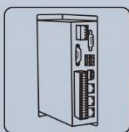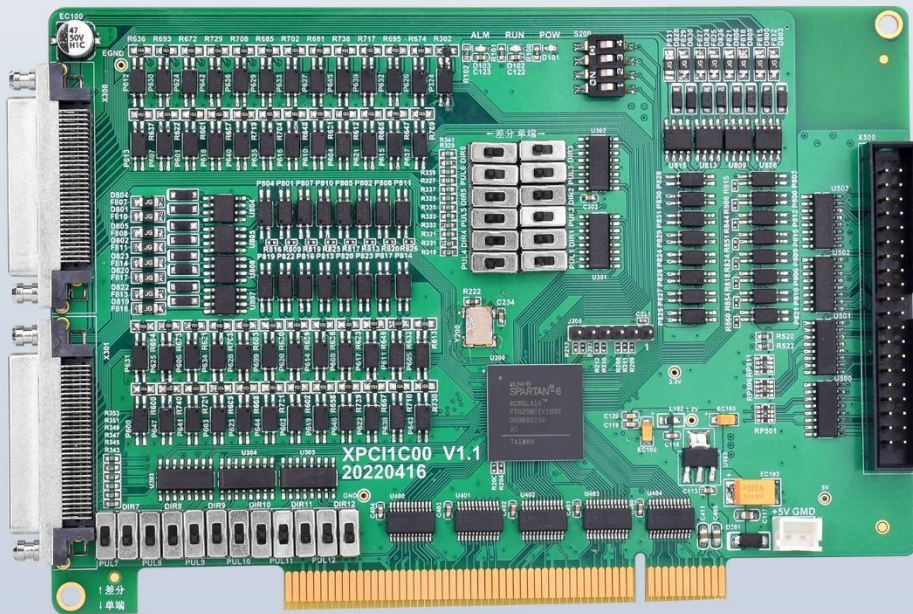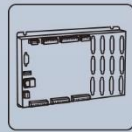# PCI Bus Motion Control Card
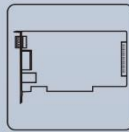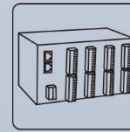
XPCI1C00

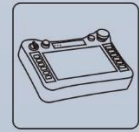Vision Motion Controller   Motion Controller   Motion Control Card   IO Expansion Module   HMI

✚ **Foreword**

Zmotion®

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

This manual is copyrighted by Shenzhen Technology Co., Ltd., without the written permission of the Zmotion Technology, no person shall reproduce, translate and copy any content in this manual. The above-mentioned actions will constitute an infringement of the copyright of the company's manual, and Zmotion will investigate legal responsibility according to law.

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	◆ 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	◆ 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.

	◆ Improper installation of the controller may result in misoperation, failure and fire.
Wiring	
⚠️ Danger	◆ 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.
⚠️ Notice	◆ 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.

Content

Chapter I Production Information

1.1. Product Information

XPCI1C00 motion control card is a kind of new type PCI bus control card. It can control multiple step motors or digital servo motors. And there are many functions on it, such as, multi-axis point to point motion, interpolation, trajectory planning, IO control, etc.

XPCI series motion control cards need to be used with MotionRT. Please refer to Chapter V.

1.2. Function Features

◆ 12 axes motion control at most.

◆ Pulse output mode: pulse / direction

◆ Support encoder position measurement, which can be configured as handwheel input mode.

◆ Mechanical control input signal: +/-EL, ORG, ALM, optoelectronic isolation.

◆ Maximum pulse output frequency of pulse axis is 5MHZ.

◆ The maximum output current of general digital outputs can reach 300mA, which can directly drive some kinds of solenoid valves.

◆ Support linear interpolation, arbitrary circular interpolation, helical interpolation

◆ Support electronic cam, electronic gear, position latch, synchronous follow, virtual axis and other functions.

◆ Support pulse closed loop, pitch compensation and other functions.

◆ 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
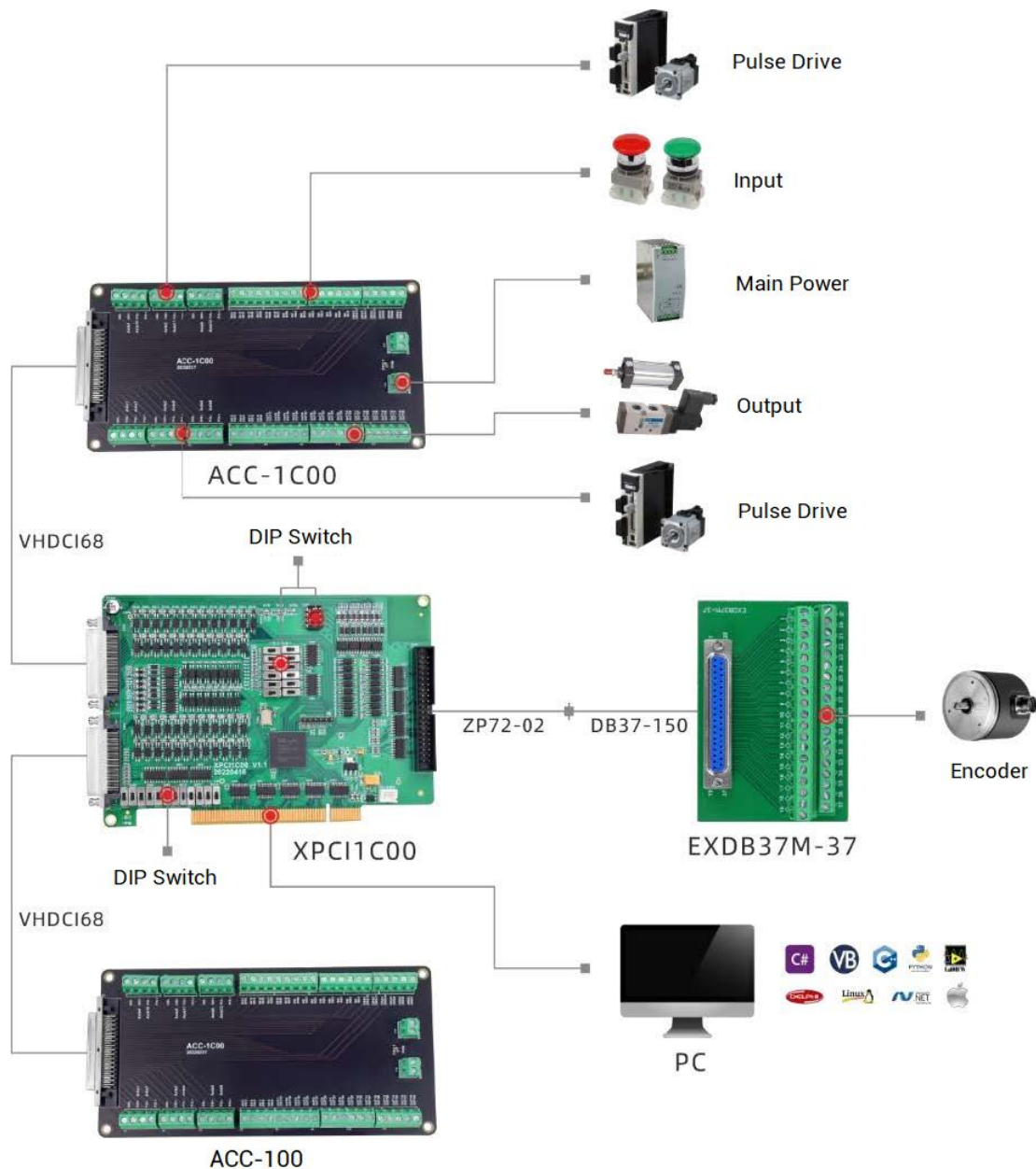
1.4. Model Information

XPCI is the abbreviation of the PCI motion control card model launched by Zmotion.

The naming rules are as follows:
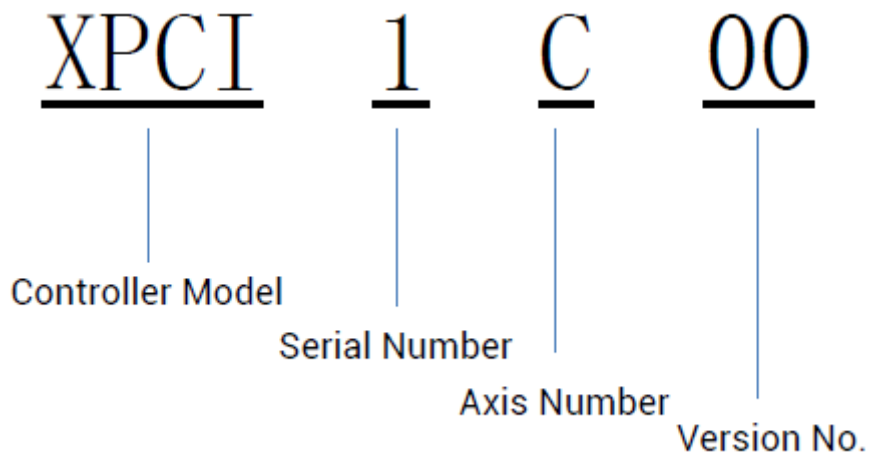
1.5. Hardware Installment

Size: 155*108mm

The card slot interface is designed according to the PCI V3.0 standard 32-bit card, and it is backward compatible with the standard PCI V2.3.

- ♣ PCI doesn't support plug in or pull out when in hot, so please close the computer before inserting and pulling the card.

✦ Please handle it carefully. Before touching the control card circuit or inserting/pulling the control card, please wear anti-static gloves or touch an effectively grounded metal object to discharge the human body to prevent possible static electricity from damaging the motion control card.

⚠️
 	
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	XPCI1C00
Basic Axes	12
Type of Basic Axes	Local pulse axes
Digital IO	There are 49 inputs and 32 outputs (with overcurrent protection).
IO Input Frequency	<5kHz
IO Output Frequency	<8kHz
Highest Pulse Frequency	5MHz
Motion Buffer of Each Axis	4096
Power Supply Input	24V DC input
Dimensions	155*108mm

2.2. Interface Definition

XPCI1C00
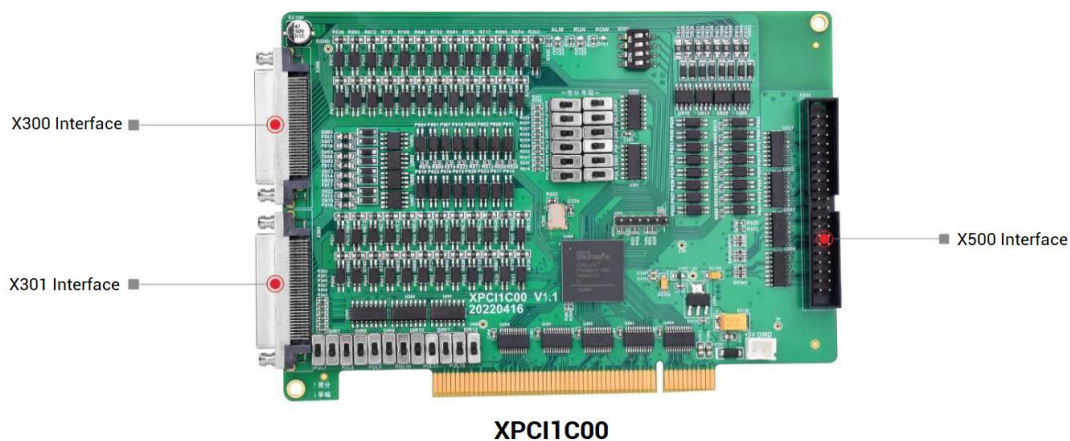
➜ **Interface Description**

Mark	Interface	Number	Description
POW	The led that indicates the current state.	1	Power state: it lights when power is conducted.
RUN		1	Run state: it lights when runs normally
ALM		1	Error state: it lights when runs incorrectly
X300	Signal Interface	1	Include 0-5 axis motor control signals and IO control signals, which is used with adapter.
X301	Signal Interface	1	Include 6-11 axis motor control signals and IO control signals, which is used with adapter.
X500	Signal Interface	1	Include 0-3 axis encoder signals, which is used with adapter.

2.3. Work Environment

Item	Parameters
Work Temperature	-20℃-60℃
Work relative Humidity	5%-95% non-condensing
Storage Temperature	-40℃ ~ 70℃ (not frozen)
Storage Humidity	Below 90%RH (no frost)
Vibration	Below 4.9m/s^2
Shock	Below 19.6m/s^2
Degree of Protection	IP20

Chapter III Wiring, Communication Configuration

3.1. Power Input

The power input adopts DC24V power supply, which is connected through the EGND and E24V terminals of the 5.08mm screw terminal on the ACC-1C00 wiring board. For specific interface specifications, please refer to 3.2.2 "Terminal Definition".

→ Specification:

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

3.2. X300, X301 Signal Interface

X300 and X301 are main interfaces for motion control and IO signal control of XPCI1C00. It is VHDCI socket, and it is necessary to connect ACC-1C00 adapter. Below shows X300 and X304 signal terminal:
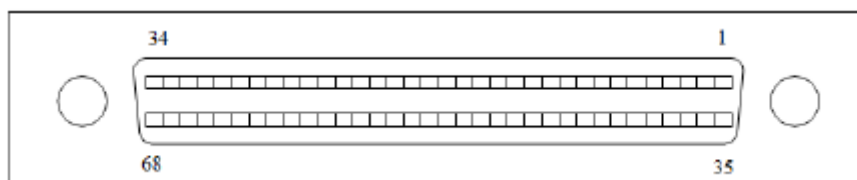
3.2.1. ACC-1C00 Adapter

ACC-1C00 is the adapter of X300 and X301 signal terminal, use VHDCI168 cable to

connect.

