

## EZRUN USER MANUAL

Brushless Electronic Speed Controller  
MAX10 SCT / MAX10

Congratulations and thank you for your trust in Hobbywing product. By purchasing a EZRUN MAX10-SCT and EZRUN MAX10, you have chosen a high performance brushless electronic speed controller! This sensorless speed-control is equipped with high-tech features to enhance your experience with Hobbywing Brushless power systems. Improper usage and unauthorized modifications to our product is extremely dangerous and may damage the product and related devices. Please take your time and read the following instructions carefully before you start using your speed control. Besides, we have the right to modify our product design, appearance, features and usage requirements without notification.

## 02 Warnings

- Ensure all wires and connections are well insulated before connecting the ESC to related devices, as short circuit will damage your ESC.
- Ensure all devices are well connected to prevent poor connection that may cause your vehicle to lose control or other unpredictable issues such as damage to the device.
- Read through the manuals of all power devices and chassis and ensure the power configuration is rational before using this unit.
- Please use a soldering iron with the power of at least 60W to solder all input/output wires and connectors.
- Do not hold the vehicle in the air and rev it up to full throttle, as rubber tires can "expand" to extreme size or even crack to cause serious injury.
- Stop using the ESC when its casing temperature exceeds 90 C/194 ℉; otherwise your ESC will get destroyed and may also get your motor damaged. We recommend setting the "ESC Thermal Protection" to 105 C/221 ℉ (this refers to the internal temperature of the ESC).
- We recommend removing the cooling fan from ESC before exposing vehicle to liquids, and fully dry it right after use.
- Always disconnect the batteries after use, as the ESC will continue to consume current if it's connected to batteries (even if the ESC is turned off). Long-time contact will cause batteries to completely discharge and result in damage to batteries or ESC. This WILL NOT be covered under warranty.

