

# THE SENSORED / SENSORLESS BRUSHLESS SPEED CONTROLLER FOR THE G.V. BL-CAGE

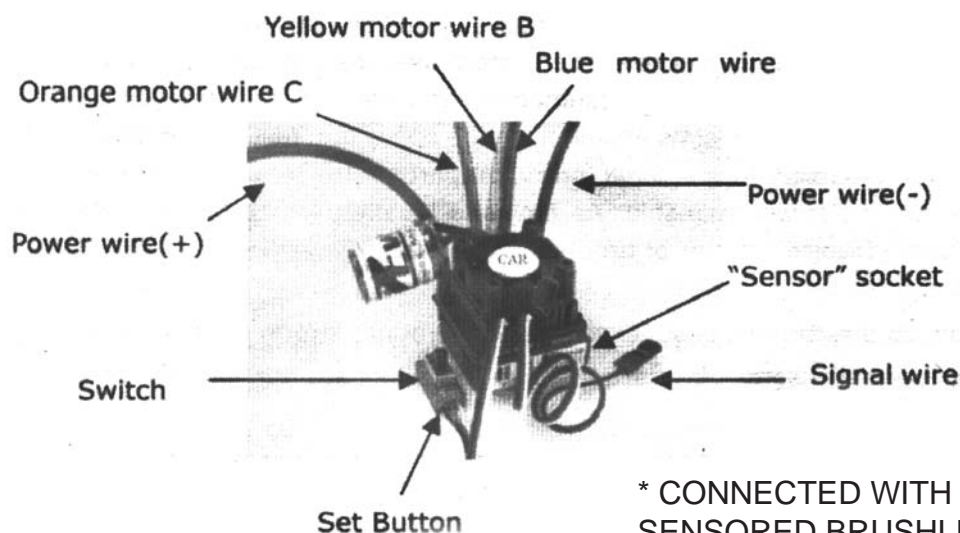
## The Sensored/Sensorless Brushless Speed Control for Cars or Trucks

Thank you for your purchasing this Brushless Electronic Speed Control (ESC). This electronic speed control is specifically designed for operating Sensored/Sensorless brushless motors. High power systems for RC model can be very dangerous and we strongly suggest that you read this manual carefully. We have no control over the correct use, installation, application or maintenance of these products, thus no liability shall be assumed nor accepted for any damages, losses of costs resulting from the use of this item. Any claims arising from the operating, failure or malfunctioning etc. will be denied. We assume no liability for personal injury, property damage or consequential damages resulting from our product or our workmanship. As far as is legally permitted, the obligation for compensation is limited to the invoice amount of product in question.

### Features:

- Enhanced throttle response, excellent acceleration, strong brakes and throttle linearity
- Using advanced software interface to set up or update the software or using programming card to make adjustments.
- Using PC or programming card to program forward or reverse throttle limit
- Using PC to program braking percent
- Multiple protection features: Low voltage cut-off protection, over-heat protection, throttle signal loss protection and motor blocked protection
- Compatible with NOVAK, LRP , ORION sensored brushless motors
- Easily program with only one button

Before using the new ESC please make sure every connection is correct.



When using Sensored Brushless motor, the Blue motor wire A, Yellow motor wire B and Orange motor wire C of the ESC must connect with the Sensored motor wire A,B,C respectively. It is necessary to connect the Sensor wire to the "Sensor" socket on the ESC. Don't change the wires sequence optionally.

**\* Connected with Sensoreless Brushless motor**

When using Sensoreless Brushless motor, the Blue motor wire A , Yellow motor wire B and Orange motor wire C of the ESC can be connected with the motor freely. If the motor runs in the opposite direction, please swap any two wire connections.

**\* Connect the ESC signal wire to the Receiver**

- Black wire   RX-
- Red wire     RX+6.0V
- White wire   RX-Signal

**ESC's indicating LEDs:**

**Conversion of Sensored and Sensorless function**

- \* When Power wires on the ESC are connected with the battery pack, the ESC can automatically identify the motor type (Sensored/Sensorless) via indicated LED.
- \*If the ESC works at the status of Sensored, remove the Sensor wire, the ESC can be automatically change to the status of Sensorless.

