VTB4REDS
REDS Racing ZX PRO 32 Bit ESC - USER MANUAL

Download the Android and iOS app here.

1. Introduction

Thank you for your purchasing the REDS RACING product, The 32 Bit ESC is our high performance sensored brushless electronic speed controller. 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. Model has no control over the incorrect 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.

2. Caution

● Avoid short circuits: make sure all ESC wires and connections are protected and are not in contact with peripheral device.
● When soldering input/output wires and connections, set the iron to 60W minimum.
● Protect the ESC from humidity, water, oil and other substance, keep the operation atmosphere dry.
● Provide the ESC with good ventilation to prevent overheating
● Always separate the ESC from the battery after each use.

3. Features

● Full aluminum case and heat sink design.
● 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. ● Data logging for real-time maximum ESC temperature, motor RPM, Voltage and Adv. Timing and so on.

4. Specification

Model	1/10 32 Bit 160A	1/8 32 Bit 150A	1/8 32 Bit 220A
Cont./Peak Current	160A/1200A	150A/950A	220A/1000A
LiPo/NiMH Cells	2-3 LiPo/4-9 NiMH	2-6 LiPo/6-18 NiMH	2-4 LiPo/6-12 NiMH
BEC Output	6.0V/7.4V Adjustable, 3A	6.0V/7.4V Adjustable, 6A	6.0V/7.4V Adjustable, 6A
Size	38.0*37.0*31.0mm	55.0*48.0*36.0mm	55.2*40.2*36.5mm
Weight	95g	180g	155g

5. Connection
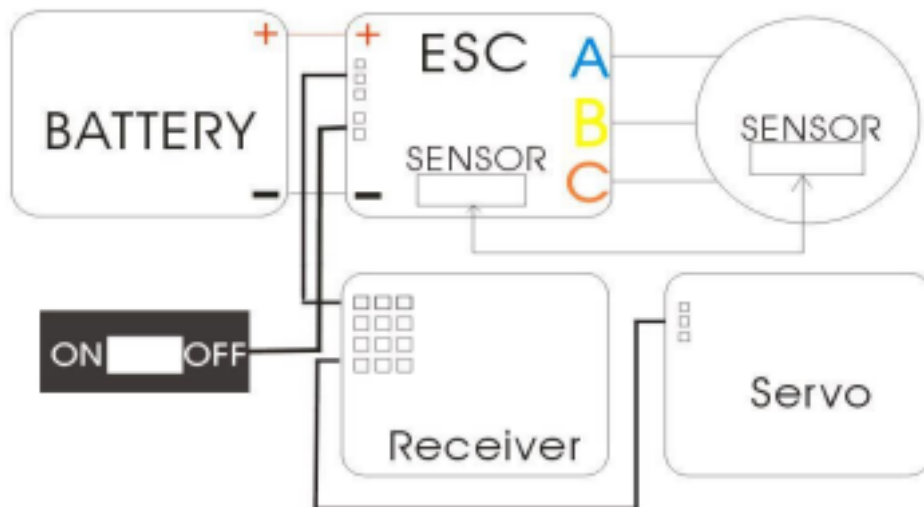
● **Battery Wire Connection**

When connecting the battery, pay attention to polarity: incorrect connection will damage the ESC. (The battery is not covered by the warranty.)

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 Blue motor wire A, Yellow motor wire B and Orange motor wire C of the ESC must be connected with the sensored motor wire A,B,C respectively. It is necessary to connect the Sensor wire to the "Sensor" socket on the ESC. Don't change the wires sequence optionally.

* Sensorless Mode

When using a sensorless brushless motor, the Blue motor wire A , Yellow motor wire B and Orange motor wire C of the ESC can be connected with the motor wires freely. If the motor runs in the opposite direction, please swap any two wire connections.

● **Receiver Wire Connection:**

The throttle control cable on the ESC have to be plugged into the throttle channel on the receiver, the signal wire supplies 6-7.4V 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

Ⅴ **Power Capacitor**

Never drive without the power capacitor! This is necessary to protect the ESC and improve performance. Pay attention to polarity: incorrect connection and poor soldering will damage the ESC. (The power capacitor is not covered by the warranty.)

