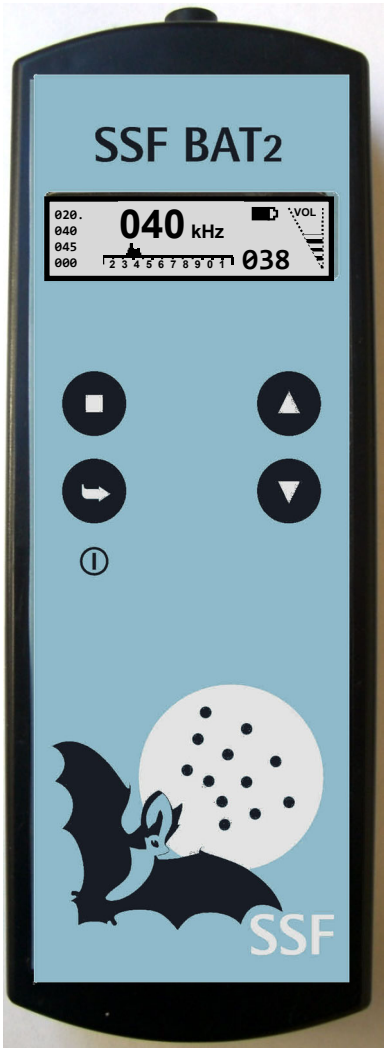
SSF BAT 2
Ultrasonic detector

BUND
Naturschutzzentrum Westlicher Hegau

Characteristics

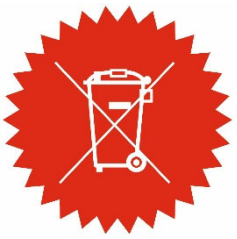


- **2 parallel** working **ways of detection**
  1. manually operated: mixer mode (Heterodyne)
  2. automatically operated: scanner with frequency indicator and spectrogram of bat calls (frequency divider) – so no bat call gets lost anymore!
- Applicable for **experts** as well as for **beginners**
- Frequency range **15 kHz to 130 kHz** adjustable in steps of 1 kHz
- Continuous **display of peak values** while scanning, ideal for easy bat detection
- Up to **4 fixed frequencies** programmable for fast accessing of known bat species
- **Easy to handle**, settings are saved
- **High sensibility**, because of special **ultrasonic microphone** in combination with a high quality pre-amplifier stage
- **High quality of sound** and volume, brilliant clear and differentiated transfer of bat call through integrated 1,5 W speaker
- Modern **microprocessor technology**, **LCD with adjustable backlight** (which can be switched off)
- **Auto shut-off** for battery protection (adjustable from 1 min to ∞)
- Optimal for use in **automatic detection systems**
- Indication of **battery status**
- 3.5 mm **earphone jack plug**

Technical details

- power supply: **4x AA Mignon** alkaline battery or rechargeable NiMH battery
- **battery life depending** on mode of operation up to **40 hours**
- power consumption approx. 30 mA
- weight including battery approx. **230 g**
- **dimensions** approx. length=185 mm, width=65 mm, height=28 mm

Disposal of electrical and electronic products



Old electrical devices often still contain valuable materials. But they also contain harmful substances. In domestic waste or if handled incorrectly, they can harm human health and the environment. Batteries, electrical and electronic products no longer in use must be disposed separately from domestic waste. The adjoining symbol indicates this obligation for separate disposal. Old electrical devices must be disposed of at collection points, municipal disposal points or via the seller. The batteries must be removed beforehand and disposed of separately. It is possible to return old SSF BAT2 devices for disposal with proper postage and at your own expense. However, postage expenses or travel costs will not be reimbursed. The return must be sent to:

BUND Naturschutzzentrum Westlicher Hegau
Erwin-Dietrich-Str. 3
D-78244 Gottmadingen
Germany

You can see whether the recycling and separate collection quotas have been met on the Federal Environment Agency website:
https://www.bmuv.de/fileadmin/Daten_BMU/Download_PDF/Abfallwirtschaft/elektrogeraete_daten_2018_bf.pdf

EU-countries

Do not throw electrical devices into the domestic waste! The implementation of European law in national laws and directives obliges you to dispose of consumable goods appropriately. This serves to protect both persons and the environment.
Used electrical equipment must be collected separately and recycled in an environmentally friendly manner. For proper treatment, recovery and recycling of old products and used batteries, please take them to a suitable collection point provided by public waste authorities, in accordance with your national legislation and the directive 2002/96/EC and 2006/66/EC.

Non-EU countries

Information on disposal in other countries outside the European Union: If you wish to discard your SSF2 detector please contact your local authorities and ask for the correct method of disposal.

WEEE-Reg.-Nr. DE 95026383

The BUND Naturschutzzentrum Westlicher Hegau is registered with the Electrical and Electronic Equipment Register „Stiftung Elektro-Altgeräte-Register" (EAR) in accordance with § 6 Abs. 2 ElektroG.

ZSVR-registration DE5890562916199

Participation in the collection system § 6 Abs. 3 VerpackV.

