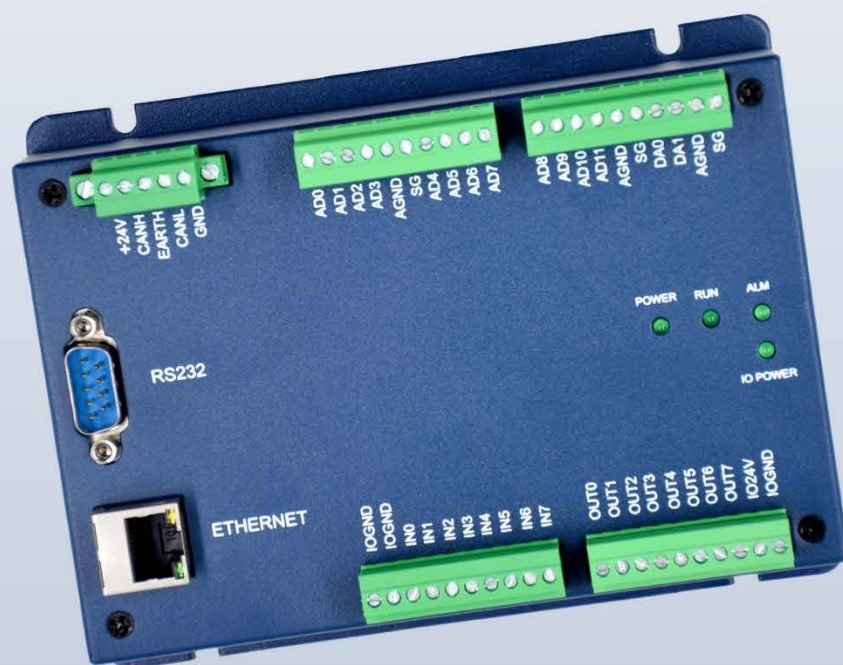
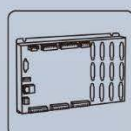


ECI Data Capture Card

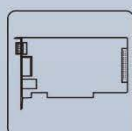
ECI0016PA



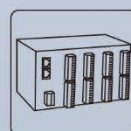
Vision Motion Controller



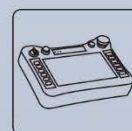
Motion Controller



Motion Control Card



IO Expansion Module



HMI



Foreword

Zmotion[®]

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">◆ 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.◆ 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.
 Notice	<ul style="list-style-type: none">◆ Avoid metal shavings and wire ends falling into the hardware circuit board during installation.◆ After installation, ensure that there are no foreign objects on the hardware circuit board.◆ When installing, make it tightly and firmly with the mounting frame.

	<ul style="list-style-type: none"> ◆ Improper installation of the controller may result in misoperation, failure and fire.
Wiring	
 <p>Danger</p>	<ul style="list-style-type: none"> ◆ The specifications and installation methods of the external wiring of the equipment shall comply with the requirements of local power distribution regulations. ◆ When wiring, all external power supplies used by the system should be disconnected before operation. ◆ When powering on and running after the wiring work is completed, the terminals attached to the product must be installed. ◆ 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.
 <p>Notice</p>	<ul style="list-style-type: none"> ◆ Avoid metal shavings and wire ends falling into the hardware circuit board during installation. ◆ The cable connection should be carried out correctly on the basis of confirming the type of the connected interface. ◆ It should be confirmed that the cables pressed into the terminals are in good contact. ◆ 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. ◆ If the controller is not installed properly, it may cause electric shock or equipment failure or malfunction.

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Chapter I Production Information

1.1. Product Information

ECI is the abbreviation of the network motion control card model launched by Zmotion Technology.

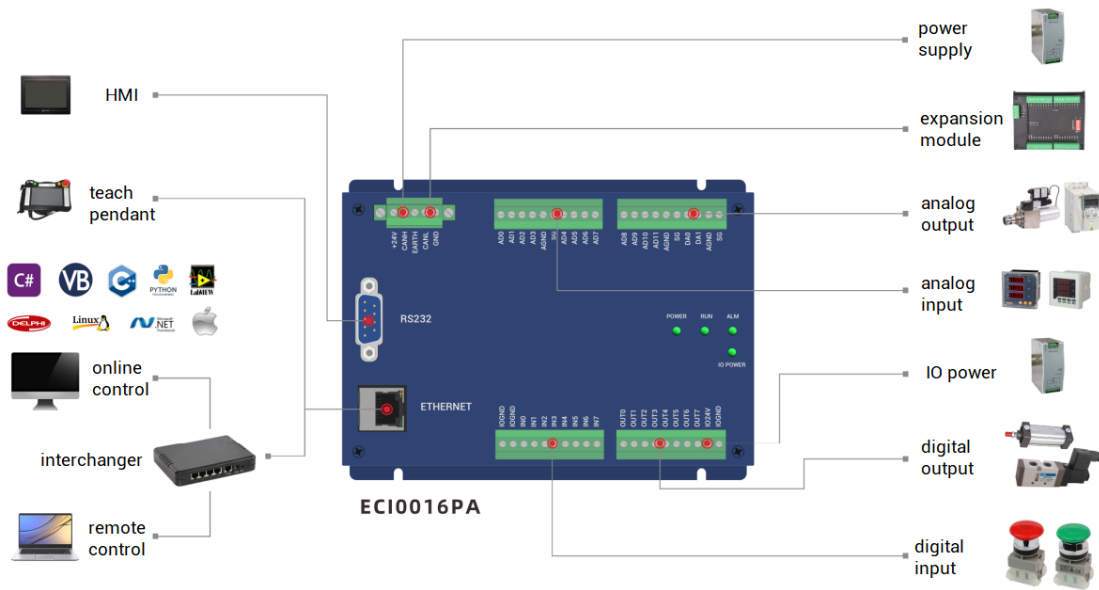
ECI0016PA is a kind of data capture card developed by Zmotion Technology. Real-time analog input capture and output control can be achieved through optimized network communication protocol.

ECI0016PA data capture card supports Ethernet and RS232 communication interface to connect to the computer. Every expansion module can be connected through CAN bus to expand inputs and outputs.

1.2. Function Features

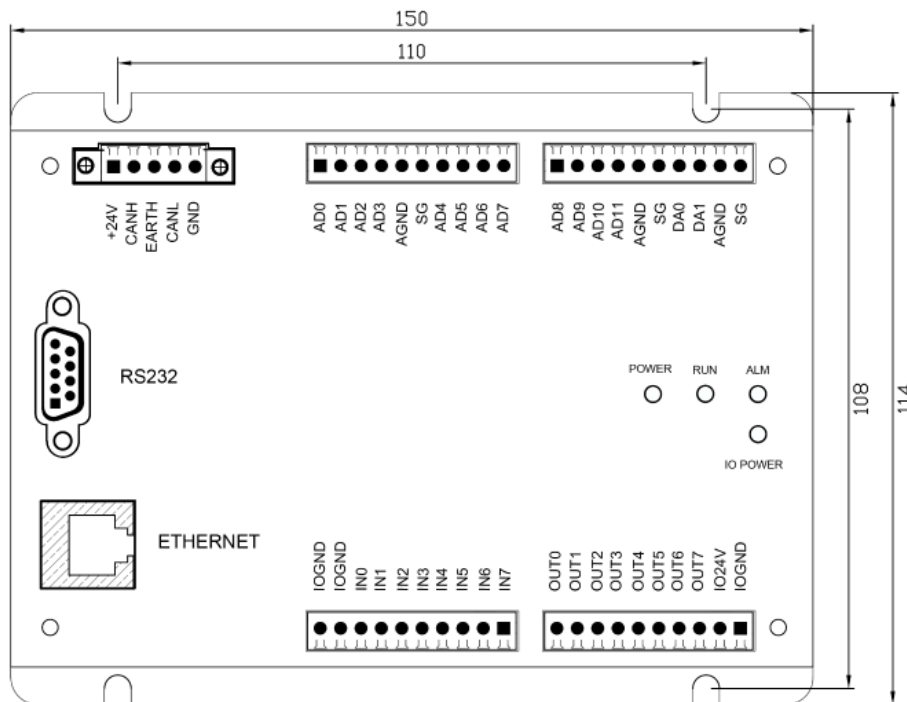
- ◆ Itself has 8 isolated inputs and 8 isolated outputs, NPN type, and they are powered by IO power supply.
- ◆ 272 inputs and 272 outputs can be extended through CAN bus.
- ◆ There are 12 ADs and 2 DAs, but 128 ADs and 64 DAs can be extended.
- ◆ The maximum output current of general digital outputs can reach 300mA, which can directly drive some kinds of solenoid valves.
- ◆ Interfaces: RS232, CAN, Ethernet.
- ◆ Support Multi-file and multi-task programming in ZBasic.
- ◆ A variety of program encryption methods to protect the intellectual property rights of customers.

