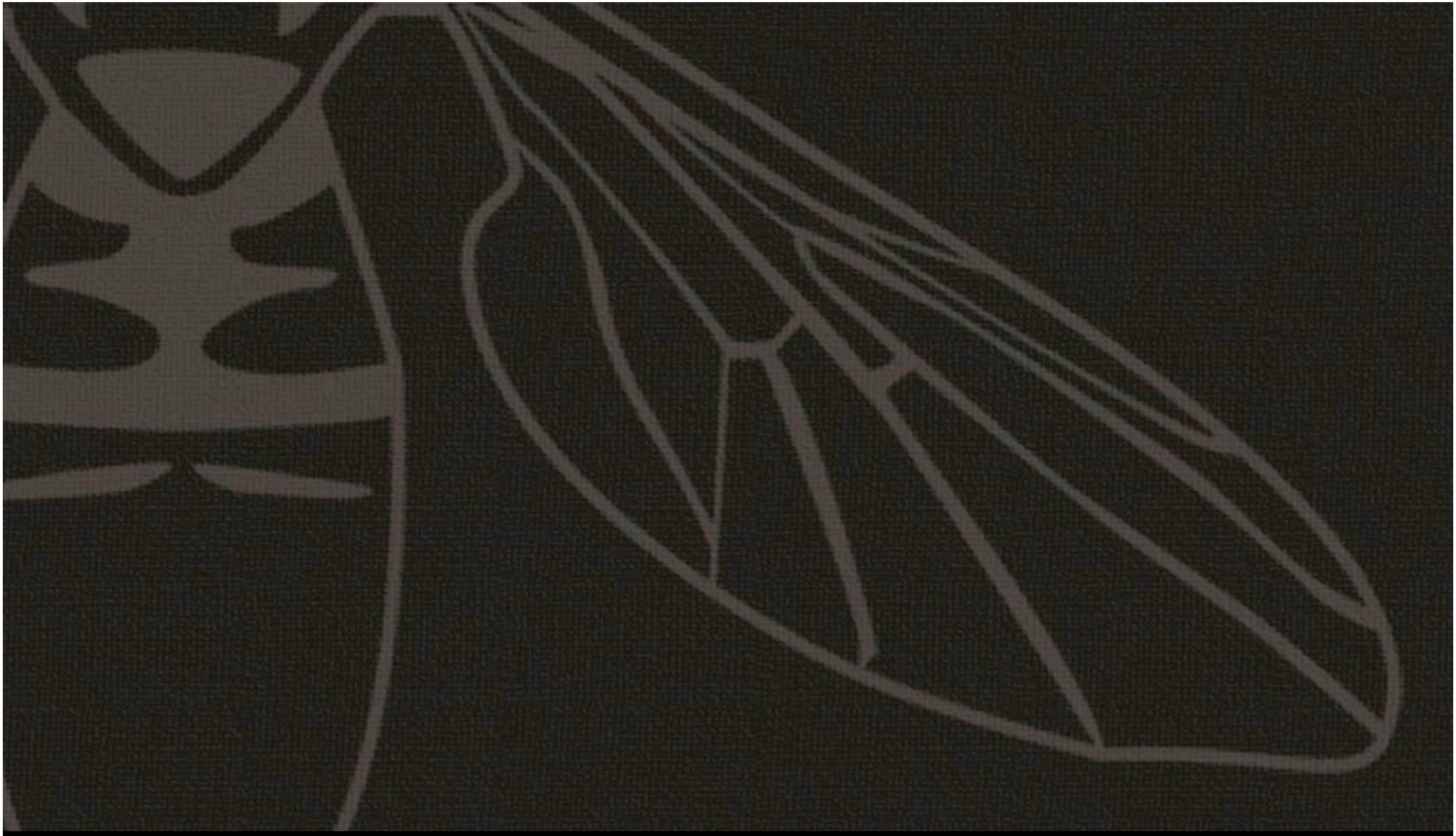


HoverflyGIMBAL™
User's Guide

HOVERFLY®

Cover Art and Illustrations Alfred D. Ducharme except where noted.

Written by Alfred D. Ducharme with editing provided by Daniel Burroughs.

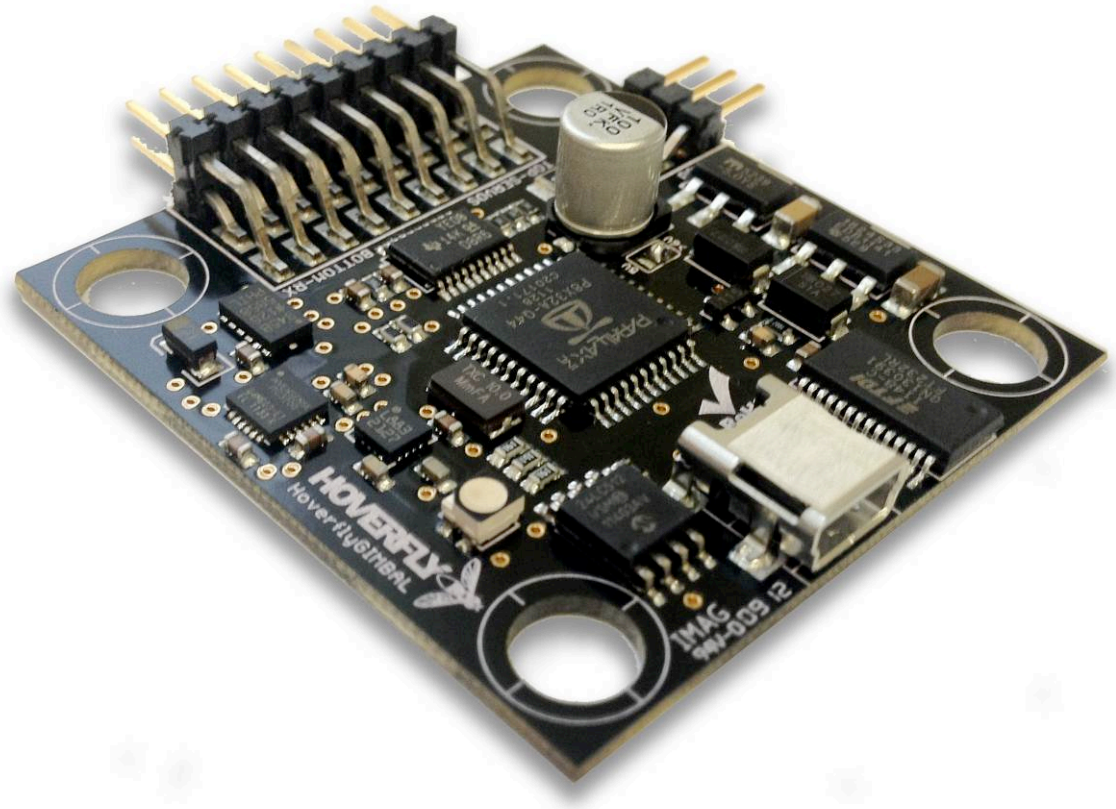
Thank You for Purchasing the HoverflyGIMBAL™!

Hoverfly's goal since inception has been to make things that "hover and fly." Of course it's a lot more fun if you hang a camera on your craft to take video and pictures. So we are pleased to introduce the HoverflyGIMBAL to our line of products to help you get better quality video and pictures.

We hope you enjoy your HoverflyGIMBAL for many years to come. Most of your questions should be answered by this User's Guide. If you still have more questions, we have support staff waiting to help you both online and on the phone.

Keep flying and making cool movies!

The Hoverfly Team



HoverflyGIMBAL™

A Note on Safety

Users should read carefully through this User's Guide to make sure that your product is setup correctly before using your aircraft. If you are not clear on any information presented and how to use the product properly please use the online Knowledgebase or contact customer support.

Table of Contents

1 About this guide

Ideally this User's Guide represents the complete documentation for the HoverflyGIMBAL™. We will make corrections and revision changes as needed and certainly when new features are added.

1.1 Content Division

This document is divided into the following chapters:

- Chapter 2 "Introduction to the GIMBAL™" a description of the hardware.
- Chapter 3 "What's Included" a brief list of the items included with your product.
- Chapter 4 "Installation" provides information on configurations, wiring, and mounting.
- Chapter 5 "Configuration" explains how to use the configurator software to setup your HoverflyGIMBAL.
- Chapter 6 "Operation" describes the operation of the HoverflyGIMBAL.

1.2 When to use the guide

This guide is intended for users of the HoverflyGIMBAL. It should be used when first installing the unit, before first flying your aircraft with the HoverflyGIMBAL, and throughout the use of the product. The guide assumes that the user has some knowledge of power and servo connections, basic electronics, and updating the firmware of electronic devices.

1.3 Format

The manual was formatted in Landscape mode to make it easier for the user to read on a typical widescreen display. This decision was made because it is distributed electronically rather than in printed hardcopy form.

1.4 Document Revisions

This guide should be considered a “living” document. There will almost certainly be errors both in form and function. Understand that new revision will be released periodically and you should check periodically for updates.

2 Introduction to the HoverflyGIMBAL™

This chapter is an introduction the HoverflyGIMBAL™ and gimbal camera mounts. Even though many of the concepts presented here are known by experienced users, we hope that it useful for all experience levels.

