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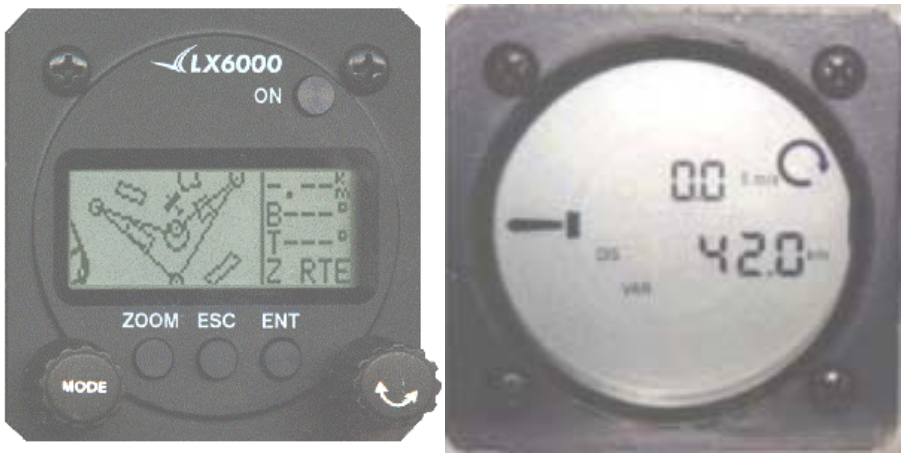
LX 6000 1.x

Variometer and GPS navigation system

preliminary version



March 2000

1 Index

2 Introduction

The LX 6000 is a high-quality variometer-system combined with GPS. It consists of two 57mm-norm devices. The system consists of two main groups:

- Calculator with controls and graphical matrix-display.
- LCD vario as variometer display, containing additional status-information (up to four additional indicators are possible)

A high speed of calculation, especially regarding graphics, is guaranteed by sophisticated microcontroller-technology. High-quality pressure-sensors which are temperature-compensated provide the necessary data for speed and altitude.

Main functions of the variometer:

-vario,netto, relative
-integrator
-speed command
-final glide path calculator
-electronical and TEK compensation

Navigation functions

-Jeppesen database containing airfields and airspace-structure
-600 turning points
-100 tasks consisting of up to ten TPs
-flight-statistics
-Near Airport function

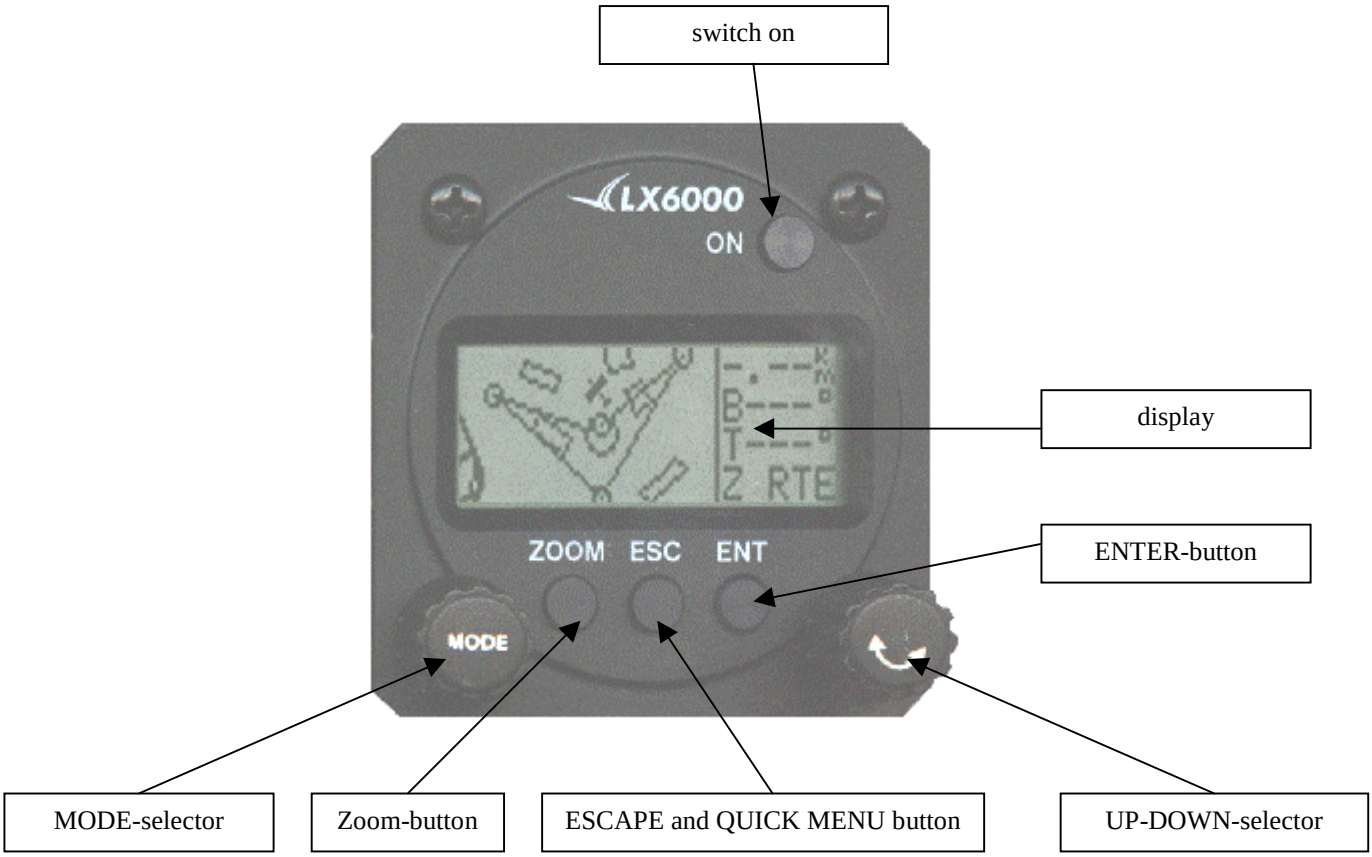
2.1 Technical data

-power supply: 8-16 VDC
-power consumption: ca. xmA
-dimensions: 2x 57mm normed housing, length (including connector): 220 mm
-NMEA interface
-12 channel GPS receiver
-external speaker
-fully compatible to LX 20 and Colibri
-logger functions according to IGC regulative, but not certified by FAI (without integrity)
-PC connector for data-transfer LX 6000 ↔ PC
-a number of LCD varios connectible (RS485 bus)

2.2 Controls

The calculator-device contains all control-elements, which are:
-two turn switches
-four push-buttons

The LCD-variometer display doesn`t contain any controls and is therefore a real “slave”-device.



2.2.1 Switch on

To switch on the device, press the ON-button. Now the display will show the current software-version and airspace-database. Following the input of current altitude (you **have to** input this value) and QNH (you don`t have to input QNH but you should because **without QNH-input now, the device won`t allow you to change QNH during flight!**) the display will show the main page.
For turning off the device you will have to enter QUICK MENU which is activated by pressing the ESC-button.

2.2.2 Mode-selector

The mode-selector is a turn switch which can be turned either clockwise or counter-clockwise. This switch`s got a **very high priority**. If you turn the mode-selector, the device will instantly leave the current mode and change to the newly chosen one, no matter in which mode it`s been working before.

2.2.3 UP/DOWN-selector

This turn switch is only active within a mode, which means it`s got a lower priority than the mode-selector. Its features are the following:

-changing sub-menus within one mode
-input-help for selecting and editing

2.2.4 ENTER-button

The ENTER-button is needed for activating sub-menus and to confirm your input while editing or selecting.

2.2.5 ESC/QM-button

This button`s got two functions:
It works as ESCAPE-button, i.e. you use it to leave sub-menus and change to a higher program-level or you confirm whole lines while editing.
While the device is working on the highest program-level, which means no sub-menu or edit-mode, the ESC-button activates QUICK MENU. In this menu the pilot can input parameters he often needs to change, like volume, ballast, Mc Cready..... You also need QUICK MENU to turn off the LX 6000.

