RADIENT REAKTOR

WATERPROOF ELECTRONICS

BRUSHLESS POWER SYSTEM

FOR RDNA0023

OWNER'S MANUAL

ESC	Sensorless 30A Waterproof with Reverse
Motor	Sensorless 3500kV 540 2-Pole, Slotless Stator
Battery Limit	Up to 3s LiPo
Waterproof	Yes
ESC Cooling Fan	Yes, 25mm
Programmable	Limited: LVC, Reverse
Protection	Thermal & Current Overload

- Before using your product, review all documentation and inspect the products carefully. If for some reason you decide it is not what you wanted, then do not continue with unpacking, setup or operation of your product. Your local hobby dealer cannot accept a product for return or exchange after partaking in actions that produce wear and tear.
- Product specifications are subject to change without notice. Due to ongoing development, the actual product may vary from images shown.
- This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.
- This product is not a toy! (14+) Recommended for ages 14 and up. Adult supervision required for ages under 18 years old. Contains small parts, keep out of reach of children 3 years of age and younger.

RELATED COMPONENTS

- [1] Reaktor Sensorless 540 3500kV 2P-SLS Brushless Motor
- [1] Reaktor Sensorless 35A Waterproof Programmable ESC
- [1] Strip of double sided tape
- [3] Plastic wire ties

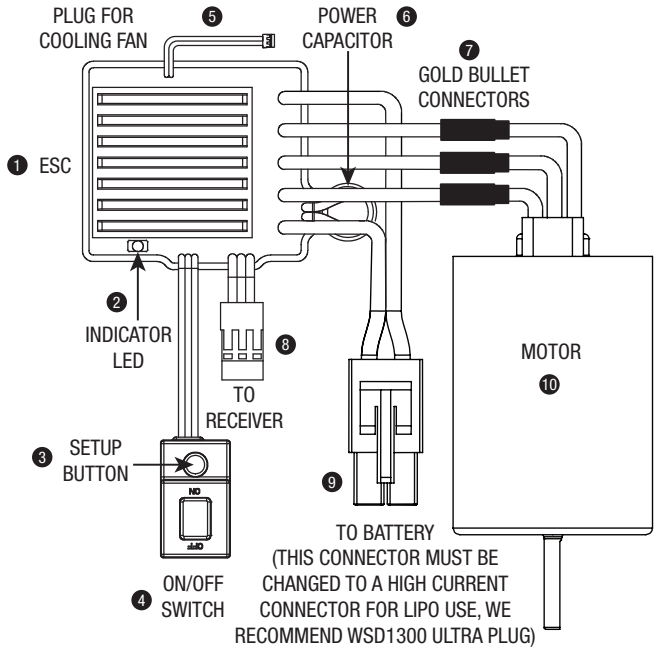
COMPATIBLE BATTERY TYPES FOR USE WITH YOUR BRUSHLESS POWER SYSTEM

- Nickle Cadmium (NiCd)
  - › 5 (6V) - 8 (9.6V) cells
- Nickle Metal-Hydride (NiMH)
  - › 5 (6V) - 8 (9.6V) cells
- Lithium Polymer (LiPo)
  - › 2s (7.4V) - 3s (11.1V) cells (series configuration)
- Lithium Iron Phosphate (LiFe/LiFePO$_4$/A123)
  - › 2s (6.6V) - 3s (9.9V) cells (series configuration)

UN BOXING

1. Carefully remove the electronics from the box.
   a. Ensure the plug is compatible with your battery.
      i. NOTE: There are many different types of battery plugs on the market. If yours does not fit the standard supplied plugs, please visit your local hobby dealer to purchase the correct adapter.
2. Read setup and operation instructions and understand all warnings and cautions before proceeding.
   a. This product is not a toy and should not be installed, operated, or maintained without supervision of an adult.
   b. It is necessary to follow all manufacturer's usage instructions if using the Reaktor motor or ESC with a different manufacturer's pairing component.

