

# LX90xx

GPS-Navigation System with variometer  
(Including LX9000 and LX9070)

Version 4.0



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## 1 Important Notices

The LX90xx 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.

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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 LX90xx 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 option, 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.

## 2 Basics

### 2.1 The LX9xx series at a glance

LX9xx series of instrument consists of two units; the main display unit and the vario unit. Within the main display unit an integral 50-channel GPS receiver and a high brightness colour display are fitted. An integrated SD card or USB interface is used for user friendly data exchange. The main display unit is equipped with a built-in flight recorder according to the most recent IGC specification for all flights. Optionally the FLARM collision avoidance system can be integrated into the main display unit.

Main display unit came in two different forms:

**LX9000** model with 5.6" screen and 640x480 pixels resolution,

And

**LX9070** model with 7.0" screen and 800x480 pixels resolution.

The V9 vario unit is a most modern variometer running on very powerful processor with inertial platform using 3 axis accelerometer, 4 gyroscopes (for inertial vario, AHRS and wind calculation), smooth audio output with audio equalizer and integrated synthesized speech output. The unit communicates with the main display unit over the RS485 system bus.

Standard version of V9 variometer features 57 mm diameter (2¼") indicator with mechanical needle and colour display for additional data. Optional variometer consists of 80 mm diameter (3") indicator called V80 which has colour screen only with three additional buttons. Optionally additional vario indicators and a wide range of interface devices can be daisy-chained using the RS485 bus.

#### 2.1.1 LX9000 Display Unit Features



- Extremely bright 5.6" (14.3 cm) colour display readable in all sunlight conditions with backlight automatically adapted using an ambient light sensor (ALS).
- Using Linux operating system (not CE Windows) ensures fast and stable operation of the firmware.
- 8 push buttons and 4 rotary switches (knobs) are used for input, which comprise the well-known LX user interface. Optionally a remote stick is available for more comfort.

- Portrait or landscape orientation.
- Pre-loaded with worldwide terrain maps, airspace and airport databases.
- Unlimited number of waypoints.
- Unlimited number of tasks (with assigned area support).
- Comprehensive flight and task statistics.
- Display of nearest airports and out-landing fields.
- Unlimited number of pilots/profiles.
- Integrated flight recorder according to high-level IGC specification.
- Real-time flight optimisation according to FAI and OLC rules.
- Flights stored in IGC format are downloadable using the integrated SD Card.
- Flight recorder functions include an integral pressure transducer based on 1013 mbar level for altitude recording, engine noise level sensor, memory to store more than 1000 hours of flights and digital and mechanical security devices to ensure high level of security.
- Integrated FLARM collision avoidance system with graphic, sound and voice (optional) presentation.

### 2.1.2 LX9070 Display Unit Features



- Extremely bright 7.0" (17.8 cm) colour display readable in all sunlight conditions with backlight automatically adapted using an ambient light sensor (ALS).
- Using Linux operating system (not CE Windows) ensures fast and stable operation of the firmware.
- 8 push buttons and 4 rotary switches (knobs) are used for input, which comprise the well-known LX user interface. Optionally a remote stick is available for more comfort.
- Portrait or landscape orientation.
- Pre-loaded with worldwide terrain maps, airspace and airport databases.
- Unlimited number of waypoints.
- Unlimited number of tasks (with assigned area support).
- Comprehensive flight and task statistics.
- Display of nearest airports and out-landing fields.
- Unlimited number of pilots/profiles.
- Integrated flight recorder according to high-level IGC specification.
- Real-time flight optimisation according to FAI and OLC rules.
- Flights stored in IGC format are downloadable using the integrated SD Card.

- Flight recorder functions include an integral pressure transducer based on 1013 mbar level for altitude recording, engine noise level sensor, memory to store more than 1000 hours of flights and digital and mechanical security devices to ensure high level of security.
- Integrated FLARM collision avoidance system with graphic, sound and voice (optional) presentation.
- 

### 2.1.3 V9 Vario Unit Features



- ARM Cortex-M4 processor
- Mechanical needle driven by stepper motor indicating various data such as netto vertical speed, relative (super netto) and vertical speed.
- 320x240 pixels sunlight readable colour screen for additional information such as average, thermal vario, time, speed etc...
- digital temperature compensated pressure sensors for altitude and airspeed
- inertial platform 3 axis digital +-6g accelerometer, 4 gyroscopes
- Smooth audio output with audio equalizer and many custom audio settings
- Integrated voice module
- 100Hz sampling rate for very fast response.
- Speed to fly indication.
- TE compensation can be selected to be either pneumatic TE probe or digital compensation.
- 



V5 vario has same functionality than V9, the only difference is, that V9 has built in inertial platform (AHRS)-

### 2.1.4 V80 Vario Unit Features



- Dual ARM Cortex-M4 processor
- Extremely bright 3.5" (8.8 cm) colour display with 320x240 pixels is used to display vario needle and additional information such as average, thermal vario, time, speed etc...
- No mechanical parts and fast refresh rate allows extremely fast response time of needle.

- Additional Flarm radar screen and artificial horizon.
- Three buttons for toggling between screen and target selection
- digital temperature compensated pressure sensors for altitude and airspeed
- inertial platform 3 axis digital +-6g accelerometer, 4 gyroscopes
- Smooth audio output with audio equalizer and many custom audio settings
- Integrated voice module
- 100Hz sampling rate for very fast response.
- Speed to fly indication.
- TE compensation can be selected to be either pneumatic TE probe or digital compensation.

### 2.1.5 Interfaces

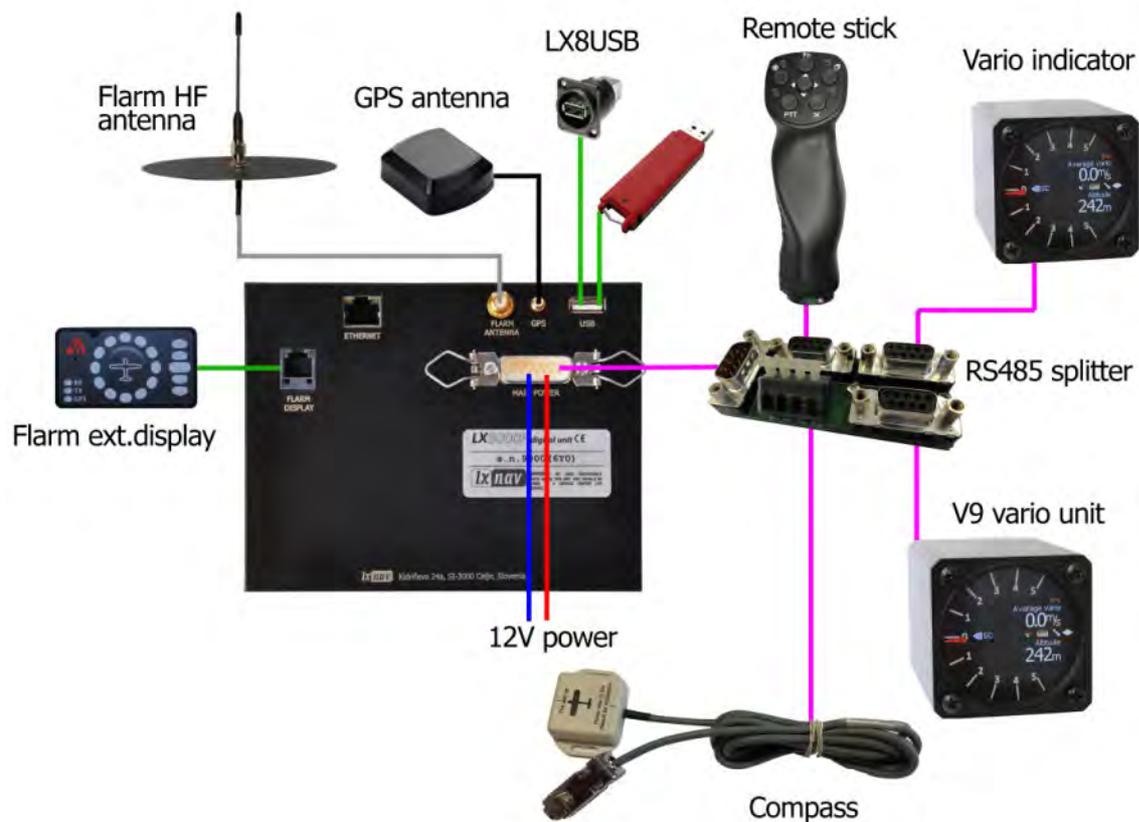
- The RS232 interface has NMEA output for external devices.
- An SD Card interface.
- A USB slot for data transfer using USB memory stick.

### 2.1.6 Internal Options

**Flarm module** can be built into the main display unit. All necessary connectors are available on the rear side of the unit (Flarm external indicator, Flarm antenna), which guaranties the same comfort as with the original Flarm devices. It is very important to point out that the whole system uses only one GPS receiver and therefore offers a low power solution.

**Artificial horizon** can be enabled on main display unit. V9 variometer is constantly using data from inertial platform in order to make vario signal smoother, however if pilot would like to see artificial horizon and software option to do so must be purchased.

## 2.1.7 External Options



By using a RS485 bus system a wide range of optional interfaces can be easily connected to the basic configuration with minimal installation work. The LXNAV bus system can be extended easily by use of RS485 splitting units, which allow plug and play connection of optional devices. The following units can be connected to the main system:

- **Second Seat Device (LX9000D, LX9070D LX8000D or LX8080D):** The unit installed in the rear seat of the glider is powered and receives all necessary data from the main unit. The communication between both units is exclusively via the RS485 bus system.
- **Remote Control:** An extremely ergonomic leather-coated handle which includes 8 push buttons to operate the main display unit and also two additional buttons with open wires. These two buttons can be used for instance as PTT for radio and SC/Vario changeover command. A second remote control can be installed to control second seat device or for side by side operation.
- **Electrical Compass Device**
- **Secondary Vario Indicators (V5 indicator or V80 indicator)**
- **Flap sensor**
- **MOP box** for jet engines

## 2.1.8 Simulator

There are two options to stay in condition and familiar with your LX90xx system. LXSim is free of charge program, which you can download from [www.lxnav.com](http://www.lxnav.com) or data from the Condor PC flight simulator ([www.condorsoaring.com](http://www.condorsoaring.com)) can be received via the RS232 port after entering suitable passwords (see Chapter 6.1.15).

These features are extremely useful for pilots who want to learn about the system and also wish to refresh their knowledge after a winter break. Please note that altitude data will be sent from the simulator which means that real final glide training will be possible.

## 2.1.9 Technical Data

### 2.1.9.1 LX9000 System

- Power input 10-24 V DC
- Consumption at 12 V:
  - 250 mA - minimum brightness without audio and options.
  - 260 mA - minimum brightness without audio and with Flarm.
  - 470 mA - maximum brightness without audio and options.
  - 480 mA - maximum brightness without audio and with Flarm.
  - 160 mA – additional for V9 vario unit
- Cut-out dimensions of the LX9000 display unit are 109 x 143 mm; outline dimensions: 113 x 145 x 38 mm exclusive connector.
- 57 mm (2¼") standard aircraft cut-out for the V9 vario unit; length 92 mm (exclusive connector).
- 80 mm (3") standard aircraft cut-out for the V80 vario unit; length 130 mm (exclusive connector).

### 2.1.9.2 LX9070 System

- Power input 10-24 V DC
- Consumption at 12 V:
  - 250 mA - minimum brightness without audio and options.
  - 260 mA - minimum brightness without audio and with Flarm.
  - 470 mA - maximum brightness without audio and options.
  - 480 mA - maximum brightness without audio and with Flarm.
  - 160 mA – additional for V9 vario unit
- Cut-out dimensions of the LX9070 display unit are 109 x 179 mm; outline dimensions: 113 x 181 x 38 mm exclusive connector.
- 57 mm (2¼") standard aircraft cut-out for the V9 vario unit; length 92 mm (exclusive connector).
- 80 mm (3") standard aircraft cut-out for the V80 vario unit; length 130 mm (exclusive connector).

## 2.1.10 Weight

- LX9000 display unit: 650 g
- LX9070 display unit: 650 g
- V9 vario unit: 300 g
- V80 vario unit: 400 g

## 3 Packing Lists

### 3.1 LX9000 (LX9070) with Flarm Option

- LX9000 (LX9070) main display unit
- V9 vario unit with V5 indicator or with V80 indicator
- Main power cable for main display unit
- Cable for vario unit
- SD card
- Barogram calibration chart
- GPS antenna
- Flarm Antenna
- Hex key "Inbus"

### 3.2 LX9000 (LX9070)

- LX9000 (LX9070) main display unit
- V9 vario unit with V5 indicator or with V80 indicator
- Main power cable for main display unit
- Cable for vario unit
- SD card
- Barograph calibration chart
- GPS antenna
- Hex key "Inbus"

### 3.3 LX9000D (LX9070D)

- LX9000D (LX9070D)
- Main power cable
- RS485 cable – 4 meter
- RS485 splitting unit
- Vario indicator V5 or V80 with cable
- SD card
- Hex key "Inbus"

## 4 Installation

The main display unit is installed in an aperture 93.5 mm wide and 81.5 mm high. The vario unit and any additional vario indicators each require a standard 57 mm cut-out or standard 80 mm cut out.

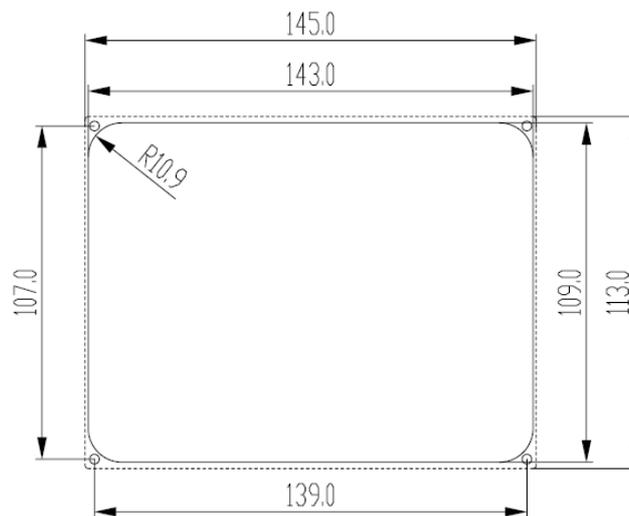
### 4.1 Installing the main display unit

Prepare the cut-out in the instrument panel according to the drilling template. Position the Main display unit in the cut-out in the instrument panel. Tighten the main display unit with attached 2.5 mm screws.

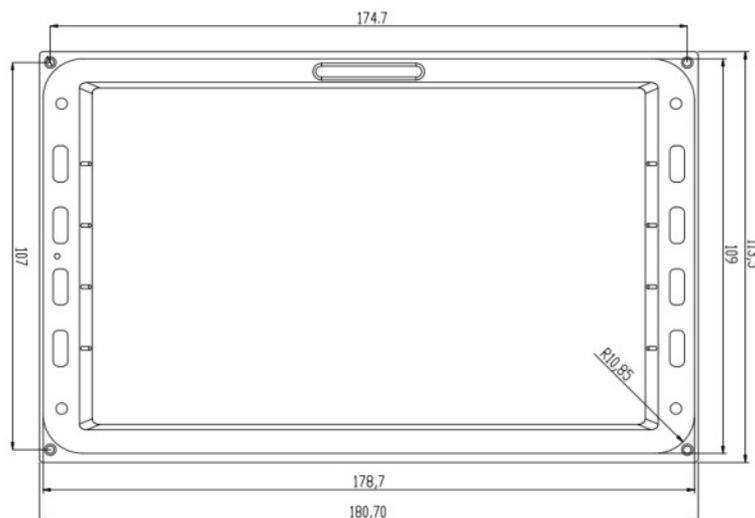


When installing the main display unit it is not necessary to remove the rotary knobs.

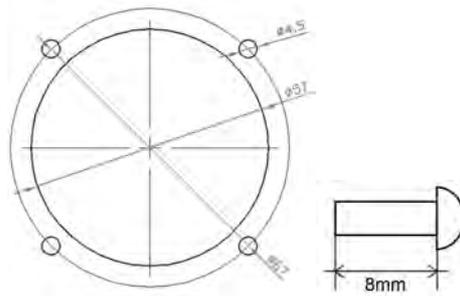
The mounting template for LX9000 main display unit is shown in the picture below (not to scale!):



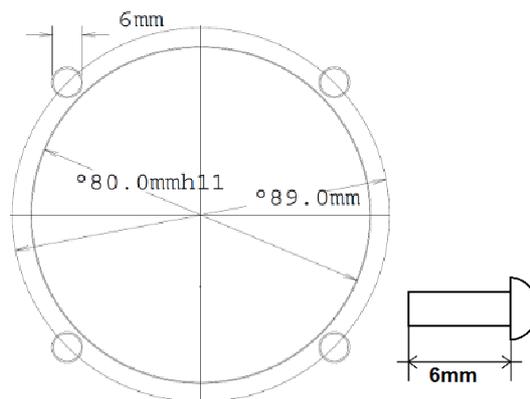
The mounting template for LX9070 main display unit is shown in the picture below (not to scale!):



## 4.2 Panel cut-out for V9/V5 vario unit



## 4.3 Panel cut-out for V80 vario unit



Length of screw is limited to max 6mm!

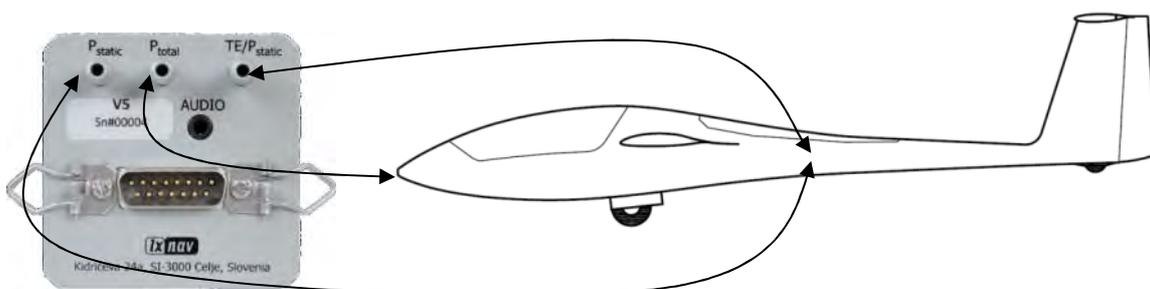
## 4.4 Pneumatic connection

Three pressure connectors are fitted to the back of the vario unit. A label shows their functions.

- $P_{\text{static}}$  means static pressure connector.
- $P_{\text{total}}$  means pitot or total pressure connector.
- TE means total energy TE connector.

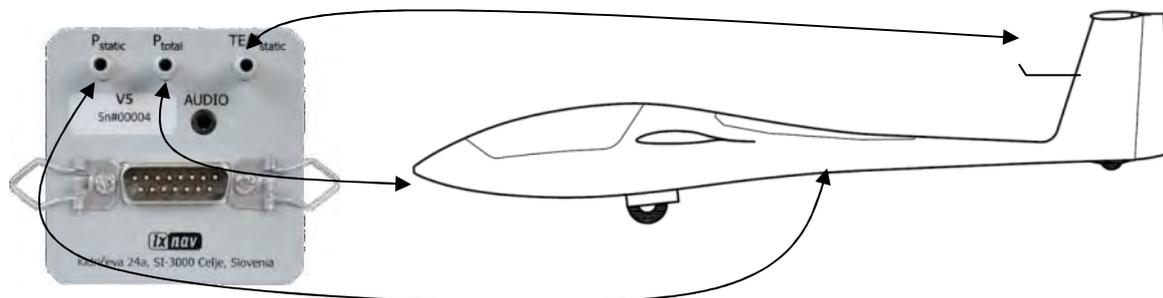
If the unit is to be configured for digital TE compensation the connections are as follows:

- $P_{\text{static}}$  Static
- $P_{\text{total}}$  Pitot or Total pressure
- TE/ $P_{\text{static}}$  Static



If the unit is to be configured for pneumatic TE compensation using a TE tube, then the connections are:

- TE/P<sub>static</sub> TE tube
- P<sub>static</sub> Static
- P<sub>total</sub> Pitot or Total pressure



If the P<sub>total</sub> and Static are connected the wrong way around there will be no integrator reading (average climb) during the flight.

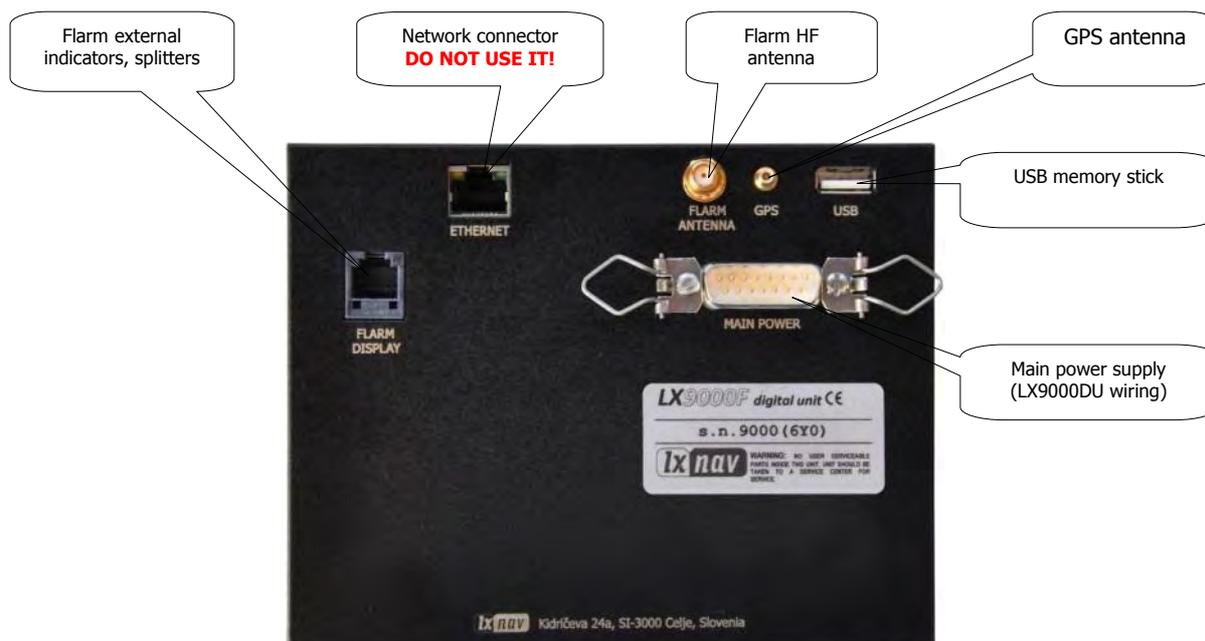
The main display unit is connected to 12 Volt power via the 15-pin SUB-D connector. The main display unit, vario unit and other vario indicators are connected via the RS485 bus and the connectors are labelled with "RS485" at each end.

Please ensure that both units are connected correctly before the first power on. The power wires (red and blue) should be connected to the main display unit.



Even though there is an automatic fuse in the instrument it is VERY IMPORTANT to use an external fuse (max. 3A). Power supply cables should use a minimum of 0.5 mm<sup>2</sup> wires.

### 4.5 Ports and Wiring

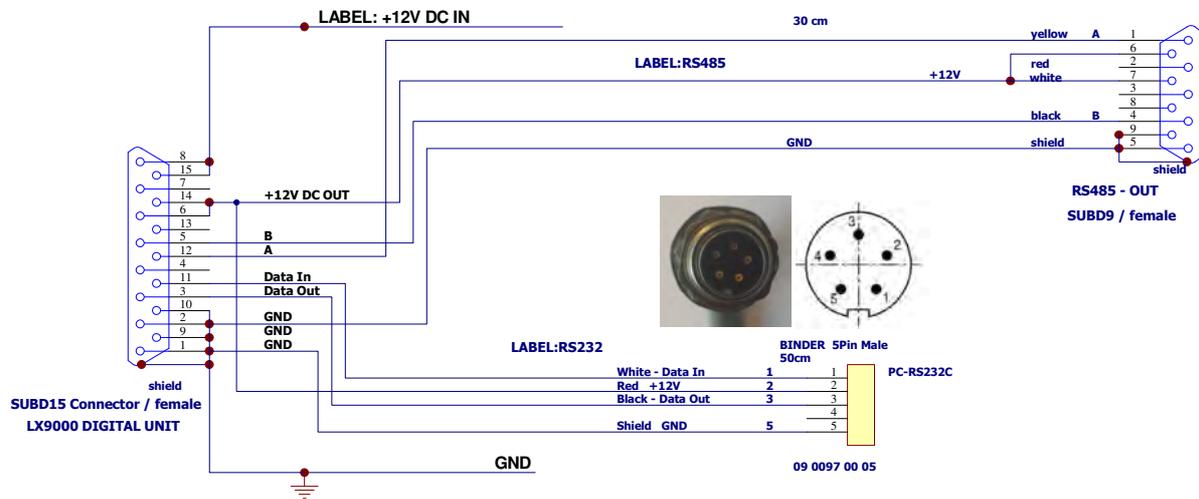


### 4.5.1 Flarm port

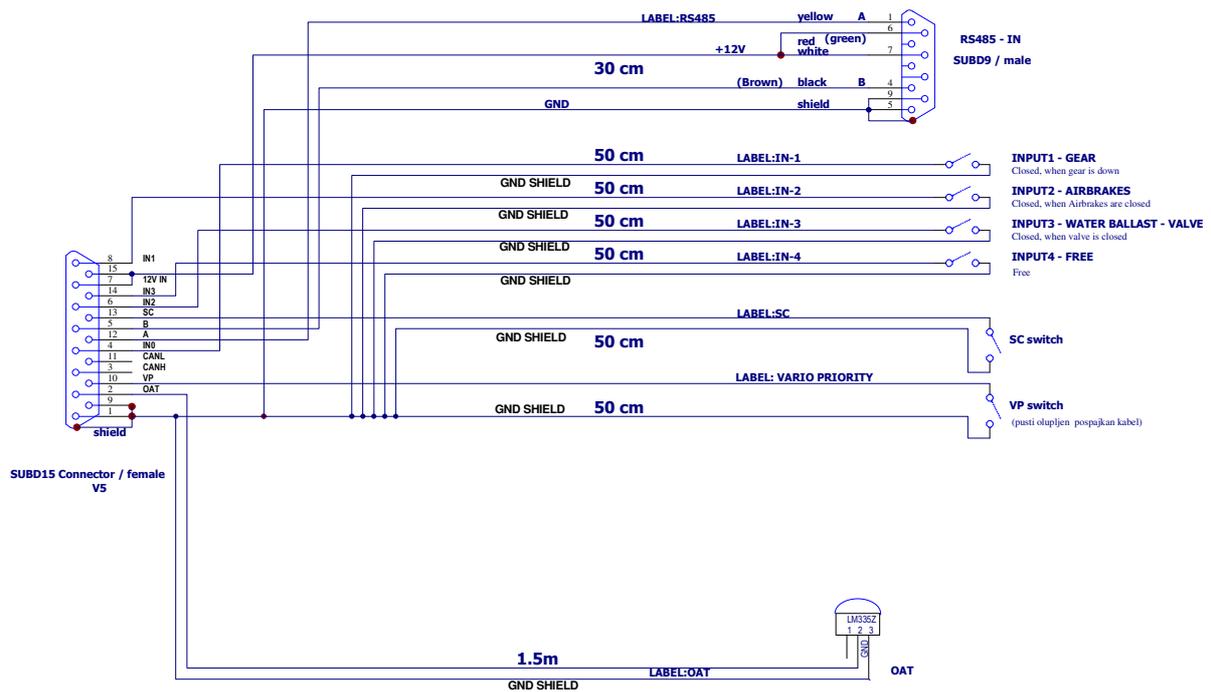


Pin number	Description
1	(output) 12V DC, to supply GPS
2	(output) 3.3V DC (max 100mA)
3	GND
4	Flarm Data Out
5	Flarm Data In
6	Ground

### 4.5.2 Main unit wiring

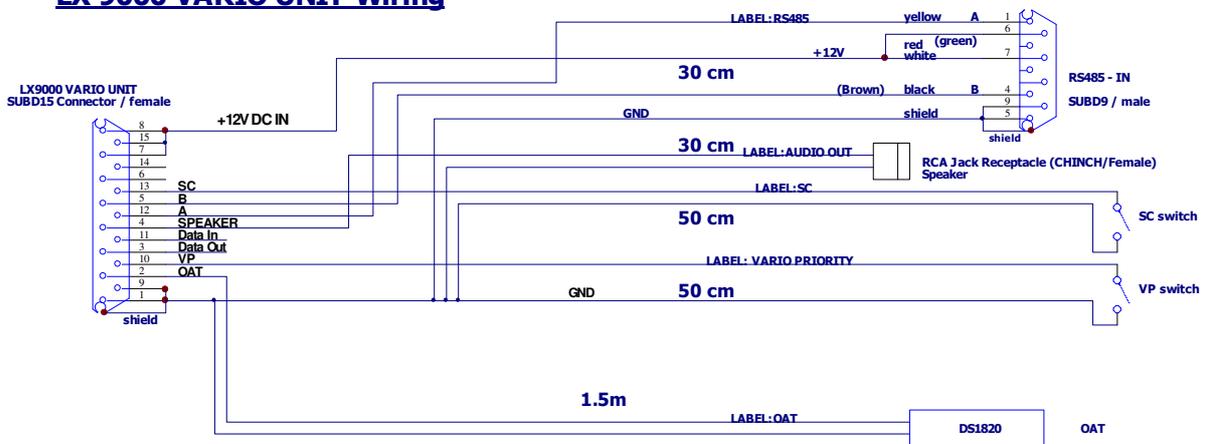


### 4.5.3 V5/V9/V80 vario unit wiring



### 4.5.4 USB-D or Analog unit wiring

#### LX 9000 VARIO UNIT Wiring



### 4.5.5 Connecting vario unit

Vario unit is connected to main unit through RS485 bus. SC cable is used for external switch, for switching between climb and cruise mode. In case that SC is connected to flaps switch, VP (vario priority) is connected to switch on stick. Inputs IN1..4 are used to connect to gear switch, airbrakes, etc...

### 4.6 Installation of Options

All options (Rear Seat Device, Remote Control, Compass Module & secondary vario indicators) are prepared to be connected to the RS485 system bus by use of RS485 splitting units. Installation of any option is plug-and-play and therefore requires only mechanical

installation work. The main display unit also powers all devices connected to the bus. An automatic fuse built into the main display unit prevents damage to the digital unit should a short circuit in the wiring or in some attached device occurs.



## 5 System Description

The main display unit can be mounted at portrait or landscape orientation. After installing the main display unit, the orientation must be defined via the Display menu (see Chapter 6.1.4).



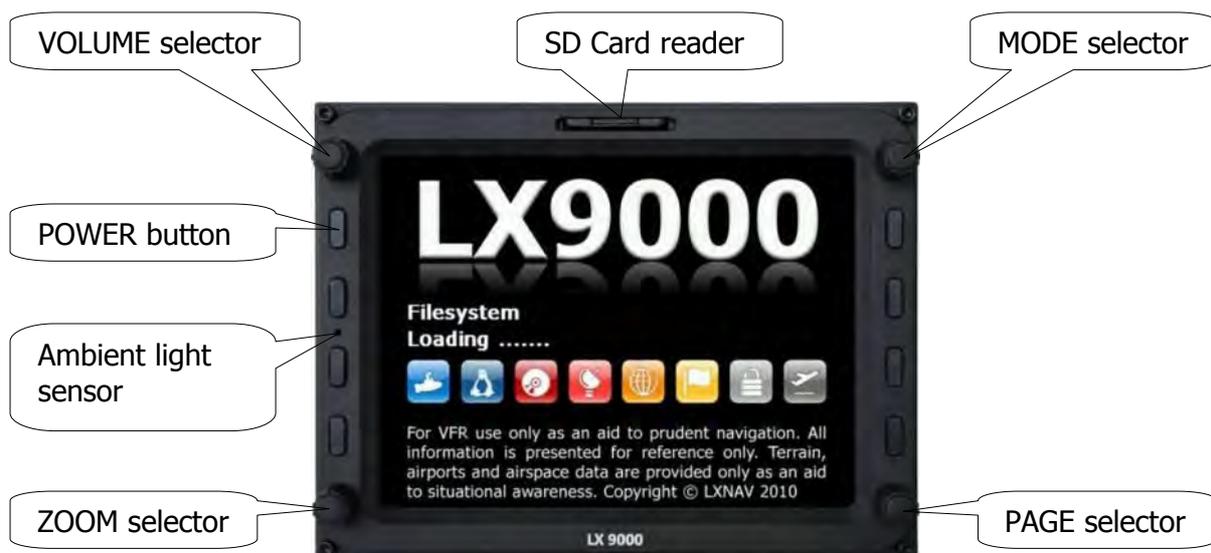
In this manual all screenshots are given for portrait orientation of the LX9000 system. However all functionality is the same in landscape orientation and on LX9070 system.

### 5.1 Rotary Switches and Buttons

The following controls are mounted on the front face of the main display unit:

- Four rotary selector knobs
- Eight push-buttons
- SD card reader

#### 5.1.1 Landscape orientation



### 5.1.2 Portrait orientation



The V9 vario unit is an indicator only and has no controls. Information displayed is controlled by the main display unit.



The V80 vario unit is having three buttons to toggle between screens. More information is given in chapter 6.1.12.4

### 5.1.3 Buttons

All buttons have a dynamic function; the first time one presses each button, it displays its function without executing any action. Not all buttons have a function on every page. In some cases buttons have a long press function.

#### 5.1.3.1 Power Button

The power button is marked with the ON/OFF symbol. It has multiple functions. Primarily it is used to switch the system on and off.

### 5.1.4 Rotary Switches (Knobs)

The main display unit has four rotary knobs. Each has a single function with the exception of the zoom knob which has, in some cases, a function other than zoom. With the upper-left rotary knob the volume can be adjusted. The upper-right rotary switch is the mode selector (it changes the mode of the operation). At the lower-right is the up/down knob which is used for selecting sub-pages, sub-menus and editing menus. At the lower-left is the zoom knob which is multifunctional. While its main function is to change the zoom level within graphic mode, it can also be used if an error is made during editing; it is possible to move the cursor back by rotating this knob. However this can only be done if 'editing' is active which is shown by the cursor blinking.