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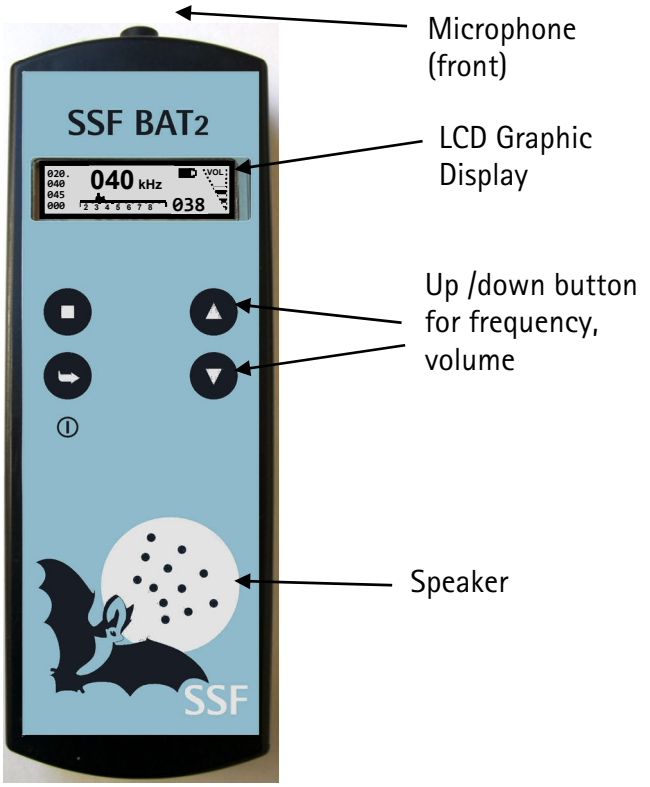
1. Technical manual



Earphone access

3.5 mm stereo jack socket on the side. Please do not use mono jack! Speaker switches off automatically while using the earphone.

Batteries

Device will not be delivered with batteries.
4 x AA mignon alkaline batteries or rechargeable batteries (NiMH) are needed for use. Please use only leakage free batteries.

The battery case is located on the back. Please unbolt to open. Please pay attention to correct insertion of batteries.

Please remove batteries when not using device for a long period (several months).

Please pay attention to the hints of the Battery regulation on the last page of this manual.

2. Quick guide

Adjustments and on / off button

Device is switched off:

short push → device is switched on

Device is switched on:
(Also see chapter „4. Settings" on page 7)

1x short push	→ menu Volume	(volume)
2x short push	→ menu Store	(frequency save/delete)
3x short push	→ menu Light	(LCD backlight)
4x short push	→ menu Off	(automatic shutoff)
Long push (2 sec.)	→ switch off device	

Up / down-button

Normal mode:

Short push	→ mixer frequency +/- 1 kHz
Long push	→ mixer frequency fast run

Programmer mode:

Volume	→ volume +/- 1
Store	→ mixer frequency +/- 1 kHz
Light	→ backlight 3 levels and switch off
Off	→ time for automatic switch off 1 min. to ∞

Frequency button

Normal mode:

Short push	→ take scanner frequency for mixer
Long push	→ take fixed frequency for mixer

Programmer mode Store:

Short push	→ select storage space
Long push	→ storage of indicated mixer frequency
Long push 4 sec.	→ deletion of stored frequency

3. Handling

Switch on / off

Switch on

Press adjustments- and on / off button , and

afterwards UP button within 1 sec., otherwise device automatically switches off.

This procedure serves to avoid an accidental switch on of the device e. g, in a bag.

After switching on device is ready for use.

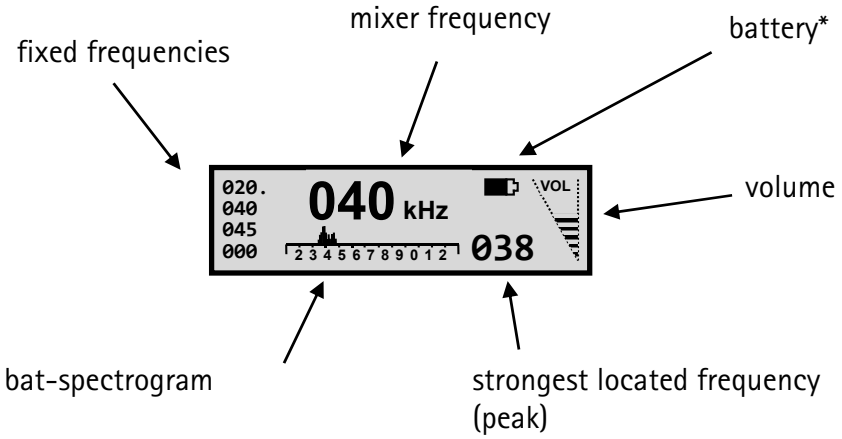
Switch off

For switch-off press adjustments- and on / off button

for more than 2 sec.

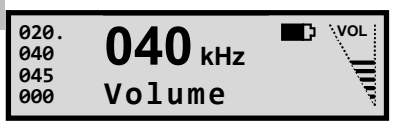
Furthermore, if device is switched on and not used within a certain time, device switches off automatically for protection of batteries. Default time is 5 minutes. (See programming „**Off**" on page 9).

Default display after switch on



* Display shows 4 level of charge state.

Volume setting



Short push of adjustments and on / off button switches on the mode "Volume" in which you can adjust the volume. This function ends automatically after 5 sec. with no push.

Adjust the volume by pressing the and button (16 stages). Graphic on the right side of the LCD shows the current stage.

Adjustment of mixer frequency

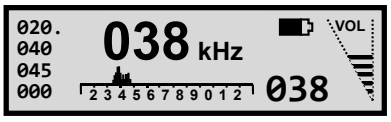
Use up / down button and in normal mode for adjustment of mixer frequency for Heterodyne receiver. With every push frequency changes by +/- 1 kHz, while a longer push switches to fast run. Frequency, resulting of mix of ultrasonic frequency and appointed mixer frequency, will be transmitted via speaker (or headphones).

Adjustment of frequency is continuously variable from 15 kHz to 130 kHz.

Use of frequency division & heterodyne

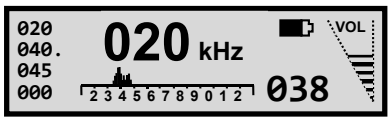
Parallel to mixer mode the **SSF BAT2** is also scanning the whole spectrum for ultrasonic frequencies using frequency division. The located frequency will be displayed in a graphic. At the same time, strongest located frequency will be displayed on the right (peak frequency).

