

LX9000

(Including the LX9000D Rear-Seat Device)
Variometer and GPS-Navigation System

Version 2.6



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1 Important Notices

The LX9000 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 LX9000 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 LX9000 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 Packing Lists

2.1 LX9000 With Flarm Option

- LX9000 digital unit
- LXNAV V5 vario unit
- Main power cable for digital unit
- Cable for vario unit
- SD card
- Barogram calibration chart
- GPS antenna
- Flarm Antenna
- Hex key "Inbus"

2.2 LX9000 without Flarm Option

- LX9000 digital unit
- LXNAV V5 vario unit
- Main power cable for digital unit
- Cable for vario unit
- SD card
- Barograph calibration chart
- GPS antenna
- Hex key "Inbus"

2.3 LX9000D

- LX9000D
- Main power cable
- RS485 cable – 4 meter
- RS485 splitting unit
- Vario indicator with cable
- SD card
- Hex key "Inbus"

3 Basics

3.1 The LX9000 at a Glance

The instrument consists of two units; the LX9000 digital unit and the vario unit. Within the LX9000 digital unit an integral 16-channel GPS receiver and a high brightness colour display with 640 x 480 pixels are fitted. An integrated SD card or USB interface is used for user friendly data exchange. The LX9000 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 LX9000 digital unit.

The 57 mm diameter (2¼") LXNAV V5 vario unit is a modern designed variometer with its own processor. It features an mechanical needle with colour display for additional data. The unit communicates with the LX9000 digital unit over the RS485 system bus. Optionally additional vario indicators and a wide range of interface devices can be daisy-chained using the RS485 bus.



3.1.1 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 way points.
- 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.

3.1.2 Vario Unit Features

- Mechanical needle driven by stepper motor indicating various data such as netto vertical speed, relative (super netto) and vertical speed.
- 240x320 pixels colour screen for additional information such as average, thermal vario, time, speed etc...
- Integrated voice module
- Many custom audio settings
- 100Hz sampling rate for very fast response.
- Speed to fly indication.
- TE compensation can be selected to be either pneumatic TE probe or electronic TE.

3.1.3 Interfaces

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

3.1.4 Options

3.1.4.1 Internal Options

Integrated Flarm electronics can be built into the LX9000 digital 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. One bicolour LED Flarm External display is included in the delivery; extension to a second seat is possible.

3.1.4.2 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 LX9000 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 LX9000 bus system:

- **Second Seat Device (LX9000D, 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 LX9000 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.
- **Electrical Compass Device**
- **Secondary Vario Indicators**

AHRS module can also be used as an external option. However it is connected to USB interface.

3.1.4.3 Simulator

There are two options to stay in condition and familiar with your LX9000.

LXSim is free of charge program, which you can download from www.lxnav.com.

Or data from the Condor PC flight simulator (www.condorsoaring.com) can be received via the RS232 port after entering suitable passwords (see Chapter 5.1.15).

These features are extremely useful for pilots who want to learn about the LX9000 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.

3.1.5 Technical Data

- 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 V5 vario unit
- Cut-out dimensions of the LX9000 digital unit are 109 x 143 mm; outline dimensions: 113 x 145 x 40 mm exclusive connector.
- 57 mm (2¼") standard aircraft cut-out for the vario unit; length 92 mm (inclusive connector).

3.1.6 Weight

- LX9000 digital unit: 650 g
- V5 vario unit: 300 g

4 System Description

The LX9000 can be mounted at portrait or landscape orientation. After installing the LX9000, the orientation must be defined via the Display menu (see Chapter 5.1.4).



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

4.1 Rotary Switches and Buttons

The following controls are mounted on the front face of the LX9000 digital unit:

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

4.1.1 Landscape orientation



4.1.2 Portrait orientation



The vario unit is an indicator only and has no controls. Information displayed is controlled by the LX9000 digital unit.

4.1.3 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.

4.1.3.1 Power Button

The power button is marked with the ON/OFF symbol. It has multiple functions. Primarily it is used to switch the LX9000 system on and off.

4.1.4 Rotary Switches (Knobs)

The LX9000 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 switch 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.

4.2 Switching on the Unit

After a short press of the power-on button the LX9000 and vario units 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 LX9000 firmware and the IGC serial number. When the boot procedure is completed the profile selection dialogue is shown. Please refer to Chapter 7.1 for more details about starting up the LX9000.

4.3 User Input

The LX9000 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:

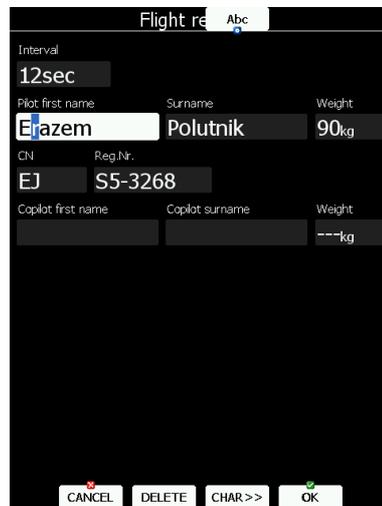
- Text editor
- Masked text editor
- Spin controls
- Selection control
- Checkboxes
- Colour selector
- Line width selector

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

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

4.3.1 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.

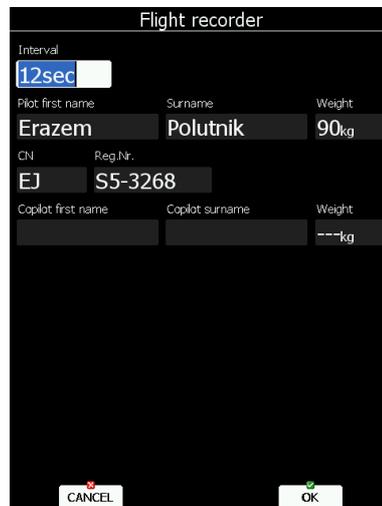
4.3.2 Masked Text Edit Control

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.



4.3.3 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.

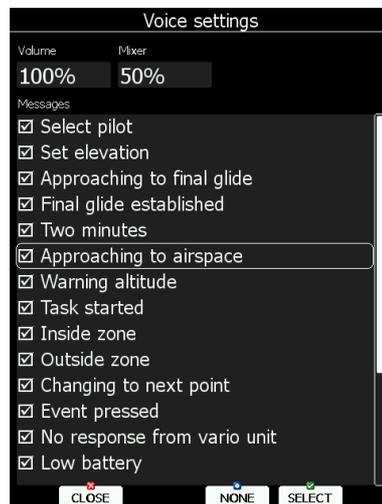


4.3.4 Selection Control

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.

4.3.5 Checkbox and Checkbox List

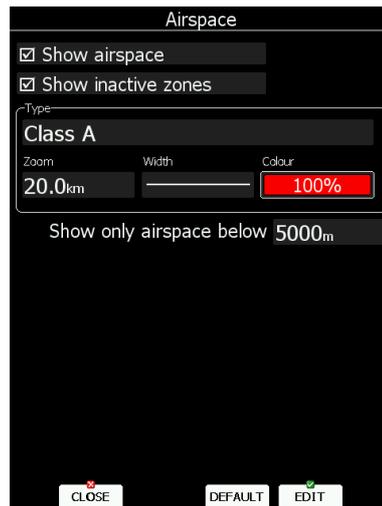
A checkbox enables or disables a particular parameter. Press **SELECT** to toggle the value. If an option is enabled a check mark will be shown, otherwise an empty rectangle will be displayed.



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

4.3.6 Colour Selector

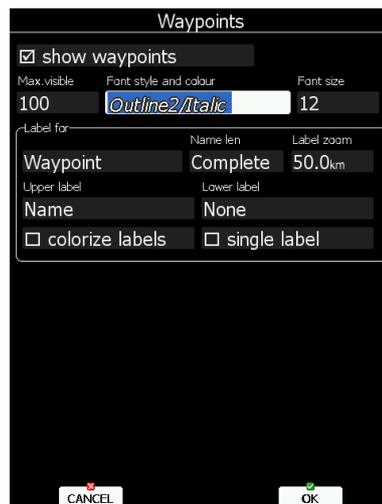
Colours and fills are set via the colour selector control. Rotate the page selector to change a colour.



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.

4.3.7 Font Selector

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



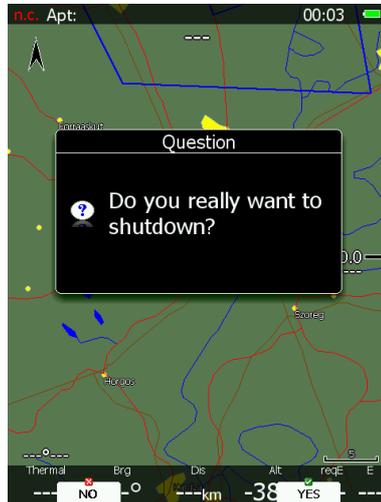
Turn the lower-right knob (page-selector) to change the font style. Text is also rendered in the selected font style. Turn the lower-left knob (zoom-selector) to change the font colour.

4.4 Switching off

Please use one of the following recommended methods for shutting down the LX9000:

Method 1

Press the button with the **OFF** label which is displayed in navigational modes. See Chapter 5.5 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 LX9000 will perform an unconditional shutdown. This method is recommended only in case that the LX9000 program hangs and it is not possible to shutdown with methods 1 or 2.



If you are using method 2 to switch off the LX9000 it is necessary to release the button when you see the shutting down message. If you continue to press the off button the LX9000 may shut down by method 3.

If the request for OFF is made during flight the instrument will ask for confirmation so that the LX9000 cannot be switched off by mistake.



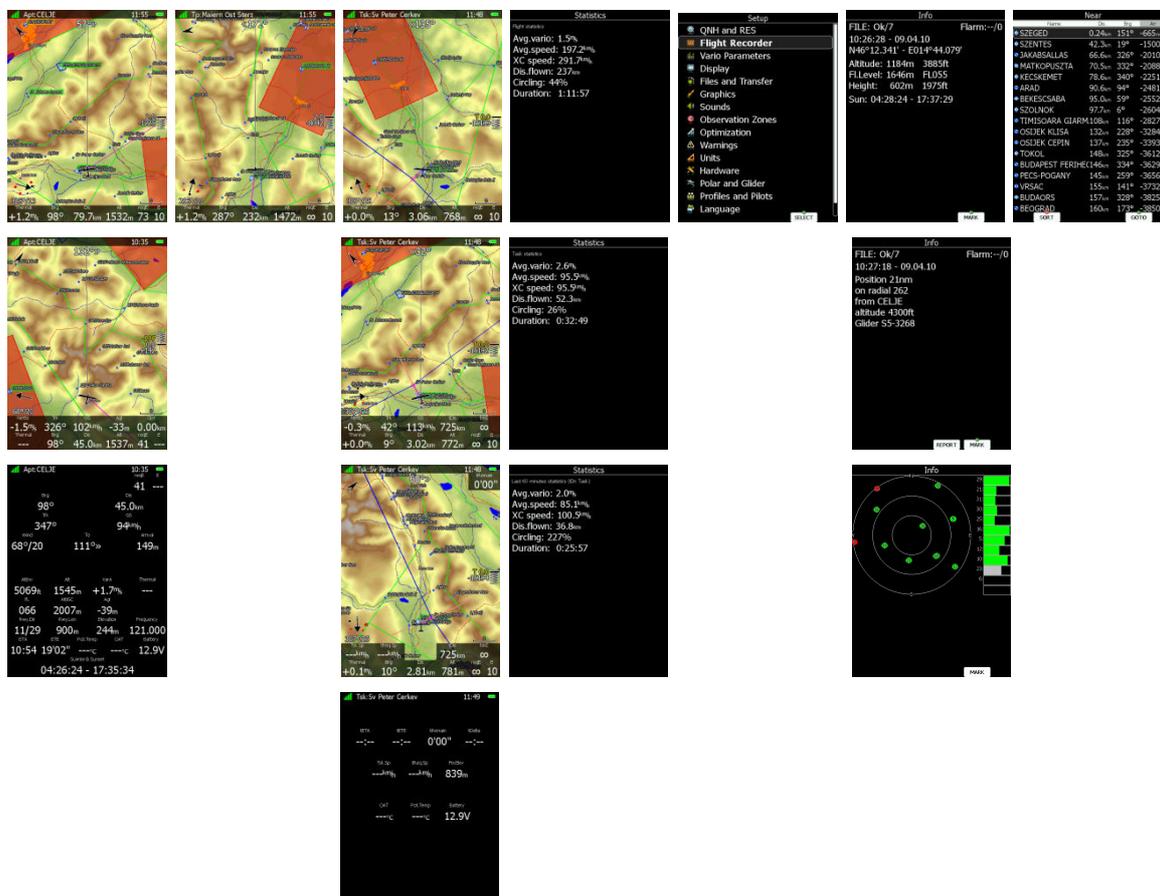
It is important that the LX9000 is switched off via software. Never power down the LX9000 using the main power switch. The LX9000 is running the Linux operating system and sudden power loss may corrupt the file system.



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.

5 Operating Modes

The LX9000 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.



- **Airport Mode**, navigation and selection airports.
- **Way Point Mode**, navigation, selection and editing way points.
- **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 LX9000.
- **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 way points 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. Refer to Chapter 5.1.14 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 and is available at no charge on our web pages. See Chapter 5.1.5.2 for more details how to obtain the latest databases.

In way point navigation mode the user is navigating to way points that were previously loaded and selected in the **Files and Transfer** menu (see Chapter 5.1.5.4).

Task navigation mode is used for task creation and manipulation. Navigation in this page is exclusively to task points.

5.1 Setup Mode

In the setup menu users can configure the LX9000. Turn the bottom-right knob or press the UP/DOWN arrow on the remote stick to select the appropriate setup item. Press the **SELECT** button or CHECK 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.

5.1.1 QNH and RES

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



5.1.1.1 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.

5.1.1.2 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.

5.1.1.3 Magnetic Variation

The LX9000 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.

5.1.1.4 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**.

5.1.1.5 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.

5.1.2 Flight Recorder

The LX9000 digital 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 5.1.11). If the LX9000 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 5.1.13).

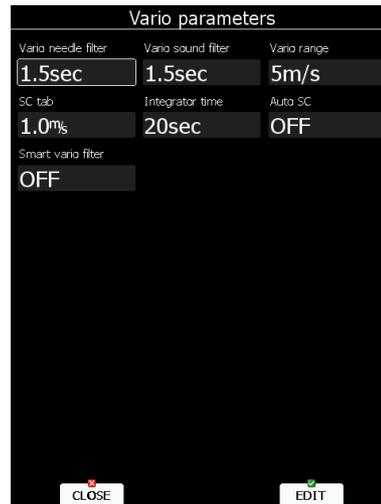


There are very few settings for the flight recorder compared to other instruments. This is because the LX9000 will record all additional data such as wind, speed and vertical speed by default.

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 5.1.12.

5.1.3 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 ± 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.
- **TAS:** When the TAS exceeds a pre-set value. The TAS 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. Behaviour of filter is different for types of attached variometer:

On V5 variometer smart vario filter defines how much filter is different for increasing vertical speed versus decreasing vertical speed. (E.g.: If vario filter is set to 1s and Smart vario filter is set to 4, then filter for increasing vario be 1s and for decreasing vario it will be 2s). This will produce an effect like on Sage variometer.

On older models of variometer smart filter value gives us four levels of dynamic damping of the vario.

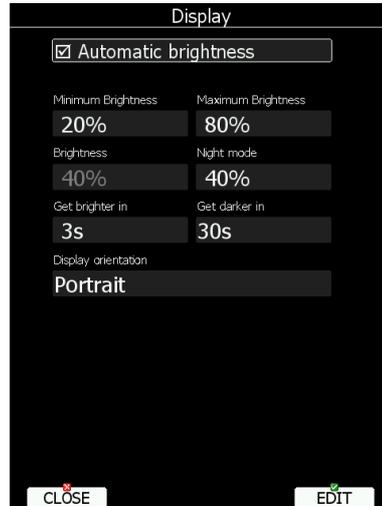
Auto reset integrator resets the integrator to zero when the LX9000VU switches from SC to VARIO mode. If this item is not checked the integrator will not be reset to zero (this function is supported with LX9000VU version 2.05 or higher).



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

5.1.4 Display

The display menu controls screen brightness. The LX9000 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.

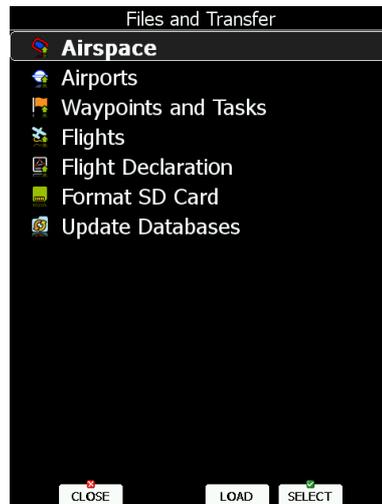
Change **Display orientation** if you would like to change the LX9000 screen orientation. The LX9000 will restart and start with new screen orientation.



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 3.1.5).

5.1.5 Files and Transfers

The Files and transfer menu is used to manage the way point, airspace and airport databases.



5.1.5.1 Uploading User Airspace and Way Points

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. A dialogue with a list of all available files will be opened. Press the COPY button to copy the selected file to the LX9000. The LX9000 will accept the following file formats:

- **Waypoints file:** SeeYou CUP files, LX navigation DA4 files and Cambridge/Winpilot DAT files. When selecting DA4 or DAT files, way points will be converted to CUP format which is the format used for internal storage of points. There is no limitation for the number of way points in a file and/or name length.
- **Airspace file:** All types of CUB files are accepted.

5.1.5.2 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.

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 LX9000 and select the **Update**

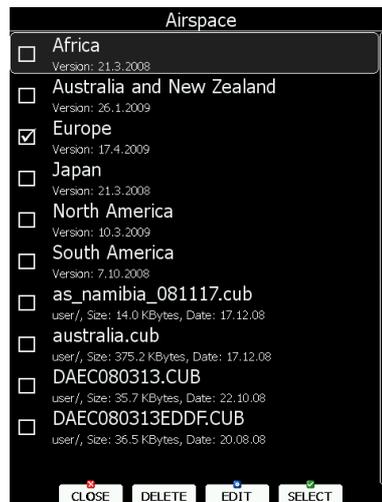
database menu item. If multiple ASAPT files are found on a SD card a dialogue to select the appropriate one will be shown.



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

5.1.5.3 Managing Airspace

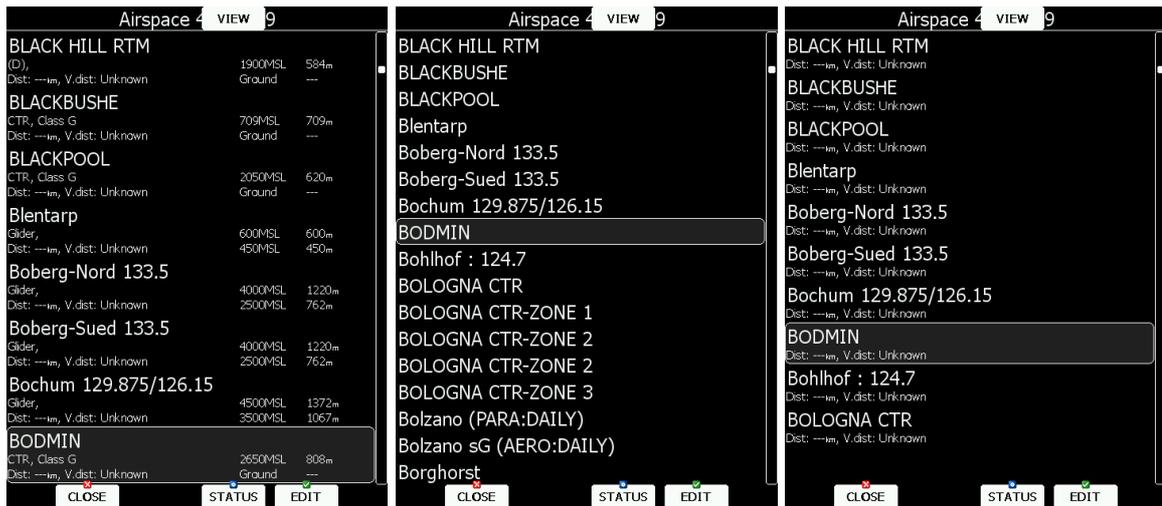
Select the **Airspace** menu item and press the **SELECT** button. A list of all available airspace databases/files will be shown on screen. The distributed airspace databases are shown first followed by user airspace files.



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.

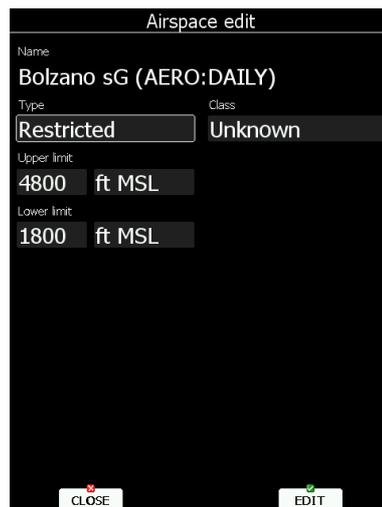
To delete airspace file select the airspace item and press the **DELETE** button. Delete action must be confirmed. Only user airspace files can be removed.

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.



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:

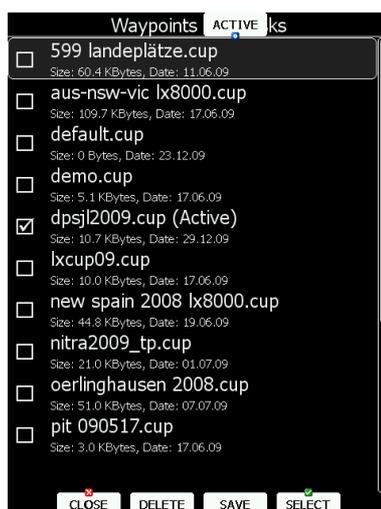
- **OFF always:** proximity warning is switched off for all the time.
- **OFF today:** proximity warning is switched off for today only.
- **OFF hh:mm:** proximity warning is switched off for 10 minutes.
- If **no label** is shown airspace is enabled for proximity warnings.



