電子變速器（ESC）說明書

感謝您購買泰世科技模型有限公司的產品！無刷動力系統功率強大，錯誤的使用可能造成人身傷害和設備損壞。

爲此我們強烈建議您在使用設備前仔細閱讀本說明書，並嚴格遵守規定的操作程式。我們不承擔因使用本產品而引起的任何責任，包括但不限於對附帶損失或間接損失的賠償責任；同時，我們不承擔因擅自對產品進行修改所引起的任何責任。

我們有權在不經通知的情況下變更產品設計、外觀、性能及使用要求。

產品特色：

- 採用超低阻抗 PCB（印刷線路板），具有極強的耐電流能力。
- 電源輸入端採用日本名牌超低阻抗大容量電容，大大提升電源穩定性，同時對電池具有保護作用。
- 具備輸入電壓異常/電池低電壓保護/過熱保護/油門信號丟失保護等多重保護功能，有效延長電變使用壽命。
- 具有普通啓動/柔和啓動/超柔和啓動三種啓動模式，相容固定翼飛機及直升機。
- 可設定油門行程，相容市面上所有遙控器。具備平滑、細膩的手感，一流的變速線性。
- 微處理器採用獨立的穩壓 IC 供電，而不是從 BEC 輸出取電，具有更好的抗干擾能力，大大降低失控的可能性。
- 最高轉速可以達到 210000 RPM（2 極馬達）、70000 RPM（6 極馬達）、35000 RPM（12 極馬達） 。
- 可配合編程設定卡（注：選配件）使用，編程卡具有簡單直觀的介面，便於您隨時隨地修改各項編程參數。（詳見設定卡說明書）
- 配合編程設定卡，您可以從 15 首樂曲中任選一首寫入電子變速器，使電變具有開機奏樂功能，炫出您的個性。

電機電子變速器產品規格：

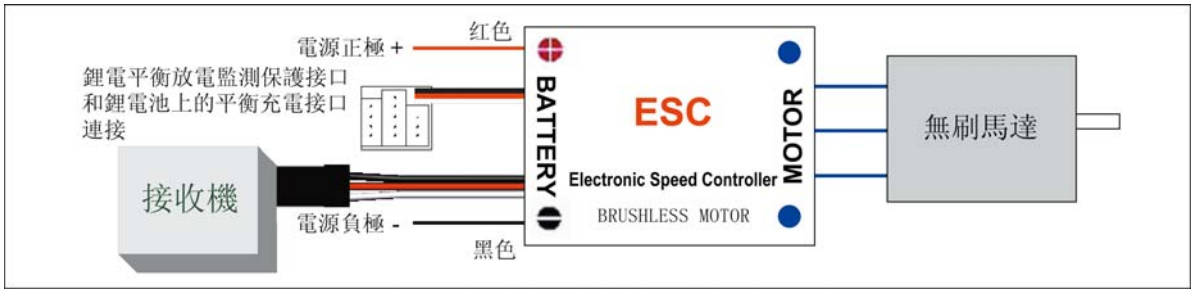
飛騰系列 Pentium Series										
電流級別	型號	持續輸出電流	瞬間電流（10秒）	BEC類型	BEC 輸出	電池節數		參數編成功能	鋰電平衡放電監測保護功能	重量
						鋰電	鎳鎘鎳氫			
22A	GUEC GE-221	22A	25A	線性模式	5V/2A	2-4	5-12	有	無	19g
66A	GUEC GE-602	66A	80A	開關模式	5V/3A	2-6	5-18	有	無	60g

BEC 驅動能力：

線性模式BEC(5V/2A)				開關模式BEC（5V/3A）	
2節鋰電	3節鋰電	4節鋰電	5節鋰電	2－4節鋰電	5節鋰電
5	4	3	2	5	4

對於尾碼爲“OPTO”的電變或者說明書上指明無內置 BEC 的電變，在使用時需要爲接收機配備單獨的電源，或者使用 UBEC 爲接收機供電。另外，當使用編程設定卡對這類電變進行參數設置時，也需要使用一個單獨的電源爲設定卡供電，詳見設定卡說明書。

