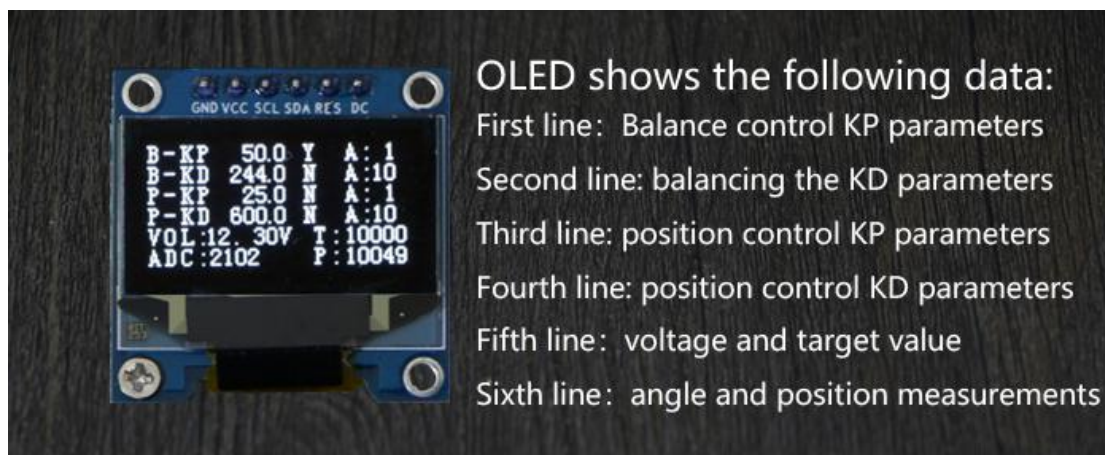


Instructions for the use of linear inverted pendulum

1. Power test for inverted pendulum (please be sure to finish).

After receiving the inverted pendulum, first make sure that the appearance is not damaged, find a table to place the inverted pendulum, so that the pendulum bar leakage outside the table can be turned without obstacles, and then connect to the power adapter, motor, angular displacement sensor line (see the video tutorial).

After completing the above wiring, you can turn on the inverted pendulum switch. At this time, the display will light up and display some information about the inverted pendulum, as follows (different versions of PID parameters):



At this point, the inverted pendulum rod is manually held close to balance, and then the inverted pendulum can be upright by clicking the USER button on the core board.



After the lever is balanced, click the X button to move the inverted pendulum, and double-click the button to move in the opposite direction.

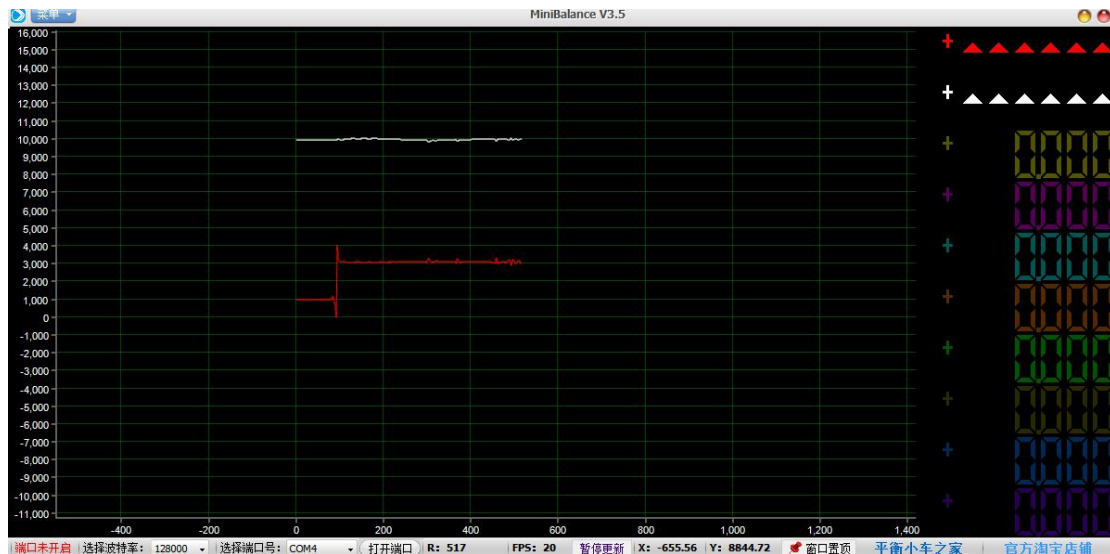


2. Data viewing

(At present, the host computer can only be used in Chinese Simplified windows operating system)

