VERTEX Lite Collar

User's Manual

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VERTEX Lite Collar

User Manual

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	Name	Date	Signature
Prepared by	Marcel Butz	24.06.2016	
Edited by	Chris Samek	03.07.2019	
Checked by	Nicola Gadow	03.07.2019	
Approved by	Robert Schulte	03.07.2019	
Authorized by			

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Issue	Date	Item(s) Affected	Description
1	22.07.16		Standardized Spellings
2	06.03.17	Layout	Changed layout
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Table of Contents

1   Product overview

The VERTEX Lite Collar generates GPS, mortality and activity data. It sends regular GPS and mortality updates via GSM / Globalstar / Iridium communication.

Most important features:

- Unlimited GPS localizations per day

- 3-axis accelerometer to measure activity

- User definable Beacon and GPS settings

- On board flash memory

- Drop Off (on demand)

- 24/7 mortality observation and notification

- Ambient temperature data

- Any Battery 1C- 7D

- Field replaceable Batteries

Communication options:

- Globalstar (One-way communication: enables data download)

- Iridium (Two-way communication: enables data download and upload of new commands and schedules)

- GSM (Two-way communication: enables data download and upload of new commands and schedules)

- Bluetooth Communication for on-site Data and Configuration management

The VERTEX Lite Collars can also host an UHF ID Tag to be used in interaction studies in combination with a VERTEX Plus collar.

All data is stored on the flash memory onboard the collar. GPS locations, temperature and event data are sent using either Globalstar / Iridium / GSM communication. After retrieval of the collar, data can be downloaded using the USB Remote Stick (wireless data communication with a few meters range).

Globalstar collars can be reconfigured with the USB Remote Stick, whereas Iridium and GSM collars can also be reconfigured remotely using the two-way communication:

- GPS schedule and settings

- Beacon schedule and settings

- Mortality period

- Iridium / GSM settings

2 Fast guide to deploy the collar

The collars come thoroughly tested and fully programmed according to your instructions. Nevertheless we recommend to setup your GPS Plus X (software) system beforehand, check the programmed settings and test the collars:

1. Make yourself familiar with the collar [(de)activation magnet should be attached]

2. Setup your GPS Plus X software system (for further information please refer to the GPS Plus X software manual)

3. Register the collars

4. Check / change the settings (using the USB Remote Stick / USB Bluetooth Stick)

5. Check Drop Off configuration and lifetime (please refer to GPS Plus Drop Off Manager or Info Files provided with the collar)

6. Make a lifetime calculation (optional)

7. Test the collars

   7.1 Remove the (de)activation magnet (not the Drop Off magnet!)

   7.2 Place them preferably outdoors with clear view to the sky (Do not place the collars too tightly as their signals might interfere and affect the testing)

   7.3 Listen for the VHF beacon signal (Check settings for frequency and pattern types beforehand)

   7.4 Wait for incoming messages (Check for expected time frames first, plan your testing to include several data transmission windows)

   7.5 Process incoming data and check signal quality etc.

7.6 (GSM / Iridium: send reconfiguration commands remotely)

7.7 Deactivate them by reattaching the magnet

Do not trigger the Drop Off! It can only be used once!

8. Check and optionally alter the settings to field configuration

9. Deploy the collar (NOTE: remove all magnets and cut the overhanging belting to minimize the risk to injure or handicap the animal)

The steps of this list will be explained in more detail in the following chapters.

3 The Vertex Lite collar system

The VERTEX Lite Collar uses a two housing design, one electronic and one battery unit. The VHF beacon antenna is integrated into the belt. There are different collar designs, housings and battery sizes to fit it to each species.

follow the links to the subtopics explaining the collar and its system:

The collar

GPS Receiver

VHF Beacon

Mortality Sensor

Communication options

Software

Data Format

3.1 The Collar

The VERTEX Lite Collar consists of the following components:

electronic housing

(de)activation magnet

collar belt with integrated VHF beacon antenna

collar belt with integrated power cable

screws to adjust collar to neck circumference

battery connector

Drop off

Drop off magnet

battery pack
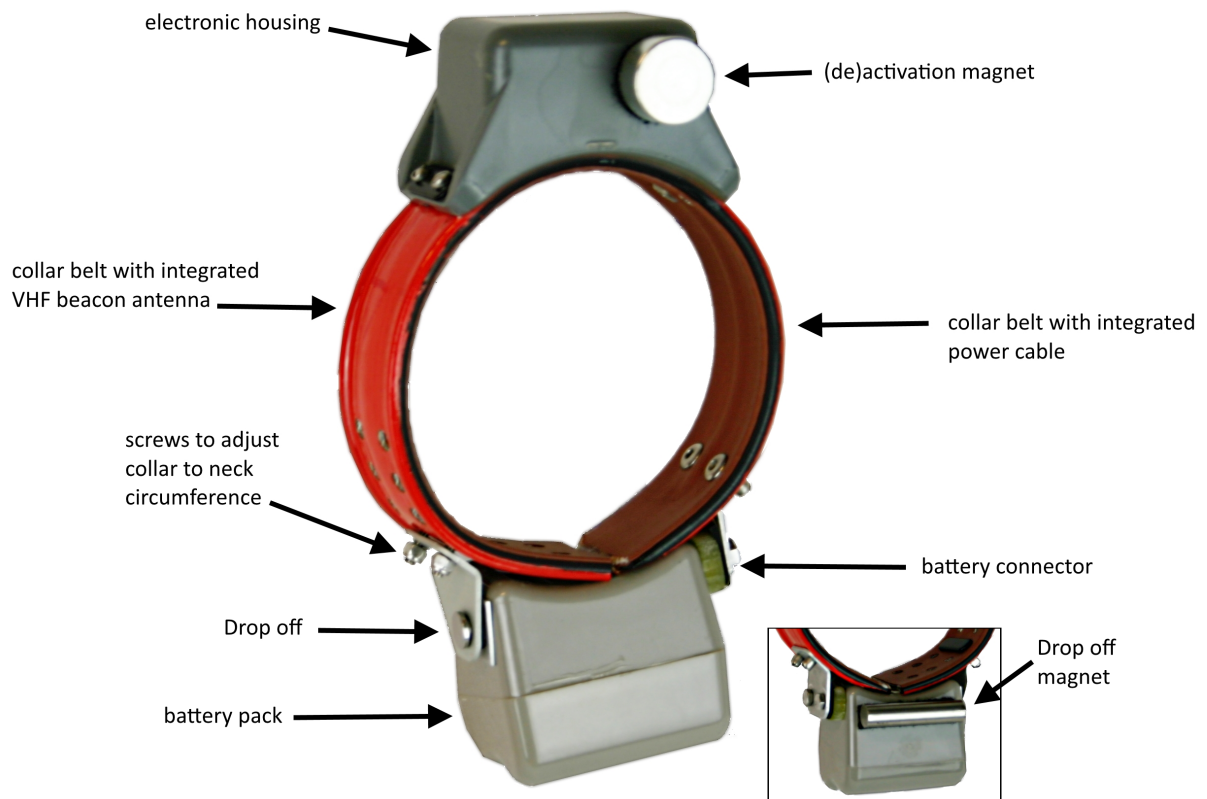
Figure 1: VERTEX Lite Collar

3.2   GPS Receiver

The collar contains a standard GPS receiver with an accuracy within 8 - 15 meters as mean. The actual accuracy depends on many factors such as terrain, satellite reception and time to conduct a fix (GPS position). Most fixes will be far more accurate.

A GPS schedule defines when GPS positions will be recorded. Programming of the GPS schedule is very flexible and easy.

Once activated the receiver listens for satellite data and collects ephemerides data to conduct a GPS location. The maximum listening period is 180s but it will stop listening before that if

a) it receives a validated fix of highest quality

b) it gets several decent quality signals

c) it gets no satellite connection at all

Each GPS position is stored with following data:

- UTC (universal time coordinated) date and time

- GPS coordinates (Latitude, Longitude and Height)

- Dilution of Precision (DOP) and navigation status as quality information as well as number of satellites used for positioning.

GPS data can be exported via the user software GPS Plus X to ASCII, Spreadsheet, DBase, GPS Exchange, Google Earth and BioTelemetry eXchange format. You can easily import the data into Google Earth via kml.file to visualise GPS positions.

3.3 VHF Beacon

The collar is equipped with a powerful VHF beacon. The VHF Beacon transmits a signal on Very High Frequency. It allows you to track the collar even if satellite or GSM communication is down. The VHF Beacon is set for a certain range of frequencies and you are able to change it within this range using GPS Plus X. You can program when the VHF Beacon is on and also its signal pattern. The VERTEX Lite has three distinct signal modes, the Standard Pattern, the Mortality Pattern, and the Emergency Pattern. There is a backup battery for the beacon to ensure you do not lose your collar due to low battery issues. The Mortality Pattern is active when a mortality event has been recorded (Mortality Sensor). The default setting can be seen below but you are able to change the Pulse Length and also Loop Length meaning the cycle in which the signal is repeated.
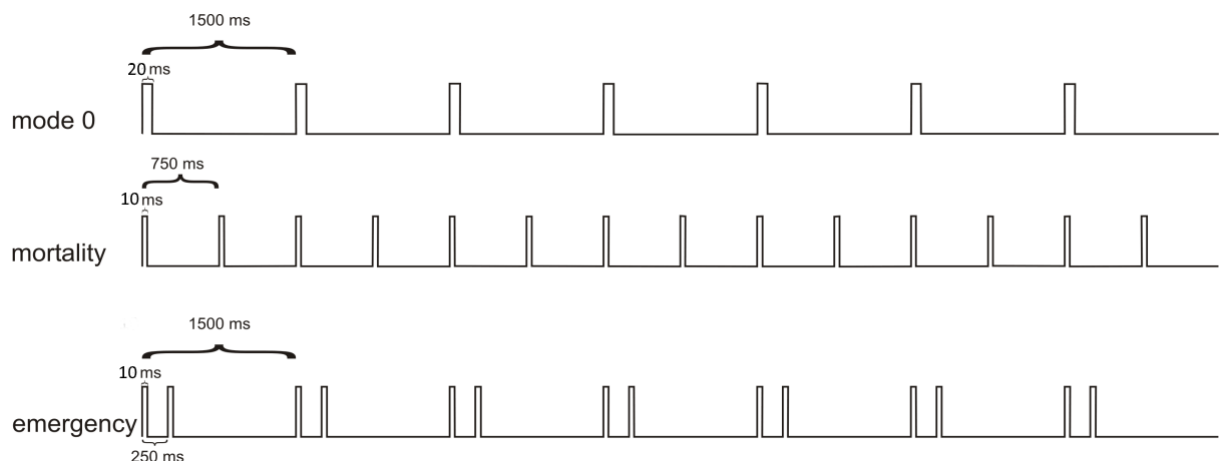
Figure 2: Beacon patterns (default setting): Standard Pattern, Mortality Pattern, Emergency Pattern

The changes can be made in the GPS Plus X software:

Devices → ✏ Remote Stick → ⚲ VERTEX Lite → ☑ Configuration → ☑ User Configuration

Devices → ✏ USB Bluetooth Stick→ ⚲ VERTEX Lite → ☑ Configuration → ☑

User Configuration

3.4   Mortality Sensor

The mortality sensor measures the activity of the animal. If no movement (activity) is detected for a user-defined period (e.g. 24 hours), a mortality event is triggered. The mortality period is user-definable and can be set up to 140 hours. When a mortality event is detected, the collar:

- Switches the VHF Beacon pattern to the Mortality Mode

- Sends out a mortality event message via Globalstar / Iridium / GSM communication

- Conducts unscheduled GPS fixes each 30 minutes for six hours before it returns to the programmed schedule

- Sends messages according to set communication patterns

The collar will end the mortality mode if the sensor registers repetitive activity for roughly 20 minutes.

NOTE: The mortality period should be adapted to the behavior of the collared animal so you get no false events (e.g. lions with a very long passive phase should get a longer mortality period as for example roe deer with a distinct but short activity pattern). The default setting is 24h which has been used successfully in a variety of studies.

3.5   Activity Sensor (Acceleration)

The VERTEX Lite Collar is equipped with a Basic Activity sensor. The data are stored in the on board flash memory. The sensor records average data every 300 seconds. You can analyze relative activity based on right-left, up-down and forward- backward movement.
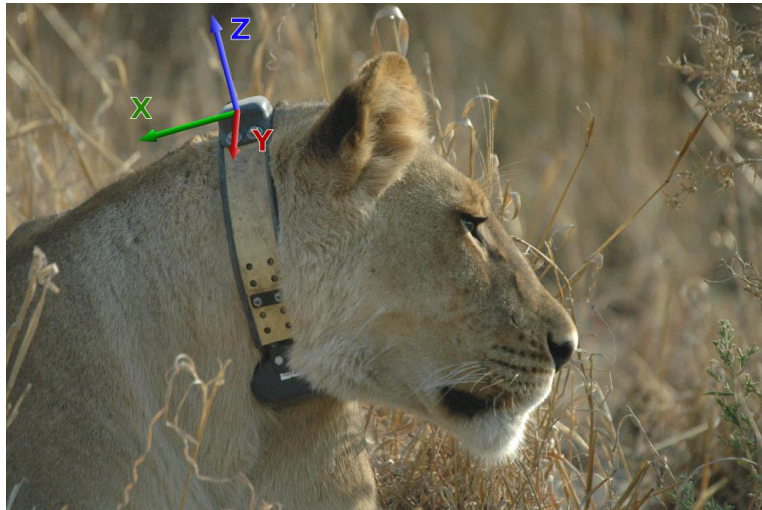
Figure 3: Directions of the three activity axes

3.6   Drop Off

Drop Offs allow retrieving the collar without having to recapture the animal.

There are two optional Drop Offs available:

- **Timer-controlled Drop Off:** The collar is released after a pre-defined period of time (relative mode, e.g. 100 weeks) or at a pre-defined date and time (absolute mode, e.g. 01 April 2017). The lifetime of the Drop Off is up to five years after production. The countdown in relative mode starts after removing the Drop Off magnet.

- **Radio-and-timer-controlled Drop Off:** The collar is released on demand by UHF radio signal. To trigger the release a UHF Handheld Terminal Version 5 or higher or a Drop Off Release Transmitter is needed. The maximum distance is about 500 m (For more information please refer to the Drop Off Release Transmitter manual). Additional timer control (relative or absolute mode) functions as backup. The lifetime of this Drop Off is up to 4 years after production.
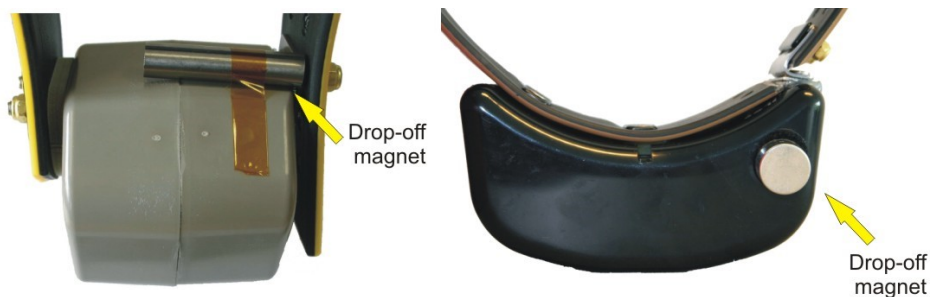
Figure 4: Drop Off magnet for standby mode

Figure 5: Drop Off release sites, magnet removed

3.7 Communication options

The VERTEX Lite Collar is available as Iridium, Globalstar or GSM version. Follow the link to your chosen configuration for information about the respective communication system.

Iridium

Globalstar

GSM

3.7.1 Globalstar Communication

Globalstar offers a one-way communication, which means you receive GPS and mortality data, transmitted by the collar. The system provides a broad, but space and time restricted coverage network.

Figure 6: Globalstar Coverage 2015

Each position data is sent by the collar (1-2 Fix per message with minimum pause of 30min between each message). Data is sent out several times to increase transmission probability but data reception is not confirmed by the satellites. The satellite sends its data to a base station on ground which forwards it via web to our system. It is possible that tran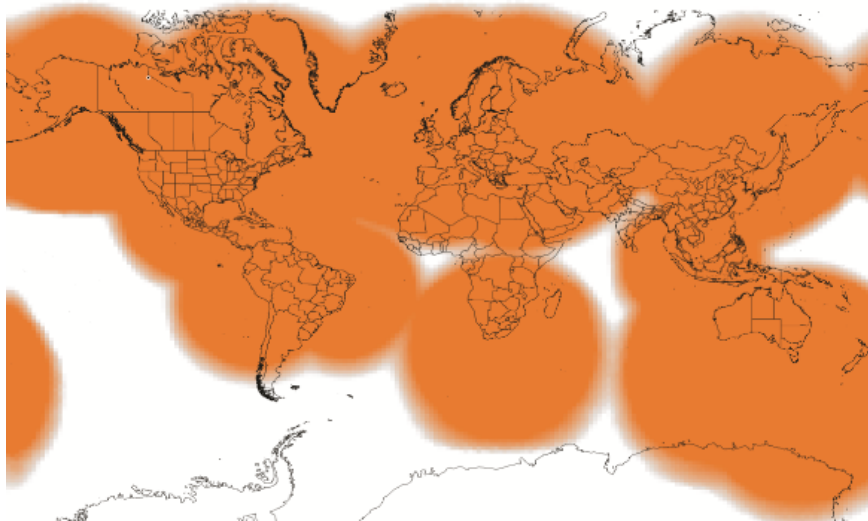smissions are blocked (e.g. thick canopy, bad angle towards sky etc.) and do not reach the satellites and thereby you. Most often the data will get through and to our system from which your GPS Plus X software will automatically download the data. You can also get the data as email forwarding when the Http download is unsuitable for whatever reason. You can get the full dataset by downloading it with the USB Remote stick after collar retrieval.

