



杰美康机电
JUST MOTION CONTROL

2HSS57-N-XX

Hybrid Stepper Servo Drive

Manual



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Thanks for selecting JMC stepper motor driver. We hope that the superior performance, outstanding quality, excellent cost performance of our product can help you accomplish your motion control project.

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Shenzhen Just Motion Control
Electro-mechanics Co., Ltd

Version	Editor	Verifier
V2.10	R&D	R&D

Contents

1. Overview	- 5 -
2. Features	- 5 -
3. Ports Introduction	- 6 -
3.1 ALM signal output ports	- 6 -
3.2 Brake, position signal output ports	- 5
3.3 Control Signal Input Ports	- 6 -
3.4 Encoder Feedback Signal Input Ports	- 8 -
3.5 Power Interface Ports	- 9 -
4. Technological Index	- 10 -
5. Connections to Control Signal	- 11 -
5.1 Connections to Common Anode	- 11 -
5.2 Connections to Common Cathode	- 12 -
5.3 Connections to Differential Signal	- 13 -
5.4 Connections to 232 Serial Communication Interface	- 14 -
5.5 Sequence Chart of Control Signals	- 14 -
6. DIP Switch Setting	- 15 -
6.1 Activate Edge Setting	- 15 -
6.2 Running Direction Setting	- 16 -
6.3 Micro steps Setting	- 16 -
6.4 Pulses smoothness setting	- 14 -
6.5 Open/close loop mode selection	- 14 -
7. Faults alarm and LED flicker frequency	- 17 -
8. Appearance and Installation Dimensions	- 19 -
9. Typical Connection	- 19 -
10. Parameter Setting	- 21 -
11. Processing Methods to Common Problems and Faults	- 27 -
11.1 Power on power light off	- 27 -

11.2 Power on red alarm light on.....- 27 -

11.3 Red alarm light on after the motor running a small angle..- 27 -

11.4 After input pulse signal but the motor not running.....- 28 -

1. Overview

The HSS57-N hybrid stepper servo drive system integrates the servo control technology into the digital stepper drive perfectly. And this product adopts an optical encoder with high speed position sampling feedback of $50\mu\text{s}$, once the position deviation appears, it will be fixed immediately. This product is compatible the advantages of the stepper drive and the servo drive, such as lower heat, less vibration, fast acceleration, and so on. This kind of servo drive also has an excellent cost performance.

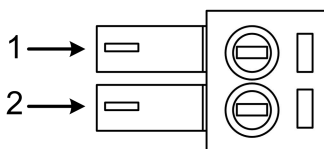
2. Features

- ◆ Without losing step, High accuracy in positioning
- ◆ 100% rated output torque
- ◆ Variable current control technology, High current efficiency
- ◆ Small vibration, Smooth and reliable moving at low speed
- ◆ Use DIP switch to choose open loop or close loop.
- ◆ Rich output control (alarm, brake control, and position output)
- ◆ Use DIP switch to choose PUL+DIR or PUL+PUL control mode.
- ◆ Accelerate and decelerate control inside, Great improvement in smoothness of starting or stopping the motor
- ◆ User-defined micro steps
- ◆ Compatible with 1000 and 2500 lines encoder
- ◆ No adjustment in general applications

- ◆ Over current, over voltage and over position error protection
- ◆ Green light means running while red light means protection or off line

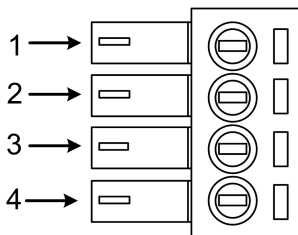
3. Ports Introduction

3.1 ALM signal output ports



Port	Symbol	Name	Remark
1	ALM+	Alarm output +	
2	ALM-	Alarm output -	

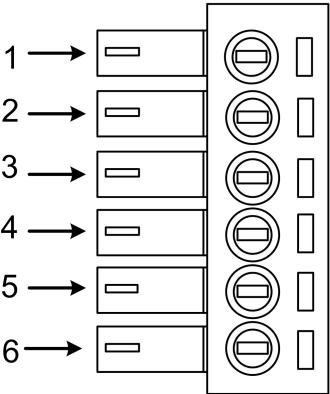
3.2 Brake and Position Signal Output Ports



