NANO³

Flight Recorder
(Including NanoConfig Configuration Program)

Version 2.61
Revision 17

1   Important Notices

The LXNAV system is designed for VFR use only as an aid to prudent navigation.   All information is presented for reference only.   Terrain, airports and airspace data are provided only as an aid to situation awareness.

Information in this document is subject to change without notice.   LXNAV reserves the right to change or improve their products and to make changes in the content of this material without obligation to notify any person or organisation of such changes or improvements.

A Yellow triangle is shown for parts of the manual which should be read very carefully and are important for operating the system.

Notes with a red triangle describe procedures which are critical and may result in loss of data or any other critical situation.

A bulb icon is shown when a useful hint is provided to the reader.

1.1 Limited Warranty

This LXNAV product is warranted to be free from defects in materials or workmanship for two years from the date of purchase.   Within this period, LXNAV will, at its sole discretion, repair or replace any components that fail in normal use.   Such repairs or replacement will be made at no charge to the customer for parts and labour, provided that the customer shall be responsible for any transportation cost.   This warranty does not cover failures due to abuse, misuse, accident, or unauthorised alterations or repairs.

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To obtain warranty service, contact your local LXNAV dealer or contact LXNAV directly.

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1.2 Battery Information

The NANO^3 is powered by a rechargeable battery. The battery can be charged and discharged hundreds of times, but it will eventually wear out. Only use the approved battery and recharge your battery only with approved chargers.

Unplug the charger from the electrical plug and the device when not in use. Do not leave a fully charged battery connected to a charger as overcharging may shorten its life. If left unused, a fully charged battery will lose its charge over time. Use the battery only for its intended purpose. Never use a charger or battery that is damaged.

If the battery pack is mishandled, the battery pack can burst, cause a fire or even chemical burns. Observe the following precautions.

- Do not disassemble.

- Do not crush and do not expose the battery pack to any shock or force such as hammering, dropping or stepping on it.

- Do not short circuit and do not allow metal objects to come into contact with the battery terminals.

- Do not expose to high temperature above 60°C (140°F) such as in direct sunlight or in a glider parked in the sun.

- Do not incinerate.

- Do not handle damaged or leaking lithium ion batteries.

- Be sure to charge the battery pack using the supplied battery charger or a device that can charge the battery pack.

- Keep the battery pack out of the reach of small children.

- Keep the battery pack dry.

- Replace the battery pack only with the same or equivalent type recommended by LXNAV.

- Dispose of used battery packs promptly as described in these instructions.

1.2.1 Disposal of Old Electrical & Electronic Equipment

(Applicable in the European Union and other European countries with separate collection systems)

This symbol on the product or on its packaging indicates that this product shall not be treated as household waste. Instead it shall be handed over to the applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. The recycling of materials will help to conserve natural resources. For more detailed information about recycling of this product, please contact your local Civic Office, your household waste disposal service or the shop where you purchased the product.

1.2.2   Disposal of Waste Batteries

(Applicable in the European Union and other European countries with separate collection systems)

This symbol on the battery or on the packaging indicates that the battery provided with this product shall not be treated as household waste. By ensuring these batteries are disposed of correctly, you will help prevent potentially negative consequences for the environment and human health which could otherwise be caused by inappropriate waste handling of the battery. The recycling of the materials will help to conserve natural resources. In case of products that for safety, performance or data integrity reasons require a permanent connection with an incorporated battery, this battery should be replaced by qualified service staff only. To ensure that the battery will be treated properly, hand over the product at end-of-life to the applicable collection point for the recycling of electrical and electronic equipment. For all other batteries, please view the section on how to remove the battery from the product safely. Hand the battery over to the applicable collection point for the recycling of waste batteries. For more detailed information about recycling of this product or battery, please contact your local Civic Office, your household waste disposal service or the shop where you purchased the product.

(Applicable for Customers in the U.S.A. and Canada)

Lithium-Ion batteries are recyclable. You can help preserve our environment by returning your used rechargeable batteries to the collection and recycling location nearest you. For more information regarding recycling of rechargeable batteries, call toll free 1-800-822-8837, or visit http://www.rbrc.org/

Do not handle damaged or leaking Lithium-Ion batteries.

2 Packing Lists

In the box you will find:
- NANO³ flight recorder with preloaded NanoConfig program and user manual which is loaded on the USB stick

- NanoPower cable

- USB cable

- Wall charger

- Barogram calibration chart
- Quick reference chart

3   Basics

3.1 NANO³ at a Glance

The NANO³ flight recorder is the smallest flight recorder designed in accordance with the IGC "All Flights" specification. It has IGC approval for all flights including world records. It features an integrated 56-channel GPS receiver with built-in antenna, altitude sensor, ENL sensor, security micro-switch, Bluetooth module and 1700mAh battery.

⚠️   The operational temperature for the NANO³ is from -20°C(68°F) to +60°C(140°F). Higher temperatures may cause the battery to inflate.

The built-in battery allows up to 25 hours of stand-alone operation. The battery can be charged when the flight recorder is connected to a computer, NanoPower or wall charger. Bluetooth is used for easy data exchange with a PDA.

The housing is made of robust ABS plastic. On the left side of the unit there is a rocker button and five status LEDs which display the operational status.
A 4 GB solid state disk is used for flight data storage. Flights are stored directly in IGC format and are downloadable through a USB connection which is compatible with all operating systems (MS Win, Linux and Mac OS).

On the right side of the unit there is a small hole with a reset button. Use a pin to press the reset button if a reset is required. In normal operation, this button should never be used.

At the back of the unit there is a mini USB connector which is used for charging and data transfer.

The internal solid-state disk is preloaded with the NanoConfig program. This program is used for uploading a flight declaration and/or changing the settings of the NANO[3]. Flight declarations can also be uploaded using a serial interface cable or Bluetooth connection.

3.2 Technical Data

Hardware
- ARM M4 core processor
- 4GBytes memory solid state disc
- QVGA 320*240 colour pixel TFT sunlight readable transreflective LCD
- Three direction rocker button and four push buttons
- 56-channel GPS receiver
- Engine noise level sensor
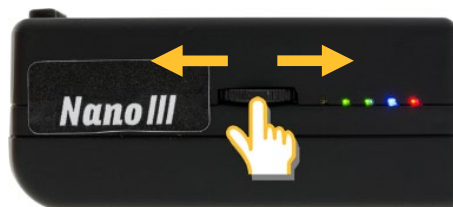- Pressure altitude sensor measuring up to 16000m

Input and Output
- USB interface (mass storage device)
- Serial RS232 interface for PDA connection
- Bluetooth interface for PDA connection

Size and Weight
- Outline dimension: 66x43x28mm
- Weight: ~76g

3.3 Rocker Button

The rocker button has several actions; you can press it or move it left or right.

A press or movement of the rocker button and the NANO[3] flight recorder will power on. Press the rocker button for a long time and the NANO[3] flight recorder will switch off. When flying, a press of the button for a short time and a pilot initiated event will be recorded, and the flight recorder will then log 30 fixes with a recording rate of one second.

Moving the rocker button will increase or decrease the sound volume when on an info page. On pages with the map, the rocker button has a zoom function.

In the setup page, you can move through each menu and make changes

3.4 Four Push Buttons

The Nano³ has four push buttons which have dynamic functions.

The function of each push button is described on the blue label adjacent to each button. A label can have two options with the second option coloured red on the label. This indicates that the button has two functions. The blue option is operated with a short press and the red option with a long press. For labels with two options, the second option is typically the opposite function of the first option. e.g. Next/Previous, Insert/Delete, Ok/Cancel, forward/backward.

The functions of buttons are mostly related to the current page (waypoint, task, FLARM, info, setup). If there is no label next to the button this button has no function.
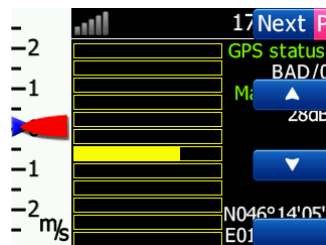
3.5 LEDs

On the left side there are five LEDs; three green, one blue and one red. The LEDs show the status of the NANO[3] flight recorder. During normal operation, the first LED blinks when the NANO[3] is powered on. The second LED blinks when the GPS status is OK. The third LED blinks when the recording of a flight has started. The fourth blue LED blinks when the Bluetooth module is switched on.

The LEDs show the status only when the LCD is off.

3.6 NanoPower Cable

The NanoPower cable is a special device which converts 12V to 5V providing a power supply for the NANO[3] and a PDA. It also translates a serial signal to match the NANO[3] signal level and a PDA or computer signal level.

Connect the red and black wire to 12V power supply. Red is positive.

Maximum input voltage is 24 Volts.

The NanoPower has two plugs. On one side there is a standard USB-A connector. Please use the included USB-A to mini-USB cable and plug the NANO[3] on this side. Any standard USB-A to mini-USB cable can also be used. On the other side there is an RJ45 plug. This plug is designed for a PDA or a computer.

The RJ45 plug is NOT designed in accordance with the IGC standard. It can be used only with a dedicated cable. Do not plug any unknown cables in to it as this may damage the NanoPower circuit.

The pin description for the NanoPower RJ45 is given below.