As shown in the figure above, connect the indicated red wire to positive (+) ESC post. Connect the short wire to negative (-) ESC post.

6. 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, otherwise the ESC can not be powered off)

● **Throttle Calibration:**

1. Turn on the transmitter, then connect the ESC with the battery packs.

2. Press and holding the power button until the blue LED is on solid, the motor beeps once at the same time, then release the power button, the red led will be on solid, the ESC enters to the calibration mode.

3. 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.

4. 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.

5. 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.

6. 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.

Note: 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 ("BOOST or Turbo On Mode ")	ON	OFF
Neutral ("BOOST and TURBO Off Mode")	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.

2. 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 "¤ ¤ ¤" indicates that the voltage is unnormal. • The RED LED blinks, double flash between every one second. Repeat like "¤¤ ¤¤ ¤¤" indicates that the temperature is unnormal.

• The RED LED blinks, single and double flash alternately between every one second. Repeat like "¤ ¤¤ ¤ ¤¤ ¤ ¤ ¤" indicates that both of the voltage and temperature is unnormal at the same time.

• The RED LED will do not have any responds even the voltage or temperature is unnormal if not detect the signal. • The BLUE LED blinks,double flash between every two seconds. Repeat like "¤¤ ¤¤ ¤¤" indicates that the throttle is unnormal. (No throttle, or the throttle is not on the neutral position)

● **Throttle Signal**

1. The ESC can support the 450Hz maximum throttle signal.

2. 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.

3. 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 & Sensoreless**

1. The sensored mode is activated once the ESC detected the hall sensor signal at any time.

2. The ESC will work on sensorless mode once the ESC didn't detect the hall sensor signal at any time. **3.** The ESC will have a slight power drop and restored soon during the moment of sensored and sensoreless mode switching. **4.** The PWM driving frequency will be selected automatically by the ESC on sensorless mode, and the manual setting is invalid. **5.** It is invalid to set the brake PMW frequency less than 1KHz and forced recognized as 1KHZ, if the ESC is on sensorless mode. **6.** Boost and turbo functions are not available on sensorless mode.

● **Forward, Reverse and Brake**

1. Forward:

(a) When the vehicle is staying stationary, pull the throttle trigger to the forward direction the vehicle will go forward. (b) When the vehicle is moving forward in a high speed, pull the throttle trigger to the forward direction, the vehicle will accelerate forward.

(c) When the vehicle is moving back in a high speed, pull the throttle trigger to the forward direction, the vehicle will brake first until to low speed, then the vehicle will go forward.

2. Reverse:

Running Mode Vehicle status Reverse Mode	Forward/Brake/Reverse		Forward/Reverse
	one shot	two shot	
When the vehicle is staying stationary	push the throttle, the vehicle will reverse directly	Do the two shot action as the note, the vehicle will reverse,	The same as one shot
When the vehicle is moving back in a high speed	push the throttle, the vehicle will accelerate reversing.	Do the two shot action as the note, the vehicle will continue reverse.	The same as one shot
When the vehicle is moving forward in a high speed	push the throttle, the vehicle will brake first until to low speed, release the throttle trigger to the neutral position and then push it, the vehicle will reverse.	Push the throttle, the vehicle will brake until to low speed, do the two shot action as the note, the vehicle will reverse	The same as one shot

Note: Two shot means release the throttle to neutral and push throttle, then release the throttle to neutral and push throttle again, the whole process need to be done within 2 seconds, or the vehicle will only brake but not reverse.

3. Brake:

Enter to the brake mode: When the vehicle is moving forward in a high speed, push the throttle trigger to the reverse direction and keep the throttle trigger on the neutral position to the full brake position range, then the vehicle will always in brake mode.

Note: If set the running mode of ESC in "forward/reverse/brake" and set the motor direction correctly, after the throttle calibration completed, then the direction of the remote control and throttle channel will not be changed anymore.

● **Boost & Turbo**

1. 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.

2. 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.

3. 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 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.

4. If set the low voltage or over temperature protection, and the protection is activated, then all the timing will be closed.

● **Protection**

1. High Voltage Protection:

 If the ESC detected the voltage too high，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.)

2. 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 will not be relieved.)

