LX Mini Map pro

(LX Micro Map pro)

Vario navigation system

Users manual for version 3.0

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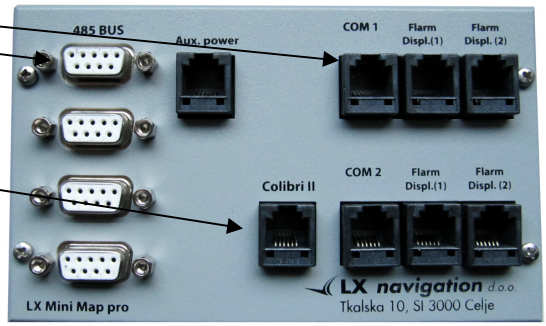
1 System description

LX Mini Map pro and LX Micro map pro have the same functions and also uses the same commands. The only difference is size of units.
The system consists of two units one unit is 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 in connection via LX Navigation system bus which makes possible that both units exchange data in both directions. The bus is also powering vario unit, so vario doesn't need separate power.
On the back side of Computer device there are many connectors which make possible to connect a wide range of interfaces after using of plug and play solution that means simple installation without any soldering works.

GPS sources, as Flarm, Colibri, Colibri II and also any other unit which is sending NMEA at any baud rate, can be used. **Four* SUB D** 9P connectors are ready to connect 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 there is no interface necessary.
The same cable is used also for data transfer.
*only three plugs by Micro Map.



1.1 *Software*

Computer built into LX Mini Map pro is running under Windows CE 5.0 operational system. This makes possible to apply navigation programs written to be used in Windows CE 5.0 environment. At the moment LX Navigation version of LK 8000 offers the best solution for now. LK 8000 is a free ware program based on XCsoar. LX navigation upgraded mentioned software so far that nearly all system functions are available by using of keys and rotary switches and therefore is using of touch screen reduced to a minimum. All touch screen functions are still available.
SeeYou mobile is also a solution.
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.
It is also possible to install LK 8000 to the flash memory of the unit. This can be done after using of LX navigation tools. See www.lxnavigation.si under downloads.

1.2 *Hardware*

1.2.1 Push buttons and rotary switches

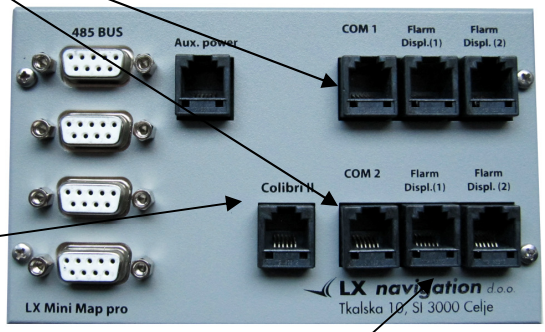
The unit has **6 push buttons** which are double occupied, so using of one push button two functions could be executed. This is realized after using of **short** and **long** press philosophy. Short press means button pressed shorter than 0,5 seconds and a long press will be indicated after one second. After any press on the button a designated function will be executed. In facts push buttons are used as a short cuts to activate individual functions.

All **four rotary switches** have also a key function after **press** is applied on their top of the knob.

1.2.2 GPS connection

The unit is capable to receive GPS signal in form of NMEA sentences on two ports which are designated as **COM 1** and **COM 2**. It is recommended to use COM 2 as a 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:

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



Connection of all mentioned units except Colibr II should done after using of so called 1:1 cable, that means 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 could be directly connected to LX MM COM 2. A suitable cable is delivery included. Colibri II can be also connected to COM 1 or COM2, but in that case a Colibri II power adapter is necessary to be interconnected.

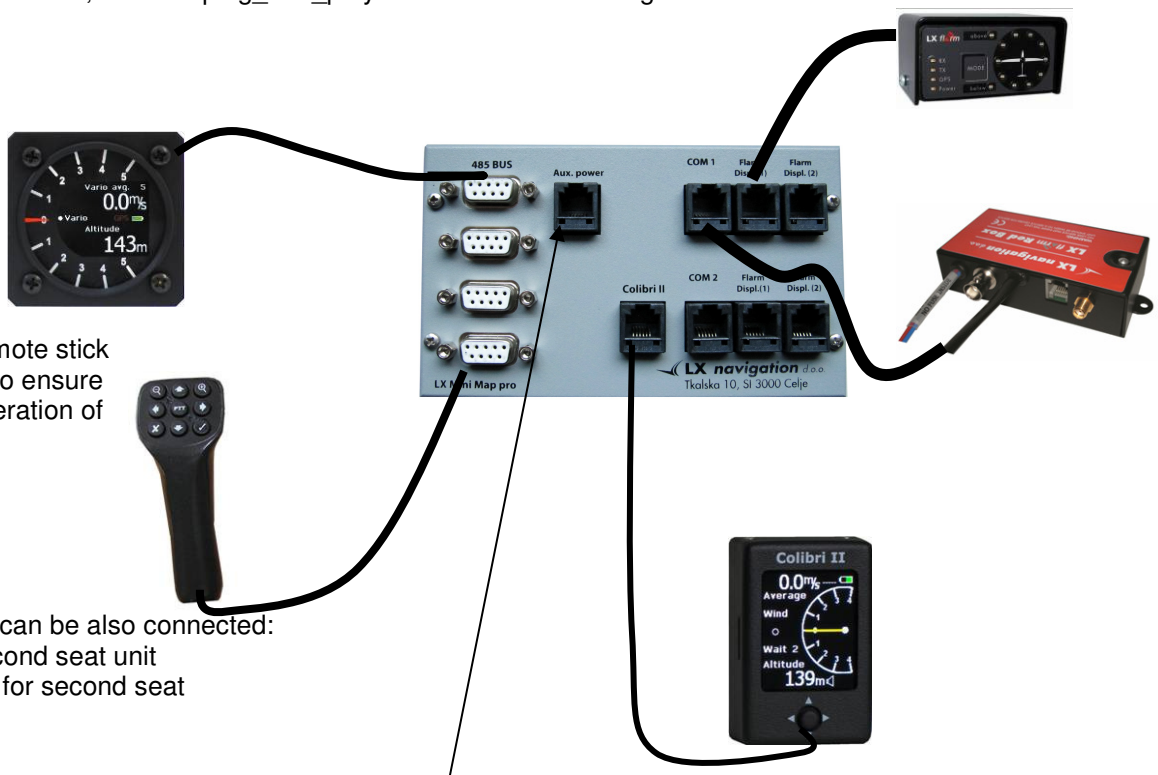
Note!
After using of **Colibri II input** all COM 2 plugs should remain not occupied.

1.2.3 Connection of Flarm displays

After Flarm is taken as a GPS source up to two **Flarm displays** can be connected to the plugs designated as Flarm Display 1 and 2. This solution makes connection of Flarm displays extremely easy without any splitters. This is valid for both COM ports.

1.2.4 Connection of System bus participants

There are **four 9P sub D** connectors on the back side of the unit. All 4 connectors are in parallel, so doesn't matter to which position a 485 bus participant will be connected. The most important participant is Vario unit, which is plug_and_play connectable via its original cable set.



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

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

1.3 *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 hasn't 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. In off condition no power will be applied to the unit, the same is valid also for auxiliary power.

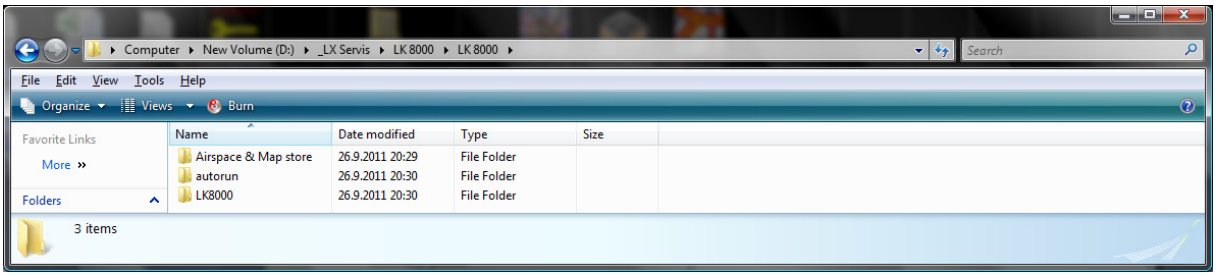
1.3.1 Auxiliary power input

A spare battery can be connected via **6P telephone** type connector (the cable isn't delivery included). After main power break the auxiliary power will be applied to the unit without any power break. The auxiliary power will remain active until main switch will be ON.

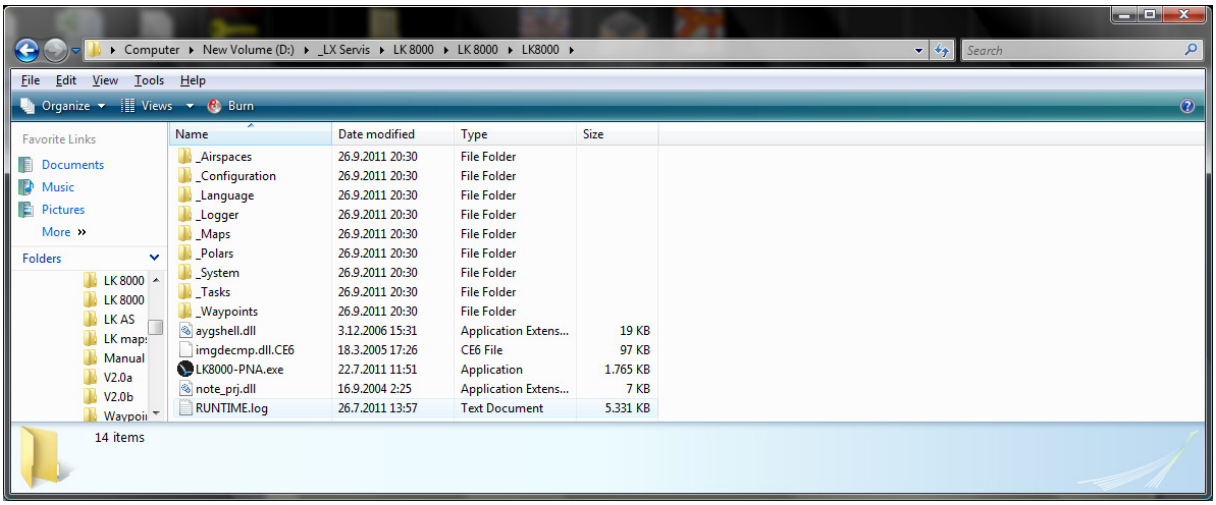
1.4 *SD card interface*

The SD card slot is positioned on the right upper corner of the unit and is capable to receive one micro size SD card. One SD card with already preloaded LK 8000 program is delivery included. 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 respectively Maps folders 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 or defect.

