

Thanks for purchasing **Turnigy® AQUASTAR ESC** speed controllers. **Turnigy® AQUASTAR 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 use.

Warnings

- Strongly **recommend** to calibrate the throttle range of transmitter when you first use the controller or when using a new/different transmitter or receiver.
- When connecting the ESC to battery pack, please ensure the polarity is correct. Incorrect polarity may cause permanent damage to the ESC and such damage is not covered by manufacturer's WARRANTY.
- When you use the ESC, turn on the transmitter BEFORE powering on the receiver.
- When you finish the running, power off the receiver BEFORE turning off the transmitter.
- Changing the PWM may cause the motor to heat ahead of time.
- 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.
- If you do not use the BEC function of the ESC and are using a separate receiver pack or UBEC to power receiver and servos instead, please disconnect the red wire from the ESC's receiver lead.
- The controller will automatically power off the motor if the battery voltage drops below the programmed cut-off voltage (factory preset at '6.0V').

I ESC Features

- Microprocessor controlled, extremely low resistance
- Water-proof PCB, and aluminum water-cool thermal dissipation
- Full protection soft, include signal lose protection, temperature protection, motor block-up protection.
- Fully program by software on computer, or by **Turnigy**® LCD program box, or by TX stick
- The firmware of the ESC is upgradeable from Internet as the new version of the software becomes available.
- Compatible to use with both general board transmitters and pistol transmitters with programmable brake setting for any competitions.

II Specifications

Models	90A	120A
Voltage	2~6 cells Lithium-Polymer OR 6~20cells NiCad/NiMH	2~6 cells Lithium-Polymer OR 6~20cells NiCad/NiMH
Current/max	90amp continuous/110 amp surge	120amp continuous/150amp surge
BEC	5V, 3.5A switching BEC, max 4A	5V, 3.5A switching BEC, max 4A
Dimensions	90mmx36mmx20mm	90mmx36mmx20mm
Weight	97g (excl. cables)	100g (excl. cables)

III Using the ESC

Connect ESC to motor, receiver and battery

- Please solder good quality golden bullet connectors to the wires of brushless motor and the three motor wires of ESC. Connect the ESC 's three motor wires to the brushless motor, swapping any of the two motor wires connection can change the motor's rotating direction.

- The quality and discharging capability of battery pack will influence the efficiency and rpm of motor. Please solder high conductive T connectors to the battery's (+) and (-)wires.

- Plug the receiver lead (small color wires)of ESC to the receiver (Usually Ch 2).

Calibrate the throttle range of transmitter *(Recommend)*

A. Board Style transmitter calibration

- Correctly connect the ESC with brushless motor, plug the receiver lead of ESC into receiver (usually into Channel 2);
- Put the throttle to the forward top position, turn on the transmitter;
- Power on the receiver, ESC and motor. There are 3 beeps emitted from the motor, which indicates all electronics are correctly power on for the setting.
- Then there are 4 long beeps emitted from the motor ♪♪♪♪ .
- During or after the 4 long beeps , move the throttle stick to the ‘0’ position you want to set, 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%.

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

B. Pistol style transmitter calibration

- Correctly connect the ESC with brushless motor, plug the receiver lead of ESC into receiver (usually into Channel 2);
- Put the throttle to the forward full position, turn on the transmitter;
- Power on the ESC, there are 3 beeps emitted from the motor, which indicates all electronics are correctly power on for the setting.
- Then there are 4 long beeps emitted from the motor ♪♪♪♪ .
- During or after the 4 long beeps , move the throttle to the neutral position. Two beeps ♪ ♪ emitting out indicates calibrating is completed.
- Following two beeps are powering beeps, it is time to go now!

Program the ESC

The **Turnigy**® Aquastar ESC programmable settings

LVC	Auto*	5.0V	6.0V (2 Lipo)	7.2V	8.4V	9.0V (3 Lipo)	12.0V (4 Lipo)	15.0V (5 Lipo)	18.0V (6 Lipo)
Brake Type	Close *	Soft brake							
Timing Advance	Low	Middle	High	Auto *					
Cutoff Type	Hard cutoff *	Soft cutoff							
Startup Type	Soft start	Standard *	Fast start						
PWM Rate	8KHz *	12KHz	16KHz						
Throttle Range	640 uS								

*Note: 1. Parameters with asterisk * behind is the default settings of ESC. LVC Is preset In ‘6.0V’ In factory.*

2. The throttle range can be read on PC after installing ‘Turnigy® Aquastar ESC’ software. It is Auto changed after calibrating the throttle range of transmitters.

