SHENZHEN BIGTREE TECHNOLOGY CO.,LTD .
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42 Stepper Motor Closed Loop

Driver Control Board

Operating Instruction

Administrator

Contents

Ⅰ. Product Introduction

Stepper motor closed loop driver uses closed - loop control technology. STM32F030C8t6 is the main controller, A4950 is the motor driver and TLE5012B is the magnetic encoder.The closed-loop driver is to feedback the rotation angle of the stepping motor to the control board. Comparing the distance that needs to be rotated with the distance of the actual rotation, it will calculate the error value, and then compensate, so as to prevent the problem of multi-step and lost step. The closed-loop driver can completely overcome the problem of losing step of the open-loop stepper motor. At the same time, it can obviously improve the performance of the motor at high speed, so as to improve the speed and precision of the machine. When the motor is out of step because of working for a long time, the main control chip can detect the step-out condition of the stepping motor through the magnetic encoder, thereby compensating, so that the machine can continue to work normally.

Ⅱ.Product Parameters

Motor power supply（VM）：12V---24V

Motor default operating current：800mA

Driver default subdivision：16 subdivision

Subdivision： 2 4 8 16 32

Maximum current：1650mA

Maximum speed：1000RPM

Main control chip： STM32f030c8t6,Crotex-M0 ，dominant frequency 48MHz

Ⅲ.Product Features

1、The product is sold as a whole set, which eliminates complicated assembly and debugging.

2、It can print at high speed without losing step.

3、Low calorific value, high operating efficiency.

4、Easy to install and wire.

5、Compared with ordinary drives, this motor runs more stably.

6、The current and subdivision of the motor can be modified by pressing the button and displayed on the OLED to realize human-computer interaction visualization. The serial port can also be used for parameter adjustment and query.
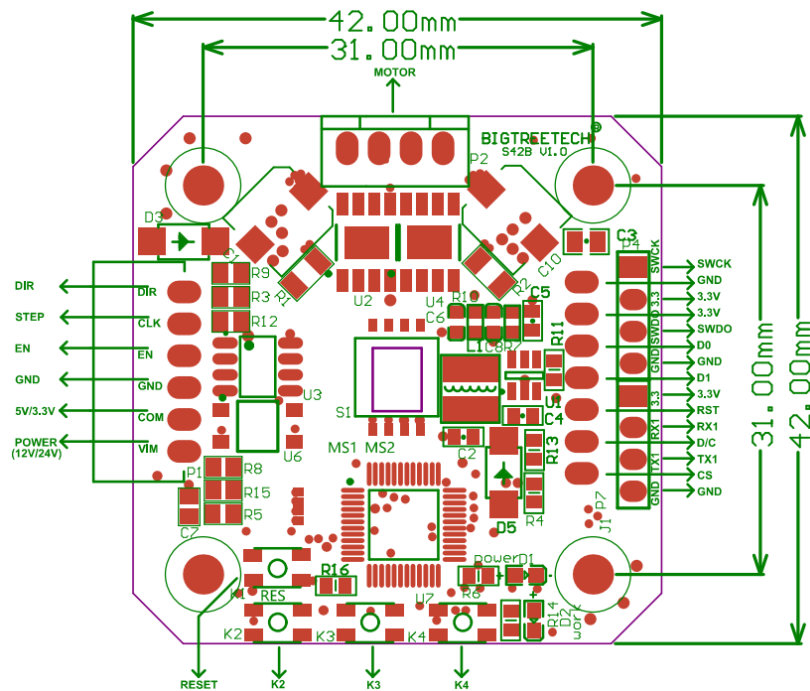
7、Without OLED, you can use serial port to connect the computer, through the serial port communication protocol for parameter adjustment and query.

8、Software algorithm to achieve low noise and low vibration.

9、C language development, easy to secondary development.

10、Setting parameters can be saved to facilitate secondary loading.

IV.Interface Specification

V.Function of the Button

K1: RESET button

K2: select the next line (only valid on Settings interface)

K3: switch between setting interface and status interface

K4: confirm the selection (only valid in the Settings interface)

VI.Parameters Adjustment.

Note：42 Stepper motor closed-loop driver control

board has two parameter adjustment methods.

1、 **Open loop/closed loop mode selection**

Turning on the 3rd position of the DIP switch means selecting the closed loop mode (default closed loop mode), disconnecting the 3rd digit of the DIP switch to indicate the open loop mode.

When initializing for the first time, select both the 1st and 2nd digits of the DIP switch the subdivision

	1st	2nd	subdivision
impulses per circle 1024:	1	1	4
impulses per circle 2048:	0	1	8
impulses per circle 4096:	1	0	16
impulses per circle 8192:	0	0	32

After the initialization is completed, select it by pressing the button.

