User Manual
CS2RS Series
RS485 Closed Loop Stepper Drive

For Models of CS2RS-D503, CS2RS-D507, CS2RS-D1008

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Notice

Read this manual carefully before any assembling and using. Incorrect handling of products in this manual can result in injury and damage to persons and machinery. Strictly adhere to the technical information regarding installation requirements.

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◆ **Thank you for purchasing Leadshine CS2RS Series Products**

◆ **Please read this manual carefully before operating**

◆ **Please keep this manual appropriately**

Record of Revisions

Reversion	Data	Description of Release
V1.00	20190517	Initial Release
V1.01	20191220	Modified Section 4 and Section 5
V2.00	20200604	Add CS2RS-D1008, modify Section 4.3

Preface

Thank you for choosing CS2RS series RS485 closed loop stepper drive system of Leadshine Technology Co., Ltd. This manual gives required knowledge & precautions for using CS2RS series closed loop stepper drives.

CS2RS Series are closed loop stepper drive based on standard Modbus RTU protocol, using RS485 communication can network up to 31 axes, built-in single axis control function with 16-segment position table (PR Mode). After programming the drives, the motion can be started by RS485 communication, or external I/O, or HMI, which has the characteristics of simple use, stable and reliable, rich function and so on.

The Manual of CS2RS Series Include:

● < User Manual of CS2RS Series RS485 Closed Loop Stepper Drive >

The user manual is about hardware, function description, Modbus communication protocol, object dictionaries, etc.

● < Software Manual of CS2RS Series RS485 Stepper Drive >, coming soon.

The user manual is coming soon, includes how to connect with Leadshine MotionStudio software, operation steps and parameters configuration, etc. Customer also can configure object dictionary through master station PC software.

Please Pay Attention to The Following Reminders:

● Only technical personnel are allowed to install debug or maintain the product.

● Make sure wiring is correct before power-on test.

● Incorrect voltage or power polar connection can cause damage to drive or other accidents.

● Contents of this manual are subject to change without prior notice for functional improvement, change of specifications or use's better understandings.

● Leadshine will not undertake any responsibility in case of user's unauthorized product changes reconstruction, product warranty will also be invalid.

Contents

1 Introduction

1.1 Product Introduction

CS2RS Series are closed loop stepper drive based on standard Modbus RTU protocol, using RS485 communication can network up to 31 axes, built-in 16-segment position table (PR Mode --Position Register mode). They can not only solve the problem of step loss in the open loop stepper system, but also can save additional controllers in most of point-to-point applications, to greatly enhance system reliability and reduce the cost. CS2RS Series also support the feature of teaching, the operation modes of Profile Position, Profile Velocity and Homing. They can power 2-phase NEMA 8, 11, 14, 17, 23, 24, 34 stepper motors with 1000 ppr to 5000 ppr incremental encoders.

The CS2RS series is highly reliable and affordable and performs excellently in many industrial applications such as solar equipment, textile, civil, robotics, power generation equipment, 3C, packaging...

1.2 Features

- No loss of step, No hunting, No torque reservation
- Low noise and vibration, smooth motion
- Support Modbus RTU protocol, Internal 16-segment position instructions
- Motion can be started by External IO or RS485
- Support operation modes: Profile Position, Profile Velocity, Homing
- 7 configurable digital inputs, 3 optically isolated digital outputs
- Limit +, Limit -, Origin, Quick stop, Enable, JOG +, JOG - and Position Table inputs
- Alarm, Brake, Homing complete, In Position complete, instructions complete, Path complete outputs
- 20-50VDC supply voltage for CS2RS-D503, max output current 3A

  20-50VDC supply voltage for CS2RS-D507, max output current 7A

  18-80VAC or 30-100VDC supply voltage for CS2RS-D1008, max output current 8A
- RS232 communication for parameters configuration
- Encoder resolution: 1000 ppr to 5000 ppr for NEMA8/11/17/23/24/ 34 CS-M motors
- Protections for over voltage, over current and position following error, encoder cable error, etc.

1.3 Compare with Step/Direction

- Built-in single-axis control can save the PLC in most of point-to-point applications
  to reduce cost;
- Built-in rich diagnostic functions and input and output signals to setup easily;
- Modbus brings more expansion possibility to add value;

1.4 Check of Product

1.4.1 Arrival inspection
- Check whether the surface of the product is damaged or not during transportation.
- Check the nameplate models of the drive and motor are what you have ordered.

● Cheek if it is fully equipped with accessories. Accessories include power supply and I/O signals connector.

CAUTION	
	● Neither the damaged nor missing accessories of stepper system is allowed to install. ● Contact Leadshine or local distributor if any failure was found.

1.4.2 Nameplate information

Model name ➤ **MODEL: CS2RS-D507**
Barcode ➤ S/N:99427953036888251 MS10A
Website ➤ www.leadshine.com
Made in China

Version No.

1.4.3 Part number

CS2 RS - D 50 7 - □

① ② ③ ④ ⑤ ⑥

① Series Name
CS2: 2nd generation closed loop stepper drives

② Communication Mode
RS: RS485

③ Product Type
D: Drive

④ Maximum Operating Voltage
50: 50VDC
100: 100VDC or 80 VAC

⑤ Maximum Output Current
7: 7.0A
8: 8.0A

⑥ Customerized Code
Blank: standard

1.4.4 Parts Description

RS232 Tuning Port

DI1
DI2
DI3
DI4
DI5
DI6
DI7
COMI

DO1
DO2
DO3
COMO

NC NC
NC NC
GND
VCCC
EZ- EZ+
EB- EB+
EA- EA+
A+
A-
B+
B-

VDC
GND

Input I/O
Output I/O
Encoder
Motor
Power

CS2RS-D503 / 507

PWR/ALM
QC passed
RS232
RS232 Tuning Port

DI1
DI2
DI3
DI4
DI5
DI6
DI7
COMI
DO1
DO2
DO3
COMO

NC NC
NC NC
GND VCC
EZ- EZ+
EB- EB+
EA- EA+

A+
A-
B+
B-
VAC
VAC

Input I/O
Output I/O
Encoder
Motor
Power

CS2RS-D1008

1.4.5 Accessories Information

Name	Necessary	Picture		Description
Motor extension cable	Yes	**Motor Side:** Manufacturer: TE Housing: 172159-1-4P Terminal: 770904-1	**Drive Side:** Manufacturer: Molex Housing: 39012040 Terminal: 39000038	(CABLEM-RZ*M*) for CS2RS-D503/507; (CABLEH-RZ*M*) for CS2RS-D1008; Optional length: 1.5m,3m,5m,8m, 10m,12m,15m
Encoder extension cable	Yes	**Motor Side:** Manufacturer: Nstash	**Drive Side:** Manufacturer: Molex Housing: 513531200 Terminal: 561349000	(CABLEM-BM*M*) Optional length: 1.5m, 3m, 5m,8m, 10m,12m,15m
Tuning Cable	No	4 RXD 3 GND 2 TXD 1 NC 4-pin white connector Female DB9 (Look from the front side)		CABLE-PC-1 cable
Network cable	Yes			Optional length: 0.1m, 0.2m, 0.3m, 0.4m, 1m, 1.5m, 2m, 3m,5m,7m, 10m

Note:
    (1) Tuning cable is not necessary, you can also modify parameters by controller PC software.
    (2) Network cable is necessary, but you can also buy shielded network cable through 3rd party.

2 Installation

2.1 Storage and Installation Conditions

2.1.1 Storage condition

● Correctly packaged and store in a clean and dry environment where direct sunlight is avoided.

● Store within an ambient temperature ranging from -20℃ to +65℃.

● Store within a relative humidity ranging from 40% to 90% and non-condensed.

● Avoid any type of exposure to corrosive gases.

2.1.2 Operating ambience conditions

● Temperature ranging from 0℃ to 50℃. The ambient temperature of drive for long-term reliability should be under 40℃. Please install the drive in a well-ventilated area.

● Operation within a relative humidity ranging from 40% to 90% and non-condensed.

● Vibration lower than 0.15mm at a frequency of 10Hz-55Hz.

CAUTION	● DO NOT mount the drive and motor in a location subjected to corrosive or flammable gases, and combustibles. ● Please mount the drive and motor in an indoor electric control cabinet without liquid where direct sunlight is avoided. ● DO NOT mount the drive and motor in a location subjected to airborne dust. ● Please ensure grounding wires are securely connected

2.2 Mechanical Specification
(Unit: mm, 1inch=25.4mm)

CS2RS-D503 / 507

CS2RS-D1008

Figure 2.1: CS2RS Series Mechanical Drawing

2.3 Installation Direction and Space

● The mounting of drive, wiring and motor should be under the regulations of EN 61800-5-1.

● Incorrect installation may result in a drive malfunction or premature failure of the drive and /or motor. Please follow the guidelines in this manual when installing

● The drive should be mounted perpendicular to the wall or in the control panel.

● In order to ensure the drive is well ventilated, ensure that the all ventilation holes are not obstructed and sufficient free space is given to the drive, and a cooling fan is mounted in the control panel.

● Please ensure grounding wires are securely connected.

