

ECHO Calibration Procedure

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This document is meant to provide a step-by-step procedure for an ECHO calibration run, that can be referred to and followed in the field.

Preparation (before going out to the antenna)

1. Charge EVERYTHING. This includes LiPo batteries, laptops, walkie talkies, Valon, drone controller(s), and the Fieldfox.
2. Generate flight path(s) using `gen_spherical_flight_path.py` on a Linux computer. Ensure they are on the laptop that is going to be running QGroundControl (QGC) during flight.
3. Program the Valon to output at desired frequency.
4. Mount the payload to the bottom of the drone with the plastic screws. Ensure the BicoLOG, Valon synth, and Valon power supply are secure and wired up appropriately (power cable from power supply to synth, SMA cable from synth to BicoLOG).

Pre-flight

1. Set up the two ground station tripods. One is the folding biconical antenna, clamped to the tripod, and connected to the Fieldfox with an SMA cable. The second is the tripod with the “pizza cutter”, which has the GPS Base module mounted on top. This is connected to the laptop running QGC via a USB port.
2. Lay out the landing mat and set the drone on it. Ensure all components are mounted securely and connected. Attach the propellers to the motors, ensuring they are the correct direction and they won't come into contact with anything.
3. Connect the drone's Pixhawk to the laptop running QGC with a microUSB cable. Navigate to the “Plan” tab in QGC, select “File” on the left side, “Open” your generated sortie of choice, and “Upload” it to the drone. Remove the microUSB cable once uploaded.
4. Connect the ground station Holybro telemetry radio to the QGC laptop with a microUSB cable. Strap a LiPo battery to the drone and plug it in to power up. In QGC, once you are communicating with the drone, navigate to the “Sensors” page and perform calibration for the Compass, Gyroscope, Accelerometer and Level Horizon (only needed once per day really).
5. Turn on the payload by pressing the power button on the Valon power supply. You should see a blue light, indicating that it is on. Verify that we are transmitting by looking for a signal with the Fieldfox.

Flight

1. Power on the Taranis transmitter and check that it is receiving telemetry from the drone (hold “Page” to bring up the sensors page).
2. Press and hold the safety switch to allow arming. On the Chiropter, it is located on the round GPS. The button should be flashing red twice.
3. Check that you are in Manual flight mode. Arm the drone by pushing the sticks on the transmitter down and in. Motors will start to spin once armed.

4. Switch to Mission/Auto flight mode, and watch the drone go. Keep eyes on the drone, Taranis telemetry, QGC telemetry, and the Fieldfox to make sure everything is working appropriately. Once the mission is complete, the drone will RTL and disarm.
5. If doing another sortie, reconnect the QGC laptop to the Pixhawk and upload the next flight path to the drone, then repeat steps 3 and 4.

Post-flight

1. Once the drone has been disarmed, unplug the LiPo battery, power off the Valon power supply, and turn off the Taranis transmitter. Also remove the propellers from the drone for travel.
2. Unplug the folding biconical antenna from the Fieldfox and the RTK Base module from the QGC laptop. Power down the Fieldfox and QGC laptop and collapse the tripods.
3. Pack up the landing mat. Double check that you have picked up everything from the site before leaving!

Back at Base

1. Flight logs can be downloaded from the drone by connecting to the Pixhawk with QGC. Navigate to the “Logs” page, hit “Refresh” on the right, and select and download any logs you wish to use.
2. Science data will need to be collected from the observatory.
3. If performing more flights the next day, recharge EVERYTHING again.