

Handbook: making optimum use of the BatLure

The BatLure is a versatile device that can be used to attract bats, test equipment, and train professionals. This handbook will provide tips on four potential applications of the BatLure, along with advice on how you can make the most of your BatLure.

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Technical Manual

General Description

This stand-alone wave player is used to attract bats for field and research purposes. It will be used to play all files present on the inserted SD card with a small amount of pause between these files.

The device is able to work for about one long night on fresh batteries. The power amplifier and speaker are loud enough to attract bats in the neighborhood.

The BatLure is a rugged aluminum device with protection features for its speaker. All parts are secured to this housing so it is not possible to lose small parts.

The auto-play feature will start playing as soon as electricity comes available on the external power connector, making it possible to operate the BatLure on a timer. When the BatLure is battery powered on 8x AA batteries, it will be able to display the status of the batteries.

Its simple user interface makes it very easy to operate, even without reading this manual you will be able to use the BatLure within a few minutes. All operations like changing the batteries or SD card do not need tools.

Layout BatLure



- 1 Battery holder
- 2 Battery lid
- 3 SD card slot
- 4 Power button
- 5 Power indicator led
- 6 Volume buttons
- 7 Volume indicator leds
- 8 Clipping indicator led
- 9 External power connector
- 10 Speaker with protector

Using your BatLure

Preparing your BatLure for use:

- A) Place batteries
- B) Place an SD Card
- C) Power-on the device

A) Placing the batteries

1. Open the battery lid by loosening the thumbscrew;
2. Pull-out the battery holder;
3. Place eight fresh AA (penlight) batteries of the same type and charge in the holder;
4. Put the battery holder back in the BatLure. Make sure the contact pins are put in first with the pins on the right-hand side;
5. Close the battery lid with the thumbscrew.

B) (Re)Placing an SD memory card

6. Open the battery lid by loosening the thumbscrew;
7. Remove old SD card (if present): push it in further and it will come back out when released;
8. Place a new SD card with playable wave files. Make sure the contacts are facing up (SD card is upside down);
9. Close the battery lid with the thumbscrew.
* To create a new SD card please see the regarding chapter.

C) Turning on the BatLure / Starting the BatLure

10. Push the power button once, the device will power up.
11. Your BatLure is now on and it will play all available files as instructed in the configuration file.
* The BatLure will show the battery status for five seconds on its volume led's.

Turning off the BatLure

12. Push and hold the power button for approximately one second
13. Release the power button when the lights turn off.
14. Your BatLure is now off.

Setting the volume

15. Power the BatLure.
16. Push the volume buttons to increase or decrease the volume level.
17. The volume led's will light up according to the volume setting for 2 seconds.
* Digital amplification and Clipping: *In normal operating mode the volume led`s are green. When using digital amplification the led`s are red. Digital amplification is a useful feature to play files that are recorded on a low amplitude level; however the possibility of clipping appears*

when enabling this feature. Clipping of the audio signal will be signaled by the "clipping led" lighting up red. Whenever this happens it is suggested to decrease the volume level to preserve audio quality.

Reading the battery status

18. Power the BatLure.
19. Push the power button briefly.
20. The volume led's will light up according to the current battery status.

There is a small difference in the reported battery status of rechargeable and non-rechargeable batteries. Rechargeable batteries tend to report a little less capacity than they really have. This does not shorten the operating time of the BatLure.

Preparing an SD card for your BatLure (a computer is needed)

21. Place the SD card in your computer and navigate to its location.
22. Copy-paste or drag-drop the files you want to play to the top-directory of the SD card.
23. You might want to edit the configuration file, otherwise remove the SD card (safe remove) and place it back in the BatLure.

*Formatting your SD card:

It is preferred to format your SD card before using it: this will make sure you will not experience any playback difficulties. Use a FAT, FAT16 or FAT32 file system.

- On Mac: Open the "Disk Utility" application and select your SD card. Select "Erase" from the menu, then choose "FAT".
- On Windows: Open "My Computer", right-click on your SD card. Select "Format" from the menu, then choose "FAT" and press start.

