

DS86 Two-phase step servo drive

User manual

Shenzhen Rtelligent Electrical and Mechanical Technology Co., Ltd.

1. Product introduction

The DS86 is a step servo driver built by Rtelligent's multi-year experience of closed-loop stepper applications.

The DS86 stepper drive features advanced digital control technology, with a combination of small size, low noise and low vibration. Parameters are set by keystrokes with digital display tubes, and with microUSB interfaces and debugging software, product performance can be further optimized.

We hope that our products superior performance, excellent quality and excellent price-performance can help you successfully complete the exercise control project.

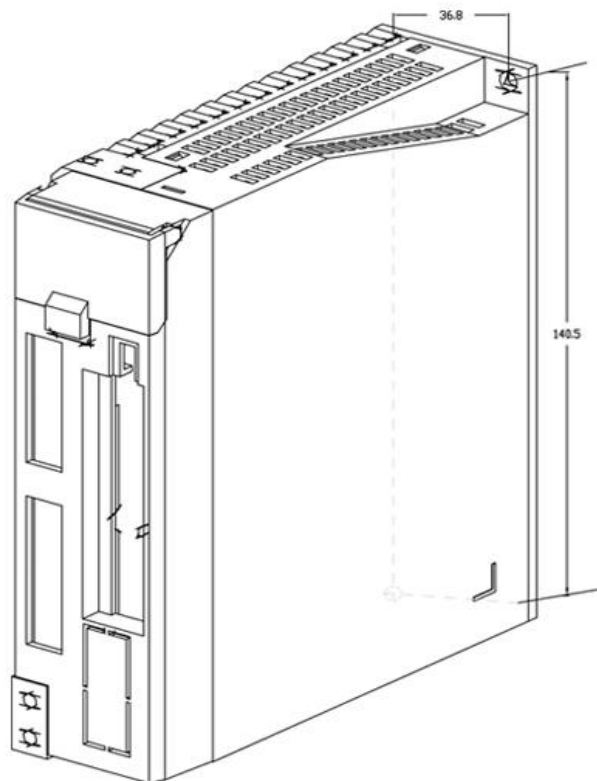
1. Characteristics

- Operating voltage: AC 18~80VAC
- Control interface: PUL+DIR; CW+CCW
- Microstep settings: 200 to 65535
- Output current: 0 to 6A(sine peak)
- Encoder resolution: 4000(default)
- Input signal: 3 photoelectric isolated digital signal inputs, high level can be directly received 5 to 24V DC level
- Output signal: 1 photoelectric isolated digital signal output, maximum voltage tolerance of 28V, maximum infusion or pull-out current 50mA

1.1 Electrical specifications

Parameters	Min	Typical	Maximum	Unit
Power supply	18	60	80	VAC
Output current (peak)	0	-	6	A
Pulse command frequency	2	-	200K	Hz
Pulse width	2.5	-	-	us
Direction signal width	62.5	-	-	us
Under voltage alarm	-	15	-	VAC
Over voltage alarm	-	90	-	VAC
Input signal voltage	4	-	28	V
ALM On current	-	-	50	mA
ALM Max voltage	-	-	30	V

1.3 Installation dimensions



1.4 Safety Notes

The transport, installation, use or repair of this product must be carried out by a professionally qualified person who is familiar with the above operations.

To minimize potential security risks, you should use this device in accordance with all local and national safety regulations, different regions have different safety regulations, you should ensure that the installation and use of the equipment in accordance with the specifications of your area.

System errors can also cause damage or personal injury to the equipment. We do not guarantee that this product is suitable for your specific application and we cannot take responsibility for the reliability of your system design.

Please read all relevant documentation before installation and use, improper use will cause damage to the equipment or personal injury, installation should strictly comply with the relevant technical requirements. It is important to verify that the system equipment is grounded and that the non-grounded system cannot guarantee the safety of electricity.

Some components inside the product may be damaged by external static electricity. Operators should ensure that they are free of static electricity before touching the product, and avoid contact with static-prone objects (chemical fibers, plastic film, etc.).

If your device is in the control cabinet, close the control cabinet cover or door during operation, as this may cause damage to the equipment or personal injury.

Hot-swap cables are strictly prohibited when the system is running, and arcs generated by hot-swappable cables can be harmful to operators and equipment.