3. When use Lipo-Polymer battery pack, please carefully set the LVC to efficiently protect the battery against discharging.

A. Program by TX stick

Turnigy[®] ESC support to fully program by TX stick, please refer to the setting diagram in the last page.

B. Program by **Turnigy**[®] LCD Program box

Program box is auto identify the ESC model and clearly display the corresponding programmable parameters in LCD. It is pocket size and conveniently take to use at fields. Please read the instructions of Program box to correctly set the **Turnigy**[®] ESC.

C. Program by software '**Turnigy**[®] Aquastar ESC' on PC.

The set-up software of '**Turnigy**[®] Program' is recorded in a CD and always attached with each **Turnigy**[®] ESC. You must install the software on PC. Please refer to the **IV** sections.

It Is ready to go now!

- After changing the ESC's parameters, It Is suggested to firstly have a test on the testbed before assembling It to hull so that to choose appropriate settings for the matched power configuration. *Please always keep the prop far away from human and objects In testing.*

- Reconnect the ESC to battery, the green LED on ESC will light for a second. And two beeps emitting out from motor while Indicates to successfully detect the signal. Then It Is time to go now.

NOTE: If the LVC of ESC Is set In "Auto", after the two beeps there will follow beeps to detect the Lipo cells while the red LED flashing.

IV Installing Software to PC

- System requirement**

- A. Personal Computer with WINDOWS 2000 or WINDOWS XP operation system
- B. CD-ROM drive (or access to Internet)
- C. USB port available
- D. 4 Megabytes hard disk space
- E. Computer screen resolution with 800×600, 1024×768 (*Recommend*), 1280×1024.

- Hardware**

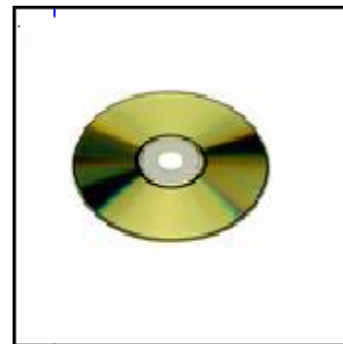
The hardware include a **Turnigy**® boat ESC, USB Linker, Set-up CD.



ESC 90A/120A



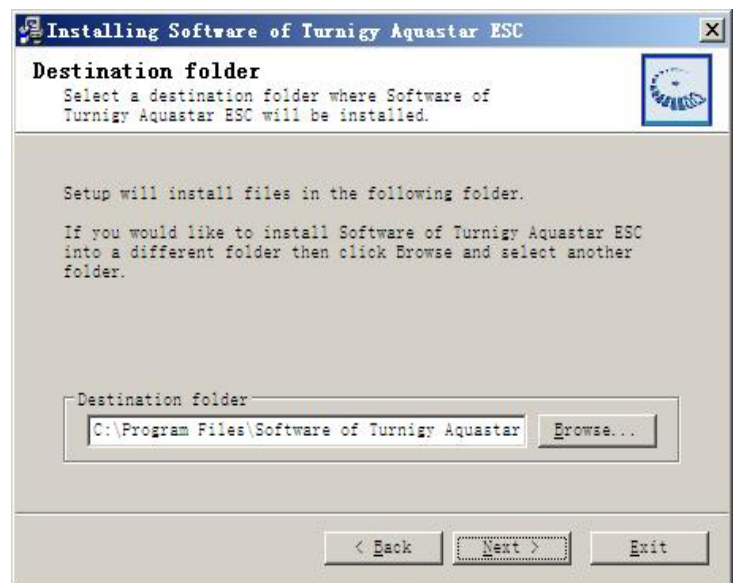
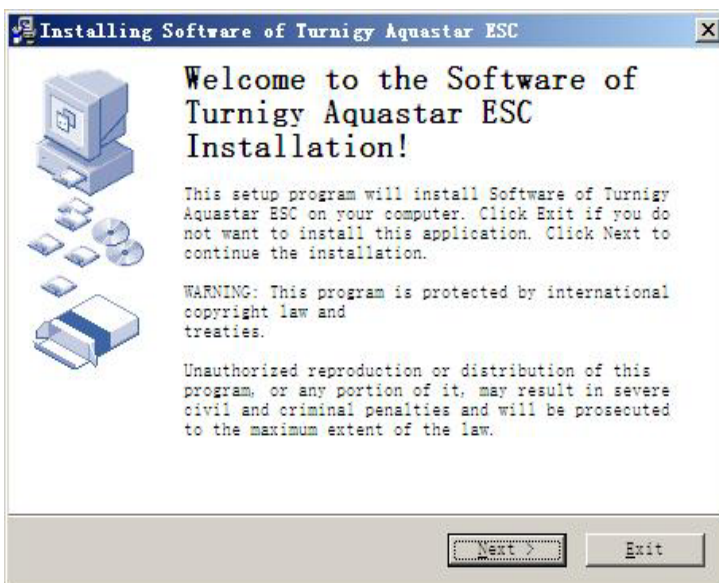
USB Linker

