



Pro/Pro+ 300A

Brushless ESC Instructions

Thanks for purchasing *Fulcrum series* brushless speed controller manufactured by Chongqing HIFEI Technology Co., Ltd. *Fulcrum series* ESC are super HV and extremely powerful ESC for model aircraft and helicopter.

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I Using Warnings

- The brushless ESC is specially designed for R/C electric powered model aircrafts, helicopters and EDF, which are not toys. It is suggested ONLY adults can run it, and little children must run it under wardship of adults.
- Please read the ESC's specifications and correctly connect ESC to battery pack at right voltage.
- When connecting the ESC to battery pack, please ensure the polarity is correct. Incorrect polarity connecting will cause short-circuit and permanent damage to the ESC, such damage is not covered by manufacturer's WARRANTY.
- Before the flying, turn on the transmitter **BEFORE** powering on the receiver.
- When finish the flying, power off the receiver **BEFORE** turning off the transmitter.
- Never disconnect the battery pack while the motor is running, as this could cause damage to the speed controller and/or motor.
- Connectors with low conductivity may cause erratic motor rotations or other unexpected movements.
- Please keep the propeller away from humans or any other objects.
- It can change the motor's rotation direction by swapping any two motor wires connecting.
- Each new ESC is preset with default parameters in factory, which can be assembled for flying directly. But in order to obtain optimum power performance and well compatible to work with the brushless motor. It is suggested to set the appropriate parameters before assemble it to hull for flying.
- The ESC wick cut-off output when no signal is checked within 100ms.
- Please calibrate the throttle range of the transmitter when it is your first time to use a new controller or when you change a new/different transmitter or receiver.
- **When finish the using of Hifei software ' V4.xx', close the software first, then pull out the USB linker from your PC, or it may cause the crash of the computer.**

II ESC Specifications

II B: Features

- Microprocessor-controlled, extremely low resistance;
- Adopt advanced aluminum PCB process;
- Solid heat dissipation;
- Full protection soft, include signal close protection, temperature protection, motor block-up protection.
- Auto detecting Lipo cells.
- ESC is fully programmable by Hifei USB linker on computer, and Hifei LCD program box;
- The firmware of the ESC is upgradeable from Internet when a new version of the software available.
- Pro+ 300A is with built-in data logger, which can record down the Voltage、Current、Throttle、Motor RPM and Temperature during flight.
- Read logged data by soft on PC or by Hifei LCD program box.



II C: ESC Models

ESC	Voltage	Current/Max	BEC	Size (mm)	Weight (incl. wires)
Fulcrum Pro 300A	4-15s Lipos 12-48s Ni-xx	300amp/350amp	OPTO	119*73*26	395g
Fulcrum Pro+ 300A (with built-in data logger)	4-15s Lipos 12-48s Ni-xx	300amp/350amp	OPTO	119*73*26	395g

II D: Programmable Parameters

LVC	Auto	4s Lipo*	5s Lipo	6s Lipo	7s Lipo	8s Lipo	9s Lipo	10s Lipo	11s Lipo	12s Lipo	13s Lipo	14s Lipo	15s Lipo
LVC/Lipo	2.5V	2.6V	2.7V	2.8V	2.9V	3.0V*	3.1V	3.2V	3.3V				
Current Limiting	Sensitivity		Standard*		Insensitivity		Disabled						
Brake Type	Close*		Soft brake		Hard brake								
Timing Advance	Low*		Middle		High		Auto*						
Cutoff Type	Hard cutoff*		Soft cutoff										
Start Type	Soft start		Standard*		Fast start								
Governor Mode	Auto* (for airplane)		Low PWM (for heli)		High PWM (for Heli)								
PWM Rate	8KHz*												

Note:

- 1) PWM of Fulcrum Pro and Pro+ 300A ESC is 8KHz, which is not programmable.
- 2) Parameters with asterisk behind are the factory default settings of Fulcrum Pro/Pro+ 300A ESC.
- 3) When ‘LVC’ of ESC is set at ‘Auto’, the motor will emit beeps to detect the number of Lipo cells after the two power beeps, and the red LED on ESC will blink in accompany with the beeps. ‘3.0v’ is the default cut-off voltage of per Lipo cell when the LVC is set at ‘Auto’ detect.
For example: If connect ESC to a 4s Lipo battery pack, the motor will firstly emit ♪ ♪ , then detect the Lipo numbers ♪ ♪ ♪ ♪ , and the red LED will blink four times. The low voltage cut-off is calculated as ‘12.0V’.
- 4) Please ensure only when the battery packs is fully charged and it can set the LVC at ‘Auto’, it is recommended to set the LVC at actual Lipo cells once the battery pack is over 4S cells.

II E: Fulcrum Pro/Pro+ 300A ESC Parameters Features

Low voltage cut-off (LVC):

Low voltage cut-off can protect battery from discharging too low and causing permanent damaged to battery, especially important for Lithium polymer cells. It is strongly recommend to set the LVC carefully before running.

E.g: if you use 2S(2 Lipo in series), you can choose '2s cells'; if you use 4S 1P battery packs, please set it at '4s cells'.

Cutoff Voltage/ cell :

The setting is to set low voltage cut-off of each Lipo cell.

E.g: if you set the LVC of per Lipo cell at '2.8V', the LVC is set at '2s cells', then the cut-off voltage of the whole battery pack is '2.8*2'=5.6V; if the LVC per Lipo cell is set at '3.2V', the cut-off voltage of whole battery pack is '3.2*2'=6.4V.

Current Limiting :

'*Sensitivity*' setting is low over-current threshold, will shut down rapidly.

'*Standard*' is moderate over-current threshold, will shut down after a slight delay.

'*Insensitivity*' is high over-current threshold, will shut down after a slight delay. Recommend only experienced modelers would change to use this programming feature.

'*Close*' current limiting detection disabled. only experienced modelers would use this option.

Brake type :

'*Brake disabled*' setting will close the brake function;

'*Soft brake*' will provide 20% of full braking power.

Timing advance :

'*Low timing*' setting adjusts the timing at the range of 0°~15°, recommended for more lower pole count brushless motors (such as 2 poles, or 4 poles). It gives more power and slightly less efficient;

'*Middle timing*' adjusts the timing at the range of 5°~20°, recommended for most brushless motors. It gives a good balance of power and efficiency;

'*High timing*' adjusts the timing at the range of 15°~30°, recommended for higher pole count motors. (such as 8, 10, 12, 14 poles or higher brushless outrunner motor)

'*Auto timing*' setting is automatically adjust the timing degree according to motor's rotating demand.

0°; 2°; 4°; 6°; 8°; 10°; 12°;14°; 16°; 18°; 20°; 22°; 24°; 26°; 28°; 30° are specific options for timing advance.

Note: These options can be only set via software 'Hifei V4.03' or newer version, which was released after 4 Dec., 2012. If you want to upgrade your old version software to have these timing advance, please download the software from www.hifei.com.

0° and 30° are special settings, can be only selected for some special motors with manufactures special requirements.

Cutoff type:

Cutoff type settings decide the way in which the ESC cutoff output to brushless motor when the LVC works, or temperature/ signal-lost protection works.

'*Hard cutoff*': when the battery volts discharges to the set LVC value or soft protection works, the motor will shut down immediately. Motor can be restarted by closing the throttle to the lowest position and re-move the throttle as normal.

'*Soft cutoff*': when the battery volts discharges to the set LVC value or soft protection works, the ESC will slowly reduce motor power to zero, you will notice a decrease in power and it is time to dock.

Startup type:

'*Soft start*': very soft and smoothly start the motor, it will take more time.

