VORTEX SETUP & FIRST FLIGHT

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Spartan

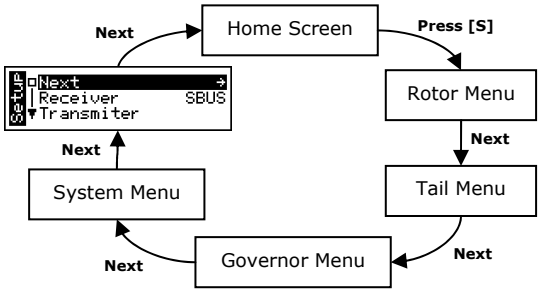
CONFIGURING THE VORTEX

To configure your new Vortex you will need a Spartan DataPod (Part no: SRC-DTPOD). The DataPod is only required for configuring the Vortex parameters and does not need to remain on the helicopter during flight. However, for convenience it can be temporarily mounted on the helicopter until the Vortex has been setup and fine tuned for your flying preference.

In this guide the tag [FAQ***] indicates that additional information is available at the online knowledge base found at the Spartan website. The number in place of the stars denotes the knowledge base topic number.

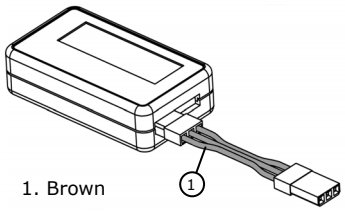
For clarity the configuration parameters affecting the flight behaviour of each major subsystem (Rotor, Tail and Governor) are listed under their own individual menus. A fourth "System" menu includes all remaining items outside the scope of the rotor, tail and governor. Finally the "Setup" menu contains items that you would typically only need to configure once when installing your new Vortex. These include receiver and servo type selection, direction reversing and travel adjustments.

For the purposes of this document we skip straight to the Setup menu. This menu offers a quick way to deploy your new Vortex by bringing together all essential parameters in one place.



You may connect the DataPod to the Vortex at any time even when the Vortex is already powered on. Use the lower plug of the DataPod as shown in the illustration.

With the exception of Setup menu (see Warning note below), you can disconnect the DataPod from the Vortex at any time without the need to return to the home screen.



1. Brown

WARNING!

To aid adjustment of certain parameters the setup process will override the pilot's controls.

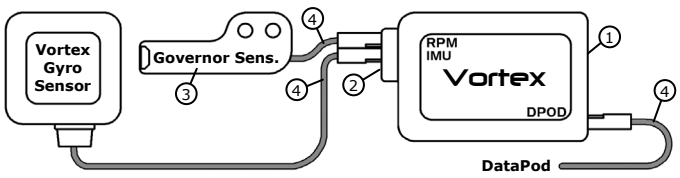
- Do not disconnect the DataPod whist Setup menu adjustments are active as this may leave servo override functions enabled.
- Do not attempt to fly the helicopter whist Setup menu adjustments are active.
- Switch off the engine and disconnect electric motors before accessing Setup menu options.

Always confirm that that collective pitch, cyclic, rudder and throttle controls operate properly before takeoff.

INTERCONNECTIONS

Do not connect any servos to the Vortex until you are prompted to do so later in this document. Some servos may be damaged if they are connected to the Vortex before the correct servo type is selected.

The receiver and power supply interconnections vary depending on what receiver type is used. See the *Setup::Receiver* section later in this guide.



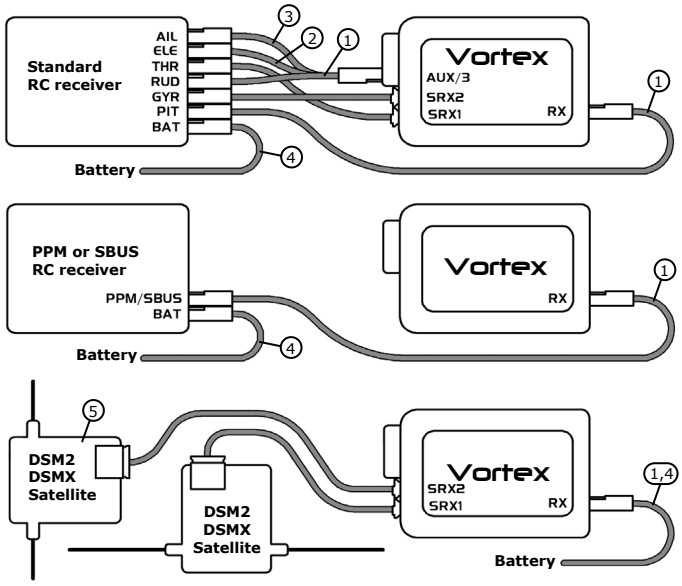
1. The power bus spans across all connectors on this side of the unit.
2. Do not connect the battery or BEC to any plug on this side.
3. Spartan SRC-RPM or other compatible governor sensor. [FAQ151]
4. Brown (top wire)