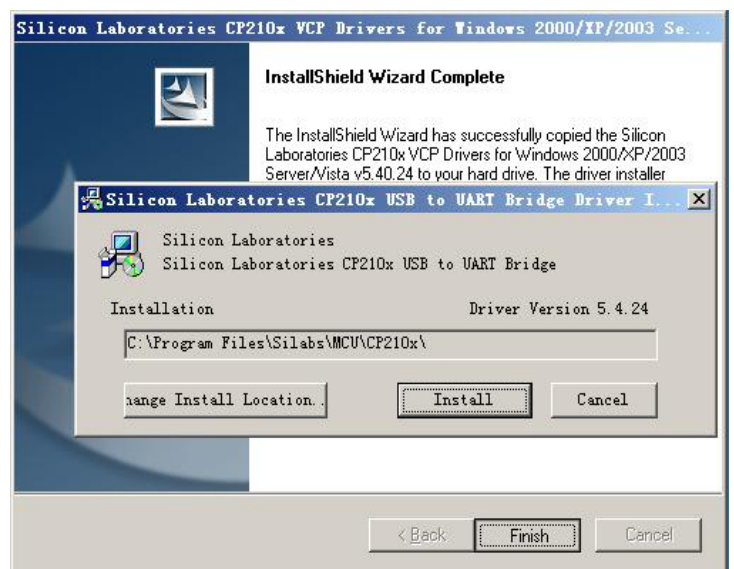
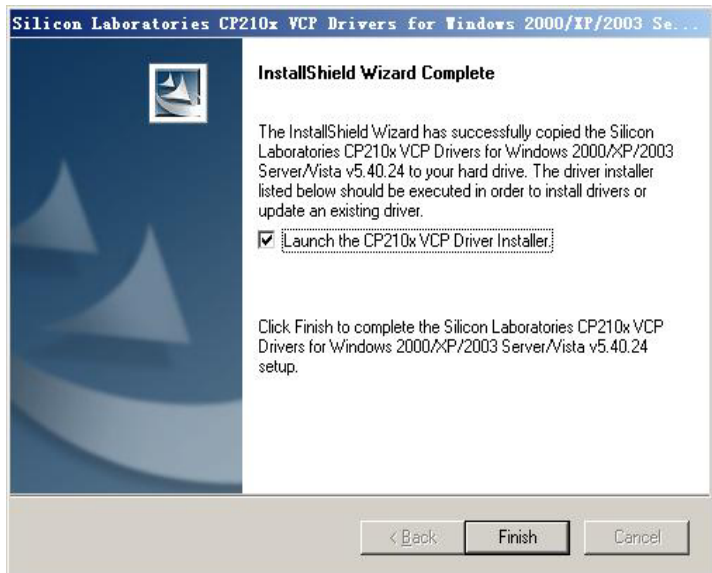
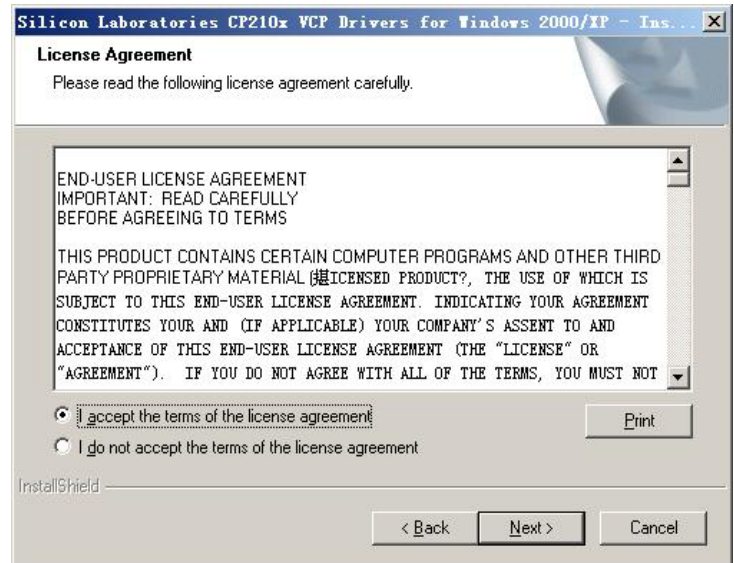
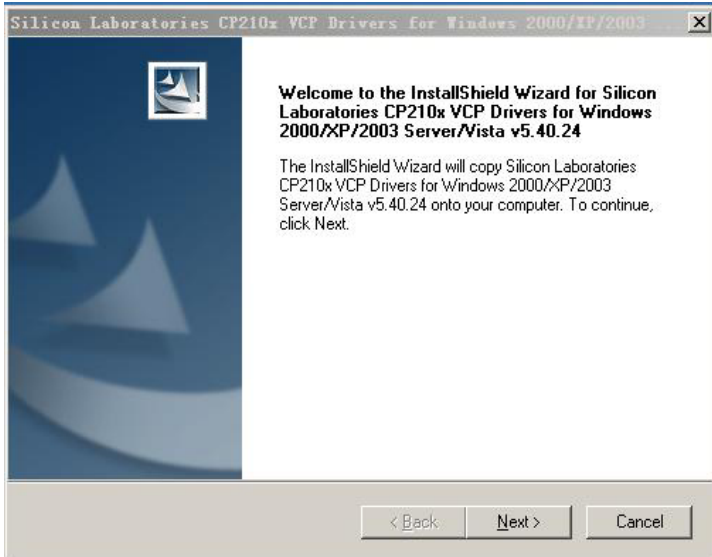



