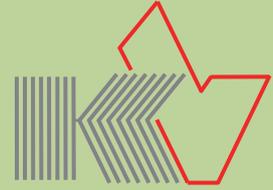# SSF BAT 3
ultrasound detector

- **Grafical display of bat calls:**
  Sonogram with individual adjustable resolution, ideal for easy bat detection (4 pictures may be stored in internal memory).
- **Spectrogram** (persistant display)
- Frequency range **15 to 150 kHz** infinitely adjustable in steps of 1 kHz
- **Automatic tracking** of bats with strongest calls in AutoBat-mode (detachable)
- **Bat list**, adjusted to the predefined maxi-frequency, for easy determination of bats
- **Bat-database** with information
- **microSD-card reader** for expanded functions. The microSD card (accessories) will be recognized as a USB-drive.
- Generation of up to **512 screenshots of sono- and spectrograms** as picture file for external use (accessories)
- **Easy to handle**, adjustments will be saved
- **Excellent sensibility**, due to high-quality ul-trasonic-electret microphone in combination with a low-noise and complex preamplifier stage
- **Noise suppression** for fading out of background noise
- **Big color display** with adjustable brightness, overview of all possible adjust-ments and the last bat calls.
- **Touch-screen** (resistive) with touch-pen
- **Clock** and **torch**
- **High quality of sound** and **volume**, brilliant clear and differentiated transfer of bat sounds through integrated 1.5 W speaker
- Two level **Boost-modus**, for higher volume on guided tours
- **Line-out** and **headphone output** (combined, automatic detection)
- **Firmware-update** via USB interface and PC
- **Auto shut-off** for battery protection (adjustable from 1 min to ∞)
- **Handy size** and **low weight**: 104x57x15 mm (HxWxD), 125 g

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Technical data

Product name:	SSF BAT3
Ambient temperature:	0°C to 40°C
Battery:	Li-Ion battery 1200mAh, 3.7V, 4.44Wh
Operating time:	according to screen brightness ca. 3-6 hours continuous operation
Microphone:	Ultrasonic Electret (FG-23629)
Frequency range:	15 kHz to 150 kHz
Processor:	DSP-Processor 140 MHz
Signal processing:	"High Speed-Low Noise"-operational amplifier separated for processor- and analogue section, low-pass 5 kHz, shielded analogue section for high signal-to-noise ratio
Display:	TFT color screen with 240 x 320 pixels
Speaker:	Rear speaker 1,5 W, additional front speaker
Jack plug:	Earphone-/Lineout-outcome (automatic detection via impedance measuring)
USB:	Battery-charge via USB-power supply, Firmware-Update via PC (see page 21)
MicroSD-card reader:	MicroSD-card max. (FAT16 max. 4GB)
Weight:	125 g (incl. battery)
Dimensions:	104x57x15 mm (HxWxD)

Scope of delivery

- SSF BAT3
- Hand strap
- Li-Ion rechargeable battery (only Germany)
- USB-power supply
- USB-cable
- Description
- Packaging

Available downloads:
- File for extension of bat database with pictures (free of charge)

Accessory also available:
- Carrier bag
- Spare battery
- microSD-card 4 GB FAT 16
- AddOn for saving screen-shots as BMP picture (microSD-card is required)

Disposal

Old electronic devices often contain valuable material, as well as harmful substances. These can harm people and the environment, if incorrectly handled. Therefore electronic waste must not be disposed with normal household garbage. Electronic waste must be disposed at suitable collection point provided by public waste authorities or via the vendor. There is the possibility to send old SSF BAT3 devices via sufficient stamped mail back to us. Transport costs or travel expense will not be refunded. Return of the product shall be directed to:

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

EU country only
Do not throw electronic devices into the domestic waste! According to the European law on waste electrical and electronic equipment and its incorporation into national law electric products must be collected separately and treated in an environmentally compatible way for re-use.

Advice on battery

Advice on battery disposal

In connection with the sale of devices that need batteries or rechargeable batteries, we are obliged to give you the following information:
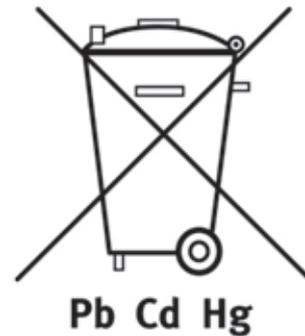
The consumer is obliged to give back used batteries. You may return any batteries and rechargeable batteries after use to the distributor or to any intended treatment facility (e.g. public waste management authorities or any distributors) free of charge.
You can also return batteries to the vendor by post. In any case the vendor will reimburse the postal charge for return of your used battery.

The symbols shown on the batteries have the following meaning:

Batteries must not be disposed of in the household waste.

