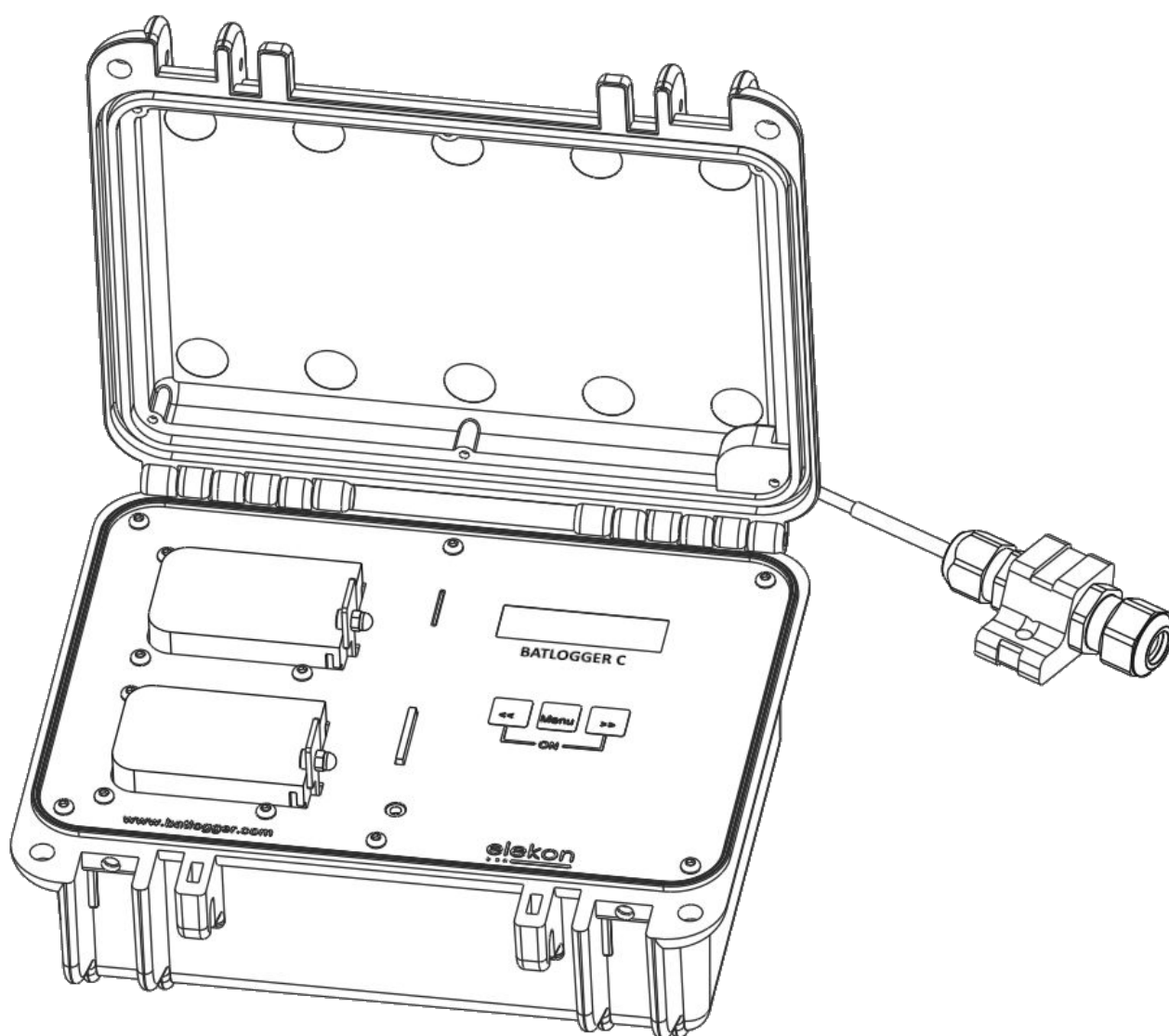




# BATLOGGER C

## Manual

Firmware version V 2.4



**elekon**

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CH-6014 Luzern

[www.batlogger.com](http://www.batlogger.com)

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# 1 Safety information and notes

Before operating the device, please read this manual thoroughly and retain it for reference.



## General safety information:

- Ignoring the associated information given under this symbol may result in serious injury or even death.
- Use the device only in its intended manner. Any other uses may lead to damage to the device or in the vicinity of the device.
- Do not place the device on or near a heat source (heating, fire, etc.). Protect it against high temperatures and temperature fluctuations
- Place the device so that it can not become a danger due to dropping, falling etc.
- The device must be kept out of reach of children.
- Make sure no foreign objects (coins, pins etc.) or liquids can enter the unit.
- Only use the specified supply voltage for the device.
- When installing the device and the external cables (microphone, power supply, etc.) it must be ensured that it can not come into contact with other live objects. Also, make sure that no electric shock caused by lightning, high-voltage power lines etc. can occur. Faulty connections and damaged cables can cause electric shock or fire.
- Be sure the use of this device is allowed in the country and in the environment required. The use of this device may be dangerous and has to be avoided in the following areas:
  - Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc.
  - Where there is risk of explosion such as gasoline stations, oil refineries, etc.
- It is responsibility of the user to enforce the country regulation and the specific environment regulation.
- Do not use the unit while operating a vehicle (such as a bicycle, motorcycle or car).
- An alteration or modification of the device affects the product safety. Caution: Risk of injury!
- Do not perform any repairs.
- Handle the device with care. It can be damaged through impact, hits or dropping even from low height.
- Avoid operation in close proximity of strong magnetic or electromagnetic fields transmitting antennas, RF generators or near electronic devices such as mobile phones. This may affect proper operation.
- By handling error, unit malfunction, or during repair work the stored data may be destroyed or erased. It is therefore advisable to make a backup copy of important data, on the PC hard drive.



**External power supply:** Unplug from outlet when not in use and before conducting maintenance. The included power supply adaptor must be used indoors only (0..40°C). Do not use with a damaged cord or plug. Do not attempt to open the charger. Repairs should only be carried out by a qualified customer care centre. When disconnecting the power adapter from the wall outlet always grasp the adapter itself and not the cord.

If any other external power supply is used (e.g. photo-voltaic panel), make sure that it is properly connected and protected from moisture, rain and any other environmental influences.



**Li-Ion battery:** Do not attempt to open or repair the battery. Do not short circuit the battery. Do not expose the battery to high temperatures or allow moisture or humidity of any kind to come into contact with it. Only use original spare parts. When transporting and storing several BATLOGGER C together, the corresponding regulations have to be followed.

The battery should be charged at temperatures between 0°C and 40°C and discharged at a temperature between -10°C and +50°C. Using the battery at temperatures outside of this ranges may cause the battery to become hot or to break and may also harm the performance of the battery or reduce the battery's expectancy.



**Environmental conditions:** The BATLOGGER C is housed in a robust, weatherproof case. The case must be properly closed and secured to maintain weatherproofness.

All external connectors are protected against moisture and rain only if the corresponding cable is properly connected. If a connector is left unconnected, it must be protected with the dummy plug.



**Microphone / Ultrasonic sensor:** An active electret microphone is used as ultrasound sensor. Attention has to be paid to a proper fitting of the microphone in its plug. The microphone itself can be damaged by water. It must be protected from dirt, rain and extreme humidity, and it requires corresponding positioning. A defective microphone can lead to unusable or incorrect data.



**Measurement device:** The BATLOGGER C is a very sensitive measurement device and must be treated as such. To achieve useful and reproducible results you should consider some preparation measures and familiarize yourself with the device. Some basic knowledge about bats and ultrasound is required.

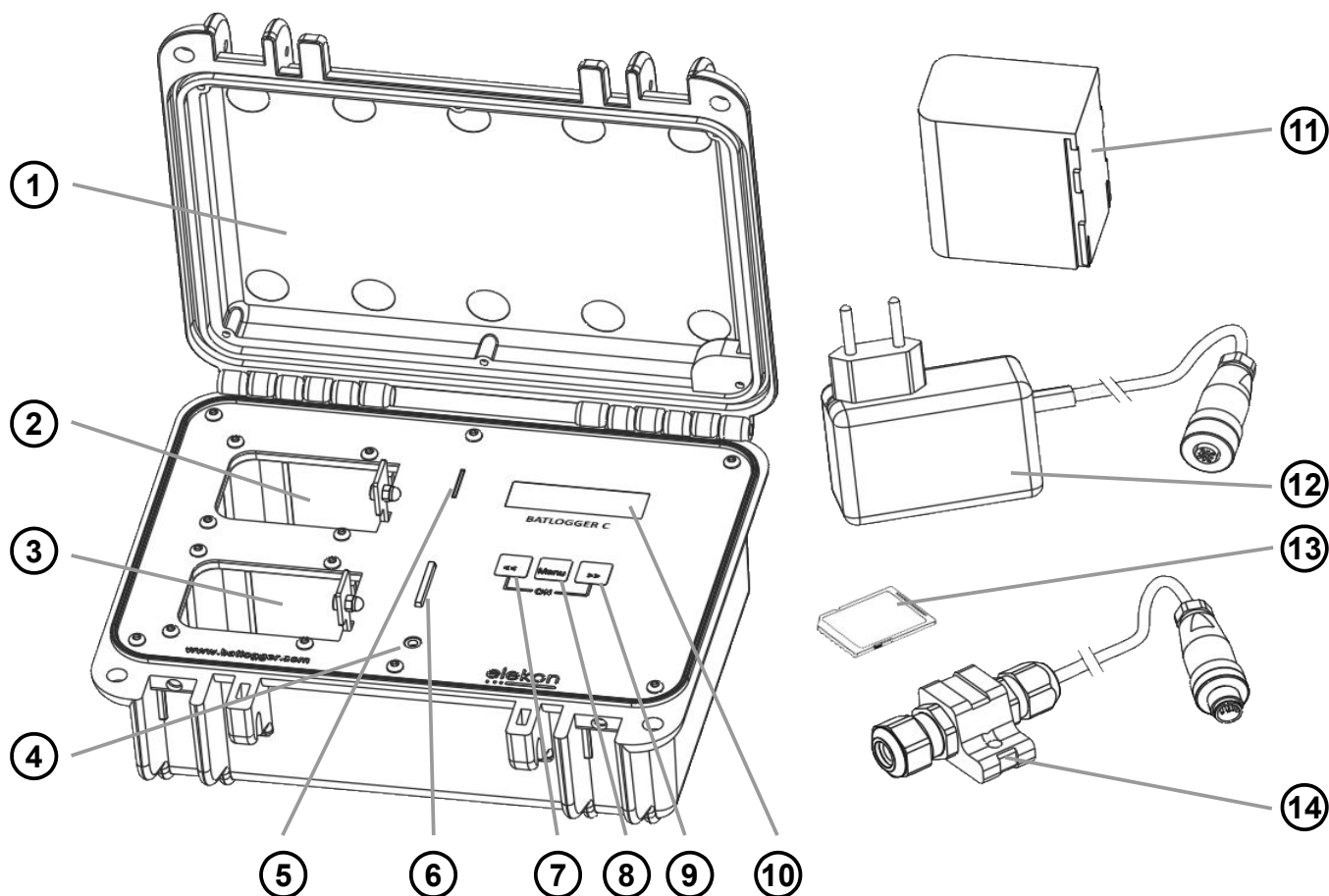


**Maintenance and care:** Only clean this device with a slightly damp, lint-free cloth and do not use aggressive cleaning agents. Ensure that no water intrudes the device.

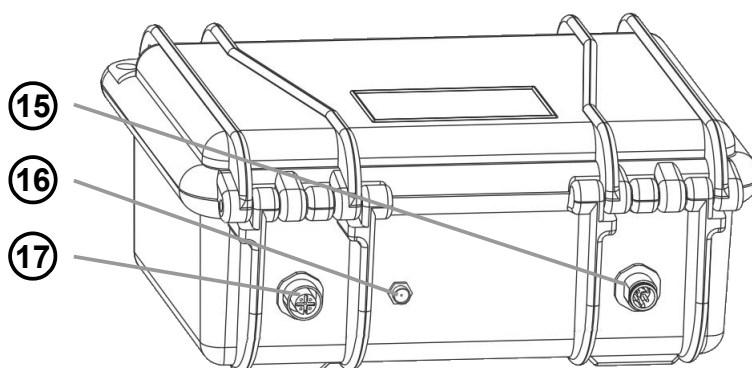


**Note on environmental protection:** Electric and electronic devices as well as batteries must not be disposed of with household waste. Consumers are obliged by law to return electrical and electronic devices as well as batteries at the end of their service lives to the public collection points set up for this purpose or point of sale. Details to this are defined by national law of the respective country. This symbol on the product, the instruction manual or the package indicates that a product is subject to these regulations. By recycling, reusing the materials or other forms of utilising old devices/batteries, you are making an important contribution to protecting our environment.

## 2 Overview



- |   |                             |
|---|-----------------------------|
| ① Case with cover                         | ⑩ LC-Display with backlight |
| ② Battery slot 1 with battery status LEDs | ⑪ Battery 7.2V, 6900mAh     |
| ③ Battery slot 2 with battery status LEDs | ⑫ Power supply 24V, 24W     |
| ④ Headphones 3.5mm jack                   | ⑬ SD card                   |
| ⑤ SIM card slot                           | ⑭ Microphone with cable 2m  |
| ⑥ SD card slot                            | ⑮ Power connector           |
| ⑦ Left Key (<<)                           | ⑯ External SMA connector    |
| ⑧ Menu Key (MENU)                         | ⑰ Microphone connector      |
| ⑨ Right Key (>>)                          |                             |



## 2.1 General

The BATLOGGER C is a data logger, which records ultrasound vocalisations of bats in real-time, and stores them for later processing on a SD / SDHC memory card (real-time recording system).

