# VOTOL EM Controller Program Manual

# It is forbidden to non-specialists use!



This manual was explained in detail for the IV generation EM series controller, which update download illustrates and parameter adjustment.

Before using the software, please read this manual. In order to facilitate the operation, please keep this manual.

In order to make the software of maximum utility, please make sure the end user to use this manual.

Please be sure to read the manual carefully before starting the operation.

Disclaimer:

For the $\text{IV}$ generation of EM series controller program updates and parameter adjustment can only be done by professional and technical personnel.

If without the written permission of our company for the $\text{IV}$ VOTOL generation EM series, the application update to download and parameter of the controller adjustment is not allowed.

It is forbidden to non-professional personnel operate this software.

In the above event, our company will no longer be responsible for accident happens by controller.

# 1. Software installation (only support win 7/10)

## 1.1 USB Driver Installation

(1) Download the "USB-to-serial-win 10-20150814" file, decompressing file.

| | | | |
|---|---|---|---|
| USB-to-serial-win10-20150814 | 2016/12/26 10:44 | WinRAR 压缩文件 | 6,422 KB |

(2) choose the suitable driver with your computer for installation.
win7,win8, win 10 are available.

| | | | |
|---|---|---|---|
| win_me_2000_XP USB-to-Serial | 2013/3/8 14:38 | WinRAR ZIP 压缩... | 1,586 KB |
| windows 7 10 32 64 USB-to-Serial ... | 2013/3/8 14:38 | WinRAR ZIP 压缩... | 2,390 KB |

1.11. Decompress the operation first

| | | | |
|---|---|---|---|
| Setup 32.64位元 | 2012/8/3 12:31 | 应用程序 | 3,075 KB |

2. Unzip the YH-340 USB package and select CH341SER.EXE to install it.

| | | | |
|---|---|---|---|
| windows 7 8 10 32 64 | 2019-08-07 13:52 | 文件夹 | |
| YH-340 USB | 2019-08-23 10:29 | 文件夹 | |
| win_me_2000_XP USB-to-Serial | 2013-03-08 14:38 | 360压缩 ZIP 文件 | 1,586 KB |
| 简介 | 2015-08-07 10:56 | 文本文档 | 2 KB |

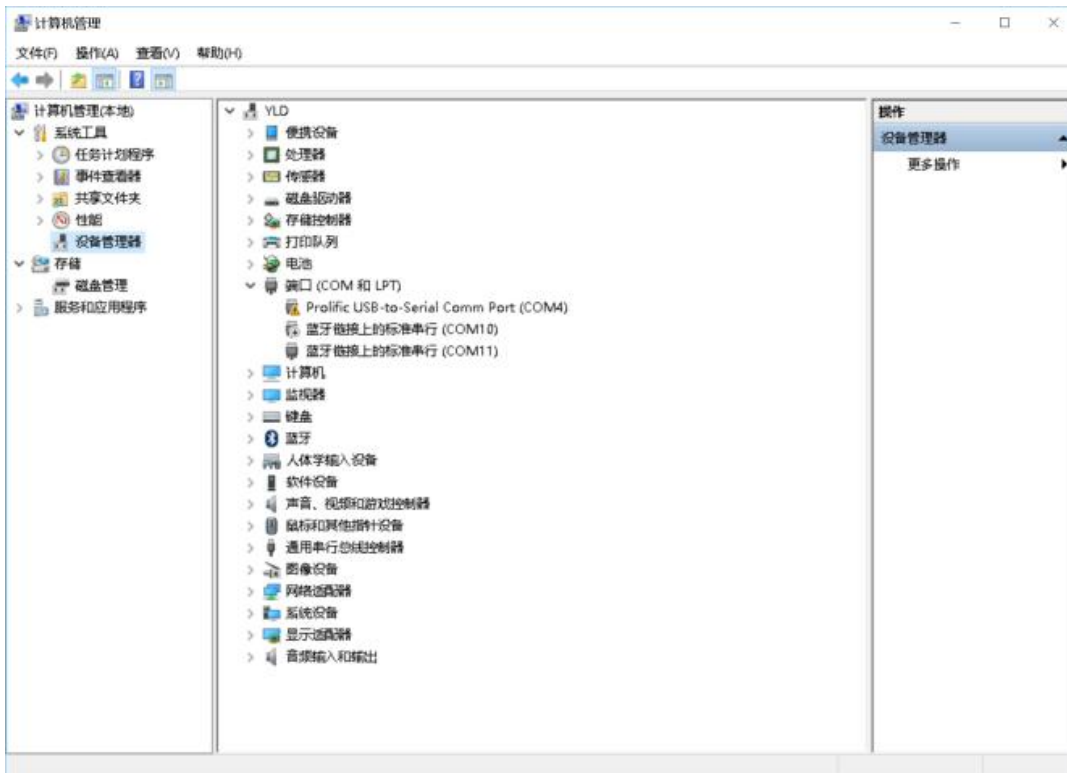| | | | | |
|---|---|---|---|---|
| CH341SER.EXE | 227.6 KB | 178.8 KB | 应用程序 | 2012-08-03 12:30 |
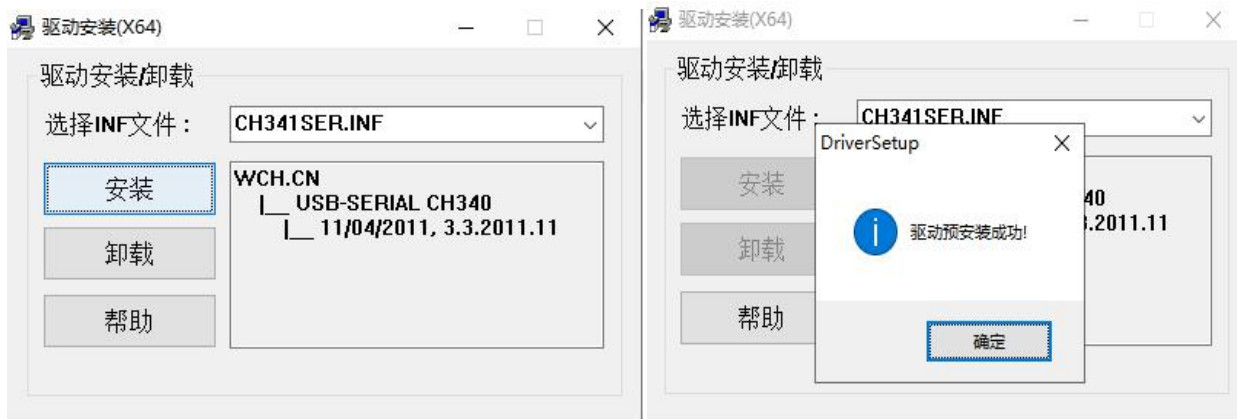


Follow the steps above to install

(3) After installation, pls. connect the USB cable with controller and computer. If it's unable to connect, pls. Check below steps.

<span style="color:red">Right click"my computer"</span>  <span style="color:red">in the desktop</span>

then click "device manager"

choose "port(COM & LPT)"

choose the COM with"!", click "serach automatically for updated driver software"



