

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

EtherCAT Laser Galvanometer Motion Controller

ZMC408SCAN-V22



This manual is mainly for ZMC408SCAN-V22, ZMC408SCAN-V22-IFOV.



Vision Motion Controller



Motion Controller



Motion Control Card



IO Expanion Module



HMI

Statement

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

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Notes

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

Danger

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

Notes

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

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Chapter I Production Information

ZMC408SCAN-V22 is a kind of high-performance fieldbus dual-SCAN motion controller launched by Zmotion. It integrates 2 100M ethernet ports, and it supports EtherCAT, ETHERNET, CAN, RS232, RS485, 24 general digital inputs, 20 general digital outputs, 2 general analog inputs, 2 general analog outputs, 4 local differential pulse axes, 1 MPG handwheel encoder interface, 2 SCAN interfaces with feedback, 1 LASER interface (specialized for laser), and 1 FIBER laser interface.

ZMC408SCAN-V22 bus controller supports EtherCAT bus connection, the fastest refresh cycle is 500µs. It supports maximum 16-axis motion control, then it achieves linear interpolation, any circular interpolation, space arc, helical interpolation, electronic cam, electronic gear, synchronous follow, virtual axis setting, etc. And real-time motion control can be achieved through optimized network communication protocol.

One Computer can link with up to 256 ZMC controllers at the same time.



1.1. System Connection

ZMC408SCAN-V22 supports ETHERNET, EtherCAT, USB, CAN, RS485, and RS232 communication interfaces. And it can connect to expansion modules to extend digital IO, analog IO, or motion axis by CAN or EtherCAT.

1.2. Programming

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ZMC408SCAN-V22 can be debugged through <u>RTSys</u> development environment, which is very convenient to program, compile, and debug. And RTSys connects to controller through RS232, RS485, ETHERNET.

What's more, application program can be developed through VC, VB, VS, C++Builder, C#, etc., while debugging, it also can connect RTSys and controller at the same time. Please note, while running, it needs dynamic library Zmotion.dll.

RTSys supports Chinese and English, more details, please refer to Chapter IV.

1.3. Function Features

- Motion control of up to 16 axes. (EtherCAT axis/encoder axis/virtual axis)
- 4 AXIS interfaces support encoder position measurement, which can be configured as handwheel input mode.
- There is 1 MPG handwheel encoder interface that supports 5-24V handwheel input.
- There are 24 leakage digital inputs, among them, 4 channels are high-speed inputs,
 20 channels are low-speed inputs. Then, these 4 high-speed inputs can be configured as latch signals.
- There are 20 leakage digital outputs, among them, 4 are high-speed outputs, which can be configured as high-speed comparison, and PWM function, other 16 outputs are low-speed digital outputs, the max output current can reach 300mA, which can drive some solenoid valves directly.
- 1 100M EtherCAT interface, 4096 isolated inputs and 4096 isolated outputs can be expanded at most through EtherCAT protocol.
- 1 USB interface is used for storage.
- 1 RS485, 1 RS232, 1 CAN and 1 100M ETHERNET interface support multi-expansion applications.
- 2 12-bit voltage type analog outputs, output measuring range is 0-10V. 2 12-bit voltage type analog inputs, input measuring range is 0-10V.
- 2 SCAN galvanometer interfaces support XY2-100 protocol, and supports galvanometer feedback.
- 1 "LASER" laser interface supports IPG, YLR, YLS and other laser power supplies.
- There is 1 "FIBER" laser interface.
- Support up to 16 axes for linear interpolation, any space circular interpolation, helical interpolation, and spline interpolation.
- Support electronic cam, electronic gear, position latch, synchronous follow, virtual axis, etc.
- Support hardware comparison output (HW_PSWITCH2), hardware timer and precision output in motion.

- Support pulse closed loop, pitch compensation.
- Support multi-file and multi-task programming in Basic.
- A variety of procedure encryption methods to protect the intellectual property rights of customers.
- Support power failure detection and power failure storage.

1.4. Hardware Installment



 \rightarrow Unit: mm

 \rightarrow Mounting Hole Diameter 4.5mm

Chapter II Product Specification

2.1. Basic Specification

ltem	Description
Model	ZMC408SCAN-V22
Axes	8 (4 pulse axes + 4 SCAN axes)
Max Extended Axes	16 (the number of axes relates to system period and
	galvanometer period)
Type of basic axes	EtherCAT/local pulse axes, SCAN axes
Internal IO	24 inputs and 20 outputs (with overcurrent protection),
	there are another 2 general inputs and 2 general outputs
	on each axis terminal, which can do alarm, enable, on-
	position, error clearing, etc.
Max extended IOs	Up to 4096 inputs and 4096 outputs
PWM	4 (general digital outputs OUT0~OUT3) + 4 (specialized
	laser interface, OUT8, OUT9, OUT44, OUT45)
Internal AD/DA	2 general ADs and 2 general DAs. For special modes, it can
	custom 1 specialized laser AD and 1 specialized laser DA.
Max extended AD/DA	1024
Pulse Bits	64
Encoder Bits	64
Speed/Acceleration bits	64
Max pulse frequency	10MHz
Axis motion buffer	4096 (the number of buffers relates to system cycle)
Array Size	2,560,000
Procedure space	128MByte
Flash Space	256MByte
Power Input	24V DC input, IO ports are not included.
Communication	RS232, RS485, Ethernet, USB drive, CAN, EtherCAT
Size	235mm*149mm*37mm

2.2. Nameplate & Models



Model	Description
71.40.40000.4.1	8 axes: 4 pulse axes + 4 scan axes
2101040630AIN-	Motion control functions: point motion (jog), electronic cam, linear,
VZZ	circular, continuous interpolation, robot algorithm
71404095041	4 axes: 2 pulse axes + 2 scan axes
ZIVIC4083CAIN-	Motion control functions: point motion (jog), electronic cam, linear,
4-122	circular, continuous interpolation, robot algorithm
71404095041	Motion control functions: point motion (jog), electronic cam, linear,
	circular, continuous interpolation, robot algorithm + "unlimited
VZZ-IFUV	view linkage library".

2.3. Usage Environment

Item	Parameters
Work Temperature	0 – 60°C (32°F - 140°F)
Work Relative Humidity	5%-90% non-condensing

2.4. Interface Definition



\rightarrow Interface Description

Mark	Interface	Number	Description
POW		1	Indicate power state: it is ON when power is
			connected.
DUN	Otata Indiantian Lad	1	Indicate motion state: it is ON when it runs
KUN	State indication Led	I	normally.
		1	Indicate error: it is ON when it runs
ALM		1	abnormally.
RS232	RS232 serial port (port0)	1	Use MODBUS_RTU protocol
RS485	RS485 serial port (port1)	1	Use MODBUS_RTU protocol

			EtherCAT bus interface, connect to EtherCAT
EtherCAT	EtherCAT bus interface	1	bus drive and EtherCAT bus expansion
			modules
			Use MODBUS_TCP protocol, expand the
			number of network ports through the
ETHERNET	Network port	1	interchanger, and the number of net port
			channels can be checked through "?*port"
			command, default IP address is 192.168.0.11
UDISK	U disk interface	1	Insert U disk equipment
E:04)/	Marin a succession and a	1	24V DC power, it supplies the power for
E+24V	Main power supply	I	controller.
0.111		_	Connect to CAN expansion modules and
CAN	CAN bus interface	I	other standard CAN devices.
			NPN type, the power is supplied by internal
IN	Digital IO input port	24	24V power supply. There are 4 high-speed
			inputs, and IN0-3 have the latch function.
			NPN type, the power is supplied by internal
	Digital IO output port	20	24V power supply. There are 4 high-speed
001			outputs, OUT0-3 support PWM, precision
			output, PSO functions.
AD	Analog input port	2	12-bit resolution, 0-10V.
DA	Analog output port	2	12-bit resolution, 0-10V.
			It includes differential pulse output and
AXIS	Pulse axis interface	4	differential encoder input.
MPG	Handwheel interface	1	5-24V handwheel signal input
		_	Laser galvanometer interface is with
SCAN	Laser galvanometer	2	feedback, use XY2-100 protocol.
			Laser power control interface supports IPG,
LASER	Laser	1	YLR, YLS and other types of laser powers.
FIBER	FIBER laser interface	1	For FIBER type lasers.