Editing the BatLure configuration file (a computer is needed)

24. Place the SD card in your computer and navigate to its location.
25. Open the file "batlureconfig.txt" in the top directory of the SD card, use a plain text editor like notepad. To get a fresh copy of "batlureconfig.txt":
 - a. Delete or rename the file "batlureconfig.txt" from you SD card (if there is one);
 - b. Place the SD card in the BatLure and turn it on;
 - c. After 5 seconds you can turn it off;
 - d. A fresh copy of "batlureconfig.txt" is placed on the SD card.

26. You can modify the file by changing the numerical values. If you use unrecognized values, a factory set of values will be used instead.

27. When you have set the “batlure-config.txt” according to your wanted setting, save it to the SD card and safely remove the SD card. It is now ready to use.

Available Configuration options:

FIELD	VALUES	UNITS	EXPLANATION
time_expansion	0 or 1	off/on	Enables or disables the time expansion feature. With this feature enabled, all files with a sample rate below 20KHz will be played 10x faster.
track_pause	1 to 600	seconds	Determines the pause between two files.
startup_volume	0 to 31	steps	Determines the volume level at power on.
repeat	1 to 100	times	Number of times to repeat a wave file (only when the file is shorter than repeat_time)
repeat_time	0 to 600	seconds	Threshold time to decide when to repeat a wave file.
list_pause	-	-	Pause at the end of playlist, before repeating
sine_mod_time	-	-	Sine modulation period (seconds), set to 0 to disable this feature
sine_mod_volmin	-	-	Sine modulation lower volume level

Batlure advanced features

Since the first BatLures were produced, there have been a number of upgrades in the BatLure design. The serial number of the BatLure is used to check whether a BatLure has certain features out of the factory, and also to check which serial number is required to update to a newer version, and with that gaining new and advanced features.

FEATURE	DESCRIPTION	STANDARD FROM	POSSIBLE FROM
FW Update	Enables in the field firmware updates. An update file is required, and can be requested.	BL1303001+	BL1302001+ (Carry in)
External Speaker Connection	Adds the possibility to connect an external speaker to your BatLure.	BL1307001+	BL1307001+ (Hardware)
Filler chunk support	Supports Filler chunks in wave files.	BL1307001+	BL1303001+ (FW update) BL1302001+ (Carry in)
Sine modulation	Sine Modulation: this feature simulates a moving sound source by modulating its volume. Disable it by setting sine_mod_time to 0. The modulator will vary the volume between the normal volume (upper level) and sine_mod_volmin	BL1307001+	BL1303001+ (FW update) BL1302001+ (Carry in)
Playlist pause	Pause at end of playlist	BL1307001+	BL1303001+ (FW update) BL1302001+ (Carry in)

BatLure error reports

The BatLure is equipped with an error reporting function: this function enables the developers to get feedback from you, the professional user, with enough technical detail to further investigate the error you came across. Whenever an error occurs, the BatLure will generate a report and save it on your

SD card. Of course no personal data is included in these files.

If you find a file called "ERRORREPORT.

TXT" on your SD card, you are encouraged to send this file to info@apodemus.eu together with the wave files that created the error.

By sending these reports you will help Apodemus further developing the BatLure hardware.

External power

The BatLure is equipped with a connector to connect an external DC power source. This power source

must be between 6...16V and must be able to supply at least 3A of peak current in order to operate.

One external power lead is supplied with your BatLure.

