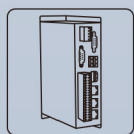
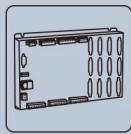


# EtherCAT Bus Expansion Module

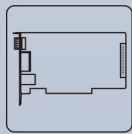
## EIO24088-V2



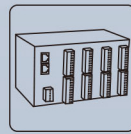
Vision  
Motion Controller



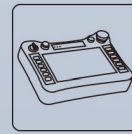
Motion  
Controller



Motion  
Control Card



IO Expansion  
Module



HMI



## Foreword



The motion controller provides rich interface, and it has excellent motion control performance, which can meet the expansion requirements of various projects.

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For details about the ZMC controller software and the introduction and routine of each command, please refer to the ZBASIC software manual.

Information contained in this manual is only for reference. Due to improvements in design and functions and other aspects, Zmotion Technology reserves the final interpretation! Subject to change without notice!

**Pay attention to safety when debugging the machine!**

**Please be sure to design an effective safety protection device in the machine, and add an error handling program in the software, otherwise Zmotion has no obligation or responsibility for the loss caused.**

In order to ensure the safe, normal and effective use of the product, please be sure to read this product manual carefully before installing and using the product.



## Safety Statement



- This chapter describes the safety precautions required for the correct use of this product. Before using this product, please read the instructions for use and correctly understand the relevant information on safety precautions.
- This product should be used in an environment that meets the design specifications, otherwise it may cause equipment damage or personal injury, and malfunctions or component damage caused by failure to comply with relevant regulations are not within the scope of product quality assurance.
- Zmotion will not take any legal responsibility for personal safety accidents and property losses caused by failure to comply with the contents of this manual or illegal operation of products.

## Safety Level Definition

According to the level, it can be divided into " **Danger** " and " **Caution** ". Failure to operate as required may result in moderate injury, minor injury or equipment damage.

Please keep this guide in a safe place for reading when needed, and be sure to hand this manual to the end user.

Install	
 Danger	<ul style="list-style-type: none"><li>◆ When the controller is disassembled, all external power supplies used by the system should be disconnected before operation, otherwise it may cause misoperation or damage to the equipment.</li><li>◆ It is forbidden to use in the following places: places with dust, oil fume, conductive dust, corrosive gas and flammable gas; places exposed to high temperature, condensation, wind and rain; places with vibration and shock. Electric shock, fire and misuse can cause product damage and deterioration.</li></ul>
 Notice	<ul style="list-style-type: none"><li>◆ Avoid metal shavings and wire ends falling into the hardware circuit board during installation.</li><li>◆ After installation, ensure that there are no foreign objects on the hardware circuit board.</li><li>◆ When installing, make it tightly and firmly with the mounting frame.</li></ul>

	<ul style="list-style-type: none"> <li>◆ Improper installation of the controller may result in misoperation, failure and fire.</li> </ul>
<b>Wiring</b>	
 <p><b>Danger</b></p>	<ul style="list-style-type: none"> <li>◆ The specifications and installation methods of the external wiring of the equipment shall comply with the requirements of local power distribution regulations.</li> <li>◆ When wiring, all external power supplies used by the system should be disconnected before operation.</li> <li>◆ When powering on and running after the wiring work is completed, the terminals attached to the product must be installed.</li> <li>◆ Cable terminals should be well insulated to ensure that the insulation distance between cables will not be reduced after the cables are installed on the terminal block.</li> </ul>
 <p><b>Notice</b></p>	<ul style="list-style-type: none"> <li>◆ Avoid metal shavings and wire ends falling into the hardware circuit board during installation.</li> <li>◆ The cable connection should be carried out correctly on the basis of confirming the type of the connected interface.</li> <li>◆ It should be confirmed that the cables pressed into the terminals are in good contact.</li> <li>◆ Do not bundle the control wires and communication cables with the main circuit or power supply wires, etc., and the distance between the wires should be more than 100 mm, otherwise noise may cause malfunction.</li> <li>◆ If the controller is not installed properly, it may cause electric shock or equipment failure or malfunction.</li> </ul>

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# Chapter I Production Information

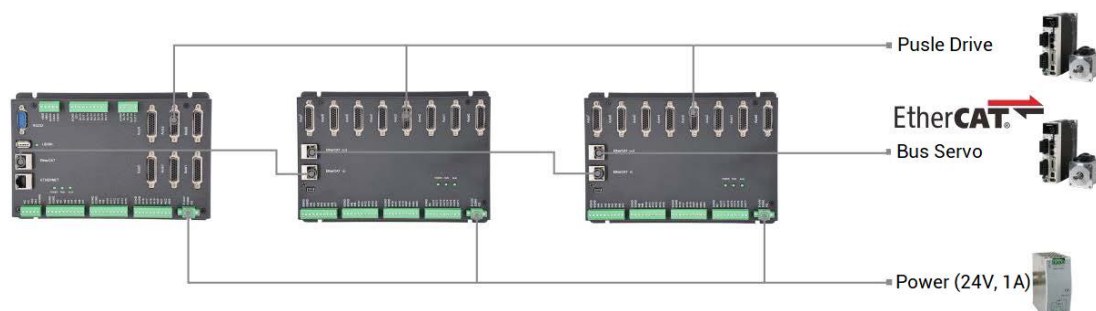
## 1.1. Product Information

EIO24088-V2 bus expansion module is used for EtherCAT bus controller, when IO, pulse axis, and other resources are not enough, an expansion module is needed. What's more, multiple EtherCAT expansion modules can be connected to the controller through EtherCAT bus at the same time. And IO and axis resources of EIO24088 can be accessed directly by mapping Number.