Figure 2.2: CS2RS series installation drawing

3 Product Specifications

CAUTION	● Don't hot plug the motor wiring, encoder wiring and RS232 communication wiring during power on. ● Be sure to check the connections and make sure the power lead polarity is correct, or there could result in injury or fire. ● Be sure wait for 5 minutes or longer to touch drives after turning off power ● Be sure to give the power supply voltage dose not exceed the drive's input range. ● If using a motor with small phase current, be sure to modify the driver output current before enabling the motor

3.1 Electrical and Operating Specifications

3.1.1 Electrical and Operating Specifications

Name	CS2RS-D503	CS2RS-D507	CS2RS-D1008
Supply Voltage	20-50VDC	20-50VDC	30-100VDC or 18-80VAC
Output Current (Peak)	0.5-3.0A	1.0-7.0A	2.1-8.0A
Size (H*W*L mm)	118*79.5*25.5		151*97*53
Weight (kg)	0.65		0.92
Matched Motor	NEMA 8, 11, 14, 17	NEMA 17, 23, 24	NEMA34
Input Signals	Limit +, Limit -, Origin, Quick stop, Enable, JOG +, JOG - and Position Table		
Output Signals	Brake, Alarm, In Position, GPIOs		
Protection Functions	Over Current, Over Voltage, Position Following Error, Encoder Cable Error, etc.		
PC Software	Leadshine ProTuner (coming soon)		
Operating Environment	Environment	Avoid dust, oil ,fog and corrosive gases	
	Operating Temperature	0-50℃ (32 F – 122 F)	
	Storage Temperature	-20℃-65℃ (-4 F – 149 F)	
	Humidity	40-90%RH	
	Vibration	10-55Hz/0.15mm	
	Mount	Vertical or horizontal mounting	

3.2 Wiring Instructions

Figure 3.1 Wiring Instructions

Note:

(1) There are two RS485 communication ports above, one of them is input port which connects with master station or previous slave, and the other is output port which connects with the following slave.

(2) Single-ended inputs I1, I2, I3, I4, I5, I6 and I7 connection types can be common-cathode and common-anode.

(3) Single-ended outputs connection type is common-anode

3.2.1 Power Supply Cable & Motor Cable

● Wire diameter: +VDC, GND, A+, A-, B+, B- terminal wire diameter≥0.3mm^2 (AWG15-22)

● A noise filter which can improve anti-interference performance is recommended to be connected between power supply and drive.

3.2.2 I/O Signal Cable

● Wire diameter: I1 - I7, O1 - O3, COM wires diameter≥0.12mm^2 (AWG24-26)

● Recommend to adopt shielded twisted pair cable with a length of less than 3 meters (the shorter the better).

● Wiring: As far as possible away from the power line wiring, in order to prevent interference

● Please connect surge absorber to inductive device, such as anti-parallel diode for DC coil, parallel RC-snubbers circuit for AC coil.

3.2.3 RS485 Communication Cable

It is recommended to use shielded Ethernet network cables that do not exceed 100 meters.

3.3 Interface Specifications

3.3.1 Connectors Definition

Figure 3.2: CS2RS series connectors

Name	Description
CN1	Input power connector
CN2	Motor connector
CN3	Encoder input signals connector
CN4	Digital inputs and outputs connector
CN5	RS485 communication connector
CN6	RS232 tuning connector
DIP Switch	Slave ID: SW1-SW5 Baud Rate: SW6-SW7 Terminal Resistance: SW8

3.3.2 CN1 &CN2 Input Power Connector

■ **CS2RS-D503 / 507**

Name	Pic	PIN	Signal	Description
CN1		1	VDC	24V- 48V
		2	GND	GND
CN2		4	A+	Motor phase A+
		3	B+	Motor phase B+
		2	A-	Motor phase A-
		1	B-	Motor phase B-

■ **CS2RS-D1008**

Name	Pic	PIN	Signal	Description
CN1& CN2		1	A+	Motor phase A+
		2	B+	Motor phase B+
		3	A-	Motor phase A-
		4	B-	Motor phase B-
		5	AC	18-80VAC or 24-100VDC ; No polarity
		6	AC	

3.3.3 CN3-Encoder Input Signals Connector

Name	Pic	PIN	Signal	Description
CN3		1, 2, 3, 4	NC	Reserved
		5	EA+	Encoder signal of phase A+
		6	EA-	Encoder signal of phase A-
		7	EB+	Encoder signal of phase B+
		8	EB-	Encoder signal of phase B-
		9	EZ+	Encoder Z+ signal (optional)
		10	EZ-	Encoder Z- signal (optional)
		11	VCC	Encoder +5V voltage
		12	GND	Encoder ground

3.3.4 CN4-I/O Signals Connector

Name	Pic	PIN	Signal	I/O	Description
CN4		1	DI1	I	Configurable Single-ended Digital Inputs DI1-DI7, 12V - 24V. Compatible with common anode and common cathode wiring, max input frequency 10KHz, DI1 is enabling signal default, DI2-DI7 are GPIOs
		2	DI2	I	
		3	DI3	I	
		4	DI4	I	
		5	DI5	I	
		6	DI6	I	
		7	DI7	I	
		8	COMI	I	
		9	DO1	O	Configurable Single-ended Outputs Signals DO1-DO3, common-cathode wiring , Max. 30V/100mA, Alarm, In-position, Brake, etc.
		10	DO2	O	
		11	DO3	O	
		12	COMO	O	

Note:

(1) DI1 is default by Enable signal, normally closed, without connection.

(2) When using Brake output signals, need to connect a relay and a diode

3.3.5 CN5-RS485 Communication Connector

Name	Pic	PIN	Signal	Description
CN5		1	RS485+	RS485 TxD+
		9		RS485 RxD+
		2	RS485-	RS485 TxD-
		10		RS485 RxD-
		3, 4, 11, 12	NC	Received
		5, 6, 13, 14	GND	GND
		7, 8, 15, 16	NC	Received
		Connector cover	PE	Shield GND

3.3.6 CN6-RS232 Tuning Port

Name	Pic	PIN	Signal
CN6		1	RxD
		2	GND
		3	TxD
		4	NC

3.3.7 DIP Switches

The CS2RS series drives use an 8-bit DIP switched to set Slave ID (also called Site Alias), Baud Rate and Terminal Resistance, they are shown as below:

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8

Slave ID   Baud Rate   120 Ω Terminal
                                Resistance

■ **Slave ID: SW1-SW5 (off=1, on=0)**

Slave ID	SW1	SW2	SW3	SW4	SW5
Default	on	on	on	on	on
1 (Factory)	off	on	on	on	on
2	on	off	on	on	on
3	off	off	on	on	on
4	on	on	off	on	on
5	off	on	off	on	on
6	on	off	off	on	on
7	off	off	off	on	on
8	on	on	on	off	on
9	off	on	on	off	on
10	on	off	on	off	on
11	off	off	on	off	on
12	on	on	off	off	on
13	off	on	off	off	on
14	on	off	off	off	on
15	off	off	off	off	on
16	on	on	on	on	off
17	off	on	on	on	off
18	on	off	on	on	off

19	off	off	on	on	off
20	on	on	off	on	off
21	off	on	off	on	off
22	on	off	off	on	off
23	off	off	off	on	off
24	on	on	on	off	off
25	off	on	on	off	off
26	on	off	on	off	off
27	off	off	on	off	off
28	on	on	off	off	off
29	off	on	off	off	off
30	on	off	off	off	off
31	off	off	off	off	off

Note: "Default" means the parameter value can be set by Leadshine software or PLC software.

"Factory" means the factory switch setting value

■ **Baud Rate: SW6 - SW7**

Baud Rate	SW6	SW7
115200 (Default)	on	on
38400 (Factory)	off	on
19200	on	off
9600	off	off

Note: "Default" means the parameter value can be set by Leadshine software or PLC software.

"Factory" means the factory switch setting value

(3) Terminal Resistance Selection: SW8

SW8=ON: terminal resistance is valid;

SW8=OFF: terminal resistance is invalid(Factory setting)

Note: The last slave in the network needs to set the SW8 to on

3.4 I/O Connection

3.4.1 Digital Inputs

The connections of input signals are as below:

COMI: can be connected to 12 / 24 V (common-anode), or 0 V (common-cathode).

Figure 3.3: Input Interface Connection

3.4.2 Digital Output

Driving a relay

Connecting a sourcing output to a PLC's input

Connecting a sinking output to a PLC's input

Figure 3.4: Output Interface Wiring

Note:

(1) The power supply (12-24VDC) above is provided by user, and if the polarity of power supply is reversed, it will damage the drive.

(2) Digital output is OC output with the maximum capacity of 100mA/24V (recommended 50mA/24V), the provided power supply should be under 30V (recommended 24V), otherwise it will cause damage to the drive.

3.4.3 Brake Output

Use PC software(from Leadshine or PLC vendor) to configure this output as a BRAKE CONTROL output. In this case, this signal can be used for automatic brake control while system power failure. This signal can be used for automatic brake control while system power failure.

When use a 24V electromagnetic relay, it is recommended to connect a diode (such as IN4007) in parallel, the polarity should not be reversed. The specific connection is as follows figure.

When use a solid-state relay (SSR), its advantages are fast response, no need to add diodes, no noise; specification such as "Non-contact, DC control DC, current limit protection 0.6-10A".

