



COPPERHEAD 10 DRIVERS ED GUIDE

095-0412-00 REVISION
DATE 4/29/2021

Castle Technical support

You may contact our world-class technical support department via e-mail anytime or by phone. Please visit Castle Creations website for technical support hours.

Website: www.castlecreations.com/support

E-mail: home.castlecreations.com/contact-support

Phone: (913) 390-6939, option #1. Mon-Fri, 9AM-4PM CST.

WARNING: This is an extremely powerful brushless motor system. We strongly recommend removing the pinion gear from the motor for your own safety and the safety of those around you before performing calibration and programming functions. Please keep your hands, hair, feet, pets, fuzzy purple shorts, and garden gnomes clear from the gear train, axle shafts, wheels, and tires of an armed high-performance system.

DO NOT hold the vehicle in the air and run it up to full throttle. Rubber tires will "grow" to extreme size on a high-speed vehicle. Tire failures at speed can cause serious injury! Make sure your tires are securely glued to the wheels and check them often.

ALWAYS disconnect the battery from the ESC when you are finished enjoying your vehicle.

The switch on the ESC controls the power that is delivered to the receiver and servo(s). The controller will always draw current when it is connected to the battery and will completely discharge batteries if they are connected for long durations. This may cause failure of your batteries. Castle Creations is not responsible for any damage as a result of batteries left plugged in to your ESC. Your Castle ESC is programmed to sound a tone every ten seconds to remind you that it is still powered.

Always monitor your ESC and motor temperatures during the first run after modifying your system to ensure they stay within the safe operating limits.

- Getting Started
- Introduction
- A Word about Batteries
- Connectors and Power Wiring
- Motor Wiring
 - Brushless Motor Wiring, Sensorless Motors
 - Brushless Motor Wiring, Sensored Motors
 - Brushed Motor Wiring, Reversing
- Radio Connection
- Audible Alerts
- Data Logging Lite
- Tuning with Castle Link
 - Castle Link and Windows PC
 - Castle B-Link Adapter and iOS/Android App
 - Field Link Programming Card
 - Transmitter Programming
- Troubleshooting
- Warranty Information
- Transmitter Programming Reference
- Audible Alert Reference
- Castle Technical Support

Getting Started

- Solder a high-quality battery connector to the ESC. See ["Connectors and Power Wiring"](#)
- Mount the ESC and motor into the vehicle.
- Connect motor to the ESC. See ["Motor Wiring"](#)
- Plug in the ESC RX lead. See ["Radio Connection"](#)
- Calibrate your ESC to your radio. See ["How to Calibrate the ESC"](#)

You are now ready to go!

Easy to Use, Sophisticated Enough to Win Everything

Castle controllers are extremely simple to set up and optimize for your application. Most users may simply plug the controller into their motor, radio, and battery and run it immediately.

Advanced users may wish to access the incredible tuning features using their Windows-based PC and the Castle Link USB adapter via a standard USB-mini cable. With Castle Link software you can tune the ESC exactly with point-and-click ease!

Please make sure to read this guide completely to get the most from your Castle ESC.

A Word about Batteries

As with any extremely high-powered electric power system, the primary limitations to ultimate vehicle performance are the batteries and connectors. Use the best batteries and connectors that you can find. The better the batteries, the more punch you'll have! Minimum recommended capacity is 5000mAh+. Do not use 20C continuous discharge batteries. We recommend 30C continuous discharge or higher (or high quality 25C batteries such as Traxxas® Power Cells®). You can't have "too much" C rating, the more the merrier! But using too low of a C rating or capacity will damage your ESC and will not be covered under warranty.

Top-of-the-line cells aren't required for this system to operate normally, but the best cells will certainly allow your Castle system to put more power to the ground.

You cannot trade off capacity (mAh) for C rating or vice versa. You MUST meet the requirements listed above.

