**Use URT-1 to control Feetech servo First hand tutorial (software debugging takes SM40BL servo as an example)**

1，Refer to URT-1 instructions.pdf

2, Bill of materials：

① URT-1 drive board.

② The MINI USB Wire Connect the driver board to the computer.

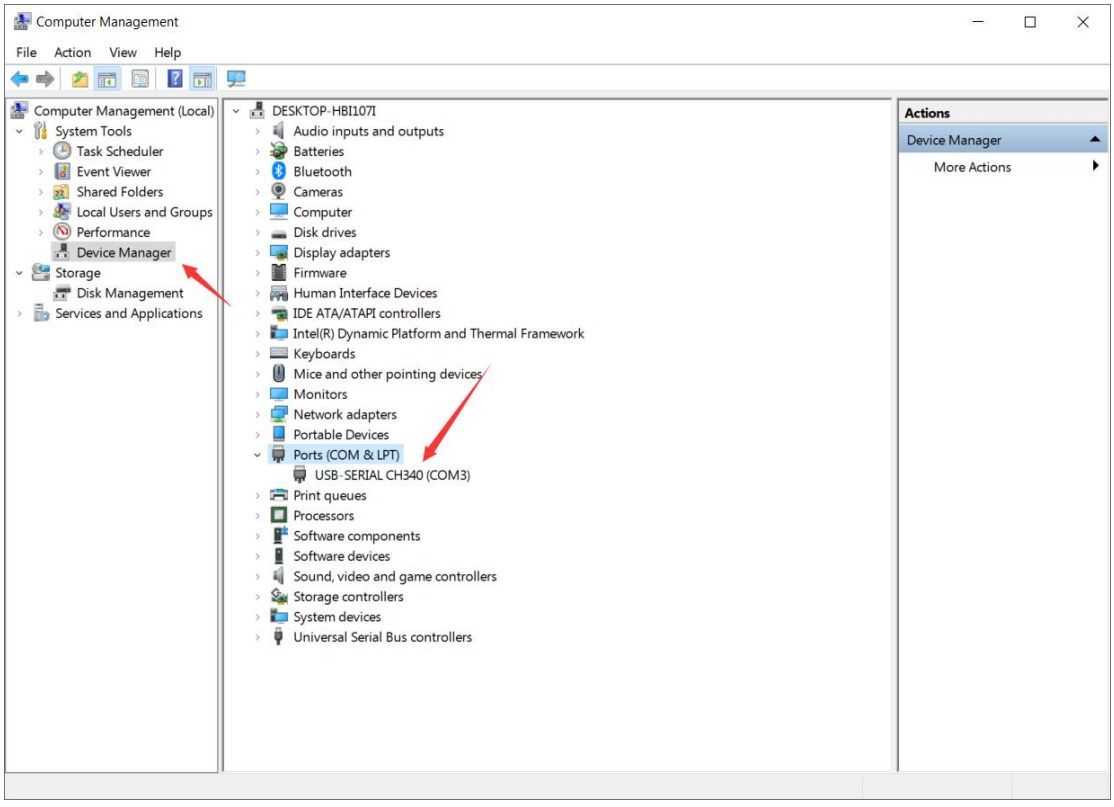
③ power supply to Feetech Servo.

④ The wire between Servo and drive board.

⑤ DuPont line (used for URT and MCU connection. Please refer to the question answer on page 9 of this document).

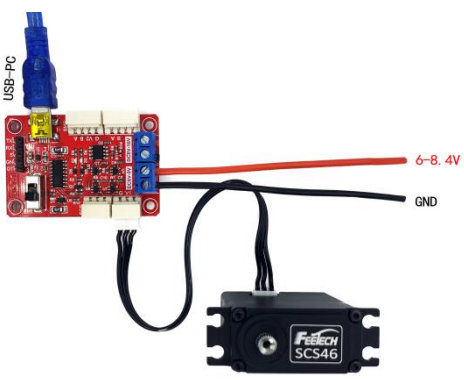
3，.Connect URT-1 and computer.

4，Install Driver，Refer to document of CH340 drive，Check the serial number of the device manager.




