Brushless ESC - DRAGON ver.4.1

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The Dragon ESC's high power BEC has been specifically designed for extreme aerobatics and therefore has the capability to support the higher momentary peak demand loads to eliminate the possibility of unwanted shutdowns, and is also capable of supporting continuous simultaneous multiple servo operations typically found in CCPM equipped hardcore 3D E-helicopters.

Specifications:

Type	Cont.\Burst Current(A)	Battery cell NiXX\Lipo	Weight (g)	BEC Output	Size(mm) W*L*H	User Program
DRAGON12A-BEC 1.0A	12A\16A	5-12NC\2-4Lipo	13	5V/1A	21x22x4	Yes
DRAGON35A BEC3.0A	35A\45A	5-12NC\2-4Lipo	35	5V/3A	28x38x8	Yes
DRAGON50A-SBEC 8-10A	50A\70A	5-18NC\2-6Lipo	58	5.0V,5.5V,6.0V adjustable /8A	30x56x11	Yes
DRAGON70A-SBEC 8-10A	70A\90A	5-18NC\2-6Lipo	58	5.0V,5.5V,6.0V adjustable /8A	30x56x11	Yes
DRAGON90A-SBEC 8-10A	90A\110A	5-18NC\2-6Lipo	63	5.0V,5.5V,6.0V adjustable /8A	34x46x13	Yes
DRAGON120A-SBEC 8-10A	120A\140A	5-18NC\2-6Lipo	63	5.0V,5.5V,6.0V adjustable /8A	34x46x13	Yes
DRAGON130A-SBEC8- 10A	130A\160A	5-18NC\2-6Lipo	150	5.0V,5.5V,6.0V adjustable /8A	55x72x17	Yes
DRAGON160A-SBEC 8-10A	160A\220A	5-18NC\2-6Lipo	150	5.0V,5.5V,6.0V adjustable /8A	55x72x17	Yes

Wires Connection:
The speed controller can be connected to the motor by soldering directly or with high quality connectors. Always use new connectors, which should be soldered carefully to the cables and insulated with heat shrink tube. The maximum length of the battery pack wires shall be within 6 inches.

Features:

- Use new generation of the MOSFETs to make sure the ESC low heating and more reliablity .
- Supports high RPM motors，can be matched with most of the motors in the RC market .
- Secondary sub-menu setting is easier to be programmed by LED card .
- Adjustable BEC output 5.0V/5.5V/6.0V and Continuous 8A current supplies the Servo with much stronger power.
- Advanced Governor Mode has the ESC to keep the motor speed even though the load is changed.
- More optional motor timing Setup and soft acceleration start ups make the motors run smoothly.
- Power arming protection prevents the motor from accidentally running when switched ON.
- Safety thermal over-load protection, when the temperature of ESC exceeds 110 deg C, the ESC will reduce the output power to allow it to cool.
- Auto throttle shut down in signal lose situation
- Super smooth and accurate throttle linearity

DRAGON ESC allows you to program all functions to fit your specific needs, which makes it very efficient and user friendly:

1. User programmable *Brake Setting (we recommend using brake for only folding props applications)*
2. User programmable *Battery Type(LiPo or NiCd/NiMH/LiFe)*
3. User programmable *Low Voltage Cutoff Setting*
4. User programmable *Factory Default Setup Restore*
5. User programmable *Timing Settings (to enhance ESC efficiency and smoothness)*
6. User programmable *BEC Voltage Output*
7. User programmable *Governor Mode (for helicopter applications)*
8. User programmable *Motor Rotation (forward/reverse)*
9. User programmable *Soft Acceleration Start Ups (for delicate gearbox and helicopter applications)*
10. User programmable *Low Voltage Cut Off Type (power reduction or immediate shut down)*

Settings:

1.Brake: ON/OFF

* **OFF**- Sets the propeller to freewheel when the throttle stick is at the minimum position.
* **ON**-**Soft Brake** Sets the propeller to the **30%** of the brake when the throttle stick at the minimum position (Recommended for folding props).
* **ON**-**Mid Brake** Sets the propeller to the **60%** of the brake when the throttle stick at the minimum position (Recommended for folding props).
* **ON**-**Hard Brake** Sets the propeller to the **100%** of the brake when the throttle stick at the minimum position (Recommended for folding props).

