PHOENIX HV 85

BRUSHLESS CONTROLLER

BY CASTLE CREATIONS

85 AMP HIGH VOLTAGE BRUSHLESS SENSORLESS SPEED CONTROL

WARNING! High power motor systems can be very dangerous! High currents can heat wires and batteries, causing fires and burning skin. Follow the wiring directions carefully! Model aircraft equipped with high power motors can kill. Always fly at a sanctioned field. Never fly over or near spectators. Even though this controller is equipped with a safety arming program, you should still use caution when connecting the main battery.

1.0 FEATURES OF THE PHOENIX HV-85™:

- Extremely Low Resistance (.0015 ohms)
- High rate adjustable switching (PWM)
- Up to 85 Amps continuous current
- Dual Opto-Coupled (No BEC)
- Up to 36 cells or 12s Lipo MAX
- 12 cells or 3s Lipo MIN
- Dynamic braking ensures folding props fold promptly
- User Programmable Features:
- Low-voltage cutoff with Auto-Lipo detect as default
- Over-current Protection
- Brake Type
- Throttle Range – fixed/self-adjusting/governor
- Timing Advance
- Cutoff Type
- Soft Start ramp up
- Switching Frequency
- Runs motor in forward OR reverse
- Overtemp Motor Cutoff with Reset
- Safe "power on" arming program ensures motor will not accidentally turn on
- Low torque "soft start" prevents damage to fragile gearboxes
- Auto shut down when signal is lost or radio interference becomes severe

2.0 WIRING YOUR PHOENIX HV-85™:

Tools required: wire cutters, wire strippers (optional), soldering iron (30-50W)
Parts required: solder (rosin core "electronic" solder), battery connector

2.1 This Phoenix HV ESC does NOT have a BEC

You must use an alternate power source for your receiver and servos, or a standard receiver battery pack.

2.2 Adding the Battery Connector

The battery connector is attached to the side of the controller that has only two power wires, and also has the radio connector. Cut the wires to the length you require on the battery side. Strip off of the wire insulation to expose just enough wire to attach the battery connector. Attach the battery connector to the wires ***ensuring that the polarity (red wire to battery red wire, black wire to battery black wire) is correct,*** following the instructions for the battery connector.

Important note: you must be sure that the polarity is correct when connecting the speed controller. Incorrect polarity will permanently damage the controller.

2.3 Connecting the Motor

The motor is connected to the side of the controller that has ***three*** power wires. Cut the wires to the length you require on the motor side. ***Do not cut*** the wires leading from the motor. Strip the wire insulation to expose just enough wire to solder the wires to the motor terminals. There should be three wires extending from the motor. Connect the three speed control wires to the three motor wires. Align the wires carefully and solder to the motor wires. Ensure that all connections (battery and motor) are correctly polarized.

2.4 Reversing Rotation

Bench test the motor connections noting the rotation of the motor. To change the rotation of the motor, swap ANY two motor wire connections.

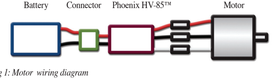

Fig 1: Motor wiring diagram

2.5 Connecting the Receiver

Connect the receiver lead (the three color wires with a connector on the end) to the throttle channel on your receiver (usually channel 3). You must use a separate receiver battery, or an alternate source to power the receiver and servos, as this is a dual Opto-Coupled ESC, and does not have a BEC.
Older AirTronics systems may require a minor change to the wiring in the receiver connector supplied with the speed controller. Refer to your servo polarity, and change the connector polarity on the ESC if it does not match.

3.0 FLYING WITH YOUR PHOENIX HV-85™:

Always perform a range check before flying with any new speed controller! Perform your range check at full throttle, half throttle and no throttle.

Initialization sequence:

1. Connect the speed controller receiver connector to the proper channel on your receiver (usually channel 3)
2. Turn on your transmitter.
3. Connect the main power battery to the speed controller.
4. The speed controller will remain disarmed (will not operate) until it sees more than four seconds of "brake" throttle. Move the throttle arm to the lowest position on your transmitter, wait at least four seconds, and then test the controller to make sure that the throttle operates.
5. Go fly!
6. If a low voltage cutoff occurs before you land, you may restart the motor and use low throttle if necessary by moving the throttle stick all the way down (to the brake position) and then throttling back up. A low voltage cutoff will occur again if the voltage drops too low.

