

Manual for Digital Closed-Loop Stepper Driver V1.0

[Please read the manual carefully before use to avoid damage to the driver]



CONTENTS

PREFACE.....	1
SAFETY PRECAUTIONS.....	1
1. PRODUCT INTRODUCTION.....	4
1.1. OUTLINE.....	4
1.2. FEATURES.....	4
1.3. APPLICATION.....	5
2. ELECTRICAL, ENVIRONMENTAL INDEX.....	5
2.1. ELECTRICAL INDEX.....	5
2.2. ENVIRONMENTAL INDEX.....	5
2.3. INSTALLATION DIAGRAM.....	6
2.4. DRIVER INSTALLATION.....	7
3. DRIVER INTERFACE AND WIRING.....	7
3.1. INTERFACE DEFINITION.....	7
3.2. CONTROL SIGNAL WIRING.....	9
3.3. OUTPUT SIGNAL WIRING.....	11
3.4. CONTROL SIGNAL MODE SETTING.....	11
3.5. ENCODER WIRING.....	11
3.6. SERIAL WIRING.....	12
3.7. STATUS INDICATOR LED.....	12
4. DIP SWITCH SETTING.....	13
5. TYPICAL APPLICATION WIRING DIAGRAM.....	15
5.1. CLOSED LOOP STEPPER MOTOR ENCODER LINE COLOR AND DEFINITION.....	16
5.2. CLOSED LOOP STEPPER MOTOR LINE COLOR AND DEFINITION.....	16

PREFACE

Thanks for choosing the HBS860H digital closed-loop stepper driver.

This manual describes the installation, debugging, maintenance, operation and other aspects of the HBS860H digital closed-loop stepper driver. Please read this manual carefully before use, and be familiar with the safety precautions. This manual may be revised timely when product is improved, specifications and version are changed or for some other reasons, which will not be notified again.

Any questions when using our products, please read the relevant manual or call our technical service department, we will meet your requirements in the shortest possible time.

Marks and warning signal:

 **Danger:** Indicates that this operation error may endanger personal safety!

 **Attention:** Indicates that this operation error may result in equipment damage!

SAFETY PRECAUTIONS

Open Box and Check

-  Controllers missing parts or damaged, do not install them;
-  The stepper driver must be used with a matching stepper motor.

Installation

 Installed on a non-flammable metal frame, prevent the intrusion of dust, corrosive gases, conductive objects, liquids and flammable materials, and maintain good heat dissipation conditions;

 During installation, be sure to tighten the mounting screws of the driver. The stepper driver and stepper motor should be protected from vibration and shock.

Wiring

-  Please perform the wiring work by professional electrical engineer;
-  Before wiring, please confirm that the input power is off. Wiring and inspection must be performed after the power is turned off and the driver indicator is off to prevent electric shock;
-  When plugging and unplugging the driver terminals, make sure that the driver indicator is off before proceeding;
-  The grounding terminal PE shall be reliably grounded through the left screw of the driver;
-  Please set the emergent stop circuit outside the controller;
-  Do not connect the power input cable to the terminal of A+, A-, B+, B-;
-  Please tighten the output terminal with a suitable torque.

Electrify

-  Please confirm whether the main circuit input power is consistent with the rated working voltage of the driver;
-  Do not test the driver for high voltage and insulation resistance at will;
-  Do not connect the electromagnetic contactor or electromagnetic switch to the output circuit.

Operation



Do not directly touch the output terminals after the driver is powered on;



When the system is running, the driver and motor may have a high

temperature rise, do not touch it



Please confirm the input and output signals to ensure safe operation;



The alarm can be reset only after the operation signal is cut off. Alarm

resetting in the running signal state will cause the driver to restart suddenly;



Do not change the parameter settings of the driver at will. The parameter modification needs to be performed under standby condition.

Maintenance and Inspection



Do not touch the controller terminals directly, and some have high voltage, very dangerous;



Before powering up, be sure to install the cover; when removing the cover, be sure to cut off the power supply first;



Before wiring, please confirm whether the input power is off;



After cutting off the main circuit input power and confirming the driver indicator light has completely extinguished, it can be inspected and maintained;



Do the inspection and maintenance by professional electrical engineer;



Do not do wiring, disassembling or other operation on the terminals during power on.



There is an integrated circuit on the main control board of the driver. Please pay full attention when checking to avoid damage caused by static induction.