## 1.2. Function Features

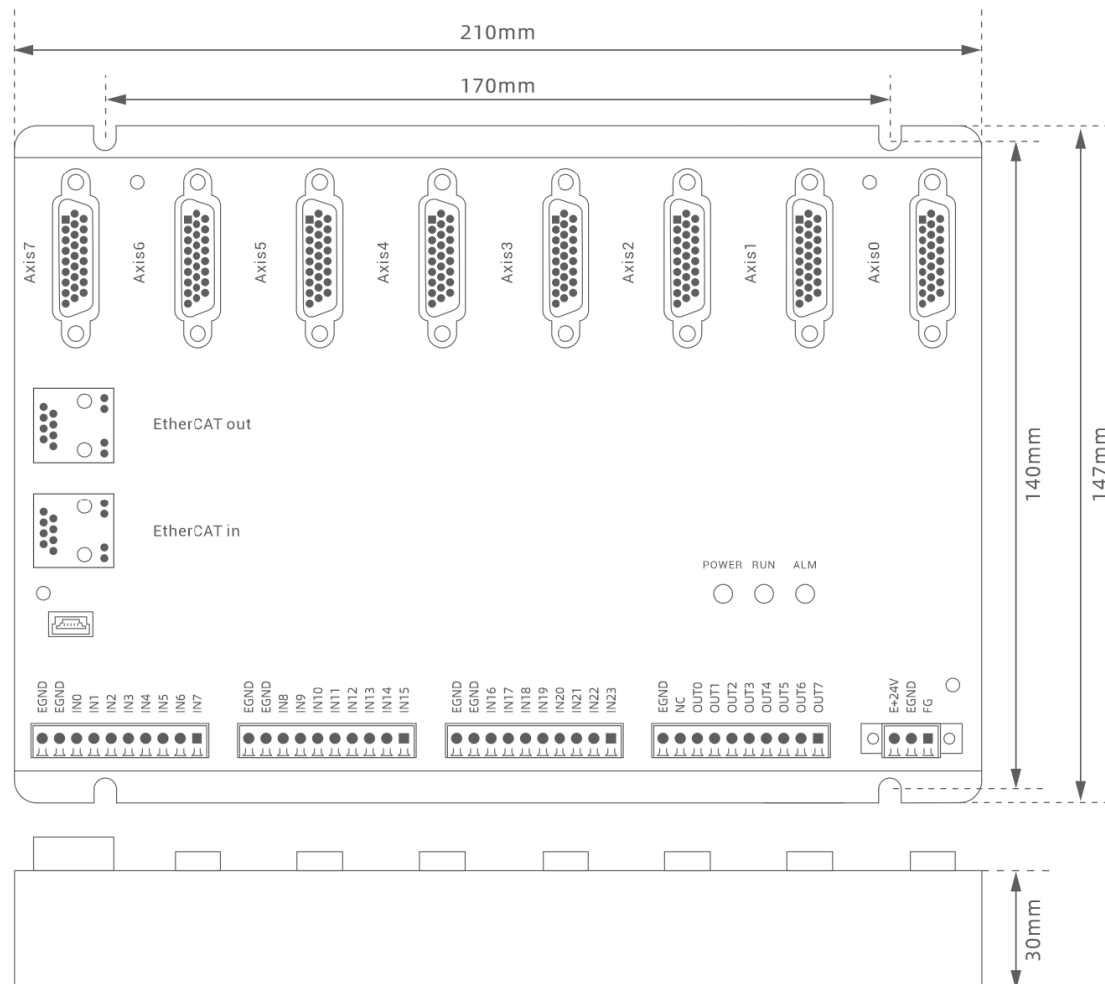
- ◆ Axis expansion: 8-axis pulse-axis expansion.
- ◆ Digital expansion: there are 24 inputs and 8 outputs, each pulse axis has one additional input and one additional output that can be configured.
- ◆ Pulse output mode: pulse / direction or dual pulses.
- ◆ Maximum pulse output frequency of each axis is 10MHZ.
- ◆ The maximum output current of outputs (except pulse-axis) can reach 300mA, which can directly drive some kinds of solenoid valves.

## 1.3. System Frame



## 1.4. Hardware Installment

EIO24088-V2 bus expansion module is installed horizontally with screws, and each controller should be fastened with 4 screws.



→ Unit: mm

→ Mounting Hole Diameter 4.5mm

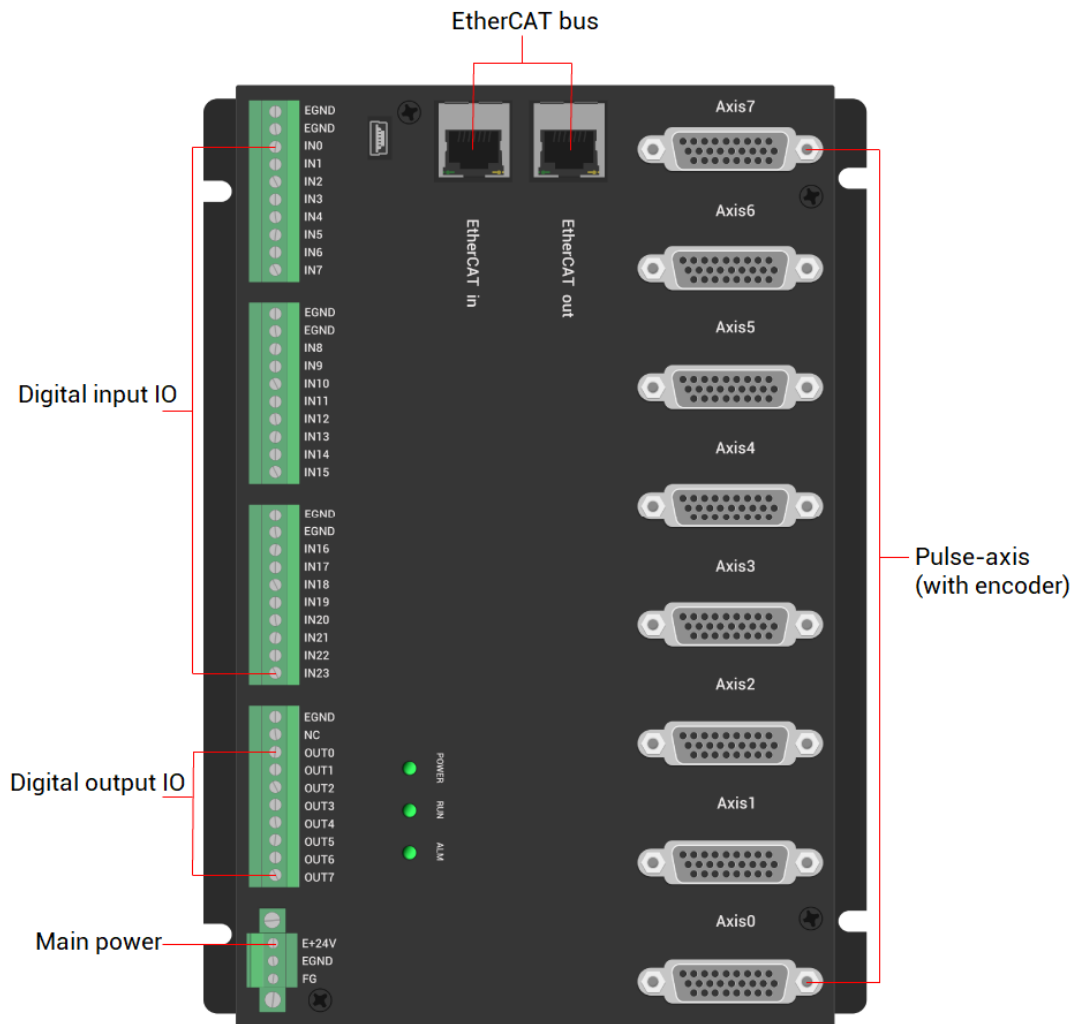
**Installation  
attention**

- Non-professionals are strictly prohibited to operate. Specifically, professionals who had been trained related electrical equipment, or who master electrical knowledge.
- Please be sure to read the product instruction manual and safety precautions carefully before installation.
- Before installation, please ensure that the product is powered off.
- Do not disassemble the module, otherwise the machine may be damaged.
- Avoid direct sunlight installation.
- In order to facilitate ventilation and controller replacement, 2-3cm should be left between the upper and lower parts of the controller and the installation environment and surrounding components.
- Considering the convenient operation and maintenance of the controller, please **do not** install the controller in the following places:
  - a) places where the surrounding ambient temperature exceeds the range of -10°C-55°C
  - b) places where the ambient humidity exceeds the range of 10%-95% (non-condensing)
  - c) places with corrosive gases and flammable gases
  - d) places with many conductive powders such as dust and iron powder, oil mist, salt, and organic solvents



