

# **VERTEX Plus Collar**

## **User's Manual**



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## 1 Product overview

The VERTEX Plus Collar is a modular system that is customized to your project needs. Your Collar is built with a combination of following options.

### Remote Communication Options

- Iridium bi-directional Satellite Communication
- Globalstar Uplink Satellite Communication
- GSM bi-directional Communication
- UHF Radio Communication
- VHF Beacon transmitter (signal transmitter only)

### Internal Sensor Options

- Mortality & Hibernation Sensor
- Temperature Sensor
- Basic Activity Sensor (3-axis acceleration, averaged data each 300sec.)
- Advanced Activity Sensor (High Resolution 3-axis acceleration, raw data up to 32Hz)

The VERTEX Plus Collar with UHF communication is able to communicate with UHF ID Tags / various external sensors:

### External Sensors (Proximity and Separation Application)

- Customizable UHF ID Tags for species interaction
- Expandable fawn collars for offspring survival studies
- Stationary UHF ID Tags for e.g. road crossings, waterholes
- Vaginal Implant Transmitter (VIT) for pregnancy observation
- Mortality Implant Transmitter (MIT) for instant mortality detection

## Drop Offs

To simplify collar recovery a radio and timer controlled Drop Off mechanism is available.

All data are stored on the non-volatile memory on-board the collar and can be downloaded via cable after retrieving of the collar.

## 2 Fast guide to deploy the collar

The collar is delivered thoroughly tested and fully programmed according to your instructions. Please spend some time and make yourself familiar with the collar and all its features. We recommend you to follow the next steps to check and test all functions of your collar.

(A magnet needs to be attached to the electronic housing to keep collar in stand-by mode, otherwise the collar will perform GPS fixes and transmissions.)

1. Setup your GPS Plus X software system (for further information please refer to the GPS Plus X software manual)
2. Register your collar
3. Attach the VERTEX Plus Collar to your PC (USB to VERTEX Plus Interface Cable)
4. Check the **configuration** and **schedules** of the collar
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 collar performance of sensors and data interfaces/transfer, also remotely.** For this you need to remove the magnet from the electronic housing (not the Drop Off magnet!) and place the collar outdoors with a clear view to the

sky. Check signal quality and process incoming data. Try sending reconfiguration commands remotely. Once you finish testing your collar deactivate it by reattaching the magnet to the electronic housing. **Do not trigger the Drop Off! It can only be used once!**

When deploying the collar:

8. Make sure the O-ring and the communication connector end cap are in place to protect the communication connector from dirt and humidity.
9. Adjust the belt to the correct circumference and cut the extra belt to minimize the risk to injure or handicap the animal.
10. **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.**

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

### 3 The VERTEX Plus Collar

If you want to achieve a deeper knowledge of all functions and features of your collar, we recommend you to read the whole chapter carefully. If you do not want to spend this time you may skip this chapter and go straight forward to the [system setup](#). The system setup gives concrete instructions how to check configurations and to test your collar before deployment.



**Figure 1: VERTEX Plus Collars: left: round collar for carnivores, right: oval collar for ungulate**

### The basic VERTEX Plus Collar consists of the following components:

- the electronic housing containing the GPS module, the VHF beacon, the optional sensors (activity/mortality/temperature), the communication modem (GSM/Iridium/Globalstar), an UHF module and the UHF ID Tag (optional)
- the magnet, which is attached to the electronic housing when the collar is in Stand-by-mode
- the communication connector for the USB to VERTEX Plus Interface Cable
- the battery pack with integrated battery connector and the Drop Off with magnet (optional)
- belt with integrated VHF/UHF- antenna at the adjustable side of the belt and electronics at the not-adjustable side of the collar

The collar is designed to function at extreme temperatures (-45°C to +70°C) and to be completely water proof (withstands total immersion).

