LX Mini Map pro

Vario navigation system

Users manual V 1.0

Preliminary

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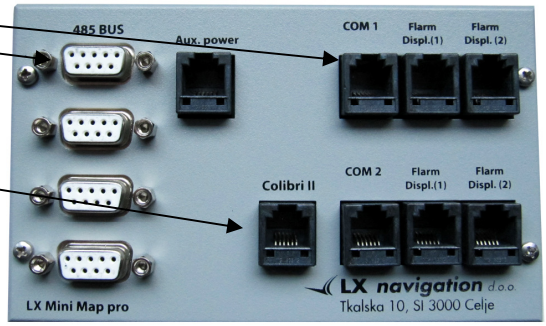
1 System description

The system consists of two units; one unit is a LX Navigation 57 mm standard **Vario** unit (USB D type) and the second unit is a **Computer device** with colour display push buttons and rotary switches.

Both units are interconnected via LX Navigation system bus which enables both units to exchange data in both directions. The bus also powers the vario unit, thus the vario does not a need separate power supply.
On the rear of the Mini Map Display/computer there are multiple connectors which enables the connection of a wide range of interfaces that are plug and play. This ensures that installation is incredibly simple requiring no soldering.

GPS sources, such as Flarm, Colibri, Colibri II and also any other unit sending NMEA at any baud rate, can be used. **Four SUB D** 9P connectors are ready to connect the vario, LX Remote, second seat unit and secondary vario indicators.
A special plug is provided for **Colibri II** connection. A built in power converter supplies Colibri II with 5V DC power and therefore no interface device is necessary.
The same cable is used also for data transfer.



1.1 *Software*

The computer built into LX Mini Map pro runs under a Windows CE 5.0 operating system. This makes it possible to apply navigation programs that are written for a Windows CE 5.0 environment. At the moment, the LX Navigation version of LK 8000 offers the best solution; LK 8000 is a free ware program based on XCsoar. LX navigation has upgraded this software so that nearly all system functions are available by using keys and rotary switches and reducing the need to use touch screen to the minimum; this ensure the ease of use of the system even when flying in turbulence. However, all touch screen functions remain available for those pilots who prefer this.
SeeYou mobile can also be used.
The unit comes with LK 8000 preloaded.
The program runs directly from the SD card, which is positioned on the front panel of the unit.

1.2 *Hardware*

1.2.1 Push buttons and rotary switches

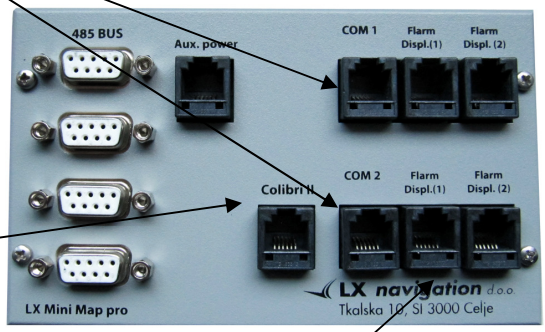
The unit has **6 push buttons** which have dual functions, so that using one push button two functions can be executed. This is achieved by use of a **short** press for one function and a long one for the other. Short press means button pressed for less than 0,5 seconds and a long press for one second or more. After any press on the button a designated function will be executed. The push buttons are used, also, as a short cuts to activate individual functions.

All **four rotary switches** also have a key function when pushed in.

1.3 *GPS connection*

The unit is capable of receiving GPS signals in form of NMEA sentences via two ports which are designated as **COM 1** and **COM 2**. It is recommended that COM 2 is used as the main input and COM 1 as a spare input. The baud rate of GPS signal on COM 2 doesn't matter as the unit adapts to input signal baud rate automatically. COM 1 needs baud rate adaptation in Setup of LK 8000. Both COM 1 and COM 2 are also able to power GPS source with 12 V, this is valid for GPS units having an IGC compatible connector (6 or 8P telephone type). Suggested units include:

-Colibri
-LX 20
-VL
-Flarm all versions
-Colibri II*



Connection of all mentioned units except Colibri II should Be done by using a 1:1 cable that means one with no wires twisted.
*a special 6P plug is provided for Colibri II connection. The connector includes also 5V power for Colibri II power management device and therefore Colibri II doesn't need any power adapter and may be directly connected to LX MM COM 2. A suitable cable is available as an option. Colibri II can be also connected to COM 1 or COM2, but in that case a Colibri II power adapter is necessary to enable the interconnection.

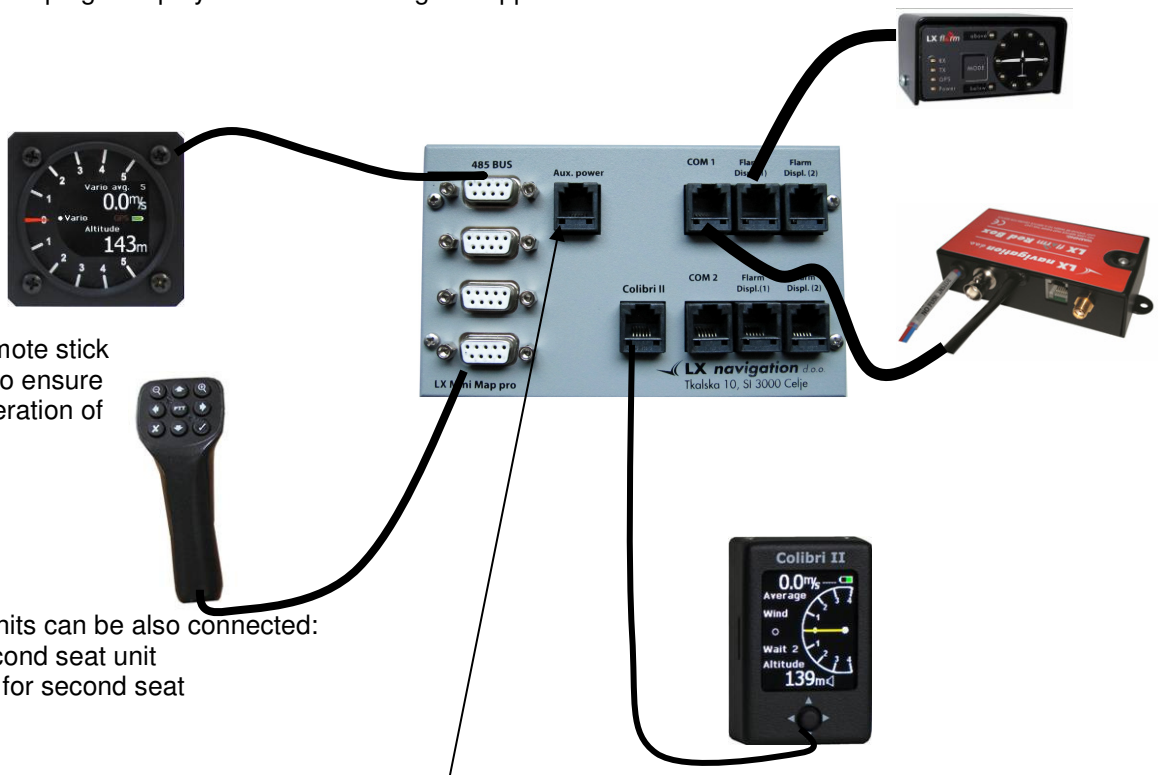
Note!
If the **Colibri II input** is used all COM 2 plugs should remain unoccupied.

1.3.1 Connection of Flarm displays

If Flarm is used as a GPS source up to two **Flarm displays** can then be connected to the sockets designated as Flarm Display 1 and 2. This solution makes connection of Flarm displays extremely easy without any splitters being required. This applies to both COM ports.

1.3.2 Connection of System bus participants

There are **four 9P sub D** connectors on the back of the unit. All 4 connectors are in parallel, so it doesn't matter to which position a 485 bus participant is connected. The most important participant is Vario unit, which is plug-and-play connectable using its supplied cable set.



Original LX Remote stick can be added to ensure comfortable operation of the system.

The following units can be also connected:
-LX MM pro second seat unit
-Vario indicator for second seat

1.4 *Power supply*

The unit needs 12 V DC power for its operation. The main power should be applied via two wires and a two pole connector.

Note!
The unit does not have a built in fuse, so please use 2A (slow type) to protect the unit against short.

The power consumption depends on vario volume setting and is typically 450 mA at 12V.
An external switch is used as a main switch. When turned off it should be wired to ensure that no power can be applied to the unit; the same applies to auxiliary power.

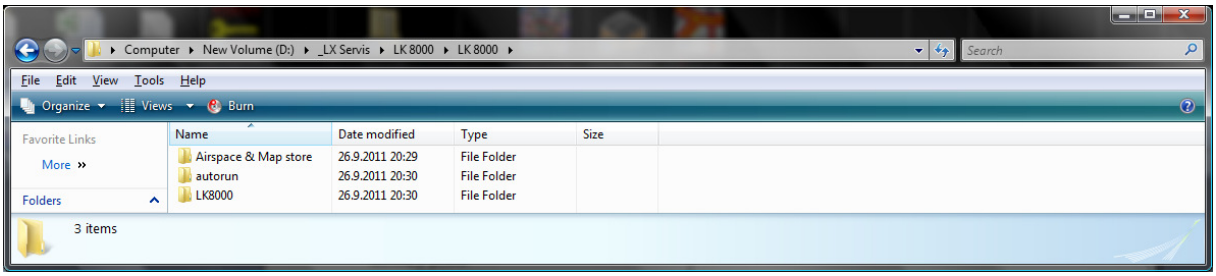
1.4.1 Auxiliary power input

A spare battery can be connected via 6P telephone type connector (the cable is not included in **the** delivery). In this case, and after a power break, the auxiliary power will be applied to the unit without any power break. The auxiliary power will remain active until main switch is turned ON.

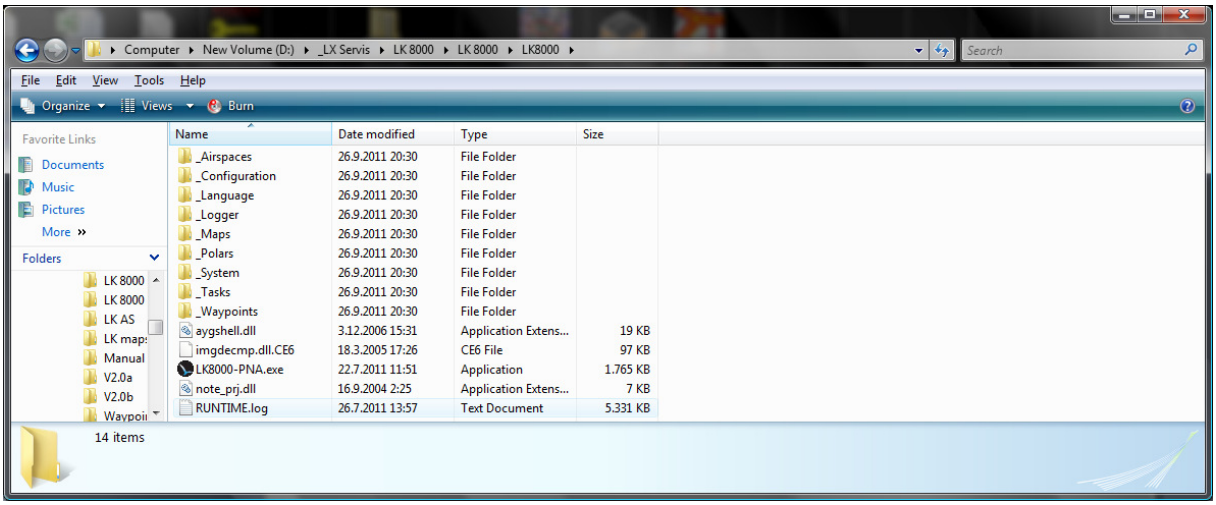
1.4.2 SD card interface

The SD card slot is positioned on the right upper corner of the unit and will accept one micro size SD card. One SD card with LK 8000 program already preloaded is included in the delivery. The program consists of:
-LK 8000 folder
-Autorun folder

In LK 8000 folder are stored program files, Autorun folder serves to run the program after every power on.
In third folder called as Airspace&Maps, airspace and terrain topology files are stored. Files of interest should be copied into Airspace and Maps folders respectively of LK 8000.