Technical specifications

Memory card:	SD Card, formatted either in FAT16 or FAT32, up to 32GB supported.
Supported files:	Wave files (.wav), Mono/ Stereo, 8/16bit
Output frequency:	5KHz...100KHz
DAC Sampling frequency:	up to 500KHz
Time expansion to real-time:	Standard supported (switchable)
Output power:	~6W
DAC resolution:	12 bit
Battery operating time:	>10hours (30% output power)
Batteries:	8x AA battery
External DC power:	6...16V, <3A peak, low impedance
Speaker:	Vifa XT25SC90-04
User controls:	On/off, Volume up, Volume down
User feedback:	Power led, clip indicator, volume leds (5x).
Size:	~170x120x65mm including battery and speaker.
Housing:	Black anodized aluminum.
Weight:	1000g including batteries.
Tripod mount:	Female thread for mounting on a standard photographing tripod (1/4UNC, 20tpi).
External power connector:	Standard
Suspending eye:	Standard



Disclaimer

Even though the ultrasonic sound produced by the BatLure is inaudible to the human ear, it can still cause damage to hearing. You should therefore avoid using the BatLure in an enclosed space. Make sure that, when you transport the BatLure (such as in your car), the protective cap is placed over the speaker, and the device is switched off. When using the BatLure in the field, we recommend you immediately move away from the location of the device after switching on the BatLure. This will help prevent damage to your hearing.

Bats are protected by law in the EU and in other countries as well. As a result, it is prohibited to capture and/or disturb them, or destroy their roosts, unless you have obtained an exemption. Make sure you are always in compliance with the legislative provisions of the country in which you are conducting ecological research!



How to make optimal use of your BatLure

10 Tip & tricks for using a BatLure

A properly deployed BatLure can lead to a significant increase in both the number and diversity of bats you are able to attract or capture. But how can you make the most of your BatLure? We will share ten tips and tricks for using your BatLure, to help you obtain optimum results while also avoiding disturbing the bats unnecessarily!

1. Avoid using the BatLure in the vicinity of a known or suspected roost

Using a BatLure in the vicinity of a known or suspected roost may disturb the colony in residence. Do you know there's a colony nearby? Don't use the BatLure in that area. This will prevent stressing the bats and avoid disturbing the colony.

2. Avoid using familiar 'distress calls'

Bats respond to a number of different kinds of sounds. These are: sounds that attract them, sounds that repel them and sounds that cause them to panic. It is important that you not use the BatLure to broadcast sounds that have been proven to cause stress in bats, because this will cause the animals unnecessary distress. Certain sounds call for experimentation, as we are unsure of their exact function. Which type of sound will be most effective in helping you achieve your goal may vary from one situation to the next.

3. Use the BatLure in a foraging area, not on the route to and from one

When capturing bats, a mist net or harp trap is typically placed either near where the bats emerge from their roost or along the route they fly to reach a foraging area. Classic trap set-ups are under a bridge over a waterway, across a path or clearing in a wood, and so on. The implicit goal is to maximise capture success by choosing a spot where many bats will pass by. When using a BatLure to catch bats, be sure to mount it within the (suspected) foraging area. Place your net or harp trap in a logical passageway where it is likely to catch the bats off guard. For example: use your net to block off a gap in the stand of reeds surrounding a pond, or place your harp trap in the space immediately under the lowest branch of a broad sweeping oak in the middle of the wood.

4. Place the speaker inside the net or harp trap

The closer to your trap set-up the speaker is mounted, the greater your chances of capturing bats. In the event a bat is drawn to the sound, they will fly directly towards the speaker. We recommend that you mount the microphone less than 30 cm from the trap in order to optimise your results. Hanging the microphone in the net is ideal. A

typical set-up involves the BatLure tied to a tree trunk, with a net stretched against it and extending out on either side.

5. Don't set the volume too high

A BatLure is more than loud enough. Whatever you do, avoid trying to broadcast as loudly as possible – this will only work against you. Would you prefer to adjust the volume anyway? You can configure the standard starting volume of the various sounds in the LogFile on the SD card that will be inserted into the BatLure. We recommend that you sort the social sounds into groups with a similar volume, save each group to a separate SD card and then optimise the starting volume of each SD card. It is namely so that volume levels may differ considerably between species groups; by following our advice, you can avoid broadcasting a recording that has an unnaturally quiet sound followed by an exaggeratedly loud one.