接線示意圖：



電子變速器（**ESC**）說明書

產品功能簡要說明：

1. **剎車設定：**無剎車/有剎車，出廠預設值爲**無剎車**。
2. **電池類型：**Li-xx（鋰電池）/ Ni-xx（鎳鎘或鎳氫）兩大類電池，預設值爲 Li-xx（**鋰電池**） 。
3. **低壓保護模式：**逐漸降低功率/立即關閉輸出，預設值爲**逐漸降低功率**。
4. **低壓保護閾值：**低/中/高，預設值爲**中截止電壓**。

   當設定使用的是 Li-xx 電池，則自動判斷鋰電節數，低/中/高情況下每節電池的截止電壓分別爲：2.6V/2.85V/3.1V。

   例如使用 3 節鋰電，設定爲中截止電壓，則低壓保護閾值爲：2.85X3=8.55V。

   a. 當設定使用的是 Ni-xx 電池，低/中/高情況下截止電壓爲開機時輸入電壓的 0%/50%/65%。0%意味著不進行低壓保護。

   例如：使用 6 節鎳氫電池，充飽電時電壓爲 1.44X6=8.64V，當設定爲中截止電壓時，則截止電壓閾值爲：8.64X50%=4.3V。

   （注： 66A 電變在使用 Ni-xx 電池時，低/中/高情況截止電壓爲開機時輸入電壓的 0%/45%/60%）
5. **啓動模式：**普通/柔和/超柔和啓動，預設值爲**超柔和啓動**。

   普通啓動適用於固定翼，柔和啓動/**超柔和啓動適用於直升機**。

   柔和啓動和超柔和啓動的初始轉速都比較低，從啓動到全速分別需要 1 秒和 2 秒，但啓動後若關閉油門，3 秒內再次啓動時則均以普通模式啓動，以免在做一些特技飛行動作時因反應過慢而導致摔機。
6. **進角：**低/中/高，預設值爲**低進角**。

   一般情況下，低進角可以適應較多的馬達。但是因爲馬達結構差異很大，請試用各個進角以獲得滿意的驅動效果。

   爲提高轉速，可以將進角設爲高進角。改變進角設置後，建議先在地面進行測試，然後再飛行。

特別提示

近期不少廠家推出了一些 KV 值較高、結構比較特別的外轉子無刷電機，其磁鐵間隙相當大，因此市面上很多品牌的電變無法適應這類電機，常見的現象有：無法啓動、啓動不良、啓動後堵轉等。

我們針對上述問題進行了產品軟體升級，目前，我們的電子變速器對各種無刷電機的適應能力均達到很好的水準。但是在使用過程中，因爲電變參數較多，不少玩家在電變和電機的搭配上還有疑問。爲了讓您更好地使用本產品，請參照以下建議，

設定電子變速器的相關參數。

建議參數配置 / **電機類型**	**進角**	**啓動方式**
內轉子無刷電機	低進角	固定翼通常使用一般模式 直升機通常使用超柔和模式
普通外轉子無刷電機	低進角或中進角	
亞拓 420LF（臺灣出品）	高進角（必須）	
冰峰雷電 450TH（臺灣出品），西爾 460FX(中國大陸出品)	低進角	柔和啓動（必須）

首次使用您的電子變速器

在使用全新的電子變速器之前請您仔細檢查各個連接是否正確、可靠（此時請勿連接電池）。經檢查一切正常後，
請按**以下順序**啓動電子變速器。

1. 將遙控器油門搖杆推至最低位置，接通遙控器電源；
2. 將電池組接上電子變速器，變速器開始自檢，電機發出“ 123”♪上電提示音後，接著發出 n 聲短促的“嗶”鳴音表示鋰電池節數，然後電機發出一聲“嗶---”長鳴音表示自檢正常，系統準備就緒，等待您推動油門啓動電機。
   - 若無任何反應，請檢查電池是否完好，電池連線是否可靠。
   - 若上電後 2 秒電機發出“嗶－嗶－”的鳴音，5 秒後又發出“5671̇2̇”特殊提示音，表示電變進入編程設定模式，這說明您的遙控器未設置好，油門通道反向，請參考遙控器說明書正確設置油門通道的“正/反”向。
   - 若上電後電機發出“嗶-嗶-、嗶-嗶-、嗶-嗶-”鳴音（間隔 1 秒），表示電池組電壓過低或過高，請檢查電池組電壓。

