

bat mode

bat-monitoring-device



USER MANUAL



bio
acoustic
technology

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GENERAL INFORMATION ON THIS USER MANUAL

This manual belongs to the system BATmode. Please read these instructions completely and carefully before taking the device into operation, it contains important instructions on commissioning, handling and operation. The safety instructions contained within must be observed!

SYMBOLS

Important notes for the users and operators of the BATmode-System are mark with the following signs:



Attention!

Instructions marked with this sign have to be complied. Neglecting any of these instructions may harm persons or cause damage to system parts.



Important!

Advices marked with this sign concerns the correct usage of the system. Neglecting any of these advices may cause malfunction of the system.

WASTE DISPOSAL

European Union:

Do not dispose parts or the whole BATmode-System at public of community supplied disposal systems. According to the European WEEE Directive 2002/96/EC on Waste of Electronic and Electrical Equipment we take our devices back for recycling or proper disposal. Send them to bat bioacoustictechnology. This service is free of charge.

Other countries:

We would like to encourage you to send us back defective devices for recycling or proper disposal. This service is for free.

SAFETY INSTRUCTIONS



- Only use power supplies authorized or supplied by bat bioacoustictechnology.
- Avoid excessive mechanic strain on the BATmode-System, especially on plugs and connectors if cables are connected to the BATmode or the antenna and microphone disc. Strong vibrations, shaking or dropping may damage system parts.
- Ensure a safe and stable mounting of the BATmode and the corresponding discs. Dropping can harm persons or property or the BATmode-system.
- Ensure that nobody can stumble on installed and connected wires. Stumpling can harm persons and damage system parts.
- Only use accessories supplied or authorized by bat bioacoustictechnology. The use of unauthorized accessories may damage the device.
- Please contact our support if the BATmode-System shows any damage or does not work properly. Do not open system parts and try to repair damage by yourself or through unauthorized personnel. This will cause the loss of warranty.

APPLICATION NOTES



- The microphone is sensitive to mechanical strain. Do not touch the microphone with fingers or objects and never use stickers or any adhesives on its surface.
- Avoid the pollution of the microphone by dust or dirt particles. This can clog the protective grid and/or damage the microphone.
- Try not to expose the running BATmode system to electromagnetic fields. Since the microphone is sensitive to those fields, interferences with the audio signal are possible.
- Ensure a sufficient air circulation around the BATmode. Overheating can cause data loss and/or damage to the BATmode.
- Avoid to interrupt power supply while the system is running. This can cause system failure and/or data loss.
- Do not twist or bend wires, since this can damage them.
- Do not use tools (nipper, wrench ...) for fixation of cable connections since this can damage the connectors and/or the wires.
- The splash-proof discs protect electronic components against rain. Nevertheless, the microphone has to be exposed to detect incoming sound waves. Indeed, the protective grid is a relatively good protection against rain, but long lasting exposure to high humidity lead to corrosion and loss of sensitivity. Consequently, avoid to expose the discs to high humidity.
- Do not expose the BATmode to any kind of humidity. Penetration of moisture can cause damage due to corrosion and short-circuiting.
- Avoid fast temperature variations and temperature below 0°C and above 40°C.
- For further questions contact the support of bat bioacoustictechnology.

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1 SCOPE OF DELIVERY

- BATmode
- Antenna disc (see Figure 5)
- Microphone disc (see Figure 6: Mi)
- Power supply (power connector cable + power supply unit)
- 2m microphone cable K1 (XLR: Y-cable 5 pin <--> 5 pin + 4 pin)
- 2m heating cable K2 (XLR: 3 pin <--> 3 pin)
- 2x 2m antenna cable K3 und K4 (RP-SMA <--> RP-SMA)
- 2m cable for temperature sensor K5 (mini XLR: 3 pin <--> 3 pin)
- Manual
- Transportation case