In a real-time recording system, the ultrasonic signal is digitized directly without change and with high sampling rate. Hereby the BATLOGGER C continuously analyses the signal and only stores it to the SD card when bat activity is detected. The Signal is recorded to internal RAM and subsequently, if certain criteria is fulfilled stored, as recording files (sequences of echolocation calls) onto SD card.

Apart from the bat calls, which are stored as standard audio WAVE files, additional information is written in text format into a “.xml” file, which stores all the settings of the BATLOGGER C at the time of recording, including time, date and location of the recording (GPS data), and the current temperature.

To allow a later overview over all deployments of the device, its operating state is being written to a “LOG” file on the SD card.

The BATLOGGER C is thus especially suitable for autonomous operation and long-term monitoring. The BATLOGGER C is primarily used stationary, which is often referred to as passive monitoring.

## 2.2 Data storage

The audio files are stored on the SD memory card as #\*\*\*\*.wav files (where # = 4 digit serial number of the device), with consecutive numbering (\*\*\*\*). For every #\*\*\*\*.wav file, a #\*\*\*\*.xml file is stored, which contains all parameter settings, date, time, geographic position and temperature at the time of recording of the corresponding WAVE file. Ultrasound data of the microphone are first written to the internal Random Access Memory (RAM) of the device. After termination of a single recording sequences (Recording...), the data is stored automatically from RAM to the SD card (Saving... #\*\*\*\*.wav). During this storage time (duration depends on file size and card type), the device is blocked.



**SD card:** The device uses SD / SDHC /SDXC cards with FAT32 file system as storage media. When the term “SD card” is used, always an SD / SDHC / SDXC card is meant. Tests have shown, that cards of different vendors may vary in writing and erasing speed. We refrain from giving recommendations for specific products or vendors, as offered sizes and technologies change constantly, which may also influence card performance. SD cards may have a write protect switch that prevents writing to the cards when the switch is on LOCK. Please make sure to disable the write protect switch of the SD card before using it.



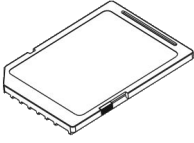
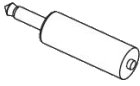

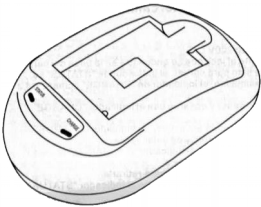
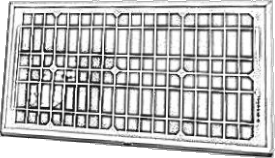
**SDXC cards:** SD cards larger than 32 GB (SDXC cards) may be formatted with exFAT upon delivery and must be formatted by with FAT32 before use. To do this insert the SD card into the SD card slot and turn on the device. You will be asked whether the card should be formatted. Press  to format and confirm with  . CAUTION: All data on the SD card will be deleted.



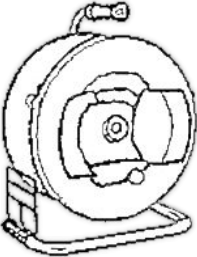
**SD card content:** A recent version of BATPARS Editor software (Windows and Mac) is stored on the included SD card. The executable file is in directory Software/BATPARS and can be started from there directly. Installation is not required.

A recent version of BatExplorer PC software is stored on the included SD card. It must be installed on the computer before first use. It can be found in the directory Software/BatExplorer.

## 2.3 Accessories

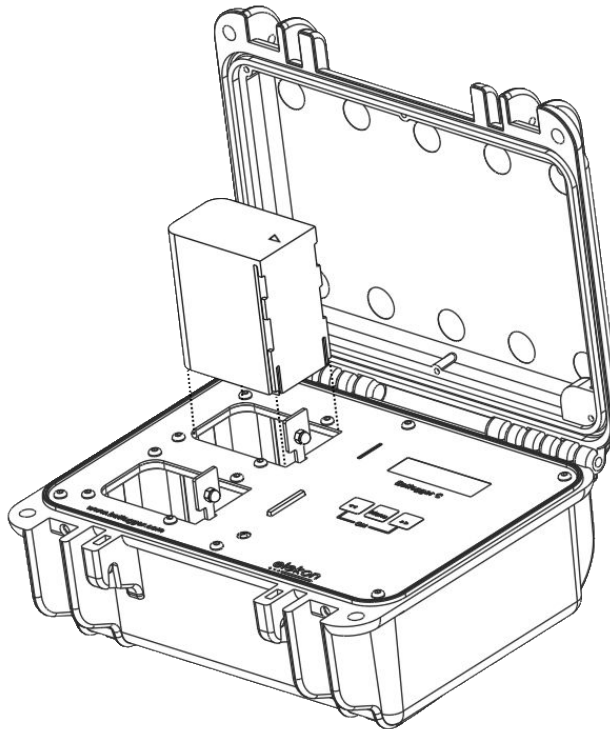
Part	Description	Part#
SD card 	SD / SDHC / SDXC cards up to 128 GB card size can be used (32 MB to 128 GB tested). The card must be formatted as FAT32. (1x SD card, 16GB included)	
Ultrasonic microphone FG black 	Ultrasonic microphone FG black or FG green can be used. To replace the microphone, see chapter 11.2. (1x FG black included)	212.233
Battery BP-945 	The battery operation endurance can be extended by installing a second battery. One battery lasts for approximately 5 nights a 10h (total 50h). See also chapter 3.2. (1x BP-945 included)	212.025
External battery charger 	Charge a (additional) battery independent of the device, e.g. while the device is in use in the field. (optional)	212.026
Photo-voltaic panel 	For power independent long-term monitoring, a photovoltaic panel can be used (10..26V, 20W). It can be connected directly to the power connector. The device has a built-in charger that is solar power ready and supports peak power tracking (MPPT). (optional)	212.027
12V adapter cable	If 12V power supply is available already, it can be connected directly to the power connector with the 12V adapter cable. (optional)	212.030
External GSM antenna with SMA cable	To improve GSM signal reception, an external GSM antenna can be connected. See also chapter 11.5 (optional)	212.029



Microphone cable with Tester	Waterproof microphone cable 2m with integrated test signal generator. Compatible with microphones FG black and FG green. (optional)	212.028
Microphone extension kit 100m green  	Extend the operating freedom with the 100 meter extension cable and the FG green microphone. Place the microphone on top of a measurement mast or tree while having the device accessible on the floor. (optional)	212.031
Headphones	Listen to recordings or live monitoring (heterodyne) with regular headphones with 3.5mm plug. Plug your headphones into the headphones jack and adjust the volume to a comfortable level (see also below). (optional)	

## 3 Preparation

### 3.1 Inserting/Removing Battery



1. Open the case cover. Make sure that the device is turned off
2. Face the  $\Delta$  mark on the battery towards the display and insert the battery into battery slot 1 or battery slot 2 until it locks into place.
3. To remove the battery, push the battery lock lever towards the display and pull the battery.



**Battery may become hot:** Be careful as the device or battery may become hot during charging or when used continuously for a long period of time.

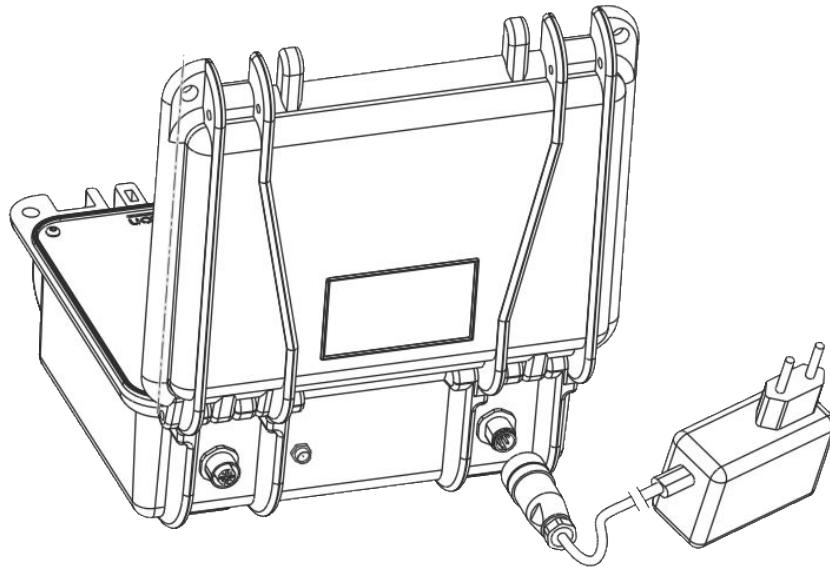


**Remove battery:** Turn off the device before removing the battery. Otherwise the data may become corrupted and/or the SD card may be damaged.



**Handle batteries with care:** Wipe the electrodes of the battery with a soft dry cloth before inserting. Remove the battery when you will not use the device for a long time. The battery may leak and damage the device if left installed during prolonged periods of non-use. If the removed battery will not be used for six months or longer, charge the battery for about 30 minutes before storing it, and after that, recharge the battery every six to twelve months. Store the battery in a location where the temperature will remain at or below room temperature. Avoid locations with high temperatures.

## 3.2 Battery charging



Upon delivery the battery of the device may not be fully charged. Please charge the battery before first use.

1. Insert one or two batteries (see above).
2. Plug in the provided power supply to the device power connector by arranging the notch of the plug to the clip of the socket.
3. Turn the screw locking ring clockwise to tighten the connector until it is fully inserted.
4. Plug the power supply into a power outlet.
5. Charging begins when the charging indicator lights red.
6. Charging is complete when the charging indicator turns green. The charging time can take several hours, depending on the state of charge.



**Usage with power supply:** The device can also be operated with the power supply connected to e.g. extend the operation time. It is even possible to use the device without a battery, but it is recommended to use at least one battery as backup power even if permanent external power supply is available.



**Usage with multiple batteries:** When using two batteries, an advanced discharge method is used to prolong battery life and minimize usage cycles. When exchanging with pre-charged batteries in the field, it may be needed to replace both batteries depending on the usage and operation method.



**Alternative power supplies:** The device can be used with alternative power supplies like photovoltaic panels, lead acid battery or similar. The power supply must meet the minimal power specification (10..26VDC, 20W). See also chapter 2.3.



**Protect external connectors:** When not in use, protect the external power connector from dirt and moisture with the supplied cover.

### 3.3 Adjusting parameters and settings

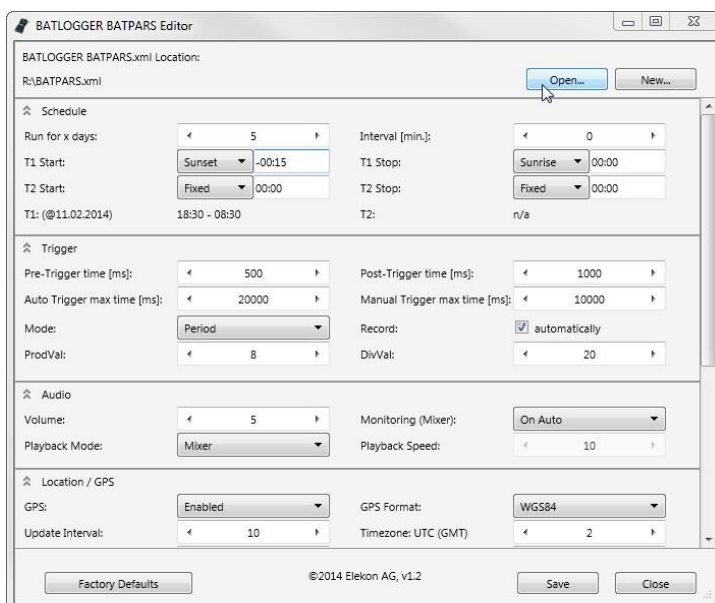
Basically the device can be used directly with factory settings. For some applications such as SMS/Email notifications, parameters must be adapted accordingly.

Ideally, adjusting parameters should take place before use, directly on a PC or Mac. See chapter 9.2 and 10.4 for detailed information about parameters and settings.

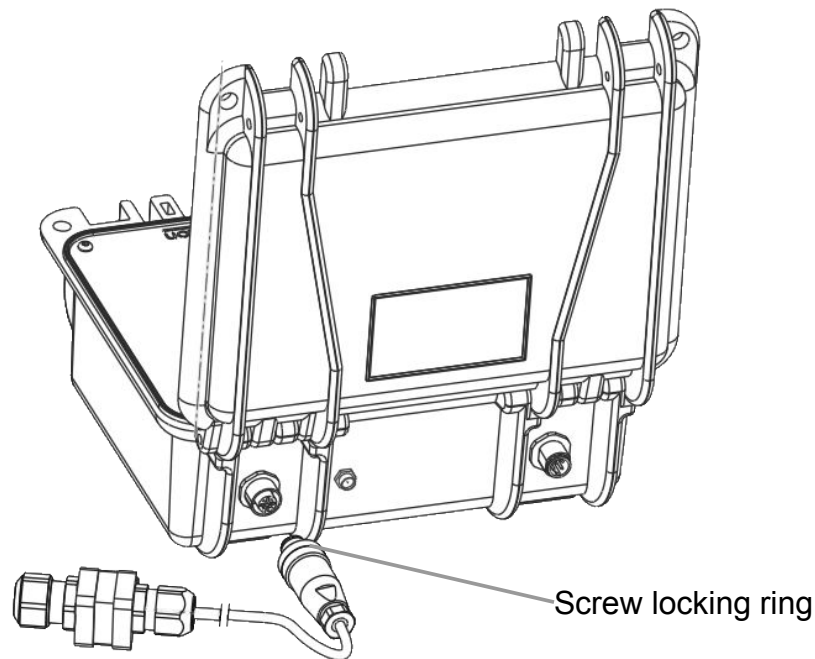
1. Insert the supplied SD card into the memory card reader of your computer and start the BATPARS editor software directly from the SD card.



