

# 无刷电子调速器说明书

感谢您购买中特威产品,Beast Pro G2 系列电调是我们新一代高性能有感无刷电子调速器(竞赛版本)。无刷动力系统功率强大,请您在使用设备前仔细阅读本说明书。深圳市中特威科技有限公司有权不经通知变更其产品,包括其外观和性能参数及使用要求;对其产品是否适合特定用途不作任何保证、申明或承诺。不承担因第三方产品相关修改所引起的任何责任,中特威科技有限公司也不承担因应用该产品而产生的任何责任,包括直接损失或间接损失的赔偿责任。

## 注意事项

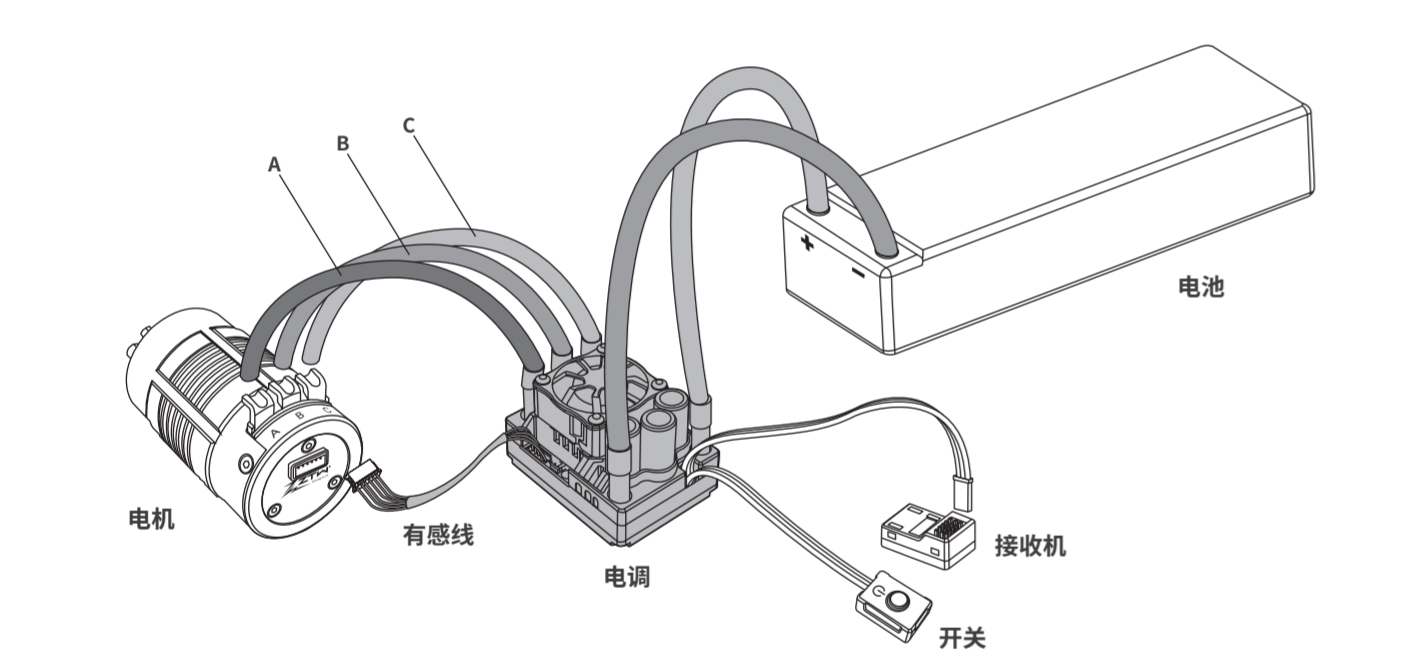
- 不能让小孩在无人人监管的情况下使用此产品。
- 电调在使用过程中可能会变烫,拿的时候要小心。
- 若需对电调的输入输出线、插头做相关焊接时,请使用至少60W功率的焊接设备进行焊接。
- 不使用电调时需要断开电池。
- 使用电调时不能靠近易燃物品。
- 如果电调出现过热、冒烟或者着火,请立即停止使用,断开电池并寻求帮助。

## 主要特性

- 全铝制金属外壳设计,散热性能优异,耐流能力强。
- 更加丰富的参数设置,允许设置大多数竞赛级参数,例如Modified模式、Stock模式、零进角、漂移等。
- 采用高性能的32位处理器,提供更加强大的数据处理能力以及更精准的油门输出。
- 全新的软件设计,超流畅的启动与精准的油门线性。
- 多重保护功能:电池低压保护、过温保护、油门信号丢失保护。
- 内置蓝牙,可通过手机APP对电调进行参数设置及软件升级(支持实时调参,无需重启电调)。
- 支持实时数据记录功能,可实时查看电调最高温度、马达转速、电压、进角等数据。

产品名称	Beast PRO Sensored 160A G2	Beast PRO Sensored 220A G2	Beast PRO Sensored 150A G2
<b>持续电流</b>	160A	220A	150A
<b>峰值电流</b>	760A	1000A	950A
<b>电池节数</b>	2-3S Lipo	2-4S Lipo	2-6S Lipo
<b>BEC输出</b>	6.0V,7.4V/4A(开关稳压)	6.0V,7.4V/10A(开关稳压)	6.0V,7.4V/8A(开关稳压)
<b>尺寸(长*宽*高)</b>	37.0*38.2*31.5mm	55.2*40.2*36.5mm	55.0*48.0*37.5mm
<b>重量</b>	96g	155g	165g
<b>编程功能</b>	手机APP	手机APP	手机APP
<b>是否支持软件升级</b>	支持	支持	支持
<b>防水特性</b>	不防水	不防水	不防水
<b>适用车型</b>	1/10th电房/电越竞赛	1/8th平路车/越野车/卡车竞赛	1/8th卡车/大脚车