## Chapter II Product Specification

### 2.1. Interface Definition



Mark	Interface	Number	Description
POW	The led that indicates the current state.	1	Power state: it lights when power is conducted.
RUN		1	Run state: it lights when runs normally
ALM		1	Error state: it lights when runs incorrectly
EtherCAT IN	EtherCAT bus interface	1	Connect to main controller or former level expansion module.
EtherCAT OUT		1	Connect to drive equipment or behind level

			expansion module.
Digital input	24		NPN type, main power 24V.
Digital output	8		NP leakage type, main power 24V.
Main power	1		24V DC power supplies for main control area of expansion module.
Pulse axis	8		Each axis can be configured as differential pulse output and differential encoder input.

## 2.2. Order Information

Model	Axes	Encoder	Inner IN	Inner OUT	ECAT IN / EACT OUT	Functions
EIO1616	-	-	16	16	1/1	Module: EIO1616M Module + Cover: EIO1616MT
EIO16084	4	4	16	8	1/1	4-axis expansion
EIO24088-V2	8	8	24	8	1/1	8-axis expansion

## 2.3. Work Environment

Item		Parameters
Work Temperature		-10℃ -55℃
Work relative Humidity		10%-95% non-condensing
Storage Temperature		-40℃ ~ 80℃ (not frozen)
Storage Humidity		Below 90%RH (no frost)
vibration	Frequency	5-150Hz
	Displacement	3.5mm(directly install)(<9Hz)
	Acceleration	1g(directly install)(>9Hz)
	Direction	3 axial direction

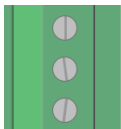
Shock (collide)	15g, 11ms, half sinusoid, 3 axial direction
Degree of Protection	IP20

# Chapter III Wiring, Communication Configuration

## 3.1. Power Input

The power supply input adopts a 3Pin (there are all 3 terminals) screw-type pluggable wiring terminal. And it is 24V DC power.

### → Terminal Definition:

Terminal	Name	Type	Function
	E+24V	Input	Positive (+) terminal of DC power input (connect positive of power to positive of controller)
	EGND	Input	Negative (-) terminal of power input
	FG	Earthing (Grounding)	Protect

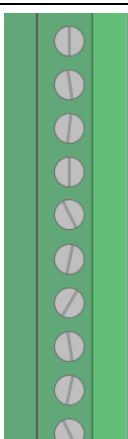
## 3.2. Power Specification

### → Specification

Item	Description
Voltage	DC24V(-5%~5%)
The current to open	≤0.5A
The current to work	≤0.4A
Anti-reverse connection	Valid
Overcurrent Protection	Valid

### 3.3. IN Digital Input

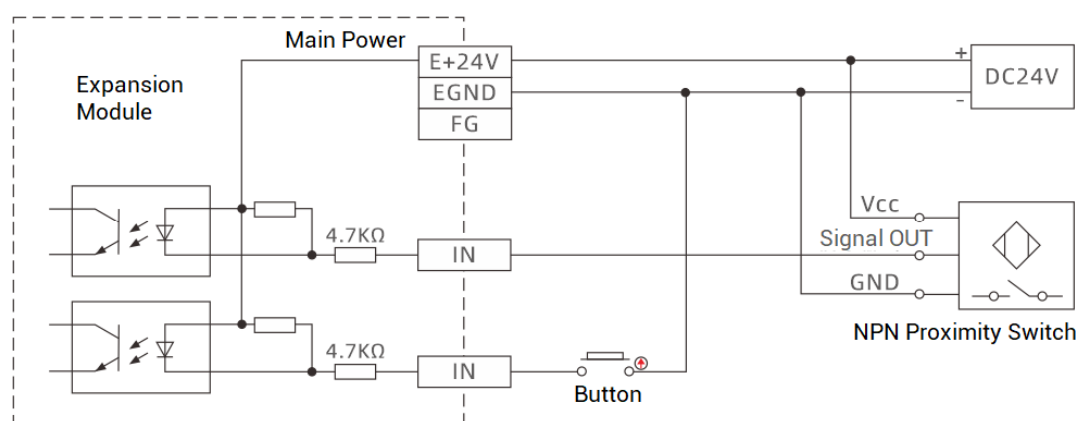
#### → Terminal Definition

Terminal	Name	Type	Function 1
	EGND	/	External power ground
	EGND	/	External power ground
	IN0	NPN type, digital inputs	Input 0
	IN1		Input 1
	IN2		Input 2
	IN3		Input 3
	IN4		Input 4
	IN5		Input 5
	IN6		Input 6
	IN7		Input 7
	EGND	/	External power ground
	EGND	/	External power ground
	IN8	NPN type, digital inputs	Input 8
	IN9		Input 9
	IN10		Input 10
	IN11		Input 11
	IN12		Input 12
	IN13		Input 13
	IN14		Input 14
	IN15		Input 15
	EGND	/	External power ground
	EGND	/	External power ground
	IN16	NPN type, digital inputs	Input 16
	IN17		Input 17
	IN18		Input 18
	IN19		Input 19
	IN20		Input 20
	IN21		Input 21
	IN22		Input 22
	IN23		Input 23

### 3.3.1. Digital Input Specification

Item	Digital input (IN0-23)
Input mode	NPN type, input is triggered when in low-electric level
Frequency	< 5kHz
Impedance	4.7KΩ
Voltage level	DC24V
The voltage to open	<14.5V
The voltage to close	>14.7V
Minimal current	-1.8mA (negative)
Max current	-6mA (negative)
Isolation mode	optoelectronic isolation
<b>Note:</b> the above parameters are standard values when the voltage of expansion module power supply (E+24V port) is 24V.	

### 3.3.2. Digital Input Wiring



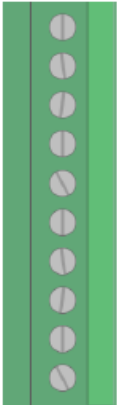
#### → Wiring Note:

- The wiring principle of digital inputs IN (0-23) is shown in the figure above. The external signal source can be an optocoupler, a key switch or a sensor, etc., all can be connected as long as the requirements on output of electric level can be achieved.
- For the public end, please connect the "EGND" port on the power supply to the "COM" terminal of the external input device. If the signal area power supply of the external device and the power supply of the expansion module are in the same power supply

system, this connection also can be omitted.

