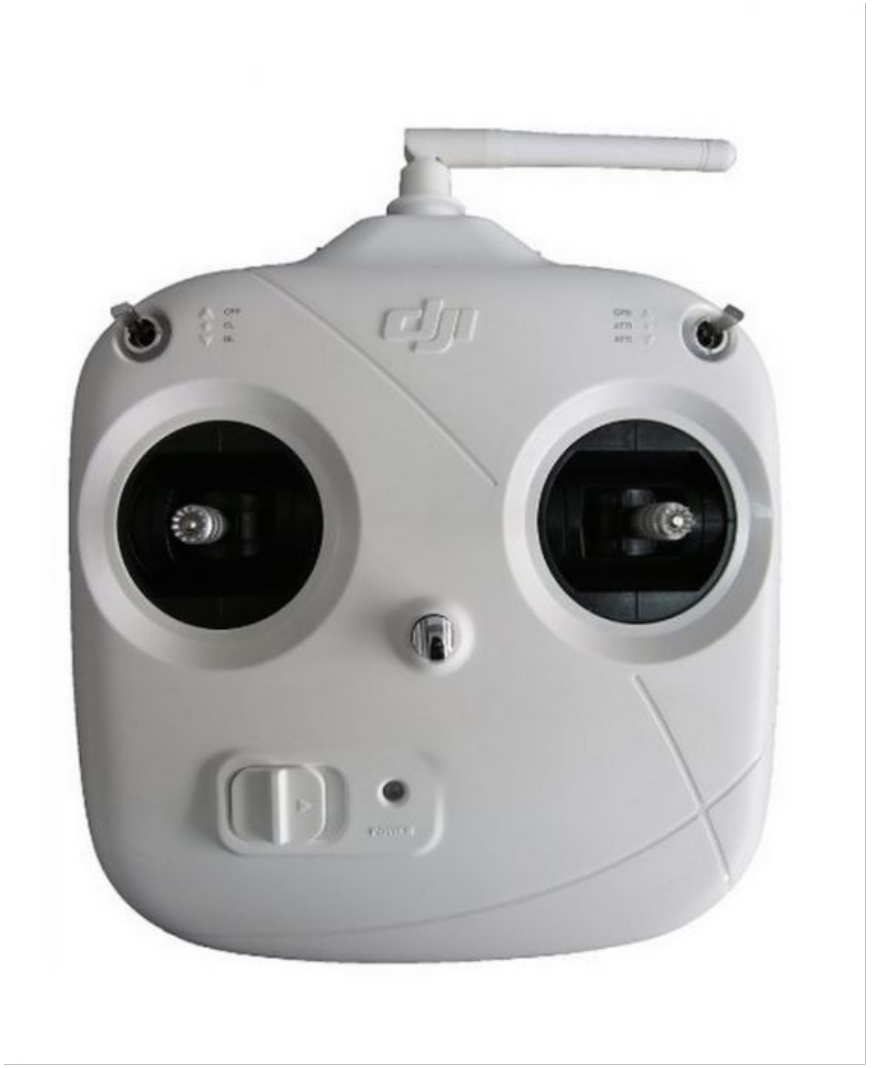
CLEAR Remote Control
User Manual

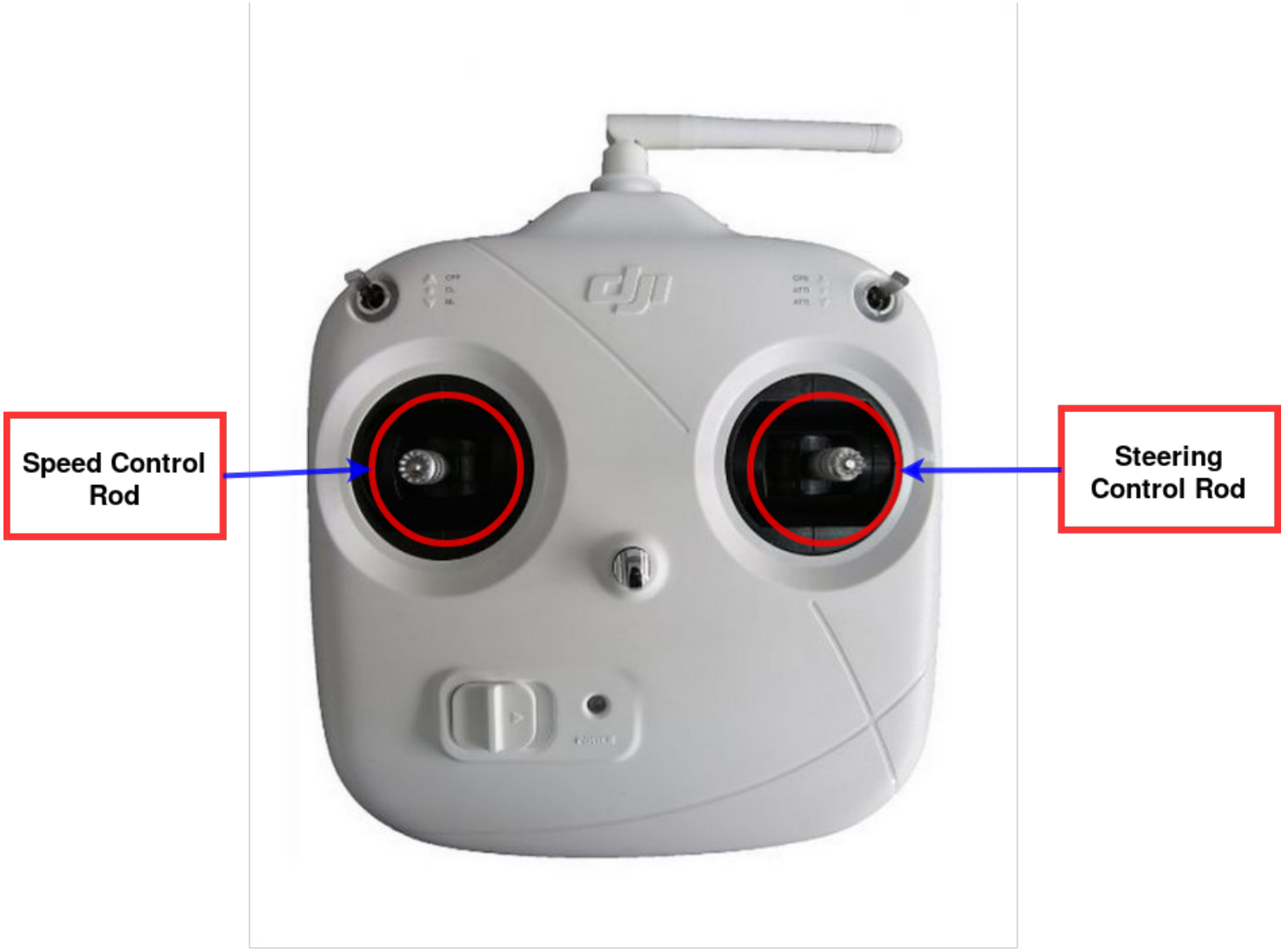
Created: 07/09/2018

Last revision: 10/09/2018

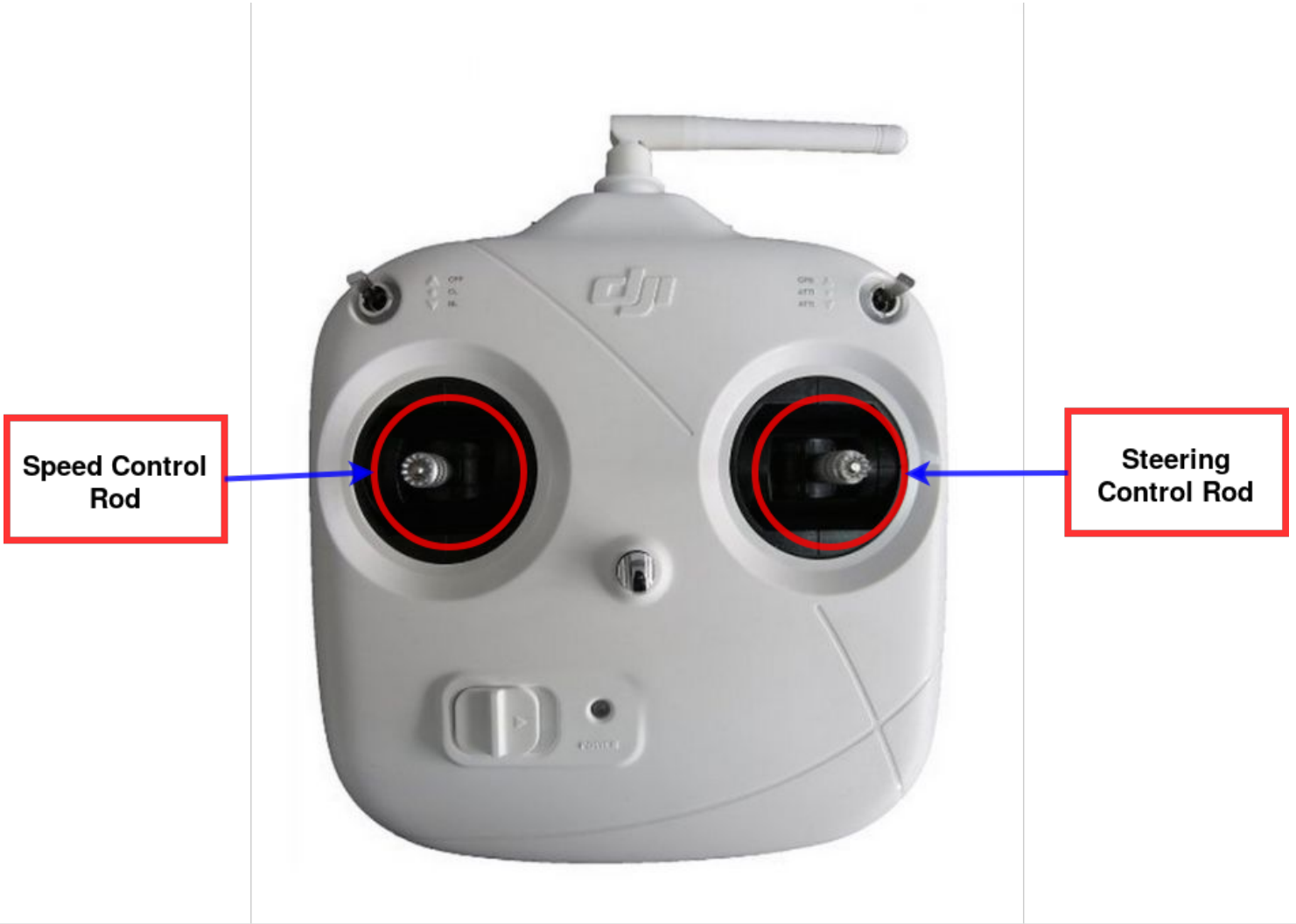