Structure of SD card



Structure of LK 8000 files

Note!
It is recommended to make a **safety copy** of all files which are stored on SD card, to prevent frustration in case of losing the card or a defect.

1.5 *Getting started*

Immediately after power is applied the unit will start and the Vario will receive power. If a SD card with navigation program is inserted the booting procedure will follow after LX Navigation logo presentation.

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1.6 *Using of CAI 302 as a vario unit*

Cambridge 302 can be also used as a vario unit. The connection can be achieved by using a special cable which connects COM 1 of LX MM pro and CAI 302.(available to special order)

1.7 *About this manual*

The manual is oriented to describe functions concerning to LX MM pro configuration (push buttons and rotary switches) and therefore there will be some functions that are not described and for which you will need to refer to the original LK8000 Manual or XC Soar. These functions are principally those relating to touch features as these were not modified in the development of the LX Navigation development of LK8000 program.

2 How to use LK 8000

LX Navigation has done a number of modifications to the LK 8000 program so that it is now possible to use push buttons and rotary switches to operate the system.

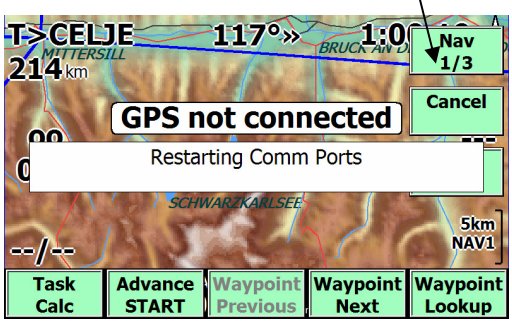
2.1 *Philosophy of push button and rotary switch operation*

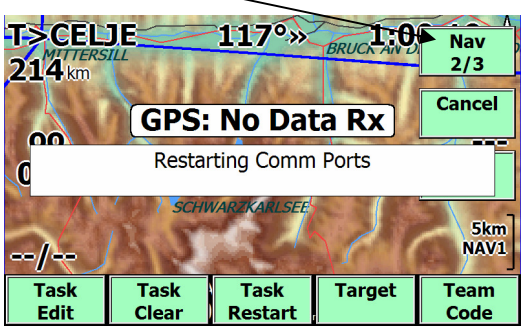
As already explained the LX Navigation version of LK 8000 program includes changes that makes it possible to operate the unit by use of push buttons and/or rotary switches.
All necessary settings of Vario unit during flight can be executed by using the controls on LX Mini Map pro. To make major changes to the vario settings the pilot should use a special program called LX Service which can be run from a desktop and in this case it will be necessary to close LK 8000 and to run LX Service.

2.1.1 Description of key functions

There are six keys on the front panel. The keys are used as short cuts to access particular functions of the program. Every key has a label and the text of the label describes the function which will be produced after particular key has been activated. Every key is programmed to understand short and long presses. After a **short press** function which is indicated before the / will be executed and after a **long press** the function written after / will become active.

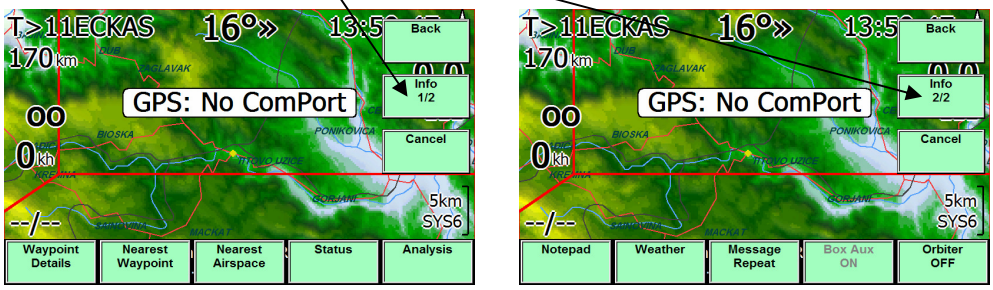
-AN / CLC : short press will activate flight analyses and long press task calculation menu
-START / R : short press will start task and long press will activate task restart procedure
-SET / SYS : short press will open basic setup and long press will offer system setup
-NAV… : after each press (short) NAV 1, NAV 2 or NAV 3 menus will open, these menus are not used for navigation, but they arrange some settings or selections





-TSK / TRG: short press will activate task edit and long press is used as a short cut to edit sectors of actual task

-INFO.. **:** after each press INFO 1 or INFO 2 options will become active



2.1.2 Description of rotary switch functions

The unit has four rotary switches which can be rotated in **both directions; in addition,** every switch also a **push button** function. The push button function is activated by finger press on the top of the switch. Push button function is simple in that every press will be recognized as a short press. Rotary switch functions are pointed out with **symbols** and also as a **text**. The symbols describe functions which will be activated **after rotation** and push button functions are described with letters (small characters) near symbols.

2.1.2.1 Vario rotary switch (audio volume and vario settings)

Rotating of the left upper rotary switch will change Vario audio volume.
After first press MC input will become active.
Update of MC will follow by rotating the knob.
After second press ballast input will be offered and so on until Filter input.
All mentioned actions will be clearly **displayed** on vario display.

Note!

After no action for several seconds the unit will change back into navigation mode automatically. After adjustment of MC and Ballast both vario unit and the LK 8000 computer will be updated automatically.

2.1.2.2 Zoom rotary switch

After rotation of the knob the **zoom range** of graphic page will change. Push button function isn't active now.

2.1.2.3 Left / Right rotary switch and Esc button

The main switch function is to rotate in - between bottom row pages (1-9) in basic navigation page (map) and to select horizontal sub pages. (See also further instructions that follow). The switch also selects in setup.

A press on the button will execute Escape

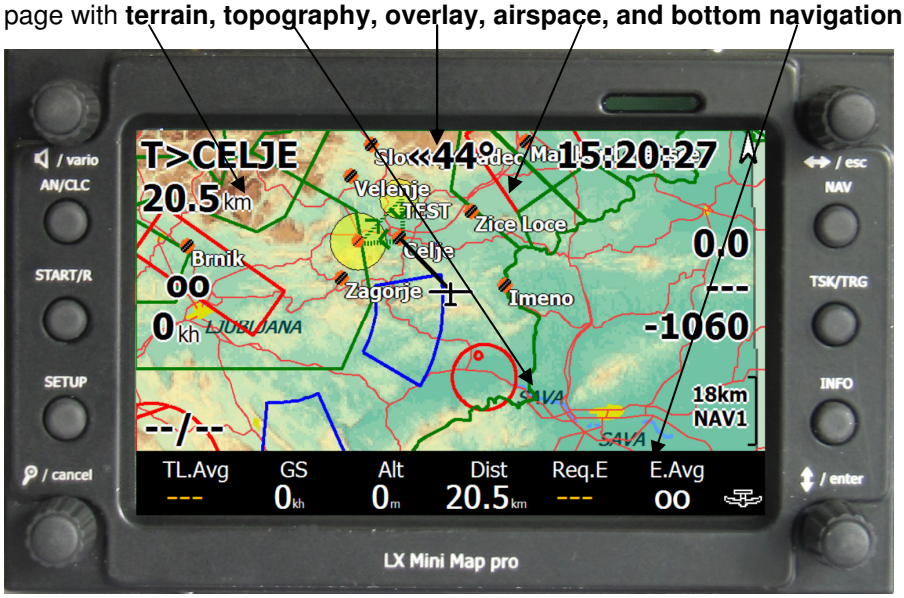
2.1.2.4 Up / Down rotary switch and Enter key

During navigation the key is used as a selector of navigation pages. In edit it is used as an up/down selector of items.
Press will activate Enter function

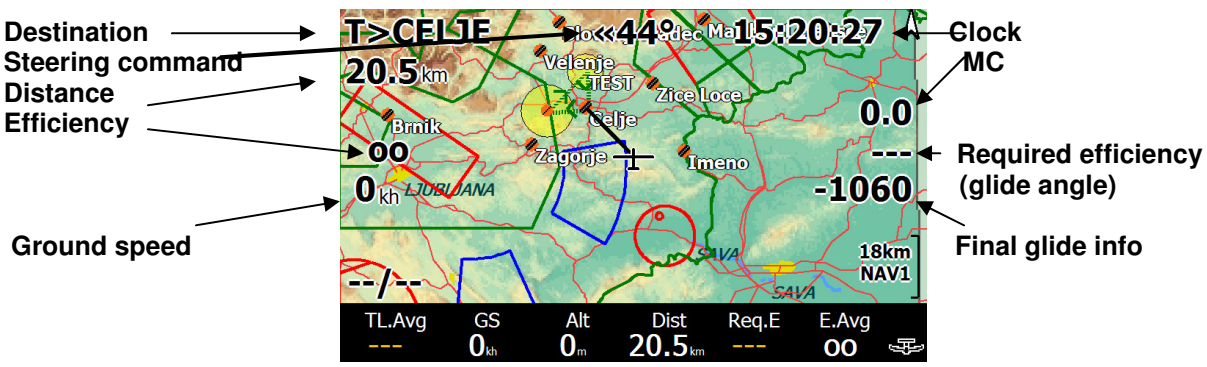
2.2 *Navigation screens*

2.2.1 Primary navigation page

The unit has one main navigation screen which appears after a successful booting process. This is in fact a graphic page with **terrain, topography, overlay, airspace, and bottom navigation data** row.



Terrain : terrain in different configurations as a background (see setup **1site** about details)
Topography: topology corresponding to the active file (see setup **1site**)
Overlay : by overlay is meant big figures and numbers over map which include navigation and also other data. The overlay can be configured in section **11** of setup.

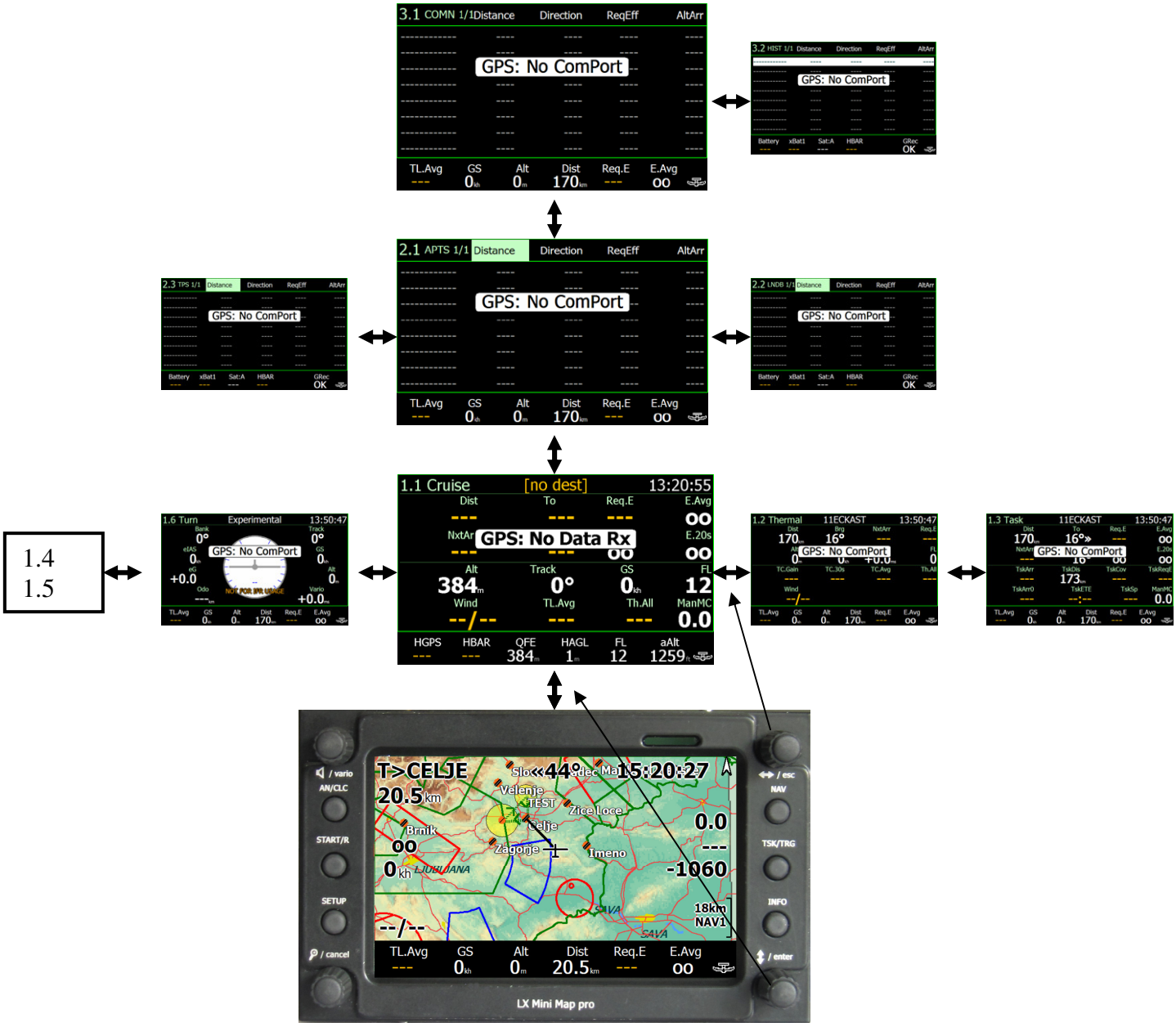


Airspace : the active airspace file should be selected **in 2nd page** of setup. The files are available on www.lxnavigation.si .