NOTE: You can set a skip count to exclude some fixes from the data satellite transmission pool to receive fewer messages and thereby extend the collar lifetime (e.g. skip count 2 means sending only every second fix, all data remains stored on the collar too). Please keep in mind that you cannot alter the settings once the collar is deployed. A skip count could potentially drastically reduce the collar messages you receive up to getting no data (e.g. high GPS skip count in a very unsuitable habitat such as dense forest). For further information please contact our customer service.

3.7.2 Iridium Communication

Iridium offers a two-way communication, meaning you receive GPS data from the collar and can send new commands and schedules remotely to the collar. The Iridium system consists of 141 satellites with global coverage for 24/7.

Figure 7: Iridium 24h worldwide satellite coverage

You can download and upload schedules and configurations remotely. Due to the two-way communication, the collar knows which data have been received by the satellite and which data need to be resent again. That means you will get all data though data packages come in later.

For transmitting the data, the collar needs a clear view to the sky. The number of fixes defines the message size and thereby transmission time.

How it works:

The system uses 3 message blocks wherein the first block can contain 1-4 GPS fixes, the second block, an additional 8 at most and the third and last block, an additional 6. In total, 18 fixes (in one big message) can be transmitted in one transmission window. The remaining space within a block will be filled with placeholder data, so the message won't get smaller if you choose less than 4 (1-3), 12 (5-11), 18 (13-17).

Please note that the collar "listens" for incoming commands only when it is sending out data, meaning you have distinct communication windows based on the schedule used and transmission made (e.g. hourly fixes with 4 fixes a message result in one message every 4 hours). Data are sent to our GPS Plus X main server and provided to your GPS Plus X software for HTTP download or email forwarding / reception.

NOTE: It highly depends on species and terrain how many fixes the collar should transmit in one message. In most cases we recommend to start with 4 fixes per message (default settings) and to increase the number after deployment when you see data is incoming regularly. An unsuitable setting (e.g. 18 fixes / message in dense forest) could result in high rate of failed transmissions or in worst case in loosing contact to the collar.

NOTE: You can set a skip count to exclude some fixes from the data satellite transmission pool to receive fewer messages and thereby extend the battery lifetime (e.g. skip count 2 means sending only every third fix, all data will be stored in the collar too). A skip count reduces the collar messages you receive (High GPS skip count in a very unsuitable habitat such as dense forest may result in losing contact with the collar).

3.7.3   GSM Communication

GSM is using the SMS service of mobile phone providers. The GSM communication is a two-way communication, meaning you receive GPS data from the collar and can send new commands and schedules remotely to the collar. GPS and mortality data will be sent automatically via SMS to the defined phone number. If you wish to send new commands or schedules remotely, please contact our customer service. It is only possible to communicate with the collar within GSM provider coverage.
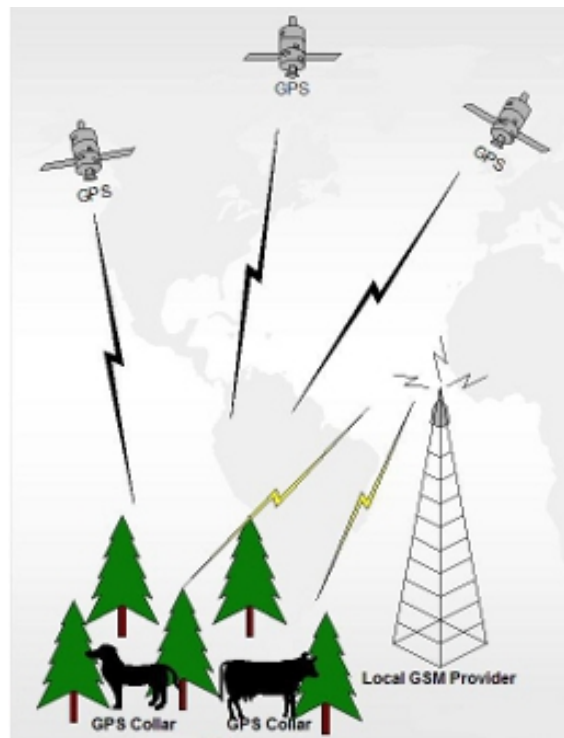
Figure 8: GSM Communication

For collar usage within Europe we provide GSM collars with **VECTRONIC SIM chips** so you do not have to take care about provider administration. **VECTRONIC SIM chips** are soldered in the electronic housing and highly reliable in all kinds of environmental conditions (heat, cold, humidity, vibrations, shock).
How it works:
One message transmitted via GSM/GPRS contains 8 GPS positions per default. Messages will be sent to VECTRONIC ground-station and from there downloaded via HTTP to GPS Plus X software. All GPS Data, irrespective of transmitting, will be stored in the non-volatile on-board-memory. Data not transmitted via GSM can be downloaded via UHF radio link (if available) or via USB Remote Stick after the collar has been retrieved.

For collar usage in Africa, Asia or North- and South America, you may choose your own mobile phone provider and provide Micro SIM cards on your own. Here, message transmitted via GSM contains 7 GPS positions per default. It is recommended having your own GSM Ground station if you using your GSM collars with your own SIM cards.

Figure 9: GSM Ground Station

NOTE: If no communication can be established between the GSM network and the collar or the GSM ground station, the GSM provider will retry to send the data. Data in the provider's memory are subject to a validity period. If no contact has been established within this period (usually 2-3 days, but depending on the provider's conditions), the data stored by the provider will be deleted without delivery. For this reason, make sure that your ground station is switched on at all times to allow the data to reach you within the validity period. If a newly sent GPS schedule is not delivered within the validity period, resend the schedule to make sure that the collar has received the new schedule from the GSM network. If you have questions please do not hesitate to ask our customer service.

3.8 Software

All VECTRONIC collars are managed with our free software GPS Plus X which can be downloaded from our homepage (www.vectronic-aerospace.com). It is also on the user-CD which initially accompanied the collars.

The auto-installer includes an Installation Wizard which will guide you through the installation and setup.

For more information refer to System Set-up.

3.9 Data Format

All data is stored internally in binary format and can be exported as ASCII, Spreadsheet, DBase, and BioTelemetry eXchange format. GPS data can also be exported as GPS Exchange and Google Earth files.

- **GPS position information:** No, Collar ID, UTC date and time, LMT date and time, origin, SCTS date and time, ECEF X,Y and Z, latitude/longitude/height, DOP, 3D Error, number of the used satellites, Satellite ID (Sat No), Carrier to Noise (C/No [dBHz]), battery voltage, mortality status, temperature and activity

- **Temperature:** Temperature data are stored and transmitted with the GPS position data.

- Mortality information: Date and time of a mortality event based on the activity of the animal. The GPS Plus X software stores the received mortality message in the data base.

- Activity: records averaged data every 300 seconds on 3-axis (X, Y, Z). So, you can analyze relative activity based on right- left, up- down and forward- backward movement. Activity data can be downloaded after collar retrieval. (Format: adf. or adf3.)

3.9.1   List of files and extensions used

Download files

.GDF	GPS Data File	Binary coded GPS fix data from the collar including main battery voltage, VHF beacon battery voltage, and temperature. The file name consists of the collar number and the time stamp of the file creation coded as "yyyymmddhhmmss".

Export files

.GDF	GPS Data File	Binary coded GPS fix data from the collar including main battery voltage, VHF beacon battery voltage, and temperature. The file name consists of the collar number and the time stamp of the file creation coded as "yyyymmddhhmmss".
.TXT	ASCII	Visually readable equidistant table, compatible to conventional text editors and spreadsheets
.CSV	Spreadsheet	Computer readable table, compatible to conventional text editors and spreadsheets
.DBF	DBase Table	Database format, compatible to conventional spreadsheets and most text editors
.GPX	GPS Exchange Format	File for data exchange with GPS devices
.KML	KML	Google Earth file to display tracks, points of interest…
.KMZ	KMZ	Zipped Google Earth file

.BTX	BioTelemetry eXchange	VECTRONIC-defined XML-format
.GDX	GPS Data eXchange	Is an XML format defined by VECTRONIC Aerospace, which will make it easier to exchange acquired data over system boundaries. It is an internal format of GPS Plus X and can also be used as import format.
.ADF		2-axis Activity Data File
.ADF3		3-axis Activity Data File

Upload files

.vbsf	Beacon Schedule File	VHF beacon schedule of the Survey collar
.vgsf	GPS Schedule File	GPS schedule of the Survey collar

Hardware information files

.CCF	Collar Configuration File	contains the configuration (schedules, communication configuration, activity mode) of the collar
.bin	Collar Firmware File	contains firmware for Survey collars
.key	Collar Key File	contains a key for one collar, needed to register the collar in the GPS Plus X and to manage its data
.txt	Collar Info File	contains all information on the collar configuration

4 System Set-up

All VECTRONIC collars come completely programmed according to your specifications. You can change the configuration yourself with the GPS Plus X user software and the Communication Device (USB remote Stick, USB Bluetooth Stick).

This section will guide you through all steps for getting started whereas you will find a more detailed description for all features in the GPS Plus X software Manual.

Firstly: <u>Installation of the user-software GPS Plus X</u>

Secondly: <u>Collar Registration</u>

Thirdly: <u>Registration of the Communcation Device</u> (USB Remote Stick / USB Bluetooth Stick)

4.1   Installation of the user-software GPS Plus X

The Installation wizard will guide you through the process of installing GPS Plus X. You can install the software from the User-CD (auto-run or manual from the folder / software / GPS Plus X) or download the latest version from our website: <u>www.vectronic-aerospace.com</u>.

The installation procedure will ask you for a destination directory and suggest a default directory. You can now decide whether you want to install one of the following software packages (list might vary with program versions):

- User Interface: Collar communication and configuration
- Data Storage Service: Data management, visualization and export
- Data Collector Service: Data reception and distribution
- Color Selector: Tool to select a color for the belt of your collar
- TeamViewerQS VAS: Tool for remote desktop support
- GPS Plus X Manual: integrated Manual

By default, GPS Plus X will be configured to run on a single computer. Please refer to the GPS Plus X software manual for further details on GPS Plus X network set-up.

4.2   Collar Registration

To be able to configure the collars and to process data and messages with the GPS Plus X software, you need to register the collars. The keys for each collar will be provided with the User-CD which comes included with the collars.

For registering the collar, please go to the ***Configuration tree*** in GPS Plus X and select → 💡 ***Collars***
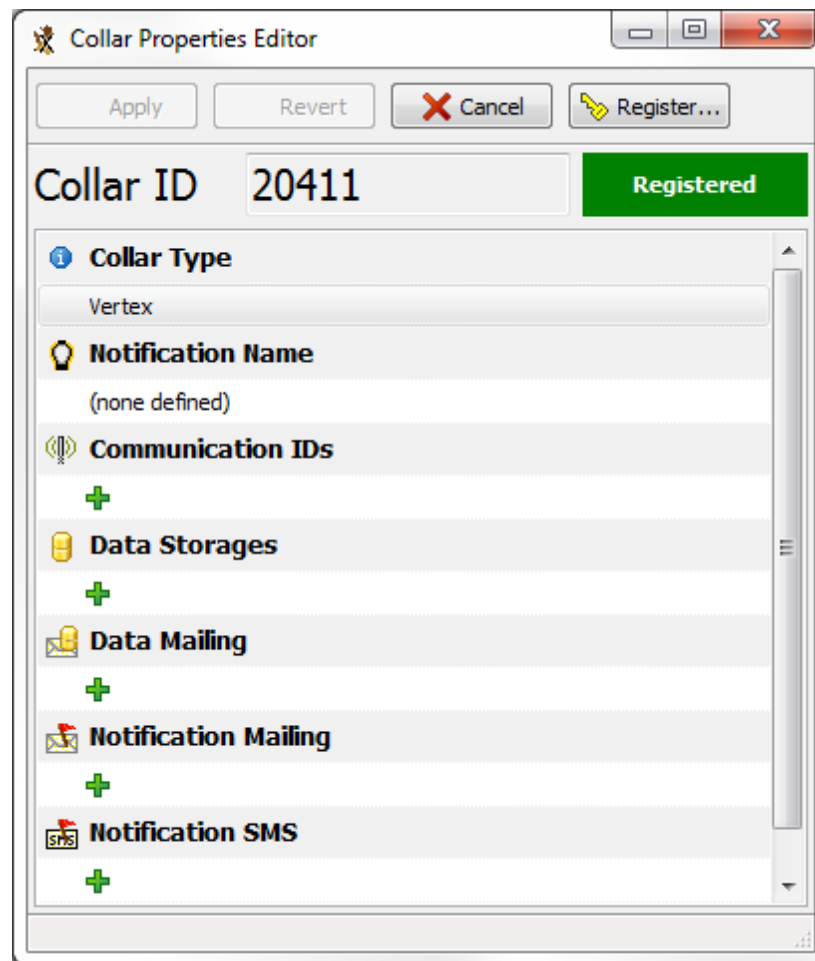
Figure 10: Collar Properties Editor

In the appearing window "Collar List", press ⚛ to add a new collar to the list. After clicking on the button, the Collar Properties Editor appears. To register a collar, click [🖊 Register...]. An open file dialog will open and you can select the collar registration key for the collar (to be found in the folder Resources\Collar and Drop Off Keys).

If you add the details before registering the collar, the registration status of the collar will be invalid. After registration, the entry of the corresponding collar will change from invalid to valid. For more information on collar registration, refer to the GPS Plus X Manual.

After you have registered the collar, you will be able to communicate with the collar using the USB Device.

4.3   Registration of Communication Devices

To be able to configure the collars and to process data and messages with the GPS Plus X software, please connect either the USB Remote Stick or the USB Bluetooth

Stick to your PC while GPS Plus X is open. When you plug in the USB Device for the first time, you need to register it. A window will appear to inform you that this device has not been registered yet (see Figure below). It will give you a Device Description and the possibility to choose a Display Name.
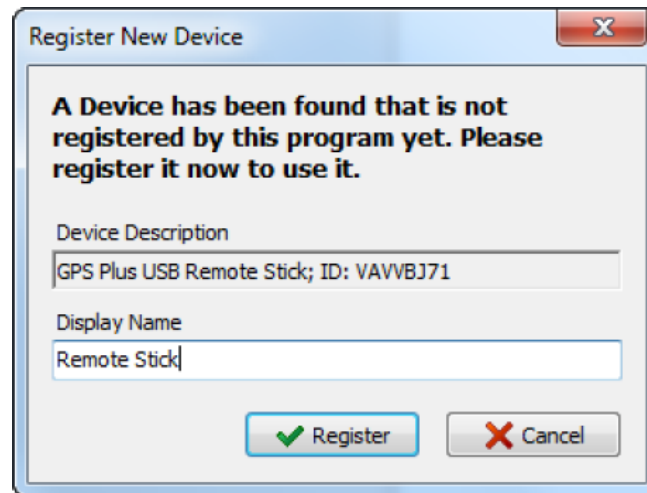

Figure 11: USB Remote Stick registration

Click on [✔ Register] after you have typed in a name which allows you to recognize your USB Device easily.

After you have registered the USB Device, it will appear in **Configuration →** ☑ **Local Settings →** ☑ **Device Registration.**

USB Remote Stick:

Clicking on the ✎ Remote Stick symbol in the Devices tree, the USB Remote Stick Properties frame will open.

Figure 12: USB Remote Stick Properties

In this frame, you can see all the details of the Remote Stick, change the Display Name and upload the new firmware by clicking on ![Upload] in the Firmware Upload tab (if a newer version than the recent one is available).

Once you have registered the collar and Remote Stick you can start managing your collar.
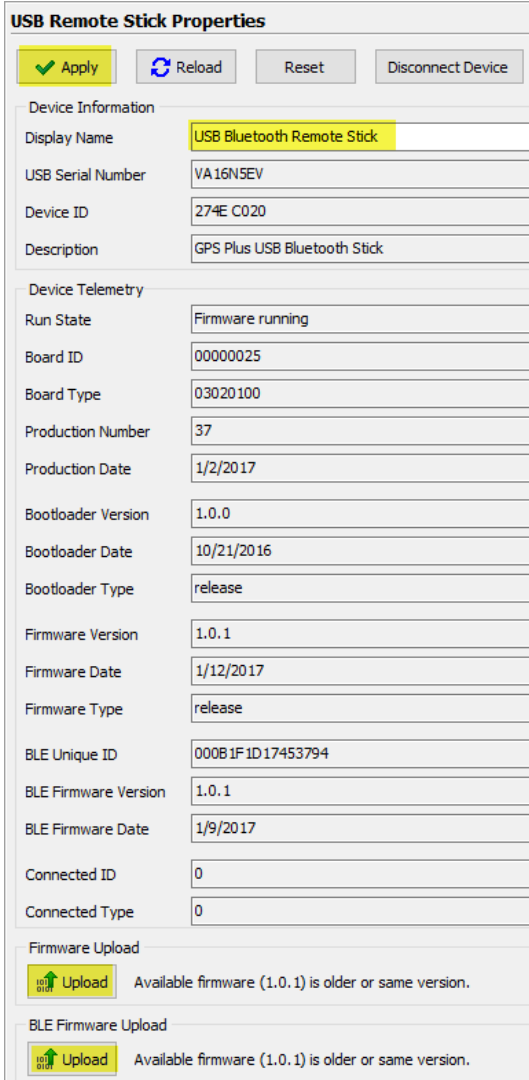
NOTE: The Driver of the Remote Stick should be found automatically. If the installation does not work automatically you can find the driver (as executable) on the User-CD, folder Resources/VECTRONIC Tools and Drivers/USB Driver installer/ USB To Collar

Interface Driver Setup.exe)

USB Bluetooth Stick:

If the Bluetooth Stick does not show up, refer to <u>USB Bluetooth Stick</u> for information about driver setup.

If you click on the 📡USB Bluetooth Stick itself the property frame will open. Here you can rename your device or upload the latest firmware version.