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

5.1.5.4 Managing Way Points

Select the **Waypoints** menu item and press the **SELECT** button. A list of all available way point 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 way point is of the proper type (airport or outlanding place). However, only one file can be the active file. The active file is used for task creation.

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

Press the **DELETE** button to remove the selected file from the LX9000.

Press the **SAVE** button to save way points 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. When the compatibility mode flag is checked the file will be saved in DA4 format, which can be used with older LX devices (LX20, Colibri, LX5000, and LX7000).



CUP and DA4 also stores tasks. Tasks will also be uploaded to the LX9000. 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 5.7.6 for more details.

5.1.5.5 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 LX9000. If an error is suspected in our database please notify us.

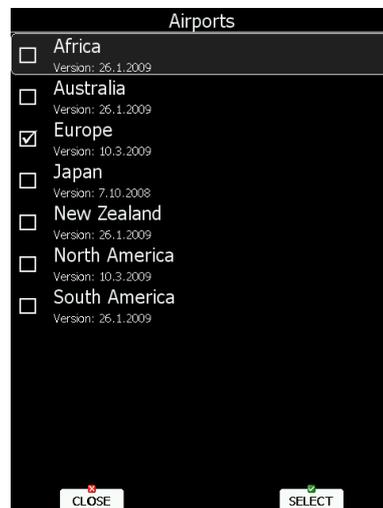
If you wish to add additional airports to the LX9000 an ordinary way point file should be created and uploaded as a way point file or use the LXe program to modify the airport database.

5.1.5.6 Managing Airports Using the LXe Program

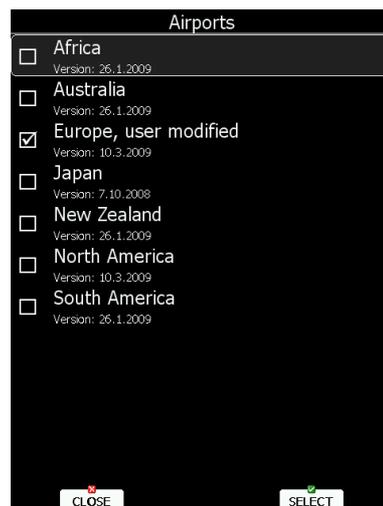
With LXe program version 3.4 or higher it is possible to edit airport data. A new feature, which applies only to the LX9000, is that each airport entry has a field called "description" in which comments or notes of up to 250 characters can be added.

Modified airport data can readily be exported to the LX9000 as a (asapt) file and imported to the LX9000 using the standard procedure for database updates (see Chapter 5.1.5.2). User modified databases will be assigned as "user modified" with a version of the database and date of export (modification) executed using LXe.

The picture below shows airports that have not been modified (as distributed in initial delivery):



The next picture shows that the European airports database has been modified by the user:



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.

5.1.5.7 Managing Flights

Select the **Flights** menu item and press the **SELECT** button. A list of all stored flights will be shown. The LX9000 is capable of storing more than 1000 hours of flight logs.

Flights 1/8				
#	Date	Takeoff	Landing	Duration
1	23.07.10	10:28	10:29	00:00
2	23.07.10	10:28	15:11	04:42
3	01.06.10	12:44	13:23	00:38
4	09.04.10	10:05	16:58	06:52
5	03.06.09	13:32	16:19	02:47
6	03.06.09	13:18	16:26	03:08
7	03.06.09	11:34	11:45	00:11
8	07.05.09	12:35	16:09	03:34






If a SD card or USB stick is inserted into the LX9000, flights can be copied to it when the corresponded button is pressed. Flights can be removed from the LX9000 using the **DELETE** button.

5.1.5.8 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 to the LX Navigation HDR file.

Flight Declaration	
Pilot	Erazem Polutnik
Glider	Ventus 2cxt, 18-meter, S5-3268, EJ
Task	761 _{km} -Broken Leg C Castelgomberto-#Ca Negra-Cagliari Elmas M





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.



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 5.1.13) 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 5.1.8) and the

elevation will be defined by the digital elevation model built into the instrument.

5.1.5.9 Formatting a SD Card

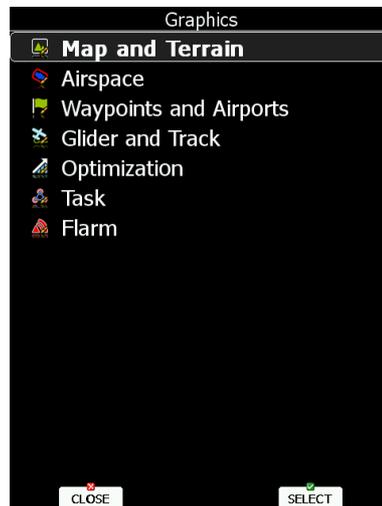
Use this option if the LX9000 cannot read your card. The LX9000 uses the same card format as used by the MS-Windows operating system (FAT). However sometimes Windows does not format the SD card properly or a new card may not be formatted properly. It is recommended to format new SD cards before using with the LX9000; the LX9000 can do this for you.



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

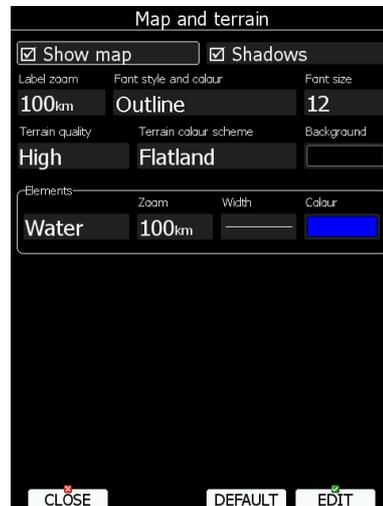
5.1.6 Graphics

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.



5.1.6.1 Terrain and Map

The LX9000 is pre-loaded with terrain for the entire world. The database includes: elevation contour lines, water bodies, roads, highways, railways, big cities and a digital elevation model. The database is derived from the VMAP0 free database and some data may be obsolete. 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 color** item. Use the lower-left knob to modify the colour and the lower-right knob to modify the style.

Terrain can be rendered in three different levels. A higher level means more details. The LX9000 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.

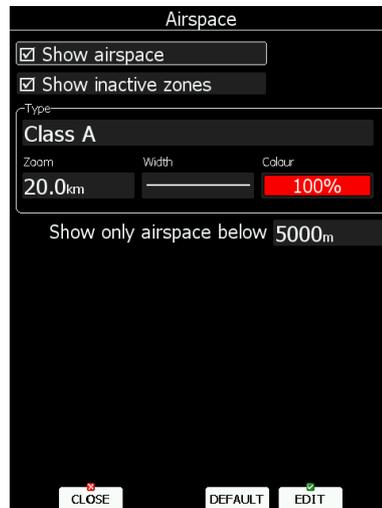
Colours of terrain can be changed using different terrain colour schemes. The following colour schemes are available:

- **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.

5.1.6.2 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.

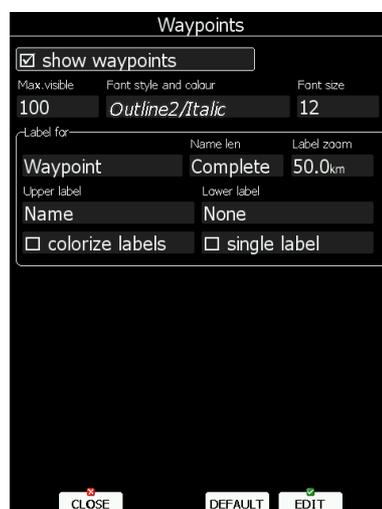


In the **Type** panel you can specify how each airspace type is displayed. You should define each type of airspace zone separately. First choose an airspace type from the list. **Zoom** value defines to which zoom level this type is going to be visible. The **Colour** item specifies airspace zone colour. You can also modify transparency of the selected type. Turn the lower-left 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). 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.

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

5.1.6.3 Way Points and Airports

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



The **Max.visible** item defines how long way point labels and detailed symbols are shown. If the maximum number of way points on the current screen is more than the defined value only small blue dots will be shown for way points 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 lower-left knob will change the font colour. Way point labels can be setup to give even more detail. Label details can be defined for each individual way point 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 way point is within range with the current MacCready settings and with a yellow background when way point is within reach with MacCready setting zero. No background is shown if the way point is not reachable.

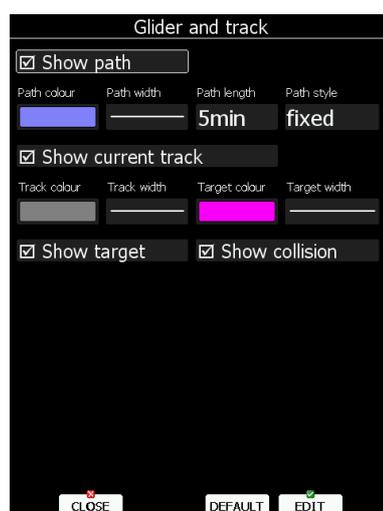
The label is selected from following options:

- **Name:** way point name is shown. The name length item controls how the name is displayed.
- **Code:** will display the ICAO code or short name.
- **Elevation:** shows way point 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.

5.1.6.4 Glider and Track

The LX9000 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 maximum recommended length is 60 minutes. The path can be coloured using:

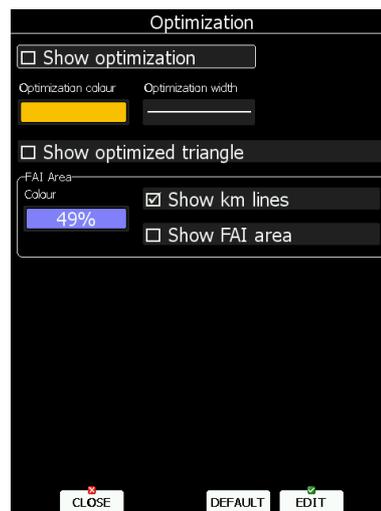
- **Vario** path style, where red colour indicates positive vertical speed and blue colour negative vario values.
- **Mc** path style, which is based on current MacCready settings. Red colour indicates segments of the flight where we have vertical speed higher than the current MacCready setting. Orange 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.

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

5.1.6.5 Optimization

The LX9000 calculates the optimised flown distance according to OLC or FAI rules in real-time during flight (see Chapter 5.1.9). 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 lower-left knob to change transparency of the area. 100% means completely transparent and only the outline will be drawn. 0% means completely solid (not recommended).

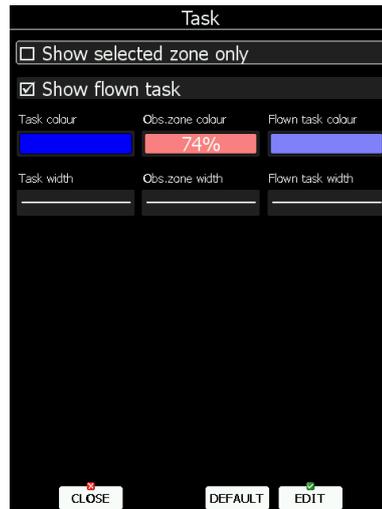
Check the **Show km lines** item to see lines which indicate what will be the size of the completed triangle.



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

5.1.6.6 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 lower-left 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.

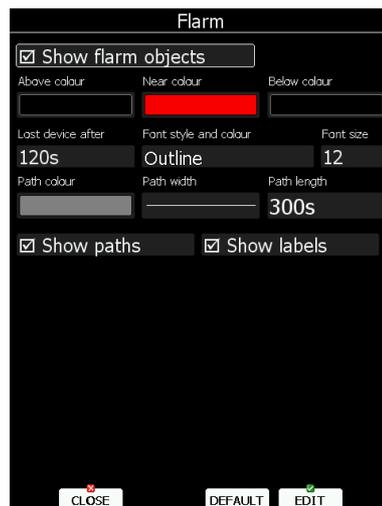
The **Show selected zone only** item controls whether all task observation zones are to be displayed or, if there is only one, then that alone will be shown.

5.1.6.7 Flarm

LX9000 devices can be equipped with the FLARM module. If your instrument 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 5.1.12.3.



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.

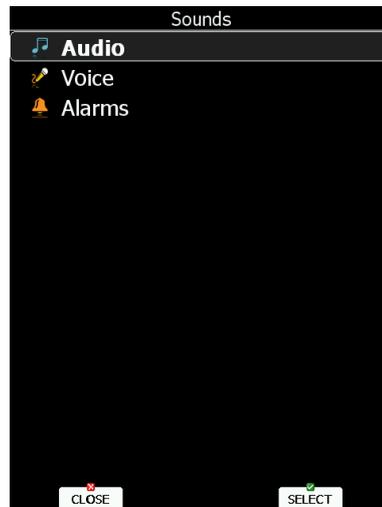
When a signal from a particular aircraft is lost the aircraft remains blinking on the screen for the duration defined in the **Lost device after** item (default 120 seconds). After that time the aircraft symbol will not be displayed.

If the **show labels** item is checked aircraft 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 color** item. Use the lower-left knob to modify colour and the lower-right 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. To enable paths check the **Show paths** item.

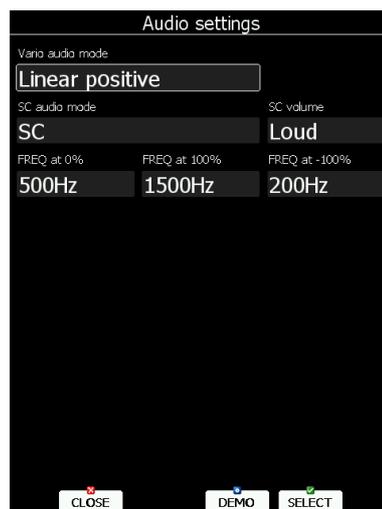
5.1.7 Sounds*

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



5.1.7.1 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).

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

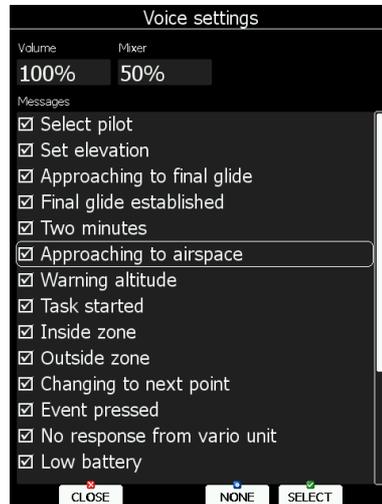
Freq at +100% defines the tone frequency at full + deflection.

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

5.1.7.2 Voice*

Voice module is part of V5 variometer. In past the LX Voice Module used to be an LX system bus participant and receives data and power via the bus.

The voice module is 100% controlled through the LX8000 via the settings described in this menu.



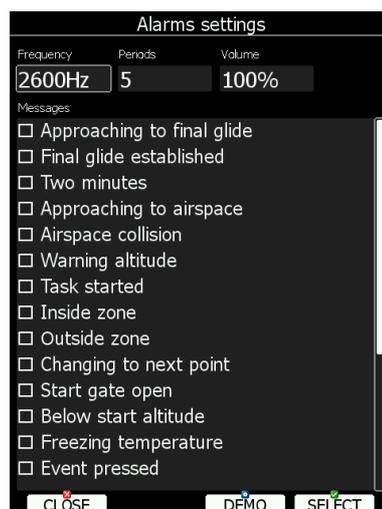
In the **Voice settings** menu volume level (loudness) of the voice module and mixing level between voice and vario sound can be adjusted. In the Messages window each item can be set separately. Only checked items will be posted to the voice module.



If voice module is integral part of V5 variometer, volume level (loudness) can be also set with volume rotary knob, when messages are being played

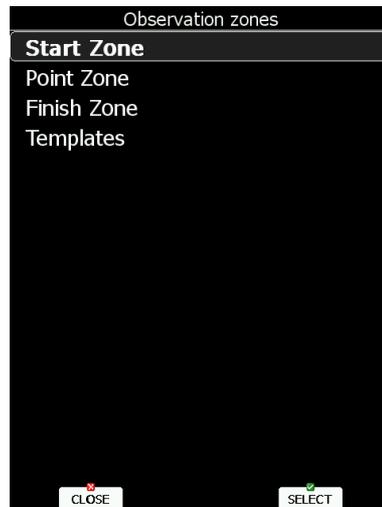
5.1.7.3 Alarms*

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 LX8000 will generate an alarm at the time of event.



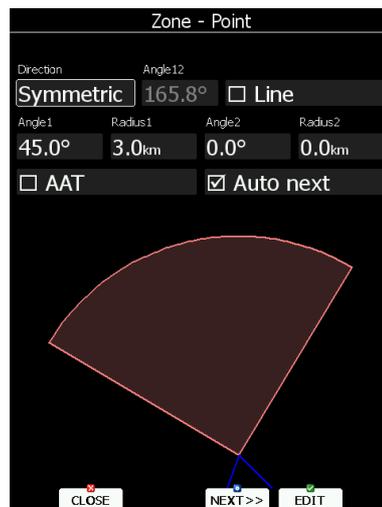
5.1.8 Observation Zones

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 tasks stored in the LX9000 will match this "global" setting except those where the zone was modified in the task edit menu (see Chapter 5.7.1).



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:** which is the most common selection for turn point.
- **Fixed:** which 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 lower-right knob to increase the radius by 0.1 of the selected distance units and the lower-left 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 lower-right knob to increase the angle by 0.5° or use the lower-left knob to choose values 22.5°, 45°, 90° or 180°.

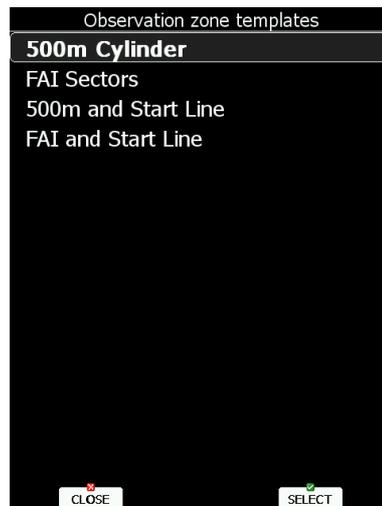
Angle2 and **Radius2** are used for more complex observation zone setups.

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.

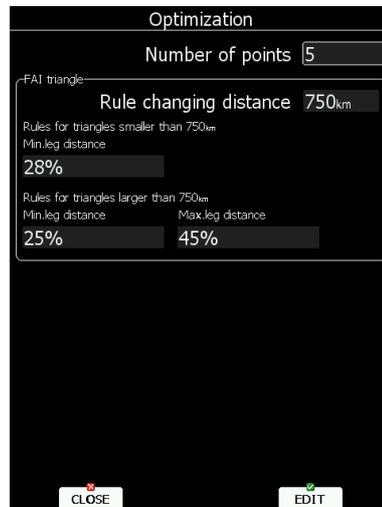


Available templates are:

- 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.

5.1.9 Optimization

During flight the LX9000 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. It will also take into account reduced distances for the last two legs. Use the value three for FAI free flight optimisation.

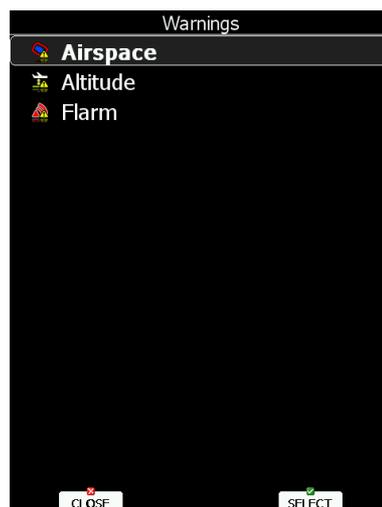


Optimisation will not take into account the 10 km distance between turn points which is required by FAI rules.

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.

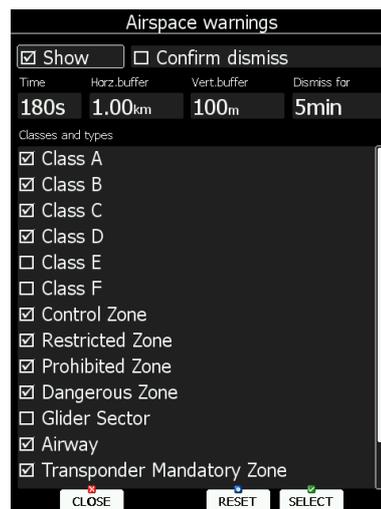
5.1.10 Warnings

There are three types of warnings available. Airspace warnings are shown when approaching a particular airspace zone. Altitude warnings are shown when approaching to a defined altitude and Flarm warnings are triggered when conflicting traffic is in the vicinity.



Use this dialogue to setup the behaviour of warnings.

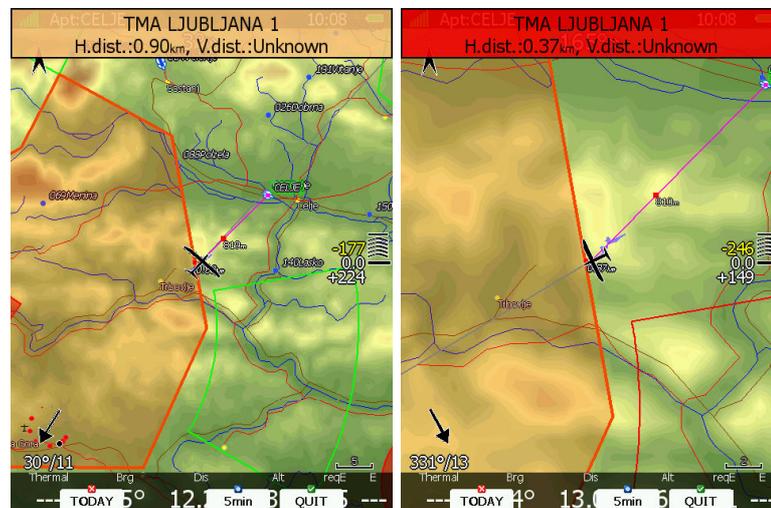
5.1.10.1 Airspace Warnings



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.



