LX flarm Mini Box

with optionally SD-card interface and IGC approved flight recorder

User manual

1 Introduction

Flarm is a collision avoidance system developed by Flarm Technologies from Switzerland. LX Navigation and Flarm Technologies signed a contract under which LX Navigation got rights to integrate Flarm technology into LX Navigation products.

A Flarm module consists of following main parts.

- GPS receiver
- Microcontroller unit
- Radio Transceiver
- Pressure altimeter
- Flarm external indicator

The GPS receiver defines position of the glider, the microcontroller is responsible for collision prediction calculations and the transceiver is sending and receiving data.

2 Technical data

- Dimensions:53x29x83 mm aluminum housing
- Weight: approximately 150 gr.
- GPS antenna as an n integral part of the unit
- RF connector: SMA female
- Dipole antenna as standard solution
- RF range: max. 5 km, depends on antenna installation
- Data interface 6P telephone type
- Power : 8-16 V DC ,consumption ca. 60 mA by 12V DC
- Pin 6 power input (8-16V), 4 and 1 GND (near to RF connector), 2 data in, 3 data out, 5 power for external display
- Flarm LED external display (dual color version)

2.1 Part list

2.1.1 Flarm Minu Box

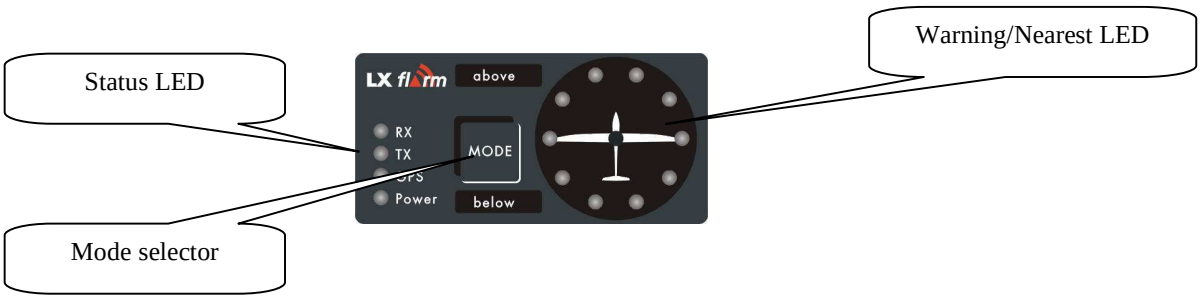
- Flarm Mini Box unit
- RF antenna
- Power supply cable

3 Operation

The unit will run immediately after power will be applied. With GPS antenna connected and visible satellites about three minutes will take to be operable. All important statuses are and information are readable on dual color display, also all inputs will be done this way.

3.1 Flarm display

The unit consists of a 50x20 mm flat housing which has one push button and 16 dual color LED's. The display is an integral part of the unit and can not be removed.



- 10 radial positioned red/green LED's, defines **direction to** the near glider (top LED active means frontal collision risk)
- 2 additionally red/green light emitting diodes marked like **above** and **below** informs about vertical position of the glider, which is close.
- **Mode** button is used to control the unit, see table below
- 5 red/green status LED's. received from Flarm unit

Description of LED statuses:

- **Power red flashing**, no data from Flarm
- **Power green** data received
- **GPS red** GPS BAD, **GPS green** GPS OK/3D
- **Tx green** flashing, data sent
- **Rx green** , minimum one glider in range
- **Green circular** , indication of near gliders
- **Red circular flashing**, collision warning
- **Above below green** by near
- **Above below red** by warning
- **018˚, 054˚, 324˚ and 288˚** green and red flashing, obstacles in front

The external display has two modes of operation:

- **WARNING Mode** will activate a red blinking diode, if another glider equipped with Flarm will be close and a prediction for a **collision** risk will exist. An audio warning will be also executed. Higher collision risk will increase blinking frequency and the same is with audio. The warnings are classified into three levels (See Flarm manual for details)

  -First level approximately **18 seconds** before predicted collision
  -Second level approximately **13 seconds** before predicted collision
  -Third level approximately **8 seconds** before predicted collision

- **NEAREST Mode** will show the direction to the nearest glider which position is inside of radio range. **One** green LED will light **permanently** and there will **be no audio**. The unit will change over to Warning Mode **automatically, if warning** criteria will be fulfilled and will continue in NEAREST after collision risk will disappear.

Note!
The external displays produced by LX Navigation will change over to **Demo mode** after MODE button will be pressed **short** 10 times. Nearest mode and all possible warnings will be displayed. To change over back to normal operation switch the unit **off**.