## 电池连接



**电池连接**  
电调连接电池时,要特别注意正负极位置,错误的连接会损坏电调和电池。如上图所示,电调正极线连接电池的正极,负极线连接电池的负极。

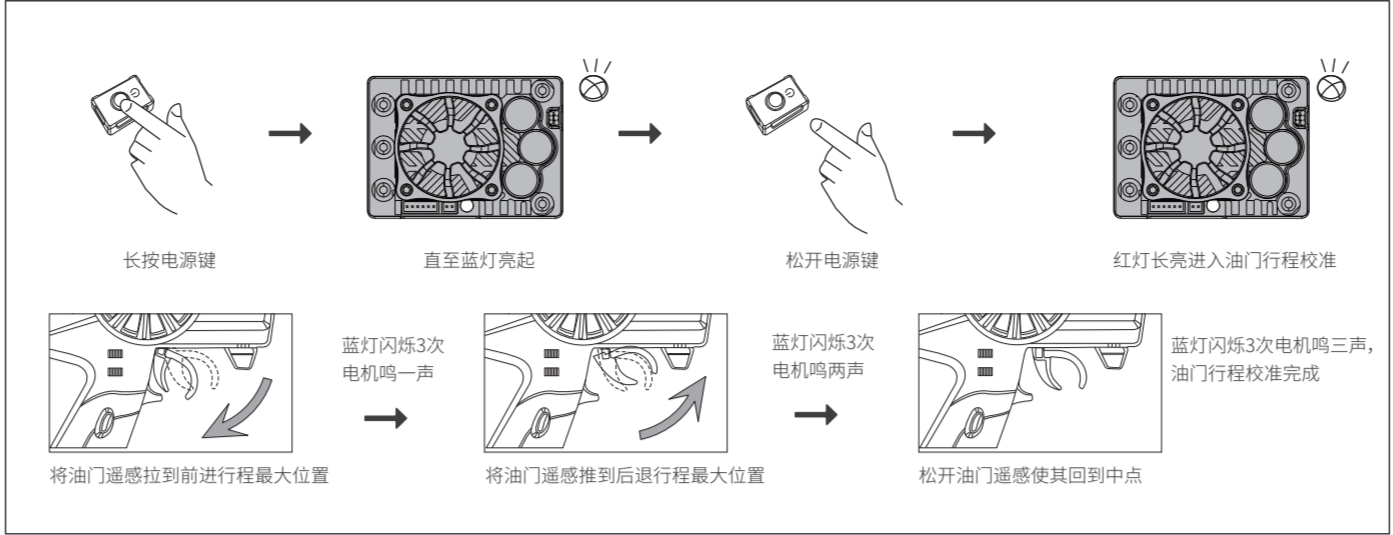
**电机连接**  
(1)有感模式  
连接有感无刷马达时,电调与马达相连有严格的线序要求,电调的#A/#B/#C必须与电机的#A/#B/#C三线严格一一对应,用6针感应线把电调与电机的感应口对接。  
(2)无感模式  
连接无感无刷马达时,电调与马达相连无严格的线序要求,电调的#A/#B/#C可以与电机的三线随意对接,若出现转向相反,任意交换两条马达线即可。

**接收机连接**  
信号线提供6.0V电压给到接收机、舵机等,所以不需要额外的电池,外接电源到接收机可能会损坏电调。  
黑线 RX- 负极  
红线 RX+正极6.0V  
白线 RX 信号线

## 电调软件功能及设置

**开关机**  
1.短按电源键电调开机。  
2.长按电源键至全部LED灯熄灭,电调将关机(油门离开中点10%距离后不能关机)。

**校准油门行程**  
1.电调连接好电池及接收机,打开遥控器。  
2.关机状态下长按电源键,直至蓝灯亮起,同时电机长鸣叫一声,松开电源键,电调将进入油门行程校准。电调进入油门行程校准后,红灯长亮,若没有油门信号,蓝灯一直双闪;油门摇杆在中位,蓝灯熄灭。  
3.将油门摇杆拉到前行程最大位置,蓝灯将闪烁3次,然后电机鸣叫一声,表示电调已记录前进油门行程,蓝灯常亮。  
4.电调记录前进油门行程后,将油门摇杆推到后行程最大位置,蓝灯将闪烁3次,然后电机鸣叫两声,表示电调已记录后退油门行程,蓝灯常亮。  
5.电调记录后退油门行程后,松开油门摇杆使其回到中点,蓝灯将闪烁3次,然后电机鸣叫三声,表示油门行程校准完成。  
6.电调支持反向油门行程校准,即遥控器在油门校准时设置了油门反向,导致油门信号脉宽大小的变化与正常情况相反时(正常情况下下拉摇杆油门信号脉宽变大,推摇杆油门信号脉宽变小),这种情况下电调仍然可以校准油门行程,电调前进、后退不受遥控器反向的影响。  
注:油门行程校准完成后,新油门行程立即生效,无需重启电调。  
\*如果在蓝灯闪烁期间油门摇杆离开前行程一定范围,电调将退出油门行程校准。



<b>油门位置</b>	<b>蓝灯状态</b>	<b>红灯状态</b>
中立位	蓝灯闪	红灯灭
最大油门位置	蓝灯亮	红灯亮
最大刹车位置	蓝灯灭	红灯亮

2.当一些电调保护功能触发时  
任何时候按下电源键红灯都会亮起。  
红灯每隔一秒闪1次(□ □ □),电压异常。  
红灯每隔一秒闪2次(□□ □□ □□),温度异常。  
红灯每隔一秒交替闪1次,2次(□ □□ □ □□ □ □□),电压和温度异常同时发生。  
在开机时没有检测到油门信号,如果此时存在电压异常或者温度异常,红灯不会有相应指示。  
蓝灯每隔两秒闪2次(□□ □□ □□ □□),油门异常(无油门,开机油门不在零位)。

**油门信号**  
1.电调最大支持450Hz的PPM油门信号。  
2.以下情况电调将开启油门保护,蓝灯双闪:(a)电调开机时,油门摇杆不在中位;(b)丢失油门信号。  
3.电调正在输出波形驱动电机,如果此时油门信号丢失,电调立即停止输出,同时蓝灯双闪,直到油门信号正常后,电调恢复输出(油门摇杆不需要回中)。

**有感&无感**  
1.任何时候电调正确检测到霍尔感应器信号后,有感模式生效。  
2.任何时候电调没有正确检测到霍尔感应器信号,电调将切换到无感模式运行。  
3.切换模式瞬间电调动力略有下降,但会立即恢复。  
4.无感模式下PWM驱动频率由电调自主选择,用户设置无效。  
5.无感模式下低于1KHz的刹车PWM频率设置无效,此时电调强制为1KHz。  
6.无感模式下BOOST和TURBO无效。

**Boost & Turbo**  
1.开启BOOST或者TURBO进角加快电机转速,同时电流增大,电池、电调和电机加剧发热,因此调节适当的进角和进角增加速率,控制进入开启的时间长短等对延长电池、电调和电机使用寿命有一定影响。  
2.BOOST和TURBO进角的区别是:拉油门还未达到最大处就已经开启的进角是BOOST进角;拉到最大才开启的是TURBO进角。  
3.油门达到最大后最终打开的进角大小为BOOST进角+TURBO进角,总进角最大为60度(Beast Pro 150A总进角为15度)。例如BOOST进角设置为45度,TURBO进角设置为50度,那么在油门达到最大后BOOST会开到45度,TURBO只能再开15度。  
4.在发生了电压保护或者温度保护且对应保护设置为开启的情况下,关闭所有进角。