Figure 3.5: Brake output connection

4 Modbus RTU

4.1 Communication Specifications

Items		Specifications	Remarks
Communication	Communication Port	RS485 and RS232	RS232 only for tuning RS485 for motion control
	Baud Rate	9600/19200/38400/115200[bps]	Parameter setting
	Synchronous Mode	Start / Stop Synchronization	-
	Communication Mode	Half-duplex, Master-slave Mode	Slave/slave communication is prohibited
	Character Composition	Starting bit:1bit Data length:8bit Check bit:even/ odd/ no Stop bit:0/1/2	Parameter setting
Protocol	Communicating Protocol	Modbus RTU	ASCII is not supported
	Slave ID	0:broadcast 1-31:valid sub-devices Numbers	Parameter setting
	Function code (FC)	Function code (FC) / Function	
		0x01 — Read single or multiple bit	-
		0x03 — Read single or multiple data	
		0x05 — Write value to single bit	
		0x06 — Write value to single data	
		0x0F — Write value to multiple bit	
		0x10 — Write value to multiple data	
	Check Mode	CRC-16	Left is Low-bit, Right is high-bit
	Message Length	Variable, the max length is 200byte	-

Single message communication rate of RS485：(Unit: ms)

Baud rate	Start receiving to send completion time	Receive wait time	Time from transmission completion to recovery of receiving state	Total
115200	2.44	0.64	0.6	3.08
38400	5.5	1.16	0.46	7.12
19200	10.76	2.2	0.38	13.34
9600	20.5	3.8	0.6	24.9

4.2 Function Codes

The current supported function codes as below

- 0x03: Read single or multiple data;

- 0x06: Write single data;

- 0x10: Write multiple data;

4.2.1 FC= 0x01-- Read single or multiple bit

Sent Message (Master to Slave)		Receive Message (Slave to Master)	
Slave ID	00 -- 1F	Slaver ID	00 -- 1F
FC	01	FC	01
First address read	High	Number of byte	High
	Low		Low
Number of bits read	High	DATA1	8-bit
	Low	DATA2	8-bit
CRC	Low	CRC	Low
	High		High

4.2.2 FC= 0x03-- Read single or multiple address

Sent Message (Master to Slave)		Receive Message (Slave to Master)	
Slave ID	00 - 1F	Slaver ID	00 - 1F
FC	03	FC	03
First address read	High	Number of byte	High
	Low		Low
Number of address read	High	DATA1	High
	Low		Low
CRC	Low	DATA2	High
	High		Low
-		CRC	Low
			High

Example A: Read value of output peak current

Send message: 01 03 01 91 00 01 D3 1B

Receive message: 01 03 02 00 0A 38 43

Details as following:

Master->slave data:

Message:	01	03	01 91	00 01	D3 1B
Description:	Slave ID	FC	Register address	Number of registers read	CRC

Slave->master data:

Message:	01	03	02	00 0A	38 43
Description:	Slave ID	FC	Number of bytes returned	Value of 0x01 91	CRC

Note: 0x0191-- output peak current, 000A(Hexadecimal)=10(decimal, unit: 0.1A), it means the current 1A.

Example B: Continuous reading parameters of RS485

Send message: 01 03 01 BC 00 06 05 D0

Receive message: 01 03 0C 00 00 00 02 00 00 00 01 00 00 00 04 B6 13

Details as following:

Master->slave data:

Message	01	03	01 BC	00 06	05 D0
Description	Slave ID	FC	Register address	Number of registers read	CRC

Slave>master data:

Message	01	03	0C	00 00	00 02	00 00	00 01	00 00	00 04	9D B3
Description	Slave ID	FC	Number of bytes returned	Value of 0x01BC	Address 0x01BD	Value of 0x01BE	Value of 0x01BF	Value of 0x01C0	Value of 0x01C1	CRC

Note:

(1) The above example shows reading the value of Pr5.22, Pr5.23, Pr5.24, their corresponding address are 0x01BD, 0x01BF, 0x01C1.

(2) The data type of parameter is 32bit,which include high 16bit register and low 16bit register.usually , we use low 16bits only ,but it need to take the high 16 bits as beginning when we read/write multiple parameters continuously.

4.2.3 FC= 0x05-- Write single bit

Sent Message (Master to Slave)		Receive Message (Slave to Master)	
Slave ID	00 -- 1F	Slaver ID	00 -- 1F
FC	05	FC	05
Address write	High	Address write	High
	Low		Low
Value write	0 or 1	DATA	0 or 1
CRC	Low	CRC	Low
	High		High

4.2.4 FC= 0x06-- Write single address

Sent Message (Master to Slave)		Receive Message (Slave to Master)	
Slave ID	00 -- 1F	Slaver ID	00 -- 1F
FC	06	FC	06
Address write	High	Address write	High
	Low		Low
Value write	High	DATA	High
	Low		Low
CRC	Low	CRC	Low
	High		High

Example C: Write value of output peak current

Send message:01 06 01 91 00 20 DD 7B

Receive message:01 06 01 91 00 20 DD 7B

Details as following:

Master->slave data:

Message	01	06	01 91	00 20	DD 7B
Description	Slave ID	FC	Register address	Write data	CRC

Slave>master data:

Message	01	06	01 91	00 20	DD 7B
Description	Slave ID	FC	Register address	Write data	CRC

Note: 0x0191-- output peak current, write data 0x0020=32(decimal, unit: 0.1A), it means the current 3.2A.

Example D: Save the written value to EEPROM

Send message: 01 06 18 01 22 11 06 06

Receive message:01 06 18 01 22 11 06 06

Details as following:

Master->slave data

Message:	01	06	18 01	22 11	06 06
Description	Address	Function code	Register address	Write data	CRC check code

Slave>master data:

Message:	01	06	18 01	22 11	06 06
Description	Address	Function code	Register address	Write data	CRC check code

Note: 0x1801-- Auxiliary control word, and 0x2211 is to save the value to EEPROM. This step is required after the parameter has been modified, to prevent losing the written value after power-off.

4.2.5 FC= 0x0F-- Write multiple bit

Sent Message (Master to Slave)		Receive Message (Slave to Master)	
Slave ID	00 - 1F	Slaver ID	00 - 1F
FC	0F	FC	0F
First address write	High	Address	High
	Low		Low
Number of bit write	High	Number of byte write	High
	Low		Low
Number of byte	Double number of bit write	CRC	Low
			High
DATA1	8-bit		
DATA2	8-bit	-	
CRC	Low		
	High		
-			

4.2.6 FC= 0x10-- Write multiple address

Sent Message (Master to Slave)		Receive Message (Slave to Master)	
Slave ID	00 - 1F	Slaver ID	00 - 1F
FC	10	FC	10
First address write	High	Address	High
	Low		Low
Number of address write	High	DATA	High
	Low		Low
Number of byte	Double number of bit write	CRC	Low
DATA1	High		High
	Low		
DATA2	High	-	
	Low		
CRC	Low		
	High		

Example E: Modify the configuration of digital input (DI)

Send message:01 10 01 46 00 04 08 00 00 00 28 00 00 00 29 1C 14

Receive message:01 10 01 46 00 04 21 E3

Details as following:

Master->slave data:

Message	01	10	01 46	00 04	08	00 00, 00 28, 00 00, 00 29	1C 14
Description	Slave ID	FC	First address write	Number of address write	Number of bytes	Written value	CRC

Slave>master data:

Message	01	10	01 46	00 04	21 E3
Description	Slave ID	FC	First address write	Number of address write	CRC

Note:

(1) In above example, modify the function of DI2 / DI3, and write the value as DI2=0x28 (means path 0), DI2=0x29 (means path 1);

(2) The data type of parameter is 32bit, which include high 16bit register and low 16bit register.usually , we use low 16bits only, but it needs to take the high 16 bits as beginning when we read/write multiple parameters continuously.

4.3 Modbus & PR Parameters

4.3.1 Basic Parameters

The data type of parameter is 32bit,which include high 16bit register and low 16bit register.usually , we use low 16bits only , but it need to take the high 16 bits as beginning when we read/write multiple parameters continuously.

Register Address	Par. # in software	Definition	Description	Range	Default	Unit
0x0001	Pr0.00	Pulse/revolution	The instructions required for the motor to run a turn	200-51200	10000	P/R
0x0003	Pr0.01	Control Mode	Value"0" for open loop; Value"2" for closed loop; Value "1" is reserved.	0-255	2	--
0x0007	Pr0.03	Motor direction	0:CW 1:CCW	0-1	0	--
0x0009	Pr0.04	Motor inductance	Invalid	0-10000	1499	0.001mH
0x000B	Pr0.05	Allowed max position following error	It's used to set the allowed max pulse count of position errors.	0-65535	4000	CPR
0x0051	Pr1.00	Position loop Kp	Increase this value will reduce position following error, but could result in motor vibration	0-3000	25	--
0x0053	Pr1.01	Velocity loop Ki	This parameter is used for tuning Velocity loop proportional gain.	0-3000	3	--
0x0055	Pr1.02	Velocity loop Kp	Increase the value can increase velocity stiffness	0-3000	25	--
0x0065	Pr1.10	Position loop KpH	Usually keep default	0-3000	0	--
0x00A1	Pr2.00	Command filter time	To configure the time for internal command filtering	0-512	15	ms
0x00A3	Pr2.01	Velocity switching point: open loop to	Usually keep the default value. Only change it when it causes	0-200	18	0.1RPS

		closed loop	motor vibration at this mode switching velocity point.			
0x00A5	Pr2.02	Velocity switching point: closed loop to open loop	Usually keep the default value.	0-200	12	0.1RPS
0x00A7	Pr2.03	Delay time of open loop to closed loop	Usually keep the default value.	0-32767	5	ms
0x00A9	Pr2.04	Delay time of closed loop to open loop	Usually keep the default value.	0-32767	250	ms
0x00AB	Pr2.05	-	Invalid	0-200	50	ms
0x0167	Pr4.19	Delay of brake released	Keep default normally	0-1500	250	ms
0x0169	Pr4.20	Delay of brake locked	Keep default normally	0-1500	250	ms
0x016B	Pr4.21	Velocity point of closing brake	Keep default normally	0-500	10	--
0x0171	Pr4.24	Distance to send "In Position" output signal	The distance (in number of pulses) to send out the In-Position signal	0-1500	200	CPR
0x0177	Pr4.27	Bus-voltage	Invalid	0-65535	0	0.1V
0x0179	Pr4.28	Input status	Bit0-Bit6: DI1-DI7	0-65535	0	--
0x017B	Pr4.29	Output status	Bit0-Bit2: DO1-DO3	0-65535	0	--
0x0187	Pr4.35	DIP switches status	Invalid	0-65535	0	--
0x0191	Pr5.00	Output peak current	It is recommended to set this value according to 1.2-1.4 times the motor phase current	0-200	60 ---507 80---1008	0.1A
0x0193	Pr5.01	Percentage of holding current in closed-loop mode	It is recommended to keep default, If the torque is not enough, it can be increased appropriately	0-100	50	%
0x0195	Pr5.02	Percentage of holding current in open-loop mode	It is recommended to keep default, If the torque is not enough, it can be increased appropriately	0-100	50	%
0x0197	Pr5.03	Percentage of shaft locked current(power on)	Keep default normally	0-100	100	--
0x0199	Pr5.04	Shaft locking time	Keep default normally	0-1500	200	1ms
0x019F	Pr5.07	Rising time of shaft locked current (power on)	Keep default normally	1-60	1	100ms
0x01A5	Pr5.10	The max Stop time	Keep default normally	100-1000	1000	ms
0x01AB	Pr5.13	Auto tuning	0--No, 1--Yes	0-1	1	--
0x01BD	Pr5.22	RS485 baud rate	When SW6 and SW7 are all OFF, it can be set by PC software. 0:2400　1:4800　2:9600 3:19200　4:38400　5:57600 6:115200	0-6	4	--
0x01BF	Pr5.23	RS485 ID	When SW1- SW5 are all ON, it can be set by PC software	0-127	1	--
0x01C1	Pr5.24	RS485 data type	0: 8-bit data, even check, 2 stop bits; 1: 8-bit data, odd check, 2 stop bits 2: 8-bit data, even check, 1 stop bit; 3: 8-bit data, odd check, 1 stop bit:	0-11	4	--