1.3. System Frame



1.4. Hardware Installment

ECI0016PA data capture card 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 -20°C - 60°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	ECI0016PA
Basic Axes	0
Digital IO	8 inputs, 8 outputs.
Max Extended IO	272 inputs, 272 outputs
AD/DA	12 ADs, 2 DAs.
Max Extended AD/DA	128 ADs, 64 DAs
Array Space	800
Program Space	3KByte
Flash Space	128KByte
Power Supply	24V DC input, IO power.
Communication Interfaces	RS232, Ethernet, CAN.
Digital output overcurrent protection	Max is 300mA.
Voltage impedance (input)	>1M Ω
Voltage range (input)	Dual-pole $\pm 10V$ (the range: -10V~10V)
Voltage load (output)	2K Ω ~1M Ω
Voltage range (output)	Dual-pole $\pm 10V$ (the range: -10V~10V)
Analog resolution (input)	16-bit
Analog resolution (output)	12-bit
Capture time	2ms/channel
Conversion time	1ms/channel
Precision (common temperature 25 °C)	$\pm 0.1\%$
Precision (environmental)	$\pm 0.3\%$

temperature 0~55 °C)	
Isolation	Between channel and switch power supply, isolated. Between channels, no-isolated.
Dimensions	150*144mm

2.2. Nameplate Information



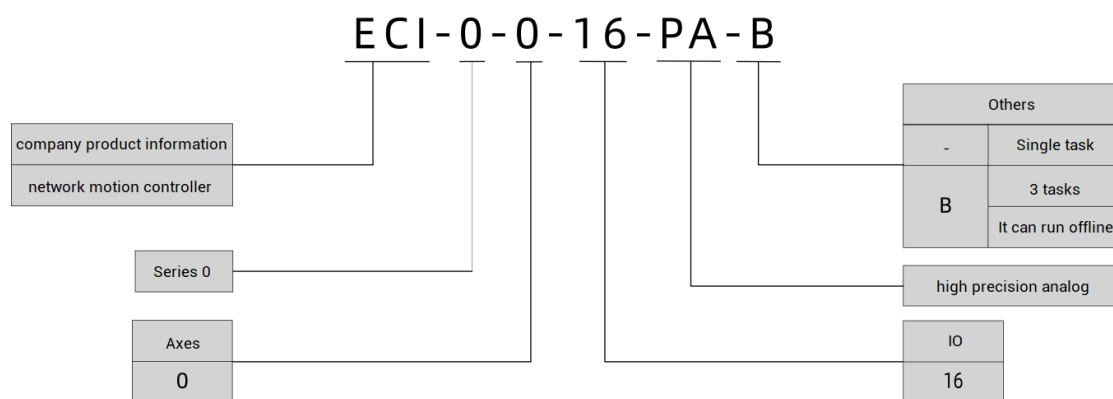
Product model: ECI0016PA

Size: 150*114mm

Power supply: 24VDC, 1A

Manufacturer: Shenzhen Zmotion Technology Co.,Ltd

→ Model Description

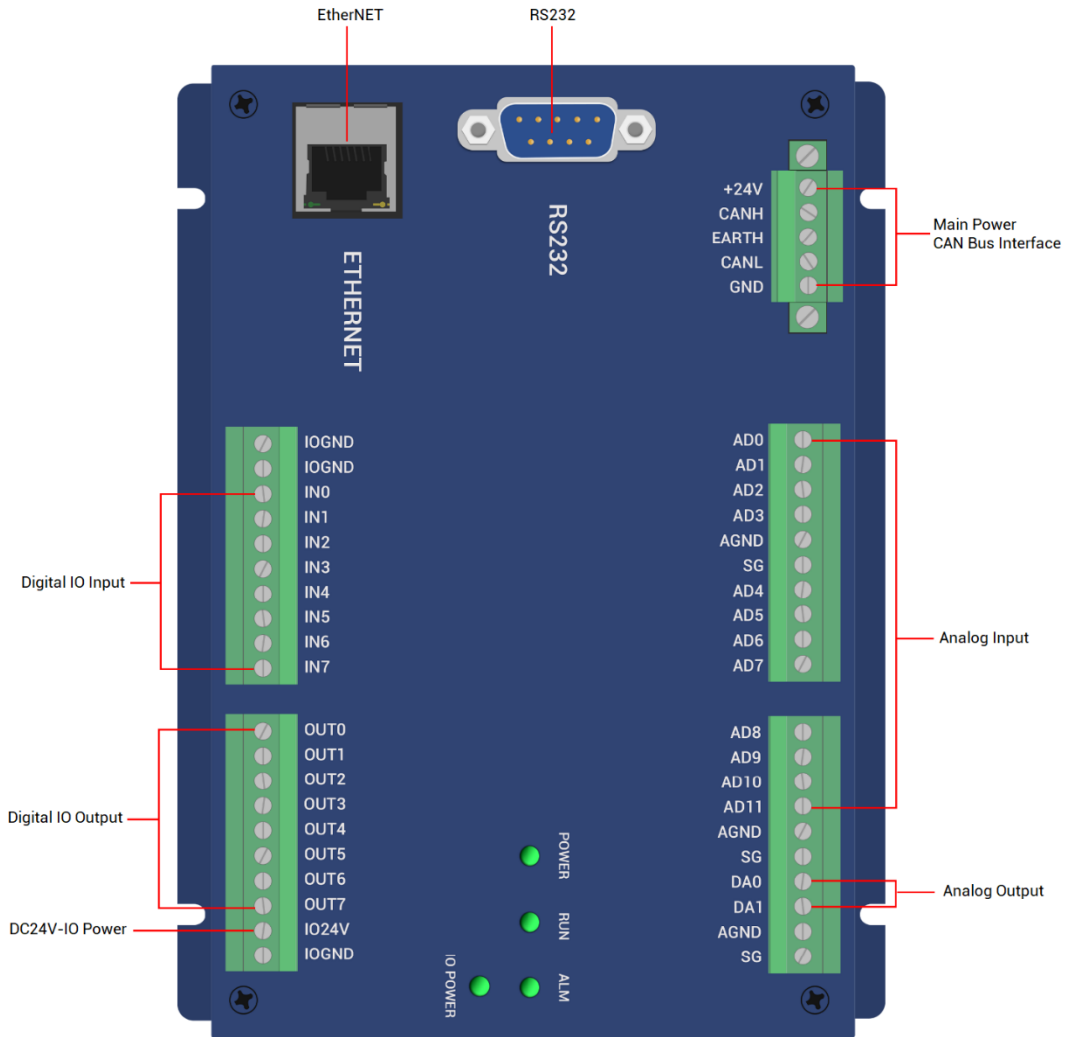


2.3. Order Information

Model	Description
-------	-------------

ECI0016PA	8 inputs and 8 outputs (with overcurrent protection)
ECI0016PAB	8 inputs and 8 outputs (with overcurrent protection), it can run offline.

2.4. Interface Definition



→ Interface Description

Mark	Interface	Number	Description
IO POWER	Status Indication Led	1	IO Power indicator: it lights when IO power is conducted.
POWER		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	1	Use MODBUS_RTU protocol
ETHERNET	Net port	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
+24V	Main power	1	24V DC power supplies for control card.
IO24V	IO Power Supply	1	24V DC power supplies for IO power.
CAN	CAN bus interface	1	Connect CAN expansion module and CAN equipment of other standards
IN	Digital IO input	16	Leakage type, IO 24V supplies the power.
OUT	Digital IO output	16	Leakage type, IO 24V supplies the power.
AD	Analog input	12	Resolution: 16-bit, -10V~10V
DA	Analog output	2	Resolution: 12-bit, -10V~10V

2.5. Work Environment

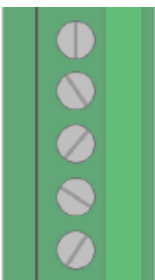
Item		Parameters
Work Temperature		-10℃-55℃
Work relative Humidity		10%-95% non-condensing
Storage Temperature		-40℃ ~ 80℃ (not frozen)
Storage Humidity		Below 90%RH (no frost)
vibration	Frequency	5-150Hz
	Displacement	3.5mm(directly install)(<9Hz)
	Acceleration	1g(directly install)(>9Hz)
	Direction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


The power supply input adopts a 5Pin (there are all 5 terminals, +24V, CANH, EARTH, CANL and EGND) screw-type pluggable wiring terminal, and the interval (means the gap distance between two ports) should be 3.81mm. This 5Pin terminal is the power supply shared by control card and CAN communication.

→ Terminal Definition:

Terminal	Name	Type	Function
	+24V	Input	Input for power 24V
	CANH	Input/Output	CAN differential data +
	EARTH	Grounding	Shield
	CANL	Input/Output	CAN differential data -
	EGND	Input	Power ground

Note:

Please separate internal power supply 24V from external IO power 24V, they cannot use the same power supply. Or use one power supply that can output two isolated 24V powers.

Terminal	Name	Type	Function
	IO24V	Input	IO power 24V input
	IOGND	Input	IO power ground

Note:

Please separate internal power supply 24V from external IO power 24V, they cannot use the same power supply. Or use one power supply that can output two isolated 24V

powers.

3.1.1. Power Supply Specification

→ Specification for Main Power Supply

Item	Description
Voltage	DC24V (-10%~10%)
Current to open	≤0.5A
Current to work	≤0.4A
Anti-reverse connection	Valid
Overcurrent Protection	Valid

→ Specification for IO Power Supply

Item	Description
Voltage	DC24V (-5%~5%)
Current to open	≤0.15A
Current to work	≤0.1A
Anti-reverse connection	Valid
Overcurrent Protection	Valid

3.1.2. CAN Communication Specification & Wiring

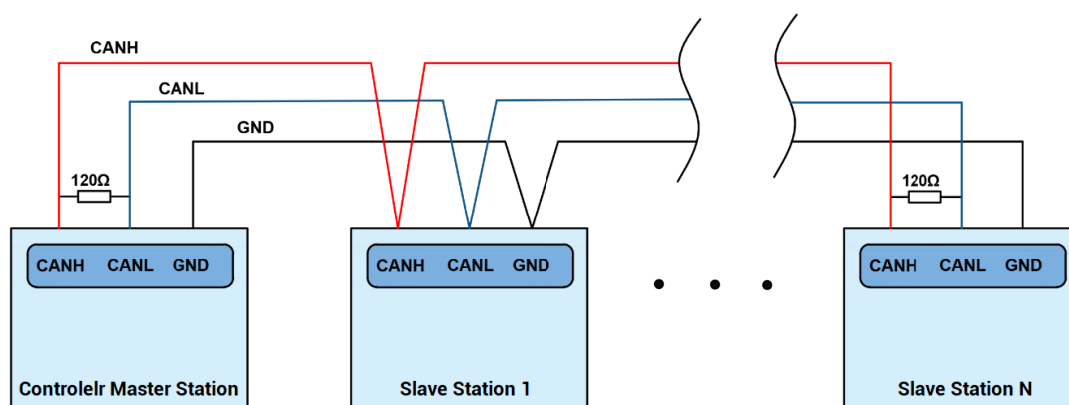
The CAN interface of the control card adopts the standard CAN communication protocol, which mainly includes three ports, CANL, CANH and the public end. And it supports connecting CAN expansion modules and other standard CAN devices.

