OGN CUBE3.5 Installation & User's Manual

Last update 2021-05-26

https://ogn.ibisek.com/

Introduction

Thank you for purchasing our OGN tracking unit CUBE3.5! We have devoted a lot of effort and craftsmanship so it would serve you well and stay reliable for many years to come. We have also included some extra functionality the other trackers do not sport which make this little the box at your hands pretty well the greatest one on the planet Earth :)

The third generation of OGN CUBE is a superb smart box purposely designed to not only track location and flight route of gliders, ultralights, tow planes and other flying objects but also to record their utilisation and overal usage. Therefore a microSD card and a three-axes accelerometer were integrated into the unit. The tracker can be interconnected with the other on-board systems via wired serial line (TTL) or wirelessly using bluetooth. As the usecases may vary for each particular owner, two variants were developed – denoted as Model A and Model B.

Your OGN tracker ID	Please use this id to register your device as described in section *Tracker Registration* below. This will open you the opportunities in tracking your flights on sites like https://logbook.ibisek.com/ http://glidertracker.de/ http://live.glidernet.org and others.

Technical specification

## Model A – to be embedded in dashboard

This model has been purposely designed to be tightly integrated into an aircraft to provide utilisation statistics and analysis in addition to position tracking for happy glider, UL and GA owners.

- dimensions:
  - enclosure: 70 x 20 x 50mm (width x height x depth)
  - antenna: 50mm
- weight: 50g
- power source: micro USB or RJ-45 socket, 5V – 14V
- current draw ~50mA
- transmitted power ~ 20mW
- communication frequency: 868.2 & 868.4 MHz
- data via bluetooth and TTL wired serial (RJ45)
- micro SD card slot for logbook recording
- three-axis accelerometer

Model B – battery powered & portable

The B as Battery powered version is well suited for pilots who are changing planes frequently or even better for competition organisers. It is conveniently portable, powered by internal battery which lasts for some 20 hours of flying and can be fully is charged using a common phone micro USB charger in just below 5 hours.
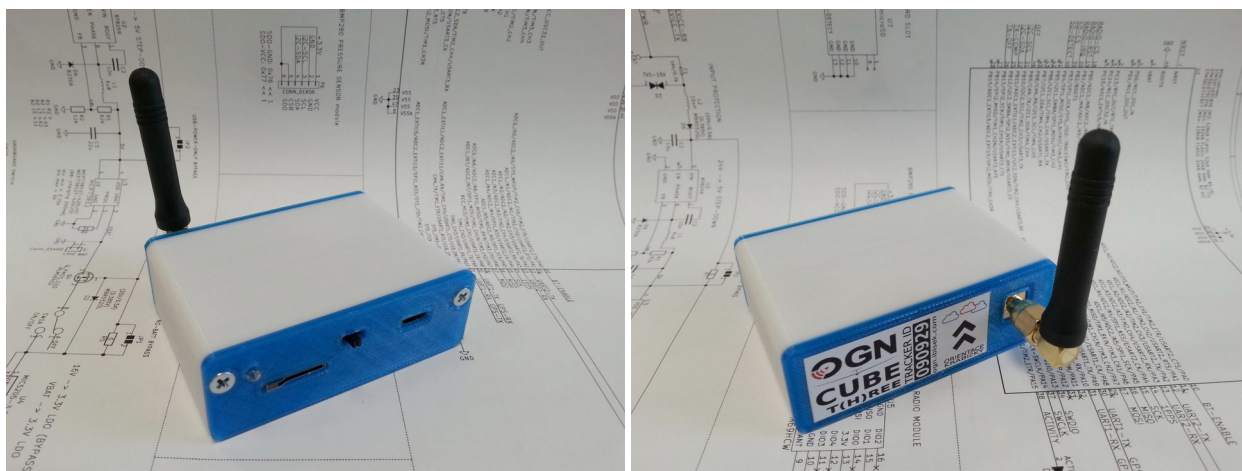
- dimensions:
    - enclosure: 70 x 25 x 50mm (width x height x depth)
    - antenna: 50mm
- weight: 84g
- power source: micro USB, 5V
- current draw: ~50mA
- transmitted power ~ 20mW
- communication frequency: 868.2 & 868.4 MHz
- data via bluetooth
- battery capacity 1020mAh
- on battery life ~ 20 hours, charging time ~5 hours
- micro SD card slot for logbook recording
- three-axis accelerometer

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Tracker Placement and Antennas Orientation

Tracker mounting position shall be decided as such it is not shielded by radio signal impenetrable elements. Covering it by metallic or carbon canopy as well as placing it into centroplane of carbon or metallic airplanes will result into weak or no data signal at all. Please also consider the distance from other sources of electromagnetic noise as magnetos or the entire engine in general when mounting into powered ships.