Through short push of frequency button this located peak frequency will be taken as mixer frequency and hearable.



Use of fixed frequencies

Through long push of frequency button one of the programmed and stored fixed frequencies will be taken as mixer frequency using the heterodyne receiver.



Dot to the right of the fixed frequency shows frequency which will be taken next. While pushing dot always jumps to the next stored frequency. Storage space not used (display: „000") will be skipped.

3 frequencies are programmed as a default setting:
20 kHz, 40 kHz und 45 kHz
Fourth storage space is left empty. See chapter „**Store**" at the end of this page for more information about programming of fixed frequency.

4. Settings

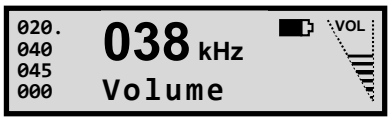
Short push of adjustments and on / off button switches through different adjustments and programming functions:
Volume, **Store**, **Light**, **Off**.

Function ends automatically after 5 sec. with no input.
(Exception: „**Store**" – ends after 10 sec.)

SSF BAT2 saves settings after switch off.

Volume

Arrow keys and adjust volume in 16 stages.
See also description on page 7.



Store (save / delete of fixed frequency)

On the left side of the display you see the programmed fixed frequency in a column. There are 4 storage spaces available for fixed frequencies.

3 default frequencies are stored already. One empty storage space is displayed as „000".

Selection of storage space

While you are in the Store menu, selection of storage space is possible through short push of button .
A „←" show the current storage space.

Adjustment of frequency

Adjustment of frequency that should be stored is now possible through pushing arrow keys and .

Saving of frequency

Through long push on button current visible mixer frequency will be saved.

Deleting of frequency

For deleting of storage space press button for 4 sec. As a warning of the coming deletion, after 3 sec., „←" symbol changes into „*". Deletion is completed when display shows „000".

Note: Only 3 frequencies can be deleted.

Light (backlight of the display)

Use the arrow keys ▲ and ▼ for adjustment of LCD backlight in 4 levels.

At level 0 backlight is switched off.

Note:
Less backlight is good for a longer battery lifetime.

Off (auto switch off)

This function is for automatic switch off of device.

Use the arrow keys ▲ and ▼ for switching through different options for the auto switch off time:
1, 5, 10, 30 minutes,
1, 4, 6, 12, 24 hours

Beside that there is the opportunity of choosing „∞". With that function device will not be switched off automatically. In combination with a sound recorder you can easily build a simple eavesdrop box that can be left out overnight.

5. Supplement

Detection methods

The **SSF BAT2** detector is a **heterodyne ultrasound receiver.** The bat calls are picked up by an ultrasonic microphone and mixed with the output of a high frequency oscillator (hereinafter referred to as oscillator frequency) in the bat detector. This produces sounds that are the sum and difference of the two frequencies (hereinafter referred to as mixer process). Through the frequency mixer process inaudible bat ultrasonic calls get converted into an audible signal, which is played over the speakers. The oscillator frequency is adjusted manually by the user. For an optimal reception the oscillator frequency should be as close as possible to the bat's ultrasound main frequency, therefore it needs to be decided beforehand which frequency ranges are of most interest. Bats with a locating-call far outside of the pre-set frequencies will not be heard using this method.
Simultaneously to the mixer process the **SSF Bat2** detector works with a **frequency scanner**. The frequencies between 15 kHz and 139 kHz are displayed graphically. The strongest frequency (peak) found during scanning is shown additionally next to the graphic on the right, and can be adopted as the mixer frequency by the touch of a button and is made audible with the heterodyne procedure. This makes it much easier to find bat frequencies. The data for the scanner is obtained by frequency division.
Additionally, up to 4 fixed frequencies can be programmed as oscillator frequencies for the heterodyne procedure for quick switching to known bat species.

Heterodyning

This method mixes the for human's inaudible ultrasonic frequency with a frequency produced by the detector. The internal frequency is called internal oscillator frequency. Through the mixing of two frequencies a differential tone is produced. For example, if the detector is set to 40 kHz and a sound of a common pipistrelle with 45 kHz is received a differential tone of 5 kHz is produced while mixing. Sounds under approx. 16 kHz are audible for humans and can be played by regular speakers. If the user slowly moves the oscillator frequency up to 45 kHz, the difference gets less, and the sound turns deeper. If you try to adjust the oscillator frequency so that the sound heard is as low as possible, you are simply adjusting it to the actual ultrasonic frequency received. Finally, the oscillator frequency can then be read and used as a feature for determining the species of bat heard. By adjusting the mixer frequency to generate a deeper sound, it simply gets aligned to the received ultrasonic frequency. The determined mixer frequency can be used as a characteristic to identify the recorded bat.
The difference between the call of the common pipistrelle just mentioned as an example at 45 kHz and a mixer frequency set to exactly 45 kHz is consequently zero and no sound is audible. In reality, however, a bat call does not consist of just one frequency, so one can orient oneself on the lowest tone heard and the oscillator frequency set to obtain this tone can be regarded as the maximum frequency represented in this call - the so-called peak frequency.

Frequency Division

In this method the ultrasound is divided by a constant factor. For example, using a device that divides by the factor 10, the call of a common pipistrelle is received at 45 kHz and played through the speakers at 4.5 kHz. This frequency division can be imagined in a way, that only every tenth of the acoustic waves is processed and the other 9 are deleted. (Regarding our example of the common pipistrelle, this means that from 45.000 acoustic waves per second 40.500 are deleted and just 4.500 are used further). As a consequence, 90% of the original information of the ultrasound signal is lost. On the other hand, in contrast to the heterodyning, the frequency dividing method does not require a specific frequency range to be selected beforehand. The system works over a wide range of the frequency band and the listener therefore does not miss any signal.
The **SSF BAT2** is using this method to scan the entire frequency band for bat calls (and of course other ultrasound signals). In order to detect the frequency peaks effectively, the level of the input signal must be above the background noise. Bat calls that are too low in noise will not be detected.
(**SSF BAT2** works internally with a divider of 8 for frequency calculation.)

