

Vortex User Guide

Doc. V4.50 ©2004-2016



OVERVIEW

The Vortex flybarless range is based on a sophisticated hybrid rotor control system that seamlessly combines mathematically accurate flybar simulation with modern digital control algorithms. Combined with Spartan's market leading tail gyro technology the holding ability of the Vortex is excellent and precise giving a very solid and dependable feel on any size helicopter from tiny electrics to nitro and gas. The built in governor responds exceptionally fast using Spartan's pre-emptive technology to provide power before the engine is bogged down. Finally, the cutting-edge silicon ring MEMS (Micro Electrical Mechanical System) sensors combined with adaptive digital filtering offer vibration immunity tolerance not previously seen in RC helicopter controllers.

TROUBLESHOOTING, WARRANTY & REPAIRS

Should you encounter any problems, please do not return this product to the store until you have carefully read this user guide, consulted the knowledge base on the Spartan website and sought advice from our technical support staff.

For repairs, servicing, technical support or questions regarding the distribution of this product visit the support page at the Spartan website: <http://www.spartan-rc.com/>

WARNING!

Model helicopters are not toys and have the potential to be very dangerous. Failure to follow the safety precautions and warnings in this user guide may result in severe injury to yourself and others. Beginners are advised to seek further advice from an experienced adult pilot.

Read through the entire user guide and other associated documents before operating this product.

This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Safety Precautions

BEFORE EACH FLIGHT:

- Verify that the Vortex operates correctly.
- Verify that the Vortex compensates in the correct direction.
- Verify that the Vortex is operating in the desired mode.
- Verify that the sensor mounting pads are in good condition.
- Verify that interconnection wires are not in contact with the sharp edges of the helicopter frames.
- Verify that all linkages, ball links and blade grip bearings can move freely without excessive friction.

GETTING STARTED

The Vortex is configured using a Spartan DataPod. Before you proceed setting up your new Vortex please download the "DataPod User Guide for Vortex" to familiarise yourself with the menu system navigation and other DataPod related functions.

In order for the setup process to flow smoothly please ensure that you apply power to the Vortex only as described below.

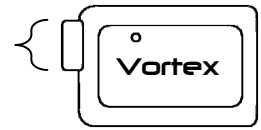
- **Using power from the ESC** - Connect the ESC to the SV5 port of the Vortex. Ensure that the motor wires are disconnected as some steps of the setup process may cause the throttle signal to change activating the motor without notice.
- **Using power from a separate BEC or battery**
 - i) **Using satellite receivers** - Connect the BEC or battery to the RX port of the Vortex.
 - ii) **Using PPM, SBUS, XBUS, SUMD or similar receiver** - Connect the BEC or battery to the receiver's battery input. Use the supplied heavy duty male-to-male servo cable to connect the receiver's output to the RX port of the Vortex.
 - iii) **Using standard receiver** - Connect the BEC or battery to the receiver's battery input. Use supplied heavy duty male-to-male servo cable to connect the receiver's collective pitch channel to the RX port of the Vortex.

Any additional connections to receiver, servos and RPM sensor will be performed at a later stage and guidance will be provided during the setup process.

You are now ready to start installing your new Vortex. Please locate the "Setup and Tuning Information" on the Spartan website and click on the Setup tab. Follow the step by step instructions provided.

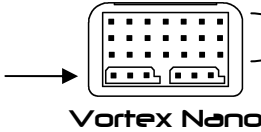
POWER BUS

Special function ports. Never connect a battery or other power source on this side on the unit.



All ports on this side share (+) and (-) lines. Power can be applied to or taken from any port.

Special function ports. Never connect a battery or other power source at the bottom row.



All ports of the top row share (+) and (-) lines. Power can be applied to or taken from any port.

OPERATION

Immediately after powering on, the Vortex performs automatic calibration of the transmitter sticks and gyro sensor resting positions. During calibration the sensor's Status light alternates rapidly between red and blue. The helicopter must remain undisturbed and the cyclic and rudder sticks must be left at the centre position. Calibration lasts approximately 4 seconds and upon completion the Vortex will zip the swashplate and tail rotor. The Status light should now be steady blue indicating a successful calibration and that the helicopter is ready to fly.

The swashplate and tail will not zip if one of the following occurs:

- The RC receiver is not providing signal for all required channels.
- The battery alarm function detected low supply voltage.
- The Vortex flight computer is not receiving signal from the sensor.
- The sensor tests have not passed (sensor light will flash error pattern).