5.Connect servo to URT-1 ，URT-1 connect to power，refer to following picture：



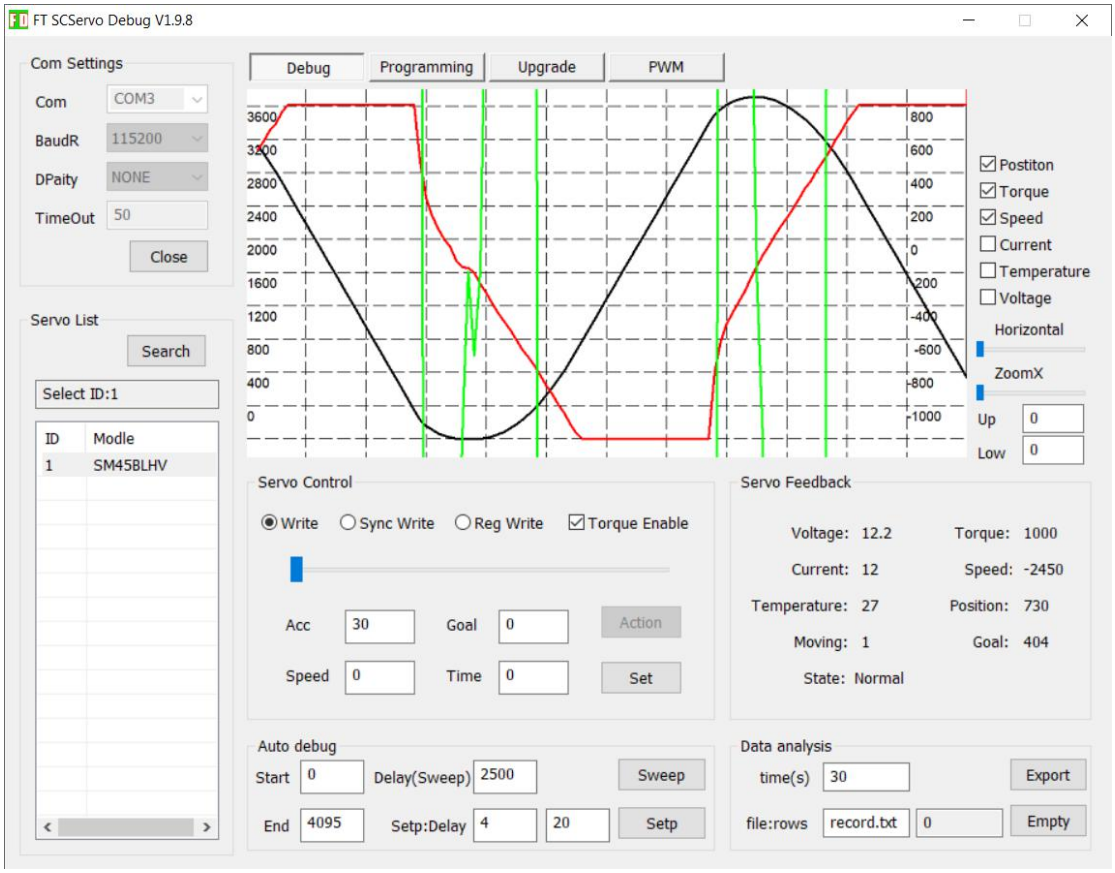
SMS series servo Schematic diagram of connection

SCS/STS series servo Schematic diagram of connection

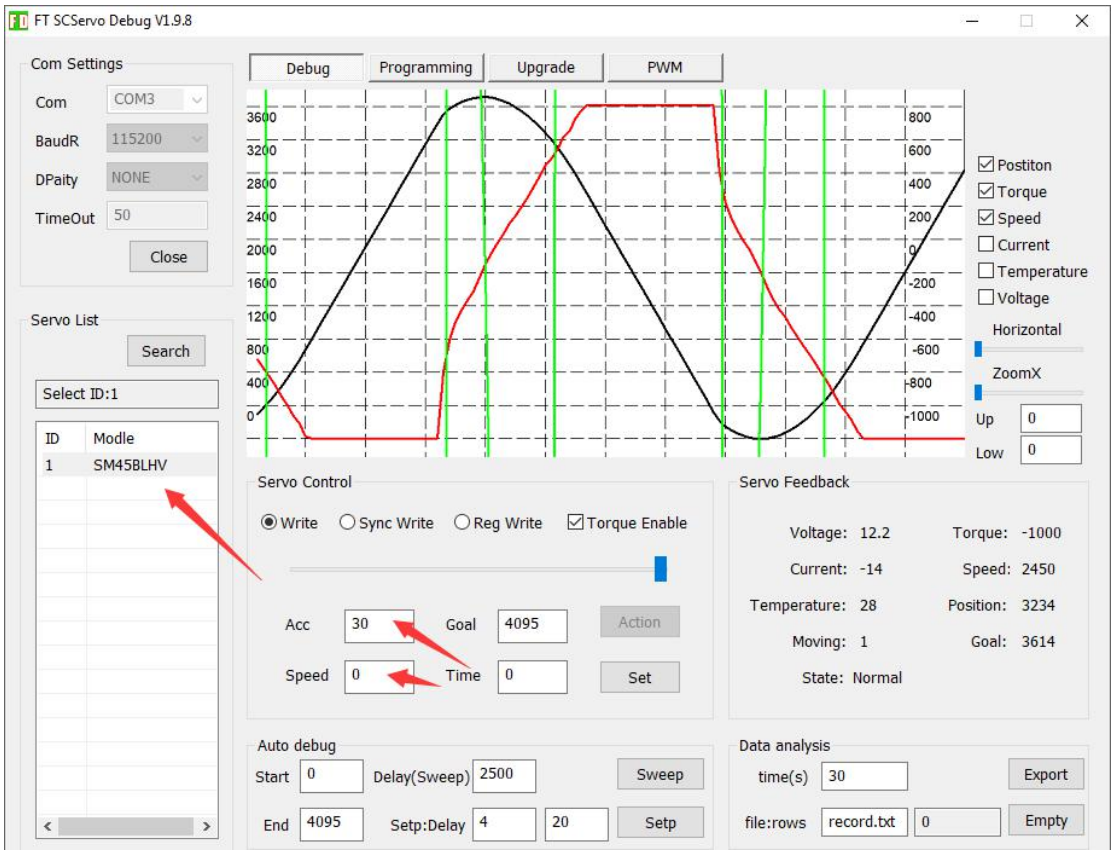
6.Open the software FD software for debugging：select port number（
The serial number of the device manager）