2.2.6 ZOOM

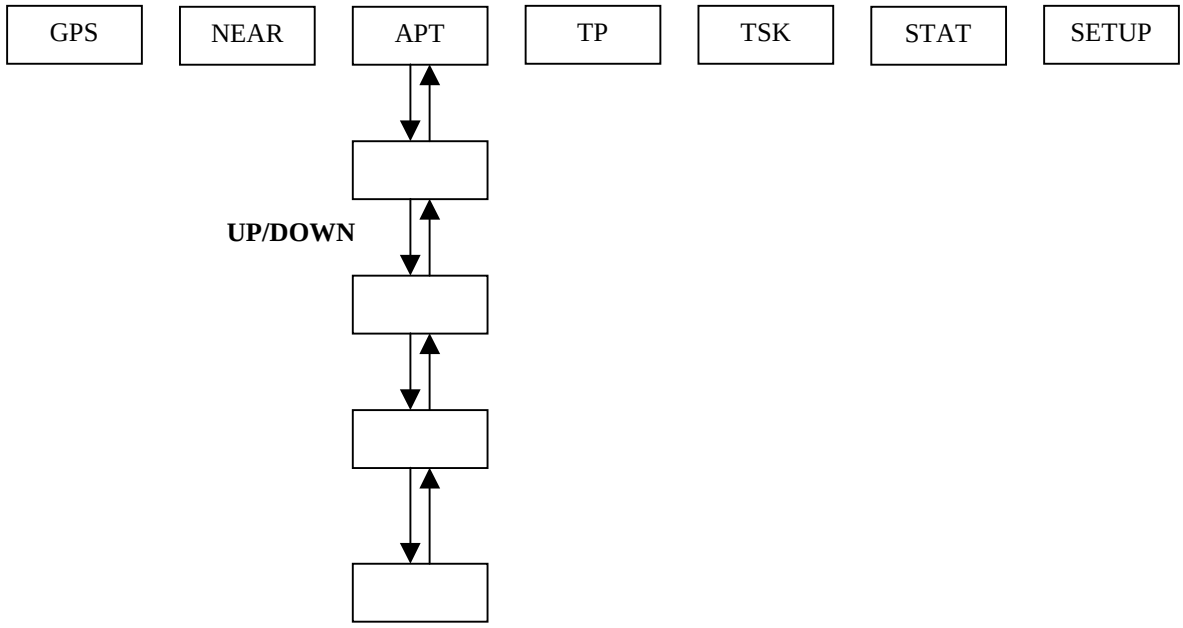
While on a graphics-page, this button activates the zoom-function. To change zoom, turn the UP/DOWN-selector.
Outside of graphical pages, this button`s got the following functions:

-displaying airfield-names in long format (12 characters instead of 8)
-backspace function for editing

3 Modes

The LX6000 features 7 different modes which can be selected by turning the mode-selector. To reduce active modes, the pilot can decide to run certain modes on “hidden pages”. These modes can be entered again via QUICK MENU.
This function allows the customer to adjust the device to his individual needs, therefore helps to make usage easier.

The diagram below shows a scheme of the menu-structure of the LX 6000. A complete “tree-structure” diagram can be found in chapter 6.



The navigation modes (APT,TP,TSK) have got sub-menus which can be selected by turning the UP/DOWN-selector.

MODES:

GPS: GPS-status-page, no inputs possible
NEAR: displays neighbouring airfields
APT: selection of and navigation to airfields
TP: selection of and navigation to turning points
TSK: selection of and navigation along tasks
STAT: flight-statistics during flight and log book on the ground

3.1 SETUP

The SETUP-mode is organized on two levels. There are settings which are needed quite often and which don`t change the system`s variables. These settings can be changed without a password.
You will need a password to change settings which affect basic settings of the system, like GPS earth date, units and so on. This password is equal for all of our devices. It is:

96990

After installation of the LX 6000 you should generally run the complete setup procedure to adjust all the specifical settings. All parameter-values you`ve set will be preserved after turning off the device, except QNH, of course. You can enter SETUP via the mode-key.
Notice: Normally you have to input the current altitude and QNH after turning on the device (also see chapter 4: Flying with LX 6000). If you only want to enter SETUP, you can flash-over these inputs by pressing ESC.

3.1.1 SETUP without password

These settings are often changed, also during flight. They don`t affect system parameters and therefore no password is necessary to change them.

Now you can select one of the various parameter settings which are described in the following:

3.1.1.1 QNH RES (QNH and reserve for final glide path)

The pilot can change these parameters during flight, if he has entered the current QNH value after turning on the LX 6000. If he hasn`t, he won`t be able to change QNH while flying.
Notice: If barometric pressure has changed since the device was switched on, the calculated altitude reserve for final glide path can be wrong.
Is neither altitude nor QNH set after turning on the LX 5000, the device will measure altitude with respect to 1013,2 hPa, which means the displayed altitudes are calculated as altitudes above this pressure-level!

Procedures:

-move the cursor on the field you want to change by turning the UP/DOWN-selector and press ENTER. -change the blinking character by turning the UP/DOWN-selector and press ENTER
-press ESC to confirm the whole line

You can change all the settings in the SETUP-menu this way. In our example, one can change the parameters in QNH RES, which are QNH, ALT and BUGS (worsening of your glide path due to insects etc. in %)

3.1.1.2 LOGGER

The LX 6000 contains a logger whose data-format is compliant to the IGC-regulative but which isn`t certified. This means the security key isn`t active. Nevertheless, the format is compatible with all programs which can deal with the IGC format.
Move the cursor to LOGGER and press ENTER. Now you can change the following settings:

FLIGHT INFO contains all important information about pilot, glider, registration, competition number class and observer. You can change all these settings by pressing enter and choosing the option EDIT. Naturally, this can also be done on your PC with the LXFAI-program.

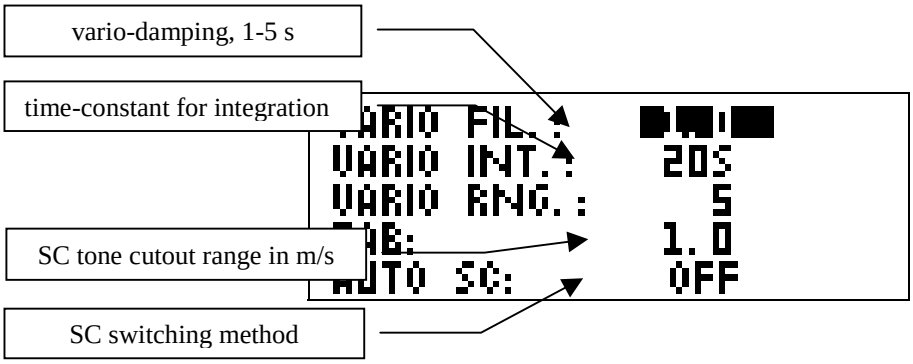
The VIEW-function can be used to have a quick look at the data. It dosen`t offer an EDIT-mode.

LOGTIME defines the sampling rate. The following settings are possible:

LOG.INT. defines the time-interval between two samples during “regular flight”.
NEAR TP defines the sampling rate near turning points, start and finish. You should choose shorter time intervals than for LOG INT to be sure to get a sample in the sectors turning points (start, finish).
TOT.MEM. displays the available capacity of memory, in our example 88,6 h. If you double the sampling rate, this capacity will be halved. As soon as the memory-capacity is exceeded, the device will start overwriting the oldest flights.

3.1.1.3 INIT

These settings define vario-damping factor, vario-range, vario integrator variable, speed command tone cutout range, switching-method between vario and speed command.



For switching between vario and speed command, the LX 6000 offers three choices:

-OFF: If you use an external key
-GPS: Activates vario if the GPS finds the glider circling via track
-SC activation depending on IAS (adjustible in 5 km/h steps from 100 to 169 km/h)

3.1.1.4 DISPLAY

The display`s contrast depends on the point of view. The pilot can adjust these settings individually via CONTRAST. The display`s also equipped with background-light which is turned on/off by an external switch (delivery contains switch).

3.1.1.5 TRANSFER

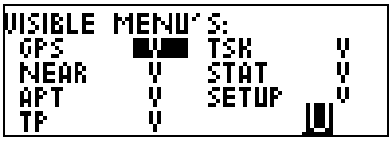
Activates data-transfer between LX 6000 and PC, LX 20 or Colibri. TRANSFER allows no inputs, the data-transfer is started by pressing ENTER.

3.1.1.6 PASSWORD

After input of the password 96990 further entries are possible (see “setup with paassword”,chapter 3.1.2).

3.1.1.7 QUICK MENU

The LX 6000 allows the pilot to run modes he doesn`t need on “hidden pages”. So he doesn`t have to scroll through all seven modes, but only throug the ones he`s activated.



When the device is delivered, **all modes are active**. It´s no problem to reactivate a hidden mode. Just press ESC on the highest program-level to enter QUICK MENU. There you can find all the deactivated modes. You can also change the following settings via QUICK MENU:

-volume
-Mc Cready
-ballast
-switch off

For more details also see chapter 4, “Flying with LX 6000”.

3.1.2 SETUP with password

After input of the password **96990** you can change the system`s variables and settings seldomly needed. This setup menu contains 14 options:

3.1.2.1 OBS.ZONE

Here you can define the procedures at turning points and the geometric forms of start- and finish-sector. The templates are pre-set configurations.

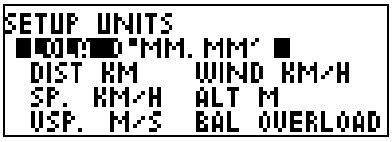
-FAI SECTOR: start, turning point: photosector according to FAI (90^0, 3km)
-500 m CYL.: 500 m cylinder
-LI/SEC/LI: start line (3 km), turning point (FAI sector), finish line (1km)

3.1.2.2 GPS

Here you set the difference between UTC (GPS-time) and local time.

3.1.2.3 UNITS

Nearly every combination of units can be individually chosen by the pilot:



-LO,LA: longitude and latitude in seconds (SS) or in decimal minutes
-DIST: distance in km, NM, ML (Stat. Mile)
-SP speed in km/h, Kts, MPH
-VSP vertical speed (vario) in m/s, Kts
-WIND wind-velocity in km/h, Kts, MPH
-ALT altitude in m, ft,
-BAL ballast as overload, kg/m^2, Lb/ft^2

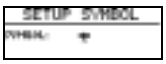
Overload is calculated by a simple term:

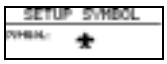
$$\text{overload} = \frac{\text{glider} + \text{pilot} + \text{ballast}}{\text{glider} + \text{pilot}}$$

If you fly without ballast, the value of overload will be 1.0.

