

## Brushless Electronic Speed Controller Operating Instructions

Thank you for purchasing an Airtek Synergie Brushless Motor Electronic Speed Controller. This has been manufactured to the highest standards, and when used within the specifications will provide a long and trouble free service life. The Synergie range can be used with fixed wing, helicopters and multi-rotors.

Your ESC wires are provided bare ended for you to solder your own connectors. We recommend that you use good quality gold bullet connectors for the 3 black motor wires (female on the ESC) and your chosen type of battery connector to the + and - wires (male end to the ESC). Please ensure you solder the battery connection for correct polarity, i.e red for +, black for - and that all connections are isolated by heat shrink tube. (all these items are available from [www.airtekhobbies.com](http://www.airtekhobbies.com)).

The Synergie series provide all the main functions most modellers desire, and can be programmed from the transmitter or by using the optional programming card.

Connect the ESC to your receiver and motor. The universal srvo plug fits into the throttle channel of your receiver; the battery connector to your lipo (but ONLY when you are ready to test/fly) and the three motor wires connect to your motor via the bullet connectors. Note: you can connect any ESC wire to any of the three motor wires. However if you find that the motor runs in reverse simply swap any two wires over. For Futaba systems the throttle channel should be set to REV.

<b>SYNERGIE SPECIFICATIONS</b>	Continuous Current	Burst Current (10s)	Lipo Cell Count	Dimensions LxWxH (mm)	Weight inc Wires	BEC Mode	BEC Output
<b>Synergie 6A BEC</b>	6A	8A	1-2	22x13x6	6g	Linear	0.8A/5V
<b>Synergie 12A BEC</b>	12A	15A	2-4	42x20x8	11g	Linear	1A/5V
<b>Synergie 20A BEC</b>	20A	25A	2-4	52x26x7	28g	Linear	2A/5V
<b>Synergie 30A BEC</b>	30A	40A	2-4	52x26x7	28g	Linear	2A/5V
<b>Synergie 40A SBEC</b>	40A	50A	2-6	73x28x12	41g	Switch	3A/5V
<b>Synergie 60A SBEC</b>	60A	80A	2-6	73x36x12	63g	Switch	5A/5V
<b>Synergie 80A SBEC</b>	80A	100A	2-6	86x38x12	81g	Switch	5A/5V

### Initial Set up of your Synergie ESC

**WARNING! When setting up your model with the prop attached TAKE GREAT CARE. Always ensure the model is adequately restrained and there are no loose items about. ESCs can arm unexpectedly particularly in the set-up stage.**

Your Synergie ESC is designed to work with all modern R/C systems. When you connect it to a new system/receiver you need to calibrate the throttle range. If you have a computer system we recommend you do this first with a 'clean' programming set up i.e. items such as end point adjustment, sub trims, throttle curves set at their neutral default values.

With the ESC connected to the throttle output of your receiver switch on the transmitter then move the throttle stick to the top position. Connect the Lipo to the ESC - 2 'BEEP' sounds should be emitted. This means the top point of the throttle range has been confirmed and saved. Then move the throttle stick to the bottom position (within 2 seconds), a long 'BEEP' should be emitted meaning the bottom point of the throttle range has been confirmed and saved. Several 'BEEP' tones should then be emitted to confirm the number of battery cells (the number of which will, of course, vary depending on the voltage/cell count of the connected lipo). When the self-test is finished a "♪123" tune should be emitted. After calibration if the throttle stick is set at anything other than low or high setting it will make constant 'BEEP' sounds until the throttle stick is either moved to the low position when the ESC will be armed ready for flight, or high position where it will enter programming mode.

### Normal Start-up Procedure

When your ESC has been calibrated and programmed as desired please observe the following start-up procedure:

Move the throttle stick to the bottom position THEN switch on the transmitter. THEN connect your lipo to the ESC which will perform a short test sequence before arming ready for flight. The test sequence starts with a long 'BEEP' which indicates that the bottom end of the throttle range has been detected. Several 'BEEP' tones should then be emitted to denote the number of battery cells attached. When the self-test is finished a "♪123" tune should be emitted. You can then advance the throttle and proceed to fly/crash in the usual way!