Bottom row: there are 10 variants of bottom rows simply selectable by ↔ rotary switch. Some of them are fixed and some of them **custom configurable**, see sections 16-19 of setup.
Page numbered as 0 is **thermal page** and is active exclusively during climbing period, during cruising flight one of pages between 1 and 9 are present (the last selected).

2.2.2 Secondary navigation pages

After rotation of ↕ rotary switch the secondary navigation pages can be called up. In fact these pages are alphanumerical pages and each of them has also some sub pages available via left right rotary switch (↔).



Note!
If Flarm is used as a GPS source one additional page numbered as number four is available.

2.2.2.1 Explanations of sub page contents

2.2.2.1.1 Sub page 1

The sub page will open after ↕ is rotated one step clock wise. This page has five variants which are simply selectable by ↔.

1.1 Cruise : shows navigation data relevant to cruise
1.2 Thermal : shows navigation data relevant in thermaling
1.3 Task : shows actual task relevant data
1.4 Custom : shows navigation data as defined in setup 19
1.5 Contest : shows data connected to OLC scoring
1.6 Turn : an experimental page with a depiction of a turn and bank indicator

2.2.2.1.2 : Sub page 2

Pages under number 2 comprise “Near” pages and show near airport data, land able points and turn points.

2.1 APTS : shows near airports, selected by distance, direction, required efficiency (glide angle) or Arrival altitude (use touch screen)

Selection of an airfield is possible by use of touch as follows:

-tap on the screen central part **up** or **down** to highlight the **airport** of interest

Final selection will follow after a long press on the central part of the display. A typical message will appear. After **Go to** selection has been made

2.2 LNDB: land able turn points are listed, selection as described in 2.2.2.1.2.
2.3 TPS : list of near turn points

2.2.2.1.3 Sub page 3

3.1 COMN : list of commonly used points
3.2 HIST : list of last used points

2.2.2.1.4 Sub page 4

This is a traffic information page active exclusively Flarm is used as a GPS source..

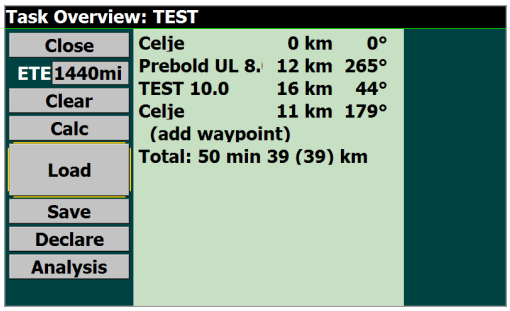
4.1 T RF : shows ID of Flarm objects and makes it possible to sort under different criteria
4.2 Target : shows detailed data of target object
4.3 Sight :

2.2.3 Short cuts to TSK/TRG, NAV, and INFO

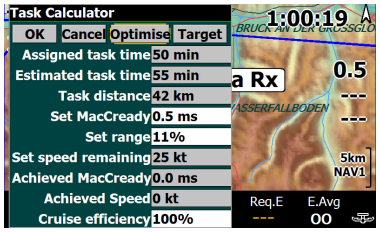
Those short cuts make possible direct access to some more important functions.

2.2.3.1 TSK/TRG button

After short press task edit menu will open.



-Clear : touch on clear will clear the task and a new one may be edited or loaded
-Load : will load a new task from the task store
-Save* : will save actual task under name
-Declare: will send task declaration data towards flight recorder if connected (this function isn't executable at the moment)
use Connect Me for declaration transfer
-Calc : will open task calculation menu,
this is the same menu as opens after long press on AN/CALC button

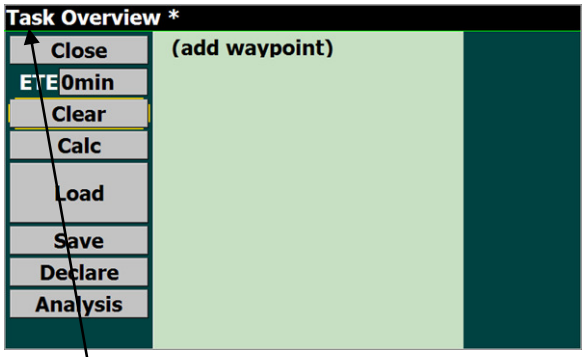


-ETE : doesn't allow any input, this is in fact time which is intended to be spent on task; it becomes real after MC is set

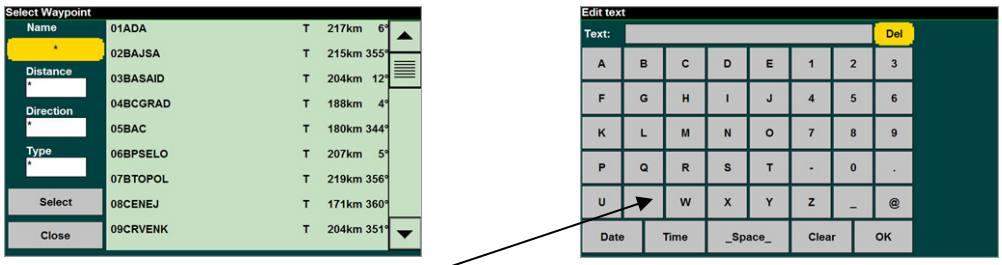
Note!
All above mentioned operations can be executed solely by using **rotary** switches, **enter** and **escape**.

***Important!**
It is not necessary to save the task and to keep it ready for navigation after power off. In that case use the **EXIT** function and run the program new. After that the prepared task will be ready for navigation at any time. Just power off will not retain the task.

2.2.3.1.1 How to input a new task



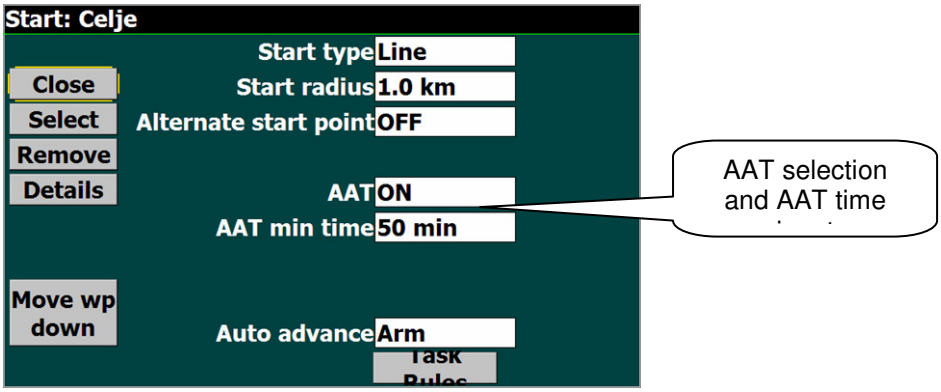
After press on Task Button of LX MM pro, **Task Overview** window will open and last flown task will be listed. If you place cursor on any point this can be replaced with another one after enter. If no task is entered (**add waypoint**) will be shown. Place cursor on **add waypoint** and menu to enter start point will open.



Turn point selection is possible under Name, Distance, Direction or Type criteria. For selection under name an input of first letters of the name is necessary.

The first selected point is task **start point**. During selection process of the start point the pilot should define if a conventional speed task or an **AAT** is planned to be flown. After AAT selection (AAT ON),the **AAT time** given by the competition director should be entered. AAT sector geometry can be annotated to correspond to individual sectors of the task. Flying an AAT makes change-over philosophy of high importance, so defineit carefully in **Auto advance**.

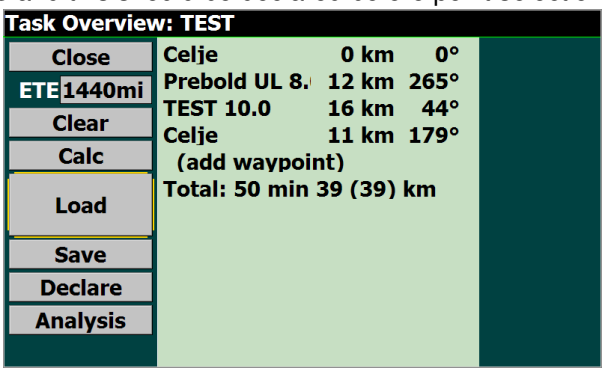
-**Manual:** change over will happen promptly after command execution (press on **Start** button)
-**Auto:** change over will happen automatically after sector has been be reached (suggested for Racing task
-**Arm:** the pilot is able to arm task start before reaching the line, after reaching the line, start will be executed automatically, change over to next turn point inside point sector is manual after pressing of **Start** button.
-**Arm Start:** arm is valid only for start sector



Use Close to step out back to edit.

Note!
It is important to select a turn point file that includes turn points you expect to use:this should be done in **System setup item 1** (1 Site). Remember that LK 8000 is also capable of uslng **.CUP** files as a turn point data base. The turn point files should be copied into **Waypoints** folder of LK 8000.

The last point is **finish line** and this should be declared before point selection.



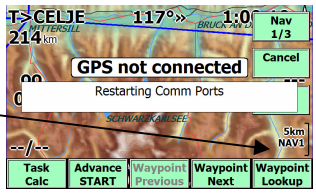
Example of a task ready to fly

After **start**, **turn points** and **finish** with its individual sectors are entered; the task is ready to be flown. Close the procedure with **Close** command.

Note!
After task is an AAT, a sector geometry input will be offered after point selection.

2.2.3.1.2 How to select a turn point

Selection of any turn point from the turn point data base is possible after using of **Waypoint Lookout** menu; this menu is included in NAV 1 which will appear after first press on NAV button. Another way to select a new turn point is to use Secondary navigation page 2.2 and 2.3. See para 2.2.2.

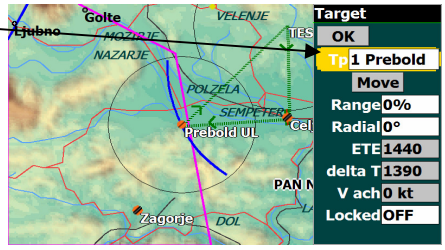


Note!
If an active task is running, selection of a turn point will close the task.

2.2.3.1.3 Target TRG

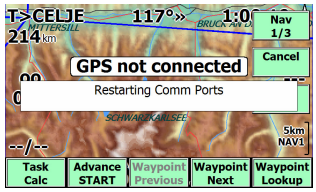
After a long press on TSK/TRG button the target menu will open. This menu is used to adapt task geometry (not sector geometry) during flight. Any sector can be modified this way.

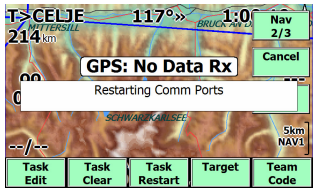
-**Select item** by ↕
-**Select point** ↔
-**Adjust** range or radial
ETE, delta T and V ach are information
-Locked should be set to ON or OFF
For details see section on flying a task.
Range will reduce or increase default task distance and radial will move along radial.

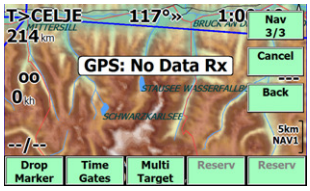


2.2.3.2 NAV button

NAV button offers short cuts to three NAV menus (1-3), which are accessible after sequenced pressing on NAV button. There is no long press function at all.





