="checkbox"/>	0V, 0V for external input power	/	/	
PE	Grouding point, for shielded cable grounding	/	/	/

Note: DI1-DI10 on the oscillator ports are occupied by the system, and ports with dedicated pins noted in the table above are not available to the user.

DI Signal Wiring

Input DI signals can be connected using both common anode and common cathode methods, divided into signal pins X6-X19 and common terminal pin S0. The wiring method for extending DI output signals is the same as above.

Wiring Diagram

- When the upper device is open collector output:

(1) Common cathode method (upper device with NPN type output)

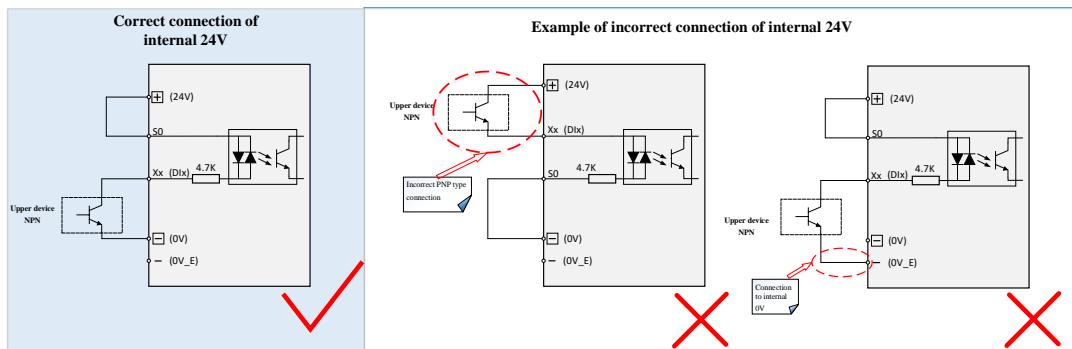


Figure 3-22 Using the internal 24V power supply (NPN type output for the upper device)

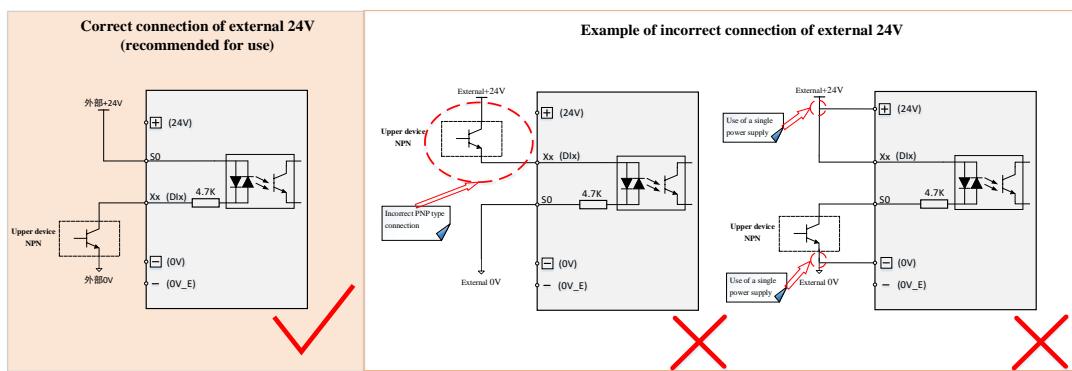


Figure 3-23 Using the external 24V power supply (NPN type output for the upper device)

(2) Common anode method (PNP type output)

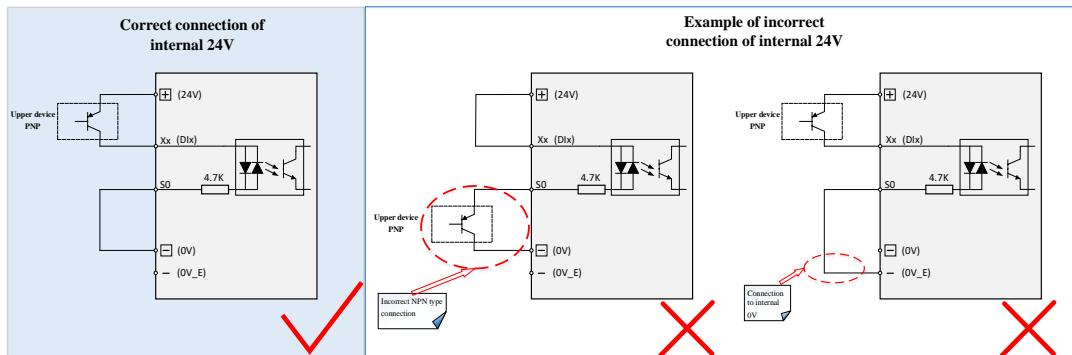


Figure 3-24 Using the internal 24V power supply (PNP type output for the upper device)

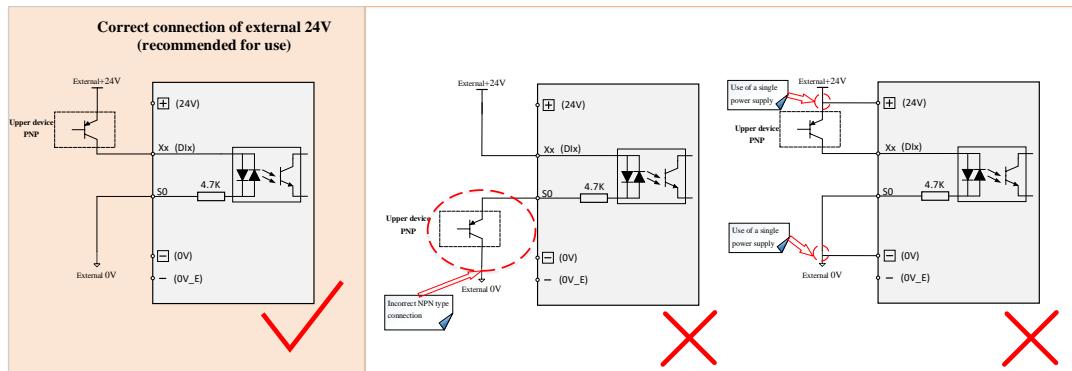


Figure 3-25 Using the external 24V power supply (PNP type output for the upper device)

- When the upper device is of relay output

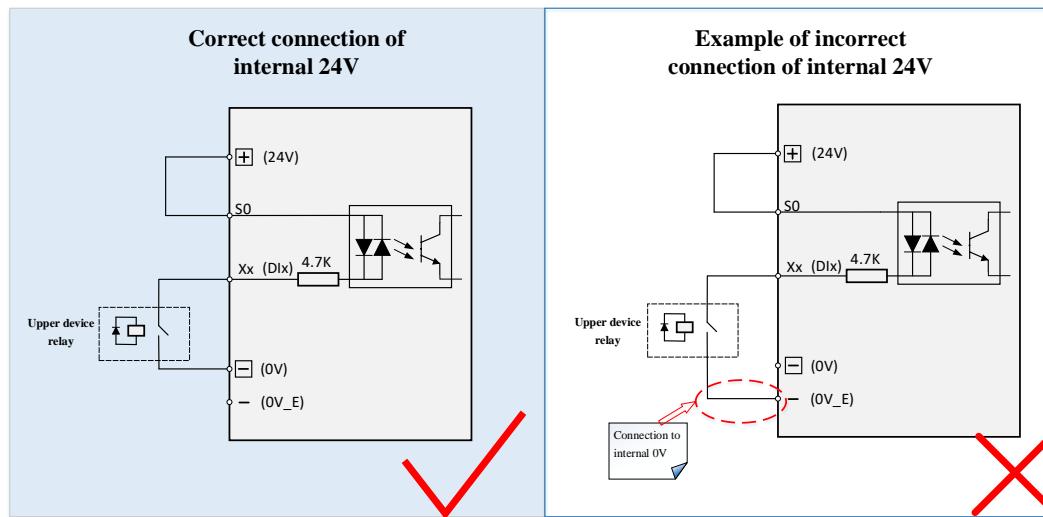


Figure 3-26 Using the internal 24V power supply (Upper device using relay output)

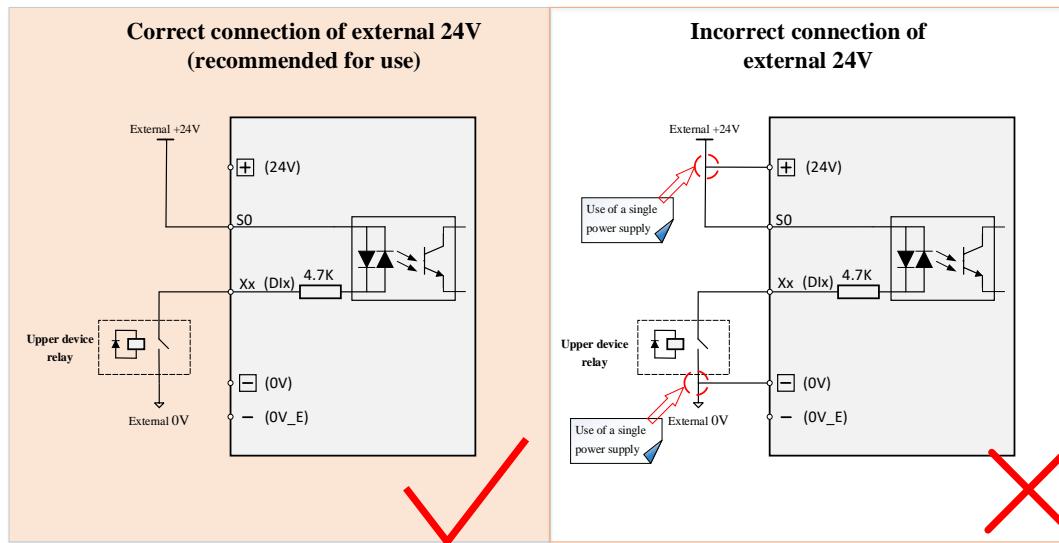


Figure 3-27 Using the External 24V Power Supply (upper device using relay output)

3.9.2 DO wiring

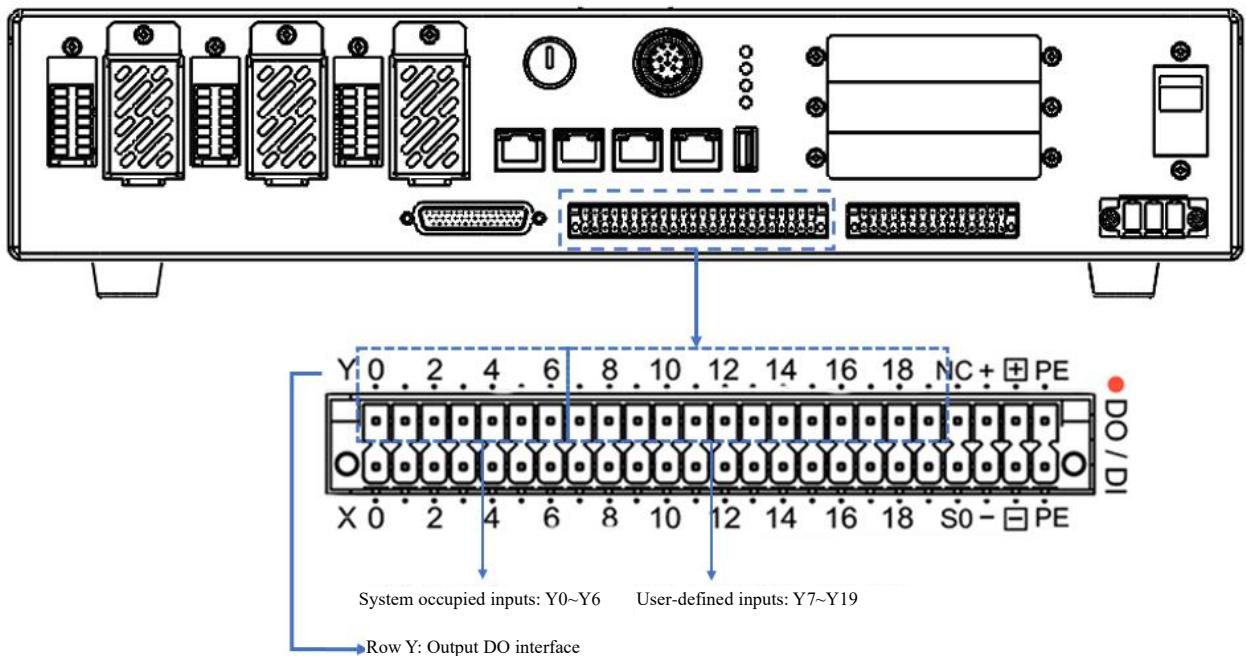


Figure 3-28 DO interface

DO Port Definitions

Item	Specifications
Number of output channels	20 channels (standard) System occupied inputs: 7 channels, Y0~Y6 User-defined inputs: 13 channels, Y7~Y19
Output connection method	Crimp type terminal
Output voltage range	19.2~28.8VDC
DO type	NPN
Max. drive current (24VDC)	300mA
Leakage current	Less than 200uA
Max. output signal frequency	1kHZ
Isolation method	Opto-coupler isolation

DO Port Definitions

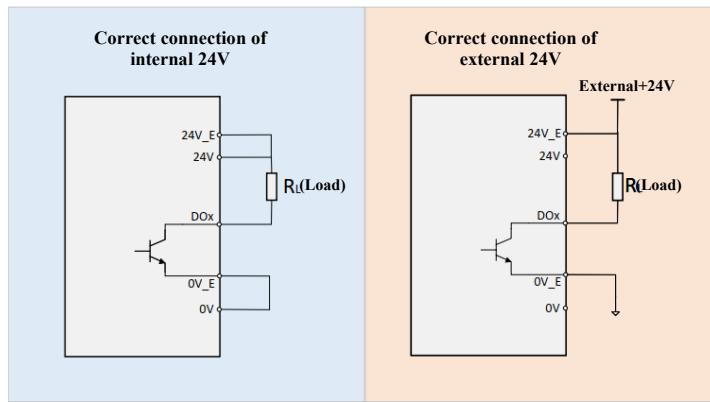
Pin	Definition	Teach Pendant Label	Description	Remarks
Y0	Special pin: System alarm	Teach Pendant DO2	DO_sysError	Output signal for system alarm

Pin	Definition	Teach Pendant Label	Description	Remarks
Y1	Special pin: Enable	Teach Pendant DO4	DO_robotMot	Output signal when enabling is completed
Y2	Special pin: Program run	Teach Pendant DO1	DO_progRun	Output signal for program running
Y3	Special pin: Safety door	/	/	/
Y4	Special pin: External E-stop	/	/	/
Y5	Special pin: Teach pendant E-stop	/	/	/
Y6	Special pin: Controller spare	/	/	/
Y7	General output 7	Teach Pendant DO9	/	/
Y8	General output 8	Teach Pendant DO10	/	/
Y9	General output 9	Teach Pendant DO11	/	/
Y10	General output 10	Teach Pendant DO12	/	/
Y11	General output 11	Teach Pendant DO13	/	/
Y12	General output 12	Teach Pendant DO14	/	/
Y13	General output 13	Teach Pendant DO15	/	/
Y14	General output 14	Teach Pendant DO16	/	/
Y15	General output 15	Teach Pendant DO17	/	/
Y16	General output 16	Teach Pendant DO18	/	/
Y17	General output 17	Teach Pendant DO19	/	/
Y18	General output 18	Teach Pendant DO20	/	/
Y19	General output 19	Teach Pendant DO21	/	/
NC	/	/	/	/
+	24V_E, +24V ($\pm 20\%$) from outside cabinet to DO inside cabinet	/	N/A	/
+	24V, +24V ($\pm 5\%$) for external input power, maximum allowable current 0.75A	/	/	/
PE	Grounding point, for shielded cable grounding	/	N/A	/

Note: DO1-DO10 on the oscillator ports are occupied by the system, and ports with dedicated pins noted in the table above are not available to the user.

DO Signal Wiring

The following diagrams illustrate wiring for loads using opto-couplers/relays. The wiring for extending DO output signals is the same.