'*Standard start*': start the motor at normal speed, it depends on the motor's quality and dynamic response.

'*Fast start*': start the motor fast, recommend this for racing.

Governor mode:

'*Auto*' recommended for general fixed-wing aircraft.

'*Low RPM*' recommended for collective pitch helicopters. Used for low pole count motors and low RPM on higher pole count motors.

'*High RPM*' recommended for collective pitch helicopters. Used for higher pole count motors and higher RPM.

Note:

a. The poles mentioned above is the magnetic poles of brushless motor, not the stator numbers of motor.

b. It is strongly recommended to have bench testing and choose appropriate parameters for your configuration before assembling the ESC to hull for running.

III Using the ESC

III A: Connect ESC to BL Motor, Receiver, battery

1st: Solder good quality connectors to ESC's motor wires and power wires before connect ESC to motor and battery.

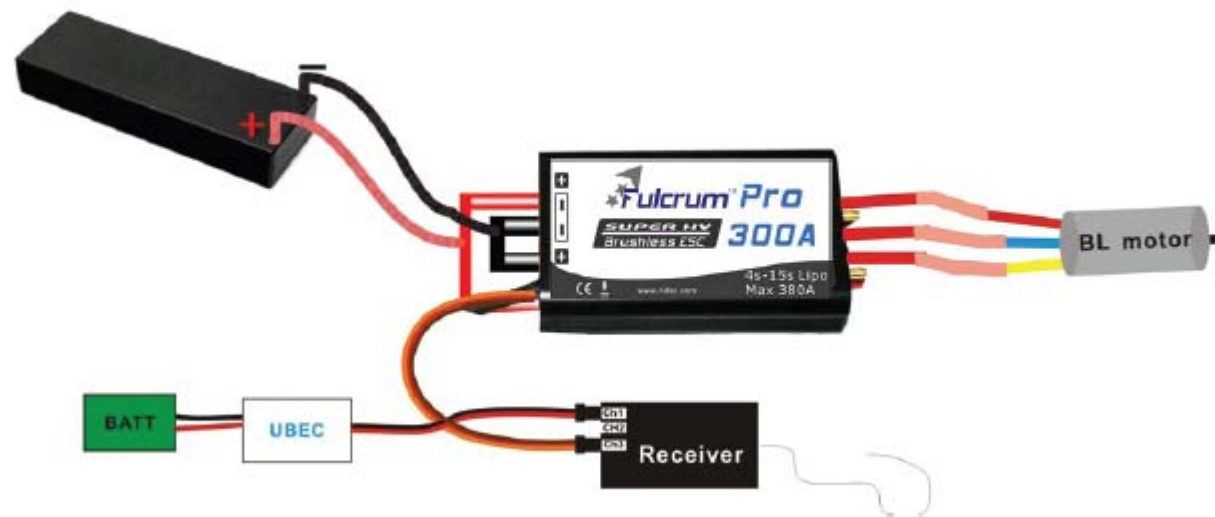
Please connect the two negative power wires in parallel d simultaneously to negative polarity of battery pack, and the two positive power wires in parallel simultaneously to the positive polarity of battery pack.

2nd: Switch 'OFF', connect ESC to brushless motor;
Swap any two motor wires connecting can change the rotation direction.

3rd: plug receiver lead to throttle channel of receiver;
If you use board transmitter radio, plug the receiver lead of ESC into CH3 of receiver;
If you use pistol transmitter radio, plug the receiver lead of ESC into CH2 of receiver.

4th: use separate receiver battery or UBEC to supply power for receiver.
In order to prevent and reduce any signal disturbance generated by ESC hardware, please put the ESC far away from receiver.

5th: refer to the instructions to calibrate the throttle of TX.



III B: Calibrate the Throttle Range of Transmitter

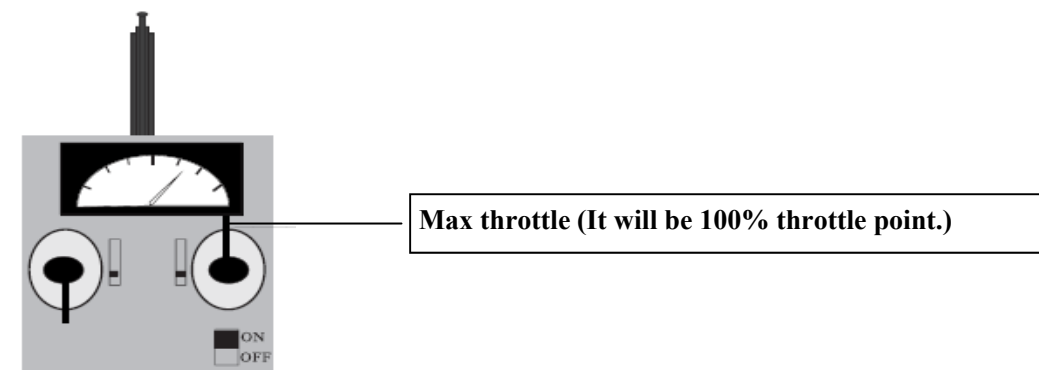
Note: in the following 3 situations, it is required to calibrate the throttle range of transmitter.

- When it is the first time to use a new speed controller.
- When change a new TX or RX, or a set of new radio system.
- When upgrade the ESC into a new version of firmware.

When running at the calibrated max throttle, the RED LED on the ESC will be blinking on to indicate the ESC is giving the max throttle.

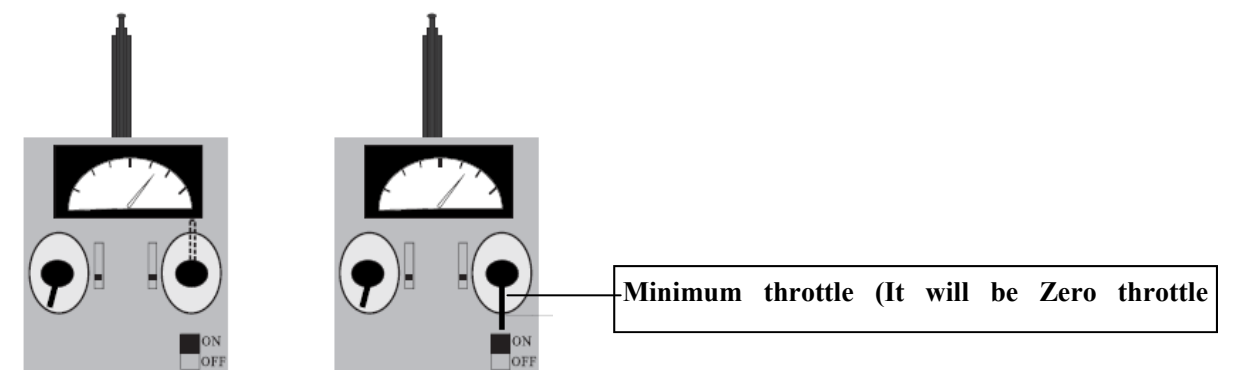
1st: Correctly connect ESC to brushless motor, plug the receiver lead of ESC into the throttle channel of the receiver (usually CH3);

2nd: Push the joystick of transmitter to the max throttle position, power on the transmitter.



3rd: Connect the ESC to battery, there are 3 beeps 🎵 emitted from the motor.

4th: After the following 2 beeps 🎵, immediately pull joystick to the minimum throttle.



5th: 🎵 2 beeps emitting, the calibrating finished.

Note: Motor is needed to install for acoustic guide. Meanwhile, please keep the propeller away from the human beings or any objects.

III C: ready to run !

—Set ESC's parameters. Do testing on test-bed and select appropriate parameters for the configuration.