Close the software when you finish

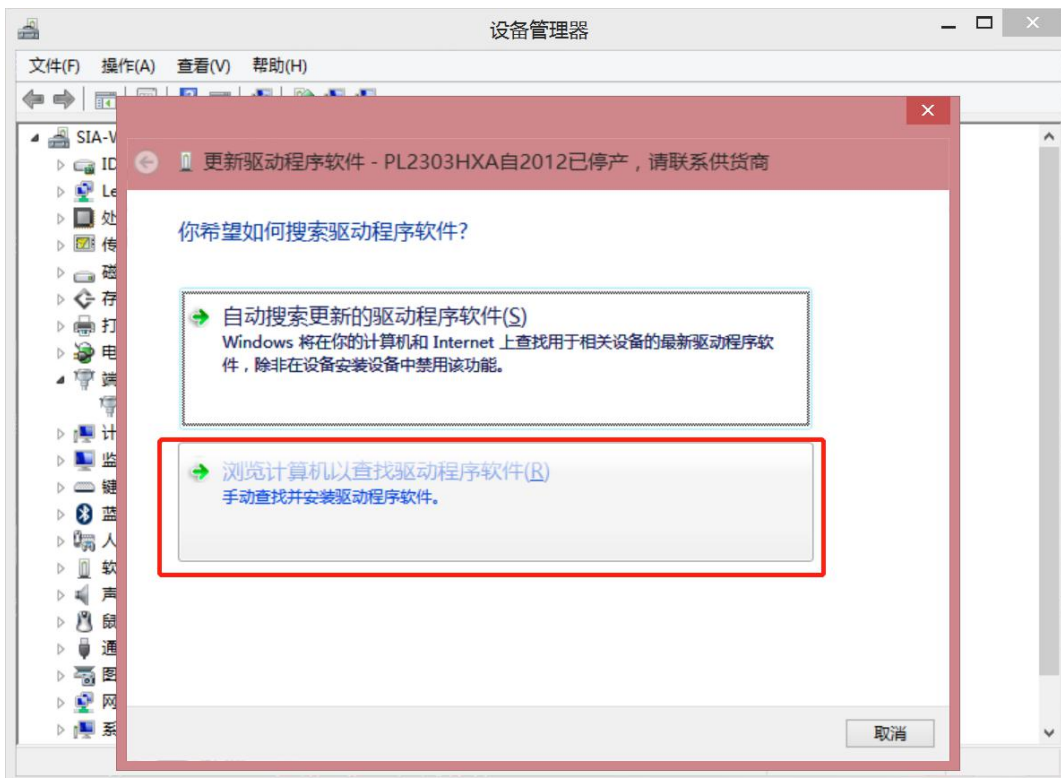**After running, please run the software directly: EM_V3 series debugging program;**

**If the port has"自 2012 已停产，请联系供货商 处理方法(Pls contact supplier if it is stop production since 2012)"**
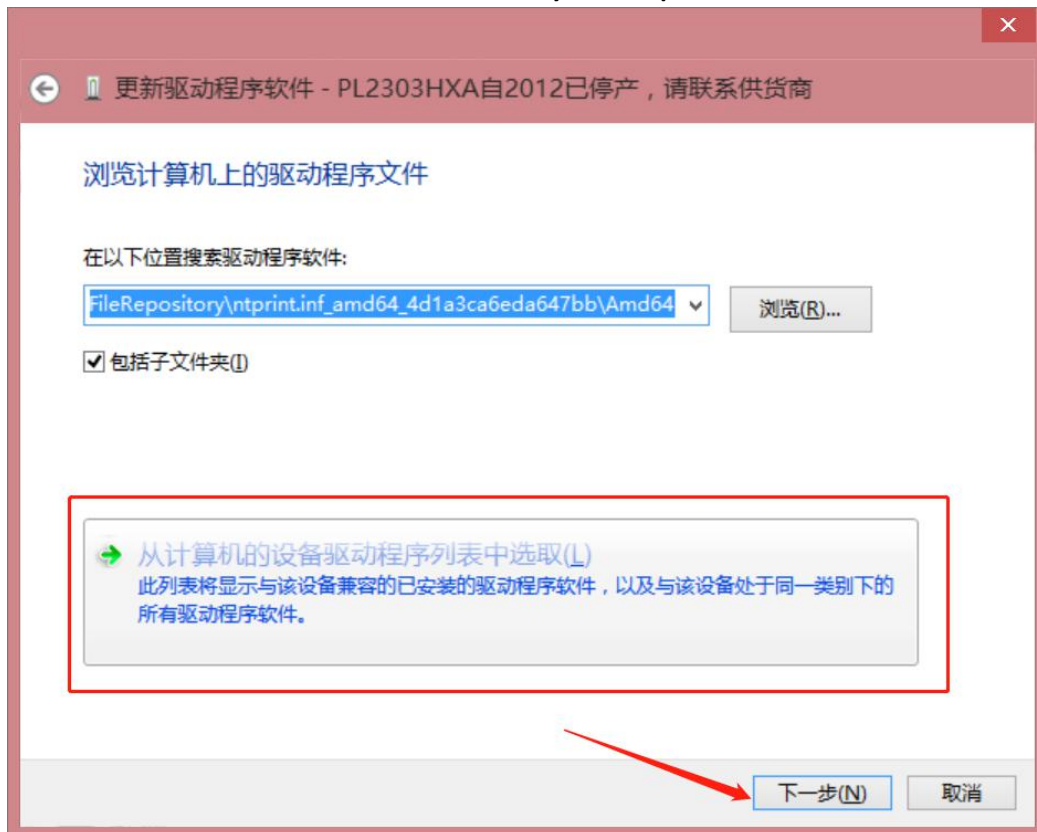


**First step: Install driver PL2303_Prolific_DriverInstaller_v110**
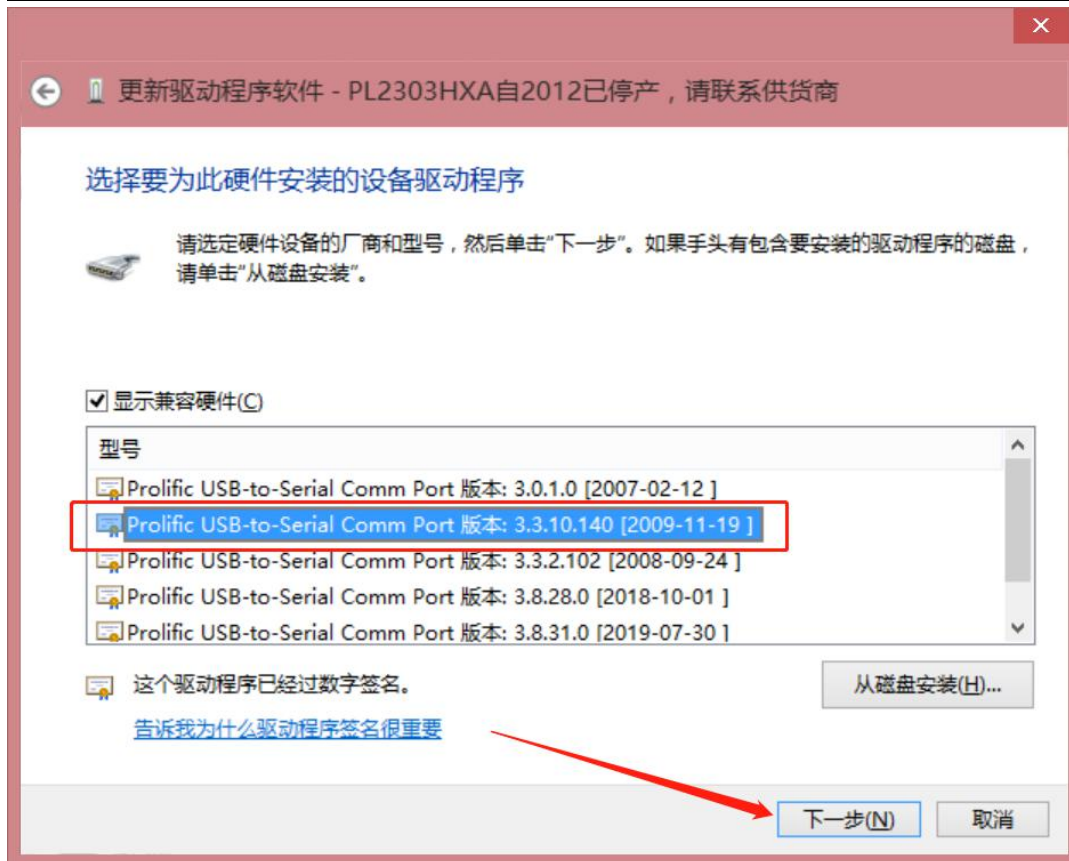


**Second: Right click to update the driver and select Browse Computer to find the driver software.**

**Thrid: Click to select from the list of drivers for your computer;**



**Select version 3.3.10.140 (2009-11-19), click Next, close the window when finished;**

# 2. Controller connection

## 2.1 Connect controller

Controller host computer simple wiring diagram

Description: controller B+ connects battery B+ controller B-connects battery B-, controller electric door locks connect battery or controller B+;