→ Specification

Item	Description
Max Communication Rate (bps)	1Mbps
Terminal Resistor	120Ω
Topology	Daisy chain connection structure
The number of nodes can be extended	Up to 16
Communication Distance	The longer communication distance is, the lower communication rate is, max 100m is recommended.

→ Wiring Reference

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:

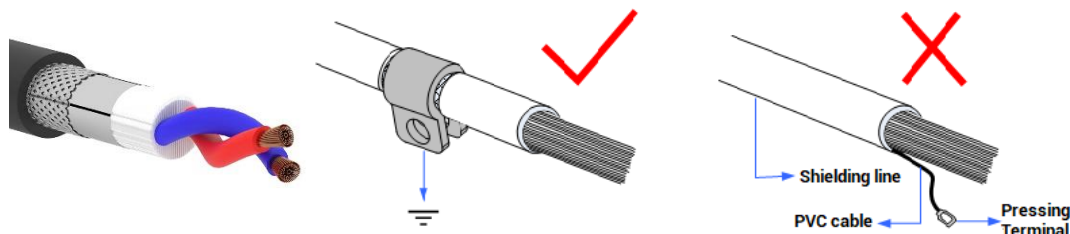
- As above, the daisy chain topology is used for wiring (the star topology structure cannot be used). When the use environment is ideal and there are no many nodes, the branch structure also can be used.
- Please connect a 120Ω terminal resistor in parallel to each end of the CAN bus for

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.



3.1.2. Basic Usage Method

- (1) Please follow the above wiring instructions to wiring correctly.
- (2) After powered on, please use ETHERNET or RS232 to connect to ZDevelop.
- (3) 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 "ZDevelop/Controller/State the Controller/Communication Info" to view the CAN status intuitively, and refer to the

"ZBasic Programming Manual" for details.

```
CAN communication settings:
CANIO_ADDRESS = 32, CANIO_ENABLE = 1
ZCAN Master
CAN baud: 500KBPS
CAN enable: ON

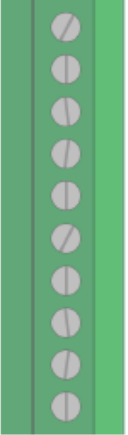
Serial port configuration:
Port0:(RS232) is ModbusSlave Mode.
Address:1, variable:2
Baud:38400
DataBits:8
StopBits:1
Parity:0
```

- (4) Correctly set the "address" and "speed" of the slave station expansion module according to the manual of the slave station.
- (5) After all the settings are completed, restart the power supply of all stations to establish communication.
- (6) 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.

3.2. IN: Digital Input

The digital input adopts one 10Pin screw-type pluggable terminals, and the gap distance between terminals should be 3.81mm.

→ Wiring Definition

Terminal	Name	Type	Function 1
	IOGND	/	IO Power Ground
	IOGND	/	
	IN0	NPN leakage type, low-speed input	Input 0
	IN1		Input 1
	IN2		Input 2
	IN3		Input 3
	IN4		Input 4
	IN5		Input 5
	IN6		Input 6
	IN7		Input 7

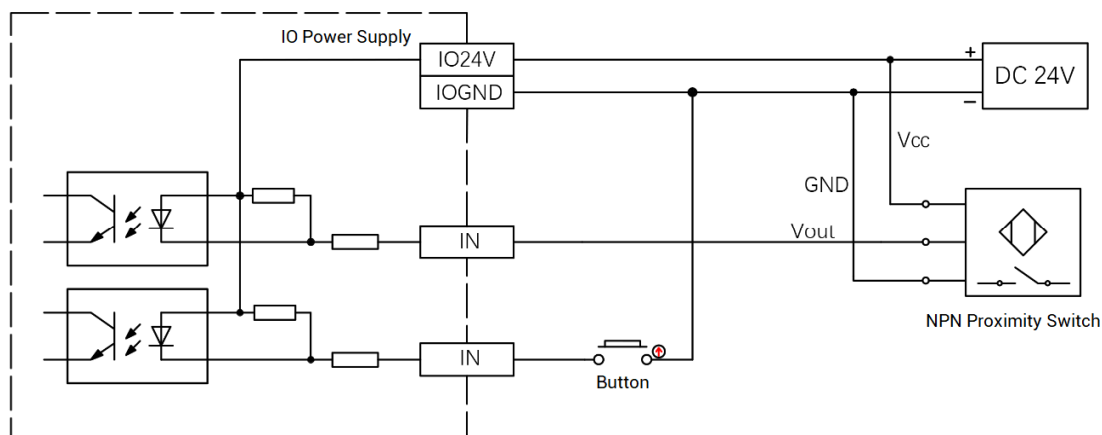
3.2.1. Digital Input Specification & Wiring

→ Specification

Item	Low-Speed Input (IN0-7)
Input mode	NPN leakage type, the input is triggered when there is 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)
Maximum current	-6mA (negative)
Isolation mode	optoelectronic isolation

Note: the above parameters are standard values when the voltage of control card power supply (E+24V port) is 24V.

→ **Wiring Reference**



→ **Wiring Note:**

- The wiring principle of low-speed digital input IN (0-7) 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.

3.2.2. Basic Usage Method

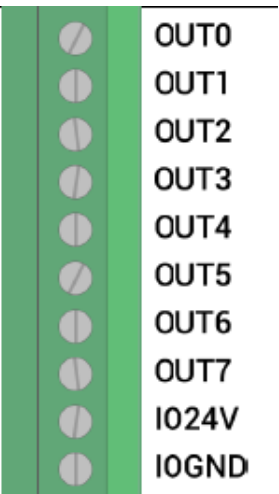
- (1) Please follow the above wiring instructions to wiring correctly.
- (2) After powered on, please select ETHERNET or RS232 to connect to ZDevelop.
- (3) State values of relative input ports can be read directly through "IN" command, also, it can be read through "ZDevelop/View/In". Please refer to "ZBasic" for details.

0	●	●
1	●	●
2	●	●
3	●	●
4	●	●
5	●	●

3.3. OUT: Digital Output

The digital output adopts one 10Pin screw-type pluggable terminals with a spacing of 3.81mm.

→ Wiring Definition

Terminal	Name	Type	Function 1
	OUT0	NPN Leakage type, low-speed output	Output 0
	OUT1		Output 1
	OUT2		Output 2
	OUT3		Output 3
	OUT4		Output 4
	OUT5		Output 5
	OUT6		Output 6
	OUT7		Output 7
	IO24V	/	IO power input DC24V
	IOGND	/	IO power ground

3.3.1. Digital Output Specification & Wiring

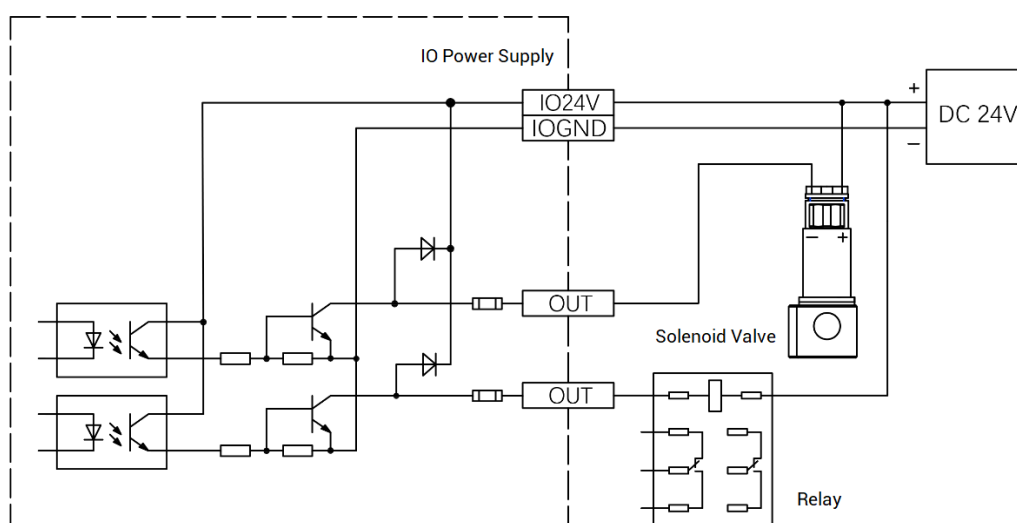
→ Specification

Item	Low Speed 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
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. For low-speed output, it is recommended to be lower than 8Hz. If there needs higher speed, please contact us to adjust parameter or custom hardware.

→ Wiring Reference



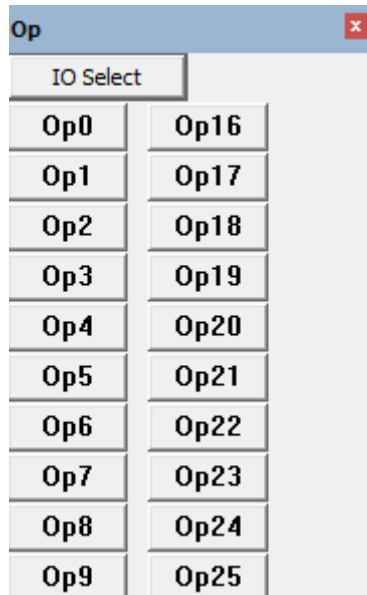
→ Wiring Note:

- The wiring principle of low-speed digital output 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 controller power supply are in the same power supply system, this connection can also be omitted.

