User Manual

Preliminar Documentation

Software version: 1.20

1.20b
See addendum pages at the end of the document for last updates.

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Introduction

LK8000 vs XCSoar

LK8000 is based on XCSoar software (www.xcsoar.org) at version 5.2.3.9, which then became the 5.2.4 version. I contributed since the 5.2.2 release, adding the Alternates and BestAlternate functions, the VisualGlide, and the whole support for PNA devices (car navigators).

In the XCS software, at that time, many bugs were existing at all levels. With the help of the betatester community on the www.postfrontal.com forum we have been able to find and correct most of those old problems. About 500 pilots participated in this bug hunting phase in late 2009, making version 1.18a a proven stable release. This 1.20 is a step forward with innovative functions.

Credits are due to all of the 5.2.2 XCSoar developers. You can find their names on the XCSoar official website.

Although based on XCS, the LK is now very different software.

- The old code was completely rechecked and eventually corrected
- The user interface was totally redesigned and rewritten from scratch
- Many new features were added
- Paragliding and Delta support was added

LK is not compatible with XCSoar configuration or tasks. It installs in a different directory, running off an SD card with no CAB files and without using the device memory. Please don't call LK8000 "XCSoar", because original XCSoar developers are afraid people would get confused. Beside, the new version 6.0 xcsoar is totally different from the LK source base. They are now very different software programs.

This manual is about things that are NOT available in the old XCSoar, either because they are new features, or because they have been fixed and/or deeply changed.

LK8000 v1.20 is not yet public software. It is free of charge, but I don't distribute it. I am doing it primarily for myself and friends. It is not illegal to have a copy of LK8000 and to use it, but it is illegal to distribute LK8000 without the necessary GPL rules respected. I am not releasing the source code at this stage, so please do not ask for it. Here we have a very interesting situation! A free software which is illegal to distribute, but perfectly legal to use.

Special thanks to:

Mino Giolai, Sergio Silva, Mateusz Pusz, Bjorn Haugsgjerd, Allan Broadribb, Berthold Bredenbeck, Peter Lengkeek, Sasa Mihajlovic, Karim Trojette, Michel Hagoort, and all of the alpha testers people. Thanks to Lucas Marchesini (D.S.X.) for data filtering algorithms and the wind calculation help, and to Donato from Digifly Europe.

Paolo Ventafridda
Milano - Italy, March 2010

This manual is incomplete

I am sorry not to be able to provide a complete and detailed manual for version 1.20. I have been trying to describe the most important differences between XCSoar and LK8000, and they have required a long work. Writing the documentation is a work in progress, since also the source code is changing, but it will get better soon.

Please go to the www.postfrontal.com forum with any questions and for support from other users.

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Maintain effective lookout of your aircraft!

Supported devices

LK8000 can run on many devices sharing the Windows CE operating system. It won't run on Android phones, on Linux embedded devices, or any non-CE system. Namely, it doesn't run on Garmin navigators, TomTom, etc. because they use a custom operating system.

It does run on CE 4.2, CE 5.0 and some 6.0 devices. Generally, it is supposed to work fine on any CE device: if it doesn't, it is normally fixed in a few days once we grab one of those new units.

PNA (car navigators) have landscape screens which LK was designed for. However, it works perfectly in portrait mode as well, and the LK user interface can also be disabled to gain a vanilla XCSoar interface. A great deal of time was spent to make it backward compatible at user interface level also in portrait mode.

LK will behave differently on different screen resolutions: the User Interface is fine tuned for each resolution, for best results. For example, on large 800x480 devices, the Bottom Bar holds 6 boxes, while on other resolutions only 5 are shown. The Nearest infopages can list 5 to 10 items, depending on screen resolution, and so on.

Supported screen resolutions

You are assured that all of the following screen resolutions have been fine tuned for the best user experience:

Portrait mode

240x320
480x640

Landscape mode

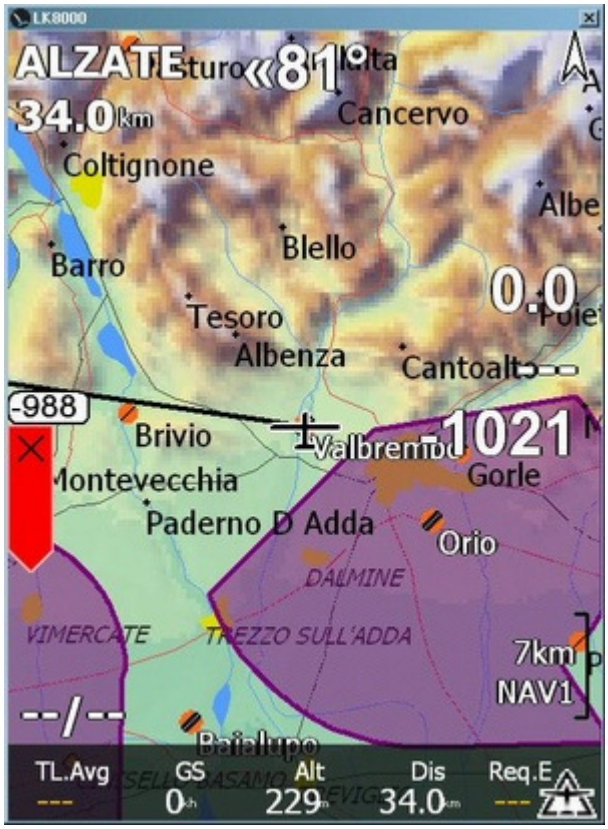
320x240
400x240
480x234
480x272
640x480
800x480

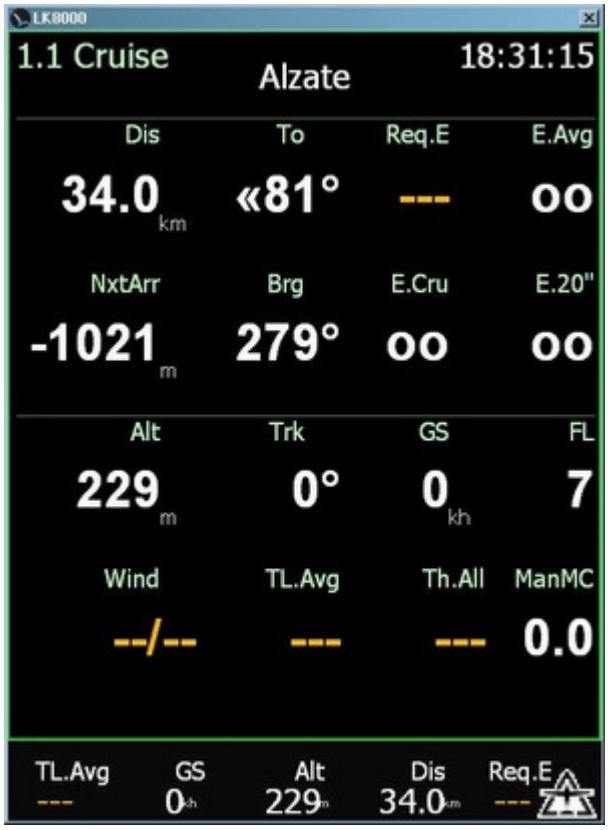
If a device is using a screen resolution that is not in this list, you will be told about the problem when running the software. It probably won't look very good from the GUI point of view. To our knowledge, these resolutions are the most commonly used nowadays. PNAs normally use 480x272 resolution with very few exceptions.

> *Adding a new resolution takes only a few hours, so this list will grow up as needed.*

Landscape vs Portrait mode

As stated above, LK can run both in portrait and in landscape mode. The LK features are available only in fullscreen mode, and portrait's fullscreen is vertical of course: it won't be that good. LK was thought for landscape mode primarily. Here are different screenshots for a 640x480 device in landscape and portrait.





Notice that portrait mode requires smaller fonts, and it will be generally harder to see during flight than a landscape device.

You can "rotate" the screen of your device with any of several free tools available on the internet. Most of devices can switch to landscape mode directly from their screen configuration. PNAs are all landscape devices.

Install LK8000

You can install the LK on an SD card or on the device internal memory.
The best and preferred method is to install LK8000 on an SD card: when your device is reset for any reason everything will be available as usual on the external card, and you will be ready to takeoff with no problems.

SD CARD INSTALL

Choose a fast SD CARD. Do not choose a cheap and slow SD card. Performance will be greatly degraded. For example, you may choose any of the Sandisk Ultra series.

Your device may or may not support SDHC cards, so be careful to choose an SD that your device can really read and write.

Unzip the content of the ZIP archive inside the main directory of the SD card.
If you have temporarily connected the SD card on your PC for installing LK, you may see the external disk drive as E: for example.
In this case, after unzip you should see a directory called

E:\LK8000

Inside that directory, you find the executables, the dll libraries and all of the needed subdirectories.

_Airspaces need SUA formatted airspace files.

_Configuration contains configuration files created by the software, and:
NOTEPAD.TXT file that you can edit
IDFLARM.TXT file that you can edit

_Logger will contain IGC files and NMEA text files created by the software while logging.

_Maps can contain terrain files that are named with .DAT suffix (example: Terrain-Dem.Dat), topology files or a unique file with XCM suffix, which is a renamed ZIP file containing all of the above.

_Polars has an example of how to create your own polar file.

_Task is the place where TSK files are created.

_Waypoints is the place where you can put your seeyou .CUP files, or winpilot .DAT or CompeGPS or all of them. There is also an editable file called WAYNOTES:TXT that has an example inside .

_System directory is very important, and you should never modify any file inside it.
There is a subdirectory called _CEUtilities where some tools are available for emergencies.
You can try those tools, which are by third parties. On PNA devices you will need to copy those tools where the DLL files are located, otherwise they wont work properly or at all.

DEVICE MEMORY INSTALL

If for any reason you cannot use an SD card, you may install everything inside the internal device memory.

In this case, the LK8000 folder should be placed exactly on the root directory of the device, and the executables together with the DLL libraries should be copied in the root directory as well, moving them from the LK8000 folder one path back.

This is not a standard procedure, it should be used only for emergencies and it is not suggested to use the internal memory.

RUNTIME.LOG

After executing LK8000, a file called RUNTIME.LOG will appear inside the LK8000 directory in use. This file is a log of LK activity, and should be used for debugging purposes. In case of problems, remember to copy this file in a safe place on the PC, because it will be overwritten the next time you execute LK.

If for any reason you cannot find waypoints and map files from the LK configuration menu, search for the RUNTIME.LOG file, because it should be placed aside the _Waypoints folder (and _Logger, etc.).

This file is human readable with a text editor.

PC INSTALL

A PC version is available for running LK on the desktop PC running Windows.
This version is exactly the same version for CE devices, with a few minor differences such as no battery support and a different and unlimited memory use.

CE devices have a memory limit for application, while PC version has not. It depends on the operating system, not on LK8000.

The LK8000 folder should be unzipped inside your Documents folder that you normally find on your desktop.

The direct path should look (on a Windows XP) something like:

C:\Documents and Settings\yourname\Documents\LK8000\,,,, (_Maps,_Waypoints etc)

FLY or SIM version

The SIMulator version is like the FLY version, but with no communication active with external gps. It is perfect for testing the software indoor.

You can make the aircraft fly on the map by clicking and moving it in the desired direction, and then releasing it.

To change altitude, you need to enter IBOX mode, click on the altitude Infobox, and use the UP-DOWN keys to increase or decrease the altitude.

Using the LK8000 touchscreen

LK's Turbulence-Proof User Interface

LK is primarily using touchscreen for all operations. Hardware keys and joggers are supported as well, but the whole human interface concept is based on touchscreen usage with no need for any external hardware buttons.

On most existing software the touchscreen interface is accomplished by creating "soft buttons", i.e. painted buttons to press. LK still has these soft buttons, but only for exception usage. As a rule, there are no "soft buttons" to press.

Soft buttons in fact require a precise user action on a restricted part of the screen. While this is easy to accomplish on the ground with a stylus, during flight it won't be so easy nor - in many cases - possible at all.

While you are flying, your body is subjected to all kinds of accelerations and your hand will not be precise in clicking. On 3 and 4 inch screen devices, it becomes a real problem to click on a little squared area that you can hardly see under the direct sunlight while lying 50cm far away in the cockpit.

If you are wearing gloves, your touch cannot be accurate. If you are circling inside a tight thermal, you cannot be accurate in touch. If there is some turbulence, you cannot be accurate. If you cannot keep your eyes on the screen because you are busy looking outside of the cockpit, you cannot be accurate either.

Under all of these circumstances, LK can be used with no problems. It was made for these situations! It was made for pilots airborne, not only for pilots on ground!

Blind clicks

Not enough? You can change pages and informations on LK without even looking at the screen! You actually can change pages on LK even with your eyes closed by just listening to the sounds. We have designed custom sounds with frequencies that your ears can easily perceive also in noisy environments. And your brain will automatically identify these sounds to LK's pages.

During normal use, you will soon be able to change pages (and there are a lot of them) without directly looking at the screen.

This will help you to maintain effective lookout!

The welcome screen

LK8000 does not offer screen buttons for most of its functions. You don't need to be precise for selecting an invisible button, since it is generally easy to locate its screen area.

While you are using LK, pressing on the screen (clicking) can be done with **short, long or very long timings, producing different results**. The most important and frequently used functions are available with short clicks.

After startup, you are asked to click on Center Screen. That's not a short click, and requires at least half a second. Then you are given the main LK8000 screen, which is made of a Moving Map page and of a bottom bar.

This is the welcome screen. LK is already running: to proceed you must click on the center of the screen. It is a "medium" click: press with your finger and keep pressed. Count "ONE", and release.

That's it, you just discovered the average click on the LK.

The basic idea in LK is that you always have important information concerning your flight available with no clicks, or with a couple of "blind clicks".

A "blind click" does not require you to be precise, as we stated before, and can be made without directly looking at the screen.

Virtual Keys and "Blind clicks"

LK8000 pages have 7 zones you can click on. We shall refer to these zones and timings using this terminology:

1			
2			
3			
4	5	6	7

- **S1** means short click on zone 1
- **M1** means medium click on zone 1 , which normally is around 0.5 to 1 second. To test: click on it, say "count one" and then release your finger.
- **L1** means long click on zone 1 which normally is around 2 seconds. To test: click on it, say "count 1... count 2" and then release your finger.

Paragliding/Delta mode offers also an 8th and 9th zone, which is in the upper right corner of the screen, over the compass indicator. That's for emergencies (to report an accident location), and it displays your current position both as Lat-Lon and UTM coordinates for 1 minute.
The 9th zone is the upper left corner and will zoom out at 7km map scale for 20 seconds. It is good for a quick outlook on the map for position reporting during XC flights.

While blind clicks on the BottomBar (4,5,6,7) are always working the same, virtual keys 1 2 and 3 work differrently depending on the screen mode.

Screen Modes

There are four screen modes in LK8000:

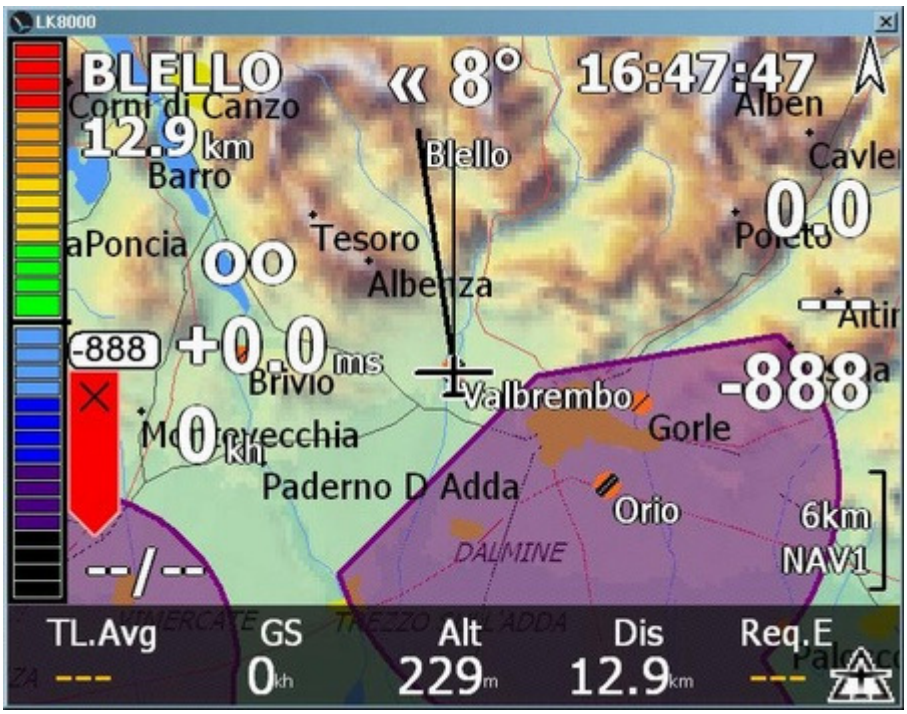
- Moving map
- Info pages
- Nearest pages
- Common pages

Screen mode Moving Map

You are now in the main LK screen, which is fully configurable. See chapter "**Map Overlays**" for a detailed description of all fields, and how you can select which information you want to be displayed.

The following picture is showing all overlays activated, and the screen is cluttered with information. It is only an example!

Some of this information is appearing only when a **destination** is selected (a "go-to"), otherwise some of the information is not painted at all.

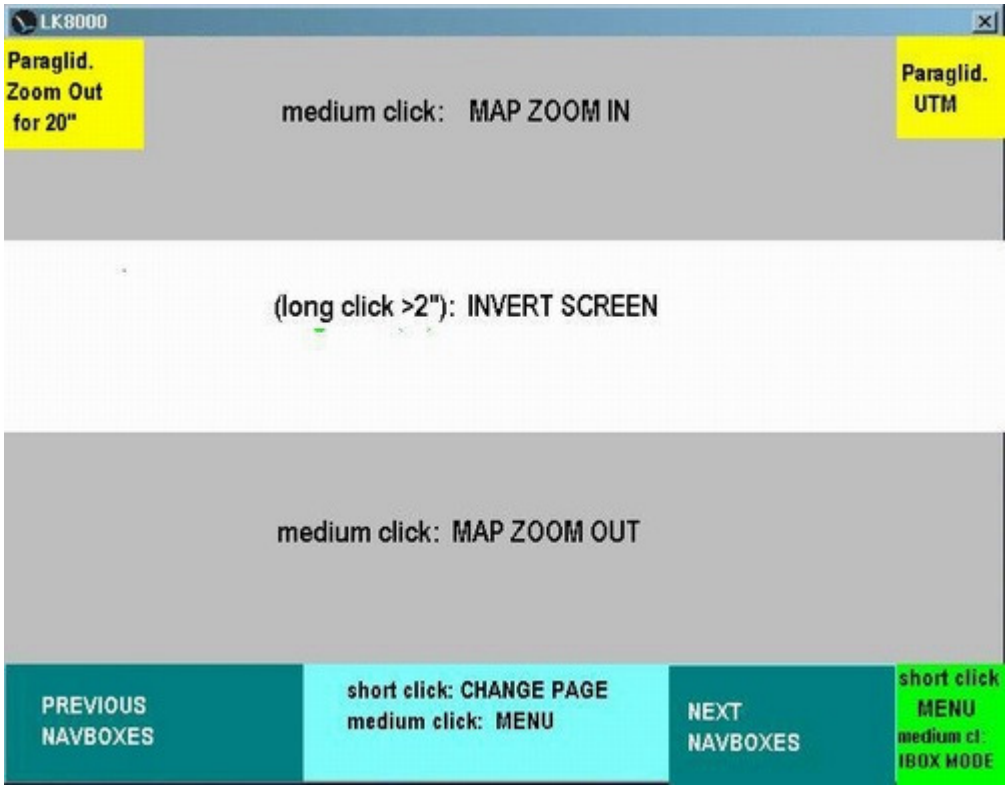


The moving map can be shown in three kinds of views (Screen Views in menu):

- Moving map with overlay, the one above
- Moving map in Pan Mode
- Moving map with Infoboxes

Moving map touchscreen

While the moving map is active, the following touchscreen clicks apply.