—Check battery's volts

—Use UBEC or separate receiver battery to power the receiver. Switch 'ON', the green LED on ESC will light for a second and then extinguish. After the two power beeps, it is time to go.

Note:

When the battery volts discharge and drop down to the set LVC value, the ESC will cutoff output to motor in the way of set 'Hard' or 'Soft' cutoff type, which notice it's time to change battery pack.

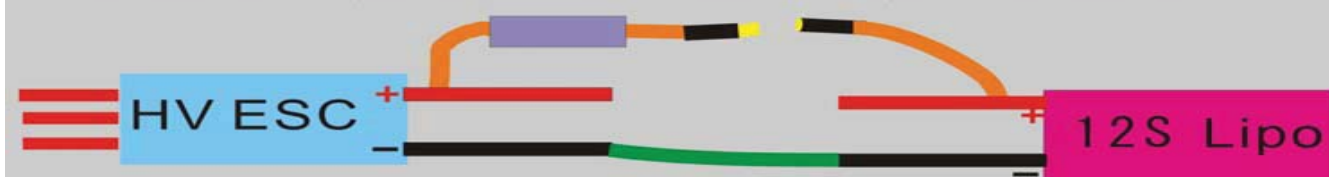
When ESC cutoff output to motor, you can re-start the motor by moving throttle from 0 position again. But ESC will cutoff again soon in 3 seconds.

III D: Wiring anti-spark cables

Fulcrum Pro 300A and Pro+ 300A ESC come with an anti-spark cables.

When run the ESC with 8s and more Lipo cells, please solder the anti-spark cable according to the below instructions, which would reduce the sparks and prevent ESC from any damage.

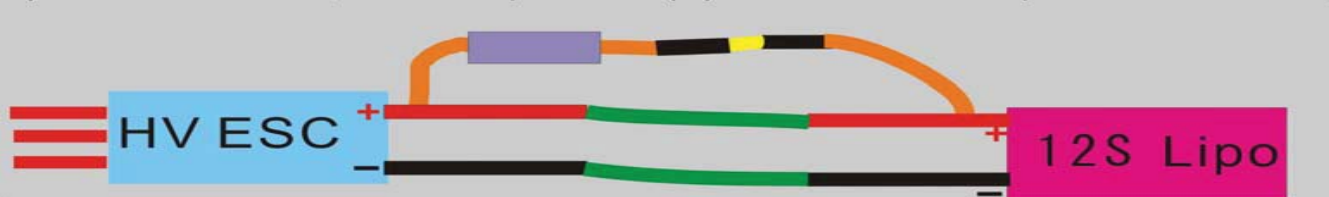
1) Connect the negative (-) cable of ESC to negative of battery



2) Connect the anti-spark leads together



3) After 3 seconds, connect positive (+) cable of ESC to positive of battery



IV Program the ESCs by Soft on PC

Fulcrum Pro/Pro+ 300A ESC supports to be fully programmed the parameters by 'Swordfish Program soft' on PC and 'Hifei Program box'.

When program the ESC by soft, a 'USB Linker' is required to link the Swordfish ESC to PC. 'USB Linker' and 'Hifei Program box' are the parts sold separately. Here the instructions will guide how to program the Swordfish 300A ESC controllers by soft on PC.

Please read the following instructions before programming.

IV A: Install Software on PC

A-a: Computer Operation System Requirements

- Personal computer with Windows XP/ Vista/ Windows 7 operation system.
- CD-ROM drive (or access to Internet)
- Available USB port
- 8 Megabytes hard disk space
- Computer screen resolution with 800X600, 1024X768(recommended) , 1280X1024

A-b: Hardware

The hardware include Swordfish Pro/ Pro+ 300A ESC, USB Linker (sold separately), a set-up CD (free to supply).



Swordfish 300A ESC



USB Linker

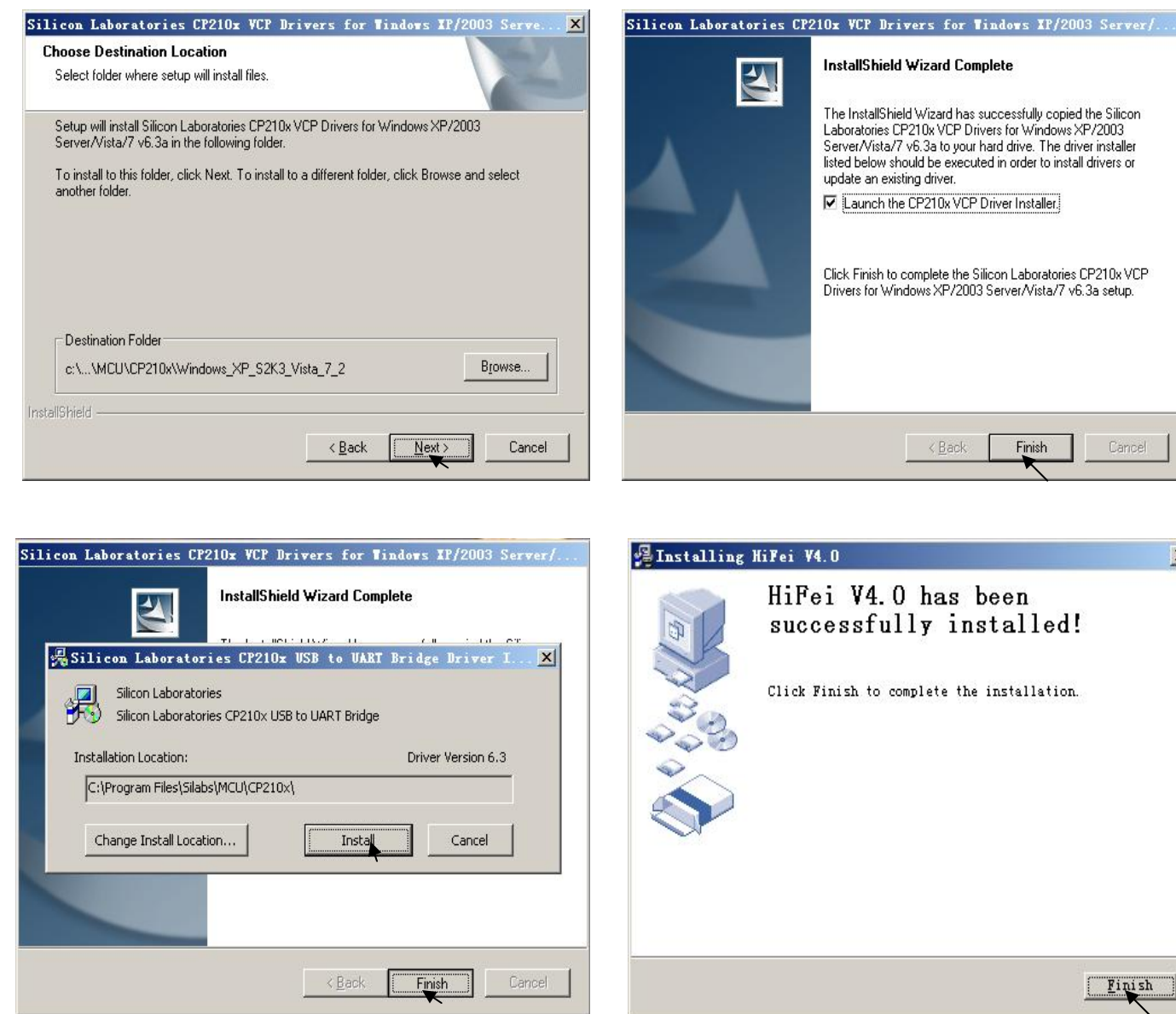
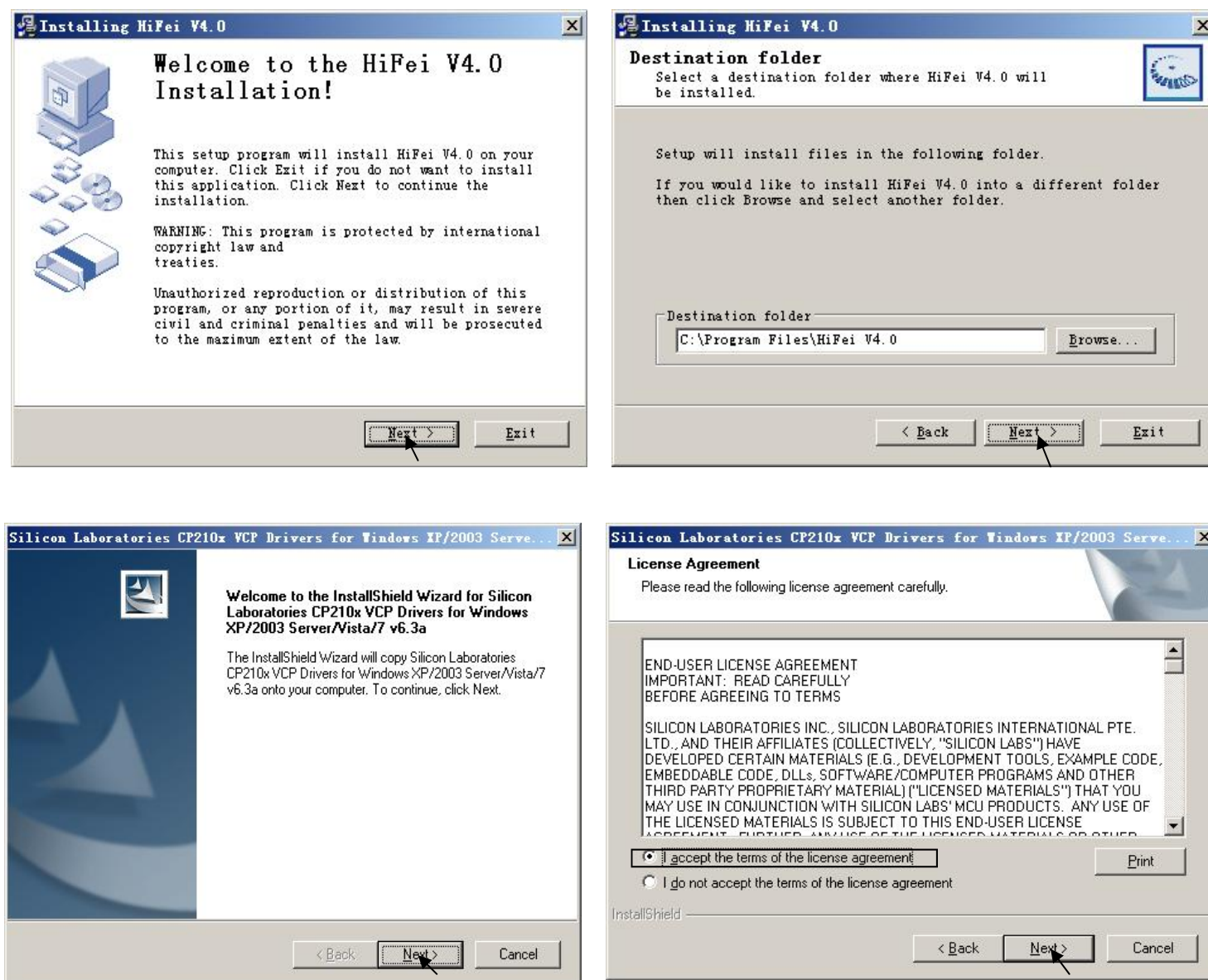