2、 **OLED Button adjustment method**

Advantages: There is no need to connect to the computer, directly display through OLED; Key setting, simple operation.

State interface
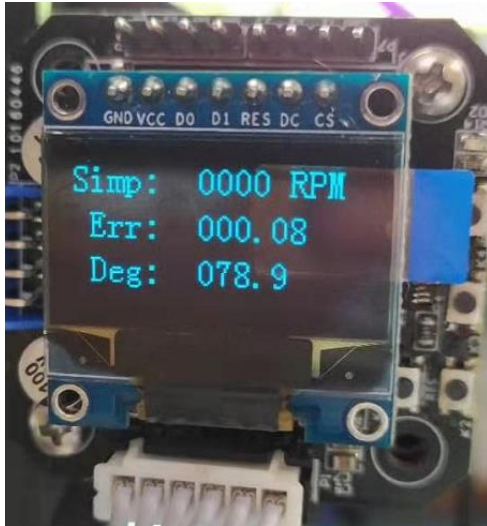
1) .0000 RPM, It means the current RPM is 0 RPM.

2) .000.08 err, This means the error between the actual position of the motor and the target position is 0.08°.

3) 078.9deg represents the current target position of the motor is 78.9°.

Note: if a negative sign appears, it indicates the opposite direction.

Setting interface

There are six options in the Settings screen

Calibrate:

When entering calibration, the system indicator flashes twice first, then the motor will turn counterclockwise 200 times (1.8° each time), turn clockwise 200 times (1.8° each time) to calibrate the encoder. After the first electricity, the parameters must be calibrated. For the first calibration, the DIP switch No. 4 on the board needs to be turned on. After a successful calibration, you will see "Calibrate finished! Please press Reset Key reboot", and the light will keep flashing! At this time, we only need to press the reset button on the OLed screen to complete the calibration!

Motor mA

Set the current when the motor is running, the default is 1600mA. The actual maximum current depends on the size

of the sampling resistance of the driver, I (Max) =Vref/10*Rs. Since the sampling resistance is 0.2R, the actual current of the motor is 1/2 of the set current. For example, when setting 800mA, the actual current of the motor is I(motor)= 1/2*400mA.

Note: The setting current should not exceed the rated current of the motor!!

Microstep,

Set subdivision, default 16 subdivision,

subdivision 2：corresponds to a cycle of 512 pulses

subdivision 4：corresponds to a cycle of 1024 pulses

subdivision 8：corresponds to a cycle of 2048 pulses

subdivision 16：corresponds to a cycle of 4096 pulses

subdivision 32：corresponds to a cycle of 8192 pulses

Calculate the main control board according to the machine structure The number of pulses per millimeter = the number of pulses per turn/the length of the machine gear per turn （Common structure: belt and gear）

EnablePin

Set the logic level of Enable Pin, Enable represents high level Enable, ! Enable stands for low Enable, default! Enable low level Enable.

DirPin

Set the logical level of the DIR Pin. Modify this option to change the direction of rotation of the motor
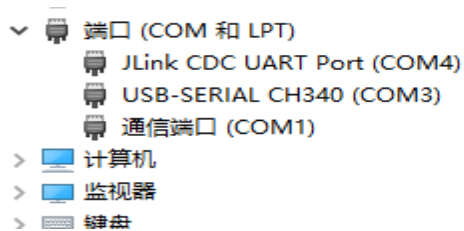
Button

K1: RESET button

K2: select the next line (only valid on Settings interface)

K3: switch between setting interface and status interface

K4: confirm the selection (only valid in the Settings interface)

3.Serial communication parameter setting

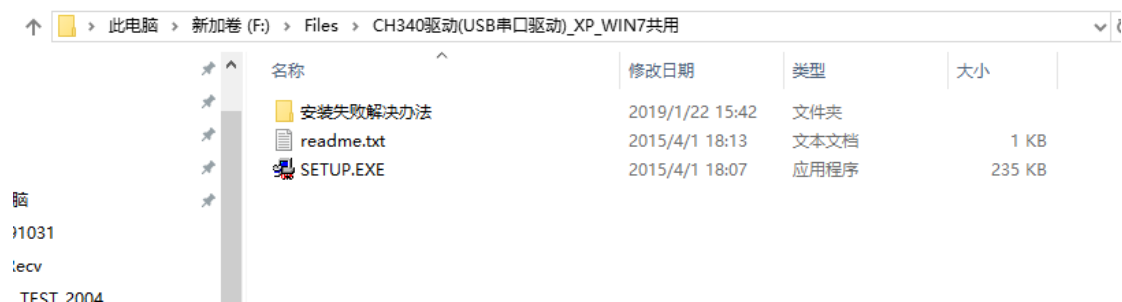After connecting to the computer, check to see if the driver is installed

If a yellow exclamation point is displayed, it indicates that the installation is not completed.

