



## I **Using Warnings**

# Brushless ESC Instructions

Thanks for purchasing **Swordfish** brushless speed controllers. **Swordfish** series ESC are specifically developed to supply stable and strong power for r/c model boats beyond you expected. Please read the instruction booklet carefully before running.

## Contents

◆Part I : Using Warnings	..... P1
◆Part II : ESC specifications	..... P2-P3
◆Part III : Using the ESC	..... P4-P5
◆Part IV : Program the ESC by soft	.....P5-P10
A. Install the 'Program soft' on PC	
B. Connect ESC to PC	
C. Program the ESC	
D. Upgrade the firmware of ESC	
◆Part V : Trouble shooting	.....P10

- The brushless ESC is used for R/C electric powered model boats, which are not toys. It is suggested **ONLY** adults can run it, and little children must run it under wardship of adults.

- Swordfish ESC is painted with water-resistant coating in factory, which can prevent a little splash water, but cannot prevent much water soaking in the ESC for a long time.

If there is possibility that ESC maybe soaked in water or become wet during running process, please use water-proof glue to seal the ESC before running.

ESC is damaged because of water soaking will not be covered under warranty.

- Please read the ESC's specifications in Page 2, correctly connect the ESC to the stipulated battery pack numbers.

Incorrect polarity connecting DO cause permanent damage to the ESC and such damage would not covered under manufacturer's **WARRANTY**.

- Before begin the running, turn on the transmitter **BEFORE** powering on the receiver.

- When finish the running, power off the receiver **BEFORE** turning off the transmitter.

- Never disconnect the battery pack while the brushless motor is running, as this could cause damage to the speed controller and/or motor. And such damage would not covered under manufacturer's **WARRANTY**.

- Connectors with low conductivity may cause erratic motor rotations or other unexpected movements.

- Please keep the propeller away from humans and any objects.

- It can change the motor's rotation direction by swapping any two motor wires connecting.

- EACH new Swordfish ESC is preset with default parameters in factory, which can be assembled for running 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 running.

- Changing the PWM may cause the motor to heat ahead of time.

- For Swordfish 20A, 40A, 90A, 120A and 200A ESC, when do not use the on-board BEC function of the ESC, and are using a separate receiver battery or UBEC instead to power receiver and servos, please disconnect the red wire from the ESC's receiver lead.

- The ESC will cut-off output when no signal is checked within 100ms.

- Please calibrate the throttle range of transmitter when you first time use a new controller or when change a new/different transmitter or receiver .

## II ESC Specifications

### II A: Swordfish series ESC Features

- Microprocessor controlled, extremely low resistance
- ESC is water-proof to prevent spill water , and aluminum water-cooler pipe is pre-mounted.
- Full protection soft, include signal lose protection, temperature protection, motor block-up protection.
- ESC has Auto detect Lipo cells feature. Forward running mode is developed for competitions.
- ESC is fully programmable by software on computer, or by Hifei LCD program box, or by smart Prog- card.
- The firmware of the ESC is upgradeable from Internet as the new version of the software becomes available.

### II B: Swordfish series ESCs

ESC	Voltage	Current / Max	BEC	Size(mm)	Weight (incl. wires)
<b>Swordfish Low Voltage ESC</b>					
<b>Swordfish 40A</b>	2-3s Lipos 6-10s Ni-xx	40amp/ 65amp	5V, 2A (linear)	59 x 23 x 10	26g
<b>Swordfish 90A</b>	2-6s Lipos 6-20s Ni-xx	90amp/ 110amp	5V, 3.5A (switching)	90 x 36 x 20	103g
<b>Swordfish 120A</b>	2-6s Lipos 6-20s Ni-xx	120amp/ 150amp	5V, 3.5A (switching)	90 x 36 x 20	108g
<b>Swordfish 200A</b>	2-6s Lipos 6-20s Ni-xx	200amp/ 220amp	5V, 3.5A (switching)	90 x 36 x 20	139.5g
<b>Swordfish High Voltage ESC</b>					
<b>Swordfish 240A</b>	4-12s Lipos 12-38s Ni-xx	240amp/ 280amp	no	112 x 53 x 22	250g

### II C: Swordfish ESC Programmable Parameters

<b>LVC (note 1)</b>	Auto	5.0V	2s cells*	7.2V	8.4V	3s cells	4s cells	5s cells	6s cells	
<b>LVC (note 2)</b>	Auto	4s cells*	5s cells	6s cells	7s cells	8s cells	9s cells	10s cells	11s cells	12s cells
<b>Cutoff voltage/cell</b>	2.5V	2.6V	2.7V	2.8V	2.9V	3.0V*	3.1V	3.2V	3.3V	
<b>Brake Type</b>	Close *		Soft brake							
<b>Timing Advance</b>	Low		Middle		High		Auto *			
<b>Cutoff Type</b>	Hard cutoff *		Soft cutoff							
<b>Startup Type</b>	Soft start		Standard *		Fast start					
<b>PWM Rate</b>	8KHz *		12KHz		16KHz					

**LVC (note 1):** It is LVC options for Swordfish Low Voltage ESC.

**LVC (note 2):** It is LVC options for Swordfish High Voltage 240A ESC.

**NOTE:** a. The parameters with asterisk behind are the Swordfish ESC's default settings.

b. 'LVC/per Lipo cell' is the new improved feature, only ESC manufactured after Nov. 2010 has this feature. If your Swordfish ESC is an old version, please contact dealer or send email to [techservice.hifei@gmail.com](mailto:techservice.hifei@gmail.com) for the new version firmware to upgrade your Swordfish ESC.

c. When the 'LVC' of ESC is set at 'Auto' detect, after the two power beeps the ESC will beep the number of Lipo cells which the auto detect feature detects, 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 you connect the 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'.

d. 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 D: Swordfish ESC Parameters Features

**Low voltage cut-off (LVC):** The setting of LVC can protect battery from discharging too low and causing permanent damage to battery, especially important for Lithium polymer cells. It is strongly recommended to set the LVC carefully before running.

e.g. If you use 2S( 2 Lipo in series), you can choose the “2s cells”; if you use 4S 1P battery packs, please set it at “4s cells”.

**Cutoff voltage/ cell:** The setting is to set the low voltage cut-off of each Lipo cell.

e.g. If 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 of per Lipo cell is set at “3.2v”, the cut-off voltage of whole battery pack is “3.2\*2”=6.4v.

**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.

**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 takes more time;

‘**Standard start**’ start the motor at normal speed. It depends on motor’s quality and dynamic response.

‘**Fast start**’ will fast start the brushless motor, recommend to use it for racing.