PIN No.	Symbol	Name	Description
1	BREAK+	Brake Output+	
2	BREAK-	Brake Output-	
3	PEND+	Position Output+	
4	PEND-	Position Output-	

Note:Brake control output signal is the open collector circuit output, the user needs to use an external 24V power supply and relay to drive the brake (our company can provide brake driver board)

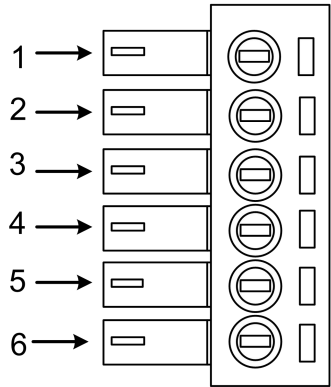
3.3 Control Signal Input Ports



Port	Symbol	Name	Remark
1	PLS+	Pulse signal +	Compatible with 5V and 24V
2	PLS-	Pulse signal -	
3	DIR+	Direction signal+	Compatible with 5V and 24V
4	DIR-	Direction signal-	

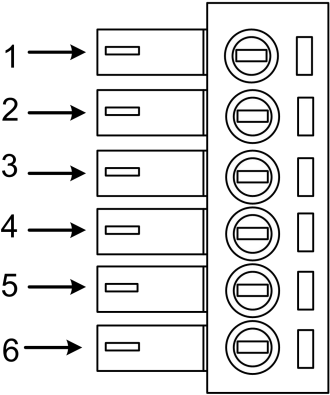
5	ENA+	Enable signal +	Compatible with 5V and 24V
6	ENA-	Enable signal -	

3.4 Encoder Feedback Signal Input Ports



Port	Symbol	Name	Wiring color
1	PB+	Encoder phase B +	Blue
2	PB-	Encoder phase B -	White
3	PA+	Encoder phase A +	Yellow
4	PA-	Encoder phase A -	Green
5	VCC	Input power	Red
6	GND	Input power ground	Black

3.5 Power Interface Ports



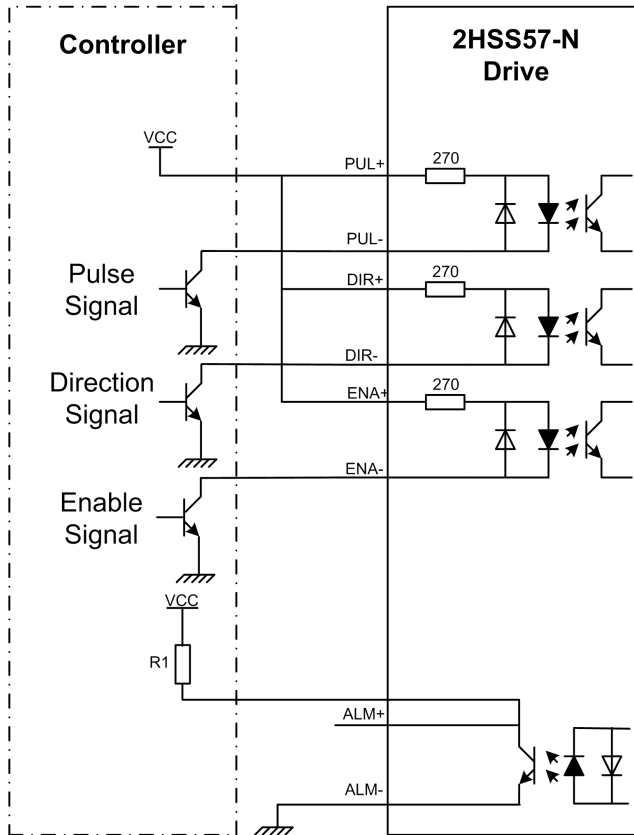
Port	Identification	Symbol	Name	Remark
1	Motor Phase Wire Input Ports	A+	Phase A+ (Red)	Motor Phase A
2		A-	Phase A- (Blue)	
3		B+	Phase B+ (Green)	Motor Phase B
4		B-	Phase B- (Black)	
5	Power Input Ports	VCC	Input Power +	24-60VDC (36V Typical)
6		GND	Input Power-	