<b>Sensored/Sensorless ESC's indicated LED</b>		
Status of the fuction	INDICATED LED	Status of the LED
Low voltage of the battery	Red LED	Blinking

Over-heat of the ESC and motor (95°C)	Orange LED	Blinking
Sensored motor	Red and Orange LED	ON
Sensorless motor	Orange LED	ON
<b>Sensorless ESC's Indicating LED</b>		
Function	Indicating LED	LED Status
Low voltage of the battery	Red LED	Blinking
Over-heat of the ESC and motor (95°C)	Orange LED	Blinking
Sensorless motor	Orange LED	ON

**Throttle Range Calibration (For first time the using transmitter or changing the transmitter you must set Throttle Range Calibration)**

1. Switch off the ESC, then connect ESC with the battery packs and turn on the transmitter; set the direction of the throttle channel to REV; set the EPA/ATV value of the throttle channel to 100%.
2. Hold the Set button and switch on the ESC, wait for about 4 seconds until the Orange LED is on solid, then release the Set button, pull the throttle trigger to full throttle until Red LED is on Solid, the motor beeps.
3. Push the throttle trigger to Full Brake until the Orange LED blinks and will be on solid, the motor beeps.
4. Now return the throttle trigger to the Neutral position, both of the Red LED and Orange LED blink simultaneity and will be on solid, the motor beeps, both of Red LED and Orange LED wink, the Throttle

Range Calibration is confirmed.

5. Turn off the ESC power switch.

6. Turn the ESC back ON; you are now ready to use the ESC.

**Programmable items and default**

programmable items	Programmable Value								
	1	2	3	4	5	6	7	8	9
Low voltage cutoff Threshold	2.6V/cell	2.8V/cell	3.0V/cell	3.2V/cell	3.4V/cell	No protection			
Running Mode	Forward w/o reverse	Forward with pause then Reverse							
Motor timing	2	4	6	8	12				
Initial Acceleration	low	Medium	High	Very high					
Reverse throttle limit	20%	30%	40%	50%	60%	70%	80%	90%	100%
Throttle limit	0%	-20%	30%	40%	50%	60%	70%	80%	90%
Braking percent	10%	20%	30%	40%	50%	60%	70%	80%	100%
Percent Drag Brake	4%	8%	12%	15%	20%	25%	30%		

ESC operating	8KHz	16KHz							
Neutral range	2%	3%	4%	5%	6%				

**Sensored/Sensorless brushless ESC general information**

**1. Low Voltage Cutoff Threshold**

● **Automatically detect the number of the cells**

According to the type of your batteries, set up the type of the batteries and Low Voltage Cutoff Threshold via PC software or program card. The ESC can detect the Voltage of the battery anytime and will stop working once the Voltage of the battery is lower than the preset Low Voltage Cutoff Threshold.

- When using **NiMH or NiCd batteries** you do not need to set a cutoff voltage to protect the batteries. If you are using more than 6-cell NiMH or NiCd batteries, you must adjust the cutoff voltage, for example if you are using an 8-cell pack of NiMH batteries you would use a cutoff of 5.6V volts (8 x 0.7V = 5.6V). When the voltage of the batteries packs is within 9-12V, the ESC will automatically identify 3S LiPos. When the voltage of the batteries packs is less than 9V, the ESC will automatically identify 2S LiPos.

- **Customize Voltage Cutoff** (for NiMH or NiCd Batteries) you can select a starting cutoff voltage of 4, 5, 6, 9 or 12 volts. Then using the up/down to the right of the voltage you can increase the voltage stepping up 0.1V between the selectable settings.

\* When using any **Lithium or M1 (A123) batteries**, they must not be discharged to less than 3.0V per cell.

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### 2. Running Mode

#### ● Forward with pause then Reverse: (DEFAULT)

General bashing around (FUN) or racing if reverse is allowed for the event. The Electronic Speed Control requires 2 seconds of continuous neutral from the transmitter prior to allowing reverse to operate.

#### ● Forward w/o Reverse

This is a Race setting - Reverse is disabled.