Size: 169*100mm

3.2.2. Terminal Definition

→ X300 Pin Definition

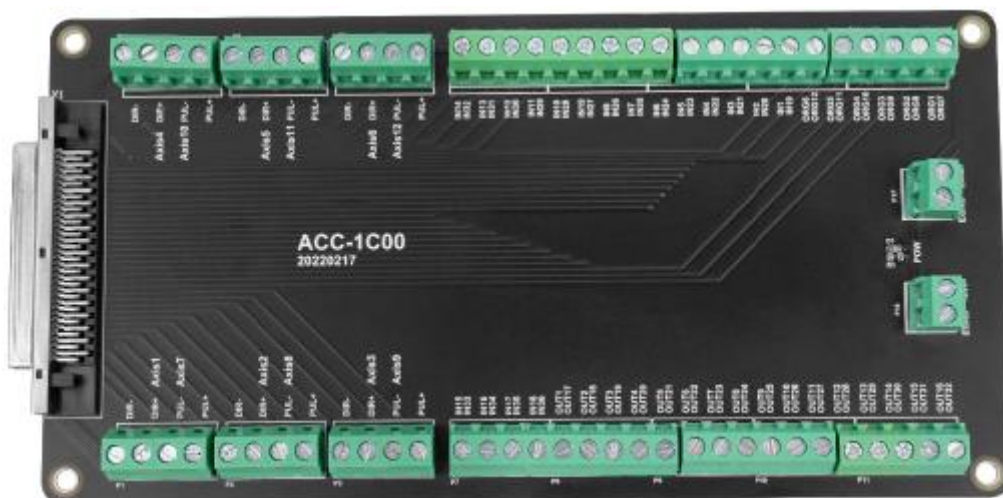| Pin	Name	Description
1	PUL0+	Pulse signal (+) of axis 0
2	PUL0-	Pulse signal (-) of axis 0
3	DIR0+	Directional signal (+) of axis 0
4	DIR0-	Directional signal (-) of axis 0
5	PUL1+	Pulse signal (+) of axis 1
6	PUL1-	Pulse signal (-) of axis 1
7	DIR1+	Directional signal (+) of axis 1
8	DIR1-	Directional signal (-) of axis 1
9	PUL2+	Pulse signal (+) of axis 2
10	PUL2-	Pulse signal (-) of axis 2
11	DIR2+	Directional signal (+) of axis 2
12	DIR2-	Directional signal (-) of axis 2
13	IN37/ORG0	Origin signal of axis 0

Pin	Name	Description
14	IN38/ORG1	Origin signal of axis 1
15	IN39/ORG2	Origin signal of axis 2
16	IN0/ALM0/R0/EA4	Alarm signal of axis 0/latch 0/encoder 4
17	IN1/ALM1/R1/EB4	Alarm signal of axis 1/latch 1/encoder 4
18	IN3/ALM2/R2	Alarm signal of axis 2/latch 2
19	IN4/ALM3/R3	Alarm signal of axis 3/latch 3
20	IN5/ALM4/R4	Alarm signal of axis 4/encoder 4
21	IN6/ALM5	Alarm signal of axis 5
22	IN7/EL0+	(+) position limit signal of axis 0
23	IN8/EL0+	(-) position limit signal of axis 0
24	IN9/EL1+	(+) position limit signal of axis 1
25	OUT0/HW0	Comparison output 0
26	OUT1/HW1	Comparison output 1
27	OUT2/PWM0	Low-speed PWM0
28	OUT3/PWM1	Low-speed PWM1
29	OUT4	General output 4
30	OUT5	General output 5
31	OUT6	General output 6
32	OUT7	General output 7
33	+24V	24V power, input
34	EGND	24V power ground
Pin	**Name**	**Description**
35	PUL3+	Pulse signal (+) of axis 3
36	PUL3-	Pulse signal (-) of axis 3
37	DIR3+	Directional signal (+) of axis 3
38	DIR3-	Directional signal (-) of axis 3
39	PUL4+	Pulse signal (+) of axis 4
40	PUL4-	Pulse signal (-) of axis 4
41	DIR04+	Directional signal (+) of axis 4

42	DIR0-4	Directional signal (-) of axis 4
43	PUL5+	Pulse signal (+) of axis 5
44	PUL5-	Pulse signal (-) of axis 5
45	DIR5+	Directional signal (+) of axis 5
46	DIR5-	Directional signal (-) of axis 5
47	IN40/ORG3	Origin signal of axis 3
48	IN41/ORG4	Origin signal of axis 4
49	IN42/ORG5	Origin signal of axis 5
50	IN10/EL1-	(-) position limit signal of axis 1
51	IN11/EL2+	(+) position limit signal of axis 2
52	IN12/EL2-	(-) position limit signal of axis 2
53	IN13/EL3+	(+) position limit signal of axis 3
54	IN14/EL3-	(-) position limit signal of axis 3
55	IN15/EL4+	(+) position limit signal of axis 4
56	IN16/EL4-	(-) position limit signal of axis 4
57	IN17/EL5+	(+) position limit signal of axis 5
58	IN18/EL-	(-) position limit signal of axis 5
59	OUT8	General output 8
60	OUT9	General output 9
61	OUT10/ERC0	Error clear signal of axis 0
62	OUT11/ERC1	Error clear signal of axis 1
63	OUT12/ERC2	Error clear signal of axis 2
64	OUT13/ERC3	Error clear signal of axis 3
65	OUT14/ERC4	Error clear signal of axis 4
66	OUT15/ERC5	Error clear signal of axis 5
67	GND	Internal power ground
68	IN0	General input 0

Note:

● Pay attention to the positive and negative poles of the IO power supply of XPCI1C00 to avoid

burning the IO port.

- The maximum output current of XPCI1C00 is 300mA, which can be directly connected to most of loads. Please calculate the current.

- The IO port of XPCI1C00 is an isolated IO port, please input the power supply of the IO port from EGND and 24V+.

- IN2-5 can be configured as pulse axis latch input, and IN2-3 can be configured as latch input of encoder axis.

- IN1, IN2, and IN5 are used as EA4, EB4, and EZ4 of the 24V encoder, and are used when there is no handwheel.

- PWM0 and PWM0 are low-speed ports, and the maximum output frequency is 10KHz.

- For the special function hardware comparison output HW0 and HW1 need control card license with HW.

→ X301 Pin Definition

Pin	Name	Description
1	PUL6+	Pulse signal (+) of axis 6
2	PUL6-	Pulse signal (-) of axis 6
3	DIR6+	Directional signal (+) of axis 6
4	DIR6-	Directional signal (-) of axis 6
5	PUL7+	Pulse signal (+) of axis 7
6	PUL7-	Pulse signal (-) of axis 7
7	DIR7+	Directional signal (+) of axis 7
8	DIR7-	Directional signal (-) of axis 7
9	PUL8+	Pulse signal (+) of axis 8
10	PUL8-	Pulse signal (-) of axis 8
11	DIR8+	Directional signal (+) of axis 8
12	DIR8-	Directional signal (-) of axis 8
13	IN43/ORG6	Origin signal of axis 6
14	IN44/ORG7	Origin signal of axis 7

Pin	Name	Description
15	IN45/ORG8	Origin signal of axis 8
16	IN19/ALM6	Alarm signal of axis 6
17	IN20/ALM7	Alarm signal of axis 7
18	IN21/ALM8	Alarm signal of axis 8
19	IN22/ALM9	Alarm signal of axis 9
20	IN23/ALM10	Alarm signal of axis 10
21	IN24/ALM11	Alarm signal of axis 11
22	IN25/EL6+	(+) position limit signal of axis 6
23	IN26/EL6-	(-) position limit signal of axis 6
24	IN27/EL7+	(+) position limit signal of axis 7
25	OUT16	General output 16
26	OUT17	General output 17
27	OUT18	General output 18
28	OUT19	General output 19
29	OUT20	General output 20
30	OUT21	General output 21
31	OUT22	General output 22
32	OUT23	General output 23
33	+24V	24V power, input
34	EGND	24V power ground
Pin	Name	Description
35	PUL9+	Pulse signal (+) of axis 9
36	PUL9-	Pulse signal (-) of axis 9
37	DIR9+	Directional signal (+) of axis 9
38	DIR9-	Directional signal (-) of axis 9
39	PUL10+	Pulse signal (+) of axis 10
40	PUL10-	Pulse signal (-) of axis 10
41	DIR010+	Directional signal (+) of axis 10
42	DIR10-	Directional signal (-) of axis 10

43	PUL11+	Pulse signal (+) of axis 11
44	PUL11-	Pulse signal (-) of axis 11
45	DIR11+	Directional signal (+) of axis 11
46	DIR11-	Directional signal (-) of axis 11
47	IN46/ORG3	Origin signal of axis 9
48	IN47/ORG4	Origin signal of axis 10
49	IN48/ORG5	Origin signal of axis 11
50	IN28/EL7-	(-) position limit signal of axis 7
51	IN29/EL8+	(+) position limit signal of axis 8
52	IN30/EL8-	(-) position limit signal of axis 8
53	IN31/EL9+	(+) position limit signal of axis 9
54	IN32/EL9-	(-) position limit signal of axis 9
55	IN33/EL10+	(+) position limit signal of axis 10
56	IN34/EL10-	(-) position limit signal of axis 10
57	IN35/EL11+	(+) position limit signal of axis 11
58	IN36/EL11-	(-) position limit signal of axis 11
59	OUT24	General output 24
60	OUT25	General output 25
61	OUT26/ERC6	Error clear signal of axis 6
62	OUT27/ERC7	Error clear signal of axis 7
63	OUT28/ERC8	Error clear signal of axis 8
64	OUT29/ERC9	Error clear signal of axis 9
65	OUT30/ERC10	Error clear signal of axis 10
66	OUT31/ERC11	Error clear signal of axis 11
67	GND	Internal power ground
68	NC	Reserved

Note:

- Pay attention to the positive and negative poles of the IO power supply of XPCI1C00 to avoid burning the IO port.

● The maximum output current of XPCI1C00 is 300mA, which can be directly connected to most of loads. Please calculate the current.

● The IO port of XPCI1C00 is an isolated IO port, please input the power supply of the IO port from EGND and 24V+.
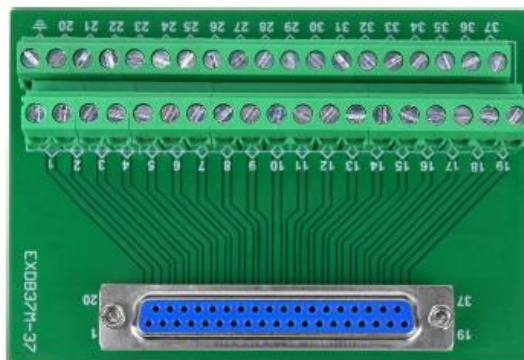
3.3. X500 Signal Interface

The X500 interface is the encoder signal interface, and the EXDB37M-37 adapter board is used to connect external devices. This terminal is optional, if you need to use encoder, it can be selected.

→ Interface Appearance
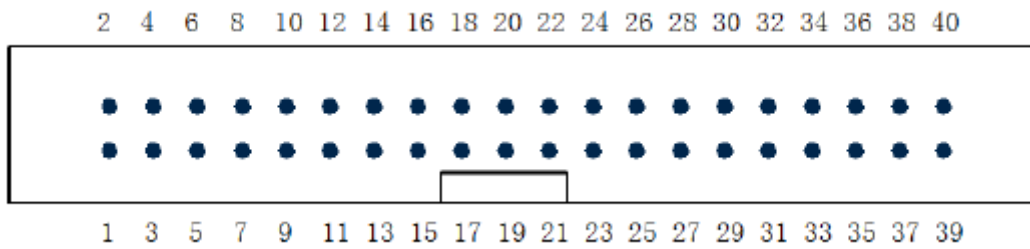
3.3.1. Adapter EXDB37M-37

EXDB37M-37 is the adapter board of X500 signal, and it is connected through adapter cable and DB37.

Size: 107*85mm

3.3.2. Terminal Definition

Terminal corresponding relation and adapter board mark number are consistent, but there is no corresponding relation between Pin 38-40 and adapter board.

Pin	Name	Function	Pin	Name	Function
1	5V	5V power	21	EA1+	Phase A (+) of encoder axis 2
2	GND	Internal power ground	22	EA1-	Phase A (-) of encoder axis 2
3	EA0+	Phase A (+) of encoder axis 1	23	EB1+	Phase B (+) of encoder axis 2
4	EA0-	Phase A (-) of encoder axis 1	24	EB1-	Phase B (-) of encoder axis 2
5	EB0+	Phase B (+) of encoder axis 1	25	EZ1+	Signal Z (+) of encoder axis 2
6	EB0-	Phase B (-) of encoder axis 1	26	EZ1-	Signal Z (-) of encoder axis 2
7	EZ0+	Signal Z (+) of encoder axis 1	27	NC	/
8	EZ0-	Signal Z (-) of encoder axis 1	28	NC	/
9	NC	/	29	GND	Internal power ground
10	5V	5V power	30	EA3+	Phase A (+) of encoder axis 4
11	GND	Internal power ground	31	EA3-	Phase A (-) of encoder axis 4
12	EA2+	Phase A (+) of encoder axis 3	32	EB3+	Phase B (+) of encoder axis 4
13	EA2-	Phase A (-) of encoder axis 3	33	EB3-	Phase B (-) of encoder axis 4
14	EB2+	Phase B (+) of encoder axis 3	34	NC	/
15	EB2-	Phase B (-) of encoder axis 3	35	EZ3-	Signal Z (-) of encoder axis 4
16	EZ2+	Signal Z (+) of encoder axis 3	36	NC	/
17	EZ2-	Signal Z (-) of encoder axis 3	37	NC	/
18	EZ3+	Signal Z (+) of encoder axis 4	38	GND	Power ground
19	5V	5V power	39	GND	Power ground
20	GND	Internal power ground	40	GND	Power ground

3.4. Pulse Directional Output

The port of the pulse direction axis is connected through the 5.08mm screw terminal on

the ACC-1C00 wiring board. For the specific interface, please refer to 3.2.2 Terminal Definition.

3.4.1. Pulse Direction Axis Specification & Wiring

→ Specification

| Item	Description
Pulse/direction (PUL/DIR) signal type	Differential/single-ended output signal (DIP switch to adjust)
Pulse/direction (PUL/DIR) signal voltage range	0-5V
Pulse/direction (PUL/DIR) signal max frequency	5MHz
Isolation	Non-isolated

→ Wiring Reference

Connect driver to controller, it needs to correspondingly connect the PUL and DIR terminals one by one. Differential or single-ended wiring can be used. Both methods can be set by adjusting the dial switch on the board. For the specific setting method, refer to 3.8 .1 Differential/single-ended DIP switch.