**保护**  
1.高压保护:  
电调在开机瞬间检测到过高电压时,且电压保护设置为“Off”电调将开启电压保护,限制输出油门,输出油门值不会超过50%(高压保护只在开机瞬间起作用,在之后的过程中出现高压电调不会开启保护,高压保护激活后,即使电压降低到正常范围内也不能解除)。  
2.低压保护:  
任何时候电调检测到电压低于设置值,并保持一段时间,电调开启低压保护,限制输出油门,输出油门值不会超过50%(低压保护激活后,即使电压回到正常范围内也不能解除)。  
3.高温保护:  
温度大于设定值时,电调开启温度保护,限制输出油门,输出油门值不会超过50%(温度降低到65度以下,解除温度保护)。  
4.电压保护或温度保护设置为OFF时,如果此时存在电压或者温度异常的状况,LED正常显示相应的指示状态,只是不做“限制输出油门”的动作。  
5.驱动异常保护,指电调驱动电机发生异常,导致电机无法正常运转。当驱动发生异常(堵转、缺相等),油门值大于一定数值,且持续了一段时间后,电调开启驱动异常保护,电机持续快速“嗒嗒嗒”鸣叫(如果发生了缺相,电机有可能无法发出鸣叫;有些电机鸣叫声会比较小),直到油门回中并保持0.2秒,才能解除保护,如果连续发生3次驱动异常,则无法解除保护,必须排除故障重启电调。

**蓝牙**  
1.开机状态下长按电源键约10秒,红灯重新亮起(如果电调装备了外置开关,则开关上红灯会闪一次),会恢复出厂默认蓝牙连接密码 0000,然后松开按键关机。  
2.手机应用程序通过蓝牙与电调建立连接,可对电调进行可编程参数项设置、查看电调实时数据和电调固件升级等操作。  
3.蓝牙连接的有效距离为10米,实际距离跟使用场合有关,如果电调附近有大量金属,或者强干扰源,或者障碍物,都有可能缩短实际连接距离。  
4.蓝牙名称不可更改。  
5.在校准油门行程期间连接蓝牙会提示连接失败。

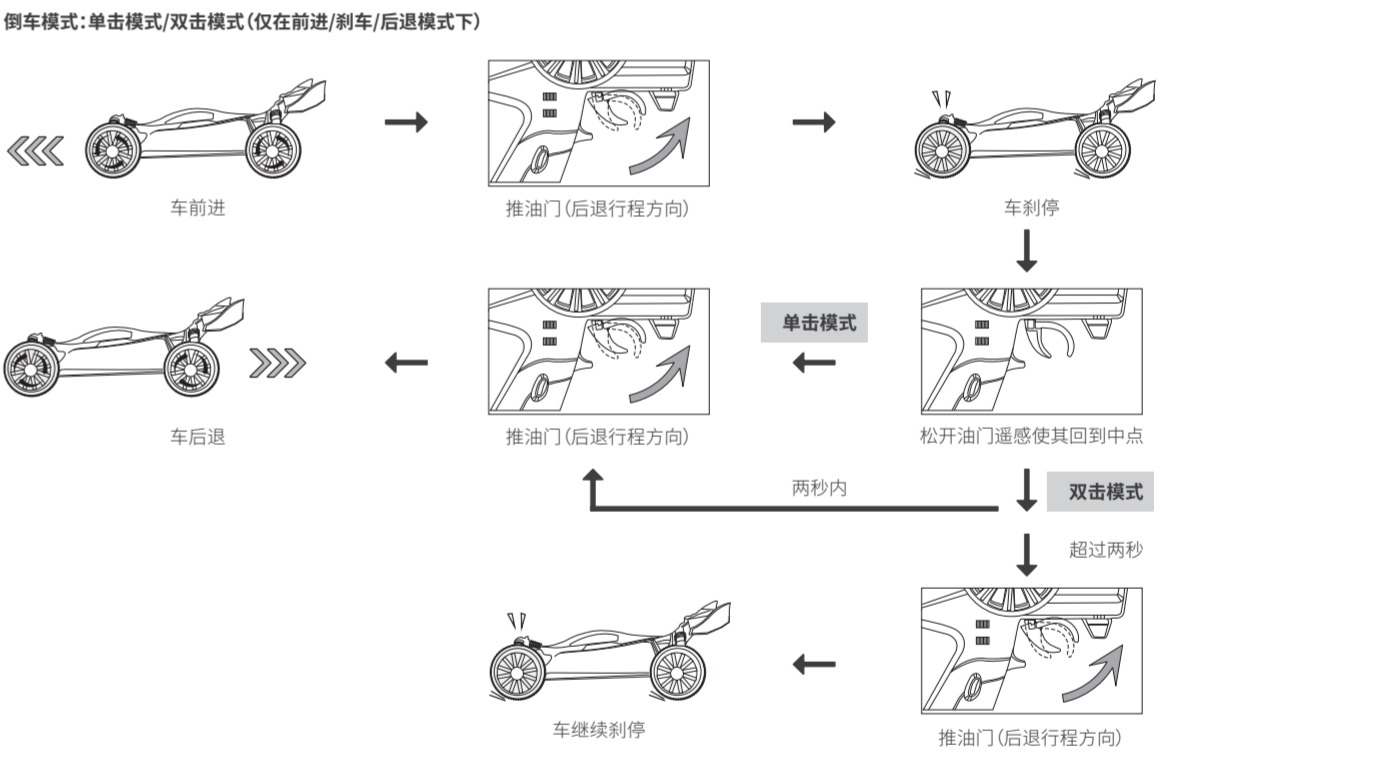
**可编程参数**  
1.更改参数项可以在电调开机后的任意状态进行,更改完成后立即生效,无需重启电调,即编程参数是在线完成的(热编程)。热编程为玩家提供了直观的编程前、后电调相应参数更改的效果,但是在电机高速旋转时更改某些参数项,会对电池、电调和电机产生一定的冲击,例如在电机高速旋转时更改了电机旋转方向,此时电调会立即驱动电机反转,但是由于惯性电机并不会立即反转,所以这时候会有较大的电流和震动;又如,在电机高速旋转,BOOST或者TURBO开启的情况下将BOOST或TURBO设置为0(Off),这种情况也会产生巨大的冲击电流,因此在电机高速旋转时请尽量避免更改参数项;  
2.编程的参数存储在电调FLASH存储器内,FLASH有一定的编程寿命(约1万次),所以,请勿频繁对电调进行编程。