The USB debug line is connected to the controller debug port;
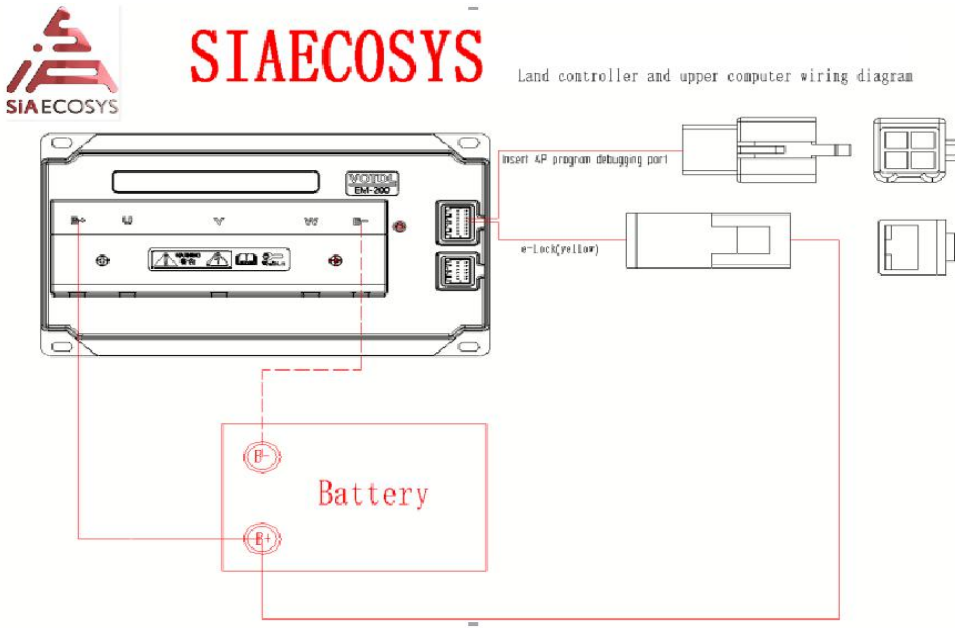
2.1.1 According to the controller with CAN or without CAN to select the appropriate USB debug line; with CAN controller need to check the CAN enable, without CAN does not need to check; EM200 controller needs to exchange the debug line CAN-H and CAN- L , otherwise can't connect the controller;
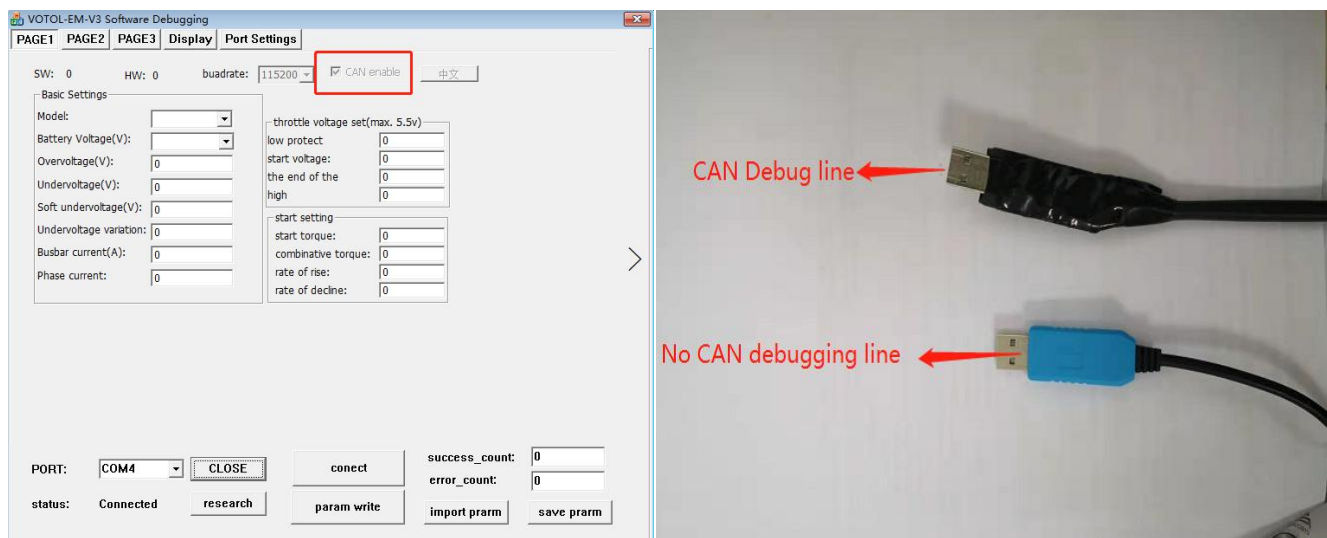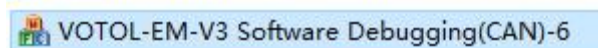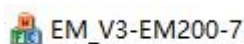


2.1.2 Host computer selection

EM50 EM100 EM150 without CAN choose  SIAECOSYS-EM-V3 Software Debugging
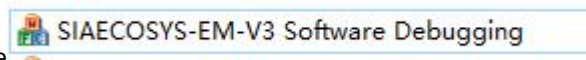
EM50 EM100 EM150 with CAN choose  VOTOL-EM-V3 Software Debugging(CAN)-6

EM200 choose  EM_V3-EM200-7

Specific host model needs to inquire the related sales;

3 Open the computer device manager before connecting to the computer to check whether the USB port is successfully

installed. Select the appropriate host computer to connect the host computer to the serial port when the controller is not powered. After selecting the corresponding serial port on the device port, click CreatFile.
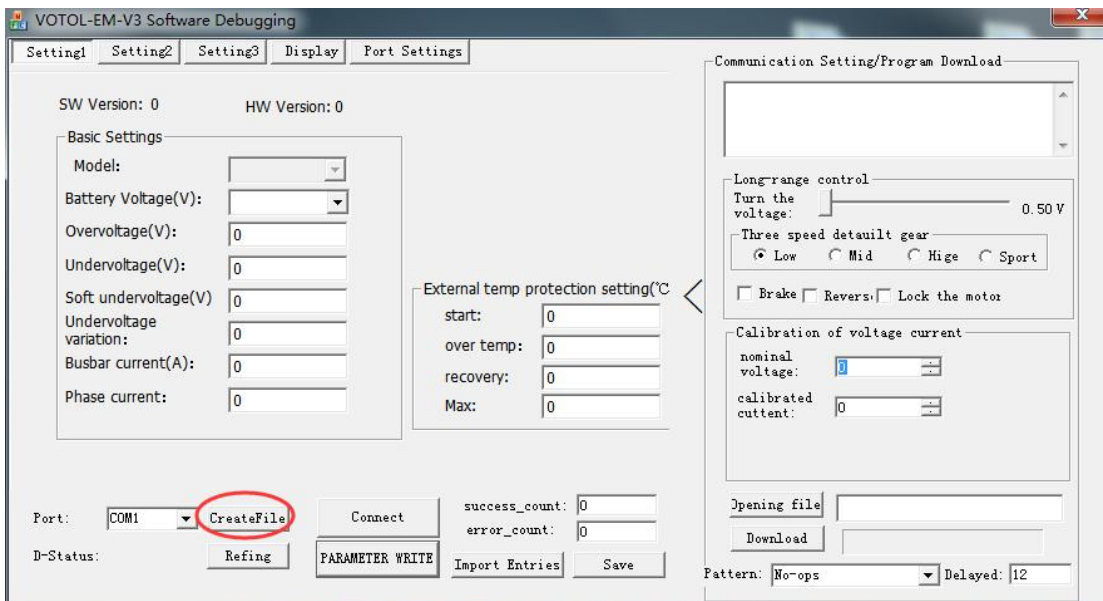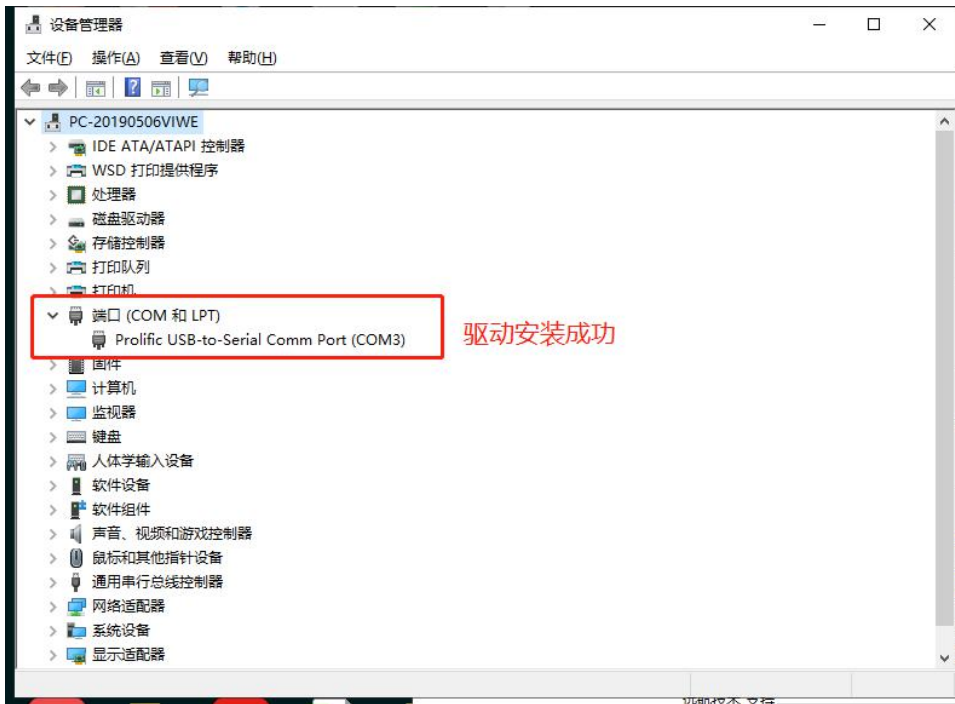