3.1、Driver installation
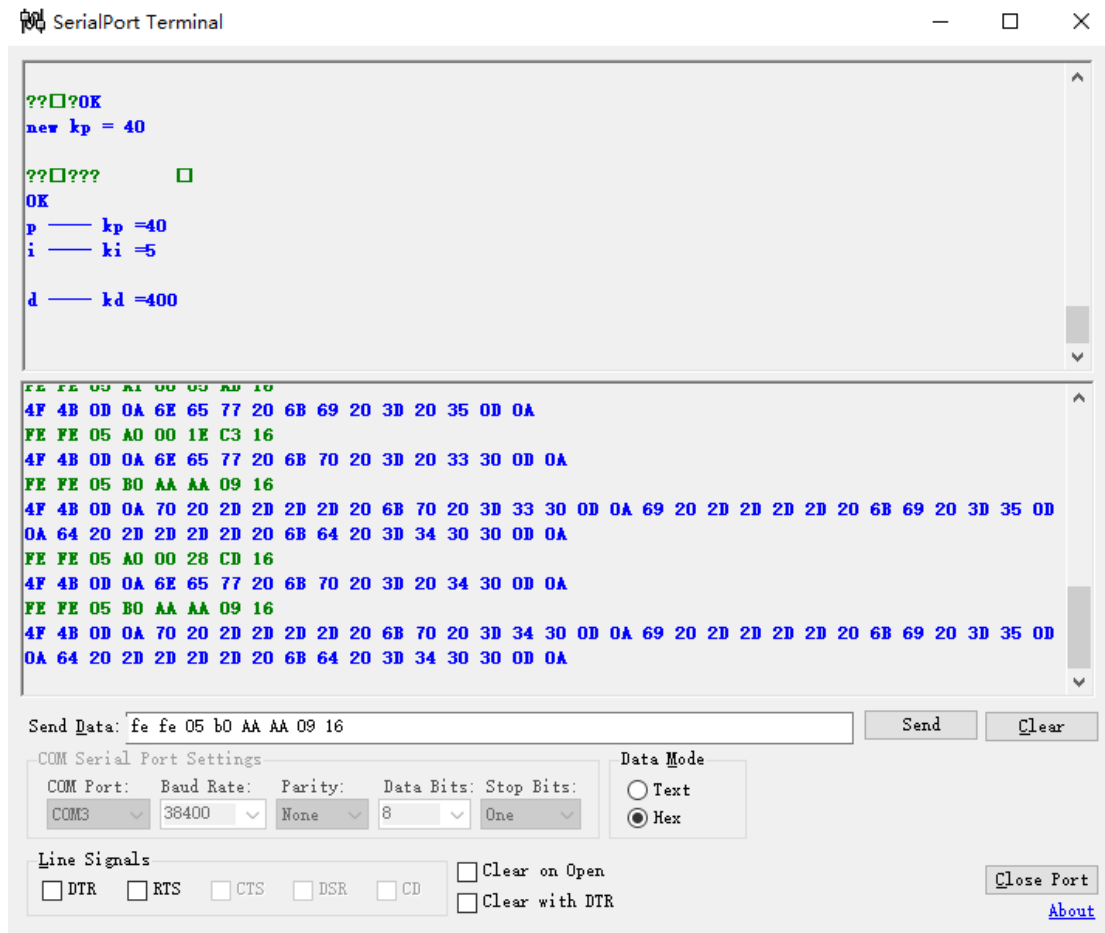
Driver download url：

https://github.com/

Install the driver, double-click SETUP.EXE

After installation, check the port number on 'my computer' -> 'management' -> 'device management' -> 'port'

3.2、Serial debugging assistant Settings

Open the serial debugging assistant

First, select serial port COM3 USB-SERIAL

Set the baud rate to 38400, no parity check, data bit: 8 bits, stop bit: 1 bit. The data mode is Hex format, and then click "Open Port" to open the serial port.

The green data indicates that it was sent.

The blue data represents that it was received.

The serial port is mainly used to modify and read the P, I ,D

parameters, and query the current and microstep now set.