**实时数据**  
1.实时数据只有在正确读到油门信号后才会有对应数值。  
2.实时数据是一种参考数据,其精度在±10%范围内,要得到精度更高的数据,必须使用专业的设备。  
3.实时数据内容:

序号	项	说明
1	Input Throttle	输入油门,接收机发送给电调的油门值。
2	Output Throttle	输出油门,电调输出到电机的油门值。
3	Voltage	电压,电调读到的电池电压。
4	Min. Voltage	最小电压,在本次电调开机过程中,电调读到的最低电压,关机后丢失。
5	Temperature	电调温度。
6	Max. temperature	最高温度,在本次电调开机过程中,电调读到的最高温度,关机后丢失。
7	RPM	转速。
8	Max. RPM	最高转速,在本次电调开机过程中,电调读到的最高转速(保持超过1秒以上的转速才会被记录),关机后丢失。
9	Adv. Timing	Advance timing :电调当前开启的总进角度数(Boost&Turbo)。

**固件升级**  
1.在固件升级过程中如果发生意外情况导致升级失败,重启电调后,电调将一直停留在引导程序区,此时手机应用连接电调后只能进入固件升级,不能进行其他操作,直到成功升级后才能恢复正常功能。  
2.固件升级模式下红灯会一直快速微弱闪烁,如果有数据在传输,蓝灯会微弱闪烁。  
3.此时按电源键约5秒电调才会关机,电调处于升级期间,请勿随意关机。

类别	设定项名称	设定项说明
<b>油门</b>	油门响应(Throttle Response)	时间越短,加速越快。
	滑行(Coast)	减油门时,车速不会立即下降,而是滑行更远。
	油门中位(Neutral Range)	油门中点宽度越大,需要拨动油门摇杆越远离中点车才开始启动。
	最小油门(Min. Throttle)	值越大,当拨动油门摇杆正好离开中点范围时,车启动速度越大。
	油门衰减(Minus)	衰减值越大,车速越低。
	油门衰减范围(Minus Range)	在油门摇杆多少范围内使衰减生效,值越大,生效范围越大。
<b>刹车</b>	最大前进力度(Max. Forward force)	值越小,前进极速越小。
	最大倒车力度(Max. Reverse force)	值越小,后退极速越小。
	刹车响应(Brake Response)	刹车响应时间越短,刹车越快。
	最小刹车力度(Min. Brake Force)	进入刹车后,值越大,当拨动油门摇杆正好离开中点范围时,刹车力度越大。
	最大刹车力度(Max. Brake Force)	值越小,极限刹车力度越小。
	前进拖刹力度(Forward Drag Brake Force)	油门在中位时,刹车的力度;值越小,车能滑行更远。
<b>BOOST进角</b>	前进拖刹响应(Forward Drag Brake Response)	时间越短,前进方向到刹车越快。
	倒车拖刹力度(Rev. Drag Brake Force)	油门在中位时,刹车的力度;值越小,车能滑行更远。
	倒车拖刹响应(Rev. Drag Brake Response)	时间越短,倒车方向到刹车越快。
	PWM频率(Brake PWM Freq.)	刹车PWM频率。
	Boost进角(Boost Timing)	开启Boost进角,使电机获得更高转速。
	触发方式(Trigger)	Boost触发方式,分为油门触发和转速触发。
<b>TURBO进角</b>	油门阈值(Throttle Threshold)	Boost油门触发阈值,Boost Trigger设为油门触发时,当油门大于阈值后,Boost将开启。
	转速阈值(RPM Threshold)	Boost转速触发阈值,Boost Trigger设为转速触发时,当转速大于阈值后,Boost将开启。
	Boost进角初始角度(Initial Angle)	Boost初始角度,Boost刚开始时,打开的进角值。该值越大,越暴力,越难以操控。
	Boost进角角度增长率(Angle Inc. Rate)	Boost进角值增加的速度。该值越大,越暴力,越难以操控。
	Boost进角角度下降率(Angle Dec. Rate)	Boost进角值减小的速度,该值越大,速度下降得越快;当速度很高时,可能会产生类似刹车的效果。
	<b>TURBO进角</b>	Turbo进角(Turbo Timing)
Turbo进角角度增长率(Turbo Inc. Rate)		Turbo进角值增加的速度,该值越大,越暴力,越难操控。
Turbo进角角度下降率(Turbo Dec. Rate)		Turbo进角值下降的速度,该值越大,速度下降得越快;当速度很高时,可能会产生类似刹车的效果。
Turbo进角延时(Delay)		Turbo进角延迟,指拉油门达到100%后延迟一段时间后再开启Turbo。
<b>一般设置</b>	Turbo进角延时重载(Delay Reload)	重载如延时,当进角已经触发,如果油门离开100%,又快速回到100%时,是重新延时还是不延时。Wait:等到进角减小到0后重新延时;Instant:油门一离开100%就立即开始重新延时。
	电机转向(Motor Rotation)	电机旋转的方向。某些车架在默认转向下,前进与后退都是相反的,此时设置另一个电机选择方向可以纠正这种错误。
	电机极数(Motor Poles)	电机极对数,设置正确的电机极对数,才能得到正确的Boost转速触发阈值。同时,玩家才可以在手机APP实时数据中看到正确的电机转速。
	运行模式(Running Mode)	运行模式分为前进/刹车、前进/刹车/后退、前进/后退。
	倒车模式(Reverse Mode)	当运行模式设置为前进/刹车/后退时,One Shot:单击油门摇杆倒车,Two Shot:双击油门摇杆倒车。
	驱动PWM频率(Drive PWM Freq.)	驱动PWM频率指电调驱动电机旋转时使用的PWM频率。频率越高越快,但油门线性会变差;频率越高、油门越细腻,但会增加电调开关损耗,导致电调温升过快。
<b>一般设置</b>	低压保护(Cutoff Voltage)	低压保护设置为自动时,电调开机瞬间自动识别锂电节数。
	高温保护(Cutoff Thermal)	当电调温度上升到设置值进,电调会自动停止或降速。
	BEC输出(BEC Output)	根据舵机需要设置BEC输出值。
	电机线A/C切换(A/C Swap)	马达线A/C切换,设置为No时,连接电调ABC与电机ABC一一对应;设置为Yes,连接电调ABC与电机CBA一一对应。



