

LX8000

(and LX8000D rear-seat device)
Variometer and GPS-Navigation System

Version 2.0



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1 Important notices

LX8000 system is designed for VFR use only as an aid to prudent navigation. All information are presented for reference only. Terrain, airports and airspace data are provided only as an aid to situational awareness.

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Yellow triangle is shown for part of manual which should be read very carefully and is important for operating LX8000.



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



Bulb icon is shown, when useful hint is given for reader.

1.1 Limited Warranty

This LX8000 product is warranted to be free from defects in materials or workmanship for two years from the date of purchase. Within this period, LX navigation 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 labor, provided that the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident, or unauthorized alterations or repairs.

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To obtain warranty service, contact your local LX navigation dealer or contact LX navigation directly

2 Packing lists

2.1 LX8000 with Flarm option

- LX8000 digital unit
- LX8000 vario unit
- Main power cable for digital unit
- Cable for vario unit
- LX5PC cable (for Flarm update)
- SD card
- Flarm LED indicator
- Barogram calibration chart
- IGC cable
- GPS antenna
- Flarm Antenna DIPOLE
- Hex key "Inbus"

2.2 LX8000 without Flarm option

- LX8000 digital unit
- LX8000 vario unit
- Main power cable for digital unit
- Cable for vario unit
- SD card
- Barogram calibration chart
- IGC cable
- GPS antenna
- Hex key "Inbus"

2.3 LX8000D

- LX8000D
- Main power cable
- RS485 cable – 4 meter
- RS485 splitting unit
- LCD indicator with cable
- SD card
- Hex key "Inbus"

3 Basics

3.1 LX8000 at a glance

The instrument consists of two units, the LX8000 digital unit and the LX8000 vario unit. Inside LX8000 digital unit an integral 16 channel GPS receiver and high brightness color display with 320x240 pixels are fitted. For user friendly data exchange an integrated SD card or USB interface is used. The LX8000 has, as an option, a built in flight recorder according to the last IGC specification for all flights. Optionally FLARM collision avoidance system is integrated in LX8000 digital unit.

The 57 mm diameter (2 1/4") LX8000 vario unit is a modern designed vario unit with its own micro processor. The unit communicates with the LX8000 digital unit over the RS 485 system bus. Optionally, additional LX digital vario indicators and a wide range of interface devices can be daisy chained using the RS 485 bus.



3.1.1 Display unit features

- Extremely bright 3.5" (8.9cm) color display readable in all sunlight conditions with backlight automatically adapted using ambient light sensor (ALS).
- Using Linux operating system (not CE Windows) ensures fast and stable operation of firmware.
- 6 push buttons and 4 rotary switches are used for input which compromise well known LX user interface. Remote stick is available optionally for more comfort.
- Preloaded with worldwide terrain maps, airspace and airport databases.
- Unlimited number of waypoints.
- Unlimited number of tasks (with assigned area support).
- Comprehensive flight and task statistics.
- Display of nearest airports and out landing fields.
- Unlimited number of pilots/profiles.
- Integrated flight recorder according to high-level IGC specification.
- Real-time flight optimization according to FAI and OLC rules.
- Flights stored in IGC format are downloadable using integrated SD Card.

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

3.1.2 Vario unit features

- Vario with many custom audio settings such as netto, relative (super netto) and average
- Smart vario
- Speed command
- Final glide calculator
- TE compensation is selectable for either pneumatic TE tube, or electronic TE

3.1.3 Interfaces

- RS232 interface has NMEA output, for external devices.
- SD Card interface
- USB for data transfer using USB memory stick.
- IGC interface to connect and power Colibri or LX 20. The connector pin out corresponds to the IGC standard.

3.1.4 Options

3.1.4.1 Internal options

If ordered, integrated Flarm electronics can be built in to the LX8000 digital unit. All necessary connectors are available on the rear side of the unit (Flarm external indicator, Flarm antenna), which guaranties minimum the same comfort like using of 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 bicolor LED Flarm External display is an apart of delivery, extension to 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, without any significant installation works. The LX 8000 bus system can be extended easily by use of RS485 splitting units, which allow plug and play connection of optional devices. Following units can be connected to LX 8000 bus system:

- **Second seat device (LX7007D or LX8000D)**. 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 RS485 bus system.
- **Remote control**. An extremely ergonomic leather coated handle which includes 8 push buttons to operate LX 8000 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 LCD indicators**
- **Voice Module**, for speech messages and warnings

3.1.4.3 Simulator

Condor PC flight simulator (www.condorsoaring.com) data can be received via RS232 port after input of suitable passwords (See chapter 5.1.15). This feature is extremely useful for the pilots who want to learn about LX8000 and also like refreshment after winter period. Please note that altitude data will be sent from the simulator, meaning that real final glide training will be possible.

3.1.5 Technical data

- Power input 10-16 V DC
- Consumption at 12V:
- 290 mA - minimum brightness without audio and options
- 300 mA - minimum brightness without audio and with Flarm
- 380 mA - maximum brightness without audio and options
- 390 mA - maximum brightness without audio and with Flarm
- 70 mA – additional for LX8000 vario unit
- Cut-out dimensions of LX 8000 digital unit 93.5x81.5mm, outline dimensions: 98x88x115mm inclusive connector
- 57mm (2 1/4") standard aircraft cut-out for LX 8000 vario unit length 120 mm (inclusive connector)

3.1.6 Weight

- 580g LX8000 digital unit
- 300g LX8000 vario unit

4 System description

4.1 Rotary switches and buttons

The following controls are mounted on the front face of the LX8000 digital unit:

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



The LX8000 vario unit is an indicator only and has no controls. Information displayed is controlled by the LX8000 digital unit.

4.1.1 Buttons

All buttons have a dynamic function in that the first press of each button displays its function without executing any action. Not all buttons have a function on every page. In some cases buttons have long press function.

4.1.1.1 Power button

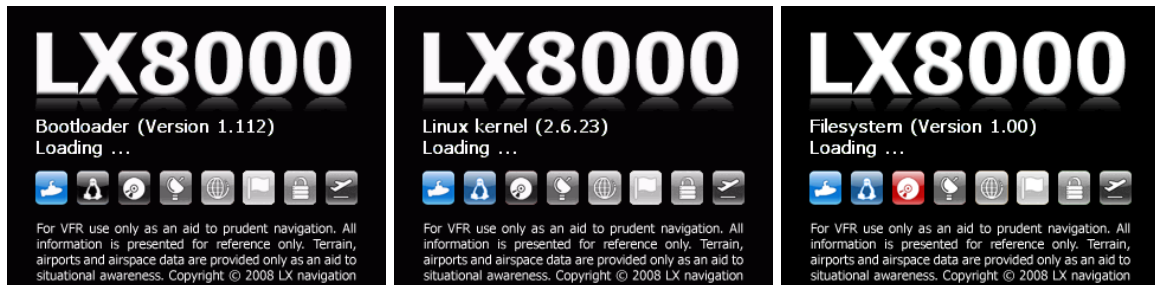
Power button is top left button with ON/OFF symbol on left side. It has multiple functions. Primarily it is used to switch the LX8000 system on and off.

4.1.2 Rotary knobs

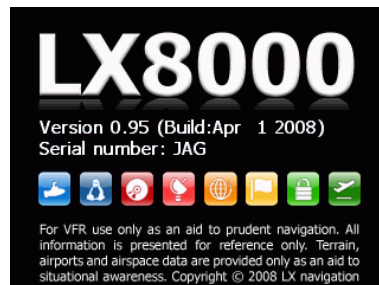
LX8000 has four rotary knobs. Each of them has one function. Only the zoom knob has, in some cases, a function other than zoom. With the upper left rotary knob the volume can be adjusted. The upper right rotary switch is the mode selector (It changes the mode of the operation). Lower right is up/down switch is used for selecting sub pages, sub menus and edit menus. At lower left is the zoom knob and it is multifunction. While its main function is to change the zoom level in the 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 LX8000 vario unit will turn on. A few seconds later the LX8000 digital unit welcome screen will appear. First screen shows the version of the boot loader, and then the version of the Linux kernel operating system is shown and then the version of the file system.



The boot procedure normally takes 30 seconds but in the case of a firmware update or system check it can take more time. On the last boot screen information about LX8000 firmware and IGC serial number is shown.



When the boot procedure is completed the profile selection dialog is shown. Please refer to chapter 7.1 for more details about starting up LX8000.

4.3 User input

LX8000 user interface consist of many dialogs which have different input controls. They are designed to make input of names, parameters, etc, as easy as possible. Input controls can be summarized as:

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

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

- Clockwise rotation will select next control.
- Counterclockwise rotation will select previous control. Press SELECT button (usually bottom-right) to enter control input.

4.3.1 Text edit control

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



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

Abc button is toggle button and will change letter case. Pressing is to toggles modes.

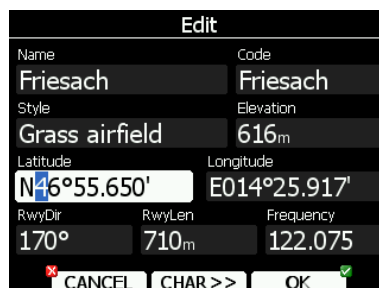
- **Abc** mode will start every new word with capital letter, next letters will be lower case.
- **ABC** mode will enter only upper case letters.
- **abc** mode will enter only lower case letters.

Press **DELETE** button will delete the character at current cursor position. Press **DELETE** button for long time to delete all characters after current cursor position.

Press **OK** to confirm changes and leave control. Press **CANCEL** button to abandon changes and revert back to values before entering controls

4.3.2 Masked text edit control

Masked editor is similar control to text editor but only limited characters can be entered at any particular position. It is designed to enter latitude, longitudes and passwords.



4.3.3 Spin control

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

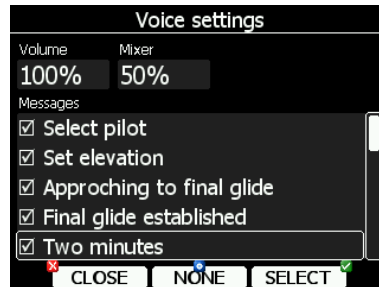


4.3.4 Selection control

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

4.3.5 Checkbox and checkbox list

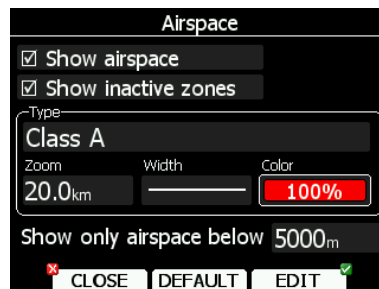
Checkbox enables or disables particular parameter. Press **SELECT** button to toggle value. If option is enabled a checkmark will be shown, otherwise an empty rectangle will be drawn.



Use page selector to iterate through checkbox list. Press **ALL** button to enable all options.

4.3.6 Color selector

Colors and fills are set with color selector control. Rotate page selector to change color.



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

4.3.7 Font selector

Using font selector it is possible to define font color and style for selected item



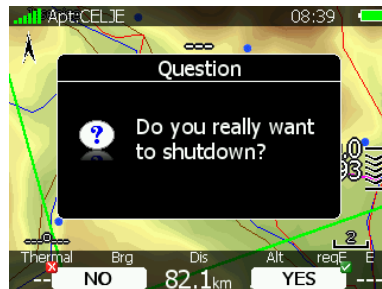
Turn right bottom knob (page-selector) to change font style. Text is also rendered in selected font style. Turn left-bottom knob (zoom-selector) to change font color.

4.4 Switching off

Please use one of recommended methods for shutting down LX8000.

Method 1

Press button having the OFF label which is displayed in navigational modes. See chapter 5.5 for more details. Message to confirm shutdown will be shown.



Method 2

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



Method 3

When button with off symbol is pressed for more than 8 seconds, LX8000 will unconditional shutdown. This method is recommended only in case that LX8000 program hangs and it is not possible to shutdown with methods 1 or 2.



If you are using Method 2 to switch off LX8000 is necessary to release button when you see a message shutting down. If you will continue pressing off button LX8000 may shut down by method 3.

In case that request for OFF is made during flight, the instrument will ask for confirmation so the LX 8000 can not be switched off by mistake.



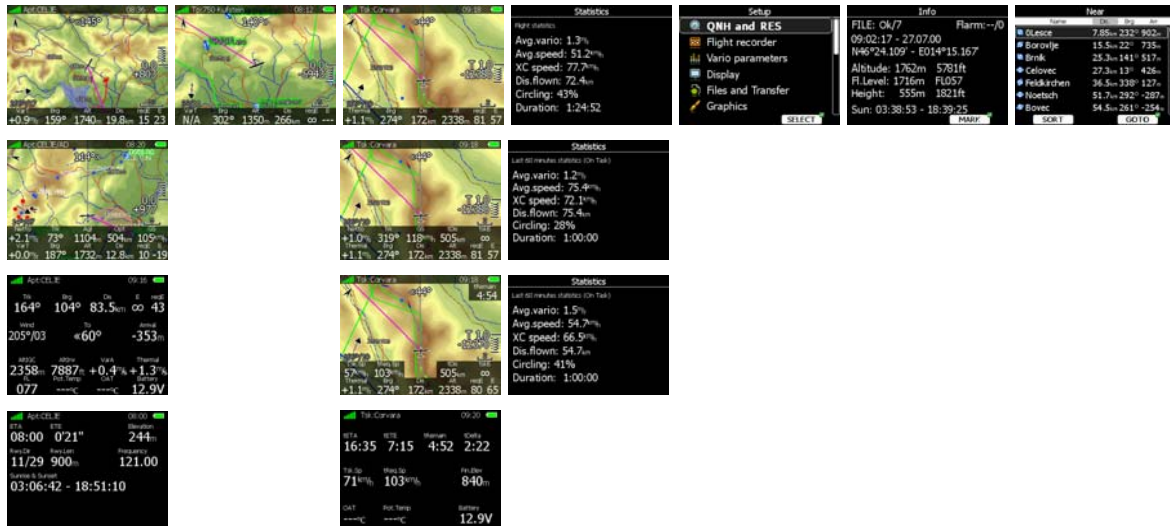
It is important LX8000 is switched off using software. Never power down LX8000 using main power switch. LX8000 is running Linux operating system and sudden power loss may corrupt file system.



During flight, if main power is lost for a few seconds, the flight recorder will not produce two flights. The most important flight parameter, altitude will remain, which means that the final glide is not interrupted.

5 Operating modes

The LX8000 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 LX8000.



- **Airport mode**, navigation and selection airports
- **Waypoint mode**, navigation, selection and editing waypoints
- **Task mode**, Navigation, selection and editing task
- **Statistics mode** shows statistical data for flight in progress or logbook
- **Setup** mode is used to configure LX8000
- **Information mode** displays GPS status, altitude, flight level and height, sunrise and sunset.
- **Near mode** shows list of all landable waypoints and airports.

Navigation modes and statistics mode have more pages, which are accessible by rotating the bottom-right knob also called 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 bottom-right knob.

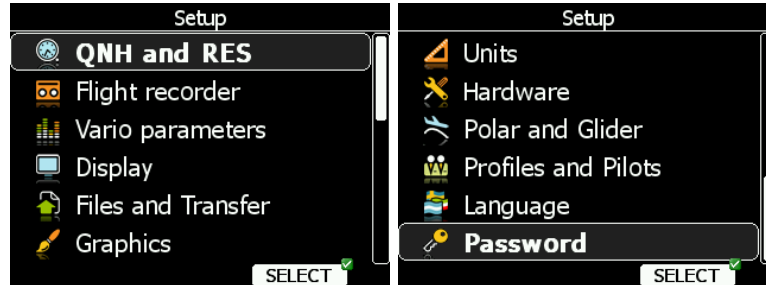
In airport navigation mode the user can navigate only to airports stored in LX navigation Airports database. This database can not be edited and is available, free, on our web pages. See chapter 5.1.5.2 for more details how to obtain latest databases.

In waypoint navigation mode user is navigating to waypoints that were previously loaded and selected in 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 done exclusively to task points.

5.1 Setup mode

In setup menu users can configure LX8000. Turn bottom-right knob or press UP/DOWN arrow on remote stick to select appropriate setup item. Press **SELECT** button or CHECK button on remote stick to enter menu. A dialog or sub-menu will open.



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

5.1.1 QNH and RES

Turn bottom-right knob to select entry field. Press EDIT button and start editing 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. As 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. After safety altitude input, the pilot has to keep final glide indicator on 0 to arrive on safety altitude.

5.1.1.3 Magnetic variation

LX8000 has a built in an Earth magnetic field model. If check Auto variation is selected, then magnetic variation is derived from this model, otherwise user can enter custom value.

5.1.1.4 ETA/ETE calculation

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

- **MacCready** setting 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 groundspeed over the last 5 minutes for distance and Vario statistics for climb rate.
- **Avg.Speed & MC** uses the average groundspeed 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 available



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

5.1.1.5 Soaring start*

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

5.1.2 Flight recorder

LX8000 digital unit has built in a fully approved flight recorder 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 recording interval, enter pilot name. Pilot weight is important, if ballast is given in kilograms of water. (See chapter 5.1.11). If LX8000 is used in double seater, the name of copilot may also be entered.



There is no setup for glider type. Glider type is defined in Polar and Glider setup (see chapter 5.1.13)

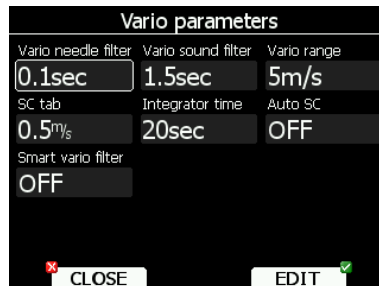


Compared to previous LX instruments (LX20, LX5000 and LX7007) there are less settings for flight recorder. This is because LX8000 will record all additional data such as (wind, speed, vertical speed) by default.

If new pilot is entered, on dialog exit, message "Do you to create new profile?" will be asked. Answer YES if you want quickly to add new profile. For more information about profiles see chapter 5.1.12.

5.1.3 Vario parameters*

The following parameters can be set using this option.



On that page following parameters are set:

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

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

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

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

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

Auto SC defines the conditions, by which the instrument is switched automatically between vario and speed command.

- OFF: Switching is possible exclusively by an external switch, connected to the LX 8000 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 a straight flight will cause a change over 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)

Smart vario filter gives us four levels of dynamic damping of the vario indication.

Auto reset integrator, resets integrator to zero in the moment, when LX8000VU switches from SC to VARIO mode. If that item is not checked, integrator will not be initiated to zero. (That function is supported with LX8000VU version 2.05 or higher.)



The external switch wired to LX 8000 AU has absolute priority and will override all other switching methods.

5.1.4 Display

Display menu controls screen brightness. LX8000 has an ambient light sensor which detects ambient light and automatically increases or reduces brightness of screen.



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

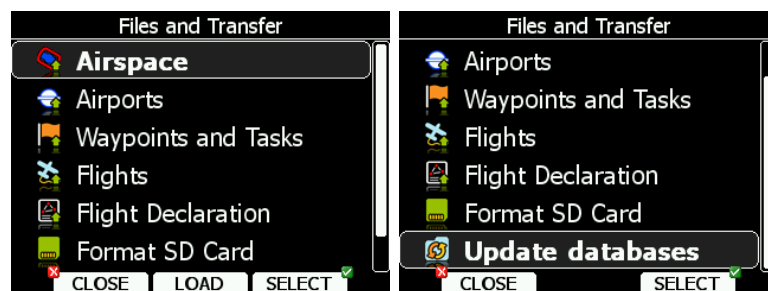
If you want to set brightness manually, uncheck **Automatic brightness** control and setup brightness manually.