FIRST FLIGHT

Before your first flight with the Vortex:

- Update the Throttle Failsafe of the Vortex as well as the one of your radio system (if provided).
- Set the Governor Rotor RPM even if you are not using the governor function. Whilst this is not essential, knowledge of the approximate rotor RPM (+/-100) allows the Vortex to optimise its rotor phase compensation and vibration filtering algorithms.
- Since the engine governor is not essential for the helicopter to fly we advise that the governor is set to Off during the first flight and until the tail, rotor and engine mixture are fine tuned.
- Most flybarless systems benefit from firm head dampening. Soft or worn out dampeners allow the rotor disk to flex excessively thus introducing a control delay which ultimately results in degraded cyclic performance. Your Vortex is designed to offer sharp cyclic stops which makes firm dampening even more important. Check their condition now.
- Ensure that any "play" in the rotor and tail system is kept to a minimum and that the tail pitch linkages can move freely without excessive friction through any guides, ball links or other joints.

Some parameters may require fine tuning during the initial flights.

- **Tail Gyro Gain** - The factory default value should provide enough stability to at least hover; however you should always proceed with care. If insufficient stabilisation or tail wag is seen the gain should be raised or lowered respectively. It is not uncommon to find that the optimal gain value for a helicopter could be as small as 25-45%. A small value does not mean that the gyro will be limited in performance. Any gain value performs well as long as it is the optimal gain value. However, a gain below 25% indicates that the mechanical gain of the tail is too high and therefore it is recommended to move the servo arm ball link further in if possible. Similarly if 100% is reached and no tail wagging is seen the ball link needs to be moved further out.
- **Rotor Gain** - The default value is a conservative estimate that should suit a large number of helicopters. In some cases better performance can be achieved by increasing the rotor gain. Adjust in small steps of 3-5% and be aware that the helicopter may start to oscillate if the gain becomes excessively high. If oscillations are seen do not increase the gain further; reduce by a few percent until they are no longer present.
- **Governor Gain** - Due to the large variations in engine and fuel performance it is expected that the governor gain may need to be adjusted. If the engine is hunting (rapidly revving up and down) reduce the gain until the hunting stops. Similarly, if the engine responds too slowly to rapid changes of the collective pitch the governor gain will need to be increased.

WARRANTY AND PRODUCT REGISTRATION

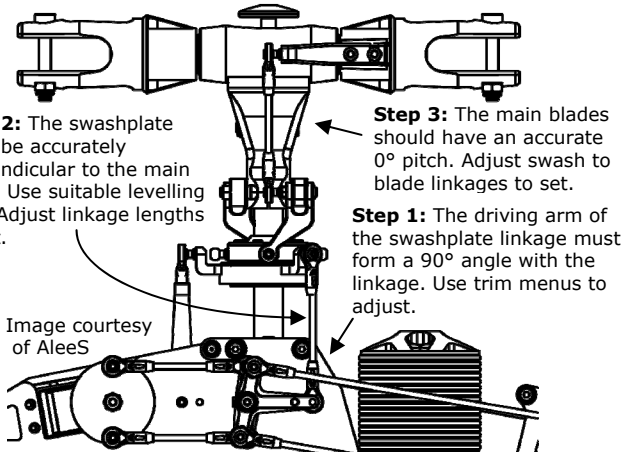
This product is warranted to be free from defects in materials or workmanship for twelve months from the date of original purchase. Within this period, Spartan RC will, at its sole option, repair or replace any components which fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labour, provided that the customer shall be responsible for any transportation costs. This warranty does not cover failures due to wear and tear, abuse, misuse, accident or unauthorized alterations or repairs. All warranty is return to

base and the original dated sales receipt must be provided; we will not replace items in advance. Spartan RC retains the exclusive right to repair or replace the product or offer a full refund of the purchase price at its sole discretion. In no event shall Spartan RC be liable for any incidental, special, indirect or consequential damages resulting from the use, misuse or inability to use the product or from defects in the product.

Important: Register your product via the Spartan website within 30 days of the original purchase to qualify for 3 years free service and discounted crash replacements. The original dated sales receipt is required for all claims. Terms & Conditions apply. Check website for qualifying products.

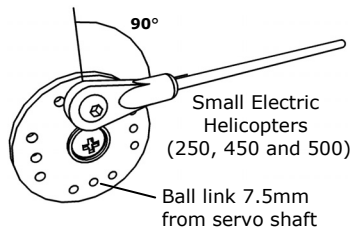
APPENDIX A – BEST PRACTICES FOR MAIN ROTOR SETUP

Set the head driving linkages whilst the "Setup::Swash::Trim(x)" menu is active. During trim adjustments the collective and cyclic controls are overridden to zero thus providing the right conditions for setting the correct swashplate and head geometry.

