# COPPERHEAD

## SENSORLESS BRUSHLESS ESC

### INTRODUCTION

The Viper Copperhead series sensorless brushless ESC is the ultimate engineering design from Viper R/C Solutions, Inc. Our commitment to quality and exhaustive track and street testing ensure that Copperhead series ESCs give you the most enjoyable and the best value power system.

**Please read the following instructions carefully before installing your new Copperhead system.**

### PRECAUTIONS

1. Viper R/C Copperhead series sensorless ESCs produce a lot of motor power. We recommend using Copperhead series ESCs with Viper R/C VX4 series sensorless brushless motors for the best performance results.
2. Always check the vehicles' manufacture gearing recommendation before you set up the system. If you were not sure about the gear set up, please contact Viper R/C directly at technical.support@viper-rc.com for suggestions. Over and under gearing will both result damage on the brushless system.
3. Do not test the motor without loading. This means without a pinion gear on the motor and running the motor at full power.
4. Do not connect reversed polarity. This will damage the ESC and battery.
5. Always monitor both the ESC and motor temperature after running them. Temperature should never exceed 160 degrees Fahrenheit.
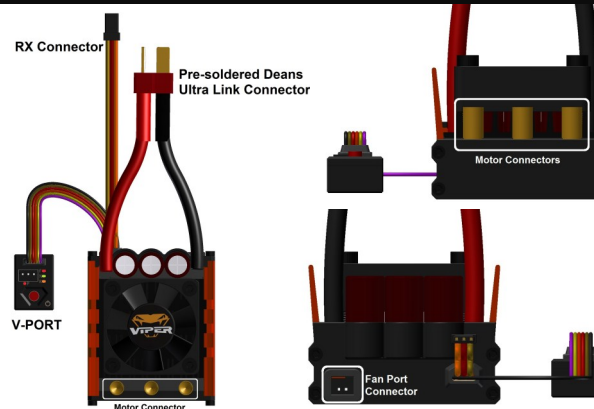
### FEATURES

- Optimized Viper brushless technology firmware that offers the smoothest start up and acceleration power
- 5 factory optimized preload profiles for different driving conditions
- Bullet connectors and pre-soldered Deans Ultra Link connector that makes the Copperhead combo a plug-n-play system out of the box
- Viper R/C ProGauge (sold separately) allows to open up all parameters for detailed adjustment
- Water resistant aluminum case with forced cooling fan for the optimized thermal performance and robust structure
- Auto Li-Po count and low voltage cut-off protection, ESC thermal protection, and motor rotor stuck protection
- ESC firmware upgradable by Viper PC LINK

### SPECIFICATIONS

| Model | Copperhead | Copperhead-R |
|---|---|---|
| Continues/Burst Current | 100A/550A | 150A/750A |
| BEC Output | 6V/5A Linear | |
| ON Resistance | 0.0009Ω * 2 | 0.0005Ω * 2 |
| Support Motor Type | Sensorless Brushless Motors | |
| Support Battery | Ni-Cd/Ni-MH 6 ~ 9 cells Li-Po 2~3S | |
| Max Input Voltage | 12.6V | 12.6V |
| Support Motor Spec | 2S Li-Po w / 540 class: KV≤6000 | 2S Li-Po w / 550 class: KV≤6000 |
| | 3S Li-Po w / 540 class: KV≤4000 | 3S Li-Po w / 550 class: KV≤4000 |
| Support Vehicle Weight | ≤6 lb | ≥6 lb |
| Motor Connector | 3.5mm Bullets | 4.0mm Bullets |
| Dimension | 45.5x39.8x29.25mm | 45.5x39.8x29.25mm |
| Weight (with battery wires and connector) | 96g | 98g |

### COPPERHEAD ESC PHYSICAL DIAGRAM



RX Connector

Pre-soldered Deans Ultra Link Connector

Motor Connectors

V-PORT

Fan Port Connector

Motor Connector

### V-PORT LED INDICATORS

**P** = Power On (Red LED)
**F** = Forward (Red LED)
**N** = Neutral (Green LED)
**R** = Reverse/Brake (Orange LED)



### BEGIN TO SET UP COPPERHEAD ESC

1. Open a new profile on the radio transmitter, ensure throttle and steering were both centered and EPA was at 100%, and then bind the radio system (for 2.4G only) by following the radio manufacture's user manual.
2. Connect the RX connector of Copperhead ESC to the throttle channel on, and the steering servo to the steering channel of the radio receiver. The motor connectors should also be connected to the motor output of the ESC.
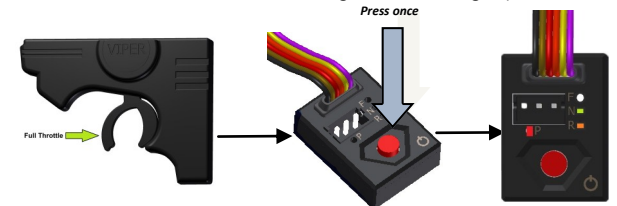3. **Radio/ESC throttle calibration**