It is recommended that the automatic brightness control always be used. Reducing brightness will also reduce power consumption. See technical data for more details (Chapter 3.1.5)

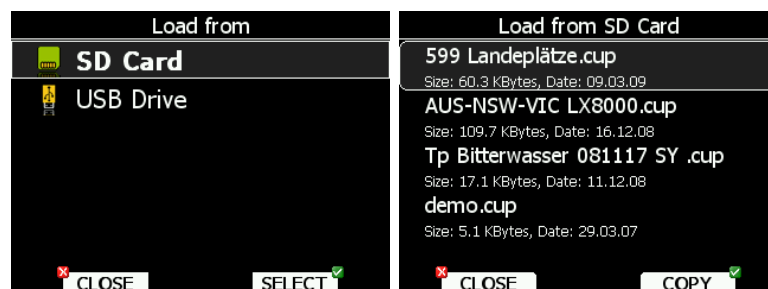
5.1.5 Files and transfers

Files and transfer menu is used to manage waypoint, airspace and airport databases.



5.1.5.1 Uploading user airspace and waypoints

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



In next step, source of data must be selected. A dialog with list of all available files will be opened. Press COPY button to copy selected file to LX8000. LX8000 will accept following file formats:

- **Waypoints file:** SeeYou CUP files, LX navigation DA4 files and Cambridge/Winpilot DAT files. When selecting DA4 or DAT files, waypoints will be converted to CUP format, which is format user for internal storage of points. There is no limitation for number of waypoints in file and/or name length.

- **Airspace file:** All types of CUB files are accepted.

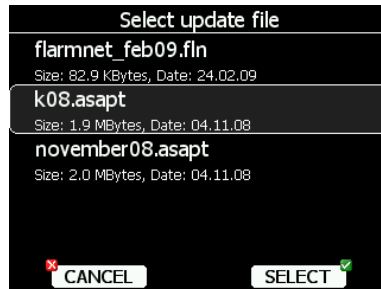
5.1.5.2 Uploading LX navigation Airspace and Airports database

LX navigation is distributing free of charge airport and airspace database for the whole world. Airport and airspace database is regularly maintained by LX navigation. Latest version of database can be found on

<http://www.lxnavigation.si/avionics/downloads/databases.cfm>

Database is distributed as single file with .ASAPT extension. Copy this file to SD Card or USB stick. Plug SD card or USB stick into LX8000 and select **Update database** menu item.

If more ASAPT files are found on SD card a dialog to select the appropriate one will be shown.



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

5.1.5.3 Managing airspace

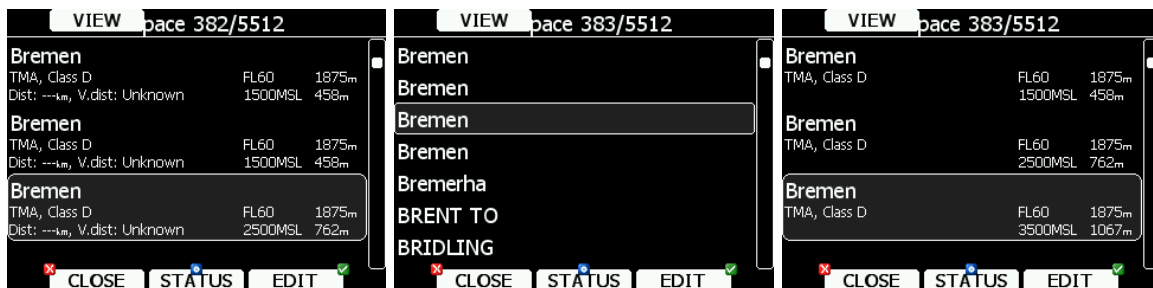
Select **Airspace** menu item and press SELECT button. List of all available airspace databases/files will be shown on screen. At top LX navigation airspace databases are shown followed by user airspace files.



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

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

It is also possible to edit airspace file. Select airspace item and press EDIT button. A list of all airspace zones in this database/file will be shown. Use page selector to scroll one by one item or zoom selector to move up or down for whole page.



Pressing VIEW button will toggle different views of zone list.

Using STATUS button, selected zone can be disabled for proximity warnings. Repeated presses will toggle 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 10minuts.
- If **no label** is shown airspace is enabled for proximity warnings.



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

5.1.5.4 Managing waypoints

Select **Waypoints** menu item and press SELECT button. List of all available waypoints files will be shown on screen.



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

Press ACTIVE button to mark selected file as active.

Press DELETE button to remove selected file from LX8000.

Press SAVE button to save waypoints to SD Card or USB stick. Save dialog will be opened.



Change file, if required. Press TO USB for saving to USB stick or press TO SD for saving to SD card. **compatibility mode**

5.1.5.5 Managing airports

Select **Airports** menu item and press SELECT button. List of all available airport databases will be shown. Only LX navigation airport databases are shown in this menu; the user cannot

modify contents or LX navigation database within LX8000. If an error or mistake is found in our database, please notify us.

If you wish to add additional airports to LX8000 an ordinary waypoint file should be created and uploaded as waypoint file or use LXe program to modify airport database.

5.1.5.6 Managing airports using LXe program

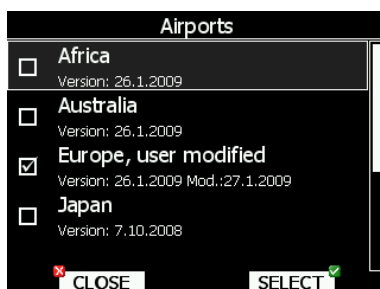
With LXe program version 3.4 or higher it is possible to edit airport data. The new feature, which applies only to the LX8000, is that each airport entry has a field called "description" in which any comment or notes of up to 250 characters can be added.

Modified airport data can readily be exported to the LX8000 with (asapt) file and imported to LX8000 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 database and date of export (modification) executed using LXe.

The picture below shows airports that have not been modified (as distributed by LX navigation in initial delivery of each LX8000)



Next picture shows European airports database modified by user.



Original database can be restored only with update database procedure using the original database file. All databases are published on www.lxnavigation.si

5.1.5.7 Managing flights

Select Flights menu item and press SELECT button. List of all stored flights will be shown. LX8000 is capable storing much more than 1000 hours of flight logs.

Flights 1/32 DELETE				
#	Date	Takeoff	Landing	Duration
1	26.12.08	11:20	17:34	06:13
2	25.12.08	12:32	17:16	04:44
3	24.12.08	13:16	16:13	02:57
4	23.12.08	12:07	15:44	03:37
5	22.12.08	12:17	15:16	02:58
6	21.12.08	11:43	17:37	05:54
7	20.12.08	11:30	16:07	04:36

If SD card or USB stick is inserted in LX8000, flights can be copied to it, when corresponded button is pressed. Flights can be removed using DELETE button.

5.1.5.8 Flight declaration

Flight declaration is composed from pilot data and declared task. Use this option, if you would like to load or save flight declaration from a file. Flight declaration is saved to LX Navigation HDR file.



On screen pilot, glider and task information are shown. Press SAVE button to save flight declaration to SD card or USB stick. Press LOAD button for loading



Please note that not all data from HDR file will be loaded. Glider type and class must be changed in Glider and Polar menu (Chapter 1.1.1 as also final glide calculations are linked to this setting).



HDR file do not include information about observation zone and turnpoint elevation. Observation zones will be set to default values (Chapter 5.1.8) and elevation will be defined by digital elevation model built in instrument

5.1.5.9 Formatting SD Card

Use this option, if LX8000 cannot read your card. LX8000 uses same card format as used by Windows operating system. However sometimes Windows does not format SD card properly or new card may not be formatted properly.

It is advised, therefore, that before using SD Card with LX8000, it is formatted: the LX8000 can do this for you.



Formatting SD Card will erase complete contents of SD card.

5.1.6 Graphics

This dialog allows user to setup the appearance of the map in navigational mode. Choose Graphics menu item and press SELECT button. Submenu will open.



5.1.6.1 Terrain and Map

LX8000 is preloaded with terrain for complete world. Database includes elevation contour lines, water bodies, roads, highways, railways, big cities and digital elevation model. Database is derived from VMAPO free database and some data may be obsolete. Database can not be modified by user.



Check **Show map** item to enable map displays in navigational pages. If item is unchecked no map will be displayed. The **zoom** defines up to which scale of zoom city names are visible. 100km means the whole width of the screen represents 100km. The user can also modify size, font style and color by **Font style and color** item. Use left-bottom knob to modify color and right-bottom knob to modify style.

Terrain can be rendered in three different levels. Higher level means more details. LX8000 is optimized to work with high terrain quality. If off option is selected, no terrain will be shown, only water bodies, roads, railways and cities.

Background color is defined by **Background** item. Default background is black.

Colors of terrain can be changed using different terrain color schemes. The following color schemes are available:

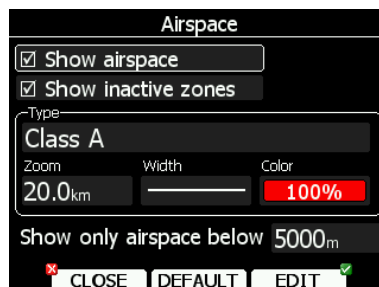
- **Mountain** is default setting with colors from green to white at 2000m.
- **Flatland** is setting where colors are changing up to 1000m.
- **Low contrast**, same as Mountains but colors are not so intensive.
- **High contrast**, same as Mountain but colors are more intensive and from 0-100m, white color is used.
- **Zebra** alternating colors are used.
- **Zebra 2**, less intensive alternating colors are used.

In **Elements** group lands features are setup separately. **Zoom** defines up to which zoom level selected land feature is visible. Also line width and color can be setup.

Press DEFAULT button to reset these settings back to default.

5.1.6.2 Airspace

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

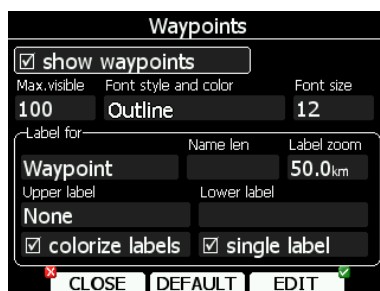


In the **Type** panel you can setup how each airspace type is displayed. You should setup each type of airspace zones separately. First choose an airspace type from the list. Using **Zoom** spin setups to which zoom level this type is going to be visible. **Color** item specifies

airspace zone color. You can also modify transparency of selected type. Turn bottom-left knob to change value of transparency. 100% means completely transparent and only airspace zone outline will be shown. 0% means completely solid. (Not recommended). If **Show inactive zones** option is checked then airspace zone with proximity warning switched off will be shown. Use **Show only airspace below** spin to eliminate airspace which is going to be too high for selected day. For example, if forecasted cloud base is at 1500m, set this value to 1600m and you will see screen is going to be much more readable. Press DEFAULT button to reset these settings back to default.

5.1.6.3 Waypoints

Waypoint look and feel is setup in this dialog. Check Show waypoints item to enable waypoints display in navigational pages. If item is unchecked no waypoints will be displayed.



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

Font style, color and size can be defined using next **Font style and color** item and **Font size** item. When editing style, turning bottom-left knob will change color of font.

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

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

Label is selected from following options:

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

Press DEFAULT button to reset these settings back to default.

5.1.6.4 Glider and track

LX8000 can show colored path flown, current track vector and target vector with terrain collision warning.



Check **show path** item, if you want to see flown path. **Path length** defines, how much of flown path will be shown. Maximum recommended length is 60 minutes. Path can be colored using:

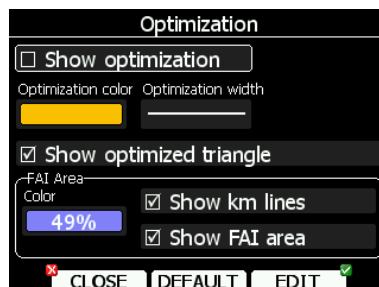
- **Vario** path style, where red colors indicates positive vertical speed and blue colors negative vario speed.
- **Mc** path style, which is based on current MacCready settings. Red color indicates part of flight where, we have vertical speed higher then current MacCready setting. Orange color shows for vertical movements about same size as current MacCready setting and blue for vario below MacCready setting. Gray color depicts sink area
- **Fixed** path style. Path color is fixed and defined by path color item.

Check **show current track** item if you would like to see your current ground track vector. **Track color** and **width** defines color and width of current track vector.

Selected target and current position are connected with magenta line. Check **show target**, if you would like to see this line. In the target color and target width you can select the **Color** 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 navigational point and current positions and therefore not enough altitude to reach the target with the current glider settings. Press DEFAULT button to reset these settings back to default.

5.1.6.5 Optimization

LX8000 is calculating optimized flown distance according to OLC or FAI rules in real-time during flight. (See chapter 5.1.9). It also calculates FAI area, which is actual FAI triangle assistant. If you enter this area and return to start point, your flight forms triangle according to FAI rules. Optimization dialog is used to setup look and feel.



Check **show optimization** item to enable display of optimized track. Optimization color and width defines color and width for these lines.

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

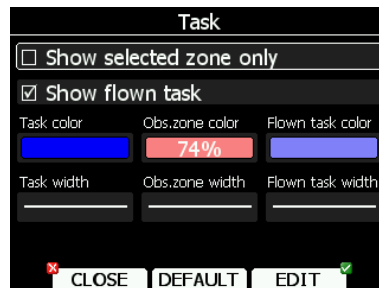
FAI Area group defines how FAI area is drawn. Select **Color** item to change color of FAI area. Use bottom-left knob to change transparency of area. 100% means completely transparent and only outline will be drawn. 0% means completely solid. (Not recommended). Check **show km lines** item to see lines which indicates, what will be size of completed triangle.



These lines will always be plotted in kilometers scale regardless of Units setup.

5.1.6.6 Task

Use this dialog to setup how task is drawn in task mode.



Task color defines color of task lines. **Observation zone color** defines colors for observation zones. Use bottom-left knob to change transparency of area. 100% means completely transparent and only outline will be drawn. 0% means completely solid. (Not recommended). When **Show flown task** is checked also flown task will be drawn. This might be useful, when flying assigned area tasks.

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

5.1.6.7 Flarm

Some LX8000 are equipped with FLARM module. If you instrument is equipped with FLARM module, this menu will let you to modify presentation of Flarm radar display.



Flarm radar is not available if competition mode is switched on or privacy is switched on. See chapter 1.1.1.



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

Colors are designed to present three values. The color for aircraft more than 100 meters above your current altitude is defined by the **above color** item. The color for aircraft more than 100 meters below your current altitude is defined by the **below color** item. The color for aircraft that are less than 100 meters below or above your current altitude is defined by the **near color** item.

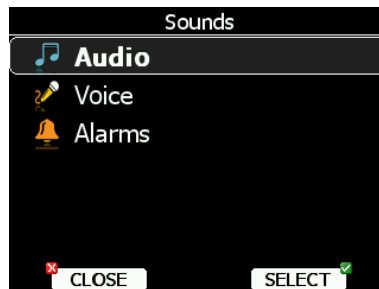
When a signal from a particular aircraft is lost, the aircraft remains blinking on screen for duration defined in **Lost device after** item (default 120 seconds). After that time the aircraft symbol will not be displayed.

Next to aircraft, aircraft altitude and vertical speed are displayed, if **show labels** item is checked. User can modify size, font style and color. Select **Font style and color** item. Use left-bottom knob to modify color and right-bottom knob to modify style.

It is possible to display flown path of tracked aircraft. **Path color** and **Path width** defines width and color of paths. To enable paths check **Show paths** item.

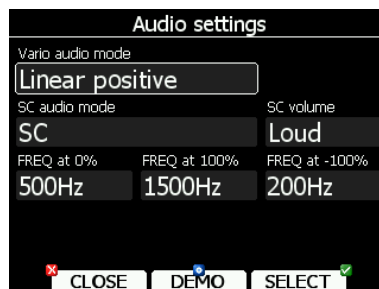
5.1.7 Sounds*

In Sound setup page, Audio settings for vario unit, voice settings for LX voice module and alarms settings for vario unit can be modified.



5.1.7.1 Audio settings*

Basically here we can setup two types of audio, audio sound for climb mode and another for cruise mode (SC).



Vario audio mode has following options:

- **Linear positive**, sound is interrupted with a silence every few milliseconds when needle is positive, on negative side sound is linear (not interrupted)
- **Linear negative**, invert function to Linear positive
- **Linear**, sound is linear and non interrupted in full scale range
- **Digital positive**, same as for Linear positive, only frequency is not changing linear but with larger steps
- **Digital negative**, invert function to Digital positive
- **Linear positive only**, sound is present only at positive values, for negative values there is silence (this function is available only from the LX8000 vario unit)
- **Digital positive only**, same function as for linear positive only, only the sound sounds is similar to the digital tone. (this function is available only from the LX8000 vario unit)

Press DEMO button to hear selected option.

SC audio mode has four modes:

- **SC positive**, Sound is interrupted with a silence every few milliseconds when needle is positive, on negative side sound is linear (not interrupted)
- **SC negative**, inverted function to SC positive
- **SC**, sound is linear and non interrupted in full scale range
- **SC Mixed**, for positive relative values sound represents relative, for negative relative values sound represents SC (For that setting is recommended to set SC needle to relative)

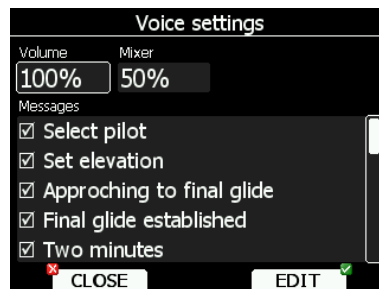
Freq at 0% defines tone frequency at 0m/s

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

Freq at -100% defines tone frequency at full - deflection

5.1.7.2 Voice*

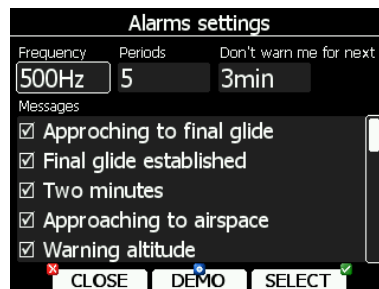
LX Voice Module is a LX system bus participant and receives data and power via bus. Voice module is 100% controlled through LX8000 after use of settings described in this menu.



On voice setting menu volume level (loudness) of voice module and mixing level between voice and vario sound can be adjusted. In message window each item can be set separately. Only checked items will be posted to voice module.

5.1.7.3 Alarms*

The unit produces an audio alarm on reaching certain confirmation points. This screen allows the parameters of the audio to be configured. With checking of particular message item LX8000 will generate an alarm at the time of event. To avoid repeating alarms for the same event, delay for next alarm of the same type can be set in **Don't warn me for next** control.



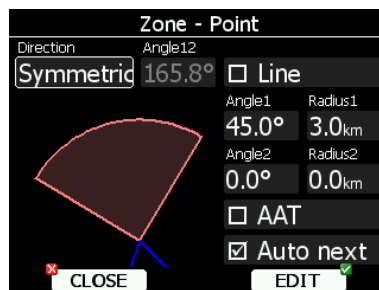
5.1.8 Observation zones

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



Each type of observation zone is defined with two angles, two radii and direction. Using these parameters enables the creation of any known zone geometry separately for start, turn point and finish.

All tasks stored in LX 8000 will match this "global" setting, except those where the zone was modified in task edit menu (See chapter 5.7.1)



Using parameters in zone dialog it is possible to describe all types of observation zones. Direction defines orientation of observation zone. Available parameters are fixed, which is mostly used for assigned areas. Parameter Angle 12 defines direction. **Symmetric** is most common selection for turn point. **Next** value will orientate observation zone in direction of outgoing leg. This is usually used for start. **Prev** will orientate zone in direction of incoming leg and is used for finish usually. **Start** parameter direction is orientating sector always towards start.