3.1.2.4 SYMBOL

Defines the size of the plane-symbol on the graphics-display.





3.1.2.5 AIRSPACE

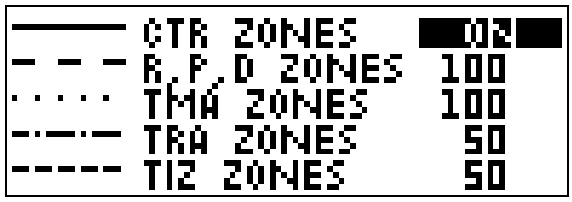
The LX 6000 is equipped with the latest airspace-database (Jeppesen). Airspace is disabled (by default) at the time of delivery. If you want airspace to be shown on the display, you need to activate it.

Airspace is activated with **ENABLE.** Beneath AIRSPACE you can read which airspace is installed. The following ones are possible:

EU_C Central Europe, installed at the time of delivery
EU_E Eastern Europe
EU_S Southern Europe
EU_SE Southeast-Europe
EU_SW Southwest-Europe
EU_W Western Europe
EU_N Northern Europe

The combination of letter and number at the end defines the date of release (for instance A00 = January 2000)
Airspace-data can only be installed from a PC (notebook).

Pressing ENTER twice on ENABLE will open a menu in which you can choose the airspace you want to be displayed:



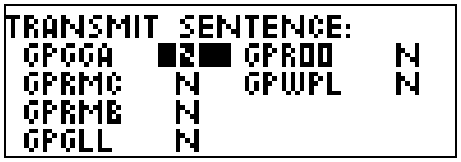
You can permanently activate (ON) or deactivate (OFF) every single airspace. The LX 6000 also offers the possibility to display certain airspaces dependant on ZOOM, for example TMA ZONES 100 means, this airspace will only be shown if ZOOM is 100 km or smaller.

The meanings of the abbreviations are the following:

CTR control zones
R,P,D restricted, prohibited, dangerous
TRA temporarily restricted areas (military usage....)
TIZ traffic information zones

3.1.2.6 NMEA

The LX 6000 can also provide other GPS-devices with GPS-data. For this function the so-called NMEA-data are necessary.



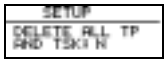
At the time of delivery all NMEA-data are inactive. The most common formats are GGA, RMC and RMB.

3.1.2.7 PC

To transfer data between LX 6000 and PC you have to make sure that the transmission rates of both devices are equal. The LX 6000 offers various transmission rates. Normally, 19200 bps is used.

3.1.2.8 DEL TP/TSK

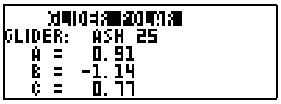
Activation of this funktion will irreversibly delete all the turning points and tasks (DEL TP/TSK doesn`t have an effect on the airfield database and airspace).

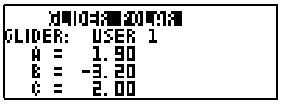


3.1.2.9 POLAR

The polars of nearly every known glider are available in the memory. If you can`t find your type of glider there, you can calculate the necessary coefficients on your own. This can be done with the program “polar.exe” which can be found in the LX GPS set of programs (included in the delivery).

How to do: Measure three different pairs of horizontal speed (km/h) and vertical speed (m/s) from your glider`s polar and enter these values into polar.exe. The program will calculate the coefficients for you.





Turning the UP/DOWN-selector clockwise will lead to the various glider polars in the memory. Turn counter-clockwise and two free places will appear (USER 1 and 2) which are reserved for polars entered by the customer.

3.1.2.10 TE COMP.

The LX 6000 offers two different methods for variometer compensation:

-compensation via TEK probe
-electronic compensation

To choose compensation via a TEK probe, set TE to 0%. With this TE-setting the filter TEF doesn`t have a function, it`s inactive.

The electronic compensation has to be defined experimentally during a test flight in quiet athmosphere. You have to choose TE 100% and TEF 6 as reference-parameters. During the test flight, the following procedures are necessary:

-accelerate to 160 km/h and keep up this speed
-now pull until speed is down to 80 km/h (don`t pull too fast)

Watch the variometer-display. It should show the rate of descent expected from the polar. One can`t completely exclude mistakes caused by vertically-oriented airmasses in the glider`s tube-system. Therefore you should avoid big accelerations. If the display shows significantly positive values while pulling, the compensation is too weak. Significantly negative values while pulling indicate that you should lower the TE-setting.
TEF defines how fast the device will react to airmass-movements. A higher value of TEF means higher damping.
A good reliability of your static pressure measurement is important for successful electronic compensation. You can test it with the following procedure:
You should start the test flight with TE-setting 0% (uncompensated). If you reduce speed, the vario should immediately indicate positive values. If it displays even bigger negative values in the beginning, your static pressure measurement isn`t reliable enough and therefore electronic compensation **is impossible**.
A correction of the TEK probe`s compensation by changing the TE-settings is impossible!! If your probe`s compensation is too low or high, the probe has to be changed mechanically (if you can exclude damages in your glider`s tube system). For more information about this topic see **Helmut Reichmann, "Streckensegelflug".**

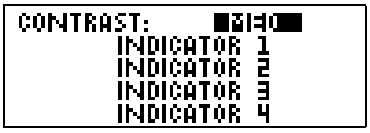
3.1.2.11 INPUT

The LX 6000 supports an external speed command/ vario switch. Das Gerät unterstützt einen externen Sollfahrt-Vario-Umschalter. Which direction of this switch means SC and which vario can be set via SC INPUT ON or OFF.

The stall-warning device is an additional feature of the LX 6000. It causes an acustic alarm when the glider`s speed is falling below the stall-speed. You can set this speed in the menu STALL W.

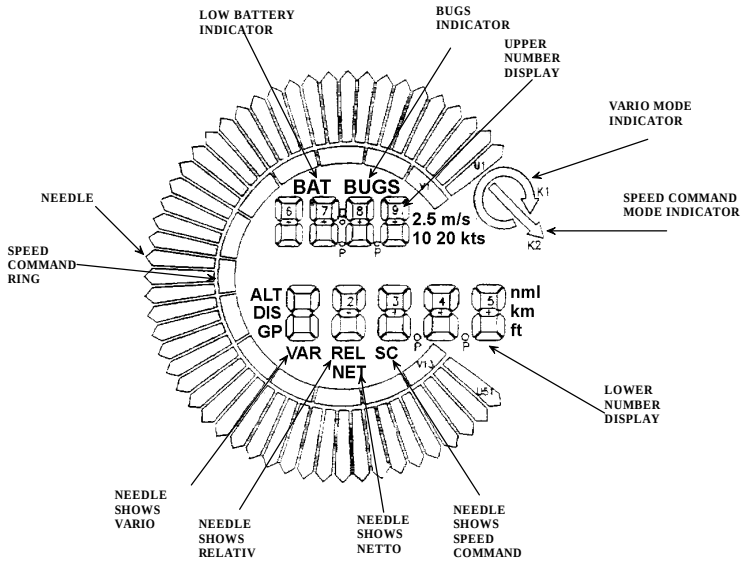
3.2.1.12 INDICATOR

As mentioned in the introduction, the LX 6000 supports a number of variometer-displays which are connected parallel to the RS485-bus. Theoretically, the possible number of connected displays is infinite.
Up to four different indicators are possible (depending on the number of DIP-switches on the back of the LCD-display, which define the address, see next page). If there are more than one displays connected, exists a number of equally-configurated displays.



The contrast of the variometer displays can be set by CONTRAST (MED, LOW or HIGH).

As already mentioned, the device supports four different kinds of display-settings, which have to be defined by the pilot. The display shows one needle, two numerical indicators, one bar-indicator and several status-indicators.



-needle	variometer needle
-SC ring	speed command indicator (permanent, not adjustible)
-upper number dislay	upper numerical indicator
-vario mode indicator	variometer or speed command status indicator
-lower number display	lower numerical indicator
-netto	netto vario (affects only the vario-needle)
-relative	relative vario (affects only the vario-needle)
-SC	speed command (affects only the vario-needle)
-GP	glide path reserve

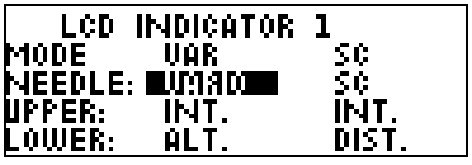
The status indications (ALT, DIS, GP) are independent of the currently chosen function. The unit-indications like km depend on the settings in the menu “UNITS”. BAT will be shown if the battery-voltage is falling below 11V.

Each vario-display`s got four DIP-switches on ist back. Here you can define the number (1-4) of the LCD-display (address).

switch 1 ON	indicator 1
switch 2 ON	indicator2
switch 3 ON	indicator3
all OFF	indicator4

At the time of delvery, all displays are defined as indicator 1.

You can change the settings of one display after pressing ENTER on INDICATOR.