**PWM rate:** **8KHz** is recommended for most brushless motors.

**12 KHz** is recommended for low inductance motors. (e.g. 8,10,12,14 poles brushless outrunner motors)

**16 KHz** is recommended for very low inductance motors. (e.g. 16,18,20,24 poles brushless outrunner motors)

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

**b.** High PWM rate is easier to make motor produce more heat. Cooling jacket for motor is very important, and please be more carefully to choose high PWM rate.

**c.** 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

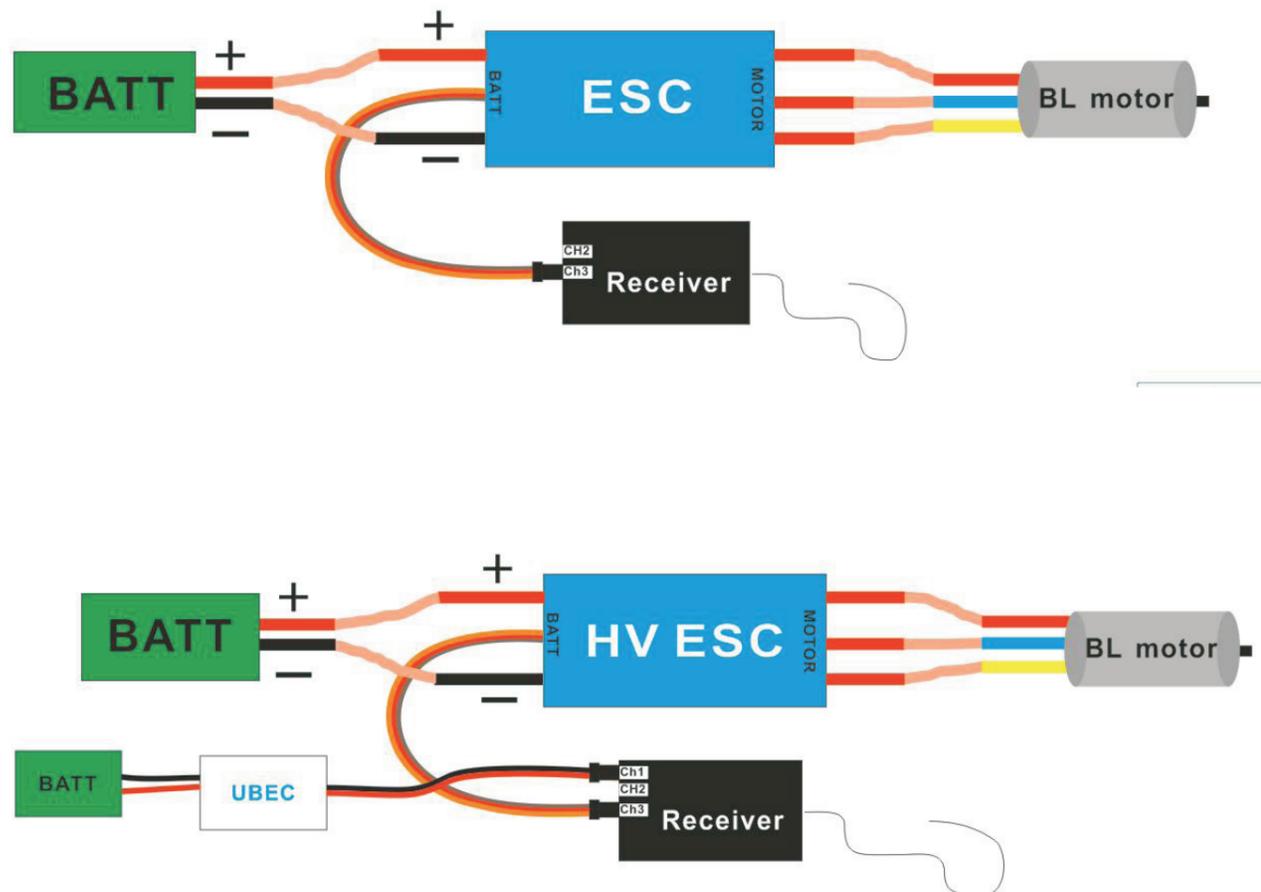
Please solder good quality connectors to ESC's motor wires and power wires before connect ESC to motor and battery.

Swap any two motor wires' connecting can change the rotation direction.

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.

When connect power wires to battery, it is **IMPORTANT** to correctly connect positive to positive, and negative to negative.

In order to prevent and reduce any signal disturbance generated by ESC hardware, please put the ESC far away from receiver.



### III B: Calibrate the Throttle Range of Transmitter

#### A. Board Transmitter

- **1. LV ESC:** Correctly connect the ESC with brushless motor, plug the receiver lead of ESC into the throttle channel of receiver (usually CH3);
- **2. HV ESC:** Switch 'OFF', connect ESC to motor, receiver, and battery;
- Put the throttle joystick to the forward top position (to set the max throttle), turn on the transmitter;
- **1. LV ESC:** Connect ESC to battery.
- **2. HV ESC:** Use UBEC or receiver battery to power the receiver, Switch 'ON' ;
- There are 3 beeps ♪♪♪ emitted from the motor, then 4 long beeps ♪♪♪♪.
- Move immediately the throttle stick to the '0' position you want to set after any one beep of the 4 long beeps, at this point, you have calibrated the throttle range of your transmitter;
- Waiting one second, there will be two beeps emitted from the motor
- Calibration of throttle is completed.

*Note: 1) Recommend the '0' position should not be set higher beyond the 50% of throttle range.  
2) Motor is needed to install for acoustic guide. Meanwhile, please keep the propeller away from human beings or any objects.*

#### B. Pistol Transmitter

- Correctly connect the ESC with brushless motor, plug the receiver lead of ESC into the throttle channel of receiver (usually CH2);
- Put the throttle to the forward full position, turn on the transmitter;
- Power on the ESC, there are 3 beeps ♪♪♪ emitted from the motor, then there are 4 long beeps ♪♪♪♪.
- Move the throttle stick to the neutral or reverse max immediately after any one beep of the 4 long beeps to set '0' throttle . Two beeps emitting out indicates calibrating is completed.
- Following two beeps are powering beeps, it is time to go now!

*Note: The Swordfish ESC cannot reverse, so throttle range must be calibrated from forward to neutral or forward to max reverse. If the throttle range were calibrated from reverse to neutral, the ESC would not work.*

**NOTE:** In the following situations, it is required to calibrate the throttle range of transmitter.

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

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

### ◆ III C: It's almost ready to run now!

- Set ESC's parameters. Do testing on test-bed and select appropriate parameters for the configuration.
- Assemble water-cooling tube, make it smooth, tight.
- Check battery's volts
- **1. LV ESC:** Connect the ESC to battery, the green LED on ESC will light for a second and then extinguish. And two beeps emitting out from motor while indicates to successfully detect the signal. It is time to go now.
- **2. HV ESC:** 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.