- Pb = Battery contains more than 0,004 percent by weight of Lead
- Cd = Battery contains more than 0,002 percent by weight of Cadmium
- Hg = Battery contains more than 0,0005 percent by weight of Mercury.

Pb Cd Hg

Please note the separate manual for rechargeable Lithium-Ion-batteries/Lithium-Polymer-batteries attached to the battery:

- Safety instructions
- Precautions for use
- Battery level at time of purchase
- Operating temperature
- Care and cleaning
- Battery life
- Transport and storage
- Battery recycling
- Specifications

Startup

<u>First startup and hints:</u>

- Remove the protective film from the display before using the device for the first time.
- Do not expose your device or its accessories to high humidity or moisture.
- For your own safety, please only use the supplied battery and charger.
- Do not store the device for a longer time with battery inserted. Fully charge the battery after a longer period of non-use. Please note the separate manual attached to the battery.
- At mains operation always operate with battery inserted.
- Insert the microSD-card, maximum size 4 GB, file system FAT16 (FAT) (not included) only free from tension (USB-cable removed).

<u>Insertion or change of battery:</u>

1. Remove of battery cover:
   Slide the cover in the direction of the arrow.
2. Insert the battery.
3. Close the battery cover. One has to pay attention that the touch-pen ③ has not accidentally turned in a way that the cover is blocked (see picture page 10).
4. The battery pack is not fully charged when leaving the factory. It has to be charged completely after purchase. The battery pack also has to be charged after not using it for a long period of time (up to 8 hours when empty).

If changing the battery takes longer than 1 minute clock and date must be set new.
The battery is delivered with the device (only Germany).

MicroSD

<u>Attachment of the hand strap:</u>

For threading the hand strap you need a 30-50 cm long dark sewing thread and a thin needle. Form the sewing thread into a loop and push it through one of the two openings at the bottom of the right side of the case, until it is visible at the second opening. Now pull up the loop with the needle. Tie the hand strap to the sewing thread and carefully pull it through the opening. After releasing the knot pull the larger end of the strap through the thinner one.

MicroSD extension

Electronic components on the board can easily be damaged. Therefore be careful while inserting and removing the card!

Hint:
Please note that the microSD-card must be formatted with FAT16-file system. FAT32 will not be supported on SSF BAT3. MicroSD-cards, purchased from us, are ready for operation and formatted with FAT16 (FAT).

Insertion or replacement of the microSD-card:

1. Remove the battery (see previous page) and switch off the USB plug.
2. The microSD-card holder has a flap mechanism, which must be opened before inserting the card. Slide the card holder carefully towards the edge of the device and fold it upwards. Insert the microSD-card (electronical contacts towards the device). Pay attention that the small nose on the card is placed in the slot designed for that purpose. Close the card holder and slide it towards the center of the device (see arrows on the microSD card cover), so that it is locked.

Functions of the microSD-card:

- Extension of the bat database with pictures. The necessary file "BAT3.RES" is already installed on microSD cards you receive from us. It can also be copied to the card (see below).
- Extension of internal memory of the device for data preservation after switch off. This way up to 4 sonogram pictures, saved in HOLD-modus, are available, even after switching off of the device (see page 12).
- Saving of screenshots (spectrogram, sonogram, Home-screen) as picture file in BMP-format for external use (AddOn, see accessories on page 3). The number of files is limited by FAT16 file system (512 files/folder).

Copying of files between computer and microSD card:

Windows will identify the microSD-card as a USB-drive and display it in the file explorer as a drive. So you can easily drag & drop files back and forth between the SSF BAT3 and your computer.

Copying of file "BAT3.RES" (if not available):
1. Download the file "BAT3.RES" from www.mekv.de/bat3
2. Connect the computer and the SSF BAT3 using the USB-cable.
3. Windows dentifies the microSD-card as a USB-drive.
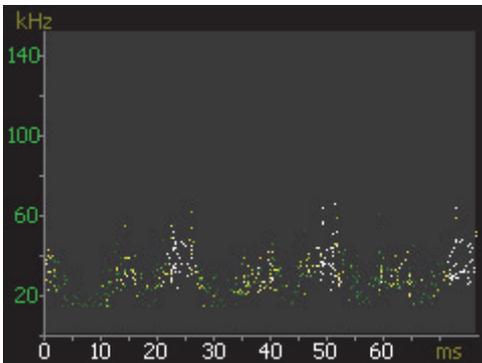4. Copy the file "BAT3.RES" to the microSD of SSF BAT3.

Installing the AddOn for saving screenshots as BMP- picture file

With the optional extension for saving screenshots (AddOn) you can archive sono-grams and spectrograms as Bitmap picture file (BMP) on a microSD card. These can be read out and edited on your computer. For this purpose an inserted MicroSD card is absolutely required (see accessories page3).