3.3.2. Basic Usage Method

- (1) Please follow the above wiring instructions to wiring correctly.
- (2) After powered on, please use ETHERNET or RS232 to connect to ZDevelop.
- (3) Open or close output port directly through "OP" command, also, it can be opened or

closed through "ZDevelop/View/Op". Please refer to "ZBasic" for details.



3.4. AD/DA: Analog Input / Output

The analog terminal adopts 2 sets of 10Pin screw-type pluggable terminals with a spacing of 3.81mm.

→ **Wiring Definition**

Terminal	Name	Type	Function 1	
	AD0	Input	Analog input terminal AIN (0)	
	AD1	Input	Analog input terminal AIN (1)	
	AD2	Input	Analog input terminal AIN (2)	
	AD3	Input	Analog input terminal AIN (3)	
	AGND	Public end	Unique public end of this analog	
	SG	/	Shield	
	AD4	Input	Analog input terminal AIN (4)	
	AD5	Input	Analog input terminal AIN (5)	
	AD6	Input	Analog input terminal AIN (6)	
	AD7	Input	Analog input terminal AIN (7)	
		AD	Input	Analog input terminal AIN (8)
		AD	Input	Analog input terminal AIN (9)

AD8		AD	Input	Analog input terminal AIN (10)
AD9		AD	Input	Analog input terminal AIN (11)
AD10		AGND	Public end	Unique public end of this analog
AD11		SG	/	Shield
AGND		DA0	Output	
SG		DA1	Output	
DA0		AGND	Public end	Unique public end of this analog
DA1		SG	/	Shield
AGND				
SG				

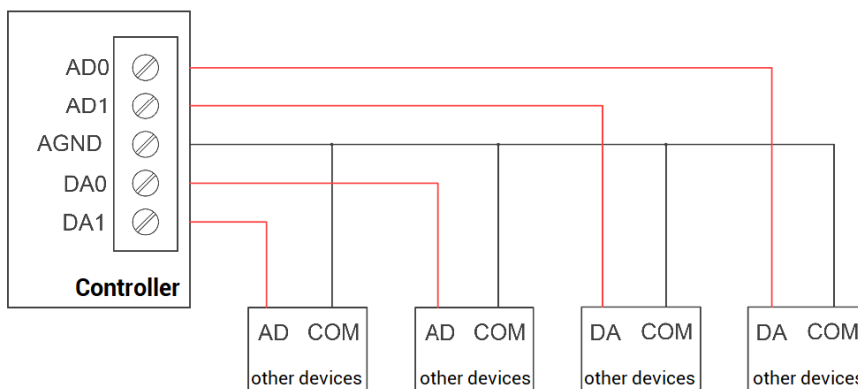
Note:
analog input supports single-end input, and the reference ground of sensor needs to be connected to AGND terminal.

3.4.1. Analog Input / Output Specification & Wiring

→ Specification

Item	AD (0-11)	DA (0-1)
Resolution	16-bit	12-bit
Data range	0-65535	0-4095
Signal range	-10V-10V input	-10V-10V output
Data refresh	1kHz	1kHz
Voltage input impedance / output load	>1M Ω (voltage input impedance)	>1K Ω (voltage output load)

→ Wiring Reference



→ **Wiring Note:**

- The wiring principle of analog input / output is shown in the figure above, and external load signal range needs to be matched.
- Please use STP, especially when there is bad environment, make sure the shield is grounded fully.

3.4.2. Basic Usage Method

- (4) Please follow the above wiring instructions to wiring correctly.
- (5) After powered on, please use ETHERNET or RS232 to connect to ZDevelop.
- (6) Analog input voltage can be read through "AIN" command, and analog corresponding voltage can be output through "AOUT" command, also, it can through "ZDevelop/View/AD/DA". Please refer to "ZBasic" for details.

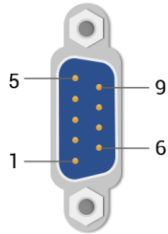
通道号	大小	刻度值	电压或电流值	最大刻度值	电压或电流范围
0	62%	40970	2.503	65535	-10~10V
1	62%	40978	2.506	65535	-10~10V
2	62%	40977	2.505	65535	-10~10V
3	62%	40974	2.504	65535	-10~10V
4	62%	40981	2.507	65535	-10~10V
5	62%	40974	2.504	65535	-10~10V
6	62%	40971	2.504	65535	-10~10V
7	62%	40978	3.126	65535	-10~10V
8	62%	40975	2.505	65535	-10~10V

通道号	大小	刻度值	电压或电流值	最大刻度值	电压或电流范围
0	0%	0	-10.000	4095	-10~10V
1	0%	0	-10.000	4095	-10~10V

3.5. RS232 Serial Port

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

→ Interface Definition

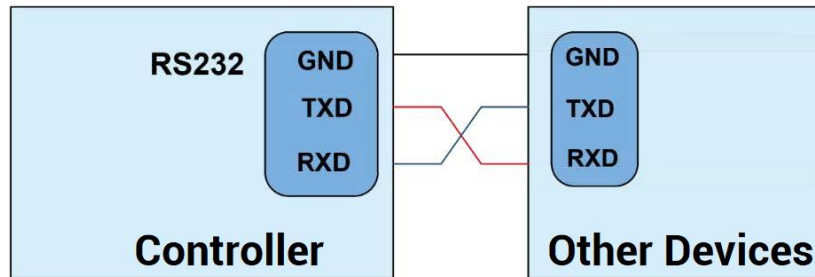
Terminal	PIN	Name	Type	Function
	1、4、 6、7、8	NC	Spare	Reserved
	2	RXD	Input	RS232 signal, receive data
	3	TXD	Output	RS232 signal, send data
	5	EGND	Output	Negative pole output of 5V power, and output for the public end
	9	E5V	Output	Positive pole output of 5V power, maximum is 300mA

3.5.1. RS232 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 10m 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.

3.5.2. Basic Usage Method

- (1) Please follow the above wiring instructions to wiring correctly.
- (2) After powered on, please use any ETHERNET or RS232 (there is default parameter, which can be connected directly) to connect to ZDevelop.
- (3) Please use the "ADDRESS" and "SETCOM" commands to set and view the protocol station number and configured parameters, see "ZBasic 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 can be directly viewed through “ZDevelop / Controller / State the Controller / CommunicationInfo”.

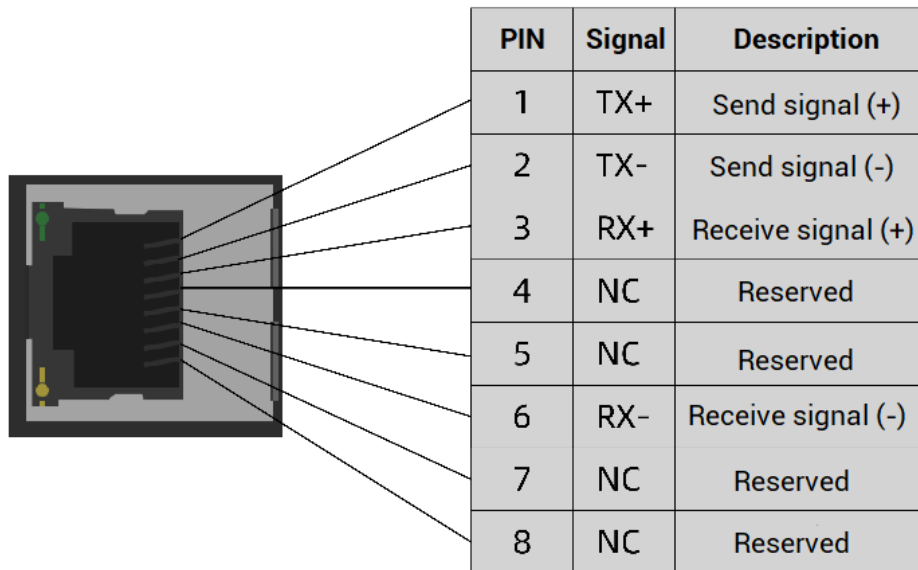
```

CAN communication settings:
CANIO_ADDRESS = 32, CANIO_ENABLE = 1
ZCAN Master
CAN baud: 500KBPS
CAN enable: ON

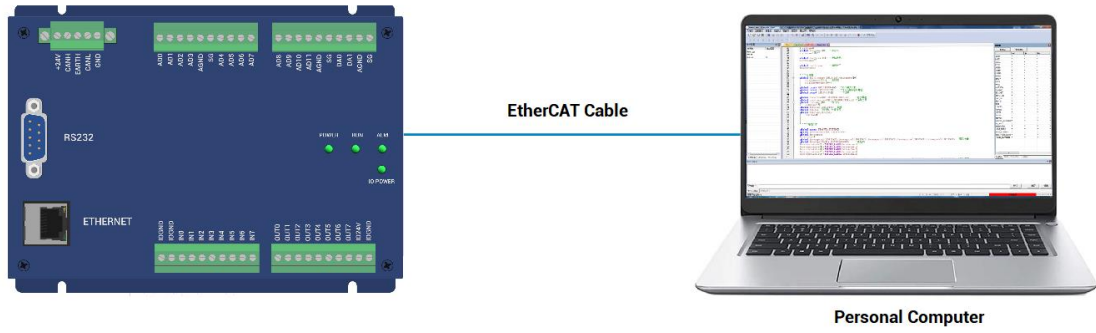
Serial port configuration:
Port0:(RS232) is ModbusSlave Mode.
Address: 1, variable:2
Baud:38400
DataBits:8
StopBits: 1
Parity:0
    
```