If the LVC of ESC is set in "Auto" detect Lipo cells, after the two power beeps the ESC will beep the number of Lipo cells WHILE the red LED blink.

**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.

## IV Program the ESCs by Soft on PC

**Swordfish** ESC supports to be fully programmed the parameters by 'Swordfish Program soft' on PC, 'Hifei Program box', and 'Swordfish small Prog-card'.

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

Please read the following instructions before programming.

### ◆ IV A: Install 'Swordfish Program' Software to PC

#### A-a: Computer Operation System requirements

- A. Personal computer with Windows 2000/ XP/ Vista/7 operation system.
- B. CD-ROM drive (or access to Internet)
- C. Available USB port
- D. 8 Megabytes hard disk space
- E. Computer screen resolution with 800X600, 1024X768(recommended), 1280X1024

#### A-b: Hardware

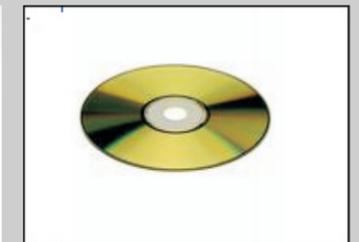
The hardware include **Swordfish ESC**, **USB Linker** (sold separately), **a set-up CD** (free to supply).



**Swordfish ESC**



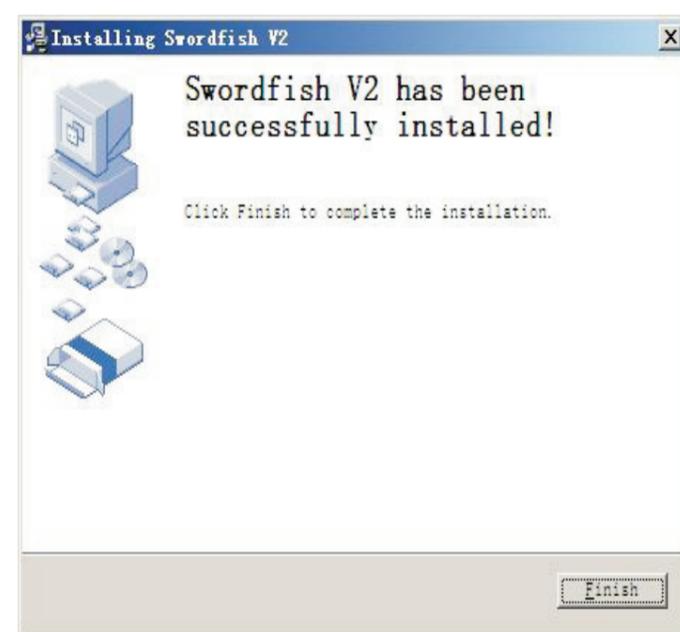
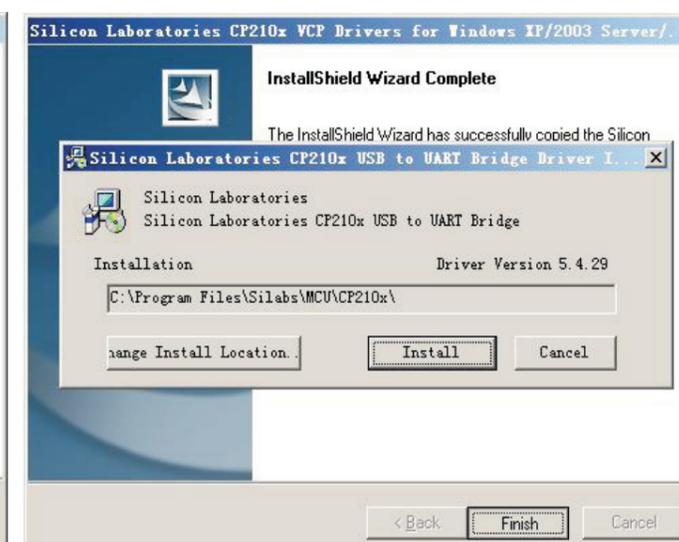
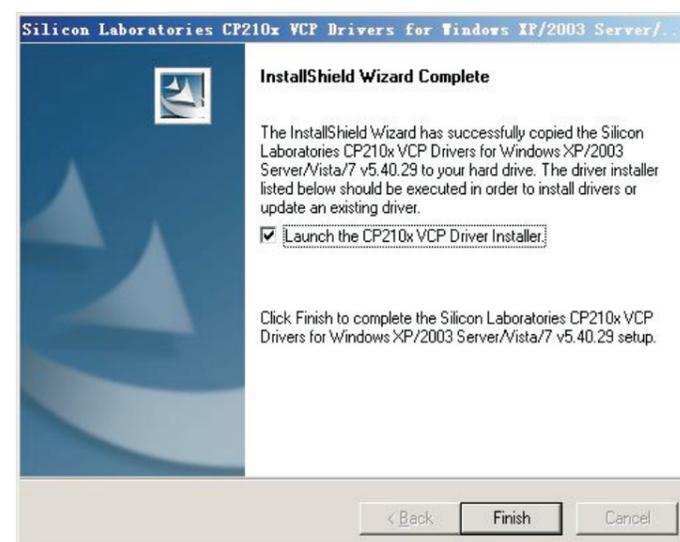
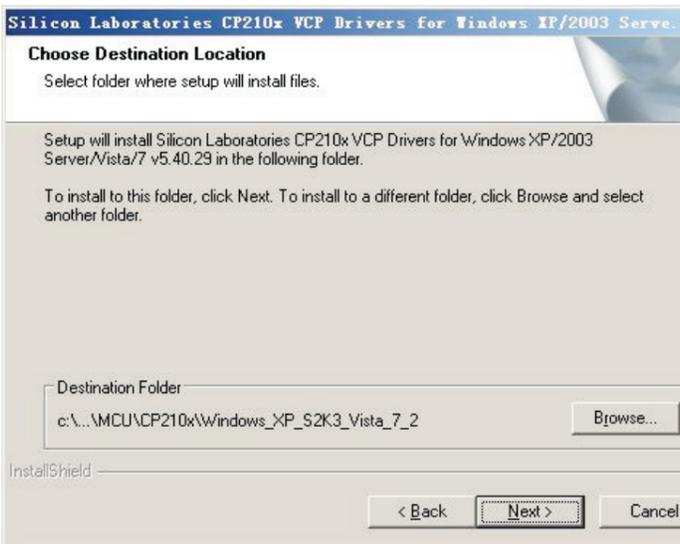
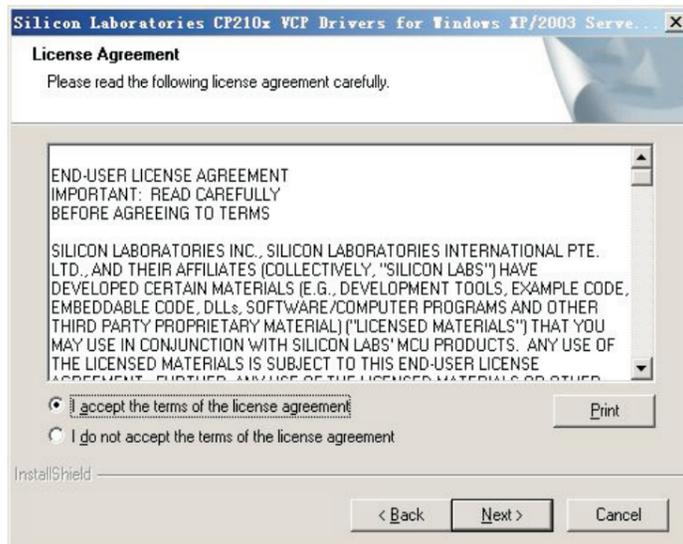
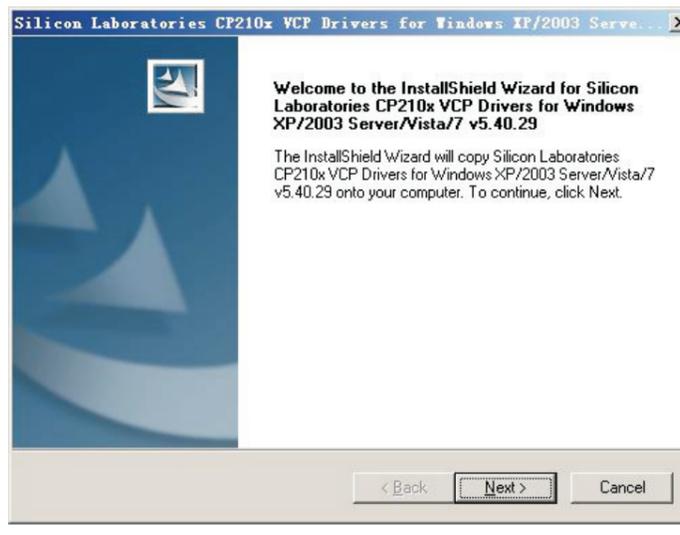
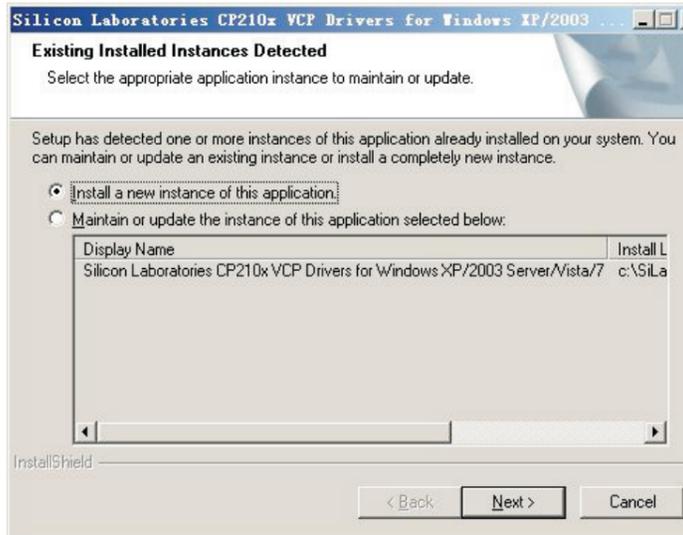
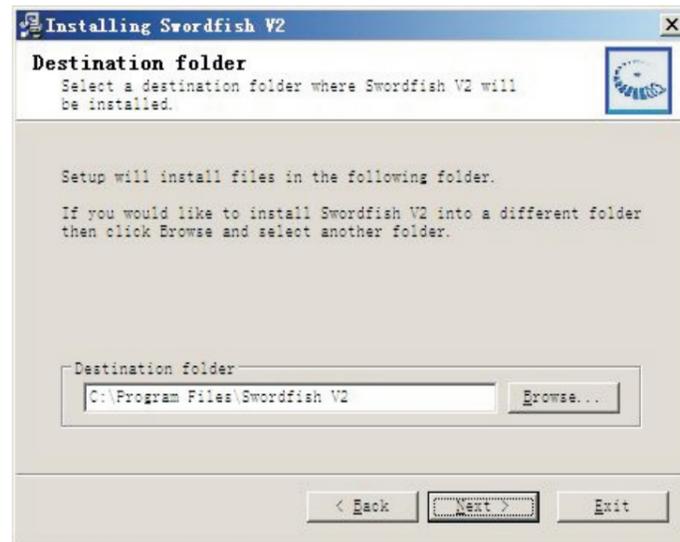
**USB Linker**



**Set-up soft**

**A-c: STEPS to install the soft**

- Insert the CD in the CD driver of the computer.
- Double click the 'Swordfish ESC setup. exe'.

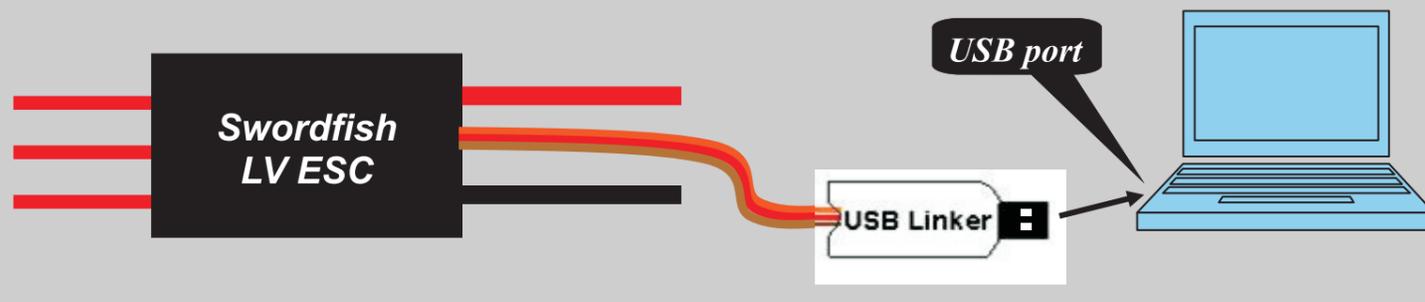


— After click the 'Finish' button, the shortcutting icon  "Swordfish Program V2" and icon of  "Upgrade" will be automatically saved on computer desktop.