Remote Control: DJI-DT7



RC Control Rods

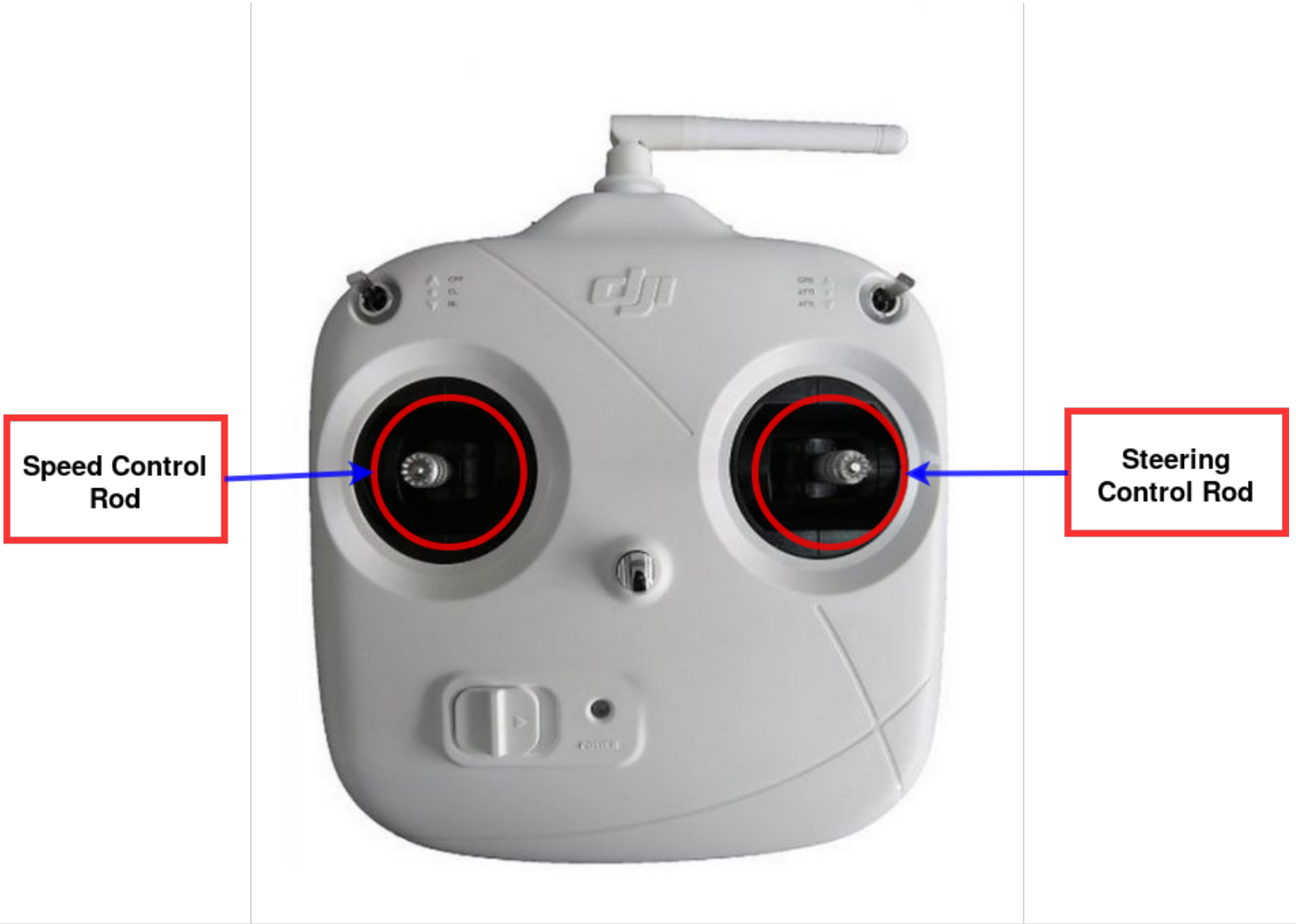


RC Speed Control Rod



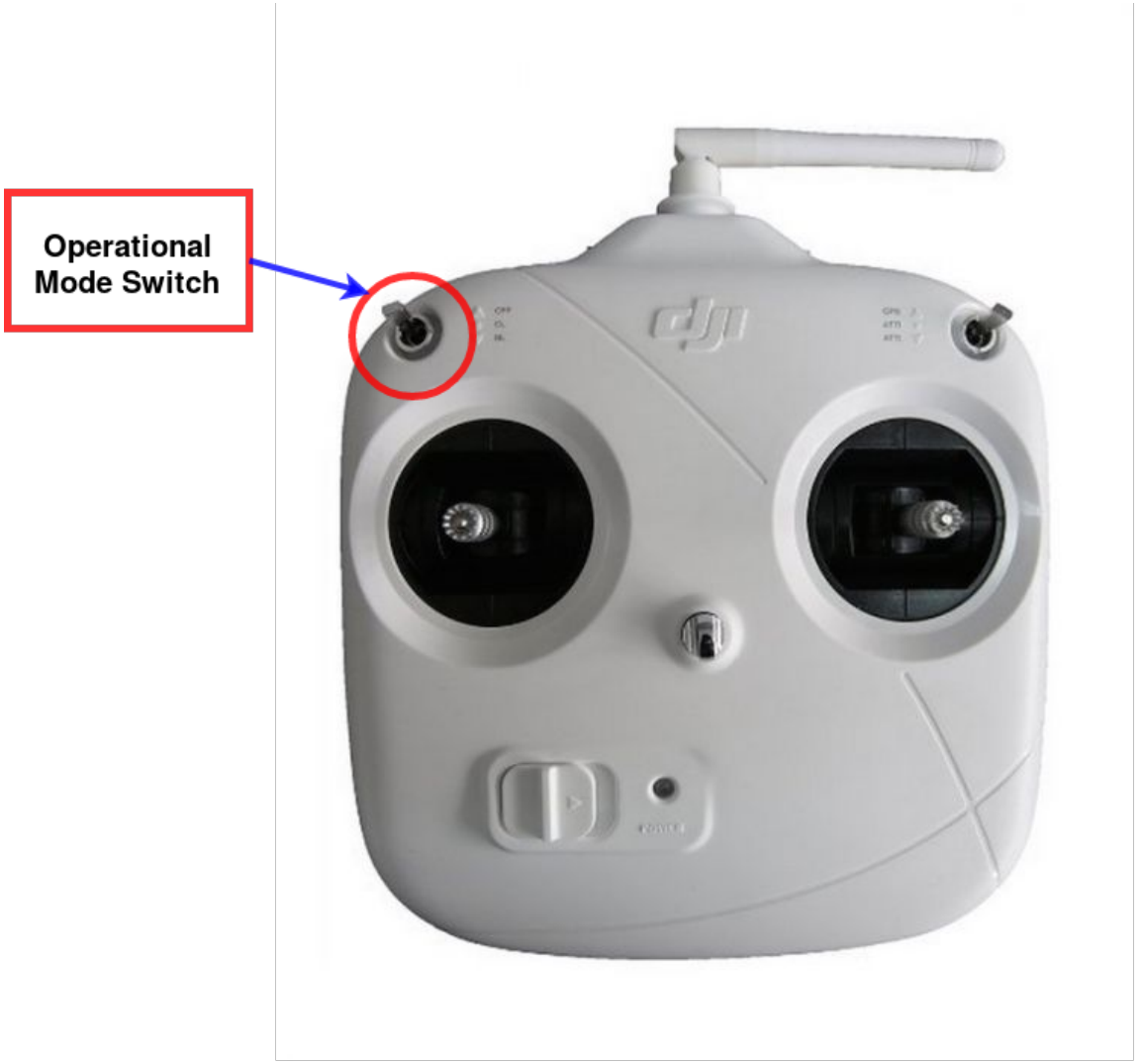
Speed Control Rod:
Move it Up and Down to control the robot speed (forward and reverse speed respectively). The position of this control will be used either to adjust the speed PID setpoint or to set the output voltage, bypassing the controller (see Emergency/Disable PID Switch).