If line checkbox is checked, the sector will become a line type of observation zone. Radius 1 parameter describes half of width of line length. Use bottom-right knob to increase radius by 0.1 of selected distance units and bottom-left knob to increase radius by 5.

If line is not checked, angle 1 parameter will define basic shape of observation zone. Value of 180° means cylinder shape of zone and 45° is classical FAI sector. Rotate bottom-right knob to increase angle for 0.5° or use bottom-left knob to choose values 22.5°, 45°, 90° or 180°.

Angle 2 and Radius 2 are used for more complex observation zone setups.

When changing parameters of observation zone the picture is automatically updated to reveal zone visualized.

Check AAT checkbox if you want to make selected zone an assigned area. AAT checkbox will be automatically checked, when radius 1 is greater than 10km.

By default, when navigation to task points is to 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 radius 1 is greater than 10 km

Use template, if you wish to modify start, point and finish zone at same time.

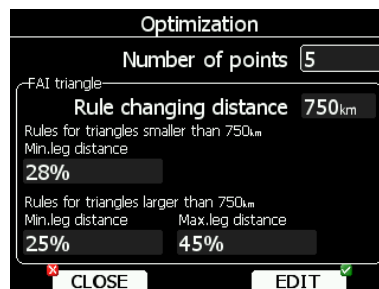


Available templates are.

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

5.1.9 Optimization

During flight LX8000 is optimizing flown path according to OLC or FAI rules. Use this dialog to change way instrument calculates optimization



Number of points defines type of optimization. Use five for OLC optimization. It will take into account also reduced distances for last two legs. Use value of three for FAI free flight optimization.



Optimization will not take into account 10km point difference, which is required by FAI rules.

FAI triangle group defines rules for FAI triangle 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 warning is shown when approaching to a defined altitude and Flarm warnings triggered, when conflict traffic is in vicinity.

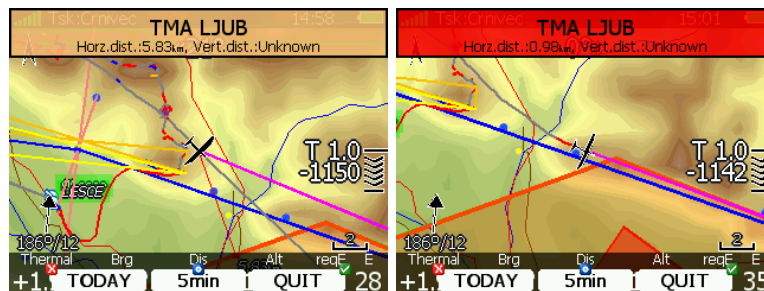


Use this dialog to setup behavior of warnings.

5.1.10.1 Airspace warnings



Airspace warnings are the most complex ones. 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 **Time** item, is computed to cross airspace zone. Second warning (red) will be raised when a projected position of flight is computed to cross airspace zone and glider is already in the buffer zone in vertical or horizontal direction. Buffer zones are defined in **Horz.buffer** item and **Vert.buffer** item. Default values are 1km for horizontal buffer and 100m for vertical buffer. First warning (orange) will also be given when you enter airspace zone buffer but projection of flight is computed to cross it.



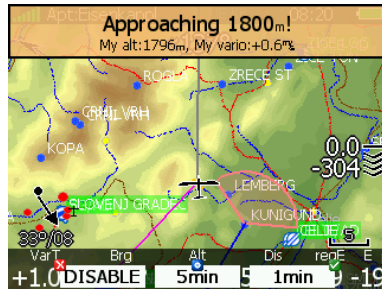
Airspace warning will be raised in all modes and dialogs. Warning for alarmed zone can be dismissed for whole day, some minutes or just quit. Quit means that message will disappear. Use **Dismiss for spin** to define dismiss time in minutes. This time will be shown in the middle bottom button, when warning will be raised. However alarmed zone will still be filled with transparent red color and outlined with a thick line and also distance to nearest point of airspace zone will be shown. To prevent dismissing by mistake check **Confirm dismiss** checkbox and you will be always prompted to confirm dismiss for particular airspace zone. RESET button will reset status for all airspace zones.

5.1.10.2 Altitude warning

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



If projected altitude is greater than set altitude, altitude warning will be raised. Altitude warning will be raised in all modes and dialogs, same as for airspace warnings.



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

5.1.10.3 Flarm warnings

Flarm warnings will be raised only when FLARM module is built in LX8000. Using this dialog user can define which data will be presented by LX voice module.



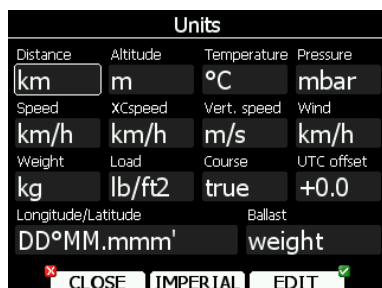
There are three types of warnings:

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

If voice option is installed, it is also possible to hear horizontal and vertical situation to current object. Uncheck appropriate items, if you want to disable this part of message. Complete message can be disabled in Sounds-Voice menu (Chapter 5.1.7.2).

5.1.11 Units

Use this dialog to setup units, UTC time offset and type of ballast input.



Middle bottom button will change all units to imperial system of measure, if current system of measure is metric one and vice versa.

Glider ballast can be entered as:

- overload factor, which is defined as,

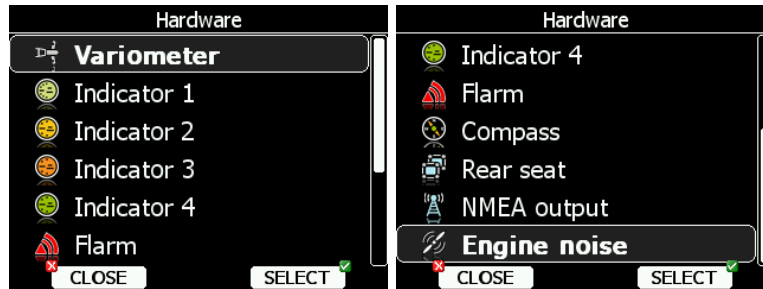
$$overload = \frac{Empty.glider.weight + Pilot.weight + Water.ballast}{Minimum.glider.weight}$$

- Load, which is entered in kg/m2 or lb/ft2.

- Weight of water ballast. If this option is used weight of glider and pilot must be entered. See chapter 5.1.13 and 5.1.2, for more details how to enter glider and pilot weight.

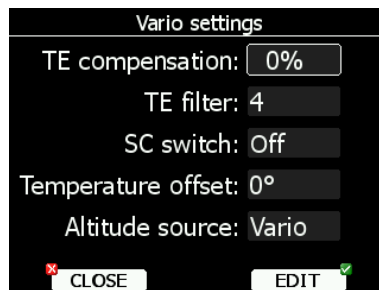
5.1.12 Hardware*

Use this menu to setup hardware properties like: total energy compensation, LCD indicators layout, compass calibration, FLARM module settings, NMEA output and data which will be exchanged between rear and front digital unit. Some items might be grayed out, when selected option is not available.



5.1.12.1 Vario settings*

All settings in this menu are related to glider.



Electronic Total energy compensation

The LX8000 offers two methods of vario TE compensation.

- TE 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 tube has been connected then 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, then TE compensation should be set to 100%.

The 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.

Select TE compensation to 100 % and TE filter to default. Accelerate up to approximately 160 km/h (75kts) and keep the speed stable for a few seconds. Gently reduce the speed to 80 km/h (45kts). Observe the vario indicator during the maneuver. At 160 km/h the vario will indicate about -2 m/s (-4kts). 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, then the compensation is too low, increase the TE%; and vice versa. Try another "zoomie" to assess the change and make further adjustments if necessary.

The TE filter is the compensation delay. Larger numbers will increase the delay and vice versa. During the first test is recommended to use TE filter 4.

Electronic TE is only effective when the pitot 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, then 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, then 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.

SC switch

The LX8000 has an input for an external speed command switch, which is wired to LX8000 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 f LX Remote).

Temperature offset

The LX8000 is supplied with an external outside air temperature (OAT) sensor. With offset setting it we will correct static error 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

Temperature offset

The LX8000 is supplied with an external outside air temperature (OAT) sensor. With offset setting it we will correct static error of temperature measurement.

Altitude source

The LX8000 is having two pressure altitude sensors. One is build in main digital unit and is used for IGC recorder and second one is build in vario unit and is connected to glider pitot-static system. Changing altitude source defines which sensor is used for a pressure altitude used in program.

5.1.12.2 Indicator 1 – Indicator 4*

The LCD vario indicator is a part of LX 8000 vario unit. An unlimited number of secondary vario indicators can be also connected to the system using the 485 system bus. The LX 8000 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 further connected indicators are simple repeaters. Each LCD indicator is set up from the following menu:



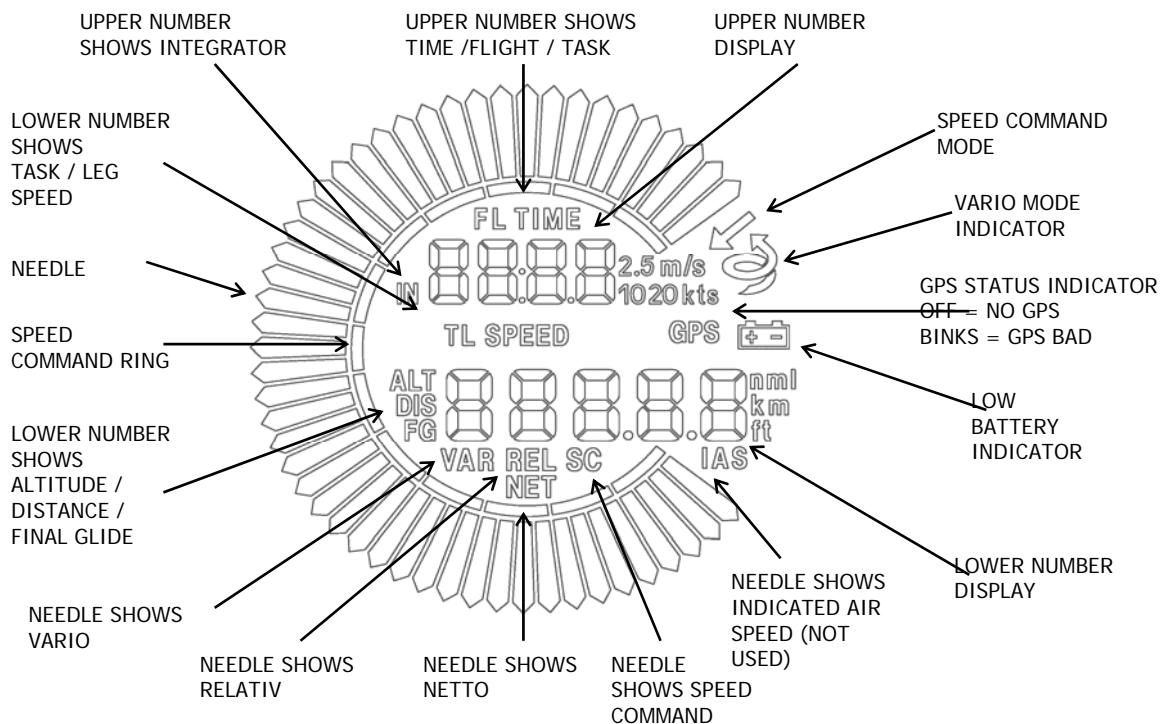
An LCD vario indicator consists of:

- 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:** 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:** 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.





The vario indicator built into the LX 8000 vario unit is always Indicator 1

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:

All settings should be made for vario and speed command mode separately (e.g.: VAR NEEDLE = needle in vario mode, SC NEEDLE = needle in SC mode).

Needle settings: Vario, SC, NETTO or RELATIVE = (netto – 0.7 m/s),

Upper numerical line: Integrator, time, flight time, task remaining time

Lower numerical line: 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.

5.1.12.3 Flarm*

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



Device ID shows Flarm unique ID, which is transmitted to other Flarms. Flarm status message is normally OK. In case of any errors or warning, an error message will appear. User can change operation mode of Flarm unit, frequency and enables 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 about your glider. For collision warnings that mode has no influence.

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

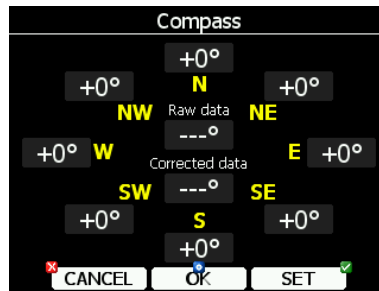
Competition mode is prepared only for competition. If that mode is enabled, pilot will not be able to see any Flarm data on LX8000 map. Status of competition mode is recorded in IGC file and can be checked during scoring.



We recommend you sign in at FLARMNET.org. Sign up is free of charge. Using FLARMNET sign up will allow others to see you not only with Device ID, but with your contest number and name. See chapter 5.5.5.7

5.1.12.4 Compass*

When compass is connected to LX8000 it is crucial for it operation to make a calibration. See chapter 10.2 for more detail about installation of compass and it calibration



5.1.12.5 Rear seat or front seat

In a double-seater configuration with LX8000D it is possible to transfer some data between front and rear seat device. Use this menu to define which data will be automatically received from other device.



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

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

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

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

Same applies for airport checkbox. Message "Airport target received" is shown.

If task checkbox is checked, task is going to be synchronized with other device.



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

5.1.12.6 NMEA output*

The LX8000 is capable of outputting position data sentences in the NMEA format for use by other devices.



Data is divided into three groups,

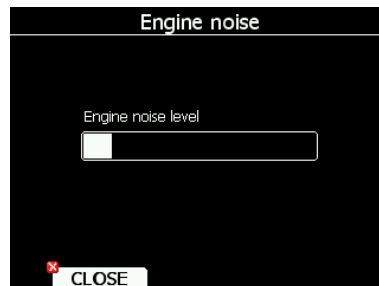
- **Gps data** will output all gps related data like time, longitude, altitude
- **LX8000 data** will output all variometer related data like vario, MacCready, ballast
- **Flarm data** will output all Flarm related data



The NMEA baud rate will be always 19200 bps, any other settings do not matter.

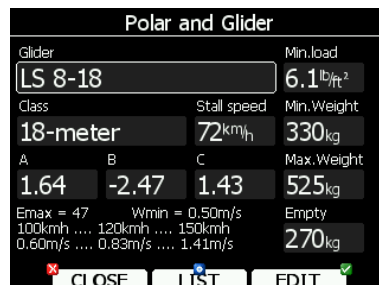
5.1.12.7 Engine noise*

Current engine noise level is shown as a progress bar. Use this menu to visualize you current engine noise.

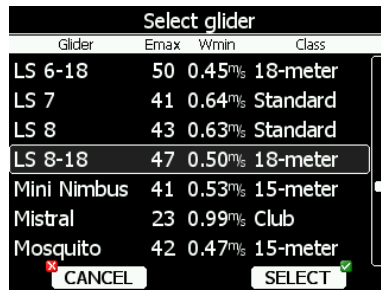


5.1.13 Polar and Glider*

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



Polars for most of modern gliders are already prepared. Press LIST button and dialog with list of all available glider will be shown.



Select required glider using and press SELECT button. All glider data will be copied to chosen polar. You may quickly check best glider ratio and minimum sink rate to see, if polar data match glider performance. You can modify polar changing coefficients **a**, **b** and **c**. Polar is defined as a quadratic notation with the parameters a, b, and c. Use Lxe program (Tools->Polar) to calculate coefficients a, b and c for given glider polar. The program requires three sink points entered at selected speeds (e.g.: 100 km/h, 130 km/h, and 150 km/h). Program will calculate the values of a, b and c, which should be noted and entered into LX8000.

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

Weights must be entered, if user enters ballast in kilograms. There are three weights to enter. **Min.weight** corresponds to min.load value and represents value at which polar was measured or recalculated. **Max.weight** is maximum takeoff weight allowed for a glider. It is not used in calculation; it is just a reminder to pilot, what is maximum takeoff weight. **Empty** weight is weight of empty glider without pilot and ballast. Overload factor is calculated as:

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

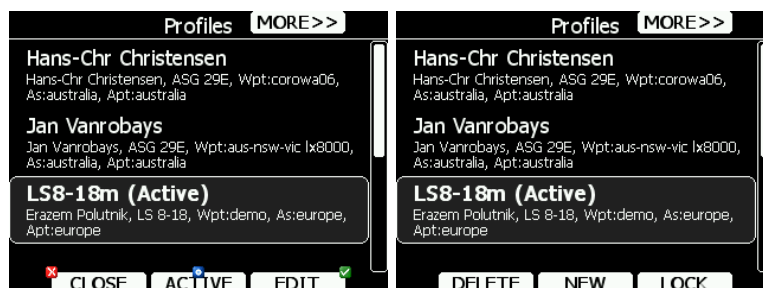
Pilot weight is set in Flight recorder menu (See chapter 5.1.2)

5.1.14 Profiles and Pilots

All LX8000 settings are stored in a profile. Profiles can be used in different ways:

- For club operation or more pilot sharing same glider. Each pilot can have his personal profile.
- When 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 pilot is flying in lot of different locations. A separate profile for each location can be created. (Example: France, Spain, Namibia, WGC2008)

Active profile is selected, when LX8000 is powered on. (See chapter 7.1.2)



Use this dialog to add new profile, delete profile, change name for existing profile and activate. Active profile is profile which is currently being used.

Press EDIT button to edit profile name.



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 too much. When profile is set locked, all settings will be read only.

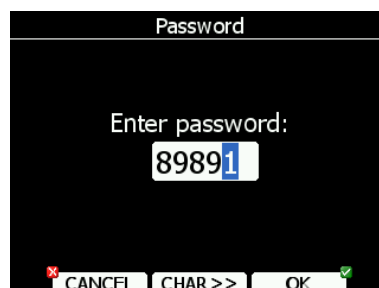
5.1.15 Language

LX8000 can run in different languages.



Select desired language. LX8000 will reload and restart in new language. If your language is not listed and you feel to become a translator for LX8000, please do not hesitate to contact us.

5.1.16 Password



There are several passwords which run some specific procedures as listed below.

- **00111** information about LX8000 and it sensors
- **01049** will perform "Auto zero" will set vario to and speed to zero.
- **30000** browse through installed files (use with caution)
- **41000** first or forced update of Flarm
- **42000** update of Flarm through PC port (default)
- **43000** update of Flarm through Colibri port
- **44441** shows debug information.

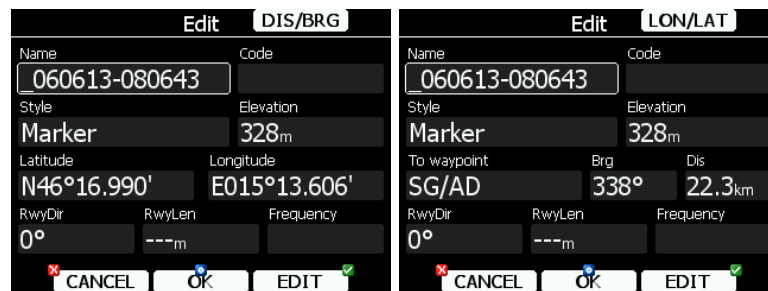
- **55556** will enable Condor simulator input via PC port
- **55557** will enable Condor simulator input via IGC port
- **89891** code is used to initiate firmware update procedure
- **99999** will erase all flights stored on LX8000.

5.2 Information mode

Informational mode displays GPS status, altitude, flight level and height. Sunrise and sunset are calculated for current position. In upper-right corner current FLARM status is shown. TX means FLARM is transmitting data to others and number indicates how many other FLARM devices are visible.