4.0 USING THE FEATURES OF YOUR PHOENIX HV-85™

Brake - moving the transmitter throttle stick to the bottom position enables the prop brake.

Cutoff - The motor cutoff will occur when the input battery voltage drops below the programmed cutoff voltage (factory preset at Auto-Lipo detect) for more than one half second. Once motor cutoff has occurred, moving the throttle to the braking position (full off) can re-arm the controller. This will allow restart of the motor at low throttle after cutoff has occurred.

Loss of Transmitter Signal, or excessive radio noise cutoff - Motor cutoff will also occur if the signal from the transmitter is lost, or if the radio noise becomes excessive. After radio connection has been re-established, moving the throttle to the braking position (full off) for one second can restart the motor.

Safe Power Up - The Safe Power up feature is a "finger saver", designed to prevent the motor from starting accidentally on power up. To arm the controller, the transmitter stick must be held in the "Brake" position (all the way down) for at least four seconds. 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. Before flying your model, be sure to "blip" the throttle to ensure that the controller is armed.

LED - The LED is used for programming the features on the Phoenix HV-85™. Once armed, the LED also provides an indication that the controller has reached full throttle by lighting solid when full throttle is 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.

5.0 TROUBLESHOOTING

Everything is hooked up correctly, the receiver and servos work, but the throttle does not work.
The controller is not seeing the four seconds of low throttle, and is not arming. Try moving your throttle stick all the way down, and moving the trim all the way down. Wait for four seconds and try the throttle again. If it still does not arm, you may need to reverse the throttle control on your transmitter, especially for Futaba brand transmitters (see your radio documentation). You may also check to make sure that your endpoint adjustments on your radio (if it has them) are set all the way open (away from zero is MORE travel).
Every time I throttle all the way up, the controller "cuts off" after a few seconds, even with fresh charged batteries.
The controller will automatically shut down the motor if the battery voltage falls below the programmed voltage cutoff (factory preset at Auto-Lipo detect) for more than half a second. This is to protect your airplane from a loss of control caused by too low a voltage at the receiver, or to prevent damaging Lipo batteries by the voltage falling below 3v/cell under load. If the cutoff is kicking in with fresh charged batteries, it means that the voltage is dropping very quickly. This is usually an indication of a motor or gear ratio, or propeller choice that is drawing too much current for the batteries to handle. Try using a smaller prop on the motor, or using batteries with a higher discharge rating.
The LED comes on when I throttle up.
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.
Nothing seems to work, receiver and servos are dead, and the throttle is dead.
Check all connections to ensure that they are correct, and that the polarity (+/-) connections are correct. If everything is correctly connected, and the receiver and servos still do not work, contact the dealer where you purchased your Phoenix HV-85™ or Contact Castle Creations directly. (See info below)

6.0 CONTACT / WARRANTY INFORMATION

Phoenix HV-85™ is warranted for one (1) 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 HV-85™ for warranty or non-warranty repair/replacement contact Castle Creations at:

e-mail: support@castlecreations.com
Internet: http://www.castlecreations.com
Mail: 402 E. Pendleton Avenue, Wellsville, KS 66092
Phone: (785) 883-4519
Fax: (785) 883-4571

7.0 PHOENIX HV-85™ PROGRAMMING FEATURES

Programming the Phoenix HV-85™

Programming the Phoenix HV-85™ is as simple as answering a few questions. Phoenix HV-85™ asks questions by flashing a setting number, followed by the possible setting values. There are eight settings that can be programmed in the Phoenix HV-85™ 1) Cutoff voltage, 2) Current Limiting, 3) Brake Type, 4) Throttle Type, 5) Timing Advance, 6) Cutoff Type, 7) Soft Start, and 8) PWM Switching Frequency.

