

ecoObs GmbH

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WTG Extension 3.0

for batcorder 2.0 & 3.0 & 3.1

Manual

February 2018 / Version 1.3

Safety / Usage instructions

This instruction manual is part of the product WTG extension for the batcorder. It contains important details for installation and operation. Read this manual carefully and observe the safety instructions, especially if you hand this product on to a third person. Keep this instruction manual for further reading!

Used symbols

This instruction manual uses the following symbols to indicate important details to the user.



Attention!

Paragraphs marked with this symbol are to be observed particularly. A disregard can endanger persons and material.



Important detail!

This symbol marks information, which is necessary for a correct function of the device. A disregard can affect the operability of the device or can lead to a complete failure.

How to dispose old devices

Of course we take back our old devices corresponding to the German ElektroG (take-back and disposal of electronic devices). Either we reuse them or the devices will be disposed by a recycling company as statutory. Please do not dispose defective devices into the domestic waste or communal collecting points, but send them (or even single components) back to us free of charge. Should you have any questions, contact us: info@ecoobs.com.

ecoObs GmbH, Pöhlstraße 1, 90475 Nürnberg

Safety instructions



- Only allow installation on a wind turbine generator (WTG) to be carried out by qualified personnel.
- Observe within the framework of the usage of this product effective security instructions for work on and in WTG's.
- The installation recommended in this manual has possibly to be modified due to security or technical reasons depending on the plant model. Therefore we recommend an early consultation with the operator resp. producer of the plant.
- Observe also the safety instructions of the batcorder!

Usage instructions



- Keep away the device in operation from electromagnetic and magnetic interference fields! It complies with the standards for electromagnetic compatibility, however it cannot be avoided that EM-fields couple in at the microphone and cause a disturbance to the audio signal.
- The microphone is sensitive against mechanical force. Make sure, that the microphone is not touched during installation or transport. Also the surface of the acrylic pane in which it is inserted must not be scratched.
- The connection plug with knurled screw is only to be locked manually. A twist of the plugs can lead to fracture in the plug. Never use any tools (pliers etc.).
- Avoid high, short-term temperature fluctuation, direct insolation and temperatures above 40°C or below 0°C.
- Dust, sticky substances (dirt, gear oil of the plant,...) can choke the microphone mesh. See to it, that the microphone disc has a proper guard.
- The microphone membrane is indeed safeguarded against raindrops, but long-term humidity effects can lead to corrosion and therewith to a loss of sensitivity. We recommend a periodic checking of the microphone through the ecoObs GmbH (at least annually).
- We cannot guarantee that all wind turbines are suited for a batcorder application. In particular older plants can exhibit extreme acoustic (e.g. drives, actuators) and/or electromagnetic emissions. These no longer allow a reasonable acoustic capture of bats. Early planning and possibly a pilot survey are therefore sensible.
- The remote enquiry via GSM-module can be disturbed in some plants. For this we recommend an early agreement with the plant's operator resp. the manufacturer.
- During wintertime the application of the batcorder with the WTG-add-

on on a wind turbine should be avoided. Frost can destroy the microphone.

- At night the add-on is operated by a rechargeable battery. It will be recharged by day through the mains supply (110-240 V AC). Without its daily charge the batcorder can only be operated for a few days. Therefore you have to make sure, that an appropriate electric supply (standard socket) is available in the nacelle and that this carries power even if the plant is shut down. Ask the plant operator about this.
- Also observe the usage instructions for the batcorder!
- If there are any questions, please contact our support per Email: info@ecoobs.de or by telephone: 0049 911 3768053

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Introduction

The WTG-add-on allows the installation of a batcorder 2.0 or 3.x into a wind turbine (nacelle) for acquisition of bat-activity within hub height. The wind turbine extension offers the possibility to operate through the mains supply of the wind energy plant as well as to monitor operations via a remote operation control.

The extension contains all the necessary parts for operating the batcorder in the nacelle together with a rechargeable battery and a special microphone (when ordering make sure to indicate if used with batcorder 2.0 or 3.x; the microphone connector differs!). In addition to the fastening material the add-on includes a control module, to which the AC/DC-charger of the batcorder and the back-up accumulator are connected. Besides a voltage control and a charging automatic for the battery it also contains the electronic for monitoring the batcorder through SMS (Transmission of status reports).

This manual is valid for software version SW219 / SW307 or newer. The software version of your batcorder is displayed on the start screen of the device. Older versions cannot be operated together with the wind turbine extension. Information concerning software updates can be obtained online under the following address: <http://www.ecoobs.com/cnt-bcupdate.html>. Please ask for the current needed software version before application.

Usage

Please observe the following details for a correct use of the wind turbine extension for the batcorder, as well as the general details for usage of the batcorder.

Installation on a wind energy plant/wind turbine generator (WTG)

The installation of the wind turbine extension should always be carried out by qualified engineers of the operator or the manufacturer of the wind energy plant. As mechanical strains can occur, each single component of the batcorder's extension has to be installed professionally on the plant. ecoObs GmbH cannot carry out installations. Please contact the operator or the manufacturer of the plant in advance, before using the wind turbine extension on a plant.

Application on a wind turbine

Frequently bat-detectors are installed on wind energy plants for capturing bat activity. Actually, this is an elegant method for surveys, but it has to be planned

extra carefully. Depending on the type of plant and the way of installations problems can arise, e.g. through electromagnetic or acoustic disturbances, mechanical strains, acoustic shadowing effects and reflections and extreme climatic conditions (wind, temperature fluctuation, rain). Therefore we will gladly advise you prior to such an application. We are not liable for loss or damages, which occur through improper installation.

Acoustic and electromagnetic influences

Increased noise within the audio signal can arise through acoustic as well as EM disturbance sources. If these disturbance signals occur within the frequency range of bat calls, they will inevitably affect the signal analysis. The call recognition implemented in the batcorder is indeed very robust, but known interfering sources should be avoided. The following list has been compiled in all conscience. In most cases the batcorder will operate reliably even under these conditions. But possibly not all bat calls will be detected or background noises will activate recordings. The later following measurement and identification of the recordings on the computer can be affected as well:

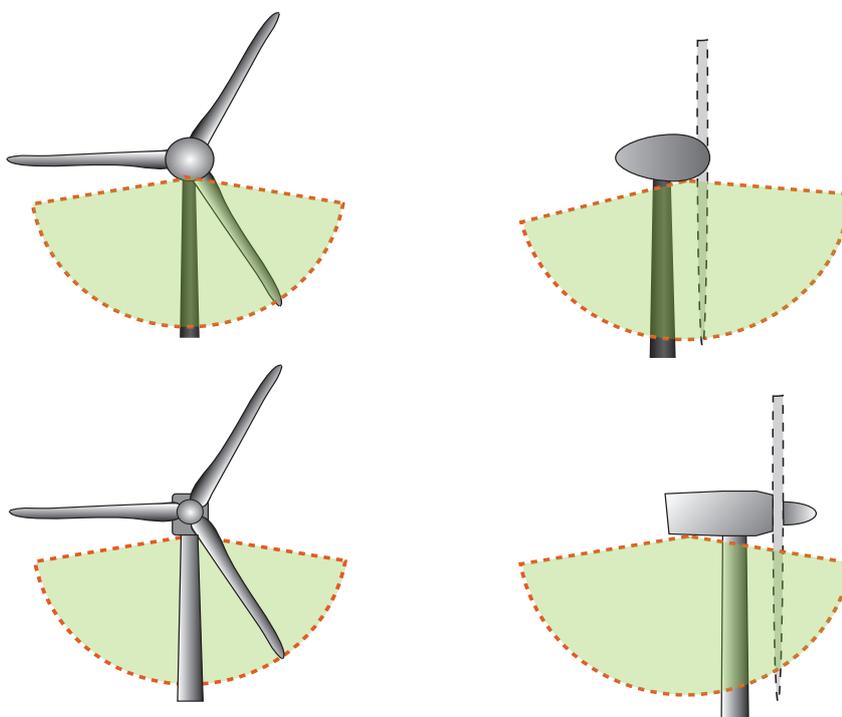
- Strong electromagnetic or magnetic fields (e.g. high voltage lines, big magnetic coils, high voltage switchgear, WTG nacelles,...) can lead to faulty recordings and disturbances in the recordings..
- A.C. sources (e.g. neon tubes, energy-saving lamps,...) can generally create noise bands.
- Strong wind flows alongside irregular formed objects (e.g. trains, trucks, cars) create low frequency noise or broadband noise signals. These may mask bat calls.
- If the microphone is fixed improperly (not flushed in the nacelle cover, too close to reflective structures outside the nacelle) a multipath sound propagation (echo) can occur. If echoes and signals interfere with each other, it may be that in the following analyses steps calls cannot be measured and identified anymore. The microphone should not be affixed too near to the tower resp. to the rotors, because these can cause acoustic shadows.

Noise filter (batcorder 3.1 only)

The batcorder 3.1 running with firmware 307 or newer implements an optional noise filter. This will eliminate false-positive recordings of short mechanical noises and similar. Thus on many turbines false-positive recordings will be reduced by up to 90%. Note that tonal noises like screeching of brakes can not be eliminated without overhearing bats. In such situations there may exist as only solution the shut down of the turbine for monitoring. The optimal filter value in most situations is 1, the strongest setting. This will still record all bat calls.

Range and Comparability

Due to the special installation of the microphone an omnidirectional observation of bats is not possible unlike to the normal batcorder application. The interfacial microphone is designed to cover an angle between 130°-150°. This is sufficient, as the acoustic shadow of the nacelle prevents a wider observation angle. The following illustration shows the observed angle with the microphone installed in the nacelles as advised by us (examples for Enercon and Vestas plants are displayed). Any other installation at the nacelle leads to a modified surveillance area. The range of recording and the resultant observed volume depend on the sound level and on the frequency of the calls specific to each bat species, as well as the threshold settings of the batcorder. With a threshold of -27 dB Noctule calls can be recorded approx. up to 25-30 m and the Common Pipis-



Examples of installation in nacelles. The upper row shows setup according to the german BMU wind energy project (Enercon E-72). Below is an example of how to install the extension and batcorder in a Vestas nacelle. These are only examples, you will have to adapt these for the usage in other nacelles.

trille up to 14-18 m. At a setting of -36 dB the recording range increases to approx. 45 m (Noctules) and 30 m (Common Pipistrelle). The specifications refer to typical sound levels of bat calls. However, lower amplitude calls will also be recorded in an inferior quality. The following measurement and analysis of the species on the computer will therefore lead to less good results. Thus the choice of the threshold is a weighting between quality and quantity. Also the amount of recorded noise increases with a lower threshold, though this is negligible in most cases.

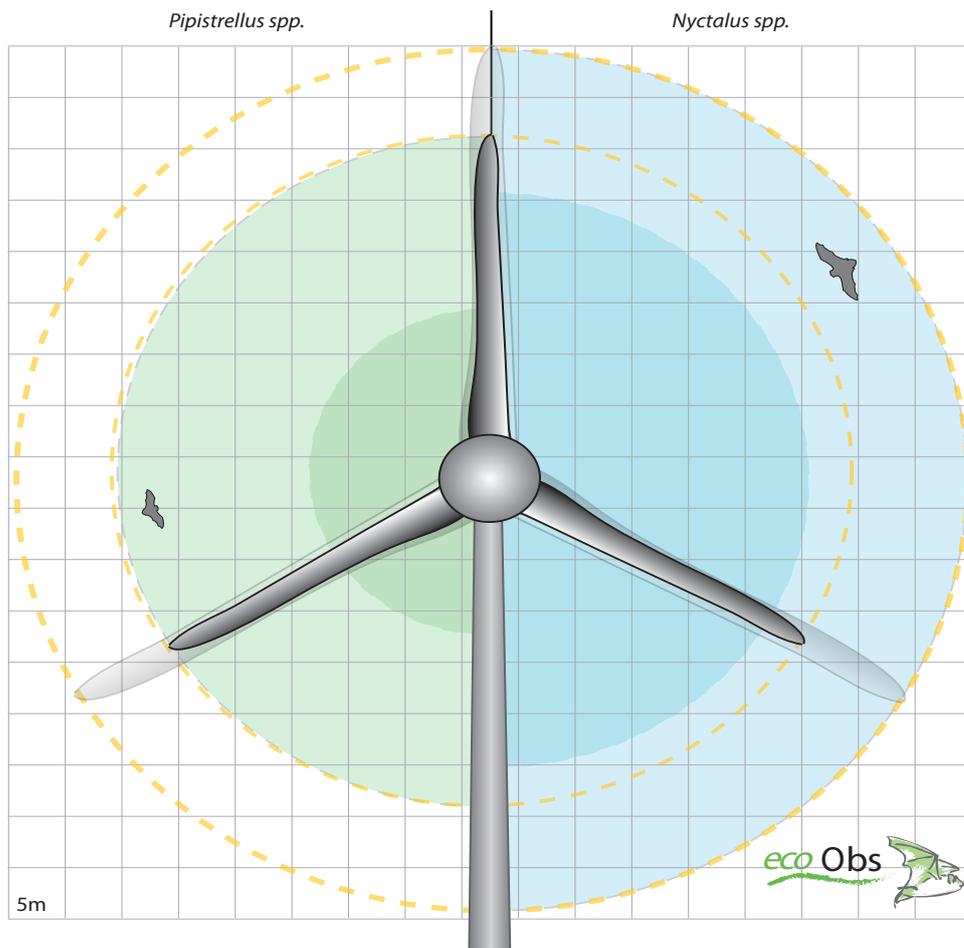


Figure:

Shown are typical detection distances (min and max) for calls of genera *Pipistrellus* and *Nyctalus* (20 and 40 kHz signals). For scale a 70m and a 90m wing diameter is displayed. The batcorder is set to a threshold of -36 dB.