1 2 3 4 5 6 7 8
Pin numbers
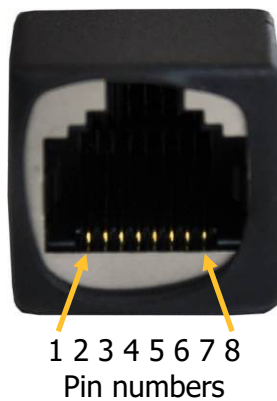
Pin Number	Description
1,2	Ground
3	(output) Transmit from NANO^3 RS232 (e.g. Computer, V7)
4	(input) Receive to NANO^3 RS232 (e.g. Computer, V7)
5	(output) Transmit from NANO^3 LVTTL (e.g. Oudie, HP302)
6	(input) Receive to NANO^3 LVTTL (e.g. Oudie, HP302)
7,8	5V OUTPUT (maximum 1A)

3.6.1   Available Cables for NanoPower

Device	Cable Code
OUDIE	CC-NP-OUDIE1
Generic RS232 with female DB9	CC-NP-232
IPAQ 310/314	CC-NP-IPAQ310
IPAQ 38/39xx/47xx	CC-NP-38
MiniMap	CC-NP-LX
Butterfly Connect	CC-NP-BFC
Flarm	CC-NP-IGC
Nanopower for PowerFLARM	NanoPower-PF
Nanopower for FLARM	NanoPower-FL

4   Operation

There are two modes of operation: **Data transfer** mode and **Normal operation** mode.
When in the data transfer mode, flights can be downloaded and the NanoConfig program
can be run. Normal operation mode is when the logger is ready for recording flights.
The mode in which the NANO³ is operating can be determined from the main screen or the
LEDs when the screen is off.
In **data transfer mode,** the last two or three green LEDs will be permanently lit, on the
screen, there will be a message "USB connected", whereas in the **normal operation mode,**
up to four LEDs will be blinking, or the screen will display data only. See Section 4.2 for a
detailed explanation of each LED.

4.1 Powering On

There are three ways to power on the NANO³ flight recorder.
Press or rock the rocker button and the NANO³ will power on On start-up, a splash
screen will appear with information containing the Serial number and version of firmware.
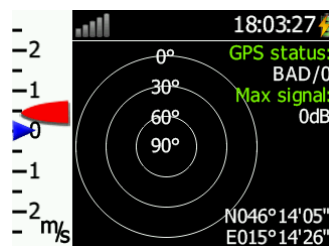The NANO³ will then go into normal operation mode.
Connect the NANO³ **to a computer using a USB cable.** It will automatically power on
and the last two or three LEDs will light up. At the same time you will see the first message
"USB connecting…" and later "USB connected", when the connection is established. This
indicates that the NANO³ flight recorder is in data transfer mode. You may now run the
NanoConfig program or copy flights using standard methods for copying files.
Connect the NANO³ to **NanoPower cable.** The NANO³ will then automatically power on
and after approximately 20seconds the NANO³ will go into normal operation mode.

Normal operating mode starts with a message "**Acquiring time**" and "**Acquiring GPS fix**".
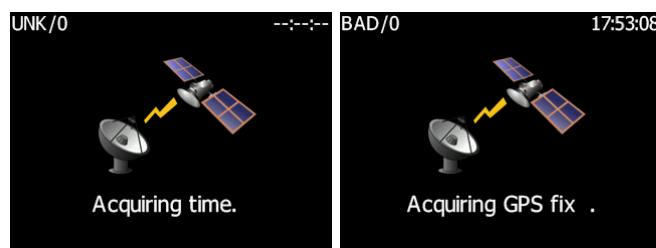
When the NANO³ acquires a GPS fix, it will switch to the GPS info page. The user can at any
time cancel the acquiring page by pressing any button. Acquiring a GPS fix may take
between a few seconds and a few minutes, depending on the satellite constellation and the
position of the NANO³. The NANO³ has a very sensitive GPS receiver which can sometimes
acquire a GPS satellite signal inside a room.

If you press or move the rocker button or any other button when in the data transfer mode, the NANO³ will revert to normal operation mode.

4.2 User Input

The NANO³ user interface consists of many dialogues, which have different input controls. They are designed to make input of names, parameters, etc. as easy as possible. Input controls can be summarised as:

- Text editor
- Spin controls (Selection control)
- Checkboxes
- Slider control
- Line width control
- Colour selection

To move the function from one control to another use the **up** or **down** buttons. By pressing the **Edit** button access to the control that is displayed is possible.

4.2.1   Buttons on the Nano3

Buttons have dynamically set functions. When you press a button there will be a blue label with the action assigned to that button in that context.

On the main screen, the top button always performs the function of switching between pages. A Short press will cycle in one direction between the pages, a long press will cycle in the opposite direction between the pages. A number of pages look similar initially as the cycling between them simply changes the zoom level. The screen will rapidly update to reflect the new zoom level. The number in a zoom level icon shows us the outer circle radius (2km – depends on distance units setting). The inner circle is half of that distance.
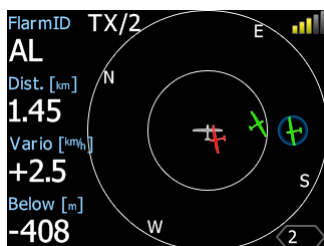
The middle buttons help with target selection by cycling through available targets. The lower button has an EDIT function, where we can edit/view the currently selected target.

4.2.2   Text Edit Control

The Text Editor is used to input an alphanumeric string; the picture below shows typical options when editing text. Use the up/down button to change the value at the current cursor position.
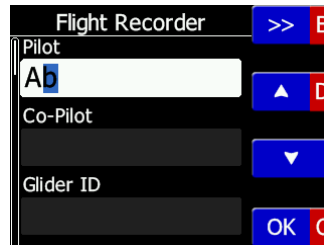
Push button **next** will move the cursor to the right. A long press on **next** will move cursor left. At last character position, a push button will confirm the edited value, a long press **Ok C**) will cancel editing and exit that control. If a long press is available, part of button label is in grey colour. For the example above, the top button's long press **>> B** has the back function. The bottom button's long press has the Cancel function. The FLARM ID field is not editable because this is the unique FLARM identification number.
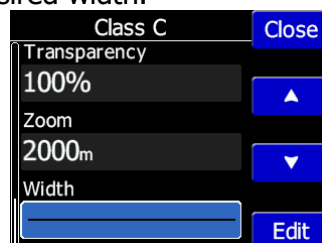
4.2.3   Selection Control

Selection boxes, also known as combo boxes, are used to select a value from a list of predefined values. Use the up/down buttons to select the appropriate value.
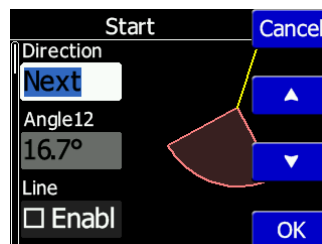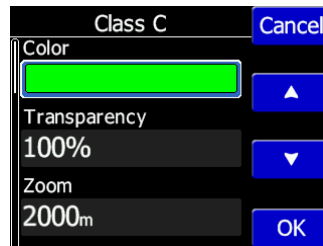
4.2.4   Line Width Selection

Line width boxes are used to select a line width from a list of predefined widths. Use the up/down buttons to select the desired width.

4.2.5   Colour Selection

Colour selection boxes are used to select a colour from a list of predefined colours. Use the up/down buttons to select the appropriate colour.
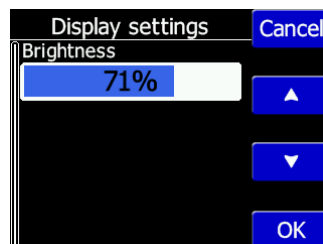
4.2.6   Checkbox and Checkbox List

A checkbox enables or disables a particular parameter. Press the **EDIT** button to toggle the value. If an option is enabled a check mark will be shown, otherwise an empty rectangle will be displayed.

4.2.7   Slider Selector

Some values like volume and brightness are displayed as a slider.

Via **Edit** you can activate a slider control, then with the **up/down** buttons you can select the preferred value and confirm it with the **Ok** push button.

4.3 Normal Operation

During normal operation mode, the user can use the NANO^3 as a flight recorder, simple navigation, vario system and FLARM radar display. There are four pages (information page, waypoint page, task page, setup page and FLARM radar). You can read more about pages in Section 5.1. If the screensaver function is enabled the screen will go off after the set time period in seconds. When the screen saver is on the pilot can still see the indicated status of the NANO^3 by monitoring the five LEDs. The first LED blinks when the NANO^3 is powered on. The second LED blinks when the GPS status is ok. The third LED blinks when flight recording has started. The fourth blue LED blinks when the Bluetooth module is switched on.
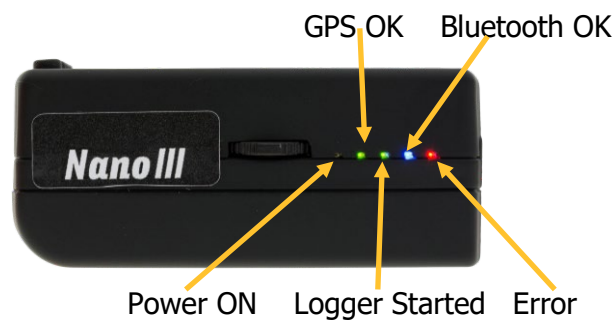
The fifth LED is red and indicates an error. See Chapter 9 for more details.