## 3.4. OUT Digital Output

### → Terminal Definition

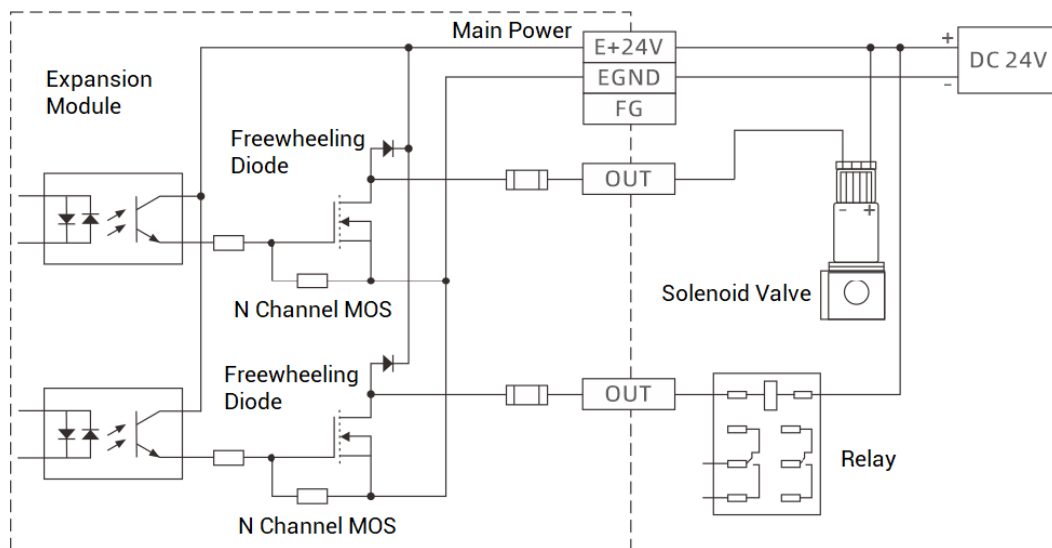
Terminal	Name	Type	Function
	EGND	/	External power ground
	NC	/	Spare
	OUT0	NPN leakage, digital outputs	Output 0
	OUT1		Output 1
	OUT2		Output 2
	OUT3		Output 3
	OUT4		Output 4
	OUT5		Output 5
	OUT6		Output 6
	OUT7		Output 7

### 3.4.1. Digital Output Specification

Item	Digital Output (OUT0-7)
Output mode	NPN leakage type, it is 0V when outputs
Frequency	< 8kHz
Voltage level	DC24V
Max output current	+300mA
Max leakage current when off	25μA
Respond time to conduct	12μs
Respond time to close	80μs
Overcurrent protection	Support
Isolation method	optoelectronic isolation
<b>Note:</b> ✧ The times in the form are typical based on the resistive load, and may change when the load circuit changes.	

- ✧ Due to the leak-type output, the shutdown of the output will be obviously affected by the external load circuit, and the output frequency should not be set too high in the application.

### 3.4.2. Digital Output Wiring



#### → Wiring Note:

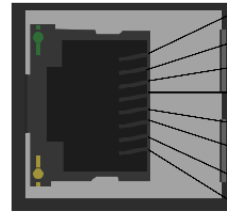
- The wiring principle of digital outputs OUT (0-7) is shown in the figure above. The external signal receiving end can be an optocoupler or a relay or solenoid valve, all can be connected as long as the input current does not exceed 300mA.
- For the connection of the public end, please connect the "EGND" port on the power supply to the negative pole of the DC power supply of the external input device. If the DC power supply of the external device and the expansion module power supply are in the same power supply system, this connection can also be omitted.

## 3.5. EtherCAT Bus Interface

EIO24088 bus expansion module has 2 100M EtherCAT communication interfaces, and they support EtherCAT protocol. EtherCAT IN is connected to main controller or former level expansion module, but EtherCAT OUT is connected to drive equipment or next



level expansion module, they can not be mixed. The pin definition is as follows:



PIN	Signal	Description
1	TX+	Send signal (+)
2	TX-	Send signal (-)
3	RX+	Receive signal (+)
4	NC	Reserved
5	NC	Reserved
6	RX-	Receive signal (-)
7	NC	Reserved
8	NC	Reserved

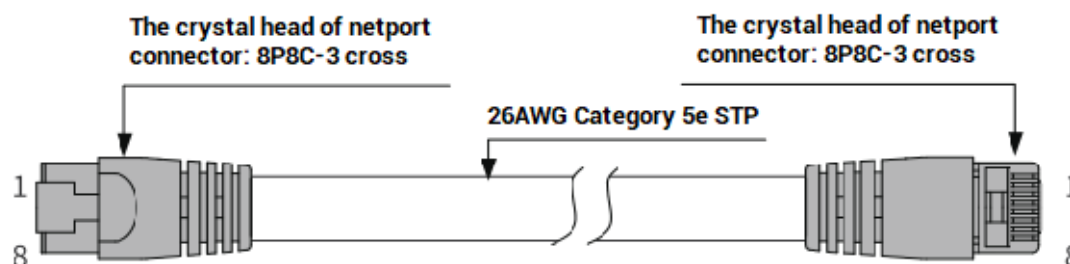
### → Specification

Item	Specification
Communication protocol	EtherCAT protocol
Valid service	CoE(PDO, SDO), FoE
Synchronization method	IO adopts input and output synchronization / DC-distributed clock
Physical level	100BASE-TX
Duplex mode	Full duplex
Topology	linear topology
Transfer media	Cable
Transfer distance	It is less than 100M between 2 nodes
Process data	Maximum 1486 bytes of one single frame
Synchronization shaking of two slave stations	<1us
Refresh	For 1000 digital inputs and outputs, about 30us

### → Communication Cable Requirements

EtherCAT communication interface adopts standard Ethernet RJ45 interface.

The network cable adopts Category 5e STP, and the crystal head has a metal shell to reduce interference and to prevent information from being eavesdropped. As shown below:



Item	Specification
Cable type	Flexible crossover cable, Category 5e
traverse	twisted pair
Line pairs	4
Isolation	cross skeleton
Connector	Crystal head with iron shell
Cable material	PVC
Cable length	Less than 100m

#### Use RJ45 network cable connection method:

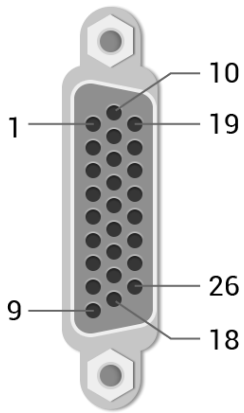
- When installing, hold the crystal head that is with the cable and insert it into the RJ45 interface until it makes a "click" sound (kada).
- In order to ensure the stability of communication, please fix the cables with cable ties.
- When disassembling, press the tail mechanism of the crystal head, and pull out the connector and the module in a horizontal direction.

Please use tube-type pre-insulated terminals and cables with appropriate wire diameters to connect the user terminals.

## 3.6. AXIS Differential Pulse Axis Interface

This product provides 8 local differential pulse axis interfaces, each interface is a standard DB26 female socket.