-Baud rate: the baud rate of SCS / STS series servo is 1000000, and that of SMS series is 115200 (baud rate is not correct / or the servo has no power supply ID can not be searched) - Open

Search.

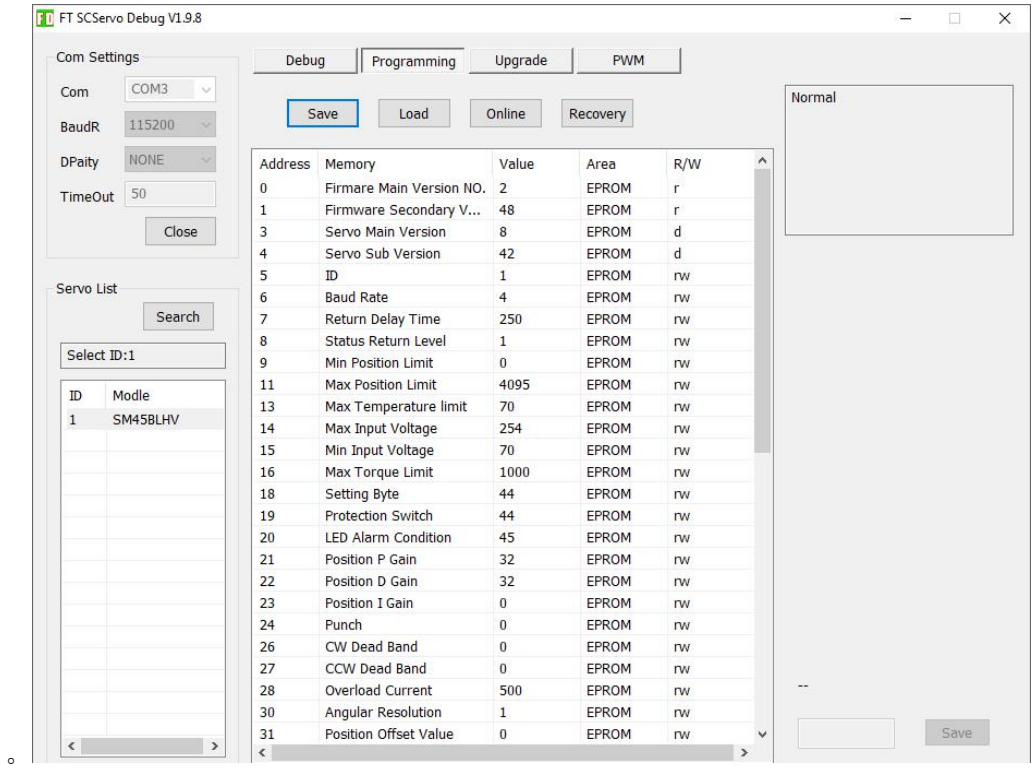



7..Click servo model，input values in Acceleration and velocity,（
The servo without acceleration function only needs to input the speed value）,click setting，pull rod，watch the servo power shaft rotation

