

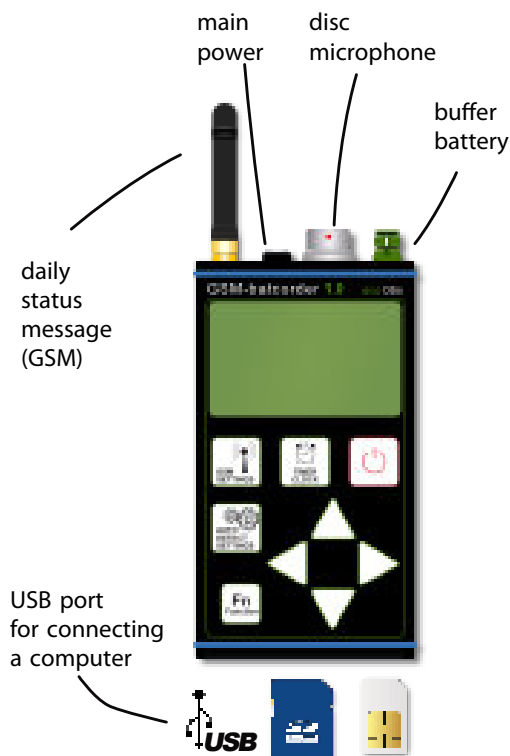
GSM-batcorder and RaspberryPi overview

The following document gives a short introduction to our RaspberryPi solution for backups of GSM-batcorder data. We will first describe the GSM-batcorder and its function to give a better understanding. 25.1.2017

GSM-batcorder

Basis of our new technology

Since 2017 the GSM-batcorder completes the monitoring of bat activity at wind-turbines. It is based on the well established batcorder 3 and includes the functionality offered by the wind turbine extension. Thus, a single device replaces the two independent devices used before. In addition it allows connection of a computer via built-in USB port for reading the recorded data. This port is enabled when the batcorder is not scanning for bat calls.



Short overview of functions

- **Status-SMS**: Each morning the device sends an SMS containing information about system status, for example recorded files, available space on sd card, microphone status etc.
- **Disk-Mikrophon**: Mikrofon-disc with 50 cm cable
- **Buffer-Battery**: the GSM-batcorder is supplied by this battery when scanning for bats. It also acts as buffer if power is out (for a week to two). At daytime, when the batcorder is inactive, the battery is recharged again.
- **Connected to main power** (EN61000-4 ESDair 15KV)
- Each evening and morning a signal is produced to test microphone sensitivity

Storage

The GSM-batcorder stores all files on its internal, user-exchangeable SD-card.

Depending on its settings these files will have durations of 200ms to a few seconds.

For one second space of 1 MB is needed.

In addition all events are recorded to the LOGFILE.TXT as well.

Typical amounts of data

By the feedback collected within the last years we can estimate the typical amount of data created per night in a normal monitoring. There are differences based on turbine type and location, but overall the typical amounts are:

- regularly less than 10 recordings are done per night on average with a few rare nights with up to 100 recordings
- often the average number of recordings is 10 to 250, single nights reaching 1000 recordings
- rarely an average of 500 recordings is reached, single nights with 5000 recordings are possible
- very rarely above 1000 recordings are stored on average per night.

In 2016 we implemented a noise filter in the batcorder that is also part of the GSM-batcorder. This will often reduce the amount of false positive triggers.

RaspberryPi - connection

The RaspberryPi can full-fill multiple tasks in a setup combined with the GSM-batcorder. The simplest use case is an automatic backup done every morning. The optimal use case is the remote access via internet. The following paragraphs cover the automatic backup.

Backup

The current implementation uses the automatic recognition of the USB port when the batcorder stops scanning for bats. The RaspberryPi detects the availability of the USB port and starts a backup if a backup medium is connected. This is based on the USBMOUNT¹ tool. A script running a rsync is then started automatically.

The script expects the backup medium to be labeled BACKUP, the GSM-batcorder is labelled automatically GSM_BC by the batcorder. The volumes are mounted within /var/run/usbmount/ if these two links are available there, the script runs a backup. As user you have to make sure the backup is labelled correctly. Note that only FAT32 formatted backup media are supported. If you need to run a differently formatted medium, make sure you install necessary packages on your RaspberryPi.

In addition the LOGFILE.TXT is zipped to a new file each time the script runs.

After running the backup the script checks used space and if necessary labels the

GSM-batcorder sd card so it will be deleted on the next time the batcorder starts.

¹ <https://usbmount.alioth.debian.org>

Possible setups of GSM-batcorder / RaspberryPi

Various setups are possible regarding connection and remote access to the RaspberryPi:

- **GSM↔RPI** : Only backup, both devices installed next to each other connected via USB.
- **GSM↔USB/FO/USB↔RPI**: batcorder installed in nacelle, RaspberryPi at ground level, connected via USB / fibreoptics; backup service only, the RaspberryPi can be accessed at ground level.
- **GSM↔RPI↔turbine network**: Both devices are setup Finte nacelle, the RaspberryPi is connected to the turbine network and can be accessed if the user connects to the network as well. Data can be downloaded from the RaspberryPi.
- **GSM↔RPI↔turbine network↔DSL**: as above, but the RaspberryPi is available through the DSL / landline of the turbine and data can be download remotely.
- **GSM↔USB/FO/USB↔RPI↔DSL**: The batcorder is installed in the nacelle and connected over USB / fibreoptics to the raspberryPi residing at ground level. The raspberryPi is connected to the DSL line and can be accessed remotely.
- **GSM↔RPI↔LTE-Modem**: as above, but using a standalone and independent

LTE/G4 modem for the raspberryPi
remote access RaspberryPi abrufbar
respektive RaspberryPi überträgt Daten
automatisch auf Server des Kunden