# LX 4000 Variometer System with Integrated GPS-Receiver

Contents



WARNING: NEVER BLOW INTO THE PNEUMATIC PRESSURE TUBES OF THE INSTRUMENT. SUCH ACTION WILL DAMAGE THE PRESSURE TRANSDUCERS !


v4.3
22 Feb 94


PASSWORD: 4 0 7 7

## 1. GENERAL DESCRIPTION

The LX 4000 consists of three units, connected by a supplied electrical harness:

A main computer unit with custom LCD, electronic pressure transducers, an integrated GPS Receiver and audio generator. The unit is designed to fit in a standard 80mm circular cutout.

A control unit with a rotary programme selection switch, rotary data input knob and ENTer and ESCape buttons. The unit is designed to fit in a standard 57mm cutout.

An analogue meter unit which can be supplied in either 57mm, 60mm or 80mm diameter cutouts to customer choice. The user is able to configure the meter to display the following data:

* TE compensated Vario
* Flight director information
* Netto Vario
* Relative Netto Vario

Statistics are gathered during and can be analyzed either in flight or post flight. An IBM compatible PC lead and software is supplied to allow programming of airfields and waypoints, and analysing statistics.

## 2. TECHNICAL DATA

| | | |
|---|---|---|
| Supply voltage | : | 10 to 14 VDC |
| Current consumption | : | approx 350 mA |
| Temperature range | : | -20 to +60 ° C |
| TE Compensation | : | Electronic or TE Probe<br>User Selectable |
| Dimensions | : | Main computer unit<br>80mm circular cutout<br>Length over connectors 200mm |
| | : | Control unit<br>57mm circular cutout<br>Length 40mm |
| | : | Variometer unit<br>57, 60 or 80mm circular cutout<br>Length 50mm |
| Total weight: | : | Approx. 1400 gms |

## 3. FUNCTIONAL DESCRIPTION

### 3.1 The Variometer

3.1.1 The variometer of the LX 4000 contains the following features:

- Total Energy compensated Variometer (TEK-Vario)
- Netto or Relative Netto Variometer
- Averager
- Flight Director
- Audio Generator

If the electronic TE mode is selected and plumbed, then all functions will only operate correctly if the total energy compensation has been correctly adjusted. Therefore, as soon as possible after installation a test flight in totally smooth air should be made (see para 11.3). If pneumatic TE is used, then the above procedure is not applicable.

3.1.2 The LX 4000 uses transducer technology to correct the variometer readings for altitude. Therefore, when comparing the vario readings with a pneumatic vario, they will only agree at the calibration altitude of the mechanical vario, normally 3000 ft. The vario reading is displayed both on the meter and acoustically by audio tones. Three vario ranges can be selected; 5 kts, 10 kts or 20 kts. The selection of the vario range is carried out in the initialisation programme (programme INI).

3.1.3 The initialisation programme INI also allows the selection of six vario time constants; 0.5, 1, 2, 3, 4 or 5 seconds.

Changing the vario range or the time constant affects both the audio and analogue vario displays.

### 3.2 The Averager

During flight the LCD permanently indicates on a digital display the average rate of the glider over the last 10, 20 or 30 seconds. This indication is a true average and not a vario indication with a long time constant as is the case in many other systems.

### 3.3 The Flight Director or Speed Command

3.3.1 The speed to fly calculation is calculated from the selected glider polar and modified by the current McCready setting, altitude, wind vector and the current rate of climb. Polars may either be selected from an extensive library or a custom polar may be defined. The speed to fly indication is presented both visually and acoustically. The following variables have an effect on the indication:

- glider polar
- polar degradation
- McCready setting
- wing loading

3.3.2 The speed to fly indication is a command and indicates whether the pilot has to "PUSH" or "PULL" to reach the desired speed.

### 3.4 Netto/Relative Netto

Depending on the configuration, the vario can show either netto or relative netto (sometimes referred to as super netto):

- Netto vario displays the vertical movement of the air mass through which the glider is flying. It is independent of the sink rate of the glider.

- Relative netto shows the actual climb or sink rate that the glider would achieve if speed was reduced to the climbing configuration. An allowance is made for the increased sink rate of the glider due to the angle of bank while turning.

### 3.5 THE GLIDE PATH

The LX4000 relies upon altimetric calculations utilising its own electronic altimeter to compute the glide path to the next turning point or airfield. To ensure that these calculations are accurate, it is essential that the electronic altimeter is referenced to both an accurate QNH and the starting airfield height.

### 3.6 THE FLIGHT LOGGER

The LX 4000 automatically stores the GPS position, vario reading and pressure height of the glider every 20 seconds. The instrument is capable of storing a total of 22 hours of data. The free memory is indicated on switch-on. If less than 8 hours storage time are left, then an additional warning is given. In the event that the memory is full, then the oldest flight data is overwritten. The memory storage is managed and downloaded by means of a PC (not supplied!) connected to the RS232 interface with the supplied cable.