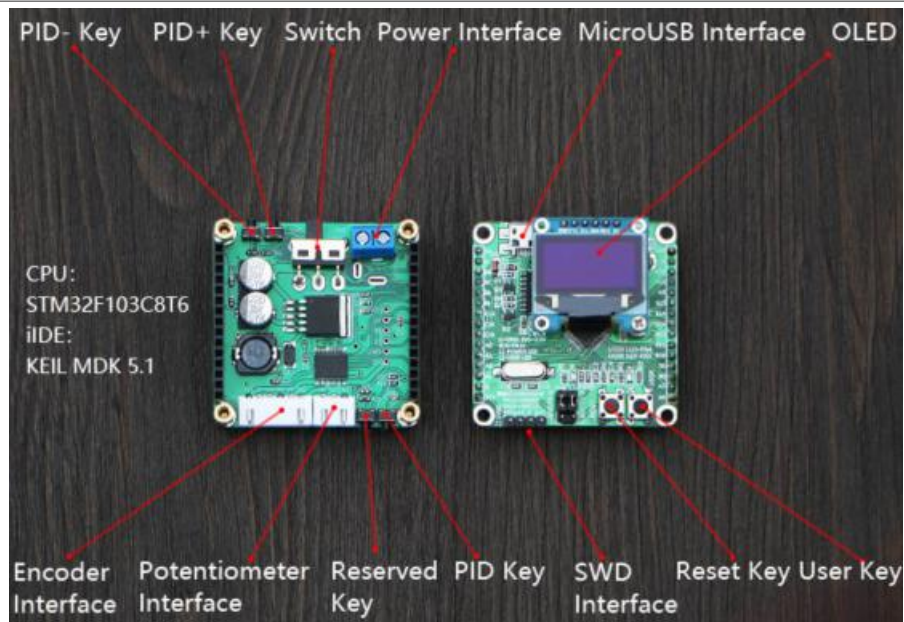
After the inverted pendulum control panel is powered on, the packet will be sent to the PC by the baud rate of 128000.

Next we open the MiniBalance PC, **note that you can not directly double-click open, must be right-clicked to run as an administrator**, open after selecting the appropriate port and set the baud rate can be seen through the PC data, very convenient. In addition, the PC with good computing and graphical performance can also display data graphically through the extended functions in the menu!



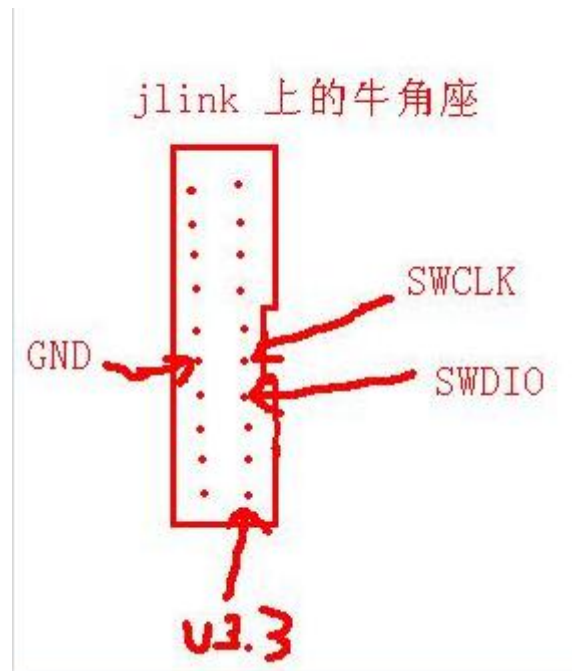
The white line is the location information, and the red line is the angle information.

3. Analysis of motherboard



(1). the motherboard can be debugged using STLINK and JLINK. If you purchase the STLINK debugger, you can connect the reserved SWD interface by yourself. Just connect VCC GND IO and SCK, install the STLINK driver and download the debugger.

(2). if you have JLINK, it can also be used for debugging. The wiring diagram is as follows:



Note that when debugging with JLINK, you must connect the 3.3V above the JLINK to the inverted pendulum, otherwise you cannot recognize the inverted pendulum.

4. Motor introduction

(1). This inverted pendulum is equipped with a motor rated voltage of 12V. If it works at a higher voltage, it is easy to cause damage to the motor. We are not responsible for the problems arising therefrom. If the motor works under a voltage of less than 12V, such as 8V, it will not reach the rated power, torque and speed will decline, performance will decline. The voltage of general 11~13V can make the motor reach the ideal working state.

(2). The motor has a 13-wire magnetic (Hall) encoder at the tail of the motor. The motor reduces speed by 1:20, so the motor can output 260 pulses when the synchronous wheel rotates in a circle. After frequency doubling, it is 1040. The encoder integrates the pull up resistance and the comparison shaping function, and can directly output the square wave. The encoder is usually powered by 5V. The encoder's VCC and GND must not be reversed, otherwise it may cause permanent damage to the encoder.

(3). The motor can not be overloaded for a long time or locked rotor, easy to cause damage to the motor, resulting in problems we are not responsible for.

5. Use data line to download program for inverted pendulum.

The main board uses a one button download circuit, which is very convenient to download. Just one MicroUSB phone data line will do.