！特別強調 ！爲了讓電變適應您的遙控器油門行程，在首次使用本電變或更換其他遙控器使用時，均應重新設定油門行程，以獲得最佳的油門線性。具體操作請參閱第 4 頁的說明。

警示音說明

1. 電壓不正常警示音：電變開機時，會對電源電壓進行檢測，當電源電壓不在正常範圍內時，電變會作如下警示：“嗶-嗶-、嗶-嗶-、嗶-嗶-”（每兩聲之間的間隔時間爲 1 秒），直到電源電壓正常爲止；
2. 油門信號丟失警示音：當電變未檢測到油門信號時，電變會作如下警示：“嗶-、嗶-、嗶-”（每聲之間的間隔爲 2 秒）；
3. 油門未歸零（油門搖杆未置於最低位置）警示音：當油門未打到最低時，電變會作如下警示：“嗶-嗶-嗶-嗶-嗶-”（很急促的單音鳴叫）；
4. 油門行程過小警示音：當所設定油門行程過窄時（電變設計時，要求油門行程不得小於三格油門），電變會做警示，表明本次行程設定無效，需重新設定。警示方式爲：“嗶-嗶-嗶-嗶-嗶-”（很急促的單音鳴叫）；

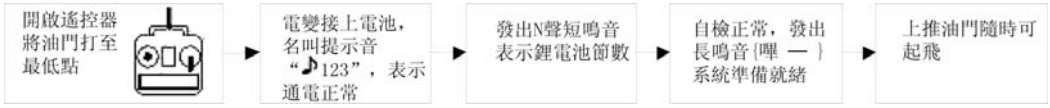
其他保護功能說明

1. 啓動保護：當推油門啓動後，如在兩秒內未能正常啓動電機，電變將會關閉電機，油門需再次置於最低點後，才可以重新啓動。（出現這種情況的原因可能有：電變和電機連線接觸不良或有個別輸出線斷開、螺旋槳被其他物體阻擋、減速齒卡死等）
2. 溫度保護：當電變工作溫度超過 110 攝氏度時，電變會降低輸出功率進行保護，但不會將輸出功率全部關閉，最多只降到全功率的 40%，以保證電機仍有動力，避免摔機。溫度下降後，電變會逐漸恢復最大動力。
3. 油門信號丟失保護：當檢測到油門遙控信號丟失 1 秒後，電變開始降低輸出功率，如果信號始終無法恢復，則一直降到零輸出（降功率過程爲 2 秒） 。如果在降功率的過程中油門遙控信號重新恢復，則立即恢復油門控制，這樣做的好處是：在油門信號瞬間丟失的情況下（小於 1 秒），電變並不會進行斷電保護；如果遙控信號確實長時間丟失，則進行保護，但不是立即關閉輸出，而是有一個逐步降低輸出功率的過程，給玩家留有一定的時間救機，兼顧安全性和實用性。
4. 過負荷保護：當負載突然變得很大時，電變會切斷動力，或自動重啓動。出現負載急劇增大的原因通常是螺旋槳打到其他物體而堵轉。

故障快速處理

故障現象	可能原因	解決方法
上電後電機無法啓動，無任何聲音	電源接頭接觸不良	重新插好接頭或更換接頭
上電後電機無法啓動， 發出“嗶-嗶-、嗶-嗶-、嗶-嗶-”警示音（每兩聲之間的間隔時間爲 1 秒）	電池組電壓不正常	檢查電池組電壓
上電後電機無法啓動， 發出“嗶-、嗶-、嗶-”警示音（每聲之間的間隔時間爲 2 秒）	接收機油門通道無油門信號輸出	檢查發射機和接收機的配合是否正常，油門控制通道接線是否插緊
上電後電機無法啓動， 發出“嗶、嗶、嗶、嗶、嗶”急促單音	油門未歸零或油門行程設置過小	將油門搖杆置於最低位置； 重新設置油門行程
上電後電機無法啓動， 發出“嗶-嗶-”提示音，然後發出“5671̇2̇”特殊提示音	油門通道“正/反”向錯誤	參考遙控器說明書，調整油門通道的“正/反”向設置
電機反轉	電變輸出線和電機線連接的線序錯誤	將三根輸出線中的任意兩根對調
電機轉動中途停轉	油門信號丟失保護	檢查遙控器和接收機的配合是否正常，檢查油門通道接線是否接觸良好
	電池電壓不足，進入低壓保護狀態	重新給電池充滿電
	接線接觸不良	檢查電池組插頭是否正常、電變輸出線和電機線連接是否穩固可靠
隨機性的重新啓動和工作狀態失常	使用環境中具有極強烈的電磁干擾	電變的正常功能會受到強烈電磁波的干擾。出現這種情況時，請參照說明書的指示，嘗試重新上電啓動來恢復正常的工作狀態；當故障反復出現時，說明使用環境中的電磁波干擾過於強烈，請在其他場所使用該產品。