1.5 *Program running from internal flash*

The program can be also executed from internal flash. In that case SD card isn't necessary. Installation to internal flash can be easily done after using of LX navigation tools which are available at http://www.lxnavigation.si/avionics/downloads.html. Using of flash solution requests a manual start of the program after click on LK 8000 icon which will be generated during installation process. Using of flash solution doesn't restrict using of SD card solution.

1.6 *Getting started*

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

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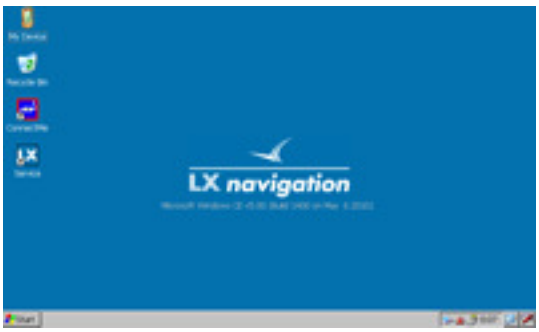


1.7 *Using of CAI 302 as a vario unit*

Cambridge 302 can be also used as a vario unit. The connection can be realized after using of special cable which connects COM 1 of LX MM pro and CAI 302.

1.8 *About this manual*

The manual is oriented to describe functions concerning to LX MM pro configuration (push buttons and rotary switches) and therefore may be some functions are not described. Touch features and also navigation functions of the program weren't accessed during LX Navigation program adaptation process. So you can also use original LK 8000 manual and also XCSoar manual.

2 How to use LK 8000

LX Navigation provided some modifications of LK 8000 program and this modifications makes possible to use push buttons and rotary switches to operate the unit extremely easy.

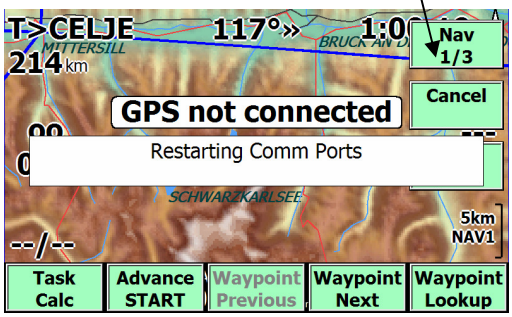
2.1 *Philosophy of push button and rotary switch operation*

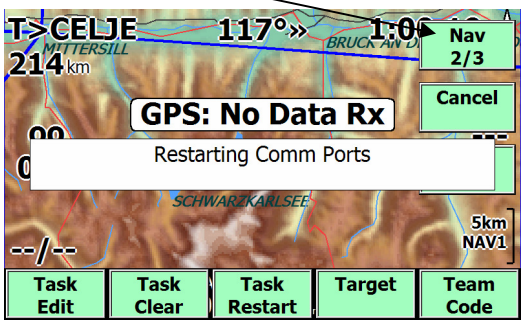
LX Navigation version of LK 8000 program includes changes which makes possible to operate the unit after using of push buttons and rotary switches.
All necessary settings of Vario unit during flight could be executed after using of commands on LX Mini Map pro. For global vario settings access the pilot should use a special program called LX Service which could be run from desktop that means it is 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 called after particular key has been activated. Every key understand short and long press. After **short press** function which is declared before / will be executed and after a **long press** the function written after / will become active.

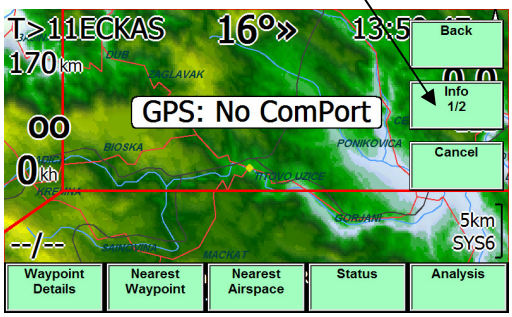
-AN / CLC : short press will activate flight analyses and long press task calculation menu
-START / R : short press will start task and long press will activate task restart procedure
-SET / SYS : short press will open basic setup and long press will offer system setup
-NAV… : after each press (short)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

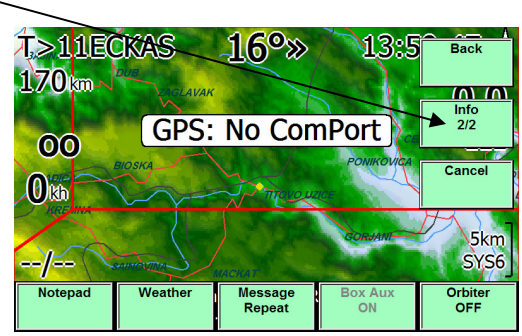




-TSK / TRG: short press will activate task edit and long press is used as a short cut to edit sectors of actual task

-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 could be rotated in **both directions**. Additionally has every switch also a **push button** function. The push button function is activated after finger press on the top of the switch. Push button function is simple, that means 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 after rotating of 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.

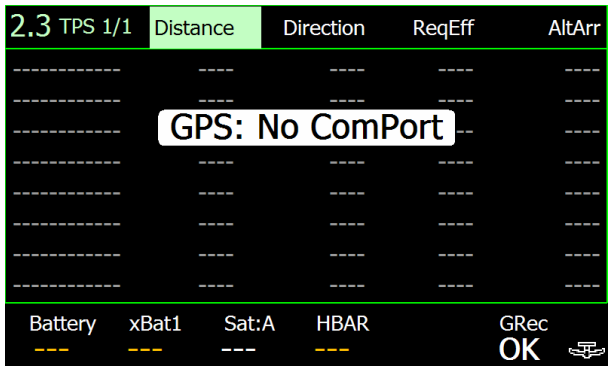
Note!
After no action for several seconds the unit will change back into navigation mode automatically. After adjustment of MC and Ballast both vario unit and the LK 8000 computer will be updated automatically.

2.1.2.2 Zoom rotary switch (select function)

After rotation of the knob the **zoom range** of graphic page will change. Push function of Zoom rotary switch will activate **Select** function. This function is active exclusively in numeric pages and not in moving map display and makes possible to select points without using of touch screen.

-select page ↕ (TPS….)
-press select
-use ↕ to highlight point of interest
-confirm selection with enter

Note!
Select feature is active only for limited time. After approximately 4 seconds without action, the ↕ will become its default function. During select active period, ↔ rotary switch lists through Distance, Direction….options.

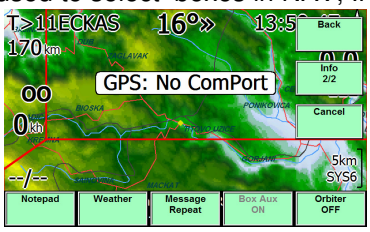


2.1.2.3 Left / Right rotary switch and Esc button

The main switch function is to rotate in-between alphanumeric pages during navigation. During edit process selections can be done. See also further captures. A press on the button will execute Escape function.

2.1.2.4 Up / Down rotary switch and Enter key

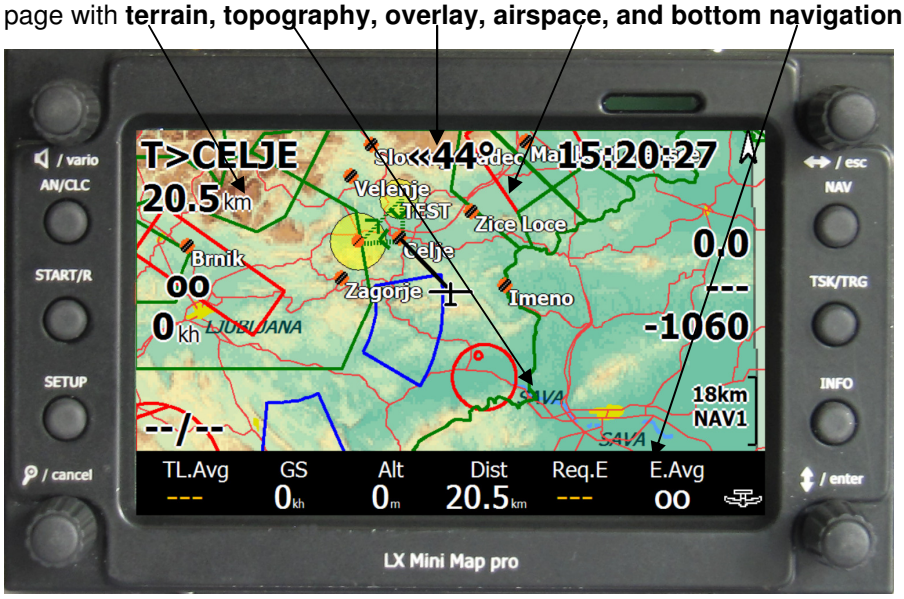
During navigation the key is used as a selector of navigation pages. In edit is used as an up/down selector of navigation pages.
Press will activate Enter function. Rotation of the key can be also used to select boxes in NAV, INFO… menus.



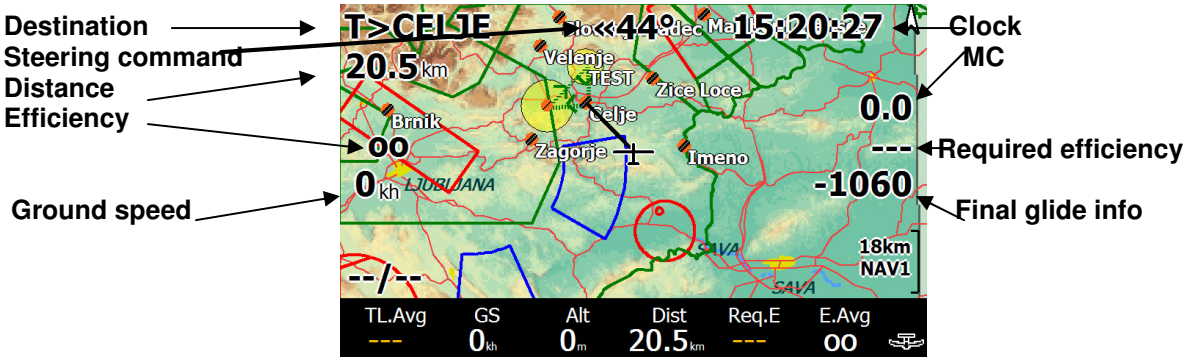
2.2 *Navigation screens*

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 : as overlay are meant big figures and numbers over map which include navigation and also other data. The overlay could be configured in section **11** of setup.