2.5. Power & CAN Interfaces

The power supply input adopts a 5Pin (there are all 3 terminals) screw-type pluggable wiring terminal, and the interval (means the gap distance between two ports) should be 3.81mm. This 5Pin terminal is shared by controller power and CAN communication.



2.5.1. Interface Definition

Те	rminal	Name	Туре	Function
			lanut	Negative (-) terminal of DC power
	EGND CANL	EGND	mput	negative of controller)
	EARTH	CHNL	Input/output	CAN communication side L
		EARTH	Earthing	Protection
	L'Z4V	CHNH	Input/output	CAN communication side H
		E+24V	Input	Positive (+) terminal of power input

2.5.2. Power Specification

$\rightarrow \textbf{Specification}$

Item	Description
Voltage	DC24V (-5% ~ 5 &)
The current to open	≤0.5A
The current to work	≤0.4A

Anti-reverse connection	YES
Overcurrent Protection	YES

2.5.3. CAN Communication Specification

Item	Description			
Maximum Communication Rate (bps)	1Mbps			
Terminal Resistor	120Ω			
Topological Structure	Daisy Chain Topology			
The number of nodes can be extended	Up to 16			
	The longer communication distance is, the			
Communication Distance	lower communication rate is, and maximum			
	of 30m is recommended.			

2.5.4. CAN Communication Wiring



\rightarrow 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.

2.5.5. Basic Usage Method

- (1) Please follow the above wiring instructions to wiring correctly.
- (2) After powered on, please use any one interface among the three interfaces (ETHERNET, RS232, RS485) to connect to <u>RTSys</u>;
- (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 "RTSys/Controller/State the Controller/Communication Info" to view the CAN status intuitively, and refer to the "Basic Programming Manual" for details.
- (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.

2.6. RS232/RS485 Serial Port

RS232 and RS485 are integrated in one standard DB9 male socket, and support MODBUS_RTU protocol and custom communication.



RS232

2.6.1. Interface Definition

Terminal	PIN	Name	Туре	Function
	1, 6, 8	NC	Spare	Reserved
	2	232RXD	Input	RS232 (port 0) signal, receive data
	3	232TXD	Output	RS232 (port 0) signal, send data
	4	1051	Input/	PS495 (port1) signal A/+
5	4	40JA	Output	
9	5	EGND	Output	Negative pole output of 5V power, and
	5			output for the public end
9	7	40ED	Input/	DC405 (nort1) signal D(
	(4000	Output	RS485 (port r) signal b/-
	0		Output	Positive pole output of 5V power,
	9	EDV	υτίρας	maximum is 300mA

2.6.2. Communication Specification

ltem	RS232 (port0)	RS485 (port1)		
Maximum Communication Rate	115200bps	115200bps		
Terminal Resistor	No	No		
Topology Structure	Connect correspondingly	Daisy chain structure		

	(1 to 1)			
The number of nodes	1	107		
can be extended	I	127		
	The Longer communication	The Longer communication		
Communication	distance is, the lower	distance is, the lower		
Distance	communication rate is,	communication rate is,		
Distance	maximum 5m is	maximum 30m is		
	recommended.	recommended.		

2.6.3. Wiring Reference



→ Wiring Notes:

- The wiring of RS232 (port0) 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.
- The wiring of RS485 (port1) is above, it is 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 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.

2.6.4. Basic Usage Method

- (1) Please follow the above wiring instructions to wiring correctly.
- (2) After powered on, please use any one interface among the three interfaces ETHERNET, RS232 (there is default parameter, which can be connected directly) and RS485 (there is default parameter, which can be connected directly, but for hardware, adapter head is needed) to connect to RTSys.
- (3) Please use the "ADDRESS" and "SETCOM" commands to set and view the protocol station number and configured parameters, see "Basic Programming Manual" for details.
- (4) According to their respectively instructions, correctly set the relevant parameters of the third-party equipment to match the parameters of each node.
- (5) When all is configured, it can start to do communicating.
- (6) Communication data of RS232 / RS485 can be directly viewed through "RTSys / Controller / State the Controller / CommunicationInfo".

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 delay: 400ms Baud: 38400 DataBits:8 StopBits:1 Parity:0 Port1: (RS485) is ModbusSlave Mode. Address: 1, variable: 2 delay: 400ms Baud: 38400 DataBits:8 StopBits:1 Parity:0

2.7. IN Digital Inputs

The digital input adopts 3 groups of 8Pin (there are 3 groups of 8 terminals) screwtype pluggable terminals, and the gap distance between terminals should be 3.81mm. In addition, the high-speed latch function is integrated in digital input signals.



2.7.1. Interface Definition

Terminal	Name	Туре	Function 1	Function 2		
	IN0		Input 0			
	IN1	NPN type, high-	Input 1	High Speed		
⊨ ● IN2	IN2	speed input	Input 2	Latch		
⊨● IN3	IN3		Input 3			
⊨● IN4	IN4		Input 4	/		
	IN5	NPN type, low-	Input 5	/		
	IN6	speed input	Input 6	/		
	IN7		Input 7	/		
	IN8		Input 8	/		
	IN9		Input 9	/		
	IN10		Input 10	/		
E IN11	IN11	NPN type, low-	Input 11	/		
≍● IN12	IN12	speed input	Input 12	/		
	IN13		Input 13	/		
	IN14		Input 14	/		
	IN15		Input 15	/		
	IN16		Input 16	/		
	IN17		Input 17	/		
	IN18		Input 18	/		
E IN19	IN19	NPN type, low-	Input 19	/		
	IN20	speed input	Input 20	/		
	IN21		Input 21	/		
	IN22		Input 22	/		
	IN23		Input 23	/		

2.7.2. Digital Input Specification & Wiring

ltem	High-Speed Input (IN0-3)	Low-Speed Input (IN4-23)					
Input mode	NPN type, the input is trig	ggered by low-electric level					
Frequency	< 100kHz	< 5kHz					
Impedance	3.3ΚΩ	4.7ΚΩ					
Voltage level	DC24V	DC24V					
The voltage to open	<15V	<14.5V					
The voltage to close	>15.1V	>14.7V					
Minimal current	-2.3mA (negative)	-1.8mA (negative)					
Max current	-7.5mA (negative)	-6mA (negative)					
Isolation mode	optoelectronic isolation						
Note: the above parameters are standard values when the voltage of controller power							
supply (E+24V port) is 24V.							

2.7.3. Wiring Reference



- The wiring principle of high-speed digital input IN (0-3) and low-speed digital input IN (4-23) is shown in the figure above. The external signal source can be an optocoupler, a key switch or a sensor, etc., all can be connected as long as the requirements on output of electric level can be achieved.
- For the public end, please connect the "EGND" port on the power supply to the "COM" terminal of the external input device. If the signal area power supply of the external device and the power supply of the controller are in the same power supply system, this connection also can be omitted.

2.7.4. Basic Usage Method

- (1) Please follow the above wiring instructions to wiring correctly.
- (2) After powered on, please select any one interface among the three interfaces ETHERNET, RS232 and RS485 to connect to <u>RTSys</u>.
- (3) State values of relative input ports can be read directly through "IN" command, also, it can be read through "RTSys/Tool/In". Please refer to "Basic" for details.
- (4) Latch function can be set and triggered through "REGIST" instruction, in software, use REG_INPUTS to configure. Please refer to "ZBasic" for details.

2.8. OUT Digital Outputs

The digital output adopts 3 sets of screw-type pluggable terminals with a spacing of 3.81mm, and the PWM and high-speed comparison output functions are integrated in digital output signal.