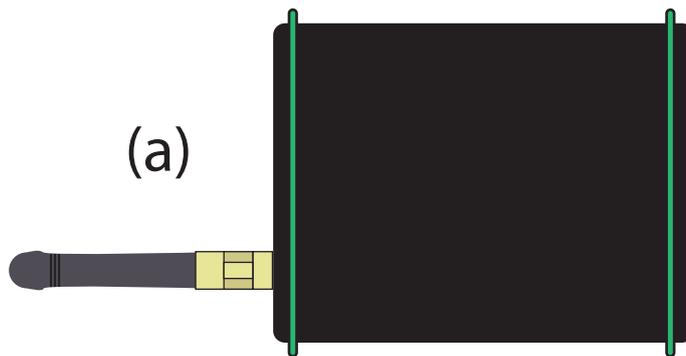
Equipment overview

Note:

Included in the standard delivery are the wind turbine extension as well as miscellaneous materials for the installation in the nacelle.

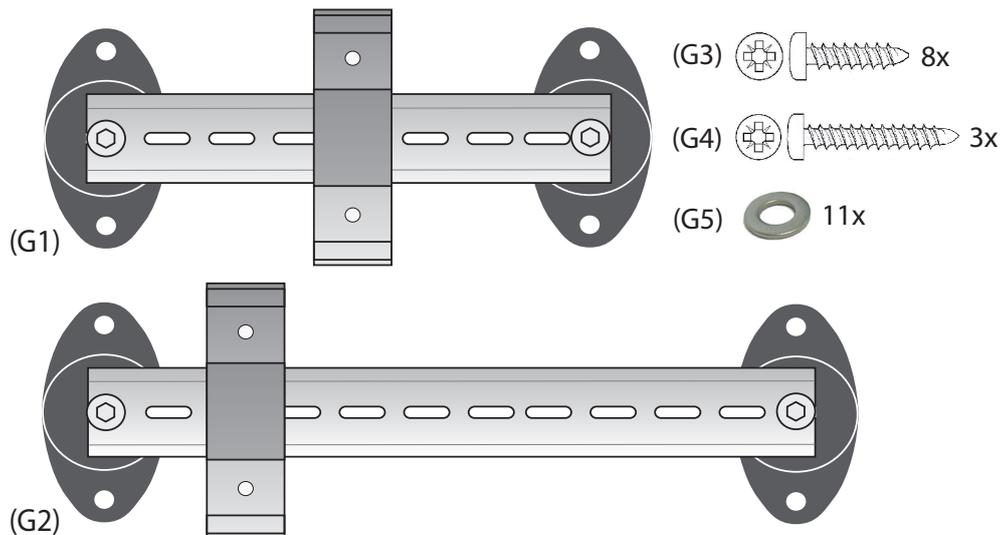
Parts list

- (a) Control module in black aluminium box with a GSM-aerial.
- (b) Lead acid battery 6V 4.5Ah, type LC-R064R5P with a 4.8 mm Faston connection.
- (c) Connecting cable approx. 15 cm long. Low-voltage plug (control module) on Faston blade receptacles (rechargeable battery). Already plugged into the battery.
- (d) Microphone disc (without illustration).



Assembly parts for nacelles

- (G1) Profile rail with a small fastening clip for the batcorder (optionally either for batcorder 2.0 or 3.0)
- (G2) Profile rail with a broad fastening clip for the control module
- (G3) 8 x DIN7981 screws C 5,5x 13H, for fixation of rails to the nacelle
- (G4) 3 x DIN7981 Screws C 5,5 x 25H, for fixation of the microphone disc to the nacelle
- (G5) 11 x washer discs DIN9021 A2



Microphone

The microphone is embedded into a disc made out of plastic, which serves as a boundary layer. An ultrasonic transmitter is built-in as well, which transmits a test signal each day to check the sensitivity of the microphone. The foam ring serves as protection against weather and prevents water from dripping in, which runs down the nacelle's cover. The microphone is connected directly with the batcorder. The ultrasonic transmitter is connected to the control module. The installation is illustrated in the following chapter. The amplification factor of the batcorder's microphone preamplifier has to be adjusted to the microphone disc. Therefore you receive from us a microphone-correction-factor (MCF), which you have to set in consideration of the batcorder's correction-factor (BCF). The correction-factor is also printed onto the microphone disc.

Power supply

To avoid any interference of the 230 Volt power supply of the plant with the batcorder's recordings, the batcorder is operated with a 6V rechargeable battery. During its application the batcorder is galvanically isolated from the mains

supply. As long as the batcorder is switched off, the battery is charged by the mains connection. The standard delivered 12V AC/DC charger of the batcorder serves as power supply. The control module contains the charge controller for the battery.



Make sure, that there is an adequate 230V connection for power supply available in the nacelle. That should constantly be current carrying even when the plant is shut down. The battery can bridge short-time failures (approx. 60 – 100 hours – depending on the actual running-time of the batcorder).



The length of the cable from charger to control module amounts up to 2 meters. Therefore it may be necessary to plan for an additional extension cable from socket to the charger.



If the battery has to be changed, you have to pay attention to connect the cables properly! Blue to “-“ and red to “+” . If the battery has been connected the wrong way around the control module as well as the batcorder will be destructed!



Please attend to, that the cable from charger to control module does not run strained through the room. Also avoid laying the cable through frequently used passageways (risk of damage). Fix the cable depending on its position/installation with adhesive tape or cable straps.



The power supply may need to be fixed to the wall connector so it cannot incidentally fall out due to vibrations.



On some turbines the power line can produce high voltage peaks (when lightning strikes for example). Without additional filters the power adapter of the batcorder may lose functionality then.

The control module is designed to be supplied by the provided AC/DC converter (charger) when running in WKA mode. Do not use any other power supply! After connecting battery and power supply the red LED indicates power. If it is blinking, there is only power from the battery but not from the power supply connected to mains. If the lead-gel battery is rather fully loaded, the blinking may only start after a few minutes.

Battery

The rechargeable battery supplied with the kit is able to cover for power-outs of a duration of a couple of days. The charging electronics are designed to work with 6V lead-gel batteries only.



Other battery types as well as batteries with voltages of 12V or 24V can not be used. They may start to burn or explode!

If the control module is operated in box mode a 12 V battery can be used.

Installation

Required material

Besides the wind turbine extension the following is required:

- **batcorder 2.0 or 3.x with up-to-date software**
- **SIM-card** (for surveillance of operations by SMS messages)
- **SDHC memory card, 4 to 32 GB (SDXC with batcorder 3)**
- If there is no power socket close to the site of installation, an extension cable is required.

For installation you need the following equipment:

- Tape measure or conventional foot rule
- Pencil or marker
- Drilling machine (note that you will possibly need an extension cable).
- Hole saw for 100mm hole (for the microphone disc)
- Drill 3.5mm or 4mm depending on nacelle material
- Phillips screwdriver, size 2
- Screw tap with all necessary accessories for a M6-thread

Position in the nacelle

The microphone and the mounting rails for the batcorder and the WTG-extension are fixed at the bottom of the plant's nacelle. So the microphone looks down after installation.

On Vestas plants the batcorder and its accessories are mounted at the back end of the plant, next to the emergency escape flap. The same accounts for most modern Enercon plants.