USB Remote Stick Properties

✔ Apply	🔄 Reload	Reset	Disconnect Device

Device Information

Display Name	USB Bluetooth Remote Stick
USB Serial Number	VA16N5EV
Device ID	274E C020
Description	GPS Plus USB Bluetooth Stick

Device Telemetry

Run State	Firmware running
Board ID	00000025
Board Type	03020100
Production Number	37
Production Date	1/2/2017
Bootloader Version	1.0.0
Bootloader Date	10/21/2016
Bootloader Type	release
Firmware Version	1.0.1
Firmware Date	1/12/2017
Firmware Type	release
BLE Unique ID	000B1F1D17453794
BLE Firmware Version	1.0.1
BLE Firmware Date	1/9/2017
Connected ID	0
Connected Type	0

Firmware Upload

📤 Upload Available firmware (1.0.1) is older or same version.

BLE Firmware Upload

📤 Upload Available firmware (1.0.1) is older or same version.

Figure 13: USB Bluetooth Stick Properties

5   Direct Collar Communication

VERTEX Lite Collars can be accessed via USB Remote Stick or via USB Bluetooth Stick.

Figure 14: left: USB Remote Stick; right: USB Bluetooth Stick

Combined with the GPS Plus X software, these are tools to upload configurations, schedules and to download measurement data or show collar status information. You need to make the configurations while one of the USB devices is attached to your computer and the collar is in a range of a few meters. You are able to communicate with several collars simultaneously and configure them parallel as well.

After you set-up your system you are able to communicate with the collar.

5.1   USB Bluetooth Stick

If you update your GPS Plus X software, the following frame will appear. Click install to be able to use the USB Bluetooth Stick.
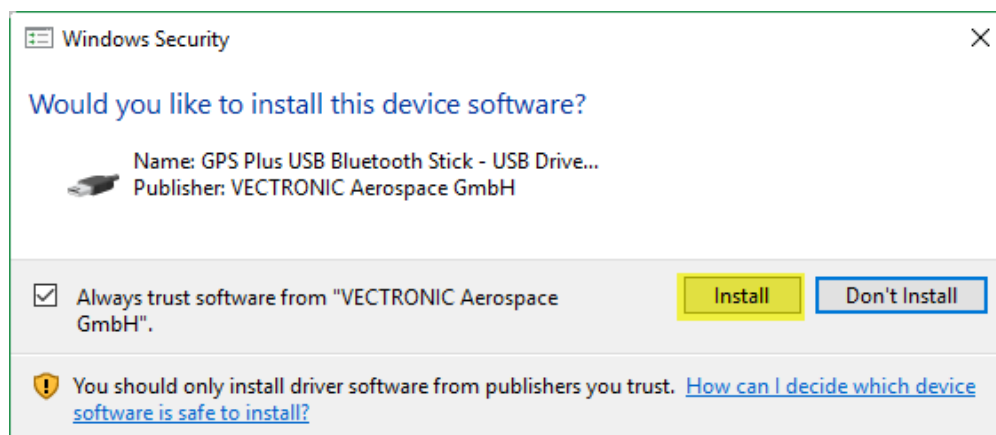

Figure 15: USB Bluetooth Stick Driver installation

You can find the USB Bluetooth Stick under **Devices → 📶 USB Bluetooth Stick**. If you remove the magnet of your VERTEX Lite collar it will appear as a subnode of the Bluetooth Stick. Now you can change Collar Configurations and Schedules and access Information and Collar Data. Refer to Collar Main Tree for more information.
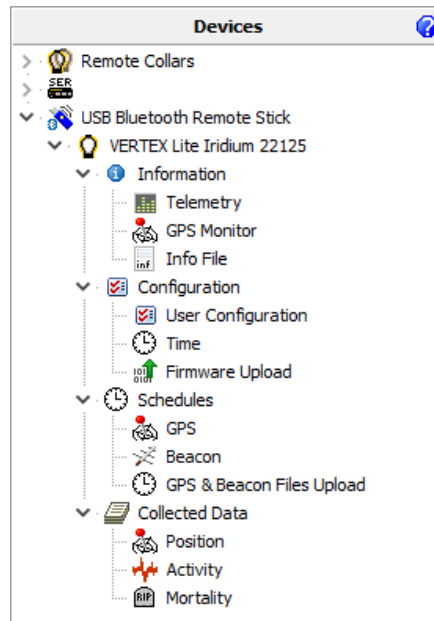

Figure 16: Device list: USB Bluetooth Stick

5.2   USB Remote Stick

You can find the USB Remote Stick under **Devices → 📶 Remote Stick**. It shows two options (📶 Radio Monitor and 📶 Device Search) whereas only the latter is important for the first steps in collar communication.

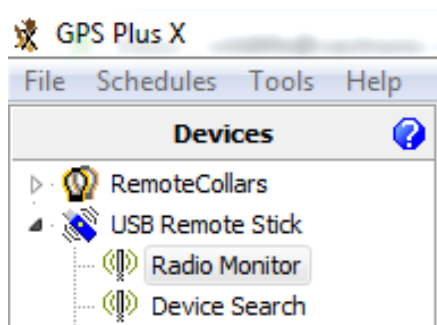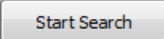**Figure 17: USB Remote Stick Device Search frame**

The "Radio Monitor" feature is discussed in chapter <u>The VERTEX Lite Collar as UHF ID Tag.</u>

In the node "Device Search" you can search for collars. Per default you search for any devices in range ("Any Device"). You can also search for specific device types. To do that, select a Device Type. If you want to search for a specific collar ID, please enable

Specific Device ID and select the ID of your collar. Click on [Start Search] , attach the magnet to your device within the next 10 seconds and detach it after one second (As it is described in <u>Collar Contact (general)</u>). A list of all devices found will appear.
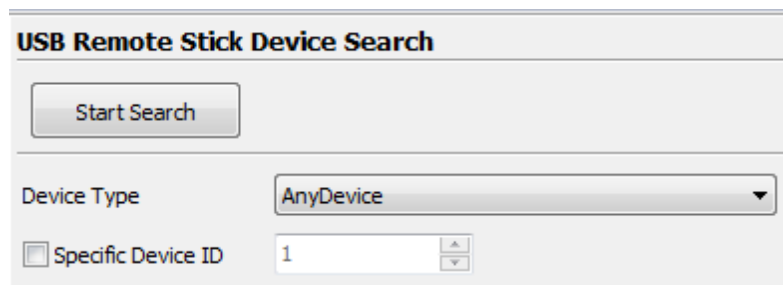
Figure 18: USB Remote Stick Device Search frame

Once ensured that the devices work and can be contacted by the software, collar communication and reconfiguration can be started.

5.2.1 Remote Stick Collar Contact

To configure the collar, make sure that the magnet is detached from the collar so that it is able to receive configurations and send data. Whenever you click on a node in the Devices tree (Information, Configuration, Schedules or Collected data), a notification message will appear. In this message, you are requested to attach the magnet to the collar and detach it after one second. You can abort the connecting process by clicking the corresponding button or the ESC button on your keyboard.
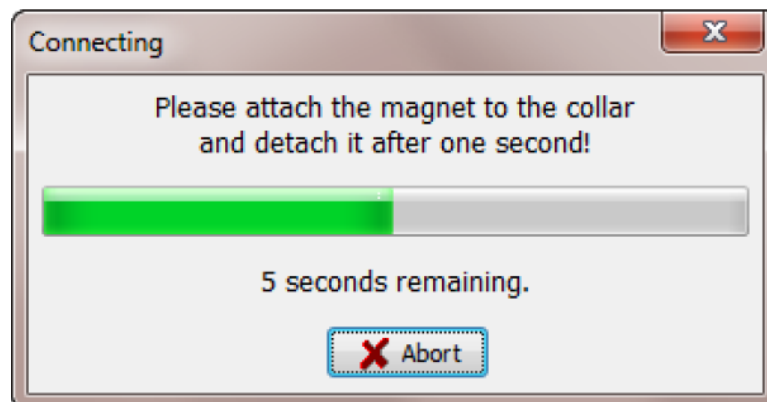
Figure 19: Notification window which appears when you send out a command of any kind.

It sometimes happens that the communication cannot be established, resulting in the display of different error messages. Most often it will be enough to redo it. The communication works best when there is a clear path between collar and USB Remote Stick without obstacles which might interfere with the signals.

Recommendation: A simple trick to speed up the process is to place the magnet upside-down on the connection port of the collar while working with it instead of reattaching it securely with the Velcro tape each time.

5.2.2   Testing several collars

Most features offer you the option to read out / upload a schedule / parameter / configuration to a specific collar or any collars in range. Using the latter option you can check and reconfigure your collars in a row without much in-between handiwork involved. Please note that it works for collars of one kind only.
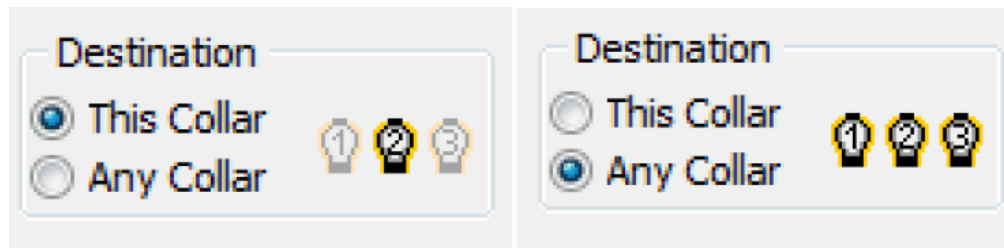

Figure 20: Command destination

Using the "Any Collar" option, the command is internally (invisibly) altered so it can be received and processed by any fitting collar (e.g. no collar ID involved). You will have to press "apply", "send" for each collar anew but do not have to move within the configuration tree.

5.3   Collar Main Tree

Devices → Remote Stick → VERTEX Lite

Devices → USB Bluetooth Stick → VERTEX Lite

The Collar Main Tree gives you an overview on what can be down- and uploaded to and from your collar and informs you about current settings.
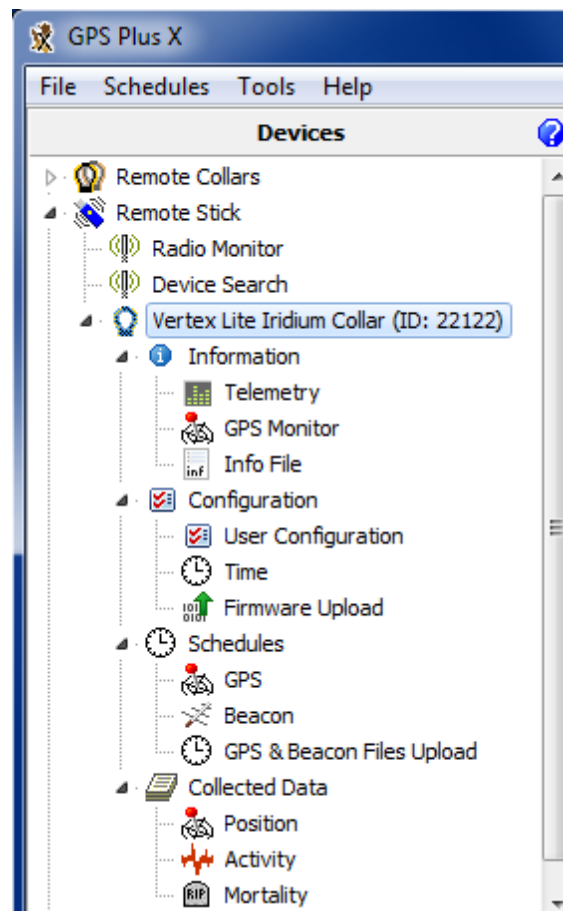
Figure 21: Collar Main Tree (VERTEX Lite)

The first node (Information) contains what it says, information about hardware and the actual settings of the collar. It also enables testing its basic functionality.

The second node (Configuration) includes all user configurations for the collar and is, with the third node (Schedules), where you can define and upload VHF and GPS schedules, the most important one.

The fourth node (Collected Data) gives you the option to download data once you retrieve the collar after its deployment.

5.3.1 Information

Devices → Remote Stick → VERTEX Lite → Information

Devices → USB Bluetooth Stick → VERTEX Lite → Information

Shows the actual hardware and programming settings of the collar and its functionality.

Telemetry

GPS Monitor

Info File

5.3.1.1 Telemetry

Devices → Remote Stick → VERTEX Lite → Information → Telemetry

Devices → USB Bluetooth Stick → VERTEX Lite → Information → Telemetry

The Telemetry window gives an overview about all hardware and software settings of the collar. It shows the actual programming with no option to change it here. That is done (as far as the options can be altered) in the node Configuration

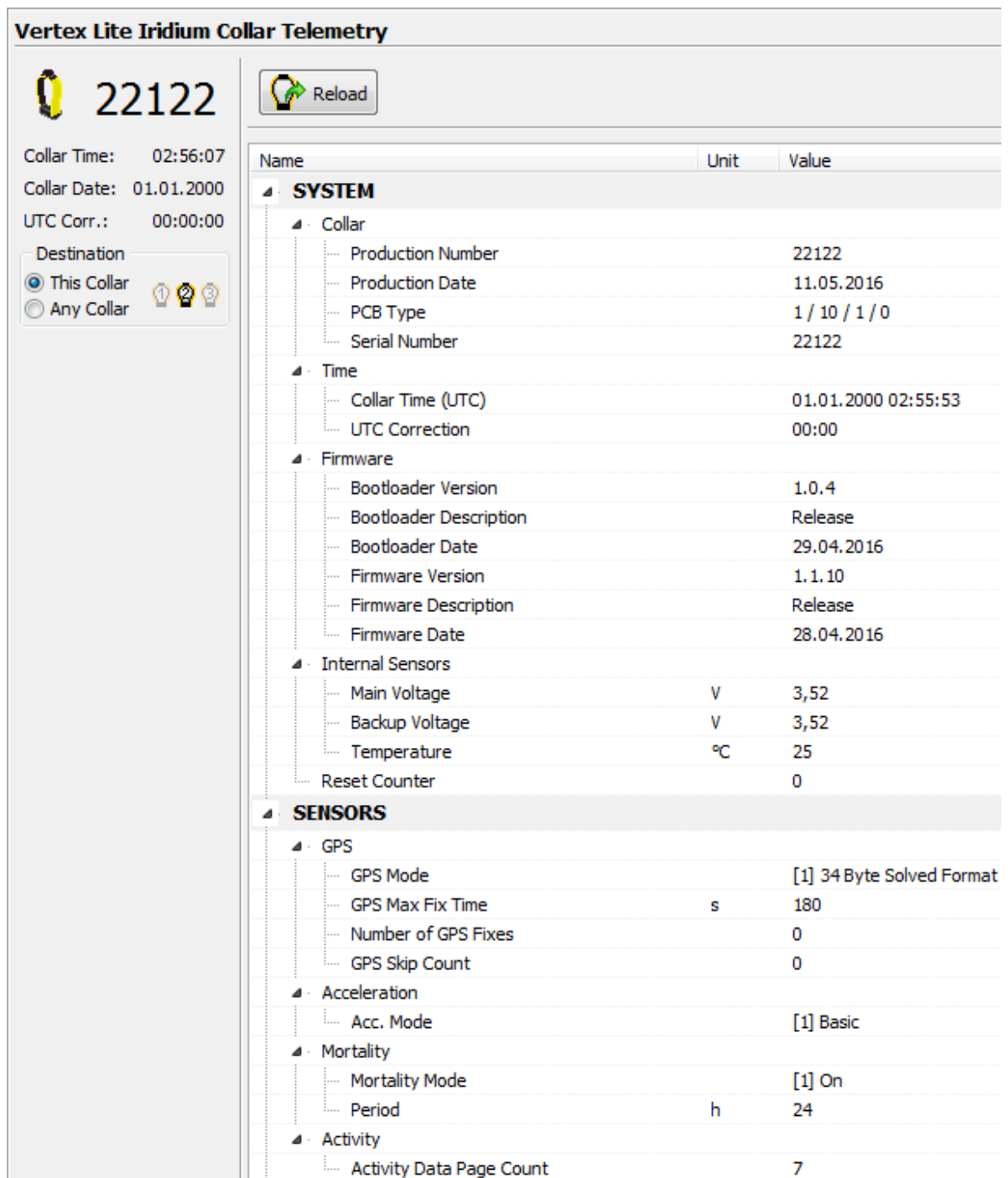**Figure 22: Collar Telemetry**

System:

Collar   shows Production Number, Production Date, Printed Circuit

Board (PCB) Type and Collar ID.

Time	shows the collar time in UTC and the UTC correction set for the collar
Firmware	shows information about the collar software: Bootloader and Firmware information. Internal or service related information only
Internal Sensors	shows the Main Voltage and the ambient temperature of the included mortality sensor. The voltage is an important value to estimate collar status as described in [Position](#)

Bluetooth Module:

Firmware Version	shows Firmware Version of the Bluetooth Module in the collar
Firmware Date	shows the date of the Bluetooth Module Firmware
Serial Number	shows Serial Number of Bluetooth module

Memory:

External Flash Erase Time

shows time when external flash memory gets erased

Reset Counter: Internal use only (debug)

IRQ Counter: Internal use only (debug)

Link Registers: Internal use only (debug)

Sensors:

GPS	shows information about the GPS Mode (internal usage only), GPS Max Fix Time in seconds, GPS Fix Count (number of fixes collected so far) and the GPS skip Count. The latter meaning to put only selected fixes into the transmission data (e.g. every second fix) and leave the rest for USB wireless data download only.
Acceleration	shows acceleration mode (basic)
Mortality	shows the Period of the mortality sensor: the Default Period which was set by VECTRONIC Aerospace and the User Period which is user definable
Activity	Activity Data Page Counter: counter to save activity data value (in pages)

Communication:

Radio	shows information about the Transmit Frequency, Receive Frequency and Transmit Power of the collar

Globalstar	shows the Globalstar Mode, the amount of Globalstar attempts and the ESN number
Iridium	shows the Fixes per Message (user-definable) and IMEI number of the collar (potentially needed in collar registration)
GSM	mode, destination number, and the reception delay which defines the delay until the GSM modem starts to send data

Beacon:

Beacon Frequency	shows the frequency of the VHF beacon: the Default Frequency which was set by VECTRONIC Aerospace and the User defined Frequency. Furthermore, the values of the Beacon Min Frequency and the Beacon Max Frequency are shown which define in what range you are able to alter the VHF frequency
Beacon Power	shows the VHF Beacon output Power.
Patterns	shows information about the Standard Pattern as well as the Mortality Pattern and the Low Battery Pattern of the VHF beacon. The patterns include the Default Pattern which was set by VECTRONIC Aerospace and the User Pattern if it is configured. For the Low Battery Pattern you can define 'Start Time', 'Cycle Period' and 'On Duration'.