6. Turn your torch/lantern off and move away from the BatLure's position as quickly as you can

Many times, bats will be attracted immediately when you switch on the BatLure with the right sound. So once you have turned the BatLure on, be sure to withdraw from the location as quickly as possible. Remaining near the set-up

with your torch or lantern on will negatively impact your capture success.

7. Don't see immediate results? Try switching sounds!

The type of sound that will work best depends on the species group, geographic area and time of year. That's why it's a good idea to experiment with different kinds of sounds, to test which one will give you the optimum result for your specific goal. Still no results after thirty minutes of broadcasting? Time to try a different sound!

8. Use either high-quality recorded sounds or artificially-generated sounds

A BatLure will faithfully reproduce whatever sound you put into it. Is the sound on your SD card of a poor quality? If it is, the BatLure will broadcast an amplified poor-quality sound.

That's why you need to ensure that the quality of your recorded sounds is sufficient. Artificial sounds are often better, in fact, because they contain little to no auditory static. And remember: bats are curious creatures. If you use a high-quality recording of a strange sound, they will often be drawn by curiosity and come investigate. What's more, not all effective sounds are species-specific. Colleagues in the UK have caught common pipistrelle bats using certain social sounds of the greater

mouse-eared bat – a species that is not (or only rarely) found in the British Isles! When working in an area for which no sounds are available, you should therefore bring a combination of sounds from other species and artificial noises. But remember to keep tip 5 in mind and avoid combining sounds of widely varying volumes on a single card.

9. Avoid combining sounds at very different volume levels

Make sure you don't combine loud and soft sounds on the same SD card. If a soft sound is broadcast first, followed by a loud noise, in all likelihood you will only frighten the bats away. That would be like first whispering something in a person's ear – and then yelling into it. After all, we humans prefer that people speak to us at a normal volume, too.

You should therefore make separate cards for each group of species and/or volume level. For instance:

- Social sounds of Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle and the greater mouse-eared bat
- Social sounds of common noctule and lesser noctule
- Social sounds of Myotis species, barbastelle, brown long-eared bat

Optimise the starting volume of each individual SD card and store the cards

in a case that you can keep in your pocket. When catching bats with a harp trap, for instance, you will set up the harp trap with the BatLure near the wires, insert the first card and withdraw as quickly as possible. After thirty minutes, come back to see what you have caught and switch out the SD card for a new one – and so on and so forth.

10. Don't be afraid to experiment!

Bats are curious creatures. So: experiment, mix and match variables and – most importantly – find what works in your specific situation! If you don't get immediate results, try using a different set of sounds or another volume setting. A small adjustment in the sounds or volume can sometimes mean the difference between attracting or capturing bats and not.

These tips will help you make the most of your BatLure. Have questions, comments or even a tip for using the BatLure effectively?

Share it with us via info@apodemus.eu

Luring bats to new roosts

When a new roost is built for a bat colony – for instance, to compensate for the loss of a known roost – it may be desirable to increase the chances of the colony taking up residence in the new roost by luring the bats to it. This can be done by using the BatLure to broadcast attracting calls.

When attempting to lure bats to a location, the BatLure's optional external speaker is a useful tool. The speaker can be placed at the entrance to the new roost, allowing for the device itself to be hidden in a more sheltered spot. Because luring a colony of bats to a new roost requires bat sounds to be broadcast for a longer period of time, it will be necessary to connect the BatLure to an external power supply. The optional power supply kit allows you

to connect the BatLure to an A/C outlet (230V) or a 12-volt battery. A 12V timer – also available as an optional accessory – makes it possible to switch the BatLure on (and off again) at pre-set times.

Attracting bats to a new roost works best when you first make high-quality recordings of sounds from the colony you wish to relocate, then broadcast them at the desired new roost location using the BatLure. That way, you can be certain of using the right sounds.

Which set-up will yield the best results will naturally depend on the situation. We therefore recommend that you experiment with different variables. Is a particular sound not working for you? Another sound might.

