# PHOENIX
## BRUSHLESS CONTROLLERS

### PHOENIX · PHOENIX ICE LITE
### PHOENIX ICE · PHOENIX ICE2 HV
### PHOENIX HV

USER GUIDE FOR ALL MODELS OF
PHOENIX™ BRUSHLESS ESCS

## castle

## SAFETY FIRST!

⚠ Castle Creations is 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.

⚠ For use by adults only.

⚠ 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.

⚠ Please observe all local laws regarding the flying of remote control aircraft.

⚠ Never fly over others or near crowds.

This product may contain chemicals known to the State of California to cause cancer and or birth defects or other reproductive harm. Do not eat this controller, it doesn't taste good.

## BATTERY ELIMINATOR CIRCUIT

### PHOENIX SERIES (does not include Ice or HV models)
You must disable the onboard BEC when using greater than a 3s LiPo on Phoenix ESCs.*

### PHOENIX ICE AND PHOENIX ICE LITE
Phoenix Ice and Ice Lite onboard BECs can be run to the maxiumum rated voltage of the ESC. The maximum voltage for the Phoenix Ice is 34V (8s) and the Phoenix Ice Lite is 25V (6s). Helicopters with blades larger than 425mm will need to use an external BEC*. For more details visit www.castlecreations.com/helisetups.

*Note: If you use a receiver battery pack or any form of an external BEC, you MUST disconnect the RED WIRE on the throttle cable for Phoenix, Phoenix Ice and Phoenix Ice Lite. This does NOT include the Phoenix HV or Phoenix Ice2 HV.

### PHOENIX ICE2 HV AND PHOENIX HV
Phoenix HV and Phoenix Ice2 HV controllers do not have an integrated BEC. You must use an external battery or BEC to power your receiver and servos. You should NEVER disconnect the red throttle wire on the Phoenix HV or Phoenix Ice2 HV ESCs.

## HOW TO CONNECT YOUR PHOENIX

### 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.

### 2. Connect the Motor to your ESC
Cut the three (red, white & black) motor wires coming off the ESC to the length you require. Solder the corresponding connectors for your motor to the wires coming from the ESC, or solder the motor wires directly to the motor leads on the ESC. 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.

### 3. Connect the ESC 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 ESC will supply power to the receiver and servos through the receiver connector.

⚠ Phoenix HV and Phoenix Ice2 HV (High Voltage) controllers require the use of a separate BEC or receiver pack to power your receiver and servos. Phoenix HV Controllers DO NOT have an onboard BEC.

⚠ NOTE TO USERS WITH A FUTABA TRANSMITTER: You must reverse the throttle channel signal on your transmitter. Please refer to your Futaba instructions.

## 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 Castle Link USB interface to change the rotation direction.

## 5. Mounting the ESC

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.

## USING YOUR PHOENIX

⚠️ *You must follow this initialization sequence before the motor will operate.*

1. Ensure that the Phoenix is connected to the proper channel on your receiver.
2. Turn your transmitter ON and set the throttle stick to mid throttle.
3. Connect the main power battery to the speed controller. The speed controller will remain disarmed and will not operate the motor until it sees zero throttle.
4. When you are ready to fly, move the throttle stick to the lowest position on your transmitter.

The Phoenix will beep the motor to indicate that it is armed. The Phoenix will not provide any power to the motor, regardless of where the throttle stick on your transmitter is positioned when first powered up. You must move the throttle stick to its lowest position to arm and use the Phoenix.