Wait at least 5 seconds after switching off the appliance or removing the wiring. The device can still store dangerous electrical energy after a power outage and will take some time to release. To ensure safety, you can measure it with a meter before touching the appliance.

Observe the important safety tips in this manual, including clear warning signs for potential safety hazards, which should be read and familiar with before installation, operation and maintenance. The purpose of this paragraph is to inform the user of the necessary safety concerns and to mitigate the risk of endangering the safety of persons and equipment. Miscalculations of the importance of safety prevention can result in serious loss or equipment unavailability.

2. Installation of the drive

The narrow edge of the drive heat sink is the mounting surface and is installed in the cabinet. The M4 screw should be installed in the drive mounting hole.

The drive power portion generates heat, and for the drive to run at maximum power, air cooling needs to be forced.

Do not install the drive in no room for air flow or around a device that can cause the ambient temperature to exceed 40degreesC, or place the drive in a damp environment or where financial chips can easily fall into the drive.

3. Connection

3.1 Connecting the power supply

Press the diagram to connect the AC power supply with the included connector. Use the AWG16 wire to connect the transformer output to the connected AC port.

Do not remove the power connector while powering on!

Note that the Input Power Range for theDS86 is 18 to 80VAC.

3.2 Connecting the motor

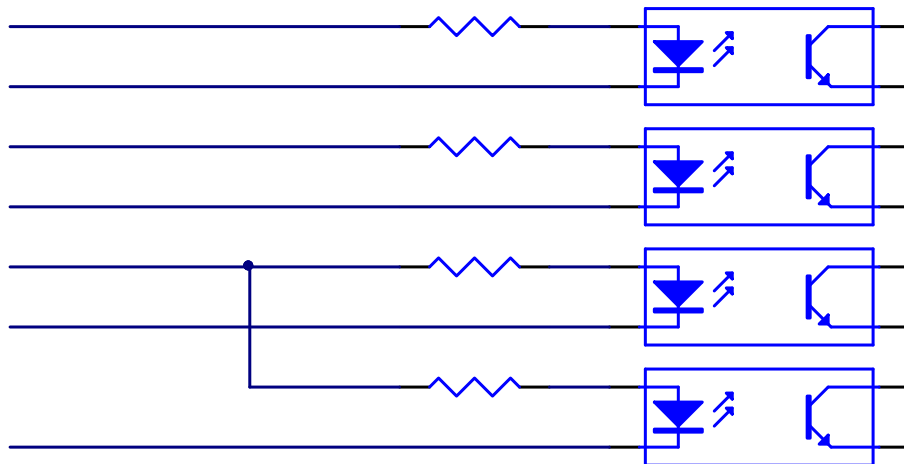
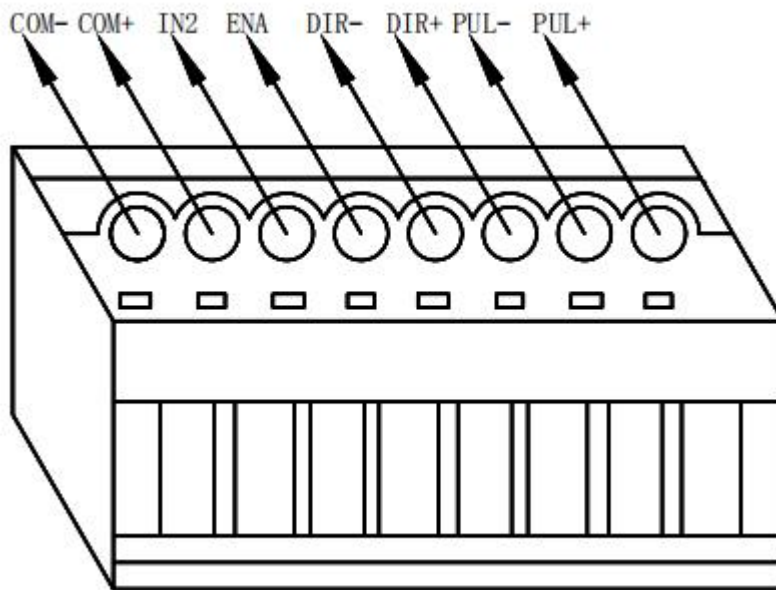
Warning: When the motor is connected to the drive, make sure that the drive is powered off. The motor cannot be disconnected while the drive is powered on. Do not attach the motor leads to the ground or to the power supply.