Connectors and Power Wiring

Poor quality battery connectors can be a roadblock to performance. Avoid the common "white plastic" connectors seen on many battery packs. A high-performance brushless setup will draw many times the power that these connectors can safely handle. Invest in connector sets made for high-powered electric systems such as our CC Bullets, Castle Polarized Connectors, Traxxas® Power Connectors, XT90, or Deans® Ultra Plugs.

Your Castle ESC has motor connectors directly on the ESC and the battery input wires are bare. You must add the connector of your choice to the battery leads. We recommend a connector rated for 60+ amps, depending on your setup.

Check the amperage ratings of your connectors to make sure they meet the amperage requirements for your application, e.g., don't use 40-amp connectors on a 1/5th scale setup.

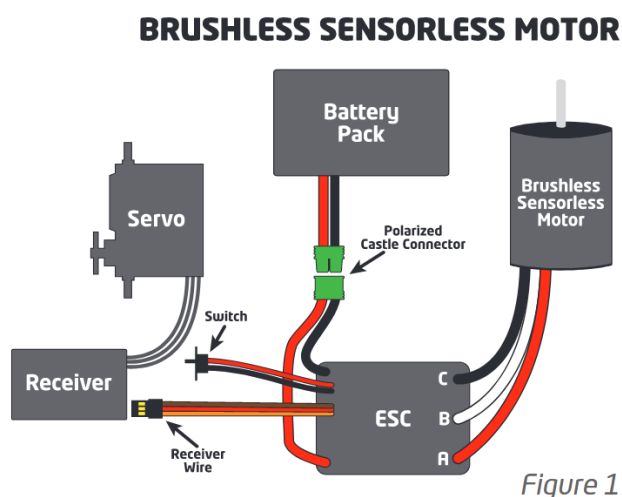
Proper polarity is essential here!

Make absolutely sure positive (+) connects to positive (+), and negative (-) connects to negative (-) when you plug in your battery! If reverse polarity is applied to your ESC from the battery, it WILL damage your ESC. This WILL NOT be covered under warranty!

Motor Wiring

Brushless Motor Wiring, Sensorless Motors (Figure 1)

For sensorless brushless motor connections, the three wires from the ESC to the motor have no polarity. Connect the three wires coming from the motor to the ESC's motor connections in any order. If you are using a motor other than a Castle Creations motor, you may need to either solder the included bullet plugs to your motor or solder the ESC wires directly to the motor wires.

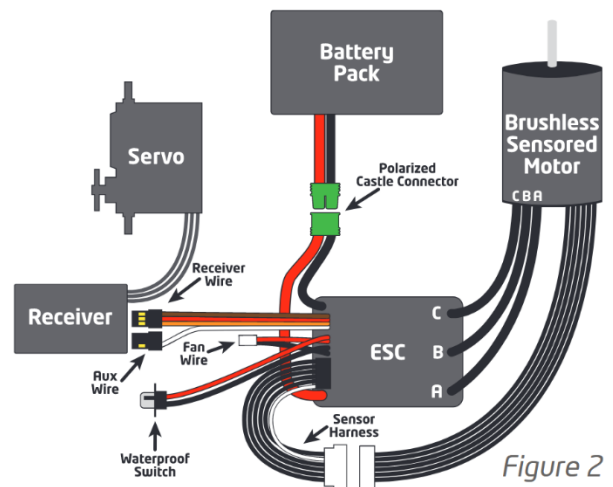


If you choose to direct solder or to shorten the motor wires, you may do so on the Castle Creations 14XX series, 15XX series, 1717, and 2028 motors only. DO NOT CUT any part of the wire length from any other motor, regardless of brand or type. In most cases, only the last 1/4 inch or so of the motor wires are able to be soldered. If they are clipped shorter you may not be able to solder the remaining portion of the wire and the motor will not run properly, if at all.

If the motor is supplied with connectors you do not want to use, simply unsolder the original motor connectors from the wires - do not cut them off.

