How to enable more flight modes

Here are two examples how to set up more flight modes for the Thunderbird. I recommend to create a new model and do all steps with it. Call the model "HaveFun" or something like that.

Four Flight Modes with ST16 Channel settings

I this example I use the Pan Mode Switch (S2, Channel 10) to select one of the two sets of flight modes:

- Set One (S2 up or down) has "Altitude" in upper position of the flight mode switch S4, "Position hold" in the middle position and "Return to home" in the lower position.
- Set Two (S2 middle position) has "Rattitude" in upper position of the flight mode switch S4, "Stabilized" in the middle position and again "Return to home" in the lower position.

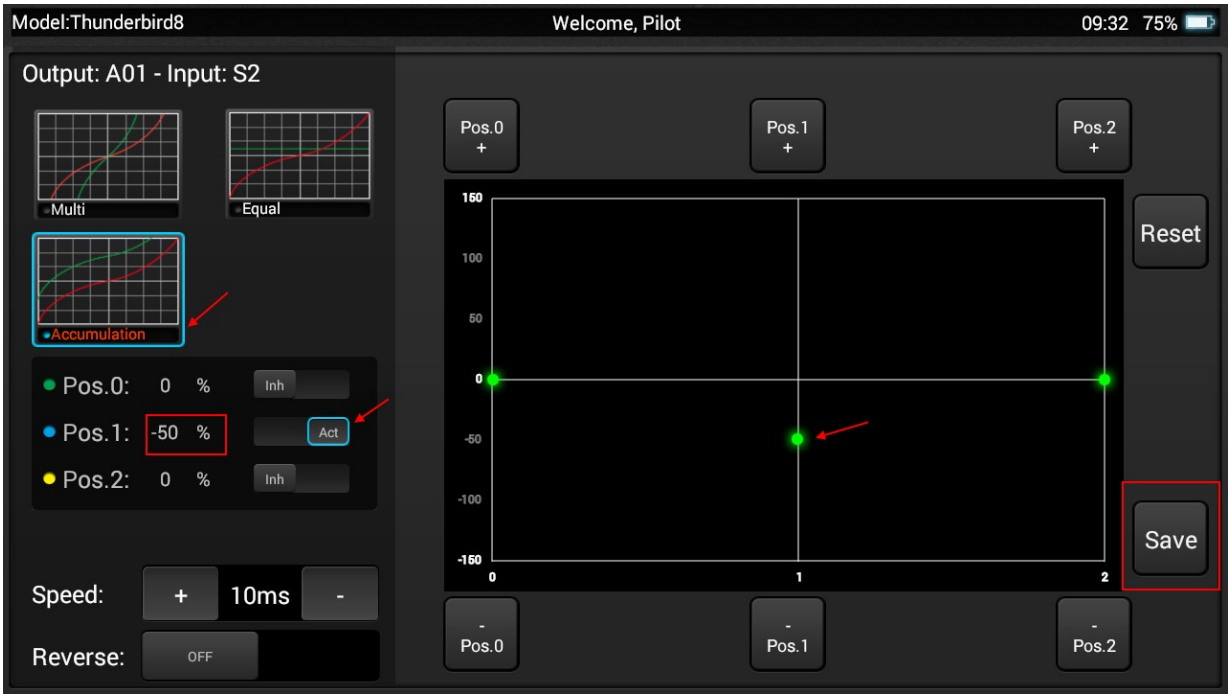
Set One is the same as GPS off/on. Set two contains more advanced flight modes. "Acro" was left off because I'm too old for this stuff.

Step 1: Channel settings at ST16

Open channel settings and select A01.