- When the load is a relay

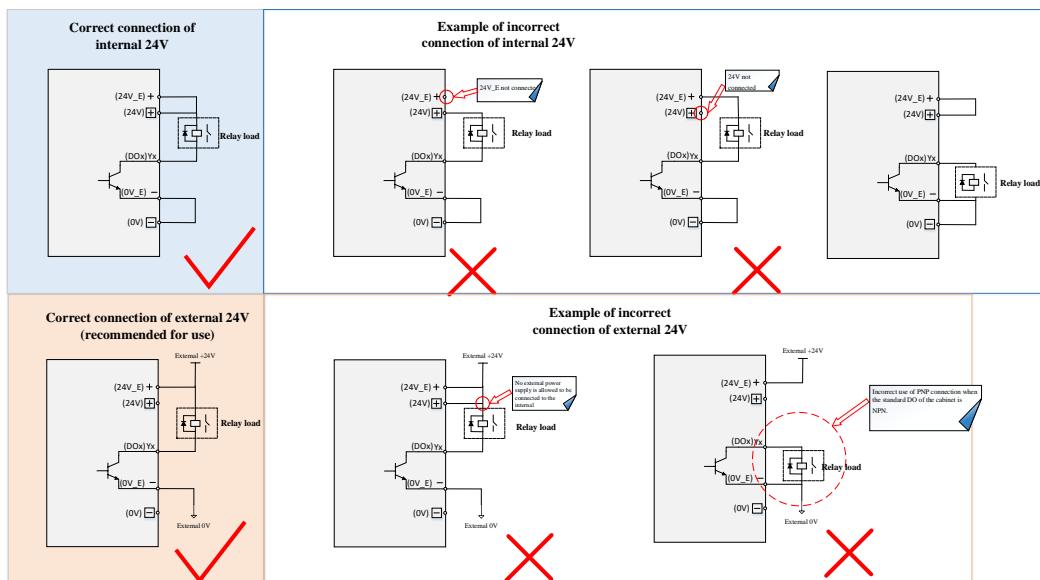


Figure 3-29 External/Internal 24V Power Supply when Load is a Relay

- When the load is an opto-coupler

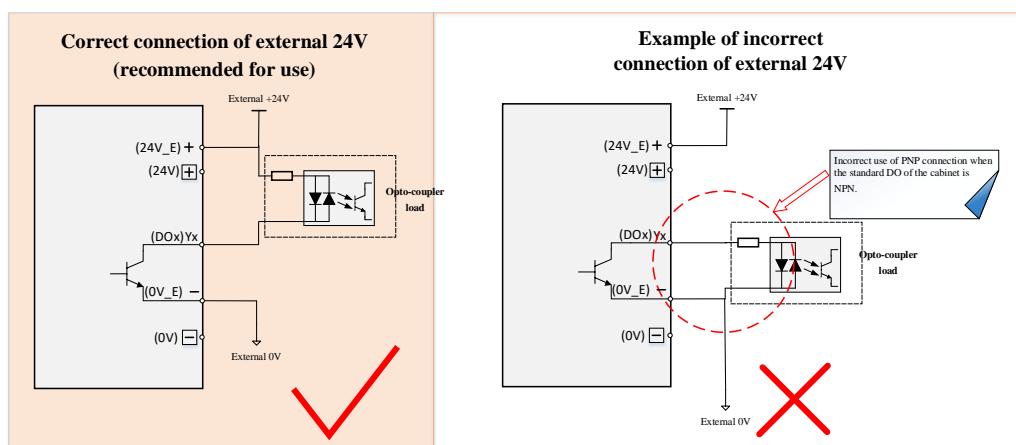


Figure 3-30 Using an External 24V Power Supply when the Load is an Opto-coupler

3.10 Communication Connection

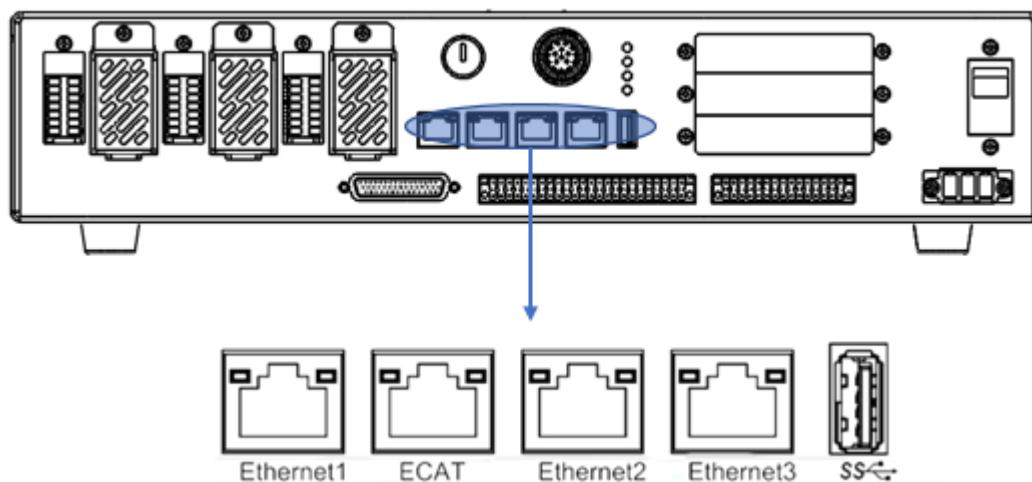


Figure 3-31 Communication Interface

3.10.1 Communication signal description

- EtherNet1 is used to connect to the virtual teach pendant;
- EtherNet2 is a reserved communication interface;
- EtherNet3 is used for controller debugging.
- EtherCat is used to connect external servo axes or other I/O modules.

The definitions for EtherCAT and EtherNet interfaces are as follows:

S/N	Definition	Description
1	TX+	Data transmit +
2	TX-	Data transmit -
3	RX+	Data receive +
4	/	/
5	/	/
6	RX-	Data receive -
7	/	/
8	/	/
Casing	PE	Shield

3.10.2 Recommended communication cables

Please use shielded/double-shielded twisted-pair CAT5e SF/UTP cables for communication. It is recommended to use connectors with metal shielding to prevent signal interference.



3.10.3 USB interface

The USB interface on the controller is used for data transfer or connecting peripherals such as USB drives, mice, keyboards, etc.

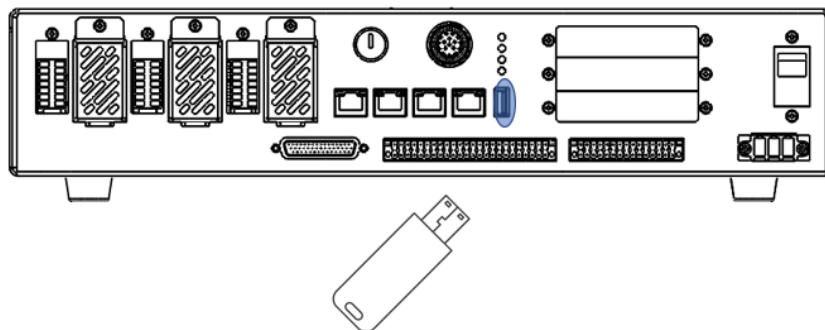


Figure 3-32 Interface Diagram

3.10.4 EtherCAT wiring

The control cabinet can act as the master station for EtherCAT communication to connect EtherCAT communication devices such as Trio modules, ED3S servo drives (as extension axes).

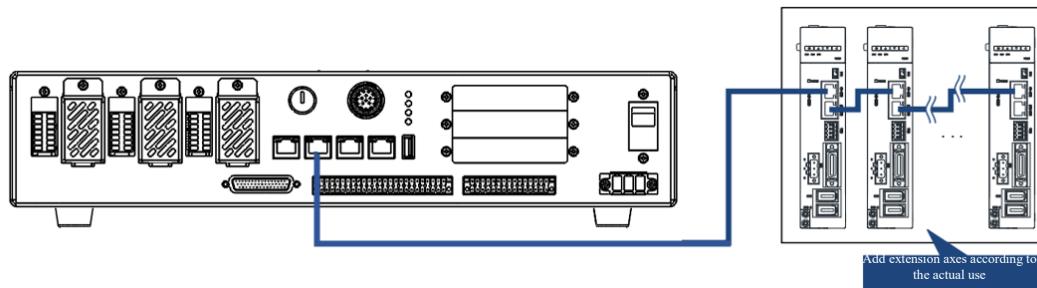


Figure 3-33 EtherCAT connection

3.11 SAFETY IO

The ERC3-C1 control cabinet comes standard with a variety of safety stop methods. The SAFETY IO interfaces are illustrated in the following diagram.

By default, shorting jumpers are inserted into the SAFETY IO, rendering the corresponding functions inactive. To use these functions, the respective shorting jumpers must be removed, and connections must be established following the appropriate wiring methods.

It is strongly advised not to remove the shorting jumpers if these functions are not in use, as doing so may trigger the corresponding functionalities, leading to operational halts or alarms.



SAFETY IO Plug Terminal, Shorting Jumper Insertion Status



Figure 3-34 SAFETY IO Shorting Jumper Insertion Diagram

The input and output signals related to safety stop and their functions are described below:

Function Name	Definition	Channels	Activation Mode	Function Description
Start Confirmation	CSB	2	Auto	In Auto mode, after pressing the start confirmation button, the control cabinet can complete power-on.
External E-stop	EX_ES	2	Auto & Manual	Class 0 stop. When the E-stop state is effective, the control cabinet and robot will immediately cut off the main power for shutdown.
Limit Switch	LS	2	Auto & Manual	Same function as External E-stop, Class 0 stop. When the E-stop state is effective, the control cabinet and robot will immediately cut off the main power for shutdown.
General Stop	GS	2	Auto & Manual	Class 1 stop. After the general stop state is effective, the control cabinet and robot will slow down first, then cut off the main power of the control cabinet, and can accept signals such as safety doors.
Auto Protection Stop	AS	2	Auto	Class 1 stop. Only effective in Auto mode. After the auto protection stop state is effective, the control cabinet and robot will slow down first, then cut off the main power of the control cabinet, and can accept signals such as safety doors.
E-stop Output	ES_OUT	2	Auto & Manual	When the external E-stop, control cabinet E-stop, teach pendant E-stop, or limit switch is effective, the E-stop output changes from closed to open.

3.11.1 SAFETY Interface Description

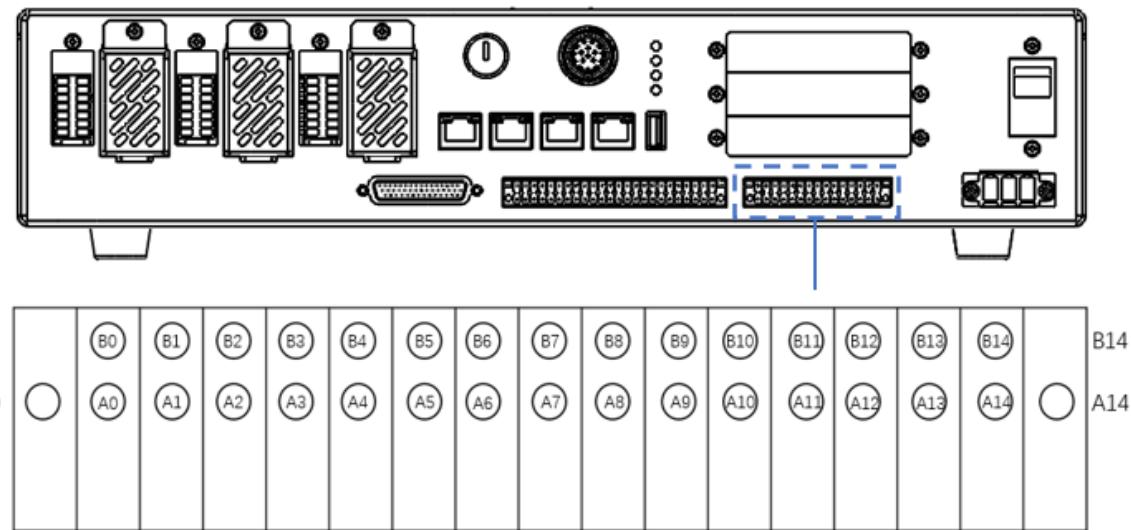


Figure 3-35 SAFETY IO Interface

Pin	Definition	Explanation	Pin	Definition	Explanation
A0	CSB1+	Channel 1 start confirmation signal +	B0	CSB1-	Channel 1 start confirmation signal -
A1	24V-SAFETY	24V power supply	B1	GND-SAFETY	Power ground
A2	CSB2+	Channel 2 start confirmation signal +	B2	CSB2-	Channel 2 start confirmation signal -
A3	AS1+	Channel 1 auto protection stop +	B3	AS1-	Channel 1 auto protection stop -
A4	24V-SAFETY	24V power supply	B4	GND-SAFETY	Power ground
A5	AS2+	Channel 2 auto protection stop +	B5	AS2-	Channel 2 auto protection stop -
A6	GS1+	Channel 1 Normal Stop +	B6	GS1-	Channel 1 Normal Stop -
A7	24V-SAFETY	24V power supply	B7	GND-SAFETY	Power ground
A8	GS2+	Channel 2 Normal Stop +	B8	GS2-	Channel 2 Normal Stop -
A9	LS1+	Channel 1 limit switch +	B9	LS2+	Channel 2 limit switch +
A10	LS1-	Channel 1 limit switch -	B10	LS2-	Channel 2 limit switch -
A11	EX_ES1+	Channel 1 external E-stop +	B11	EX_ES2+	Channel 2 external E-stop +
A12	EX_ES1-	Channel 1 external E-stop -	B12	EX_ES2-	Channel 2 external E-stop -
A13	ES1_OUT+	Channel 1 E-stop output + (max. output capability: 100mA)	B13	ES2_OUT+	Channel 2 E-stop output + (max. output capability: 100mA)
A14	ES1_OUT-	Channel 1 E-stop output - (max. output capability: 100mA)	B14	ES2_OUT-	Channel 2 E-stop output - (max. output capability: 100mA)

[Note] 24V-SAFETY provides a 24V power supply with a maximum output current of 80mA. It is prohibited to be used for external load drive!

3.11.2 Start confirmation wiring method

When using the start confirmation function, connect the CSB- and CSB+ to a self-resetting NO switch externally. The main power of the control cabinet will only be turned on after pressing the start confirmation button. Its wiring method is as follows:

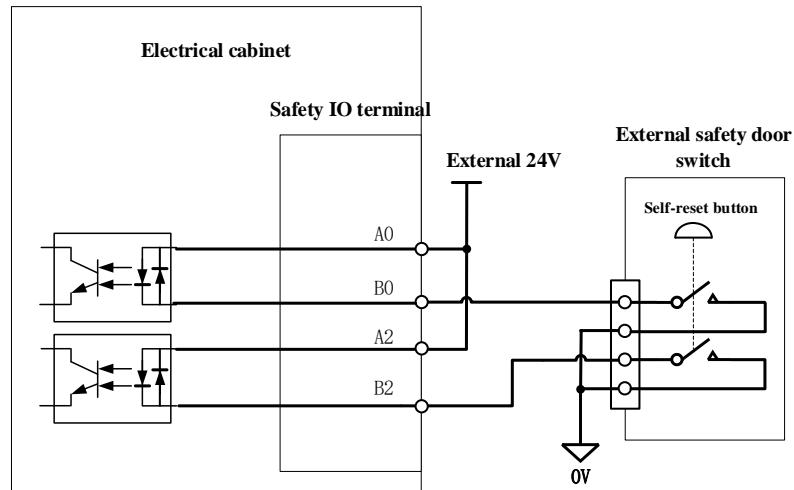


Figure 3-36 Start Confirmation Wiring Diagram (External 24V power supply)

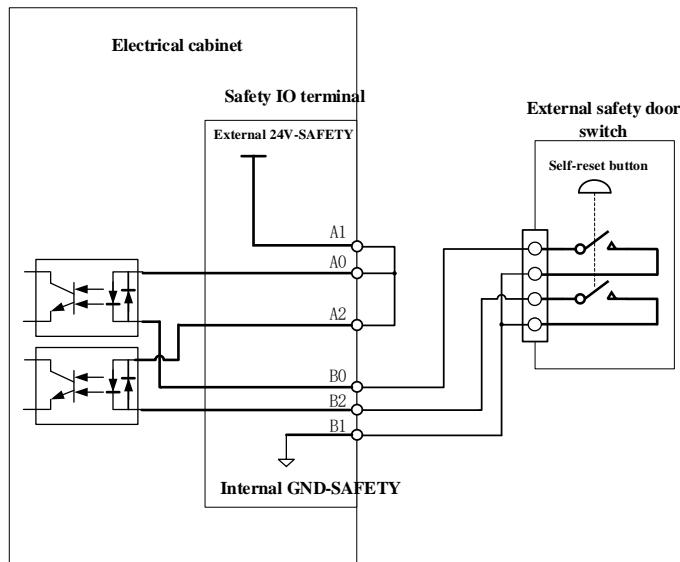


Figure 3-37 Start Confirmation Wiring Diagram (Internal 24V power supply)



Ensure that the dual-channel wiring is normal when using this function.

When the start confirmation function is not used, short-circuit using a jumper, with the specific wiring method as follows:

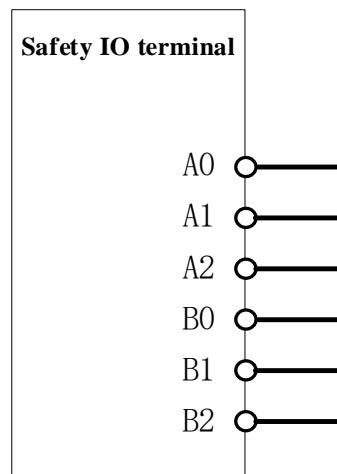


Figure 3-38 Wiring Method for Not Using Start Confirmation

3.11.3 External E-stop wiring method



Caution

- Emergency stops are designated for handling urgent situations and should only be used to halt a robot in emergencies during its normal operation.
- Engaging the emergency stop button when not necessary may cause the robot to deviate from its normal operational trajectory. Additionally, the impact from an emergency stop can reduce the lifespan of the robot's reducer and increase wear on the motor brake pads. It is strictly prohibited to use the E-stop button for regular halting or power disconnection in non-emergency situations.

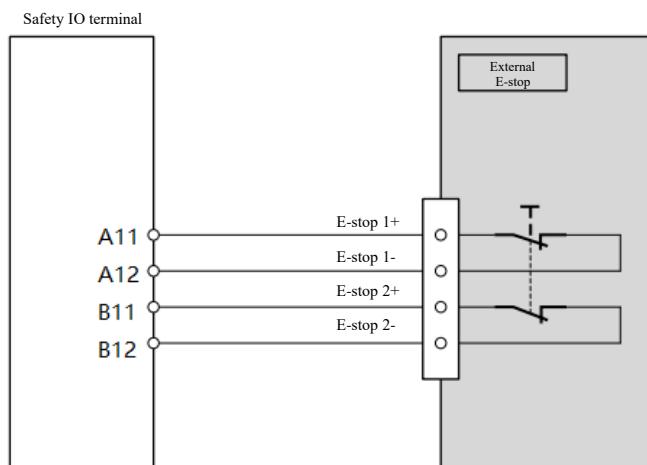


Figure 3-39 Using External E-stop



Ensure that the dual-channel wiring is normal when using this function.

