

SUPER VORTEX ZERO

Sensored Brushless Competition ESC

USER'S GUIDE

AIRTRONICS
Get The Advantage.
#96338

FEATURES AND SPECIFICATIONS

- Brushless Sensored Design w/Custom Sanwa Programming
- Adjustable Voltage Cutoff
- Twelve Programming Modes (Red, Blue & Green Setup LEDs)
- Thermal Overload Protection Circuit
- Compatible with Normal, SHR and SSR Channel Modes*
- Supports Remote Programming via Transmitter*
- Input Power (Cells): 1S or 2S LiPo (4C to 6C Ni-Cd/Ni-MH)
- Motor Limit: 3.5T w/1S LiPo or 4.5T w/2S LiPo
- On Resistance: 0.00038 ohms
- Rated Current : 740 Amps/Phase @ 25°C (77°F)
- BEC: 6.0V/3.0A
- Dimensions: 1.25 x 1.39 x 0.77" (32.0 x 35.5 x 19.7mm)
- Weight: 42g (Excluding Wiring and Power Capacitor)

*When used with compatible Airtronics or Sanwa transmitter and receiver.

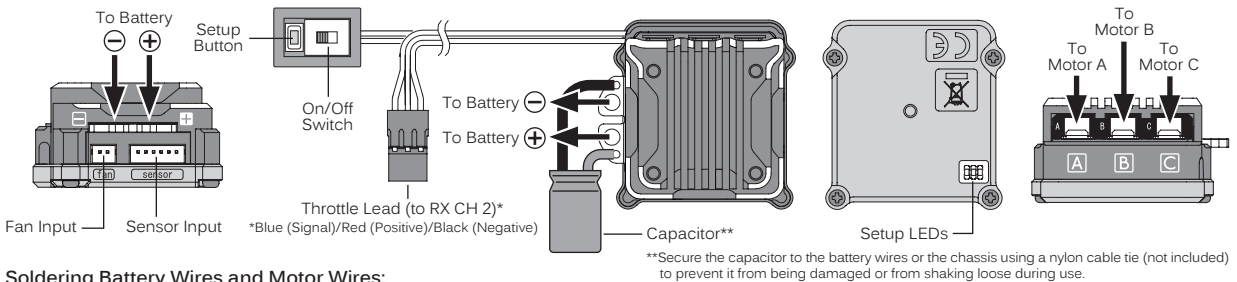
WHAT'S INCLUDED

- Super Vortex Zero Competition ESC
- Sensor Cable
- Cooling Fan w/Mounting Screws
- 3 Feet 12AWG Flexible Silicone Wire
- Heat-Shrink Tubing
- User's Guide

PRECAUTIONS AND WARNINGS

- This ESC is designed for use with Airtronics or Sanwa 2.4GHz radio systems. Functionality of this ESC with radio system brands other than Airtronics or Sanwa may differ. Carefully check the function of the radio system when a brand other than Airtronics or Sanwa is used.
- This ESC is designed for use with 3.5T or greater (w/1S LiPo) and 4.5T or greater (w/2S LiPo) sensored brushless motors only.
- When soldering the motor and battery wires to the ESC, be careful not to overheat the mounting posts or damage can result.
- When soldering your battery connector and battery wires to the ESC, please observe correct polarity. Plugging the battery into the ESC with reverse polarity will damage the ESC beyond repair! Use high-quality 4mm bullet connectors, Dean's Ultra-Plug or similar.
- The power capacitor installed on the ESC is mandatory for proper use. Do not remove the power capacitor.
- Do not use a battery with a nominal input voltage greater than 7.4 volts (2S LiPo or 6C Ni-Cd/Ni-MH).
- If the ESC and/or your battery become hot, disconnect your battery from the ESC immediately and allow the ESC and/or your battery to cool down before reconnecting.
- Mount the ESC using double-sided foam tape and in a position that allows for adequate airflow. If airflow is limited, install the included cooling fan onto the ESC if room permits under your vehicle's body.
- Turn your transmitter ON before turning the ESC ON and turn the ESC OFF before turning your transmitter OFF.
- Always disconnect your battery from the ESC when not in use.
- The ESC is not waterproof. Do not run through water or allow the ESC to become wet with moisture or the ESC can be damaged.
- Maintain your motor on a regular basis to ensure high performance. Degradation of motor performance can put undue stress on the ESC, resulting in damage to the ESC.