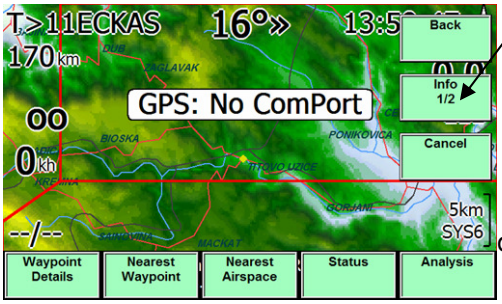


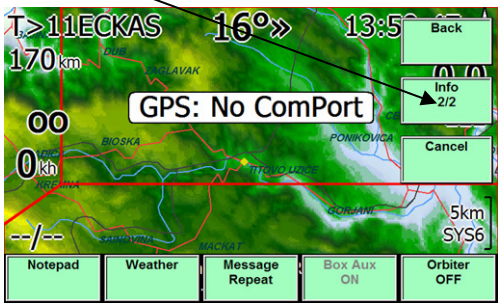
Individual functions can be executed by using the touch screen.

Note!
Use Waypoint Lookup for waypoint selection.

2.2.3.3 INFO button

INFO button offers two short cuts to info menus (1/2 and 2/2) of LK 8000. There is no long press function.





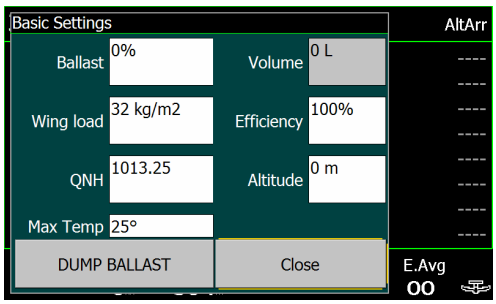
dual boxes.

2.3 *Setup*

There are two levels of setup. Daily settings, such as altitude and QNH are available after short press on Setup button. A long press on the same button will activate system setup where system data is stored.

2.3.1 Daily settings

After a short press on Setup button the following page will open.
Ballast input may be entered as percentage of ballast or directly in litres. Maximum value of ballast depends on individual polar. Polar should be defined in **section 7** of setup.
Altitude setting is a very important setting as this value has a direct influence on final glide. It is necessary to set take off field **elevation**. When vario unit is connected the altitude data comes from vario altimeter, so the values should match all the time.
Efficiency means glide characteristics degradation in % of gliding ratio and for instance 90% means 10% degradation.

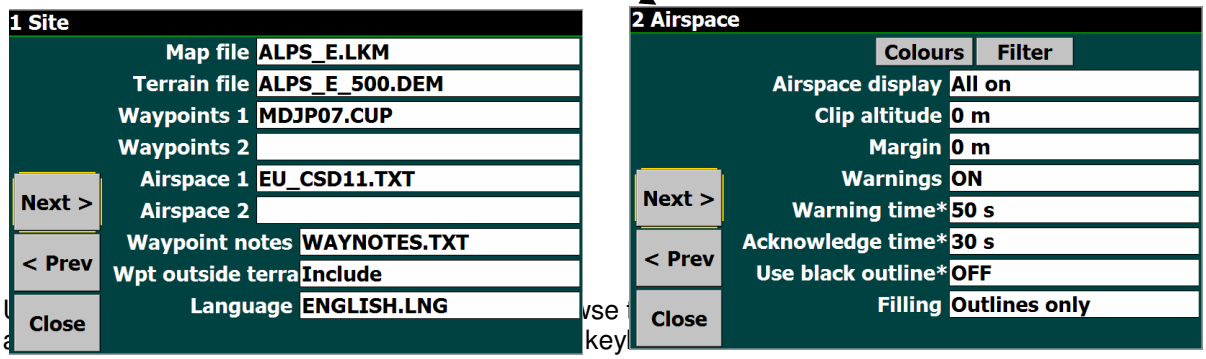


2.3.2 System Setup

After a long press on Setup button, 23 system setting pages are offered.

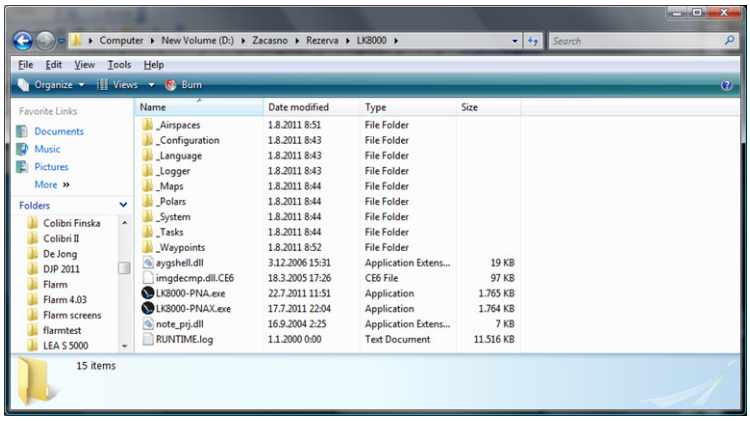
Note!
All actions of selections can be done by using ↕, ↔, Escape (valid for Mini Map pro) and Enter key of MM keyboard.

Setup defines system parameters and therefore it is obligatory to pass all items of setup once after system has been installed.
Setup consists of 23 items and **each item function** is shown in upper left corner of the display.

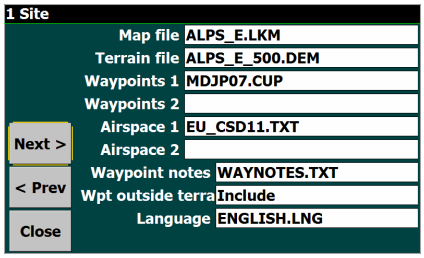


2.3.2.1 Setup 1 Site

Setup 1 makes it possible to select appropriate **terrain, topography, waypoint** and **airspace** files. Nearly all terrain and topography sections are already copied on to the SD card which comes with the unit in folder **Mapterrain.**
There is no installation process at all; all mentioned files should be simply copied into appropriate folders of LK 8000 SD card. Into **Maps** copy both terrain and topography files (xxxx.LKM and xxxx.DEM). Terrain files which included bigger numbers cover more area (xxxx 1000.DEM approximately 1000x1000 km).



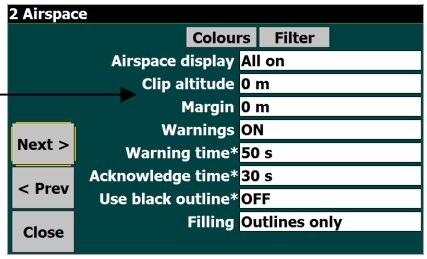
Waypoints in .**CUP or .DAT** format are accepted, waypoints having attribute of land able will be also listed in near function.
Airspace and Waypoints selections make it possible to enable **two sections** at the same time.
In that case a combined data base which consists of two waypoint or airspace files will be active. Using **Waypoint notes** you will be able to define your home data even if turn point file is not included in the data.
For details see LK 8000 manual. When selecting a waypoint that is outside the active terrain database the system will offer options of **Ask**, **Include** and **Exclude**.
Language selection is possible by use of **Language** menu.



Note!
Acceptable airspace format files are exclusively in **Open Air format** those files have extension .txt. LX Navigation offers current airspace files in .txt format on www.lxnavigation for free

2.3.2.2 Airspace

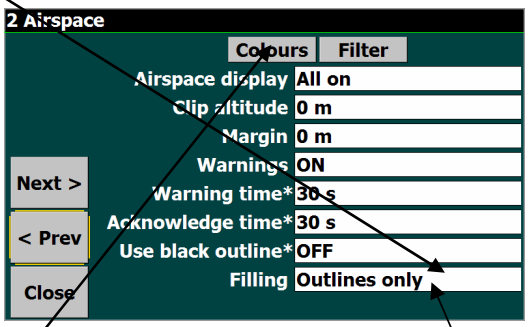
The basic selection is offered after entering into Airspace menu and extensions are available under Colours and Filter.



-**Airspace display** offers four options:
All on, will display the complete airspace at the same time
Clip, only airspace below user defined altitude in Clip alt. will be active.
*Auto,*only airspace at the current altitude regarding to Margin setting (+and -)
*All below,*only airspace below the glider will be shown.
-Clip altitude,valid only if clip mode has been selected.
-Margin, valid after Auto setting.
-Warnings, offers **on** and **off** solution.
-**Warning time,** defines the time period, before reaching airspace, in which a warning is given.
-**Acknowledgment,** setting of time period in which an acknowledged airspace warning will not be repeated.
-Black outline, ON will present all AS sections as a black outline, no filling and colours.
-**Filling** makes it possible to define as outlines only or patterns. In that case colour setting will define colours.

2.3.2.2.1 Custom adaptation of airspace colours

Option **Colours** in Airspace menu makes it possible to customise airspace colours and shadings. A colour can be allocated to any airspace. The airspace patterns can be also filled or just lines used to represent the airspace. A special option **outline only** will designate airspace sections only with a border. If you set Use black outline to ON, airspaces will be shown only with a thin black line.



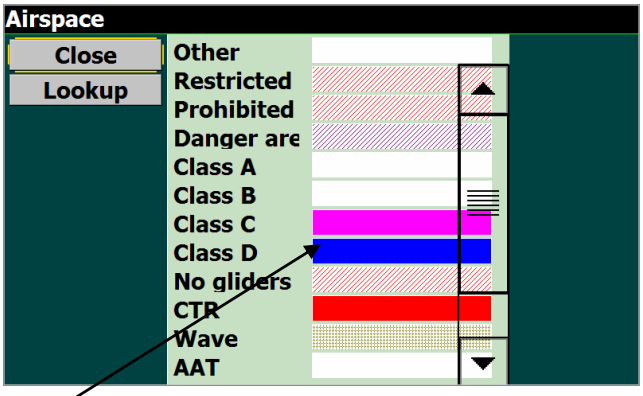
Determination of colours

The colors are connected to airspace classification (A,B, C …). So the pilot is able to add any colour from the palette to any class. Some special items are added to the classes as Glider sites, AAT sectors and some other options.

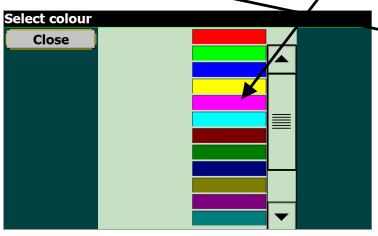
Note!

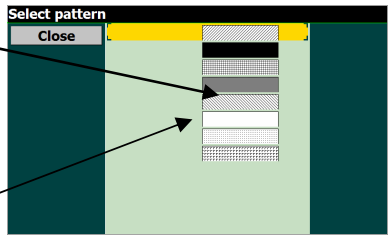
CTR is defined as class in LK 8000. If you want to use a special colour for CTR this shouldn't have a class designation as well, otherwise it will be treated the same as all other elements of the airspace class. Using unknown as class designator will also solve the problem.