◆ **IV B: Connect 'Swordfish ESC' to PC**

**B-a: Connect Swordfish low voltage ESC to PC**

Correctly connect the ESC's receiver lead to USB Linker, and plug the USB Linker to one of computer's USB ports. *(Please DO NOT connect ESC to battery and motor)*

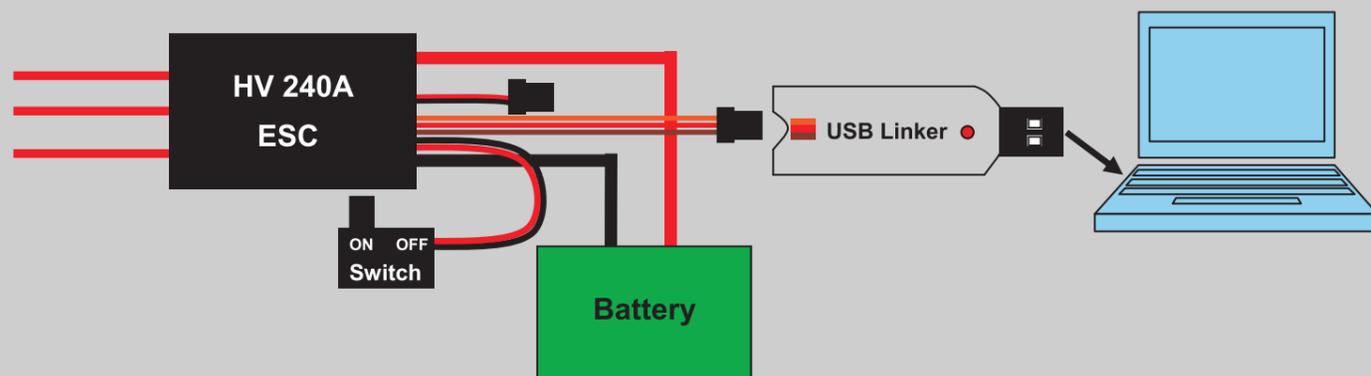


**B-b: Connect Swordfish high voltage 240A ESC to PC**

Because Swordfish HV 240A ESC has no built-in BEC, it need to connect the ESC to battery pack or an auxiliary 'Y Cables' to correctly connect ESC to USB linker while not connect ESC to battery. Please refer to following two wiring diagrams and select the either method to correctly connect the ESC to PC.

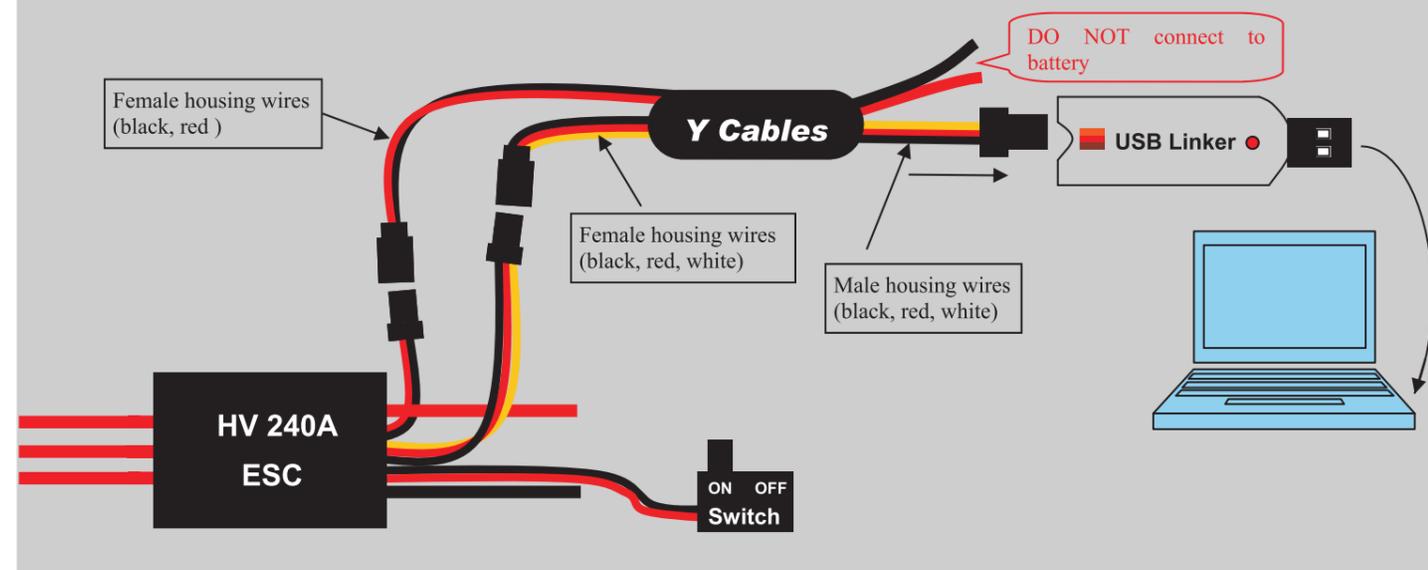
Connecting diagram 1:

- Check and switch 'OFF' the switch of ESC
- Correctly connect the receiver lead of ESC to USB Linker, plug USB Linker into one of USB Ports on PC;
- Connect ESC to battery;
- Switch 'ON' the switch, the green LED on ESC will light.



Connecting diagram 2:

- Check and switch 'OFF' the switch of ESC
- Correctly connect ESC's receiver lead to Y Cables' Female housing wires (black, red, white), and connect the ESC's two small wires (red, black) to Y Cables' Female housing wires (red, black), connect the Y Cables' Male housing wires correctly to USB Linker.
- Plug USB Linker into one of USB Ports on PC.
- Switch 'ON' the switch of ESC. The green LED on ESC will light.



**NOTE: a.** When the ESC is successfully connected to computer, the red LED on USB Linker will light, and the green LED on ESC will light on.

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.