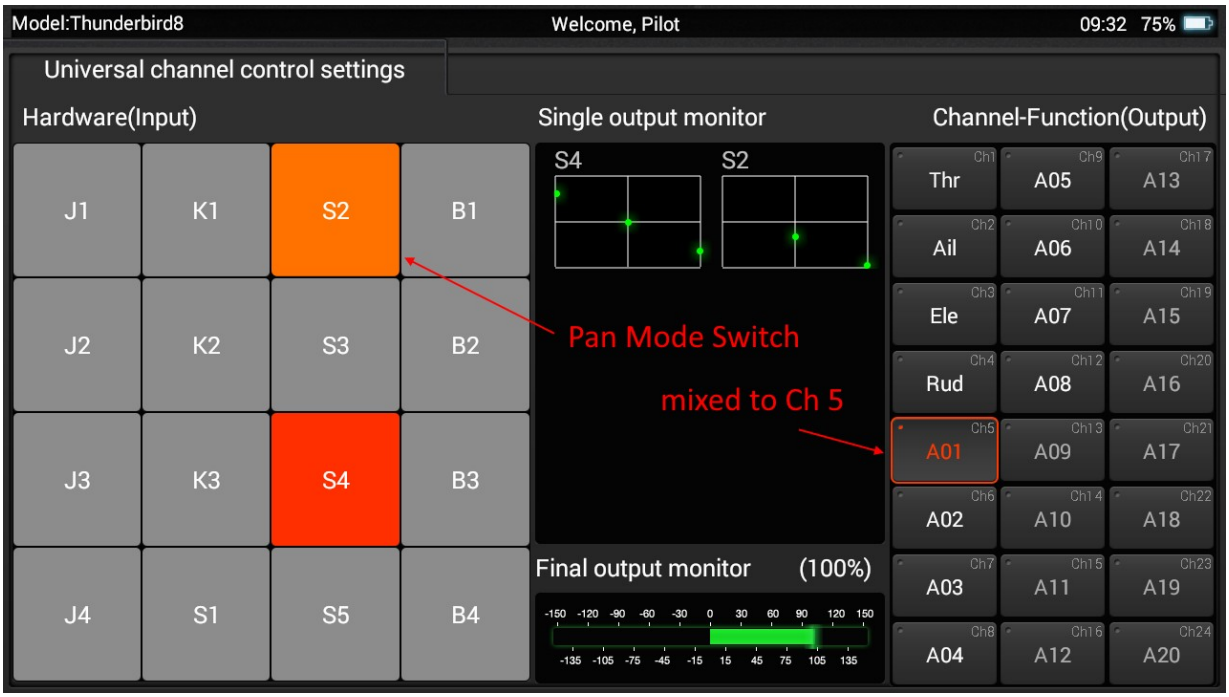
Tap on S2 and hold it to get menu. Select "Edit" from the menu.

Set "Accumulation", Pos.0 to "Act" and -50%. Tap on Save.



Now you should get a mixed channel for flight modes:

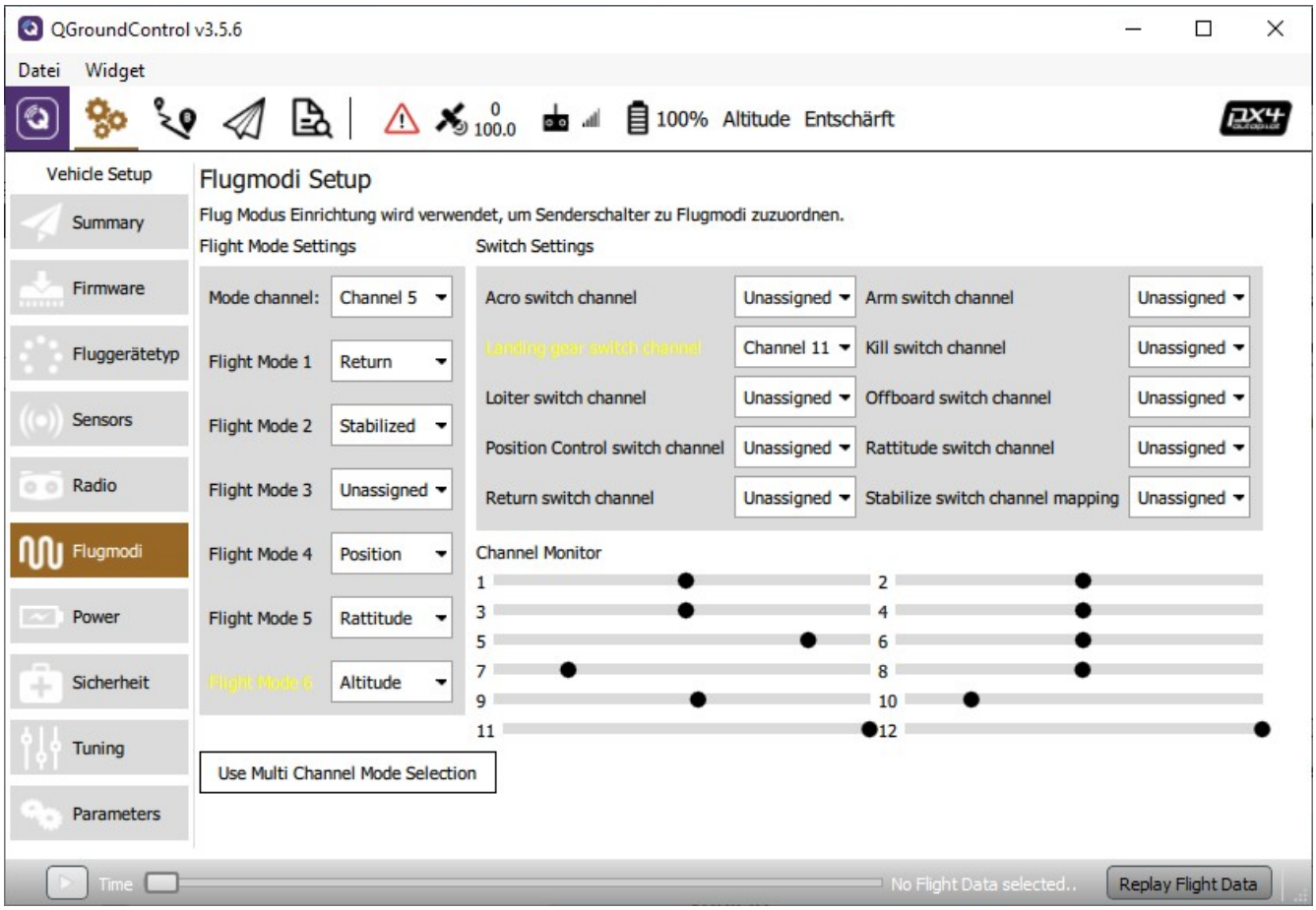
- S2 up/down: 100% > 0 > -100%
- B2 middle: 50% > -50% > -150%



Remark: Channel A02 (RTH channel) must still have values 0 > 0 > 150% in both positions of S2 switch. Check this!

Step 2: Assign flight modes in QGroundControl

Bind the new model to Thunderbird and connect it to QGroundControl by USB cable.
Now we have more possibilities to add flight modes:



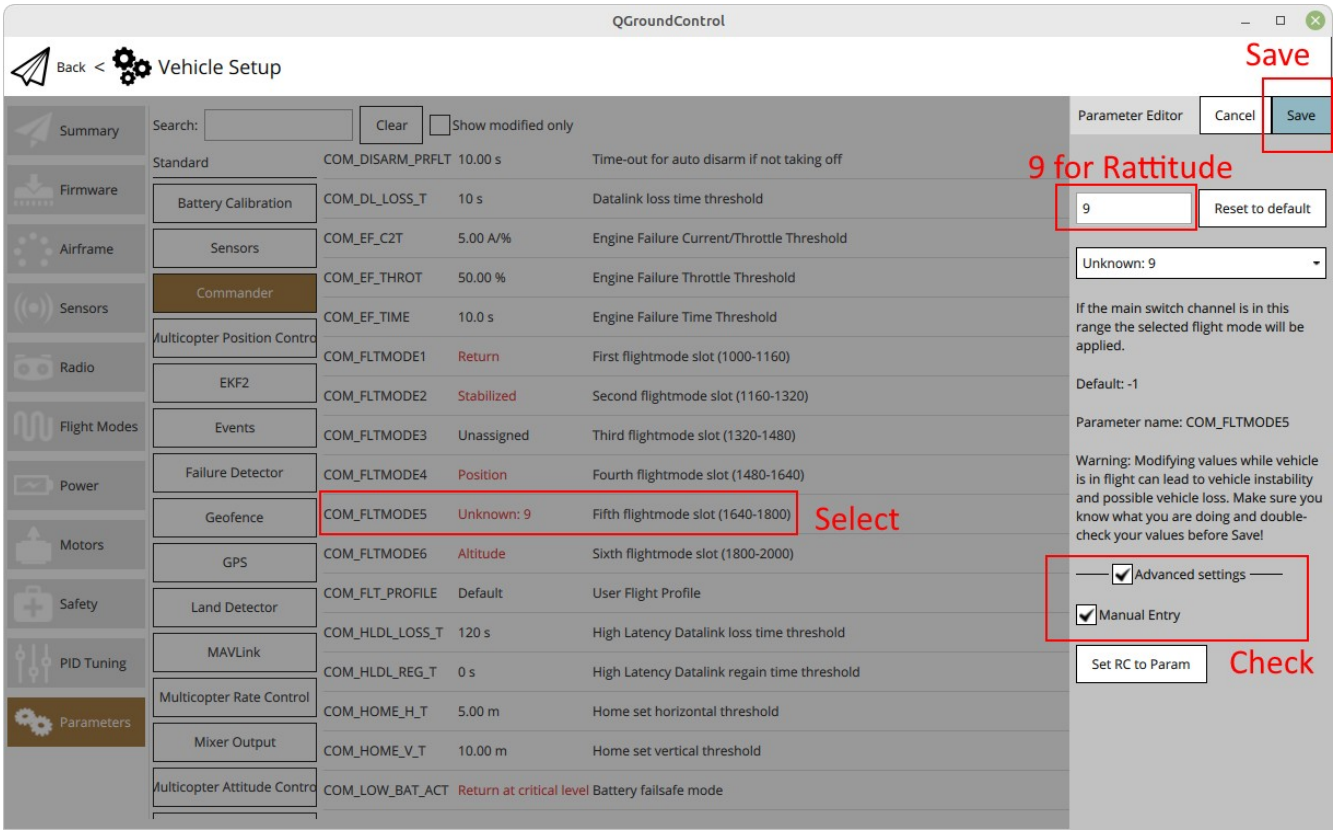
Go to ***QGroundControl*** > ***Vehicle Setup*** > ***Flight Modes*** and assign flight modes to the mode items.

- Mode channel remains Channel 5.
- Flight mode 1 is lower position of the Flight mode switch S4, remains "Return" for both Sets.
- Flight mode 2 belongs to Set Two, middle position, will be assigned to "Stabilized".
- Flight mode 3 remains "Unassigned".
- Flight mode 4 belongs to Set One, middle position, remains "Position".
- Flight mode 5 belongs to Set Two, upper position, will be assigned to "Rattitude" *****.
- Flight mode 6 belongs to Set One, upper position, will be assigned to "Altitude".