RC Steering Control Rod

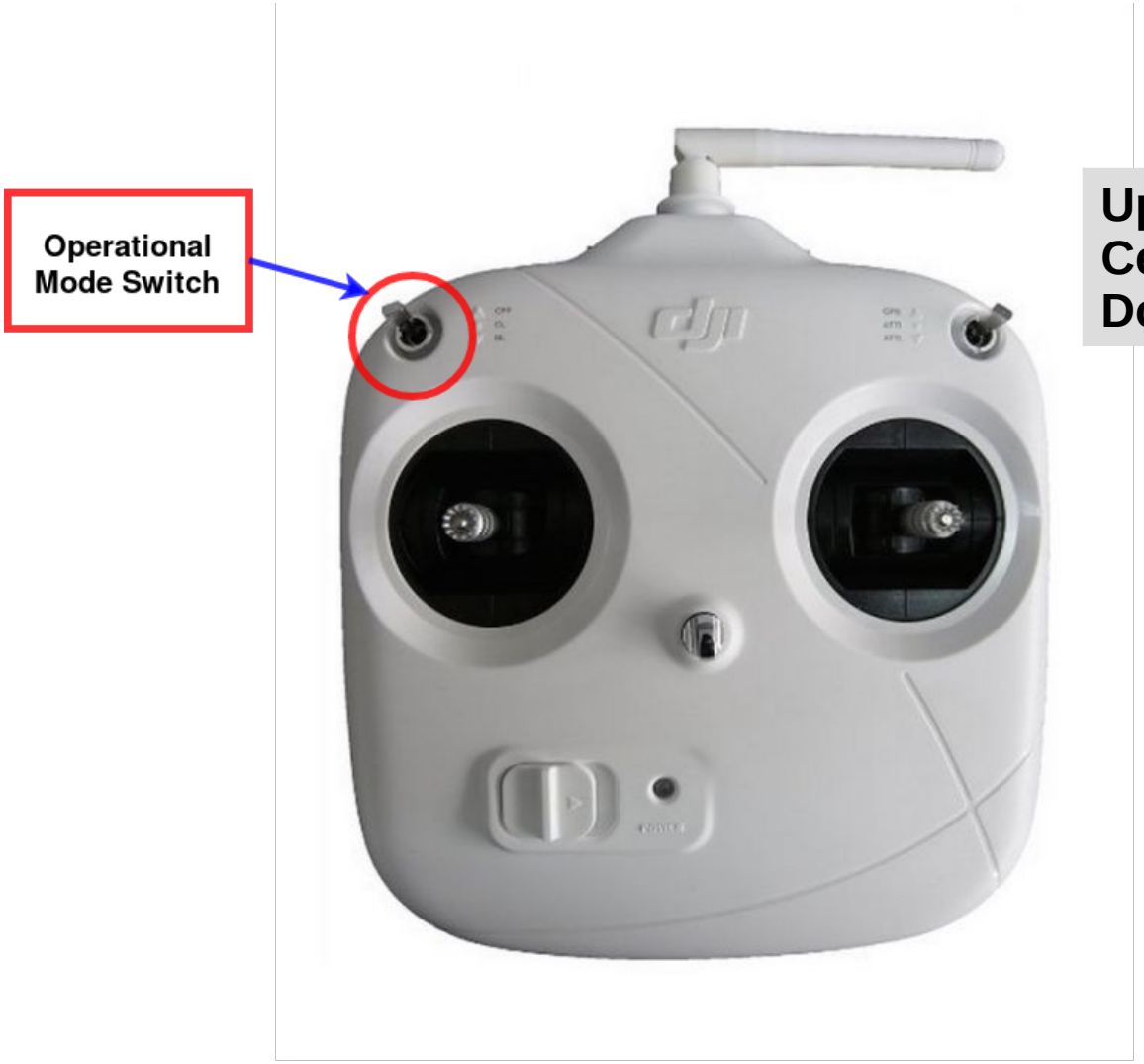


Steering Control Rod:
Move it to the Left and Right to control the steering angle. If the PID is enabled (see Emergency /Disable PID Switch) the control is performed in angular position, while if the PID is disabled, the control rod changes the PWM value sent to the motor, thus controlling the angular velocity.