**b.** The "Y Cables" is always attached and packed with the HV ESC, and it is free.

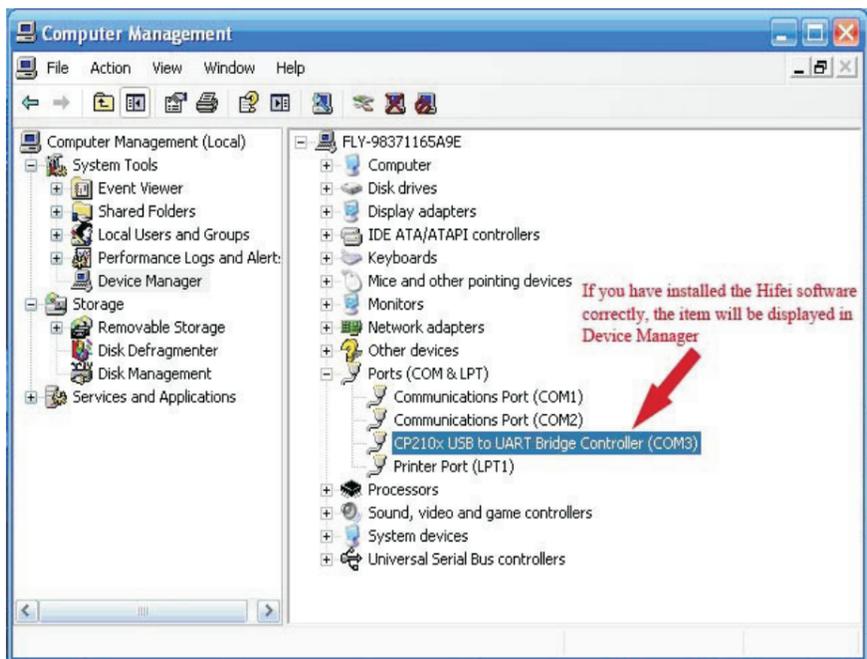
◆ **IV C: Open the software to program the ESC**

**C-a: Check 'com port' before open the software**

When successfully connect the ESC to PC, the computer will automatically recognize a 'com port' as the communicating bridge between ESC to computer. Please first check the correct 'com port' recognized on your PC :

**Right click the mouse the icon 'My Computer' → Manage → Device Manager → Ports(Com & LPT).** The 'com port' number after "CP210×USB to UART Bridge Controller" is the right port.

The com port is generally 'com 3' or 'com 4,' but there are different 'com port' on different computers. You can find the accurate com port on your computer in this way:



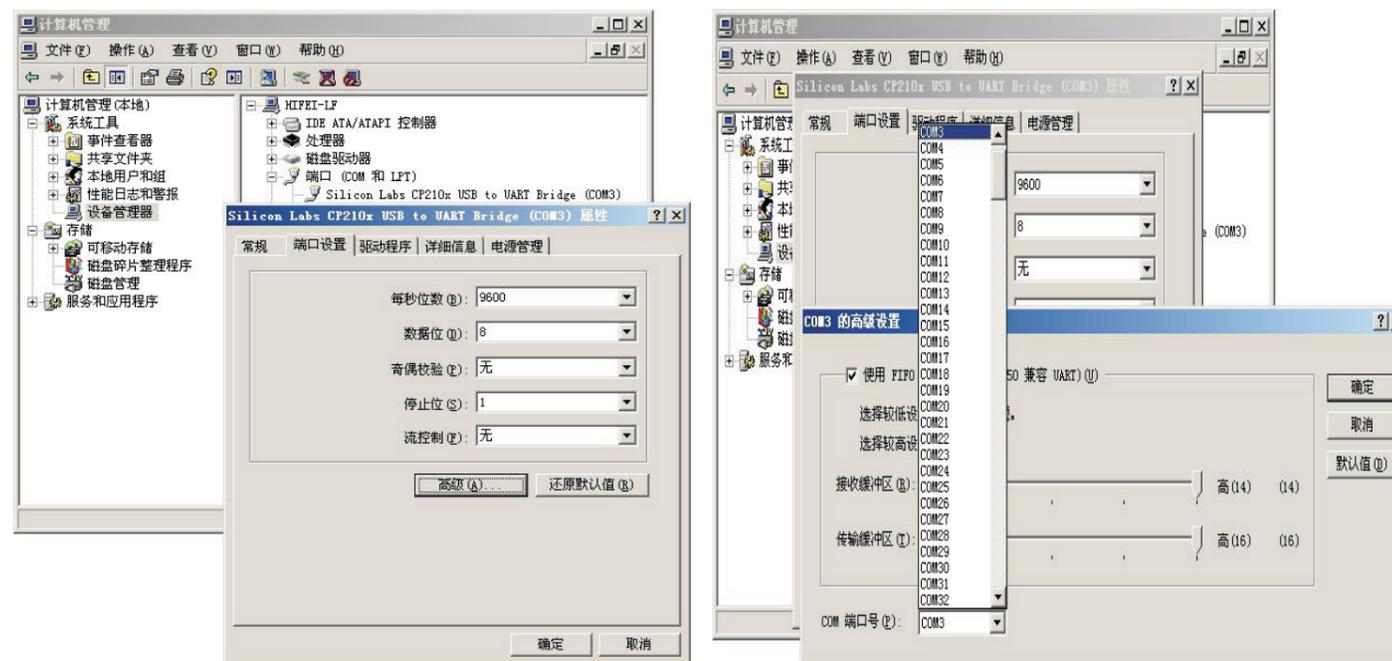
**C-b: How to change the 'COM port' number and make it to be accessible**

The valid COM port number options which are supplied in the Program soft for choice are COM 1, COM 2, COM 3, COM 4. When you check the COM port and find the COM port number recognized on your computer is COM 7(for example). In this situation, it is needed to change the 'COM 7' into one of the valid COM port numbers. You can change the COM number in this way:

— Single right click mouse 'Silicon Labs CP210XUSB to UART Bridge' and choose 'Attribute'.