2.2

Then power on (connect with e-lock), click connect (in setting 1 page), the nominal voltage should not be 0. If it's 0, click connect again.

## VOTOL-EM-V3 Software Debugging

PAGE1 | PAGE2 | PAGE3 | Display | Port Settings

SW: 2.31    HW: 1.63    buadrate: 115200    ☑ CAN enable    中文

### Basic Settings

Model: EM-150

Battery Voltage(V): 72V

Overvoltage(V): 91

Undervoltage(V): 64

Soft undervoltage(V): 67

Undervoltage variation: 1

Busbar current(A): 120

Phase current: 9960

#### throttle voltage set(max. 5.5v)

low protect: 5.52

start voltage: 0.06

the end of the: 1.59

high: 5.32

#### start setting

start torque: 0

combinative torque: 37270

rate of rise: 0

rate of decline: 2

### comunicatin and download set

#### remote control

throttle: [slider]                    2.78 V

⦿ L    ○ M    ○ H    ○ S    ☐ switch

☐ brake    ☐ reverse    ☐ lock

#### calibration

vol cal: 1131    ☐ show err

cur cal: 43

weak flux: 7

open file: [         ]

download: [         ]

moden: No-ops    delay: 12

PORT: COM4    CLOSE    **conect**    success_count: 23    error_count: 0
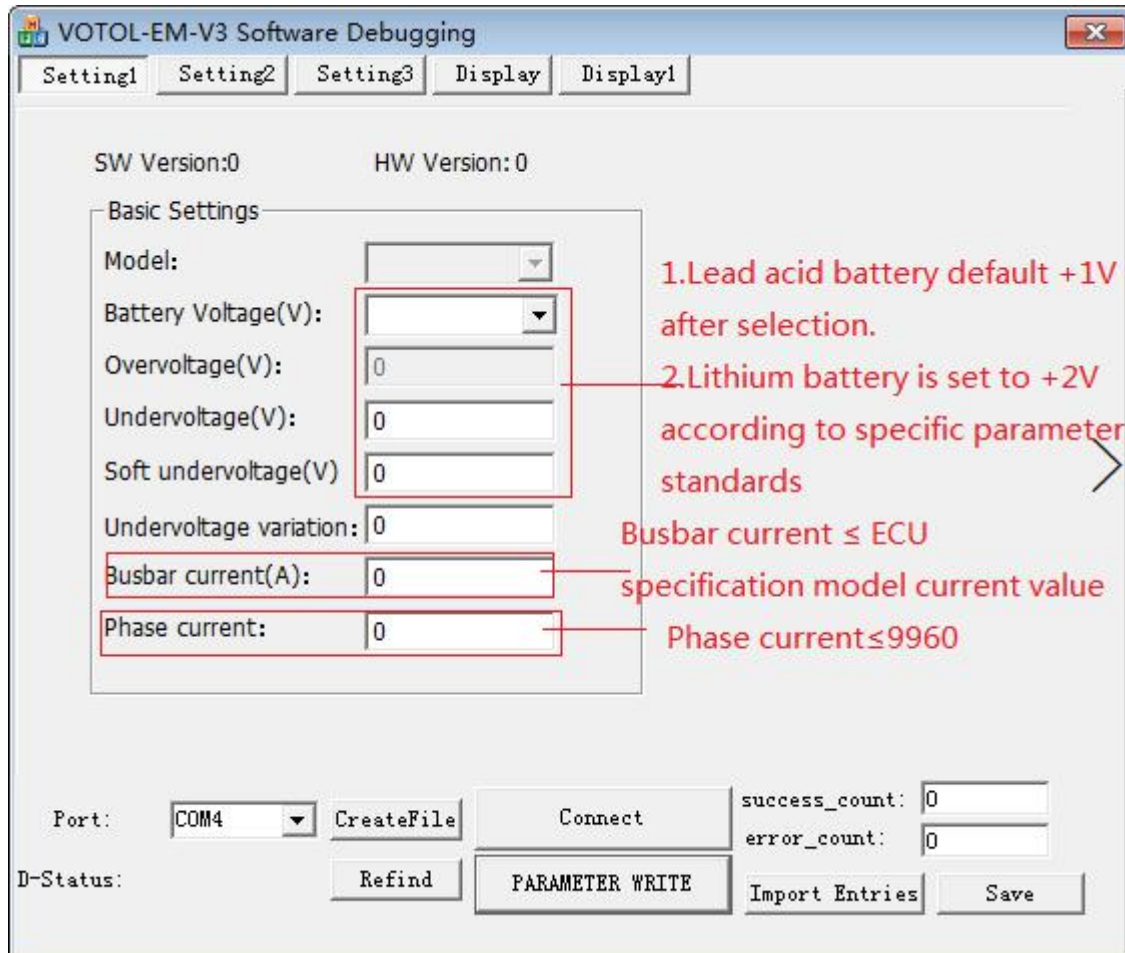
status: Connected    research    param write    import pram    save pram

# 3. The setting

## Setting page 1



## 1.1：Voltage equipment

1.1.1、Battery voltage setting: Corresponding to the ECU voltage, absolutely not allowe overpressure.

1.1.2、Lead-acid battery overvoltage, undervoltage, soft undervoltage basic value default: due to software settings defects, the original voltage compensation +1V.

1.1.3、The lithium battery is set according to the actual lithium battery parameter value. Due to software setting defects, the original voltage compensation +1V. The original lithium battery parameters are compensated for +1V, and the total compensation is +2V.

1.1.4、Attention

1.1.4.1、Overvoltage fault: After open the electric door lock, the vehicle doesn't move. The Controller overvoltage protection function starts.

1.1.4.2、ECU undervoltage fault: due to the lithium battery protection board overvoltage device is too high or the undervoltage setting is too low, resulting in lithium battery protection, burning MOS.

Please adjust suitable battery voltage before running the motor and controller(for lithium battery).

Overvoltage: real overvoltage +3V

Undervoltage: real undervoltage +1V

Soft undervoltage: undervoltage + 3V

g. real overvoltage 84V, set 87V. real undervotlage 60V, set 61V. Soft undervotlage: 64V.