INTRODUCING THE REAKTOR BRUSHLESS ESC AND MOTOR



FEATURES AND FUNCTIONS

1. Brushless, Sensorless Electronic Speed Controller (ESC)
2. Indicator LED
    a. Will blink 2 or 3 times indicating the number of cells detected for LiPo use, blinking 2 times for 2s and 3 times for 3s.
    b. Will blink with error codes.
        i. LVC is active = 1 slow blink.
        ii. Over Temperature Protection is active = 2 slow blinks.
        iii. Over Current Protection is active = 3 slow blinks.
        iv. The above can blink in succession if multiple errors have occurred. For instance if the LVC and over current are active, the ESC will blink 1 time, then short pause, then 3 times then long pause and repeat the cycle.
    c. Will blink to indicate setup mode while programming ESC.
    d. Will blink to indicate LVC mode while programming ESC.
    e. Will blink to indicate Reverse setting while programming ESC.
3. Setup Button
    a. Used to program the ESC's various features and for calibrating it to your transmitter.
4. ON-OFF Switch
    a. Used for powering on the ESC and enter programming modes.
5. Fan Plug
    a. Used by default to power the installed fan on the ESC
    b. Can also be used to power a cooling fan on motor heat sink instead (Cannot run 2 fans at same time and ESC fan must be used with 3s LiPo batteries)
6. Power Capacitor
7. Gold Bullet Connectors
    a. 3.5mm High current connectors used to deliver power from ESC to the motor.
8. Receiver Plug
    a. Supplies BEC power to the receiver and servo.
    b. Receives signal from receiver/transmitter.
9. Battery Connector
    a. Included connector is compatible with Tamiya plugs, the most common in the RC industry.
    b. This connector must be changed if the ESC will be used with a LiPo battery.
    c. We recommend using a Deans Ultra Plug (WSD1300) for optimal results.
10. Brushless, Sensorless Motor

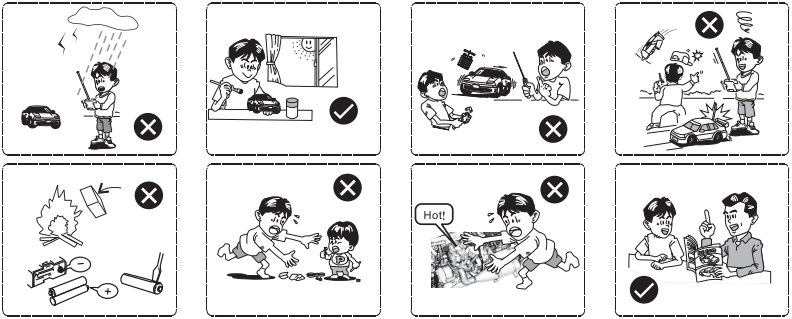
GETTING STARTED

Although great for first time users, Radient RC products are indeed advanced and sensitive electronics that could result in injury if used improperly. Always use caution and common sense as failure to operate your Radient RC product in a safe and responsible manner can result in damage to the product or other properties. Therefore this product is not intended for use or maintenance by children without direct adult supervision. Radient RC, and your local hobby dealer shall not be liable for any loss or damages, whether direct, indirect, special, incidental, or consequential, arising from the use, misuse, or abuse of this product or any product required to operate or maintain it. Following are some general tips that will help increase the safe operation and enjoyment of using your charger.

- Always turn on your radio/transmitter before turning on the ESC.
- Always turn on your ESC while holding your vehicle off the ground to prevent accidental runaways.
- Ensure your ESC is set to the proper LVC mode for the type of battery you are using.
- For best performance and product life, operate in a dry area with low dust
- Always use hobby grade batteries with your ESC.
- Operate in an open environment away from property, and cars (never run into the street for any reason).
- Always disconnect the battery from the ESC after use to prevent accidental over-discharge and possible fire.
- Never connect the battery to the ESC when the ESC switch is turned ON. Ensure the switch is OFF before connecting the battery.
- Never stick anything into the motor can due to risk of electrical shock or interference with the rotating parts.
- Always allow the ESC and motor to completely cool before reuse.
    - › NOTE: Only use genuine replacement or aftermarket parts available from your local dealer to ensure proper operation of your Radient RC product.