## 5.2 Switching on the Unit

After a short press of the power-on button the main display unit and vario unit will turn on and a welcome screen will appear. The first screen shows the boot loader screen followed by the Linux kernel screen and then the file system screen.



The boot procedure normally takes up to 20 seconds but in the case of a firmware update or system check it can take more time. The final boot screen displays information about the LX90xx system firmware and the IGC serial number. When the boot procedure is completed the profile selection dialogue is shown. Please refer to Chapter 8.1 for more details about starting up the system.

## 5.3 User Input

The main display unit 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
- Masked text editor
- Spin controls
- Selection control
- Checkboxes
- Colour selector
- Line width selector

To move the function from one control to another, rotate the PAGE selector knob (page selector) as follows:

- Clockwise rotation will select the next control.
- Counter clockwise rotation will select the previous control. Press the SELECT button (usually lower-right) to enter control input.

### 5.3.1 Text Edit Control

The Text Editor is used to input an alphanumeric string of arbitrary length; the picture below shows typical options when editing text. Use the bottom-right knob to change the value at the current cursor position.



Press the **CHAR>>** button to advance the cursor to the next position. The cursor can also be moved to next position using the bottom-left knob. Rotate it clockwise to move forward.

The **Abc** button is a toggle button and will change the letter case. Press it to toggle modes.

- **Abc** mode will start every new word with a capital letter; subsequent letters will be lower case.
- **ABC** mode will enter only upper case letters.
- **abc** mode will enter only lower case letters.

Pressing the **DELETE** button will delete the character at current cursor position. Continually press the **DELETE** button to delete all characters after the current cursor position.

Press **OK** to confirm changes and leave control. Press **CANCEL** to abandon changes and revert back to the values before entering this screen.

### 5.3.2 Masked Text Edit Control

The masked editor is a similar control to the text editor but only limited characters can be entered at any particular position. It is designed to enter latitude, longitude and passwords.



### 5.3.3 Spin Control

Spin controls are designed for numeric parameters. Rotate the bottom-right knob (page selector) to increase/decrease the selected value. The bottom-left (zoom) knob will increase/decrease the value with a different step compared to the page selector.

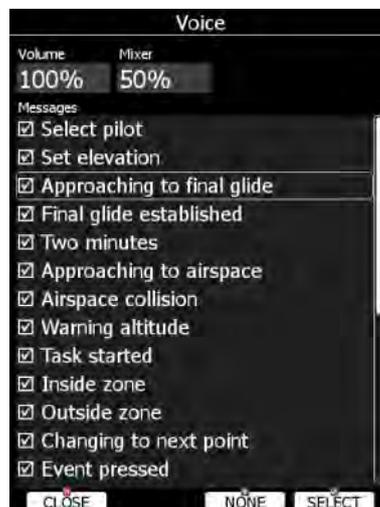


### 5.3.4 Selection Control

Selection boxes, also known as combo boxes on Windows operating system, are used to select a value from list of predefined values. Use the page selector to scroll through the list.

### 5.3.5 Checkbox and Checkbox List

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



Use page selector to scroll through the checkbox list. Press the **ALL** to enable all options.

### 5.3.6 Colour Selector

Colours and fills are set via the colour selector control. Rotate the page selector to change a colour.



Rotating the zoom selector changes colour transparency. Transparency is very important for fill colours which are used for airspace zones, observation zones and FAI area. If a fill colour is not transparent (0%), all other map items will not be seen through it. If a fill colour is 100% only the solid border will be drawn.

Press PICK button to define colour more precisely. A colour dialog will open, where you can select colour from HSV circle or enter values for red, green and blue colour.

### 5.3.7 Font Selector

Using the font selector it is possible to define a font colour and style for a selected item.



Turn the PAGE selector knob (page-selector) to change the font style. Text is also rendered in the selected font style. Turn the ZOOM selector knob (zoom-selector) to change the font colour.

Press PICK button to define colour more precisely. A colour dialog will open, where you can select colour from HSV circle or enter values for red, green and blue colour.

### 5.3.8 Line pattern Selector

Using line pattern selector it is possible to define width and pattern of line. Turn the PAGE selector knob (page-selector) to change the width of line. Turn the ZOOM selector knob (zoom-selector) to change the line pattern. Results are immediately visible on selected item.

## 5.4 Switching off

Please use one of the following recommended methods for shutting down the LX90xx system:

### Method 1

Press the button with the **OFF** label which is displayed in navigational modes. See Chapter 6.5 for more details. A message to confirm shutdown will be shown.



### Method 2

Press the button with the **OFF** symbol for approximately 4 seconds. The OFF message will be displayed and the instrument will shut down. When the message appears you must release the power button.



### Method 3

When the button with the **OFF** symbol is pressed for more than 8 seconds the system will perform an unconditional shutdown. This method is recommended only in case that the program hangs and it is not possible to shutdown with methods 1 or 2.



If you are using method 2 to switch off the system it is necessary to release the button when you see the shutting down message. If you continue to press the off button the main display unit may shut down by method 3.

If the request for OFF is made during flight the instrument will ask for confirmation so that the system cannot be switched off by mistake.



It is important that the main display unit is switched off via software. Never power down the system using the main power switch. The main display unit is running the Linux operating system and sudden power loss may corrupt the file system.



If main power is lost for a few seconds during flight the flight recorder will not produce two flights. The most important flight parameter (altitude) will remain which means that the final glide calculations are not affected.

## 6 Operating Modes

The main display unit has seven **modes** or **main menus**. All of them are selectable by rotating the upper-right knob which is also called **MODE selector**. The diagram below shows the mode structure of the LX9000 running in portrait screen.



- **Airport Mode**, navigation and selection airports.
- **Waypoint Mode**, navigation, selection and editing waypoints.
- **Task Mode**, Navigation, selection and editing task.
- **Statistics Mode** shows statistical data for flight in progress or logbook.
- **Setup** mode is used to configure the whole system.
- **Information Mode** displays GPS status, altitude, flight level and height, sunrise and sunset or position report to selectable point or satellite sky view.
- **Near Mode** displays a list of all landable waypoints and airports.

The Navigation modes and statistics mode have additional pages which are accessible by rotating the bottom-right knob also called the **PAGE selector**.

Three main navigational modes **airport**, **waypoint** and **task mode** are selected by rotating the upper-right knob. All three options are similar and have similar basic navigation data screens accessed by rotating the bottom-right knob.



It is possible to fully customise all three main navigational pages using the program LXStyler. This program can be downloaded from our webpage [www.lxnav.com](http://www.lxnav.com). Refer to Chapter 6.1.14 for more details.



It is also possible to customise selected navigational pages using STYLE menu option. Refer to Chapter 7 for more details.

In airport navigation mode the user can navigate only to airports stored in LXNAV's Airports database. This database cannot be edited on device itself and is available at no charge on our web pages. See Chapter 6.1.5.2 for more details how to obtain the latest databases.



Database can be modified using program LXAsapt editor. This program can be downloaded from our webpage [www.lxnav.com](http://www.lxnav.com)

In waypoint navigation mode the user is navigating to waypoints that were previously loaded and selected in the **Files and Transfer** menu (see Chapter 6.1.5.4). Task navigation mode is used for task creation and manipulation. Navigation in this page is exclusively to task points.

## 6.1 Setup Mode

In the setup menu users can configure the main display unit and connected devices. Turn the bottom-right knob - PAGE selector - or press the UP/DOWN arrow on the remote stick to select the appropriate setup item. Turn the bottom-left knob - ZOOM selector - or press the LEFT/RIGHT arrow on the remote stick to move faster over menu. Press the **SELECT** button or push middle multi-directional button on the remote stick to enter a menu. A dialogue or sub-menu will open.



The setup menu is slightly different on the rear seat device as not all options are applicable. Items which are marked with an asterisk (\*) are available only in the front seat setup menu.

### 6.1.1 QNH and RES

Turn the bottom-right knob to select the required entry field. Press the **EDIT** button and start editing the value.



#### 6.1.1.1 QNH\*

Using this feature it is possible to offset the altitude datum which could have changed due to pressure changes during the flight. Since changing the QNH influences the indicated altitude, care should be taken when changing the value as an incorrect setting can upset the final glide calculation.

### 6.1.1.2 Safety Altitude

This setting is the altitude reserve or safety altitude and is the height that the instrument adds to the final glide altitude required so that the glider arrives over the final glide destination at the selected safety altitude. Once the safety altitude has been specified, the pilot has to keep the final glide indicator on 0 to arrive at the safety altitude.

### 6.1.1.3 Altitude source

The system has two pressure altitude sensors. One is built into the main display unit and is used for the IGC recorder and the second one is built into the vario unit and is connected to the glider pitot-static system. Changing the altitude source defines which sensor is used for pressure altitude used in program.

### 6.1.1.4 Magnetic Variation

The main display unit has a built-in Earth magnetic field model. If Auto variation is checked the magnetic variation is derived from this model, otherwise the user can enter a custom value.

### 6.1.1.5 ETA/ETE Calculation

In changing this value you may choose from four different methods to calculate the estimated time of arrival to the navigational point. Calculation is always divided into straight flight and climb time calculations.

- **MacCready** uses the Polar data and MacCready setting to calculate speed to fly and climb rate.
- **Vario** uses the last four thermals average to compute climb rate and uses this value to calculate speed to fly.
- **Avg.Speed & Vario** uses the average ground speed over the last 5 minutes for distance and Vario statistics for climb rate.
- **Avg.Speed & MC** uses the average ground speed over the last 5 minutes for distance and MacCready.

All four methods of calculating ETA and ETE (Estimate Time of Arrival & Estimate Time Elapsed) take into account glider altitude, wind and safety (arrival) altitude thus ensuring that the calculation made is the best possible.



Suggested methods for competition pilots are **Avg.Speed & Vario** or **Avg.Speed & Mc**.

### 6.1.1.6 Soaring Start\*

Soaring start is the time when the glider starts soaring (released from tow, engine switched off). A soaring start time is needed to start the flight optimization.

## 6.1.2 Flight Recorder

The main display unit has a built-in flight recorder fully approved by the IGC (a sub-committee of the FAI) and will produce secure flight records that are acceptable for all FAI requirements including world records.



Select the recording interval and enter the pilot name. Pilot weight is important if ballast is specified in kilograms of water (see Chapter 6.1.11). If the system is used in two-seat aircraft the name of the co-pilot may also be entered.



There is no setup for glider type. Glider type is defined in the Polar and Glider setup (see Chapter 6.1.13).



There are very few settings for the flight recorder compared to other instruments. This is because main display unit will record all additional data such as wind, speed and vertical speed by default.



If a new pilot is entered, upon exiting the dialogue the message *"Do you want to create new profile with this pilot?"* will be asked. Answer **YES** if you want to quickly add a new profile. For more information about profiles see Chapter 6.1.12.

### 6.1.3 Vario Parameters\*

This option is used to set the following parameters:



On this page the following parameters are set:

**Vario needle filter** sets a time constant of the vario needle. The value can be adjusted between 0.1 and 5 s with step 1.0 s or 0.1 s. Default value is 1.5 s.

**Vario sound filter** sets a time constant of vario sound. The value can be adjusted between 0.1 and 5 s with step 1.0 s or 0.1 s. Default value is 1.5 s.

**Vario range** sets full scale range of the vario (2.5 m/s, 5 m/s or 10 m/s). Default value is 5 m/s (10 kts).

**SC tab** defines the width of the audio dead band in speed to fly mode. Default value is  $\pm 1$  m/s.

**Integrator time** defines the integration period for the average vario in seconds. The default is 20 seconds.

**Auto SC** defines the conditions when the instrument is switched automatically between vario and speed command.

- **OFF:** Switching is exclusively by an external switch connected to the vario unit.
- **GPS:** When the GPS detects that the glider is circling an automatic change over to vario will happen after approximately 10 seconds. Detection of straight flight will cause a changeover to speed command.
- **G-load:** When accelerometer detects increased g-load, because of circling, variometer will change from cruise to climb mode.
- **IAS:** When the IAS exceeds a pre-set value. The IAS at which switching occurs can be selected in 5 km/h steps from 100 up to 160 km/h (or the equivalent in knots or mph).

Using **Smart vario filter**, vertical speed can be further filtered. Smart vario filter defines maximum speed of vario needle. Higher the value is, slower will be the needle.

**Beep at max** will enable a short beep few seconds before a maximum in thermal is reached.

**Beep before max** defines how many seconds before a maximum in thermal a short beep will be heard.

**Auto reset integrator** resets the integrator to zero when the vario unit switches from cruise to climb mode. If this item is not checked the integrator will not be reset to zero.

**Netto filter** sets a time constant of the netto vertical speed filter. The value can be up to 20 times bigger than vario needle filter. Default value is same as vario needle filter.

**SC filter** sets a time constant of the speed to fly (SC) filter. The value can be up to 20 times bigger than vario needle filter. Default value is same as vario needle filter.

**Relative filter** sets a time constant of relative vertical speed filter (also known as supper netto vertical speed). The value can be up to 20 times bigger than vario needle filter. Default value is same as vario needle filter.

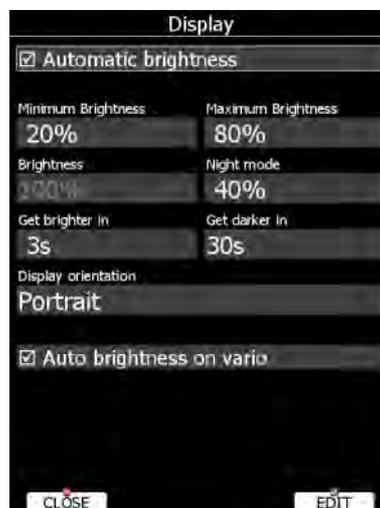
**Netto time** defines the integration period for the average netto vertical speed in seconds. The default is 20 seconds.



The external switch wired to the vario unit has absolute priority and will override all other switching methods.

### 6.1.4 Display

The display menu controls screen brightness. The main display unit has an ambient light sensor which detects ambient light and automatically increases or reduces the brightness of the screen.



If the **Automatic brightness** checkbox is selected, the instrument will automatically adjust brightness according to current light conditions. **Minimum** and **Maximum brightness** items control value limits. Use time values to setup how fast adaptation to brighter conditions or darker conditions will occur. Default values are tuned to human eyes and do not require change.

**Night mode brightness** defines maximum brightness when instrument is operating in night mode. In night mode, brightness is reduced to very low value to reduce difference between ambient light and device backlit.

If you want to set the brightness manually uncheck the **Automatic brightness** control and set the brightness manually.

Change **Display orientation** if you would like to change the display unit screen orientation. The main display unit will restart and start with new screen orientation.

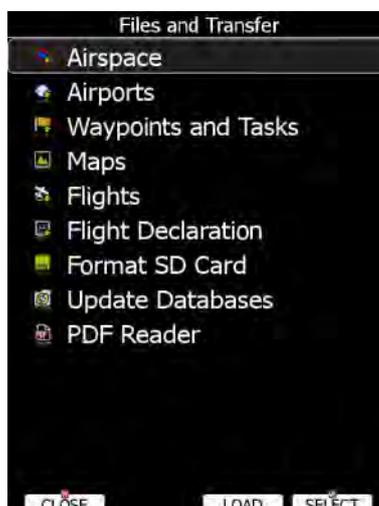
Checking **Auto brightness on vario** while enable automatic regulation of brightness on vario unit, if available. If this option is uncheck, vario unit will always run at full backlight.



It is recommended that the automatic brightness control is always enabled. Reducing brightness will also reduce power consumption. See technical data for more details (Chapter 2.1.9).

## 6.1.5 Files and Transfers

The Files and transfer menu is used to manage the waypoint, airspace and airport databases, recorded flights, flight declaration and PDF documents.



Within a profile user can selected different airport databases, airspace and waypoint files. Selected files can be stored inside main display unit or on inserted SD card or USB stick. It is also possible to upload files from SD card or USB stick to main display unit.

### 6.1.5.1 Uploading User Airspace and Waypoints

Databases can be loaded from a SD card or USB stick. Select the type of database you wish to upload and press the LOAD button.



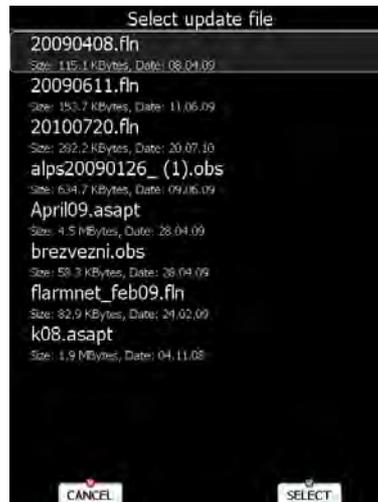
In next step the data source must be selected. Unavailable data source are going to be greyed out. A dialogue with a list of all available files will be opened. Press the **COPY** button to copy the selected file to the main display unit. The main display unit will accept the following file formats:

- **Waypoints file:** SeeYou CUP files, CUPX files, which may include also images and Cambridge/Winpilot DAT files. When selecting DAT files, waypoints will be converted to CUP format which is the format used for internal storage of points. There is no limitation for the number of waypoints in a file and/or name length.
- **Airspace file:** All types of CUB files are accepted.

### 6.1.5.2 Uploading Airspace and Airports Database

LXNAV distributes free of charge airport and airspace database for the whole world. The airport and airspace database is regularly maintained by LXNAV. The latest version of the database can be found on our webpage [www.lxnav.com](http://www.lxnav.com).

The database is distributed as single file with **.asapt** extension. Copy this file to a SD Card or USB stick. Plug the SD card or USB stick into the main display unit and select the **Update database** menu item. If multiple ASAPT files are found on a SD card a dialogue to select the appropriate one will be shown.



Databases are updated automatically and progress of the update will be shown on the screen.

### 6.1.5.3 Managing Airspace

Select the **Airspace** menu item and press the **SELECT** button. A list of all available airspace databases/files will be shown on screen. The distributed airspace databases are shown first followed by user airspace files, followed by airspace file on SD card and at the end are shown airspace files on USB stick.



Select the required airspace and press **SELECT**. If a check mark is shown in front of an airspace item, this airspace file will be shown in the graphics and used for proximity calculation, when enabled.

Button labels vary depend on airspace location. For distributed airspace, only buttons SELECT and EDIT are available. For user airspace files stored on main display unit, button DELETE, TO USB and TO SD are added.

To delete airspace file select the airspace item and press the **DELETE** button. Delete action must be confirmed. Only user airspace files can be removed.

Press **TO USB** button to copy selected airspace to USB stick. Press **TO SD** button to copy selected airspace to SD card.

When airspace file from SD or USB is highlighted **LOAD** button is displayed. Press **LOAD** button to upload selected airspace to main display unit.



When an airspace file from USB or SD card is selected, it will be available only, if SD card or USB stick is inserted in main display unit.



Selecting airspaces on SD card or USB allows you to create portable profiles, which can be transferred from one device to another device.

It is also possible to edit an airspace file. Select an airspace item and press the **EDIT** button. A list of all airspace zones in this database/file will be shown. Use the page selector to scroll through the items one by one or the zoom selector to move up or down for a whole page. At the bottom of page, a map with selected airspace zone is drawn.



Pressing the **VIEW** button will toggle different views of the zone list.

Using the **STATUS** button the selected zone can be disabled for proximity warnings.

Repeated presses will toggle the following options:

- **OFF always:** proximity warning is switched off for all the time.
- **OFF today:** proximity warning is switched off for today only.
- **OFF hh:mm:** proximity warning is switched off for 10 minutes.
- If **no label** is shown airspace is enabled for proximity warnings.



Press EDIT to edit data for the selected zone. Airspace type, class and altitude borders can be modified in this dialogue.

#### 6.1.5.4 Managing Waypoints

Select the **Waypoints and Tasks** menu item and press the **SELECT** button. A list of all available waypoint files will be shown on the screen.



Multiple files can be selected. All checked files will be shown on the graphics page and used in the near mode calculation, if the waypoint is of the proper type (airport or outlanding place). However, only one file can be the active file. The active file is primary used for task creation.



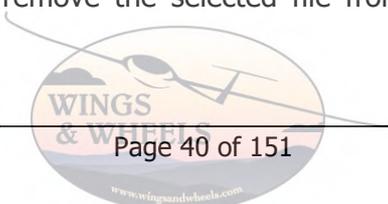
When a waypoint file from USB or SD card is selected, it will be available only, if SD card or USB stick is inserted in main display unit.



Selecting waypoint files on SD card or USB allows you to create portable profiles, which can be transferred from one device to another device.

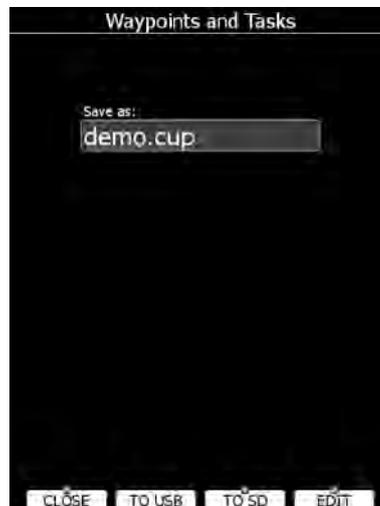
Press the **ACTIVE** button to mark the selected file as active.

Press the **DELETE** button to remove the selected file from the internal storage of main display unit.



If waypoints file from SD or USB are selected button **LOAD** is visible. Press the **LOAD** button to upload selected waypoint file to internal storage.

If waypoints file from internal storage is selected button **SAVE** is visible. Press the **SAVE** button to save waypoints to the SD Card or USB stick. The save dialogue will be opened.



Change the filename if required. Press **TO USB** for saving to the USB stick or press **TO SD** for saving to the SD card.



CUP and CUPX files also stores tasks. Tasks will also be uploaded to the main display unit. This feature is very useful, if you wish to prepare tasks on a computer using SeeYou or a similar program. You can subsequently easily select a task via the Task->Edit->Load option. See Chapter 6.7.7 for more details.



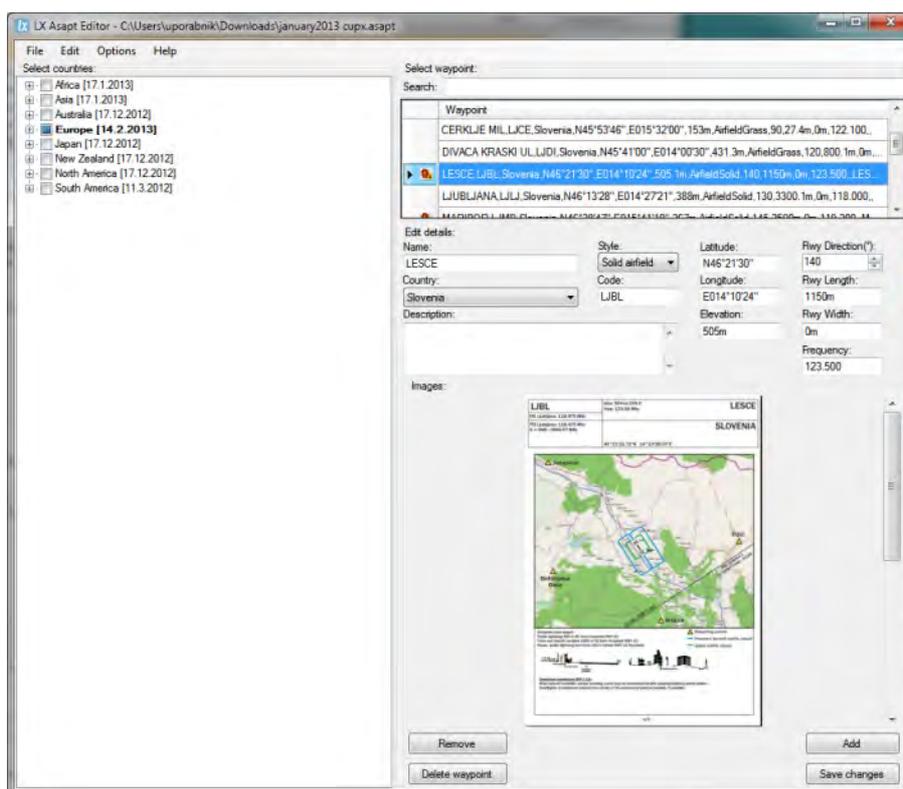
Some of CUPX waypoint files with images are password protected and a valid password must be obtained before using such a file. Please contact vendor to obtain password for your display unit.

### 6.1.5.5 Managing Airports

Select the **Airports** menu item and press the **SELECT** button. A list of all available airport databases will be shown. Only distributed airport databases are shown in this menu; the user cannot modify contents of a database within the main display unit. If an error is suspected in our database please notify us.

If you wish to add additional airports to the system an ordinary waypoint file should be created and uploaded as a waypoint file or use the LXAsapt editor program to modify the airport database.

### 6.1.5.6 Managing Airports Using the LX Asapt editor



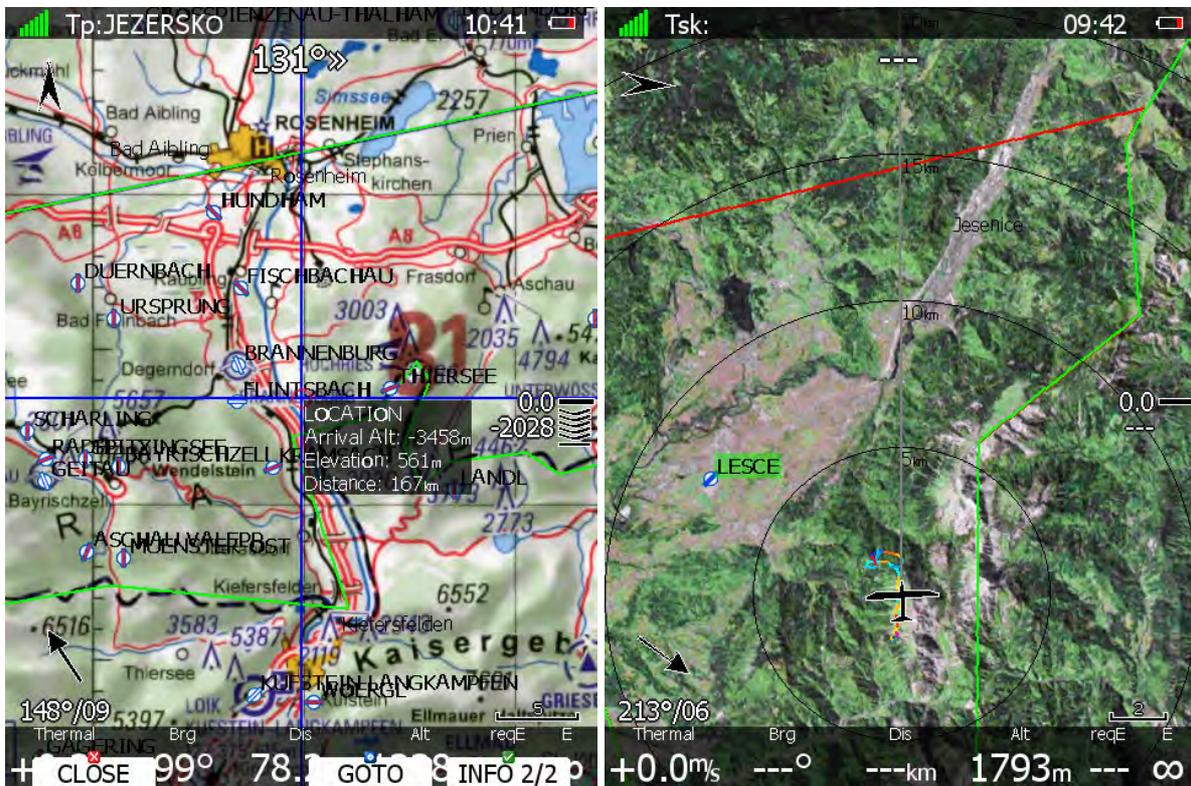
LX Asapt Editor allows you to edit any LXNAV airport database distributed as asapt files. You can quickly filter the regions and find the airports you're interested in. View and edit all details of the airports, add charts, photos (from files or clipboard) and any other information you would like associated with them. You can also delete the regions you're not interested in and add any new or missing airports anywhere in the world (for supported regions). The application also monitors every change you make to the database, so you can simply apply changes to a new database when it is released by LXNAV.

Modified airport data can readily be exported to the system as a (asapt) file and imported to the main display unit using the standard procedure for database updates (see Chapter 6.1.5.2).

The original database can be restored only via the update database procedure using the original database file. All databases are published on [www.lxnav.com](http://www.lxnav.com).

### 6.1.5.7 Managing Maps

Main display unit is preloaded with terrain and vector map data for complete Earth. However it is also possible to use scanned (rasterized) maps as background of navigational screen. Next two images are showing example of scanned ICAO map and satellite imagery.



The system is supporting two file formats: CMR file format provided by SeeYou software from Naviter. There are available free of charge sectional maps of USA ([www.soaringdata.info](http://www.soaringdata.info)) and QMP file format provided by Ifos. Please contact Ifos ([www.ifos.de](http://www.ifos.de)) or ([www.strepla.de](http://www.strepla.de)) to purchase scanned maps.



Select the **Maps** menu item and press the **SELECT** button. A list of all available map files will be shown on the screen.

Multiple files can be selected. All checked files will be shown on navigational page depend on raster map setting (See chapter 6.1.6.1 and 6.5.6.3).

Press **DELETE** button to remove selected map. Press **LOAD** button to upload selected map to internal memory.



When a map file from USB or SD card is selected, it will be available only, if SD card or USB stick is inserted in main display unit.



Map files can be very big in size and can occupy a lot of space of internal storage of main display unit. Selecting maps directly from SD card or USB allows you to save space at no performance cost and create portable profiles, which can be transferred from one device to another device.

### 6.1.5.8 Managing Flights

Select the **Flights** menu item and press the **SELECT** button. A list of all stored flights will be shown. The main display unit is capable of storing more than 1000 hours of flight logs.

Flights 1/60				
#	Date	Takeoff	Landing	Duration
1	14.08.13	12:49	18:24	05:35
2	03.05.13	04:48	16:37	11:48
3	03.05.13	04:48	08:45	03:56
4	07.10.12	08:44	16:19	07:34
5	06.10.12	08:14	10:29	02:14
6	05.10.12	09:11	11:51	02:40
7	03.10.12	05:49	09:05	03:16
8	19.06.12	10:26	18:56	08:30
9	11.06.12	10:23	16:00	05:37
10	12.05.12	12:09	16:29	04:20
11	24.04.12	08:42	14:24	05:42
12	20.04.12	11:48	14:24	02:36
13	20.04.12	09:48	15:42	05:54
14	20.04.12	09:48	12:23	02:35
15	05.04.12	07:54	14:33	06:38

CLOSE DELETE TO USB TO SD

If a SD card or USB stick is inserted into the main display unit, flights can be copied to it when the corresponded button is pressed. Flights can be removed from the main display unit using the **DELETE** button.

### 6.1.5.9 Flight Declaration

The Flight Declaration is composed from pilot data and declared task. Use this option if you wish to load or save a flight declaration from a file. The flight declaration is saved into binary HDR file.

Flight Declaration	
Pilot	Hrazem Polutnik
Glider	Ventus 2cxt, 18-meter, S5-3118, EJ
Task	190km-Tri. PRIEVIDZA-110Ksinna- 262Rycerka_Gorna-PRIEVIDZA

CLOSE TO NAME SAVE LOAD

On the screen pilot, glider and task information are shown. Press the **SAVE** button to save the declaration onto a SD card or USB stick. Press the **LOAD** button for loading. If Nano flight recorder is connected to USB port, **TO NANO** button will appear. Press it to transfer declaration to Nano flight recorder.



Please note that not all data from the HDR file will be loaded. Glider type and class must be changed via the **Polar and Glider** menu (Chapter 6.1.13) as also final glide calculations are linked to this setting.



HDR files do not include information about observation zone and turn point elevation. Observation zones will be set to default values (Chapter 6.1.8) and the elevation will be defined by the digital elevation model built into the instrument.

### 6.1.5.10 Formatting a SD Card

Use this option if the main display unit cannot read SD card. The system uses the same card format as used by the MS-Windows operating system (FAT). However sometimes Windows does not format the SD card properly or a new card may not be formatted properly. It is recommended to format new SD cards before using them.



Formatting a SD Card will erase the entire contents of the SD card.

### 6.1.5.11 Managing PDF documents

Main display unit can store almost unlimited number of PDF documents. User can store here flight manual, maintenance manual, scans of all gliding documents and also checklists.

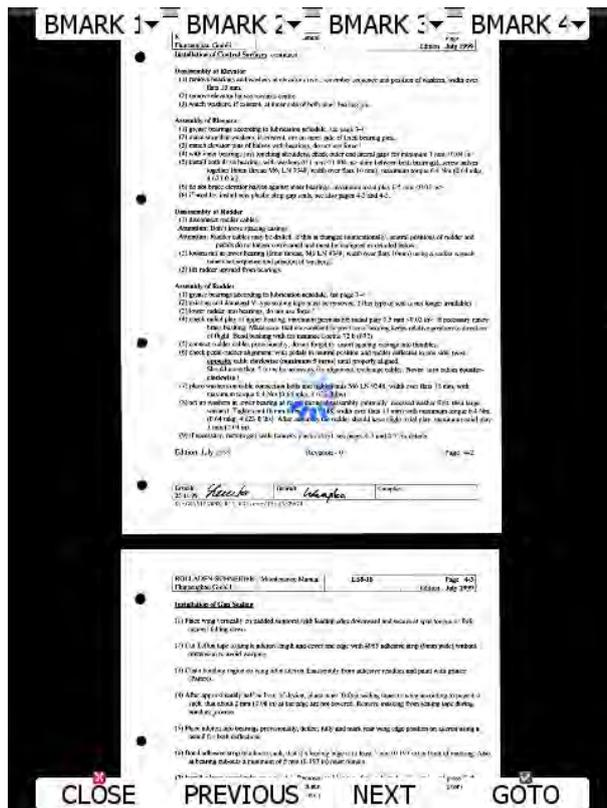


Select the **PDF READER** menu item and press the **SELECT** button. A list of all available PDF documents will be shown on the screen. Select desired document using PAGE selector. Press **DELETE** button to delete selected document. Press **LOAD** button to upload selected document to internal memory.