## 4. Controls of the LX4000

### 4.1 MAIN DISPLAY UNIT

4.1.1 Volume Control - This rotatable control is the audio volume control.

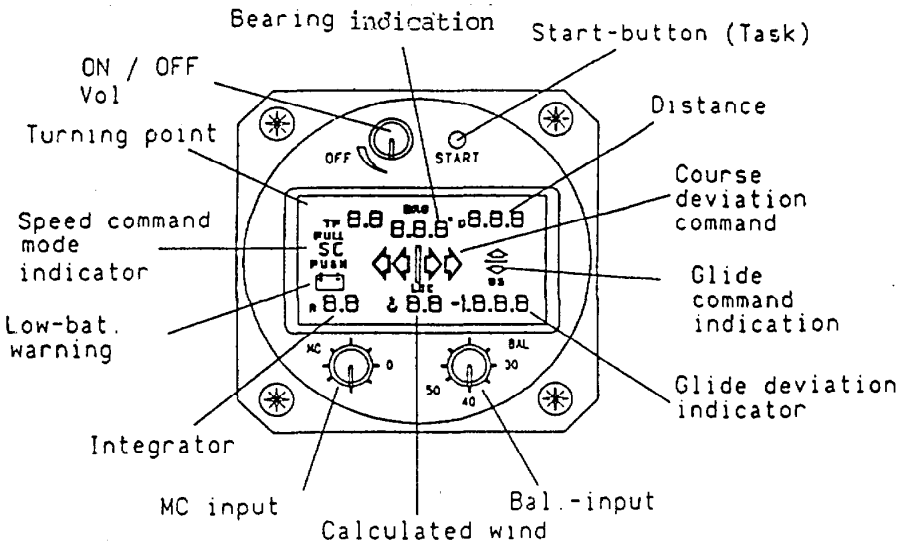
4.1.2 The START button - This push button is used during flight to instruct the computer to start a task.

4.1.3 McCready control - This is used to set the McCready value from 0-7.5 kts in 0.5 kt steps.

4.1.4 Wing Loading control - This is used to set the wing loading as a percentage increase from the unballasted weight using the non-dimensional formula:

$$\text{Wing Loading} = \frac{\text{Glider Weight + Pilot Weight + Ballast}}{\text{Glider Weight + Pilot Weight}}$$

4.1.5 The LCD displays the following data:




- Top left; Either 'APT' if going to an airfield or 'TP*' if going to a turning point.

- Centre left; The label 'SC' is displayed when the vario is in the cruise mode speed and the speed to fly is correct. Either 'PUSH' or 'PULL' will be displayed above or below the 'SC' when the speed is incorrect. When the vario is in climb mode, this display is absent.

- Bottom left; an 'A' is displayed followed by the numerical averager display.

- Top centre; the 'BRG' displayed is the magnetic bearing from the present position to the selected waypoint.

- Centre; the course deviation indicator shows the difference between the bearing and the track made good. When no left/right arrows are shown, then the glider is tracking directly to the selected turning point; one arrow indicates 10° difference and two arrows indicate 20° or more difference. The arrows are a command display; left arrows indicate turn left to point towards the TP.

can

- Bottom centre; the wind component calculated during the CRUISE mode is displayed. Headwind components are denoted by the minus sign and tailwind components by a plus sign. When in CLIMB mode, the wind component displayed is frozen to that calculated during the last CRUISE setting.

- Top right; the distance to the next turn point

- Centre right; the glide slope indicator shows whether the glider is above or below the glide slope. It is a command display and a 'UP' arrow means fly up, you are below the glide path.

- Bottom right; the glide deviation indicator shows the amount by which you are above or below the glide path. The maximum figure that can be displayed is 2000ft; above and below this figure four dashes are displayed.

## 4.2 CONTROL UNIT

4.2.1 Programming switch - This 10 position rotatable switch is used to select the following functions:

APT - Selects the Airport Library. 3000 airfields are pre-programmed into memory and a further 100 can be user programmed.

TP - Selects the Turning Point Library. 100 user defined TPs be programmed into memory.

TSK - Select Tasks. 100 user defined tasks, each containing 10 legs, can be programmed using any combination of airfields or turning points from the libraries.

INI - Initialisation. There are 2 initialisation modes; one can be used at any time and enables the user to change vario range, vario time constant etc; the second can only be accessed by use of the password and enables the user to carry out system configuration such as change of measuring units.

STA - Statistics. This feature allows a variety of statistical functions to be selected during or post flight:

- average speed
- average rate of climb during a task leg
- percentage of time spent thermalling during task
- actual flight time in minutes
- course deviation in distance (km or nm)

POS - Position. Gives status of GPS satellites and present geographic position in lat and long co-ordinates.

TIME - Time. Displays the local time of day and also incorporates a stopwatch function.

CAL - Calculates:

- Distance and course between two free-chosen airport or turning-points

- Task calculation of course and distance for each leg and total task.

PC - Selects the RS232 port and prepares to transfer data to or from an IBM PC. The software for the PC is supplied on a separate disc. All user programmable parameters (airports, turning points and tasks) may be transferred, re-programmed or entered using the computer interface.

EM - Emergency position which displays the ten nearest airfields.

4.2.2 Data Input Knob - This rotatable switch, when turned, alters the alpha numeric character under the cursor.

4.2.3 Enter Button - When pressed, this button accepts the information at the cursor, moves the cursor to the right and writes the data to memory.

4.2.4 Escape Button - When pressed, this button steps to the next screen.

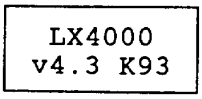
## 5. OPERATING AND CONFIGURING THE LX4000

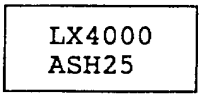
### 5.1 Data Entry Procedure

The data entry procedure is the same for all screens of the LX4000. When the instrument requires data to be entered, a flashing reverse video cursor will be positioned on the first digit it is required to alter. When <ENTer> is pressed, the data under the cursor is accepted and the cursor moves to the next digit. If the data shown is incorrect, then rotate the data input knob until the desired character is over the cursor and press <ENTer> when the new data will be written to memory and the cursor will move to the next character. If <ESCape> is pressed, then it accepts that the original and entered data is correct, and the user wishes to move to the next screen. On occasions, the cursor will display 'Y' or 'N'. Pressing <ENTer> with 'Y' showing will enter the data and move to the next screen; selecting 'N' and pressing <ENTer> will return the user to the beginning of the particular data entry sub routine.