TIPS FOR SAFELY OPERATING YOUR BRUSHLESS POWER SYSTEM

- Although your ESC is waterproof, your radio/transmitter is likely not. Do not operate your transmitter in the rain.
- Do not operate radio controlled equipment in electrical or thunder storms.
- Avoid charging on or around flammable items.
- Never attempt to use a swollen or damaged battery.
- Never leave the battery plugged into the ESC while unattended.
- Never operate the ESC and motor without adult supervision.
- Never use the ESC and motor when HOT. Always allow the ESC and motor to cool to room temperature before using again.
- Never drop the motor or ESC.
- Inspect the motor and ESC before use. Never operate the ESC if the wire or connector has been damaged.
- Incorrect use of the battery, or connections can cause personal injury or property damage.
- Disconnect input power immediately if the battery or connector becomes hot or changes form during use. WANING: The plug and battery will be hot in this situation.
- Do not operate your high speed vehicle around small children who could get hurt in the event of an accident.
- Always be aware of your surroundings when operating your vehicle.
- Be sure there is room to safely STOP your vehicle once you get it up to the desired speed.



BATTERIES AND CONNECTORS

Batteries:

The Radient Reaktor ESC can operate with LiPo/LiFe and NiCd/NiMH (NiXX) batteries which require different LVC operating modes. It is extremely important to choose the correct operating mode to work with your batteries. Choosing the wrong charging mode can cause over-discharge of your LiXX type batteries which could lead to fire or explosion. Be sure to properly identify the battery chemistry and voltage of every pack before attempting to use it to ensure the correct settings. Some LiPo battery packs are designed to look like NiXX battery packs. One indication of a LiPo battery is the presence of a balance plug either exiting the battery with small wires and small plug on the end or a small female plug embedded into the end of the battery pack. If you are unsure of the battery type you are attempting to use; please consult your local hobby dealer for assistance.

Connectors:

The supplied connector is known as Tamiya style and it is the most common battery connector in the industry for entry level products. Although not a high current connector, it can be used successfully with NiXX type batteries. If you plan on using your system with LiXX type batteries you must change the connector to a high current type; we recommend Deans Ultra Plugs (WSD1300). It is always better (regardless of battery type being used) to change the connector on your system than to use an adapter, this reduces the electrical resistance in the system and provides the optimal performance. If you have a mixture of batteries including LiPo and you cannot change the connectors on all of your batteries at one time and need to use an adapter, it is recommended that you place the high current connector on the ESC and use adapters to connect to the batteries from there.

WARNING: Always ensure the connector polarity is correct ([+] to [+] and [-] to [-]) before connecting the battery to the ESC. The Reaktor ESC uses a RED wire for [+] and a BLACK wire for [-]. If you connect a battery to the ESC with reverse polarity, the ESC WILL be damaged and this will not be covered under warranty.

INSTALLING AND WIRING YOUR ESC AND MOTOR

Installation:

Installing your ESC and motor is critical for proper operation. You will need to mount your components securely to a rigid part of the chassis in your vehicle. It is not recommended to use a hook and loop type material to secure your ESC as this can come loose in wet conditions and get damaged.

1. Ensure the mounting surface of the ESC and chassis are clean of debris and oils, use denatured rubbing alcohol to clean the surfaces.
    a. You will need to check the mounting integrity periodically to ensure it remains mounted in the vehicle. Good RC quality double sided tape can be purchased at your local hobby dealer.
2. Install the ESC so that the ESC itself and its wires are away from moving components in the vehicle.
3. Install the power capacitor pack either to the indicated area on the ESC label or to the chassis. It should not be allowed to flop around.
4. Install the switch so that it is easily accessible when the body is on the vehicle, typically near an edge of the chassis but not sticking over the edge. You want the switch protected in case of a crash.
    a. Typical installation orientation is such that the ON position is facing towards the front of the vehicle, or the inside of the vehicle to prevent accidentally turning off during a crash.
5. Install the motor with the correct length 3mm screws for your vehicle and set the gear mesh
    a. Review the gearing instructions that came with your vehicle. Since every vehicle is different, a universal gearing recommendation is not adequate. Consult your local hobby dealer for assistance in selecting the correct gearing.
        i. NOTE: for up to 2s LiPo, if you are changing from a brushed motor setup, it is typically recommended to reduce the pinion gear size by 2 teeth when changing to a brushless system.
        ii. NOTE: for a 3s LiPo, it is recommended to reduce the size of the pinion gear by an additional 1-2 teeth if possible.
        iii. Ultimately the concern with gearing is motor temperature. The correct gearing can often be determined by a few test runs.
            01). While running easy, more gentile on the throttle, you can monitor the motor temperature in 30 second intervals. If the motor seems to be getting extremely hot you need to gear down (reduce the pinion gear size), wait for the system to cool and test again.
            02). If the motor does not seem to be getting hot, you can run a bit harder on the throttle and keep checking the motor temperature. If after 5 minutes of running the motor is still not hot you can gear up (increase the size of the pinion gear) and perform the test again.