Sensor Communication:

Repetition Interval	defines how often the collar transmits its UHF ID
Proximity Transmitter	shows if its on / off, transmit frequency, and transmit power

5.3.1.2 GPS Monitor

Devices* → 🛰*Remote Stick* → ♀*VERTEX Lite* → ⓘ*Information* → 🛰*GPS Monitor

Devices* → 🛰*USB Bluetooth Stick* → ♀*VERTEX Lite* → ⓘ*Information* → 🛰 *GPS Monitor

The GPS monitor function allows a user to check the GPS receiver. There are two options in this frame, GPS Warmstart and a GPS Coldstart. Both commands should only be used for diagnostics and outside of buildings with open view to the sky.

▷GPS Warmstart: This button will initiate a Warmstart of the collar. The GPS receiver will use the Ephemerides and other data already stored in the collar (flash memory, remains there for roughly 2hours) and only complete them with actual satellite data. Depending on what is already stored, it can be fast or take some time. You can abort the Warmstart by changing the node.

▷ GPS Coldstart: The command is quite similar to the GPS Warmstart command. The GPS receiver will skip its potentially stored ephemerides and download every available data from the GPS satellites anew. It will take much longer to acquire a GPS location. A GPS Coldstart is necessary if you changed the battery pack of your collar or if the collar was inactive for a few weeks / months.

Vertex Plus Collar GPS Monitor

19594	▶ Warmstart ▶ Coldstart ■ Close Connection	

Collar Time:	: :
Collar Date:	. .
UTC Corr.:	: :

Date	15.09.2015	Status	3D Nav, validated	Main	3,66 V
Time	09:32:52	DOP	3,4	Beacon	3,78 V
ECEF X	3789074 m	Latitude	52,4303867°	Temp	24 °C
ECEF Y	911432 m	Longitude	13,5251007°		
ECEF Z	5032196 m	Height	64,10 m	3D Error	N/A

Channel	1	2	3	4	5	6	7	8	9	10	11	12
Sat No.	26	21	29	16	31	0	0	0	0	0	0	0
C/N dBHz	29	29	29	35	44	0	0	0	0	0	0	0

Figure 23: VERTEX Lite GPS Monitor after fix has been obtained

5.3.1.3 Info File

Devices → 🖎***Remote Stick →*** ♀***VERTEX Lite →*** ⓘ***Information →*** 🗊***Info File***

Devices → 🖎***USB Bluetooth Stick →*** ♀***VERTEX Lite →*** ⓘ***Information →*** 🗊
Info File

The collar info file includes all information on the collar configuration. It can be saved as .TXT file or printed directly. It contains technical information of the collar as well as the schedules. For the GPS as well as for the VHF beacon you can see the Default Schedule and the User Defined Schedule. For the GPS as well as for the VHF beacon,

you can see which schedule is used at the moment. Every schedule is shown in a version which can be easily read and in the .XML format which is machine readable. An example of an Info File of the VERTEX Lite is given in in the following table.

Recommendation: Create and save a new Info-Sheet whenever you have the collar at hand and did any changes, especially before deployments.

Vertex Lite Iridium Collar Information File

[22122]

Collar Time: 00:01:25
Collar Date: 01.01.2000
UTC Corr.: 00:00:00

Destination
◉ This Collar
○ Any Collar

[Reload] [Save] [Print]

```
Information file of Vertex Lite Iridium Collar collar no. 22122
Date of readout: 17.06.2016 14:12:29
GPS Plus X Version:      10.2.0.16074
------------------------------------

SYSTEM:
  Collar:
    Production Number:            22122
    Production Date:              11.05.2016
    PCB Type:                     1 / 10 / 1 / 0
    Serial Number:                22122
  Time:
    Collar Time (UTC):            01.01.2000 00:01:14
    UTC Correction:               00:00
  Firmware:
    Bootloader Version:           1.0.4
    Bootloader Description:       Release
    Bootloader Date:              29.04.2016
    Firmware Version:             1.1.10
    Firmware Description:         Release
    Firmware Date:                28.04.2016
  Internal Sensors:
    Main Voltage:                 3.54 V
    Backup Voltage:               3.52 V
    Temperature:                  26 °C
  Reset Counter:                  0

SENSORS:
  GPS:
    GPS Mode:                     [1] 34 Byte Solved Format
    GPS Max Fix Time:             180 s
    Number of GPS Fixes:          0
    GPS Skip Count:               0
  Acceleration:
    Acc. Mode:                    [1] Basic
  Mortality:
    Mortality Mode:               [1] On
    Period:                       24 h
  Activity:
    Activity Data Page Count:     8

COMMUNICATION:
  Radio:
    Transmit Frequency:           442.000 MHz
    Receive Frequency:            442.000 MHz
    Transmit Power:               8 dBm
  Iridium:
    Mode:                         [1] 1 Position per Message
    IMEI:
    CSQ Sample Count:             204

BEACON:
  Beacon Frequency:               (not configured) MHz
  Beacon Min Frequency:           4294.967 MHz
  Beacon Max Frequency:           4294.967 MHz
  Standard Beacon:
    Standard Power:               10 dBm
    Pattern:                      Pulse type: 1;  Pulse length: 20 ms;  Pulse Period: 1500 ms
  Mortality Beacon:
    Mortality Mode:               [0] Always on
    Mortality Pattern:            Pulse type: 1;  Pulse length: 10 ms;  Pulse Period: 750 ms
  Low Battery Beacon:
    Low Battery Power:            10 dBm
    Low Battery Pattern:          Pulse type: 1;  Pulse length: 10 ms;  Pulse Period: 1500 ms
    Low Battery Start Time:       01.01.2000 00:00:00
    Low Battery Cycle Period:     1d 00:00:00
    Low Battery On Duration:      1d 00:00:00

SENSOR COMMUNICATION:
  Repetition Interval:            1250 ms
  Proximity UHF Tx Tag:
    Proximity Transmit Mode:      [0] Off
    Proximity Transmit Frequency: 443.000
    Proximity Transmit Power:     10 dBm
```

Figure 24: VERTEX Lite Iridium Info File

5.3.2   Configuration

Devices → 🔹*Remote Stick →* 🔱*VERTEX Lite →* ☑*Configuration*

Devices → 🔹*USB Bluetooth Stick →* 🔱*VERTEX Lite →* ☑*Configuration*

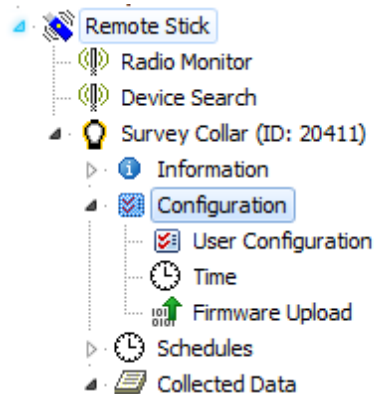In the Configuration node you can change all user-definable configurations of your collar.

Figure 25: Configuration node

Please refer to following subtopics of the Configuration Node:

User Configuration

Setting the time

Firmware Upload

5.3.2.1 User Configuration

Devices → 🔹*Remote Stick →* 🔱*VERTEX Lite →* ☑*Configuration →* ☑*User Configuration*

Devices → 🔹*USB Bluetooth Stick →* 🔱*VERTEX Lite →* ☑*Configuration →* ☑ *User Configuration*

In this frame you can change the user-definable configurations. The actual configurations can be seen in the collar's Telemetry and Info File. Faulty entries (e.g. faulty UTC correction) will automatically be reset back to the factory settings defined by VECTRONIC Aerospace.

When configuring different settings, a small window will appear whenever marking a parameter you like to change. In this window, you will get the information which values you can put there (Min value and Max value). This window appears in the User

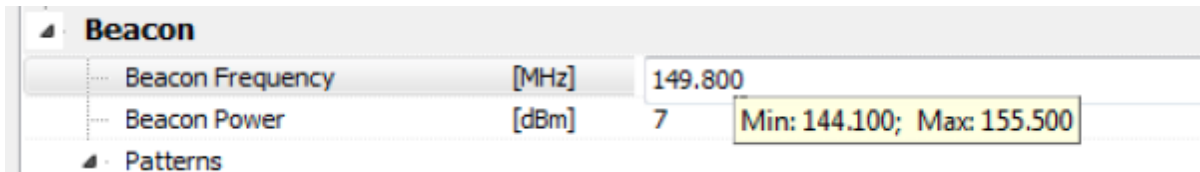Configuration frame for every value you can configure.

Figure 26: Window with Min and Max value for the Beacon Frequency

You can define the following parameters:

System

UTC correction	the collars use the UTC (Universal Time Coordinated) time which is also used by the GPS satellite system. It differs to your LMT (Local Mean Time). To give an example: LMT in Germany is +2 hours to UTC, UTC correction: +2 hours. You can set the UTC Correction in GPS Plus X and the collar will then translate your in LMT programmed schedule internally.

Recommendation: Stick to either way (UTC correction **or** UTC schedules) for all collars and document it carefully. This helps to prevent confusion especially if you ask us to do some changes.

Sensors

GPS → Skip Count	The GPS skip count refers to the satellite communication enabling you to set a number of GPS location which will be conducted and stored but are not added to the transmission pool. (Example: a Globalstar collar with 2 fixes a day and skip count 1, will send only one data message with 1 location per day).
Mortality → Period	Here you can set a time span using the up- and down arrows. If the activity values remain under the set threshold (64 within a 0-255 range, changeable by VECTRONIC) for this time span, the animal is assumed to be dead and a mortality event is triggered. The default value is 24h with have been successfully used in many studies.

NOTE: Please consider which values might reflect animal behavior at best. A short period might lead to false alarms as the animal is only resting.

Communication

Iridium

The Iridium Mode (1-18) defines the number of fixes per Iridium message. Please check Iridium Communication for information about message set-up and size.

Recommendation: Mode 4

Globalstar

Choose one out of 3 modes: [0] Disabled, [1] 1 Position per Message, [2] 2 Positions per Message

GSM

The GSM Mode defines number of fixes per SMS.

Recommendation: 8 fixes per message with VAS SIM chips

7 fixes per message with SIM cards from your own provider

You can change the destination address of all incoming messages. By default it will be the number of VECTRONIC ground station. If you are using your own ground station your own mobile number is setup here.

You can configure the Reception Delay which depends on the providers delay. The GSM module in the collar will be booked in the network for additional time to receive messages.

Beacon

Beacon Frequency

Choose the frequency of your VHF beacon simply by typing it into the field. You can only select frequency values between the minimum and maximum value.

NOTE: Signal strength is best with the primarily set value (hardware dependent), signal strength will slightly decrease at the rim.

Beacon Power

Recommendation: Stick to the default value of 10dBm as it offers the optimum balance between signal strength and energy consumption. Please contact our customer service if you have questions.
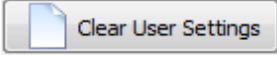
Beacon Mortality Mode　　This defines whether at a mortality event the VHF should switch to be always on (24/7) or remain schedule controlled (e.g. short window only). The Default setting is: Always on

Beacon Patterns　　In this frame you can configure the VHF beacon pattern for both the Standard Mode and the Mortality Mode active during a mortality event. You can set the pulse length in milliseconds (ms) and the Loop Length in ms. The "pulse Type" is for internal usage only and can't be changed by the user.

NOTE: The default settings have been successfully used in many studies. Changes will affect battery consumption.

Figure 27: VERTEX Lite User Configuration

After you have provided your changes in the configuration, you can choose to send the new configuration only to the selected collar or to any collar by setting up the Destination on the left side of the frame. Press [Apply] to send the settings to the specific collars. Press [Reload] to reload the configuration from the actual chosen collar. Pressing the button [Clear User Settings], all settings in the collar except the schedules are deleted. Afterwards, the default settings defined by VECTRONIC Aerospace are applied.

5.3.2.2 Setting the time

Devices → Remote Stick → VERTEX Lite → Configuration → Time

Devices → USB Bluetooth Stick → VERTEX Lite → Configuration → Time

To set the time in the collar, make sure that the USB Device is attached to your PC, click on the Time frame in the Configuration node, attach the magnet to your collar within 10 seconds and detach the magnet from the collar.

Two times are displayed, the Current Collar Time [UTC] and the PC Time. The frame also displays the Computer UTC Correction. The New Collar Time [UTC] is by default given as the PC Time calculated from the PC UTC correction and the PC's current time. If there are differences between PC time and the time you want to set in the collar, use the up- and down arrows and the calendar function or type in the new time. After you have provided your changes in the time, you can choose to send the new configuration only to the selected collar or to all collars found in the Device Search by setting up the Destination on the left side of the frame. Press [Apply] to send the new time to the collar / to the collars. With [Reload] you can reload the configuration from the collar.

NOTE: With each successful GPS fix, the collar time is automatically adjusted to the correct UTC time. UTC correction will be only applied for schedules and time of the day settings. Also, UTC correction cannot be enabled by sending the local mean time to the collar.

Figure 28: Set Time Frame

5.3.2.3 Firmware Upload

Devices → ⬧Remote Stick → ♀VERTEX Lite → ☑Configuration → ▥⬆ Firmware Upload

Devices → ⬧USB Bluetooth Stick → ♀VERTEX Lite → ☑Configuration → ▥⬆ Firmware Upload

A Firmware update is only necessary if you experience problems with the current collar firmware or need a feature only available in a newer version than the present one. In this case, get the appropriate file from VECTRONIC Aerospace. Select the update (.bin) file with ⬚. Afterwards, you can see that some information appears in the window. You can check information on Device Model, File Type, Version (the firmware version you are going to upload to the collar) and the Version Attributes. Send the upgrade to the collar with ⬚Start⬚. The upload will be verified automatically while it is progressing.
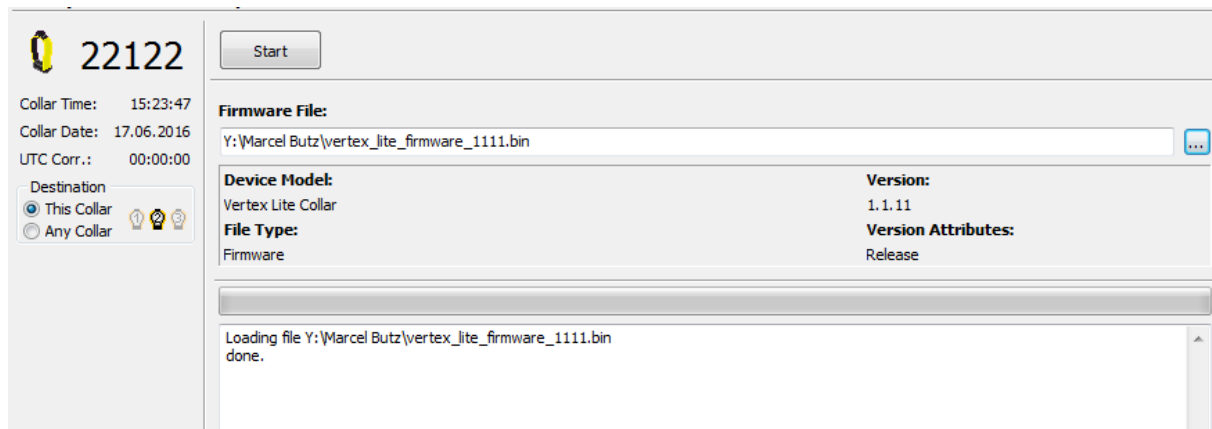
Figure 29: Collar Firmware Upload frame

5.3.3 Schedules

Devices → Remote Stick → VERTEX Lite → Schedules

Devices → USB Bluetooth Stick → VERTEX Lite → Schedules

Schedules, either VHF or GPS, define when the respective sensor is on, meaning the VHF Beacon is broadcasting and the GPS receiver is conducting GPS fixes. Both require battery power and some serious thought should be given to the settings before deployment.
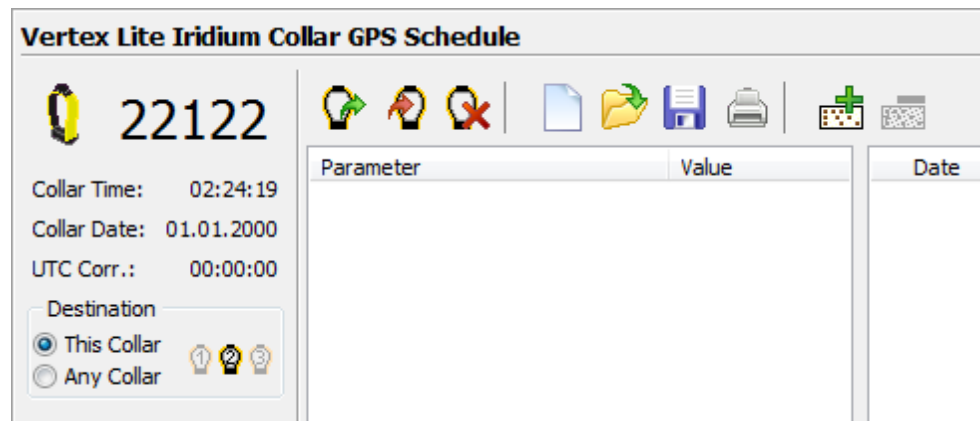
Figure 30: Schedule creation window

The schedule creation window shows all options around collar creation and is more or less identical for the GPS as well as the VHF schedule builder. They differ in the rule formats which are described in the following chapters.
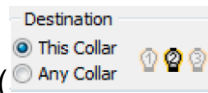
Load schedule from collar (either GPS and VHF schedule)

Upload created schedule to collars ( )

Erases the collar schedule

Clears the tool window to start schedule builder anew

Loads a previously saved schedule

Saves a created schedule for later usage and control

Prints out the listed rules

Schedule builder tool: add a new rule

Schedule builder tool: delete selected rule

NOTE: Please keep in mind that the VERTEX Lite Globalstar collars can't be reconfigured remotely once deployed.