When the external E-stop function is not used, short-circuit using a jumper, with the specific wiring method as follows:

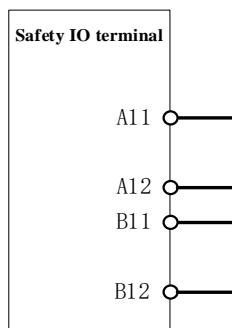


Figure 3-40 Not Using External E-stop Connection

3.11.4 Limit switch wiring method

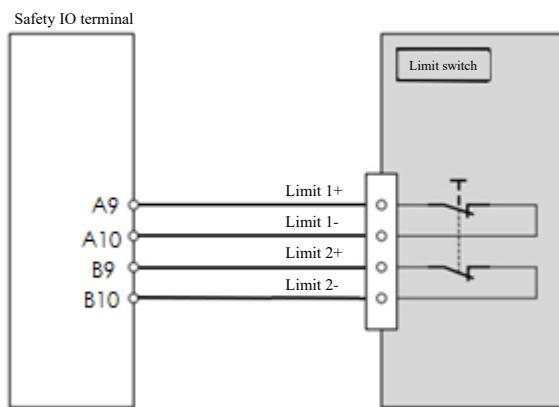


Figure 3-41 Using External Limit Switch



Ensure that the dual-channel wiring is normal when using this function.

When not using the limit switch function, short-circuit using a jumper, with the specific wiring method as follows:

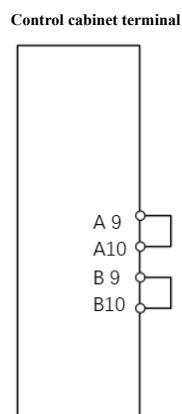


Figure 3-42 Not Using External Limit Switch Connection

3.11.5 Safety door wiring method

Safety doors and safety light curtains can be used to control protective barriers and doors during robot operation.

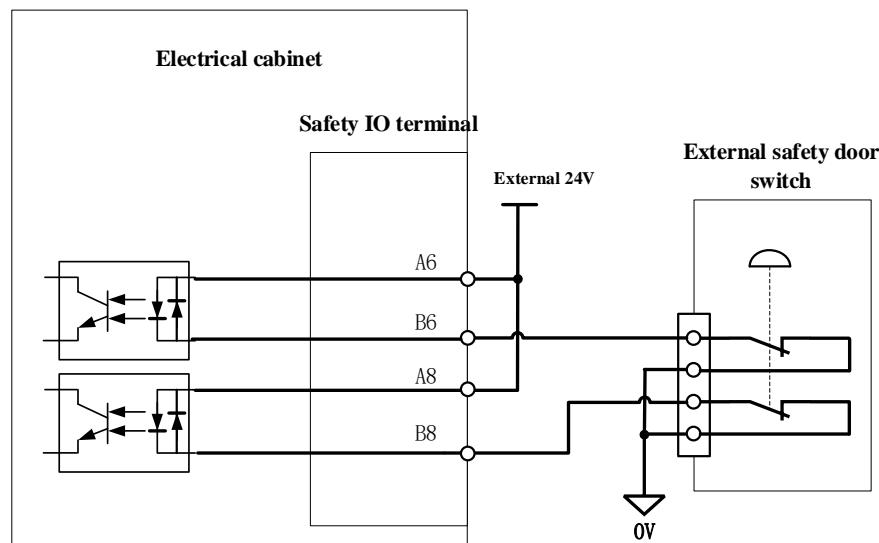


Figure 3-43 External Safety Door Connection (using external 24V power supply connection)

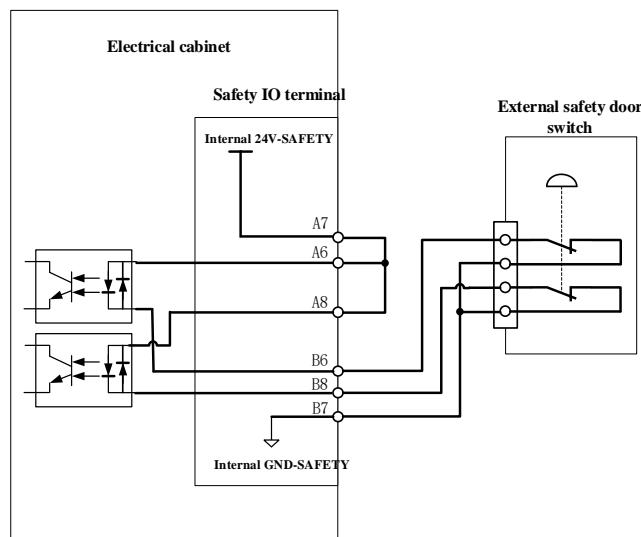


Figure 3-44 External Safety Door Connection (using internal 24V power supply connection)



Ensure that the dual-channel wiring is normal when using this function.

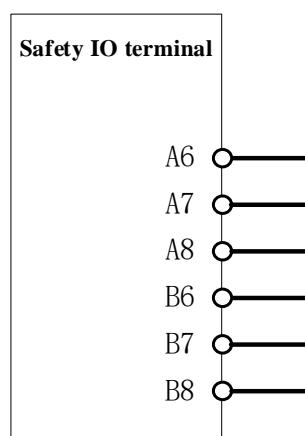


Figure 3-45 Not Using External Safety Door Connection

3.11.6 Auto protection stop wiring method

The wiring method for safety doors and safety light curtains in Auto mode is shown in the following figures:

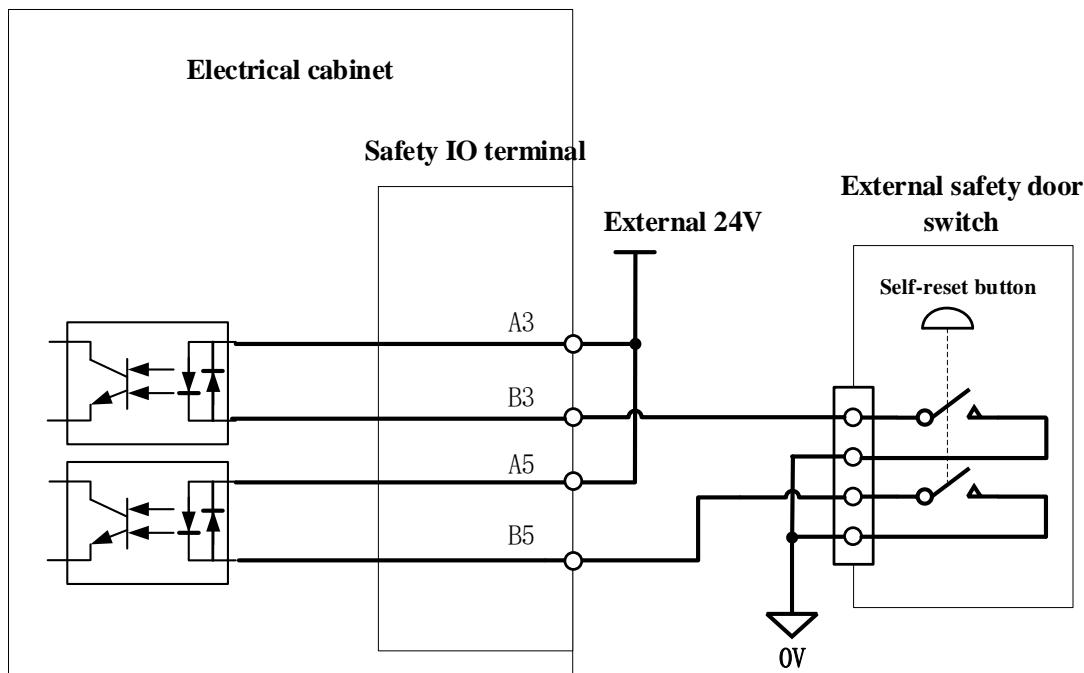


Figure 3-46 Auto Protection Stop Connection (Using external 24V power supply)

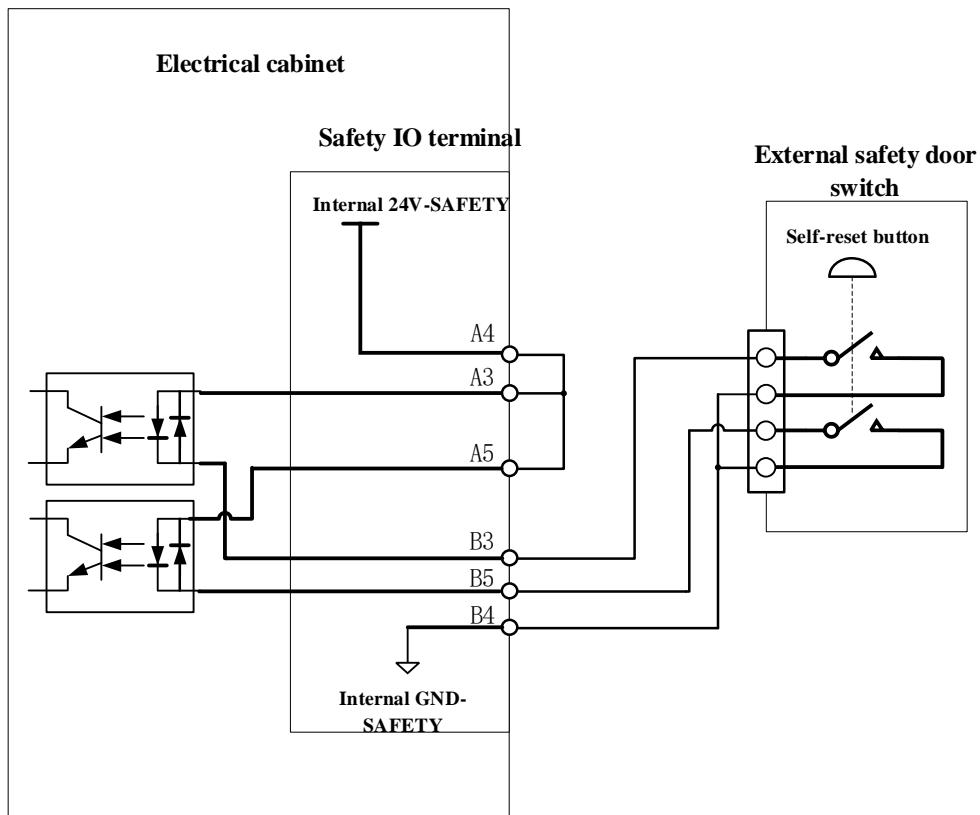


Figure 3-47 Auto Protection Stop Connection (Using internal 24V power supply)



Ensure that the dual-channel wiring is normal when using this function.

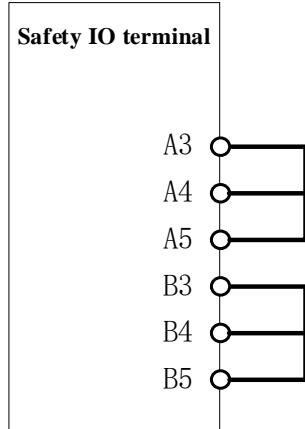


Figure 3-48 Not Using Autom Protection Stop Connection

3.11.7 E-stop output wiring method

(1) Wiring method with relay as the load

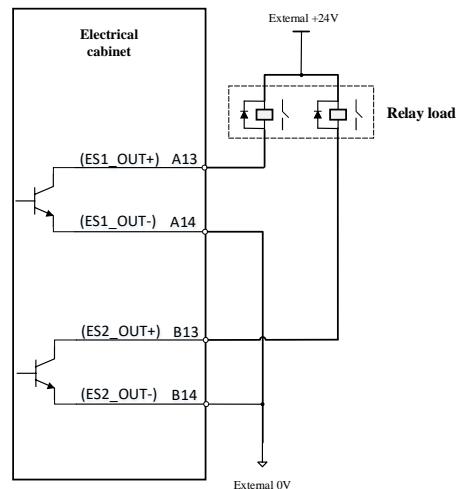


Figure 3-49 E-stop Output Wiring (Relay as load)

(2) Wiring method with client DI module as the load

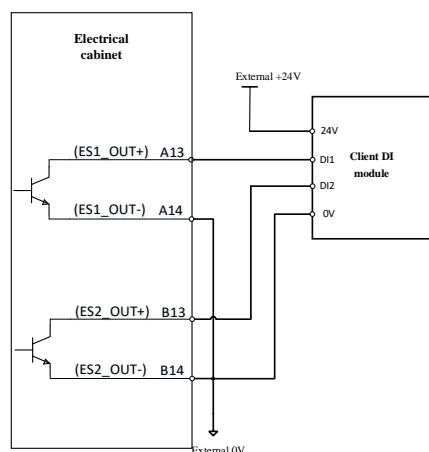


Figure 3-50 E-stop Output Wiring (DI module as load)

Chapter 4 (Optional) Expansion Cards

4.1 Expansion Slot Description

Expansion cards are optional accessories developed for customer applications. The ERC3-C1 control cabinet can accommodate up to three expansion cards.

The types of expansion slots can be freely combined. Available expansion cards include:

- **16-channel digital input expansion card (up to 3 DI expansion boards can be installed, providing a maximum of 48 DI channels);**
- **16-channel NPN type digital output expansion card (up to 3 DO expansion boards can be installed, providing a maximum of 48 DOs);**
- **16-channel PNP type digital output expansion card (up to 3 DO expansion boards can be installed, providing a maximum of 48 DOs);**
- **ABZ expansion card (up to 1 ABZ expansion card can be installed);**
- **Ethernet port adapter expansion card (up to 1 Ethernet port adapter expansion card can be installed, only in the top slot CN3).**



Caution

- The ERC3-C1 control cabinet can accommodate up to three expansion cards;
- The total number of expandable input and output channels is 48;
- DI/DO expansion cards require an external power supply;
- No underlying configuration is required for the installation of expansion cards. If you have any questions, please contact ESTUN technical support to avoid damage due to incompatibility or improper operation.

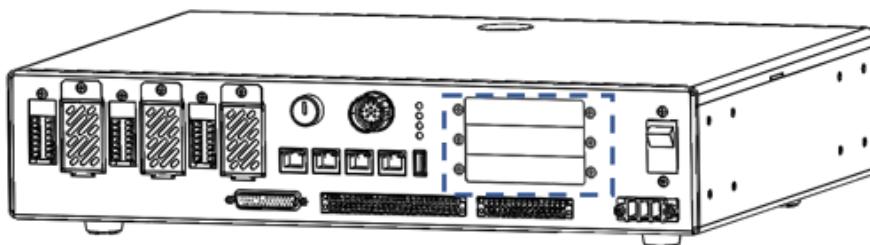


Figure 4-1 Expansion Slots

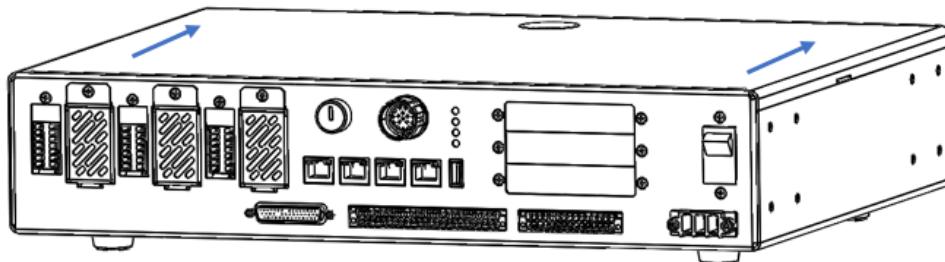
Expansion Card Name	Model	Function
16-channel digital input expansion card	ERC3-DI-CB-A-V100B1	For user input signal expansion
16-channel NPN type digital output expansion card	ERC3-DONPN-CB-A-V100B1	For user NPN type output signal expansion
16-channel PNP type digital output expansion card	ERC3-DOPNP-CB-A-V100B1	For user PNP type output signal expansion
ABZ expansion card	ERC3-ABZ-CB-A-V100B1	For user encoder signal expansion

Ethernet port adapter expansion card	ERC3-C1-ECZJ-V100B0	For user ECAT signal adapter
--------------------------------------	---------------------	------------------------------

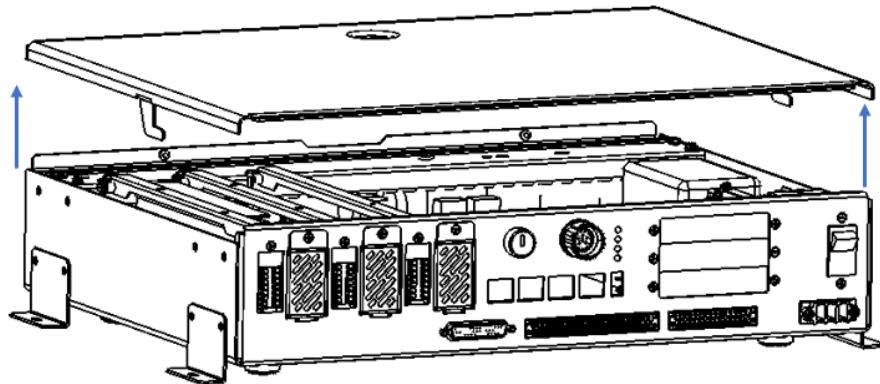
4.2 Installing Steps

Step 1 Use a screwdriver to remove the two captive screws at the back of the control cabinet's top cover.

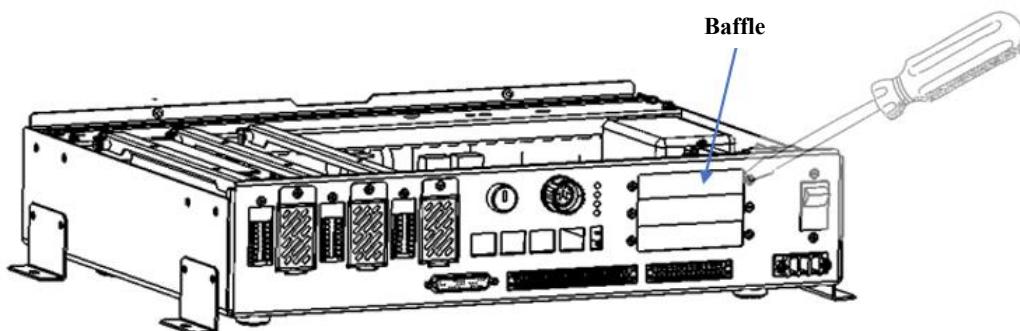
Step 2 Push the control cabinet cover backward horizontally with both hands.