Register Address	Par. # in software	Definition	Description	Range	Default	Unit
			4: 8-bit data, no check,1 stop bit: 5: 8-bit data, no check,2 stop bits;			
0x01C3	Pr5.25	RS485 control word	-	0-32767	0	--
0x01E1	Pr6.00	JOG speed	This JOG is triggered by RS485. For JOG triggered by IO, please use Pr8.40/8.41	0-5000	60	r/min
0x01E3	Pr6.01	Interval		0-10000	100	ms
0x01E5	Pr6.02	Running times		0-30000	1	--
0x01E7	Pr6.03	Acceleration		0-10000	200	--
0x01FF	Pr6.15	Version	Invalid	0-65535	0	--
0x0201	Pr6.16	Version	Invalid	0-65535	0	--
0x0231	Pr7.00	Motor model	Invalid	0-100	0	--
0x0233	Pr7.01	Encoder resolution	Encoder resolution of closed-loop stepper motor	0-20000	4000	CPR=4*PPR
0x0235	Pr7.02	Back EMF coefficient	Invalid	0-32767	100	1ms
0x0237	Pr7.03	Current loop Kp	When auto-tuning is disabled, this can be modified	0-3000	1500	--
0x0239	Pr7.04	Current loop Ki		0-1500	300	--
0x023B	Pr7.05	Adjustment Percentage of current loop	Invalid	0-1024	100	--
0x023D	Pr7.06	Current loop Kc	Invalid	0-32767	300	--
0x0243	Pr7.09	Over voltage threshold	Invalid	0-1000	90	V

4.3.2 Input and Output Parameters

Register Address	Par. # in software	Definition	Description	Range	Default	Unit
0x0145	Pr4.02	SI1 (DI1)	SI1 is set to enable by default, N.C (normally closed). Other inputs are N.O (normally open) by default, and the value plus 0x80 is normally closed. The specific configuration is as follow table.	0-65535	136 (0x88)	--
0x0147	Pr4.03	SI2 (DI2)		0-65535	0	--
0x0149	Pr4.04	SI3 (DI3)		0-65535	0	--
0x014B	Pr4.05	SI4 (DI4)	Note: (1) If the input function is set repeatedly, only after the restart drive can detect it. (2)When input functions are configured, it is effective after clicking save and restart drive.	0-65535	0	--
0x014D	Pr4.06	SI5 (DI5)		0-65535	0	--
0x014F	Pr4.07	SI6 (DI6)		0-65535	0	--
0x0151	Pr4.08	SI7 (DI7)		0-65535	0	--
0x0157	Pr4.11	SO1 (DO1)	They are N.O (normally open) by default, and the value plus 0x80 is normally closed. The specific configuration is as follow table. Note: (1) When input functions are configured, it is effective after clicking save and restart drive.	0-65535	0	--
0x0159	Pr4.12	SO2 (DO2)		0-65535	0	--
0x015B	Pr4.13	SO3 (DO3)		0-65535	0	--

Digital Input port function assignment:

Normal-open (N.O);   Normal-closed (N.C).

Digital Inputs				Digital Outputs			
Functions	Symbols	Type		Functions	Symbols	Type	
		N.O.	N.C.			N.O.	N.C.
Control Trigger	CTRG	0x20	0xA0	Command Complete	CMD_OK	0x20	0xA0
Homing Trigger	HOME	0x21	0xA1	Path Complete	MC_OK	0x21	0xA1
Quick Stop	STP	0x22	0xA2	Homing Complete	HOME_OK	0x22	0xA2
JOG CW	JOG+	0x23	0xA3	Alarm	ALM	0x25	0xA5
JOG CCW	JOG-	0x24	0xA4	Brake	BRK	0x24	0xA4
Positive Limit	PL	0x25	0xA5	In-position	PEND	0x23	0xA3
Negative Limit	NL	0x26	0xA6				
Origin Signal	ORG	0x27	0xA7				
Path Address 0	ADD0	0x28	0xA8				
Path Address 1	ADD1	0x29	0xA9	-			
Path Address 2	ADD2	0x2A	0xAA				
Path Address 3	ADD3	0x2B	0xAB				
Enable	SRV-ON	0x08	0x88				
Clear error	CLR	0x07	0x87				

4.3.3 PR Motion Parameters

PR (Position Register) mode is developed by Leadshine, which supports uni-axis motion control function and can be configured with 16-segment position table.

Register address	Par. # in software	Definition	Range	Default Value	Description
0x6000	Pr8.00	PR global control function (CTRG)	0-3	0	Bit0: CTRG effective edge. 0--rising edge, 1--falling edge Bit1: Software limit.. 0--disable, 1--enable Bit2: Homing after power on. 0--no, 1--yes Bit4: CTRG trigger type. 0--refer to bit0, 1--level trigger
-	Pr8.01	PR path segment	16		16-segment
0x6002	Pr8.02	Control register input	0	0	Write 0x1P ("P" = 0-15), run the path P motion; Write 0x20, homing; Write 0x21, manually set to origin position; Write 0x40, quick stop; Read 0x6002 can check the running path # and status ,(1) if return "0x000P", it means the path P motion complete, can receive new motion command; (2) if return 0x010P, it means the path P motion is running; (3) if return 0x020P, it means a position following error during path P operation
0x6006	Pr8.06	Limit+ H	32767	0x7FFF	Software limit positive high bits
0x6007	Pr8.07	Limit+ L	32767	0xFFFF	Software limit positive low bits
0x6008	Pr8.08	Limit- H	32767	0x8000	Software limit negative high bits
0x6009	Pr8.09	Limit- L	32767	0	Software limit negative low bits
0x600A	Pr8.10	Homing mode	-	0	Bit0: homing direction, 0--CCW, 1--CW; Bit1: Whether to move to the specified position after homing, 0--no, 1--yes; Bit2-Bit7: homing method, 0--limit switch homing, 1--origin homing, 2-- Z signal homing, 3-- reserved, 8--manually return to zero immediately; Bit8: homing with Z signal (index signal), 0--no, 1--yes.

0x600B	Pr8.11	Origin signal position high bits	32767	0	The origin signal position on the coordinate system . Pr8.11 is high 16 bits, and Pr8.12 is low 16 bits
0x600C	Pr8.12	Origin signal low bits	32767	0	-
0x600D	Pr8.13	Homing stop position high bits	32767	0	The motor moves to the Specified position after homing. If bit1 of Pr8.10=1, the motor will move to Specified absolute position. Pr813 is high 16 bits , and Pr814 is low 16 bits.
0x600E	Pr8.14	Homing stop position low bits	32767	0	-
0x600F	Pr8.15	Homing high speed	6000	200	The 1st segment speed of homing, unit: rpm
0x6010	Pr8.16	Homing low speed	6000	50	The 2nd segment speed of homing, unit: rpm
0x6011	Pr8.17	Homing Acc	32767	100	Acc of homing, unit: ms/1000rpm
0x6012	Pr8.18	Homing Dec	32767	100	Dec of homing, unit: ms/1000rpm
0x6016	Pr8.22	Limit stop time			Deceleration time after limit, unit:ms
0x6017	Pr8.23	E-STOP time			Deceleration time after emergency stop, unit:ms
0x601A	Pr8.26	I/O combination trigger	65535	0	It can save the configuration of an input for CTRG. 0--disable; 1--enable, only valid after homing; 2--enable, nothing to do with home
0x601B	Pr8.27	I/O combination filter time	65535	0	Unit: ms
0x601C	Pr8.28	Output value of S code	32767	0	
0x601D	Pr8.29	PR alarm	65535	0	Prmov1.err =0, the new command is automatically zeroed; =0x100, limit switch alarm when homing; =0x20P, path P has limit switch alarm.
0x6026	Pr8.38	JOG 2 speed	32767	0	JOG triggered by external I/O signal, Unit: rpm
0x6027	Pr8.39	JOG 1 Speed	32767	0	
0x6028	Pr8.40	JOG Acceleration	32767	0	Unit: ms/1000rpm
0x6029	Pr8.41	JOG Deceleration	32767	0	Unit: ms/1000rpm
0x602A	Pr8.42	Profile position H			Read only, High 16-bit (0-65535)
0x602B	Pr8.43	Profile position L			Read only, Low 16-bit (0-65535)
0x602C	Pr8.44	Actual position H			Read only, High 16-bit (0-65535)
0x602D	Pr8.45	Actual position H			Read only, Low 16-bit (0-65535)

4.3.4 PR Path Parameters

Register address	Par. # in software	Definition	Description
0x6200	Pr9.00	PR path 0	The corresponding functions can be selected for different bit Bit0-3: Motion Type, =0---- no action =1---- position mode =2----velocity mode =3---- homing; Bit4: INS, =0---- No interrupt