2.Battery type: LiPo / NiCad/NiMh/ LiFe

* **NiCad/NiMH** – Sets Low Voltage protection threshold for **NiCad/NiMH** cells.
* **LiPo** – Sets Low voltage protection threshold for **LiPo** cells and automatically detects the number of cells within the pack.
* **LiFe** – Sets Low Voltage protection threshold for **LiFe** cells.

Note: Selecting the NiCad/NiMH option for the battery type, triggers the ESC to automatically set the cutoff

threshold to the factory default of 60%.The cutoff threshold can then be subsequently altered through the Low Voltage protection function, if required. The ESC will read the initial voltage of the NiCad/NiMh pack once it is plugged in and the voltage read will then be used as a reference for the cutoff voltage threshold.

3.Cut Off Voltage Threshold(Low Voltage Protection Threshold):

Low (2.8V)/ Medium (3.0V)/ High (3.2V)/No Protection

1) For Li-xx packs- number of cells are automatically calculated and requires no user input apart from defining the battery type. This ESC provides 4 setting options for the low voltage protection threshold ; Low (2.8V)/ Medium (3.0V)/ High (3.2V)/No Protection. For example : the voltage cutoff options for an 11.1V/ 3 cell Li-Po pack would be 8.4V (Low)/ 9.0V(Med)/ 9.6V(High)
2) For Ni-xx/Life packs-low / medium / high cutoff voltages are 50%/60%/65% of the initial voltage of the battery pack.. For example: A fully charged 6 cell NiMh pack's voltage is 1.44V x 6=8.64V,when "LOW" cutoff voltage is set, the cutoff voltage is: 8.64V x 50%=4.3V and when "Medium" of "High" is set, the cutoff voltage is now 8.64V X 65%=5.61V.

4. Restore factory setup defaults:

Restore- Sets the ESC back to factory default settings;

Brake:	OFF
Battery type Detect:	LiPo with Automatic Cell detective
Cut Off Voltage Threshold:	Medium (3.0V/60%)
Motor Timing:	2°
SBEC Voltage Output	5.0V
Governor Mode :	RPM OFF
Motor Rotation :	Forward
Soft Acceleration Start Up:	30%
Low Voltage Cutoff Type:	Reduce power

5. Motor Timing : Auto Timing , 2°, 8°, 15°, 22°, 30°

* **2°, 8°** – Setting for most of in-runner motors.
* **15°, 22°** –Setting for motors with 6 or more poles.
* **30°** – Setting for motors with more poles.

In most cases, automatic timing works well for all types of motors.However for high efficiency we recommend the Low timing setting for 2 pole motors (general in-runners) and high timing for 6 poles and above (general out-runners). For higher speed, High timing can be set. Some motors require different timing setups therefore we suggest you to follow the manufacturer recommended setup

*** Note**: Run your motor on the ground first after making any changes to your motor timing!

6. User programmable SBEC Voltage output

There are the three different levels of BEC voltage output can be selected.

*** The 1st Level : 5.0V**
*** The 2nd Level : 5.5V**
*** The 3rd Level : 6.0V**

7.Governor Mode (Heli Governor mode)

*** RPM OFF Control : Soft Start and Delay RPM will be *OFF***

* **Soft Start :** **For 1st Soft Start** There will be a 5-second delay from start to full rpm;
For 2nd Soft Start There will be a 10-second delay from start to full rpm;
For 3rd Soft Start There will be a 15-second delay from start to full rpm;
But if the throttle is cut off after starting, then the next start will be as normal start.

* **Governor Mode : Governer.** There will be control motor rpm with Governor Function;
If lower the throttle to the 80% position of the full throttle or lower than 80% position, the RPM would be

definitely changed , the lost RPM will be detected and compensated automaticly by the ESC that makes sure to keep the RPM at the same speed, but if the throttle is cutoff after starting, then the next start will be as normal start.

Note: Once the Governor Mode is enabled, the ESC's Brake and Low Voltage Cutoff Type settings will automatically be resetted to No Brake and Reduce Power respectively, regardless of what settings they were previously set.