### Programming your Synergie ESC

As supplied your Synergie ESC is pre-programmed with certain default values, and for many these may prove to be just right for normal use. However, your ESC can be programmed for many different parameters by following these instructions. There are 2 ways you can programme your Synergie ESC. The first, and certainly the easiest is to use the optional programming card (item SEPC1 available from [www.airtekhobbies.com](http://www.airtekhobbies.com)). These make programming the ESC very simple. to programme this way please follow the instructions that are included with the programming card. The second is to programme via the transmitter/throttle stick. Instructions for this are shown overleaf.

# Programmable Parameters available on your Synergie ESC

## 1. Brake Type

Many flyers prefer a brake to be set on the motor to prevent the prop 'free-wheeling' or 'wind-milling' when the power is cut. For users of folding prop assemblies this is essential as it allows the blades to stop and fold back against the fuselage resulting in a reduction in drag. There are six brake types that can be programmed into the ESC. OFF - the brake is not set, Low - the brake is set but with a low braking force, Mid-Low, Middle (recommended for general use), Mid-High and High (fast acting braking with maximum holding force).

## 2. Timing Mode

The explanation of ESC timing is really beyond this instruction sheet, but for those interested there is a lot of extra information available on the internet. WE RECOMMEND IF YOU ARE UNSURE ABOUT TIMING ISSUES YOU LEAVE THESE AT THE DEFAULT (15°). In general terms high timing is recommended for high kv/low inductance motors, and low timing for low kv/high inductance motors. In broad terms higher timing will increase RPM and motor temp and lower timing will drop the RPM and the motor will run cooler. Most of the time you can just leave it on medium to get a good balance of performance/temperature. If your motor 'screeches' or has starting difficulties it may be worthwhile experimenting with the timing.

There are 5 timing modes available Low: 0°, Mid-low: 8°, Middle:15° (default), Mid-high:23° and High:30°

## 3. Starting Force

There are 13 options for starting force, 0.03, 0.05, 0.06, 0.09, 0.13, 0.19, 0.25, 0.38, 0.50, 0.75, 1.00, 1.25, 1.50. The default is 0.75. WE RECOMMEND IF YOU ARE UNSURE ABOUT SETTING THE STARTING FORCE YOU LEAVE AT THE DEFAULT VALUE (0.75)

## 4. Open Entry

This is reserved for future programming options and contains no user changeable parameters.

## 5. Control Frequency

Most users will not need to adjust the Control Frequency and will leave it at the default value of 8KHz. for advanced users there is a second value of 22KHz

## 6. Low Voltage Protection

Lipo batteries are easily ruined if an individual cell goes below the minimum voltage threshold. Your Synergie ESC has a built-in low-voltage protection system. When your lipo reaches the critical voltage you have set the ESC will shut down power to the motor, leaving enough power for your receiver and servos to allow you to land or crash (whichever is your preference!). There are three settings available 2.8v per cell, 3.0v per cell (default) or 3.2v per cell. We recommend using one of the 2 highest values.

## 7. Cut-Off Mode

The cut-off mode determines how the ESC cuts off the motor when the voltage reaches the set low voltage protection threshold (please see value 6 above). There are 2 options, soft-cut (the default) and cut-off. With soft cut the ESC gradually reduces power to 30% of the current power. Cut-off immediately shuts down the motor to zero when the low voltage protection threshold is reached. Under either setting when the throttle is reduced to the lowest value and then pushed back to high the motor will re-start for a short burst. This can be useful in an emergency situation when on a 'dead stick' landing.

# Programming the Synergie ESC via the Transmitter

## STEP 1 - Entering the Programming Mode

Switch the transmitter ON. Push the throttle stick to the TOP position. THEN connect the ESC to the lipo. After 2 seconds there will be 2 'BEEP' sounds which confirms that maximum throttle has been detected. Keep the throttle stick at the top position, wait a further 2 seconds until you hear a tune - ♪ 1 2 3 ♪ 1 2 3. You are now in programming mode.

