

# Tempest ESC User and Programming Manual

## INTRODUCTION:

Thank you for purchasing a Tempest Speed Controller! Remember that Brushless Power Systems can be very dangerous, and if handled improperly, they can cause personal injury and damage to other related products. We strongly recommend reading through this User Manual before using this product. Because we have no control over the use, installation or maintenance of this product, we assume no responsibility or liability for any losses, injury or damage caused by its use. For more information about this product, and the rest of the Tempest Power System product line, visit our website at: [www.TempestPower.com](http://www.TempestPower.com)

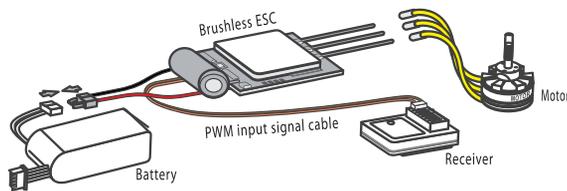
## PRODUCT FEATURES:

- 32-Bit ARM MCU offers small size, light weight and high-speed operation.
- High-resolution signal input offers smooth and linear throttle response.
- Throttle signal loss protection prevents fly-aways by reducing throttle.
- Auto-Calibration of throttle endpoints gives full range of throttle operation.
- High level of compatibility, works with most brands of brushless motors.
- Integrated BEC circuits provide reliable power to radio receiver and servos.
- Over-Temperature protection reduces motor power if ESC gets too hot.
- Synchronous Rectification and Regenerative Braking offer high efficiency.
- Wide range of adjustable parameters to suit many different types of motors.
- Easy ESC programming is available with Full-Featured Programming Card.

## SPECIFICATIONS:

- Several different models available from 6-Amp 2-cell to 120-Amp 8-cell.
- PWM Frequency adjustable from 8 KHz up to 32 KHz to match motor.
- Wide throttle range compatibility from 900uS to 2400uS if needed.
- High speed operation with Max Speed of 300,000 RPM on 2-pole motors, 100,000 RPM on 6-pole motors and 43,000 RPM on 14-pole motors.
- Over-Temperature Protection with user selectable temperature set-point.
- Locked-Rotor Protection shuts down the ESC if the prop is blocked.
- Low Voltage Cutoff available to prevent over-discharge of batteries.
- Auto Cell Count detection available, or set to a fixed number of cells.
- Inactivity Alarm warns you if you forget to unplug the battery after flight.

## CONNECTION DIAGRAM:



## OPERATION:

### 1. Initial Throttle Calibration

Before using the ESC for the first time, please set the throttle endpoints.  
(Note: Futaba transmitters must have the throttle channel reversed to work properly with an electronic speed controller.)

- Step 1:** Turn on your transmitter and set the throttle stick to full throttle position.  
**Step 2:** Power on the ESC, your motor will beep 2 times to indicate High set point.  
**Step 3:** Move the throttle stick to the lowest position, the motor will beep twice again to indicate Low set point, and then after a short delay, it will beep two more times to indicate the ESC is now armed and ready for use.

### 2. Turning the Brake On and Off using Throttle Stick Programming

You can turn the Motor Brake on or off at the field, without the Programming Card, using throttle stick programming. The following steps explain how to do this.

- Step 1:** Turn on your transmitter and set the throttle stick to mid-throttle.  
**Step 2:** Power up the ESC, you will get the regular start-up tones followed by a series of single beep tones. At this point, if you move the throttle stick to full throttle, it will turn the brake on. If you move it to low throttle, it will turn the brake off. After moving the stick you will hear a series of tones followed by 2 beeps. At this point, the ESC is armed and ready to use.

### 3. Normal ESC Startup Procedure

Before you power up the aircraft, always make sure that the transmitter is turned on and the throttle stick is at the minimum throttle position. (If you power up the ESC with the throttle stick above 3/4 throttle, the ESC will try to do a Throttle Endpoint Calibration.)