1. PRODUCT INTRODUCTION

1.1. Outline

The 2S86 stepper driver is a high performance digital closed loop two phase hybrid motor driver. This series of stepper drivers adopt the latest 32-bit motor control dedicated DSP chip, and uses advanced digital filter control technology, resonant vibration suppression technology and precision current control technology to achieve accurate and smooth operation. This stepper driver series are featured with high torque output, low noise, low vibration and low heat, making it ideal for electronic processing equipment, laser processing, medical and small CNC equipment.

1.2. Features

- Low vibration and noise;
- Max. 512 micro-step subdivision, min. unit 1;
- Matching motor: 86mm series and below;
- Input voltage: 30~110VDC, 24-80VAC;
- Output current: 8A(Peak);
- 3 optically isolated differential signal inputs: 5~24VDC;
- 4 DIP switch selection, 16-segment subdivision;
- Support single and double pulse
- With over-voltage, over-current, out of tolerance protect function etc.;

1.3. Application

Suitable for all kinds of small automation equipment and instruments, such as: pneumatic marking machine, labeling machine, cutting machine, laser marking machine, plotter, small engraving machine, CNC machine tool, pick and place device. It is particularly effective in applications where users expect low noise, low vibration, high stationarity and high precision.

2. ELECTRICAL, ENVIRONMENTAL INDEX

2.1. Electrical Index

Driver Parameter		Min.	Standard	Max.	Unit
Input voltage	DC	30	36/48	110	V
	AC	24		80	
Output current peak		1	-	8	A
Step signal frequency		0	-	200k	Hz
Control signal input current		7	10	16	mA
Over-voltage protection		-	120	-	VDC
Input signal voltage		5	-	24	VDC
Insulation resistance		100			MΩ

2.2. Environmental Index

Cooling Type		Natural cooling or forced cooling
Service environment	Application occasion	Avoid dust, oil mist and corrosive gases
	Service temperature	0~50℃
	Max. ambient humidity	90% RH (no condensation))

	Storage temperature	-10~70℃
	Vibration	10~55Hz/0.15mm

2.3. Installation Diagram

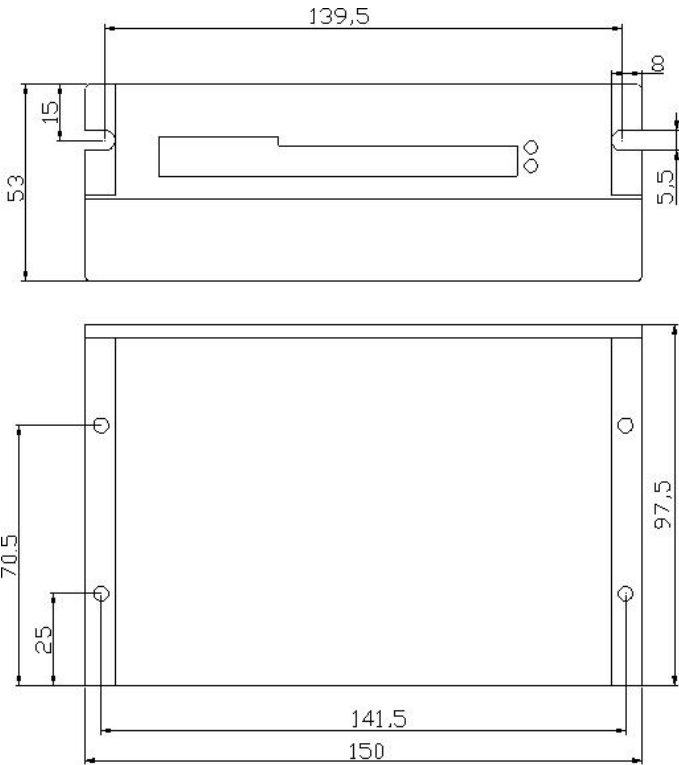


Fig.1 Installation dimension diagram(unit: mm)

2.4. Driver Installation

Users can install with the wide or narrow side of the driver's cooling base. If install with a wide side, use M3 screw to install through the holes in the four corners. If install with narrow side, use M3 screws to install through the holes on both sides. For good heat dissipation, the narrow side mounting is recommended.

The driver power device will generate heat. If continuous operation is under high input voltage and high power conditions, the effective heat dissipation area or forced cooling should be expanded. Do not use in places where air is not circulating or where the ambient temperature exceeds 60℃; do not install the driver in a place that is wet or has metal shavings.