ד ∎	П •	П •	П •	п ●	П •		П •	П •	П ●		Π ●	П •	•	П •	П •	•	•		П •	П •	Т •
E24V	E5V	0UT0	OUT1	OUT2	OUT3	OUT4	OUT5	OUT6	0UT7	OUT34	OUT35	OUT10	OUT11	OUT12	OUT13	OUT14	OUT15	OUT16	0UT17	OUT18	0UT19

2.8.1. Interface Definition

Terminal	Name	Туре	Function 1	Function 2	Function 3	
	F241/	,	Output freewheeling	1	1	
	EZ4V	/	clamp port	/	/	
		,	5V power output, max	1	1	
	EDV	/	is 300mA	/	/	
		NPN	Output 0		High-speed	
	0010	type,	Output o		Comparison Out 0	
	OUT1	high-	Output 1	PWM 1	High-speed	

		speed			Comparison Out 1	
		output	Output 2		High-speed	
E24V ■ 弌 E5V ● 弌	0012		Output 2	F WIVI Z	Comparison Out 2	
			Output 2		High-speed	
	0013		Output 3	F WIVE 3	Comparison Out 3	
OUT3 ● ゴ OUT4 ● ゴ	OUT4	NPN	Output 4	/		
OUT5	OUT5	type,	Output 5	/		
	OUT6	low-	Output 6	/		
, <u></u>		speed	Output 7	/		
	0017	output	Output 7			
	OUT34		Output 34	/	/	
	OUT35	NPN type, low- speed	Output 35	/	/	
OUT35	OUT10		Output 10	/	/	
OUT10 ● _ OUT11 ● 二	OUT11		low-	Output 11	/	/
OUT12 ● 1 OUT13 ● 1	OUT12			Output 12	/	/
OUT14	OUT13		Output 13	/	/	
	OUT14	output	Output 14	/	/	
	OUT15		Output 15	/	/	
	OUT16	NPN,	Output 16	/	/	
OUT16 ■ 1 OUT17 ● 1	OUT17	low-	Output 17	/	/	
OUT18	OUT18	speed	Output 18	/	/	
	OUT19	output	Output 19	/	/	

Note:

The E24V is a freewheeling clamp port. When there is an inductive load on the output port, connecting it to the positive pole of the load power supply, then it can enable the freewheeling function of each digital output port to protect the circuit.

The E5V power output port is used for PWM or common anode wiring of single-ended axis. It is not recommended for other purposes due to lower power.

The output OUT (8-9) support high-speed precision output and are allocated to the laser power interface.

2.8.2. Digital Output Specification

Itom	High Speed Output	Low Speed Output					
item	(OUT0-3)	(OUT4-7, 10-19, 34, 35)					
Output mode	NPN type, it is 0V when outputs						
Frequency	< 400kHz	< 8kHz					
Voltage level	Load power ≤ 30V	Load power ≤ 30V					
Max output current	+300mA/point	+300mA/point					
Max leakage	25.14	254					
current when off	ΖΟμΑ	ΖυμΑ					
Respond time to	1µs (resistive load typical	12µs					
conduct	value)						
Respond time to	200	00					
close	σμο	ουμς					
Overcurrent	Support	Support					
protection	зарроп	Support					
Isolation method	optoelectronic isolation						
Martin							

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.

2.8.3. Wiring Reference



\rightarrow Wiring Note:

- The wiring principle of high-speed digital outputs OUT (0-3) and low-speed digital outputs OUT (4-7, 10-19, 34, 35) is shown in the figure above. The external signal receiving end can be an optocoupler or a relay or solenoid valve, all can be connected as long as the input current does not exceed 300mA.
- For the connection of the public end, please connect the "EGND" port on the power supply to the negative pole of the DC power supply of the external input device. If the DC power supply of the external device and the controller power supply are in the same power supply system, this connection can also be omitted.
- The E24V port is the freewheeling clamp port of this part of the digital output port. When this port is suspended, each output port will not have the freewheeling function. It needs to be connected to the positive pole of the load power supply to enable this function.
- The E5V port is a 5V power output port, which can be used when some loads need to provide an external 5V power input, the maximum current is 300mA.

2.8.4. Basic Usage Method

- (1) Please follow the above wiring instructions to wiring correctly.
- (2) After powered on, please use any one interface among the three interfaces ETHERNET, RS232 and RS485 to connect to <u>RTSys</u>.
- (3) Open or close output port directly through "OP" command, also, it can be opened or closed through "RTSys/Tool/Op". Please refer to "Basic" for details.

Ор		_	X
IO Selec	:t		
OpO		Dp16	
Op1	0	Dp17	
Op2		Op18	
Op3	0	Op19	

- (4) The PWM function, set the frequency and duty cycle through "PWM_FREQ" and "PWM_DUTY". Please refer to Basic for details.
- (5) Hardware comparison output can be set and opened through "HW_PSWITCH2". Please refer to Basic for details.

2.9. AD/DA Analog Input/Output

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



2.9.1. Interface Definition

Terr	Terminal		Туре	Function				
	ADO	AD0	loput	Analog input terminal: AIN(0)				
	AD1	AD1	mput	Analog input terminal: AIN(1)				
	AGND	AGND	Public End	Public end of this analog				
⊨●	DA0	DA0	_	Analog output terminal: AOUT(0)				
	DA1	DA1	Output	Analog output terminal: AOUT(1)				

2.9.2. AD/DA Analog Input/Output Specification

ltem	AD (0-1)	DA (0-1)
Resolution	12-bit	12-bit
Data range	0-4095	0-4095
Signal range	0-10V input	0-10V output
Data refresh ratio	1KHz	1KHz
Voltage input impedance	≤300Ω (voltage input	≥1KΩ (voltage output
/ output load	impedance)	load)

2.9.3. Wiring Reference



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

2.9.4. Basic Usage Method

- (1) Please follow the above wiring instructions to wiring correctly.
- (2) After powered on, please use EtherNET or RS232 or RS485 connect to RTSys.
- (3) Analog input voltage can be read through "AIN" command and corresponding analog voltage can be output through "AOUT" command, also, data of each channel can be checked through "RTSys/Tool/AD/DA". Please refer to "Basic" for details.

2.10. AXIS Axis Interface

This product provides 4 local differential pulse axis interfaces, each interface is a standard DB26 female socket.



2.10.1. Interface Definition

Interface	Pin	Signal	Description
	1	EGND	Negative pole of IO 24V power
	2	IN24-	General input (recommended as driver
		27/ALM	alarm)
		OUT20-23	General output (recommended as driver
		/ ENABLE	enable)

	4	EA-	Encoder differential input signal A-				
	5	EB-	Encoder differential input signal B-				
	6	EZ-	Encoder differential input signal Z-				
	7	+5\/	Positive pole of 5V power of				
	ſ	737	pulse/encoder signal				
	8	Reserved	Reserved				
	0	יטוט	Servo or step directional output +				
	9	דחוט	(differential signal)				
	10	CND	Negative pole of 5V power of				
	10	GND	pulse/encoder signal				
	11	וווס	Servo or step pulse output –				
	11	PUL-	(differential signal)				
	12	Reserved	Reserved				
\bigcirc	10		Negative pole of 5V power of				
	13	GND	pulse/encoder signal				
	14	OVCC	Positive pole of IO 24V power				
	15	OUT24-27	Digital output, recommended as drive				
26	15	/ CLR	alarm clearing				
9-18	16	IN28-31 /	Digital input, recommended as on-				
\bigcirc	10	INP	position signal				
	17	EA+	Encoder differential input signal A+				
	18	EB+	Encoder differential input signal B+				
	19	EZ+	Encoder differential input signal Z+				
	20	GND	Negative pole of 5V power of				
	21	GND	pulse/encoder signal				
	22		Servo or step directional output -				
	22	DIN-	(differential signal)				
	23	DI II +	Servo or step pulse output +				
	25	FULT	(differential signal)				
	24	CND	Negative pole of 5V power of				
	24	UND	pulse/encoder signal				
	25	Reserved	Reserved				
	26	Reserved	Reserved				
Note:							
♦ ALM, ENABLE, C	LR and II	NP are recom	nended to be used as axis IO, because the				

drive capacity is small.