After click on **Colours** following window will open:



To alter colour click on the **bar** and the whole **palette** will be offered. After clicking on a colour a pattern selection will follow, select **pattern**. To remove patterns and to use only colored airspace borders, select filling as **Outlines only**

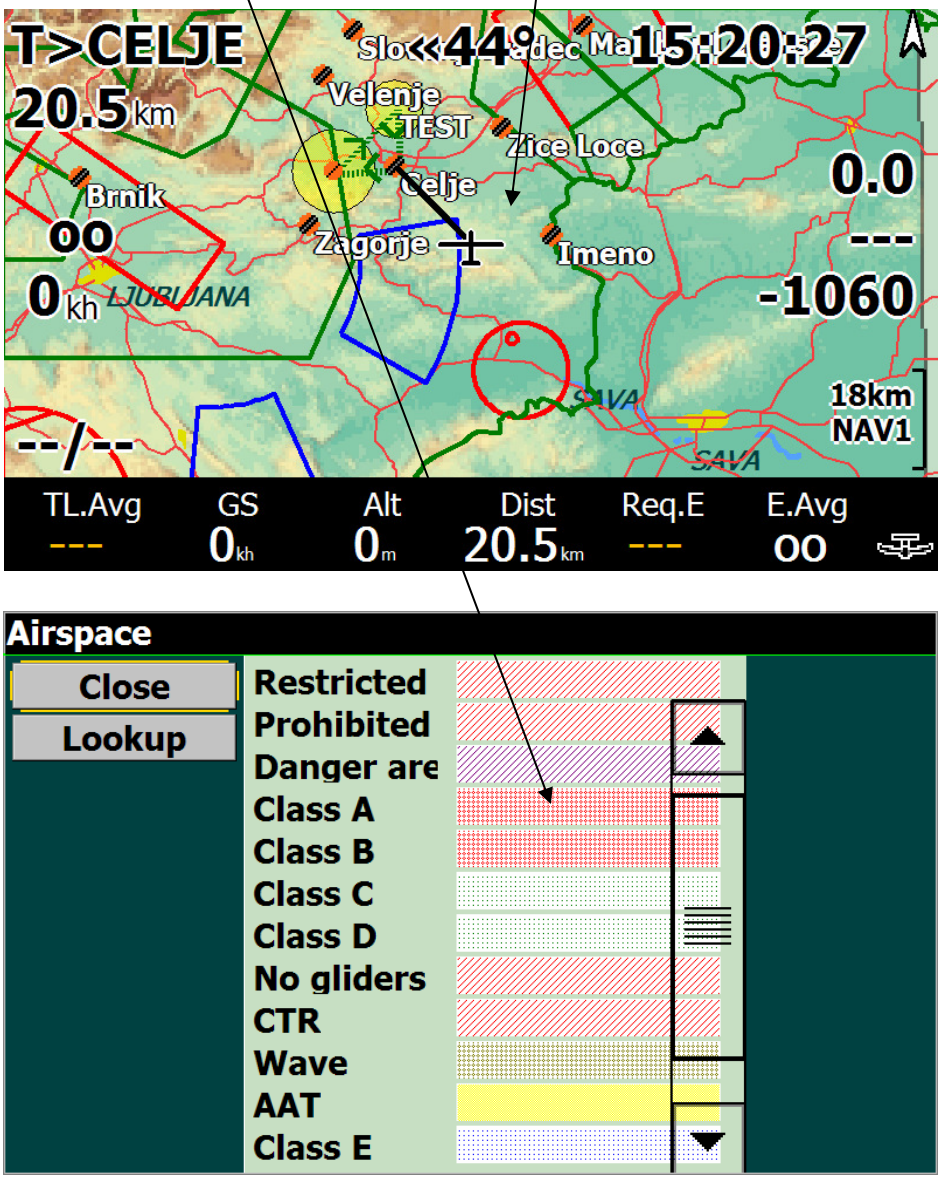




Note!

Selecting the **no pattern** in pattern selection will still fill the borders of the airspace transparently. It may cause irregular display of airspaces if they cross each other.

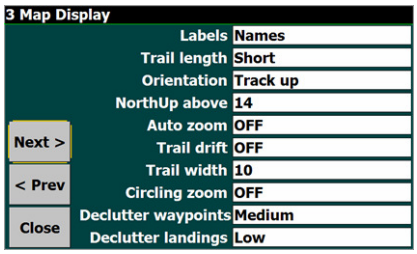
The default **selection of colours** will show **airspaces like this:**



Note!
You can only adjust colour of airspace if it has defined as a class in the OpenAir file.
Otherwise adjusting the color is not possible.

2.3.2.3 Map display

This menu shows how different information will be displayed on the map.

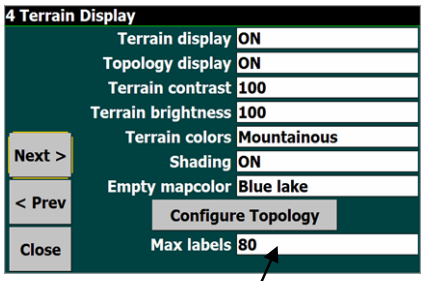


-Labels, setting will optimize waypoint designation.
-**Trail length,** will define trail length.
-**Orientation,** will define map orientation.
-**North above,** defines automatic change over to north up.
-**Auto zoom,** suggested setting is no.
-Trail drift, suggested setting is off.
-**Trail width** from 1 to 50.
-**Circling zoom**, sets different zoom factor during circling period.
-**Declutter** waypoint prevents display overload.
-**Decluter** landings, prevents display overload.

Note!
Waypoints are displayed up to zoom 13 km and land able up to zoom 23 km. Higher zoom levels remove waypoints from the display.

2.3.2.4 Terrain display

Terrain may be displayed by using the different settings in this menu.



-**Terrain display** makes it possible to enable or disable terrain
-**Topology display** enables or disables roads, rivers, railways and towns
-**Terrain contrast** in steps from 1 to 100
-**Terrain brightness** in steps from 1 to 100
-**Terrain colours** makes it possible to select different terrain options which correspond to pilot personal requirements
-**Shading** has only the option ON and OFF
-**Empty mapcolor** defines background colour when no terrain Is present
-**Max labels** defines maximum number of labels

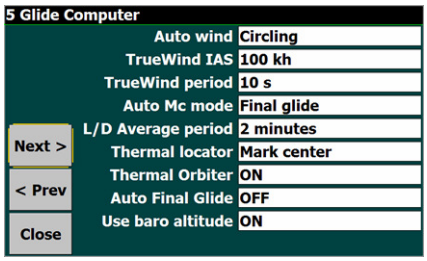
2.3.2.4.1 Configure topology

Presence or disappearing of different topology elements is connected with zoom status. The zoom values at which individual topology elements will appear and disappear is defined in **Configure topology** menu.

2.3.2.5 Glide computer

Some important system parameters can be set in this menu.

Note!
It is recommended to use baro altitude ON when using a GPS source which is capable sending baro based altitude data. Set LXWp data on LX units. Also use baro altitude ON in MM KB/V configuration.



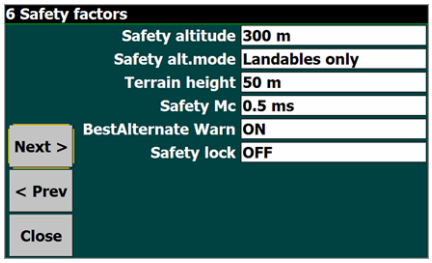
-**Auto wind**, defines method of wind calculation.
Circling, this method uses GPS position fixes to estimate the wind based on drift, typically while thermalling.
ZigZag, this method uses GPS position fixes and true airspeed measurements to estimate the wind, typically during cruise.
Both, combines circling and ZigZag.
-**True wind IAS,** setting of the IAS you will fly after using of True wind method (see LK manual True wind) Calculation)
-True wind period, defines period in which you intend to keep IAS stable during True wind calculation.
-Auto MC mode, defines which auto MC algorithm is to be used.
Final glide, adjusts MC for fastest arrival.

Average climb, MC auto setting based on total average.

Both, uses average on task and fastest arrival in final glide mode.
Equivalent MC,
-**LD average period**, defines time slot in which L/D average is calculated.
-Thermal locator, will show you location of thermals.
-Thermal orbiter, offers on and off option.
-**Auto final glide,**
-Use baro altitude, enables use of baro altitude signal if present.

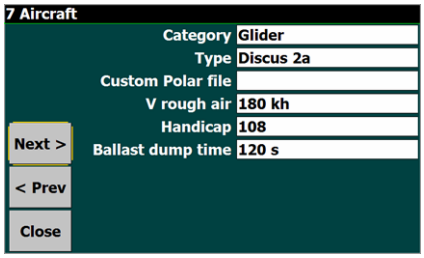
2.3.2.6 Safety factors

Some safety factors which influence flight safety are included in this menu.
-Safety altitude, will increase your final glide required altitude.
-Safety alternations mode, you can define which types of points will be included as alternate points.
-Terrain height, the height above terrain that the glider must clear during final glide.
-Safety MC, MC setting required to reach alternates and airports.
-Best alternate warning, ON and OFF option.
-Safety lock will disable setup entry during flight.



2.3.2.7 Aircraft

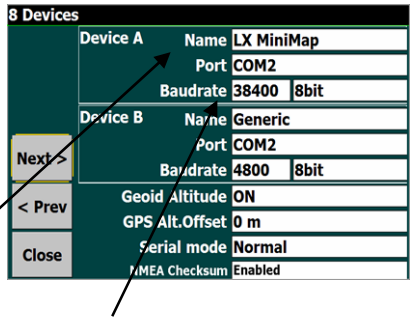
-**Category** defines generic type of aircraft
-**Type (**glider type); this input is extremely important if the instrument is to be used in the glider*
-**Custom polar** This file can be added after input of custom polar file see LK Manual page 108
-**V rough air****, speed limit in rough air should be entered
-**Handicap****, handicap factor used for scoring
-**Ballast dump time****, time required to dump the ballast



*to each glider type offered in the library there is an individual polar and this should be carefully selected. If using of MM KB/V version the polar selection should be also done in **LX service** program, this selection is valid only for vario unit and has **absolutely no influence on final glide**. The polar selection in LX service program will influence speed command only.
**should be entered by pilot after using of flight manual and sporting code (handicap)

2.3.2.8 Devices

The unit has **two inputs** for GPS signal called Devices A and B. It is suggested that Device A is used as main GPS input and Device B as a spare GPS input. If GPS signal is lost on port A the unit will switch to Device B.
MM offers two COM ports, COM port 1 and COM port 2, other offered ports are not wired, so never select higher than COM 2.
There is a significant difference between COM 1 and COM 2 by LX MM pro.
COM 1 is wired directly to the GPS source and COM 2 is wired to the into MM built in microcontroller. So after selection of COM 2 it is obligatory to select Name as **LX Mini Map** and baud rate **38400**, GPS source baud rate doesn't matter. COM 1 requires baud rate which matches GPS source baud rate.

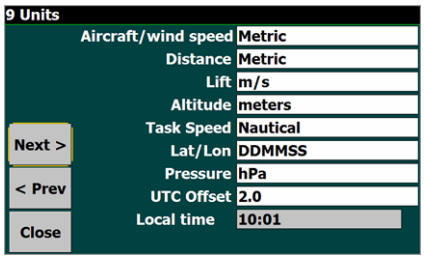


Note!
LX MM KB/V requires COM 2 and LX mini Map as obligatory. There are two types of harness, one for COM 1 and other for COM 2.

Use serial mode as Normal and NMEA checksum Enabled.

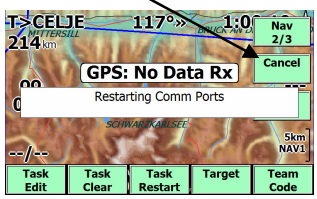
2.3.2.9 Units

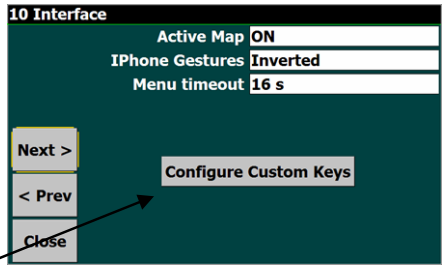
Units are selectable from this menu.
UTC offset will adapt time display to your local time.



2.3.2.10 Interface

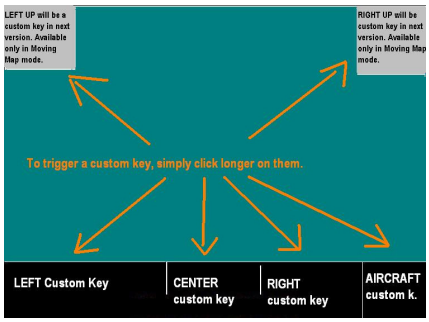
It is important in Interface to set **Menu timeout**. This setting Selects time interval before **menu icons** disappear after an activation
.





2.3.2.10.1 Configure Custom Keys

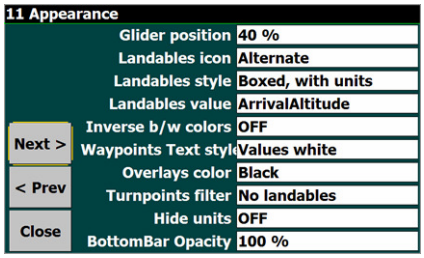
Settings under **Configure Custom Keys** makes itpossible to design custom key functions of touch screen according the requirements of the pilot.

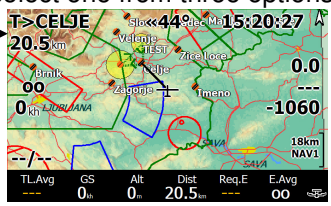


Custom keys organisation structure: for details see original LK 8000 manual page 24.