OVERVIEW, CONNECTIONS AND MOUNTING



Soldering Battery Wires and Motor Wires:

IMPORTANT: When soldering your battery connector and battery wires to the ESC, please observe correct polarity - positive to positive and negative to negative. When soldering the motor wires to the ESC and your motor, make sure that the wiring matches - A, B and C from the ESC to A, B and C on your motor. Refer to the diagrams above.

- 1) Cut the silicone wire included into three lengths long enough to connect between the ESC and your motor, then two equal lengths long enough to connect between the ESC and your battery. Strip approximately 3/32" to 1/8" of insulation off the ends of the wires to prepare them for soldering. For optimum performance, the motor wires (A, B and C) should all be equal length.
- 2) Using a rosin-core solder and a sufficiently hot soldering iron, pre-tin the ends of each wire. To do this, heat the end of the wire and apply solder until it is thoroughly covered. Next, pre-tin the battery mounting posts and motor mounting posts on the ESC by heating each mounting post and applying enough solder to cover the mounting post with a thin layer of solder.

WARNING: Do not leave the soldering iron on the mounting posts for any longer than is necessary to melt the solder. If the mounting posts overheat, it can damage the ESC. A suitably hot soldering should not be left on the mounting posts longer than about 5 seconds. If the solder is not melting within about 5 seconds, use a hotter soldering iron.

- 3) While holding the tinned end of the wire in contact with the mounting post, hold the soldering iron in contact with both the wire and the mounting post. Wait a couple of seconds for the solder to melt and flow between the two parts, then remove the soldering iron. Continue to hold the wire in place for a couple of seconds, then let loose after the solder cools.
- 4) Repeat the previous procedures to solder the remaining wires to the ESC, then to solder the motor wires to your motor and the battery wires to your battery connector (use high-quality 4mm bullet connectors, Dean's Ultra-Plug or similar). We recommend that you use heat-shrink tubing to insulate the solder joints between the battery wires and your battery connector(s).

OVERVIEW, CONNECTIONS AND MOUNTING

Mounting the ESC:

- 1) Using two suitable sizes of double-sided foam tape, mount the ESC and the ESC On/Off switch to your model's chassis.
- 2) Securely plug one end of the sensor cable into the Sensor Input socket on the ESC, then securely plug the other end of the sensor cable into the Sensor Input socket on your motor. Both ends of the sensor cable are the same.
- 3) Plug the throttle lead into the throttle channel slot (usually channel 2) in your receiver, observing correct polarity - Blue (Signal), Red (Positive) and Black (Negative). The plug is universal, so it should work with all modern major brand receivers.

IMPORTANT: When used with a receiver battery or a DC-Booster, please do not connect the pin of the positive terminal of the throttle lead to the receiver throttle channel slot.

ESC Mounting Tips:

- For maximum efficiency, orientate the ESC so that the cooling fins are parallel to the airflow. Do not wrap the ESC in foam rubber or in any way block airflow to the cooling fins.
- Install the On/Off switch on the chassis of your model in a location that's convenient to access and that doesn't interfere with any moving parts. In addition, it may be necessary to secure the battery and/or motor wires to your chassis to prevent damage to them.
- Secure the capacitor to the ESC battery wires or the chassis using a nylon cable tie (not included) to prevent it from being damaged or from shaking loose during use.
- In most cases, the use of the included cooling fan isn't necessary, but in some cases, such as when there is limited airflow over the ESC or if your using a higher than normal Timing Advance value, the cooling fan can help prevent the ESC from going into thermal shutdown. When installing it, tighten the mounting screws (included) evenly to ensure you don't warp the cooling fan.

TRANSMITTER SETUP AND CALIBRATING THROTTLE END POINTS

Prior to plugging in your battery and turning the ESC ON, set up your transmitter as described in this section. This will ensure proper ESC operation.

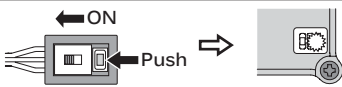
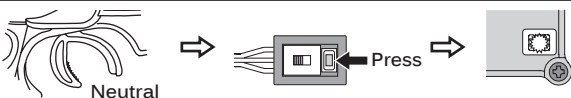
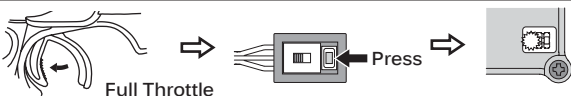
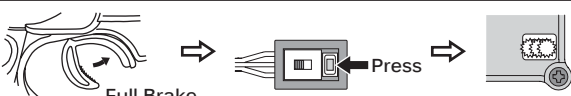
- 1) Adjust your transmitter's throttle channel D/R, EPA, EXP, ARC, Sub-Trim and Servo Reversing settings to the values shown in the table at right. Refer to your transmitter's User's Guide for information about changing these settings. Not all transmitters may support all options.

