

BGC gimbal & Pixhawk

SToRM32 Gimbal Controller

The *SToRM32-BGC* is a relatively low-cost 3-axis brushless gimbal controller that can communicate with ArduPilot (Copter, Plane and Rover) using MAVLink.

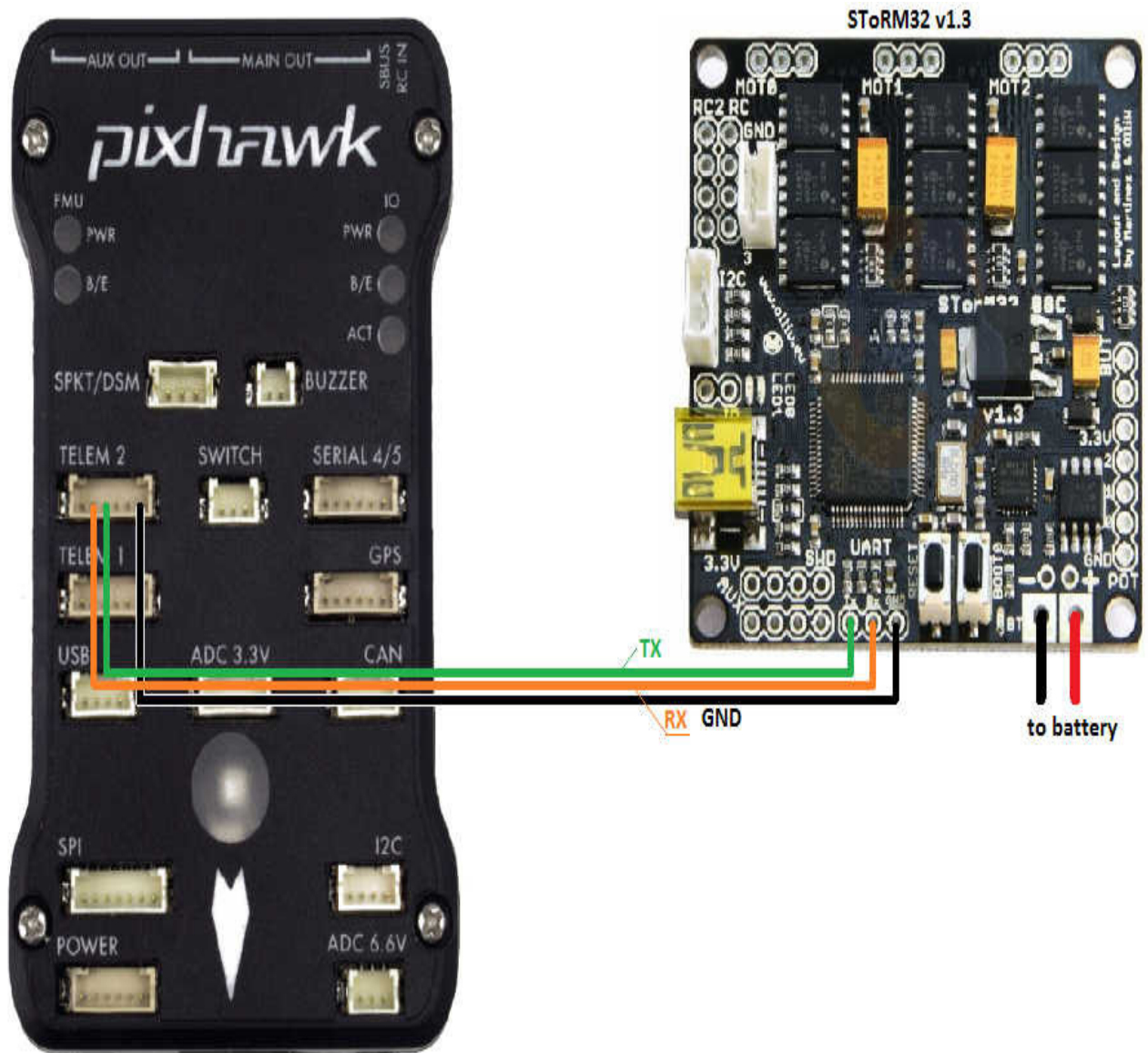
With 3-axis control and MAVLink interface, the SToRM32 offers more capabilities and than the Tarot Gimbal. MAVLink is a richer communications format than PWM and may be used in the future to provide additional information to the gimbal including centrifugal force corrections leading to better performance during aggressive maneuvers.

