



**Operation Manual of**  
**HCR Gimbal**

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## 1. Gimbal connections

**Powering up gimbal:**



**Fig 1.1** Connecting to power supply

**Fig 1.2** UART for communication

After connecting to the power supply, the gimbal will perform a series of alignments, self-tests and will determine the status of the gimbal, indicated by the Status LED color. During this time, do not disturb the gimbal or camera position.

Always the gimbal should be powered on with a balanced camera set up otherwise after initialization the controller will return an error followed by a red color indicator.

If the status LED is blinking green, the gimbal is ready for use.

If the status LED is solid red, something is wrong with the gimbal and motors cannot start. Try checking the balance of the camera and adjusting it accordingly.

If the status LED is Blue, gimbal is in operating condition and is ready to listen to the operator commands.

After powering up the gimbal, it will automatically detect if the gimbal is in inverted operation or normal operation based on pan motor position. During working, switching to another working operation made easy by changing pan motor position, the gimbal will automatically detect new types of working operation.

## 1.2 Steps to follow to mount gimbal to the gimbal head:



**Fig 1.2.1** Steps for attaching & locking the gimbal with gimbal head



**Fig 1.4** Steps for detaching & releasing the gimbal from gimbal head

1. Press and release button on the gimbal head with a white dot on it should be aligned with unlock symbol.
2. Align white bars on the gimbal and gimbal head.
3. Slowly slide the gimbal into gimbal head, once it is done rotate the gimbal head till white dot gets aligned with lock symbol.

### 1.3 Mounting the camera:



### 1.4 Balancing the gimbal:

To achieve the best performance proper balancing is necessary. Accurate balance is critical in shots where the gimbal will be subjected to extreme movements or accelerations. There are 3 axes that need to be precisely balanced prior to powering up the gimbal.

Maintaining the Center of Gravity (CG) of the gimbal, slide camera into the gimbal's slot. To avoid the camera from drifting out of its mount position, follow the below adjustments to maintain the balance in all the 3 axis.

### 1.5 Tilt axes Front-Back balance adjustment:

Loosen the thumbscrew available underneath the camera tray. Then, gently slide the camera forward or backward until the tilt axis remains level. Tighten the thumbscrews to lock the camera and camera tray in position.

### 1.6 Tilt axes Vertical balance adjustment:

When the proper vertical balance is achieved, you can rotate the camera in any angle, and it will regain that position.

Rotate the tilt axis so that the camera is pointing upward. Then, loosen both vertical adjustment thumbscrews, gently slide the camera mount crossbar and the top bar forward and backward until the camera remains pointing upward when released.

Tighten the thumbscrews. Check the number markings on both vertical rods are the same. Sometimes, the vertical balance could not be achieved, the front-back balance should be rechecked in this case.

### **1.7 Roll and Pan axis balance adjustments:**

Loosen the thumbscrew underneath the roll/pan bar, then gently slide the roll/pan bar left or right until roll/pan axis remains level. Tighten the thumbscrew to lock the roll/pan bar in position.

### **1.8 Mounting the vibration dampers:**

Mount the vibration dampeners to the drone for damping the vibrations & having good stabilization.

Using 4xM2.5 to mount the top part onto the frame or damping isolator. Pay attention to the arrow on the gimbal head which indicates the home position or forward position of the gimbal.



## 2. Gimbal Control SDK : [Github link](#)

### Steps to control the gimbal using the control SDK:

- Connect the 6pin TTL cable Com2 port on the gimbal head.
- check the USB is recognized by the OS (use `ls /dev/ttyUSB0` command).
- Run the gimbal control executable file after providing the appropriate permissions to the file.

**Pan range:** -320 deg to 320 deg

**Tilt range:** -90 deg to 45deg

**Roll range:** -45 deg to 45 deg

### Controlling the Gimbal:

Use the `gimbalcontrol.py` file to control the gimbal i.e... pan/tilt

**Function** : Set position

**Input args** :

**Pos** : `{"pitch":<float>,"roll": <float>,"yaw": <float>}` The set position function commands the gimbal to move to a specific position(pitch/roll/yaw)

**Function** : move to

**Input args** : op: pitch/roll/yaw

**Pos** : `<float>` The move to function commands the gimbal to move to a specific (pitch/roll/yaw) position

**Function** : Get position

**Input args** : not required

The get position function commands the gimbal to get the current position (pitch/roll/yaw)

**Function** : move left

**Input args** : not required

The move left functions commands the gimbal to move continuously to left side (-ve direction)

**Function** : move right

**Input args** : not required

The move right functions commands the gimbal to move continuously to left side (-ve direction)

**Function** : move up

**Input args** : not required

The move up functions commands the gimbal to move continuously to left side (-ve direction)

**Function** : move down

**Input args** : not required

The move down functions commands the gimbal to move continuously to left side (-ve direction)

**Function** : sweep

**Input args** : Angle, Speed

**Angle** : number (+180 to -180)

**Speed** : int (10 to 40)

The sweep functions commands the gimbal to move continuously between the specified angle and angular velocity.

**Function** : stop

**Input params** : not required

The stop functions commands the gimbal to stop the ongoing operations.

**Function** : reset

**Input params** : not required

The reset functions commands the gimbal to move to the home position of the gimbal.

### Gimbal Parameters configuration:

#### FILTER:

The purpose of the filters is to eliminate noise and vibration due to structural resonances in the camera, lens, or gimbal. Setting the filters too high or too low can cause signal disturbances that can reduce the overall stabilization.

**Gyro Filter:** Defines the strength of the filter applied to Gyro sensor output. If the gimbal has oscillations that cannot be corrected by adjusting stiffness settings, the Gyro Filter is used to further tune the gimbal and remove the oscillation.

**Output Filter:** Defines the strength of the filter applied to motor output. If the gimbal has oscillations that cannot be corrected by adjusting stiffness settings, the Output Filter is used to further tune the gimbal and remove the oscillation. 1. If the gimbal is vibrating at a high frequency after tuning, increase the filter values. 2. If the gimbal is oscillating or rocking at a low frequency after tuning, decrease the filter values.

#### Default values:

**GYPRO FILTER:** 2

**OUTPUT FILTER:** 3

**HOLD STRENGTH:**

For heavy cameras, it's suggested to increase hold strength for each axis around 10% than the default value.

**Default values:****Pan: 40****Tilt:40****Roll: 40****GAIN:**

Defines how fast each axis will return to commanded position. To reload default expert settings just press "Default" in the expert menu.

**Default value: 120**

**PAN STIFFNESS:** Slowly increase this setting until you feel an oscillation in the pan axis, then reduce the setting until the oscillation subsides. Tilt the gimbal about 20 degrees from the verticality and make sure that no vibrations are presented.

**TILT STIFFNESS:** Slowly increase this setting until you feel an oscillation in the tilt axis, then reduce the setting until the oscillation subsides. Make sure there is no vibration when tilting the camera up and down and when moving the gimbal in any orientation.

**ROLL STIFFNESS:** Slowly increase this setting until you feel an oscillation in the roll axis, then reduce the setting until the oscillation subsides. Pick the gimbal up and make sure there is no vibration when you move the gimbal around.