5.3.3.1 GPS schedule

Devices → Remote Stick → VERTEX Lite → Schedules → GPS

Devices → USB Bluetooth Stick → VERTEX Lite → Schedules→ GPS

A GPS schedule consists of one or more rules specifying the date and time when the collar will do GPS fixes. Each schedule consist of a varying set of rules each consisting of:

Start Date:	the date when the rule should start
End Date:	the date when the rule should end
Period Length:	the length of the period in which the Sequence for GPS recording is repeated.
Sequence:	The sequence is the length of time between GPS fixes in a

given period. Here you can define: Offset – it defines the time span between the start of the period and the recording of the first GPS position; Duration – period in which the GPS positions will be recorded with the Fix Rate repetition; Fix Rate – GPS position recording repetition rate.

<u>NOTE:</u> You can only take GPS fixes within the time span of the period. This way, the sum of offset and duration must be smaller than the value of the defined period length. If you wish to take only 1 GPS fix per sequence, the fix rate can equal the duration value. If you have already two position recordings in one sequence, you can delete the other sequence in the rule editor.

You can use up to 292 rules within one schedule and get as complex as you want (rules for all biological- and physical seasons, planned field operation, different study or monitoring questions etc.).

<u>NOTE:</u> Iridium: Field studies have shown that the transmittal of 8 fixes per day in Mode4 – 4 fixes per message) has the best energy consumption / transmittal probability ratio. Transmittal of more fixes per day will work as well but might result in a higher degree of unsuccessful transmission attempts. Data will reach you at some point but may be delayed due to missed transmissions.

<u>Recommendation:</u> For safety reasons you should define at least one schedule starting on 01.01.2000. If the collar's time is reset for any reason, the timer will start at this date and will attempt to take one fix per week until another schedule starts or until the clock is set to the correct UTC time by a successful GPS fix.

After changing the default rules to the user defined rules, you can choose if you like to send the new schedule only to the selected collar or to all collars found in the Device Search by setting up the Destination on the left side of the frame.

If you want to create a new schedule the first time (only the default schedule exists in the collar), a notification window will appear when selecting the GPS schedule frame.
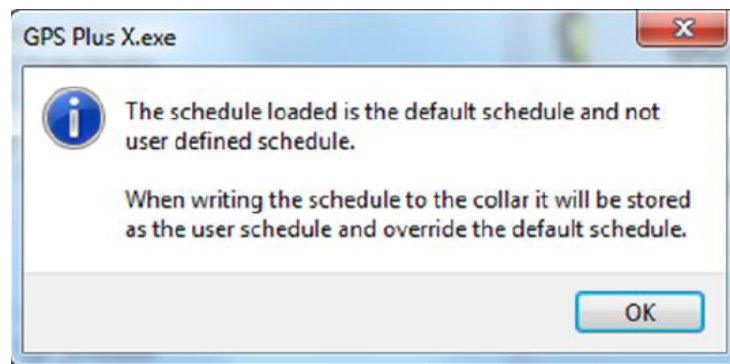
Figure 31: Notification window whenever a schedule node is activated for the first time

VERTEX Lite Iridium / GSM: You can send new schedules remotely.

NOTE: The collar will take one GPS fix per week when all schedule rules are in the future. It will take a GPS fix every four hours when all schedules are outdated.
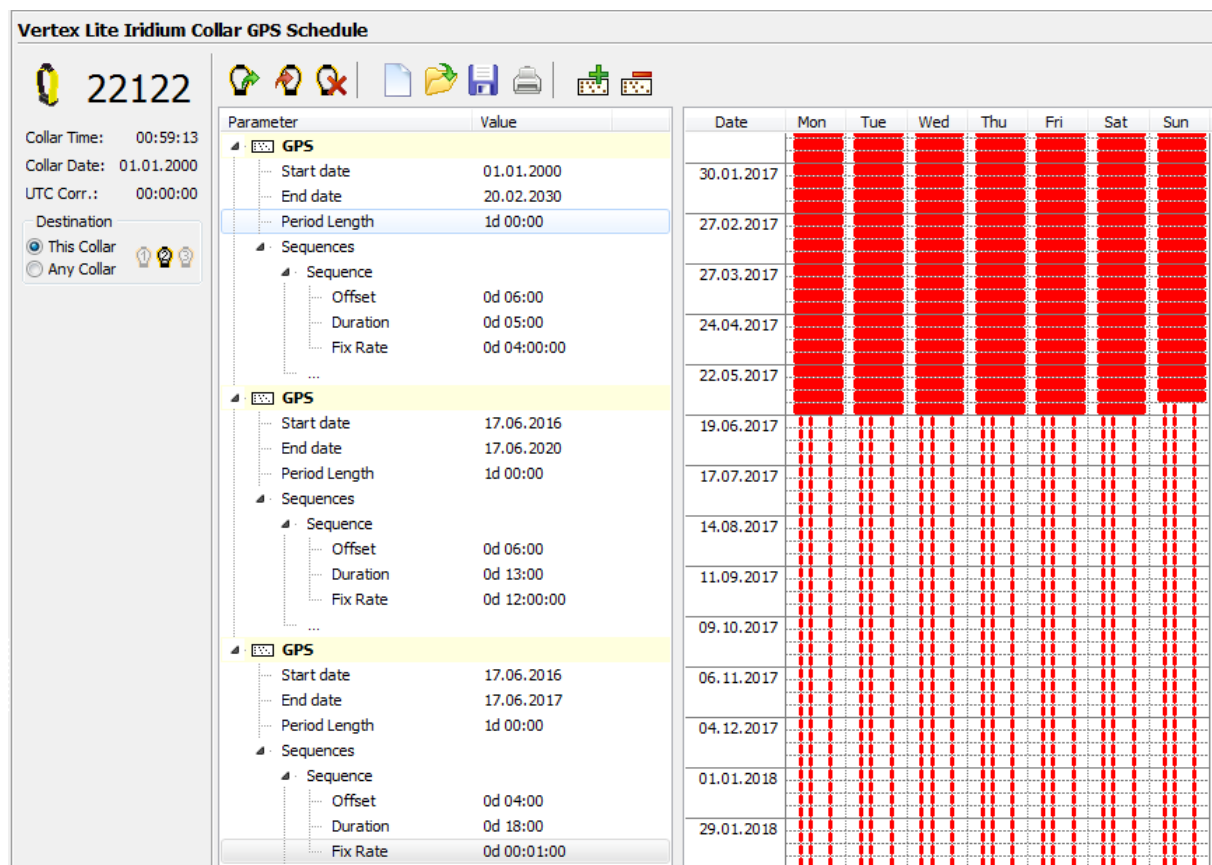

Figure 32: VERTEX Lite Iridium GPS schedule

5.3.3.2 VHF Beacon Schedule

Devices → Remote Stick → VERTEX Lite → Schedules → Beacon

Devices → USB Bluetooth Stick → VERTEX Lite → Schedules → Beacon

The configuration of the VHF Beacon schedule is similar to the configuration of the GPS schedule (see Schedules) but without setting the Fix Rate. You can only set the Start Date and End Date, Period Length, Offset and Duration. The VHF beacon is active in the time span between Offset and Duration.

For example: If you choose 6 hours for the Offset and a Duration of 4 hours with a Period Length of 1 day, the VHF beacon will be active every day from 6.00 am to 10.00 am. In difference to the GPS schedule, you can define max. 372 VHF beacon schedule rules.
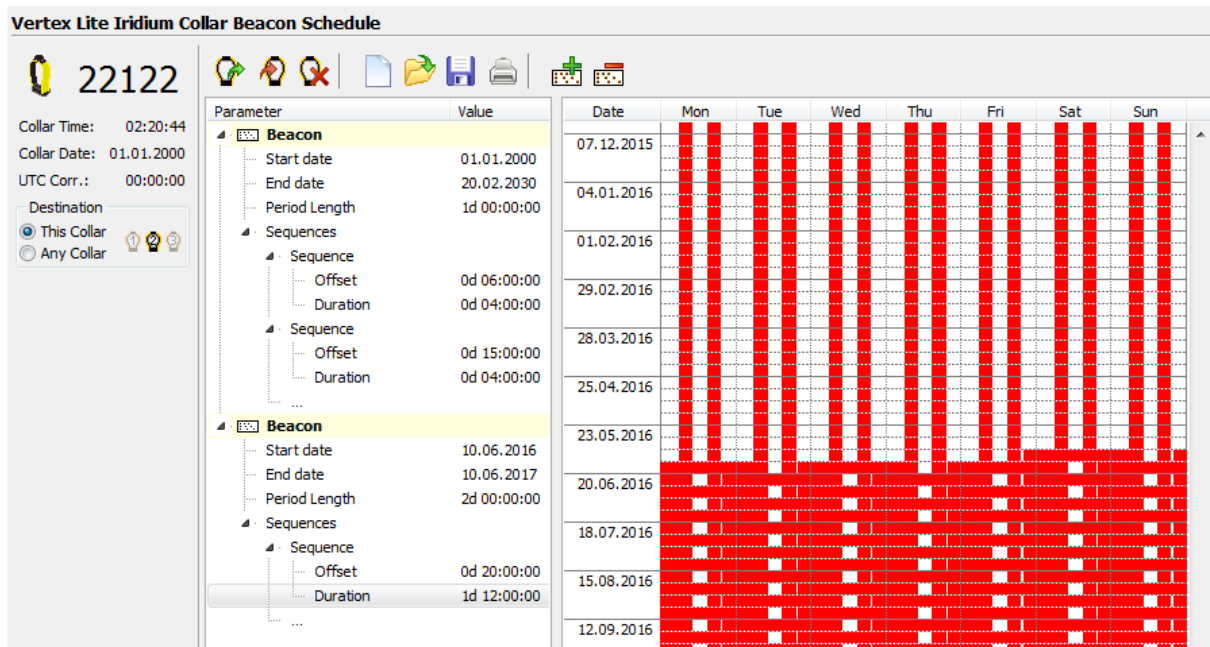
Figure 33: VERTEX Lite Beacon Schedule

To save battery life, it might be useful to switch off the beacon during times when you will not track your animal (e.g. during the night).

After setting up the VHF Beacon schedule, you can choose if you like to send the new schedule only to the selected collar or to all collars found in the Device Search by setting up the Destination on the left side of the frame. To send the VHF beacon schedule to the collar / to the collars, press

NOTE: If all End Dates of the VHF schedule are outdated, the VHF beacon is switched on 24 hours per day.

NOTE: With Globalstar communication you cannot change settings after deployment.

5.3.3.3 VHF Beacon & GPS Beacon Schedule Files Upload

Devices → ✎Remote Stick → ♀VERTEX Lite → ◷Schedules → ◷GPS & Beacon Files Upload

Devices → ✎USB Bluetooth Stick → ♀VERTEX Lite → ◷Schedules → ◷GPS & Beacon Files Upload

This setting is partly redundant to the separate VHF and GPS schedule creator (VHF Beacon Schedule, GPS Schedule) enabling you to upload already prepared and stored schedules to one or many collars simultaneously. You have no option to cross-check the schedules again **so you should be well experienced to use this feature instead of the single schedule upload explained before.**
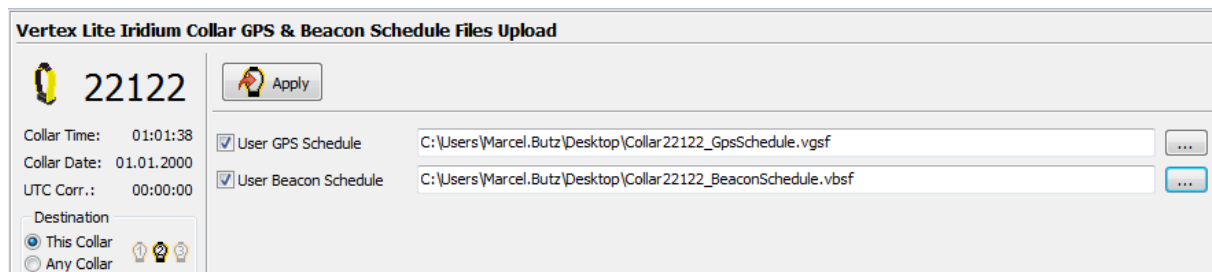

Figure 34: GPS & Beacon files upload frame

5.3.4 Collected Data

Devices → ✎Remote Stick → ♀VERTEX Lite → ◲Collected Data

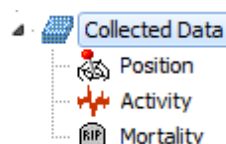*Devices → ✎USB Bluetooth Stick → ♀VERTEX Lite → ◲Collected Data*

Figure 35: Collected Data configuration node

This frame shows the data retrieval options of the collars.

The main function of this node is to download the collar data. The output window and

functions differ but the main functions are identical for GPS, mortality, and activity data.

Reads data from the collar and displays it in the frame; this is not done automatically as the download of data can take several seconds to minutes.

Saves data to the storage module; we advise to save all data from the collar, even if you export them as data files.

This command erases the data stored on the collar. Please make sure that you have stored the data before you use this command. Data cannot be restored once deleted.

Recommendation: Please transfer the data to the GPS Plus X storage before you export it or change any settings for the next collaring session.

Figure 36: Collected data output window (position)

All output windows include a filter rider to restrict the output file to a certain period and/or also to certain data value attributes. You have to check each parameter to set in filter parameters.

The output window for mortality data differs as it offers far less options (no quality parameters, no KML-Export function and no chart option).

The content of the data will be explained in the specific sub-node.

NOTE: This is an output and export frame only. Changes (e.g date filter) affect the exported files only, nothing is changed with the original data-set stored within GPS Plus X.

5.3.4.1 Position

Devices → ✎Remote Stick → ♀VERTEX Lite → ▱Collected Data → ☠ Position

Devices → ✎USB Bluetooth Stick → ♀VERTEX Lite → ▱Collected Data → ☠ Position

The position node shows collected GPS data and allows the visualization and the export of the data or parts of it. It's divided into Filter, Export and Data.

Filter: Enables you to set some filters to alter the data set.
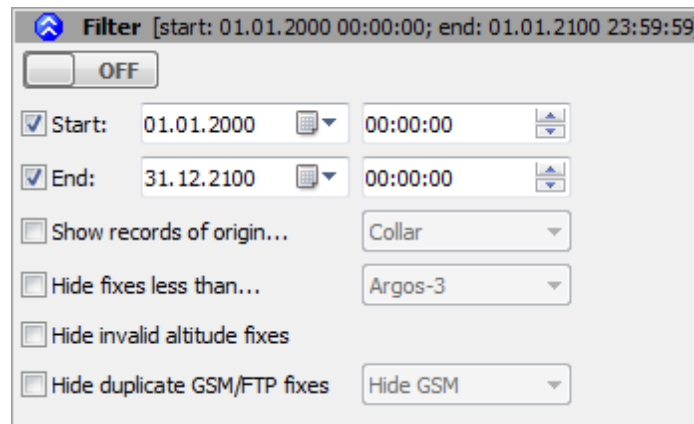
Figure 37: (Position) Filter- Collected Data node

Start and End	Defines the period for which GPS fixes will be shown. Other fixes are invisible. That way you can exclude for example the testing phase.
Hide fixes less than	Defines a quality parameter for the GPS fixes whereas 3D. Val. (Validated) refers to the best possible GPS fix (number of satellites used, satellite signal quality etc). Please refer to the main GPS Plus X manual for details.
Hide invalid altitude fixes	Check if you want to exclude GPS fixes with values below -1000 or above 10000 meters height as these positions are impossible. The height is the least secure value as it strongly depends on referent points (geoid maps) which can vary in quality and accuracy.

Export: This section defines the export formats. You can check several options and GPS Plus X will create a file for each format.
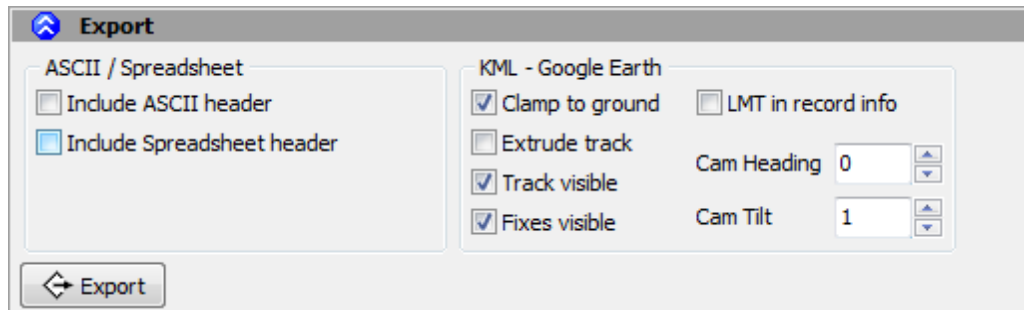
Figure 38: Export window- Collected Data node

ASCII	has equal sized (number of characters) fields for every row and thus can be easily read by humans (as a table). File: *.txt
Spreadsheet	is machine readable, which means table entries are separated by a freely definable character (e.g. comma) that can be defined in the options form. File: *.csv
KML-Google Earth	is a XML format used in Google Earth and some other mapping software to display tracks, points of interest, etc.
Clamp to ground	if checked, the path displayed in Google Earth is always shown as anchored to the ground, regardless of its altitude or if terrain is enabled or not
Extrude Track	if checked, the path displayed in Google Earth is always shown as anchored to the ground, regardless of its altitude or if terrain is enabled or not
Track visible	if checked, the track will be visible in Google Earth as coloured line
Fixes visible	if checked, all fixes will be visible in Google Earth as coloured icons
LMT in record info	if checked, the local mean time according to

	the UTC correction of GPS Plus X will be shown in Google Earth
Cam Heading	viewing direction of 0 – North, 90 – West, 180 – South, 270 - East
Cam Tilt	inclination of the camera, 0 – straight downwards, 90 – horizontal into viewing, direction, 180 – straight upwards, 270 - horizontal into opposite viewing direction

Data: This window shows all GPS positions with their unique values (DOP, Satellites used etc – see below). A click on a single fix (line) will show its values in the upper part for better visualization.