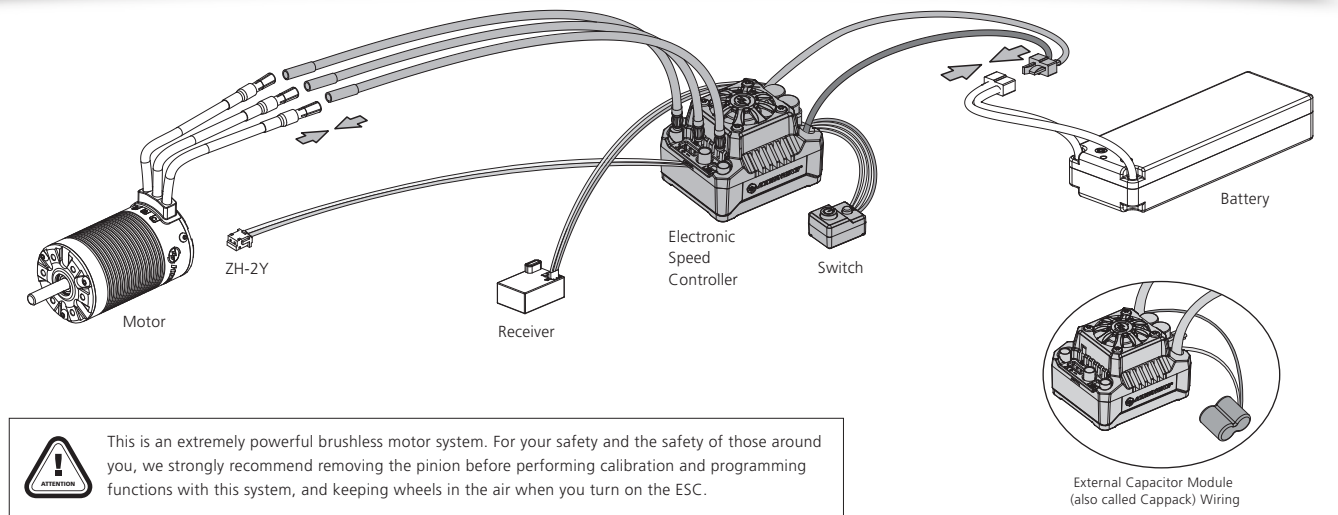
## 03 Features

- ESC is compatible with both sensorless and sensored brushless motors (only in sensorless mode).
- Fully waterproof design for all conditions.
- Super internal switch-mode BEC with switchable voltage of 6V/7.4V for usage with high torque and high voltage servos.
- Motor Thermal Protection: It will be available after you plug the temperature monitoring cable on the ESC into the temperature monitoring port (marked with "TEMP") at the bottom of the matching HOBBYWING motor.
- Highly reliable electronic switch design prevent mechanical switch failure due to dirt, water, dust and etc.
- Separate programming port to easily connect the LED program card or the LCD program box to the ESC.
- Proportional brake with 9 levels of maximum brake force and drag brake force.
- 5 levels of acceleration/punch from soft to aggressive for different vehicles, tires and tracks.
- Capacitor Protection: Innovative Capacitor Protection effectively protects capacitors from exploding and causing irreversible damage to the ESC from overloading.
- Multiple protections: motor lock-up protection, low-voltage cutoff protection, thermal protection, overload protection, and fail safe (throttle signal loss protection).
- Single-button ESC programming and factory reset.
- Advanced programming via portable LED program card, multifunction LCD program box or WiFi module.
- Firmware upgrade via HOBBYWING multifuncn LCD program box or WiFi module (item sold separately).

## 04 Specifications

| Model              | EZRUN MAX10 SCT                                                                                                                                                                                                                               | EZRUN MAX10                                                                                                                                          |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cont./Peak Current | 120A / 830A                                                                                                                                                                                                                                   | 60A / 450A                                                                                                                                           |
| Motor Type         | Sensorless / Sensored Brushless Motor (only in sensorless mode)                                                                                                                                                                               | Sensorless / Sensored Brushless Motor (only in sensorless mode)                                                                                      |
| Applications       | 1/10 <sup>th</sup> Short Course Truck,Truck and Monster Truck                                                                                                                                                                                 | 1/10 <sup>th</sup> Buggy, On-road, Light-weight 2WD SCT, Truck and Monster Truck                                                                     |
| Motor Limit        | Brushless Motor Limit with 2S LiPo / 6 Cell NiMH: KV<=6000 (3656 size motor)<br>Brushless Motor Limit with 3S LiPo / 9 Cell NiMH: KV<=4000 (3656 size motor)<br>Brushless Motor Limit with 4S LiPo / 12 Cell NiMH: KV<=3000 (3656 size motor) | Brushless Motor Limit with 2S LiPo / 6S NiMH: KV<=6000 (3652 size motor)<br>Brushless Motor Limit with 3S LiPo / 9S NiMH: KV<=4000 (3652 size motor) |
| LiPo /NiMH Cells   | 2-4S LiPo / 6-12S NiMH                                                                                                                                                                                                                        | 2-3S LiPo / 6-9 Cell NiMH                                                                                                                            |
| BEC Output         | 6V/7.4V Switchable, Continuous Current of 4A (Switch-mode)                                                                                                                                                                                    | 6V/7.4V Switchable, Continuous Current of 3A (Switch-mode)                                                                                           |
| Cooling Fan        | Powered by the stable BEC voltage of 6V/7.4V                                                                                                                                                                                                  | Powered by the stable BEC voltage of 6V/7.4V                                                                                                         |
| Connectors         | Input End: No Connectors.<br>Output End: 4.0mm Female Gold Connectors (pre-soldered onto the PCB of the ESC).                                                                                                                                 | Input End: No Connectors<br>Output End: 3.5mm Female Gold Connectors (pre-soldered onto the PCB of the ESC)                                          |
| Size/Weight        | 49 x 39.5 x 34.7mm (W/Fan) / 105g                                                                                                                                                                                                             | 39.4 x 32.8 x 23.1mm (w/o Fan) / 67.8g                                                                                                               |
| Programming Port   | FAN/PRG Port                                                                                                                                                                                                                                  | FAN/PRG Port                                                                                                                                         |

