4460.5

Stepper Control & Drive Board

(Modbus protocol)

User Manual

V1.0 2022/11/03

1. Function Introduction

The 4460.5 stepper control & drive board can use 3 speed regulation methods to control the stepper motor:

1. External potentiometer interface P5 (default, jumper cap P3 shorts 2 and 3)

2. Built-in potentiometer VR1 (jumper cap P3 shorts 1 and 2)

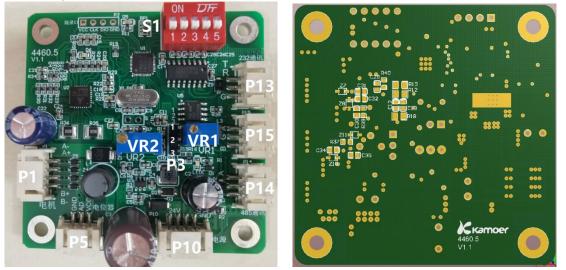3. Communication bus RS485 communication control (both P14 and P15, Modbus-RTU communication protocol)

Figure 1.1 Front and back view

- S1: P5 or VR1 potentiometer knob speed regulation and RS485 communication control function selection, communication baud rate setting;
- P13: RS232 interface (PH-3Y connector), no function for now, reserved;
- P14: RS485 interface (PH-3Y connector), parallel with P15, supports Modbus-RTU communication protocol;
- P15: RS485 interface (PH-3Y connector), parallel with P14, supports Modbus-RTU communication protocol;
- P10: Power input interface (input voltage range DC12～24V, XH-4Y connector);
- P5: External speed regulating potentiometer interface (PH-3Y connector);
- P1: Stepper motor interface (XH-4Y connector);
- P3: The knob speed control circuit selects built-in or external, the default is external speed control (the jumper cap P3 is shorted to 2 and 3);
- VR1: Built-in potentiometer speed regulation (when the built-in potentiometer speed regulation is selected), rotate clockwise to increase;
- VR2: stepper motor current adjustment potentiometer;

Note: The 4460.5 stepper control driver board can drive 28/42 stepper motor peristaltic pumps such as KCS, KCM, KAS, etc. The following description takes KCS as an example, just connect the stepper motor of the corresponding pump to the motor interface of the 4460.5

2. External Knob for Speed Regulation (Default connection)

Step 1: Dial the No. 1 position of the DIP switch S1 to the "ON" position, Positions 2, 3 and 4 of the S1 determine the maximum adjustable speed of the potentiometer, could adjust according to the table on Step 2, position 5 of S1 can be in any position (as shown in Figure 2.1)
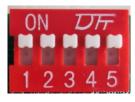

Figure 2.1

Step 2: The maximum speed is set via digits 2, 3 and 4 of the DIP switch S1, as shown in Table 2.1:

No. 2 position	No. 3 position	No. 4 position	Maximum speed(rpm)
OFF	OFF	OFF	150
OFF	OFF	ON	200
OFF	ON	OFF	250
OFF	ON	ON	300
ON	OFF	OFF	350
ON	OFF	ON	400
ON	ON	OFF	450
ON	ON	ON	500

Table 2.1

Step 3: Short-circuit the jumper cap between pins 2 and 3 of P3

Step 4: P5 Connect Speed Knob

Step 5: P1 Connect KCS Peristaltic Pump

Step 6: P10 Connecting the Power Cable

Step 7: Turn on the power, turn the speed control knob connected to the P5 port clockwise, and the speed will increase

Note: When the knob is used to adjust the speed, there is no need to connect the communication line.

3. Built-in Knob VR1 Speed Regulation

Step 1: Dial the No. 1 position of the DIP switch S1 to the "ON" position, and any other position for others (as shown in Figure 2.1)

Step 2: The relationship between bits 2, 3, and 4 of S1 and the maximum adjustable speed is shown in Table 2.1

Step 3: Short-circuit the jumper cap between pins 1 and 2 of P3

Step 4: P1 Connect KCS Peristaltic Pump

Step 5: P10 Connecting the Power Cable

Step 6: Turn on the power, turn the VR1 knob clockwise, the speed will increase

Note: The external speed regulating potentiometer P5 does not need to be connected.