4.4 Battery Status

The battery status is indicated by the LEDs only when in fast charge mode - refer to Section 4.7 If all the LEDs are on it means that the battery is fully charged. During operation, as each LED goes out it means 20% less battery capacity remains. A detailed explanation of the LEDs is given in the table below.

PWR	GPS	LOG	BT	Err	Description
🔆	🟢	🟢	🟢	🔴	100% full, approximately 28 hours of operation
🟢	🟢	🟢	🟢	🔴	95% full, 27 hours remaining
	🟢	🟢	🟢	🔴	80%, 22 hours remaining
		🟢	🟢	🔴	60%, 17 hours remaining
			🟢	🔴	40%, 10 hours remaining
				🔴	20%, 5 hours remaining
				🔆	5%, 1 hour remaining

From version 2.0 NANO^3 is able to measure the battery level more accurately. This means it can calculate the remaining time of working based on the current consumption rate.
It is possible in some circumstances for the accuracy of this calculation to drift so there is a built in ability to re calibrate the battery.

4.4.1   Battery Calibration

The battery can be calibrated in the following way.
1. The NANO^3 must be fully charged
2. The NANO^3 is fully charged when charge current drops below 5 mA.
3. Disconnect the supply cable and leave the NANO^3 running until it shuts down due to the battery being empty.

To be certain that the NANO^3 is really in discharge mode, the bottom row of the INFO page text will show "DIP", which means Discharge in Progress.

We can increase the speed of the discharge cycle, if we turn on Bluetooth module, set up brightness of LCD to maximum and turn off screen fade.

After this procedure the NANO^3 has measured its battery capacity and with the next charge the indication will be more accurate.

Calibration of battery is performed during production of nano. In case that calibration data is wrong, calibration cycle is necessary for correct indication of the charge level.

If the charge level does not show the correct value, compared to the battery voltage, a battery calibration cycle is required. Example: Charge level: 99% and measured voltage 3.6V.

4.5 Powering Off

Press the rocker button for a long time and the red LED and the adjacent green LEDs will start blinking. Once you see this you may release the button and the unit will power off.

4.6 Security Void

When the security (secret key) is lost at power on, the red light will be on and the remaining four green LEDs will start blinking and the "DIGITAL SIGNATURE FAILED" message will appear on the screen. To continue press or move the rocker button for a longer period. The NANO^3 will be fully functional, however the flight will not be signed.

In order to produce IGC-certified files, the NANO^3 flight recorder must be returned to the dealer or manufacturer for resealing.

4.7 Charging the Battery

The battery will be charged when the NANO^3 is connected to the external power through a USB port. It can be charged from a wall adapter, directly from a PC or from the NANO^3 power cable.
If you want to charge faster, you must connect the NANO^3 to a power supply, wait for it to boot up, then press the rocker button to switch the unit off. In this mode all the NANO^3 functions (GPS, Bluetooth, Memory) are turned off and this will increase the charging speed. In this mode the NANO^3 can be fully charged in approximately 5 hours. The LCD screen is still on, but the backlight is off. It is still possible to monitor the level of charge. The level of

charge is also visible via the LED indicators. More information on charge level and LED indication in Section 4.4.

Sometimes it may appear that the NANO3 battery level when connected to a charger looks full. When you then disconnect the power, the battery level drops to 90%. This is normal as the battery level indication is different when the charger is connected and when it is disconnected. To really fully charge the Nano3, please continue charging for a few hours. In fast charge this time will be shorter. the charge current must drop close to 0 & you will see indication FULL.

4.8 Connecting to a Computer

The NANO^3 must be turned off before connecting to a computer.
Connect it to a computer using the supplied USB cable or any other standard USB-A to mini-USB cable. The NANO^3 flight computer will be identified automatically and a new removable storage device will be shown. The name of the device will be NANO3_<SERIALNUMBER>.
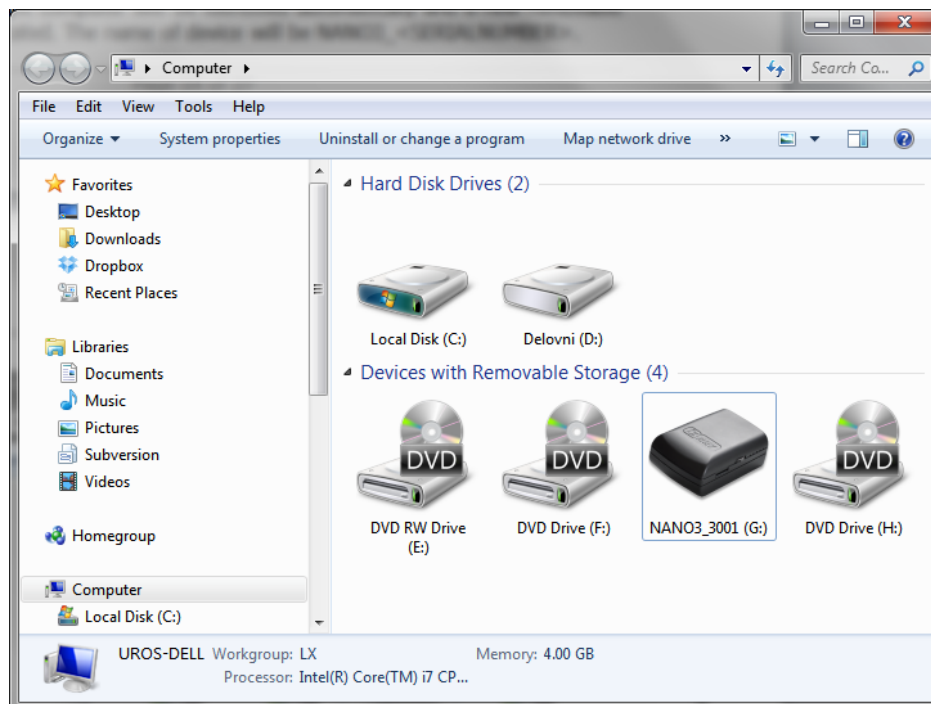

Open this device to see its content.
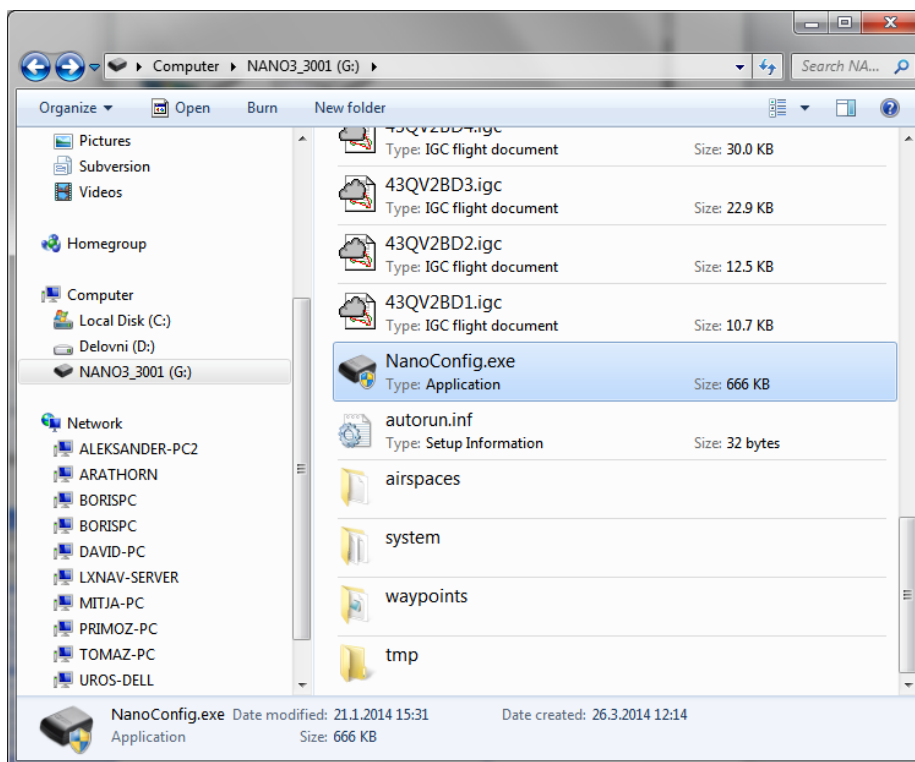
In the root folder you will find the NanoConfig program and the flights created by the NANO³. The NanoConfig program will run only on Microsoft Windows operating systems. Double click to run it.

> On the first connection of the NANO³ to a computer it may not be recognized immediately. Disconnect the NANO³ from the computer and connect it again in order for it to be recognized.