Set-up soft

A-c: STEPS to install the soft

- Insert the CD in the CD driver of the computer.
- Double click the icon 'HiFei V4. xx' Setup.

Note: if your computer is windows 7 operation system, DO NOT install the soft into hard disk 'C'.

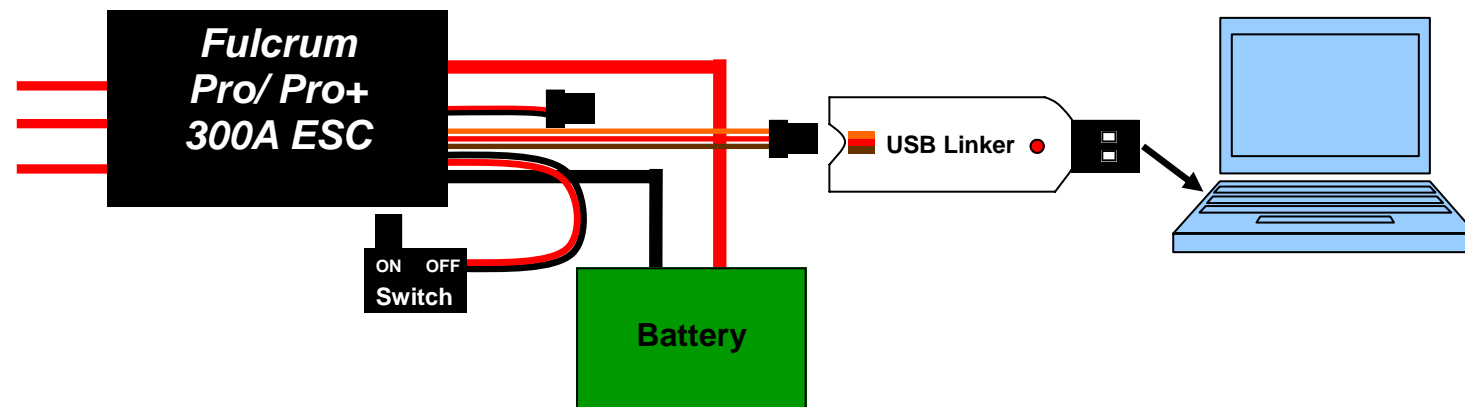


—After click 'Finish' button, the software shortcutting icon  "HiFei Vx.xx" appears on computer desktop.

—Installation completed

IVB: Connect Fulcrum Pro/Pro+ 300A to PC

- Switch ‘OFF’ ESC.
- Connect ESC’s receiver lead to Hifei USB Linker in right polarity.
- Insert Hifei USB Linker to one of USB Ports of PC.
- Connect ESC to battery. Switch ‘ON’.



Note:

When ESC is successfully connected to computer, red LED on USB Linker will light, and green LED on ESC will light.

If the green LED on ESC does not light, please check the connecting polarity between ESC’s receiver lead and USB Linker; and ensure connecting is tight.