## 1.2：Current device

1.2.1、Busbar current setting: The current is selected according to the ECU specification model.

| VOLTAGE \ MODEL | EM-30S | EM-50 | EM-50S | EM-100 | EM-100S | EM-150 | EM-150S | EM-200 | EM-300 |
|---|---|---|---|---|---|---|---|---|---|
| 48-60V | 33A | 45A | 50A | 85A | | 120A | 150A | 200A | 400A |
| 72V | 33A | 45A | 50A | 85A | 100A | 120A | 180A | 200A | 400A |
| 84V | 30A | 45A | | 80A | | 120A | | | |
| 96V | | 40A | | 70A | | 100A | | 180A | 350A |

1.2.2、Phase current setting: can only be adjusted downwards.
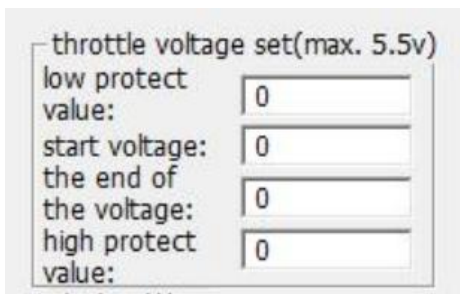
1.2.3、Attention

1.2.3.1、Setting the busbar current too high, causing the ECU burn MOS.

1.2.3.2、As the phase current value decreases, the corresponding motor stall protection time is shortened.

## Setting page 2

## 1 throttle voltage adjust



(1)  low protection value: The throttle error is shown

(2) Starting voltage: when the value is reached, the motor starts running

(3) End voltage: when the value is reached, the controller thinks the full voltage is reached (it is recommended to set the voltage lower 0.2v compared with thactual torque voltage).

(4) High protection value: when the value is higher than that, the torque fault will be displayed

## 2Start setting adjustment (for tricycle gear box only)
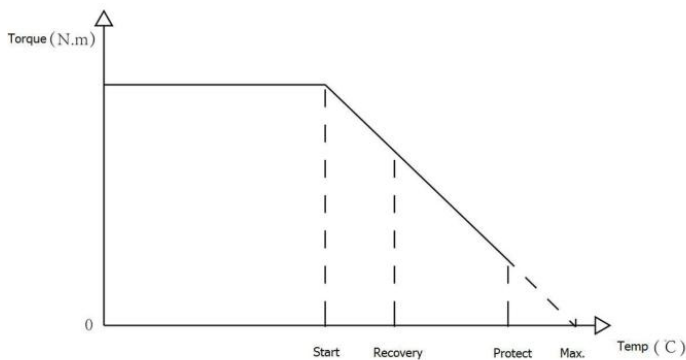
(1) Starting torque: used for gear combination

(2) Combined torque: a force of lifting after gear clearance is combined

(3) Upward slope: upward slope of motor torque

(4) Downward slope: downward slope of motor torque

## 3 Controller and motor temperature protection function adjustment



(1)  Start: Enter into the function of temperature protection, limit the motor torque.

(2)  Over temperature: Cut off the output of motor torque

(3) Recover: When the motor temperature lower than the temperature protection value, you can re-twist the throttle, then the motor will restore motivation

(4) Maximum: The motor maximum temperature is 150

## Setting for page 2



**3.1：** Parameters setting for sports mode(S gear)

3.2.1、 Busbar current setting: According to the controller type current corresponding to the selection, absolutely no overcurrent is allowed.

| VOLTAGE MODEL S | EM-30 | EM-50 | EM-50S | EM-100 | EM-100S | EM-150 | EM-150S | EM-200 | EM-300 |
|---|---|---|---|---|---|---|---|---|---|
| 48-60V | 35A | 50A | 55A | 100A | ---- | 200A | ---- | 320A | 550A |
| 72V | 35A | 50A | 55A | 100A | 150A | 200A | 250A | 320A | 550A |
| 84V | 33A | 50A | 50A | 100A | ---- | 180A | ---- | | |
| 96V | ---- | 45A | 50A | 80A | ---- | 130A | ---- | 250A | 500A |

3.2.2、Sport mode flux weakening value：Flux weakening value for S gear: the parameter value is <3000, and the vehicle speed is adjusted according to the motor parameters. BOOST weak magnetic value> high speed weak magnetic value

3.2.3、 Automatic logout enablers, confirm by select:Check the jog button / uncheck the long press button, choose one

3.2.3.1、Check to make the jog effective. The weak magnetic time enters the exit and can be adjusted.

**3.2：** Downhill electric brake assist：start by select "HDC Enable", downhill electric brake assist (slow down in steep slopes) function. Enable electric brake by enter minimum speed, if less than the speed, the function will be invalid.

3.2.1Value 400 corresponding to speed around 15kmh(it depends on motor feature, sometimes with a

3.2.2、Note: The drum motor is not suitable for use, resulting in loose motor shaft.

3.3 、 Flux weakening compensation: only valid when the inner rotor motor type is selected as V-shaped magnetic steel

Note: The maximum value of 255 is generally filled in 95

3.4、Three gear setting：Confirm the motor base speed value adjustment setting parameter value. The basic speed is filled in according to the <Appendix EM_V3 Parameter Adjustment Calculation Formula>.

3.4.1、The low, medium, high, and third speed values are valid within 100% of the parameter value, and the medium, high, and high speed values are exceeded and the 100% parameter value is filled. Exceeded by weak magnetic file (medium, high, BOST)

3.4.2、In the flux weakening area, the actual parameters of the motor are adjusted, and the vehicle speed is based on the road test.

3.4.3、 Single voltage mode: The high voltage value is invalid.

3.4.4、 Attention

3.4.4.1 、 Drum motor: 60KM/H motor weak magnetic speed is less than <120%, 80KM/H motor weak magnetic speed is less than <125%, 110KM/H motor weak magnetic speed is less than <135%.

2.4.4.3 Inner rotor motor Hall: The built-in Hall weak magnetic speed is less than <135%, and the external Hall weak magnetic speed is less than 170%.

3.4.4.3、 Internal rotor motor magnetic knitting: Built-in flux weakening speed <230%.

3.4.4.4The motor base speed exceeds 100% of the motor speed value and enters the weak value zone adjustment parameter. BOOST>High speed weak magnetic file.

3.4.4.5 Weak magnetic failure: The flux weakening value exceeds the motor and controller parameter values, causing the motor to demagnetize and the controller to burn MOS.

3.5、Jog/push selection: choose one

3.6、 The three-speed default gear: the electric door lock opens the default several options.

3.7、 Soft start setting: The smaller the value, the softer the start.

3.8、 Speed limit setting:

3.8.1、 Function selection: speed limit, unlimited speed, two choices, default speed limit

3.8.2 、 The speed limit speed is calculated based on vehicle parameter requirements. <Appendix EM_V3 parameter adjustment calculation formula>

3.8.3 、 The upper limit speed and the solution speed limit are determined according to customer requirements.

## Setting page 3



3.1、  Motor Setting：

3.1.1、Motor pole pairs：Fill in according to the motor manufacturer parameters.

3.1.2、Hall phase shift angle：Fill in according to the motor manufacturer parameters.

3.1.3、Motor type：Fill in according to the motor manufacturer parameters.

Note: Wheel Hub motor is surface mount

3.1.4、Hall, phase line exchange: exchange the motor forward and reverse.

3.2、The controller to speedometer date output has 2 types: Single-line speedometer and hall speedometer, it needs to be decided by the vehicle's speedometer.

3.3、 Moving assist and cruising function：Used in two-wheelers

Note: Speed "3KM / H, torque 9 ~ 19N.M

3.4  Cruise function: function selection, the default does not open.

3.5 Dual voltage setting: default single voltage。

Note: The dual voltage function speed parameter value is followed by the motor speed setting. Adjust the parameters on the setup page 2.

3.6、 Reversing speed limit: The calculation formula is adjusted with reference to the EM_V3 parameter adjustment calculation formula file.

Note: The speed of the two-wheeler is 5KM/H, and the tricycle is 15KM/H.

3.7、 Reversing, EBS setting, low brake selection, starting safety switch function。

3.7.1、 According to the weight of the vehicle (recommended within 30%)

3.7.2、 Two-wheeler 35~60 interval

3.7.3、 Two-wheeler 45~75 section

3.7.4、 Energy recovery with lithium battery parameter value equipment, the actual road test shall prevail. BMS protection results in burning MOS. Jianyi rushing discharge branch.