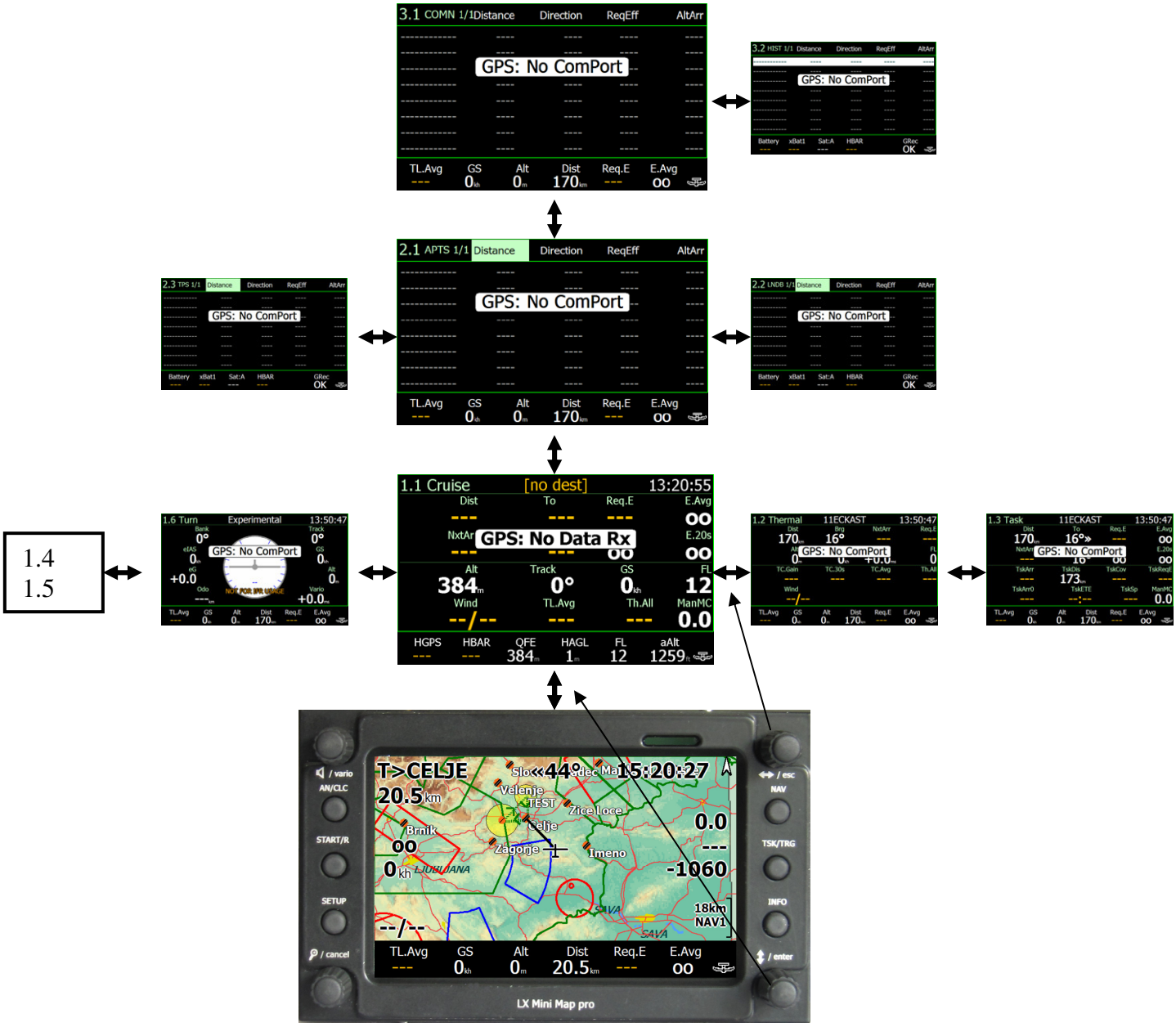


Airspace : the active airspace file should be selected **in 2nd page** of setup. The files are available on www.lxnavigation.si .

Bottom row: there are 10 variants of bottom rows simple selectable by ↔ rotary switch. Some of them are fixes 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 straight away flight one of pages between 1 and 9 are present (the last selected).

2.2.2 Secondary navigation pages

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



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

2.2.2.1 Explanations of pages contents

2.2.2.1.1 Sub page 1

The sub page will open after ↕ will be rotated one step clock wise. This page has five variants which are simple 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 some kind of turn and bank indicator

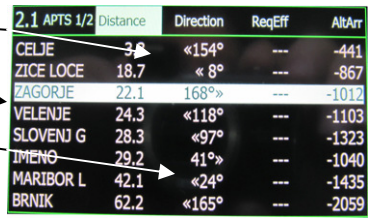
2.2.2.1.2 : Sub page 2

Pages under number 2 are some kind of "Near" pages and show near airport data, land able points and turn points.

2.1 APTS : shows near airports, selected under the distance, direction, required efficiency or Arrival altitude (use touch)
Selection of an airfield is possible after using 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 very typical message will appear.
After **Go to** is selection finished.



Selection is also possible without using of touch, refer 2.1.2.2.

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 common used points
3.2 HIST : list of last used points

2.2.2.1.4 Sub page 4

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

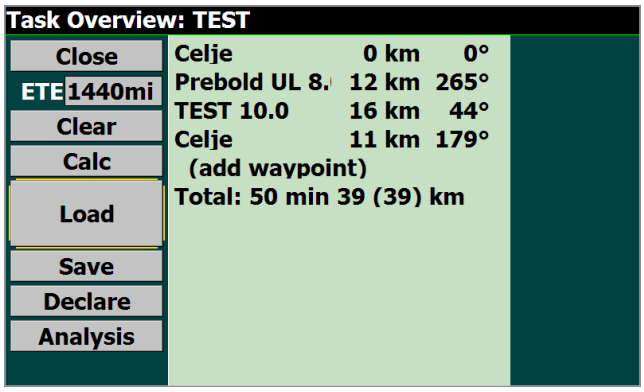
4.1 T RF : shows ID of Flarm objects and makes possible to sort under different criteria
4.2 Target : shows detailed data of target object
4.3 Sight :

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

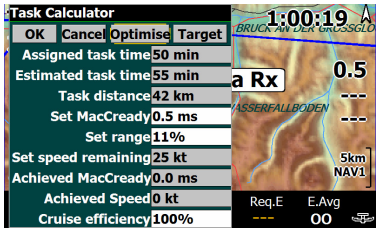
Those short cuts make possible direct access to some more important functions.

2.2.3.1 TSK/TRG button

After short cut task edit menu will open.



-Clear : enter on clear will clear the task and a new one could be edit or load
-Load : will load a new task from the task store
-Save* : will save actual task under name
-Declare: declares task to flight recorder (doesn't work at the moment. Use ConnectMe for now.
-Calc : will open task calculation menu, this is the same menu as opens after long press on AN/CALC button

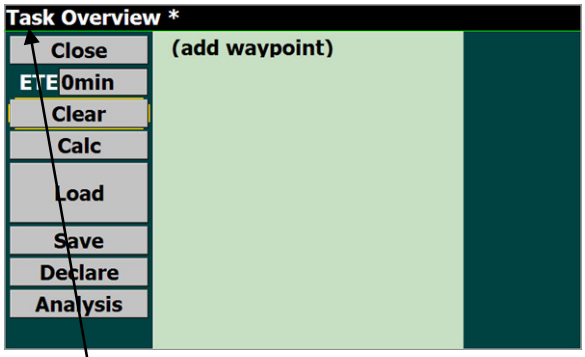


-ETE : doesn't allow any input, this is in fact time which is intended to be spent on task it becomes real after MC is set

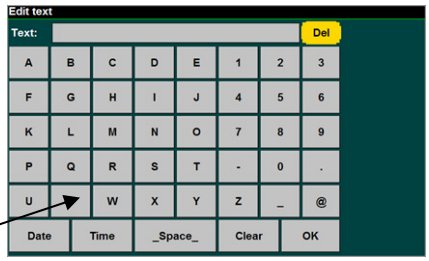
Note!
All mentioned operations can be executed exclusively after using of **rotary** switches, **enter** and **escape**.

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

2.2.3.1.1 How to input a new task



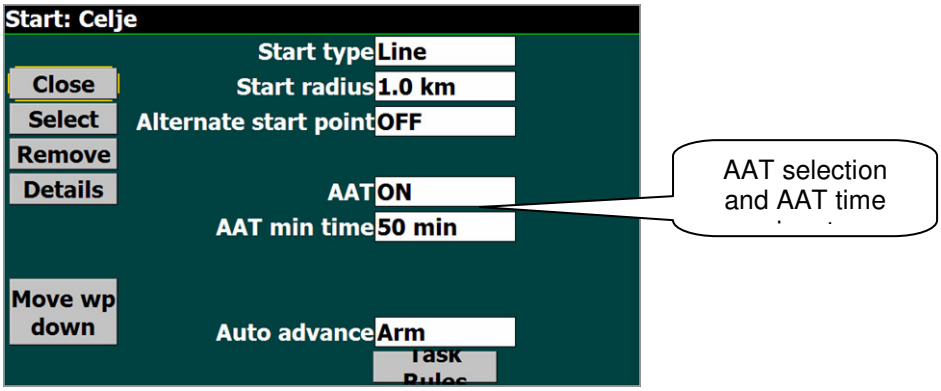
After press on Task Button of LX MM pro, **Task Overview** window will open and last flown task will be listed. If you place cursor on any point this could be replaced with another one after enter. By no task only (**add waypoint**) will be offered. Place cursor on **add waypoint** and menu to enter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



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

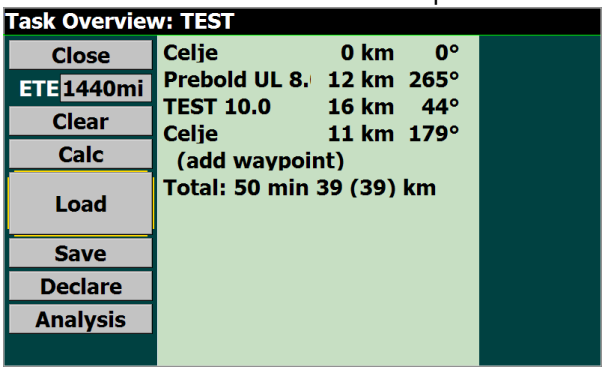
The first selected point is task **start point**. During selection process of the start point the pilot should define if a conventional speed task or an **AAT** will be flown. After AAT selection (AAT ON), **AAT time** given by competition director should be entered. AAT sector geometry can be annotated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

-**Manual:** change over will happen promptly after command execution (press on **Start** button)
-**Auto:** change over will happen automatically after sector will 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



Note!
It is important to have selected a turn point file which includes turn points of interest this should happen in **System setup item 1** (1 Site). Remember that LK 8000 is also capable to use **.CUP** files as a turn point data base. The turn point files should be simple copied into **Waypoints** folder of LK 8000.

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



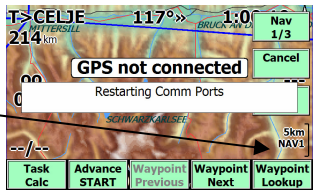
Example of a finally ready task

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 mentioned menu is included in offer of NAV 1 which will appear after first press on NAV button. Another way to select a new turn point is using of Secondary navigation page 2.2 and 2.3. See capture 2.2.2 and 2.1.2.2.