Zooming in and out is accomplished by medium clicks on top and lower part of map area.

Clicking on the center for a long time will invert screen colors. This is useful during flight when light conditions require an higher contrast.

All LK8000 information is inverted to give you the best contrast on all pages, not only the moving map.

Bottom Bar touchscreen

You can change to previous and next navboxes with a short click on those areas.

The center area of the BottomBar gives you two choices:

- with a short click you change **screen mode**
- with a medium click you call menu.

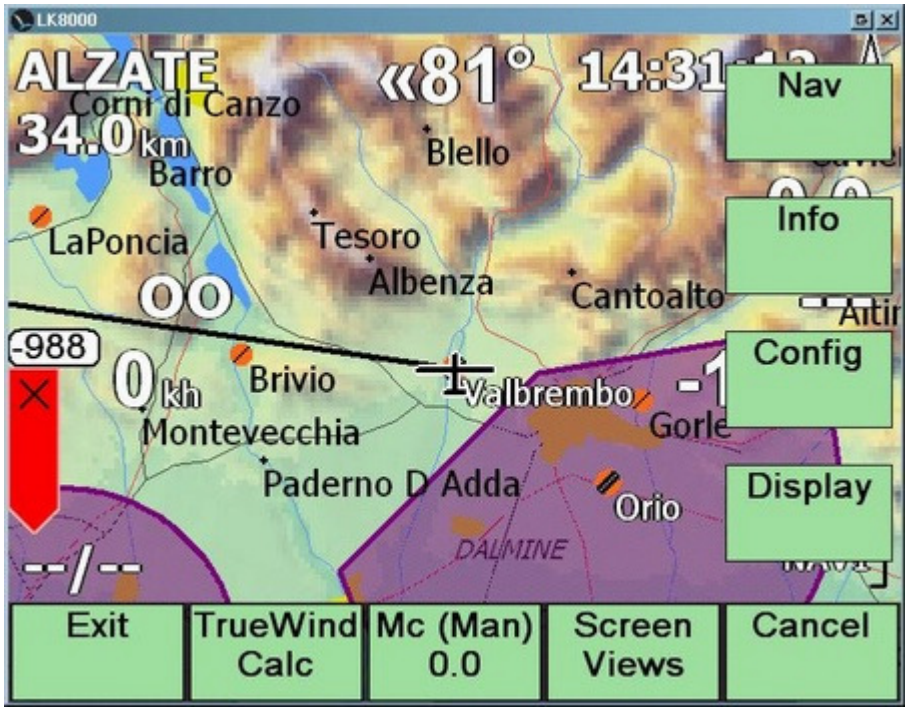
The aircraft icon on the right gives you two main functions:

- short click to call menu
- medium click to switch to InfoBox mode

On some screen sizes - mainly 3.5 inches and below - it may be difficult to select the aircraft icon because of the narrow display. In this case, the center bottom bar medium click will also work.
It is a redundant approach to call the important menu selection.

Menu Button

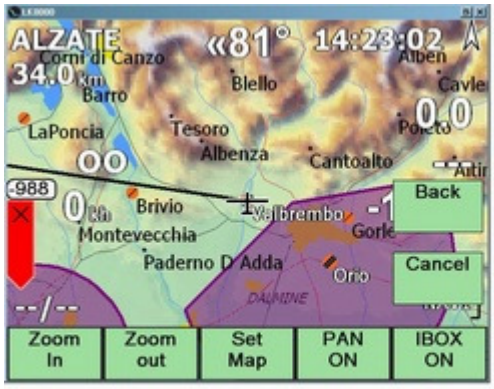
The first and most important button is the MENU which pops up green buttons on screen for multiple choices. You call MENU with a short click on the aircraft icon, in the bottom right part of screen. Alternatively, you call MENU with a medium (> 0.5s) click on the center of bottom bar.



The main Menu activated by Menu button.

After a few seconds of inactivity it automatically disappears.

Screen views in Moving Map



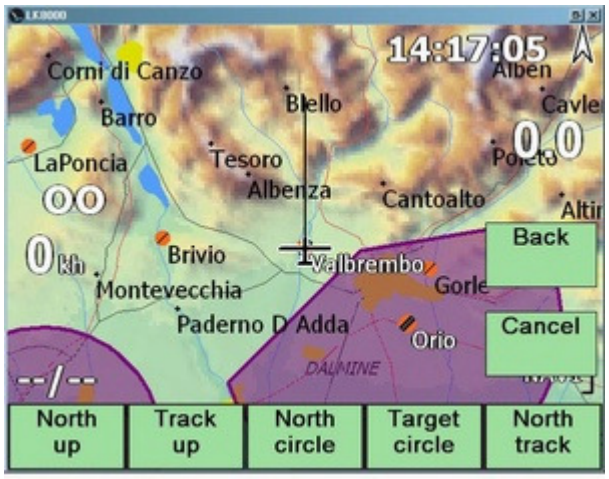
Clicking on Screen Views from main menu will pop up this submenu.

Zoom In and Out are changing map scale, like with the shortcuts of virtual keys mentioned earlier.

Let's look at Set Map, PAN mode and IBOX mode.

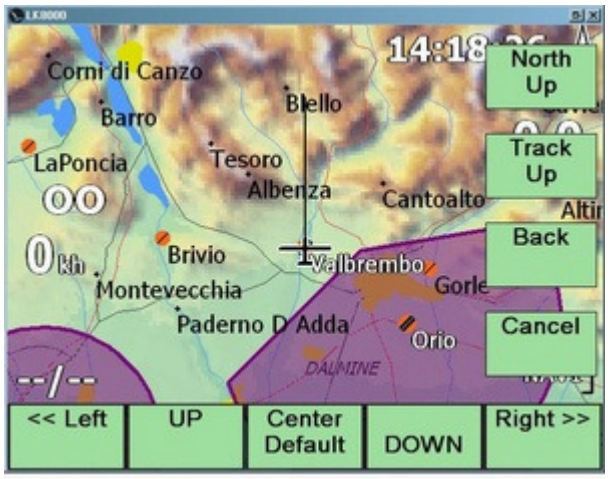
Screen Views: Set Map

Change position of the glider and screen orientation during flight



A general screen orientation button is inside MENU DISPLAY 3.3 **Map Orient** , and you will be able to choose among all choices that are also available inside System configuration.

However, a better approach is to use MENU Screen Modes **Set Map**

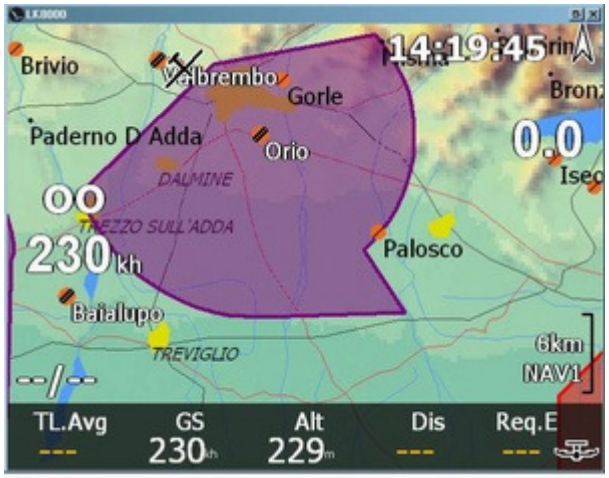


.

Here you can quickly toggle between **North Up and Track Up** (with North while circling).

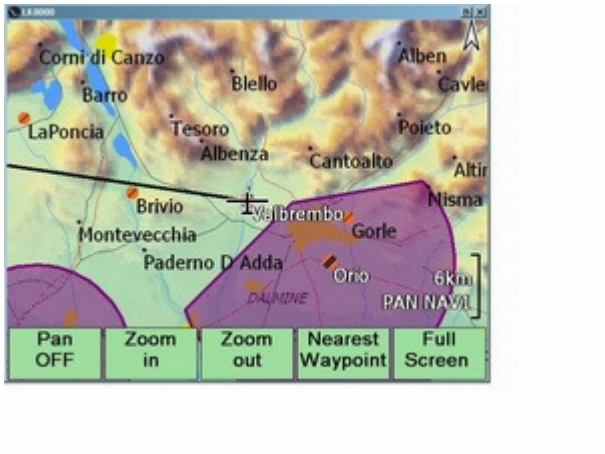
At the same time, you can reposition the aircraft on the screen to better suit your navigation.

The "Center Default" button will reset aircraft to the position configured inside System menu 11 (Appearance).



Screen View: PAN mode

Selecting PAN from Screen Views buttons will bring you to the PAN menu.



During PAN mode the moving map is not automatically updating. Only the aircraft is moving on it.
The map is placed in NORTH UP orientation.
You can drag with your finger on it, to move the map to a particular location.
There are NO overlays in pan mode. You exit PAN mode clicking on Pan Off button.

Nearest Waypoint will pop up waypoint's details of anything closer to the center cross. It is ideal to select a waypoint near a location you have been dragging to.

Full Screen will leave you with a plain moving map with no overlay and buttons, still draggable.
To exit full screen pan mode, click on aircraft icon and access Screen View pan off button.

SIM mode only: change position of the aircraft on the moving map

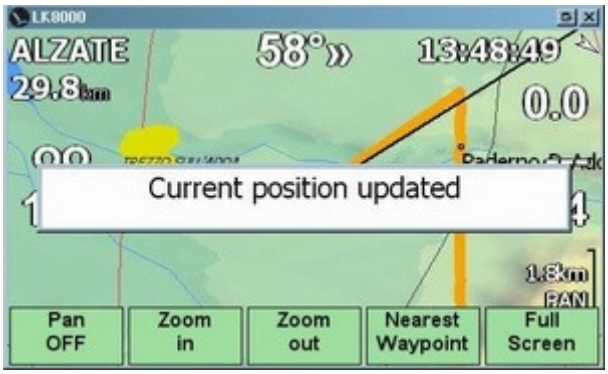
For simulation only, in order to quickly change position of the glider without having to set a new home and restart LK, do the following:

- Enter PAN mode

Move around, and place the central screen cross exactly where you want to "be"

Do not place exactly on an existing waypoint, otherwise you will be clicking on waypoint and details will be shown.

If the screen center cross is not over an existing waypoint, simply clicking on it (i.e.: CLICK on the CENTER SCREEN CROSS) will make that position your current position. Click either shortly or longer, it depends on your configuration.

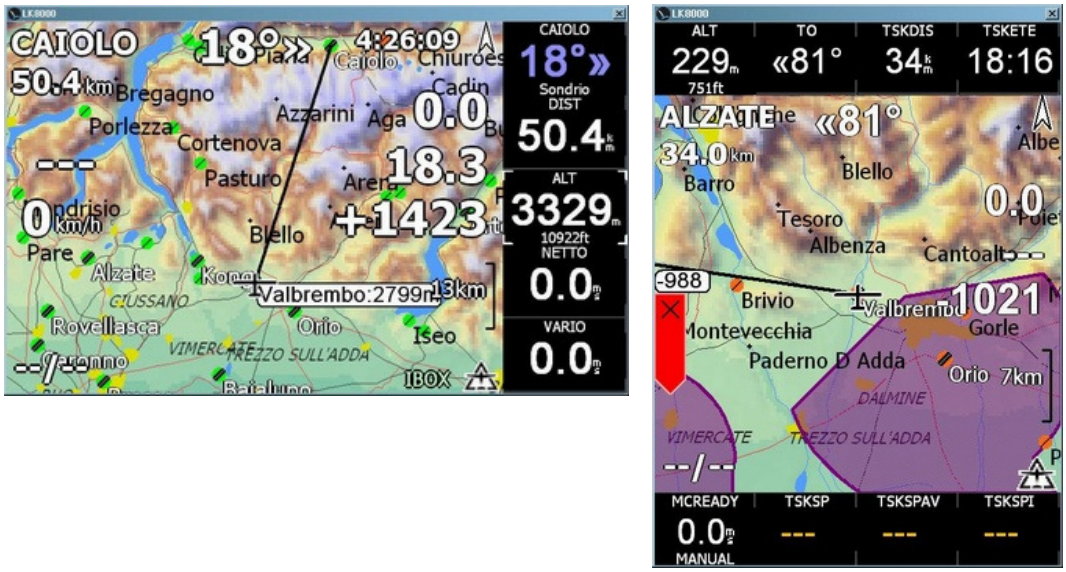


- If you clicked correctly, a message will appear.

- Exit Pan mode, position is now updated.

Screen View: IBOX mode

IBOX or InfoBox mode is the old XCSoar modality for viewing flight values aside the moving map. It is now obsoleted by the LK InfoPages, however it has been revised and adapted to make it useable also in landscape mode. In portrait mode it is still the best solution for small screen size devices (3.5 inches namely).



IBOX in landscape and portrait modes

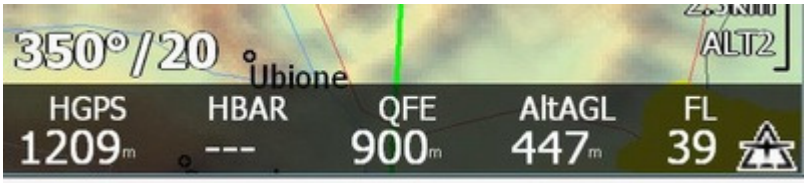
The biggest limitation of IBOX mode is that you must choose in advance which values have to be painted, for each flight status (cruise, thermal, final glide and auxiliary). In portrait mode, you can have 8 values painted, while in InfoPages there are 4 pages of 16 values, and one of them is fully configurable as well.

In IBOX mode some of the values can be selected and changed. For example, while running the simulator mode, clicking on ALT ibox and the using up down arrow or virtual keys will change the altitude. Apart from this, the native LK modality is much more flexible and practical during flight.

To access IBOX you can get here from Screen Views or - as a shortcut – long click on the aircraft menu in the bottom right part of moving map.
To get back to LK view, you do the same again. So you can switch to IBOX and LK mode in a second.

"NavBoxes" on the BottomBar

The black bottom bar is showing five values (on some high resolution devices such as HP314, six values are shown). We call the bottom bar also "Navboxes".
There are several "stripes" of values, and you can change stripes clicking on the right or on the left part of the bottom bar.



Clicking on the right will move to next stripe, clicking on the left will move to the previous stripe.
When you get to the first stripe, a higher "CLICK" sound is played, otherwise the click is lower.

> *This way you can change stripes getting to the first one without looking at the screen, simply clicking until you can listen to the higher click. It works the same as on some digital watches, to let you know you are at the beginning of a menu.*

Each stripe of NAVBOXES is named on the right lower part of the map, near the zoom level.
The first and default stripe is called **NAV1** . Then you will find **ALT2**, **STA3**, **TSK4**, **ATN5**, **SYS6**, **CRU7**, **FIN8**, **AUX9**.
Plus, an hidden stripe called **TRM0** is available only while thermalling (circling).

> *As you can see, each stripe is named both with three letters and a number, so after some usage of LK8000 you will easily remember their position, and you will be able to select them without even looking at the screen, starting from the first one.*

In total, there are thus 10*5 = 50 values (60 values on some devices).
Some of these stripes cannot be configured, some other are configurable.

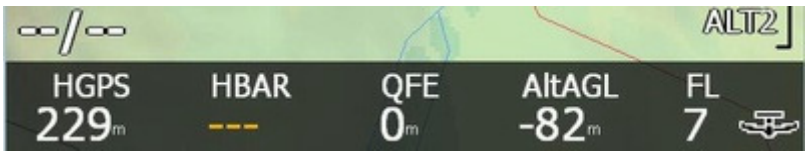
<u>Configurable stripes are</u>: TRM0, CRU7, FIN8, AUX9 .
Their values are configured inside system menu configuration pages 16,17,18,19 .
Those 16 ,17, 18, 19 pages let you configure up to 9 choices, ordered 1 to 9.
NAVBOXES will use the first 5 (or 6, on hires devices).

These configurations are also used for INFOPAGES (1.1, 1.2 etc.) using in this case 8 choices.
See the INFOPAGE documentation.

NavBoxes stripes

NAV1 **- Navigation**

- Last Thermal Average value
- Ground speed
- Altitude in use (either GPS or Baro if available)
- Distance to destination
- Required efficiency to destination



ALT2 **- Altitudes**

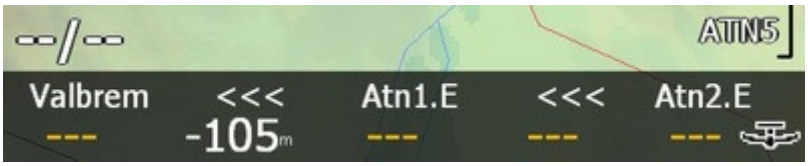
- Height GPS
- Height Baro
- QFE
- Altitude Above Ground Level, if terrain map is configured
- Flight Level

STA3 **- statistics**

- All thermals average, or daily thermal average
- Odometer, counting distance like in a car
- Fly Time , how much time you have been airborne
- Distance Home
- Radial Home

TSK4 - **task information**

- Task Distance left
- Task Arrival Altitude
- Task Estimated Time Enroute (the time left to complete the task)
- Task distance covered Start
- Altitude of your task start, good to remind you of the 1000m FAI rule.



ATN5 - **Alternates**

Requested efficiency and Arrival Altitude for :

- BestAlternate
- Alternate1
- Alternate2

BestAlternate has an explanation in a separate chapter in this manual. Alternates can be chosen by selecting a waypoint, and using the "Set as Alternate1" or "Set as Alternate2" buttons.
You can thus keep under your eyes two manually selected alternate destinations, and one automatically selected "best" alternate destination.

> *On some screen devices, there is no space to display Arrival altitude of Alternate 2, as in the picture above.*

SYS6 - **System info**

- Battery is showing percentage of internal battery left, if this information is available from your hardware. It is followed by the letter C when under CHARGE, and D when DISCHARGING.
  Example: 89%C or 72%D

- External Battery 1 : if connected to an external device providing battery information, this is the voltage of such device.

- Satellites in view by GPS. Followed by A if using GPS on port 1, and B if using GPS data from port B. See the FALLBACK mechanism later.

Screen mode Info Pages

Short clicking on the center of bottom bar will toggle between moving map, infopages, nearest pages and common pages.

Each of these modes has pages. LK remembers which page you were looking at, in each screen mode. When you toggle screen modes, you will be brought back to the page you had previously selected.

There are 5 Info Pages. Each infopage has 16 values, which are predefined. You don't need to configure anything, since they are predefined and always available even after a reset. You are assured that during flight this information is always available, and always at the same place and position.