## 05 Connections



- Motor Wiring**  
There is no polarity on the A/B/C three ESC-to-motor wires, hence, do not worry on how you connect them initially. You may find it necessary to swap two wires if the motor runs in reverse. And plug the temperature monitoring cable (PVC cable with a 2H-2Y male connector) on the ESC into the temperature monitoring port (a 2H-2Y female connector marked with "TEMP") at the bottom of the matching HOBBYWING motor, the Motor Thermal Protection will function.
- Receiver Wiring**  
Plug the throttle control cable on the ESC into the throttle (TH) channel on receiver. The throttle control cable will output the voltage of 6V/7.4V to the receiver and steering servo. Hence, no separate battery can be connected to the receiver. Otherwise, your ESC may be damaged.
- External CapPack Wiring (Optional)**  
If the temperature of the capacitor is consistently above 85 C° when in use, you need to connect an external cappack (stock accessory included in the product box) to Red & Black power wires (the input end of the ESC). Otherwise, the insufficient capability of the on-board cappack may cause capacitors to swell or even explode. The ESC may be damaged and no longer work. Please connect an external cappack to your ESC by referring to the wiring diagram (as shown on the right side). The sequence is connecting Red/Positive to Red/Positive, Black/Negative to Black/Negative.
- Battery Wiring**  
Proper polarity is essential. Please ensure positive (+) connects to positive (+), and negative (-) connects to negative (-) when plugging in the battery! When reverse polarity is applied to your ESC from the battery, it WILL damage your ESC. This WILL NOT be covered under warranty!

## 06 ESC Setup

### 1 Radio Calibration

Begin using your ESC by calibrating with your transmitter. We strongly recommend Hobbywing users to use the "Fail Safe" function on the radio system and set (F/5) to "Output OFF" or "Neutral Position". Example of calibrating Neutral range and Endpoint.

1. Turn on the transmitter, ensure all parameters(D/R, Curve, ATU) on the throttle channel are at default (100%). For transmitter without LCD, please turn the knob to the maximum, and the throttle "TRIM" to 0. Please also turn the corresponding knob to the neutral position. For FutabaTM transmitter, the direction of throttle channel shall be set to "REV", while other radio systems shall be set to "NOR". Please ensure the "ABS / braking function" of your transmitter must be DISABLED.

2. Start by turning on the transmitter with the ESC turned off but connected to a battery. Holding the SET button and press the ON/OFF button, the RED LED on the ESC starts to flash (Note 1 the motor beeps at the same time), and then release the SET button immediately. (The ESC will enter the programming mode if the SET button is not released in 3 seconds, please restart from step 1.)

**Note 1: Beeps from the motor may be low sometimes, and you can check the LED status instead.**

3. Set the neutral point, the full throttle endpoint and the full brake endpoint.

- Leave the throttle trigger at the neutral position, press the SET button, the RED LED dies out and the GREEN LED flashes 1 time and the motor beeps 1 time to accept the neutral position.
- Pull the throttle trigger to the full throttle position, press the SET button, the GREEN LED blinks 2 times and the motor beeps 2 times to accept the full throttle endpoint.
- Push the throttle trigger to the full brake position, press the SET button, the GREEN LED blinks 3 times and the motor beeps 3 times to accept the full brake endpoint.

4. The motor can be started 3 seconds after the ESC/Radio calibration is complete.

### 2 Power ON-OFF Warning

- Power ON/OFF:**  
(Start with the ESC turned off), press the ON/OFF button to turn on the ESC; (start with the ESC turned on) press and hold the ON/OFF button to turn off the ESC.
- Warning Tones:**  
Turn on the ESC (that is to turn it on without holding the SET button); the motor will beep the number of LiPo cells you have plugged in. For example, 2 beeps indicate a 2S LiPo, 3 beeps indicate a 3S LiPo.