2. Open the file "BATCPARS.xml" which is stored in the root directory of the SD card by clicking the "Open..." button.
3. Change parameters as needed.  
e.g. set capture time frames (schedule) for long-term monitoring and directly check programmed times in advance.
4. Save the parameter file by clicking \*Save\*. The parameters are now on the SD card.
5. Close the BATPARS editor software with "Close".
6. Insert the SD card now in the device. The parameters are now loaded at start-up.



### 3.4 Connect and install the microphone



1. Plug in the connector by arranging the clip of the plug to the notch of the socket.
2. Turn the screw locking ring clockwise to tighten the connector until it is fully inserted.

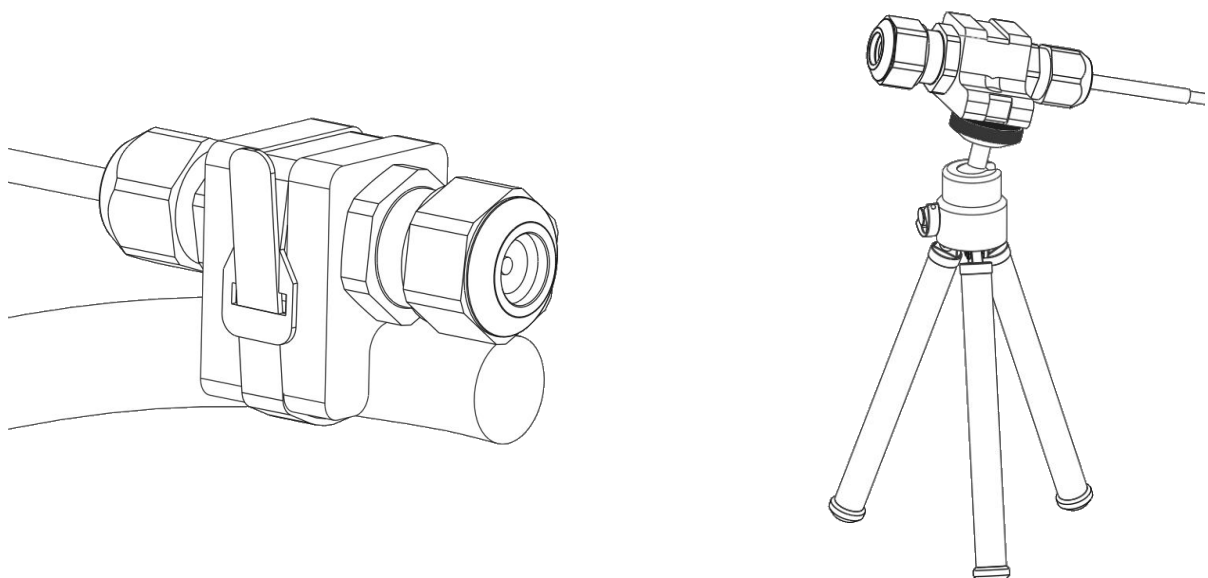
The microphone can be placed independently from the device to ensure optimal acoustic reception, while allowing an inconspicuously placement.

To increase the life of your microphone, it should always be mounted with the opening facing ground up to a maximum horizontal position to prevent moisture accumulation inside. Use a tripod or similar to easily mount and direct the microphone as needed.

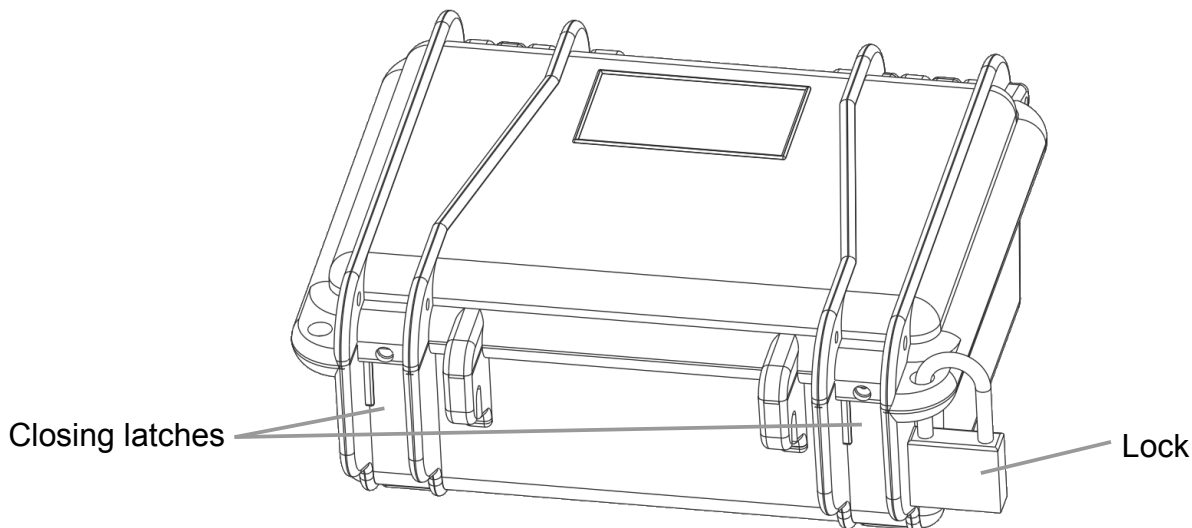
Also consider the surroundings of the microphone. Close objects or surfaces may reflect sound and distort recorded bat calls.



**Microphone mounting:** To properly place the microphone, use the tripod socket, the included strap or similar to mount it to sturdy object (tripod, post, branch, etc.).



### 3.5 Close and secure the device



When using the device in the field, the cover must be closed tightly and the external connectors must be mounted correctly to protect the device from dust and water. Close the latches until you hear a “click”.



**Ensure tightness:** Make sure that there is no dirt between the cover and housing that could affect tightness. If necessary, clean the sealing with a lint-free, slightly dampened cloth.

The device should be placed so that the sockets are located rather down and the housing valve rather up so that water can not move into the connector on the cable. Internal moisture can lead to short circuits and damage the unit or even cause a fire.



**Avoid temperature fluctuations:** The device must be protected from direct sunlight and extreme cold in order to avoid extreme temperature fluctuations that could affect tightness. Place the device in a shady place. Optionally, a dehumidifying agent can be used to prevent condensation inside the unit.

The display backlight turns off when the cover is closed.

To prevent unauthorised manipulation use one or two locks, a cable lock, a chain or similar to protect the device.



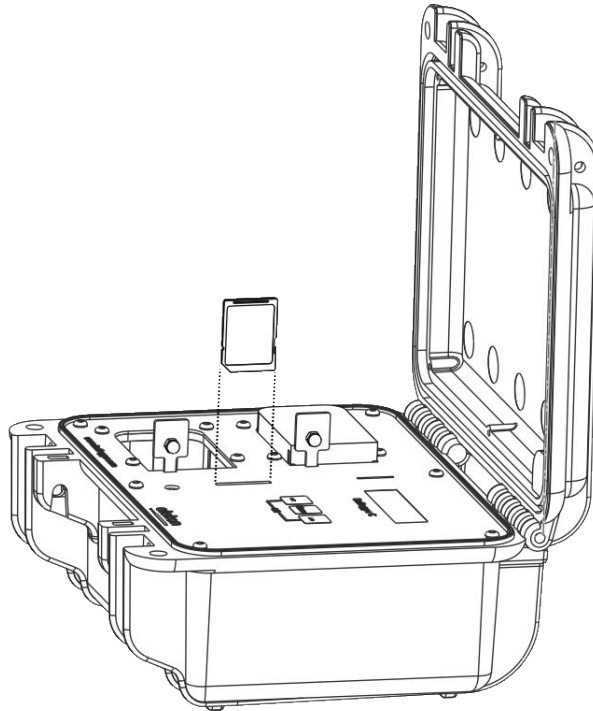
**Secure the device:** The device must be properly installed and secured. In particular, it must be ensured that during operation it can not come loose or fall down and that no people or animals can be injured.



**Motion detection:** The device has a built-in motion detection sensor. Enable theft alarm notification to enable motion detection. See chapter 7.4.3 for further information.

## 4 General handling and operation

### 4.1 Inserting/Removing SD Card

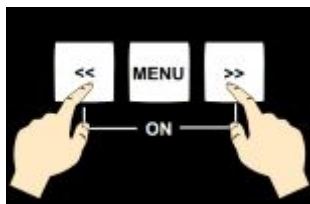



1. Open the case cover. Make sure that the device is turned off
2. Insert the SD card all the way into the SD card slot with the card label facing toward the display.
3. Push the SD card in once to remove.



**Remove SD card:** Turn off the device before removing the SD card. Otherwise the data may become corrupted and/or the SD card may be damaged.

## 4.2 Turn on the device



Press both keys  and  simultaneously to turn on the device.

```
BATLOGGER C
<< Power-On >>
```

Device powers up, keep both keys  and  pressed.

```
BATLOGGER C
#1234 FW2.4
Elekon AG ^o^
```

Serial number and software version are indicated on the display. Release the keys.

```
Initializing
SD Card
```

The SD/SDHC card is initialised.

```
Using Parameters
from SD Card
```

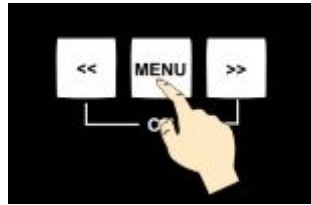
Parameters are loaded from “BATCPARS.XML” file. See also chapter 3.3.

```
01.04.2015 18:59
15.2GB Free
Start Record >
```

Device is ready. The main menu is active.





### 4.3 Main menu with info lines



Press the  key to change between the menu entries.



The top two lines of the display shows different information screens in cycle:

```
01.04.2015 19:00
15.2GB Free #17
Start Record? >
```

Press  key to enter “Recording mode”. See chapter 5.  
Press  key to proceed to the next menu item.



Date/Time, Free SD card memory, number of recordings made.

```
#1234 19°C ■
1. Freq 49kHz □
Test Record? >
```

Press  key to enter “Test Recording mode”. See chapter 5.  
Press  key to proceed to the next menu item.



Serial number, temperature, last detected frequency, battery status.

```
7 Sats 3D (2.5m)
+41.2535,+8.5455
Process File? >
```

Press  key to enter “Process File” menu. See chapter 6.  
Press  key to proceed to the next menu item.



GPS/Location information, see chapter 8.1.

```
GSM ready: ####_
Provider
Setup? >
```

Press  key to enter “Setup” mode. See chapter 9.  
Press  key to proceed to the next menu item.

GSM information, see chapter 7.3.

```
01.04.2015 19:01
15.2GB Free
Shut Off? >
```

Press  key to shut-down the device.  
Press  key to proceed to the first menu item.

Information screens cycle in 1s intervals.

#### Automatic shut-off:

If no keys are pressed for 4 minutes, and the device is not in recording or sleep mode, it will switch off automatically.

## 4.4 Set time

The device has an internal real-time clock that is used for the delayed recording and the time stamps of the recordings. There are three ways to adjust the device time: manually, via GPS receiver or via the mobile network.

To keep the clock current, it is necessary to update it regularly. In unattended operation, the time is automatically updated when the following conditions are met:

TIMEMODE = 1 (Auto GPS): GPS\_MODE must be set to 1 (On) or 2 (On with GPX) and GPS reception must be ensured.

TIMEMODE = 2 (Auto GSM): Status notification must be enabled, GSM\_SMSMODE or GSM\_EMAILMODE >= 1 and GSM reception must be ensured (valid SIM card inserted).




See also chapter 9.2 for more information regarding settings.

## 4.5 Device lock (Theft protection)

The device lock can be used to prevent manipulations on a running unattended device or to leave the device unusable and thus unattractive for possible thieves. For this, a user definable PIN (Personal Identification Number) can be configured (see chapter 9.2.7).

If device lock is enabled, on device start-up or manual wakeup, the correct PIN must be entered before the device can be used.

```
Enter device PIN
<0>
```

Use the keys  or  to change the digit between “<” “>”.  
Press  key to switch to the next digit or to delete the digit on the left with <←>.

```
Enter device PIN
0000<↵>
```

Press  key to enter the PIN with <↵>.

When the correct PIN was entered, the device will start up as usual.

When an incorrect PIN was entered, the device will turn off. After 5 incorrect attempts, the device is blocked and needs to be unblocked with the PUK (Personal unblock key). Contact Elekon AG to get the PUK.