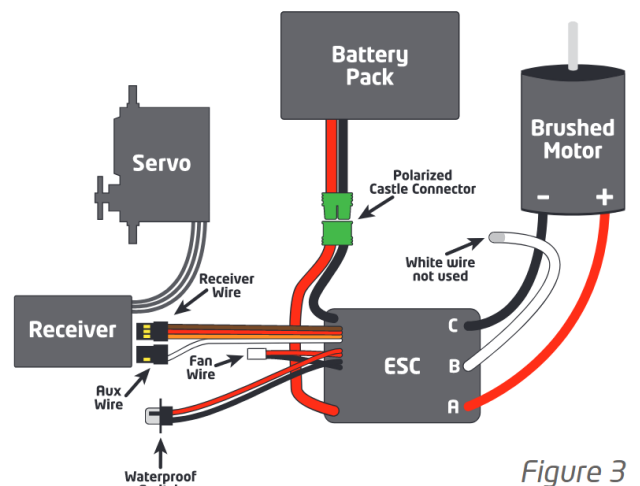
Brushless Motor Wiring, Sensored Motors* (Figure 2):

For sensored brushless motor connections, the three wires from the ESC to the motor DO HAVE polarity. Connect the ESC to the motor. Connect A to A, B to B, C to C, and install the sensor harness after removing the dust cover. In order to change the motor direction, use Castle Link, manually programming or B-Link Adapter.



Brushed Motor Wiring, Reversing (Figure 3)

Use this mode if you wish to use reverse. Make sure you change the Motor Type setting to "Brushed Reversing" in the ESC before using a brushed motor. Connect the motor wires to the two outside motor bullet connectors. In most applications, the red wire from the ESC will connect to the red wire (or positive + side hood) of the motor, and the black wire to the black wire (or negative - side hood) of the motor. The middle bullet connector on the ESC is not used. After calibration (See "How to Calibrate the ESC"), you may need to swap the two motor wires to get the wheels to spin in the right direction.



Radio Connection

RX Wire (Orange/Red/Brown)

Your Castle ESC RX wire plugs into the throttle channel of your receiver. This is usually channel 2. Your Castle ESC provides power to the receiver and the steering servo. No separate receiver battery is needed to power the radio system. Some servos can draw

more current than the on-board BEC can handle and will require an external BEC or receiver pack.

Castle ESC receiver plugs are designed to work with any current receiver, but you will need to make sure the polarity is correct when connected to the receiver. The ESC signal wire is orange or white, the positive wire is red, and the negative wire is brown. Check your receiver documentation for correct connection polarity if it's not marked.

Most receivers use negative (brown) towards the outside of the case and signal (orange/white) towards the channel markings on the case.

Individual transmitter signals for neutral, full throttle, and full brake vary. You must calibrate your Castle ESC so that it will operate effectively with your transmitter. Anytime the ESC is powered up with a new transmitter or with different throttle channel settings, it will need to be calibrated to the transmitter's throttle settings. The ESC may also need to be calibrated after updating to new software via Castle Link.

If you are using a Futaba-made transmitter, you will need to set the transmitter's throttle channel direction to the REVERSE (Rev) position. This is either an external micro switch on the transmitter or an option available within the computer programming of the transmitter. Please start by zeroing out any throttle trim that you may have set in your transmitter.

How to Calibrate The ESC

Safety First! Remove the pinion prior to calibration.

Step 1: Start with the transmitter ON, the battery disconnected, and the ESC switch in the OFF position.

Step 2: Plug a battery into the ESC. If your ESC does not have a switch, hold full throttle on your transmitter before plugging in the battery.

Step 3: Hold full throttle on the transmitter and turn the ESC switch ON. Keep holding full throttle on the transmitter. If all your connections are correct, you will hear one multi-toned initialization "ring" from the motor (all sounds are played by the ESC vibrating the motor).

Step 4: If the ESC's voltage cutoff is set to Auto-LiPo (the default setting), then the ESC will emit a sequence of beeps indicating the number of battery cells.

If the number of beeps does NOT match the number of cells, disconnect the battery and confirm that it is fully charged.