			=1---- interrupt(all the current ones are 1.);
			Bit5: OVLP,
			=0---- Non overlapping
			=1---- Overlapping
			Bit6:
			=0----absolute position
			=1----relative instructions
			Bit8-13: Jump to the corresponding PR path 0-15;
			bit14: JUMP,
			=0---- No jump
			=1---- jump
0x6201	Pr9.01	Position H	High 16 bit,
0x6202	Pr9.02	Position L	Low 16 bit
0x6203	Pr9.03	Speed	Unit: rpm
0x6204	Pr9.04	Acc	Unit: ms/1000rpm
0x6205	Pr9.05	Dec	Unit: ms/1000rpm
0x6206	Pr9.06	Suspend time	Suspend time after the command is stopped
0x6207	Pr9.07	Special parameter	PR Path 0 maps directly to Pr8.02, Others are reserved
0x6208	Pr9.08	PR path 1	---
0x6209	Pr9.09	Position	---
0x620A	Pr9.10	Position	---
0x620B	Pr9.11	Speed	---
0x620C	Pr9.12	Acc	---
0x620D	Pr9.13	Dec	---
0x620E	Pr9.14	Suspend time	---
0x620F	Pr9.15	Special parameter	---
0x6210	Pr9.16	PR path 2	---
0x6211	Pr9.17	Position	---
0x6212	Pr9.18	Position	---
0x6213	Pr9.19	Speed	---
0x6214	Pr9.20	Acc	---
0x6215	Pr9.21	Dec	---
0x6216	Pr9.22	Suspend time	---
0x6217	Pr9.23	Special parameter	---
Similar as above paths	Pr9.24- Pr9.31	Similar as above paths	Each path has 8 data
Similar as above paths	Pr9.32- Pr9.39	Similar as above paths	Each path has 8 data
Similar as above paths	Pr9.40- Pr9.47	Similar as above paths	Each path has 8 data
Similar as above paths	Pr9.48- Pr9.55	Similar as above paths	Each path has 8 data
Similar as above paths	Pr9.56- Pr9.63	Similar as above paths	Each path has 8 data
Similar as above paths	Pr9.64- Pr9.71	Similar as above paths	Each path has 8 data

4.3.5 Status Monitoring Parameters

Register address	Definition	Attributes	Unit	Description
0x1001	Control Mode	R	/	Invalid, always "0"

0x1003	Motion state	R	/	Bit0: 0--normally, 1--faulty;
				Bit1: 0--drive disable, 1--enable;
				Bit2: 0--not running, 1--running;
				Bit4: 0-- Command not completed,
				      1-- Command completed;
				Bit5: 0-- Path not completed,
				       1-- Path completed;
				Bit6: 0--Homing not completed,
				       1--Homing completed.

0x1010 (high 16-bit) 0x1011 (low 16-bit)	Position following error	R	pulses	-
0x1012 (high 16-bit) 0x1013 (low 16-bit)	Profile position	R	pulses	-
0x1014 (high 16-bit) 0x1015 (low 16-bit)	Feedback position	R	pluses	-
0x1044 (high 16-bit) 0x1045 (low 16-bit)	Profile velocity	R	rpm	-
0x1046 (high 16-bit) 0x1047 (low 16-bit)	Feedback velocity	R	rpm	-

4.3.6 Control and Status Word Parameters

(1) The related function is started by sending the control word,

(2) The completion is judged by checking the status word. The status word is automatically returned to its initial state after it is read.

■ **Control Word:**

Register address	Definition	Attributes	Description
0x1801	Control word	W	Write 0x1111: Reset current alarm Write 0x1122: Reset history alarm Write 0x2211: Save all parameters to EEPROM Write 0x2222: Parameter reset(exclude motor parameters) Write 0x2233: All parameters are reset to factory Write 0x4001: **JOG CW** (Need to write once at least 50ms) Write 0x4002: **JOG CCW**

■ **Status Word of Saving Parameter:**

Register address	Definition	Attributes	Description
0x1901	status word	R	Show 0x5555: Saving parameter OK Show 0x1111: Saving parameter fault Note: (1) It always been 0x1111 if parameters have never been saved; (2) The first read display 0x5555 after saving the parameters, then second read above becomes 0x1111.

4.4 Error Codes and Troubleshooting

4.4.1 Communication Error Codes

When the master station receive a message from the slave about a communication error, you can follow the table below for analysis

No.	Return Instructions (slave->master)		
	Symbols	Description	Content
1	ID	Slave ID	0-31
2	FC	Function code	FC+0x80
3	EC	Error Code	-
4	CRC	check code	Low
			High

Error code:

Error Code (EC)	Description
0x01	Wrong FC(This supports FC beside of 01h/ 03h/ 05h/ 08h/ 0Fh/ 10h)
0x02	Wrong access address
0x03	Wrong data,
0x04	Data written over limit
0x08	Wrong CRC check code

Example F: CRC check code error

Master-> slave data::

Message	01	03	00 01	00 01	D5 C1
Description	Slave ID	Function code	Register address	Read Number of registers	CRC check code

slave-> Master data:

Message	01	83	08	40 F6
Description	Slave ID	FC+0x80	Error code	CRC

Example F: Function code error

Master-> slave data::

Message	01	02	00 01	00 01	E8 0A

Description	Slave ID	Function code	Register address	Read Number of registers	CRC check code

slave-> Master data:

Message	01	82	01	81 60
Description	Slave ID	Function code+0x80	Error code	CRC check code

4.4.2 Drive Alarm Codes and Troubleshooting

Register Address	definition	operation	unit	description
0x2203	Current alarm	R	/	Below table

Error code and cause:

Error code	Content	Red Light Flash Times	Sequence wave of RED LED	Trouble Shooting
0x01	Over current	1		1. Restart the drive; 2. If it still exists, check whether the motor is short-circuited or not connected to the motor;
0x02	Over voltage	2		1. Restart the drive; 2. If it still exists, check the voltage of power supply;
0x40	Current sampling circuit error	3		1. Restart the drive; 2. If it still exists, the hardware failure
0x80	Shaft locking error	4		1. Check whether the motor wire is broken
0x200	EEPROM error	5		1. Connect the drive to Leadshine software to reset parameters to the factory 2. If it still exists, the hardware failure
0x100	Auto tuning error	6		1. Restart the drive; 2. If it still exists, disable auto-tuning by 0x01AB (Pr5.13).
0x20	Position following error	7		1. Check if the value of encoder resolution 0x0233 (Pr7.01) is correct; 2. Check if the encoder cable is broken ; 3. Check if the motor is lost of step; 4.
-	Encoder cable error	8		
-	Repeated settings of input function	9		

4.4.3 LED display and troubleshooting

The green light is always on after the drive power on. When the error is occurred, the drive will stop

working and red light will be flashed indicates the current error code. Whatever error occurs, the user need to power off the drive and restart it after removing the error.

The user can read the corresponding error code through the PC software. The latest errors will be saved to EEPROM which supports 10 historical errors in the list.

he red LED is the error indicator, which flashes periodically for 5 seconds in the event of error occurred. The flash frequency of red LED is 2Hz, that is 200ms on and 300ms off.

4.4.4 Troubleshooting

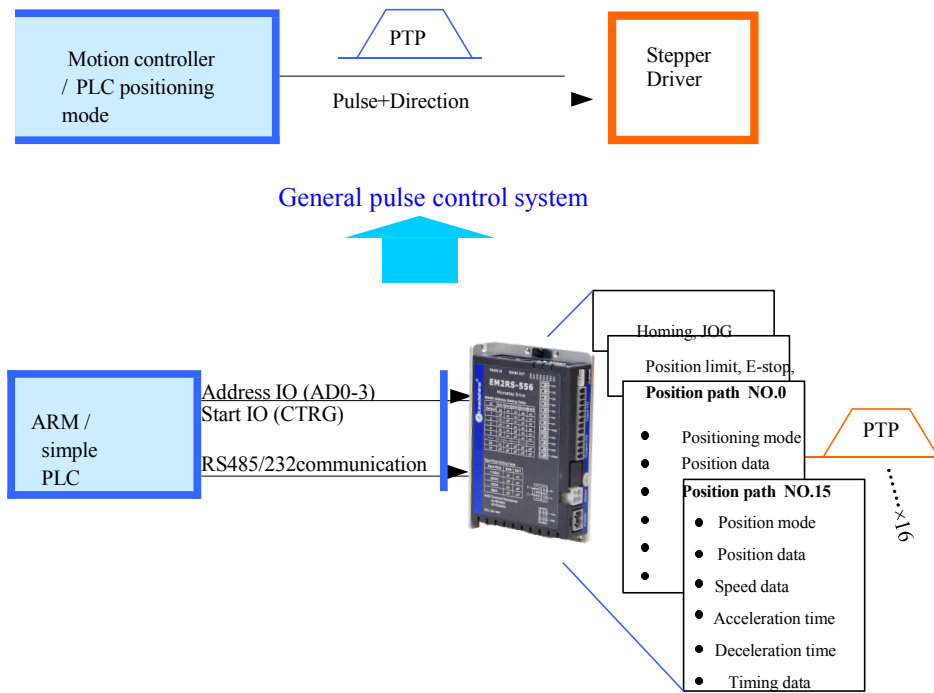| Symptoms	Possible Problems	Solutions
Green LED is off	Power is off	Check the power connection
Red LED flash 1 times	Over current	Re-power; If the error is still existed after re-power,, then check the motor connection (circuit short or not)
Red LED flash 2 times	Over voltage	Re-power; If the error is still existed after re-power, check the power supply(voltage is too high)
Red LED flash 3 times	Amplifier error	Re-power; If the error is still existed after re-power, hardware issue .
Red LED flash 4 times	Shaft locking error	Check the motor wiring whether broken or not
Red LED flash 5 times	Storage error	Connect to Leadshine ProTuner and reset drive; If the error is still existed after parameter setting, hardware issue.
Red LED flash 6 times	Parameter auto tuning error	Restart power; Close auto tuning function via Leadshine ProTuner
Motor not running	Disabled Motor shaft	Check whether the enable input is configured or not and is normal closed
Can not connect to master	Communication error	Check the network cable RS485 ID setting is not correct(check the address setting)

4.4.5 Error clear

Check the error via Leadshine ProTuner

Current Error	Current happened error	Over current,over voltage,etc
History error	History happened error .	Over current,over voltage,etc
Read error	Read Historical error .	Check the Historical happened error .
Clear current error	Current error	(1) It can clear over voltage error, but can not clear over current error; (2) There are two methods to clear the current alarm: one is via Leadshine ProTuner, and the second is via external I/O. (3) If the current error cannot be cleared, please check the drive

Clear history error	History error	All history error records can be cleared by Leadshine ProTuner

5 PR Functions

PR is uni-axial motion control function which is controlled by procedure software. Mainly uni-axial motion instructions control to, save the motion control function of the controller.