4.9 Downloading Flights

Turn off the NANO³ and connect it to a computer using a USB cable. Navigate to the root folder of the NANO³ and use your preferred method of copying files.
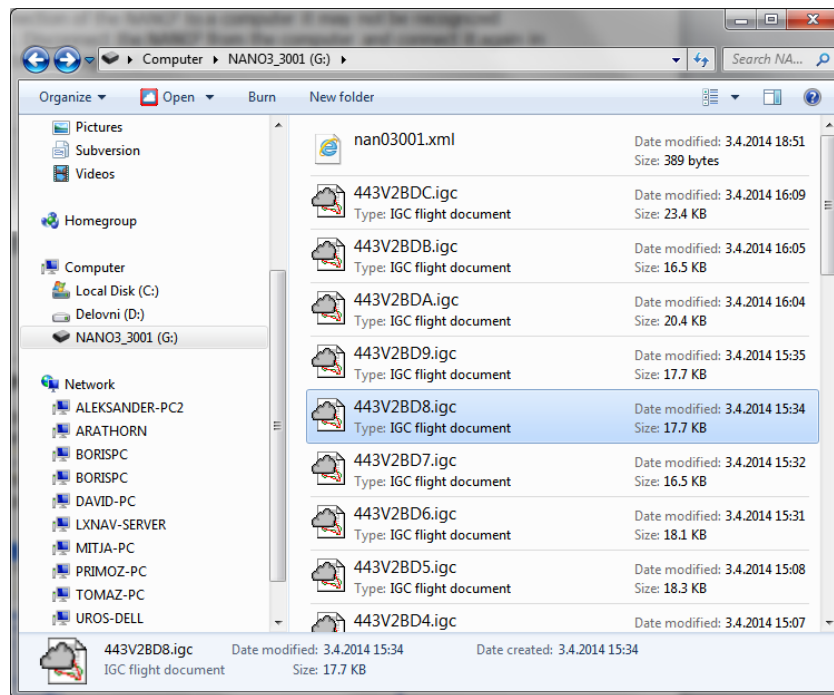
Flights are stored in files with the IGC standard filename. If you find it difficult to decode this standard, we recommended that you switch to detailed view to see the date of the file. In the detailed view the file date and time show the landing time of the glider.

Flights can also be downloaded using the NanoConfig for Android devices. More details are in Section 8.4.

4.10 Bluetooth Pairing

In order to connect to the NANO^3 via Bluetooth you have to search on a PDA for Bluetooth enabled devices that are within range (see Section 8.2.2.5 to enable Bluetooth). The NANO^3 will be identified as LXNAV-NANO3-<SERIALNUMBER>. Click PAIR or CONNECT to connect to the NANO^3. A security pin must be entered. The pin code for the NANO^3 is 1234 or 0000 and cannot be changed.

4.11 Storing the Nano

The NANO^3 must be stored in a dry environment with temperature lower than 25°C (77° F). If the NANO^3 will not be used for an extended time it is recommended that you charge the battery to 50% beforehand.
The NANO^3 and the BATTERY have protection circuits which protect the battery from being overcharged or overly discharged. If the NANO^3 is stored with an empty or near empty battery, eventually the battery will be discharged so far that it will not be possible to charge it again.

4.12 Replacing the Battery

The battery can be replaced by the user. You will need a screwdriver with cross head (Phillips). Unscrew the three screws.
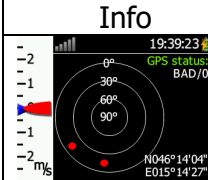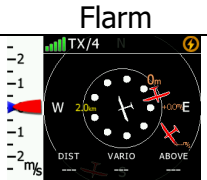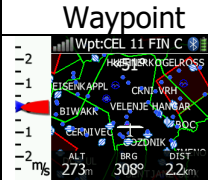

Open the cover and remove the battery.
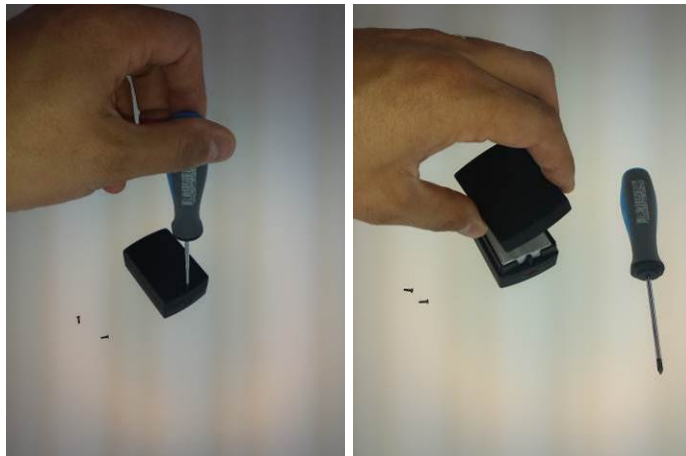
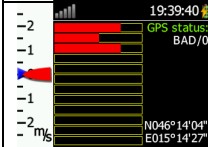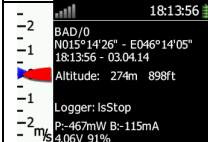Insert a new Nokia 3310 battery (Li-Ion). Make sure that the contacts are properly aligned. Close the cover and put back the three screws gently.

5 Working with the NANO³

5.1 Tree Structure

The NANO³ has four modes: Info, Waypoint, Task and Setup mode. Info mode has two subpages where you will find all the necessary information about the status of the NANO³.

Info	Flarm	Waypoint	Task	Setup

5.2 Main Navigation Screen Description

The main navigation screen consists of a map with coloured airspace, waypoints with names or task (depends on which page you are looking at), a vario tape on the left and a status bar at the top. The vario tape and vario dynamics can be configured in the Setup-Hardware-Vario menu. If you don't want to see the vario tape you can switch it off. The status line indicates the status of the GPS, the chosen waypoint that you are navigating to, the status of the Bluetooth device and the battery level. Menu buttons appear when you press any one of the buttons. Each button has its own function which is described in the button label. The functions of buttons are mostly related to the page where you are (waypoint, task, FLARM, info, setup). If there is no label on the button, this button has no function.

The battery level can be displayed in two ways, with the classic battery level indicator or round progress with a number inside which indicates remaining hours. Outside progress indicates the battery level as a percentage. When the remaining time is calculated to be less than 1 hour, the indication becomes red and the inside number means remaining minutes, the outer ring is progress for the last hour (60 minutes).


Classic battery indication

Indication of battery with remaining time

Indication of charge level, when battery is charging

When the battery is charging the indication is as follows: Inside symbol indicates charging, the outer ring is the charge percentage.

The accuracy of the battery life measurement depends on how accurate the battery capacity has been measured. More about battery calibration can be read in Section 4.4. In the centre top of the map is the "off course" indicator, which helps the pilot to fly in the right direction. At the bottom of the map screen are three nav boxes showing bearing, distance to the target and the pressure altitude.

GPS status	Batt Level
Nav. target	BT status
Vario average	
Vario needle	
	Nav boxes
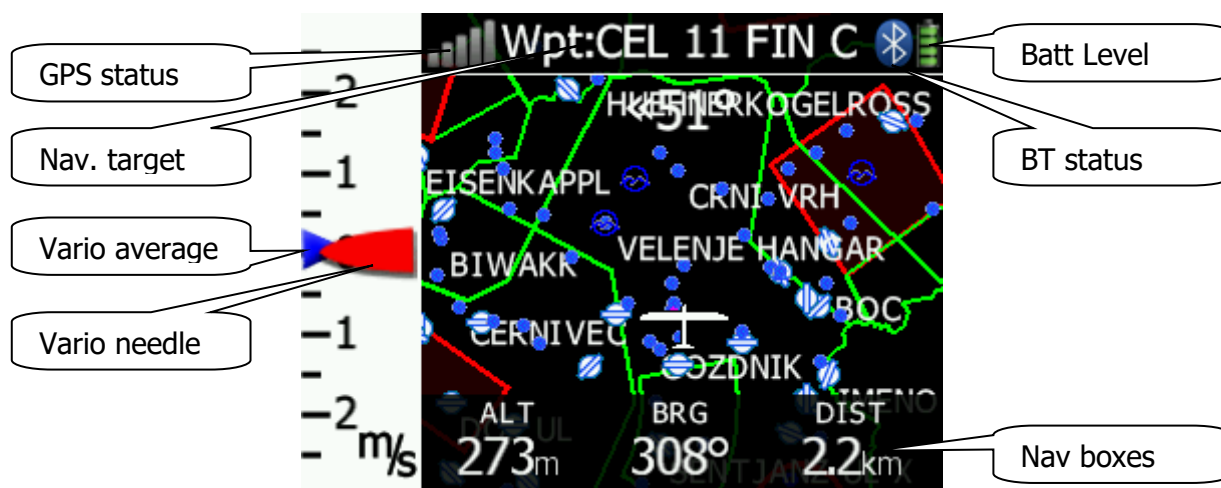
5.3 Info Screen

On the info screen GPS, Battery and Flight Recorder status are displayed.

5.4 FLARM Screen

This is visible only when the Nano3 detects that a FLARM is connected to the external port. Selection of FLARM targets and zooming is then available. If the Nano3 is connected to a PowerFLARM, it is also able to show PCAS traffic.

5.4.1 FLARM Symbols

Unknown
Glider
Tow plane
Helicopter
Parachute
Drop plane
Hang glider

Para Glider
Powered Aircraft
Jet Aircraft
Balloon
Airship
UAV

5.5 Waypoint Screen

In this screen the pilot can navigate to a selected waypoint, **Select** a waypoint from the opened CUP file, or select a landable waypoint from the near list **Near**.

5.6 Task Screen

In this screen the user can navigate to waypoints within a task, switching between them, edit task points and their zones. More in Section 8.1.2.

5.7 Setup Menu

5.7.1   QNH

In this page the pilot can change the QNH setting. If the QNH setting is correct the Nano[3] will show the correct altitude.

A wrong QNH setting will have effect only on altitude warnings. QNH setting has no influence over the recorded altitude in the IGC file.