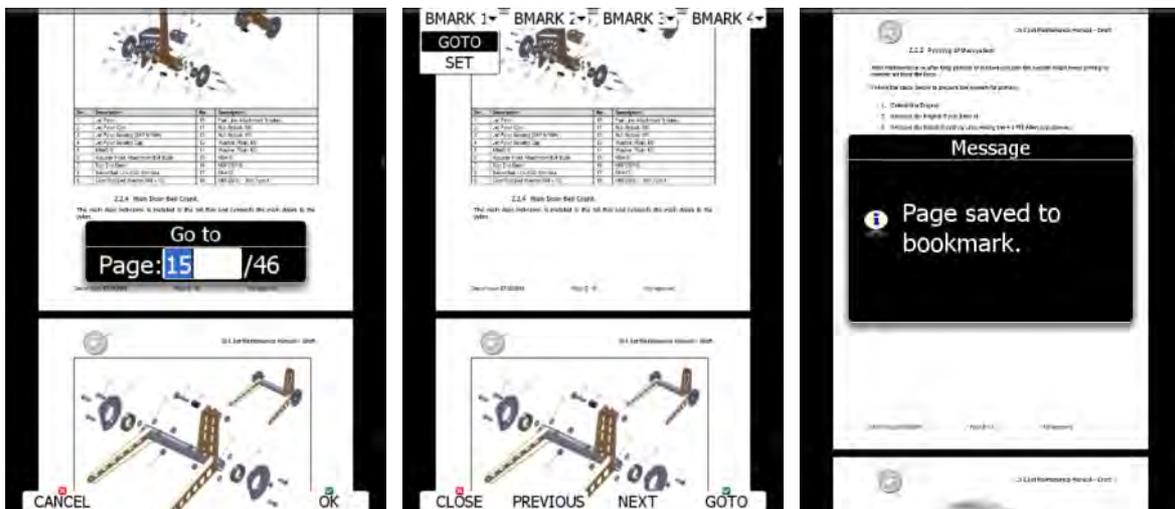


Documents can be very big in size and can occupy a lot of space of internal storage of main display unit. There it not necessary to copy documents to internal memory. Documents can be selected directly from SD card or USB at no performance cost.

Press **SELECT** button again to open selected document.



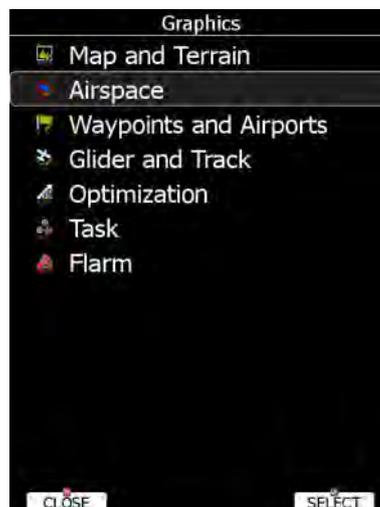
A document will load within few seconds. Use **PAGE** selector or **NEXT** and **PREVIOUS** button to move up/down through document. Use **ZOOM** selector to zoom current page. Use **MODE** selector to move left/right on the selected page. Press **GOTO** button to navigate to specific page. A goto dialog will be open. Use **PAGE** or **ZOOM** selector to select desired page



It is also possible to set four independ bookmarks. Press **BMARK1** to open bookmark drop down menu. Press **BMARK1** button once more to set a bookmark. A message will confirm that bookmark has been saved.

## 6.1.6 Graphics

This dialogue allows the user to define the appearance of the map in navigational mode. Select the **Graphics** menu item and press the **SELECT** button. A submenu will open.



### 6.1.6.1 Terrain and Map

The main display unit is pre-loaded with terrain and vector maps for the Earth. The database includes: elevation contour lines, water bodies, roads, highways, railways, big cities and a digital elevation model. The database is derived from the OSM free database. The database cannot be modified by the user.



Check the **Show map** item to enable map displays in the navigational pages. If this item is unchecked no map will be displayed. Check **Shadows**, if you terrain to be shaded. The **Label zoom** value defines up to which scale of zoom city names are visible. 100km means the whole width of the screen represents 100 km. The user can also modify size, font style and colour via the **Font style and colour** item. Use the ZOOM selector knob to modify the colour and the PAGE selector knob to modify the style. Press **PICK** button to define colour more precisely.

Terrain can be rendered in three different levels. A higher level means more details. The main display unit is optimised to work with high terrain quality. If the value **off** is selected no terrain will be shown; only water bodies, roads, railways and cities.

The background colour is defined by the **Background** item. The default background is black.

**Colours of terrain** can be changed using different terrain colour schemes. The following colour schemes are available:

- **Mountain** is default setting with colours from green to white at 2000 m.
- **Flatland** is setting where colours are changing up to 1000 m.
- **Low contrast:** same as Mountain but colours are not so intensive.
- **High contrast:** same as Mountain but colours are more intensive and from 0-100 m, white colour is used.
- **Zebra** alternating colours are used.
- **Zebra 2,** less intensive alternating colours are used.
- **ICAO** colouring is similar to ICAO maps.
- **Cliffs** colours emphasis slopes and is similar to Google maps display
- **Atlas** colour scheme is approximation of Imhof colouring widely used in map books.
- **Grayscale.**

In the **Elements** group land features are setup separately. **Zoom** defines up to which zoom level a selected land feature is visible. Also line width and colour can be setup. Press the **DEFAULT** button to reset these settings back to default.



If you have checked shadows and you are flying on flat areas with elevation close to MSL or below, on terrain will be displayed black spots. Black spots will disappear, if you uncheck shadows.

Check **Show raster maps**, if you would like to see also scanned maps (See also chapter 6.1.5.7).

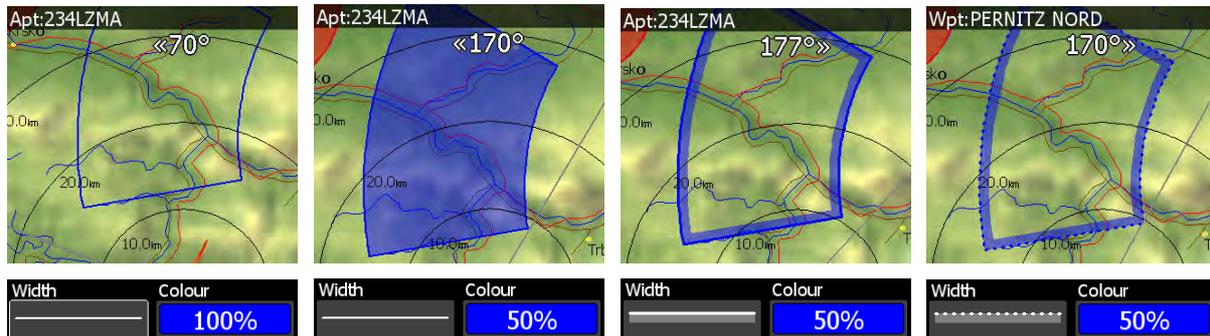
### 6.1.6.2 Airspace

In this dialogue you can define the airspace map presentation. Check the **Show airspace** item to enable airspace displays in navigational pages. If this item is unchecked no airspace will be displayed.



If the **Show inactive zones** option is checked then airspace zones with proximity warning switched off will be shown. Use **Show only airspace below** to eliminate airspace which is going to be too high for the day. For example, if the forecasted cloud base is to be 1500 m, set this value to 1600 m and your screen will be much more readable. In the **Type** panel you can specify how each airspace type is displayed. You should define each type of airspace zone separately. First choose an airspace type from the list. **Zoom** value defines to which zoom level this type is going to be visible. The **Colour** and **Width** items specify how selected airspace zone will be drawn. You can also modify transparency of the selected type. Turn the ZOOM selector knob to change the transparency value. 100% means

completely transparent and only the airspace zone outline will be shown. 0% means completely solid (not recommended). Image below shows example of combinations of Width and Colour property and rendering of airspace zone.



Press the **DEFAULT** button to reset these settings back to default.

### 6.1.6.3 Waypoints and Airports

The waypoint and airport look and feel is defined in this dialogue. Check the **show waypoints** item to enable waypoints and airports display in navigational pages. If this item is unchecked no waypoints will be displayed.



The **Max.visible** item defines how long waypoint labels and detailed symbols are shown. If the maximum number of waypoints on the current screen is more than the defined value only small blue dots will be shown for waypoints and no labels will be drawn.

Font style, colour and size can be defined using the **Font style and colour** item and the **Font size** item. When editing style, turning the ZOOM selector knob will change the font colour.

Waypoint labels can be setup to give even more detail. Label details can be defined for each individual waypoint type.

A label consists of two selectable values: upper label and lower label. If you prefer to have labels in single line, the **single label** checkbox should be checked. A label can also be coloured. Check the **Colorize label** item. Coloured labels are drawn with a green background when the waypoint is within range with the current MacCready settings and with a yellow background when waypoint is within reach with MacCready setting zero. No background is shown if the waypoint is not reachable.

The label is selected from following options:

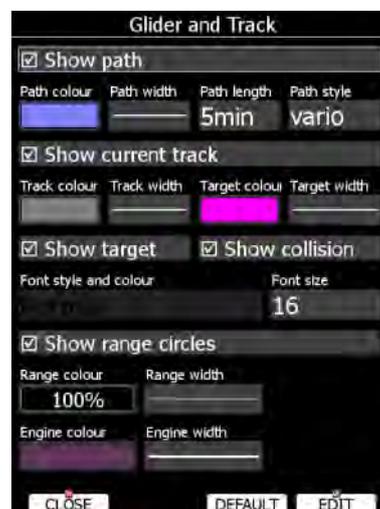
- **Name:** waypoint name is shown. The name length item controls how the name is displayed.

- **Code:** will display the ICAO code or short name.
- **Elevation:** shows waypoint elevation.
- **Arrival altitude** shows arrival altitude taking into account current MacCready setting, safety altitude and current wind. Due to complexity of the calculation it will not take the wind profile into account.
- **Required altitude** shows how much height is needed to reach the point. Required altitude takes into account current MacCready setting, safety altitude and current wind. Due to complexity of the calculation it will not take the wind profile into account.
- **Required Mc** gives an estimate of the maximum MacCready value which we can use to reach the point.
- **Required L/D** shows the required glide ratio to the point taking into account the safety altitude.
- **Frequency** will display the point frequency, if available.

Press the **DEFAULT** button to reset these settings back to default.

#### 6.1.6.4 Glider and Track

Navigational screen can show the coloured path flown, current track vector and target vector with terrain collision warning.



Check the **Show path** item if you want to see the flown path. **Path length** defines how much of the flown path will be shown. The path can be coloured using:

- **Vario** path style, where red colour indicates positive vertical speed and blue colour negative vario values.
- **Mc** path style, which is based on current MacCready settings. Red colour indicates segments of the flight where we have vertical speed higher than the current MacCready setting. Orange colour shows vertical movements similar to the current MacCready setting and blue for vario values below the MacCready setting. Grey depicts sink areas.
- **Fixed** path style. Path colour is fixed and defined by path colour item.
- **Altitude** path style, where red colour means low altitude and blue means high altitude.
- **Ground speed** path style, where red colour means slow speed and blue colour means fast speed.

Check the **Show current track** item if you would like to see your current ground track vector. **Track colour** and **width** defines the colour and width of the current track vector. Selected target and current position are connected with a magenta line. Check **Show target** if you would like to see this line. In the target colour and target width you can select the **Colour** and **Width** of this line. You can also choose to show or hide the terrain collision point and the target line itself. The terrain collision marker is a red square which is only displayed when there is terrain between the navigational point and the current position

and therefore not enough altitude to reach the target with the current glider settings. **Font Style, Colour** and **Size** define what font for terrain collision altitude and range circles. Enable **Show range circles** to plot range circles around aircraft symbol. Having range circles on navigational screen, it is much easier to guess distance to nearest point of interest.

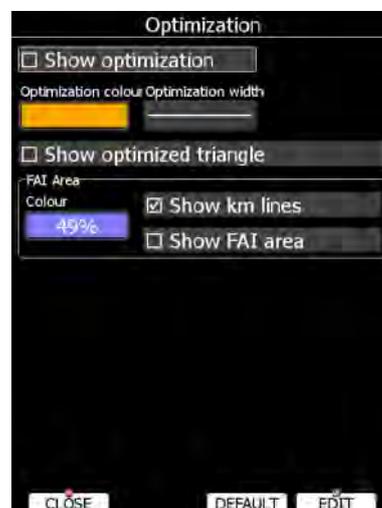
**Range colour** and **range width** define the way circles are rendered.

A built in engine noise level sensor detects, if engine is running or not. Use **Engine colour** and **width** properties to visualize part of path, where engine was running.

Press the **DEFAULT** button to reset these settings back to default.

### 6.1.6.5 Optimization

The main display unit calculates the optimised flown distance according to OLC or FAI rules in real-time during flight (see Chapter 6.1.9). It calculates the available FAI triangle area, which is also called the FAI triangle assistant. If you enter this area and return to the start point your flight forms a triangle according to FAI rules. The Optimisation dialogue is used to define the look and feel.



Check the **Show optimization** item to enable display of the optimised track. **Optimization colour** and **width** defines the colour and width for these lines.

If **Show optimized triangle** is checked also lines for the largest optimised triangle are shown. Please note this might not be a triangle according to FAI rules.

The FAI Area group defines how the FAI area is drawn. Select the **Colour** item to change the colour of the FAI area. Use the ZOOM selector knob to change transparency of the area. 100% means completely transparent and only the outline will be drawn. 0% means completely solid (not recommended).

Check the **Show km lines** item to see lines which indicate what will be the size of the completed triangle.



These lines will always be plotted in kilometres scale regardless of the Units value.

### 6.1.6.6 Task

Use this dialogue to define how a task is drawn in task mode.



**Task colour** defines the colour of task lines. **Obs.zone colour** defines colours for observation zones. Use the ZOOM selector knob to change transparency of area. 100% means completely transparent and only the outline will be drawn. 0% means completely solid (not recommended). When **Show flown task** is checked also the flown task will be drawn. This might be useful when flying assigned area tasks.

The **Show selected zone only** item controls whether all task observation zones are to be displayed or, if there is only one, then that alone will be shown.

### 6.1.6.7 Flarm

The system can be equipped with the internal or external FLARM module. If your device is equipped with FLARM this menu will let you to modify presentation of the Flarm radar display.



Flarm radar is not available if competition or privacy modes are active. Refer to Chapter 6.1.12.6.



Checking **Show Flarm object** will enable display of aircraft detected by FLARM.

Colours are designed to present three values. The colour for aircraft more than 100 meters above your current altitude is defined by the **Above Colour** item. The colour for aircraft more than 100 meters below your current altitude is defined by the **Below Colour** item.

The colour for aircraft that are less than 100 meters below or above your current altitude is defined by the **Near Colour** item.

When a signal from a particular aircraft is lost the aircraft remains blinking on the screen for the duration defined in the **Lost device after** item (default 120 seconds). After that time the aircraft symbol will not be displayed.

**Show labels** combo box defines for which Flarm objects altitude and vertical speed are displayed next to the aircraft symbol. The user can modify size, font style and colour. Select the **Font style and colour** item. Use the ZOOM selector knob to modify colour and the PAGE selector knob to modify style.

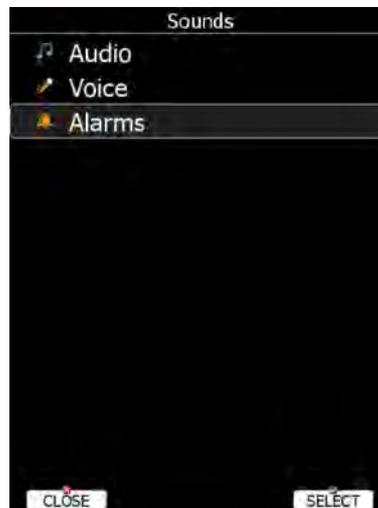
It is possible to display the flown path of tracked aircraft. **Path colour** and **Path width** define width and colour of paths. **Show paths** combo box defines for which Flarm object paths are going to be visible.

**Symbol size** defines size of symbol of Flarm object.

Check **Show PCAS** to see non-directional traffic on navigational screen. Non-directional traffic will be draw with dotted circle at received distance from aircraft position.

## 6.1.7 Sounds\*

In the Sounds setup page audio settings, voice settings and alarms settings for the vario unit can be modified.



### 6.1.7.1 Audio Settings\*

Basically here we can set up two types of audio; audio sound for climb mode and another for cruise mode (SC).



Vario audio mode has the following options:

- **Linear positive:** sound is interrupted with silence every few milliseconds when the needle is positive; on negative side sound is linear (not interrupted).
- **Linear negative:** inverse function to **Linear positive**.
- **Linear:** sound is linear and non-interrupted in full scale range.
- **Digital positive:** similar to **Linear positive**, except frequency is not changing linearly but with larger steps.
- **Digital negative:** inverse function to **Digital positive**.
- **Linear positive only:** sound is present only at positive values, for negative values there is silence.
- **Digital positive only:** similar function to **Linear positive only**, except the sound is similar to the digital tone.

Press the **DEMO** button to hear the selected option.

SC audio mode has four modes:

- **SC positive:** sound is interrupted with silence every few milliseconds when the needle is positive; on negative side sound is linear (not interrupted).
- **SC negative:** inverse function to SC positive.
- **SC:** sound is linear and non-interrupted in full scale range.
- **SC Mixed:** for positive relative values the sound represents relative; for negative relative values the sound represents SC (for that setting it is recommended to set SC needle to relative).
- **Netto speed:** variometer will produce exactly the same sound as defined in Vario audio, except it will follow netto vertical speed.

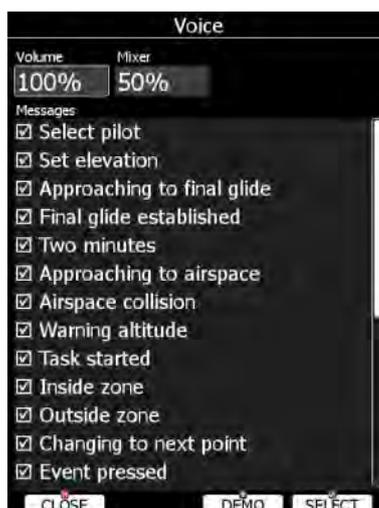
**Freq at 0%** defines the tone frequency at 0 m/s.

**Freq at +100%** defines the tone frequency at full + deflection.

**Freq at -100%** defines the tone frequency at full – deflection.

### 6.1.7.2 Voice\*

Voice module is integrated part of V5, V9 or V80 variometer. The voice module is 100% controlled through the main display unit via the settings described in this menu.



In the **Voice** menu volume level (loudness) of the voice module can be adjusted. In the Messages window each item can be set separately. Only checked items will be played by the voice module.



Volume level (loudness) can be also set with volume rotary knob, when messages are being played

### 6.1.7.3 Alarms\*

The vario unit produces an audio alarm on reaching certain confirmation points. This screen allows the parameters of the audio to be configured. If a particular message item is checked the main display unit will generate an alarm at the time of event.



**Frequency** and **Periods** define the length and pitch of alarm. Press **DEMO** button to play alarm sound. Change volume to define loudness of alarm.



Volume level (loudness) can be also set with volume rotary knob, when alarm is being played

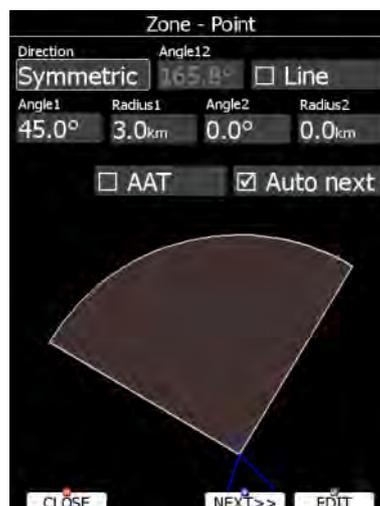
### 6.1.8 Observation Zones

This menu defines the default observation zone geometry. The following items can be chosen: start zone, turn point zone, finish zone and templates.



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.

All stored tasks will match this "global" setting except those where the zone was modified in the task edit menu (see Chapter 6.7.1).



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 PAGE selector knob to

increase the radius by 0.1 of the selected distance units and the ZOOM selector knob to increase the radius by 5.

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. Rotate the PAGE selector knob to increase the angle by 0.5° or use the ZOOM selector knob to choose values 22.5°, 45°, 90° or 180°.

**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.

Check the **AAT** checkbox, if you want to make the selected zone an assigned area. The **AAT** checkbox will be automatically checked when **Radius1** is greater than 10 km.

By default navigation to task points will be automatically advanced; uncheck **Auto next** if you do not want to change over to next point when reaching selected point. This option will be automatically unchecked when **Radius1** is greater than 10 km.

Use **Template** if you wish to modify start, point and finish zones at same time.



Available templates are:

- 500 m cylinders are used for start, points and finish.
- FAI sectors, 90° and 3 km long sector is use in start, turn point and finish.
- 500m and start line. The 500 m cylinder is used for turn points. A 1 km long line is used for start and finish.
- FAI and start line. 90° and 3 km long sector is used for turn points. A 1 km long line is used for start and finish.

### 6.1.9 Optimization

During flight the system optimises the flown path according to OLC or FAI rules. Use this dialogue to change the way instrument performs this optimisation.



Number of points defines the type of optimisation. Use five for OLC optimisation. Use the value three for FAI free flight optimisation.



Optimisation will not take into account the 10 km distance between turn points which is required by FAI rules.

The FAI triangle group defines the rules for FAI triangles and these rules can bend a little if you do not want to fly marginal triangles.

Check **Reset optimization on engine run** to reset optimization counter each time engine is started.

### 6.1.10 Warnings

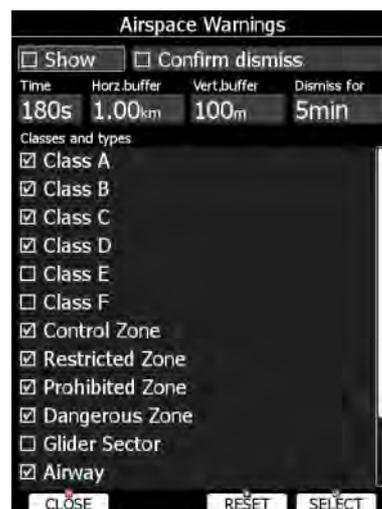
There are four types of warnings available. Airspace warnings are shown when approaching a particular airspace zone. Altitude warnings are shown when approaching to a defined altitude, Flarm warnings are triggered when conflicting traffic is in the vicinity and Time Alarms are raised at defined time interval to remind pilot to do specific task.



Use this dialogue to setup the behaviour of warnings.



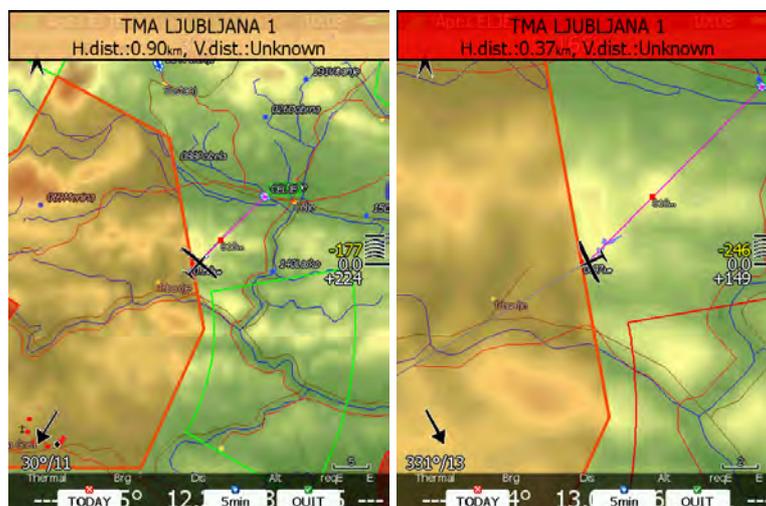
### 6.1.10.1 Airspace Warnings



Airspace warnings are the most complex ones. An airspace warning is activated by two triggers; First warning (orange) will be given when a projected position of flight for period, which is defined in the **Time** item, is computed to cross an airspace zone.

Second warning (red) will be raised when a projected position of flight is computed to cross airspace zone and the glider is already in the buffer zone in the vertical or horizontal directions. Buffer zones are defined in the **Horz.buffer** and **Vert.buffer** items. Default values are 1 km for horizontal buffer and 100 m for vertical buffer.

The first warning (orange) will also be given when you enter an airspace zone buffer but the projected flight is computed to cross it.



An Airspace warning will be raised in all modes and dialogues. A warning for an alarmed zone can be dismissed for a whole day, some minutes or just quit. **Quit** means that the message will disappear. Use **Dismiss for** spin to define dismiss time in minutes. This time will be shown in the lower-middle button after which the warning will be raised again. However an alarmed zone will still be filled with transparent red colour and outlined with a thick line and also the distance to the nearest point of the airspace zone will be shown.

To prevent dismissing by mistake check the **Confirm dismiss** checkbox and you will be always prompted to confirm dismiss for a particular airspace zone.

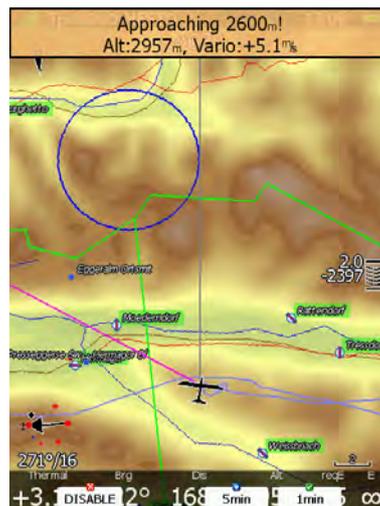
The **RESET** button will reset the status for all airspace zones.

### 6.1.10.2 Altitude Warning

Altitude warnings will be enabled if **Show warning** is checked. Altitude is given in MSL. Projection is calculated based on the 20 second average vertical speed and time which is defined in the **Time** item.



If the projected altitude is greater than the set altitude, an altitude warning will be raised. Altitude warnings will be raised in all modes and dialogues just as for airspace warnings.



Altitude warnings can be dismissed for 1 minute, 5 minutes or disabled.

### 6.1.10.3 Flarm Warnings

Flarm warnings will be raised only when system is receiving FLARM data from internal or external FLARM module. Using this dialogue the user can define which warnings will be shown and how they are going to be shown. There are three types of warnings:

- **Traffic** warnings will be raised once a new aircraft is detected by FLARM.
- **Collisions** will be shown every time a collision risk with an aircraft occurred.
- **Obstacles** warnings will be displayed when a collision with a ground obstacle is predicted.



If the voice option is installed it is also possible to hear the horizontal and vertical situation to the current object. Uncheck appropriate items if you want to disable this part of the message. You can also define the way direction to the Flarm object will be presented. There are three options:

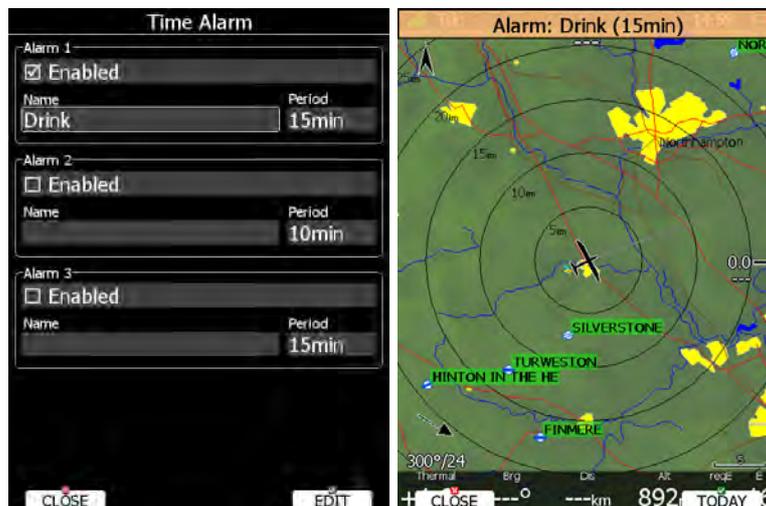
- **Relative bearing:** In this option direction will be given relative to the glider's nose direction (e.g. *Traffic 3' o'clock*, which means traffic, is on your right side).
- **True bearing:** Direction is give with absolute direction (e.g. *Traffic from 330°*)
- **Relative/True bearing** is a combination of both methods. Relative bearings will be given when flying straight and true bearings will be given when thermaling.
- **Graphical presentation.** When this item is check, also a graphical presentation of FLARM will be shown, when Flarm warning is displayed.



Picture above shows typical Flarm warning with graphical presentation and relative bearing of object. Press CLOSE to dismiss warning, CIRC.OFF to dismiss for time of circling and 1min to dismiss all Flarm warnings for one minute.

### 6.1.10.4 Time Alarm

Use this dialogue to define three independent time alarms that will be triggered at specified periods.



### 6.1.11 Units

Use this dialogue to specify units, UTC time offset and type of ballast input.



The lower-middle button will toggle all units between imperial and metric units.

Glider ballast can be entered as:

- overload factor, which is defined as:

$$\text{overload} = \frac{\text{Empty.glider.weight} + \text{Pilot.weight} + \text{Water.ballast}}{\text{REFERENCE.glider.weight}}$$

- **Load**, which is entered in kg/m<sup>2</sup> or lb/ft<sup>2</sup>.
- **Weight of water ballast**. If this option is used the weights of the glider and pilot must be entered. Refer to Chapters 6.1.13 and 6.1.2 for more details of how to enter glider and pilot weights.

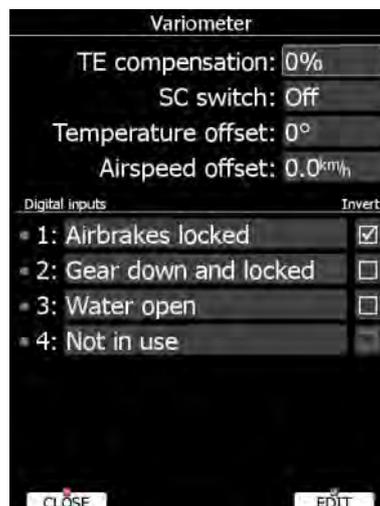
### 6.1.12 Hardware\*

Use this menu to define hardware properties such as total energy compensation, vario indicators layout, compass calibration, FLARM module settings, AHRS settings, NMEA output and data which will be exchanged between the rear and front display units. Some items may be greyed out when the selected option is not available.



#### 6.1.12.1 Vario unit settings – TE compensation\*

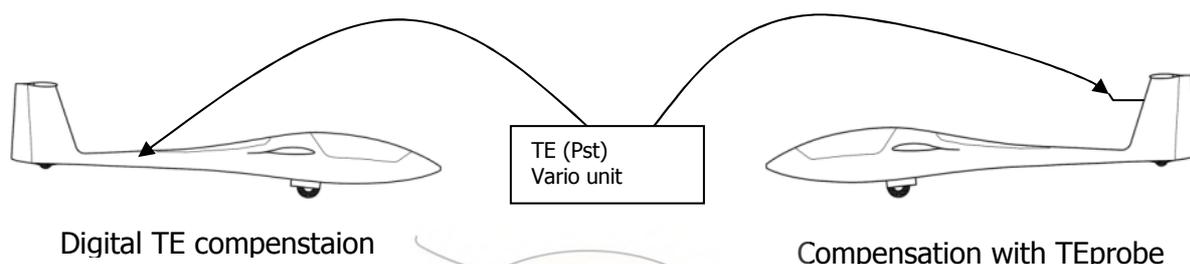
All settings in this menu are related to the glider.



##### 6.1.12.1.1 TE compensation - Digital Total Energy Compensation

There are two ways by which the vertical speed can be corrected for total energy:

- digital TE compensation based on speed changes with time
- Pneumatic compensation with a total energy probe.





If the digital TE option has been used TE compensation should be set to 100%.



It is important to note that the method of TE compensation is set up when the instrument is installed by virtue of the pneumatic connections made to the TE and static ports. Changing the compensation type in the setup screen below WILL NOT change the method of compensation - the pneumatic plumbing has to be changed first.



If the TE tube has been connected TE compensation should be set to 0%. The quality of the TE compensation depends entirely on the location, size and dimension of the TE tube. The installation must be leak-proof.

The digital TE compensation can be fine-tuned during flight using the following procedure. It is essential that this is only done in smooth air; it is not possible to tune the TE accurately in turbulent air.

Set TE compensation to 100%. Accelerate up to approximately 160 km/h (75 kts) and keep the speed stable for a few seconds. Gently reduce the speed to 80 km/h (45 kts). Observe the vario indicator during the manoeuvre. At 160 km/h the vario will indicate about  $-2$  m/s ( $-4$  kts). During the speed reduction the vario should move towards zero and should never exceed zero (slightly positive indications are acceptable). If the vario shows a climb the compensation is too low; increase the TE%; and vice versa. Try another "zoom" to assess the change and make further adjustments if necessary.

Digital TE compensation is only effective when the Pitot tube and static sources are co-located and the pneumatic lines to the instrument are approximately the same length. The best sensor to use is the combined Pitot/static Prandtl tube. If problems are experienced with the digital TE compensation the most likely cause is the glider's static source. The static source can be checked by plumbing the pneumatic tubes for digital TE compensation and then setting the TE: to 0%. In still air accelerate to approximately 160 km/h and slowly reduce the speed. Observe the vario indicator. If the static source is good the vario should immediately start to move to show a climb. If the needle firstly shows increased sink and then moves to a climb, the static source of the glider is unsuitable and there is no way to provide successful digital TE compensation. The use of a dedicated and accurate fin-mounted Pitot/static source such as a Prandtl tube might help.

#### 6.1.12.1.2 SC Switch

The vario unit has an input for an external speed command switch which is wired to the vario unit cable set. Using the external switch it is possible to switch between SC and Vario manually. Setting the **SC switch** to **ON** means that closing the switch will cause the instrument to enter SC mode and setting **SC switch** to **OFF** means that closing the switch will select Vario mode. There is a third option by setting **SC switch** to **TASTER** and connecting a push button to the input; each key press will toggle between SC and Vario (mandatory setting for LX Remote).