2 DEVICE DESCRIPTION

2.1 BATmode

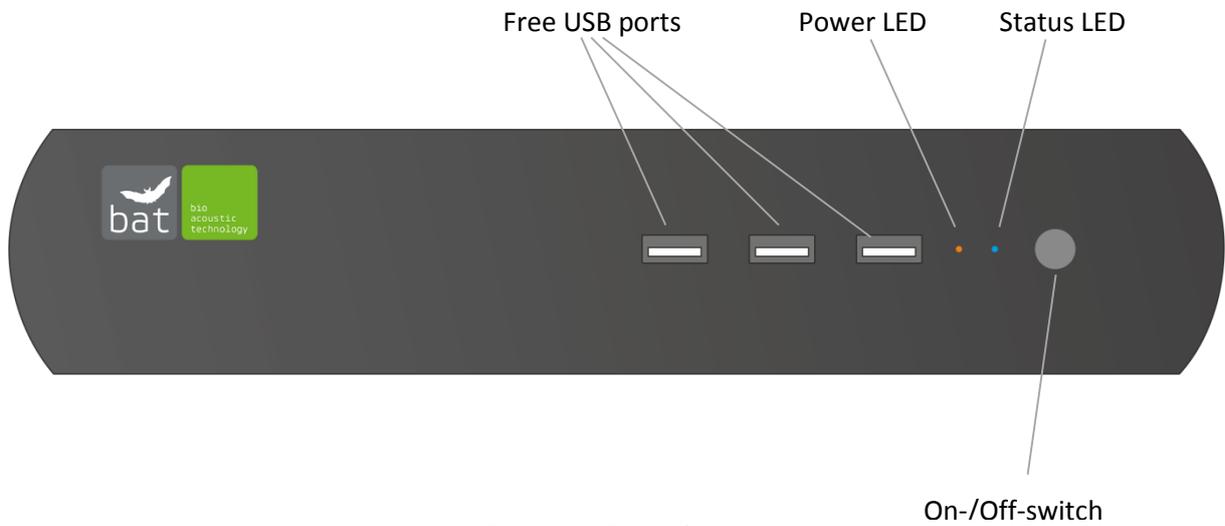


Figure 1: BATmode front

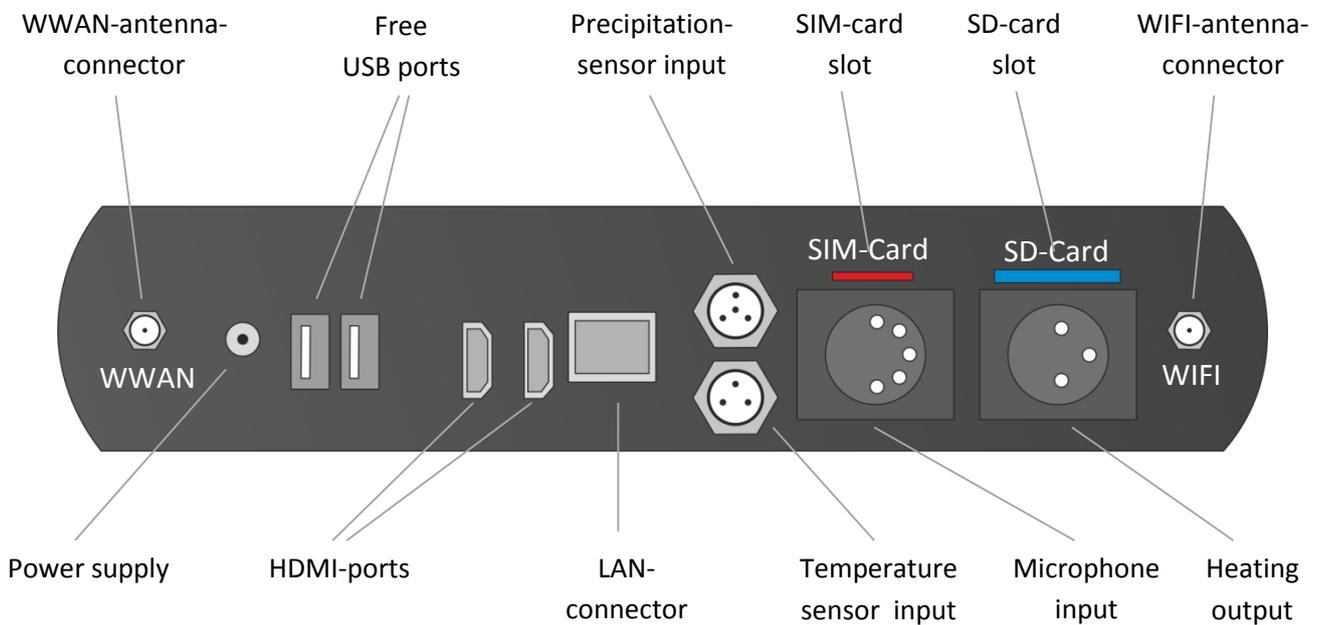


Figure 2: BATmode back

2.1.1 Power-LED

The yellow Power-LED shows the state of the BATmode. Table 1 depicts all possible states of the Power-LED.

Table 1: States of the Power-LED

| LED state | Description |
|-----------------|-------------|
| Off | Device off |
| Blinking | Standby |
| Continuously on | Device on |

2.1.2 Status-LED

The blue Status-LED shows the monitoring state. Table 2 depicts all possible states of the Status-LED.

Table 2: States of the Status-LED

| LED state | Description |
|-----------------|--|
| Off | BATcontrol software not started |
| Continuously on | BATcontrol software started, monitoring off |
| Blinking | BATcontrol software started, monitoring on |

2.1.3 On-/Off-switch

The on-/off-switch allows to switch the system on or off. Table 3 lists all possible system states in dependency of the duration the switch is pressed.

Table 3: System state in dependency of the duration the on-/off-switch is pressed

| If the system is in the following state... | ... and the on-/off-switch is pressed for... | ...the system changes to the following state |
|--|--|--|
| Off | less than four seconds | On |
| On | less than four seconds | Standby |
| On | more than six seconds | Off |
| Standby | less than four seconds | On |
| Standby | more than six seconds | Off |

In case of power failure the BATmode-System will restart automatically when power returns.

2.1.4 SIM-card slot

To establish a WWAN connection and to send and receive SMS a SIM card (mini SIM) with an adequate SMS and data plan is required. The SIM card has to be inserted into the SIM card slot as depicted in figure 3.

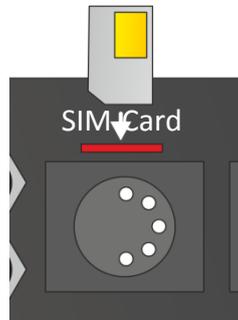


Figure 3: Insertion of SIM card



Basically, bat bioacoustic technology recommends the use of PIN free SIM cards, because only an inactivated PIN allows to unlock the SIM card after a reboot of the system automatically.

2.1.5 SD-card slot

Disc space of the BATmode can be extended by the use of a memory card. The following types of cards are supported:

- SD cards
- SDXC cards
- MMC cards

The memory card has to be inserted into the memory card slot as depicted in figure 4.

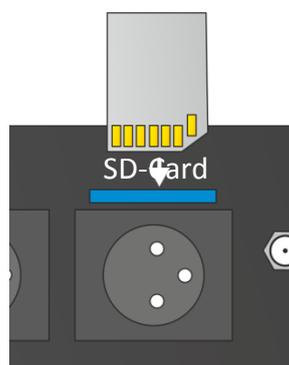


Figure 4: Insertion of memory card

2.1.6 Precipitation sensor port

To acquire precipitation data a precipitation sensor can be connected the BATmode-System via a mini-XLR connector (see Figure 2). The BATmode-System is specified for the “Precipitation sensor” manufactured by Adolf Thies GmbH & Co. KG. It can be purchased including a suiting connection cable from bat bioacoustictechnology. The corresponding pin connection is presented in table 4.

Table 4: Pin connection of the precipitation sensor port

| Pin-Number | Description |
|------------|-----------------|
| 1 | Ground |
| 2 | Sensor output - |
| 3 | Not connected |
| 4 | Sensor output + |



Do not use unauthorized precipitation sensors und connection wires, since this can cause system failure, damage and the loss of data.