Fixed frequencies

The fixed frequencies are preprogramed oscillator frequencies for the heterodyne method. They are used to quickly switch to specific bat frequencies. For example, frequencies of noctule bat and common pipistrelle can be stored here can then be used as setting with a single push of a button.

The **SSF BAT2** can store up to four freely selectable frequencies. In the default settings there are three frequencies preprogramed: 20, 40 and 45 kHz. The fourth memory location is not occupied in the default settings.

A special thanks to Dr. Wolfgang Fiedler for the description of the detection methods and the bat calls as well as for the overview over European bat species.

Bat species

Detecting flying bats with the **SSF BAT2** is easy and very quick to learn. However, the precise identification of the bat species found is usually very difficult, sometimes impossible, and requires a lot of experience. The following information is intended to provide some initial hints. Anyone who wants to learn more about determining bat species using ultrasound detectors cannot avoid using special literature, practical training from an experienced specialist or at least a "detector workshop" such as those offered by bat conservation organizations.

Frequency information always refers to the peak frequency. It should be noted that the frequencies can also vary slightly within a bat species and even one and the same animal changes its pitch depending on various environmental factors. Finally, due to the so-called "Doppler effect", the frequency also increases when the bat flies towards the receiver and decreases when it flies away from the receiver.

CF calls: We speak of constant frequency calls (CF = constant frequency) when the bat call consists predominantly of a single frequency. To our ears, such calls have a clear sound. Short CF calls sound a bit like drops of water falling into a basin. The peak frequency here corresponds to the frequency at which the majority of the call lies. In Europe, only horseshoe bats make clear CF calls.

FM calls: Frequency modulated calls (FM = frequency modulated) are calls that cover a wide frequency band in a short time. For many bats, such FM calls start very high and then quickly drop to lower frequencies. To our ears, such calls sound more like a knock and have no actual sound component. The peak frequency here only makes up a small part of the entire call and is where the call has the highest sound pressure, the highest "volume".

FM-CF calls: Some bat species emit calls that have both an FM and a CF component. Typical examples are the pipistrelle bats. Their calls start very high at around 100 kHz, then drop very quickly to around 45 kHz and maintain this frequency for a relatively long time (around 9 milliseconds).

In addition to these initial clues about the bat species, the calls can also give us important ecological information. Thanks to the "**feeding buzzes**", you can hear whether the bats are hunting insects. Shortly before catching an insect, the bats emit more calls per unit of time than usual. This is because they then have to know particularly precisely where the insect they want to catch is. That's why it sounds something like this: "tack - tack - tack - tacktacktacktack tatatatata ttrrrrrrrp", with the final part sounding like quickly closing a zipper.

It is also important to remember that bats not only make location calls, but also a whole range of communication and other calls, some of which can also be in the range above 15 kHz. These include, in particular, characteristic **display calls**, some of which can also be used as a clue to species identification.

Overview of the bat species found in Europe

A large part of the information comes from the two recommended books "Handbook of the bats of Europe and northwest Africa" by C. Dietz, O. von Helversen and D. Nill, published in 2007 by Kosmos-Verlag and the Kosmos nature guide "The bats of Europe" by W. Schober and E. Grimberger (1998 edition). Both books are only available in German. Species that are endemic to islands (Sardinia, Canary Islands) are not included.

Abbreviations: CF and FM calls are explained on page 12. "ms" = millisecond. "c/s" = number of calls per second.

Lesser horseshoe bat (*Rhinolophus hipposideros*): CF calls up to 60 ms long at 108 - 114 kHz. Very agile, butterfly-like flight up to about 10 m high, often close to the vegetation, even in the middle of dense foliage. Hunts exclusively in flight, typically in the forest, especially in the shrub layer. Two other very similar species occur in the Mediterranean region: the **Mediterranean horseshoe bat** (*Rhinolophus euryale*) and the **Mehely's horseshoe bat** (*Rhinolophus mehelyi*).

Greater horseshoe bat (*Rhinolophus ferrum-equinum*): CF calls at 79 - 84 kHz (no possibility of confusion with other bat species). Hunts in slow flight, often close to the ground, in about half of the cases short hunting flights from a perch.

Blasius' horseshoe bat (*Rhinolophus blasii*): CF calls at 92 - 98 kHz (no possibility of confusion with other bat species). This species only occurs on the Balkan Peninsula in Europe.

Daubenton's bat (*Myotis daubentonii*): 3 - 7 ms long FM calls, falling from 55 - 95 kHz to around 30 kHz (range 40 - 25 kHz). Peak frequency at around 45 kHz. Usually 13 - 28 c/s. Typical hunting flight very low over open water surfaces, but not exclusively.

Pond bat (*Myotis dasycneme*): 4 - 8 ms long FM calls, falling from 65 - 85 kHz to mostly below 30 kHz (35 - 25 kHz). Peak frequency at 36 - 40 kHz. Usually 8 - 10 c/s. Very similar in calling and hunting behavior to the Daubenton's bat, but with characteristic social calls at 30 - 40 kHz.

Long-fingered bat (*Myotis capaccinii*): 3 - 7 ms long FM calls, falling from 70 - 90 kHz to 35 - 39 kHz. Very similar in calling and hunting behavior to the Daubenton's bat, but with a tendency towards a slightly higher final frequency. The species occurs in southeastern Switzerland, but mainly in the Mediterranean region and the Balkans.

