REDS ZX PRO GEN2 160A 1/10 ESC MANUAL

1. INTRODUCTION

Congratulations for the purchase of REDS ZX PRO 32BIT 160A sensored brushless competition electronic speed controller. REDS ZX PRO GEN2 160A ESC is specifically designed for 1/10 scale electric R/C racing. This speed controller has been designed, developed and tested by REDS Racing in cooperation with the best drivers in the world. The most advanced technologies and materials have been used to get the best performance and reliability. To get the best performance and reliability, read this manual carefully before using the speed controller. Always follow the safety precautions. Download the Android and iOS app here.

Feature	Value
Current Continuous	160 A
Peak Current	760 A
Input	2-3S LiPo
Supported Motors	540 size 2 pole sensored brushless
Suitable Motor	Over 3.5T
BEC Output	6V-7.4V @3A
Size (LxWxH)	37x38.2x31.5 mm
Weight	95g (with wires)
ESC Programming	iOS and Android app
Firmware Upgrade	Supported through the iOS app
Waterproof	No
Car Applicable	1/10 Touring and Buggy car Stock and Modified

2. SAFETY PRECAUTIONS

This product is a sophisticated hobby product and not a toy. It is not suitable for any other purpose. It must be operated with caution; common sense and some basic mechanical and electronic ability is required. Failure to operate this product in a safe and responsible manner could result in injury or damage to the product or property. This product is not intended to be used by children without direct adult supervision. It is essential to read and follow all instructions and warnings found in this manual prior to installation, set-up and use in order to operate the esc properly and to avoid damage or injury.

3. WARNINGS

- Never let children use this product without the strict supervision of an adult.
- Always unplug the battery from the ESC when not in use or while in storage.
- Never leave this product unattended while it is connected to a power source.
- Always power ON your transmitter before the ESC and power OFF the ESC before the transmitter.
- Always disconnect the battery and stop using the ESC if it begins lo act abnormally.
- Make sure all cables are in good condition end securely fastened.
- Keep in mind that vibration during operation may loosen connections and cause loss of control.
- Do not connect in reverse polarity.
- Make sure that all cables and connectors are properly insulated to prevent short circuits.
- Keep this product away from water, oil, fuel or other conductive liquid.
- If the ESC overheats, emits smokes or burns, stop using it, disconnect the battery and seek assistance.
- When soldering input/output wires and connections, set the iron to 60W minimum.
- Make sure to use suitable gear ratios for your track condition. Unsuitable gear ratios may overload and damage your speed controller and motor.
- Always use caution when handling your ESC as it may become extremely hot during use.
- Never operate with throttle when the motor has no load. Running the motor without load may cause damage and risk of fire.
- Do not use near flammable materials.

4. INSTALLATION

### 4.1. Soldering Battery Wires, Motor Wires, and Capacitor

Make sure to use a soldering iron with sufficiently high temperature. Never leave the soldering iron on the mounting point for longer than 5 seconds. If it takes more than 5 seconds to melt the solder between the joints, switch to a higher temperature solder iron. Overheating the mounting points will damage the ESC.
We recommend using a red color wire for the positive (+) battery input terminal, and a black color wire for the negative (-) terminal. Connecting a battery in reverse polarity will damage the ESC.
Pay special attention to the polarity marking below the mounting point. Make sure you connect each phase (A,B,C) of the motor to the corresponding (A,B,C) mounting point on the ESC.
Remember to solder the included power capacitors to the battery input mounting point. Running the motor without connecting capacitor will damage the ESC.

4.2. Connection and Mounting

Connect one end of the sensor cable to the motor's sensor port, and the other end to the ESC's sensor port.
Mount your ESC securely using high quality double-sided tape with a minimum thickness of 3mm.
Connect the receiver connector to the throttle channel (CH2) of your radio receiver.

If necessary, install the included cooling fan on top of the ESC with screws, and make sure to check for correct polarity when connecting to the cooling fan power port.

The signal wire supplies 6.0-7.4 V 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
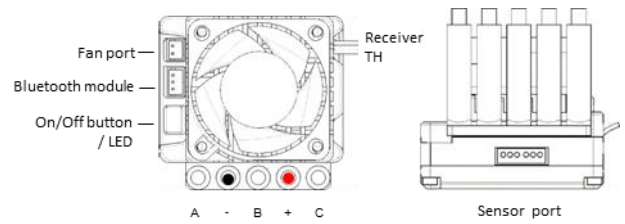

4.3. Power On/Off ESC

Press the power button to turn on the ESC. Press and hold the power button until all LED lights are off, then the ESC will be powered off. Make sure the throttle trigger is on neutral position, otherwise the ESC cannot be powered off.

5. ESC/RADIO CALIBRATION

Connect the ESC to a charged battery and place your vehicle on a stand with the wheels off the ground. Turn on the transmitter making sure the throttle is at neutral.