Infopage 4 can be fully customized.

The BottomBar is always active, and you can mix up infopages with navboxes, with many possible combinations.

Infopage 1.1 CRUISE

This is the main navigation infopage.

1.1 means:

Infopage 1, Subpage 1 (CRUISE)

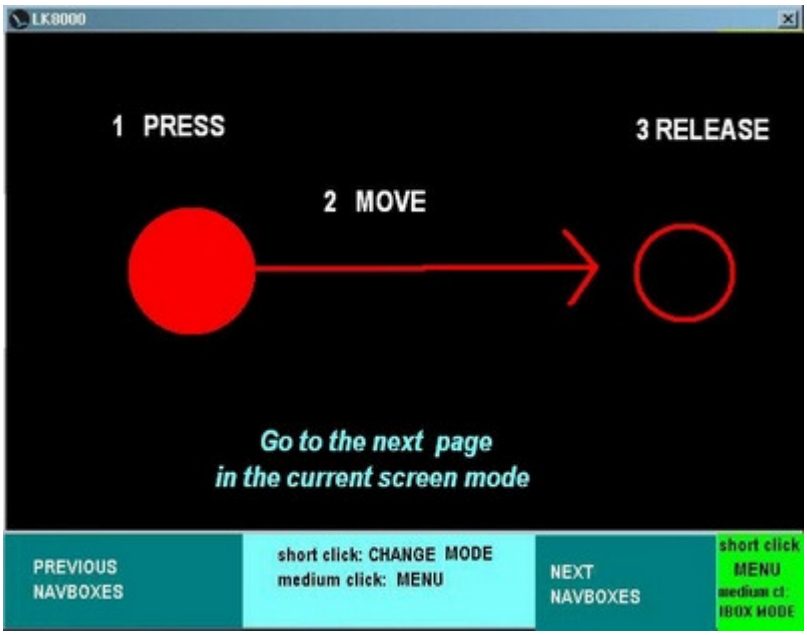
Destination waypoint name and local time is shown on the top.

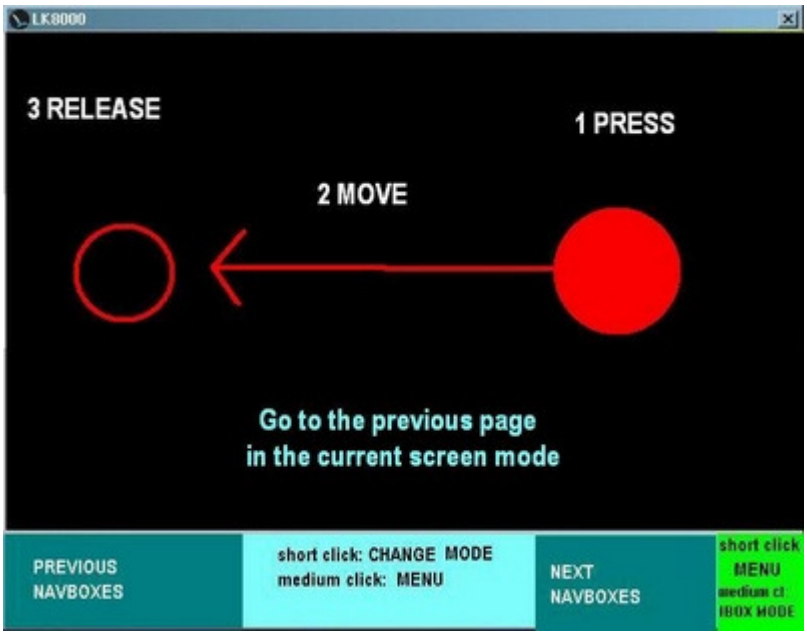
Values from top left to bottom right are:

Dis : Distance to destination
To : Bearing different to destination
Req.E : Required efficiency to destination
E.Avg : current averaged efficiency in the last minutes (normally 2, but you can configure it)
NxtArr : Arrival altitude at next waypoint, i.e. the destination
Brg : Bearing to the destination
E.Cru : Cruise efficiency: average efficiency since you left your last thermal
E.20" : Last 20 seconds efficiency
Alt : your altitude
Trk : your ground track, or Heading
GS : Ground speed
FL : flight level, in hundreds of feet. 63 means 6300 feet.
Wind : direction and intensity
TL.Avg: Last Thermal average lift
Th.All : All thermal average lift, or daily thermal average
ManMC or AutMC is your current McCready value, and its setting (manual or automatic)

Touchscreen Gestures for Info Pages

As we said, there are five info pages. To change info page we use gestures.
Just like an IPHONE, you change to next or previous by "switching" pages as in a book.
It is easier to try it than to explain.





You may have noticed that actually it works reversed, compared to an IPHONE.
This is the default. If you want to invert next and previous, go inside config system menu 10 "Interface" and change IPHONE gestures.

Now that you know how to do it, you can change to the next Info Page...

Info Page 1.2 Thermal

New values we haven't seen yet are:

Vario - the variometer lift value, from an external variometer or calculated by the GPS or barometric altitude difference from the last fix.
TC.Gain : Current Thermal altitude Gain
TC.30" : Thermal average lift in last 30 seconds
TC.Avg : Current Thermal average, since the beginning of circling
Th.All : all thermal average, so far, also called daily thermal average

You may normally leave the thermal when TC.30 is lower than TC.Avg.
You may set MC value to either Th.All or TC.Avg which will become TL.Avg after leaving the thermal and starting back in cruise mode.

Info Page 1.3 Task

First 8 values are the same as in Cruise mode.
The next 8 values are different:

TskArr : Arrival altitude to complete the whole task
TskDis : remaining distance to complete the task
TskCov : task distance covered so far
TskReqE : Requested efficiency to complete the task
TskArrMc0 : Arrival altitude to complete the task at MC=0
TskETE : Estimated Time Enroute to complete the task (task time to go)
TskSp : Achieved task speed

Info Page 1.4 Custom

Custom page is special because all of its values can be configured inside Setup System (accessible from Config 2/3). These values reflect as well the NavBoxes values. So you only need to configure them once.

First 8 values are the Auxiliaries boxes, and they are steady.
Next 8 values are **dynamically** shown depending on the flight status.

- During cruise mode, they are the CRUISE boxes
- During Thermalling, they are the Thermal boxes
- During final glide, they are of course the final glide boxes.

You can change the flight status also manually, from Menu Display 2/3 .

Info Page 1.5 Turn Rate Indicator

The TRI (Turn Rate Indicator) is reporting your banking status, estimated acceleration and estimated airspeed. It's all estimated, if you don't have real accelerometers and real airspeed sensors.

The estimated Air Speed is calculated using the Ground Speed, corrected for your altitude air density, and for the estimated wind speed and direction, in real time.

It should not be used for attempting any IFR flight. However, if you ever will be loosing visibility inside a cloud, remember that looking at your analog magnetic compass will result in fake turning indications when heading east or west and accelerating or decelerating. See the TrueWind explanation about this. In this case, I believe that a turning rate indicator, even if affected by 1-2 seconds delay, is better than an analog magnetic compass.

Bottom line: do not enter clouds unless you have a real gyroscopic equipment.

Screen Mode Nearest

The nearest pages are calculated in real time and updated on screen every 5 seconds.
It is intentionally done like that, to let you read values with calm.
The first Nearest page is for Airports, that you have configured inside waypoint files (either SeeYou or Winpilot). There are basically two kinds of landing places for LK: airports-airfields and outlandings.

Nearest Page 2.1 Airports

2.1 APTS 1/3	Dist	Dir	rEff	Arriv
VALBREMBO	15.3	112°»	5.8	+2275
ORIO	23.4	93°»	8.9	+2068
ALZATE	33.6	«169°	13.5	+1656
BAIALUPO	34.5	127°»	12.7	+1907
CAIOLO	36.9	«34°	14.3	+1586
SAMOLACO	43.3	«77°	16.3	+1490
ROVELLASC	45.3	«180°	17.3	+1533
BRESSO	45.8	157°»	16.8	+1642
LINATE	51.2	145°»	18.6	+1558

TL.Avg	GS	Alt	Dis	Req.E
+1.9	132	2863	33.7	13.6

By default, each page is sorted by Distance, but you can change it by clicking on Dir, rEff, Arriv or onto APTS to get alphabetic sorting. See the turnpoint page later on for an example.

APTS 1/3 is telling you that there are 3 pages of Airports to view, and you are looking at page 1.

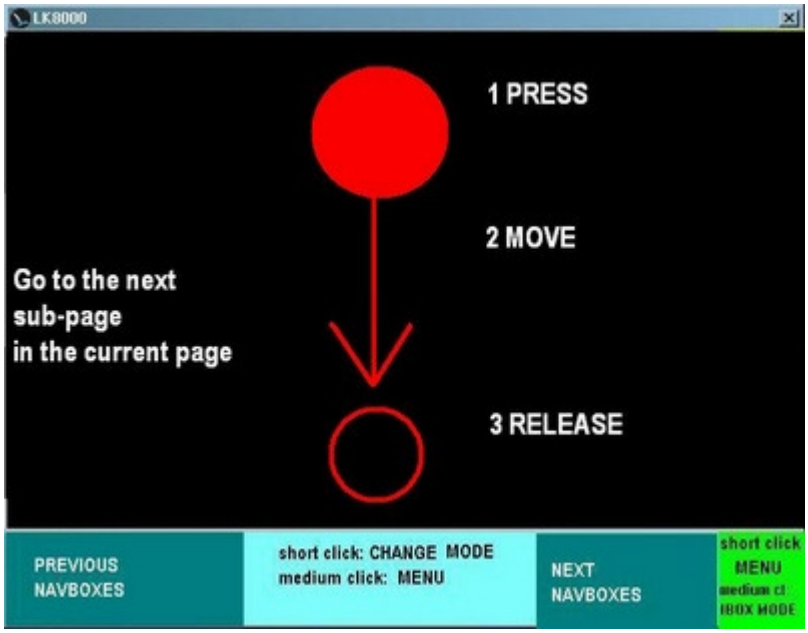
Light red letters are telling you that the waypoint is not reachable, either for obstacles or for glide range. We can not make these values RED because RED on black is not visible under direct sun light wearing sunglasses. So we are using light red, better than nothing.

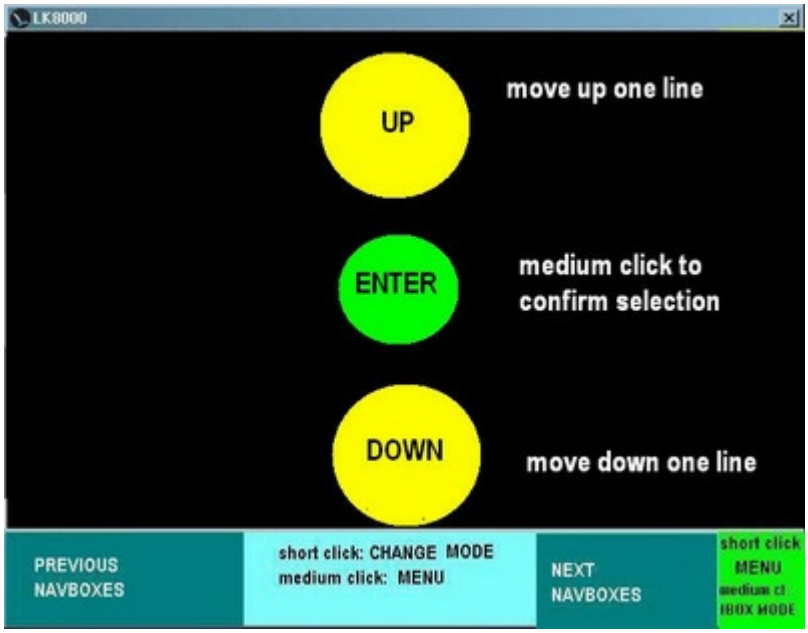
To select a waypoint, move use up down and enter.
To change to page 2/3 or backward, use gestures.

The following page is explaining how to do this.

The up down enter approach is turbulence proof, and once you will understand how easy it works you will love it. Unfortunately it is not available in waypoint lookup selection, yet.

Touchscreen Gestures for Nearest Pages





Nearest Page 2.2 Landables

- Landables are showing both Airports and Outlanding points.
- Outlanding are written in ITALIC and painted light yellow as well.
- They are light red if unreachable, no matter if airports or outlandings.

Nearest Page 2.3 Turnpoints

2.3 TPS 1/6	Dist	Dir	rEff	Arriv
SORNADELL	1.9	55°»	1.6	+1190
BLELLO	3.1	151°»	1.6	+1946
CASTELLOR	3.5	82°»	2.5	+1311
I CANTI	3.8	«139°	3.0	+1163
FUIPIANO	4.5	«158°	3.2	+1311
CANCERVO	6.1	«29°	6.2	+822
SANTONIO	7.4	97°»	4.1	+1654
VENTUROSA	7.6	«36°	8.4	+707
CORNA MAR	7.7	118°»	4.0	+1737

TL.Avg	GS	Alt	Dis	Req.E
+1.9	144	2807	34.8	14.3

Turnpoints are not airports or outlandings.
A nice feature is that sorting turnpoints (as landables, of course) by Direction, will let you know instantly what's in front of you.

Sorting modes inside Nearest pages

2.3 TPS 1/6	Dist	Dir	rEff	Arriv
ALBEN	9.6	«102°	---	-517
ALBENZA	16.6	150°»	49.0	-96
ALTINO	8.4	«16°	11.7	+519
ARALALTA	22.6	«154°	---	-846
ARERA	17.9	«101°	---	-1208
BALLERINO	15.2	«14°	33.3	+105
BLELLO	15.1	176°»	16.2	+541
BRONZONE	20.3	« 8°	51.1	-73
CANCERVO	17.9	«153°	---	-557

TL.Avg	GS	Alt	Dis	Req.E
+2.2	119	1731	---	---

2.3 TPS 1/6	Dist	Dir	rEff	Arriv
MISMA	6.9	«»	13.1	+362
PRANZA	10.3	«15°	17.4	+352
GRONE	16.0	«18°	32.4	+122
BRONZONE	19.8	«20°	56.4	-107
BALLERINO	14.7	«27°	35.9	+70
ALTINO	7.9	«30°	11.8	+484
VAL CAVAL	12.9	«33°	9.9	+1008
TORREZZO	16.6	«34°	54.3	-76
GUGLIELMO	32.4	«35°	---	-960

TL.Avg	GS	Alt	Dis	Req.E
+2.2	136	1678	---	---

2.3 TPS 1/6	Dist	Dir	rEff	Arriv
PODONA	1.7	145°»	4.6	+331
VAL CAVAL	12.6	«31°	9.8	+987
TAKEOFF	14.3	115°»	10.5	+993
POIETO	3.5	«92°	11.7	+215
ALTINO	7.5	«27°	11.8	+464
CANTOALTO	6.7	137°»	13.1	+335
MISMA	6.5	3°»	13.1	+343
SANTONIO	10.0	162°»	15.0	+406
CORNA MAR	12.1	153°»	16.0	+439

TL.Avg	GS	Alt	Dis	Req.E
+2.2	135	1647	---	---

2.3 TPS 1/6	Dist	Dir	rEff	Arriv
VAL CAVAL	12.2	6°»	9.6	+985
TAKEOFF	14.6	153°»	10.8	+974
PADERNO D	25.6	155°»	18.5	+716
ALTINO	7.1	9°»	11.3	+462
BLELLO	16.4	«155°	19.4	+419
CORNA MAR	12.5	«170°	16.8	+416
UBIONE	13.0	«180°	17.3	+409
RONCOLA	15.5	177°»	19.6	+387
SANTONIO	10.4	«160°	16.0	+383

TL.Avg	GS	Alt	Dis	Req.E
+2.2	147	1629	---	---

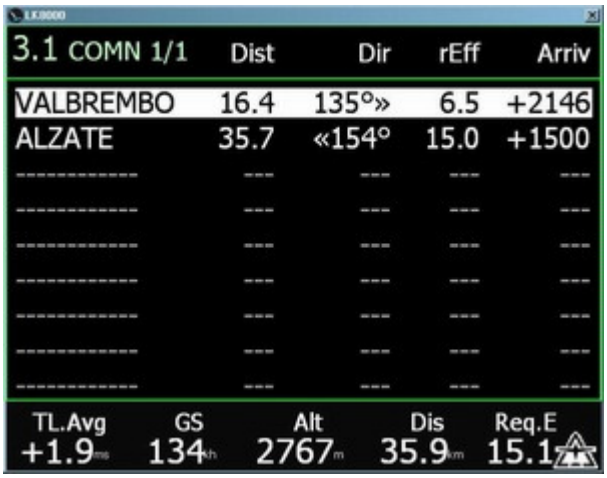
Each nearest page (APTS, LNDB, TPS) can be sorted independently by name, distance, requested efficiency and altitude arrival. When you switch between Nearest pages, the old sort order is remembered for each page.

Screen Mode Commons

The Common pages are meant to list all waypoints that are pertinent to the daily usage, or to previous flights. The basic idea is that you should have available this information simply because you have already selected it for some reason.

There are currently two common pages, the COMMON itself and the HISTORY page.

Commons Page 3.1 Commons



Page 3.1 is very practical!
You will find here:

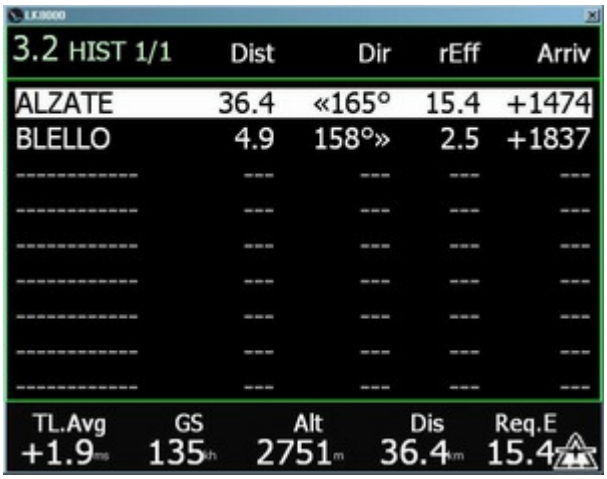
1) Home waypoint
2) BestAlternate waypoint
3) Alternate 1 waypoint
4) Alternate 2 waypoint
5) Task waypoints, starting from the current destination

During flight, all the important waypoints are listed here!
You can keep under your eyes all numbers at once. Landables, home, task.

> *Waypoints here cannot be sorted.*

Of course, if it happens that your home waypoint is also the bestalternate, it will be painted only once. The same for tasks points. You are assured that all of them are listed, nevertheless.

Commons Page 3.2 History



Just like in many GPS units - such as the Garmin's - every time you are doing a Go To a waypoint, this waypoint is saved by LK inside an history list. This list is then saved to disk, and it will survive software restart.

The history waypoints are listed in inverted chronological order: the latest inserted is the first to be shown. When you insert a waypoint already in this list, it is moved to the first position.

