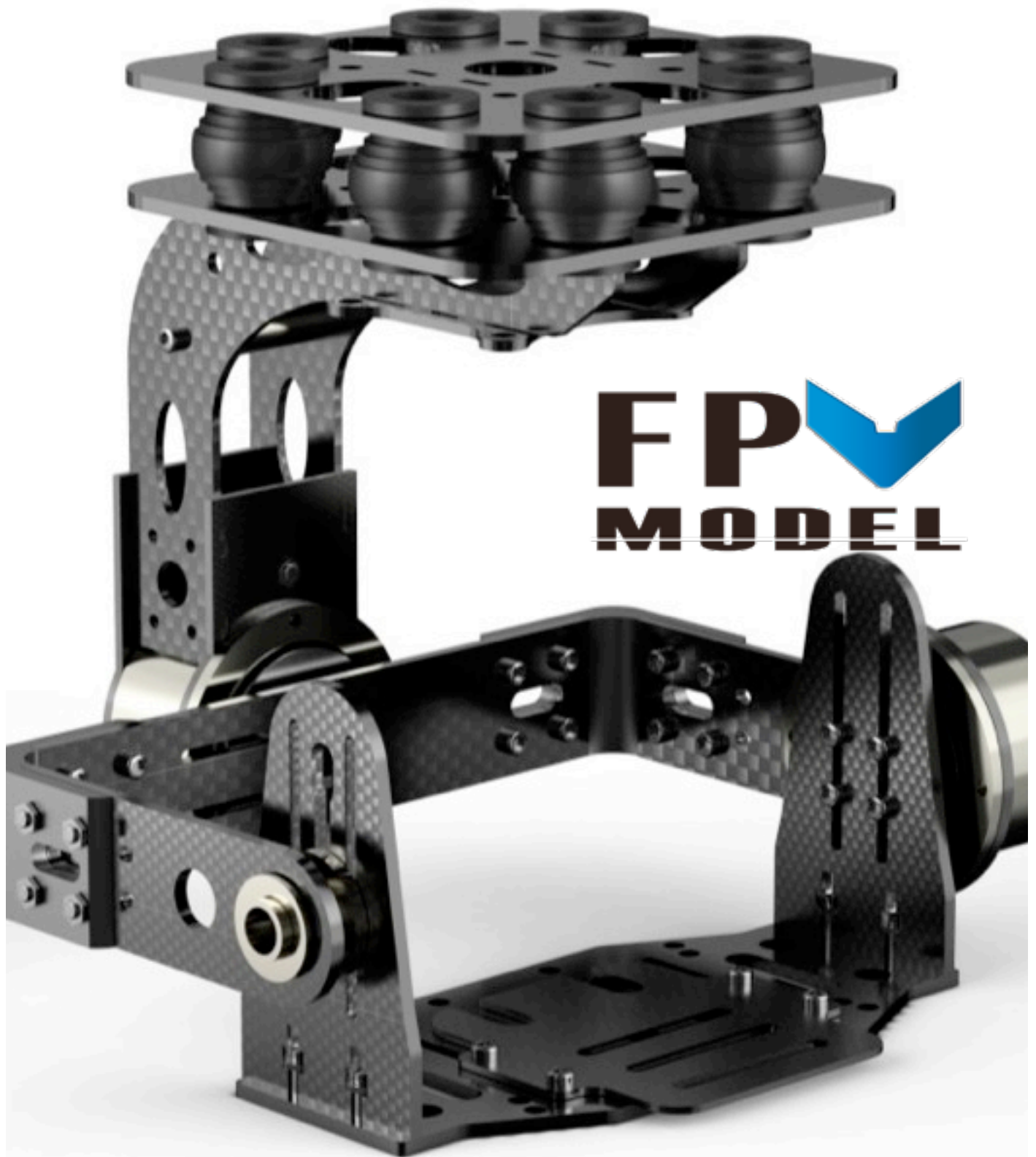


MANUL

YUN-I BRUSHLESS GIMBAL



FPV
MODEL

YUN-I BRUSHLESS GIMBAL

Connecting to the Computer



To connect the controller to the PC, you need to connect a USB adapter to the Simple BGC controller. The software will automatically detect the YUN-I Simple BGC controller.