Depending on the type of nacelle and available installation possibilities a modification of the construction may be necessary. The mounting rails can e.g. also be fixed vertically to structures/bars inside the nacelle. The microphone must not be installed too exposed (e.g. to a side panel or to the surface of the nacelle), because it then is too open to atmospheric conditions and also to draining rainwater, and it will then wear out early. An installation at the bottom of the nacelle, at the side averted to the rotor, though is possible and reasonable, because there less turbulences do occur and therefore less noise and humidity resp. dirt are to be expected.

Installation of the boundary-layer microphone

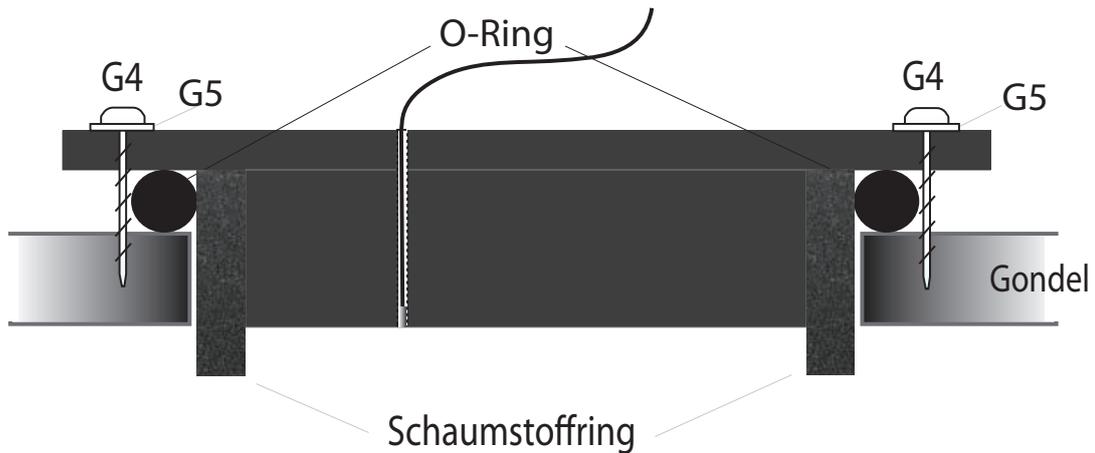
For the installation of the boundary-layer microphone it is necessary to cut a hole into the nacelle cover of a 10cm diameter. This measure is only to be carried out by qualified engineers of the wind energy plant's operator or by engineers of the manufacturer! The microphone disc is then attached fittingly into the hole. For fixing the microphone disc 3 flake board screws (GRP-assembly kit) or 3 M6 cheese head screws DIN912 (alu-assembly kit) will be included.

For the flake board screws 3mm holes have to be drilled. For the M6 cheese head screws 6mm threads have to be cut. The microphone disc can be used for marking the position of the holes.



Pay attention: The distance from disc to batcorder must not be more than 50 cm! (cable length of the microphone is approx. 50 cm.).