3. DRIVER INTERFACE AND WIRING

3.1. Interface Definition

3.1.1 Motor and power input port

Terminal NO.	Mark	Name	Remark
1	A+	Phase A motor winding+	
2	A-	Phase A motor winding-	
3	B+	Phase B motor winding+	
4	B-	Phase B motor winding-	
5	AC1	Input power 1	+30V~ +100VDC 24V-80VAC
6	AC2	Input power 2	

3.1.2 Encoder signal input port

Terminal NO.	Mark	Name	Remark
1	EB+	Motor encoder B phase positive input	

2	EB-	Motor encoder B phase negative input	
3	EA+	Motor encoder A phase positive input	
4	EA-	Motor encoder A phase negative input	
5	VCC	Encoder power supply	+5V
6	GND	Encoder power ground	0V

3.1.3 Control Signal Terminal

Terminal NO.	Mark	Name	Remark
1	PUL+	Pulse positive input	
2	PUL-	Pulse negative input	
3	DIR+	Direction positive input	
4	DIR-	Direction negative input	
5	ENA+	Enable positive input	
6	ENA-	Enable negative input	
7	Pend+	In-position signal positive output	
8	Pend-	In-position signal negative output	
9	ALM+	Alarm signal positive output	
10	ALM-	Alarm signal negative output	

3.1.4 RS232 communication interface

RS232 interface pin alignment definition as below

Terminal NO.	Mark	Name	Remark
1	NC		
2	RxD	RS232 receiver	
3	GND	Power ground	
4	NC		
5	TxD	RS232 sender	
6	3.3V	Power supply positive end	Internal power supply

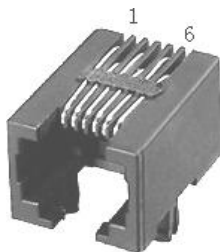


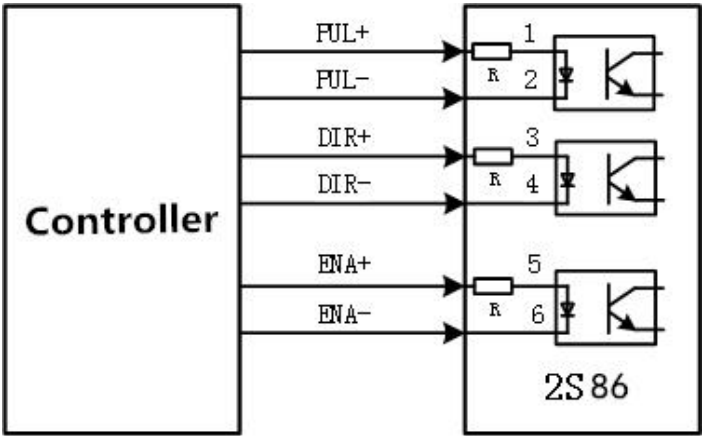
Fig.2 RS232 interface pin alignment definition

3.1.5 Encoder signal output port

Termi	Mark	Name	Remark
1	EB-	Motor encoder B phase negative output	
2	EB+	Motor encoder B phase positive input	
3	EA-	Motor encoder A phase negative input	
4	EA+	Motor encoder A phase positive output	

3.2. Control Signal Wiring

Control signal differential mode input, control signal interface wiring diagram, as shown below:



Control signal single-ended mode input, control signal interface wiring diagram

as shown below:

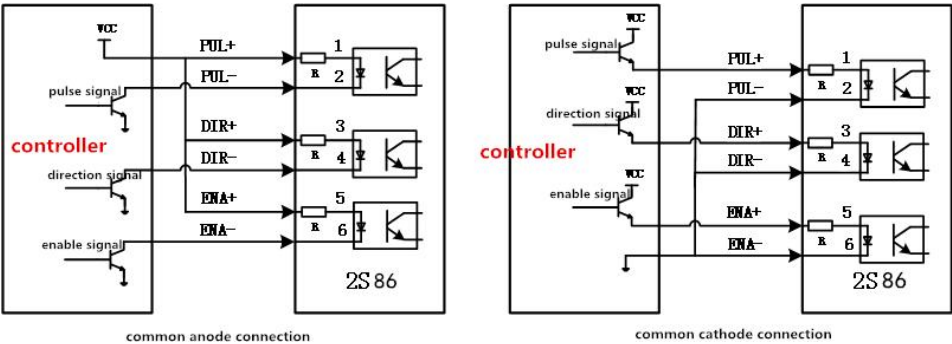


Fig.3 Input interface circuit

Note: The control signal level is common for 5-24V.