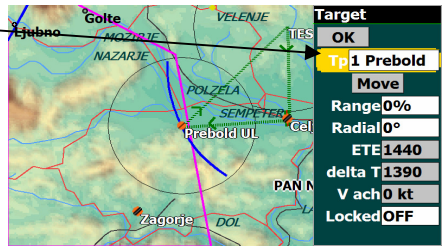


Note!
If an active task is running, selection of a turn point will close the task.

Target TRG

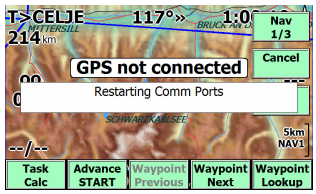
After a long press on TSK/TRG button so called target menu will open. This menu is used to adapt task geometry (not sector geometry) during flight. Any sector could be modified that way.

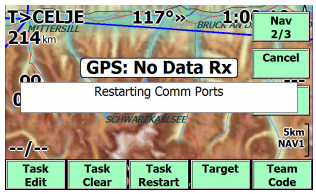
-**Select item** by ↕
-**Select point** ↔
-**Adjust** range or radial
ETE, delta T and V ach are informations
-Locked should be set as ON or OFF
For details see capture flaying a task.
Range will reduce or increase default task distance and radial will move along radial.

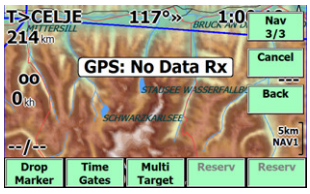


2.2.3.2 NAV button

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.





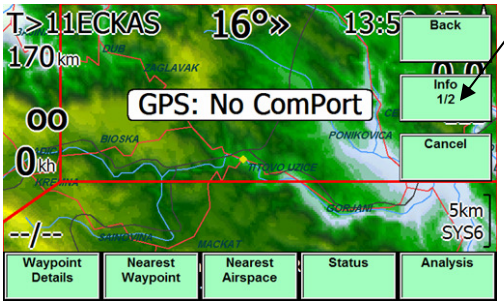


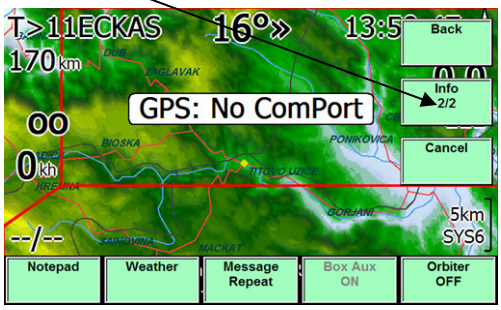
Individual functions could be executed after using of touch screen at the moment.

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.





At the moment use touch to activate individual boxes.

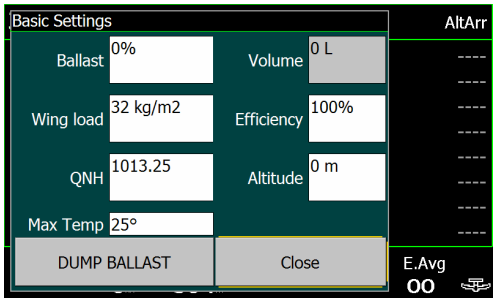
2.3 *Setup*

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

2.3.1 Daily settings

After short press on Setup button following page will open.

Ballast input is possible as percentage of ballast or directly in liters. Maximal 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**. After vario unit is connected the altitude data are coming 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.

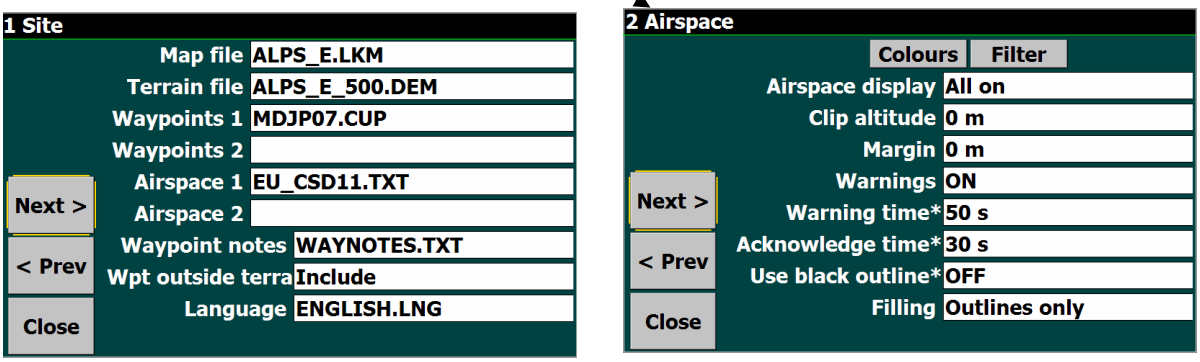


2.3.2 System Setup

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

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

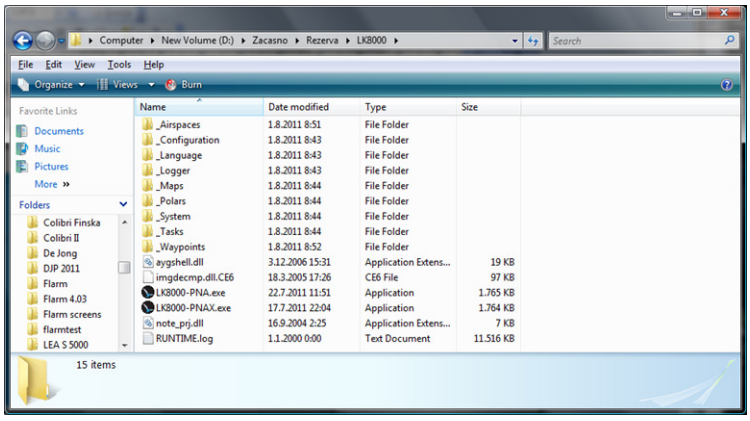
Setup defines system parameters and therefore it is obligatory to pass the materia after the system installation. To enter system setup provide following:
Setup consists of 23 items and **each item function** is present in upper left corner of the display this makes easy adaptation of some system parameters in future.



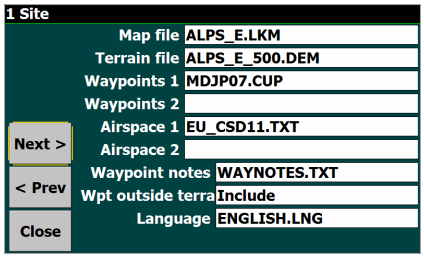
Use Next, Previous and Close commands to browse through setup items. All also available after using of ↕ rotary switch and enter of MM keyboard.

2.3.2.1 Setup 1 Site

Mentioned setup makes possible to select appropriate **terrain, topography, waypoint** and **airspace** files. Nearly all terrain and topography sections are already copied on the SD card which comes with the unit in folder **Mapterrain.**
There is no installation process at all; all mentioned files should be simple 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 covers more area (xxxx 1000.DEM approximately 1000x1000 km).



Waypoints in .**CUP or .DAT** format are accepted, waypoints having attributes land able will be also listed in near function.
Airspace and Waypoints selections make 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 of **Waypoint notes** you are able to define your home data even after turn point file will not include those data. See also LK manual For details see LK 8000 manual. Waypoint outside terrain offers **Ask**, **Include** and **Exclude** option.

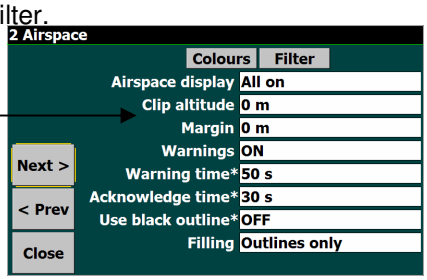


Language selection is possible after using of **Language** menu.

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

2.3.2.2 Airspace

All about selection and airspace format see 8.8.1. The basic selection is offered after enter into Airspace menu and extensions are available under Colour and Filter.

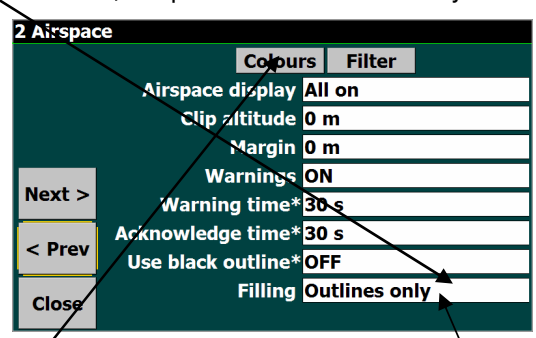


-**Airspace display** offers four options:
All on, will display the complete airspace at the same time
Clip, only airspace below user defined altitude in Clip alt. will be active.
*Auto,*only airspace at the current altitude regarding to Margin setting (+and -)
*All below,*only airspace below the glider 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 how many time before reaching airspace a warning will be activated.
-**Acknowledgment,** setting of time period in which and 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 possible to define as outlines only or patterns. In that case colour setting will define colours. See 8.7.2 for details.

2.3.2.2.1 Custom adaptation of airspace colours

Option **Colurs** of Airspace menu makes possible customization of airspace colurs and shadings.

A colour can be delegated to any airspace. The airspace patterns can be also filled or only lines can 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.

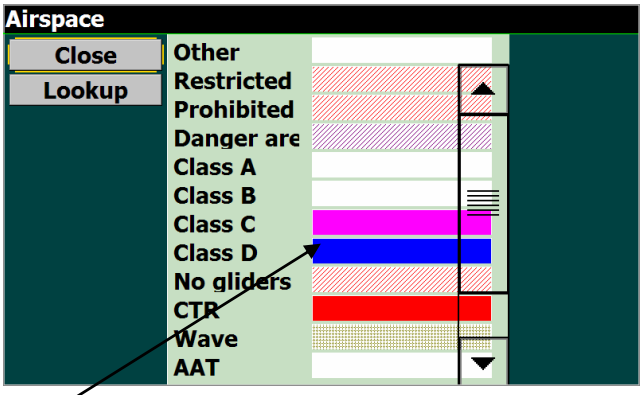


Determination of colours

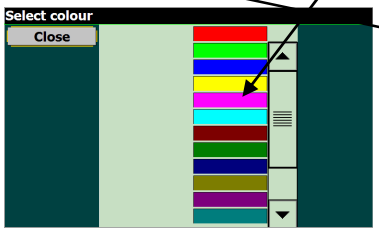
The colors are connected to airspace classification (A,B, C …). So the pilot is able to add any colur from the palette to any class. Some special items are added to the classes as Glider sites, AAT sector and some other options.