3. Temperature Protection:

If the ESC detected the temperature higher than the set value, then the ESC will open the temperature protection, and the maximum throttle output will be limited within 50%.

(The temperature protection will be relieved if the temperature dropped to 65℃.

4. 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 the timing. **5.** If the ESC detected the motor have the driving problem (like motor rotor locked or motor phase lost problem) which can cause the motor not run smoothly, and when you pulled the throttle trigger to a lever for a while, then the ESC driving abnormal protection will be opened, and the motor will emit special tone like beep-beep-beep (note: some motors can not beep or beep with a low sound if motor have phase loss problem), and the protection will be closed until you released the throttle trigger to neutral position for 0.2 seconds. If this problem occurs three times continuously, then you have to solve the motor drive problem first,or the protection will exist all the time.

● **Bluetooth**

1. 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.

2. With REDS RACING Bluetooth, connected the REDS RACING app to the ESC, the user can program parameters, upgrade firmware and check the real-time data of the ESC on the APP.

3. 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) **4.** The Bluetooth name can not be changed.

5. The Bluetooth connecting will be failed during the esc throttle calibration process.

● **Programmable Items**

1. 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.

2. 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**

1. The real-time data can be read only when the ESC have the throttle signal.

2. 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.

3. 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
8	Adv. Timing	Advance Timing, The ESC total timing (Boost & Turbo)

● **Firmware Upgrade**

1. 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.

2. 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.

3. Do not turn off the ESC during the time of the ESC firmware upgrading process.

7. Programmable Items Description

1. Throttle Response: It indicates how often the ESC performs throttle adjustment.

2. Coast: When the throttle value changes from high to low, it will decrease every 0.01 second. For example: the current throttle stick is at 80%, and the next moment is at 30%. If the throttle coast is not turned on, the throttle value will be immediately reduced from 80% to 30%. If it is turned on, the throttle value will be 80%, 70%... 30% dropped so slowly. Note: If the throttle stick is at 0% at the next moment, the throttle value will be equal to 0 immediately. This item only works within the forward throttle range, and has the most obvious effect at 30% throttle.

3. Neutral Range: Throttle midpoint width, the range of the throttle stick in the centered state.

4. Min. Throttle: The minimum throttle, limit the throttle value can not be too small, this item can be adjusted according to the RC car configuration, the smaller the lighter the car, this item can be adjusted down, so that the RC car can get a very low speed, the larger the heavier the car, this item can be adjusted large, it can eliminate the jitter caused by insufficient starting power.

5. Minus: Throttle minus, decay the throttle value. For example, if the throttle stick is at 20%, if the decay is not turned on, the throttle value is 20%. After setting it to 1% decay, the output throttle value is 20% * (1-1%) = 19.8%. This item only works within the forward throttle range. Throttle Decay Range: For example, if it is set to 50%, it means that the throttle below 50% will be used for throttle Decay. This item only works within the forward throttle range.

6. Minus Range: For example, if it is set to 50%, it means that the throttle below 50% will be used for throttle Minus. This item only works within the forward throttle range.

7. Max. Forward force: If it is set to 80%, the actual throttle value is 80% when the throttle stick is at 100% of the forward throttle.

8. Max. Reverse force: If it is set to 80%, the actual throttle value is 80% when the throttle stick is at the 100% position of the throttle in the reverse direction.

9. Brake Response: It indicates how often the ESC will perform the brake adjustment.

10. Min. Brake Force: It limits the minimum braking force.

11. Max. Brake Force: If the minimum braking force is set larger than the maximum braking force, the maximum braking force is equal to the minimum braking force.

12. Fwd. Drag Brake Force: It refers to the braking force when the throttle stick returns to the 0% position from the forward stroke after the RC car moves forward. If it is turned on, the ESC will turn on correspond brake force when the throttle stick at the 0% position.

13. Fwd. Drag Brake Response: It indicates how often the ESC performs drag brake adjustment.

14. Rev. Drag Brake Force: Rev drag braking force refers to the braking force when the throttle stick returns to the 0% position from the reverse stroke after the RC car moves backward.