As the programmer, you must answer "yes" or "no" to the setting values as they are presented by the Phoenix HV-85™. The setting values are "flashed" out by the LED. Answering "no" to a setting value will cause the Phoenix HV-85™ to ask for the next value. Answering "yes" to a setting value will store that setting in the Phoenix HV-85™'s permanent memory. After a setting is stored, the Phoenix HV-85™ will continue to ask about other settings until all settings have been stored. NOTE: If you answer "no" to all values for a particular setting, the Phoenix HV-85™ will keep whatever value had been previously programmed. Only by answering "yes" to a value will the Phoenix HV-85™ store/change that value.

When answering a question, you will need to move the transmitter stick to the yes (full on throttle) position or the no (full off throttle) position and keep it there for about 5 seconds. When the Phoenix HV-85™has accepted your answer, it will flash the LED rapidly. After the LED starts it's rapid flashing, move the throttle stick to the middle position to confirm that you are ready for the Phoenix HV-85™ to ask the next question.

You are not required to continue through all eight programming options. For example, if you wish only to change the Cutoff Voltage (option 1) then after programming that setting you can disconnect power from the PhoenixHV-85™ and proceed to the arming sequence (see Section 3.0). Disconnecting the controller in the middle of programming simply retains the values for the remaining programming options.

8.0 ENTERING PROGRAMMING MODE

The Phoenix HV-85™ software is designed to make it difficult to accidentally enter programming mode, therefore it may seem like a long process to enter programming mode. This is to prevent entering programming mode while preparing to fly or while in flight. To enter programming mode, follow the steps below:

8.1 Verify Normal Operation

If this is the first time the Phoenix HV-85™ has been used, it is important to verify that the Phoenix HV-85™ operates normally with your transmitter otherwise programming may not function properly. Follow the instructions in section 3.0 Initialization Sequence (steps 1-4). Once you have verified that the Phoenix HV-85™ operates normally, proceed to 8.2 below. If the Phoenix HV-85™ does not operate properly, see section 5.0, Troubleshooting.

8.2 Enter Programming Mode

8.2.1 Remove battery power from the Phoenix HV-85™.
8.2.2 Move the transmitter stick to the top position (normally full "On").
8.2.3 Re-connect battery power to the Phoenix HV-85™.
8.2.4 After approximately 2 seconds, the Phoenix HV-85™ will emit a short tone, and the LED on the Phoenix HV-85™ should flash a short, single flash followed by a pause.

Phoenix HV-85™ responds: flash – pause

8.2.5 Move your transmitter stick to the middle position.
8.2.6 After approximately 2 seconds, the Phoenix HV-85™ will emit a short tone, and the LED on the Phoenix HV-85™ should flash a short, double flash followed by a pause.

Phoenix HV-85™ responds: flash – flash – pause

8.2.7 Move your transmitter stick to the top position again.
8.2.8 After approximately 2 seconds, the Phoenix HV-85™ will emit a short tone, and the LED on the Phoenix HV-85™ should flash a short, triple flash followed by a pause.

Phoenix HV-85™ responds: flash – flash – flash – pause

8.2.9 Move your transmitter stick back to the middle position again.
8.2.10 After approximately 2 seconds, the Phoenix HV-85™ will emit four short tones, and the LED on the Phoenix HV-85™ will start a flash sequence of a single flash followed by another single flash, followed by a long pause.

Phoenix HV-85™ responds: flash – flash – pause

8.2.11 The Phoenix HV-85™ is now in programming mode, and is already asking you the first question in the first section of programming.

9.0 PROGRAMMING THE PHOENIX HV-85™

Important Note: When answering a question, you will need to move the transmitter stick to the yes (full "On" throttle) position or the no (full "Off" throttle) position and keep it there for about 2 seconds. When the Phoenix HV-85™ has accepted your answer, it will flash the LED rapidly. After the LED starts it's rapid flashing, move the throttle stick to the middle position to confirm that you are ready for the Phoenix HV-85™ to ask the next question.

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 HV-85™ 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 (see Section 3.0).