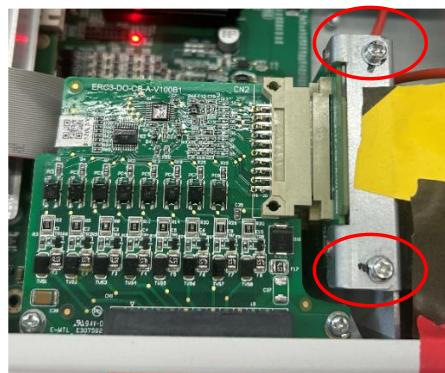
Step 3 Open the control cabinet cover as shown in the figure below.



Step 4 Unscrew the expansion card front panel screws with a screwdriver.



Step 5 Loosen the screws in the red circle a bit to better fit the expansion card.



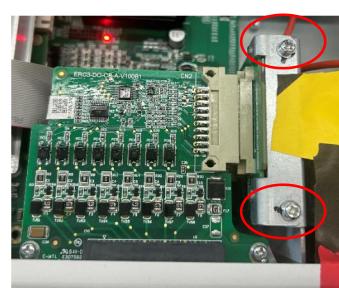
Step 6 Insert the expansion card into the corresponding slot in the control cabinet, see “4.1 Expansion Slot Description” for correspondence.



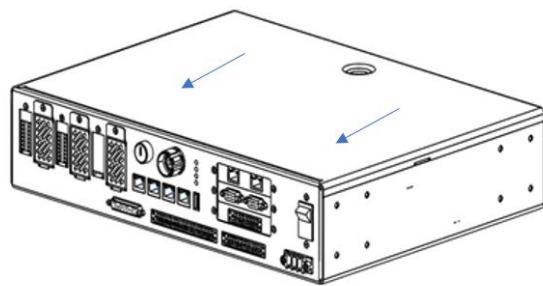
Step 7 Secure the expansion card with screws.



Step 8 Tighten the previously loosened screws.

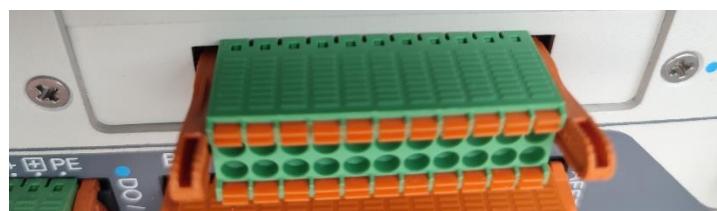


Step 9 Close the control cabinet cover and push it forward horizontally with both hands.



Step 10 Tighten the two screws at the back of the control cabinet's top cover with a screwdriver.

Step 11 Install the plug.



4.3 DI Expansion Card

4.3.1 Expansion card information

Expansion Card Name	Model	Function
16-channel digital input expansion card	ERC3-DI-CB-A-V100B1	For user input signal expansion

4.3.2 Installation dimensions

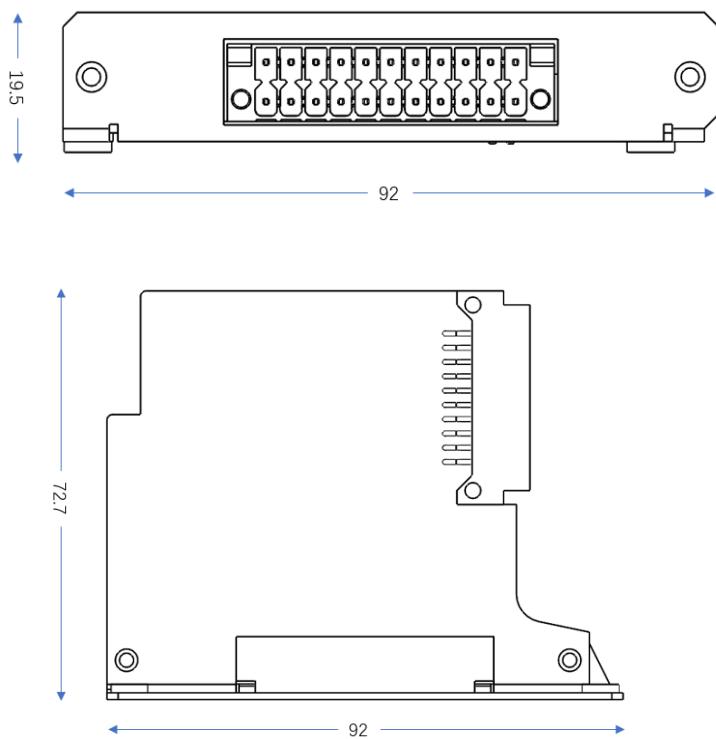


Figure 4-2 DI Expansion Card Installation Dimensions

4.3.3 Terminal definitions

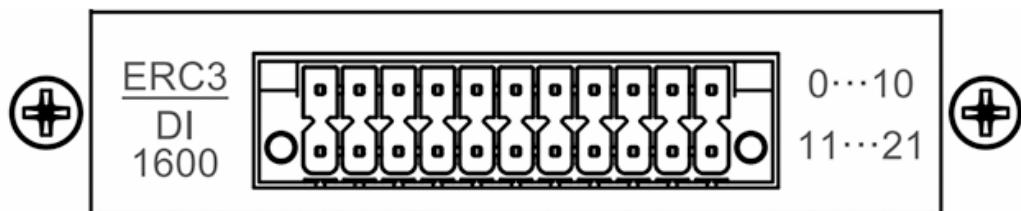


Figure 4-3 DI Expansion Card Terminals

Pin	Definition	Description	Pin	Definition	Description
0	DI0	Expansion input 0	11	DI1	Expansion input 1
1	DI2	Expansion input 2	12	DI3	Expansion input 3
2	DI4	Expansion input 4	13	DI5	Expansion input 5
3	DI6	Expansion input 6	14	DI7	Expansion input 7
4	COM1	Common terminal for DI0-DI7	15	NC	/
5	DI8	Expansion input 8	16	DI9	Expansion input 9
6	DI10	Expansion input 10	17	DI11	Expansion input 11
7	DI12	Expansion input 12	18	DI13	Expansion input 13
8	DI14	Expansion input 14	19	DI15	Expansion input 15

Pin	Definition	Description	Pin	Definition	Description
9	COM2	Common terminal for DI8-DI15	20	/	Not defined
10	PE	Grounding point for shielding cable grounding	21	PE	Grounding point for shielding cable grounding

4.3.4 Port specifications

Item	Specification
Number of input channels	16
Input connection method	Crimp type terminal
Input voltage range	19.2~28.8V DC
Input type	Digital, selectable NPN or PNP type inputs via common terminal
Max. input voltage	30V DC
Input current (typical 24V)	Approximately 4.85mA
ON voltage (V)	18~30V DC
OFF voltage (V)	0~5V DC
Input impedance	Greater than 4.7K
Isolation method	Opto-coupler isolation

4.3.5 External wiring diagram

The DI signal input can use common anode and common cathode wiring methods, divided into signal pins DI0-DI7 with the corresponding common terminal COM1, and signal pins DI8-DI15 with the corresponding common terminal COM2.

- When the upper device has open-collector output

(1) Common cathode wiring method (NPN output for upper device)

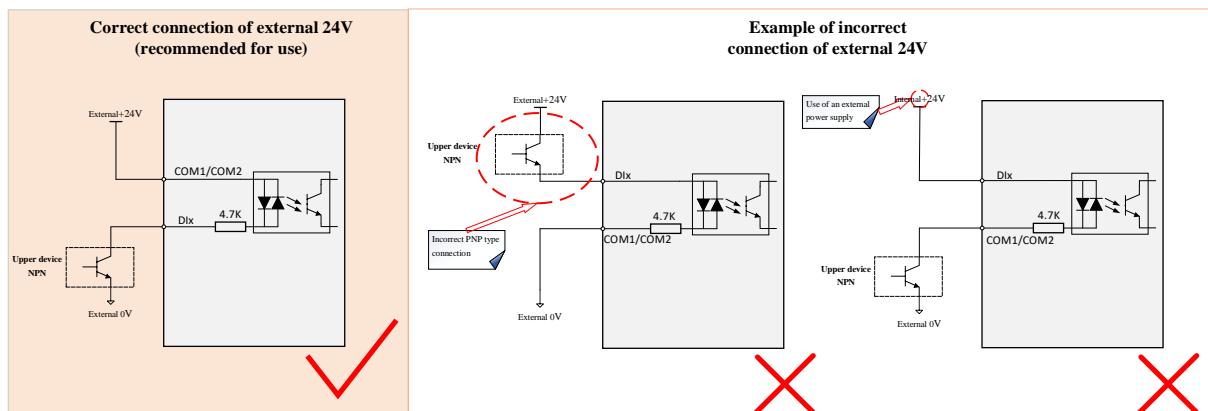


Figure 4-4 Using the External 24V Power Supply (NPN type output for the upper device)
(2) Common anode wiring method (PNP output for upper device)

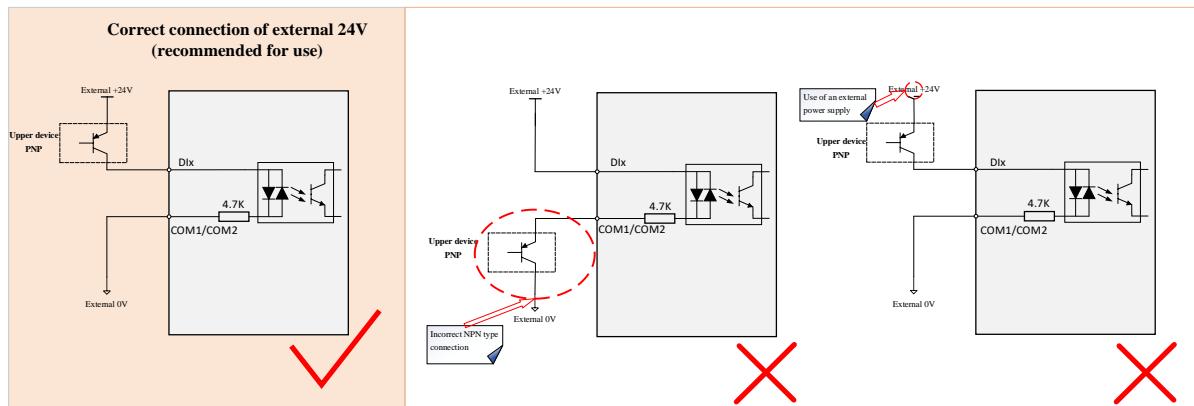


Figure 4-5 Using the External 24V Power Supply (PNP output for the upper device)

(3) When the upper device has relay output

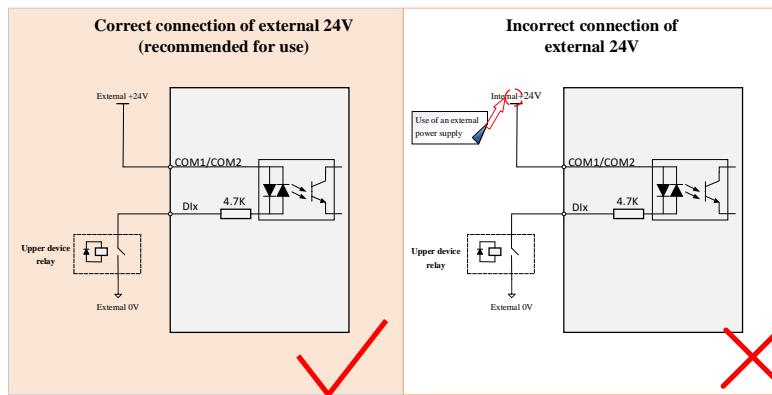


Figure 4-6 Using the External 24V Power Supply (upper device using relay output)



When using the expansion card, an external DC_24V power supply is required.

4.4 DO Expansion Card

4.4.1 DO expansion card description

The DO expansion card is divided into a 16-channel NPN type digital output expansion card and a 16-channel PNP type digital output expansion card. Users can select according to their needs.

4.4.2 DO expansion card information

Expansion Card Name	Model	Function
16-channel NPN type digital output expansion card	ERC3-DONPN-CB-A-V100B1	For user NPN type output signal expansion
16-channel PNP type digital output expansion card	ERC3-DOPNP-CB-A-V100B1	For user PNP type output signal expansion

4.4.3 Installation dimensions

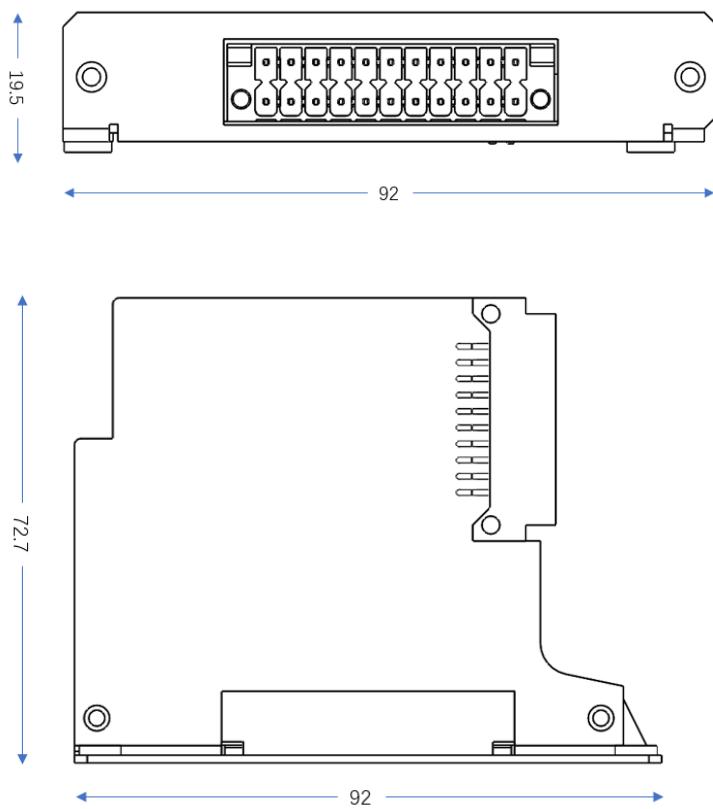


Figure 4-7 DO Expansion Card Installation Dimensions

4.4.4 Definition of NPN type digital output expansion card terminal

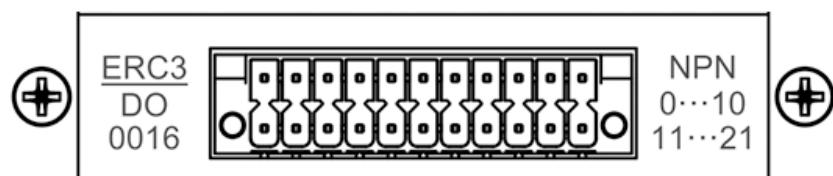


Figure 4-8 DO Expansion Card Terminals

Pin	Definition	Description	Pin	Definition	Description
0	DO0	Expansion output 0	11	DO8	Expansion output 8
1	DO1	Expansion output 1	12	DO9	Expansion output 9
2	DO2	Expansion output 2	13	D010	Expansion output 10
3	DO3	Expansion output 3	14	D011	Expansion output 11
4	DO4	Expansion output 4	15	DO12	Expansion output 12
5	DO5	Expansion output 5	16	DO13	Expansion output 13
6	DO6	Expansion output 6	17	DO14	Expansion output 14
7	DO7	Expansion output 7	18	DO15	Expansion output 15

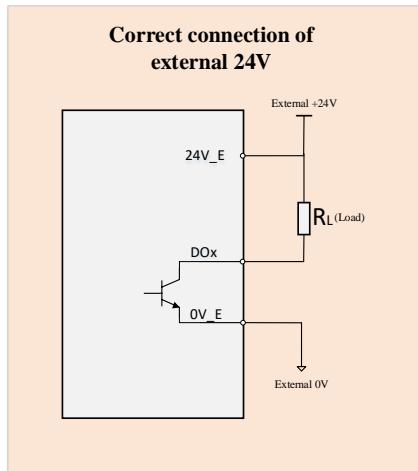
Pin	Definition	Description	Pin	Definition	Description
8	24V_E	External power input	19	0V_E	External ground
9	NC	/	20	NC	/
10	PE	Grounding point for shielding cable grounding	21	FG	Grounding point for shielding cable grounding

Port Specifications

Item	Specification
Number of output channels	16
Output connection method	Crimp type terminal
Output type	Digital, NPN type output
Input voltage range	19.2~28.8V DC
Max. drive current per channel (typical 24V DC)	300mA
Isolation method	Opto-coupler isolation

NPN Type DO External Wiring Diagram

The following diagram illustrates external wiring for loads such as opto-couplers or relays.