2.2 Antenna disc

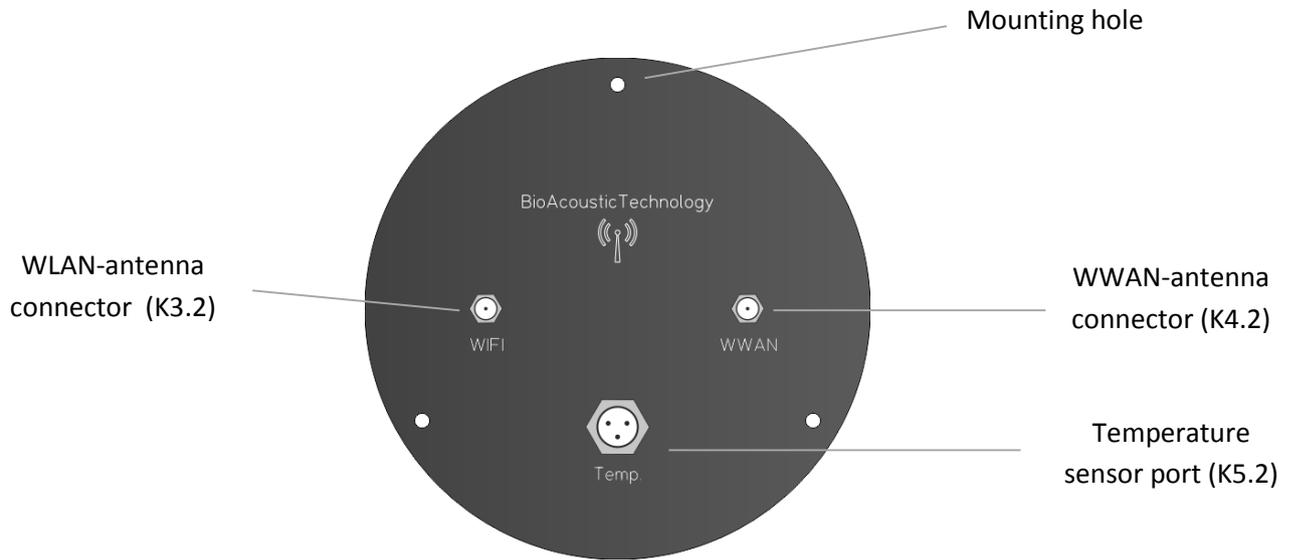


Figure 5: Antenna disc

2.3 Microphone disc

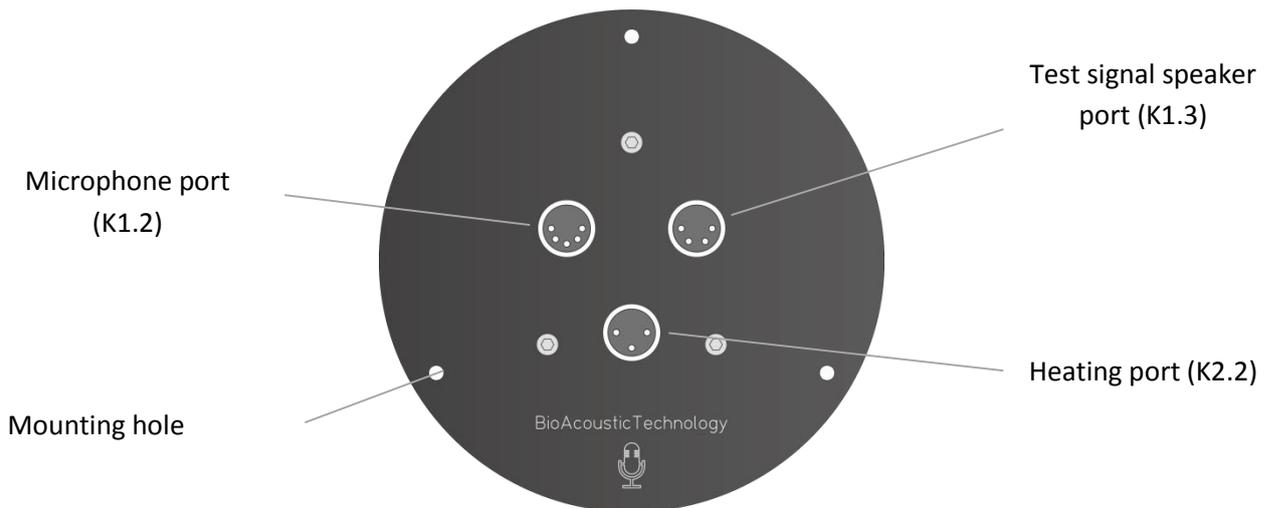


Figure 6: Microphone disc

3 START-UP

3.1 Installation

3.1.1 Microphone and antenna disc

To install the microphone and antenna disc drill two mounting holes with 100 mm diameter each in the bottom of the nacelle of the wind turbine. To guarantee for optimal acoustical bat monitoring results and the best possible WIFI reception at the tower base both discs should be installed looking down to the ground as vertically as possible. The discs have to be mounted with three 4 mm SPAX-screws each. bat bioacoustictechnology recommends to pre-drill the mounting holes for the SPAX-screws.

3.1.2 BATmode

The BATmode has to be installed protected against splashing water and mechanical strain. To do so remove the device's feet and mount the BATmode on a VESA (200 mm x 200 mm) compatible mounting plate. bat bioacoustictechnology recommends the use of the BATbox, which is especially made for an easy and safe installation of the BATmode in wind turbines.



Ensure a sufficient air circulation around the BATmode. Overheating can cause system failure or damage to the BATmode.

3.2 Connecting

1. Initially, connect antenna wires (K3 and K4) with the corresponding connectors at the BATmode and the antenna disc (see Figure 2 and Figure 5).

Ensure not to interchange both wires. This would cause declined signal reception levels of the WIFI and WWAN connection.

2. Use cable K5 to connect the temperature sensor input of the BATmode with the corresponding temperature sensor output of the antenna disc (see Figure 2 and Figure 5).
3. Connect the heating connector of the BATmode with the one of the microphone disc by using cable K2 (see Figure 2 and Figure 6).
4. Connect the single end of cable K1 with the microphone input of the BATmode (see Figure 2). Subsequently, connect both connectors at the other end of the y-wire with the microphone and heating port of the microphone disc (see Figure 6). Due to different pin numbers, it is not possible to connect cable K1 incorrectly.
5. Optionally, precipitation data can be acquired by the BATmode. For this purpose, a precipitation sensor has to be connected to BATmode (see Figure 2).

Only use authorized precipitation sensors und connection wires, since the use of different devices can cause system failure, damage and loss of data.

6. To simplify the parameterization of the BATmode-System conventional peripheral pc devices (mouse, keyboard, screens ...) can be connected to the free USB and HDMI ports optionally (see Figure 2).
7. If it is intended to use wired LAN connection to remotely access the BATmode-System, connect a corresponding Ethernet cable to the LAN port (RJ45) of the BATmode (see Figure 2).
8. Finally, connect the power supply to the BATmode (see Figure 2).



Only use power supplies authorized or supplied by bat bioacoustic technology, since the use of different devices can cause system failure, damage and loss of data.



Do not use tools (nipper, wrench ...) for fixation of cable connections since this can damage the connectors and/or the wires. Always use strain reliefs to avoid unintentional disconnection.

3.3 First start-up

During first start-up of the BATmode-System, the following steps should be executed in the named order to individually setup the system and activate all functions.

1. Insert a SIM card in the corresponding slot of the BATmode. The data plan has to include SMS and/or data transmission. (*Basically, bat bioacoustictechnology recommends the use of PIN free SIM cards, because only an inactivated PIN allows to unlock the SIM card after a reboot of the system automatically.*)
2. For an initial parameterization connect the peripheral pc devices named under bullet 6 in chapter 3.2 (mouse, keyboard, screen) to the BATmode.
3. After connecting the BATmode to the power supply (bullet 7 in chapter 3.2) start the system by pressing the on-/off-switch.
4. While starting Windows the BATcontrol software will be opened automatically.
5. For a start, close the BATcontrol software.
6. The first step now should be to change your user password to ensure data integrity. This is a two-step process:
 - Assign a safe new password under <Start->Control Panel->User Account->Change your password> (pre-configured password: "12345")
 - To allow for an automatic log-on to Windows you have to change the auto-log-on password with the tool "ChangeAutologonPassword", which can be find under <Start ->All Programs->bat bioacoustictechnology->ChangeAutologonPassword>

Important: Both passwords have to match!

7. If you inserted a SIM card, you have to specify the APN data of your mobile provider to establish a wireless data connection. For this purpose, choose the button <Network> in the system tray of Windows that you find to the right of the taskbar. Click in the corresponding connection (for instance Telekom.de) on <Connect> and insert the values of your provider.
8. Start BATcontrol.
9. Assign new WIFI hot-spot settings on the page <Connectivity>. Insert a new WIFI-SSID as well as a new password and restart the hot-spot with the updated setting by pressing <Activate Settings>.
10. To use status mails specify the SMTP settings of your mail provider in the corresponding sub window opened by pressing the button <SMTP-Settings> on the page <Connectivity>.