2.1 Camera Gimbal

A camera gimbal is an electro-mechanical system used to move a camera in 1, 2 or 3 axis, typically called: Roll, Pitch, and Yaw. A separate servo motor is used in each axis to allow a user to manually move the camera and thereby change its field-of-view pointing direction. When a gimbal is mounted to a moving platform this motion is translated into motion of the camera. A user could perhaps very quickly manually adjust the three axes of the gimbal to maintain a constant pointing direction as the platform moves. This would however, become very cumbersome and is not practical for most applications. The HoverflyGIMBAL automatically compensates all three axes of the gimbal to effectively negate the platform motion. In addition, the user may still utilize manual movement of the camera pointing direction but without the need to be concerned with platform motion. Essentially the HoverflyGIMBAL does all the work while you as the user can concentrate on framing the shot.

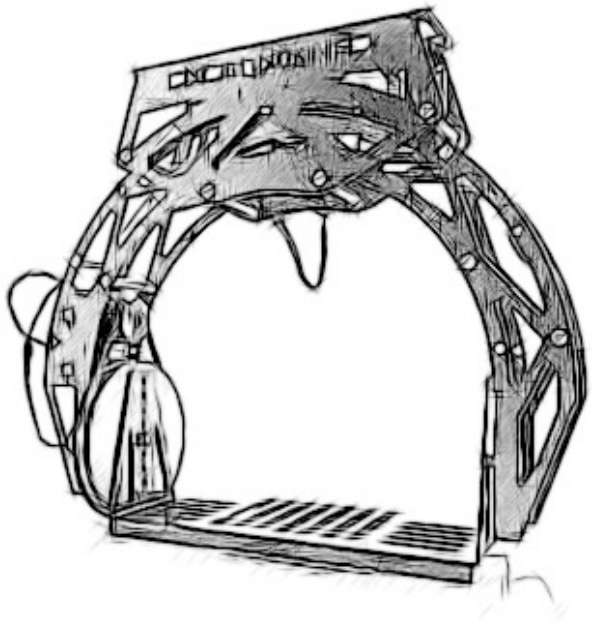


Figure 1. Basic camera gimbal mount with Roll and Pitch control.

2.2 How the HoverflyGIMBAL works

The HoverflyGIMBAL utilizes state-of-the-art digital sensors to constantly monitor the motion of the camera gimbal it is mounted to. These include a 3-axis digital gyroscope for measuring rotational rates about each axis, a 3-axis digital accelerometer for measuring accelerations along each axis, and finally a 3-axis digital magnetometer to monitor the compass bearing. The data from these sensors is fused together inside 8 microcontrollers working in parallel to provide useful command signals for the gimbal servos. In addition, there are three receiver input channels to allow the user to control the overall pointing direction (minus the platform motion).

The HoverflyGIMBAL is mounted to the camera gimbal in one of 24 different positions giving the user plenty of mounting options. There are better positions than others and these are described in the section on mounting. The user will need to be familiar with the gimbal mount in order to mount the HoverflyGIMBAL to yield optimal performance.

The HoverflyGIMBAL has two modes of operation. Autonomous mode keeps the camera in the home position and automatically motion compensates the axes the user chooses during setup. In Guided mode, an external receiver is attached to the HoverflyGIMBAL allowing the user to control or guide the camera in 1 or 2 axes. Each one of these modes is completely configurable by the user and will provide the flexibility to use your gimbal in the way that best suits your application.

One additional, but very important, input is the power input to the HoverflyGIMBAL. This power connection powers both the receiver and the gimbal servos. The voltage you chose MUST be the value required by your servos. The HoverflyGIMBAL does not regulate down to the servo voltage automatically. An additional caution is that the voltage level used by the servos may be different than what your receiver requires. The user must make sure that the chosen voltage is appropriate for the receiver and gimbal servos.

3 What's included

3.1 In the box

The following items should all be included with your HoverflyGIMBAL™ product:

- HoverflyGIMBAL™
- Vibration Grommets
- Nylon hardware set
- USB Cable

3.2 Also included

In addition to the hardware, the following is included with your purchase:

- HoverflyGIMBAL™ User's Guide (this manual) – Downloadable in PDF format from http://www.hoverflytech.com/Documentation.html
- E-Mail support – support@hoverflytech.com
- Ticket and Knowledgebase System –hoverflytech.zendesk.com
- RCGroups Forum Support – www.rcgroups.com/hoverfly-technologies-711/
- Mutirotorforums Forum Support – www.multiotorforums.com follow link to Hoverfly Technologies
- Firmware Update Client - /www.hoverflytech.com/Software_Updates.html
- HoverflyGIMBAL Configurator - www.hoverflytech.com/Software_Updates.html
- Free firmware updates – Using the free Update Client

IMPORTANT: Check your Update Client for firmware updates often. Updates will include new features and possibly critical revisions of the firmware.

4 Installation

In this section you will find detailed information concerning the installation of your HoverflyGIMBAL™. It is important to the overall performance that you carefully follow these installation requirements.

4.1 Vibration

The HoverflyGIMBAL utilizes extremely sensitive gyroscopes and accelerometers to monitor the orientation and motion of a gimbal. These sensors will register even the slightest vibration existing in the airframe. Unbalanced or damaged propellers are one of the biggest contributors of unwanted vibration. The special vibration grommets included with the HoverflyGIMBAL should be used at all times. These grommets mechanically de-couple the HoverflyGIMBAL from the airframe/gimbal substantially. Over tightening the screws holding the HoverflyGIMBAL to the standoffs will negate the beneficial aspects of the grommets. Hand-tighten these screws lightly to hold the HoverflyGIMBAL onto the airframe, but do not compress the grommets too much. If you are concerned that the nylon nuts will loosen during flight a small drop of cyanoacrylate (CA) glue will secure them.

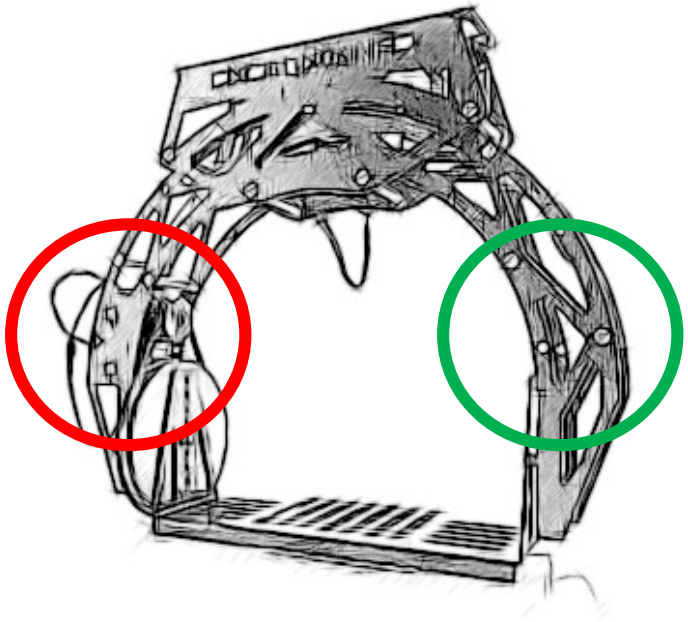
4.2 Magnetic Fields

The HoverflyGIMBAL utilizes a digital magnetometer to sense the Earth's magnetic field and determine the compass bearing of the gimbal mount. These magnetic fields are relatively week as compared to those generated by motors, servos, and other electronics. Therefore, it is essential that when you mount the HoverflyGIMBAL to the gimbal that you be aware of external magnetic interference.

The most important source that you should be aware of is the magnetic fields generated by the servos used to control the different gimbal axes. The HoverflyGIMBAL could be mounted just about anywhere on the gimbal. However, if it is mounted on a portion of the gimbal where a servo will be passing by the HoverflyGIMBAL, the overall performance will be poor. An example is shown below.

BAD PLACEMENT

Servo would be directly behind HoverflyGIMBAL.



GOOD PLACEMENT

No servo would be directly behind HoverflyGIMBAL

Example of good and bad mounting choices.

4.3 Power

WARNING: The user must power the HoverflyGIMBAL with a voltage equal to the maximum voltage of both the servos and receiver being used. The HoverflyGIMBAL, Receiver, and Servo powers are all connected. The HoverflyGIMBAL does NOT regulate power for the servos and receiver.

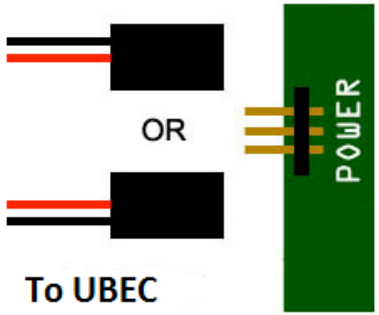
The HoverflyGIMBAL must be powered properly in order to power both the receiver (optional) and gimbal servos. Most gimbal servos operate at either 6.0V or 7.4V. The best way to verify the voltage you will need is to find the brand and model number of each servo. Then go to the manufacturer's website (ex. Savoxusa.com) and check the voltage range for each servo. In some cases two servos can use up to 7.4V but one cannot exceed 6.0V. You will want to use 6.0V so that the lower voltage servo is not damaged. Then you will want to verify the acceptable voltage range of the receiver that you plan to use. An example might be the Spektrum AR8000 (more channels than you will need but it's an example). The AR8000 receiver can operate from 3.5V t 9.6V so using the above servo example of 6.0V will not damage this receiver.