## 5 Record bat calls

For long term passive monitoring, the device usually only operates during the night and “sleeps” during the day to save battery power and SD card space (Delayed recording).

It is also possible to immediately start record mode to test the installation or to use the device for active monitoring by executing the “Test record” function in the main menu.

### 5.1 Delayed recording (Recording in time frames)

One or two operation time frames can be configured.

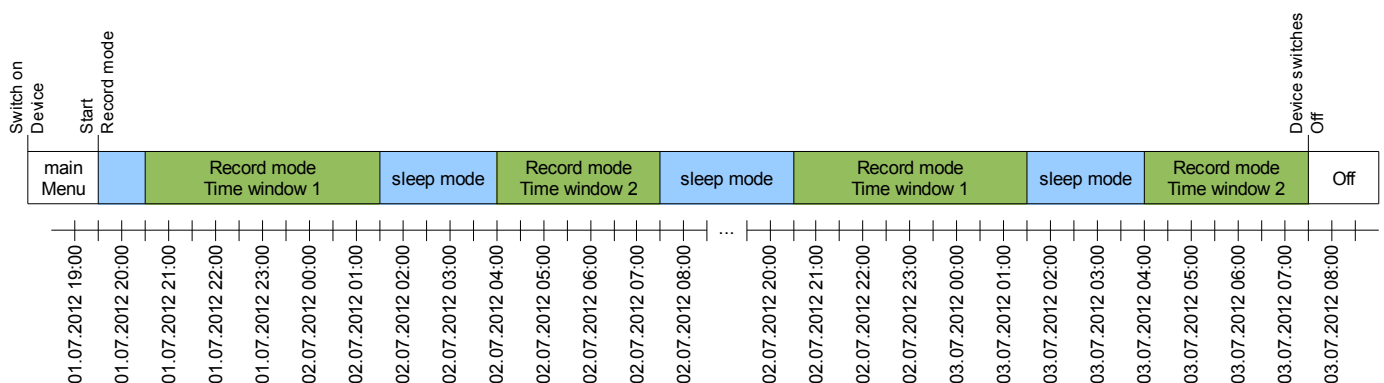
During the operation time (record mode), the device detects and records bat calls depending on the recording and trigger settings (see below).

During the sleep time (sleep mode), the device goes into power saving mode and turns off any peripherals. It will only wakeup for SMS/Email notification, Theft alarms (see chapter 7.4.3) or if aborted by the user.

The time frames can be configured flexibly. The times can also be set dynamically by the position of the sun (sunrise and sunset). The device date/time and location must be configured correctly in order that the dynamic times are calculated accurately (see also chapter 9.2).

Example:

- Nr. Days = 2
- T1 Start = 20:30 (Sunset) T1 Stop = 01:30
- T2 Start = 04:00 T2 Stop = 07:30 (Sunrise + 15min)



When starting delayed recording, the device checks its status depending on the configured features before changing to record or sleep mode:

- Microphone connection
- Date/Time
- GPS/Location
- Trigger
- GSM settings/connection

```
Mic possibly  
damaged!  
Continue? >
```

If the microphone or its connection is not installed correctly or damaged:

Press **>>** key to start recording anyway.

Press **MENU** key to abort.

```
Check date/time  
01.01.2000 00:00  
Start w/o GPS? >
```

If internal clock not has been updated by GPS or GSM yet:

Press **>>** key to start recording anyway.

Press **MENU** key to abort.

```
Loc. not set!  
Start anyway? >
```

If no GPS position fix and therefore manual location can not be updated:

Press  key to start recording anyway.

Press  key to abort.

```
Manual mode set!  
Start anyway? >
```


If manual trigger mode is configured:

Press  key to start recording anyway.

Press  key to abort.

```
Update to  
curr. location?>
```

Current GPS position differs from manual location:

Press  key to start update manual location with current coordinates.

Press  key to keep configured manual location.

```
Phone number  
invalid!  
Start anyway? >
```

If SMS phone number is invalid and SMS notification is enabled:


Press  key to start recording anyway.

Press  key to abort.

```
Email sett.  
Invalid!  
Start anyway? >
```

If email settings are invalid and email notification is enabled:

Press  key to start recording anyway.

Press  key to abort.

```
GSM not ready  
or no signal!  
Start anyway? >
```

If GSM modem not connected yet and SMS/email notification is enabled:

Press  key to start recording anyway.

Press  key to abort.


When time frame start time has not passed yet, the device displays the programmed schedule and then enters sleep mode:

```
Delayed rec:  
T1 20:15-08:30  
T2 00:00-00:00
```

Programmed time frames are displayed.

```
Sleeping:  
15:32 - 20:15  
next: Rec T1
```

The device is now in sleep mode.

Press  key to wakeup the device, abort delayed recording and exit to main menu.

When a time frame start time has passed, the device will wakeup and start recording mode.  
When a time frame stop time has passed, the device will go back to sleep mode.

## 5.2 Record mode

The device can be operated in different ways.

In **automatic recording** the signal from the microphone is constantly monitored and the recording started automatically, when a triggering event is registered (detected ultrasound signal, e.g. bat call). The duration of such recordings depends on the presence of the triggering criteria. The default setting allow for a recording duration which includes 0.5 seconds before the first and 1 second after the last trigger event (pre- and post-trigger). With the default settings, the shortest recording duration is therefore 1.5 seconds, which corresponds to roughly 1 MB of data on the SD card.

If the device is set for **continuous recording**, the RAM is filled with data and thereafter data are written to the memory card. As the loggers RAM is limited to 32 MB, the length of a single recording sequence can not exceed approx. 53 seconds, but can be set to less. Subsequently this recording sequence will be written as #\*\*\*\*.wav file to the SD card and a new recording will start, thereby overwriting data in RAM. The time required for data storage to the memory card is largely depending on the file size but also on the type of card. In general the writing of the file should require significantly less time than the recording itself.

In **manual recording** the triggering has to be performed through the key pad and may also be stopped this way. If a manual stop does not occur, the recording will stop automatically after a user selectable manual trigger time (default = 10 sec), and the #\*\*\*\*.wav file be written to memory card.

In record mode, the device displays important information and following functions can be executed:

The top two lines of the display shows different information screens in cycle:

```
01.04.2015 20:31
15.2GB Free #17
Sampling... ^5^
```

Press **>>** key to manually start a recording. Press **>>** key again to stop it.  
Press **<<** key to reset mixer frequency (see chapter 5.4)  
Press **MENU** key to proceed to the next menu item.

Date/Time, Free SD card memory, Nbr. of recordings.

```
#1234 19°C ■
1. Freq 49kHz □
Exit Record? >
```

Press **>>** key to exit record mode.  
Press **MENU** key to proceed to the next menu item.




Serial number, temperature, last detected frequency, battery status.

```
7 Sats 3D (2.5m)
+41.2535,+8.5455
Volume = 3 <>
```

Press **<<** key to decrease volume.  
Press **>>** key to increase volume.  
Press **MENU** key to proceed to the next menu item.  
(Only available when live monitoring is enabled.)



GPS/Location information, see chapter 8.1.

```
GSM standby
MFreq = 48kHz <>
```

Press  key to decrease mixer frequency.  
Press  key to increase mixer frequency.  
Press  key to proceed to the next menu item.  
(Only available when live monitoring is enabled and mode is manual.)

GSM is inactive during record mode.

```
01.04.2015 20:32
15.2GB Free
LR:xxxxxxxx.wav>
```

The file name of the last recording is displayed.  
Press  key to load the "Process File" menu with the last recording selected. it can then directly be processed, e.g. played, deleted, etc. See also chapter 6.  
After leaving "Process File" menu, record mode is continued.  
Press  key to proceed to the first menu item.

Information screens cycle in 1s intervals.

When an automatic trigger is configured (default), the device records bat calls automatically:

```
01.04.2015 20:31
15.2GB Free #17
Sampling... ^5^
```

The device is listening for bat calls (triggers). The current crest factor is displayed (^5^) if a crest trigger is used.

```
Activity:
Freq 32 kHz
Recording...
```

If the trigger condition is met, a new recording is started automatically.  
The recording stops, when the trigger condition is not met any more during at least the post trigger time.

```
Saving...
xxxxxxxx.wav
Freq = 32kHz
```

The recording is now saved to the SD card. The file name and detected peak frequency is displayed.  
After that, listening continues.

### **5.3 Trigger modes**

There are different approaches to detect bat calls. As the nature is not predictable, none of them is perfect. The difficulty lies in the distinction between signal (bat calls) and unwanted noise. Different algorithms are implemented and can be selected to automatically trigger recordings. Depending on the recording location (e.g. noisy environment, insects, etc.) and operation purpose (e.g. passive or active monitoring, etc.), it may be good to use different trigger modes and/or trigger settings.

#### **5.3.1 CrestAdvanced trigger**

Responds to all loud, narrow noises like bat calls, sensitivity to disturbing noise minimized. Very sensitive, detects even very quiet respectively far away calls. Sensitivity and frequency bounds can be adjusted. Responds to any loud, narrow-band sound, e.g. to technical sounds and insects.

#### **5.3.2 Crest trigger**

Responds to all loud, narrow noises like bat calls, but also technical noise and insects. Very sensitive, detects even very quiet respectively far away calls. Sensitivity and lowest frequency can be adjusted. Responds to any loud, narrow-band sound, e.g. to technical sounds and insects.

#### **5.3.3 Period trigger**

The difference in sound production of bats (vocal cords) and insects (stridulation) affects the continuity period. The trigger period takes advantage of this. Insects (grasshoppers, crickets) do not trigger or only very rarely but low frequency bats may not be identified.

## 5.4 Live monitoring


Is the device in record mode and live monitoring function is enabled (see page 35) the ultrasonic sounds are output live on the headphones. Here, the bat calls are transformed into audible range after the mixer-principle (heterodyne).

The volume can be adjusted during operation.

There are two methods to use the live monitoring:

- Automatic

The mixer is adapted automatically and continuously to the currently detected frequency of the calling bat.

Reset frequency: With the  key the mixer frequency can be reset to 48kHz at any time. This is handy to minimize noise or feedback loops that can occur at low frequencies.

- Manual

The mixer frequency can be set manually.



**Volume:** Too loud audio output, particularly with headphones, can cause hearing damage. Reduce the volume to an appropriate level.

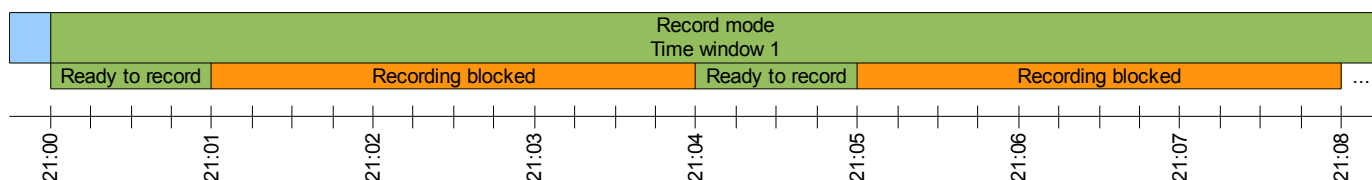
## 5.5 Interval recording (Record in time intervals)

As with time delayed recording, time frames have to be defined and a number of days must be set. When also a recording interval is entered, then the device switches to record mode at the start time, but only for a single recording or max. for one minute.

Then further recordings are blocked for the programmed number of minutes ("RecIntvl" / default = 0 = off). This is followed by another record mode. This interval operation continues to the end of the time frame. For this interval operation the various trigger modes can be used.

Example:

- Rec Intervall = 3





## 6 Process recordings

For immediate control, stored audio files can be replayed through headphones in mixer or time expansion mode. Ultrasound signals are transformed to audible range, in time expansion slowed down by a user selectable factor  $x$  (default  $x = 10$ ). A stored sequence therefore requires an  $x$ -fold playback time of the original recording to monitor. Only recorded files can be played back and listened to. Additionally recording details of a file such as date, time, length, peak frequency and more can be displayed.

Single recordings on the memory card can also be erased through this mode. Erasing the complete memory card must be achieved by formatting it (Settings menu).



**Headphones:** To listen to a recording, headphones with 3.5mm connector are needed. They must be plugged into the headphones jack.




### 6.1 Select folder

Depending on the settings, the recordings are stored in folders on the SD card. Per default, every night a new folder will be used:



- BL20150401
  - 12340001.wav
  - 12340002.wav
- BL20150402
  - 12340001.wav
  - 12340002.wav
  - 12340003.wav
- BL20150403
  - 12340001.wav
- ...

To process a recording, first select the folder:



```
Process
Select folder:
BL20150403  <>
```

Press  key to select the previous folder.  
Press  key to select the next folder.  
Press  key to proceed to the next menu item.



```
Process
Fold: BL20150403
Open folder?  >
```

Press  key to open the selected folder and proceed to select and process a recording file. See chapter 6.2.  
Press  key to proceed to the next menu item.

```
Process
Fold: BL20150403
Delete folder? >
```

Press  key to delete the selected folder and all its content. See chapter 6.1.1.  
Press  key to proceed to the next menu item.

```
Process
Exit Process?  >
```




Press  key to exit process menu.  
Press  key to proceed to the first menu item.

When no folders are used or present, the select folder menu is skipped and the select file menu is displayed.