3.4 Remote access to the BATmode-System

Alternatively, you can use peripheral devices named under bullet 6 in chapter 3.2 to parameterize the BATmode-System and start the acoustical monitoring or you can utilize remote access via WIFI, LAN or WWAN connections.

3.4.1 Remote access via WIFI connection

To allow for a remote access via WIFI BATcontrol provides a WIFI hot-spot (pre-configured by bat bioacoustictechnology):

- SSID: Your chosen SSID (pre-configured SSID: „BATmode“)
- WIFI password: Your chosen WIFI password (pre-configured password: „12345678“)
- IP of the WLAN adapter: 192.168.173.1
- User: BAT
- User password: Your chosen user password (pre-configured user password: „12345“)

The SSID as well as the password of the WIFI hot-spot can be changed in BATcontrol.

To change the user password please refer to bullet 6 in chapter 3.3.

Remote access is possible via WIFI-capable PCs (Windows, Linux or Mac OS operating systems), smartphones or tablets (Android, Windows phone, iOS), whereat additional programs or apps might be necessary. bat bioacoustictechnology recommends the following software tools:

- Windows: Additional software is not required, software is integrated in Windows (Remote Desktop Connection)
- Mac OS and iOS: Microsoft Remote Desktop
- Android and Windows Phone : Microsoft Remote Desktop

Example for Windows:

The following steps have to be executed on a Windows running PC to remotely access BATmode via WIFI:

- (a) Connect to the WIFI hot-spot of the BATmode-System (SSID and password see above).
- (b) Open the program Remote Desktop Connection (for instance <Start> -> Search <Remote Desktop Connection>).
- (c) Enter in the field <Computer> the IP address of the WIFI adapter of the BATmode (see above).
- (d) Press <Connect> and sign in with your user password.

3.4.2 Remote access via LAN connection

To establish a remote connection by LAN the BATmode has to be connected to the WWW via the RJ45 port (bullet 7 in chapter 3.2).

- IP address of the LAN adapter: see Control Panel->Network and Internet->Network Connections -> Ethernet->Properties -> Internet Protocol Version 6 (TCP/IP) -> Properties
- User: BAT
- User password: Your chosen user password (pre-configured user password: „12345“)

To change the user password please refer to bullet 6 in chapter 3.3.

Remote access is possible via PCs (Windows, Linux or Mac OS operating systems), smartphones or tablets (Android, Windows phone, iOS), whereat additional programs or apps might be necessary. bat bioacoustictechnology recommends the following software tools:

- Windows: Additional software is not required, software is integrated in Windows (Remote Desktop Connection)
- Mac OS and iOS: Microsoft Remote Desktop
- Android and Windows Phone : Microsoft Remote Desktop

Example for Windows:

The following steps have to be executed on a Windows running PC to remotely access BATmode:

- (a) Connect the PC with the WWW.
- (b) Open the program Remote Desktop Connection (for instance <Start> -> Search <Remote Desktop Connection>).
- (c) Enter in the field <Computer> the IP address of the LAN adapter of the BATmode (see above).
- (d) Press <Connect> and sign in with your user password.

3.4.3 Remote access via WWAN connection

The WWAN connection is established via the mobile network. For this purpose, a SIM card has to be inserted in the BATmode and a connection has to be configured (APN settings, see bullet 1 and 7 in chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**).

Subsequently, if mobile reception level and SIM card balance are sufficient, the BATmode can be accessed remotely. Indeed, due to technical reasons, the SIM card need to feature a public IP address (ask your provider) to establish a connection. Alternatively, server based remote services can be used (bat bioacoustictechnology recommends TeamViewer). However, to utilize those services, the corresponding software has to be installed on the BATmode as well as on the accessing PC, smartphone or tablet.

4 BATCONTROL SOFTWARE

4.1 Structure

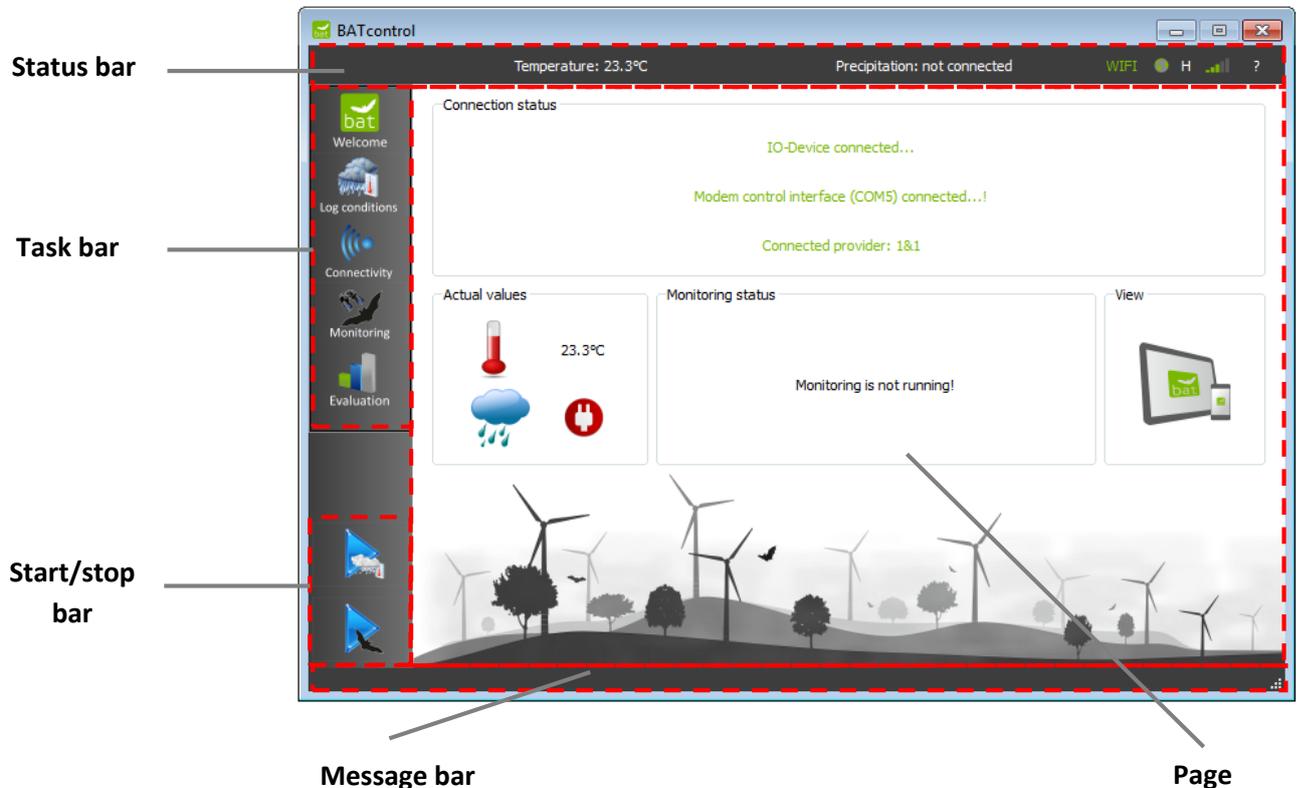


Figure 7: Structure of the BATcontrol software

Fundamental control elements of the BATcontrol software are depicted in Figure 7 and will be described within this chapter in detail.

