Connecting your ESC Diagram

Battery Pack

A quality connector is essential

Scorpion ESC

Solder or use Connectors

Receiver

Remove or cut the red wire if you need to disable the SBEC

Motor

HK-2213-14

Programming Card DIP Switches

SW-2   SW-4

Aux. Battery Connection

ESC Connection

DIP Switches (DIP...) 1 2 3 4 5 6 7 8 9 10   11 12 13 14 15 16 17 18 19 20
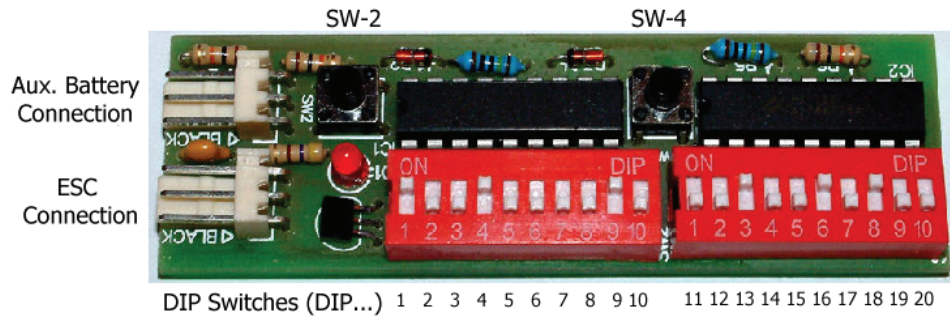
Scorpion
Brushless Controllers
User guide for
Commander 15V LBEC series

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 it's 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.
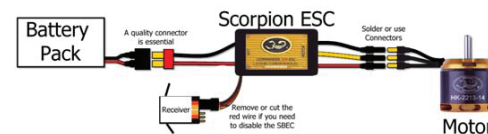
⚠ Never fly over others or near crowds.

Included in the BOX

1 x Scorpion LBEC ESC
1 x Program card
1 x Instruction Manual

Battery Eliminator Circuit (BEC)

The Commander 15V LBEC series feature a Linear BEC that will convert the voltage from your battery pack to 5.0 volts to power your receiver and servos. The Commander LBEC will deliver 4 amps of continuous current. The Linear BEC will operate from 6 to 15 Volts

1.0 Connecting your ESC

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*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

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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 then 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 LBEC features

ALL of the Scorpion 15V LBEC programming features are available though 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

Safe Power up	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.
Loss of signal (fail safe)	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.
Low Voltage Cutoff	You can choose for your ESC to stop or reduce power when the input battery voltage drops to a preset/programmed cutoff voltage.
Current Limiting	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 then 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!!
Thermal Protection	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 and a DI DI DI sound will be played.
Brake	Stops rotation of the motor when the throttle signal is moved to the lowest position.
Electronic timing	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 15V LBEC to the programming card

Your Scorpion LBEC is programmed using Program card included with this ESC.

First you must connect your Program Card to your ESC Ensure the brown wire from your esc is facing outwards (inline with the <BLACK arrow)

Figure 1
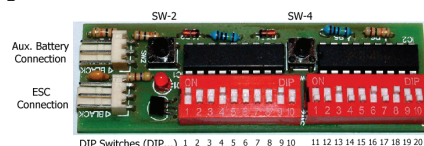
6.0 Using the Programming Card

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

The Scorpion Programming Card is a very simple device that allows you to set a variety of program options into your Speed Controller. To use the programmer, you simply set the DIP switches to the positions indicated in the chart on the next page of these instructions, power up the controller, and push two buttons. Please follow the complete step by step instructions on the next page

to successfully program your Scorpion Brushless Speed Controller

6.1 Plug the Speed Controller signal lead into the ESC connection on the Programming Card, take care to note the proper polarity. The word "Black" is printed on the edge of the connector that corresponds to the black or brown wire of your ESC lead. The ESC connection is the one closest to the 2 DIP switches as shown in Figure 1 above.

6.2 Make sure that there is a motor attached to the output leads of the ESC, and then plug a battery pack into the input leads of the ESC. If you are running your ESC in Opto-Coupled mode, you will need to plug an additional 4-cell receiver pack battery into the Auxiliary Battery Connection shown above in Figure 1. The word "Black" is printed next to the edge of the connector to show the proper polarity for plugging in the auxiliary battery.

6.3 To use the default ESC parameters, set DIP 1 to the ON position and press the SW-2 Button, the default settings will now be set in the ESC. To allow users selected settings set Switch #1 to the OFF position, and set the rest of the DIP switches to the proper positions as shown the next page to obtain the desired settings.

6.4 Once the settings are selected, push the button labeled SW2 for 2 seconds and release. You will hear a tone come from the motor. Next, push the button labeled SW4 for 2 seconds and release. You will hear a second tone come from the motor, and that completes the programming sequence.

Unplug the Programming Card and Auxiliary battery if used, and plug the signal lead from the ESC back into the throttle channel on your receiver noting the proper polarity.

7.0 Switch Position Guide

DIP Switch 1

	DIP1
Factory Default*	ON
User Select Mode	OFF

DIP Switch 2
Battery Type Selection (Default = Li-Po)

	DIP 2
NI-CAD/Ni-MH	Off
Li-Po*	ON

DIP Switch 3 - 6
Cell Count Detection (Default = Auto)

	DIP 3	DIP 4	DIP 5	DIP 6
Auto Detect*	Off	Off	Off	Off
2-Cell Li-Po	On	Off	Off	Off
3-Cell Li-Po	Off	On	Off	Off
4-Cell Li-Po	On	On	Off	Off

DIP Switch 7 & 8
Battery Low Voltage Cutoff (Default = 3.0v/0.85v)

Li-Po/Ni-XX	DIP 7	DIP 8
2.9v/0.80v	Off	Off
3.0v/0.85v*	Off	On
3.1v/0.90v	On	Off
3.2v/0.95v	ON	On

DIP Switch 9
Power Cutoff Type (Default = 50% Reduction)

	DIP 9
Hard Cutoff	Off
50% Power Reduction*	ON

DIP Switch 10
Current Overload Protection (Default = On)

	DIP 10
Protection On*	Off
Protection Off	ON

DIP Switch 11 & 12
Motor Braking Type (Default = Soft Brake)

	DIP 11	DIP 12
No Brake	Off	Off
Soft Brake*	On	Off
Medium Brake	Off	On
Hard Brake	On	On

DIP Switch 13 & 14
Motor Acceleration Time (Default = 0.3 Sec)

	DIP 13	DIP 14
0.15 Second	Off	Off
0.30 Second*	On	Off
0.60 Second	Off	On
1.00 Second	On	On

DIP Switch 15 & 16
PWM Control Frequency (Default = Auto)

	DIP 15	DIP 16
Auto*	Off	Off
8 KHz	On	Off
16 KHz	Off	On
32 Khz	On	On

DIP Switch 17, 18 & 19
Timing Advance (Default = Auto)

	DIP 17	DIP 18	DIP 19
Auto*	Off	Off	Off
5 Degrees	On	Off	Off
15 Degrees	Off	On	Off
25 Degrees	On	On	Off

DIP Switch 20
Motor Direction (Default = Forward)

	DIP 20
Forward*	Off
Reverse	On

Factory Default settings marked with *