5.1 PR Main Features

PR (Position Register) mode is developed by Leadshine, which supports uni-axis motion control function and can be configured with 16-segment position table.

Features	Description
Homing	The drive can detect homing signal by homing processing,and confirm the homing point of mechanical coordinate system ● Homing by detecting limit signal ,homing by detecting original signal,set homing point by manual; ● Homing direction can be set; ● Homing offset can be set; ● move to the Specified position after homing; ● Acc/Dec of homing speed can be set; Note: 1) Control instruction can not be sent to drive during homing 　　　2) The above functions are valid at PR mode only
JOG	JOG can be realizes by IO or RS485,which can be used for debugging. ● CW JOG; ● CCW JOG; ● JOG teaching function; ● the speed and ACC of JOG can be set; Note: JOG function triggered by input signal level
Limit	Protect the machine by limiting the working area range ● Positive/negative hardware limit; ● Software limit setting; ● Acc/Dec limit can be set Note: 1) software limit is valid after homing completed; 　　　2) The above functions is valid at PR mode only
Emergency stop	The movement stop immediately when the emergency stop input is on .it is valid at PR mode only
Positioning	Select the positioning path number by positioning the address IO (ADD0-3), and then start the positioning path movement by starting IO (CTRG) or RS485 ● Include positioning mode,speed mode,homing mode ● Support IO rising edge trigger, double edge trigger,level trigger,RS485 trigger ● Support continuously positioning ● The max is 16 segments ● Position,speed,ACC/DEC can be set ● pause time or timing time can be set ● support interrupt, re, jump and other functions
RS485 control	The above PR functions are controlled by RS485

Note:

1) In PR control mode, the Pulse/revolution is 10000P/r and can not be modified 2) PR mode is valid when P0.01=0.

5.2 Homing

Homing includes Homing by detecting limit signal , homing by detecting original signal, set homing point by manual, auto homing after enabling drive.
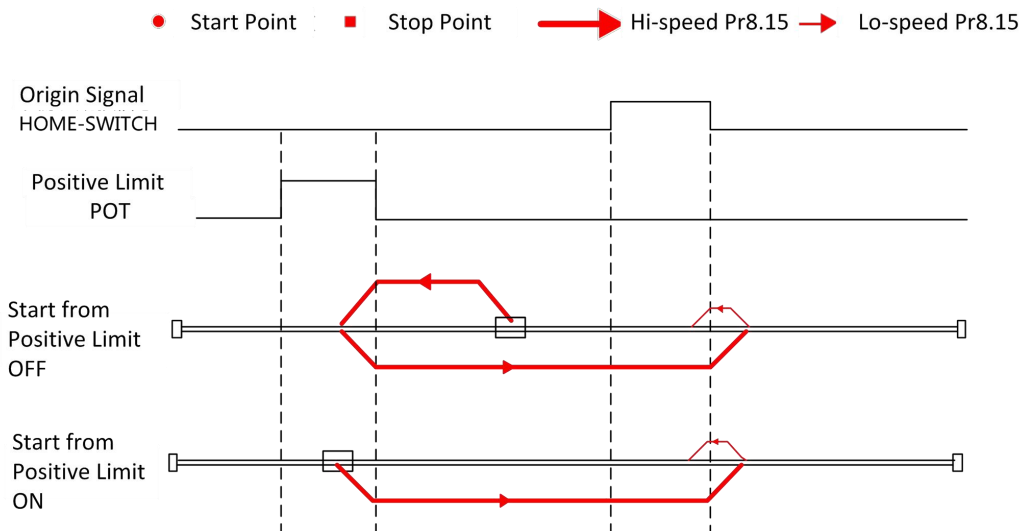
5.2.1 Parameters

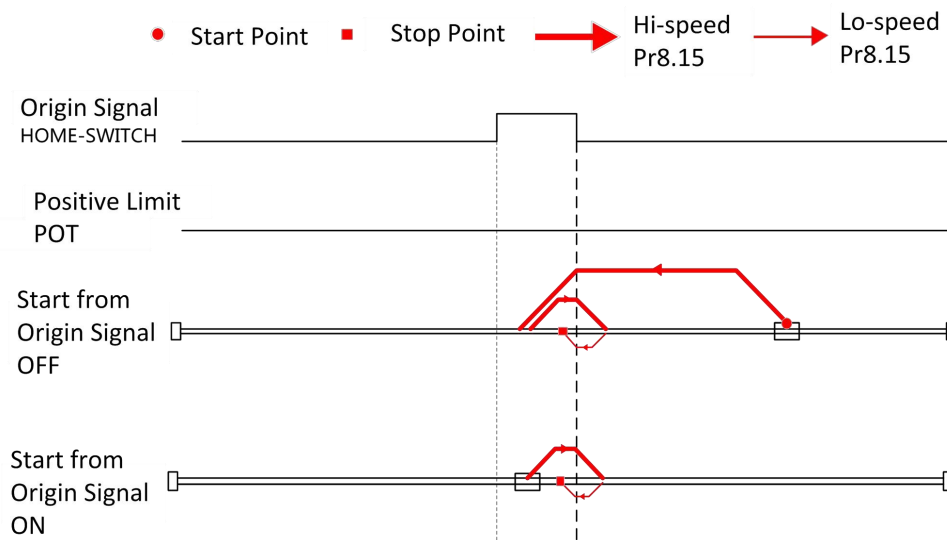| Parameters	Register address	Definition	Description
Pr8.10	0x600A	Homing mode	Bit0: homing direction =0:CCW; =1:CW. Bit1: move to the Specified position after homing? =0: No; =1: Yes. Bit2: homing type =0: Homing by detecting limit signal =1: Homing by detecting origin signal Note: (1) Write 0x21 to the address 0x6002, or click the "manual homing" button to set the current point to origin signal); (2) Write 1 to the bit2 of address 0x6000 can set to auto-homing after enabling drive; (3) Except for all of the above, the other homing mode is invalid.
Pr8.11	0x600B	Origin signal position high bits	The origin signal position on the coordinate system . Pr8.11 is high 16 bits, and Pr8.12 is low 16 bits
Pr8.12	0x600C	Origin signal low bits	
Pr8.13	0x600D	Homing stop position high bits	The motor moves to the Specified position after homing. If bit1 of Pr8.10=1, the motor will move to Specified absolute position. Pr813 is high 16 bits , and Pr814 is low 16 bits.
Pr8.14	0x600E	Homing stop position low bits	
Pr8.15	0x600F	Homing high speed	The 1st segment speed of homing, unit: rpm
Pr8.16	0x6010	Homing low speed	The 2nd segment speed of homing, unit: rpm
Pr8.17	0x6011	Homing Acc	Acc of homing, unit: ms/1000rpm
Pr8.18	0x6012	Homing Dec	Dec of homing, unit: ms/1000rpm

Note: Generally homing to find the origin signal, the motion is decelerating to stop, so after finding the origin will also move a distance, resulting in the actual read position value may not be 0, but in fact the position is accurate, and will output homing completion signal. If the motion is an absolute position mode, it does not matter whether the origin is at 0. But if the user does care about the 0 position, you can set the parameters by PC software
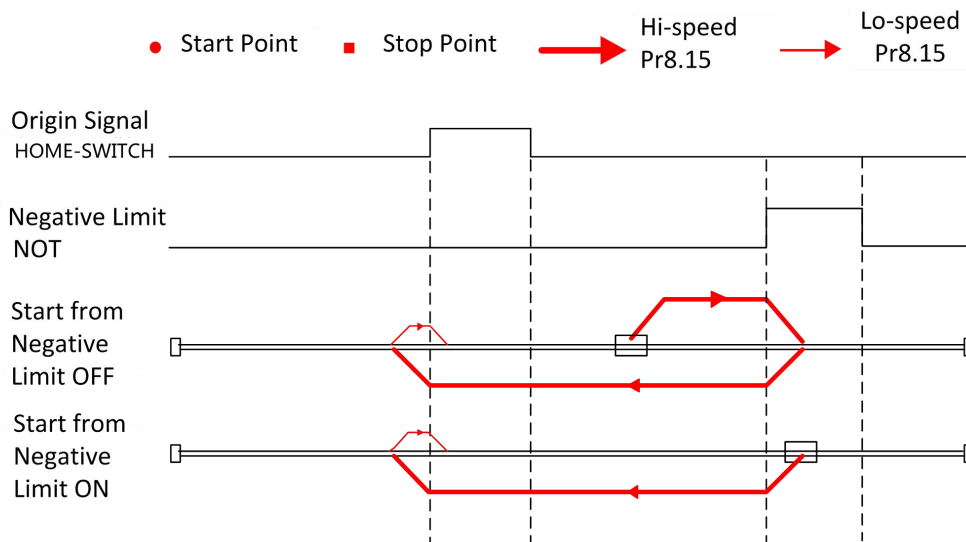
5.2.2. Homing by Origin Signal
(1) Origin Signal and Positive Limit Switch