4. Technological Index

Input Voltage		24~60VDC(36V Typical)
Output Current		4.5A 20KHz PWM
Pulse Frequency max		200K
Communication rate		57.6Kbps
Protection		● Over current peak value 8A±10% ● Over voltage value 80V ● The over position error range can be set through the HISU
Overall Dimensions (mm)		111.5×75.5×34
Weight		Approximate 300g
Environment Specifications	Environment	Avoid dust, oil fog and corrosive gases
	Operating Temperature	70℃ MAX
	Storage Temperature	-20℃~+80℃
	Humidity	40~90%RH
	Cooling method	Natural cooling or forced air cooling

5. Connections to Control Signal

5.1 Connections to Common Anode

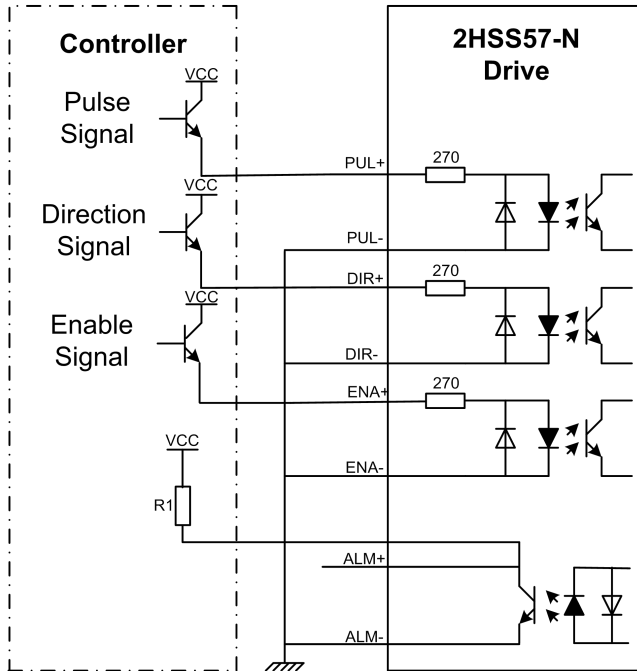


Remark:

The control signal can be compatible with 5V and 24V;

R1(3~5K) must be connected to control signal terminal.

5.2 Connections to Common Cathode

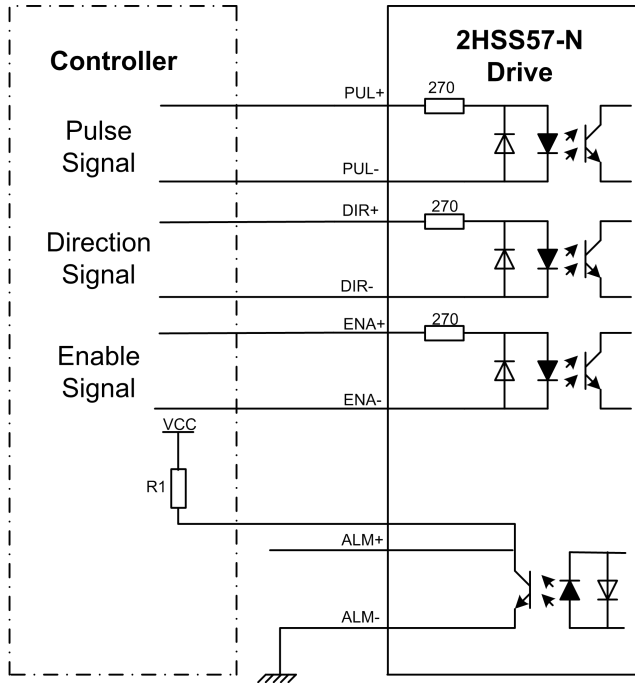


Remark:

The control signal can be compatible with 5V and 24V;

R1(3~5K) must be connected to control signal terminal.

5.3 Connections to Differential Signal

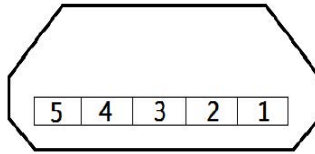


Remark:

The control signal can be compatible with 5V and 24V;

R1(3~5K) must be connected to control signal terminal.

