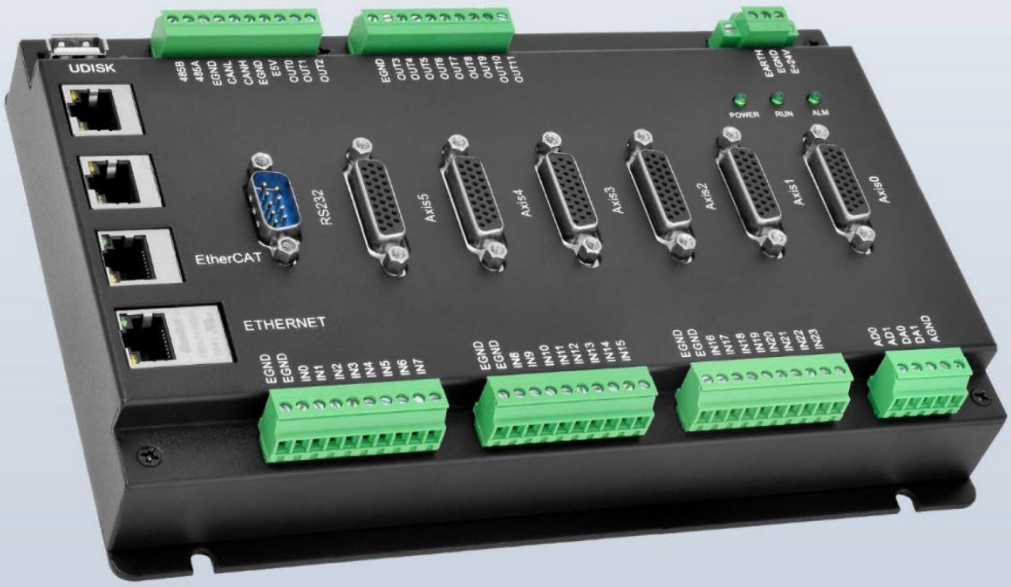
Zmotion®
正运动技术

做更好用的运动控制，智造美好生活
Better Motion Control, Smarter Life

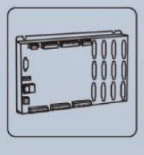
EtherCAT & Pulse Motion Controller

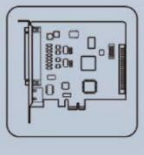
ZMC460

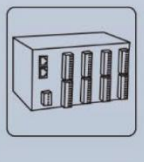


This Manual is mainly for ZMC460, ZMC430.

Vision Motion Controller


Motion Controller


Motion Control Card


IO Expansion Module

HMI

Statement

Thank you for choosing our Zmotion products. Please be sure to read this manual carefully before use so that you can use this product correctly and safely. Zmotion is not responsible for any direct or indirect losses caused by the use of this product.

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The information in this manual is for reference only. Due to design improvements and other reasons, Zmotion reserves the right of final interpretation of this information! Contents are subject to change without prior notice!

➢ Notes

In order to prevent possible harm and damage caused by incorrect use of this product, the following instructions are given on matters that must be observed.

■ Danger

Do not use it in places with water, corrosive or flammable gases, or near flammable substances.	May cause electric shock, fire, damage, etc.
When installing or disassembling, make sure the product is powered off.	
Cables should be connected securely, and exposed parts that are energized must be insulated by insulators.	
Wiring work must be performed by professionals.	

■ Notes

It should be installed within the specified environmental range.	May cause damage, mis-operation, etc.
Make sure there are no foreign objects on the product hardware circuit board.	
After installation, the product and the mounting bracket should be tight and firm.	
After installation, at least 2-3cm should be left between the product and surrounding components for ventilation and replacement.	
Never disassemble, modify, or repair it by yourself.	

Content

Chapter I Production Information....5
1.1. Product Information....5
1.2. Function Features....5
1.3. System Frame....6
1.4. Hardware Installment....7
Chapter II Product Specification....9
2.1. Basic Specification....9
2.2. Nameplate & Models....10
2.3. Interface Definition....11
2.4. Work Environment....12
Chapter III Wiring and Communication....13
3.1. Power Input....13
3.1.1. Power Specification....13
3.2. RS485, CAN Communication Interface....13
3.2.1. RS485, CAN Communication Specification & Wiring....14
3.2.2. Basic Usage Method....16
3.3. RS232 Serial Port....18
3.3.1. RS232 Communication Interface Specification & Wiring....18
3.3.2. Basic Usage Method....19
3.4. IN Digital Input & High-Speed Latch Port & Single-ended Encoder....21
3.4.1. Digital Input Specification & Wiring....22
3.4.2. Basic Usage Method....24
3.5. OUT: Digital Output, PWM Terminal, Hardware Comparison Output, Single-ended Pulse....24
3.5.1. Digital Output Specification & Wiring....25
3.5.2. Basic Usage Method....27
3.6. AD / DA: Analog Input / Output....28
3.6.1. Analog Output Specification & Wiring....28
3.6.2. Basic Usage Method....29
3.7. U Disk....30
3.8. ETHERNET....30

3.9. EtherCAT Bus Interface 32
3.10. AXIS Differential Pulse Axis Interface 33
3.10.1. AXIS Interface Signal Specification & Wiring 35
3.10.2. Basic Usage Method 38
Chapter IV Expansion Module 40
4.1. CAN Bus Expansion 40
4.1.1. CAN Bus Expansion Wiring 40
4.1.2. CAN Bus Expansion Resource Mapping 42
4.2. EtherCAT Bus Expansion 46
4.2.1. EtherCAT Bus Expansion Wiring 46
4.2.2. EtherCAT Bus Expansion Resource Mapping 48
Chapter V Programming 50
5.1. Program in RTSys Software 50
5.2. Upgrade Controller Firmware 55
5.3. Program in Host-Computer by PC Languages 56
Chapter VI Operation and Maintain 59
6.1. Regular Inspection and Maintenance 59
6.2. Common Problems & Solutions 60

Chapter I Production Information

1.1. Product Information

ZMC4 series supports Zmotion XPLC function, and can be configured and displayed through the network.

ZMC460 high-performance multi-axis motion controller is a stand-alone motion controller that is compatible with EtherCAT bus and pulse type. The controller itself supports complex continuous trajectory control requirements of up to 60 axes.

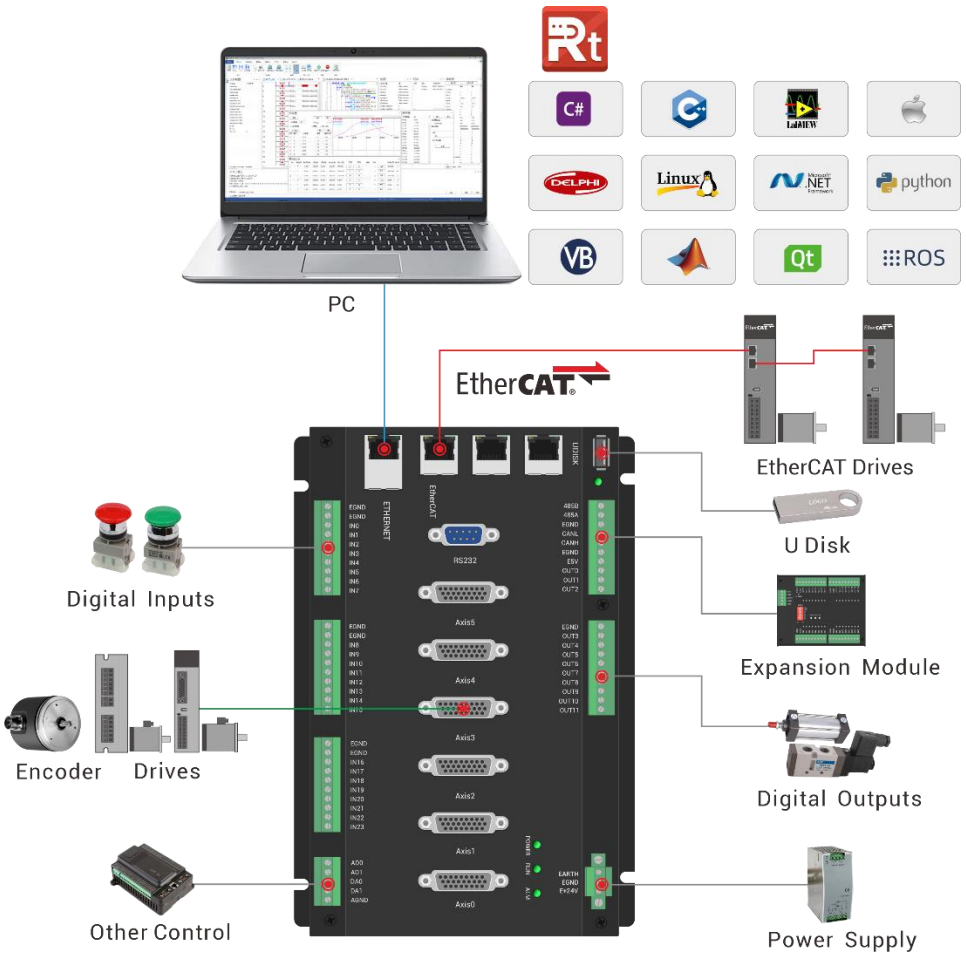
ZMC4 series high-performance multi-axis motion controller can be applied in robots (SCARA, Delta, 6 joints), electronic semiconductor equipment (testing equipment, assembly equipment, locking equipment, soldering machine), dispensing equipment, non-standard equipment, printing and packaging equipment, textile and garment equipment, stage entertainment equipment, medical equipment, assembly line, etc.

1.2. Function Features

- Motion control of up to 60 axes.
- Pulse output mode: pulse / direction or dual pulses or quadrature pulse.
- Maximum pulse frequency output of each axis: 10MHZ.
- IO can be expanded through CAN and EtherCAT, and 4096 isolated inputs and 4096 isolated outputs can be extended at most.
- Axis position limit signal / origin signal port can be configured as any input at will.
- The maximum output current of general digital outputs can reach 300mA, which can directly drive some kinds of solenoid valves.
- Interfaces: EtherCAT, RS232, RS485, U Disk, Ethernet.

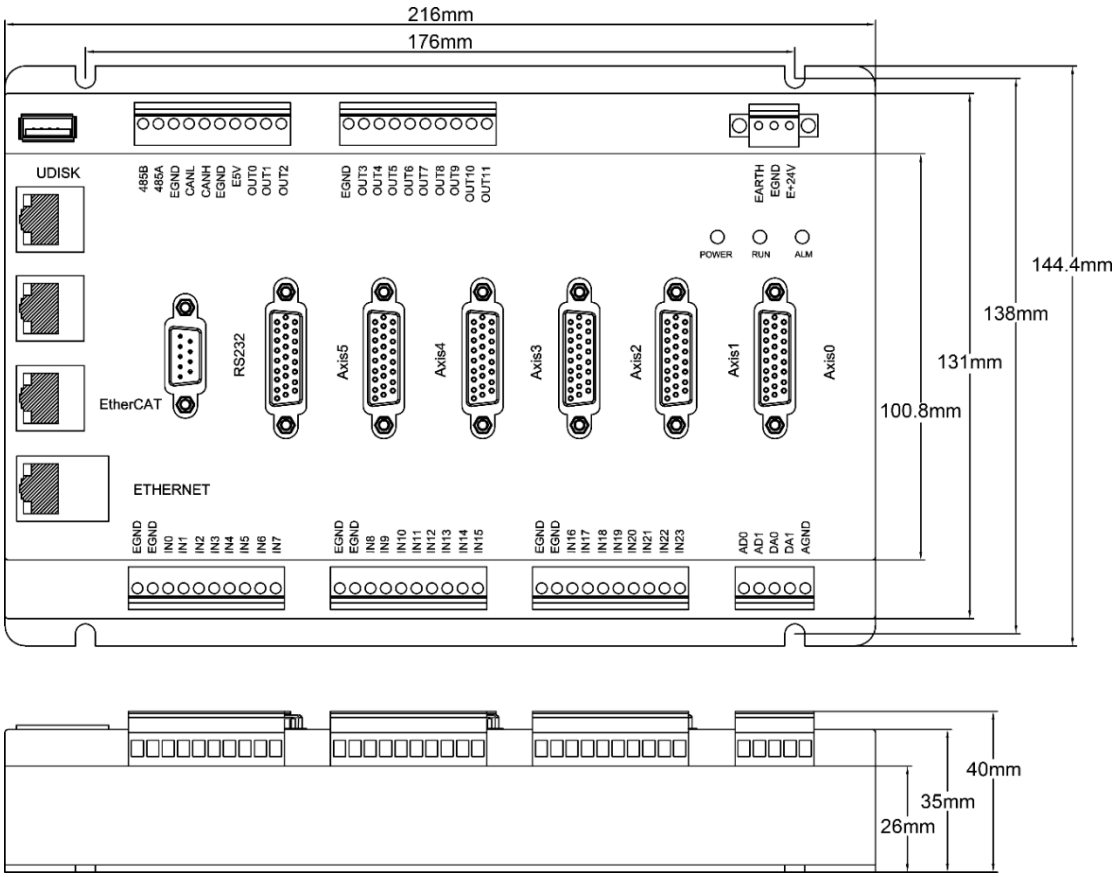
- Support linear interpolation, any circular interpolation, helical interpolation and spline interpolation of 60 axes at most.
- Support electronic cam, electronic gear, position latch, synchronous follow, virtual axis, etc.
- Support hardware comparison output (HW_PSWITCH2), hardware timer, precision output in motion.
- Support pulse closed loop, pitch compensation and other functions.
- Multi-file and multi-task programming in Basic.
- A variety of program encryption methods to protect your intellectual property rights.
- Support power failure detection and power failure storage.

1.3. System Frame



1.4.Hardware Installment

The ZMC460 motion controller adopts the horizontal installation method of screw fixing, and each controller should be installed with 4 screws for fastening.



→ Unit: mm → Installment 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.