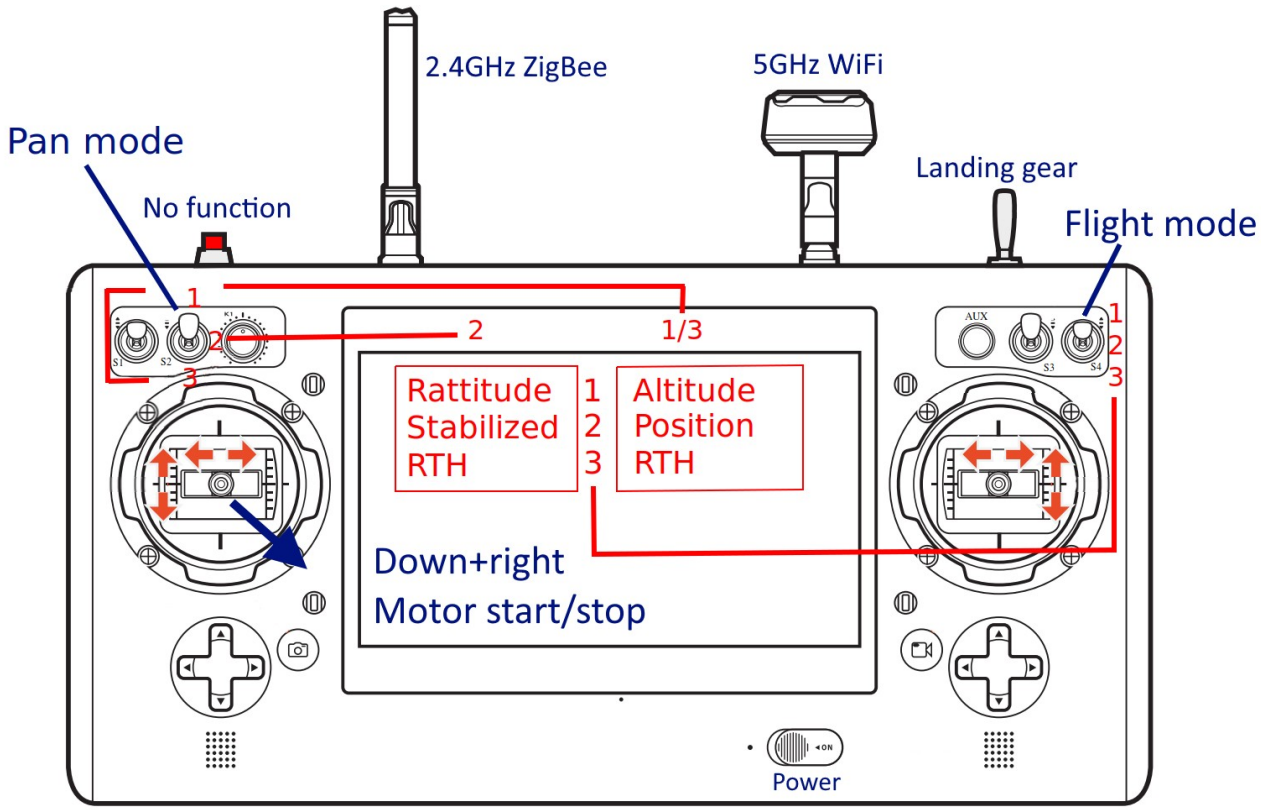
Test all switch positions carefully in flight mode settings of QGroundControl. The active switch combination is highlighted.

Mode-switch	AUX-switch	FlightMode	Status LED	Pos %	Log value
up	up	Altitude	Blue blinking	+100%	3412.0
up	down	Rattitude	White blinking	+50%	2730.0
middle	up	Position hold	Purple solid	0%	2048.0
middle	down	Stability	Blue solid	-50%	1365.0
down	up	RTH	Red blinking	-100%	683.0
down	down	RTH	Red blinking	-150%	0.0

* In newer versions of QGroundControl the flight mode "Rattitude" is no more available. But we can still assign this mode as long as it is available in our firmware. The flight mode names are represented as numbers in the parameters (enum). Rattitude is still number 9.
Go to Vehicle Setup > Parameter and select parameter set "Commander". There are parameters COM_FLTMODEx for six slots [x = 1 ... 6] . You see what was already assigned. Select the slot you want to change (for above example this is COM_FLTMODE5) and check "Advanced Settings" and "Manual Entry". Enter "9" for Rattitude, save and done.



Important Note: Test changed flight modes without propellers before you use this settings in real flight sessions. First test flights do better without camera. **Do all this on your own risk!**