The user must verify the voltage to use and then supply the Power input on the HoverflyGIMBAL with this value. Using a 3s 11.2V lipo battery will damage the servos and the receiver using the above example value of 6.0V. A proper solution is to use a Universal Battery Elimination Circuit (UBEC or sometimes just BEC) such as those made by Castle Creations, Inc.

Example UBEC or BEC made by Castle Creations.

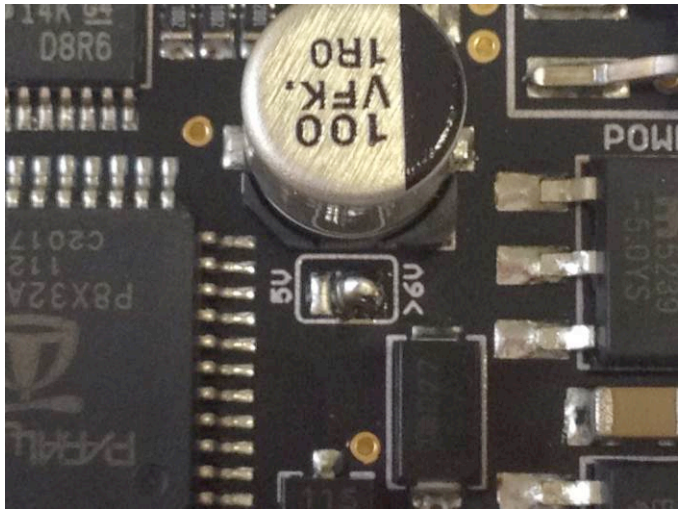
The Castle Creations UBEC can be easily programmed using the Castle Link programming card to any voltage up to 9.0V. However, you will also need to be concerned with maximum current. The UBEC shown above can supply up to 10A and the Pro version can supply up to 20A (check the voltage range requirement here http://www.castlecreations.com/products/ccbec.html). A typical Photo Higher AV200 gimbal works well with the 10A UBEC from Castle Creations with up to a Canon 5D/7D and a 3s lipo battery.

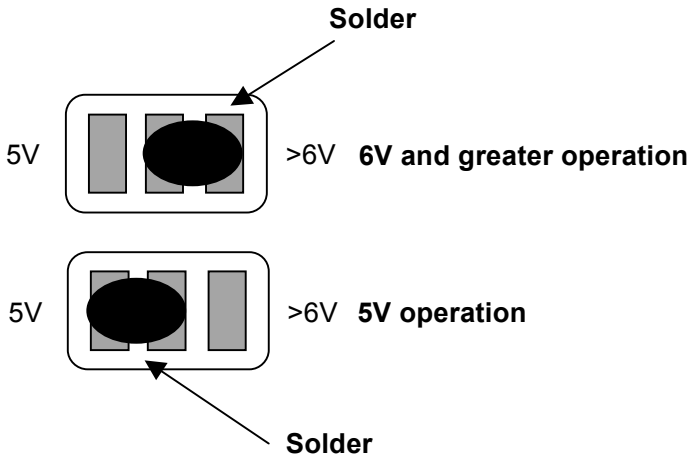
The connection to the HoverflyGIMBAL is shown below where the center pin is Power and the outer pins are both ground.



Power connection to HoverflyGIMBAL.

In rare cases where you must use 5.0V for your servos and receiver then a modification to the HoverflyGIMBAL is required. The HoverflyGIMBAL ships ready to use with voltages of 6.0V and greater and must be modified to work at 5.0V. Adjusting operation for 5.0V is simple and only requires a soldering iron. Simplly move the solder jump on the board as illustrated below.

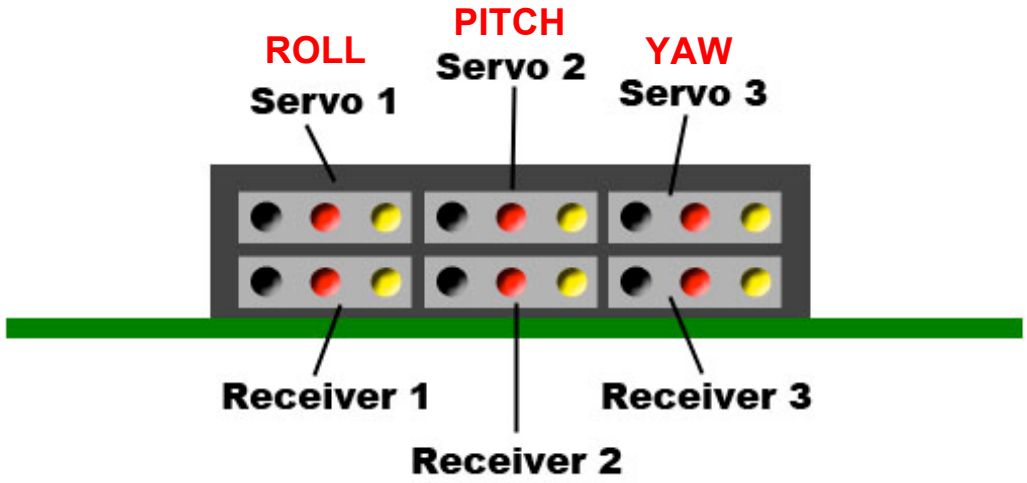




HoverflyGIMBAL modification for 5.0V operation.

4.4 Servo Connections

The HoverflyGIMBAL will operate with 1, 2, or 3 servo controlled motion axes. These are defined as the Roll, Pitch, and Pan axes of the camera and are considered to be channels 1, 2, and 3 by the HoverflyGIMBAL. In cases when a pan or 360-degree mount is not used, the user does not need to attach the 3rd channel to the HoverflyGIMBAL.



Servo connections looking at the pins.

NOTE: Some gimbals utilize servos that do not operate directly with the HoverflyGIMBAL. For these servos the user must use a Signal Booster servo extension in-line with the servo connections to the HoverflyGIMBAL. If your servos are twitching or not operating properly then you will most likely need to purchase these.

4.5 Receiver Connections

The HoverflyGIMBAL will operate in Autonomous mode if no external receiver is detected. In most cases, the user will want to change the Pitch and Pan of the camera during flight and leave the roll axis level (auto-compensated). This can be accomplished in two ways. First, the axis to be controlled can be connected to the flight receiver and assigned to channels not needed for flight. Second, a second transmitter/receiver is used to allow a camera operator to control the camera during flight. This is what we refer to as "flying the camera." In either scenario the setup of the HoverflyGIMBAL will be the same.

There are three receiver inputs that can be used by the HoverflyGIMBAL. This includes two stick (or knob) channels and a switch channel. The stick channels can be used to control two of the gimbal axes and the switch channel is used to change the operation mode of the HoverflyGIMBAL. For example, the aileron/elevator stick (assuming a second camera transmitter is used) on the transmitter could be assigned to the Pitch and pan axes of the gimbal. The roll (or horizon) would be automatically controlled by the HoverflyGIMBAL. A three-position switch would then be used to change modes from Control OFF, Control ON Angle, Control ON Velocity. These modes will be described in more detail in the section on operation. This is the most typical setup used with the HoverflyGIMBAL but the user can configure the operation in the Configurator to meet their needs.

4.6 Mounting Orientation

The HoverflyGIMBAL can be mounted in any orientation just about anywhere on the gimbal, but there are some restrictions. Some gimbals use potentiometer controlled servos and some use continuous rotation. For example the Photohigher AV200 360 degree pan gimbal uses a continuous rotation servo for Pan and potentiometer controlled servos on the Roll and Pitch axes. You can check by looking at the axis to see if the servo will continuously rotate around the axis. If not then there must be an external potentiometer measuring the angle somewhere on the mount. This will appear as an extra set of wires coming from the body of the servo. If you see these wires then it is a potentiometer controlled servo. The HoverflyGIMBAL must be mounted on the lowest axis with a potentiometer controlled servo. On the AV200 360

degree pan mount, the HoverflyGIMBAL must be mounted so that it moves along with the Pan rotation. Other mounts utilize continuous rotation servos on all three axes, such as the PhotoshipOne 3X Pro. In this case, the HoverflyGIMBAL must be mounted on the camera tray so that it moves with the Pan, Roll, and Pitch axes.

Once the choice is made for mounting, considering the servo operation and magnetic fields (Section 4.2), then the orientation needs to be decided. The orientation of the HoverflyGIMBAL is described by two factors: the side of the camera mount that the board is attached to and the direction the power input is facing. The first part of the board orientation is described by where the HoverflyGIMBAL board is attached to the gimbal mount. The HoverflyGIMBAL can be mounted in FRONT, BACK, TOP, BOTTOM, RIGHT, and LEFT positions. The direction of the Power input can also be FRONT, BACK, TOP, BOTTOM, RIGHT, and LEFT position and is simply the direction the pins of the power input are pointing. This is a total of 24 different orientations. This information is used in the Configurator to indicate to the HoverflyGIMBAL how it is mounted. To describe mounting orientation put both of these words together. As shown in the examples below, the first word indicates the position on the gimbal and the second word indicates the direction of the power input pins.

Example mounting orientations with associated names.