Figure 39: Data window- Collected Data node

No.	line index, dependent on time stamp; this index number is created when data are read out of the collar and will not be changed when data are filtered (this way, "data gaps" caused by filtering are easily detectable)
Collar ID	ID of the collar from which the positions have been downloaded
UTC date and time	time in Universal Time Coordinated (UTC, equivalent to GMT, without daylight saving time/ summer time)

LMT date and time	local mean time, depending on the value set in UTC Correction (see System UTC Correction)
Origin	shows where the the message originates from
SCTS Date/Time	the date/time when the message receives the provider
ECEF X, Y, and Z	coordinates in the Earth Centred Earth Fixed coordinate system
Latitude, Longitude, Height	geographical position based on WGS84

Chart: The Chart function plots the GPS data in a basic graph. A nice feature to get a first overview about distribution and migration pattern. You can zoom in by drawing a square with your mouse or use the option riders within (File, View) which includes a save option as well.
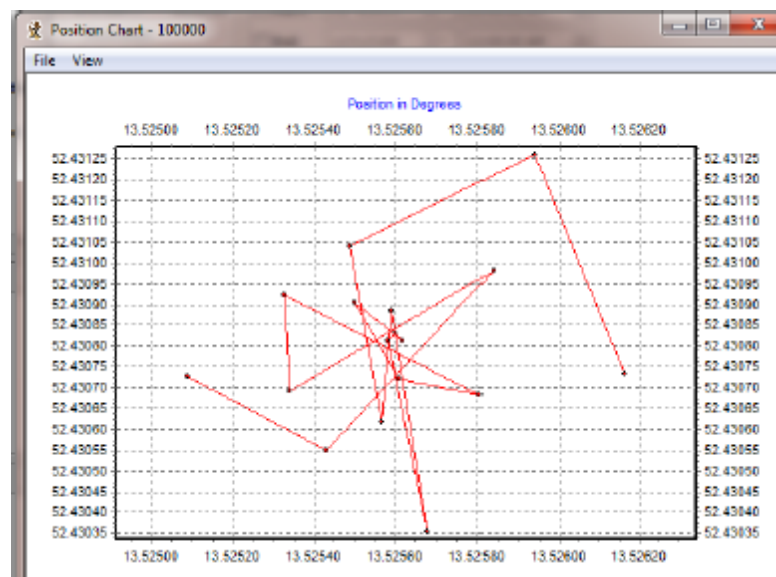
Figure 40: Basic graphic plotting of GPS data- Collected Data node

No.	line index, dependent on time stamp; this index number is created when data are read out of the collar and will not be changed when data are filtered (this way, "data gaps" caused by filtering are easily detectable)
Collar ID	ID of the collar from which the positions have been downloaded

UTC data and time	time in Universal Time Coordinated (UTC, equivalent to GMT, without daylight saving time/summer time)
LMT date and time	local mean time, depending on the value set in UTC Correction
Origin	shows where the message originates from
SCTS Date/Time	the date/time when the collar has been read out
ECEF X, Y and Z	coordinates in the Earth Centred Earth Fixed coordinate system
Latitude, Longitude and Height	geographical position based on WGS84
DOP	(Dilution of Precision) value for the geometric constellation of the received GPS satellites
Fix Type	quality of fix obtained
3D Error	shows the difference [m] between the real position and the transmitted position
Sats used	number of satellites used for the fix.
Sat No/ C/NO [dBHz]	channels of the GPS receiver with two columns each containing the received satellite number and the carrier to noise ratio in dBHz
Main [V]	voltage of the main battery in Volts
Mortality Status	shows if the animal was deemed alive or dead
Beacon [V]	voltage of the beacon battery in Volts
Temp [°C]	Ambient temperature

5.3.4.2 Activity

Devices → 🛰️ ***Remote Stick →*** 💡 ***VERTEX Lite →*** 📖 ***Collected Data →*** 〰️***Activity***

Devices → 🛰️ ***USB Bluetooth Stick →*** 💡 ***VERTEX Lite →*** 📖 ***Collected Data →*** 〰️
Activity

Filter: Enables you to set some filters to alter the dataset.

Figure 41: Activity Data Filter

Export: This section defines the export formats. There are only two formats available for the activity data export.

Figure 42: Activity data export

ASCII	has equal sized (number of characters) fields for every row and thus can be easily read by humans (as a table). File: *.txt
Spreadsheet	is machine readable, which means table entries are separated by a freely definable character (e.g. comma) that can be defined in the options form. File: *.csv

Data: This window shows all activity data stored in the collar.

Figure 43: Activity Data Frame
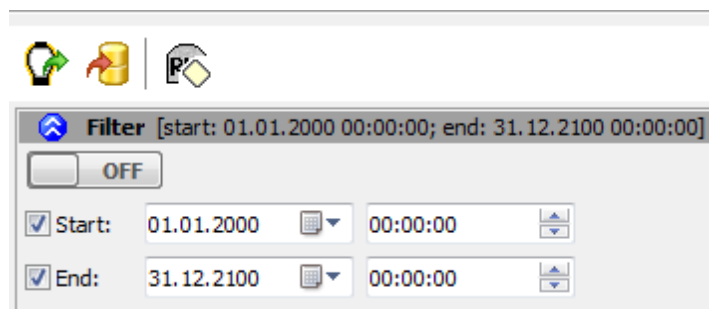
Press to see a visualization of the data.

5.3.4.3 Mortality

Devices → ✎Remote Stick → ♀VERTEX Lite → ▱Collected Data → ⚰ Mortality

Devices → ✎USB Bluetooth Stick → ♀VERTEX Lite → ▱Collected Data → ⚰ Mortality

Filter: Enables you to set some filters to alter the dataset.

Figure 44: Mortality Data Filter

Export: This section defines the export formats. There are only two formats available for the mortality data export.
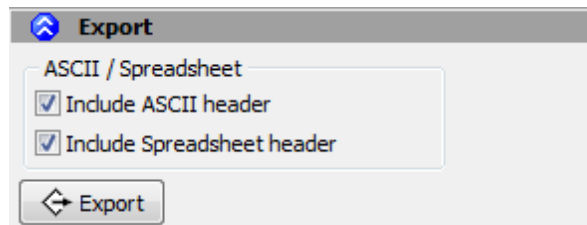
Figure 45: Mortality Data Export

ASCII	has equal sized (number of characters) fields for every row and thus can be easily read by humans (as a table). File: *.txt
Spreadsheet	is machine readable, which means table entries are separated by a freely definable character (e.g. comma) that can be defined in the options form. File: *.csv

Data: This window shows all mortality Events stored in the collar. positions with their unique values (DOP, Satellites used etc – see below). A click on a single fix (line) will show its values in the upper part for better visualization.

Figure 46: Mortality Data Overview

6 Remote Collar (Communication)

***Devices →* Remote Collars *→* VERTEX Collars**

This chapter deals with the remote communication to the collar using Iridium satellite communication or GSM communication.
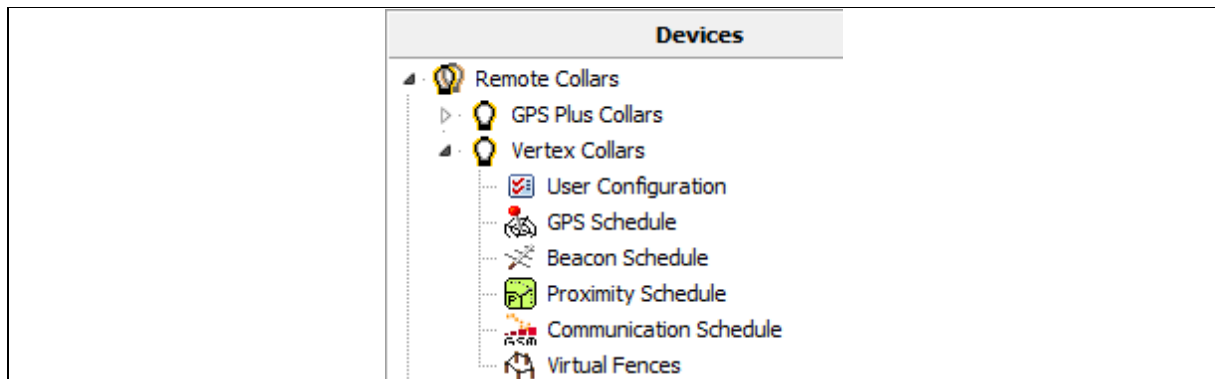
Figure 47: Remote Collars tree shows the option list of this node. It shows GPS Plus Collars as well as VERTEX collars.

The first node (User Configuration) contains the configuration you can change.

The second node (GPS Schedule) is used to define and send GPS schedules to one or more collars and the third node (Beacon Schedule) includes the same options for VHF Beacon schedules.

The last 3 nodes (Proximity Schedule, Communication Schedule, Virtual Fences) are for VERTEX Plus collars only and are not applicable for VERTEX Lite Collars.

6.1 Remote User Configuration

Devices → Remote Collars → VERTEX Collars → User Configuration

Figure 48: Remote User Configuration

All options are explained in Chapter <u>User Configuration</u> and <u>Schedules</u>.

<u>NOTE:</u> Please keep in mind that some changes will affect not only the collar but also your ability to reset them. **All changes should be well planned and documented.**
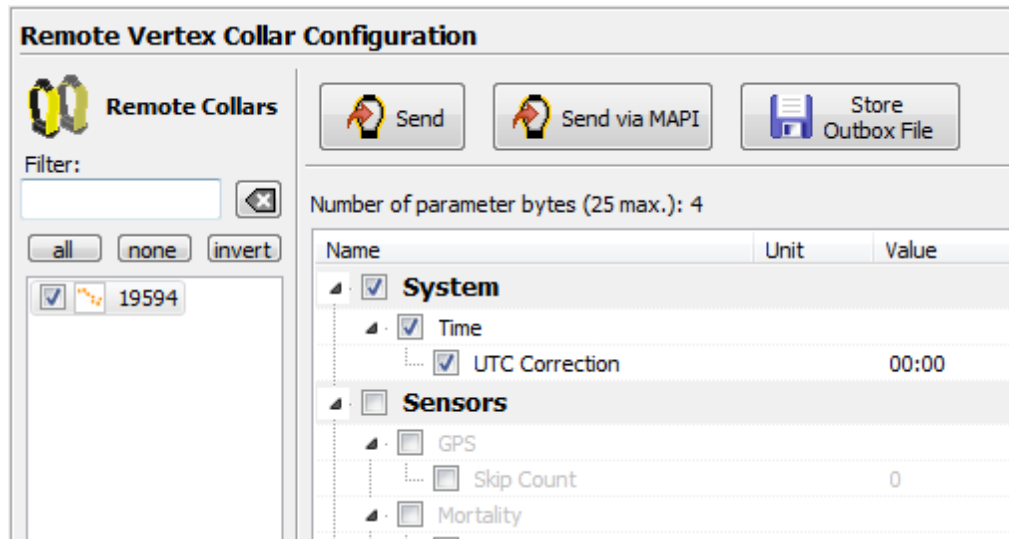
Figure 49: Remote VERTEX Collar Configuration

You can check the parameters you want to change and alter the values. The message can contain a maximum of 25 bytes only. The program indicates when your changes exceed that threshold. **Number of parameter bytes (25 max.): 43** Please send two messages instead including a part of the changes only. The collar will receive both and store all changes.

To send out commands you have to do the following steps:

1. Check the Parameters you want to change

2. Change the parameter to new values

3. Check the collar(s), one or more according to left sided list you want to send the new configuration to 19594

4. Press the send Button

5. Optionally: click on "Store Outbox File" for third party applications.

6. Follow up on collar command reception (in ***Data → Collar Reception Status***)

NOTE: check the changes before sending them as you might have problems to change them again (e.g. adding skip count, raising positions / messages → fewer messages from the collar, fewer communication windows for you).

NOTE: make sure you have chosen the correct collars only.

NOTE: Status and further information about Remote Commands can be seen in **Data** → ⓘ **Remote Command Status.** Please keep track on your changes for you and your planning but also for us in the event that you need support.

6.2   Remote GPS Schedule

Devices → 👑 *Remote Collars →* 👑 *VERTEX Collars →* 🛰️ *GPS Schedule*

The GPS schedule editor is identical to the one described in GPS schedule. Any schedule sent to the collar will erase the existing one on the collar, meaning you will have to include all rules of the first one. There is a size limitation for an Iridium / GSM Message, one message to the collar can contain 108 bytes only (approximately 4-7 rules). If your schedule gets too complex, you might have to use some simpler rules and update them from time to time to keep your planned schedule working.

The software GPS Plus X will warn you whenever your schedule is invalid in rule usage or size and abort the upload.
For remote communication with a GSM collar with customer SIM card, a Ground Station is necessary. If you do not own one, please contact our customer service.

For remote communication with an Iridium collar you need to set further configurations (email address,...) to communicate with your collar. Therefore refer to the GPS Plus X software manual and search for 'Collar Command Destinations'.

The steps to send out commands to your collar are explained in the GPS Plus X software manual, please search for 'Remote communication via GSM and IRIDIUM'.

6.3   Remote Beacon Schedule

Devices → 👑 *Remote Collars →* 👑 *VERTEX Collars →* ✳️ *Beacon Schedule*

The VHF Beacon schedule editor is identical to the one described in VHF Beacon schedule. Any schedule sent to the collar will erase the existing one on the collar, meaning you will have to include all rules of the first one.
There is a size limitation for Iridium / GSM Messages which means you won't be able to make new ones as complex as the first one. An Iridium / GSM message to the collar

can contain 108 bytes only (approximately 5-9 VHF Beacon rules). If your schedule gets too complex, you might have to use some simpler rules and update them from time to time to keep your planned schedule working.

The software GPS Plus X will warn you whenever your schedule is invalid in rule usage or size and abort the upload.

7   Calculate Collar Lifetime

This command estimates the lifetime of your VERTEX Lite Collar and can be found in the Tools menu of GPS Plus X. (***Tools → Calculate VERTEX Collar Lifetime)***
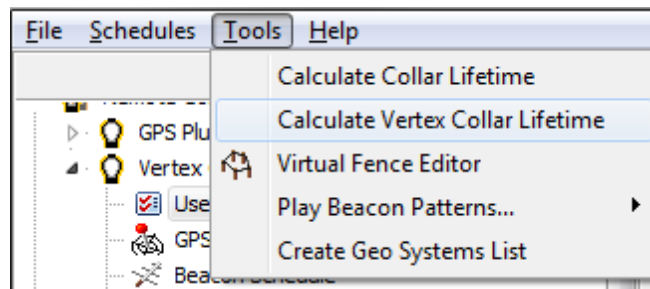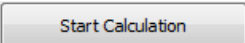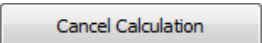
Figure 50: Tools Menu

Select your collar (e.g. VERTEX Lite Iridium and battery size) and check the settings (Position Transmission & Beacon).

NOTE: You will find recommendations to the "Position Transmission" in the specific chapter (Iridium Communication) and we recommend to stick to the default values for the Beacon settings (VHF Beacon).

Now you can enter a GPS and VHF Beacon schedule which are described in chapters GPS schedule and VHF Beacon schedule. After you have selected all the options for the collar, press [Start Calculation] or ▶ to start the calculation. Pressing [Cancel Calculation] or ■ while the calculation process is running will cancel the calculation. It might be useful to save the settings using the 💾 icon as this schedule could later be used for collar configuration. The 📂 icon enables you to load schedules into the calculation tool, potentially retrieved from the collar as described in chapter Schedules.

Figure 51: VERTEX Lite Collar Calculate Lifetime

The output contains the collar lifetime for the main battery whereby all functions (GPS,VHF and satellite communication) are working and the VHF Beacon battery lifetime whereby only the VHF Beacon will be powered for collar retrieval. It will outlive the main battery to a degree as the back up battery size which differs for the models (1C to 13D collar).

The window shows 3 values (Best case, Average and Worst case). In a best case scenario, the collar is assumed to receive the ephemerides very fast and is able to calculate its position within 45 s in Average. The Average scenario assumes an average GPS fix calculation time of 90 seconds which should be the case for most collars. A worst case scenario calculates with an average fix time of 180s. That might apply in a heavily forested or relieved area where the collar has difficulties contacting the satellites.

The Start and End Date depend on your starting point (main option frame).

NOTE: Several factors affect the calculation time such as satellites in range again affected by the habitat and potential obstacles (e.g. thick canopy) and time between two fixes and potential benefit of using existing ephemerides data (fixes within an hour).

Recommendation: please calculate with the average scenario to start with especially when you use a Globalstar collar or work in forested habitats.

8   Test the collar

It is recommended to test the collar in advance to confirm that GPS positions are received and transmitted as programmed before you deploy it on the animal.

1. Remove the magnet from the electronic housing **(not the Drop Off magnet!)**

2. Place them outdoors with clear view to the sky (NOTE: Place the collars about 1m apart otherwise their signals might interfere and affect the testing)

3. Listen for the VHF beacon signal with your tracking receiver (NOTE: check settings for frequency and communication windows for beacon beforehand)

4. Wait for incoming messages (NOTE: check for expected time frames first)

5. Process incoming data and check signal quality etc.

6. Send reconfiguration commands remotely

7. Deactivate the collar by reattaching the magnet to the electronic housing

NOTE: To save battery life, leave the magnet on the collar during storage and do not leave the collar connected to your computer if you do not use it. Disconnect the battery pack if you store the collar for months.