Closed-loop stepper motor that connects the motor leads to the driver needs to be wired according to the wiring of the motor. You cannot change the orientation by tuning the A-, A- windings. You can change the positive direction of the motor by setting the parameters on the drive.

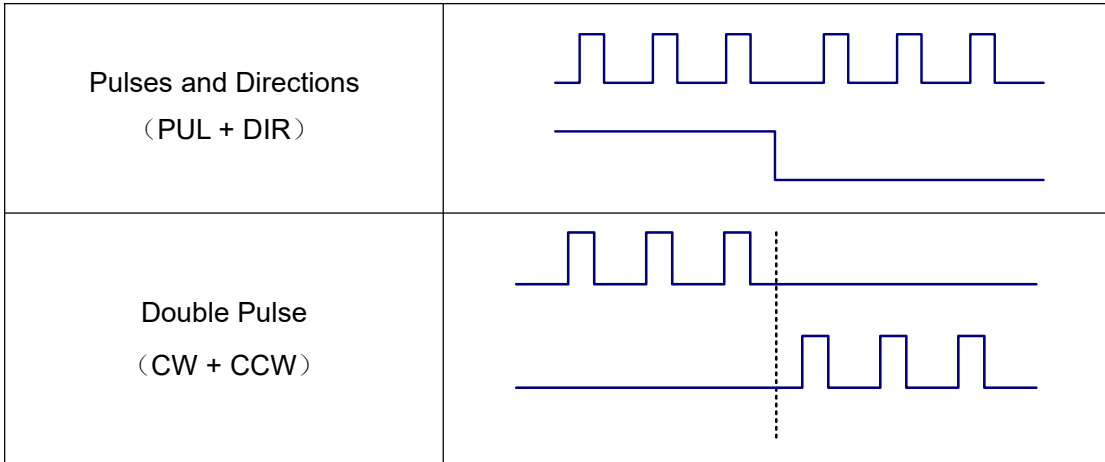
By default:

A+ --- RED, A- --- Blue , B+ --- Green, B- --- Black

3.3 Control signal P1



3.3.1 Pulse direction input



3.3.2 Enable input

EN signal control the power portion of drive, with the signal input photoelectric isolation, can accept 5-24VDC single-ended or differential signals up to 28V.

When EN+ is connected to 24V, if EN- signal is suspended (optocoupled not on), the driver is enable, the motor is operating normally; The EN- signal is low (optocoupled on), the power portion of the driver is off, and the motor is not excitation.

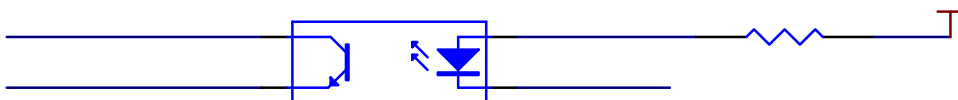
When the motor is in the error state, the EN input can be used to restart the drive. First remove the existing fault from the application system, and then enter a follow-edge signal to the EN pin, the driver can restart the power part, the motor excitation operation.

3.3.3 Alarm output

ALM is a photoelectric isolated output with a maximum voltage of 30 VDC and a maximum saturation current of 100mA.

By default, when the drive is working properly, the output optocoupler is not on, and when an alarm occurs, the optocoupler is on.

The logic of the alarm can be changed by parameter 13.



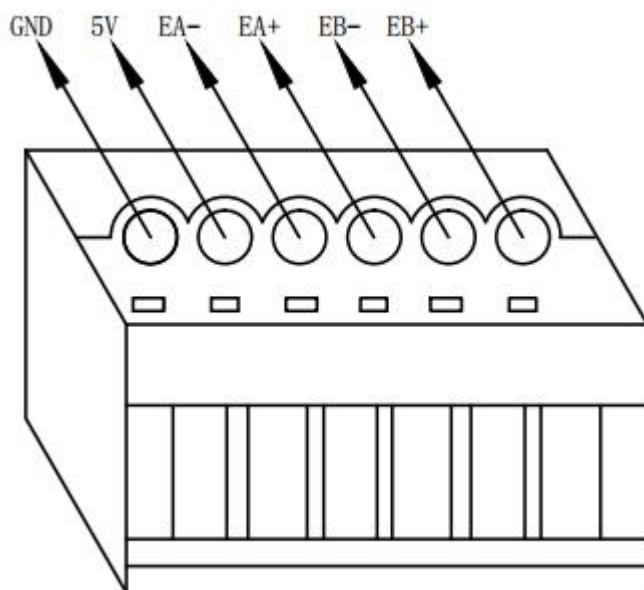
3.4 Encoder Signal P3

The encoder output signal in P3 is a differential level output of 5V.

