CHAPTER 1
VORTEX USER GUIDE

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Spartan

OVERVIEW

The Vortex flybarless system is based on a sophisticated hybrid rotor control system that seamlessly combines a mathematically accurate flybar emulation 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 look-ahead 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.

SPECIFICATION

- Dimensions control unit: 34 x 23.8 x 11mm (1.34 x 0.94 x 0.43 inch)
- Dimensions sensor: 20.6 x 20.6 x 9.6mm (0.81 x 0.81 x 0.36 inch)
- Weight: 14 grams (combined control unit & sensor)
- Sensor lead: 16cm long (6.3 inch)
- Sensor Type: Balanced ring MEMS with digital interface
- Governor: Selectable Nitro or Electric
- Control system: Proprietary PID with adaptive tuning
- Supported tail servos: Digital 760us, 960us and 1520us centre pulse
- Supported swash servos: Digital or analog 1520us centre pulse
- Supported receivers: Standard pulse, PPM, SBUS, 1/2 Satellites
- Standard setup: DataPod
- Computer connectivity: DataPod Bridge Mode
- Operating voltage: 3.8V to 8.4V Current draw: <100mA

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 manual 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.

SPARE PARTS AND ACCESSORIES

Order Code	Description
SRC-DTPOD	Spartan DataPod. Required for setup and fine tuning the Vortex VX1.
SRC-VPADS	Vortex Sensor Pads. (10x) 20x20x1mm adhesive pads for gyro sensor mounting.
SRC-QPADS	Mini Gyro Pads. Mix of thin 1mm pads and thicker 3mm pads for very high vibration environments. Total 15pcs.
SRC-RPM	Governor RPM Sensor. Includes governor sensor, screws and magnets.
SRC-RPMK	Governor RPM Sensor Kit. Includes governor sensor, screws, magnets and mounting brackets for 50 and 90 size nitro engines.
SRC-MAG	Governor Sensor Magnets (2pcs). 4mm diameter x 2mm thickness
SRC-VXW	Vortex VX1 Receiver Wire Set

OPERATION

The Vortex is configured using a Spartan DataPod. The installation process is detailed in the "Vortex Setup & First Flight" guide. After the first successful flight you may wish to alter the Vortex's flight characteristics to your flying style through the numerous configuration options provided via the DataPod. Their function is described in the "Vortex Fine Tuning Guide".

WARNING!

Immediately after powering on, the Vortex performs automatic calibration of the transmitter sticks and gyro sensor resting positions. During this time 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 enter flight mode and zip the swashplate and tail rotor. During calibration the sensor's Status light alternates rapidly between red and blue.

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).

In a similar way to your RC radio system the Vortex offers four flight modes (N, 1, 2 and H) so its behaviour can be altered for different flying styles. We recommend that the flight modes of the Vortex are linked to the same switches that control the flight modes of your radio, thus allowing both sides to track each other. However, if necessary, the flight modes of the Vortex can be control by different switches subject to the functionality provided by your radio system.

Most modern radios allow setting a different gyro gain for each flight mode and as such we recommend using the gyro menu as a means of selecting the active flight mode of the Vortex. Here is how it works: The radio's flight mode switch is set to Idle1 → The radio outputs the gain value assigned to Idle1. → The Vortex receives the gain channel and interprets it as a command to which of its own flight modes it should select. Note that the gain percentage set on the radio no longer controls the tail gyro gain. Instead it is used as an index to the desired flight modes. Specific examples for popular radios and a video description of this process are available in knowledge base topic 138 that can be found at the Support section of the Spartan website.

STATUS LIGHT – FLIGHT COMPUTER

	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 rapid flashing	Trim flight active.
	Steady violet for few seconds	The Vortex is saving data such as changes to the configuration parameters to its internal memory.
Error Codes	Red slow flashing	The Vortex is waiting for signal from the receiver. Usually seen before the receiver has linked to the transmitter.
	Red 1 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.
	Violet slowly pulsing	The input voltage is too low for the Vortex to operate correctly.
Fw Ldr	Violet rapid flashing	Firmware update mode.

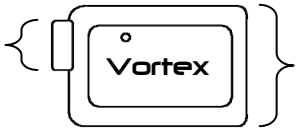
STATUS LIGHT – SENSOR

	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	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	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.

POWER BUS

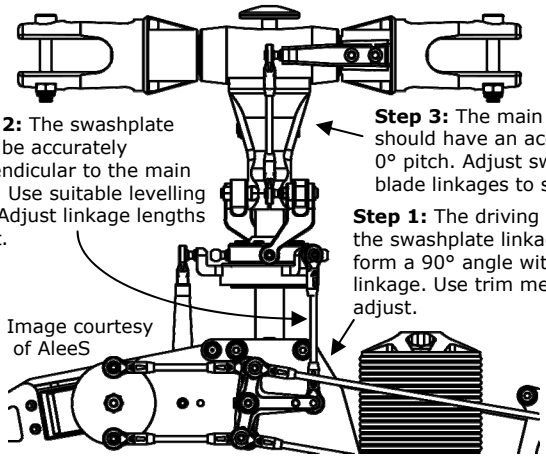
Special function connectors. Never connect a battery or other power source on this side on the unit.