#### 6.1.12.1.3 Temperature Offset

The system is supplied with an external outside air temperature (OAT) sensor. With the offset setting it will correct static errors of temperature measurement.



There is another input called VARIO PRIORITY. When this input is activated by grounding the appropriate wire the unit will change over to Vario immediately.

This input wire is set open (not grounded) as a factory default on delivery.

#### 6.1.12.1.4 Airspeed Offset

Some gliders are having quite big difference between calibrated airspeed and indicated because of imperfect static ports (e.g.: Cirrus Standard). As airspeed affects wind calculation. It is possible to define an airspeed offset to improve wind calculation.



Vario indicator will ignore this setting and shows not corrected airspeed.

#### 6.1.12.1.5 Digital inputs

V9 or V5 variometers are having four programmable digital inputs. They are labelled with IN1, IN2, IN3 and IN4 on V5/V9 cable-set. See chapter 4.5.3 for more details on vario unit wiring diagram. In current version digital input can represent the state of following actions:

- Gear down and lock
- Airbrakes open
- Water ballast open

Digital input shall be wired via switch to ground and it shall open or close, when selected action is performed. A green light will light.

If necessary, check **Invert** check box, to reverse the operation of digital input.

Once digital inputs are connected the system will warn pilot, if airbrakes are open on take-off and when gear is not locked prior to landing.

#### 6.1.12.2 Vario Indicator Setup\*

The vario indicator is always part of the vario unit. However an unlimited number of secondary vario indicators can be connected to the system using the RS485 system bus. There are three different types of vario indicators; **V5 vario indicator**, which is standard part of V5/V9 variometer, **V80 vario indicator** and old **LCD or USB-D vario indicator**. LCD vario indicator and USB-D type of indicator are setup through menu **LCD Indicator**, whereas others, more modern vario indicators, are having its own menu item identified with serial number.



LXNAV is highly recommending upgrading old LCD or USB-D type of vario unit to latest technology vario unit. Please contact local dealer or LXNAV for more details.

### 6.1.12.3 Vario indicator V5\*

**V5 Vario indicator** is having mechanical needle and colour screen with 320x240 pixels resolution on which user selectable data are displayed.

Each V5 vario indicator is identified by a serial number, which is also displayed on hardware menu. Therefore literally unlimited number of vario indicators can be connected to RS485 bus and each of them can be setup separately.



Description of vario indicator is shown on next picture.



**Mechanical needle** displays vario, netto, relative or speed to fly value. It can be setup separately for climb mode or cruising mode. Printed scale can be chosen in range from -5 to 5 or from -10 to 10. Within software range can be set to 2.5, 5, 10m/s or 5, 10, 20kts or 500, 1000, 2000fpm.

**Upper number** and **Lower number** can be configured as average vario, time, flight time, task remaining time, netto value, outside temperature, thermal average, indicated airspeed, true airspeed, current altitude, distance to goal, arrival altitude, Last 60 minutes speed, altitude in feet, flight levels, voltage or average netto. It can be setup separately for climb mode or cruising mode.

**Speed to fly bar** symbol is indicating which speed you have to fly according to current MacCready setting, sink rate and speed. One arrow means 10units of speed faster or slower. Up red arrows mean fly slower and down blue arrows mean fly faster.

**Red diamond symbol** can show average vertical speed or current g-load.

**Blue arrow symbol** shows current MacCready value.

**Green T symbol** represents last thermal average value.

**White bar** displays arc between minimum and maximum vertical speed value in last 20 seconds in white colour or minimum and maximum g-load in red colour, depending on settings.

Press **RESET-G** button to reset g-meter.



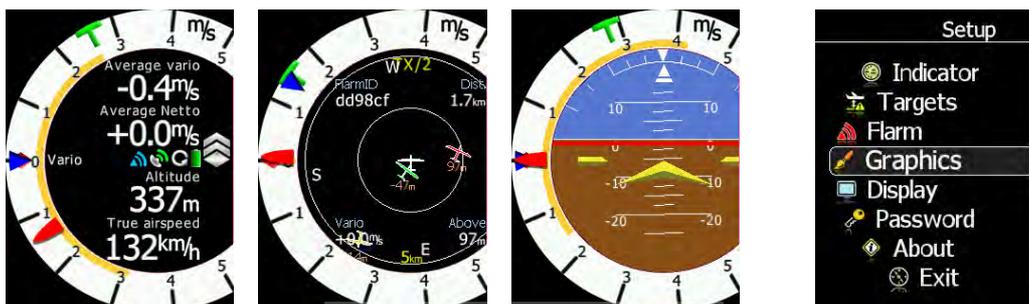
Most innovative feature of V5 vario system is an upgrade. Firmware for vario unit can be easily upgraded by customer with SD card. See Chapter 9 for more details.

#### 6.1.12.4 Vario indicator V80mm

**V80 Vario indicator** is without mechanical needle. It features 3.5" colour screen with 320x240 pixels resolution on which user selectable data are displayed and needle is drawn. Each V80 vario indicator is identified by a serial number, which is also displayed on hardware menu. Therefore literally unlimited number of vario indicators can be connected to RS485 bus and each of them can be setup separately.



V80 vario indicator basic screen is split into two parts, white ring with needle and vario scale. Additionally to needle, blue MacCready triangle, green thermal average T and red diamond for 20 seconds average are shown. In the middle four user-customizable numbers are show. When middle button on V80 indicator is pushed display will toggle between numeric display, Flarm radar display and artificial horizon screen.



Press middle button for long time to enter setup menu. In setup menu it is possible to setup graphic interface for Flarm radar screen and numeric values. Numeric screen can also be setup on main display unit.



### 6.1.12.5 LCD and USB-D Vario indicator



This is type of the older vario indicator. An LCD vario indicator or USB-D vario indicator consists of:

- Needle
- Two numerical displays (upper and lower).
- Labels and indicators.

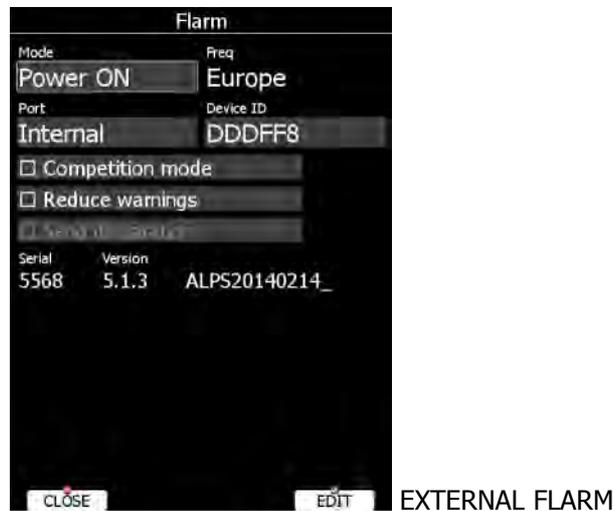
These following functions can be set (see next picture):

- **Needle:** vario needle (Vario, SC, Netto or Relative).
- **SC Ring:** Displays speed command at all times.
- **Upper Numeric Display:** Integrator, time, flight time, task remaining time. Upper line; the parameter displayed can be configured in both Vario and SC modes.
- **Vario Mode Indicator:** Shows current flight mode (vario or speed command).
- **Lower Numeric Display:** Altitude (NN altitude), Distance (distance to the navigation point), Glide diff. (final glide altitude difference), Speed (TAS), Leg speed (speed on leg), QNH (ft) (NN altitude in ft), Flight levels. Lower line; the parameter displayed can be configured in both Vario and SC modes.

The labels will automatically be displayed depending on the current function. The BAT warning will be displayed when the supply voltage is below 11 volts.

### 6.1.12.6 Flarm\*

On the Flarm setup page, information about built in or external Flarm are visible. Information like serial number, selected frequency, firmware version and database versions are shown.



EXTERNAL FLARM

If Flarm module is built in user can select operation mode. There are three different operational modes available:

- **Power OFF** - Flarm unit is switched off.
- **Power ON** - Flarm unit is switched on.
- **Privacy ON** - Flarm unit works in stealth mode. Other Flarm units will not receive altitude and vario information concerning your glider. For collision warnings this mode has no influence.

If there is no Flarm module built into the main display unit, then instead of operation mode combo box, baud rate selection will be displayed

**Freq** shows selected frequency depending on the continent, where system is located.

**Port** defines serial interface through which Flarm data are being received. Use **Ext. (PC)** port when you want to receive externally connected Flarm on PC port. See chapter **XXXX**

**Device ID** shows the Flarm unique ID, which is transmitted to other FLARMS.

**Competition mode** is intended only for competitions. If this mode is enabled the pilot will not be able to see any Flarm data on the navigational screens. The competition mode status is recorded in the IGC file and can be checked during scoring.



If you are flying in a competition it is sufficient to turn on **Competition mode**. However if you do not want other aircraft to see you, you should switch mode to **Privacy ON**.

**Reduce warnings** will significantly reduce Flarm warnings. Use this option if you are flying in gaggles or areas with high density of other aircraft.



We recommend you sign in at [FLARMNET.org](http://FLARMNET.org). This is free of charge. Registering with FLARMNET allows others to see you not only with Device ID but also with your contest number and name. Refer to Chapter 6.5.6.8.

**Send declaration** check box is available only when external Flarm is connected. Check this option, if you want that task declaration is automatically transferred to Flarm.

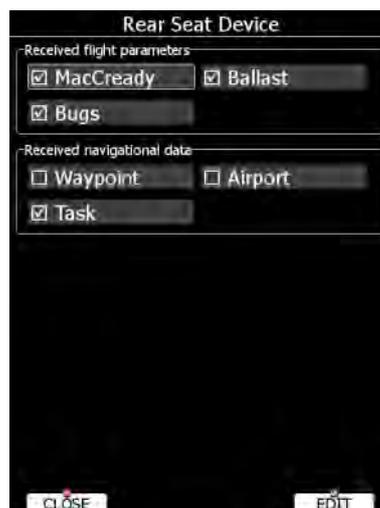
### 6.1.12.7 Compass\*

When a compass is connected to the system calibration is crucial for correct operation. Refer to compass manual for more info about installation and its calibration.



### 6.1.12.8 Rear Seat or Front Seat

In a two-seat configuration with the rear seat device it is possible to transfer selected data between the front and rear seat device. Use this menu to define which data will be automatically received from the other device.



Data are divided into two groups; flight parameters and navigational data. If a specific value is checked this value will be automatically received from the other device.

Check **MacCready**, **Ballast** or **Bugs** to receive current MacCready value, current ballast setting or bugs from other device.

If the **Waypoint** checkbox is checked a new waypoint target will be automatically assigned when the user changes the waypoint target on other device. The message *"Waypoint target received"* will be displayed on the screen and you will be navigating to the same waypoint as other device. Please note that it is not necessary to have this waypoint in your databases as the complete waypoint information is transferred.

If the **Waypoint** checkbox is not checked it is still possible to send a target to the other device using the SEND action in waypoint mode.

The same applies to the **Airport** checkbox. The message *"Airport target received"* is displayed.

If the **Task** checkbox is checked the task will be synchronised with the other device.



When flying an assigned area task it is worth not having the task checkbox checked. This will allow one pilot to play with “what if” scenarios. Once a proper direction is found you can send the task to the other device using the **SEND** action in task mode.

### 6.1.12.9 Remote stick



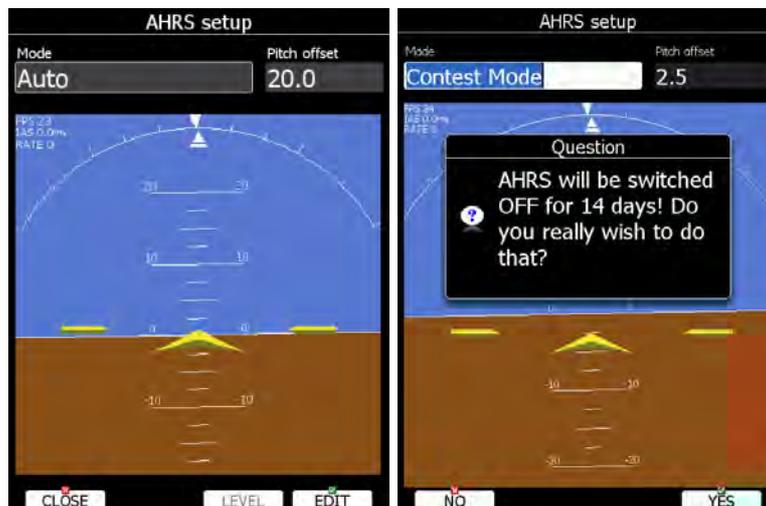
When a remote stick is connected to the system, it is possible to define type of remote stick via this menu. In case LXNAV remote stick with six buttons is connected, user can specify functionality of function button. There are several options available for function button:

- **Toggle vario range** will toggle between vario range 2.5m/s, 5m/s or 10m/s.
- **Toggle map settings** will toggle between two stored map settings.
- **SELECT** will call airport select menu or waypoint select menu or task edit depending on current navigational page.
- **MC/BAL** will open MacCready and ballast dialog.
- **MAP** will open map properties dialog.
- **WIND** will open wind selection dialog.
- **AIRSPACE** will open airspace zones dialog.
- **MARK** will create a waypoint or marker at current position.
- **FLARM** will display a list with all Flarm objects in vicinity.
- **PAN** will set navigational screen into pan mode.
- **EVENT** will mark an event into recorded IGC file
- **ROT.FAI** will rotate FAI triangle area, if shown on navigational screen.
- **TEAM** opens dialog to enter team partner code.

Check **Use stick for front seat** if there are two remote sticks installed and system without rear seat device (e.g. Pipistrel Taurus)

### 6.1.12.10 AHRS

When AHRS device is connected to the system or AHRS option on V9 is enabled, this menu is used to calibrate AHRS for installation error.

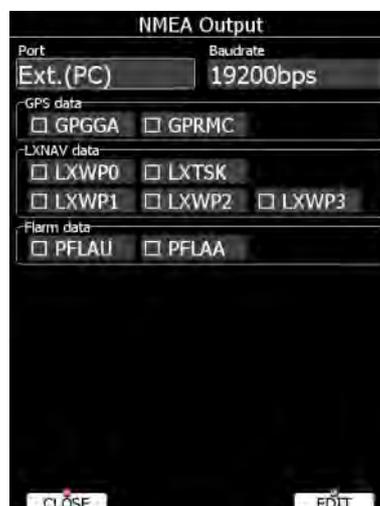


Place your glider in levelled position and press LEVEL button. You can also modify pitch offset, if you rotate PAGE selector knob. More detailed can be pitch set using pitch offset spin control.

Mode defines modes of operation of AHRS. AHRS can be switched to **Contest Mode**, where AHRS will be disabled for period of competition.

### 6.1.12.11 NMEA Output

The main display unit is capable of transmitting position data sentences in NMEA format for use by other devices.



**Port** defines on which serial interface data will be transmitted. **Baud rate** defines transmission speed. Data is divided into three groups:

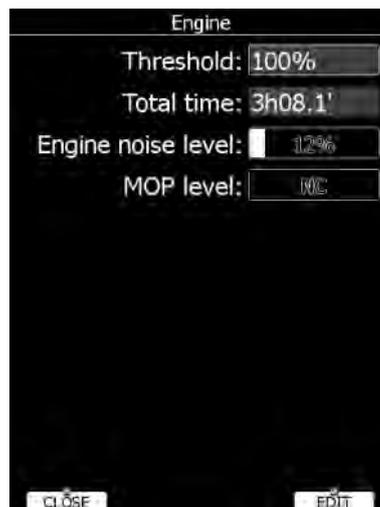
- **GPS data** will output all GPS-related data such as time, longitude and altitude.
- **LXNAV data** will output all variometer-related data such as vario, MacCready and ballast.
- **Flarm data** will output all Flarm-related data.



NMEA data is available also on Flarm display port on main display unit and rear display unit at 19200bps. However only Flarm data and GPS data.

### 6.1.12.12 Engine \*

Use this menu, when the system is installed into glider with engine. The current engine noise level is shown as a progress bar. If external MOP sensor is installed also MOP level will be shown.



Set **Threshold** to define when engine is running. By default threshold is set to 100%, which means no engine run will be detected. Lower this value to approximately 80% to detect engine running. Engine total time will be accumulated and displayed in total time box. If necessary, total time can be adjusted, to match current engine total time.

### 6.1.12.13 Flaps\*

When flap sensor is installed, use this menu to set flaps position. Use page selector to select desired flap position. Press **SET** button to set position. Continue with procedure for all flap positions.



When all flap positions are set, a green dot will be displayed with current flap position. If flap labels are not set yet, press EDIT button to name flap label. Flap labels must be entered with increasing speed range. It is recommended that flaps labels are set together with speed range in Polar and Glider setup. See Chapter 6.1.13 for more details.

### 6.1.13 Polar and Glider\*

Use this dialogue to enter glider polar and other properties of glider. As default polar a standard class glider is selected.

Polars for most modern gliders are already prepared. Press the **LIST** button and a dialogue with a list of all available gliders will be shown.

Select Glider			
Glider	Emax	Wmin	Class
Antares 18S	54	0.54%	18-meter
Antares 18T	51	0.49%	18-meter
Antares 20E	55	0.51%	Open
Antares 23T	59	0.40%	Open
Antares 23E	60	0.46%	Open
Apis 13m	38	0.60%	Ultralight
Arcus	47	0.56%	Doublese
Arcus T	47	0.56%	Doublese
Arcus M	47	0.56%	Doublese
ASG 29 18m	52	0.47%	18-meter
ASG 29E 18m	52	0.47%	18-meter
ASG 29 15m	45	0.57%	15-meter
ASG 29E 15m	45	0.62%	15-meter
ASW 22BLE	60	0.39%	Open
ASH 25	59	0.43%	Open

Select the required glider using the PAGE selector knob and press the **SELECT** button. All glider data will be copied from the chosen polar. You may quickly check the best glider ratio and minimum sink rate to see if the polar data matches the glider performance. 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 LX-Polar program to calculate coefficients a, b and c for a given glider's polar. The program requires at least 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 system.

You can download program free of charge from [www.lxnav.com](http://www.lxnav.com)

**Stall speed** is used to generate stall warnings which are available only with the LX Voice module.

Weights must be entered if user enters ballast in kilograms. There are three weights to enter. **Ref.weight** corresponds to the **Ref.load** value and represents the value at which the polar was measured or recalculated. Reference weight or reference wing load value will be automatically recalculated based on **Wing area** property. **Max.weight** is the maximum take-off weight allowed for a 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 pilot and ballast. The overload factor is calculated as:

$$\text{overload} = \frac{\text{Empty.glider.weight} + \text{Pilot.weight} + \text{Water.ballast}}{\text{REFERENCE.glider.weight}}$$

Pilot weight is set in the **Flight recorder** menu (see Chapter 6.1.2).

For aircraft with flap, it is also recommended to enter flap position labels and speed range for corresponded flap position. Speed range shall be given for reference wing load or reference weight.

Once speed range is entered, the system will be able to display requested flap position based on current wing loading and g-factor.

### 6.1.14 Profiles and Pilots

All settings and navigational page layouts are stored in a profile. Profiles can be used in different ways:

- For club operation or multiple pilots sharing the same glider. Each pilot can have his personal profile.
- When the user is flying a glider which can have a different wing spans. In this situation the pilot has two profiles, one for each configuration.
- When a pilot is flying in several different locations. A separate profile for each location can be created (examples: France, Spain, Namibia, WGC2014).

Profile consists of two parts:

- **Navigational page layout** defines which navboxes and symbols are visible on navigational page. It defines colour of navboxes, font sizes and colours, how many navigational pages are visible and which modes are enabled. Navigation page layout can be setup with LX Styler or on device itself (See chapter 7).
- **Device settings** includes glider polar, selected databases, selected airspace and waypoints file, map colours, vario indicator settings and flight computer properties. Device settings can be modified on device itself through setup menu (See chapter 6.1) or with LX Styler.

An active profile is selected when the system is powered on (see Chapter 8.1.2).



Use this dialogue to add a new profile, delete a profile, load/save a profile, copy device settings, change name for an existing profile and to activate a profile. The active profile is the profile which is currently being used. Select a profile using PAGE selector knob. Press **TO USB** or **TO SD** for the profile will be stored to a USB stick or SD card. A profile is stored

to a file with the **.lxprofile** extension. Press the **LOAD** button to load a profile from a SD card or USB stick. A profile will be copied to the main display internal storage. Press the **EDIT** button to edit the profile name.



A profile can also be locked. This option is very useful for club operation where one does not want a global club profile to be changed. When a profile is locked all settings will be read-only. Press **LOCK** button to lock/unlock profile. When a profile is locked am message (locked) will be written below the profile name. Press **ACTIVE** to make selected profile as active one.

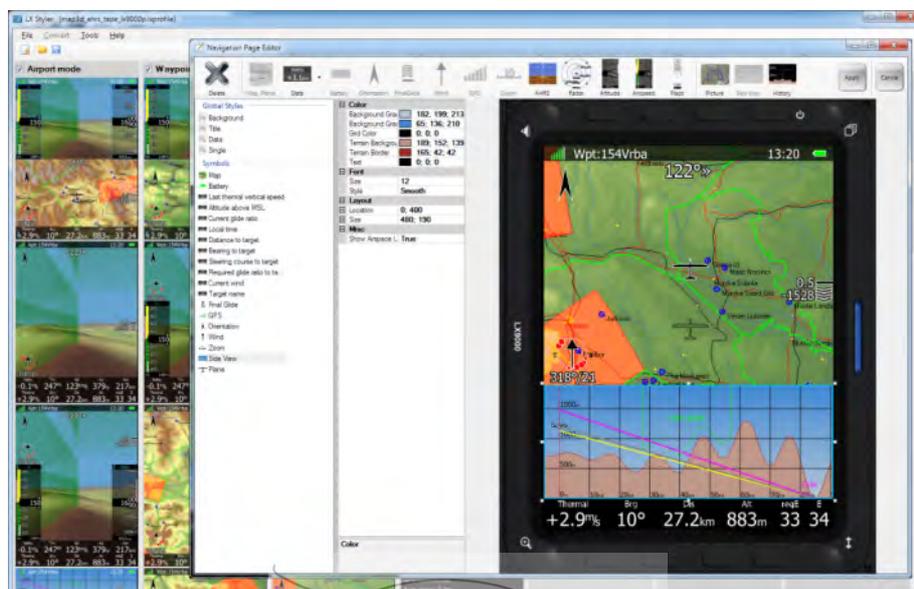


When a profile file from USB or SD card is selected, it will be available only, if SD card or USB stick is inserted in main display unit.



Selecting profiles on SD card or USB allows you to create portable profiles, which can be transferred from one device to another device.

A profile file can be opened and manipulated with the LXStyler program. LXStyler is a special program designed to customise layout navigational pages. It can be downloaded free of charge from our web pages [www.lxnav.com](http://www.lxnav.com). For more information about LXStyler please refer to the LXStyler manual.



If new profile is created with LX Styler, it will have default device settings. However, it is possible to copy device settings from profile to another profile. Select newly created profile as active profile. Select profile from which you would like to copy settings to active profile. Press **COPY** button. A confirmation dialog will open.



It is also possible to export profile including all the airspace files and waypoint files. Use **EXPORT** and **IMPORT** button to export/import profile with airspace and waypoint data.

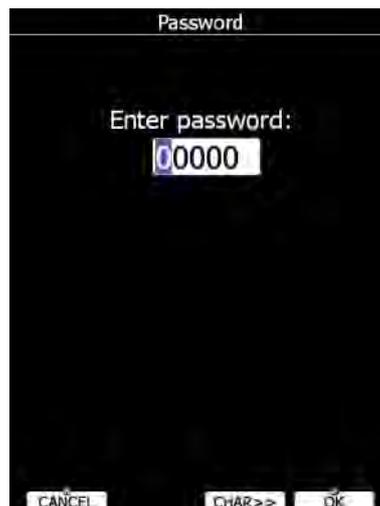
### 6.1.15 Language

The system can run in different languages.



Select the desired language. The main display unit will reload and restart in the new language. If your language is not listed and you feel able to become a translator for the system please do not hesitate to contact us.

### 6.1.16 Passwords



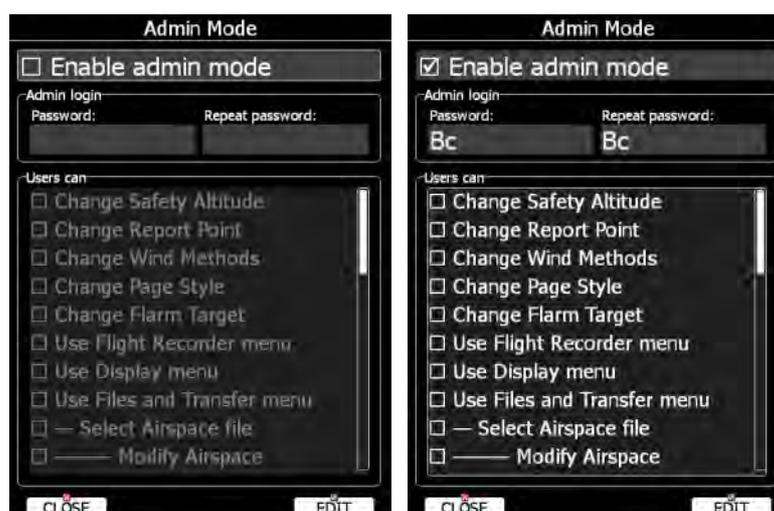
There are several passwords which run specific procedures as listed below:

- **00111** displays information about the system and its sensors.
- **01043** will perform "Auto zero" and set indicated speed to zero.
- **30000** browses through installed files (use with caution).
- **41000** first or forced update of Flarm.
- **42000** update of Flarm through PC port (default).
- **44441** shows debug information.
- **55556** will enable Condor simulator input via the PC port.
- **89891** is used to initiate the firmware update procedure.
- **99999** will erase all flights stored on the main display unit.

### 6.1.17 Admin mode

Admin mode is very powerful tool to disable particular functionality of the system for normal users. It is designed for club usage, where one person is taking care of all instruments.

To enable Administration mode, check **Enable admin mode** check box. Next step is to enter and re-enter administration password. Once password is entered it is possible to define, which actions normal user can do.



There are several actions, which can be disabled for normal user:

- **Change Safety Altitude**, user will not be able to set safety altitude.
- **Change Report Point**, user will not be able to set report point, if it is already set.

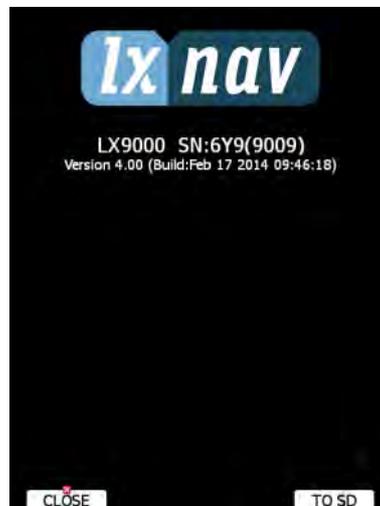
- **Change Wind Methods**, user will not be able to change methods for wind calculation.
- **Change Page Style**, it is not possible to change page layout
- **Change Flarm Target**, user can not change flarm targets names and other data for it.
- **Use Flight Recorder menu**, user can not modify flight recorder properties.
- **Use Display menu**, user can not modify display properties.
- **Use Files and Transfer menu**, it is not possible to use files and transfer menu completely.
- **Select Airspace file**, user can not select and modify airspaces at all.
- **Modify Airspace**, user can select different airspace file, but he can not edit or delete it.
- **Select Airport file**, user can not select and modify airports.
- **Select Waypoints file**, user can not select and modify waypoints files.
- **Modify Waypoints**, user can select, but can not delete waypoints file.
- **Select Raster maps**, user can not select and modify scanned maps.
- **Modify Raster maps**, user can select, but not modify scanned maps.
- **Format SD Card**, user can not format SD card.
- **Update Databases**, user can not update databses.
- **Modify PDFs**, user can not delete stored PDF documents.
- **Delete Flight**, user can not delete stored flight.
- **Use Graphics menu**, can not use this menu.
- **Use Sounds menu**, can not use this menu.
- **Use Observation Zones menu**, can not use this menu.
- **Use Optimization menu**, can not use this menu.
- **Use Warnings menu**, can not use this menu.
- **Use Units menu**, can not use this menu.
- **Use Hardware menu**, can not use this menu completely.
- **Use rear/front seat menu**, user can not use this menu.
- **Use NMEA output menu**, user can not use this menu.
- **Use Polar menu**, user can not modify any glider parameters
- **Use Profiles menu**, user can not modify Profiles at all. He can change profile only by restarting the device.
- **Modify Profiles**, user can not delete, edit or lock profile.
- **Use Language menu**, user can not use this menu.
- **Use Passwords menu**, user can not use this menu.

Once actions are selected and admin mode is closed, user will un-selected items grayout.



### 6.1.18 About

About dialogs shown current serial number and version info of the main display unit. Use this menu, whenever you are experienced a problem with the system. If SD card is inserted into the main display unit, button **TO SD** will be shown. Press **TO SD** and a report will be saved to SD card. A report will have a name »debug\_20140216\_14\_21\_28.reprot«. Please email this report to us for further help.



## 6.2 Information Mode

Information mode consists of three pages; GPS status page, position report page and satellite sky view page. Use the PAGE selector knob or the up/down arrow to toggle pages.

### 6.2.1 GPS Status Page

GPS status, altitude, flight level and height are shown on this page. Sunrise and sunset are calculated for the current position. In the upper-right corner the current FLARM status is shown. TX means FLARM is transmitting data to others and the number indicates how many other FLARM devices are within range.



If you press the **MARK** button a new waypoint will be created with the current latitude, longitude and elevation based on the terrain database. The waypoint name is generated from the current date and time separated by the minus character and preceded by an underscore.



Waypoint data can be modified. Refer to Chapter 6.6.1 for more details. Press the **OK** button to save a marked waypoint or press **CANCEL** to exit without saving. Press **GOTO** button to navigate immediately to selected point.

### 6.2.2 Position Report

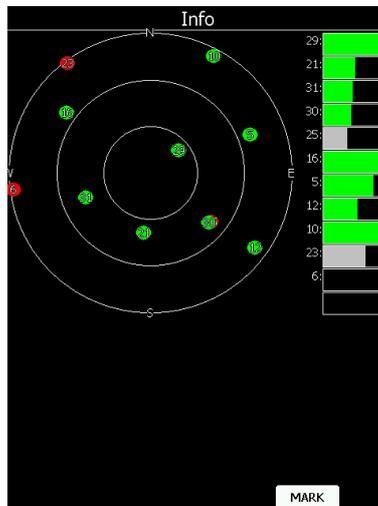
This page shows your position report relative to an arbitrary selectable point. Use this page when you are talking to ATC.



Press the **REPORT** button to select a report point. Radials will always be magnetic and distance will always be in nautical miles. If you press the **MARK** button a new waypoint will be created.

### 6.2.3 Satellite Sky View

Information about tracked satellites is given on this page. If no satellite information is available a message "No satellite info" is displayed.



Green satellites are satellites currently being used for position determination. Three concentric circles represent satellite elevation (0, 30, 60 degrees above horizon). If a satellite is in the centre of the circles it is directly overhead. When you are experiencing bad satellite reception, check this page. If the satellites are always red in a particular place, you should consider moving the GPS antenna to another position. If you press the **MARK** button a new waypoint will be created.

### 6.3 Near Mode

A list of all landable waypoints and airports is shown in this mode. The default sorting order of the items is by arrival altitude. Press the **SORT** button to toggle the sort method. The selected sort method is indicated by the grey background in the header.

Near				Near				Near			
Name	Dis.	Brg	Arr	Name	Dis.	Brg	Arr	Name	Dis.	Brg	Arr
DOLENJA VAS	21.3km	293°	1245ft	DOLENJA VAS	21.0km	293°	1231ft	DOLENJA VAS	23.0km	289°	1199ft
LESCE	33.1km	283°	92ft	LESCE	32.8km	284°	77ft	LESCE	35.0km	282°	37ft
KRANJSKA-GOR	52.2km	305°	-2271ft	KRANJSKA-GOR	51.9km	305°	-2291ft	KRANJSKA-GOR	53.6km	303°	-2289ft
FEDERAUN	56.4km	312°	-1484ft	FEDERAUN	56.2km	313°	-1505ft	FEDERAUN	57.5km	311°	-1486ft
TOLMIN	61.3km	265°	-927ft	TOLMIN	61.0km	265°	-947ft	TOLMIN	63.4km	265°	-990ft
VOLARJE	64.8km	269°	-33413ft	VOLARJE	64.5km	269°	-33434ft	VOLARJE	66.3km	312°	-2820ft
MARTULJEK O	65.2km	314°	-2823ft	MARTULJEK O	65.0km	314°	-2846ft	MARTULJEK O	66.9km	269°	-33473ft
MOJSTRANA	66.6km	315°	-2622ft	MOJSTRANA	66.4km	315°	-2645ft	MOJSTRANA	67.7km	313°	-2617ft
RATECE	69.1km	299°	-3629ft	RATECE	68.8km	299°	-3651ft	RATECE	70.6km	298°	-3653ft
SRPENICA	74.2km	286°	-34021ft	SRPENICA	74.0km	286°	-34044ft	SRPENICA	76.1km	285°	-34064ft
KOBARID	74.7km	284°	-2048ft	KOBARID	74.4km	284°	-2070ft	KOBARID	76.6km	283°	-2092ft
BOVEC	79.9km	273°	-3124ft	BOVEC	79.6km	273°	-3147ft	BOVEC	82.0km	273°	-3178ft
NOTSCH IM GAILT80.8km	294°	-3449ft		NOTSCH IM GAILT80.6km	294°	-3472ft		NOTSCH IM GAILT82.5km	293°	-3478ft	
MALBORGHETTO	81.2km	294°	-4032ft	MALBORGHETTO	80.9km	295°	-4054ft	TREFFEN	82.0km	315°	-3196ft
VORDERBERG	82.3km	308°	-3538ft	VORDERBERG	82.1km	308°	-3561ft	NOTSCH IM GAILT82.5km	293°	-3478ft	
PATERNION	82.9km	308°	-3381ft								

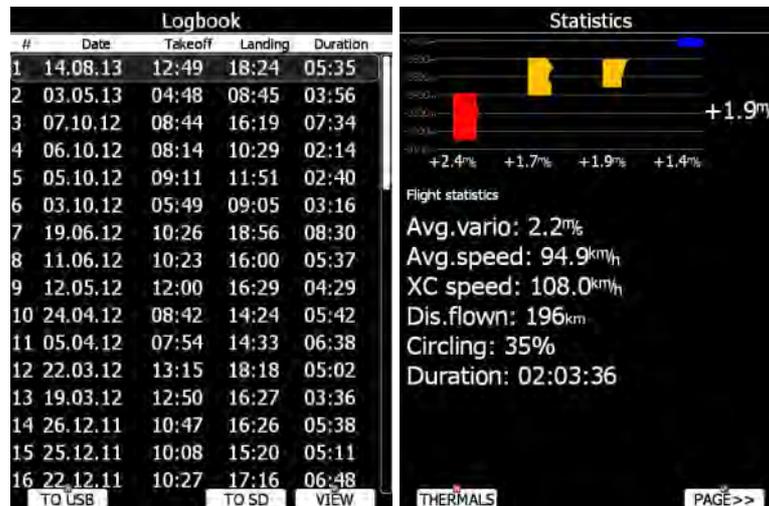
Press **VIEW** button to change how much details are visible for selected item. Select the preferred landable place via the PAGE selector knob and press the **GOTO** button. It will automatically change to airport mode and navigation will commence to selected point. Duplicates are automatically removed. If a target with nearly the same latitude and longitude is found within both the distributed airports database and user waypoint file then only the target from the user waypoint file will be displayed.