4.7 Mounting Hardware

The HoverflyGIMBAL ships with nylon mounting hardware and vibration grommets. These grommets should be used in order to reduce the amount of vibration that is coupled into the sensitive sensing electronics on the HoverflyGIMBAL. The user should drill the appropriate holes in the gimbal or make a small adapter plate so that all four screws are utilized to mount the board to the gimbal.

Failure to use the supplied grommets may result in reduced overall performance of the HoverflyGIMBAL.

IMORTANT: When mounting the board make sure that it is square with the level position of the camera tray. In addition, the board should be mounted flat to a surface that is normal (90 degrees) to a flat surface. This will assure that the Roll and Pitch axis are level.

5 HoverflyGIMBAL Configurator Software

In this chapter the required calibration and setup steps for the HoverflyGIMBAL are detailed.

5.1 Installing the Configuration Software

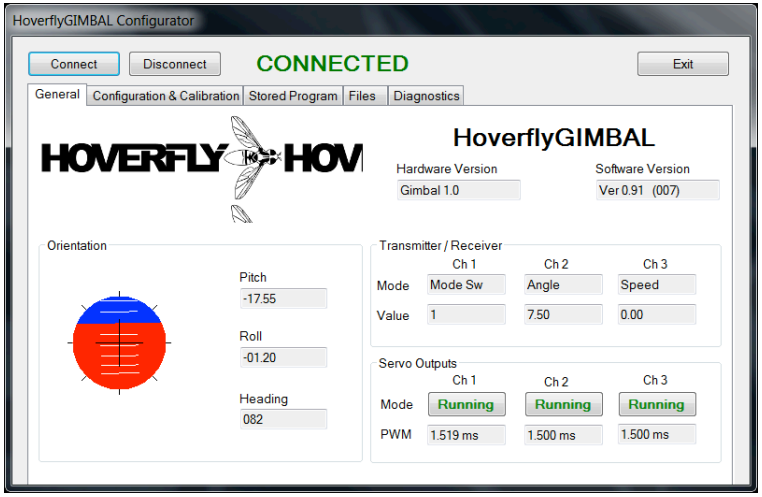
In order to use the HoverflyGIMBAL the user must first download and install the Firmware Update Client and Configurator from the Hoverfly website (www.hoverflytech.com). The software can be found under " Support & Downloads" in the upper right hand corner of the website.

Install the Firmware Update client first and install the latest firmware on the HoverflyGIMBAL following the on-screen instructions. The process is self guided and should only take a few minutes. This will assure that the latest firmware is being used before starting the configuration process.

Once the latest firmware is installed you may install the HoverflyGIMBAL Configurator and launch the program. This chapter will detail the process for calibrating and configuring your gimbal controller.

5.2 Calibration

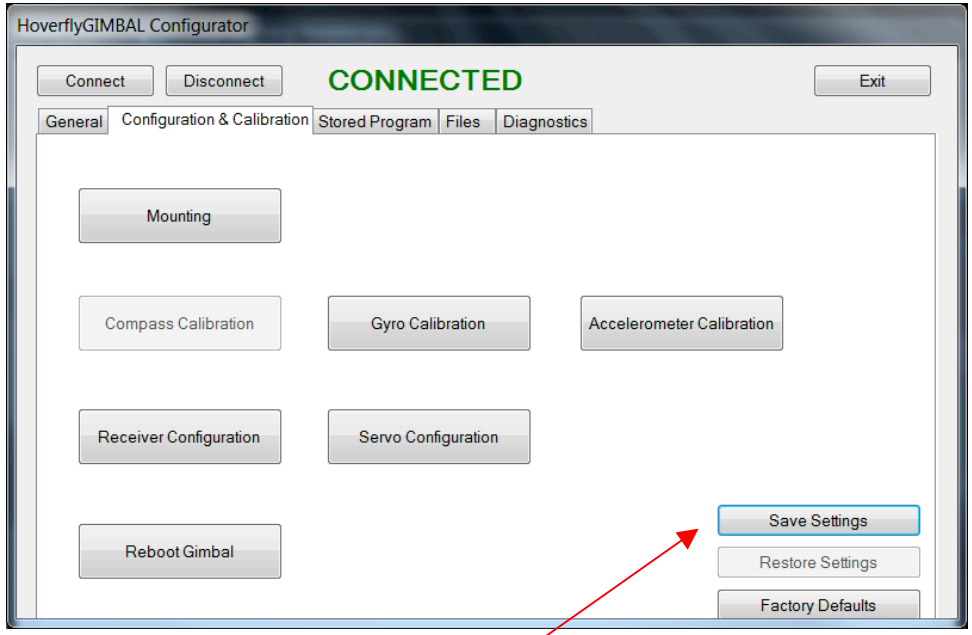
Once the HoverflyGIMBAL Configurator is launched you may connect the HoverflyGIMBAL to your computer using the supplied USB cable. Once you press the Connect button you will see the General screen as shown below.



HoverflyGIMBAL Configurator General tab

If your board does not connect press the button again. The firmware needs to reset and get to the point where it can establish a connection. Do not get frustrated, this may take a few attempts but everything is working as designed.

You will need to complete the calibration procedures for the gyroscopes, accelerometers, and magnetometers (not available yet). Start by selecting the Configuration & Calibration tab.

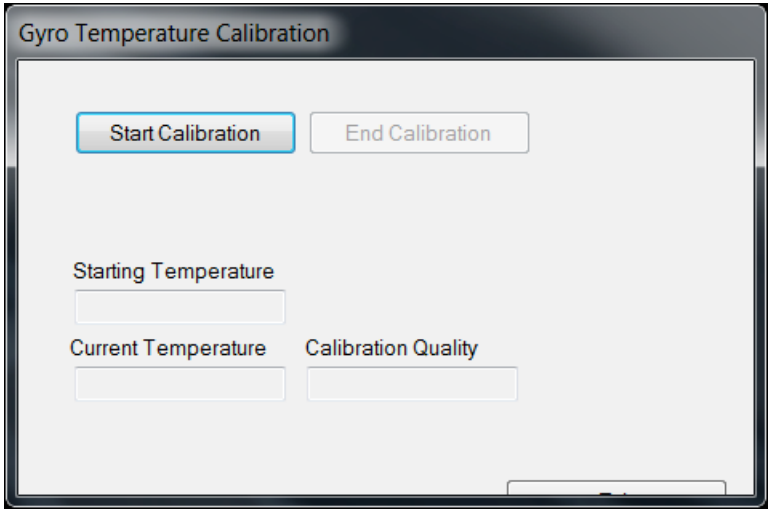


HoverflyGIMBAL Configurator Configuration & Calibration tab.

SAVE SETTINGS: Once you complete each one of the following sections you should use the Save Settings button to store the newly set values into the HoverflyGIMBAL.

5.2.1 Gyroscope Calibration

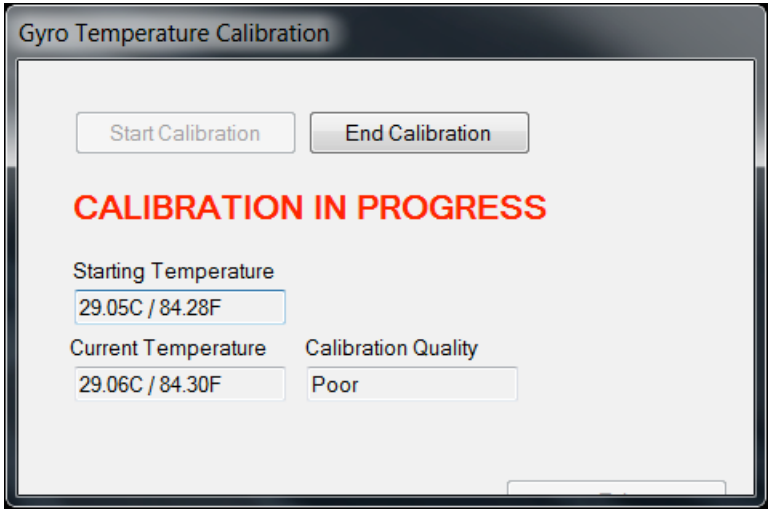
The gyroscope must be calibrated over a range of temperatures. Start by pressing the Gyro Calibration button and you will see the screen shown below.



Gyro Temperature Calibration window (scaling will be updated in the next release).

After pressing the Start Calibration button you will receive a warning concerning the calibration. It is important that the HoverflyGIMBAL start this calibration at a low temperature that will increase as the board warms up. This can take a very long time if you do not start with the board unpowered. There are two tricks you can use. First, you can put the HoverflyGIMBAL in a plastic bag in a refrigerator for about 5 minutes and then perform the calibration. Second, you can use a heat gun or hair blow dryer to CAREFULLY heat the board up a few degrees during the calibration. If you use a heat gun it should be no closer than 0.5 meters and great care should be taken not to melt any plastic parts. The best approach is to follow the warning and let the board warm up on its own.

Once you start the calibration the “Calibration Quality” will be shown. Once it reads “Good” you can stop the calibration using the End Calibration button. It is vitally important that the HoverflyGIMBAL be perfectly still during this calibration. There should be no macro, micro, or vibratory motion during the entire calibration.