If you press MARK button, new waypoint will be created with current latitude and longitude and elevation based on terrain database. Waypoint name is generated from current date and time preceding with underscore character.



Waypoint data can be modified. See chapter 5.6.1 for more details. Press OK button to save marked waypoint or press CANCEL to exit without saving.

5.3 Near mode

List of all landable waypoints and airports is shown in this mode. Default sorting order of items is by arrival altitude. Press SORT button to toggle sort method. Selected sort is indicated with grey background in header column.



Select preferred landable place with bottom-right knob and press GOTO button. It will automatically change to airport mode and navigation will commence to selected point.

Duplicates are automatically removed. If target with nearly same latitude and longitude is found in LX navigation's Airports database and user waypoint file, user waypoint file will be displayed.

5.4 Statistics mode

Statistics mode operates in two different ways. During flying statistical data for flight in progress is shown and on ground logbook for all stored flights is shown.

Logbook					Statistics
#	Date	Takeoff	Landing	Duration	
1	26.12.08	11:20	17:34	06:13	Flight statistics
2	25.12.08	12:32	17:16	04:44	Avg.vario: 1.3 ^{m/s}
3	24.12.08	13:16	16:13	02:57	Avg.speed: 57.7 ^{km/h}
4	23.12.08	12:07	15:44	03:37	XC speed: 76.5 ^{km/h}
5	22.12.08	12:17	15:16	02:58	Dis.flown: 92.5 ^{km}
6	21.12.08	11:43	17:37	05:54	Circling: 40%
7	20.12.08	11:30	16:07	04:36	Duration: 1:36:12

TO USB TO SD

5.4.1 Logbook

If SD card or USB stick is inserted into LX8000, user can copy selected flight to SD card or USB stick. Select desired flight using bottom-right knob then press appropriate button.



Flight is automatically copied to SD card and/or USB stick, if it is inserted in LX8000, when message Calculating security is displayed. This message appears when landing conditions are met.

You can also delete flight, using Files and Transfer menu (See chapter 5.1.5.7)

5.4.2 Statistics during flight

Using bottom-right knob user can change statistics page. There are three pages available:

- Flight statistics, gives data for whole flight. Distance flown is optimized distance. XC speed is average speed corrected for altitude difference. Average vario is used in this calculation
- Task statistics, gives data for started task. Distance flown is distance that has already been flown on task.

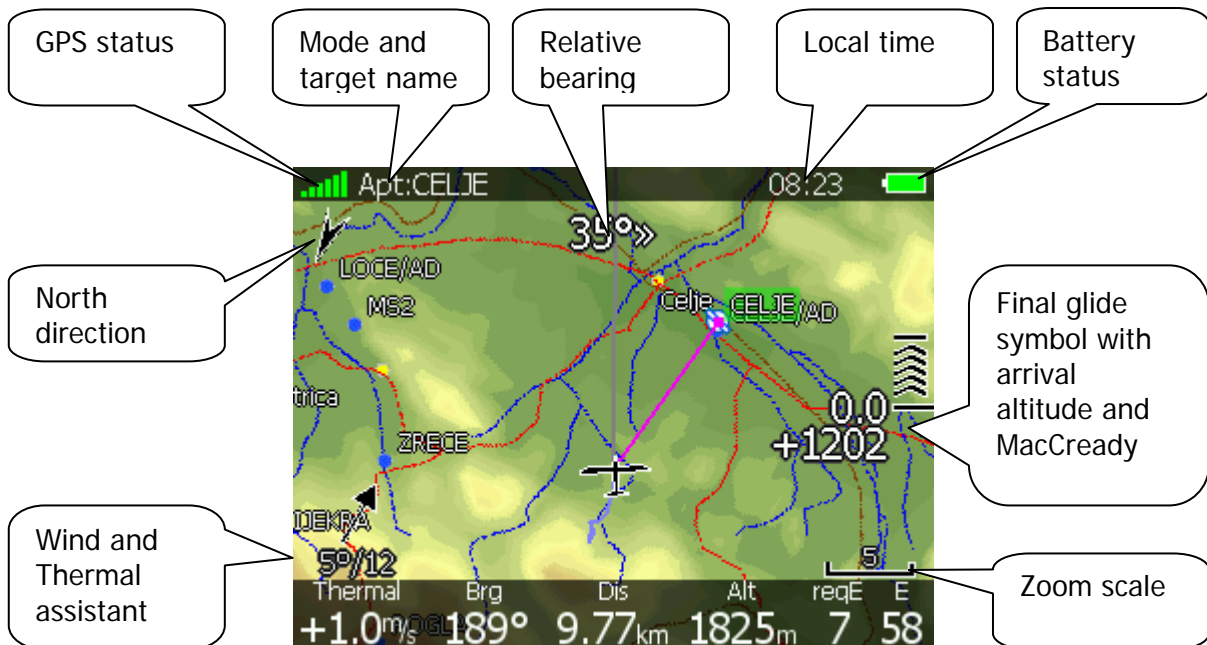
Statistics	Statistics
Task statistics	Last 60 minutes statistics (On Task)
Avg.vario: 1.4 ^{m/s}	Avg.vario: 1.5 ^{m/s}
Avg.speed: 54.6 ^{km/h}	Avg.speed: 54.7 ^{km/h}
XC speed: 54.6 ^{km/h}	XC speed: 66.5 ^{km/h}
Dis.flown: 70.9 ^{km}	Dis.flown: 54.7 ^{km}
Circling: 39%	Circling: 41%
Duration: 1:17:56	Duration: 1:00:00

- Last 60 minutes statistics, gives data for last 60minutes of flight. If task was started then distance is distance flown on task for last hour, otherwise it is optimized distance. If task distance is used a remark (on task) is drawn in heading row.

5.5 Airport mode

Using bottom-right knob you can iterate through different pages. There are four navigational pages available.

5.5.1 First navigation page



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

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

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

Relative bearing gives advice to which direction and how much do we have much you to turn in order to fly towards selected target.

In bottom row several items of data are given. **Thermal** shows last Thermal average, **Brg** is track to selected target, **Alt** is MSL altitude,

Last two numbers (**reqE** and **E**) show required glide ratio to target. In case above required glide ratio is 7 and current glide ratio is 58. Current glider ratio is calculated over last two minutes of flight.

5.5.1.1 Final glide symbol

Final glide symbol is a complex symbol. Bottom number shows your arrival altitude, negative numbers indicates that you are below glide slope required and positive numbers indicates you are above glide path. In case above, the glider is above glide path. Chevrons show position compared to required glide path in percent. One arrow means 5% above or below final glide. For example, if two arrows are visible, it means you are 10% above glide path.

Middle number is current MacCready setting. In task mode it is prefixed with letter **T**, **A**, **B**, **G**, **S** or **AG**. See chapter (7.2.1) for detailed explanation of this modes. Sometimes there will be another number, above MacCready. This value is used for arrival over terrain. If we are on final glide to a selected target, but between it and current position there is terrain, which

cannot be crossed without more height, then this number will give us estimate as to how much have to climb to get over terrain.

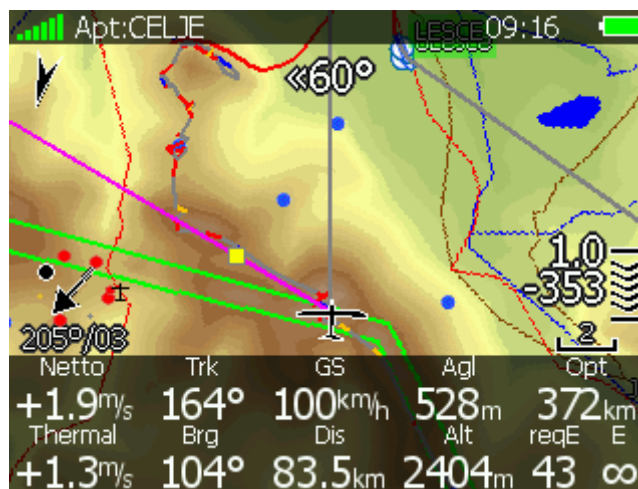
5.5.1.2 Thermal assistant

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

Such color scheme gives us hint about a thermal at glance. If most of dots are red, we should consider increasing MacCready, if most of dots are blue, we should consider decreasing MacCready setting.

5.5.2 Second navigation page

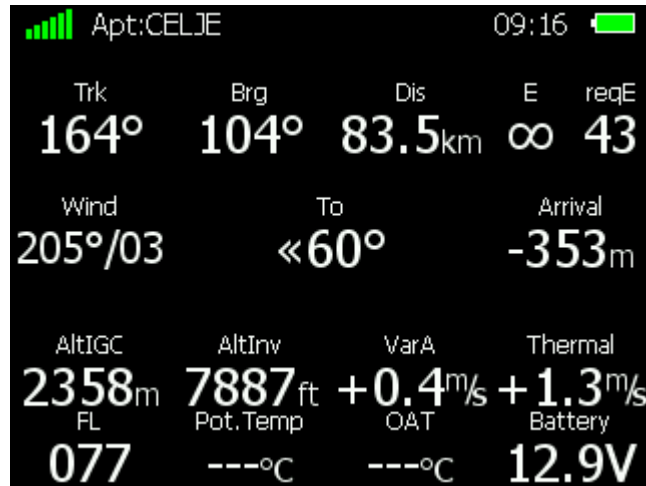
Second page is similar to first page however more data is shown in bottom line. Additional to this data, that is same as on first page, the following items are shown.



Current netto vertical speed, current track, height above ground, optimized distance and current groundspeed.

5.5.3 Third navigation page

Third page has no graphics. Additional to data on previous pages internal pressure sensor altitude is shown. **AltInv** shows altitude in opposite units as defined in Units setup. **OAT** is outside temperature, **Pot.Temp** is potential temperature and battery is showing current voltage.



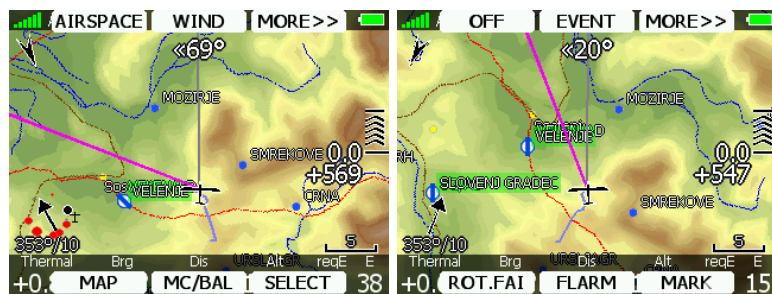
5.5.4 Fourth navigation page

Fourth navigational page has also no graphics. Estimated time of arrival and estimated time established are drawn in top row. Information for selected airport are written on this page. Information includes airport frequency, runway info and sun times for selected target.

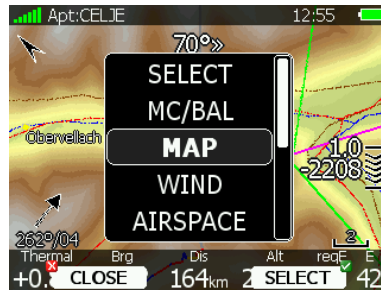


5.5.5 Button actions

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



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



Using UP/DOWN key pilot may select between options.



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

In airport mode following selections are available:

- **Select** option is used to select airport for new navigational target
- **Mc/Bal** will set MacCready, ballast and bugs, See chapter 5.5.5.2 for more details.
- **Map** item is used to quickly change and modify map parameters
- **Wind** will open dialog, where wind changes with altitude are shown, wind can set and methods for wind calculation are shown.
- **Airspace** shows list of airspace zones in vicinity of our position
- **Mark** option is used to mark current position and create waypoint
- **Flarm** button will open list with all visible Flarm objects. You can selected one and use it for navigational purposes.
- **Rot.FAI** will rotate FAI area, if it is enabled. If it is not enabled, this option is not shown.
- **Event** is used to log an event. Recording rate will be increased to 1 second for one minute. A message "Event marked" will be shown on screen.
- **Send** is available only when we are having double seater configuration with LX8000D. Press this button to send current navigational point to rear seat device. This action will force change of navigational target for selected navigation mode on rear seat device.
- **Off** will switch of instrument. Message LX8000 switching off will be displayed.

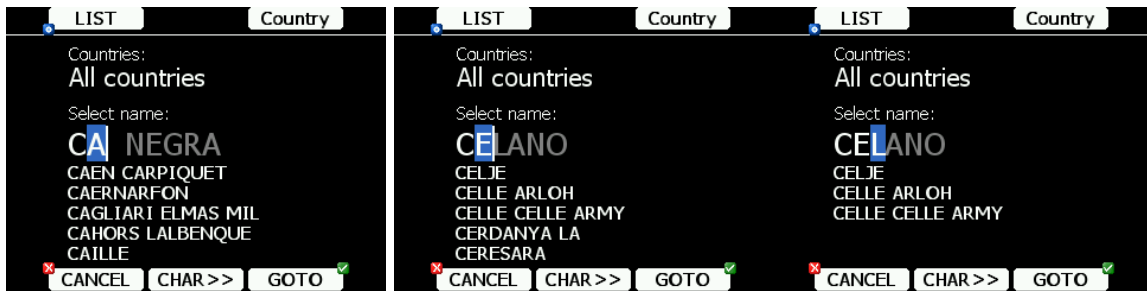


LX8000 can also be powered off, if upper left button is pressed for long time, until message "switching off" is shown.

5.5.5.1 Select an airport

There are two methods of selecting; **filter** mode and **list** mode. You can toggle between these two modes pressing **LIST** or **FILTER** button. Selecting airport in filter mode is

straightforward. Enter first letter of airport name using bottom-right knob. Helper will show first airport matching this letter and next few airports will be displayed in lower part of screen.



Press CHAR>> button and cursor will move to second letter. Use bottom-right knob to select second letter. If you want to return to first letter, turn left-bottom knob.

You will note that part of airport name is written in darker color. Once it become white, it means this is the only selection. Pressing GOTO will navigate directly to it. If there are more than one airport starting with filtered letters and you press GOTO button, cursor will jump to beginning of the airport name. Turning lower-right knob will selected among airports. Press GOTO once more and you will be navigating to it.



If you do not know exact name of airport, then just select first letter and press GOTO button. Now scroll to desired airport using bottom-right knob. Press GOTO button once more and you will then be navigating to selected airport.

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



Press SORT button to change sort order of airports. Select an airport using bottom-right knob. Press GOTO and you will be navigating to it.

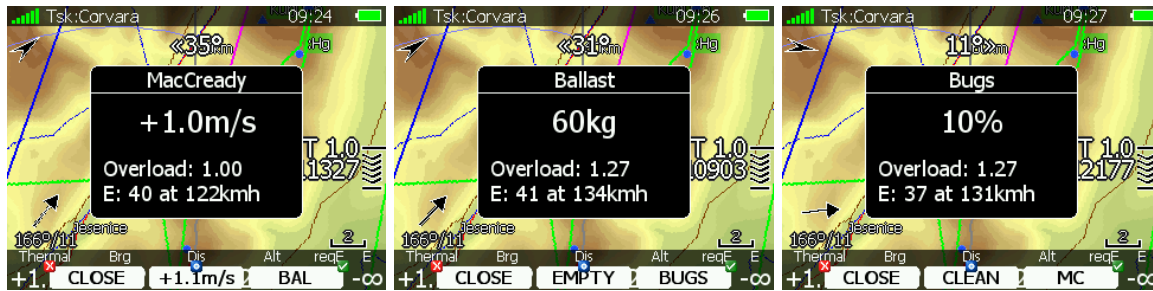
By default LX8000 will search airports through all countries. It is possible to create search only from selected countries. Press COUNTRY button and dialog with list of all available countries will be shown.



Select desired countries and press CLOSE.

5.5.5.2 MacCready, ballast and bugs setting

These are probably the settings pilots use most often during flight. Press MC/BAL button. Dialog for MacCready, ballast and bugs will be shown.



Use bottom-right knob to modify MacCready setting. In middle button there is a suggestion for MacCready setting, which is based on last four thermals. Additionally to selected MacCready value an overload factor is also shown and calculated glide ratio with corresponding speed.

Pressing CLOSE button will close dialog and return to navigational page. Changes will be saved. Dialog will automatically be closed after 10 seconds, if no action is taken.

Pressing BAL button will toggle menu from MacCready setting to Ballast setting. Ballast is entered in values, which are defined in Units menu (See chapter 5.1.11). You can set load for empty glider by pressing Empty button.

Pressing BUGS button will toggle menu again from Ballast setting to Bugs setting. A bug setting is used to set polar degradation because of dirty wing. The input is in percentage degradation of glide ratio. (5% means that glide ratio degradation is 5%). Pressing CLEAN will set bugs to zero instantly. Press MC to get back on MacCready screen.

5.5.5.3 Map settings

Map can be quickly configured using this dialog. Select map orientation in orientation setup. Map can have **north, east, west or south** orientation. These orientations are fixed and are not changed with glider position. Additional to this orientation, there are several more, which will rotate map with glider position change:

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



If Zoom to target check is selected, zoom will be automatically adjusted, so that target point is always visible. Maximum zoom is 200km and minimum zoom is 1km. Next checkboxes will turn on or off following items:

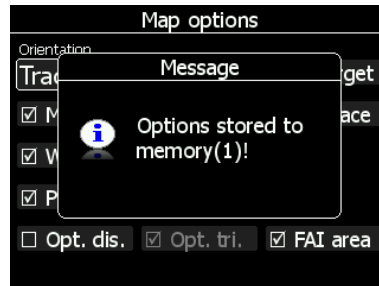
- **Map** – complete map is turned on/off
- **Terrain** – only terrain is turned on/off
- **Airspace** – toggle airspace display on/off
- **Wpts** – waypoints drawing is turned on/off
- **Flarm** – Flarm radar display is turned on/off.
- **Path** – flown path is switched on/off

- **Cur.trk** – current track vector
- **Opt.dis.** – optimized distance
- **Opt.tri.** – optimized triangle
- **FAI area** – FAI triangle assistant is turned on/off



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 item is checked.

It is possible to store map settings for future use. There are two memory locations MEM1 and MEM2 for two different memory settings.

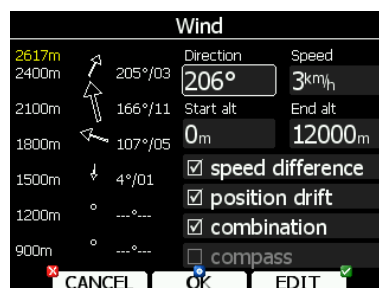


Press button MEM 1 for long time. A message "Options stored to memory (1) will be displayed and settings are stored. Change setting a little bit. Press button MEM2 for long time. A message "Options stored to memory (2) will be displayed and settings are stored to memory location 2. Now short pressing MEM1 will invoke saved settings under memory 1.

5.5.5.4 Wind

LX8000 constantly calculates winds using four different methods. Speed difference method is used during circling and is taking into account ground speed difference in single circle. Position drift is calculating wind based on position drift during circling. Minimum three circles must be done to get first wind measurements. Third method is combination, which takes into account also airspeed received from vario unit.

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



Wind profile is shown on left side of dialog. Yellow color altitude indicates our current MSL altitude. Using bottom-left knob you can scroll wind layers up and down.

Use EDIT button to manually enter wind. If new direction is entered to direction spin all wind directions in range from start altitude to end altitude will be modified. Same procedure is used for wind speed.

User can also disable or enable particular wind method. It is recommended to have all method enabled.

Once wind is modified to suit your needs press OK button to accept wind values. Dialog will exit automatically.

If CANCEL button is pressed wind dialog will be closed, without applying changed values.