Small rectangle in bottom right corner of point icons indicates that selected point is having images.

## 6.4 Statistics Mode

The Statistics mode operates in two different ways. During flight statistical data for the current flight is shown whilst on the ground the logbook for all stored flights is displayed.



### 6.4.1 Logbook

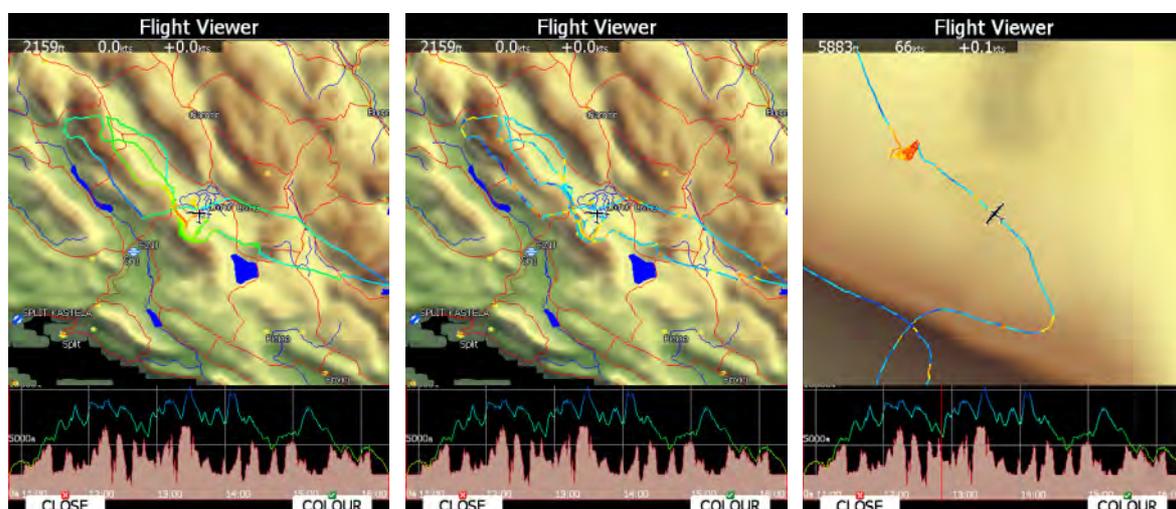
If a SD card or USB stick is inserted into the main display unit the user can copy a selected flight to it. Select the desired flight using the PAGE selector knob and then press the appropriate button.



A flight is automatically copied to the SD card and/or USB stick if it has been inserted into the main display unit when the message *"Calculating security"* is displayed. This message appears when landing conditions are met.

You can also delete a flight using the **Files and Transfer** menu (see Chapter 6.1.5.7).

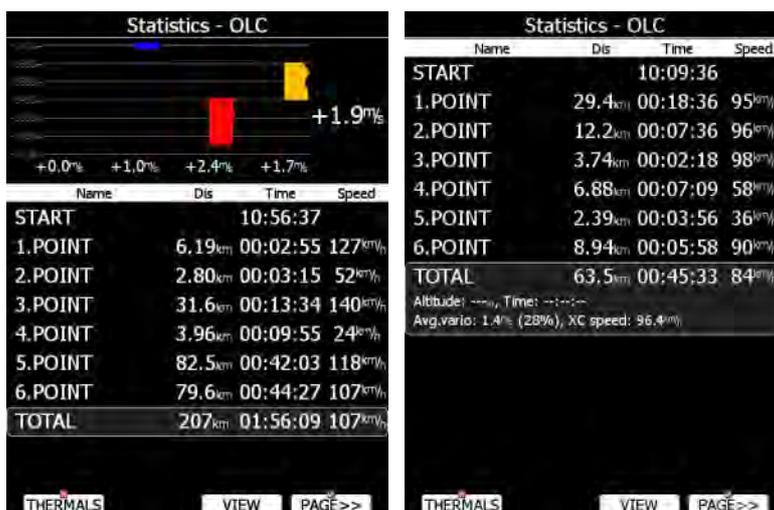
Press **VIEW** button to reply the flight. When VIEW button is pressed flight viewer will open.



A map with flown path is shown and barogram. Use ZOOM selector knob to zoom in or zoom out flight. Use PAGE selector knob to move through flight.

### 6.4.2 Statistics during flight

Main statistics page is split into two parts. In top part, last four thermals are shown. Thermal average is shown below each thermal column. Thermals are coloured based on MacCready value. Red colour means that thermal average was 0.5 m/s or more above current MacCready setting. Blue colour means that thermal average was 0.5 m/s or less below current MacCready setting. Orange colour is for matching thermal average. On the left side altitude scale is drawn. On right side average of last four thermals is printed. Shape of thermal column corresponds to strength of thermal at particular altitude. Press **THERMALS** button to disable or enable thermals view.



In bottom part selected statistics is shown. There are three different pages of statistics available:

- **General statistics**, which is divided further into flight statistics, task statistics and last 60 minutes statistics.
- **Detailed task statistics** displays detailed statistics for each task let.
- **OLC statistic** shows statistics for optimized part of the flight according to the rules defined in Optimization menu.

Use **PAGE>>** button to toggle between different pages.

### 6.4.2.1 General statistics

Using the PAGE selector knob the user can change the statistics subpage.



There are three subpages available:

- **Flight statistics** displays data for whole flight. **Dis.flown** is the optimised distance. XC speed is average speed corrected for altitude difference. **Average vario** is used in this calculation.
- **Task statistics** displays data for the started task. Distance flown is the distance that has already been flown on the task.
- The **last 60 minutes** statistics displays data for the last 60 minutes of flight. If the task was started then **Dis.flown** is the distance flown on the task for the last hour otherwise it is the optimised distance. If the task distance is used a remark (On Task) is displayed in the header.

### 6.4.2.2 Detailed task statistics

Using the PAGE selector knob the user can select different task points. Press **VIEW** button to show more details for selected leg.



### 6.4.2.3 OLC statistics

Using the PAGE selector knob the user can select different optimized points. Press **VIEW** button to show more details for selected optimized leg.



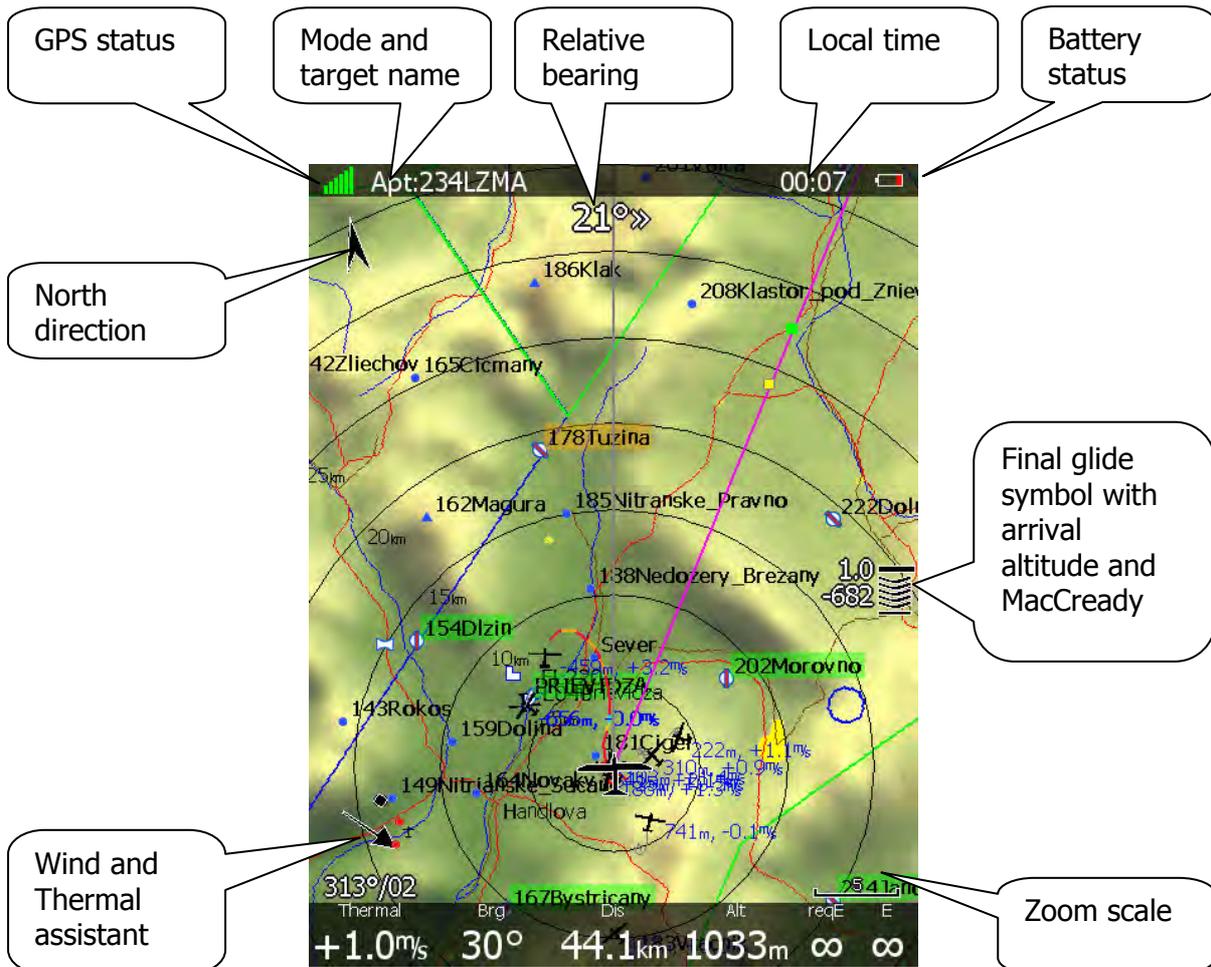
## 6.5 Airport Mode

Using the PAGE selector knob you can scroll through the pages. There are several navigational pages available.



Navigational pages can be customised using LXStyler. The description below applies to the default navigational pages.

### 6.5.1 Initial Navigation Page



In the top row the GPS status is shown. Green colour represents GPS 3D, yellow colour means GPS 2D and red colour is GPS bad. The number of coloured bars indicates the number of visible satellites. Each bar represents two satellites.

Local time shows the local time. You can set a different time zone in the **Units** dialogue (see Chapter 6.1.11).

The battery symbol indicates status of the battery. When the battery is very low the symbol will turn red and also the **Low battery** warning will be displayed.

North direction is pointing to true north. This is important if map orientation is not north up at the top.

The airplane symbol in the middle of the screen is showing current position. The grey line indicates our current ground track and the magenta line is connecting the airplane position with selected goal. When we are below the glide-path to current goal a green and a yellow

rectangle will be displayed on the magenta line. The green rectangle represents the position from where you will achieve the final glide with current altitude and current MacCready setting. The yellow rectangle represents the position from where you will achieve the final glide with current altitude and MacCready zero.

The relative bearing (near the top) gives advice on which direction and how much to turn in order to fly towards the selected target. In the above example we should turn right 21°.

In the lower left corner of screen a **wind symbol** is displayed. The arrow indicates the wind direction relative to the map orientation. Wind direction and wind speed are numerically presented below the arrow.

**Zoom scale** is displayed in bottom right corner of screen. A distance of drawn zoom symbol is plotted above the scale. If there is a letter "a" written next to distance scale, it means, scale of map will automatically adapt to goal.

In the bottom row several items are displayed. **Thermal** shows the last thermal average, **Brg** is the bearing to the selected target, **Dis** is the distance to the target and **Alt** is the current MSL altitude.

The last two numbers (**reqE** and **E**) show the required glide ratio to the target. In the above example the required glide ratio is infinitive and current glide ratio is also infinitive. The current glide ratio is calculated over the last two minutes of flight.

#### 6.5.1.1 Final Glide Symbol

The final glide symbol is a complex symbol. The bottom number (-682 in the above example) shows your predicted arrival altitude. Negative numbers indicate that you are below the glide path and positive numbers indicates you are above the glide path. In the above example the glider is below the glide path. Chevrons show the position relative to the required glide path in percent. One arrow means 5% above or below final glide. In the example more than 25% below glide path is shown.

The middle number is the current MacCready setting. In task mode it is prefixed with the letter **T, A, B, G, S** or **AG**. See chapter 8.2.1 for detailed explanation of this mode. Sometimes there will be another number above MacCready which is used for arrival over terrain. If we are on final glide to a selected target but between it and the current position there is a terrain, which cannot be crossed without more height, then this number will give you an estimate, how much you have to climb, to pass over the terrain. A red rectangle will also be shown on the magenta line indicating the point of potential collision.

#### 6.5.1.2 Thermal Assistant

During thermaling the wind symbol will also shows the thermal assistant. The thermal assistant continuously analyses the thermal whilst circling. The sizes of the dots indicate the strength of the thermal. Big dots mean stronger lift at that point. On the left or right side of the circle a small airplane symbol is shown. This airplane indicates your position. A black dot indicates the thermal maximum. The pilot should extend the circle when the black dot is about 60° away from glider. This value varies and depends on turn rate of the glider and type of thermal. All other dots are coloured based on the MacCready setting. Red colour means values above MacCready, blue values below MacCready and yellow dots represents lift about the same strength as the MacCready setting.

This colour scheme gives us hints about a thermal at glance. If most of dots are red we should consider increasing the MacCready value; if most of dots are blue we should consider decreasing the MacCready setting.

## 6.5.2 Second Navigation Page

The second page is similar to the first page with additional data shown in the bottom line.



The additional items are the current net vertical speed, current track, ground speed, height above ground and optimised distance.

## 6.5.3 Third Navigation Page

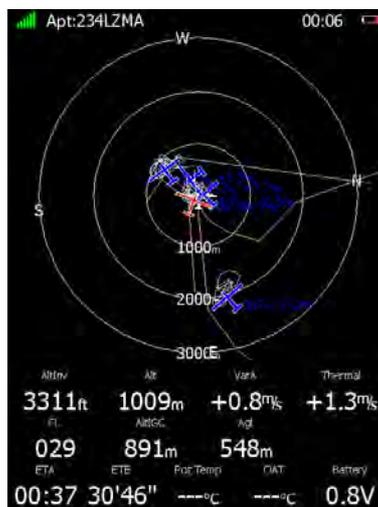
The third page is a combination of first navigational page and side view.



Side view is showing lateral view from glider towards selected goal. Terrain below glider is displayed including glider projected track based on glide ratio in grey colour. Yellow and magenta lines are showing requested glide ratio to goal based on zero MacCready setting and current MacCready setting.

### 6.5.4 Fourth Navigation Page

The fourth navigational page is combination of FLARM radar screen and some additional altitude data.



The internal pressure sensor altitude is shown as **AltIGC**. **AltInv** shows the altitude in opposite units to those defined in the **Units** setup. **OAT** is the outside temperature, **Pot.Temp** is the potential temperature and **Battery** displays the current voltage. The estimated time of arrival and estimated time established are displayed at the bottom part of page.

### 6.5.5 Fifth Navigation Page

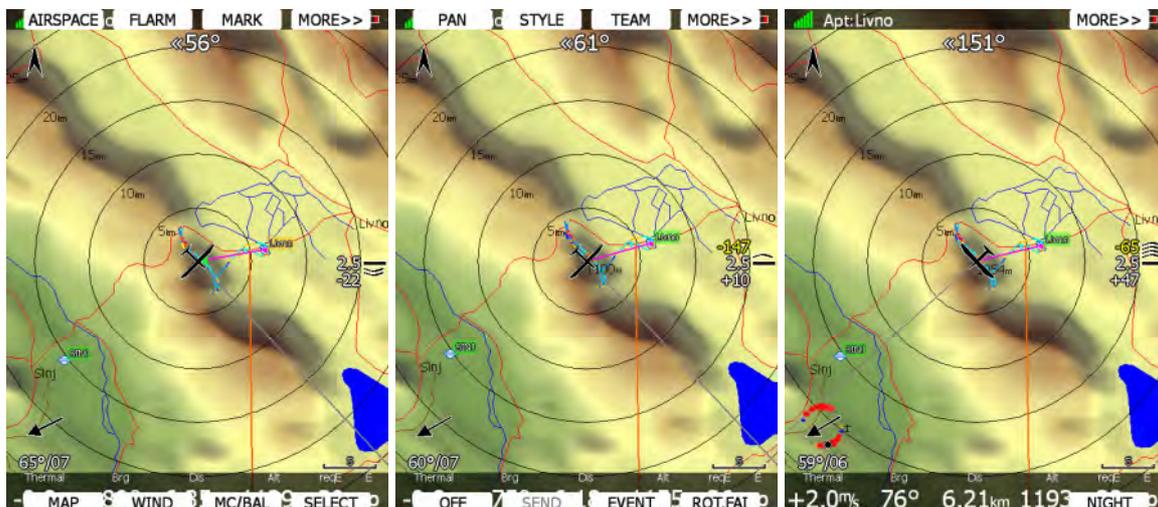
On this page images of selected airport are shown, if available.



Also information for the selected airport is shown at the bottom part. This information includes airport frequency, runway info and description. The estimated time of arrival, estimated time established and sunrise/sunset times for the selected target are displayed in last row.

## 6.5.6 Button Actions

When any of the eight buttons are pressed, the functions for the buttons are shown. If a selected button is pressed once more the selected action will take place.



Press the **MORE>>** button to see more options. If the remote stick is available the behaviour is slightly different. When the check button is pressed on the remote stick a menu will appear instead of the button functions.



By using the UP/DOWN key the pilot may select between options.

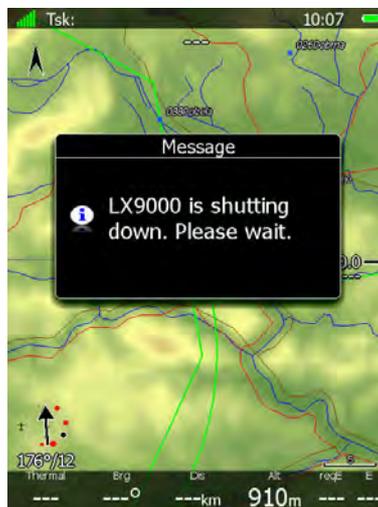


Button functions or the remote menu will disappear automatically after 10 seconds if no further action is taken.

In airport mode the following selections are available:

- **Select** option is used to select an airport as the new navigational target.
- **Mc/Bal** will set MacCready, ballast and bugs (see Chapter 6.5.6.2 for more details).
- **Map** item is used to quickly modify map parameters.
- **Wind** will open a dialogue where wind changes with altitude are shown, wind can be set and methods for wind calculation are shown.
- **Airspace** shows a list of airspace zones in the vicinity of the current position.
- **Mark** is used to mark the current position and create a waypoint.
- **Team** will open dialogue, where pilot can enter team code of his partner. Team code is compatible with SeeYou Mobile application.

- **Flarm** will display a list with all visible Flarm objects. You can select one and use it for navigational purposes.
- **Pan** will change main display unit into panning mode. In this mode user can move over map in all directions.
- **Rot.FAI** will rotate the FAI area if it is enabled. This option is not shown if it is not enabled.
- **Event** is used to log an event. The recording rate will be increased to 1 second for one minute. A message "*Event marked*" will be displayed on the screen.
- **Send** is available only when we have a two-seat configuration with a rear-seat device. Press this button to send the current navigational point to the rear seat device. This action will force a change of navigational target for the selected navigation mode on the rear seat device.
- **Layout** will run page layout editor. In layout editor, it is possible to modify layout of current navigational page.
- **Night** will reduce backlight to level acceptable for flying in very dark conditions.
- **Off** will switch off the instrument. The message "*Device is shutting down. Please wait.*" will be displayed.



The main display unit can also be powered off by pressing the upper-left button until the message "switching off" appears.

### 6.5.6.1 Select an Airport

There are four different methods of selecting an airport. They are called **filter** mode, **list** mode, **map** mode and **history** mode. You can toggle between these four modes by pressing the **METHOD** button several times.



#### Filter mode

Selecting an airport in filter mode is straightforward. Enter the first letter of the airport name using the PAGE selector knob. The helper will show the first airport matching this letter and the next few airports will be displayed in lower part of screen.



Press the **CHAR>>>** button and cursor will move to the second letter. Use the PAGE selector knob to select the second letter. If you wish to return to the first letter turn the ZOOM selector knob counter-clockwise.

You will note that part of the airport name is written in a darker colour. Once it becomes white it means this is the only selection. Pressing **GOTO** will navigate directly to it. If there are more than one airports starting with the filtered letters and you press the **GOTO** button the cursor will jump to the beginning of the airport name. The PAGE selector knob will select among the airports. Press **GOTO** once more and you will navigate to it.



If you do not know the exact name of an airport just select the first letter and press the **GOTO** button. Now scroll to the desired airport using the PAGE selector knob. Press the **GOTO** button once more and you will navigate to the selected airport.

By default the main display unit will search airports through all countries. It is possible to create a search only from selected countries. Press the **COUNTRY** button and a dialogue with a list of all available countries will be shown.



Select the desired countries and press **CLOSE**.

**List mode**

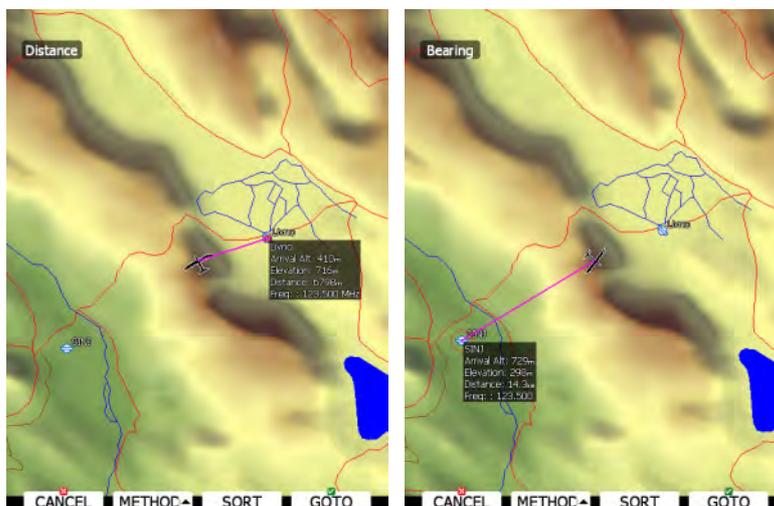
In list mode airports are listed as in near mode.



Press the **VIEW** button to change details of selected airport. Press the **SORT** button to change the sort order of the airports. Select an airport using the PAGE selector knob. Press **GOTO** and you will navigate to it.

## Map mode

In map mode, airports are selected directly on the map. Rotate PAGE selector knob to select an airport.



Details of selected airport will be drawn next to it. In upper-left corner of screen current sort method is shown. There are two possibilities, distance sort or bearing sort. Press **SORT** button to change it.

## History mode

History mode shows all previously selected airports and additional two points: take-off location and soaring begin location (not shown on picture below).

Name	Dis.	Brg	Arr
• DIVACA KRASKI UI311	111km	314°	-5688m
• PLOCE	92.6km	149°	-1108m
• UDBINA	123km	316°	-2427m
• Livno	5.95km	48°	-156m
• Take-off location	6.17km	42°	-152m

CANCEL METHOD- (with a left arrow) GOTO (with a right arrow)

Use PAGE selector knob to select desired airport. Press **GOTO** to start navigation to it.

### 6.5.6.2 MacCready, Ballast and Bugs Settings

These are probably the settings pilots use most often during flight. Press the **MC/BAL** button. The dialogue for MacCready, ballast and bugs will appear.



Use the PAGE selector knob to modify the MacCready setting. In the middle button there is a suggestion for the MacCready setting which is based on the last four thermals. Additionally to the selected MacCready value an overload factor is also shown together with the calculated glide ratio with corresponding speed.



You will notice that the MacCready value displayed on the final glide symbol is coloured yellow or red. The coloured value indicates that your MacCready value is too low corresponding to the current wind and selected target. Increase the MacCready value.

Pressing the **CLOSE** button will close the dialogue and return to the navigation page. Changes will be saved. The dialogue will automatically be closed after 10 seconds if no action is taken.

Pressing the **BAL** button will toggle the menu from MacCready setting to Ballast setting. Ballast is entered in values which are defined in the Units menu (see Chapter 6.1.11). You can set the load for an empty glider by pressing the **Empty** button.

Pressing the **BUGS** button will toggle the menu again from Ballast setting to Bugs setting. A bug setting is used to set polar degradation due to a dirty wing. The input is in percentage degradation of glide ratio (5% means glide ratio degradation is 5%). Pressing **CLEAN** will set bugs instantly to zero. **MC** will return to the MacCready screen.

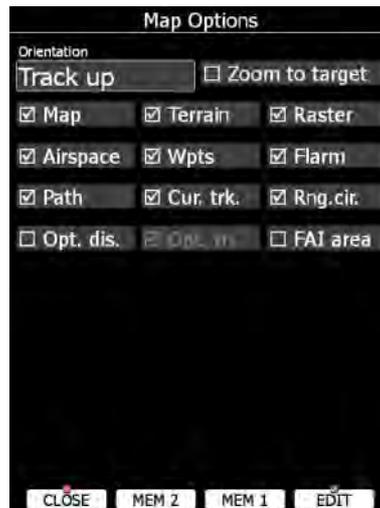
### 6.5.6.3 Map Settings

Map can be quickly configured using this dialogue. Select map orientation in the orientation setup.

A map can have **north**, **east**, **west** or **south** orientation. These orientations are fixed and are not changed with glider position. Additionally to this orientation there are several more which will rotate the map as the glider position changes:

- **Track up** will always have the glider ground track in the up direction.
- **Heading up** will always have glider heading in the up direction. If the compass module is available the heading will be taken from the compass otherwise the heading is calculated from the wind and the ground speed vectors.
- **Goal up** will have target point in upper part of screen.
- **Trk/north up** is a combination of **Track up** and **north up** orientation. During circling orientation will be **north up** otherwise **Track up**.

- **Hdg/north up** is a combination of **heading up** and **north up** orientation. During circling orientation will be **north up** otherwise **Heading up**.



If **Zoom to target** is checked the zoom will be automatically adjusted so that the target point is always visible. Maximum zoom is 200 km and minimum zoom is 1 km. The check boxes will turn on or off the following items:

- **Map** – complete map is turned on/off.
- **Terrain** – only terrain is turned on/off.
- **Raster** – scanned maps is turned on/off.
- **Airspace** – toggle airspace display on/off.
- **Wpts** – waypoints drawing is turned on/off.
- **Flarm** – Flarm radar display is turned on/off.
- **Path** – flown path is switched on/off.
- **Cur.trk** – current track vector.
- **Opt.dis.** – optimised distance.
- **Opt.tri.** – optimised triangle.
- **FAI area** – FAI triangle assistant is turned on/off.



A Flarm object may also be hidden because competition mode is on or privacy mode is on. Please check these settings, if FLARM objects are not visible, even if the item is checked.

It is possible to store map settings for future use. There are two memory locations MEM 1 and MEM 2 for two different memory settings.



Press button **MEM 1** for a long time. A message "Options stored to memory (1)" will be displayed and the settings are stored. Change the settings a little bit. Press button **MEM 2** for long time. A message "Options stored to memory (2)" will be displayed and the settings are stored to memory location 2. Now short pressing of **MEM 1** will invoke the saved settings from memory 1.

#### 6.5.6.4 Wind

The main display unit constantly calculates winds using four different methods. **Speed difference** method is used during circling and is taking into account ground speed difference in a single circle. **Position drift** is calculating wind based on position drift during circling. A minimum of three circles must be completed to obtain the first wind measurements. The third method is **combination**, which takes into account also airspeed received from the vario unit.

If the **compass** module is available wind is also estimated using the wind triangle. Calculated wind is stored in layers. Layer height is 300 m or 1000 ft and cannot be modified by the user.



The wind profile is shown on the left side of the dialogue. Yellow coloured altitude indicates our current MSL altitude. Using the ZOOM selector knob you can scroll up and down through the wind layers.

Use the **EDIT** button to manually enter wind data. If a new wind direction is entered all wind directions in range from start altitude to end altitude will be modified. The same procedure is used for wind speed.

The user can also disable or enable a particular wind method. It is recommended to have all methods enabled.

Once the wind is modified to suit your needs press the **OK** button to accept the wind values. The dialogue will exit automatically.

If the **CANCEL** button is pressed the wind dialogue will be closed without applying the changed values.

### 6.5.6.5 Airspace

The Airspace dialogue shows a list of airspace zones in the vicinity of your position. Vertical and horizontal distances are calculated to all airspace zones in the list.



The VIEW button toggles the list views. When the **STATUS** button is pressed the status of the selected airspace zone will toggle between **OFF always**, **OFF today**, **OFF hh:mm** and enabled.

If the **EDIT** button is pressed a new dialogue will open where you can modify properties for the selected zone. Refer to Chapter 6.1.5.3 for more details.

When a zone is alarmed the distance will be coloured orange.

### 6.5.6.6 Mark

If you press the **MARK** button a new waypoint will be created with the current latitude and longitude and elevation based on the terrain database. The waypoint name is generated from the current date and time separated by the minus character and preceded by an underscore.



Waypoint data can be modified. Refer to Chapter 6.6.1 for more details. Press the **OK** button to save a marked waypoint or press **CANCEL** to exit without saving. Press **GOTO** button to navigate immediately to selected point.

### 6.5.6.7 Team

The Team feature will help you find or hide your teammate. It lets you share your position with other pilots and even encrypt this information so that your competitors won't be able to decode it.



To use it press **TEAM** button. First you will have to enter team reference point. Press Select to select a source waypoint for the calculation. It is imperative that your teammate does the same. If you would like to hide the information from others, enter the Team Password. Again, both or all pilots have to share the same key. Go fly. When asked about your position, answer "Hotel-Golf-Echo-Mike". Your teammate will tap the Team button, enter the code and say "Thanks" while others won't have a clue unless they have the key.

### 6.5.6.8 Flarm

Press the **Flarm** button to view the list of other aircraft received by Flarm. A list with all received aircraft since the last switch on is shown.

Flarm Traffic					SELECT
Device ID	Dis.	Brg	Var	Alt	
8A3F	1.34 <sub>km</sub>	161°	-0.3‰	1425 <sub>m</sub>	
EDC	1.46 <sub>km</sub>	21°	-0.1‰	1788 <sub>m</sub>	
1CE1	1.76 <sub>km</sub>	130°	+0.9‰	1667 <sub>m</sub>	
1104	1.75 <sub>km</sub>	125°	+0.1‰	1243 <sub>m</sub>	
1BAC	1.72 <sub>km</sub>	116°	+2.6‰	1288 <sub>m</sub>	
716	2.19 <sub>km</sub>	276°	+0.5‰	1057 <sub>m</sub>	
162D	2.68 <sub>km</sub>	59°	-1.0‰	1739 <sub>m</sub>	
69BB	2.80 <sub>km</sub>	61°	+1.1‰	1772 <sub>m</sub>	
7B8	4.35 <sub>km</sub>	341°	+0.6‰	982 <sub>m</sub>	
1BE9	4.97 <sub>km</sub>	185°	+1.8‰	1521 <sub>m</sub>	
497	6.33 <sub>km</sub>	348°	+2.3‰	850 <sub>m</sub>	

Flarm Traffic					SELECT
Device ID	Dis.	Brg	Var	Alt	
8A3F	1.52 <sub>km</sub>	159°	+1.0‰	1437 <sub>m</sub>	
EDC	1.51 <sub>km</sub>	10°	+0.1‰	1785 <sub>m</sub>	
1CE1	1.87 <sub>km</sub>	132°	+0.9‰	1676 <sub>m</sub>	
1104	1.74 <sub>km</sub>	124°	+1.8‰	1270 <sub>m</sub>	
★ 1BAC	1.60 <sub>km</sub>	131°	+0.7‰	1288 <sub>m</sub>	
★ 716	2.53 <sub>km</sub>	274°	+1.6‰	1082 <sub>m</sub>	
★ 162D	2.68 <sub>km</sub>	58°	+0.4‰	1752 <sub>m</sub>	
69BB	2.47 <sub>km</sub>	58°	+0.6‰	1771 <sub>m</sub>	
7B8	4.03 <sub>km</sub>	341°	-3.3‰	945 <sub>m</sub>	
1BE9	5.25 <sub>km</sub>	184°	+0.6‰	1520 <sub>m</sub>	
497	5.89 <sub>km</sub>	346°	+2.1‰	865 <sub>m</sub>	

The list is sorted by distance. Move through Flarm targets using PAGE selector button. Press **SELECT** button to mark selected target as favourite target. A yellow star will be

drawn next to it. You can select as many favourites as you want. Depend on Flarm graphics settings (See chapter 6.1.6.7) only favourites will be displayed on the map. One target can be selected as an active target. Press **ACTIVE** button to make target as active one. A blue bulls-eye will be plotted next to it. Team navboxes will show distance and bearing to this target.