正常使用開機過程說明:



油門行程設定說明:（注意！當第一次使用或電變搭配其他遙控器使用時，均應重新設定油門行程，其他時候則不用）

使用遙控器編程設定說明:

使用遙控器油門搖杆設定參數分爲四個步驟：

一．進入編程

二．選擇設定項

三．選擇設定項下的參數值

四．退出

一、進入編程模式:

1) 開啓遙控器，將油門打到最高，電變接上電池
2) 等待2秒，鳴叫“嗶-嗶-”提示音
3) 再等待5秒，會鳴叫“ 567i2 ”特殊提示音，表示已經進入編程模式。

二、選擇設定項：

進入編程設定後，會聽到8種鳴叫音，按如下順序迴圈鳴叫，在叫某個提示音後，3秒內將油門打到最低，則進入該設定項。

1.	“嗶”	剎車	（1短音）
2.	“嗶-嗶-”	電池類型	（2短音）
3.	“嗶-嗶-嗶-”	低壓保護方式	（3短音）
4.	“嗶-嗶-嗶-嗶-”	低壓保護閾值	（4短音）
5.	“嗶——”	啓動模式	（1長音）
6.	“嗶——嗶-”	進角	（1長1短）
7.	“嗶——嗶-嗶-”	恢復出廠預設值	（1長2短）
8.	“嗶——嗶——”	退出	（2長音）

注:一長音“嗶——”相當於5聲短音“嗶-”，所以在第二步“選擇設定項”中，一長一短“嗶——嗶-”表示第 6 選項。

三、選擇參數值：

馬達會迴圈鳴叫，在鳴叫某個提示音後將油門搖杆打到最高點，則選擇該提示音所對應的設定值，接著鳴叫特殊提示音“i5i5”，表示該參數值已被保存。（此時如果不想再設定其他選項，則在2秒內將油門打到最低，即可快速退出編程設定模式；如果還要設定其他選項，則繼續等待，退回第二步驟，再選擇其他設定項）

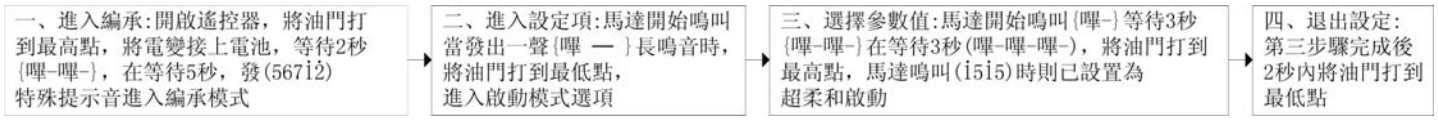
提示音 / 設定項	“嗶-” 1 聲	“嗶-嗶-” 2 聲	“嗶-嗶-嗶-” 3 聲
剎車	***無剎車**	有剎車	
電池類型	***鋰電池**	鎳鎘/鎳氫電池	
低壓保護方式	***逐漸降低功率**	立即關閉動力	
低壓保護閾值	低	***中**	高
啓動模式	普通啓動	柔和啓動	***超柔和啓動**
進角	***低**	中	高

四、退出設定

有如下兩種方式退出設定。

1. 在第三步驟，選擇設定值時，鳴叫特殊提示音“i5i5”後，2 秒內將油門打到最低點，則退出設定。
2. 在第二步驟，選擇設定項時，當電機鳴叫出“嗶——嗶——”（即第 8 個設定項）兩長音後，3 秒內將油門打到最低點，則退出設定。

編程設定示例：（例如將啓動模式設成“超柔和啓動”，即第 5 設定項的第 3 個參數值）



Manual of Sensor less Brushless Motor Speed Controller Ver. HW-01-081027.1

Thanks for purchasing our Electronic Speed Controller (ESC). High power system for RC model can be very dangerous, so we strongly suggest you read this manual carefully and thoroughly. In that we have no control over the correct use, installation, application, or maintenance of this product, no liability shall be assumed nor accepted for any damages, losses or costs resulting from the use of the product. Any claims arising from the operating, failure or malfunctioning etc. will be denied. We assume no liability for personal injury, property damage or consequential damages resulting from our product or our workmanship. As far as is legally permitted, the obligation to compensation is limited to the invoice amount of the affected product.