SETUP MENU

Important: Walk through the Setup menu from the first option to the last in the order that they are listed. When you reach the end of Setup menu most helicopters should be ready to fly. However, pay particular attention to the *Your First Flight* section of this document.

Receiver:

i) Receiver type: Select the receiver type that you are using. "Std" stands for standard RC receiver with individual wire connections for each channel. If you are using Spektrum satellites select the type of satellite (DSM2 or DSMX), not the capability of your transmitter.



1. Brown (top wire)
2. Red wire
3. Orange wire
4. Not applicable when the ESC supplies power. However, if the ESC offers a second power output it can be connected here.
5. The use of a second satellite receiver is optional. Follow the advice provided by the radio manufacturer. Both satellite receivers must be of the same type; either both DSM2 or both DSMX.

ii) Bind sat RXs now?: If you have chosen DSM2 or DSMX you will be prompted to bind your satellite receivers. You must do this at least once as the bind process also configures the Vortex for the number of satellite receivers you will be using.

iii) Aileron channel (onwards): The next few screens enable you to choose which transmitter channel is assigned to each control. For example, the aileron is operated by channel 1, etc. If you are unsure check your transmitter's user guide or servo monitor menu. This step is not applicable when using "Std" receiver type.

Transmitter: This screen shows a live representation of the transmitter controls. You must adjust your transmitter to match the Vortex as follows:

i) Set your transmitter for mechanically mixed swashplate. This may be referred to as "1 servo swash", S-1, H-1, etc.

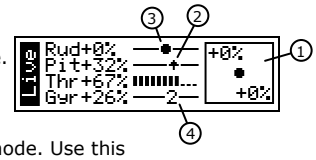
ii) Ensure that aileron, elevator and rudder trims remain at zero in all flight modes (Norm, Idle1, Idle2, Hold).

iii) Move the sticks and confirm that aileron, elevator, rudder, collective and throttle* operate in the correct direction. Reverse any transmitter channels that move the wrong way.

iv) Set your collective stick to mid-point. Adjust the sub-trims so that aileron, elevator, rudder and collective read 0%.

v) Operate the sticks and adjust the transmitter endpoints so that aileron, elevator, rudder and collective reach +/-100%. Similarly the throttle* should reach 0% and 100%.

vi) Set your transmitter to control the gyro gain channel so that the correct flight mode (N,1,2,H) of the Vortex is selected. We advice to link the Vortex flight modes with your transmitter's Norm, Idle1, Idle2 and Hold. However, you may also use a separate switch if you wish. Specific advice for popular radios can be found in [FAQ 138].



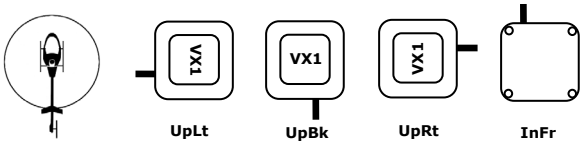
1. Cyclic viewing area
2. Up arrow indicated positive collective.
3. A round marker is displayed when the rudder and collective sticks are at mid-point.
4. Shows the currently selected flight mode. Use this for guidance when setting up your transmitter in step (v) above.

* Throttle adjustment is not required if you intend to set the built-in governor to Inhibit. In this mode the throttle signal simply passes through the Vortex and appears in port SV5 unmodified.

Important: The cyclic and rudder stick neutrals are updated the moment the transmitter screen is closed. Ensure the sticks remain at their mid-points.