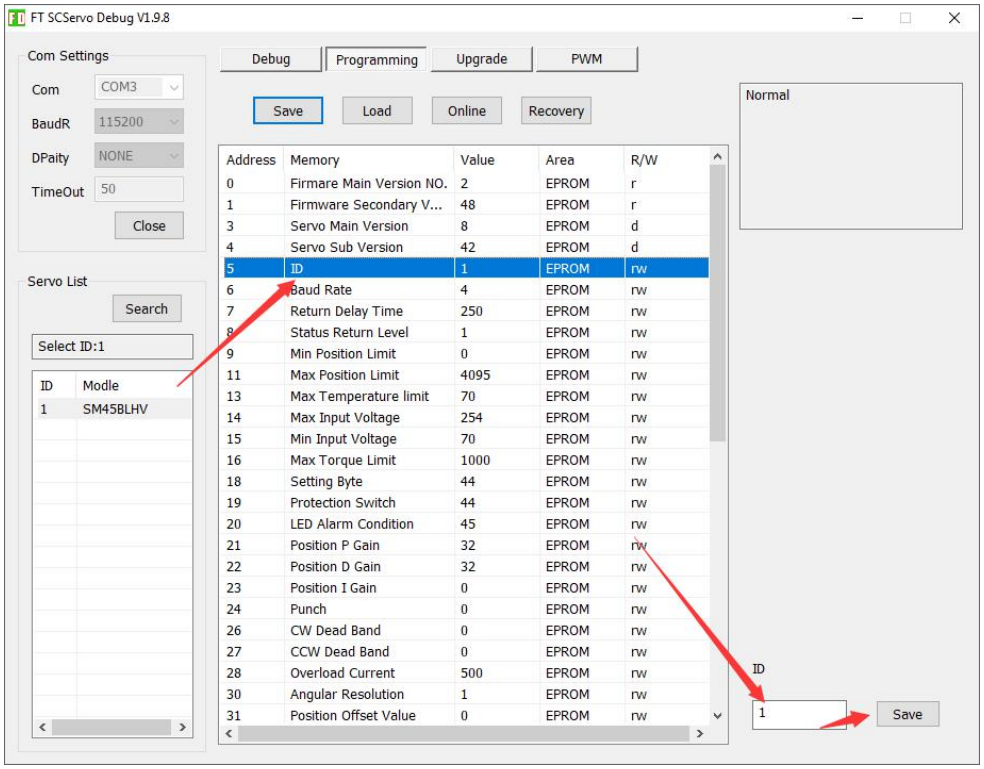



8.For a more detailed description of FD, please refer to the scservo debug user manual 17.4.6.pdf

9..Modify the servo parameter sheet please click programming



10， How to modify servo parameter？click ID ，input numbers at lower right corner then click save that will do.




11， How to modify servo Baud rate？Click Baud rate，input number at lower right corner，then click save that will do.