3.6. ETHERNET

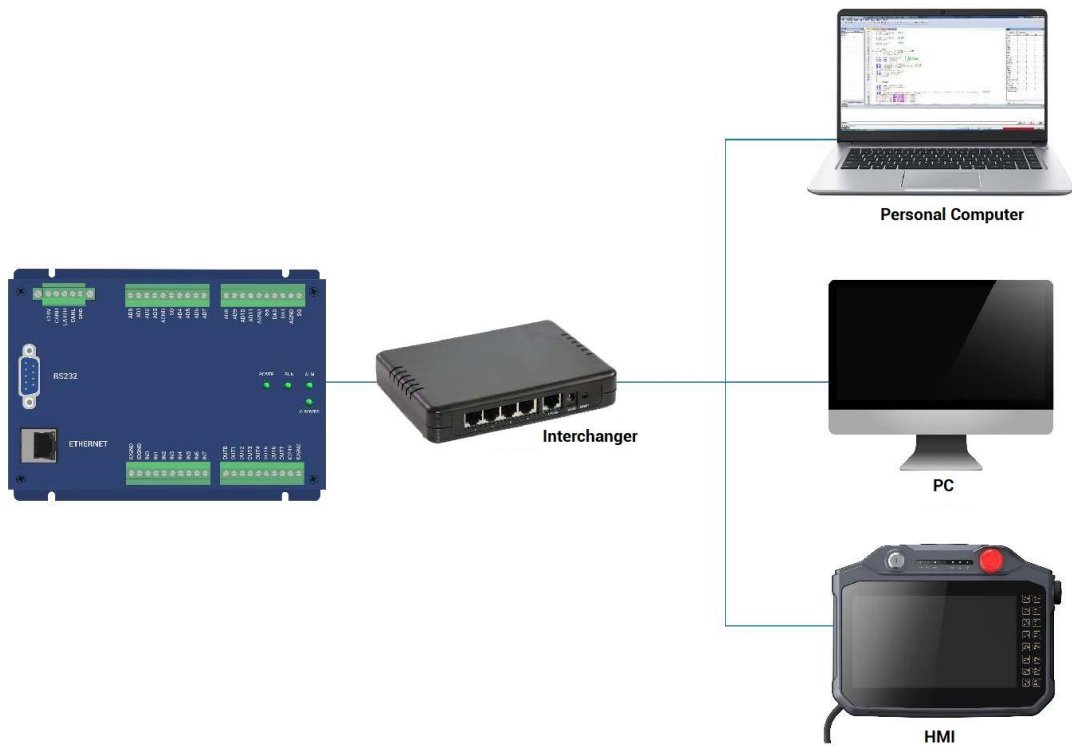
ECI0016PA data capture card has an Ethernet port, and it supports MODBUS_TCP protocol and custom communication, and the default IP address is 192.168.0.11. The pin definition is as follows:



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



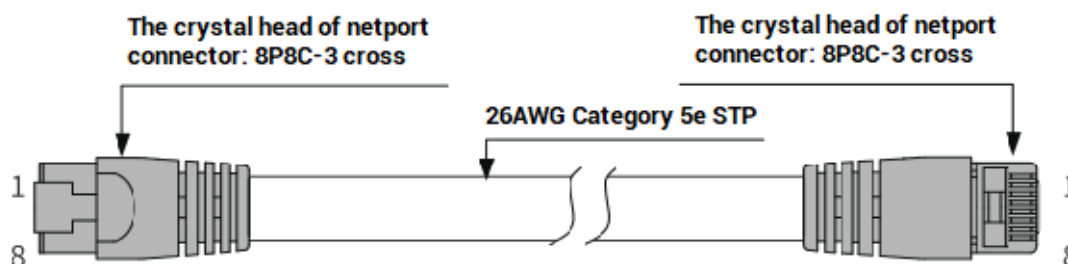
The controller can also be connected to the interchanger through an Ethernet cable, and then use interchanger to connect to other devices, then multi-point connection can be achieved. The schematic diagram is as follows:



→ **Communication Cable Requirements**

ETHERNET 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.

Chapter IV Expansion Module

The control card can expand digital IO and analogs AD/DA through CAN bus, ZIO series CAN bus expansion modules or ZMIO310-CAN series bus expansion modules can be selected. For details, please refer to corresponding user manuals.

4.1. Configure as CAN Expansion Module

4.1.1. ZCAN Slave Protocol Configuration

ECI0016PA is used as IO control card by default. When it is configured as the CAN bus slave station, ECI0016PA can be used as digital IO expansion module.

When ECI0016pa is used as ZIO expansion module, using CANIO_ADDRESS to configure CAN address and CAN communication speed. CAN ID addresses correspond to expanded IO number. For example, when CANIO_ADDRESS=1, IO Number of expanded ECI0016PA is 32. After CANIO_ADDRESS parameters modified, it is saved into FLASH automatically, and it will take effect after restart.

Below form shows CAN address and starting IO and AIO Number:

CAN Address	Starting IO No.	Starting AD No.	Starting DA No.
0	16	8	4
1	32	16	8
2	48	24	12
3	64	32	16
4	80	40	20
5	96	48	24
6	112	56	28
7	128	64	32
8	144	72	36
9	160	80	40
10	176	88	44
11	192	96	48
12	208	104	52
13	224	112	56

14	240	120	60
15	256	128	64

Firstly, check controller states to get the max IO No. and AIO No. of controller itself, then use CANIO_ADDRESS to configure. When IO/AIO No. of the card and IO/AIO No. of controller itself repeat, only one is valid. Therefore, it is recommended to configure CANIO_ADDRESS again to make them different.

ECI0016PA is as CAN communication master station by default, but when it is used as ZIO expansion module. If you need it is as CAN slave station, it is necessary to configure CAN address and communication ratio again. It can configure CANIO_ADDRESS parameter through online command.

According to CAN wiring, then after powered on, set DIP correctly, POWER, RUN and IO POWER are ON, ALM is off. At the same time, "Controller"—"State the Controller"—"ZCanNodes" in ZDevelop shows expansion module information and expanded IO No. range.

When multiple expansion modules are connected, DIP ID and corresponding resource No, reference are below:

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)

ALMRM led is ON, please check the wiring, resistor or DIP setting, and whether controller is set as master station (CANIO_ADDRESS = 32 means main station, others are slave station).

Example:

CANIO_ADDRESS=1

'set CAN ID as 1, now is slave station, 500KBPS, used as ZCAN slave station.

CANIO_ADDRESS=2 + 256

'set CAN ID as 2, now is slave station, 250KBPS, used as ZCAN slave station.

CANIO_ADDRESS=3 + 512

'set CAN ID as 3, now is slave station, 125KBPS, used as ZCAN slave station.

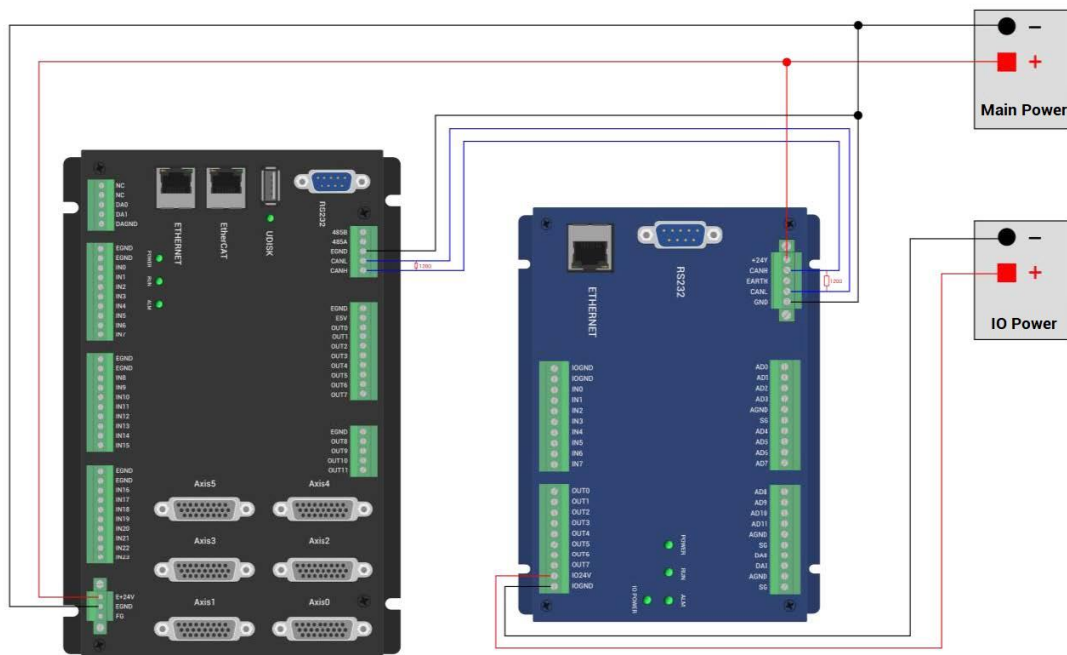
CANIO_ADDRESS=4 + 768

'set CAN ID as 4, now is slave station, 1MBPS, used as ZCAN slave station.

4.1.2. CAN Expansion & Main Station Wiring

ECI0016PA supports ZCAN protocol, connect to other controllers as ZIO expansion module through ZCAN protocol.

When it is ZIO expansion module, the wiring reference:



→ Wiring Note:

- ✧ 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.
- ✧ Please use STP to ensure communication quality and the shield layer is connected to ground.
- ✧ Please use the same power supply for internal powers of controller and expansion module.

4.1.3. IO Watch

The data acquisition card can operate IO, AD, and DA by using the input and output related instructions IN, OUT, AIN, and AOUT.

The analog input resolution of the data acquisition card is 16 bits, and the scale value

range of the AIN command is 0~65535. For example, the voltage input range of the data acquisition card is bipolar $\pm 10V$, the scale value 0 corresponds to $-10V$, the scale value 32767 corresponds to $0V$, and the scale value 65535 corresponds to $10V$.

The analog output resolution of the data acquisition card is 12 bits, and the scale value range of the AOUT command is 0~4095. For example, the voltage output range of the data acquisition card is bipolar $\pm 10V$, the scale value 0 corresponds to $-10V$, the scale value 2047 corresponds to $0V$, and the scale value 4095 corresponds to $10V$.