Screenshot: SPECTR00.BMP

Screenshot: SONO00.BMP

By ordering the SSF BAT3 with included AddOn the activation is already fixed in the system. No installing is necessary.

In subsequent order of the AddOn you will receive an activation-file per email. For this the last 5 digits of the serial number of the device will be needed. You will find the serial number in the About-Menu (see page 15). Copy the received activation-file on to the MicroSD-card. After the restart of the SSF BAT3 the AddOn is activated and the activation is firmly fixed in the system. After that the activation-file will not be needed again and can be deleted.

To indicate the activated additional function the SSF BAT3 will show the text: "AddOn: File" when started.

(see "Saving screenshots of spectrograms and sonograms" on page 14).

Switch on/off

<u>Switch on:</u>

The device will be switched on pressing the "Power on"-button ⬛ .
The message "Unlock: press F1" appears. To unlock the system press the button F1 within 2 seconds. This procedure serves to avoid an accidental switch on of the device.

Start display
with version and
serial number

Hint:
In order to save battery the brightness of the display is optimized to dark ambient light. For a walk at night there is an additional ECO-mode available, to reduce the brightness even more (see page 19).

If there is not enough battery power left while switching on the device, there will be the information on the display to connect the device to the USB charger. The device then switches itself off.

At every switch on the device starts automatically with the settings that were last selected.

<u>Switch off:</u>

In the Home-screen, press the button F1 "Off" twice to switch off the device.

If SSF BAT3 is switched on and not used, the device switches off automatically after a programmable time (see page 20: Auto-Off) to save battery consumption.
Shortly before the expiry of that period the brightness of the display reduces (see page 20: Display-Dim settings).

Hint:
If a computer is connected via the USB port (recognizable by the USB-symbol on the tool bar, see page 11), please disconnect before switching off the device, using the function "Ejection of medium" on your computer. Thereby you avoid the possible loss of data.

After Switch-on by pressing the "Power on"-button (15) the device is ready for operation.

You see the Home-Screen. For an initial test just snap your fingers. Friction creates **ultrasound**, which you can hear via the speaker and see on the display. Now the first bats are waiting for you!

The yellow field on top shows the currant **mixer-frequency** (8). This will be set by using the buttons ▼/▲ (13). The better the current mixer-frequency corresponds to the **best -frequency** (the strongest called frequency), the more deep and strong the batsound will be expressed by the detector.

The area below is the so called **spectrogram** (9).
Here you see on a frequency scale between 15 kHz and 150 kHz the frequency band of the output sound.

The bigger field thereunder is the **sonogram** (10). Here you see the chronological sequences of the bat calls. Typically these calls have a duration of a few milliseconds, during which the frequency drops variously strong and fast, depending on the species.

You adjust the **volume** by pressing the +/- buttons (14).

(1)	Time
(2)	Symbols
(3)	Touch-Pen
(4)	Microphone
(5)	Jack plug
(6)	USB-port
(7)	Torch
(8)	Frequency
(9)	Spectrogram
(10)	Sonogram
(11)	Menu
(12)	Menu buttons
(13)	Buttons ▼/▲
(14)	Buttons +/-
(15)	Power on
(16)	Hand strap

Symbols

Volume
Adjustment of volume by +/- buttons (14).

Speaker
Normal volume.

Boost-Mode 1
Increased volume (see page 19).

Boost-Mode 2
Increased volume (see page 198).

Headphone
A headphone is plugged into the jack, the speaker is switched off.

Line-Out (automatic detection)
A device with line-input is connected via the jack plug (see page 20).

USB
The device is connected to a computer via USB port and the microSD card is recognized as USB memory device (see page 7).

The **Screenshot**-function is activated. Via the touchscreen you can choose the area of the display for creating a picture file (only available with optional extension, see accessories on page 3).

Battery
The number of bars show the state of charge.

The battery is empty. The device must be connected to a battery charger.

AutoBat-Mode
Auto   The frequency of the bat will be detected automatically. The mixer-frequency will be adjusted accordingly (see page 20).

Squelch   **Squelch-Mode**
Squelch is on (see page 20).

