SHENZHEN BIQU TECHNOLOGY CO., LTD.
BIG TREE TECH

BIGTREETECH
57 stepper motor closed loop drive control board
Instruction Manual

Contents

一、 Product Introduction

步进电机闭环驱动使用了闭环控制技术。以 STM32F103CBt6 为主控制器，A4950 作为电机驱动器，TLE5012B 为磁性编码器。闭环驱动是通过把步进电机的转动角度，反馈给控制板，把需要转动的距离和实际转动的距离进行比较，计算出误差值，然后进行补偿，从而达到防止多步和丢步的问题。该闭环驱动可以彻底克服开环步进电机的丢步问题，同时也能明显的提升电机高速工作时的性能，从而提升机器的加工速度和精度。电机在长时间工作造成失步时，主控芯片可以通过磁性编码器检测出步进电机的失步情况，从而进行补偿，使机器可以继续正常工作。

二、 Product Specification

Motor power supply (VM): 12V---24V

Motor default working current: 1600mA

Drive subdivision default: 16 subdivision

Subdivision number: 2 4 8 16 32

Maximum current: 3300mA

Maximum speed: 1000RPM

Main control chip: STM32f103cbt6, Crotex-M3, clocked at 72MHz

三、 **Product Features**

1. The product is sold as a complete set, eliminating the need for complicated assembly and debugging steps, just plug it in and use it immediately.

2. It can print at high speed without losing steps.

3. Low heat generation and high operating efficiency.

4. Convenient installation and easy wiring.

5. Compared with ordinary drives, the motor runs more stable.

6. With OLED, the current and subdivision of the motor can be modified by pressing the keys, and displayed on the OLED to realize the visualization of human-computer interaction, and the operation is simple and convenient.

7. Without OLED, you can use the serial port to connect to the computer, and use the serial port communication protocol for parameter adjustment and query.

8. The software algorithm realizes low noise and low vibration.

9. C language development is convenient for transplantation and secondary development.

10. The set parameters can be saved, which is convenient for secondary loading.

11. With CAN interface

四、 Interface Description
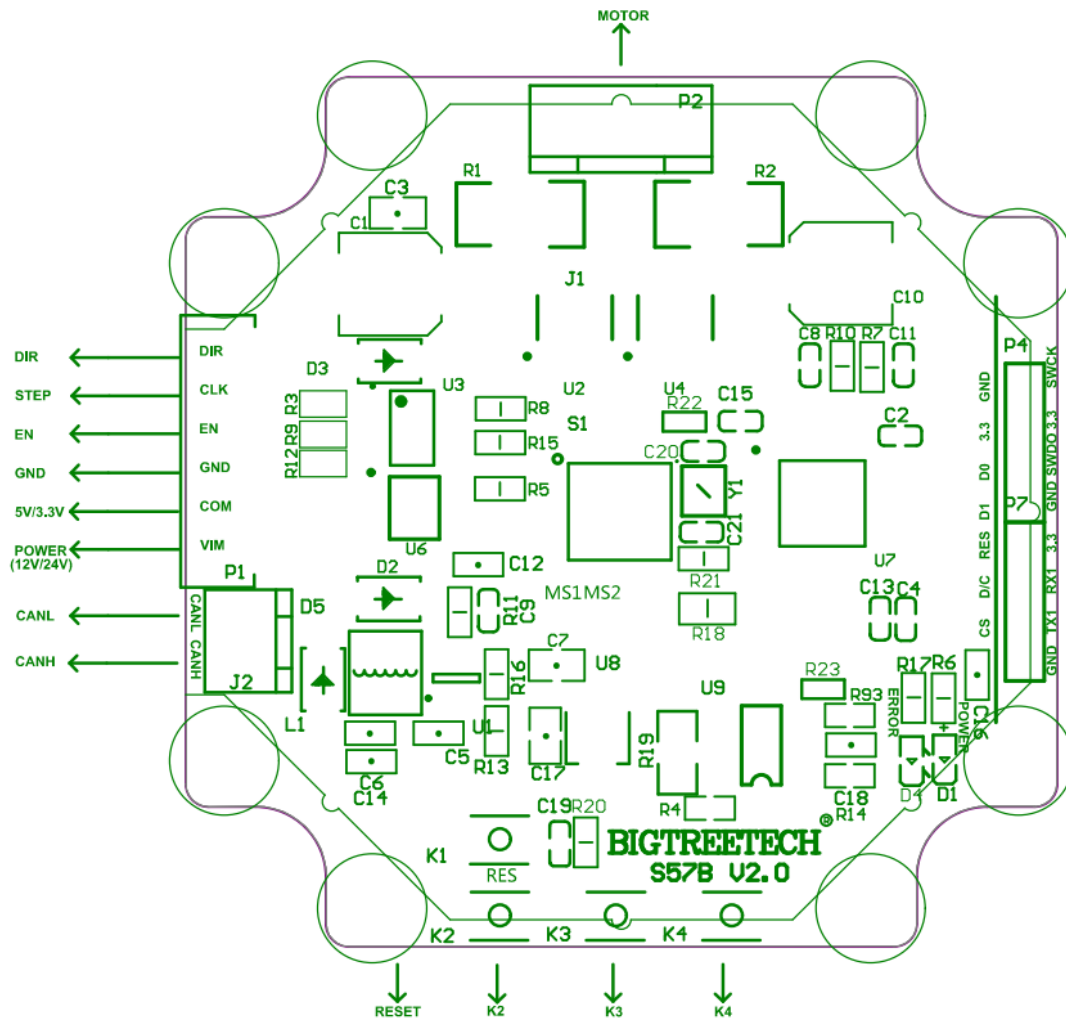
五、 Key Function