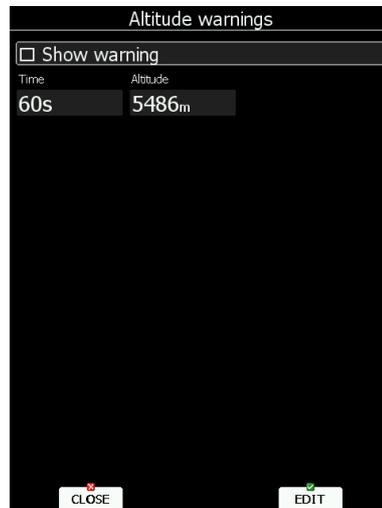
An Airspace warning will be raised in all modes and dialogues. A warning for an alarmed zone can be dismissed for a whole day, some minutes or just quit. **Quit** means that the message will disappear. Use **Dismiss for spin** to define dismiss time in minutes. This time will be shown in the lower-middle 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.

5.1.10.2 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.



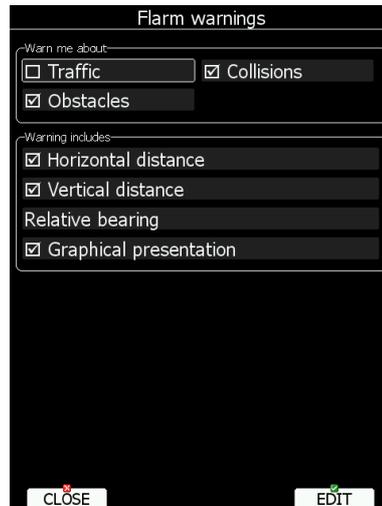
If the projected altitude is greater than the set altitude, an altitude warning will be raised. Altitude warnings will be raised in all modes and dialogues just as for airspace warnings.



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

5.1.10.3 Flarm Warnings

Flarm warnings will be raised only when a FLARM module is built into the LX9000. Using this dialogue the user can define which data will be presented by the LX voice module.



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.

5.1.11 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:

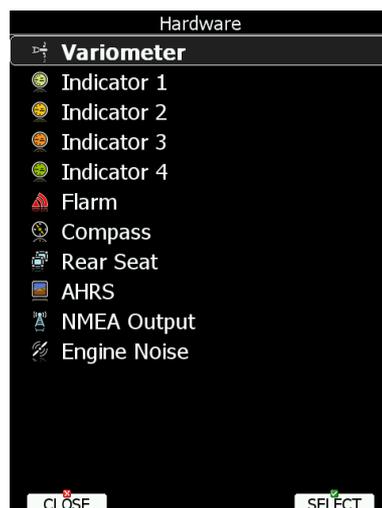
- overload factor, which is defined as:

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

- **Load**, which is entered in kg/m² or lb/ft².
- **Weight of water ballast.** If this option is used the weights of the glider and pilot must be entered. Refer to Chapters 5.1.13 and 5.1.2 for more details of how to enter glider and pilot weights.

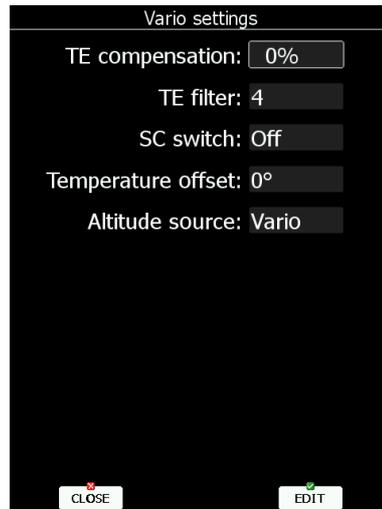
5.1.12 Hardware*

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



5.1.12.1 Vario Settings*

All settings in this menu are related to the glider.



5.1.12.1.1 Electronic Total Energy Compensation

The LX9000 offers two methods of vario TE compensation:

- TE pitot tube
- Electronic TE compensation



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 (see Chapter 6).



If the TE pitot tube has been connected TE compensation should be set to 0%. There is no further adjustment of TE compensation possible. Quality of the TE tube is the one and **only** factor.



If the electronic TE option has been installed TE compensation should be set to 100%.

The electronic 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% and TE filter to default. 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.

The TE filter is the compensation delay and is not used on V5 variometer. Larger numbers will increase the delay and vice versa. During the first test is recommended to use TE filter 4.

Electronic 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 electronic TE compensation the most likely cause is the glider's static source. The static source can be checked by plumbing the pneumatic tubes for electronic 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 TE compensation electronically. The use of a dedicated and accurate fin-mounted pitot/static source such as a Prandtl tube might help.

5.1.12.1.2 SC Switch

The LX9000 has an input for an external speed command switch which is wired to the vario unit. 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 INPUT to **TASTER** and connecting a push button to the input; each key press will toggle between SC and Vario (mandatory setting for LX Remote).

5.1.12.1.3 Temperature Offset

The LX9000 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.

5.1.12.1.4 Altitude Source

The LX9000 has two pressure altitude sensors. One is built into the main digital 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.

5.1.12.2 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; **LCD vario indicator with monochrome LCD**, **USB-D type of vario indicator** or **V5 vario indicator**.

LCD vario indicator and USB-D type of indicator are setup through menus Indicator 1 – Indicator 4, whereas V5 vario indicator is identified by its serial number and is setup through menu Indicator Sn#XXXXX.

All new instruments are delivered with V5 vario indicator.

5.1.12.2.1 V5 Vario indicator

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, 2000rpm.

Upper number can be configured as average vario, time, flight time, task remaining time, netto value, outside temperature or thermal average. It can be setup separately for climb mode or cruising mode.

Lower number shows current altitude, distance to goal, arrival altitude, true airspeed, Last 60 minutes speed, altitude in feet or flight levels.

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 shows average vertical speed.

Blue arrow symbol shows current MacCready value.

Green T symbol represents last thermal average value.

White bar, which is not shown on picture above, displays arc between minimum and maximum vertical speed value in last 20 seconds.



Most inovative feature of V5 vario system is an upgrade. Firmware for sensorbox and vario indicator can be easily upgraded by customer with SD card. See

Chapter **Error! Reference source not found.** for more details.

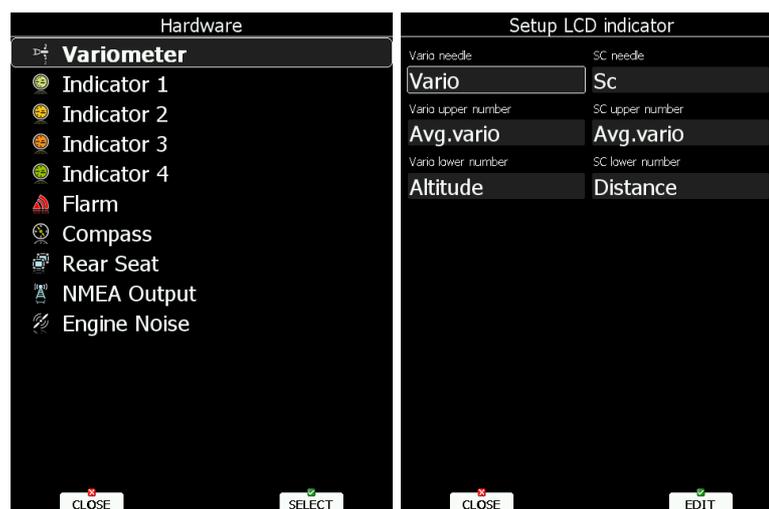
5.1.12.2.2 USB-D Vario indicator



A vario indicator consists of:

- **Mechanical needle**, which can indicate vertical speed, speed to fly value, netto vertical speed, or Relative vertical speed.
- **Speed to fly ball** will tell us if we have to fly faster or slower. If the ball moves up you have to slow down and if ball moves down you have to speed up.
- **Upper Numeric Display**: The parameter displayed can be configured separately for Vario mode and SC mode. Following parameters can be displayed; average vertical speed, local time, flight time, task remaining time.
- **Lower Numeric Display**: The parameter displayed can be configured separately for Vario mode and SC mode. Following parameters can be shown: 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.
- **GPS indicator** shows the current GPS status.
- **Battery indicator** shows the current battery level. It will turn re, when the battery voltage is below 11 volts.
- **Vario range number** indicates current vario range.

The LX9000 provides 4 different sets of data that can be displayed on the vario indicators. This means that up to 4 indicators can be set to display different information; any additional connected indicators are simple repeaters. Each indicator is set up from the following menu.



Each further indicator (available as option) has a DIP switch on the rear side that sets and identifies the indicator and enables it to be programmed under that identification. The positions of the switches are listed below.

SW 1 ON	Indicator set1
SW 2 ON	Indicator set2
SW 3 ON	Indicator set3
All OFF	Indicator set4

After identification the needle and the two numerical displays of each indicator can be programmed to display the following parameters:



The vario indicator built into the USB-D is always Indicator 1.

5.1.12.2.3 LCD Vario indicator

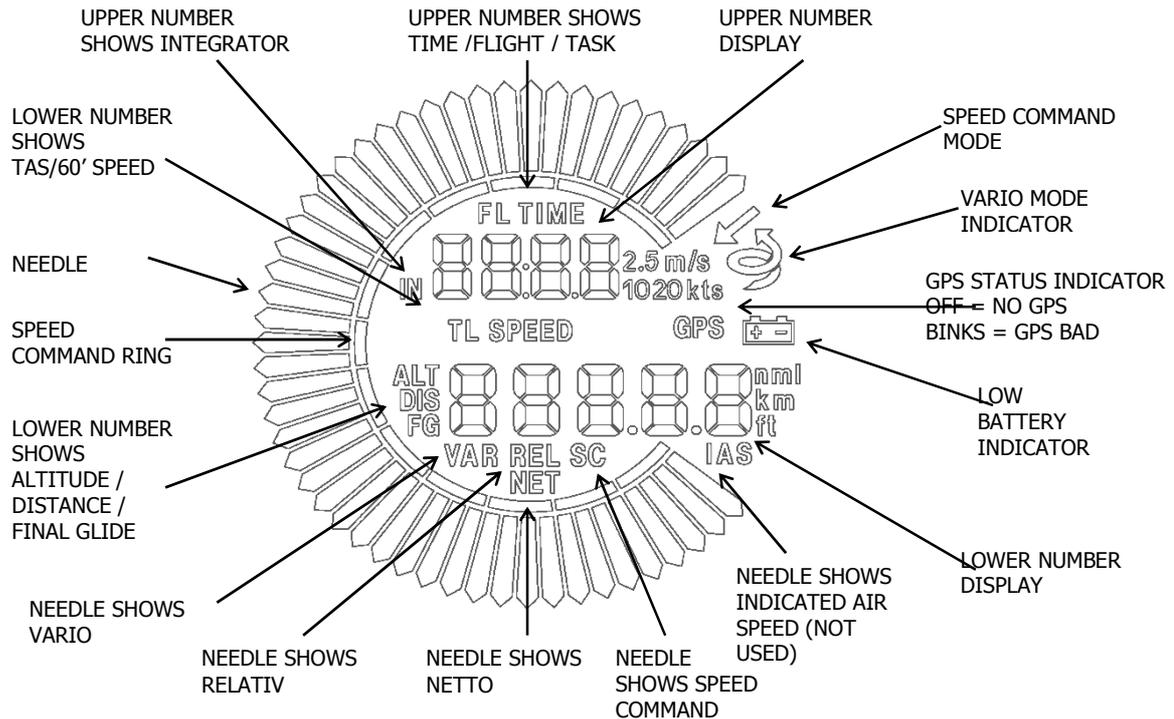
This is type of the oldest vario indicator. An LCD vario indicator consists of:

- 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.



5.1.12.3 Flarm*

On the Flarm setup page, information about Flarm serial number, version, database and Flarm status is shown.



Device ID shows the Flarm unique ID, which is transmitted to other FLARMS. The Flarm status message is normally OK. In case of any errors or warning an error message will appear. The user can change the operation mode of Flarm unit, frequency and enable/disable competition mode.

Three operation modes are 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.
- **Ext.(PC)** – Use this mode when you want to receive externally connected Flarm on PC port.

Depending on which region/continent you are flying in, set the correct frequency band.

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 LX9000 map. 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**.

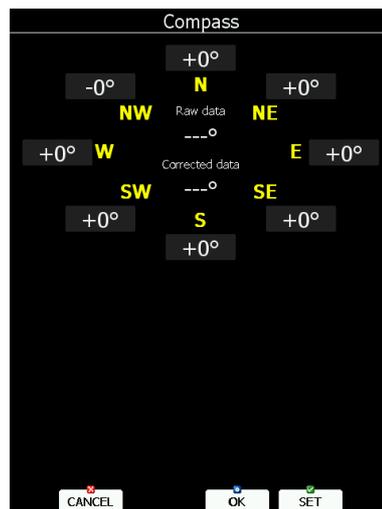
Reduce warnings will significantly reduced Flarm warnings. Use this option if you are flying in gaggles or areas with high density of other aircraft.



We recommend you sign in at FLARMNET.org. 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 5.5.4.7.

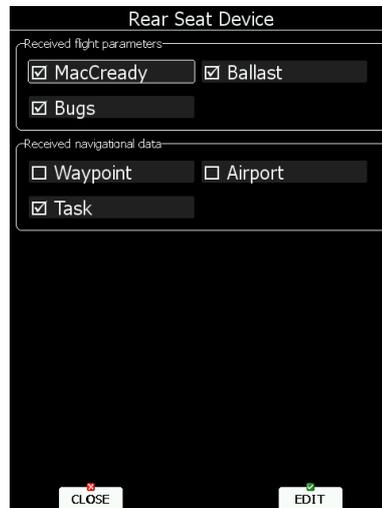
5.1.12.4 Compass*

When a compass is connected to the LX9000 calibration is crucial for correct operation. Refer to Chapter 10.2 for details about installation of the compass and its calibration.



5.1.12.5 Rear Seat or Front Seat

In a two-seat configuration with the LX9000D it is possible to transfer selected data between the front and rear seat devices. 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 way point target will be automatically assigned when the user changes the way point target on other device. The message "*Waypoint target received*" will be displayed on the screen and you will be navigating to the same way point as other device. Please note that it is not necessary to have this way point in your databases as the complete way point 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 way point mode.

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

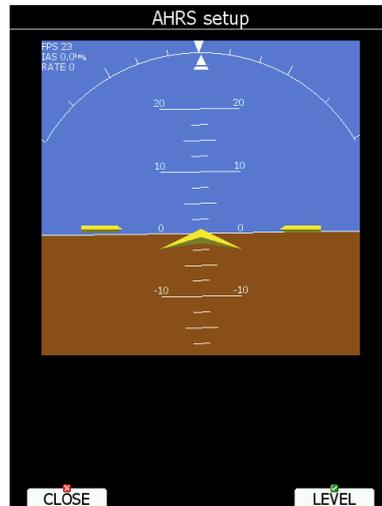
If the **Task** checkbox is checked the task will be synchronised with the other device.



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.

5.1.12.6 AHRS

When AHRS device is connected to the system, 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 only, if you rotate PAGE UP/DOWN rotary knob.

5.1.12.7 NMEA Output*

The LX9000 is capable of outputting position data sentences in NMEA format for use by other devices.



Data is divided into three groups:

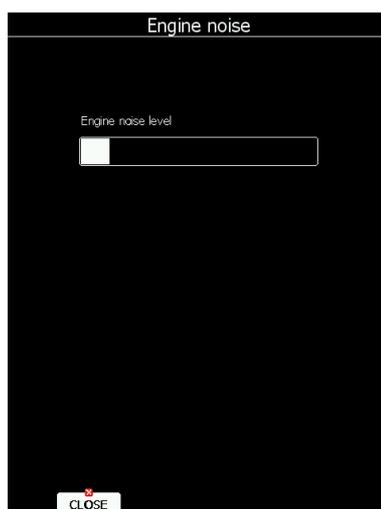
- **GPS data** will output all GPS-related data such as time, longitude and altitude.
- **LX9000 data** will output all variometer-related data such as vario, MacCready and ballast.
- **Flarm data** will output all Flarm-related data.



The NMEA baud rate will be always 19200 bps; any other settings are ignored.

5.1.12.8 Engine Noise*

The current engine noise level is shown as a progress bar. Use this menu to display your current engine noise.



5.1.13 Polar and Glider*

Use this dialogue to enter glider polar and other glider properties. 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
Janus B	39	0.63 ^{m/s}	Doubleseat
Janus C	42	0.62 ^{m/s}	Doubleseat
Janus CM	42	0.70 ^{m/s}	Doubleseat
Jeans Astir	32	0.69 ^{m/s}	Club
LAK17-15m	47	0.58 ^{m/s}	15-meter
LAK17-18m	50	0.45 ^{m/s}	18-meter
LAK19-18m	48	0.45 ^{m/s}	18-meter
LAK19-15m	44	0.56 ^{m/s}	Standard
LS 1cd	36	0.60 ^{m/s}	Standard
LS 1	36	0.63 ^{m/s}	Unknown
LS 3 17m	46	0.55 ^{m/s}	18-meter
LS 3	39	0.63 ^{m/s}	15-meter
LS 4	40	0.65 ^{m/s}	Club
LS 6	40	0.60 ^{m/s}	15-meter
LS 6-18	50	0.45 ^{m/s}	18-meter
LS 7	41	0.64 ^{m/s}	Standard
LS 8	43	0.63 ^{m/s}	Standard

Select the required glider using the lower-right 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 LXe program (Tools->Polar) to calculate coefficients a, b and c for a given glider's polar. The program requires three sink points entered at selected speeds (e.g.: 100 km/h, 130 km/h, and 150 km/h). The program will calculate the values of a, b and c, which should be noted and entered into the LX9000.

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. **Min.weight** corresponds to the min.load value and represents the value at which the polar was measured or recalculated. **Max.weight** is the maximum takeoff weight allowed for a glider. It is not used in the calculation; it is just a reminder to the pilot of the maximum takeoff weight. **Empty** weight is weight of the glider without pilot and ballast. The overload factor is calculated as:

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

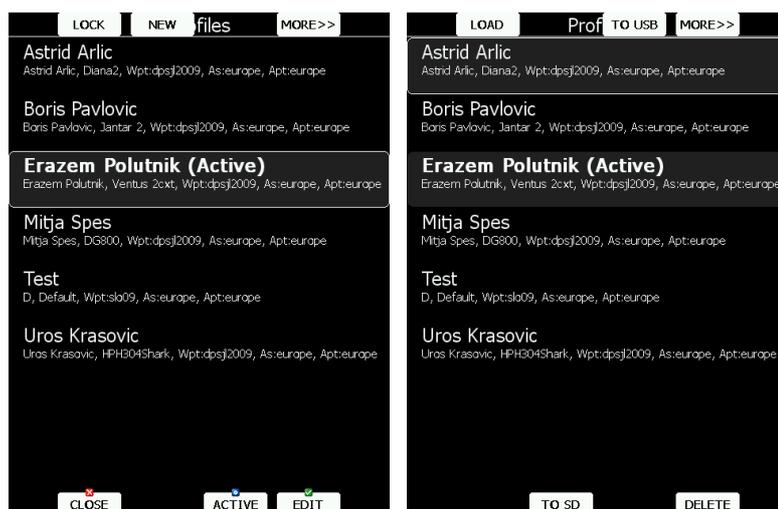
Pilot weight is set in the **Flight recorder** menu (see Chapter 5.1.2).

5.1.14 Profiles and Pilots

All LX9000 settings and navigational page look and feel 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, WGC2008).

An active profile is selected when LX9000 is powered on (see Chapter 7.1.2).



Use this dialogue to add a new profile, delete a profile, load/save a profile, change name for an existing profile and to activate a profile. The active profile is the profile which is currently being used.

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.

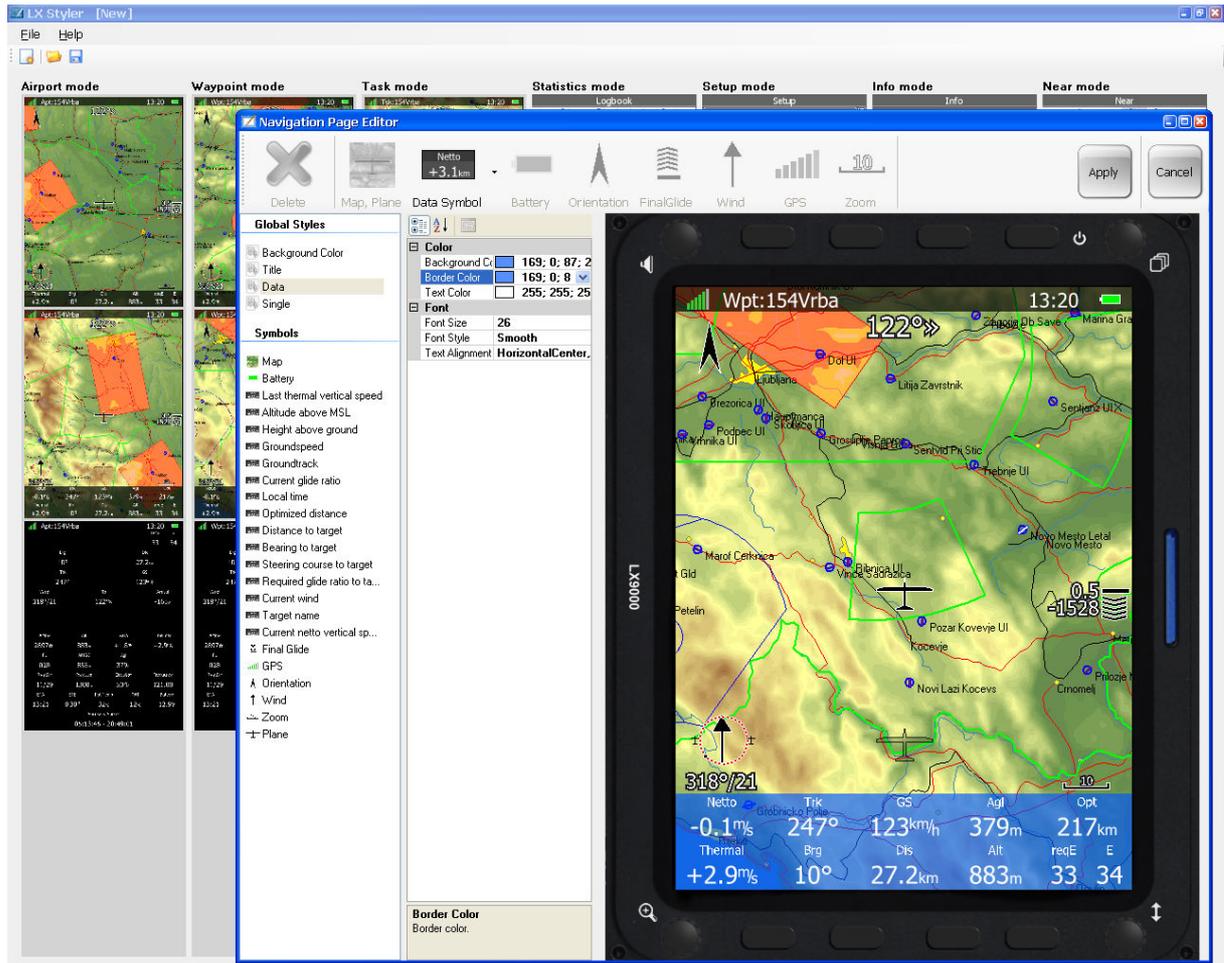
Press the **LOAD** button to load a profile from a SD card or USB stick. A profile will be copied to the LX9000.

