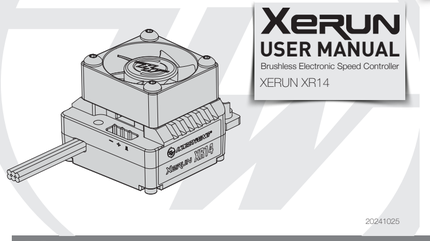


01 Introduction

Thank you for purchasing this HOBBYWING product! Please read this instruction manual carefully before use, once you use the product, it is understood that you have read and agreed with all the content. Brushless power systems can be very dangerous and any improper use may cause personal injury and damage to the product and related devices, so please strictly follow the instruction during installation and use. Because we have no control over the use, installation, or maintenance of this product, no liability may be assumed for any damages or losses resulting from the use of the product. We do not assume responsibility for any losses caused by unauthorized modifications to our product. We have the right to modify our product design, appearance, features and usage requirements without notification. We, HOBBYWING, are only responsible for our product cost and nothing else as result of using our product. With the possible differences between the two version of the manual, for users in mainland China, please take the Chinese version as standard; for users in other regions, please take the English version as standard.

HW-SMA546DUL00

02 Warnings

- To avoid short circuits, ensure that all wires and connections are well insulated before connecting the ESC to related devices.
- Ensure all devices in the system are connected correctly to prevent any damage to the system.
- Read the manuals of all the items being used in the build. Ensure gearing,setup, and overall install is correct and reasonable.
- Stop usage if the casing of the ESC exceeds 90℃ / 194℉ as this may cause damage to both the ESC and motor. Hobbywing recommends setting the "ESC Thermal Protection" to 105℃ / 221℉ (this refers to the internal temperature of the ESC).
- The battery must be disconnected after use. There is a small draw even when the system is off, and will eventually fully drain the battery. This may cause damage to the ESC, and will NOT BE COVERED UNDER WARRANTY.

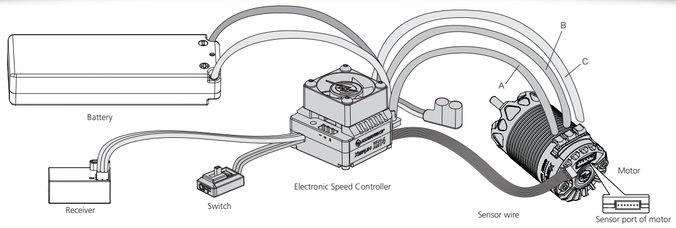
03 Features

- 2 select-to-use profiles applicable to RC car racing.
- Adjustable PWM & brake frequencies allows users to precisely regulate the driving & braking forces (of the motors).
- Softening function (innovative by HOBBYWING) for power delivery tuning and better driving efficiency.
- Multiple protections: low-voltage cutoff protection, ESC and motor thermal protection, fail safe (throttle signal loss protection), reverse polarity protection.
- The data recording function utilizes the OTA Bluetooth module to view various running data of the power system in the HW LINK App on mobile phones, making it easier for drivers to analyze the operation of the power system.
- Firmware upgrade via Hobbywing LCD Program Box Pro/G2 or OTA Programmer (item sold separately).

04 Specifications

Model	XERUN XR14
Cont./Peak Current	70A/300A
Motor Type	Sensored/Sensorless Brushless Motors
Applications	1/14 Scale Racing, 1/12&1/10 Light load vehicles with zero-timing(blinky) mode
Motor Limit	KV＜6000 or ≥8.5T 2848(380)&3650(540)size motor
LiPo Cells	2S LiPo
BEC Output	6V/7.4V @ 4A(Switch-mode)
Cooling Fan	Powered by the BEC voltage
Size	35.2(L) x 31.3(W) x 28.5(H)mm(w/Fan)
Weight	66g(w wires)
Programming Port	Shared with Fan port

05 Connections



This is an extremely powerful brushless motor system. For your safety and the safety of those around you, we strongly recommend removing the pinion gear attached to the motor before performing calibration and programming functions with this system. It is also advisable to keep the wheels in the air when you turn on the ESC.