Throttle Channel High Side and Brake Side D/R	100%
Throttle Channel High Side and Brake Side EPA	100%
Throttle Channel High Side and Brake Side EXP	OFF or 0%
Throttle Channel High Side and Brake Side ARC	OFF or 0%
Throttle Channel Sub-Trim	0 or Centered
Throttle Channel Servo Reversing*	NOR or REV

The steps below assume your transmitter and receiver have already been paired. Although in most cases it's possible to bind your transmitter and receiver with the ESC powering your receiver, in some cases you may need to unplug the ESC and bind your transmitter and receiver using a separate receiver battery pack. Once the binding procedure is complete, you can unplug the separate battery pack and plug the ESC back into you receiver.

WARNING: To prevent any chance of a runaway model, or damage or injury during the calibration process, remove the pinion gear from your motor. After completing the calibration process, reinstall the pinion gear.

*Do not change after calibration.

1	Verify that the ESC On/Off switch is turned OFF. With the throttle trigger in the neutral position, turn your transmitter ON, then plug your fully-charged battery into the ESC, making sure to observe correct polarity.	
2	Turn the ESC On/Off switch ON. Press and hold the Setup Button. The Setup LED will turn solid green.	
3	With the throttle trigger in the neutral position, press the Setup Button. The Setup LED will turn solid blue, indicating the throttle neutral position is stored.	
4	While holding the throttle trigger in the full throttle position, press the Setup Button. The Setup LED will turn solid red, indicating the full throttle position is stored. Release the throttle trigger.	
5	While holding the throttle trigger in the full brake position, press the Setup Button. The Setup LEDs will turn solid red, blue and green, indicating the full brake position is stored and the calibration process is complete. Release the throttle trigger.	

IMPORTANT: The steps above only need to be done once, unless you change transmitters or make changes to your transmitter's throttle channel preferences, in which case you should repeat the calibration steps. After calibrating the throttle end points, increasing throttle channel EPA will not increase motor speed, however, decreasing throttle channel EPA will.

LED THROTTLE POSITION CONDITION INDICATORS

When the throttle trigger is moved, the Setup LEDs will illuminate solid, flash or flash rapidly, allowing you to visually verify ESC performance relative to throttle trigger position. This ensures your throttle is working and calibrated correctly throughout the entire range of deflection in both directions.

Use the table at right to determine the throttle trigger position based on the Setup LED condition.

Throttle Trigger Position	Setup LED
Neutral (with Advanced Timing OFF)	Flashing Blue
Neutral (with Advanced Timing ON)	Solid Blue
Any Throttle Setting Other Than Full (SSR Mode)	Flashing Blue Rapidly
Any Throttle Setting Other Than Full (NOR/SHR Mode)	Flashing Red Rapidly
Full Throttle	Solid Blue
Any Brake or Reverse Setting Other Than Full	Flashing Red Rapidly
Full Brake or Full Reverse	Solid Red

The Super Vortex Zero supports twelve different Programming Modes with various Programming Mode Values that can be changed to suit your specific needs. The Setup LEDs will flash to indicate the current Programming Mode and Programming Mode Value:

Blue and Red LED - The number of blue LED flashes indicates the current Programming Mode you're in. The LED will flash red when you enter the Setup Mode to change Programming Mode Values.

Green LED - The number of flashes indicates the current Programming Mode Value within the Programming Mode.

The Super Vortex Zero functions in three different modes as described:

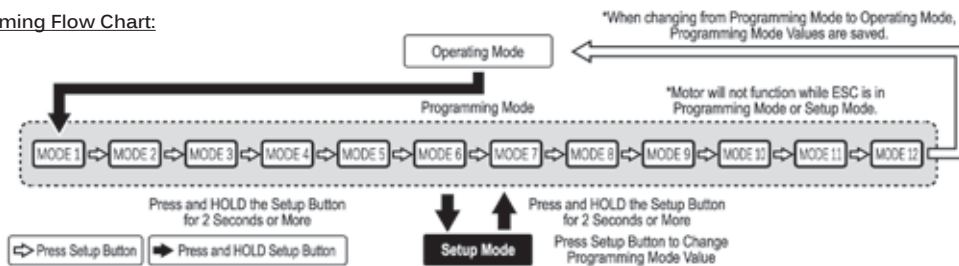
Operating Mode - This mode is used under normal operating conditions (e.g., when you're driving your model).