1. **Differential method:**
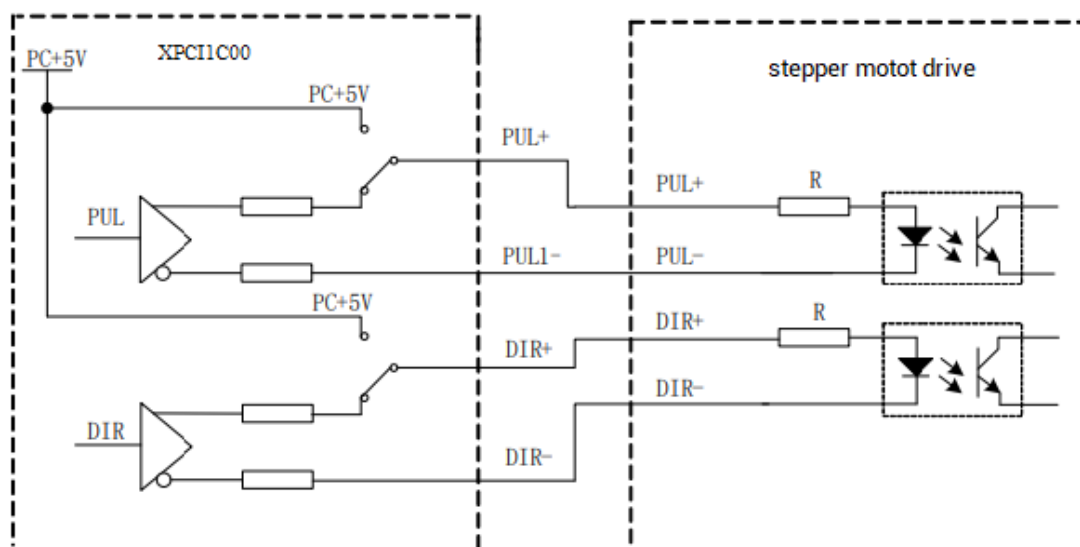
2. **Single-ended method:**
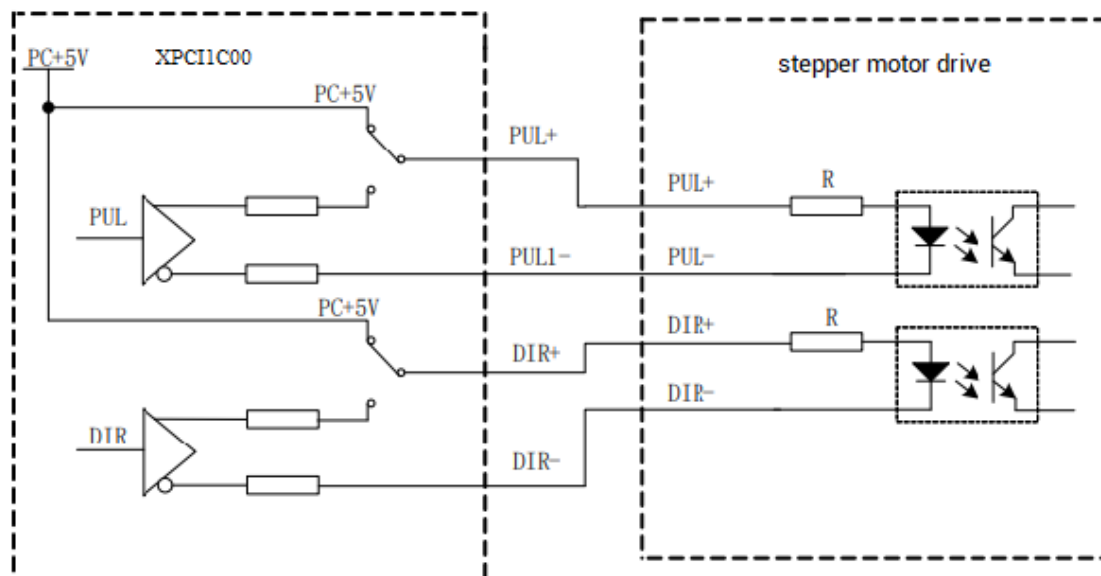
→ Wiring Note

● Some servo drives are not optically isolated (for example, Panasonic economical servo), and the GND of the internal power supply (terminal 1) needs to be connected with the GND of the drive through ACC-1C00.

● If the high-speed differential pulse port is connected, it is necessary to connect the GND of the internal power supply (terminal 1) to the GND of the driver through ACC-1C00.

● If the drive and the control card use different 24V power supplies, connect the external power supply ground EGND (terminals 34 and 66) to the drive COM through ACC-1C00.

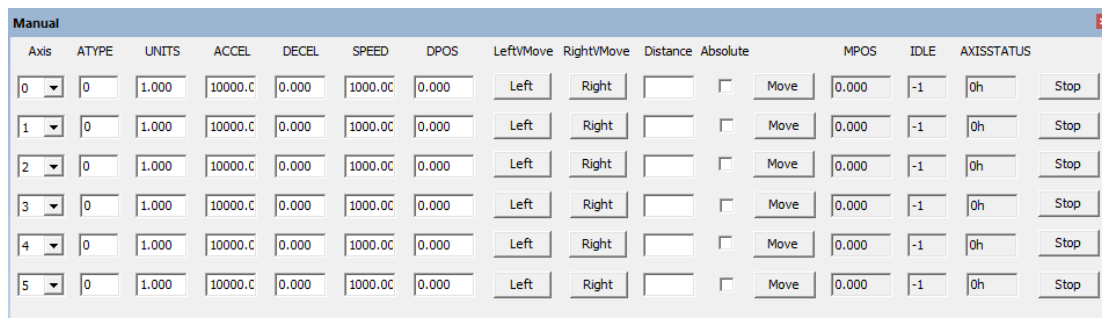## 3.4.2. Basic Usage Method

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

(2) After powered on, please connect to ZDevelop.

(3) Set axis parameters, such as, ATYPE, UNITS, SPEED, ACCEL, 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 "ZBasic", or see "ZDevelop/View/Axis parameter".

Axis Parameters				
Axis select	**Parameter select**			
	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
FWD_IN	-1	-1	-1	-1
REV_IN	-1	-1	-1	-1
IDLE	-1	-1	-1	-1
LOADED	-1	-1	-1	-1
MSPEED	0	0	0	0
MTYPE	0	0	0	0
NTYPE	0	0	0	0
REMAIN	0	0	0	0
VECTOR_BUFFERED	0	0	0	0
VP_SPEED	0	0	0	0
AXISSTATUS	0h	0h	0h	0h
MOVE_MARK	0	0	0	0
MOVE_CURMARK	-1	-1	-1	-1
AXIS_STOPREASON	0h	0h	0h	0h
MOVES_BUFFERED	0	0	0	0

Axis Parameters | Help | Property |

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

3.5. Encoder Input

The encoder input is connected through the EXDB37M-37 wiring board and 5.08mm screw-type wiring terminal. For the specific interface, please refer to 3.3.2 Terminal Definition.

3.5.1. Encoder Interface Specification & Wiring

→ Specification

Item	Description	
Encoder type	High-speed encoder 0-3	Low-speed encoder 4
Encoder signal type	Differential/single-ended input signal (compatible)	Single-ended input signal
Encoder signal voltage range	0-5V	0-24V
Encoder signal max frequency	5MHz	5kHz
Isolation	Non-isolated	Isolated

→ Wiring Reference

Connect driver to controller, it needs to connect A, B and Z one by one. Both differential method and single-ended method can be used

1. **High-speed encoder 3 differential method:**
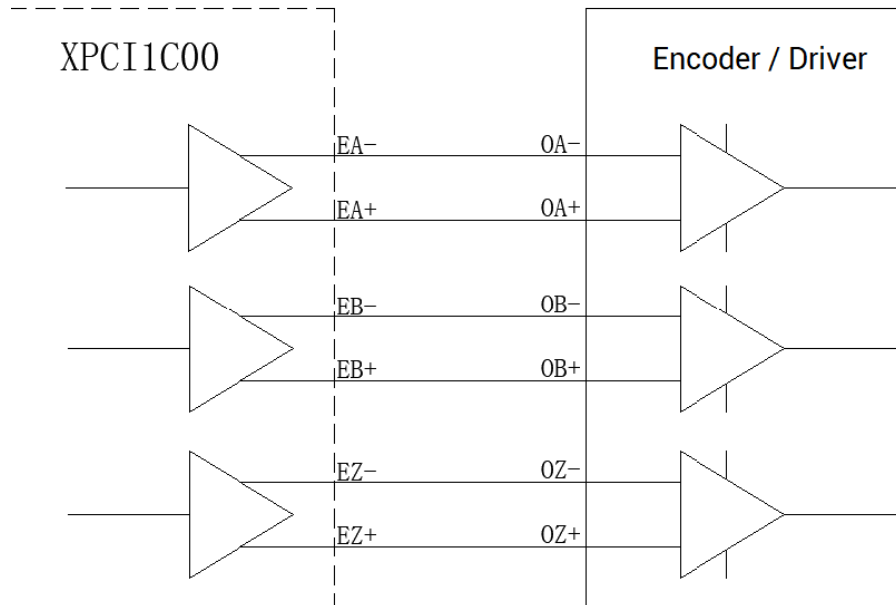
2.   Low-speed encoder 4 wiring reference:
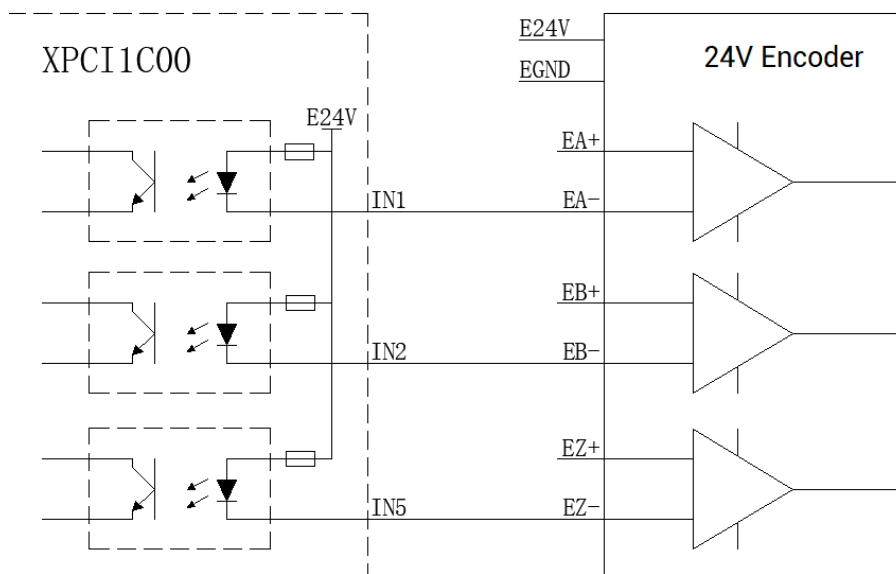
→ **Wiring Note**

● For low-speed encoder, they are input port reuse function.

3.5.2. Basic Usage Method

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

(2)　After powered on, please connect to ZDevelop.

(3)　Set axis parameters, such as, ATYPE, UNITS, SPEED, ACCEL, 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 "ZBasic",
or see "ZDevelop/View/Axis parameter".

Axis Parameters				
Axis select	Parameter select			
	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
FWD_IN	-1	-1	-1	-1
REV_IN	-1	-1	-1	-1
IDLE	-1	-1	-1	-1
LOADED	-1	-1	-1	-1
MSPEED	0	0	0	0
MTYPE	0	0	0	0
NTYPE	0	0	0	0
REMAIN	0	0	0	0
VECTOR_BUFFERED	0	0	0	0
VP_SPEED	0	0	0	0
AXISSTATUS	0h	0h	0h	0h
MOVE_MARK	0	0	0	0
MOVE_CURMARK	-1	-1	-1	-1
AXIS_STOPREASON	0h	0h	0h	0h
MOVES_BUFFERED	0	0	0	0

Axis Parameters | Help | Property |

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

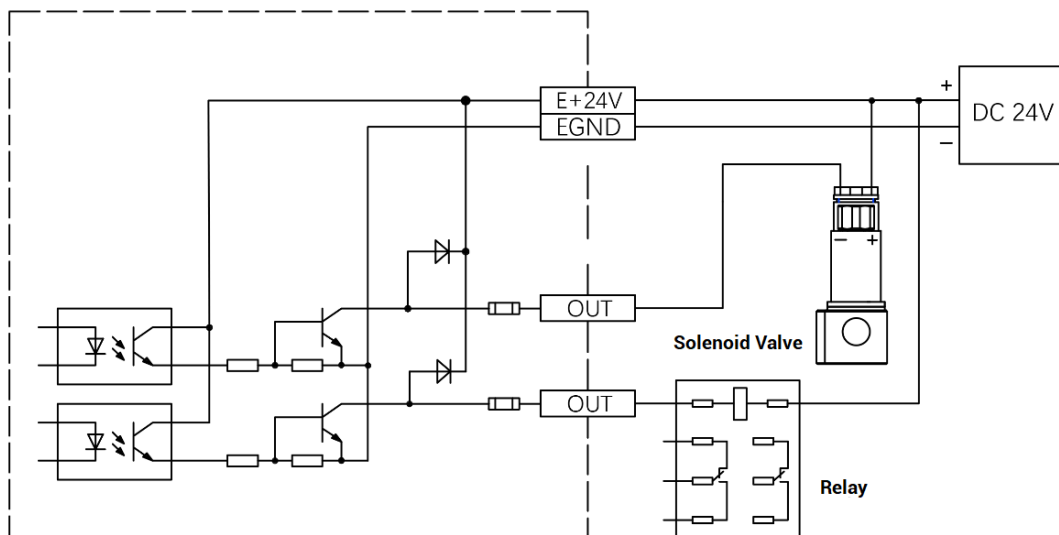## 3.6. IN: Digital Input

Digital inputs are distributed in X300 and X301 signal interfaces.

3.6.1. Digital Input Specification & Wiring

→ Specification

Item	Low-speed input (specialized input) (general input IN0-IN31)
Input method	NPN Leakage type
Frequency	<5kHz
Voltage level	DC24V
Current	4.8mA
Max leakage current when off	25μA
Voltage to open	<14.5V
Min current	1.8mA
Impedance	4.7Ω
Isolation	optoelectronic isolation
The times in the form are typical based on the resistive load, and may change when the load circuit changes.	