### 3 Programmable Items

(Those "black background and white text" options are the factory default settings)

| Programmable Items          | Parameter Values |             |                     |             |          |          |          |          |          |  |
|-----------------------------|------------------|-------------|---------------------|-------------|----------|----------|----------|----------|----------|--|
| <b>Basic Setting</b>        | Option 1         | Option 2    | Option 3            | Option 4    | Option 5 | Option 6 | Option 7 | Option 8 | Option 9 |  |
| 1. Running Mode             | Fwd/Br           | Fwd/Rev/Br  |                     |             |          |          |          |          |          |  |
| 2. LiPo Cells               | Auto Calculation | 2S          | 3S                  | 4S          |          |          |          |          |          |  |
| 3. Cutoff Voltage           | Disabled         | Auto (Low)  | Auto (Intermediate) | Auto (High) |          |          |          |          |          |  |
| 4. ESC Thermal Protection   | 105 C/221 ℉      | 125 C/257 ℉ |                     |             |          |          |          |          |          |  |
| 5. Motor Thermal Protection | Disabled         | 105 C/221 ℉ | 125 C/257 ℉         |             |          |          |          |          |          |  |
| 6. Motor Rotation           | CCW              | CW          |                     |             |          |          |          |          |          |  |
| 7. BEC Voltage              | 6.0V             | 7.4V        |                     |             |          |          |          |          |          |  |
| 8. Brake Force              | 12.5%            | 25%         | 37.5%               | 50.0%       | 62.5%    | 75.0%    | 87.5%    | 100.0%   | Disabled |  |
| 9. Reverse Force            | 25%              | 50%         |                     |             |          |          |          |          |          |  |
| 10. Start Mode (Punch)      | Level 1          | Level 2     | Level 3             | Level 4     | Level 5  |          |          |          |          |  |
| <b>Advanced Setting</b>     |                  |             |                     |             |          |          |          |          |          |  |
| 11. Drag Brake              | 0%               | 2%          | 4%                  | 6%          | 8%       | 10%      | 12%      | 14%      | 16%      |  |