5.7.2   Flight Recorder

Within this page flight recorder, pilot information and glider data are configured.
- **Recording interval** sets the interval when the GPS position will be stored in flight
- **Auto Finish** will allow the automatic finish of the flight under certain conditions. Uncheck this item for wave flying (ground speed is used to indicate the end of a flight and in wave it is possible to be stationary or even fly backwards in relation to the ground)
- **Auto Off** will power off the NANO[3] 30 minutes after the flight is finished
- **Logger always on** will force the logging/write position to an IGC file immediately after power on. Normally the NANO[3] logger is triggered by ground speed exceeding 40km/h or vario more than 1m/s. This function is recommended to be enabled only for hang gliders.
- **Pilot** name must be entered here
- **Co-Pilot** name must be entered here if glider is a double seater.
- **Competition sign** of glider
- **Registration** of glider
- **Glider type**
- **Glider class**
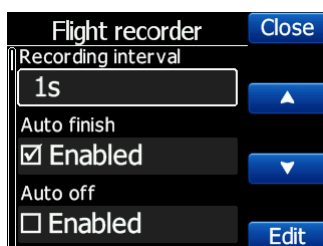
5.7.3   Display

Within this menu the following items can be set:
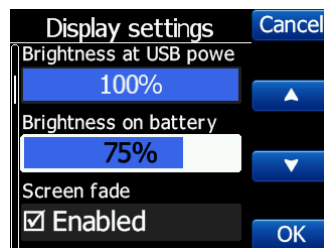
- **Brightness at USB power** will set the level of backlight when USB power is present
- **Brightness on battery** will set the level of backlight when USB power is not present
- **Screen fade** enables fading screen to level "**Fade brightness**" after "**Fade Timeout**" time
- **Screen off** enables power off of the screen after "**Off timeout**" seconds.
- **Wake screen on events** enables turning on the screen, even if the screen is off.

5.7.4   Graphics

Graphics has many sub items which are related to **Map, Airspace, Waypoints, Glider, Task, Flarm, Theme setting** and **NavBox** customization.

5.7.5 Warnings
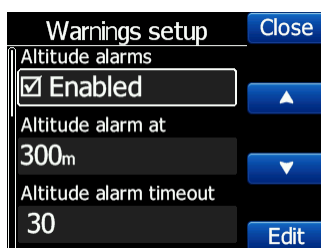
Altitude warnings and **FLARM warnings** and their conditions can be setup under this menu.

The FLARM warnings are classified into three levels (refer to the FLARM manual for details on www.flarm.com):

- First level (Low) approximately 18 seconds before a predicted collision
- Second level (Important) approximately 13 seconds before a predicted collision
- Third level (Urgent) approximately 8 seconds before a predicted collision.

5.7.6 Observation Zones

This menu defines the default observation zone geometry. The following items can be chosen: start zone, turn point zone and finish zone.
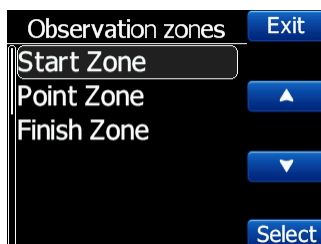
Each type of observation zone is defined with two angles, two radii and mean bearing (**Angle12**). These parameters enable the creation of any known zone geometry separately for start, turn point and finish.
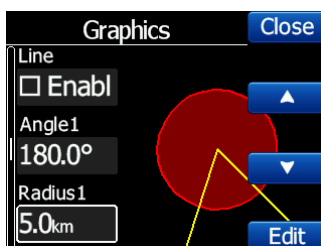
Using parameters in the zone dialogue it is possible to describe all types of observation zones. **Angle12** defines the orientation of the observation zone. Available values for **Direction** are:

- **Symmetric:** This is the most common selection for turn point.
- **Fixed**: This is mostly used for assigned areas.
- **Next:** will orient the observation zone in direction of the outgoing leg. This is usually used for start.

- **Prev:** will orient the zone in direction of the incoming leg and is usually used for the finish.
- **Start:** orientates the sector always towards the start.

If the **Line** checkbox is checked the sector will become a line type of observation zone. The **Radius 1** parameter describes half of width of line length. Use the UP/DOWN arrow buttons to increase or decrease radius for step 0.1. Long press will increase/decrease for 5.0.

If **Line** is not checked the **Angle1** parameter will define the basic shape of the observation zone. A value of 180° means that the zone is a cylinder and 45° is the classical FAI sector. Use Up/Down buttons to select right angle.

Angle2 and **Radius2** are used for more complex observation zone setups.

When changing observation zone parameters, the screen is automatically updated to display the new zone.
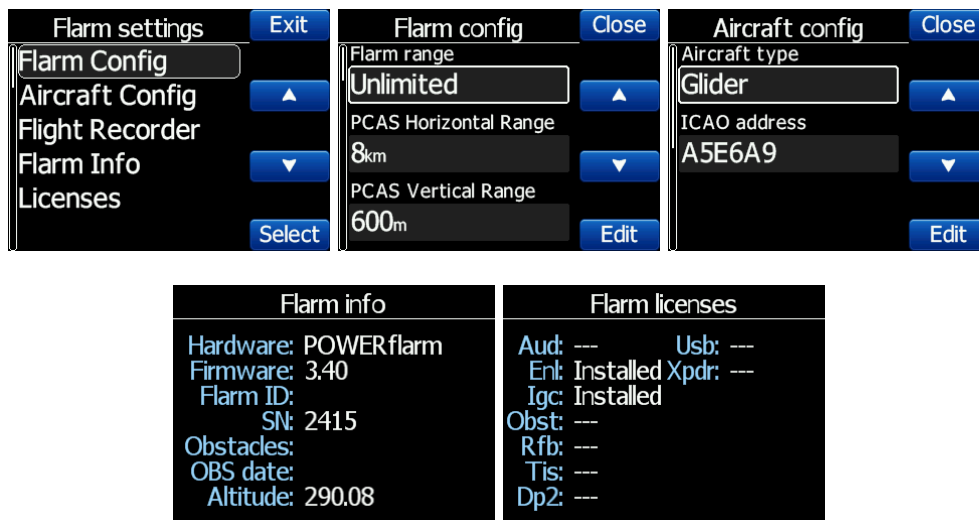
5.7.7   Hardware

In the Hardware menu there are four sub items:

5.7.7.1 FLARM

If a FALRM source is detected, the user can make some configuration setting changes on the FLARM and see some FLARM status information.

5.7.7.2 Vario
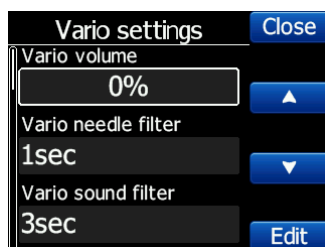
Vario submenu allows you to adjust the **Vario filters** for the **Vario needle** and the **vario sound**, the time constant for **average vario** and vario tape **range**.

5.7.7.3 Communication
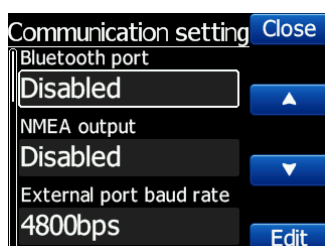
In the communication menu you can enable or disable the **Bluetooth** device, enable or disable **NMEA output** on the USB port and set the **baudrate** for the external serial interface. Communication enables you to set the way NANO³ will communicate with the FLARM. With **Target data NMEA** enabled you can use NMEA data transmission (GPRMB and LXVTARG) to other external GPS devices (Oudie, PDA's, Smart phones...). **Target data source** enables the NANO³ to communicate all information about the current target, depending on which page you are (Task or Waypoint). **AUTO option** automatically detects the page mode (whether you are in Task or Waypoint page) and sends information about your current target.

5.7.7.4 ENL
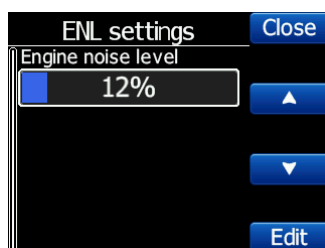
This page is just for monitoring the engine noise level.

5.7.7.5 Sounds

In this menu various setting for sounds can be adjusted: the **Volume** of the vario sound, enabling of **system sounds** and enabling of **vario sounds**. From version 1.5 here is also the sound setting for FLARM warnings.
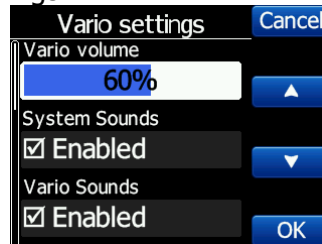
The vario volume can also be adjusted using rocker button, but only in the GPS info page.

5.7.8   Files

Airspace and **waypoints** files can be selected here. The NANO^3 supports **CUP** file format for waypoints and **CUB** file format for airspace. There is no limitation in the number of waypoints, but reducing the size of the airspace area or number of waypoints, will improve the performance of the NANO^3.