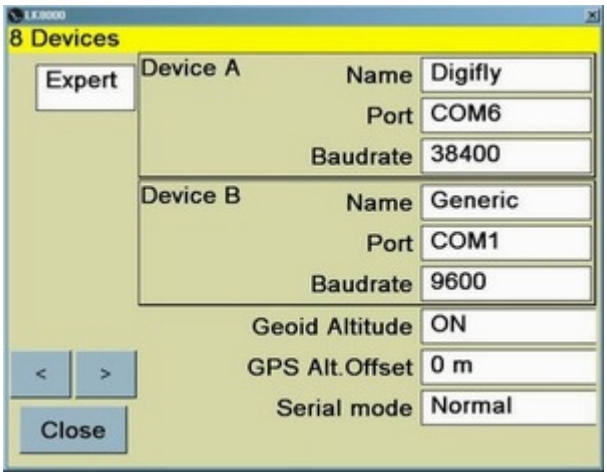
You cannot remove waypoints from history, since they are automatically removed when they exceed the maximum number, normally around 40.

When you change waypoint files from System Config menu, the history is reset.

The history file inside the _Configuration directory cannot be edited manually.

Advanced Dual Port Communications

LK8000 can use 2 (two) simultaneous serial lines that provide NMEA data from GPS and/or vario instruments.



We call them PORT 1 and PORT 2, **or** Device **A** and Device **B**. Each Port is connected to a physical COM port such as COM1, COM2 etc.
You may configure PORT 1 con COM2, and PORT2 con COM1, for example. Do not confuse LK's ports with computer COMs!

Each port can be configured to use a dedicated "device type" such as an LX, a Compeo, a Zander, a Digifly etc. FLARM/DSX traffic advisors are automatically detected and do not need to be configured. They are considered "Generic" devices.

- PORT 1 is normally the primary GPS input. If available, GPS position and speed is taken from this port.
- PORT 2 is normally an additional GPS input, or vario/air pressure instrument.

If you are using only one port, set both ports with exactly the same parameters

Fallback mechanism

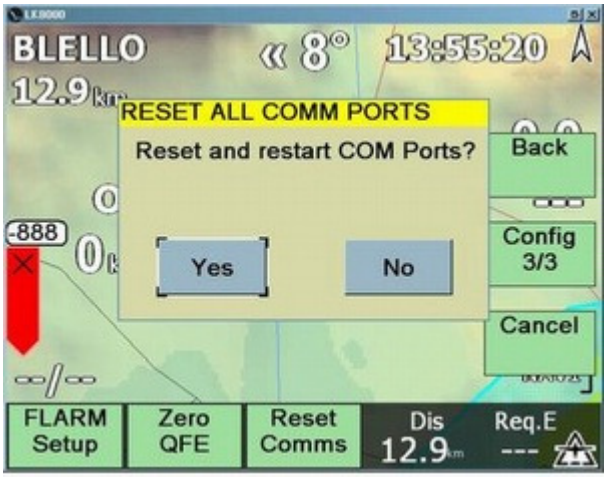
Whenever for some seconds no GPS fix is available from PORT 1 the GPS fix available from PORT 2 will be used. This is called **FALLBACK**. Of course, if no valid fix is available from PORT 2 either, then there is no "fallback".

When Fallback happens, a message is given on screen for a couple of seconds. You don't need to perform any action: fallback is an automatic operation.

If after a fallback the primary NMEA source port becomes again available, it will be used automatically.

Automatic and Manual Comm Port Restart

If no GPS fix is available on either port, then every 30 seconds LK will close and restart communications. This has no effect on the logger and on any calculation, except that - of course - during restart no data is received, no data is processed and no data is recorded.
Attention please: if a valid gps fix is found, NO AUTOMATIC reset is performed.
If you are using external equipment that needs a port reset, such as a Bluetooth device, then you should perform a general Comm Port reset manually using CONFIG 3/3 button "Reset Comms".
In this case, ALL comm ports will be reset.



A port reset usually takes 2 or 3 seconds, not more.

Baro Altitude and Air Sensors

If one external device providing baro altitude or any other special air sensor, such as vario, IAS, TAS, nettovario fails to work, a message will appear on screen telling you the problem.
If you configured "Use baro altitude" , and no baro is anymore available, LK8000 will FALLBACK using GPS altitude. As soon as real baro altitude is back, it will be used automatically and a new message will be telling you.

The FALLBACK mechanism grants you that if you have two GPS devices connected, and at least one of them is working, you will be able to proceed without any problem. And baro/gps altitude is always managed at best.

A special usage device is "NMEA OUT": in this case, the incoming NMEA stream from GPS on Port 1 will be sent out "as is" on Port 2. If you couple Port 2 to a Bluetooth virtual COM, then you will be broadcasting the NMEA stream to external devices such as a secondary PNA/PDA.

Do not connect two devices that are providing baro altitude at the same time.

BlueTooth Devices

Some bluetooth devices will give problems on disconnection. Always close LK8000 BEFORE shutting down the external bluetooth GPS.

Some bluetooth devices will not be able to connect again after disconnection, no matter if COM port are restarted by LK8000. It is a problem of the BT stack layer in the operating system, and the only solution is to exit LK8000, disable and re/enable BT, and then restart.

Always check what your bluetooth stack is doing upon disconnection, so you shall know what to expect during the flight. We are aware that if your external BT GPS is an "SPP SLAVE" mode device, you will have problems if BT is disconnected. If your external BT GPS is an "SPP MASTER" then it will recover automatically.

New Microsoft Windows Mobile 6 Intermediate Driver GPS

Currently the Intermediate layer from Microsoft in NOT supported.

PNAs devices with internal GPS + BlueTooth

If you are using a PNA device that has an internal GPS and also Bluetooth or RS232, you may choose to use the external bluetooth gps or vario or both (such as a flarm) on PORT 1, and leave the internal GPS on Port 2 so that if for any reason external port is failing, you will be using the internal gps automatically thanks to the FALLBACK mechanism.

Smart message notifications

When LK8000 is switching to another port for getting a valid GPS fix, you will be notified with a message.

If you have two gps sources, it may happen that sometimes one of them is missing the fix for some seconds, and then it is recovering. In this case, you will notice several messages telling you what's happening. This is of course normal, since the Fallback engine is working fine. However, it may become annoying!

So, after some messages you will be told "GOING SILENT on com reporting", and no more messages of this kind will be printed.
IN CASE you manually reset com ports from the config menu button, messages will be printed again for another bunch of times, and then LK will go silent as usual.

External Devices

Condor Simulator

Set the config system menu Device A and B name to Condor. This will allow LK8000 to correctly parse incoming data from condor, setting automatically wind bearing and speed, barometric altitude etc.
By the way, Barometric and GPS altitude in condor are equal. This means your virtual GPS has no errors. You can in any case set "Use baro altitude" in system config menu 5..

Very important: in the device config menu, set **"Geoid Altitude" OFF** to get correct readings of GPS altitude. Or if you don't care about GPS, use baro altitude as stated above.

DigiFly Leonardo

LK8000 fully supports **Digifly Leonardo Pro BT** at the latest firmware release dated February 2010. Telemetry is available either through serial RS232 or BlueTooth serial.

If you are using Bluetooth, remember to unplug serial cable! If you are using serial cable, remember to disable Bluetooth on the device.
In ADV SETTINGS choose Telemetry mode FL1 for normal flight usage with samples at 1hz (one sample per second). Do not choose FL2 in current LK8000 version. Check that you are not using CAR mode, otherwise no air telemetry is sent out, of course.

LK8000 is receiving from Leo GPS position, GPS altitude, Barometric altitude, Vario and battery information.

Optionally, if your Leo is equipped with external sensors, IAS and Netto Vario are received.

LK8000 does NOT use Leo's values for wind calculation and ground efficiency, since it has its own calculations. You will thus be able to read wind values both from Leo and LK8000, each one calculating it independently. The same for GR (glide ratio).

Battery information is available in infobox External.Battery 1 and 2.

- EXT.BATT.1 will report voltage on the main lithium battery,
- EXT.BATT.2 will report voltage on the backup AA battery.

Baro Altitude is received from Leo and compared to corresponding QNH. We are using Altimeter n.1. If you did not change QNH on the Leo (i.e. you did not adjust the altimeter n.1 to the correct altitude), then LK8000 will look at your GPS location, and guess an average altitude. The Baro altitude is then set accordingly.

If you have no GPS signal, or you have no terrain configured in LK8000, then it is not possible to guess an average altitude for your location and QNH will not be set automatically.

Once QNH is changed for the first time (either because you adjusted altitude in altimeter 1, or because in the meantime GPS signal was acquired and terrain altitude was used), then it will NO

MORE be changed automatically. To adjust baro altitude in LK8000 anytime you can enter MENU CONFIG "BASIC SETTINGS", where you can change both altitude and pressure value, whatever you prefer.

Remember that the Leo will stop sending out telemetry values when you enter the config MENU!

Brauniger / Flytec Compeo 5030

LK8000 can parse Compeo's NMEA sentences GPRMZ and VMVABD. The latter provides Baro altitude, vario, airspeed and temperature.

Airspeed is assumed to be IAS (indicated). Compeo does not specify in NMEA which air speed it is sending, unfortunately.

> *AIRSPEED IS ASSUMED TO BE THE IAS, NOT THE TAS. IF TAS IS BEING SENT, IAS AND TAS ARE WRONG! LK8000 IS EXPECTING IAS (INDICATED AIR SPEED) FROM THE FLYTEC.*

Baro altitude can be adjusted for QNH as all instruments with LK8000 from Menu config Basic Settings.

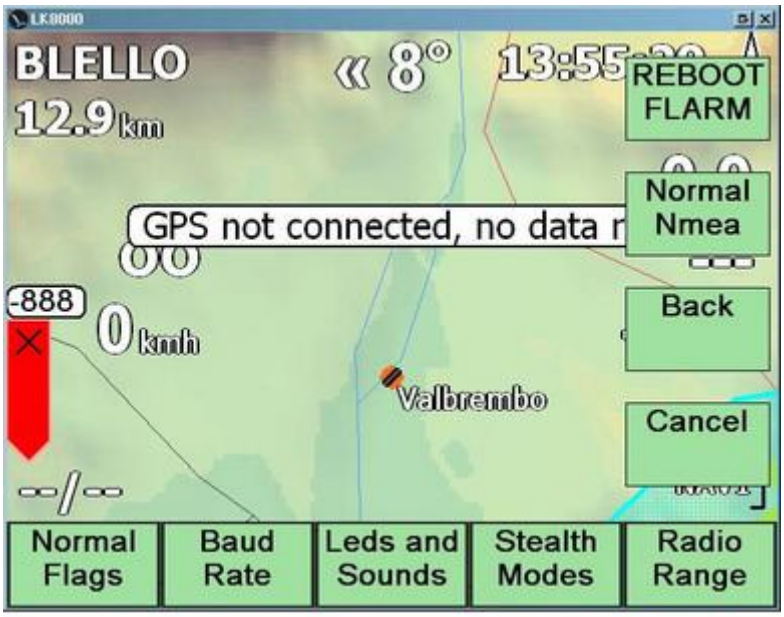
Flymaster F1

LK8000 fully supports the Flymaster F1 device, including battery informations (external battery 1 and 2 voltage, and battery bank in use).

FLARM

Flarm is automatically detected and the barometric altitude will be automatically available. Device type should be set to Generic, and "Use barometric altitude" should be set ON.

- If the connection is at 19200bps or higher speed, Flarm will also send traffic informations.
- If the connection is at 4800 or 9600bps, Flarm will NOT be sending out traffic infos.



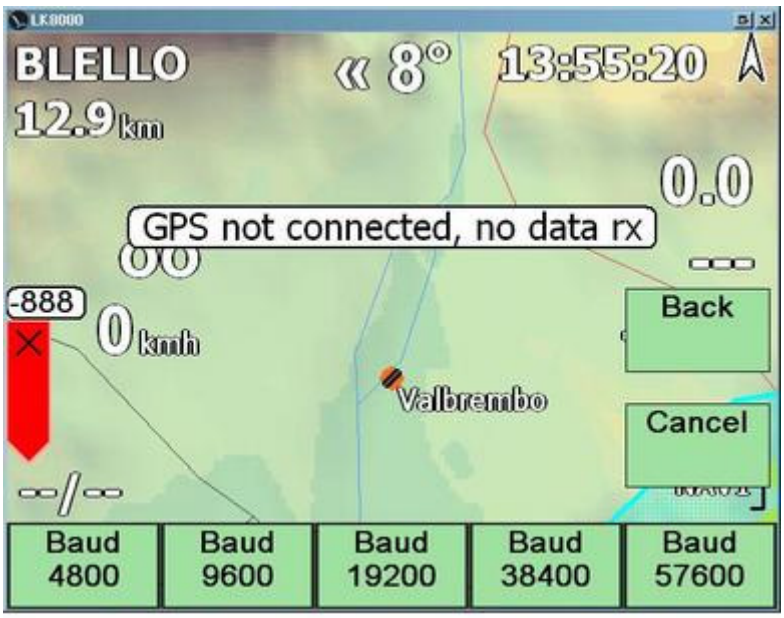
LK8000 has a special menu for flarm, which is accessible from Menu Config 3/3.

This menu is available (clickable) only when a Flarm is actually detected.

Some of these functions and submenus are available only when on ground, and not during flight.

- REBOOT will cause immediate reset of Flarm. It will restart automatically.
- NORMAL NMEA wil force Flarm to use normal settings for NMEA data, including traffic informations (if port speed is not below 19200bps).

Baud Rate menu



If you see this menu, then you are already connected to the Flarm unit.

You can choose a different communication speed. 38400 is suggested for traffic informations.

After selecting the port speed, Flarm will start using that speed immediately, and thus the LK8000 will give a warning about lost GPS connection.

Go inside system config menu and change baud rate accordingly.

Leds and Sounds

From this menu you can control Flarm's lights and sounds.

Stealth Modes

Only Stealth ON and OFF are available inside this menu. Other functionalities are reserved and/or inhibited, since they require non-official third-parties Flarm firmware.

Stealth mode will drastically reduce data broadcasting of your telemetry, and at the same time will drastically reduce the number of informations you will be receiving from other aircrafts around.

Radio Range

By default, Flarm will not transmit to LK8000 traffic informations from aircrafts that are more than 3 km far away.

You can command Flarm to extend or reduce this range, up to 25km or down to 2km.

This operation can only be done while on ground.

Traffic on the moving map

From System Config menu 13 "Map Overlays" you can activate FLARM on Map.
Traffic in range will be visible on the moving map:

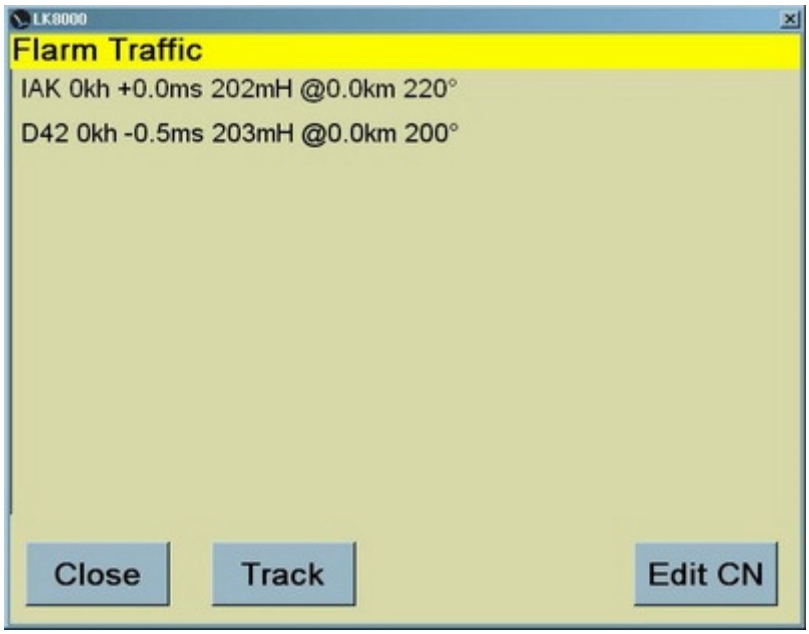
Aircraft ID should be configured manually.

The **3.9** in this screenshot is the average climb rate of that glider.

Traffic on Info Page

From Menu Info 2.2 you can select Flarm Traffic, to display informations about other gliders.

Ground speed, average climb rate, altitude, distance and bearing difference from our glider.



Traffic as seen on ground, before takeoff.

Our glider is not listed of course.

Click on one item on the list, and then Edit CN to set its name and save it to the FLARMID.TXT file inside _Configuration.

FLARM support is still work in progress!

LK8000 1.20 does not have yet the new traffic pages. They are expected to be available in version 1.22 by april-may 2010. At that time, the menu button for traffic above will be removed being obsoleted. **This is only a temporary workaround to let you have Traffic display**.

LK8000 1.22 will offer two separated InfoPages for Traffic: one for listing traffic like for Nearest turnpoints and another one for "shadowing".

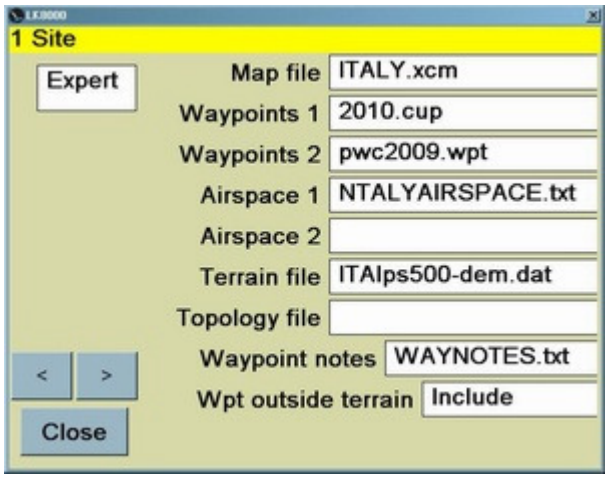
The "shadow", "ghost" etc. functionalities are partially already included inside 1.20! Do not be surprised if on the temporary Flarm Traffic page some gliders will appear with "ghost" written aside.

"You can run, but you cannot hide"
LK8000 1.22 "StarFighter" Shadowing function

Multiple waypoint's formats in LK8000

Inside config menu 1, you can choose up to TWO different waypoint files located inside **_Waypoints** subfolder. You normally load waypoint file n.1 with ordinary waypoints, and waypoint file 2 with special turnpoints to use for contests, or daily tasks. However, you can use both files with no restrictions.

There is no predetermined limit for the number of waypoints you can load, it depends on how much memory you have available. However, it is not advisable to exceed 5000 waypoints if you are also using large maps and airspaces.



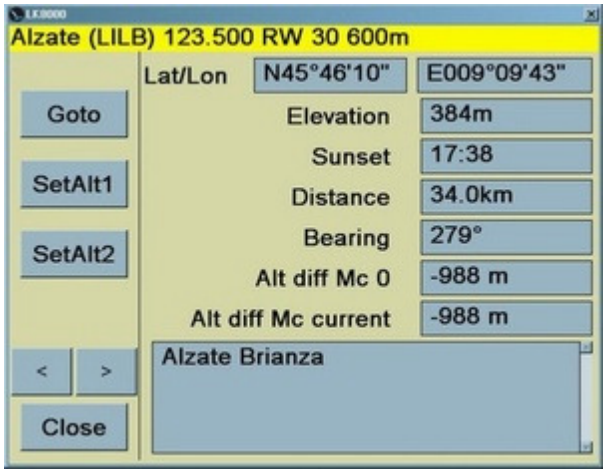
LK8000 can load different kinds of waypoint files, also differently between file 1 and file 2.