- When the load is a relay

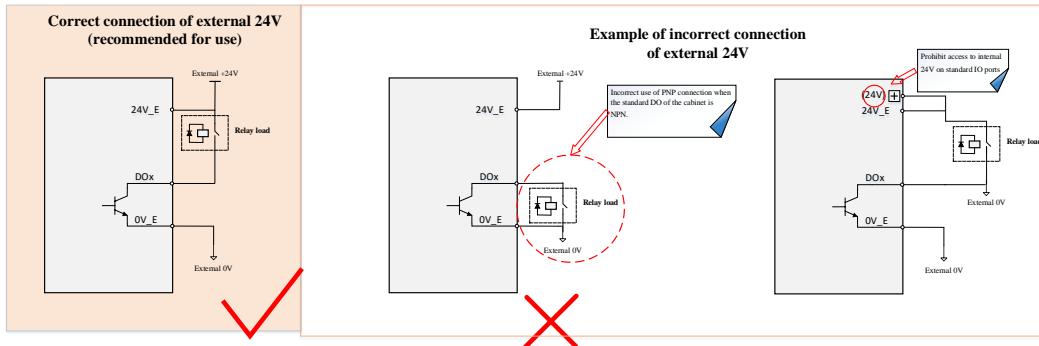


Figure 4-9 External 24V Power Supply for Relay Load

- When the load is an opto-coupler

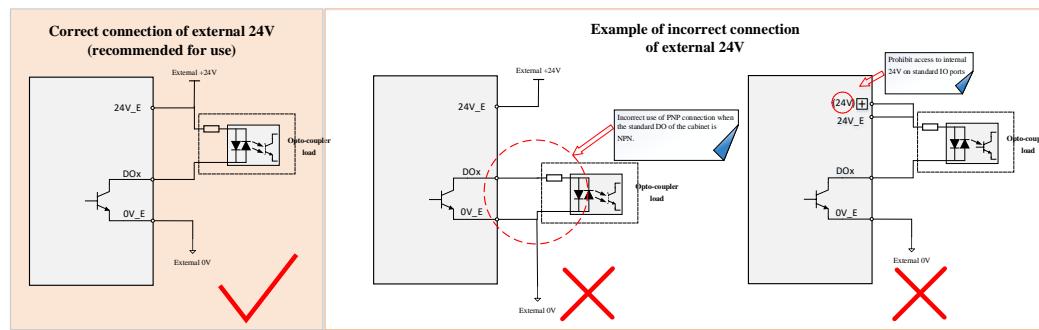


Figure 4-10 Using External 24V Power Supply for Opto-coupler Load



When using the expansion card, an external DC 24V power supply is required.

4.4.5 Definitions of PNP type digital Output expansion card terminals

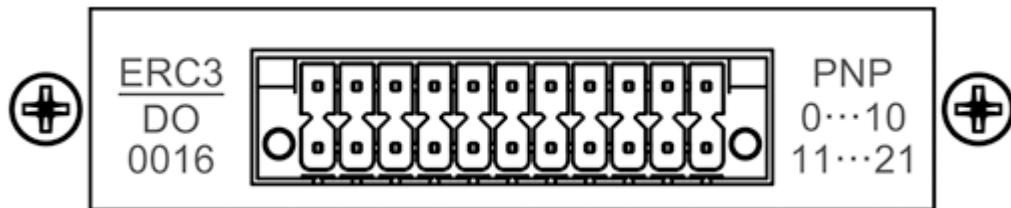


Figure 4-11 PNP DO Expansion Card Terminals

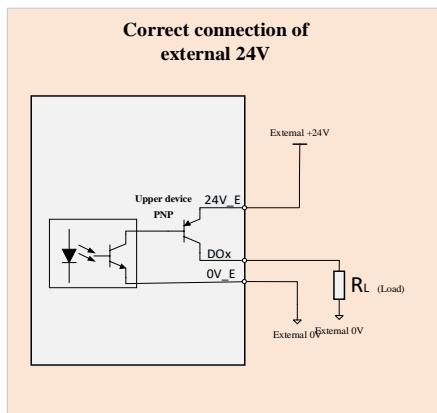
Pin	Definition	Description	Pin	Definition	Description
0	DO0	Expansion output 0	11	DO8	Expansion output 8
1	DO1	Expansion output 1	12	DO9	Expansion output 9
2	DO2	Expansion output 2	13	D010	Expansion output 10
3	DO3	Expansion output 3	14	D011	Expansion output 11
4	DO4	Expansion output 4	15	D012	Expansion output 12
5	DO5	Expansion output 5	16	D013	Expansion output 13
6	DO6	Expansion output 6	17	D014	Expansion output 14
7	DO7	Expansion output 7	18	D015	Expansion output 15
8	24V_E	External power input	19	0V_E	External ground
9	NC	/	20	NC	/
10	Grounding point for shielding cable grounding	21	FG	Grounding point for shielding cable grounding	Grounding point for shielding cable grounding

Port Specifications

Item	Specification
Number of output channels	16
Output connection method	Crimp type terminal
Output type	Digital, PNP type output
Input voltage range	19.2~28.8V DC
Max. drive current per channel (typical 24V DC)	250mA
Isolation method	Opto-coupler isolation

DO External Wiring Diagram (PNP Type)

The following diagram illustrates external wiring for loads such as opto-couplers or relays.



- When the load is a relay

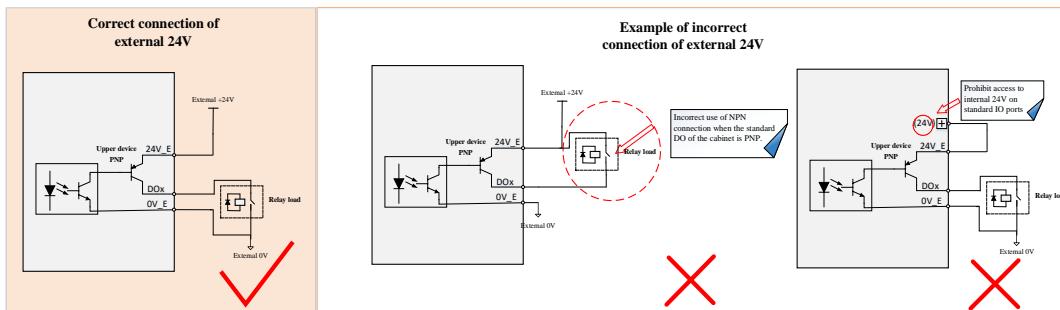


Figure 4-12 External 24V Power Supply for Relay Load

- When the load is an opto-coupler

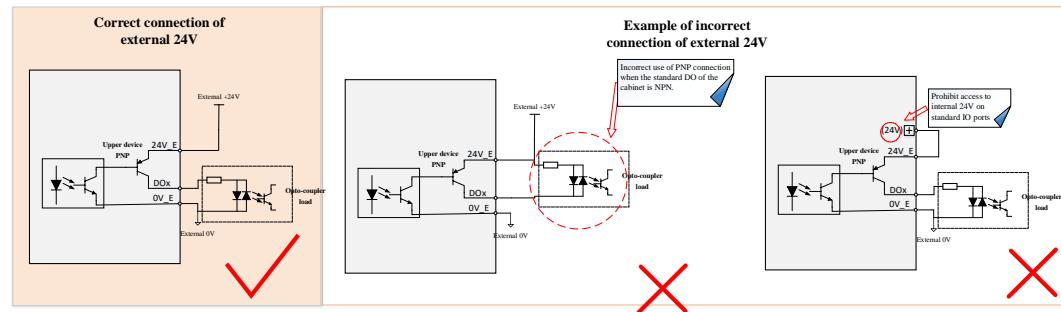


Figure 4-13 Using External 24V Power Supply for Opto-coupler Load



When using the expansion card, an external DC 24V power supply is required.

4.5 ABZ Expansion Card

The interface of ABZ expansion card is for high-speed pulse input signals, allowing users to connect an external incremental encoder. The control cabinet can detect its feedback signals and convert them into data information for corresponding software applications.

The ABZ encoder expansion card (a maximum of 1 ABZ expansion card) can be installed. If you need to use the expansion card function, please contact our technical personnel first.

4.5.1 Expansion card information

Expansion Card Name	Model	Function
ABZ expansion card	ERC3-ABZ-CB-A-V100B1	For user encoder signal expansion

4.5.2 Installation dimensions

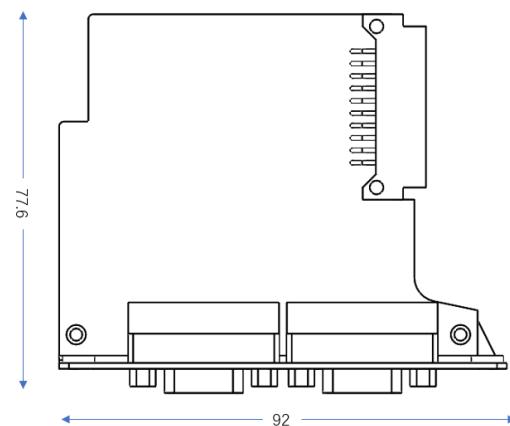
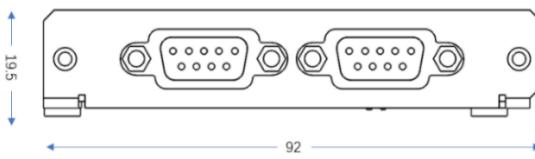


Figure 4-14 ABZ Encoder Installation Dimensions

4.5.3 Terminal definitions

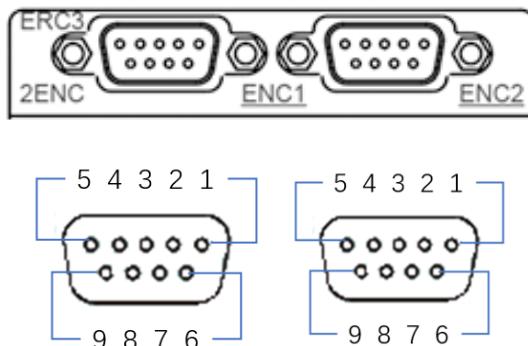


Figure 4-15 ABZ Encoder Terminals

Pin	Definition	Description	Pin	Definition	Description
1	Z+	Encoder Z-phase pulse differential positive	2	B+	Encoder B-phase pulse differential positive
3	A+	Encoder A-phase pulse differential positive	4	NC	Not connected
5	0V	Encoder power signal ground	6	Z-	Encoder Z-phase pulse differential positive
7	B-	Encoder B-phase pulse differential positive	8	A-	Encoder A-phase pulse differential positive
9	5V	5V power supply	/	/	/



Users may make a matching DB9 male cable according to the ESTUN encoder interface definition. If there are any issues, please contact our technical personnel.

Port Specifications

Item	Specification
Input channels	2
Input connection method	Differential input, 4x counting mode
Supply voltage range	5.1~5.2V
Max. input signal frequency	200KHz
Input impedance	>20R
Input signal	A/B/Z three-phase input

Isolation method	Non-isolated
------------------	--------------

4.5.4 Wiring Method

The wiring of the ABZ expansion card is shown in the following figure.

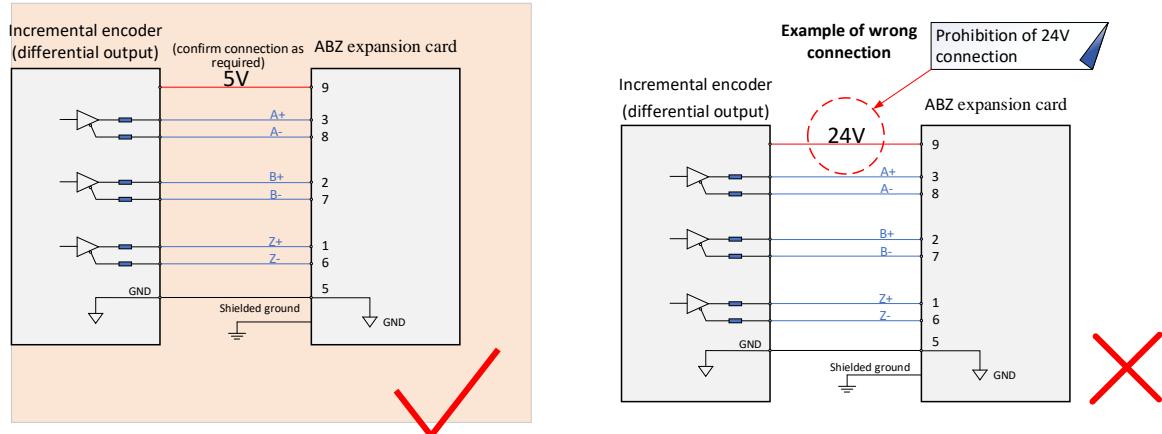


Figure 4-16 ABZ expansion card connection diagram

4.6 Ethernet port adapter Expansion Card

The Ethernet port adapter expansion card (a maximum of 1 Ethernet port adapter expansion card can be connected) can be selected according to the user's needs.

4.6.1 Expansion card information

Expansion Card Name	Model	Function
Ethernet port adapter expansion card	ERC3-C1-ECZJ-V100B0	For user ECAT signal conversion

4.6.2 Installation dimensions

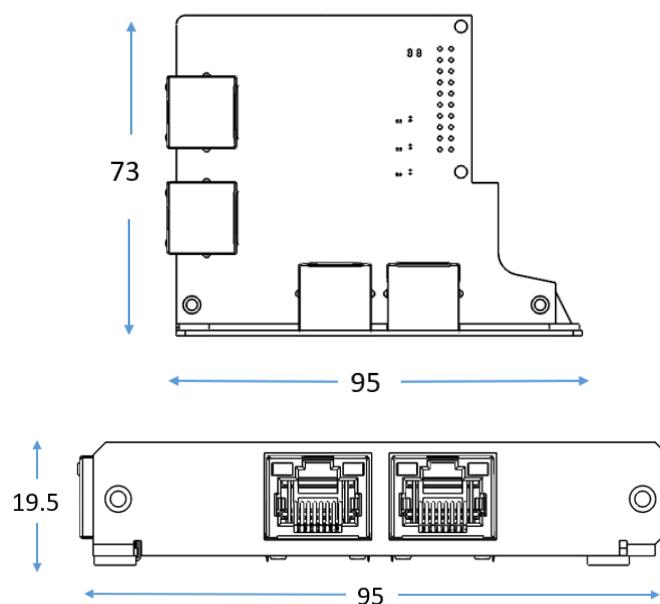


Figure 4-17 Ethernet Adapter Card Installation Dimensions

4.6.3 Terminal definitions

The ECAT1 interface definition is as follows:

S/N	Definition	Description
1	TX+	Data transmit +
2	TX-	Data transmit -
3	RX+	Data receive +
4	/	/
5	/	/
6	RX-	Data receive -
7	/	/
8	/	/
Casing	PE	Shielding

4.6.4 Recommended communication cables

Please use a Cat 5e shielded/dual-shielded twisted-pair cable (CAT5e SF/UTP). It is recommended to use connectors with metal shielding layers to prevent signal interference.



4.6.5 Network Port Adapter Expansion Card Network Cable Connection

After installing the expansion card according to “4.2 Installing Steps”, users need to connect two network cables to the controller side of the network port, the network cable connection is shown in the following figure.

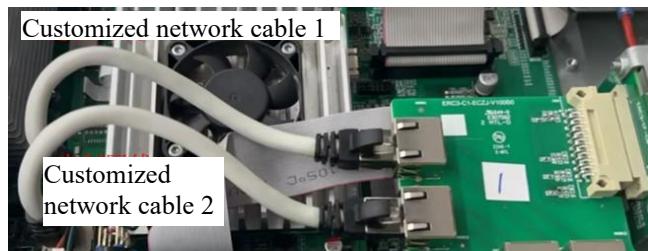


Figure 4-18 Network adapter card cable connection

4.6.6 Wiring method

The wiring method for the Ethernet port adapter expansion card is shown in the following diagram.

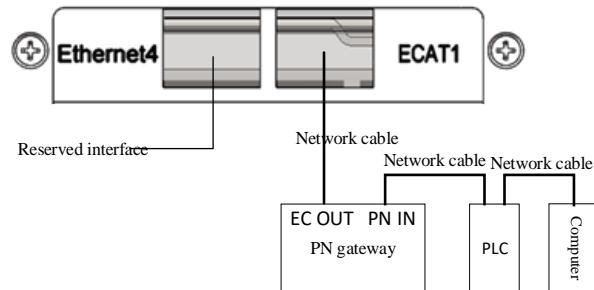


Figure 4-19 Ethernet Port Adapter Expansion Card Connection Diagram

Note: See supporting documentation for controller software configuration “Configuration Manual for Communication Gateway EC2PN-GW-A of ER Series Industrial Robots RCS2”



For using ESTUN's PN gateway, please contact ESTUN.

Chapter 5 Servo Parameter Settings

5.1 Check before Power-on

Before powering up the control cabinet, please check and confirm the following items and make necessary adjustments.

S/N	Content
1	Check the internal and external appearance of the control cabinet.
2	Check if the fixing screws are securely connected.
3	Confirm the status of connectors and the installation positions of various units in the control cabinet.
4	Connect cables between the control cabinet and the robot.
5	Power off the circuit breaker, then connect the input power cable.
6	Confirm the input power voltage.
7	Press the E-stop button on the operation panel, then turn on the power.
8	Confirm the interface signals between the control cabinet and the robot.
9	Confirm and set various parameters.
10	Touch the E-stop button on the operation panel.
11	Confirm the movement of each axis in manual mode.
12	Confirm the operation of each interface signal.
13	Confirm the operation of control interface signals for peripherals.

5.2 Pn Parameter Settings for Teach Pendant

Modify the drive unit parameters by following these step below.

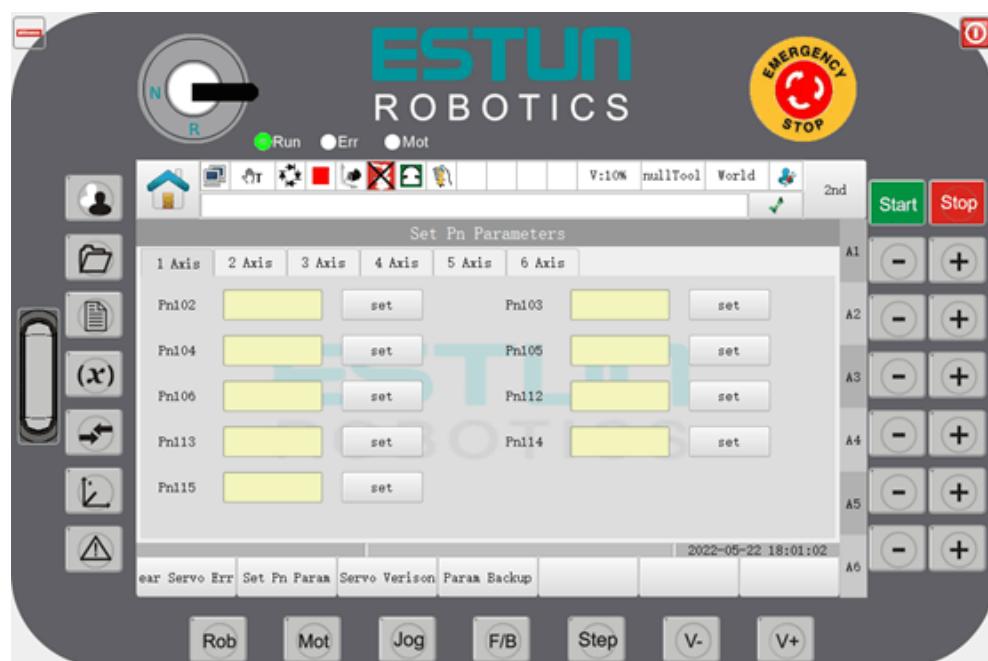
Step 1 Turn on the main power. After switching on the power, the control cabinet will perform an initialization diagnosis. The screen of the teach pendant will display the initialization screen.