Please refer to the [SToRM32-BGC wiki pages](#) for more detailed information including where the gimbals can be purchased. This gimbal has been tested with a [DYS 3-axis brushless gimbal](#).

Note

Support for this gimbal is included in Copter 3.3 (and higher) for gimbals running [v067e](#) (or higher).

Connecting the gimbal to the Pixhawk



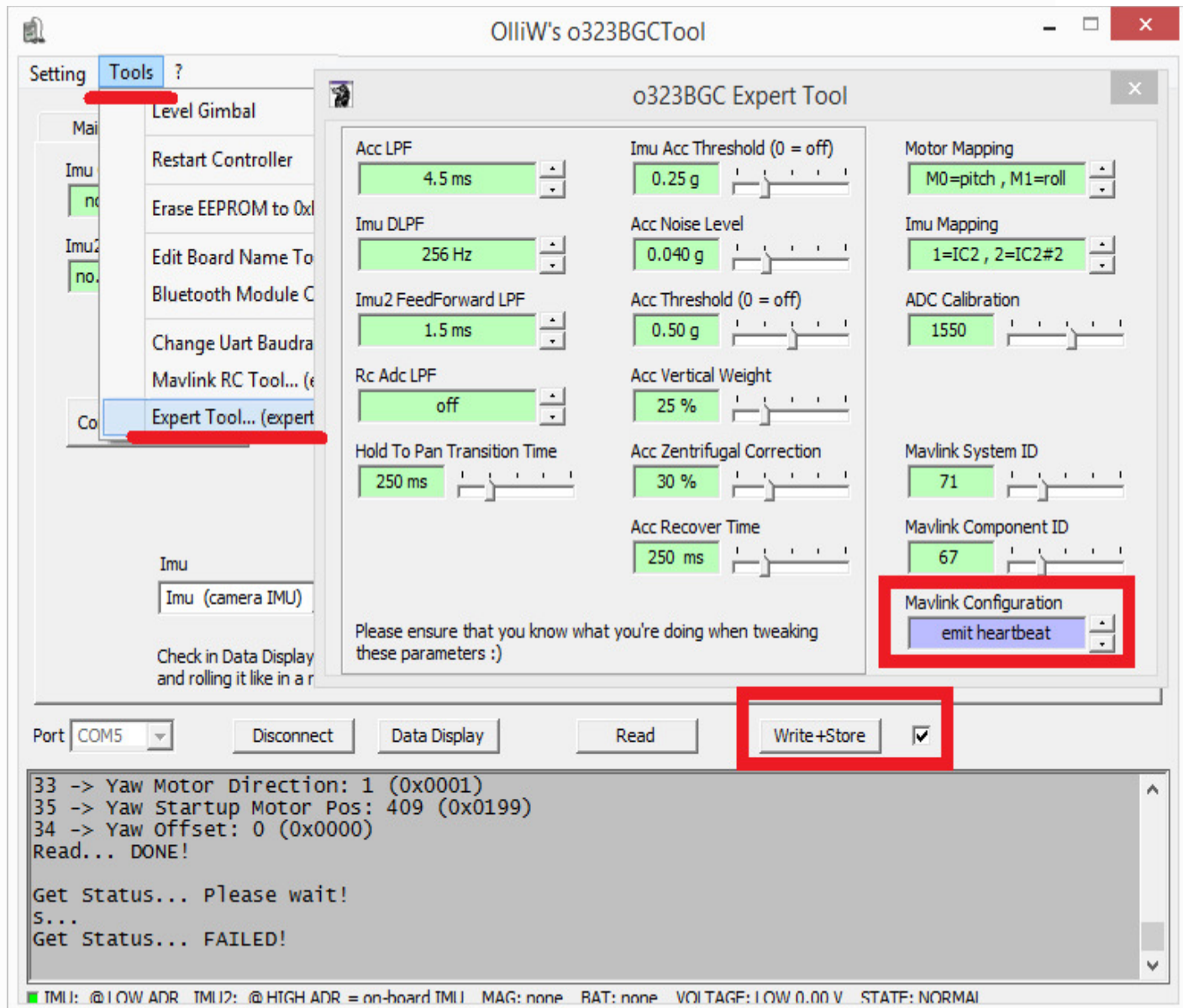
You will need to solder 3-pins of a [DF13 6-pin cable](#) to the gimbal controller board as shown above and then plug the other end into one of the Pixhawk's Telemetry ports (Telem1, Telem2, Serial4).