### 6.1.1 Delete folder

CAUTION: All data in the folder will be deleted.




```
Delete folder?  
<< >> to confirm
```

Press both keys  and  simultaneously to confirm deletion.  
Press  key to cancel.



## 6.2 Select recording file

To process a recording, select the recording file (wav):



```
Process  
Sel File (54):  
12340001.wav <>
```

Press  key to select the previous recording file.  
Press  key to select the next recording file.  
Press  key to proceed to the next menu item.



```
Process  
File: #12340001  
Play Mixer? >
```

Press  key to play back the selected recording file in mixer mode. See chapter 6.2.1.  
Press  key to proceed to the next menu item.



```
Process  
File: #12340001  
Play Pitch? >
```

Press  key to play back the selected recording file in pitch mode. See chapter 6.2.2.  
Press  key to proceed to the next menu item.



```
Process  
File: #12340001  
Play All? >
```

Press  key to play all recordings of the selected folder in sequence. See chapter 6.2.3.  
Press  key to proceed to the next menu item.



```
Process  
File: #12340001  
Analyse? >
```

Press  key to analyse the selected recording file. See chapter 6.2.4.  
Press  key to proceed to the next menu item.

```
Process  
File: #12340001  
Delete? >
```

Press  key to delete the selected recording file. See chapter 6.2.5.  
Press  key to proceed to the next menu item.

```
Process  
Exit Process? >
```




Press  key to exit process menu.  
Press  key to proceed to the first menu item.

## 6.2.1 Play recording in mixer mode

```
Loading...  
#12340001
```

The selected recording file is loaded from the SD card into RAM.

```
Playing...  
#12340001  
PB Volume=2 <>
```

Press  key to decrease volume.  
Press  key to increase volume.  
Press  key to stop playback.

After playback stops, a new recording file can be selected. See chapter 6.2.

## 6.2.2 Play recording in pitch mode






**Play back real ultrasonic sound:** When the pitch factor is set to one, the recordings are played in real-time, full spectrum. This means that the recorded bat calls are reproduced close to the original bat calls from the animal. With this mode an artificial bat can be simulated.

```
Loading...  
#12340001
```

The selected recording file is loaded from the SD card into RAM.

```
Playing...  
#12340001  
PB Volume=2 <>
```

Press  key to decrease volume.  
Press  key to increase volume.  
Press  key to stop playback.  
After playback stops, the first menu item is loaded.




After playback stops, a new recording file can be selected. See chapter 6.2.

## 6.2.3 Play all recordings in the folder

```
Loading...  
#12340001
```

The first recording file of the folder is loaded from the SD card into RAM.

```
Playing...  
#12340001  
PB Volume=2 <>
```

Press  key to decrease volume.  
Press  key to increase volume.  
Press  key to stop playback.

After playback of a recording, the next recording is loaded and played.

After the last recording, the first is played (endless loop).

After playback was manually stopped, a new recording file can be selected. See chapter 6.2.


### 6.2.4 Analyse recording

The metadata of the selected recording file is loaded and displayed:

```
File: #12340001
03.04.2015
20:34:46    <>
```

Press  key to show previous data screen.


Press  key to show next data screen.

Press  key to go to the last menu item.

```
File: #12340001
Dur =    4 s
Peak = 40 kHz <>
```


Press  key to show previous data screen.


Press  key to show next data screen.

Press  key to go to the last menu item.


```
File: #12340001
Temp =  10 °C
                <>
```


Press  key to show previous data screen.

Press  key to show next data.

Press  key to go to the last menu item.

```
Process
File: #12340001
Exit Analyse? >
```



Press  key to exit analyse menu.

Press  key to show first data screen.

### 6.2.5 Delete recording

**CAUTION:** The recording (wav) and its metadata (xml) will be deleted.

```
Delete file?
<< >> to confirm
```

Press both keys  and  simultaneously to confirm deletion.

Press  key to cancel.

After deletion, a new recording file can be selected. See chapter 6.2.

## 7 SMS/Email notification

To use SMS/Email notification via the inbuilt mobile phone GSM/GPRS module, a valid mobile phone contract and a SIM card (standard size) is needed.

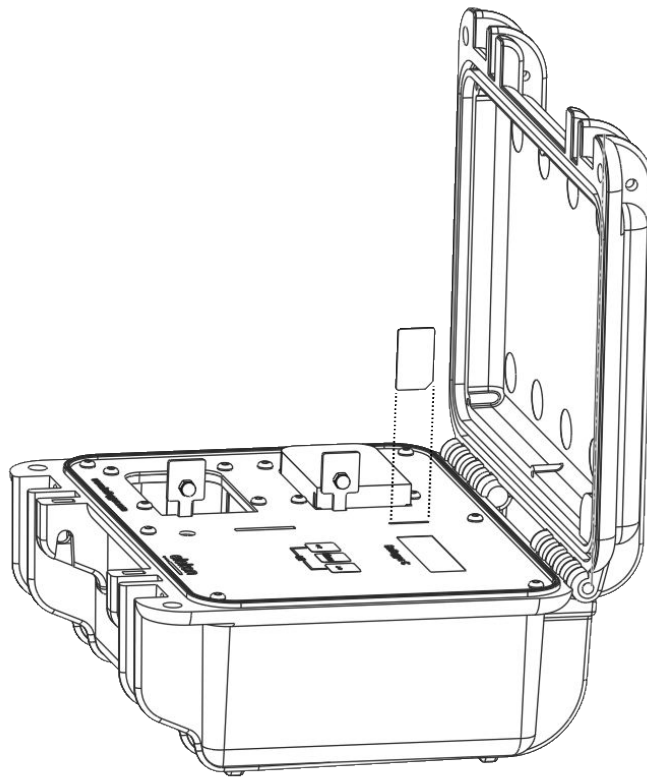


**Mobile phone costs:** Depending on your mobile phone contract, additional costs may occur when sending SMS or email notifications. For sending emails, a data contract may be needed.



**Email account:** It is recommended to use an individual email account for sending emails from the device. The login data is saved on the device itself and in an event of loss or theft, the login data may be abused.

### 7.1 Inserting/Removing SIM card



1. Open the case cover. Make sure that the device is turned off
2. Insert the SIM card all the way into the SIM card slot with the card label facing toward the display.
3. Push the SIM card in once to remove.



**Remove SIM card:** Turn off the device before removing the SIM card. Otherwise the data may become corrupted and/or the SIM card may be damaged.

## 7.2 Configuration

To monitor the unsupervised operation, a notification via SMS (Short Message Service) and/or email can be set up as follows:

1. Start BATPARS Editor Software on your PC/MAC (see chapter 3.3)
2. Enter the GSM/SMS/Email parameters
  - Transmission mode and time (See also chapter 7.4)

### SMS:

- Phone number of the recipient in international format e.g. +411234567 (see also chapter 9.2.5)

### Email:

Sending emails needs an internet connection via GPRS (2G mobile phone data communication) and SMTP (Simple Mail Transfer Protocol) server access. The internet connection is provided by your mobile phone provider. As SMTP server most email providers or an own email server can be used.

- GPRS server/login data (ask your phone provider for the correct data)

Some examples:

- Swisscom: APN: gprs.swisscom.ch, no username/password needed
- T-Mobile: APN: internet.t-mobile, Username: tm, Password: tm
- Vodafone: APN: web.vodafone.de, no username/password needed
- A1: APN: a1.net, Username: ppp@a1plus.at, Password: ppp

- SMTP server data (ask your email provider for the correct data)

Some examples:

- Bluewin: Server: smtpauths.bluewin.ch, Mode: SSL, Port: 465
- GMX: Server: mail.gmx.net, Mode: SSL, Port: 465
- T-Online: Server: securesmtp.t-online.de, Mode: SSL, Port: 465
- Gmail: Server: smtp.gmail.com, Mode: SSL, Port: 465

- SMTP login data, the username and password of email account

For example:

Username: batlogger1234@myprovider.com

Password: \*\*\*\*\*

- Email address of the sender and recipient

For example:

"From" Address: batlogger1234@yourprovider.com

"To Address": yourname@yourprovider.com

3. Insert the SIM card into the SIM card slot, and turn on the device (see above)
4. Enter PIN code of the SIM card when prompted

```
GSM:
Enter SIM PIN
<0>
```

Use the keys **<<** or **>>** to change the digit between “<” “>”.  
Press **MENU** key to switch to the next digit or to delete the digit on the left with **<←>**.

```
GSM:
Enter SIM PIN
0000<↵>
```

Press **MENU** key to enter the PIN with **<↵>**.



**Test settings:** It is recommended to test the GSM/SMS/Email settings before deploying the device in the field. To do this, turn on the device, enter the “Setup” menu “GSM/SMS/Email” section and execute the SMS or Email test functions.

See chapter 9.2 for detailed description of the GSM/SMS/Email settings.

### 7.3 GSM information

```
GSM initializing
No Signal
Start Record? >
```

After turning on the device, the GSM module needs to initialize and to register to the mobile network.

```
GSM ready: ###__
Provider
Start Record? >
```

Once the GSM module is connected to the network, the signal level (e.g. **###\_\_**) and the provider name is displayed.

## 7.4 Notification modes

Any of the following modes can be configured to be either sent by SMS and/or email.

### 7.4.1 Status message

A status message is sent once a day to ensure normal operation and to get an overview of the current status of the device.

```
BATLOGGER C #2123
08.04.2015 10:00:27
456 new recs
7.3V 7.9V 23C 14.5GB Free
Loc man: +47.2000,+7.4000
Mic S/N=19.4 dB
```

Device  
Date/Time of the device  
Nbr of recordings of last night  
Battery voltages, temperature, SD card space  
GPS information  
Microphone information



**Send-time:** The status message can only be sent during the sleep time (sleep mode) of the device. The first status message will be sent after the end of the first recording time frame.



**Send error:** If the status message can not be sent on the configured time or a transmission error occurs, the device tries to send the message again every hour during the sleep mode.

### 7.4.2 Alerts

If an unexpected event occurs, like low battery, microphone defects etc. an alert message is sent with information regarding the event.

### 7.4.3 Motion alarm

When the motion alarm (theft alarm) is enabled, device movements will be detected.

```
Motion alarm
armed in
25.3 s
```

After starting record mode, one has 30s until the motion detection is active.  
Close the case and complete installation in this time.





If motion is detected in record mode (and sleep mode):

```
Device moved!
Alarm in
12.9 s
```

One has 30s until the alarm is triggered.  
Press any key to disarm the alarm.

If the device lock feature is enabled (see chapter 9.2.7), the correct PIN must be entered to disarm the alarm.

```
Enter device PIN
<0>
```

Use the keys  or  to change the digit between "<" ">".  
Press  key to switch to the next digit or to delete the digit on the left with <←>. Press  key to enter the PIN with <↵>. See also chapter Fehler: Referenz nicht gefunden.

```
Disarmed
```

The motion alarm is now inactive, the record mode is aborted and the device can be used as usual.

If the alarm is not disarmed within 30s, an alarm message is sent. After an alarm message was sent, the motion alarm is disabled for one hour.

If device lock is set to "on alarm only" (see chapter 9.2.7) the device is protected with the device PIN after a motion alarm event.



## 8 GPS / Location

The device is equipped with a GNSS (Global Navigation Satellite System) receiver, commonly known as “GPS”.

It is used to set the device date and time and to set/update location coordinates stored together with each recording. Additionally it can be used to record the travelled track to a GPX file if used for active monitoring.

Each recording is geotagged with the coordinates of the recording location.

For passive monitoring, the recording location is set once upon start of the record mode. In the record mode, the GPS receiver is then turned off to save battery power.

If no GPS reception is possible (e.g. in a cave), a manual position can be configured (see chapter 9.2). It is also possible to navigate to this position by using the GPS status display (“Show Status”). There the distance and heading from the current position to the manual position is displayed continuously (find starting point again, Geocaching, ...).



**GPS receiver:** GPS requires a direct line of sight between the receiver and the satellites. If an object is within direct path, the accuracy suffers due to reflections and attenuation of the signals. This is particularly problematic in urban areas, in valleys and on mountain slopes. Even smaller objects (tree cover, roof, human body) can lead to reflections and attenuation. For accurate positioning it is therefore essential to have unobstructed view to the sky.

### 8.1 GPS information

```
No GPS fix  
3 Sats in view  
Start Record? >
```

After turning on the device, the GPS receiver searches for currently visible satellites.

```
7 Sats 3D (5.3m)  
NW 5.3km/h 524m  
Start Record? >
```

Once a position fix has been achieved, the number of satellites (e.g. 7) used to calculate the position and the approximate position accuracy (e.g. circle with radius 5.3m) is displayed.

When in motion, heading (e.g. NW), velocity (e.g. 5.3km/h) and height above sea level (e.g. 524m) is displayed.

When in stand, current position coordinates (e.g. +41.2535, +8.5455) are displayed.

## 9 Setup (Settings)




The device can be configured to fit different needs. Parameters of functions like recording time frames (delays), triggers, GPS, backlight, time zone, audio, SD card and more can be changed in the setup menu.

Most settings can be changed both directly on the device as well as with the BATPARS Editor software on your computer (see also section 3.3). Some settings can only be carried out on the device itself (e.g. set time). Others can only be made with the BATPARS Editor software (e.g. email settings), because it would be very time-consuming to enter long values with three keys.