K1: Reset button (RESET)

K2: Select the option in the next line (only valid in the setting interface)

K3: Switch setting interface and status interface

K4: Confirm selection (only valid in the setting interface)

六、 Parameter Adjustment

Note: There are two parameter adjustment methods for the 57 stepper motor closed-loop drive control board.

1. Open-loop and closed-loop mode selection

Turning on the "No. 3" of the DIP switch indicates that the closed loop mode is selected (the default closed loop mode). Turning off the "No. 3" of the DIP switch indicates that the open loop mode is selected.

When initializing for the first time, the combination of No. 1 and No. 2 of the DIP switch selects subdivision

	No. 1	No. 2	Subdivision
Number of pulses per revolution 1024:	1	1	4
Number of pulses per revolution 2048:	0	1	8
Number of pulses per revolution 4096:	1	0	16
Number of pulses per revolution 8192:	0	0	32

After the initialization is complete, press the button to select.

2. OLED button adjustment method

Advantages: You don't need to connect to a computer, just use OLED display, button settings, simple and intuitive operation.

Status interface
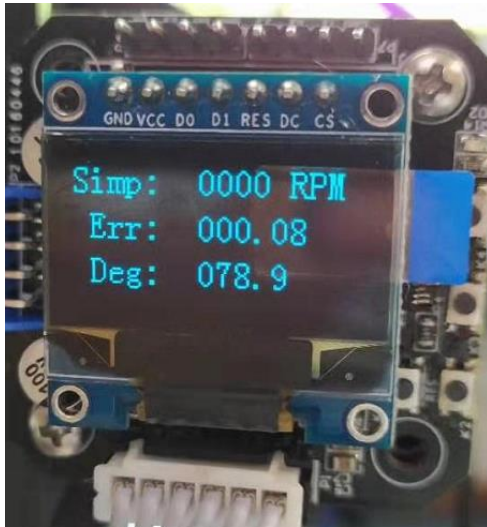
1) The first line 0000 RPM: Means thatthe current number of revolutions 0 revolutions per minute.

2) The second line 000.08 err: Means that the error between the actual position of the motor and the target position is 0.08°.

3) The third line 078.9deg: Means that the current target position of the motor is 78.9°.