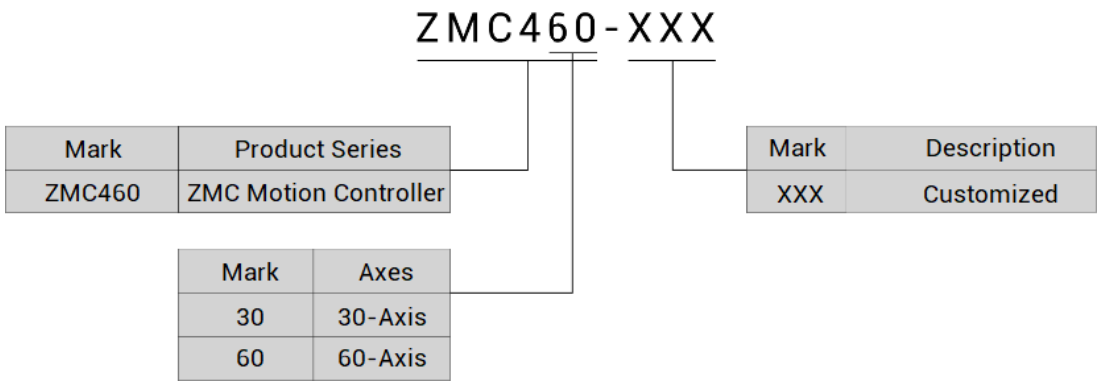
	● In order to facilitate ventilation and controller replacement, 2-3cm should be left between the upper and lower parts of the controller and the installation environment and surrounding components. ● Considering the convenient operation and maintenance of the controller, please do not install the controller 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. Basic Specification

Item	Description	
Model	ZMC460	ZMC430
Basic Axes	60	30
Max Extended Axes	60	60
Basic Axes Type	EtherCAT/ Local pulse axes	
Digital IO	24 inputs, 12 outputs, each pulse axis has 1 input and 1 output	
Max Extended IO	4096 inputs, 4096 outputs	
PWM	12	
AD/DA	2 general ADs and 2 general DAs, 0-10V	
Max Extended AD/DA	1000 ADs, 1000 DAs	
Pulse Bit	64	
Encoder Bit	64	
Speed Acceleration Bit	64	
Pulse Max Frequency	10MHz	
Motion Axis Buffer	4096	
Array Space	320000	
Program Space	32MByte	
Flash Space	256MByte	
Power Supply Input	24V DC input	
Communication Interfaces	RS232, RS485, Ethernet, U disk, CAN, EtherCAT	
Dimensions	216mm*144mm*35mm	

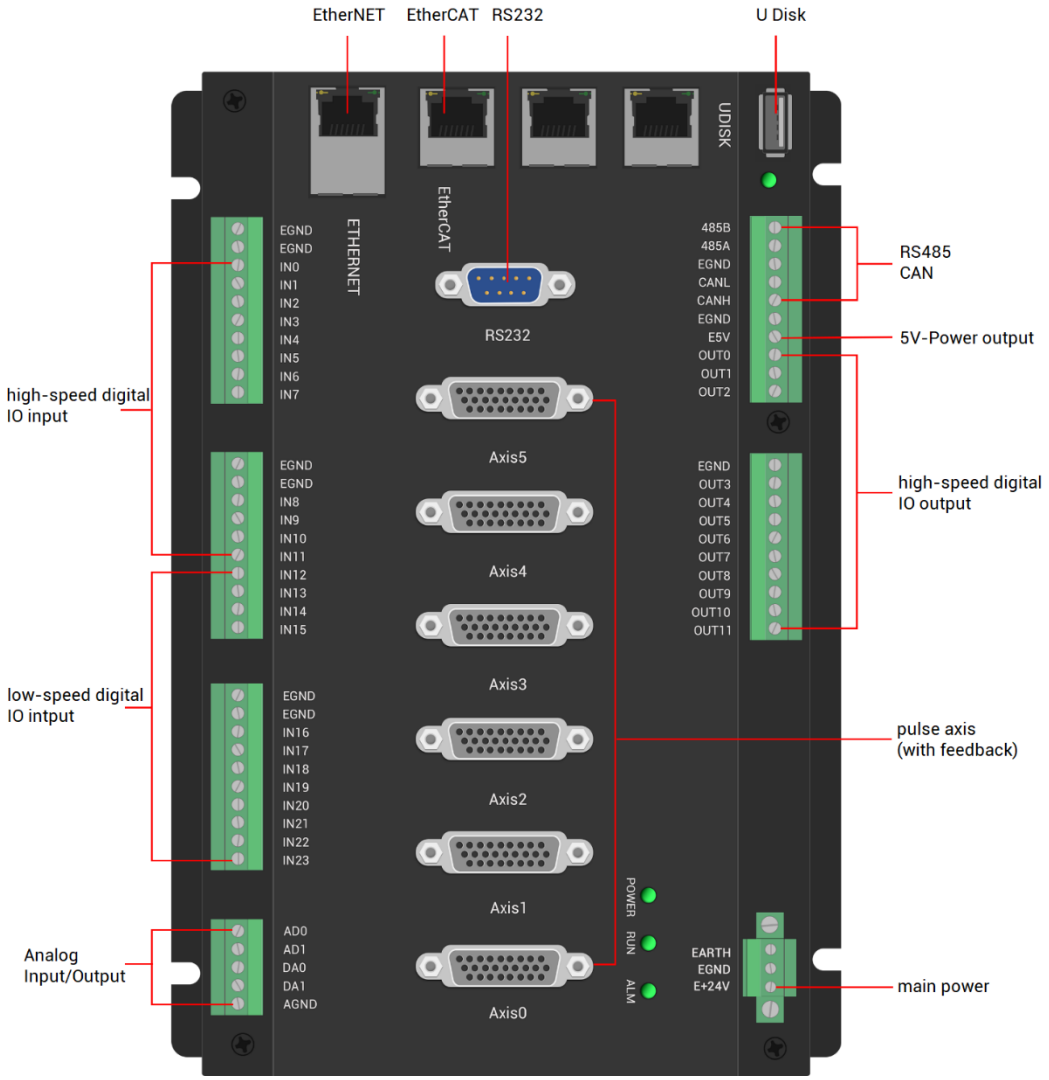
2.2. Nameplate & Models



Model	Description
ZMC460	60 axes, point to point, linear, circular, electronic cam, continuous trajectory motion, robotic arm instructions.
ZMC430	30 axes, point to point, linear, circular, electronic cam, continuous trajectory motion, robotic arm instructions.

- Except for the axis resources in the function description in the form above, the above models have the same resources, so you can refer to this manual.

2.3. Interface Definition



→ Interface Description

Mark	Interface	Number	Description
POWER	Status Indication Light	1	Power indicator: it lights when power is conducted.
RUN		1	Run indicator: it lights when runs normally
ALM		1	Error indicator: it lights when runs abnormally
RS232	RS232 serial port (port0)	1	Use MODBUS_RTU protocol
RS485	RS485 serial port (port1)	1	Use MODBUS_RTU protocol
EtherCAT	EtherCAT bus interface	1	EtherCAT bus interface, connect to EtherCAT bus drive and EtherCAT bus

			expansion module
ETHERNET	Ethernet	1	Use MODBUS_TCP protocol, expand Ethernet through interchanger, the number of net port channels can be checked through "?*port", default IP address id 192.168.0.11
UDISK	U disk interface	1	Insert U disk equipment
E+24V	Main power	1	24V DC power supplies for controller
CAN	CAN bus interface	1	Connect to CAN expansion module and CAN equipment of other standards
IN	Digital IO input	24	NPN type, there are 12 high-speed inputs, IN0-3 have latch function, IN0-11 have single-ended encoder function.
OUT	Digital IO output	12	NPN type, there are 12 high-speed outputs, OUT0-11 have PWM, single-ended pulse and hardware comparison output function.
AD	Analog input	2	Resolution: 12 bits, 0-10V
DA	Analog output	2	Resolution: 12 bits, 0-10V
AXIS	Pulse axis	6	It includes differential pulse output and differential encoder input

2.4. 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 and Communication

3.1. Power Input

The power supply input adopts a 3Pin (there are all 3 terminals) screw-type pluggable wiring terminal, and the interval (means the gap distance between two ports) should be 3.81mm. This 3Pin terminal is the power supply of the controller.

→ Terminal Definition:

Terminal	Name	Type	Function
	EARTH	Connect to ground	Case Protection
	EGND	Input	Negative (-) of DC input
	E+24V	Input	Positive (+) of DC input

3.1.1. Power Specification

→ Specification

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

3.2. RS485, CAN Communication Interface

The communication interface adopts a 5Pin screw-type pluggable wiring terminal and the gap spacing between 2 terminals should be 3.81mm. For both RS485 communication and

CAN communication, they can be used by connecting the corresponding interface.

→ Terminal Definition:

Terminal	Name	Function
	485B	485-
	485A	485+
	EGND	Communication Public End
	CANL	CAN differential data -
	CANH	CAN differential data +

3.2.1. RS485, CAN Communication Specification & Wiring

The RS485 serial port supports the MODBUS_RTU protocol and custom communication, mainly including 485A, 485B and public end.

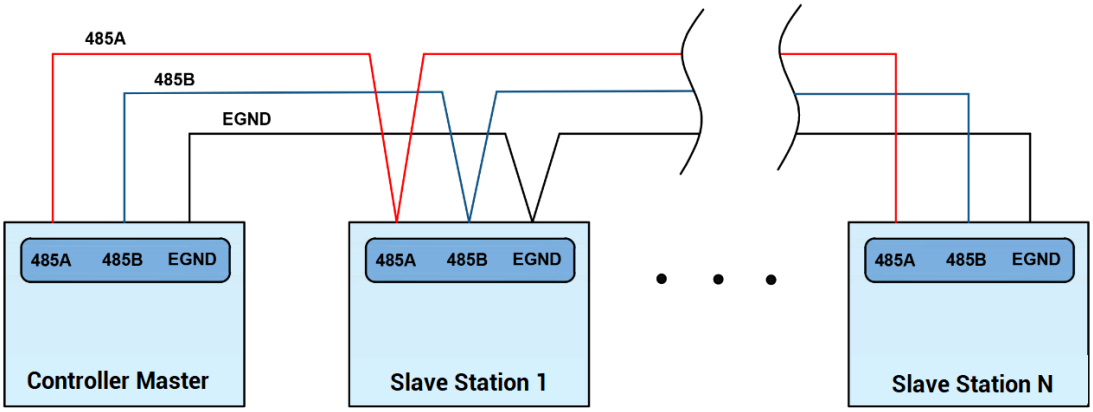
The CAN interface of the controller adopts the standard CAN communication protocol, which mainly includes three ports, CANL, CANH and the public end. And it can connect CAN expansion modules and other standard CAN devices.

→ Specification

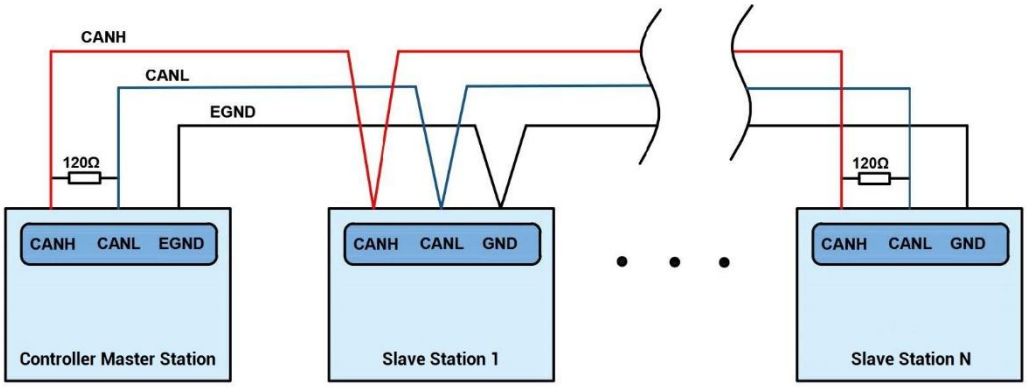
Item	RS485	CAN
Maximum Communication Rate (bps)	115200	1M
Terminal Resistor	No	120Ω
Topological Structure	Daisy Chain Topology	
The number of nodes can be extended	Up to 127	Up to 16
Communication Distance	The longer communication distance is, the lower communication rate is, and maximum of 30m is recommended.	

→ Wiring Reference

Connect 485A and 485B of RS485 to 485A and 485B of the controller correspondingly, and connect the public ends "EGND" of RS485 communication parties together.



Connect the CANL and CANH of the standard CAN module to the CANL and CANH of the other side correspondingly. And public ends of the CAN bus communication both parties are connected together. In CAN bus left and right sides, connect a 120Ω resistor respectively (please see below graphic).



→ Wiring Notes:

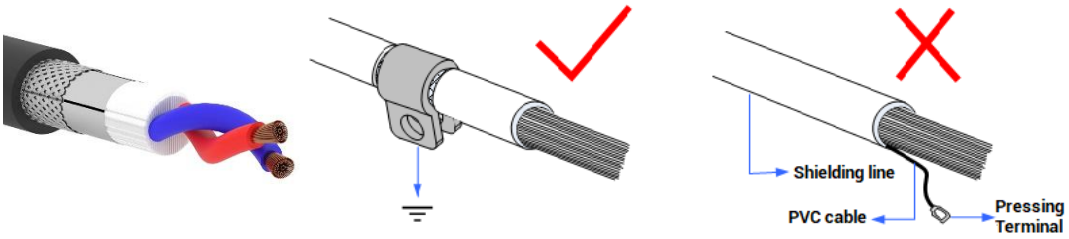
- As above, the daisy chain topology is used for wiring (the star topology structure cannot be used). When the use environment is ideal and there are no many nodes, the branch structure also can be used.
- Please connect a 120Ω terminal resistor in parallel to each end of the CAN bus for

matching the circuit impedance and ensuring communication stability.

- Please be sure to connect the public ends of each node on the CAN bus to prevent the CAN chip from burning out.
- Please use STP (Shielded Twisted Pair), especially in bad environments, and make sure the shielding layer is fully grounded.
- When on-site wiring, pay attention to make the distance between strong current and weak current, it is recommended for the distance to be more than 20cm.
- It should be noted that the equipment grounding (chassis) on the entire line must be good, and the grounding of the chassis should be connected to the standard factory ground pile.

→ Cable Requirements:

Shielded Twisted Pair, and the shielded cable is grounded.



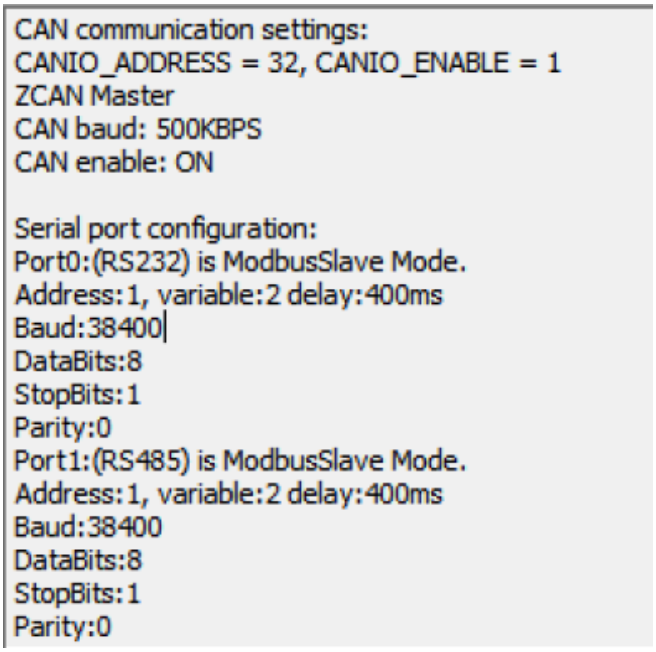
3.2.2. Basic Usage Method

(1) Please follow the above wiring instructions to wiring correctly.

(2) After powered on, please use any one interface among the three interfaces (ETHERNET, RS232, RS485) to connect to RTSys;

(3) Please use the "ADDRESS" and "SETCOM" commands to set and view the protocol station number and configured parameters, see "Basic Programming Manual" for details.