### 9.1 Operation

The setup menu is structured in various submenus. The structure is described in chapter 9.2. The general operation and navigation is as follows:




```
Setup X/Z
Submenu X      >
```

Press  key to go to the last menu item.  
Press  key to enter the submenu X.  
Press  key to go to the next menu item.




```
Setup Y/Z
Submenu Y      >
```

Press  key to go to the last menu item.  
Press  key to enter the submenu Y.  
Press  key to go to the next menu item.



```
Submenu Y
Parameter A
ON             <>
```

Use the keys  or  to change the value.  
Press  key to go to the next parameter.



```
Submenu Y
Parameter B
Value = 1<2>.3
```

For larger number values (e.g. coordinates, date/time, ...) single digits can be increased/decreased  
Use the keys  or  to change the digit between "<" ">".  
Press  key to switch to the next digit, to delete the digit on the left with <←> or to enter the value with <↵>.

```
Setup Y/Z
Function       >
```

Press  key to execute the function.  
Press  key to go to the next menu item.

```
Setup Z/Z
Exit Setup?   >
```

Press  key to exit (sub-)menu.  
Press  key to show first menu item.

## 9.2 Setup-Menu

### 9.2.1 Setup 1/8: Delay Record

See also chapter 5.1.


Menu / Parameter	Description	Default
Setup 1/8 Delay Record	<b>Timing</b> (delay) of the recordings (Program 1 or 2 time slots per day for a programmed number of days)	
Nr. Days	Enter the number of days (0..999) on which the time frames (one or both) are performed. 0 = time control (delay) disabled  Example: 30 For a maximum of 30 days, recording is performed during the configured time slot (see below)	365
T1 Start Mode	Mode 1. start time 0 = Fixed: Fixed time 1 = Sunset: Time of sunset at location of LOC_LAT/LOC_LON of the respective day 2 = Sunrise: Time of sunrise at location of LOC_LAT/LOC_LON of the respective day	1
T1 Start	1. start time Depending on the mode: time or difference (in 15 minute steps)  Example: Fixed 20:30 Start 1. time frame at 20:30	00:00
T1 Stop Mode	Mode 1. stop time 0 = Fixed: Fixed time 1 = Sunset: Time of sunset at location of LOC_LAT/LOC_LON of the respective day 2 = Sunrise: Time of sunrise at location of LOC_LAT/LOC_LON of the respective day	2
T1 Stop	1. stop time Depending on the mode: time or difference (in 15 minute steps)  Example: Fixed 01:00	00:00

		Stop 1. time frame at 01:00	
	T2 Start Mode	Mode 2. start time 0 = Fixed: Fixed time 1 = Sunset: Time of sunset at location of LOC_LAT/LOC_LON of the respective day 2 = Sunrise: Time of sunrise at location of LOC_LAT/LOC_LON of the respective day	0
	T2 Start	2. start time Depending on the mode: time or difference (in 15 minute steps) Fixed 00:00 = 2. time slot disabled  Example: Sunrise -02:30 Start 2. time frame 2:30h before sunrise	00:00
	T2 Stop Mode	Mode 2. stop time 0 = Fixed: Fixed time 1 = Sunset: Time of sunset at location of LOC_LAT/LOC_LON of the respective day 2 = Sunrise: Time of sunrise at location of LOC_LAT/LOC_LON of the respective day	0
	T2 Stop	2. stop time Depending on the mode: time or difference (in 15 minute steps) Fixed 00:00 = 2. time slot disabled  Example: Sunrise +00:30 Stop 2. time frame 30min after sunrise	00:00
	Rec Intervall	Interval time between single recordings (in one minute steps)  Example: 3 After a recording at least 3 minutes no new recording is started (triggered)	0

## 9.2.2 Setup 2/8: Trigger

See also chapter 5.3.

Menu / Parameter		Description	Default
Setup 2/8 Trigger		<b>Trigger settings</b> Set the trigger mode, that is how a recording is started	
	TRIG_MODE	<i>Choose trigger mode:</i> 0 = Manual: start and stop recording need manual key input (autom. stop after "MANTRIG MAXTIME") 1 = Continuous: continuous recording of blocks of default 53 seconds duration (interrupt for storage). 2 = Crest Adv: automatic triggering with Crest factor, enhanced call detection and reduce noise sensitivity (manual triggering possible to override automatism) 3 = Crest: automatic triggering with Crest factor (manual triggering possible to override automatism) 4 = Period: automatic triggering with Period algorithm (manual triggering possible to override automatism)	2
	TRIG_AUTOREC	0 = Manual: A trigger event does not start recording. The recording must be started and stopped manually, but the trigger frequency is displayed. 1 = Auto: A trigger event automatically starts the recording and recording automatically stops when trigger conditions are no longer met.	1
	TRIG_MODE: Crest Adv	Min. Crest	Minimal Crest factor as trigger condition Lower values trigger easier
		Min. F	Minimal frequency for trigger condition in kHz
		Max. F	Maximal frequency for trigger condition in kHz
	TRIG_MODE: Crest	Min. Crest	Minimal Crest factor as trigger condition Lower values trigger easier
		Min. RMS	Factor for minimal effective value as trigger condition Lower values trigger easier
		Min. Peak	Factor for minimal amplitude as trigger condition Lower values trigger easier
		HP	Factor for the lowest frequency, that still may elicit a trigger event (Factor times 1,22 kHz)

	TRIG_MODE: Period	ProdVal	Period-Trigger: ProdVal Higher values improve triggering at low frequencies, but also insects, and vice versa.	8
		DivVal	Period-Trigger: DivVal Higher values improve triggering at low frequencies, but also insects, and vice versa.	20
	PRETRIG_TIME_MS	Pre-trigger length in ms 0..5000		500
	(only changeable via BATPARS.XML)	Length ahead of the trigger event that is saved from the buffer to the recording file.		
	POSTTRIG_TIME_MS	Post-trigger length for automatically triggered recordings in ms 0..10000		1000
	(only changeable via BATPARS.XML)	If no trigger event is detected during this time, the recording will be stopped.		
	AUTOTRIG_MAXTIME_MS	Maximal length for automatically triggered recordings in ms 0..535000		20000
	(only changeable via BATPARS.XML)	The recording is stopped when reaching maximal length even if trigger events are still detected.		
	MANTRIG_MAXTIME_MS	Maximal length for manually triggered recordings in ms 0..535000		10000
	(only changeable via BATPARS.XML)	The recording is stopped when reaching maximal length even if the stop key (  ) is not pressed.		
	TRIG_NRBLOCKS	Number of blocks that must meet trigger criteria in order to trigger 1..10		2
	(only changeable via BATPARS.XML)			

### 9.2.3 Setup 3/8: Audio

Menu / Parameter	Description	Default
Setup 3/8 Audio	<b>Audio settings</b>	
Volume	Headphones/Speaker -Volume 0 = mute 9 = very loud  ATTENTION: Too high volume can cause hearing loss.	2
Monitoring	Live monitoring (mixer output) 0 = Off: Live monitoring disabled 1 = On Auto: Live monitoring enabled, frequency is set automatically 2 = On Manual: Live monitoring enabled, frequency must be set manually	0
PB Mode	Playback mode 0 = Pitch: playback slowed down with PB Speed factor 1 = Mixer: playback mixed with peak frequency of the recording	1
PB Speed	Playback speed 1: real-time 2: half speed etc.  Example: 10 The recordings are played slowed down 10 times (time expansion and frequency division). Thus the ultrasonic sounds are audible (e.g. 45 kHz -> 4.5 kHz)  The real-time playback enables the output of the original ultrasonic sounds. This can be useful for demonstration purpose for example. Pay attention to connect a speaker with appropriate ultrasound capability.	10
Microphone-test mode	Mode used when "Test Microphone" function is executed. 0 = Manual: Record the current (silent) spectrum and write it to the log file 1 = Automatic (tbd)	0
Test Microphone	Execute microphone test with selected mode (see above)	

## 9.2.4 Setup 4/8: Location / GPS

See also chapter 8.


Menu / Parameter		Description	Default
Setup 4/8 Location / GPS		<b>Position and GPS settings</b>	
	Show Status	<p>Displays the current status of GPS reception and information about the current location and the received satellites. Switch the displayed information with the <b>&lt;&lt;</b> or <b>&gt;&gt;</b> key or exit with the <b>MENU</b> key.</p> <ul style="list-style-type: none"> <li>• Fix status, approx. accuracy in meters (radius), actual position</li> <li>• Height above sea level, speed and heading</li> <li>• HDOP and VDOP</li> <li>• Sunset and sunrise at actual location at today's date</li> <li>• Satellites in view, SNR and PRN of the five strongest satellites</li> <li>• Distance and direction to position of LOC_LAT/LOC_LON</li> </ul>	
	GPS Mode	<p>Set position determination mode</p> <p>0 = Off: position determination disabled</p> <p>1 = On: position determination enabled</p> <p>2 = On w/GPX track: position determination and track recording (GPX) enabled</p> <p>3 = Off w/ManLoc: position determination disabled, position of LOC_LAT/LOC_LON is stored as recording position into the XML file</p> <p>4 = Off w/StartLoc: position determination disabled, position of LOC_LAT/LOC_LON is updated when start recording mode and stored as recording position into the XML file</p> <p>Example: 0 GPS off for the lowest possible power consumption or because reception is not possible, such as in caves.</p>	3
	Coord.Fmt	<p>Coordinates display format to display current location</p> <p>0 = WGS84: (e.g.. 47.052804 / 8.257801)</p> <p>1 = CH1903: (e.g.. 662240 / 211632)</p>	0
	TZ	<p>Set time zone</p> <p>Deviation to UTC in hours</p> <p>Example: +2 Daylight savings time in Zurich (CH)</p>	+2






	GPS_INTERVAL		Interval of position determination in seconds Lower values = more frequent position determination, higher power consumption Higher values = less frequent position determination, lower power consumption  Note: While recording, the position determination is paused for performance reasons.	10
	Set manual location		Enter manual location (coordinates) This location is used: <ul style="list-style-type: none"> <li>• To calculate sunset and sunrise</li> <li>• As recording position in GPS mode 3 and 4 (Off w/Loc, Off w/StartLoc)</li> <li>• To calculate distance and direction in the GPS status view</li> </ul>	
		LOC_LAT	Latitude, in WGS84 or CH1903 (dep. Coord. Fmt)	47.2
		LOC_LON	Longitude, in WGS84 or CH1903 (dep. Coord. Fmt)	7.4
		Set current location	The coordinates of the current position are stored as manual location	
	Reset module		Reset the GPS module to factory defaults. A reset may help if no position fix can be achieved even after a long time trying.	

## 9.2.5 Setup 5/8: GSM / SMS / Email

See also chapter 7.

Menu / Parameter		Description	Default
Setup 5/8 GSM / SMS / Email		<b>GSM / SMS / Email notification setup</b>	
	Show Status	Displays the current status of GSM modem and information about the current connection. Switch the displayed information with the << or >> key or exit with the  key. <ul style="list-style-type: none"> <li>• IMEI</li> <li>• Modem revision</li> <li>• Signal strength</li> <li>• Provider</li> </ul>	
	SMS	Enter SMS (Short Message Service) submenu	
	GSM_SMSMODE	SMS notification mode. Send a message to the configured telephone number when: Off: SMS notification is disabled Status: Everyday at the configured time (see below) a message is sent with status information like battery voltage, nbr. of recordings, SD card space Alerts: Send a message if a critical state is detected like battery low, Theft Alarm: Enable motion detection (see also 7.4.3) and send a message if the device was moved but not disarmed.  Any combination of the above modes can be configured.	Off
	GSM_NUMBER Code	Telephone number prefix (International format) without the leading +.  Examples: +4179 Switzerland +43664 Austria +447701 GB +491511 Germany	41
	GSM_NUMBER	Telephone number without prefix.  Example: 791234567  The prefix (above) and this number is combined to the complete telephone number in the format +YYYYYYYYXXXXXXXXX. For numbers longer than 9 digits split the number and extend the code above with the first additional digits.  Example with long numbers: GSM_NUMBER Code=491520, GSM_NUMBER=123456789	0

		Send Test SMS	Send a test SMS to the configured telephone number	
		Read SMS	Read SMS. Displays the numbers of SMS received. Choose the SMS number to display with the << or >> key and display the message with the  key. Scroll the message text with the << or >> key. Exit with the  key.	
	Email		Enter Email submenu Most email and GPRS parameters must be configured with the BATPARS Editor Software. See chapter 3.3.	
		GSM_EMAILMODE	Email notification mode. Send a message to the configured email address when: Off: Email notification is disabled Status: Everyday at the configured time (see below) a message is sent with status information like battery voltage, nbr. of recordings, SD card space Alerts: Send a message if a critical state is detected like battery low, Theft Alarm: Enable motion detection (see also 7.4.3) and send a message if the device was moved but not disarmed.  Any combination of the above modes can be configured.	Off
		Show Email parameters	Displays the configured email and GPRS parameters Switch the displayed information with the << or >> key or exit with the  key. <ul style="list-style-type: none"> <li>• GPRS APN server and user name</li> <li>• SMTP server, mode, port, user name</li> <li>• Senders email address</li> <li>• Receivers email address</li> </ul>	
		Send Test Email	Send a test email to the configured email address	
	Status notification send time mode		Notification send time mode 0 = Fixed: Fixed time 1 = Sunset: Time of sunset at location of LOC_LAT/LOC_LON of the respective day 2 = Sunrise: Time of sunrise at location of LOC_LAT/LOC_LON of the respective day	0
	Status notification send time		Notification send time Depending on the mode: time or difference (in 15 minute steps)  Example: Fixed 10:00 Send a status notification every day at 10:00	10:00
	Get date/time		Update device date/time with GSM date/time.	