Words in <...> represents designations used within the BATcontrol software.

4.1.1 Status bar

The status bar shows current status data of the BATmode-System:

- Current measured temperature value
- Current measured precipitation value
- WIFI hotspot (If the hotspot is started, a green WIFI symbol is shown.)
- Internet connection (If the BATmode is online a globe token is shown.)
- Type of the mobile broadband connection (G: GPRS, E: Edge, 3G: UMTS, H: HSPA)
- Signal level of the mobile broadband connection

4.1.2 Task bar

By using the task bar on the right side you can switch between the program pages.

4.1.3 Pages

The following pages are available:

- <Welcome>: General information and view settings
- <Log conditions>: Settings of the environmental condition logging
- <Connectivity>: Setting of WIFI hotspot, WWAN connection, status messages, remote control and mybat
- <Monitoring>: Settings of the acoustical monitoring
- <Evaluation>: Visualization of different parameter over time and “at a glance” evaluation of the recorded acoustical data

In the following chapter 4.2 pages are described in detail.

4.1.4 Start/stop bar

The two buttons of the start/stop bar allows for the starting and stopping of the acoustical monitoring and the recording of environmental conditions, respectively.

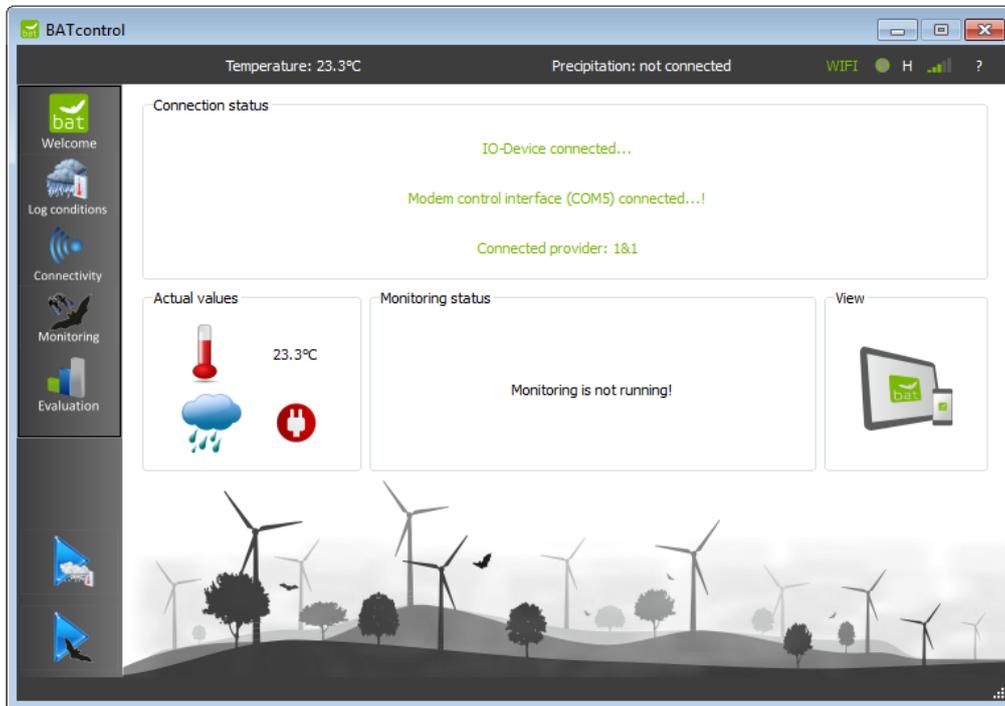
4.1.5 Message bar

Latest messages are shown in the message bar.

4.2 Operation

4.2.1 Page: Welcome

The welcome page shows the state of the components of the BATmode-System and the corresponding connection status.



4.2.1.1 <Connection status> box

The <Connection status> box gives you feedback whether the IO-Device of the BATmode-System is identified correctly and the mobile broadband modem is connected via the modem control interface. If connection to both devices is not established automatically on software startup please connect the support of bat bioacoustictechnology.

Furthermore, the current state of the SIM card is depicted. If the message <SIM card locked> is shown, your SIM card was detected, correctly. Nevertheless, you have to unlock the SIM with your PIN or specify the APN of your provider, respectively. For this purpose, choose the button <Network> in the system tray of Windows that you find to the right of the taskbar. Click in the corresponding connection (for instance Telekom.de) on <Connect> and insert your PIN or the values of your provider.



Basically, bat bioacoustictechnology recommends the use of PIN free SIM cards, because only an inactivated PIN allows to unlock the SIM card after a reboot of the system automatically. Furthermore, the system has to be installed in an area with sufficient mobile network coverage.

4.2.1.2 <Actual values> box

The <actual values> box shows current temperature and precipitation values. If a sensor is not correctly connected, a corresponding symbol is displayed.

4.2.1.3 <Monitoring status> box

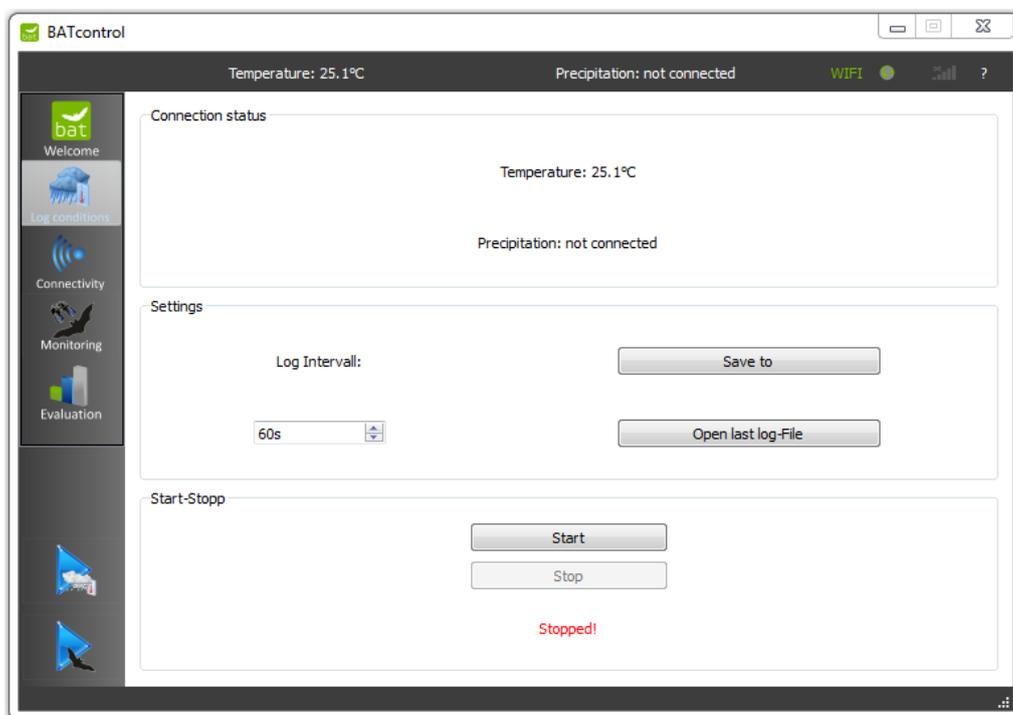
The <Monitoring status> box displays latest values of a running acoustic monitoring.

