



INSTRUCTION MANUAL FOR REDBACK RACING BRUSHLESS ESC's

Thank you for purchasing Redback Brushless Electronic Speed Controller (ESC)

Brushless systems for RC models can be very dangerous and we strongly suggest that you read this manual carefully. You are responsible over the use, installation, application, and maintenance of these products, we accept no liability for any damages, loss or costs resulting from the misuse of this item.

Redback ESC's high powered BEC has been specifically designed for extreme aerobatics and therefore are capable of supporting the peak demand loads and eliminate the possibility of unwanted shutdowns. They are also capable of supporting continuous simultaneous multiple servo operations typically found in CCPM equipped 3D E-helicopters.



I. Connections:

Plug the "S" or universal servo connector into the throttle channel of your receiver. Controller Red and Black wires connects to battery pack Red and Black wires respectively.

II. Features:

Next generation of MOSFET used to make sure the ESC maintains low temperatures and are more efficient;
Adjustable SBEC output 5.0V/5.5V/6V and continuous 5A current supplies much more power to the servos;
Advance governor mode: To help keep constant motor speed;
Adjustable motor timing setup and soft acceleration start-ups.
Super smooth and accurate throttle linearity;
Supports high RPM motors.
Power Arming Protection (prevents the motor from starting accidentally when switched ON);

Built-in Intelligent ESC Safety Functions:

1. Over-temp Protection: When the temperature of ESC exceeds 110 deg C, the ESC will reduce the output power to allow it too cool.
2. Lost Throttle Signal Protection: The ESC will automatically reduce output power to the motor when it detects throttle signal loss for 2 second, a subsequent loss of throttle signal beyond 2 seconds, will cause the ESC automatically to cut power to the motor.

All functions are programmable, to meet your specific needs.

III. Settings:

1. Brake Type (Brake Off/Soft Brake/Mid Brake/Hard Brake)

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

2. Battery Type (NiCd or NiMH/LiPo/LiFe)

- * NiCd/NiMH:Set Low voltage protection threshold for NiCd/NiMH cells.
- * LiPo:Set Low voltage protection threshold for LiPo cells and auto- matically detects the number of cells within the pack.
- * LiFe:Set Low voltage protection threshold for LiFe cells.

Note: Selecting the NiCd/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 NiCd/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/50%)/ Medium(3.0V/60%)/ High(3.2V/65%)/No Protection

* 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).

* 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 1.44Vx6=8.64V,when "LOW" cutoff voltage is set, the cutoff voltage is: 8.64Vx50%=4.3V and when "Medium" of "High" is set, the cutoff voltage is now 8.64Vx65%=5.61V.

4. Restore factory settings (set the ESC parameters back to default values)

Factory Default	Brake Type	Brake OFF
	Battery Type	LiPo with Automatic Cell Detective
	Cut Off Voltage Threshold	3.0V/60%
	Motor Timing	Auto
	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/2°/8°/15°/22°/30°

- * Auto:ESC determines the optimum motor timing automatically.
- * 2°, 8°:for most inrunner motors.
- * 15°, 22°:for motors with 6 or more poles.
- * 30°: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 or use the automatic timing setting if you are unsure.

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

6. SBEC Voltage Output (5V/5.5V/6V)

7. Governor Mode-for heli. (RPM OFF / 1st Soft Start / 2nd Soft Start / Governor Mode 1 / Governor Mode 2)

- * RPM OFF:Rpm control off
- * Soft Start:For 1st soft-start, there will be a 8-second delay from start to full rpm.
For 2nd soft-start, there will be a 18-second delay from start to full rpm.

Note: If the throttle is cut off after before 3 Seconds, then the next start will be as normal start. If the throttle is cut off after 3 Seconds, the next start will be a soft start.

- * Governor Mode: Governor Mode 1 : There will be a 23-second delay from start to full rpm; If the throttle falls to 80% of full throttle or lower than 80% the lost RPM will be detected and automatically compensated by the ESC to help maintain RPM at the same speed.

(Note: This function is only for Low KV motor)

- * Governor Mode 2 : There will be a 23-second delay from start to full rpm; If the throttle falls to 80% of full throttle or lower than 80% the lost RPM will be detected and automatically compensated by the ESC to help maintain RPM at the same speed.

(Note: This function is only for High KV motor)

Note: If the throttle is cut off after before 3 Seconds, then the next start will be as normal start. If the throttle is cut off after 3 Seconds, the next start will be a soft start.