RC Operational Mode Switch

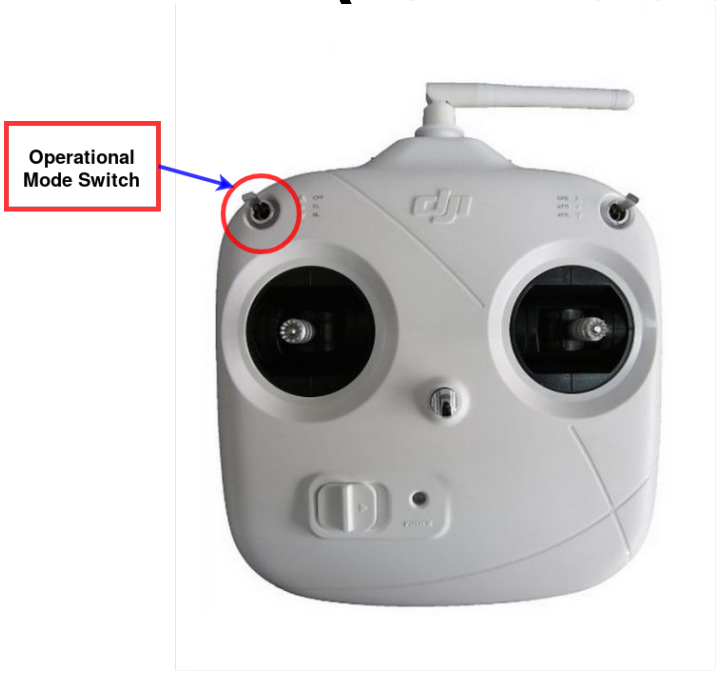


RC Operational Mode Switch



Up: ROS Control
Center: Manual Safe
Down: Manual NOT-SAFE

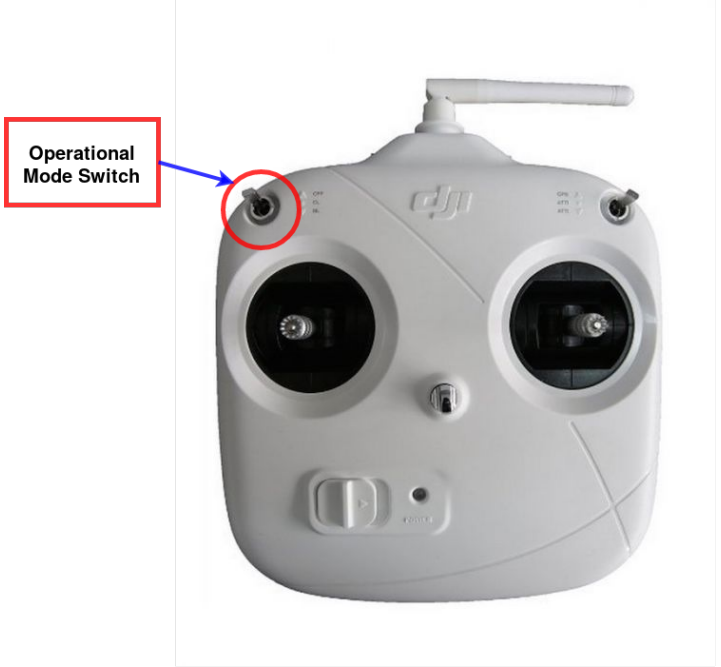
ROS Control Mode (On-board LED = Blue)



Up: ROS Control
Center: Manual Safe
Down: Manual NOT-SAFE

- Speed and steering angle values received trough the *desired_ackermann_state* topic will be used to adjust the PID controllers setpoint.

ROS Control Mode (On-board LED = Blue)

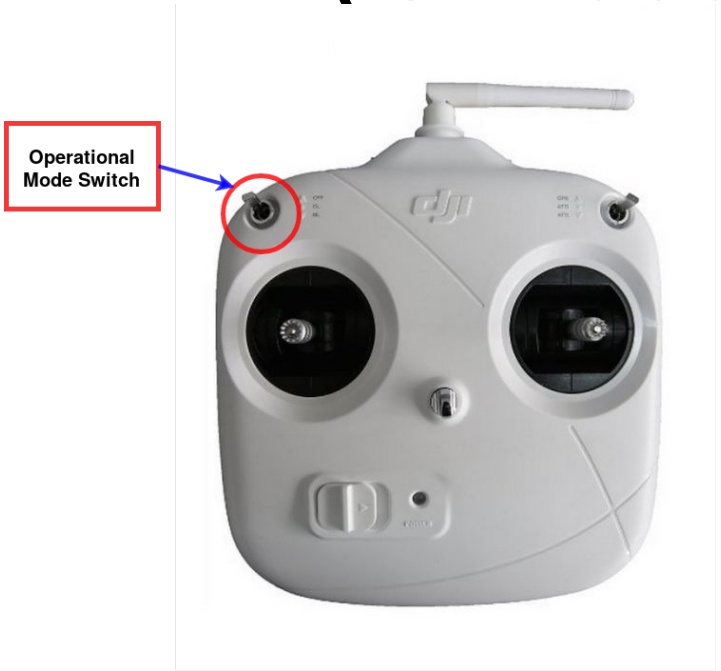


Up: ROS Control
Center: Manual Safe
Down: Manual NOT-SAFE

- Speed and steering angle values received trough the *desired_ackermann_state* topic will be used to adjust the PID controllers setpoint.

- The presence of the “speed recommender” safety system is required. This system uses on-board sensors to adjust the robot speed, approaching obstacles slowly and stopping the robot if the distance becomes smaller than a user-configurable safety distance threshold.

ROS Control Mode (On-board LED = Blue)



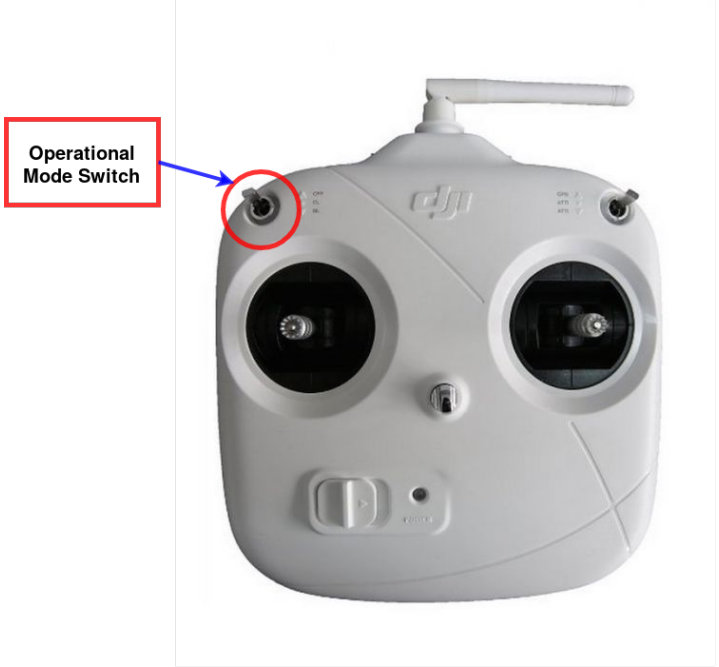
Up: ROS Control
Center: Manual Safe
Down: Manual NOT-SAFE

- Speed and steering angle values received trough the *desired_ackermann_state* topic will be used to adjust the PID controllers setpoint.

- The presence of the “speed recommender” safety system is required. This system uses on-board sensors to adjust the robot speed, approaching obstacles slowly and stopping the robot if the distance becomes smaller than a user-configurable safety distance threshold.

- Whenever the “speed recommender” overrides the PID speed setpoint, the on-board LED will turn to Yellow. If the “speed recommender” messages are not received within a safety time threshold the system state changes automatically to Emergency mode. (Both conditions also applies to Manual Safe mode).