15. Rev. Drag Brake Response: Drag Brake Response.

16. Brake PWM Freq.: Brake PWM frequency.

17. Boost Timing : Turn on the timing to make the motor get a higher speed. Boost timing can be triggered by throttle threshold or RPM threshold. For example, if the Boost timing is set to 30 degree, and 50% throttle triggers the Boost timing, the 1 degree Boost timing will be activated when the throttle stick reaches 50%, and 30 degrees will be turned on when the throttle stick reaches 100%. The timing value increases linearly between 50% and 100% throttle; At same timing value, if the value is set to trigger at 18kr/min, when the motor speed reaches 18kr/min, the Boost timing will open to 30 degrees.

18. Boost Trigger: Boost trigger mode includes throttle trigger and RPM trigger.

19. Boost Throttle Threshold: Boost Throttle trigger threshold. For example, Boost timing is set to 30 degrees, 50% throttle threshold triggers Boost, then the throttle stick reaches 50% position to enable Boost timing, and when the throttle stick reaches 100%, 30 degree timing is enabled. The timing value increases linearly from 50% to 100% throttle.

20. Boost RPM Threshold: Boost RPM trigger threshold. The Boost RPM triggers the threshold. When the motor reaches the RPM threshold, the set boost timing will be fully turned on.

21. Boost Initial Angle: For example, set the boost timing to 30 degrees, 50% of the throttle triggers Boost, the initial angle is 2 degrees, when the throttle is at 50%, the actual boost angle is 2 degrees (if the initial angle higher than the boost timing, then the final angle is the Boost timing initial value).

22. Angle Inc. Rate: For example: set the Boost timing to 30 degrees, and the throttle triggers Boost. If the throttle value is instantly increased to 100%, the Boost timing will not reach 30 degrees immediately, but will increase to 30 degrees at the set increasing speed; It is the same when it is set to RPM trigger.

23. Angle Dec. Rate: The rate at which the boost timing is reduced to 0 when the boost trigger condition is no longer met.

24. Turbo Timing: Turbo timing is the timing that starts when the throttle stick reaches 100%.

25. Turbo Inc. Rate: The speed with the Turbo timing increasing. For different motors, if the speed is set too fast, there will be large burst current and the motor will vibrate violently.

26. Turbo Dec. Rate: The speed with the turbo timing decreasing. When the throttle stick leaves the 100% position, the conditions for turning on Turbo are no longer met, but the Turbo timing will not be immediately reduced to 0, but will decrease at the set speed. When the Turbo is turned on, the motor speed is very fast. If the Turbo timing value quickly decreases to 0 at this time, the speed decreases too fast, the motor will vibrate severely and reverse high voltage, so please choose the appropriate timing to reduce the speed.

27. Turbo Delay: Turbo delay refers to a delay after the throttle stick reaches 100% before turning on Turbo.

28. Delay Reload: The update time point of the delay. When the timing has been triggered, if the throttle leaves 100% and quickly returns to 100%, whether to delay again or not. Wait: wait until the timing is reduced to 0, then update the delay, and then re-delay; Instant: update the delay as soon as the throttle leaves 100%, and start the re-delay immediately.

29. Motor Rotation: In some RC car, under the default rotation, forward and backward are reversed. At this time, setting another motor rotation can correct this error.

30. Motor Poles: Set the correct number of motor poles to get the correct Boost RPM trigger threshold. At the same time, players can see the correct motor RPM in the real-time data of the mobile APP.

31. Running Mode: Running mode includes Forward/Brake, Forward/Brake/Reverse, Forward/Reverse.

32. Reverse Mode: In the reverse mode, when the Running Mode is set to Forward/Brake/Reverse, one shot: single-click the throttle stick to reverse; two shot: double-click the throttle stick to reverse.

33. Drive PWM Freq.: The drive PWM frequency refers to the PWM frequency used when the ESC drives the motor. The lower frequency, the higher acceleration, but the linearity of the throttle becomes worse and feel aggressive throttle feeling. The Higher frequency ,the smoother throttle feeling, but it will cause the temperature of the ESC to rise too fast.

34. Cutoff Voltage: Low-voltage protection, when set to auto, the ESC will automatically recognize the number of lithium battery cells when the ESC is turned on.

35. Cutoff Thermal: 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℃).

36. BEC Output: BEC Voltage Output.