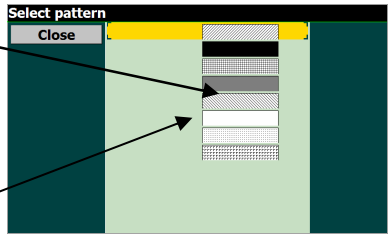
Note!
CTR is defined as class in LK 8000. If you want to use a special colour for CTR this shouldn't have a class designation too, otherwise will be threaded as all other items of the class. Unknown as class designator will also solve the problem.

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



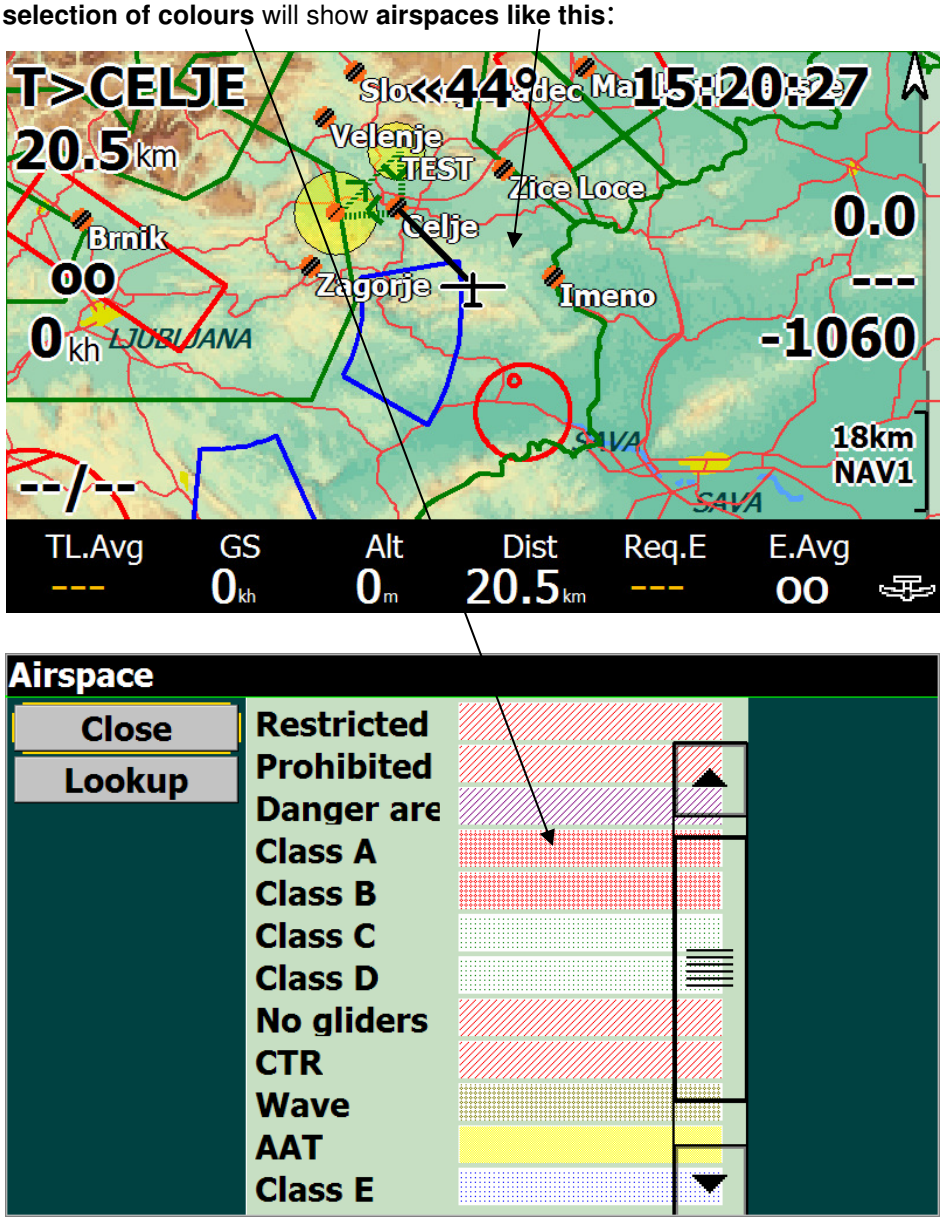
To alter colour click on the **bar** and the whole **palette** will be offered. After clicking on a colour a pattern selection will follow, select **pattern**. To remove patterns and to use only colored airspace borders, select filling as **Outlines only**





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.

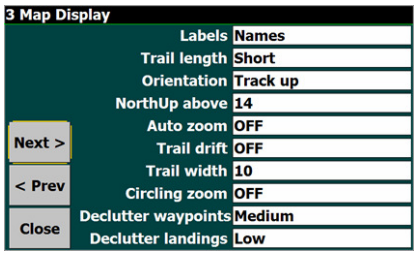
The default **selection of colours** will show **airspaces like this:**



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

2.3.2.3 Map display

This menu speaks how different information will be displayed over the map.

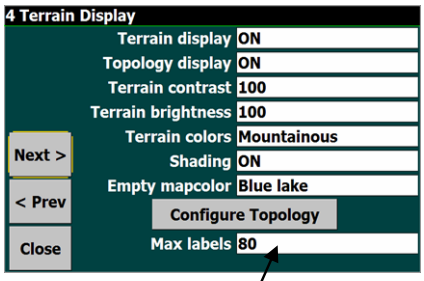


-Labels, setting will optimize waypoint designation.
-**Trail length,** will define trail length.
-**Orientation,** will define map orientation.
-**North above,** defines automatic change over to north up.
-**Auto zoom,** suggested setting is no.
-Trail drift, suggested setting is off.
-**Trail width** 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 until zoom 13 km and land able until zoom 23 km. Higher zoom levels remove waypoints from the display.

2.3.2.4 Terrain display

Terrain may be displayed after using of different settings of this menu.
-**Terrain display** makes possible to enable or to 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 possible to select different terrain options which corresponds to pilot personal requirements
-**Shading** has only option ON and OFF
-**Empty mapcolor** defines background colour after no terrain presence
-**Max labels** defines maximum number of labels



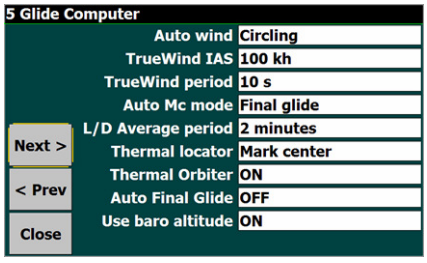
2.3.2.4.1 Configure topology

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

2.3.2.5 Glide computer

Some important system parameters are to be set in this menu.

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

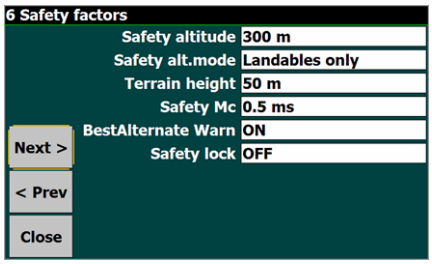


-**Auto wind**, defines method of wind calculation.
Circling, this method uses GPS position fixes to estimate the wind based on drift, typically while thermalling.
ZigZag, this method uses GPS position fixes and true airspeed measurements to estimate the wind, typically during cruise.
Both, combines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

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

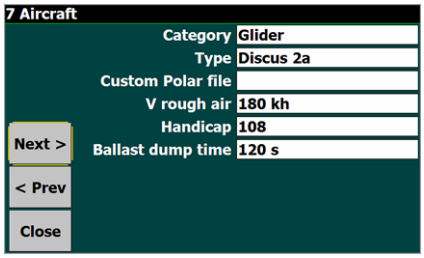
2.3.2.6 Safety factors

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, for point reach calculations to alternates and airports.
-Best alternate warning, ON and OFF option.
-Safety lock, will disable setup entry during flight.



2.3.2.7 Aircraft

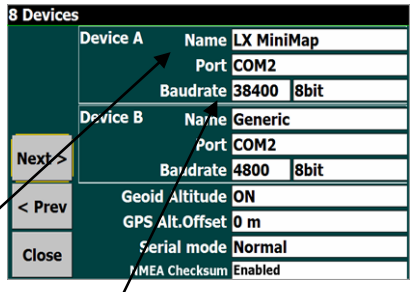
-**Category** defines rank of the aircraft
-**Type** input is extremely important after the instrument is intended to be used in the glider*
-**Custom polar** file can be added after input of custom polar file see LK Manual page 108
-**V rough air****, speed limit in rough air should be entered
-**Handicap****, handicap factor by scoring
-**Ballast dump time****, time which is necessary to dump the ballast



*to each glider type offered in the library, belongs an individual polar and this should be carefully selected. After 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 is offering **two inputs** for GPS signal called as devices A and B. It is suggested to take Device A as a main GPS input And Device B as a spare GPS input. After loosing of GPS signal 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. 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 match GPS source baud rate.

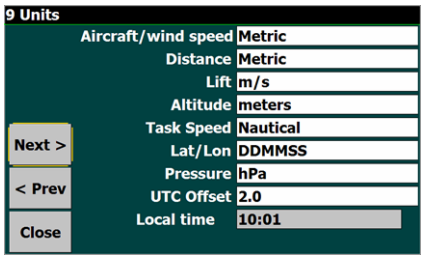


Note!
LX MM KB/V requires COM 2 and LX mini Map as obligatory. There are two types of harness, one for COM 1 and other for COM 2.

Use serial mode as Normal and NMEA checksum Enabled.

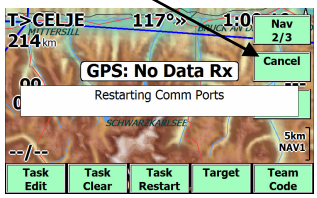
2.3.2.9 Units

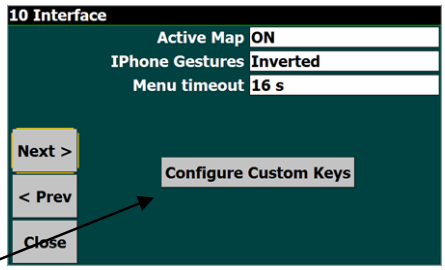
Nearly believable sets of units are selectable from this menu. UTC offset will adapt time display to your local time.



2.3.2.10 Interface

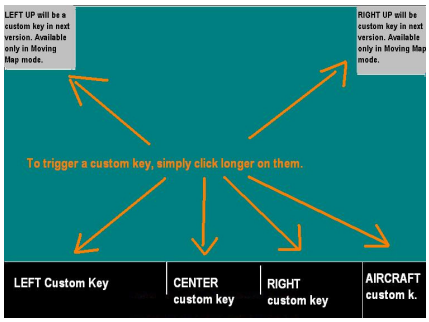
Interface important setting is **Menu timeout**. Setting defines disappearing time of **menu icons** after an activation has happened.