→ Wiring Reference

1. specialized input: origin switch signal

Generally, in motion control system, one position sensor needs to be used to set one position reference point, namely, the origin position. Then, it is convenient to control

position precisely.

XPCI1C00 motion control card origin switch signal input circuit:
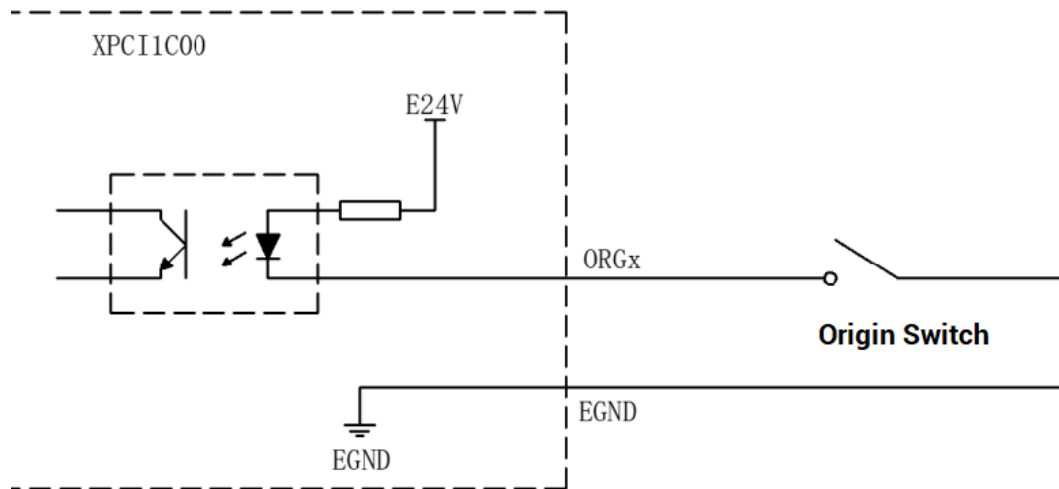
2. specialized input: alarm switch signal

Generally, there is one alarm signal output, and this signal can be read through XPCI1C00.
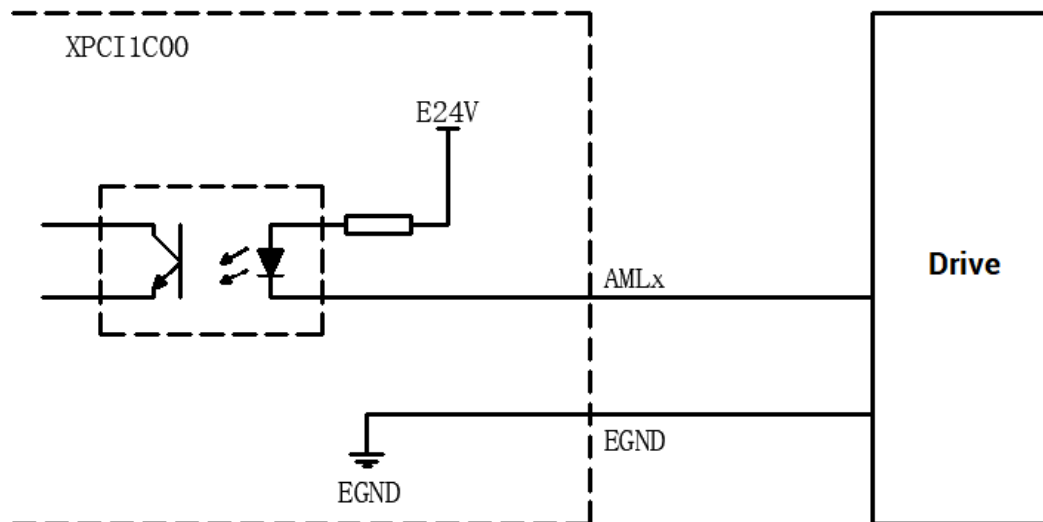
3. specialized input: position limit switch signal

In the motion system, one position sensor is usually used to set a mechanical limit point to determine the boundary position of the motion and protect the mechanical equipment.

Each axis of XPCI1C00 has two position limit signal input ports +EL and -EL. +EL is positive limit signal, -EL is negative limit signal.

The limit switch signal input circuit diagram is shown in the figure.
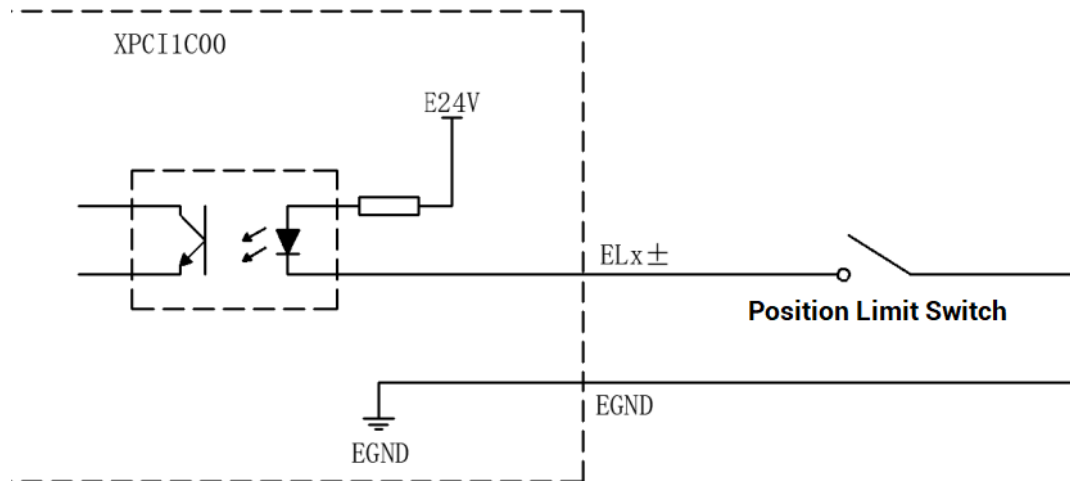
4. general inputs:

XPCI1C00 motion control card provides users with isolated general input signals, which can be used for input signals of switches, sensors or other devices.
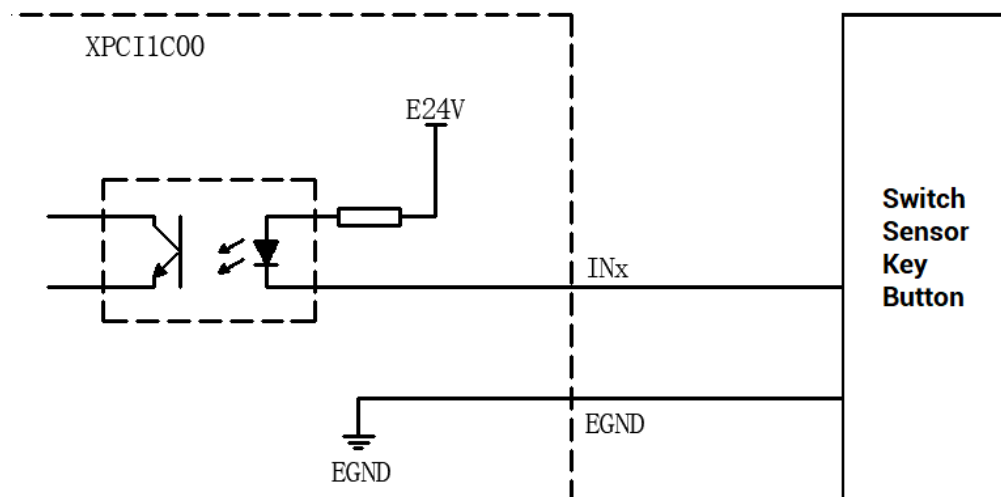
→ Wiring Note

- The valid electric level of EL± signal can be set by software.
- If the limit switch is a normally open switch, it is necessary to set the EL± signal to be valid at low level. When the external mechanical parts touch the limit switch, the switch is closed, EL± is valid, and the mechanical parts are prohibited from continuing to move in the original direction.
- If the limit switch is a normally closed switch, it is necessary to set the EL± signal to be valid at high level. When the external mechanical parts touch the limit switch, the

switch is disconnected, EL± is valid, and the mechanical parts are prohibited from continuing to move in the original direction.

3.6.2. Position Sensor & Signal Distribution

The X300 and X301 signal interfaces define dedicated IOs, which are used to access signals such as origin, limit, and alarm. The configuration of the sensor can refer to the figure below.
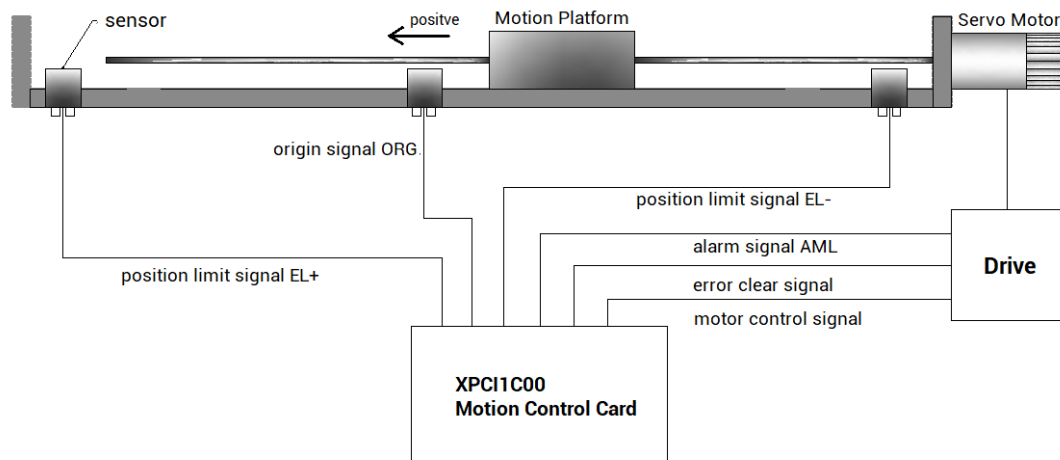
3.6.3. Basic Usage Method

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

2. After powered on, please connect to ZDevelop.

3. State values of corresponding input can be read directly through "IN" command, or they can be checked through "ZDevelop/View/In".

3.7. OUT: Digital Output

Digital outputs are distributed in X300 and X301 signal interfaces.

3.7.1. Digital Output Specification & Wiring

→ Specification

Item	Low-speed output (general input OUT0-OUT27)
Output method	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	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 8HKz. 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 input IN (0-27) is shown in the figure above. The external signal source can be an optocoupler, a relay or a solenoid valve 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 negative pole of DC power supply of 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.

3.7.2. 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.

3.8. DIP Switch

This product has several DIP switches.

3.8.1. Differential/Single-ended DIP Switch

→ DIP Switch Appearance
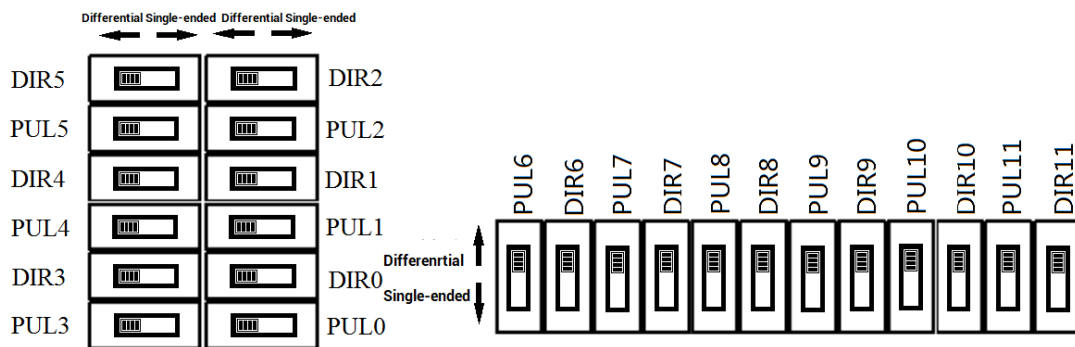
→ Usage Description

It is one switch to select to set the pulse output mode as differential or single-ended output mode. "Differential" position is dialed, which means differential output mode is selected, "Single-ended" position is dialed, which means singled-ended output mode is selected.

Default is differential output mode.

→ Note

● PUL and DIR of each axis must be dialed consistently, and DIP switch of each axis are independent.

3.8.2. S200 DIP Switch

→ DIP Switch Appearance
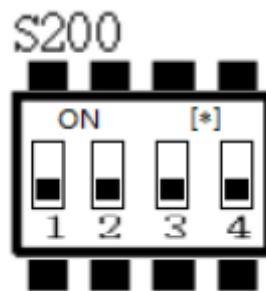
→ Usage Description

4 DIP Switch (1-4) of S200 is the selection switch of initialization electric level when power on of OUT0-OUT31, "1" corresponds to initial high level, "0" corresponds to initial low level.

Set Bit 1 of S200 as ON: OUT0-OUT9 reverse, OUT initial state is 0, IN initial state is 1, the DIP value is 16.

Set Bit 2 of S200 as ON: OUT10-OUT19 reverse, OUT initial state is 0, IN initial state is 1, the DIP value is 32.

Set Bit 3 of S200 as ON: OUT20-OUT31 reverse, OUT initial state is 0, IN initial state is 1, the DIP value is 64.

Set Bit 1 of S200 as ON: OUT initial state is 0, IN initial state is 1, the DIP value is 1.

Chapter IV Accessories

When XPCI1C00 is used, following accessories are needed. It will be equipped with standard accessories from the factory, and users can also purchase optional accessories according to their needs.

4.1. Standard Accessories

→ Cable

The cable is used to connect ACC-1C00 adapter board and signal interfaces (X300 & X301), and VHDC168-100 (length is 1m) or VHDC168-200 (length is 2m) can be selected. VHDC168-100 is configured by default.

VHDCI68-pin male head is fully connected to SCSI68 male head, one-to-one correspondence, with shielding.