Step 5: After the beeps, the green LED on the ESC will blink rapidly. If the red LED is blinking instead, reverse your throttle channel. After a couple of seconds, the motor will "ring" four times in a row. Next, the ESC will rapidly blink the red LED and the motor will beep continuously. At this point, the full throttle endpoint has been set within the ESC and now it's looking for the full brake endpoint (red LED blinking).

STEP 6: Move the throttle trigger to the full brake position and hold full brake. After a few seconds, the motor will "ring" four times rapidly. The ESC will then blink the yellow LED and the motor will beep continuously. At this point, the full brake endpoint has been set within the ESC and now it's looking for the neutral endpoint (yellow LED blinking).

STEP 7: Now relax the trigger to the neutral position. The ESC will now "ring" four times and flash the yellow LED rapidly to accept the neutral position.

After accepting the neutral position, the ESC will "ring" twice, flash all the LEDs, and the yellow LED will illuminate. This is the arming tone and LED indication that the **ESC IS NOW ARMED** and the vehicle will respond to throttle inputs from your transmitter.

From this point on, when you connect batteries and turn the switch on, the ESC will give the initialization "ring" followed by battery cell count beeps (only in Auto-LiPo mode), and then after the arming delay the ESC will "ring" twice, indicating it is **ARMED** and will respond to throttle application.

If you have problems calibrating your transmitter with the Castle ESC, please see the troubleshooting guide at the end of this manual, visit our www.castlecreations.com/FAQ, or contact our world class technical support department via email or on the phone.

Final Check

Once you are calibrated and armed, do one last check before going out and experiencing the Castle brushless difference. Slowly advance the throttle and check the rotation direction of the motor and the color of the LEDs on the ESC. If the motor is spinning in the right direction and the green LED is blinking, then you are ready for a test run. If the ESC shows the green LED with throttle, but the wheels spin in the wrong direction, you'll need to change the motor direction. See the "Motor Wiring" section.

Closely monitor your ESC and motor temperatures during the first run to ensure they stay within the safe operating limits.

Audible Alerts

The Copperhead ESC will provide you with audible alerts that notify you of various issues and error conditions to help you diagnose problems in your setup. These alerts only occur when the vehicle is stopped and the ESC is in neutral. They repeat every five seconds until the ESC's power is cycled.

Your ESC will emit a single beep every ten seconds to let you know the ESC is powered. This is NOT an error condition. This is simply a reminder to disconnect the battery.

If you wish to silence these features, they can be disabled using Castle Link. See "Disable Idle Beeps" and "Disable Error Beeps" on the "Basic" tab in Castle Link.

The audible alerts consist of a sequence of long and short beeps, repeating every five seconds. To determine the cause of the alert, record • for short beeps and - for long beeps, then match the code you heard to the following list.

The red LED will always blink, even if silenced.

• • Start Fail

The ESC was unable to start the motor. Check your motor wiring and make sure there is nothing interfering with your drive train.

- – **Low Voltage Cutoff**

Main battery voltage dropped below the cutoff value. The default is Auto-LiPo which sets the cutoff value based on the detected cell count. Other options may be entered in Castle Link.

- • • **Sensors Lost***

The ESC detected unusual signals or loss of signal on the sensor cable coming from the motor. Check the sensor cable for good connections to the ESC and motor. If you are not using a sensored motor, ensure the motor type is not set to "Sensored Only" in Castle Link.

- • – **Radio Glitch**

The ESC detected unusual signals or loss of signal on the throttle wire.

- • • **Over-Temperature**

The ESC reached an over-temperature condition. Occurs when operated under too high a load or operated without proper cooling airflow.

- • – **BEC Over-Temperature***

The ESC detected that the integrated BEC is overheating due to current draw above the rating of the BEC. This is commonly caused by faulty servos or a servo that exceeds the amp rating of the BEC. (e.g. digital servos with very high torque/speed values)

- • • • **Datalog Full Warning**

The ESC's internal datalog has reached its capacity. The datalog must be cleared before it can record any new data.