5.5.5.5 Airspace

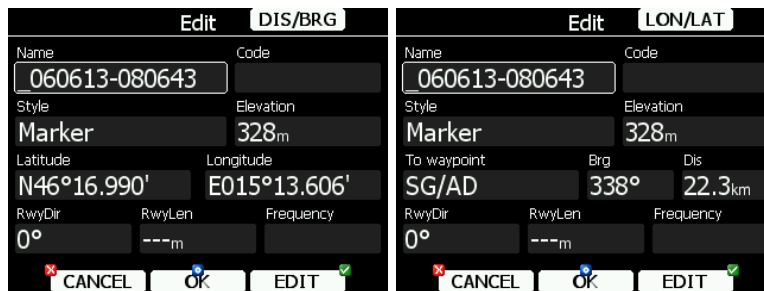
Airspace dialog shows list of airspace zones in vicinity of your position. Vertical and horizontal distance is calculated to all airspace zones in list.



Pressing VIEW button, list will toggle views. When STATUS button is pressed status of selected airspace zone will toggle from **OFF always**, **OFF today**, **OFF hh:mm** and enabled. If EDIT button is pressed, new dialog will open, where you can modify properties for selected zone. See chapter 5.1.5.3 for more details. When zone is alarmed, distance will be colored orange.

5.5.5.6 Mark

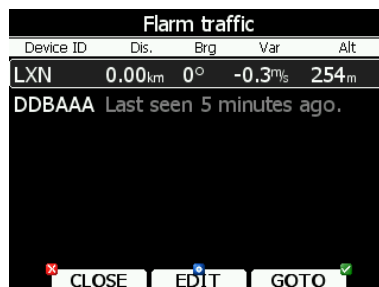
If you press MARK button, new waypoint will be created with current latitude and longitude and elevation based on terrain database. Waypoint name is generated from current date and time starting with underscore character.



Waypoint data can be modified. See chapter 5.6.1 for more details. Press OK button to save marked waypoint or press CANCEL to exit without saving.

5.5.5.7 Flarm

If you would like to see list of other airplanes received by Flarm, press FLARM button. A list with all received airplanes since last switch on is shown.



List is sorted by distance. Select desired Flarm and press GOTO button. You will start navigating to this Flarm position. Instead of Flarm device ID, you can also show competition number for particular glider. Press EDIT to enter edit dialog for selected Flarm object.

Edit Flarm traffic

Device ID: DDBAAA Last seen: Right now

Pilot name:

Glider: Reg.Nr.: CN:

Home airfield: Frequency:

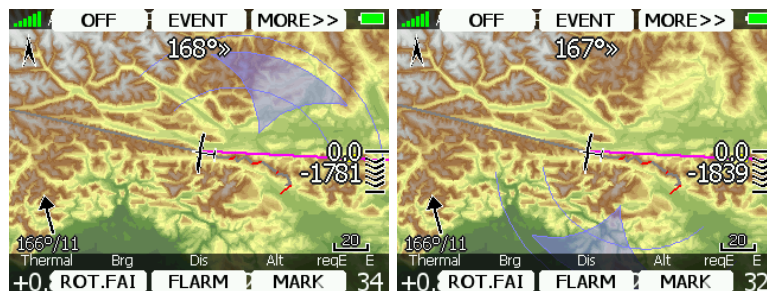
Enter data about Flarm pilot and glider. LX8000 is preloaded with FlarmNet database to identify different FLARM Device IDs with pilot and plane data. You can upload FlarmNet database downloading it from <http://www.flarmnet.org>. Update procedure is same as update procedure for airport databases. See chapter 5.1.5.2 for more detail about update.



We encourage all users to upload their data to FlarmNet web site. It is very easy. All you need is to write down your Flarm device ID, which you will find in Hardware->Flarm dialog (See 5.1.12.3) and register at www.flarmnet.org.

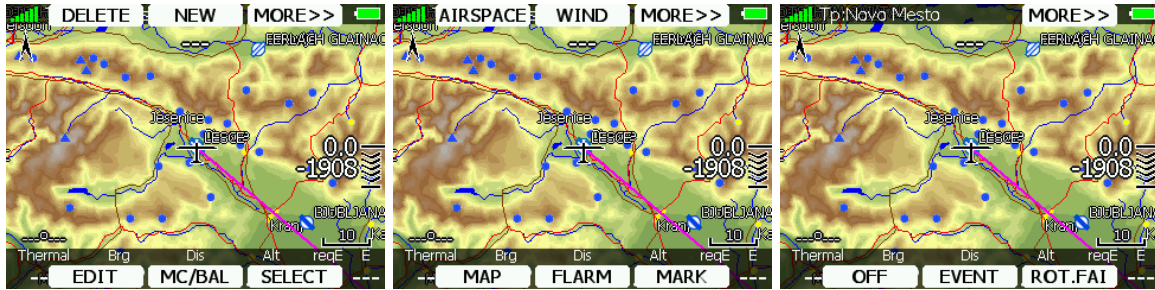
5.5.5.8 Rotate FAI area

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



5.6 Waypoint mode

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



- **Select** option is used to select waypoint for new navigational target.
- **Mc/Bal** will set MacCready, ballast and bugs, See chapter 5.5.5.2 for more details.
- **Edit** button will edit data for selected point.
- **New** button will add new point. New point can be copied also from LX navigation Airports database.
- **Delete** button deletes selected point.
- **Mark** option is used to mark current position and create waypoint
- **Flarm** button will open list with all visible Flarm objects. You can selected one and use it for navigational purposes.
- **Map** item is used quickly to change and modify map parameters.
- **Wind** will open dialog, where wind changes with altitude are shown, wind can set and methods for wind calculation are shown.
- **Airspace** shows list of airspace zones in vicinity of our position.
- **Rot.FAI** will rotate FAI area, if it is enabled. If it is not enabled, this option is not shown.
- **Event** is used to log an event. Recording rate will be increased to 1 second for one minute.
- **Send** is available only when we are having double seater configuration with LX8000D. Press this button to send current navigational point to rear seat device. This action will force change of navigational target for selected navigation mode on rear seat device.
- **Off** will switch of instrument. Message LX8000 switching off will be displayed.

5.6.1 Editing waypoint

Press EDIT button. Edit dialog will be open with details of selected waypoint.

Edit		DIS/BRG
Name	Code	
Novo Mesto	NM APT	
Style	Elevation	
Grass airfield	167 _m	
Latitude	Longitude	
N45°48.700'	E015°06.850'	
RwpyDir	RwpyLen	Frequency
50°	1000 _m	123.500
CANCEL	OK	EDIT

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

Edit LON/LAT		
Name	Code	
Novo Mesto	NM APT	
Style	Elevation	
Grass airfield	167m	
To waypoint	Brg	Dis
LESCE	310°	94.7km
RwyDir	RwyLen	Frequency
50°	1000m	123.500
<input type="button" value="CANCEL"/> <input type="button" value="OK"/> <input type="button" value="EDIT"/>		

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

5.6.2 New waypoint

Select this option, if you want to add new waypoint to active waypoints file. If no waypoints file is selected, new waypoint file will be created with name default.cup. A message, copy from airport is displayed first. Press YES, if you would like to copy it from LX navigation Airports database. An airport select dialog will be opened. Select airport you would like to copy. If no is selected, blank edit dialog is opened.

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



Elevation will be assigned automatically once position is entered. Elevation is taken from digital elevation model, which is stored in LX8000 for complete world.

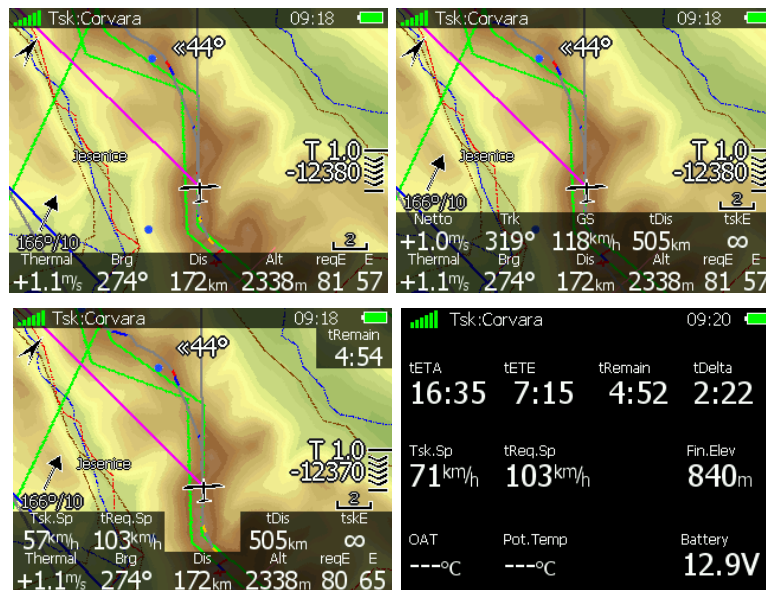
5.7 Task mode

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



A task can be created only from waypoints stored in active waypoint file. A task can be loaded from tasks stored in active waypoint file. A task can also be saved to an active waypoint file. (See chapter 5.1.5.4 for details how to set active waypoint file). A task used for navigation will also be the declared in IGC file.

Task mode is having four pages. Use bottom-right knob to switch between pages. Pages are designed to suit need for racing tasks as well as for assigned area task with minimum task time.



First page is identical to airport and waypoint mode first page. It shows navigational data to current turnpoint. However, the final glide indicator always shows required altitude to finish. On second page additional data compared to first page is shown:

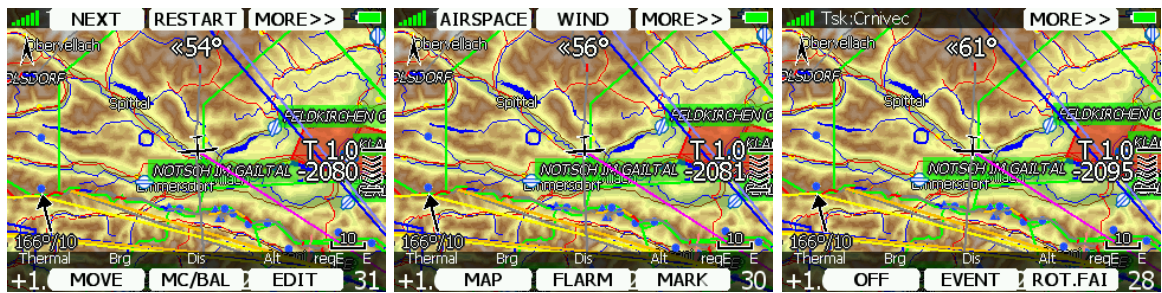
- **current netto vertical speed**
- **current track and groundspeed**
- **tDis.** symbol shows remaining total task distance.
- **tskE** shows required glider ratio to task finish.

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

- **Tsk.Sp**, which is task speed achieved until this moment.
- **tReq.Sp**, which is required speed to task finished and is calculated as remaining task distance divided by remaining time.
- **tRemain** symbol indicates remaining task time.

Fourth page has no map and shows time values for task being flown and elevation of finish point. Additional outside temperature, potential temperature and battery voltage are shown.

When any of six buttons is pressed, functions for buttons are shown. If selected button is pressed once more, selected action will take place. Press MORE>> button to see more actions. If remote stick is available, behavior is slightly different. When check button is pressed on remote stick menu will appear, instead of button functions.



- **Edit** action is used to edit task. This is the one and only that will be declared and will be available for navigation.
- **Mc/Bal** action will set MacCready, ballast and bugs, See chapter 5.5.5.2 for more details.
- **Move** action is used in assigned area tasks to move navigation point inside selected assigned are.
- **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 next turn point.
- **Mark** option is used to mark current position and create waypoint
- **Flarm** button will open list with all visible Flarm objects. You can selected one and use it for navigational purposes.
- **Map** item is used to change quickly and modify map parameters, See chapter 5.5.5.3 for more details.
- **Wind** will open dialog, where wind changes with altitude are shown, wind can set and methods for wind calculation are shown. See chapter 5.5.5.4 for more details.
- **Airspace** shows list of airspace zones in vicinity of our position, See chapter 5.5.5.5 for more details.
- **Rot.FAI** will rotate FAI area, if it is enabled. If it is not enabled, this option is not shown.
- **Event** is used to log an event. Recording rate will be increased to 1 second for one minute. A message "Event marked" will be shown on screen.
- **Send** is available only when we are having double seater configuration with LX8000D. Press this button to send task to rear seat device. This action will force change of task on rear seat device.
- **Off** will switch of instrument. Message LX8000 switching off will be displayed.

5.7.1 Task edit

Press EDIT action and task edit dialog will open. Task is created and manipulated in this dialog. A list of task points is shown. In upper left corner, type and total distance is displayed. In upper right corner task time is shown. Use bottom-right knob to select task points or task time control.

There are plenty of actions available in task edit dialog to make creation of task as easy as possible.



Press MORE>> button to get more actions. Available actions are:

- Press **EDIT** button to enter new task point, edit existing one or to enter task time

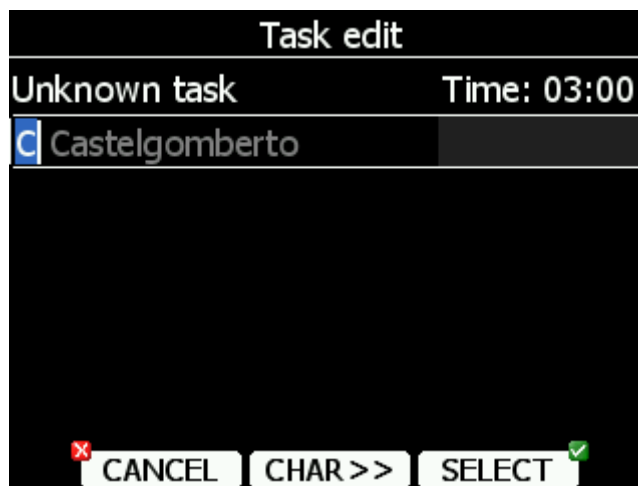
- **OK** action will confirm changes to task and return to navigational page
- **CANCEL** action will cancel all modifications of task and return to navigational page
- Use **ZONE** button to modify observation zone for selected point. Default zone style is defined in Observation Zones menu in setup mode (See chapter 5.1.8)
- **OPTIONS** action is going to open new dialog, where some additional properties for task can be setup. Task name is set in this dialog.
- Press **LOAD** to load task from active waypoint file.
- Press **SAVE** button to store task to active waypoint file. Later this task can be loaded from active waypoint file.
- **INVERT** actions will invert complete task.
- **INS PNT** will insert new point above current cursor position.
- **DEL PNT** will delete a point at current position.
- **CLEAR** will completely erase task.
- **MOVE UP** is used to move selected point upwards in task
- **MOVE DN** is used to move selected point downwards in task

5.7.2 Creating task

Make sure at least one waypoint file is loaded into LX8000. It is checked and marked as active waypoint file. See chapter 5.1.5.1 for more details how to upload waypoint file to LX8000

Select task time and press EDIT button. Enter task time, if required. Rotate bottom-right knob to increase time in 15minuts steps and bottom-left knob to increase task time in 1 minute steps. Close task time edit and rotate bottom-right knob to select first empty point.

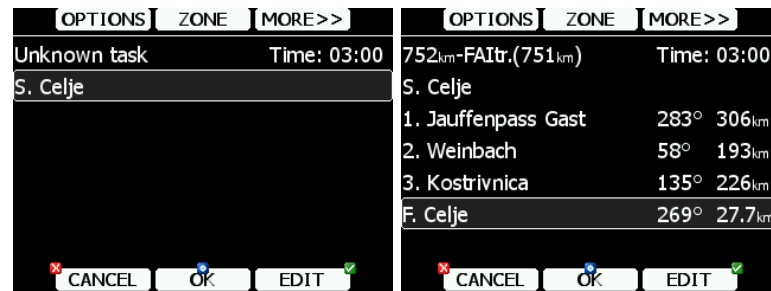
Press EDIT button and input turnpoint name. Entering point name is very straight forward. Enter first letter of task point name using bottom-right knob. The "Helper" will show first waypoint that matches this letter



Press CHAR>> button and cursor will move to second letter. Use bottom-right knob to select second letter. If you want to return to first letter, turn bottom-left knob.

Repeat procedure until your desired point is selected. Press SELECT button to complete to complete selection. If you do not know exact name of point, which is very unlikely, then just select first letter and press SELECT button. Now scroll to desired point using bottom-right knob. Press SELECT button once more to complete selection.

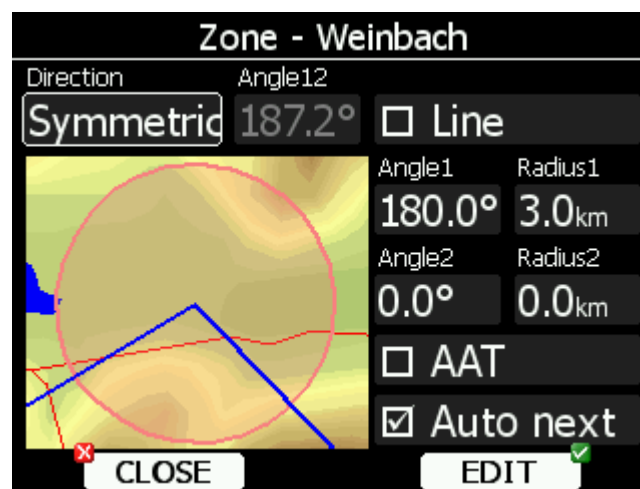
Task edit dialog should now like screen below. Letter "S." indicates you enter start point.



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

5.7.3 Modifying zones

Now it is time to modify observation zones. Select point and press ZONE button. New dialog with selected observation zone will open.



Using parameters in zone dialog is possible to describe all type of observation zones. Direction defines orientation of observation zone. Available parameters are fixed, which is mostly used for assigned areas. Parameter Angle12 defines direction. Symmetric is most common selection for turn point. Next value will orientate observation zone in direction of outgoing leg. This is usually used for start. Prev will orientate zone in direction of incoming leg and is used for finish usually. Start parameter direction is orientating sector always towards start.

If line checkbox is checked sector will become line type of observation zone. Radius1 parameter describes half of width of line length. Use bottom-right knob to increase radius by 0.1 of selected distance units and bottom-left knob to increase radius by 5.

If line is not checked, angle1 parameter will define basic shape of observation zone. Value of 180° means cylinder shape of zone and 45° is classical FAI sector. Rotate bottom-right knob to increase angle for 0.5° or use bottom-left knob to choose values 22.5°, 45°, 90° or 180°. Angle 2 and Radius 2 are used for more complex observation zone setup.

When changing parameters of observation zone, picture is automatically updated to show the zone.

Check AAT checkbox, if you want to make selected zone an assigned area. AAT checkbox will be automatically quickly be checked, when radius 1 is greater than 10km.

By default, when navigating on task, points will be auto 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 radius 1 is greater than 10km.



If zone is an assigned area. Turn point will be marked with symbol '#' in front on point name.

5.7.4 Task options

Press OPTIONS button. Options dialog will be opened.

Enter task description. This is very useful on competitions, where you get more then one task per day. Some hints for name 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, LX8000 will not navigate you to finish point elevation, but to altitude, which is going to be 1000m below start altitude.

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

5.7.4.1 Gate time

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

5.7.4.2 Below altitude start procedure

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



Lower number shows difference to set altitude. Negative values mean altitudes below set altitude. Upper yellow number indicates amount of seconds left to be below set altitude. Chevrons indicate meters below or above required altitude. Each line represents 10m. A message "You were XX seconds bellow YYYYm! is displayed once you fulfill conditions.