Supported formats are currently:

- **Winpilot** .dat
- **Naviter SeeYou** .cup
- **CompeGPS** .wpt

For example you can load 2010.cup as file 1, and pwc2009.wpt as file 2. The first is a SeeYou file, the second is a CompeGPS waypoint file with turnpoints for a competition. Or you can load both .cup, or both .dat, or only one, etc. No restrictions!

Naviter's **SeeYou** .cup format may bring you additional information for landable points, such as runway length, runway direction, radio frequency, etc. **Comments** are truncated to 150 characters, for memory reasons.



CHANGING A WAYPOINT and then pressing SAVE in <u>config menu 21</u> will force LK8000 to rewrite the waypoint file this waypoint was belonging to. For example, if the waypoint you modified was inside waypoint file 2 , which is a SeeYou .cup file, then this file will be rewritten with the new waypoint at the end.

ADDING A WAYPOINT will eventually save it to waypoint file 1. Whatever format it is using.
Read it again: waypoint file 1. The first file you chose in config menu 1. NOT THE SECOND,
Read more about this in CompeGPS explanation .

Waypoint Names, Task Waypoints, History Waypoints

A **unique** waypoint is identified by having at the same time unique:

- name
- coordinates
- type (airport, outlanding, turnpoint)

> *Several waypoints can co-exist having the same name, but different attributes, as long as they have different coordinates or type.*

If two waypoints differ only for altitude, or other minor details, then the already existing one will be used, and the latter will be discarded.

Loading a task file, will also load embedded waypoints for the task, adding them to the internal list. LK8000 is comparing these waypoints inside the already existing waypoints loaded from files.

If a waypoint is already existing, with the same name and attributes, it will be used in place of that inside task file. Normally from the user point of view there is no apparent difference.

However there is a small difference: **task waypoints**, even if modified, **will not be saved** to file. Task waypoints, if not existing already, will not be saved to **history** as well.

In other words: task waypoints are considered **temporary**, and part of a task file.
They won't survive a software restart, unless of course you reload the same task.

But until software restart, they will remain in memory and they will be selectable in waypoint lookup, in nearest turnpoint pages, in history, in commons.

Even if they have the same name! So be careful: whenever possible, do not use the same name for different waypoints.

If you are using names such as START, FINISH etc. remember that loading several task files will NOT delete internally old waypoints until software restart.

SeeYou Waypoint files

- any task lines (normally at the bottom of the file) will be removed.
- MAX number of characters in radio Frequency field is 15, anything over 15 will be considered an error and NOT used
- MAX number of characters in Code field is 15, anything over 15 will be considered an error and NOT used
- Comments are truncated at 150 characters
- Waypoint names are truncated to 30 characters, although they are printed differently depending on device screen resolution, normally around 10 chars.

COMPEgps Waypoint files

- LK8000 1.20 can load only WGS84 LAT/LON WAYPOINTS FROM COMPEgps. You cannot use WPT file with UTM coordinates in current version.

- All COMPEgps waypoints are loaded and saved as simple TURNPOINTS (not AIRPORTS or LANDING points). This should be no problem for paragliders, since they are not using the BestAlternate functions.

- Normally you should load COMPEgps as file 2.

- Saving waypoints will force LK to remove all "w" lines in the original file. Keep a copy of original!

- Altitude in COMPE has a strange (like the format itself!) format, with a precision of 1/1000000 of meter (that's right, 1/million of meter). During load and save operation it will be normal to have rounding errors in this range.

Changing Waypoint files, and Home Waypoint

Home waypoint is remembered as a waypoint in a fixed numbered position. If you change waypoint FILES, then Home may be lost, unless:

- You are loading a Winpilot file with "H" field set in flags . Example:

2521:50:04:17N,018:37:42E,285M,ATH,Rybnik,This is my airport with H for home set

- You are loading a SeeYou file with "LKHOME" codename field set . Example:

"Valbrembo",LKHOME,IT,4543.403N,00935.710E,229.0m,5,20,680.0m, "122.600",

- You are loading WAYNOTES.TXT and you have configured HOME there. You can find WAYNOTES.TXT inside the _Waypoints subfolder, it is simple text readable, with instructions at the beginning.

- You are loading new files, and previously you had an home which is also available inside one of those files. This last feature generally is often accomplished, so you should not lose home airport anymore starting from version 1.20 of LK8000.

If you have set HOME in several waypoints, the last one read from the last waypoint file will be used. If you are using WAYNOTES as well, its home will preveal.

TAKEOFF Virtual waypoint, and Home waypoint

While on ground, a virtual TAKEOFF waypoint is generated in the waypoint list.

This waypoint is updated in position and altitude until not moving over takeoff speed.

> *TAKEOFF is considered a TURNPOINT, and thus all calculations are made as for a Turnpoint (MC, safety altitude configured etc.). TAKEOFF is NOT considered a landing point. It is a very good final destination for final glides to landing, because the altitude will be automatically set to the real QNH, and because no safety altitude may be used in turnpoints.*

- Gliders: if no Home waypoint has been assigned, then TAKEOFF waypoint is elected as Home automatically.

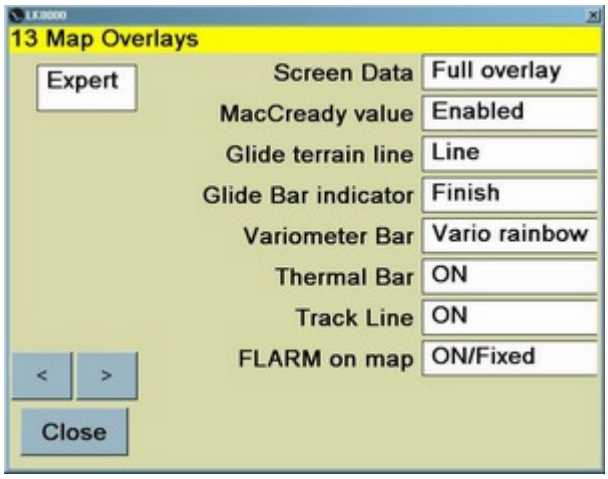
- Paragliders/Delta: Home waypoint is automatically assigned to takeoff, even if already existing. Thus, PGs should not assign an Home Waypoint since it is updated automatically.

TAKEOFF is never saved to history file and should not be used as a waypoint name

To manually assign a HOME, choose a waypoint and in its details pages go to the last one, where you can find "Set as Home". If you are on simulator, the position on map is instantly updated

Just in case it happens: if for any reason TAKEOFF is reset, it will appear very far away from you. Default position for a wrong takeoff location is at... Santa Claus home, at the North Pole.

Moving Map Overlays



In Config Menu 13, "Map Overlays" you can choose what to paint on the moving map.

Additional information can be added: depending on your screen size and resolution, all information or only part of it may be painted, in order to not clutter the screen too much.

You have full control on these overlays, and they can be enabled and disabled any time.

Let's start with an empty map, with all overlays off.

You only notice the purple airspace areas, and the destination to waypoint has a black bearing line.

Wind is displayed, if available in the bottom left, here it is indicated as --/-- .

MacCready Value **:** Enabled (0.0)

Vario : enabled Rainbow (painted with no values in the picture, and thus no colors).

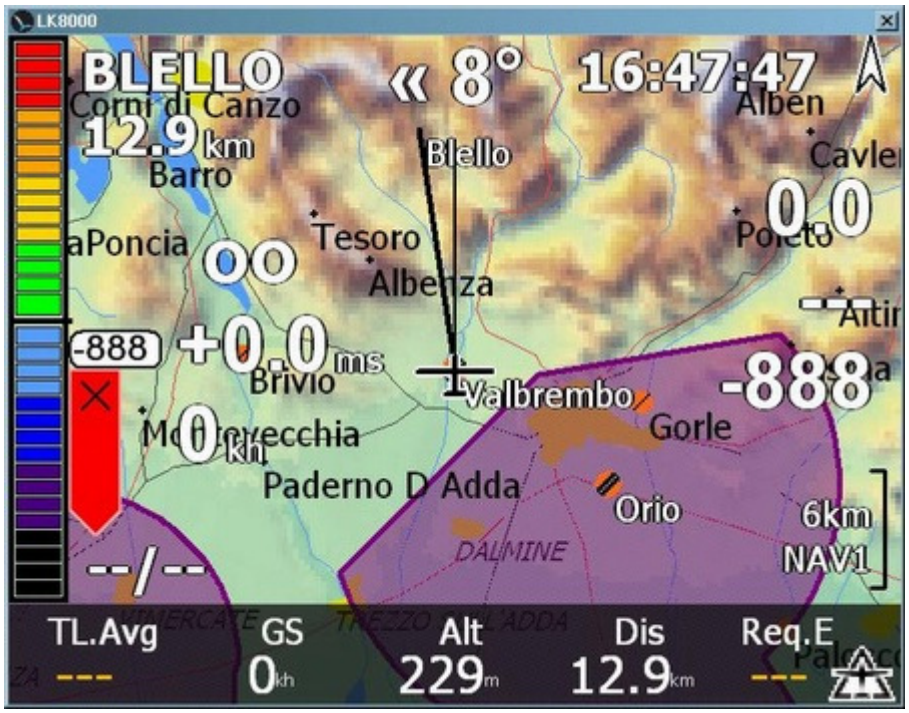
Track line : ON
The track line works only in trackup mode, not in North up. It is showing the heading direction of your aircraft as a thin black link. In the picture it is pointing to N.

Added Glide Bar Indicator, the red bar on the left.

Screen Data: Half Overlay

Adding destination waypoint name and distance on top left, bearing difference on top center, Requested Glide Ratio and Arrival altitude on the **right** (under MC 0.0).

Paragliders/Delta: MC, Average Efficiency, Arrival Altitude



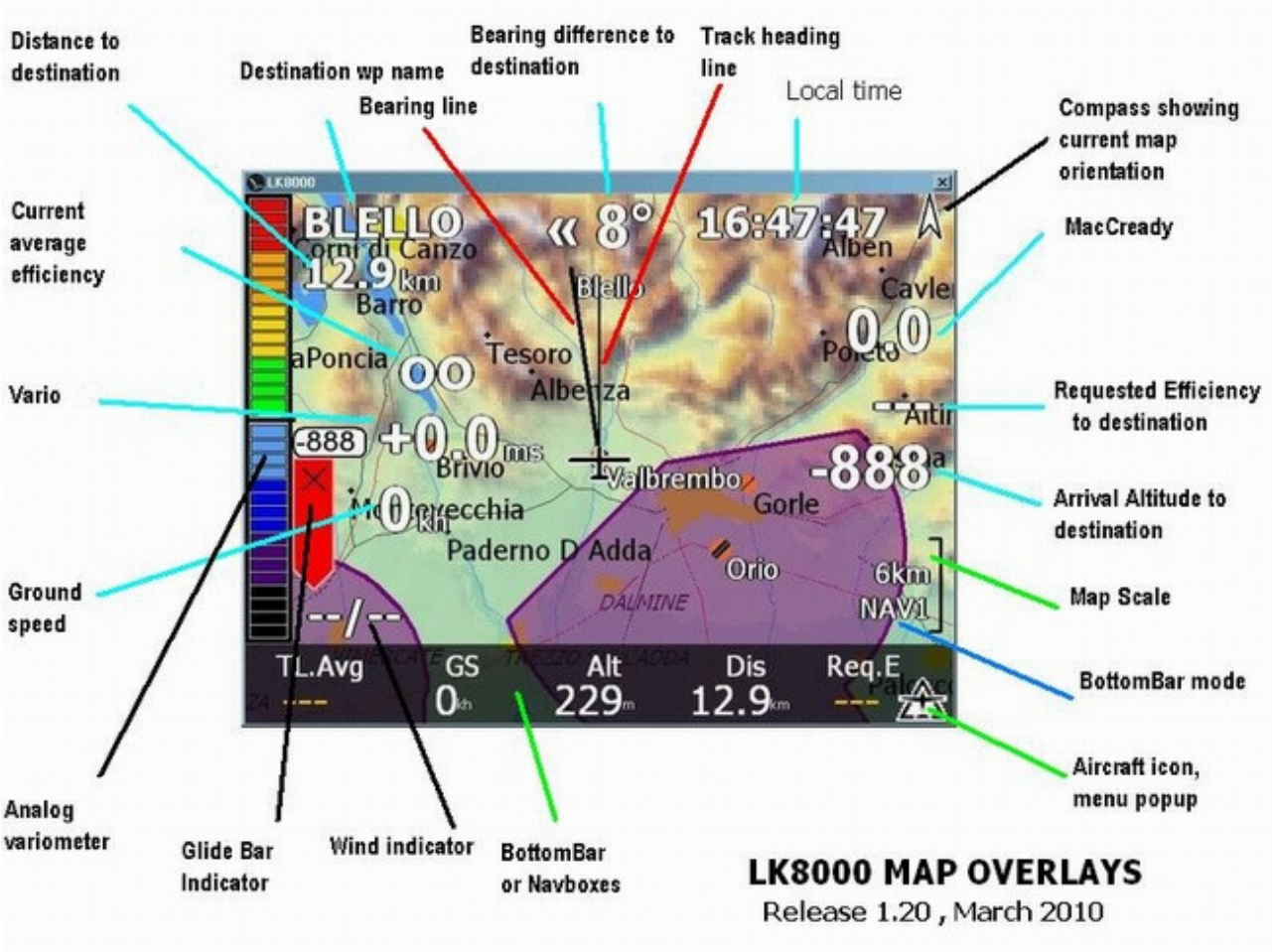
Screen Data : Full Overlay

Adding a clock, and three **values on the left** :

oo means "infinitum" (too high to display), and it is the average glide ratio.
Then we have the vario +0.0 ms.
And below, ground speed.

Paragliders/Delta: Altitude, Vario, Ground Speed

The LK8000 moving map is fully configurable, and you can customize it at best for your needs.



Note: this picture reflects Glider mode. Paragliders/Delta will have slightly different values as described in the previous page.

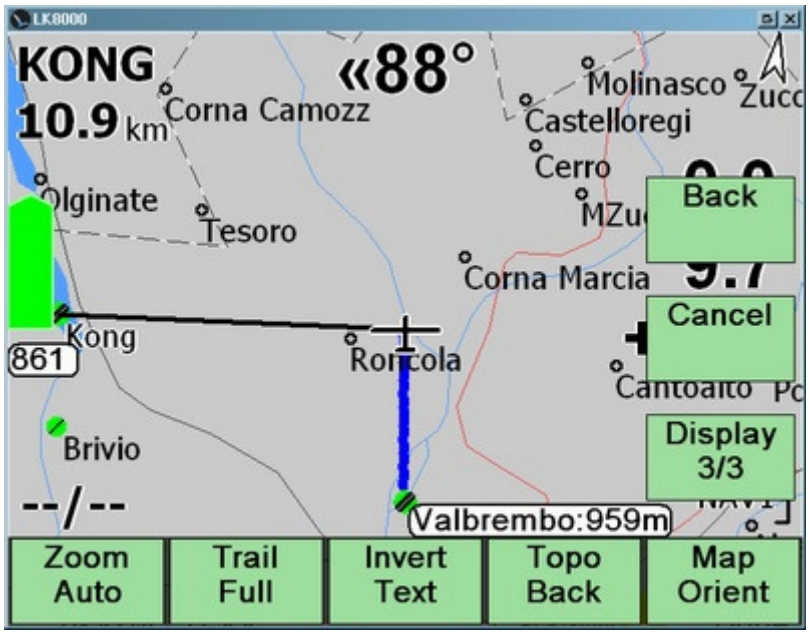
Map background color with no terrain

From Menu Display 1/3 you can on-the-fly enable and disable labels (only turnpoints: landables are always painted), topology and terrain.

When you disable terrain, or you haven't configured one, the map background color is the one which has been configured inside System Config Menu 4 "Terrain Display" , Empty mapcolor.
By default it is "LCD green".

With no terrain displayed, LK will use black overlays on light backgrounds, and white overlays on dark backgrounds, to achieve the best possible screen contrast.

So in this example, the LCD green background has automatically forced a black color for overlays. With the dark grey background, all values are painted white.



From Menu Display 3/3 you can change in real time the background color, by clicking on the Topo Back button.

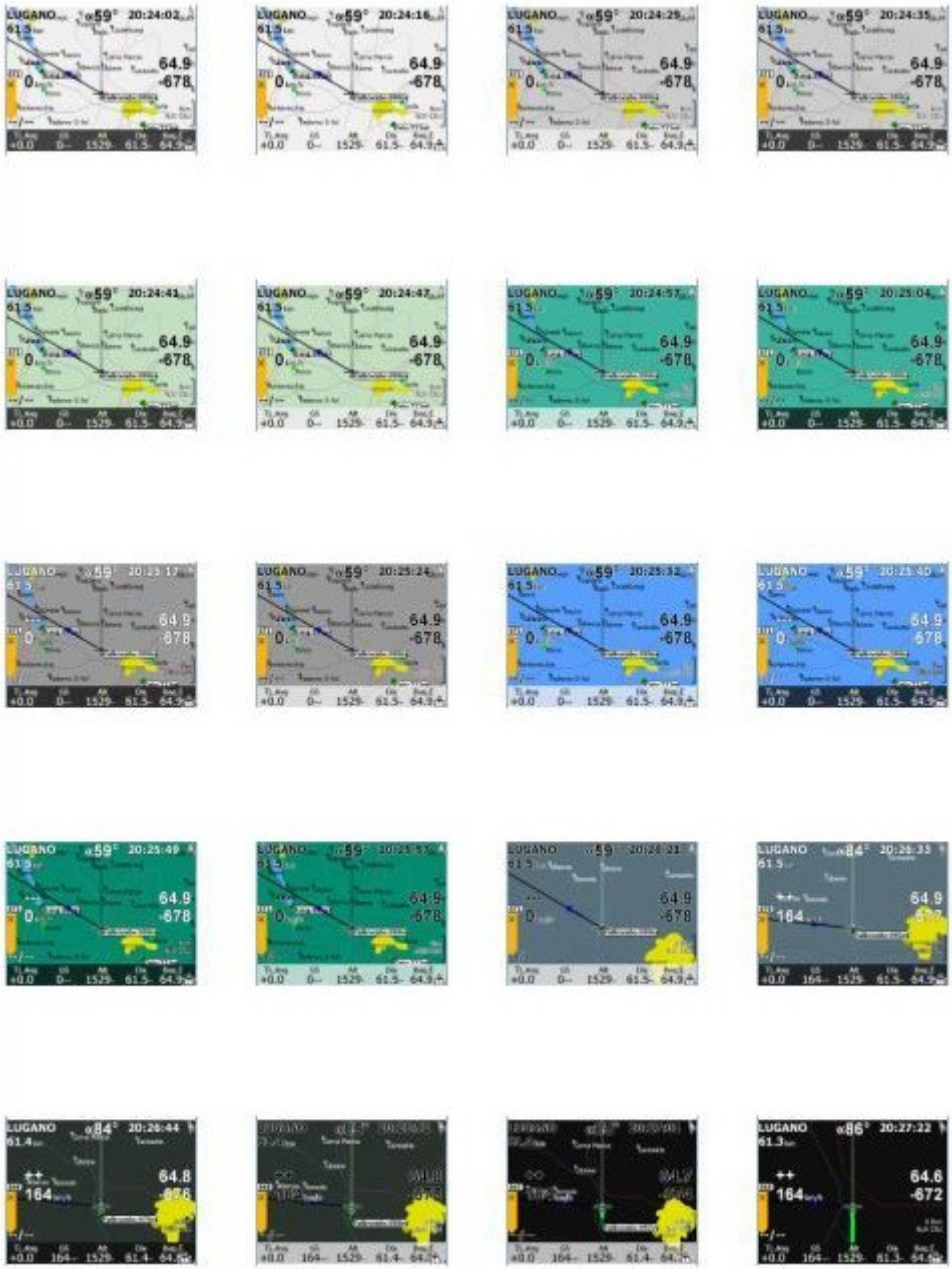
This button is enabled only when no terrain is displayed, otherwise you wouldn't notice any difference.