Control signal timing diagram

In order to avoid some wrong actions and deviations, PUL, DIR and ENA should meet certain requirements, as shown below:

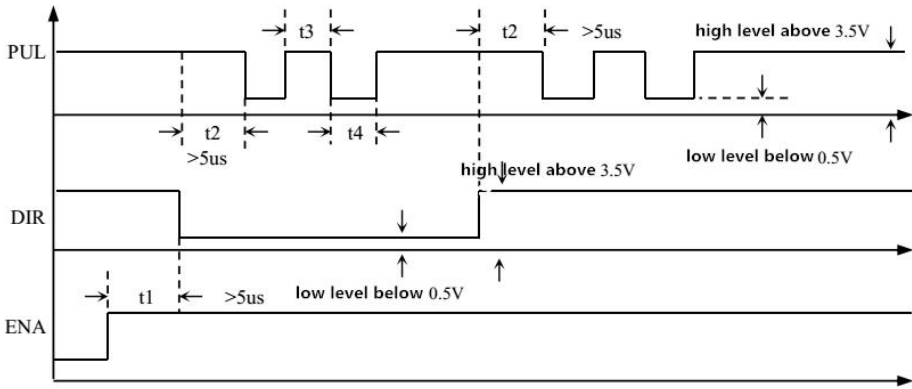


Fig.4 Control signal timing diagram

Note:

1) t1: ENA (enable signal) should be confirmed to be high at least 5μs ahead of DIR.

In general, it is recommended that ENA+ and ENA- is hanging.

- 2) t2: DIR is confirmed for its state to be high or low at least 5 μ s ahead of PUL falling edge.
- 3) t3: The pulse width is at least not less than 2.5 μ s.
- 4) t4: The low level width is not less than 2.5 μ s.

3.3. Output Signal Wiring

Signal output wiring, such as alarm signal output ALM, photoelectric isolation OC output, maximum withstand voltage 30VDC, maximum saturation current 50mA.

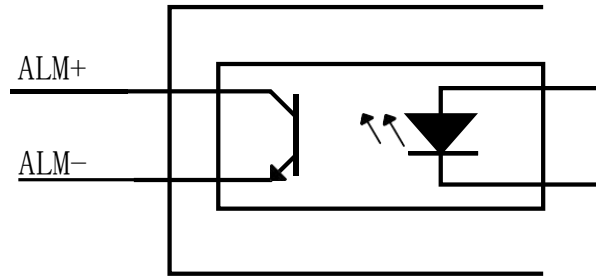


Fig.4 Output Signal Wiring

3.4. Control Signal Mode Setting

Pulse trigger edge and single and double pulse selection: The pulse rising edge or falling edge trigger is effective by dialing setting; It is also possible to set the single pulse mode or the double pulse mode.

3.5. Encoder Wiring

Directly powered by HBS860H, GND is connected to the encoder ground, VCC is connected to the encoder power supply +, encoder A+, A-, B+, B- signals are correspondingly connected to the drive EA+, EA-, EB+, EB- port.

3.6. Serial Wiring

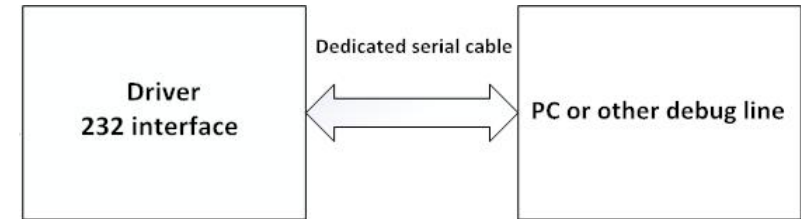


Fig.5 Serial wiring diagram

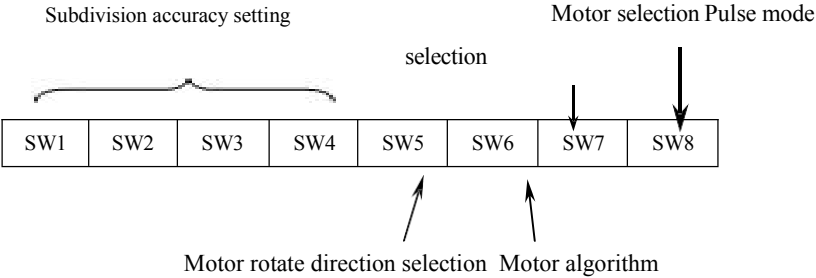
3.7. Status Indicator LED

The green LED is the power indicator, which is always on when the driver is powered up; it is off when the driver is powered off. The red LED is the fault indicator. When the driver fails, it will stop and prompt the corresponding fault code. The fault can be cleared when the user needs to power off and restart the power. The status indicator LED represents different operation and fault information, as shown in the following table:

Status	Condition	Status indicator LED description	
over-current	The phase current through the motor exceeds the rated current or the phase-to-phase short circuit	1 red	
over-voltage	Power supply voltage exceeds maximum rated voltage	2 red	
out-of-tolerance	Position out of tolerance	5 red	

4. DIP SWITCH SETTING

2S86 driver use an eight-digit dial switch, set the subdivision accuracy, control signal mode, effective edge and motor rotate direction. The detailed description is as follows:



Subdivision settings. The subdivision parameters can be customized according to customer requirements. The range is 400~51200 Step/Rev.

Step/Rev	SW1	SW2	SW3	SW4
400 (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

SW5: Motor rotate direction setting. When SW5=off, the motor rotates counterclockwise (CWW); SW5=on, rotates clockwise (CW).

SW6: Motor algorithm selection.

SW7 SW8: Set the Motor type.

5. TYPICAL APPLICATION WIRING DIAGRAM

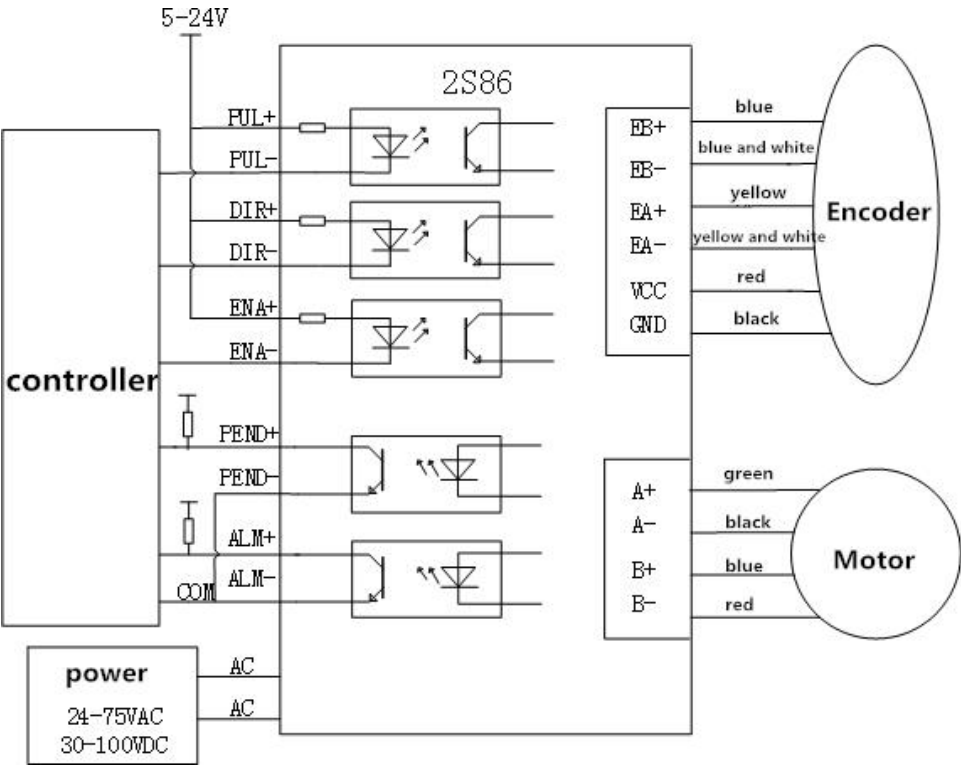


Fig.6 Typical Application Wiring Diagram

5.1. Closed Loop Stepper Motor Encoder Line Color and Definition

Pin	Encoder line color	Signal	Description
1	blue	EB+	Encoder B channel positive output
2	blue and white	EB-	Encoder B channel negative output
3	yellow	EA+	Encoder A channel positive output
4	Yellow and white	EA-	Encoder A channel negative output
5	red	VCC	Encoder +5V power input
6	black	GND	Encoder GND input

5.2. Closed Loop Stepper Motor Line Color and Definition

Pin	86 motor color	Signal	Description
1	Red	A+	Phase A motor winding +
2	Blue	A-	Phase A motor winding -
3	black	B+	Phase B motor winding +
4	green	B-	Phase B motor winding -