The baud rate is：

0 Corresponding 1000000

1 Corresponding 500000

2 Corresponding 250000

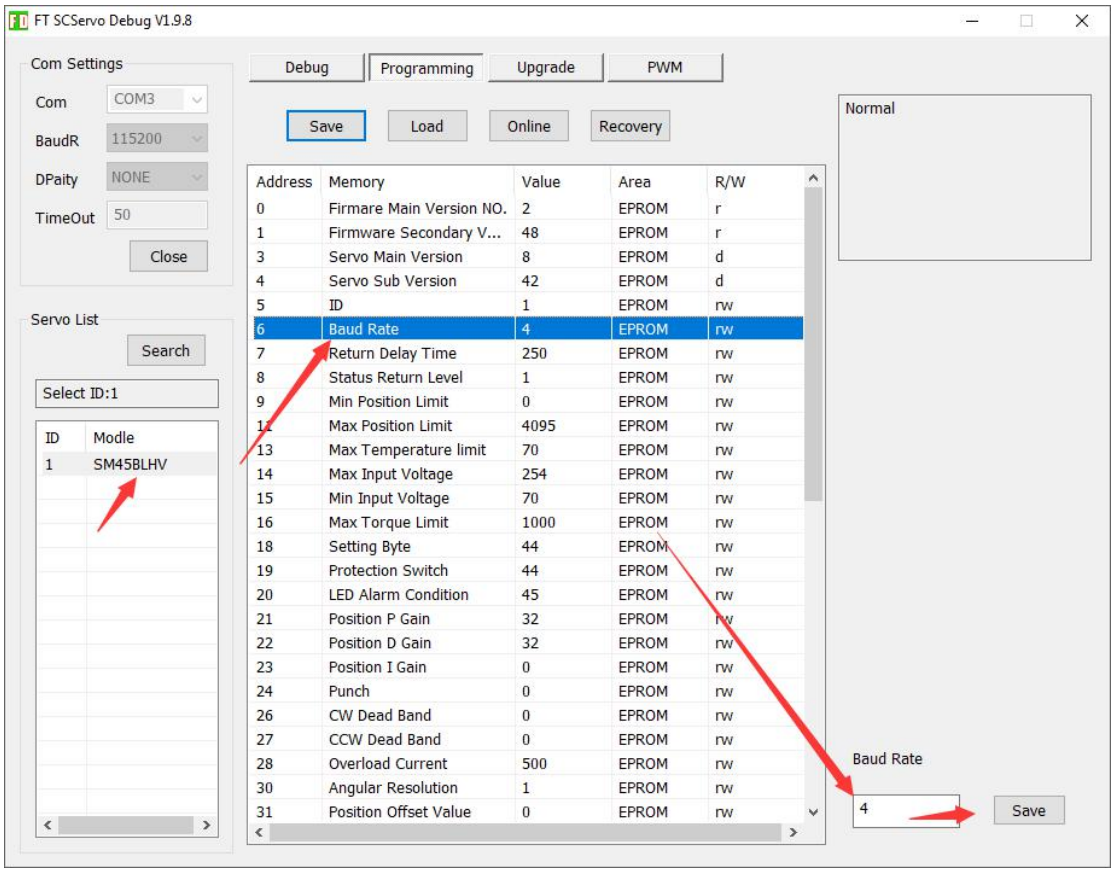
3 Corresponding 128000

4 Corresponding 115200

5 Corresponding 76800

6 Corresponding 57600

7 Corresponding 38400




12.Same way to modify：

①Modify multi circles rotations：

Address：30 angle resolution 1 means CW 1 turn， CCW 1 turn

2 means CW 2 turns，CCW 2 turns Can’t over 100

②open pid parameter adjust interface，address：21-23

③Zero position calibration function（Position correction），Address：31

④Multi Work Mode（0 Position control mode 和 1 Constant speed motor mode，2PWM motor mode）