Sensor:

i) Sensor cable exit: Select the sensor orientation. "UpBk" means the sensor is upright "Up" with the cable exiting towards the back "Bk". The sensor can also be mounted inverted "In". Examples:

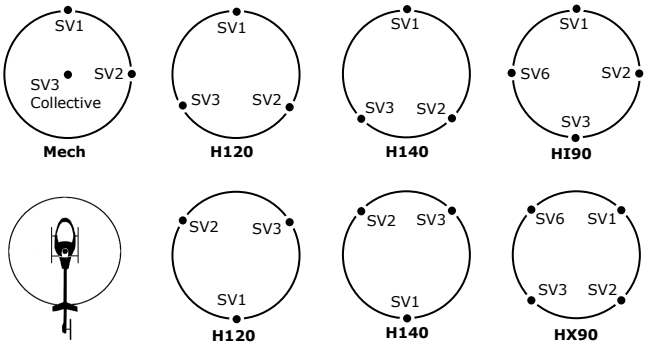


ii) Sensor live: The bar graphs display live measurements from the gyro sensors. Rotate the helicopter in the pitch, roll and yaw axis and verify each sensor is reading the correct axis and direction.

Swash: Follow the steps below to configure the main rotor controls. For guidance on the mechanical rotor setup please see [FAQ153].

i) Servo type: Select if you are using analogue or digital swashplate servos. Once the correct servo type is selected you may plug the swashplate servos to the Vortex. The swashplate representations below show the corresponding port names for each servo.

ii) Swash type: Select the swashplate type of your heli. See [FAQ 140] for advice on how to connect the fourth swash servo (SV6).



iii) Trim Sv1/2/3/6: Trims for each swash servo to aid with optimal linkage geometry. When the trim menus are active the servos are driven to zero degrees collective and neutral cyclic. If you are using a digital pitch gauge, at this point it should be reading zero. Leave it powered on for the steps below.

iv) Swash servo match: Operate the collective stick and select the option that makes the swashplate remain level as it travels up and down. Do not worry if the direction of travel is correct at this time. (Note: This option is displayed for CCPM swashplates only.)

v) Collective Direction: Operate the collective stick and select the option that makes the collective pitch move in the right direction.

vi) Coll 0 degrees Trim: This option allows slightly raising or lowering the swashplate to set 0 degree collective pitch. The best practice is for this to be done mechanically by adjusting the linkage lengths. However, use of this parameter may be needed for helicopters with an A-arm and DFC head.

vii) Max Pos/Neg Collective: Adjust these values so that the desired maximum positive and negative collective pitch is reached.

viii) Cyclic Direction: Operate the cyclic stick and select the option that makes the swashplate move the correct way.

ix) Ail/Ele 8 degrees: Use a pitch gauge and adjust this value so that 8 degrees pitch on the main blades is reached. Keep it below 120% if possible and adjust the servo ball link if necessary to achieve it. The aileron and elevator values will typically be the same. However, the linkage geometry of some helicopters may require a separate adjustment.

x) Cyclic Limit: Adjust this value to set the maximum cyclic that the Vortex is allowed to use. Due to geometry of the swashplate and head linkages there may be small variations between the displayed and measured values. This is not a problem nor will it affect the way the helicopter is flying. Also, ensure that collective pitch is set to perfect 0° whilst measuring cyclic pitch. [FAQ164]

xi) Cyclic Ring Taper: This parameter reduces the cyclic ring size by the set percentage at maximum positive and negative collective. Use this parameter to eliminate binding of the head linkages when both full collective and full cyclic are preset.

Rotor Direction: Select if the main rotor blades spin clockwise or counter-clockwise.

Tail: Follow the steps below to setup the tail gyro. For guidance on the mechanical tail setup please see [FAQ152].

i) Servo type: Select the tail servo type you are using. If you are unsure what to choose please read [FAQ12]. Once the correct servo type is selected you may plug the tail servo to the SV4 port of Vortex.

ii) Servo direction: Operate the rudder stick and check if the tail rotor pitch moves the correct way. Reverse this parameter as needed.

iii) Servo Trim: Adjust this value to achieve 90 degree angle between the tail servo horn and linkage.

iv) Servo Endpoint CW: Adjust the servo travel so it reaches maximum tail rotor pitch without binding.

v) Servo Endpoint CCW: Adjust the servo travel so it reaches maximum tail rotor pitch without binding.