4. RS485 (Modbus-RTU protocol) control

Step 1: Set up the DIP switches

- For RS485 control, firstly, you need to turn the No. 1 position of the DIP switch S1 to OFF;

- Then, if you know the current baud rate of the device, you can set the No. 2 position of the DIP switch S1 to OFF. At this time, after the device is powered on, the baud rate saved in the baud rate register is applied;

- If you don't know the current baud rate of the device, you can turn on the 2nd position of the DIP switch S1. At this time, after the device is powered on, the applied baud rate is 9600 by default;

- If the device needs to be connected to a 120Ω terminal resistance in the communication network, it needs to turn on the 5th position of the DIP switch S1, otherwise turn it off;

Step 2: Connect the communication cable

- When you need to use RS485 communication, insert the communication line into the RS485 communication port P14 or P15.
  RS485 port definition: A /G /B next to the terminal corresponds to the definition of RS485 A(D+)/ GND /B(D-)

Step 3: P1 is connected to KCS peristaltic pump;
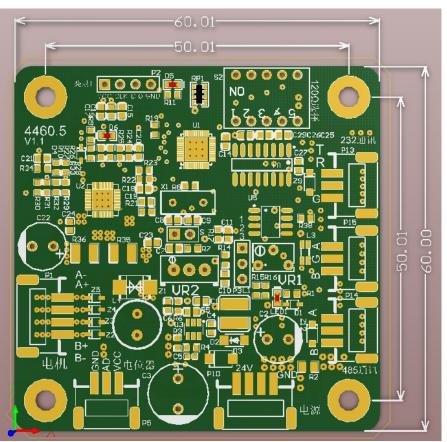
Step 4: P10 connect the power cord;

Step 5: Turn on the power and send commands based on the Modbus-RTU protocol to control the operation of the pump.

5. Current Regulation (adjusted at the Factory)

Adjust the current through the VR2 potentiometer, and the current adjustment range is 0~2A. Clockwise adjustment of the current increases, the motor torque increases.

Note: Generally, in the case that the motor is easy to lose step, increase the current (it is recommended that the current be as small as possible, and the motor heats up if the current is large).

6. Circuit Board Dimensions

Circuit board size: 60 x 60mm

Mounting hole size: 50 x 50mm

7. Communication protocol (Modbus-RTU)

7.1 Overview

This communication protocol is based on Modbus-RTU.

7.2 Communication parameter setting

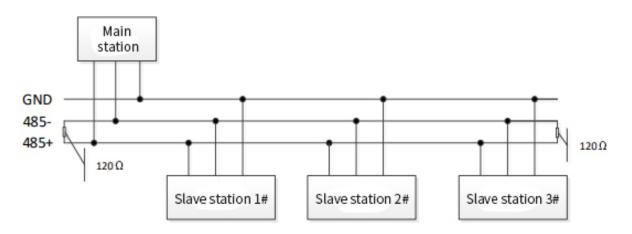| baud rate	start bit	data bits	stop bit	parity bit
9600 (default)	1	8	1	none

Figure 7.1

By setting the communication baud rate register and communication address register of the RS485 communication interface, the communication baud rate and communication address of the device can be changed respectively. However, after setting, it needs to be saved by triggering the Flash save register, and it will take effect after the device restarts.

The baud rate supported by the device is 9600 by default, and when the No. 2 position of the DIP switch S1 is ON, no matter what the baud rate is set in the software, after restarting, the default baud rate of 9600 is applied.

The address range supported by the device is 1-247, the default device address is 1, and the broadcast address is 0.

In the process of RS485 network construction, if the network terminal is embedded and connected to other devices, a 120Ω terminal matching resistor needs to be connected at the end of the network. The device has a 120Ω terminal matching resistor onboard, and the 5th position of the DIP switch S1 needs to be connected. When ON, the terminating resistor is connected to the network.