Press the **GOTO** button to start navigation to this Flarm position. Instead of Flarm device ID, you can also show the competition number for a particular glider. Press **EDIT** to enter the edit dialogue for the selected Flarm object.

Enter data about the Flarm glider and pilot. The main display unit is pre-loaded with the FlarmNet database to identify known FLARM Device IDs with plane and pilot data. You can upload the latest FlarmNet database after downloading it from <http://www.flarmnet.org>. The update procedure is similar to the update procedure for airport databases.

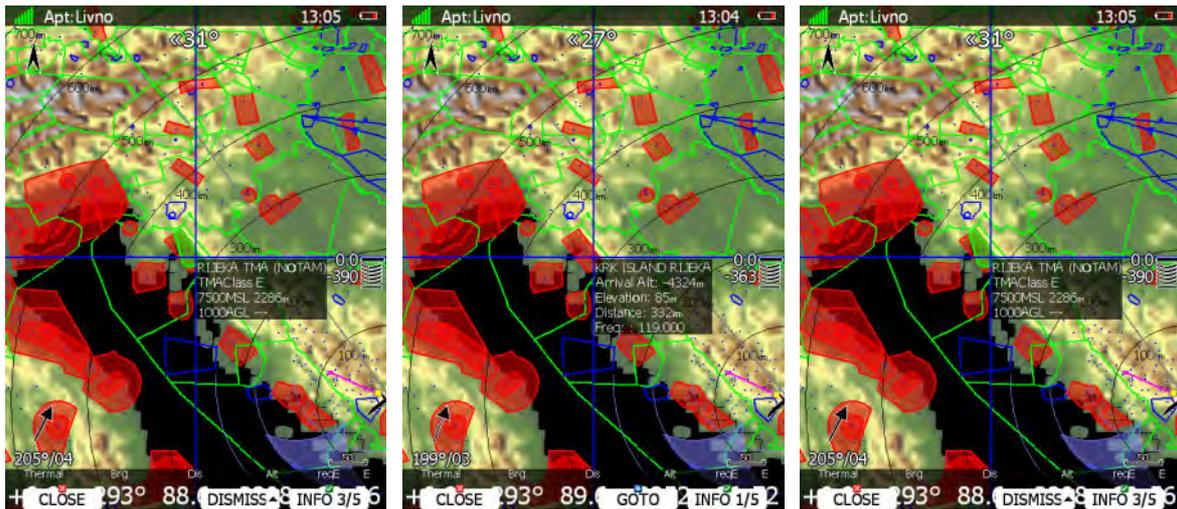
See Chapter 6.1.5.2 for more details about updates.



We encourage all users to upload their data to the FlarmNet web site. It is very easy. All you need is to determine your Flarm device ID which you will find in the Hardware->Flarm dialogue (see 11.1.4) and then register at FlarmNet.

### 6.5.6.9 Pan

Pan mode is a special mode where you can freely move around the map; zoom in and zoom out the map to explore some details along the course. Press **PAN** button to active this mode.



A blue cross will be plotted over the screen with info box for given cross position. Move cross up and down on map using PAGE selector knob. Move cross left and right using MODE selector knob. Turn ZOOM selector knob to zoom map.

If remote stick is being used move jogger to move map. Press **INFO** button to change information for given position of cursor. There are three types of information possible: information about waypoint in the vicinity, airspace information and current position.

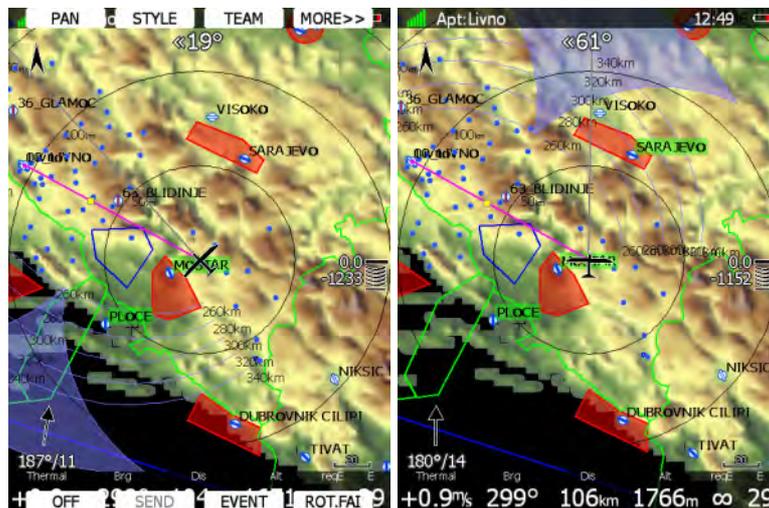
When airspace info is given, press **DISMISS** button to dismiss zone for selected time period.

When waypoint or position info is give, press **GOTO** button to navigate to this point.

Press **CLOSE** to leave pan mode.

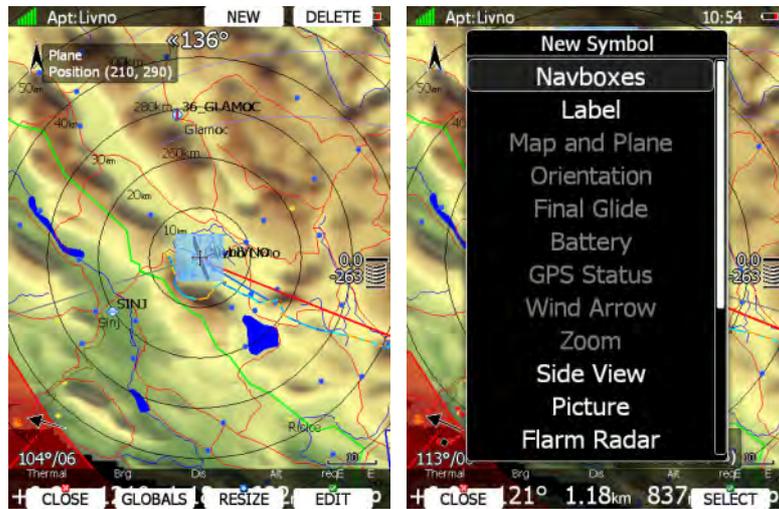
### 6.5.6.10 Rotate FAI Area

This option is used to rotate the FAI triangle assistant to match your suitable position. If FAI area is not enabled this option will be grey-out.



### 6.5.6.11 Style

Use this option to modify layout of navigational page. See chapter 7 for detailed explanation.

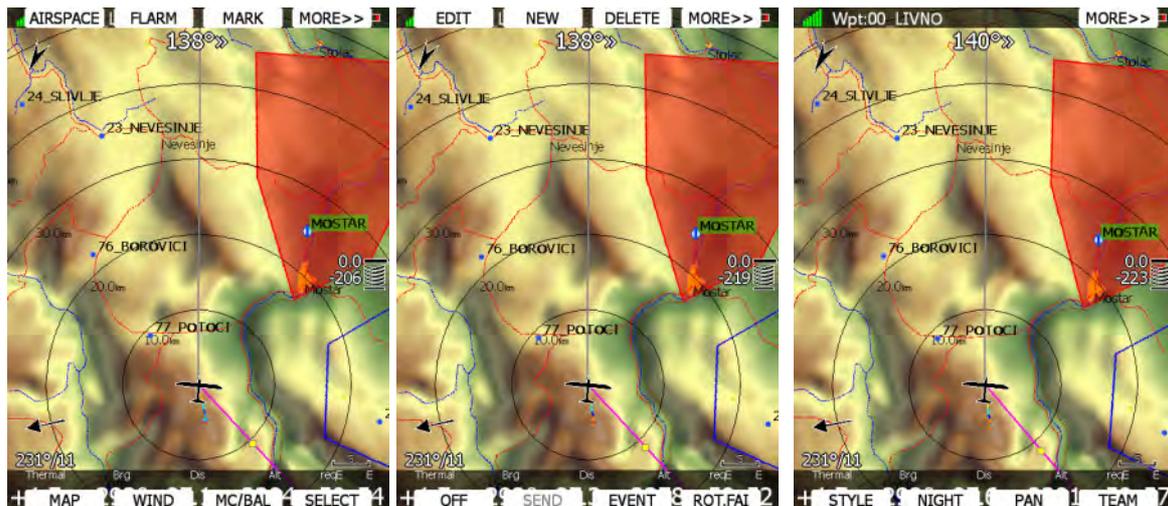


## 6.6 Waypoint Mode

Waypoint mode is very similar to airport mode. In this mode the user can navigate to waypoints from selected files. In addition to the options in airport mode there are three additional options: Edit waypoint, new waypoint and delete waypoint.



Navigational pages can be customised using LXStyler. The description below applies to the default navigational pages.



- **Select** is used to select a waypoint as the new navigational target.
- **Mc/Bal** will set MacCready, ballast and bugs. See Chapter 6.5.6.2 for more details.
- **Map** item is used quickly to change and modify map parameters.
- **Wind** will open a dialogue where wind changes with altitude are shown, wind can be set and methods for wind calculation are shown.
- **Airspace** shows a list of airspace zones in the vicinity of the current position.
- **Mark** option is used to mark the current position and create a waypoint.
- **Team** will open dialogue, where pilot can enter team code of his partner. Team code is compatible with SeeYou Mobile application.
- **Flarm** button will display a list with all visible Flarm objects. You can select one and use it for navigational purposes.
- **Edit** button will edit data for the selected point.
- **New** button will add new point. A new point can also be copied from the airports database.
- **Delete** button deletes the selected point.
- **Pan** will change main display unit into panning mode. In this mode user can move over map in all directions.
- **Rot.FAI** will rotate the FAI area if it is enabled. This option is not shown if it is not enabled.
- **Event** is used to log an event. The recording rate will be increased to 1 second for one minute.
- **Send** is available only with two-seat configurations. Press this button to send the current navigational point to the rear seat device. This action will force a change of navigational target for the selected navigation mode on the rear seat device.
- **Style** will run page layout editor. In layout editor, it is possible to modify layout of current navigational page.
- **Night** will reduce backlight to level acceptable for flying in very dark conditions.

- **Off** will switch off the instrument. The message *LX9000 switching off* will be displayed.

### 6.6.1 Editing Waypoints

Press the **EDIT** button. The Edit dialogue will be open with details of the selected waypoint.

Edit				DIS/BRG
Name	00_LIVNO		Code	00
Style	Grass airfield		Elevation	707m
Latitude	N43°47.650'		Longitude	E016°53.533'
RwyDir	RwyLen	RwyWidth	Frequency	
130°	800m	---m		
CANCEL		GOTO	OK	EDIT

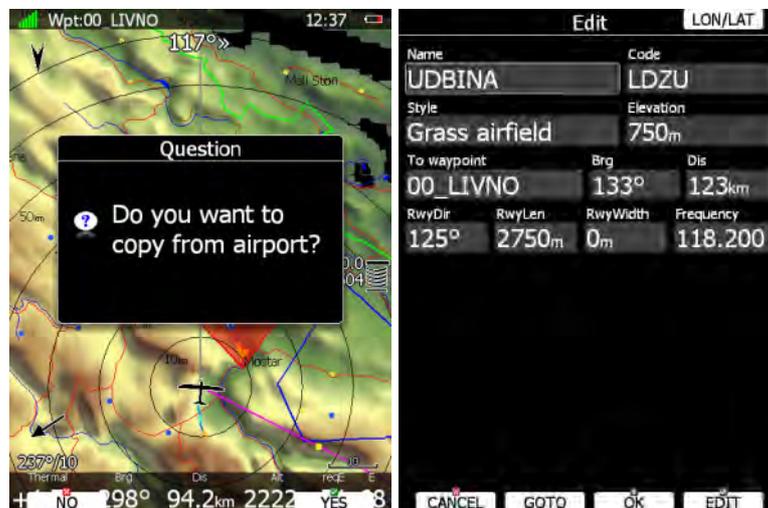
There are two possibilities to enter a position. You can modify latitude and longitude to define a position of the point or press the **DIS/BRG** button to enter the position as distance and bearing to a selectable point.

Edit				LON/LAT
Name	00_LIVNO		Code	00
Style	Grass airfield		Elevation	707m
To waypoint	Brg	Dis		
00_LIVNO	0°	0.00km		
RwyDir	RwyLen	RwyWidth	Frequency	
130°	800m	---m		
CANCEL		GOTO	OK	EDIT

Press the **LON/LAT** button to toggle back to input of latitude and longitude. Modify other attributes at your discretion. When finished, press the **OK** button to confirm changes or press **CANCEL** to dismiss changes. The modified waypoint will be updated in the appropriate file automatically.

## 6.6.2 New Waypoint

Select this option if you want to add new a waypoint to the active waypoints file. If no waypoints file is selected a new waypoint file will be created with name **default.cup**. A message *"Do you want to copy from airport?"* is displayed first. Press **YES** if you would like to copy it from the Airports database. An airport select dialogue will be opened. Select the airport you wish to copy. If none is selected a blank edit dialogue is opened.



The minimum data that must be entered are name, latitude and longitude. Press the **OK** button to confirm changes and create the new waypoint. The new waypoint is added to active waypoint file. Press the **CANCEL** button to abandon creation of new point.



Elevation will be assigned automatically once the position is entered. Elevation is taken from digital elevation model which is stored in the main display unit for the entire world.

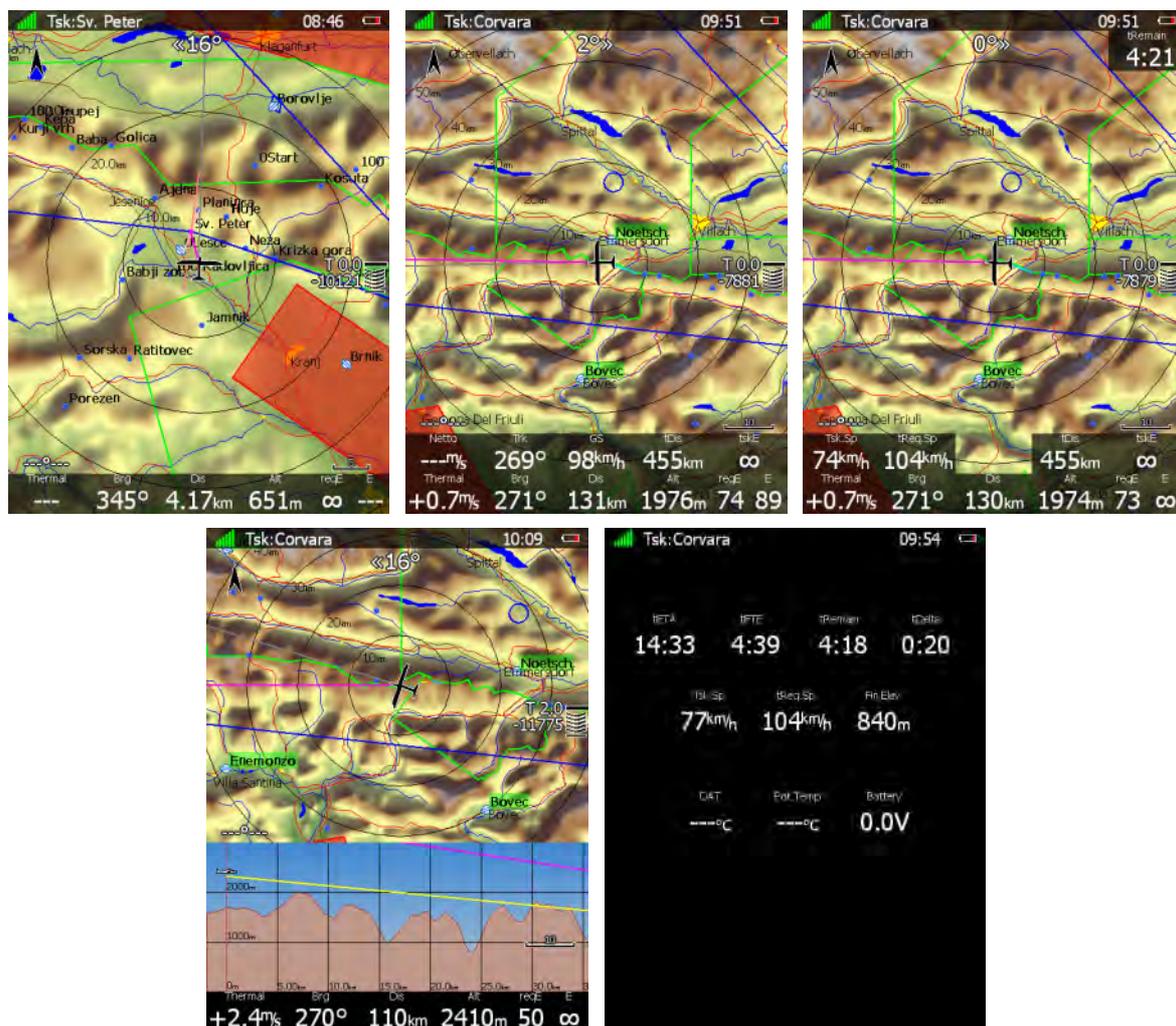
## 6.7 Task Mode

Task navigation mode is used for task manipulation. Navigation in this page is exclusively to the selected turn point of the declared task.



A task can be created only from stored waypoints or airports. A task can also be loaded from stored tasks. A task can will be saved to an active waypoint file (see Chapter 6.1.5.4 for details how to set an active waypoint file). A task used for navigation will also be declared in the IGC file.

Task mode has five pages. Use the PAGE selector knob to switch between pages. These pages are designed to suit needs for racing tasks as well as for assigned area tasks with minimum task time.



The first page is identical to first pages of the airport and waypoint modes. It shows navigational data to the current turn point. However the final glide indicator always shows the required altitude to complete the task.

On the second page additional data is shown:

- **current netto vertical speed**
- **current track and groundspeed**
- **tDis** shows the remaining total task distance.
- **tskE** shows the required glide ratio to task finish.

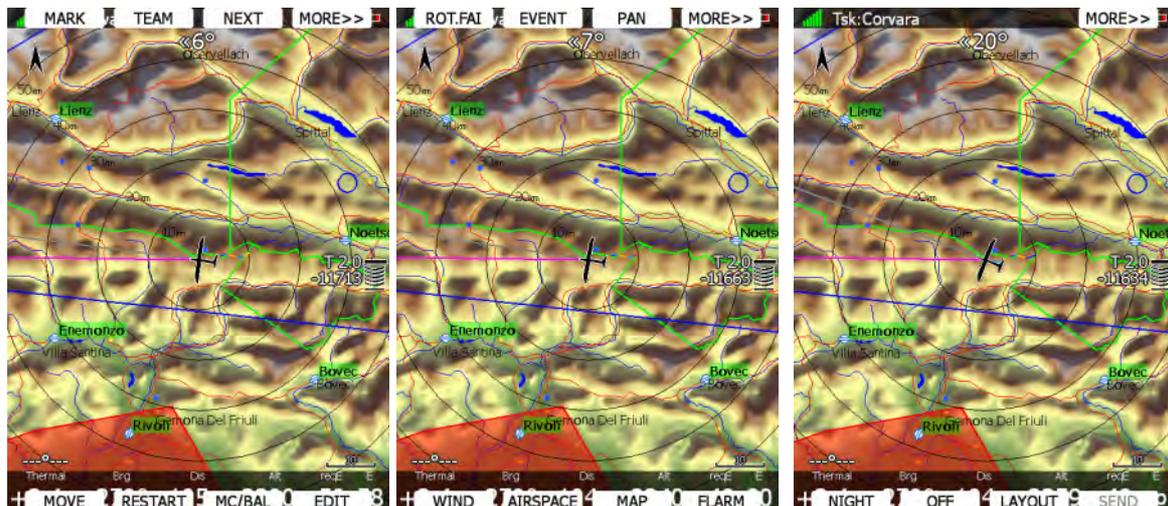
The third page is designed for tasks with time limits which are in most cases going to be assigned area tasks. Three new symbols are added:

- **Tsk.Sp** which is task speed achieved up to this moment.
- **tReq.Sp** which is the required speed to task completion. It is calculated as the remaining task distance divided by the remaining time.
- **tRemain:** indicates the remaining task time.

The fourth page is identical to the fourth page of the airport or waypoint mode. It shows side view.

The fourth page has no map and shows time values for the task being flown and the elevation of the finish point. In addition outside temperature, potential temperature and battery voltage are shown.

When any of the eight buttons are pressed functions for the buttons are shown. If the selected button is pressed once more the selected action will take place. Press the **MORE>>** button to see more options. If the remote stick is available the behaviour is slightly different. When the check button is pressed on the remote stick menu will appear instead of the button functions.



- **Edit** action is used to edit the task. This is the one and only task that will be declared and will be available for navigation.
- **Mc/Bal** action will set MacCready, ballast and bugs – see Chapter 6.5.6.2 for more details.
- **Move** action is used in assigned area tasks to move the navigation point inside the selected assigned area.
- **Restart** is used to restart a task. This action is available only when flying.
- **Cycle** is available when multiple start points are defined and is used to change, cycle through start points.
- **Start** or **Next** option is used to start a task or to advance to the next turn point.
- **Mark** is used to mark the current position and create a waypoint.
- **Team** will open dialogue, where pilot can enter team code of his partner. Team code is compatible with SeeYou Mobile application.
- **Flarm** button will display a list with all visible Flarm objects. You can select one and use it for navigational purposes.
- **Map** is used to change quickly and modify map parameters – see Chapter 6.5.6.3 for more details.

- **Wind** will open a dialogue where wind changes with altitude are shown, wind can be set and methods for wind calculation are shown. See Chapter 6.5.6.4 for more details.
- **Airspace** shows a list of airspace zones in the vicinity of the current position. See Chapter 6.5.6.5 for more details.
- **Pan** will change main display unit into panning mode. In this mode user can move over map in all directions.
- **Rot.FAI** will rotate the FAI area if it is enabled. This option is not shown if it is not enabled.
- **Event** is used to log an event. The recording rate will be increased to 1 second for one minute. A message "Event marked" will be shown on the screen.
- **Send** is available only with two-seat configurations. Press this button to send the task to the rear seat device. This action will force a change of task on the rear seat device.
- **Layout** will run page layout editor. In layout editor, it is possible to modify layout of current navigational page.
- **Night** will reduce backlight to level acceptable for flying in very dark conditions.
- **Off** will switch off the instrument. The Message "LX9000 switching off" will be displayed.

### 6.7.1 Task Edit

Press the **EDIT** button and the task edit dialogue will open. A task is created and manipulated within this dialogue. A list of task points is shown. In the upper-left corner the type and total distance is displayed. In the upper-right corner the task time is shown. Use the PAGE selector knob to select task points or task time control.

There are numerous actions available within the task edit dialogue to make creation of tasks as easy as possible.



Press the **MORE>>** button to see more options. Available actions are:

- Press the **EDIT** button to enter a new task point, edit an existing one or to enter task time.
- **OK** action will confirm changes to the task and return to the navigational page.
- **CANCEL** action will cancel all modifications of the task and return to the navigational page.
- Use the **ZONE** button to modify the observation zone for selected point. The default zone style is defined in the Observation Zones menu in setup mode (see Chapter 6.1.8).
- **OPTIONS** action will open a new dialogue where additional properties for the task can be defined. The task name is set in this dialogue.
- There are three different methods of creating task. List mode. Detailed list mode and map mode. Press **VIEW** button to change method.

- **STARTS** will open new dialogue, where user can enter multiple start points.
- Press **LOAD** to load the task from the active waypoint file.
- Press **SAVE** button to store the task to the active waypoint file. This task can later be loaded from the active waypoint file.
- **TO NANO** button will be available, if Nano flight recorder is connected to the main display unit. Press this button to send declaration to it.
- **INVERT** action will invert the complete task.
- **INS PNT** will insert a new point above the current cursor position.
- **DEL PNT** will delete a point at the current position.
- **CLEAR** will completely erase the task.
- **MOVE UP** is used to move selected point upwards within the task.
- **MOVE DN** is used to move selected point downwards within task.

### 6.7.2 Task Creation

Make sure that at least one waypoint file is loaded into the main display unit and that it is checked and marked as an active waypoint file. Refer to Chapter 6.1.5.1 for details on how to upload waypoint files to the system.

Select task time and press the **EDIT** button. Enter the task time if required. Rotate the PAGE selector knob to increase time in 15 minute steps and the ZOOM selector knob to increase task time in 1 minute steps. Close the task time edit and rotate the PAGE selector knob to select the first empty point.

Press the **EDIT** button and enter a turn point name. Entering a point name is very straightforward. Enter the first letter of the task point name using the PAGE selector knob. The "Helper" will show the first waypoint that matches this letter.

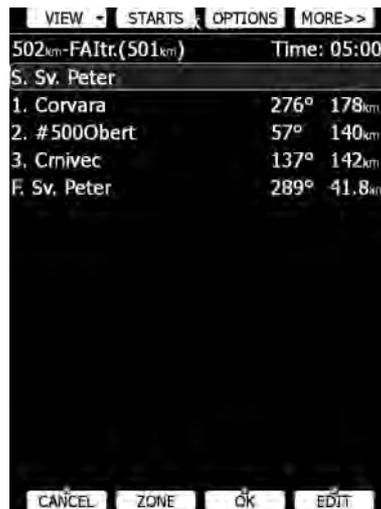


Press the **CHAR>>** button and the cursor will move to the second letter. Use the PAGE selector knob to select the second letter. If you want to return to the first letter turn the ZOOM selector knob anticlockwise.

Repeat this procedure until your desired point is selected. Press the **SELECT** button to complete this selection. If you do not know exact name of a point just select the first letter and press the **SELECT** button. Now scroll to the desired point using the PAGE selector knob. Press the **SELECT** button once more to complete this selection.

The task edit dialogue should now look like the screen below. The letter "S" indicates you entered the start point.

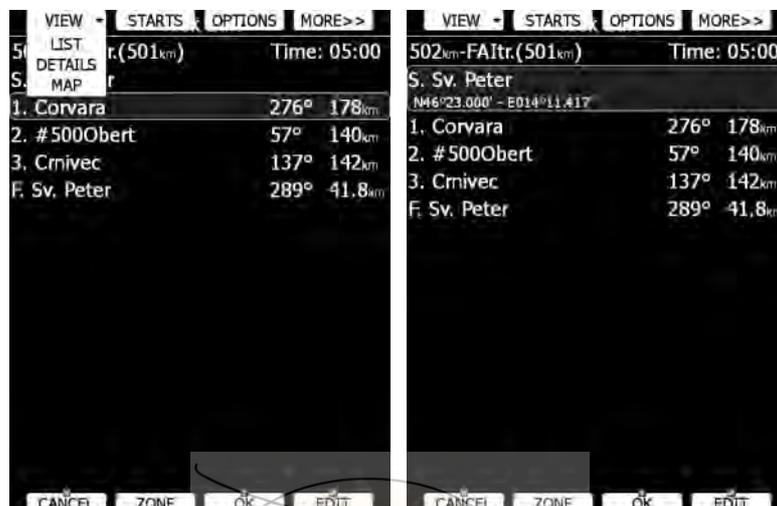
Move the cursor down to the next empty point and repeat the above procedure until the entire task is entered.



If you would like to change source for selection of waypoints, which are used to create task, press **SOURCE** button and select appropriate source. There are three options available: active waypoint file, all selected waypoint files or waypoint files and airports.



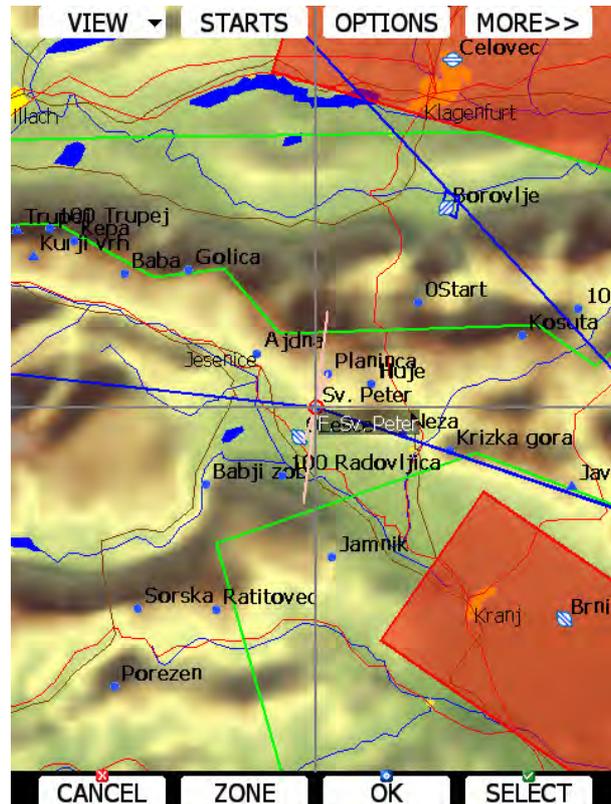
Sometimes, it is easier to see list of all waypoints. Press **LIST** button to change selection method to list mode. Press **FILTER** button to go back to this mode. In list selection mode, it is possible to sort waypoints on name, distance or bearing. Distance and bearing are calculated to previous point in task. This is very useful, when you do not know exactly waypoint name, but just direction and distance, where to go.



Press **VIEW** button to change view from list to detailed list view. In detailed list view also latitude and longitude for selected task point are given. Press VIEW button once more to enter map edit mode.

### 6.7.2.1 Map mode

In map mode, it is possible to create task on map. Use MODE selector knob to move grey cross left or right and PAGE selector knob to move up and down. Turn ZOOM selector knob to zoom.



Move cross to task point to pick it and move it around. Move cross to task leg to insert point.

### 6.7.3 Multiple start points

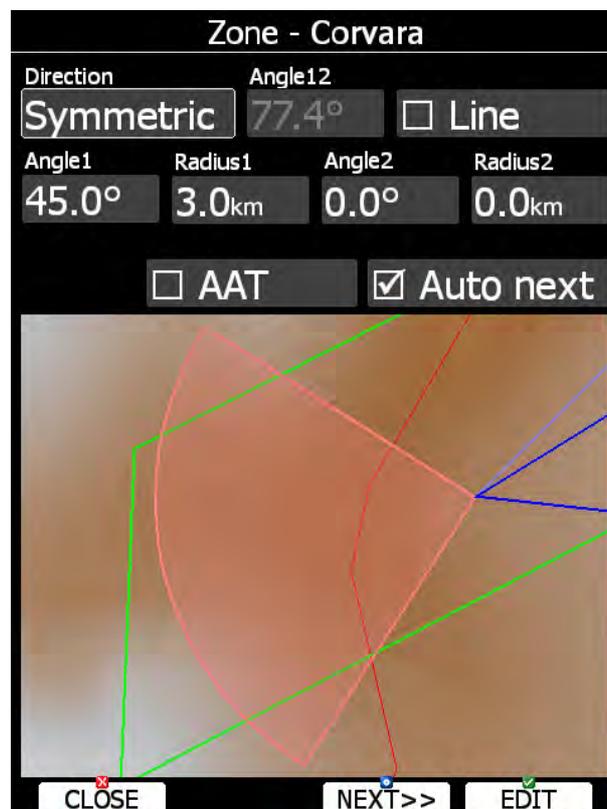
On some competitions, multiple start points are used for start. Press **STARTS** button to open multiple starts dialog.



First start point will be grey out. This is point, which is defined in task. Add as many start points as required. Later it is possible to cycle through start points with CYCLE button.

### 6.7.4 Modifying Zones

Now it is time to modify the observation zones. Select a point and press the **ZONE** button. A new dialogue with the observation zone for the selected point will open.



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 parameters for **Direction** are:

- **Symmetric:** the most common selection for a turn point.

- **Fixed:** mostly used for assigned areas.
- **Next:** orients the observation zone in direction of the outgoing leg. This is usually used for start.
- **Prev:** orients the zone in direction of the incoming leg and is usually used for the finish.
- **Start:** orients the sector always towards the start.

If the **Line** box is checked the sector will become a line type of observation zone. The **Radius1** parameter defines half the width of the line length. Use the PAGE selector knob to increase the radius by 0.1 of the selected distance units and the ZOOM selector knob to increase the radius by 5 units.

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 classic FAI sector. Rotate the PAGE selector knob to increase the angle by 0.5° or use the ZOOM selector knob to choose values 22.5°, 45°, 90° or 180°.

**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.

Check the **AAT** checkbox, if you want to make the selected zone an assigned area. The **AAT** checkbox will be automatically checked when **Radius1** is greater than 10 km.

By default navigation to task points will be automatically advanced; uncheck **Auto next** if you do not want to change over to next point when reaching selected point. This option will be automatically unchecked when **Radius1** is greater than 10 km.

Press the **NEXT>>** button when you are happy with the changes and to continue with the next observation zone setup.



If the zone is for an assigned area turn point it will be marked with symbol '#' in front of the point name.

### 6.7.5 Task Options

Press the **OPTIONS** button. The options dialogue will be opened.

Enter the task description. This is very useful during competitions where you are given more than one task per day. Some hints for names are **DAY1-B, Triangle1000km** etc. Check **Finish is 1000m below start** when you are making a badge or record flight. If this option is checked the system, will not navigate you to the finish point elevation, but to the altitude which is going to be 1000m below the start altitude. Check **Navigate to nearest point** and the system will navigate you to the nearest point on the start zone or start line

and finish zone. **Start out the top** will enable detection of start, when leaving start sector from the top of it.



The **Navigate to nearest point** option is very useful and actually a must if a finish cylinder is used with a significantly large radius. Enabling this option will calculate the final glide to the edge of the cylinder rather than to the centre of the cylinder.