⚠️ *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.*

⚠️ *Always perform a range check at full, half, and zero throttle before flying with any new speed controller! For helicopters, range check with the blades off the helicopter at full, half, and zero throttle.*

### Notes on the Features of Your Phoenix

Standard Features are always employed by the Phoenix.

| LED | The LED is used for programming the features on the Phoenix. Once armed, the LED also provides an indication that the controller has reached full throttle by lighting continuously. |
|---|---|
| Loss of Signal | The Phoenix will stop the motor as a safety feature when the throttle signal is lost or corrupt. Moving the throttle to the brake position for two seconds may be required to rearm the motor. |

| Safe Power Up | To arm the controller, the throttle must be held in the "Brake" position (all the way down). *Until the controller is armed, it will not provide any power to the motor regardless of where the throttle stick on your transmitter is positioned when first powered up.* |
|---|---|

Programmable Options can be changed at the discretion of the user. The Phoenix comes with default or factory settings on these options which are the best for most applications. You may change these settings using your transmitter and receiver or with the Castle Link, which is sold separately. There are more programmable options available with the Castle Link, these extra settings are not easily made using the YES/NO abilities of the stick programming mode.

| Low Voltage Cutoff | ESC optionally stops or ramps down the motor power when the input battery voltage drops to the programmed cutoff voltage. |
|---|---|
| Current Limiting | ESC optionally detects an over-current and shuts down to protect it's circuitry. |
| Brake | Stops rotation of the motor when the throttle signal is moved to the lowest position. |
| Throttle | Allows user to choose between the Phoenix automatically calibrating the throttle endpoints every time it is powered up, using preset throttle endpoint settings, or using one of a number of helicopter specific settings. |
| Electronic Timing Advance | A setting that may improve the efficiency of the system for some motors. The standard Phoenix setting is to automatically detect and adjust for the motor it is driving. |
| Low Voltage Cutoff Type | Select the method of cutoff employed by the Phoenix when the low voltage set in #1 is reached. Options are Hard Cutoff and Soft Cutoff. |

## TROUBLESHOOTING

**Problem:** *The BEC (receiver and servos) works, but the motor does not respond to throttle.*

**Solution:** The controller may not be seeing a low enough throttle signal to arm. Increase the low side throttle endpoint in your transmitter until you hear the ESC arm. If you do not have a computer transmitter, bring the throttle stick and throttle trim all the way down to arm the ESC. If using a Futaba transmitter, verify the throttle channel is reversed.

**Problem:** *When I throttle all the way up, the controller "cuts off", even with fully charged batteries.*

**Solution:** The controller will automatically shut or ramp down the motor (depending on which cutoff type is selected) if the battery voltage falls below the cutoff voltage. Your controller will repeatedly blink the LED with 2 flashes. If the cutoff occurs with freshly charged batteries, it means that the voltage has dropped very quickly. This is usually an indication of a power system that is drawing too much current for the batteries to handle. Try using a smaller prop on the motor or use a pack with a higher mAh capacity.

---

**Problem:** *The LED comes on when I go to full throttle.*

**Solution:** This is normal. The LED comes on when full throttle has been reached. If the unit is in Auto-Calibrating Throttle mode (program setting 4-1) then you may see full throttle LED indication before the stick is in the full up position. Simply continue moving the stick to full up. The controller will detect the high stick travel and adjust full throttle accordingly.

---

**Problem:** *Nothing is working – receiver, servos, and motor are all dead.*

**Solution:** Check all connections to ensure that the polarity (+/-) of the connections are correct (especially the receiver plug polarity). If everything is correctly connected, contact the dealer where you purchased your Phoenix ESC or contact Castle Creations directly.

### Error Codes:

The following error codes are only applicable to controllers running version 1.55 or made after December 15, 2006. The controller will alert you to errors by blinking the LED and beeping the motor.  Please count the error code beeps or flashes and use the following chart to determine the issue.

| | |
|---|---|
| **1 beep and flash** | **Start failure:** The motor was jammed or locked. |
| **2 beeps and flashes** | **Low Voltage Cutoff:** Your batteries are likely discharged. Check that batteries are fully charged and that Phoenix detects the proper number of cells at power-up. |
| **3 beeps and flashes** | **Over-Current:** Current draw exceeded the safe capacity of the controller. Reduce current draw by changing to a smaller propeller, different gear combination, or fewer cells. |
| **4 beeps and flashes** | **Motor Anomaly:** Controller encountered abnormal motor behavior such as a prop strike or other physical interference. May also indicate lost synchronization or magnetic overload within the motor. |
| **5 beeps and flashes** | **Radio Signal:** Signal from receiver is corrupt or non-existent. Check transmitter and receiver. |