3.8、 Low brake enable: brake signal high and low brake, default high brake, check low brake.

3.9、 Safety Switch Function valid checked
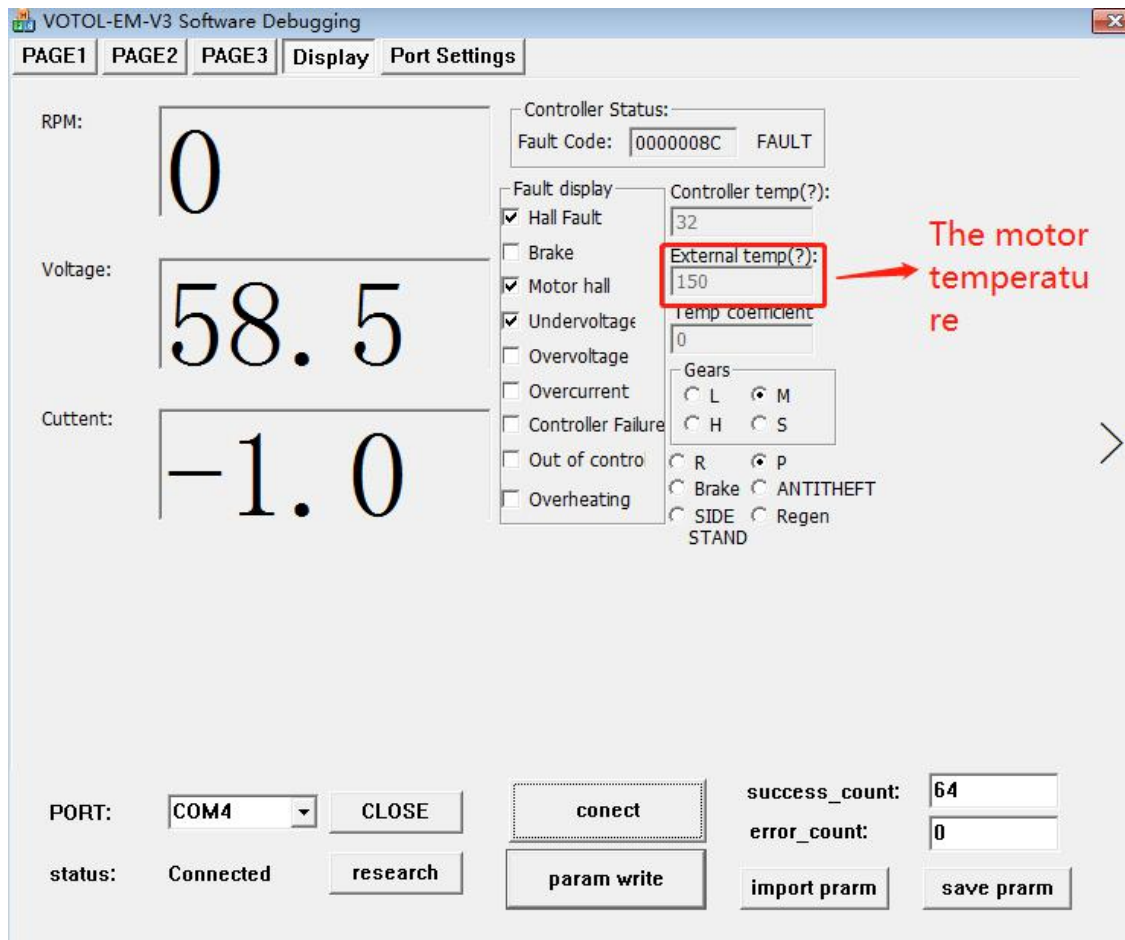
3.10、 Import configuration files: configured files are imported from the computer

3.11、 Save configuration file

Standard Edition：BZB/V39

## Display page 4

External templs is the motor temperature

# Extended page



4.1、Update the upgrade ECU program.

4.1.1、Open the "BIN" file on your computer and download it to the ECU.

Click open file, select the file type as BIN format, click download to 100%;



4.1.2、

nsert the line by model and plug in the computer. The line is divided into the following models: EM-30~EM-150 universal, EM-200, EM-300, CAN
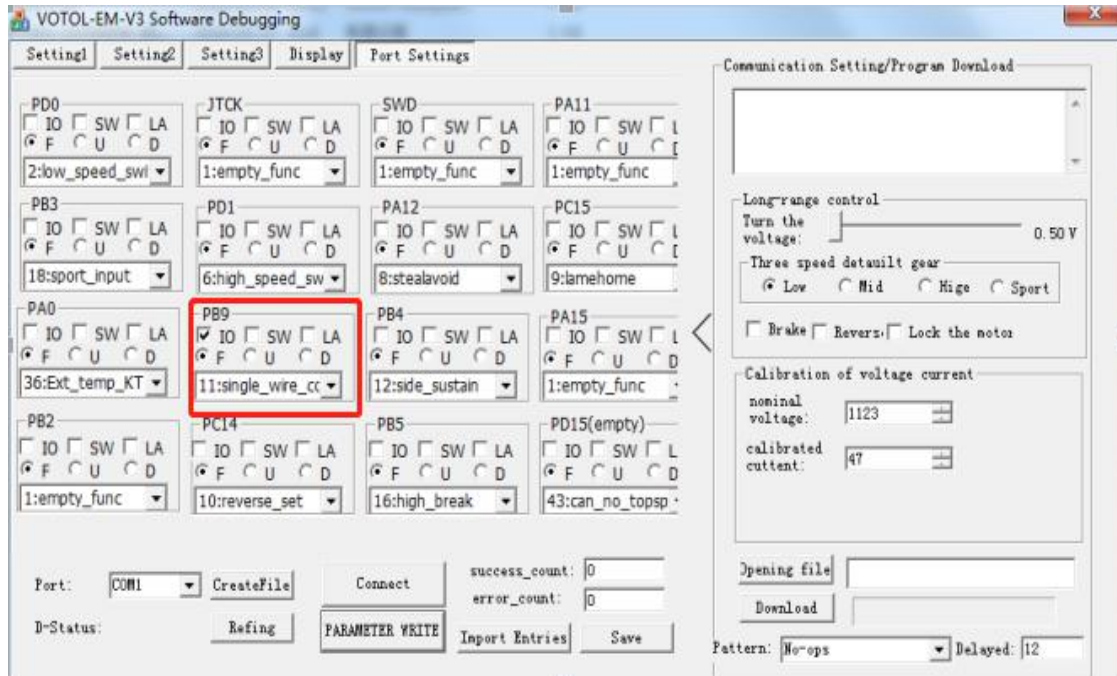
4.1.3、Attention：

4.1.3.1、Use USB isolation dedicated line. It is not a dedicated isolation line that burns the ECU port and the computer.

4.1.3.1、The ECU is not read completely, and the ECU is connected several times in the setup meeting.