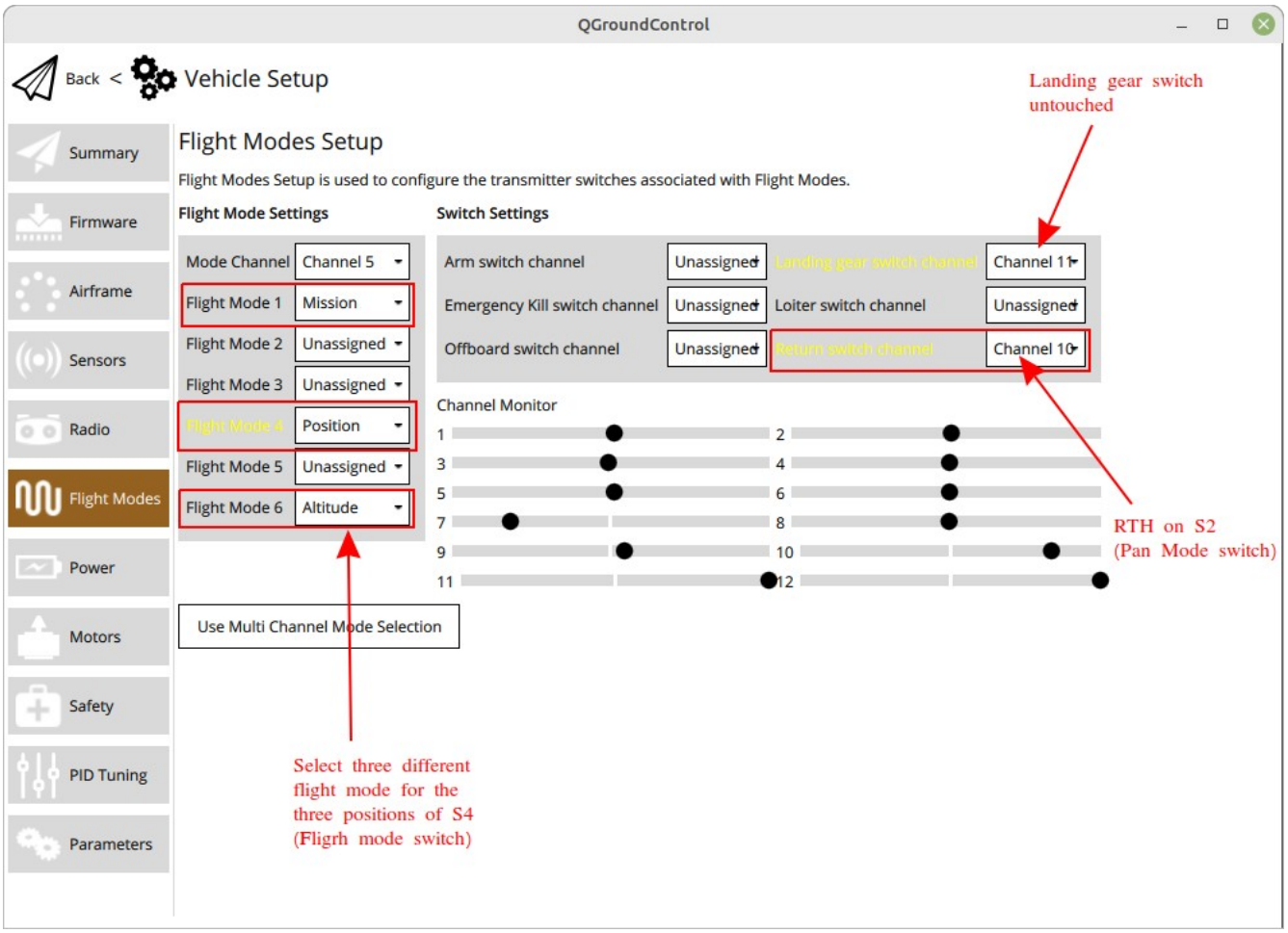


Now the Pan Mode switch is used to switch between the two degrees of difficulty of the flight modes.
The more difficult flight modes are only active in the middle position of the Pan mode switch S2.
In panic it doesn't matter if you switch up or down to get back to normal - have fun.

Note: PX4 Flight Modes are described here:
https://docs.px4.io/main/en/flight_modes/#multicopter