⑤Self unloading force protection

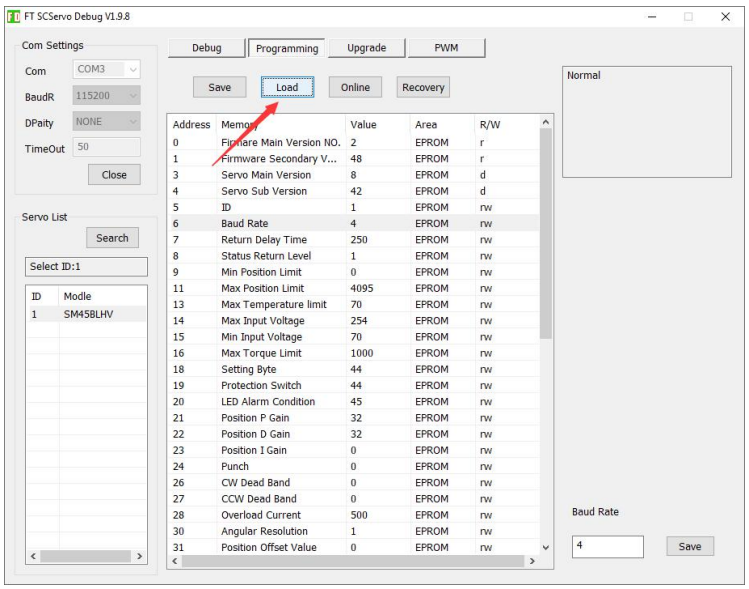
overload protection，Address：34-36

Over heating protection,Address:13

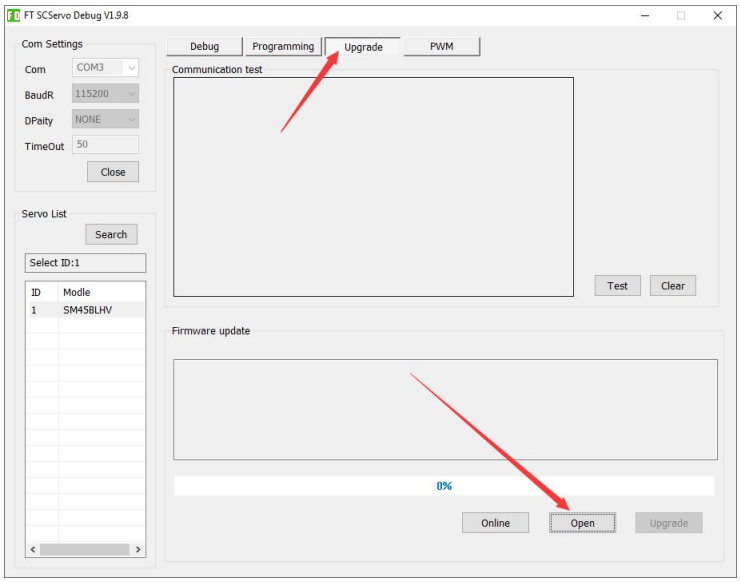
Overcurrent protection，Address：28

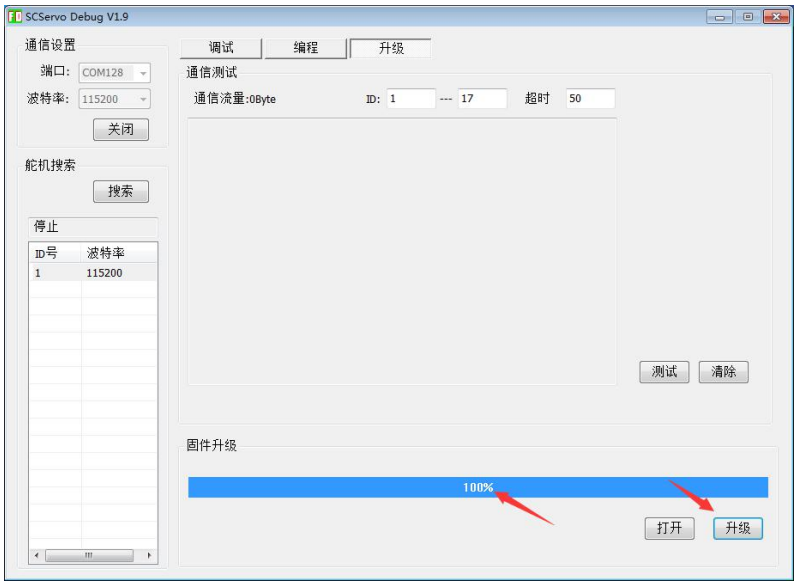
Overvoltage protection，address：14-15

13，How to load the servo parameters：




## 14，How to Update Firmware



Explaination：

1.The parameters in the above programming are FD software reading the parameters inside the servo.

If you use SCS type or SMCL type，as different function，when FD software reading don’t have option at Acceleration,

position correction.

2.When first time use the servo，please connect according to instruction Illustration，Don't be too hasty and mishandle Positive and negative connection of power supply,cause servo short-circuit and damage the computer hardware.

3.If you are familiar with the above tutorials，The servo is rotating in your careful operation,Congratulations you had

learned to controlFeetech servo in easyway.

Next, if you want to enter a professional model,in otherways

likeArduino/STM32/PC/JAVA/C++/C# control。We have prepared

the communication protocol, memory table, serial debugging assistant and so on for your reference.

4.Feetech servo divided into three series：

Note：

| Feetech servo | | Motor type | Communication level | communication protocol | Memory table | Model number |
|---|---|---|---|---|---|---|
| SCS series | | Carbon brush/ coreless | TTL | Protocol manual (191218) | SCS1.1 Memory table(170307) | SCS009/SCS45/SCS25/SCS15/SCS115 SCS2332/SCS215/SCS40/SCS40-DS/SCS6560 |
| STS series | | Carbon brush/ coreless | TTL | | SMS1.0 Memory table(170720) | STS3032/STS20/STS3046/STS3046-DS |
| SMS series | SMCL series | Carbon brush/ coreless | RS485 | | SMS1.0 Memory table(170720) | SM30-360M/SM60/SM80/ SM100/SM150 |
| | SMBL series | brushless | RS485 | | SM30BL-SMS1.0 Memory table(171120) | SM30BL/SM40BL |