# Port setting

## 1. One-line setting

**PB9 choose 11**



**Output choose one-       Lin**
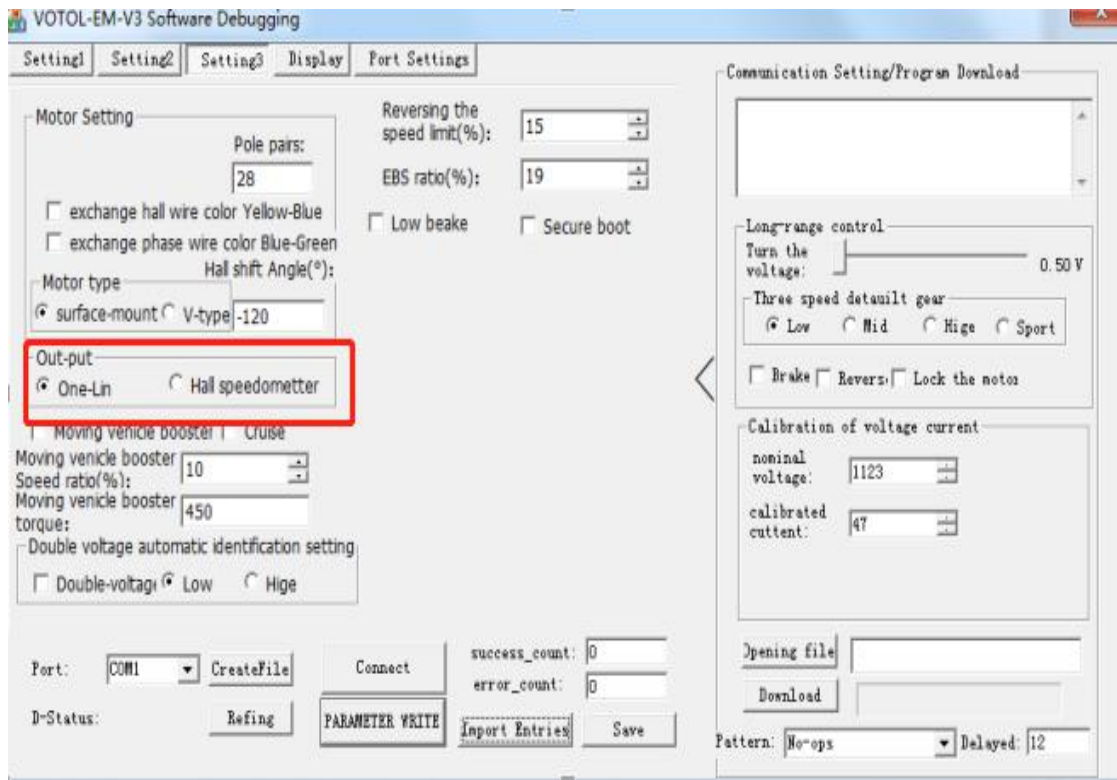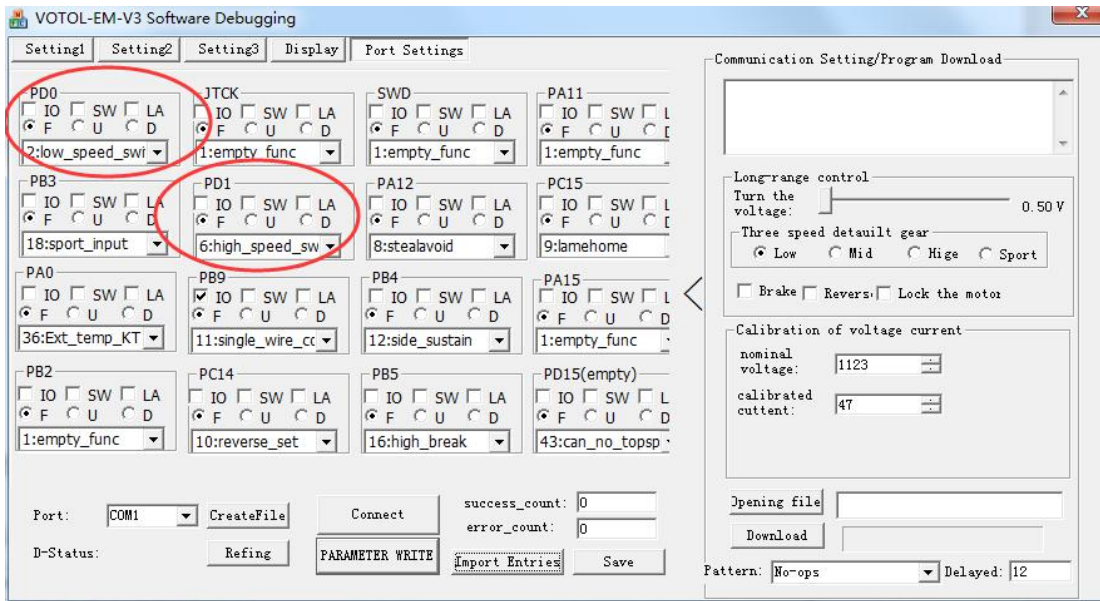
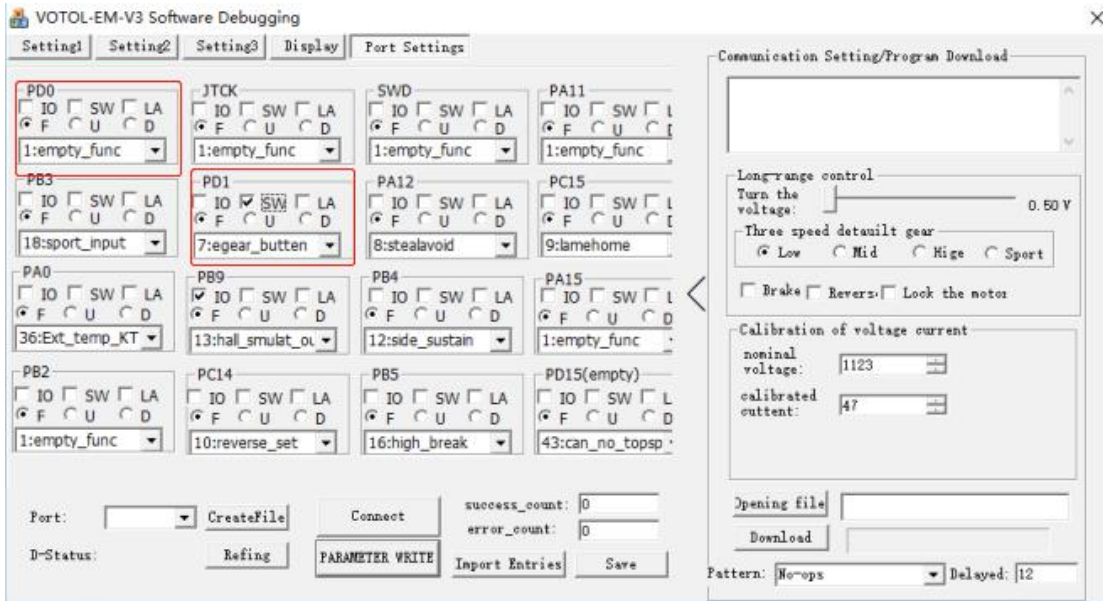2.Hall setting