   <span style="color:red">**Every VIPER Copperhead ESC needs to run radio calibration process when it is brand new out of the package, switching radio system, changing a new ESC profile or after firmware update. Process is as easy as the following steps after all wires and battery connector are properly connected.**</span>
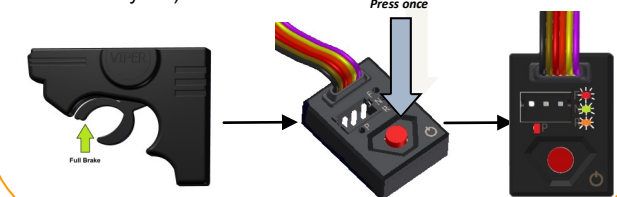
   a) Connect a proper/charged battery pack to the ESC.
   b) Power on the transmitter with the throttle at neutral and throttle trim was centered.
   c) Leave the throttle on the transmitter at neutral, press and hold the red power button on the V-PORT for three seconds. (Followed by beep tone from the motor, F/N LED on the V-PORT will be indicated as the image at right)

   *Power on transmitter and keep position at neutral*    *Press and hold for 3 sec.*
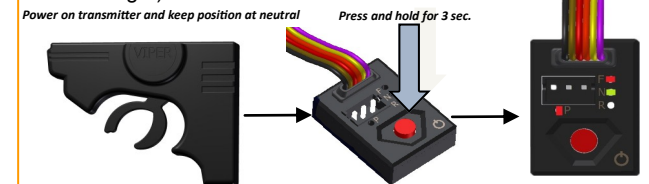
   

   d) Pull full throttle and hold, while holding press the red power button once. (Followed by beep tone, N/R LED will be indicated as the image shown at right.)

   *Full Throttle*    *Press once*

   

   e) Push full brake and hold, while holding press the red power button once. (Followed by beep tone, all LED's will cycle.)

   *Press once*

   *Full Brake*

   

## 3. Radio/ESC throttle calibration CON'T

Calibration completed!

**If the radio was not able to be calibrated successfully, the LEDs on the V-PORT will be all flashing. Please try to adjust the throttle trim on your transmitter (+/- 10% a step) and run the calibration process again. Every Radio system has different factory default signal, it important to make the Copperhead ESC to read proper radio endpoint signal for optimized performance.**

## 4. Power on/off Copperhead ESC

a) Power on transmitter
b) Connect a proper/charged battery pack to the ESC.
c) Press the red power button on the V-PORT for one second to power on or off the ESC.
d) The "P" LED on the V-PORT will be enabled following by beeping tone on the motor.
e) The "F" and "R" LEDs will be flashing a number of time to indicate the corresponding profile number.



*Press one sec*  *Power on LED indicators.*  *F/R LEDs flash the number of corresponding profile.*

## 5. Double check the radio signal

- If radio calibration was done properly, you should see a solid "N" LED on the V-PORT when the throttle was at neutral position.

- By pulling the throttle, you should see the "F" LED starts flashing at start up, and will become solid at full throttle. If you do not see a solid "F" LED at full throttle, it means the radio calibration process was not done correctly.

- By pushing the brake/reverse, you should see the "R" LED starts flashing at start up, and will become solid at full brake (reverse). If you do not see a solid "R" LED at full brake (reverse), it means the radio calibration process was not done correctly.

## 6. Change running profiles

There were 5 factory preload running profiles in every Copperhead ESC. Please choose a desired/suitable profile for your application. The process could be done easily by pressing the red power button on the V-PORT.

