

# Scorpion Brushless Controllers User guide for Commander 26V ESC series



## SAFETY

- ⚠ Scorpion and their re-sellers are not responsible for your use of this product, or any damage or injuries you may cause or sustain as a result of its usage.
- ⚠ Understand that an electric motor that is connected to a battery and speed control may start unexpectedly and cause serious injuries. Always treat them with necessary respect. Keep the propeller away from your body and others at all times.
- ⚠ We suggest that you remove the propeller when you are working on the plane with the battery connected.
- ⚠ We suggest that you remove the pinion when working on a Helicopter with the battery connected
- ⚠ Please observe all local laws regarding the flying of remote control aircraft.
- ⚠ Never fly over others or near crowds.

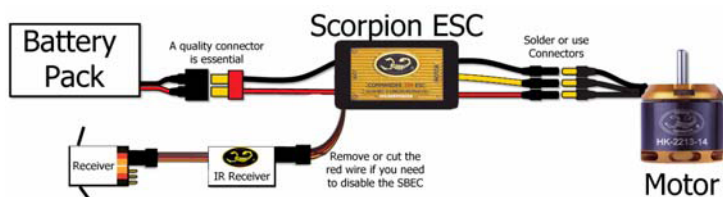
## Included in the BOX

- 1 x Scorpion SBEC ESC
- 1 x IR Program card
- 1 x IR Receiver
- 1 x Instruction Manual

## Battery Eliminator Circuit (BEC)

The Commander 26V ESC series feature a inbuilt switching BEC that will convert the voltage from your battery pack to 5.7 volts to power your receiver and servos. The Commander SBEC will deliver 3 amps of continuous current with 4 amp bursts. With a Switching type BEC, you do not need to de-rate the BEC as the input voltage increases. The full 3 amps of BEC current is available for any input between 2-cell and 6-cell Li-Po operation.

## 1.0 Connecting your ESC



\*for larger picture refer to back of this manual

### 1.1. Add your battery connector

You must attach a quality battery connector of your choice to the red (+) and black (-) power wires. Solder the battery connector to the wires. ENSURE THAT THE POLARITY IS CORRECT (red wire to battery red wire, black wire to battery black wire). Follow the instructions provided with the battery connector.

### 1.2 Connect Motor to ESC

Cut the three (red, yellow & black) motor wires coming off the ESC to the length you require. We recommend using bullet connectors to connect your esc to your motor as scorpion motors come with pre-installed bullet connectors that include a female set for your ESC. Solder the corresponding connectors for your motor to the wires coming from the ESC, or solder the motor wires directly to the motor leads. You may find it convenient to temporarily connect the motor leads to the ESC and test for proper rotation before you permanently solder them. See "Reversing Rotation" below. Once connected DO NOT allow any exposed wire or connectors to contact each other, insure that proper insulation around each of the three wires is achieved, Heat shrink is the best material for this job.

### 1.3 Connect to your receiver

Connect the receiver lead (the three colored small wires with a black plastic connector on the end) to the throttle channel on your receiver. Do not connect a receiver battery pack to the receiver, as the Scorpion ESC will supply power to the receiver and servos through the receiver connector.

### 1.4 Reversing Rotation (if necessary)

Bench test the motor and speed control after the connections are made to determine the rotation of the motor. To change the rotation of the motor, swap ANY two motor wire connections, or use the scorpion programming card included with your esc to change the rotation direction.

### 1.5 Mounting the ESC

Mount the ESC with the Heatsink side of the controller facing outward. We recommend using Velcro to attach the ESC to the airframe for easy removal. Double sided tape is also acceptable. If zip ties are used, do not place them over any of the components on the ESC. Instead, zip tie around the motor and battery wires, leaving some slack to allow for movement.

## 2.0 Using your scorpion ESC

**2.1** Ensure that the ESC is connected to the proper channel on your receiver.

**2.2** Turn your transmitter ON and set the throttle stick to zero throttle.

**2.3** Connect the main power battery to the speed controller.

**2.4** The ESC will beep the motor (4 tones) to indicate that it is armed.

- ▲ The ESC will not provide any power to the motor, if the throttle stick is anywhere higher than zero throttle when the main battery is plugged in. To arm the esc ready for use you, You must move the throttle stick to zero then disconnect and re connected the battery.
- ▲ Always power your radio transmitter before powering up the receiver and/or the ESC. Some receivers with failsafe features or Spektrum receiver units that are not bound on receiver power up are entirely capable of causing the arming sequence to occur and command the ESC to drive the motor. Always keep the aircraft restrained and clear of body parts when the ESC is powered.
- ▲ If your ESC cannot sense any radio signal it will beep the motor and flash orange on the LED continuously

### 3.0 Scorpion ESC features

ALL of the Scorpion 26V ESC programming features are available through the use of the ESC programming card included with your ESC. So there is NO need to purchase any other cables or cards to allow you to program your ESC properly

Scorpion ESC's come with default or factory settings which are recommended for most applications. Programming options can be changed at the discretion of the user. See section 6.0 for programming instructions