PB9 choose13
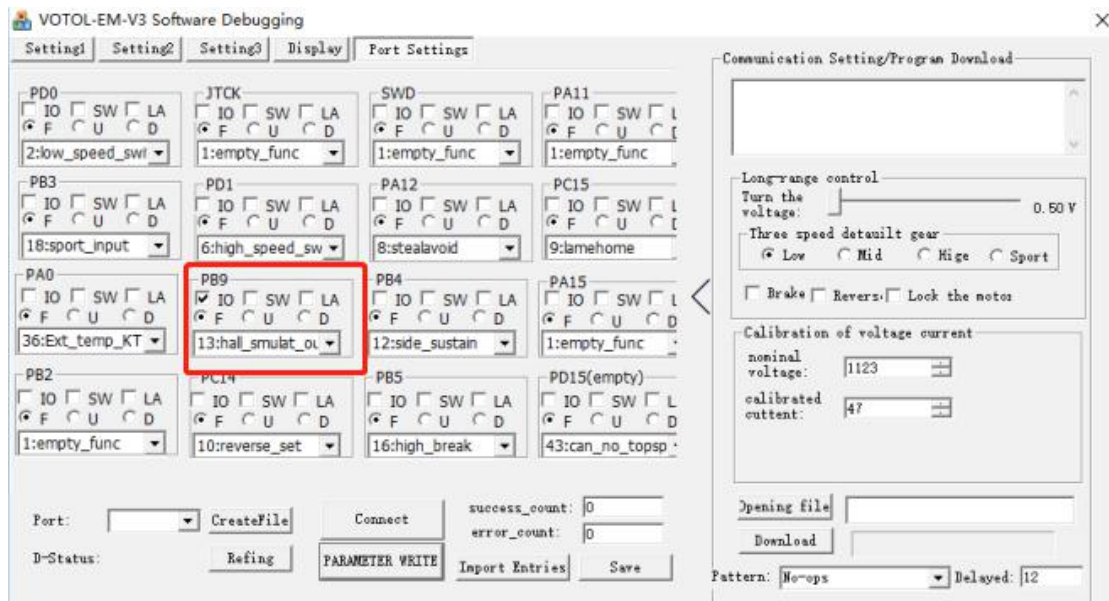


Output choose hall speedometer
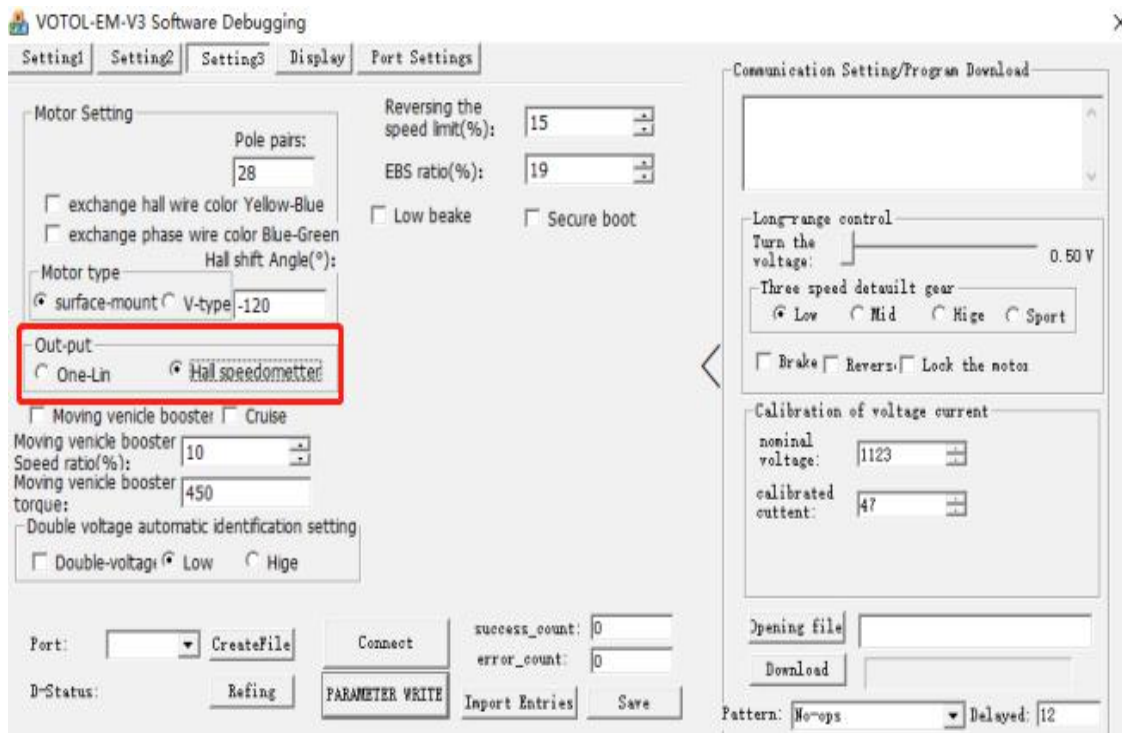
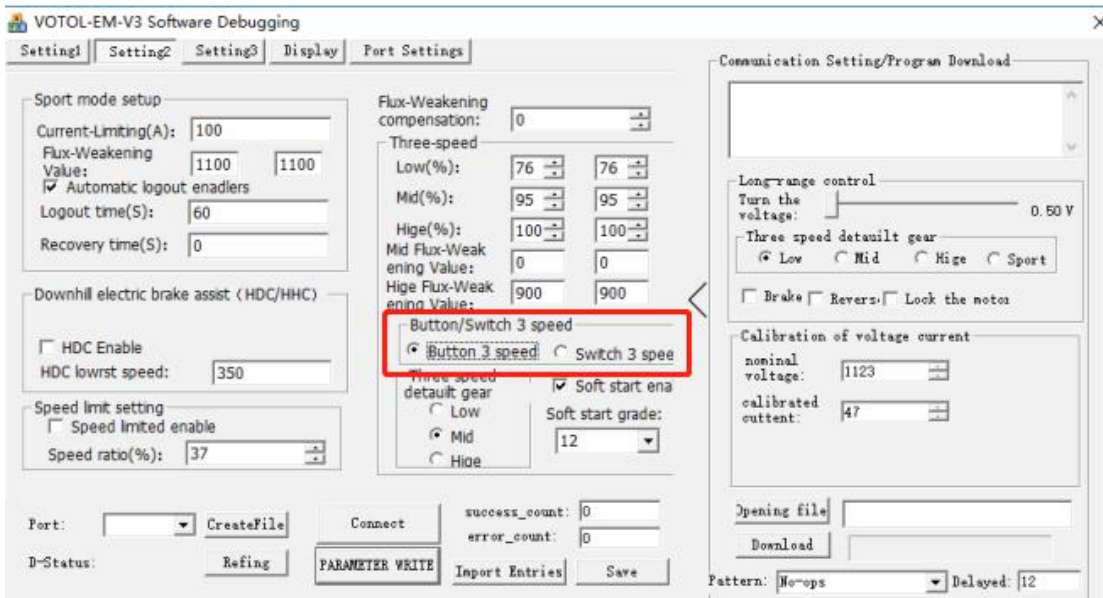## 3. Trigger three-speed setting





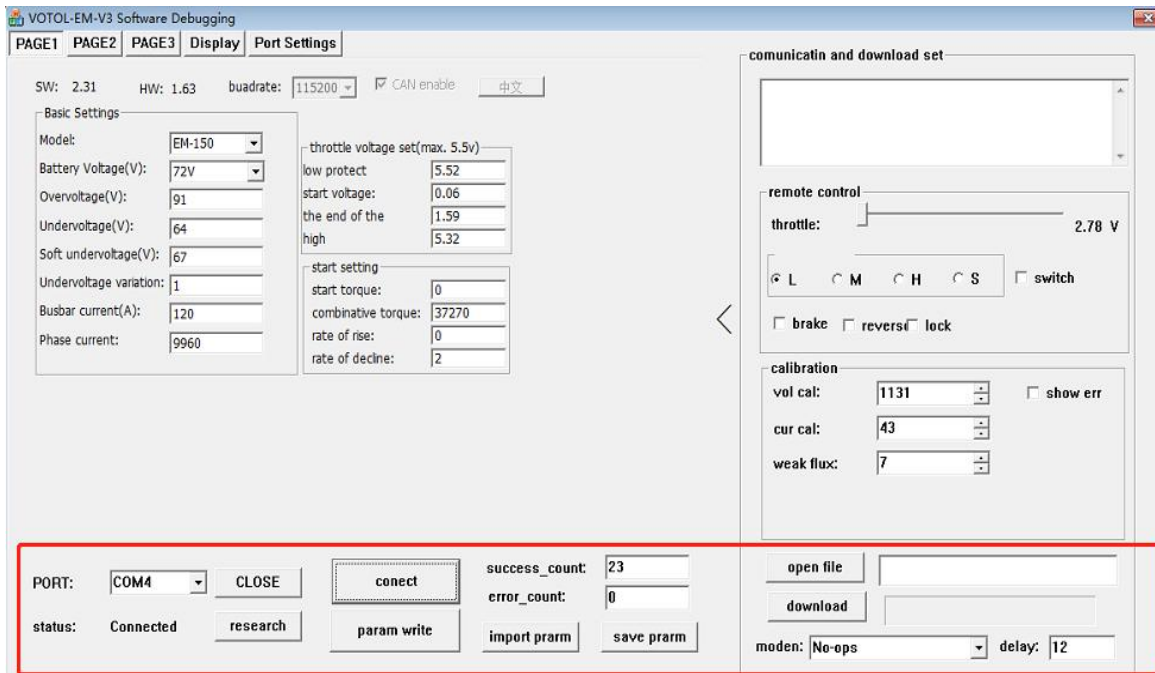## 4.Jog three-speed setting

PD0 1    PD1 SW choose 7

Choose Button 3 speed

5. To import the configuration, click import prarm, select the appropriate INI file, and then click param write; to export the configuration, click save pram and save；

After adjusting the parameters, click paparam write to save the parameters;



Remarks: Please carefully read this attentions before the user adjusts the parameters. Since the user does not adjust the parameters according to the precautions, the controller is not responsible for the after-sales of such controllers.