Just after connection, current settings will be read from board and real-time data communication will proceed. You may press read at anytime to load settings from the controller.

When you finish editing, Press WRITE to write parameters to device memory and apply it. To return to factory default settings, press USE_DEFAULTS.

YUN-I BGC Assistant

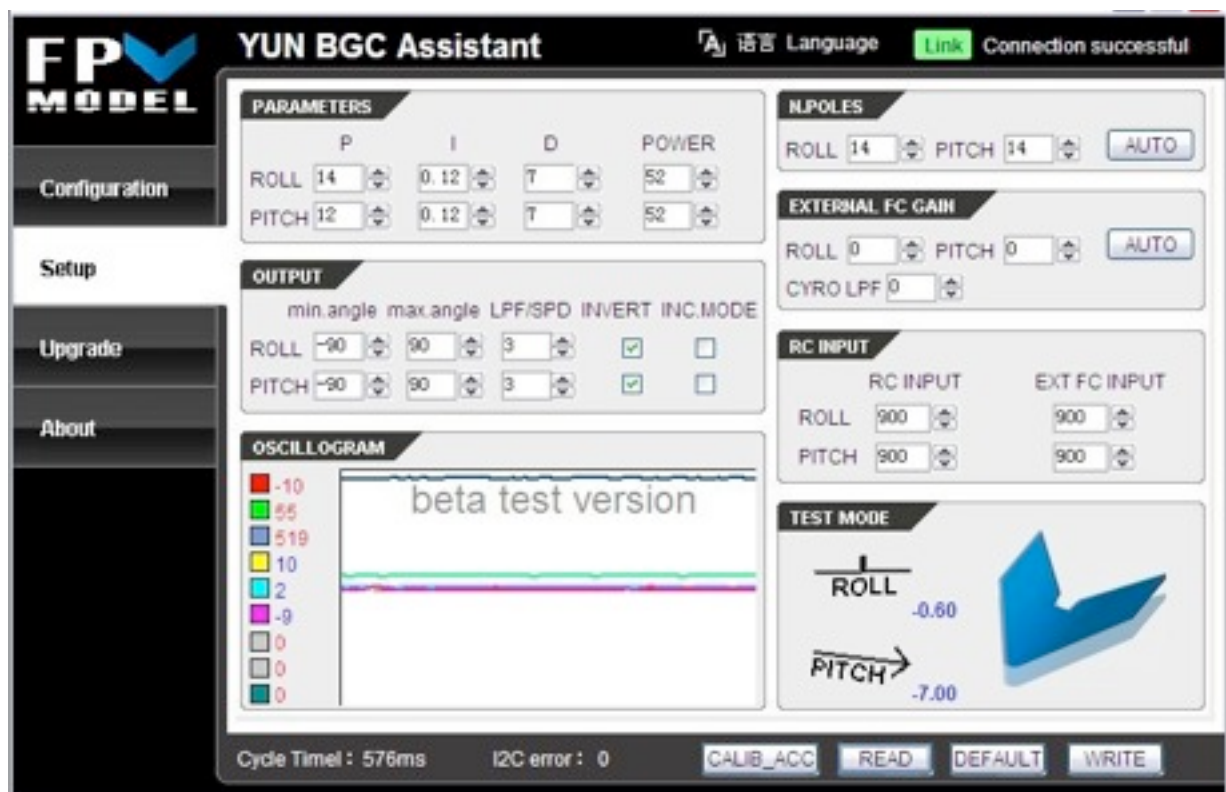
Settings

To change value in field, move cursor inside the field then press mouse button and drag from left to right.

Input signal from receiver and external flight controller in range of 900-1200 micro-seconds.

Current IMU sensor orientation. (Numbers mean angles in degrees)

Description of Parameters

**P,I,D - PID controller settings (each axis has it's own)**

P - Defines the reaction to disturbance. The higher it is, the more quickly it reacts.

This can also be explained as a "gain" of the sensor signal before it passes to motors.