Set-up CD

STEPS to install the soft:

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





- After click the **'finish'** button , there will be an icon  **'Turnigy Aquastar ESC'** on computer desktop.
- (Meanwhile the soft will be automatically saved into **'Start' → 'Programs'**.)
- Installation complete.

Program the ESC

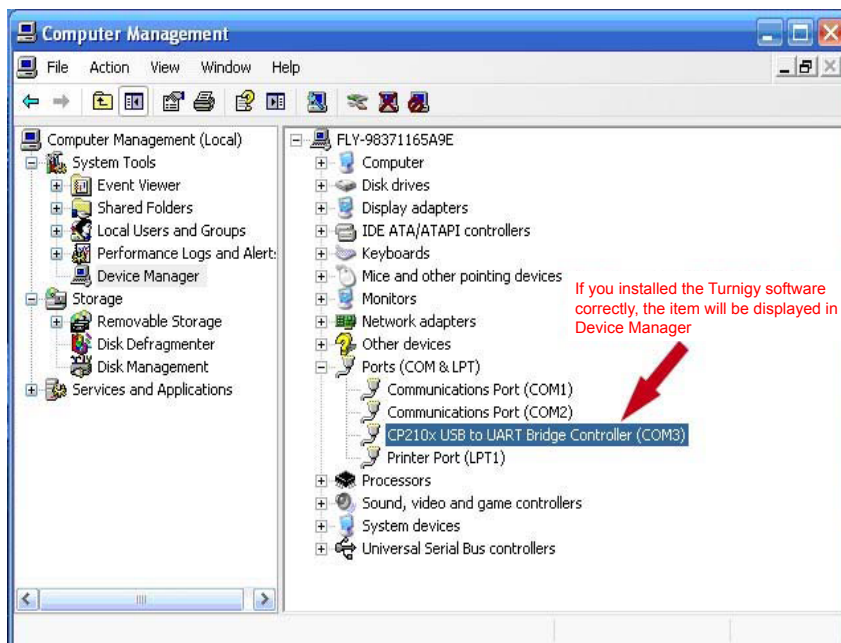
▶ Please refer to the label of USB Linker and correctly connect the receiver lead of ESC to USB Linker.

▶ Connect the USB Linker to one of the available USB ports of PC. A little red LED on USB Linker will light up. The green LED on the controller would light up while connecting is successful other wise not.