IVC: Fully Program ESC’s Paramaters

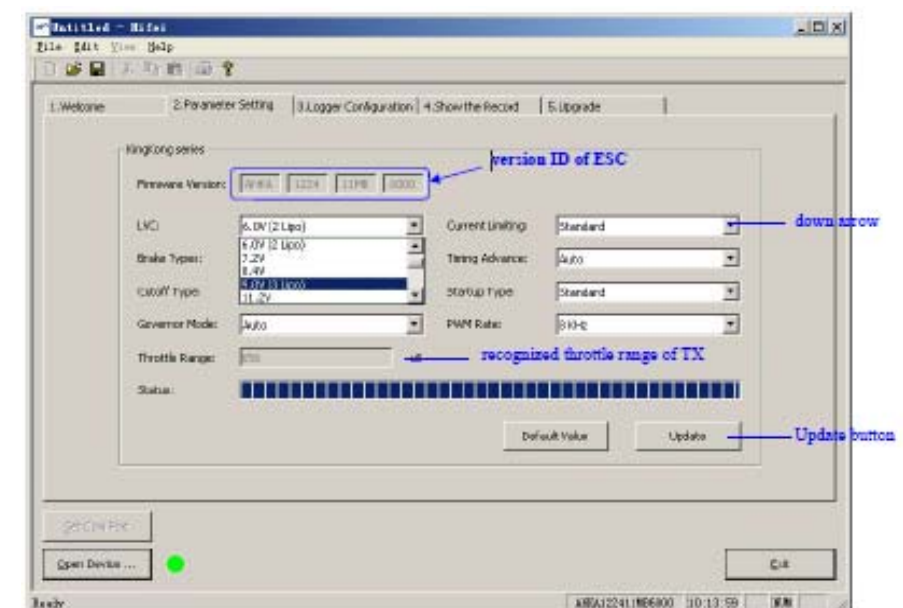
— Double left click mouse the icon ‘Hifei Vx.xx’ on desktop.

— Click “open device” to enter into operations.

Note: Software V4.01 or newer version is improved to be able to automatically recognize right ‘Com Port’, so there is no need to set ‘Com Port’ by hand, but click ‘open device’ to get into programming interface.



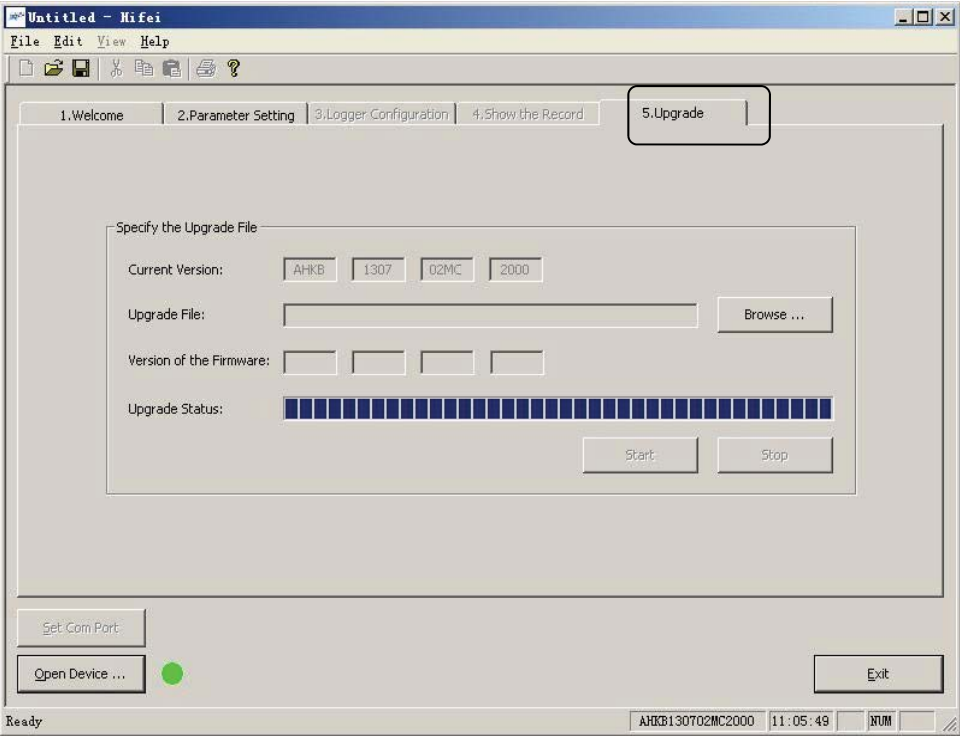
— If connection succeed, it will jump into the following interface to program ESC settings. See the following picture.



Note: when finish the using of Hifei software ‘V4.xx’, close the software first, then pull out the USB linker from your PC, or it may cause the crash of the computer.

IVD: Upgrade ESC’s firmware

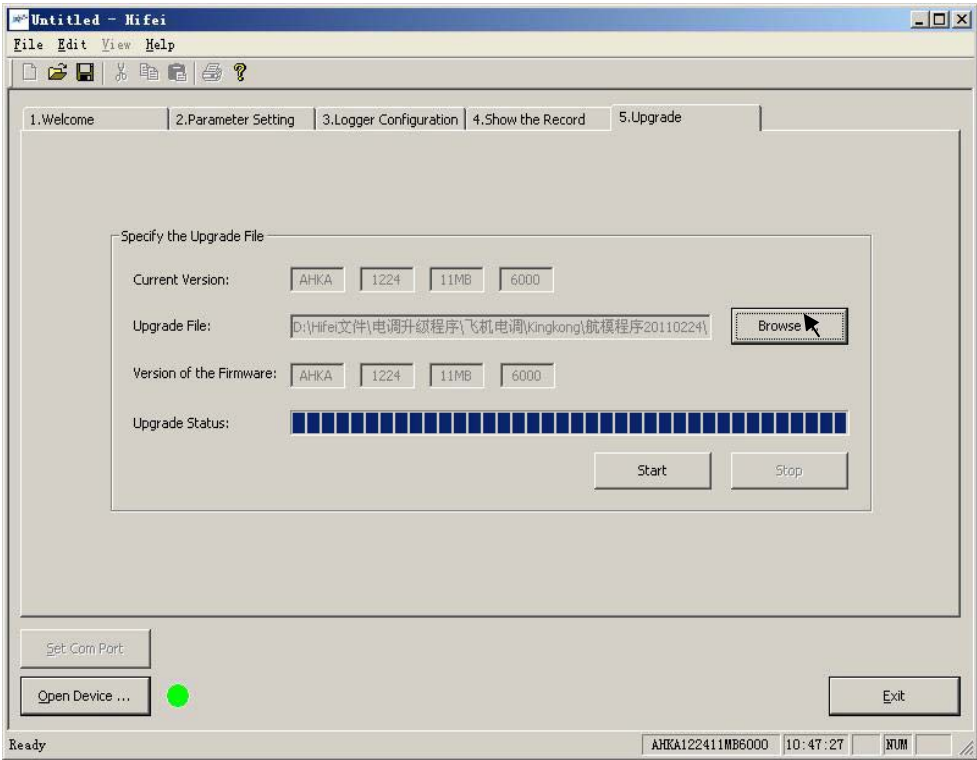
-Click tab “upgrade” as the picture shows below.