- **Brake / Reverse** - This is only to determine if reverse is to be enabled or not.

You will find in racing, most tracks will not allow racing with reverse enabled.

**Note: There is automatic protection within this ESC. Only after you have stopped and returned the trigger to neutral will reverse become available. If while traveling in reverse, pull the trigger to go forward. This is to help prevent serious damage to the drive train.**

#### ESC - reverse operation

Should you get into a situation that requires reverse, after you have applied any brakes you may have needed, return the throttle trigger to the neutral position. Wait a moment or two and then push the trigger forward for reverse.

**3. Motor Timing** - This option affects the power band and efficiency (run time) of an electric motor. The default is "Normal" and is a good starting point to deliver power and provide good run time.

- 2° Provides maximum efficiency with less power. Higher timing produces significantly more power but at the expense of efficiency (less run time) and typically the motor will generate more heat. Each brushless motor will respond to timing differently. Good for running around on paved, or harder surfaces, and racing with high KV rated or low-turn motors

- **4°** Provides power for running through soft surfaces, having fun and longer run time.
- **6° (Default)** Good mix of power and efficiency using any motor
- **8°** More power than efficiency so run time will reduce, and you should be monitoring motor heat. The higher KV or lower turn motors will generate heat quickly using this setting. A safe high temperature range is 165F to 180F (74° - 82° Celsius), going higher may damage your motor.
- **12°** This is maximum power and must be used with **caution**.

**Note** : Any motor has the potential to over-heat in this setting. Frequently check the motor temperature and make sure you're not operating higher than 165° and 180° Fahrenheit (74° - 82° Celsius), which may damage your motor, or damage your Electronic Speed Control (ESC).

**4. Initial Acceleration** - Use this to limit the initial power that is sent to the motor when starting from a complete stop.

Using the low option, the vehicle will launch very slowly and provide the longest run times. When using the HIGH choice, you will have wheel-spinning acceleration at the cost of run time. This is also very tough on the batteries as the amperage draw can be very high. If your vehicle cuts out, hesitates or loses radio control, you should consider setting this at a lower value.

- **Low** Using this option will provide longer run times and is easiest on the batteries. It is a good choice for beginners.
- **Medium** Medium requires more from your batteries, and is good for low traction surfaces.
- **High** This option will provide full acceleration and requires stout batteries to supply the load required in this setting.
- **Very high** This option will provide full acceleration and requires stout batteries to supply the load required in this setting.

**5. Reverse Throttle Limit** - Use this to limit the power available using reverse throttle. The lower the percent or level the less speed will be available in reverse.

20%, 30%, 40%, 50% (Default), 60%, 70%, 80%, 90%, 100%

**6. Throttle Limit** - Use this to limit the power available using forward throttle.

The lower the percent the less forward throttle speed will be available.

0% (Default), 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%

**7. Braking Percent** - Gives you the ability to have full control over the amount of brake your vehicle will have.

10%,20%,30%,40%,50%(Default),60%,70%,80%,100%

**8. Percent Drag Brake** - 4% (Default), 8%, 12%, 15%, 20%, 25%, 30%

The drag brake function provides the driver a set percentage of brake when you have the transmitter resting in neutral. This will create the "feel" of a brushed motor.

Drag brake are used in racing to slow a vehicle as you let off approaching a corner versus the driver having to push the brake at every corner.

Try working with this to get a sense of how you might use this for your track.

If you are running on a high traction track with tight corners, a stronger setting should work best.

If you are running in an open area, you will find a smaller percentage will result in better control.

If you are running in dusty or slippery surfaces, you will more than likely want to use the lowest option.