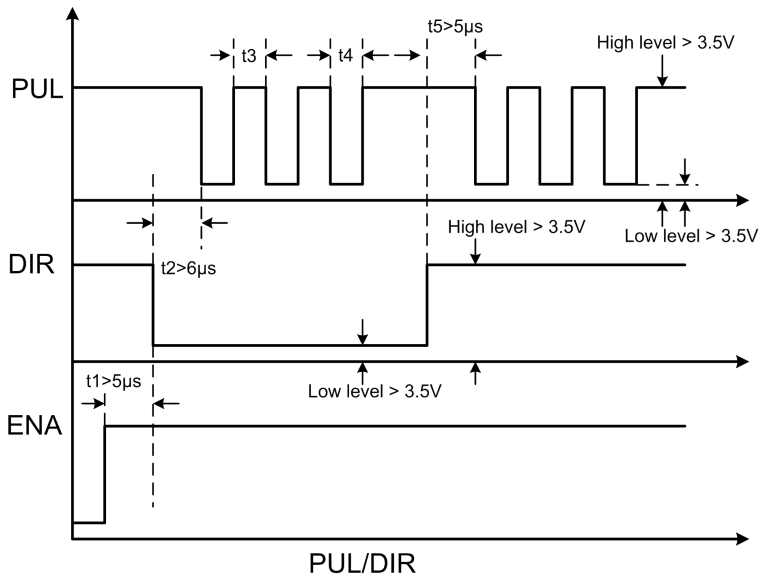
5.4 Connections to 232 Serial Communication Interface



Pin-out number	Label	Defined declaration
1	5 V	RS232 power supply 5 V
2	TX232	RS232 send
3	RX232	RS232 receive
4	Reservation	No connection
5	GND	RS232 GND

5.5 Sequence Chart of Control Signals

In order to avoid some fault operations and deviations, PUL, DIR and ENA should abide by some rules, shown as following diagram:



Remark:

- t_1 : ENA must be ahead of DIR by at least $5\mu s$. Usually, ENA+ and ENA- are NC (not connected).
- t_2 : DIR must be ahead of PUL active edge by $6\mu s$ to ensure correct direction;
- t_3 : Pulse width not less than $2.5\mu s$;
- t_4 : Low level width not less than $2.5\mu s$.

6. DIP Switch Setting

6.1 SW1 Pulse Mode Setting

SW1 is used for setting the pulse mode, “off” means the pulse mode is PUL+DIR, while “on” is the pulse mode is PUL+PUL.

6.2 SW2 Running Direction Setting

SW2 is used for setting the running direction, “off” means CCW, while “on” means CW.

6.3 SW3-SW6 Micro steps Setting

The micro steps setting is in the following table, while SW3、SW4、SW5、SW6 are all on, the internal default micro steps inside is activate, this ratio can be setting through the HISU.

Dial switch Micro steps	SW3	SW4	SW5	SW6
Default	on	on	on	on
800	off	on	on	on
1600	on	off	on	on
3200	off	off	on	on
6400	on	on	off	on
12800	off	on	off	on
25600	on	off	off	on
51200	off	off	off	on
1000	on	on	on	off
2000	off	on	on	off
4000	on	off	on	off
5000	off	off	on	off

8000	on	on	off	off
10000	off	on	off	off
20000	on	off	off	off
40000	off	off	off	off

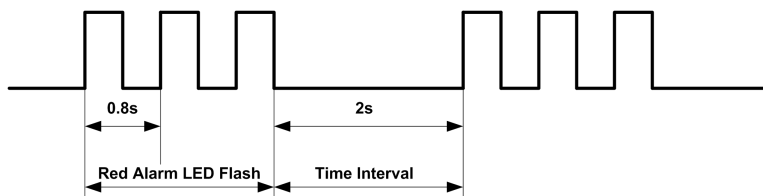
6.4 SW7 Pulses smoothness setting

SW7 sets the pulses smoothness, “off” means pulses smoothness function is off, “on” means the pulses smoothness function is on. In addition, the customer can also use the HISU parameter P19 to set the pulses smoothness degree. About the specific parameter settings, see parameter list description.