## STEP 2 - Selecting Programming Parameters

Hold the throttle stick at its maximum position. There are 7 different parameters that you can set up with the transmitter. You will hear 7 different 'BEEP' combinations which correspond to each of the 7 different parameters. When you hear the "BEEP" combination of the parameter you wish to programme pull the throttle stick to the lowest position within 2 seconds. The indicating sounds are:

1. 'BEEP' (one short sound) which indicates you are in BRAKE TYPE mode
2. 'BEEP-BEEP' (two short sounds) which indicates you are in TIMING mode
3. 'BEEP-BEEP-BEEP' (three short sounds) which indicates you are in START FORCE mode
4. 'BEEP-BEEP-BEEP-BEEP' (four short sounds) This is a blank setting which contains no user selectable parameters
5. 'BEEP.....' (one long sound) which indicates you are in CONTROL FREQUENCY mode
6. 'BEEP.....BEEP' (one long and one short sound) which indicates you are in LOW-VOLTAGE PROTECTION mode
7. 'BEEP.....BEEP-BEEP' (one long sound and two short sounds) which indicates you are in CUTOFF mode

Please note these selections are sequential i.e. if you wish to programme START FORCE settings you have to wait until it has cycled through BRAKE TYPE and TIMING modes. If you miss your setting the programme will cycle again from values 1 to 7 after a short break.

## STEP 3 - Selecting Programming Values

When you have entered the Programming Parameter you desire to change as described above you then need to set the parameter to your desired value. Pull the throttle stick fully back WITHIN 2 SECONDS when you hear the 'BEEP' sequence of your chosen parameter as described in step 2. You will then get a sequence of 'BEEPS' similar to those you heard in step 2. There will be a distinct pause between each 'BEEP' or sequence of 'BEEPS' as it scrolls through the available programming values. The first value is always a single 'BEEP' and the number of options will vary according to the number of programming options of your chosen parameter. When you have reached your desired sequence of 'BEEPS' pull the throttle stick to the lowest setting WITHIN 2 SECONDS then you will hear a tune ♪ 3 2 1 ♪ 3 2 1 and your parameter is set. For the parameter values please refer to the options under numbers 1 to 7 at the head of this page which are described in the order of the 'BEEPS'

## Confused?

Programming ESC's from the transmitter can often be a confusing process, so please find below a practical example to follow:

Let's say we have a powered glider fitted with a folding prop unit and we want to set the brake so the blades will fold back when the motor stops and we can then enjoy some soaring. By default the brake is set to 'off' so we obviously need to programme the ESC to set the brake for us. Firstly we have to decide which brake option we want. Lets keep it simple and go for the default value of MIDDLE. If we look at the details on the brake types under section 1 we will see that brake type MIDDLE is the 4th option available ( OFF = 1, Low = 2, Mid-Low = 3 and **MIDDLE = 4**). Therefore we follow step 1 to enter the programming mode, then follow step 2 to select the parameter (which in our case of BRAKE is parameter number 1). We then go to Step 3 where we will select the 4th 'BEEP' set ('BEEP', BEEP-BEEP', BEEP-BEEP-BEEP, and then ours '**BEEP-BEEP-BEEP-BEEP**'). When you hear this sequence of beeps, pull the throttle stick back, wait for the catchy tune then your brake is set.

If you are struggling with programming your ESC please consider purchasing the optional programming card which makes it all much, much easier!

## Restoring Factory Settings

To restore the factory settings pull the throttle stick to the bottom position WITHIN 1 SECOND of entering the programming mode as described in step 1 above. Then WITHIN 2 SECONDS push the throttle stick to the top position when you will hear a tune which means the factory settings have been restored, then finally pull the throttle stick to the bottom position WITHIN 2 SECONDS.

We wish you many enjoyable hours of service from your Airtek Synergie ESC. For a full range of products to compliment your ESC please visit [www.airtekhobbies.com](http://www.airtekhobbies.com)