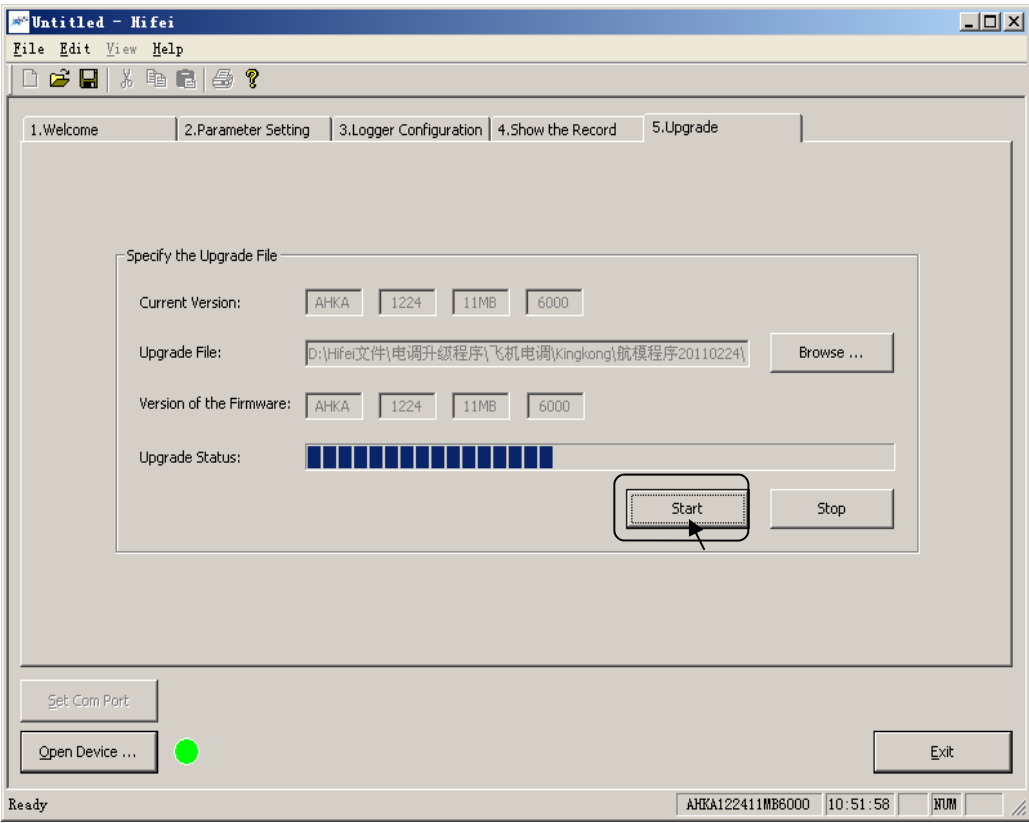
-Click ‘browse’ to select the new fireware which the ESC will be upgraded into.

When upgrade ESC’s firmware, correct firmware for the ESC is required.

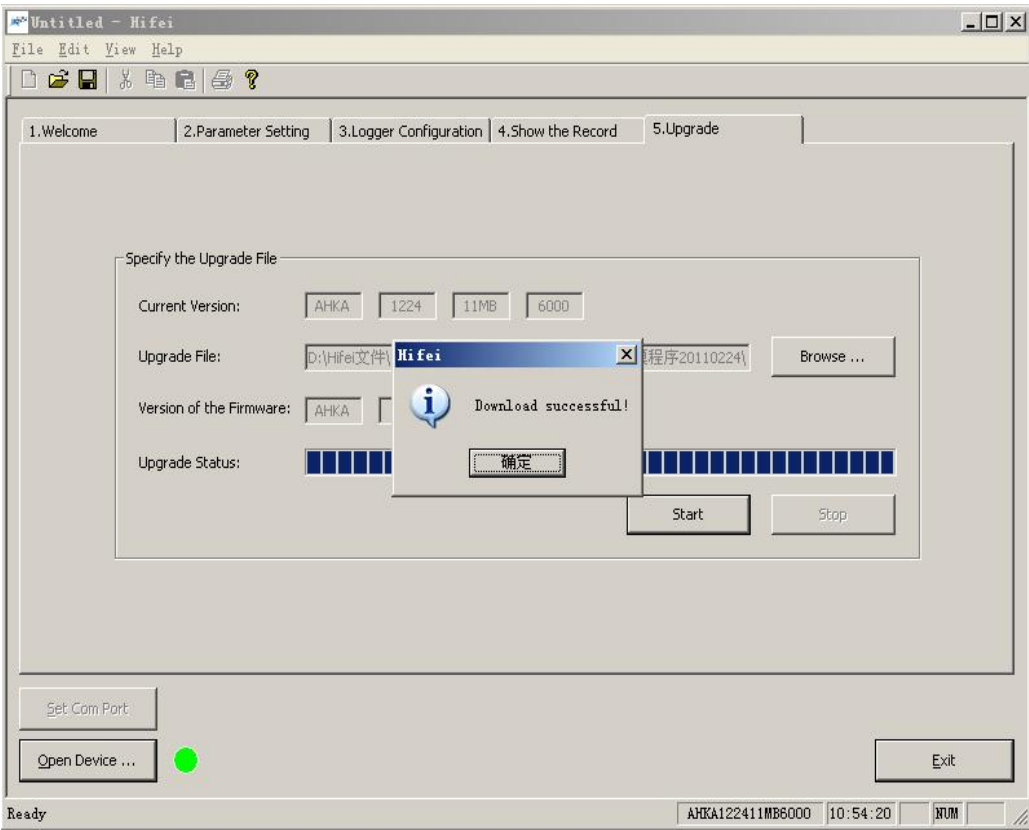
For example, if you made a mistake to upgrade 300A ESC into other type HIFEI ESC, your ESC could not work normally, or even the ESC will be damaged. Which is not covered by warranty.



-Click ‘Start’ to get into the upgrading process, it will be finished within 20 seconds.



-See ‘ Download successfully’, Upgrading is finished.

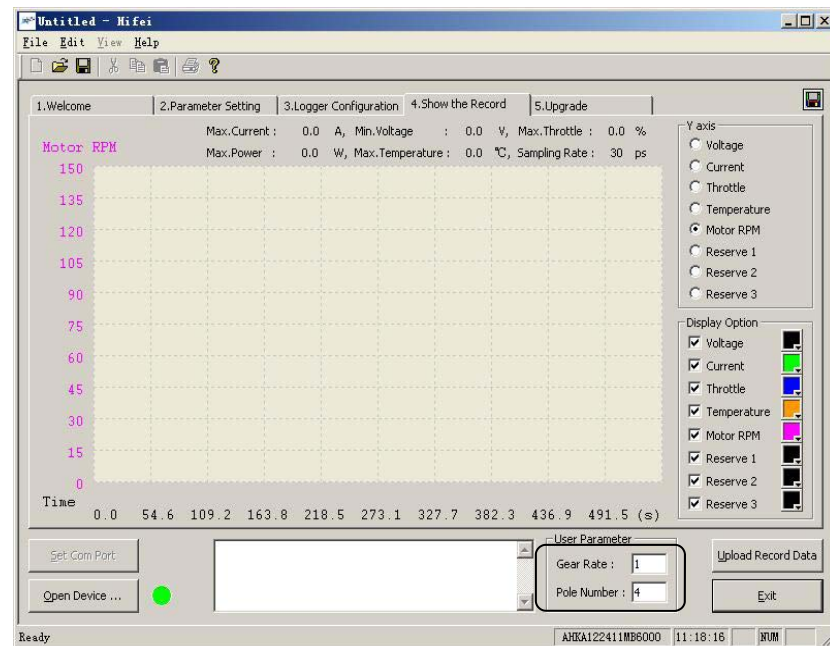


IVE: Read Flight Data from Fulcrum Pro+ 300A

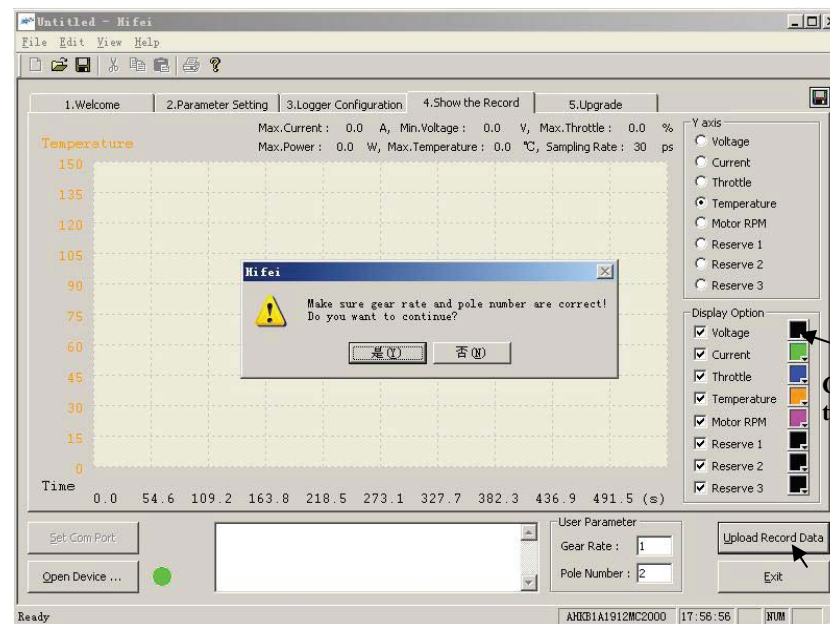
When connect Pro+ 300A ESC to PC, tabs ‘Logger Configuration’ and ‘Show the Record ‘ will auto highlight and can be clicked.