Scheibenmikrofon-Einbau

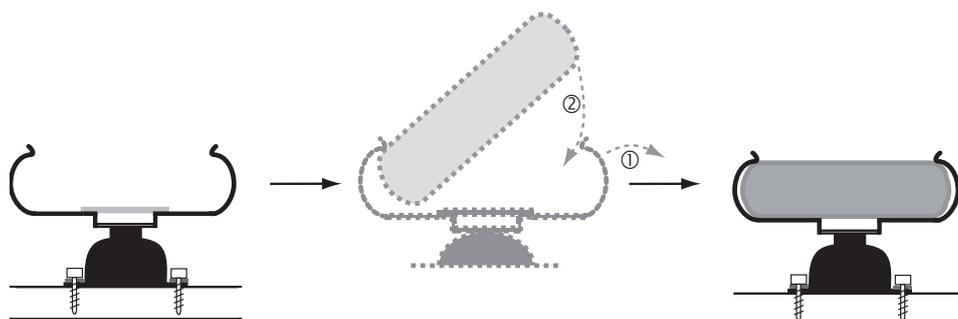


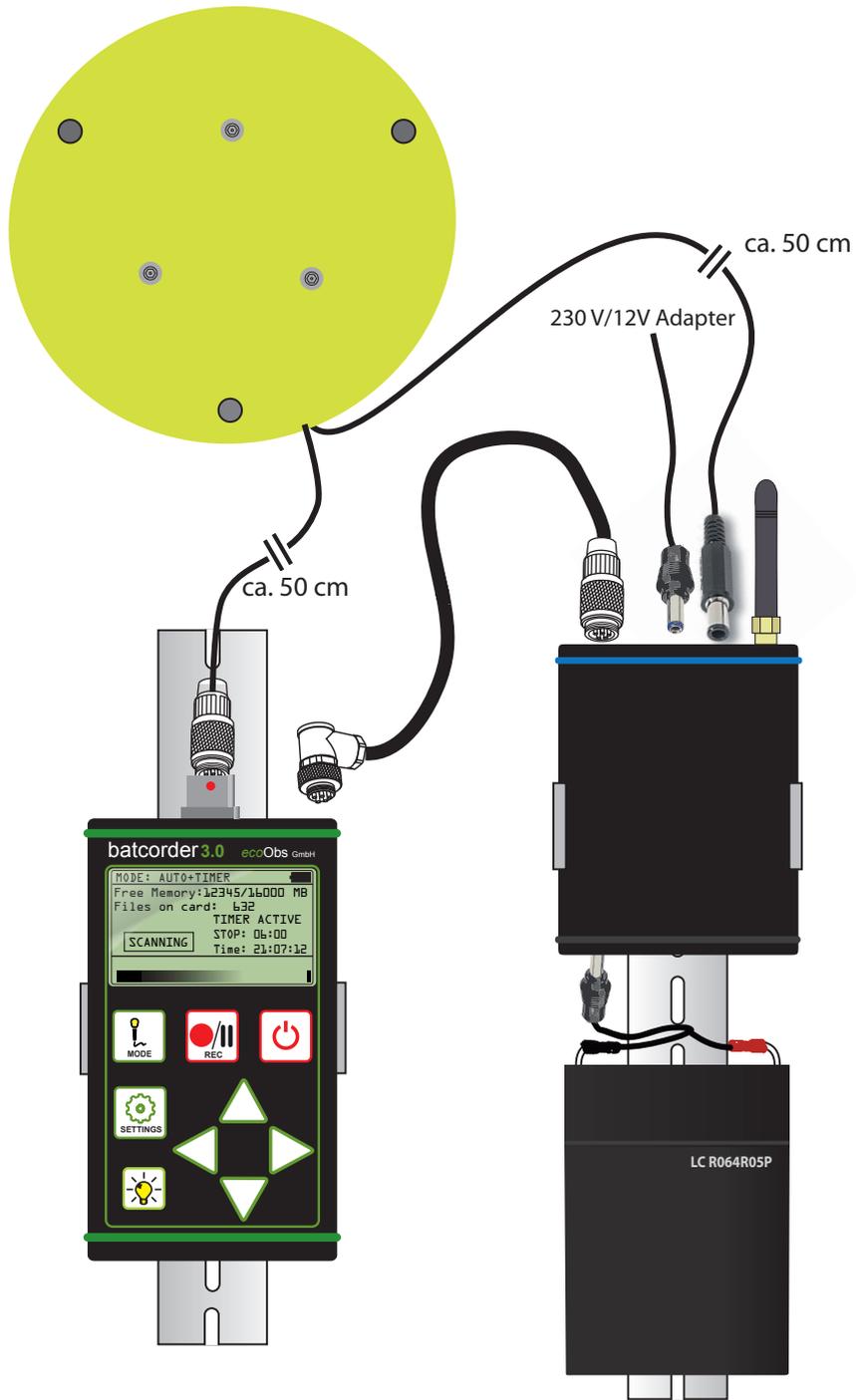
Installation of the mounting rails

The batcorder as well as the control-module are fixed at the WTG-nacelle via profile rails and a clip system. The profile rails are attached to the nacelle (inside the nacelle) with dampers. You have to observe the proper distance to the microphone disc and to the module. Corresponding to the illustration the profile rails and the fastening clips are mounted and the batcorder has to be clicked into the fastener (an installation overview is given on the left page). We recommend to connect the cables to the devices **before** you fix the batcorder and the control-module onto the mounting rails.

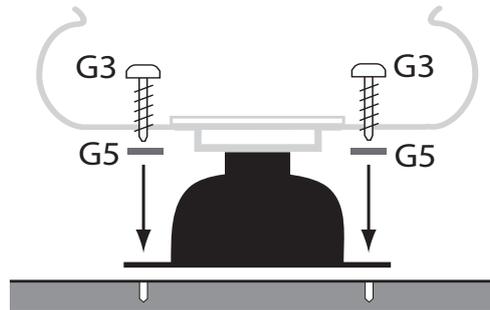
Installation of the mounting rails in GRP-nacelles

The rubber buffers of the mounting rails are fixed with the provided flake board screws (G3). Therefore suited holes have to be pre-drilled. Lay down the rails at the chosen position onto the nacelle bottom and sketch the position of the pilot holes for the screws. Use a 3 mm drill bit for pre-drilling. And also use the enclosed washers.





Trageschienen/Gummipuffer befestigen



Insert batcorder and module into the fastening clips

We recommend to connect the cables to the devices **before** fixing the batcorder and the control-module onto the mounting rails. The batcorder and the control-module are inserted from above into the fastening clips and are secured additionally with wire straps. The battery pack is also mounted onto the control-module via wire straps. The battery has a gummed face on its bottom, with which it lays onto the cap rail. It is then fixed with two wire straps onto the cap rail. The rubber prevents from shifting.

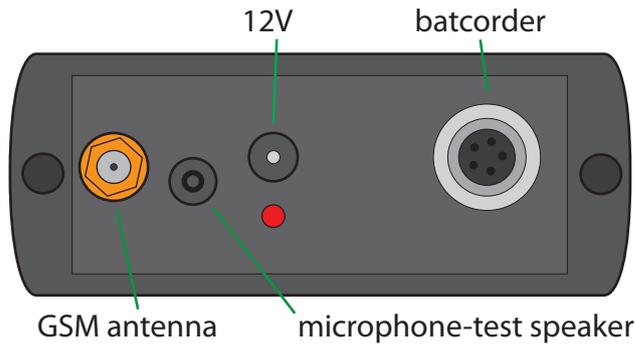


You always have to pay attention that every piece is fixed securely when installing the devices into the nacelle. They must in no case loosen, even if accelerating forces occur in the nacelle, caused by wind or other events (e.g. emergency shut-down).

Connection of cables

Each plug only fits in its designated socket. Thus an accidental inversion of the connections is ruled out.

batcorder – control module



Connect batcorder and control module with the corresponding cable (standard electric cable of the batcorder with silver plug adapters). Socket and plug respectively have a groove, so that the plugs can only be inserted in a single position into the socket. They then can be screwed tightly with the metal knurled nut. The angulated plug is screwed to the batcorder and the straight one to the module.



Do not twist the cable! Conduct the lock only by means of twisting the knurled screw.

Microphone disc

The triple-pole plug of the microphone is inserted to the central connection at the front side of the batcorder. The microphone plug has, like the electric cable, a groove, which has to be attached fittingly into the groove at the socket (upwards). The microphone cable is locked to the batcorder by tightening the knurled screw. The second cable leads from the microphone disc (connection of the ultrasonic transmitter) to the control module. The plug-in position is located between the GSM-aerial and the socket for power supply.

Electricity supply

The battery cable is connected to the rear side of the control module (side with only one socket). After connecting the low voltage plug of the power-supply-pack to the module, a red LED at the module indicates that the device is ready-to-operate on main power. A blinking LED indicates no main power, but only battery power. Assure that all cables lie loose (without tension or twist). But the cables should not have too much play. Therefore, if necessary, you can fix them with tape or wire straps.

Choice of SIM-card

Optionally the batcorder is able to send a periodic status report to a listed telephone number. For this functionality you need a SIM card (not included!).

The following information refers mainly to the German mobile networks but will be simialr in other countries.

Choice of card

We recommend to use post-paid mobile phone cards. Typically the network operators offer a free transmission of SMS between two so called partner cards. Some providers offer up to 20 partner card per contract.

If prepaid cards are used, it can happen easily, that the account on the card is emptied during the period of observation, and then a transmission of status reports is no longer possible. Also some providers lock prepaid cards if no phone calls are registered for a certain amount of time.

SMS transmission

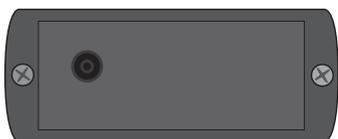
One problem with transmitting SMS via the control module is not only the reception but also the in-time allocation of time frames for data transfer. In general, using the D-net is preferable to using the E-net. It is most reliable to use cards from the same network operator both for the control module and the receiving mobile phone.



The reception for a GSM-network may be very good at the observation site (indicated by the reception bars in the batcorder menu; see following chapter), but nevertheless problems with the transmission of the text message can occur, if there is no appropriate time frame for data transfer available. This is due to the capacity utilization of the network, as well as to the chosen network operator. Therefore cards which automatically search for a network with the best reception are not reasonable.

At the moment we have made best experiences with the D-net and cards from the German Telekom. But this may differ from region to region. Please inform us about positive as well as negative experiences on your side.

SIM-card installation



For installing the SIM-card you have to open the control module at the opposite side of the aerial



connection. This face has only one socket at the left for connecting the module with the battery. To open the case both screws (cross recess) have to be removed. Behind it there is a circuit board, on which the GSM modem is installed. The GSM-modem has a slot on its right side, in which the SIM-card has to be inserted. Therefore you push the SIM-card carefully as far as it will go into the slot. The contactors of the SIM-card have to look down, so that the gated edge lies at the left front. To remove the SIM-card, it has to be pushed lightly into the slot, it then pops out (push-in–push-out).



When tightening the case cover again, you have to be careful not to overbolt. Also make sure not to tilt the lid when closing it again. Otherwise you may cause damage to the cover and the screws. Be sure that the rubber seal is fitted in correctly.



The SIM-card must only be inserted or changed when the module is not connected to the power supply. Otherwise the control module or the SIM-card may get damaged.

