



UNDERSTANDING ELECTRICS

Part 3 The Electronic Speed Controller (ESC)

All radio controlled speed controllers designed for our electric brushless flight motors look very similar. The main body is usually rectangular and covered with heat shrink. Inside you will find a circuit board attached to a flat metal heat sink. The electric power comes into the unit through the red (positive) and black (negative) wires that protrude from one end and these are connected to the battery (red to red and black to black).

The electronic circuitry converts the direct current input into the pulses required to power the motor and these are fed to the motor through the three wires that protrude from the other end of the unit. These wires can be connected to the motor in any order. If when the motor is started it runs in the wrong direction change over any two of these wires and the motor will run in the other direction.

Speed controllers are not 100 percent efficient and some of the electrical energy is converted to heat, hence the need for a heat sink

to keep the circuit board cool. It is important that the controller is mounted with some airflow around it so that the heat sink can work efficiently.

There is one other wire that exits from the body of a speed controller and this is of the same type you find on servos and this should be plugged into the throttle channel of your receiver.

A Typical Speed Controller

Choosing a suitable speed controller:-

1. If you are new to electrics I would recommend you buy a new ESC. The latest units are all fully protected against accidental start up when connecting the battery if the receiver or transmitter are not on or if the throttle setting is above zero. Some of the earlier units you may pick up cheap on the second hand market may not have these finger saving features as ESC's have improved in many ways over the last few years.
2. You should have already chosen your motor and thus know both the maximum voltage (number of cells) and the maximum current (amps) you wish to run at.
3. Choose a speed controller that will work in your voltage range. They are clearly marked eg. 3 to 6 lipos or it may state a voltage range as in the picture example of 5.6 volts to 26 volts (2 to 6 Lipos).

4. Choose a speed controller that will exceed your maximum current by approximately 10 to 20 percent eg If your maximum current is 35 amp buy a 40amp controller. Do not try to use a speed controller rated less than your potential maximum current as it will overload cut your motor when you go to full power. You will often see two current values on a speed controller. IGNORE the short burst value and only use the continuous current value using the above guidelines

There are two main types of speed controller:-

1. Those that supply power to the receiver as well as controlling the motor. These are called BEC controllers. BEC stands for battery eliminating circuitry meaning that a separate battery for the receiver is not required. This type of speed controller uses the main power lipo to supply the motor at the full pack voltage as well as reducing the voltage to 5 or 6 volts to supply the receiver.
2. Those that only supply power the motor. These are called OPTO (Opto-isolation) controllers and must be used with a separate power source to supply the receiver. OPTO controllers reduce the level of radio interference that can be created, especially at high currents, by electrically isolating the signal from the radio throttle channel to the speed controller.

Please note that it is possible to use a BEC unit with a separate receiver power supply by removing the middle wire from the lead from speed controller to the receiver. The



separate power supply plugs into the normal battery socket of the receiver.

Label on Speed Controller clearly shows all of the specifications

discussed in this article.

The rules I use for choosing which type of speed controller are quite simple:-

1. I do not use a BEC speed controller to supply power to the receiver on models of more than about 7lb weight.
2. I do not use a BEC speed controller to supply power to the receiver on models using more than 4 lipo cells.
3. All my larger, more powerful models use OPTO controllers or BEC controllers with the middle wire disconnected. The receiver is powered via a separate power source.

Speed controllers come set up for general sport flying. The manufacturer's instructions will tell you how to adjust for specialist applications such as a brake to enable glider props to fold.

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