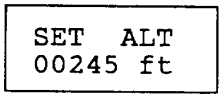
## 5.2 Switching on the Variometer and Initialisation

- On switching on the variometer, the main LCD indication flashes while the following screens are displayed on the control unit until an internal self checking procedure is complete. The v4.3 refers to the software version installed while the K93 refers to the airfield database that is installed.




- Once the self check procedure is complete, 'Set Alt' will be displayed with cursor positioned on the first digit. Enter the airfield height.

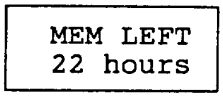



- Turn the input switch until the correct figure is under the cursor and press <ENTer>. Repeat with the remaining digits.

- If the altitude is correct or no input is required, just press <ESCape>.

- The display will now ask for the QNH to be entered. If the QNH is not known, set your mechanical altimeter to the airfield height and read off the QNH from the subscale. If <ENTer> or <ESCape> is pressed without rotating the data input knob, then the standard pressure setting of 1013 mbs is selected


- The display will now show the logger memory remaining:



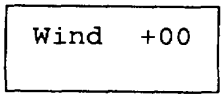

## 5.3 INITIALIZATION

- There are two initialization modes; one mode is unprotected while the other mode is protected by a password (4077). Although initialization is normally carried out on the ground, both modes are accessible in flight. However, only the TE element of the protected mode can be adjusted during flight.

- Turn Programme switch to "INI"
- LCD will show "INIT."

- Press <ENTer>

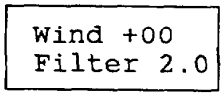
5.3.1 Wind and Vario Damping




- Wind Component inputs are now possible. The computer normally calculates the wind by comparing GPS groundspeed with TAS. This screen gives the pilot the capability of modifying the computer calculated wind component. It will normally be set to '0'.

- Tail wind or head wind components are indicated on the main LCD with '+' for tail wind and '-' for head wind.

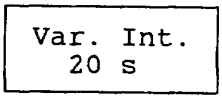
- The same screen sets the vario time constant; referred to as 'Filter';




- The following variometer time constants in seconds, can be selected:

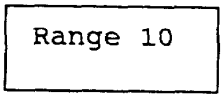
| | | |
|---|---|---|
| Filter 0.5 secs | - | Minimum Damping |
| Filter 1.0 secs | | |
| Filter 2.0 secs | | |
| Filter 3.0 secs | - | Normal Damping |
| Filter 4.0 secs | | |
| Filter 5.0 secs | - | Maximum Damping |

5.3.2 Averager Period

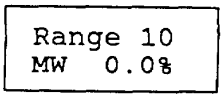



- This screen sets the period in seconds over which the integration takes place. The possible selections are 30s, 20s and 10s.

5.3.3 Vario Range and Polar Degradation




- This screen sets the vario analogue meter range; +/-5 kts, +/-10 kts or +/-20 kts.



- This screen sets the percentage polar degradation from 0% to 30% in 2.5% steps. Commit it to memory by noting that 'MW' means 'Mucky Wing'!

5.3.4 Audio Dead Band and Cruise/Climb Switching

- The TAB setting alters the audio dead band in cruise mode as follows:

```
TAB 1.0
```

TAB 0.0 - No audio dead band
1.0 - +/- 1 kt
2.0 - +/- 2 kts
3.0 - +/- 3 kts
4.0 - +/- 4 kts

- The same screen selects the method and airspeed at which the cruise/climb switching is made. If 'OFF' is selected, then cruise/climb switching is made by an external switch which can be mounted to change with the flap setting if required. Alternatively, the speed at which cruise/climb switching occurs can be entered between the limits of 55 and 85kts at 2.5kt intervals.

```
TAB   1.0
AUTO  55
```

5.3.5 Safety Altitude

- The next screen allows the entry of a safety altitude. The selected safety altitude will be added to all glide height computations.

```
Alt. res.
 *** ft
```

5.4 INITIALIZATION BY PASSWORD

The following configurations can only be made by entering the password and, with the exception of the TE calibration, are only accessible on the ground.

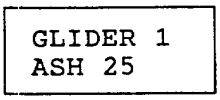
```
PASSWORD
  0000
```

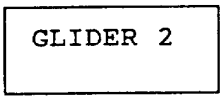
In order to enter this programme, a password, 4077, has to entered using the standard input procedure.

```
PASSWORD
  4077
```

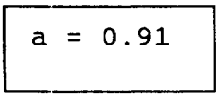
### 5.4.1 Setting the Glider Polar

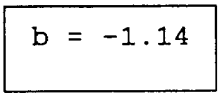
The glider polar is set by entering three co-ordinates; a, b and c. These co-ordinates can either be extracted from Annex A or calculated by means of a supplied computer programme. The computer programme is named 'POLAR.EXE' and is supplied on the PC disc. Two polars can be configured so as to take account of gliders that have dual span capability or for example, variable pilot weights. They are described as Glider 1 and Glider 2. Start by entering a name by which the polar is to be referred by:

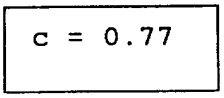


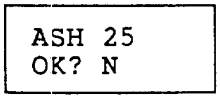




Then enter the three co-ordinates obtained from the polar table or computer programme.



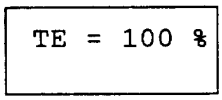




- Select 'Y' and <ENTer> if OK

### 5.4.2 Setting the Total Energy Compensation




This screen selects the method of TE compensation;

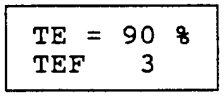
- If TE Compensation is by TE probe, select;

TE = 0 %

- If Electronic TE Compensation is required, initially select 100%. Following a flight test in still air, the TE compensation can be adjusted between 50% and 150% as follows;

TE under compensated - select higher % setting,
TE over compensated - select lower % setting.

