![ecoObs technology & service logo]

mini-batcorder 1.0
GPS
www.ecoObs.de

START/STOP

● *Battery:*
  ● *Fully charged*
  ● *Recharge soon*
  ● *Recharge*

● *Memory:*
  ● *Enough capacity*
  ● *Low capacity*
  ● *No free memory*

● *GPS:*
  ● *GPS signal*
  ● *Clock only*
  ● *No signal*

Mini-batcorder 1.0

Quick guide

About this quick guide

This quick guide for the *Mini-batcorder* (1.0) contains important notes for the user. Please read this manual carefully, especially the safety suggestions, and pass this manual on to every user.

Waste disposal:

European Union:
According to the European WEEE Directive 2002/96/EC on Waste of Electronic and Electrical Equipment we take our devices back for recycling or proper disposal. Please send them to the address mentioned below; do not dispose devices at public or community supplied disposal systems! This is free of charge.

Other countries:
To reduce the environmental impact we take our devices back for recycling or proper disposal. We encourage you to send us back defective units or parts. This is free of charge.

If you have questions about the disposal process, please contact info@ecoobs.de

ecoObs GmbH, Hermann-Kolb-Strasse 35b, 90475 Nuernberg, Germany

Safety precautions

We are not legally liable for injury to persons or damages to property caused by improper use or by ignoring the safety instructions. For such occasions the warranty expires.

- Don't use the *batcorder* while driving a car or another vehicle.
- Do not install the device at an unstable location, dropping can harm persons or property or damage the *batcorder*.
- Don't leave the *batcorder* unattended, since children can injure their eyes or health with the microphone extender.
- Please mail our hotline at info@ecoobs.de or call **++49 911 3768053** if the *batcorder* shows any external damage or does not work. Please do not try to repair damage your self or through non-authorized personnel.
- Avoid excessive mechanic strain on the *batcorder.* Strong vibrations, shaking or dropping may damage the device.
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Application notes

- Try to avoid electromagnetic fields when using the *batcorder*! Microphones are sensitive to such fields. These can interfere with the audio signal.
- **The microphone is sensitive to mechanical strain**. Avoid impacts on the microphone tip and lateral mechanical strain on the microphone extender.
- Please avoid direct sun light on the *batcorder* as well as fast temperature variations or temperatures below 0°C and above 40°C.
- Dust or sticky substances can clog the microphone grid. Don't expose the *batcorder* to such conditions.
- The aluminum case is sealed up. But the microphone has to be exposed to be sensitive to incoming sound waves. The fine mesh of the microphone grid is a comparatively good protection against raindrops. Nevertheless long lasting exposure to high humidity can lead to corrosion, thus to loss of sensitivity. Hence, avoid long-term outdoor exposure.
- If you have further questions, please contact info@ecoobs.de or **+49 911 3768053** .

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Usage

Detecting bat calls reliably and in a quantitative manner poses high demands on setup and actual recording location. Automatic triggering, recording and computerized analyzing on species level highly depends on the proper detector setup. We therefore recommend to follow the following advice. The user guidelines were compiled particularly regarding influences on the triggering mechanism, automated call analysis (with bcAdmin) and automated discrimination (batIdent).

Acoustic and electromagnetic influences

Noise in the audio signal can be induced by either acoustic wor electromagnetic interferences. Such signals can influence bat call analysis dramatically. Even though the *batcorder* possesses a robust triggering-algorithm in most environmental setups, known sources of disturbance should be avoided. While the batcorder will cope with these situations, nevertheless it may record more parasite recordings or miss some bats. Also, the automated analysis of calls may suffer. The following list gives sources of perturbation, based on our knowledge:

- Strong electromagnetic fields (for example power lines, big coils, power switchboards, wind turbines, ...) may lead to additional recordings of noise and noise in recordings.
- AC sources (for example neon lamps, energy saving lamps, ...) may produce narrow bandwidth ultrasonic noise.
- Strong wind streaming alongside irregular shaped bodies (for example trains, cars, ...) create low frequency noise as well as broadband noise and can mask bat calls.
- Reflections from nearby objects can interfere with bat calls, since calls as well as echoes of the calls arrive with very small time differences at the microphone. This leads to interferences and thus to a decline of the trigger algorithms performance. Thus, the microphone should be placed at least at 2m distance (height & range) to any objects. Recording close to vegetation, walls, underneath bridges, underpasses as well as above sealed roads or water bodies is not recommended. Often the box extension will improve recordings at such

locations, since it shields for example echoes from behind the microphone.