故障现象	可能原因	解决办法
上电后指示灯不亮,电机无法启动,风扇不转。	1、电池电压没有输入到电调。 2、电调开关损坏。	1、检查电源输入通路是否有焊接不良情况,并重新焊好。 2、更换开关。
电机转动过程中,突然停转或功率输出显著降低。	1、接收机遇到干扰。 2、电调进入电池低压保护状态。 3、电调进入过温保护状态。	1、检查接收机出现干扰的原因,检查发射机电池电量。 2、红灯每隔一秒闪1次,电压异常,请更换电池。 3、红灯每隔一秒闪2次,温度异常。
电机抖动,无法启动。	1、电调和电机连接的插头有虚焊。 2、电调故障(部分功率管MOSFET烧坏)。	1、检查各焊接点,必要时重新焊接。 2、联系经销商处理维修事宜。
油门在中点时,车子缓慢前进或缓慢后退。	1、遥控器中位有漂移,导致信号不稳。 2、油门行程没校准好。	1、更换信号稳定的遥控器。 2、重新校准油门行程。

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Thank you for your purchasing the ZTW product, the Beast Pro G2 Series ESC is our new generation of high performance sensored brushless electronic speed controller (competition version). The high power systems for RC models can be very dangerous, we strongly suggest that you read this manual carefully before using your speed control. ZTW Model have no control over the use, installation, application, or maintenance of these products, thus no liability shall be assumed nor accepted for any damages, losses of costs resulting from the use of this item.

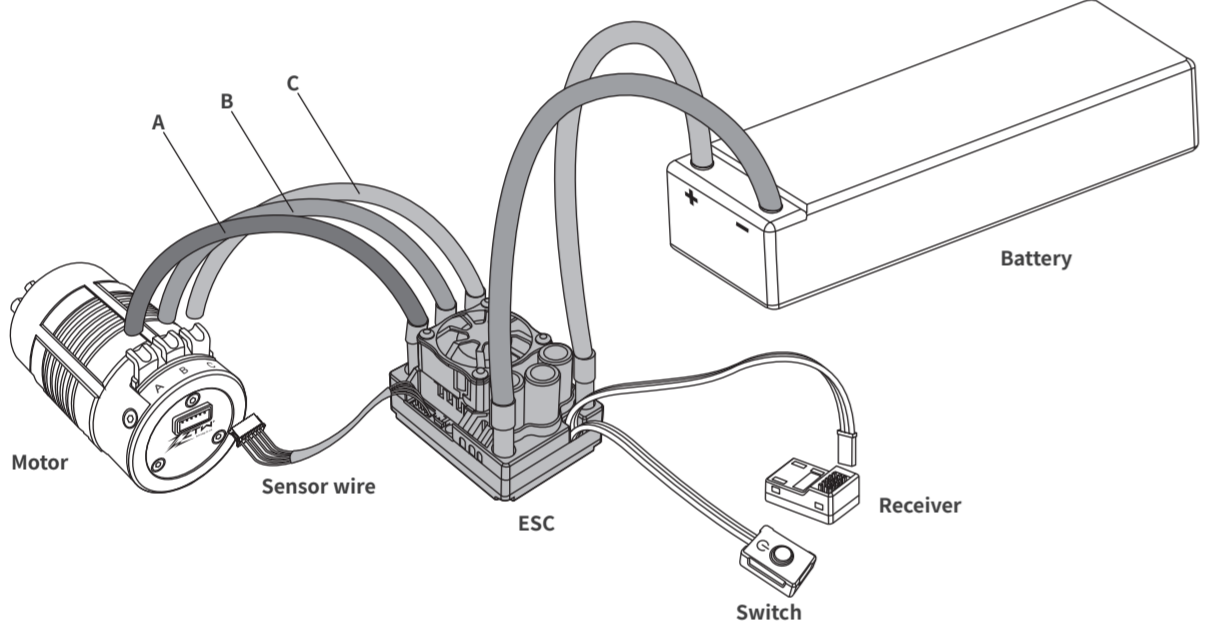
- ### Caution
- Do not let children use this product without the supervision of an adult.
  - The ESC might get hot during use, be careful when handling it.
  - When soldering input/output wires and connections, set the iron to 60W minimum.
  - Always disconnect the battery after use, do not store with the battery connected.
  - Do not use near flammable materials.
  - If the ESC overheats, emits smokes or burns, immediately discontinue use, disconnect the battery and seek assistance.

- ### Features
- Full aluminum case and heat sink design, with highly efficient heat dissipation system.
  - Plenty of adjustable parameters allows adjusting the settings for most of racing, such as Modified, stock, zero timing, drifting etc.
  - 32-bit microprocessor can support more powerful processing capability and more accurate motor output.
  - Enhanced throttle response, excellent acceleration, linearity and drive ability.
  - Multiple protection features: Low voltage cut-off protection, over-heat protection and throttle signal loss protection.
  - Built-in Bluetooth allows programming the parameter settings and firmware upgrades via app (support real time programming, no need restart the ESC).
  - Data logging for real-time maximum ESC temperature, motor RPM, Voltage and Adv. Timing and so on.

### Specification

Product Name	Beast PRO Sensored 160A G2	Beast PRO Sensored 220A G2	Beast PRO Sensored 150A G2
Cont. Current	160A	220A	150A
Burst Current	760A	1000A	950A
Input Voltage	2-3S Lipo	2-4S Lipo	2-6S Lipo
BEC Output	6.0V,7.4V/4A(Switch BEC)	6.0V,7.4V/10A(Switch BEC)	6.0V,7.4V/8A(Switch BEC)
Size(L*W*H)	37.0*38.2*31.5mm	55.2*40.2*36.5mm	55.0*48.0*37.5mm
Weight	96g	155g	165g
ESC Programming Via	Mobile Phone APP	Mobile Phone APP	Mobile Phone APP
Firmware Upgrade	Supported	Supported	Supported
Waterproof	No	No	No
Car Applicable	1/10 Touring Car/Buggy Racing	1/8th On-Road/Off-Road/Truggy Racing	1/8th Trucks/Monster Trucks