Features:

- **Balance Discharge Monitoring and Protection (BDMP) Design for lithium battery pack.** This innovative new system provides real time monitoring of the discharge voltage of each cell in your lithium (Li-ion/Li-poly) battery packs. Since each cell is monitored and protected by the ESC, you can expect an even longer service life from your battery packs as you fly with increased confidence. **(Remark: This function is ONLY available for the "Guard" series ESC)**
- Compatible with Lithium and Nickel battery types. (Lithium-Ion / Lithium-Polymer or Nickel Metal Hydride / Nickel Cadmium)
- Extreme low output resistance, super current endurance.
- Multiple protection features: Low-voltage cut-off protection / over-heat protection / throttle signal loss protection.
- 3 start modes: Normal / Soft / Super-Soft, compatible with fixed-wing aircraft and helicopter.
- Throttle range can be configured to be compatible with all transmitters currently available on market.
- Smooth, linear and precise throttle response.
- Separate voltage regulator IC for microprocessor (except Pentium-6A and Pentium-10A), providing good anti-jamming capability.
- Supported motor speed (Maximum): 210000 RPM (2 poles), 70000 RPM (6 poles), 35000 RPM (12 poles).
- Our pocket-sized **Program Card** can be purchased separately for extremely easily programming the ESC at the field.
- With a program card, you can activate the music playing function of the ESC, and totally there are 15 songs can be selected.

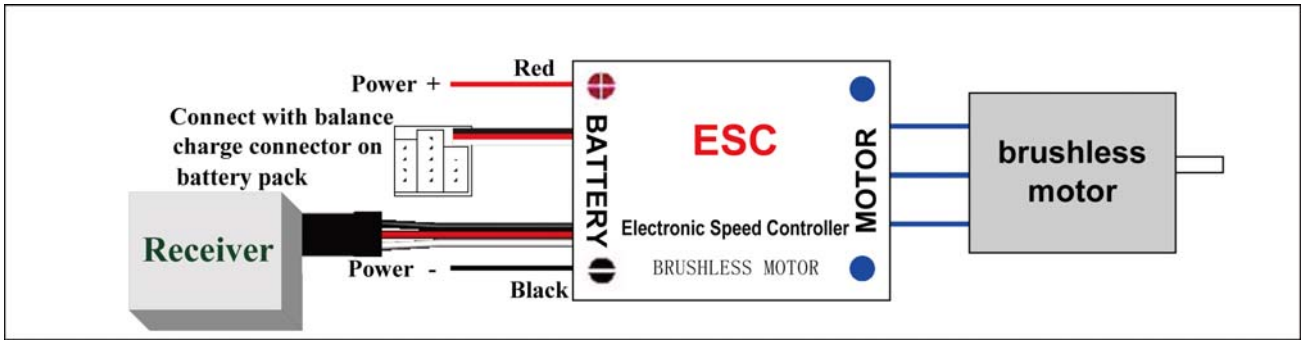
Specifications:

Pentium Series											
Class	Model	Cont. Current	Burst Current (>10s)	BEC Mode (*Note1*)	BEC Output	Battery Cell		User Programm-able	Balance Discharge Protection	Weight	Size
						Li-ion Li-poly	NiMH NiCd				L*W*H
22A	GUEC-GE-221	22A	25A	Linear	5V/2A	2-4	5-12	Available	N/A	19g	45*24*11
66A	GUEC GE-602	66A	80A	Switch	5V/3A	2-6	5-18	Available	N/A	60g	70*31*14

BEC Output Capability	Linear Mode BEC(5V/2A)				Switch Mode BEC(5V/3A)	
	2S Li-Poly	3S Li-Poly	4S Li-Poly	5S Li-Poly	2S - 4S Li-Poly	5S-6S Li-Poly
Standard micro servos(Max.)	5	4	3	2	5	4

IMPORTANT! The ESC named "xxx-xxx-OPTO" does not have a built-in BEC. An UBEC (Ultimate-BEC) or an individual battery pack should be used to power the receiver. And an individual battery pack is needed to power the program card when setting the programmable value of such ESCs. Please read the user manual of program card for reference.