Note: If a minus sign appears, it means the direction is opposite.

Set interface
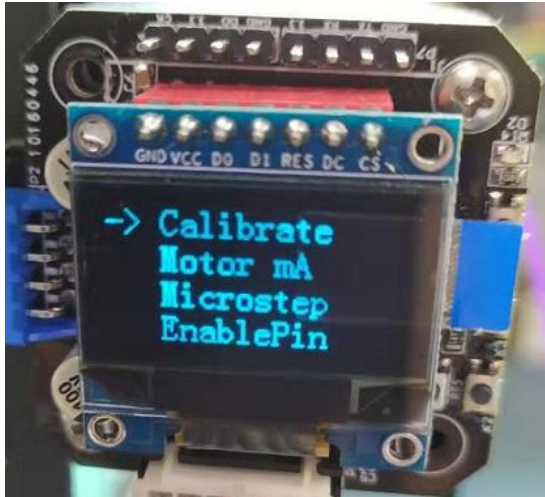
There are 6 options in the setting interface.

Calibrate:

When entering calibration, the system indicator light flashes twice, and then the motor will first rotate 200 times counterclockwise (1.8° each time), and then rotate 200 times clockwise (1.8° each time) to calibrate the encoder. After the first power supply, the parameters must be calibrated.The dial switch No. 4 on the board shall be put on for the first calibration. After the calibration is successful, the interface will prompt "Calibrate finished! Please press Reset Key reboot", and the indicator light will keep flashing! At this point, we only need to press the reset button according to the prompt on the OLed screen to complete the calibration operation!

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 resistor of the drive, I(max)=Vref/10*Rs. Since the sampling resistance is 0.1R, the maximum current of the motor is 3.3V/10*0.1R=3.3A. Note: The set current should not exceed the rated current of the motor, generally set to 2000mA.

Microstep,

Set subdivisions, the default is 16 subdivisions,

Subdivision 2: corresponds to 512 pulses in a circle

Subdivision 4: 1024 pulses corresponding to a circle

Subdivision 8: corresponding to 2048 pulses in a circle

Subdivision 16: corresponds to 4096 pulses per circle

Subdivision 32: corresponding to 8192 pulses per circle

Calculate the number of pulses per millimeter of the main control board according to your own machine structure = the number of pulses per circle/the length of one circle of machine gear (common structure: belt plus gear)

EnablePin

Set the logic level of the enable signal, Enable represents high level

enable, !Enable represents low level enable, default !Enable low level enable

DirPin

Set the logic level of the dir signal, modify this option to change the direction of rotation of the motor

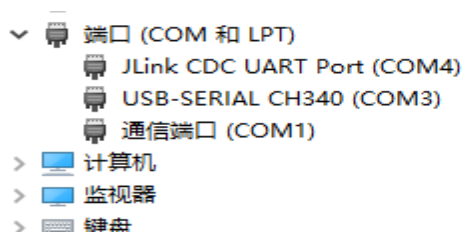## button

K1: Reset button (RESET)

K2: Select the option in the next line (only valid in the setting interface)

K3: Switch between setting interface and status interface

K4: Confirm selection (only valid in the setting interface)

2. Serial communication parameter setting

3. After connecting to the computer, check if the driver is ready for installation

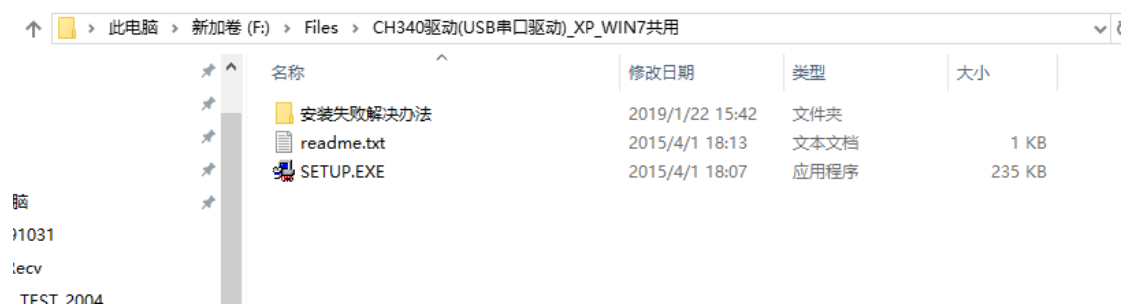4.If a yellow exclamation mark is displayed, it means that the

installation is not ready.