The DS86 receives incremental photo encoder signals, only A,B signals are required inside the drive.

In order to improve the performance of the photoelectric encoder signal, the photoelectric encoder signal is usually differential signal.





If a single-ended output is required, the A, B should be connected to EA+ and EB+, Keep EA- and EB- Keep unconnected.

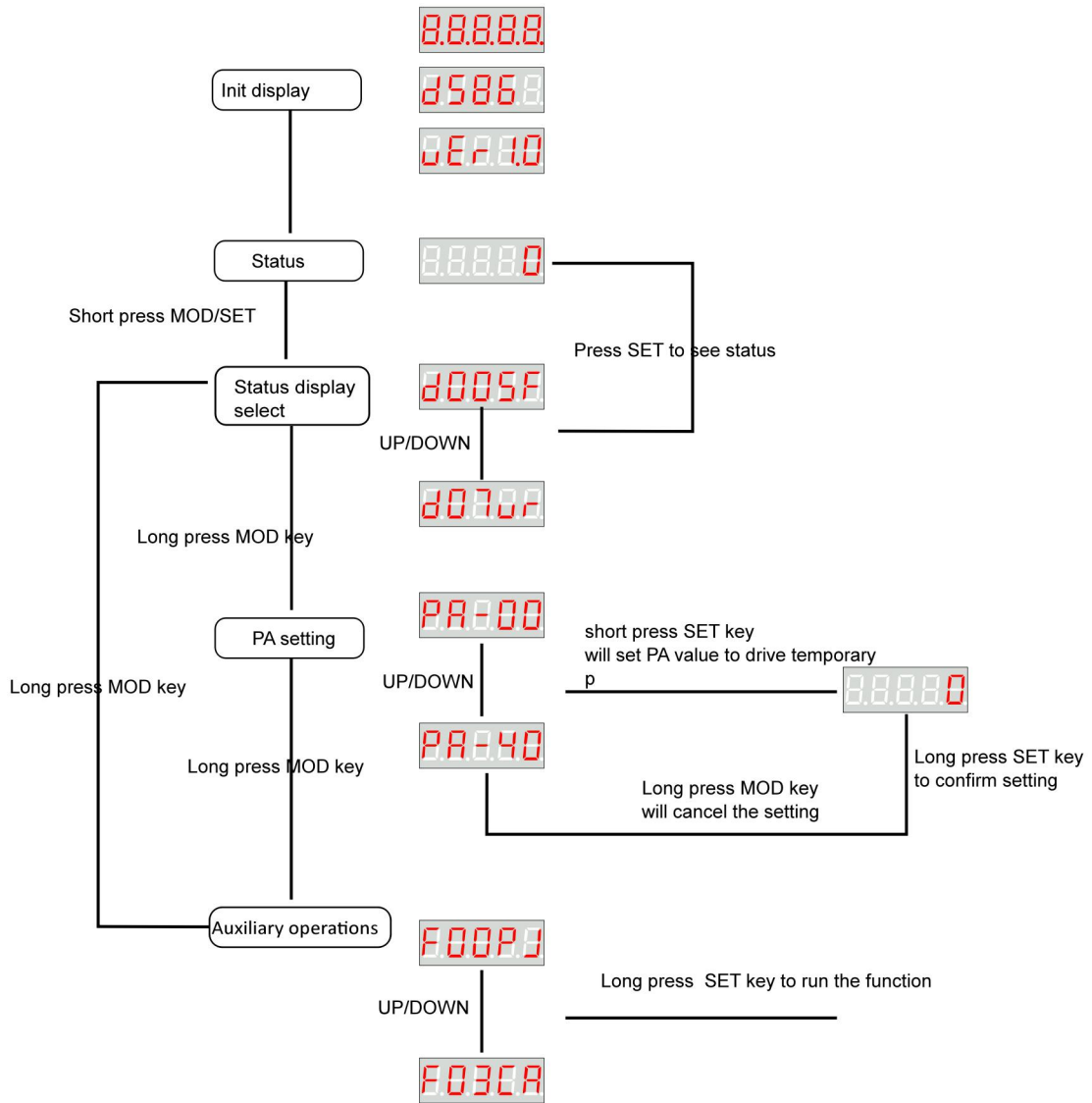


4 Key operation









4.1 Key operation logic

DS86 has 4 keys, each defined as follows:

Icon	Description
	MOD Return to the next level of menu, cancel the operation.
	UP For menu selection, data settings
	DOWN For menu selection, data settings
	SET Functional confirmation



4.2 Drive monitoring

Monitoring parameters	Symbol	Description
0		Feedback speed for current drives Unit: RPM
1		Reference speed of the current drive Unit: RPM
2		See where the current encoder is in one circle
3		View the number of pulses received by the current drive The resolution of the settings in Microstep
4		View drive current tracking error Tracking error based on encoder resolution
5		Bus voltage Voltage = display value/100(V)
6		View drive fault code AL001 - Over Current alarm AL002 - Over Voltage alarm AL003 - Internal voltage error AL004 - Position trace error alarm AL005 - Encoder failure AL006 - Parameter check error
7		Drive version

4.3 Parameter settings

Drive can be set parameters with pa-00 to PA-40

Index number	Name	Range	Default Value	Description
0	Control mode	[0,2]	1	0 Open-loop operation 1 Servo Mode One 2 Servo Mode Two
1	Microstep	[200,655 35]	1600	Number of pulses required for the motor to run a lap
2	Maximum current	[100,700 0]	7000	Unit: mA When matching different motors,





				first confirm that the maximum current is appropriate and then connected to the motor.
3	Base current Percentage	[1,100]	50	
4	Encoder resolution	[500,65535]	4000	The number of pulses feedback by the motor running one turn. For orthogonal encoders, 4x frequency is performed inside the drive. So the resolution of the 1000-wireencoder is 4000;
5	Positional error Alarm threshold	[100,65535]	4000	Set a drive tracking error alarm threshold
6	Directional inversion	[0,1]	0	0 Default 1 Invert the direction
7	Instruction filtering	[1,512]	128	The driver has a built-in pulse command filter that smooths the pulse command. it also causes lag, Time lag = Set value × 50us。 For point motion, setting pulse filtering can make the motor start and stop more smooth. For interpolation motion, set the filter parameter to 1.
8	Pulse mode	[0,1]	0	0 PUL + DIR 1 CW + CCW
9	Pulse Edge	[0,1]	0	0 Rising edge 1 Following edge
10	Enable level	[0,1]	0	0 OPEN 1 CLOSE
11	Enable action	[0,1]	0	0 Free motor 1 Lock motor
12	ALM Multiplex function	[0,2]	0	0 ALM 1 Inposition 2 Break out
13	ALM Output level	[0,1]	0	0 OPEN 1 CLOSE
14	Inposition detect mode	[0,1]	0	0 Anytime 1 Detection after pulse stop
15	Inposition accuracy	[1,1000]	10	Represents the accuracy range of the motor in position. Units are based on encoder resolution.
16	Inposition output	[20,1000]	20	Duration of time after the motor

	detect time			enters the accuracy range in position。 Time = Set value × 50us
17	Motor lock time	[200,65535]	1000	Time = Value × 50us
18	Auto PI	[0,1]	1	0 Disable 1 Enable Use the autoPI function to Set Kp,Ki automatically calculated, without setting.
19	Current loop Kp	[200,10000]	—	
20	Current loop KI	[0,2000]	—	
21	Current loop Kc	[0,1023]	256	
22	User-set resistance	[100,10000]	1000	In servo mode two, the winding resistance of the motor needs to be set when the AUTOPI function is not used. Unit: mOhm
23	User-set inductors	[1,20]	1	In servo mode two, when the AutoPI function is not used, the winding inductor of the motor needs to be set. Unit: mH
24	torque constant Kt	[0,2000]	600	In servo mode two, the user is required to set the torque constant according to the characteristics of the motor. 57A1EC---150 57A2EC---200 86A4EC---400 86A8EC---600
25	Servo Mode One Position loop Kp	[0,5000]	2500	In servo mode one, control parameters are usually available using the default parameters without debugging
26	Servo Mode One Position loop Ki	[0,1000]	0	
27	Servo Mode One Position loop Kd	[0,1000]	200	
28	Servo Mode One Position loop Kvff	[0,100]	30	
29	Servo Mode One Low-speed vibration damping Kdi	[0,500]	200	