How to tune: Slowly increase the value from zero until quality of stabilization reaches the desired effect. If the values are too high this may lead to the system being self excited. (visible as increasing oscillations)

D - defines inhibition of reaction. It helps to prevent low-frequency oscillations, but too high values may lead to high frequency noise in the system, that may be increased in case of vibrations. Try to keep this setting as close to zero as possible.

I - defines the speed of reaction to control commands from the receiver. The low values give very slow and smooth reaction to operator control, but also very slow movement to proper horizon position in case of big error. The high value let the fast movement of camera and fast return of horizon if inclined.

Important!!!

If vibrations from the main frame are passed to the camera platform, they may lead to easy self-excitation and unbalance. It is very important to prevent vibrations using high quality vibration dampers in the gimbal mount. (FPV Model has taken care of this problem)

In case of low-frequency oscillations, they may be suppressed by increasing D Parameter. Increase D by 1..2 units and if oscillations stop you may increase P further.

Description of Parameters

Power - defines output power for each motor. Set it from 0-255, where 22 is the maximum available power.

The base rules how to set this parameter:

1. MOTOR SHOULD NOT OVERHEAT! Too high temperature (above 80C) will lead to permanent loss of magnetic properties.
2. Low power means low torque - gimbal may suddenly loose its position and fail to recover.
3. If you have tuned PID controller, and decided to increase power - you should decrease PID controller values, because power is proportional to gain.

Invert - defines the direction of motor rotation. It is very important to choose right setting for it. There is auto-detection possible. To start detection, set P,I,D=0, set POWER according to recommendations above (or set 100 as general value). Level camera plate horizontally (may not be precise because magnetic field vector is in random position) and press the AUTO button (located near Invert setting). Camera will tilt on small angles during calibration.

N. Poles - defines number of poles (magnets) of each motor. This value is roughly detected in auto calibration procedure described above. If it detected wrong, set it manually: count the number of magnets in your motor (generally it is 14 poles)

Inc. Mode - RC control mode switch. If not set, it is absolute mode - camera will follow stick position. If stick not moved, camera will stop, too. If set, it is incremental mode - camera will rotate with speed, proportional to stick declination from center position. In both cases, view angle is limited by RC min.angle, RC max.angle parameters, and reverse of control is possible.

LPF/SPD - in case of absolute mode, it set low-pass filter applied for receiver signal. The bigger it is, the smoother is control (but more delayed response). In case of incremental mode. It set the angular speed of camera rotation. The bigger it is, the faster rotation.

External FC Gain - This setting is required, if you were made optional connection to flight controller. This connection helps to improve stabilization quality. Many flight controllers have output to camera gimbal servos for ROLL and PITCH axis. You should configure this outputs to about +-30 degrees range and connect to SimpleBGC according to connection diagram. Then follow the next steps:

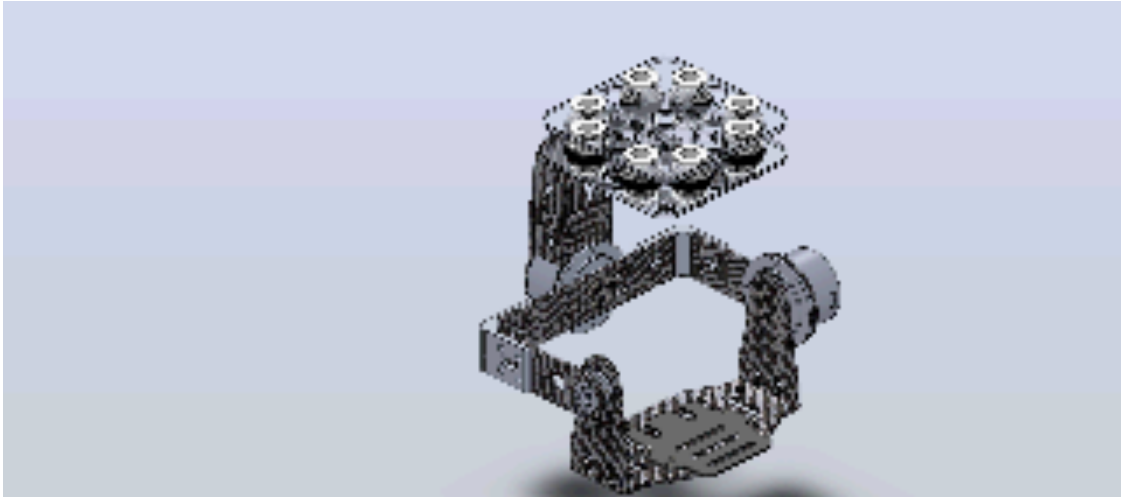
1. Activate cam stab mode in your flight controller (read it's manual how to configure and activate it).
2. Disable all filtering and compensation, if present, to make linear response.
3. Connect Simple BGC to PC, run Assistant and press START button. If all connected properly you will see response from flight controller in EXT_FC_INPUT box. Check if it reacts to frame tilting.
4. Controller should be tuned and powered on. Camera stabilization should work. Press AUTO button and slowly tilt copter frame by each axis back and forth about 20-30 degrees. Repeat this 5-10 times for each axis (all takes about 30 seconds)
5. Press AUTO again. Calibration stops and estimated settings will be read from controller.