## → Interface Definition

Interface	Pin	Signal	Description
	1	EGND	Negative pole of IO 24V power
	2	IN24-31/ALM	General input (recommended as driver alarm)
	3	OUT8-15/ENABLE	General output (recommended as driver enable)
	4	EA-	Encoder differential input signal A-
	5	EB-	Encoder differential input signal B-
	6	EZ-	Encoder differential input signal Z-
	7	+5V	Positive pole of 5V power of pulse/encoder signal
	8	Reserved	Reserved
	9	DIR+	Servo or step direction output + (differential signal)
	10	GND	Negative pole of 5V power of pulse/encoder signal
	11	PUL-	Servo or step pulse output – (differential signal)
	12	Reserved	Reserved
	13	GND	Negative pole of 5V power of pulse/encoder signal
	14	OVCC	Positive pole of IO 24V power
	15	Reserved	Reserved
	16	Reserved	Reserved
	17	EA+	Encoder differential input signal A+
	18	EB+	Encoder differential input signal B+
	19	EZ+	Encoder differential input signal Z+
	20	GND	Negative pole of 5V power of pulse/encoder signal
	21	GND	
	22	DIR-	Servo or step direction output - (differential signal)
	23	PUL+	Servo or step pulse output + (differential signal)

	24	GND	Negative pole of 5V power of pulse/encoder signal
	25	Reserved	Reserved
	26	Reserved	Reserved
<b>Note:</b> <ul style="list-style-type: none"> <li>✧ ALM, ENABLE, CLR and INP are recommended to be used as axis IO, because the drive capacity is small.</li> <li>✧ OVCC, +5V are only used for communication between the controller and the servo driver, please do not use it as power supply for other places.</li> </ul>			

### →Pulse Axis PIN & IO PIN

Pulse Axis No.	IN (PIN 2)	OUT (PIN 3)
AXIS0	IN24	OUT8
AXIS1	IN25	OUT9
AXIS2	IN26	OUT10
AXIS3	IN27	OUT11
AXIS4	IN28	OUT12
AXIS5	IN29	OUT13
AXIS6	IN30	OUT14
AXIS7	IN31	OUT15

## 3.6.1. AXIS Interface Signal Specification & Wiring

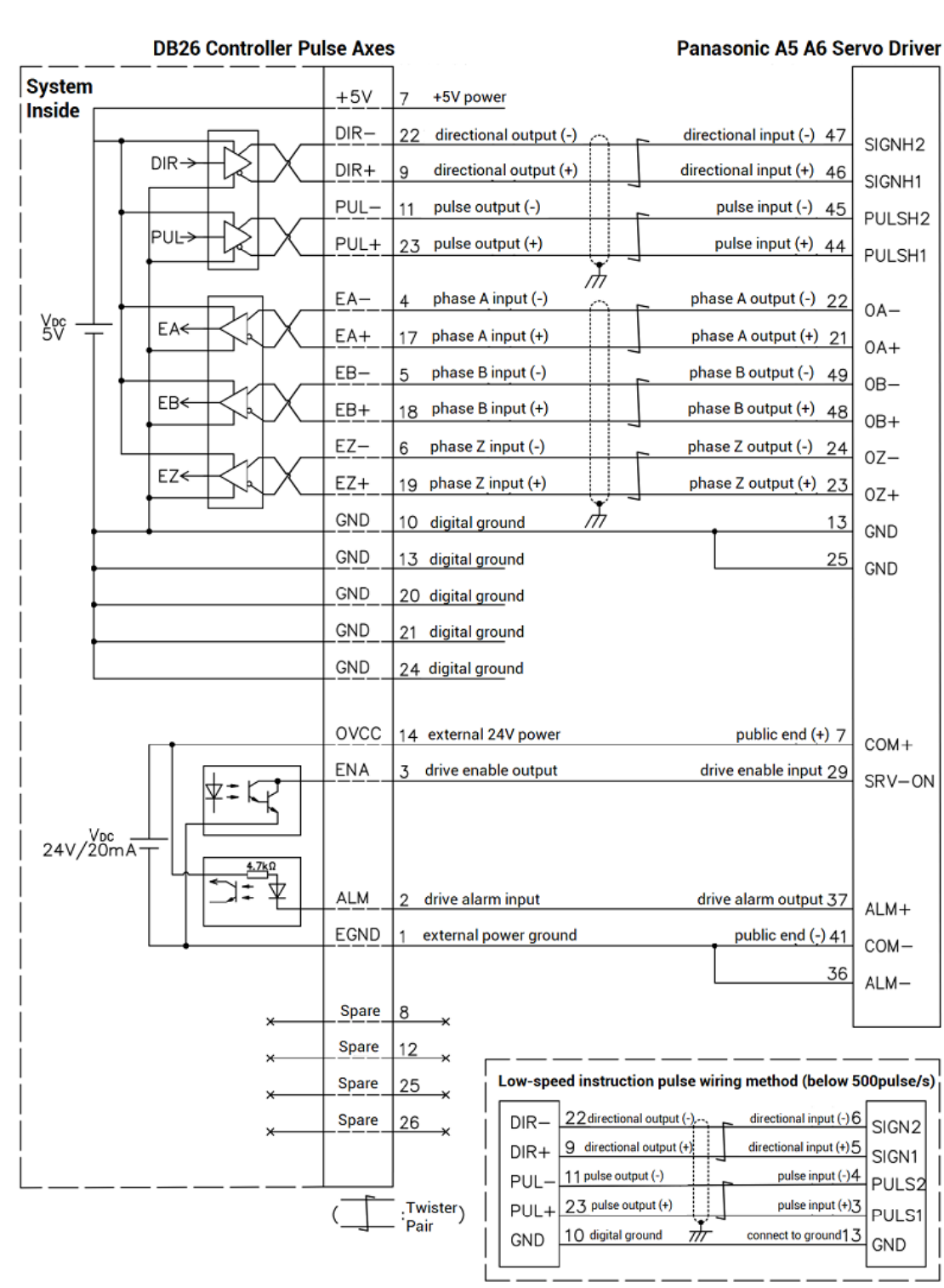
### → Specification:

Signal	Item	Description
PUL/DIR	Signal type	Differential output signal
	Voltage range	0-5V
	Maximum frequency	10MHz
EA/EB/EZ	Signal type	Differential input signal
	Voltage range	0-5V