- A further TE parameter is also configurable; the TEF (TE Filter). The TEF can be selected between 0 and 9



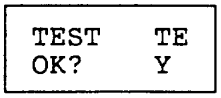

TE compensation too fast : Increase TEF
TE too slow : Decrease TEF

Further guidance on setting the TEF is given in paragraph 11.2.

Note: If Electronic TE compensation is required, then both the TE(pst) pneumatic connection and the Pst connection must both be connected to true static.

5.4.3 Flight Testing the TE Setting

- The next screen allows the pilot to test fly the selected settings and, if acceptable, write them to memory by pressing <ENTer> with 'Y' selected. If the settings need further refinement, then set 'N', press <ENTer> and the TE setting screen will re-appear allowing the TE settings to be refined.

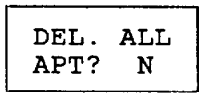


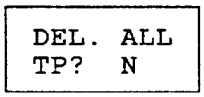

By pressing <ENTer> the settings are stored in memory.

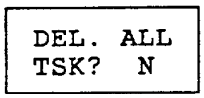
- During flight only the TE compensation procedure can be accessed; all the following parameters can only be set on the ground. Full instructions for refining the TE compensation are at paragraph 11.2.

5.4.4 Deleting All User Airports, Waypoints or Tasks

- The next screens allow deletion of all user input airports, turning points or tasks

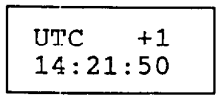


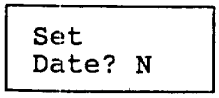




- To erase simply place cursor on default 'N' and using input selector, select 'Y' and press <ENTer>.

5.4.5 Setting the Local Time and Date




- This screen allows the local time to be set. The time displayed on the lower line is GMT and is obtained from the GPS satellites. Setting +1 gives a display of BST.




- This screen allows the date to be altered. Select 'Y' if it is required to set or alter the date.

5.4.6 Selecting the Mapping Datum

- The next screen selects the mapping datum. A list of the available mapping datums are at Annex A. For UK, select datum 39 while for most of Europe use datum 49. Using the wrong datum will cause small errors between the displayed GPS position and the position plotted on a map.

```
Set GPS
datum? N
```

```
GPS earth
datum  39
```

- When entered, there will a short delay of 2 seconds while the datum is read from memory and entered.

5.4.7 Setting the Units

```
UNIT USA
```

- This screen selects the units;
  MET = Metric (Kms, KPH and meters)
  USA = English (Nms, kts and feet)
  AUS = Australian (Kms, kts and feet)

- If 'MET' or 'AUS' is selected, then a further screen will be displayed asking whether the wind component should be kph or m/s, or kph or kts.

```
Compass
corr.? N
```

- If a compass option is installed, this screen allows the compass to be corrected.

5.4.8 Configuring the Course Deviation Indicator (CDI)

- Two CDI displays can be selected; DEV and CDI. See paragraph 11 for an explanation of the two types. If DEV is selected, then a further parameter giving the deviation from track is required to be selected. The two possible screens are:

```
35nm LAS
....0....
```

'Ind CDI'

```
35nm LAS
  <315°>
```

'Ind DEV'

5.4.9 Selecting the Flight Director

```
SC Active
   ON
```

- When selected 'ON', CRUISE mode is selected when the flap/external switch is made. 'OFF' selects CRUISE mode when flap switch is open.

5.4.10 Selecting the Stall Warning

```
Stall
warn.? N
```

- If it required to activate the stall warning feature, then reply 'Y' to this screen. You will then be able to enter the stall warning speed.

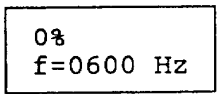
5.4.11 Configuring the Audio

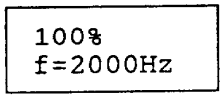
```
AUDIO LP
```

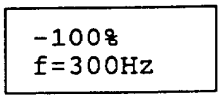
- The following audio tones may be selected:

LP - Classic audio tone; broken for climb, solid for sink
LN -
L - As LP but no sink tone
DP - As LP but with solid climb tone
DN - As DP but
N - Musical audio tones

- The next three screens select the frequency of the audio tones. 0% is the audio frequency with the vario at zero, 100% is the audio frequency at maximum climb indication while -100% is audio frequency at maximum sink indication. The frequencies shown below are the default frequencies and all can be modified and stored using the usual input procedure.

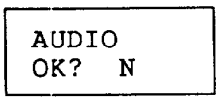


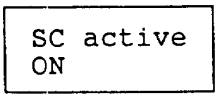


Once the audio has been configured, the unit plays a short demo sequence of the audio type and frequencies.

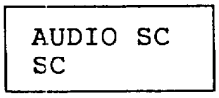



If the selection is satisfactory, select 'Y' and press <ENTer>. If 'N' is selected you are returned to the start of the audio configuration screens.

### 5.4.11 Audio Tone Control




When selected 'ON', CRUISE mode is selected when flap/external switch is made. 'OFF' is vice versa

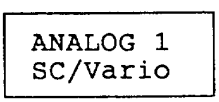


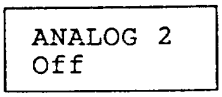

Conventional silent band in CRUISE mode

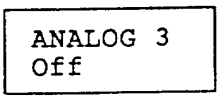

Audio tone in CRUISE mode when vario is showing 'PULL' (ie positive)


Audio tone in CRUISE mode when vario is showing 'PUSH' (ie negative)

### 5.4.12 Selecting the Analogue Meter Indications



- The next three screens shown above, select the information that is displayed on the analogue meters. Normally only one meter is fitted but up to 3 may be connected and individually programmed. If only a single parameter is selected then the meter will display this parameter all the time. Where two functions are shown split by a '/', then the first will be displayed when in cruise mode and the second when in climb mode. A list of the possible combinations are:

  - SC/Vario
  - Vario
  - SC (Speed Command)
  - Netto
  - Relative (or Super Netto)
  - Off

## 6. Programming Airports, Turning Points and Tasks

The airports stored in the instrument are classified using the ICAO country code. The first two letters of the ICAO code denote the country while the second two letters identify the airfield. If an airfield does not have a full ICAO locator, then it will be designated by its name and the ICAO locator will be shown as 'EG__'. When programming user selected airfields which do not have a current ICAO locator, then select two numbers to place after the two letter country code. You do not necessarily have to remember these digits as airports can also be called up by name.