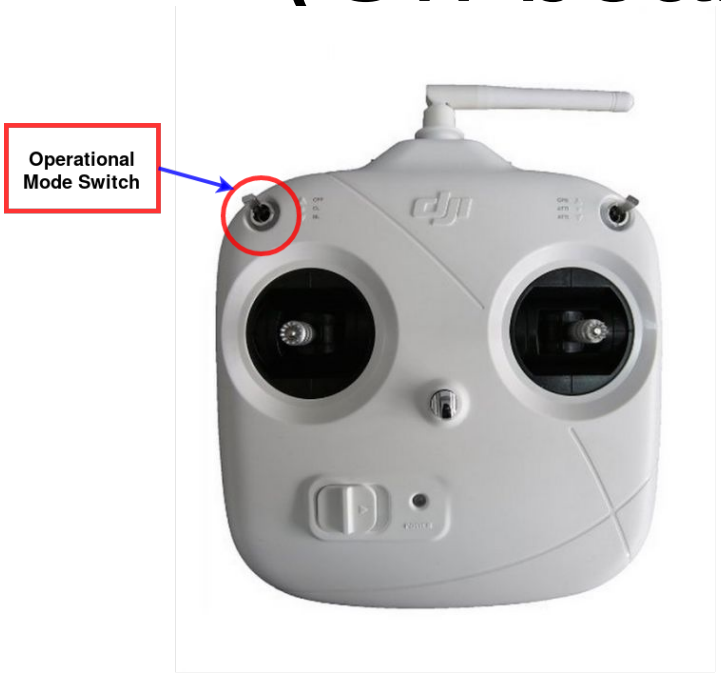
Manual Safe Mode
(On-board LED = Green)



Up: ROS Control
Center: Manual Safe
Down: Manual NOT-SAFE

- PID setpoints are controlled using the RC control rods.

Manual Safe Mode
(On-board LED = Green)

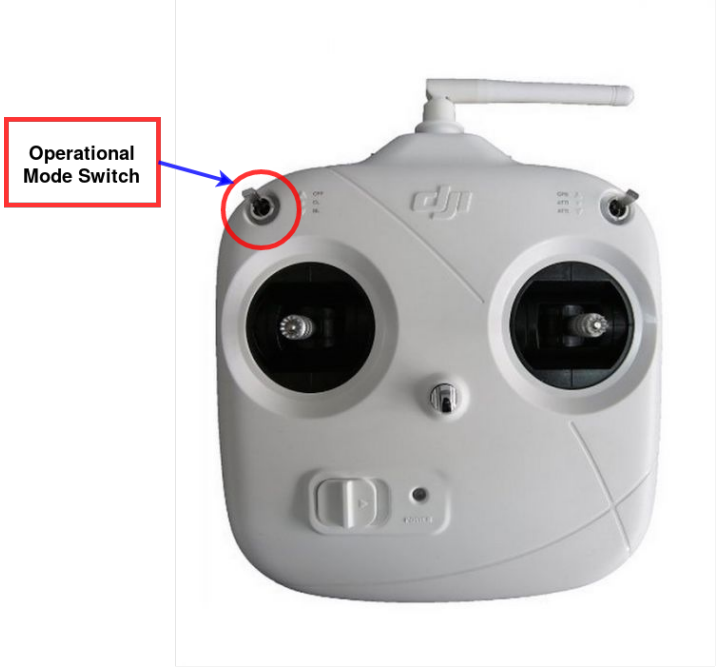


Up: ROS Control
Center: Manual Safe
Down: Manual NOT-SAFE

- PID setpoints are controlled using the RC control rods.

- The presence of the “speed recommender” safety system is required. If it is not detected, the system will change to Emergency mode.

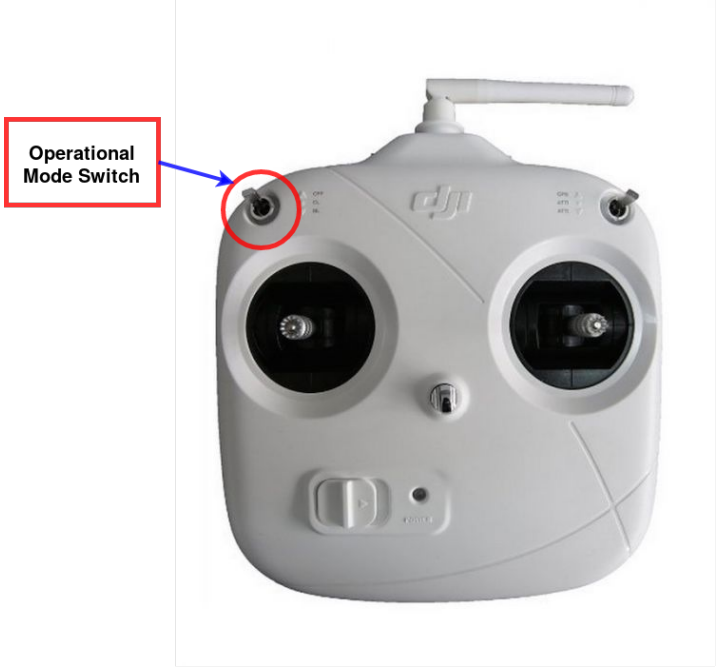
Manual NOT-Safe Mode (On-board LED = White)



Up: ROS Control
Center: Manual Safe
Down: Manual NOT-SAFE

- The safety system is **<u>disabled</u>**, so the robot won't stop to avoid collisions.