The unit orientation is depicted on the sticker at the back of the unit where also the radio antenna is connected. Under ideal circumstances the box shall be put flat so the integrated GPS antenna could be facing the sky as much as possible. In case the sticker gets lost you can determine the correct location without opening the box very easily: place the box flat so the SMA (radio) connector would be facing the observer and be on the right side of the unit at the same time Then the GPS antenna faces the sky.

Illustration 1: Orientation as depicted on the label

Illustration 2: Orientation of GPS (white-brown box on the left) and radio (right) antennas

The external radio antenna shall be in vertical orientation, no matter whether up or down. Antenna tilt (also when circling in thermals) influences its gain (efficiency) in case when transmitting data to other planes or ground stations. And again, to avoid shielding by metallic or carbon elements that prevent radio waves propagation is strongly recommended.

LED Signalling

After powering on the tracker you can observe the following indications in this order:

(1) 0. – 10. s: flashing in 1s interval – bootloader awaits new firmware upload.

(2) 11.-13. s: LED ON for approximately 2 seconds – initialisation of serial lines (bluetooth + GPS), radio unit, barometric sensor, SD card (if inserted) and system services.

(3) 14.+ s: two medium-short flashes per second – awaiting GPS fix.

(4) very short flashes – radio traffic– regularly every second (radio TX), or in random intervals (radio RX).

You can check the boot process on Youtube on this address:

 "OGN CUBE boot sequence" https://www.youtube.com/watch?v=_XDIrd3SX6g

Tracker Registration

To be seen online with correct identification (or not) either on the web or mobile app you need to register your tracker on the Glidernet Device Database - http://ddb.glidernet.org/

After having creating an account click on "Add device" and then:

(1) select "Device type" as OGN,

(2) "Device ID" is the tracker ID printed on the sticker on the rear side,

(3) choose your "Aircraft type",

(4) fill-in airplane registration (as on the fuselage and bottom of the wing),

(5) fill-in "Competition number" (on the rudder),

(6) and confirm you are owner of this device.

By submitting this form the tracker information is added to your list of registered tracker and during the next 15-30 minutes will propagate also into the OGN network.


Illustration 3: Tracker registration to OGN device database

Bluetooth connection & LK8000

The CUBE trackers can be connected to PDA or phone using bluetooth. When the tracker is on and the bluetoot is enabled bluetooth beacons can be received. The units announce themselves with name in form OGN CUBE xxxxxx" where xx is ID of the tracker. The PIN for bluetooth pairing is either none or 1234 pin (depends on the master device).

After successful result of the pairing process the the CUBE's port can be set-up in the LK8000 or XCSoar configuration to receive notifications about the surrounding traffic in reach of the radio.
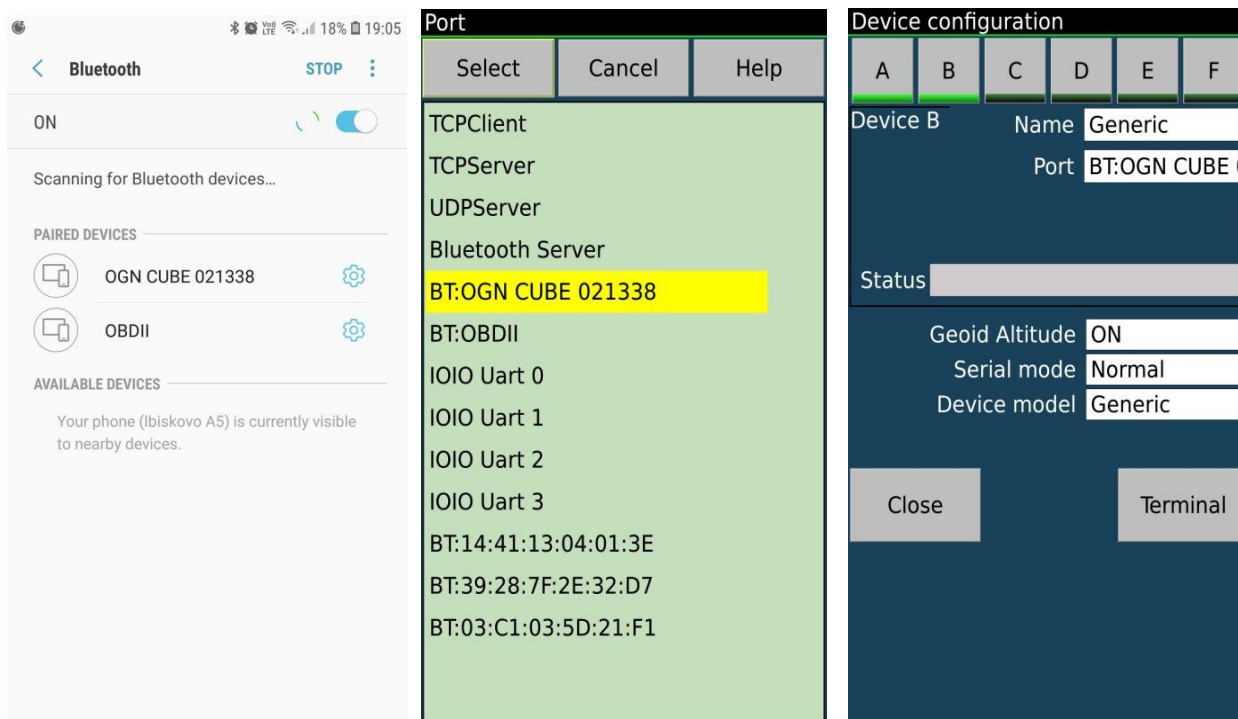