<div align="center">(continued in next column)</div>

| | |
|---|---|
| **6 beeps and flashes** | Over temperature |

### Beep Codes/Conditions

All Castle ESCs will sound a single beep every 20 seconds to remind the user that the controller is connected to a battery and drawing power. Leaving a controller connected to a battery for extended periods will likely damage the battery.

### Red LED
- Blinks out cell-counts /error codes
- Flashes a little at low throttle
- Flashes a lot at high throttle
- Solid on at full-throttle
- Pulses quickly when governor-mode is locked

### Yellow LED - used for Data Logging (Phoenix Ice, Phoenix Ice Lite and Phoenix Ice2 HV only)
- Yellow LED flashes when logging, and is on continuously when log is full.

### Green LED - not currently used - reserved

**Look for more troubleshooting tips on the Castle Creations website at: www.castlecreations.com/support**

## CONTACT & WARRANTY INFO

Your Phoenix ESC is warranted for one year from date of purchase to be free from manufacturing and component defects. This warranty does not cover abuse, neglect, or damage due to incorrect wiring, over voltage, or overloading. If you have any questions, comments, or wish to return your Phoenix ESC for warranty or non-warranty repair or replacement, contact Castle Creations, Inc. at:

<div align="center">

Phone: (913) 390-6939
Fax: (913) 390-6164
540 North Rogers Road
Olathe, Kansas 66062 USA
www.castlecreations.com

</div>

## NON-WARRANTY REPAIRS

***Never throw away a damaged Phoenix!*** You may send it to Castle and take advantage of our flat price replacement offer. Please check our website for specific pricing.

## PROGRAMMING PHOENIX AND PHOENIX HV ESCS

Phoenix Series controllers offer users the option of changing programmable settings. You do not need to program anything to make the controller work. Programming is only necessary if you wish to change the default settings or if you wish to use advanced features such as helicopter modes.

If you need to change settings, we highly recommend using the Castle Link (sold separately). It is easier and allows you to modify many more settings than the "stick" programming procedure described below. ***Please note that there are***

*many features that may only be accessed via Castle Link.*

## Connecting Phoenix and Phoenix Ice Series to Castle Link

The Phoenix line is capable of drawing power for Castle Link operation from the USB port and does not require an external power source.

## Connecting Phoenix HV and Phoenix Ice2 HV to Castle Link

You must power the Phoenix HV using a battery pack on the battery leads in order to power the onboard processor for Castle Link operation. This is necessary because the throttle lead/Castle Link serial wire is optically isolated from the controller and cannot provide power from the USB port to the controller. Any pack of 4s or larger will be sufficient for this purpose. You **must** plug the HV controller into the Castle Link **before** you plug in your battery pack. The ESC will not link if connected out of order.

## Manually Changing Programmable Settings

The Phoenix ESC software is designed to make it difficult to accidentally enter programming mode. Once in programming mode, the Phoenix ESC "asks" questions by beeping and flashing the setting number, followed by the number for each of the setting values. You must answer "yes" or "no" by moving the throttle stick on your transmitter to each of the



setting values as the Phoenix ESC presents them. The values are always presented in sequence, and do **NOT** "tell you" what any of the settings are currently programmed for.

The current setting and setting value are "flashed" out by the LED. (For example if you are on setting #3 and value #2, there will be 3 beeps/flashes, then 2 beeps/flashes repeating until you answer). Answering "no" to a setting value will cause the Phoenix ESC to ask for the next value in sequence. Answering "yes" to a setting value will store that setting in the permanent memory, and skip to the next setting.