♦ OVCC, +5V are only used for communication between the controller and the servo driver, please do not use it as power supply for other places.

--Pulse-Axis PIN No. & IO--

Pulse Axis	Related IN	Related OUT	Related OUT	Related IN
No.	(PIN2)	(PIN3)	(PIN15)	(PIN16)
AXIS1	IN24	OUT20	OUT24	IN28
AXIS2	IN25	OUT21	OUT25	IN29
AXIS3	IN26	OUT22	OUT26	IN31
AXIS4	IN27	OUT23	OUT27	IN31

2.10.2. Signal Specification

Item	Description		
Pulse / Direction (PUL/DIR) Signal type	Differential output signal		
Pulse / Direction (PUL/DIR) Signal Voltage Range	0-5V		
Pulse / Direction (PUL/DIR) Signal Max Velocity	10Mbps		
Encoder (EA/EB/EZ) Signal Voltage Range	0-5V		
Encoder (EA/EB/EZ) Signal Max Velocity	10Mbps		
Input Method (NI24, 21)	Leakage type, it is triggered		
input Method (IN24-31)	by low level		
Input Frequency (IN24-31)	< 5kHz		
Input Impedance (IN24-31)	6.8ΚΩ		
Input Voltage Level (IN24-31)	DC24V		
Input ON Voltage (IN24-31)	<10.5V		
Input OFF Voltage (IN24-31)	>10.7V		
Min Input Current (IN24-31)	1.8mA		
Max Input Current (IN24-31)	4mA		
Isolation Method (IN24-31)	optoelectronic isolation		
Output method (OUT20-27)	NPN, it is 0V when outputs		
Output Frequency (OUT20-27)	<8kHz		
Max Output Current (OUT20-27)	300mA		

Overcurrent protection	NO	
Isolation Method (Ol	optoelectronic isolation	
5V Power Supply (+5V, GND)	Max Output Current	50mA
24V Power Supply (OVCC, GND)	50mA	

2.10.3. Wiring Reference

\rightarrow Wiring with Panasonic A5/A6 Servo Driver:



Zmotion

→ Single-Ended Pulse-Axis Wiring:

+5V	7 +5V power	Driver
DIR-	22 directional output (-)	DIR-
DIR+	9 directional output (+)	A 7
PUL-	11 pulse output (-)	PUL-
PUL+	23 pulse output (+)	

→ Single-Ended Encoder-Axis Wiring:

+5V	7 +5V power	51/
ΕΔ_	4 A input (-)	V.C.
	17 A input (+)	
	5 B input (-)	A NPN
EB-	18 B input (+)	Encoder
EB+	6 Z input (-)	В
EZ-	19 Z input (+)	
EZ+	10/13/20/21/24	Z
GND		GND

• Notes:

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

2.10.4. Basic Usage Method

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

- (2) After powered on, please use any one interface among the three interfaces ETHERNET, RS232 (default parameter, it can be connected directly) and RS485 (default parameters, it can be connected directly, but for hardware, adapter head is needed) to connect to RTSys.
- (3) Set axis parameters, such as, ATYPE, UNITS, SPEED, ACCEL, FWD_IN, REV_IN, etc.
- (4) There are many parameters related to pulse axis, they can be set and checked through relative instructions, please see "axis parameter and axis status" of "Basic", or see "RTSys/View/Axis parameter".

Axis Parameters				E
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	20000000	200000000	200000000	20000000
RS_LIMIT	-200000000	-200000000	-200000000	-200000000

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

Manual															×
Axis	ATYPE	UNITS	ACCEL	DECEL	SPEED	DPOS	LeftVMove	RightVMove	Distance /	Absolute		MPOS	IDLE	AXISSTATUS	
0 💌	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right			Move	0.000	-1	0h	Stop
1 💌	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right			Move	0.000	-1	0h	Stop
2 💌	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right			Move	0.000	-1	0h	Stop
3 💌	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right			Move	0.000	-1	0h	Stop
4 💌	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right			Move	0.000	-1	0h	Stop
5 💌	0	1.000	10000.0	0.000	1000.00	0.000	Left	Right			Move	0.000	-1	Oh	Stop

Refer to BASIC Routine:

BASE(0,1)	'select axis 0 and axis 1
ATYPE = 1,1	'set axis 0 and axis 1 as pulse axes
UNITS = 100,100	'set pulse amount as 100 pulses
SPEED = 10,10	'set axis speed as 10*100 pulse/s
ACCEL = 1000,1000	'set axis acceleration as 1000*100 pulse/s/s

FWD_IN = -1,-1	'prohibit using axis positive hardware position limit
REV_IN = -1,-1	'prohibit using axis negative hardware position limit
MOVE(10) AXIS(0)	'axis 0 moves distance of 10*1000 pulses in positive
MOVE(-20) AXIS(0)	'axis 0 moves distance of 20*1000 pulses in negative

2.11. MPG Handwheel Interface

This product provides a special interface for the local handwheel encoder axis, which is a double-row standard DB15 female seat.



2.11.1. Interface Definition

Interface	PIN	Signal	Description
	1	H-5V	Positive pole of 5V power supply for output,
			which supplied power for handwheel
	2	HA-	Encoder phase A signal (IN32)
	3	HB-	Encoder phase B signal (IN33)
	4	HEMGN	Emergency stop signal (IN43)
$\left(\right)$	5	NC	Reserved
1 9	6	HX1	Select ratio X1 (IN34)
8 15	7	HX10	Select ratio X10 (IN35)
	8	HX100	Select ratio X100 (IN36)
	9	HSU	Select axis 3 (IN40)
Ċ,	10	HSV	Select axis 4 (IN41)
	11 5010	Negative pole of 5V power supply for output,	
	11	TT EGND	signal public end
	12	HSW	Select axis 5 (IN42)
	13	HSZ	Select axis 2 (IN39)

		14	HSY	Select axis 1 (IN38)	
		15	HSX	Select axis 0 (IN37)	
Note:					
> 5V power supply only supplies for handwheel, don't supply power for others.					
All signals of this interface are digital input signals, number is IN (32-43).					

2.11.2. MPG Handwheel Interface Specification

\rightarrow Specification

Item	IN (32-43)		
Mode (input)	NPN, it is triggered when low electric inputs.		
Frequency (input)	<5kHz is recommended		
Impedance (input)	510Ω		
Max voltage (input)	26V		
The current to open (input)	<2.8		
The current to close (input)	>2.9A		
Min current (input)	1.8mA		
Max current (input)	5.5mA		
Isolation	optoelectronic isolation		
5V power supply (H-5V,	1004		
EGND) max output current	TOUTIA		

2.11.3. Basic Usage Method

- 1. Refer to above handwheel wiring graphic, correctly connect the handwheel and controller.
- After powered on, please select ETHERNET or RS232 or RS485 to connect to RTSys.

Zmotion	ZMC408SCAN-V22 EtherCAT Galvanometer Motion Controller User Manual V1.0.1

 Configure axis No., for ZMC408SCAN, axis 4 is the default handwheel interface, if there is no default AXIS axis No. (axis 10, 11, 12, 13 are recommended), remapping must be done. Followings are processes.

BASE(target axis number)'the axis No. to be remappedATYPE(target axis number) = 0'set axis type as 0BASE(8)'handwheel interface initial axis No. is 8 (invalid)ATYPE(8) = 0'set initial type of handwheel interface as 0AXIS_ADDRESS(target axis number)=(-1<<16) + 8</td>'bind initial axis 8 to target axis No.ATYPE(target axis number) = 6

'set this new axis interface as required axis type, such as 3 or 6

- 4. Configure IO: assign axis selection (HSX, HSY, HSZ, HSU) and ratio (HX1, HX10, HX100) and emergency stop (HEMGN) functions as required. These signals are essentially digital input signals with fixed numbers but no fixed functions. It needs RTSys to develop (the axis selection is the connected axis of "connect" synchronization motion, and the ratio is the "connect" ratio).
- 5. When completed above steps, it can start to use handwheel.