1. Motor Connection

Sensored motor connection MUST connect A from the ESC to A on the motor, B to B, and C to C, with the sensor wire connected any variation of the motor to ESC connections may cause damage.

Note:If the motor direction is reversed, change the parameter item "Motor Rotation" to change the motor direction.

2. Receiver Connection

The throttle control cable on the ESC has to be plugged into the throttle (TH) channel on the receiver. The throttle control cable has an output voltage of ESC to the receiver and steering servo, no separate battery can be connected to the receiver. Otherwise, your ESC may be damaged. If additional power is required, disconnect the red wire on the throttle plug from the ESC.

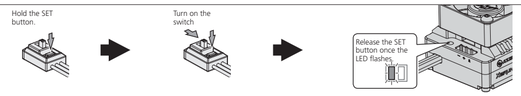
3. Battery Connection

Proper polarity is essential. Please ensure positive (+) connects to positive (+), and negative (-) connects to negative (-) when plugging in the battery! Please note, this esc has reverse polarity protection, so reverse connection will not damage the esc, but standard conventional external capacitor pack will be damaged.

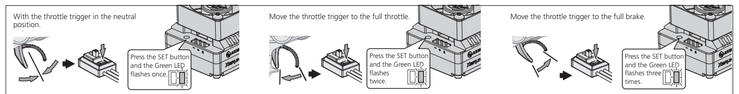
06 ESC Setup

1 ESC/Radio Calibration

The calibration must be done on the first use of the ESC, or if a new radio or receiver is installed, otherwise the ESC cannot work correctly.
We strongly recommend to activate the "Fail Safe" function of the transmitter and set no signal protection for throttle channel of transmitter (F/S) to "OFF" or set its value to the "Neutral Position" to ensure the motor can be stopped when there is no signal received from the transmitter. The throttle calibration steps is as follows:



1. Turn on the transmitter, set parameters on the throttle channel like "D/R", "EPA" and "ATL" to 100% (for transmitter without LCD, please turn the knob to the maximum) and the throttle "TRIM" to 0 (for transmitter without LCD, please turn the corresponding knob to the neutral position). **This step can be skipped if the radio's settings are default!**
2. Turn off the ESC. Hold the SET button and turn on the ESC, the RED LED on the ESC starts to flash (the motor beeps at the same time), and then release the SET button.
   Note : 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.
   1) Leave the throttle trigger at the neutral position, press the SET button, the GREEN LED dies out and the GREEN LED flashes once and the motor beeps 1 time to store the neutral position.
   2) Pull the throttle trigger to the full throttle, press the SET button, the GREEN LED flashes twice and the motor beeps 2 times to store the full throttle position.
   3) Push the throttle trigger to the full brake, press the SET button, the GREEN LED flashes 3 times and the motor beeps 3 times to store the full brake position.
4. The motor can work normally after the throttle range calibration is complete.