**Profile#1 Street Mode with NiMH Battery**
**Profile#2 Street Mode with Li-Po Battery**
**Profile#3 Street Speedy Mode with Li-Po Battery**
**Profile#4 Street Extreme Mode with Li-Po Battery**
**Profile#5 Track Racing Mode with Li-Po Battery**

a) Power on transmitter.
b) Connect a proper/charged battery pack to the ESC.
c) Press and hold the red power button on the **V-PORT** for three seconds. (Followed by beep tone, F/N LEDs on the **V-PORT** will be indicated as the image shown at right)
d) Press the corresponding number of time of the desired profile (refer to the profile list below) on the red power button on the **V-PORT.** For example, press 5 times if you wish to load profile 5. The F/R LEDs will be indicated on every button press.
e) Release the power button for 3 seconds. The VTX ESC will save the profile number and F/R LEDs will be flashing the number of time of the corresponding profile that it was saved.
f) The VTX ESC will then run an auto system reset. The F/R LEDs will be flashing the corresponding profile number every time after beeping of system initialization.
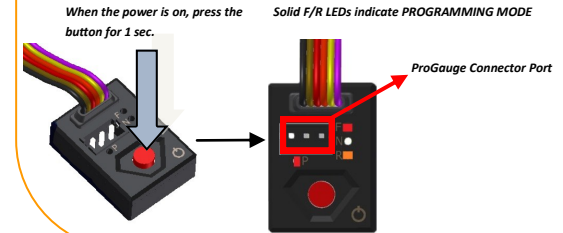
| | Brake Strength | Brake Cruve | Throttle Punch | Start Power | Motor Timing | Neutral Deadband | Battery Type | Battery Cut off Voltage | Run Mode |
|---|---|---|---|---|---|---|---|---|---|
| Profile 1, Street Mode with NiMH Battery | 8 | Linear | 1 | 1 | 1 | Wide | NiMH | 5.4V | 2 Stage Reverse |
| Profile 2, Street Mode with Li-Po Battery | 8 | EXP+1 | 3 | 2 | 3 | Middle | LiPo | 3.2V/S | 2 Stage Reverse |
| Profile 3, Street Speedy Mode with Li-Po Battery | 10 | EXP+2 | 5 | 3 | 5 | Middle | LiPo | 3.2V/S | 2 Stage Reverse |
| Profile 4, Street Extreme Mode with Li-Po Battery | 10 | EXP+3 | 7 | 5 | 7 | Middle | LiPo | 3.2V/S | 2 Stage Reverse |
| Profile 5, Track Racing Mode with Li-Po Battery | 10 | EXP+3 | 7 | 5 | 7 | Narrow | LiPo | 3.0V/S | Forward Only |



*Press and hold for 3 sec.*  *Press the number of your desired profile*
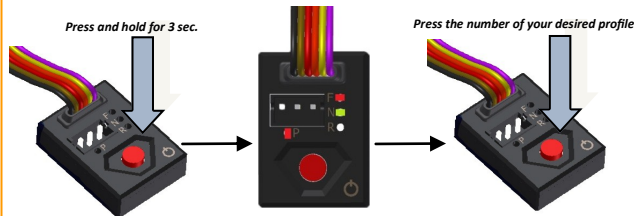
## 7. Use ProGauge (sold separately ) on Copperhead ESC

You could use Viper ProGauge (sold separately) to open all the parameters in your Copperhead ESC. This allows you to make the adjustment to push the performance of your Copperhead ESC to its limit, or to make a mild output in every profile. Please follow the procedure below to connect the ProGauge to your Copperhead ESC and refer to the parameter table for details.

a) Power on Copperhead ESC. (Transmitter could be on or off.)
b) Press the red power button on the **V-PORT** for one second.
c) F/R LEDs will light up to indicate that the Copperhead ESC is in **PROGRAMMING MODE. (LED indicator shown as image below)**
d) Connect the ProGauge to the **V-PORT** by plugging it in, and then scroll down to "**Link Device**" on the ProGauge. Use the **ESC/Up/Down/OK** keys on the ProGauge to **Change/Load/Save** settings. Please refer to Table.1 for setting option and parameters.
e) Any setting on ProGauge needs to be saved in order to store in the Copperhead ESC memory for properly **future use**.
f) After saving the settings, unplug the **V-PORT** connector and press the red power button for one second to go back to **RUNNING MODE**.



*When the power is on, press the button for 1 sec.*  *Solid F/R LEDs indicate PROGRAMMING MODE*

*ProGauge Connector Port*

## PRODUCT WARRANTY

Your VIPER Copperhead series ESC is guaranteed to be free from defects in materials and workmanship for a period of 180 days. Your **original receipt** showing the item and the date and place of purchase is required with your warranty service application. An ESC that is found to have been mishandled, abused or used incorrectly, including use in an application other than that for which the ESC is intended, will not be covered under the warranty. Viper R/C Solutions, Inc. has no control over the use of the ESC application. Viper R/C Solutions, Inc. is not liable for any loss or damage, whether direct or indirect, incidental, or consequential, or any situation from the use, misuse or abuse of the product. Your VIPER Copperhead ESC is not a toy. This product is not in-tended for use by a child under age of 14 without adult supervision. The Copperhead ESC generates a lot of power that could result physical injuries. By setting up, connecting or operating the product, the user accepts all related liabilities.