- • • **Motor Over-Temperature***

The ESC detected that the sensored motor's temperature has exceeded the Motor Temperature Cutoff value set in Castle Link. Motor temperature sensors vary. Always

check motor temperatures periodically after making system adjustments. *Only available when running sensored motors with sensor wire connected.

Data Logging Lite

Your Copperhead ESC is able to measure and record important power system information during your race, turn-by-turn. After your run, you can download and analyze this log using Castle Link. You will be able to inspect many parameters including battery voltage, motor RPM, ESC temperature, motor temperature, and ripple voltage.

Recording Duration

The ESC writes the recorded data to a limited amount of memory. Recording time varies with the parameters selected and the sample rate. The ESC compresses data wherever possible; periods at idle or constant throttle do not take very much memory. Use Castle Link to select or deselect parameters logged by the ESC.

Automatic Data Reset

At power up, Automatic Data Reset checks the amount of memory used. If that value is more than the programmed limit, the controller will erase the entire data log. This ensures that the last few runs are saved to memory and available for analysis. The ESC will emit a long beep tone after the arming "rings" to alert you that the data log was erased.

Manual Data Reset

Recorded data can be erased manually by holding your transmitter at full reverse when powering up the ESC. The motor will emit the normal power up chimes. Leave throttle at full reverse for six seconds and the motor will emit a long beep tone. The ESC will then erase the entire data log. Return the throttle to neutral and the ESC will arm.

Tuning with Castle Link™

All Castle ESCs may be connected to your PC using the Castle Link USB adapter. The Castle Link software will give you access to a whole new world of tuning options. You may use Castle Link to tune your throttle and brake curves, set your drag brake feel, and use the incredible Torque Limit to keep the front end of your car on the ground with all the power you have at your command. As new software becomes available, you can install it in your

Castle ESC for new and updated features. All of this ensures your Castle ESC will be the best that it can be.

Using Castle Link

Disconnect the RX (Orange/Red/Brown) wire from your receiver and connect it to the Castle Link USB adapter. Castle ESCs may also be programmed using your transmitter and receiver (see "Transmitter Programming"), or a Field Link Programming Card (see "Field Link Programming Card").

Castle Link Quick Connect

Experienced modelers go to great lengths to tie down their servo and throttle leads - and some find that unplugging a Castle controller from the receiver disrupts all their work. The Castle Link Quick Connect allows you to connect the Castle Link USB adapter without removing wires from your receiver. Visit www.castlecreations.com/quickconnect to purchase online.

Castle B-Link Bluetooth Adapter

The Castle B-Link Bluetooth Adapters allows you access of the settings available via the Castle Link; with the convenience of accessing right from your Apple iOS or Android device.

Field LINK™ Programming Card

You can use a Field Link programming card to easily change many settings at the field without your PC, or it will function as a Castle Link adapter when you do have a PC available. For more information visit www.castlecreations.com/fieldlink.

Transmitter Programming

Transmitter programming is very easy; simply answer YES or NO to a list of options. These are grouped into six settings and each setting has several possible options. You can only accept one option per setting. By answering YES to an option, you will jump to the next setting. If you answer NO to an option, you will move to the next option within that setting.

At each option, you can accept it by going to full throttle on your transmitter, or you can reject the option by going to full brake. In programming terms, full throttle is 'YES' and

full brake is 'NO.' The ESC will indicate that it has accepted your selection by producing a continuous "skipping" tone. When you hear this tone, allow the trigger to go back to the neutral position to advance to the next setting or option depending on your selection.

How to Get into Programming Mode:

- Turn your transmitter on.
- Plug the battery into the ESC with its switch off.
- Hold full throttle on your transmitter and turn the ESC switch on.
- The ESC will go through its boot-up sequence and blink the green LED. If the ESC's voltage cutoff is set to Auto-LiPo (the default setting), then the ESC will emit a sequence of beeps indicating the number of battery cells.

If the number of beeps does NOT match the number of cells, disconnect the battery and confirm that it is fully charged.