(4) Please use the "CANIO_ADDRESS" command to set the master's "address" and "speed" according to the needs, and use the "CANIO_ENABLE" command to enable or disable the internal CAN master function, or through "RTSys/Controller/State the Controller/Communication Info" to view the CAN status intuitively, and refer to the “Basic Programming Manual" for details.



(5) According to their respectively instructions, correctly set the relevant parameters of the third-party equipment to match the parameters of each node.

(6) Correctly set the "address" and "speed" of the slave station expansion module according to the manual of the slave station.

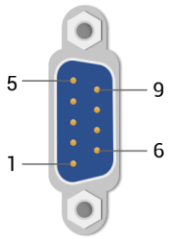
(7) After all the settings are completed, restart the power supply of all stations to establish communication.

(8) Note that the "speed" settings of each node on the CAN bus must be consistent, and the "address" settings cannot cause conflicts, otherwise the "ALM" alarm light will be on, and the communication establishment will fail or the communication will be disordered.

3.3. RS232 Serial Port

RS232 is in a standard DB9 male socket and supports MODBUS_RTU protocol and custom communication.

→ Interface Definition:

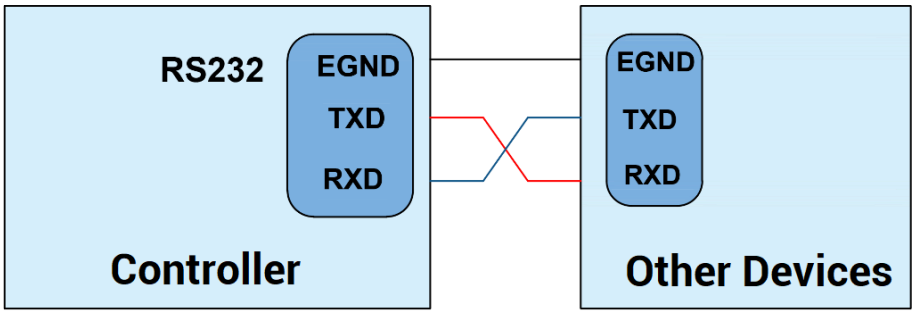
Terminal	PIN	Name	Type	Function
	1, 4, 6, 7, 8	NC	Spare	Reserved
	2	RXD	Input	RS232 signal, receive data
	3	TXD	Output	RS232 signal, send data
	5	EGND	Output	Negative pole output of 5V power, and output for the public end
	9	E5V	Output	Positive pole output of 5V power, maximum is 300mA

3.3.1. RS232 Communication Interface Specification & Wiring

→ Specification:

Item	RS232
Maximum Communication Rate (bps)	115200
Terminal Resistor	No
Topology Structure	Connect correspondingly (1 to 1)
The number of nodes can be extended	1
Communication Distance	The Longer communication distance is, the lower communication rate is, maximum 5m is recommended.

→ Wiring Reference:

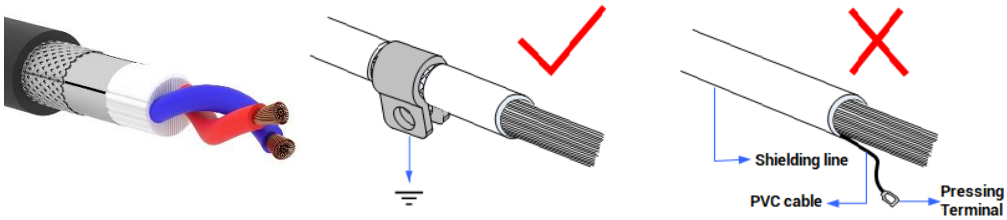


→ Wiring Notes:

- The wiring of RS232 is as above, it needs to cross-wiring for sending and receiving signals, and it is recommended to use a double-female head cross line when connecting to a computer.
- Please be sure to connect the public ends of each communication node to prevent the communication chip from burning out.
- Please use STP, especially in bad environments, and make sure the shielding layer is fully grounded.

→ Cable Requirements:

Shielded Twisted Pair, and the shielded cable is grounded.



3.3.2. Basic Usage Method

(1) Please follow the above wiring instructions to wiring correctly.

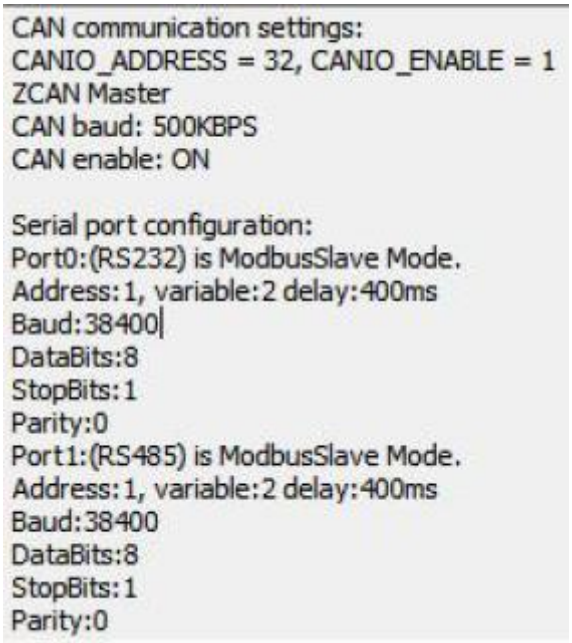
(2) After powered on, please use any one interface among the three interfaces ETHERNET, RS232 (there is default parameter, which can be connected directly) and RS485 (there is default parameter, which can be connected directly, but for hardware, adapter head is needed) to connect to RTSys.

(3) Please use the "ADDRESS" and "SETCOM" commands to set and view the protocol station number and configured parameters, see "Basic Programming Manual" for details.

(4) According to their respectively instructions, correctly set the relevant parameters of the third-party equipment to match the parameters of each node.

(5) When all is configured, it can start to do communicating.

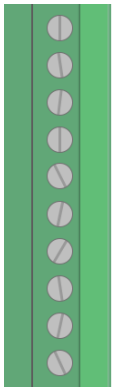
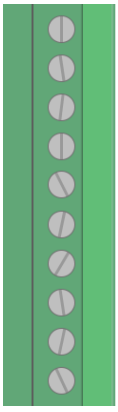
(6) Communication data of RS232 / RS485 can be directly viewed through “RTSys / Controller / State the Controller / CommunicationInfo".

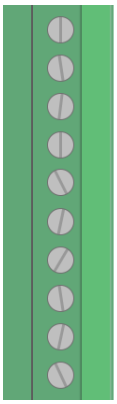


3.4. IN Digital Input & High-Speed Latch Port & Single-ended Encoder

The digital input adopts 3 groups of 10Pin (there are 3 groups of 10 terminals) screw-type pluggable terminals, and the gap distance between terminals should be 3.81mm. In addition, the single-ended encoder and the high-speed latch functions are integrated in digital input signals.

→ Wiring Definition

Terminal	Name	Type	Function 1	Function 2	Function 3
	EGND	/	IO Public End	/	/
	EGND	/		/	/
	IN0	NPN type, high-speed input	Input0	High speed latch	EA6
	IN1		Input1	High speed latch	EB6
	IN2		Input2	High speed latch	EZ6
	IN3		Input3	High speed latch	EA7
	IN4		Input4	/	EB7
	IN5		Input5	/	EZ7
	IN6		Input6	/	EA8
	IN7		Input7	/	EB8
	EGND	/	IO Public End	/	/
	EGND	/		/	/
	IN8	NPN type, high-speed input	Input8	/	EZ8
	IN9		Input9	/	EA9
	IN10		Input10	/	EB9
	IN11		Input11	/	EZ9
	IN12	NPN type, low-speed input	Input12	/	/
	IN13		Input13	/	/
	IN14		Input14	/	/
	IN15		Input15	/	/
	EGND	/	IO Public End	/	/
	EGND	/		/	/
	IN16	NPN type, low-speed input	Input16	/	/
	IN17		Input17	/	/
	IN18		Input18	/	/
	IN19		Input19	/	/

	IN20		Input20	/	/
	IN21		Input21	/	/
	IN22		Input22	/	/
	IN23		Input23	/	/

Note:

- ✧ IN0-3 have high-speed latch function, and IN0-11 have single-ended encoder function.
- ✧ It is necessary to configure single-ended encoder axis 6-9 as local axes compulsively through AXIS_ADDRESS. When ATYPE=0, they are general inputs.

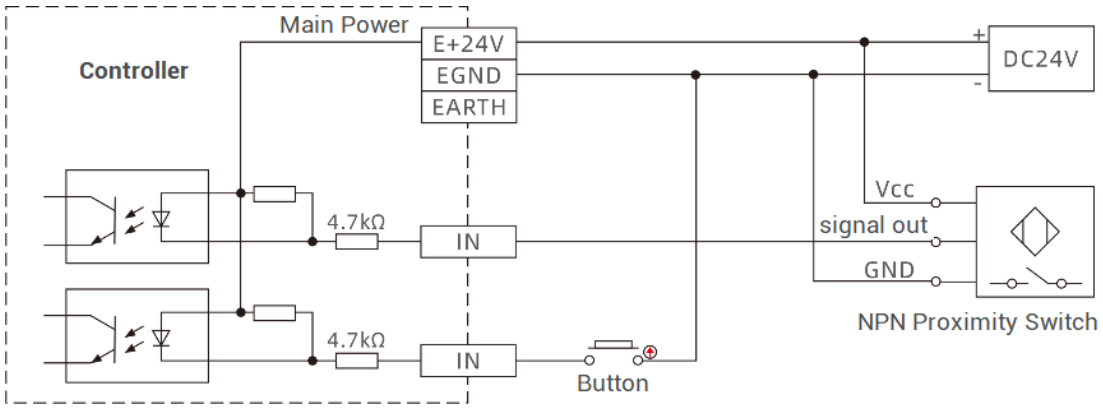
3.4.1. Digital Input Specification & Wiring

→ Specification

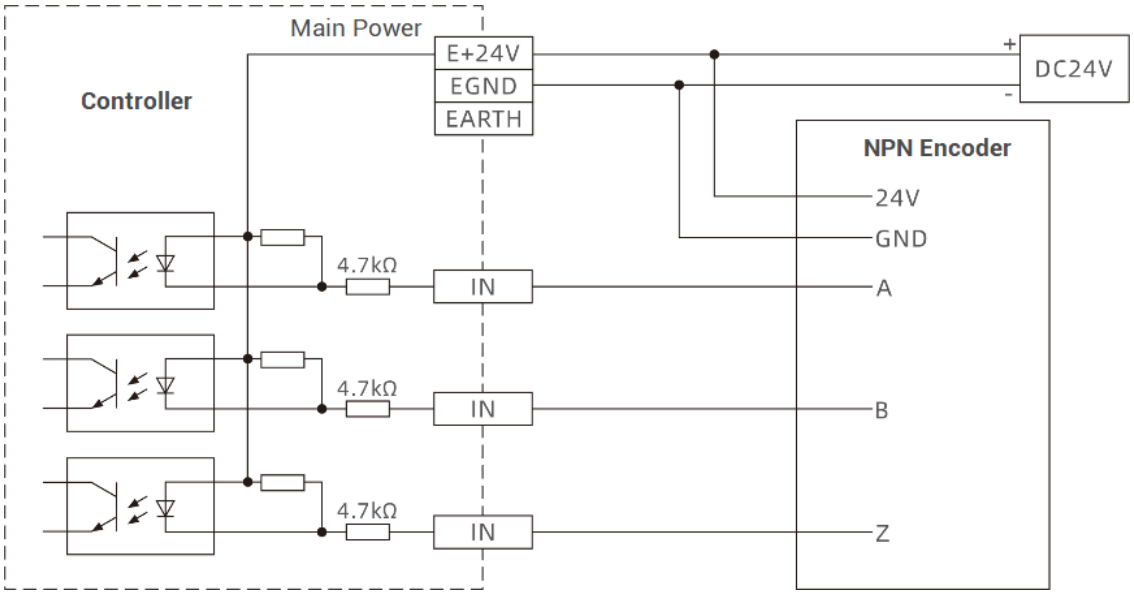
Item	High-Speed Input (IN0-11)	Low-Speed Input (IN12-23)
Input mode	NPN type, the input is triggered when by low-electric level	
Frequency	<100kHz	<5kHz
Impedance	3.3KΩ	4.7KΩ
Voltage level	DC24V	DC24V
The voltage to open	<15V	<14.5V
The voltage to close	>15.1V	>14.7V
Minimal current	-2.3mA (negative)	-1.8mA (negative)
Max current	-7.5mA (negative)	-6mA (negative)
Isolation mode	Optoelectronic isolation	
Note: the above parameters are standard values when the voltage of controller power supply (E+24V port) is 24V.		

→ Wiring Reference

➢ **General Input Wiring**



➢ **Single-Ended Encoder Wiring**



→ Wiring Note:

- The wiring principle of high-speed digital input IN (0-11) and low-speed digital input IN (12-23) 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 controller are in the same power supply system, this connection also can be omitted.

3.4.2. Basic Usage Method

(1) Please follow the above wiring instructions for correct wiring.

(2) After power on, please use any of the three interfaces ETHERNET, RS232 and RS485 to connect to RTSys.

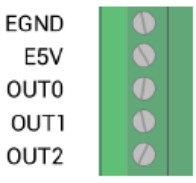
(3) State values of relative inputs can be read directly through "IN" command, also, it can be read through "RTSys/Tool/In". Please refer to "Basic" for details

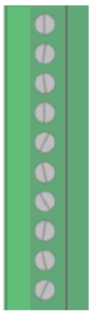
(4) Latch function can be set and opened through "REGIST" instruction, in software, use REG_INPUTS to configure. Please refer to "Basic" for details.

3.5. OUT: Digital Output, PWM Terminal, Hardware Comparison Output, Single-ended Pulse

The digital output adopts 2 sets of screw-type pluggable terminals with a spacing of 3.81mm, and the PWM, single-ended pulse and hardware comparison output functions are integrated in digital output signals.

→ Wiring Definition

Terminal	Name	Type	Function 1	Function 2	Function 3	Function 4
	EGND	/	External power ground	/	/	/
	E5V	/	5V power output, max 300mA	/	/	/
	OUT0	NPN,	Output0	PWM Output 0	Hardware	PUL6

	OUT1	high-speed	Output1	PWM Output 1	Comparison Output	DIR6
	OUT2		Output2	PWM Output 2		PUL7
	EGND	/	External power ground	/	/	/
EGND OUT3 OUT4 OUT5 OUT6 OUT7 OUT8 OUT9 OUT10 OUT11 	OUT3	NPN, high-speed output	Output4	PWM Output 3	Hardware Comparison Output	DIR7
	OUT4		Output5	PWM Output 4		PUL8
	OUT5		Output6	PWM Output 5		DIR8
	OUT6		Output7	PWM Output 6		PUL9
	OUT7		External power ground	PWM Output 7		DIR9
	OUT8		Output8	PWM Output 8		PUL10
	OUT9		Output9	PWM Output 9		DIR10
	OUT10		Output10	PWM Output 10		PUL11
	OUT11		Output11	PWM Output 11		DIR11

Note:

- ✧ The E5V power output port is used for PWM or single-ended axis common anode wiring. It is not recommended for other purposes due to lower power.
- ✧ OUT0-11 have the functions of PWM, single-ended pulse and hardware comparison output, when PWM is off, it is low speed output.
- ✧ Single-ended pulse axis 6-11 need to be configured as local axes compulsively through AXIS_ADDRESS, when ATYPE=0, they are general output.