5.7.4.3 Maximum start speed and/or maximum start altitude

A lot of competitions are limiting start altitude and/or start groundspeed. LX8000 helps pilots to cross start line at correct altitude with correct groundspeed. Enter **Start alt.** and/or **Start gsp.** to use this option. Indication will be shown on final glider symbol. Character "A" will be displayed before MacCready value, if start altitude was entered and/or character "G" will be displayed if start speed was input.



Lower number indicates at what altitude you will reach start altitude. Negative value indicates you are going to get there below required start altitude.



Arrival altitude to start is not based on MacCready, glider and wind settings. It is calculated based on energy difference during flying straight. This will give you very precise estimate at what altitude you will arrive to start. Speeding up will result in greater energy lose and arrival altitude will decrease, slowing down to best glider ratio will decrease energy lose and arrival altitude will increase.

Upper yellow number shows current ground speed and chevrons indicate, if you have to slow down or you may speed up.

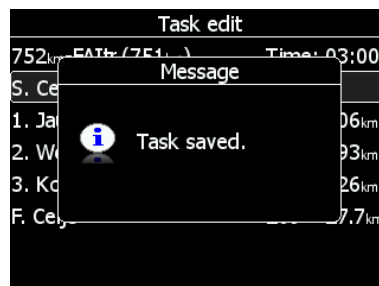
On picture above, we are 43meters above glide to start altitude, our speed is 121km/h and chevrons show, we can speed up.



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

5.7.5 Saving task

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



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

5.7.6 Loading task

It is possible to load task from stored tasks active waypoint file. Select LOAD action in task mode. A dialog with list of all stored tasks will be shown.

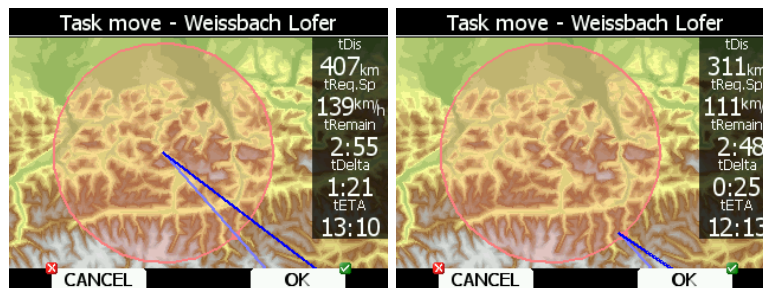


Total task distance, task description and task points are shown for each task stored. Select desired task rotating bottom-right knob and press LOAD. Task will be loaded into active task and task edit dialog will be opened.

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

5.7.7 Moving task point

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



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

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

Keep in mind time of arrival can be calculated using different methods, which are found in QNH, RES setup (See chapter 5.1.1).

Point is moved using bottom two knobs. Rotate right knob (page selector) to move point in radial direction from area center.

Use bottom-left knob (zoom) to move point in axial direction.

If more then one assigned area is set for task, NEXT>> button is shown in bottom line. Press this button, if you would like to move point in other assigned area.

6 Variometer and Altimeter

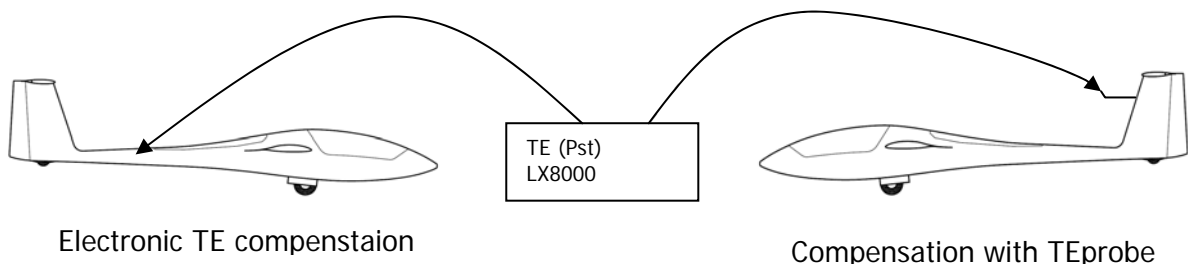
All signals from the pneumatic sensors (altitude, speed) are derived from high quality pressure sensors which mean that no flask is necessary. The vario signal is derived from the altitude signal. All signals are temperature and altitude compensated. A custom programmable LCD has been designed to display the vario information as well as many other parameters. Display is user configurable. Variometer can be configured to show:

- **Range** 5 ,10 and 2.5 m/s or 10, 20 and 5 kts
- **time constants** 0.1s to 5s, in addition there are 4 settings of electronic processing for the vario signal
- **netto** air mass lift and sink
- **relative** shows the lift or sink that would be achieved if the glider was circled at 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 electronic TE compensation is selected, then the TE (P_{st}) port should be connected to a good static pressure source. If pneumatic compensation is selected, then the TE (P_{st}) port should be connected to the TE probe.



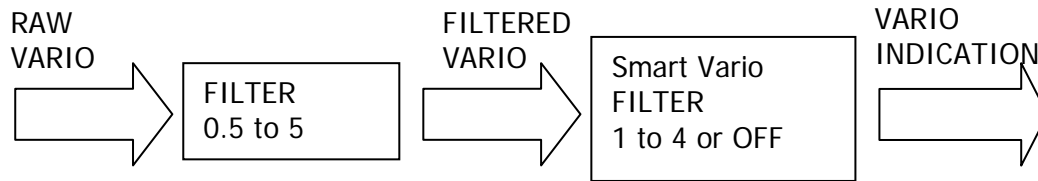
6.1 Smart Vario description

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 setting is the fastest while the 5 setting provides maximum damping.

The second filter, called the Smart Vario, is a dynamic filter and controls the rate at which the vario indication moves. When set to OFF, there is no restriction on the rate of movement of the vario indication other than the setting of the time constant filter. When set to 1, the vario indication will not move faster than 1 m/s (2kts) per second, while when set to 4, the vario indication will not move faster than 4 m/s (8kts) per second. It should be noted that when set to 4, the vario indication 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 LX8000 is temperature compensated from -20°C up to + 60°C. The altimeter is calibrated from 0 to 6000m (20,000ft), but indication goes up to 8000m (26,000ft).

6.2.1 IGC barogram recalibration procedure

LX8000 has an additional pressure sensor for altitude recording. To comply with IGC procedures, this sensor has no external pneumatic connection. To carry out the barogram 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 recording interval to 1 second (see chapter 5.1.2)

Place it in the chamber and carry out a short climb to about 100m (to start flight recorder)

Bring the chamber pressure to exactly 1013.2hPa

Decrease the pressure by 1000m and hold for about 30 seconds

Continue the procedure to 6000m

Increase the pressure in 1000m steps back to 1013.2hPa

After reaching ground wait about 3 minutes and switch the instrument off

Leave the instrument minimum 5 minutes off

Download the last flight and print the barograms using the Lxe PC program

Restore 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 optimize 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 LX8000

To get the best out of the LX8000, it is important that some preparation is done prior to the takeoff. Trying to configure the instrument or set a task while flying is very hazardous, especially on competition or at 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

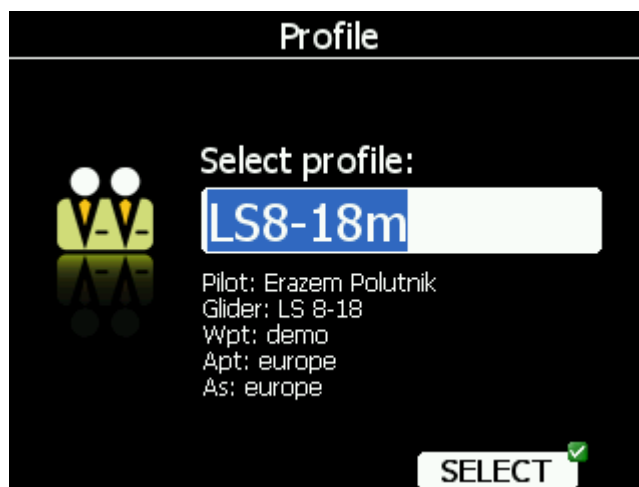
7.1.1 Power on procedure

Press power-on button. LX8000 vario unit will turn on and few seconds later the LX8000 digital unit welcome screen will appear. First screen shows the version of the boot loader, version of the Linux kernel operating system is shown afterwards, then version of the filesystem. Boot procedure normally takes 30 seconds. When completed profile selection dialog is shown.



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

7.1.2 Profile selection



Turn bottom-right knob to select desired profile, if more then on profile is available. For selected profile pilot name, glider type, loaded waypoint files, loaded airports databases and loaded airspace databases are shown.

To learn more about profiles, please refer to chapter 5.1.14. Press SELECT button to confirm selection of profile. Set elevation dialog will be show next

7.1.3 Set elevation and QNH

This setting is crucial for final glide calculation: therefore pay a lot of attention to it.



The instrument will offer elevation from terrain database, based on current latitude and longitude. Elevation will mostly be within few meters from current elevation. Use bottom-right knob to fine tune elevation.

If elevation is not known and QNH pressure is known, you should NOT press button QNH. Just keep turning bottom-right knob (PAGE selector) and look at QNH value to adjust it to proper value.

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.

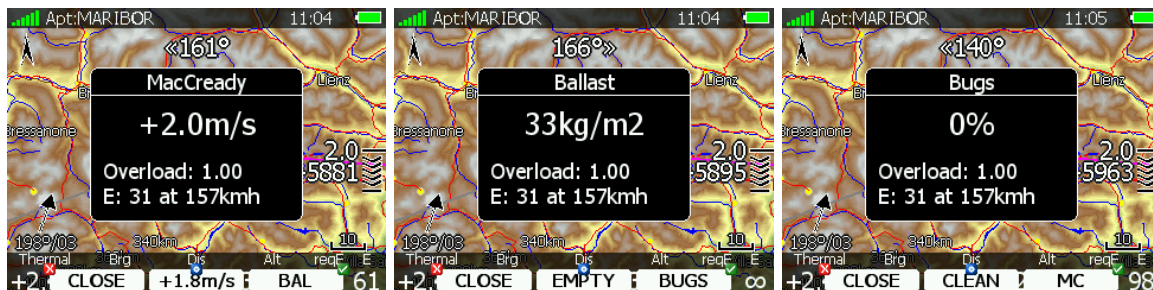


Profile selection dialog and Elevation dialog are not shown if LX8000 is switched off and on during flying.

7.1.4 Preflight check

After elevation setup, LX8000 will get in airport mode. It will take about 30seconds to draw map screen for first time. All waypoint files and databases are loaded at that time and therefore instrument might react a little bit slowly.

It is recommended to check MacCready, ballast and bugs settings to match current glider configuration. Press MC/BAL button. Dialog for MacCready, Ballast and bugs will be shown.



Use bottom-right knob to modify MacCready setting. See chapter 5.5.5.2 for more details. It is also highly recommended to check safety altitude setting. See chapter 5.1.1 to find out how to setup 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 haste, all the following actions, except task in not going to be declared, can also be done during flight.



Compared to LX7007 there is no option to declare a task. There is one and only task. This task is going to be automatically declared in IGC file on take off. Task can also be modified during flight, but changes are not going to be written to IGC file.

There are three methods to create task at the moment. More methods will be available in future releases.

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



Check task. It is very important to check task. Check turning points sequence, distance between points, bearings and total task distance, Check visually task and observation zones geometry in map view,

7.1.5.1 Assigned Area Tasks (AAT)

Assigned area task is in fact a speed task where the task distance is not exactly defined. Pilot has limited influence on task geometry due to bigger observation zones (assigned areas) Pilot decides how deep he will fly into individual area to reach best average task speed and finishing task not earlier as designated task time.

Assigned area task has same structure as whichever other task and all known methods to enter are the same as described. The only differences are bigger observation zones having specific geometry. Use ZONE button (see chapter 5.7.3) to modify individual observation zone.

19.07.2007

Type: Assigned area task with 4 areas

Task time: 02:30:00

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

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

Observation zone description:

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

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

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

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

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

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

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

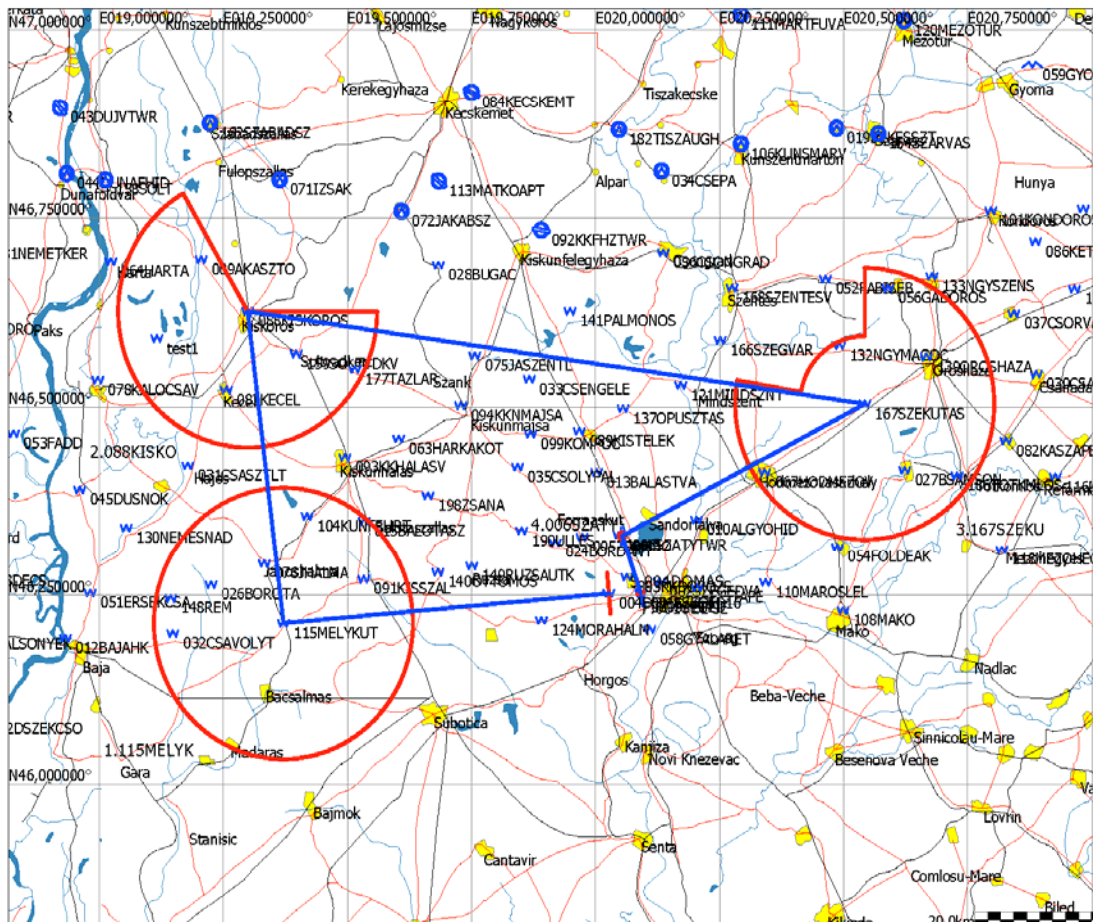
[Style=Fixed Value, A12=320° R1=20,0km, A1=140°, R2=10,0km, A2=180°, Assigned area]

4.Point 006SZATY: Cylinder R=500m

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

Finish 001SZEGE: To Previous Point, Line 1000m

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



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DJP2007

Usually task sheet with observation zone definitions matching LX8000 observation zone definition will be given. An example of task sheet is given in previous picture. However, when assigned area is defined only with two radials and two radiuses some calculation must be accomplished.

Let us assume assigned area defined as

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

To convert this description, following calculation must be performed

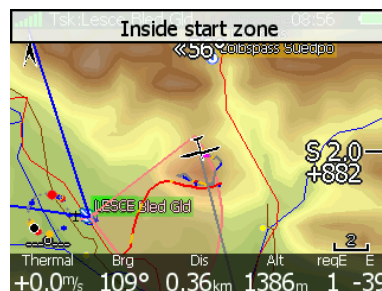
- Direction set to FIXED
- $\text{Angle12} = (\text{Radial2} - \text{Radial1}) / 2 + 180^\circ = 230^\circ$. Attention should be paid in north directions
- $\text{Angle1} = (\text{Radial2} - \text{Radial1}) / 2 = 20^\circ$
- $\text{Radius1} = \text{Max.radius} = 200\text{km}$
- $\text{Radius2} = \text{Min.radius}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

7.2 Flying a task

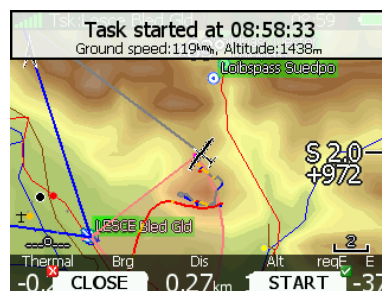
After take off, the unit will change over into flying mode. The pilot will notice this because statistics page will change from logbook view to flight statistics.

7.2.1 Starting a task

Before starting task and in task mode an character "S" will be displayed on final glide symbol. This indicates task has not been started yet. Lower number tells you at what altitude you will start. For more advanced start options like maximum start speed, maximum altitude, before start altitude see chapter 5.7.4. Once you decide to start task, and glider enters start observation zone, message "Inside start zone" will be displayed.



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



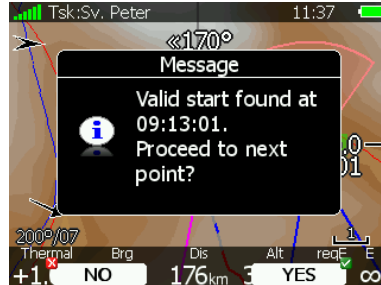
Groundspeed and pressure altitude are also shown in message. At bottom two buttons are displayed. Use CLOSE button, if this was not a valid start and you want to remove message from screen. If message is removed, it will appear again next time you leave start. If you press START button, navigation will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



Compared to LX7007 there is no need to press START inside start observation zone. You may press it any time after leaving start observation zone or crossing start line. LX8000 will always take correct time for start time.

If for some reason you miss start message you may always start task pressing START button. Go to task mode. Press any key. In top row button START button is shown. Press this button and navigation will be advanced to next turnpoint.

In case you change task in the air and you are already flying towards first turnpoint, you will still be able to start a task. Press start button and message dialog to confirm task start will be opened.



7.2.2 Restarting task

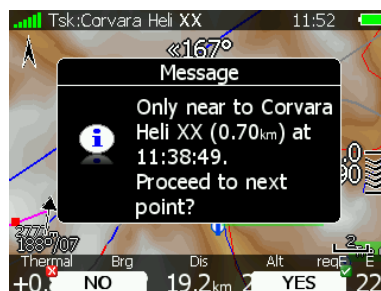
If for some reason you decide to abandon task and you would like to restart task, go to task mode. Press any key. In top row button hint RESTART is shown. Press it. You have to confirm restarting of task. Once task is restarted, navigation will be changed back to start point.

7.2.3 Over turnpoint

When turnpoint observation zone is reached message "Inside zone" will be displayed and task will auto advance to next turnpoint when Auto next option was selected (see chapter 5.7.3).

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

In case you did not reach turnpoint and you would like to continue navigation towards next point anyway, press NEXT button.



Message dialog will appear. If you confirm this dialog with YES, task will be advanced to next turnpoint and it will be recalculating task, taking optimal fix as task point.

7.2.4 Entering assigned area

Most probably when entering assigned area, auto advance is going to be turned off. Message "Inside zone" will be shown and buttons CLOSE and NEXT will be drawn in bottom row. Pressing CLOSE button will dismiss inside zone message. Task will be auto advanced to next point, when leaving assigned area. If you want to auto advance to next turnpoint earlier you may always press NEXT button in task mode (see 7.2.3).