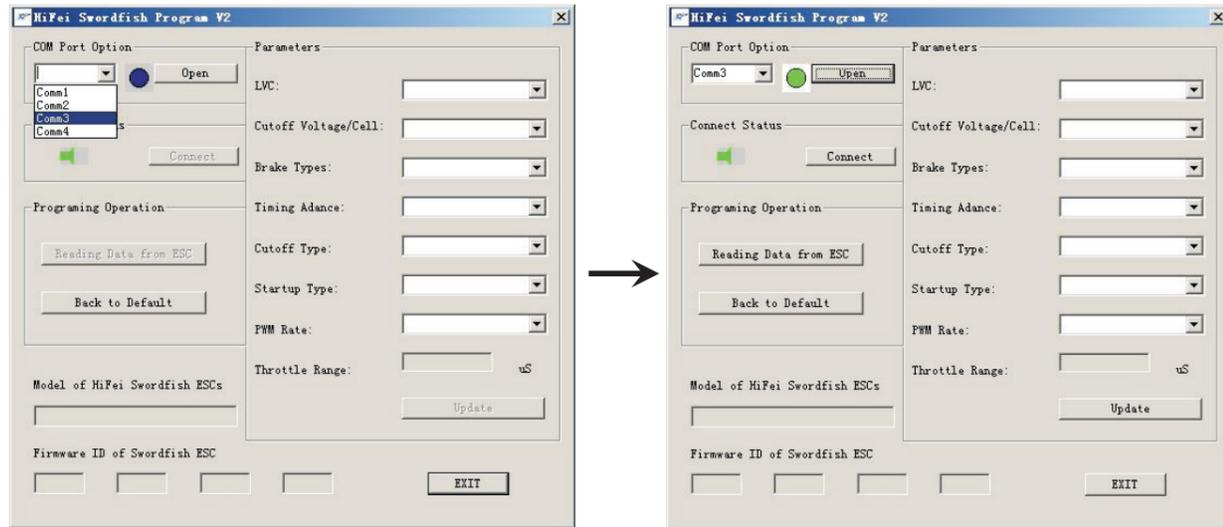
— Choose 'COM port' setting, select 'Advance', and set the 'COM port', and save the modification.



### C-c: Program the ESC

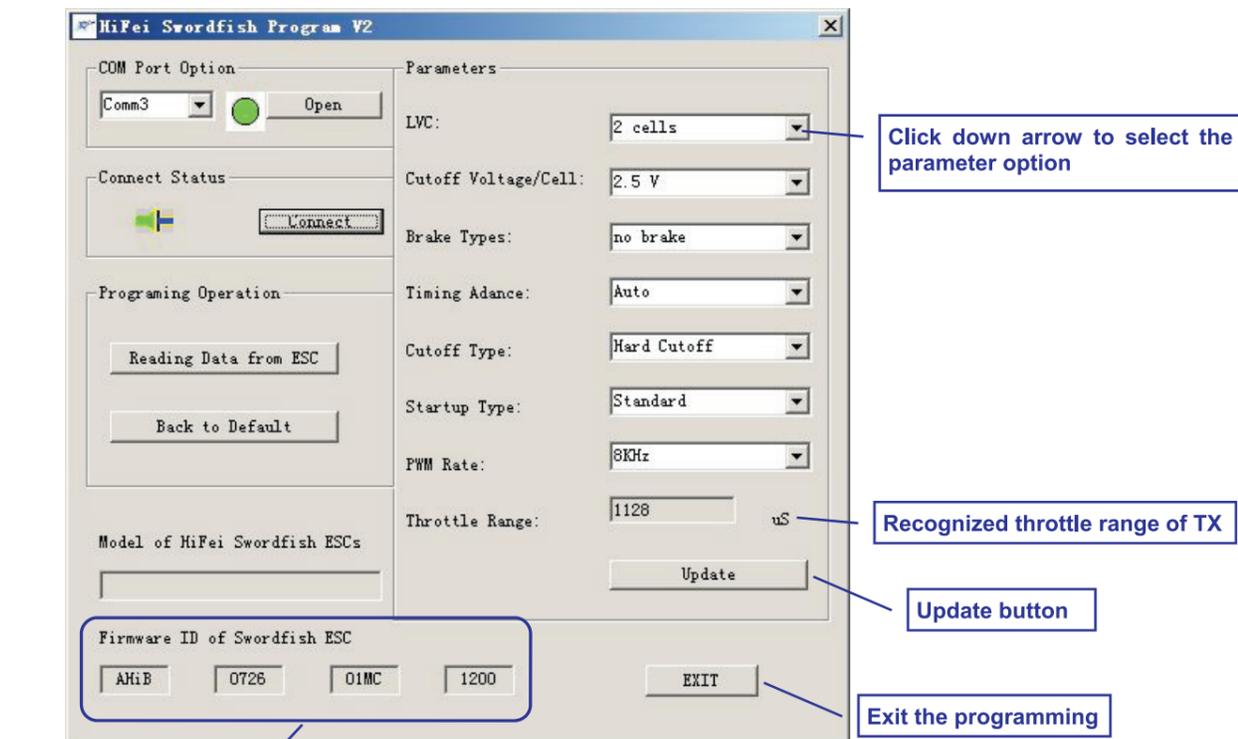
— Double left click mouse the icon  **'Swordfish Program'** on desktop

— Select the **'COM Port'** by clicking down arrow and input the right one. Click **'Open'** button, the light will become green. (see the picture 1)



Picture 1

— Click **'Connect'**, the soft will read out the ESC's present parameters. (see the picture 2)



Version No. of ESC

Picture 2

— Click down arrow to select the parameter options you would like to set, and click **'Update'** to save modifications.

— Click **'Exit'** to exit the Program soft and finish the programming.

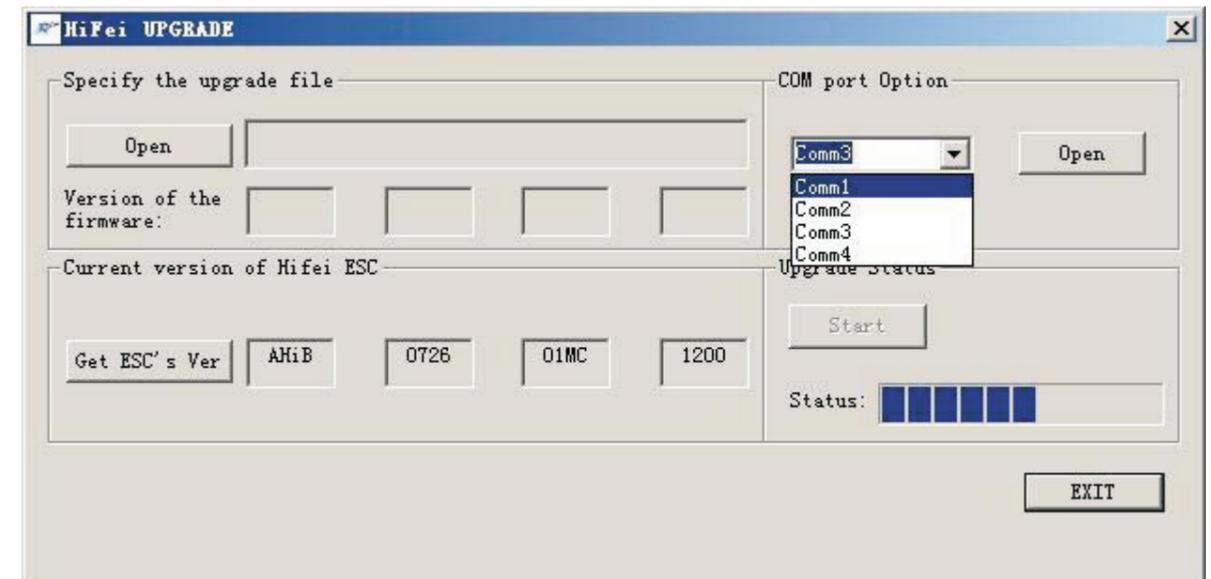
### ◆ IVD: Upgrade ESC's firmware

Swordfish series controllers' firmware can be upgraded by soft on PC. When manufacturer release a new version firmware, it is much easier to upgrade your Swordfish ESC through Internet in quite short time.