The communication protocols of the three series are identical and interworking

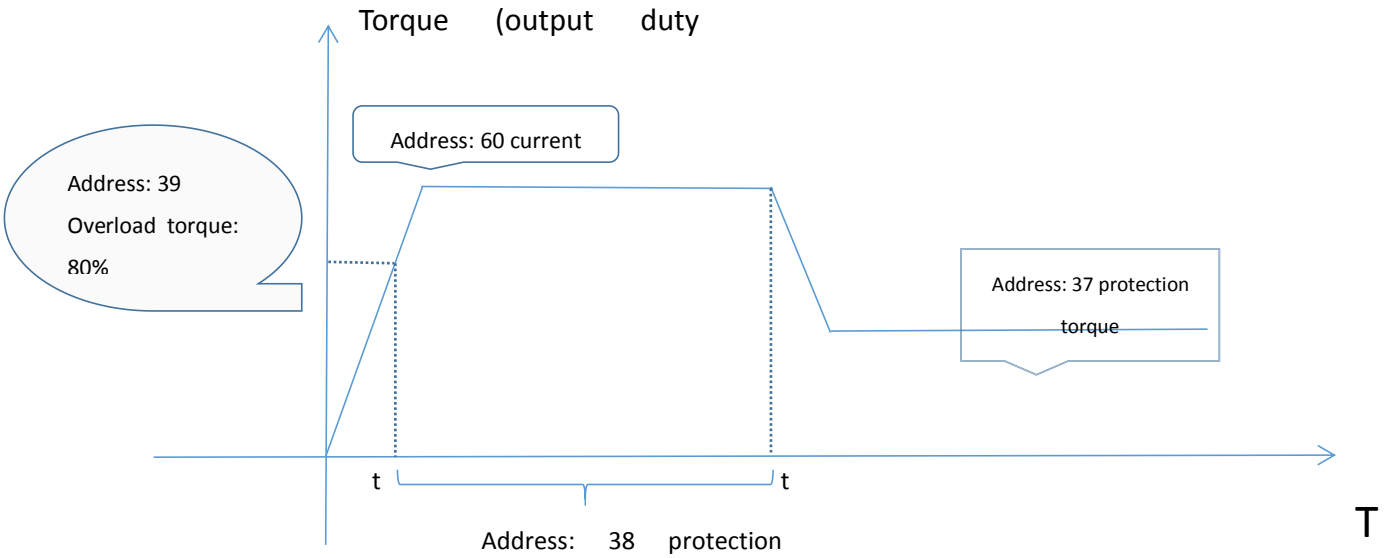
# Feetech Bus Servo FAQ

**1、What happens when SCS series serial port Servo is locked?**

For example：SCS45

Firmware Version：5

Software：FD 1.9.6




When the servo scs45 is blocked in motion，Unable to reach the target position，At this time, the overload torque (address: 39) monitors that the current load (address: 60) reaches 80% of the torque, and the protection time (address: 38) starts to count down (time is calculated according to the set value * unit 40ms). After the time is over, the protection torque (address: 37) starts to turn on, and the rotation is blocked according to the set torque (maximum torque * set percentage, 0 is the free state). At this time, the torque is reduced due to the torque When it is small, the current will not rise again until the next command (the command packet opposite to the locked rotor direction) is sent, and the servo returns to normal. The benefits are:

1. The temperature will not rise continuously;

2. The current will not continue to increase, protecting the power supply;

3. Prevent burning;

4. Protection gear;

Eliminate the potential safety hazards caused by the steering gear to the equipment。

**2、How to decide whether to turn on overload protection?**

Check Address：19 Value of unloading condition：

| 32 | 16 | 8 | 4 | 2 | 1 |
|---|---|---|---|---|---|
| overload | Empty address | current | temprature | sensor | voltage |

Such as：

Value 32，Indicates overload protection is on；

Value 40，Namely 32+8，Indicates to open overload protection and overcurrent protection (at present, SCS series has no overcurrent detection function);

Value 36，Namely 32+4，Indicates overload protection and temperature protection are turned on；

Value 37，Namely 32+4+1,Indicates overload protection, temperature protection and voltage protection are turned on；

Value 45，Namely 32+8+4+1，It means to open overload protection, current protection, temperature protection and voltage protection.

**3.How to set the motor mode?**

SCS Motor mode setting method:

1). The maximum and minimum angles (addresses 9 and 11) are set to 0;

2). Use time parameter 1-1000 (counter clockwise); use bit10 (1024) in negative direction.

STS motor mode setting method:

1). The operation mode is set to 1, and the motor speed closed-loop mode is opened;

2). Use the speed parameter 10-9999: clockwise; - 10 - (- 9999): counter clockwise.

3). Set the operation mode to 2, and open the motor speed open-loop mode;

4). Use time parameter 50-1000: counter clockwise; speed is step / second, bit15 is direction bit.

Note: speed closed-loop: within a certain range, with the increase of load, the speed intelligent adjustment remains unchanged.

Speed closed loop: within a certain range, the speed gradually decreases with the increase of load.

SMBL / SMCL:Motor mode setting method:

1). The operation mode (address: 33) is set to 2;

2). It is controlled by time parameter 100-1000, 0, - 100 - (- 1000).

**4.What is the minimum step speed of the servo**

SCS series minimum speed is 20 degrees per second, SM series minimum speed is 4 degrees per second.

**5.Why FD software can't scan ID?**

Only one servo is connected in series: check the hardware connection. If the urt-1 board is used for debugging, the board of urt-1 needs external power supply:

If the servo of SCS series,it needs to be powered on the blue terminal 4.8V-8.4V

（SCS009.SCS2332,SCS45suggest power supply 4.8-6V,SCS15,SCS115,SCS215,SCS40,SCS40-DS,SCS46,SCS6560 suggest power supply 7V-8.4V）

If SM servo,it need power supply on the blue port with 12V，

（SM29BL,SM30BL,SM40BL,SM45BL,SM60CL,SM85CL,SM120BL）

Check the baud rate: the default baud rate of SCS series is 1000000bps, and the default baud rate of SM series is 115200bps. If the baud rate is not selected correctly, it cannot be searched.

Series connection of multiple servos: before series connection, it is necessary to connect each servos with FD software separately and modify the ID in the programming interface. If it is necessary to connect three servos in series, it is necessary to modify the ID of each servos to 1, 2, 3 respectively, so that they can be arranged and searched out. In addition, if the servos of SCS series and SM series are connected in series, it is necessary to modify the baud rate to be the same in the programming interface. Otherwise, FD software only scans the servos with the same baud rate as the servos.

In addition to the above power supply, baud rate, ID and other settings, it is still unable to scan out.

1. You can try to change a servo, or try to change a computer, because the urt-1 needs to be loaded with a driver. If the driver is not installed, it may not be able to scan out.

2、Check the circuit problem, do not use other servo cable, power supply is recommended to select large power, otherwise, the problem of frequent voltage fluctuation when the load occurs

will lead to communication timeout and other phenomena。

3、If the first operation has been scanned out, but it cannot be scanned out when it is connected later, it is necessary to check whether the parameters are modified, or whether there is short circuit caused by the reverse connection of positive and negative power supply during the operation. It is recommended to save a copy of the parameters in the local programming interface after the connection during the first operation.