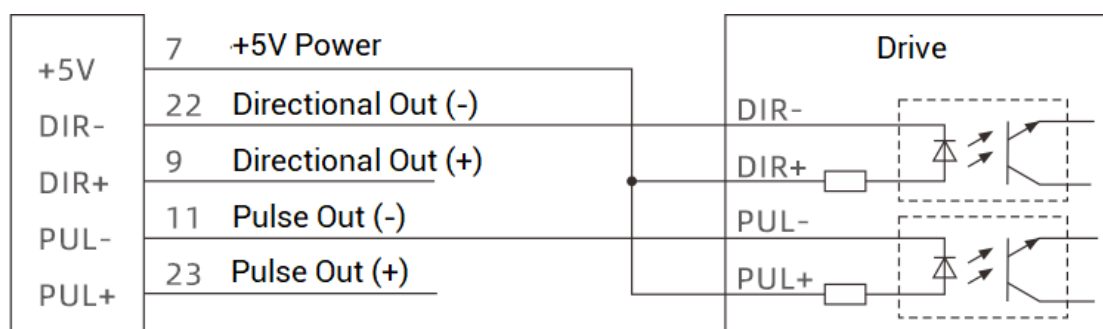
	Maximum frequency	5MHz
IN24-31	Input method	NPN leak type, it is triggered when low electric level is input.
	Frequency	< 5kHz
	Impedance	6.8KΩ
	Voltage level	DC24V
	The voltage to open	<10.5V
	The voltage to close	>10.7V
	Minimal current	-1.8mA (negative)
	Maximum current	-4mA (negative)
	Isolation	optoelectronic isolation
OUT8-15	Output method	NPN leak type, it is 0V when outputs
	Frequency	< 8kHz
	Voltage level	DC24V
	Maximum current	+50mA
	Overcurrent protection	No
	Isolation	optoelectronic isolation
+5V, GND	Maximum output current for 5V	50mA
OVCC, EGND	Maximum output current for 24V	50mA

### → Wiring Reference:

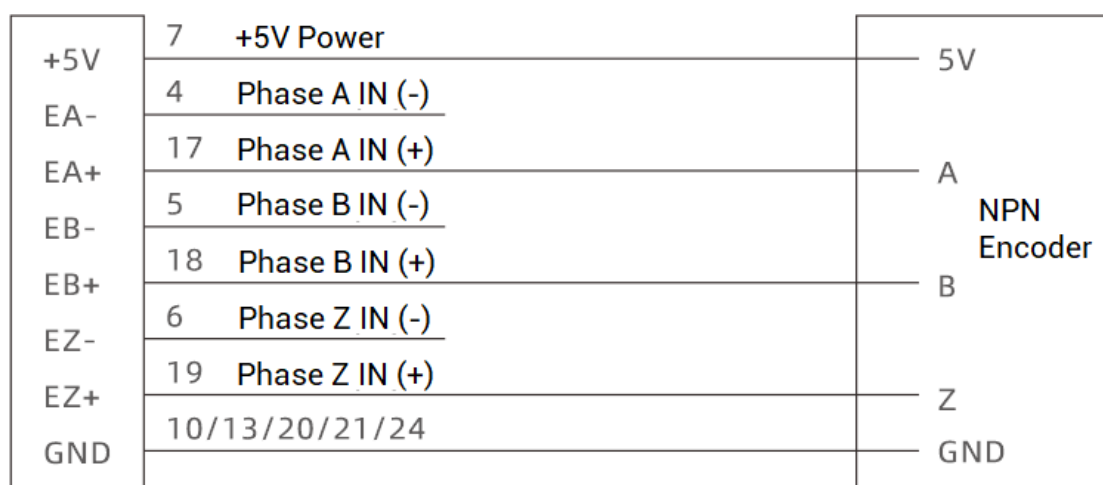
- Reference example of wiring with Panasonic A5/A6 servo driver:



➤ PUL/DIR Common Anode Wiring:



➤ EA/EB/EZ Common Anode Wiring:



→ **Wiring Note:**

- ✧ The wiring principle of the differential pulse axis interface is shown in the figure above, and the wiring methods of different types of drivers are different, please connect carefully.
- ✧ Please use STP, especially in bad environments, and make sure the shielding layer is fully grounded.

## Chapter IV Expansion Module

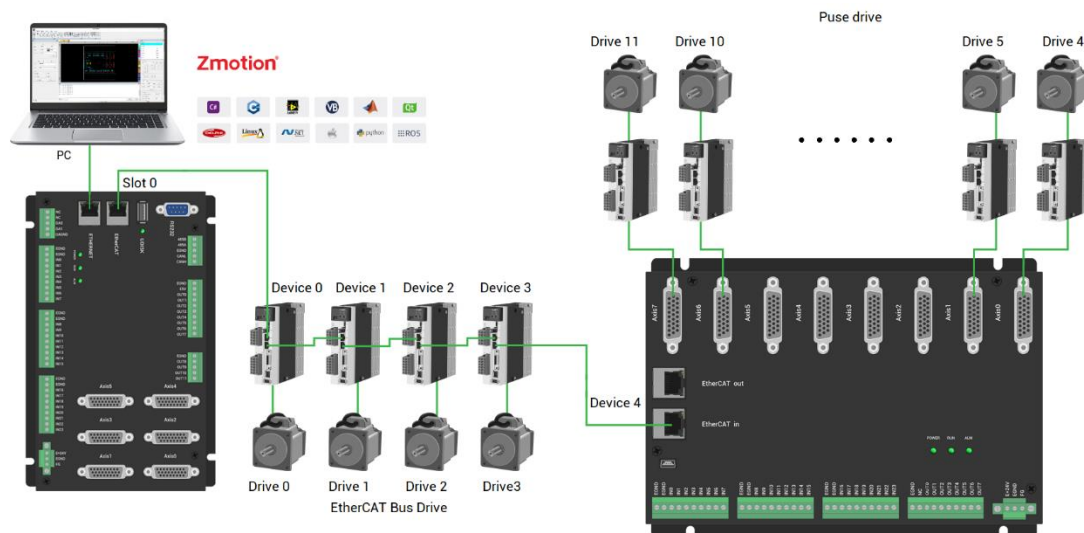
### 4.1. EtherCAT Expansion Wiring Reference

EIO24088-V2 expansion module is powered by the single power. The main power can supply power for IO, the main power uses 24V DC power.

After the expansion wiring is completed, each EIO expansion module does not need to develop again. It only needs to manually configure the unique IO address and axis address in the EtherCAT master controller, and it can be accessed after the configuration is completed. The IO address number is set through the bus command NODE\_IO, and the program on the controller can access the resources on the expansion module only through the IO number.

When wiring, pay attention that EtherCAT IN is connected to the upper-level module, and EtherCAT OUT is connected to the lower-level module. The IN and OUT ports cannot be mixed.

EIO expansion module wiring reference example (take ZMC432 + EIO24088-V2 as an example):



Involved number concepts in above figure are as follows: the bus-related command parameters will use the following numbers:

#### Slot number (slot):

The slot number refers to the number of the bus interface on the controller, and the slot number of the EtherCAT bus is 0.

#### Device number (node):



The device number refers to the number of all devices connected to a slot. It starts from 0 and is automatically numbered according to the connection sequence of the devices on the bus. You can view the total number of devices connected to the bus through the `NODE_COUNT(slot)` command.