-Click tab ‘Show the Record’, input correct ‘Gear Rate’ and ‘Pole Number’ of used brushless motor at the bottom of the soft interface.

If not use gear box, please keep it as default ‘1’, ‘Pole Number’ here indicates magnetic poles of brushless motor, which is always a double number of 2.

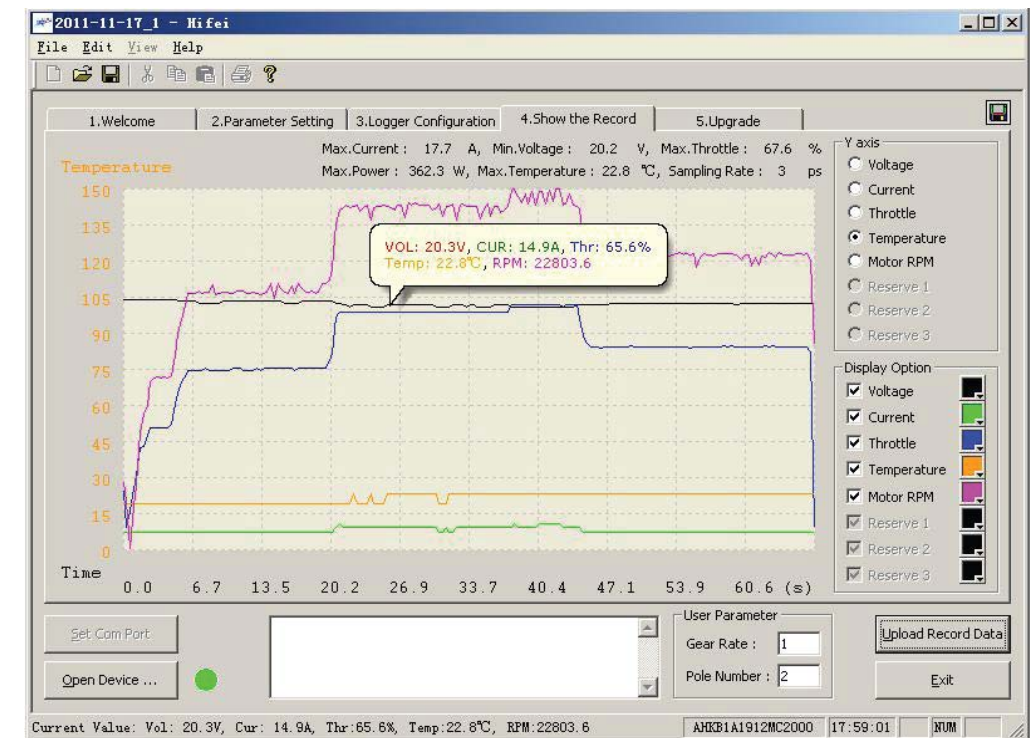


—Click ‘Upload Record Data’ at the right bottom

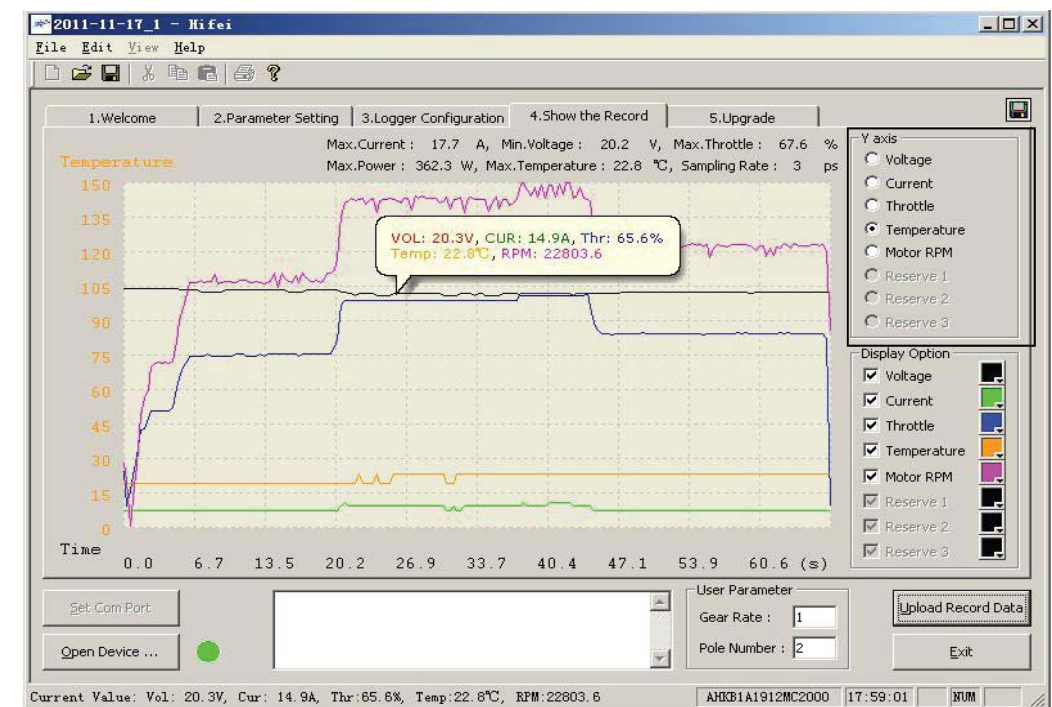


Click down arrow to choose the color.

-Logged flight data is showed as curves.



- It can change Y axis displaying content by setting at top right corner ‘Y axis’.



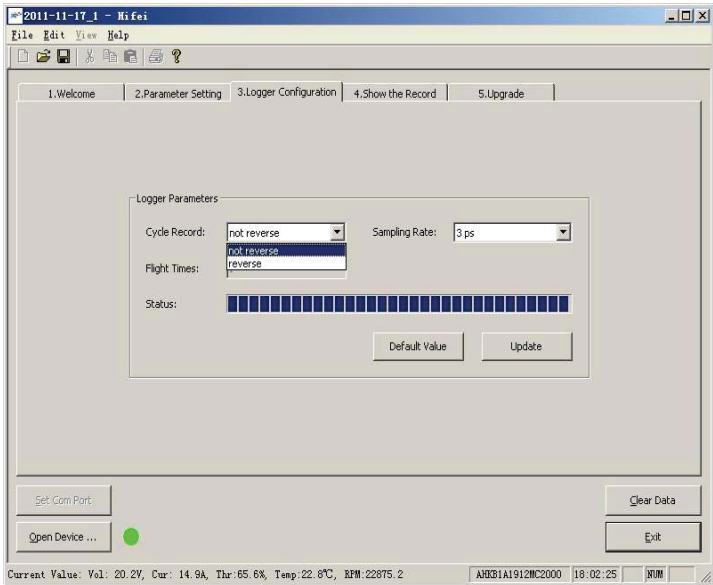
Note:

- a. Input correct poles number of motor is important to get more precise data of RPM.
- b. Temperature is showed in centigrade.
- c. There is $\pm 2\%$ physical deviation about data of RMP.
And $\pm 5\%$ deviation about data of max current.
And $\pm 5\%$ Celsius deviation about data of temperature.