HOLD   **Hold-Mode**
Recording of sonogram is stopped (see page 14).
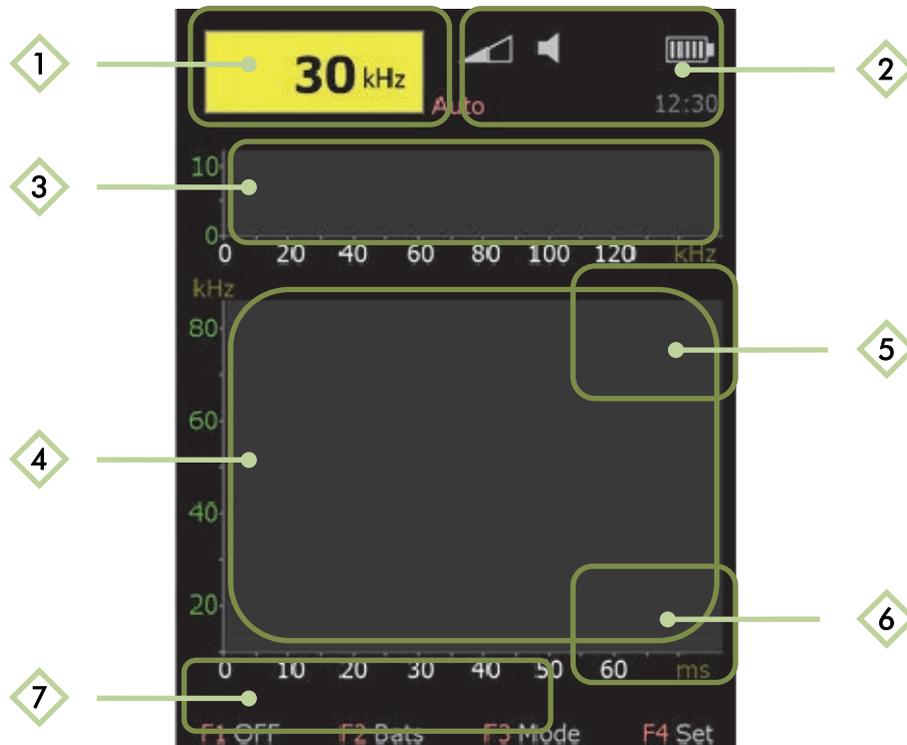
12:30   **Time**
Setting of the clock in the set-menu (see page 21).

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Touch Screen

Home-screen touch functions:

There are areas defined on the touch screen, in which different functions can be activated through tapping.

1   AutoBat on/off (see page 16)

2   Speaker on/off; when speaker is turned off the symbol for speaker is dark grey.

3   Setting of the mixer-frequency (see page 12);
with activated screenshot function* (camera symbol): creation of spectro-gram picture and saving on microSD card (see page 13)

4   Stopping of sonogram recording HOLD-modus (see page 13);
with activated screenshot function* (camera symbol): creation of sonogram picture and saving on microSD card (see page 13)

5   With activated screenshot function* (camera symbol): creation of screenshot of the whole screen and saving on the microSD card (see page 13)

6   In HOLD-modus: saving sonogram in internal memory (see page 13)

7   Back to the main menu (this touch field is also active outside the home-screen)

* only available with installed AddOn, see page 8
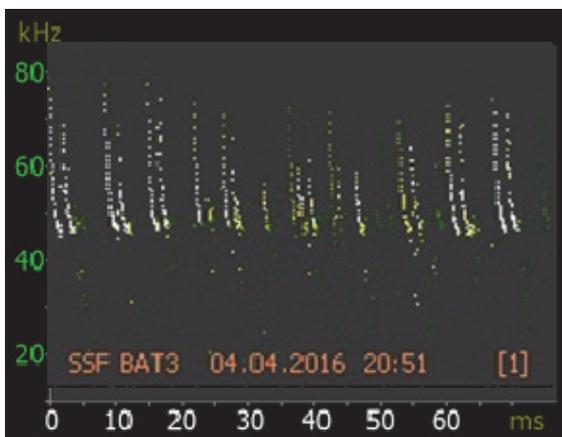
Diagramms

Spectrogram ⑨

A spectrogram visualizes bat calls within the complete frequency range. The display is persistent. That means the display of frequency values remains unchanged until it gets overwritten.

Setting of the mixer-frequency within the spectrogram

The mixer-frequency can be configured by the ▼/▲ buttons and through tipping on the spectrogram field ◆3◆ directly. After a short tip anywhere on the frequency field, the frequency jumps to that choice. On the left side of the spectrogram field more lower frequencies are picked, on the right side higher ones.

Sonogram ⑩

The sonogram is a presentation of ultrasound events in a chronological order. With default setting the frequency axis goes from 15 to 150 kHz, the time axis from 0 to 60 ms. The amplitude values will be displayed gradually, from dark green (low amplitude) via light green and yellow to white (highest amplitude). The adjustment of the sonogram axis is described on page 17.

HOLD-function

By touching the sonogram field once the recording stops. This function is useful to calmly watch an interesting bat call. The operating status is shown through the text "HOLD" on the top right corner of the sonogram. By touching the sonogram field again the HOLD modus is terminated.