#### Features:

<b>Safe Power up</b>	To arm the controller, the throttle must be held in the "Brake/Zero" position (all the way down). If throttle is not at zero at startup, the ESC will not provide any power to the motor regardless of where the throttle stick is positioned when first powered up.
<b>Loss of signal (fail safe)</b>	The Scorpion will stop the motor as a safety feature when the throttle signal is lost or corrupt for 3 seconds. If a signal is regained the user will have instant control again.
<b>LED</b>	The LED is used for programming/startup confirmation of your scorpion esc. Once armed the LED can be set to give an indication of low battery conditions
<b>Low Voltage Cutoff</b>	You can choose for your ESC to stop or reduce power when the input battery voltage drops to a preset/programmed cutoff voltage.
<b>Current Limiting</b>	Amp output limit, the output is rated at 10% over the rated Amp. At approximately 10% over the rated Amps it will automatically limit the output to the motor, as long as the motor is not rated too much over the ESC spec limits, this safety mechanism will prevent a over load to the ESC but if you install a motor for example rated at 100 amp on a ESC that are rated for only 60Amp, this mechanism will not work properly due to the instant surge of power demand from the motor, it may shutdown too early or simply fry the ESC, the only solution to this is to never use a Motor that has a rating bigger than the ESC, don't even think you can use it if you run the motor at a slower RPM or load, it will not work!!
<b>Thermal Protection</b>	At 95 degree C, the ESC will slowdown the power output to the motor by 50% ( the on board LED will flash red), to re initiate full throttle you need to move the throttle stick to idle position and then the ESC will resume normal output once you throttle up again. If your ESC is over 60deg on startup it will not arm red LED will flash and a DI DI DI sound will be played.
<b>Brake</b>	Stops rotation of the motor when the throttle signal is moved to the lowest position.

<b>Throttle</b>	Airplane, Car and Heli modes come pre programmed and can be selected by the user
<b>Electronic timing</b>	Manual settings that may improve the efficiency of the system for some motors are available. The standard Scorpion setting is to automatically detect and adjust for the motor it is driving.

### 4.0 Initial setup

You MUST perform throttle range setup before the first use of the ESC. Remove propeller/pinion from motor while performing initial throttle range setup.

#### 4.1 Throttle range setup (full throttle and stop)

#### 4.2 Turn on transmitter and set throttle to maximum position

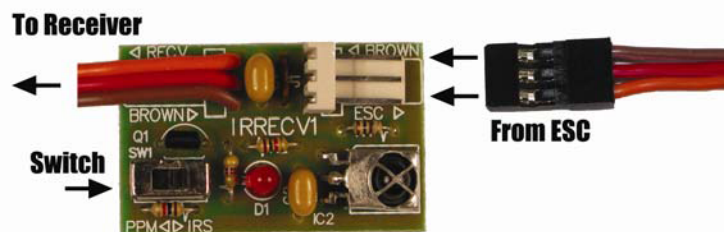
**4.3** Connect battery to ESC. After approximately 2 seconds, the LED flashes rapidly, then 1 second after you will hear 2 beeps from the motor confirming the maximum throttle position has been set. (If at this time, you leave the throttle stick at maximum position for over 10 seconds, the ESC will reset itself to Factory default throttle setting)

**4.4** Move throttle to minimum position within 10 seconds and hold throttle at minimum position, the LED flashes slowly for 1 second. Then you will hear 2 beeps (1 KHZ tone) indicating minimum throttle position is set and confirmed. You only need to do this once as throttle range will be stored in the memory of the speed controller. You can reset the throttle range by performing steps 1.1 to 1.3 again

### 5.0 Connecting your Scorpion ESC to the programming card

Your Scorpion ESC is programmed using the Infrared (IR) Program card and Receiver included with this ESC.

First you must connect your IR Receiver to your ESC  
Ensure the brown wire from your esc is facing outwards

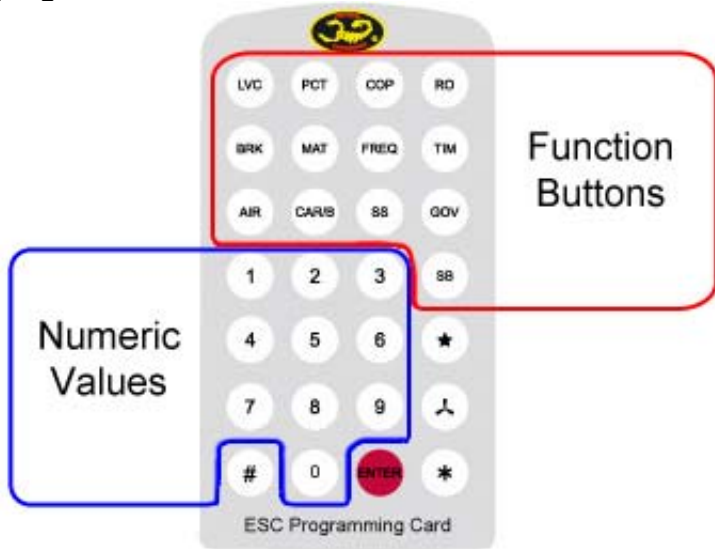


- 5.1** Once you have plugged in the IR Receiver push the switch across to IRS.
- 5.2** Now connect a battery to the ESC. Your motor will emit 3 beeps and the LED will flash 3 times red.
- 5.3** Your IR Receiver is now ready to receive a signal from the program card.