To display traffic in LK8000 you need to enable "Traffic on map" in system configuration, page 13.

Similarly, you can pair the tracker with your computer and observe its activity on serial port using miniterm or putty (baudrate 115200).

OGN Cube Control

This is an Android application readily available from the PLAY application repository which should help you with your CUBE's:

- firmware updates,
- Logbook maintenance (work in progress),
- flight tracking (work not started yet),
- tracker configuration (planned)
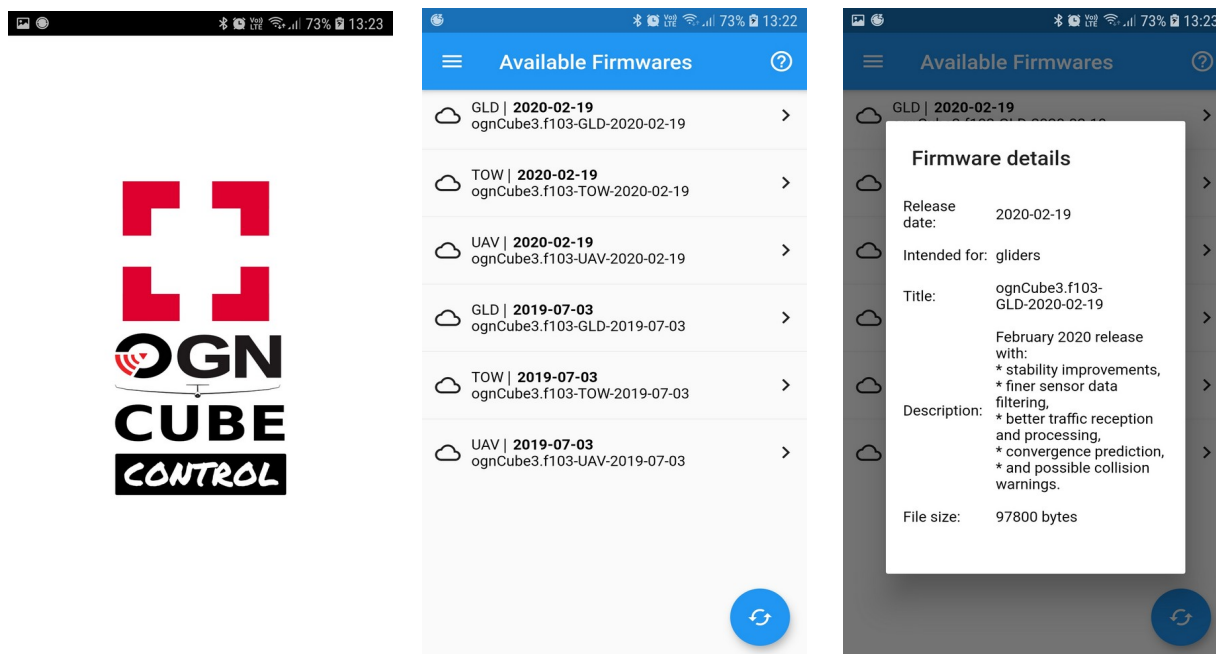
It is available from the PLAY store on this address:

https://play.google.com/store/apps/details?id=com.ibisek.cube_control

Alternativelly, you can use the following QR code to get it right into your phone:

[Model A] RJ45 Connector Pinout

The meaning of the RJ45 pins (model A only) is as follows:

Pin	CUBE 3	CUBE 3.1, CUBE 3.5
1	GND	GND
2	GND	GND
3	CUBE RX (TTL at VCC level!)	CUBE RX (**RS232** level!) @ 115200 bd
4	CUBE TX (TTL at VCC level!)	CUBE TX (**RS232** level!) @ 115200 bd
5	Radio TX OFF	Radio TX OFF
6	(not connected)	External GPS in (at **TTL** level)
7	VCC (external power input **5-15V**)	VCC (external power input **5-32V**)
8	VCC (external power input **5-15V**)	VCC (external power input **5-32V**)

CAUTION! Relying solely on the cable colours can be misleading as cables sourced from various vendors can be marked differently. Hence it is better to consider the plug by its clip on one side.