The indications can be set separately for the variometer- and speed-command-mode.Adjustable parts of the display are the needle and the two numerical indications. The following settings of the needle are possible:

-vario, SC, NETTO, RELATIVE (= netto – 0.7 m/s),

The upper numerical indicator supports the following functions:

-integrator, clock, flight-time, leg-time

The lower numerical indicator:

-ALT, distance, GL DIF. (final glide path reserve), SPEED (average speed, only while TSK started), LEG S. (average leg-speed).

3.1.2.11 BEEPER

The LX 6000 is equipped with a beeper which indicates entering a fotosector. Via TIME, INTERVAL and PERIOD, individual settings are possible.

This was the last step of the SETUP-procedure. Now the device is ready to fly.

3.2 Navigation functions

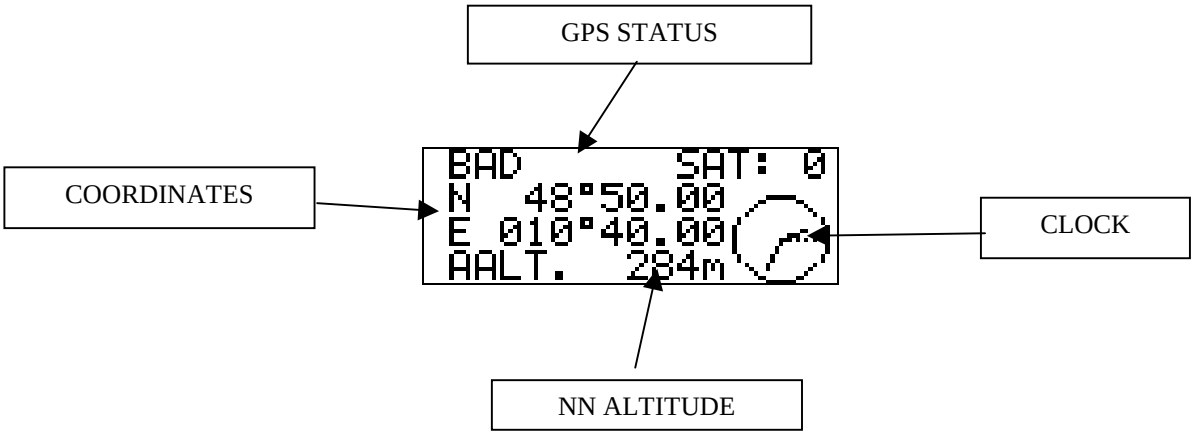
The LX 6000 features the following navigation functions:

-GPS status and indication of coordinates
-Near Airport mode
-APT, flying to and from airfields from the Jeppesen database
-TP, flying to and from turning points from your personal database
-TSK, flying tasks from your personal database
-STATISTIK during flight and log book while on the ground

All these modes can be entered easily by turning the mode-selector.

3.2.1 GPS status indication

This indicator is meant for your information. Only few settings are possible.



Turning the UP/DOWN selector clockwise will change the indicator in the last line. You can choose among the following:

AALT. current altitude (NN) measured by the pressure sensor
GALT GPS-altitude
DA date
TI time

Zusätzlich gibt es auch noch die Stopuhr in der letzten Zeile, die mit dem ZOOM-Knopf aktiviert, gestartet (R), und zurückgesetzt wird. Verlassen der Stopuhr ist nur möglich (mit Enter), wenn die Stopuhr zuruükgesetzt ist (S: 00:00)

3.2.2 NEAR AIRPORT

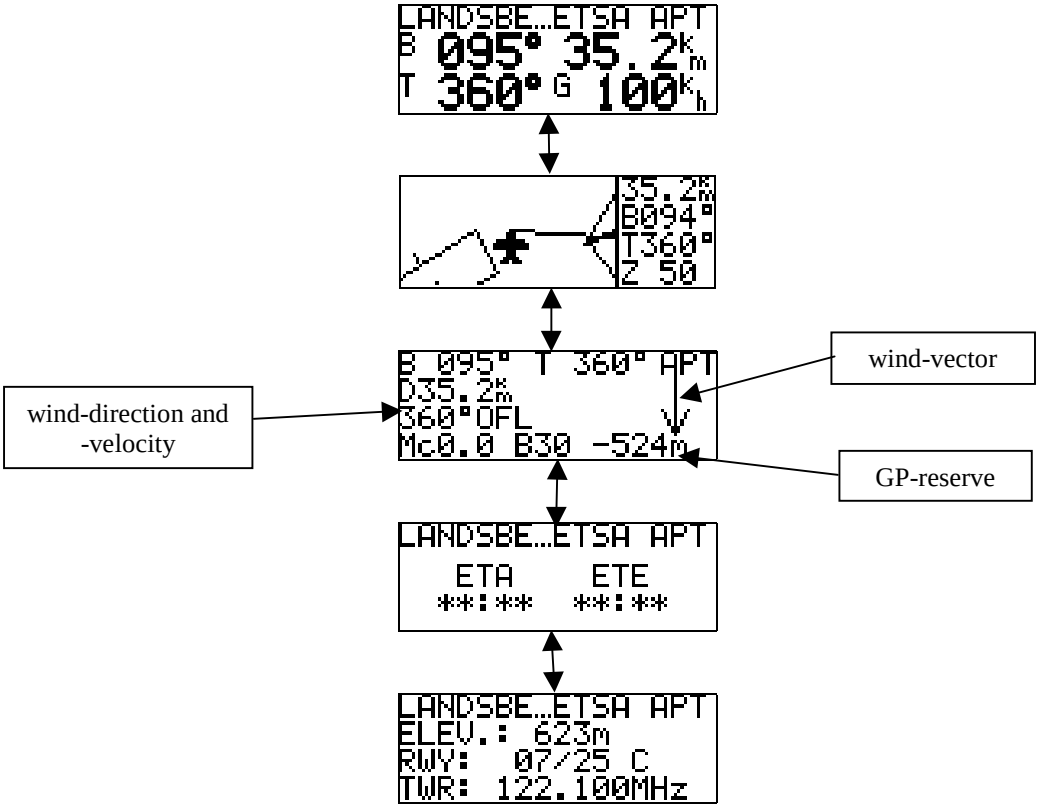
NEAR AIRPORT shows you the ten nearest airfields with bearing and distance. You can select one of these airfields via UP/DOWN and ENTER. After selection of an airfield the device will immediately enter the APT mode and navigate to the chosen airfield.

3.2.3 APT: Airfields

APT is one of three main navigation pages (APT, TP and TSK). You can only change from one of these pages to another by turning the mode selector. The main screen displays elementary data for navigation like bearing, distance, ground-track and ground-speed. “Below” this screen you find four other pages turning the UP/DOWN selector. Aside from navigation it`s also possible to edit data (new inputs or changing old data).

3.2.3.1 Navigation with APT-mode

The graphic below shows the five pages available in the APT mode.



The graphical display always shows the plane-symbol in the middle of the screen. To zoom in or out, press the ZOOM key, select the desired zoom-value by turning the UP/DOWN selector and confirm with ENTER.

The airfield-names are displayed with 7 characters plus ICAO-registration. Pressing ZOOM will show the long names (up to 12 characters, not available on the graphics-page!).

ETA and ETE define the estimated time of arrival and the neccessary time to reach the chosen airfield (estimated time elapsed). If there`s no possibility to reach this airfield (track ≠ bearing), the display will show the star-symbols as in the graphic.

The last graphic shows information about the chosen airfield. C means asphalted runway, g means grass-runway.

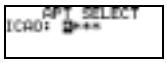
3.2.3.2 APT select, team function and wind-calculation

Pressing ENTER while on the APT page opens a menu in which you can select an airfield, activate the team-function and choose the method of wind-calculation.

3.2.3.2.1 Airport select

Press ENTER on SELECT and the screen below will appear. You`ve got two possibilities for selecting an airfield.

One way to choose an airfield is to enter its ICAO-registration



In our example, Munich was selected:

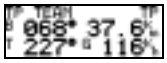
If you`ve made a mistake, press the ZOOM button (backspace) and correct your input.
If you don`t know the ICAO-registration of the desired airfield, flash over this input via ESC. Now you`ll have to select the country where this airfield is located (UP/DOWN and ENTER) and enter the first four letters of the airfield`s name.

You needn`t input all the four letters. You may enter just the first two, for example, and flash-over the rest via ESC. Now you can choose between all the airfields which names begin with these letters by turning the UP/DOWN selector.

3.2.3.2.2 TEAM function

The team function can be helpful if two or more pilots are flying together and can`t see each other anymore. One can easily find his partner again with this function or show another team member the way to a good thermal etc.
To make use of the TEAM function, all team members have to select the **same aiming airfield or turning point** (in the mode TP APT or TSK).
If a pilot wants to show his team the way to his current position, he transmits his bearing and distance to the commonly chosen aiming point to the other pilots via radio. Now they have to enter their partner`s bearing and distanse in the TEAM function:

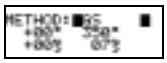
After pressing ESC the LX 6000 will change to the TP-mode. Now the position of the team partner has become the new aiming point. On the screen you will see an additional indication showing that the TEAM function is activated:



As soon as a **new TP** is selected, the **TEAM function will be deactivated**.

3.2.3.2.3 WIND calculation

The LX 6000 offers **five differend methods** of wind calculation.