Brandt's bat (*Myotis brandtii*): 4 - 7 ms long FM calls, falling from just under 100 kHz to around 26 kHz. Very similar to the Whiskered bat. Peak frequency at 40 - 50 kHz. Around 10 - 11 c/s. Very agile, often undulating flight at variable heights (ground to treetops) in light forests, over bodies of water or along riparian vegetation.

Whiskered bat (*Myotis mystacinus*): 3 - 6 ms long FM calls, falling from 75 - 120 kHz to just over 30 kHz. Very similar to the Brandt's bat. Peak frequency at 40 - 50 kHz. Around 10 - 11 c/s. Very agile flight along vegetation edges, usually at a height of 1-6 m, but also up to treetop height. Also in orchards or over small bodies of water.

Alcathoe Whiskered bat (*Myotis alcathoe*): around 4 ms long FM calls, falling from 120 kHz to 46 - 43 kHz. Hunts along streams and over floodplains.

Natterer's bat (*Myotis nattereri*): 2 - 5 ms long FM calls, with an exceptionally large frequency range from 100 - 150 kHz to around 20 kHz. Peak frequency at 50 kHz. 11 - 14 c/s. Very maneuverable, also hunts in slow and hovering flight close to vegetation, sometimes also inside stables.

Geoffroy's bat (*Myotis emarginatus*): 1.5 - 4 ms long FM calls, often falling from over 140 kHz to around 38 kHz. Hunts in structurally rich forests, on forest edges and in orchards. Close to vegetation up to the treetops and inside stables (typical pendulum flight 50 - 100 cm below the ceiling).

Bechstein's bat (*Myotis bechsteini*): FM calls lasting 2.5 - 5 ms, falling from around 100 kHz to around 35 kHz. Around 9 - 15 c/s. Hunts at a height of 1-5 m, very close to the vegetation. Flight behaviour similar to the Natterer's bat. It is not possible to distinguish it from other Myotis species using a bat detector.

Greater mouse-eared bat (*Myotis myotis*): FM calls lasting up to 10 ms, but often shorter, falling from 70 - 120 kHz to 26 - 29 kHz. Around 12 - 20 c/s. Often hunts in rapid and only moderately agile flight at a height of 1-2 m, with the head characteristically tilted downwards, so the ears point forwards. Largest native bat species.

Lesser mouse-eared bat (*Myotis blythii*): very similar to the greater mouse-eared bat, indistinguishable in the bat detector. Mainly distributed in southern Europe, but occurs in parts of Switzerland, Austria, the Czech Republic and Slovakia.

Greater noctule bat (*Nyctalus noctula*): often two alternating calls, audible in the detector as "plip plop". The "plip" calls are FM calls up to 13 ms long, falling from 30 - 60 kHz to 22 - 28 kHz. The "plop" calls are almost pure CF calls at 19 - 22 kHz. Peak frequencies around 25, rarely over 30 kHz. Around 8 "plip" and 2 "plop" sounds per second. Fast, straight flight at a height of 10 - 50 m, rapid dives and occasionally hunting much lower (e.g. street lamp), but typically several meters away from vegetation.

Giant noctule Bat (*Nyctalus lasiopterus*): up to 28 ms long, very loud CF calls at 14 – 23 kHz, in open air 17 – 20 kHz. With some experience it might be possible to distinguish it from the Greater Noctule through longer call intervals with experience – but generally the frequencies overlap a lot. Very fast, straight and sometimes very high flight.

Leisler's bat (*Nyctalus leisleri*): CF calls up to 20 ms long at around 24 kHz. Sometimes there is an FM beginning. Hunts in very fast, mostly straight flight close above or just below the treetops, along forest clearings or over bodies of water as well as around street lamps.

Common Pipistrelle (*Pipistrellus pipistrellus*): FM-CF calls up to 10 ms long with a final frequency that is usually 44 - 47 kHz. Peak frequency at around 48 kHz. 10 - 12 c/s. Agile and winding flight at a height of 2 - 6 m, often flying the same patterns along linear structures over and over.

Soprano Pipistrelle (*Pipistrellus pygmaeus*): Calls very similar to those of the Pipistrelle, but end frequency at 54 – 55 kHz, peak frequency at around 55 kHz. Very agile hunting flight, which often covers smaller areas and is closer to the vegetation than that of the Pipistrelle.

Nathusius's Pipistrelle bat (*Pipistrellus nathusii*): 5 - 12 ms long FM-CF calls with end frequency around 37 – 41 kHz, peak frequency at around 38 kHz. Around 8 – 10 c/s. Hunts in fast and straight flight, often along linear structures at a height of 3 – 20 m.

Kuhl's Pipistrelle bat (*Pipistrellus kuhlii*): FM-CF calls up to 12 ms long with end frequency around 36 – 40 kHz. Peak frequency at around 38 kHz and therefore indistinguishable from the Nathusius's bat. Flight very similar to that of the Pipistrelle.

Savi's Pipistrelle bat (*Hypsugo savii*): FM-CF calls up to 16 ms long with a final frequency of around 32 - 37 kHz. Flies higher, faster and straighter than the Pipistrellus species.

Parti-coloured bat (*Vespertilio murinus*): FM-CF calls up to 20 ms long with a final frequency of around 22 - 25 kHz. Peak frequency around 25 kHz. 5 - 6 c/s. Very fast, straight flight at a height of 10 - 40 m (similar to the greater noctule). Usually patrols in open air over bodies of water and open land, less often over forest, especially in autumn close to street lamps.

Serotin bat (*Eptesicus serotinus*): FM-CF calls up to 23 ms long with a final frequency of around 23 – 27 kHz. Peak frequency around 25 kHz. 6 – 7 c/s. Agile, quick hunting flight along the edges of vegetation or around individual trees, usually at a height of 3 – 5 m. Search flights on longer, uniform paths.