2.3.2.10.1 Configure Custom Keys

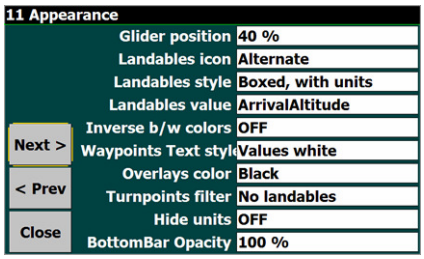
Settings under **Configure Custom Keys** makes possible to design custom keys functions of touch screen regarding to pilot individual requirements.

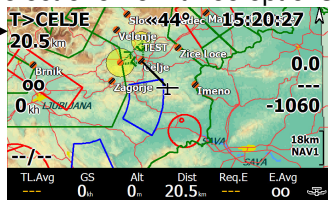


Custom keys organization structure, for details see original LK 8000 manual page 24.

2.3.2.11 Appearance

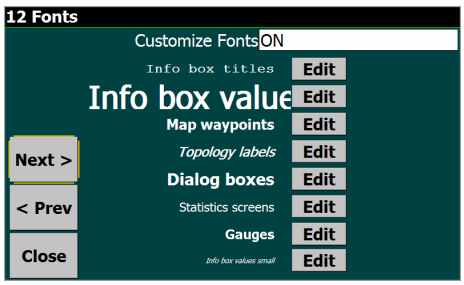
Settings connected with this menu define moving map organization.
-**Glider position,** defines position of the glider symbol, 0% central
-**Landable Icons**, defines icons of land able points.
-**Landables style**, layout of land able points.
-**Landables value**, req. efficiency or arrival altitude shown.
-**Inverse b/w colours**, colour inversion of figures of map overlay.
-**Waypoints Text style**, select one from three options.
-**Ovelays color**,



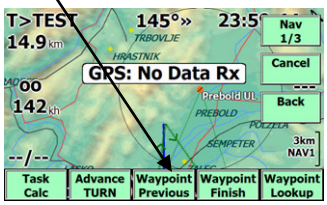


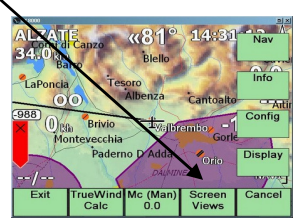
-**Turn points filter**, options NO landables, ALL Waypoints and DAT Turn points
-**Hide units**, will hide unit on all figures of overlay (moving map).
-**BottomBar Oppacity**, sets opacity of bottom bar.

2.3.2.12 Fonts

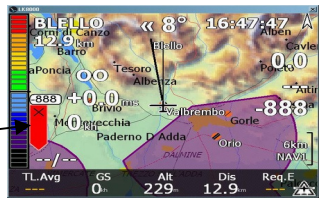


Selection of Customize Fonts ON makes possible to adjust font size of different displays.
Info box tittles, will influence info box tittles,
if **IBOX** solution will be selected in **Screen Vievs**
Info Box values, will influence Info Box values displays
Map waypoints, makes possible to adjust fonts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

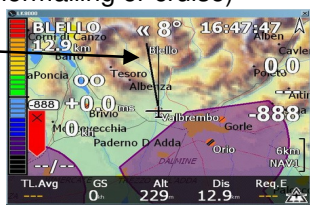


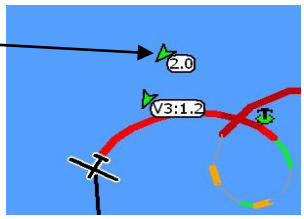


2.3.2.13 Map Overlays



Overlay means figures and letters over moving map.
-**Screen data**, select one of offered option.
-**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 enable several options are offered, additionally will also appear **vario figure**
-Variobar mode, defines vario bar regarding 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



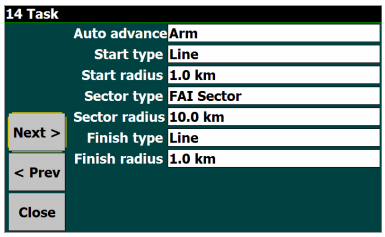


Fixed scale will make Flarm objects presentation unclear by high zoom levels.

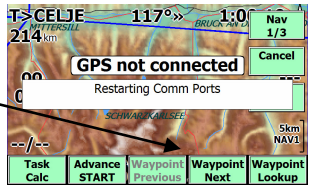
2.3.2.14 Task

Settings regarding task global settings are to be defined in this menu.

Note!
Any task could be individually prepared after using of Task edit function.



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

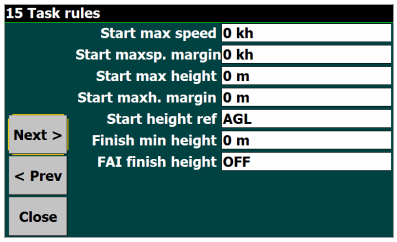


Auto selection will cause an automatic change over after reaching of TP or start.
Arm selection will prepare ready for start and will execute change over automatically after sector will be reached.

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.

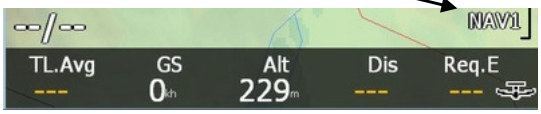


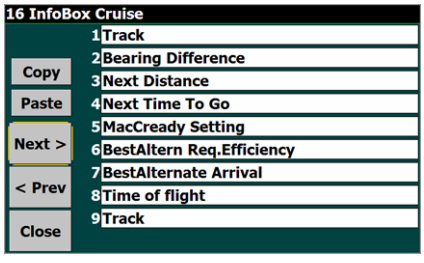
Start max speed, input of maximal allowed speed over start line.
Start max speed margin, start speed tolerance.
Start max height, maximal start height over ground by start.
Start max height margin, start height tolerance.
Start height reference, inputs MSL and AGL. MSL means above sea level.
Finish min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

2.3.2.16 Info Box Cruise

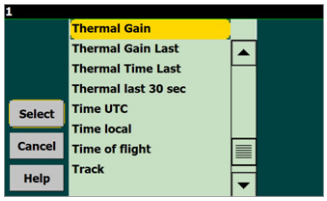
This menu makes possible to custom design **page 7** of bottom row **(CRU 7).**

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 of ↔ selector.



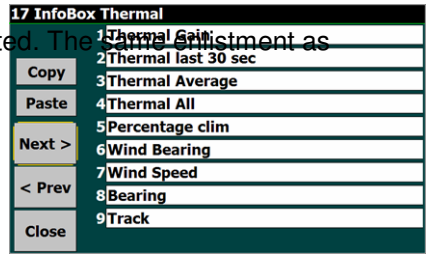


Number of available boxes depends on the display, typical value is 5.
Any position offers a bright spectrum of selections.
Settings having first two letters AA are settings regarding to **A**ssigned **A**rea task.
Use also **Help** which is available after item selection.



2.3.2.17 Info Box Thermal

This is **page 0** of bottom row which is active only during climbing period. During cruise period the last selected page will become active, after straight flight will be detected. The same enlistment as in 2.3.2.15 is offered.



2.3.2.18 Info Box Final Glide

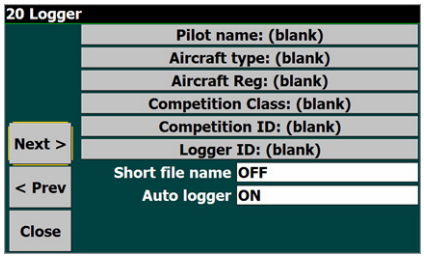
The same options as in paragraph 8.8.17.

2.3.2.19 Info Box Auxilarry

The same options as in paragraph 8.8.18.

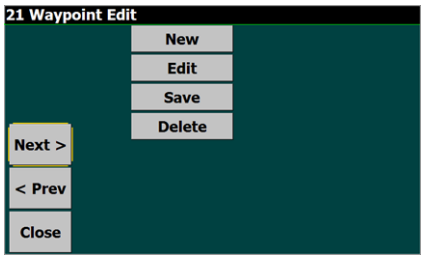
2.3.2.20 Logger

The program is capable to log flight data, all inputs connected to flight recorder are to be done in this menu. The logged data are not IGC approved.



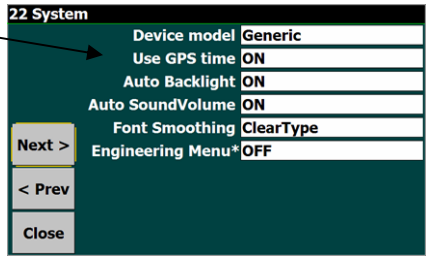
2.3.2.21 Waypoint Edit

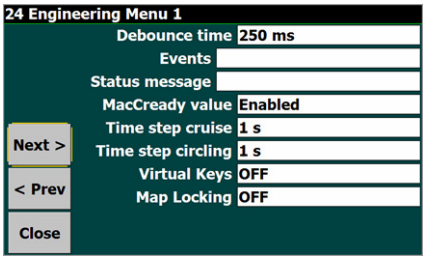
Any waypoint data of active turn point data base can be altered after using of this menu.



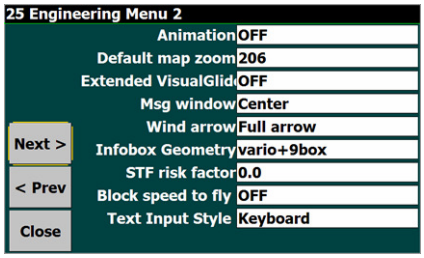
2.3.2.22 System

Suggested options for operation with LX Mini Map. Engineering Menu is used to define some further system parameters. After selection ON close menu and start new. 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 option.
Engineering menu 2 is available after **Next** command.



Use Help to understand individual options.

2.3.2.23 Para /Hang gliders specials

Settings of this menu are not relevant for gliding instrument.

3 Interaction LK 8000- LX Vario unit

Interaction of LX Vario unit (USB – D) and LK 8000 program is realized via LX system bus. For LX bus connectors are to be found on the rear panel of the unit. To one of them which one doesn't matter the vario unit should be connected, there is also power 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 on 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 doesn't matter on which unit a change will happen.

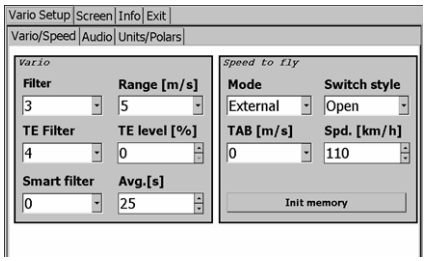
3.1 *LX Service program*

Every unit comes from the factory with preloaded **LX Service** program which makes possible to define some system parameters. The access is absolute simple after 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 simple exit from navigation program.