Note: when watching the analogs, it is necessary to modify the scale value and the value of the voltage or current range in the "ZDevelop/View/AD/DA" interface.

Please refer to "ZBASIC Programming Manual" for details of the instructions.

4.2. CAN Bus Expansion

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

Connect control card to CAN bus expansion modules, when the eighth bit of the DIP switch of the expansion module is turned to ON, which indicates that a 120 ohm resistor has been connected, but needs to connect one 120 ohm resistor externally. When connecting multiple CAN expansion modules, you only need to dial ON for the eighth digit of the last expansion module, which means please do not dial bit-8 of other modules.

4.2.1. CAN Expansion Wiring

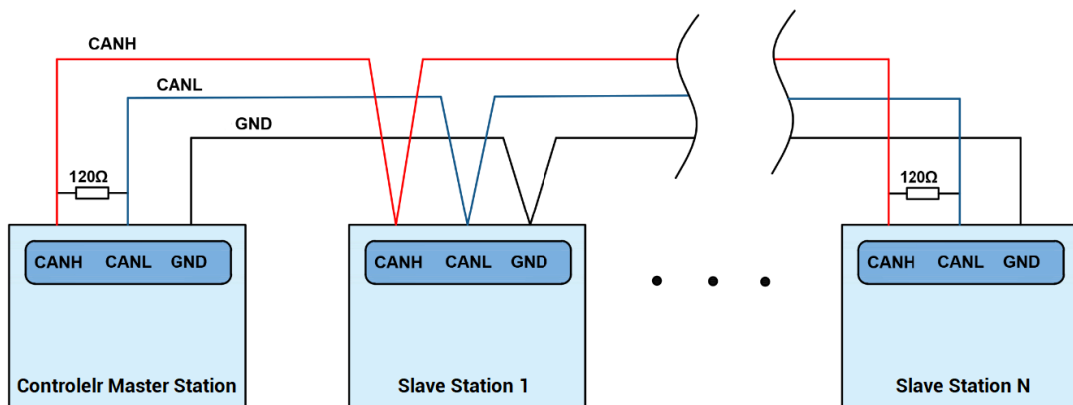
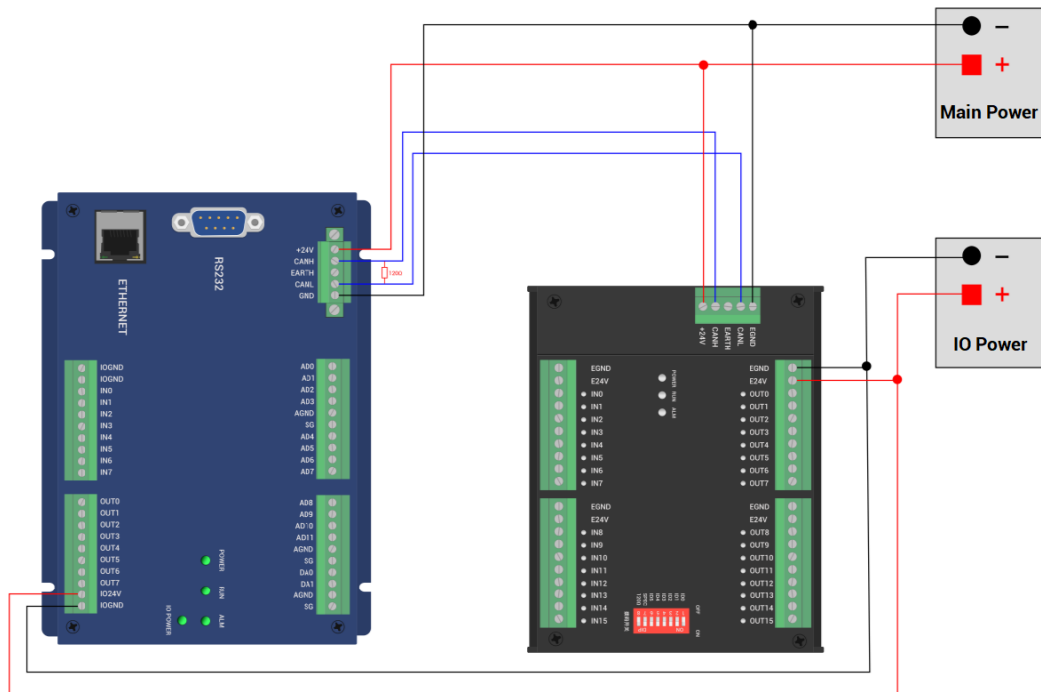
The ZIO expansion module is powered by the dual power supply. Except the main power supply, an additional IO power supply is required to supply independent power for IO. Both the main power supply and the IO power supply use 24V DC power supply. For ZAIO, it only needs to connect to the main power supply.

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 (take ECI0016PA and ZIO1616 as the

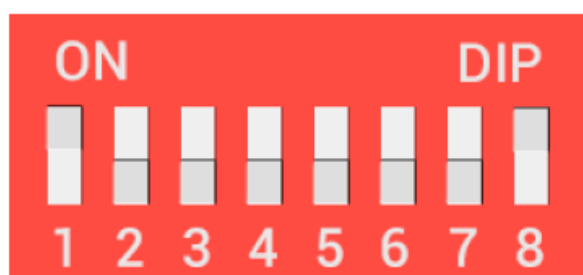
example):



→ **Wiring Note:**

- ❖ ECI0016PA control card uses dual-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).

4.2.2. CAN Bus Expansion Resources 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 \times 8 + dial code 3 \times 4 + dial code 2 \times 2 + dial code 1.

Dial code 5-6 to select CAN bus communication speed, speed combination value=dial code 6 \times 2 + dial code 5 \times 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

→ Expansion Resources Checking:

According to CAN wiring, after powered on, and all resistor codes were set correctly, POWER, RUN and IO POWER should be ON, ALM is OFF. At the same time, it shows expansion module information and expanded IO range number in "ZDevelop/Controller/State the controller/ZCanNodes".

When connecting multiple expansion modules, DIP ID and corresponding resources No. are below:

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)

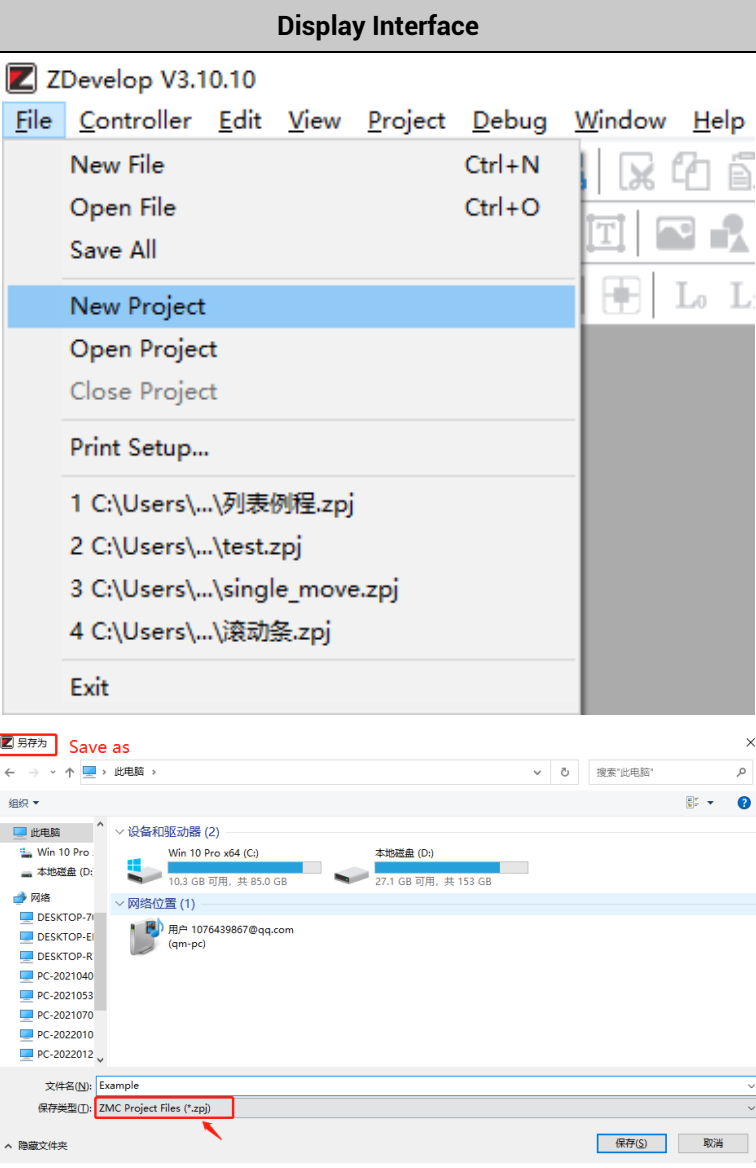
If ALMRM led is ON, please check wiring, resistor, DIP setting, CANIO_ADDRESS setting (should be 32 master station) and CAN communication speed.