Northern bat (*Eptesicus nilssonii*): FM-CF calls up to 20 ms long with a final frequency of around 26 – 29 kHz, peak frequency at 30 kHz. Around 5 c/s. Quick, agile flight along the edges of vegetation and in open air (up to 50 m high) or around street lamps.

Western Barbastelle bat (*Barbastella barbastellus*): 2 alternating CF-FM call types, the first with low intensity, 3 - 6 ms long and falling from approx. 45 kHz to approx. 30 - 35 kHz (peak frequency around 43 kHz), the second call type 2 - 3 ms long and falling from 36 to approx. 28 kHz (peak frequency 30 - 35 kHz). Very agile, fast flight, often close to treetops or under the canopy and often along the edges of vegetation.

Brown long-eared bat (*Plecotus auritus*): very quiet FM sounds with two harmonics that usually do not overlap. The basal call falls from 55 kHz to 20 - 25 kHz, the first harmonic from over 80 kHz to 40 kHz. Peak frequencies are around 26, 42 and 59 kHz. About 20 c/s. A swaying search flight, often hovering when searching for insects on the surface of vegetation or catching insects from the air.

Grey long-eared bat (*Plecotus austriacus*): very similar to the brown long-eared bat: very quiet FM sounds with two harmonics, which usually do not overlap (can only be determined with graphic sound analysis). The basal call drops from 55 kHz to 20 - 25 kHz, the first harmonic from over 70 kHz to 38 kHz. A swaying search flight, often hovering when searching for insects on the surface of vegetation or catching insects from the air - the latter more common than with the brown long-eared bat.

Alpine long-eared bat (*Plecotus macrobullaris*) and the **Balkan long-eared bat** (*Plecotus kolombatovici*) are also very similar to the two long-eared bat species already mentioned.

Long-winged bat (*Miniopterus schreibersi*): FM-CF sounds up to 15 ms long, starting at 55 – 75 kHz and falling to around 52 kHz. Peak frequency at 49 – 53 kHz. Flies nimbly around street lamps or below the canopy, over bodies of water or elsewhere close to vegetation at a height of 10 – 20 m.

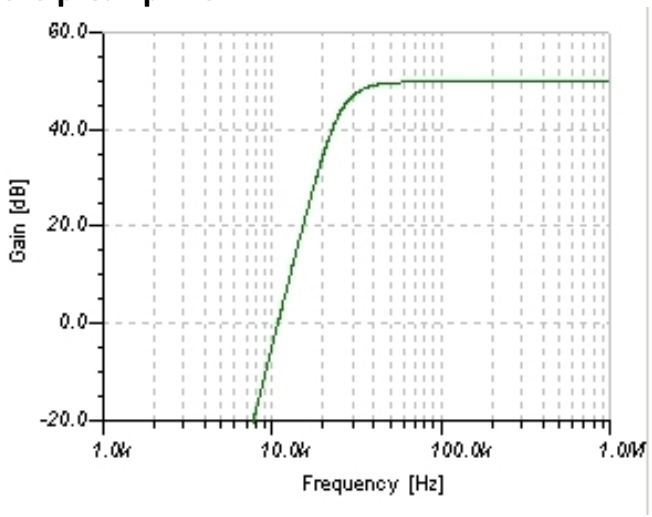
European Free-Tailed bat (*Tadarida teniotis*): CF sounds up to 27 ms long with end frequencies of 9 – 11 kHz (type 1) and 13 – 15 kHz (type 2). Peak frequency around 10 – 14 kHz and thus in the range audible to humans. 1 – 4 c/s. Very fast (up to at least 65 km/h), straight and sometimes very high hunting flight at a height of 10 – 300 m over a variety of different habitats. In Europe almost only in the Mediterranean region.

Further links

- www.all-about-bats.net, BUND Nature Conservation Center Westlicher Hegau
- www.fledermausschutz.de, Nature Conservation Union Germany (NABU)
- www.fledermausschutz.ch, Foundation for the Protection of our Bats (SSF)