6.5 SW8 Open/Close loop mode selection

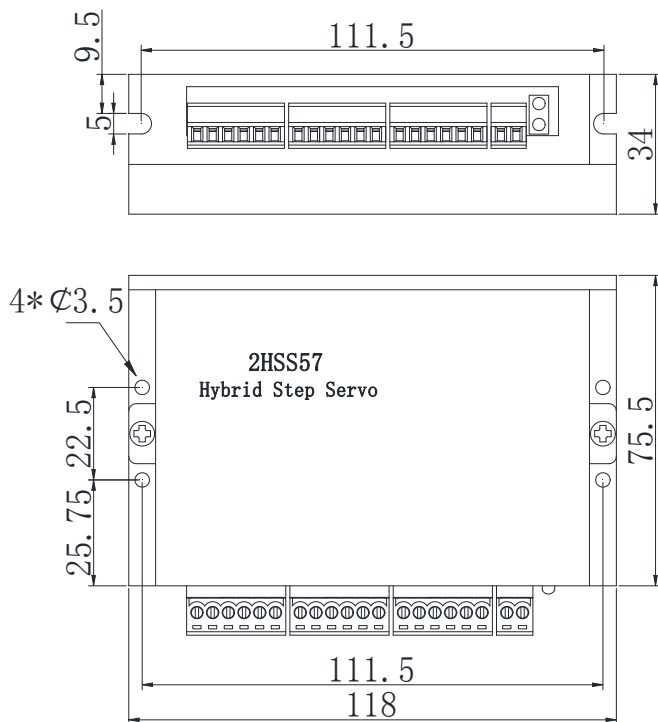
SW8 sets the open loop / closed loop operation mode, “off” means closed loop operation mode, “on” means open loop operation mode. If the customer chooses the open loop operation mode, the drive is an ordinary digital drive and can be run without encoder.

7. Faults alarm and LED flicker frequency



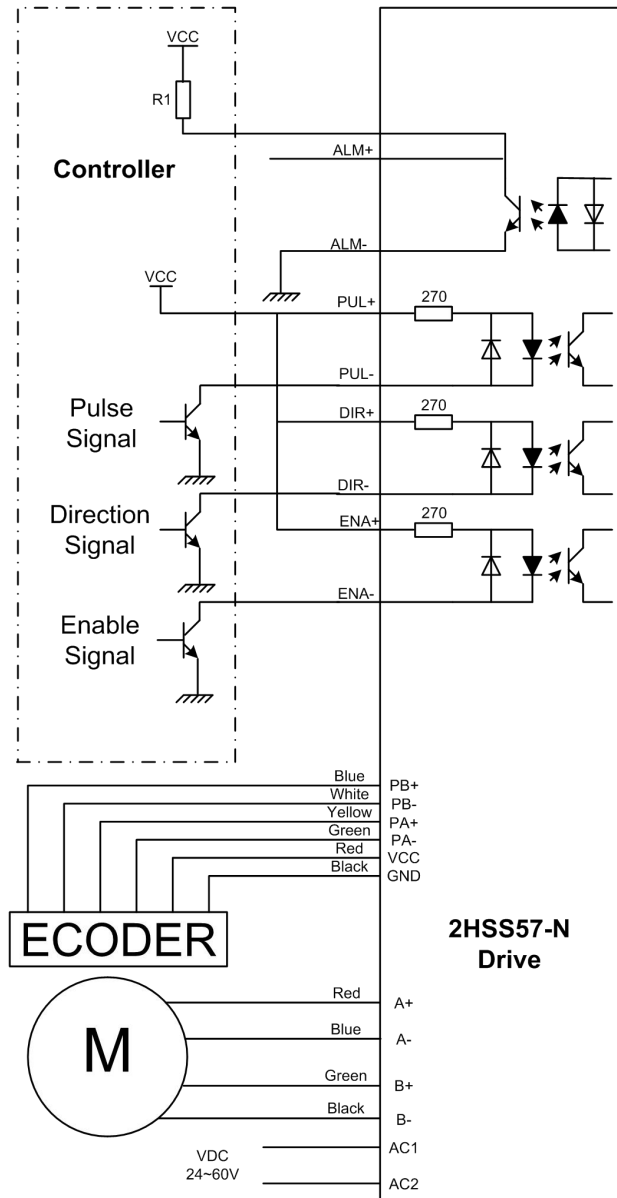
Flicker	
Frequency	
Description to the Faults	
1	Error occurs when the motor coil current exceeds the drive' s current limit.
2	Voltage reference error in the drive
3	Parameters upload error in the drive
4	Error occurs when the input voltage exceeds the drive' s voltage limit.
5	Error occurs when the actual position following error exceeds the limit which is set by the position error limit.