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.

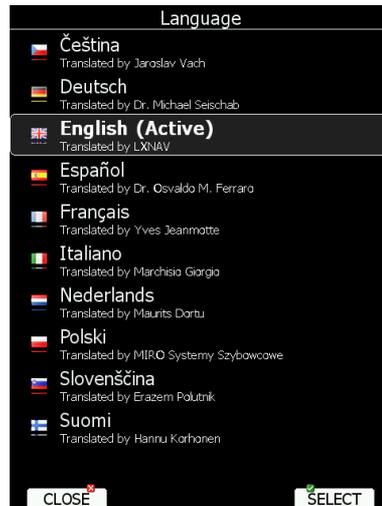
A profile file can be opened and manipulated with the LXStyler program. LXStyler is a special program designed to customise the look and feel of navigational pages. It can be downloaded free of charge from our web pages www.lxnav.com.



For more information about LXStyler please refer to the LXStyler manual.

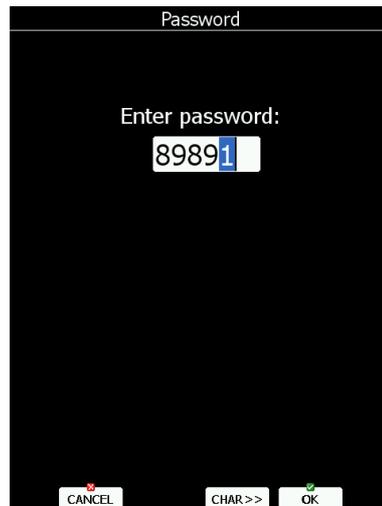
5.1.15 Language

The LX9000 can run in different languages.



Select the desired language. The LX9000 will reload and restart in the new language. If your language is not listed and you feel able to become a translator for the LX9000 please do not hesitate to contact us.

5.1.16 Passwords



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

- **00111** displays information about the LX9000 and its sensors.
- **01049** will perform "Auto zero"; will set vario and 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.
- **46000** enables/disables the co-pilot remote stick. This option is used if you want to drive a single LX9000 via two remote sticks in a side-by-side aircraft (e.g. Stemme S10).
- **55556** will enable Condor simulator input via the PC port.
- **89891** is used to initiate the LX9000 firmware update procedure.
- **99999** will erase all flights stored on the LX9000.

5.2 Information Mode

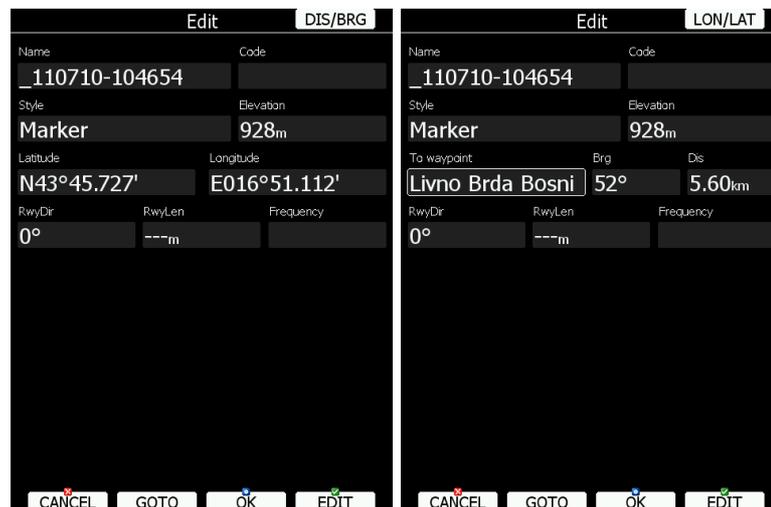
Information mode consists of three pages; GPS status page, position report page and satellite sky view page. Use the lower-right knob or the up/down arrow to toggle pages.

5.2.1 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 way point will be created with the current latitude, longitude and elevation based on the terrain database. The way point name is generated from the current date and time separated by the minus character and preceded by an underscore.



Way point data can be modified. Refer to Chapter 5.6.1 for more details. Press the **OK** button to save a marked way point or press **CANCEL** to exit without saving. Press **GOTO** button to navigate immediately to selected point.

5.2.2 Position Report

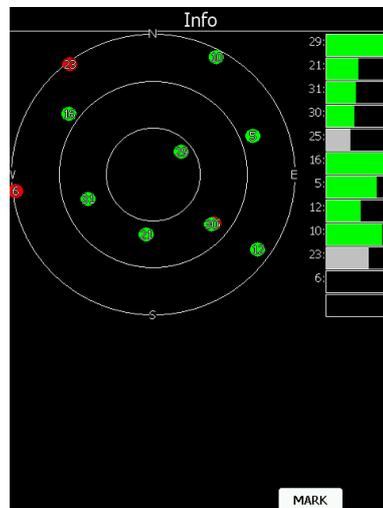
This page shows your position report relative to an arbitrary selectable point. Use this page when you are talking to ATC.



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 way point will be created.

5.2.3 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 way point will be created.

5.3 Near Mode

A list of all landable way points 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			
Name	Dis.	Brg	Arr
◆ SZEGED	0.24km	151°	-665m
◆ SZENTES	42.3km	19°	-1500m
◆ JAKABSALLAS	66.6km	326°	-2010m
◆ MATKOPUSZTA	70.5km	332°	-2088m
◆ KECSKEMET	78.6km	340°	-2251m
◆ ARAD	90.6km	94°	-2481m
◆ BEKESCSABA	95.0km	59°	-2552m
◆ SZOLNOK	97.7km	6°	-2604m
◆ TIMISOARA GIARM.	108km	116°	-2827m
◆ OSIJEK KLISA	132km	228°	-3284m
◆ OSIJEK CEPIN	137km	235°	-3393m
◆ TOKOL	148km	325°	-3612m
◆ BUDAPEST FERIHEC	146km	334°	-3629m
◆ PECS-POGANY	145km	259°	-3656m
◆ VRSAC	155km	141°	-3732m
◆ BUDAORS	157km	328°	-3825m
◆ BEOGRAD	160km	173°	-3850m

SORT
GOTO

Select the preferred landable place via the lower-right 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 way point file then only the target from the user way point file will be displayed.

5.4 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.

Logbook					Statistics
#	Date	Takeoff	Landing	Duration	Flight statistics
1	23.07.10	10:28	10:29	00:00	Avg.vario: 1.5 ^{m/s}
2	23.07.10	10:28	15:11	04:42	Avg.speed: 56.4 ^{km/h}
3	01.06.10	12:44	13:23	00:38	XC speed: 76.6 ^{km/h}
4	09.04.10	10:05	16:58	06:52	Dis.flown: 72.9 ^{km}
5	03.06.09	13:32	16:19	02:47	Circling: 40%
6	03.06.09	13:18	16:26	03:08	Duration: 1:17:33
7	03.06.09	11:34	11:45	00:11	
8	07.05.09	12:35	16:09	03:34	

5.4.1 Logbook

If a SD card or USB stick is inserted into the LX9000 the user can copy a selected flight to it. Select the desired flight using the lower-right 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 LX9000 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 5.1.5.7).

5.4.2 Statistics During Flight

Using the lower-right knob the user can change the statistics page. There are three pages 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.

Statistics	Statistics
Task statistics Avg.vario: 2.6 ^m / _s Avg.speed: 95.5 ^{km} / _h XC speed: 95.5 ^{km} / _h Dis.flown: 52.3 ^{km} Circling: 26% Duration: 0:32:49	Last 60 minutes statistics (On Task) Avg.vario: 2.0 ^m / _s Avg.speed: 85.1 ^{km} / _h XC speed: 100.5 ^{km} / _h Dis.flown: 36.8 ^{km} Circling: 227% Duration: 0:25:57

- 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.

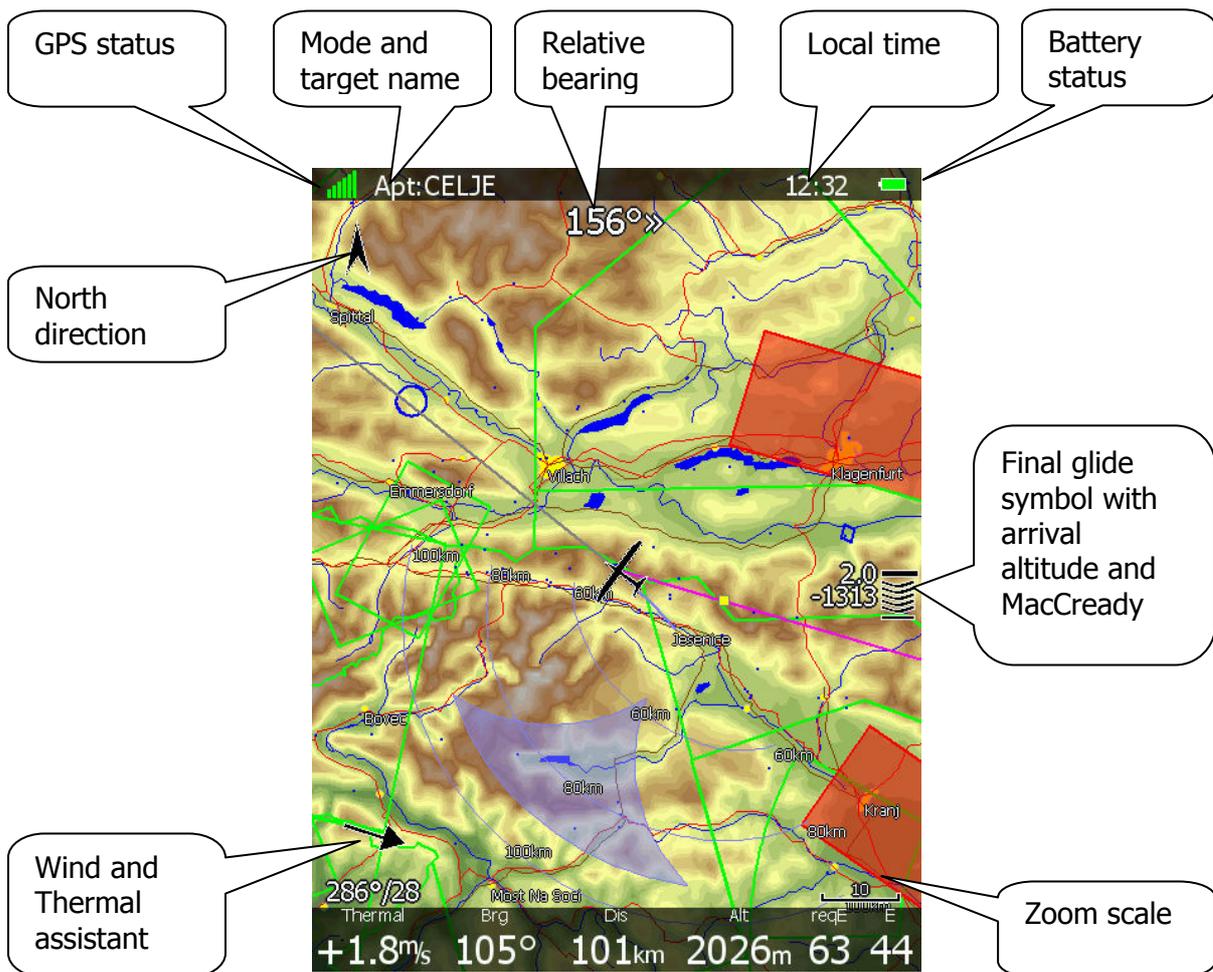
5.5 Airport Mode

Using the lower-right knob you can scroll through the pages. There are four navigational pages available.



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

5.5.1 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 5.1.11).

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 reach aachieve 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 156°.

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.

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 63 and current glide ratio is 44. The current glide ratio is calculated over the last two minutes of flight.

5.5.1.1 Final Glide Symbol

The final glide symbol is a complex symbol. The bottom number (-1313 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 7.2.1 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 terrain which cannot be crossed without more height, then this number will give us an estimate as to how much we 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.

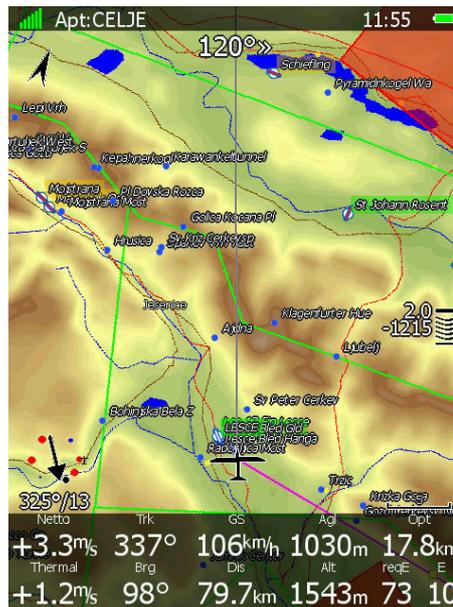
5.5.1.2 Thermal Assistant

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.

5.5.2 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.

5.5.3 Third Navigation Page

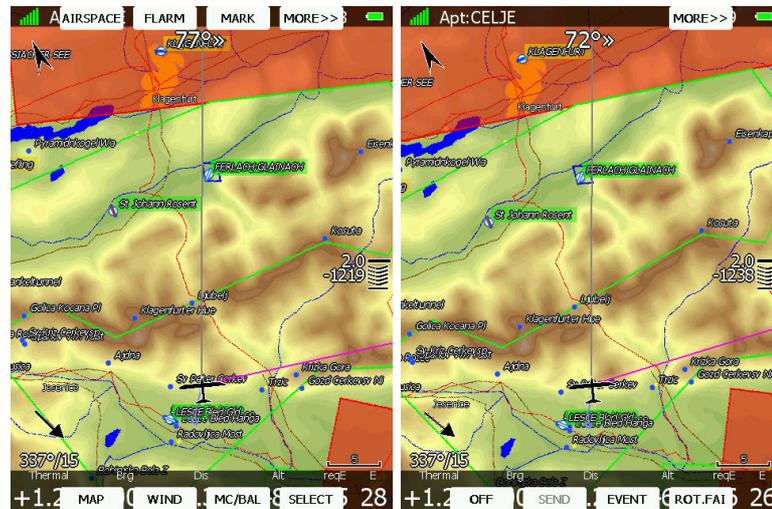
The third page has no graphics. In addition to data shown on the previous pages the internal pressure sensor altitude is shown as **AltIGC**. **AltInv** shows the altitude in opposite units to those defined in the **Units** setup. **OAT** is the outside temperature, **Pot.Temp** is the potential temperature and **Battery** displays the current voltage.



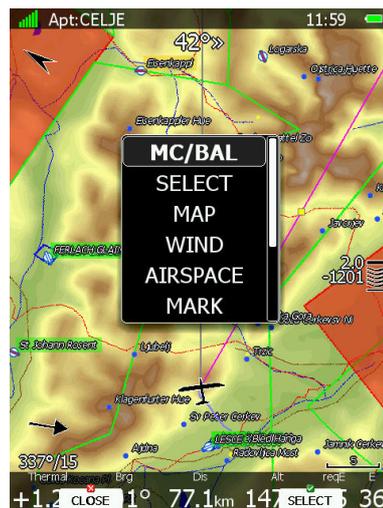
The estimated time of arrival and estimated time established are displayed at the bottom part of page. Also information for the selected airport is shown at the bottom of this page. This information includes airport frequency, runway info and sunrise/sunset times for the selected target.

5.5.4 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 5.5.4.2 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 way point.
- **Flarm** will display a list with all visible Flarm objects. You can select one and use it for navigational purposes.

- **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 LX9000D. 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.
- **Night** will reduce backlight to level acceptable for flying in very dark conditions.
- **Off** will switch off the instrument. The message *LX9000 is shutting down. Please wait.* will be displayed.



The LX9000 can also be powered off by pressing the upper-left button until the message "switching off" appears.

5.5.4.1 Select an Airport

There are two methods of selecting: **filter** mode and **list** mode. You can toggle between these two modes by pressing the **LIST** or **FILTER** buttons. Selecting an airport in filter mode is straightforward. Enter the first letter of the airport name using the lower-right 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 lower-right knob to select the second letter. If you wish to return to the first letter turn the lower-left knob anticlockwise.

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 lower-right 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 lower-right knob. Press the **GOTO** button once more and you will navigate to the selected airport.

Press the **LIST** button to enter list mode. In list mode airports are listed as in near airport mode.

FILTER				
Name	Dis	Brg	Arr	
CAZAUX CAZAUX AI1149	1149 _{km}	263°	-39905 _n	
CAZERES PALAMINY1039	1039 _{km}	253°	-35256 _n	
CELANO	503 _{km}	178°	-13535 _n	
CELJE	148 _{km}	104°	-2690 _m	
CELLE ARLOH	718 _{km}	342°	-24930 _n	
CELLE CELLE ARMY710	710 _{km}	341°	-24635 _n	
CERDANYA LA	1023 _{km}	247°	-34999 _n	
CERESARA	261 _{km}	236°	-7202 _m	
CERKLJE MIL	184 _{km}	113°	-3543 _m	
CERVIA CERVIA MII275	275 _{km}	197°	-6683 _m	
CESKA LIPA	467 _{km}	10°	-14895 _n	
CESKE BUDEJOVICE274	274 _{km}	16°	-8185 _m	
CHALAIS	1041 _{km}	266°	-36278 _n	
CHALGROVE	1190 _{km}	303°	-43562 _n	
CHALON CHAMPFOF652	652 _{km}	275°	-22597 _n	
CHALONS ECURY-SI721	721 _{km}	294°	-25639 _n	
CHALONS VATRY	727 _{km}	292°	-25922 _n	

CANCEL COUNTRY SORT GOTO

Press the **SORT** button to change the sort order of the airports. Select an airport using the lower-right knob. Press **GOTO** and you will navigate to it.

By default the LX9000 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.

Country
<input checked="" type="checkbox"/> Albania - (AL)
<input checked="" type="checkbox"/> Austria - (AT)
<input checked="" type="checkbox"/> Bosnia and Herzegovina - (BA)
<input checked="" type="checkbox"/> Belgium - (BE)
<input checked="" type="checkbox"/> Bulgaria - (BG)
<input checked="" type="checkbox"/> Belarus - (BY)
<input checked="" type="checkbox"/> Switzerland - (CH)
<input checked="" type="checkbox"/> Czech Republic - (CZ)
<input checked="" type="checkbox"/> Germany - (DE)
<input checked="" type="checkbox"/> Denmark - (DK)
<input checked="" type="checkbox"/> Estonia - (EE)
<input checked="" type="checkbox"/> Spain - (ES)
<input checked="" type="checkbox"/> Finland - (FI)
<input checked="" type="checkbox"/> Faroe Islands - (FO)
<input checked="" type="checkbox"/> France - (FR)
<input checked="" type="checkbox"/> Gibraltar - (GI)
<input checked="" type="checkbox"/> Greenland - (GL)

CLOSE NONE SELECT

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

5.5.4.2 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 lower-right 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 5.1.11). 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.

5.5.4.3 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.
- **Hdg/north up** is a combination of **heading up** and **north up** orientation. During circling orientation will be **north up** otherwise **Heading up**.



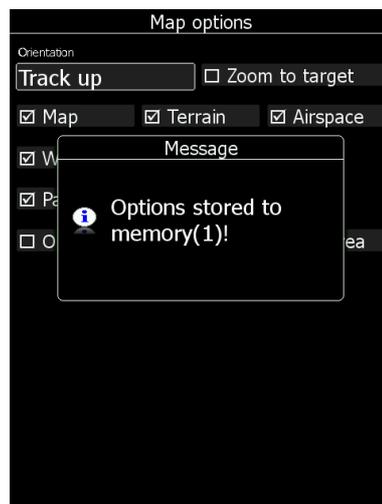
If **Zoom to target** is checked the zoom will be automatically adjusted so that the target point is always visible. Maximum zoom is 200 km and minimum zoom is 1 km. The check boxes will turn on or off the following items:

- **Map** – complete map is turned on/off.
- **Terrain** – only terrain is turned on/off.
- **Airspace** – toggle airspace display on/off.
- **Wpts** – way points 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.



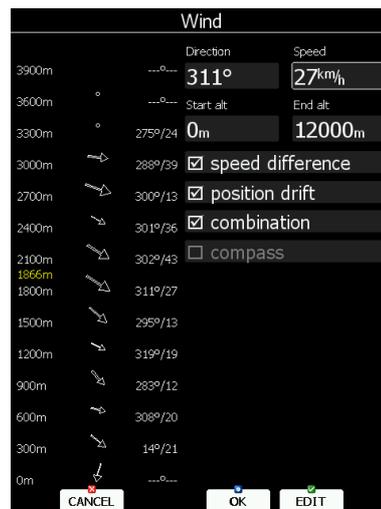
Press button **MEM 1** for a long time. A message "*Options stored to memory (1)*" will be displayed and the settings are stored. Change the settings a little bit. Press button **MEM 2** for long time. A message "*Options stored to memory (2)*" will be displayed and the settings

are stored to memory location 2. Now short pressing of **MEM 1** will invoke the saved settings from memory 1.

5.5.4.4 Wind

The LX9000 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 lower-left 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.