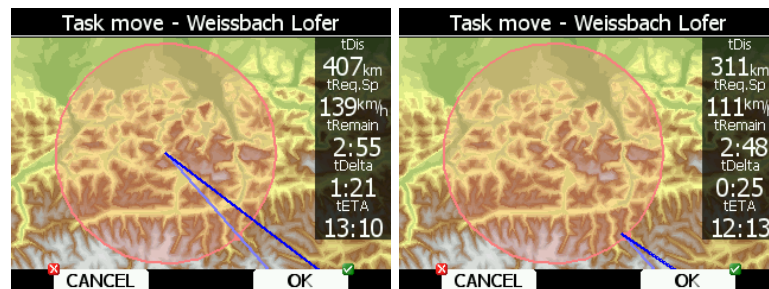
If button NEXT is pressed task is advanced to next turnpoint.



When flying in assigned area it is NOT important when you will advance to next turnpoint. LX8000 is always taking into account most optimal fix inside assigned area for 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 point within this area. Moving point will increase or decrease total task length. Select MOVE action in task mode. A dialog with current assigned area will be shown.



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

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

Keep in mind time of arrival can be calculated using different methods, which are found in QNH, RES setup (See chapter 5.1.1).

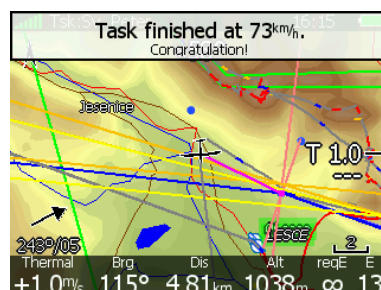
Point is moved using bottom two knobs. Rotate right knob (page selector) to move point in radial direction from area center.

Use bottom-left knob (zoom) to move point in axial direction.

If more than one assigned area is set for task, NEXT>> button is shown in bottom line. Press this button, if you would like to move point in other 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 new task and press RESTART button.

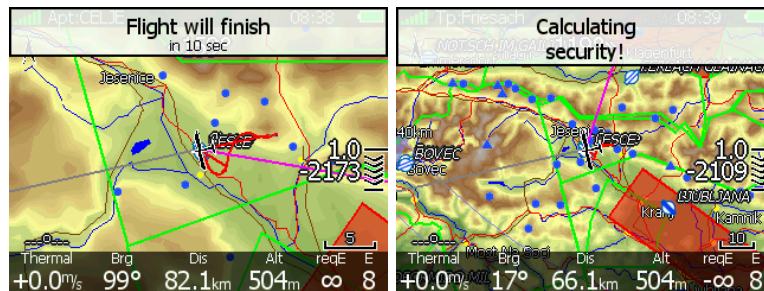


If the finish regulations prescribe entering a cylinder, usually 2 km radius with a base of 200m, then program the finish zone to the cylinder parameters and set the safety altitude in INIT to the height of the base of the cylinder. When on the final glide, MOVE the finish point to the border of the cylinder and all it is then necessary to do is to fly the glider to keep the final glide deviation on 0m.

7.3 Flying a free flight (OLC)

7.4 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 off the unit OFF** immediately after landing, but to wait a few minutes. First message "Flight will finish in 10 seconds" will appear and at the end message "Calculating security!".



Flight is finished, when message Calculating security disappears. At that moment the statistics page will be changed back to logbook view. Now it is safe to switch off instrument. If SD card or USB stick is inserted at this moment, flight will automatically be copied to it. Please use regular methods to power down LX8000. See chapter 4.4 for more details.



It is important that LX8000 is switched off using software. Never power down LX8000 using main power switch. LX8000 is running Linux operating system and sudden power loss may corrupt file system

8 Installation

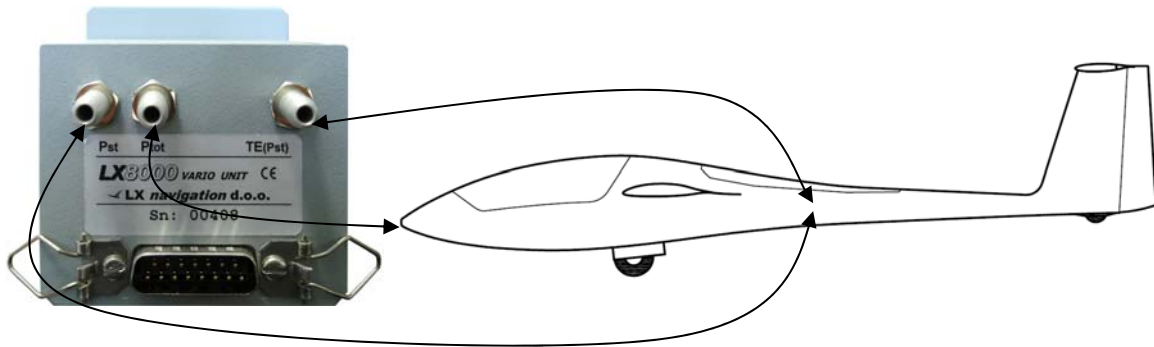
The LX8000 digital unit is installed in an aperture 93.5mm width and 81.5mm height
The LX8000 vario unit and any additional vario indicators need a standard 57mm cut-out each.

Three pressure connectors are fitted to the back of the LX8000 vario unit. A label shows their functions.

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

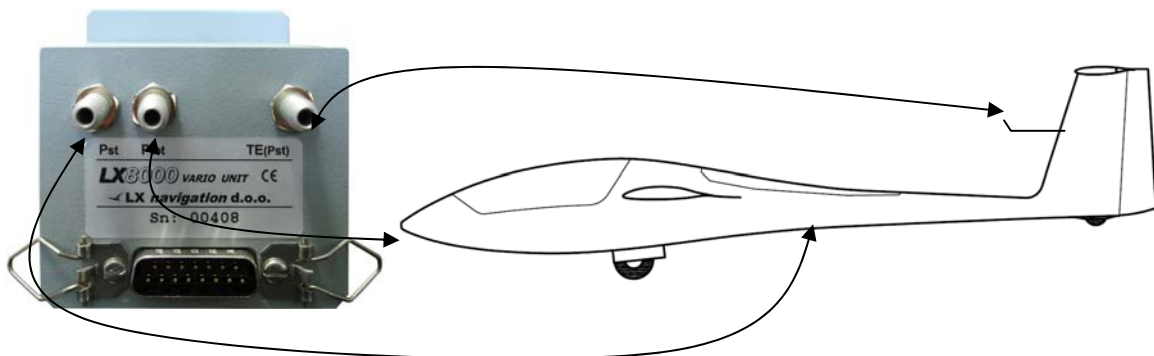
If the unit is to be configured for electronic TE compensation, then the connections are as follows:

- P_{st} Static
- P_{tot} Pitot or Total pressure
- TE/ P_{st} Static



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

- TE/ P_{st} TE tube
- P_{st} Static
- P_{tot} Pitot or Total pressure



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

The LX8000 digital unit is connected to 12 Volt power via the 15-pin SUB-D connector. LX 8000 digital unit and LX8000 VARIO UNIT (57 mm units are connected via the RS485 bus and the connectors are marked like 1-1.

Please check, if both units are connected correctly, before first power on. The power wires (red and blue) should be connected to the main LX8000 digital unit.

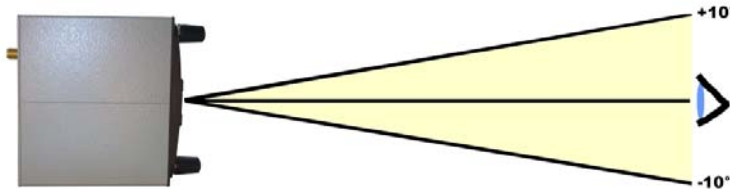


Even there is an automatic fuse in the instrument it is **VERY IMPORTANT** to use an external fuse (max. 3A). Power supply cables should use a minimum of 0.5mm² wires. To prevent damage to LX8000 digital unit after a short circuit on the 485bus there is an automatic fuse.

If a short circuit happens then the 57 mm unit will not work any more, but the reason is not the defect of 57mm unit, but hot automatic fuse. Turn off the LX8000 system and wait for the automatic fuse to cool down.

8.1 Mounting LX8000

Prepare the cut-out in the instrument panel according to the drilling template. For best viewing angle consider installing LX8000 into position which will meet requirements shown on picture below.

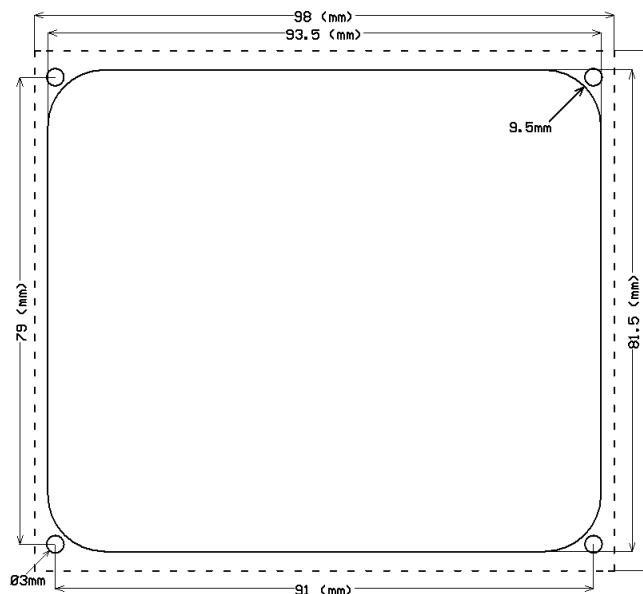


Position the LX8000 digital unit in the cut-out in the instrument panel. Tighten the LX8000 digital unit with the 2,5mm screws.



When mounting LX8000, it is not necessary to remove rotary knobs.

Mounting template is shown on picture below (not in scale!):



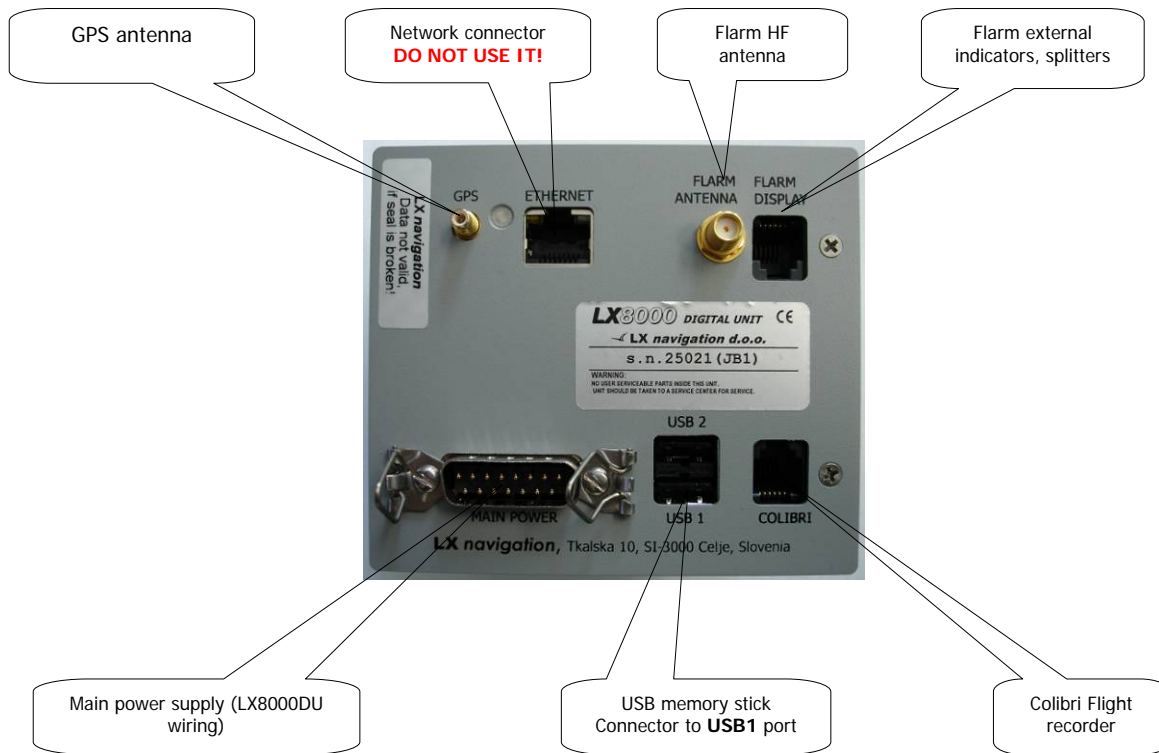
LX8000 vario unit should be mounted to standard 57 mm hole.

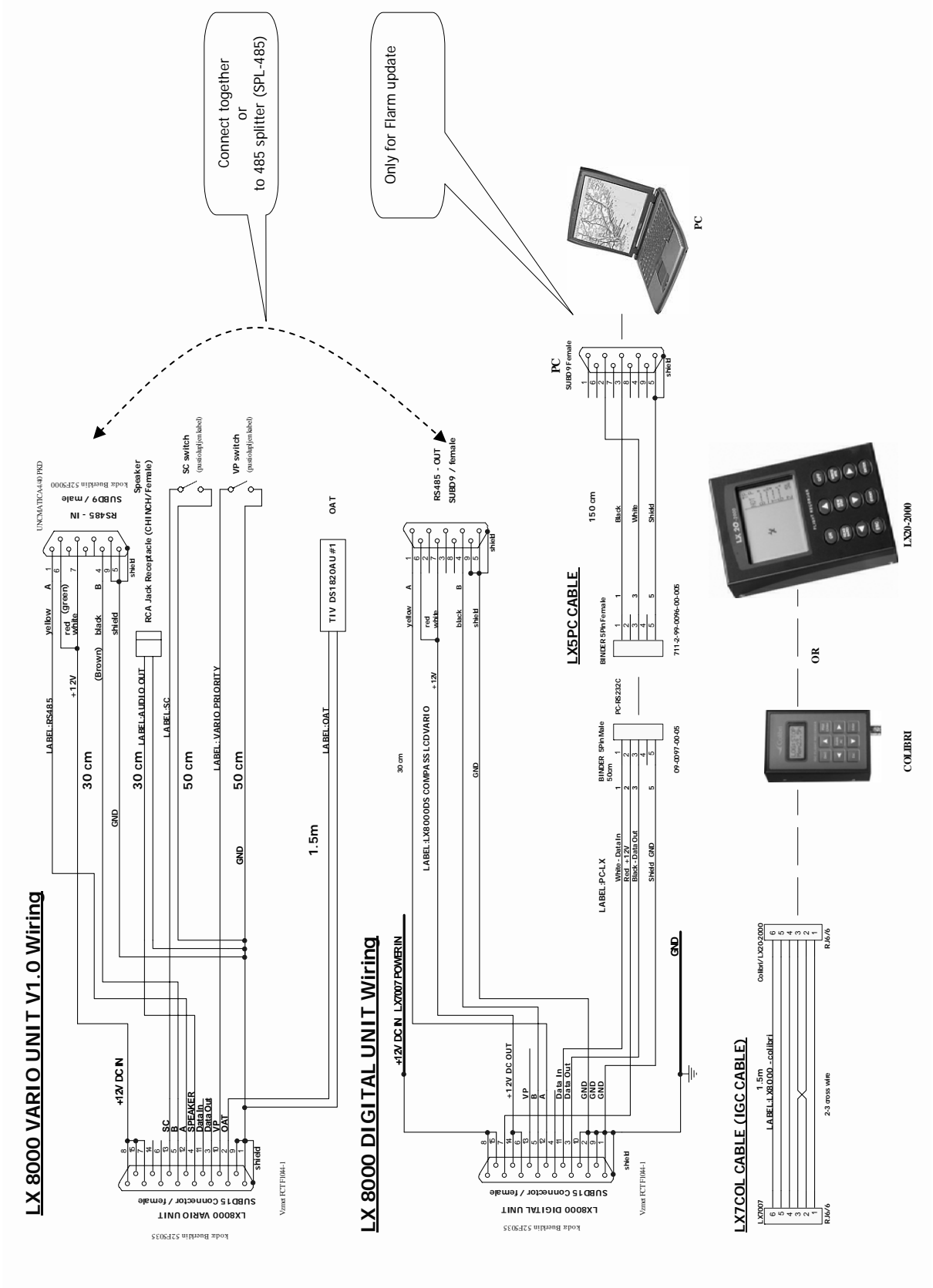
8.2 Installation of options

All options (LX8000D, Remote Control, Voice Module, Compass Module, secondary vario indicators) are prepared to be connected to RS485 system bus by use of 485 splitting units. Installation of any option is plug and play and therefore requires only mechanical installation works. LX8000 digital unit also powers all the bus connected devices. An automatic fuse built into the LX8000 digital unit prevents damage to the digital unit should a short circuit in wiring or in some attached device will occur.



8.3 Ports and Wiring



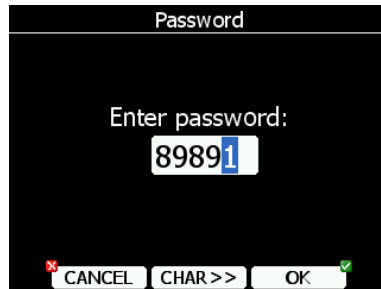


9 Firmware update

Firmware update of LX8000 can be easily done using SD Card. Use following link to send us a request for firmware update:

<http://www.lxnavigation.si/avionics/lx8000fw.cfm>

You can also subscribe to a newsletter to get automatically news about LX8000. We will send you an update file and update code. Update code is six letter long string and update file is having .lx8000 extension. To proceed with firmware update copy update file to SD card or USB stick and insert it in LX8000.



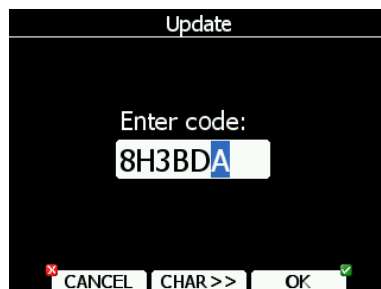
Start LX8000 and go to Setup->Password menu option.

Enter password 89891 and press ENTER

LX8000 will automatically search for an update file. If more than one update file is found, selection dialog will be shown.

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

Enter update code, which was send to you.



Please note update file and update code are matching pair only for particular serial number.

If update file is verified, LX8000 will reboot and new firmware is ready for use.

10 Options

10.1 Flarm option



Before using Flarm it is highly recommended to read Flarm user manual, which can be downloaded from www.flarm.com. Respect all limitations listed in mentioned documents.

Flarm is a collision avoidance system developed by Flarm Technologies from Switzerland. LX navigation and Flarm Technologies signed a contract under which LX navigation has rights to integrate Flarm technology into LX navigation products.

A Flarm module consists of following main parts.

- GPS receiver
- Microcontroller unit
- Radio Transceiver
- Pressure altimeter
- Flarm external indicator



It is also possible to replace Flarm external indicator (LED) with Flarm graphic display. Even using both in parallel is possible.

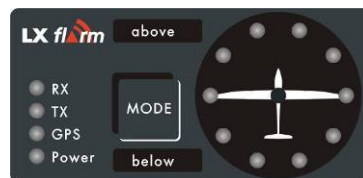
The GPS receiver defines position of the glider, the microcontroller is responsible for collision prediction calculations and the transceiver is sending and receiving data.

10.1.1 Configuration

All electronic parts are integrated into LX8000 cabinet: an exception is the radio communication antenna and Flarm External Display. Some inputs are possible to external display.