BASIC Routine Reference:

ATYPE(6) = 0	'restore axis type of axis 8
ATYPE(8) = 0	'restore default handwheel axis type
AXIS_ADDRESS(10) = (-1<<	16)+8 'map the address of MPG manual pulse axis to axis 10
ATYPE(10) = 3	'set manual pulse axis as quadrature encoder type
UNITS(10) = 1	'set the unit as pulse for pulse amount of manual pulse axis
CONNECT(100,10) AXIS(0)	

'axis 0 connects to manual pulse axis at the synchronous ration of 100

2.11.4. Wiring Reference



Notes:

- The wiring principle of handwheel encoder axis interface is shown above, please connect carefully due to diversified handwheel designs.
- Please use STP, especially in bad environments, and make sure the shielding layer is fully grounded.

2.12. SCAN Interface

This product provides a special interface for the local handwheel encoder axis, which is a double-row standard DB25 female seat.

SCAN1



2.12.1. Interface Definition

Interface	PIN	Signals	Description
	1	CLK-	Clock signal -
	14	CLK+	Clock signal +
	2	SYNC-	Synchronization signal -
	15	SYNC+	Synchronization signal +
	3	Х-	SCAN X channel signal -
jo	16	Х+	SCAN X channel signal +
25 13	4	Y-	SCAN Y channel signal -
	17	Y+	SCAN Y channel signal +
14 1	5	Z-	SCAN Z channel signal -
	18	Z+	SCAN Z channel signal +
T	6	Y RETURN-	SCAN Y channel feedback signal -
	19	Y RETURN+	SCAN Y channel feedback signal +
	7	Z RETURN-	SCAN Z channel feedback signal -
	20	Z RETURN+	SCAN Z channel feedback signal +
	8	X RETURN-	SCAN X channel feedback signal -
	21	X RETURN+	SCAN X channel feedback signal +

9, 10, 12, 13,	NC	/
22, 25		
11, 23,	GND	Signal ground public and
24	GND	

Attention:

- 1. When in 2D SCAN (default), SCAN0 relates to Axis 4 and Axis 5 of 2D galvanometer, SCAN1 relates to Axis 6 and Axis 7 of 2D galvanometer.
- 2. When in 3D SCAN (default), SCAN0 relates to Axis 4, Axis 5 and Axis 8 of 3D galvanometer.

2.12.2. Signal Specification

ltem	(CLK, SYN, X, Y, Z) ±	(X, Y, Z) RETURN±	
Signal type	Differential output	Differential input	
Electric level standard	0-5V TTL		
Max communication velocity	10Mbps		
Max current	±20mA -44µA/+8mA		
Isolation method	Non-isolation		

2.12.3. Wiring Reference



\rightarrow Wiring Notes

- Wiring principle of SCAN galvanometer axis interface is above, please use standard differential wiring, and note signal specification should match each other.
- Please use STP, especially in bad environments, and make sure the shielding layer is fully grounded.

2.12.4. Basic Usage Method

- Please wiring correctly according to above wiring description.
- Please select one interface among EtherNET, RS232 (default parameters can be directly connected) and RS485 (default parameters can be connected directly, need to use adapter head for hardware) to connect <u>RTSys</u>.
- Set fundamental motion parameters, such as, ATYPE, UNITS, etc. (preset Units as 65536 / the max galvanometer breadth).
- There are many parameters relate to pulse axes, and they are set and checked through relative instructions, please see "axis parameter and axis status" in "ZBasic Program Manual" for details, also can be viewed through "RTSys/View/axis parameter".
- Through "RTSys/View/Manual", relative motions can be operated and controller.

Refer to BASIC routine:

BASE (4, 5)	'select axis Scan 0, Scan 1, they relate to axis 6 and axis 7
ATYPE = 21, 21	'select axis 4 and axis 5 as galvanometer axes type
UNITS = 200, 200	'set pulse amount of axis 4, 5 as the unit of 200 bit
DPOS = 0, 0	
FORCE_SPEED = 100, 100	'set axis speed as 100∗200 bit/s
MOVESCANABS(0, 0)	'galvanometer moves to center origin position
MOVESCAN(50) Axis(4)	'axis 4 moves 50*200 bits forward
MOVESCAN (-50) Axis(5)	'axis 5 moves 50*200 bits reverse

2.13. LASER

This product provides one local interface specialized for YLR, which is a double-row standard DB25 male seat.