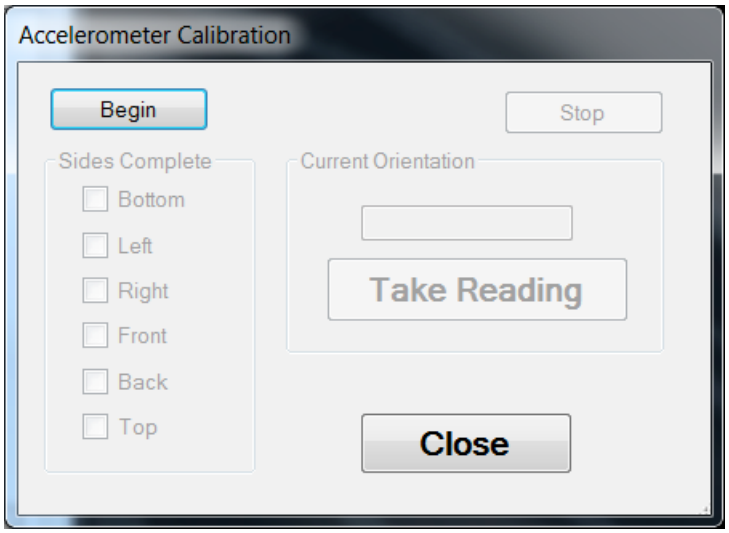


Gyro Temperature Calibration with calibration in progress.

Once you end the calibration the window can be closed using the OK button in the lower right corner (not readily visible in this version of the Configurator).

5.2.2 Accelerometer Calibration

The Accelerometer Calibration records the orientation values for each of six positions. The calibration window is shown below.



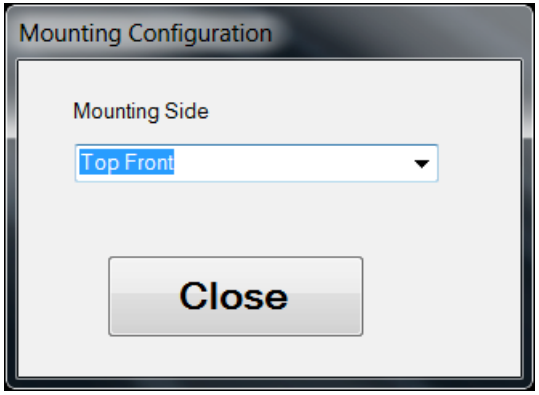
Accelerometer Calibration window.

Press the Begin button to start the calibration. You will need to position the board in each of the six orientations. The HoverflyGIMBAL knows approximately which orientation it is in, and when you take each reading it will know exactly. The user must hold the board very still when taking each reading. Be sure to hold each side as level as possible to provide the best reading.

The window may be closed once the calibration is complete.

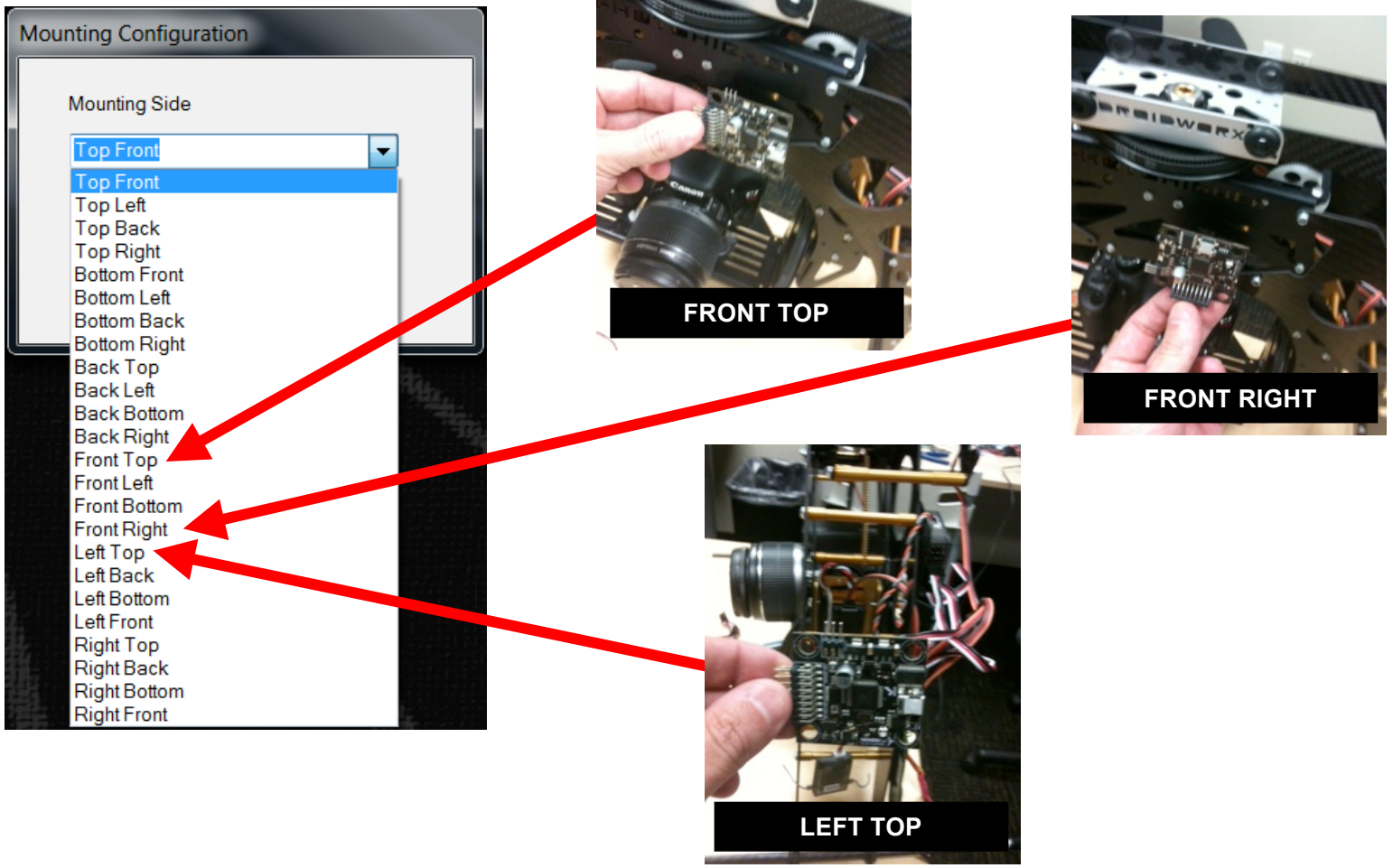
5.3 Mounting Configuration

Once the mounting orientation and position has been decided it is necessary to store this information into the HoverflyGIMBAL. Choose the Configuration & Calibration tab if it is not already chosen. Then choose the Mounting button and you will see the following window.



Mounting Configuration window.

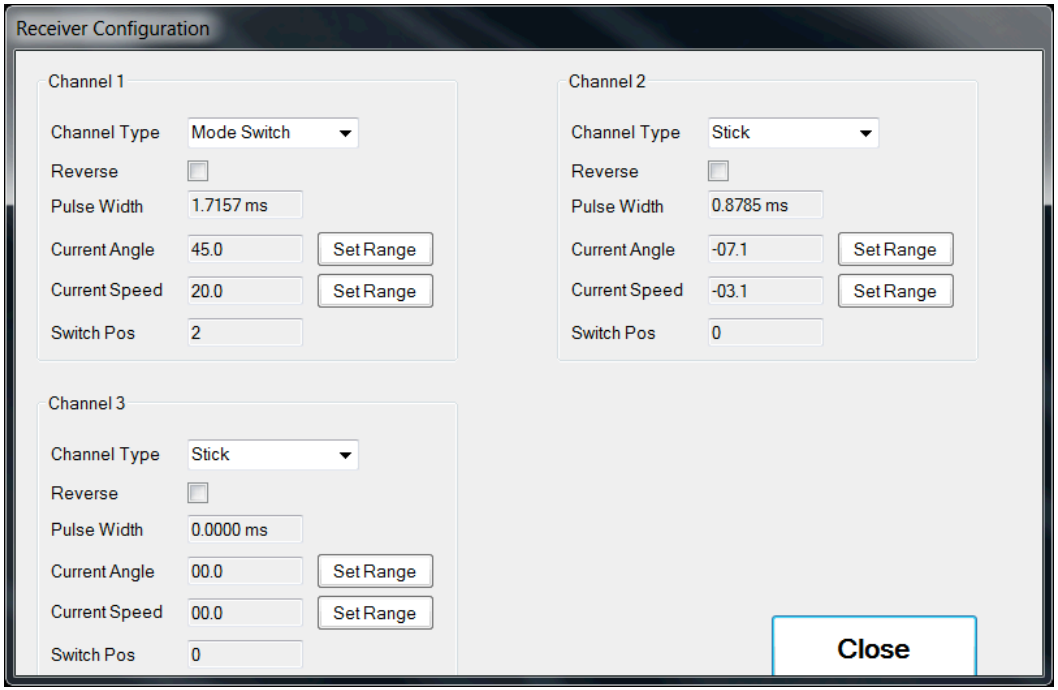
The pull down menu has 24 selections and these can seem a bit overwhelming at first. The first word indicates the position of the HoverflyGIMBAL on the camera mount and the second word is the direction of the Power input pins on the HoverflyGIMBAL once it is mounted. (See Section 4.6 Mounting Configuration for a detailed explanation.)