- ▲ please note that IR will be interfered in direct sunlight so to program your model we suggest doing it indoors in the shade out of direct sunlight
- ▲ before flying you will need to place the switch back to PPM mode

## 6.0 Using the Programming Card

All parameters of the esc can be changed via the program card.



To program any function on the card you must follow the following procedure:

- 6.1 Press a function button
- 6.2 enter a numeric value
- 6.3 Enter to complete

Example Low Voltage Cut to enter 9.5V Press "LVC" Press "0" Press "9" Press "5" then "ENTER" If successful a DI DOO sound will come from the motor and the LED will Flash RED. An invalid option will not get any confirmation sound from the motor and the LED will not flash

⚠ Please note that there is a time limit from when you press a function button the numeric values and enter if you go over this time limit no sound of ESC flashes will come from the esc

Function Button	Numeric Value	What it does
<b>Example from Above</b>	095	Sets Low Voltage Cut to 9.5Volts
<b>LVC (Low Voltage Cut)</b>	050-250	Low Voltage Cut 050 (5V) to 250(25V) in .5V increments. *6V
<b>BRK (Brake Setting)</b>	1* 2 3 4 5	* No brake Very soft brake Soft Brake Hard Brake Very Hard Brake
<b>AIR</b>	1*	Activate Airplane mode
<b>PCT Program Cut Type (LVC type)</b>	1* 2 3	Cut 50% of maximum power No Cut just LED warning Pulse warning
<b>MAT Motor Acceleration Time Delay</b>	1* 2 3 4 5	0.15 second 0.3sec 0.45sec 0.7sec 1.3 sec
<b>CAR/B Car/Boat mode</b>	1 2	No reverse With reverse (brake preset)
<b>COP Current Overload Protection</b>	1* 2	Protection on Protection off (this option will void warranty)
<b>FREQ Drive Frequency</b>	1* 2	8khz (recommended for most Brushless motors)

	3	18khz (for use with low inductance motors) 32khz (for use with VERY low inductance motors)
<b>SS Soft Start</b>	1 2	Soft start with out governor for use when plugged into throttle channel 12 second delay to 50% of set speed. Soft start with governor mode (see GOV function) Requires use of a spare channel other then the throttle channel
<b>RO Motor Rotation direction</b>	1* 2	Clockwise Counter clock wise
<b>TIM Motor Timing</b>	1* 2 3 4 5 6	Auto Timing 5° 15° 20° 25° 30°
<b>GOV Governor</b>	50 60 70 80 90	50%RPM 60%RPM 70%RPM 80%RPM 90%RPM
<b>SB Motor Start Booster</b>	1 2*	ON OFF
<b>ENTER</b>		Enter value send signal to ESC
<b>OTHER</b>		All other keys are reserved for future programming options

\*Factory Default

## 7.0 Lights and Sounds

Your ESC will emit different lights and sounds according to the function it is applying below is a table of the following conditions:

<b>No Signal from receiver at startup</b>	LED light will flash orange with constant 2 warning tone. If Using program card, the LED will flash red and emit 3 beep tones then you will enter setup mode
<b>Loss of signal during operation</b>	LED will flash red with a 2 beep warning tone
<b>Over temperature during power up (&gt;60°C)</b>	LED will be constant red with 2 beep warning tone. To restart, disconnect power source, wait for cool down then re-connect.
<b>Over heat during operation (&gt;85 °C)</b>	Power reduced to half throttle , red LED will flash. To reset throttle must be put into idle position
<b>Power on low voltage warning</b>	LED will flash red quickly with beep warning tone when voltage is low than the preset cut-off voltage.
<b>Low voltage cut warning</b>	When voltage is lower than preset cut off voltage, red LED will flash rapidly red.
<b>Over Amp Protection</b>	Is only activated at over 50% throttle during over-amp protection, LED will flash red rapidly
<b>Governor Limit Warning</b>	If governor reaches 100% throttle, orange LED light turn on.
<b>Soft start indication</b>	Orange LED light will turn off automatically when soft start has been deactivated.

## 8.0 Trouble Shooting

If you hear a pulsed warning tone and/or see a continuous orange flashing LED after powering up the ESC:

Check your transmitter. Is it on? If yes.

Check that your throttle is at its minimum position. Your esc will not arm if you throttle is anything other then zero at startup

Check the ESC servo connection? Connection good? If yes.

Check the motor connection to the ESC, reconnect them if necessary.

Check your battery. Fully charged? Replace battery if necessary.

Try another receiver.

Disconnect battery and then reconnect battery and start at step 2.0 again

## Connecting your ESC Diagram