**Factory default settings are indicated by an asterisk in the option listings below.*

NOTE: When setting Lipo cut off voltage be sure to follow your battery manufacturers recommendations!

9.1 Programming Setting 1 –Cutoff Voltage

	Setting	Recommended for use with:
Option 1:	Auto-Lipo detect*	(ESC detects cell count, and sets cutoff for 3v/cell)
Option 2:	12V cutoff voltage	4s Lithium Polymer packs
Option 3:	18V cutoff voltage	6s Lithium Polymer packs
Option 4:	24V cutoff voltage	8s Lithium Polymer packs
Option 5:	30V cutoff voltage	10s Lithium Polymer packs
Option 6:	36V cutoff voltage	12s Lithium Polymer packs

Phoenix HV-85™ Displays:	Programming Question Asked:	Your Response:	Phoenix HV-85™ Action:	Your Action:
1 flash – short pause – 1 flash – long pause	Setting 1 (cutoff voltage), Option 1 (Auto-Lipo)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Current Limiting (9.2 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
1 flash – short pause – 2 flashes – long pause	Setting 1 (cutoff voltage), Option 2 (12V)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Current Limiting (9.2 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
1 flash – short pause – 3 flashes – long pause	Setting 1 (cutoff voltage), Option 3 (18V)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Current Limiting (9.2 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
1 flash – short pause – 4 flashes – long pause	Setting 1 (cutoff voltage), Option 4 (24V)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Current Limiting (9.2 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
1 flash – short pause – 5 flashes – long pause	Setting 1 (cutoff voltage), Option 5 (30V)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Current Limiting (9.2 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
1 flash – short pause – 6 flashes – long pause	Setting 1 (cutoff voltage), Option 6 (36V)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Current Limiting (9.2 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response. Maintains previous setting for cutoff voltage (no change)	Return Tx stick to center and proceed to next setting–Current Limiting (9.2 below)

PHOENIX HV-85™ — BRUSHLESS CONTROLLER BY CASTLE CREATIONS

85 AMP HIGH VOLTAGE BRUSHLESS SENSORLESS SPEED CONTROL

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9.2 Programming 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 HV-85™ when an over-current condition is detected. There are five options:

Option 1: Very sensitive (Very low over-current threshold, will rapidly shut-down)
Option 2: Sensitive (Low over-current threshold, will rapidly shut-down)
Option 3: Standard * (Moderate over-current threshold, will shut down after a slight delay)
Option 4: Insensitive (High over-current threshold, will shut down after a slight delay)
Option 5: Over current disabled (Over current detection disabled)

Phoenix HV-85™ Displays:	Programming Question Asked:	Your Response:	Phoenix HV-85™ Action:	Your Action:
2 flashes - short pause 1 flash – long pause	Setting 2 (current limiting), Option 1 (Very sensitive)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Brake Type (9.3 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
2 flashes - short pause – 2 flashes – long pause	Setting 2 (current limiting), Option 2 (Sensitive)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Brake Type (9.3 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
2 flashes - short pause – 3 flashes – long pause	Setting 2 (current limiting), Option 3 (Standard)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Brake Type (9.3 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
2 flashes - short pause – 4 flashes – long pause	Setting 2 (current limiting), Option 4 (Insensitive)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Brake Type (9.3 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
2 flashes - short pause – 5 flashes – long pause	Setting 2 (current limiting), Option 5 (Disabled)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Brake Type (9.3 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response. Maintains previous setting for Current Limiting (no change).	Return Tx stick to center and proceed to next setting – Brake Type (9.3 below).

9.3 Programming Setting 3 – Brake Type

Delayed brake provides a 4-second delay before braking occurs. Soft brake provides 50% of full braking power; hard brake is 100% braking power. Hard brake on high voltage systems should only be used with ***very*** small props.