⚠ **NOTE: If you answer "no" to all values for a particular setting, the ESC will keep whatever value had been previously programmed. Only by answering "yes" to a value will the Phoenix ESC store/change any value.**

You will need to move the transmitter stick to the "yes" (full throttle) position or the "no" (zero throttle) position to answer the question. When the Phoenix ESC has accepted your answer, it will flash the LED rapidly, and emit a constant beeping. Move the throttle stick back to the middle position for the next question.



After you have verified that the controller works properly, follow the steps below to change settings.

If you wish to re-program only some of the features you do not need to continue through the programming steps for the remaining settings. Once you have programmed each of the features you wish to change and the Phoenix ESC has confirmed the selection, instead of returning to mid-throttle for the next question, disconnect battery power, re-connect power, and arm the speed control as normal.

## Clearing the Phoenix Ice and Ice2 HV data log

Power your controller up with your TX & RX on and set to full throttle. The controller will chime the normal power up chimes. Leave your TX at full throttle for 6 seconds after power up. The controller will emit a short tone after 1 second and then a long tone 5 seconds later. The controller will then erase the data log. You must then move the throttle stick to lowest power to arm the controller.

## 1. Enter Programming Mode

**1A.** The Phoenix controller must be connected to a motor in order for you to hear the programming beeps. Turn your transmitter on, and leave the Phoenix ESC **unpowered**. Move the transmitter stick to the top position (full throttle).

**1B.** Connect battery power to the Phoenix ESC. The Phoenix ESC will beep its initialization tones when first plugged in. After a short period of time the Phoenix ESC will emit another short tone and the LED on the Phoenix ESC should flash a short, single flash that repeats. If the ESC flashes continuously it is not seeing a full throttle position. Move your throttle trim to the top position or increase your full throttle endpoint or ATV on your transmitter.

**1C.** Move your transmitter stick to the middle position. The Phoenix ESC will emit another short tone, and the LED on the Phoenix ESC should flash a short, double flash that repeats.

**1D.** Move your transmitter stick back to the top position again. After a short time, the Phoenix ESC will emit a short tone, and the LED on the Phoenix ESC should flash a short, triple flash that repeats.

**1E.** Move your transmitter stick back to the middle position again. The Phoenix ESC will emit four short tones in a row, and the LED on the Phoenix ESC will start a repetitive flash sequence of a single flash followed by a long pause.

The Phoenix ESC is now in programming mode and asking you the first question.

## 2. Enter your Settings

⚠ **NOTE: When setting LiPo cutoff voltage, always follow your battery brand recommendations.**

## Setting 1A: Cutoff Voltage - Phoenix/Phoenix Ice

| Option | | Recommended Use |
|---|---|---|
| 1 | Auto-LiPo* | Automatically detects LiPo cell count, and sets 3.2v/cell cutoff voltage. Safe for use with any LiPo packs, but **DO NOT** use with NiMH/NiCad packs. The Phoenix ESC will beep the number of cells it's detected immediately after the initialization tones, and before the arming tones. **This is the FACTORY setting.** |
| 2 | 4.0V Cutoff | 5 cell NiCad or NiMH packs only. |
| 3 | 5.0V Cutoff | 5-8 cell NiCad or NiMH packs only. |
| 4 | 6.0V Cutoff | 5-10 cell NiCad or NiMH packs, or safe for 2 cell only LiPo packs. |
| 5 | 9.0V Cutoff | 5-16 cell NiCad, 5-16 cell NiMH, or safe for 3 cell only LiPo packs **(BEC MUST be disabled for MORE than 10 NiMH/NiCad cells).** |
| 6 | 12.0V Cutoff | Up to 16* cell NiMH or NiCad packs, or safe for 4 cell LiPo packs **(BEC MUST be disabled for MORE than 10 NiMH/NiCad cells, or 3s LiPo).** *up to 20 cells with PHX 60/80/125* |