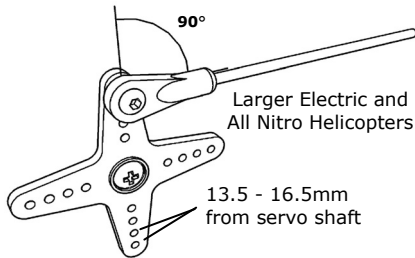


APPENDIX B – BEST PRACTICES FOR TAIL ROTOR SETUP

Set the tail rotor linkages whilst the "Setup::Tail::Servo Trim" menu is active. This menu overrides the rudder control to zero thus providing the right conditions for setting the correct tail geometry. The servo arm should be at a 90 degree angle with the pushrod as illustrated. The linkage length should be adjusted so the tail rotor pitch is set to 0 degree.



for the larger electric and all nitro helicopters. Alternatively you may choose to place the ball link at a distance that allows the servo to have a combined travel of around 80 degrees from the low endpoint to the high endpoint.



Follow the advice in the helicopter's assembly manual regarding the placement of the ball link onto the tail servo horn. When such advice is not provided or has resulted in poor tail performance we recommend placing the ball link at 7.5mm in the case of small electric helicopters and 13.5 - 16.5mm

For best results set the tail rotor pitch to approximately 8 degrees when the collective stick is at hover point. This is not a strict requirement but it can improve certain aspects of the tail performance.

APPENDING C- SENSOR MOUNTING

The correct operation, performance and stability of your Vortex can be greatly affected by the way it is mounted on the airframe. For products with a remote gyro sensor the advice below applies to the sensor unit instead. In such cases the Flight Computer has no particular mounting orientation requirements.

Use the supplied adhesive foam pads to mount the unit to the helicopter frame. Replacement mounting pads are available from your Spartan Vortex retailer.

- The unit can be mounted upright, inverted, facing left or facing right. However the cables must always exit towards the front or back of the airframe.

- It is essential that the unit is aligned as accurately as possible with the pitch, roll and yaw axis of the aircraft. Always mount it to a rigid flat surface.
- Do not allow the unit's case to touch other objects.
- Avoid fixing the cables to the helicopter for the first 5cm (2 inches) from the unit end to reduce transmission of vibrations through the cables.
- Avoid mounting the unit in direct proximity to large electric motors.

WARNING!

- Inspect the condition of the adhesive pad as part of your regular pre-flight checks.
- Do not mount the unit in locations where it may be subjected to high levels of oily smoke, fuel, or other liquids.
- Do not allow the remote sensor cable to touch any sharp edges of the helicopter airframe.
- Do not fit cable braid over the remote sensor cable.
- Do not put any tension on the remote sensor cable. It can damage the wires and result to an in flight failure.

APPENDIX D - FLIGHT COMPUTER STATUS LIGHT

	Status Light	Description
Normal Operation	Steady blue	Normal operation – Nothing to report.
	Blue 1 flash	The aileron stick is not at neutral.
	Blue 2 flashes	The elevator stick is not at neutral.
	Blue 3 flashes	The rudder stick is not at neutral.
	Blue slow flashing	Trim flight active.
	Blue rapid flashing	The throttle level is in the auto-abort trigger range (7.5% to 15%).
Error Codes	Steady violet for few seconds	The Vortex is saving data such as changes to the configuration parameters to its internal memory.
	Red slow flashing	The Vortex is waiting for signal from the receiver. Usually seen before the receiver has linked to the transmitter.
	Red momentary flash	The Vortex changed over to the other satellite receiver.
	Red rapid flashing	The Vortex is scanning both satellite receivers but neither is receiving a transmission.
Fw Ldr	Violet slowly pulsating	The input voltage is too low for the Vortex to operate correctly.
	Violet rapid flashing	Firmware update mode.

APPENDIX E - SENSOR STATUS LIGHT

For systems without a remote sensor the light codes described below will appear on the unit itself instead.

	Status Light	Description
Normal Operation	Alternating Blue/Red	The sensor is calibrating. Do not move the heli.
	Steady blue	Sensor calibration ok.
	Steady red	The sensor was moved during calibration. The calibration quality may be bad and drift may occur in flight.
Error Codes	Violet 1, 2 or 3* flashes, then repeat	The sensor self-test failed. It may indicate a fault but it can also be triggered if the sensor is abruptly moved during calibration.
	Red 1, 2 or 3* Flashes, then repeat	The sensor is reporting that it is operating outside its design specification. It may indicate a sensor fault but can also be triggered by extreme shock in case of a crash.
Fw Ldr	Violet rapid flashing	Firmware update mode.

* The number of flashes indicates the sensor that is reporting the error.

LIABILITY DISCLAIMER

Because Spartan RC and their distributors have no control over the installation and use of this product, no liability may be assumed nor will any liability be accepted for any damages resulting from the use of this product. Under no circumstances will the buyer be entitled to consequential or incidental damages. By the act of installing this product, the buyer accepts all resulting liability.

COPYRIGHT AND LICENCE

The documentation, electronic design and firmware are the Copyright of Spartan RC. The firmware is licensed for use only on products manufactured by Spartan RC. Reproduction and distribution of this document for non-commercial use is allowed. Reproduction must remain intact, as a complete whole, and including this notice.