4.2.1.4 <View> box

By using the view button (schematic picture of a PC or tablet, respectively) you can change between fullscreen and normal mode. The fullscreen view is optimized for mobile devices with touch control and the normal view is intended to be used for desktop PCs with mouse control.

4.2.2 Page: Log Conditions

The page <Log conditions> contains all relevant settings to acquire environmental data.



By applying external sensors the BATmode-System is capable to acquire temperature and precipitation (optional) data. For this purpose, a temperature sensor is integrated in the antenna disc (figure 5). The precipitation sensor is not included in the scope of delivery and has to be ordered separately. The BATmode-System is specified for the “Precipitation sensor” manufactured by Adolf Thies GmbH & Co. KG. It can be purchased including a suiting connection cable from bat bioacoustictechnology.

To acquire temperature and/or precipitation data connect the corresponding sensors to the BATmode (bullet 2 und 5 in chapter 3.2). The current values will be shown in the status bar and on the <Welcome> und <Log conditions> pages. You can specify the log interval with <Log Intervall> and change the location of the resulting file with <Save to> on the page <Log conditions>. Pressing the

button <Open last log-File> will open the last log file. To start environmental condition logging use the start button in the start/stop bar or press the button <Start> on the page <Log conditions>. You can stop data logging either be using the stop button in the start/stop bar or pressing the button <Stop> on the page <Log conditions>.



Do not use unauthorized precipitation sensors und connection wires, since this can cause system failure, damage and the loss of data.

4.2.3 Page: Connectivity

On page <Connectivity> you can configure all settings which are relevant to monitor the BATmode-System remotely.

4.2.3.1 <Status SMS> box

The BATmode-System can send daily status messages via SMS to you at a specified time. If you wish to receive the daily messages, check the box <enable Status SMS> and insert the receiver's number in <Number for Status SMS>. Sending time will be set in <Send time>. Two different SMS formats are available and can be chosen by the radio buttons <human readable> and <CSV>. While the human-readable format allows for a manual message evaluation, the CSV (comma separated values) format is intended to be used with spreadsheet analysis tools or databases. You can send a test message to the specified number by pressing <Send Test SMS>.

The content of the messages is composed of current status values of the BATmode-System. In the human-readable format corresponding acronyms are prefixed to the respective values. Table 5 lists the used acronyms and respective descriptions. By choosing the CSV format values are separated only with semicolons and acronyms are used any longer.



To send a status via SMS a sufficient SIM card balance or adequate mobile tariff is resumed. Furthermore, the system has to be installed in an area with sufficient mobile network coverage.

Table 5: Meaning of the acronyms used in status SMS

| Acronym | Meaning |
|---------|--|
| ID | ID of the system defined with Prefix. The value is also prefixed in the filenames of the record files. |
| Time | Datetime when the status SMS was sent |
| LR | Last recorded reference value of the microphone played by the test signal speaker. |
| LD | Date of the last record format: yyyyymmdd hh:mm:ss |
| FL24 | Number of records in the last 24 hours |
| FSS | Number of records since monitoring started |
| FreeC | Free disc space on partition C in GB (HDD) |
| FreeSD | Free disc space on partition D in GB (SD card) |
| Temp | Current temperature in °C |
| Prec | Current precipitation value in mm/min |
| SigStr | Current mobile signal level |
| WWW | Status of internet connection |

4.2.3.2 <Remote and mybat> box

SMS-Remote

Basic remote commands can be transmitted to the BATmode-System via SMS. If you want to allow SMS remote, check the box <Allow SMS remote>. Available commands and the corresponding system responses are listed in Table 6. All received SMS commands are stored in a log file. You can determine the path of the log file by pressing <save log-file to>. To open the log file press <open log-file>.

Table 6: SMS remote commands

| SMS text | System response |
|--|--|
| Reboot! | System reboots. |
| Shutdown! | System shuts down. <i>Caution: The system cannot be started again remotely!</i> |
| Send status! | Status SMS is send to predefined number. |
| Send Mail! | Status mail is send to predefined E-Mail address. <i>If no receiver address is defined and/or no internet connection is available and/or no or wrong SMTP settings are defined, no action is conducted.</i> |
| Send Mail to <i>max@moritz.com</i> | Status mail is send to <i>max@moritz.com</i> . <i>If no internet connection is available and/or no or wrong SMTP settings are defined, no action is conducted.</i> |
| Start WIFI-Hotspot! | WIFI hotspot is started with the predefined settings. |
| Stop WIFI-Hotspot! | WIFI-Hotspot stops. |
| Connect WWAN! | WWAN connection will be established. |
| Disconnect WWAN! | WWAN connection will be disconnected. |
| Start monitoring! | Acoustic monitoring will be started un gated. That means acoustic events will be recorded independent of time of day. |
| Start monitoring: 11:00-14:00! | Acoustic monitoring will be started gated by recording period one. Consequently, acoustic events will be recorded in this example only in the time period between 11:00 and 14:00 o'clock. |
| Start monitoring: 11:00-14:00 and 20:00-02:00! | Acoustic monitoring will be started gated by recording period one and two. Consequently, acoustic events will be recorded in this example in the time period between 11:00 and 14:00 o'clock as well as 20:00 and 02:00 o'clock. |
| Stop monitoring! | Acoustic monitoring will be stopped. |
| Start condition logging! | The recording of environmental conditions will be started with the predefined sampling interval. |
| Start condition logging: <i>xys!</i> | The recording of environmental conditions will be started with a sampling interval of <i>xy s</i> . |
| Stop condition logging! | The recording of environmental conditions will be stopped. |
| Send MAC! | The MAC address of the BATmode is send to the sender of the SMS. |



To use SMS remote commands an unlocked SIM card has to be inserted in the BATmode. Basically, bat bioacoustic technology recommends the use of PIN free SIM cards, because only an inactivated PIN allows to unlock the SIM card after a reboot of the system automatically. Furthermore, the system has to be installed in an area with sufficient mobile network coverage.

mybat

myBAT is a cloud based monitoring, control and administration tool for your BATmode-System. It allows you to view the current status of your monitoring system and control it remotely. Furthermore, information about recorded data are imaged and can be exported to external tools.

For further information and to signup visit www.mybat.bioacoustictechnology.de.

To activate mybat enable <use mybat>.



mybat requires an active internet connection. By using mybat increased charges of your internet service provider may occur.

4.2.3.3 <Support by manufacturer> box

By enabling <Send Status-Messages to bat bioacoustictechnology> a daily status mail as well as SMS will be send to bat bioacoustictechnology. Based on this messages we offer a monitoring service for your BATmode-System. For prices and terms do not hesitate to contact us.