GS: Calculates wind-velocity and -direction while circling. The fastest and slowest groundspeed is measured. Then the device calculates the wind-velocity from the difference of these speeds and the wind-direction from their position in the circle.
For this wind calculation the LX 6000 needs two circles flown with quite constant speed and angle.

POS: This method also calculates the wind vector while circling. But here the displacement is measured. POS achieves the most accurate calculation, but needs at least six constantly flown circles. Therefore this method isn`t suitable for flights in turbulent mountain-thermals. For mountain-flying, you should choose one of the other methods.

COMB: Calculates wind vector while flying straight on. For COMB calculation changes of the airspeed and groundspeed due to wind-influences are measured.
Notice: This method achieves a good reliability only if you don`t fly completely straight on but always change speed and direction a little bit. But most of the time this happens automatically while looking for thermals.

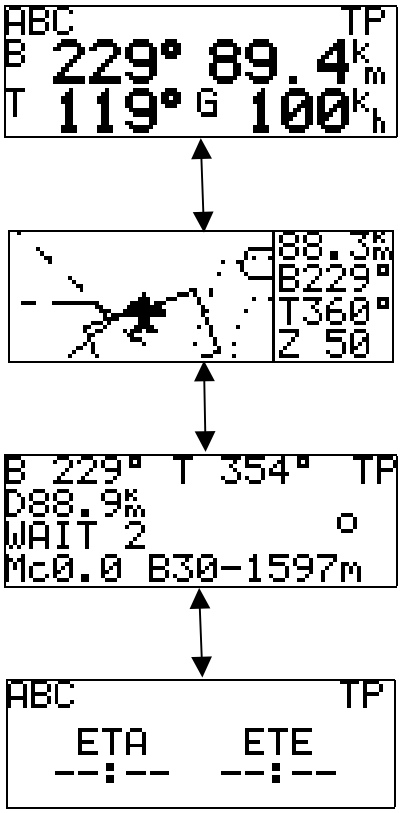
COMPON: This method just calculates the difference between groundspeed and airspeed and therefore only shows you a wind velocity in the direction of the current track.

FIX: Is no method of wind calculation but the pilot enters a fixed wind vector.

Notice: No matter which method you`ve chosen, it`s always possible to change the calculated wind vector by own inputs (FIX).

3.2.4 TP Turning points

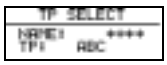
The LX 6000 is capable of saving **600 turning points** which are described by up to eight characters. The menu-structure is very similar to the APT mode, this means four or five pages (if the chosen TP is an airfield, there will appear an additional page with airport data):



3.2.4.1 TP select

Pressing **ENTER** while in the TP mode leads to a very similar menu to the one in the APT mode. This menu has some additional options: EDIT, NEW, DELETE and TP QUICK.

With SELECT you can choose turning points by entering the first letters of their names:



3.2.4.2 TP edit

The option **EDIT** allows the pilot to change all the TP data individually.

You can edit names, coordinates and elevation of a turning point.

3.2.4.3 Creating new turning points

The LX 6000 offers the user three ways to create new turning points.

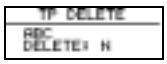
-manual input of coordinates
-copy APT data
-copy from LX 20, Colibri or PC.

The option **NEW** in th TP menu allows you to choose between manual input of coordinates or copying airport data.

If you want to select an airfield from the APT database as a new turning point (enter **Y**), this works the same way like selecting airfields in the APT menu.
If you choose manual input (enter **N**), you will have to enter name and coordinates of the new TP on the following page:

How to copy TP data from PC or loggers will be explained in chapter 4.

3.2.4.4 Delete turning points



The option DELETE irreversibly erases turning points.

3.2.4.5 TEAM-function

This function has already been explained in the APT chapter.

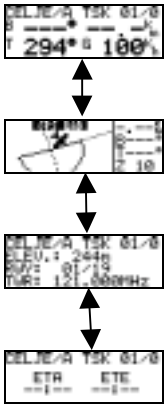
3.2.4.6 TP QUICK (saving the corrent position)

This function is only active during flight (GPS = OK and 50 km/h IAS), not while on the ground. TP QUICK can be activated by pressing **ENTER** in the **TP mode**.

The turning points marked by TP QUICK will be saved with the point of time when they were created and get the preliminary label AP. This label can be changed immediately in the TP QUICK function. To change the complete name of these TPs you will have to enter the EDIT mode.

3.2.5 TSK (Tasks)

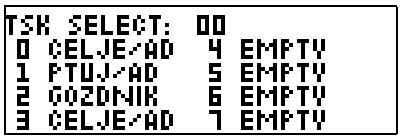
The LX 6000 is capable of saving 100 tasks which consist of up to ten turning points.
The TSK mode offers manifold flight statistics, simplifies the procedures at turning points and automatically navigates to the next aiming point as soon as yo hav reached a TP. The menu structure is very similar to the one in the TP or TSK mode.



The tasks are numerated from 00 to 99. The indication (01/1) in the upper right corner of the display shows you which task is activated at the moment and to which turning point the device navigates (0 is always the start point).
In the graphic you can have a look at the activated task. Via ZOOM you can zoom in or out. Fotosector will be displayed automatically as soon as the zoom is chosen high enough.
More information about tasks can also be found in the chapter “Flying with the LX 6000”.

3.2.5.1 TSK Select

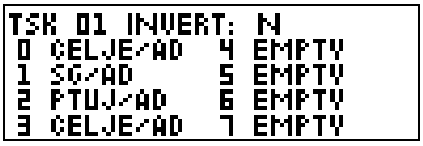
Pressing ENTER while in the TSK mode will lead to the TSK menu. In the option **SELECT** (select by pressing ENTER) a list of the tasks from 00 to 99 will be shown.



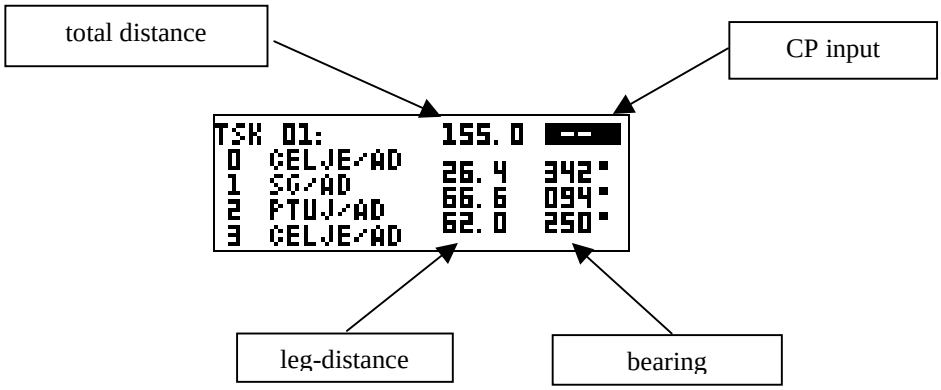
To select a task, move the cursor to the desired task by turning tre UP/DOWN selector and press ENTER.

3.2.5.2 TSK edit

The selected task can be edited in the option EDIT.

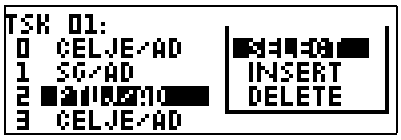


The display above shows the currently chosen task. If you change **INVERT: N to Y**, this task will be inverted. After pressing ENTER the following screen will appear:



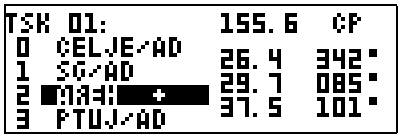
In the field which is marked as “CP input” you can enter a so-called CONTROL POINT. Usually the last turning point is chosen as CP. If a control point has been entered, the LX 6000 **starts calculating the final glide path to the finish point already when reaching the last turning point** before the CP. Navigation goes on as usual, over all the turning points.
To enter a CP makes sense for example if the last turning point is very close to the finish point and you don`t want to start final glide just before reaching the finish. In competition flight, the CP function can help you to be some minutes faster.

If you want to edit the chosen task, first select a turning point via UP/DOWN and enter.



Now you`ve got three possibilities to change the task at the marked point:

-exchanging a turning point with another via SELECT
-INSERT a turning point



The new turning point will be inserted above the marked point.

-DELETE turning points

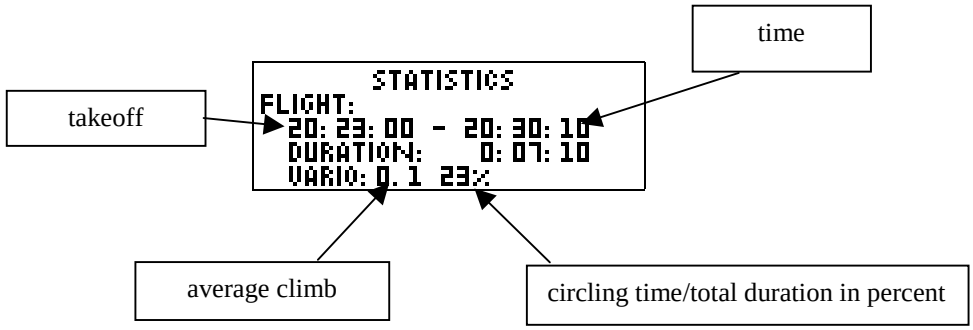
This way you can create new tasks on the LX 6000. The procedure will be ended by ESCAPE.