3.5.1. Digital Output Specification & Wiring

→ Specification

Item	High Speed Output (OUT0-11)	Low Speed Output
Output mode	NPN type, it is 0V when outputs	
Frequency	<400kHz	<8kHz
Voltage level	DC24V	DC24V

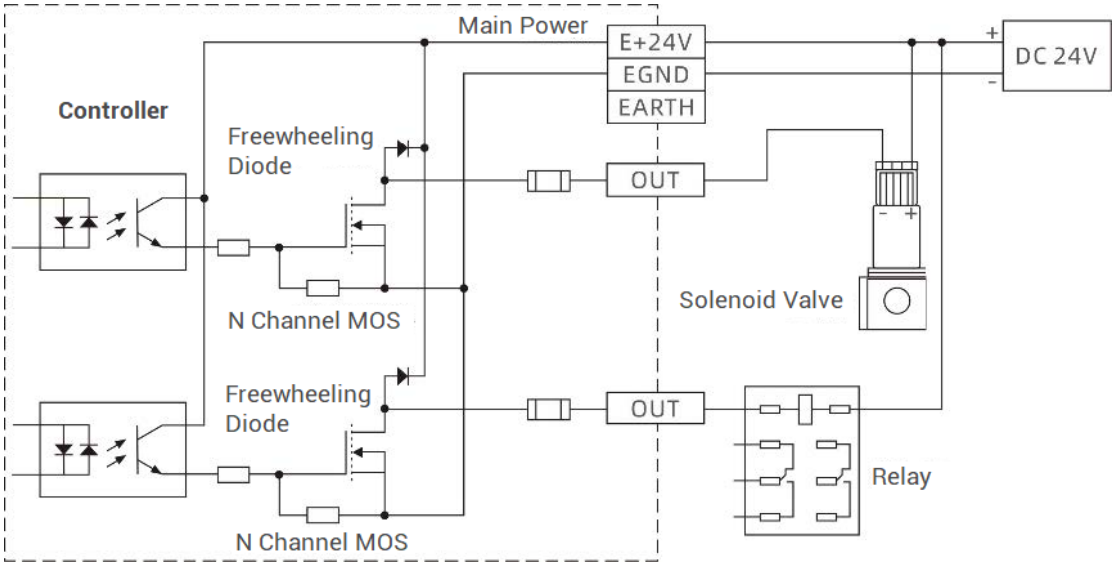
Max output current	+300mA	+300mA
Max leakage current when off	25μA	25μA
Respond time to conduct	1μs (resistive load typical value)	12μs
Respond time to close	3μs	80μs
Overcurrent protection	Support	Support
Isolation method	Optoelectronic isolation	

Note:

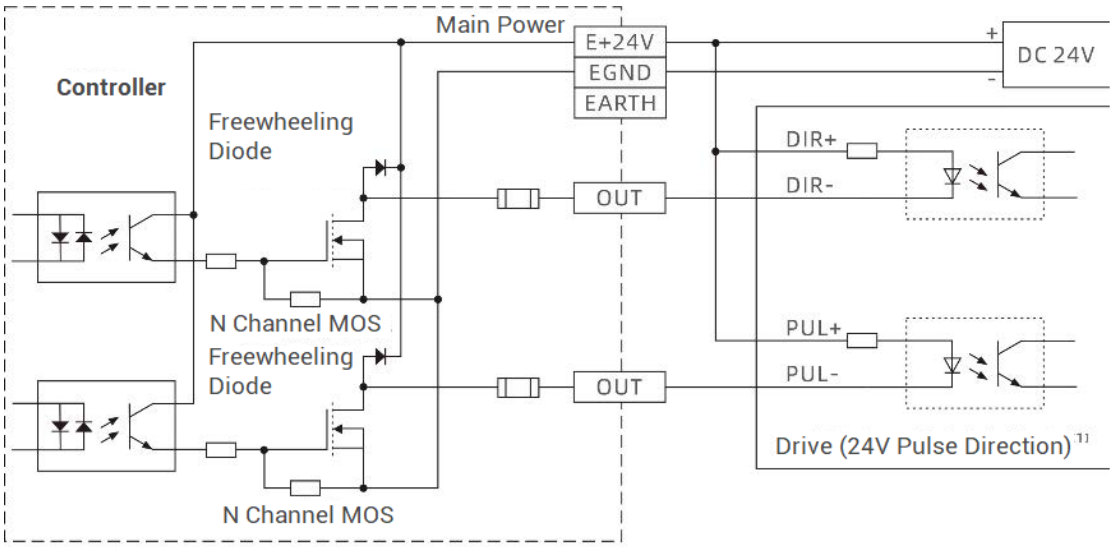
- ✧ The times in the form are typical based on the resistive load, and may change when the load circuit changes.
- ✧ Due to the leak-type output, the shutdown of the output will be obviously affected by the external load circuit, and the output frequency should not be set too high in the application.

→ Wiring Reference

➢ General Output Wiring



➢ **Single-Ended Pulse-Axis Wiring**



[1] for 5V pulse directional interface, please connect PUL+ and DIR+ to E5V.

→ Wiring Note:

- The wiring principle of high-speed digital output OUT (0-11) 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 controller power supply are in the same power supply system, this connection can also be omitted.
- The E5V port is a 5V power output port, which can be used when some loads need to provide an external 5V power input, the maximum current is 300mA.

3.5.2. Basic Usage Method

(1) Please follow the above wiring instructions to wiring correctly.

(2) After powered on, please use any one interface among the three interfaces ETHERNET, RS232 and RS485 to connect to RTSys.

(3) Open or close output port directly through “OP” command, also, it can be opened or closed through “RTSys/Tool/Op”. Please refer to “Basic” for details.

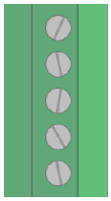
(4) The PWM function, set the frequency and duty cycle through “PWM_FREQ” and “PWM_DUTY”. Please refer to Basic for details.

(5) Hardware comparison output can be set and opened through “HW_PSWITCH2”. Please refer to Basic for details.

3.6. AD / DA: Analog Input / Output

The analog port adopts a set of 5Pin screw-type pluggable terminals with a spacing of 3.81mm.

→ Terminal Definition

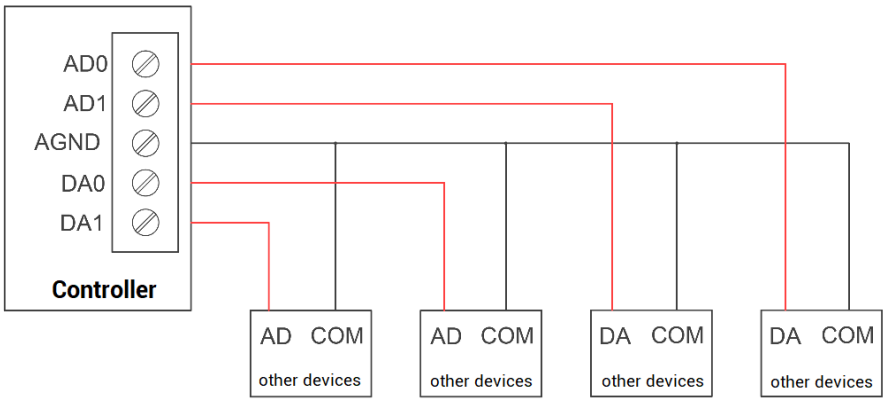
Terminal	Name	Type	Function
	AD0	Input	Analog input terminal AIN(0)
	AD1		Analog input terminal AIN(1)
	DA0	Output	Analog output terminal: AOUT(0)
	DA1		Analog output terminal: AOUT(1)
	AGND	Public End	Analog public end

3.6.1.Analog Output Specification & Wiring

→ Specification

Item	AD (0-1)	DA (0-1)
Resolution	12-bit	12-bit
Data range	0-4095	0-4095
Signal range	0-10V input	0-10V output
Data refresh ratio	1KHz	1KHz
Load impedance	>40KΩ (voltage input impedance)	>1KΩ (voltage output load)

→ Wiring Reference

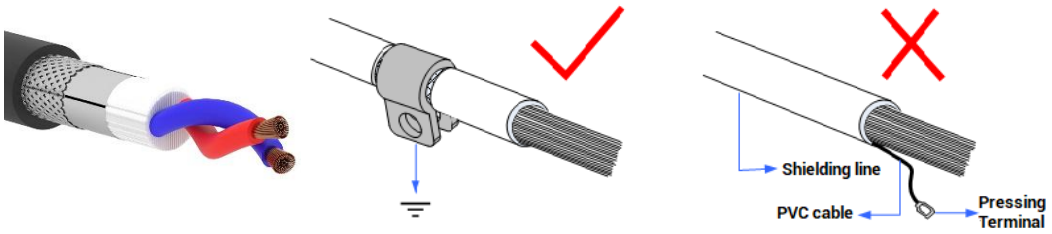


→ Wiring Note:

- The analog input/output wiring method is as shown in the figure above, and the external load signal range must match it.
- Please use STP cables, especially in harsh environments, and make sure the shielding layer is fully grounded.

→ Cable Requirements:

Shielded Twisted Pair, and the shielded cable is grounded.



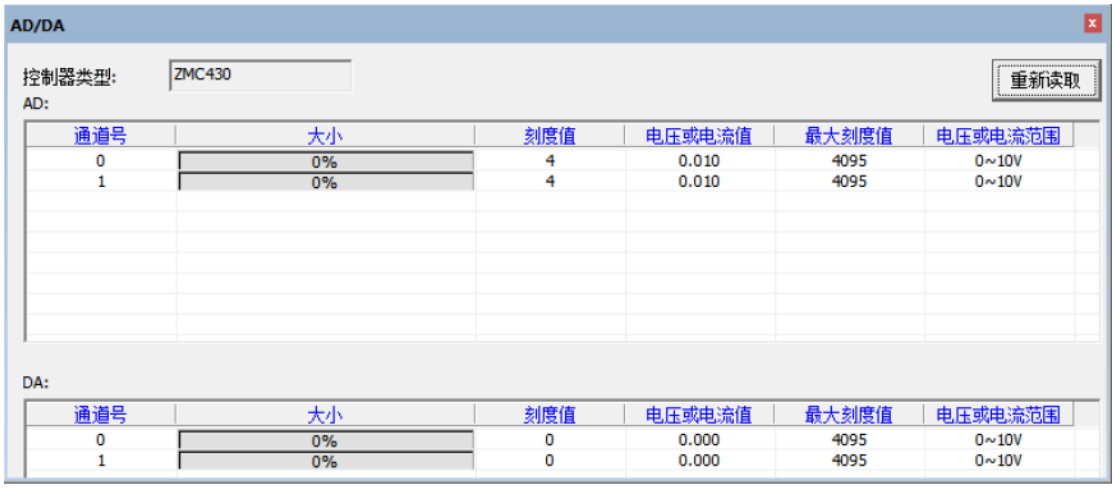
3.6.2. Basic Usage Method

(1) Please follow the above wiring instructions to wiring correctly.

(2) After powered on, please use any one interface among the three interfaces ETHERNET, RS232 and RS485 to connect to RTSys.

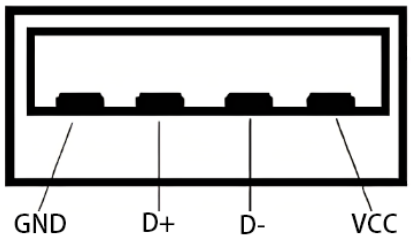
(3) Analog input voltage can be read through “AIN” command and corresponding analog

voltage can be output through "AOUT" command, also, data of each channel can be checked through "RTSys/Tool/AD/DA". Please refer to "Basic" for details.



3.7. U Disk

The ZMC460 motion controller provides a USB communication interface to insert a U disk device, which is used for ZAR program upgrade, controller data import and export, and 3 file executions. Its schematic diagram is shown in the figure below:



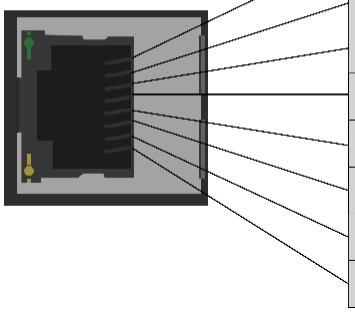
→ Specification

Item	USB2.0
Max Communication Ratio	12Mbps
Max Output Current of 5V	500mA
Whether Isolates	No

3.8. ETHERNET

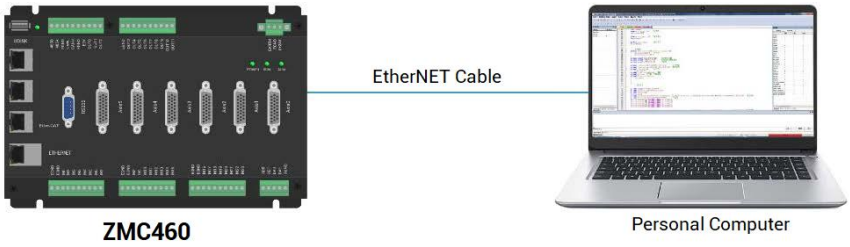
ZMC460 motion controller has a 100M network port, supports MODBUS_TCP

protocol and custom communication, and the default IP address is 192.168.0.11. The pin definition diagram is as follows:

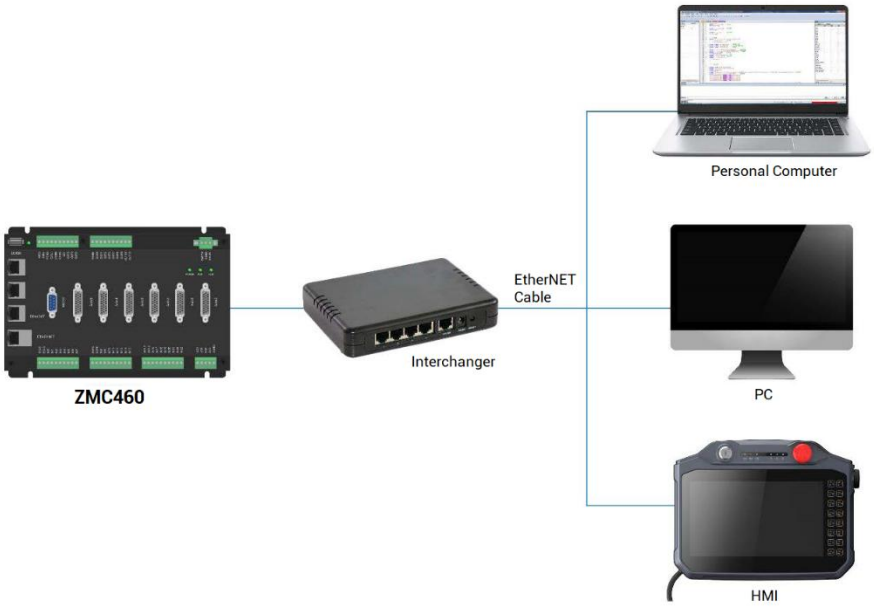


PIN	Signal	Description
1	TX+	Send signal (+)
2	TX-	Send signal (-)
3	RX+	Receive signal (+)
4	NC	Reserved
5	NC	Reserved
6	RX-	Receive signal (-)
7	NC	Reserved
8	NC	Reserved