4.2.3.4 <Status mail> box

The BATmode-System can send daily status mails to you at a specified time. If you wish to receive the daily mails, check the box <enable Status Mail> and insert the receiver's address in <Address for Status Mail>. Sending time is set in <Send time>. By checking the boxes <Reference-Log>, <Files-Log>, <Remote-Log> and/or <Conditions-Log> you can determine, which files are attached to the status mail. You can send a test mail to the specified address by pressing <Send Test Mail>.



To send mails an active internet connection is required and you have to provide SMTP settings of your mail provider in the window <SMTP Settings>.

4.2.3.5 <WIFI-Hotspot> box

Use the <Start>/<Stop> button to deactivate or activate the WIFI hot-spot. The SSID as well as the password of the WIFI hot-spot can be changed in the respective fields.

4.2.3.6 <WWAN> box

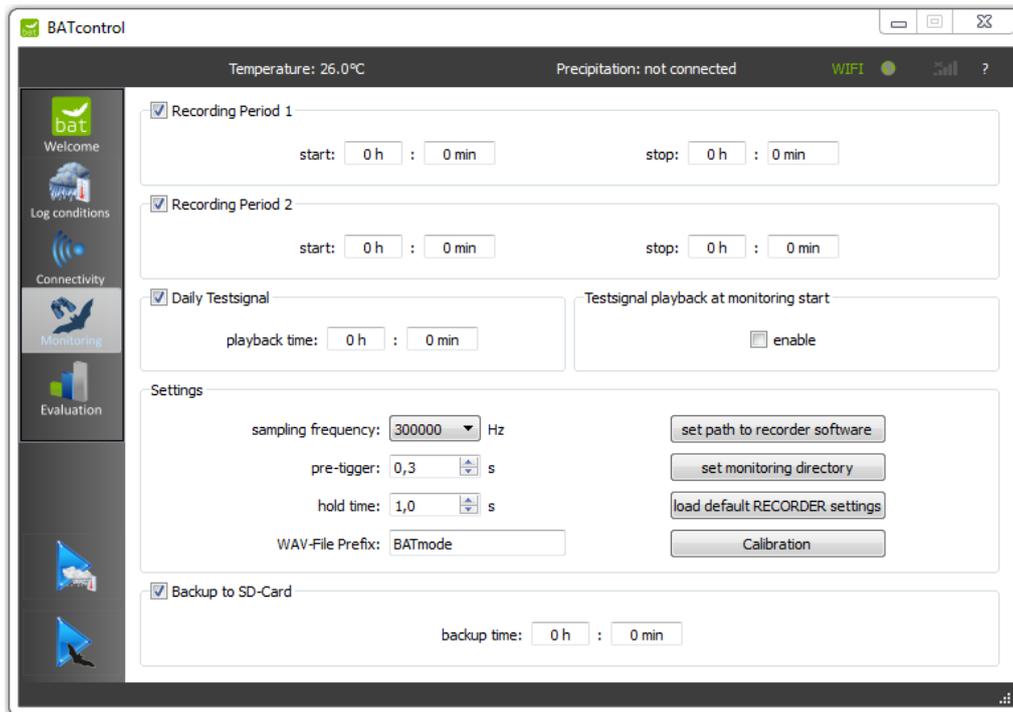
By pressing the <Connect>/<Disconnect> button, respectively, the pre-configured WWAN connection can either be connected or disconnected.



To establish a WWAN connection a SIM card with unlocked PIN has to be inserted in the BATmode and correct APN settings has to be configured. Basically, bat bioacoustictechnology recommends the use of PIN free SIM cards, because only an inactivated PIN allows to unlock the SIM card after a reboot of the system automatically.

4.2.4 Page: Monitoring

On page <Monitoring> the setup for the acoustical monitoring is configured.



4.2.4.1 Monitoring times

To determine time periods during which acoustical bat monitoring is active use <Recording Period 1> and <Recording Period 2>. Bat calls will be recorded only within the defined intervals of time. If none of the both time periods is checked, the acoustical monitoring is activated, continuously.

4.2.4.2 Test signal

To play daily test signals with the integrated test signal speaker and monitor microphone sensitivity check the box <Daily Testsignal>. The time the test signal is played can be determine with the two spin boxes. The test is independent of the two recording periods.

If you want to execute the microphone sensitivity test at monitoring start, check the box <enable> in <Testsignal playback at monitoring start>.

To monitoring the developing of microphone sensitivity use the evaluation plot "Reference level" (see chapter 4.2.5.1). Strong alternations of the microphone sensitivity will cause low data quality.

4.2.4.3 Settings

To determine the used sampling rate for the acoustic monitoring use the dropdown menu <sampling frequency> in <Settings>. Available sampling rates: 50, 62.5, 75, 100, 125, 150, 166.6, 187.5, 214, 250, 300 kHz.

The temporal length of an acquired ultrasound signal, which is triggered by a trigger event, can be determined with the so called <pretrigger> and the <hold time>, respectively. <pretrigger> defines the length of acquisition time in advance of the trigger event and <hold time> represents the time of data acquisition after an trigger event occurs.



Settings for <pretrigger> and <hold time> have a significant impact on the required disc space per recorded file. Nevertheless, if selected time spans for <pretrigger> and <hold time> are too small, acquired bat calls may not be recorded in their full length.

The input field <WAV-File Prefix> allows you to specify the prefix of the filename of recorded files. Consequently, the name of a recorded file consists of the following parts:

[prefix][date and time of acquisition][autoincremented number].WAV

The path <path to Avisoft recorder> determine the path to the executive file „rec_usgh.exe“ of the RECORDER software of Avisoft. It is by default: „C:\Program Files (x86)\Avisoft Bioacoustics\RECORDER USGH\rec_usgh.exe“. Assure that the path is correct. Otherwise, BATcontrol is not able to start the RECORDER software.

By using <set monitoring directory> you can determine the location the recorded bat call files are stored to. The default location is: „C:\BATmode\calls“.

By using the button <load default RECORDER settings> you can load a default configuration file for RECORDER software. These default configuration file conforms to the settings recommended by bat bioacoustictechnology. On loading default values current settings as well as current calibration values will be discarded.



Please consider that all settings, which are employed within the RECORDER software are saved on closing the software.

Please note that changing the base directory in the RECORDER-Software is not adopted to BATcontrol prior closing the RECORDER-Software. Consequently, BATcontrol is not able to access recorded data and cannot make them accessible via myBAT for example. If you want to change the directory where recorded data is saved, we recommend to set the directory via the BATcontrol button <set monitoring directory> before starting the monitoring.

Also running the RECORDER software externally, that means, it is not started by BATcontrol, may affect settings, if the configuration file “[Path to BATcontrol]\recorderconfig.ini” is loaded.