10.1.1.1 Flarm external LED display

Flarm External display is mainly used as a collision warning interface and status indicator. To connect both units use original cable (telephone type) delivered with the unit. Use connector on the back side of the LX8000 marked FLARM. The unit is powered from LX8000. Delivered is an external display developed by LX navigation, which is slightly adapted to work with LX 8000.



5. radial positioned red/green LED's defines 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.

Mode button is used to control the unit. Four red/green LED's are indicating Flarm status.

The external display has two modes of operation:

- **Warning mode** will activate a red blinking diode, if another glider equipped with Flarm is close and a prediction of a collision risk exists. An audio warning will also be played. Higher collision risk will increase blinking frequency and the same is with audio. The warnings are classified into three levels (See Flarm manual for details). First level

approximately 18 seconds before predicted collision, 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 positioned inside radio range. One green LED will light permanently and there will be no audio. The unit will change over to **warning mode** automatically, if warning criteria are satisfied and will continue in **nearest mode** after collision risk disappears.



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

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



To change mode of operation press MODE button for approximately 2 seconds. If the radial LED's run from top toward bottom then 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.

Obstacles

Flarm unit is capable of storing coordinates of obstacles which could cause a collision during flight. This data is available on www.flarm.com. Use Flarm tools to update obstacles. The unit is factory preloaded 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 LED's will be active (such a situation will never appear with glider v glider collision risk). Medium and high risk will be indicated with more LED's active and more frequent audio signal.

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



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

Settings for LX Flarm LED display

Using mode selector key it is possible to adjust some parameters of the external display. Disconnect the unit, press mode selector and hold, power on, hold mode selector for about 4 seconds. The display parameters can be defined pressing mode selector for approximately 2 seconds and observing green LED's. To move in-between parameter press short mode and observe red LED's.

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 LX 8000 use exclusively 19200 bps

If two units work in parallel (double seater) one unit must be PIC and another PAX.

10.1.1.2 LX Flarm graphic display

This type of display is 100% compatible with LX8000 Flarm output and may be used instead of LED version. See manual for details.



10.1.1.3 LX Flarm display 57 mm

This unit is standard 57mm unit and replaces LED version also.



10.1.2 Installation

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



The antenna position must be as much as possible vertical. Use only original antenna which is always delivered with the unit. Use original cable to connect LX8000 and antenna. Never use antenna without original aluminum ground plane. Having no space to install metal back plane, dipole variant of antenna is available. On the picture is connected GROUND PLANE antenna. With new LX8000F DIPOLE antenna is included, which is having even better performance and ground plane antenna.

The Flarm external display is a small unit and can be placed somewhere on the instrument panel. To fix the device use self adhesive back side of the device. If a position on the top of the instrument panel will be chosen, LX navigation offers a suitable box.

10.1.3 Functional check after installation

After LX8000 has been switched on the Flarm External Indicator will receive power and will pass initial routine which will take several seconds.

Description of LED statuses:

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 , minimum one glider in range

6. Green circular , indication of near gliders
7. Red circular flashing, collision warning
8. Above below green by near
9. Above below red by warning
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 obligatory check functionality from 2 to 3 and 11.

10.1.4 Error messages

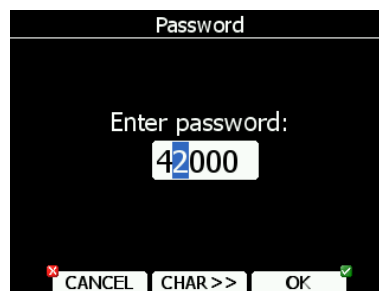
After Flarm failure has been detected, LX8000 will show this situation after booting and the routine Flarm self test is not OK.

10.1.5 Flarm traffic information on moving map

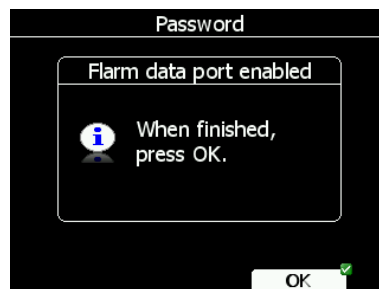
All Flarm equipped gliders in range will be shown on moving map as small aircraft symbols, whether or not they cause a collision warning or not. Each glider has own trace and information of altitude and vario.

10.1.6 Flarm update procedure

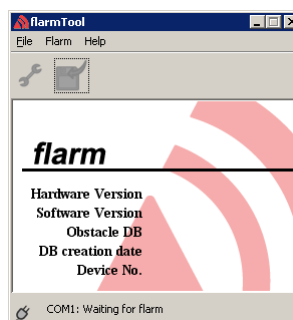
Power on LX8000. Go into password menu and enter password 42000.



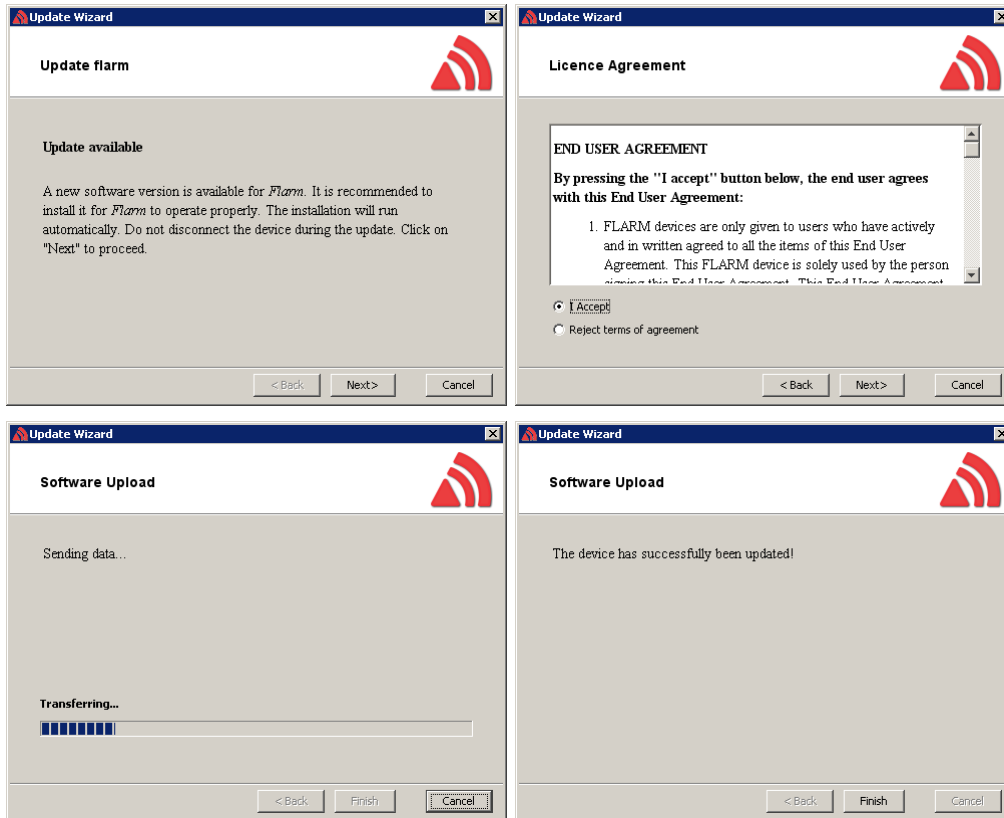
Following message will appear.



Run Flarm tool and select communication port.



Connect LX8000 via PC cable with your PC. In the same time Flarm tool will detect Flarm. Please follow the instructions.



In case that Flarm stops working and update is not possible over described procedure with password 42000, use following recover procedure. In Flarm tool choose Recover and follow instructions. On LX8000 enter password 41000



When recover is finished press OK button.

10.1.7 Uploading obstacles

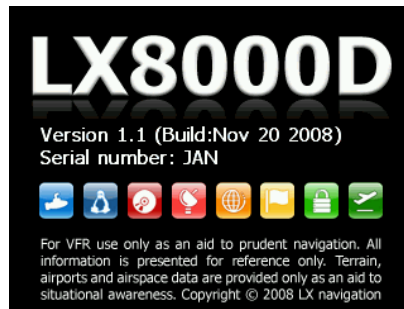
Go into password menu and enter password 42000. Run Flarm tool and select communication port. Connect LX8000 via PC cable with your PC



When finished, press OK button on LX8000.



10.2 Rear seat device (LX8000D)



In double-seater gliders it is possible to install rear seat device LX8000D. LX8000D looks almost identical to LX8000. However inside device there is no gps and Flarm module. Rear seat device must and can be connected only to LX8000 via RS485 bus system. Power is available on bus, thus no external power is needed. Device can be switch on only when LX8000 is powered on.

Basic idea of double-seater configuration is that both devices are working independent from each other with possibility to exchange different data on user request of automatically.

10.2.1 Data exchange

Because gps and Flarm module are not integrated in LX8000D, this data is received from LX8000 digital unit through RS485 bus.

After power on, LX8000 also sends polar data and pilot information to have them synchronized in both devices.

User can define which data will be automatically synchronized between LX8000 and LX8000D.



Waypoint and task databases are not synchronized between LX8000 and LX8000D as it was in LX7007/LX7007D. To have databases synchronized you have to use SD card and copy files from rear to front device or vice versa. See chapter 5.1.5.4 how to copy waypoint files.

To setup data, which is going to be received from LX8000D, enter "Rear seat device" menu on LX8000 digital unit (See chapter 1.1.1).

To define, which data is going to be received from LX8000, go to "Front seat device" menu in LX8000D unit (See chapter 1.1.1).



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

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

If waypoint checkbox is checked, new waypoint target will be automatically assigned when user changes waypoint target on other device. A message "Waypoint target received" will be

shown on the screen and you will be navigating to the same waypoint as other device. Please note, it is not necessary to have this waypoint in your databases as complete waypoint information is send.

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

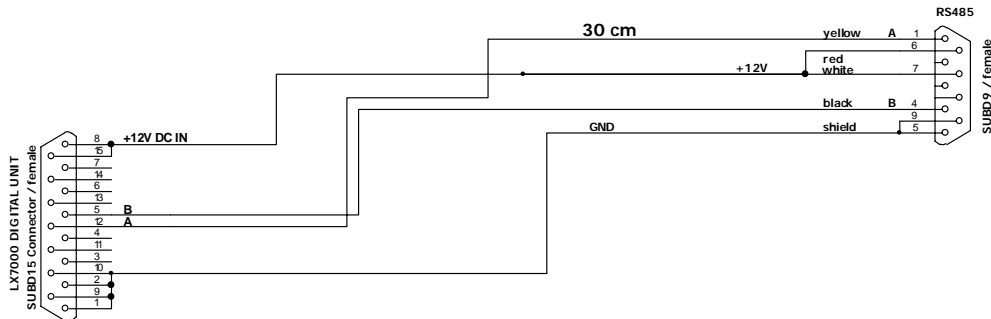
Same applies for airport checkbox. Message "Airport target received" is shown.

If task checkbox is checked, task is going to be synchronized with other device.

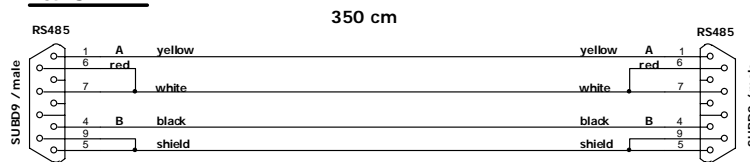


When flying assigned area task, it is worth not having task checkbox checked. This will allow one pilot to play with "what if" scenarios. Once a proper direction is found, you can send task to other device using SEND action in task mode.

10.2.2 Cable wiring



485 CABLE

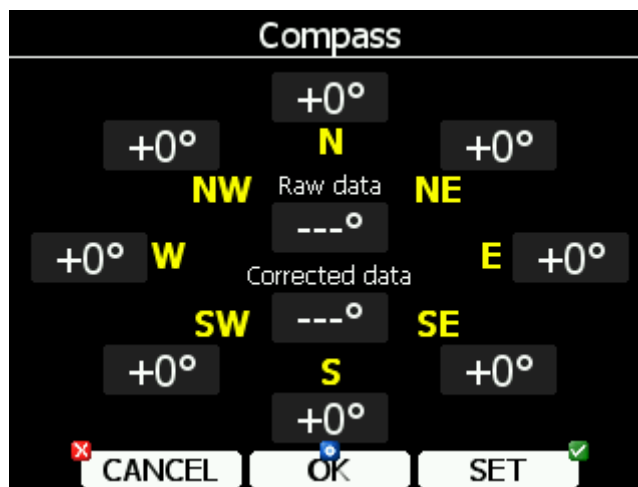


10.3 Compass Module



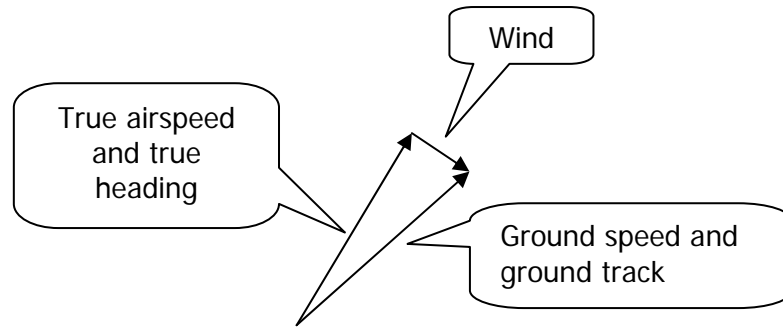
10.3.1 General

The compass module is an electronic compass device (magnetic field sensor), which was developed for the LX8000. The LX8000 recognizes the compass module automatically when it is plugged onto 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 reading in compass calibration page.



Heading indication is by default true. After change of setting 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 as occurs when the glider is turning.

10.3.2 Installation of the compass module

The device consists of two parts, a compass sensor and electronic device. The compass sensor should be built somewhere far from iron parts, which can cause errors in reading. Respect flight direction arrow and install the unit horizontally. All connections are plug and play, so no mistake possible is possible. A 485 splitting unit to extend RS485 bus is included. The box with electronics could be installed on the convenient place in the glider, orientation doesn't matter.



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

10.3.2.1 Where to install

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. Minimum distance is 20cm. 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.

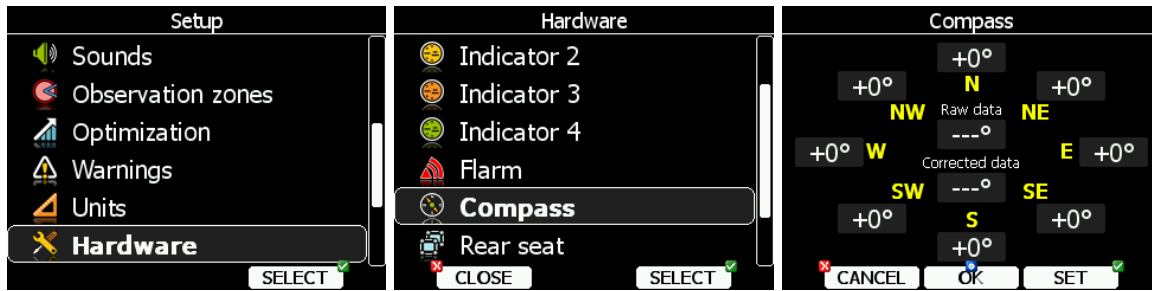
10.3.3 First test after installation

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 into north direction, while doing that watch the HDG raw data on 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 $\pm 5^\circ$.

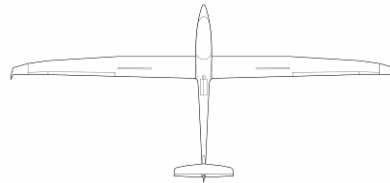
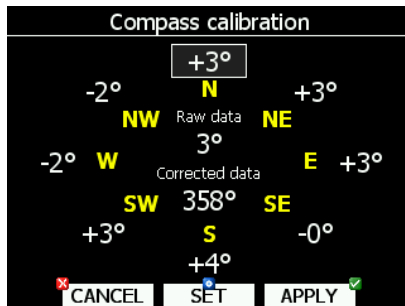
Now turn the aircraft into the other directions and read the displayed values (don't change the compass position anymore). If they vary more than $\pm 15^\circ$ look for another place for the compass module.

10.3.4 Adjusting the compass module

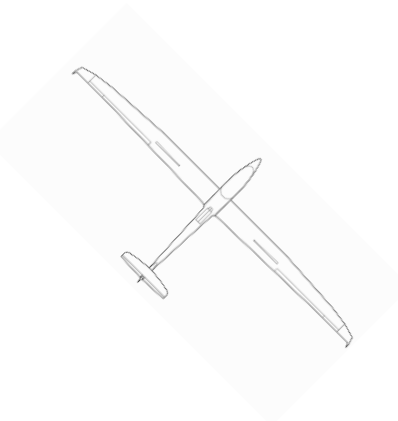
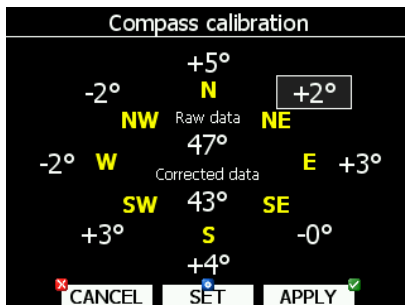
The compensation of the compass is done in the setup/hardware/compass



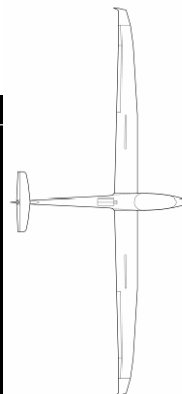
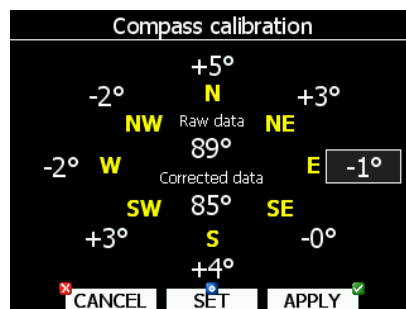
1. Orientate the glider to 360°. N label will be automatically focused



2. Stabilize reading and press SET to save correction for this direction
3. Rotate glider to next direction 45°, focus on label will move to NE



4. Stabilize reading and press SET to save correction for this direction
5. Repeat procedure for the remaining directions



At the end press OK button to save calibration data or press CANCEL to cancel changes to be saved. Previous settings will remain.



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

10.3.5 Final check

Go back to compass calibration page and check again 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 installation or in the adjustment procedure. When the final test is satisfactory, your LX8000 is ready to calculate the wind with the compass method.



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

10.3.6 Input of local magnetic variation

The correct input of local magnetic variation is essential. Use QNH and RES menu. Wrong magnetic variation may degrade wind calculation significantly. If auto variation is selected the LX8000 automatically calculates magnetic variation from a mathematical model. See chapter 5.1.1 for more details.

10.4 LX 8000 Remote control

Remote control consists of two parts:

- Leather coated stick with built in electronics
- Interface printed circuit board which connects wires coming out from the stick to the LX 8000 RS485 system bus



The stick is delivered in three diameters 18mm, 20mm and 24mm. LS gliders need 24mm, all other glider types will accept 20mm.

All necessary electronic 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.



Don't forget to initialize speed command input setting to TASTER (See chapter 5.1.12.1)

10.4.1 Stick handle with keys



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 PTT and climb/cruise buttons are wired separate. All remaining buttons are connected to the built in microcontroller and only four wires should be connected to the 485 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 LX 8000 side, remote stick will be automatically detected.

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

10.5 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 done 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 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

April 2008	Initial release of owner manual
May 2008	Update to firmware version 1.0. Added firmware update procedure
December 2008	Update to firmware version 1.1. Added LX800D manipulation and wiring diagram
March 2009	Update to firmware version 2.0. Improved selection of airports and waypoints and advanced task options