- Many bushcrickets have calls in the ultrasonic spectrum. At a distance of 2 meters or more to vegetation, the signal strength of these calls is reduced, hence, generates only few to none trigger events.

Site selection and recording modalities

Even if all tips mentioned before are taken into account, there are some disadvantageous locations for bat detection:

- **Hibernaculum or swarming site**: A bat detector set up inside or in front of a hibernaculum will lead to a huge number of recordings in autumn and spring. This makes data analysis more difficult. Social calls as well as unspecific echolocation calls near structures may lead to uninterpretable recordings. The more species and individuals are recorded at the same time, the less predictions can be made on bat density or quantification of activity. We recommend avoiding such sites, if studying general bat activity. Place the *batcorder* at distances of at least 50 to 100 meters of such sites to gain a more useful measure of activity.

- **Bodies of standing water**: many bat species are hunting at lakes and other water bodies. Thus, such sites lead to good results for accessing the overall species diversity of an area. But comparison of bat activity to recordings from other sites is difficult for similar reasons as mentioned before (swarming sites). In addition reflexions from the the water surface will degrade the quality of the recordings. We recommend to place the batcorder in a distance of at least 5 to 10 meters to the waterside.

- **Car transects**: A method sometimes chosen for monitoring purposes are car transects. That means, bat activity is measured along a driven distance. We advise against using this method, since danger of accidents rises, and recording while driving goes along with a lot of noise. In addition the mechanical strain on the device, echos from the car surface and the potential displacement of sensitive species have to be taken into account.

Using the Mini-batcorder

The Mini-batcorder is designed as an passive detector for automated recording of bat calls. It features the same technologies as the regular batcorder in a small and simple to use design. It was developed as high quality bat call recorder for NGOs at an affordable price.

The Mini-batcorder features a minimalistic interface with only two buttons and some status LEDs. All settings are changed using free software available for Mac and Windows (https://ecoobs.com/download-en/)

The LEDs are used to indicate success as well as errors when using the Mini-batcorder.

Recordings are stored on an internal micro SD card and are downloaded via USB. The internal battery is also charged using USB.

The microphone is identical to the batcorder microphone and possesses a high recording quality. It is situated at the top of the microphone extension. Please make sure not to touch that area to avoid damage. The connector has a red dot which needs to be aligned with the red mark on the case. When connected, the plug is fixed automatically. For removing the microphone you only need to pull again.

Please do not twist the microphone extender when attaching or removing, that may damage your device.

The built-in GPS chip is primarily used to update the clock of the Mini-batcorder. For saving power it is not designed to log transects or get coordinates for each recording. If necessary, our software bcadmin for example can geolocate recordings using the recording timestamp and GPS tracks written for example by your smartphone.

While the Mini-batcorder was not designed to be left out running in any weather - for this the normal batcorder 3 is much better suited - it is designed to easily survive normal rain showers. Please make sure the rubber lid is foxed on the USB connector. Otherwise this will be an entry point for water.

Starting/Stopping the Mini-batcorder

Turning on the Mini-batcorder

Press the Start/Stop switch
All 3 LEDs are blinking green for three times, recording mode is activated. The Mini-batcorder will run for 10 to 12 hours with LEDs activated. The run-time is extended to ca. 40 hours by activating stealth mode.

Turning off the Mini-batcorder

Press and hold the Start/Stop switch for a couple of seconds
All 3 LEDs are blinking red for three times, the device is off now

Note: a single press on the Start/Stop button does only toggle stealth mode. Only the 3x red flashing LEDs indicate a system shut-down.

Stealth mode
Pressing the Start/Stop switch shortly while the Mini-batcorder is active will toggle stealth mode.

Connecting with your computer
Please make sure that the Mini-batcoorder is stopped / switched off, before you connect it with your computer. After connecting the LEDs flash green for three times. When disconnecting, please make sure you eject the Mini-batcorder first from your operating system. Then, after disconnecting the USB cable, the LEDs flash red 3 times. Only then the Mini-batcorder has itself switched off again.

Visual feedback

Battery-LED

In recording mode the following colors indicate:

- Green: battery is charged above 50%
- Orange: charge state of below 50%
- Red: only little charge is left
- Red-blinking: battery is empty. device turns off

When charging the battery the following colors indicate:

- Green flashing: battery is charged above 95%
- Orange flashing: charge state above 75%
- Red flashing: charge state below 75%

Memory-LED

In recording mode the following colors indicate:

- Green: free space > 32 GB
- Orange: free space < 32 GB and > 4GB
- Red: only only < 4 GB left
- Red-blinking: memory can't be read, an error occurred. The Mini-batcorder needs to be formatted either as exFAT or NTFS on your computer.