Programming Mode - This mode is used to choose one of the twelve available Programming Modes.

Setup Mode - This mode is used to choose one of the various Programming Mode Values within a chosen Programming Mode.

1	Enter Programming Mode	Press and HOLD the Setup Button for 4 seconds or more. The Setup LEDs will flash, indicating the ESC is in Programming Mode. Release the Setup Button.
2	Changing Programming Modes	Press the Setup Button to cycle through the twelve different Programming Modes. The blue LED will flash a specific number of times, indicating the current Programming Mode and the green LED will flash a specific number of times, indicating the current Programming Mode Value within that Programming Mode.
3	Changing Programming Mode Values (Setup Mode)	From within the desired Programming Mode, press and HOLD the Setup Button for 2 seconds or more to enter the Setup Mode. The red and green LEDs will both flash a specific number of times, indicating the current Programming Mode Value. Press the Setup Button to choose the desired Programming Mode Value. The red and green LEDs will flash a specific number of times, indicating the new current Programming Mode Value you chose. After choosing the desired Programming Mode Value, press and HOLD the Setup Button for 2 seconds or more to return to the Programming Mode as described in step 2 above. Repeat steps 2 and 3 to select another Programming Mode and change its Programming Mode Value.
4	Saving Programming Mode Values	From within the Programming Mode, press the Setup Button to cycle through the twelve Programming Modes and return to the Operating Mode. The Setup LEDs will turn solid (if Timing Advance is Enabled) or flash blue (if Timing Advance is Disabled), indicating your Programming Mode Values have been saved. IMPORTANT: If you don't want to save your Programming Mode Values, turn the ESC OFF and back ON before returning to the Operating Mode as described.

ESC Programming Flow Chart:



Programming Modes and Programming Mode Values:

MODE 1 (Cut-Off Voltage) Ensure that the Cut-Off Voltage value you choose matches the battery type you're using.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
OFF	3.0v	3.3v	3.6v	4.0v	4.4v	4.8v	5.2v	5.6v	6.0v	6.4v

MODE 2 (Reverse) Enable or Disable Reverse function. Reverse is 50% of speed of forward.

#1	#2
Disabled	Enabled

MODE 3 (Thermal Protection) ESC and motor over-heat protection. Requires motor be equipped with temperature sensor.

#1	#2	#3	#4	#5	#6
120°C/80°C	120°C/90°C	120°C/100°C	120°C/110°C	120°C/120°C	OFF/OFF

MODE 4 (Timing Advance) After Enabling, allows adjustment of Boost Rate, Turbo and Power Mode.

#1	#2
Disabled	Enabled

MODE 5 (Full Brake Rate) Adjust the maximum brake setting without using transmitter Brake Side EPA.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%

MODE 6 (Drag Brake) Changes the braking effectiveness as the throttle trigger is returned to neutral.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%

MODE 7 (Feel) Higher values increase the smoothness of the throttle in the forward and return to neutral directions.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
0	10	20	30	40	50	60	70	80	90	100

*Default values are shown in gray.

IMPORTANT:

The cut-off voltage you choose should not be set lower than recommended for your battery, particularly when using LiPo batteries. Refer to your battery specifications for the correct cut-off voltage to use. Setting too low a value can damage your battery. For LiPo batteries, 3.2v per cell is a safe value.

The first Thermal Protection temperature value relates to ESC temperature and the second temperature value relates to motor temperature. When the temperature of the ESC and/or motor reaches the specified value, the motor will slow down and the Boost function will not work. Once the temperature cools 20°C below the specified value, the function will return to normal. If the motor does not feature a built-in temperature sensor, motor thermal protection will not work.

Timing Advance must be Enabled to see changes made to Boost Rate/Timing Advance Rate, Turbo and Power Mode settings.