Example mounting selections.

5.4 Receiver Configuration

The Receiver Configuration button on the Configuration & Calibration tab is where the receiver channels 1, 2, and 3 on the HoverflyGIMBAL are assigned a channel type and how it will communicate information. If you are using the HoverflyGIMBAL in Autonomous mode with no receiver then you can skip this configuration. The Receiver Configuration window shown below is divided into sections for each Channel.



Receiver Configuration window.

The configuration should begin by selecting the type for each channel. Each channel can be controlled by a Stick (or knob) on a transmitter or assigned to be a Mode Switch. The Mode Switch should be a three position switch on the transmitter.

The Pulse Width, Current Angle, Current Speed, and Switch Pos are fields that display the current values of these channels. If you have a receiver connected and powered then you will see these values change as you move the assigned switch and/or sticks.

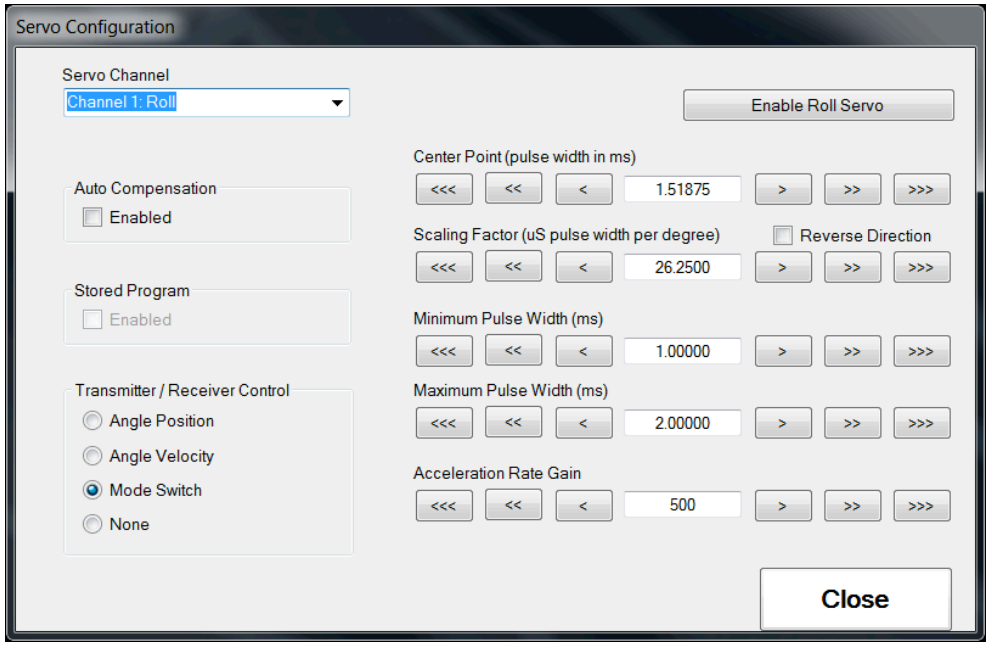
The user can set the range for angle and speed. The angle is the angle of the axis for which the channel is assigned and the Set Range button will allow you to set the Maximum Deflection of that axis. The Maximum Deflection is the value that will be used when the stick is at its maximum. Likewise the speed is the change of angle over time for an axis of the gimbal mount. Using the Set Range button will allow you to set the maximum speed for that axis. These values are used for different Modes described in Section 5.5.

After you power the HoverflyGIMBAL you may find that one or more axes are moving in the reverse direction. The Reverse checkbox can be used to correct this. The channel could also be reversed on the transmitter but we suggest using the Configurator. If you have to switch transmitters for some reason all of the settings will be stored in the HoverflyGIMBAL and a default flight model can be used on the new transmitter.

5.5 Servo Configuration

PINCH: The Enable Servo button will activate the gimbal. This can be dangerous if your fingers are in the wrong spot. Do NOT attempt to complete the servo configuration without first mounting the HoverflyGIMBAL and gimbal assembly to the aircraft. **You have been warned!**

Most of the setup work will be spent using the Servo Configuration window. This is where the behavior of each gimbal servo, and connected axis, will be defined. Start by making sure that the correct axes are connected to the correct channels on the HoverflyGIMBAL (Section 4.4).



Servo Configuration window showing Channel 1: Roll.

5.5.1 Transmitter/Receiver Control

The Transmitter/Receiver selections determine how information from the transmitter will be used to control an associated axis on the gimbal. There are four selections you can choose from (lower right of window).

5.5.1.1 Angle Position

The Angle Position choice means that the stick deflection on the transmitter will result in an equal angular change on that axis. The Maximum Deflection set in the Receiver Configuration determines the angle at full deflection of the stick. If the Maximum Deflection is set to 45 degrees then moving the stick all the way to one side or up will change the corresponding axis to 45 degrees. The opposite deflection will then be -45 degrees.

5.5.1.2 Angle Velocity

In this mode a deflection of the stick results in a change in that axis at a speed defined by the angle of the stick. When the stick is returned to center position the axis will stop moving and maintain that new angle. You can think of this as an “offset” in angle for that axis. The Maximum Speed set in the Receiver Configuration determines the maximum speed that axis will change angle when the stick is at full deflection.

5.5.1.3 Mode Switch

Making this selection will cause the channel to choose between None, Angle Position, and Angle Velocity modes using the three position switch on the transmitter. Every servo channel using the Mode Switch selection will be controlled in the same way when the three position switch is used.

5.5.1.4 None

This selection essentially turns off transmitter control of this servo/axis. The axis can still be compensated automatically be choosing the Auto Compensation checkbox for Enabled.

5.5.2 Auto Compensation

The Auto Compensation selection allows the HoverflyGIMBAL to automatically compensate for the overall motion of the craft. For example the Roll channel when auto compensated will automatically keep the horizon level during flight.

5.5.3 Servo Control

On the right side of the Servo Configuration window there are several movement buttons that are used to adjust the ranges and speeds of the selected servo.

5.5.3.1 Center Point

The Center Point is the center position of the servo and is displayed in milliseconds (ms). The typical center position is 1.5 ms but the user will have to fine tune each axis.

5.5.3.2 Scaling Factor

Some gimbals use belts or gears on some axes and as a result the scaling factor is used to scale the servo value to yield the correct deflection angle and velocity. It is best to re-visit this control once the Minimum, Maximum and Center Points have been adjusted. Then the user should follow the procedure provided here.

1. Enable the Roll or Pitch servo with the gimbal level and mounted to the aircraft.
2. Place a bubble level onto the camera tray.
3. Re-adjust the center point until the bubble is centered.
4. With Auto Compensation Enabled tilt the mount (either in Roll or Pitch).
5. Adjust the Scaling Factor until the bubble is centered.
6. Repeat this from side-to-side and front-and-back for both the Roll and Pitch axes.

5.5.3.3 Minimum Pulse Width

The Minimum Pulse Width displayed in milliseconds (ms) is the negative end-point for the selected servo. You will need to Enable Auto Compensation and pitch or roll the gimbal. Then use the Minimum Pulse Width to reduce the travel until the servo no longer binds at the maximum angle. This will take some trial and error since which side is Minimum is not typically obvious.

5.5.3.4 Maximum Pulse Width

The Maximum Pulse width displayed in milliseconds (ms) is the positive end-point for the selected servo. Just as described above you will need to pitch and roll using auto compensation to determine the positive side of the axis. The Maximum Pulse Width can then be adjusted until the maximum travel is obtained (when the servo does not bind).

5.5.3.5 Acceleration Rate Gain

The HoverflyGIMBAL can command a servo to travel much quick than is mechanically possible. There will be an inherent lag in each axis because of the maximum speed of angular change that a particular model servo can achieve. To minimize this lag, the Acceleration attempts to move the servo quickly before a large motion occurs. Use the Acceleration to improve upon the mechanical performance of the gimbal mount. This may take some adjustment before you are satisfied with the performance. If you notice some oscillation or bouncing at the ends of a movement, then your acceleration rate is most likely too high. If there seems to be lag in the movement then the acceleration is too low. It may take several iterations until you find a value that yields the style of video you would like to see.

5.5.4 Stored Program

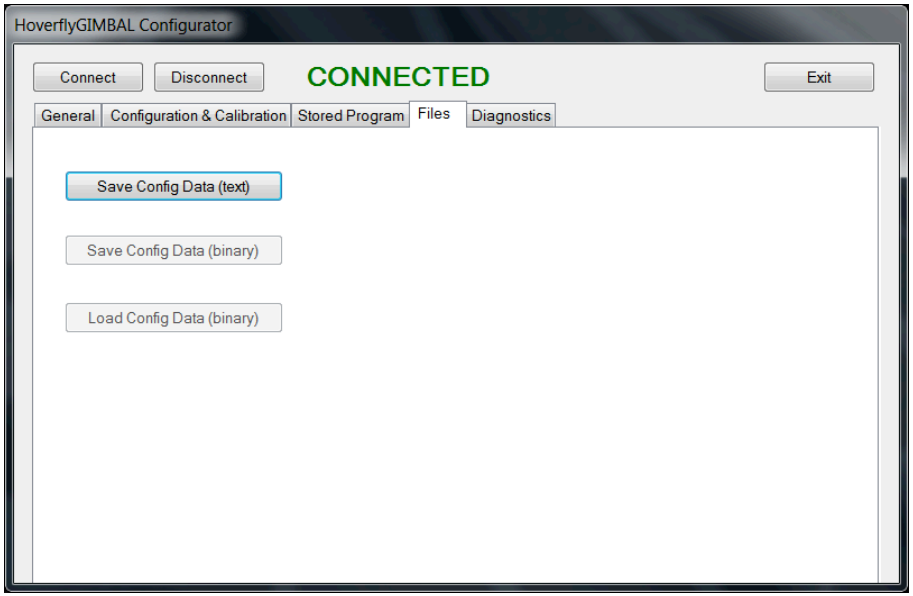
This feature will be available in a future update. It will allow the user to use the Stored Program tab to create a pre-defined movement or show. An example would be a 360 degree pan at a constant velocity. Check for firmware and Configurator updates soon.