- Running Mode**  
**Option 1: Forward with Brake**  
It has forward and brake functions only and is usually a racing mode.  
**Option 2: Forward / Reverse with Brake**  
This mode can be used as for training and it has "Forward/ Reverse with Brake" mode. Hobbywing adopted the "DOUBLE-CLICK" method, that is your vehicle only brakes on the 1st time you push the throttle trigger forward (brake) (1st push). The motor stops when you quickly release the throttle trigger and then re-push the trigger quickly (2nd push), only then the vehicle will reverse. The reverse function will not work if your car does not come to a complete stop. The vehicle only reverses after the motor stops. This method is for preventing vehicle from being accidentally reversed.
- LiPo Cells**  
"Auto Calculation" is the default setting. If LiPo batteries are often used with the same cell count, we would strongly recommend setting this item manually to avoid the incorrect "calculation" (For instance, the ESC may take a not fully charged 3S LiPo as a fully charged 2S LiPo) which may cause the low-voltage cutoff protection to not function ideally.
- Cutoff Voltage**  
Sets the voltage at which the ESC lowers or removes power to the motor in order to either keep the battery at a safe minimum voltage (for LiPo batteries). The ESC monitors the battery voltage all the time, it will immediately reduce the power to 50% and cut off the output 10 seconds later when the voltage goes below the cutoff threshold. The RED LED will flash a short, single flash that repeats (☆, ☆, ☆) to indicate the low-voltage cutoff protection is activated. Please set the "Cutoff Voltage" to "Disabled" if you are using NiMH batteries.  
**Option 1: Disabled**  
The ESC does not cut the power off due to low voltage. We do not recommend using this option when you use any LiPo battery as you will irreversibly damage the product. You need to select this option when you are using a NiMH pack.  
**Option 2: Auto (Low)**  
Low cutoff voltage, difficulty to get the LVC Protection activated, is applicable to batteries with poor discharge capability.  
**Option 3: Auto (Intermediate)**  
Medium cutoff voltage, prone to getting the LVC Protection activated, is applicable to batteries with ordinary discharge capability.  
**Option 4: Auto (High)**  
High cutoff voltage, very prone to getting the LVC Protection activated, is applicable to packs with great discharge capability.  
**Warning:** If you set the Cutoff Voltage to Disabled when you use a LiPo pack, then please pay attention to the power change of your vehicle. In general, the battery voltage gets pretty low when your vehicle is severely losing power, then you should stop using that pack.
- ESC Thermal Protection**  
The ESC will automatically cut off the output with the GREEN LED flashes (☆, ☆, ☆) when the temperature gets up to the value you've previously preset and activates the ESC Thermal Protection. The output will not resume until the temperature gets down.
- Motor Thermal Protection**  
The GREEN LED flashes (☆ ☆, ☆ ☆, ☆ ☆.....) when the motor temperature reaches to the preset value. The output will not resume until the motor temperature gets down.  
**Note:** this protection works only when the temperature monitoring cable on the ESC is plugged into the temperature monitoring port (marked with "TEMP") at the bottom of the matching HOBBYWING motor. It will be void if you don't plug the cable into the port or set the "Motor Thermal Protection" to "Disabled".
- Motor Rotation**  
Pull the throttle trigger with the motor shaft facing you, the motor spins counter clockwise. When this item is set to CCW, the motor spins clockwise. When it is set to CW. The (A/B/C) wiring order of motors from different manufacturers may vary, so do the direction of the motor rotations. You can adjust the "Motor Rotation" or swap any two (ESC-to-motor) wires if the motor runs in reverse.
- BEC Voltage:**  
**Option 1: 6.0V**  
It's applicable to ordinary servos. Do not use this option with high voltage servos; otherwise your servos may not function normally due to insufficient voltage.  
**Option 2: 7.4V**  
It's applicable to high voltage servos. Do not use this option with ordinary servos; otherwise your servos may be burnt due to high voltage.
- Brake Force**  
The ESC provides proportional braking function; the braking effect is decided by the position of the throttle trigger. It sets the percentage of available braking power when full brake is applied. Large amount will shorten the braking time but it may damage your pinion and spur. Please select the most suitable brake amount as per your car condition and your preference.
- Reverse Force**  
Different reverse amount will bring different reversing speed. For the safety of your vehicle, we recommend using a low amount.
- Start Mode / Punch**  
You can choose the punch from level 1 (very soft) to level 5 (very aggressive) as per the track, tires, grip, conditions. This feature is very useful for preventing tires from wheel-spinning during the warm-up process. In addition, "level 4" and "level 5" have strict requirement on battery's discharge capability. It may affect the starting-up if the battery discharges poorly and cannot provide large current in a short time. If the car stutters or suddenly loses power in the starting-up process, indicates that the battery's discharge capability is poor, you might need to reduce the punch or increase the FDR (Final Drive Ratio).
- Drag Brake**  
Drag brake is the braking power produced when releasing from full speed to neutral zone. This is to simulate the slight braking effect of a neutral brushed motor while coasting. (Attention! Drag brake will consume much power, so apply it cautiously.)

### 4 ESC Programming

1. Programming your ESC with the SET button

2. Program your ESC with a LED program card

The portable LED program card is an optional accessory applicable for field use. Its friendly interface makes the ESC programming easy and quick.

Before the programming, you need to connect your ESC and the program card via a cable with two JR male connectors, and then turn on the ESC, all programmable items will show up a few seconds later. You can select the item by choosing via "ITEM" & "VALUE" buttons on the program card. Press the "OK" button to save all new settings to your ESC.