9   Attach the collar to the animal

- The collar has no forward or backward side so you can deploy it to your liking.

- Make sure the belt fits perfectly to the animal's neck. If it is too loose, the animal may get it off. In worst case the animal might get injured by a collar too loose or tight.

- Cut the overhanging belt part and smooth the cut edge.

To achieve the best possible GPS signal, the GPS antenna should be on top of the animal's neck. The GPS antenna is inside the electronic case facing upwards. If the

collar is adjusted to the circumference given on the order information sheet, the electronic case is located exactly on top of the animal's neck.
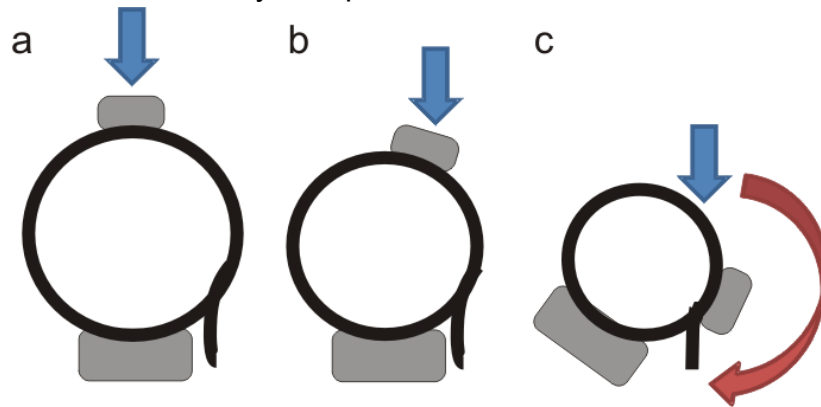
Figure 52: Collar circumferences (a) Predefined circumference: Electronic case is exactly on top of animal's neck, best possible GPS reception. (b) Up to ±10% variation from predefined circumference: Electronic case is slightly on side of animal's neck (c) bad or no GPS reception

- Make sure the magnet is removed from the electronic housing and from the Drop Off, otherwise it stays deactivated and will not perform any GPS fixes or transfer data, and the Drop Off will not release the collar.

If you need help or advice please contact our customer service. We will gladly put you in touch with other scientist working on similar species.

NOTE: Please do not shorten the belt beyond the perforated beltpart as you would possibly cut and thereby damage the VHF antenna. If you need further shortening, please get in touch with our customer service.

NOTE: Make sure the magnets are removed from the housing, otherwise the collar stays deactivated and the Drop Off will not release the collar.

10 Battery options

The VERTEX Lite Collar enables the usage of different battery sizes. All batteries can be coupled with a Drop Off system.

The battery design itself depends on the belt shape (oval, round and oval/round) and the usage of a Drop Off system. The following table gives an overview about battery types and weights with or without Drop Off.

Battery for round collar:

	without Drop Off	with Drop Off
1C IG	128 g	186 g
1D IG	205 g	300 g
2D IG	329 g	430 g
3D IG	492 g	580 g
4D IG	616 g	708 g
5D IG	800 g	855 g
7D IG	Ca. 1050 g	

Battery for oval collar:

	without Drop Off	with Drop Off
1C AG	128 g	186 g
1D AG	234 g	309 g
2D AG	348 g	456 g
3D AG	512 g	603 g
4D AG	634 g	716 g
5D AG	800 g	855 g
7D AG	Ca. 1050 g	

curved batteries:

	without Drop Off	with Drop Off
3D_R	635 g	807 g
4D_R	792 g	984 g
5D_R	951 g	Not available

11 Changing of battery pack

All VERTEX Lite Collars have user changeable battery packs (exception: 1c- fix battery). Make sure to follow the instructions to prevent any damage to the collar and its parts when changing the battery pack.

NOTE: If you change the battery of a collar with Drop Off, **please note the Drop Off number on the battery housing**. This ensures that you can reach the Drop Off that you actually want to reach when retrieving the collar, especially for remote Drop Offs!

NOTE: Be careful when un- or replugging the battery connector pins since they can break if bent.

NOTE: Store the battery package at room temperature.

There are 3 different belt shapes. For each shape the battery changing procedure differs a little. Please follow the links for the respective instructions.

Oval collar

Round Collar, standard battery pack

Round collar, curved battery pack

11.1 Oval Collar

Figure 53: Battery Connector on oval collar

Unscrew the two nuts attaching the battery pack to the adjustable side of the collar with an 8 or 7 mm (depending on collar size) hexagon socket wrench (delivered with the collar). Remove the black base plate. The screws are integrated into the battery pack and cannot be removed.

Figure 54: Removing the battery connector from oval collar

Unscrew the two nuts and remove the washer on the non-adjustable side of the collar with the battery connector. **Carefully** pull the battery connector from the battery pack (Figure above, left). The battery pin socket is located between the two screws (Figure above, centre).

To attach a new battery pack, replace the O-ring on the battery plug and **carefully** push the three threaded pins of the connector plug into the connector socket (Figure above, right). Be careful to avoid any damage to the connector! Place the washer on the threaded pins and reattach the collar with new self-locking nuts to ensure that the O-ring of the nuts is not damaged.

NOTE: After changing the battery pack of your collar, a GPS coldstart is necessary. For this please refer to GPS Monitor.

11.2 Round Collar, standard battery pack

Figure 55: Battery connector on round collar, standard battery pack

Remove the screws attaching the bracket to the battery pack with an 8 or 7 mm (depending on collar size) hexagon socket wrench (delivered with the collar). Start with the screws on the adjustable side and then remove the screws attaching the battery connector.
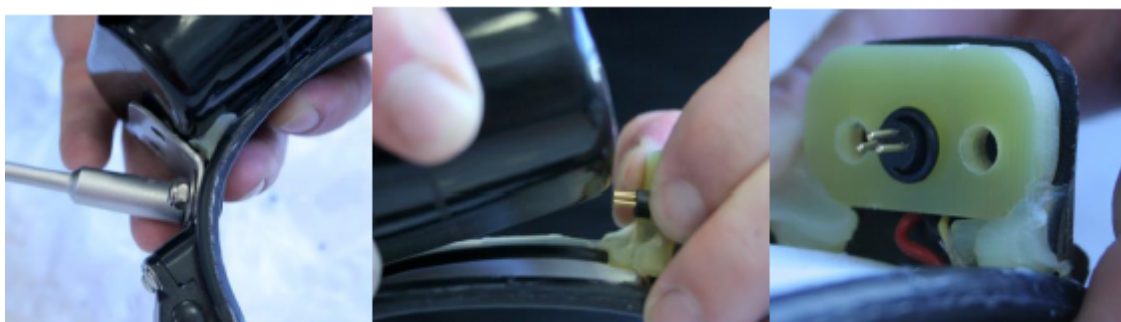
Figure 56: Removing the battery connector from round collar, standard battery pack

Unscrew the nuts attaching the bracket to the collar to gain more flexibility around the battery pack (Figure above, left). **Be careful when moving the battery pack.** Unplug the battery connector by **carefully** pulling the bracket away from the battery pack (Figure above, centre). Be careful to avoid any damage to the connector!

To attach a new battery pack remove the O-ring around the battery connector (be careful not to damage the cables). Replace the O- ring on the battery plug. **Carefully** push the three threaded pins of the connector plug into the connector socket. Tighten the bracket to the collar with new self-locking nuts and screw the battery pack to the bracket with unused screws to ensure that the self-locking coating on the screws is not damaged. Apply fresh O-ring around the battery connector to protect the contacts from humidity and to prevent sticks and debris from being caught between collar and battery pack.

NOTE: After changing the battery pack of your collar, a GPS coldstart is necessary. For this please refer to GPS Monitor.

11.3 Round Collar, curved battery pack
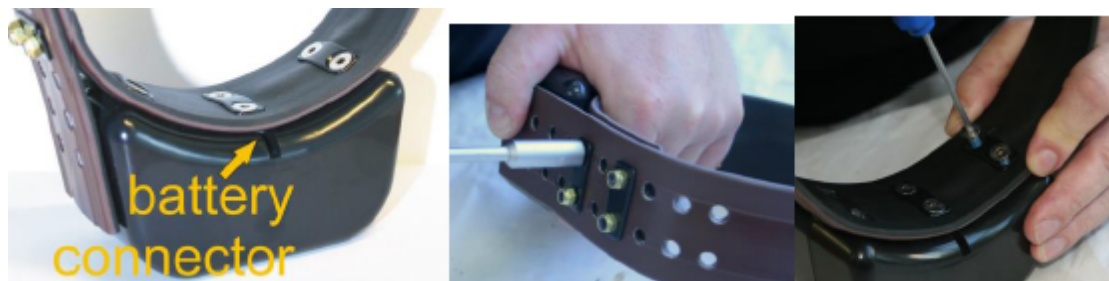
Figure 57: Battery connector on round collar, curved battery pack

First remove the nuts for closing the collar with an 8 or 7 mm (depending on collar size) hexagon socket wrench (Figure above, centre), then open the screws attaching the battery pack to the collar with a 3 mm hexagon socket key ("Inbus" or "Allen key", delivered with the new battery pack) starting with the exterior screws (Figure above, right).

Figure 58: Removing the battery connector from round collar, curved battery pack

Unplug the battery connector by pulling the collar away from the battery pack (Figure above, left). You can support this by **very carefully** wedging a flat screwdriver between the battery connector and the battery pack (Figure above, right). Be careful to avoid any damage to the connector!
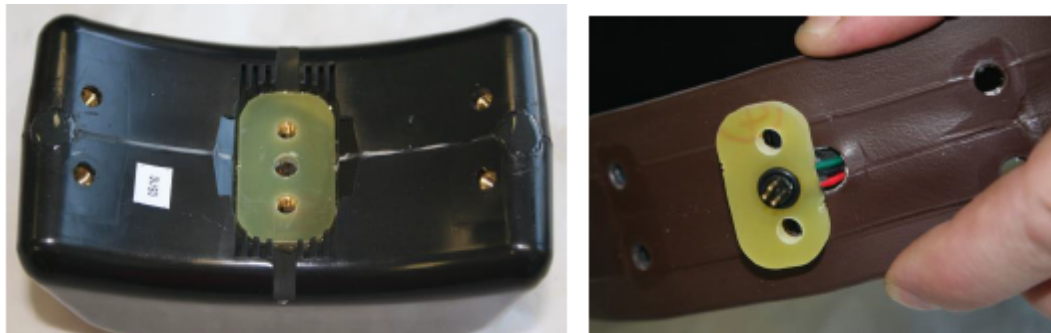
Figure 59: Battery connector and plugs on round collar, curved battery pack

Above, you can see the battery socket (left) and pins (right). To attach a new battery pack, exchange the O-ring on the battery plug and **carefully** plug the three threaded battery pins into the socket.

Figure 60: Attachment of curved battery pack to round collar with two metal base plates (left) and two Fastlock washers (right)

In older collars, the battery packs are fixed to the belt with six screws and three metal

base plates. To avoid the base plates pressing onto the battery cable, new batteries are fixed with only two metal base plates and two Fastlock washers (Figure above).

this side onto collar

Figure 61: Attachment for curved battery pack on round collar. Left: metal base plate; centre: screw and Fastlock washer; right: angle to attach screws

Put the black washer (Figure above) with the convex side onto the collar (otherwise you will not be able to countersink the screw head) and carefully attach the collar with unused screws beginning with the central pair and then the pair at the side next which you will open to deploy the collar. Note that the exterior threads run radially to the curved surface of the battery pack. Take care to arrange the screw correctly to avoid damaging the thread. Countersink the screws into the battery pack.

NOTE: After changing the battery pack of your collar, a GPS coldstart is necessary. For this please refer to GPS Monitor.

12 The Vertex Lite collar with integrated UHF ID-Tag

Devices → ◈ Remote Stick → ⦿ Radio Monitor

The VERTEX Lite Collar can be equipped with an internal UHF ID Tag to be used in interaction studies. They send out a unique signal which can be observed by VERTEX Plus collars (with UHF communication) recording all encounters and separation events.

The node Radio Monitor in the Devices tree allows you to check if your devices work. You can check **ID / Separation Tag**, Mortality Implant and Vaginal Implant by enabling one of these devices. For testing the device select ID / Separation Tag and take the magnet off the device and click on Apply . The Listening Frequency [MHz] of the USB Remote Stick is preset but can be changed if necessary to the transmit frequency of the UHF ID-Tag. If messages from this device are received, you will get a list with status messages of the corresponding device. With Clear Log you can delete the received entries. It will be shown with the same ID number as the collar.
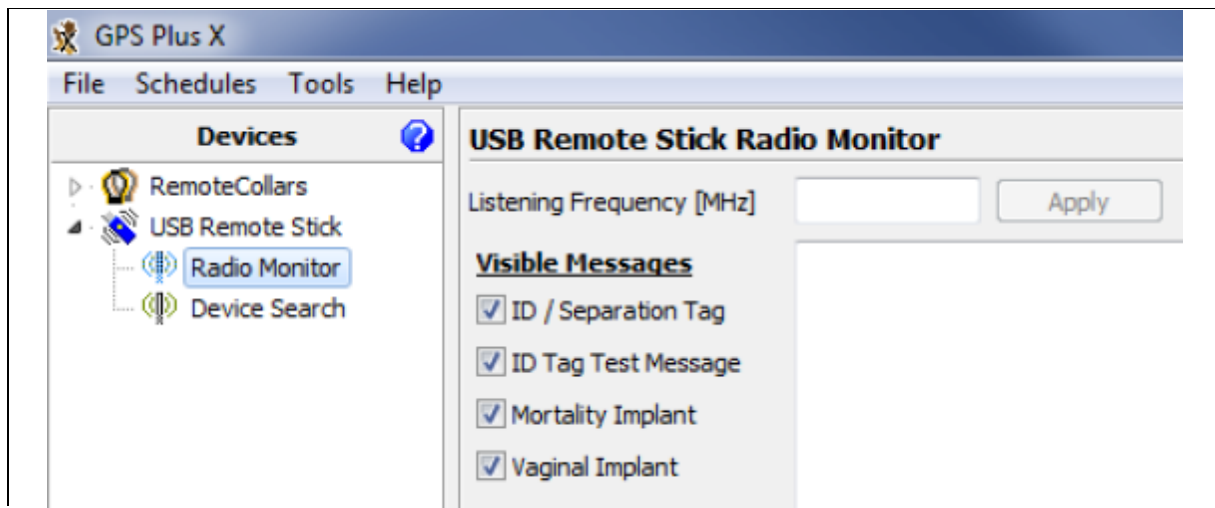
Figure 62: USB Remote Stick Radio Monitor frame

13   Specification

13.1   Environmental specification for the collar

Operational temperature range: -40°C to +70°C
Operating humidity range: <= 100% RH (relative humidity)
Storage temperature range: -45°C to +80°C
Storage humidity range: <= 100% RH (relative humidity)

Battery:

Do not short-circuit, recharge, puncture, incinerate, crush, immerse or expose battery to temperatures above the declared operating temperature range of the product. **Risk of fire or explosion!**

Storage:

Store in a cool (preferably below 30°C) and ventilated area, away from moisture, sources of heat, open flames, food and drink. Keep adequate clearance between walls and batteries. Temperature above 100°C may result in battery leakage and rupture.

Other:

Lithium batteries are not rechargeable and should not be recharged. Risk of fire and explosion.

Disposal Considerations:

Do not incinerate, or subject cells to temperatures in excess of 100°C. Such abuse can result in loss of seal, leakage, and/or cell explosion.

Do not dispose of the battery with the regular garbage, but in accordance with appropriate local regulations.

13.2 Declarations of Conformity

> **GPS Plus Collar   Globalstar**
>
> Contains FCC ID: L2V-STX2-1
> Contains IC: 3989A-STX2-1
>
> Canada 310
> This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Declaration of Conformity for USA

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1)this device may not cause harmful interference, and

(2)this device must accept any interference received, including interference that may cause undesired operation.

Usually this is followed by the following FCC caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Declaration of Conformity for CANADA

Operation is subject to the following two conditions:

(1)this device may not cause interference, and

(2)this device must accept any interference, including interference that may cause undesired operation of the device.

Usually this is followed by the following RSS caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Declaration of Conformity

acc. to 1999/5/EC (R&TTE), 2004/108/EC (EMC directive), 2006/95/EC (Low voltage directive)
We declare that the following product,

Type designation:	GPS Plus Globalstar Collar
Type or model:	---
Serial no.:	---

complies with the technical regulations and their valid changes at the time of issuing this declaration.