- Pressing of MODE selector continuously for approximately **4 seconds will deactivate** Flarm external display for 5 minutes, no **warnings** and no **near** information will be displayed during this period. A very typical situation only Power LED on, will characterize this status.

Note!
To change mode of operation press **MODE** button for approximately 2 seconds. If the radial LED's will run from top toward bottom means change over to NEAREST and vice versa. After new power on, the mode active before switching off will remain.

- **Obstacles.** Flarm electronic is capable to store **coordinates of obstacles**, which could cause a collision during flight. This data is available on www.flarm.com, use Flarm tools to update. The unit is factory loaded with actual obstacle database. An obstacle warning will be activated, if an obstacle is to be found in the front of the glider and a collision risk is predicted.
  After a low level warning has been activated two upper LEDs will be active (such a situation will newer appear by glider collision risk). Medium and high risk will be indicated with more LED's active and more frequent audio signal.

  - To change **audio warning volume** press short mode selector, each press will increase audio volume (three levels and mute available).

Note!
To change mode of operation press **MODE** button for approximately 2 seconds. If the radial LED's will run from top toward bottom means change over to NEAREST and vice versa. After each **new power on**, the unit will start in **Nearest** mode.

3.1.1 Display settings

Using of mode selector button is possible to adjust some parameters of the display (baudrate and hierarchy). **Disconnect** the unit, **press mode selecto**r and hold, **power on** and continue holding of mode selector for **about 4 seconds.**
The display parameter indication will change (see table below) after each press on mode selector for approximately **2 seconds.** To change press mode short, the status will indicate circular **LED's**.

Parameter	LED	Green LED 018°	Green LED 054°	Green LED 090°	Green LED 126°	Green LED 162 °	Green LED 198°
Twin confg.	Tx	PIC	PAX				
Baudrate	Tx+Rx	4800 bps	9600 bps	19200 bps	-------	38400 bps	57600 bps

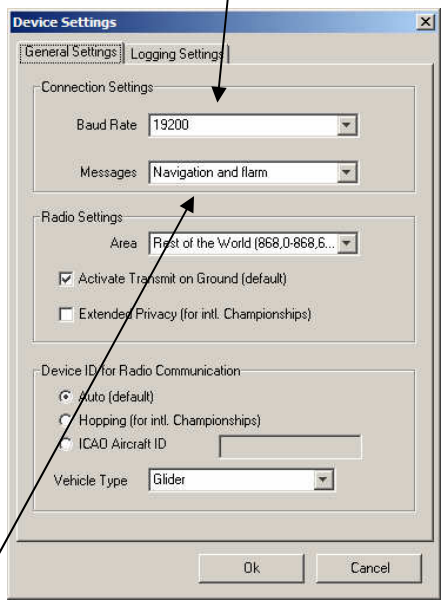
Table of possible settings

If two units will work in parallel (double seater), one unit must be PIC (front seat) and another PAX.

Note!
LX Flarm Mini Box baudrate is factory set to **19200**.

3.1.2 Mini Box settings

As there are practically two units built in the Flarm Mini Box, (Flarm electronics and the display) it is obligatory that both have the same **communication speed** (baudrate). If there is any reason for another com speed, (using of Flarm as GPS source for other units…), the com speed of the Flarm unit can be adjusted any time after using of Flarm tools. Use option **Settings**, how to connect Flarm Mini Box to PC see capture 4.



Note!
The option **"Navigation and Flarm"** means that the Flarm unit is sending Flarm and navigation data. This option is obligatory to be enabled, if the LX Flarm Mini Box will be taken as GPS source for another navigation instrument or PDA.

If another navigation device for instance PDA is intended to be used, a splitter should be inserted. LX Navigation offers a wide range of splitters.

Note!
LX Flarm Mini Box settings update is also possible to be carried out by using of SD card and **flarmcfg.txt** file. See capture 8 for details.

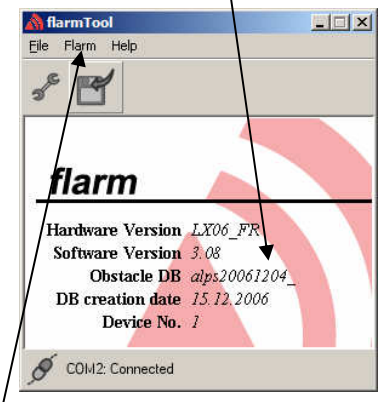
4 Firmware update

Flarm software expires and therefore periodically firmware upgrades are necessary. Flarm original tools should be used, available on www.flarm.com. A cable set isn't a part of delivery. Use IGC compatible cables, for instance Colibri/LX20 power and data adapter (**COL-AC-PC**).