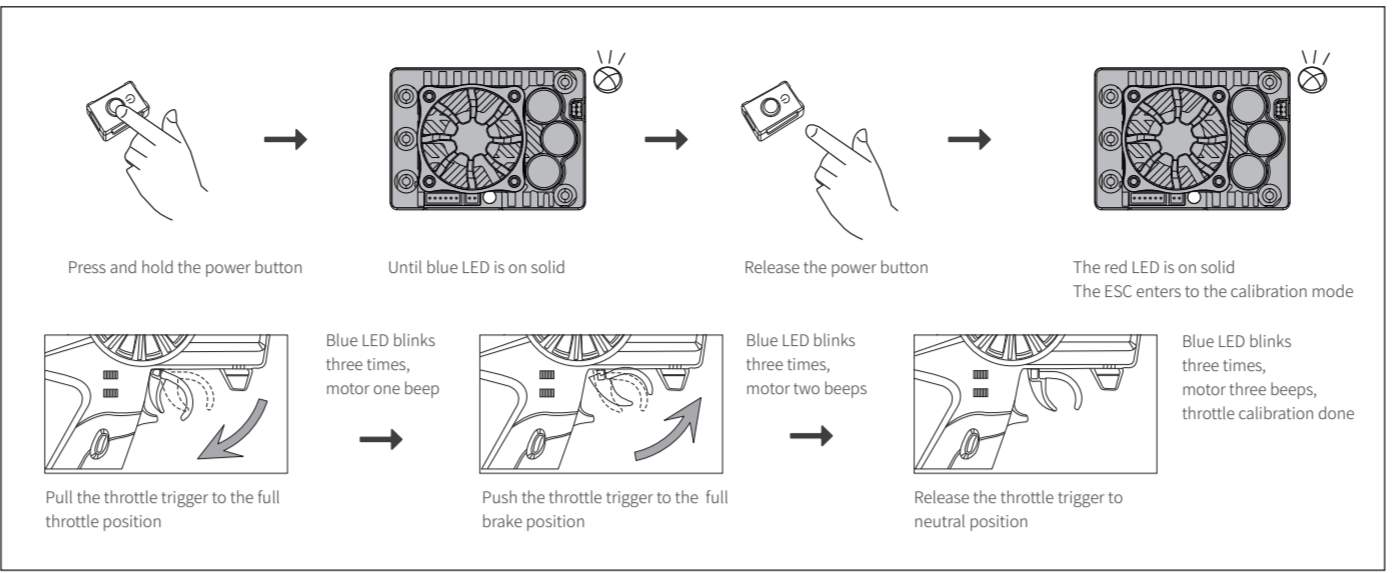
### Connection



- #### Battery Wire Connection
- When connecting the battery, pay attention to polarity: incorrect connection will damage the ESC and Battery. As shown in the figure above, connect the positive (+) wire is connected to (+) battery port, and the negative (-) wire is connected to the (-) battery port.
- #### Motor Wire Connection
- Sensored Mode:
    - When using a sensored brushless motor, the three A/B/C ESC wires must connect to the three A/B/C motor wires correspondingly. It is necessary to connect the Sensor wire to the "Sensor" socket on the ESC. Don't change the wire sequence optionally.
  - Sensorless Mode:
    - When using a sensorless brushless motor, the #A, #B, #C wires of the ESC can be connected with the motor wires freely (without any sequence). If the motor runs in the opposite direction, please swap any two wire connections.
- #### Receiver Wire Connection
- The signal wire supplies 6.0V to the receiver, servo, etc. So there is no need to connect an additional battery. External power connected to the receiver may damage the ESC.
- Black wire RX  
Red wire RX+6.0V  
White wire RX-Signal

### Software Functions and Settings

- #### Power On/Off ESC
- Press the power button then the ESC will be powered on.
  - Press and holding the power button until the all LEDs died out, then the ESC will be powered off.  
(Note: Please place the throttle trigger on the neutral position: within 10%, otherwise the ESC can not be powered off.)
- #### Throttle Calibration
- Connect the ESC with the battery and receiver well, then turn on the transmitter.
  - Press and holding the power button until the blue LED is on solid, the motor have a long beep at the same time, then release the power button, the red led will be on solid, the ESC enters to the calibration mode.
  - Pull the throttle trigger to the full throttle position, the blue led blinks three times and the motor beeps once, the full throttle position is saved.
  - Push the throttle trigger to the full brake position, the blue led blinks three times and the motor beeps twice, the full brake position is saved.
  - Release the throttle trigger to the neutral position, the blue led blinks three times and the motor beeps three times, the throttle calibration is completed.
  - The ESC can support reverse throttle calibration, if the transmitter throttle set reverse (it means pull the throttle will go to 1000 throttle position/normally is 2000, and push the throttle will go to 2000 throttle position/normally is 1000), then you do the throttle calibration the same way as usual (as above), it will not have any effects on the ESC forward and revers way even if the transmitter throttle set reverse.
- Remark:** No need to restart the ESC again after throttle calibration finished.  
Do not move the throttle during the time of the blue led blinks.



#### LED Status

1. During operation

Throttle Position	Blue LED	Red LED
Neutral	Blinking	OFF
Full Throttle	ON	ON
Full Brake	OFF	ON

- Note: When you pull the throttle from neutral position to full throttle position, the Blue LED will blink, and the blink frequency will go faster when the throttle goes higher.
- When some protection is activated
    - The RED LED is always on solid once the power button is pressed.
    - The RED LED blinks, single flash between every one second. Repeat like "α α α" indicates that the voltage is abnormal.
    - The RED LED blinks, double flash between every one second. Repeat like "αα αα αα" indicates that the temperature is abnormal.
    - The RED LED blinks, single and double flash alternately between every one second. Repeat like "α αα α αα" indicates that both of the voltage and temperature is abnormal at the same time.
    - The RED LED will not have any responds even the voltage or temperature is abnormal if not detect the signal.
    - The BLUE LED blinks, double flash between every two seconds. Repeat like "αα αα αα" indicates that the throttle is abnormal.
    - (No throttle, or the throttle is not on the neutral position)

- #### Throttle Signal
- The ESC can support the 450Hz maximum PPM throttle signal.
  - The ESC throttle protection will be activated under the following situation, and the BLUE LED blinks double flash:
    - The throttle trigger do not place on the neutral position when the ESC turns on.
    - Lost the throttle signal.
  - If the ESC lost throttle signal during the operation, the BLUE LED will blink double flash, and the ESC will start to work again until the throttle signal is back to normal.

- #### Sensored & Sensorless
- The sensored mode is activated once the ESC detected the hall sensor signal at any time.
  - The ESC will work on sensorless mode once the ESC didn't detect the hall sensor signal at any time.
  - The ESC will have a slight power drop and restored soon during the moment of sensored and sensorless mode switching.
  - The PWM driving frequency will be selected automatically by the ESC on sensorless mode, and the manual setting is invalid.
  - It is invalid to set the brake PWM frequency less than 1KHz and forced recognized as 1KHz, if the ESC is on sensorless mode.
  - Boost and turbo functions are not available on sensorless mode.

- #### Boost & Turbo
- After the boost or turbo timing triggered, the RPM and current will be increased, and the battery/ESC/motor will be heating, so setting the proper timing and timing increased rate, and control the time of timing will effect the battery/ESC/motor service life.
  - The difference of the Boost and Turbo Timing:
    - The Boost timing will be triggered even though you do not pull the throttle trigger to the full throttle position.
    - The Turbo timing will be triggered only when you pull the throttle trigger to the full throttle position.
  - The Boost timing plus the Turbo timing is equal to the final opened timing when the throttle reaches its maximum position, and the final total timing is 60 degree (for Beast Pro 150A total timing is 15 degree). For example: If Boost timing set at 45 degree, and Turbo Timing set at 50 degree, so when the throttle reaches its maximum position, the Boost timing will be 45 degree, and Turbo Timing only can be opened at 15 degree.
  - If set the low voltage or over temperature protection, and the protection is activated, then all the timing will be closed.