In the same section you can convert all IGC files loaded on the NANO^3 to KML file format. FlarmNet data can be loaded also in this section and is useful only if FLARM is connected to NANO$^{3.}$

A Waypoint CUP file is limited to maximum 1 Mbyte size
An Airspace CUB file is limited to maximum 5 Mbytes size
The FlarmNet FLN file is limited to maximum 5 Mbytes size

5.7.9   Units
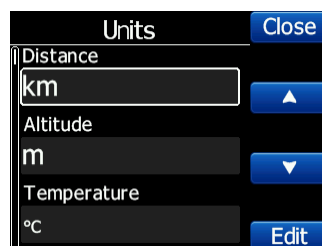
In this menu can be set the units for speed, distances, altitudes…

5.7.10 Logbook

All flights recorded by the NANO³ are stored and sorted by date here. The user can find the date, take-off and landing time and duration of the flight. Use the two middle buttons to navigate through the list. A long press of these buttons will bring you faster to the first or last flight recorded.

5.7.11 Polar & Glider

The Polar and Glider section allows you to load and edit a set of parameters for your glider's polar. You can select from a pre-defined list of nearly every common glider or make your own polar.

Select a Glider from the List: presents you with an alphabetical list of all the common gliders and associated polar data. All glider data will be copied from the chosen polar.

You can modify the polar by changing coefficients **a**, **b** and **c**. A polar is defined as a quadratic equation with the parameters a, b, and c.
Use the SeeYou program (Tools->Polar) to calculate coefficients a, b and c for a given glider's polar. The program requires three sink points entered at selected speeds (e.g.: 100 km/h, 130 km/h, and 150 km/h). The program will calculate the values of a, b and c, which should be noted and entered into the NANO³.

- **Class**: Options for Touring, Ultralight, World, Twin-seater, Club, 18-meter, 15-meter, Open, Standard and Unknown are available.
- **A, b, c**: Options can be adjusted or entered for a non-listed glider.
- **Reference load** (wing loading) value represents the value at which the polar was measured.

- **Reference weight** corresponds to the weight value at which the polar was measured.
- **Maximum takeoff weight** is the maximum take-off weight allowed for the glider. It is not used in the calculation; it is just a reminder to the pilot of the maximum take-off weight. **Empty weight** is weight of the glider without the pilot and ballast.
- **Pilot weight** is the weight of the pilot with parachute and baggage.
- **Co Pilot Weight** is the weight of the co-pilot with parachute and baggage.

5.7.12 Wind

In this section the user can define wind calculation method. Select **Manual** to manually adjust the wind speed and wind course. In **automatic** mode this will be done automatically by the NANO[3] based on GPS data.
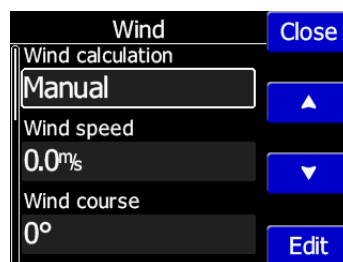
5.7.13 Password
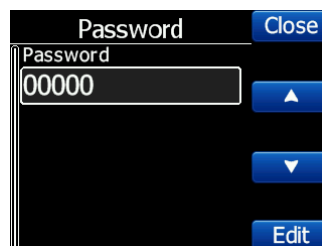
The following passwords are available to users:

00666   Reset all settings to factory default
00667   Reset battery calibration to factory default (battery needs calibration cycle, to be calibrated)
32233   Format internal flash memory (all data will be lost)
11111   Prepare battery for storage (discharge to 50%)

5.7.14 About

Under the about menu the user can see the version and serial number of the NANO[3.]

5.7.15 Shutdown
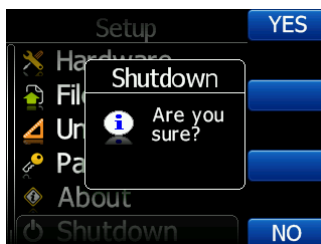
Pressing the button adjacent to this item on the NANO[3] screen will shut down the NANO[3] after confirmation.

6   FLARM on NANO³

NANO³ is able to display FLARM and PCAS traffic on the map or radar screens. The radar screen is visible only when a FLARM is detected by the NANO³. In case of a collision warning another screen will be displayed, which will inform us from which direction the threat is coming from.

PCAS alerts on the map are represented as a dotted circle with relative altitude; the PCAS warning is represented as lights on a clock as red or orange.
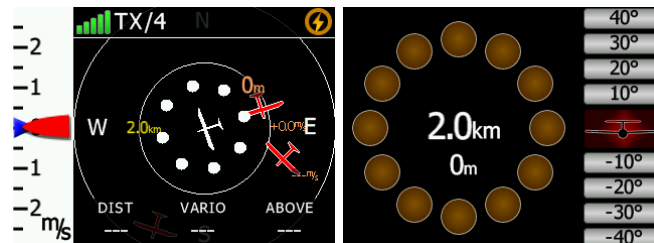
FLARM warnings can be dismissed with a short press of any button. The dismiss time can be configured in setup.

6.1 Connecting a FlarmMouse to the NANO³
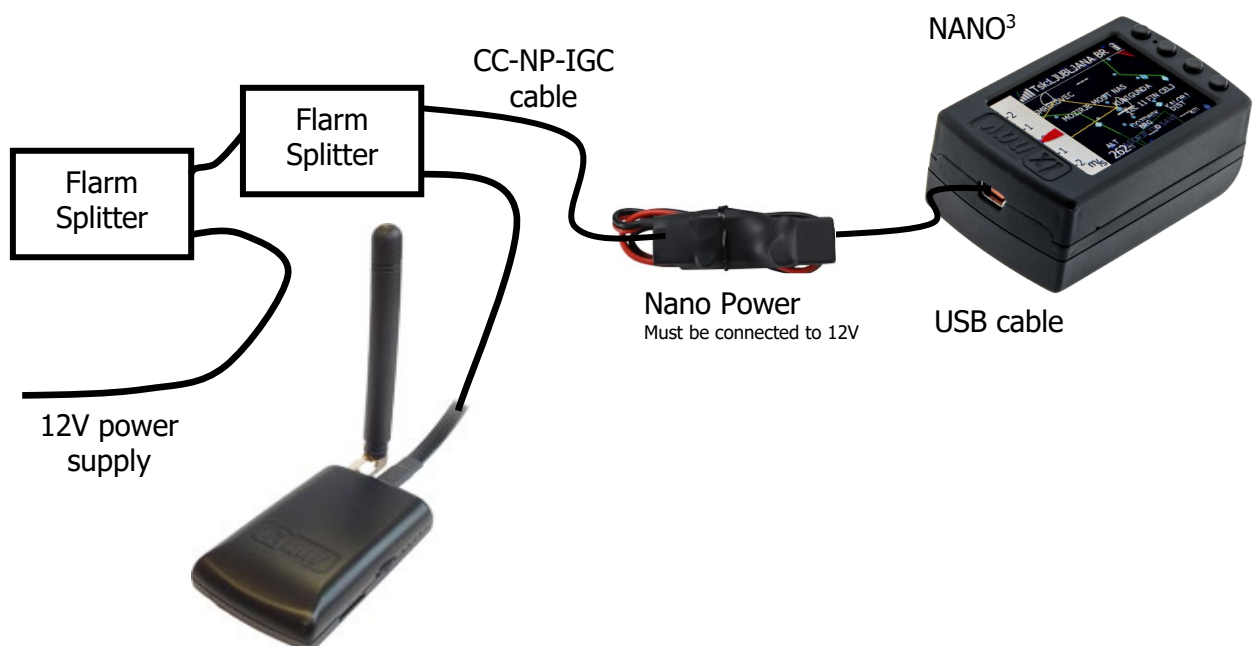
6.2 Connecting a FLARM to the NANO³
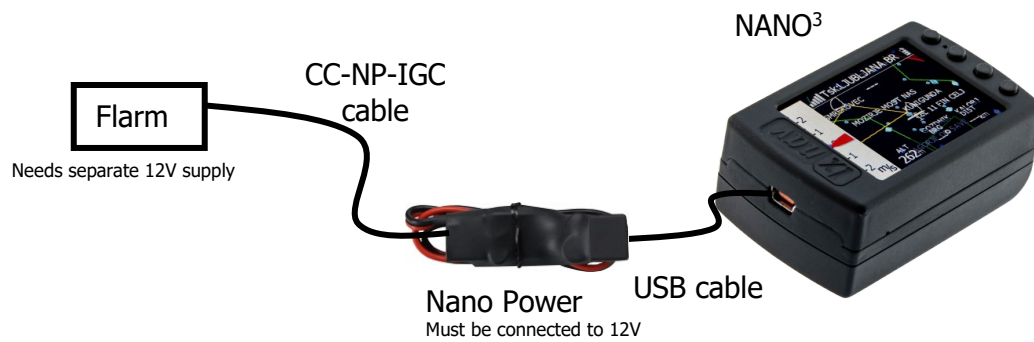
NANO³