3.3.1, driver installation

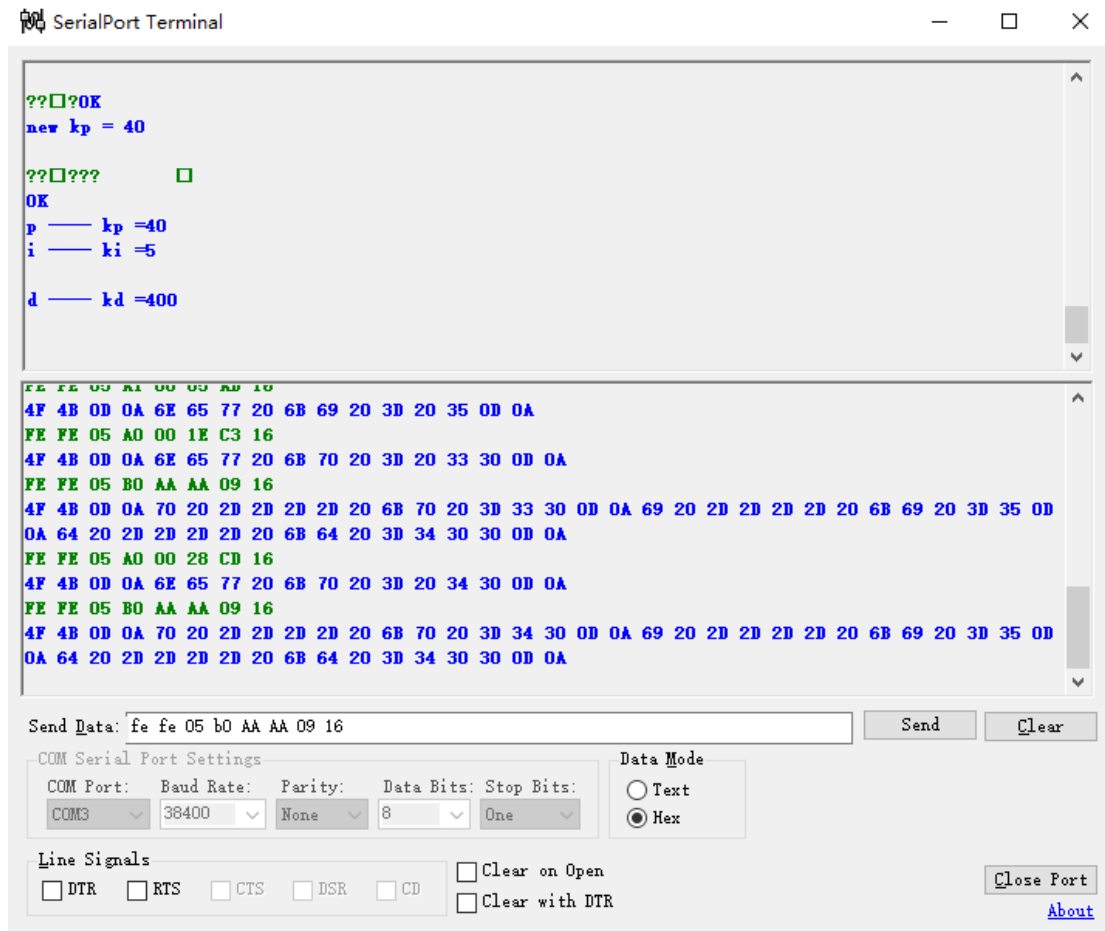Driver download address:

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 serial debugging assistant

First select the serial port, here is COM3 USB-SERIAL

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

Green data means it is sent.