GPS-LED

In recording mode the following colors indicate:

- Green: valid timestamp and coordinates received
- Orange: only a valid timestamp was received
- Red: no signal

Further signals

- when turning on
- when turning off
- Recording mode: the batcorder indicates a recording by all three LEDs until recording is finished. In stealth mode the LEDs stay off.

x3 when connected to a computer

x3 when disconnected from computer

Flashing from bottom to top, one after the other if a power pack is connected while the Mini-batcorder is switched on. The same pattern in red is shown if the power pack is removed again.

Connecting with USB

Data connection and battery charging

Make sure the Mini-batcorder is turned off, then connect it to your computer via USB. After connecting the Mini-batcorder is mounted by your computer as mass storage device. You can access all recordings without the need of any special software. The Mini-batcorder cannot be turned off when connected to a computer. Als note that the internal battery is charged when connected to a computer.

Deleting the Mini-batcorder memory

After connecting the Mini-batcorder to your computer you can initiate a memory delete by deleting the LOGFILE.TXT. At the next startup the Mini-batcorder then will reformat its card and delete all files.

Using an external power source

The Mini-batcorder can use an external power source that is connected to USB. Note that due to the low power intake of the Mini-batcorder the USB-powerbank must also work if power of less than 20mA is drawn.

To use a USB-powerbank first start the Mini-batcorder. After it has started recording mode you can connect the powerbank.

If the powerbank is recognized and gives power, the three LEDs flash one after the other in green.

If the power bank is not giving power anymore or is disconnected, the three LEDs flash in red one after the other.

GPS functionality

The main functionality of the built-in GPS receiver is to regularly get a current timestamp for setting the Mini-batcorder date and time.

Since the GPS module does roughly triples the power consumption it is only in normal mode (always on) if the Mini-batcorder is not in stealth mode. Then it acquires a new position every minute. If the accuracy (PDOP) is increased in regards to the latest dataset in the logfile a new entry is added.

if in stealth mode the GPS is is turned off after one hour regardless its state.

Power supply

The Mini-batcorder can be powered using a powerbank and runtime can be extended. Note that due to the low power consumption of the Mini-batcorder some powerbanks will not turn on. They must be able to detect and run with consumers drawing currents of below 25 mA. Also note that the capacities of powerbanks usually are determined by consumers wit around 500 mA. Thus the actual run times of the Mini-batcorder may be short than expected since the power banks my not be designed for low power consumption.

When connecting the power bank, the batcorder may first draw more power to charge the internal battery. Thus the power bank may work at first glance. Yet, it may then shut down when the internal battery is charged and stay off. So make sure you test a full battery cycle of the powerbank before relying on it in the field or buying multiple powerbanks of the same model.

Settings

Using the freely supplied software tools (see ecoObs downloads page) you can setup your Mini-batcorder according to your needs.

Filecode

The **Filecode** consists of ten alphanumeric characters (including underscore) and is used as identification of a recording.

Quality

The standard value for *Quality* is 20, which is optimal for most bats in common recording situations. At higher values (>20), less call like signals will be recognized, while lowering the *Quality* value (<20) tightens up the trigger algorithm.

Threshold

The *Threshold* influences the recording range of the *batcorder*. The standard value of -27 dB is approximate to an amplitude of 4.5% of the maximal amplitude. This resembles a recording distance (radius) of at least 10 meters for most European bat species. If you want to increase the recording range, *Threshold* has to be lowered to a value of -30 dB or -36 dB. A change of the threshold value does not change the *batcorder*s gain! Only signals with amplitudes above the threshold will be analyzed. Possible values are -18, -24, -27, -30, -36 dB and -42 dB (12.5% to 0.8% of maximal amplitude). If you use a value different from -27 dB you have to adjust the appropriate setting in bcAdmin. In newer versions of bcAdmin the threshold is set in the same steps as in the batcorder menu.

Posttrigger

The post trigger is defined by the interval between two successive detected calls that are still written into the same sound file. After this interval, a new recording is started if a call is recognized. We recommend a value of 400 ms or 600 ms. Possible values are 0 ms, 200 ms, 400 ms, 600 ms and 800 ms.