Note!
Colibri power adapter will also power Mini Box

The procedure:

- Run actual Flarm **tool on PC**
- **Power ON** Red Box
- Wait (apr.30 seconds) until **connect** status on tools will appear



- Click on **Flarm**
- Select kind of transfer (**Recover** for firmware update)
- Follow **wizard**
- Wait until **finish**
- **Disconnect** comport
- Switch Flarm unit **off and after again on**
-

5 Installation

The unit is designed to be installed on the top of the instrument panel to ensure GPS reception. As the unit needs some manipulation during flight, please respect this fact.

5.1 Power

Each unit is delivered with a power cable. On one end you will find one red and one blue wire, connect them to the glider 12 V power network **(red +/ blue -).** The opposite side is equipped with a **6p** telephone type connector and this should be plugged into suitable plug on the **back side** of the unit.

Note! There is no internal fuse built in the unit. Use External fuse 1A. The unit is prevented against wrong polarity of input voltage.

5.2 RF antenna installation

The RF antenna installation should be taken serious; a bad positioned antenna may reduce system parameters dramatically. The antenna orientation should be as much as possible vertical and also as high as possible. Special care should be taken by carbon gliders.

Dipole antenna

5.3 GPS antenna orientation

The GPS antenna is positioned on the top of the unit and can't be removed. Don't cover antenna with metal parts to ensure GPS reception.

Note! Flarm unit will not work until having GPS 3D, means antenna installation is an important fact.

5.4 Final check

After LX Flarm unit will receive power, the display will pass initial routine and this procedure will take several seconds. Check LED status indicators and observe, if they indicate any error.

1. **Power red flashing**, no data from Flarm……**ERROR**
2. **Power green** data received……..OK
3. **GPS red** GPS BAD, **GPS green** GPS OK/3D……OK
4. **Tx green** flashing, data sent……..OK
5. **Rx green** minimum one glider received……...OK

Note!
After installation obligatory check functionality from 1 to 3 and 5. Tx lamp flashing is connected with GPS status, if bad no transition.

5.5 How to connect NMEA users

LX Flarm Mini Box may supply several navigation devices with NMEA position data. Mentioned data is available on the 6P telephone type connector situated on the back side of the unit, the same connector also serves for the power supply. There are units 100% plug and play connectable and some other devices needs splitters.

Unit	Plug and play	Mini B.s plitter	Mini. B. s.unit	LXIPQ
LX 1600	Yes	No	No	No
LX 7007 basic	Yes	No	No	No
PDA	No	No	Yes	Yes

Note!
Adapt bud rate after using of Flarm tools, if required.

6 SD card and Flight recorder option (Firmware 3.05 or later)

LX Flarm Mini Box may be optionally delivered with SD card interface. The card slot is an integral part of the unit.

One **already formatted SD** card is delivered with the unit. The functionality of SD card is as follows:

- Storing of flights

Note! The flight recorder hasn't IGC approval.

- Update of obstacle data base
- Flarm firmware update

Note! Flarm traffic avoidance functionality does not depend on SD card status (inserted or not).

Files for any update are available on www.flarm.com/support/updates/.

Note! FAT 32 formatted SD cards will **no be accepted** by the system. Use FAT 16 formatted cards, delivery included card is already formatted and ready for operation.

All files should be **copied to the SD** card (no folders permitted), also it is not allowed to change any file name.

6.1 Firmware update procedure

Ready for update:

-Insert the card and switch the Flarm unit off, for minimum 5 seconds
-Power on Flarm unit **Firmware update:**

-An update will follow after a file having extension **.fw** will be detected; the procedure will take approximately one minute and will run automatically.

The obstacle data base update procedure:

-If an **.obs** file type will be detected, an update will follow. The update may take **several minutes.**

Read of flight recorder data:

-The last 20 flights will be automatically copied to SD card after each power on. If some flights also exist, they will not be doubled. After a longer time flying without the card inserted the copy procedure may take some longer time because all 20 flights must be transferred to the card. To start copy to SD card remove power for apr. 5 seconds and power on again. The procedure will run automatically.

7 Limitations

Note! Using of Flarm will **not reduce responsibility** of the pilot to monitor the airspace and to react in case of a collision risk.

See Flarm manual for details.