Blue data means it is received.

The serial port is mainly used to modify and read P, I, D parameters, current, direction, enable and microstep. (If you need to add functions, you can modify the source code of the program yourself

and expand the functions you need). For the specific protocol, see the closed-loop board serial port tuning 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 successfully sent and received, the corresponding values of new kp, Ki, and kd will be prompted.

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, then fill in the command, and then calculate the checksum

Send: FE FE 05 A3 01 f4 9d 16

Return: OK

Current parameter reading:

Send: FE FE 05 B1 AA AA 0A 16

Return: OK

Currents =800 mA

Microstep parameter modification: the data bit is a hexadecimal number, for example, 32 microsteps correspond to the hexadecimal number 0x000F, and then calculate the checksum

Send: FE FE 05 A4 00 0F B8 16

Return: OK

Microstep parameter reading:

Send: FE FE 05 B2 AA AA 0B 16

Return: OK

Microstep =16 -->4096 Gear

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

Send: FE FE 05 A5 00 AA 54 16

Return: OK

Enable signal parameter reading:

Send: FE FE 05 B3 AA AA 0C 16

Return: OK

! Enable=1

Direction signal parameter modification: There are only two options for data: 0x0011 (to increase the moving distance is clockwise rotation) and 0x0022 (to increase the moving distance is counterclockwise rotation)

Send: FE FE 05 A6 00 11 BC 16

Return: OK

Direction signal parameter reading:

Send: FE FE 05 B4 AA AA 0D 16

Return: OK

Dir =1, CW

(Subject to actual parameters: here is an example!!!)

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

7. Frequently Asked Questions (FQA)

1. When the calibration function is executed, the system operation status indicator flashes 10 times continuously, and the calibration will not be entered because the magnetic encoding chip is not detected.

2. If during personal DIY, after the calibration is completed, when the main board sends pulses to the closed-loop board to move the motor, the system indicator light is always on, the possible reasons are:

<a>. The closed loop board was not calibrated well during calibration.

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

<c>. The magnet is not in the center.

3. The use of the DIP switch, if it is the first use to calibrate, you must turn on the No. 4 position of the DIP switch during calibration to complete a calibration. After the calibration is completed, you do not need to dial the No. 4 dial code again. switch.

4. When the structure of the machine is belt + gear, if you want to perform a closed loop test, please reduce the current of the motor, generally choose 400 to 600mA to drive the shaft.

When the current is too large, it is difficult to manually push the motor. Even if it is pushed, there is a high possibility of wrong teeth.

5. We found that when SKR V1.3 motherboard was used to drive this driver, the motor did not rotate after the motherboard gave S57B pulse.This is because the pulse frequency was too fast and S57B 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 S57B firmware source code.

6、The vibration phenomenon on the Y axis of the Ender3 model is due to the inappropriate PID parameter settings. The user can modify the Kd value with the serial port command according to the actual situation.

8. Matters needing attention

1. When inserting the adapter board, please pay attention to the direction of the adapter board and be sure not to connect it reversely.

Pay attention to the line sequence of the motor and the closed-loop link line!

2. When using it for the first time, the closed-loop driver board must be connected to the motherboard with firmware, and then the encoder can be calibrated. The calibration time takes 1-2 minutes, please wait patiently.

3. Check if the driver is ready for installation when connecting to the computer with the serial port

4. When the data displayed on the display screen or serial port is abnormal, please remove the closed-loop drive board and check whether the magnet on the motor shaft is in the center position. If not, please adjust back to the center and recalibrate.

5. After the calibration is completed, do not set up immediately after power-on, wait until the initialization is completed (1-2s) before setting the parameters.

6. Please do not artificially rotate the motor after power on.

7. The distance between the magnet in the center of the motor shaft and the magnetic encoder chip is greater than 2mm

8. The full stability of the machine structure must be guaranteed！！！