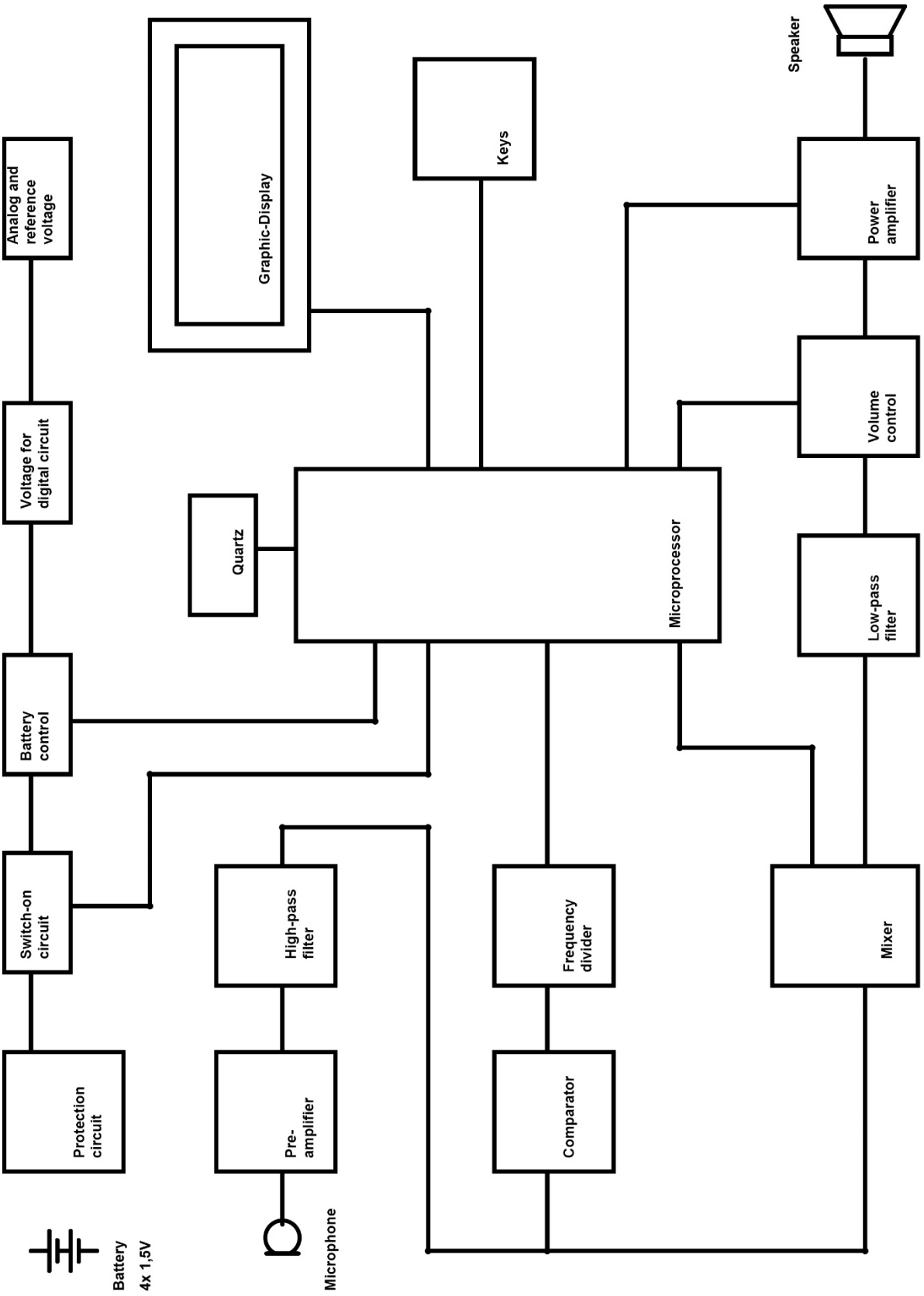
Technical specifications

Frequency response of the preamplifier

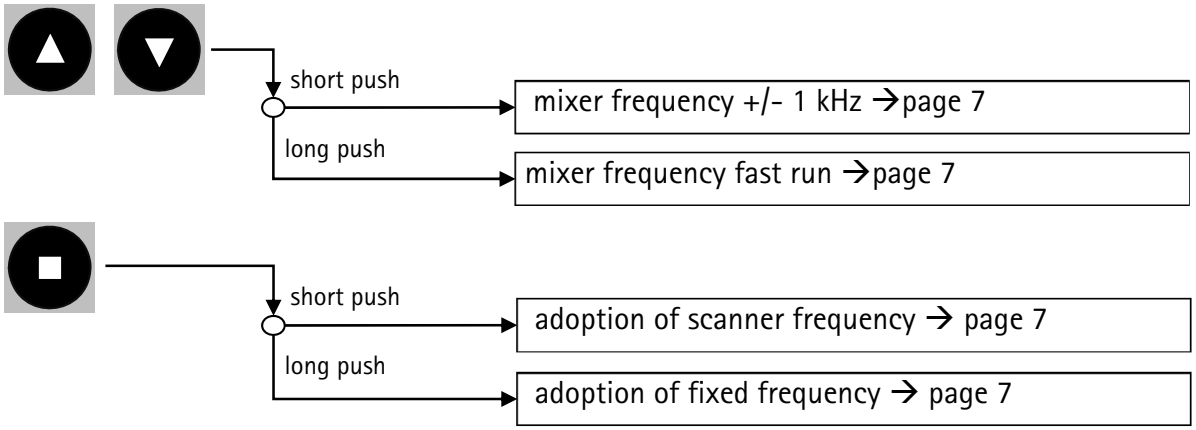


The preamplifier is optimised for the amplification of ultrasound signals over 15 kHz. Background noise, that could lead to overmodulation of the sensitive preamplifier will be masked out.