Note

The remaining 3 pins (VCC, RTS, CTS) of the cable should not be connected.

Configuring the gimbal

In addition to the regular gimbal configuration described on the [SToRM32-BGC wiki](#), the MAVlink heartbeats should be enabled through OlliW's o323BGCTool's **Tools | Expert Tool** screen as shown below.



Set-up through the Mission Planner (MAVLink protocol)

Through your GCS (i.e. MP's Full Param List or Tree) set the following parameters

If using Telem1:

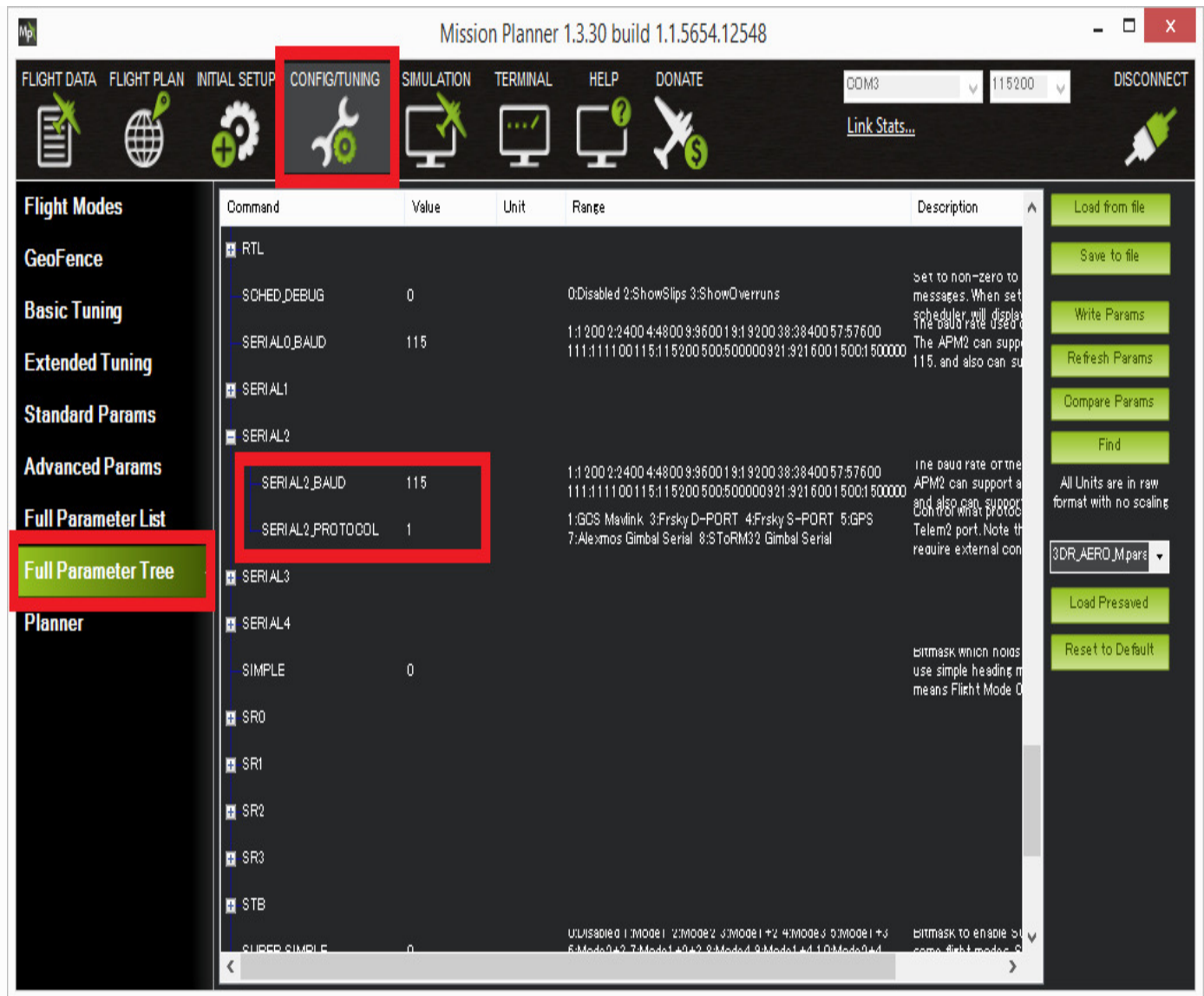
- `SERIAL1_BAUD = "115"`
- `SERIAL1_PROTOCOL = "1"`
- `BRD_SER1_RTSCCTS = "0"`