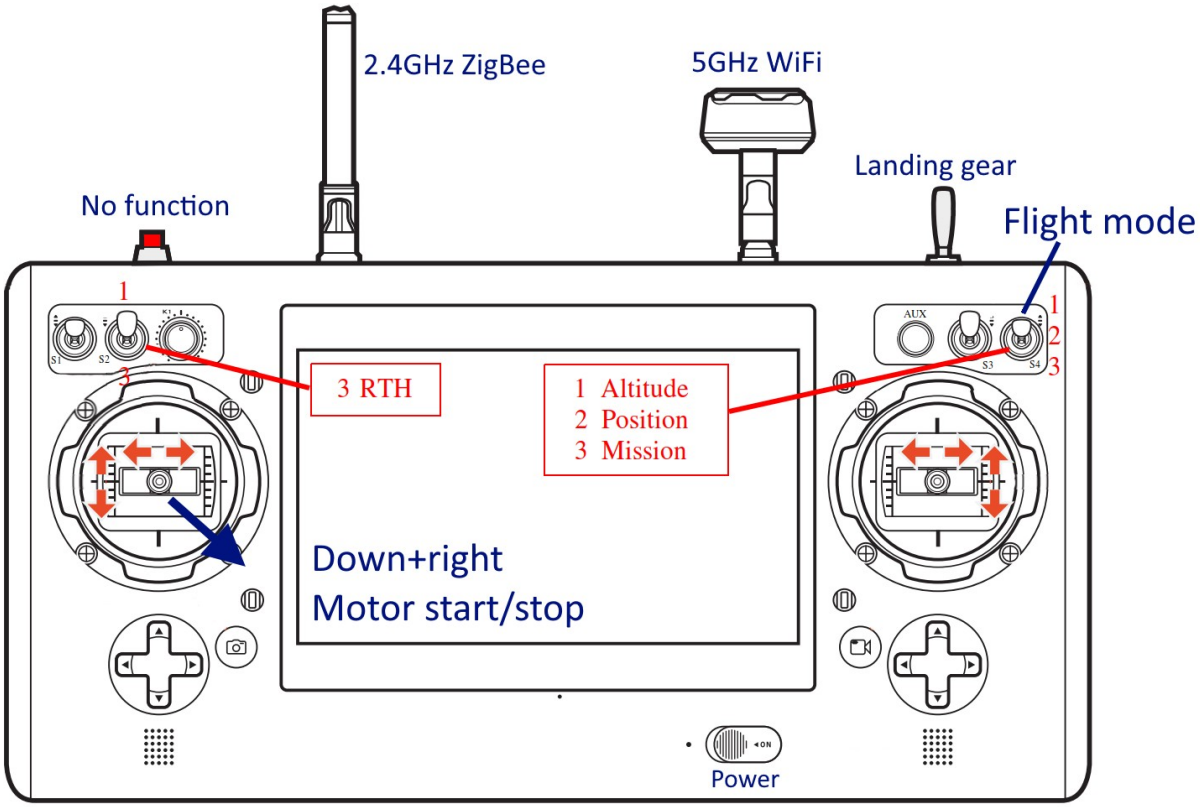
Three Flight Modes without any Channel settings

Here is another example for only three different flight modes but without changing any channel settings. We only need settings in ***QGroundControl > Vehicle Setup > Flight Modes***:



In this example, RTH is set to the lower position of the Pan Mode switch S2 = Channel 10. This allows to set any of the three PX4 Flight Modes to the 3-way switch S4 (Flight mode).
The Flight Mode switch in this example has Altitude Mode in the upper position, Position Mode (=Angle Mode with GNSS support) in the middle position as usual and Mission Mode in the lower position. Of course you can set any other PX4 Flight Modes on the three slots (1, 4 and 6).

Important Note: Test changed flight modes without propellers before you use this settings in real flight sessions. First test flights do better without camera. **Do all this on your own risk!**



Note: PX4 Flight Modes are described here:
https://docs.px4.io/main/en/flight_modes/#multicopter

Appendix

Servo values representation

ST16 [#]	Servo [µs]	Value [%]
0	900	-150
511	1000	-125
683	1100	-100
1023	1200	-75
1365	1300	-50
1535	1400	-25
2048	1500	0
2560	1600	25
2730	1700	50
3072	1800	75
3412	1900	100
3584	2000	125
4095	2100	150

Flight mode slots (related to standard servo values 900-2100µs)

Slot	Parameter	Thresholds [µs]	Value [%]
1	COM_FLTMODE1	1000-1160	-100
2	COM_FLTMODE2	1160-1320	-75 .. -50
3	COM_FLTMODE3	1320-1480	-25
4	COM_FLTMODE4	1480-1640	0
5	COM_FLTMODE5	1640-1800	50
6	COM_FLTMODE6	1800-2000	100

Flight Mode values in FLTMODE parameter:

- -1: Unassigned
- 0: Manual
- 1: Altitude
- 2: Position
- 3: Mission
- 4: Hold
- 5: Return
- 6: Acro
- 7: Offboard
- 8: Stabilized
- 9: Rattitude
- 10: Takeoff
- 11: Land
- 12: Follow Me