Step 2 After initialization is complete, check the system's operating status using the status indicators on the teach pendant. The Run LED should be constantly ON, and the Err LED should be OFF, indicating normal operation.

Step 3 When the teach pendant displays the Home screen, select "General Settings > Servo Management".



Step 4 Select the "Set Pn Parameters" tab. When the Teach Pendant displays the "Set Pn Parameters" screen, choose the drive axis you want to modify (e.g., Axis 1), then click the "Set" button.



Step 5 Set the desired parameters in the parameter dialog box that appears.



Please note that only a subset of Pn parameters can be set using the teach pendant. To set additional parameters, please use the operation panel. The robot must be in a stopped state before setting Pn parameters.

5.3 Introduction to Servo Parameters

5.3.1 Instructions for use

When indicating a parameter change, the effective time of the change is as follows:
 "Restart": The change takes effect only after the power is restored.
 "Immediately": The change takes effect immediately after the parameter settings are confirmed.

S/N	Name	Scope	Unit	Factory value	When to take effect				
	Basic function settings 0	0000~1111	-	0000	Restart				
Pn000	<div style="border: 1px solid red; padding: 5px; margin-top: 10px;"> Pn000.0: Servo ON <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">0</td> <td style="padding: 2px;">External S-ON is valid.</td> </tr> <tr> <td style="padding: 2px;">1</td> <td style="padding: 2px;">External S-ON is not valid. Motor excitation signal automatically turned on after /S-RDY output.</td> </tr> </table> Pn000.1: Reserved Pn000.2: Reserved Pn000.3: Reserved </div>	0	External S-ON is valid.	1	External S-ON is not valid. Motor excitation signal automatically turned on after /S-RDY output.				
0	External S-ON is valid.								
1	External S-ON is not valid. Motor excitation signal automatically turned on after /S-RDY output.								
					Detailed explanation of parameters				

5.3.2 Detailed explanation of parameters

S/N	Name	Scope	Unit	Factory value	When to take effect												
	Basic function settings 0	0000~0111	-	0110	Restart												
Pn000	Pn000.0: Servo ON <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">0</td> <td style="padding: 2px;">External S-ON is valid.</td> </tr> <tr> <td style="padding: 2px;">1</td> <td style="padding: 2px;">External S-ON is not valid. Motor excitation signal automatically turned on after /S-RDY output.</td> </tr> </table> Pn000.1: Prohibit forward rotation input <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">0</td> <td style="padding: 2px;">External P-OT is valid. When a travel limit occurs, the system stops according to the method set in Pn003.1.</td> </tr> <tr> <td style="padding: 2px;">1</td> <td style="padding: 2px;">External P-OT is not valid.</td> </tr> </table> Pn000.2: Prohibit reverse rotation input <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">0</td> <td style="padding: 2px;">External N-OT is valid. When a travel limit occurs, the system stops according to the method set in Pn003.1.</td> </tr> <tr> <td style="padding: 2px;">1</td> <td style="padding: 2px;">External N-OT is not valid.</td> </tr> </table>	0	External S-ON is valid.	1	External S-ON is not valid. Motor excitation signal automatically turned on after /S-RDY output.	0	External P-OT is valid. When a travel limit occurs, the system stops according to the method set in Pn003.1.	1	External P-OT is not valid.	0	External N-OT is valid. When a travel limit occurs, the system stops according to the method set in Pn003.1.	1	External N-OT is not valid.				
0	External S-ON is valid.																
1	External S-ON is not valid. Motor excitation signal automatically turned on after /S-RDY output.																
0	External P-OT is valid. When a travel limit occurs, the system stops according to the method set in Pn003.1.																
1	External P-OT is not valid.																
0	External N-OT is valid. When a travel limit occurs, the system stops according to the method set in Pn003.1.																
1	External N-OT is not valid.																

	Pn000.3: Reserved				
	Basic function settings 1	0000-1111	-	0000	Restart
Pn001	Pn001.0: CCW, CW selection				
	0	CCW, counterclockwise rotation for positive direction.			
	1	CW, clockwise rotation for positive direction.			
	Pn001.1: Reserved				
	Pn001.2: Reserved				
	Pn000.3: Reserved				
	Application function settings 2	0000~1111	-	0000	Restart
Pn002	Pn002.0: Actual position calculation selection after homing				
	0	The multi-turn encoder is not involved in calculation.			
	1	Use the absolute encoder as an incremental encoder.			
	Pn002.1: Reserved				
	Pn002.2: Absolute encoder selection				
	0	Use the absolute encoder as an absolute encoder			
	1	Use the absolute encoder as an incremental encoder			
	Pn002.3: Reserved				
	Application function settings 3	0x0000~0x1132	-	0x0000	Restart
Pn003	Pn003.0: Motor stop method when GR1 alarm occurs, STO active, SOFF				
	0	DB brake stop, and remain free state after stopping.			
	1	DB brake stop, and remain DB state after stopping.			
	2	Free stop, and remain free state after stopping.			
	Pn003.1: Stop method when overtravel occurs				
	0	DB brake stop, and remain free state after stopping.			
	1	Free stop, and remain free state after stopping.			
	2	Reverse connection brake stop, at zero clamp after stopping.			
	3	Reverse connection brake stop, and remain free state after stopping.			
	Pn003.2: Forced stop method selection				
	0	Selected by Pn parameter			
	1	Selected by bus			
	Pn003.3: Reserved				

	Application function settings 4	0x0000~0xFF25	-	0x0000	Restart
Pn004	Pn004.0: Stop method when GR2 alarm occurs				
	0	DB brake stop, and remain free state after stopping.			
	1	DB brake stop, and remain DB state after stopping.			
	2	Free stop, and remain free state after stopping.			
	3	Reverse connection brake stop, and remain DB state after stopping.			
	4	Reverse connection brake stop, and remain free state after stopping.			
	5	Treat as a warning, motor operates normally.			
	Pn004.1: Ek zero clearing method in non-bus mode				
	0	Clear when SOFF, clear when STO, and not clear when OT.			
	1	Only the CLEAR signal is cleared.			
	2	Clear when SOFF, STO, or OT (except zero clamp).			
Pn004.2: Reserved					
Pn004.3: Reserved					
	Application function settings 5	0x00D0~0x33D3	-	-	Restart
Pn005	Pn005.0: Internal torque feedforward method				
	0	General internal torque feedforward.			
	1	Reserved			
	2	High-speed internal torque feedforward.			
	3	Reserved			
	Pn005.1: Control method in non-bus mode				
	D	Speed control			
	Pn005.2 : Torque feedforward method				
	0	Internal torque feedforward, set by Pn005.0.			
	1	Reserved			
	2	Controller-set torque feedforward, effective in bus control mode, set via object 0x60B2.			
	3	Reserved			
Pn005.3: Speed feedforward method					
0	Internal speed feedforward				
1	Reserved				
2	Controller-set speed feedforward. Effective in bus control mode, set via object 0x60B1.				
3	Reserved				
Pn007	Application function settings 7	0x0000~0x112F	-	250	Restart

	<table border="1"> <tr><td colspan="2">Pn007.0: Reserved</td></tr> <tr><td colspan="2">Pn007.1: Main power supply method</td></tr> <tr><td>0</td><td colspan="3">Single-phase AC</td></tr> <tr><td>1</td><td colspan="3">Three-phase AC</td></tr> <tr><td>2</td><td colspan="3">DC</td></tr> <tr><td colspan="2">Pn007.2: Undervoltage torque Limitation Enable</td></tr> <tr><td>0</td><td colspan="3">Invalid undervoltage torque limitation</td></tr> <tr><td>1</td><td colspan="3">Undervoltage torque limitation enabled</td></tr> <tr><td colspan="2">Pn007.3: AC power supply frequency</td></tr> <tr><td>0</td><td colspan="3">50Hz</td></tr> <tr><td>1</td><td colspan="3">60Hz</td></tr> </table>					Pn007.0: Reserved		Pn007.1: Main power supply method		0	Single-phase AC			1	Three-phase AC			2	DC			Pn007.2: Undervoltage torque Limitation Enable		0	Invalid undervoltage torque limitation			1	Undervoltage torque limitation enabled			Pn007.3: AC power supply frequency		0	50Hz			1	60Hz		
Pn007.0: Reserved																																									
Pn007.1: Main power supply method																																									
0	Single-phase AC																																								
1	Three-phase AC																																								
2	DC																																								
Pn007.2: Undervoltage torque Limitation Enable																																									
0	Invalid undervoltage torque limitation																																								
1	Undervoltage torque limitation enabled																																								
Pn007.3: AC power supply frequency																																									
0	50Hz																																								
1	60Hz																																								
Pn008	Startup panel display selection	0~9999	-	9999	Restart																																				
	This value sets the Un number displayed on the panel at startup. If the value is not in the Un list, the "status screen" is displayed. If set to 0, the Un000 content is displayed at startup.																																								
Pn012	Discharge time	0~100	-	50	Immediately																																				
	The longer the set time, the stronger the discharge capacity.																																								
Pn102	Speed loop gain	0~1000	rad/s	500	Immediately																																				
	This value determines the magnitude of the speed loop gain.																																								
Pn103	Speed loop integral time	0~5000	0.1ms	125	Immediately																																				
	Decreasing this value will shorten the positioning time and improve the speed response.																																								
Pn104	Position loop gain	0~1000	1s	40	Immediately																																				
	This value determines the amount of gain in the position loop. Increasing this value increases the servo rigidity of the position control, but too large a value may cause oscillations.																																								
Pn105	Torque command filter time constants	10~2500	0.01ms	50	Immediately																																				
	Setting the torque command filter can eliminate or reduce mechanical vibration, but may introduce mechanical vibration if not set properly.																																								
Pn106	Percentage of load inertia	0~9999	%	0	Immediately																																				
	Ratio of load inertia to motor rotor inertia. Set value = (Load inertia/Motor rotor inertia) x 100																																								
Pn112	Internal speed feedforward percentage	0~100	%	0	Immediately																																				
	This value sets the speed feedforward percentage. The higher the value, the faster the position response and																																								

	the smaller the position deviation. Setting the value too high can cause overshoot and oscillation. Effective when Pn005.3 = 0.				
Pn113	Internal speed feedforward filter time constant	0~640	0.1ms	0	Immediately
	This value smooths the mechanical impact caused by speed feedforward. Setting it too large may cause excessive delay in speed feedforward and induce oscillation.				
Pn114	Internal torque feedforward percentage	0~100	%	0	Immediately
	This value sets the torque feedforward percentage to accelerate speed response. Used in manual tuning mode, set the load inertia percentage correctly. Effective when Pn005.2 = 0.				
Pn115	Internal torque feedforward filter time constant	0~640	0.1ms	0	Immediately
	This value smooths the mechanical impact caused by torque feedforward.				
Pn130	Coulomb Friction Load	0~3000	0.1Tn	0	Immediately
	This value compensates for Coulomb friction load or fixed load.				
Pn131	Coulomb friction compensation speed hysteresis	0~100	rpm	0	Immediately
	The threshold for starting Coulomb friction compensation.				
Pn132	Viscous friction coefficient	0~1000	0.1%Tn/1000rpm	0	Immediately
	The viscous friction coefficient				
Pn135	Speed feedback low-pass filter	0~3000	0.01ms	4	Immediately
	Time constant of the speed feedback filter. Effective when Pn162 = 0.				
Pn305	JOG speed	0~6000	rpm	500	Immediately
	The magnitude of the speed command when the JOG is running and the direction is determined by the keys.				
Pn306	Soft start acceleration time	0~10000	ms	0	Immediately
	Time required to accelerate to 1000rpm under ramp speed command.				
Pn307	Soft start deceleration time	0~10000	ms	0	Immediately
	Time required to decelerate to 1000rpm under ramp speed command.				
Pn323	Overspeed alarm detection threshold	0~8000	ms	8000	Immediately

	Triggers overspeed alarm A.03 when motor speed exceeds this set value.				
Pn401	Forward internal torque limit	0~400	%	350	Immediately
	Forward internal torque limit				
Pn402	Reverse internal torque limit	0~400	%	350	Immediately
	Reverse internal torque limit				
Pn408	Speed limit during torque control	0~6000	rpm	1500	Immediately
	Speed limit during torque control				
Pn504	Deviation counter overflow alarm threshold	1~83886080	pulse	41943040	Immediately
	Triggers an alarm when the deviation counter value exceeds this threshold.				
Pn505	Servo On waiting time	-2000~2000	ms	-50	Immediately
	<p>This parameter is only effective when the port output parameter is configured to have /BK output.</p> <p>This parameter controls the timing of the holding brake (to prevent gravitational slip or sustained external force acting on the motor).</p> <ol style="list-style-type: none"> When this parameter is positive, upon receiving the servo ON input, the /BK signal is output first, then after a delay set by this parameter, the motor excitation signal is given; When this parameter is negative, upon receiving the servo ON input, the motor excitation signal is given immediately, then after a delay set by this parameter, the /BK signal is output. 				
Pn506	Basic waiting process	0~500	10ms	50	Immediately
	<p>This parameter is only effective when the port output parameter is configured to have /BK output.</p> <p>This parameter controls the timing of the holding brake (to prevent gravitational slip or sustained external force acting on the motor).</p> <p>The standard setting is to output /BK (brake action) simultaneously with servo OFF.</p> <p>Depending on the mechanical structure and characteristics of the brake, the machine may move slightly under the influence of gravity. At this time, using the user parameter to delay the servo OFF action can eliminate the movement. Using this parameter to delay the servo OFF action can eliminate this movement. This parameter is only effective when the motor is stopped or at low speed.</p>				
Pn507	Brake waiting speed	10~100	rpm	100	Immediately
	<p>This parameter is only effective when the port output is configured to include /BK output.</p> <p>This parameter controls the timing of the holding brake (to prevent gravitational slip or sustained external forces on the motor).</p> <p>When the motor speed drops below the value set by this parameter after servo OFF, the /BK signal is output.</p>				
Pn508	Brake waiting time	0~100	10ms	10	Immediately
	<p>This parameter is only effective when the port output is configured to include /BK output.</p> <p>This parameter controls the timing of the holding brake (to prevent gravitational slip or sustained external forces on the motor).</p> <p>The /BK signal is output after the delay exceeds the value set by this parameter following servo OFF.</p> <p>The /BK signal is output if either the brake waiting speed or brake waiting time condition is fulfilled.</p>				

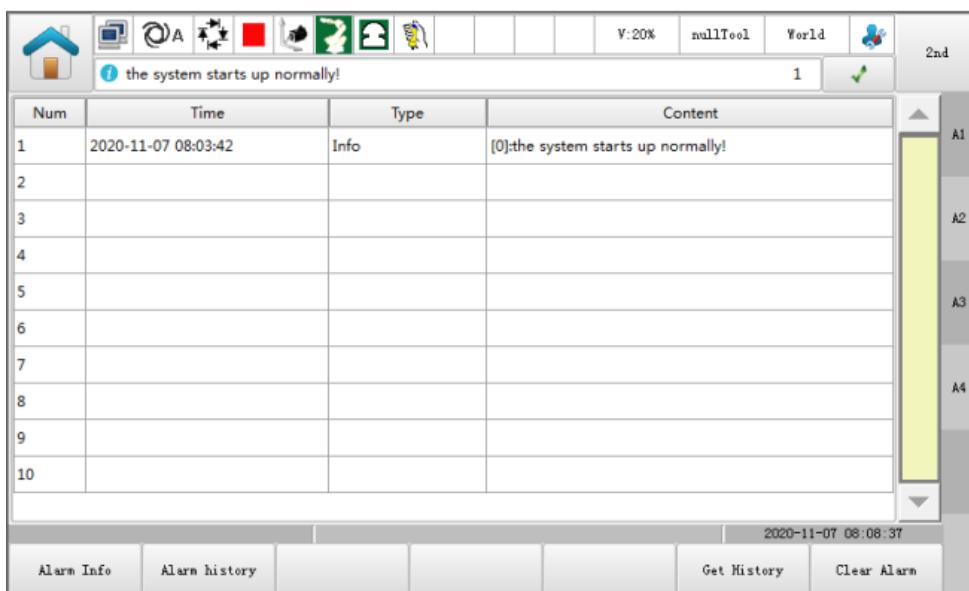
Pn535	Bleeder resistor resistance value	20~300	Ω	-	Immediately
	Bleeder resistor resistance value				
Pn536	Bleeder resistor power	10~37500	W	60	Immediately
	Bleeder resistor power				
Pn537	Bleeder resistor heat transfer coefficient	20~100	-	-	Immediately
	Bleeder resistor heat transfer coefficient				

Chapter 6 View Servo Alarms and Handling

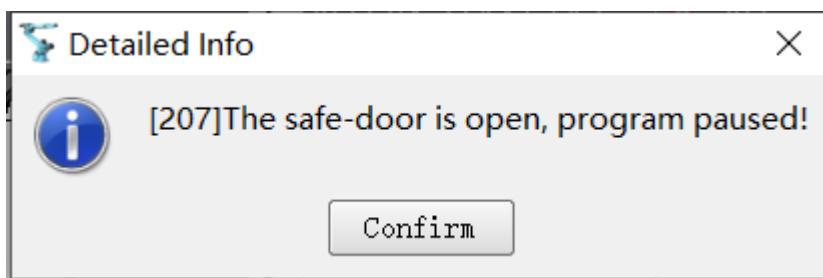
6.1 View Alarms Using Teach Pendant

When a robot encounters an alarm during its operation, it immediately halts its motion. The teach pendant will display an alarm icon, to allow users to access the "Log Management" interface to view detailed information about the alarm.