NOTE: *Never plug the USB Linker to USB port of PC BEFORE installation of software is successfully completed.*

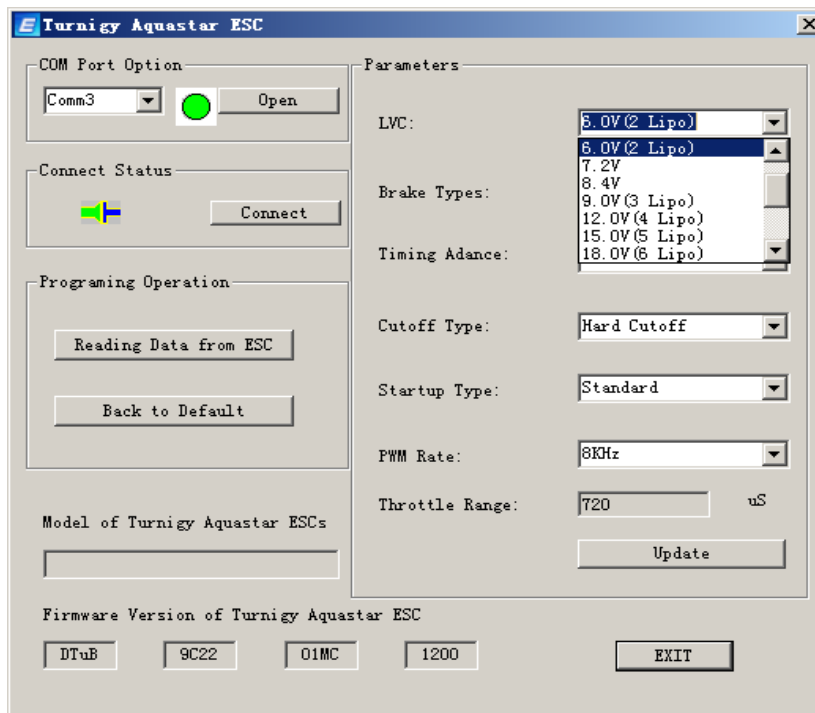
▶ When successfully connect to PC, the computer will automatically recognize a ‘com port’ as the name “CP210×USB to UART Bridge Controller”, please find the correct ‘com port’ number on you PC in this way.

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: **Click the right button of mouse the icon ‘My Computer’ → Manage → Device Manager → Ports (Com & LPT)**. The ‘com port’ after “CP210 × USB to UART Bridge Controller” is the right one.



Note: *If you cannot find such kind of ‘com port’ in the ‘Device Manager’, please check whether the connection of ESC to USB Linker is correct and ensure they are tightly connected without any loose. If they are both right, the problem is probably that the software has not been successfully installed on your PC. Please Install the soft again.*

- ▶ Open the software by double left clicking the icon ‘Turnigy Aquastar ESC’ on desktop.
OR open the software in ‘Start’ → ‘Programs’ → ‘Turnigy Aquastar ESC’
- ▶ Select the com port by clicking the menu of ‘Port Num’ and input the right one.
- ▶ Click ‘Open’, then click ‘Connect’. The current settings of ESC will be displayed.
- ▶ Single left click the down arrow to choose the parameter you want to set.