Important: The sum of CW+CCW endpoints should be greater than 200% for optimal performance. If the sum is less, move the servo ball link inwards to reduce the tail's mechanical gain. [FAQ84] [FAQ80]

Governor: Follow the steps below to setup the governor:

i) Governor type: When "Inhibit" is selected the governor function is disabled and the transmitter throttle signal is passed direct to SV5 servo output. Select this option when using the governor inside your ESC. When "MixOnly" is selected all throttle mixing functions and throttle endpoints of the Vortex operate however the governor function is disabled. Finally, option "Nitro" activates the governor function with optimisations for nitro type engines. Additional governor types are in development.

ii) Servo type: Select the throttle servo type you are using. For brushless motor ESCs use the "Analog" option. If you are unsure what to choose please read [FAQ12]. Once the correct servo type is selected you may plug the throttle servo or ESC to the SV5 port of the Vortex.

iii) Servo direction: Operate the throttle stick and observe the servo moves the correct way. Reverse as required.

iv) Thro idle endpoint: Adjust the servo endpoint for the approximate idle position.

v) Thro max endpoint: Adjust the throttle servo endpoint so the carburettor reaches the fully open position.

vi) Gear ratio: This is the gear ratio between the engine and the main rotor. If you are unable to find this information in the helicopter's user guide you can calculate it by dividing the number teeth of the main gear by the number of teeth of the pinion gear.

Heli Wizard*: This menu configures the "Rotor::Flybar Ratio" (rotor gain) based on the option that best describes your helicopter. The preset value should be seen as a starting point and in some cases further tuning may be required. [FAQ169]

Style Wizard*: This menu configures certain parameters of the Vortex based on your flying style selection. Each flying mode can be configured separately. Based on your selection this wizard modifies Cyclic Sens, Cyclic Expo, Style, Paddle Resp, Padd Dynamic, Rudd Exro and Rudd Sens.

* The "Wizards" are not configuration parameters themselves. Instead they modify a selection of other parameters to achieve a certain task. You may imagine them similar to asking a friend "Can you configure my Vortex for 3D?"

YOUR FIRST FLIGHT

Safety Precautions

BEFORE EACH FLIGHT:
- Verify that the Vortex operates correctly.
- Verify that the Vortex compensates in the correct direction in all axes.
- 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.

Immediately after powering on, the Vortex performs automatic calibration of the sticks and 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 zip the swashplate and tail rotor. [FAQ158]

Most flybarless systems benefit from firm head dampening. Soft or worn out dampeners allow the rotor disk to flex thus introducing a control delay which can ultimately result in cyclic lag and elevator bounce. Your Vortex is designed to offer sharp cyclic stops and for this firm dampening becomes more important. Check their condition now. [FAQ160]

There are a few parameters outside the scope of the Setup menu that you will need to adjust during your first flight. If you are new to helis please see [FAQ141]. Guidance for F3C pilots is provided in [FAQ149]. If you want to see what settings other 3D pilots use visit [FAQ155].

System :: Failsafe – Failsafe defaults to 0% throttle. However the default value is only meaningful when the Vortex's internal governor or "MixOnly" function is used. When the Setup :: Governor Type is set to "Inhibit" you must update the failsafe value before your first flight.

Gov :: Rotor RPM – Before you first flight set the governor rotor RPM even if you are not using the internal governor. The RPM value does not need to be precise and a best guess within ±100RPM would be acceptable. Knowledge of the rotor RPM allows the Vortex to optimise its rotor phase compensation and vibration filtering algorithms. The latter reduces servo wear and receiver battery consumption.

Gov :: Enable – As the engine governor is not essential for the helicopter to fly we advice that the governor is set to Off during the first flight and until the tail, rotor and engine mixture are fine tuned.

Tail :: Gain – The tail gyro gain will need to be adjusted during the first flight. 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 35-45%. 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 30% 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. Similarly if 100% is reached and no tail wagging is seen the ball link needs to be moved further out. [FAQ84]

Rotor :: Ele Debounce – This parameter allows the Vortex to compensate for the angular momentum of the tail which would normally result to a soft bouncy stop at the end of rapid fore/aft cyclic movements. During the first flight increase this parameter in steps of 10% until the vertical tail bounce is eliminated. Always proceed with care during take off and do not increase this value in larger steps as excessive debounce gain can cause rapid tail oscillations and render the helicopter unflyable. It is not uncommon for the elevator debounce gain to be in the 100-140% range and typically 600 size helicopters will work best at around 130%. However, do not jump straight to 130% as a starting point.

Rotor :: Trim flight – The trim flight can greatly improve piro compensation and the behaviour of the helicopter during certain aerobatic manoeuvres. Please read the "Vortex Tuning Guide" for details on how to perform a trim flight.

Gov :: 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 to responds too slowly to rapid changes of the collective pitch the governor gain will need to be increased.

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