Note2: Once the Governor Mode is enabled, the ESC's Brake and Low Voltage Cutoff Type settings will automatically be reset to Brake Off and Reduce Power respectively, regardless of what settings they were previously.

8. Motor rotation (Forward / Reverse)

Motor rotation is usually reversed by swapping positive and negative motor wires. However, in cases where the motor cables have been directly soldered to the ESC cables, motor rotation can be reversed by changing the setting value on the ESC.

9. Start Up Strength (Low/Mid/High)

- * Low(10%-15%-20%):Sets ESC start up strength for the motors which needs low start up current.
- * Mid (25%-30%-35%):Sets ESC start up strength for the motors which needs mid start up current.
- * High(40%-45%-50%):Sets ESC start up strength for the motors which needs high start up current.

10. Low Voltage Cut Off 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.

Using Your New ESC:

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

2. Powering up the ESC for the first time and set the Automatic Throttle Calibration: Redback ESCs feature Automatic Throttle Calibration This step is done once to allow the ESC to "learn and memorize" your transmitter throttle output signals and is only repeated if you change your transmitter.

* Switch your transmitter ON and set the throttle stick to maximum position.

* Connect the battery pack to the ESC. Wait for about 2 seconds, the motor will beep two tones, 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.

ESC Normal 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 the status of its state.

* 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 denoting Brake status (one beep(+) for Brake "ON" and two beeps (++) for Brake "OFF").

Now, the ESC is ready for use.



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Entering the Programming Mode(via Transmitter):

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 4 times of two short tone (" " " " " ") 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 one special tone 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 one special tone 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.

* Programmable items and the tones:

1	Beep-	Brake Type (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-	Governor Mode (1 long tone 2 short tone)
8	Beep----- Beep- Beep- Beep-	Motor Rotation (1 long tone 3 short tone)
9	Beep----- Beep- Beep- Beep- Beep-	Start Up Strength(1 long tone 4 short tone)
10	Beep----- Beep-----	Low Voltage Cut Off Type (2 long tone)
Remark : One long tone "Beep-----" is equal to five short tone "Beep-".		

* Detail value of each programmable item and the tones:

Tone of value Prog.Item	BEep-	BEep- BEep-	BEep- BEep- BEep-	BEep- BEep- BEep- BEep-	BEep- ----	BEep- BEep-	BEep----- B E E P BEep-	BEep----- B E E P B E E P BEep-	BEep----- B E E P B E E P BEep- BEep-
Brake Type	Brake OFF	Soft Brake	Mid Brake	Hard Brake					
Battery Type	NiCd/ NiMH	LiPo	LiFe						
Cut Off Voltage Threshold	2.8V/50%	3.0V/60%	3.2V/65%	No Protection					
Restore Factory Setup Defaults	Restore								
Motor Timing	Auto	2°	8°	15°	22°	30°			
SBEC Voltage Output	5.0V	5.5V	6.0V						
Governor Mode	RPM OFF	1st Soft Start	2nd Soft Start	Governor Mode 1	Governor Mode 2				
Motor Rotation	Forward	Reverse							
Start Up Strength	10%	15%	20%	25%	30%	35%	40%	45%	50%
Low Voltage Cut Off Type	Reduce Power	Cut Off Power							
Remark : Value marked in grey is factory default.									

For example, setting timing mode to 15°

1. Switch your transmitter ON and set the throttle to its maximum position.
2. Connect the battery pack to the ESC.
3. In about 2 seconds, 4 sets of two short tones (" " " " " ") will be heard, confirming that the ESC has now entered the programming mode.
4. After hearing "Beep-----" put the throttle stick to minimum position
5. After hearing "Beep-Beep-Beep-Beep-", put the throttle stick to its maximum, the motor emits special tones confirming the new setting has been saved.

Note: The ESC only allows the setting of one function at a time. Should you require making changes to other functions, disconnect the battery pack and wait 5 seconds to reconnect the battery and repeat the above steps. After setting all parameters, disconnect the battery from ESC.