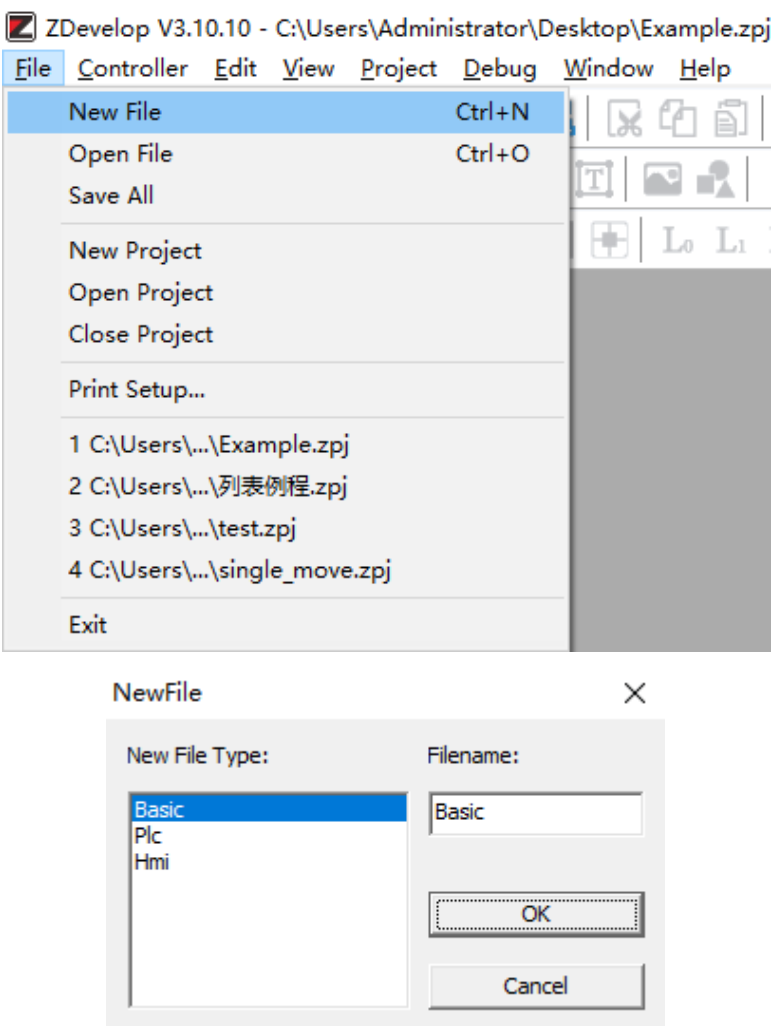
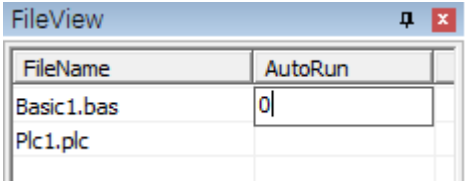
Chapter V Expansion Module

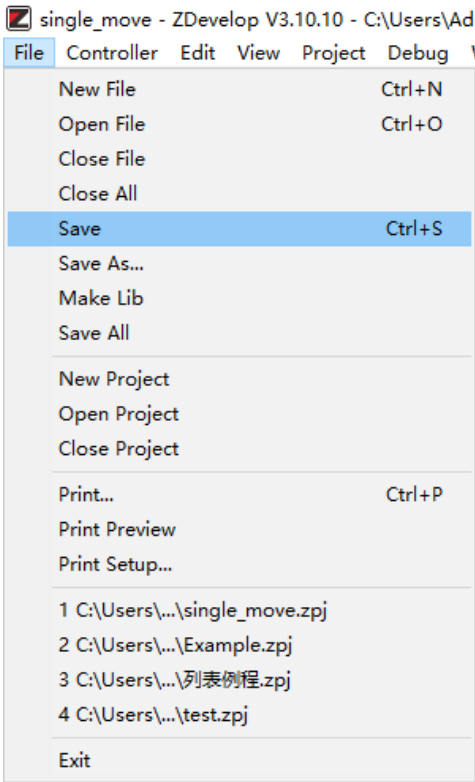
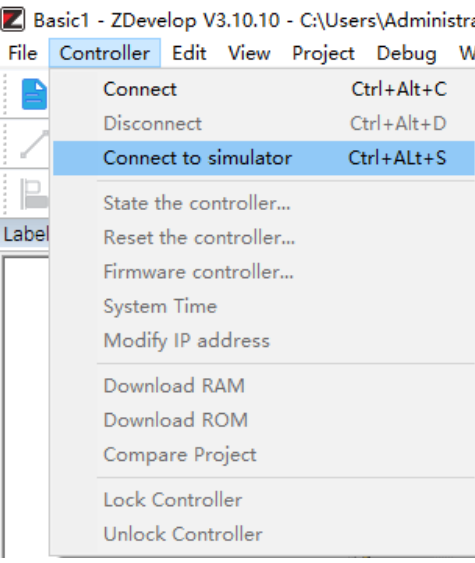
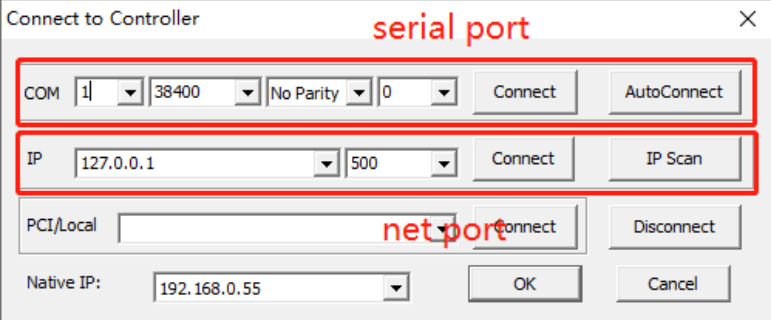
5.1. ZDevelop Software Usage

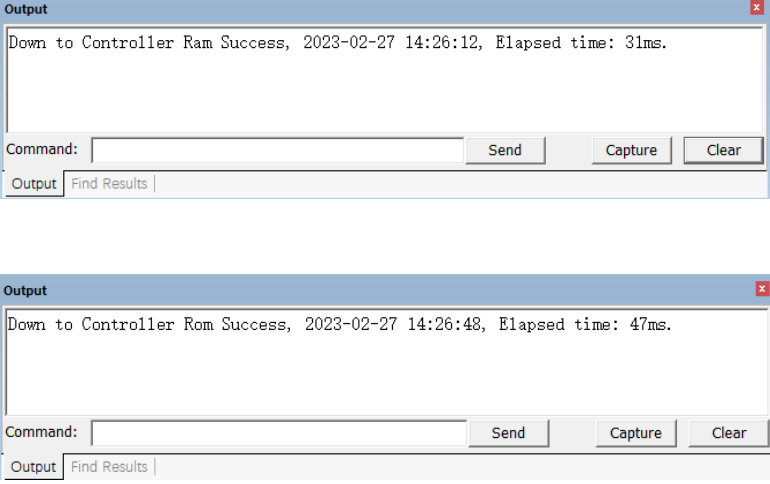
ZDevelop is a PC-side program development, debugging and diagnostic software for the ZMoiton series motion controllers of Zmotion Technology. Through it, users can easily edit and configure the controller program, quickly develop applications, diagnose system operating parameters in real time, and watch the motion controller. The running program is debugged in real time and supports Chinese and English bilingual environments.

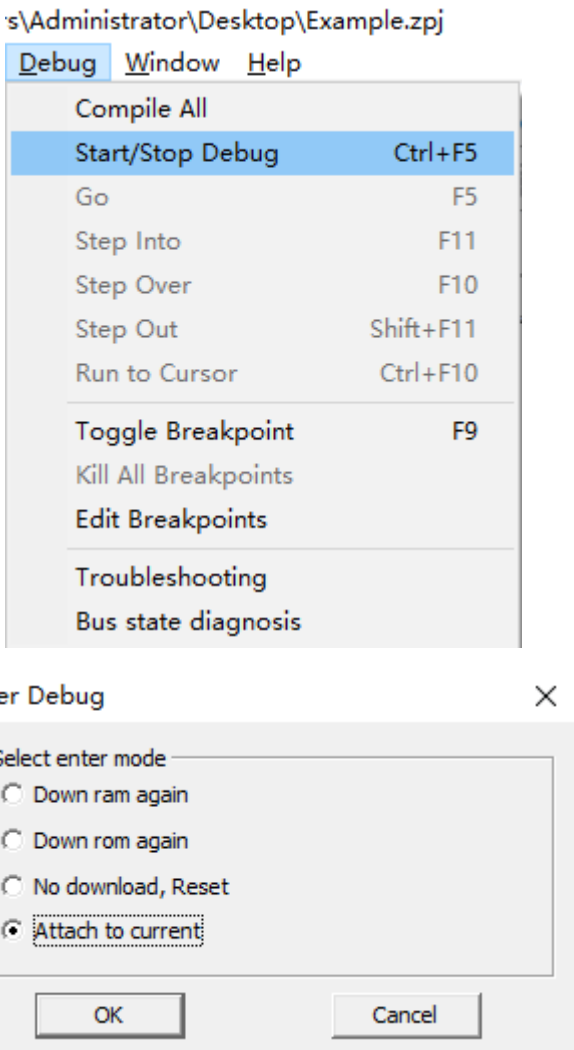
ZBasic, ZPLC and ZHMI can run multi-tasks, and ZBasic can run multi-tasks, and can be mixed with ZPLC and ZHMI.