2.3.2.11 Appearance

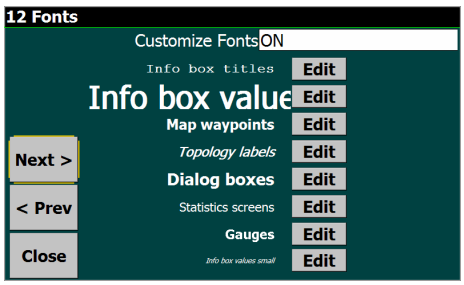
Settings connected with this menu define moving map display.
-**Glider position,** defines position of the glider symbol, 0% central
-**Landable Icons**, defines icons of landable points.
-**Landables style**, layout of landable points.
-**Landables value**, required glide angle or arrival altitude.
-**Inverse b/w colours**, colour inversion of figures of map overlay.
-**Waypoints Text style**, select one from three options.
-**Overlays colour**,



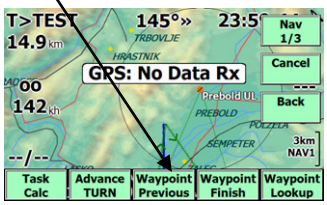


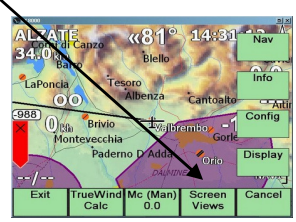
-**Turn points filter**, options NO landables, ALL Waypoints and DAT Turn points
-**Hide units**, will hide units on all figures of overlay (moving map).
-**BottomBar Opacity**, sets opacity of bottom bar.

2.3.2.12 Fonts

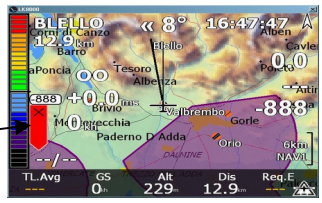


Selecting Customize Fonts ON makes it possible to adjust font size of different displays.
Info box tittles, will influence info box tittles,
if **IBOX** solution is selected in **Screen Views**
Info Box values, will influence value displays in Info Box
Map waypoints, makes it possible to adjust fonts of way point designators on the map
Topology labels, will adjust topology label details
Dialog Boxes, dialog boxes are boxes which appear during booting, after press on menu button and also setup is will affect this setting.

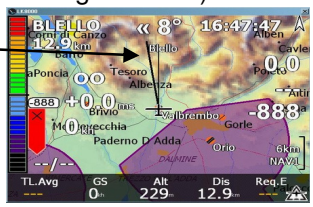




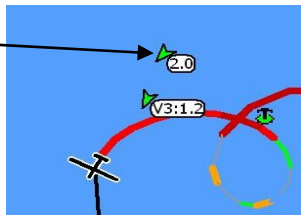
2.3.2.13 Map Overlays



Overlay means figures and letters over moving map.
-**Screen data**, select one of offered options.
-**Font size**, defines font size of overlay data.
-**Show Clock**, will show clock on overlay
-**Glide terrain line,** line or shade.
-Glide bar indicator
-Variometer bar, after enabling several options are offered, and in addition the **vario figure** will also appear.
-Variobar mode, defines vario bar relating to mode of operation (thermalling or cruise)
-**Thermal bar,** display of thermal profile.
-Track line, setting ON and OFF
-**Flarm on Map,** offered options are: OFF, ON fixed, ON scaled suggested solution is ON scaled.
Flarm objects



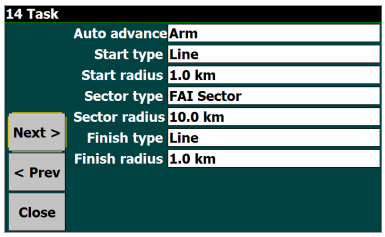
Fixed scale will make Flarm objects presentation unclear with high zoom levels.



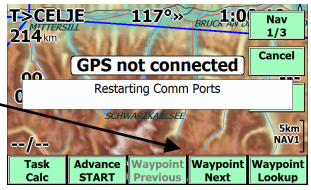
2.3.2.14 Task

Settings relating to task global settings are defined in this menu.

Note!
Any task can be individually prepared by using Task edit function.



Auto advance, defines changeover procedures at start and turn points
Manual selection requests manual change over by the pilot after Using Next Waypoint command of NAV 1/3 menu.

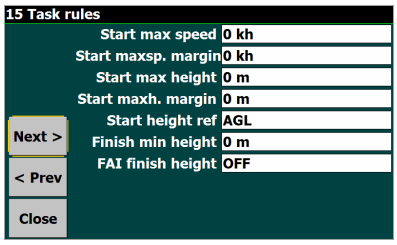


Auto selection will cause an automatic change over after reaching TP or start.
Arm selection will prepare ready for start and will execute change over automatically once sector has been reached.

Start Type, defines start sector geometry
Start radius, defines start sector expanse
Sector Type, is connected to turn point sector geometry
Sector radius, sector expanse
Finish Type and finish radius, defines finish geometry

2.3.2.15 Task rules

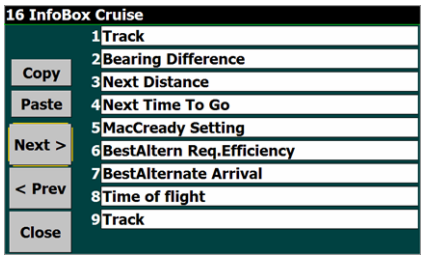
Task rules may be defined to limit valid starts according to competition rules.



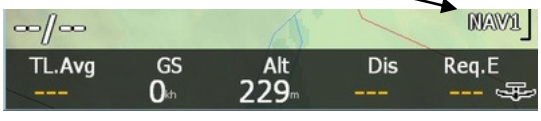
Start max speed, input of maximum allowed speed over start line.
Start max speed margin, start speed tolerance.
Start max height, maximum start height over ground at start.
Start max height margin, start height tolerance.
Start height reference, inputs MSL and AGL.(MSL means above mean sea level.)
Finish min height, minimum height above ground at finish line.

2.3.2.16 Info Box Cruise

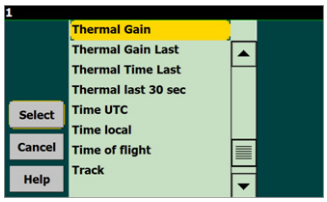
This menu makes it possible to custom design of page **7** of bottom row **(CRU 7).**



Bottom row is lower section of moving map which has 9 variants. Individual variant is described with **three letters** and **numbers** from 1 to 9 and selectable by rotating ↔ selector.

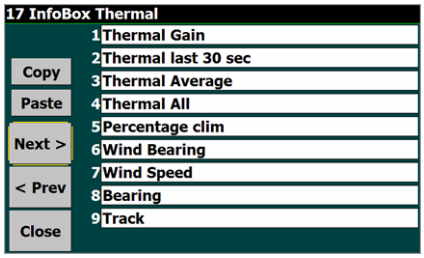


Number of available boxes depends on the display; typical value is 5.
Any position offers a wide spectrum of selections.
Settings having first two letters AA are settings regarding to **A**ssigned **A**rea task.
Use also **Help** which is available after item selection.



2.3.2.17 Info Box Thermal

This is **page 0** of bottom row which is active only during a climb. During cruise the last selected page will become active once straight flight has been be detected. The same list as in 2.3.2.15 is offered.



2.3.2.18 Info Box Final Glide

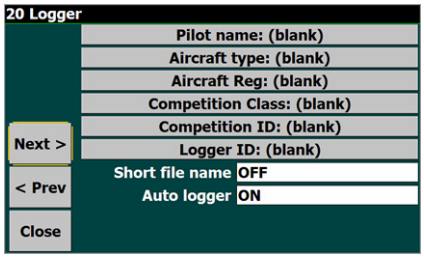
The same options as in paragraph 2.3.2.16.

2.3.2.19 Info Box Auxiliary

The same options as in paragraph 2.3.2.16.

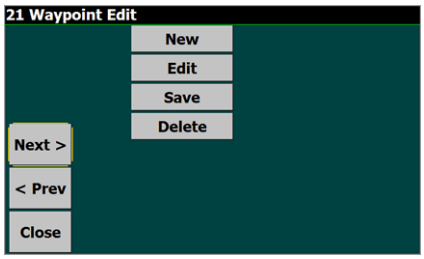
2.3.2.20 Logger

The program is capable of logging flight data, all inputs connected to flight recorder are done in this menu. The logged data is not IGC approved. This setting will not change of any data of a flight recorder which is connected as a GPS source.



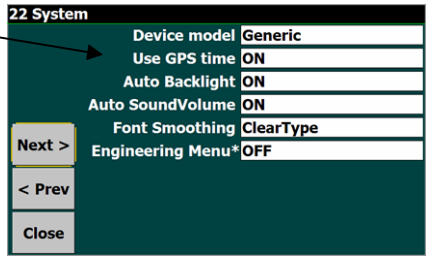
2.3.2.21 Waypoint Edit

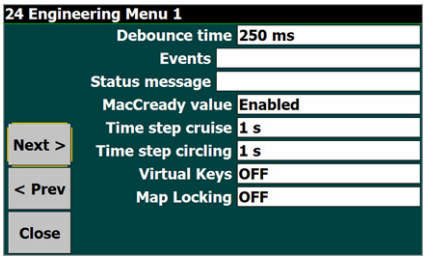
Any waypoint data for an active turn point data base can be altered by use of this menu.



2.3.2.22 System

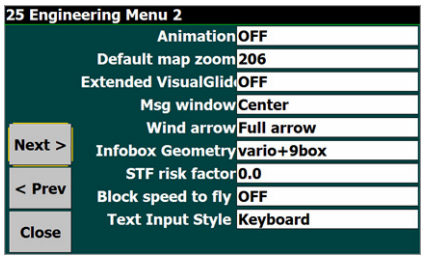
Suggested options for operation with LX Mini Map. Engineering Menu is used to define some further system parameters. After selecting ON close menu and start again. Now a new menu numbered as **24** will become active.





Debounce defines touch screen reaction time on press. If you intend to use virtual keys use enable this option.

Engineering menu 2 is available after **Next** command.



Use Help to understand individual options.

2.3.2.23 Para /Hang glider specials

Settings in this menu are not relevant for the instrument used for traditional gliding.

3 Interaction LK 8000- LX Vario unit

Interaction of LX Vario unit (USB – D) and LK 8000 program is achieved via LX system bus; LX bus connectors are to be found on the rear panel of the unit. The vario unit should be connected to one of them, it does not matter which. Power is applied via bus. To adjust vario parameters and screen orientation a special program, which is available from LX MM desktop, should be run. The program is called **LX Service** and is preloaded in to every unit. See table below to learn about data exchange philosophy.

FUNCTION	SYCRONIZED*	LK8000 ►VARIO	VARIO ► LK8000
MC	✓		
BALLAST	✓		
BUGS	✓		
ALTITUDE		✓	
QNH		✓	

* data will be changed on both units It doesn't matter on which unit a change is made.

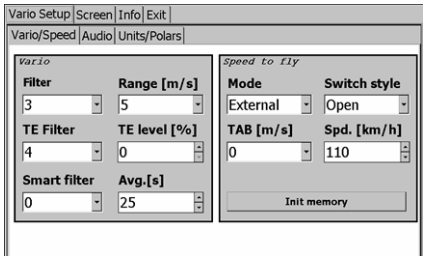
3.1 *LX Service program*

Every unit comes from the factory with preloaded **LX Service** program which makes it possible to define some system parameters. The access is very simple; just click on short cut which is available on the desk top of the unit. To access desk top **remove SD card** and power on Mini Map, or simply exit the navigation program.

3.1.1 Mini Map Setup

This setup should be used exclusively if LX **Mini Map KB/V or pro** version is to be operated. The following programs will be useable: LK 8000, Winpilot Strepla. If using SeeYouMobile all settings can be done in SeeYouMobile also (LX 1600 2 and 2) and the actual setting LX Service will be overridden doesn't matter at all.