(2) Origin Signal at Positive Direction

(3) Origin Signal and Negative Limit Switch

(4) Origin Signal at Negative Direction

5.2.3. Homing by Limit Switch

(1) Positive Limit Switch

(2) Negative Limit Switch

5.3 Position limit, JOG and E-stop function

Register address	Par. # in software	Definition	Range	Default Value	Description
0x6000	Pr8.00	PR global control function (CTRG)	0-3	0	Bit0: CTRG effective edge. 0--rising edge, 1--falling edge Bit1: Software limit.. 0--disable, 1--enable Bit2: Homing after power on. 0--no, 1--yes Bit4: CTRG trigger type. 0--refer to bit0, 1--level trigger
	Pr8.01	PR path segment	16		16-segment
0x6002	Pr8.02	Control register input	0	0	Write 0x1P ("P" = 0-15), run the path P motion; Write 0x20, homing; Write 0x21, manually set to origin position; Write 0x40, quick stop; Read 0x6002 can check the running path # and status ,(1) if return "0x000P", it means the path P motion complete, can receive new motion command; (2) if return 0x010P, it means the path P motion is running; (3) if return 0x020P, it means a position following error during path P operation
0x6006	Pr8.06	Limit+ H	32767	0x7FFF	Software limit positive high bits
0x6007	Pr8.07	Limit+ L	32767	0xFFFF	Software limit positive low bits
0x6008	Pr8.08	Limit- H	32767	0x8000	Software limit negative high bits
0x6009	Pr8.09	Limit- L	32767	0	Software limit negative low bits
0x600A	Pr8.10	Homing mode		0	Bit0: homing direction, 0--CW, 1--CCW; Bit1: Whether to move to the specified position after homing, 0--no, 1--yes; Bit2-Bit7: homing method, 0--limit switch homing, 1--origin homing, 2-- Z signal homing, 3-- reserved, 8--manually return to zero immediately; Bit8: homing with Z signal (index signal), 0--no, 1--yes.
0x600B	Pr8.11	Origin signal position high bits	32767	0	The origin signal position on the coordinate system .
0x600C	Pr8.12	Origin signal low bits	32767	0	Pr8.11 is high 16 bits, and Pr8.12 is low 16 bits
0x600D	Pr8.13	Homing stop position high bits	32767	0	The motor moves to the Specified position after homing. If bit1 of Pr8.10=1, the motor will move to Specified absolute
0x600E	Pr8.14	Homing stop position low bits	32767	0	position. Pr813 is high 16 bits , and Pr814 is low 16 bits.

0x600F	Pr8.15	Homing high speed	6000	200	The 1st segment speed of homing, unit: rpm
0x6010	Pr8.16	Homing low speed	6000	50	The 2nd segment speed of homing, unit: rpm
0x6011	Pr8.17	Homing Acc	32767	100	Acc of homing, unit: ms/1000rpm
0x6012	Pr8.18	Homing Dec	32767	100	Dec of homing, unit: ms/1000rpm
0x6016	Pr8.22	Limit stop time			Deceleration time after limit, unit:ms
0x6017	Pr8.23	E-STOP time			Deceleration time after emergency stop, unit:ms
0x601A	Pr8.26	I/O combination trigger	65535	0	It can save the configuration of an input for CTRG. 0--disable; 1--enable, only valid after homing; 2--enable, nothing to do with home
0x601B	Pr8.27	I/O combination filter time	65535	0	Unit: ms
0x601C	Pr8.28	Output value of S code	32767	0	
0x601D	Pr8.29	PR alarm	65535	0	Prmov1.err =0, the new command is automatically zeroed; =0x100, limit switch alarm when homing; =0x20P, path P has limit switch alarm.
0x6026	Pr8.38	JOG 2 speed	32767	0	JOG triggered by external I/O signal, Unit: rpm
0x6027	Pr8.39	JOG 1 Speed	32767	0	
0x6028	Pr8.40	JOG Acceleration	32767	0	Unit: ms/1000rpm
0x6029	Pr8.41	JOG Deceleration	32767	0	Unit: ms/1000rpm
0x602A	Pr8.42	Profile position H			Read only, High 16-bit (0-65535)
0x602B	Pr8.43	Profile position L			Read only, Low 16-bit (0-65535)
0x602C	Pr8.44	Actual position H			Read only, High 16-bit (0-65535)
0x602D	Pr8.45	Actual position H			Read only, Low 16-bit (0-65535)

Note:

(1) Pr8.39 - Pr8.41(JOG) are available when triggered by I/O

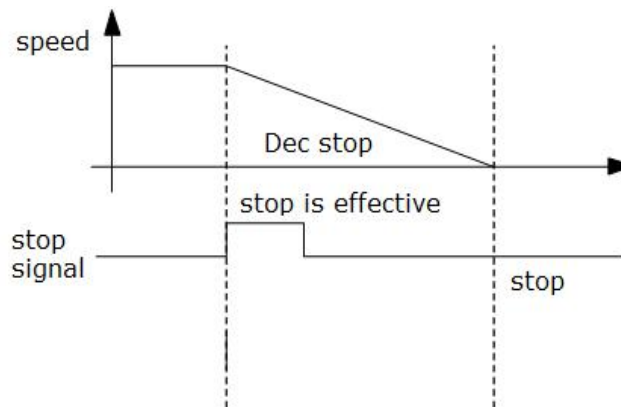(2) Pr6.00 - Pr6.03 (JOG) are available when triggered by RS485

5.3.1 JOG

JOG function

JOG time sequence

5.3.2 Limit and E-stop

Used for emergency stops

E-stop time sequence

5.4 Trigger Method

Parameter	Register address	Definition	Description

Pr8.00	0x6000	PR control setting	Global Control function of PR:
			Bit0: CTRG
			    =0: Rising edge trigger
			    =1: Double edge trigger;
			Bit1:
			    =0:Software limit is invalid
			    =1: Software limit is valid;
			Bit2:
			    =0: homing after power up is invalid
			    =1: homing after power up is valid;
			Bit4:
			    =0: level trigger is invalid
			    =1: level trigger is valid;
			    (if bit4=1,both the trigger type setting of bit0 and triggered by RS485 are invalid)

Pr8.02	0x6002	Trigger register	Write corresponding command to the 0x6002 to realize the selection and startup of each action. Write value 0x01P----P-segment positioning, (P indicates path NO. 0-15); Write value 0x020---- Homing; (edge triggered) Write value 0x021---- Set the current position as origin by manual; Write value 0x040---- E-stop; Read value 0x000---- Positioning is completed and new data can be received; Read value 0x01P, 0x020, 0x040---- Not responding to the command; Read value 0x10P---- Path is running; Read value 0x200---- Command is completed and waiting for positioning. Note: (P indicates path NO. 0-15);

5.4.1 Fixed trigger method

Fixed trigger mode is after configuring homing and path (less than 16-segment), then use Pr8.02(0x6002) to start the operation path which replace CTRG and HOME. This mode apply to fixed motion and simple operation system.

10-11	**Pr9.01**	High position	XXXX			
12-13	**Pr9.02**	Low position	XXXX			
14-15	**Pr9.03**	Speed	XXXX			
16-17	**Pr9.04**	Acceleration	XXXX			
18-19	**Pr9.05**	Deceleration	XXXX			
20-21	**Pr9.06**	Delay time	XXXX			
22-23	**Pr9.07**	Trigger control	0x0010			
24	**CRC**	Check code	Lo			
25			Hi			

5.5 Trigger Path

The positioning path can be run with single segment movement or continuous movement, which includes three motion types: position positioning type, speed movement type, homing type ,There are 16 PR paths, and each path sets the motion type, the position mode, the speed, the acceleration and deceleration and the pause time.
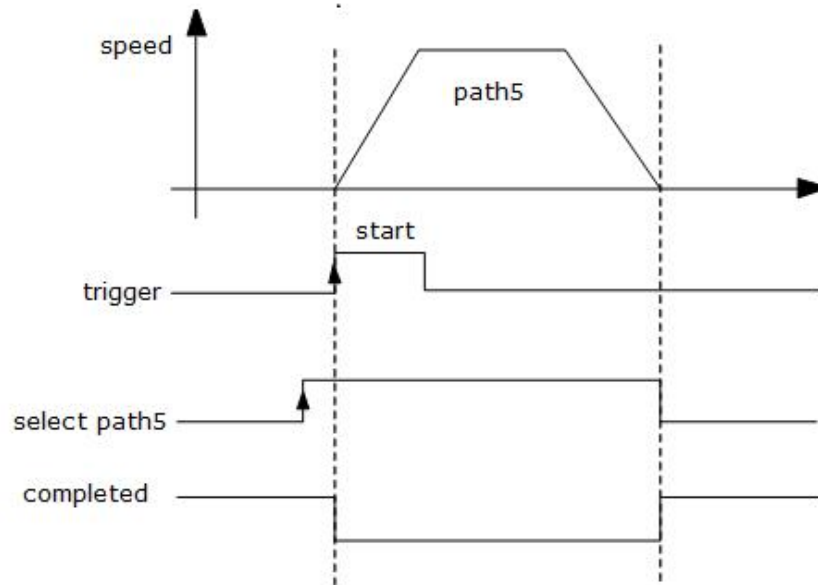
5.5.1 PR Path Parameters

NO.	Register Address	Definition	Description

Pr9.00	0x6200	PR path 0	The corresponding functions can be selected for different bit
			Bit0-3: TYPE,
			  =0---- no action
			  =1---- position positioning
			  =2---- speed movement
			  =3---- homing;
			Bit4: INS,
			  =0---- No interrupt
			  =1---- interrupt(all the current ones are 1.);
			Bit5: OVLP,
			  =0---- Non overlapping
			  =1---- Overlapping
			Bit6:
			  =0----absolute position
			  =1----relative instructions
			Bit8-13: Jump to the corresponding PR path 0-15;
			bit14: JUMP,
			  =0---- No jump
			  =1---- jump