Batcorder settings



This chapter only covers the specific features concerning the batcorder settings, which result from an operation with the wind turbine add-on. It is absolutely necessary that you acquaint yourself with the basic operating modes of the batcorder by reading its instructions manual carefully.

Settings for recording

For recording you have to activate the Auto+Timer mode of the batcorder. This mode applies the turn-on/-off times chosen by you. As long as the device is switched on, it is possible to use also the “Manual” and “Auto” mode. The settings *Quality*, *Critical Frequency* and *Posttrigger* should be left at their default settings. To increase the range *Threshold* can be lowered down to -36 dB. This complies with the settings used at the BMU-project of the Hanover university and the Erlangen-Nuremberg university. In bcAdmin you may have to adjust the threshold during analysis also! Necessarily you should also follow the instruction manual of the batcorder.



Before installation acquaint yourself by all means with the operating modes of the batcorder. Be certain, that the person, who installs the batcorder, obtains all the necessary information for operating the

batcorder. At best a person, who is already skilled in operating the device is present in the nacelle whilst installation.



Consider that an incorrect configuration and wrong settings during the installation as well as while changing the memory cards, can lead to a malfunction of the device or respectively that the data gathered during utilization time is waste. This would necessitate a new ascent of the nacelle.

Start-Stop times



Please note that the batcorder has to be turned off at least 3 hours each day to recharge the battery.

Microphone calibration settings



The batcorder is not calibrated for the disc microphone when delivered. Thus, you have to manually set the correct correction factor printed on the disc microphone.

Start the batcorder with the wind extension module and the microphone connected and fully operational. The batcorder enters the SDHC/clock settings menu.

```

SETTINGS SDHC-CARD+CLOCK 
Free Memory: 12345/16000 MB
Files on card: 9999
Erase: Press REC+UP
Filecode: XXXXXXXXXXXX

Date:23.02.09 Time:13:05:02
    
```

Make sure the blinking cursor sits on a field of the filecode setting. Now press and hold the **REC** key. Now press the right arrow key and then release both keys again. You now have entered the menu **Microphone correction factor**. In this menu you can set the microphone correction factor which is responsible for the gain of the batcorder.

The correction results from addition of the microphone correction factor (MCF) and the batcorder correction factor (BCF; last page in your batcorder manual):

$$CF = MCF + BCF$$

Starting with the batcorder 3.0 the BCF is built into the batcorder and it is not necessary to add it to the MCF. In that case $CF = MCF$.

Press **Rec** to save the correction factor. The menu **Testsignal calibration** is automatically opened after saving the factor.

Testsignal calibration

The wind turbine extension produces an acoustic testsignal each morning using the transducer located in the microphone disc. The initial calibration is done by the batcorder automatically after saving the correction factor (see above). It is used as reference for the daily tests. Thus, if the initial signal is recorded at different conditions, the resulting TSL reported may be lower than expected.



Calibrate the initial signal after installing the batcorder in the nacelle for optimal results.

You have to repeat the above steps whenever you exchange the batcorder microphone in the gondola or if you have a new setup. We also recommend a test and recalibration of the microphone each year. For this please send the microphone to: ecoObs GmbH, Pöhlstraße 1, 90475 Nürnberg, Germany

GSM settings

For being able to use the GSM-functionality, you have to make some batcorder settings. We recommend to carry out these steps before installation e.g. at the office to exercise the handling of the full setup.

Insert the SIM-card into the module (see previous chapters). Then connect batcorder and control module and plug the power supply (AC/DC converter). If the LED at the control module glows it indicates that it is ready to operate. Now switch on the batcorder. The starting sequence takes a few seconds, as the batcorder has to build up a data link to the control module. After this the standard starting menu is displayed: Settings SDHC-Card+Clock.

A plug symbol at the right upper corner indicates that the control module has been found.

```

SETTINGS SDHC-CARD+CLOCK
Free Memory: 12345/16000 MB
Files on card: 9999
Erase: Press REC+UP
Filecode: XXXXXXXXXXXX

Date:23.02.09 Time:13:05:02

```

By pushing the set-button twice you reach the settings for the GSM-operation. You can only switch to this menu, when the control module has been detected successfully. There the PIN of your SIM-card and afterwards the call number for sending a status report via SMS can be set. If no SIM-card has been detected, a message is displayed and the menu is left.

The next menu displays the discovered signal strength. Note that at first a general reception strength will be identified. The evaluation of the signal strength can take a few seconds. It is regenerated every half minute cycle. If the network of your operator is available can only be checked after entering the PIN. Push **next** for the following display. If no PIN has been entered for the SIM-card yet this is the next step in the batcorder preparation. Otherwise the following step will be skipped. The entry of the PIN will only be necessary again when the SIM-card has been changed.

```

SETTINGS - GSM

Signal strength:
██████████ | -063dBm
Quality: excellent

next ▶

```

In the following menu please enter the PIN of your SIM-card and follow the instructions.

```

SETTINGS - GSM
Insert GSM-PIN: 1234
Press REC for sending PIN
Press SETTINGS for cancel

```

After pushing the **REC** button the PIN is transferred to the SIM-card and the return signal is retrieved. If PIN is correct the GSM-modem tries to dial into the operator's network. If this does not succeed or the PIN is invalid, an error message will be displayed.



If the PIN has been entered wrong three times, the SIM-card is going to be locked and can only be unlocked by entering the PUK. The PUK cannot be entered via the batcoder. Therefore you have to insert the card into a mobile phone and to carry out the cancellation of the lock.

With both steps being successful, the next menu displayed is for entering the telephone number to which the SMS- status reports shall be send.

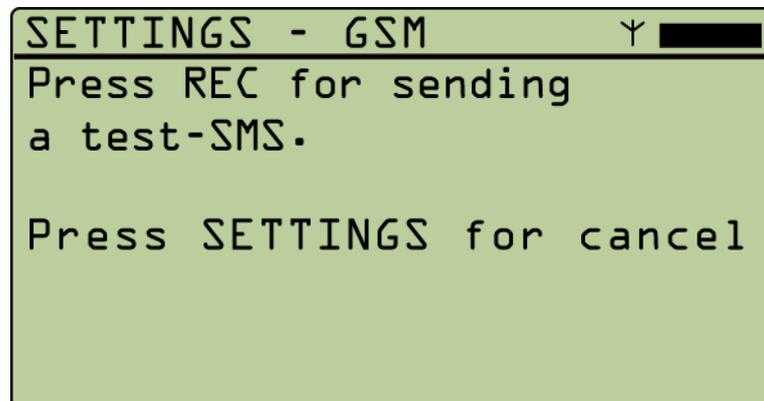
```

SETTINGS - GSM
Number for SMS:
+491731234567
Press REC for saving number
Press SETTINGS for cancel

```

The telephone number always has to be entered as following: country code + network code (without the first zero!) + call number. This means, in your own country a country code has to be entered as well. To erase redundant digits at the end of the call number please move the cursor onto the last digit and scroll to the space-character(" "). Repeat this step if necessary for further redundant digits.

After entering and saving the call number you have the possibility to send a test-SMS to the designated number to check the GSM-modem's operation and settings.