## Setting 1B: Cutoff Voltage - Phoenix HV/Phoenix Ice2 HV

| Option | | Recommended Use |
|---|---|---|
| 1 | Auto-LiPo* | Automatically detects LiPo cell count, and sets 3.2v/cell cutoff voltage. Safe for use with any LiPo packs, but **DO NOT** use with NiMH/NiCad packs. The Phoenix ESC will beep the number of cells it's detected immediately after the initialization tones, and before the arming tones. **This is the FACTORY setting.** |
| 2 | 12V Cutoff | 4s LiPo packs |
| 3 | 18V Cutoff | 6s LiPo packs |
| 4 | 24V Cutoff | 8s LiPo packs |
| 5 | 30V Cutoff | 10s LiPo packs |
| 6 | 36V Cutoff | 12s LiPo packs |

⚠️ **NOTE: 3.2v per cell is the lowest cutoff that should be used for LiPo packs. Some cell manufacturers may recommend higher voltages. Please use the cutoff recommended for your cells.**

## Setting 2: Current Limiting

⚠️ **NOTE: Change this setting at your own risk! Damage to the controller as a result of over-current is NOT covered by the manufacturer's warranty.** Only experienced modelers should use this programming feature. Current limiting describes the reaction of the Phoenix ESC when an over-current condition is detected.

| Option | | Recommended Use |
|---|---|---|
| 1 | Very Sensitive | Will rapidly shut down when over current is detected. |
| 2 | Sensitive | |
| 3 | Normal* | Moderate over-current threshold, will shut down after a slight delay. Recommended for all systems except for helicopters and high power LMR applications. **This is the FACTORY setting.** |

| | | |
|---|---|---|
| 4 | Insensitive | **Recommended setting for all helicopters and LMR applications (covered under warranty). |
| 5 | Disabled | ***Use at your own risk!*** |

## Setting 3: Brake Type

Soft brake provides 50% of full braking power; hard brake is 100% braking power.

| Option | | Recommended Use |
|---|---|---|
| 1 | Soft Delayed Brake* | General aircraft use, with fixed or folding prop. **This is the FACTORY setting for Phoenix and Phoenix HV controllers.** |
| 2 | Hard Delayed Brake | Direct drive applications where more braking power is required. |
| 3 | Soft Brake – No Delay | Competition use where a very short brake delay is required. |
| 4 | Hard Brake – No Delay | Competition use where a very short brake delay is required. Brake action may be very abrupt. **Be very cautious with high-powered setups.** |
| 5 | Brake Disabled* | Helicopters, 3D airplanes, and by choice, on most aerobatic airplanes. **This is the FACTORY setting for Phoenix Ice controllers only.** |

## Setting 4 – Throttle Type

| Option | | Recommended Use |
|---|---|---|
| 1 | Auto Calibrating Throttle* | Any fixed wing aircraft, but NOT for use with helicopters. When using Auto Calibrating Throttle, you must throttle up to full throttle for four seconds and back to the off position each time you power up and fly your airplane. This will set the automatic throttle endpoints within the controller. **This is the FACTORY setting.** |
| 2 | Fixed Throttle | Any fixed wing aircraft, fixed pitch helicopters, and collective pitch helicopters using a manually created and tuned pitch and throttle curve on your transmitter. This mode uses normally accepted TX throttle endpoints; some TX throttle signals are outside these values. Use auto calibrating throttle for those setups. |