Step 1 Click on the "Log Management" or  button on the Home page or screen to enter the "Log Management" page. Then, click on the "Alarm" button below to view the "Current Alarms" information.

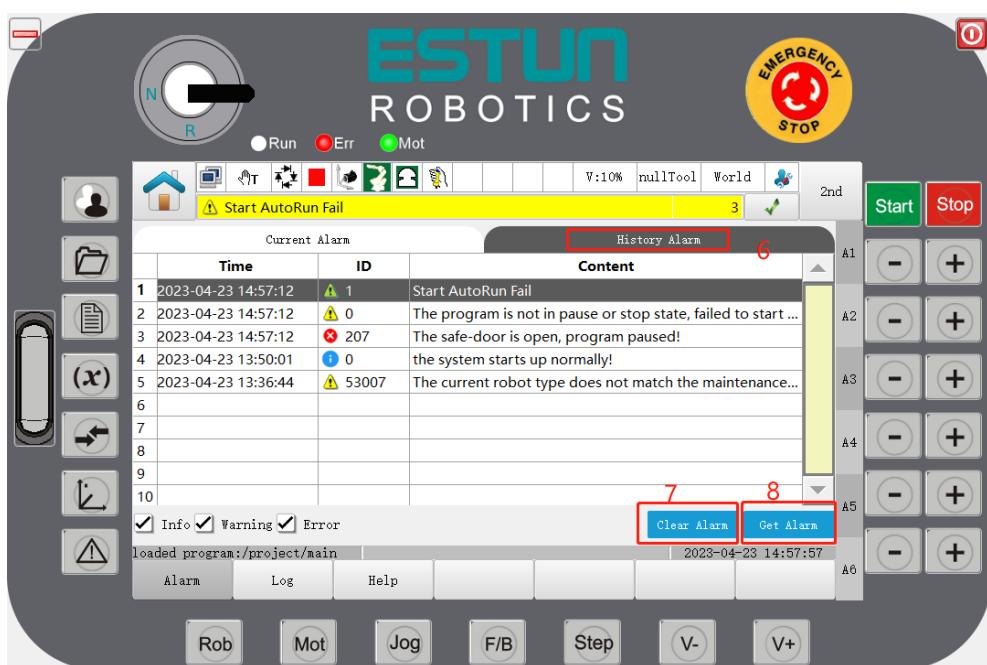


Step 2 Click on the "Content" of the current alarm to view its "Detailed Information", including phenomenon, cause analysis, and solutions.



Step 3 If the current alarm has been confirmed as resolved, click the "Clear Current Alarm" button below to clear the current alarm.

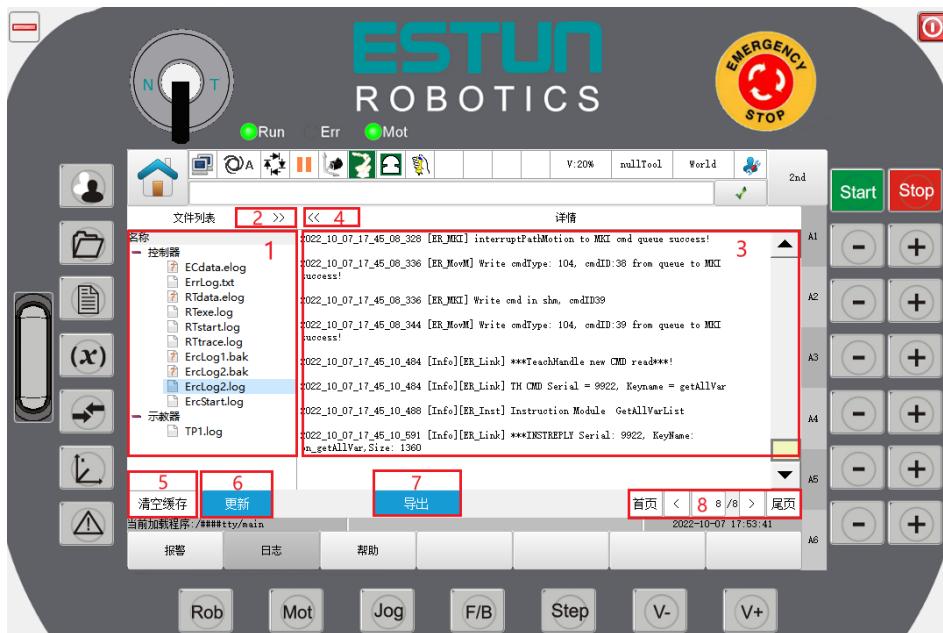
Step 4 Click on the "Historical Alarms" above to access the "Historical Alarms" tab. Then, click the "Get Historical Alarms" button to obtain historical alarm information.



6.2 Log

Step 1 Click on the "Log" button in the "System Log" interface to switch to the logging interface.

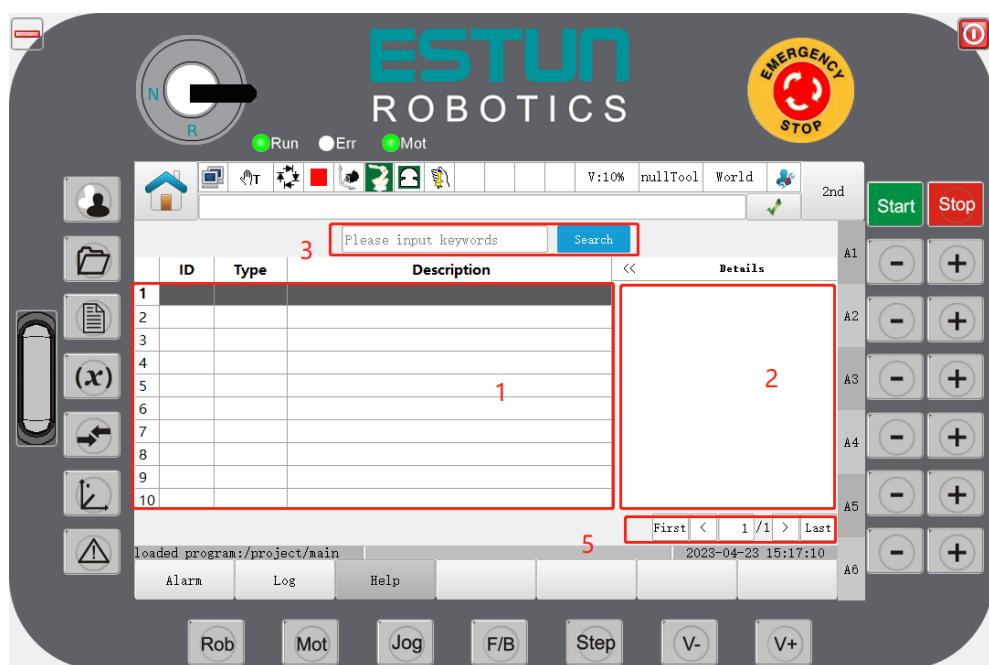
Step 2 Users can view the contents of the log on the controller or demonstrator side as appropriate.



6.3 Help

On the Log management screen, you can check whether there are any alarm details on the Help screen.

Step 1 On the "Log management" screen, click the "Help" button at the bottom to switch to the "Help" tab.



Step 2 Click "Search box", enter "Alarm number" or "Keyword" and click "Confirm". "Press the "Search" button to find out the detailed information of the alarm.

6.4 Alarm List

No.	Name	Cause of fault	Solution
A.01	Storage parameter check exception	Storage parameter check exception	Try performing a factory reset; if the alarm persists, return to the factory.
A.03	Overspeed	The motor speed calculated in the program exceeds 1,000 rpm or exceeds the speed specified in Pn323	1. Check the setting value of Pn323 2. Check the motor power line connection 3. Return to the factory
A.04	Motor overload	The motor experiences an overload and triggers an alarm	Select a larger power servo drive and motor, or reduce the cycle speed
A.05	Position deviation counter overflow	The value of the deviation counter Ek exceeds the limit	Try reducing the pulse input frequency or increasing the position loop gain
A.06	Position deviation pulse exceeds parameter Pn504 value	The deviation counter Ek value exceeds Pn504 * electronic gear && Pn521.1 = 1 enabling alarm	1. Try reducing the pulse input frequency or increasing the position loop gain 2. Increase the Pn504 setting
A.07	Inappropriate configuration of electronic gear ratio and desired pulse frequency	Use of different processing schemes based on different encoder bit numbers: (1) Encoder bits < 20, electronic gear ratio (A/B) range: [0.001, 4000] (2) Encoder bits = 21, electronic gear ratio (A/B) range: [0.001, 8000] (3) Encoder bits = 22, electronic gear ratio (A/B) range: [0.001, 16000] (4) Encoder bits = 23, electronic gear ratio (A/B) range: [0.001, 32000] (5) Encoder bits = 24, electronic gear ratio (A/B) range: [0.001, 64000] If beyond these ranges, an alarm will occur	Adjust electronic gear settings
A.08	Issue with current detection channel 1	There's issue for current detection channel 1	Return to the factory
A.09	Issue with current detection channel 2	There's issue for current detection channel 2	Return to the factory
A.11	Module internal junction temperature too high	High ambient temperature, improper installation orientation of the servo drive, or inadequate spacing with other servo drives causing excessive internal junction module temperature	Improve the cooling conditions of the servo drive, reduce ambient temperature, and install according to the servo drive's installation standards
A.12	Module overcurrent or discharge circuit current overcurrent	IPM module or discharge circuit current exceeds the maximum allowed value	Return to the factory
A.13	Overvoltage	Bus voltage exceeds the maximum threshold	1. Check if the bleeder resistor wiring is abnormal 2. Try modifying the motor's operating trajectory or reducing the cycle speed
A.14	Undervoltage	Bus voltage is below the minimum threshold	Check the main power supply system; if normal, return to the factory
A.15	Bleeder resistor damaged	Bleeder resistor is not connected.	Check if the bleeder resistor is not connected or the wire is burnt
A.16	Abnormal discharge	Abnormal discharge	Try modifying the motor's operating trajectory or reducing the cycle speed
A.18	IGBT module overheating	IPM or IGBT detects a temperature exceeding 105°C	Try optimizing the drive's cooling environment
A.1A	Charging resistor overload	Charging resistor overload	Avoid frequent the mains power-up and power-off within a short period.
A.1B	DB brake circuit damaged	DB brake circuit damaged	Return to the factory

No.	Name	Cause of fault	Solution
A.1C	Fan failure alarm	Fan failure alarm, fan failure time exceeds 30 seconds	Return to the factory
A.1D	NTC disconnected	Temperature sensor disconnected	Return to the factory
A.1E	Mains charging circuit fault	Charging resistor is faulty	Return to the factory
A.1F	Ground short circuit fault	Ground short circuit fault in the motor power line, causing excessive current or voltage pump-up	Check the motor power line
A.23	Discharge brake circuit overcurrent	Hardware detects excessive discharge current in the discharge circuit	1. Correctly connect the bleeder resistor 2. Replace the bleeder resistor 3. Return to the factory
A.24	Main circuit power supply wiring error	Main circuit power supply wiring error	Check whether the main circuit power supply method (DC power supply, AC power supply) is consistent with the parameter setting
A.2A	Brake feedback abnormality	Brake feedback abnormality	Return to the factory
A.35	Control board temperature sensor disconnected	–	–
A.42	Mismatch between motor power and drive power	Motor power does not match the drive power	Use a motor that matches the drive power; for example, a 400W drive can only match a 400W motor
A.43	Encoder type error	Encoder type read from the encoder is inconsistent with the type stored in the encoder EEPROM	Return to the factory
A.45	Multi-turn information error	Multi-turn information error, possibly caused by encoder contamination or strong electromagnetic interference	Check if the encoder battery is normal, try using Fn011 to clear the error, then restart the drive
A.46	Multi-turn overflow	Multi-turn overflow	Use Fn011 to clear the error, then restart the drive
A.47	Battery voltage too low	Encoder battery voltage too low	Replace the battery, use Fn011 to clear the error, then restart the drive
A.48	Battery undervoltage	Encoder battery undervoltage	Replace the battery, use Fn011 to clear the error, then restart the drive
A.49	Detection of abnormal multi-turn or single-turn information	Abnormal multi-turn or single-turn position information as fed back from encoder	Return to the factory
A.4A	Encoder temperature too high	Encoder temperature is too high	Reduce motor load, optimize heat dissipation environment, use Fn011 to clear the error, then restart the drive
A.50	Encoder disconnected	Encoder disconnected	Check if the encoder cable is reliably connected; keep the encoder cable away from strong radiation sources
A.51	Overspeed detected by absolute encoder	Encoder detects motor overspeed	Reduce motor speed command, use Fn011 to clear the error, then restart the drive
A.52	Encoder internal error	Encoder internal error	Clearable through Fn011; try to power up again
A.53	Encoder single-turn information error	Encoder internal error	Clearable through Fn011; try to power up again
A.54	Checksum or stop bit error in encoder control field	Checksum or stop bit error in encoder control field	Clearable through Fn011; try to power up again
A.58	Empty or incorrect information for encoder phase in Zone 1	Encoder phase information in Zone 1 is empty or incorrect	Try replacing the motor

No.	Name	Cause of fault	Solution
A.59	Empty or incorrect information for encoder motor body in Zone 2	Information for encoder motor body in Zone 2 is empty or incorrect, or motor parameter version is incorrect	Try replacing the motor
A.65	Position overflow alarm	Position difference given by IP or CSP is too large	Check if the controller's trajectory planning is correct
A.70	DC synchronization error	EtherCAT master's set period does not meet requirements or SYNC0 is not synchronized with the drive	Check if the master's DC setting parameters are correct
A.71	SM Event synchronization error (event arrived too early)	SM Event synchronization error (event arrived too early)	Check master settings
A.72	SM Event synchronization error (event arrived too late)	SM Event synchronization error (event arrived too late)	Check master settings
A.74	Error setting period in Position Cubic interpolation algorithm	An algorithm period error is detected when using the Cubic interpolation algorithm, which is equal to the DC synchronization period	Check that the DC cycle setting value is correct and is not set to 0
A.75	Synchronization period setting error	DC sync period or 60C2 object setting is not an integer multiple of 125us or is less than 125us	Check the setting of DC synchronization period, and the setting of 0x60C2
A.76	Acceleration object set to 0 in PP/PV mode	Acceleration object is set to 0 in PP/PV mode	Modify the value of /0x6083/0x6084/0x6085 to a non-zero value
A.77	EtherCAT communication interrupted	Slave is in OP mode, and the interval for receiving process data is greater than the watchdog setting time	Restart the controller or check the network cable's ON/OFF connection
A.81	Motor UVW wiring error	Motor UVW wiring error	Check if UVW wiring is loose, missing phase or wrong phase sequence
A.82	Motor type mismatch	Motor type mismatch	Try replacing the motor
A.83	Abnormal motor operation	Motor wiring abnormality or motor reverse trailing for power generation	<ol style="list-style-type: none"> 1. Check if motor power line wiring phase sequence is correct; 2. Determine if the motor is generating reverse drag; 3. Based on actual conditions, set Pn521.2=1 to mask this alarm.
A.94	Excessive mixing deviation of the second encoder	Excessive mixing deviation of the second encoder	<ol style="list-style-type: none"> 1. Check that the parameters of Pn210, Pn212, Pn213 and Pn214 are set correctly; 2. Check whether the second encoder wiring is normal; 3. Check whether the mechanical connection structure is loose, slippery or has a large gap;
A.D1	Undervoltage warning	Undervoltage warning	<ol style="list-style-type: none"> 1. Check whether the mains input voltage is normal; 2. check whether the drive power line wiring is correct;
A.101	Storage check exception	Storage check exception	If alarm persists, then return to the factory
A.103	MC1 feedback exception	Control input and output of MC1 are inconsistent	Return to the factory
A.104	MC2 feedback exception	MC2 control input and output are not consistent	Return to the factory
A.105	5V_STO undervoltage	5V_STO undervoltage	Return to the factory
A.106	5V_STO overvoltage	5V_STO overvoltage	Return to the factory
A.107	Ambient temperature over-temperature	Ambient temperature inside the control cabinet exceeds the limit value	<ol style="list-style-type: none"> 1. Shut down and cool it down; 2. Return to the factory

No.	Name	Cause of fault	Solution
A.110	External E-stop abnormality	Channel 2 limit switch is disconnected or E-stop button is pressed; channel 1 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.111	External E-stop abnormality	Channel 1 limit switch is disconnected or E-stop button is pressed; Channel 2 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.112	Teach pendant E-stop abnormality	Channel 2 teach pendant E-stop signal is valid; Channel 1 teach pendant E-stop is invalid, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.113	Teach pendant E-stop abnormality	Channel 1 teach pendant E-stop signal is valid; Channel 2 teach pendant emergency stop is invalid, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.114	Manual mode abnormality	Channel 2 is in manual mode; Channel 1 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.115	Manual mode abnormality	Channel 1 is in manual mode; Channel 2 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.116	Auto mode exception	Channel 2 is in auto mode; Channel 1 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.117	Auto mode exception	Channel 1 is in auto mode; Channel 2 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.118	Startup confirmation error	Channel 2 start confirmation short-circuited; Channel 1 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.119	Startup confirmation error	Channel 1 start confirmation short-circuited; Channel 2 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.11A	Teach pendant enable error	Channel 2 teach pendant enable status is valid; Channel 1 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.11B	Teach pendant enable error	Channel 1 teach pendant enable status is valid, Channel 2 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.11C	AS signal exception	Channel 2 AS2 safety door is closed; Channel 1 AS1 safety door is disconnected, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.11D	AS signal exception	Channel 1 AS2 safety door is closed; Channel 2 AS2 safety door is disconnected, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.11E	GS signal exception	Channel 2 GS2 safety door is closed; Channel 1 GS1 safety door is disconnected, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.11F	GS signal exception	Channel 1 GS2 safety door is closed; Channel 2 GS2 safety door is disconnected, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.121	Abnormal signal insertion of the teach pendant	Teach pendant aviation plug is not reliably plugged in, Channel 1 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.122	Abnormal insertion signal of teach pendant	Teach pendant aviation plug is not reliably plugged in, Channel 2 status is abnormal, and system alarm is triggered	1. Check cable and terminal connections; 2. Return to the factory
A.130	E-stop 1 fault of the teach pendant hardware	Hardware failure of the E-stop circuitry of channel 1.	Return to the factory
A.131	E-stop 2 fault of the teach pendant hardware	Hardware failure of the E-stop circuitry of Channel 2	Return to the factory