→ Wiring Board

Two ACC-1C00 wiring boards are equipped as standard, please refer to 3.2.1 ACC-1C00 wiring board description for specific parameters.
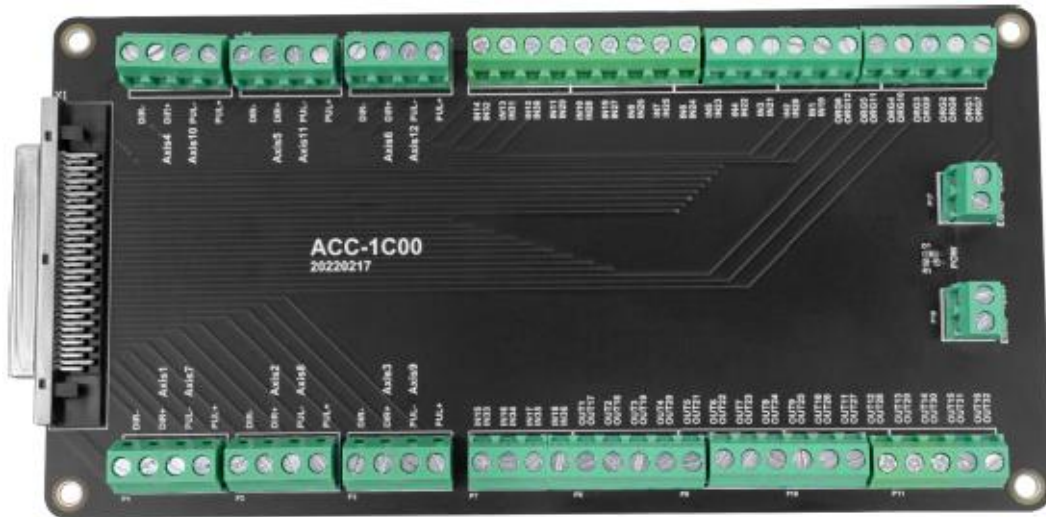
4.2. Optional Accessories

When the user needs to use the encoder, it supports the expansion of the four-axis differential encoder.

→ Adapter Cable

The 40P socket of the control card can be converted to DB37 through the ZP72-02 conversion cable, and can be installed on the card slot of the industrial computer for easy wiring.

CH2 is connected with X302.
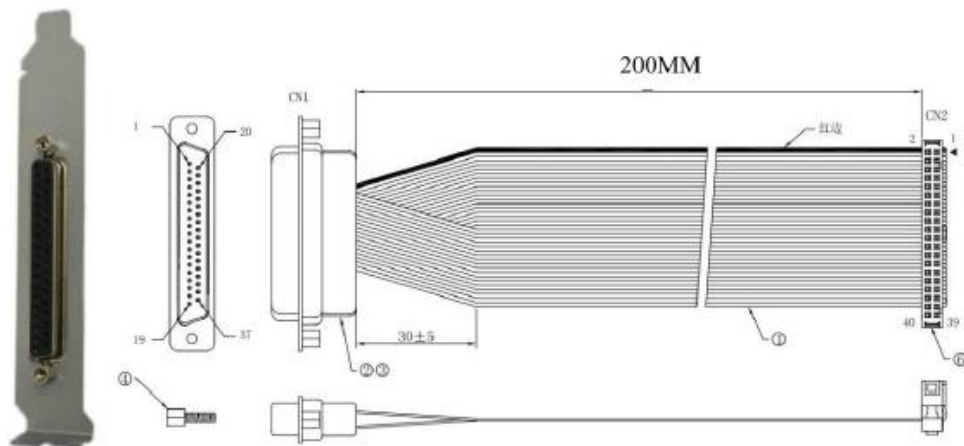
→ Cable

Connect the DB37-150 adapter cable to the interface board, which is convenient for users to install and connect the interface board.

37-pin male-to-male full contact, one-to-one correspondence, shielded.

The cable length is 1.5 meters.

→ Wiring Board

Please refer to 3.3.1 EXDB37M-37 wiring board description for specific parameters.
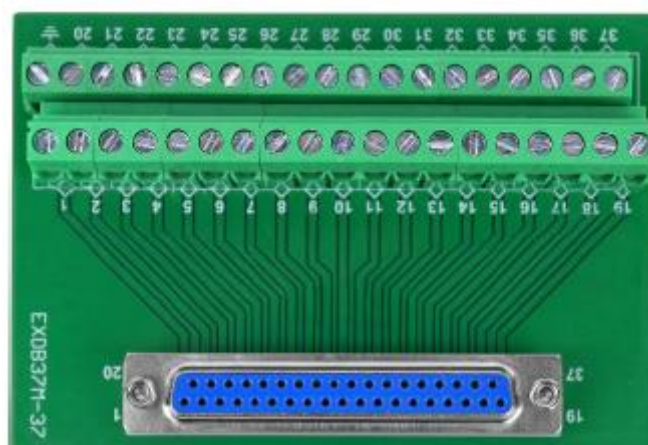
Chapter V Installation

5.1. XPCI1C00 Installation

Install steps:

1. Turn off the power to the computer.

2. Open the computer case, select a free PCI card slot, and use a screwdriver to remove the corresponding baffle strip.

3. Insert the motion control card into the slot securely, and tighten the fixing screws on the baffle strip.

4. Remove a baffle bar adjacent to the slot, and fix the adapter board on the slot of the chassis with screws.

5.2. Drive Program Installation

It is used with the card.

Method 1: install automatically

Use the built-in installation wizard software dpinst_amd64.exe in the driver directory to automatically install, and the specific operation is according to the software guide.
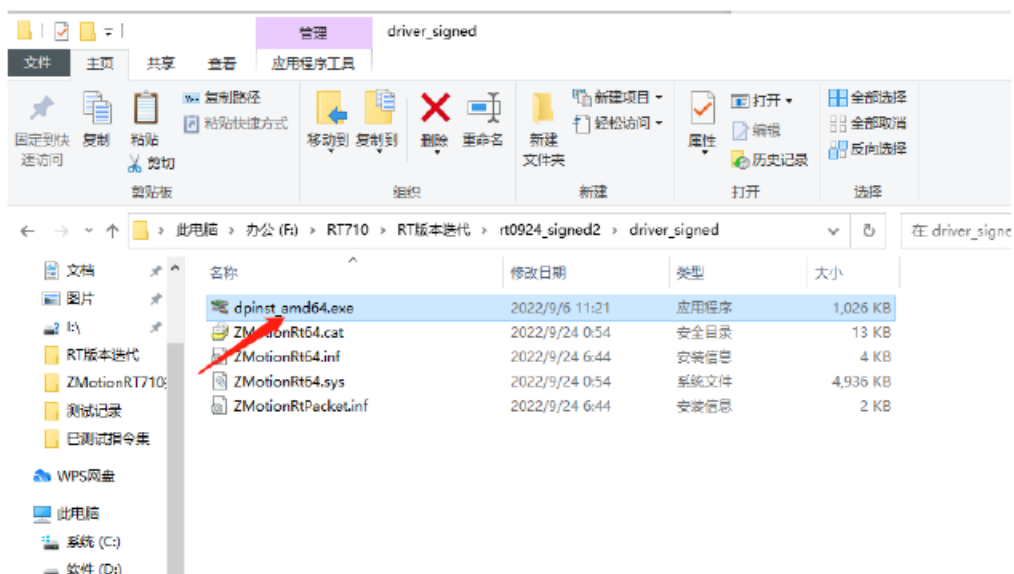
Note: If there is no PCI device, the software cannot be installed successfully, only the ZMotionRT64.sys file can be installed! !

Method 2: install manually

1. Open the Device Manager menu and select the PCI device in Other Devices.
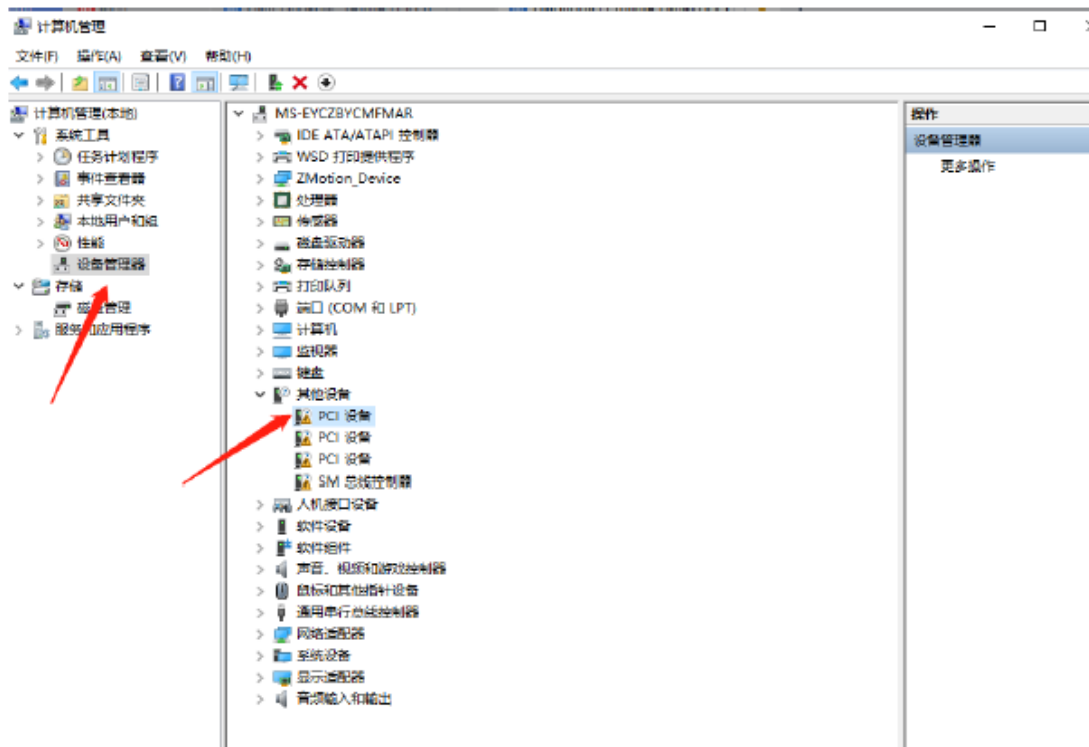
2. If there are multiple PCI devices, right-click "Properties" to view detailed information, select "Hardware ID" for properties, and confirm that it is a PCI device starting with PCI\VEN_EF34&DEV_1000&.
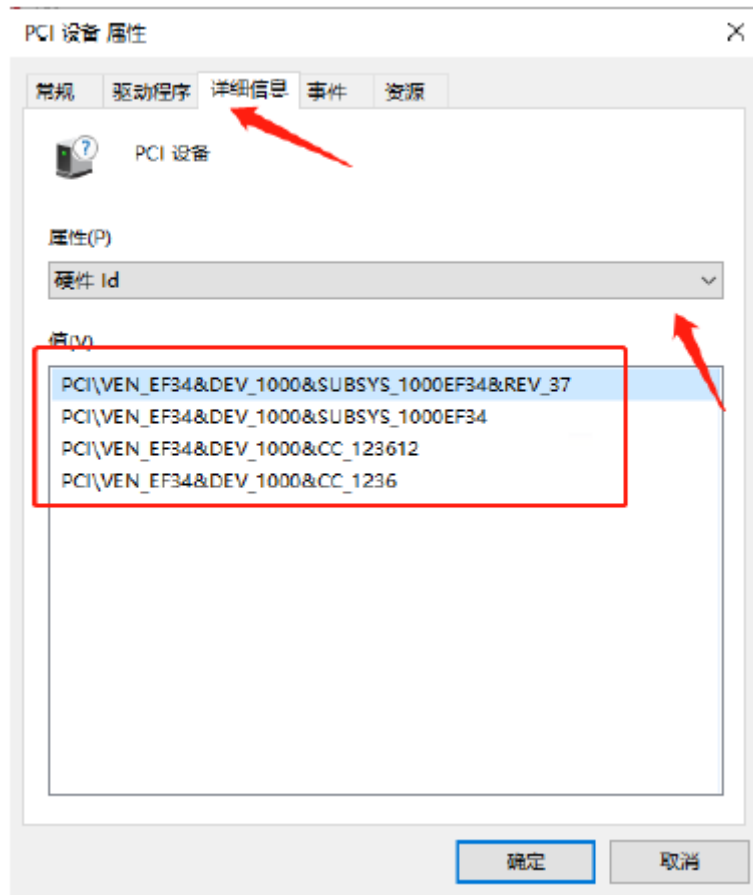
3. Find PCI Device, right-click to select "update drive program".
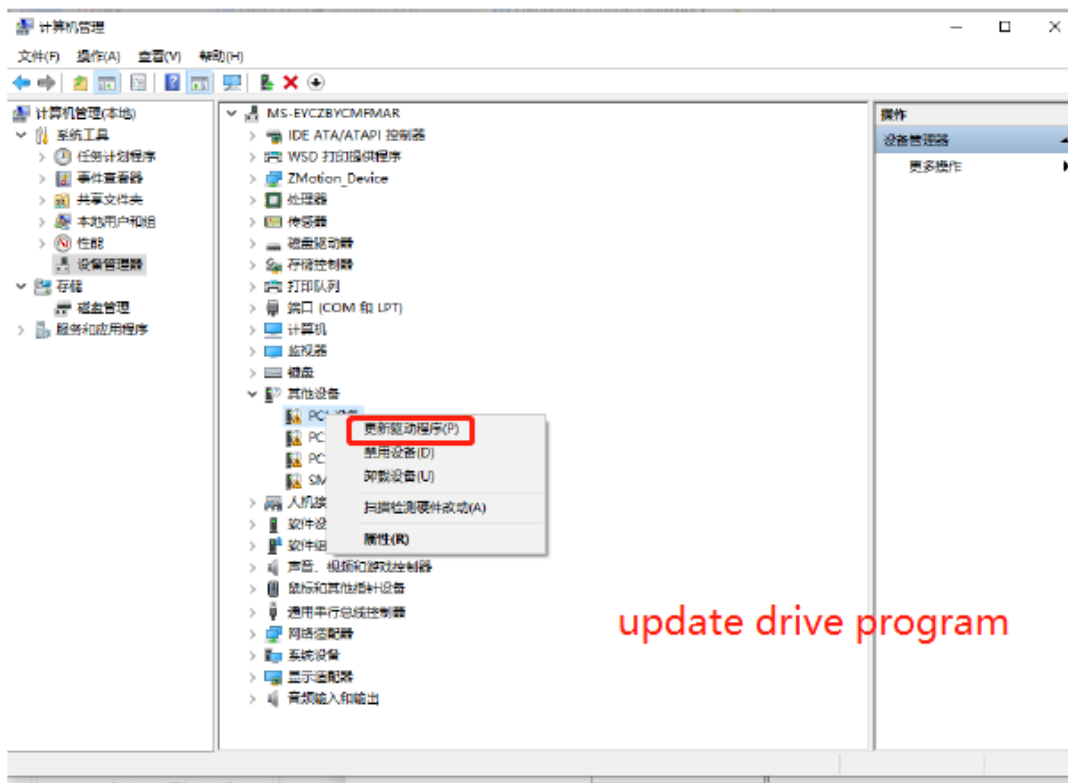
4. Select "browse my PC to check drive program".
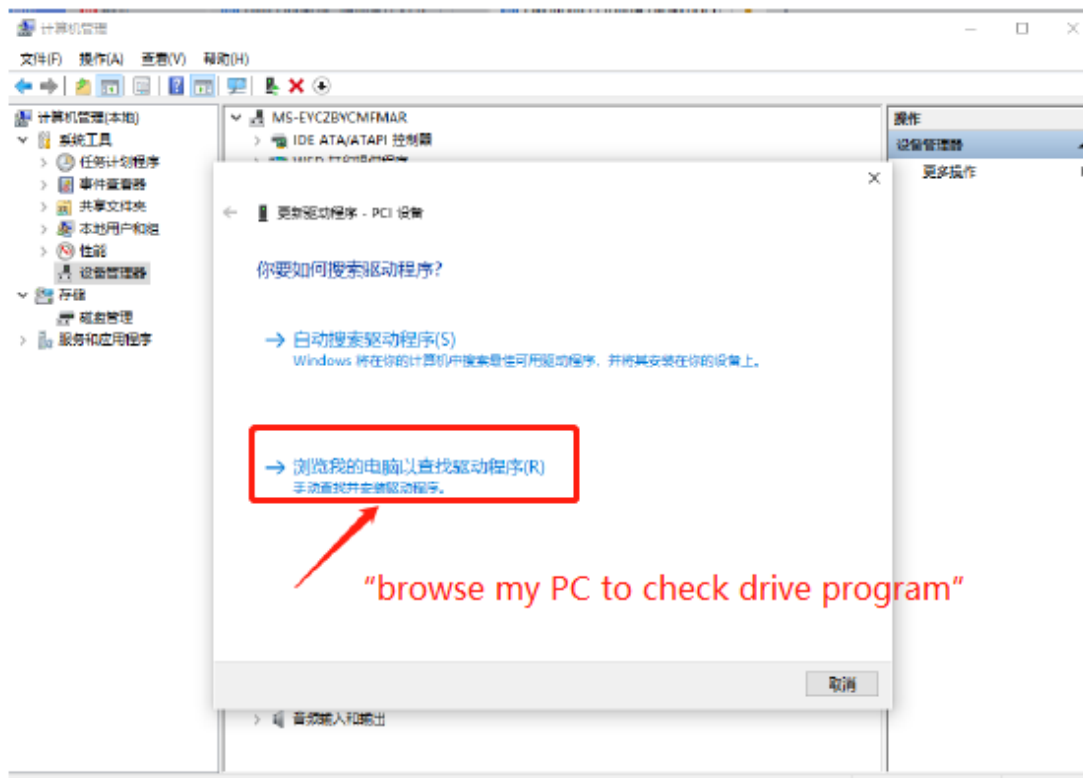
5. Click "browse", and select driver folder.
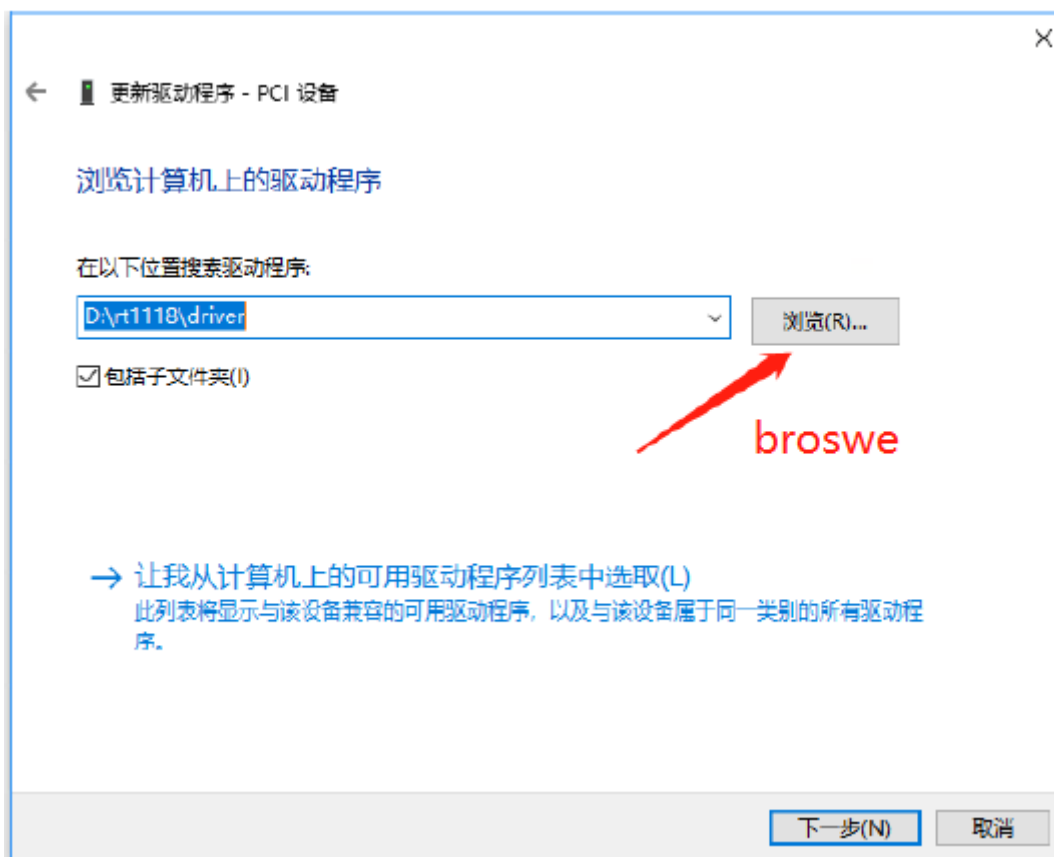
6. Click "next step".