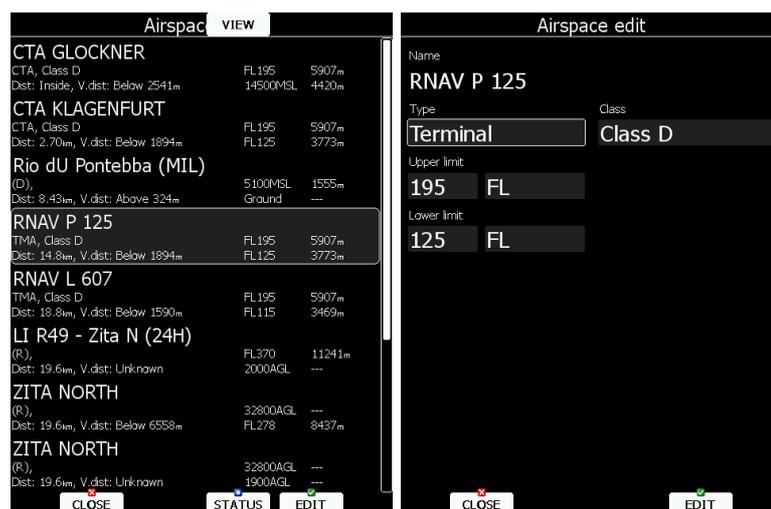
The user can also disable or enable a particular wind method. It is recommended to have all methods enabled.

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.

5.5.4.5 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.



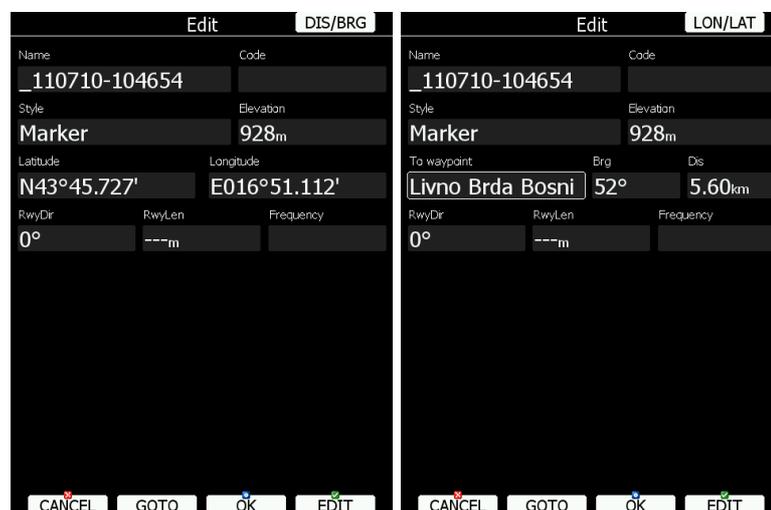
The VIEW button toggles the list views. When the **STATUS** button is pressed the status of the selected airspace zone will toggle between **OFF always**, **OFF today**, **OFF hh:mm** and enabled.

If the **EDIT** button is pressed a new dialogue will open where you can modify properties for the selected zone. Refer to Chapter 5.1.5.3 for more details.

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

5.5.4.6 Mark

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



Way point data can be modified. Refer to Chapter 5.6.1 for more details. Press the **OK** button to save a marked way point or press **CANCEL** to exit without saving. Press **GOTO** button to navigate immediately to selected point.

5.5.4.7 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					Flarm traffic				
Device ID	Dis.	Brg	Var	Alt	Device ID	Dis.	Brg	Var	Alt
DD9818	0.01km	0°	+1.4m/s	617m	CD	0.27km	320°	+2.4m/s	1055m

The list is sorted by distance. Select the desired Flarm target and press the **GOTO** button. You will start navigating 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.

Edit Flarm		
Device ID	Last seen	
DD9818	Right now	
Pilot name		
<input type="text"/>		
Glider	Reg.Nr.	CN
<input type="text"/>	<input type="text"/>	CD
Home airfield	Frequency	
<input type="text"/>	<input type="text"/>	
<input type="button" value="CANCEL"/> <input type="button" value="DELETE"/> <input type="button" value="CHAR->"/> <input type="button" value="OK"/>		

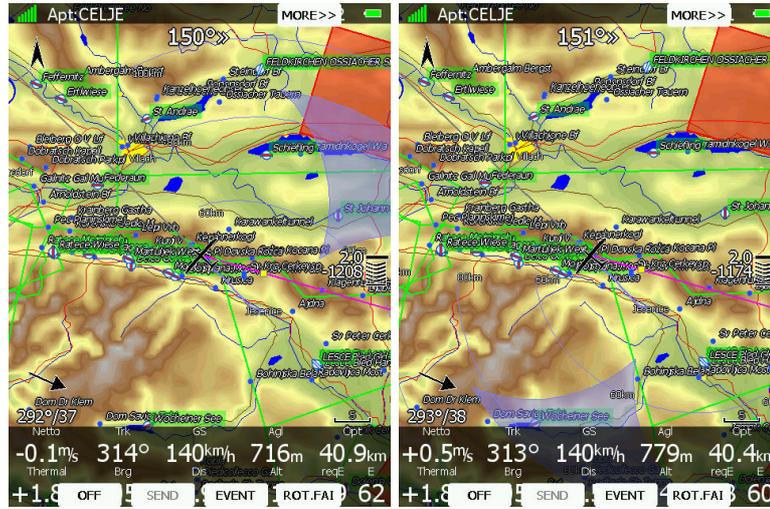
Enter data about the Flarm glider and pilot. The LX9000 is pre-loaded with the FlarmNet database to identify known FLARM Device IDs with plane and pilot data. You can upload the latest FlarmNet database after downloading it from <http://www.flarmnet.org>. The update procedure is similar to the update procedure for airport databases. See Chapter 5.1.5.2 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 10.1.5) and then register at FlarmNet.

5.5.4.8 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 not be shown.

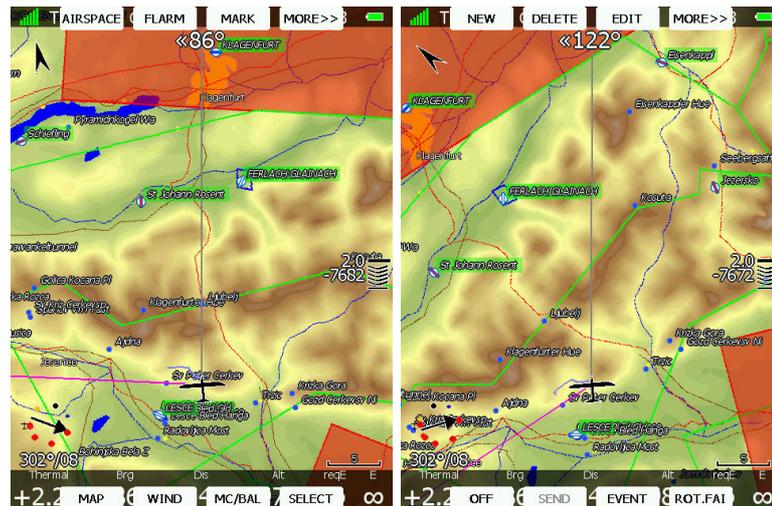


5.6 Way Point Mode

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



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



- **Select** is used to select a way point as the new navigational target.
- **Mc/Bal** will set MacCready, ballast and bugs. See Chapter 5.5.4.2 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 way point.
- **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.
- **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 with the LX9000D. 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.
- **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.

5.6.1 Editing Way Points

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

Edit		
Name	Code	
NOVO MESTO	LJNM	
Style	Elevation	
Grass airfield	180m	
Latitude	Longitude	
N45°48.400'	E015°07.200'	
RwyDir	RwyLen	Frequency
50°	16m	123.500
CANCEL	DIS/BRG	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.

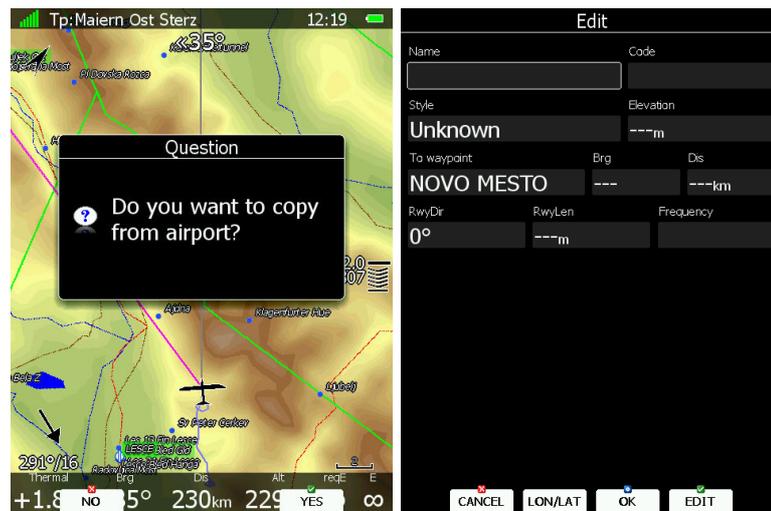
Edit		
Name	Code	
NOVO MESTO	LJNM	
Style	Elevation	
Grass airfield	180m	
To waypoint	Brg	Dis
Maiern Ost Sterz	294°	320km
RwyDir	RwyLen	Frequency
50°	16m	123.500
CANCEL	LON/LAT	OK EDIT

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 way point will be updated in the appropriate file automatically.

5.6.2 New Way Point

Select this option if you want to add new a way point to the active way points file. If no way points file is selected a new way point 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 way point. The new way point is added to active way point 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 LX9000 for the entire world.

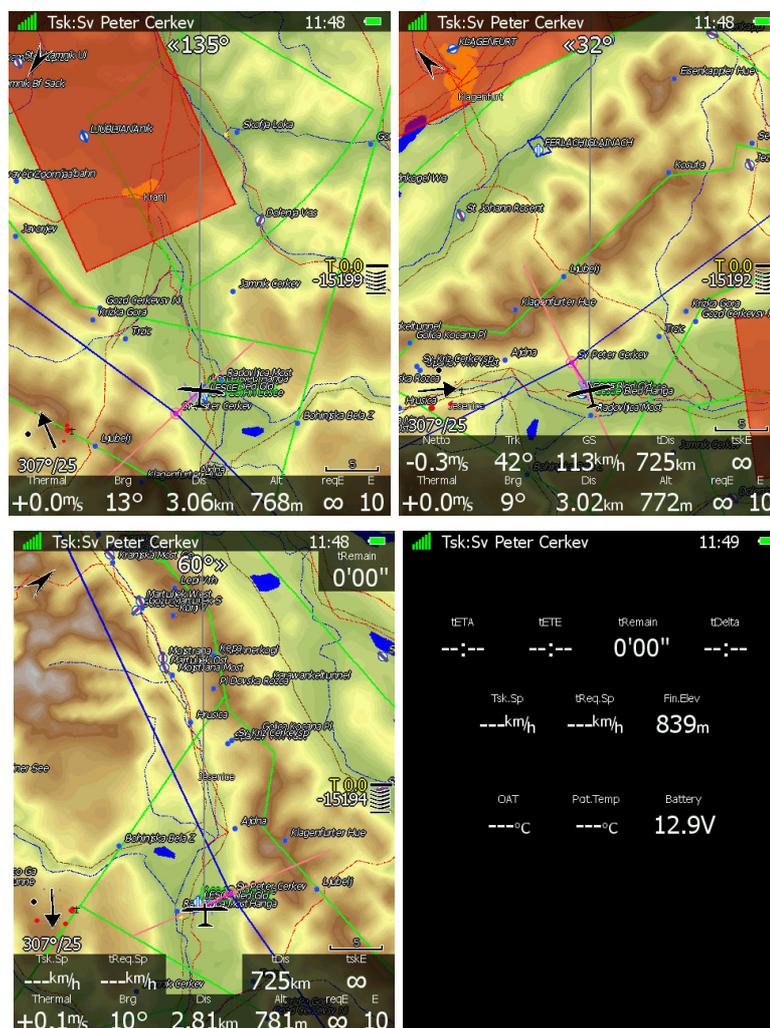
5.7 Task Mode

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 way points stored in the active way point file. A task can be loaded from tasks stored in the active way point file. A task can also be saved to an active way point file (see Chapter 5.1.5.4 for details how to set an active way point file). A task used for navigation will also be declared in the IGC file.

Task mode has four pages. Use the lower-right 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 way point 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:

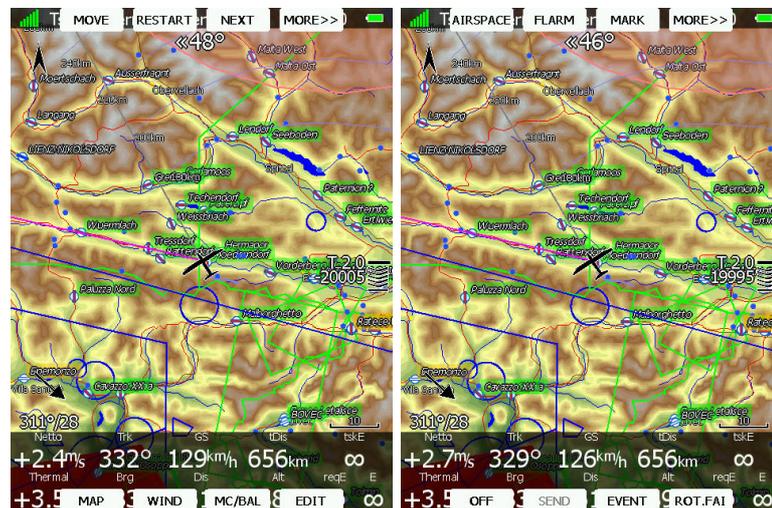
- **current netto vertical speed**
- **current track and groundspeed**
- **tDis** shows the remaining total task distance.
- **tskE** shows the required glide ratio to task finish.

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 and is calculated as the remaining task distance divided by the remaining time.
- **TRemain:** indicates the remaining task time.

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 5.5.4.2 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.
- **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 way point.
- **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 5.5.4.3 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 5.5.4.4 for more details.
- **Airspace** shows a list of airspace zones in the vicinity of the current position. See Chapter 5.5.4.5 for more details.
- **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 with the LX9000D. 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.
- **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.

5.7.1 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 lower-right 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:

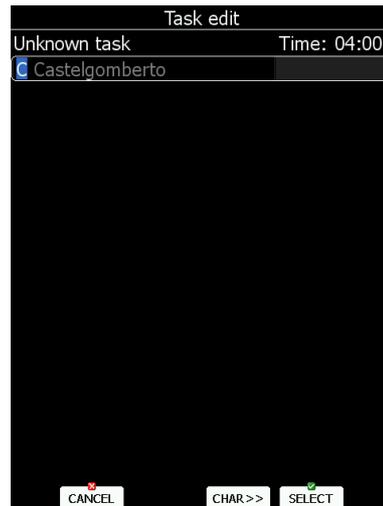
- Press the **EDIT** button to enter a new task point, edit an existing one or to enter task time.
- **OK** action will confirm changes to the task and return to the navigational page.
- **CANCEL** action will cancel all modifications of the task and return to the navigational page.
- Use the **ZONE** 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 5.1.8).
- **OPTIONS** action will open a new dialogue where additional properties for the task can be defined. The task name is set in this dialogue.
- Press **LOAD** to load the task from the active way point file.
- Press **SAVE** button to store the task to the active way point file. This task can later be loaded from the active way point file.
- **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.

5.7.2 Task Creation

Make sure that at least one way point file is loaded into the LX9000 and that it is checked and marked as an active way point file. Refer to Chapter 5.1.5.1 for details on how to upload way point files to the LX9000.

Select task time and press the **EDIT** button. Enter the task time if required. Rotate the lower-right knob to increase time in 15 minute steps and the lower-left knob to increase task time in 1 minute steps. Close the task time edit and rotate the lower-right 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 lower-right knob. The "Helper" will show the first way point that matches this letter.



Press the **CHAR>>** button and the cursor will move to the second letter. Use the lower-right knob to select the second letter. If you want to return to the first letter turn the lower-left 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 lower-right knob. Press the **SELECT** button once more to complete this selection.

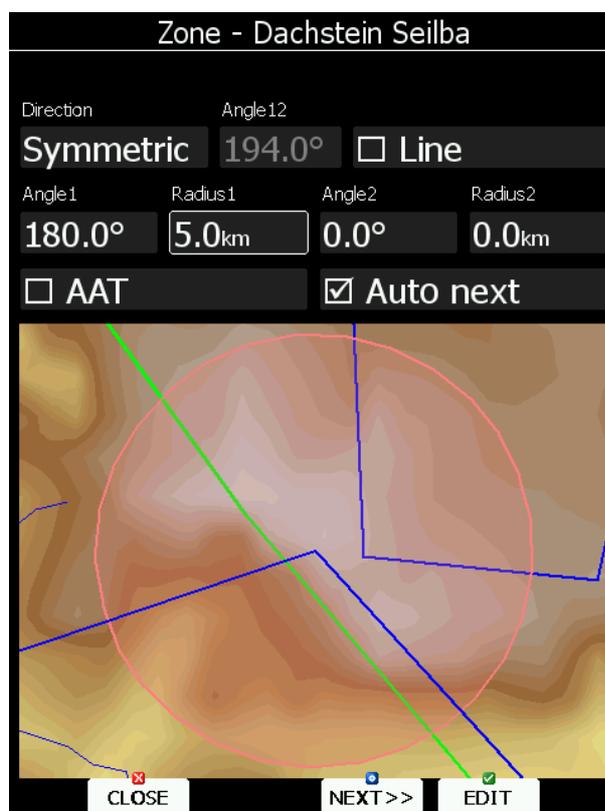
The task edit dialogue should now look like the screen below. The letter "S" indicates you entered the start point.



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

5.7.3 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 lower-right knob to increase the radius by 0.1 of the selected distance units and the lower-left 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 lower-right knob to increase the angle by 0.5° or use the lower-left 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.

5.7.4 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 LX9000 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 LX9000 will navigate you to the nearest point on the start zone or start line and finish zone.



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.

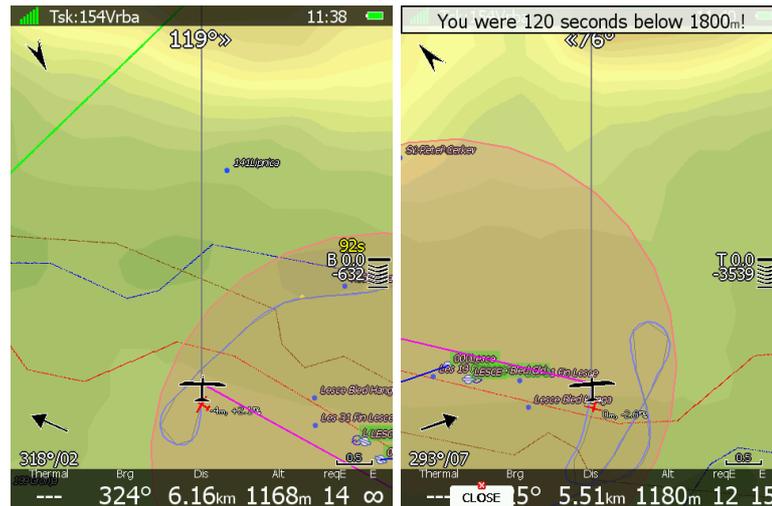
There are also several options in this menu which will help competition pilots to have a less stressful start.

5.7.4.1 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.

5.7.4.2 Below Altitude Start Procedure

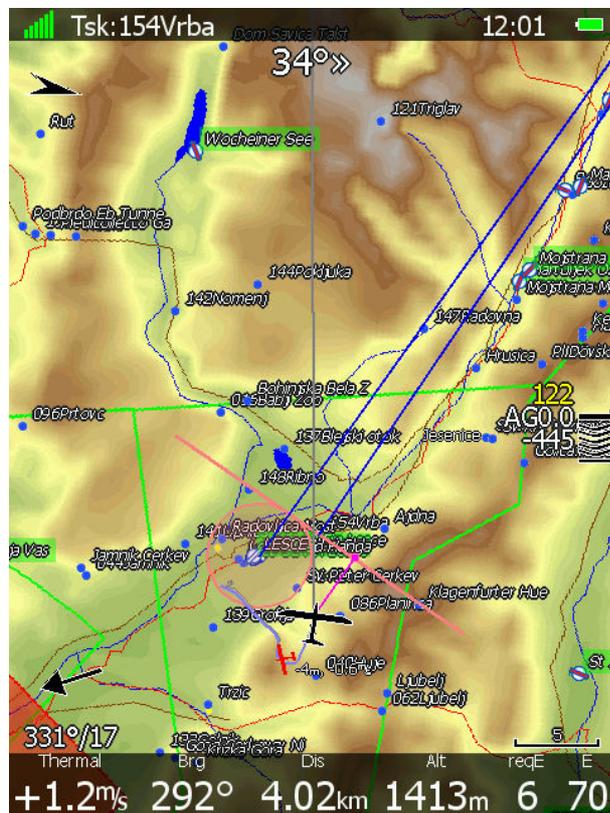
On some competitions there is a rule that a pilot must be below a defined altitude for a certain amount of time. Enter **Below alt.** and **Below time** to use this option. An indication will be given on the final glide symbol. Character "B" will be displayed before the MacCready value which indicates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

5.7.4.3 Maximum Start Speed and/or Maximum Start Altitude

A lot of competitions are limiting the start altitude and/or start ground speed. The LX9000 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 will give you 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.

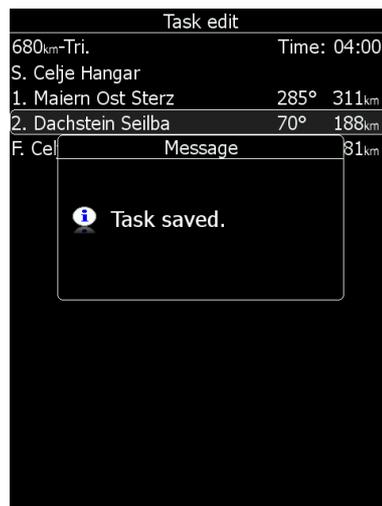
In the picture above we are 445 meters below the glide to start altitude. Our speed is 122 km/h and the chevrons show that we can speed up.