No.	Name	Cause of fault	Solution
A.132	Class 0 signal 1 fault	Hardware failure of Channel 1's Class 0 E-stop circuitry	Return to the factory
A.133	Class 0 signal 2 fault	Hardware failure of Channel 2's Class 0 E-stop circuitry	Return to the factory
A.134	Enable 1 failure of teach pendant hardware	Hardware fault in Channel 1's teach pendant enable circuitry	Return to the factory
A.135	Enable 2 failure of teach pendant hardware	Hardware fault in Channel 2's teach pendant enable circuitry	Return to the factory
A.136	Auto mode protection stop 1 fault	Hardware fault in auto mode protection stop circuitry of Channel 1	Return to the factory
A.137	Auto mode protection stop 2 fault	Hardware fault in auto mode protection stop circuitry of Channel 2	Return to the factory
A.138	Normal mode protection stop 1 fault	Hardware fault in general mode protection stop circuitry of Channel 1	Return to the factory
A.139	Normal mode protection stop 2 fault	Hardware fault in general mode protection stop circuitry of Channel 2	Return to the factory
A.13A	Class 1 signal 1 fault	Class 1 E-stop circuitry hardware fault on Channel 1	Return to the factory
A.13B	Class 1 signal 2 fault	Class 1 E-stop circuitry hardware fault on Channel 2	Return to the factory
A.140	Input channel 1 fault	Input hardware circuitry fault on Channel 1	Return to the factory
A.141	Input channel 2 fault	Input hardware circuitry fault on Channel 2	Return to the factory
A.142	Forming module 1 fault	Hardware circuitry fault in the forming module of Channel 1	Return to the factory
A.143	Forming module 2 fault	Hardware circuitry fault in the forming module of Channel 2	Return to the factory
A.144	PNP1 fault	PNP hardware circuitry fault on Channel 1	Return to the factory
A.145	PNP2 fault	PNP hardware circuitry fault on Channel 2	Return to the factory
A.146	Logic or gate 1 fault	Logic or gate related hardware circuitry fault on Channel 1	Return to the factory
A.147	Logic or gate 2 fault	Logic or gate related hardware circuitry fault on Channel 2	Return to the factory
A.148	Buffer module A1 fault	Buffer module A hardware circuitry fault on Channel 1	Return to the factory
A.149	Buffer module A2 fault	Buffer module A hardware circuitry fault on Channel 2	Return to the factory
A.14A	Buffer module B1 fault	Buffer module B hardware circuitry fault on Channel 1	Return to the factory
A.14B	Buffer module B2 fault	Buffer module B hardware circuitry fault on Channel 2	Return to the factory
A.150	Diagnostic task not completed within 20ms	Diagnostic task not completed within 20ms	1. Power off and restart; 2. Return to the factory
A.151	STO state machine jump error	State machine jump error when exception goes to state 0	1. Power off and restart; 2. Return to the factory
A.152	STO state machine jump error	State machine jump error when exception goes to state 1	1. Power off and restart; 2. Return to the factory
A.153	STO state machine jump error	State machine jump error when exception goes to state 2	1. Power off and restart; 2. Return to the factory
A.154	STO state machine jump error	State machine jump error when exception goes to state 3	1. Power off and restart; 2. Return to the factory
A.155	STO state machine jump error	State machine jump error when exception goes to state 4	1. Power off and restart; 2. Return to the factory
A.156	STO state machine jump error	State machine jump error when exception goes to state 5	1. Power off and restart; 2. Return to the factory
A.157	STO state machine jump error	State machine jump error when exception goes to state 6	1. Power off and restart; 2. Return to the factory

No.	Name	Cause of fault	Solution
A.158	STO state machine jump error	State machine jump error when exception goes to state 7	1. Power off and restart; 2. Return to the factory
A.159	STO state machine jump error	State machine jump error when exception goes to state 8	1. Power off and restart; 2. Return to the factory
A.15A	STO state machine jump error	State machine jump error when exception goes to state 9	1. Power off and restart; 2. Return to the factory
A.160	Class 0 E-stop time for Channel 1 is too fast	E-stop time less than the limit for Class 0 in Channel 1	1. Clear the alarm and execute the Class 0 stop again; 2. Return to the factory if it is repeatedly occurring.
A.161	Class 0 E-stop time for Channel 2 is too fast	E-stop time less than the limit for Class 0 in Channel 2	1. Clear the alarm and execute the Class 0 stop again; 2. Return to the factory if it is repeatedly occurring.
A.162	Class 0 E-stop time for Channel 1 is too slow	E-stop time greater than the limit for Class 0 in Channel 1	1. Clear the alarm and execute the Class 0 stop again; 2. Return to the factory if it is repeatedly occurring.
A.163	Class 0 E-stop time for Channel 2 is too slow	E-stop time greater than the limit for Class 0 in Channel 2	1. Clear the alarm and execute the Class 0 stop again; 2. Return to the factory if it is repeatedly occurring.
A.164	Class 1 E-stop time for Channel 1 is too fast	E-stop time less than the limit for Class 1 in Channel 1	1. Clear the alarm and execute the Class 1 stop again; 2. Return to the factory if it is repeatedly occurring.
A.165	Class 1 E-stop time for Channel 2 is too fast	E-stop time less than the limit for Class 1 in Channel 2	1. Clear the alarm and execute the Class 1 stop again; 2. Return to the factory if it is repeatedly occurring.
A.166	Class 1 E-stop time for Channel 1 is too slow	E-stop time greater than the limit for Class 1 in Channel 1	1. Clear the alarm and execute the Class 1 stop again; 2. Return to the factory if it is repeatedly occurring.
A.167	Class 1 E-stop time for Channel 2 is too slow	E-stop time greater than the limit for Class 1 in Channel 2	1. Clear the alarm and execute the Class 1 stop again; 2. Return to the factory if it is repeatedly occurring.
A.170	DC synchronization error	The cycle set by the EtherCAT master does not meet the requirements or SYNC0 is not synchronized with the drive.	Check if the master DC setting parameters are correct
A.175	Synchronization cycle setting error	DC sync period or 60C2 object setting is not an integer multiple of 125us or is less than 125us	Check the setting of DC syn period, check the setting of 0x60C2
A.177	EtherCAT communication interrupted	Slave in OP mode receives process data at intervals greater than the watchdog setting time	Restart the controller or check the network cable connection
A.180	Card slot 1 fault	Reserved	Reserved
A.181	Card slot 2 fault	Reserved	Reserved
A.182	Card slot 3 fault	Reserved	Reserved
A.183	Card slot 1 expansion card error	Reserved	Reserved
A.184	Card slot 2 expansion card abnormality	Reserved	Reserved
A.185	Card slot 3 expansion card abnormality	Reserved	Reserved

No.	Name	Cause of fault	Solution
A.186	Abnormal number of encoder expansion card	The number of encoder expansion cards is more than 2	1. Check the number of expansion cards; 2. Return to the factory.
A.187	Encoder 1 disconnected	Encoder 1 disconnected	1. Check the encoder 1 cable and terminal; 2. Return to the factory.
A.188	Encoder 2 disconnected	Encoder 2 disconnected	1. Check the encoder 1 cable and terminal; 2. Return to the factory.
A.189	Encoder 1 phase abnormality	Reserved	Reserved
A.18A	Encoder 2 phase abnormality	Reserved	Reserved

Chapter 7 Maintenance

7.1 Maintenance precautions

Before performing maintenance, please carefully read the following content and ensure a thorough understanding of the methods for safe maintenance.

- Maintenance of the robot system must be carried out by personnel who have received safety training. Trained personnel refer to individuals who have undergone safety training in accordance with the laws and regulations of their respective countries, specifically designed to provide knowledge on industrial robots, their operation, teaching, inspection, and related regulations.



Danger

- Do not disassemble parts that are not described in this manual or perform maintenance using methods different from those specified. This could result in the robot system malfunctioning or serious safety issues.
- Do not enter the robot's workspace while it is powered on.
- Always verify the robot's movement from outside the safety barrier after replacing components.
- Before formal operation, confirm the correct operation status of the emergency stop switch and safety door switch.

- Except for maintenance operations, do not open the control cabinet cover to avoid electrical hazards.



WARNING

- Always replace components after turning off the power to the control cabinet and associated devices.
- Do not disconnect motor connectors while the power is on.
- Perform maintenance, inspections, and other tasks in teams of two, with one person maintaining a posture to immediately press the emergency stop button and the other person remaining vigilant to complete the task quickly and ensure a clear path for retreat.



Caution

- Do not disassemble parts that are not covered in this manual.
- Maintenance personnel must keep the robot key secure, and unauthorized personnel should not modify programs or parameters.

7.2 Daily inspection

To ensure the normal functioning of the product and protect it from damage, it is necessary to perform regular maintenance and inspections.

If the equipment is located in the following environments, reduce the inspection interval:

- Temperature, humidity, dust, and vibration in the environment
- High-temperature environment
- Frequent start-stop situations
- Environments with AC power and load fluctuations
- Environments with significant vibration or impact
- Environments with corrosive substances, such as acids or alkalis

To ensure the proper functioning of the product and prevent damage, daily confirmation should be made for the following items:

Item	Content	Solution
Installation environment	Check the control cabinet and surrounding cables for abnormalities	Verify if the installation brackets are vibrating. Check for loose or corroded connections at cable terminals.
Input voltage	Input power voltage	Confirm if the input voltage is within the allowable range. Check for any significant load starting in the vicinity.
Terminals	Control cabinet terminals	Ensure that the bolts on both sides of the input, output, and other terminals are tightened

7.3 Regular inspection

Regular inspections should be conducted on areas that are difficult to inspect during operation. It is essential to maintain the control cabinet in a clean state and effectively remove accumulated dust from the product surface to prevent dust, especially metal dust, from entering the internal components.

(● : Replace ○ : Check)

Inspection Frequency			Maintenance			Inspection Parts	Content	Inspection/Handling Method
Weekly	3 months	1 year	4 years	5 years	8 years			
○						Electric cabinet body	Splash, dust and other impurities adhered	Confirmation by visual inspection, cleaning
○						Rear body of control cabinet	Splash, dust and other impurities adhered, and other debris should be closely inspected, with particular emphasis on checking whether the transformer terminals are covered in dust, to prevent short circuits	Confirmation by visual inspection, cleaning
○						Warning label on electrical cabinet	Peeling, defacement	Confirmation by visual inspection, cleaning. Replace the sticker when there are obvious stains or the surface begins to peel
○						Fan	Normal operation confirmation	Confirmation by visual inspection, cleaning
○						Filter sponge	Dirt and blockage	Confirmation by visual inspection, cleaning and replacement
○						Teach pendant console, electric cabinet operation panel, other operating switches	Confirm the function of indicator light, operation switch, button switch, etc.	Confirmation by visual inspection
○						Teach pendant	Check the E-stop button and	Please make sure that all

					control table, control cabinet operation panel	enable the switch	E-stop buttons and enable switches can effectively cut off the servo power during operation.
	○		●	●	Cable set, teach pendant cable, other external wiring	Make sure there is no damage, broken, loose joints	Visual check. Tighten. If the cable is damaged, replace it.
		○		●	Teach pendant	Confirmation of damage, cleaning of operation position, confirmation of LCD display	Visual check and cleaning. When the display of the LCD screen becomes obviously dark, replace the teach pendant.
				●	Overhaul		



Use a soft cloth to remove dust when cleaning. Do not use equipment such as air blowers to blow away dust. Wind pressure can cause dust to enter the fan and the blade to rotate at a speed exceeding the specified speed, which may cause fan failure or affect its life. Use a vacuum cleaner only on the blade part, do not vacuum on the rotating part and the main body. This may cause the fan to fail or affect its life.

7.4 Program Backup and Loading

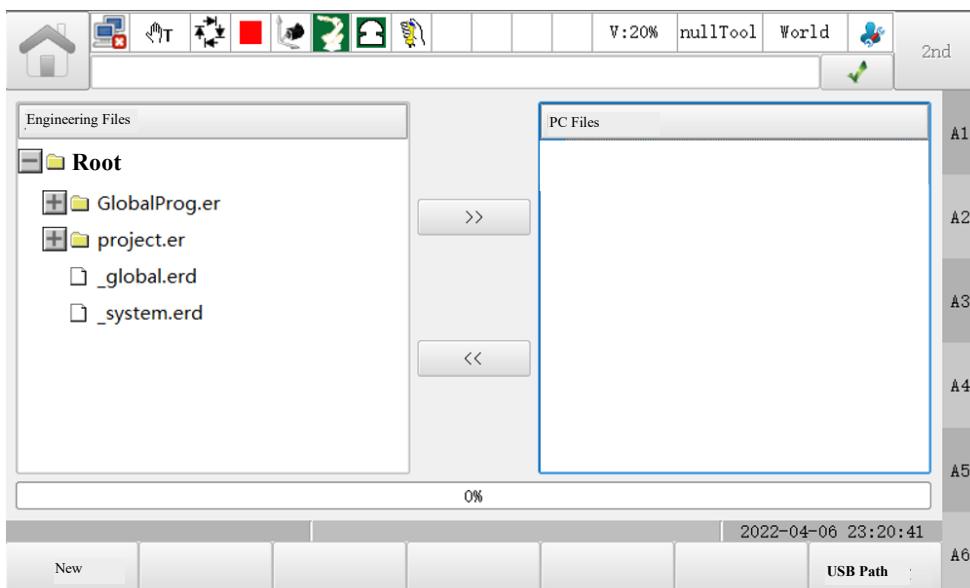
7.4.1 Program backup

Step 1 Insert the USB flash drive into the USB port of the teach pendant.

Step 2 Click to enter the project management interface.

Step 3 Click "Management" on the right-side menu to access the interface shown in Figure 7-1.

Figure 7-1 Explanation of the Project Program Import and Export Interface



Step 4 Select the program to be backed up from the left side and click to complete the backup of the program to the USB drive.

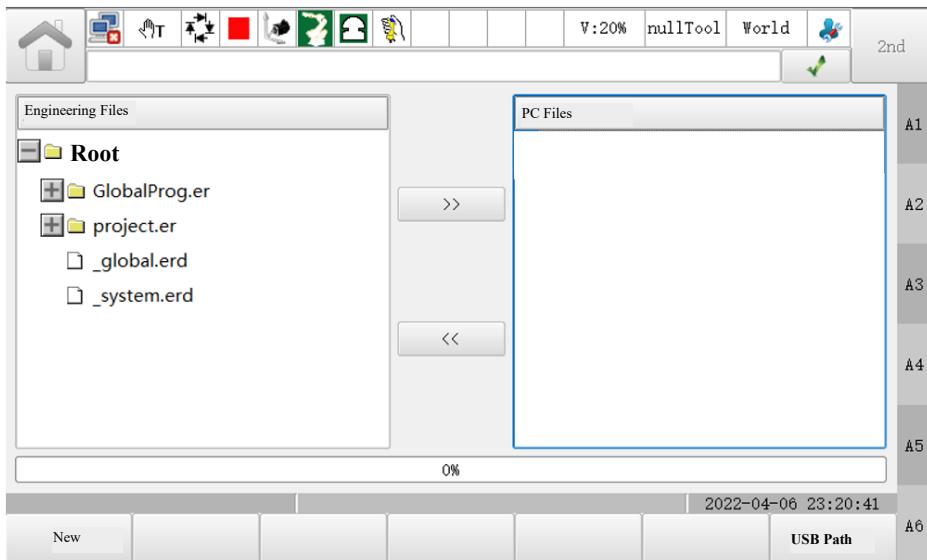
7.4.2 Program loading

Step 1 Insert the USB flash drive into the USB port of the teach pendant.

Step 2 Click  to enter the project management interface.

Step 3 Click "Management" on the right-side menu to access the interface shown in Figure 7-1.

Figure 7-2 Explanation of the Project Program Import and Export Interface



Step 4 Click the "USB Path" at the bottom right to select the previously backed-up program and import it into the teach pendant.

Step 5 Once the program is located in the "Program Management" interface, click the "Load" button.

7.5 List of spare parts

Table 7-1 Spare Parts List for ERC3-C1 Control Cabinet

S/N	SAP	Name	Qty.
1	21200000216	Drive board ERC3-C1-DRV-1004-V100B2	1
2	21200000217	Drive board ERC3-C1-DRV-0404-V100B1	1
3	21200000414	Drive board ERC3-C1-DRV-2004-V100B0	1
4	21G00000028	Power board ERC3-C1-POW-V100B3	1
5	21J00000005	Capacitor board ERC3-CAP-A-V100B1	1
6	150000000063	Robot controller ERC30F	1
7	13100003531	16-channel digital input expansion card	1
8	13100003532	16-channel NPN digital output expansion card	1
9	13100003845	16-channel PNP digital output expansion card	1
10	13100003533	ABZ expansion card	1
11	13100004315	Ethernet port interface expansion card	1