WARNING: The ideal running temperature of the Reaktor motor is less than 175 degrees Fahrenheit. The motor temperature should never exceed 200 degrees Fahrenheit. If it does, stop running immediately. To test for temperatures this high it is not recommended to use your hands as it is inaccurate and you can get burned. Check with your local hobby dealer about obtaining an inexpensive temperature gun for monitoring your system temperatures.

Wiring:

6. Connect the 3 motor wires on the ESC. Any order will work for now but may need adjustment after setting the ESC to the radio.
7. Secure the excess wire using plastic wire ties, away from any moving parts of the vehicle and so that they will not fall out of the car during running.
8. Plug the ESC wire into the channel 2 port on your receiver, ensure proper polarity on the wires.
9. Ensure the ESC is OFF and connect your charged battery (up to 3s LiPo).

ESC CALIBRATION AND SETTINGS...

The Radient Reaktor series brushless motor and ESC is a great power plant to satisfy your need for speed and performance as an entry level brushless system. Though the Reaktor system was engineered for value, performance was definitely a factor. We've included some great features for you to help keep your system running in top shape while keeping your battery upgrade path open since it is compatible with LiPo batteries.

WARNING: ALWAYS ALLOW YOUR MOTOR TO COOL BETWEEN RUNS. EXCESSIVE ACCELERATION AND AGGRESSIVE DRIVING WILL CAUSE YOUR SYSTEM TO GET HOT. EXERCISE GREAT CARE WHEN HANDLING YOUR VEHICLE AFTER RUNNING TO AVOID GETTING BURNED.

Setting the ESC To Your Transmitter:

Note: Always turn your transmitter on first, then the vehicle. For best results it is recommended to hold the transmitter 2-3ft away from the vehicle while performing this operation (i.e., hold the transmitter in left hand extended while setting ESC with right hand).

1. Place your vehicle on an stand or box so that the tires are not touching the ground before turning on the ESC and keep it in this position until the ESC settings are complete and verified as correct. Exercise good judgement with the surroundings you are in, if the vehicle accelereates unexpectedly and drives off, you don't want anything to get damaged or anyone to get hurt.
2. Ensure your Throttle channel (Ch. 2) on your transmitter is set to "Reverse" for Futaba type transmitters.
    a. If you are unsure if you have Futaba or JR type transmitter, you can try setting the ESC as is and if it does not work, then change Ch. 2 to reverse.
3. Adjust both Throttle and Reverse/Brake EPA settings to 100%.

...ESC CALIBRATION AND SETTINGS CONTINUED

4. Turn the ESC on and wait for the LED turn turn solid, the ESC is initializing and starting up during this time.
    a. Note: Always wait for the LED to turn solid before touching the throttle trigger on the transmitter. Neglecting to do this may result in a false initialization of your ESC and it will not function properly. In this case you must turn it OFF and back ON again to restart the process.
5. With the ESC ON, press and hold the button near the switch for 3 seconds to enter setup mode. The LED will start to flash.
6. Without touching the trigger, press the button to set the neutral position.
7. Pull and hold full throttle and press the button again, release the trigger.
8. Push and hold full brake/reverse on your transmitter and press the button again, release the trigger.

Your ESC should now be set and calibrated to your transmitter. You will need to verify the correct operation. By default your ESC comes set with reverse active. This means you will have both forward and reverse throttle. When you pull the throttle trigger on the transmitter back, the vehicle tires should turn so that the vehicle will move forward. If instead the tires go in the opposite direction, you may need to swap any two of the motor wires. Retest the motor direction and confirm all is correct.

Using The Running Modes (including Low Voltage Cut-Off [LVC]):

The Reaktor ESC has 3 built in running modes with different acceleration profiles and correlating LVC settings. It is essential that you use the proper running mode for the type of battery that your are using to achieve the optimal performance from your ESC and motor. These 3 modes are indicated LED blinking the number of times stated, the LED will pause before repeating the signal.