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

MAIN ROTOR LINKAGE SETUP

Set the head driving linkages whilst any of the "Setup::Swash::Trim Sv1/2/3/6" menus is active. In these menus the collective and cyclic controls are overridden to zero thus providing the right conditions for setting the correct swashplate and head geometry.



Step 2: The swashplate must be accurately perpendicular to the main shaft. Use suitable levelling tool. Adjust linkage lengths to set.

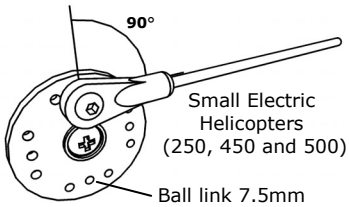
Step 3: The main blades should have an accurate 0° pitch. Adjust swash to blade linkages to set.

Step 1: The driving arm of the swashplate linkage must form a 90° angle with the linkage. Use trim menus to adjust.

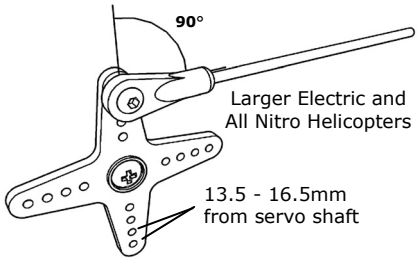
Image courtesy of AleeS

TAIL ROTOR LINKAGE 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° angle with the pushrod as illustrated. The linkage length should be adjusted so the tail rotor pitch is set to 0°.

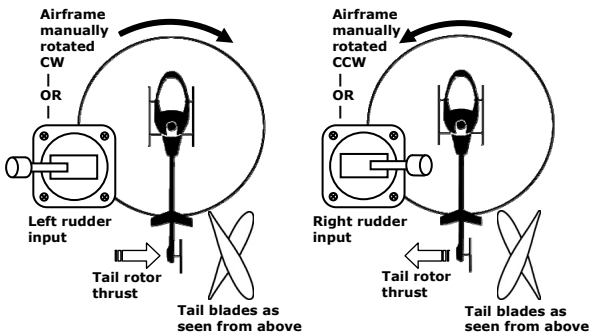


Follow the advice in the helicopter's assembly manual regarding the placement of the ball link onto the tail servo horn. When such advice is not provided or has resulted in poor tail performance we recommend placing the ball link at 7.5mm in the case of small electric helicopters and 13.5 - 16.5mm for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



To fly in Rate mode adjust "Tail::Collective to Tail" so that the tail rotor pitch is approximately 8° when the collective stick is at hover point. Fine tune as needed to eliminate tail drift in flight.

Ensure that any slop in the 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.



MOUNTING THE SENSOR

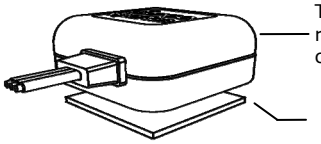
The correct operation, performance and stability of your Vortex can be greatly affected by the way the sensor is mounted on the aircraft.

WARNING!

- The sensor can be mounted upright or inverted and the cable can exit towards any direction (front, back, right or left). However, it is essential that it remains accurately perpendicular to the main shaft and its vertical walls align as accurately as possibly with the pitch and roll axis of the aircraft. Always choose a rigid flat surface.
- Do not mount the sensor in locations where it may be subjected to high levels of oily smoke, fuel, or other liquids.
- Do not allow the sensor case to touch other objects.
- Do not allow the sensor cable to touch any sharp edges of the helicopter airframe.
- Avoid mounting the sensor in direct proximity to other electronic equipment and particularly servos.
- Avoid fixing the cable to the helicopter for the first 5cm (2 inches) from the sensor end to reduce transmission of vibrations through the cable.
- Do not fit cable braid over the sensor cable.
- Do not put any tension on the sensor cable. It can damage the wires and result to an in flight failure.
- Inspect the condition of the adhesive pad as part of your regular pre-flight checks.

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

The thin (1mm thickness) pad provides firmer attachment of the sensor to the airframe. The thick (3mm) pad offers better vibration dampening. We recommend that you first try the thin pad. All electric and most nitro helicopters should work fine with this option. If you experience drift you may consider changing to the thicker pad, however excessive vibration may be caused by an underlying problem which should be first investigated. In high vibration environments such as large nitro and gas helicopters the use a thicker foam pad is not always necessary. However it would be justifiable if any drift is seen.



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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 and Conditions apply.

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.