2 Programmable Items

Section	Item	Programmable Items	Parameter Values
General Setting	1A	Running Mode	Forward with Brake / Forward/ Reverse with Brake / Forward and Reverse
	1B	Max. Reverse Force	25% / 50% / 75% / 100%
	1C	Cutoff Voltage	Disabled / Auto (3.5V/Cell) / 3.0-7.4V Adjustable (Step: 0.1V)
	1D	ESC Thermal Protection	Disabled / 105℃/221℉ / 125℃/257℉
	1E	Motor Thermal Protection	Disabled / 105℃/221℉ / 125℃/257℉
	1F	BEC Voltage	6.0V / 7.4V
	1G	Motor Rotation	CCW / CW
Throttle Control	2A	Throttle Rate Control	1-30 Adjustable (Step: 1)
	2B	Neutral Range	3%-10% Adjustable (Step: 1%)
	2C	Initial Throttle Force	1-15 Adjustable (Step: 1)
	2D	Coast	0-15% Adjustable (Step: 1%)
	2E	PWM Drive Frequency	1K-32K(Step: 1K)
	2F	Softening Value	0-30゜Adjustable (Step: 1゜)
	2G	Softening Range	0% / 10% / 20% / 25% / 30% / 35% / 40% / 45% / 50% / 55% / 60% / 65% / 70% / 75%
Brake Control	3A	Drag Brake Force	0%-100% Adjustable (Step: 1%)
	3B	Max. Brake Force	0%-100% Adjustable (Step: 1%)
	3C	Brake Rate Control	1-20(Step: 1)
	3D	Brake Frequency	0.5K / 1-16K(Step: 1K)
Timing	4A	Boost Timing	0-48゜Adjustable (Step: 1゜)
	4B	Boost Timing Activation	RPM / Auto
	4C	Boost Start RPM	500-35000RPM (Step: 500RPM)
	4D	Boost End RPM	3000-60000RPM (Step: 500RPM)
	5A	Turbo Timing	0-48゜Adjustable (Step: 1゜)
	5B	Turbo Delay	Instant / 0.05s / 0.1s / 0.15s / 0.2s / 0.25s / 0.3s / 0.35s / 0.4s / 0.45s / 0.5s / 0.6s / 0.7s / 0.8s / 0.9s / 1.0s
	5C	Turbo Increase Rate	1deg/0.1s / 2deg/0.1s / 3deg/0.1s / 5deg/0.1s / 8deg/0.1s / 12deg/0.1s / 16deg/0.1s / 20deg/0.1s / 25deg/0.1s / 30deg/0.1s / Instant
	5D	Turbo Decrease Rate	1deg/0.1s / 2deg/0.1s / 3deg/0.1s / 5deg/0.1s / 8deg/0.1s / 12deg/0.1s / 16deg/0.1s / 20deg/0.1s / 25deg/0.1s / 30deg/0.1s / Instant

1A. Running Mode

Option 1: Forward with Brake

Racing mode. It has only forward and brake functions.

Option 2: Forward/ Reverse with Brake

This option is known to be the "training" mode with "Forward/ Reverse with Brake" functions. The vehicle only brakes on the first time you push the throttle trigger to the reverse/brake position.If the motor stops when the throttle trigger return to the neutral position and then re-push the trigger to reverse position, the vehicle will reverse, if the motor does not completely stop, then your vehicle won't reverse but still brake, you need to return the throttle trigger to the neutral position and push it to reverse again.This method is for preventing vehicle from being accidentally reversed.

Option 3: Forward and Reverse

The motor will reverse immediately when the throttle trigger is pushed to reverse position.This mode is generally used in special vehicles.

1B Max. Reverse Force

The reverse force of the value will determine its speed. For the safety of your vehicle, we recommend using a low amount.

1C. 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 reduce the power and then cut off the output about 40 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" or customize this item 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

The ESC calculates the corresponding cutoff voltage for the battery shall be 7.0V(2S LiPo).

Option 3: Customized

The customized cutoff threshold is a voltage for the whole battery pack (adjustable from 3.0V to 7.4V).

1D. ESC Thermal Protection

After enabling this function, when the temperature of the ESC reaches the set value, it will reduce the power and then cut off the output about 40 seconds later. The Green LED will flash a short, single flash that repeats (☆, ☆, ☆) to indicate the over-heat protection is activated.

Warning! Please do not disable this function unless you're in a competition. Otherwise the high temperature may damage your ESC and even your motor.

1E Motor Thermal Protection

After enabling this function, when the temperature of the motor reaches the set value, it will reduce the power and then cut off the output about 40 seconds later. The Green LED will flash a short, double flash that repeats (☆☆, ☆☆, ☆☆) to indicate the over-heat protection is activated.

Warning! Please do not disable this function unless you're in a competition. Otherwise the high temperature may damage your motor and even your ESC. For non-Hobbywing motor, the ESC may get this protection activated too early/late because of the different temperature sensor inside the motor. In this case, please disable this function and monitor the motor temperature manually.