**THE FOLLOWING ARE FOR HELICOPTER APPLICATIONS ONLY**
*We highly recommend programming your ESC using the Castle Link USB Programming Kit to gain access to advanced helicopter settings that are not accessible with throttle programming.*

| | | |
|---|---|---|
| 3 | Governor Mode LOW | For collective pitch helicopters only: Governor mode acts as an RPM control, rather than a throttle control. Throttle stick position (or throttle curve %) determines the RPM that the motor will run and the controller will attempt to hold that RPM regardless of how the load (collective) changes. This is useful in a collective pitch helicopter where a constant head speed is desirable. The low RPM range has finer RPM control at lower RPMs. The low RPM range is useful for low pole count motors (Hacker, Feigao, HiMax, etc.) and low RPMs on higher pole count motors. **Brake is ALWAYS disabled in Governor Mode.** |
| 4 | Governor Mode HIGH | Same operation as Low Governor, but allows for higher head speeds if the desired head speed cannot be reached in Low Governor. RPM range has finer RPM control at higher RPMs. The high RPM range is useful for higher pole count motors (Aveox, Astro, Mega, Neu, and all outrunners) and higher RPMs. **Brake is ALWAYS disabled in Governor Mode.** |

## Setting 5: Electronic Timing Advance

Electronic timing advance may be used to fine tune either a bit more power or a bit more efficiency out of an electric power system.

| Option | | Recommended Use |
|---|---|---|
| 1 | High Advance | May give an increase in RPM and current draw at the expense of runtime and a hotter motor and batteries. |
| 2 | Standard Advance* | Almost always the best balance of power and efficiency for any motor. **This is the FACTORY setting.** |
| 3 | Low Advance | May slightly decrease RPM and current draw, and will give longer runtime and a cooler motor and batteries. This is the preferred setting for outrunner motors. |

## Setting 6: Low Voltage Cutoff Type

| Option | | Recommended Use |
|---|---|---|
| 1 | Hard Cutoff* | Will shut the motor off when the programmed cutoff voltage is reached. The motor may be restarted by lowering the throttle to the brake position, and re-arming. For gliders and some parkflyers where a "motor off" situation does not put the model in danger. **This is the FACTORY setting.** |
| 2 | Soft Cutoff | Instead of turning the motor off, the Phoenix ESC ramps down the throttle to safely maintain the battery voltage at the programmed cutoff level. Very useful for 3D flying, indoor flying, all helicopters, and most any sport flying where you do not want the motor to turn off when the low voltage cutoff is reached. |

## Setting 7: Soft Start

| Option | | Recommended Use |
|---|---|---|
| 1 | Very Soft Start | Governor mode: slowest spool up, and softest start. Other throttle types: softest start, most throttle change dampening. |
| 2 | Soft Start* | Governor mode: soft start, medium spool up. Other Throttle types: soft start, slight throttle change dampening. **This is the FACTORY setting.** |
| 3 | Fast Start | Governor mode: faster start, fast spool up. Best on manually optimized pitch and throttle curves with fixed throttle type. Other throttle types: fast start, least throttle change dampening. |

## Setting 8: PWM Switching Rate

⚠️ *Note: The following settings apply only to the Phoenix-35 and above.*

| Option | | Recommended Use |
|---|---|---|
| 1 | 12 kHz | Recommended for most brushless motors. |
| 2 | 16 kHz | Recommended for low inductance motors. RARE. Suggested for Kontronik Tango motors. |
| 3 | 24 kHz | Recommended for very low inductance motors. |
| 4 | Outrunner Mode | Recommended for all outrunner motors. |

### *PHOENIX ESC REQUIRES NO PROGRAMMING!*

If you choose, you may simply connect the wires to your components and go fly.

The following standard settings will work for most applications.

#### STANDARD SETTINGS:

★ Auto-LiPo cell detection with soft cutoff when cells reach discharged state

★ Throttle Range is self-adjusting

★ Auto motor cutoff when radio signal is lost or radio interference becomes severe

The **Castle Link USB programming kit** (sold separately) gives you access to many advanced programming options, such as incredible helicopter governor modes, control line governor settings, motor timing, audible alert tones, as well as incredible data logging capabilities for the Phoenix Ice. Please visit castlecreations.com to download the latest software!

### Designed in Kansas
Components manufactured in the USA, Mexico, and China.