Useful country codes are:
EB = Belgium
ED = Germany
EK = Denmark
EI = Ireland
EF and LF = France
EG = UK
LO = Austria
LF = France
LI = Italy

### 6.1 SELECTING A PRE-PROGRAMMED AIRFIELD BY NAME

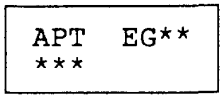
Example: Lasham in UK

- Select APT on the programming switch. The airfield shown will be the last airfield that was last selected.

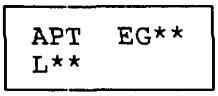
| APT LFNA |
| --- |
| GAP/TALLA |

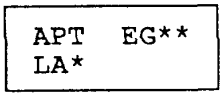
- press <ENTer>
- the cursor will flash on the country-code
- select country code with the programming switch
- press <ENTer>
- press <ENTer> twice more to step over the two stars following the country-code on the LCD:

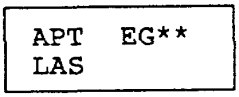
- three stars will now be shown with the cursor flashing on the first



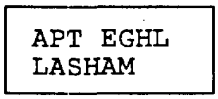

- These three stars are now replaced with the first three letters of the required airfield name, pressing <ENTer> after each letter has been selected, thus;




- The display will show:



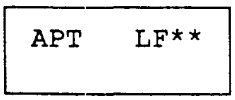

The flashing cursor will now be on the country code.

- If there was more than one airfield starting with LAS in the UK, as there is (Lashenden), then these airports can be cycled through by turning the data input knob. Similarly, if only LA* is entered, all airfields starting with LA can be cycled through in the same manner. Once the required airfield is selected, press <ENTer> and if the GPS is locked on to the satellites, the bearing and distance to the selected airport will be shown on the main display.

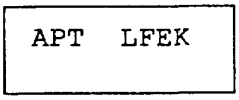
## 6.2 SELECTING A PRE-PROGRAMMED AIRFIELD BY ITS ICAO LOCATOR

Example: Issoudun in France (LFEK)

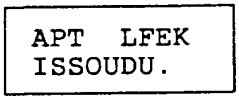
- Press <ENTer>
- Select the country code (LF) with the data input knob and press <ENTer>
- Overwrite the last two stars with the ICAO locator (EK)
- Press <ENTer> after selecting each letter




ENTER




ENTER

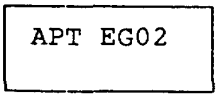



## 6.3 ENTERING A NEW USER SELECTED AIRFIELD

Example: My-Strip in UK

Firstly decide how to define the ICAO locator part of the airfield description. As the airfield will obviously not have an ICAO locator, it is advisable to allocate two unused numeric characters after the country locator; eg EG02

- Press <ENTer>
- Enter country code (EG)




- Select two numerical digits (02) or other identifier and press <ENTer>

| | |
|---|---|
| Ent. new<br>APT? N | - Select 'Y' and press <ENTer> |
| NAME<br>MY_STRIP | - Enter Name, pressing <ENTer> after each letter |
| LAT N00<br>00.00 | - Enter Latitude, pressing <ENTer> after each digit |
| LAT N51<br>54.91 | |
| LON E000<br>00.00 | - First set the designator to 'E' or 'W' and then enter the longitude, pressing <ENTer> after each digit |
| LON W001<br>08.11 | |
| ALT<br>0000 ft | - Enter Altitude in feet, pressing <ENTer> after each digit |
| ALT<br>0256 ft | |
| FREQUEN.<br>000.000 | - Enter the Tower frequency and press <ENTer> |
| FREQUEN.<br>129.975 | |
| RWY -- G<br>Tc0000ft | - Enter main runway direction, (reciprocal is automatically calculated), press <ENTer> |
| RWY 06 G<br>Tc0000 B | - Enter surface ('G'rass or 'C'oncrete)<br>- Enter circuit height based on QNH. If not specified leave as 0000. |
| Data<br>OK? N | - Enter circuit direction expressed as a quadrant (N,S,E or W). If variable use 'V' or 'B' or leave blank.<br>- Enter 'Y' if data is correct |
| APT EG02<br>MY_STRIP | - If data is correct, then this display is shown. Bearing and distance will be shown on the LCD display |

Note: If it is not required to enter the airfield frequency, runway and circuit height, then by moving the programme selector to any other position, blank data will be written into these fields.