1F. BEC Voltage

It supports 6.0V/7.4V adjustable. Set a reasonable value according to the working voltage of the servo.

1G. Motor Rotation/Direction

Used to set the rotation direction of the motor. Due to differences in chassis frame structure, it is possible for the car to reverse when the throttle is applied to forward, in this case, you can solve it by adjusting this item.

2A. Throttle Rate Control

This item is used to control the throttle response. The higher the throttle rate, the more aggressive the throttle will be applied. A suitable rate can help driver to control the vehicle properly during the starting-up process.

2B. Neutral Range

This parameter adjusts the range of the throttle neutral area to suit different transmitters and driver habits. If the neutral position of the transmitter is unstable, causing the car to move slowly forward or backward, or have difficulties calibrating the neutral range, the setting can be raised to correct the issue.

2C. Initial Throttle Force

It also called as minimum throttle force. You can set it according to wheel tire and traction. If the ground is slippery, please set a small throttle force. Some motors have strong cogging effect with lower FDR, if there is any cogging with very light throttle input, you can try to increase the initial throttle force.

2D. Coast

This function allows the motor to naturally and smoothly reduce rpm/speed, and the vehicle will not experience sudden deceleration during the throttle release process. The higher the value, the stronger the "coasting" feeling.

What is COAST?

When a vehicle has a larger final drive ratio, the tendency of having a "drag" feel is higher. The "COAST" technology is to allow the car to roll (coast) even when the final drive ratio is high. The Coast function brings better and smoother control feeling to racers. Some drivers will refer to this to the traditional brushed motors.

Note: The Coast setting will not work if the drag brake is not set to 0%.

2E PWM Drive Frequency

The acceleration will be more aggressive at the initial stage when the drive frequency is low; a higher drive frequency is smoother but this will create more heat to the ESC.

2F. Softening Value

It allows users to fine-tune the bottom end, change the driving feel, and maximize the driving efficiency at different track conditions. The higher the "Softening Value ", the softer the bottom end. Sometimes drivers may feel the power of the bottom end is too aggressive. Little throttle input usually brings too much power to the car and make it hard to control at the corners, this is HOBBYWING's solution to help bottom end traction.

2G. Softening Range

It's the range to which "Softening Value" starts and ends. If set to 30% then the softening range will be from 0 throttle to 30% throttle.

3A. Drag Brake

It is the braking power produced when releasing from full speed to neutral position. This is to simulate the slight braking effect of a neutral brushed motor while coasting. It's not recommended for buggy and monster truck. **(Attention! Drag brake will consume more power and heat will be increased, apply it cautiously.)**

3B. Max. Brake Force

This 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.

3C. Brake Rate Control

This parameter is used to control the response of the brake. The higher the setting value, the faster the brake. A suitable rate can aid the driver to brake his vehicle correctly. Generally, you can set it to a high value to have a quick brake response.

3D. Brake Frequency

The brake force will be larger if the frequency is low; you will get a smoother brake force when the value is higher. Please choose the frequencies as per the actual test results of your vehicles.

4A. Boost Timing

It is effective within the whole throttle range; it directly affects the car speed on straightaway and winding course. The ESC adjusts the timing dynamically according to the setting of the "Boost Timing Activation". The Boost Timing is not constant but variable.

4B. Boost Timing Activation

Option 1: RPM

In RPM mode, it is associated with the 4C and 4D parameter items. The actual Boost Timing is 0 when the RPM is lower than the Boost Start RPM. The Boost Timing changes as per the RPM when the RPM change is between the Boost Start RPM and the Boost End RPM. When the RPM is higher than the Boost End RPM, the actual Boost Timing is the value you had previously set.

Option 2: Auto

In Auto mode, the ESC adjusts the Boost Timing dynamically as per the throttle amount. Only at full throttle, the actual Boost Timing is the value you had previously set.