Applied standards/ directives were:	Title or description of the standard:
EN 300 440-1,-2 V1.5.1/ V1.3.1	**Short Range Devices 1- 40 GHz**
EN 301 441 V1.1.1	**Satellite Earth Stations and Systems (SES)**
EN 301 489-1,-3 V1.8.1 / V 1.4.1	**EMC for SRD 9 kHz – 40 GHz**
EN 301 489-20 V1.2.1	**EMC for Mobile Earth Stations (MES) used in the Mobile Satellite Services (MES)**
EN 60950-1:2006	**Safety of information technology equipment**

Address of the manufacturer or his authorized representative:

Company:	**VECTRONIC Aerospace GmbH**
Name:	**Mr. Robert Schulte**
Street:	**Carl-Scheele-Str. 12**

Location:	**12489 Berlin**
Country	**Germany**
Telephone:	**+49 (0) 30 6789 4990**
Fax:	**+49 (0) 030 6789 5230**
Email:	**mail@vectronic-aerospace.com**

This declaration was issued under the sole responsibility of the manufacturer and if required of his authorized representative:

Contact person:

Name:	**Mr. Robert Schulte**
Telephone:	**+49 (0) 30 6789 4990**
Fax:	**+49 (0) 30 6789 5230**

The product carries the CE mark " $C\epsilon$ 07 00 ① "

Berlin, 2010-08-23

. . . .
Robert Schulte

13.3   Certificates

m. dudde hochfrequenz-technik
DIN EN ISO/IEC 17025 akkreditiertes Prüflabor
Reg.-Nr.: DAT-P-225/96-02
Rottland 5a, D-51429 Bergisch-Gladbach
Tel. : +49 22 07 - 96 89 - 0
Fax : +49 22 07 - 96 89 - 20
Email: manfred.dudde@t-online.de
www.dudde.com

Deutscher
Akkreditierungs
Rat
DAR

DAT-P-225/96

Certificate of Conformity
N⁰ 10006100

Product definition	: GPS transmitter
Trademark	: VECTRONIC
Product name (Type)	: **GPS Plus Globalstar Halsband**
Hardware version	: GPS Plus Globalstar Halsband
Serial number	: 7247, 7278
Software release number	: ---
Operating frequency (TX)	: 1616.25 MHz
Alignment range	: 1610.00 - 1626.50 MHz
Channel spacing	: ---
Rated RF output power	: 70.2 mW e.i.r.p
Class of emission	: 1M95 G1D

This Certificate of Conformity has been granted based on the results of various measurements and tests, performed by m. dudde hochfrequenz-technik on a representative sample of the above mentioned product. The tests have been carried out against the following specifications:

EN 301 441 V1.1.1 (2000-05)
EN 300 440-1 V1.4.1 (2008-05)
EN 300 440-2 V1.2.1 (2008-05)
EN 301 489-1 V1.8.1 (2008-04)
EN 301 489-20 V1.2.1 (2002-11)
EN 60950-1: 2006

The tested sample fulfils the requirements of the above mentioned specifications. The associated m. dudde hochfrequenz-technik test reports numbers are: 10006099, 100066077, 10005993 and 10005994

This Certificate of Conformity has been granted to:

VECTRONIC Aerospace GmbH

Carl-Scheele-Str. 12

12489 Berlin

Bergisch Gladbach, 2010-05-18

Manfried Dudde

Expertise

Expert Opinion of the Notified Body on the Conformity Assessment according to Article 10.5 of R&TTE Directive 1999/5/EC

PHOENIX TESTLAB
EU Identification Number 0700

Bundesnetzagentur

Recognised by

BNetzA-bS-02/51-55

Expertise No.	10-111760
Certificate Holder	VECTRONIC Aerospace GmbH
Address	Carl-Scheele-Str. 12 12489 Berlin Germany
Product Description	GPS Receiver/ Globalstar Transmitter
Brand Name / Model Name	Globalstar / GPS Plus Collar
Frequency Range	1611.25 – 1616.25 MHz
Transmitted Power	-38.7 dB (W/4kHz) (mean power)

Opinion on the Essential Requirements

Article 3.1a): Health and Safety	**Remarks see annex**
Article 3.1b): Electromagnetic Compatibility	**No remarks**
Article 3.2: Effective Use of the Radio Spectrum	**No remarks**

CE-marking

Marking Example (Class 1)

CE 0700

This certificate is issued in accordance with the Directive 1999/5/EC of the European Parliament and the Council on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity dated 9th March 1999 and is only valid in conjunction with the following annex (2 pages).

Blomberg, 26 July 2010

Place, Date of Issue

Signed by Holger Bente
Notified Body

Phone +49(0)5235-9500-24
Fax +49(0)5235-9500-28
notifiedbody@phoenix-testlab.de

PHOENIX TESTLAB GmbH
Königswinkel 10
D-32825 Blomberg, Germany
www.phoenix-testlab.de

Technical Construction File (TCF):

Description

User Manual:	GPS Plus Manual, Version 0.1, 54 pages, 16.07.2010
Operational Description:	STX2 Data Sheet _UM-9100-0151-01 r3, Part Number 9100-0151-01, Rev.1.2, 38 pages, 18 October 2005

Manufacturing Documents

Block Diagram:	Block Diagram, Vers.no.1.10, 2 pages, 2010-03-01
Circuit Diagram:	Schematics, Vers.no.1.10, 3 pages, 2010-03-01
Parts Placement:	TOP GPS PLUS Globalstar, 1 page, -- Bottom GPS PLUS Globalstar, 1 page, --
PCB-Layout:	Layer1-6 GPS PLUS Globalstar, 6 pages , --
Parts List:	Parts List, Vers.no.1.10, 3 pages, 2010-03-01
Hardware Version:	--
Software Version:	--

Applied Standards and Test Reports

Specification	Laboratory	Test Report Number
EN 60 950-1: 2006	m. dudde	10006186
EN 301 489-1 V1.8.1: 2008-04 EN 301 489-3 V1.4.1: 2002-08 EN 301 489-20 V1.2.1: 2002-11	m. dudde	10006149 10006116
EN 300 440-2 V1.3.1: 2009 EN 300 440-1 V1.5.1: 2009-03	m. dudde	10006148
EN 301 441 V1.1.1 : 2000-05	m. dudde	10006238

Further Documents

Antenna Characteristics, Vers.no.1.10, 9 pages, 2010-03-01

Phone +49(0)5235-9500-24
Fax   +49(0)5235-9500-28
notifiedbody@phoenix-testlab.de

PHOENIX TESTLAB GmbH
Königswinkel 10
D-32825 Blomberg, Germany
www.phoenix-testlab.de

Opinion on the Essential Requirements:

The basis of this Expertise is the Technical Construction File (TCF). If the TCF includes test reports issued by laboratories accredited to the standard ISO/IEC 17025, the test results of these reports are considered as a basis for the conformity assessment of the Notified Body.

Article 3.1a): Health and Safety:

- Safety: Conform
- Health: Not assessed

Article 3.1b): Electromagnetic Compatibility:

- Conform

Article 3.2: Effective Use of the Radio Spectrum:

- Conform

General Remarks:

- Before putting a product on the market which uses non harmonised frequencies (Class 2) the national authorities of the member states have to be notified.

- This conformity assessment is limited to the essential requirements of the R&TTE Directive. Only products fulfilling all essential requirements of all applicable new approach directives may be placed on the market and put into service.
  Products in compliance with all provisions of the applicable directives providing for the CE marking must bear this marking.

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PHOENIX TESTLAB GmbH
Königswinkel 10
D-32825 Blomberg, Germany
www.phoenix-testlab.de

Agence Nationale des Fréquences

DIRECTION TECHNIQUE DU CONTROLE DU SPECTRE
Département R&TTE

Affaire suivie par : M LOUIS Laurent
Mel : rtte@anfr.fr / Fax : 33 (0)3 29 42 20 30
Ref : ANFR/DTCS/RTTE/18240-10/LL

Madame/Monsieur,

J'accuse réception de la notification adressée par Anja HITTIG-RADEMACHER, dûment habilité(e) par la société VECTRONIC Aerospace GmbH, en vue de la mise sur le marché français du type d'équipements suivant :

Désignation commerciale : VECTRONIC
Référence : GPS Plus Globalstar Halsband

La mise sur le marché et/ou la mise en service du matériel que vous avez notifié ne sont pas soumises à des restrictions puisque cet équipement relève de la classe 1 définie par la décision de la Commission européenne du 6 avril 2000 établissant la classification initiale des équipements hertziens et des équipements terminaux de télécommunications ainsi que des identificateurs associés (JOCE du 19 avril 2000, http://ec.europa.eu/enterprise/sectors/rtte/files/class_en.pdf) sous réserve du respect de l'ensemble des conditions fixées dans la liste indicative et non exhaustive des équipements relevant de la classe 1 (http://www.ero.dk/rtte).

En conséquence, il est inutile de notifier à l'autorité responsable de la gestion des fréquences votre intention de commercialiser ces appareils sur son marché national.

Sous réserve du respect des dispositions de la directive 99/05/CE du 9 mars 1999 transposée dans le code des postes et des communications électroniques, vous pouvez donc commercialiser votre équipement en France sans délai.

Je vous prie de croire, Madame/Monsieur, en l'expression de ma considération distinguée.

Fait à Saint Dié des Vosges, le 18/08/2010

Pour le Directeur Technique du Contrôle du Spectre
(DTCS)

Hakim LATRACHE

4 RUE ALPHONSE MATTER – BP 8314 – 88108 SAINT-DIE DES VOSGES CEDEX – FRANCE
Téléphone : +33 (0)3 29 42 20 00 – Télécopie : +33 (0)3 29 42 20 10 – N° SIREN : 180 053 027
http://www.anfr.fr   mel : rtte@anfr.fr

LIETUVOS RESPUBLIKOS
RYŠIŲ REGULIAVIMO TARNYBA
COMMUNICATIONS REGULATORY AUTHORITY OF THE REPUBLIC OF LITHUANIA

Attn.: Ms. Anja Hitting-Rademacher   *31*.08.2010   Our ref: (11.16) 1B-*3470*
M.dudde hochfrequenz-technik   Your ref:

Fax: +49 2207 9689 20

Subject: notification of Radio Equipment in accordance with article 6.4 of Directive 1999/5/EC

Dear Ms. Rademacher,

We confirm that the short range device for animal position identification, model: GPS Plus Globalstar Halsband, manufactured by Vectronic Aerospace GmbH, can be placed on the Lithuanian market.

An individual authorisation to use frequency/channel is not required for the operation of the equipment mentioned above under the conditions set in the line 79 (which refers to European Communications Committee Decision ERC/DEC (00)06) of the List of radio frequencies/channels, which may be used without an individual authorisation, approved by Order No. IV-27 of the Director of the Communications Regulatory Authority of 13 of March 2003 (Official Gazette *Valstybės Žinios*, 2003, No. 30-1277).

Sincerely yours

Romualdas Leonavičius

Deputy Director

Contact: Raimundas Jarmalis, tel. +370 5 210 56 96, e-mail rjarmalis@rrt.lt

State budgetary agency	27a Algirdo str.	Tel: +370 5 210 56 23/33,	E-mail: rrt@rrt.lt
Code 121442211	LT-03219 Vilnius	Fax: +370 5 216 15 64	Web site: www.rrt.lt
VAT code LT 214422113	Lithuania		
Register: The register of legal entities			

INSTITUT LUXEMBOURGEOIS DE RÉGULATION

m.dudde hochfrequenz-technik

c/o   Mrs Anja HITTIG - RADEMACHER
Rottanne 5a

D - 51429 Bergisch Gladbach
Germany

Luxembourg, the 06/09/2010

Our reference : RT/CK D 45682

File treated by : Kaiser Claude   Tel: +352 45 88 45 - 44

Subject : Notification according to the directive (99/05/CE) R&TTE

Dear Madam, Dear Sir,

Refering to your notification request, received on the 10 August 2010   via the OSN system
we inform you about the results of our technical analysis. (see overleaf)

Please note, that no legal claim to frequency assignment can be derived from this notification as
according to article 3 of the law of 30 May 2005, concerning radio frequency management, the
frequency use in Luxembourg may be subject to licence. Futher information is given in our
analysis.

Please be informed that the "Institut luxembourgeois de la normalisation, de l'accréditation, de la
sécurité et qualité des produits et services" (ILNAS) is acting as market surveillance authority in
Luxembourg concerning R&TTE products.

Pour le Ministre des Communications et des Médias,

Roland Thurmes
Premier Conseiller de direction

SIÈGE: 45, ALLÉE SCHEFFER - ADRESSE POSTALE: L-2922 LUXEMBOURG
TEL. (352) 45 88 45 1 - FAX (352) 45 88 45-88 - WWW.ILR.LU

Results of our technical analysis:

Date of notification	Observations
Our reference	
10/08/2010	**Notification body:** 0700 - Phoenix Testlab GmbH, Germany **Manufacturer:** VECTRONIC Aerospace GmbH **Type / Number of model:** VECTRONIC: GPS Plus Globalstar Halsband **Operating frequency:** 1610-1626.2 MHz
100810/16025	
	The equipment you notified, according to article 6.3 of the decree of 4th February 2000 concerning radio equipments and telecommunications terminal equipments and the mutual recognition of their conformity (equivalent to article 6.4 of the R&TTE directive), does operate in accordance with the planned frequency use in Luxembourg, which is regulated by the decree of 29th July 2008 containing the frequency plan and the national interfaces LUX/RI MSS 06, LUX/RI MSS 06.1 under following conditions: Maximum radiated power: -3 dB (W/4 kHz) (mean limit) In this context, the mean is the mean over time whilst the MES is in the carrier-on mode -15 dB (W/4 kHz) (peak limit)

MINISTERIO
DE INDUSTRIA, TURISMO
Y COMERCIO
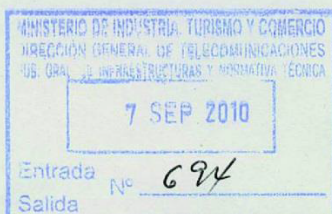
SECRETARÍA DE ESTADO DE TELECOMUNICACIONES
Y PARA LA SOCIEDAD DE LA INFORMACIÓN

DIRECCIÓN GENERAL DE TELECOMUNICACIONES

SUBDIRECCIÓN GENERAL DE INFRAESTRUCTURAS
Y NORMATIVA TÉCNICA

MINISTERIO DE INDUSTRIA, TURISMO Y COMERCIO
DIRECCIÓN GENERAL DE TELECOMUNICACIONES
UB. GRAL DE INFRAESTRUCTURAS Y NORMATIVA TÉCNICA

7 SEP 2010

Entrada
Salida   Nº 6 94

M.DUDDE HOCHFREQUENZ-TECHNIK,
ATTN. MR. RALF GRABOWSKI
ROTTLAND 5 A,
51429 BERGISCH GLADBACH
ALEMANIA

SOLICITANTE: VECTRONIC AEROSPCE GMBH

Ref: 000341/2010

Estudiada la Notificación recibida el **31-08-2010**, en relación con el artículo 21 del Reglamento que establece el procedimiento para la evaluación de la conformidad de los aparatos de telecomunicaciones, aprobado por Real Decreto 1890/2000, de 20 de noviembre, modificado por la disposición final tercera del Real Decreto 424/2005 de 15 de abril (BOE 29 de abril de 2005), para los equipos:

Equipo**:** ....**Transceptor por satélite**
Fabricado por**:** ....**VECTRONIC Aerospace GmbH**
en**:**...........................**ALEMANIA**
Identificación del equipo:

MARCA	MODELO	DENOMINACIÓN COMERCIAL
VECTRONIC	GPS Plus Globalstar Halsband	VECTRONIC

Le comunico que dichos equipos pueden ser puestos en el mercado español, siempre y cuando se cumplan todos los requisitos adicionales para su comercialización recogidos en el Real Decreto 1890/2000, de 20 de noviembre y otras disposiciones que le sean de aplicación.

Además, para la puesta en el mercado y puesta en servicio de estos equipos es necesario:

1. Incorporar la marcación correspondiente de acuerdo con los artículos 16 y 17 del citado Reglamento.

2. Incluir en el manual del usuario toda la información requerida según los artículos 12, 13, y 14 de dicho Reglamento, incluyendo las restricciones o requisitos potenciales para la utilización del equipo en algunos o todos los Estados miembros de la Unión Europea.

Estos equipos son conformes con el Cuadro Nacional de Atribución de Frecuencias vigente en la actualidad. Debido a que éste se modifica con cierta periodicidad, se aconseja su consulta por si los cambios que se produzcan puedan afectar a estos equipos.

Madrid, a 2 de septiembre de 2010
EL JEFE DEL ÁREA DE CERTIFICACIÓN Y REGLAMENTACIÓN TÉCNICA,

Juan Antonio Mayayo Leiva.

Capitán Haya, 41- Despacho 719
28071 Madrid
TLF: 91 346 26 62
FAX: 91 346 23 79

NEMZETI HÍRKÖZLÉSI HATÓSÁG HIVATALA

Nemzeti Média– és Hírközlési Hatóság Hivatala
Frekvencia engedélyezési osztály
E-mail cím: feo@nhh.hu
Ügyintéző: Bucsás István
Telefonja: 4680661
Ügyiratszám: 18775-2/2010.

Fax: 4680508
Hivatkozási szám:OSN.:5944
Ügyintézőjük: Anja Hittig-Rademacher
Tárgy: tájékoztatás

m. dudde hochfrequenz-technik
Anja Hittig-Rademacher

Rottland 5a.
51429, Bergisch Gladbach,
Germany

Tisztelt Anja Hittig-Rademacher Úrhölgy!

Hivatkozással a 2010. augusztus 10-én kelt levelére, amelyben a(z) **VECTRONIC Aerospace GmbH.** gyártmányú **GPS Plus Globalstar Halsband** típusú, Brand:VECTRONIC rádióberendezés forgalomba hozatalával kapcsolatban az alábbiakról tájékoztatom:

A fenti rádióberendezést, a Frekvenciasávok Nemzeti·Felosztási Táblázatának megállapításáról szóló 346/2004. (XII. 22.) számú Kormányrendelet, **H141** számú lábjegyzete, továbbá a frekvenciasávok felhasználási szabályainak megállapításáról szóló 35/2004. (XII. 28.) számú IHM rendelet **4.** számú melléklete alapján **nem kell bejelenteni (notification is not needed in Hungary).** A fenti berendezés **Magyarországon szabadon forgalomba hozható és egyedi engedély nélkül üzemeltethető** a rádióberendezésekről és az elektronikus hírközlő végberendezésekről, valamint megfelelőségük kölcsönös elismeréséről szóló 5/2004. (IV. 13.) IHM rendeletben előírtak szerint.

Budapest, 2010. augusztus 11.

főigazgató nevében és megbízásából

Üdvözlettel:

Czuczy András
osztályvezető

1133 Budapest, Visegrádi u. 106. Levélcím: 1386 Budapest 62., Pf. 997
Tel.: (06-1) 468-0500   Fax: (06-1) 468-0509   www.nhh.hu
q:\nem kell 2010\18775-2 gps plus globalstar halsband nem k btájék doc