To change settings of the RECORDER-Software, which are not covered by BATcontrol, we recommend the following approach:

- 1) Start monitoring in BATcontrol
- 2) When the RECORDER-Software is opened, stop the recording by pressing the Stop-Button in the RECORDER-Software
- 3) Change settings in the RECORDER-Software
- 4) Close the RECORDER-Software
- 5) Restart monitoring with BATcontrol

To make bat call recordings comparable and compatible to German BMU guidelines and the tool ProBat a calibration of the used trigger level is necessary. For this purpose, open the calibration dialogue by pressing the button <Calibration>. To calibrate the BATmode-System insert calibration data you find at the microphone disc and press <Calibrate now!>-.



bat bioacoustictechnology recommends to recalibrate the microphone after each year of monitoring. This is necessary to consider sensitivity alternations of the microphone and/or changes of the sound pressure level of the test signal speaker, which can be caused by ageing, dirt particles or influences of weather. If you wish to recalibrate your microphone and test signal speaker, contact the support of bat bioacoustictechnology and send the microphone disc.

4.2.4.4 Daily Backup

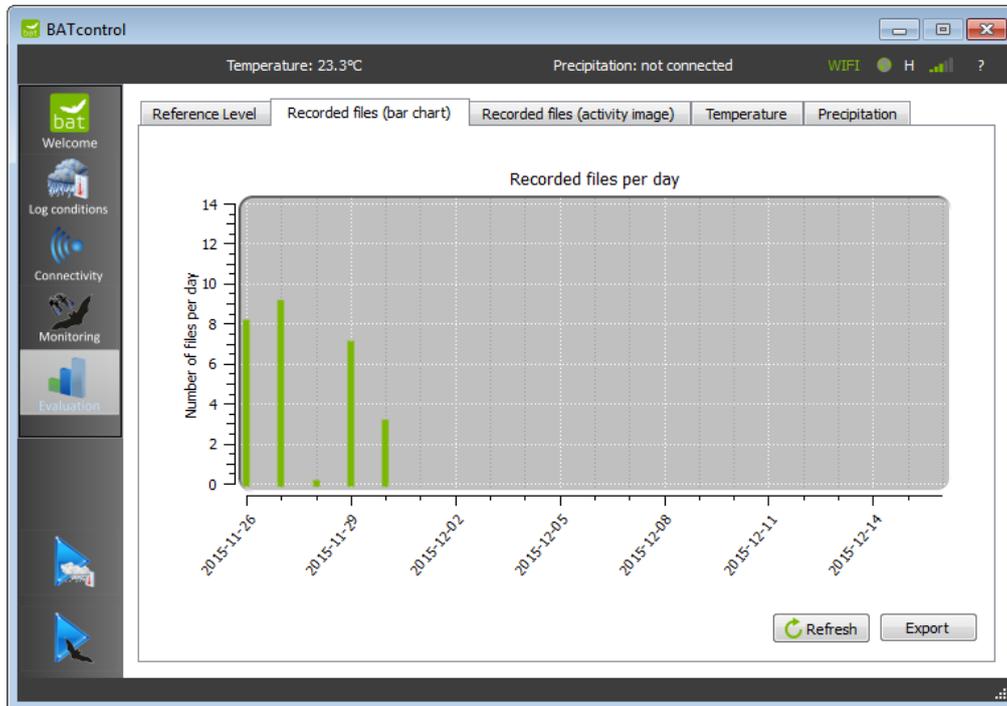
To perform a daily backup of the recorded files to an inserted memory card enable the box <Backup to SD-Card>. The time the daily backup is executed can be chosen with the two corresponding spin boxes.



Ensure that enough memory is available on the memory card and that write protection has not been activated. If there is not enough space available on the SD card or write protection is activated, backup won't be executed.

4.2.5 Page: Evaluation

The page <Evaluation> visualizes important parameters of the acoustical monitoring as well as of the environmental condition logging. By applying this graphical evaluation tools you can easily assess the quality of your recorded data and intervene, if data quality is below your expectations.



To regenerate the plots use the button <Refresh>.

If you want to export a plot as pixel or vector graphic, use the button <Export>.

The following plots are available:

4.2.5.1 Reference level

This plot visualizes the sound pressure level of the daily test signal in reference to the maximum sound pressure level (SPL) of the microphone in dB. The horizontal grey lines marks a ± 6 dB discrepancy of the recorded SPL from the SPL determined in the calibration. Variations of the daily test signal level either indicate an altered microphone sensitivity (microphone sensitivity can alter due to ageing, weather induced effects or deposited dirt particles on the microphone's protective grid) or a changed SPL of the test signal speaker. If the daily test signal level is also after a restart of the system constantly beyond the ± 6 dB lines the microphone or the test signal speaker may be defective. Please contact the support of bat bioacoustictechnology.

Since the file „reference.txt“ at the specified monitoring path is evaluated to create the plot, not only data from the current acoustical monitoring are incorporated in the figure. Also data from past monitorings may be shown in the plot, if data was not deleted.

4.2.5.2 *Number of recorded files per day*

In this bar chart the numbers of recorded files are plotted per day.

Since all WAV files in the specified path are evaluated to create the plot, not only data from the current acoustical monitoring are incorporated in the figure. Also data from past monitorings may be shown in the plot, if data was not deleted.

4.2.5.3 *Activity image*

This image visualizes color scaled the cumulative size of recorded WAV files per minute. Thereby, the x-axis represents the day time and the y-axis depicts the respective date when files were recorded. By applying this graphical evaluation tool you can easily assess the quality of your recorded data. Recorded noise for instance will be distributed equally over the whole day. In contrast, bat calls will be recorded mainly in times of twilight.

Since all WAV files in the specified path are evaluated to create the plot, not only data from the current acoustical monitoring are incorporated in the figure. Also data from past monitorings may be shown in the plot, if data was not deleted.

4.2.5.4 *Temperature values over time*

This figure shows the logged temperature values over time. Values are only shown, if condition monitoring was activated at the respective point of time.

Since the log file at the specified path is evaluated to create the plot, not only data from the current environmental condition logging are incorporated in the figure. Also data from past loggings may be shown in the plot, if no new log file was specified.

4.2.5.5 *Precipitation values over time*

This figure shows the logged precipitation values over time. Values are only shown, if condition monitoring was activated at the respective point of time.

Since the log file at the specified path is evaluated to create the plot, not only data from the current environmental condition logging are incorporated in the figure. Also data from past loggings may be shown in the plot, if no new log file was specified.

5 TECHNICAL DATA OF THE BATMODE

5.1 Power supply

- 19 V DC ($\pm 10\%$), Connector: 5.5 mm/2.5 mm

5.2 Microphone input

- Sampling rate [kHz]: 50, 62.5, 75, 100, 125, 150, 166.6, 187.5, 214, 250, 300
- Resolution: 16 bit
- Type of converter: Delta-sigma-architecture with integrated adaptive anti-aliasing-filter
- Frequency response (-3dB): 20Hz – 135 kHz
- Input sensitivity: -9dBV = -7 dBu = 0.35 Vrms
- Input impedance: 50 kOhm

5.3 Temperature sensor input

- Sampling rate: 128 Hz
- Resolution: 12 bit
- Input impedance: 8 MOhm

5.4 Precipitation sensor input

- Shunt: 200 Ohm
- Sampling rate: 128 Hz
- Resolution: 12 bit
- Input impedance: 8 MOhm

5.5 Heating output

- 19 V DC / 500mA



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