Wiring Diagram:



Programmable Items:

1. **Brake Setting**：Enabled / Disabled, default is Disabled
2. **Battery Type**：Li-xx(Li-ion or Li-poly) / Ni-xx(NiMH or NiCd)，default is Li-xx.
3. **Low Voltage Protection Mode(Cut-Off Mode)**： Soft Cut-Off (Gradually reduce the output power) or Cut-Off (Immediately stop the output power). Default is Soft Cut-Off.
4. **Low Voltage Protection Threshold(Cut-Off Threshold)**：Low / Medium / High, default is Medium.
   - **When NOT using balance discharge monitoring and protection function** (i.e. **Not** plugging the balance charge connector into the BDMP socket on the Guard series ESC, the ESC only monitors the voltage of the whole battery pack)
     1) For lithium batteries, the number of battery cells is calculated automatically. Low / medium / high cutoff voltage for each cell is: 2.6V/2.85V/3.1V. For example: For a 3 cells lithium pack, when “Medium” cutoff threshold is set, the cut-off voltage will be: 2.85*3=8.55V.
     2) For nickel batteries, low / medium / high cutoff voltages are 0%/45%/60% of the startup voltage (i.e. the initial voltage of battery pack), and 0% means the low voltage cut-off function is disabled. For example: For a 10 cells NiMH battery, fully charged voltage is 1.44*10=14.4V, when “Medium” cut-off threshold is set, the cut-off voltage will be:14.4*45%=6.5V。
   - **When using balance discharge monitoring and protection function** (i.e. Plugging the balance charge connector on battery pack into the BDMP socket on the Guard series ESC, the ESC monitors not only the voltage of the whole battery pack but also the voltage of each cell). For lithium battery，low / medium / high cut off voltage for each cell is: 2.6V/2.85V/3.1V. When the voltage of any cell in battery pack is lower than the cut-off threshold, the protection function is activated.
5. **Startup Mode**：Normal /Soft /Super-Soft, default is Super-Soft.
   Normal is preferred for fixed-wing aircraft. Soft or Super-soft are preferred for helicopters. The initial acceleration of the Soft and Super-Soft modes are slower in comparison, usually taking 1 second for Soft startup or 2 seconds for Super-Soft startup from initial throttle advance to full throttle. If the throttle is closed (throttle stick moved to bottom) and opened again (throttle stick moved to top) within 3 seconds of the initial startup, the restart-up will be temporarily changed to normal mode to get rid of the chances of a crash caused by slow throttle response. This special design is very suitable for aerobatic flight when quick throttle response is needed.
6. **Timing**：Low / Medium / High, default is Low. *Note2*
   Usually, low timing value can be used for most motors. We recommend the **Low** timing value for 2 poles motor and **medium** timing value for motors with more than 6 poles to get a high efficiency. For higher speed, **High** timing value can be chosen.
   ***Note2*: After changing the timing setting, please test your RC model on the ground prior to flight!**

Special Note

Some high KV out-runner motors have very special construction, the space between each magnet is very large, and many ESCs can’t drive these motors. After much testing, our ESCs have proven to work very well with these types of motors. Some RC enthusiasts still have several questions about the programming value for these special motors. Therefore, we have provided some suggestions as follows:

Programmable Value Suggestion / Motor	Timing	Startup Mode
Generic in-runner motor	Low	Usually, aircraft use “Normal” startup mode and helicopter use “Super-soft” startup mode
Generic out-runner motor	Low or Medium	
Align 420LF (Made in TAIWAN, out-runner)	High (MUST)	
450TH (Made in TAIWAN, out-runner)	Low	Soft (MUST)

Begin To Use Your New ESC

Please start the ESC in the following sequences:

1. Move the throttle stick to the bottom position and then switch on the transmitter.
2. Connect the battery pack to the ESC, the ESC begins the self-test process, a special tone “ ♪ 123” is emitted, which means the voltage of the battery pack is in normal range, and then N “beep” tones will be emitted, means the number of lithium battery cells. Finally a long “beep------” tone will be emitted, which means self-test is OK, the aircraft/helicopter is ready to go flying.
   - If nothing is happened, please check the battery pack and all the connections;
   - If a special tone “ ♪ 56712” is emitted after 2 beep tones (“beep-beep-”), means the ESC has entered the program mode, it is because the throttle channel of your transmitter is reversed, please set it correctly;
   - If the very rapid “beep-beep-, beep-beep-” tones is emitted, means the input voltage is too low or too high, please check your battery’s voltage.

VERY IMPORTANT!

Because different transmitter has different throttle range, we strongly suggest you use the “Throttle Range Setting Function” to calibrate throttle range. Please read the instruction on page 4------“Throttle Range Setting”.

Alert Tone

1. Input voltage is abnormal: The ESC begins to check the voltage when the battery pack is connected, if the voltage is not in the acceptable range, such an alert tone will be emitted: “beep-beep-, beep-beep-,beep-beep-” (Every “beep-beep-” has a time interval of about 1 second.)
2. Throttle signal is abnormal: When the ESC can’t detect the normal throttle signal, such an alert tone will be emitted: “beep-, beep-, beep-”. (Every “beep-” has a time interval of about 2 seconds)
3. Throttle stick is not in the bottom position: When the throttle stick is not in bottom (lowest) position, a very rapid alert tone will be emitted: “beep-, beep-, beep-”. (Every “beep-” has a time interval of about 0.25 second.)

Protection Function

1. Abnormal start up protection: If the motor fails to start within 2 seconds of throttle application, the ESC will cut-off the output power. In this case, the throttle stick **MUST** be moved to the bottom again to restart the motor. (Such a situation happens in the following cases: The connection between ESC and motor is not reliable, the propeller or the motor is blocked, the gearbox is damaged, etc.)
2. Over-heat protection: When the temperature of the ESC is over 110 Celsius degrees**,** the ESC will reduce the output power.
3. Throttle signal loss protection: The ESC will reduce the output power if throttle signal is lost for 1 second, further loss for 2 seconds will cause its output to be cut-off completely.

Program Example

Setting “Start Mode” to “Super-Soft”, i.e. value #3 in the programmable item #5

1. Enter Program Mode
Switch on transmitter, move throttle stick to top position, connect battery pack to ESC, wait for 2 seconds, “beep-beep” tone should be emitted. Then wait for another 5 seconds, special tone like ‘♪ 5671̇2̇” should be emitted, which means program mode is entered.

2. Select Programmable Items
Now you’ll hear 8 tones in a loop. When a long “beep------” tone is emitted, move throttle stick to bottom to enter the “Start Mode”

3. Set Item Value (Programmable Value)
“Beep-”, wait for 3 seconds; “Beep-beep-”, wait for another 3 seconds; then you’ll hear “beep-beep-beep”, move throttle stick to top position, then a special tone “ ♪1̇5̇1̇5̇” is emitted, now you have set the “Start Mode” item to the value of “Super-Soft”

4. Exit Program Mode
After the special tone “♪1̇5̇1̇5̇”, move throttle stick to bottom within 2 seconds.

Trouble Shooting

Trouble	Possible Reason	Action
After power on, motor does not work, no sound is emitted	The connection between battery pack and ESC is not correct	Check the power connection. Replace the connector.
After power on, motor does not work, such an alert tone is emitted: “beep-beep-, beep-beep-,beep-beep-” (Every “beep-beep-” has a time interval of about 1 second)	Input voltage is abnormal, too high or too low. The balance charge connector is not located properly in BDMP adapter.	Check the voltage of battery pack Check the connection of the balance charge connector and the BDMP adapter.
After power on, motor does not work, such an alert tone is emitted: “beep-, beep-, beep- ”(Every “beep-” has a time interval of about 2 seconds)	Throttle signal is irregular	Check the receiver and transmitter Check the cable of throttle channel
After power on, motor does not work, such an alert tone is emitted: “beep-, beep-, beep-” (Every “beep-” has a time interval of about 0.25 second)	The throttle stick is not in the bottom (lowest) position	Move the throttle stick to bottom position
After power on, motor does not work, a special tone “ ♪ 5671̇2̇” is emitted after 2 beep tone (beep-beep-)	Direction of the throttle channel is reversed, so the ESC has entered the program mode	Set the direction of throttle channel correctly
The motor runs in the opposite direction	The connection between ESC and the motor need to be changed.	Swap any two wire connections between ESC and motor
The motor stop running while in working state	Throttle signal is lost	Check the receiver and transmitter Check the cable of throttle channel
	ESC has entered Low Voltage Protection mode	Land RC model as soon as possible, and then replace the battery pack
	Some connections are not reliable	Check all the connections: battery pack connection, throttle signal cable, motor connections, etc.
Random stop or restart or irregular working state	There is strong electro-magnetic interference in flying field.	Reset the ESC to resume normal operation. If the function could not resume, you might need to move to another area to fly.