(If you need to add functions, you can modify the program source code, expand the required functions). For details, see the closed-loop board serial communication protocol. Examples of parameter setting instructions are as follows:

Position PID parameter modification:

Kp：Send：FE FE 05 A0 00 28 CD 16

　　Return：OK

Ki: Send：FE FE 05 A1 00 0A B0 16

　　Return：OK

Kd: Send：FE FE 05 A2 00 C8 6F 16

　　Return：OK

After the data is sent and received successfully, the corresponding values of new KP, Ki and kd will be indicated.

Position PID parameter reading：

Send：FE FE 05 B0 AA AA 09 16

Return：p ---- kp =40

　　　　i ---- ki =10

d ---- kd =200

Current parameter modification: for example, set 500mA, convert 500 to hexadecimal 0x01f4, fill in the command, and then calculate the checksum

Send：FE FE 05 A3 01 f4 9d 16

Return：OK

Current parameters:

Send：FE FE 05 B1 AA AA 0A 16

Return：OK

Currents =800 mA

Microstep parameter modification: data bits are hexadecimal Numbers. For example, 32 microsteps correspond to the hexadecimal number 0x000F, and then the checksum is calculated

Send：FE FE 05 A4 00 0F B8 16

Return：OK

Micro step parameters:

Send：FE FE 05 B2 AA AA 0B 16

Return：OK

    Microstep =16 -->4096 Gear

Modification of Enable signal parameters: only two options for data are 0x0055 (high level Enable) and 0x00AA (low level Enable)

Send：FE FE 05 A5 00 AA 54 16

Return：OK

Enable signal parameters：

Send：FE FE 05 B3 AA AA 0C 16

Return：OK

    ！Enable=1

Direction signal parameter modification: data only has two options 0x0011 (increase the distance moved clockwise) and 0x0022 (increase the distance moved counterclockwise)

Send：FE FE 05 A6 00 11 BC 16

Return：OK

Reading of direction signal parameters:

Send：FE FE 05 B4 AA AA 0D 16

Return：OK

Dir =1， CW

(Here is an example, please take the actual parameters prevail!)

Note: serial debugging assistant tool download link:https://github.com/ . You can also use other software with serial port tools

Ⅶ.Frequently Asked Questions（FQA）

1、When the calibration function is executed, the system operation status indicator flashes 10 times continuously, which means the calibration will not be entered because

the core code chip is not detected.

2、For DIY, if the system indicator light is always on when the motherboard sends a pulse to the closed-loop board to move the motor after the completion of calibration. The possible reasons are as follows:

<a>、The closed-loop board is not calibrated properly

<b>、The magnet is too close to the magnetic encoding chip （less than 2mm）, or too far （ over 4mm）, or the magnet is not suitable.

<c>、The magnet is out of center.

3、The use of the DIP switch, if it is the first time to use you need to calibrate it. The calibration must be turned on the 4th position of the DIP switch to complete a calibration. After being completed, it is not necessary to dial the DIP switch 4 again.

4、In the case of the machine structure is belt + gear, if you want to conduct a closed-loop test, please turn down the current of the motor, generally choose 300 to 500mA to push the shaft.

It is difficult to push the motor manually when the current is too large. Even if it is pushed, there is a high probability of the wrong tooth.

5、We found that when SKR V1.3 motherboard was used to drive this driver, the motor did not rotate after the motherboard gave S42B pulse.This is because the pulse frequency was too fast and S42B could not be detected. At present, there are two ways to modify:

1.Modify pulse width and pulse frequency in Marlin firmware.

Details: Modify the high pulse width in configuration. adv,

define MINIMUM_STEPPER_PULSE 3

define MAXIMUM_STEPPER_RATE 150000

2.Modify the pulse signal sampling frequency in the S42B firmware source code.

Ⅷ.Notes

　　1、When inserting the adapter board, please pay attention to the direction of the adapter board.

Notice the motor and the loop chain wiring sequence!

2、For the first time, the closed-loop driver board must be connected to the motherboard with firmware, and then the encoder shall be calibrated. The calibration time will take 1-2 minutes, please wait patiently.

3、Check if the driver is installed when connecting to the computer with the serial port

4、When the data displayed on the display or serial port is abnormal, please remove the closed-loop driver board and check if the magnet on the motor shaft is in the center position. If not, please return it to the center for recalibration.

5、After completing the calibration, do not set it immediately after power-on. Please wait for the initialization to complete (1-2s) before setting the parameters.

6、Please do not manually turn the motor after power-on.

7、The distance between the magnet at the center of

the motor shaft and the core encoder should be greater than 2mm.

8、Full stability of machine structure must be guaranteed!!