- There will be a sequence of four "rings" and the red LED will blink.
- Keep holding the trigger, within 6 – 8 seconds there will be a sequence of four "rings" and the yellow LED will blink.
- You are now in programming mode; let the trigger return to neutral.

Note: Before attempting to manually program the ESC it must be calibrated to your radio. See the "How to Calibrate the ESC" for more details.

To Make Changes in Programming Mode:

Once in programming mode, the ESC will beep once, pause, then beep once again and repeat until a change is made with your transmitter. For instance, if you want to adjust setting 1 (Brake/Reverse Type) to option 1 (With Reverse) you would pull full throttle to select it. When the trigger is returned to neutral the beep pattern will change to 2 beeps followed by 1 beep. By selecting an option, you have now moved on to setting 2 and option 1. If at setting 2 (Cutoff Voltage) you reject option 1 (Auto-LiPo) by going to full brake/reverse, the beep pattern will then change to 2 beeps followed by 2 beeps. This means the ESC is still at setting 2 but is now asking if you would like to accept option 2 (None).

Reject options unless you wish to change that specific setting. As an example, say you want to adjust the Drag Brake to 20%. Work through the settings and options, rejecting all options until you get to 4 beeps, meaning setting 4 (Drag Brake), followed by 3 beeps, meaning option 3 (20%). Select this option by going to full throttle. Once you have changed the setting you want, you can unplug power from the ESC to get out of programming mode. You do not need to finish all the settings. The ESC will store your changes until you change them again.

The next section of the manual gives a description of each of the settings and options and what to expect when you change an option from default.

There is a reference guide on the last page.

1. Brake/Reverse Type

Sets whether reverse is enabled or not, and exactly how it can be accessed.

- **Option 1: With Reverse (Default)**

This setting allows the use of reverse only after the ESC senses the vehicle has come to a stop. Use it for race practice sessions and bashing, but check with your race director to see if this setting is allowed for actual racing.

- **Option 2: Without Reverse**

Reverse cannot be accessed under any circumstances with this setting. Use this setting for sanctioned racing events that do not allow reverse driving.

- **Option 3: Crawler Reverse**

Reverse or forward is accessible at any time, even if the vehicle is still moving.

2. Cutoff Voltage

Sets the voltage at which the ESC stops the motor in order to protect the battery from over-discharge.

Option 1: Auto-LiPo (Default)

This setting automatically detects the number of LiPo cells you have plugged in. It will automatically set the cutoff to 3.2 volts per cell detected. The ESC will beep the number

of cells detected between the initialization "ring" and the arming "rings" on initial power up of the ESC.

If the number of cells indicated does not match the number of cells in your LiPo pack, do not operate the vehicle. Unplug your battery and ensure that it is fully charged.

Check with your battery manufacturer to make sure 3.2V per cell is their recommended cutoff. You can change this value in Castle Link if a higher per cell voltage is needed.

Option 2: None

This setting disables low voltage cutoff.

Do not use this setting with any Lithium pack! Use this setting ONLY with NiCad or NiMH packs.

3. Brake Amount

Sets what percentage of available braking power is applied with full brake.

Option 1: 25% Power

Option 3: 75% Power

Option 2: 50% Power (Default) Option 4: 100% Power

4. Drag Brake

Sets the amount of brake applied at neutral throttle for a slight braking effect while coasting.

Option 1: Drag Brake Disabled (Default)

Vehicle will coast with minimal resistance from the motor at neutral throttle.

Option 2: Drag Brake 10%

Low amount of braking effect from the motor at neutral throttle.

Option 3: Drag Brake 20%

Moderate braking effect from the motor at neutral throttle.

Option 4: Drag Brake 30%

High braking effect from the motor at neutral throttle.

Option 5: Crawler Full On

This setting applies full brake at neutral throttle to prevent crawler-type vehicles from rolling or coasting when stopping on an incline.