**9. ESC Operating**

8KHz (default) 16KHz

**10. Neutral Deadband** - This setting adjusts the amount of "Deadband" off neutral on the throttle

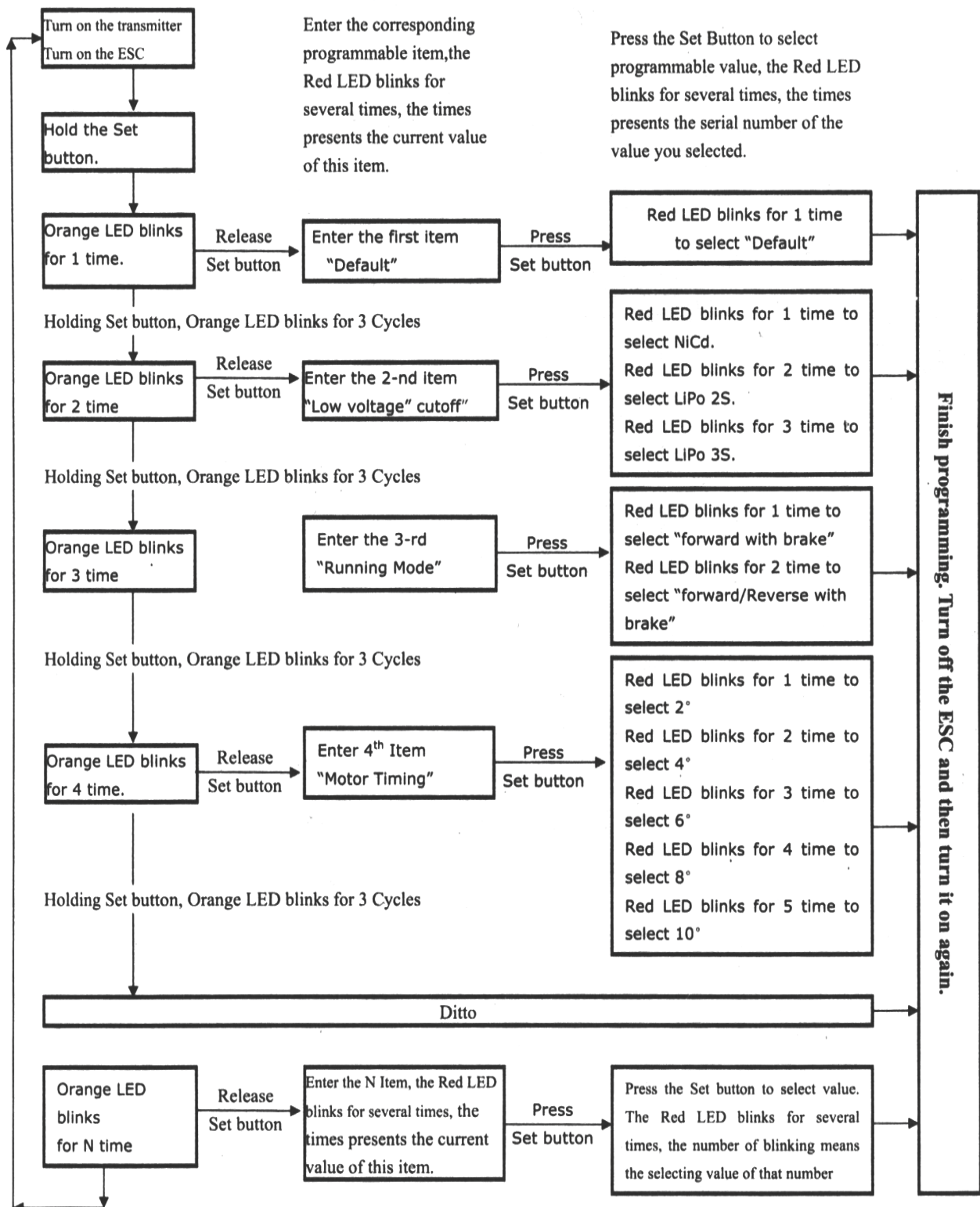
trigger. This is in Milli-Seconds (MS) and is the amount of neutral when you pull the trigger.

The smaller the value the less "Deadband" or movement is required off-center for the ESC to begin throttle functions.