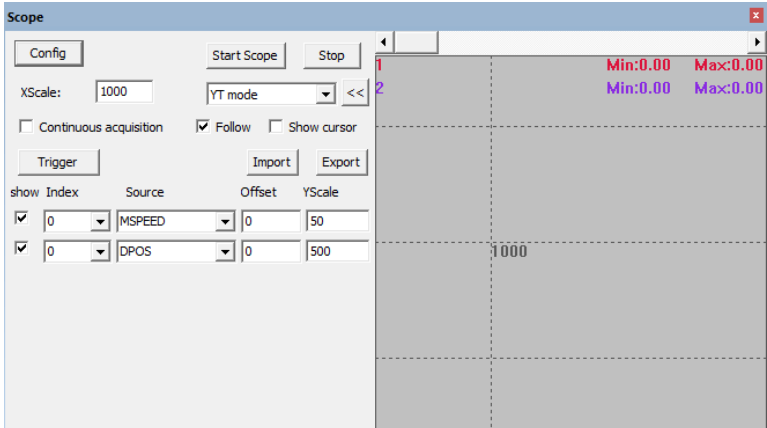
Step	Operations	Display Interface
1	Open ZDevelop, click "File" – "New Project", Save as window will pop up, then enter file name, save the project file with suffix "zpj".	 <p>The screenshot shows the ZDevelop V3.10.10 application window. The 'File' menu is open, and 'New Project' is highlighted. Below the menu, a list of existing project files is visible, including '列表例程.zpj', 'test.zpj', 'single_move.zpj', and '滚动条.zpj'. A 'Save as' dialog box is also open, showing the file name 'Example' and the file type 'ZMC Project Files (*.zpj)' selected. The dialog box also shows the file explorer view with drives C: and D: and a network location.</p>

<p>2</p>	<p>Click "File" – "New File", select file type to build, here select Basic, click "OK".</p>	 <p>The screenshot shows the ZDevelop V3.10.10 application window. The 'File' menu is open, showing options: New File (Ctrl+N), Open File (Ctrl+O), Save All, New Project, Open Project, Close Project, Print Setup..., and a list of recent files: 1 C:\Users\...\Example.zpj, 2 C:\Users\...\列表例程.zpj, 3 C:\Users\...\test.zpj, 4 C:\Users\...\single_move.zpj, and Exit. Below the menu, the 'NewFile' dialog box is open. It has a 'New File Type:' list with 'Basic' selected, and a 'Filename:' field containing 'Basic'. There are 'OK' and 'Cancel' buttons.</p>						
<p>3</p>	<p>Double click "AutoRun", enter task number 0.</p>	 <p>The screenshot shows the 'FileView' dialog box. It contains a table with two columns: 'FileName' and 'AutoRun'. The table has three rows: 'Basic1.bas' with '0' in the 'AutoRun' column, and 'Plc1.plc' with an empty 'AutoRun' column.</p> <table border="1" data-bbox="715 1288 1181 1422"> <thead> <tr> <th>FileName</th> <th>AutoRun</th> </tr> </thead> <tbody> <tr> <td>Basic1.bas</td> <td>0</td> </tr> <tr> <td>Plc1.plc</td> <td></td> </tr> </tbody> </table>	FileName	AutoRun	Basic1.bas	0	Plc1.plc	
FileName	AutoRun							
Basic1.bas	0							
Plc1.plc								

<p>4</p>	<p>Edit the program in program editing window, click "save", new built basic file will be saved under "zpj." project automatically. "Save all" means all files under this project will be saved.</p>	 <p>The screenshot shows the 'File' menu in ZDevelop V3.10.10. The 'Save' option is highlighted in blue, with the keyboard shortcut 'Ctrl+S' displayed to its right. Other menu items include 'New File', 'Open File', 'Close File', 'Close All', 'Save As...', 'Make Lib', 'Save All', 'New Project', 'Open Project', 'Close Project', 'Print...', 'Print Preview', 'Print Setup...', and a list of open files.</p>
<p>5</p>	<p>Click "controller – connect", if no controller, select connect to simulator.</p>	 <p>The screenshot shows the 'Controller' menu in ZDevelop V3.10.10. The 'Connect to simulator' option is highlighted in blue, with the keyboard shortcut 'Ctrl+ALT+S' displayed to its right. Other menu items include 'Connect', 'Disconnect', 'State the controller...', 'Reset the controller...', 'Firmware controller...', 'System Time', 'Modify IP address', 'Download RAM', 'Download ROM', 'Compare Project', 'Lock Controller', and 'Unlock Controller'.</p>
	<p>Then, "connect to controller" window will pop up, you can select serial port or net port to connect, select matched serial port</p>	 <p>The screenshot shows the 'Connect to Controller' dialog box. It has two sections: 'serial port' and 'net port'. The 'serial port' section includes fields for COM (1), Baud Rate (38400), Parity (No Parity), and Stop Bits (0), with 'Connect' and 'AutoConnect' buttons. The 'net port' section includes fields for IP (127.0.0.1) and Port (500), with 'Connect' and 'IP Scan' buttons. Below these are fields for 'PCI/Local' and 'Native IP' (192.168.0.55), with 'Connect', 'Disconnect', 'OK', and 'Cancel' buttons.</p>

	<p>parameters or net port IP address, then click "connect".</p>	
<p>6</p>	<p>Click "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. RAM: it will not save when power off. ROM: it will save data when power off, and when the program is connected to controller again, running according to task number.</p>	 <p>The image shows two screenshots of a software interface's 'Output' window. The top screenshot displays the message: 'Down to Controller Ram Success, 2023-02-27 14:26:12, Elapsed time: 31ms.' Below the message is a 'Command:' input field, and three buttons: 'Send', 'Capture', and 'Clear'. At the bottom of the window, there are tabs for 'Output' and 'Find Results'. The bottom screenshot displays the message: 'Down to Controller Rom Success, 2023-02-27 14:26:48, Elapsed time: 47ms.' It has the same layout as the top screenshot.</p>

<p>7</p>	<p>Click “Debug” – “Start/Stop Debug” to call “Task” and “Watch” window, because it was downloaded before, here select “Attach the current”.</p>	
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<p>8</p>	<p>Click “View” – “Scope” to open oscilloscope.</p>	
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Note:

- 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. PC Upper-Computer Program Application

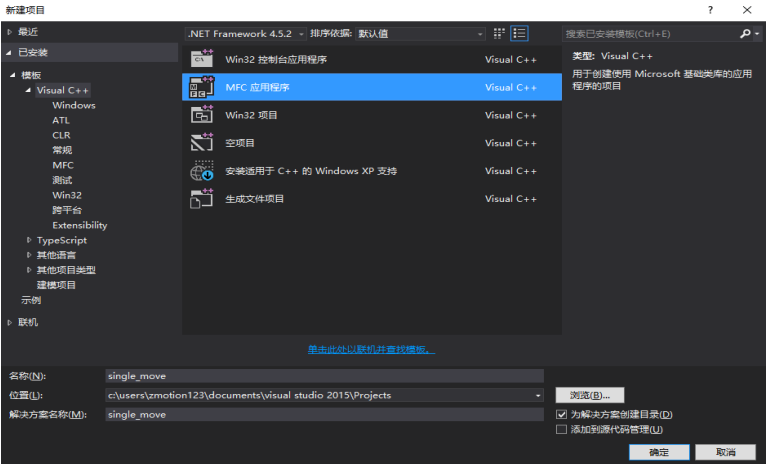



The controller supports development under various operating systems such as windows, linux, Mac, Android, and wince, and provides dll libraries in various environments such as vc, c#, vb.net, and labview, as shown in the figure below. PC software programming refers to "ZMotion PC Function Library Programming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

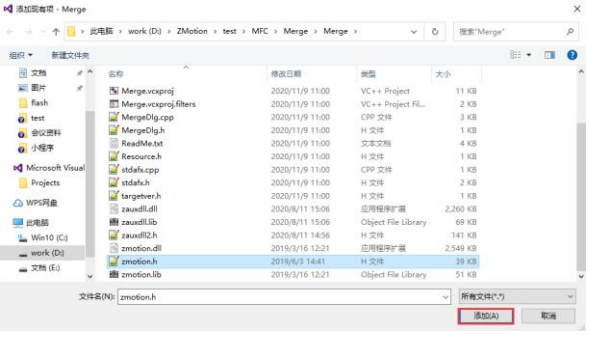
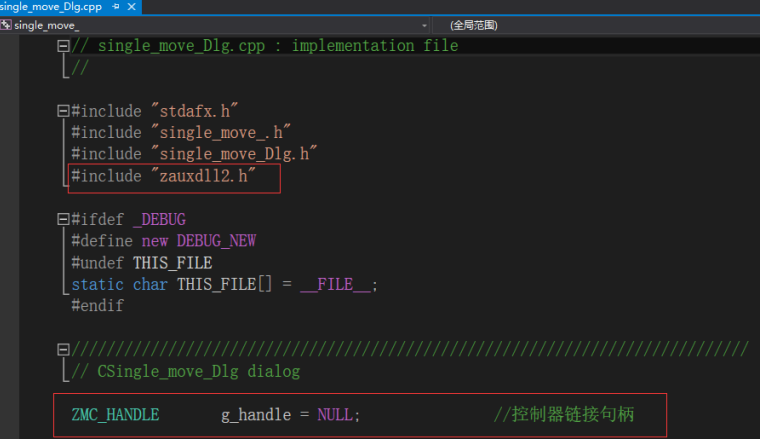


The program developed using the PC software cannot be downloaded to the controller, and it is connected to the controller through the dll dynamic library. The dll library needs to be added to the header file and declared during development.

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

Step	Operations	Display Interface
1	Open VS, click "File" – "New" – "Project".	

<p>2</p>	<p>Select development language as "Visual C++" and the select program type as "MFC application type".</p>	
<p>3</p>	<p>Select "Based on basic box", click "next" or "finish"</p>	
<p>4</p>	<p>Find C++ function library provided by manufacturer. Routine is below (64-bit library)</p>	
<p>5</p>	<p>Copy all DLL related library files under the above path to the newly created project.</p>	
<p>6</p>	<p>Add a static library and related header files to the project. Static library: zauxdll.lib,</p>	<p>1) Right-click the header file first, and then select: "Add" → "Existing"</p> 

	<p>zmotion.lib</p> <p>Related header files: zauxdll2.h, zmotion.h</p>	<p>Item".</p> <p>2) Add static libraries and related header files in sequence in the pop-up window.</p>	
<p>7</p>	<p>Declare the relevant header files and define the controller connection handle, so far the project is newly created.</p>		

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)	-20 °C -60 °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 %-9 5 % 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
Motor does not rotate.	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. Check whether the limit sensor is working normally,

invalid.	<p>and whether the "input" view can watch the signal change of the limit sensor.</p> <ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 1. Program running error, please check ZDevelop error code, and check application program.
Fail to connect controller to PC through serial port.	<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 1. Check the CAN wiring and power supply circuit, whether the 120 ohm resistor is installed at both ends.

	<ol style="list-style-type: none">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.	<ol style="list-style-type: none">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.