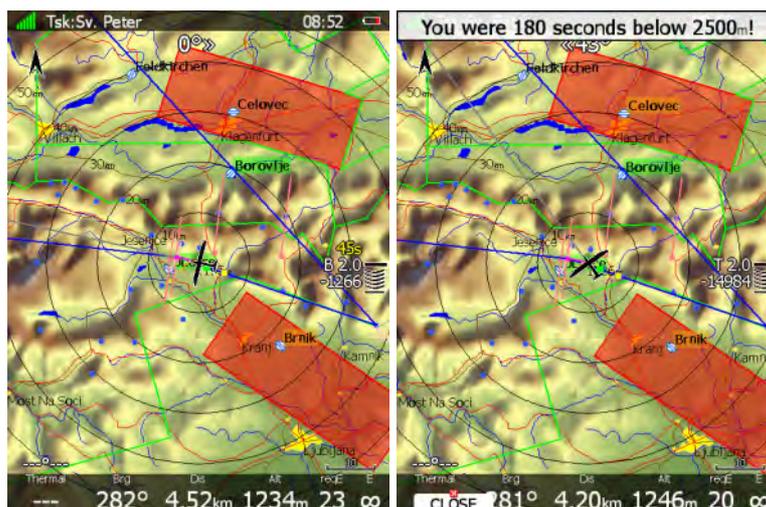
There are also several options in this menu which will help competition pilots to have a less stressful start.

### 6.7.5.1 Gate Time

**Gate time** is the time when the start gate is going to open. If this value is entered the instrument will not give you any message about starting a task before the gate time is reached. A notification will be given when the gate is opened.

### 6.7.5.2 Below Altitude Start Procedure

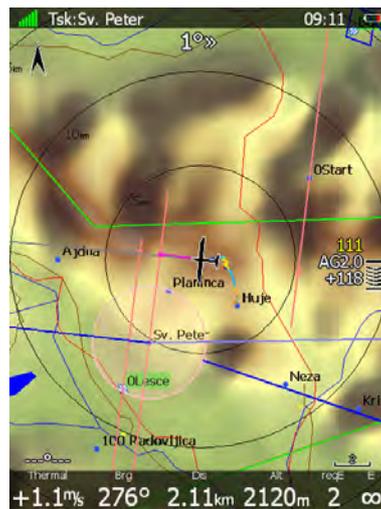
On some competitions there is a rule that a pilot must be below a defined altitude for a certain amount of time. Enter **Below alt.** and **Below time** to use this option. An indication will be given on the final glide symbol. Character "**B**" will be displayed before the MacCready value which indicates that the final glide is in below altitude mode.



The lower number shows the difference to the set altitude. Negative values mean altitudes below set altitude. The upper yellow number indicates the number of seconds left to be below the set altitude. Chevrons indicate meters below or above required altitude. Each line represents 10 m. A message "*You were XX seconds below YYYYm!*" is displayed once you fulfil the conditions.

### 6.7.5.3 Maximum Start Speed and/or Maximum Start Altitude

A lot of competitions are limiting the start altitude and/or start ground speed. The system helps pilots to cross the start line at the correct altitude with correct ground speed. Enter **Start alt.** and/or **Start gsp.** to use this option. An indication will be shown on the final glide symbol. Character "**A**" will be displayed before the MacCready value if a start altitude was entered and/or character "**G**" will be displayed if a start speed was specified.



The lower number indicates at what altitude you will reach start altitude. A negative value indicates you are going to be there below the required start altitude.



The arrival altitude to start is not based on MacCready, the glider nor the wind settings. It is calculated based on energy difference during flying straight. This gives a very precise estimate at what altitude you will arrive at the start. Speeding up will result in greater energy loss and the arrival altitude will decrease; slowing down to best glider ratio will decrease energy loss and the arrival altitude will increase.

The upper yellow number shows the current ground speed and the chevrons indicate if you have to slow down or you may speed up.

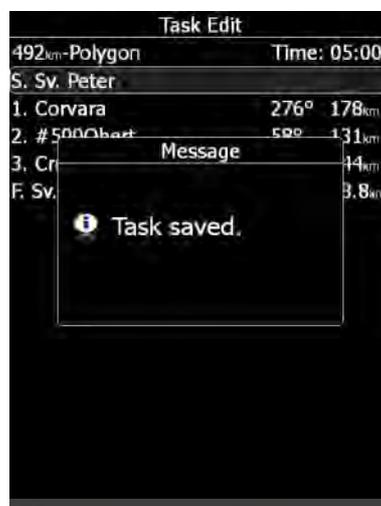
In the picture above we are 118 meters above the glide to start altitude. Our speed is 111 km/h and the chevrons show that we can speed up.



Start speed and start altitude mode is available only if the **Navigate to nearest point** is checked.

### 6.7.6 Saving a Task

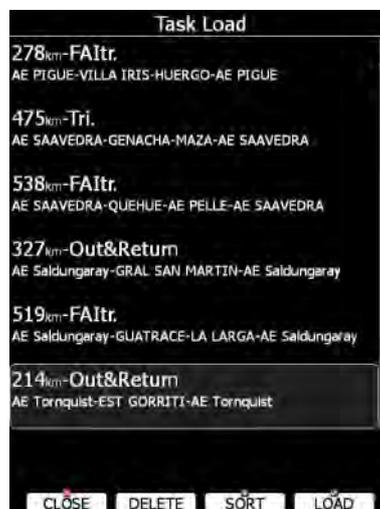
Once a task is completed it could be saved to the active waypoint file. Press **SAVE** and the message "Task saved" will appear on screen.



If the task already exists in the active waypoint file the message "*Task is already saved!*" is shown.

### 6.7.7 Loading a Task

It is possible to load a task from the stored tasks within the active waypoint file. Select the **LOAD** action within task mode. A dialogue with a list of all stored tasks will be shown.



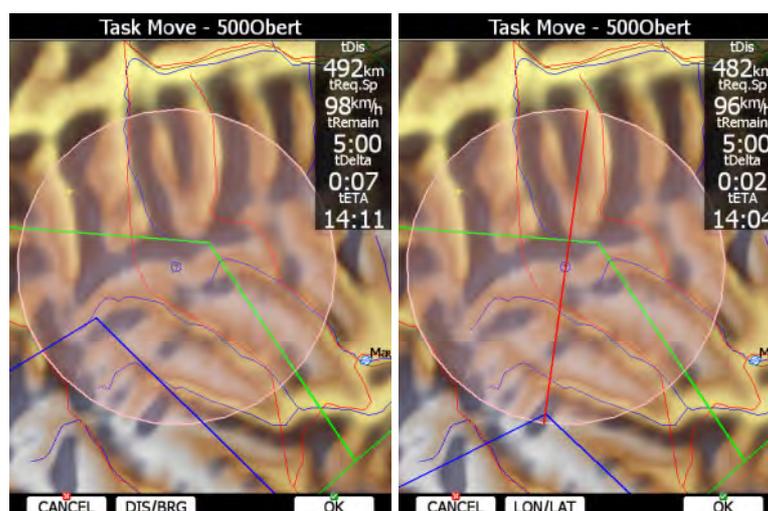
Total task distance, task description and task points are shown for each task stored. Select the desired task by rotating the PAGE selector knob and press **LOAD**. The task will be loaded into the active task and the task edit dialogue will be opened.

It is also possible to delete tasks from the active waypoint file. Press the **DELETE** button to delete the selected task.

Tasks can be sorted by start point, task distance and task description. Press the **SORT** button to toggle the sort method.

### 6.7.8 Moving a Task Point

If at least one observation zone is defined as an assigned area, it is possible to move a point within this area. Moving a point will increase or decrease the total task length. Select the **MOVE** action within task mode. A dialogue with the current assigned area will be shown.



In the upper-right corner the remaining task distance, required task speed, remaining task time, delta time and estimated time of arrival are shown.

**Delta time** is the difference between the remaining time and time of arrival. If it is negative you will arrive back home too soon and if it is positive you will arrive too late. Keep in mind that the time of arrival can be calculated using different methods which are found in the QNH and RES setup (see Chapter 6.1.1).

A point is moved using the lower two knobs.

Press the **DIS/BRG** or **LON/LAT** button to toggle between the two methods of moving the point.

When the **DIS/BRG** button is shown the point is moved in the x, y directions. Use the PAGE selector knob to move the point in the north/south direction or rotate the ZOOM selector knob to move point in east/west direction.

If the **LON/LAT** button is shown the point is moved in the radial and azimuth directions. Radial direction is indicated with red line going through whole sector. Rotate the PAGE selector knob (page selector) to move the point in the radial direction from the area centre. Use the ZOOM selector knob (zoom) to move the point in the axial direction.

If more than one assigned area is set for a task the **NEXT>>** button is shown in the lower line. Press this button if you wish to move the point into another assigned area.

## 7 Navigational page layout

On the main display unit navigational page layout can be completely modified and customized to match user preferences. There are two possibilities for page customization.

- **LX Styler program**, a free program for Windows operating system, which can be downloaded from our webpage [www.lxnav.com](http://www.lxnav.com). (See LX Styler manual for more details)
- **LAYOUT** option on main display unit, where you can modify selected navigational page.



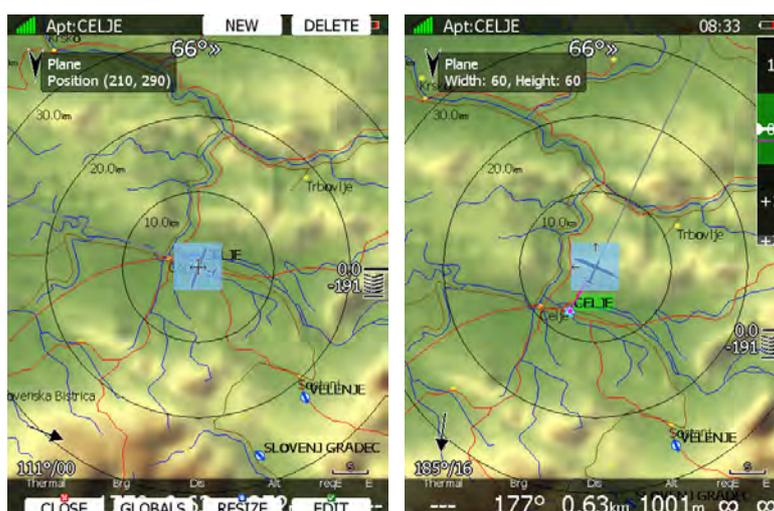
We highly recommend using LX Styler program instead of LAYOUT option.

**LX Styler** can be used in comfort of your house during long winter period, when you have limited access to your glider.

Use **LAYOUT** option to make quick changes to layout, just before going to fly.

In this chapter only customization on device will be explained. For more info about LX Styler please refer to its manual.

Navigational page consists of many symbols and navboxes, each of them if fully customizable. Press **LAYOUT** button on navigational screen and device will enter page customization mode.



Selected symbol will be drawn with light blue background. In top-left corner information about this symbol is give. In the middle of symbol there is cross with arrows drawn, which indicates, symbol is now in move mode. This is also indicated by position label in information text box in top-left corner.

Use PAGE selector knob to move symbol left and right and ZOOM selector knob to move symbol up and down.

Rotate MODE selector knob to select different symbol.

There are several actions available via speed buttons:

- **NEW** will create new symbol
- **DELETE** will delete selected symbol. A confirmation message will be displayed prior to erasing of symbol
- **EDIT** action will launch edit dialog for selected symbol. All details for selected symbol are setup there.
- **RESIZE/MOVE** button will toggle between move mode and resize mode. When in move mode inside symbol will be drawn a cross with arrows and position is print in information text-box. When in resize mode, two arrows are drawn on the edge of

symbol. They are showing also direction of resizing. In information text-box height and width of symbol are given.

- **GLOBALS** will open dialog, where global properties of navigational page are set. Use this dialog, if you want to change font properties for all the symbols at once.
- **CLOSE** action will close page customization mode and return to normal navigational mode.

## 7.1 Global styles for navigational page

Press GLOBALS button to open dialog for global styles.



Dialog is splitted into four groups. First group defines colours and font properties for title of navbox. Second group defines colours and font properties for navboxes main value. Third group defines properties of navboxes, which have only a single line. In last group background on navigational page is defined.

## 7.2 Creating new symbol

Press NEW button to add a symbol to navigational page. A pull down menu will open.



When symbol is already included on the page, it will be grey-out. There are several symbols available:

- **Navboxes** are symbols which have numeric value.
- **Label** is just a plane label with text. You can use it for checklist
- **Map and Plane** will add map and aircrafts symbol to the page

- **Orientation** symbol is showing direction of north.
- **Final glide** symbol shows current MacCready setting and information about required altitude. It is highly recommended to include this symbol on navigational page.
- **Battery** displays status of power supply.
- **GPS Status** indicates status of gps signal.
- **Wind Arrow** shows direction of wind relative to map orientation
- **Zoom** symbol defines scale of map.
- **Side View** enables lateral view of our position toward selected goal.
- **Picture** symbol will print images binded to selected waypoint or airport.
- **Flarm Radar** symbol will display a radar screen showing Flarm targets at predefined zoom, which can not be modified.
- **Artificial Horizon** will show an artificial horizon symbol.
- **Altitude Tape** shows altitude with some additional features like on modern primary flight displays.
- **Airspeed Tape** shows airspeed with some additional features like on modern primary flight displays.
- **Magnetic Rose** and **Magenetic Rose2** displays magnetic rose around aircraft.
- **Flaps tape**<sup>®</sup> is unique display of current and required position of flaps. Scale of flap tape matches airspeed tape.
- **3D map** enables display of synthetic 3D terrain. This option is not available in version 4.0 of firmware.

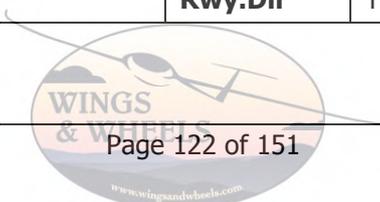
### 7.2.1 Navboxes

Navbox is basic element used on navigational page to display numerical value for selected value. Press EDIT button to edit navbox properties



Navbox consist of numerical value, which can have units or can be without units, and title. Title can be customized only for all navboxes together through GLOBALS style. However title can be hidden. There is a lot of navboxes available. See following table for more details.

Title	Description	Title	Description
<b>60'.Sp</b>	Last 60 minutes speed	<b>ReqAlt</b>	Required altitude to target
<b>AgI</b>	Height above ground	<b>reqE</b>	Required glide ratio to target
<b>Alt</b>	Altitude above MSL	<b>reqFlaps</b>	Requested Flaps
<b>AltGain</b>	Gained altitude in thermal	<b>reqSTF</b>	STF for required MacCready
<b>AltIGC</b>	IGC altitude	<b>Rwy.Dir</b>	Target runway direction



<b>AltInv</b>	MSL in other units	<b>Rwy.Len</b>	Target runway length
<b>Arrival</b>	Arrival altitude on target	<b>sBrg</b>	Bearing to zone center
<b>ArrMc0</b>	Arrival altitude for Mc=0	<b>sDis</b>	Distance to zone center
<b>As.Dis</b>	Distance to nearest zone	<b>STF</b>	Speed to fly
<b>Battery</b>	Battery voltage	<b>Sunrise &amp; Sunset</b>	Sunrise and sunset at target
<b>Brg</b>	Bearing to target	<b>Target</b>	Target name
<b>Code</b>	Target code	<b>tArr</b>	Arrival altitude for task
<b>curFlaps</b>	Current Flaps	<b>tArrMc0</b>	Task arrival altitude for Mc=0
<b>cWind</b>	Head/Tail wind component	<b>TAS</b>	True airspeed
<b>Description</b>	Target description	<b>tDelta</b>	Task delta time
<b>Dew.Temp</b>	Dew point temperature	<b>tDis</b>	Remaining task distance
<b>Dis</b>	Distance to target	<b>tETA</b>	Task estimated time of arrival
<b>DisInv</b>	Distance in other units	<b>tETE</b>	Task estimated time en route
<b>E</b>	Current glide ratio	<b>Th.E</b>	Thermal glide ratio
<b>Elevation</b>	Target elevation	<b>thE</b>	Theoretical glide ratio
<b>Emc</b>	MacCready glider ratio	<b>Thermal</b>	Last thermal vertical speed
<b>Eng.FT</b>	Engine flight time	<b>Time</b>	Local time
<b>Eng.TT</b>	Engine total time	<b>tmAlt</b>	Team partner altitude
<b>ETA</b>	Estimated time of arrival	<b>tmBrg</b>	Team partner bearing
<b>ETE</b>	Estimated time en route	<b>tmCode</b>	Team code of my position
<b>Fin.Elev</b>	Task finish elevation	<b>tmDist</b>	Team partner distance
<b>FL</b>	Flight level	<b>tmName</b>	Team partner name
<b>Frequency</b>	Target frequency	<b>tmRelAlt</b>	Relative altitude of teammate
<b>Gnd</b>	Terrain elevation	<b>tmTo</b>	Relative bearing of teammate
<b>GS</b>	Groundspeed	<b>tmVario</b>	Team partner vario
<b>Hdg</b>	Heading	<b>tmWptcode</b>	Team code for waypoint
<b>Humidity</b>	Relative humidity	<b>To</b>	Steering course to target
<b>IAS</b>	Indicated airspeed	<b>toWind</b>	Head/tail Wind to target
<b>Mc</b>	MacCready Value	<b>tRemain</b>	Task remaining time
<b>Netto</b>	Current netto vertical speed	<b>tReq.Mc</b>	Task required MacCready
<b>OAT</b>	Outside temperature	<b>tReq.Sp</b>	Task required speed
<b>Opt</b>	Optimized distance	<b>Tri</b>	Optimized FAI triangle
<b>OptHome</b>	Optimized distance to home	<b>Trk</b>	Ground track
<b>Pot.Temp</b>	Potential temperature	<b>trqSTF</b>	Task STF for required MacCready
<b>Radial</b>	Radial from target	<b>Tsk.Sp</b>	Task speed
<b>Req.Mc</b>	Required MacCready to target	<b>tskE</b>	Task required glide info
<b>Vario</b>	Current vertical speed	<b>tVario</b>	Average vario for task
<b>VarioFL</b>	Average vario for flight	<b>VarA</b>	Averaged vertical speed
<b>Wind</b>	Current wind	<b>xTrk</b>	Task cross track distance

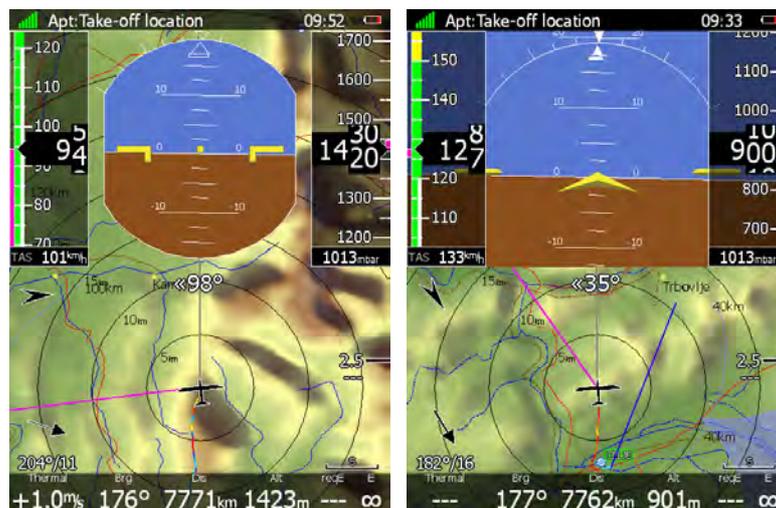
## 7.2.2 Final glide symbol

The final glide symbol is a complex symbol. The bottom number shows your predicted arrival altitude. Negative numbers indicate that you are below the glide path and positive numbers indicates you are above the glide path. In the above example the glider is below

the glide path. Chevrons show the position relative to the required glide path in percent. One arrow means 5% above or below final glide. The middle number is the current MacCready setting. In task mode it is prefixed with the letter **T**, **A**, **B**, **G**, **S** or **AG**. See chapter 8.2.1 for detailed explanation of this mode. Sometimes there will be another number above MacCready which is used for arrival over terrain. If we are on final glide to a selected target but between it and the current position there is a terrain, which cannot be crossed without more height, then this number will give you an estimate, how much you have to climb, to pass over the terrain. A red rectangle will also be shown on the magenta line indicating the point of potential collision.

### 7.2.3 Artificial Horizon

Artificial horizon symbol together with speed tape and altitude tape make a very sophisticated primary flight display out of your main display unit.



Shape of symbol can be customized as well.

### 7.2.4 Altitude Tape

Altitude tape shows altitude band with current altitude in the middle. Additional to that current QNH setting is displayed and trend vector.



### 7.2.5 Airspeed Tape

Airspeed tape shows current indicated airspeed. Band colours are fully customizable to match your aircraft speeds.. Additional to that current true airspeed is displayed and trend vector.



### 7.2.6 Flap tape®

Flap tape displays current and required flap position. Scale of flap tape matches airspeed tape.



Magenta pointer shows required flap settings. White pointer shows selected flap position. Selected flap position band is coloured with green colour, when matching flaps are set. When wrong flaps are set, then selected flap band will be coloured red.

## 8 Flying with the System

To get the best out of the system it is important that some preparation is done prior to take-off. Trying to configure the instrument or set a task while flying is very hazardous especially in a competition. At the least, it could spoil your whole day! Pre-flight preparation will ensure that the flight will be both safe and enjoyable.

### 8.1 On the Ground

#### 8.1.1 Power on Procedure

Press the power-on button. The main display unit and the vario unit will turn on and few moments later welcome screen will appear. The first screen shows the version of the boot loader followed by the version of the Linux kernel operating system, then the version of the file system. The boot procedure normally takes 10 seconds. When completed the profile selection dialogue is shown.



It is recommended to switch the unit ON some minutes prior to take-off to give the GPS receiver time enough to acquire satellites. The flight recorder will also make a take-off baseline. Longer running on the ground will not reduce flight recorder capacity.

#### 8.1.2 Profile Selection



Turn the PAGE selector knob to select the desired profile if more than one profile is available. First profiles stored in internal storage are displayed, next profiles on SD card are shown and at last profiles on USB stick are shown. You will note profile resides on SD card/USB stick with small SD card/USB stick symbol in lower right part of pilot icon.

For the selected profile the pilot name, glider type, loaded waypoint files, loaded airports databases and loaded airspace databases are shown.

If a file is stored on SD card or USB stick, label [SD] or [USB] will be in front of file name.

To learn more about profiles refer to Chapter 6.1.14. Press the **SELECT** button to confirm selection of the profile. Press **DEFAULT** button to start the system with default settings. The set elevation dialogue will be shown next.

### 8.1.3 Set Elevation and QNH

This setting is crucial for final glide calculation: therefore pay careful attention to it.



The instrument will offer elevation from the terrain database based on current latitude and longitude. Elevation will mostly be within few meters from the current elevation. Use the PAGE selector knob to fine-tune the elevation. If the elevation is unknown and the QNH pressure is known you should NOT press button **QNH**. Just keep turning the PAGE selector knob and observe the QNH value to adjust it to proper value. The **QNH** button should be pressed only when airfield elevation and QNH pressure are given. This might happened on some competitions. In all other cases elevation should always match QNH pressure.

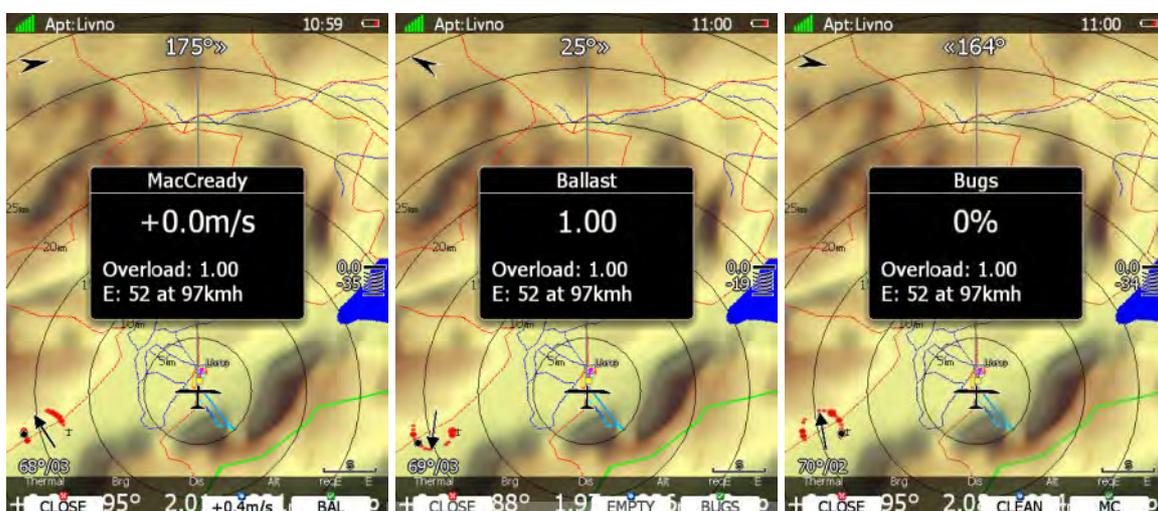


The profile selection and Elevation dialogues are not shown if the system is switched off and on during flying.

### 8.1.4 Preflight Check

After elevation setup the system will switch to airport mode. It will take few moments to draw the map screen for the first time. All waypoint files and databases are loaded at that time and therefore instrument might react somewhat slowly.

It is recommended to check the MacCready, ballast and bugs settings to match the current glider configuration. Press the **MC/BAL** button. The dialogue for MacCready, Ballast and bugs will appear.



Use the PAGE selector knob to modify the MacCready setting. Refer to Chapter 6.5.6.2 for more details.

It is also highly recommended to check the safety altitude setting. Refer to Chapter 6.1.1 to find out how to define the safety altitude.

### 8.1.5 Preparing a Task

While it is advisable to prepare the task properly before taking off and thus avoid mistakes made in a haste, all the following actions, preparing, editing, loading and saving, can be done while in the air. But then, the task cannot be declared in the air.



There is only one task. This task will be automatically declared in the IGC file on take-off. The task can also be modified during flight but any changes will not be written to the IGC file.

There are currently three methods to create a task.

- Read waypoint and task file from SD card and load a saved task.
- Load a similar task and modify it.
- Enter task manually.



It is very important to check the task prior to take-off. Check the turning points sequence, distance between points, bearings and total task distance. Visually check the task and observation zone geometry in the map view.

#### 8.1.5.1 Assigned Area Tasks (AAT)

In fact an assigned area task is a speed task where the task distance is not exactly defined. The pilot has limited influence on the task geometry due to larger observation zones (assigned areas). The pilot decides how far he will fly into each individual area to reach best average task speed and not finishing the task earlier than the designated task time.

An assigned area task has the same structure as other tasks and all known methods to enter are the same as described. The only differences are larger observation zones having a specific geometry. Use the **ZONE** button (see chapter 6.7.4) to modify the individual observation zone.

19.07.2007

**Type: Assigned area task with 4 areas**

**Task time: 02:30:00**

**Task distance: 163,5km/344,4km**

Style	Code	Points	Latitude	Longitude	Dis.	Crs.
Take off		000SZEGE	N46,247500°	E020,091383°		
Start		004DOMAS	N46,252500°	E020,026950°		
1.Point		115MELYK	N46,213050°	E019,371383°	50,6km	265°
2.Point		088KISKO	N46,626383°	E019,299450°	46,3km	353°
3.Point		167SZEKU	N46,504167°	E020,542500°	96,0km	98°
4.Point		006SZATY	N46,329450°	E020,053617°	42,2km	243°
Finish		001SZEGE	N46,252783°	E020,090833°	9,0km	161°
Landing		000SZEGE	N46,247500°	E020,091383°		

Observation zone description:

Start 004DOMAS: To Next Point, Line 6,0km

[ Style=To Next Point, A12=Auto, R1=3,0km, A1=45°, R2=0,0km, A2=0°, LineOnly ]

1.Point 115MELYK: Cylinder R=20,0km

[ Style=Symmetrical, A12=Auto, R1=20,0km, A1=180°, R2=0,0km, A2=0°, Assigned area ]

2.Point 088KISKO: R=20,0km, Brg1=150°, Brg2=270°

[ Style=Fixed Value, A12=30,1° R1=20,0km, A1=120°, R2=0,0km, A2=0°, Assigned area ]

3.Point 167SZEKU: Rmin=10,0km, Rmax=20,0km, Brg1=100°, Brg2=180°, Cylinder R=10,0km

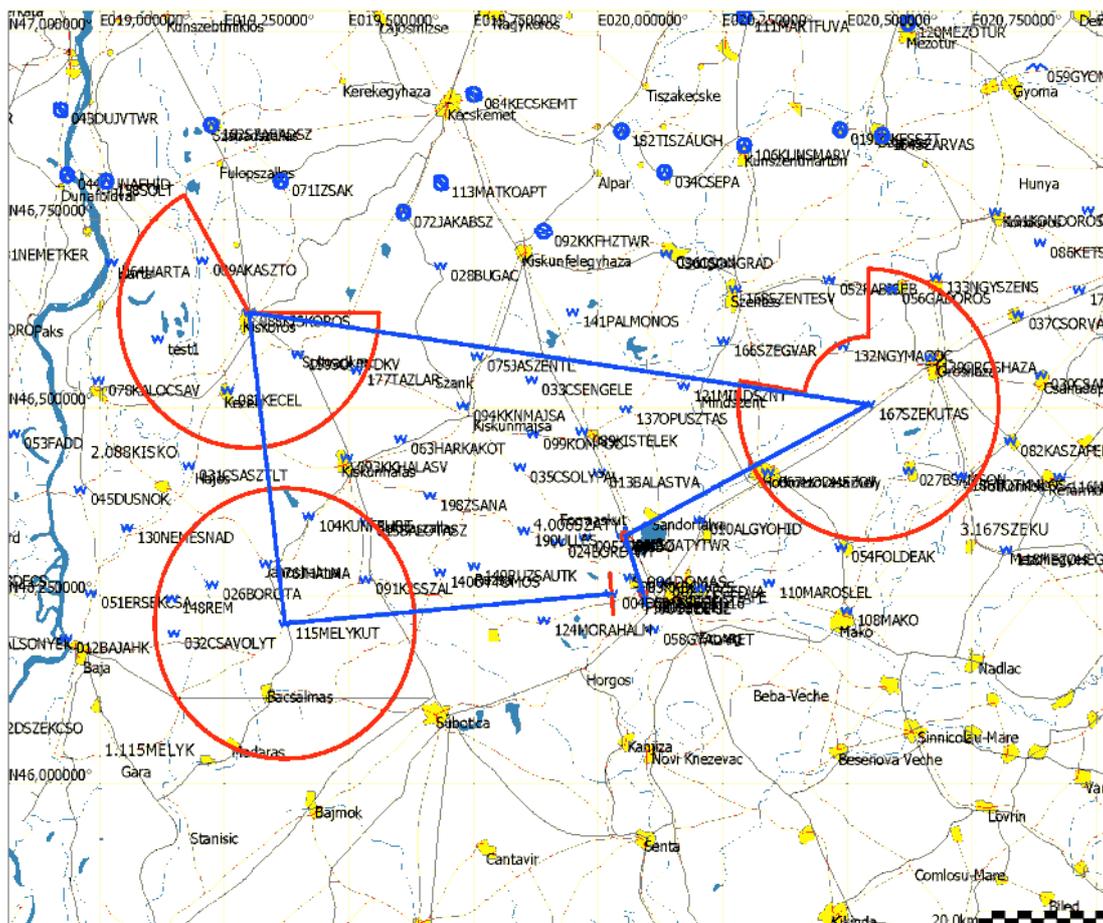
[ Style=Fixed Value, A12=320° R1=20,0km, A1=140°, R2=10,0km, A2=180°, Assigned area ]

4.Point 006SZATY: Cylinder R=500m

[ Style=Symmetrical, A12=Auto, R1=0,5km, A1=180°, R2=0,0km, A2=0°, Assigned area ]

Finish 001SZEGE: To Previous Point, Line 1000m

[ Style=To Previous Point, A12=Auto, R1=0,5km, A1=45°, R2=0,0km, A2=0°, LineOnly ]



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Usually a task sheet with observation zone definitions matching the system observation zone definition will be given. An example of a task sheet is shown on the previous page. However when an assigned area is defined only with two radials and two radii some calculation must be accomplished.

Let us assume an assigned area defined as:

Radial1=30°, Radial2=70°, Min.radius=50 km and Max.radius=200 km

To convert this description the following calculation must be performed:

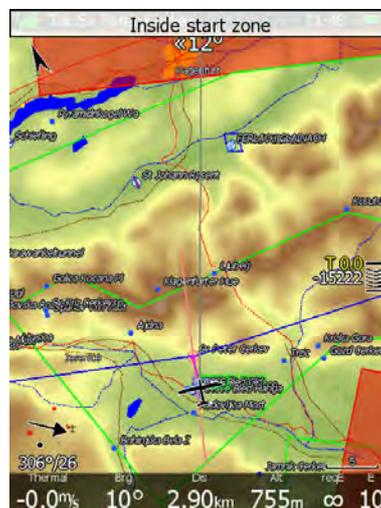
- Direction set to FIXED.
- $\text{Angle12} = (\text{Radial2} + \text{Radial1}) / 2 + 180^\circ = 230^\circ$ . Attention should be paid with northerly directions.
- $\text{Angle1} = (\text{Radial2} - \text{Radial1}) / 2 = 20^\circ$ .
- $\text{Radius1} = \text{Max.radius} = 200 \text{ km}$ .
- $\text{Radius2} = \text{Min.radius} = 50 \text{ km}$ .

## 8.2 Flying a Task

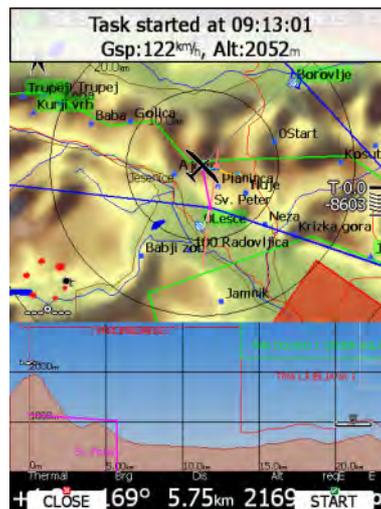
After take-off the unit will switch to flying mode. The pilot will notice this because the statistics page will change from logbook view to flight statistics.

### 8.2.1 Starting a Task

Before starting a task (in task mode) a character "S" will be displayed on the final glide symbol. This indicates that the task has not yet been started. The lower number tells you at what altitude you will start. For more advanced start options such as maximum start speed, maximum altitude and before start altitude see chapter 6.7.5. Once you decide to start the task and glider enters start observation zone, the message "Inside start zone" will be displayed.