CC-NP-IGC
cable

Flarm

Needs separate 12V supply

Nano Power
Must be connected to 12V

USB cable

6.3 Connecting a FLARM to the NANO³ using NanoPower-FL

NANO³

Flarm

NanoPower-FL
gets 12V from flarm

USB cable

6.4 Connecting a FLARM to the NANO³ using NanoPower-PF

NANO³

PowerFlarm

NanoPower-PF
gets 12V from flarm

USB cable
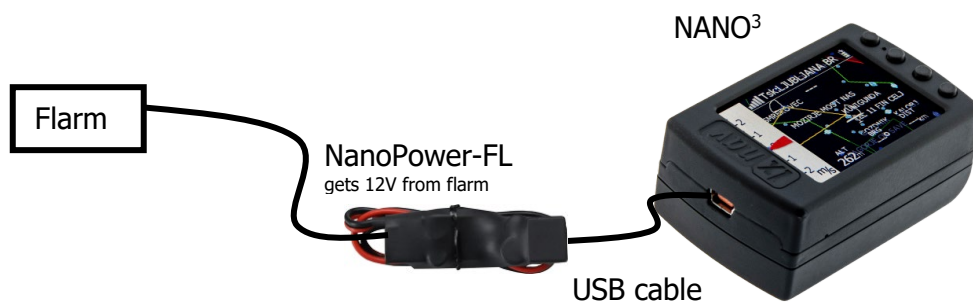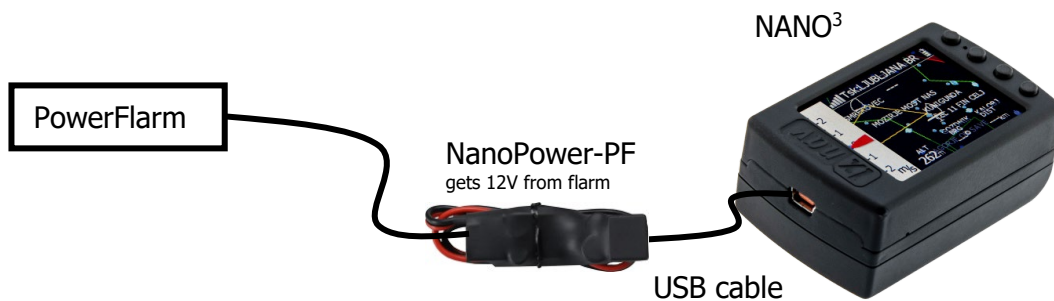
7   Final Glide Calculation on the NANO³

From version 2.5 (October 2016), the Nano³ offers final glide calculation.
Nav boxes can now be configured in setup-graphics-nav. boxes, to display the different values like such as Arrival Altitude, Required altitude, Arrival Altitude at MC=0 setting, etc.
All the final glide calculations are based on Helmut Reichman's final glide theory. This is related to the altitude of the glider, distance to the target, elevation of the target, measured wind, glider polar, Mc setting, Ballast setting, Bugs setting.

To ensure the correct calculation for final glide, the pilot needs to enter the correct elevation of the departure airfield, correct polar of the glider, weight of the pilot, ballast and bugs. The waypoint must have valid elevation information.

> Some CUP files may have been distributed with waypoints without an elevation or set with the elevation set to zero. If that is the case, the final glide calculation will be wrong and may be dangerous for the pilot.
> Please ensure that target waypoints always all have the correct elevation.

The altitude of the glider can be corrected with QNH setting. However, sometimes the pressure changes during a soaring day and without correcting the QNH, the final glide may be wrong +-100m (+-300ft) or even more.
The pilot can set the QNH in the setup QNH menu.

To match the best glider performance with the weather conditions, the pilot can change the MC setting.
The MC can be changed by pressing the rocker button. The pilot can set the ballast or bugs setting in the same way.

8 Configuring the NANO³

Flight declarations can be uploaded to the NANO³ in four different ways:
- Directly on the NANO³
- Using the NanoConfig program on a PC,
- Bluetooth (NanoConfig for Android, Oudie, XCSoar,..)
- Serial interface (PDAs, Oudie, XCSoar)

Declarations are stored in the SYSTEM folder in a file called **decl**. The declaration file is formatted as a standard IGC header file. It is recommended that you do not try to modify this file yourself.

8.1 Directly on the NANO³

8.1.1 Pilot Information

Detailed information is written in Section 5.7.1 of this manual.

8.1.2 Declaration and Editing of a Task

In the Task page the user can enter or edit the task, which will then be automatically declared when you leave this page. Waypoints can be loaded into a task from the active waypoint file.

A Task can be entered in a very simple way. Press the **edit** button within the task page. Using the up or down button you can highlight an existing waypoint or empty space and then set a new waypoint. By pressing the **Ins**. (insert) button you can browse through all of the waypoints in the selected CUP file.

Selecting from a list of waypoints is very intuitive. The NANO³ will only offer you a choice of characters that are available from the list of waypoint names available. Using the button **>>** you can move to the next character (right); the red part of the label **B** indicates one space back or one character to the left using a longer press of the button. With the **OK** button you can confirm a selected waypoint or use **C** button to cancel the selection.

When you are back in the Task menu, you can **Insert** or **Delete D**   waypoint.

To *insert* a waypoint, make a short press on the **Ins.** button and to *delete* a waypoint you press and hold down D for about (not more than) a second.

Each waypoint can have a custom zone or area applied. These areas can be modified by pressing the Zone button.
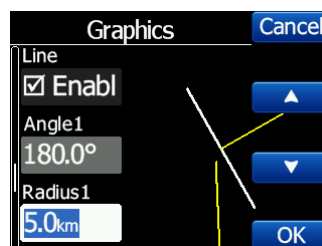
8.2 On a PC with NanoConfig for Windows

Use the NanoConfig program to configure the NANO[3]. A flight declaration can be uploaded, or various parameters can be modified using this program. The NanoConfig program consists of two major screens: a flight declaration screen and a settings screen.
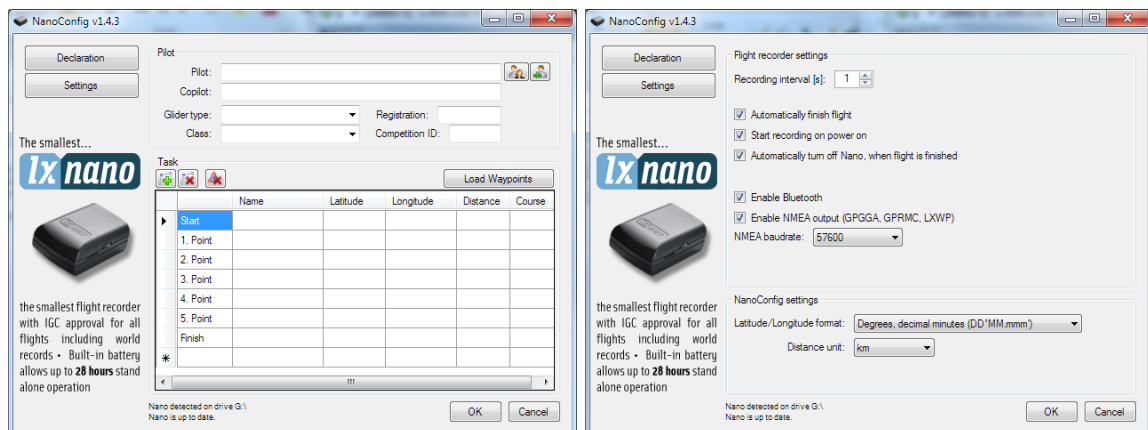
You may toggle between these two screens by pressing the **Declaration** or **Settings** button in the upper left corner of the NanoConfig program.

Press the **OK** button to confirm changes and exit from the program. Press **Cancel** to abandon changes and exit without saving data.

It is important to run the NanoConfig program directly from the NANO[3]. Do not copy the NanoConfig program to another location as the settings and declarations will not be written properly to the NANO[3].

The version of the program is displayed in the lower left corner of the NanoConfig window. When requesting support from LXNAV or reporting a bug, please always include the version of the program in your email.

All NANO[3] configuration variables are stored in the SYSTEM folder of the NANO[3] in a file named "system.ini". It is strongly recommended that you do not modify this file yourself. If you need more information about the "system.ini" file, please contact us.

8.2.1   Using the NanoConfig Program

Run the NanoConfig program and go to the declaration screen. The declaration screen is split into two groups. Pilot and glider related information is in the top group and the task declaration is shown in the bottom group.

8.2.1.1 Pilot Information

Enter pilot and glider information into the pilot section. At the top right you will find two icons. The first icon will show a list of stored pilot information and the second will add the current pilot information to the list.
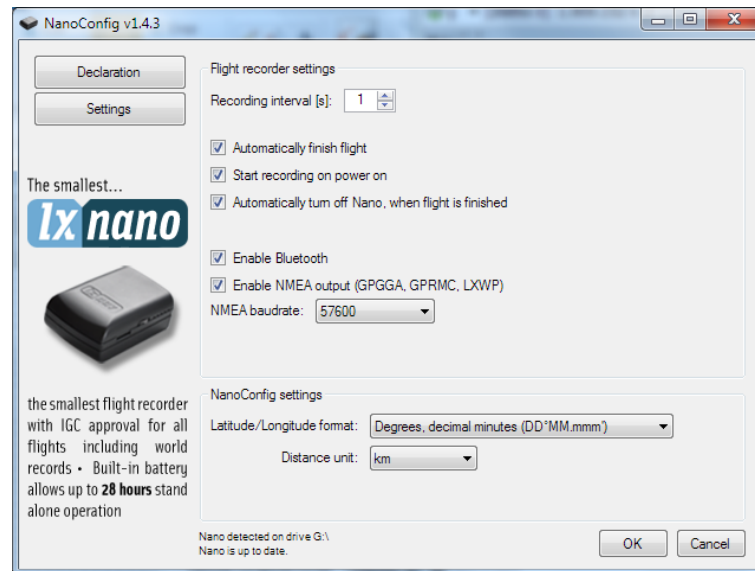

8.2.1.2 Task Declaration

Before creating a task, you must load the waypoints from which the task will be created. Press the **Load Waypoints** button to load waypoints. Waypoints can be loaded from a CUP formatted file. Once waypoints are loaded you can create a task by entering the names of the waypoints. Use the icons in the upper left corner of the task declaration group to add or

delete a point or to clear the whole task. Task points can also be deleted by pressing the DEL key or can be inserted by pressing the INS key.