3.1.1 Mini Map Setup

Mentioned setup should be used exclusively after LX **Mini Map KB/V or pro** version will be operated and following programs will be in use: LK 8000, Winpilot Strepla. After using of SeeYouMobile all settings could be done in SeeYouMobile (LX 1600 2 and 2) and this setting doesn't matter at all.

3.1.1.1 Vario/Speed



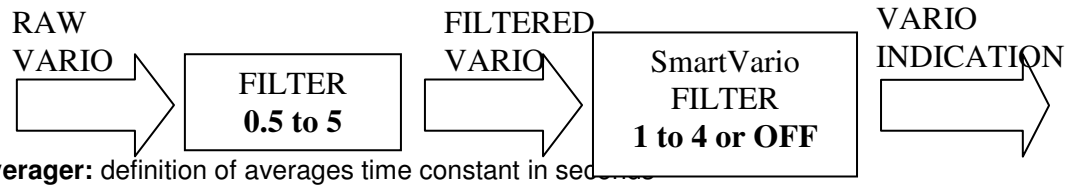
Filter: Vario needle dumping
Range: Vario range
E filter: filter which is active only after using of electronic compensation, after using of TE tube should be set to 0%
TE level: adjustment of electronic TE compensation
The TE compensation can be fine tuned during flight with the following procedure. 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:

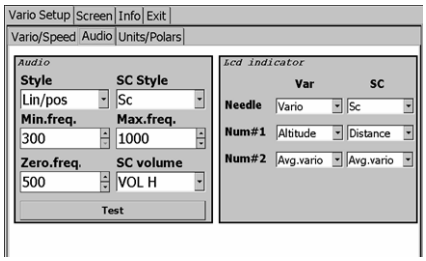
- The Smart Vario should not be used in isolation but in conjunction with the setting of the time constant filter. When the Smart Vario is activated, the time constant filter may need further adjustment to provide optimum indications.



Averager: definition of averages time constant in seconds

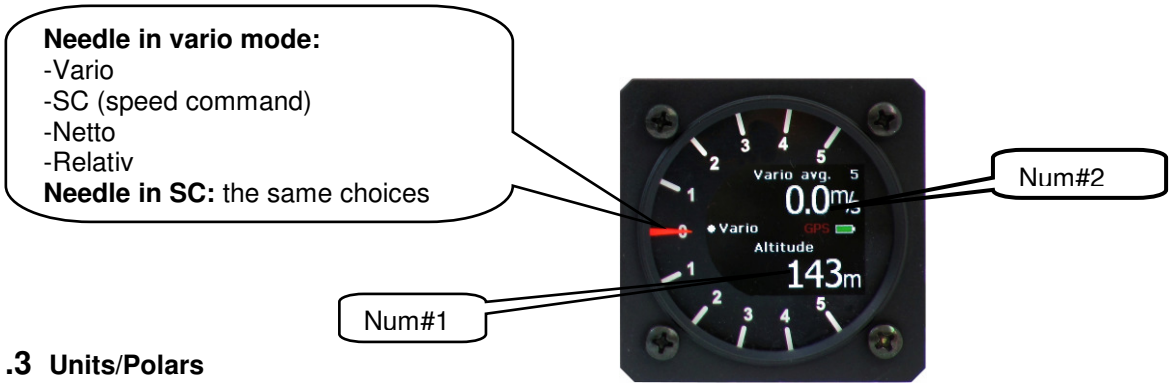
Speed to fly:
Mode: *external* will enable SC command input via external switch (connected to Vario unit), *On circling* means auto change over Vario SC after detection of circling and vice versa, *Auto speed* automatic change over after under IAS control
Switch style: defines external switch status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

3.1.1.2 Audio



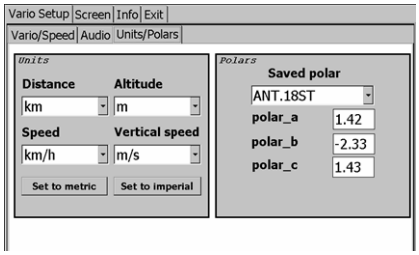
Style: 6 different types of audio variants can be preset (use *Test* to hear the melodies)
Frequencies: set minimum, maximum and zero audio frequencies
SC Volume: L variant reduce audio by speed command and vice versa
LCD Indicator
Settings of this menu define Variometer needle function

and also numeric indications. There are two sets of settings with respect to vario mode and SC.



3.1.1.3 Units/Polars

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

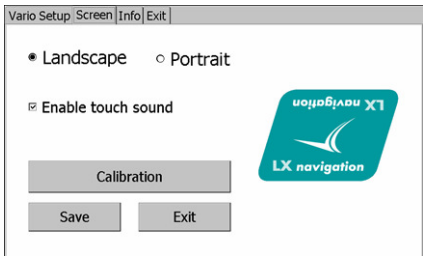


Note!
Setting of polar will not set polar in LK 8000, so the polar should be selected in LK 8000 separately.

By all versions of MM except KB/V this message shows that vario unit is not connected and therefore no vario settings are possible.

3.1.2 Setting Screen

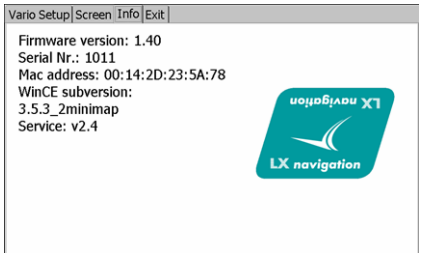
To enter LX Mini Map preferred orientation use Landscape or Portrait function. To recalibrate the screen, run Calibrate and follow instructions.



Note!
Not necessary by programs which support mentioned option.
Enable touch sound command will activate or deactivate sound which will appear after every touch.

3.1.3 Info

Shows firm ware version of LX MM microcontroller and service program version. There is microcontroller bult into LX MM which manages keyboard and also vario connection.



4 Flying with LX Mini Map pro

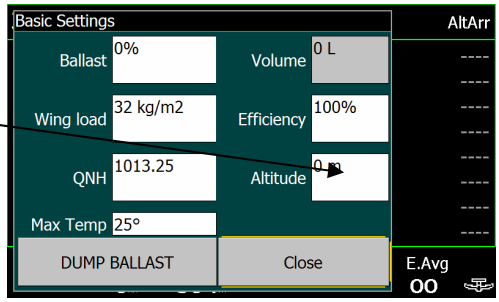
Note!
After using of LX Navigation version (3.0) of LK 8000, all commands can be executed by rotary switches and push buttons, no need of touch at all.

4.1 *Before flight*

Every flight and specially a completion flight need some preparation before flight.

4.1.1 Input of take off elevation

Input of take off **airport elevation** is most important setting which should be carried out before take off.
After power on and successful booting, a very typical message "**Using baro altitude**" will inform that the unit is connected to vario and receives its altitude data.
After a short press to Setup button the elevation input will be possible.
Use ↔,↕ Enter and Escape for inputs.
Also check ballast, and efficiency settings if correct.



Note!
A wrong altitude setting may degrade your final glide calculation significant.

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 one existing should be carried out or a new one should be created. Special intention should be paid, if an AAT is foreseen.

Note!
Check settings of sectors, a wrong defined sector may destroy your daily 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

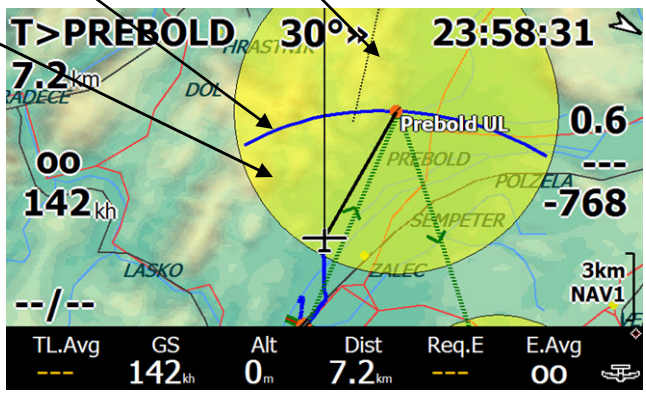
It is recommended to make all inputs connected to a task on ground. Flying a racing task, which have small sectors, what the entire pilot has to do is to manage start and turn point change over in case of a not automatic option has been selected in System Setup. AAT makes all mentioned procedures more complex, due to big sectors and quite a lot of freedom where to switch to next point.

4.2.2.1 AAT Management

AAT management consists of strategy how deep the pilot will fly into individual sector to reach optimal task speed and not to arrive too early.

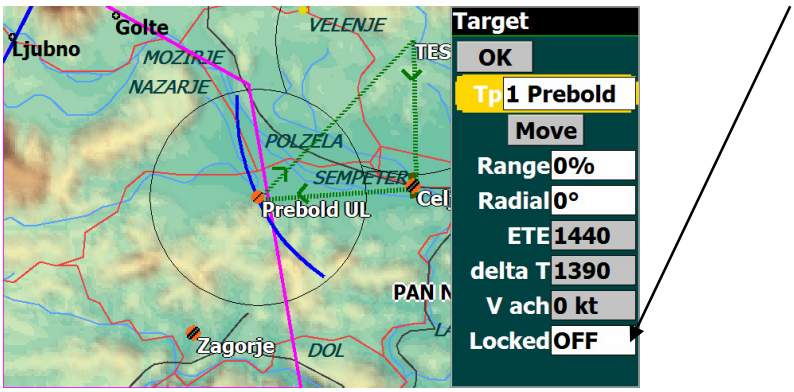
4.2.2.2 Equidistant arc

In every sector a **blue arc** which is going 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 rentable to fly along the arc, the distance will not increase, but the time will be spent.



4.2.2.3 Automatic Move Function

LK 8000 offers a very sophisticated method which is running fully automatic 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 will enter the sector and after using of Lock ON option the task geometry remains unchanged until reaching the arc or change over command.

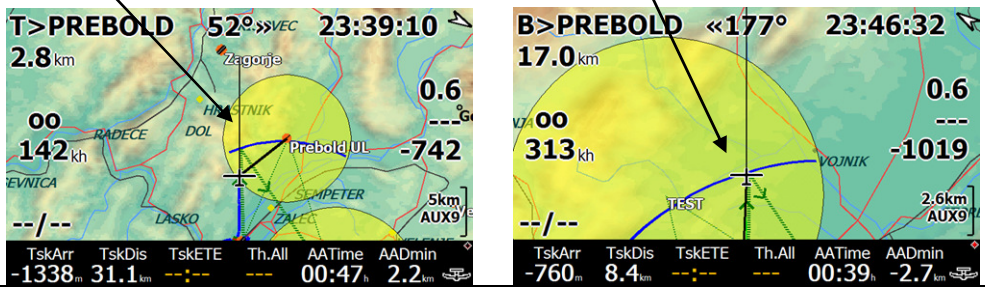


4.2.2.3.1 Using of Lock ON option

The task point will remain tight to TP default position even after the glider will enter the sector. As the glider will reach the arc, the arc will be moved up synchronized with glider position. Selection of next turn point will cause an automatic task modification, glider actual position will, be taken as new turn point. Point move will also happen if change over command will be executed before reaching of the arc line. A significant task distance jump is expected if the change over to next TP happens quite far from 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 as 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 symphonized** with the glider.