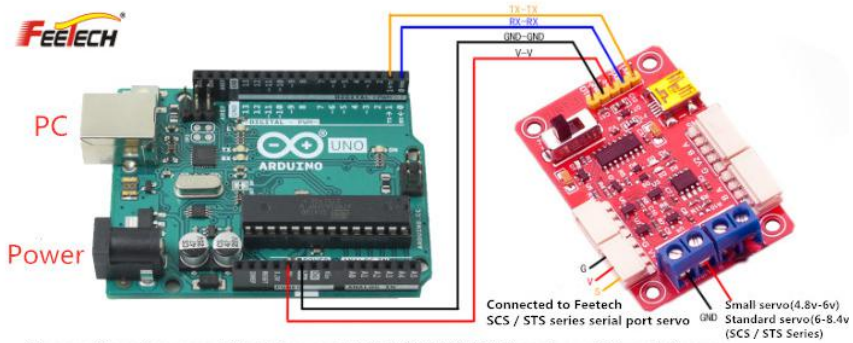
**6.How does single chip microcomputer control serial port servo?**

Single chip microcomputer can not be directly connected with serial port servo, and it needs to be controlled by signal conversion urt-1. It can also be converted through the schematic diagram of signal conversion circuit, which can be viewed in the serial port servo data package.

**7. How urt-1 connects to STM32 or Arduino**

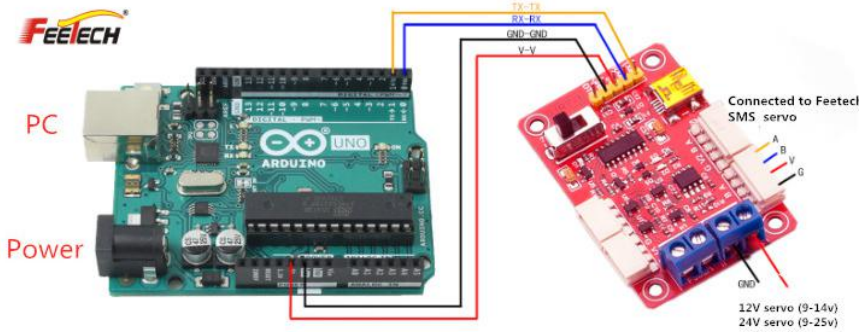
TX-TX RX-RX 5V-5V GND -GND

A B-B V-V G-G




Connection diagram of Arduino and FEETECH SCS / STS series serial port Servo
STM32 series development plate connection method is similar

Note:Arduino level switch 5V, STM32 level switch 3.3V,
USB port and UART port cannot be used at the same time




Connection diagram of Arduino and FEETECH SCS / STS series serial port Servo
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Note: Arduino level switch 5V, STM32 level switch 3.3V
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**8.How to use the servo in the manipulator fixture.**

Only the same objects (objects of the same quality) are clamped, and the "torque limit" percentage shall be set in advance. If the objects with unfixed mass and volume are clamped for many times, the torque value that the servo needs to output cannot be determined, and the objects may be damaged or the servo may be overloaded and unloaded. Taking the serial servo as an example, the output of the "torque limit" percentage of the serial servo is controllable. When the weight of the object requires a force of 1kg from the servo, it can keep the object from falling and damaging. We can do this by assuming that the locked rotor torque is 10kg.cm, and inputting 100 in the 16 address "torque limit" (representing 10% of 10kg, i.e. 1kg output). It can realize 1 kg force to pick up the goods.

**9.Reduction ratio of each model**

SCS2332: 205:1

SCS009：256:1
SM150　396:1

**10.PDI parameter：** PDI parameterIf there is a follow-up lag in your command change track, increase the p value; if there is an overshoot, increase the D value; if there is a static error, the I value works to reduce the static error, and the dynamic follow-up basically works at any time

**11.In the protocol：** SCS series high byte first, SMS low byte first

**12.Can you provide the schematic diagram of the board of FE-URT-1？**

We only provide the part of signal conversion circuit, the whole circuit principle of the product is not allowed to be sent out according to the regulations of the company. In addition, this signal conversion circuit has been used by hundreds of companies. Maybe each company will increase ESD protection measures under its own optimization. If you want to use 485 level and TTL level actuator to multiplex a serial port, I can send the TTL and 485 conversion circuit to you.

**13. How to realize the step function of STS series.**

STS series is contactless magnetic coded position sensor, which has 360 degree absolute angle control and supports step mode. The function settings are as follows: in the programming interface, set the maximum angle and minimum angle to "0" and the operation mode to "3". Then return to the debugging interface, input the speed value and target value, click "set" once, and the steering gear will move according to the set speed and target, If you click again, the target will move in the same direction at the same speed. If the target position is set to a negative number, it will move in the opposite direction.