The Ethernet port of the controller can be connected point-to-point with a computer, HMI, etc. through an Ethernet cable. The schematic diagram is as follows:

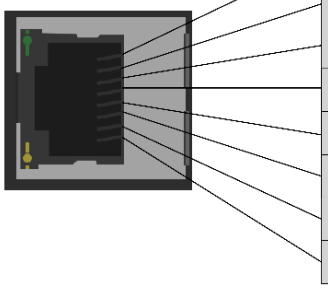


The controller can also be connected to the interchanger through an Ethernet cable, and connected to other devices through the interchanger to realize multi-point connection. The schematic diagram is as follows:



3.9. EtherCAT Bus Interface

ZMC460 motion controller has a 100M EtherCAT communication interface, supports EtherCAT protocol, and connects to EtherCAT driver or EtherCAT expansion module. The pin definition diagram 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

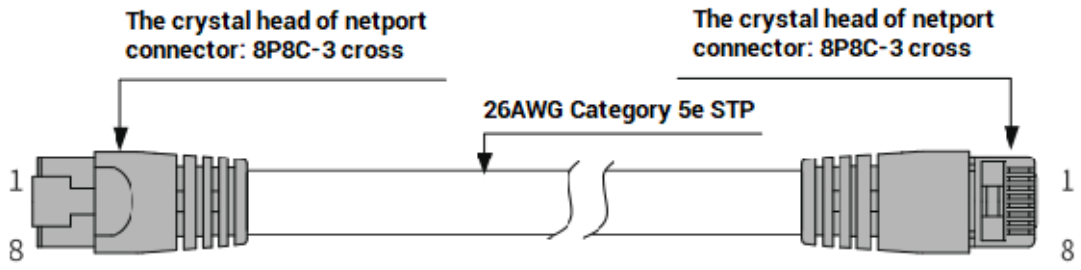
→ Specification

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	1000 digital input and output about is 30us

→ Communication Cable Requirements

Both ETHERNET communication interface and EtherCAT communication interface adopt 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.

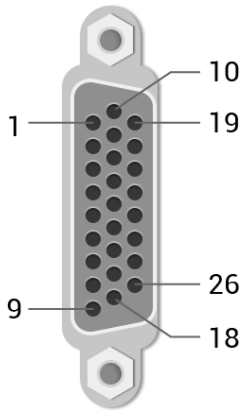
Please use tube-type pre-insulated terminals and cables with appropriate wire diameters to connect the user terminals.

3.10. AXIS Differential Pulse Axis Interface

This product provides 6 local differential pulse axis interfaces, each interface is a standard DB26 female socket. Each terminal provides 0V and +5V output, which can provide 5V power for the encoder.

Before the axis is used, the use mode of the axis must be configured through the ATYPE parameter.

→ Interface Definition

Interface	Pin	Signal	Description
	1	EGND	Negative pole of IO 24V power
	2	IN24-29/ALM	Digital input, it is recommended to do drive alarm
	3	OUT12-17/ENABLE	Digital output, it is recommended to do drive 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 directional 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 directional 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

Note:

- ALM and ENABLE are recommended to be used as axis IO due to their small drive capacity.
- OVCC, +5V is only used for communication between the controller and the servo driver, please do not use it as power supply for other places.

➢ Relation of Pulse-Axis PIN No. & IO:

Pulse Axis No.	Corresponding IN (PIN2)	Corresponding OUT (PIN3)
AXIS 0	IN24	OUT12
AXIS 1	IN25	OUT13
AXIS 2	IN26	OUT14
AXIS 3	IN27	OUT15
AXIS 4	IN28	OUT16
AXIS 5	IN29	OUT17

3.10.1. AXIS Interface Signal Specification & Wiring

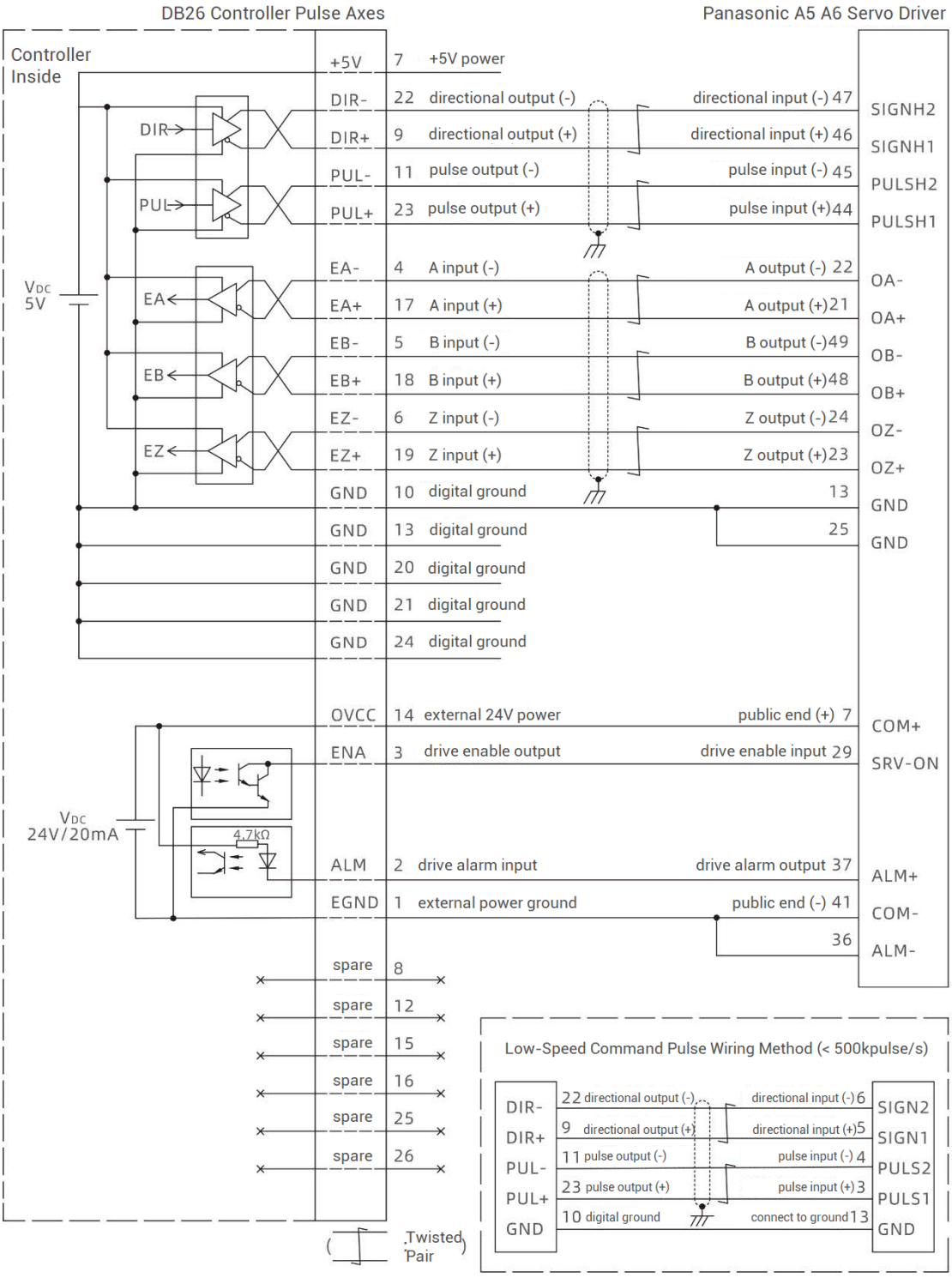
→ Specification:

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

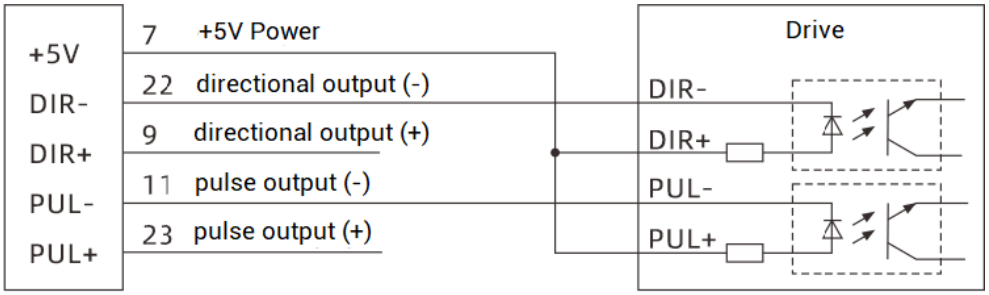
IN24-29	Input method	NPN type, it is triggered when low electric level is input.
	Frequency	< 5kHz
	Impedance	6.8KΩ
	Voltage level	DC24V
	The voltage to open	<10.5V
	The voltage to close	>10.7V
	Minimal current	-1.8mA (negative)
	Maximum current	-4mA (negative)
	Isolation	optoelectronic isolation
OUT12-17	Output method	NPN type, it is 0V when outputs
	Frequency	< 8kHz
	Voltage level	DC24V
	Maximum current	+50mA
	Overcurrent protection	No
	Isolation	optoelectronic isolation
+5, GND	Maximum output current for 5V	50mA
OVCC, EGND	Maximum output current for 24V	50mA

→ Wiring Reference:

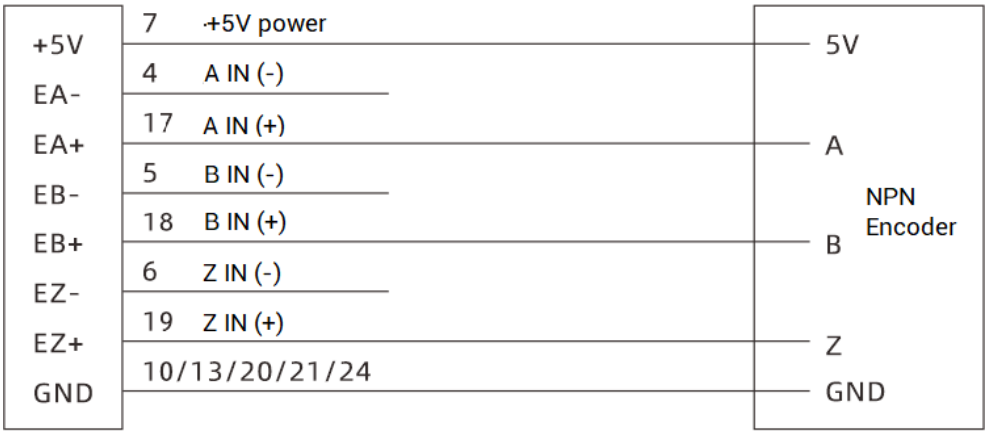
➢ **Reference example of wiring with Panasonic A5/A6 servo driver:**



➢ **Single-Ended Pulse Axis Wiring:**



➢ **Single-Ended Encoder 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.

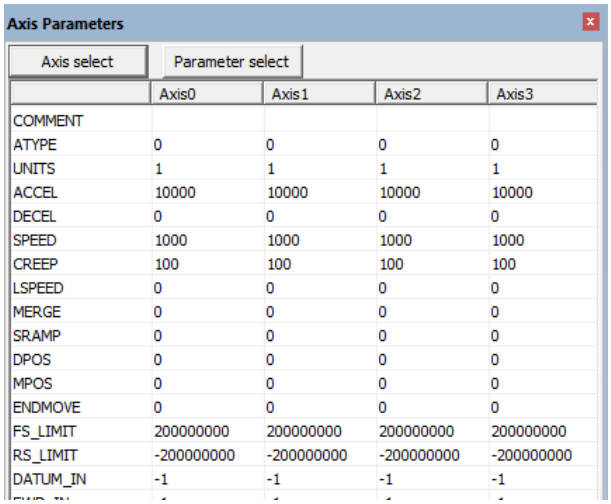
3.10.2. Basic Usage Method

(1) Please follow the above wiring instructions to wiring correctly.

(2) After powered on, please use any one interface among the three interfaces ETHERNET, RS232 (default parameter, it can be connected directly) and RS485 (default parameters, it can be connected directly, but for hardware, adapter head is needed) to connect to RTSys.

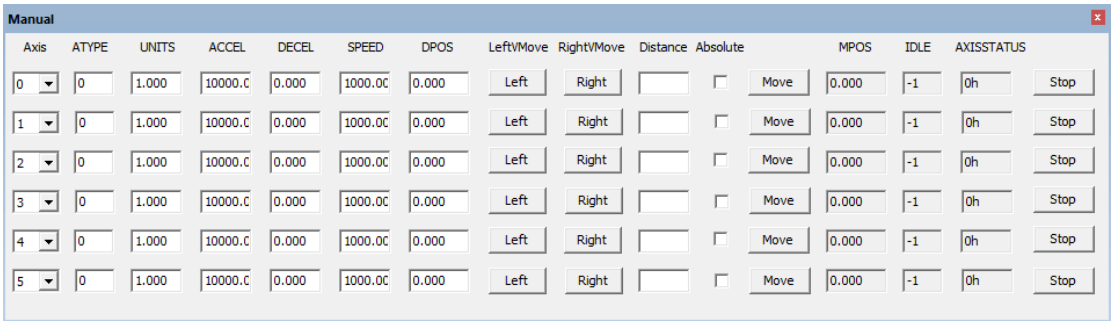
(3) Set axis parameters, such as, ATYPE, UNITS, SPEED, ACCEL, FWD_IN, REV_IN, etc.

(4) There are many parameters related to pulse axis, they can be set and checked through relative instructions, please see “axis parameter and axis status" of “Basic", or see “RTSys/Tool/Axis parameter".



	Axis0	Axis1	Axis2	Axis3
COMMENT				
ATYPE	0	0	0	0
UNITS	1	1	1	1
ACCEL	10000	10000	10000	10000
DECEL	0	0	0	0
SPEED	1000	1000	1000	1000
CREEP	100	100	100	100
LSPEED	0	0	0	0
MERGE	0	0	0	0
SRAMP	0	0	0	0
DPOS	0	0	0	0
MPOS	0	0	0	0
ENDMOVE	0	0	0	0
FS_LIMIT	200000000	200000000	200000000	200000000
RS_LIMIT	-200000000	-200000000	-200000000	-200000000
DATUM_IN	-1	-1	-1	-1

(5) Control corresponding motion through “View – Manual".