You will be able to toggle all colors, changing the best one for your current light conditions.

> *The background color is also used as background for the analog Variometer.*

At the same time, you can use the Invert Text button, to reverse screen. With topology only, it will reverse the BottomBar color, and at the same time attempt to change overlays again.

There are a lot of possible combinations, for all kind of light conditions, and it is very easy to change them and experiment also during the flight.



The Snail Trail

While you are flying, a snail-trail will display on the moving map your trace. Below 3km zoom this trace is colored, otherwise it is painted blue for better visibility.

Colors are showing lifts and sinks in the air.

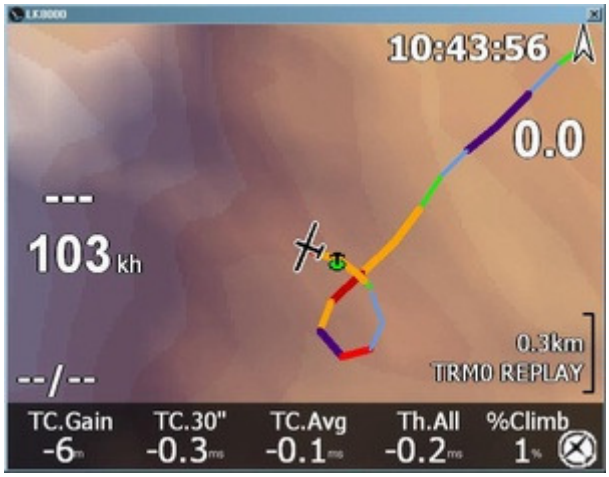
- For Gliders, netto vario (either real or estimated) is used for calculating lifts and sinks.
- For paragliders and delta, the vario (either real or calculated) is otherwise used.

Green yellow and red are showing positive air mass.

Blue, violet and black are showing sinks.

On a ridge, it is thus easy to spot good points for turning.

With an higher zoom level, colors would simply melt on the little moving map screen, so they are not used. A blue line will be visible much better.



As soon as you enter a thermal, display is switched to thermal mode with a different zoom level, and colors are shown.

During thermalling, even if you zoom out a lot, colors are always painted.

The snailtrail can be customized in width and length inside System Config menu 3.

During the flight you can dynamically change the trail size using the Trail button inside menu DISPLAY 3.3 . Short, Long, Full and Off are available in sequence. The "Full" option will **not** display the whole flight, only the last hour or so.

Estimated IAS, NettoVario and Speed To Fly explained

Most of us do not have a IAS sensor connected to the LK8000, nor accelerometers. We simply have a ground speed and hopefully a barometric altitude.

Nevertheless LK8000 will try to estimate the indicated air speed you are reading on the analog airspeed indicator.

To do so, ground speed is corrected for the wind, and then it is compensated for the air density at your current altitude.

NettoVario is assuming that you have such an IAS while looking at your glider's sink rate. This sink rate is then added to the current vario value. If you are sinking at 1.4m/s at 100kmh on a DG300, for example, the netto will be -1.4m/s + 0.6m/s = -0.8m/s .

No TE (Total Energy) is estimated, so if you pull up or push down the estimated Netto will be more wrong.

Normally you don't have a vario available as well. So we calculate this value using the altitude difference during time. If you have no barometric altitude, GPS altitude will be used. The latter is not that accurate.

Vario this way is not only inaccurate, but most importantly it is 1 to 2 seconds late because it is based on an altitude measured in the past seconds.

The estimated Netto Vario is thus good only for the snail trail and for minor internal calculations, and you should not count on it for anything else.

The Speed To Fly reflects the Netto Vario problematics.

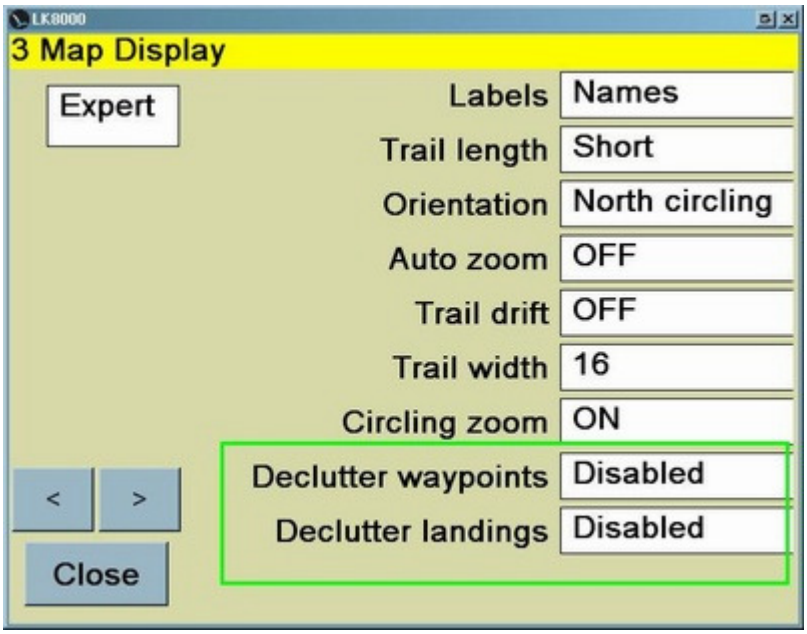
IntelliMap Labels

A common problem on moving map display is that the screen is covered with waypoint labels.
At low zoom level the map is plain unreadable being covered of symbols and names.
LK8000 has a new waypoint labelling approach called IntelliMap, which will paint important labels first, and avoid to paint unnecessary informations.

Moreover, waypoints can be painted differently and on inverted colors. Depending on the screen size and brightness, and how far the device is positioned from the pilot, it is possible to choose the best combination of parameters to let informations be always visible.

First of all, ordinary turnpoints are displayed up to 13km zoom, and landable waypoints are displayed up to 23km zoom. Over this zoom level, no waypoints are painted at all.

IntelliMap can be partially enabled or totally disabled, depending on two configuration options inside system config menu 3 Map Display. It works independently on turnpoints and landables.



So let's look at some examples for Decluttering waypoints. We have many waypoints available, since we mapped all of our mountain tops. Now decluttering gives this result:

Declutter waypoints: Disabled

With no decluttering the map is just unreadable.

You should never disable decluttering if you have many waypoints!

Declutter waypoints: Low

Waypoint labels are painted only if not overwriting another label, and leaving enough space to make them both readable. Zooming in, as in the second picture at 5Km, will result in displaying more details.

Declutter waypoints: High

High decluttering will check that labels are separated by even more space, and thus some of them are not painted at all.

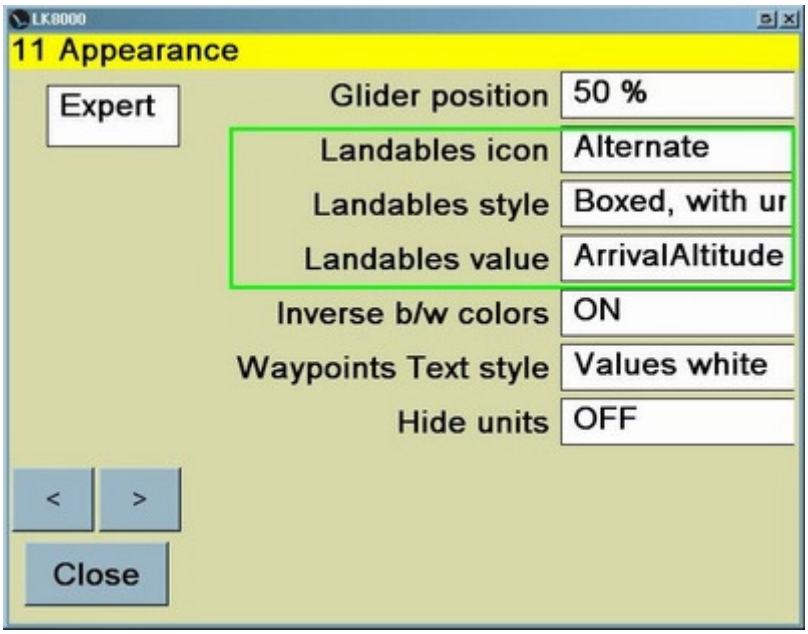
You will need to zoom in further in order to view more details.

Landables and decluttering

Landables' symbols are always painted on the map, with no exceptions.

> *Outlandings and Airfields/Airports have slightly different symbols, but they are always painted with the same color: orange for unreachable waypoint, green for reachable waypoint.*

You can change the landable's symbols inside System Config menu 11 Appearance. By default LK is using the Alternate symbols which are visible in these pictures.

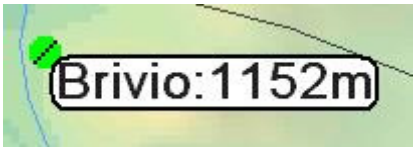


A landable waypoint is painted with or wihout a box around, together with a value.

This value can be an Arrival Altitude or the Requested Efficiency, at your choice.

You can choose it inside Appearance menu as well, in "Landables Value".

Landables' styles and values



Style Boxed
Value Arrival Altitude

Style Unboxed
Value Arrival Altitude
Text Style Values white

Style Unboxed
Value Arrival Altitude
Text Style All Black

Style Boxed
Value Efficiency

Declutter Landables: Disabled

With no decluttering, all landables fields are painted with their values.

In this example, with plenty of spare heigth we have a lot of landables that are visible.

The problem is that outlandings are painted together with airports, even if our arrival altitudes on airports is positive everywhere. So why painting also outlanding's values?

Declutter Landables: Low

Set decluttering Low, and no outlanding will be painted closed to airports if it is obvious that you have plenty of margins to get onto a real airfield.

Declutter Landables: High

High Decluttering will consider your altitude, your glide ratio, the number of airfields around, the arrival altitude over them, to decide what to paint. If you happen to be very high on ground - such as in this example - IntelliMap will not paint values almost at all . In this example only the Home airport is shown, since that's considered special being the place you want to come back to.

If you get lower on terrain, values will gradually be back visible.

Sometimes IntelliMap will choose to let you see on the map a particular place far away, to let you know you can make it over there, and five minutes later will let you notice another place which is becoming almost unreachable.

In other words, if there is nothing really important to be shown on map, IntelliMap will try to find for you more interesting things than obvious places, concerning landables.

Beyond colors and numbers

A landing icon (or symbol) can be green or red-orange, showing the arrival altitude or the requested efficiency.

Colors and numbers are both important. You may have a positive arrival altitude, but an orange icon because of terrain obstacles, or because the glide ratio at the same time is telling to the LK8000 that something is not good and it is better to be cautious.

You must understand that estimations are just guesses, and that <u>you</u> are supposed to interpret colors and values and <u>then</u> take a decision. You <u>must</u> - and we repeat it again: you must - perfectly <u>know</u> <u>how</u> these estimations are calculated.

So read the following pages very carefully.

Arrival Altitude Explanation

Some pilots prefer to use the "Requested Efficiency" value to estimate their glide path to destination. Some other pilots just love to read the altitude arrival value.
There's a very important difference between Requested Efficiency and Arrival Altitude.

Requested Efficiency is a geometric value based on your altitude and the distance to the waypoint. This is a pure and simple absolute number, and the pilot will judge by himself if it is a good or bad value for his aircraft, for the wind conditions, for the weather conditions etc.
Requested Efficiency for landing point does take into account safety altitude of course, but does not take into account the wind. When it is windy, your rEff will remain the same, only your real efficiency will change. You will judge the value.

Arrival altitude on the contrary is **estimated** with complicated calculations, taking into account your glider's polar, the wind, and your MC settings. It is important to understand that an estimation is only a guess, and that it is additionally using your own guessing on MC setting.

It is thus always a good idea to keep an eye also on Requested Efficiency, and let your brain compute the glide path's quality estimation.

Here are some explanations on how Arrival Altitude is calculated.

- **SafetyAltitude** is used for landables and optionally for all turnpoints, depending on how you configured it in System config menu 6.

- Landables use current **MC** only if it is greater than **safetyMC** (this means that you have configured a faster speed), otherwise SafetyMC.

> *Landables are thus always using at least safetyMC or more.*

> *Landables do always use safety altitude.*

- **Tsk values** and **Turnpoints** are all calculated with current MC and optionally safetyaltitude.

- **Wind** is used for all calculations.

- NO totaly energy (aka speed compensation) is used. So you normally have some more margins if you are flying at a high speed. However, LK8000 considers total energy an extra safety margin, deliberately. No optimistic estimations.

> *If you are running a task, it is better not to use an existing Landing point as a turnpoint, because calculations will use safetyaltitude and values will be confused. Create a dedicated turnpoint for it.*

Obstacles and Red Crosses on the moving map

If you have configured "**Glide Terrain**" as either **Line** or **Shade** inside Config Menu 13 "**Map Overlays**", then obstacles are painted on the moving map.

> *Obstacle calculation works only during flight and not on ground. In SIM mode it is working also on ground.*

If a destination cannot be reached being out of current glide range, there is no need to paint obstacles because you simply cannot glide that far. Arrival altitude is negative, and you know that you need to climb.

In this screenshot we are 50km away from an airport.

1829 QNH, 40 LD request to get there. With a DG300, -77m are missing for a glide with no obstacles.
The Alps are blocking the glide. Since we are not in glide range, nothing special on the map.

If a destination IS WITHIN GLIDE RANGE, and one or more obstacles are detected, arrival altitude is painted RED, as well as required glide ratio, in map overlays.

Now at 1929m QNH we are theoretically within glide range, with +23m altitude arrival. However, mountains are a big obstacle.
LD and Arrival altitude are painted RED, to give a warning that in spite of the positive values, there are problems to proceed. The bearing line has two red crosses.
First red cross is marking the very first obstacle we shall meet. 44 meters are missing to pass the obstacle. That 44 number is telling us that it is probably a steep mountain, otherwise it could be a lower number, or no number at all, only a cross

The second number is telling us that in order to make it to the destination, we need about 1250m. That's a lot for a 50km glide, but the mountains are pretty high there. We are assuming a MC0 to the obstacle, since we have set MC 0.0 .

Now at 3129m QNH we know that we are still missing something to get through.

At these distances, values are approximated so rounding errors in calculations may lead to discrepancies between first and last obstacles.

But since we are calculating using a guessed MC, as well, it is not that important.

And finally at 3329m we have **green icon**, as predicted. We shall arrive 1423m over the destination, at MC0.

Notes on Obstacle calculation

If the far obstacle can be painted in current map (zoom issue) then it is painted with the real altitude difference needed to arrive over the obstacle. If the altitude difference is not painted, then this number is less than 50m and you are still far away from obstacles. This number in fact is rounded with 50m precision.

Then the first obstacle is painted with a red cross too, and the arrival difference is written only if meaningful.

When you are near obstacles, less than 5km away, the altitude difference is shown even if showing only a few meters.

ALL CALCULATIONS on obstacles consider safetyMC, depending on how you set it.
So if you are gliding towards a landable place, SafetyMC will apply. If you are gliding towards a non landable WP, and you have chosen to use SafetyMC only for landables, then current MC will be used. Read this twice..it is important.

Arrival altitude over obstacles ALWAYS considers Safety Terrain Height.

BestAlternate

BestAlternate function is always active and it is constantly trying to **guess the best landing** option from your current position, using waypoints in memory that are marked as landables, and using the terrain data - if available - to calculate obstacles.

The "bestlanding option" is NOT necessarily the closest! It is normally the home airfield, to begin. Or another airport where we can be towed or winched. An outlanding is never preferred to an airfield. All of this considering glide ratio, wind, obstacles and - very important - with large safety margins. Expecially if you are flying in the mountains, the BestAlternate will constantly keep en eye around for you, suggesting in advance a gateway to a safe landing.

A new search is made every minute (60 seconds). On PC version every 10 seconds.

During those 60 seconds the information displayed inside infopages and bottombar is updated in real time with the current required glide ratio and arrival altitude to the destination, just like an Alternate.

> *In other words: the selection of BestAlternate is made every minute, but the values concerning the current best are updated in real time.*

When the BestAlternate has changed, a bell is played and a message appears on the screen:

Unless you have disabled all sounds in LK, or have disabled Warnings for the BestAlternate, there are two sounds you should take care of, announcing a message on screen:

- a soft bell sound announcing that the landing target has changed
- a double alert "croak" sound announcing that you are under a safe glide for the closest known landing place, or that there are no landing places around at all!

<u>These sounds will play **only** if you are at least 250 meters over the safety altitude.</u>

If you set for example 300m as Safety altitude over an airport, then below 550m there will be NO sounds at all. We assume that the pilot knows he is in trouble at that height, or that he is simply landing, or taking off.

How does the BestAlternate "think" ?

BestAlternate tries to be smart selecting the best choice, just like you would do during the flight.

1. LK8000 looks around, getting a preliminary list of landing points within your gliders best LD, minus the SAFETY altitude.

   > *Example: you are at 1300mH, safetyaltitude is 300m, your glider has best LD=40, search range is 1000m*40 = 40km. The distance is approximate in this phase. In any case, this search is limited to 100KM.*

   Notice that if you are over 100km away from the nearest landing point you can't really expect a computer to be helpful in case of troubles. You are the pilot! BestAlternate is only a suggestion, and it may fail drastically for many reasons, such as: an incorrect terrain data, an incorrect QNH reading, an incorrect waypoint list, etc.

2. For each landing point LK8000 calculates the estimated altitude arrival, taking into account:

   - your current altitude
   - the landing point altitude + SAFETY Arrival Height (configured in system menu 6 "Safety Factors")
   - your glider Polar, bugs and ballast
   - a glide at MacCready set to SafetyMC (configured in system menu 6 "Safety Factors") (otherwise at MC=0. It is suggested to set 0.5 as a safety factor there).
   - current wind
   - terrain obstacles

3. Even if we already use a SAFETY arrival height and a safety glide at an higher MC, we still can't accept an arrival 1m over safety. That is 2m away from being unreachable! So we higher this value to 100m. So we select only those landing points that have an Arrival Height 100m over Safety altitude. This is an additional safety margin called "OverSafety".

4. We sort this list, from the best (the highest arrival altitude available) to the worst, ALL of them passing point 1) 2) and 3). All of them are good, and all of them are considered "Reachables".

5. For each reachable landing point in this list, we calculate the required LD. (wind was taken into account at point 2, remember). We filter out all reachable points that have an LD over (bestLD-30%).