8.2.2   Changing Parameters with NanoConfig

Run the NanoConfig program and go to the settings screen. The settings screen is split into two sections: settings dedicated to the NANO³ and settings for NanoConfig.

Parameters for the NANO³include recording interval, NMEA output and Bluetooth enable settings.

In NanoConfig you can change the distance units used in the task declaration and the format of latitude and longitude.

8.2.2.1 Flight Recording Interval

The flight recording interval is set to one second by default. It is recommended that you keep this setting. Even with the recording interval set to one second, the NANO³is capable of storing approximately 28000 hours of flight. Having a recording interval of one second will allow you to perform more accurate post-flight analysis and increases the probability of obtaining a data point in the observation zone.

If you wish to change these settings, use the up/down arrow or enter a new value.

8.2.2.2 Automatically Finish Flight

If this option is enabled the flight will be automatically finished and digitally signed once conditions for finishing the flight are met. The NANO³ must fulfil the following conditions for 30 seconds: GPS status is OK, ground speed is below 4 m/s, vertical speed is within 0.2 m/s and altitude is below 3000 m.

8.2.2.3 Start Recording on Power On

If this option is enabled recording of a new flight will be automatically started when the NANO³ is powered on. If this option is disabled, the NANO³ will start recording when the vertical speed is above 1 m/s and the ground speed is above 8 m/s. This option is most useful for hang gliders.

⚠ When this option is enabled, option Automatically finish flight is ignored.

8.2.2.4 Automatically Turn Off Nano When Flight is Finished

This option is very useful for a NANO^3 which installed more or less permanently in the glider. If this option is enabled, the NANO^3 will automatically switch off 30 minutes after the flight is finished.

8.2.2.5 Bluetooth

Check the **Enable Bluetooth** checkbox if you want to turn it on. By default, Bluetooth is disabled.

⚠ When Bluetooth is enabled, the NANO^3 will consume more power and the total endurance of a new and charged battery will reduce approximately to 16 hours. Without Bluetooth enabled NANO^3 can run up to 35 hours.

8.2.2.6 NMEA Output

Check **Enable NMEA output** to output NMEA data. The NANO^3 will transmit the following NMEA sentences GPGGA; GPRMC, LXWP0 every second and LXWP1 once per minute.
NMEA can be output to either the serial interface or Bluetooth but not to both simultaneously.
Change the NMEA **baud rate** if you want to output NMEA at different baud rates.

8.3 Using Bluetooth or Serial Interface

Flight declarations can also be uploaded using the serial interface or Bluetooth (see Section 8.4.1 for Bluetooth pairing). The NANO^3 must be running in normal operating mode.

⚠ When connecting through the serial interface, you should use the same baud rate as is set for NMEA output on the NANO^3.
When connected through Bluetooth baud rates are not important.

Please refer to the manual for the software used to upload flight declarations (e.g. SeeYou Mobile).

8.4 NANO3 Config for Android Devices

NanoConfig can be downloaded from the LXNAV web site or the Google Play Market. NanoConfig is a configuration tool for the NANO^3. The user can easily modify flight recorder parameters, edit pilot and glider information, edit the declaration and transfer flights from the NANO^3 to a smart phone.

NanoConfig consists of five tabs: Main, Logbook, Pilot, Task and Settings.

8.4.1 Connecting and Pairing the NANO^3

When you run the NanoConfig on a smart phone, the program will first ask you to turn on Bluetooth if it is not turned on already.

Via the menu button activate the scan function which will scan for Bluetooth devices. If the NANO^3 is turned on and the Bluetooth functionality in the NANO^3 is enabled, it will appear on the scanned list. Choose nano. The first time it will be necessary to pair the NANO^3 and the Smart Phone together. For more about pairing refer to Section 4.9.

8.4.2 Main Page

In the main tab you can see an information about the NANO^3 and its GPS status.

8.4.3 Downloading Flights

The first time you access this tab, NanoConfig will automatically start reading flights from the connected NANO^3. Downloading always starts from the most recent to the oldest flight. If you have a lot of flights in the NANO^3's memory, the transfer of the logbook can be interrupted with the BACK button.

After downloading of the logbook data is finished, a short press on the desired flight will start the download process. If the flight size is big, the download may take more than minute. Flights are downloaded into the NanoConfig folder. With a long press on the flight, the downloaded flight can be shared with other applications installed on your smart phone (Gmail, SeeYou, OLC (not available), Google Docs, Facebook).

8.4.4   Editing Pilot Info

The Pilot tab can be used to edit information about the glider and crew.

8.4.5   Editing a Task for Declaration
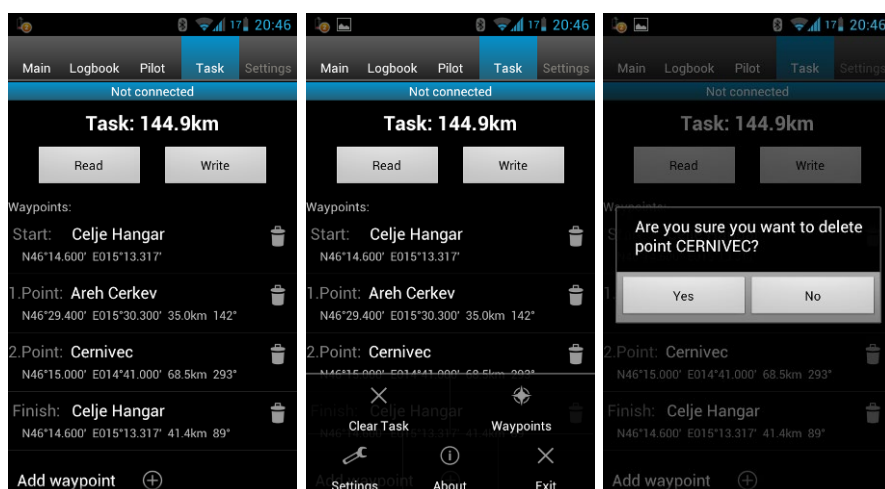
Editing the task is very simple. First it is necessary to choose a waypoint file in CUP (SeeYou) format. To select the CUP file, use the MENU button. On some devices you must press menu button ▤ for a long time. Press the Add waypoint button to add the waypoint to the last position. A long press on the waypoint will offer an option to insert a waypoint. On the right-hand side of waypoint name is the trash box. Press the trash box to delete the waypoint from the list. After a task has been entered, it can be transferred to the NANO^3 by pressing the Write button.

8.4.6   Configuring NANO^3

In this tab the recording interval, automatic power off, and NMEA settings can be configured.

9   Troubleshooting

Q: My computer does not recognize the NANO^3 as a USB mass storage device?
A: Make sure that the NANO^3 is turned off before connecting to the computer.

Q: When I power on, I see all green LEDs blinking and the red LED is illuminated.
A: This means that your flight recorder has lost security. Contact us for further details.

Q: When I power on, I see one green LED and the red LED is illuminated.
A: There is a problem with internal Solid-State Disc.

Q: Is the internal LiIon battery for the NANO^3 end-user replaceable or would I need to send the unit back to LXNAV or a dealer to have the battery replaced?
A: User can replace the Li-Ion Battery. See Section 4.12.

Q: I can't read the NANO^3 on my notebook.
A: Change the power management scheme on your notebook or connect the notebook to a power supply.

Q: When I connect the NANO^3 to my notebook, the message "USB device connected" appears, disappears, appears, etc. on the laptop screen.
A: Change the power management scheme on your notebook or connect the notebook to a power supply.

Q: Can I open files from the NANO^3 on the Apple computer?
A: Yes.

Q: I run Ubuntu on my laptop so cannot run NanoConfig.exe.
A: NanoConfig is a Windows application which only runs on the Windows operating system.

Q: Can I declare a task with an OUDIE?
A: Yes, the declaration can be done via serial cable or over Bluetooth. Please read the step by step instructions http://www.lxnav.com/downloads/manuals/FAQ_Upload_declaration_from_OUDIE%20to%20NANO.pdf

Q: When I run NanoConfig, I see error errors.
A: Probably Microsoft Net Framework is not installed.

10 Revision History

Rev	Date	Comments
1	April 2014	Initial release of owner manual
2	Version 1.1	Corrected Sections: 5.7.1, 5.7.5
3	January 2015	Added Section 3.6.1
4	April 2015	Release version 2.0
5	May 2015	Release version 2.01, Updated Sections 5.2 5.5 5.7.6
6	June 2015	Release version 2.03, Updated Section 4.2
7	August 2016	Updated Section 4.4.1
8	September 2016	Added Sections 5.7.11,5.7.12
9	November 2016	Updated Section 5.7.5
10	February 2017	Updated Section 8.4.5
11	July 2017	Added Section 5.4.1
12	September 2017	Added Chapter 7
13	March 2019	Updated Section 4.10
14	December 2019	Updated Section 5.7.8
15	February 2020	Updated Section 4.2.2
16	March 2020	Updated Section 5.7.7.3
17	July 2020	Corrections to English language text.