8.Motor Rotation: Forward/ Reverse

In most cases motor rotation is usually reversed by swapping two motor wires. However, in cases where the motor cables have been directly soldered the ESC cables, motor rotation can be reversed by changing the value of setting on the ESC.

9. Soft acceleration start ups

*__Low__(10%-15%-20%) Sets ESC soft acceleration start up for the motors which needs low start up current

*__Mid__ (25%-30%-35%) Sets ESC soft acceleration start up for the motors which needs mid start up current

*__High__(40%-45%-50%) Sets ESC soft acceleration start up for the motors which needs high start up current

10.Low Voltage Cutoff Type : Reduce Power / Cut off Power

* Reduce Power – ESC reduces motor power when the pre-set Low Voltage Protection Threshold value is reached.(recommended)
* Cut Off Power – ESC instantly cuts motor power when the pre-set Low Voltage Protection Threshold value is reached.

THE PROCEDURE AND INSTRUCTION OF THE PROGRAMMING BY TRANSMITTER

1. ENTERING THE PROGRAMMING MODE
2. SELECTING THE PROGRAMMABLE ITEM
3. SELECTING THE DESIRED VALUE OF THE PROGRAMMABLE ITEM
4. DISCONNECTING THE BATTERY PACK

1. ENTERING THE PROGRAMMING MODE

1).Switch your Transmitter ON and set the throttle stick to its maximum position.

2).Connect the battery pack to the ESC

3).Wait for about 2 seconds until you hear two short beeps (●● ●● ●● ●●) confirming that the ESC has now entered the programming mode.

2. SELECTING THE PROGRAMMABLE ITEM

The Programming Mode is in Sequence, each Programmable Item is equivalent to an audible tone emitting for four times. You will hear 10 tones in a loop with the following sequence.When the desired tone for the Programmable Item is reached, move the throttle stick down to its minimum position. The motor will emit two beeps(**) confirming the desired programmable item has been entered.

3. SELECTING THE DESIRED VALUE OF THE PROGRAMMABLE ITEM

The motor has been emitting sequentially. If the desired value of the programmable item is reached, set the throttle stick to its maximum position. The motor will emit two beeps(**) confirming the new setting has been stored.

4. DISCONNECTING THE BATTERY PACK.

If you don't want to go on to programming, disconnect the battery pack directly. If you want to go on to programming, keep waiting to the next programmable item to select the value you need.

Note: You could also select the LED program card to program your desired function. Program card is as the option spare part, its programming procedure is described in the LED program card user manual.

THE TONES WILL BE HEARD IN SEQUENCE AS FOLLOWS:

1 Beep- : **Brake (1 short tone)**

2 Beep-Beep- : **Battery Type (2 short tone**)

3 Beep-Beep-Beep- : **Cut Off Voltage Threshold (3 short tone)**
4 Beep-Beep-Beep-Beep- : **Restore Factory Setup Defaults (4 short tone)**
5 Beep----- : **Motor Timing (1 long tone)**
6 Beep-----Beep- : **SBEC Voltage Output (1 long tone 1 short tone)**
7 Beep-----Beep- Beep- : **Motor Rotation (1 long tone 2 short tone)**
8 Beep-----Beep- Beep- Beep- : **Governor mode (1 long tone 3 short tone)**
9 Beep-----Beep- Beep- Beep- Beep- : **Soft Acceleration Start Up (1 long tone 4 short tone)**
10 Beep----- Beep----- : **Low Voltage Cutoff Type (2 long tone)**

Remark :One long tone "Beep-----"is equal to five short tone "Beep-".