Description of Parameters

GYRO LPF - gyro sensor low-pass filtering. Use this only in case of high vibrations interfering sensor. Generally, should be set to zero.

Tuning Algorithm



Balancing camera

It is very important to perfectly balance the camera for each 3 axis. To check balance, take gimbal in hands (powered off) and rapidly move it back and forth, or left and right. Try to catch resonance where camera begin to swing. If swing is weak or not noticed at all - camera is balanced well.

Don't let wires to resist rotation. Take as thin and flexible wires, as possible.

Hint: Perfect balance and easy rotation lets you greatly decrease power needed for stabilization.

Gyro calibration

This is made on every power-on after 3-4 second delay. It is **VERY IMPORTANT** to keep the whole system at rest for a few seconds after power-on, preventing even small moving or disturbance. Signal LED will flash slowly about 3-4 seconds and then light on when calibration is done.

Accelerometer calibration

This is generally done one time at the beginning of the system tuning. But it is better to re-calibrate accelerometer after a long time, or when the temperature was considerably changed since last calibration.

To calibrate accelerometer, you don't need to connect main power, Just connect FTDI cable.

Simple mode: Level the sensor board strictly horizontally (this is "base position"), fix it in this position by hands, and press CALIB_ACC button (or menu button). Signal LED will flash about 2-3 seconds. Don't move sensor board while calibrating.

Extended mode (preferred): First of all, make calibration in simple mode. Then, rotate sensor board by 90 degrees, to make every of 5 faces "looking up" (total 5 positions excluding "base"). Fix sensor in every position, press CALIBRATE_ACC and wait about 3 seconds. Repeat this step 5 times (the sequence of rotation is no matter). Remember, that calibration in simple mode will cancel results of extended calibration, so make it first.