Manual NOT-Safe Mode (On-board LED = White)



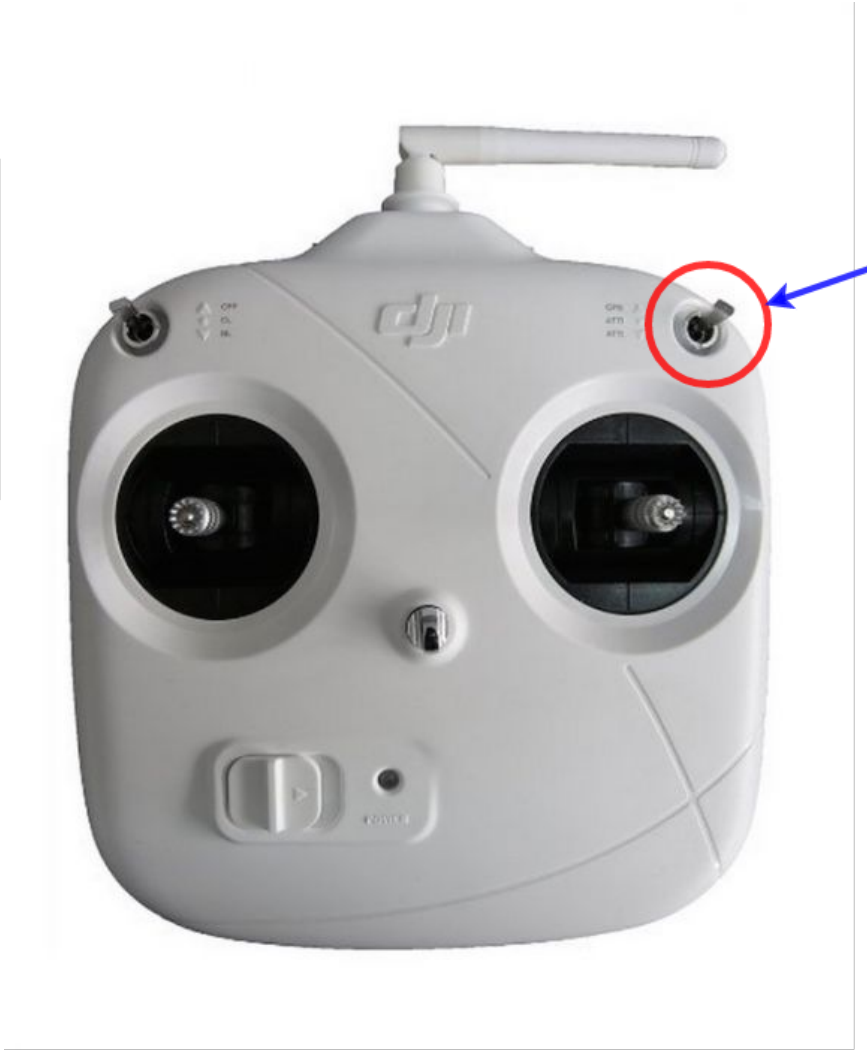
Up: ROS Control
Center: Manual Safe
Down: Manual NOT-SAFE

- The safety system is **disabled**, so the robot won't stop to avoid collisions.

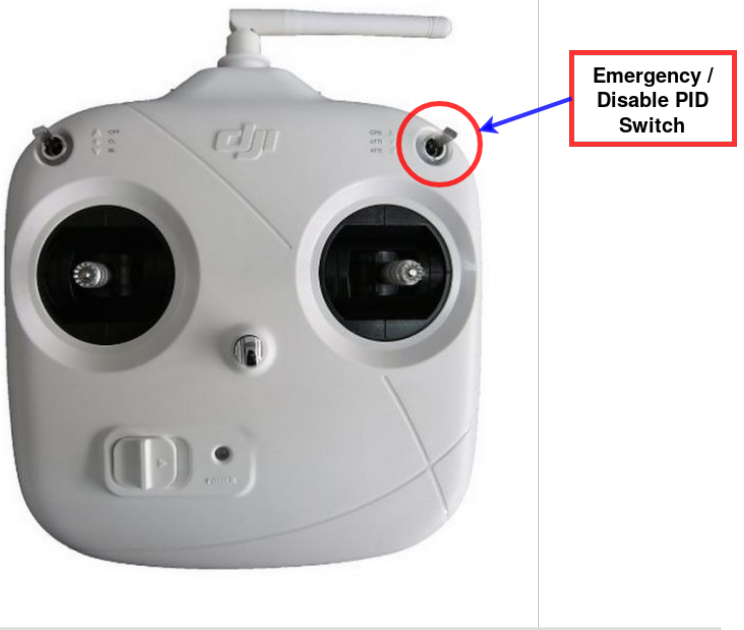
- The RC control rods can be used to adjust the PID's setpoints, or altermatively, to actuate directly the motors (speed voltage and steering PWM), bypassing the PIDs. (see Emergency/Disable PID switch).

RC Emergency / Disable PID Switch

Up: **Emergency**
Center: **No-Emergency**
Down: **Emergency or Disable PID (in Manual NOT-SAFE mode)**



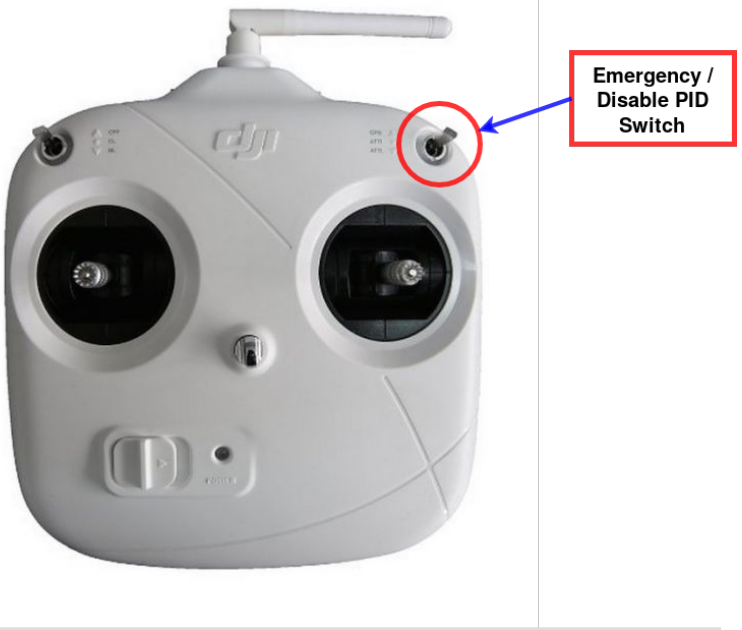
Emergency Mode (On-board LED = Red)



Up: Emergency
Center: No-Emergency
Down: Emergency or Disable PID (in Manual NOT-SAFE mode)

- In Emergency Mode, the motors are disabled and the brakes are activated immediately.