Press and hold the power button until the blue LED is on solid, the motor will have a long beep at the same time. Then, release the power button, the red led will be on solid and the ESC enters to the calibration mode.
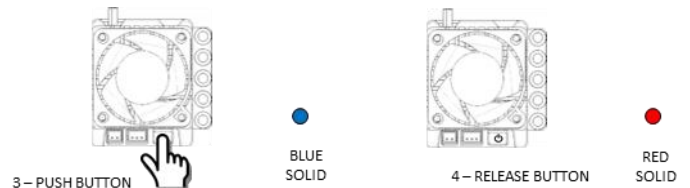
Pull the throttle trigger to the full throttle position, the blue led blinks three times and the motor beeps once, the full throttle position is saved.

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.

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.

IMPORTANT. ESC/Radio calibration must be done when the ESC is new, when you change transmitter, after repair service and every time you install a new firmware. 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 reverse way even if the transmitter throttle set reverse.

Remark: No need to restart the ESC after throttle calibration is finished. Do not move the throttle when blue led blinks.

6. LED STATUS INDICATOR

6.1. During operation

Throttle Position	BLUE LED	RED LED
Neutral	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.

6.2. 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 "¤ ¤ ¤" indicates that the voltage is abnormal.
- The RED LED blinks, double flash between every one second "¤¤ ¤¤ ¤¤" indicates that the temperature is abnormal.
- The RED LED blinks, single and double flash alternately between every one second "¤ ¤¤ ¤ ¤¤ ¤ ¤¤" indicates that both of the voltage and temperature is abnormal at the same time. The RED LED will not have any responds even the voltage or temperature is abnormal if not detect the signal.
- The BLUE LED blinks, double flash between every two seconds. Repeat like "¤¤ ¤¤ ¤¤" indicates that the throttle is abnormal. (No throttle, or the throttle is not on the neutral position)

7. BLUETOOTH

With REDS Racing ZX PRO 32 BIT 160A 1/10 ESC and Bluetooth module, connected the REDS app to the ESC, the user can program parameters, upgrade firmware and check the real-time data of the ESC on the APP.
Due to the range limit of Bluetooth, the operational distance is around 10 meters. The operational distance will be lower if there are many metal parts, interference signals or obstacles.
Note that the Bluetooth name cannot be changed. The Bluetooth connection will fail during the ESC throttle calibration process.
How to reset Bluetooth password? When the ESC turns on, press and hold the power button for about 10 seconds, the ESC will restore the Bluetooth password to default setting 0000.

8. FIRMWARE UPGRADE

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.

The Red Led will blink a faint light when the ESC is in the firmware upgrade mode, and the Blue Led will blink a faint light when the ESC have data transmission.

Please do not turn off the ESC when during firmware upgrading process. (The ESC can only be switched off after pressing the power button around 5 seconds)

9. THROTTLE SIGNAL

REDS ESC can support 450Hz maximum PPM throttle signal.
ESC throttle protection will be activated under the following circumstances (the BLUE LED blinks twice):
- The throttle trigger is not placed on neutral position when the ESC turns on.
- Lost of the throttle signal.

If the ESC loses throttle signal during the operation, the BLUE LED will blink twice, and the ESC will start to work again when the throttle signal is back to normal.

10. SENSORED & SENSORLESS

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

11. BOOST & TURBO

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

12. PROTECTION

12.1. High Voltage Protection

If the ESC detects high voltage, 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 works 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.)

12.2. 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 can not be relieved.)

12.3. Thermal Protection

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℃)

12.4. Voltage and temperature protection set off

If the voltage protection and temperature protection set off, and when the voltage and temperature become abnormal, the LED status will indicate the problems correspondingly, but will not limit the throttle output and will not close all ESC timing.

12.5. Driving problem detected

If the ESC detected the motor having problems (like a locked rotor or motor phase lost problem) which can cause the motor not run smoothly, and when the throttle trigger leave neutral position for a while, then the ESC driving abnormal protection will be activated, 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 will have to solve the motor problem first, or will be in protection mode all the time.

13. REAL-TIME DATA

The real-time data can be read only when the ESC have the throttle signal.
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 professional equipment.
The description of the real-time data items:

n	DATA	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 reached by the ESC
7	RPM	Motor speed RPM
8	Max. RPM	The maximum RPM reached by the motor
9	Adv. Timing	ESC total timing (Boost & Turbo)

14. PROGRAMMABLE ITEMS

The user can program parameters when ESC is on, and new programmed parameters will take effect immediately, no need to restart the ESC, it means the programming parameters can be completed 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 is in a high-speed rotation.

The programming parameters are saved in the ESC embedded flash memory, and the flashed card have a limited programming life (around 10k times).

14.1. Throttle

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

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.

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

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.

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.

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.

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.

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.

14.2. Brake

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

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

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.

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.

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

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.

Rev. Drag Brake Response: Drag Brake Response.

Brake PWM Freq.: Brake PWM frequency.

14.3. Boost

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 degrees, 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.

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

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.

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.

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).

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.

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

14.4. Turbo

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

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.

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.

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

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.

14.5. General

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.

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.

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

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.

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 the frequency, the smoother the throttle feeling, but it will cause the temperature of the ESC to rise too fast.

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.

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 drops to 65℃).

BEC Output: BEC Voltage Output.

15. WARRANTY