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

5.7.5 Saving a Task

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



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

5.7.6 Loading a Task

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



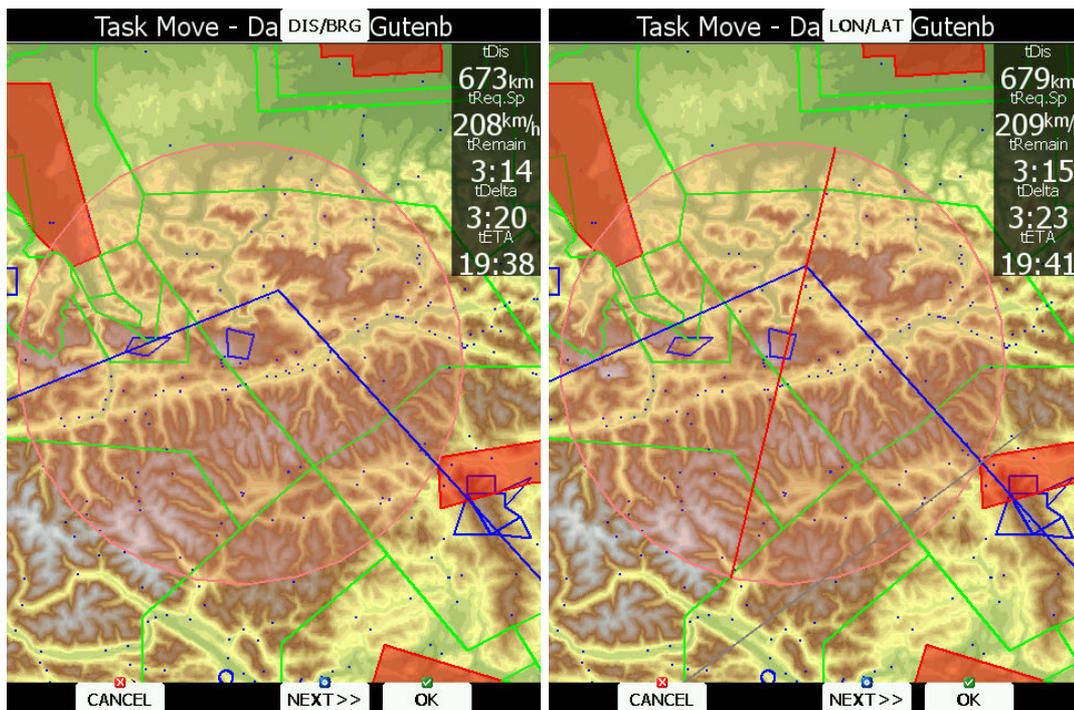
Total task distance, task description and task points are shown for each task stored. Select the desired task by rotating the lower-right knob and press **LOAD**. The task will be loaded into the active task and the task edit dialogue will be opened.

It is also possible to delete tasks from the active way point 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.

5.7.7 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 5.1.1).

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 lower-right knob to move the point in the north/south direction or rotate the lower-left 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 lower-right knob (page selector) to move the point in the radial direction from the area centre.

Use the lower-left 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.

6 Variometer and Altimeter

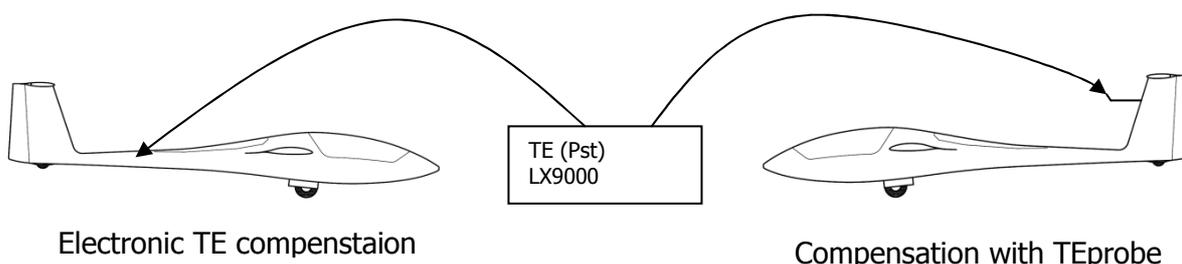
All signals from the pneumatic sensors (altitude, speed) are derived from high quality pressure sensors which mean that no flask is necessary. The vario signal is derived from the altitude signal. All signals are temperature and altitude compensated. Mechanical needle and colour display are displaying the vario information as well as many other parameters. The display is user configurable. The variometer can be configured to show:

- **Range** 5, 10 and 2.5 m/s or 10, 20 and 5 kts.
- **time constants** 0.1 s to 5 s, in addition there are 4 settings for electronic processing for the vario signal.
- **netto** shows the air mass lift and sink.
- **relative** shows the lift or sink that would be achieved if the glider was circling at the thermaling speed.

There are two ways by which the vario indications can be corrected for total energy; electronic TE compensation based on speed changes with time and pneumatic compensation with a TE probe. The quality of the TE compensation depends entirely on the location, size and dimension of the TE tube. The installation must be leak-proof.



If an electronic TE compensation is selected the TE (P_{st}) port should be connected to a good static pressure source. If pneumatic compensation is selected the TE (P_{st}) port should be connected to the TE probe.



6.1 Smart Vario Description

The LX system incorporates two configurable electronic filters in the circuitry. The first filter adjusts the time constant and is adjustable between 0.5 and 5 seconds. The 0.5 second setting is the fastest while the 5 second setting provides maximum damping.

The second filter, called the Smart Vario, is a dynamic filter and controls the rate at which the vario indicator moves. Its behaviour differs depend on variometer type.

6.1.1 Smart vario on V5 vario system

On V5 variometer smart vario filter defines how much filter is different for increasing vertical speed versus decreasing vertical speed. (E.g.: If vario filter is set to 1s and Smart vario filter is set to 4, then filter for increasing vario be 1s and for decreasing vario it will be 2s). This will produce an effect like on Sage variometer.

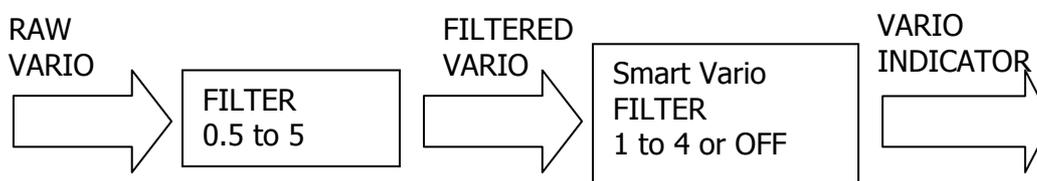
6.1.2 Smart vario on other vario systems

On older models of variometer smart filter value gives us four levels of dynamic damping of the vario. When set to **OFF** there is no restriction on the rate of movement of the vario indicator other than the setting of the time constant filter. When set to 1 the vario indicator will not move faster than 1 m/s (2 kts) per second, whilst when set to 4 the vario indicator

will not move faster than 4 m/s (8 kts) per second. It should be noted that when set to 4 the vario indicator will move four times faster than when set to 1.

Summary:

The Smart Vario should not be used in isolation but in conjunction with the setting of the time constant filter. When the Smart Vario is activated the time constant filter may need further adjustment to provide optimum indications.



6.2 Altimeter

The altimeter of the LX9000 is temperature compensated from -20°C up to + 60°C. The altimeter is calibrated from 0 to 9000 m (30,000 ft), but indication goes up to 16000 m (52,000 ft).

6.2.1 IGC Barograph Recalibration Procedure

The LX9000 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 5.1.2).
- 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 6000 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 using the LXe PC program.
- Restore the flight recorder settings.

The barogram will be the last flight in the logbook.

6.3 Speed Command

Speed command flying based on the MacCready theory is a very useful tool to optimise cross-country speed. There are many visual indicators (see LCD Vario). When the instrument changes to speed command mode the audio will change and become a director informing the pilot whether he is flying too fast or too slow. In order to reduce confusion between vario and speed command audio some special features were developed:

- Continuous audio signal in + possible (other kinds of signals can be chosen, see setup).
- No audio at correct speed (dead band).

7 Flying With the LX9000

To get the best out of the LX9000 it is important that some preparation is done prior to takeoff. 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.

7.1 On the Ground

7.1.1 Power on Procedure

Press the power-on button. The LX9000 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 30 seconds. When completed the profile selection dialogue is shown.



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

7.1.2 Profile Selection



Turn the lower-right knob to select the desired profile if more then one profile is available. For the selected profile the pilot name, glider type, loaded way point files, loaded airports databases and loaded airspace databases are shown.

To learn more about profiles refer to Chapter 5.1.14. Press the **SELECT** button to confirm selection of the profile. The set elevation dialogue will be shown next.

7.1.3 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 lower-right 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 lower-right knob (PAGE selector) 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 LX9000 is switched off and on during flying.

7.1.4 Preflight Check

After elevation setup the LX9000 will switch to airport mode. It will take about 30 seconds to draw the map screen for the first time. All way point 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 lower-right knob to modify the MacCready setting. Refer to Chapter 5.5.4.2 for more details.

It is also highly recommended to check the safety altitude setting. Refer to Chapter 5.1.1 to find out how to define the safety altitude.

7.1.5 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 takeoff. 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. Further methods will be available in future releases.

- Read way point 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 takeoff. 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.

7.1.5.1 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 5.7.3) to modify the individual observation zone.

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

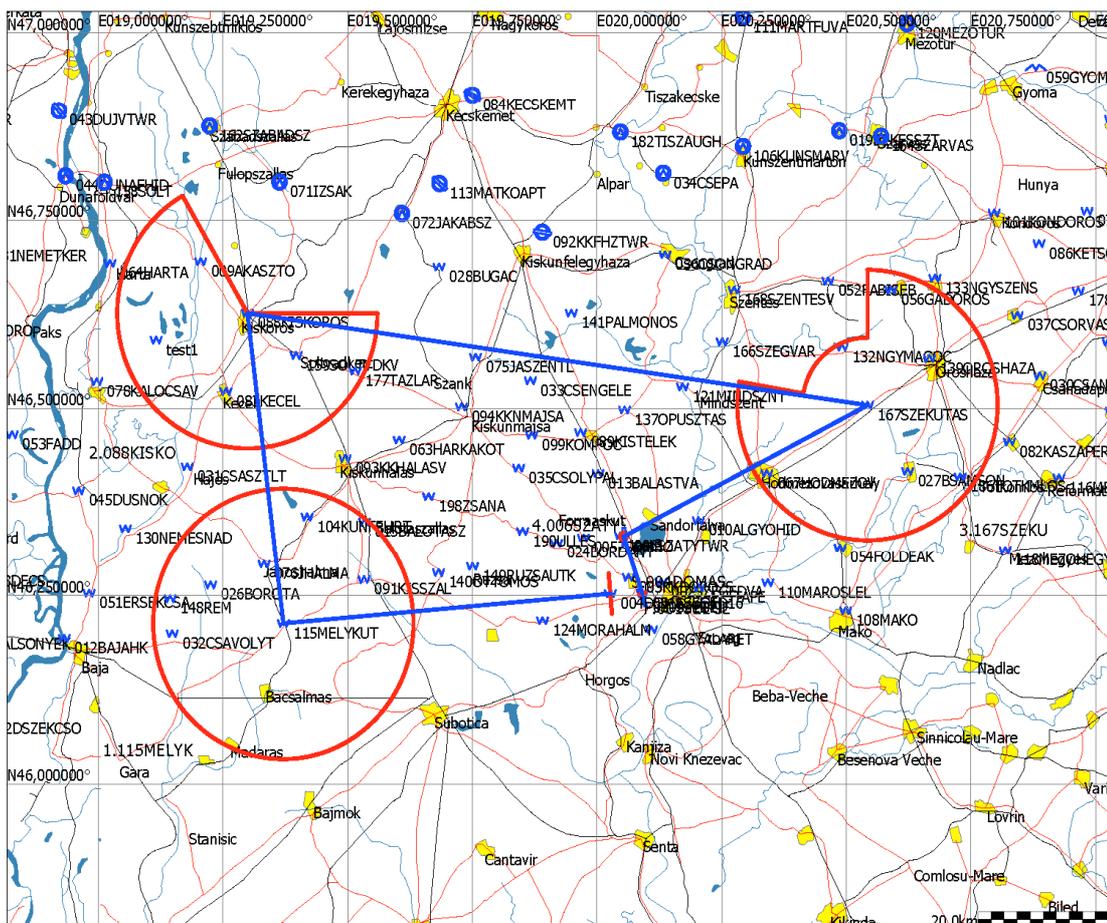
[Style=Fixed Value, A12=320° R1=20,0km, A1=140°, R2=10,0km, A2=180°, Assigned area]

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]



Usually a task sheet with observation zone definitions matching the LX9000 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:

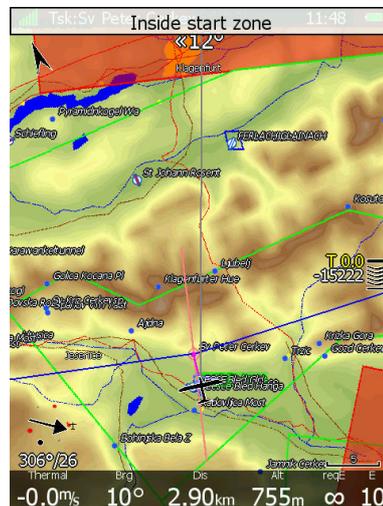
- Direction set to FIXED.
- $\text{Angle12} = (\text{Radial2} - \text{Radial1}) / 2 + 180^\circ = 230^\circ$. Attention should be paid with northerly directions.
- $\text{Angle1} = (\text{Radial2} - \text{Radial1}) / 2 = 20^\circ$.
- $\text{Radius1} = \text{Max.radius} = 200 \text{ km}$.
- $\text{Radius2}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

7.2 Flying a Task

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

7.2.1 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 5.7.4. 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 LX9000 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.



7.2.2 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.

7.2.3 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 5.7.3).

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.

7.2.4 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 7.2.3).

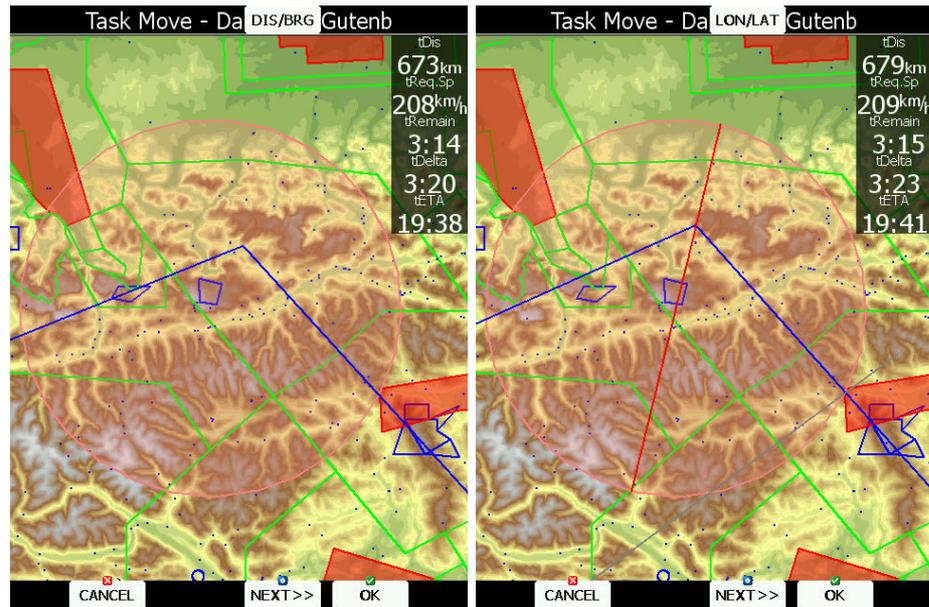
If **NEXT** is pressed the task is advanced to the next turn point.



When flying in an assigned area it is NOT important when you will advance to next turn point. The LX9000 is always taking into account the most optimal fix inside the assigned area for the total distance calculation.

7.2.5 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 5.1.1).

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 lower-right knob to move the point in north/south direction or rotate the lower-left 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 lower-right knob (page selector) to move the point in the radial direction from the area centre.

Use the lower-left 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.

7.2.6 Task Finish

On entering the finish zone the task stops automatically and a message will be displayed.



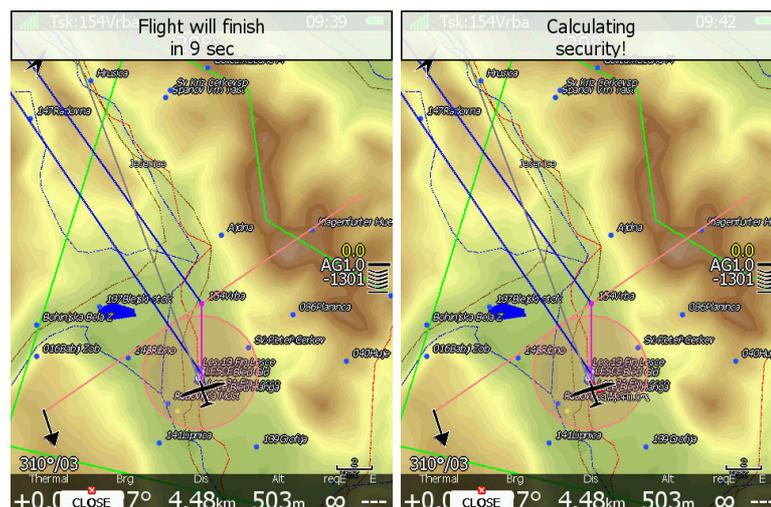
If you want to fly a new task without landing, load the new task and press the **RESTART** button.



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.

7.3 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 LX9000 the flight will automatically be copied to it.

Please use regular methods to power down the LX9000. See Chapter 4.4 for details.



It is important that the LX9000 is switched off via software. Never power down the LX9000 using the main power switch. The LX9000 is running the Linux operating system and sudden power loss may corrupt the file system.

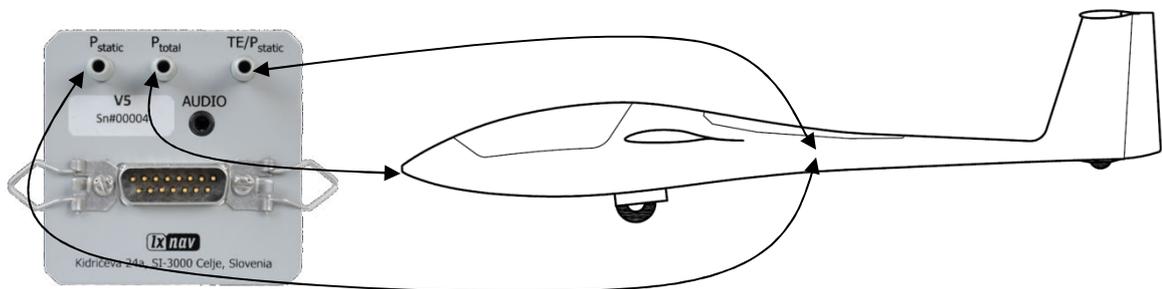
8 Installation

The LX9000 digital unit is installed in an aperture with dimensions 143 mm x 109 mm. The V5 vario unit and any additional vario indicators each require a standard 57 mm cut-out. Three pressure connectors are fitted to the back of the V5 vario unit. A label shows their functions.

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

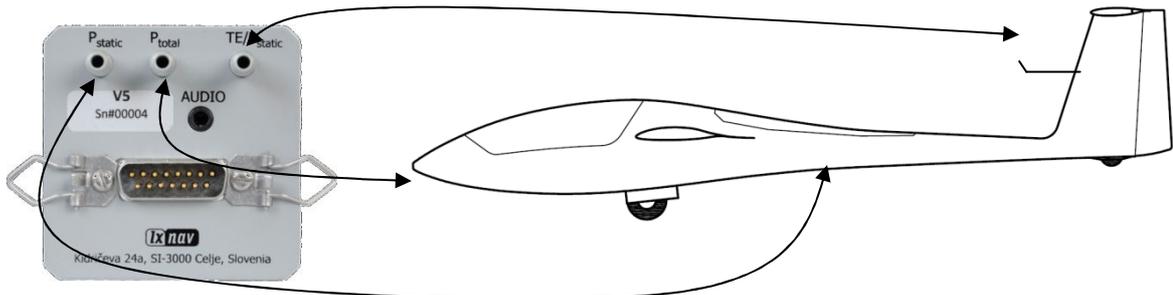
If the unit is to be configured for electronic TE compensation the connections are as follows:

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



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

- TE/ P_{static} TE tube
- P_{static} Static
- P_{total} Pitot or Total pressure



If the P_{total} and Static are connected the wrong way around there will be no integrator reading (average climb) during the flight.

The LX9000 digital unit is connected to 12 Volt power via the 15-pin SUB-D connector. The LX9000 digital unit and the vario unit (57 mm units) are connected via the RS485 bus and the connectors are labelled with "1" 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 LX9000 digital 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 mm² wires. To prevent damage to the LX9000 digital unit after a short circuit on the RS485 bus there is an automatic fuse.

If a short circuit occurs then the 57 mm unit will appear not to work anymore. The reason is not the defect of 57 mm unit – it is due to the hot automatic fuse. Turn off the LX9000 system and wait for the automatic fuse to cool down.

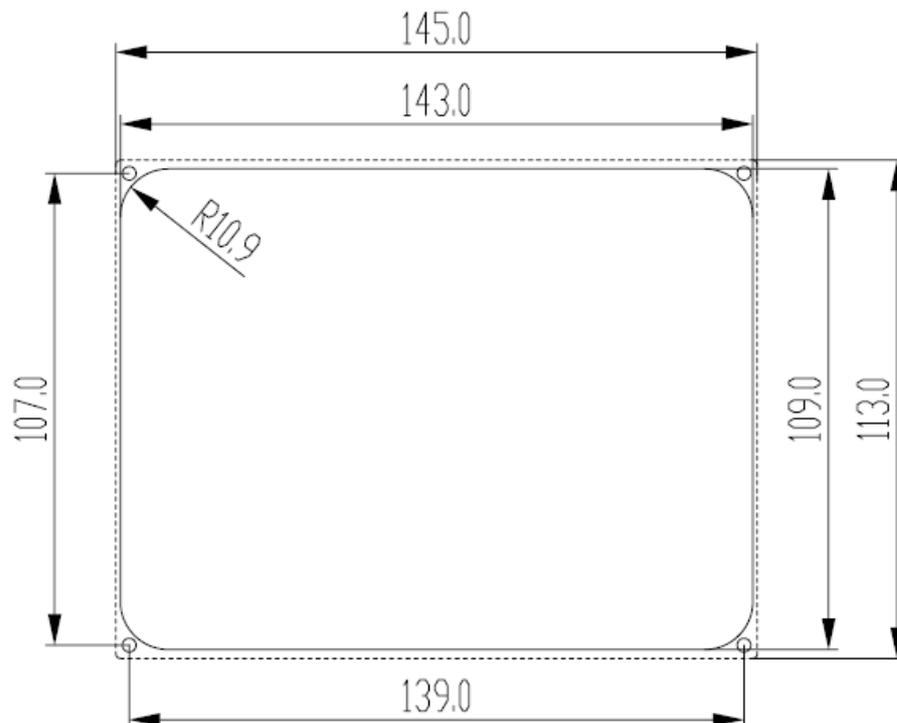
8.1 Installing the LX9000

Prepare the cut-out in the instrument panel according to the drilling template. Position the LX9000 digital unit in the cut-out in the instrument panel. Tighten the LX9000 digital unit with attached 2.5 mm screws.