7. Wait until installed, click close.
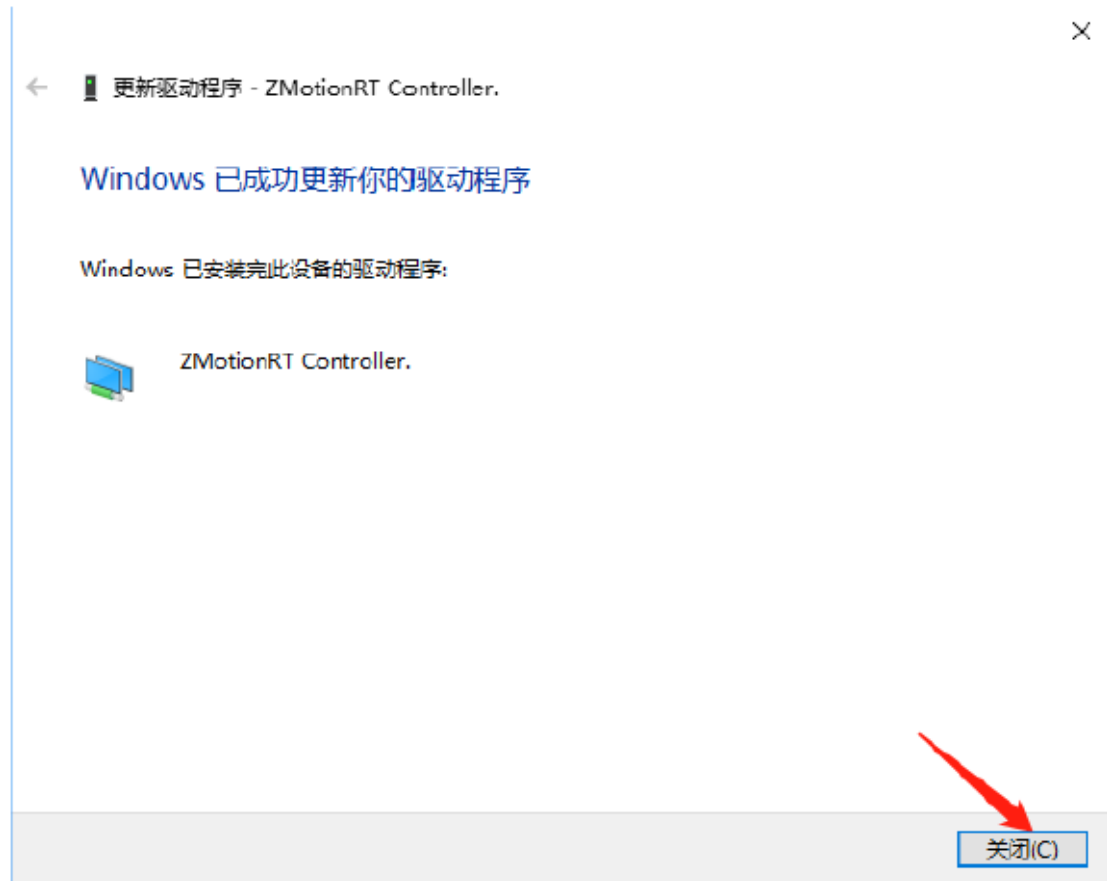
8. If there is ZMotionRTController in the device manager, the installation is successful.
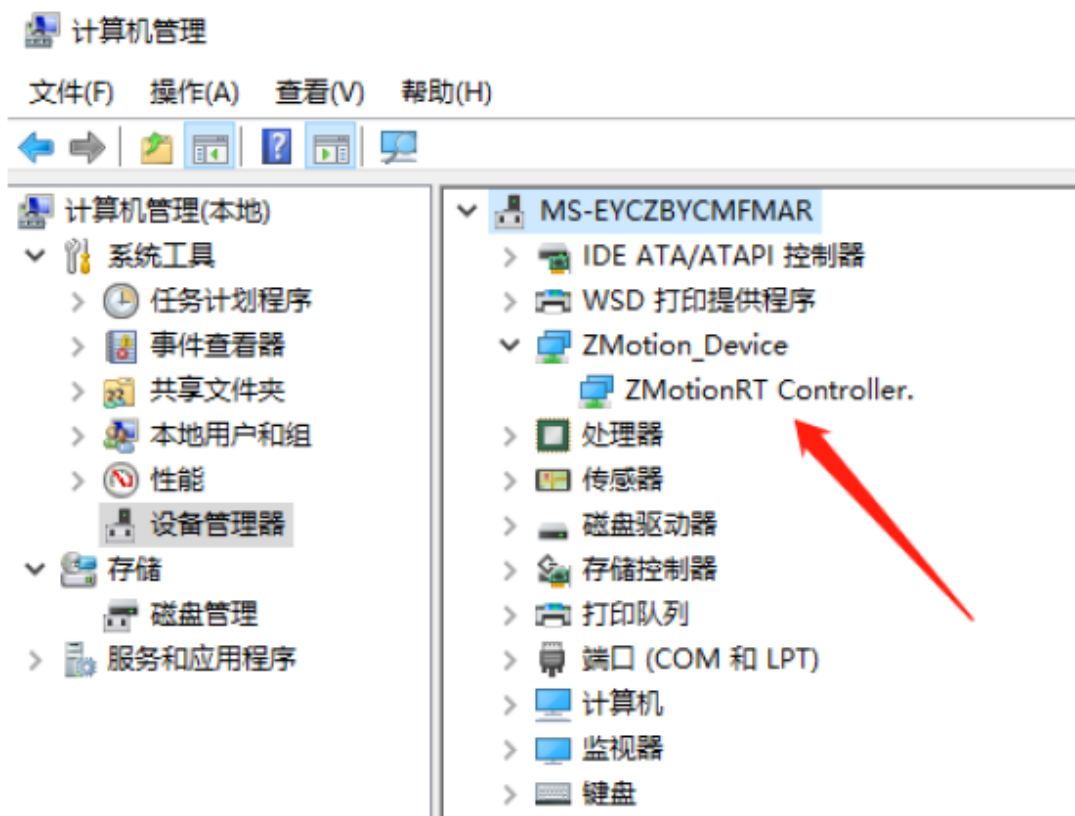
5.3. Ordinary Network Card Install EtherCAT Bus Protocol

MotionRT710 supports the ETHERCAT network port of XPCIE, and also supports the common network port of the computer as ETHERCAT.