8. Appearance and Installation Dimensions



9. Typical Connection

This drive can provide the encoder with a power supply of +5v, maximum current 80mA. It adopts a quadruplicated-frequency counting method, and the resolution ratio of the encoder multiply 4 are the pulses per rotate of the servo motor. Here is the typical connection of 2HSS57-N.



10. Parameter Setting

The parameter setting method of 2HSS57-A drive is to use a HISU adjuster through the 232 serial communication ports, only in this way can we setting the parameters we want. There are a set of best default parameters to the corresponding motor which are carefully adjusted by our engineers, users only need refer to the following table, specific condition and set the correct parameters.

Actual value = Set value × the corresponding dimension

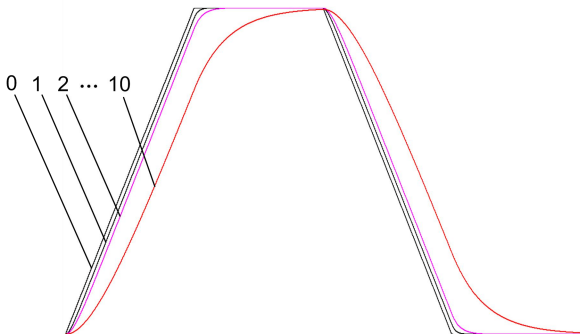
Mode	Definition	Range	Dimension	Drive Restart	Default Value
P1	Current loop Kp	0—4000	1	N	1000
P2	Current loop Ki	0—1000	1	N	100
P3	Damping coefficient	0—500	1	N	30
P4	Position loop Kp	0—3000	1	N	2000
P5	Position loop Ki	0—1000	1	N	200
P6	Speed loop Kp	0—3000	1	N	300
P7	Position loop Ki	0—1000	1	N	1000
P8	Open loop current	0—40	0.1	N	30
P9	Close loop current	0—20	0.1	N	20
P10	Alarm level	0—1	1	N	1
P11	Reserved				
P12	Reserved				
P13	Enable signal level	0—1	1	N	0
P14	Arrival level	0—1	1	N	1
P15	Encoder line number	0—1	1	Y	0
P16	Position error limit	0—3000	10	N	400
P17	Reserved				

P18	Reserved				
P19	Speed smoothness	0—10	1	N	7
P20	User-defined p/r	4-1000	50	Y	8
P21	Reserved				
P22	Pulse filter	0-1000	4	Y	3
P23	Driver enable lock	0—1	1	N	0
P24	Reserved				
P25	Open and closed loop ratio	0—40	1	N	20
P26	Position output threshold	0—1000	1	N	10
P27	Reserved				
P28	Reserved				
P29	Reserved				
P30	Detect the lack of Phase	0—1	1	Y	0
P31	Reserved				
P32	Reserved				
P33	Reserved				
P34	Reserved				
P35	Reserved				
P36	Reference Pulses	read only			
P37	Feedback Pulses	read only			
P38	Error of Reference and Feedback	read only			
P39	Erase Software	0-4000	1	Y	0

There are total 39 parameter configurations, use the HISU to download the configured parameters to the drive, the detail descriptions to every parameter configuration are as follows:

Item	Description
Current loop Kp	Increase Kp to make current rise fast. Proportional Gain determines the response of the drive to setting command. Low Proportional Gain provides a stable system (doesn't oscillate), has low stiffness, and the current error, causing poor performances in tracking current setting command in each step. Too large proportional gain values will cause oscillations and unstable system.
Current loop Ki	Adjust Ki to reduce the steady error. Integral Gain helps the drive to overcome static current errors. A low or zero value for Integral Gain may have current errors at rest. Increasing the integral gain can reduce the error. If the Integral Gain is too large, the system may "hunt" (oscillate) around the desired position.
Damping coefficient	This parameter is used to change the damping coefficient in case of the desired operating state is under resonance frequency.
Position loop Kp	The PI parameters of the position loop. The default

Position loop Ki	values are suitable for most of the application, you don't need to change them. Contact us if you have any question.
Speed loop Kp	The PI parameters of the speed loop. The default values are suitable for most of the application, you don't need to change them. Contact us if you have any question.
Speed loop Ki	
Open loop current	This parameter affects the static torque of the motor.
Close loop current	This parameter affects the dynamic torque of the motor. (The actual current = open loop current + close loop current)
Alarm level Control	This parameter is set to control the Alarm optocoupler output transistor. 1 means the transistor is cut off when the system is in normal working, but when it comes to fault of the drive, the transistor becomes conductive. 1 means opposite to 0.
Enable Control	This parameter is set to control the Enable input signal level, 0 means low, while 1 means high.
Arrival level Control	This parameter is set to control the Arrival optocoupler output transistor. 1 means the transistor is cut off when the drive satisfies the arrival

	command, but when it comes to not, the transistor becomes conductive. 1 means opposite to 0.
Encoder resolution	This drive provides two choices of the number of lines of the encoder. 0 means 1000 lines, while 1 means 2500 lines.
Position error limit	The limit of the position following error. When the actual position error exceeds this value, the drive will go into error mode and the fault output will be activated. (The actual value = the set value $\times$ 10)
Speed smoothness	This parameter is set to control the smoothness of the speed of the motor while acceleration or deceleration, the larger the value, the smoother the speed in acceleration or deceleration. 
User-defined p/r	This parameter is set of user-defined pulse per revolution, the internal default micro steps inside is activate while SW3、SW4、SW5、SW6 are all on,

	users can also set the micro steps by the outer DIP switches. (The actual micro steps = the set value $\times$ 50)
Pulses filter	The function of this parameter is to set pulse filter degree. The larger the value, the bigger filter degree. If this parameter is 3(default value is 3), max external pulse frequency is 200K. If this parameter is 9, max external pulse frequency is 100K.
Driver enable lock	When the driver is in the state of EN_OFF, if this parameter is 0, the motor is not lock and driver don't cont pulses. If this parameter is 1, the motor will be locked and the driver don't cont pulses too.
Open and closed loop ratio	the threshold of open loop and close loop switch.
Position output threshold	This parameter is set of the threshold of position error to output position output signal.
Detect the lack of Phase	This parameter is set of detect the lack of phase. If this parameter is 0 (Default Value), turn off this function. If this parameter is 1, turn on this function.
Reference Pulses	Read this parameter can know the reference pulses.
Feedback Pulses	Read this parameter can know the feedback pulses (encoder unit).
Error of Reference and Feedback	Read this parameter can know the error of reference and feedback.
Erase Software	This parameter is set of erase software of drive. If set this parameter is 2929, the driver will be erased,

	then this driver will not work. Notice: This parameter is only used by Manufacturer.
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11. Processing Methods to Common Problems and Faults

11.1 Power on power light off

- No power input, please check the power supply circuit. The voltage is too low.

11.2 Power on red alarm light on

- Please check the motor feedback signal and if the motor is connected with the drive.
- The stepper servo drive is over voltage or under voltage. Please lower or increase the input voltage.

11.3 Red alarm light on after the motor running a small angle

- Please check the motor phase wires if they are connected correctly, if not, please refer to the 3.4 Power Ports.
- Please check the parameter in the drive if the poles of the motor and the encoder lines are corresponding with the real parameters, if not, set them correctly.

- Please check if the frequency of the pulse signal is too fast, thus the motor may be out of its rated speed, and lead to position error.

11.4 After input pulse signal but the motor not running

- Please check the input pulse signal wires are connected in reliable way.
- Please make sure the input pulse mode is corresponding with the real input mode.