Pretrigger/Posttrigger

50ms   400 ms   recording ends
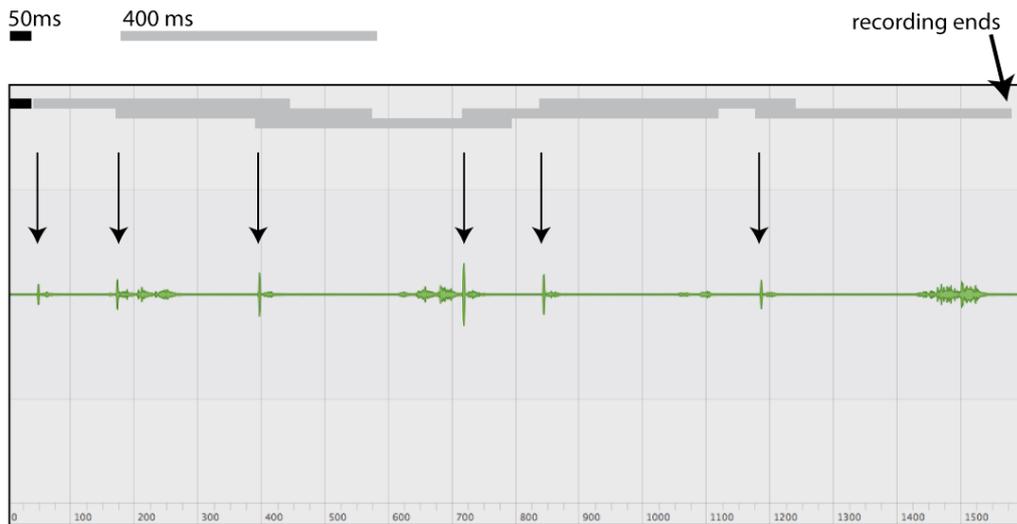
The graph explains pre- and posttrigger times of the *batcorder*. Arrows indicate positive trigger events (= bat calls). The pretrigger of 50 ms is not adjustable.

Critical Frequency

The third setting, is important for bat call recognition. Calls below this frequency are ignored in the analysis, thus, the signal is neither filtered analogously nor digitally. It is set independently of the existing, unchangeable analogous high pass filter. By choosing a higher *Critical Frequency,* bushcrickets can be more effectively eliminated. Be reminded that you may also miss low frequency bats, like the noctule bat if the CF is chosen too high. Possible are all values from 14 to 110 kHz in steps of 2 kHz.

Recording file format

You can choose to either recording in raw file format (standard batcorder format) or in 500 kHz wave file. We do not recommend 44.1 kHz since it does shift frequencies and makes analysis impossible.

Miscellaneous

Sound format

Recordings with the *batcorder* are written as raw audio files without header information. The data is organized as PCM values with an amplitude resolution of 16 bit, LittleEndian byte order (Intel) and a sample rate of 500 kHz. The files can be read with any sound software that is capable of opening raw audio files with the necessary sampling parameters. This should work in SASLab Pro (Avisoft; user defined import format), Pettersson Batsound (chose .dat file, samplerate of 50 kHz!), Audacity (use 50 kHz samplerate!) and Amadeus Pro (Hairer; import raw audio file).

Note you can switch the Mini-batcorder using the supplied software to record wave files as well.

Filenames

Each recording gets a unique filename using a fixed scheme. The names are chosen to support easy archiving and quick recognition of recordings. The filename begins with the date: DDMMYY (for example 100707 for July, 10th 2007). This is followed by the ten characters long filecode (see Settings SDHC-CARD+CLOCK) and a consecutively numbered count. A valid filename, is for example

100707-LOCATIONAX-00095.RAW

By choosing descriptive **filecodes** and including the date, filenames are easily recognizable. Thus, recordings can easily be assigned to an event.

Log file

The *batcorder* creates a log file on the SDHC card to control its proper function (LOGFILE.TXT). This file holds entries to all important events. Activation and deactivation of each mode are stored, as well as each recording.

Firmware-Updates

The Mini-batcorder firmware is continuously improved. Firmware updates are provided as files and can be download from our homepage. Before you can install the update you will need to delete recordings from your Mini-batcorder.

you can initiate a memory delete by deleting the LOGFILE.TXT. At the next startup the Mini-batcorder then will reformat its card and delete all files.

Now copy the firmware file on the Mini-batcorder and restart after disconnecting from your computer. The LEDs will flash in a certain longer pattern which indicates successful installation. On next startup the software on your computer should indicate the new firmware as well. Note that with new features you may also need to update the software for setting up the Mini-batcorder.