

The PROSYSTEMY Drone Technology Laboratory (DRONTECHLAB) is highly flexible framework. Any sensor with an appropriate communication interface may be integrated for sensing unmanned aerial vehicle (UAV) bench angles, accelerations, changes in orientation around a reference axes, altitude, angular velocity, GPS location, current, temperature and so on. The supported standard communication interfaces include RS485 MODBUS RTU protocol, RS485 NMEA 0183 protocol, 0-10V, 4-20mA, NTC, analog inputs, 0-10V analog outputs, 24VDC digital outputs.

Default DRONTECHLAB sensing unit is high-precision 9-axis inclinometer/gyroscope from WitMotion, which combines measurement of several process values. Measured values are sent to the DCU flight controller via RS485 Modbus RTU. By default, sensing of pitch, roll and yaw angles and magnetic field vectors are included in the software.

Before use, it is necessary to configure and calibrate the inclinometer in order to achieve the correct functionality. To calibrate the sensor, it is recommended to remove the inclinometer from the UAV bench and perform calibration procedure according to the manufacturer's instructions. Note that, in the case of complete DRONTECHLAB UAV bench, the sensor is already calibrated and set. If there is a suspicion of incorrect functionality, the re-calibration is recommended.

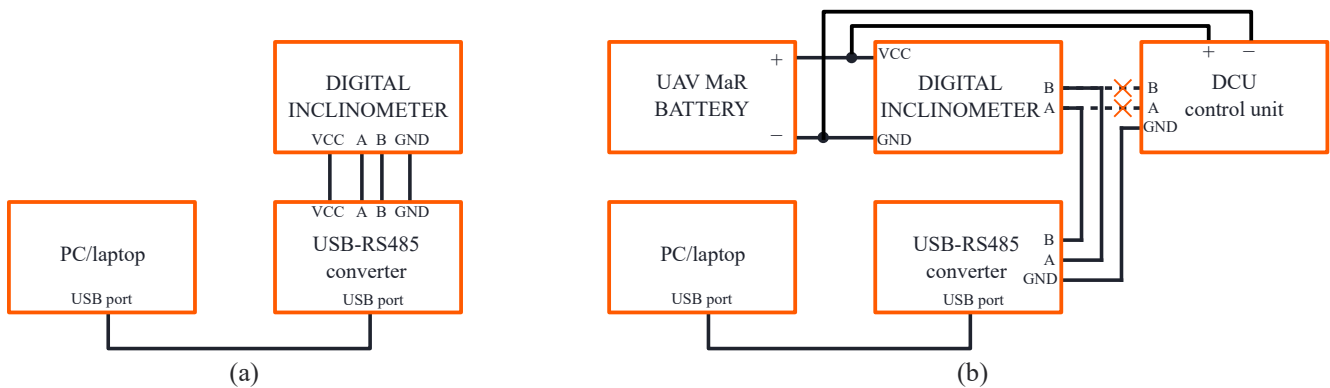


Figure 1: Schematic connection of the gyroscope sensor and PC/laptop, while (a) the gyroscope sensor is unmounted from the UAV and (b) the gyroscope sensor is mounted on the UAV.

The connection of the inclinometer with PC is schematically shown in Figure 1. Default sensor configuration is shown in Figure 2.

Manufacturer configuration application (see Figure 2 or Figure 3) provides interface for parameter modification, as well as calibration. 'Magnetic Field' calibration needs to be evaluated for proper functionality (please follow hyperlink*). Table 1 and Figure 3 shows modification with respect to default parameters. Note that these parameters have been determined experimentally to achieve the best performances. These parameters may vary in specific application.

* <https://www.wit-motion.com/proztsz/43.html>

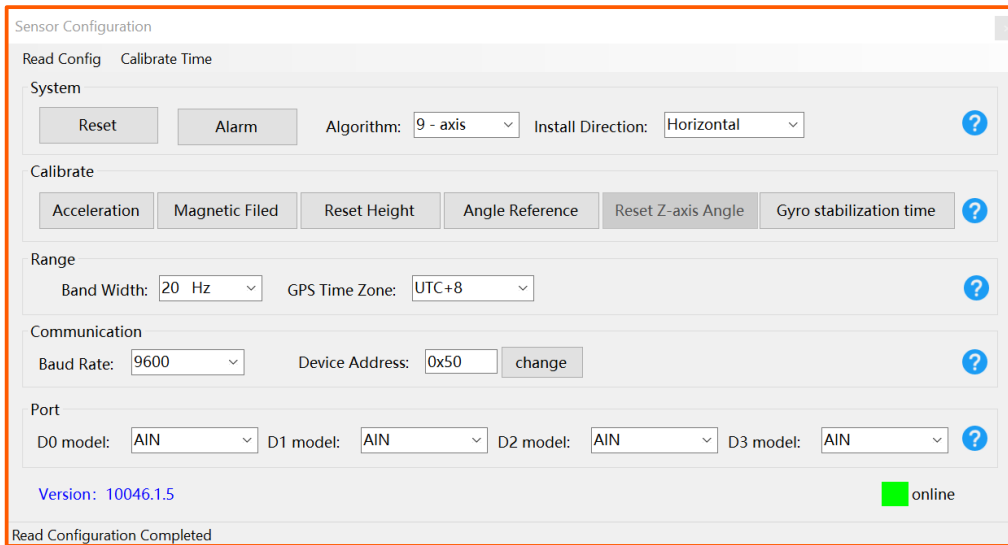


Figure 2: Default sensor configuration set by manufacturer.

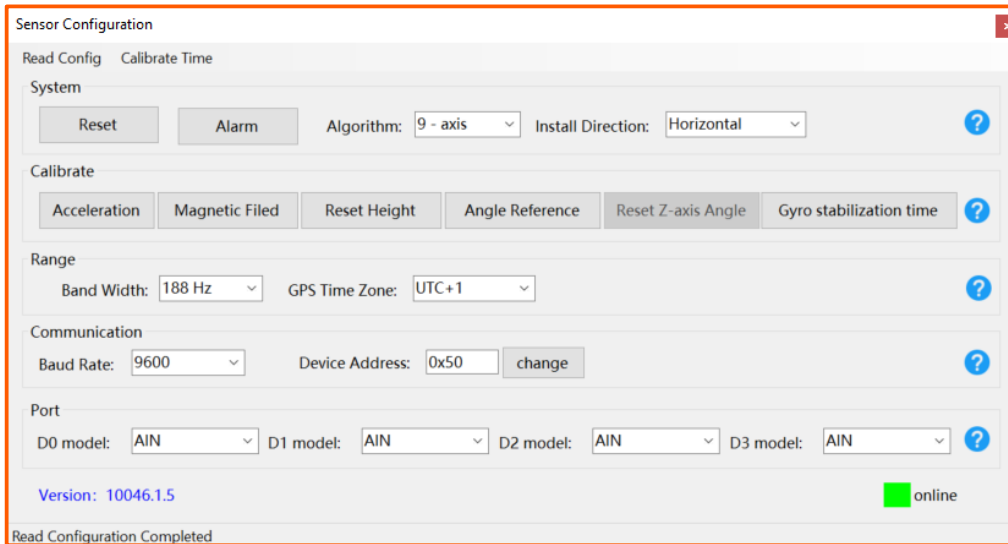


Figure 3: Sensor configuration set by DRONTECHLAB.

Table 1: Description and default functionality of PS4 gamepad buttons.

Parameter	Manufacturer	DRONTECHLAB	Note
Band Width	20 Hz	188 Hz	Experimentally determined - can be changed.
GPS Time Zone	UTC+8	UTC+1	Used for sensor with GPS.