Sonogram memory

During the HOLD modus you can save up to four sonograms by touching the field "Memory? press here" (bottom right corner of the sonogram field) . If you save more than four sonograms the oldest one will be overwritten. After switching off the device saved pictures are lost. The recall of internal archived sonograms is possible in the sonogram submenu (see page 17).

Hint:
An inserted microSD card (see page 7) leads to data preservation even after the switch off of the device. This way sonogram pictures, saved in HOLD-modus, are available.

Saving screenshots of spectrograms and sonograms (AddOn)

With the optional extension for saving screenshots (see accessories on page 3 and AddOn on page 8) you can archive sonograms and spectrograms as Bitmap picture file (BMP) on the microSD card. These can be read out and edited on your computer.

Therefore at first activate the screenshot function in the set menu by pressing the button F2 Scrshot (see page 15). The activation is shown by the camera symbol at the upper edge of the sonogram field.
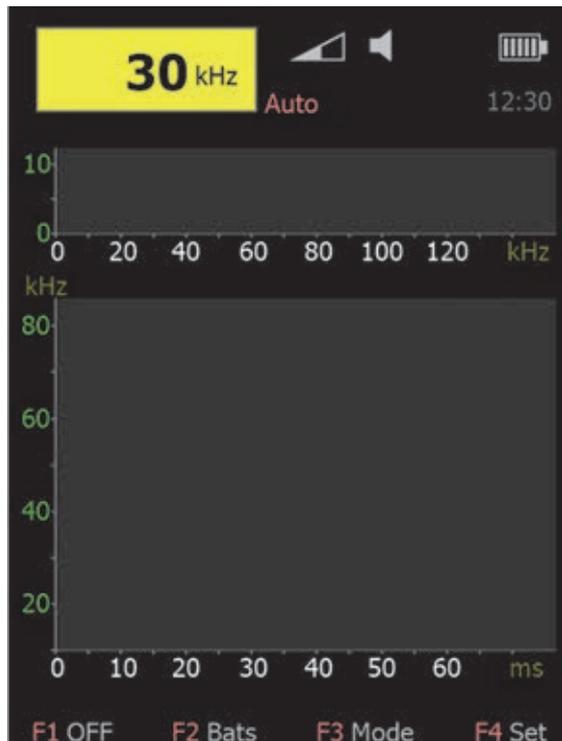
By tapping on the touch screen you choose the part of the screen you want to export: the whole screen by tapping on the camera symbol, the spectrogram or sonogram by tapping on the respective field (see also the description of the fields on the touch screen on page 11).

Hint:
A read out of files has to take place on the computer. The display of files directly on the SSF BAT3, including file functions, is planned. The number of files on the microSD is limited to 512 files because of the FAT16-file system.

Home–Screen

You get to menus and submenus by pressing the buttons F1 to F4:

F1:   OFF
F2:   Bats
F3:   Mode
F4:   Set

To exit the menus or submenus press the button F4 (Home).

With a long press of the buttons F1 to F4 you can switch the back light intensity (see Dim–function on page 19).

Button F1: OFF

F1 Off	Switch off device
F2 Help	Help on operation of the device
F3 About	Display of version and serial number and function for firmware–update (see page21)

Button F2: Bats

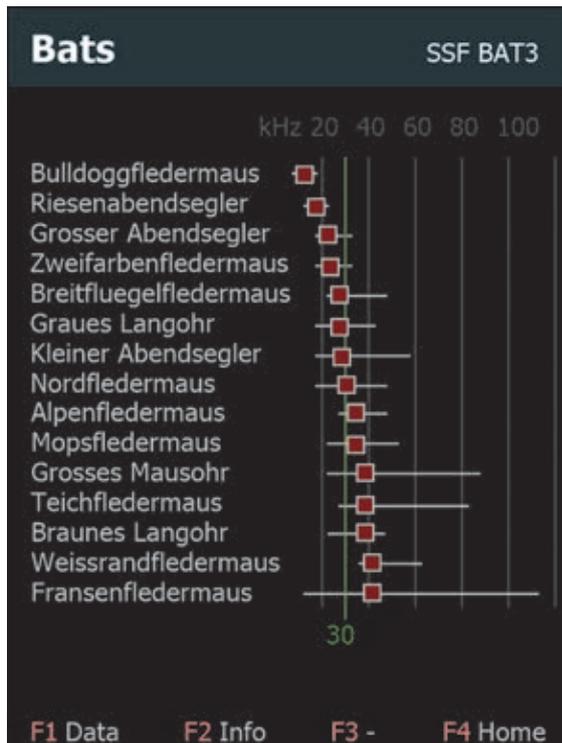|	
F1 Data	Bat database (see page 16)
F2 Info	General information and technical terms (see page 16)

Button F3: Mode

F1 AutoBat	Automatic detection of bat calls (see page 20)
F2 Squelch	Squelch on/off (see page 19)
F3 Sonogr	Adjustment of the sonogram axis (see page 16 and 17)

Button F4: Set

F1 Torch	Torch on/off; torch switches off automatically after 60s.
F2 ScrShot	Screenshot function activated/deactivated (see page 13) (only with optional extension for creation of screenshots, see accessories on page 3)
F3 Options	Options screen for adjustment of device characteristics (see page 18)

By pressing the button F2 in the home-screen you get to the **Bats**-Screen (see page 14).