Refer to BASIC Routine:

```
BASE(0,1)                'select axis 0 and axis 1
ATYPE = 1,1              'set axis 0 and axis as pulse axes
UNITS = 1000,1000        'set pulse amount as 1000 pulses
SPEED = 10,10            'set axis speed as 10*1000 pulse/s
ACCEL = 1000,1000        'set axis acceleration as 1000*1000 pulse/s/s
FWD_IN = -1,-1           'prohibit using axis positive hardware position limit
REV_IN = -1,-1           'prohibit using axis negative hardware position limit
MOVE(10) AXIS(0)         'axis 0 moves distance of 10*1000 pulses in positive
MOVE(-20) AXIS(0)        'axis 0 moves distance of 20*1000 pulses in negative
```

Chapter IV Expansion Module

The controller can expand digital IO, analog IO, pulse axis and other resources through CAN bus (ZIO series expansion modules). For details, please refer to "ZIO Expansion Card Hardware Manual". Also, through EtherCAT bus (EIO series expansion cards) expansion of these resources also can be achieved, please refer to each EIO hardware manual for details.

4.1. CAN Bus Expansion

ZIO series expansion modules or ZMIO310-CAN coupler with sub modules can be used.

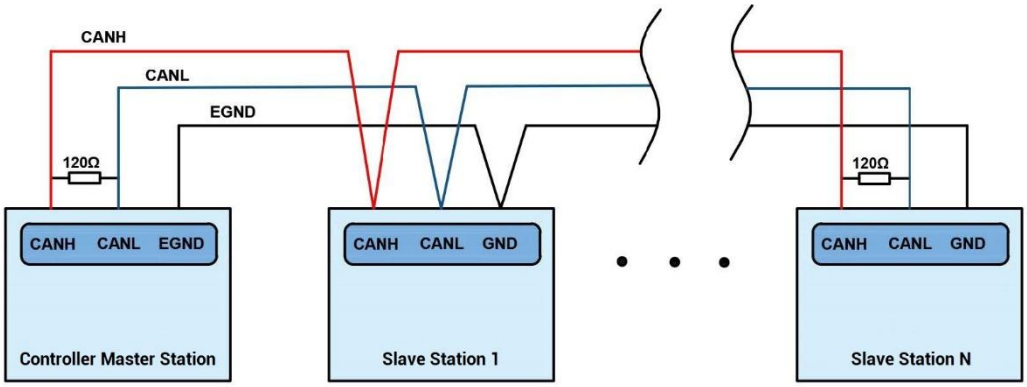
4.1.1. CAN Bus Expansion Wiring

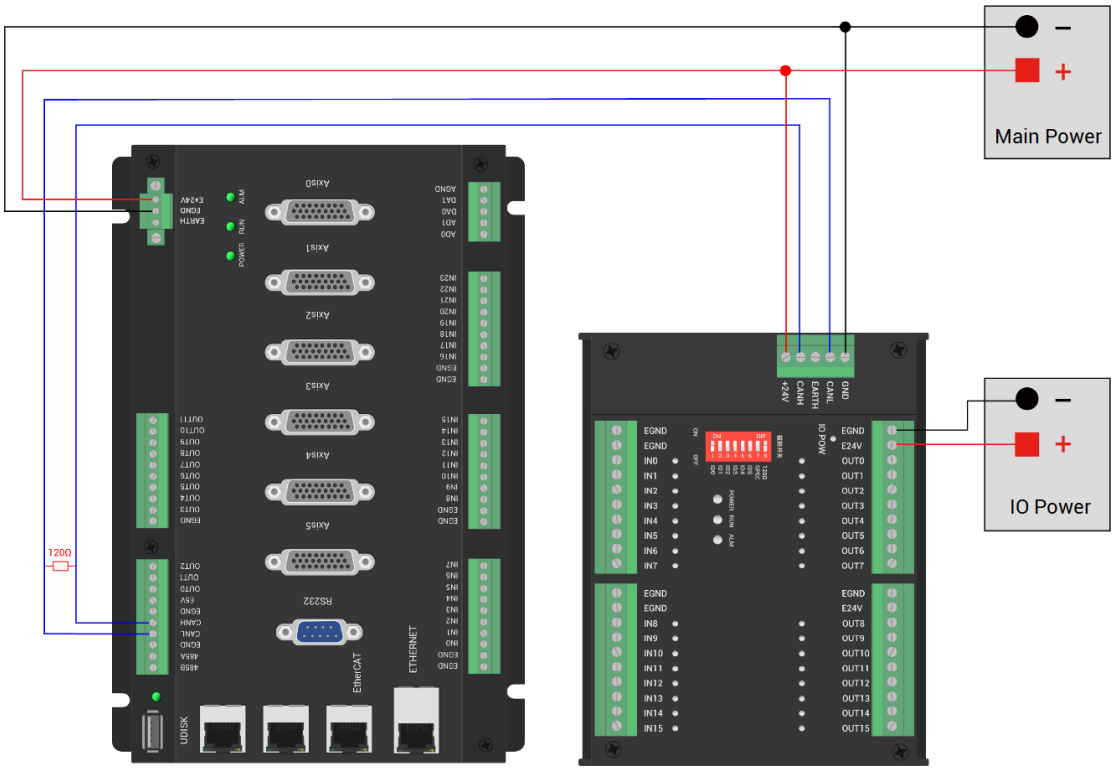
The ZIO expansion module is powered by the dual power supply. Except the main power supply, an additional IO power supply is required to supply independent power for IO. Both the main power supply and the IO power supply use 24V DC power supply. For ZAIO, it only needs to connect to the main power supply.

To prevent interference, separate the IO power supply from the main power supply.

Please select the expansion module according to the requirements, and select IO mapping or axis mapping according to the resources of the expansion module.

Wiring reference of connection between ZIO expansion module and control card and standard wiring of CAN bus are shown as below:





→ Wiring Note:

- ZMC460 controller uses the single power, and ZIO expansion module uses dual-power. When using, main power supply of expansion module and main power supply of controller can share one power. When they use different power supplies, controller power EGND needs to connect to expansion module power GND, otherwise CAN may be burnt out.
- When connecting multiple ZIO expansion modules on the CAN bus, a 120-ohm resistor needs to be connected in parallel between the CANL and CANH terminals, for the ZIO expansion module that is with 8-digit dialing codes, the terminal resistor can be realized by dialing the code (DIP).

4.1.2. CAN Bus Expansion Resource Mapping

The ZCAN expansion module generally has an 8-bit DIP switch, dial ON to take effect, and the meaning of the DIP is as follows:

1-4: they are used for ZCAN expansion module IO address mapping, the corresponding value is 0-15.

5-6: CAN communication speed, corresponding value is 0-3, four different speeds are optional.

7: reserved.

8: 120-ohm resistor, dial ON means a 120-ohm resistor is connected between CANL and CANH.

The IO numbers of the entire control system cannot be repeated, and existed numbers must be avoided when mapping resources. And the DIP switch must be dialed before power-on, if re-dial after power-on, it is invalid. It needs to be powered on again to take effect.

Dial 1-4 to select the CAN address, and the controller sets the IO number range of the corresponding expansion module according to the CAN DIP address. When each is dialed as OFF, the corresponding value is 0, when it is ON , it corresponds to a value of 1, and the address combination value = dial 4 × 8 + dial code 3 × 4 + dial code 2 × 2+ dial code 1.

Dial code 5-6 to select CAN bus communication speed, speed combination value=dial code 6 × 2 + dial code 5×1, the combined value range is 0-3.

The corresponding speeds are as follows:

DIP 5-6 combination value	CANIO_ADDRESS high 8-bit value	CAN communication speed
0	0 (corresponds to decimal 128)	500KBPS (default value)
1	1 (corresponds to decimal 256)	250KBPS
2	2 (corresponding to decimal 512)	125KBPS
3	3 (corresponding to decimal 768)	1MBPS

The controller side sets the CAN communication speed through the CANIO_ADDRESS command. There are also four speed parameters that can be selected. The

communication speed must be consistent with the communication speed of the expansion module that corresponds to the combination value, then they can communicate with each other.

The factory default communication speed is 500 KBPS on both sides, there is no need to set this, unless you need to change the speed.

The CANIO_ADDRESS command is a system parameter, and it can set the master-slave end of CAN communication. The default value of the controller is 32, that is, CANIO_ADDRESS=32 is the master end, and the slave end is set between 0-31.

The CAN communication configuration can be viewed in the "State the Controller" window.

→ IO Mapping:

the CAN expansion module uses bit1-4 of the DIP switch. According to the number of currently included IO points (the largest number in IN and OP must include IO point in the axis interface), use the bit 1-4 to set the ID, so as to determine the number range of IO to be expanded.

If the controller itself contains 28 INs and 16 OPs, then the starting address set by the first extended board should exceed the maximum value of 28. According to below rule, the dial code should be set to the combination value 1 (binary combination value 0001, from right to left, dial code 1-4, at this time dial 1 is set to ON, and the others are set to OFF), the IO number on the expansion board = the expansion board number value + the initial IO number value, among them, the IOs that are vacant from 29-31 Numbers are not used. Subsequent extended boards continue to confirm the dial settings according to the IO points in turn.

The initial digital IO mapping number starts from 16 and increases in multiples of 16. The distribution of digital IO numbers corresponding to different dial IDs is as follows:

DIP 1-4 combination value	Starting IO number	Ending IO number
0	16	31
1	32	47
2	48	63
3	64	79
4	80	95
5	96	111
6	112	127
7	128	143

8	144	159
9	160	175
10	176	191
11	192	207
12	208	223
13	224	239
14	240	255
15	256	271

The initial IO mapping number of the analog AD starts from 8 and increases in multiples of 8. The initial IO mapping number of the analog DA starts from 4 and increases in multiples of 4. The allocation of digital IO numbers corresponding to different dial code IDs is as follows:

DIP 1-4 combination value	Starting AD number	End AD number	Starting DA number	End DA number
0	8	15	4	7
1	16	23	8	11
2	24	31	12	15
3	32	39	16	19
4	40	47	20	23
5	48	55	24	27
6	56	63	28	31
7	64	71	32	35
8	72	79	36	39
9	80	87	40	43
10	88	95	44	47
11	96	103	48	51
12	104	111	52	55
13	112	119	56	59
14	120	127	60	63
15	128	135	64	67

→ Axis Mapping:

When the CAN bus expansion mode is used to expand the pulse axis, ZIO16082M can be selected to expand two pulse axes. These two pulse axes need to be mapped and bound with the axis No., then access.

Extended axes need to perform axis mapping operations, using the AXIS_ADDRESS command to map, and the mapping rules are as follows:

AXIS_ADDRESS(axis No.)=(32*0)+ID

'the local axis interface of the expansion module AXIS 0

AXIS_ADDRESS(axis No.)=(32*1)+ID

'the local axis interface of the expansion module AXIS 1

The ID is the combined value of the DIP bit1-4 of the expansion module. After the mapping is completed and the axis parameters such as ATYPE are set, the expansion axis can be used.

Example:

```
ATYPE(6)=0                    'set as virtual axis
AXIS_ADDRESS(6)=1+(32*0)
        'ZCAN expansion module ID 1 axis 0 is mapped to axis 6
ATYPE(6)=8      'ZCAN extended axis type, pulse direction stepping or servo
UNITS(6)=100 0 'pulse equivalent 1000
SPEED(6)=100    'speed 100uits/s
ACCEL(6)=1000    'acceleration 1000units/s^2
MOVE(100) AXIS(6) 'extended axis movement 100units
```

Extended resource viewing:

According to the CAN connection, after the power is turned on, and the wiring resistance dial code is set correctly, the power indication led (POWER) and the running indication led (RUN), the IO power indication led (IO POWER) are on, and the alarm indication led (ALM) is off. At the same time, the "Controller" - "State the controller" - "ZCanNodes" in the RTSys software displays the expansion module information and the extended IO number range.

The dial ID and the corresponding resource number when connecting multiple expansion modules are as follows:

Local	432-0(ZMC432)	32	30(0-29)	18(0-17)	0	2(0-1)
1	48(ZIO1632)	0	16(32-47)	32(32-63)	0	0
3	26(ZIO16082)	2	16(64-79)	8(64-71)	0	0
4	10(ZAIO0802)	0	0	0	8(40-47)	2(20-21)

ALM indicator light is on, please check whether the wiring, resistor and dial setting are correct, and whether the CANIO_ADDRESS command of the controller is set as the master end (32), and whether the CAN communication speed is consistent.

4.2. EtherCAT Bus Expansion

The EIO expansion modules and ZMIO310-ECAT are expansion modules used by the EtherCAT bus controller. For example, EIO series can expand the resources of digital IO and pulse axis. When the resources of the controller are insufficient, the EtherCAT bus controller can be connected to multiple EIO expansion modules for expansion, you can view the maximum number of IO expansion points and the maximum number of expansion axes of the controller, and in this way, it supports IO remote expansion.

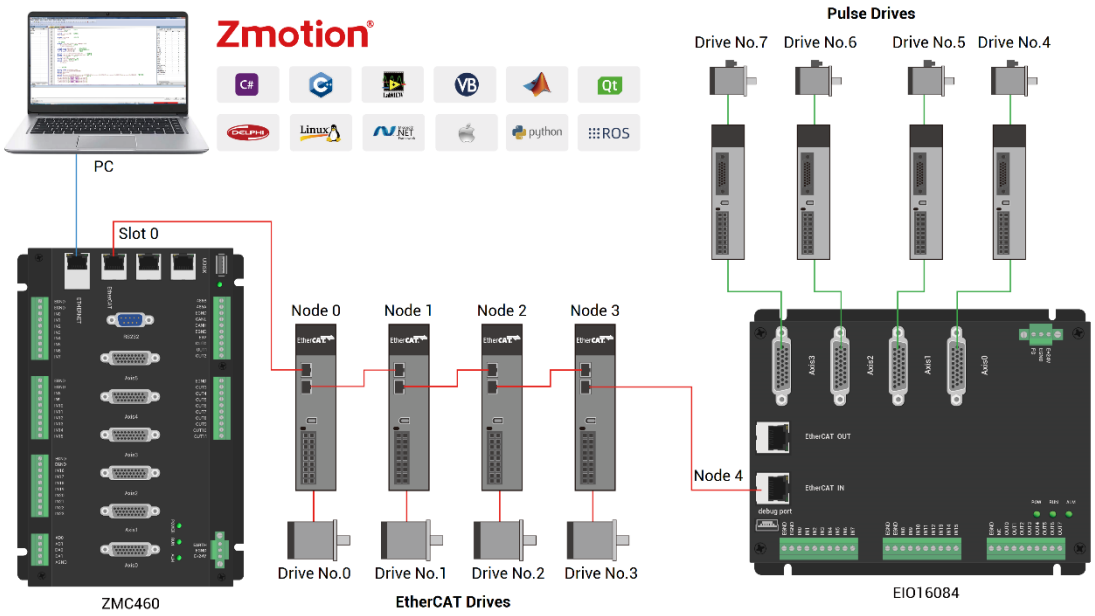
4.2.1. EtherCAT Bus Expansion Wiring

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. The configuration of the axis address uses the AXIS_ADDRESS command to map axis number, and when the binding is completed, specify the axis number through the BASE or AXIS command.