If using Telem2:

- `SERIAL2_BAUD = "115"`
- `SERIAL2_PROTOCOL = "1"`
- `BRD_SER2_RTSCCTS = "0"`

If using Serial4:

- `SERIAL4_BAUD = "115"`
- `SERIAL4_PROTOCOL = "1"`



- 60 degrees of roll ($MNT_ANGMIN_ROL = -6000$, $MNT_ANGMAX_ROL = +6000$)
- Can point straight down ($MNT_ANG_MIN_TIL = -9000$)
- Can point straight up ($MNT_ANG_MAX_TIL = +9000$)

Mp

Mission Planner 1.3.18 build 1.15503.19823 ArduCopter V3.3-dev (ccc8b18e)

FLIGHT DATA

FLIGHT PLAN

INITIAL SETUP

CONFIG/TUNING

SIMULATION

TERMINAL

HELP

DONATE

COM3115200DISCONNECT

Link Stats...

Flight Modes

GeoFence

Basic Tuning

Extended Tuning

Standard Params

Advanced Params

Full Parameter List

Full Parameter Tree

Planner

Command	Value	Unit	Range	Description
MNT				
MNT_ANGMAX_PAN	17999	Centi-De...	-18000 17999	Maximum physical pan (yaw) angular position of the mount
MNT_ANGMAX_ROL	6000	Centi-De...	-18000 17999	Maximum physical roll angular position of the mount
MNT_ANGMAX_TIL	9000	Centi-De...	-18000 17999	Maximum physical tilt (pitch) angular position of the mount
MNT_ANGMIN_PAN	-18000	Centi-De...	-18000 17999	Minimum physical pan (yaw) angular position of mount.
MNT_ANGMIN_ROL	-6000	Centi-De...	-18000 17999	Minimum physical roll angular position of mount.
MNT_ANGMIN_TIL	-9000	Centi-De...	-18000 17999	Minimum physical tilt (pitch) angular position of mount.
MNT_DEFLT_MODE	3			
MNT_JSTICK_SPD	0		0 100	0 for position control, small for low speeds, 100 for max speed. A good general value is 10 which gives a m...
MNT_LEAD_PTCH	0			
MNT_LEAD_RLL	0			
MNT_NEUTRAL_X	0	Centi-De...	-18000 17999	Mount roll angle when in neutral position
MNT_NEUTRAL_Y	0	Centi-De...	-18000 17999	Mount tilt/pitch angle when in neutral position
MNT_NEUTRAL_Z	0	Centi-De...	-18000 17999	Mount pan/yaw angle when in neutral position
MNT_RC_IN_PAN	0		0:Disabled 5:RC5 6:RC6 7:RC7 8:RC8	0 for none, any other for the rc channel to be used to control pan (yaw) movements
MNT_RC_IN_ROLL	0		0:Disabled 5:RC5 6:RC6 7:RC7 8:RC8	0 for none, any other for the rc channel to be used to control roll movements
MNT_RC_IN_TILT	6		0:Disabled 5:RC5 6:RC6 7:RC7 8:RC8	0 for none, any other for the rc channel to be used to control tilt (pitch) movements
MNT_RETRACT_X	0	Centi-De...	-18000 17999	Mount roll angle when in retracted position
MNT_RETRACT_Y	0	Centi-De...	-18000 17999	Mount tilt/pitch angle when in retracted position
MNT_RETRACT_Z	0	Centi-De...	-18000 17999	Mount yaw/pan angle when in retracted position
MNT_STAB_PAN	0		0:Disabled 1:Enabled	enable pan/yaw stabilisation relative to Earth
MNT_STAB_ROLL	0		0:Disabled 1:Enabled	enable roll stabilisation relative to Earth
MNT_STAB_TILT	0		0:Disabled 1:Enabled	enable tilt/pitch stabilisation relative to Earth
MNT_TYPE	4			
MOT				

Load

Save

Write Params

Refresh Params

Compare Params

Find

All Units are in raw format with no scaling

3DR_AERO_Mp

Load Params

Reset to Default

Set-up through the Mission Planner (SToRM32 serial protocol)

The custom SToRM32 protocol was added as an alternative to the MAVLink protocol and has the same features. To use the serial protocol use all the same settings as above except set the SERIALX_PROTOCOL to “8” (where “X” is “1”, “2” or “4” depending upon which Pixhawk serial port the gimbal is connected to).

When [Configuring the Gimbal](#) controller the “MAVLink configuration” should be set to “no heartbeat”.

Testing the gimbal

For instructions for testing the gimbal moves correctly please check the [similar section for the Tarot gimbal](#).