Here you find information on all bat species currently found in Europe in a database and as a bat list for an overview.

Button F1: **Bat list**
The listing of names is adjusted dynamically to the set mixer-frequency. The frequency range and the best-frequency of each individual species are displayed on the right of the bat names. The green line shows the currently set mixer-frequency (see picture).

Button F2: **Bat database**
Here you find information on size, ultrasound calls and flight style of the different bat species. These pages you scroll by using the buttons ▼/▲. By pressing the button F2 again you switch the way the list is sorted. The way of sorting is shown in the header, either "Bats (A–Z)" or "Bats (Frequency)".

Button F3: **Information and definition of terms**
For bat detection and for the function of an ultrasound detector; these pages you scroll by using the buttons ▼/▲.

Button F4: **back to the Home-Screen**

Hint:
Images of bat species are only displayed if a microSD card is inserted and the file "BAT3.RES" is installed (see page 7).

Description of the Mode-submenu

By pressing the button F3 in the Home-Screen you get to the Mode-submenu. This is very useful to quickly adjust the following parameters:
AutoBat-on/off, squelch-on/off, sonogram-adjustments.

Button F1: AutoBat on/off

With activated AutoBat function, the mixer-frequency is set automatically to the bat call with the highest amplitude. You see the activated AutoBat function by appearance of the text "Auto" top right, next to the display of frequency.

You can activate/deactivate AutoBat by touching the yellow frequency display field .

In the options menu (see page 20) you can adjust the delay time for the change of the mixer-frequency. If the delay time is set too short, the mixer-frequency in the AutoBat function jumps back and forth, because bat calls always vary. On the other hand, if the delay time is set too long, you might miss new passing bats.

Button F2: Squelch on/off

The button F2 allows you to quickly switch on/off of the squelch function. If the squelch function is enabled you see the text "Squelch" on top of the device right beneath the icons.

There are two levels of squelch function. These will be adjusted in the options menu. (see page 19).

Button F3: Sonogram-adjustments

By pressing the button F3 you get to the sonogram-submenu (see page 17).

Here you can adjust the sonogram frequency and time scale and you can retrieve saved sonograms.

Button F4: back to the Home-Screen

By pressing the button F3 in the mode-submenu you get to the **sonogram-submenu** (respectively in the home-menu by pressing F3 twice) (see page 154).

Here you can adjust the sonogram frequency and the time scale and you can retrieve saved sonograms.

Button F1: **Sonogram frequency axis (kHz)**
With this button you adjust the range of the frequency axis: 15–50 kHz, 15–80 kHz, 15–140 kHz.

Button F2: **Sonogram time axis (ms)**
With this button you adjust the range of the time axis:
0–30 ms, 0–60 ms, 0–120 ms.

The greater the chosen value of the axis setting, the bigger is the over view in the sonogram. Smaller values bring a better resolution.

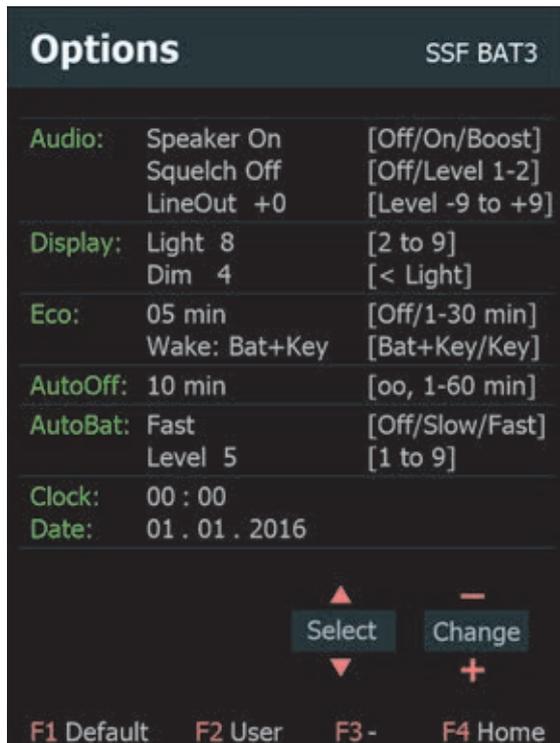The changed axis parameters will also be saved by saving of the user configuration (see page 18).