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:



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.

4.2.2. 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

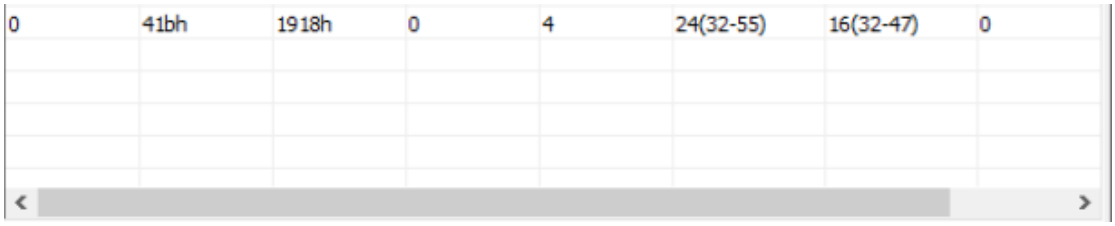
node: device number, starting from 0

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 EIO16084, after configuration according to the above syntax, the IO numbers corresponding to input IN0-15 are 32-47 in turn, the general input port numbers in the axis interface are 48-55, and the drive alarm inputs of axes AXIS 0-3 are 48-51 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.



→ 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 EIO16084, and EIO16084 is connected to drive, then driver 0 here is the first pulse driver connected to EIO16084, otherwise it is the EtherCAT driver.

Chapter V Programming

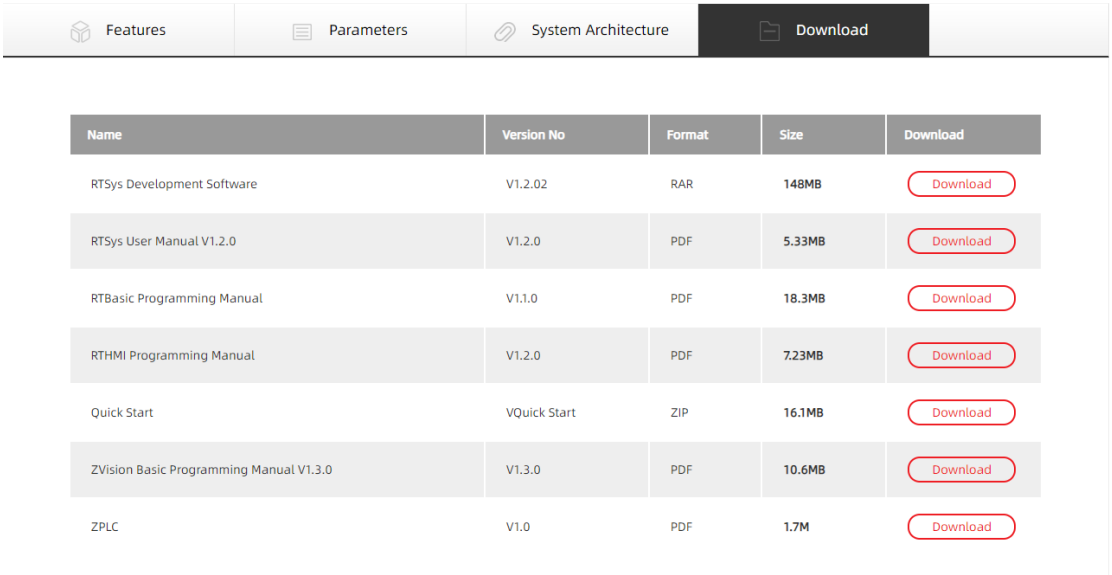
5.1. Program in RTSys Software

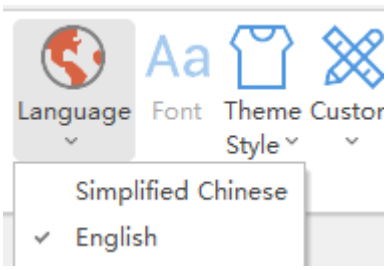
RTSys is a PC-side program development, debugging and diagnostic software for the Zmotion motion controllers. Through it, users can easily edit and configure the controller program, quickly develop applications, diagnose system operating parameters in real time, and debug the running program in real time. What's more, it supports Chinese and English bilingual environments.

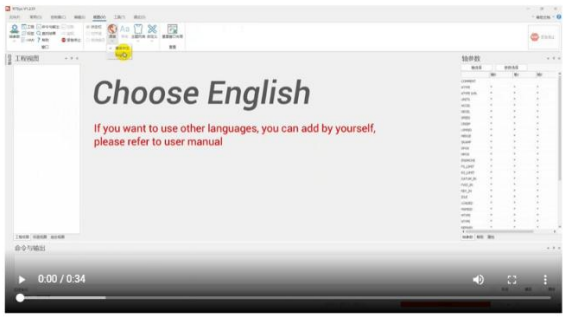
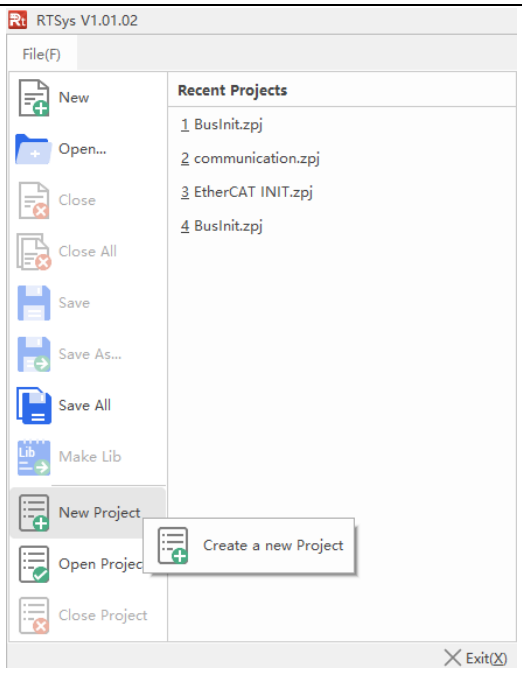
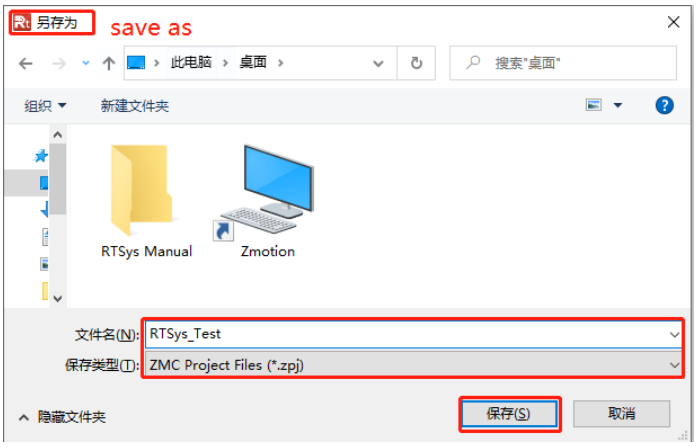
In RTSys, there are 4 programming languages for motion control development, Basic, PLC, HMI and C language, they can run multi-tasks among them, especially for Basic, multi-task running can be achieved separately, hybrid programming is also OK with PLC, HMI and C language.

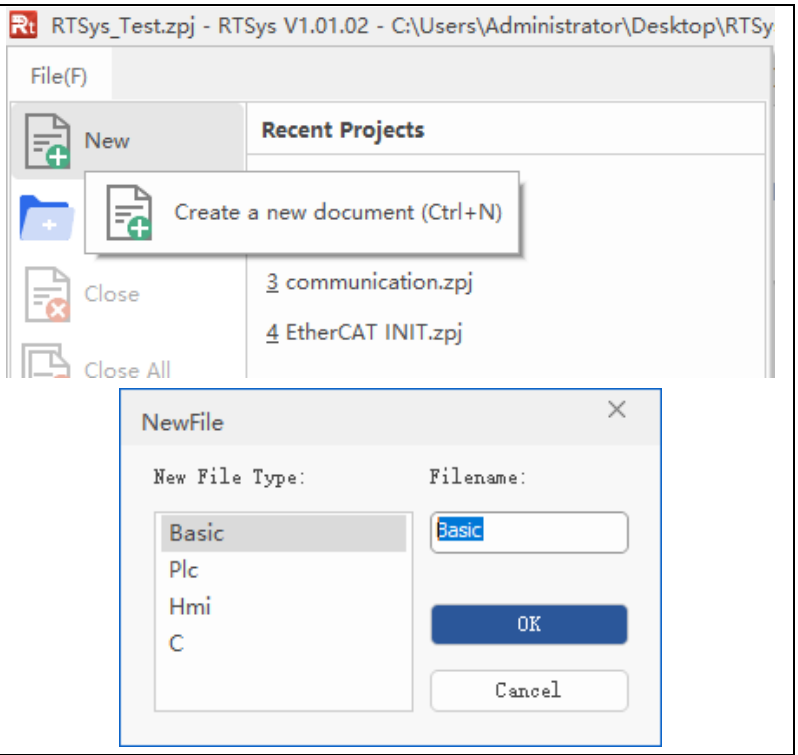
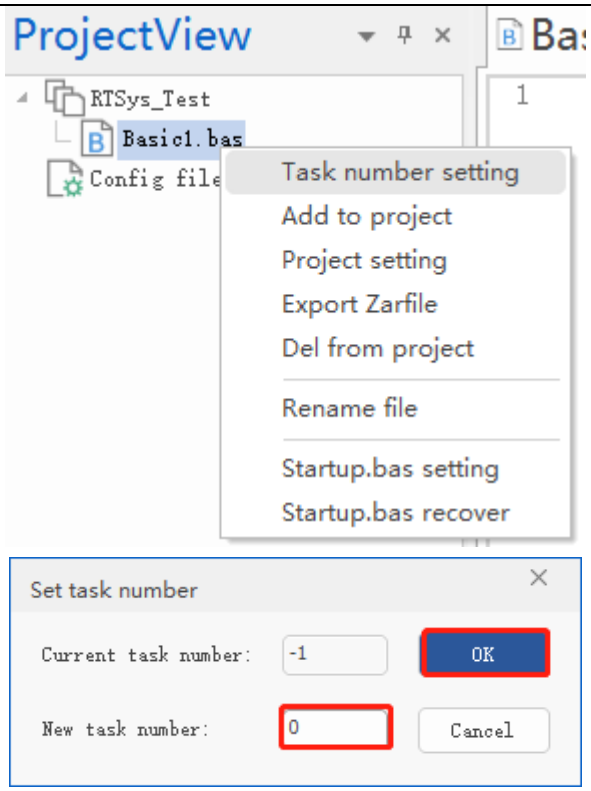
RTSys Downloading Address: https://www.zmotionglobal.com/pro_info_282.html

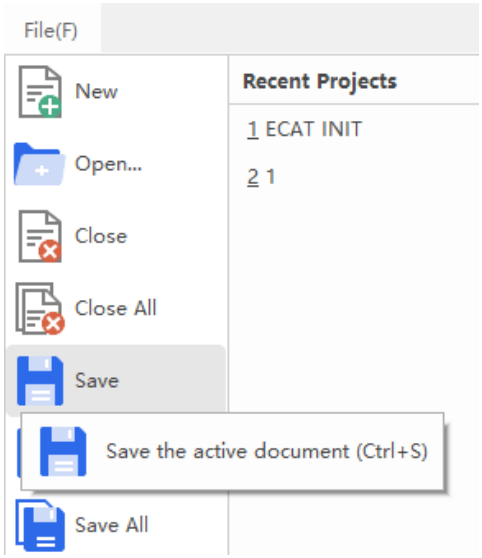
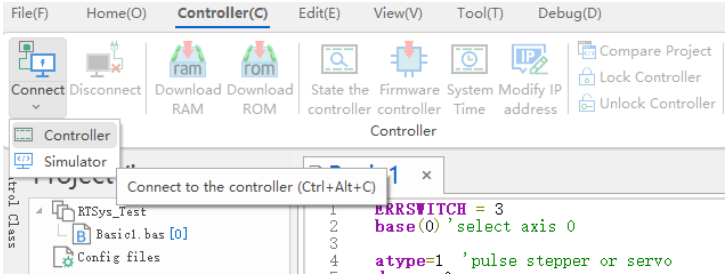
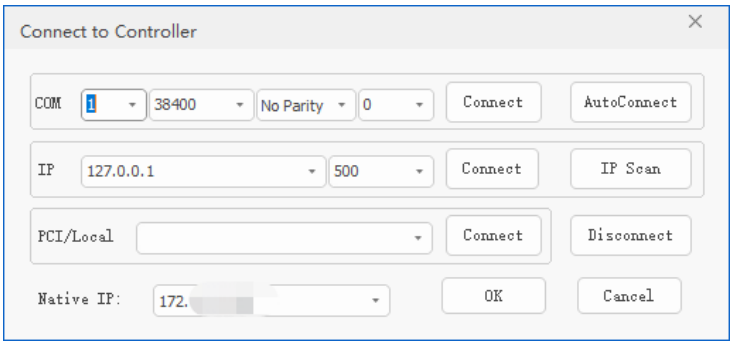
And related manuals can be found in "Download":