3. Program your ESC with a multifunction LCD program box

You can program this EZRUN MAX10-SCT ESC via a multifunction LCD program box or via a multifunction LCD program box & a PC (HOBBYWING USB LINK software needs to be installed on the PC). Before programming, you need to connect your ESC and the LCD program box via a cable with two JR male connectors and turn on the ESC, then the boot screen will show up on the LCD, press any button on the program box to initiate the communication between your ESC and the program box. The "CONNECTING ESC" will be displayed, a few seconds later, the program box will display the current mode like profile 1 and then the 1<sup>st</sup> programmable item like running mode. You can adjust the setting via "ITEM" & "VALUE" buttons, and then press the "OK" button to save new settings to your ESC.

4. Program your ESC with a WiFi Module

The EZRUN Max10 ESC can also be programmed via a WiFi module along with small phone devices (HOBBYWING WiFi Link software needs to be installed on the smart phone). Before programming, users will need to plug the programming cable on the WiFi module into the programming port on ESC and switch on the ESC. For detailed information about ESC programming via WiFi module, please refer to the user manual of Hobbywing's WiFi Module.

5. Factory Reset

**Restore the default values with the SET button**  
Press and hold the SET button for over 3 seconds anytime when the throttle trigger is at the neutral position (except during the ESC calibration and programming) can factory reset your ESC. RED & GREEN LEDs flash simultaneously indicating you have successfully restored all the default values within your ESC. Once you power the ESC off, and then back on, your settings will be back in the default mode.

**Restore the default values with a LED program card**  
After connecting the program card to the ESC, press the "RESET" button and the "OK" button to factory reset your ESC.

**Restore the default values with a multifunction LCD program box**  
After connecting the program box to the ESC, continuously press the "ITEM" button on the program box until you see the "RESTORE DEFAULT" item, and then press "OK" to factory reset your ESC.

**Restore the default values with a WiFi module (& WiFi Link)**  
After connecting the WiFi module to the ESC, open the HOBBYWING WiFi LINK software on your smart phone, select "Parameters" followed by "Factory Reset" to reset the ESC.

6. Explanation for LED Status

1. During the Start-up Process

- The RED LED flashes rapidly, showing indications that the ESC doesn't detect any throttle signal or the neutral throttle value stored on your ESC may be different from the current value stored on the transmitter.
- The GREEN LED flashes "Number" times indicating the number of LiPo cells you have connected to the ESC.

2. In Operation

- RED & GREEN LEDs die out when the throttle trigger is in throttle neutral zone.
- The RED LED turns on solid when your vehicle runs forward. The GREEN LED comes on when pulling the throttle trigger to the full (100%) throttle endpoint.
- The RED LED turns on solid when you brake, the GREEN LED will also come on when pushing the throttle trigger to the full brake endpoint and setting the "maximum brake force" to 100%.
- The RED LED turns on solid when you reverse your vehicle.

3. When Some Protection is Activated

- The RED LED flashes a short, single flash and repeats (☆, ☆, ☆) indicating the low voltage cutoff protection is activated.
- The GREEN LED flashes a short, single flash and repeats (☆, ☆, ☆) indicating the ESC thermal protection is activated.
- The GREEN LED flashes a short, double flash and repeats (☆☆, ☆☆, ☆☆☆) indicating the MOTOR thermal protection is activated.