8 LX Flarm Mini box with IGC approved flight recorder

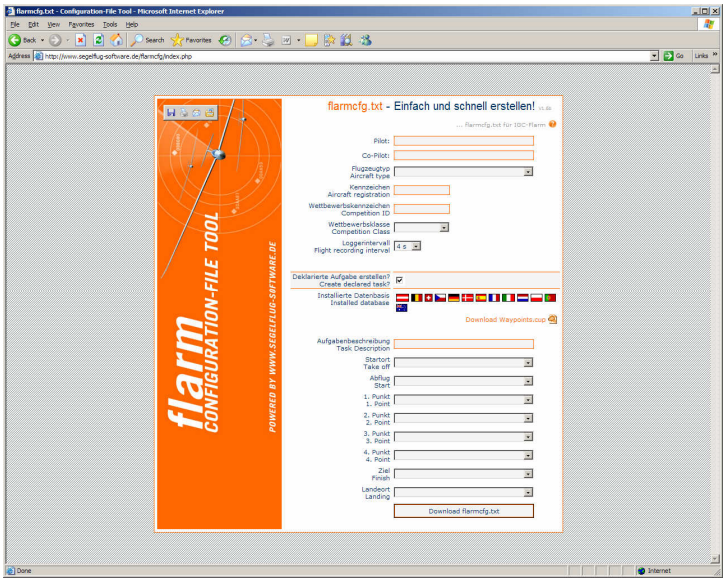
LX Flarm Mini Box is offered also with “diamond level” IGC approved flight recorder. Units having this option differ against to non approved units in following:

- On the label you see a three character IGC designation code (for instance MR0)
- The unit is protected with two safety label against non authorized opening of the box
- A push button marked as **even**t is positioned on the top of the box, its main function is setting of additionally records after activation

Note! The label should remain not damaged, after damage the flight data will become invalid.

8.1 Task declaration

There are many ways to provide task declaration. The simplest way seems to be with SD card and **flarmcfg.txt file.** Immediately after Flarm will recognise mentioned file an automatic update will follow. To create files use FLARM-CONFIGURATION TOOL available on **www.segelflug-software.de/flarmcfg/.**



As a possible PC solution we suggest SeeYou and as PDA solution you can use:

- ConnectMe (a free ware program from Naviter)
- Srepla

For details see also www.fai.org/gliding/system/files/lxn**minibox**.pdf

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FLARM QUICK CHECKLIST

This Quick-Checklist is intended to support your FLARM installation and commissioning activities.
In any case, also consult the Installation and Operating Manuals.
We recommended filling out this Checklist and to store it together with the official aircraft files.

Aircraft registration: ..... Aircraft type: .....
FLARM serial number: .....
Checks done by: .....
Place and date: ..... Signature: .....

Check the following items during installation:

- ☐ Most up-to-date **Installation Manual** consulted? *most up-to-date v3.08*
- ☐ **Radio antenna** attached by tight screwing?
- ☐ **Radio antenna** adequately placed?
- ☐ - vertical position
- ☐ - unobstructed radiation to all sides, neither metal nor carbon alongside or above
- ☐ - doesn't touch cockpit canopy
- ☐ **GPS antenna** plugged in?
- ☐ **GPS antenna** adequately placed? Unobstructed view of the sky, neither metal nor carbon alongside or above
- ☐ Enough **spacing** between all radio and GPS antennae incl. those from other devices?
- ☐ Installation and wiring suitable even for severe **turbulence** and accelerations?
- ☐ Installation and wiring not obstructing **emergency exits**?
- ☐ No **wiring** bent or under stress?
- ☐ All **wiring** correct, and remaining wires individually insulated?
- ☐ Separate **electrical fuse** / **circuit breaker** installed and accessible?
- ☐ **Display** visible, **sound** audible and **push button** accessible?
- ☐ Device accessible for software and obstacle-data **updates**?

Check the following items after installation:

- ☐ Most up-to-date **software-version** uploaded? *most up-to-date v3.08*
- ☐ Most up-to-date **obstacle-data** uploaded? *most up-to-date May 7, 2007*
- ☐ **Device readiness** (after some minutes Power/GPS/Send diodes are continuously on)?
- ☐ **No interference or adverse effects** with other essential systems, e.g. compass, radio, FADEC?
- ☐ For **tug/tow planes**: aircraft type configuration set to tug/tow plane with PC software?
- ☐ **Official aircraft files** updated? (includes S/N, software-version, obstacle-data-version, aircraft type configuration, installation location device / display / GPS antenna / radio antenna / circuit breaker)
- ☐ Deadline for **mandatory software-update** noted? *currently February 2008*

Prior to each flight, always check the following items:

- ☐ **Device readiness** (after some minutes Power/GPS/Send diodes are continuously on, no errors displayed)?
- ☐ Most up-to-date **Operating Manual** consulted, and manual on board? *most up-to-date v3.08*
- ☐ Select appropriate **sound volume** and **operating mode**
- ☐ Most up-to-date **software-version** uploaded? *most up-to-date v3.08*
- ☐ Most up-to-date **obstacle-data** uploaded? *most up-to-date May 7, 2007*

Quick-Checklist version 3.08E **Page 1 of 1** May 13, 2007