1. Off: (Indicated by 1 blink of the LED) If you plan to use high performance NiMH batteries of 3000mAh or above it is recommended to turn off the LVC mode to obtain best performance from your batteries.
2. LiPo: (Indicated by 2 blinks of the LED) Use the LiPo mode whenever you use a LiPo battery with your ESC. It will protect your battery from over-discharge.
    a. **When running a LiPo battery it is required to change the included battery connector to a high current connector. We recommend W.S. Deans Ultra-Plugs (WSD1300) available at your local hobby dealer. Using the supplied connector with LiPo batteries will cause the connector to over-heat and possibly melt which could lead to the battery experiencing a dead-short and causing fire. It is critical that the connector be changed and that you do not try to use an adapter in this application. You can purchase an adapter from Ultra-Plug (F) to Tamiya style (F) from your local hobby dealer which will allow you to continue to use your included Helion battery after you have changed your main power connector.**
    b. **When running a LiPo battery it is also recommended to run the optional (RDNA0026) motor heat sink with cooling fan to keep your motor and ESC running at lower temperatures.**
3. NiMH: (Indicated by 3 blinks of the LED) Using the supplied 1800mAh battery requires that you use the NIMH mode to ensure proper operation of your ESC and maximized performance from your batteries. **Your ESC is pre-configured to this setting.**

Setting The Running Mode (LVC):

If you are running your vehicle and notice a sudden decrease in power, look at the LED on the ESC. If it is flashing, your ESC has detected battery voltage that is lower than what should be safely run without causing damage to your battery or electronic equipment. Follow the below instructions to change the setting.

1. With the ESC OFF, press and hold the button and turn ON the power switch to the ESC. The LED will blink a pattern (1=OFF, 2=LiPo, or 3=NiMH) blinks per second indicating which LVC mode you are in. Press the button to cycle through the modes.
2. Turn your ESC OFF when you have made your selection to save the settings

Turning Reverse ON/OFF:

Most organized racing does not allow use of reverse. Follow the below procedure to select your desired reverse/brake mode.

1. With the ESC OFF, press and hold the button and turn ON the power switch to the ESC. The LED will blink the LVC setting.
2. Press and hold the button near the switch for 3 seconds to enter programming mode. The LED will flash the setting. 1 flash indicates ON. 2 flashes indicates OFF. Press the button to cycle through the modes.
3. Turn your ESC OFF when you have made your selection. The settings are automatically saved.

PROTECTION MODES AND ERROR CODES...

The Reaktor ESC has built in protection modes besides the most common LVC. We have designed and integrated thermal overload and over-current protection which helps to protect your system when you forget to. When the protection modes are active, the ESC will indicate with an error code on the LED that the particular protection mode is active.

LVC Protection:

LVC protection is intended to protect your LiPo batteries from over-discharge and thus potential damage. The LVC circuitry is programmed to serve two functions while protecting your ESC. The first indicator is reported when the ESC measures 3.3 Volts per cell where the ESC will cut the power to the motor to 50% and give an error on the LED by a slow flashing signal. The second indicator occurs when the ESC measures 3.2 Volts per cell where the ESC will cut the power to 0%. Hence when you feel the power cut suddenly, it is recommended that you drive slowly back to a safe area to shut down and recharge or change your battery. Though measuring voltage is an easy task, the battery voltage is related

...PROTECTION MODES AND ERROR CODES CONTINUED

to the current draw on the battery, as the current draw increases, the voltage drops. The highest current draw on you ESC is the special case of full throttle. When the ESC senses you are at full throttle it gives a little leeway on the battery voltage to ensure its not just a spike in power drain in which the LVC would activate and kill your fun. Instead the ESC knows this special case and requires a full 2 second measurement under the stated voltage before activating the protection. This helps eliminate the power spikes that could be considered low voltage by other ESC's and instead allows you to keep enjoying your product, only alerting you when its absolutely necessary.

Thermal Overload Protection:

The thermal overload protection is built in to monitor the internal temperature of the ESC, ensuring that it does not get higher than safe limits during normal operating conditions. If the ESC detects unsafe temperatures, the power output will be reduced and the LED indicator will blink 2 times quickly then pause and repeat the signal.

Current Overload Protection:

Your ESC is designed to handle 30A continuous current draw with momentary short loadings of 35A. The ESC has custom current overload protection circuit built in to monitor the loads on the components to help prevent overloading and failure. When an over current situation is detected, the ESC will reduce the output power to the motor and indicate the error by blinking 3 times quickly then pause and repeat the signal.

NOTE: For best results, always pair your Reaktor ESC with a Reaktor motor, compatibility with other brands is not guaranteed.