3.2.6 Statistics

The flight statistics help the pilot with tactical decisions during flight (is my average speed too slow or can I even enlarge the distance?....).
On the ground the LX 6000 offers a log book containing the last flights. How many flights are in the log book depends on the duration of the flights.

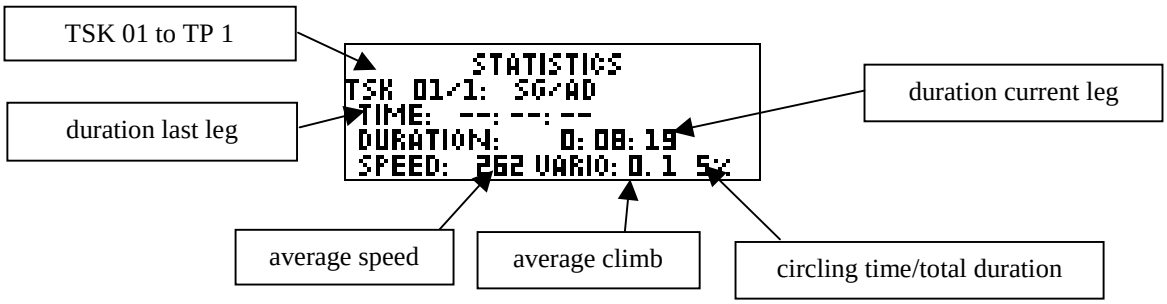
3.2.6.1 Flight statistics

This page is only available during flight. After changing to the **STATISTICS** page, the flight statistics are shown first:

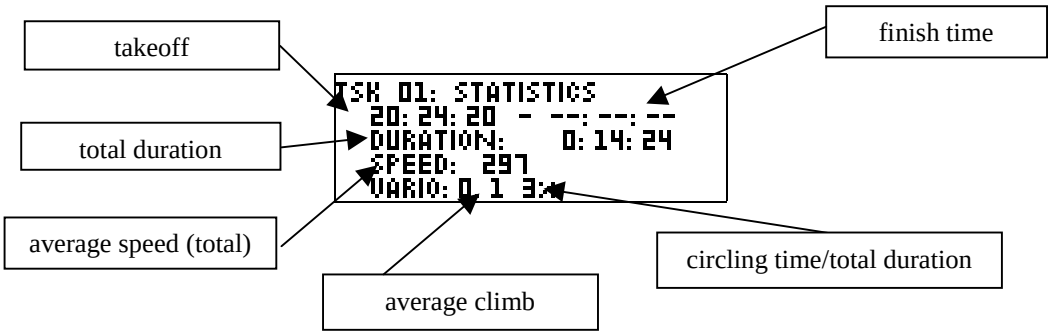


3.2.6.2 TSK Statistics

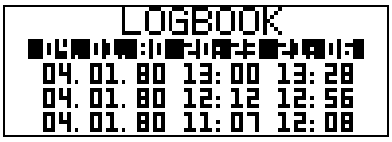
If a task is started, turning of UP/DOWN (clockwise) will lead to the leg statistics:



Turning the UP/DOWN selector further clockwise will lead to the complete TSK statistics. This page is still available after landing:



3.2.6.3 Log book



In the menu LOGBOOK you can see all the flights in the memory with takeoff and landing time. This menu is only available while on the ground.

3.3 Variometer-functions

The LX 6000 is an electronic variometer, i.e. the necessary data for altitude and speed come from high-quality pressure sensors. The vario indication is calculated from altitude-data, therefore no bottle is necessary. All indication values are altitude-compensated, so systematic altitude-errors can be excluded.
The vario indicator is a LCD-needle integrated into a multi-functional vario display. In addition to that the device supports different audio-signals for vario and speed command.

3.3.1 Vario

Indications:

-variometer range 5,10 und 2.5 m/s 10,20 und 5 kts
-five time-constants 1s bis 5s
-nettovario indicates airmass-movements independent from polar descent rate
-relativario indicates expected climb independent from polar descent rate
-audio signals can be set individually

For the TE-compensation you can choose between two methods:

The electronic compensation uses the variation of speed. For applying this method you have to connect the TE-port of the device with the static pressure tube system.
If you decide for compensation with a TEK probe, you have to connect the device`s TE-port with the probe. You can use a number of devices at the same time with only one probe.
No matter which method you`ve chosen, you should be sure that all the tubes are made tight carefully.

3.3.1.1 Altimeter

The altimeter is temperature-compensated in a range from -20°C to +50°C.
The calibration ranges from 0m to 6000m. Altitudes up to approximately 8000m can be displayed. The LX 6000 always indicates heights above sea level (NN), given the calibrations after starting the device were done correctly.

3.3.1.2 Speed command

Speed commanmd helps the pilot finding the optimum speed while flying straight on. The speed command also supports a visual indication and an acustic signal which can be set individually.

3.4 Flying with the LX 6000

Flying with the LX 6000 is really fun, if both the pilot and the device are well-prepaired. So the following chapter will explain how to prepare and realize flights with the LX 6000 in some examples.

3.4.1 Preparation on the ground

The preparation of a flight does`n really take much time but it`s worth while investing some minutes. After you`ve switched on the LX 6000, it shows the current software version and database for approximately 20 seconds. The device needs this time to stabilize ist sensors. After these 20 seconds a window appears in which the calibration for pressure and altitude can be done.

3.4.1.1 SET ALT

As you know it from every mechanical altimeter, the LX 6000 should be calibrated by the current pressure before every flight. To achieve high reliability, the pressure sensors are calibrated by both the airfield`s elevation and the current QNH value.
After you`ve switched on the device you first have to input the airfield`s altitude, for example:

SET ALT: 0185 m

Thereafter you can enter the current QNH value:

QNH:-------mb

Turn the UP/DOWN selector and the standard value QNH 1013 will appear. With UP/DOWN and ENTER you have to input the current QNH.
You don`t have to change this setting but it`s recommended to do so, if you want to get altitude values as exact as possible.
Correcting the altitude values during flight is possible, too. Enter the current QNH in the menu INIT to do so. Such a correction can be necessary, if the displayed altitude isn`t correct anymore due to pressure changes.
Note: A **correction of altitude** values during flight is **only possible, if you`ve entered a QNH** after SET ALT in the start menu!
If you only want to enter setup, you can flash over SET ALT and QNH via ESCAPE.

3.4.1.2 Settings and controls before takeoff

We recommend you to check all the settings in SETUP (without password), especially if other pilots have flown the glider before. All the parameter settings which have been entered, except QNH and BUGS, are preserved when you switch off the device.
A short look at QUICK MENU shows which modes are run on hidden pages.
The GPS status indication usually shows GPS OK after a few minutes (depends on how long the device has`nt been activated).Now the LX 6000 is ready to fly.
If you wish to have an indisputable flight documentation, you should additionally check the LOGGER-settings and change them, if necessary.
If you want to fly a task, it`s best to select it already while on the ground or copy a task from PC, LX 20 or Colibri.
After all these preparations pilot and glider are ready to fly.

3.4.1.3 Using QUICK MENU

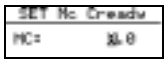
This menu is activated by the **ESC/QM** button. This button`s got two functions: While on the highest program level it activates QUICK MENU, in sub-menus it works as ESCAPE key.

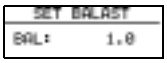
QUICK MENU allows the following settings:

-volume
-Mac Cready
-ballast
-switch off

The volume-regulation is done via a digital potentiometer, i.e. there`s no separate volume-key but the regulation of volume is only possible in the menu.

The same goes for MC and ballast:





SWITCH OFF shuts down the device.

After **Y** and **ENTER** the LX 6000 will be **shut down.**

3.4.1.3.1 Using “Hidden Pages”

The LX 6000 allows the pilot to run certain modes in the background. The necessary settings can be done in SETUP via QUICK MENU. In our example two modes are run in the background:

These modes can only be activated via QUICK MENU. Using “hidden pages” makes the usage of the device eadier for the pilot and saves time. But you should remember that information on “hidden pages” is only accessible via QUICK MENU.

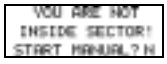
3.4.2 During flight

It`s best to switch on the LX 6000 already some minutes before takeoff so that the GPS is given some time to find enough satellites and you can start with GPS OK.
If you want to fly to a certain aiming point, you can select this point already on the ground and don`t have to do it while flying.
The same goes for flying a task. You should also select the desired task before flight and check with EDIT if the order of the turning points is correct and so on.
As soon as you`ve selected a turning point or task the device is ready for navigation.
The starting point is always point “0” in your task (so don`t immediately enter the first turning point).
As soon as the glider reaches this starting point during flight, you`ll hear an acustic signal (beep) from the device and on the graphics page INSIDE will appear.

The LX 6000 just indicates that you`re inside the start sector. If you want to start your task, you have to do the following:

-stay in the TSK mode
-press ENTER
-start the task

The page shown above is only active during flight. So you can`t start a task while on the ground. To start the task while flying move the cursor to START and press ENTER. Now the dispay will show TSK IS STARTED and navigation will switch over to the first turning point.
It`s also possible to start the task outside the start sector. Generally, this functions like starting a task inside the sector, but the pilot has to confirm that he really wants to start outside the sector:



During flight, pressing the START key in the started task will lead to the page below:

-RESTART restarts the task
-via JUMPyou can flash over turning points you haven`t reached. Navigation will switch to the next turning point then.
-TEAM activates the team function described in the chapter APT.