7. Trouble Shooting

| Trouble(s)                                                                                                                                                                                                                                       | Possible Causes                                                                                                                                                                               | Solution(s)                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The ESC was unable to start the status LED, the motor, and the cooling fan after it was powered on.                                                                                                                                              | 1. No power was supplied to the ESC.<br>2. The ESC switch was damaged.                                                                                                                        | 1. Check if all ESC & battery connectors have been well soldered or firmly connected.<br>2. Replace the broken switch.                                                                                                                                                                                                                                    |
| The ESC was unable to start the motor after it was powered on, but the motor emitted a short, double beep (BB, BB, BB...) that repeats with GREEN LED on the ESC blinked. (The interval between two beeps was 1 second.)                         | The battery voltage was beyond the normal operating voltage range of the ESC.                                                                                                                 | Check the battery voltage.                                                                                                                                                                                                                                                                                                                                |
| After the ESC was powered on and finished LiPo cells detection (the GREEN LED flashed N times), and then the RED LED flashed rapidly.                                                                                                            | 1. The ESC didn't detect any throttle signal.<br>2. The neutral throttle value stored on your ESC is different from the value stored on the transmitter.                                      | 1. Check if the throttle wire is reversely plugged in or in the wrong channel and if the transmitter is turned on.<br>2. Re-calibrate the throttle range after you release the throttle trigger to the neutral position.                                                                                                                                  |
| The vehicle ran backward when you pulled the throttle trigger towards you.                                                                                                                                                                       | 1. The (ESC-to-motor) wiring order was incorrect.<br>2. Your chassis is different from popular chassis.                                                                                       | Swap any two (ESC-to-motor) wires.                                                                                                                                                                                                                                                                                                                        |
| The motor suddenly stopped or significantly reduced the output in operation.                                                                                                                                                                     | 1. The receiver was influenced by some foreign interference.<br>2. The ESC entered the battery LVC (Low Voltage Cutoff) protection.<br>3. The ESC entered the thermal (over-heat) protection. | 1. Check all devices and try to find out all possible causes, and check the transmitter's battery voltage.<br>2. The RED LED keeps flashing indicating the LVC protection is activated, please replace your pack.<br>3. The GREEN LED keeps flashing indicating the thermal protection is activated, please let your ESC cool down before using it again. |
| The motor stuttered but couldn't start.                                                                                                                                                                                                          | 1. Some soldering between the motor and the ESC was not good.<br>2. The ESC was damaged (some MOSFETs were burnt).                                                                            | 1. Check all soldering points, please re-solder if necessary.<br>2. Contact the distributor for repair or other customer services.                                                                                                                                                                                                                        |
| The vehicle could run forward (and brake), but could not reverse.                                                                                                                                                                                | 1. The throttle neutral position on your transmitter was actually in the braking zone.<br>2. Set the "Running Mode" improperly. 3. The ESC was damaged.                                       | 1. Re-calibrate the throttle neutral position. No LED on the ESC will come on when the throttle trigger is at the neutral position.<br>2. Set the "running mode" to "Forward/Reverse with Brake".<br>3. Contact the distributor for repair or other customer services.                                                                                    |
| The car ran forward/backward slowly when the throttle trigger was at the neutral position.                                                                                                                                                       | 1. The neutral position on the transmitter was not stable, so signals were not stable either.<br>2. The ESC calibration was not proper.                                                       | 1. Replace your transmitter<br>2. Re-calibrate the throttle range or fine tune the neutral position on the transmitter.                                                                                                                                                                                                                                   |
| 1. The LCD program box kept displaying "CONNECTING ESC" after you connected it to your ESC.<br>2. The LED program card kept display 3 short lines (- - -) after you connected it to your ESC.                                                    | The programming card/box was connected to the ESC via the throttle control cable (Rx cable).                                                                                                  | It is wrong to use the Rx cable to connect programming card/box. The programming port of this ESC is also the fan port, so please connect the ESC and programming card/box by plugging the programming cable into the fan port.                                                                                                                           |
| When pressing the SET button to set the throttle neutral position, the GREEN LED didn't flash and no beep was emitted, or you were unable to set the full throttle endpoint and the full brake endpoint after the neutral position was accepted. | 1. The ESC throttle cable wasn't plugged in the correct channel on the receiver.<br>2. The ESC throttle cable was reversely plugged in.                                                       | 1. Plug the throttle cable into the throttle (TH) channel on your receiver.<br>2. Plug in the throttle cable properly by referring to relevant mark shown on your receiver.                                                                                                                                                                               |