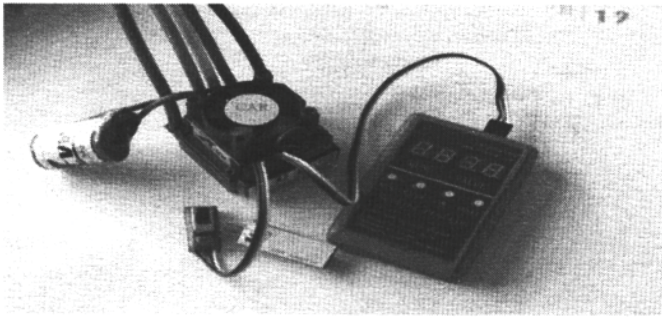
Using a higher value for this setting will provide a wider Deadband.

- 2%
- 3%
- 4% (Default)
- 5%
- 6%

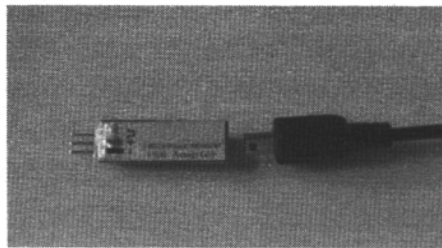
**Program method (For Sensoreless ESC without PC software)**



## Modifying the ACTIVE profile



The Program Card is used to make all adjustments to the active profile in your ESC. Any active profile can be modified by PC software. Connect the USB cable to your PC or Laptop computer.



1. Insert CD-ROM to your PC or Laptop computer.
2. Plug the USB Adapter into your PC or laptop computer.
3. Connect the USB Adapter to the mini USB connector on the USB Cable

You will be prompted to install the device drivers, they are both unsigned to select OK and continue. After a few moments, the USB adapter LED will turn from Red to Blue.

If your Adapter LED remains Red, then disconnect the Adapter, wait a minute and then reconnect. If the Blue LED does not come on, please reboot.

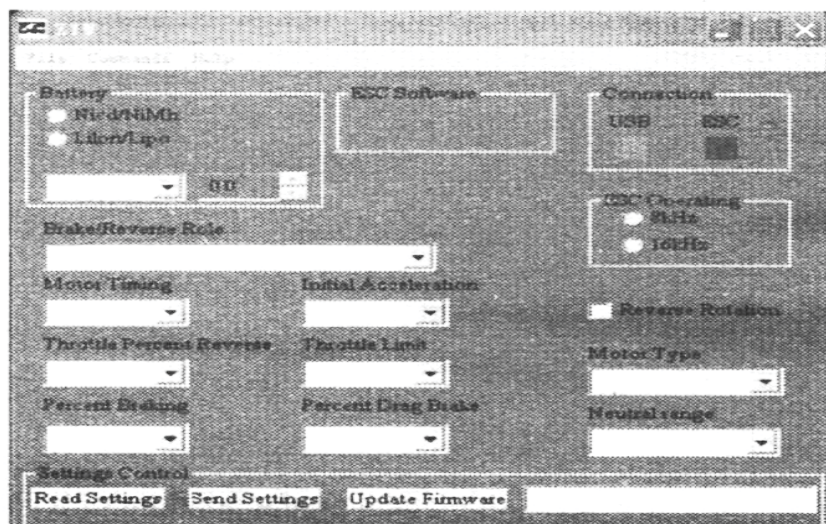
You will be prompted to install the device drivers, they are both unsigned to select OK and continue. After a few moments, the USB adapter LED will turn from Red to Blue.

If your Adapter LED remains Red, then disconnect the Adapter, wait a minute and then reconnect. If the Blue LED does not come on, please reboot.

**Note:** If working with Windows 2000, you will be required to reboot before the USB Adaptor gets connected and the small LED on the adapter turns from Red to Blue.

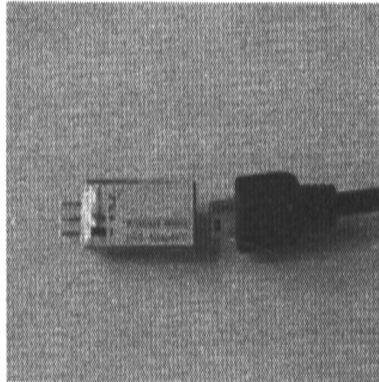
•With the USB Adapter LED now Blue, you are ready to start the Software. Locate and select the icon on your desktop.