1. On the Windows network connection interface, select the network port that needs to be used as the bus, right-click Properties->Installation->Protocol->Add.
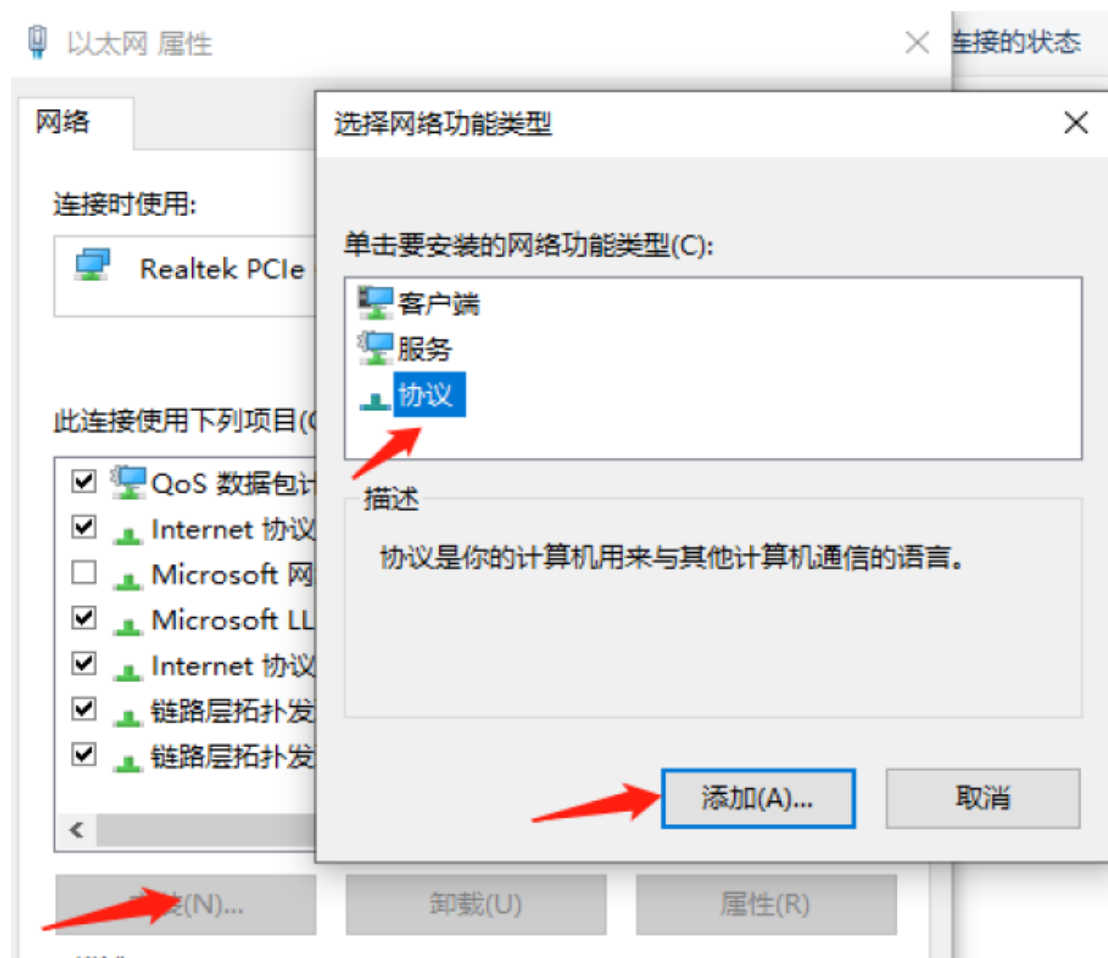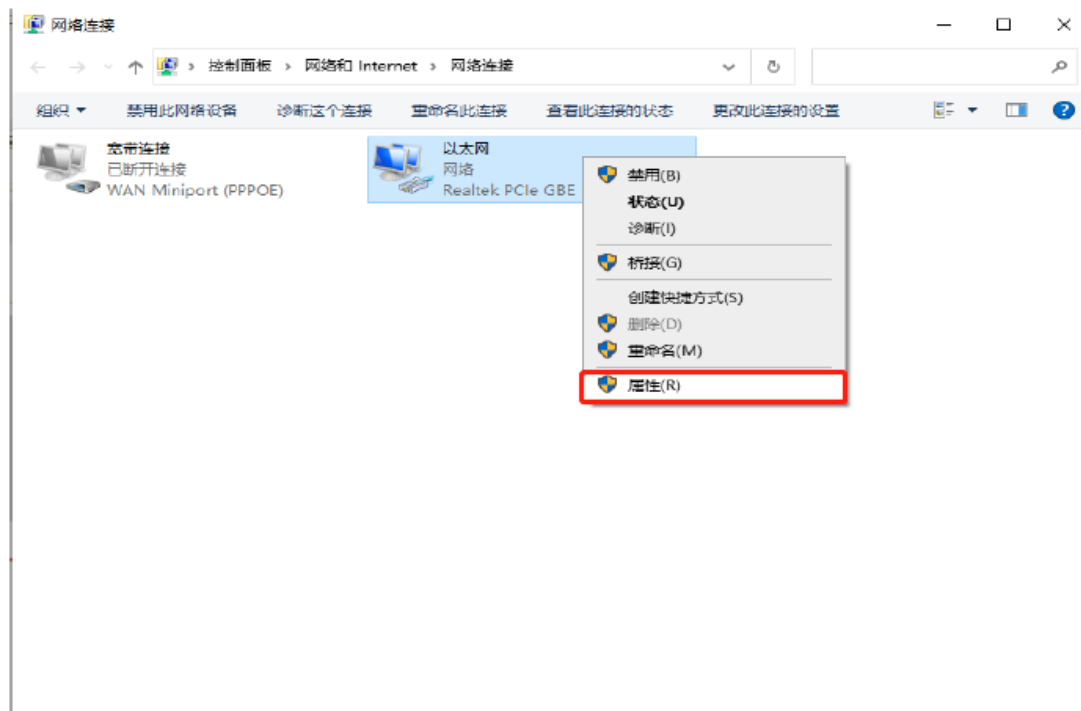
2. Select "installation from disk".
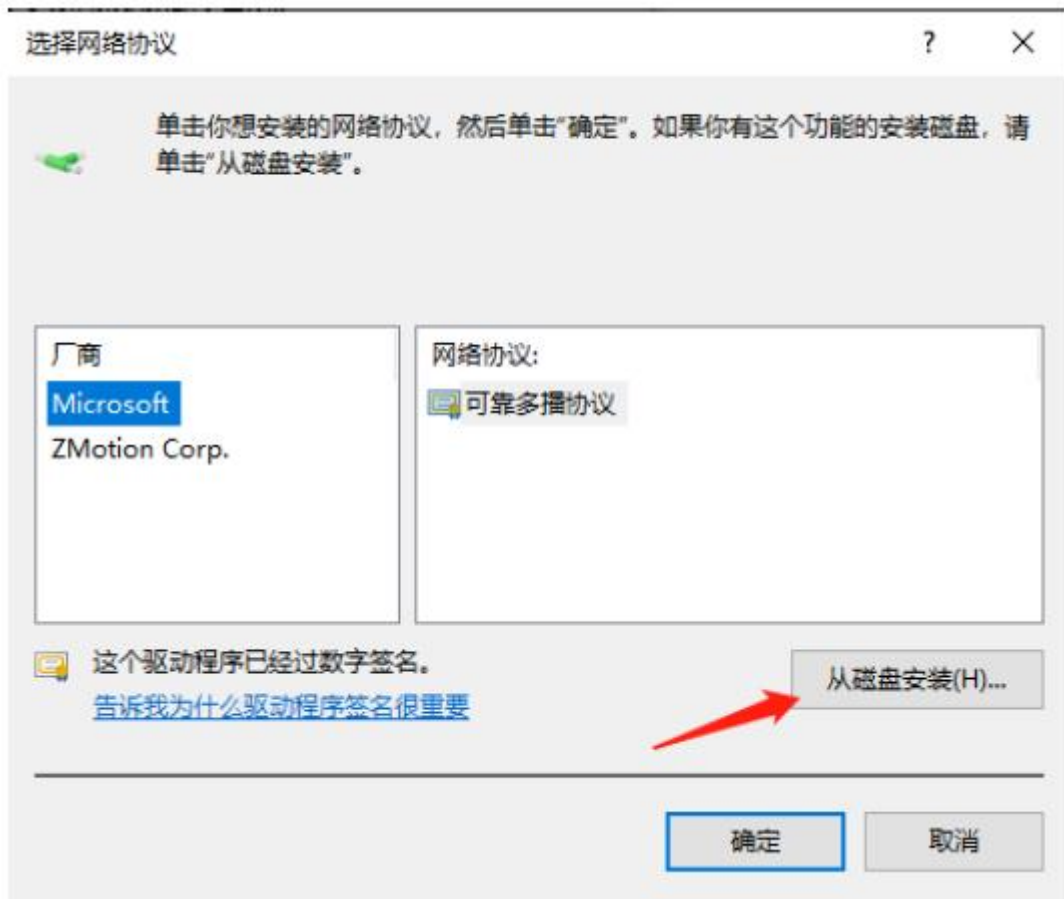
3. Brower drive position, select "ZMotionRtPacket.inf".
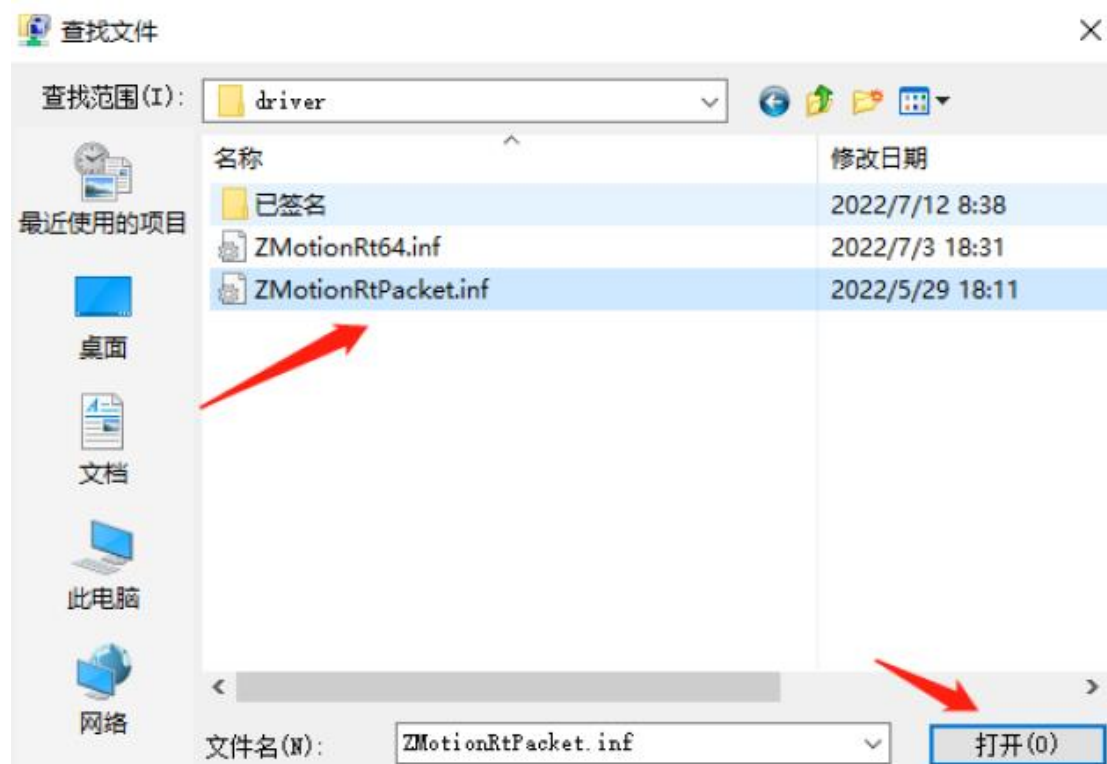
4. Click "ok".

Note: The installation wizard software cannot install this agreement! !