Testing equipment

The BatLure can be used as a means of testing bat detectors. We know of at least three applications for the BatLure in this area:

- Comparing the sensitivity of various bat detectors
- Testing the response curve of an ultrasonic microphone
- Testing automatic detectors when used for long-term measurements

Comparing the sensitivity of various bat detectors

Bat detectors are available in a wide range of types, sizes and price classes. Testing the differences in the spectrum and sensitivity of bat detectors is extremely complicated. A BatLure, however, makes it possible to compare devices in pragmatic fashion.

Sensitivity

A BatLure can be used to determine the sensitivity of different bat detectors in a rough and simple fashion. Mount the BatLure on a tripod in an open area. Affix the BatLure vertically, so that the lobe of the microphone is oriented horizontally. Using a tape measure, set out a distance of 50 m from the microphone. Set up a test sound: a recording of a common pipistrelle, for instance. Select the specific frequency on the bat detector that you wish to test (use headphones) and walk backwards away from the source until you can no longer hear the test sound. Record this distance. Repeat this procedure for each detector you wish to test. You can also conduct this exercise to 'see how your measurements measure up' with a group during a training session or workshop; the results are often surprising.

Keep in mind that this is a relative comparison, of course. It involves selecting a specific sound, volume and frequency. The method is therefore intended primarily to illustrate the differences between various bat detectors. It is, of course, important to remember what you hope to measure and which species you are hoping to detect. In other words, a more expensive bat detector will not necessarily be better for your specific purposes. On the other hand: being able to tell how your measurements hold up, and being familiar with the inherent limitations of your particular measuring device, are absolutely vital bits of information!

Testing the response curve of an ultrasonic microphone

It is important that you test the sensitivity of your bat detector regularly. Ultrasonic microphones are extreme-



ly sensitive to all manner of external factors that can reduce their function. Fluctuations in temperature, moisture, vibration, jolts, and smoke can affect the sensitivity of an ultrasonic microphone. And, as it happens, these are all factors likely to be encountered by a bat detector in the course of the average bat-research outing.

A decrease in the function of the bat detector's microphone also means a decrease in detection ability. And that can lead to skewed research results!

For this reason, it is crucial to inspect the condition of ultrasonic microphones regularly – certainly prior to the start of field season and after any incident involving the device (being dropped, rained on, etc.). This will allow you to find any defects in the bat detector's ultrasonic microphone at an early stage, and have them repaired in time for the season. This is in the best interest of both your equipment and your research!

TIP: keep a maintenance log for your bat detector. In the log, note the date of purchase, any interventions (alterations or repairs) and the test results (which test sound, which frequency, at what distance), so that you will have good records and will be quick to notice any sudden decrease in the device's performance. If the sensitivity of your device has been compromised,

you should contact your dealer. In some brands, it is relatively inexpensive to replace the microphone.

Testing automatic detectors when used for long-term measurements

When taking long-term measurements using an automatic detector, it is important to inspect the device during set-up and periodically after that. This is especially important in locations where weather conditions might affect the response of an ultrasonic microphone. In order to interpret the results, it is important to know when the quality of the microphone has decreased or, worse still, the microphone stops working during the measurement period. We therefore recommend that you check the function of your passive detector regularly during such studies – the BatLure is a useful tool to do just that.

The method here will be identical to that used to check the function of the ultrasonic microphone in regular bat detectors. Please note that when the microphone is installed on a mast, the height and orientation of the microphone will play a role in testing its sensitivity. The frequency of the test signal is another important factor. At greater distances, you should use a relatively low-frequency signal.

Training bat professionals

The BatLure lends itself to indoor use in training beginners and professionals to recognise bat sounds. Because the BatLure can play calls made by any species of bat, it is possible to practice perceiving the sounds of many, many different kinds of bat – including species not found in the area where the training session is held.

The BatLure can be used both indoors and out. Multiple people can practice detecting and recognising the same sound at the same time. Using the BatLure frees you from any dependence on the actual presence (or absence) of bats and/or the weather conditions on the day of the training session.

Preparing for training

We have lined up a few tips and exercises for training bat professionals. These can help you make the most of your BatLure.