   > *Example: for a glider that has best LD=40, this safety margin is 28. We call this margin SafeLD.*

We now choose the BestAlternate from this list:

a. If Home Waypoint is in this list with a Safe LD, we choose HOME.
b. If no home, we look for a Safe LD "Preferred". (see later for "Preferred").
c. If no home and no preferred, we choose the best SafeLD Airport available.
d. If no airport either with a safeLD, then we look for a good outlanding, with SafeLD of course.
e. If nothing with a SafeLD was found, then we get the best Reachable suggested at point 4).
f. If still no luck, we shall use a Reachable without the OverSafety (those 100m extra arrival margin).

g. And finally, if everything so far has failed, and we don't even have anything close to be selected, even if unreachable, then we keep the old BestAlternate.. But it will show "---" since not reachable at all.

That's all for the selection criteria. Now how do you set a "preferred"?
Go inside the _Waypoints subfolder in the LK8000 directory, and edit the WAYNOTES.TXT file.

Think in advance!

You have been sinking for the last minutes, and probably lost too much altitude. There was a gateway to the bestalternate until 2 minutes ago, but now it seems too late to turn back for it.
The situation does not look that critical, though. Until this message appears on the screen:

Now you know that straight flight won't get you anymore to that outlanding, and you may be in troubles.

Think in advance! Do not let this message ever appear on your screen.

> *The BestAlternate function is not available for Paragliders/Delta, even if they configured landable waypoints.*

Takeoff and Landing detection

Since some functions are only available while the aircraft is on ground - for example the auto QFE reset, access to Profiles, configuration of FLARM, etc. - it is important to understand how the takeoff is detected, and how the landing is detected.

Moreover, the internal logger will automatically start logging, if configured to do so, at takeoff, and stop logging after landing.

For gliders:

- Takeoff is detected when above 40 km/h for at least 10 seconds
- Landing is detected when below 40 Km/h for at least 60 seconds , at less than 300m AGL

For paragliders:

- Takeoff is detected when above 5 km/h for at least 10 seconds
- Landing is detected when below 5 Km/h for at least 10 minutes
- Landing is forced when Logger is stopped while speed is below 5kmh

.

Battery Manager v1

On PNA/PDA version (not on PC version) battery is constantly checked automatically and warnings are given about its status.

- If you plug/unplug the external power supply, a message is given on screen immediately

Following messages are given only once, and at least after 5 minutes have passed since the last warning, if:

- Battery status changed from discharging to charging
- Battery is 100% charged
- Battery discharge is at 30%
- Battery discharge is at 20%
- Battery discharge is at 10% : warnings are repeated every 2 minutes
- Battery discharge is at 5% : warnings are repeated every minute, with additional CROAK sound (there are no frogs aboard, it's your LK!)

Battery manager is NOT operative in the first 30 seconds after startup. This is needed to let the internal battery settle its charge. Thus, if you plug/unplug power supply during this initial period of time, no messages will appear.

> *The "Battery is charging" message is given only if the battery is REALLY recharging.*
> *If you have plugged power supply, but the battery does not charge, there are either problems with power supply (example: HP314 not receiving enough current) or with the battery itself, which could be exhausted.*

These messages are related to the internal PDA or PNA battery, not to external devices. You may look at external device's battery status through xBatt1 and xBatt2 information.

Save and Load Profiles

LK8000 at startup is looking inside **_Configuration** subdirectory for a **DEFAULT_PROFILE.prf** file and other .prf files. If there are NO profiles, then factory defaults are loaded: LK8000 is reset to zero configuration.

> *This is a good approach if you want to reset configuration because something is not working: remove all profiles from _Configuration after exiting LK8000. Then run LK8000.*

On exit, LK8000 is saving current configuration in memory to the DEFAULT_PROFILE.prf , all the times.

> *Even if you have loaded a different profile on startup, the DEFAULT_PROFILE on exit will ALWAYS remember what was the latest configuration in use, with no exceptions.*

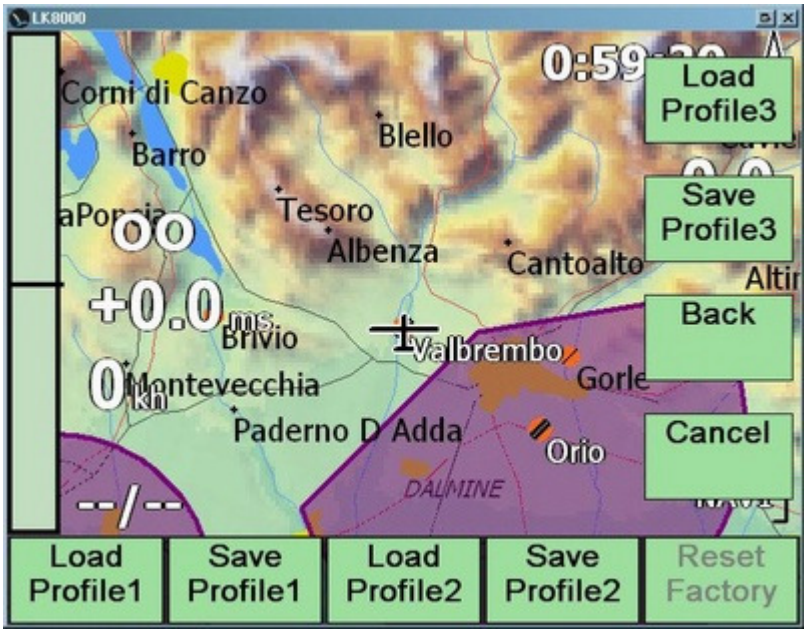
If on startup only DEFAULT_PROFILE.prf is found, and NO other profiles, then it is the only choice and it is loaded without asking anything to you.

If on startup there are 2 or more profiles available, then it will ask you to choose one. Remember that no matter what you load, on exit DEFAULT_PROFILE is saved back with current choices.

Please understand the following: a profile contains information about screen settings that are device specific. You **cannot copy** a profile from a PDA to another PDA, to PC, to PNA or whatever else device because each profile belongs to the device it was generated for! LK8000 can't know if you have copied a profile from another device, and it will assume that what's inside is good all the way. Screen will be probably unreadable.

> *It is never a good idea to exchange profiles between different devices.*

When you want to save a particular setting to another profile, in order to be able to load it back later, go to **MENU CONFIG 3.3** Profiles and choose **PROFILE1**, **PROFILE2** or **PROFILE3** .



You will be asked to confirm, and then a new PROFILE1.prf (or 2, or 3) will be created inside _Configuration.

> *Remember, again, that in any case on exit all settings will also be saved to DEFAULT_PROFILE.*

There are 3 profiles available for loading and saving, from within LK8000 CONFIG 3.3 Profiles. However, if you exit LK8000 and enter the _Configuration directory, you will be able to copy, rename, delete these profiles, and name them with more reasonable names such as "DG300.prf" , "CONDOR.prf" etc.

> *You can have as many profiles as you want. On startup, you will be asked to choose among them.*

Loading a profile from startup is the safest choice, however you can also load a profile from CONFIG 3.3 Profiles , with some limitations you should be aware of.

LOADING A PROFILE FROM CONFIG 3.3 Profiles menu does NOT grant you that all values are correctly shown inside Config System menu. If the current and new configuration differs in minor simple things then there will be no problems. Here the problem is that the profile you are loading is loaded OVER the old configuration currently in memory. It does NOT reset values that are not saved inside new profile, over old ones.

> *Bottom line: whenever possible, load your profiles only from startup.*

- Profiles menu in config 3.3 is NOT accessible during flight.
- It is not advisable to change/modify/edit profiles with a text editor.

> *Remember that while saving a profile, you are also saving settings inside ENGINEERING menu. If you are changing settings inside ENGINEERING menu (which is never a good thing) then you are aware of possible consequences.*

TrueWind Calculation v1

TrueWind lets you know wind speed and direction during a **straight glide**. Normally the wind is calculated and automatically set only during thermalling. While thermalling LK will still calculate and set the wind as before, as TrueWind is a user triggered optional function.

> *By "set the wind" we mean: adopt the calculated wind and let it be used by the software, appearing as the current wind. You can however just look at the TrueWind calculated values, and do not set them for real usage.*

Normally to calculate the wind direction and intensity during straight flight we need to know ground speed, ground course (track), air speed and air course (heading). This information is used to calculate the vector differences and results in wind direction and speed.

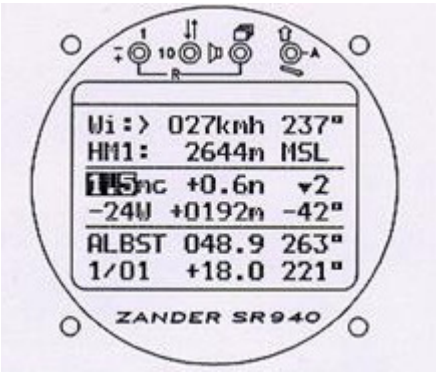
Problem is: LK8000 is running on PDA and PNA that in most of cases do not have Air speed information, and do not have a digital compass to tell your real heading.

If you have an air speed sensor, such as a pitot, reporting IAS or TAS, it will be used to make more accurate calculations. TrueWind v1 will not benefit from a digital compass at this time.

So how does it work, how is it possible to calculate the wind without knowing IAS or TAS and heading? With a simple trick! We shall let the software know in advance what will be the air speed, and assume heading by ground course. That's it. (Paragliders and delta pilots may also need a bottle of Wild Turkey)

It is important that wind calculation does ***not*** require any action by the pilot before requesting for the result: LK8000 is always looking at what you are doing, and ready to compute the wind on demand remembering your last minute of flight, second by second.

TrueWind has proven to be very accurate both in simulations and in real flights. It is tolerant to inaccurate piloting, and even in turbulence can calculate valuable information.



Results during a real test flight with turbulence were matching the wind calculated by a Zander with digital compass, with only minor differences.

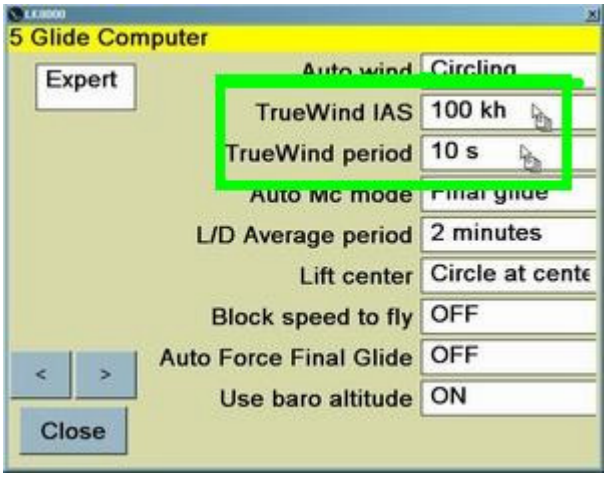
At the same time, since TrueWind was calculated after having just left a thermal, the circling-calculated wind was practically identical to TrueWind.

Later analysis on Naviter's SeeYou PC has shown matching results.

It does work! However, you should carefully read the following pages in order to understand how to configure and use TrueWind for best possible results.

TrueWind Configuration

Configuration is done once for all inside Config System menu 5 "Glide computer".



TrueWind IAS

The IAS box should be set to a reasonable glide speed you can keep with no problems going straight.

- By default this speed is 120kmh, or 64knots. You can change this value, but our advice is that you don't choose a slow speed because of difficulty to maintain it constant during turbulence. It is normally easier to keep a constant speed if your aircraft is flying fast.

- You are choosing the ***indicated air speed*** you shall read on your glider's speed indicator (anemometer), at any altitude.
- PARAGLIDERS should choose the Basic Speed ("Hands Up speed") of their wing. Check the basic speed for your wing at www.para2000.org

- You must stabilize your air speed to this value for a "TrueWind" period (some seconds really) during flight before asking for the TrueWind calculated.

TrueWind Period

The Period box lets you choose the amount of time, in seconds, you will be holding speed and heading during straight flight before asking for the wind to be calculated.

A value between 8 and 15 is normally OK. Suggested value is 10.

There is a "tolerance" to this time period, assuming that you couldn't keep track and speed constant enough. At least 70% of that "TrueWind period" must be satisfied, nevertheless.

Using TrueWind during flight

Now, while you are flying straight, in order to get TrueWind you need to follow 3 simple steps:

Step 1 : CHANGE YOUR HEADING

Change direction, and looking at your analog compass keep heading to either

0, 30, 60, 90, 120, 150, 210, 240, 300, 330 degrees.

These values are indicated on your aeronautical compass as

N 3 6 E 12 15 S 21 24 W 30 33

In practice, you have to keep a constant heading, and you should choose the best value you can keep under control on your aeronautical analog magnetic compass.

> *Choose the direction which better suits your current route. You will have to deviate direction, of course, but that's necessary only for a few seconds, and max deviation will be 15 degrees, as an average.*

Be precise, and follow your compass until you are heading to one of the "principal" directions.

Step 2 : CHANGE YOUR SPEED

Now that you are heading constantly, **stabilize your speed** to the TrueWind IAS that you have chosen in the configuration. When your speed is correct keep it and count up to 10 seconds depending on the period of time you have configured.

> *Don't worry if your speed is not exactly the chosen one, because LK8000 will be calculating your average speed during this period of time. Just do your best.*

Step 3 : PRESS BUTTONS AND GET THE WIND!

You are done! You have been heading constantly toward a "principal" compass direction, and you have been keeping the chosen indicated air for enough seconds.

Allright! Call Menu, and press TrueWind button.

Select the value you have been reading on your analog compass: there are only three buttons!

N S E W **3 12 21 30** **6 15 24 33**

You will be instantly given Wind speed and direction (from), and the Quality factor. You are asked if you want to use these values.

Press Yes and the wind will be updated and used by the software. Press No and it will be ignored. You can repeat the procedure if you think something went wrong.

TrueWind messages and Auto-Retry

If you did not keep heading and/or speed for enough time constantly, you will be told what's the problem. Don't give up! Keep flying straight, holding speed and direction: TrueWind will ***automatically*** retry to calculate the wind in the next **20 seconds**. As soon as there is enough data to calculate the wind, the message will ***automagically*** appear on screen

If you could not make it in the next 20 seconds too, then no error message is given. Better luck next time!

If there is a very strong wind that is making your ground direction very different from your compass reading, you will be told as well.

TrueWind Quality Result

A "Quality" of TrueWind is reported each time, based on how much you could satisfy the "TrueWind period".

For example, if you set 10 seconds TrueWind Period, which is the default, wind will be calculated even if you could keep constant speed and track for only 7 seconds, with a Quality of 70%.

Quality is considering "*ground speed quality*" and "*heading quality*" at the same time, for your information.

So if you could keep speed for 7 seconds, and heading for 9, quality will be 80%.

Accelerations and compass errors - very important!

You are flying straight, and you are ready to test the TrueWind for the first time. You only have to keep direction and speed constant, right? It does look easy.

You accomplish the first step choosing a plain East direction. Neat and big on your compass.
Your aircraft is now pointing to east, no doubts. And it is not rolling either: wonderful!

Now it's time for step 2: you want to stabilize the speed to -say- 100kmh.
You trim a bit the elevator, to get to your 100kmh , but all of a sudden something happens: your compass is not pointing to East anymore! It is actually turning. Ouch!

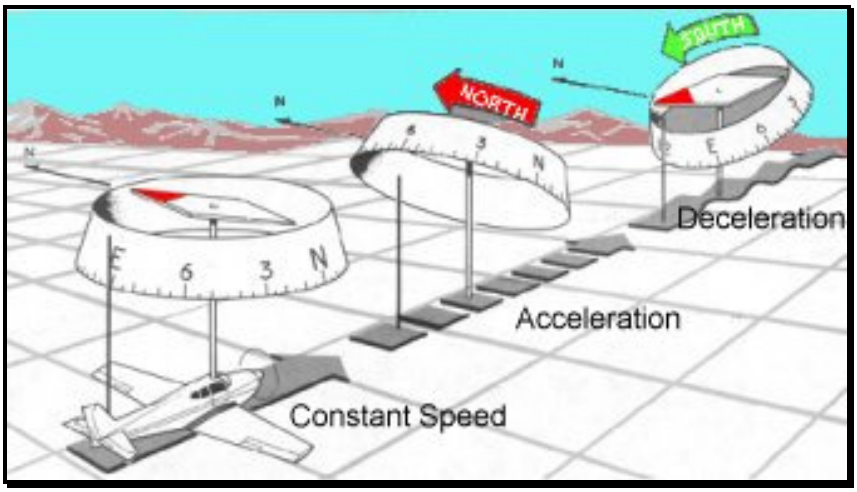
So you start back from step 1, and you have some problems this time because it looks like your compass is not working that well.but finally you manage to point East again.

Back to step 2, trim a bit... and OUCH, compass problem again: it is turning!

What's going on?

Mystery solved

Explanation from the web may help you in case you wonder what has happened.



(From pilot's web site)

The magnetic dip and the forces of inertia cause magnetic compass errors when accelerating and decelerating on Easterly and westerly headings. Because of the pendulous-type mounting, the aft end of the compass card is tilted upward when accelerating, and downward when decelerating during changes of airspeed. When accelerating on either an east or west heading , the error appears as a turn indication toward north. When decelerating on either of these headings, the compass indicates a turn toward south. The word "ANDS" (Acceleration-North/Deceleration-South) may help you to remember the acceleration error.

How to get along with acceleration errors on compass readouts

In two words: ignore them!
After Step 1, accomplish step 2 without bothering to look at the compass. Keep concentrated on the airspeed, instead. Assume that your compass is still reading OK, and it is not really turning.
Acceleration is making the compass turn if you are heading East or West, or nearby. But as you can verify by yourself, your aircraft is not really turning, is it?

Once you are satisfied with Step 1, level your roll angle and go for Step 2, and once Step 2 is over ask for results on Step 3. Do not look at the compass after Step 1, or you will go crazy.

North and South vs East and West

As you can understand from the previous explanation, your compass won't suffer too much while you accelerate towards N or S. This is making N and S direction easier to point to, looking at the compass. However any direction is OK, as long as you know how to get along with wrong compass readings.

How does it work?

How does the TrueWind know that you are heading north, for example, if you don't have a digital compass?

That is another trick, with some limits. Let's assume you have chosen "N E S W" button, trying to keep north on your compass.

We assume that if your ground track direction is 020 , you are trying to keep 000 , and you are drifted 20 degrees by the wind. Or, if your ground direction is 070, we assume you are keeping 090 (that is: EAST) on your compass.

However, if we read 045 ground course, it is not possible to know if you are heading N or E.
The "dead zone", or "uncertain" zone, ranges from 035 to 055 in this case. So, a course angle of 035-055, 125-145, 215-235 and 305-325 degrees is considered invalid. We cannot be sure about your heading intentions. That's of course valid in the case you have pressed "N E S W".

> *Wrong wind readouts? The principle cause does not depend on the pilot precision, because TrueWind will average values and correct and smooth errors. Instead, the main problem could be the calibration of your airspeed indicator and especially that of your analog compass. We can't do miracles in this case.*

TrueWind with an Air Speed Indicator connected

If you are lucky to have IAS/TAS being sent to LK8000, such as with Zander, Cambridge, LX, Digifly, Compeo, etc. then TrueWind will automatically use this IAS. You don't need to configure the TrueWind IAS in config system menu 5.