Blinking Error Codes:

The following error codes will be indicated on the LED followed by a pause, then the signal will repeat. Turn the ESC OFF then ON to clear the error code.

1. 1 slow blink = LVC active
2. 2 quick blinks = Thermal Overload Protection active
3. 3 quick blinks = Current Overload Protection active
4. Any combination of above with short pauses between indicates a combination of the listed protection modes.

GENERAL CARE AND MAINTENANCE

Care:

- Always use clean, dry cloth or soft bristle brush to clean your equipment.
- Never use chemical cleansers to avoid damage to the sensitive electronics and plastics.
- Before every use, inspect the input and output power wires and plugs and discontinue use if there are any signs of damage.
  - › Contact your local hobby dealer or Radient RC Customer Support for assistance with repair needs.
  - › NOTE: Continued use of a damaged product will void the warranty and could cause personal injury and property damage.

Maintenance:

- Periodically use compressed air to blow out dust that has been trapped inside the motor, on the ESC fan and in the heatsink to help prevent excessive heat due to dust build up.
  - › **WARNING: Always wear eye protection when using compressed air to clean your charger.**
- Periodically add a drop of bearing oil to the bearing near the output shaft of the motor.

STORAGE AND DISPOSAL

Storage:

- Store in a cool dry place to prevent moisture from building up and causing rust.
- Ensure your ESC is disconnected from the battery and in the OFF position when not in use.

Disposal:

- Your product and the various batteries it is intended to be used with are considered electronic waste and should never be discarded in standard garbage containers. Please visit your local hobby dealer and use the FREE battery disposal center for proper disposal/recycling of batteries. Consult your local city waste disposal center for information on disposal of electronics other than batteries.
- Please do your part to protect our environment.

RELATED SPARE PARTS LIST

RDNA0019..... REAKTOR BRUSHLESS ESC, SENSORLESS, 30A-WP WITH REVERSE .....
RDNA0023..... REAKTOR BRUSHLESS ESC AND MOTOR COMBO, SENSORLESS 30A-2PSLS-WP 3500KV.....
RDNA0026..... REAKTOR MOTOR HEATSINK WITH 30MM COOLING FAN.....
RDNA0027..... REAKTOR 25MM COOLING FAN FOR ESC .....
RDNA0028..... REAKTOR BRUSHLESS MOTOR, SENSORLESS, 3500kV 2PSLS.....

WATERPROOF ELECTRONICS

RADIENT REAKTOR

BRUSHLESS POWER SYSTEM

RDNR0024
000075-001 (REV E)

TROUBLESHOOTING GUIDE

Problem / Symptom	Possible Cause	Possible Solution
ESC will not set to transmitter	Receiver and transmitter not bound	Try re-binding your receiver and transmitter
	Throttle Channel not set to Reverse	Unless using Futaba radio, set Th channel to Reverse
	Batteries dead in car or transmitter	Replace batteries
	Transmitter is too close to vehicle	Hold transmitter farther away from vehicle
Car slowed down drastically druing run	Battery voltage too low, LVC active	Charge or change batteries
	ESC temp overload protection active	Turn off ESC and allow ESC and motor to cool before running again
	ESC current overload protection active	
Car doesn't accelerate	Ensure the proper running mode is used	Change running mode based on battery you are using
Reverse not working	Reverse mode has been disabled in ESC	Follow setup instructions to turn reverse mode on
	ESC was improperly set to transmitter	Re-set to transmitter, ensure Th channel is set to Reverse for non Futaba transmitters
	EPA on transmitter has been turned down for reverse	Adjust EPA's to 100% and reset ESC to transmitter
Motor only goes in reverse or goes in reverse when I pull trigger to go forward	Throttle Channel not set to Reverse	Unless using Futaba radio, set Th channel to Reverse and reset ESC to transmitter
	Motor connected to ESC improperly	Switch any two motor wires
	EPA on transmitter has been turned down for reverse	Adjust EPA's to 100% and reset ESC to transmitter
LED is flashing on ESC	1 flash per second	Low voltage cut-off protection active
	2 flashers per second	ESC over-temp protection active
	3 flashes per second	ESC over-current protection active
	Any combination of above	multiple errors have occurred. Turn ESC off, change battery and allow system to cool before using again. Ensure your ESC is in the correct running mode for the type of battery you are using