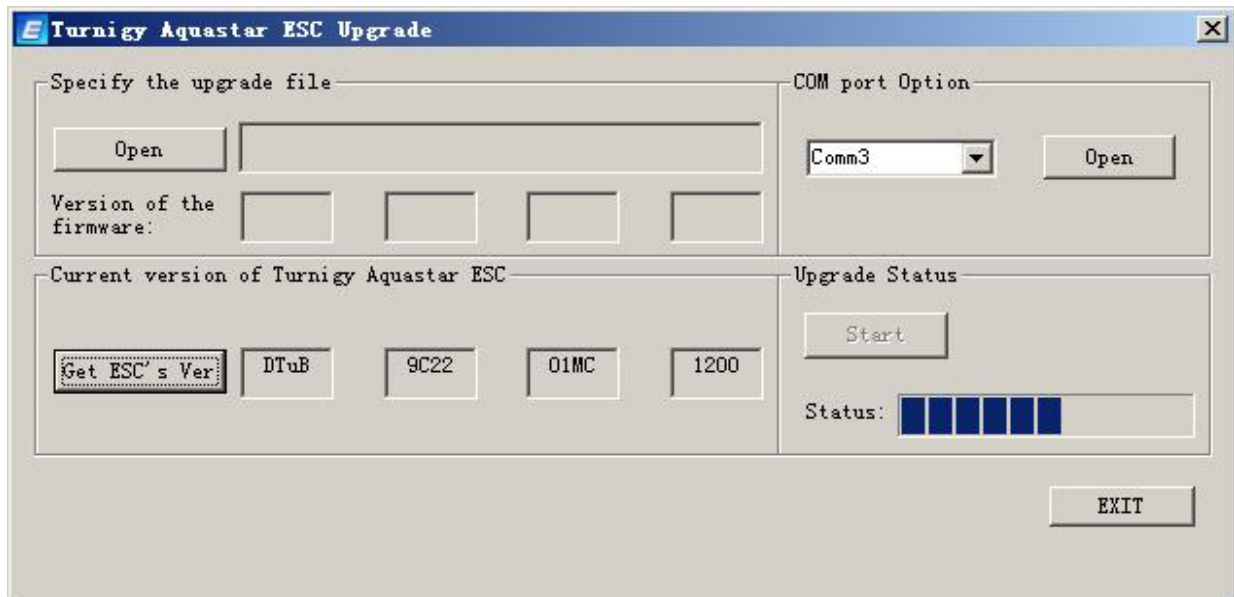


- ▶ Click the ‘Update’ button to save the modification.

NOTE : Please set the parameters always after current parameters of ESC is displayed in window and according to the instructing turn, otherwise programming of ESC will be defeated and ESC will still keep the parameters set in last time.

Upgrade the firmware of ESC

- Click ‘Start’ to get into ‘Programs’
- Choose and click ‘Turnigy ESC for Boat’, and click ‘Turnigy Aquastar ESC Upgrade’
- Input the correct ‘Com port’, click ‘Open’ button.
- Single left click ‘Get ESC’s Ver’ to read out the version number of the ESC.



- Single left click **'Open'** to open the latest upgradeable firmware, which can be downloaded from website once a new one is released.

- Click **'Start'** to upgrade the firmware of ESC to the latest, it will be completed in 3-5 seconds.

Turnigy® Aquastar ESC settings' features

- Low Cut-off Voltage

Option 1:Auto Lipo	Auto Lipo Cells Detecting
Option2:6.0V(default)	6-8 cell NiCad or NiMH packs, or 2 cell Lithium packs
Option 3:7.2V	8 cell NiCad or NiMH packs, or 2 cell Lithium packs
Option 4:8.4V	9 cell NiCad or NiMH packs
Option 5:9.0V	10 cell NiCad or NiMH packs, or 3 cell Lithium packs
Option 6:12.0V	4 Lipo cells
Option 7:15.0V	5 Lipo cells
Option 8:18.0v	6 Lipo cells

NOTE: Low Cut-off Voltage can protect the main battery from being discharged too low, and provide the normal operating voltage to receiver and servos.

- Brake Type

Option 1:Brake disabled (default)	Brake disabled is mainly used for helicopters.
Option 2:Soft brake	Soft brake provides 50% of full braking power.
Option 3:Hard brake	Hard brake is 70% braking power. Direct drive applications where more braking power is required. Hard brake should only be used below 12V.

- Timing Advance

Option 1: Low advance timing 0°~15°	Recommended for more lower pole count motors. Gives more power and slightly less efficient.
Option 2: middle advance timing 5 °~ 20 °	Recommended for most motors .Gives a good balance of power and efficiency.
Option 3: High advance timing 15° ~ 30 °	Recommended for most of higher pole count motors
Option4:Auto(default)	Recommended for most of all brushless motors.

- Cutoff Type

Option 1 :Hard cutoff (default)	When battery voltage reaches cut-off voltage the motor will shutdown immediately. Motor can be restarted by closing the throttle to the lowest position and then move the throttle as normal
Option 2: Soft cutoff	When battery voltage reaches cut-off voltage, the ESC will slowly reduce motor power to zero, you will notice a decrease in power and it is time to land, the throttle maintains its full linear response.

NOTE: Soft cutoff is always automatically active in Governor Mode.

- Start Type

Option 1: soft start	Very soft and smoothly start the motor, it will takes more time
Option 2:standard start (default)	Start the motor at normal speed
Option 3: Fast start	Fast star up, recommended to use it for racing.