3.1.1.1 Vario/Speed



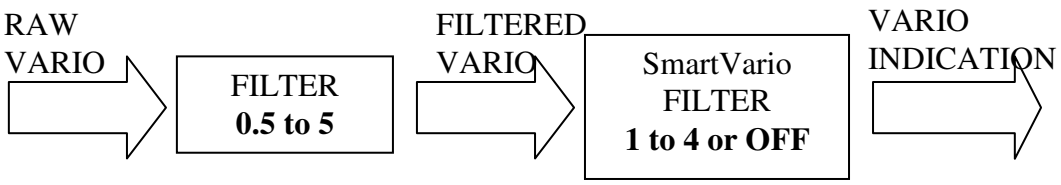
Filter: Vario needle dumping
Range: Vario range
TE filter: filter which is active only if using electronic compensation; if using TE tube compensation it should be set to 0%
TE level: adjustment of electronic TE compensation
The TE compensation can be fine tuned during flight with the following procedure. It is essential that this is only done in smooth air; it is not possible to tune the TE accurately when it is thermic.

- Select 100 % and default TEF
- Accelerate up to approximately 160 km/h (75 kts) and keep the speed stable for a few seconds
- Gently reduce the speed to 80 km/h (45 kts)

Observe the vario indicator during the manoeuvre. At 160 km/h the vario will indicate about –2 m/s (-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.
Smart filter: 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 (2 kts) 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:

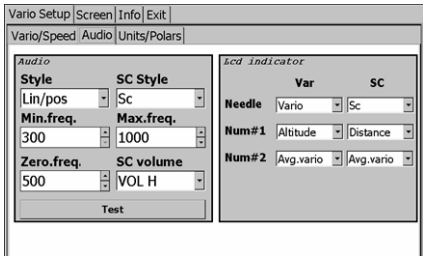
- The Smart Vario should not be used in isolation but in conjunction with the setting of the time constant filter. When the Smart Vario is activated, the time constant filter may need further adjustment to provide optimum indications.



Averager: definition of averager time constant in seconds

Speed to fly:
Mode: *external* will enable SC command input via external switch (connected to Vario unit), *On circling* means auto change over to Vario after detection of circling and vice versa, *Auto speed* automatic change over means by the IAS as set up by the pilot
Switch style: defines external switch status which will command SC, "taster" means change over after every push of the button
Spd: defines IAS at which a change over from vario into SC will occur, is active only after the setting *Auto speed* has been selected
TAB: preset **no** audio zone around zero when in speed command mode

3.1.1.2 Audio

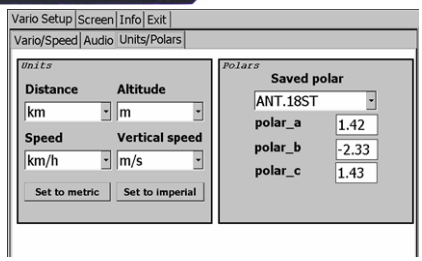


Style: 6 different types of audio variant can be preset (use *Test* to hear the melodies)
Frequencies: set minimum, maximum and zero audio frequencies
SC Volume: L variant reduce audio in speed command and vice versa
LCD Indicator
Settings of this menu define Variometer needle function and also numeric indications. There are two sets of settings with respect to vario mode and SC.

Needle in vario mode:
-Vario
-SC (speed command)
-Netto
-Relative
Needle in SC: the same choices

3.1.1.3 Units/Polars

Any combination of unitsto be be used in Vario (USB- d) can be selected; there are also two defaults, metric and imperial.
Item **Polars** makes it possible to input any polar from the library. User polar selection enables customer polar inputs.

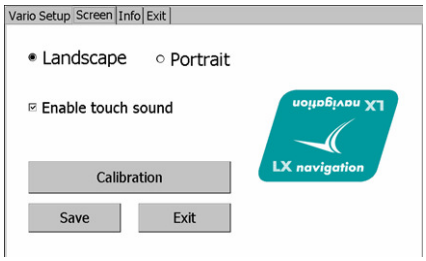


Note!
Setting of polar will not set polar in LK 8000, and so the polar should be selected in LK 8000 separately. Setting in LX service will influence only speed command function.

This message shows that the vario unit is not connected and therefore no vario settings are possible.

3.1.2 Setting Screen

To enter LX Mini Map preferred orientation use Landscape or Portrait function. To recalibrate the screen, run Calibrate and follow instructions.

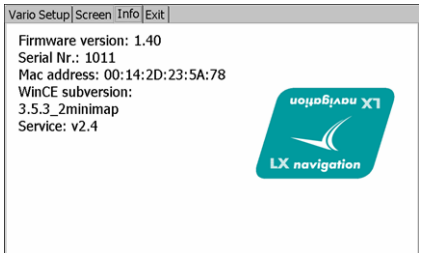


Note!
Not necessary with programs that support screen setting option.

"Enable" touch sound command will activate or deactivate sound which will appear after every touch.

3.1.3 Info

This page shows firm ware version of LX MM microcontroller and service program version. There is a microcontroller built into LX MM which manages keyboard and also the vario connection.

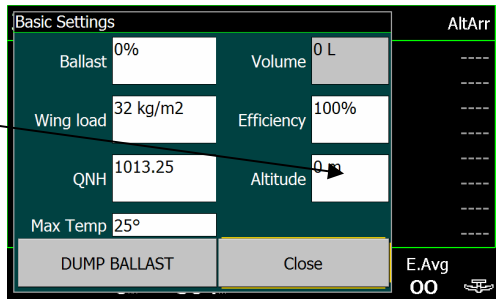


4 Flying with LX Mini Map pro

4.1 *Before flight*

Before every flight and especially a competition flight some preparation before flight is required.

4.1.1 Input of take off elevation



Input of take off **airport elevation** is the most important setting which should be carried out before take off.
After power on and successful booting, a message "**Using baro altitude**" will inform that the unit is connected to vario and is receiving its altitude data.
After a short press of Setup button the elevation input can be made.
Use ↔,↕ Enter and Escape for inputs.
Also check that ballast, and efficiency (polar degradation due to muddy wings) settings are correct.

Note!
A wrong altitude setting will degrade your final glide calculation significantly and could spoil your day!

After input the altitude reading in **basic setup** menu and the **altitude** reading on vario unit should match.

4.1.2 Task preparation

If a task is intended to be flown a selection of an existing could be made or a new one could be created. Special attention should be paid if an AAT is planned.

Note!
Check settings of sectors, a wrongly defined sector may destroy your day result.

4.2 *During flight*

4.2.1 Selection of turn points

Flying from one point to another point is the simplest way of navigation. To select turn points use Sub pages 2.1 until 2.3 or Waypoint Lookout of NAV 1/3.

4.2.2 Flying a task

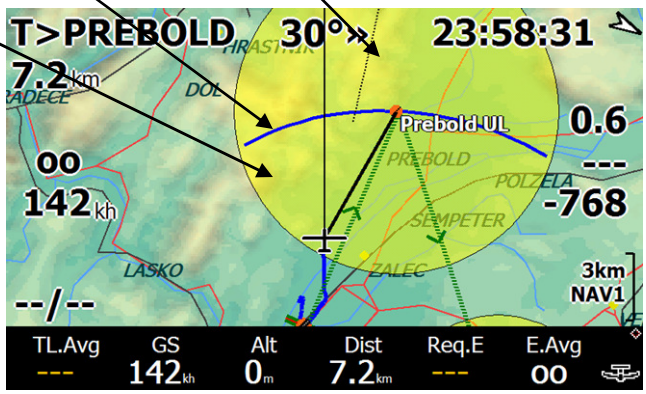
It is recommended that all task-planning is done on the ground. If flying a racing task around a set course, which have small sectors, all the pilot has to do is manage the start and turn point change over in case the automatic option has not been selected in System Setup. AAT makes all pre-flight planning procedures more complex due to big sectors and quite a lot of freedom as to where to switch to next point.

4.2.2.1 AAT Management

AAT management consists in part of deciding on a strategy as to how deep to fly into one or more sectors in order to achieve the optimum task speed as near as possible to the set task time.

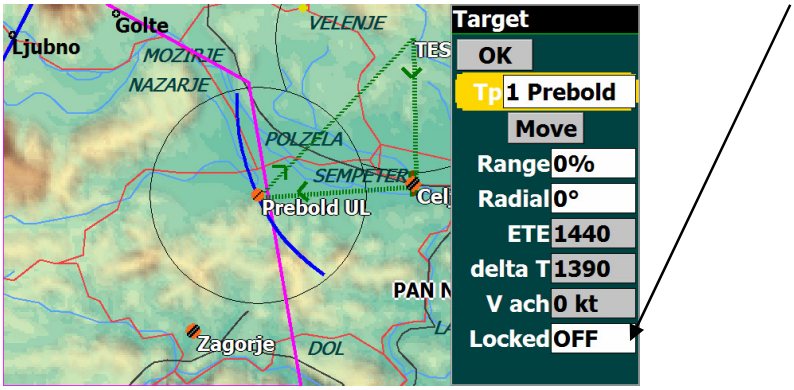
4.2.2.2 Equidistant arc

In every sector a **blue arc,** that goes through the centre of the sector, defines two areas where the distance will be **less** than default and the area which will **increase** the task distance. So it is not sensible to fly along the arc as the distance will not increase and time will be wasted.



4.2.2.3 Automatic Move Function

LK 8000 offers a very sophisticated method which runs fully automatically and without any pilot assistance.
There are two different approaches. The pilot should choose Lock ON or Lock OFF option. **Lock OFF** will adapt task geometry immediately after the glider enters the sector whereas when using the Lock ON option the task geometry remains unchanged until reaching the arc or change over command is given.

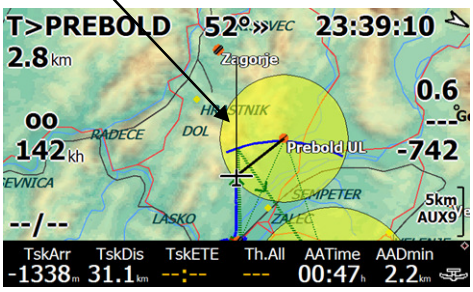


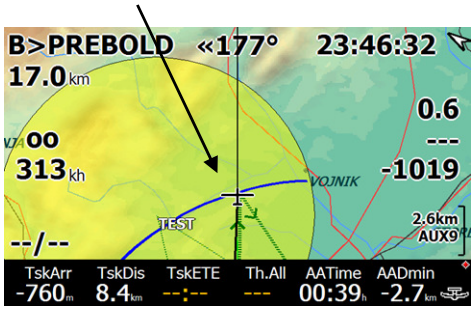
4.2.2.3.1 Use of Lock ON option

In this option the task point will remain close to the TP default position even after the glider enters the sector. As the glider reaches the arc it, the arc, will move and be synchronized with the glider position. Selection of the next turn point will automatically modify the task and the actual position of the glider will be taken as the new turn point. A similar move of the Point will also occur if a change-over command is given before reaching the arc line. A significant task distance jump is be expected if the change over to next TP happens some distance from the original TP position.

4.2.2.3.2 Using of Lock OFF option

Lock OFF option makes task progress even more sophisticated and easy. Immediately the glider enters the sector a **moved turn** point is offered. The position of such a hypothetical point is defined automatically and is based on position and actual track. During staying in "minus" distance area the point is positioned on the blue arc and after reaching of blue arc, the arc and hypothetical point are **moving and synchronized** with the glider.



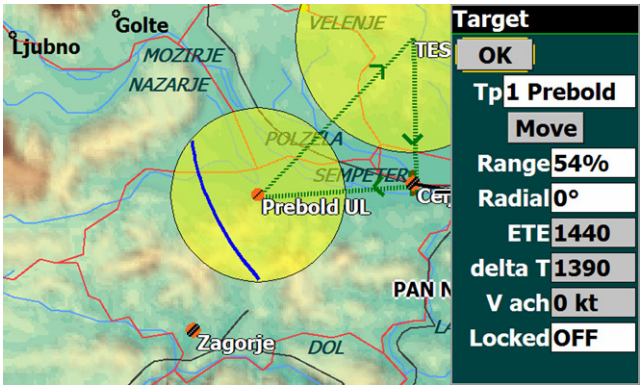


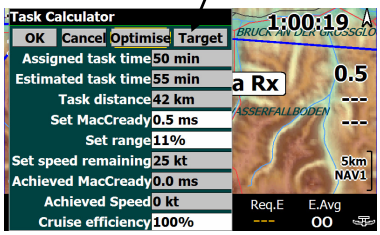
Note!
Flying along blue arc will not increase the distance, to increase the distance fly perpendicular against arc.