Normal startup procedure:

Move throttle stick to bottom and then switch on transmitter.	Connect battery pack to ESC, special tone like "♪123" means power supply is OK	Several "beep-" tones should be emitted, presenting the number of lithium battery cells	When self-test is finished, a long "beep-----"tone should be emitted	Move throttle stick upwards to go flying

Throttle range setting: (Throttle range should be reset whenever a new transmitter is being used)

Switch on transmitter, move throttle stick to top	Connect battery pack to ESC, and wait for about 2 seconds	"Beep-Beep-" tone should be emitted, means throttle range highest point has been correctly confirmed	Move throttle stick to the bottom, several "beep-" tones should be emitted, presenting the number of battery cells	A long "Beep-" tone should be emitted, means throttle range lowest point has been correctly confirmed

Program the ESC with your transmitter (4 Steps):

1. Enter program mode
2. Select programmable items
3. Set item's value (Programmable value)
4. Exit program mode

1. Enter program mode

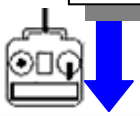
1) Switch on transmitter, move throttle stick to top , connect the battery pack to ESC
2) Wait for 2 seconds, the motor should emit special tone like "beep-beep-"
3) Wait for another 5 seconds, special tone like "♪567i2" should be emitted, which means program mode is entered

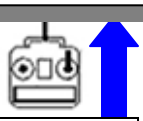
2. Select programmable items:

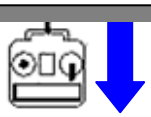
After entering program mode, you will hear 8 tones in a loop with the following sequence. If you move the throttle stick to bottom within 3 seconds after one kind of tones, this item will be selected.

1.	"beep"	brake	(1 short tone)
2.	"beep-beep-"	battery type	(2 short tone)
3.	"beep-beep-beep-"	cutoff mode	(3 short tone)
4.	"beep-beep-beep-beep-"	cutoff threshold	(4 short tone)
5.	"beep-----"	startup mode	(1 long tone)
6.	"beep-----beep-"	timing	(1 long 1 short)
7.	"beep-----beep-beep-"	set all to default	(1 long 2 short)
8.	"beep-----beep-----"	exit	(2 long tone)

Note: 1 long "beep-----" = 5 short "beep-"



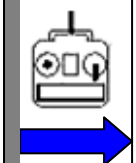




3. Set item value (Programmable value):

You will hear several tones in loop. Set the value matching to a tone by moving throttle stick to top when you hear the tone, then a special tone "♪i5i5" emits, means the value is set and saved. (Keeping the throttle stick at top, you will go back to step 2 and you can select other items; Moving the stick to bottom within 2 seconds will exit program mode directly)

Tones / Items	"beep-" 1 short tone	"beep-beep-" 2 short tones	"beep-beep-beep" 3 short tones
Brake	**Off**	On	
Battery type	**Li-ion / Li-poly**	NiMH / NiCd	
Cutoff mode	**Soft-Cut**	Cut-Off	
Cutoff threshold	Low	**Medium**	High
Start mode	Normal	Soft	**Super soft**
Timing	**Low**	Medium	High



4. Exit program mode

There are 2 ways to exit program mode:

1. In step 3, after special tone "♪i5i5", please move throttle stick to the bottom position within 2 seconds.
2. In step 2, after tone "beep-----beep-----" (i.e. item #8), move throttle stick to bottom within 3 seconds.