When install the soft on PC, the software for upgrading is installed meanwhile, and the shortcut icon is saved on desktop.

— Double left click mouse the icon  **'Upgrade'** on desktop

— First select the **'COM Port'** by clicking down arrow and input the right one. Click **'Open'** button on the right.



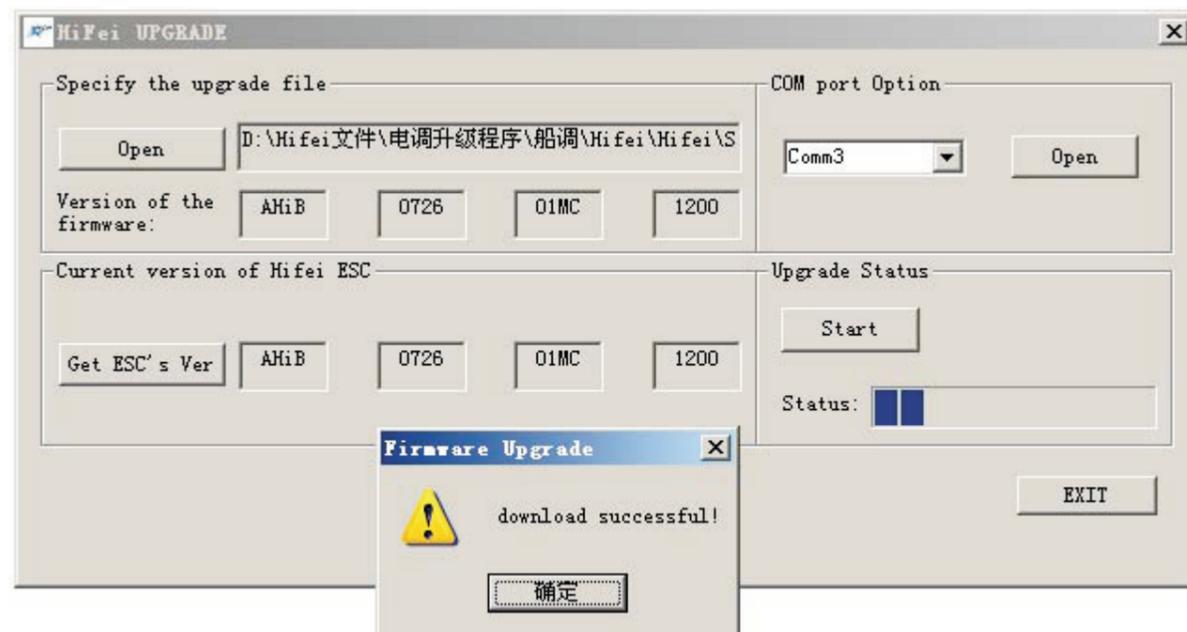
— If com port is right, the ESC is correctly connected to PC. The **'Get ESC's Ver'** button would highlight and can be clicked.

— Click 'Get ESC's Ver' to read out the current version number of ESC.

— Click 'Open' at upper left to find out the new version firmware for upgrading into.



— Click 'Start' to begin the upgrading. The process would be completed in 10 seconds.



**NOTE:** a. Please read the instructions of Hifei Program box and Swordfish prog-card before programming the ESC.

b. Because the Swordfish prog-card is small, so it cannot set the cut-off voltage of per Lipo cell, It is suggested to own either 'USB Linker' and 'Program box' to set this parameter when you have a prog-card.

## IV Trouble shooting

Trouble	Possible reason	Shoot methods
When connect ESC to battery, there is no two power beeps emitted from brushless motor.	<ol style="list-style-type: none"> <li>The battery voltage exceeds the range of ESC's working voltage. May it is too low or too high.</li> <li>Motor is damaged, or the ESC is not well connected with motor.</li> </ol>	<ol style="list-style-type: none"> <li>Check battery's voltage and change suitable battery pack.</li> <li>Check the connectors, ensure ESC is tightly connected with motor. Check motor whether it is good.</li> </ol>
Motor shut down suddenly even at full throttle or when not decrease the throttle.	<ol style="list-style-type: none"> <li>Battery voltage discharge and drop down to the set low cut-off voltage, the ESC cut-off output to motor to protect the battery.</li> <li>Temperature protection</li> </ol>	<ol style="list-style-type: none"> <li>Please stop the running and change a new battery pack.</li> <li>Stop running for a while until the ESC's temperature decrease and recover to be normal.</li> </ol>
When connect ESC to PC according to the instructions, it still cannot connect the ESC to PC succellful for programming.	<ol style="list-style-type: none"> <li>There is loose between USB Linker to 'USB port' of PC.</li> <li>The com port is not correct.</li> <li>ESC's receiver lead to USB Linker is wrongly connected.</li> </ol>	<ol style="list-style-type: none"> <li>Plug out the USB Linker from the PC, and re-plug it in.</li> <li>Check the correct com port.</li> <li>Check the connecting polarity between ESC to USB Linker.</li> </ol>

# Warranty Form

Please fill out the following **Service-Request form** as true and send it with the returned ESC or send it in pdf. format into [techservice.hifei@gmail.com](mailto:techservice.hifei@gmail.com). We will keep you informed about the inspection result as soon as possible after carefully checking. Please confirm and keep your email address correct. We sincerely appreciate for your support.

Those with asterisk \* behind are required.

ESC Model \*: \_\_\_\_\_ Purchase Date\*: \_\_\_\_\_

Contact person: \_\_\_\_\_ E-mail: \_\_\_\_\_

## Usage Info:\*

Electric Model Name *:		Other:	
Battery*	Lithum-Polymer	NiCad or NiMH	Other
	_____(cells)	_____(cells)	
Motor*	Name:		
	Magnetic poles:		KV:
Propeller*	_____ (inch)		
Gearbox			

## Detail description of problems\*

--