2.13.1. Interface Definition

Interface	PIN	Signal Port		Description
	1,4,14	LAGND	LAGND	Laser analog signal reference ground
	2,3,13	NC	/	Reserved
	5	Guide Control	OUT32	Red light control output pin, 24V is valid
	6	ACON	OUT33	Reserve output pin, 24V is valid
	7	LaserRequest	OUT28	Laser request output, 24V is valid
	8	Program start	OUT29	Program start output, 24V is valid
	9	ERST	OUT30	Laser reset output, 24V is valid
	10	LASER ON	OUT31	Laser enable output, 24V is valid
	11	PWM	OUT9	PWM signal, 24V electric level
	12	Modulation-	/	Modulation signal -
	15			Reserve analog input, 0-10V, 16-bit
13-0-25	15	LASER_AD/NC	AIN(2)	resolution, special modes are valid
	16 LASER_DA 17 Error 18 Emission	LASER_DA/NC	AOUT(2)	Reserve analog output, 0-10V, 16-bit
				resolution, special modes are valid
		Error	IN44	Laser alarm input, 24V is valid
		Emission EN	IN45	Laser emission input, 24V is valid
٢	10	Pow Active	IN49	Laser main power has opened, 24V is
	19		11149	valid
	20	20 Power ON	IN48	Laser system input when powered on,
	20			24V is valid
	21	Laser standby	IN47	Laser input when in standby status, 24V
	21			is valid
	22	Poody	IN46	Laser is in ready status to input, 24V is
	~~~	neudy	111+0	valid
	23,25 EGND	FGND	EGND	Reference ground of each digital input
				and output
	24 Moo		OUT8	Modulation signal +, 24V electric level

Attention:

1. AIN (2) and AOUT (2) are reserved signals, but standard models don't have, please select special mode when ordering if you need.

# 2.13.2. Signal Specification

Signal	ltem	Parameter
	Output method	Source type
	Output frequency	<8kHz
	Max output voltage	24V
	Min output voltage	0V
001 (28-33)	Normal voltage	0V
	Max output current	8mA
	Overcurrent protection	NO
	Isolation method	Optoelectrical isolation
	Output method	Push-pull output
	Output frequency	Recommendation: <1MHz
	Max output voltage	24V
	Min output voltage	0V
001 (8-9)	Normal voltage	24V
	Max output current	±50mA
	Overcurrent protection	NO
	Isolation method	Optoelectrical isolation
	Input method	Source type
	Input frequency	<5KhZ
	Input impedance	3.3kΩ
	Input voltage level	DC24V
IN (44-49)	Voltage to ON	>7.2V
	Voltage to OFF	<7.1V
	Min input current	+1.8mA
	Max input current	+7.5mA
	Isolation method	Optoelectrical isolation
	Resolution	16-bit
	Data range	0-65535
AOUT(2)	Signal range	0-10V
	Data refresh ratio	1kHz
	Load impedance	<10Ω
AIN (2)	Resolution	16-bit

Data range	0-65535	
Signal range	0-10V	
Data refresh ratio	1kHz	
Load impedance	>3.3kΩ	

### 2.13.3. Basic Usage Method

- Please wiring correctly according to above wiring description.
- Please select one interface among EtherNET, RS232 (default parameters can be directly connected) and RS485 (default parameters can be connected directly, need to use adapter head for hardware) to connect <u>RTSys</u>.
- Through "RTSys/In, Op window to operate and watch relative IOs.
- Through "RTSys/AD/DA window to operate and watch relative analog inputs and outputs.
- In RTSys, send online command "PWM_FREQ (PWM No.) = frequency, PWM_DUTY (PWM No.) = duty cycle.

#### **Refer to BASIC routine:**

BASE (4, 5)	'select axis Scan 0, Scan 1 relates to axis 6 and axis 7
ATYPE = 21, 21	'select axis 4 and axis 5 as galvanometer axes type
UNITS = 200, 200	'set pulse amount of axis 4, 5 as the unit of 200 bit
Dpos = 0, 0	
CORNER_MODE = 2, 2	'set axis corner deceleration mode is used for corner delay
DECEL_ANGLE = 30*PI/18	0, 30∗PI/180
STOP_ANGLE = 90*PI/180	, 90*PI/180
ZSMOOTH = 1000, 1000	'in galvanometer Scan instruction, Zsmooth is the max delaying time 1000us when in corner delaying
FORCE_SPEED = 100, 100	'in galvanometer Scan instruction, Force_speed is axis 4/5, and the Scan motion speed is 100*200 bit/s
MOVESCANABS (0,0)	'galvanometer moves to center origin position
Base (4, 5)	
AOUT (0) = 2048	'set laser power as 50% for 12-bit analog output 0, 0-10V relates to 0-100% power.
Op (29, ON)	'open laser to enable IO

FORCE_SPEED = 2000	'empty motion speed
MOVESCANABS (50, 50)	'empty move to 50, 50
MOVEOP_DELAY = -1.5	'open the light in advance 1.5ms, use Move_Delay to delay switching on the light
MPVE_PWM (8, 0.5, 10000)	'set PWM duty cycle as 0.5, frequency as 10000K
MOVE_OP (8, ON)	'start to output the light when laser OP8
FORCE_SPEED = 1000	'standard scale speed
MOVESCANABS (150, 150)	'move to 150, 150
MOVEOP_DELAY = -2.5	'delay 2.5ms to switch off
MOVE_OP (8, OFF)	'laser OP8 to switch off the light

In the motion command application field of galvanometer processing, in the MOVESCAN and MOVESCANABS commands, here, CORNER_MODE=2 is used to enable the corner delay of the galvanometer axis, and ZSMOOTH is used to set the maximum time of the corner delay, unit is us. DECEL_ANGLE and STOP_ANGLE commands are used to set the initial angle and angle of the corner delay, the specific time of the corner delay is linearly distributed from 0-ZSMOOTH between these two angles.

### 2.13.4. Wiring Reference

 Wiring reference of 16-DA in LASER interface (it needs to custom special version for with 16-bit analog)



> Wiring reference of terminal's 12-DA:



- Wiring reference of LASER laser interface is above, except OUT8 and OUT9, other digital IOs can be customized.
- There are 2 wiring ways for lasers that need analog input. Controller 12-DA interface can be used for not high resolution, but if you need high resolution, please use LASER interface with 16-DA.
- Please use STP, especially in bad environments, and make sure the shielding layer is fully grounded.

### 2.14. FIBER Laser

FIBER interface is one 5V TLL electrical level control interface for laser, which can control JPT, MOPA, TPG, YLP, YLPN, etc. This interface is one double-row standard DB25 female male.



# 2.14.1. Laser Output Interface Definition

DIN	Cirral	Description	Relative digital input	
PIN	Signai	Description	/ output signal	
1	D0	Power set position D0	OUT36	
2	D1	Power set position D1	OUT37	
3	D2	Power set position D2	OUT38	
4	D3	Power set position D3	OUT39	
5	D4	Power set position D4	OUT40	
6	D5	Power set position D5	OUT41	
7	D6	Power set position D6	OUT42	
8	D7	Power set position D7	OUT43	
9	LATCH	Power latch signal, valid in rising edge OUT46		
10	NC	Reserved	/	
11	STA2	Alarm status feedback (input interface)	IN68	
12	NC	Reserved	/	
13	NC	Reserved	/	
1415	CND	Negative pole of +5V output, signal	1	
14,15 GND		public end	/	
16	STA0	Alarm status feedback (input interface)	IN66	
17	+5V output positive pole, max is		1	
1 <i>(</i> +5V		100mA, spare when no use	/	
18	M0	Main oscillator switch signal	OUT47	
19	GATE	Laser modulation signal	OUT44 (PWM10)	

20	PRR	Laser frequency signal OUT45 (PWM11)				
21	STA1	Alarm status feedback (input interface) IN67				
22	RED LIAGHT	Red light signal	OUT48			
23	EMSTOP	Emergency stop signal	OUT49			
24,25	NC	Reserved	/			

# 2.14.2. Signal Specification

Item	IN (66-68)	Item	OUT (36-49)	
Input method	NPN type, it is triggered by low electricity	Output method	0-5V TTL output	
Input frequency	Recommendation: <5kHz	Output frequency	Max 10Mbps	
Input	4.7ΚΩ	Max output	4.9V	
impedance		voltage		
Voltage to ON	<2 9\/	Min output	0.1V	
	~2.JV	voltage		
Voltage to OFF	>3V	Initial logic	0	
Min input	1.9mA	Max output	+ 20m A	
current	I.OIIIA	current	± 2011A	
Max input	9 1 m A	Overcurrent	NO	
current	0. IIIA	protection	NO	
Isolation	NO	Isolation	NO	
+5V max output current		100	mA	

### 2.14.3. Basic Usage Method

- Please wiring correctly according to above wiring description.
- Please select one interface among EtherNET, RS232 (default parameters can be directly connected) and RS485 (default parameters can be connected directly, need to use adapter head for hardware) to connect RTSys.

Zmotion'

- Through "RTSys /In, Op window to operate and watch relative IOs.
- Through "RTSys /AD/DA window to operate and watch relative analog inputs and outputs.
- In RTSys, send online command "PWM_FREQ (PWM No.) = frequency, PWM_DUTY (PWM No.) = duty cycle.

#### Refer to BASIC routine:

```
BASE (4, 5)
                         'select axis Scan 0, Scan 1 relates to axis 6 and axis 7
ATYPE = 21, 21
                         'select axis 4 and axis 5 as galvanometer axes type
UNITS = 200, 200
                         'set pulse amount of axis 4, 5 as the unit of 200 bit
Dpos = 0, 0
CORNER_MODE = 2, 2
                        'set axis corner deceleration mode is used for corner delay
DECEL_ANGLE = 30*PI/180, 30*PI/180
STOP_ANGLE = 90*PI/180, 90*PI/180
ZSMOOTH = 1000, 1000
                           'in galvanometer Scan instruction, Zsmooth is the max
                           delaying time 1000us when in corner delaying
FORCE\_SPEED = 100, 100
                          'in galvanometer Scan instruction, Force_speed is axis 4/5,
                           and the Scan motion speed is 100*200 bit/s
MOVESCANABS (0,0)
                           'galvanometer moves to center origin position
Base (4, 5)
LASER_SET (1, 1)
                           'map AOUT3 to OUT36-43, control laser power by AOUT3
AOUT (3) = 127
                         'set laser power as 50%, 0-255 relates to 0-100% power.
Op (47, ON)
                           'open laser to enable IO
FORCE_SPEED = 2000
                           'empty motion speed
MOVESCANABS (50, 50)
                           'empty move to 50, 50
MOVEOP_DELAY = -1.5
                           'open the light in advance 1.5ms, use Move_Delay to delay
                            switching on the light
MPVE_PWM (11, 0.5, 10000)
                            'set PWM duty cycle as 0.5, frequency as 10000K
MOVE_OP (44, ON)
                             'start to output the light when laser OP44
FORCE_SPEED = 1000
                            'standard scale speed
MOVESCANABS (150, 150)
                           'move to 150, 150
MOVEOP_DELAY = 2.5
                           'delay 2.5ms to switch off
MOVE_OP (44, OFF)
                            'laser OP44 to switch off the light
```

In the motion command application field of galvanometer processing, in the MOVESCAN and MOVESCANABS commands, here, CORNER_MODE=2 is used to enable the corner delay of the galvanometer axis, and ZSMOOTH is used to set the maximum time of the corner delay, unit is us. DECEL_ANGLE and STOP_ANGLE commands are used

to set the initial angle and angle of the corner delay, the specific time of the corner delay is linearly distributed from 0-ZSMOOTH between these two angles.

#### **FIBER Output Interface** MFPT-200P Laser DB25 Interface DB25 Male 5V Power + 17 17 +5V GND 14 Power / COM Ground 14 15 15 DC5V Power Config Pos D0 OUT36 1 1____ Power Config Pos D1 OUT37 2 2 Power Config Pos D2 OUT38 3 3 Power Config Pos D3 OUT39 4 4 OUT40 5 Power Config Pos D4 5 Power Config Pos D5 OUT41 6 6 7 Power Config Pos D6 OUT42 7 OUT43 8 Power Config Pos D7 8 9 Power Latch Signal OUT46 9 OUT47 Main Oscillator Switch 18 18 Laser Modulation OUT44 19 19 OUT45 20 Laser Frequency Signal 20 OUT48 22 Red Led Signal 22 23 OUT49 23 Emergency Stop IN68 Alarm State Feedback 4<u>70Ω</u> 11 11 ₹ 1kΩ Alarm State Feedback IN66 16 470Ω 16 ₹₹ 1kΩ Alarm State Feedback 470Ω IN67 21 21 <u>1kΩ</u>

# 2.14.4. Wiring Reference

### $\rightarrow$ Wiring Notes

- Above is the example of MFPT-200P, also, you can refer this to customize the specific pin to be connected.
- Please use the cable with shield, and shield layer should be connected to the ground fully (chassis).

# **Chapter III Expansion Module**

The controller can expand digital IO, analog IO, pulse axis and other resources through CAN bus or EtherCAT. For details, please refer to "ZIO Expansion Card Hardware Manual". Also, through EtherCAT bus (EIO series or ZMIO310 series vertical bus expansion modules) expansion of these resources also can be achieved, please refer to each EIO hardware manual for details.

For ZIO expansion board, following shows the wiring example:



### $\rightarrow$ Wiring Note:

- ZMC408SCAN-V22 controller uses the single power, but ZIO expansion module uses dual-power. When using, connect two channels of IO power into 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-cdoe DIP switch, the terminal resistor can be realized by dialing the code (DIP).

# Chapter IV Programming

### 4.1. Program in RTSys Software

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

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

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

Features	Parameters	System Archite	cture	Download	
Name		Version No	Format	Size	Download
RTSys Development Softv	vare	V1.2.02	RAR	148MB	Download
RTSys User Manual V1.2.0	RTSys User Manual V1.2.0		PDF	5.33MB	Download
RTBasic Programming Ma	RTBasic Programming Manual		PDF	18.3MB	Download
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ZVision Basic Programming Manual V1.3.0		V1.3.0	PDF	10.6MB	Download
ZPLC		V1.0	PDF	1.7M	Download

#### And related manuals can be found in "Download":

Step	Operations	Display Interface		
1	Switch the Language: "Language" –	Language Font Theme Custor Style ~ ~		
	"English", then	Simplified Chinese		
	there will pop	✓ English		

#### Zmotion'





	Save File: edit							
	the program in							
	program editing	Hile(F)						
	window, click							
	"save", new	Open 21						
	built file will be							
5	saved under	Close						
Ū	"zpj." project	Close All						
	automatically.	Save						
	"Save all"							
	means all files	Save the active document (Ctrl+S)						
	under this	Save All						
	project will be							
	saved.							
	Connection:	File(F)         Home(O)         Controller(C)         Edit(E)         View(V)         Tool(T)         Debug(D)						
	Click "controller	Image: State of the s						
	– connect", if	Connect Disconnect Download Download State the Firmware System Modify IP RAM ROM controller Time address Controller Controller Simulator Connect to the controller (Ctrl+Alt+C)						
	no controller,							
	select connect	Image: Brown of the sector						
	to simulator.	Config files						
	Then, "connect							
	to controller"							
	window will pop							
6	up, you can	Connect to Controller ×						
	select serial							
	port or net port	COM 38400 * No Parity * 0 * Connect AutoConnect						
	to connect,	IP 127.0.0.1 * 500 * Connect IP Scan						
	select matched	PCI/Local + Connect Disconnect						
	serial port	Native IP: 172 OK Cancel						
	parameters or							
	net port IP							
	address, then							
	click "connect".							
7	Download	• <b>RAM:</b> it will not save when power off.						
	Program into	• <b>ROM:</b> it will save data when power off, and when the program						

	Controller:	is connected to controller again, running according to task
	"Ram/Rom" –	No.
	"download	File(F) Home(O) Controller(C)
	RAM /	
	download	Connect Disconnect Connect Disco
	ROM", if it is	
	successful,	Output ×
	there is print	Connected to Controller:VPLC5xx-Simu Version:5.20-20240426. Down to Controller Ram Success, 2024-08-15 11:16:29, Elapsed time: 94ms.
	indication, at	
	the same time,	Command: Send Capture Clear
	program is	Output Find Results
	downloaded	Output ×
	into controller	buwn to controller nom success, 2024-08-13 11.11.02, Blapsed time. 93ms.
	and runs	
	automatically.	Command: Send Capture Clear
	Debug: "Debug"	Output Find Results
	- "Start/Stop	File(F) Home(O) Controller(C) Edit(E) View(V) Tool(T) Debug(D)
	Debug" to call	Image: Step Into       Image: Im
	"Task" and	Download Download     Start/Stop     Land to Cursor     Carlot Start     Breakpoint       RAM     ROM     Debug     Debug     Debug     Debug
	"Watch"	Entre Debug
8	window,	
	because it was	C Down ram again
	downloaded	C Down rom again
	before, here	Attach to current
	select "Attach	
	the current".	
		Scope ×
	Scope function:	Change contig Accessicality neip           Manual-trigger           Manual-trigger           Manual-trigger           Manual-trigger
	Click "View" –	X Seale: <u>1s</u> - Display: <u>YT mode</u> - Channels: <u>2</u> - 3D view: <u>Oblique view</u>
	"Scope" to open	Centinuous Fellov Magnifier Channel Cursor Statistics
9	oscilloscope. It	Show         Index         Source         Offset         Scale           Image: Image of the state of
	can capture	
	needed data,	
	needed data, for debugging.	

#### Notes:

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

### 4.2. Upgrade Controller Firmware

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

#### How to update:

- a. Open ZDevelop / RTSys software, then click "controller connect", find PCI/LOCAL method, click "connect". If connected, there will be "Connected to Controller: PCIE464 Version: 4.93 - 20231220." In "output" window.
- b. Click "controller state the controller", find basic info, then current software version can be checked.
- c. Click "controller update firmware", current controller model and software version can be viewed.