Notice in the Connection box the USB is Green and the ESC is still Red.

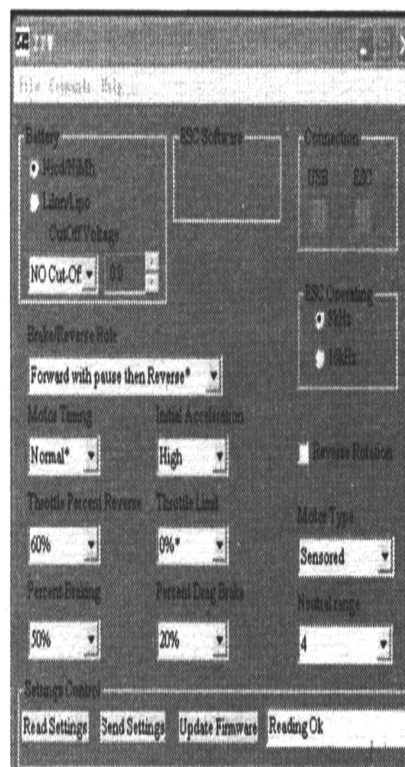


● You are ready to connect the Adapter to the ESC, using the Signal Wire.

Please note the label on the USB Adaptor, there are 3 color bars each marked and indicating how to connect the Receiver wire to the adapter.



● With the ESC connected to the USB Adapter, the Software Connection status icons should now both be GREEN.



The software is now installed and ready for use.

Please refer to the section (above) for a general overview and field specific help.



Take a moment to review the selectable functions, and read the specific help text for each to become familiar with them. To make configuration changes to a function select the setting you want, and from the drop down menu select your new choice or option. When you are satisfied and finished with this configuration, click the "Send Settings" button located on the bottom (off center) of each tabbed page.

**Connection:** This section is displayed on every Tab. There are two icons; one for the USB connection, the other indicates the Electronic Speed Control connection. They are RED in color when disconnected and GREEN on connection.

**Note:** Without an understanding of a specific function and reason, it is not recommended that you make changes to the "default" configuration. There have been defaults selected as a direct result of our testing, which was used to establish these settings. Changing of the configuration will be at your own risk.

**Read Settings:** Use of this button will read the current Electronic Speed Control (ESC) configuration and present it on the current tabbed page only.

**Send Setting:** Use of this button will send (write) the current selected configuration to the ESC for the current tabbed page only.

**Upgrade Firmware:** Use of this button will begin the firmware upgrade process. The following pop up will be displayed, and you need to select the location of the firmware update file. You may cancel this process here without any effect to the ESC firmware.

After finding and selecting the file, this confirmation screen will then display. You may still cancel at this time without any effect to the ESC firmware.

If you select OK, the progress status percentage of the upgrade will be displayed in the lower right. Please do not unplug your computer or the ESC while the upgrade is in progress or damage to the ESC may result.

If no problems were encountered, OK will be displayed and the configuration redisplayed. You are finished with the upgrade and you can re-configure the ESC or end the program.

If a problem is encountered and the upgrade fails, simply restart the upgrade process again. If there should be another failed upgrade, then end all other programs on your computer and possibly re-download the file from the website : [www.ztwoem.com](http://www.ztwoem.com)

### Using Program card

1. The Program card with LED display is easy to use and convenient to carry. All of the programmable functions are shown on the program card.
2. Turn on the ESC. Remove the Signal wire and plug it into the top-socket on the Program card, wait for 2 seconds until the LED is ON.  
The first programmable function will be shown, if an error occurs, please reconnect them.
3. If ESC is not connected with the batteries, the Program card should be connected with other power supply, the range of power supply is within 5.0-6.3V.
4. Press the button "Menu" on the Program card and circularly select each programmable function. At that time the number of the programmable function will be displayed on the left of the LED, the current value will be displayed on the right. Then press the button Value to change the value and press the button OK to confirm. At the same time the Red indicating LEDs of both program card and the ESC blink. Turn off the ESC; the modified settings will be saved in the ESC's memory.
5. Press the button Reset to restore the default settings.