When you reach the finish, the display will show TSK END or TSK FINISHED:

or

4 Communication with PC and loggers

The LX 6000 is able to communicate with the following devices:

- PC (LXFAI, LXGPS, Strepla, CAL, LX Explorer coming soon)
- LX 20
- Colibri
- Posigraph

The communication with LX 20, colibri and posigraph is very helpful, especially if you don`t own a notebook. It`s possibe to transfer the following data from these devices to the LX 6000 and vice versa:

-TP and TSK-data
-information about pilot and glider (flight info)
-logger settings

This function of the LX 6000 offers the pilot the possibility to create a catalogue of frequently used turning points and tasks at his PC at home and transfer these data to the LX 6000 via portable devices like the mentioned loggers or a laptop.

4.1 Communication with the PC

For communication with the PC the serial port is used. For this connection you need a special cable which is included in the delivery (standard 9P SUB D connector at the PC and special 5P flange coupling at the LX 6000).
For the PC-communication you need the program LX FAI (also included in the delivery, free updates on our homepage). LX FAI supports the following applications:

-READ LOGGER
-LOGGER-setup
-READ FLIGHT INFO
-WRITE FLIGHT INFO
-READ TP and TSK
-WRITE TP and TSK

For an update of the database (APT and airspace) the program LX GPS is necessary.
This program wiil be delivered with every new database. For updating the device you need an **UPDATECODE** which is to be found on the disks. This code is calculated especially for one device so you can`t update other devices using this code.
With LX GPS you can also create TP and TSK files identical to the ones made by LX FAI.

4.2 Comunication with LX 20 and Colibri

4.3 Running the device without GPS (LX6000 E)

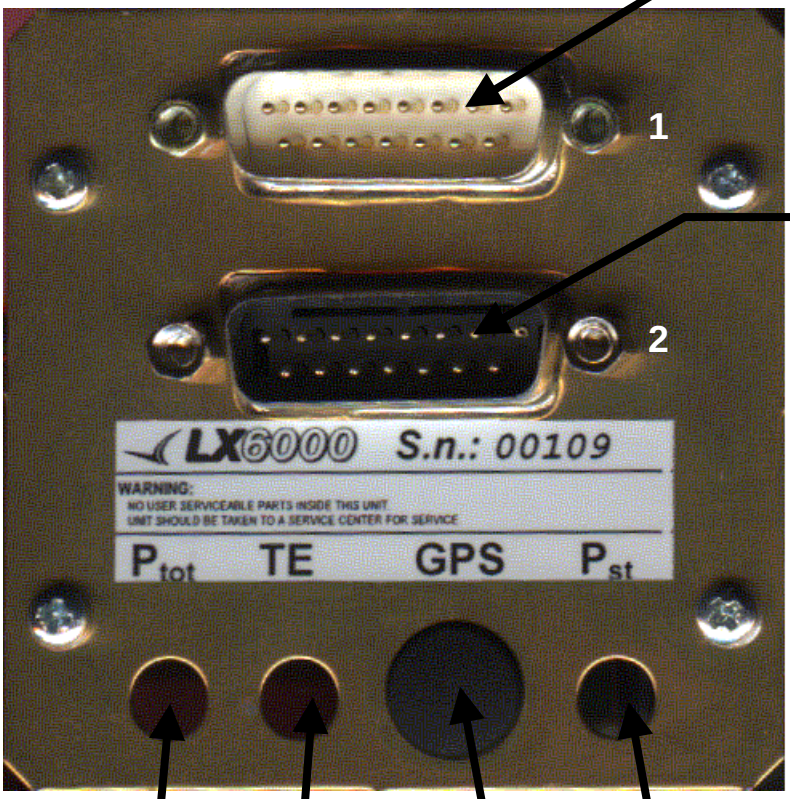
5 Installation

5.1 Mechanical installation

For the mechanical installation one needs only two 57mm-cutouts (2,5'') in the panel.
The antenna should be mounted horizontal and with "free sight", e.g. on the panel cover. If it is mounted under this cover or anywhere in the fuselage please note that **CFK will shield the GPS-signals.**

5.2 Cables

LX6000 back side



POWER connector

I/O connector

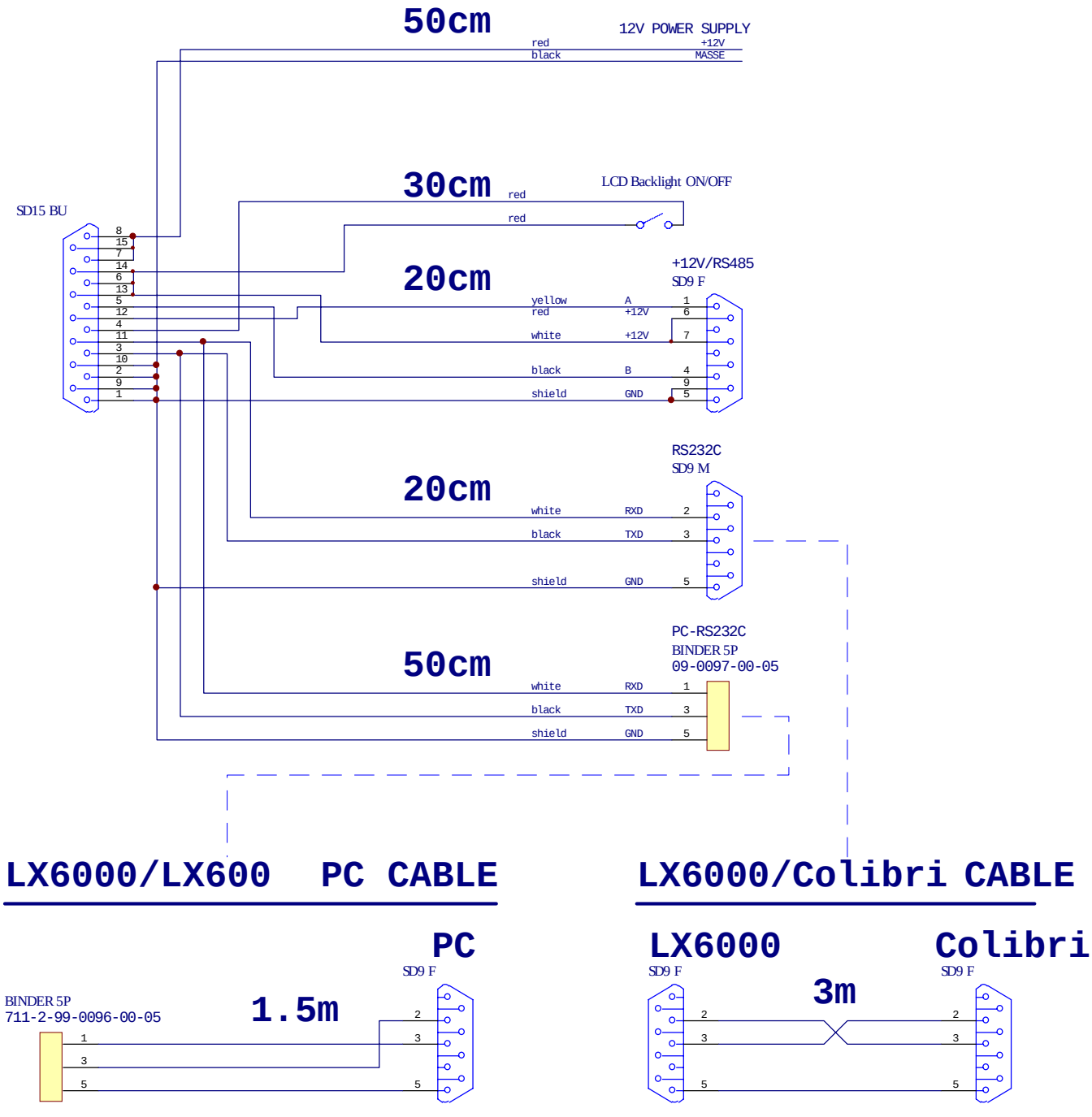
P_{tot} probe - SPEED

TE (total energy) probe or P_{st} (static)