## COPPERHEAD PARAMETER TABLE

This parameter table is a reference when using Copperhead series ESC with Viper ProGauge for detailed tuning.

| Menu | Parameters | Options | Descriptions |
|---|---|---|---|
| Brake | Brake Strength | Level 1 to Level 10 | Level one being the softest brake setting and level 10 being the strongest brake setting for the car. |
| | Brake Curve | EXP1 to +EXP3 / Linear / -EXP1 to –EXP3 | This is engaged after the Neutral Brake percentage is reached. A negative EXP Curve will have a softer brake feel at the beginning of the brakes being engaged and get more aggressive as they are fully engaged. A linear Dynamic Brake Curve will be uniform throughout the whole brake range. A positive EXP Curve has strong brakes initially and then becomes softer. |
| Drag Brake | Drag Brake | Level 1 to Level 10 | It will provide a drag force when the throttle was released to the neutral point. |
| Throttle | Throttle Punch | Level 1 to Level 10 | Level one being the softest punch setting and level 10 being the strongest punch setting for the car. |
| | Throttle Curve | EXP1 to +EXP3 / Linear / -EXP1 to –EXP3 | A negative Throttle Curve will have a softer throttle feel at the beginning of the throttle being engaged and get more aggressive as it is fully engaged. A linear Throttle Curve will be uniform throughout the whole throttle range. A positive Throttle Curve has strong throttle initially and then becomes softer. |
| | Dead Band | Narrow/Middle/Wide | This is the amount of "play" when the throttle is engaged. Narrow makes the throttle engage more instantaneously, while Wide would have a lag in the throttle response. |
| Motor Timing | Motor Timing | Level 1 to Level 10 | Parameters from 1 thru 10 can be seen as 3 degree incremental (So Level 10 will be 30 degrees max timing). |
| Misc Control | Run Mode | Forward Only/2 Stage Reverse/1 Second Reverse/Stop to Reverse | **2 Stage Reverse**- Reverse is activated when brake is pressed twice on the trigger. **1 Second Reverse**- Reverse is activated when brake is pressed for more than 1 second. **Stop to Reverse**- Reverse is activated as soon as the brakes are pressed. **Forward Only**- Race setting that allows no reverse. |
| | Motor Direction | Normal/Reverse | Controls the forward or reverse on the motor direction. |
| | Start Power | Level 1 to Level 10 | Start power at standstill. Level 1 will have the least energy to the motor to overcome initial rotor friction. Level 10 will have the max energy to overcome friction in the motor which will ensure faster starts in the beginning of the race. |
| | Forward Power | Level 1 to Level 10 | Set the amount of total forward power when full throttle is applied. |
| | Reserve Power | Level 1 to Level 10 | Set the amount of total reverse power when full throttle is applied. |
| | Auto Power Off | Disable/ 1 to 10 minutes | Set the amount of time to auto power off the ESC when there is no action detected |
| Battery Cut Off | Battery Cut Off | NiMH 4.5V/Li-Po 3.0V per cell/Li-Po 3.1V per cell/Li-Po 3.2V per cell/Li-Po 3.3V per cell | Set the battery type and low voltage cut off level |

## TROUBLESHOOTING

| Problem | Possible Causes | Suggest Solutions |
|---|---|---|
| Not able to calibrate radio properly/ All LED flash with motor beeping after calibration process | Throttle channel on the transmitter was not centered. | * Check radio transmitter throttle position. <br> * Try to trim the throttle position or throttle EPA. <br> * contact Viper R/C at technical.support@viper-rc.com |
| Motor keeps beeping after ESC powers on | Radio transmitter setting was changed out of range after calibration | * Reset radio transmitter setting and re-calibrate |
| Motor runs in the opposite direction | Incorrect motor connection | * Swap any two motor wires in between motor and ESC. Or use Viper ProGauge to change the motor direction in MISC Menu. |
| Power cut off with solid "N" and flashing F/R LEDs on the V-PORT | ESC overheat | * Check the Li-Po cell and motor pinion set up to ensure the motor/ gear mesh/battery voltage was set up at a matching level |
| Motor output power trembles | 1. Poor battery discharge performance <br> 2. Incorrect/ too aggressive gear set up <br> 3. Battery low voltage cut off | * Need a better discharge performance battery pack <br> * Smaller pinion gear <br> * Recharge battery pack |

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