(1). Hardware preparation

Hardware:

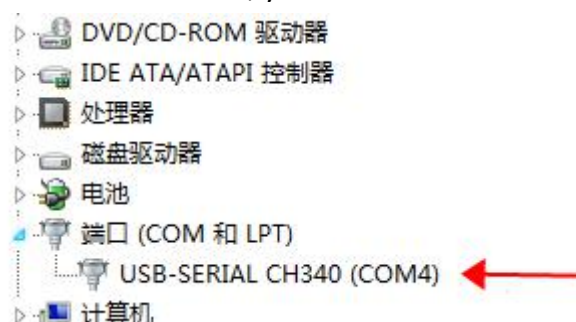
① inverted pendulum motherboard

② MicroUSB mobile data line

(2). Software preparation

Software: MCUISP burning software (attached information), corresponding USB to TTL module CH340G driver. There are also drivers in the attached information. If the driver installation is really difficult, download a driver software.

After the installation is successful, you can see the device manager.



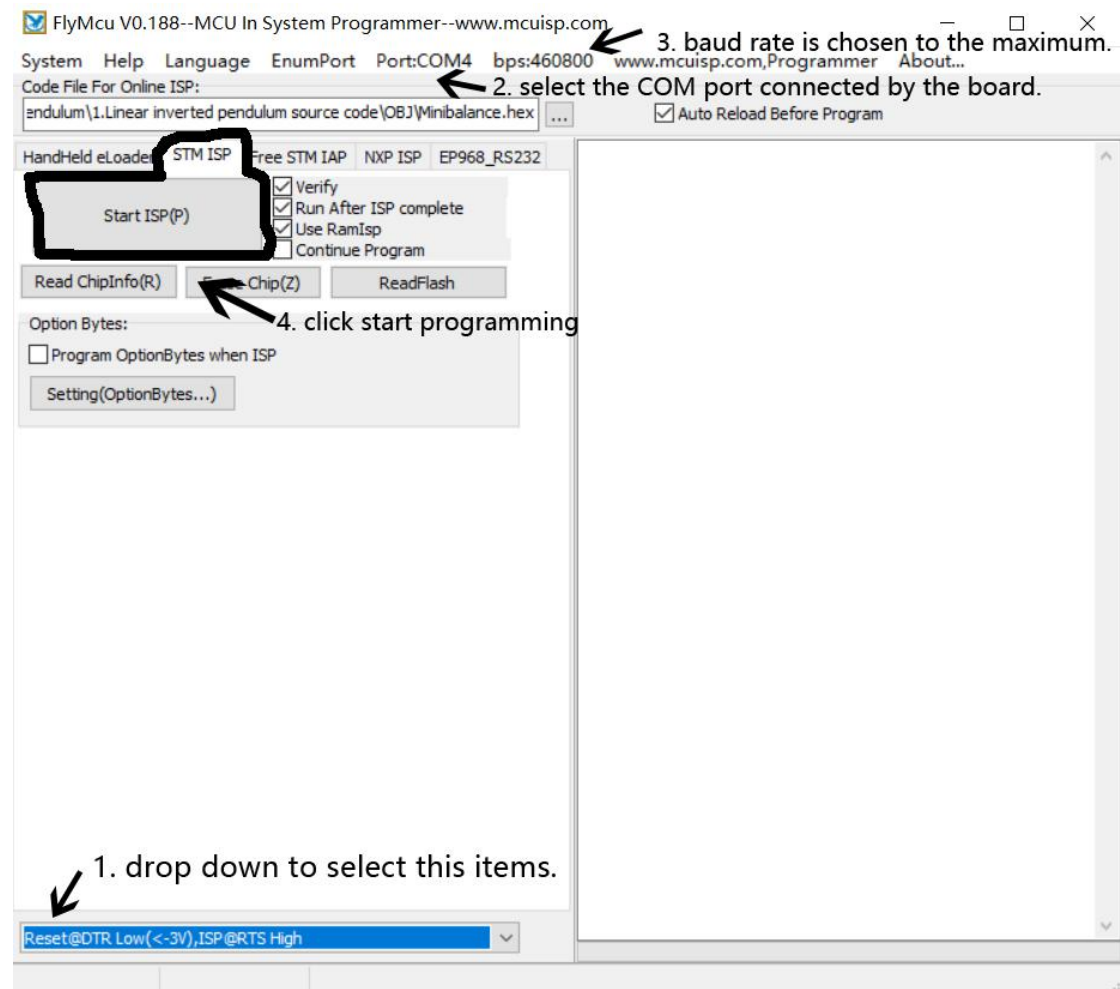
You can see that the driver has been installed successfully, otherwise there will be a red exclamation mark!

(3). wiring

Very simple, data lines connect to computers and boards.

(4). setting up the ISP software, opening the MCUISP software in the attached

materials, and making the following settings:



OK, everything is ready, and then click start programming, the program can be downloaded! After the program is selected, it will run automatically after the program is downloaded.