4C. Boost Start RPM

This item defines the RPM at which Boost Timing is activated. For example, when the Boost Start RPM is set to 5000, the ESC will activate the corresponding Boost Timing when the RPM goes above 5000. The specific value is determined by the Boost Timing and the Boost End RPM you had previously set.

4D. Boost End RPM

This item defines the RPM at which Boost Timing (you specifically set) is applied. For example, when Boost Timing is set to 10 degrees and the Boost End RPM to 15000, the ESC will activate the Boost Timing of 10 degrees when the RPM goes above 15000. The ESC will adjust the Boost Timing accordingly as per the actual RPM when the RPM goes below 15000.

5A. Turbo Timing

This item is adjustable from 0 degree to 48 degrees, the corresponding turbo timing (you set) will initiate at full throttle. It's usually activated on long straightaway and makes the motor unleash its maximum potential.

5B. Turbo Delay

When "TURBO DELAY" is set to "INSTANT", the Turbo Timing will be activated right after the throttle trigger is moved to the full throttle position. When other value(s) is applied, you will need to hold the throttle trigger at the full throttle position (as you set) till the Turbo Timing initiates.

5C. Turbo Increase Rate

This item is used to define the "speed" at which Turbo Timing is released when the trigger condition is met. For example, "3 degs/0.1sec" refers to the Turbo Timing of 3 degrees that will be released in 0.1 second. Both the acceleration and heat is higher when the "Turbo increase rate" is of a larger value.

5D. Turbo Decrease Rate

After the Turbo Timing is activated and the trigger condition turns to not be met (i.e. vehicle slows down at the end of the straightaway and gets into a corner, full throttle turns to partial throttle, the trigger condition for Turbo Timing turns to be not met), if you disable all the Turbo Timing in a moment, an obvious slow-down like braking will be felt and result in poor control. If the ESC can disable the Turbo Timing at some "speed", the slow-down will be linear and the control will be improved.

Warning! Boost Timing & Turbo Timing can effectively improve the motor efficiency; they are usually used in competitions. Please take some time to read this manual and then set these two items carefully, monitor the ESC & motor temperatures when you have a trial run and then adjust the Timing and FDR accordingly as aggressive Timings and FDR may cause your ESC or motor to be burnt.

3 Preset Modes

In order to make one firmware applicable to all different racing conditions, there are two "easy-to-select" preset modes (as shown below). Users are able to change the settings of the modes provided (and rename those modes) as per the control feel, track, and etc.

Preset Modes for Different Racing:

Mode #	Modes/Profiles	Applications
1	1/14 On-Road	Suitable for 1/14 on-road racing
2	1/14 Off-Road	Suitable for 1/14 off-road racing

4 ESC Programming

1. Program your ESC with a Multifunction LCD Program Box Pro

Connect the interface marked with "- +" on the esc to the interface marked with "ESC" on the program box using a separate programming cable(a cable with JR plugs at both ends included in the program box packaging), then connect the esc to the battery and turn it on. Click on 【Parameter Settings】 to set the esc.

2. Using the OTA Programmer for parameter settings

Insert the programming cable of the OTA Programmer into the programming interface of the esc, and use your phone to install the HW Link APP to set the esc.

3. Read the running data of esc

1) Click on the【Data record】on the homepage of the LCD box pro to read the five extreme values of the highest temperature of the esc, the highest temperature of the motor, the maximum current, the lowest voltage of the battery, and the highest rpm of the motor during the operation of the esc.

2) By using the OTA Bluetooth module, you can view the five extreme values recorded above, real-time data, and historical data (curve chart) under the【Data Log】menu in the HW LINK App on your phone.

4. Upgrade of firmware for esc

1) Using the LCD box pro or OTA programmer, download and install the HW LINK App on your phone,click on the【Firmware Update】button on the APP homepage to upgrade the firmware of the esc.

2) Connect to the computer through the LCD box pro, download and install Hobbywing USB LINK software on the computer, and use this software to upgrade the firmware for esc.