Illustration 4: RJ45 pin denotion with the clip at the bottom side of the plug

Illustration 5: RJ45 pin denotion on the front face of the unit with the clip at the bottom side

WARNING regarding the pins #3+4

CUBE3: voltage level of the TTL serial line is determined by the external power input on pins #7+8. In case the power voltage is 5V you can connect your PDA with 5V TTL I/O directly.

CUBE3.5: this is a true RS232 i/o - the voltage levels are **+/- 12V**. Do not connect your PDA without an appropriate RS232<->TTL converter as you may **BURN** it!! (Depends on your PDA).

Notes regarding pin #5: this input is designed to turn off radio transmission while maintaining the reception on. To activate TX OFF you need to connect this pin using a two-way switch to ground (GND). Otherwise keep it floating (do not connect anywhere).

[Model B] Battery Care and Manipulation

The battery-powered Cubes are equipped by the fairly standard NOKIA BL-5C 1020mAh Li-ion battery. The reason for this choice are its compact dimensions and primarily its omnipresence – you can get a replacement battery almost everywhere for a reasonable price.

Illustration 6: Internal 1020mAh "Nokia" battery

The battery is connected to the board using two-pin JST connector as show in illustration 10 right below. Installation of the battery inside the enclosure is depicted in no. 8.

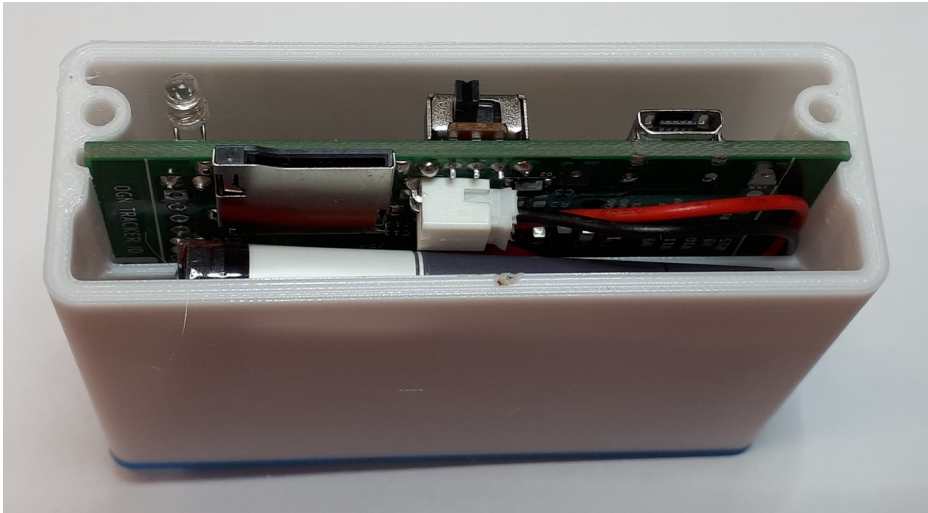*Illustration 7: Battery connected to PCB using a 2.0mm JST connector*

Illustration 8: Battery and pcb installation in the enclosure

The JST connector by itself does not allow gratuitous change polarity, however, when preparing a replacement battery care must be taken the red conductor is soldered to the positive (+) pole of the battery (the polarity is depicted both on the battery and the pcb from the bottom side). Soldering the leads requires some skill – you need to be quick and precise. Please be aware the plastic shield around the pads could be easily molten when applying to much heat or solder. Additionally, these batteries may suffer thermal damage when overheating the soldering pads too much. Have no fear still, this is a simple operation that can be easily done at home or your airfield's workshop. Eventually, you can always ask a friend if you feel uncertain :)

Illustration 9: Wire leads soldered to the battery pads

The full battery charge takes approximately 5 hours and can be done using any arbitrary phone adapter fitted with micro USB plug. Charging current is 200mA. Right after the charging is initiated the unit gets powered up and after a while goes into standby (provided the front-side switch is in OFF / left position). The battery status is not indicated in any way. The device does not measure voltage or power used as it does not have any means to power down all its components. Hence, it is a good habit to charge the battery on a regular basis or at least after 10 hours of operation.

When shelving the unit for longer periods of time (e.g. over winter) we recommend to double check the power switch is in OFF (left) position. Also check the battery state at least twice over the period (or even better every month) and charge it to full state. This shall keep your battery fit also for the next season.

Technical Support and Manufacturer Contact

In case there is something you want to share please use information published in the "Contacts" section of the https://ogn.ibisek.com/ web site (at the current moment of this writing it defaults to ibisek@protonmail.com). Alternatively, we can have a chat in person at most weekends at the Křižanov (LKKA) airfield :)