IV F: Logger Configuration

—Click tab ‘ Logger Configuration’ to change setting logger.

➡ Cycle Record: ‘Not reverse’ indicates the data logger cannot record any more when the space is filled up; ‘reverse’ indicates the data logger can record indefinitely by overlapping the former data and do a cycle. ‘ Not reverse’ is the default.



➡ Sample Rate is the frequency by which data logger samples the power data during running. The default setting is 3 per second.

Please refer the following form about the recording time and minimum running time when set sampling rate at different options.

Sampling Rate	Possible Recording Time	Minimum Running Time
Once/ a second	Approx. 68.1 minutes	> 60 seconds
Twice/ a second	Approx. 34.05 minutes	> 30 seconds
3 times/ a second	Approx. 22.7 minutes	> 20 seconds
5 times/a second	Approx. 13.62 minutes	> 10 seconds
10 times/a second	Approx. 6.81 minutes	> 5 seconds
15 times/a second	Approx. 3.405 minutes	> 3 seconds
30 times/a second	Approx. 2.27 minutes	> 2 seconds

Possible Recording Time means longest time data logger can record with the set sampling rate.
Minimum Running Time: ESC must run longer than the minimum running time, otherwise the software can not read and display the data on the PC window.

Note: please DO NOT power off ESC abnormally while not moving throttle back to zero position, otherwise power data will be unavailable.

V Trouble shooting

Trouble	Possible reason	Shoot methods
When connect ESC to battery, there is no two power beeps emitted from brushless motor.	1. The battery voltage exceeds the range of ESC’s working voltage. May it is too low or too high. 2. Motor is damaged, or the ESC is not well connected with motor.	1. Check battery’s voltage and change suitable battery pack. 2.Check the connectors, ensure ESC is tightly connected with motor. Check motor whether it is good.
Motor shut down suddenly even at full throttle or when not decrease the throttle.	1. Battery voltage discharge and drop down to the set low cut-off voltage, the ESC cut-off output to motor to protect the battery. 2. Temperature protection	1. Please stop the running and change a new battery pack. 2. Stop running for a while until the ESC’s temperature decrease and recover to be normal.
When connect ESC to PC according to the instructions, it still cannot connect the ESC to PC sucefull for programming.	1. There is loose between USB Linker to ‘USB port’ of PC. 2. The com port is not correct. 3. ESC’s receiver lead to USB Linker is wrongly connected.	1.Plug out the USB Linker from the PC, and re-plug it in. 2. Check the correct com port. 3.Check the connecting polarity between ESC to USB Linker.

Part VI : Warranty Clause

Thanks for purchasing Hifei Brushless Electronic Speed Controller (ESC). Here we guarantee all Hifei ESC is made by strict workmanship standards and rigorously tested before leaving the factory. But as ESCs are usually working under atrocious environment and other possible damage during transportation, we commit under-warranty service and disclaimer in accordance with the following clauses. We reserve the rights to change clauses without notification in advance.

Hifei Brushless ESCs are used for radio controlled electric model airplanes, boat s and cars. Which are not toys, and must be used with much care. It is required to read the ESC user-manuals and warnings before using. This warranty does not cover abuse, neglect, or damage due to incorrect wiring, over voltage, or overloading.

Please read the warranty clause carefully. When request warranty, it is required to fill out the ‘Warranty Form’ and send one copy of the form and a copy of purchase receipt with the ESC together back to factory. Please note we do not accept request for refunding.

All Hifei ESCs are warranted for one year since the date of purchase from Hifei authorized dealers which comply with the following under-warranty clauses.

VI A: Under Warranty Conditions

In the following conditions, you can request a new replacement within 15 days since the purchase date. (Purchase receipt or invoice must be provided)

1) Replacement

The requested ESC must keep in new condition.

- a) New ESC you got has defect on components or workmanship;
- b) New ESC you got works abnormally in first testing.

Note: any change to a new ESC (such as cutting short cables, unpack ESC, etc) will be disclaimed.

In the following situations, we commit free repairing to requested ESC.

2) Repair

Purchase receipt and warranty form are required to ship back together with the ESC.

- a) the date exceeds 15 days , the defective ESC will be repaired and shipped back.
- b) the ESC can not work or be damaged in testing, which is caused by the quality defects of ESC within the valid warranty date.

Note: You bear the shipping cost for returning, and we pay the cost for shipping the repaired ESC back to you.

We promise to repair the returned ESC and ship it within 5 working days since we received it.

VI B: Disclaimer Conditions

In any of the following conditions, we disclaim the warranty

- a) The purchase date over 1 year.
- b) A valid purchase certificate and/or warranty form in not provided.
- c) ESC was damaged due to not following the manuals or any misuse, such as overload using ESC, ESC’s on-board overloading, affected by the humidity, incorrectly soldered connectors, incorrect polarity the controller, misuse on other application, disconnect ESC from battery while motor is rotating, etc.
- d) The ESC is changed, disassembled and repaired by yourself or any other third party without authorization from Hifei in advance.
- e) The ESC is severely damaged and be irretrievable.

VI C: Charged Repairing Service

We also provide charge-repairing service to Hifei ESC which is disclaimed warranty. According to the damage degree of the ESC, we will notify you the repairing fee and get your agreement before repair it.

Note: you pay all the shipping cost.

When request warranty service, please firstly contact the shop where you purchase the ESC, or send e-mail to techservice.hifei@gmail.com to describe the ESC problem, you will receive an authorized RMA number from Hifei. Please write the RMP number on ‘Warranty Form’.

RAM No.: _____

Warranty Form

Please fill out this [Service-Request form](#) and ship one copy with the ESC which you will ship back for service. We will keep you informed about the inspection result as soon as possible after carefully checking, so please ensure your email address correct. We sincerely appreciate for your support.

Those with asterisk * behind are required.

ESC Model: * _____ Purchase Date: * _____

Contact Person: * _____ E-mail: * _____

I Using info:*

Model airplane info	Name _____ Manufacturer _____	Length: _____ Wingspan: _____
Battery*	Lithium-Polymer (Lipo)	NiCad or NiMH
	Cell Count ____; Voltage ____; C Rating ____; Mah Rating ____;	Cell Count ____; Voltage ____; Mah Rating ____;
Motor*	Manufacturer _____; Motor Size or Model _____;	KV _____ No. of poles _____
Propeller*	Prop manufacturer Prop size _____ (inch) / _____ (mm)	
Radio	Manufacturer _____; TX model _____; RX _____; servo count _____;	

II Detail Description of Problems Symptoms *

When the ESC be problemed:	(date)/	(month) /	(year)
Detail symptom description:			
<div></div>			

III Please notify us of your shipping address, phone call and e-mail, so we will ship the ESC after it is repaired back to you. We will keep all your info confidential.

Your name	Telephone		
Shipping address	Street		
	City	Country	Postal code
E-mail			

IV Please ship the ESC to our factory address:

Company: Chongqing HIFEI Technology Ltd.			
Address	Street: 2 nd Floor, K Building, 52 Keyuan 4 th street, Gaoxin District,		
	City: Chongqing	Country:P.R. China	Postal code: 400041
Contact person	Michelle Lee	Telephone: +86 23 68621580	
E-mail	techservice.hifei@gmail.com		

V Please ship one copy of purchase receipt with the ESC*.