7.3 Modbus-RTU Register List

● Coil register

Object name	Object address	Data type	Defaults	Min	Max	Unit	Power off save	Read and write permissions	Object definition
Start-stop control	0x0001	uint16_t	0	0	1	/	/	RW	0: stop; 1: run
Motor direction	0x0002	uint16_t	0	0	1	/	support	RW	0: Clockwise; 1: Counterclockwise
Working mode	0x0003	uint16_t	0	0	1	/	/	RW	0: speed mode; 1 position mode
Flash save	0x0004	uint16_t	0	0	1	/	/	RW	Write 1 to trigger, automatically clear to 0
Restore Defaults	0x0005	uint16_t	0	0	1	/	/	RW	Write 1 to trigger, automatically clear to 0

● Holding register

Object name	Object address	Data type	Defaults	Min	Max	Unit	Power off save	Read and write permissions	Object definition
485 mailing address	0x4001	uint16_t	1	1	247	/	support	RW	0: broadcast address
485 Communication baud rate	0x4002	uint16_t	3	0	7	/	support	RW	0:1200; 1:2400; 2:4800:;3:9600; 4:19200;5:38400; 6:57600; 7:115200
Subdivision	0x4003	uint16_t	256	1	256	/	support	RW	Number of subdivisions supported: 1, 2, 4, 8, 16, 32, 64, 128, 256; Other values are equivalent to 256
Potentiometer Maximum speed	0x4004-0x4005	uint32_t	35000	100	50000	0.01 rpm	support	RW	100 times magnification rounded up
Error code	0x4006	uint16_t	0	0	65535	/	/	RW	
Starting speed	0x4007-0x4008	uint32_t	5000	0	50000	0.01 rpm	/	RW	100 times magnification rounded up

Target speed/ Max speed	0x4009-0x400A	uint32_t	35000	100	50000	0.01 rpm	/	RW	100 times magnification rounded up
Acceleration	0x400B-0x400C	uint32_t	50000	1000	4291000	pulse/ sec^2	/	RW	
Deceleration speed	0x400D-0x400E	uint32_t	50000	1000	4291000	pulse/ sec^2	/	RW	
Target position increment	0x400F	uint32_t	102400	0	2^32-1	pulse	/	RW	

● **Input register**

Object name	Object address	Data type	Defaults	Min	Max	Unit	Power off save	Read and write permissions	Object definition
Actual speed	0x3001-0x3002	uint32_t	0	/	/	0.01 rpm	/	R	100 times magnification rounded up
Actual location Incremental	0x3003-0x3004	uint32_t	0	/	/	pulse	/	R	Each trigger run will automatically start counting from 0
Firmware version	0x3005	uint16_t	/	/	/	/	/	R	
Hardware version	0x3006	uint16_t	/	/	/	/	/	R	
Devise serial number	0x3007-0x3008	uint32_t	/	/	/	/	/	R	

7.4 Firmware upgrade

The 4460.5 stepper control & drive board can carry out firmware upgrade to achieve function optimization and defect improvement. This function can be achieved through the firmware upgrade tool "HD Firmware Upgrade Tool" provided by Kamoer.

Firmware upgrade tool usage environment and tool requirements:

1. Windows operating system;

2. USB to 485 converter;

3. Firmware to be upgraded provided by Kamoer;

4. Firmware upgrade tool provided by Kamoer.

The following describes the upgrade operation steps:

（1）Connect the P14 or P15 interface of the 4460.5 stepper control driver board to the USB to

485 converter, and connect the USB end to the computer USB interface;

（2）Open the firmware upgrade tool "HD Firmware Upgrade Tool" on the computer;

（3）First, on the "Communication Configuration" page, click the "Refresh Port" button, then select the appropriate port at the communication port, and finally click "Open Port", as shown in the figure:

（4）Next, on the "Firmware Upgrade" page, click "Select Firmware", select the firmware to be upgraded provided by Kamoer, and then click the button "Start Update", and wait for the words "Device: Waiting for power on" to appear in the status bar below, power on or power on the device again, as shown in the figure:

（5）After waiting for about 2 minutes, the firmware upgrade can be completed. After the upgrade is completed, the update progress is displayed as "100%". At this time, you can close the firmware upgrade tool and use it normally.

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