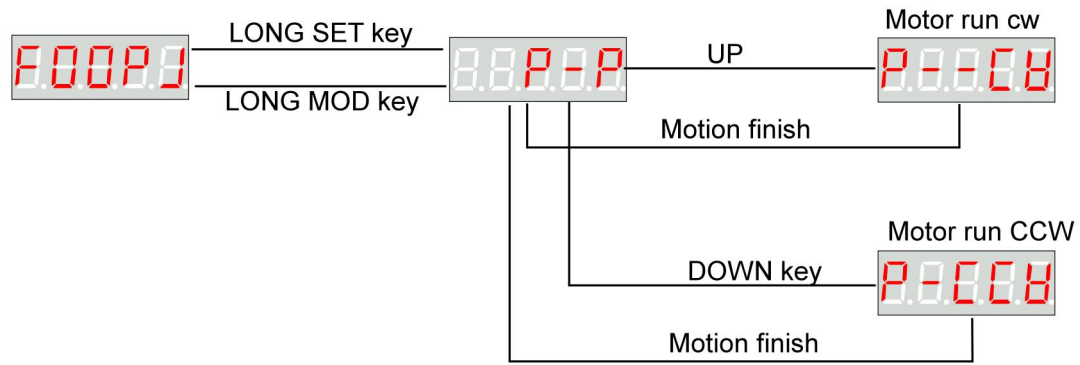
30	Servo Mode two Position loop Kp	[0,20000]	4000	
31	Servo Mode two Position loop Ki	[0,20000]	2000	
32	Servo Mode two Speed feedback Kv1	[0,2000]	200	
33	Servo Mode two Speed feedback Kv2	[0,2000]	300	
34	Servo Mode two Speed feedforward Kvff	[0,2000]	200	
35	Servo Mode two Gravity compensation	[0,1023]	512	
36	Internal testing Pulse frequency	[0,65535]	1600	
37	Internal testing Distance	[0,65535]	1600	
38	Internal testing Time	[0,65535]	200	
39	Speed filtering FV1	[10,2000]	200	
40	Speed filtering FV2	[10,2000]	600	

4.4 Auxiliary operations

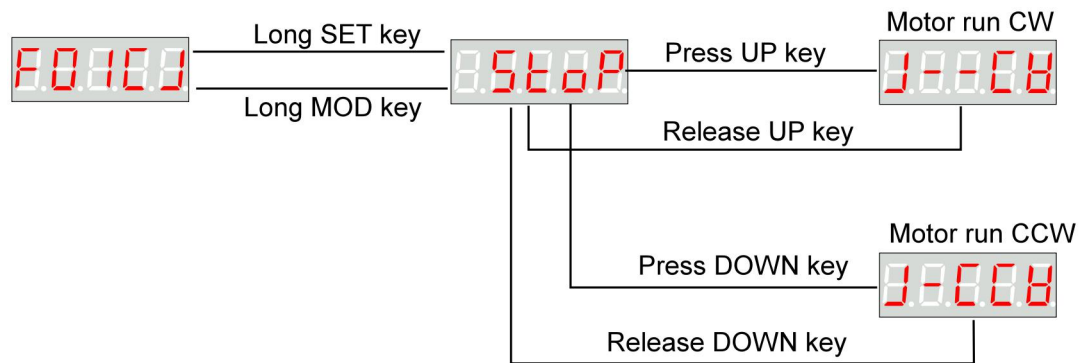
Through assisted operation, Drive completes the following functions

Index	Symbol	Description
0		Point-to-Point motion test
1		Continuous motion test
2		Save parameters
3		Clear parameters, restore factory settings

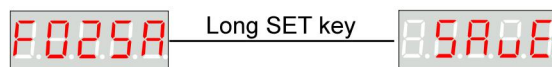
The logic of the point-to-point motion test operation is as follows:



Run the test operation logic continuously:



Save parameter operation logic:



When the save is complete, the drive will automatically reset and reinitialize the parameters

Restore factory settings operating logic:



Factory reset, drive resets automatically, reinitials parameters