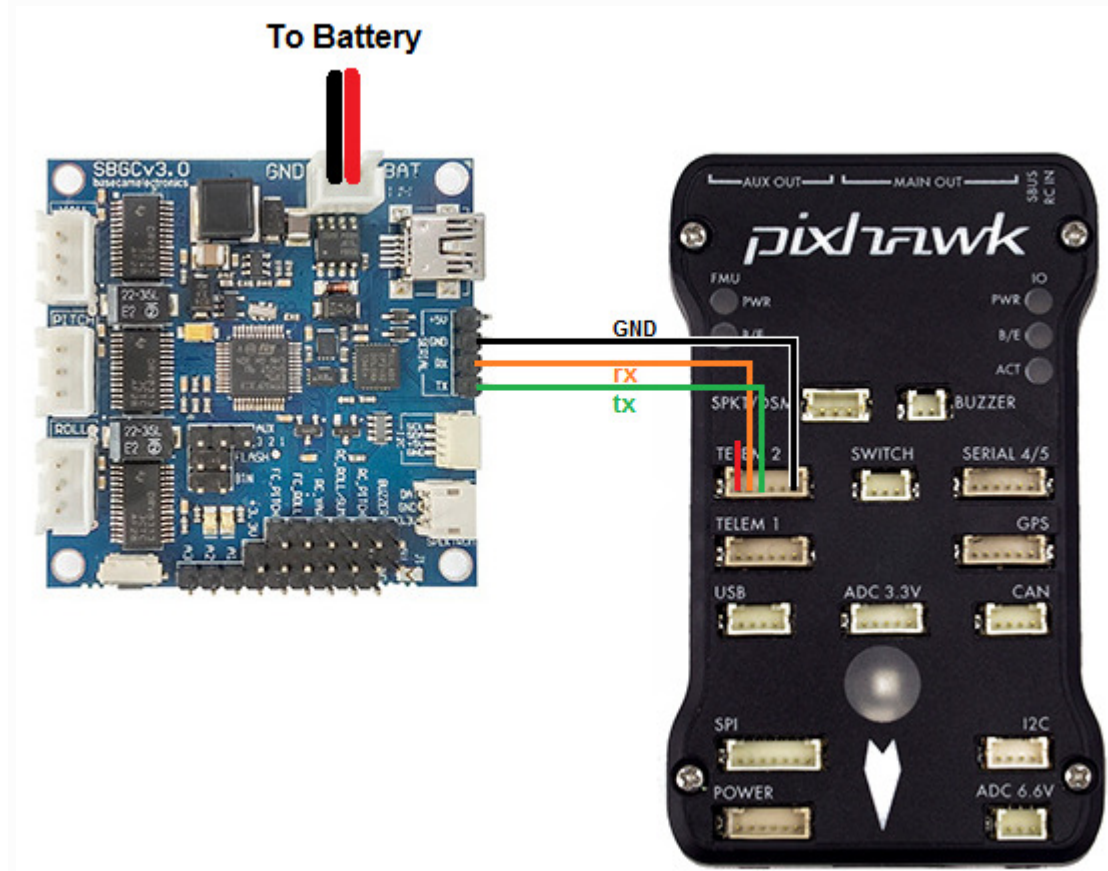
The video below shows the SToRM32 being tested on Copter3.3. It demonstrates a few features that would not be possible on a 2-axis gimbal like the [Tarot Gimbal](#).

Resistor issue on some boards

Some in-depth analysis [here on rcgroups](#) turned up that some SToRM32 boards need resistor #4 (shown in pic below) shorted (i.e. a wire soldered over the top of the resistor to turn it into a regular wire) in order for the gimbal controllers messages to get through to the Pixhawk.

The SimpleBGC controller and accompanying 2-axis and 3-axis gimbals can be purchased from basecamelectronics.com and many other retailers.

Connecting the gimbal to the Flight Controller



Although the SimpleBGC can be connected using PWM (similar to the Tarot gimbal) we recommend using the serial interface connected to one of the flight controller's Serial/Telemetry ports like Telem2 as shown above.

Setup through the Ground Station

Set the following parameters through your ground station and then reboot the flight controller:

- **MNT_TYPE** to 3 / "AlexMos-Serial"