Description of Parameters

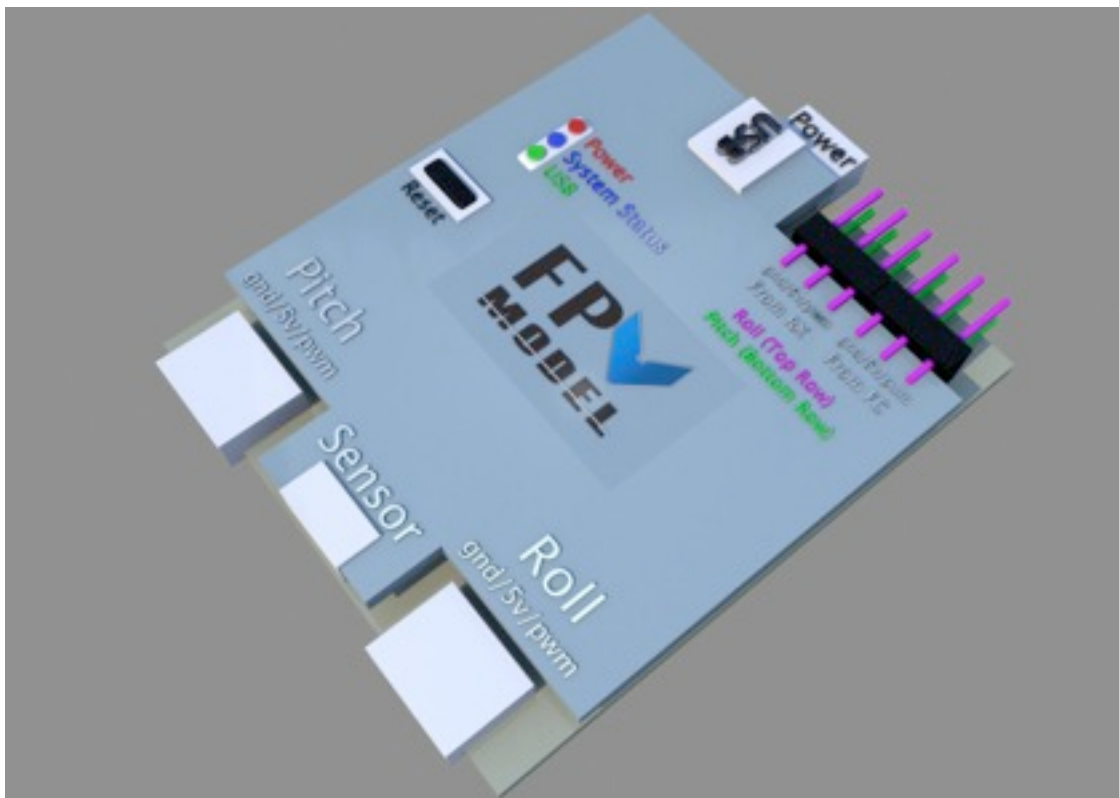
Hint:

Precise ACC calibration is very important to keep horizon stable in case of aggressive flight.

- ^ Tuning Parameters
- ^ Reset parameters to factory defaults pressing USE_DEFAULTS button.
- ^ Connect main power.
- ^ Set POWER according to this Manual.
- ^ Run auto-detection for INVERT and N.POLES. Check N.POLES. Check N.Poles and correct if necessary.
- ^ Tune PID controller. To check quality of stabilization, you may refer to peak-meter (red strokes and numbers beside axis drawing). They show the maximum fluctuations of camera angle. Try to decline frame by small angles (10-20 degrees, moderate speed) and tune PID to minimize this values. For beginning, 1.0 is good Result.
- ^ Connect external flight controller and make auto calibration of EXT_FC_GAIN as described above. After calibration, you may get camera angle fluctuations less than .2 degrees even in that case of fast and big frame disturbances.

Connecting YUN-I Simple BGC to Motors, Gyro Sensor, and Power Supply

Below is a diagram of the Simple BGC layout. Pitch motor connection is to the left of the sensor connection and roll motor connection is to the right of the sensor connection.



The sensor connection is where the Gyro Sensor will need to be connected. Please remember not to hold the gyro in your hand while connected to the sensor connection in the middle of the camera tray.)

The battery supply needs to be connected to the power port, this power port is located just below the USB Port.

Test Gimbal in real Conditions

Leave board connected to Assistant, start main frame motors and give throttle to hover (WARNING: take frame firmly in you hands ABOVE your head! Be very careful.) See graph in Simple BGC assistant to check ACC and GYRO raw data.

This graph lets you to estimate the level of vibrations presented in the YUN-I.

Remember the too big vibrations will highly impact overall stabilization quality. Try to balance props and motors, and use vibration dampers in the gimbal mount.

You may need to slightly adjust PID settings and take vibrations into account, to make it stable.

Menu Button

If you have connected menu button, you can get quick access to a number of functions:

Single-press - Runs accelerometer calibration (like CALIB_ACC button in Simple BGC Assistant)

Double-press - temporarily switching input from receiver's PITCH axis to ROLL axis. This is useful if you connect only one receiver channel to RC_PITCH, and want to adjust ROLL axis before flight.

When finished, double-press menu button again and ROLL position will be saved to memory.

Press and hold for 3 seconds - reset system

Signal LED states

LED is off - small delay before calibration to let you take your hands off

LED slow flashing - run calibration procedure

LED fast Flashing - system error. Connect Simple BGC Assistant to see error description

LED is on - all ok, stabilization performed