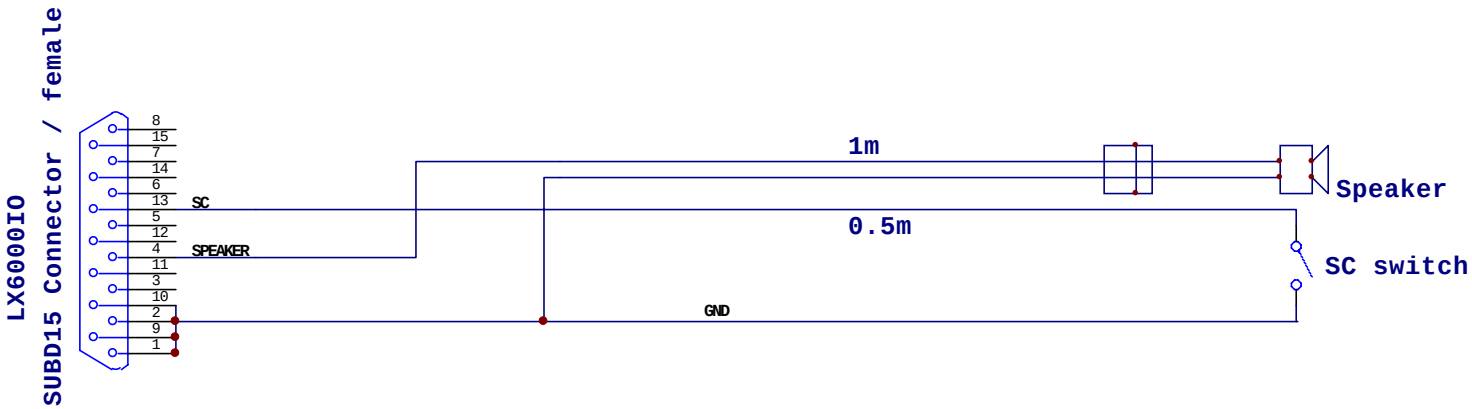
P_{st} for speed

GPS antenna

Power Connector(1):

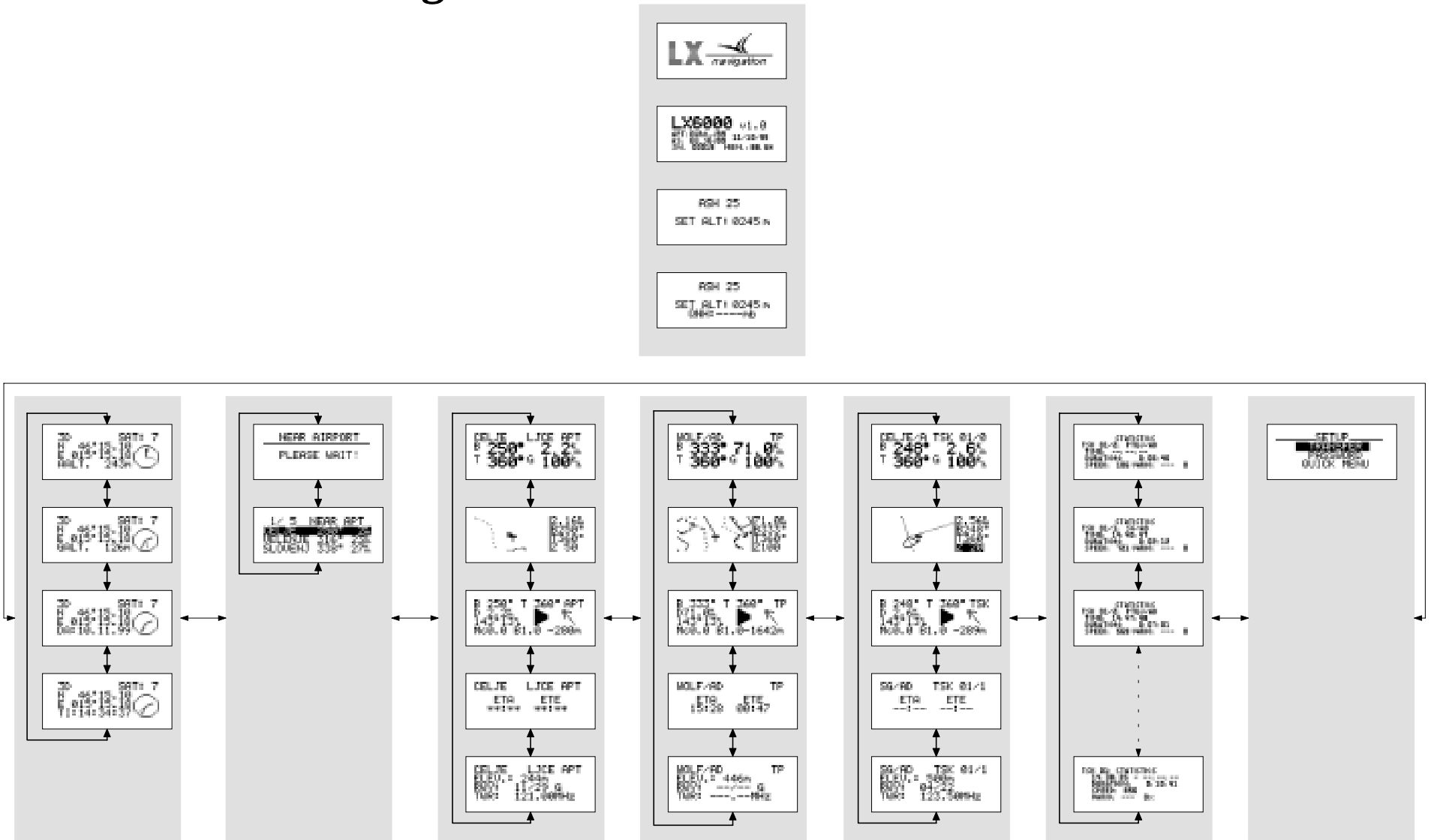


I/O connector(2)

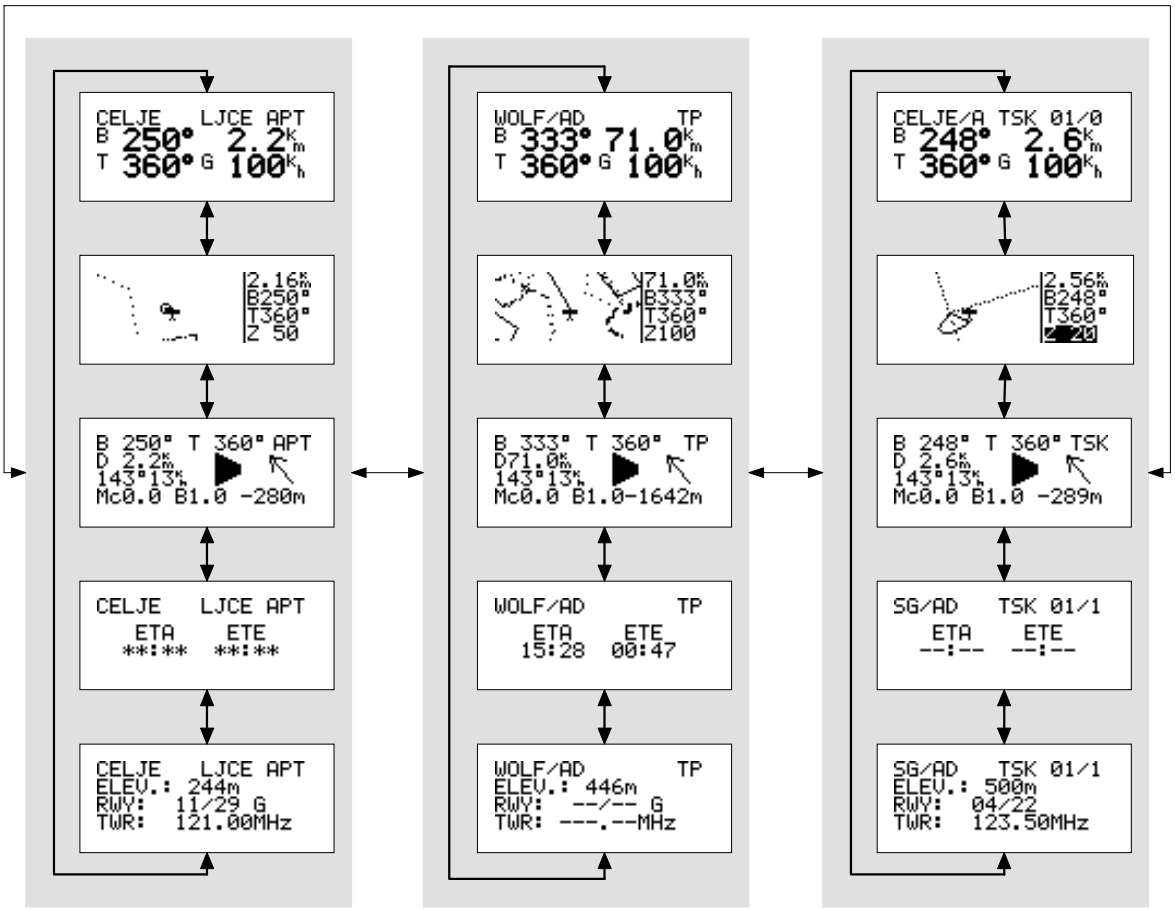


5.3 System enhances

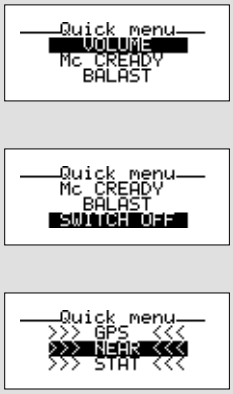
6 Tree structure diagram



7 Quick menu



If we want to go in page which is disabled, just press esc and choose disabled menu.



Options in QUICK MENU:

```
   VOLUME
 Mc CREADY
   BALLAST
 SWITCH OFF
```

Then follows all disabled menu's

```
>>> GPS  <<<
>>> NEAR <<<
>>> STAT <<<
>>> SET  <<<
```

8 Passwords