- **SERIAL2_PROTOCOL** to 7 / "AlexMos Gimbal Serial" (Note "SERIAL2" should be "SERIAL1" if using Telem1 port, SERIAL4 if using Serial4/5, etc)

If you are unable to connect you may wish to set the following parameters although normally this should not be required:

- `SERIAL2_BAUD` to 115 (means use serial baudrate of 115200)
- `BRD_SER2_RTSCTS` to 0 to disable flow control on Telem2 (use `BRD_SER1_RSCTS` if connecting to Serial1, Serial4/5 never uses flow control)

The gimbal's maximum lean angles can be set using these parameters:

- `MNT_ANGMIN_ROL`, `MNT_ANGMAX_ROL` to -3000 and 3000 to limit the roll angle to 30 degrees in each direction
- `MNT_ANGMIN_TIL`, `MNT_ANGMAX_TIL` to -9000 and 0 to limit the gimbal to point between straight down (-90 degrees) and straight forward (0 degrees)

To control the gimbal's lean angles from a transmitter set:

- `MNT_RC_IN_TILT` to 6 to control the gimbal's tilt (aka pitch angle) with the transmitter's Ch6 tuning knob

For a 3-axis gimbal with 360 degrees of yaw set:

- `MNT_ANGMIN_PAN`, `MNT_ANGMAX_PAN` to -18000 and 18000 to get a full 360 degrees of yaw range

Testing the gimbal

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