5.6 Stored Programs

More details when this feature is released in the near future.

5.7 Files

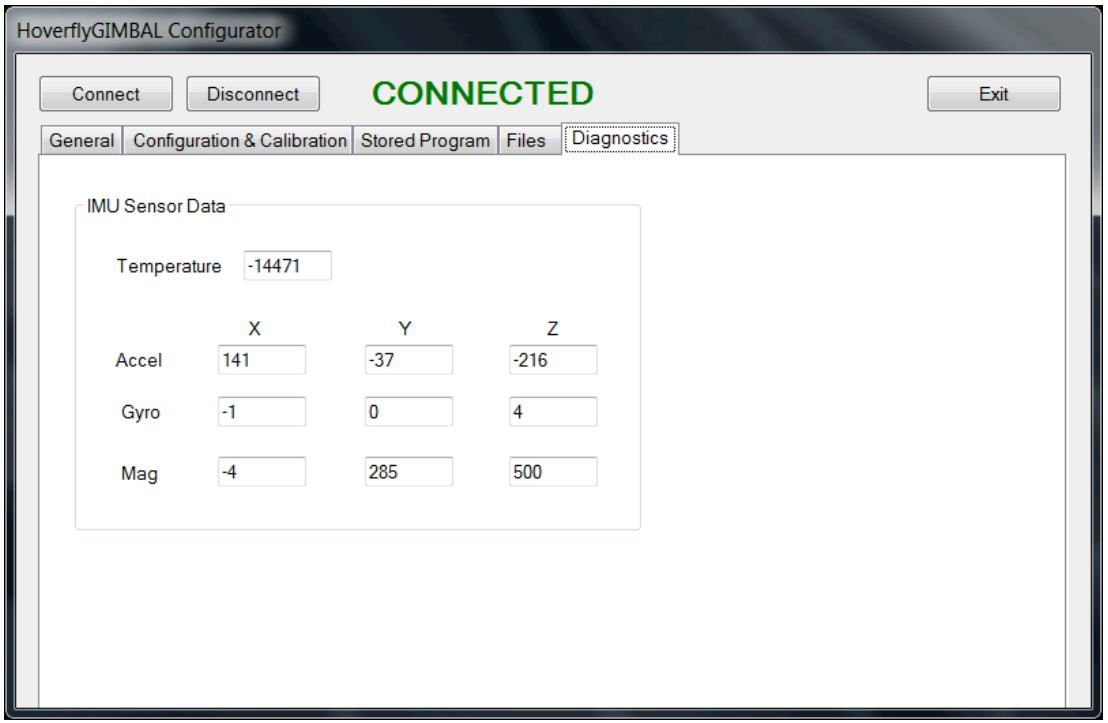
Once you have configured the HoverflyGIMBAL with your gimbal mount and receiver it is a good idea to save the configuration data onto your computer. Use the Save Config Data to save a text file in a folder on your computer. Later if you want to program a new HoverflyGIMBAL or restore your past settings this file can be loaded back into the Configurator.



HoverflyGIMBAL Configurator Files window.

5.8 Diagnostics

The Diagnostics tab is used to view real-time data from each of the three sensors on-board the HoverflyGIMBAL. It really has no purpose to the user except to verify that each of the sensors is working correctly. You can connect the HoverflyGIMBAL and observe the values displayed. You can use this tab to verify that each sensor is generating data if you believe that something is not working correctly. Customer support may also ask you to check operation using this tab.



HoverflyGIMBAL Configurator Diagnostics window.

6 Example Configuration and Operation

In this chapter, we will detail the configuration settings for a typical installation on a Roll, Pitch, Pan gimbal mount. The main settings will be described. The Center Point, Scaling Factor, Minimum and Maximum Pulse Widths, and Acceleration Rate Gain will not given since they depend on your particular mount.

6.1 Desired Operation

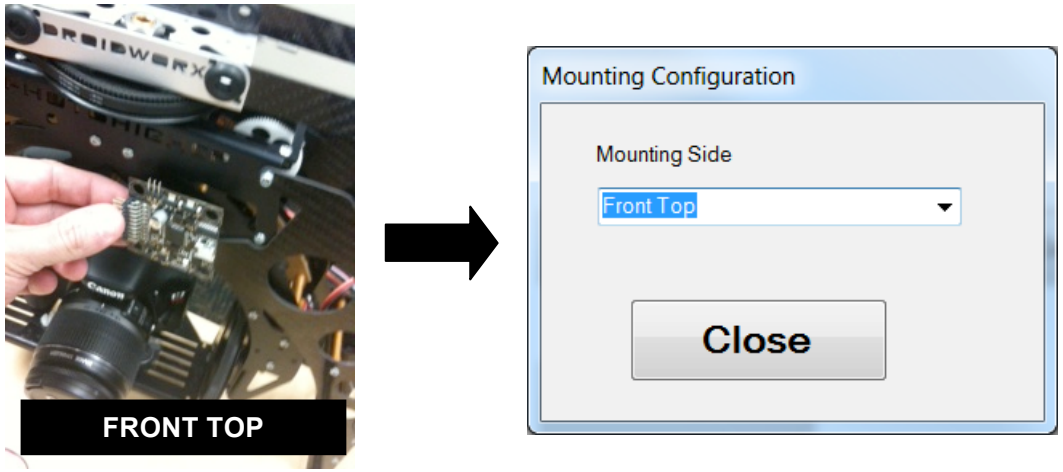
In this example a separate transmitter will be used to control the camera. The right stick typically used for aileron and elevator will be used to control the Pitch and Pan of the gimbal mount while the Roll will be automatically compensated. In addition, a three position switch will be used to select the mode of operation.

6.2 Calibrations

The Gyro and Accelerometer calibrations should be performed before mounting the board to the gimbal mount. These calibrations are easier to perform before mounting (especially the accelerometer calibration). See Section 5.5.1 and 5.5.2 for detailed instructions on calibration.

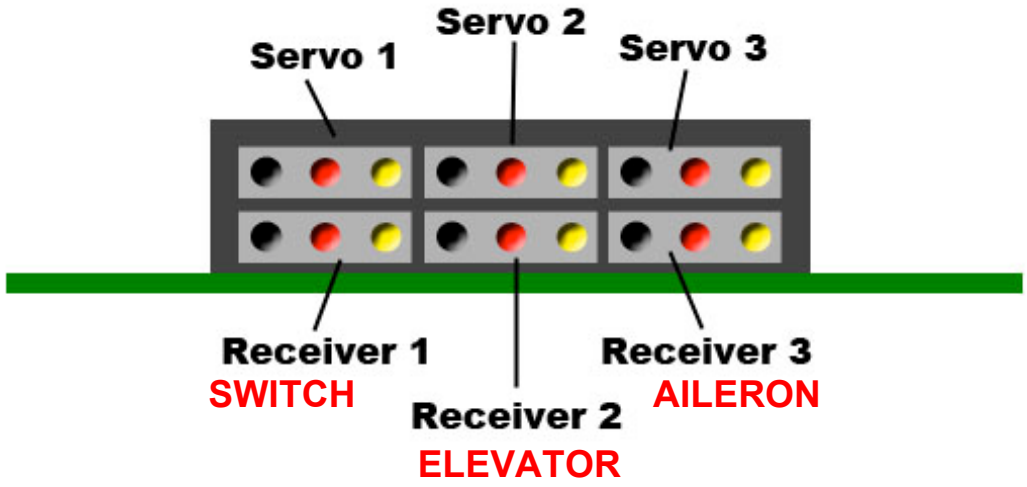
6.3 Mounting Choice

The HoverflyGIMBAL will be mounted on the lens side (FRONT) and with the Power input pins pointing up (TOP). So the mounting selection will be FRONT TOP. See Section 4.6 for detailed mounting instructions.