## 6.4 ERASING OR CORRECTING AN USER AIRFIELD ENTRY

- Select the user airfield

| | |
|---|---|
| APT EG02<br>MY_STRIP | - Press <ESCape> for at least 5 seconds |
| APT EG02<br>VIEW! | - Press <ENTer> |
| APT EG02<br>CLEAR? N | - Select 'N' and <ENTer> to View/Change<br>- Select 'Y' and <ENTer> to Erase<br>- Assuming 'N' has been entered |
| NAME<br>MY_STRIP | - If correct, press <ESCape> to confirm<br>- Else press <ENTer> and correct |

- After checking and confirming/altering name and position as necessary,

| | |
|---|---|
| DATA OK? | - Select 'Y' |
| APT EG02<br>VIEW! | - Press <ESCape> if now correct<br>- Or <ENTer> to recycle again |

## 6.5 ENTERING A NEW TURNING POINT

- Select TP on the programme selector
- Using the data input knob, search for any un-programmed TP position from 0 to 99.

| | |
|---|---|
| TP 00<br>NOT PROG | - Press <ENTer> |
| NAME | - Enter name with data input knob and <ENTer> button |

- Enter latitude, longitude and height

| | |
|---|---|
| NAME<br>DID | LAT N51<br>37.27 |
| LON W001<br>15.57 | ALT<br>0210 ft |

- When entry is complete, the data can be written to memory or corrected.

| | |
|---|---|
| DATA<br>OK? Y | TP 00<br>DID |

## 6.6 OVER WRITING OR CORRECTING A TURNING POINT

- Select the TP it is required to over-write or correct
- Press <ENTer>
- Enter 'N' to correct data

| | | |
|---|---|---|
| TP 00<br>DID | NAME<br>DID | DATA<br>OK? N |

## 6.7 DELETING A TURNING POINT

- Select TP it is required to erase
- Press <ESCape> for at least 5 seconds until 'Delete' screen appears
- Enter 'Y' to delete TP

| | | |
|---|---|---|
| TP 00<br>DID | DELETE<br>TP? Y | TP 00<br>NOT PROG |

## 6.8 ENTERING PRESENT POSITION AS A WAYPOINT

Provided that the GPS is active, the present position can be written into a unprogrammed TP using the following procedure:

| | |
|---|---|
| TP 55<br>NOT PROG | - Select a TP number that is not programmed<br>- Press <START> |
| NAME<br>THERMAL 1 | - Enter name it is required to call present position and press <ENTer> |

It is easiest to enter a simple character or numeral to identify the position and return to it and rename it at leisure.

## 6.8 ENTERING A TASK

Example: Bicester - Didcot - Lasham A/F - Bicester

- Select TSK on programming switch
- Up to 100 tasks can be pre-programmed with up to 10 airfields or turning points in each task.
- Select a TSK between 0 and 99 that has not been programmed.

| | |
|---|---|
| TSK 00<br>NOT PROG | - Press <ENTer> |

| | |
|---|---|
| TSK 00/0<br>NOT PROG | - 00/ is Task No<br>- 0 is leg 0 of the task |

- By rotating the data input knob, the starting turning point or airfield can be selected
- Turn data input until 'EG**' is shown
- Select and input 'EG**' if the locator is known, else step over the 'EG**' and input the first three characters of the airfield name. If more than one airfield exists with these 3 characters in the first digits, then they can be cycled by rotating the data input knob.

| | |
|---|---|
| APT EG__<br>BICESTER | - When correct airfield selected, press <ENTer> |

- The task screen and selected TP or airfield will now flash alternately

| | | |
|---|---|---|
| TSK 00/0 | Alternating with | APT EG__<br>BICESTER |

- Turn data input knob one step to the right to write start point of task into memory

| | |
|---|---|
| TSK 00/1<br>NOT PROG | - Press <ENTer> |

- Turn data input knob to select TP 00 and press <ENTer>

| | | |
|---|---|---|
| TSK 00/1 | Alternating with | TP 00<br>DIDCOT |

- Turn data input knob another step to right to write first turning point into memory
- Select and enter second turning point, Lasham, using the same technique
- Select last turning point, Bicester, using the same technique

| | | |
|---|---|---|
| TSK 00/3 | Alternating with | APT EG__<br>BICESTER |

- When the task is complete, press <ESCape> and it is now possible to designate the last turnpoint as a control point. Such a point may be designated for airspace or traffic pattern reasons. This last TP (or APT), now designated as a control point, is not considered to be a turning point in the normal sense and while the flight director will give steering information to overfly the control point, the range and final glide slope information will be to the goal, routed around the control point. As on occasions the control point may be quite close to the destination airfield, this facility gives much improved final glide control on long final glides.

| Control<br>Point? N | - If no Control Point is required, enter 'N'. Otherwise enter 'Y' and the last point entered will be considered to be a 'Control Point' |
|---|---|

- The task is now programmed and the screen will display:

| ED__<br>BICESTER | Alternating with | TSK 00<br>NO START |
|---|---|---|

- In Gliding Mode, the task will start automatically when the glider is in the photo zone. Alternatively, the task can be started at any time by pressing <START>.

### 6.9 STARTING A TASK

The selected task is automatically started if the glider is flown into the FAI start zone. Alternatively, a start can be initiated at any time by pressing the <START> button. If it is required to re-start, then press the <START> button for at least 5 secs when you will be returned to the start task screen.

### 6.10 DELETING A TASK

- Select the task number it is required to delete
- Press <ESCape> for 5 seconds until 'Delete' screen appears
- Select 'Y' and press <ENTer>

| TSK 00<br>NO START | DELETE<br>TSK? Y | TSK 00<br>NOT PROG |
|---|---|---|

### 6.12 OVER-WRITING A TASK

- To overwrite an existing task, proceed as for modifying or overwriting a turning point.

## 7. STATISTICS

- Select STA on the programme selector.