When choosing a sound, it is important to use only one sound per SD card. That way you always know which call from which species you are broadcast-

ing. After all, each species requires its own volume and settings. For example, someone sitting in the front row will be able to hear the whisper-like echolocation of the brown long-eared bat, while someone seated at the back of the room will not.

To start, you will need to generate a `batlureconfig.txt` file by switching on the BatLure with the SD card inserted. Then, you will adjust the play volume to the desired level. Once you have isolated the sound you wish to play, you should adjust the settings to always repeat it.

Another option is to use an editing program (such as BatSound) to paste sounds one after another in order to create a longer sound file. Don't forget that when you play a time-expanded sound back in real-time, the sound will last only one-tenth as long as it does on your sound file! Be sure to always test the sound file beforehand, so you have a chance to identify any mistakes before getting started in the field!

Practising with the BatLure

Note: the characteristics of the space in which the exercise is conducted will affect the result. That's why the first thing you should do is use the bat detector to search for disruptive sources of ultrasonic sound. Fluorescent tube lighting, for instance, often generates an ultrasonic sound. Try to switch off any potential other sources of ultrasonic sound, if you can. Set up the BatLure and mark the zone in which the sound from the device can be picked up using a bat detector (this is the emission cone of the BatLure). Next, arrange the chairs inside that zone so that the trainees will have the best possible chance to actually pick up the sound.

1) Using a heterodyne bat detector for the first time

This exercise is ideal for helping novice bat researchers gain familiarity with their heterodyne bat detectors.

Save a sound, such as that of the common pipistrelle, to an SD card and insert it into the BatLure. Play the sound on repeat. Meanwhile, check to see if everyone knows how to switch the bat detector on and make sure they are scanning different frequencies. Then, ask the participants search (eyes closed) for the peak frequency.

The advantage of this indoor exercise with the BatLure is that everyone can get accustomed to using their bat detector under controlled circumstances. After that, they will be ready to work in the field (meaning in the dark) straight away.

2) Structures in heterodyning (optical and audio)

This exercise is intended to help trainees recognise different sounds and connect them to a specific signal structure (FM, FM-qcf, QCF, CF)

All participants in this exercise must put on headphones. Next, a sound will be played in various structures. Using the frequency button on the bat detector, the participants will use heterodyne scanning to identify different signal characteristics, such as F-max, F-min, bandwidth and peak frequency.

After listening to each structure, call a participant to the board and ask them to draw a sonogram of what they have just heard. This is a good exercise for learning how to connect an auditory experience to the visual representation of a sonogram.

3) Exercise involving time expansion

For this exercise, it is important to use bat detectors without a screen (such as the Petterson D240x) rather than detectors with a screen.

First, turn off the lights in the room. Then, you will give a brief explanation of a situation in the field (habitat and context), asking the participants to imagine they are there. Next, play a sound and have the participants listen to it in heterodyne. It is important that all participants wear their headphones during this exercise.

There are two key points to keep in mind with this exercise. First, you should pay attention to the emission cone of the BatLure speaker. This should be pointed sufficiently out into the open space. Secondly, remember the directionality and sensitivity of the participants' respective bat detectors. Some microphones have a greater range than others. It is important to take this into account. Play around with this a bit – it gives participants the chance to figure out what their detector can and cannot do.

The participants will listen to the sound being played. Each of them will then write down what they have heard.

Next, the bat detectors and headphones will be put aside and the entire group will listen to the time expansion sound that will be played via the computer speakers a few times over. It is important to play the recording through a high-quality speaker. The students will once again write down what they think they have heard.

Finally, the entire group will look and listen to the sound in BatSound together; the exercise will be discussed and corrections will be offered in the group. This exercise is valuable for anyone, from beginner to advanced expert.

When using the recordings for training purposes, you should keep in mind that – in case of long-term exposure to ultrasonic sound – this may lead to permanent hearing damage or even deafness!



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Netherlands
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Apodemus-service

- Borrowing equipment free of charge for defect products within 3 years after purchase
- All products on stock
- No shipping costs within Europe
- Quick delivery

