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	3.0-11.1V Adjustable (Step:0.1V)						
	1D	ESC Thermal Protection	105℃/221℉	125℃/257℉	Disabled						
	1E	Motor Thermal Protection	105℃/221℉	125℃/257℉	Disabled						
	1F	BEC Voltage	6.0V	7.4V							
	1G	Remote Off	Enabled	Disabled							
	1H	Sensor Mode	Full Sensored	Sensored/Sensorless Hybrid							
Throttle Control	2A	Throttle Rate Control	1-30 Adjustable (Step: 1)								
	2B	Throttle Curve	Linear	Customized							
	2C	Neutral Range	4%	6%	8%						
	2D	Coast	0%-20% Adjustable (Step: 1%)								
	2E	PWM Drive Frequency	1K	2K	4K	8K	12K	16K			
	2F	Softening Value	0-25° Adjustable (Step: 1°)								
	2G	Softening Range	0%	10%	20%	25%	30%	35%	40%	45%	50%
Brake Control	3A	Drag Brake	0%-100% Adjustable (Step: 1%)								
	3B	Max. Brake Force	0%	12.5%	25%	37.5%	50%	62.5%	75%	87.5%	100%
	3C	Initial Brake Force	=Drag Brake	0%-50% Adjustable (Step: 1%)							
	3D	Brake Rate Control	1-20 Adjustable (Step: 1)								
	3E	Brake Curve	Linear	Customized							
	3F	Brake Frequency	0.5K	1K	2K	4K					
	3G	Brake Control	Linear	Traditional	Hybrid						
Timing	4A	Boost Timing	0-64° Adjustable (Step: 1°)								
	4B	Boost Timing Activation	RPM	Auto							
	4C	Boost Start RPM	500-35000 RPM Adjustable (Step: 500RPM)								
	4D	Boost End RPM	3000-60000 RPM Adjustable (Step: 500RPM)								
	5A	Turbo Timing	0-64° Adjustable (Step: 1°)								
	5B	Turbo Delay (sec)	Instant	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.0
	5C	Turbo Increase Rate (degree/0.1sec)	6		12		18		24		30		Instant					
	5D	Turbo Decrease Rate (degree/0.1sec)	6		12		18		24		30		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. Hobbywing has 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.

Option 3: Forward and Reverse

This mode is often used by special vehicles (rock crawler). It adopts the “SINGLE-CLICK” method. The vehicle will reverse immediately when you push the throttle trigger forward (brake).

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 immediately reduce the power to 30% (in 3 seconds) 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" 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 as per the number of LiPo cells it detects and the "3.3V/cell" rule. For example, if the ESC detects a 2S, the cutoff voltage for the battery shall be 6.6V.

Option 3: Customized

The customized cutoff threshold is a voltage for the whole battery pack (adjustable from 3.0V to 11.1V). Please calculate the value as per the number of LiPo cells you are using. For example, when you use a 2S and you want the cutoff voltage for each cell is 2.8V, you will need to set this item to 5.6V.

1D. ESC Thermal Protection

The output from the ESC will be cut off with the value you have preset.

The GREEN LED flashes (☆, ☆, ☆) when the ESC temperature reaches to the preset value. The output will not resume until the ESC temperature gets down.

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

The GREEN LED flashes (☆☆, ☆☆, ☆☆) when the motor temperature reaches to the preset value. The output will not resume until the motor temperature gets down.

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

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.

1G. Remote Off

Option 1: Enabled

Users can simply push and hold the brake trigger for 6 seconds. This option allows the user to turn off the ESC without pushing the ON/OFF button switch.

Option 2: Disabled

Users must turn off the ESC by pressing the ON/OFF switch button from the ESC.

1H. Sensor Mode

Option 1: Full Sensored

The power system will work in the "sensored" mode at all times. The efficiency and drivability of this mode is at the highest.

Option 2: Sensored/Sensorless Hybrid
The ESC operates the motor in sensored mode during the low-speed start-up process, followed by switching to operating the motor in the “sensorless” mode. This dual drive mode is applicable to 4WD SCT vehicles using 4 pole motors.
Warning! Do not select the option 1 if you are using a non-Hobbywing matching motor, when it’s a 4 pole sensored motor, otherwise you may damage your ESC and motor.