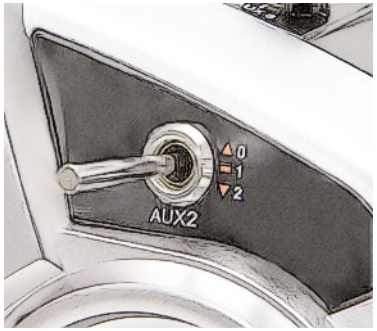


6.4 Receiver Connection and Configuration

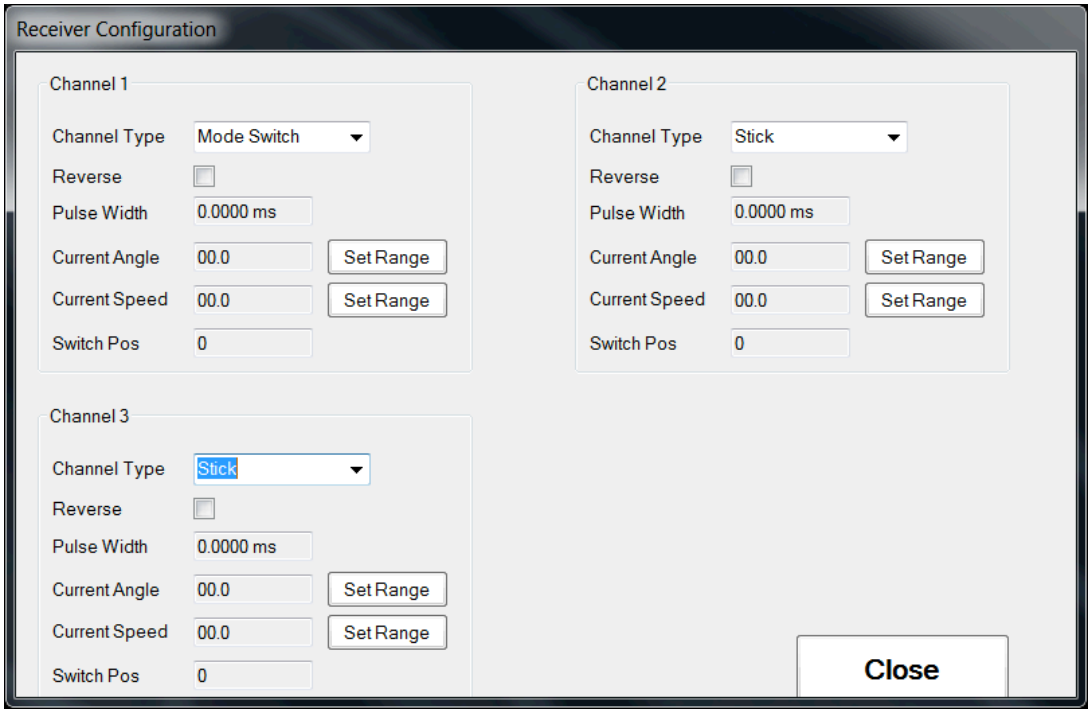
Since the aileron/elevator stick and three position switch are required for this example the associated channels on the receiver will be connected to the receiver inputs on the HoverflyGIMBAL. The following illustrations show the correct connections to the receiver.



A three position switch is required for Mode selection. On a Spektrum DX8 the AUX 1 or AUX2 switches are both three position switches as shown below.

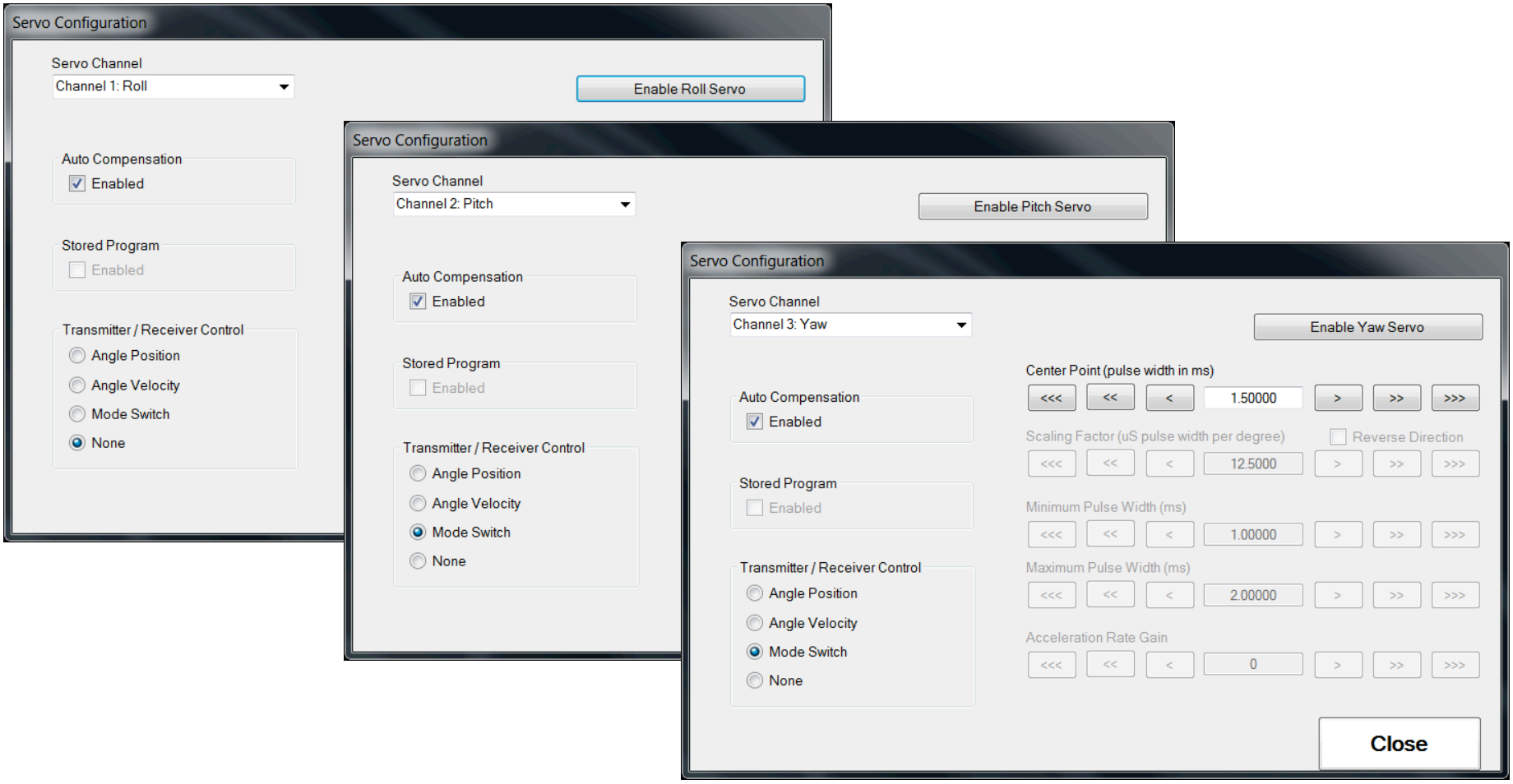


The Receiver Configuration for these choices is shown below.



6.5 Servo Connection and Configuration

The gimbal servos must be connected in the following order Roll=Channel 1, Pitch=Channel 2, and Yaw=Channel 3. The following Servo Configurations would then be set to achieve the desired operation.


Servo Configuration
Servo Channel
Channel 1: Roll
Enable Roll Servo
Auto Compensation
Enabled
Stored Program
Enabled
Transmitter / Receiver Control
Angle Position
Angle Velocity
Mode Switch
None
Servo Configuration
Servo Channel
Channel 2: Pitch
Enable Pitch Servo
Auto Compensation
Enabled
Stored Program
Enabled
Transmitter / Receiver Control
Angle Position
Angle Velocity
Mode Switch
None
Servo Configuration
Servo Channel
Channel 3: Yaw
Enable Yaw Servo
Center Point (pulse width in ms)
<<< << < 1.50000 > >> >>>
Auto Compensation
Enabled
Scaling Factor (uS pulse width per degree)
Reverse Direction
12.5000
Stored Program
Enabled
Minimum Pulse Width (ms)
1.00000
Transmitter / Receiver Control
Angle Position
Angle Velocity
Mode Switch
None
Maximum Pulse Width (ms)
2.00000
Acceleration Rate Gain
0
Close

6.6 Servo Movement Adjustments

Since each gimbal mount is a bit different, the Center Point, Scaling Factor, Minimum and Maximum Pulse Widths, and Accelerations will need to be set for your mount.

6.7 Operation

The gimbal mount now has three modes of operation selectable using the three position switch.

6.7.1 None or Off Mode

In the “0” switch position, the Roll, Pitch and Yaw axes of the mount will perform auto compensation only without allowing the user to control these axes.

6.7.2 Angle Position Mode

In the “1” switch position, the Pitch and Yaw axes will be controlled by the elevator and aileron stick movements. The mount will return to the home position when the stick is centered. The Roll axis will automatically be compensated to maintain a level horizon during flight.

6.7.3 Angle Velocity Mode

In the “2” switch position, the Pitch and Yaw axes will be controlled by the elevator and aileron stick movements. A movement of the stick will result in a change of angle on the associated axis. When the stick is centered the gimbal mount will hold that position while being auto compensated. The Roll axis will automatically be compensated to maintain a level horizon during flight.

Appendix – Specifications

Parameter	Value
Dimensions	45mm x 45mm x ~ 15mm
Hole Spacing	35mm x 35mm
Input Voltage	Determined by Servo and Receiver maximum voltages but not to exceed 16V
Output Current (Servos)	Determined by Servos
Input Channels	3
Output Servos	3
Digital Sensors	3-axis Gyroscope 3-axis Accelerometer 3-axis Magnetometer
Firmware Updating	USB connector
RoHS Compliant	Yes