Pr9.01	0x6201	Position H	High 16 bit,

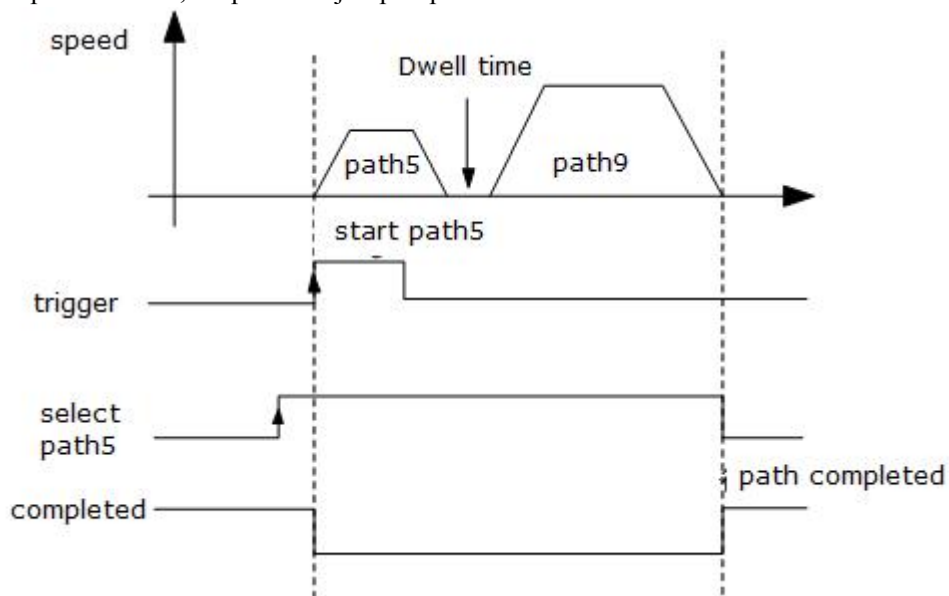| Pr9.02	0x6202	Position L	Low 16 bit
Pr9.03	0x6203	Speed	Unit: rpm
Pr9.04	0x6204	Acc	Unit: ms/1000rpm
Pr9.05	0x6205	Dec	Unit: ms/1000rpm
Pr9.06	0x6206	Suspend time	Suspend time after the command is stopped
Pr9.07	0x6207	Special parameter	PR Path 0 maps directly to Pr8.02, Others are reserved
Pr9.08	0x6208	PR path 1	---
Pr9.09	0x6209	Position	---
Pr9.10	0x620A	Position	---
Pr9.11	0x620B	Speed	---
Pr9.12	0x620C	Acc	---
Pr9.13	0x620D	Dec	---
Pr9.14	0x620E	Suspend time	---
Pr9.15	0x620F	Special parameter	---
Pr9.16	0x6210	PR path 2	---
Pr9.17	0x6211	Position	---
Pr9.18	0x6212	Position	---
Pr9.19	0x6213	Speed	---
Pr9.20	0x6214	Acc	---
Pr9.21	0x6215	Dec	---
Pr9.22	0x6216	Suspend time	---
Pr9.23	0x6217	Special parameter	---
Pr9.24- Pr9.31	Similar as above paths	Similar as above paths	Each path has 8 data
Pr9.32- Pr9.39	Similar as above paths	Similar as above paths	Each path has 8 data
Pr9.40- Pr9.47	Similar as above paths	Similar as above paths	Each path has 8 data
Pr9.48- Pr9.55	Similar as above paths	Similar as above paths	Each path has 8 data
Pr9.56- Pr9.63	Similar as above paths	Similar as above paths	Each path has 8 data
Pr9.64- Pr9.71	Similar as above paths	Similar as above paths	Each path has 8 data

5.5.2 Timing sequence

For example, the motion timing sequence after setting path 5

Single-end path sequence diagram

5.5.3 Multi-segment jump

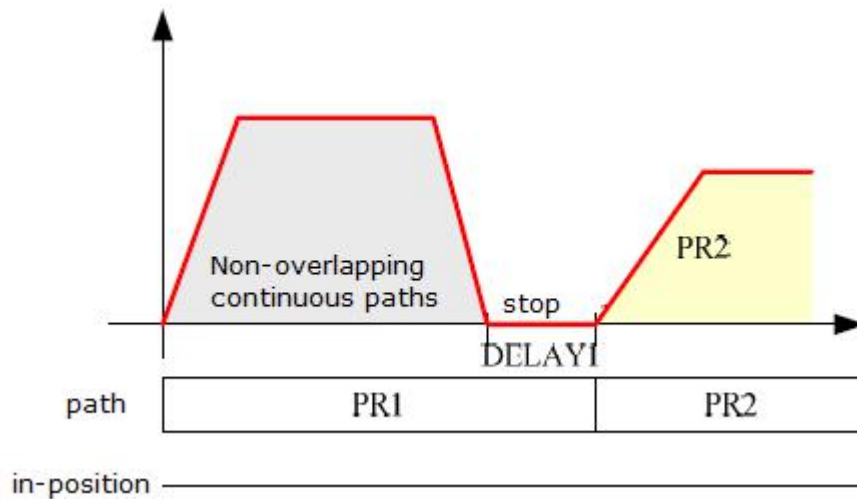For example: set paths 5 and 9, set path 5 to jump to path 9.

Multi-segment jump path sequence diagram

5.5.4 Continuous movement

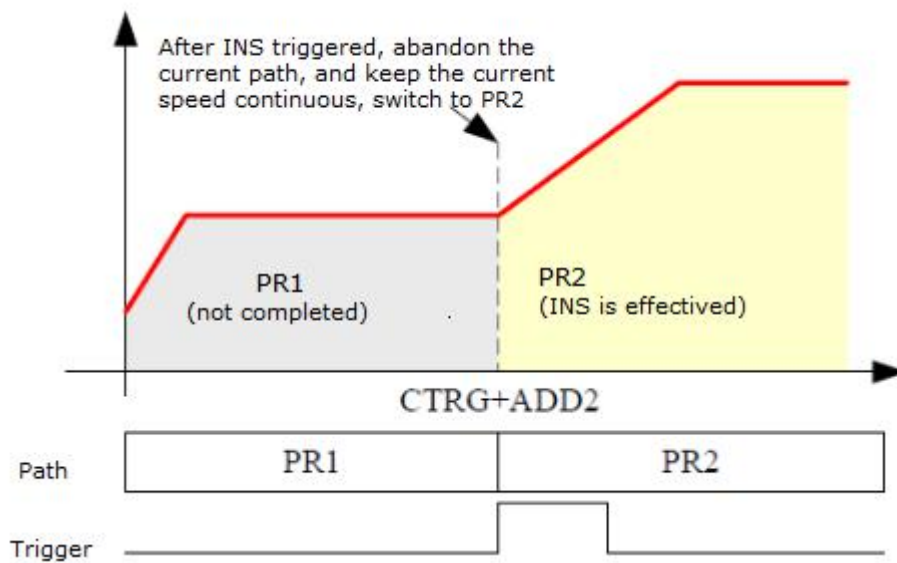The bit5 of Pr9.00 is 0 , which does not overlap the continuous path.

As shown in the figure below, set PR1 (PR path1) and PR2 (PR path2) to run continuously and PR1 jump. There is no in-position signal in the intermediate delay from PR1 jump to PR2.

Continuous movement timing sequence (no overlap).

5.5.5 Interrupt function

The interrupt function is the priority of a PR path. Interrupts a valid path means that interrupting and abandoning the current path under trigger, and runs another path directly, which is similar as Interrupt priority of function.. As below example, interrupt the PR1 (PR path1) to run PR2 (PR oath2)

Interrupt function timing sequence

5.6 Trigger the Motion of Multi-Segment PR Path

You can configure up to 16 PR paths by digital input DI1-DI7.

5.6.1 16-segment PR paths, which can be selected by combination

Set DI1 as path address 0 (ADD0),

Set DI2 as path address 1 (ADD1),

Set DI3 as path address 2 (ADD2),

Set DI4 as path address 3 (ADD3),

Set DI5 as trigger (CTRG)

As shown in the table below, "on" means signal input on , "off " means signal input off

IO / PR path	DI1 (ADD0)	DI2 (ADD1)	DI3 (ADD2)	DI4 (ADD3)	DI5 (CTRG)
Path 0	off	off	off	off	on
Path 1	on	off	off	off	on
Path 2	off	on	off	off	on
Path 3	on	on	off	off	on
Path 4	off	off	on	off	on
Path 5	on	off	on	off	on
Path 6	off	on	on	off	on
Path 7	on	on	on	off	on
Path 8	off	off	off	on	on
Path 9	on	off	off	on	on
Path 10	off	on	off	on	on
Path 11	on	on	off	on	on
Path 12	off	off	on	on	on
Path 13	on	off	on	on	on
Path 14	off	on	on	on	on
Path 15	on	on	on	on	on

5.6.2 8-segment PR path, which can be selected by combining

Set DI1 as path address 0 (ADD0),

Set DI2 as path address 1 (ADD1),

Set DI3 as path address 2 (ADD2),

Set DI5 as trigger (CTRG)

As shown in the table below, "on" means signal input on, "off" means signal input off

IO / PR path	DI1 (ADD0)	DI2 (ADD1)	DI3 (ADD2)	DI5 (CTRG)
Path 0	off	off	off	on
Path 1	on	off	off	on
Path 2	off	on	off	on
Path 3	on	on	off	on
Path 4	off	off	on	on
Path 5	on	off	on	on
Path 6	off	on	on	on
Path 7	on	on	on	on

5.6.3 4-segment PR path, which can be selected by combining

Set DI1 as path address 0 (ADD0),

Set DI2 as path address 1 (ADD1),

Set DI5 as trigger (CTRG).

As shown in the table below, on means signal input on,off means signal input off

IO/running path	DI1 (ADD0)	DI2 (ADD1)	DI5 (CTRG)
Path 0	off	off	on
Path 1	on	off	on
Path 2	off	on	on
Path 3	on	on	on