Tone of value / Prog.Item	BEEP-	BEEP- BEEP-	BEEP- BEEP- BEEP-	BEEP- BEEP- BEEP- BEEP-	BEEP -----	BEEP ------ BEEP -	BEEP ------ BEEP- BEEP-	BEEP ------ BEEP- BEEP- BEEP-	BEEP ------ BEEP- BEEP- BEEP- BEEP-
Brake	***Brake OFF***	Brake On (Soft)	Brake On (Mid)	Brake On (Hard)					
Battery Type	NiCd/NiMH	***LiPo***	LiFe						
Low Voltage Cut Off Threshold	2.8V/50%	***3.0V/60%***	3.2V/65%	No Protection					
Restore Factory Setup Defaults	Restore								
Motor Timing	***Auto Timming***	2°	8°	15°	22°	30°			
SBEC Voltage Output	***5.0V/8A (Adjust)***	5.5V/8A (Adjust)	6.0V/8A (Adjust)	SBEC = 8.0A/Max 12.0A					
Motor Rotation	***Forward***	Reverse							
Governor Mode	***RPM OFF***	1st Soft Start (5sec Delay)	2nd Soft Start (10sec Delay)	2rd Soft Start (15sec Delay)	Governor Mode				
Soft Acceleration Start Up	10%	15%	20%	25%	***30%***	35%	40%	45%	50%
Low Voltage Cut Off Type	***Reduce Power***	Cut Off Power							

FOR Example : Setting the motor timing ----15°

1). Switch your Transmitter ON and set the throttle stick to its maximum position. Connect the battery pack to the ESC and wait for about 2 seconds until you hear two sets of audible tone (•• •• •• ••) confirming that the ESC has now entered the programming mode.
2). After hearing "Beep-----",put the throttle sticker to its minimum.
3). After hearing "Beep-Beep-Beep-" ,put the throttle sticker to its maximum, the motor will emits special tones confirming the new setting has been stored.
4). Disconnect the battery pack.

Using Your New ESC

Improper polarity or short circuit will damage the ESC therefore it is your responsibility to double check all plugs for proper polarity and first fit BEFORE connecting the battery pack.

Built-in Intelligent ESC Safety Functions

1. **Over-heat protection**: When the temperature of ESC exceeds 110 deg C, the ESC will reduce the output power to allow it to cool.
2. **Lost Throttle signal protection**: The ESC will automatically cut power to the motor when it detects a lost of throttle signal for 2 seconds.

****** POWERING UP THE ESC FOR THE FIRST TIME & SETTING THE AUTOMATIC THROTTLE CALIBRATION ******

The DRAGON ESC features Automatic Throttle Calibration to attain the smoothest throttle response and resolution throughout the entire throttle range of your transmitter. This step is done once to allow the ESC to "learn and memorize" your Transmitter's throttle output signals and only repeated if you change your transmitter.

1.Switch your Transmitter ON and set the throttle stick to its maximum position.

2.Connect the battery pack to the ESC. Wait for about 2 seconds, the motor will beep for twice, then put the throttle in the minimum position, the motor will also beep, which indicates that your ESC has got the signal range of the throttle from your transmitter.

The throttle is now calibrated and your ESC is ready for operation.

NORMAL ESC START UP PROCEDURE

1. Switch your Transmitter **ON** and set the throttle to its **minimum** position.
2. Connect the battery pack to the ESC.
3. When the ESC is first powered up, it emits two sets of audible tones in succession indicating its working status.
   * The first set of tones denotes the number of cells in the LiPo pack connected to the ESC. (Three beeps (***)indicates a 3 cell LiPo pack while 4 beeps (****) indicates a 4 cell LiPo pack).
   * The second set of tones denotes Brake status (one beep(*) for Brake "ON" and two beeps (**) for Brake "OFF").

The ESC is ready for use now.

Wrong battery polarity will damage the ESC and void the warranty.

- Install the ESC in a suitable location with adequate ventilation for cooling. This ESC has a built-in over temperature cutoff protection feature that will immediately cut power to the motor once the ESC temperature exceeds the 230 Deg F/ 110 Deg C high temperature limit.
- Use only batteries that are supported by the ESC and ensure the correct polarity before connecting.
- Switch your Transmitter ON and ensure the throttle stick is in the minimum position before connecting the battery pack.
- Never switch your transmitter **OFF** while the battery is connected to your ESC.
- Only connect your battery pack just before flying and do not leave your battery pack connected after flying.
- Handle your model with extreme care once the battery pack is connected and keep away from the propeller at all times. Never stand in-line or directly in front of any rotating parts.
- Do not immerse the ESC underwater or allow it to get wet while powered up.
- Always fly at a designated flying site and abide by the rules and guidelines set by your flying club.