5. Motor Type

Sets which type of motor you will use with the Castle ESC. **The ESC may be damaged if this setting does not match the motor type/hook-up method in the car, and this damage is NOT covered under warranty.**

Option 1: Brushless (Default)

See Brushless Motor Setup, figure 1

Option 2: Brushed Reversing

See Reversing Brushed Motor Setup, figure 3

6. Motor Direction

Allows you to change the motor direction.

Option 1: Normal (Default)

Option 2: Reverse

Troubleshooting

If you're still having difficulties with your Castle ESC after trying the suggestions offered here, please contact Castle Creations technical support at the email or phone number listed in the next section.

Problem: My Castle ESC may or may not arm, but it will not calibrate to my transmitter.

Solution: Most calibration issues can be solved by changing settings on the transmitter. Make sure you have both your throttle and brake endpoints (called EPA or ATV on your radio) on the throttle channel set to between 100 to 120%. If you have a Futaba-made transmitter, make sure to have the throttle channel set to the reversed position. See "How to Calibrate the ESC".

Problem: My ESC calibrates for the full throttle and full brake positions but won't calibrate to the neutral throttle position (yellow LED keeps flashing with single beeps).

Solution: Try moving the throttle trim one way, then the other. If your transmitter has a 50/50 and 70/30 setting for the throttle, set it for 50/50 and retry calibration. If you have changed the throttle dead band to a narrower band using Castle Link, you may want to try going back to the "normal" setting.

If you have changed the motor type to "Sensored only" using Castle Link and the ESC is not beeping, the yellow flashing light at neutral is normal and the ESC is ready for use.

Problem: My vehicle acts like it has "turbo lag" (poor acceleration/punch for the first few feet or yards, and then it "kicks in").

Solution: Make sure you're using high quality batteries and a battery connector capable of high amp flow (60+ amps). Ensure connector is properly sized for your application. This behavior is very typical of a battery pack that is having difficulty providing the power your system requires for top performance. Refer to "A Word about batteries" section for recommended battery capacity and C ratings for use with Castle ESCs.

For NiCad/NiMH packs, use copper bars to connect cells rather than welded tabs.

Problem: My battery pack is plugged into the ESC and nothing is working - no steering and no throttle.

Solution: Make sure the ESC's RX wire is plugged into channel 2 on the receiver, and that it's plugged in with the correct orientation. Double check your solder connections on the battery plug, and make sure the battery is charged.

For more troubleshooting tips visit www.castlecreations.com/FAQ

Warranty Info

Your Castle ESC is warranted for one (1) year from date of purchase to be free from manufacturing and component defects. This warranty does not cover damages caused to your motor or controller from abuse. Abuse includes, but is not limited to, incorrect wiring, over-voltage, overloading, improper gearing, improper motor selection, incorrect controller settings, insufficient batteries or inadequate connectors.

If you have any questions, comments, or wish to return your Castle ESC for warranty or non-warranty repair or replacement, please visit www.castlecreations.com/support before contacting us directly.

Transmitter Programming Reference

*Default Setting

1.Brake/Reverse Type

- With Reverse*
- Without Reverse
- Crawler Reverse

3. Brake Amount

- 25%
- 50%*
- 75%
- 100%

5. Motor Type

- Brushless*
- Brushed Reversing
- Brushed High Power

2.Voltage Cutoff

- Auto-Lipo*

4. Drag Brake

- Disabled*
- 10%
- 20%
- 30%
- Crawler Full On

6. Motor Direction

- Normal*
- Reversing

Audible Alert Reference

Start Fail	• •
Low Voltage Cutoff	• —
BEC Over-Temperature	— • —
Sensors Lost	• • •
Motor Over-Temperature	— — •
Radio Glitch	• • —
Datalog Full Warning	• • • •
Over-Temperature	• — •

Castle Technical support

You may contact our world-class technical support department via e-mail anytime or by phone. Please visit Castle Creations website for technical support hours.

Website: www.castlecreations.com/support

E-mail: home.castlecreations.com/contact-support

Phone: (913) 390-6939, option #1. Mon-Fri, 9AM-4PM CST.