Option 1: Soft delayed brake — General aircraft use, with fixed or folding prop
Option 2: Hard delayed brake — Direct drive applications where more braking power is required
Option 3: Soft brake, no delay — Competition use where a very short brake delay is required
Option 4: Hard brake, no delay — Competition use where a very short brake delay is required
Option 5: Brake Disabled * — Helicopters and 3D aircraft

Phoenix HV-85™ Displays:	Programming Question Asked:	Your Response:	Phoenix HV-85™ Action:	Your Action:
3 flashes - short pause – 1 flash – long pause	Setting 3 (brake type), Option 1 (soft, delayed 4-seconds)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting-Throttle Type (9.4 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
3 flashes - short pause – 2 flashes – long pause	Setting 3 (brake type), Option 2 (hard, delayed 4-seconds)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting-Throttle Type (9.4 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
3 flashes - short pause – 3 flashes – long pause	Setting 3 (brake type), Option 3 (soft, no delay)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting-Throttle Type (9.4 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
3 flashes - short pause – 4 flashes – long pause	Setting 3 (brake type), Option 4 (hard, no delay)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting-Throttle Type (9.4 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
3 flashes - short pause – 5 flashes – long pause	Setting 3 (brake type), Option 5 (brake disabled)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting-Throttle Type (9.4 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response. Maintains previous setting for Brake Type (no change).	Return Tx stick to center and proceed to next setting–Throttle Type (9.4 below)

9.4 Programming Setting 4 – Throttle Type

Option 1: Auto-Calibrating throttle* — Recommended for general aircraft
Option 2: Fixed throttle — Fixed pitch helicopters
Option 3: Governor Mode – Low RPM Range (see Note below) — Recommended for collective pitch helicopters
Option 4: Governor Mode – High RPM Range (see Note below) — Recommended for collective pitch helicopters

Phoenix HV-85™ Displays:	Programming Question Asked:	Your Response:	Phoenix HV-85™ Action:	Your Action:
4 flashes - short pause – 1 flash – long pause	Setting 4 (throttle type), Option 1 (auto-calibrating)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting-Timing Advance (9.5 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
4 flashes - short pause – 2 flashes – long pause	Setting 4 (throttle type), Option 2 (fixed)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Timing Advance (9.5 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
4 flashes - short pause – 3 flashes – long pause	Setting 4 (throttle type), Option 3 (Governor mode Low RPM range)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Timing Advance (9.5 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
4 flashes - short pause – 4 flashes – long pause	Setting 4 (throttle type), Option 4 (Governor mode High RPM range)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Timing Advance (9.5 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response. Maintains previous setting for throttle (no change).	Return Tx stick to center and proceed to next setting–Timing Advance (9.5 below)

NOTE: Governor mode acts as an RPM control, rather than a throttle control. Throttle stick position determines the RPM that the motor runs and the controller will attempt to hold that RPM regardless of load 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, and the high RPM range has finer RPM control at higher RPMS. The low RPM range is useful for low pole count motors (Hacker, etc.) and low RPMs on higher pole count motors. The high RPM range is useful for higher pole count motors and higher RPMs. Brake is ALWAYS disabled in Governor Mode.

9.5 Programming Setting 5 – Electronic timing advance

Option 1: High advance timing (12°-35°) — Recommended for more power at the expense of efficiency
Option 2: Standard advance timing (5°-20°)* — Recommended for a good balance of power and efficiency.
Option 3: Low advance timing (0°-15°) — Recommended for use when efficiency or run-time is primary concern – Gives a slight loss of power with a slight increase in efficiency.

NOTE: The controller senses the motor type by its inductance, and automatically sets the optimum advance range according to motor type (eg: outrunner motors will automatically be run at a higher advance setting).