Button F3: **Memory**
Saved sonograms in the HOLD-modus (see page 12) can be retrieved. Every saved diagram is provided with the date and a time stamp of the recording (see picture). By pressing the button F3 again you get to further saved diagrams.

Button F4: **back to the Home-Screen**

Description of the Options-Screen

By pressing the button F4 (Set) in the home screen and pressing of button F3 (Options) afterwards, you get to the **Options**-Screen (see page 14).

The options screen allows you to adjust the device settings. The settings will be saved after turning off the device.

The value, which should be adjusted, is selected with the buttons ▼/▲ (painted yellow). With the buttons +/- the selected value will be changed.

Button F1: Default
The default values are loaded.

Button F2: User
A previously saved configuration is loaded.

Saving of configuration
The saving of the current settings as a user configuration is carried out by a long press of button F2 until the "Settings Saved!" is displayed.

Button F4: back to the Home-Screen

Description of adjustment possibilities in the Options-Screen:

Audio-speaker:
Four volume settings are available: Off - normal - boost1 - boost2. In boost-mode the volume is higher. You can use this mode for example for guided group tours. The setting will be indicated by the speaker icon on the home-screen (see page 11).

Audio-Squelch:
Three different settings for squelch are available: off – level1 – level2.
The chosen setting determines the squelch level. With activated squelch the background noise will be suppressed, but very low bat calls can be unintentionally suppressed as well.

You can switch squelch on/off also in the mode-menu (see page 16).

Audio-LineOut:
The detector automatically recognizes if an earphone or another device is plugged into the jack ⑤. The LineOut-level is adjustable. The standard is level 0 and the value is adjustable between -9 and +9.

Display-Light:
Setting for the background light of the display; this setting has a direct influence on the power consumption of the device and thus on the operating time.

At the start the background light is always set to level 8.

Display-Dim:
Setting the dimmed level of the background light; this is used in the ECO-mode to conserve the battery.

Additionally in the home-screen you can switch between the chosen display light and the dimmed level by long pressing a function key (F1 – F4).

In this way you can dim the display to your predefined level of brightness, if the display dazzles you while bat observation.

This function is also useful, if in the dimmed level you are not able to read the display properly because of bright ambient light.

ECO:
After the time set here has passed, the brightness of the display will be set to the dimmed value and the speaker will be turned off, in order to save battery capacity.

ECO-Wake:

With this function you can set in which way the system awakes from the eco-mode. Two settings are available. With the setting „key" the system leaves the eco-mode after pressing any button, while the setting „bat+key" leaves the eco-mode by pressing any key and additionally after receiving an ultrasonic sound.

Auto-Off:

Time until device switches off automatically; 30 seconds before the automatic shutdown the information "AutoOFF pending: press key to resume" will be displayed. By pressing any key the auto off function is interrupted.
The setting ∞ means that the device will not be switched off automatically (continuous operation).

AutoBat:

In the AutoBat-mode the mixer-frequency is set automatically to the currently strongest ultrasonic frequency. There are two settings available for the speed, with which the systems responds, "Slow" and "Fast". These influence the delay time until the next automatic adjustment of the mixer-frequency.

If the delay time is set too short, the mixer-frequency in the AutoBat function jumps back and forth, because bat calls always vary a bit. On the other hand, if the delay time is set too long, you can miss new passing bat species.
The optimal setting depends on the situation.

If in the AutoBat-mode the frequency is changed manually by using the buttons ▼/▲ , the AutoBat-mode is interrupted for 5 seconds.

Switching on/off the AutoBat-mode is also available in the mode-submenu (see page 16).

AutoBat-Level:

Setting the sensitivity for AutoBat-switching; the higher the value is set, the louder the ultrasonic call must be, so that the device will automatically switch to a new mixer-frequency.

Clock:

Setting of the time shown on the home-screen; time and date are still powered by the battery when the device is turned off. If the changing of the battery takes longer than 5 minutes, the clock must be set new.

Date:

Setting of the date; date and time are used as timestamp when sonograms are saved.

Firmware-update

The SSF BAT3 uses a DSP processor with a special operating system (firmware). This firmware is constantly being improved and enhanced by new functions. The version of the firmware is shown after switching on the device and in the About-menu (see page 14). The firmware can be updated via an USB interface of a Windows-PC.