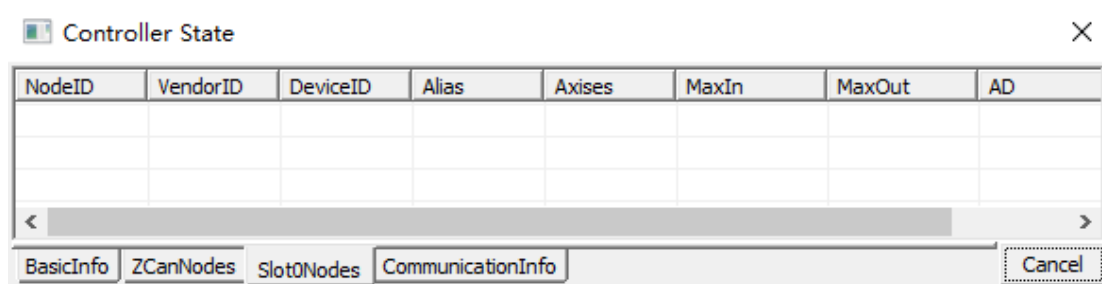
**Drive number:**

The controller will automatically identify the drive on the slot, and the number starts from 0, and the number is automatically numbered according to the connection sequence of the drive on the bus.

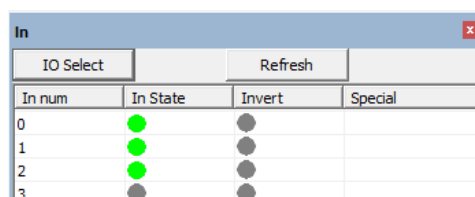
The drive number is different from the device number. Only the drive device number on the slot is assigned, and other devices are ignored. The drive number will be used when mapping the axis number.

## 4.2. EtherCAT Expansion Module Usage

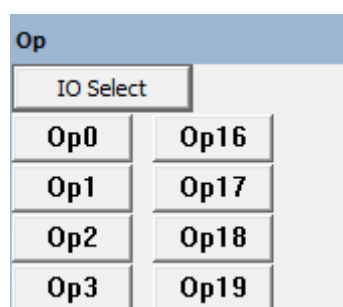
1. Please follow the above wiring instructions to correctly complete the wiring of power supply, EtherCAT bus, IO signal and other modules.
2. After the controller is powered on, please use the ETHERNET interface and RS232 serial port to connect to ZDevelop.
3. The EIO24088-V2 expansion module can only be used after bus initialization.
  - ① Execute the bus initialization program, identify the device number of the EIO expansion module and the connected drive number during the initialization process, operate the axis mapping according to the drive number, and use the `AXIS_ADDRESS` command to map the axis, also operate the IO mapping of the expansion module according to the device number, and use the `NODE_IO` command to map the IO, set `DRIVE_PROFILE` and `ATYPE`;
  - ② After successful initialization, enable the driver on the expansion module.
  - ③ Enable and set the basic motion parameters `ATYPE`, `UNITS`, `SPEED`, `ACCEL`, `FWD_IN`, `REV_IN` and other axis parameters, and then send the motion command to drive the motor.
4. After the setting is completed, the communication can be established. If the communication is successful, "controller status" - "slot 0 node" will display the information of the expansion module.



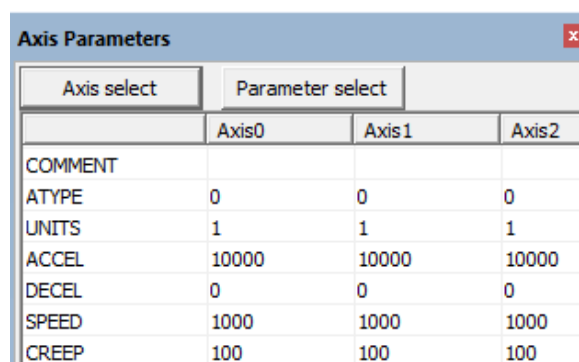
5. Corresponding input state values can be directly read through "IN" command, or through "ZDevelop/View/IN". Please refer to ZBasic Programming Manual.



6. Open or close outputs through "OP" command, or through "ZDevelop/View/OP". Please refer to ZBasic Programming Manual.



7. There are many parameters related to pulse-axis, and they can be set through relative commands, please refer to ZBasic Programming Manual. Or through "ZDevelop/View/Axis Parameter".



8. Through ZDevelop/View/Manual to operate relative motions.

Axis	ATYPE	UNITS	ACCEL	DECEL	SPEED	DPOS	Left/Move	Right/Move	Distance	Absolute	MPOS	IDLE	AXISSTATUS		
0	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right		<input type="checkbox"/>	Move	0.000	-1	0h	Stop
1	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right		<input type="checkbox"/>	Move	0.000	-1	0h	Stop
2	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right		<input type="checkbox"/>	Move	0.000	-1	0h	Stop
3	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right		<input type="checkbox"/>	Move	0.000	-1	0h	Stop
4	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right		<input type="checkbox"/>	Move	0.000	-1	0h	Stop
5	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right		<input type="checkbox"/>	Move	0.000	-1	0h	Stop

### → Notes:

- Regardless of whether the IO on the expansion module is used or not, the NODE IO command needs to be used to map the input and output numbers of the EIO24088-V2. The DRIVE\_PROFILE of the expansion module is set to 0, and the ATYPE is set to 65, but the actual axis type is not 65 because it is a pulse type drive. The configuration of the real axis type uses the SDO command to configure the data dictionary 6011h settings.
- If a hard limit alarm occurs during the initialization process, you can point the mapping number of the hard limit FWD\_IN and REV\_IN to -1 in the axis parameter window, which means no mapping, and then modify FWD\_IN and REV\_IN when the limit switch needs to be connected.

## 4.3. EtherCAT Bus Expansion Resource Mapping

### → IO Mapping:

The program on the controller can access the resources on the expansion module only through the IO number. The IO number of the EtherCAT bus expansion module is set through the bus command NODE\_IO, and the input and output are configured at the same time.

When IO mapping, first check the maximum IO number of the controller itself (including the external IO interface and the interface in the pulse axis), and then use the command to set.

If the extended IO coincides with the IO number of the controller itself, the two will work at the same time, so the mapped number of the IO mapping must not be repeated in the entire control system.

**IO mapping syntax:**

`NODE_IO( slot, node ) = iobase`

slot: slot number, 0-default

node: device number, starting from 0

iobase : mapping the IO start number, the setting result will only be a multiple of 8

**Example:**

`NODE_IO(0,0)=32` 'set the IO start number of slot 0 interface device 0 to 32

If device 0 is EIO24088, after configuration according to the above syntax, the IO numbers corresponding to input IN0-23 are 32-55 in turn, the general input port numbers in the axis interface are 56-63, and the drive alarm inputs of axes AXIS 0-3 are 56-59 respectively. The IO numbers corresponding to the output OUT0-7 are 32-39 in sequence, the general output port numbers in the axis interface are 40-47, and the drive enable outputs of the axes AXIS 0-3 are 40-43 respectively.

0	41bh	1ab0h	0	8	32(32-63)	16(32-47)	0
---	------	-------	---	---	-----------	-----------	---

**→ AXIS Mapping:**

Before using the axis of the expansion module, you need to use the `AXIS_ADDRESS` command to map the axis number, and the axis mapping also needs to pay attention to the axis number of the entire system cannot be repeated. The mapping syntax of the EIO series extended axis is the same as that of the bus driver.