Movement will make arc smaller and smaller and it will eventually become a point, this point shows maximum distance point relating to the sector.

4.2.2.4 Manual Move

Manual move can be done on the ground and also during flight. There are two parameters which the pilot is able to vary; the range and the radial. Both mentioned adaptations are available in **Target** menu. **Target** can be also run from Task Calc menu, but using of a short cut TRG is much simpler.



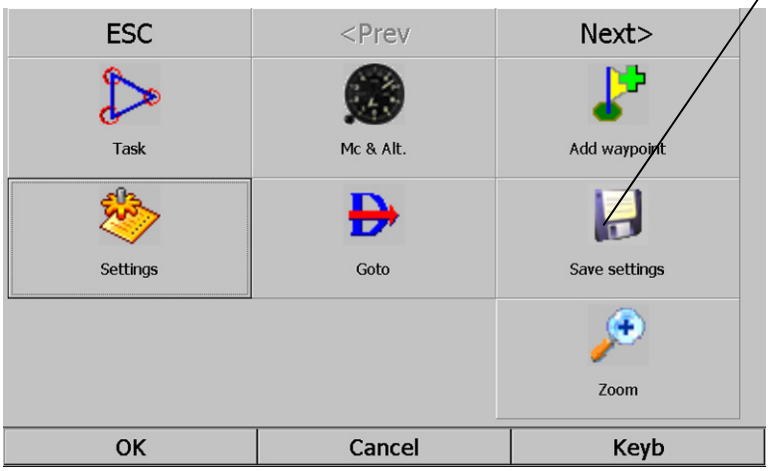


Range: -% decreases the distance and vice versa
Radial: - moves left and + moves right
Delta T: defines early or delayed arrival in minutes

5 Using SeeYou Mobile

Using SeeYou Mobile is also a good solution.

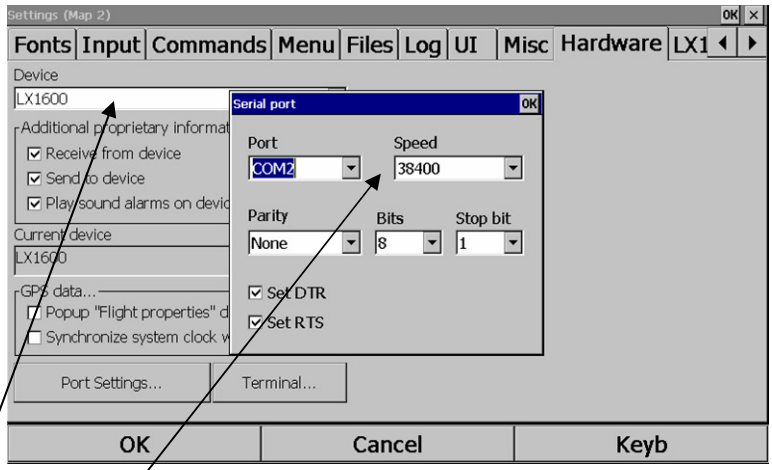
Important!
After changes in setup have been made,it is vital to save changes, by Save Settings command, otherwise the settings will be lost after power off.



5.1 *LX Mini Map pro and SeeYou Mobile*

Please refer to SeeYou Mobile manual for information about SeeYou fetures, this section will inform only about important settings that are necessary for normal operation.

5.1.1 GPS settings

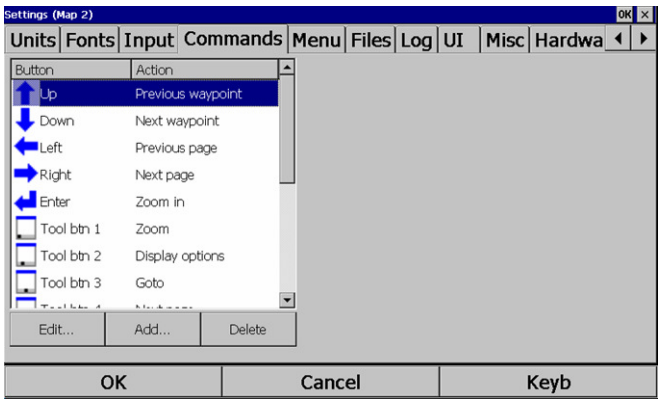


- **COM 2* 38400 bps**, obligatory and no variation possible
- **COM 1** set to match GPS source baud rate setting, not for MM pro
- **Select device** which is connected to Mini Map as a GPS source, for instance LX

*LX Mini Map has a built in microcontroller positioned between the GPS source (connected to COM 2) and Mini Map computer. The microcontroller listens to the GPS source, converts data into 38400 and transfers GPS data exclusively at 38400 bps towards Mini Map. The baud rate of GPS source is detected automatically and therefore its baud rate doesn't matter.

5.1.2 Keyboard customization

SeeYou Mobile menu **Commands** make it possible to customize LX Mini Map keyboard according to customer personal requirements.



5.1.2.1 Keyboard

Table below shows the set of characters regarding the individual keys of LX MM pro. Short cuts can be created as described below:

BUTTON	SHORT PRESS	LONG PRES
AN/CLC	E	F
START/R	G	H
SETUP	C	I
NAV	L	M
TSK/TRG	N	O
INFO	P	R

ENCODER	LEFT	RIGHT	PRESS
VOLUME/VARIO	NA*	NA*	NA*
ZOOM/SELECT	J	K	SPACE
UP_DOWN/ENTER	ARROW_UP	ARROW_DOWN	ENTER
LEFT_RIGHT/ESC	ARROW_LEFT	ARROW_RIGHT	ESC

*reserved for vario control and therefore not usable as a custom key for SeeYou Mobile

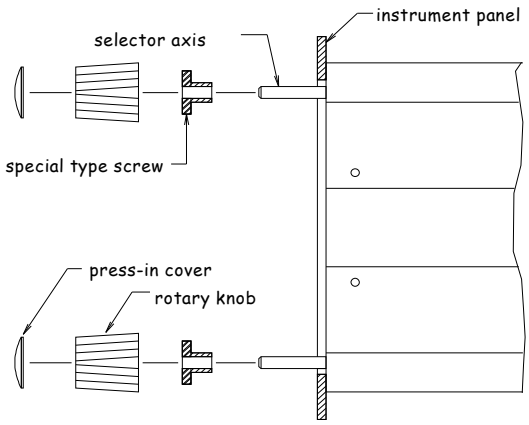
6 Installation

The computer device needs a new cut-out of the panel. Therefore every unit comes with a template which makes possible to make the new cut out by hand and without the use of special tools. On www.lxnavigation.si you will find also **.dxf** file in case you wish to use a CNC machine for the cut out. Vario unit uses a standard 57 mm air norm cut out.

6.1 *Mechanical installation*

6.1.1 Computer device

Once the cut out is ready the unit can be installed and fixed. The procedure is:
-remove caps from the rotary switches
-unscrew screws enough for the rotary knobs to be removed from the axle.
-unscrew all four bolts with holes through their centres
-insert the unit into the cut out
-fix the unit by using of four special bolts
-insert knobs and tighten the screws inside
-check that the push button functions of rotary switches
are working, otherwise adjust

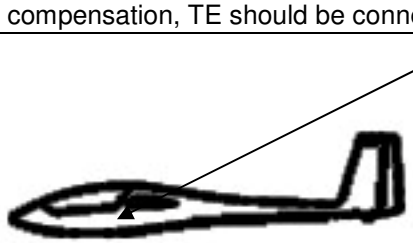


6.1.2 Vario device

The installation process of vario unit is extremely simple. Insert the unit and fix it after using the four M4 screws supplied. Connection of pneumatic tubes should be carried out absolutely correctly and depends of TE compensation to be used.
The unit has three pressure inputs. A **label** situated close to the input designates its function.

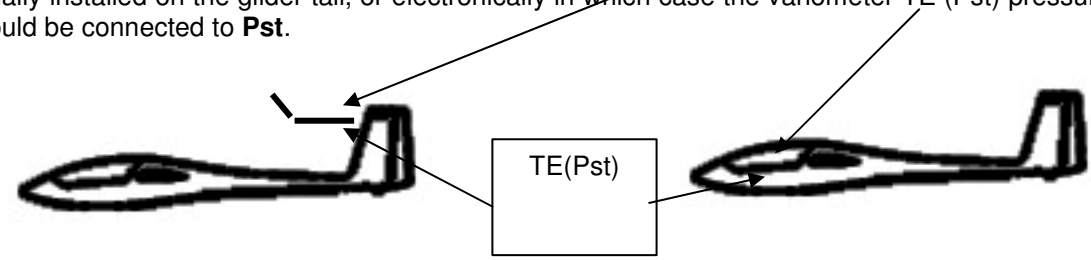
Pst, static pressure input
Ptot, total pressure input (Pitot)
TE, total energy probe, or static

Important!
If using **electronic type** of TE compensation, TE should be connected to **static** pressure source.



6.1.2.1 Electronic TE compensation

The variometer TE compensation can be achieved by either using a **TE probe,** as shown above and usually installed on the glider tail, or electronically in which case the variometer TE (Pst) pressure inlet should be connected to **Pst**.



Pneumatic TE compensation **requests** TE COMP setting 000%, TE filter setting doesn't matter. If electronic TE is used some tuning will be necessary.
The electronic TE compensation can be fine tuned during flight with the following procedure. It is essential that this is only done in smooth air as it is not possible to tune the TE accurately when it is thermic.

- Select 100 % and default TEF
- Accelerate up to approximately 160 km/h (75 kts) and keep the speed stable for a few seconds
- Rapidly reduce the speed to 80 km/h (45 kts)

Observe the vario indicator needle 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 **TEF** (TE filter) is the compensation delay. Larger numbers will increase the delay and vice versa. During the first test is recommended to use TEF 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.

6.2 *Electrical installation*

The power should be applied via red and black wire of the main connector. Use 12 V DC power from board power network.

Note!
There is no fuse built into the unit, so use an external fuse 2A.

To switch on an **external toggle** switch must be provided so then when ON both computer and vario get power.
Connection of vario unit should be done using one of four 485 bus connectors. All necessary cables are included in vario box.

6.2.1 Auxiliary power supply

A diode separated power input will become active and will power the unit if the main power fails.. The unit will receive power until main supply is back in operation.

6.2.2 Connection of other bus participants

Other bus participants can be:
-LX Remote
-Secondary vario indicators
-IAS indicator
-Altimeter
All mentioned devices should be connected to one of the four 485 bus connectors.

6.2.3 Insertion of SD card

A Micro type of SD card is compatible with LX Mini Map pro. The card should be inserted the right way, otherwise a damage of SD slot could occur. Never force the SD card into position..Keep contacts of SD card **up** when inserting.
Suggested type is Kingston micro SD 2GB.

6.3 *GPS source connection*

As mentioned in previous sections, the unit has two inputs for GPS signal. The inputs are marked as **COM 1** and **COM 2**. The third port marked as **Colibri II** is in fact COM 2 but delivers also power (5V) for Colibri II or LX GPS Mouse. Connection to COM 2 **excludes** connection of Colibri II and vice versa. The signal should match NMEA standard.

Note!
It is **obligatory** to use **COM 2 or Colibri II** configuration if the unit is to be used in conjunction with LX Vario (USB D). For stand-alone operation without a vario it doesn't matter but for CAI 302 as vario use exclusively COM 1 for CAI connection.

Both COM 1 and COM2 are followed with two another 6P telephone type connectors; both of them are able to supply one Flarm external display which means that splitters are not needed.

The majority of GPS sources used in gliding are pin compatible to LX MM COM 1 or COM 2. In fact any unit having an IGC standard connector is capable of being connected by using 1:1 cable (no twisted wires).
LX MM pro cable set includes one 1:1 cable and also one open end cable.

LX MM pro COM 1 and COM 2 also deliver 12 V power to GPS unit.

GPS source	Plug and play	Power	Remark
Colinri II	Y	Y	5V via Col II port
Colibri	Y	Y	
LX Mouse	Y	Y	5V via Col II port
LX 20- 2000	Y	Y	
LX 20	N	N	
VL	Y	Y	Units having 6P con.
Flarm RB	Y	Y	
Flarm MB	Y	Y	
Flarm	Y	Y	*

* **Power Data** port should be used and not External.

7 Firmware update

Firmware update is extremely easy and can be done by the user. In fact for an update it is only necessary to replace .exe file with a higher version.