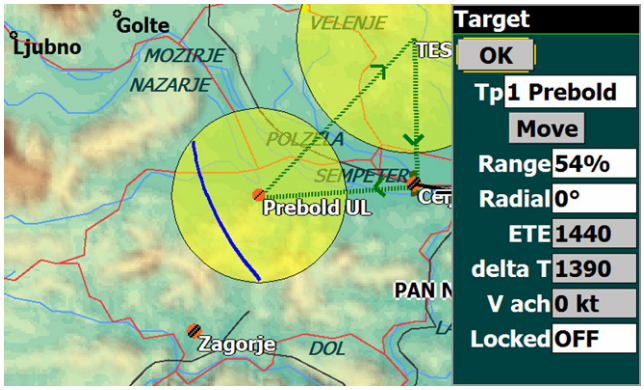
Note!

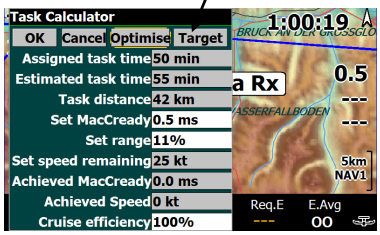
Flying along blue arc will not increase the distance, to increase the distance fly perpendicular against arc.

Movement will make arc smaller and smaller and will become a point at the end, this point shows maximal distance point of the sector.

4.2.2.4 Manual Move

Manual move can be done on 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 run from Task Calc menu.



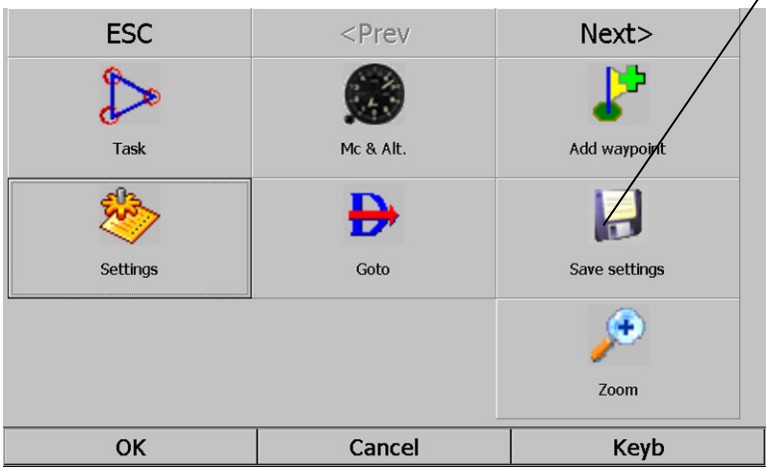


Range: -% decreases the distance and vice versa
Radial: - moves left and + moves right
Delta T: defines early or delayed arrival in minutes

5 Using of SeeYou Mobile

Using of SeeYou Mobile is also a solution.

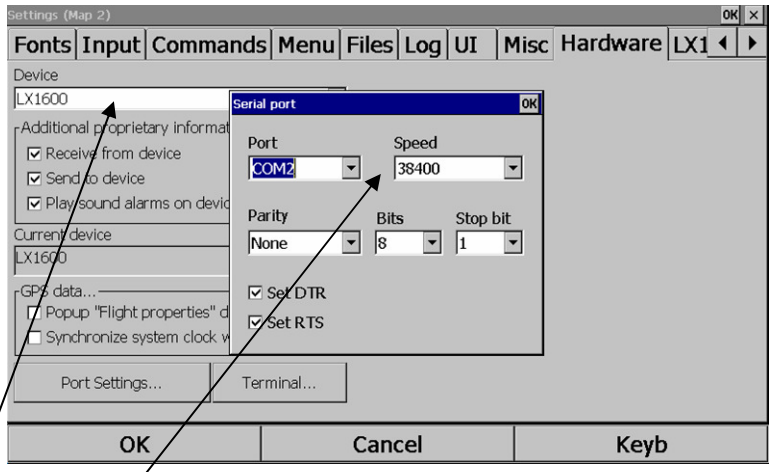
Important!
After changes in setup have been provided, is absolute necessary to save changes, by Save Settings command, otherwise the settings will be lost after power off.



5.1 *LX Mini Map pro and SeeYou Mobile*

Please refer SeeYou Mobile manual to get informed about SeeYou fetures, this capture will inform only about important settings which are necessary for operation.

5.1.1 GPS settings



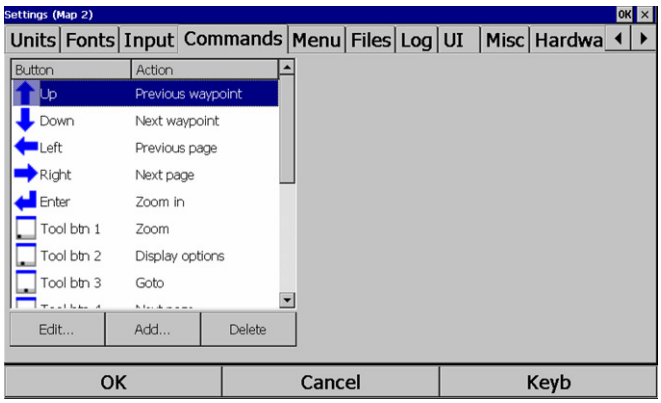
- **COM 2*** **38400 bps** obligatory no variation possible
- **COM 1** set to match GPS source baud rate setting see also
- **Select device** which is connected to Mini Map as a GPS source, for instance LX

*LX Mini Map has build in microcontroller which is positioned between GPS source and Mini Map computer. The microcontroller listen 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.

Note!
Enable additionally data sent by recorder to supply altitude and other data towards LX Mini Map (for instance LXWp by LX Navigation devices).

5.1.2 Keyboard customization

SeeYou Mobile menu **Commands** makes possible to customize LX Mini Map keyboard regarding to customer personal requirements.



5.1.2.1 Keyboard

Table below shows the set of characters regarding to individual keys of LX MM pro. Shot cuts could be realized as described in 5.1.2.

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

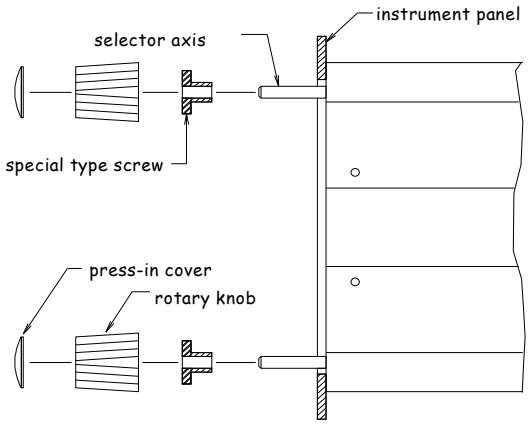
6 Installation

The computer device needs a new cut of the panel. Therefore every unit comes with a template which makes possible to make the new cut out by hand and without assistance of. On www.lxnavigation.si you find also **.dxf** file in case that you will use 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

After cut out is ready the unit can be installed and fixed. The procedure:
-remove caps from the rotary switches
-unscrew screws so far that the rotary knobs will
remove fro the axel
-unscrew all four bolts with holes
-insert the unit into the cut out
-fix the unit after using of four special bolls
-insert knobs and tight the screws on the top
-check if the push button functions of rotary switches
is working, otherwise adjust



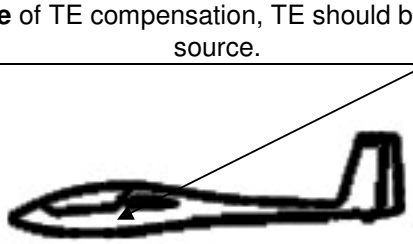
6.1.2 Vario device

The installation process of vario unit is extremely simple. Insert the unit and fix it after using of 4 M4 screws. Connection of pneumatic tubes should be carried out absolutely correct and depends of TE compensation solution.
The unit has three pressure inputs. A **label** situated close to the input designates its function.

Pst, static pressure in

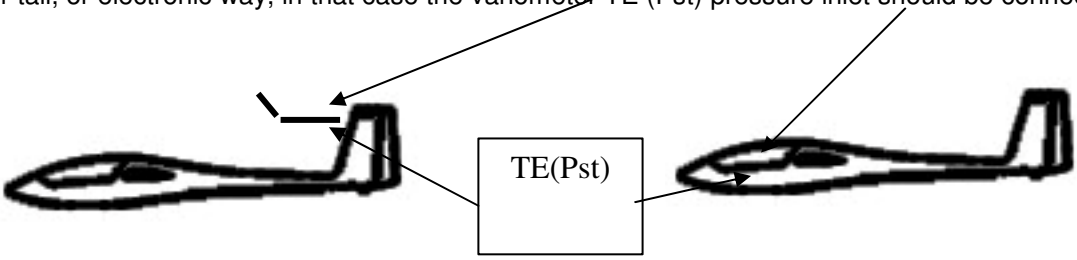
Ptot, total pressure input (Pitot)
TE, total energy probe, or static

Important!
After using of **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 realized after using of **TE probe** usually installed on the glider tail, or electronic way, in that case the variometer TE (Pst) pressure inlet should be connected to **Pst**.



Pneumatic TE compensation **requests** TE COMP setting 000%, TE filter doesn't matter. After using of electronic way 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; 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 is provided, after it's on position both computer and vario will get power.
Connection of vario unit should be realized via 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 after main power will fail. The unit will receive power until main switch will be in on position.

6.2.2 Connection of other bus participants

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

6.2.3 Insertion of SD card

A Micro type of SD card is compatible to LX Mini Map pro. The card should be inserted right way, otherwise a damage of SD slot could happen.
Keep contacts of SD card **up** by inserting.
Suggested type is Kingston micro SD 2GB.

6.3 *GPS source connection*

As mentioned in previous captures 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 Colibr II** configuration after the unit is used in conjunction with LX Vario (USB D). By stand alone operation doesn't matter and by CAI 302 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 that means no splitters.

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 to be connected after of using of so called 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 are also delivering 12 V power towards 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.

6.4 *LX Remote*

7 Firmware update

Firmware update is extremely easy and can be done by user.
Refer http://www.lxnavigation.si/avionics/downloads.html for details.

8 The data base

LX navigation has prepared data base which is capable to be used in all units running under LK 8000.

8.1 *Airport data base*

.cup files for every county are available on http://www.lxnavigation.si/avionics/downloads.html
It is suggested to activate the file of interest as Waypoint 2 file.

8.2 *Airspace*

LX navigation publish all airspace files also in txt format and those can be directly used in LK 8000.