**Axis mapping syntax:**

`AXIS_ADDRESS( axis number )=(slot number<<16)+driver number+1`

**Example:**

`AXIS_ADDRESS(0)=(0<<16)+0+1`

'the first drive on the EtherCAT bus, drive number 0, bound as axis 0

`AXIS_ADDRESS(1)=(0<<16)+1+1`

'the second drive on the EtherCAT bus, drive number 1, bound as axis 1

If the first node is EIO24088, and EIO24088 is connected to drive, then driver 0 here is the first pulse driver connected to EIO24088, otherwise it is the EtherCAT driver.

## Chapter V Data Dictionary

### SDO command configures drive parameters:

For example: the real axis type setting of the extended pulse axis is set through the data dictionary 6011h, (refer to the parameters in the table below, set in order according to the axis number, the first drive sets the data dictionary 6011h+0\*800h, and the second drive sets 6011h+ 1\*800h, and so on, add 800h for each drive, and the same for other parameters).

### 5.1. Input & Output

Number	Description	Type	Read/write	Others
6000h	Input	ARRAY U8	RO	1-close
6200h	Output	ARRAY U8	RW	1-open
6206h	Abnormal output mode	ARRAY U8	RW	1-use abnormal output
6207h	Abnormal output usage status	ARRAY U8	RW	

### 5.2. The First Drive on The First Expansion Module

Number	Description	Type	Read/write	Others
6011h	Atype	UNSIGNED8	RW	Axis type of expansion board: <ul style="list-style-type: none"> <li>● 0: virtual axis</li> <li>● 1: step or servo of pulse directional</li> <li>● 2: servo of analog signal control</li> <li>● 3: orthogonal encoder</li> <li>● 4: step + encoder</li> </ul>

				<ul style="list-style-type: none"> <li>● 5: step + pulse directional encoder</li> <li>● 6: pulse directional encoder</li> <li>● 7: pulse directional step/servo + EZ signal input</li> </ul>
6012h	Invert_Step	UNSIGNED16	RW	See controller introduction Invert_Step
6013h	Iolevel	UNSIGNED32	RW	B0-origin electrical level B1-limit position level B8-automatic use enable signal B9-use ALM signal to alarm B11-B15: origin signal selection
6014h	Axisstatus	UNSIGNED32	RO	See controller introduction AXISSTATUS
6040h	Controlword	UNSIGNED16	RW	Relative master controller DRIVE_CONTROLWORD: B0- Switch on B1- Enable voltage B3- Enable operation B7- Fault reset
6041h	Statusword	UNSIGNED16	RO	Relative master controller DRIVE_STATUS: B0 Ready to switch on B1 Switch on

				B2 Operation enabled B3 Fault B4 Voltage enabled B5 Quick stop B7 Warning B8 EZ status B9 Remote B10 Target reached B11 Internal limit active B12-13 Operation mode specific B14 EA status B15 EB status
6060h	Modes of operation	INTEGER 8	RW	6: homing 8: positioning in cycle
607Eh	Polarity	INTEGER 8	RW	1- opposite direction 0- normal direction
60fDh	Drive input compatibility	UNSIGNED 32	RW	

## Chapter VI Run and Maintain

The correct operation and maintenance of the device can not only guarantee and extend the life cycle of the equipment itself, but also take technical management measures according to the pre-specified plan or the corresponding technical conditions to prevent equipment performance degradation or reduce the probability of equipment failure.

### 6.1. Regular Inspection and Maintenance

The working environment has an impact on the device. Therefore, it is usually inspected regularly based on the inspection cycle of 6 months to 1 year. The inspection cycle of the device can be appropriately adjusted according to the surrounding environment to make it work within the specified standard environment.

Check item	Check content	Inspection standards
power supply	Check whether the voltage is rated	DC 24 V ( -10%~10% )
surroundings	Whether the ambient temperature is within the specified range (when installed in the cabinet, the temperature inside the cabinet is the ambient temperature)	-10 °C - 55 °C
	Whether the ambient humidity is within the specified range (when installed in the cabinet, the humidity in the cabinet is the ambient humidity)	10%-95% non-condensing
	Is there direct sunlight	No
	With or without droplets of water, oil, chemicals, etc.	No
	Whether there is dust, salt, iron filings, dirt	No
	Whether there is corrosive gas	No
	Whether there are flammable and explosive gases or articles	No



	Whether the device is subjected to vibration or shock	Should be within the range of vibration resistance and impact resistance
	Is the heat dissipation good	Keep good ventilation and heat dissipation
Installation and Wiring Status	Whether the basic unit and the expansion unit are installed firmly	The mounting screws should be tightened without loosening
	Whether the connecting cables of the basic unit and the expansion unit are fully inserted	The connection cable cannot be loosened
	Are the screws of the external wiring loose	Screws should be tightened without loosening
	Whether the cable is damaged, aged, cracked	The cable must not have any abnormal appearance

## 6.2. Common Problems

Problems	Suggestions
Controller can't communicate with EIO expansion module.	<ol style="list-style-type: none"> <li>1. Check whether controller or expansion module is powered on.</li> <li>2. Check the wiring, whether the problem is cable, please try to change one cable. And please check EtherCAT IN and EtherCAT OUT wiring.</li> <li>3. Check EtherCAT interface of expansion module and controller, they should be in good quality.</li> <li>4. Check whether bus initialization program is correct.</li> <li>5. Check whether expansion module addresses conflict, and IO mapping and axis mapping setting.</li> <li>6. Check controller and expansion module firmware, try to update.</li> <li>7. Check whether the controller supports expansion module, if not, please add XML file.</li> </ol>
No signal comes to the	<ol style="list-style-type: none"> <li>1. Check whether IO power is needed.</li> </ol>

input.	<ol style="list-style-type: none"><li>2. Check whether the limit sensor is working normally, and whether the "IN" view can watch the signal change of the limit sensor.</li><li>3. Check whether the mapping of the limit switch is correct.</li><li>4. Check whether the limit sensor is connected to the common terminal of the controller.</li></ol>
The output does not work.	<ol style="list-style-type: none"><li>1. Check whether IO power is needed.</li><li>2. Check whether the output No. is consistent with the No. that is operated.</li></ol>
No voltage and current signals on input channel	<ol style="list-style-type: none"><li>1. Check whether IO power is needed.</li><li>2. Check whether the output No. is consistent with the No. that is operated.</li></ol>
POWER led is ON, RUN led is OFF.	<ol style="list-style-type: none"><li>1. Check whether the power of the power supply is sufficient. At this time, it is best to supply power to the controller alone, and restart the controller after adjustment.</li><li>2. Check whether the ALM light flickers regularly (hardware problem).</li></ol>
RUN led is ON, ALM led is ON.	<ol style="list-style-type: none"><li>1. Program running error, please check ZDevelop error code, and check application program.</li></ol>