You may now leave the start observation zone and fly towards the first turn point. When leaving the start observation zone the message "Task started" will be shown.

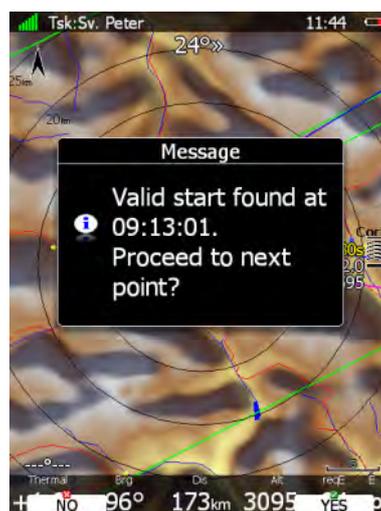


Ground speed and pressure altitude are also shown in the message. At the bottom two buttons are displayed. Use the **CLOSE** button if this was not a valid start and you want to remove the message from screen. If message is removed it will appear again next time you leave the start zone. If you press the **START** button navigation will be advanced to the first turning point.



There is no need to press **START** inside the start observation zone. You may press it any time after leaving the start observation zone or crossing the start line. The system will always take the correct time as start time.

If for some reason you miss the start message you may always start the task by pressing the **START** button. Go to task mode and press any button. In the top row the **START** button is shown. Press this button and navigation will be advanced to the next turn point. In case you change the task in the air and you are already flying towards first turn point you will still be able to start a task. Press the **START** button and a message dialogue to confirm task start will be opened.



### 8.2.2 Restarting Task

If for some reason you decide to abandon the task and you would like to restart the task go to task mode and press any button. In top row the **RESTART** button is shown. Press it. You have to confirm restarting of the task. Once the task is restarted navigation will be changed back to start point.



### 8.2.3 Over Turn Point

When a turn point observation zone is reached the message "*Inside zone*" will be displayed and the task will auto advance to the next turn point if the **Auto next** option was selected (see Chapter 6.7.4).



When the **Auto next** option was not selected the message **NEXT** will be displayed. Press the associated button to advance to the next turn point. If for some reason you missed this message you can always advance the task to the next turn point by pressing the **NEXT** button. Go to task mode. In the upper row the **NEXT** button is shown. Press this button and navigation will be advanced to next turn point.

In case you did not reach turn point and you wish to continue navigation towards the next point anyway press the **NEXT** button.



A message will appear. If you confirm this with **YES** the task will be advanced to the next turn point and it will recalculate the task taking the optimal fix as the task point.

### 8.2.4 Entering Assigned Area

Most probably when entering an assigned area auto advance is going to be turned off. The message "*Inside zone*" will be shown and buttons **CLOSE** and **NEXT** will appear in the lower row. Pressing the **CLOSE** button will dismiss the inside zone message. The task will be auto advanced to the next point when leaving the assigned area. If you want to auto advance to the next turn point earlier you may always press the **NEXT** button in task mode (see 8.2.3).

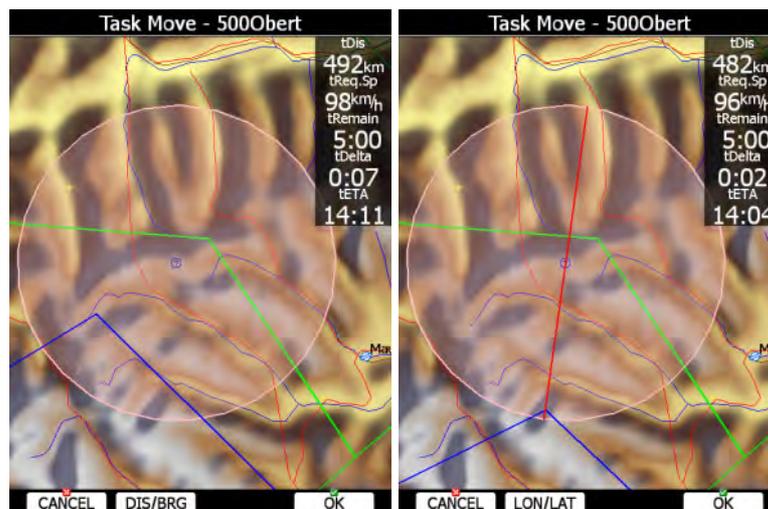
If **NEXT** is pressed the task is advanced to the next turn point.



When flying in an assigned area it is NOT important when you will advance to next turn point. The system is always taking into account the most optimal fix inside the assigned area for the total distance calculation.

### 8.2.5 Moving Point Inside Assigned Area

If at least one observation zone is defined as an assigned area, it is possible to move the point within this area. Moving the point will increase or decrease the total task length. Select the **MOVE** action within task mode. A dialogue with the current assigned area will be shown.



In the upper-right corner the remaining task distance is shown as well as the required task speed, remaining task time, delta time and estimated time of arrival.

**Delta time** is the difference between the remaining time and time of arrival. If it is negative you will arrive back too soon and if it is positive you will arrive too late.

Keep in mind that the time of arrival can be calculated using different methods which are found in the QNH and RES setup (see Chapter 6.1.1).

A point is moved using the lower two knobs.

Press the **DIS/BRG** or **LON/LAT** button to toggle between the two methods of moving the point.

When the **DIS/BRG** button is shown the point is moved in the x, y directions. Use the PAGE selector knob to move the point in north/south direction or rotate the ZOOM selector knob to move the point in east/west direction.

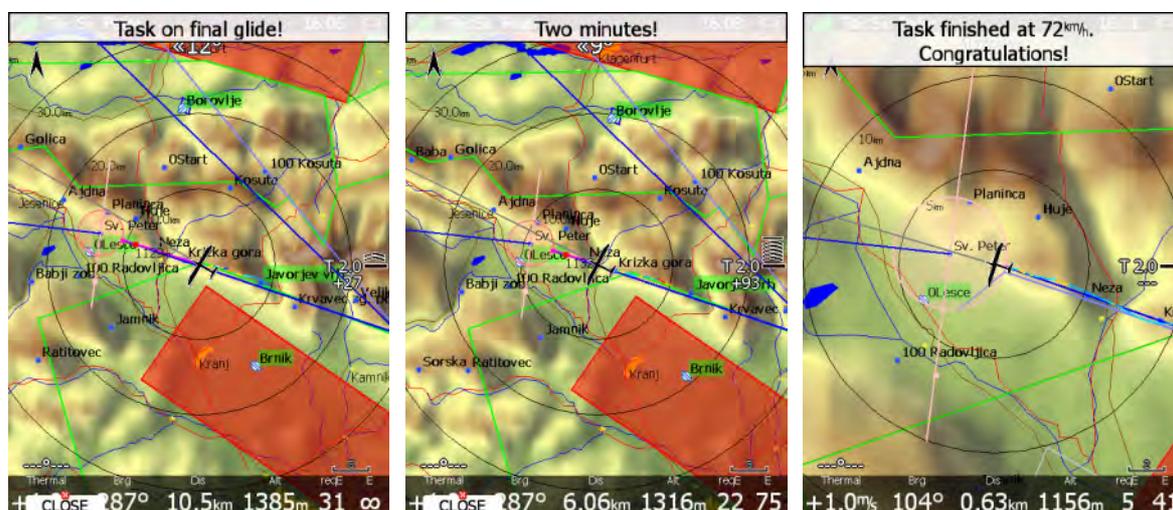
If the **LON/LAT** button is shown the point is moved in radial and azimuth direction. Radial direction is indicated with red line going through whole sector. Rotate the PAGE selector knob (page selector) to move the point in the radial direction from the area centre.

Use the ZOOM selector knob (zoom) to move point in the axial direction.

If more than one assigned area is set for a task the **NEXT>>** button is shown in the lower line. Press this button if you would like to move point into another assigned area.

## 8.2.6 Task Finish

When reaching final glide, a message task on final glide will be displayed. The main display unit will also warn you, when you are two minutes to finish. On entering the finish zone the task stops automatically and a message will be displayed.



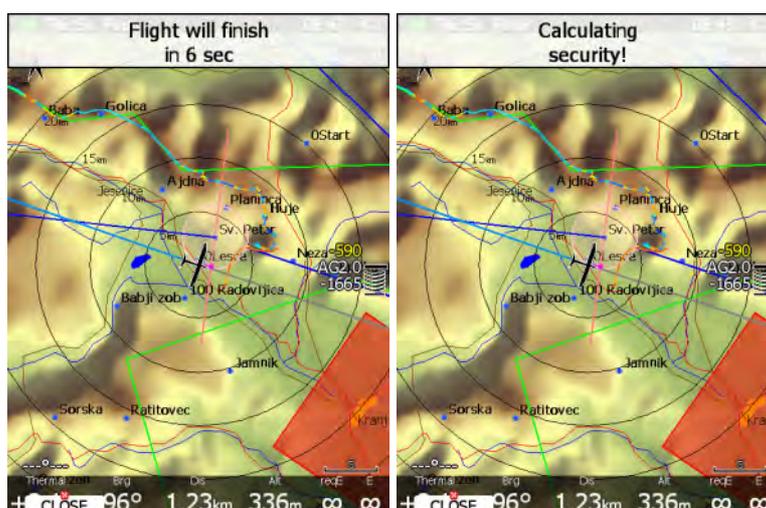
If you want to fly a new task without landing, load the new task and press the **RESTART** button.



The **Navigate to nearest point** option is very useful and actually a must if a finish cylinder is used with significantly large radius. Enabling this option will calculate the final glide to the edge of the cylinder rather than to the centre of the cylinder.

## 8.3 Procedure after Landing

IGC Regulations require a straight line (base line) in the barogram at the beginning and end of the flight. For this reason that it is essential **not to switch the unit OFF** immediately after landing, but to wait a few minutes. First the message "Flight will finish in 10 seconds" will appear and then the message "Calculating security!"



The flight is finished when the message Calculating security disappears. At that moment the statistics page will be changed back to logbook view. Now it is safe to switch off the instrument.

If a SD card or USB stick is currently inserted into the main display unit the flight will automatically be copied to it.

Please use regular methods to power down the system. See Chapter 5.4 for details.



It is important that the system is switched off via software. Never power down the system using the main power switch. The main display unit is running the Linux operating system and sudden power loss may corrupt the file system.

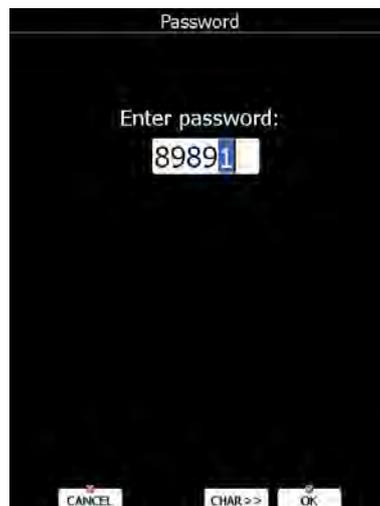
## 9 Firmware Update

Firmware updates of the main display unit, vario unit or vario indicator can be easily carried out using the SD Card. Please visit our webpage [www.lxnav.com](http://www.lxnav.com) and send us a request for the firmware update.

You can also subscribe to a newsletter to receive news about the system automatically.

### 9.1 Updating main display firmware

We will send you an update file and update code. The update code is a string six letters long and the update file has the **.lx9000** or **.lx9070** extension. To proceed with the firmware update copy the update file to a SD card or USB stick and insert it into the main display unit.



Start the main display unit and go to the Setup->Password menu option.

Enter password **89891** and press **ENTER**.

The system will automatically search for an update file. If more than one update file is found a selection dialogue will appear.

After the update file is selected an update code must be entered.

Enter the update code which was sent to you.

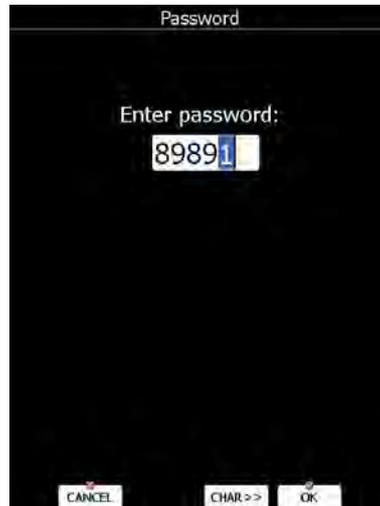




Please note that the update file and update code are a matching pair only applicable to a particular serial number.

Once the update file is verified the main display unit will reboot and the new firmware is ready for use.

## 9.2 Updating vario unit or Vario indicator



Start the system and go to the Setup->Password menu option.

Enter password **89891** and press **ENTER**.

The system will automatically search for an update file. If more than one update file is found a selection dialogue will appear.

Select appropriate update file and wait until update will finish.

## 10 IGC Barograph Recalibration Procedure

The main display unit has an additional pressure sensor for altitude recording. To comply with IGC procedures this sensor has no external pneumatic connection. To carry out the barograph calibration procedure it is necessary to remove the instrument from the glider and place it in a vacuum chamber. The procedure is as follows:

- Switch the instrument ON and wait some minutes (straight line on the barogram beginning).
- Set the recording interval to 1 second (see Chapter 6.1.2).
- Place it in the chamber and carry out a short climb to about 100 m (to start the flight recorder).
- Bring the chamber pressure to exactly 1013.2 hPa.
- Decrease the pressure by 1000 m and hold for about 30 seconds.
- Continue the procedure to 9000 m.
- Increase the pressure in 1000 m steps back to 1013.2 hPa.
- After reaching ground wait about 3 minutes and then switch the instrument off.
- Leave the instrument off for at least 5 minutes.
- Download the last flight and print the barogram.
- Restore the flight recorder settings.

The barogram will be the last flight in the logbook.

## 11 Options

### 11.1 Flarm



Before using Flarm it is highly recommended to read the Flarm user manual which can be downloaded from [www.flarm.com](http://www.flarm.com). Respect all limitations listed in this document.

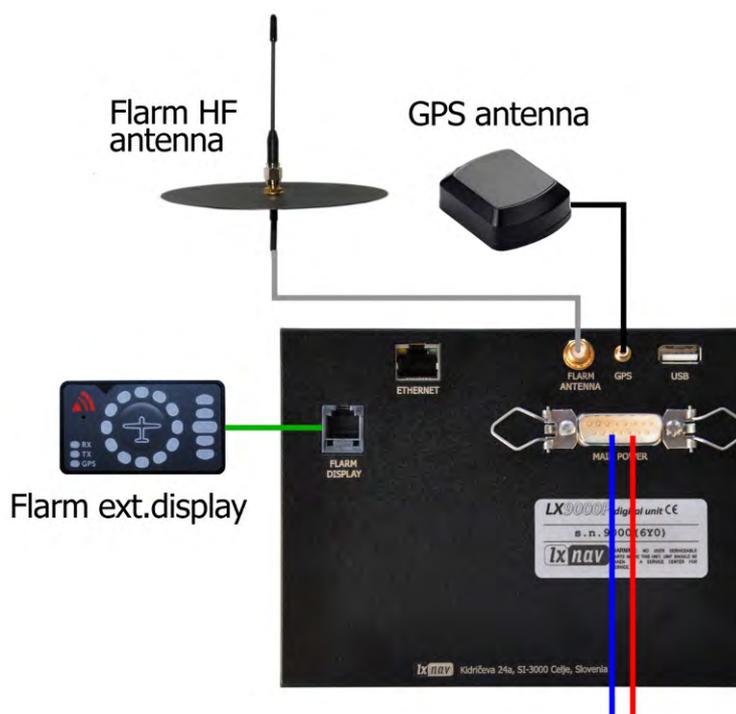
Flarm is a collision avoidance system developed by Flarm Technologies from Switzerland. The Flarm module consists of following main parts: GPS receiver, microcontroller unit, radio transceiver pressure altimeter and optional an external indicator. All electronic parts are integrated into the main display unit cabinet. An exception is the radio communication antenna and the Flarm External Display. Some input is possible via the external display.



In case, that unit has no built flarm, external flarm connection is possible using LX5flarm or LX5PF cable for power flarm.

#### 11.1.1 Installation

The position of the radio communication antenna is extremely important as a bad installation will reduce the system range dramatically. It is highly recommended to install the antenna on the top of the instrument panel with a suitable aluminium round plate having a diameter of about 12 cm used as a back plane and an approximately 10 cm long rubber antenna used as the radiator. The metal plate may be mounted outside or inside of the instrument panel. If carbon is used, use only the top mounting variant.



The antenna position must be mounted as vertical as possible. Use only the original antenna which is always delivered with the unit. Use the original cable to connect the main display unit to the antenna. Never use an antenna without the

original aluminium ground plane. If there is no space to install the metal ground plane a dipole variant of the antenna is available. The picture shows the connected GROUND PLANE antenna. With the system a DIPOLE antenna is included which has an even better performance than a ground plane antenna.

The Flarm external display is a small unit and can be placed anywhere on the instrument panel. To fix the device, use self-adhesive tape on the back of the device. For position on the top of the instrument panel a suitable box is available.

### 11.1.2 Flarm Update Procedure

The Flarm is updated via the SD card. From the Flarm web ([www.flarm.com](http://www.flarm.com)) Support / Updates page download the appropriate file and copy to the SD card (e.g. flarm\_407.fw). Enter password **89891** and select the Flarm update file. Wait until it is completed.

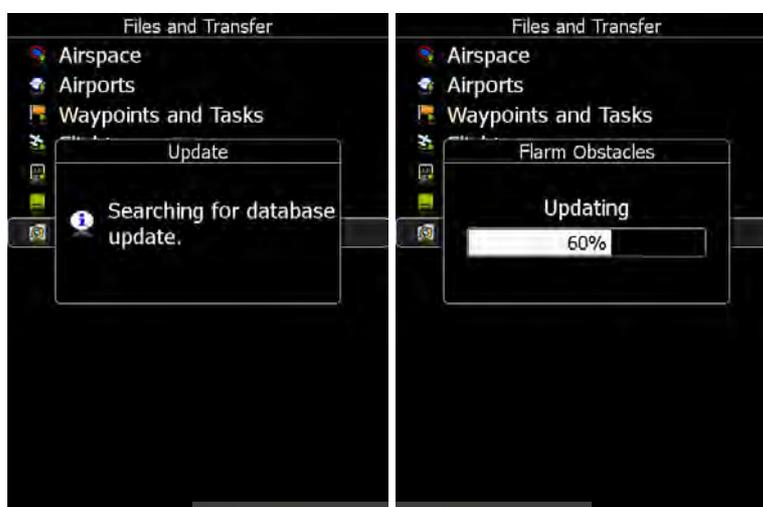


In case of a problem it is still possible to perform an update using FLARMtool and the serial connection. Please refer to an older LX8000 manual for the detailed procedure.

### 11.1.3 Uploading Obstacles

Obstacles are updated via the SD card too. Go to the Flarm webpage, download the obstacle file (e.g. alps20090727\_.obs) and copy it to the SD card.

In the **Files and Transfer** menu select the **Update Databases** menu item. Select the obstacle file and wait until the update completes.



#### 11.1.4 Uploading FlarmNet Files

The FlarmNet information is also updated via the SD card. Go to the FlarmNet site ([www.flarmnet.org](http://www.flarmnet.org)), select the **Download latest FlarmNet File** tab and download the file for the LX8000 (e.g. 20091208.fln). Copy this file to the SD card.

In the **Files and Transfer** menu select the **Update Databases** menu item. Select the FlarmNet file and wait until the update completes.



## 11.2 Rear Seat Device



In two-seat gliders it is possible to install the rear seat device. The rear seat device looks almost identical to the main display unit. However inside the device there is no GPS or Flarm module. The rear seat device must be connected only to the main display unit via the RS485 bus system. The basic idea of two-seat configuration is that both devices work independently from each other with the possibility to exchange various data on user request or automatically.



On back side of LX9xxxD is Flarm port which is inoperational.

### 11.2.1 Data Exchange

Because the GPS and Flarm modules are not integrated in the rear seat device this data is received from the main display unit through RS485 bus.

After power on, the main display unit also sends polar data and pilot information to have them synchronised in both devices.

The user can define which data will be automatically synchronised between the devices.



Waypoint and task databases are not synchronised between the devices. In order to have databases synchronised, you have to use the SD card and copy files from the rear to front device or vice versa. See Chapter 6.1.5.4 for how to copy waypoint files.

To set up data which is going to be received from the rear seat device, enter the "Rear seat device" menu on Main display unit (see Chapter 6.1.12.8).

To define which data is going to be received from the main display unit go to "Front seat device" menu (see Chapter 6.1.12.8).



Data is divided into two groups; flight parameters and navigational data. If a specific value is checked this value will be automatically be received from the other device.

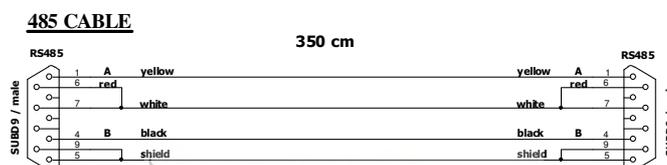
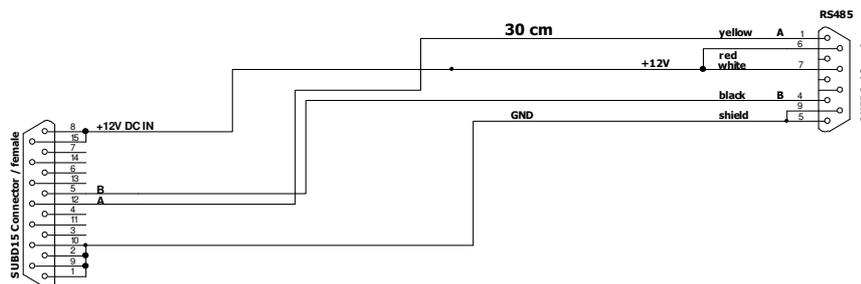
Check **MacCready**, **Ballast** and/or **Bugs** to receive the current MacCready value, current ballast setting or bugs from the other device.

If **Waypoint** is checked a new waypoint target will be automatically assigned when the user changes the waypoint target on the other device. A message "Waypoint target received" will be shown on the screen and you will be navigating to the same waypoint as other device. Please note that it is not necessary to have this waypoint in your databases as the complete waypoint information is sent. If **Waypoint** is not checked it is still possible to send a target to other device using the **SEND** action in waypoint mode. The same applies to the **Airport** checkbox. The message "Airport target received" is displayed. If the **Task** checkbox is checked the task will be synchronised with the other device.



When flying an assigned area task it is worth having **Task** unchecked. This will allow one pilot to play with "what if" scenarios. Once a proper direction is found you can send the task to the other device using the **SEND** action in task mode.

### 11.2.2 Cable Wiring



## 11.3 ADSB-Receiver (TRX-1090)

It is possible to connect to the system with build in Flarm an ADSB-receiver TRX-1090 from Garrecht Avionics ([www.garreicht.com](http://www.garreicht.com)).



TRX-1090 can only be connected to the system with integrated Flarm option.

The TRX-1090 has been developed to upgrade the FLARM collision avoidance system, which is installed in more than 13.000 aircraft worldwide. The unit will be connected between FLARM and a FLARM compatible external display unit and will simultaneously show FLARM targets and Mode-S transponder equipped aircraft with ADS-B output capability. The presence of transponder equipped aircraft not broadcasting ADS-B output will be detected and indicated on the connected display as a non-directional target. The TRX-1090 comes with a high sensitivity low distortion receiver unit and a highly complex and powerful signal processing unit with multi-level error correction algorithms to provide data with a very high accuracy.

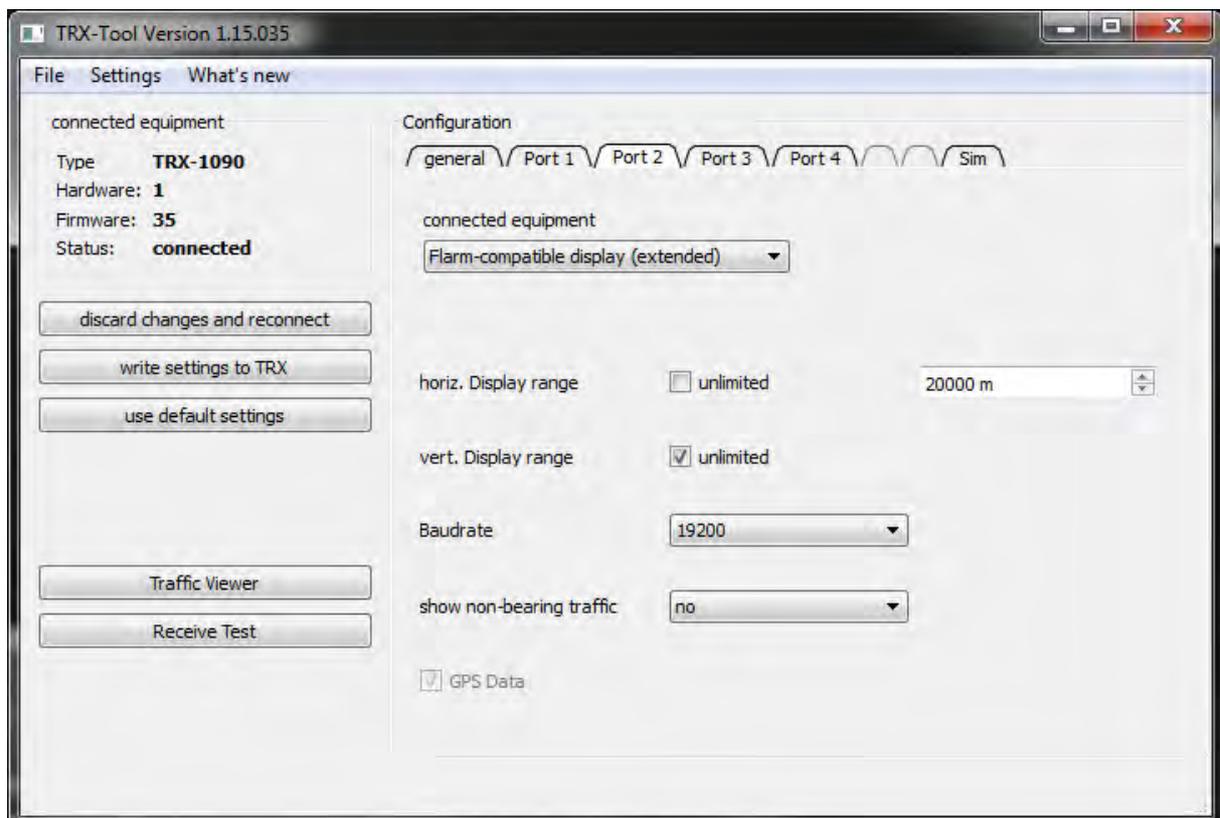
### 11.3.1 Installation

#### 11.3.1.1 TRX tool

Using the TRX-Tool program you should configure also TRX-1090 to be used together with the system. TRX-Tool can be downloaded on the web (<http://www.garreicht.com>) under Support/Downloads/Software section. Run the TRX-Tool program and connect the TRX-1090 to PC using a USB cable. Select Port4 tab and change connected equipment to LX8000 (or FLARM without RX line connected).



Select Port2 tab and change **Baud rate** to 19200bps.



The LX90xx system and TRX-1090 are now ready for operation. On the info page you should see the TX sign and number of received objects.

### 11.3.1.2 Connecting TRX-1090 to the system

Disconnect cable from the Flarm external display and connect the free cable to Port4 on the TRX-1090. Use the LX9000-TRX cable (not-included, must be ordered separately) and connect it between PORT2 and PC port on the main display unit.

On the main display unit go to the setup menu and choose Hardware->Flarm menu item. Change mode to **Ext.(PC)**.



Port on LX9000		Cable		Port on TRX 1090
LX9000 FLARM	->	via cable (Flarm-TRX1090)	->	TRX Port4 (Flarm original or compatible)
LX9000PC (5pin rounded connector)	<-	via cable (TRX LX9000)	<-	TRX Port2 (Flarm Compatible display, set to 19200)

## 11.4 External Flarm or Power Flarm

If main display unit has no internal Flarm, user has a possibility to connect to it external Flarm or Power Flarm. All Flarm/Power Flarm items will be displayed on the navigation map, with same functionality as is with built-in Flarm.

### 11.4.1 Installation

External Flarm/Power Flarm can be connected to the main display unit with **LX5FLARM** cable.

On main display unit side LX5FLARM is connected to 5 pin rounded connector. On the other side of LX5FLARM cable is 6 pin standard IGC RJ12 plug connector, which is plugged into Flarm/Power Flarm port.



Using improper type of cable may harm your display unit or Flarm/Power Flarm units.

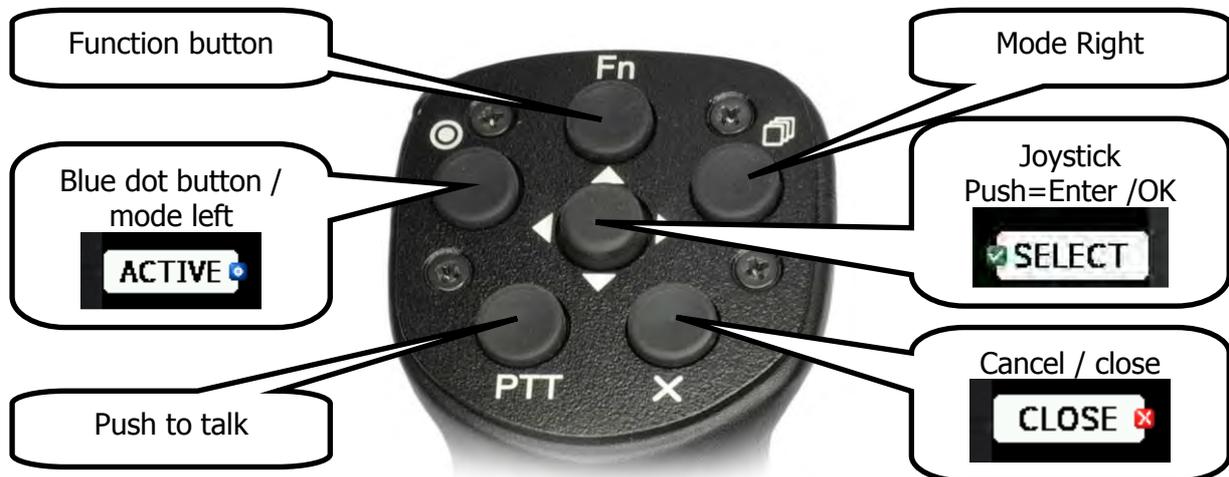
## 11.5 Remote Control

Remote stick is available in three different versions. Normal one, with red starter button or with trim switch



The stick is available also in various diameters: 18 mm, 19.3 mm, 20.3 mm, 24.4 mm and 25.4 mm. All necessary electronics is built into the top of the stick. The four coloured wires from the bottom must be connected to RS485 splitter. Additionally two shielded cables are used for speed to fly command and push to talk button.

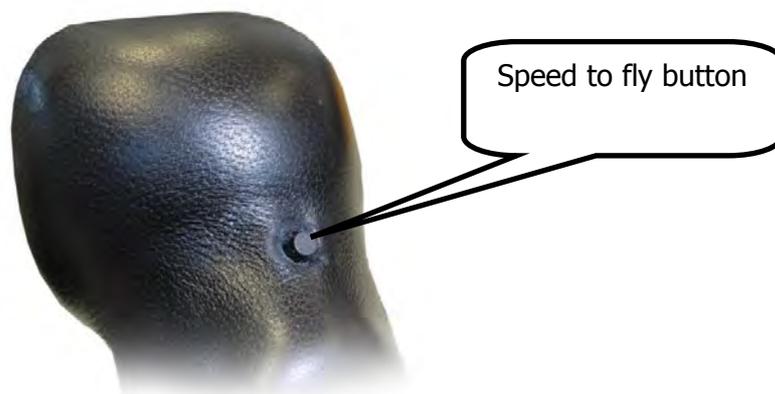
### 11.5.1 Functions



Remote stick has six push buttons and one multi-directional button in the middle. Move multi-directional button left and right to zoom in and out. Move it in up and down direction to select different page or to move on menu. Press it to select an item or to invoke a menu in navigational mode.

On the main display unit some of the speed buttons have small icons. There are three icons available: **red cross**, which corresponds to the X button on the remote, **blue dot**, which corresponds to the upper left button with a dot, and **green tick**, which is the middle button.

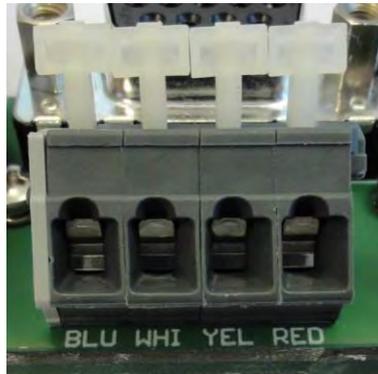
The function button is a custom button, whose function can be set by the user (See chapter 6.1.12.9).



On the front side of the remote stick there is a speed to fly button.

## 11.6 Installation

Remote stick is connected to RS485 bus through RS485 splitter. Be careful to connect correct coloured wire to pin, which is marked with same colour.



PTT wires are connected to radio push to talk input and SC wire is connected to Speed to fly input of vario unit.



Do not forget to set the speed command input setting to TASTER (see Chapter 6.1.12.1).



After installation there is no special setting required on main display unit as the remote stick will be automatically detected.

## 11.7 Flap sensor®

The flap encoder is connected to the system via the RS485 bus. It is physically mounted near the flap mechanism. The flap encoder is very sensitive and accurate and can detect very small movements.



Please refer to flap sensor manual for details about installation. For configuration on the main display unit see Chapter 6.1.12.13.

## 11.8 Secondary Vario Indicators

An unlimited number of secondary vario indicators can be connected to the system bus. RS485 splitting units should be used to extend the bus capacity. The functionality of secondary units depends on settings made in setup (see chapter 6.1.12.1.4).

Each unit has two female nine-pin connectors on the back side. Both connectors are 100% pin to pin compatible and it doesn't matter which will be used. Any other RS485 bus operated unit can be any time connected to a free connector port of the vario indicator.

## 12 Revision History

September 2010	Initial release of owner manual based on LX9000 manual version 2.3
April 2011	Corrections to English language text. V5 vario unit
September 2011	Updates for firmware version 2.6. Added AHRS section.
February 2014	Updates for firmware version 4.0.