Just head correctly and keep a constant indicated air speed, whatever you like. But keep it constant!

TrueWind and Condor Simulator

LK8000 since version 1.20 has automatic wind setting, constantly updating internally the wind that Condor is sending through NMEA. Thus, you will always get correct wind in real time. No need to use TrueWind.

The TrueWind calculation is nevertheless available. Assuming you are doing tests on Condor to use TrueWind, you will need to keep speed and heading as usual, just like if you had no IAS available. LK8000 knows that you are using Condor, and if you are asking for TrueWind it will let you have it as in a real glider, with no cheating. You don't need to change device name.

TrueWind with a Delta or a Paraglider

Normally on a Delta or Para you don't have an analog compass, so you don't know your real heading. Some instruments such as Garmin 76S series do have an electronic compass available, but it is working only when correctly positioned otherwise it is giving random values. You may buy a good trekking compass, which is always a good idea also for navigation in case the GPS fails to work.

Airspeed is available on some instruments, such as Flytec, Compeo, Digifly, otherwise the best solution is to use the "Hands Up" speed and of course.. to put up your hands.

The basic trim speed for paraglider's wings - also for competition wings - is 39 km/h.

The TrueWind Period should be lowered to 8 seconds.

If you don't have either a good compass or the air speed indicator, or you can't keep Hands Up speed, then it is time to grasp that bottle of Wild Turkey we have been talking about a few pages back, and forget TrueWind.

Basic Settings: Barometric altitude and QNH

If your NMEA feed is providing barometric altitude, you should select it inside system config menu 5, "Use baro altitude" first. Your baro altitude will be at all effects used internally for navigation.

Baro altitude is really a pressure measurement, and it works the same as on wrist altimeters such as a Suunto or a Casio. Flarm, LX, Zander, Cambridge, etc. are all reporting the same altitude being based on digital pressure sensors.

This altitude is relative to a certain pressure assumed on Mean Sea Level: **1013.25hPa** . It is called **Standard Pressure**, and any altitude relative to standard pressure is called **QNE**. Air spaces and air navigation are all relative to standard atmosphere, and thus they are all using standard pressure.
However, you know that pressure changes, and your altimeter needs to be calibrated before takeoff, regulating the pressure. Normally, you simply adjust the altitude to the correct known ground altitude, and the reference pressure inside the altimeter is set accordingly automatically. The new pressure is called **QNH**.

Now, from Config menu, Basic Settings you can change either the Altitude or the QNH.

You need a valid baro altitude available first, of course. And you normally do it once before takeoff. Adjust the altitude to the known correct ground altitude, and you will see that the QNH pressure is adjusted as well. During flight, you may ask your AFIS for QNH: change the QNH and your altitude will be recalibrated.

Automatic QNH and QFE

QNH auto calibration

LK will try to guess and set automagically your QNH (your Altitude, really) at startup.
Don't be surprised if your QNH seems good without having regulated anything!

Let's call it QNH auto-calibration. It works only if:

- you have an incoming barometric altitude from a vario of course
- you have a valid GPS fix
- you have configured terrain data and you are standing on a known terrain
- you are not moving
- it is the first time attempting to adjust automatically QNH (i.e.: NOT after landing)
- you haven't changed QNH yourself yet: of course LK will not change your settings.

The first attempt requires a valid GPS fix. LK will look at your position immediately, and if you are close to your home airport (<2km from your home airport waypoint position) then your Home waypoint altitude will be used. We are assuming here that you have set a very correct known altitude for home! In this case, the baro pressure will be set in order to match the home airport altitude. This is the best possible guess.

Otherwise, LK will try to use the terrain (approximated) altitude at your position , which normally requires further manual adjusting in Basic Settings because terrain is never exact being an average of an area.

QFE auto calibration

QFE is using either GPS altitude, or BARO altitude if selected. QFE is **reset automatically** to 0 while on ground.

It will NOT be reset to zero after landing.

> *LK is using a simple QFE approach, because it is not considering any pressure.*
> *It is basically an altitude offset which is fixed, and related either to GPS or BARO altitude.*
> *For this reason, changing QNH while airborn will **not** change QFE accordingly*

QFE manual reset

QFE can also be reset manually from CONFIG 3.3 menu button. You will be asked for confirmation.

Basic Settings: Wing Loading

Wing loading is the result of glider weight divided by wing's surface. While the wing area does not change, the weight for this calculation can change a lot giving as a result different wing loadings.

When you select a glider, or a WinPilot polar custom polar file, you are actually telling LK:

- what was the weight in use during tests for the polar flight, that gave following results
- what is the maximum water ballast you can load
- and what does the polar curve look like, for that default weight

In LK you can change the wing loading simply selecting a value in Basic Settings. Once set, the polar curve is shifted correctly. You don't need to change the polar itself!

> *It is very wrong to change the polar weight value, without recalculating also sink rates!*

Be careful: if you are using a WinPilot custom polar, you don't have any wing area value in there! So, no calculation of wing loading is possible, and thus in Basic Settings, no Wing Loading will be selectable.

To fix this problem, a new polar field is managed inside WinPilot polar file. See the example which is also inside the _Polar subdirectory .

LK8000 Polar file explanation

You can create your own polar file, which is based on WinPilot format. LK has an **optional additional field**, appended, for **Wing Area**.

Without wing area, you can't change wing loading in Basic Settings. Since the wing area of your glider is an easy to find, and a fixed parameter we strongly suggest that you add this additional parameter to the default WinPilot polar file. Wing area is in square meters.

> *Before explaining the format of a polar line, be sure to understand the following: a polar defines the sink rate of a glider at 3 different speeds, in order to provide later an interpolation for your current speed and determine the estimated sink rate.*
> *Whoever made the polar, has determined these values using a glider with a certain weight: this weight was normally without ballast and includes also the pilot's weight. It is easy to understand: you jump on your glider, and you fly away measuring sink rates. The weight matters a lot!*
> *It is also called "Dry All Up Weight" (Dry AUW), so you should not change the weight field unless you are actually creating from scratch your polar, measuring also sink rates!*

You can change the real gross weight of your glider (you+glider+parachute+whatever), ballast apart, simply changing in Basic Settings the wing loading. In that case, the polar is **shifted** correctly, and these sink rates are still valuable.

If you don't understand what we are talking about, then use a predefined polar and do not change anything inside Basic Settings.. (but probably you should ask a mate for some help about these things, as well!).

Winpilot Polar file example

All lines starting with a * are comments of course

- Field 1: Gross weight of the glider, excluding ballast, when the values were measured
- Field 2: Max ballast you can load (water). It will add wing loading, separately
- Field 3-4, 5-6, 7-8 are couples of speed, sink rate in km/h and m/s. These values are used to create an interpolated curve of sink rates.
- **Field 9: New and Optional!** Normally winpilot does not have this value. Put here at all cost the glider wing surface area in square meters (m2). If the polar curve you are using does not have this value, go on wikipedia to find the wing area for that glider and add it after a comma.

Here is the polar for a glider:

- that during test flight was weighting 330kg including pilot and everything
- that can load extra 90 liters of water ballast
- that at 75km/h has a sink rate of 0.7 m/s
- at 93 km/h of 0,74
- at 185 km/h sinks at 3.1 m/s
- and finally that has a wing surface of 10.6 m2.

```
330, 90,75.0,-0.7,93.0,-0.74, 185.00,-3.1,10.6
```

> *Thus, the polar was calculated with a default wing loading of 31.1 kg/m2.*

VisualGlide

VisualGlide draws on the map screen some arcs, each one representing a loss of height and a distance. It is triggered by VisualGlide menu button inside Menu Display 1.

The represented loss of height is in units of **100m** or **300ft** depending on the metrics you chose, and it is calculated based on your current glide ratio.

This screenshot is showing a real usage of VG during flight: you are about to leave terrain and mountain to cross a large lake!

How do you know how far is the next possible thermal point? How large is the lake? What will the height loss be, approximately, if you keep flying as in the past minutes?

The VisualGlide will let you know all of this information at a glance.

In the picture, we can immediately read the distance to the top of the next mountain after crossing the lake: it is after the third circle. On the second circle we read 7km, and on the 4th circle (not visible much in this shot) 14km. So each arc in this picture represents 3.5km.

Now we know that the top of "Mottarone" mountain is about 12km away.
We also know that, with the current glide ratio of 36 (see the big number of the left of map) we shall approximately lose something more than 300m of height.

If the glide ratio changes, those arcs are changed as well with their values.

A minute later, while we are on the downwind part of the mountain that we are leaving, our glide ratio falls down to 26. With this glide ratio we would loose 400m height to get to Mottarone, which is now 10km far.

The glide ratio in use is the average one, calculated on a selectable period of time (2 minutes by default).

VisualGlide limiters

Minimum glide ratio accepted is 1/4 of your best LD, and maximum glide ratio accepted is your best LD.

> *In other words, even if you fly with tail wind at 30% better than your best LD factor, VG will limit your glide to best LD anyway. This is because we want to paint a conservative value, without tail wind and/or energetic routes.*

On the contrary, if you are flying in a head wind or simply at a higher MC, VG will show your real glide ratio.

Please understand that the VisualGlide is only painting your current Glide Ratio on the moving map, without considering safety issues of any kind. If it is windy, and you change direction, remember that your glide ratio will be fully valuable only after the configured period of time for averaging.

VisualGlide does not account for wind! It simply uses the wind effect on your ground efficiency.

Visual glide can also be used to simply visualize distances on the map if you ignore the height values. Distances are an absolute value, and are always correctly scaled on your map.

Configuring LK8000 for Paragliding

The following configuration is a good example. But first of all:

- **select Aircraft Category: Paraglider in system config menu 7**
- **change from Basic to Expert menu**

2. Airspace
Use black Outline: Off

3. Map Display
Labels: Names
Trail Length: Short
Orientation: Track Up
Auto Zoom: Off
Trail Drift: Off
Trail Width: 8 to 14 (I use at 12)
Circling Zoom: On
Declutter waypoints: Low
Declutter landings: Low

4. Terrain
Terrain display: Off
Topology display: On
Empty mapcolor: * (LCD Green)

5. Glide Computer
Auto Wind: Circling
TrueWind IAS: 39kh
TrueWind Period: 8 s
Auto Mc mode: Both
L/D average period: 15 Seconds
Lift Center: Circle at Center
Block Speed to fly*: Off
Auto Force Final Glide*: Off
Nav by baro altitude: On

6. Safety Factors
Safety Alt. Mode: Landables and TurnPoints

7. Aircraft
Category: Paraglider/Delta
Type: Para EN A/DHV1, Para EN B/DHV12, Para EN C/DHV2, Para EN D/DHV23 or Para Competition, Delta USHPA 2, 3 , 4

8. Devices - Bräuniger Compeo, Flymaster F1, Digifly are supported by LK8000

Device A
Name: Flymaster F1, Compeo, Digifly (Device A is used for the external devices, if you don't have external device use Generic for the internal GPS)
Port: COM7
Baud: 57600

Device B
Name: Generic (use device B for the internal GPS, if you don't have internal GPS put the same of Device A)
Port: COM7
Baud: 57600
Geoid Altitude: On
Serial Mode: Normal or Polling (if you have problems with Normal mode)

9. Units
Aircaft/Wind Speed: Metric
Distance: Metric
Lift: M/S
Altitude: Meters
Task Speed: Metric

10. Interface
Safety Lock: Off
Menu Timeout: 16s
Text input Style: Keyboard
Virtual Keys: On
Iphone Gestures: Normal
Map Locking: On

11. Appearance
Glider Position: 50%
Landables Icons: Alternate
Landables Style: Boxed. with units
Landables value: Arrival Altitude
Inverse b/w colors: On
Waypoints text style: Values White
Hide Units: Off

12. Fonts

13. Map Overlays
Screen Data: Full Map Overlay
MacGready Value: Enabled
Glide Terrain line: Shade
Glide Bar indicator: Next Turnpoint
Variometer Bar: Vario Rainbow
Thermal Bar: Off
Track Line: Off
FLARM on map: Off

14. Task
Auto Advance: Auto
Start Type: Cylinder
Start Radius: 400m
Sector Type: Cylinder
Sector Radius: 400m
Finish Type: Cylinder
Sector Radius: 400m

15. Task Rules

16. Infobox cruise
1. Speed Dolphin
2. Home distance
3. Next ETE
4. Task Distance
5. Task Alt.Arrival
6. *Ext.Batt.Bank*
7. *Ext.Batt.1 Voltage*
8. *Ext.Batt.2 Voltage*

17. Infobox circling
1. Thermal Gain (or Average thermal strength)
2. Home distance
3. Next ETE
4. Task distance
5. Task Alt.Arrival
6. *Ext.Batt.Bank*
7. *Ext.Batt.1 Voltage*
8. *Ext.Batt.2 Voltage*

18. Infobox Final Glide
1. Speed Dolphin
2. Home distance
3. Next ETE
4. Task Distance
5. Task Alt.Arrival
6. *Ext.Batt.Bank*
7. *Ext.Batt.1 Voltage*
8. *Ext.Batt.2 Voltage*

19. Infobox Aux
1. Ext.Batt.Bank
2. Ext.Batt.1 Voltage
3. Ext.Batt.2 Voltage
4. Altitude QNH
5. Speed ground
6. *Next Waypoint*
7. *Wind Speed*
8. *MacCready Setting*

20. Logger
Time step cruise: 1s
Time step circling: 1s
Short File name: Off
Autologger: On

21. Waypoint Edit

22. System

Use GPS time: On
Autoback Light: On
Auto SoundVolume: On

23. Paragliders/Delta Specials

Circ. zoom Value: Standard
Cruize zoom: 4

[Courtesy of Sergio Silva]

Infobox Values

The following is a list of **new** infoboxes available only in LK8000 , and those that have **changed** from XCSoar 5.2.4. When you select an infobox from System Config menu 16,17,18,19 there's an Help button for each one with a complete description.

Code	Name	Description
IAS or eIAS	Airspeed IAS	Indicated Airspeed reported by a supported external intelligent vario. If no sensor is available, it is estimated using current wind and air density at current altitude. In this case it is entitled eIAS
TAS or eTAS	Airspeed TAS	True Airspeed reported by a supported external intelligent vario. If no sensor is available, it is estimated using current wind and air density at current altitude. In this case it is entitled eTAS
aAGL	Altern AGL	Altitude above ground level with units inverted: if you are using meters, than it will be in feet, if you are using feet than it will be in meters.
aAlt	Altern QNH	QNH altitude with units inverted: if you are using meters, than it will be in feet. If you are using feet than it will be in meters.
HBAR	Altitude BARO	This is the barometric altitude obtained from a GPS equipped with pressure sensor, or a supported external intelligent vario. If you have selected Use Baro Altitude in system config menu 5, then this altitude is also shown as QNH altitude, and used internally for all calculations.
HGPS	Altitude GPS	This is the altitude reported from the GPS. Depending on your GPS device it can be quite accurate or very wrong sometimes. Expecially if you are using a car navigator gps, the reported altitude can be very wrong during thermalling. If you have no Baro Altitude available, or you haven't selected it inside configu menu 5, then this GPS altitude is going to be used internally for all calculations. QNH altitude can use either GPS or Baro altitude. Normally you should use as main infobox the QNH altitude, because it will always tell you what is being used internally.
QFE	Altitude QFE	Automatic QFE. This altitude value is using GPS or Baro altitude and it is constantly reset to 0 on ground before taking off. After takeoff, it is no more reset automatically even if on ground. Changing QFE does not affect QNH calculations. QFE is not used for calculations, it is only a reference for the pilot.
Alt	Altitude QNH	This is the heigth above mean sea level reported by the GPS or by the Baro sensor (if pressure altitude is available and it selected to be used). It is the altitude used internally for all calculations. GPS altitude and Baro altitude infoboxes are available too. One of those two values is used for the QNH altitude. Use THIS altitude as MAIN reference, since this is the one being used by LK8000.

Battery	Battery	On PDA and PNA systems, this gives the percent battery capacity available. If ending with a C it means that the battery is under charge, if ending with a D it means that battery is discharging.
xBatt1 xBatt2	External Batteries	External device battery bank 1 and 2 voltages, if available.
xBank	External Battey Bank	External device battery bank in use, if available
FL	Flight Level	Altitude Flight Level indicator. FL is expressed in hundreds of feet. This indicator is using current altitude which is not necessarily barometric, and in any case not necessarily calculated on the standard atmosphere. In other words, it is not accurate and can be very wrong even by some hundreds feet! So use it as an approximated indicator.
Odom	Odometer	The distance made since takeoff, calculated each second, also while circling. This value is reset to zero at takeoff, and cannot be reset in any other way. This value is calculated just like if you were driving a car on a flat surface.
Req.E	Next Req.Efficiency	The required glide ratio to reach the next waypoint, given by the distance to next waypoint divided by the heigth required to arrive at the Safety Arrival Altitude. Over 199 and below 1 no value is shown. This is a pure geometric calculation, equal to Garmin, Naviter and most common other instruments.
NxtArr	Next Alt.Arrival	Arrival Altitude at the next waypoint altitude, calculated for current MacCready. It does not use Safety MC and does not use safety altitude unless it is a landing point, unless configured to do so.
Average	Aver	The distance made in the configured period of time, divided by the altitude lost since then. Negative values are shown as OO (infin) and indicate climbing cruise (heigth gain). Over 200 this value is shown as OO too. You can configure the period of averaging in the System Config menu. Suggested values for this configuration are 60, 90, 120. Lower values will be closed to Instant Efficiency, and higher values will be closed to Cruise efficiency (efficiency from the last thermal). Notice that the distance is NOT the straight line between your old an new position: it is exactly the distance you have made even in a zigzag glide. This value is not calculated while circling.

ADDENDUM

Version 1.20b released March 18th 2010

Zoom Out

Clicking on the upper left corner on the moving map screen will result in a zoom-out action for 20 seconds. After this time, zoom will be back to previous scale.

This was previously available only for paragliders.
Zoom out scales are different for gliders and para and cannot be adjusted.

In addition, during those 20 seconds of zoom out, you can click again on the upper left corner to dismiss the function and be immediately back to normal zoom.

Battery Warnings

Battery messages are now limited to a max of 30, not including those about critical conditions.
In case you have a faulty charging process, or a buggy device, this will solve an annoying problem of too many notifications.

ActiveMap

When map is active (ActiveMap ON) , short clicking on the map will result in selecting the nearest waypoint's details. This is the old beahaviour of LK8000, and it is still the default.

During flights, it is very difficult to select a waypoint by clicking on it on the map. Many pilots requested that this feature could be disabled, and Paragliders expecially requested the MapLock facility.

Disabling ActiveMap will no more select waypoints. Instead, if clicking on the upper half part of the map will result in zoom in, and clicking on lower part of the map will result in zoom out just like with Virtual Keys, but with a much faster response.

ActiveMap is still compatible and can be mixed with Virtual Keys and MapLock. However, using also virtual keys will require a very short click to obtain a zoom action. It is better to disable Virtual Keys while Active Map is not desired, and you prefer to have fast zoom in and zoom out expecially on PNA devices.

ActiveMap OFF will still allow you to select airspaces of course.

ActiveMap can be permanently enabled inside System Config menu 10 "Interface".
ActiveMap can also be temporarily enabled and disabled from Config menu 3/3.

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