Afterward the batcoder displays whether the test-SMS has been successful or not. If the transmission has been successful and all necessary entries have been made, the batcoder is ready for operating with the WTG-extension. Both components can then be installed in the nacelle.

After installation in the nacelle you should again send a test-SMS, to make sure that the installation in the nacelle is correct. Therefore you again follow the above mentioned steps and so you have an additional control over the selected number. By changing into the GSM-menu you can again measure the signal strength or you can adjust the call number.

Transmission of status SMS

The batcoder automatically sends a status SMS whilst finishing the scanning (this equals the stopping time of the timer) to the entered call number. Condition is, that the operator's mobile network has been found. The message contains the following information:

- Filecode of the batcoder: batcoder: **XXXXXXXXXX**
- Free memory on the SDHC-card: **free mem: xx.xGB**
- Number of recordings: **files total: xxxxx**
- Number of recordings previous night: **last night: xxxxx**
- Microphone-signal-level (in percent): **TSL: -x dB / - xdB**
- **Minimum temperature in °C**

The TSL has to be read as deviation of the reference value you achieved when calibrating. -6 dB indicate that the reception dropped to half of the reference value. A variation of TSL is to be expected. If it drops to a low value and stays for a longer time of a few days a microphone defect can be expected.

For batcorder 2.0 as well as batcorder 3.x with SW < 307 the TSL value is indicated in a different format, The minimum temperature is also missing:

- Microphone-signal-level (in percent): **TSL: xxx%**

The case may arise that instead of a status report an error message is displayed. If you are not sure, whether this is a critical error, please contact us please also note down the exact text of the error message.

Special error messages

It is possible that the status message is replaced by a detailed error report. Possible such errors are:

„batcorder turned off because of low battery.“

Reason: The lead gel battery could not be charged or is defective.

„Not enough disk space. Replace SD-card!“

The SDHC card must be replaced.

„SD-card read or write error occurred. Replace SD-card!“

A write error occurred. Please replace the SDHC card.

„Maximum number (65535) of files reached! Please replace card!“

The batcorder handles a maximum of 65535 recordings. The SDHC card has to be replaced.

„AC adapter down!“

The 230V AC/DC converter has no current. Possibly the wind turbine power supply is switched off for maintenance. The batcorder can run for a few days without mains power.

Error detection with the help of the status SMS

Too small or too large numbers of recordings

No recordings

If (over several days) no recordings at all have been made, a technical problem, e.g. a microphone failure, may exist. However, there are also often places or

periods in which nearly no bat activity exists. It is very conspicuous though, if an existing bat activity suddenly stops entirely. Then an inspection on-site of the assembling as well as of the batcorder is necessary. Therefore also note the chapter “Reduction of microphone sensitivity”.

Very many or long recordings

Normally at many locations there are only a few recordings per night to be expected (approx. 0-50). At some locations and especially at the beginning of autumn the number can raise up to several hundreds. Mostly this concerns only a few nights, in which the activity is extremely high. If the batcorder permanently records a lot of sequences (several hundred up to thousand), this may be due to a malfunction or wrong settings of the batcorder. An inspection on-site of the assembling as well as of the batcorder is necessary.

- (a) Quality value is too high: We recommend for the settings of the recording control a value of 20 for the quality parameter. This parameter is crucial to whether the signals are classified as bat call or as disturbances. With this value a large part of potential noises are identified and are therefore not recorded. Not until higher wind speeds (from 8-9 m per second) increased recordings of noises do occur. If the quality value is set too high (>20) it is possible however, that even at lower wind speeds the number of recordings increases.
- (b) If a lot of and partly big (5 MB) files are written permanently, even at low wind speeds, the microphone in the nacelle may be positioned too near to an electromagnetic or acoustic disturbance source. At some plants increased acoustic noises do occur, which are very similar to bat calls and are therefore recorded. The position of the installation has to be reconsidered.
- (c) Possibly the batcorder itself has a malfunction (increased noise and disturbance bands) which leads to increased recordings. Then the device possibly has to be sent in.

Often we are able to conduct a pre-analysis with the help of the recordings from the nacelle. Therefore, in case of potential failures, please always send us also the recordings of the batcorder.

Absence of status SMS

If the status SMS fails to appear, there are several sources of error possible, which can prevent a transmission. In the following it is assumed, that the test transmission of a message has worked also when installed on the wind turbine.

Long-term power supply cut-off

Possibly the power of the plant has been cut-off or a cable connection is faulty. The battery recommended by us is not dimensioned for longer running times of the batcorder. It has to be charged regularly by day. An once charged battery lasts for about 60 to 100 hours scanning/recording by the batcorder. This means, that the battery without a mains connection is no longer charged enough after a few days, to supply the batcorder with power. In this case normally a status SMS is send in time..

Timer deactivated

If the batcorder failed because of a power failure which could not be bridged, then possibly the timer-mode is malfunctioning. Hence the batcorder is no longer switching-on at the set start time and thus also does not send any SMS.

Dialing in to the mobile network not possible

If there exist disturbances in the cellular network of the network operator or should the account of the SIM-card be consumed, then it is not possible to send status SMS. Therefore we do not recommend to use pre-paid cards, rather use post-paid cards. Even with a good reception, at can occur that it is not possible to transmit a message, as due to a high capacity utilization of the network no time slots for transmitting the data are provided. Also the operation of the WTG can lead to disturbances in the SMS transmission.

An absent message is therefore not equivalent to a malfunction of the batcorder. Before checking on-site, some days should be waited. If , however, at the beginning of the analysis messages had been sent reliably, but then no SMS has been received for **a couple of days (3-6)**, this indicates a problem of the batcorder, and a checking of the device should be carried out.

Reduction of microphone sensitivity

By an by the microphone can lose sensitivity. If installed correctly it is indeed relatively robust, but long-term, non-stop outdoor exposure can lead to fatigue. In particular humidity an frost have negative effects. As on wind turbines there are particular extreme conditions, the sensitivity decreases considerably, often even after one year in operation. Since thereby data can no longer be collected comparably, a recalibration or an exchange is then necessary.

The microphone sensitivity is determined by using an ultrasonic transmitter, which is embedded in the microphone disc. When the device is switched off in

the morning a short sine sound will be played and compared with a reference value. If a reduction of sensitivity has been detected, this will be displayed with the message: TSL - xdB / -x dB or TSL: xxx% . A measurement of sensitivity, not carried out in a sound room, however, is never absolutely reliable and can vary e.g. depending on the weather conditions. If it rains, a waterdrop can cover the mesh over the microphone membrane as well. But if in the text message the information is sent about a decrease of sensitivity over several days (minimum < 70% over several days) it can be assumed that there is a serious loss of sensitivity.

Putting into operation

Painstakingly check the settings and faultless operation of the batcorder already before installation into a WTG nacelle. An incorrect configuration or wrong settings otherwise lead to no (usable) data for an analysis period, and/or it makes a new date on location necessary to clear faults.