When installing the LX9000 it is not necessary to remove the rotary knobs.

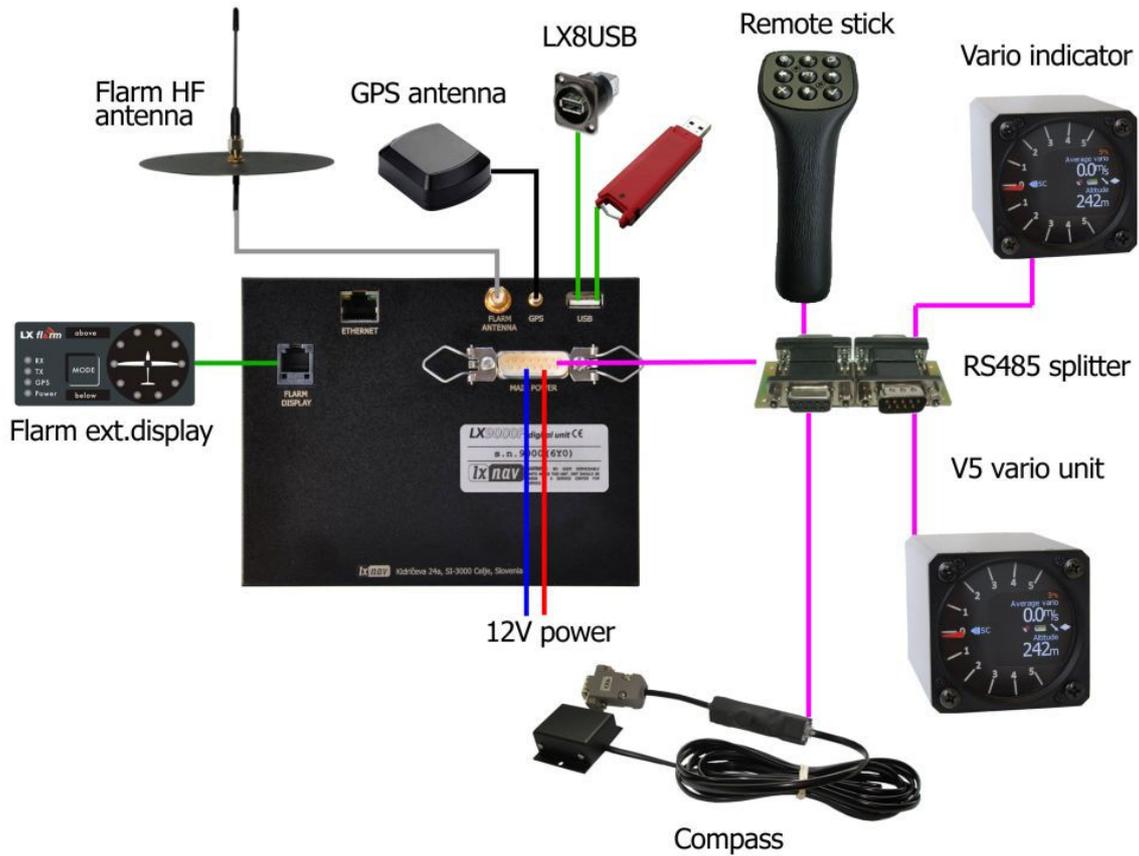
The mounting template is shown in the picture below (not to scale!):



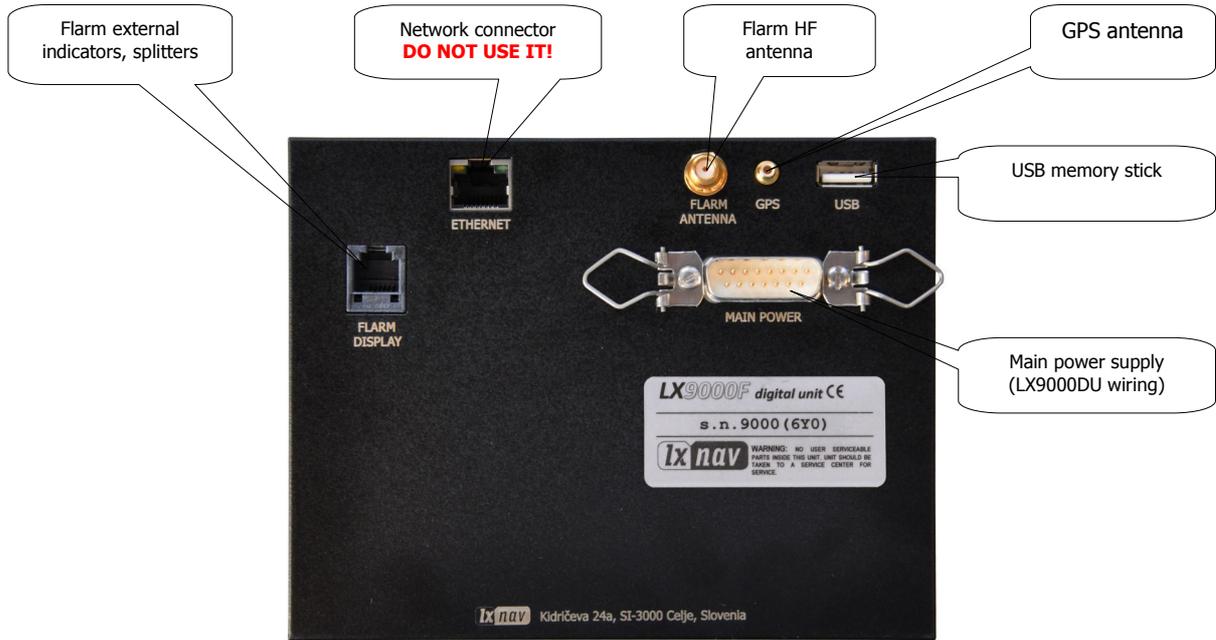
The vario unit should be mounted in a standard 57 mm hole.

8.2 Installation of Options

All options except AHRS (LX9000D, 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 LX9000 digital unit also powers all devices connected to the bus. An automatic fuse built into the LX9000 digital unit prevents damage to the digital unit should a short circuit in the wiring or in some attached device occurs.

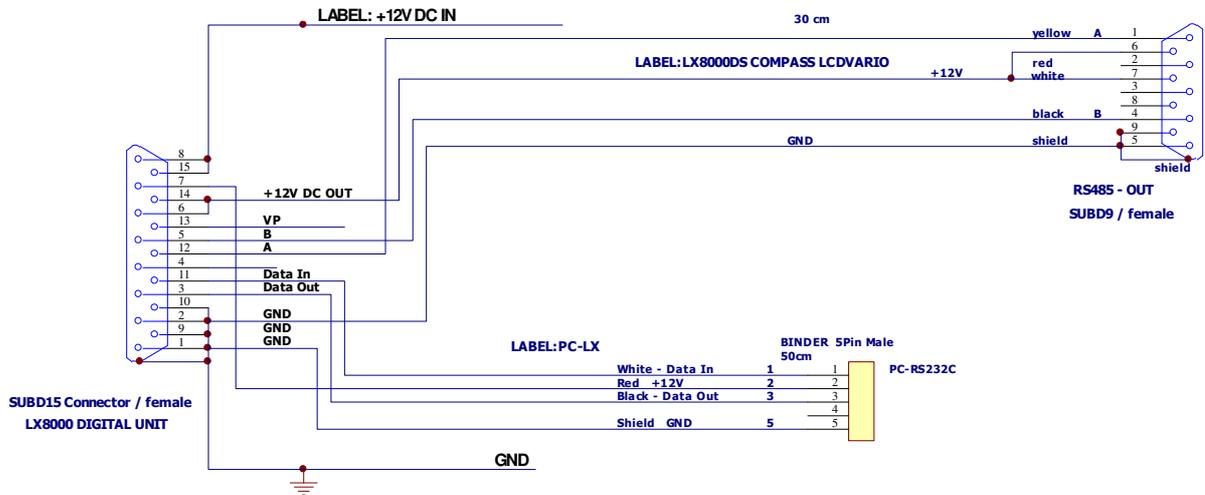


8.3 Ports and Wiring



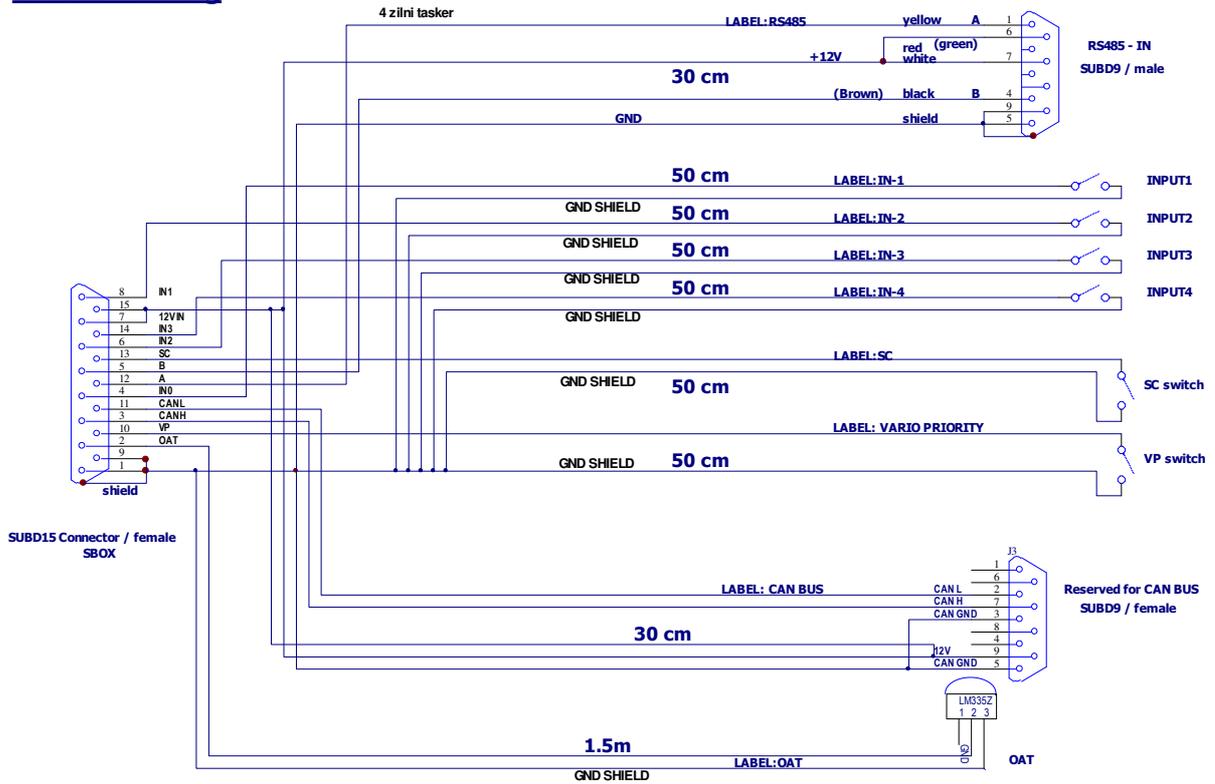
8.3.1 Main unit wiring

LX 9000 DIGITAL UNIT Wiring



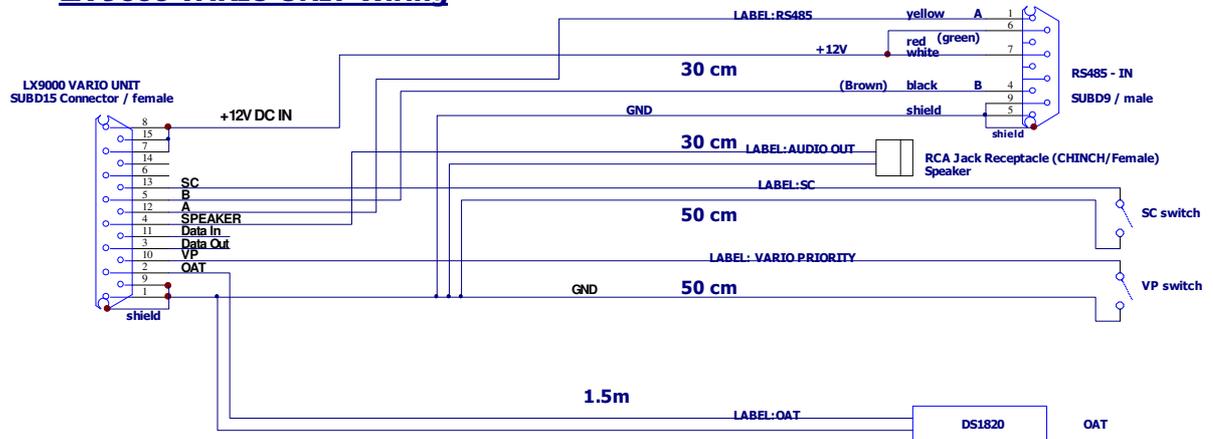
8.3.2 V5 vario unit wiring

V5 V1.0 Wiring



8.3.3 USB-D or analog unit wiring

LX 9000 VARIO UNIT Wiring



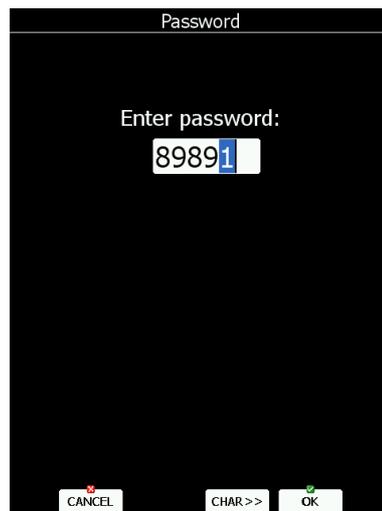
9 Firmware Update

Firmware updates of the LX9000, V5 vario unit or vario indicator can be easily carried out using the SD Card. Please visit our webpage www.lxnav.com and send us a request for the firmware update.

You can also subscribe to a newsletter to receive news about the LX9000 automatically.

9.1 Updating LX9000 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** extension. To proceed with the firmware update copy the update file to a SD card or USB stick and insert it into the LX9000.



Start the LX9000 and go to the Setup->Password menu option.

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

The LX9000 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.

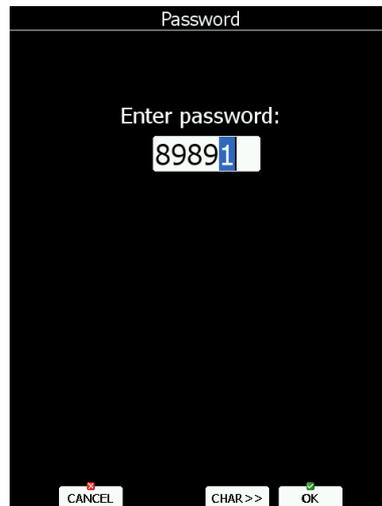
Enter the update code which was sent to you.



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 LX9000 will reboot and the new firmware is ready for use.

9.2 Updating V5 or Vario indicator



Start the LX9000 and go to the Setup->Password menu option.

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

The LX9000 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 Options

10.1 Flarm



Before using Flarm it is highly recommended to read the Flarm user manual which can be downloaded from 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 (common to both the LX9000 and Flarm), microcontroller unit, radio transceiver pressure altimeter and optional an external indicator. All electronic parts are integrated into the LX9000 cabinet. An exception is the radio communication antenna and the Flarm External Display. Some input is possible via the external display.

10.1.1 Flarm External LED Display

The Flarm external display is mainly used as a collision warning interface and status indicator. To connect both units use the original cable (telephone type) delivered with the unit. Use the connector on the back side of the LX9000 marked FLARM. The unit is powered from the LX9000.



Radial positioned red/green LEDs define the direction to the near glider (top LED active means frontal collision risk). Two additional red/green light emitting diodes marked **above** and **below** inform about vertical position of the glider when close. The **Mode** button is used to control the unit. Four red/green LEDs indicate the Flarm status. The external display has two modes of operation:

- **Warning mode** will activate a red blinking LED if another glider equipped with Flarm is close and a collision risk is predicted. An audio warning will also be heard. A higher collision risk will increase the blinking frequency and similar with audio. The warnings are classified into three levels (see the Flarm manual for details). The first level is approximately 18 seconds before predicted collision, the second level approximately 13 seconds before predicted collision and third level approximately 8 seconds before predicted collision.
- **Nearest mode** will show the direction to the nearest glider located within radio range. One green LED will light permanently and there will be no audio. The unit will change over to **warning mode** automatically if the warning criteria are satisfied and will revert to **nearest mode** after the collision risk disappears.



The external displays produced by LX Navigation will change over to Demo mode after **MODE** button is pressed briefly 10 times. The nearest mode and all possible warnings will then be displayed. To return to normal operation switch the unit off and back on again.

Pressing the **MODE** selector and holding down for approximately 4 seconds will deactivate the Flarm external display for 5 minutes; no warnings and no near information will be displayed during this period. This will be indicated by only the Power LED being on.



To change the mode of operation, press the **MODE** button for approximately 2 seconds. If the radial LEDs run from top to bottom this means change over to **nearest mode** and vice versa. After any power off followed by power on the mode active before switching off will remain.

10.1.1.1 Obstacles

Flarm unit is capable of storing co-ordinates of obstacles which could cause a collision during flight. This data is available on www.flarm.com (see Chapter 10.1.4). Use Flarm tools to update obstacles. The unit is factory pre-loaded with current obstacle database. An obstacle warning will be activated if an obstacle is found in front of the glider and a collision risk is predicted. After a low level warning has been activated two upper LEDs will be active (such a situation will never appear with glider v glider collision risk). Medium and high risk will be indicated with more LEDs active and higher frequency audio signal.

To change the audio warning volume, briefly press the mode selector; each press will increase the audio volume (three levels and mute available).



To change the mode of operation, press the **MODE** button for approximately 2 seconds. If the radial LEDs run from top to bottom this means a change over to **nearest mode** and vice versa. After each new power on the unit will start in Nearest mode.

10.1.1.2 Settings for the LX Flarm LED Display

Using the **MODE** key it is possible to adjust some parameters of the external display. Disconnect the unit, press the **MODE** selector and hold. Power on and hold the **MODE** selector for about 4 seconds. The display parameters can be defined by pressing the **MODE** selector for approximately 2 seconds and observing green LEDs. To move between parameters briefly press **MODE** and observe the red LEDs.

Parameter	LED	Red LED 018°	Red LED 054°	Red LED 090°	Red LED 126°	Red LED 162°	Red LED 198°
Twin cfg.	Tx	PIC	PAX				
Baud rate	Tx+Rx	4800 bps	9600 bps	19200 bps	-----	38400 bps	57600 bps

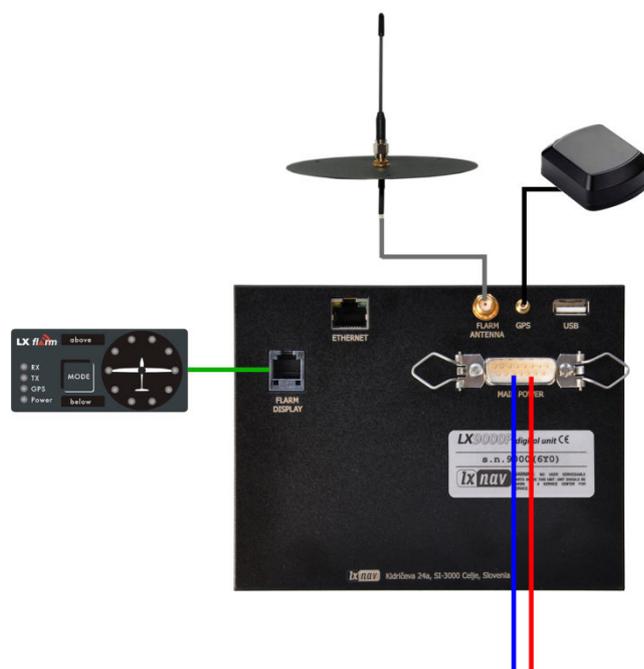


In conjunction with the LX9000 use exclusively 19200 bps.

If two units work in parallel (two-seat aircraft) one unit must be designated PIC and the other PAX.

10.1.2 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 LX9000 to the antenna. Never use an antenna without the original aluminium ground plane. If there is no space to install the metal back plane a dipole variant of the antenna is available. The picture shows the connected GROUND PLANE antenna. With the new LX9000F 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.

10.1.2.1 Functional Check After Installation

After the LX9000 has been switched on the Flarm External Indicator will receive power and will perform its initial routine which will take several seconds.

Description of the LED status:

1. Power red flashing: no data from Flarm.
2. Power green: Flarm data received.
3. GPS red: GPS BAD; GPS green: GPS OK/3D
4. Tx green flashing: data sent.
5. Rx green: at least one glider in range.
6. Green circular: indication of near gliders.
7. Red circular flashing: collision warning.
8. Above/below LED is green means an aircraft is near.

9. Above/below LED is red when warning is raised.
10. 018°, 054°, 324° and 288° green and red flashing, obstacles in front.
11. Check functionality of mode key; each short press will activate audio for a short time.



After installation you must verify the above functionality items 2, 3 and 11.

10.1.3 Flarm Update Procedure

The Flarm is updated via the SD card. From the Flarm web (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.