Phoenix HV-85™ Displays:	Programming Question Asked:	Your Response:	Phoenix HV-85™ Action:	Your Action:
5 flashes - short pause – 1 flash – long pause	Setting 5 (timing advance), Option 1 (high advance)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Cutoff Type (9.6 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
5 flashes - short pause – 2 flashes – long pause	Setting 5 (timing advance), Option 2 (standard)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Cutoff Type (9.6 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
5 flashes - short pause – 3 flashes – long pause	Setting 5 (timing advance), Option 3 (low)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Cutoff Type (9.6 below)
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response. Maintains previous setting for timing advance (no change).	Return Tx stick to center and proceed to next setting–Cutoff Type (9.6 below)

9.6 Programming Setting 6 – Cutoff Type

Option 1: Hard Cutoff* (Immediate motor shutdown) — Option 2: Soft Cutoff (Throttles down power at low voltage or over-current)

Phoenix HV-85™ Displays:	Programming Question Asked:	Your Response:	Phoenix HV-85™ Action:	Your Action:
6 flashes - short pause – 1 flash – long pause	Setting 6 (cutoff type), Option 1 (hard cutoff)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next setting–Soft Start (9.7 below).
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
6 flashes - short pause – 2 flashes – long pause	Setting 6 (cutoff type), Option 2 (soft cutoff)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response. Maintains previous setting for cutoff type.	Return Tx stick to center and proceed to next setting–Soft Start (9.7 below).
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response. Maintains previous setting for cutoff type.	Return Tx stick to center and proceed to next setting–Soft Start (9.7 below).

9.7 Programming Setting 7 – Soft Start

Option 1: Very soft start — Recommended for use with fragile gearboxes; governor mode softest start, slowest spool up, and throttle changes
Option 2: Soft Start* — Recommended for most setups; governor mode soft start, slow spool up and throttle changes
Option 3: Fast start — Recommended for fastest startup; governor mode faster start, fast spool up and throttle changes

Phoenix HV-85™ Displays:	Programming Question Asked:	Your Response:	Phoenix HV-85™ Action:	Your Action:
7 flashes - short pause – 1 flash – long pause	Setting 7 (soft start), Option 1 (very soft)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response. LED remains on to confirm it is ready to be armed.	Return Tx stick to center and proceed to next setting–PWM Rate (9.8 below).
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
7 flashes - short pause – 2 flashes – long pause	Setting 7 (soft start), Option 2 (soft start)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response. LED remains on to confirm it is ready to be armed.	Return Tx stick to center and proceed to next setting–PWM Rate (9.8 below).
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
7 flashes - short pause – 3 flashes – long pause	Setting 7 (soft start), Option 3 (fast start)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response. LED remains on to confirm it is ready to be armed.	Return Tx stick to center and proceed to next setting–PWM Rate (9.8 below).
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response. Maintains previous setting for throttle type (no change).	Return Tx stick to center and proceed to next setting–PWM Rate (9.8 below).

9.8 Programming Setting 8 – PWM Switching Rate

Option 1: 13 KHz* — Recommended for most brushless motors
Option 2: 26 KHz — Recommended for low inductance motors
Option 3: 52 KHz — Recommended for very low inductance motors

Phoenix HV-85™ Displays:	Programming Question Asked:	Your Response:	Phoenix HV-85™ Action:	Your Action:
8 flashes - short pause – 1 flash – long pause	Setting 8 (switching rate), Option 1 (13 KHz)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response. LED remains on to confirm it is ready to be armed.	Programming complete. Proceed to arming section of this User's Guide (section 3) to arm the unit for flight.
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
8 flashes - short pause – 2 flashes – long pause	Setting 8 (timing advance), Option 2 (26 KHz)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response. LED remains on to confirm it is ready to be armed.	Programming complete. Proceed to arming section of this User's Guide (section 3) to arm the unit for flight.
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response.	Return Tx stick to center and proceed to next option for this setting
8 flashes - short pause – 3 flashes – long pause	Setting 8 (timing advance), Option 3 (52 KHz)?	Yes – Throttle stick in up position	Stores selection. Flashes rapidly to confirm receipt of your response. LED remains on to confirm it is ready to be armed.	Programming complete. Proceed to arming section of this User's Guide (section 3) to arm the unit for flight.
		No – Throttle stick in off position	Flashes rapidly to confirm receipt of your response. Maintains previous setting for PWM Switching Rate, and will exit programming mode, and allow the Phoenix HV-85 to arm at low throttle.	Programming complete. Proceed to arming section of this User's Guide (section 3) to arm the unit for flight.