5 Factory Reset

- **Restore the default values with a Multifunction LCD Program Box Pro**
  After connecting the program box to the ESC, Click on【Parameter Settings】and select the【Reset Parameters】 to restore the factory settings.
- **Restore the default values with a OTA Programmer (& HW Link App)**
  After connecting the OTA Programmer to the ESC, open the HOBBYWING HW Link App on your smart phone, select "Parameters" followed by "Factory Reset" to reset the ESC.

07 Explanation for LED Status

1. During the Start-up Process

- The RED LED turns on solid indicating the ESC doesn't detect any throttle signal or the throttle trigger is at the neutral position.
- The GREEN LED flashes rapidly indicating the neutral throttle value stored on your ESC may be different from the current value stored on the transmitter. When this happens, re-calibrate the throttle range.

2. In Operation

- The RED LED turns on solid when the throttle trigger is in the throttle neutral zone. The RED LED will blink slowly to suitable for zero-timing/Blinky racing rules if the total value of Boost Timing and Turbo timing is 0, and the Softening value is also set to 0 at the same time..
- The GREEN LED blinks when your vehicle runs forward. The GREEN LED turns solid when pulling the throttle trigger to the full (100%) throttle endpoint.
- The GREEN LED blinks when you brake your vehicle. The GREEN LED turns solid when pushing the throttle trigger to the full brake endpoint and setting the "maximum brake force" to 100%.
- The GREEN LED blinks when you reverse your vehicle. The GREEN LED turns solid when pushing the throttle trigger to the full brake endpoint and setting the "reverse force" to 100%.

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.
- The RED & GREEN LEDS flash a short, single flash and repeats at the same time indicating the drive mode has been automatically switched to sensorless mode from senored mode because of abnormal sensor signal when pairing the ESC with a sensored motor.

08 Trouble Shooting

Trouble	Possible Causes	Solutions
The ESC was unable to start the status LED, the motor, after it was powered on.	No power was supplied to the ESC.	Check if all ESC & battery connectors have been well soldered or firmly connected.
After power on, the RED LED flashes and the motor does not work.	The throttle cable of the esc is connected incorrectly or the throttle is not at the neutral position.	1. Plug the throttle cable into the throttle channel (CH2) by referring to relevant mark shown on your receiver. 2. Calibrate the esc and radio.
The vehicle is going in the reversed direction when the forward throttle is applied.	The default/popular motor rotation direction does not match your car frame.	Adjust the parameter "Motor Rotation".
The motor suddenly stopped or significantly reduced the output in operation.	1. The receiver was influenced by some foreign interference; 2. The ESC entered the LVC protection; 3. The ESC entered the thermal shutdown protection.	1. Check all devices and try to find out all possible causes, and check the transmitter's battery voltage; 2. The RED LED keeps flashing indicating the LVC protection is activated, please replace your pack; 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. The (ESC-to-motor) wiring order was incorrect 2. Some soldering between the motor and the ESC was not good; 3. The ESC was damaged (some MOSFETS were burnt).	1. Check the wiring order; 2. Check all soldering points, please re-solder if necessary; 3. Contact the distributor for repair or other customer service.
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; 2. Set the "Running Mode" improperly; 3. The ESC was damaged.	1. Recalibrate the throttle neutral position; 2. Set the "Running Mode" to "Fwd/Rev with Brk "; 3. Contact the distributor for repair or other customer service.
The motor got stuck or stopped when increasing the throttle during the starting-up process.	1. Poor discharging capability of the pack; 2. The RPM of the motor was too high, or the FDR was too low; 3. The Throttle Rate Control is set too high.	1. Change another pack with great discharging capability; 2. Change a low-speed motor, or increase the FDR; 3. Set the Throttle Rate Control to a low level.
The RED & GREEN LEDS on the ESC flashed rapidly at the same time when the throttle trigger was at the neutral position.	(When pairing with a sensored motor) the ESC automatically switched to sensorless mode when it detected incorrect signal from Hall sensor.	1. Check if the sensor cable is loose or poor contact issue exists; 2. Hall sensor inside the motor or the ESC is damaged.