After the transmitter is on, and the throttle stick is at the lowest setting, plug in the motor battery. The ESC will detect the number of cells in the battery pack and beep once for each cell in the pack. For example, when using a 3-cell pack, the ESC will beep 3 times, and when using a 4-cell pack, the ESC will beep 4 times. After the initial series of beeps that indicates the number of cells, there will be a short pause, followed by 2 more beeps. This indicates the ESC is now armed and ready to use.

## DETAILED SETTINGS WITH PROGRAMMING CARD:

Tempest ESC Programming Card							
	FLASH	DATA				SIGNAL	
CUTOFF MODE / BATTERY	OFF	SLOW DOWN	CUT OFF	LIHV	LIPO	NIMH	
CUTOFF VOLTAGE	2.9	3	3.1	3.2	3.3	3.4	3.5
CELLS	2	3	4	5	6	7	8
CELLS	9	10	11	12	13	14	AUTO
PROTECT TEMP.	OFF	90°C	100°C	110°C	120°C	130°C	140°C
TIMING	0°	6°	12°	18°	24°	30°	AUTO
BRK/STL MOTOR DIR.	OFF	25%	50%	75%	100%	NORMAL	REVERSED
STARTUP POWER	10%	20%	25%	30%	35%	40%	45%
INACTIVITY RESP.	OFF	10S	15S	20S	30S	40S	60S
MOTOR TYPE	NORMAL	DISC TYPE	EDF				
BEC VOLTAGE	5.0V	5.5V	6.0V	7.4V	8.0V		
SHOULD ACC.	L1	L2	L3	L4	L5	L6	L7
PWM FREQ	8K	12K	16K	24K	32K		
BEACON DELAY	OFF	1MIN	2MIN	3MIN	4MIN	5MIN	10MIN
	⬇	⬆	⚡	⏪			
	⬆	⬆	USB	ENTER			

## Safety Points:

Brushless motors are extremely powerful, and improper use can cause serious bodily injury and damage to surrounding objects. Care should be taken at all times to insure that they are operated in a safe manner.

- Do not operate the aircraft any longer than necessary after Low Voltage Cutoff activates. This can cause permanent damage to your batteries.
- If the Over-Temperature Protection comes on, land immediately and change the position of the ESC to increase airflow and provide better cooling.
- Do not operate the ESC at current levels higher than it is rated for.
- Do not allow anything to come into contact with the propeller while running.
- If the motor twitches back and forth when the throttle is advanced, this indicates loss of connection on one of the three motor leads. DO NOT operate the motor in this condition as it will damage the motor and/or the ESC. Check all connections between the motor and ESC before restarting.
- Do not use the ESC if any Motor leads or ESC leads are damaged.

## TROUBLESHOOTING:

- If the motor rotates in the wrong direction, this can be corrected by powering down the motor, unplugging any two connections between the motor and ESC, and switching the positions before plugging them back in.
- Do Not apply reverse polarity to the input connections! This will damage the ESC, and is not covered under warranty.
- If the motor makes a "Pinging" noise during acceleration, the timing is not set correctly, or you are using too large of a prop. Timing can be changed with the Tempest Programming Card, which is available separately.
- If the motor stops running, and then you hear 2 beeps, this means that the ESC has hit the Low Voltage Cutoff point. Charge the battery before using it again.
- The AUTO Timing setting is designed to work well with most motors. If your motor does not work properly on the AUTO setting, try other fixed timing settings. For Inrunner type motors, a setting of 0-12 degrees is a good point to start. For Outrunner type motors, 12-24 degrees normally works well.
- Higher timing settings will make more power, and draw more current. If the timing is set too high, the motor will misfire and run erratically.

## FAULT ANALYSIS BEEPS:

The Tempest ESC will cause the Motor to beep in specific patterns whenever a fault condition occurs. These warning beeps can be cleared by powering down the ESC, waiting for a few seconds, and then powering it back up.

- 1 Beep repeating indicates that a Low Voltage condition has occurred.
- 2 Beeps repeating indicates the Over Temperature point has been reached.
- 3 Beeps repeating indicates a loss of Receiver Control Signal.
- 4 Beeps repeating indicates a failure of the Motor to start properly.