CHANGING PROGRAMMING MODE VALUES

Programming Modes and Programming Mode Values, Continued:

MODE 8 (Drag Brake Feel) Higher values increase the smoothness of the Drag Brake function.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
0	10	20	30	40	50	60	70	80	90	100

MODE 9 (Brake Feel) Higher values increase the smoothness of throttle in the brake and return to neutral directions.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
0	10	20	30	40	50	60	70	80	90	100

MODE 10 (Boost Rate/Timing Advance) Higher values increase motor performance throughout the entire throttle range.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

MODE 11 (Turbo) Increases the Timing Advance value at only the full throttle position by the percentage chosen.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
0%	2%	4%	6%	8%	10%	12%	14%	16%	18%	20%

MODE 12 (Power Mode) Adjusts the starting position of the Boost function.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
P-M0	P-M1	P-M2	P-M3	P-M4	P-M5	P-M6	P-M7	P-M8	P-M9	P-M10

IMPORTANT:

Increasing Boost Rate/Timing Advance, Turbo and Power Mode values can result in damage to your motor and/or ESC from excessive heat. Values should be adjusted in single increments and you should check the temperature of the ESC and your motor after each adjustment.

Using higher Power Mode values will cause the Boost function to start working at a lower throttle position. When using a modified motor, we don't suggest using a value higher than # 5. When using a stock motor, any value can be used, but you must check your ESC and motor temperatures to ensure they're not overheating.

LED OPERATING ERROR DESCRIPTIONS

If the ESC detects an error during use, the Setup LEDs can be used to determine what the error is and what may cause it.

Setup LED Condition	Error	Possible Cause
Flashing Red, Blue & Green	No Signal	The transmitter is turned OFF or the ESC is not plugged into the receiver correctly.
Slowly Flashing Blue & Red	Abnormal Motor Rotation	Damaged motor and/or motor sensors. Also check sensor cable.
Slowly Flashing Red & Green	Low Battery	The battery voltage is below the Voltage Cut-Off limit or the battery could be damaged.
Flashes x 1 Red	Sensor Error	The sensor cable is unplugged or damaged, or the motor and/or motor sensors are damaged.
Flashes x 2 Red	Thermal Protection of FET	The ESC has overheated and the thermal protection feature has shut it down. Ensure Power Mode, gear ratio and Timing Advance are not too high. Ensure the number of turns of the motor is not too low.
Flashes x 3 Red	Thermal Protection of Motor	
Flashes x 4 Red	Thermal Protection of BEC	The BEC has been overloaded. Check cooling fan (install if necessary), servo(s) and other equipment.

TROUBLESHOOTING

Problem	Cause	Solution
Servo(s) work, but motor does not run	ESC not connected properly	Plug ESC into channel 2 and verify all connections and polarity
	Thermal protection Activated	Allow ESC to cool down sufficiently
	Wire or connector is disconnected	Verify that all connections are tight and secure
	Motor wires are connected incorrectly	Reconnect motor wires correctly per diagram on front page
	Motor is damaged	Replace or repair motor
	ESC is damaged	Contact Service and Support (see below)
Servo(s) do not work	Transmitter and receiver not paired	Pair (bind) transmitter and receiver
	ESC not connected properly	Plug ESC into channel 2 and verify all connections and polarity
	Battery is completely drained	Charge battery fully
	ESC is not turned ON	Turn ESC ON
	ESC is damaged	Contact Service and Support (see below)
	Transmitter is set up incorrectly	Set up transmitter and calibrate end points as described on page 2
Motor runs slowly or has no acceleration	Pinion gear is too large for motor	Use smaller pinion gear
	Battery is faulty or motor is damaged	Replace battery or repair or replace motor
	ESC is damaged	Contact Service and Support (see below)
ESC is overheating and going into thermal shutdown	Inadequate cooling	Improve cooling for ESC or use optional cooling fan
	Battery nominal voltage too high	Use recommend battery
	Incorrect gearing or binding in drive-train	Adjust gearing or repair drive-train
	Timing Advance value set too high	Lower Timing Advance value or turn Timing Advance OFF
	Damaged motor	Repair or replace motor
ESC works intermittently	ESC going into thermal shutdown	Improve cooling for ESC or use optional cooling fan
	Loose connection	Check all connections to ensure they're tight
	ESC is damaged	Contact Service and Support (see below)

SERVICE AND SUPPORT

Your Airtronics Super Vortex Zero Sensored Brushless Competition ESC is warranted against manufacturer defects in materials and workmanship, at the original date of purchase. This warranty does not cover suitability for specific application, components worn by use or improper voltage, tampering, modification, misuse, abuse, improper wiring, reverse polarity or moisture damage.

For additional warranty and service information, please visit <http://www.airtronics.net/index.php/service>.

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