### 7.1 IN-FLIGHT STATISTICS

The in-flight statistics are activated as soon as the speed exceeds 30 kts. If no task has been started, then the statistics displayed refer to the flight since take-off. Once the start button has been pressed, then the in-flight statistics displayed refer to the current leg only.

| TSK STAT. | - Press <ENTer> |
|---|---|

| 122' 30"<br>62 kts | - Flight Time in minutes and seconds<br>- Average speed |
|---|---|

| |
|---|
| ENGINE<br>12' 30" |

- Press <ENTer>
- Engine running time in minutes and seconds is displayed if Engine recording option has been installed

## 7.2 STATISTICS AVAILABLE AFTER FLIGHT

| |
|---|
| STAT. |

- Press <ENTer>

| |
|---|
| TSK 00<br>09:10:22 |

- Starting Time (Local)

- Press <ENTer>

| |
|---|
| TSK 00/1<br>1.2 kts |

- Task 00, Leg 1
- Average climb, Leg 1

- Press <ENTer>

| |
|---|
| TSK 00/1<br>044 kts |

- Average groundspeed on leg 1

- Press <ENTer>

| |
|---|
| TSK 00/1<br>52% |

- % Time spent thermalling on leg 1

- Press <ENTer>

| |
|---|
| TSK 00/1<br>10:32 |

- Time (local) of reaching first turning point

- Press <ENTer>

| |
|---|
| TSK 00/2 |

- The same data is now repeated for the second leg

- After recalling all the individual legs, the statistics for the complete flight are then displayed.

| |
|---|
| TSK 00.<br>2.1 kts |

- Denotes data for the complete task
- Average achieved rate of climb

- Press <ENTer>

| |
|---|
| TSK 00<br>46 kts |

- Average ground speed for complete task

- Press <ENTer>

| |
|---|
| TSK 00<br>46% |

- % Time spent thermalling

- Press <ENTer>

| | |
|---|---|
| TSK 00 END<br>14:09:34 | - Time (local) task completed |

- Press <ENTer>

| | |
|---|---|
| LAND<br>14:15:12 | - Time (local) of landing |

## 8. CALCULATIONS

Select Programming switch to CAL

### 8.1 Calculation of Data Between Two Points

| | |
|---|---|
| CALC | - Press <ENTer> |
| CALC<br>EXIT | - Turn Input Switch until 'Points' is shown<br>- Press <ENTer> |
| CALC<br>POINTS | - Select any two waypoints or airfields<br>- (see para )<br>- Turn Input Switch one click to the right |
| P1 TP00 | - 1st TP or Airfield selected<br>- Press <ENTer> |
| P2 TP01 | - 2nd TP or Airfield selected<br>- Press <ENTer> |
| P12 64<br>74.9 nm | - P1 to P2 = 064 degrees<br>- Distance 74.9 nms<br>- Turn Input Switch |
| CALC<br>EXIT | - Press <ENTer> to exit |

### 8.2 Calculation of Task Details

| | |
|---|---|
| CALC | - Press <ENTer> |
| CALC<br>TSK | - Turn Input Switch until 'TSK' is shown<br>- Press <ENTer> |
| CALC<br>TSK 00 | - Enter selected pre-programmed task<br>- Press <ENTer> |

| | |
|---|---|
| 0>1 244<br>74.9 nm | - Heading of first leg 244 degrees<br>- Distance 74.9 nms<br>- Press <ENTer> |
| 1>2 18<br>145.7 nm | - Heading of second leg 018 degrees<br>- Distance 145.7 nms<br>- Press <ENTer> |
| TSK 00<br>220.6 nm | - Entire task length 220.6 nms<br>- Turn Input Selector until CALC EXIT appears and then press <ENTer> |

## 9. Communicating with a PC

## 10 Emergency Airfield Facility

On selecting EM with the programme selector and pressing <ENTer>, the computer calculates the 10 nearest airfields.

| | |
|---|---|
| EMR.<br>------- | - Press <ENTer> |
| EMR.<br>WAIT! | - Wait approx 2 secs |
| E0 17 nm<br>BOOKER | - Nearest Airfield, distance 17 nms<br>- Turn Input Selector one click |
| E1 22 nm<br>AYLESBURY | - Next nearest airfield 22 nms |

Each turn of the input selector will select the next nearest airfield up to a maximum of 10 airfields. Cycle the input knob until the desired emergency airfield is selected and press <ENTer>, then turn the programme selector to APT and the range and bearing will appear on the main LCD.

## 11. FLYING WITH THE LX 4000

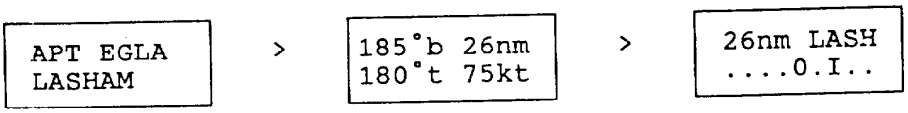
Switch on the instrument, allow it to carry out its internal checks and then enter the airfield height and QNH. If you are likely to be final gliding to a different airfield or the pressure is likely to change while on task, it is important that an accurate QNH is entered (see para 11.)

Set the programme selector to 'POS' and check that the instrument has locked on to the satellites shown by the display 'GPS=OK'.

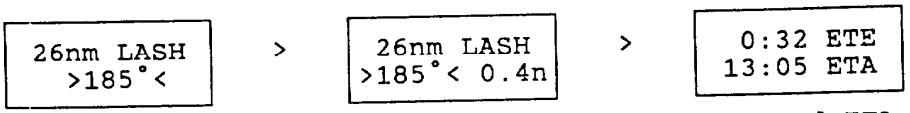
## 11.1 'GO TO' an Airfield or Turning Point

To operate in this mode, use the programme selector to select either 'APT' if you want to go to an airfield already in the database, or 'TP' if you want to go to a turnpoint or waypoint. Select the required facility and press <ESCape>. The first screen will show track made good, bearing and distance to the facility and ground speed. Each further press of <ESCape> (denoted by the > in the examples below) will cycle to the next display screen. The number of screens displayed depends on whether 'APT or 'TP' was selected and are shown below.