2A. Throttle Rate Control
This item is used to control the throttle response. It can be adjustable from 1 to 30 (step: 1), the lower the throttle rate, the more the limit will be on the throttle response. A suitable rate can help driver to control his vehicle properly during the starting-up process. Generally, you can set it to a high value to have a quick throttle response if you are proficient at throttle control.

2B. Throttle Curve
The throttle curve parameter reconciles the position of the throttle trigger (in throttle zone) and the actual ESC throttle output. It is linear by default and we can change it to non-linear via adjusting the throttle curve. For example, if adjust it to +EXP, the throttle output at the early stage will be higher (than the output when the curve is linear); if it is adjusted to –EXP, the throttle output at the early stage will be lower (than the output when the curve is linear).

2C. Neutral Range
As not all transmitters have the same stability at “neutral position”, please adjust this parameter as per your preference. You can adjust to a bigger value when this happens.

2D. Coast
The RPM of the motor will be lowered gradually when throttle is reduced. The vehicle will not reduce speed abruptly when the throttle is reduced to return to the neutral position.
The bigger the value, the more the “COAST” will be felt. Example, COAST of 0 deactivates, and a COAST of 20% would be the maximum amount of COAST.
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 5: The “Coast” will be void (even if you set it to any value besides 0) if the above “drag brake” is not “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 milder the bottom end. In Modified class, drivers often 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, so HOBBYWING creates this softening function to solve the issue.
Note 6: You can increase the motor mechanical timing accordingly after you set the softening value. Every time you increase the softening value by 5 degrees, you can increase the mechanical timing by 1 degree. For example, if you set the softening value to 20 degrees, then you can increase the mechanical timing by 4 degrees. Please note that you will never increase the mechanical timing by over 5 degrees.

2G. Softening Range
It's the range to which "Softening Value” starts and ends. For example, 0% to 30% will be generated when the user pre-programs the "Softening Range" at a value of 30%.

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. Initial Brake Force

It is also known as “minimum brake force”. It is the force when pushing throttle trigger from neutral zone to the initial brake position. To get a smoother braking effect, the default is equal to the drag brake.

3D. Brake Rate Control

It’s adjustable from 1 to 20 (step: 1), the lower the brake rate, the more limit on the brake response. 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.

3E. Brake Curve

This item is used for regulating the relation between the throttle range in brake zone and the brake force. The default setting is linear. You can change it to non-linear via a LCD program box and a PC (HOBBYWING USB LINK software needs to be installed on the PC.) for different braking effect.

3F. 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.

3G. Brake Control

Option 1: Linear

Hobbywing has recommended using this mode under all circumstances. The braking effect is a bit weaker in this mode than in Traditional brake mode, but it’s easy to control and brings great control feel.

Option 2: Traditional

This brake mode is the same as to the XERUN series of ESCs, the brake force is stronger.

Option 3: Hybrid

The ESC switches the brake mode between Linear and Traditional as per the vehicle speed to prevent the slide (between tires and track) from affecting the braking effect.

Note 6: Please select the right mode for your vehicle as per the track condition, motor performance, and etc.

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 as per the RPM (when “Boost Timing Activation” set to “RPM”) or throttle amount (when “Boost Timing Activation” set to “Auto”) in the operation. The Boost Timing is not constant but variable.

4B. Boost Timing Activation

Option 1: RPM

In RPM mode, the ESC adjusts the Boost Timing dynamically as per the motor speed (RPM). 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. For example, if the Boost Timing is set to 5 degrees and the Boost

Start RPM is 10000, the Boost End RPM is 15000. The Boost Timing corresponds to different RPM is shown below. When the RPM is higher than the Boost End RPM, the actual Boost

Timing is the value you had previously set.

RPM (Motor Speed)	<10000	10001-11000	11001-12000	12001-13000	13001-14000	14001-15000	>15000
Actual Boost Timing	0 Degree	1 Degree	2 Degrees	3 Degrees	4 Degrees	5 Degrees	5 Degrees

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 64 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, "6 degs/0.1sec" refers to the Turbo Timing of 6 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 cause the control of vehicle to become bad. 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.