If there is ZMotionRT64PacketProtocolDriver in the properties, it means the installation is successful, and you can add the corresponding network port bus protocol if you check it. The network port that does not connect to the device can be unchecked here.
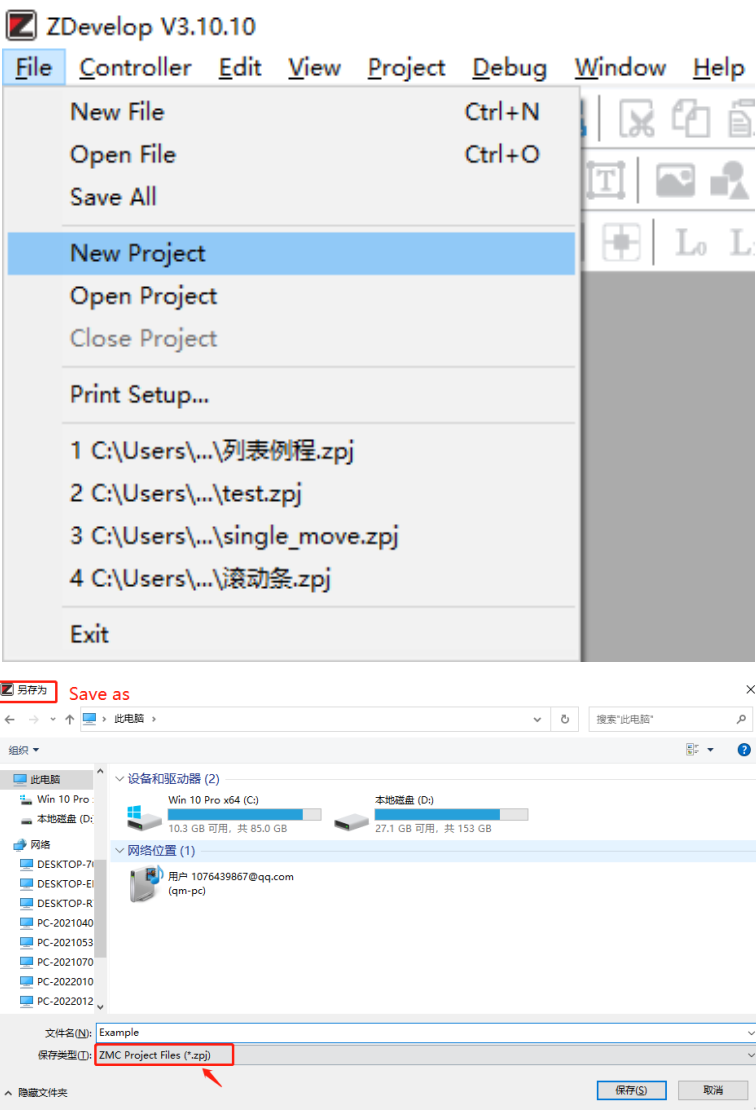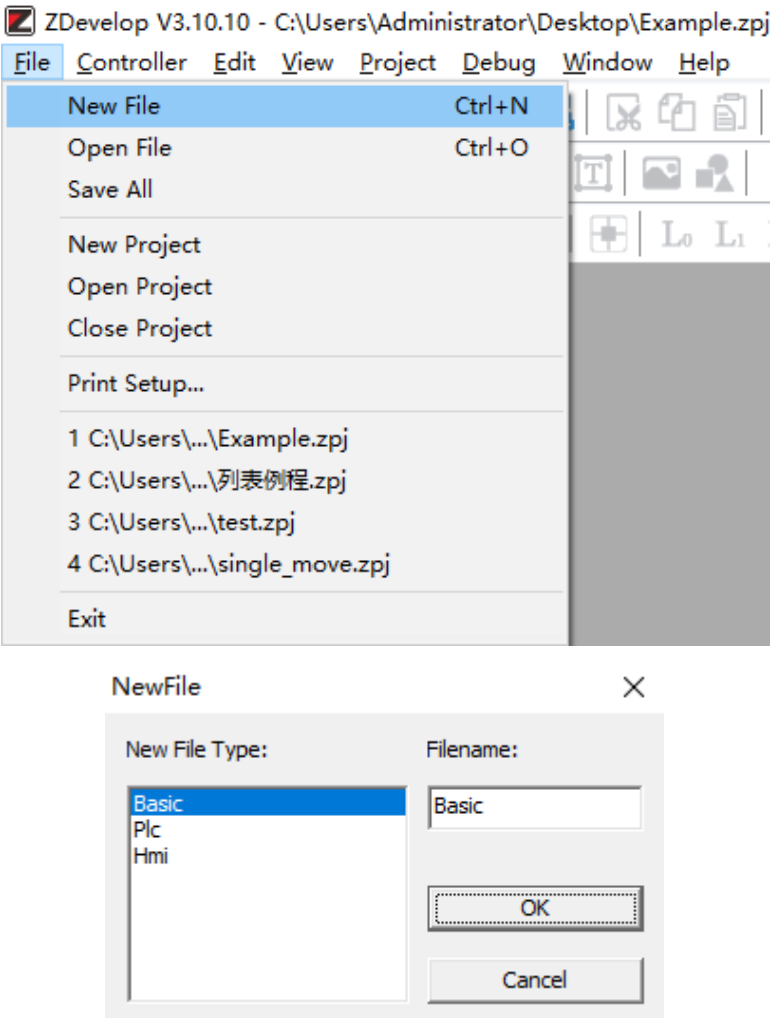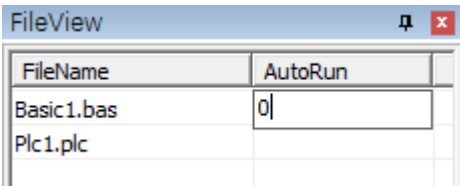
Chapter VI Program & Applications
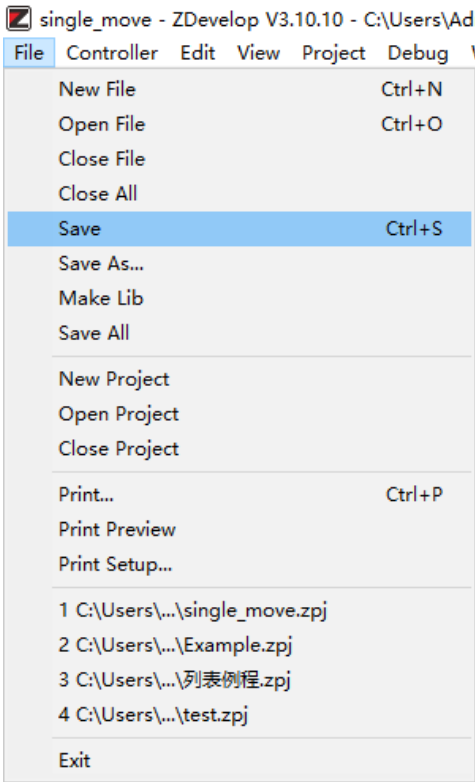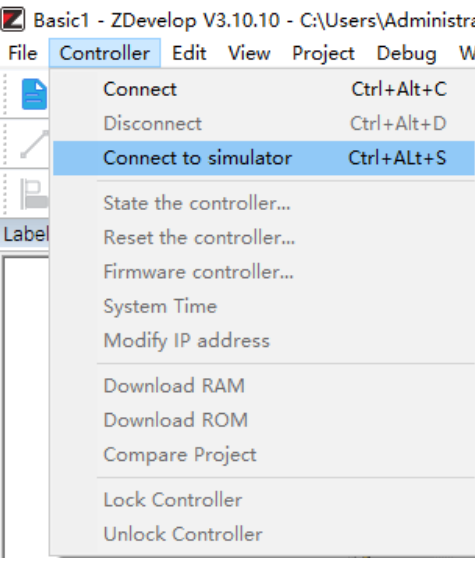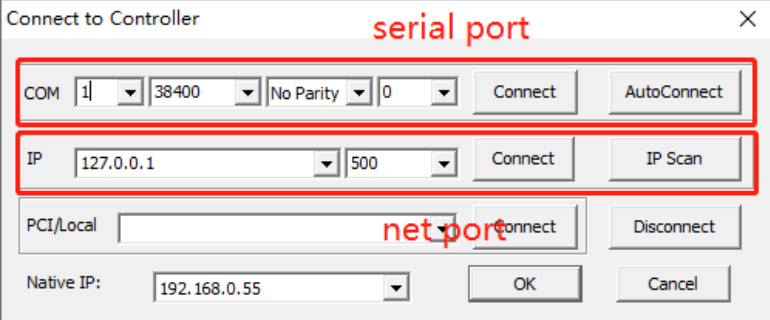
6.1. ZDevelop Software Usage
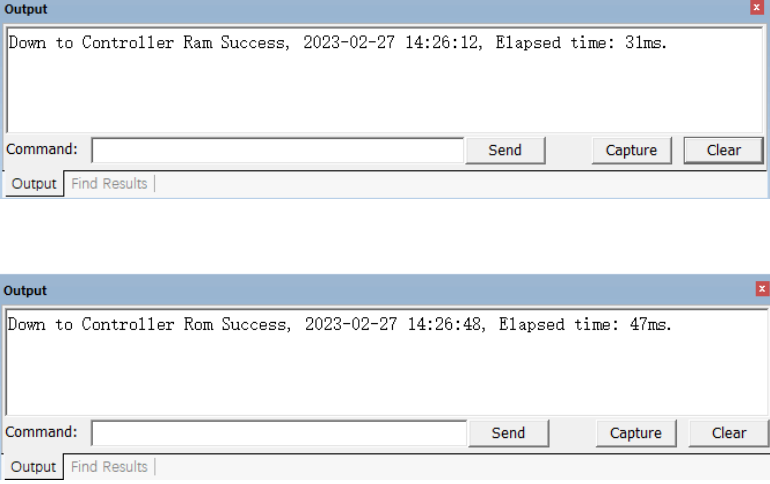
ZDevelop is a PC-side program development, debugging and diagnostic software for the ZMoiton series motion controllers of Zmotion Technology. Through it, users can easily edit and configure the controller program, quickly develop applications, diagnose system operating parameters in real time, and watch the motion controller. The running program is debugged in real time and supports Chinese and English bilingual environments.
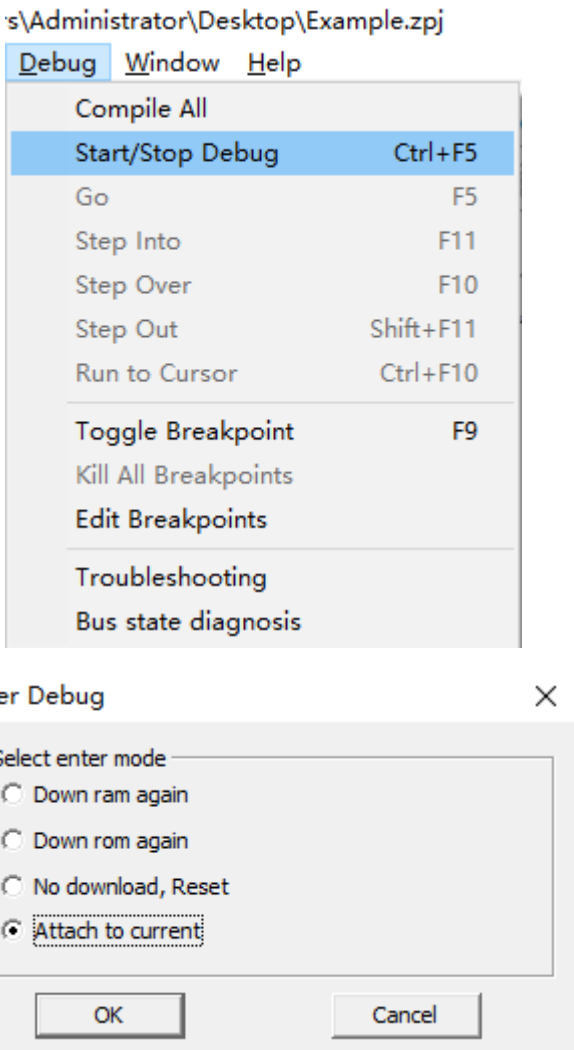
ZBasic, ZPLC and ZHMI can run multi-tasks, and ZBasic can run multi-tasks, and can be mixed with ZPLC and ZHMI.
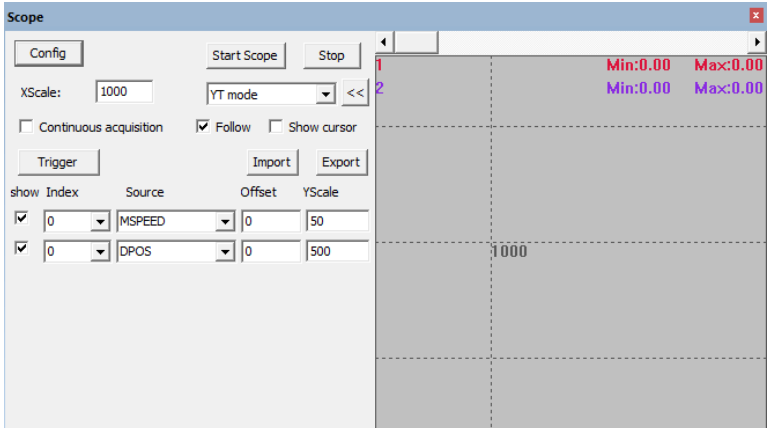
Step	Operations	Display Interface
1	Open ZDevelop, click "File" – "New Project", Save as window will pop up, then enter file name, save the project file with suffix "zpj.".	

2	Click "File" – "New File", select file type to build, here select Basic, click "OK".	
3	Double click "AutoRun", enter task number 0.	

4	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.	
5	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".	
6	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.	**Output** [x] Down to Controller Ram Success, 2023-02-27 14:26:12, Elapsed time: 31ms. Command: [ ] Send Capture Clear Output Find Results **Output** [x] Down to Controller Rom Success, 2023-02-27 14:26:48, Elapsed time: 47ms. Command: [ ] Send Capture Clear Output Find Results

| 7 | Click "Debug" – "Start/Stop Debug" to call "Task" and "Watch" window, because it was downloaded before, here select "Attach the current". | s\Administrator\Desktop\Example.zpj

Debug Window Help
Compile All
Start/Stop Debug   Ctrl+F5
Go   F5
Step Into   F11
Step Over   F10
Step Out   Shift+F11
Run to Cursor   Ctrl+F10
Toggle Breakpoint   F9
Kill All Breakpoints
Edit Breakpoints
Troubleshooting
Bus state diagnosis

Enter Debug   ×
Select enter mode
○ Down ram again
○ Down rom again
○ No download, Reset
◉ Attach to current
OK   Cancel |
| 8 | Click "View" – "Scope" to open oscilloscope. | Scope |

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

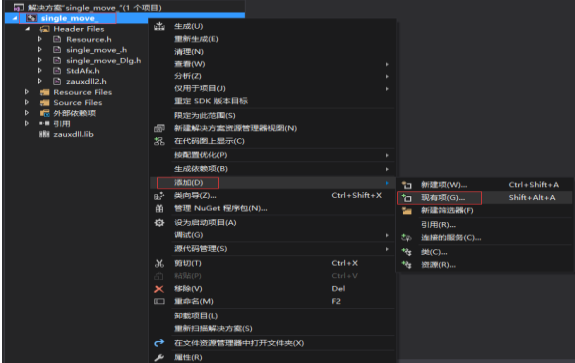# 6.2. PC Upper-Computer Program Application

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".

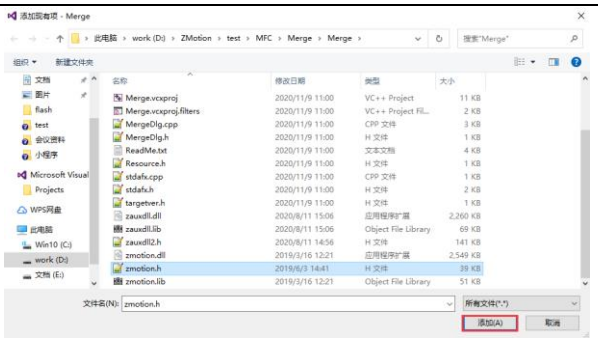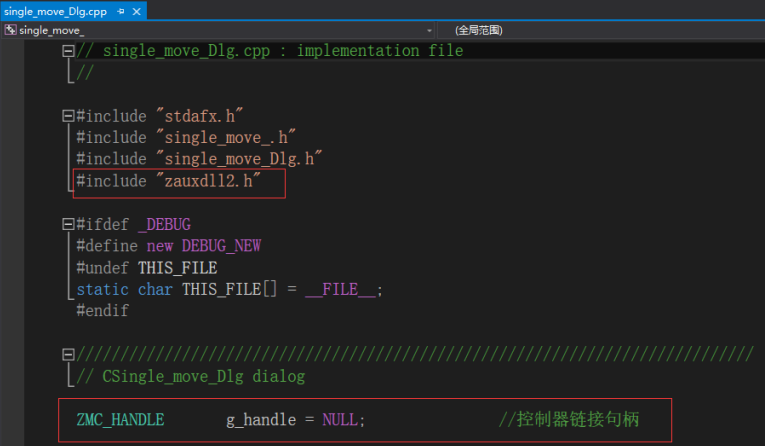The program developed using the PC software cannot be downloaded to the controller, and it is connected to the controller through the dll dynamic library. The dll library needs to be added to the header file and declared during development.

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

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

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.	
6	Add a static library and related header files to the project. Static library: zauxdll.lib,	1) Right-click the header file first, and then select: "Add" → "Existing	

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

Chapter VII Run and Maintain

The correct operation and maintenance of the motion controller 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.

7.1. Regular Inspection and Maintenance

The working environment has an impact on the controller. Therefore, it is usually inspected regularly based on the inspection cycle of 6 months to 1 year. The inspection cycle of the motion controller 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 ℃ -60 ℃
	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 controller 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

7.2. Common Problems

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

invalid.	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 ZDevelop 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.