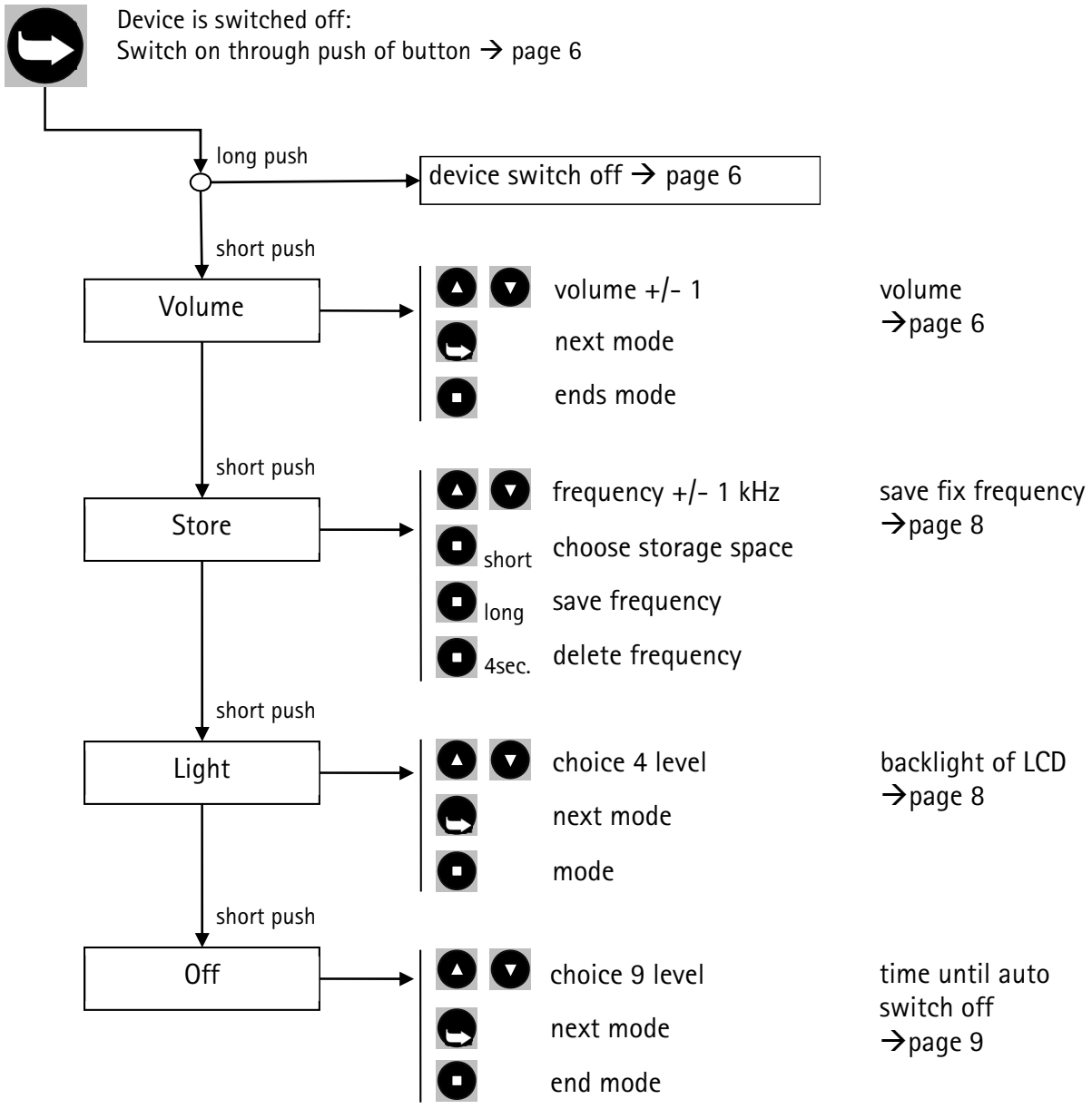
Block diagram



Overview of operation



Settings



Important information concerning the microphone

How to preserve and recover the microphone's function

The microphone is a special ultrasonic sound sensor, made with MEMS technology. Because of the highly sensitive technology the microphone is sensitive against humidity. Therefore, by fog, rain or condensed water the sensitivity can decrease massively. Please, do not blow into the microphone. Particles from cigarette smoke can damage the microphone permanently.

In most cases the normal function is restored by the next day. Please, keep the device in a clean and dry place, for example in a dry wooden box. Adding a package of silica gel can be useful. Please, do not try to dry with excessive warmth, like using an oven, microwave, hairdryer or heater.

How to exchange the microphone yourself or make use of the service

If the microphone does not regain its normal function after several days, possibly chalk, salt or dirt particles have accumulated in the microphone. In these cases, the problem can be fixed only by the exchange of the microphone.

With newer SSF-BAT2 devices whose serial numbers end with "S" or are marked with a green dot (the serial number is in the battery compartment), the microphone is now a plug-in device and can easily be exchanged by the customer. Spare microphones can be ordered at www.all-about-bats.net or via email: bestellung@all-about-bats.net. There you will also find instructions for replacing the microphone. Older devices must be sent to Microelectronic Volkmann for microphone replacement.

Development of **SSF BAT2**
microelectronic VOLKMANN

In der Gebhardsösch 9
D-78467 Konstanz

Tel. +49 (0)7531-938686
Fax +49 (0)7531-3692306

www.mekv.de

A special thanks goes to all the people who helped with time, input and testing.
(in alphabetical order)

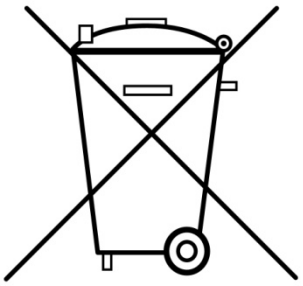
Ulrike Binkle (without her the project would have been impossible), Dr. Wolfgang Fiedler (Vogelwarte Radolfzell), Harald Kautz und Harald Richter (Uni Konstanz), Dr. Michael Klinger (BUND), Hubert Kraettli (SSF), Christian Lichtenau (translation), Kyra von Lienen (proofreading), Dr. Hans-Peter Stutz (SSF), Yvonne Volkmann (Design), Attendee of civilian service: Lisa, Sarah, Kilian (Beta-Test), and all the helpers not mentioned ...

Dipl.Ing. Karl Volkmann

Battery Regulation

In connection with the sale of devices that need batteries or rechargeable batteries, we are obliged to give you the following information: The new regulation obliges battery manufacturers and importers to take back, sort and dispose of all old batteries. The consumer is obliged to give back used batteries in retail stores or in municipal collection points. You can send batteries via sufficient stamped mail back to the retail store.

Batteries, which contain pollutants, are marked with the symbol of a crossed out dustbin, similar to the symbol in the illustration. The chemical description of the pollutant is situated below the symbol of the dustbin. "Cd" stands for Cadmium, "Pb" for Lead, "Hg" for Mercury.



Print Nr. IBV 2024 P004

Information in this manual is subject to technical changes.

Manufacturing and distribution by:

BUND
FREUNDE DER ERDE

BUND Naturschutzzentrum
Westlicher Hegau

Tel. +49 (0)7731-977 105
Fax +49 (0)7731-977 104

info@all-about-bats.net
www.all-about-bats.net