		Depending on the network operator (provider) this feature might not be supported.	
	Dial number	Enter a telephone number and dial to test if the GSM module is functional or to send supplementary service codes like *130# to configure telephone functions like redirections, check credits etc.	
	Reset module	Reset the GSM module to factory defaults. A reset may help if no connection can be achieved or SMS/Email notification does not work correctly.	

## 9.2.6 Setup 6/8: SD card

See also chapter 2.2.

Menu / Parameter	Description	Default
Setup 6/8 SD Card	<b>SD card setup</b>	
Folder_MODE	<p>Store recording in folders</p> <p>0 = None: No folders used, all data is stored in the root folder of the SD card</p> <p>1 = Daily: Use a new folder daily (12:00 – 12:00): BLyyyyymmdd</p> <p>2 = Weekly: Use a new folder weekly (Mo 12:00 – Mo 12:00): BLyyyWww</p> <p>3 = Monthly: Use a new folder monthly (1. 12:00 – 1. 12:00): Blyyyymm</p> <p>Example: 1</p> <p>Recordings (WAV, XML, GPX, KMZ) are stored into a separate folder each night</p> <p>Folder “BL20130802” contains data of the night from 2. to the 3. August 2013</p> <p>Folder “BL20130803” contains data of the night from 3. to the 4. August 2013</p> <p>etc.</p> <p>The folder is changed each day at noon (12:00)</p>	1
STATUS_MODE	<p>BLWiFi status</p> <p>0 = Off: Disabled</p> <p>1 = On: Enabled, BLWiFi can display the actual state if a connection is established</p>	0
Write BATPARS	Write the current settings to the BATPARS.XML file	
Delete BATPARS	Delete the BATPARS.XML file from the SD card	
Format SD Card	<p>Format the SD card</p> <p>Delete all recordings, meta-data and files from the SD card. Only BATPARS.XML and BATREC.LOG files will not be deleted.</p> <p>CAUTION: All data on the SD card will be deleted. Make sure that you have made a backup.</p>	
Test SD Card		

## 9.2.7 Setup 7/8: Miscellaneous

Menu / Parameter		Description	Default
Setup 7/8 Miscellaneous		<b>Various settings</b>	
	Set Date/Time	Set date and time	
	TIMEMODE	0 = Manual: Date and time can be set manually 1 = Auto GPS: Date and time is set automatically on GPS reception 2 = Auto GSM: Date and time is set automatically on GSM reception	1
	Backlight mode	Set the display backlight brightness 0 = Off: 1 = Dimmed: 2 = Bright: Backlight is turned off when the case cover is closed.	1
	Charger mode	Off: Charge always if external power supply is available On: Disconnect external power supply (charging) during recording to minimize electrical noise	0
	12V	Off (Auto): 24V power supply or photo-voltaic panel is used to charge On: 12V power supply is used	Off
	Device Lock (Theft protection)	Change device lock mode and PIN	
	Device Lock Mode	Off: Device is always operable On: Device is operable only after entering correct PIN (see also chapter 4.5) On alarm only: Device is locked if a motion alarm was triggered only (see also chapter 7.4.3)	Off
	Device PIN	PIN (Personal Identification Number) can be freely selected by the user and must be 4..6 digits. PIN must be confirmed by entering it again.  ATTENTION: Write the PIN down and keep it in a secret and secure place. If the PIN is lost, the device must be unblocked with the PUK. Contact Elekon AG to get the PUK.	
	Load Defaults	Set settings back to factory defaults	
	SETUP_DISABLED (only changeable via BATPARS.XML)	Disable setup menu 0 = Setup menu is accessible 1 = Setup menu is locked, no configuration changes can be done on the device	0

### 9.2.8 Setup 8/8: Exit setup

<i>Menu / Parameter</i>		<i>Description</i>	<i>Default</i>
Setup 8/8 Exit Setup		<b>Exit Setup menu</b> and save changes	
	Save to BATCPARS	Write settings to BATCPARS.XML file and exit Setup menu	
	Save to int.Mem	Write settings to internal memory and exit Setup menu If the BATCPARS.XML file exists on the SD card, those settings will be loaded on the next start of the device.	
	Discard changes	Discard changes and exit Setup menu	

## 10 Recordings and Files

### 10.1 The audio data file "xxxxxxx.wav"

After completion of recording into internal RAM, the stored data is written as standard audio WAVE file onto the inserted SD card with the file name "xxxxxxx.wav". (e.g. 10160435.wav) The first four digits identify the serial number of the device and the following four digits exhibit the consecutive number of the recorded files on the inserted SD card.

The above example therefore identifies the 435th recording on this SD card of the device with the serial number 1016.

The \*.wav file contains all the uncompressed raw measurement values of the analogue to digital converter and a "header", which is specific to the wave format. This "header" contains, amongst other information, the sampling rate of the digitiser.

Concurrent with these recorded wave data, a file containing meta information about the recording (see below) is saved to SD card with the name \*.xml (in our example 10160435.xml).

The recordings can optionally be stored into sub-folders (daily, weekly, monthly). See also chapter 9.2.6.

The standard \*.wav files can be read and opened with general audio software or bat specific sound analysis programs. It may be displayed as time signal or spectrogram. The latter offers best possibilities to identify species.

Elekon AG offers a specific analysis software for Windows PCs: **BatExplorer**. It can be found on the included SD card or can be downloaded from [www.batlogger.com](http://www.batlogger.com).

[WSL](http://www.wsl.ch) offers **BatScope**, a Mac software tool for management and review of recorded data and with automatic bat species identification: see <http://www.wsl.ch/fe/biodiversitaet/produkte/batscope/> or [bats@wsl.ch](mailto:bats@wsl.ch)



## 10.2 Meta data file "xxxxxxx.xml"

With every saved recording "xxxxxxx.wav" audio file, an additional information file "xxxxxxx.xml" (e.g. 10160435.xml) is saved, following the same numbering convention, and containing various meta information on recording time, date, location, temperature and device parameter settings.

Example of the content of an \*.xml meta information file:

```
<BatRecord>
  <Firmware>2.4</Firmware>
  <SN>1016</SN>
  <Filename>10160435.wav</Filename>
  <DateTime>28.04.2015 21:31:29</DateTime>
  <Duration>2 Sec</Duration>
  <Samplerate>312500 Hz</Samplerate>
  <Temperature>26 C</Temperature>
  <BattVoltage>3.92 V</BattVoltage>
  <GPS>
    <Valid>yes</Valid>
    <Position>47.056358 8.251432</Position>
    <Altitude>475.299988 m</Altitude>
    <CH1903>661752/212022</CH1903>
    <HDOP>1.140000</HDOP>
    GPSTimestamp>19:31:20+2h</GPSTimestamp>
    <GPSAge>9 Sec</GPSAge>
  </GPS>
```

(In case of invalid or missing GPS information, the above section will just contain: <Valid>never</Valid>)

```
<Trigger>
  <TRIG_MODE>Crest</TRIG_MODE>
  <Version>V1.0</Version>
  <Event>AutoTriggered</Event>
  <PRETRIG_TIME_MS>500</PRETRIG_TIME_MS>
  <POSTTRIG_TIME_MS>1000</POSTTRIG_TIME_MS>
  <TRIG_PAR0>6</TRIG_PAR0>
  <TRIG_PAR1>2</TRIG_PAR1>
  <TRIG_PAR2>2</TRIG_PAR2>
  <TRIG_PAR3>12</TRIG_PAR3>
  <TrigValue0>6</TrigValue0>
  <TrigValue1>40</TrigValue1>
  <TrigValue2>263</TrigValue2>
  <TrigValue3>44</TrigValue3>
</Trigger>
</BatRecord>
```

### The .xml info file contains the following information:

The firmware of the device was version 2.4  
The device number was 1016 (**Serial Number**)  
The accompanying WAVE file is "10160435.wav"  
The recording happened on April, 28. 2015 at 21:31:29  
The recording duration is 2 seconds  
The sampling rate was 312500 samples per second  
The temperature when recording was 26° C  
The battery voltage amounted to 3.92 V

The GPS information was valid  
Lat.- & longitude of the rec. position in degrees (**WGS84**)  
Elevation above sea level was 475.3 m  
The Swiss coordinates are 661752 / 212022 m (**CH1903**)  
The horizontal precision amounts to 1.14 (lower=better)  
GPS time was 19:31:20 UTC + 2 h. for local time  
The GPS "age" was 9 seconds (last positional reading)

The trigger mode was set to "Crest"  
The version of the triggering algorithm was V1.0  
The triggering was automatic, thus with the Crest routine  
Before the first trigger occurred, 0.5 s were recorded  
After the last trigger event, 1 s was additionally recorded  
The parameter "min.Crest" was set to 6  
The parameter "min.RMS" was set to 2  
The parameter "min.Peak" was set to 2  
Trigger cutoff freq. was set to > than 12x1.22kHz=15 kHz  
Triggering Value of parameter TRIG\_PAR0  
Triggering Value of parameter TRIG\_PAR1  
Triggering Value of parameter TRIG\_PAR2  
Triggering Value of parameter TRIG\_PAR3

### 10.3 Log file "BATREC.log"

When in use, the device automatically writes a log file "BATREC.log" in text format to the SD card. Every text line is preceded by the serial number (SN) of the device writing the log. In the file "BATREC.log", all activities of the device are listed chronologically. Events like starting up or shutting down are logged accurate to the minute, while logging of the normal recording activity only happens every hour.

Example BATREC.log:

SN2123 07.04.2015 19:25:10? - power on (SWRev=2.4, HWRev=B3)	Device #1021 was switched on
SN2123 07.04.2015 19:25:16 - Schedule: T1 20:15 - 07:00, MSG 08:15	Delayed record schedule
SN2123 07.04.2015 19:25:18 - record mode started	Record mode was started by the user
SN2123 07.04.2015 19:25:20 - sleeping until 20:15 ...	Device is in sleep mode
SN2123 07.04.2015 20:15:01 - Idle: #R=0, T[°C]=24, B1[V]=n/a, B1[A]=7.37, B2[V]=0.115, B2[A]=n/a, C[V]=n/a, C[A]= n/a	Device status after wakeup
SN2123 07.04.2015 20:15:01 - sampling T1 until 07:00 ...	Device is in record mode
SN2123 07.04.2015 21:00:00 - Listening: #R=27, T[°C]=23, B1[V]=7.36, B1[A]=0.112, B2[V]=n/a, B2[A]=n/a, Ext[V]=n/a, Ext[A]= n/a	Device status during record mode (listening for trigger event)
SN2123 07.04.2015 22:00:00 - Listening: #R=32, T[°C]=22, B1[V]=7.34, B1[A]=0.111, B2[V]=n/a, B2[A]=n/a, Ext[V]=n/a, Ext[A]= n/a	Number of recordings, actual temperature, battery and external power voltage and current is logged (only battery 1 is present in this ex.)
SN2123 07.04.2015 23:00:00 - Listening: #R=54, T[°C]=22, B1[V]=7.31, B1[A]=0.113, B2[V]=n/a, B2[A]=n/a, Ext[V]=n/a, Ext[A]= n/a	
SN2123 08.04.2015 00:00:00 - Listening: #R=7, T[°C]=21, B1[V]=7.28, B1[A]=0.109, B2[V]=n/a, B2[A]=n/a, Ext[V]=n/a, Ext[A]= n/a	
SN2123 08.04.2015 01:00:00 - Listening: #R=10, T[°C]=21, B1[V]=7.27, B1[A]=0.110, B2[V]=n/a, B2[A]=n/a, Ext[V]=n/a, Ext[A]= n/a	
...	
SN2123 08.04.2015 07:00:02 - sleeping until 08:15 ...	End of time frame T1 is reached
SN2123 08.04.2015 08:15:01 - Idle: #R=0, T[°C]=19, B1[V]=7.27, B1[A]=0.114, B2[V]=n/a, B2[A]=n/a, C[V]=n/a, C[A]= n/a	Device is in sleep mode
SN2123 08.04.2015 08:15:25 - SMS sent to: +41XXXXXXX	Device status after wakeup
SN2123 08.04.2015 08:17:09 - sleeping until 20:15 ...	Notification message was sent
SN2123 08.04.2015 11:57:08 - record mode stopped (wakeup by user)	Device is in sleep mode
SN2123 08.04.2015 11:57:13 - shutdown	Record mode was aborted by the user
	Device was shut-down

### 10.4 Parameter file "BATCPARS.xml"

The device settings are stored in the BATCPARS.xml file on the SD cards root directory. The parameter file is loaded upon device start-up. The file can be modified with any computer as it complies to the XML standard. Preferably it is edited with the BATPARS Editor Software, see chapter 3.3.

Settings, that are changed interactively on the device are also saved to the file.

When formatting an SD card, the parameter file will be preserved.

Without the "BATCPARS.xml" file on the SD card, the device starts with its internal "CMOS" parameters, which correspond to the values last set.