Emergency Mode (On-board LED = Red)

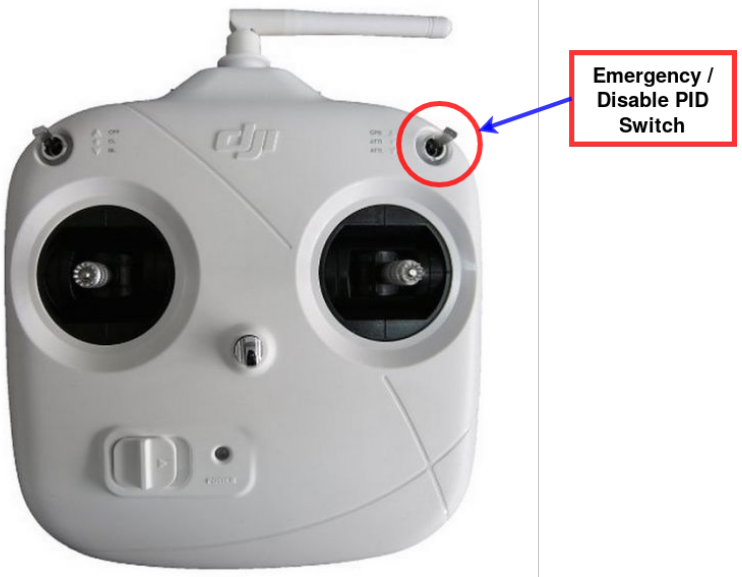


Up: Emergency
Center: No-Emergency
Down: Emergency or Disable PID (in Manual NOT-SAFE mode)

- In Emergency Mode, the motors are disabled and the brakes are activated immediately.

- To enter in Emergency Mode from the RC, just change the Emergency Switch to one of the extreme positions (Up or Down) except in Manual NOT-SAFE mode, where Down Position is reserved for PID controllers bypass (On-board LED → Yellow).

Emergency Mode (On-board LED = Red)



Up: Emergency
Center: No-Emergency
Down: Emergency or Disable PID (in Manual NOT-SAFE mode)

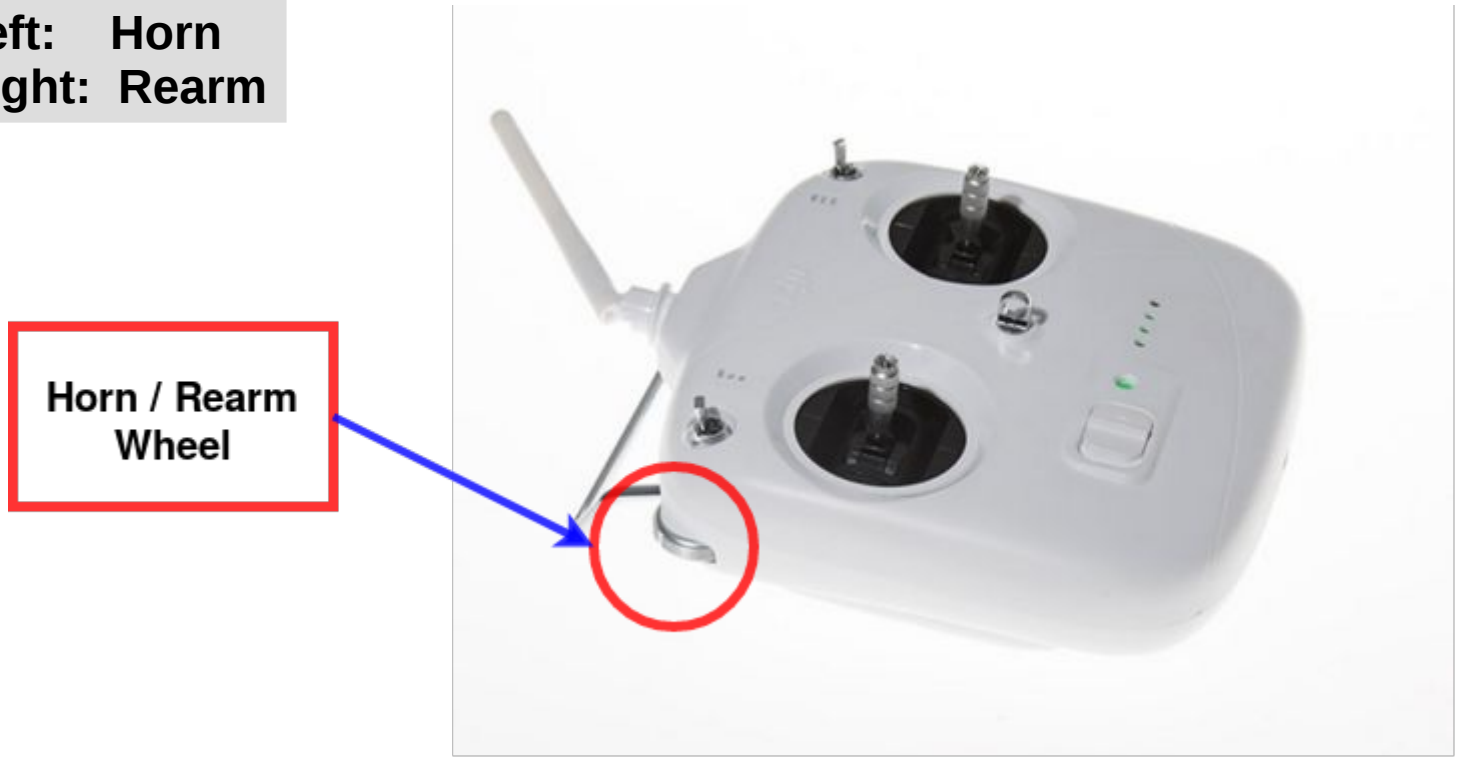
- In Emergency Mode, the motors are disabled and the brakes are activated immediately.

- To enter in Emergency Mode from the RC, just change the Emergency Switch to one of the extreme positions (Up or Down) except in Manual NOT-SAFE mode, where Down Position is reserved for PID controllers bypass (On-board LED → Yellow).

- To exit from Emergency mode: Set the Operational Mode Switch to “Manual NOT-SAFE” mode, set the Emergency/Disable PID switch to “No-Emergency” and rearm the system using the Horn/Rearm wheel (see next slide).

RC Horn / Rearm Wheel

Full left: Horn
Full right: Rearm



<u>Horn / Rearm Wheel:</u>
Drive the wheel to its left extreme position to activate the horn.
To finalize the rearm process (see Emergency / Disable PID Switch section) drive the wheel to its right extreme position.