Program the ESC (via LED Program card):

1. Turn on ESC. Remove the signal wire and plug it into the top-socket on the Program card until LED lights, The first programmable item will be shown, if there is a mistake, pls reconnect.
2. If the ESC is not connected to batteries, the Program card will need another power supply, the range of power supply is between 5.0-6.3V.
3. Press the "Menu" Key on the Program card and circularly select each programmable item, at that time the number of the programmable item will be displayed on left of the Programming card, the current value will be displayed on right of Programming card, then press the "Value" Key to amend the value, next press the "OK" Key to confirm, at the same time the Red LED of Programming card will blink and motor will beep. Turn off the ESC, the modified value will be saved.
4. Press the "Reset" Key to restore to factory default settings.

* Programming Parameters on LED Prog-Card:

1. Brake Type	1-Brake Off 2-Soft Brake 3-Mid Brake 4-Hard Brake
2. Battery Type	1-NiCd/NiMH 2-LiPo 3-LiFe
3. Cut Off Voltage Threshold	1-2.8V/50% 2-3.0V/60% 3-3.2V/65% 4-No Protection
4. Motor Timing	1-Auto 2-2° 3-8° 4-15° 5-22° 6-30°
5. SBEC Voltage Output	1-5.0V 2-5.5V 3-6.0V
6. Governor Mode	1-RPM OFF 2-1st Soft Start 3-2nd Soft Start 4-Governor Mode1 5-Governor Mode2
7. Motor Rotation	1-Forward 2-Reverse
8. Start Up Strength	1-10% 2-15% 3-20% 4-25% 5-30% 6-35% 7-40% 8-45% 9-50%
9. Low Voltage Cut Off Type	1-Reduce Power 2-Cut Off Power

IV.General Safety Precautions:

- * DO NOT install propeller (fixed wing) or drive pinion (helicopter) on the motor when you test the ESC and motor for the first time to verify the correct settings on your radio. Only install your propeller or pinion after you have confirmed that the settings on your radio are correct.
- * 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.
- * NEVER use ruptured or punctured battery cells.
- * NEVER use battery packs that are known to overheat.
- * Use batteries that are supported by the ESC and ensure the correct polarity before connecting. Wrong battery polarity will damage the ESC and void the warranty!
- * NEVER short-circuit the battery or motor terminals.
- * Always use proper insulation material for cable insulation.
- * DO NOT exceed the number of cells or servos specified by the ESC.
- * Always use proper cable connectors.
- * Install the ESC in a suitable location with adequate ventilation for cooling. Redback ESCs have built-in over-temperature cut-off protection that will immediately cut power to the motor once the ESC temperature exceeds 230 Deg F/ 110 Deg C limit.
- * 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 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.
- * Fly at a designated flying site and abide by the rules and guidelines set by your flying club.

V.Trouble Shooting:

Trouble	Possible Reason	Solution
Motor doesn't work, but there are audible tones from automatic detection of the number of cells after powering up ESC	The ESC throttle calibration has not been set up	Set up the ESC throttle calibration
Motor doesn't work and no audible tone emitted after connecting the battery, Servos are not working either.	Poor/loose connection between battery pack and ESC	Clean the connector terminals or replace connector
	No power	Replace with a freshly charged battery pack
	Poor soldered connections (dry joints)	Re-solder the cable connections
	Wrong battery cable polarity	Check and verify cable polarity
	ESC throttle cable connected to receiver in the reverse polarity	Check the ESC cable connected to the ESC to ensure the connectors are in the correct polarity
Motor runs in reverse rotation	Faulty ESC	Replace ESC
	Wrong polarity between the ESC and the motor	Swap any two of the three cable connections between the ESC and the motor or access the Motor Rotation Function via the ESC programming mode and change the pre-set parameters
	Lost throttle signal	Check proper operation of the radio equipment Check the placement of the ESC and the receiver and check the route of the receiver's aerial and ESC cables to ensure there is adequate separation to prevent RF interference Install a ferrite ring on the ESC's throttle cable
Motor stops running in flight	Battery pack voltage has reached the Low Voltage Protection threshold	Land the model immediately and replace the battery pack
	Possible bad cable connection	Check and verify the integrity of the cable connections
	Possible RF Interference at the flying field	The normal operation of the ESC may be susceptible to surrounding RF interference Restart the ESC to resume normal operation on the ground to verify recurrence. If the problem persists, test the operation of the ESC at a different flying field
Motor restarts abnormally	Inadequate Ventilation	Relocate the ESC to allow better ventilation
ESC Overheats	Servos drawing too much current and over loading the ESC	Use servos that are adequately sized for the ESC. The maximum BEC current drawn should be within the BEC limits
	Over sized motor or prop	Prop down or resize the motor