The following proceedings for initiation should conscientiously be observed. These are also to be observed when e.g. changing the SDHC-card:

1. Insert a SDHC-card into the batcorder. Ensure, that this card is formatted correctly. Check the card beforehand with a device on the ground. In case of need have a card for substitution ready.
2. Switch on the batcorder and let the batcorder check the SDHC-card and if necessary it has to be formatted by the batcorder. If the card is changed the batcorder always has to be switched on again to check the card, because in case of a wrong formatted or faulty card it may not be possible to initiate the recording at the automatic start.
3. Check date and time as well as the filecode
4. Check the settings for recording (*quality, posttrigger, threshold und critical frequency*)
5. Make a test recording at manual mode.
6. Send a test SMS.
7. Check the setting of start and stop time in the Auto-Timer-Mode.

If all checks were successful, you can switch-off the batcorder.

Switching operation mode

The control module can be switched to operate as a box module reducing the power intake. This is necessary if for example the power supply by the turbine

is problematic or not existing. To switch the mode you need a batcorder 3 running on firmware 307 or newer. When starting the batcorder while it is connected to the control module hold the Mode key. A menu will show up allowing to switch between WKA (wind turbine) and box mode.

Note that when operating in box mode the 230V charger can not be connected to the module, otherwise it may get damaged. Thus when switching modes please only connect the lead-gel battery.

When running in box mode you can extend the runtime by using larger capacity batteries. In that case a 12 V battery can be used. With a 12 V 22 Ah battery you can get runtimes of 2,5 months and above in typical operation.

Rechargeable battery

The battery provided by us is dimensioned in such a way, that the batcorder operates for several days even given a mains failure. In the module the electronics for charging are designed for a 6 V lead-gel storage battery.



Not applicable are 12V or 24 V lead-gel storage batteries. Other battery types (NiMH; Li-ion,...) are not supported! These batteries can start to burn or can explode. Never ever connect these!

Timer on/off cycle simulation

For testing purposes the batcorder can be started in Timer-mode manually and also be stopped manually. To do so, start the batcorder while holding down the REC key. Follow screen instructions and Timer mode starts. By pressing Rec you can stop timer mode again. You then should receive a status SMS.

Processing of the recordings

Frequency of changes of the SDHC-cards

By using memory card with 16 or 32 GB, the necessary dates on location for changing filled-up SDHC-cards are reduced to a minimum. Possibly operations with one card are even feasible over several month. However, we recommend to change the card at least every four weeks. Several criteria increase the possibility of faulty cards, especially temperature fluctuation and electromagnetic radiation. Therefore a sufficiently often replacement of the cards with a

following check up of the recordings is highly recommendable. Only this can counter a possible loss of data in time.

Manual recordings check

After changing the cards, the up to date recordings should be saved on a hard dis. A short manual check-up of randomly chosen sequences out of the recording period enables to discover possible malfunctions of the device or failures, which lead to non analyzable recordings. Leads to faults are e.g. extremely long, several MB big recordings and/or extremely many recordings (hundreds to thousands per night). Ordinary recordings have a very low background emission, which is observable in a oscillogram or a sonagram. If all recordings show a highly increased noise or strong noise bands (in the sonagram), this is an indication for a disturbance. These can occur temporarily by increased acoustic or electromagnetic radiation (e.g. by much wind) or they can exist permanently. With permanent disturbances one should think about a malfunction of the device. But it also can be that the plant / the place of installation are generally not suitable for acoustic observation.

Analysis with bcAdmin

If you use our program bcAdmin for storage and analysis of your recordings, you have to adjust the settings of the analysis-algorithm to the batcorder settings as necessary. Should you have decreased the Threshold for recordings to a value below -27, you have to decrease the analysis threshold also in bcAdmin. Do analyze the nights of recordings, which you want to compare with each other, always with the same settings.

Species analysis with batIdent (former bcDiscriminator)

If you use the program batIdent for an automatic species analysis the quality of the results depend on the chosen settings on the batcorder and at bcAdmin. For optimum results we recommend to use the default settings of the batcorder and bcAdmin. If the threshold for recording is decreased to increase the range on the wind turbine, the identification results will be worse on average. This means, that more sequences will be discriminated only on a low level (e.g. "Nyctaloid") and that an increased number of wrong identifications will occur.



Activity analysis of various locations or within one time-series are only comparable concerning quantity and quality, if the chosen settings for the batcorder as well as for bcAdmin are alike.



If the threshold for recording has been changed at the batcorder, the threshold for analysis on the computer has to be adjusted accordingly. On this, please also read the manual for the program bcAdmin.

The call recognition of the batcorder sees to it that disturbance signals are basically not recorded. At high wind speeds (from about 8-9 m per second) recordings of disturbances occur increasingly even on the batcorder. These, however, will be recognized as outlier for the most part through the measurement of bcAdmin and the identification by batIdent. Respective call sequences are then marked in the identification entry either as “No Calls” or “Spec”. These recordings should not be included in the evaluation. On some plants disturbance signals can occur, which very much resemble bat-signals and therefore lead to wrong identifications. So can a squeaking noise of a constant frequency of 20 kHz be identified as an evening bat. If such identifications occur cumulatively at high wind speeds, here also should be checked again manually..

Technical specs

Battery input:

Input voltage 5.5V - 10V

Current at 6V:

batcorder off: < 2mA ; < 12mW

batcorder on / scanning:

batcorder 2: ca. 32mA ; 192mW

batcorder 3: ca. 17mA ; 100mW

batcorder on / writing a recording:

batcorder 2: ca. 42mA - 60mA; 252mW - 360mW

batcorder 3: ca. 25mA - 45mA; 150mW - 270mW

Power input (wall socket):

12-15 V / mind. 0.5A.

GSM-Modem:

Telit GL865-DUAL

Dual-Band GSM 900/1800MHz

Output-Power:

-Class 4 (2W) @ 900 MHz

-Class 1 (1W) @ 1800 MHz

EC Declaration of Conformity



*in accordance with EMC regulation 2004/108/EG
in accordance with LVD 2006/95/EG*

Responsible person for documents

*Claus Schuster
Hermann-Kolb-Str. 35b, 90475 Nuernberg, Germany*

The manufacturer

ecoObs GmbH, *Hermann-Kolb-Str. 35b, 90475 Nuernberg, Germany*

hereby declares for the product:

Product description: *WKA-extension - extension for the batcorder (digital bat call recorder) for monitoring setups in wind turbine nacelles.*

This product was designed to comply with the relevant sections of the above referenced specifications.

Nuernberg, 01.02.2013

(Claus Schuster)
Geschäftsführer , Entwicklung

(Dr. Volker Runkel)
Geschäftsführer, Anwendung

Problems / Support

Description of failures and contact

Like every other device the wind turbine extension of the batcorder can cause problems in operation. As in most cases these occur from easily to resolve reasons, we ask you to always contact us with a precise description of the failure, before sending us the device. The failure description should always include the serial number of the batcorder and the software version (Hxxx Sxxx). It is very helpful, to disclose a precise description of the failure.

For online reports of a failure you have our bugreporter at your disposal (<http://bugreporter.ecoobs.de>). Should you not use this, you can also send your failure report directly to:

info@ecoobs.de or
ecoObs GmbH,
Hermann-Kolb-Str. 35b, 90475 Nürnberg, Germany
Phone +49 (0)911 3768053.