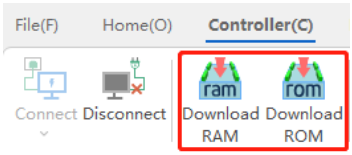
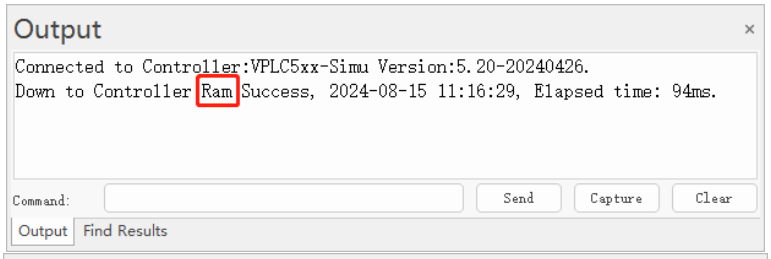
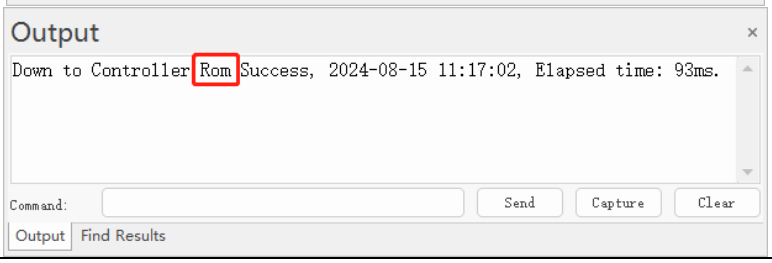
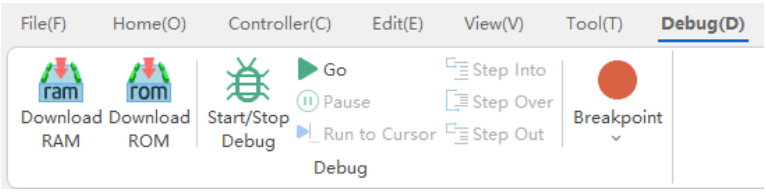
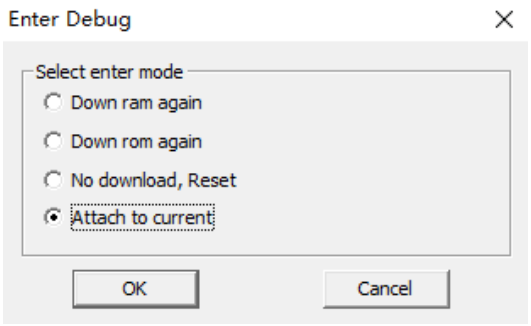
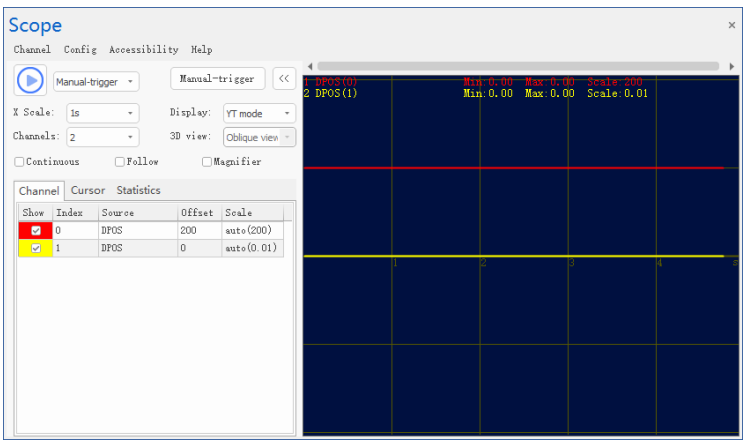


Step	Operations	Display Interface
1	Switch the Language: "Language" – "English", then there will pop	

	up one window, click OK, and restart it.	Language Switch Video Showing: E. How to Switch the Language Find "视图" (the fourth one in the above menu), then find the "语言", choose English, restart RTSys. Enligsh RTSys will take effect when opened again. 
2	New Project: "File" – "New Project", Save as window will pop up, then enter file name, save the project file with suffix "zpj.".	 

3	New File: “File” – “New File”, select file type to build, here select Basic, click “OK”.	
4	Set Auto Run No.: right click the file, open task number setting window, enter task No., which can be any + value, no priority, but not the same.	

5	Save File: edit the program in program editing window, click "save", new built file will be saved under "zpj." project automatically. "Save all" means all files under this project will be saved.	
6	Connection: Click "controller – connect", if no controller, select connect to simulator.	
	Then, "connect to controller" window will pop up, you can select serial port or net port to connect, select matched serial port parameters or net port IP address, then click "connect".	
7	Download Program into	● **RAM:** it will not save when power off. ● **ROM:** it will save data when power off, and when the program

	Controller: "Ram/Rom" – "download RAM / download ROM", if it is successful, there is print indication, at the same time, program is downloaded into controller and runs automatically.	is connected to controller again, running according to task No.   
8	Debug: "Debug" – "Start/Stop Debug" to call "Task" and "Watch" window, because it was downloaded before, here select "Attach the current".	 
9	Scope function: Click "View" – "Scope" to open oscilloscope. It can capture needed data, for debugging.	

Notes:

- When opening an project, choose to open the zpj file of the project. If only the Bas file is opened, the program cannot be downloaded to the controller.
- When the project is not created, only the Bas file cannot be downloaded to the controller.
- The number 0 in automatic operation represents the task number, and the program runs with task 0, and the task number has no priority.
- If no task number is set for the files in the entire project, when downloading to the controller, the system prompts the following message WARN: no program set autorun

5.2. Upgrade Controller Firmware

Firmware upgrade can be achieved by downloading zfm firmware package in RTSys. zfm file is the firmware upgrade package of controller, please select corresponding firmware because different models are with different packages, please contact manufacturer).

How to update:

a. Open ZDevelop / RTSys software, then click "controller – connect", find PCI/LOCAL method, click "connect". If connected, there will be "Connected to Controller: PCIE464 Version: 4.93 – 20231220." In "output" window.

b. Click "controller – state the controller", find basic info, then current software version can be checked.

c. Click "controller – update firmware", current controller model and software version can be viewed.

d. Click "browse", and select saved firmware file, click "update", then one window will pop up, please click "ok".

e. After that, "connect to controller" window appears again, and please select "PCI/Local" again, and click "connect".

f. When connection is successful, "firmware update" interface is shown. Now

system enters ZBIOS state, please click “update” again.

g. When it is loaded, “firmware update” window disappears, now in output window, it shows “Update firmware to Controller Success”.

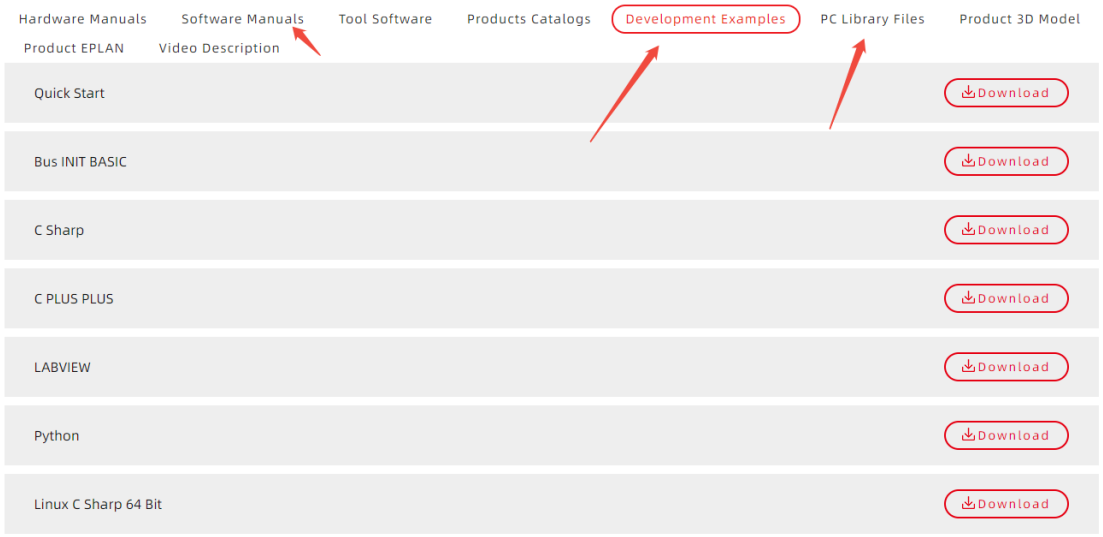
h. Do step a and step b again, check whether the firmware is updated or not.

5.3. Program in Host-Computer by PC Languages

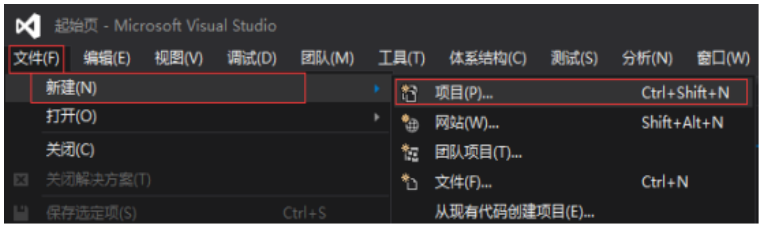
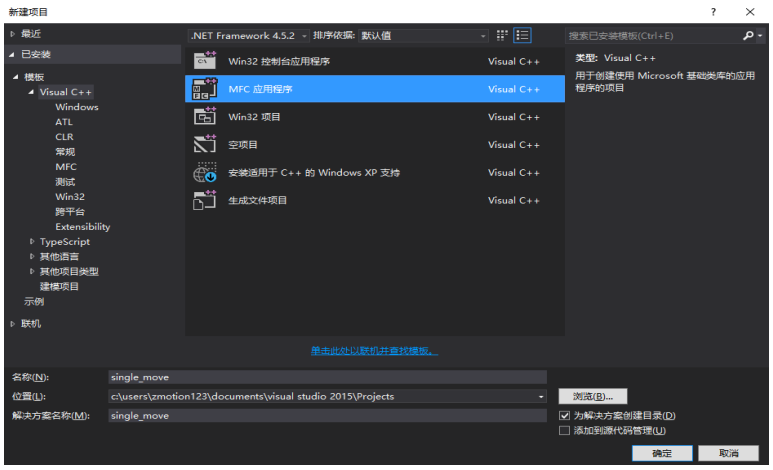
The controller supports development under various operating systems such as windows, linux, Mac, Android, and wince, and provides dll libraries in various environments such as vc, c#, vb.net, and labview, as shown in the figure below. PC software programming refers to "Zmotion PC Function Library Programming Manual".

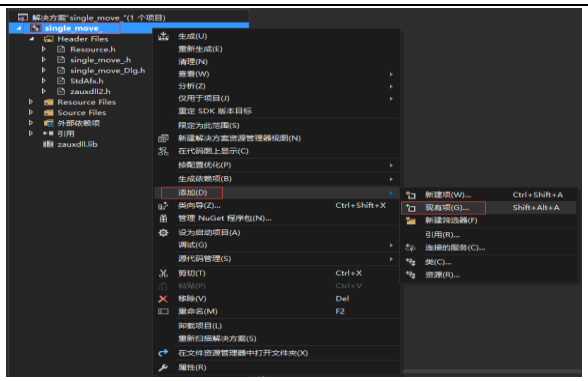
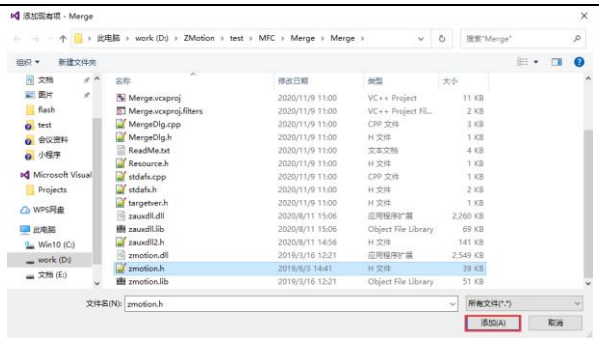
The program developed using the PC software cannot be downloaded to the controller, and it is connected to the controller through the dll dynamic library. The dll library needs to be added to the header file and declared during development.

- Get PC library file, example: https://www.zmotionglobal.com/download_list_17.html



The c++ project development process in VS is as follows:

Step	Operations	Display Interface
1	Open VS, click “File” – “New” – “Project”.	
2	Select development language as “Visual C++” and the select program type as “MFC application type”.	
3	Select “Based on basic box”, click “next” or “finish”	
4	Find C++ function library provided by manufacturer. Routine is below (64-bit library)	
5	Copy all DLL related library files under the above path to the newly created project.	

<table>
<tr><td rowspan="2">6</td><td rowspan="2">Add a static library and related header files to the project. Static library: zauxdll.lib, zmotion.lib
Related header files: zauxdll2.h, zmotion.h</td><td>1) Right-click the header file first, and then select: "Add" → "Existing Item".</td><td>  </td></tr>
<tr><td>2) Add static libraries and related header files in sequence in the pop-up window.</td><td>  </td></tr>
<tr><td>7</td><td>Declare the relevant header files and define the controller connection handle, so far the project is newly created.</td><td colspan="2">

```
// single_move_Dlg.cpp : implementation file
//

#include "stdafx.h"
#include "single_move_.h"
#include "single_move_Dlg.h"
#include "zauxdll2.h"

#ifdef _DEBUG
#define new DEBUG_NEW
#undef THIS_FILE
static char THIS_FILE[] = __FILE__;
#endif

/////////////////////////////////////////////////////////////////////////////
// CSingle_move_Dlg dialog

ZMC_HANDLE      g_handle = NULL;            //控制器链接句柄
```

</td></tr>
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Chapter VI Operation 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 24V (-5%~5%)
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	No

	explosive gases or articles	
	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 & Solutions

Problems	Suggestions
Motor does not rotate.	1. Check whether the ATYPE of the controller is correct. 2. Check whether hardware position limit, software position limit, alarm signal work, and whether axis states are normal. 3. Check whether motor is enabled successfully. 4. Confirm whether pulse amount UNITS and speed values are suitable. If there is the encoder feedback, check whether MPOS changes. 5. Check whether pulse mode and pulse mode of drive are matched. 6. Check whether alarm is produced on motion controller station or drive station. 7. Check whether the wiring is correct. 8. Confirm whether controller sends pulses normally.

The position limit signal is invalid.	1. Check whether the limit sensor is working normally, and whether the "input" view can watch the signal change of the limit sensor. 2. Check whether the mapping of the limit switch is correct. 3. Check whether the limit sensor is connected to the common terminal of the controller.
No signal comes to the input.	1. Check whether the limit sensor is working normally, and whether the "input" view can watch the signal change of the limit sensor. 2. Check whether the mapping of the limit switch is correct. 3. Check whether the limit sensor is connected to the common terminal of the controller.
The output does not work.	1. Check whether IO power is needed. 2. Check whether the output number matches the ID of the IO board.
POWER led is ON, RUN led is OFF.	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. 2. Check whether the ALM light flickers regularly (hardware problem).
RUN led is ON, ALM led is ON.	1. Program running error, please check RTSys error code, and check application program.
Fail to connect controller to PC through serial port.	1. Check whether the serial port parameters are modified by the running program, you can check all the current serial port configurations through ?*SETCOM. 2. Check whether the serial port parameters of the PC match the controller. 3. Open the device manager and check whether the serial driver of the PC is normal.
CAN expansion module cannot be connected.	1. Check the CAN wiring and power supply circuit, whether the 120-ohm resistor is installed at both

	ends. 2. Check the master-slave configuration, communication speed configuration, etc. 3. Check the DIP switch to see if there are multiple expansion modules with the same ID. 4. Use twisted-pair cables, ground the shielding layer, and use dual power supplies for severe interference (the main power supply of the expansion module and the IO power supply are separately powered)
Fail to connect controller to PC through net port.	1. Check IP address of PC, it needs to be at the same segment with controller IP address. 2. Check controller IP address, it can be checked and captured after connection through serial port. 3. When net port led is off, please check wiring. 4. Check whether controller power led POWER and running indicator led RUN are ON normally. 5. Check whether the cable is good quality, change one better cable to try again. 6. Check whether controller IP conflicts with other devices. 7. Check whether controller net port channel ETH are all occupied by other devices, disconnect to other devices, then try again. 8. When there are multiple net cards, don't use other net cards, or change one computer to connect again. 9. Check PC firewall setting. 10. Use “Packet Internet Groper” tool (Ping), check whether controller can be Ping, if it can't, please check physical interface or net cable. 11. Check IP address and MAC address through arp-a.