- #### Protection
- High Voltage Protection:
    - If the ESC detected the voltage too high (Higher than the esc standard voltage), when the ESC turns on, and the voltage protection was not set "OFF", then the voltage protection will be activated, and the maximum throttle output will be limited within 50%. (The high voltage protection only worked on the moment of the ESC turns on, and it will not work on the other stages even it detected the high voltage, once the high voltage protection opened, even though the voltage comes down to the normal voltage, the protection will not be relieved.)
  - Low Voltage Protection:
    - If the ESC detected the voltage less than the set value at anytime, and this voltage keep for a while, then the low voltage protection is activated, and the maximum throttle output will be limited within 50%. (Once the low voltage protection activated, even though the voltage comes back to normal, the protection can not be relieved.)
  - Thermal Protection:
    - The output throttle from the ESC will be limited (not over 50%) with the thermal value you have preset. (The Thermal protection will be dismissed when the ESC temperature drop to 65°C)
  - If the voltage protection and temperature protection set off, and when the voltage and temperature become abnormal, the LED status will indicates the problems correspondingly, but will not limit the throttle output and will not close all ESC timing.
  - If some issues happen, cause ESC drive the motor failure, it will go into a protection; you will hear motor "beep beep beep", and it will stop beeping until release throttle to neutral position at least 0.2s.

- #### Bluetooth
- Reset password: When the ESC turns on, press and holding the power button around 10 seconds, the ESC will restore the Bluetooth password to default setting 0000.
  - With ZTW Bluetooth, connected the ZTW app to the ESC, the user can program parameters, upgrade firmware and check the real-time data of the ESC on the APP.
  - Due to the range limit of Bluetooth, the operational distance is around 10 meters. (If there are many metals or other strong interference signals or obstacles around will short the operational distance)
  - The Bluetooth name can not be changed.
  - The Bluetooth connecting will be failed during the ESC throttle calibration process.

- #### Programmable Items
- The user can program parameters at any status if the ESC turns on, and new programmed parameters will be took effect immediately, no need to restart the ESC, it means the programming parameters can be competed online, so it can provide a very intuitive feeling between the before programming and after programming. There will be some impacts on the battery/ESC/motor if you program some parameters when the motor in a high-speed rotation. For example, if you changed the motor rotation when the motor in a high-speed rotation, then the ESC will drive the motor reverse immediately, but the motor can not be reverse immediately because of its inertia, then it will cause a big current and vibration. Or when the Boost or Turbo timing opened, but you set it off when the motor in a high-speed rotation, it also will cause a big current, so we would like to recommend not programming parameters when the motor in a high-speed rotation.
  - The programming parameters are saved in the ESC embedded flash memory, and the flashed card have a limited programming life (around 10K times), so don't program the ESC very often.

- #### Real-time Data
- The real-time data can be read only when the ESC have the throttle signal.
  - The real-time data is just a reference data with ±10% accuracy, if you want to get the more accurate real-time data, you need to use the more professional equipment.
  - The description of the real-time data items:

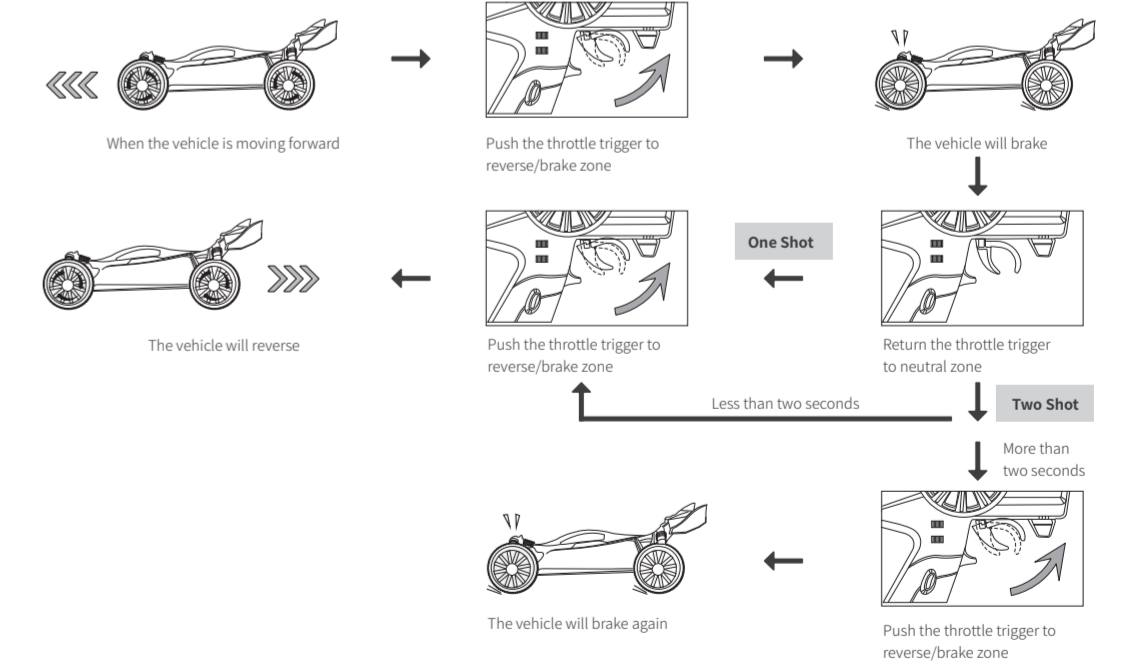
Number	Item	Description
1	Input Throttle	The throttle from the Receiver to the ESC
2	Output Throttle	The throttle from the ESC to the Motor
3	Voltage	The battery voltage is being read by the ESC
4	Min. Voltage	The minimum voltage was read by the ESC
5	Temperature	The ESC temperature
6	Max. Temperature	The maximum temperature was read by the ESC
7	RPM	Revolutions per minutes
8	Max. RPM	The maximum RPM was read by the ESC
9	Adv. Timing	Advance Timing, The ESC total timing (Boost & Turbo)