### 10.5 Google-Earth file "route.kml"

When GPS is in use, the device automatically stores a Google-Earth file with the name "route.kml" onto the SD card, which will be extended with every additional recording. If the SD card is used repeatedly (eject, reinsert) the "route.kml" will not be erased, but also extended. Deleting recording files does not affect the "route.kml" file. However, formatting the SD card will also erase the "route.kml" file.

In the file "route.kml", all recording positions with "valid" GPS data are listed chronologically. A new file is created if no "route.kml" file is available one a recording is stored.

## **10.6 Track file "xxxxxxx.gpx"**

Optionally, the track travelled can be recorded. This requires that the GPS mode is set to 2. In this mode a GPX file is with the current record number created (e.g. 10160435.gpx) and then the current GPS position is recorded continuously. The sampling rage can be set using the „GPS\_INTERVAL“ parameter.

The track recording is stopped when the recording mode is exited. When recording mode is restarted a new GPX file is created, or, if no audio recording was made since last start, the existing GPX file is continued.

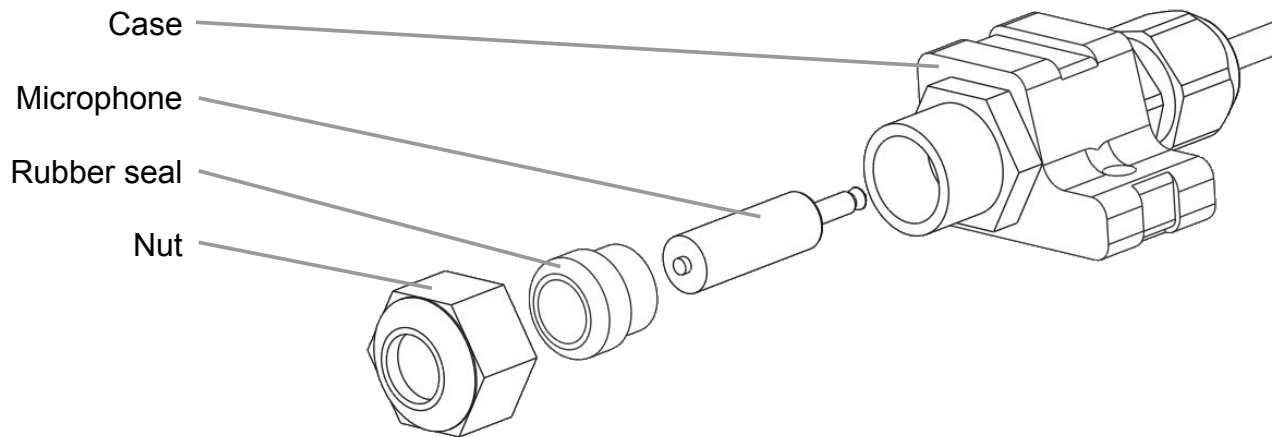
The GPX file contains the route taken as so-called track. It is based on the XML standard and can be opened with Google Earth for example or most major GIS software.

# 11 Troubleshooting

## 11.1 Checklist

<i>Problem</i>	<i>Cause</i>	<i>Remedy</i>
Device does not turn on.	Battery/power supply is not installed properly.	Check battery and/or power supply.
	Battery power is low.	Charge battery.
A lot of noise is recorded.	Trigger settings not optimal.	Check and/or adapt trigger settings.
	Electromagnetic interferences.	Check installation and power supply. Connect microphone shield to ground.
	Noisy environment.	Change location and/or placement/orientation of microphone.
No recordings triggered.	Microphone is defective.	Check and/or replace microphone. See chapter 11.2.
	Trigger settings wrong.	Check and/or adapt trigger settings. See chapter 9.2.2.
“SD card error” is displayed.	SD card is full.	Delete files or format SD card.
	SD card is write protected.	Disable “Lock” switch on SD card.
	SD card is defective.	Check and/or replace SD card.
	SD card type is not supported.	Replace SD card with a valid type.
SMS/Email notification does not work	SIM card, mobile provider registration issue.	Check SIM card and mobile contract. Check the log file for error messages.
	Invalid GSM settings.	Check and/or adapt GSM settings. See chapter 9.2.5.
	Insufficient GSM signal strength.	Install an external GSM antenna. See chapter 11.5.
GPS position does not get a „fix“	Insufficient GPS signal strength.	Ensure the a clear view of the sky. Avoid any obstacles (trees, buildings, mountains, etc.) in the field of view to improve signal reception.
	GPS module disturbed.	Reset GPS module to factory settings. See chapter 9.2.4.
Device lost date/time information.	CR2032 battery is dead.	Replace CR2032 battery. <ol style="list-style-type: none"> <li>1. Disconnect power supply</li> <li>2. Remove batteries</li> <li>3. Remove 6x screws</li> <li>4. Lift and tilt the inset core carefully</li> <li>5. Replace CR2032 battery</li> <li>6. Place back inset core</li> <li>7. Restore 6x screws</li> </ol>

## 11.2 Replace microphone



1. Remove the microphone case nut by unscrewing it counter-clockwise
2. Pull out the rubber seal
3. Pull out the microphone
4. Insert the new microphone carefully. Avoid touching the microphones top (capsule). Make sure it is fully inserted until you hear a “click”.
5. Insert the rubber seal
6. Mount the microphone case nut by screwing it clockwise by hand (max. torque 3 Nm)

## 11.3 Test microphone



**Microphone testing:** The ultrasonic microphone should be tested on a regular basis as it may become less sensitive over time, especially if it was exposed to moisture and weather. Keep it clean and dry to get best results.

### 11.3.1 Record silent spectrum

1. Place the white protective cover over the microphone in order to block any noise from reaching the microphone. Go in a silent environment.
2. Use the “manual test microphone” function (see chapter 9.2.3) or start a manual recording.
3. Compare the silent spectrum to the microphones specification.

### 11.3.2 Record a test tone

If you have access to an ultrasonic tone generator that produces reproducible output, you can record that tone and measure the frequency peak of the tone in the recording with appropriate audio software (e.g. Audacity).

## 11.4 Update device firmware



**Power loss during update:** If the device loses power during firmware update, it may get damaged and left unusable. Make sure that batteries are fully loaded and/or plug in power supply before updating.


Download possible new firmware version from [www.batlogger.com](http://www.batlogger.com) and copy it to the SD card.

Power up the device as in chapter 4.2.

```
New FWxxx.BLC  
Flash Firmware >
```



Device starts up and detects new firmware file

Press  key to install the new firmware.

Press  key to skip firmware installation.

```
Programming  
xxxxxx Bytes...
```


The new firmware is flashed to the device. After flashing, the device needs to be restarted.

Press both keys  and  simultaneously to turn on the device again if it does not reboot by itself.

```
FW Verify Ok !  
Del. FW on SD? >
```

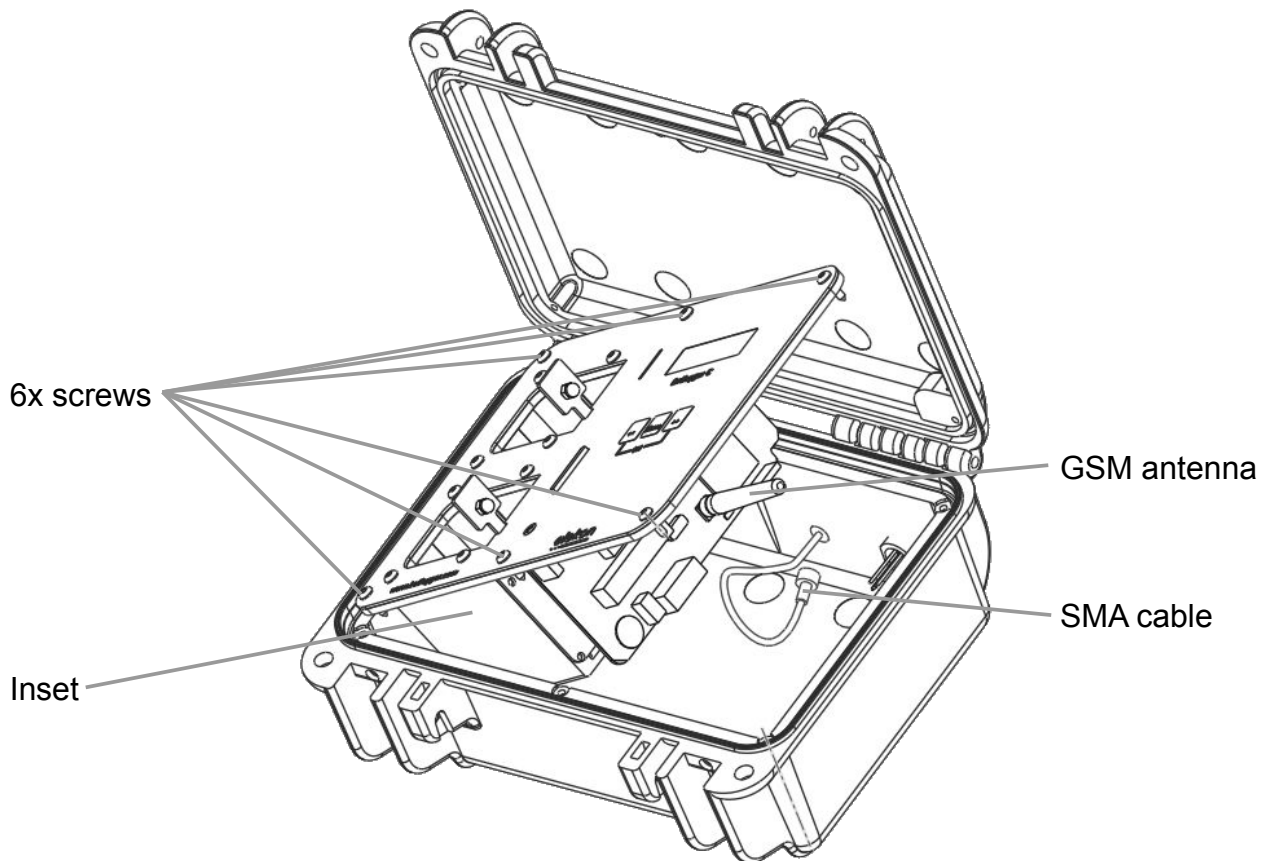
The installed firmware is then verified against the version stored on the SD card.

Press  key to delete the firmware file from the SD card.

Press  key to keep the firmware file e.g. to update another device.

Also see notes attached to the firmware file for further information.

## 11.5 Install external GSM antenna



1. Disconnect power supply
2. Remove batteries
3. Remove 6x screws with a Torx® T10 screwdriver
4. Lift and tilt the inset carefully
5. Remove the GSM antenna by unscrewing it counter-clockwise carefully
6. Plugin the SMA cable into the internal SMA connector where the antenna was and screw it on clockwise carefully
7. Place back inset
8. Mount 6x screws
9. Plugin the cable of the external GSM antenna into the external SMA connector and screw it on clockwise carefully by hand (max. torque 0.5 Nm)



**Protect external connectors:** When not in use, protect the external SMA connector from dirt and moisture with the supplied cover.

## 12 Technical specifications

<b>Case, dimensions</b>	
Size (B x H x T)	224×191×99 mm
Weight	1.55 kg (with 1 battery), 1.8kg (with 2 batteries)
Weather protection (case closed)	IP67 (except microphone, ext. power supply)
Operating conditions	-10..+50°C, 10..90%RH (non condensing) Charging: 0..+40°C Ext. power supply: 0..+40°C
Storage conditions	-20..+60°C, 5..95%RH (non condensing)
<b>Power</b>	
Battery	One or two 7.2V 6900 mAh Li-Ion batteries BP-945, Operating time approx. 5 nights a 10h per battery
Power supply	10..26 VDC, min. 20W, Wall power supply 24 VDC 24W (100-240 VAC), Photovoltaic-panel support
<b>Audio</b>	
Sampling	312.5 kHz, 16 bits
Microphone	Ultrasonic microphone FG black, Waterproof cable 2m
Sensitivity range	10 – 150 kHz
Recording duration	0 – 53.5 sec per file, pre- and post-trigger configurable
Trigger modes	Manual, Continuous, Crest Adv, Crest, Period
Scheduled recording	Two time frames programmable per day for recordings (time of the day)
Interval recording	Recording in intervals with preset pause times (number of minutes)
Output/Playback	3.5 mm headphones jack, Heterodyne, Time expansion (1 – 20)
<b>Data storage</b>	
File formats	*.wav, *.xml, *.kml, *.gpx, *.log
Storage media	SD/SDHC/SDXC card (SD 2.0), max. 128GB, FAT32 formatted
<b>Software</b>	
Settings and configuration	BATPARS Editor (WIN, MAC)
Analysis and species identification	BatExplorer (WIN) BatScope (MAC)
<b>Various</b>	
GSM	Integrated GSM/GPRS module, Quad-band (850 / 900 / 1800 / 1900 MHz), Standard SIM card slot, internal or external antenna, SMS and/or email notification
GNS/Location	Integrated GPS/GLONASS receiver, coordinates / elevation / time, manual location



## 13 Exclusion of Warranty

Elekon AG assumes no liability and provides no warranty for damage resulting from improper installation, mounting and improper use of the product or from failure to observe the operating instructions and/or safety notes.

## 14 Service and Support

Please contact Elekon AG if you have any questions about this product:

+41 41 2504040 or [mail@elekon.ch](mailto:mail@elekon.ch)

Further support information can be found on: [www.batlogger.com](http://www.batlogger.com)



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