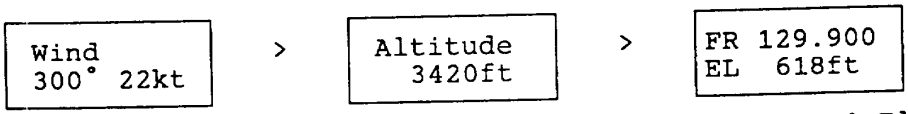
### 11.1.1 APT Selected




Initial page — Bearing & Track — CDI

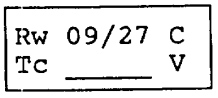



Alternative DEV pages instead of CDI — ETE and ETA



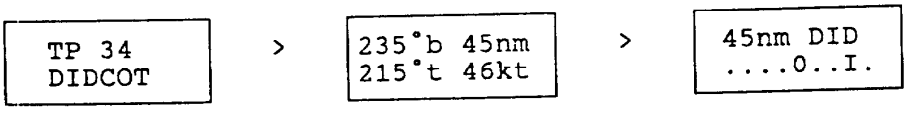

Wind Velocity — Height on QNH — Twr Freq & El.

Note: Wind velocity is only shown if the compass option is installed.




Main runway direction, surface, circuit height on QNH (if published) and circuit direction.

### 11.1.2 TP Selected



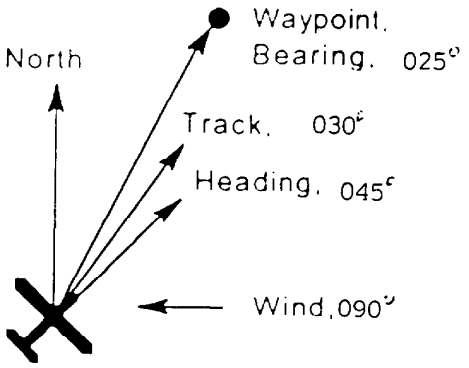


Note: Wind velocity is only shown if the compass option is installed.

### 11.1.3 Recommended Flying Screen

If the screen on the left below is selected on the control unit, it will show bearing to the first TP, current track over the ground, range and ground speed. This is the most useful screen for a glider pilot.

```
025°b 34nm
030°t 25kt
```




The locator on the main screen will be showing one 'turn left' arrow to indicate the 5° difference between the bearing and track. If the glider is turned 5° left, the bearing and track will now be the same and only the central bar denoting 'on track' will be shown on the locator. The glider is then tracking directly to the TP with an allowance made for any cross wind.

## 11.2 Flying a Pre-Programmed Task

Programme and select the task number that it is planned to fly; the following screens will be shown on the control unit screen.

```
TASK  10
NO START
```

alternating with

```
TASK  10/0
BICESTER
```

This indicates that Task 10 has been selected, the start point is Bicester and a start has not yet been made. As soon as the glider is situated in the photo sector, press the <START> button. The main LCD will now indicate the first turn point showing its range and bearing.

On reaching the first TP, the instrument will automatically select the second TP. The final glide display is shown for every leg although for intermediate legs you will usually go high on the glide path as the TP is approached. When carrying out a final glide, the glide path arrows will show if you are below or above the required glidepath, remember they are a command indication; if the arrow is pointing up, then you are below the glidepath and vice versa. The altitude figure displayed at the lower right shows the amount by which you are below or above the glide path. Negative figures indicate below the glide path while no sign indicates above the glide path. The maximum height deviation from the

glide path that is displayed is 2000ft; **if you are above or below this height difference then dashes will be displayed.** Remember that the safety altitude set in the **INI screen is** not displayed; if you have set a 500ft safety altitude, then if you follow the final glide director exactly, you will end up 500ft over the finish line.

As the internal altimeter is referenced to QNH and airfield elevations are programmed into the airfield information, then final glides to goal airfields that are at a different elevation from the departure airfield will automatically be taken into account. However, if the QNH has changed significantly between take off and the final glide, then a revised QNH should be set in the INI screen.

If it is required to make a re-start, press the <ESCape> button for at least 5 secs and the instrument will return to the start screen.

## 11.3 Total Energy Compensation

The instrument can be configured to either TE compensation by pneumatic tube or electronically. If tube compensation is selected, then no further calibration can be made.

If electronic TE is selected, then the TE can be fine tuned during flight and, if necessary, adjusted. When carrying out zoomies to check the TE compensation remember that rapid pull ups and push-overs will result in false TE readings caused by the rapid change in induced drag. TE compensation assumes that induced drag is purely a function of airspeed and the calculation does not take into account the large changes in induced drag that can occur during rapid pull ups or push overs.

To check and adjust the electronic TE compensation proceed as follows:

1. Ensure that all flight tests are carried out in totally smooth air; it is impossible to set up the calibration if thermic conditions exist.

2. Ensure that all pneumatic pipes and connections are well made and tight.

3. Put the instrument in permanent vario mode by selecting 'AUTO-OFF' in the INI mode and ensure that the flap switch (if fitted) is in climb mode.

4. Select programme INI, enter the password '4077' so that the following screen is displayed on the control unit:

| TE = 100 % |
|---|

5. Fly at a constant speed around 80 kts for at least 20 secs.

6. Reduce speed to around 45 kts and note the vario reading. If the vario is correctly compensated, then the reading will follow the polar sink.

7. If the vario shows an increasing sink reading while slowing down then it is over compensated. Reduce the TE value below 100% and try again.

8. If the vario shows decreasing sink or climb while slowing down then it is under compensated. Increase the TE value above 100% and try again.

9. If the vario shows a rapid movement and then settles down while slowing down, then reduce the TEF (Filter) factor and vice versa.

10. Once you are satisfied with the TE compensation, select 'Y' and press <ENTer> when the new values will be written to memory.