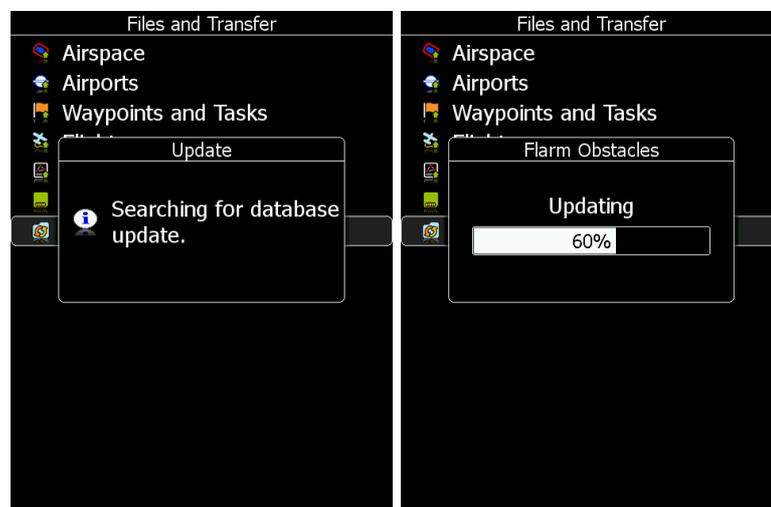


In case of a problem it is still possible to perform an update using FLARMtool and the serial connection. Please refer to an older LX8000 manual for the detailed procedure.

10.1.4 Uploading Obstacles

Also updating Flarm obstacles has been simplified in LX9000 version 2.2. Obstacles are updated via the SD card. 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.

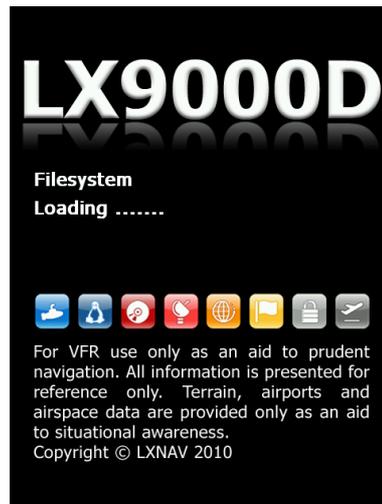


10.1.5 Uploading FlarmNet Files

The FlarmNet information is also updated via the SD card. Go to the FlarmNet site (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.

10.2 Rear Seat Device (LX9000D)



In two-seat gliders it is possible to install the LX9000D rear seat device. The LX9000D looks almost identical to the LX9000. However inside the device there is no GPS or Flarm module. The rear seat device must be connected only to the LX9000 via the RS485 bus system. Power is available from the bus hence no external power is needed. The device can be switched on only when the LX9000 is powered on.

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.

10.2.1 Data Exchange

Because the GPS and Flarm modules are not integrated in the LX9000D this data is received from the LX9000 digital unit through RS485 bus.

After power on, the LX9000 also sends polar data and pilot information to have them synchronised in both devices.

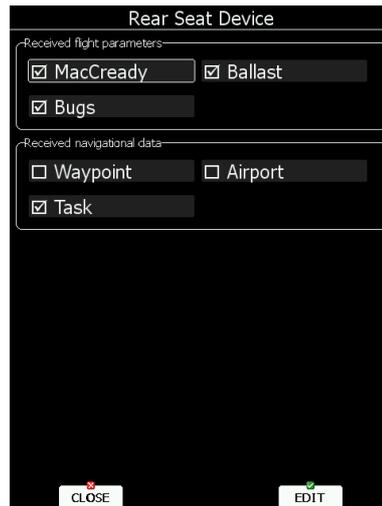
The user can define which data will be automatically synchronised between the LX9000 and LX9000D.



Way point and task databases are not synchronised between the LX9000 and LX9000D. 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 5.1.5.4 for how to copy way point files.

To set up data which is going to be received from the LX9000D, enter the "Rear seat device" menu on LX9000 digital unit (see Chapter 5.1.12.5).

To define which data is going to be received from the LX9000 go to "Front seat device" menu in the LX9000D unit (see Chapter 5.1.12.5).



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.

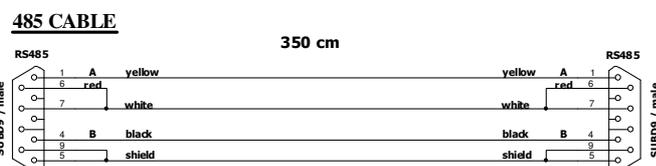
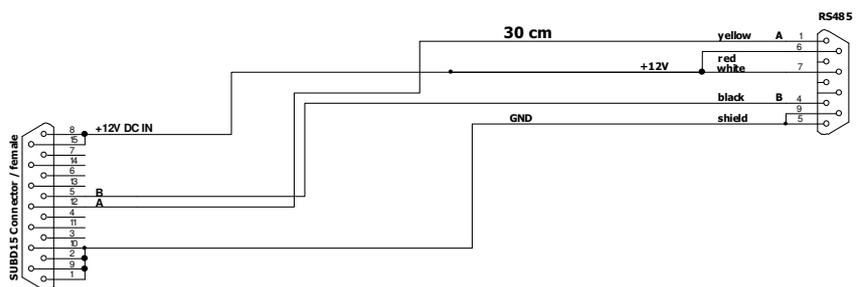
Check **MacCready**, **Ballast** and/or **Bugs** to receive the current MacCready value, current ballast setting or bugs from the other device.

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

10.2.2 Cable Wiring



10.3 ADSB-Receiver (TRX-1090)

It is possible to connect to LX9000F an ADSB-receiver TRX-1090 from Garrecht Avionics (www.garrecht.com).



TRX-1090 can only be connected to LX9000 with integrated Flarm option.

The TRX-1090 has been developed to include the very popular 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 directed 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.

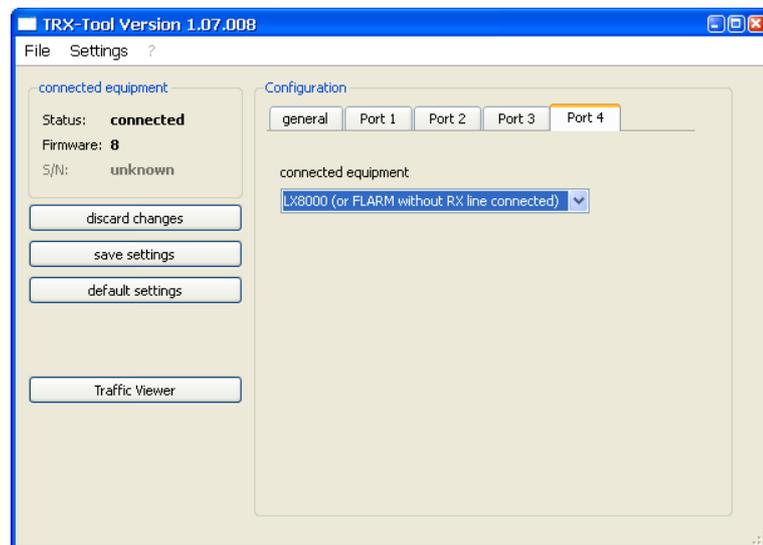
10.3.1 Installation

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 LX9000.

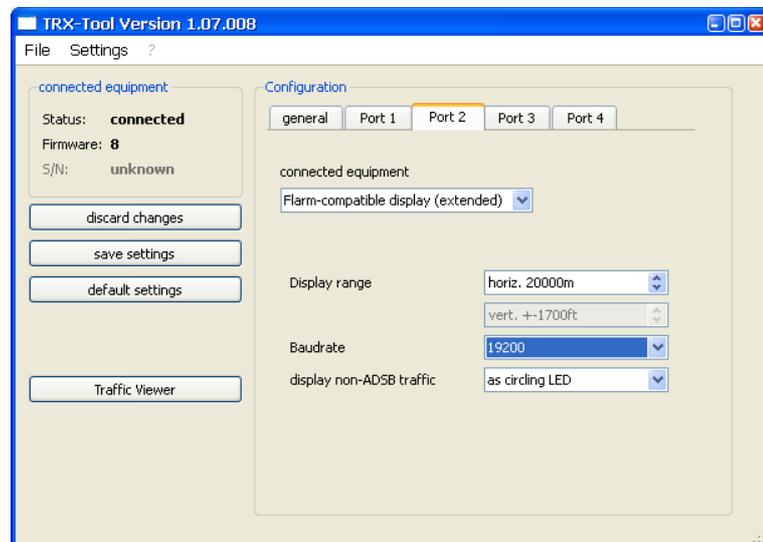
On the LX9000 go to the setup menu and choose Hardware->Flarm menu item. Change mode to **Ext.(PC)**.



Using the TRX-Tool program you should configure also TRX-1090 to be used together with the LX9000. Run the TRX-Tool program and connect the TRX-1090 to PC using a USB cable. Select Port4 tab and change **connected equipment** to LX9000 (or FLARM without RX line connected).



Select Port2 tab and change **Baudrate** to 19200bps.



The LX9000 and TRX-1090 are now ready for operation. On the info page you should see the TX sign and number of received objects.

10.4 AHRS

The LX AHRS system is designed for VFR use only. These instruments are not intended for use in type certificated aircraft. LXNAV makes no claim as to the suitability of its products in connection with FAR 91.205.



10.4.1 Installation

AHRS shall be installed as close as possible to aircraft center of gravity. It should be leveled with wings and fuselage as much as possible. Take care of flying direction label on the top of AHRS box. Small adjustments (few degrees) can be later corrected through AHRS setup menu.



Connect total pressure and static pressure to corresponding pressure connectors on AHRS module.

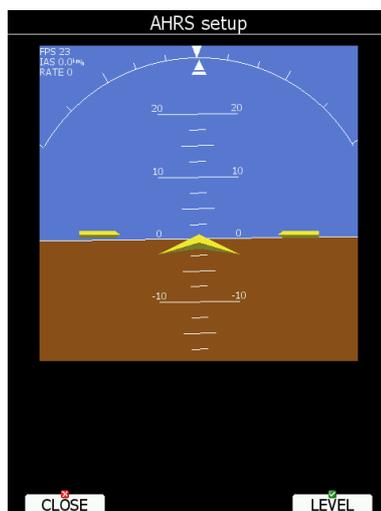


If total pressure is not connected, AHRS will not work properly.

Connect AHRS and main unit using supplied USB cable.

10.4.2 Level adjustments

In case that AHRS module is not aligned with glider, some minor corrections can be done through setup. Go to Setup->Hardware->AHRS menu.

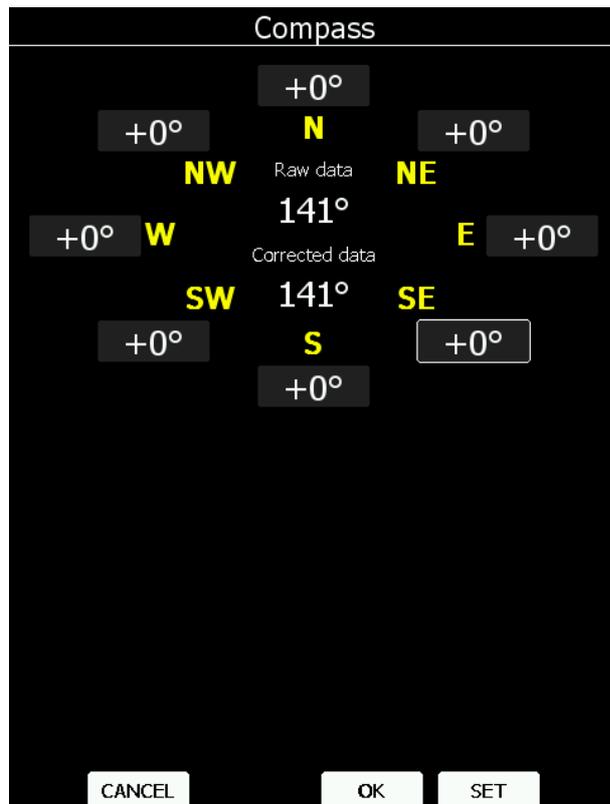


Place you glider in levelled position and press LEVEL button. You can also modify pitch only, if you rotate PAGE UP/DOWN rotary knob.

10.5 Compass Module



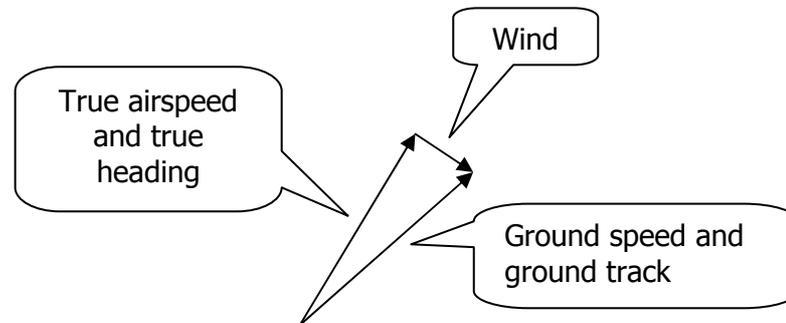
The compass module is an electronic compass device (magnetic field sensor) which was developed for the LX9000. The LX9000 recognises the compass module automatically when it is plugged into the RS485 bus. The only configuration settings needed are related to the compensation procedure. An indication that the compass module is connected is the appearance of raw data readings in the compass calibration page.



The heading indication is by default true. After change of settings in **UNITS** the indicated heading may be magnetic heading.

The compass module not only permits the display of magnetic heading but also permits the calculation of the wind vector in straight flight. The wind vector is calculated using the

triangle of velocities method where the vectors of ground speed with track, TAS with compass heading and the wind vector form a triangle of velocities. The angular difference between HDG and TRK depends on the magnitude of the wind vector and is normally quite small which means that the measurement has to be quite precise if accuracy is to be achieved. While the GPS data (TRK and GS) is precise small inaccuracies in the heading of about 5° can cause errors of up to 25 km/h in the wind strength. This method only works during straight flight and the calculation is stopped as soon as HDG and TAS change rapidly such as when the glider is turning.



10.5.1 Installation of the Compass Module

The device consists of two parts: a compass sensor and an electronic device. Pay attention to the flight direction arrow and install the compass unit horizontally. All connections are plug-and-play so no mistake is possible. A RS485 splitting unit to extend the RS485 bus is included. The compass module should be installed as far as possible away from magnetic, electrical and steel parts (loud speakers and analogue vario indicators contain strong magnets). Even the mechanical compass should be as far away from the sensor as possible. The minimum distance is 20 cm. As mentioned above the arrows should be aligned accurately in the flight direction and parallel to the fore and aft axis of the glider. For a proper installation a flat area parallel to the horizontal plane is needed.



The orientation is clearly marked on the label which is on the bottom of the unit.

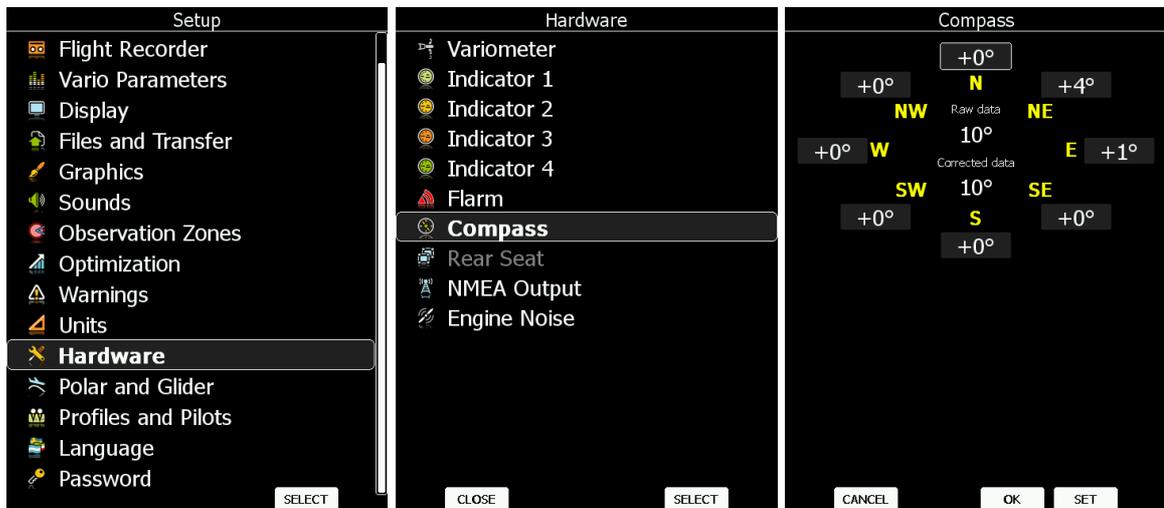
10.5.2 First Test After Installation

An external reference compass is required which can either be a prismatic landing compass or a calibrated compass base on the airfield surface. Using the reference compass the glider should be aligned in each of the eight main directions (360° , 45° , 90° , 135° , 180° , 225° , 270° and 335°). Now the glider should be oriented to the north direction whilst also watching the HDG raw data on the compass calibration page (do not try to compensate the compass yet). If the HDG varies more than $\pm 5^\circ$ rotate the compass so that the deviation decreases below $\pm 5^\circ$.

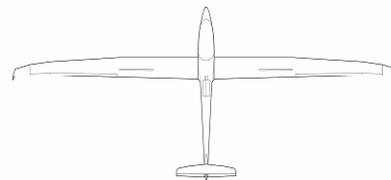
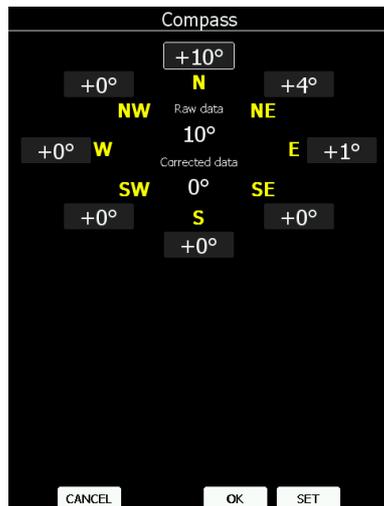
Now turn the aircraft to the other directions and read the displayed values (don't change the compass position anymore). If they vary more than $\pm 15^\circ$ look for another place for the compass module.

10.5.3 Adjusting the Compass Module

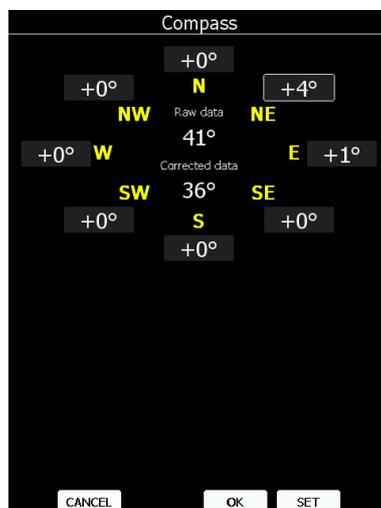
The compensation of the compass is carried out in the setup/hardware/compass screen:



1. Orient the glider to face north. The **N** label will be automatically highlighted.

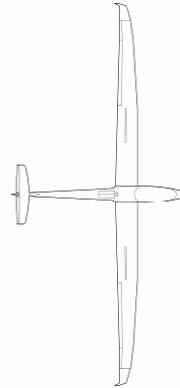
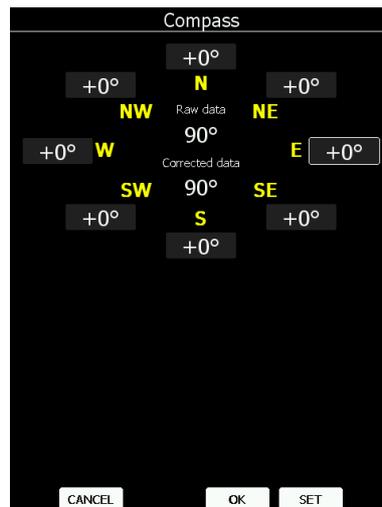


2. Stabilise the reading and press **SET** to save the correction for this direction.
3. Rotate the glider 45° to the right. The highlight on the label will move to NE.



4. Stabilise the reading and press **SET** to save the correction for this direction.

5. Repeat procedure for the remaining directions.



At the end press the **OK** button to save the calibration data or press **CANCEL** to cancel the changes in which case the previous settings will remain.



Switch the unit OFF by using the OFF button to store the calibration data properly. The calibration data will remain until next calibration procedure.

10.5.4 Final Check

Go back to the compass calibration page and check again the corrected data for all 8 directions. The error should now be less than $1^\circ - 2^\circ$ (better to have 1°). If the errors are larger then one should search for faults in the installation or in the adjustment procedure. When the final test is satisfactory your LX9000 is ready to calculate the wind with the compass method.



The calibration is specific for your combination of aircraft and compass which means that you cannot transfer the compass to another aircraft whilst using the same calibration values. It is recommended to repeat the calibration procedure every year.

10.5.5 Input of Local Magnetic Variation

The correct input of local magnetic variation is essential. Use the QNH and RES menus. False magnetic variation may degrade the wind calculation significantly. If auto variation is selected the LX9000 automatically calculates the magnetic variation from a mathematical model. See Chapter 5.1.1 for more details.

10.6 Remote Control

The remote control consists of two parts: a leather coated stick with built-in electronics and a printed circuit board which connects the wires coming out from the stick to the LX9000 RS485 system bus. The stick is available in three diameters: 18 mm, 20 mm and 24 mm.



All necessary electronics is built into the top of the stick and only the wires from the control tube to the interface unit need to be used. This solution makes the installation very easy. Additionally two shielded cables are used for speed command key and PTT.



Do not forget to set the speed command input setting to **TASTER** (see Chapter 5.1.12.1).

The original stick grip should be removed and replaced with the new one. On the top of the new grip there are 9 push buttons. An additional button positioned on the front side is for climb/cruise change over. Both the PTT and climb/cruise buttons are wired separately. All remaining buttons are connected to the built-in microcontroller and only four wires should be connected to the RS485 system bus. A very small interface printed circuit board connects four wires coming out of the stick to the 485 System bus.



After installation there is no special setting required on LX9000 side as the remote stick will be automatically detected.

Use the left/right arrow to zoom in and out. Use the up and down arrow keys to toggle between pages within the current mode. Press the upper-right button to enter the next mode. Press the upper-left button to move to the previous mode.

10.7 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 5.1.12.2).

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.

11 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. Added LX8080 chapters.