- d. Click "browse", and select saved firmware file, click "update", then one window will pop up, please click "ok".
- e. After that, "connect to controller" window appears again, and please select "PCI/Local" again, and click "connect".
- When connection is successful, "firmware update" interface is shown. Now f.

system enters ZBIOS state, please click "update" again.

- g. When it is loaded, "firmware update" window disappears, now in output window, it shows "Update firmware to Controller Success".
- h. Do step a and step b again, check whether the firmware is updated or not.

### 4.3. Program in Host-Computer by PC Languages

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



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

Get PC library file, example: <u>https://www.zmotionglobal.com/download_list_17.html</u>

Hardware Manuals	Software Manuals	Tool Software	Products Catalogs	Development Examples	PC Library Files	Product 3D Model
Product EPLAN	Video Description				1	
Quick Start						Download
			/		/	
Bus INIT BASIC						Download
C Sharp						( Download
C PLUS PLUS						Download
LABVIEW						Download
Python						Download
Linux C Sharp 64 B	lit					( Download

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	部型       NET framework 4.5.2 · 即存依率 就从值       評 語       改正包含英國的Cut+6: 0 · 0 ·         · 巴皮林       Win32 拉特台应用程序       Visual C++       万 · 0 · 0 ·         · 密田       · Win32 拉特台应用程序       Visual C++       万 · 0 · 0 ·         · Windows ATL CR 带成 ATL CR 带成 使用       · Win32 连目       Visual C++       万 · 0 · 0 · 0 ·         · Windows ATL CR 带成 使用       · Win32 连目       Visual C++       一 · 0 · 0 · 0 · 0 · 0 ·         · Win32 语句       · 0 · 0 · 0 · 0 · 0 · 0 · 0 ·       · 0 · 0 · 0 · 0 · 0 · 0 · 0 ·       · 0 · 0 · 0 · 0 · 0 · 0 · 0 · 0 ·         · Win32 语句       · 0 · 0 · 0 · 0 · 0 · 0 · 0 · 0 · 0 · 0			
	application type".	名称(L): single_move 位置(L): clusers/zmotion123/documents/visual studio 2015/Projects - 解決方案名称(M): single_move □ 力解決方案创建目录(D) □ 指加制作の皆環(U) 構定 取消			
3	Select "Based on basic box", click "next" or "finish"	<form>         Mc deflegenge single_move       ? * X         Deflection       Deflection         Mit      </form>			
4	FindC++functionlibraryprovidedbymanufacturer.Routineisbelow(64-bit)library)	> 03光盘资料 > 8.PC函数 > 微盘整理函数库备份文件 > 函数库2.1 > windows平台 > 64位库 > C++.zip > dll库文件         名称       修改日期       类型       大小         國 zauxdll.dll       2020/8/11 15:06       应用程序扩展       2,260 KB         圖 zauxdll.lib       2020/8/11 15:06       Object File Library       69 KB         ② zauxdll2.h       2020/8/11 14:56       C/C++ Header       141 KB         ③ zmotion.dll       2019/3/16 12:21       应用程序扩展       2,549 KB         避 Im zmotion.h       2019/3/16 12:21       Object File Library       51 KB			
5	Copy all DLL rela	ed library files under the above path to the newly created project.			

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

#### Zmotion'

6	Add a static	1) Right-	[7] 紙水方面: single move (1 小規則)     [8] 2 3 3 3 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5		
	library and	click the	▶         Display_moves_bh         (B)EN           >         Display_moves_bh         (B)EN		
	related header	header file	D 備 Resource Files (0/17) / 3/481/0     D 備 Secource Files 第二位 20 K 板本目标     型位 20 K 板本目标     使意 分配の使用 開発力が応期にの     使き 分配の使用 例 価格体別を設定数で使用後に的(h)     離 zaundl.2b     S 在で移動上型示(c)		
	files to the	first, and	19-0-00-00-00-00-00-00-00-00-00-00-00-00-		
	project. Static	then select:	新 管理 NuCart 程序性(N)		
	library:	"Add" $\rightarrow$	Mit (2000)         Crist         Yeg (2000)           Mit (2000)         Crist         Yeg (2000)		
	zauxdll.lib,	"Existing	新聞時間(1) 単新目標系が方案(5) (*) 在文社会測測管理書中15月交は失(0) を 単数(10)		
	zmotion.lib	ltem".			
	Related header	2) Add static	N 通過回動現・Merge X		
	files:	libraries and	田沢・ 新雄文件先 田・ 田・ 田 ●   田 文類 # ^ 白作 第次日時 光気 大小 ^ ^ *   田 文類 # ^ 日前 Mangazuron Effect 2007/11/91100 VC++ Project 11 11日 * * * * * * * * * * * * * * * *		
	zauxdll2.h,	related	Dist         If MangeOlg.cpp         2020111/91100         CPP 2/H         3/48           0 drol22894         If MangeOlg.cpp         202011/91100         P2/H         1/48           0 drol22894         If MangeOlg.cpp         202011/91100         P2/H         1/48           0 drol22894         If MangeOlg.cpp         202011/91100         P2/H         1/48           0 drol2974         If MangeOlg.cpp         202011/91100         P2/H         1/48		
	zmotion.h	header files	Ind         Microsoft Visual         CP 2018         103           Projects         Eff staffscop         202011/9.1100         CP 2018         203           Monipolity         Eff staffscop         202011/9.1100         P.2018         203           Monipolity         Eff staffscop         202011/9.1100         P.2018         203           Monipolity         Projects         103         P.2018         203		
		in sequence			
		in the pop-up	■ 文和 (6) (2015/07.1 44.1 m. 2015/07.1 44.1 m. 2015 ● 2015/07.1 52.21 Object Re Library 51.4 5 で 文片名印(2) (2015/07.1 52.21 Object Re Library 51.4 5 で 文片名印(2) (2015/07.1 52.21 Object Re Library 51.4 5 で)		
		window.	(850A) \$508		
7	Declare the	single_move_Dlg.cpp P X	- (全局范围)		
	relevant header	■// single_ [//	move_Dig.cpp : implementation file		
	files and define	⊟#include "   #include "	⊟#include "stdafx.h" #include "single_moveh"		
	the controller	#include #include "	single_move_Dig. n zauxdl12. h"		
	connection	⊟#ifdef _DE   #define ne	BUG w DEBUG_NEW		
	handle, so far	#undef THI static cha #endif	S_FILE r THIS_FILE[] =FILE;		
	the project is	무/////////	₽/////////////////////////////////////		
	newly created.	[// CSingle	_move_Dlg dialog		
		ZMC_HANDLE	S_namere Rock, 7/11-19/milety P110		

# **Chapter V Operation and Maintain**

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

### 5.1. Regular Inspection and Maintenance

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

Check item	Check content	Inspection standards
power supply	Check whether the voltage is rated	DC 24V ( -5%~5% )
	Whether the ambient temperature is within the specified range (when installed in the cabinet, the temperature inside the cabinet is the ambient temperature)	-10°C - 55°C
surroundings	Whether the ambient humidity is within the specified range (when installed in the cabinet, the humidity in the cabinet is the ambient humidity)	10%-95% non-condensing
	Is there direct sunlight	No
	With or without droplets of water, oil, chemicals, etc.	No
	Whether there is dust, salt, iron filings, dirt	No
	Whether there is corrosive gas	No
	Whether there are flammable and	No

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

# 5.2. Common Problems & Solutions

Problems	Suggestions	
	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	
Matar daga patratata	values are suitable. If there is the encoder feedback,	
Motor does not rotate.	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.	

	1.	Check whether the limit sensor is working normally,
		and whether the "input" view can watch the signal
The position limit signal		change of the limit sensor.
The position limit signal is invalid.		Check whether the mapping of the limit switch is
		correct.
		Check whether the limit sensor is connected to the
		common terminal of the controller.
	1.	Check whether the limit sensor is working normally,
		and whether the "input" view can watch the signal
		change of the limit sensor.
No signal comes to the	2.	Check whether the mapping of the limit switch is
input.		correct.
	3.	Check whether the limit sensor is connected to the
		common terminal of the controller.
	1.	Check whether IO power is needed.
The output does not work.	2.	Check whether the output number matches the ID of
		the IO board.
	1.	Check whether the power of the power supply is
		sufficient. At this time, it is best to supply power to
POWER led is ON, RUN led		the controller alone, and restart the controller after
is OFF.		adjustment.
	2.	Check whether the ALM light flickers regularly
		(hardware problem).
RUN led is ON, ALM led is	1.	Program running error, please check RTSys error
ON.		code, and check application program.
	1.	Check whether the serial port parameters are
		modified by the running program, you can check all
		the current serial port configurations
Fail to connect controller		through ?*SETCOM.
to PC through serial port.	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	1.	Check the CAN wiring and power supply circuit,
cannot be connected.		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)
	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.
Fail to connect controller	6.	Check whether controller IP conflicts with other
to PC through not nort		devices.
to PC through het port.	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.