- PWM Switching Rate

Option 1:8KHz(default)	Recommended for most brushless motors
Option 2: 12KHz	Recommended for low inductance motors
Option 3: 16KHz	Recommended for very low inductance motors

Note: we strongly recommend only the experienced modeler could change this setting.

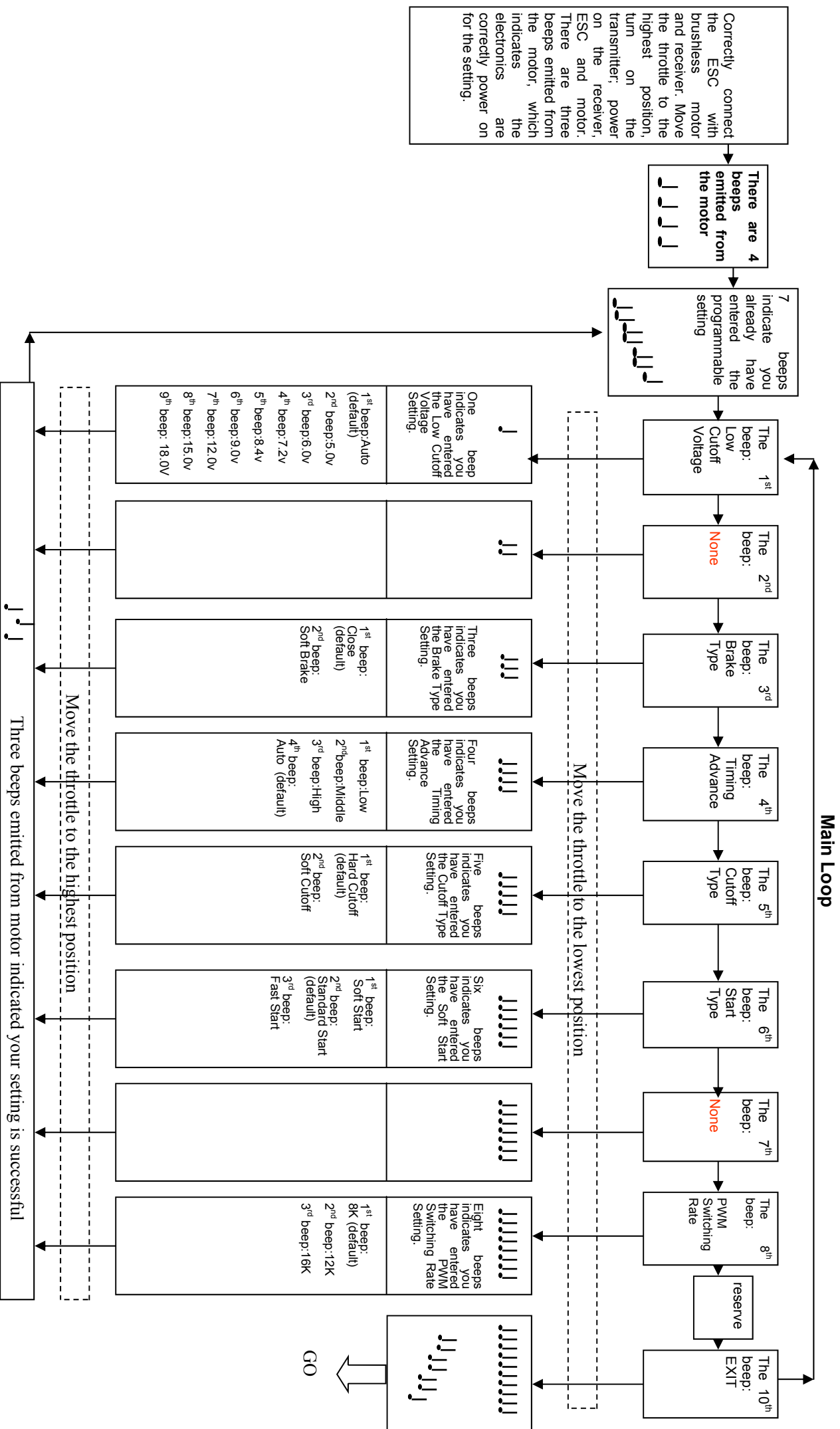


Figure. 1 : Operational Flowchart for Programming the ESC with Throttle