For firmware updates you need the bootloader file "BAT3-Update" which can be downloaded on the producer's homepage: www.mekv.de/bat3
Save the update file on your computer in a folder of your choice (e.g. c:\user\bat3). After unzipping you will get two files: "mikro-Bootloader USB HID.exe" (bootloader software) and "BAT3.hex" (update file).

Updating the SSF BAT3 firmware:

Start the bootloader software.

Connect the computer and the SSF BAT3 with an USB cable.

Start the update function on the SSF BAT3 by pressing the following key sequence in the home-screen: F1-F3-F1 (Off-About-Update).

As soon as the USB symbol (1) changes to red, the SSF BAT3 has been detected by the bootloader software.

You now have 5 seconds to click on the "Connect" button (2).

Then click on "Browse for HEX" (3) and choose the file "BAT3.hex" in the pop-up window. Click on the "Open" button to open the file.

The upload of the file SSF BAT3 starts after clicking on "Begin uploading" (4). The process is displayed on the progress bar. Upon successful completion you can click on "OK" and the SSF BAT3 starts with the new firmware.

Please visit the producer's homepage for future product updates and enhancements:
www.mekv.de/bat3

The **SSF BAT3** detector is a **Heterodyne-ultrasonic receiver** (mixer procedure). By the help of a frequency-mix-procedure, the non-audible ultrasonic sound of a bat is converted into an audible signal, played back by the speaker.

The mixer-frequency can be adjusted by the user or adjusts automatically (AutoBat-setting). When setting the frequency manually, the user has to decide which frequency range is of special interest. If the frequency of bat calls lies far outside of this range, they get missed.

The discovery of flying bats with the use of the **SSF BAT3** is easy and quickly learned. The exact determination of found bat species is usually very difficult, sometimes impossible and in any case requires a lot of experience. The following information shall give some initial directions. Those who want to get deeper into the determination of bat species by the use of an ultrasonic detector will have to use specialist literature or take practical lessons by an experienced specialist. Another way is to participate in a „detector-workshop", offered by bat protection organizations.

Frequency data always relate to the best-frequency. It has to be taken into account that the frequency can vary a little within a species. Even the same animal, depending on the situation (barrier or open airspace, hunting in groups or alone, air moisture, etc.), can alter the used frequency.
Finally the so-called „Doppler-Effect" occurs. The frequency increases when the bat flies towards the detector and reduces when the bat flies away from the detector.

CF-calls: A constantly frequent call (CF = constant frequency) is a call, which consists predominantly of one frequency. For human beings such calls have a clear sound. Short CF-calls remind one of the sound of water drops which fall into a water basin. The best-frequency in this case corresponds to the frequency, in which the far bigger part of the call is located. In Europe clear and long CF-calls are only uttered by horseshoe bats (Family: Rhinolophidae).

FM-calls: Frequency modulated calls (FM = frequency modulated) are calls, which range over a wide frequency band in a short period of time. Many bat species start such FM-calls with high frequencies and quickly fall to lower frequencies. For human ears such calls sound like a knocking and feel like they do not have a sounding component. The best-frequency only represents a small part of the call. It is located where the call features the highest acoustic pressure, in other words, the highest volume.

QCF-calls: Some bat species send calls which consist of FM- and CF-parts. Typical representatives here are the pipistrelle bats. Their calls begin very high at around 100 kHz and then quickly fall to approx. 45 kHz. This frequency is then held for a relatively long time (approx. 9 milliseconds).

In addition to these first indications for the bat species, the calls can also deliver important ecological information. So called **„Feeding Buzzes"** allow you to hear if the bats are hunting insects. Shortly before the catch of an insect, the bats emit more calls per time than normal. This is due to the fact that they need to know exceedingly exactly where the insect is located. Therefore it sounds roughly like this: „tack – tack – tack – tacktacktacktack tatatatata ttrrrrrrp", whereas the last part reminds of a fast-closing zipper.

It is also important to know that bats not only emit calls for orientation. They also have a whole string of other calls, for example for communication, which are partially also located above 15 kHz. These include mainly characteristic **mating calls**, which sometimes can be used for identification of species.

References:

The tabular overview of the frequency ranges and the main frequencies were taken from the "Stiftung zum Schutze unserer Fledermäuse in der Schweiz (SSF)" (*Foundation for Protection of our Bats in Switzerland*). The majority of information in the bat database were taken from the recommendable books „Die Fledermäuse Europas" by C. Dietz and A. Kiefer, published in 2014 by Kosmos, and the Kosmos-Naturführer „Die Fledermäuse Europas" by W. Schober and E. Grimberger (Edition 1998). Species occurring endemically on islands (Sardinia, Canary Islands) are excluded.

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Abbreviations:

QCF- and FM-call are explained on page 22.
„ms" = millisecond.
„L/s" = number of calls per second

Notes

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