- #### Firmware Upgrade
- If the ESC firmware upgrade failed during the upgrading process, please restart the ESC again, and must upgrade the ESC firmware via the APP again (all the other functions are not available), the ESC will get right after the firmware upgraded successfully.
  - The Red Led will blink a faint light when the ESC in the firmware upgrade mode, and the Blue Led will blink a faint light when the ESC have data transmission.
  - Please do not turn off the ESC during the time of the ESC firmware upgrading process. ( And the ESC only can be switched off after pressing the power button around 5 seconds)

### Programmable Items Description

SECTION	PROGRAMMABLE ITEMS	PROGRAMMABLE ITEMS DESCRIPTION
THROTTLE	Throttle Response	The shorter the time, the quicker the acceleration.
	Coast	With this function activated, the car won't slow down immediately but coast for a while when reducing the throttle input.
	Neutral Range	The wider the neutral range, the further the throttle trigger/stick must be moved away from the neutral point. Otherwise, the car won't move.
	Min. Throttle	The bigger the value, the more aggressive the start-up when moving the throttle trigger/stick away from the neutral range.
	Minus	The bigger the throttle minus value, the lower the car speed.
	Minus Range	It determines the throttle range within which the (Throttle) Minus function works. The bigger the value, the wider the effective range.
BRAKE	Max. Forward force	The lower the value, the slower the maximum speed in the Forward direction.
	Max. Reverse force	The lower the value, the slower the maximum speed in the Reverse direction.
	Brake Response	The shorter the time, the quicker the braking.
	Min. Brake Force	After entering the braking mode, the higher the value, the stronger the brake force when moving the throttle trigger/stick away from the neutral range.
	Max. Brake Force	The lower the value, the weaker the maximum brake force.
	Fwd. Drag Brake Force	The brake force when the throttle trigger/stick is at the neutral position. The lower the value, the further the coast.
BOOST	Fwd. Drag Brake Response	The shorter the time, the faster the braking in the forward direction.
	Rev. Drag Brake Force	The brake force when the throttle trigger/stick is at the neutral position. The lower the value, the further the coast.
	Rev. Drag Brake Response	The shorter the time, the faster the braking in the Reverse direction.
	PWM Freq.	The PWM frequency for braking.
	Boost Timing	With this function activated, the motor will be able to get a higher RPM.
	Trigger	It's the way how Boost Timing is triggered, it can be triggered by throttle input or RMP.
TURBO	Throttle Threshold	The throttle threshold at which the Boost Timing will be triggered. The Boost Timing will be activated when the Boost Triggering is set to "By Throttle" and the throttle input exceeds the threshold.
	RPM Threshold	The RPM threshold at which the Boost Timing will be triggered. The Boost Timing will be activated when the Boost Triggering is set to "By RMP" and the motor RPM exceeds the RPM threshold.
	Initial Angle	It's the timing value when the Boost Timing is initially activated. The higher the value, the more aggressive the power, and the more difficult to control it.
	Angle Inc. Rate	The higher the value, the more aggressive the power, and the more difficult to control it.
	Angle Dec. Rate	The higher the value, the quicker the speed decrease. The effect, similar to braking, will be generated when the speed is really high.
	Turbo Timing	It's the timing activated when the throttle input reaches 100%.
GENERAL	Angle Inc. Rate	The higher the value, the more aggressive the power, and the more difficult to control it.
	Angle Dec. Rate	The higher the value, the faster the speed decrease. The effect, similar to braking, will be generated when the speed is really high.
	Turbo Delay	With this function activated, the Turbo Timing won't be activated immediately after the throttle trigger/stick is moved to the 100% position.
	Delay Reload	It determines whether or not to delay and reload when the throttle trigger/stick is moved away and quickly returned to the 100% point with the Turbo Timing is activated. There are two options: Wait (reload after the turbo timing is decreased to 0), Instant (reload immediately when the throttle trigger/stick is moved away from the 100% position).
	Motor Rotation	It's the direction in which motor spins. With the factory default setting, it may run in the opposite direction in some scenarios. This function allows users to switch the rotational direction if necessary.
	Motor Poles	It allows users to manually set the pole count of the motor, so to get the correct RPM threshold at which the Boost Timing will be triggered. And users are able to check the actual motor RMP in the real-time data part of the mobile phone App.
GENERAL	Running Mode	There are three running modes: Forward/Brake, Forward/Brake/Reverse, and Forward/Reverse.
	Reverse Mode	It's only available when the running mode is set to Forward/Brake/Reverse. There are two options: One Shot (pull the throttle trigger/stick once) & Two Shots (quickly pull the throttle trigger/stick twice).
	Drive PWM Freq.	It's the PWM frequency ESC used for driving motor. The lower the PWM driving frequency, the faster the acceleration, and the worse the throttle linearity; the higher the PWM driving frequency, the smoother the throttle linearity, and it will result in fast temperature increase.
	CutOff Voltage	With it set to "Auto", the ESC will automatically identify the number of LiPo cells you've plugged in the moment it's powered on.
	CutOff Thermal	The ESC will automatically cease operation when the internal temperature rises above user-selectable values.
	BEC Output	Select the output of the Battery Eliminator Circuit depending on the operating voltage requirements of the servos.
A/C Swap	It's for switching the motor wires: A & C. When setting to "No", the output wires at the ESC side will be connected to the motor in the following sequence: A-A, B-B, and C-C; when setting to "Yes", the wiring sequence will be: A-C, B-B, C-A.	

#### Reverse Mode: One shot & Two shot (In the Forward/Brake/Reverse Mode)



### Trouble Shooting

Trouble Shooting	Possible causes	Solutions
The ESC was unable to start the status LED, the motor, and the cooling fan after it was powered on.	1. No power was supplied to the ESC. 2. The ESC switch was damaged.	1. Check if all ESC & battery connectors have been well soldered or firmly connected. 2. Replace the broken switch.
The motor suddenly stopped or significantly reduced the output in operation.	1. The receiver was influenced by some foreign interference. 2. The ESC entered the battery LVC (Low Voltage Cut off) protection. 3. The ESC entered the thermal (over-heat) protection.	1. Check all devices and try to find out all possible causes, and check the transmitter's battery voltage. 2. The RED LED blinks, single flash between every one second. 3. The RED LED blinks, double flash between every one second.
The motor stuttered but couldn't start.	1. Some soldering between the motor and the ESC was not good. 2. The ESC was damaged (some MOSFETs were burnt).	1. Check all soldering points, please re-solder if necessary. 2. Contact the distributor for repair or other customer services.
The car ran forward/backward slowly when the throttle trigger was at the neutral position.	1. The neutral position on the transmitter was not stable, so signals were not stable either. 2. The ESC calibration was not proper.	1. Replace your transmitter 2. Re-calibrate the throttle range or fine tune the neutral position on the transmitter.