### 3.1 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 visualize GPS positions.

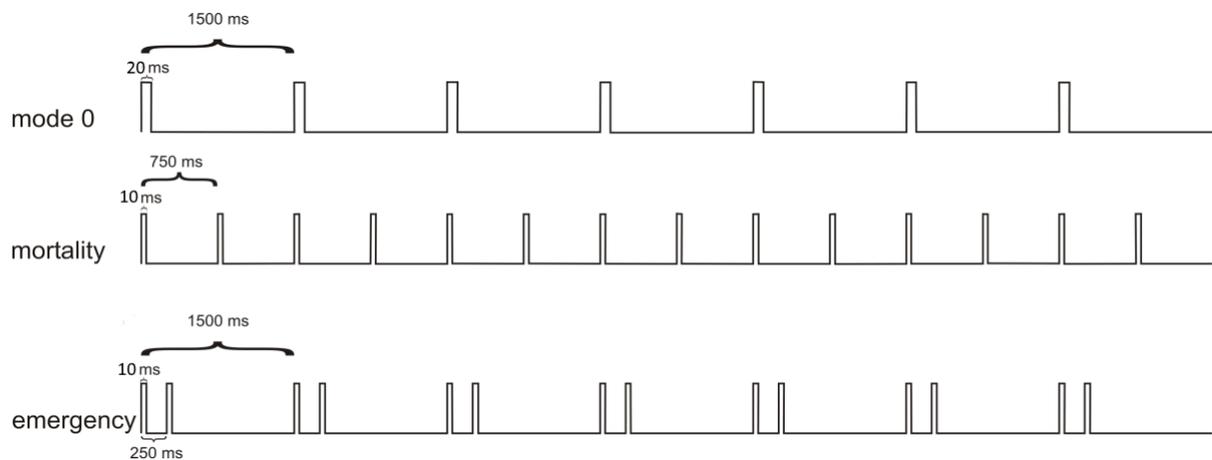
### 3.2 VHF Beacon

Optionally, the collar be can equipped with a powerful VHF beacon, so you can locate your animal via VHF tracking. The VHF beacon has its own battery which is located in the main battery pack. Even if the main battery is low the beacon can proceed sending a signal by using its own backup battery, so you still be able to find your collar even if the main battery is empty. The VHF beacon frequency can be changed within a small range using the GPS Plus X software. The VHF beacon schedule defines the beacon

active time. You can program the VHF beacon active time and also its signal pattern. Different beacon signal pattern can be useful if you want to characterize a certain collar to distinguish between different animals.

Changes can be made in the GPS Plus X software. You will find an instruction how to change the beacon schedule in chapter [Schedules](#). To change frequency and patterns follow the instructions in chapter [Configuration](#).

The VERTEX Plus Collar has three signal modes, the Standard Pattern (default: mode 0), the Mortality Pattern and the Emergency Pattern. The Mortality Pattern is active when your animal has not moved for a defined time (mortality period) ([Mortality & Hibernation Sensor](#)). The Emergency Pattern gets activated if the main battery of your collar is low. The default settings are shown below but you are able to change the Pulse Length and also Loop Length (cycle in which the signal is repeated) of the standard pattern.



**Figure 2: Beacon patterns for default mode (mode 0), mortality mode and emergency mode**

In GPS Plus X software it is possible to listen to single patterns.

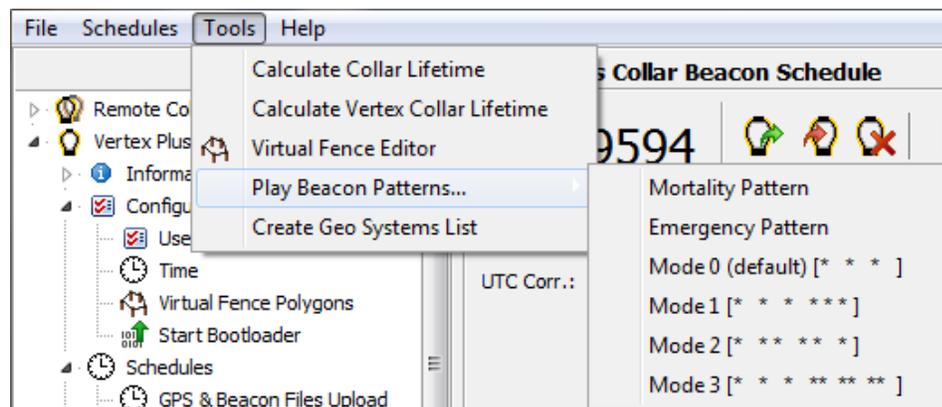


Figure 3: Play Beacon Patterns

### 3.3 Communication options

The VERTEX Plus Collar is available with Iridium, Globalstar or GSM as remote communication. Follow the link to your chosen configuration.

[Iridium](#)

[Globalstar](#)

[GSM](#)

#### 3.3.1 Iridium Communication

Iridium offers a two-way communication which means you receive GPS data from the collar and can send new commands and schedules remotely to the collar. The Iridium system consists of 66 satellites with global coverage, 24 hours per day.



Figure 4: Iridium Global 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 even though some data packages come in later.

For transmitting the data the collar needs 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 whereas the first block can contain 1-4 GPS fixes, the second block additional 8 at most (12 in total so far) and the third and last block 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 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 losing 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).

### 3.3.2 Globalstar Communication

The Globalstar system provides one-way communication only. It enables data download via satellite with a broad but space and time restricted coverage network that affects its usability and performance in certain areas (see coverage map).

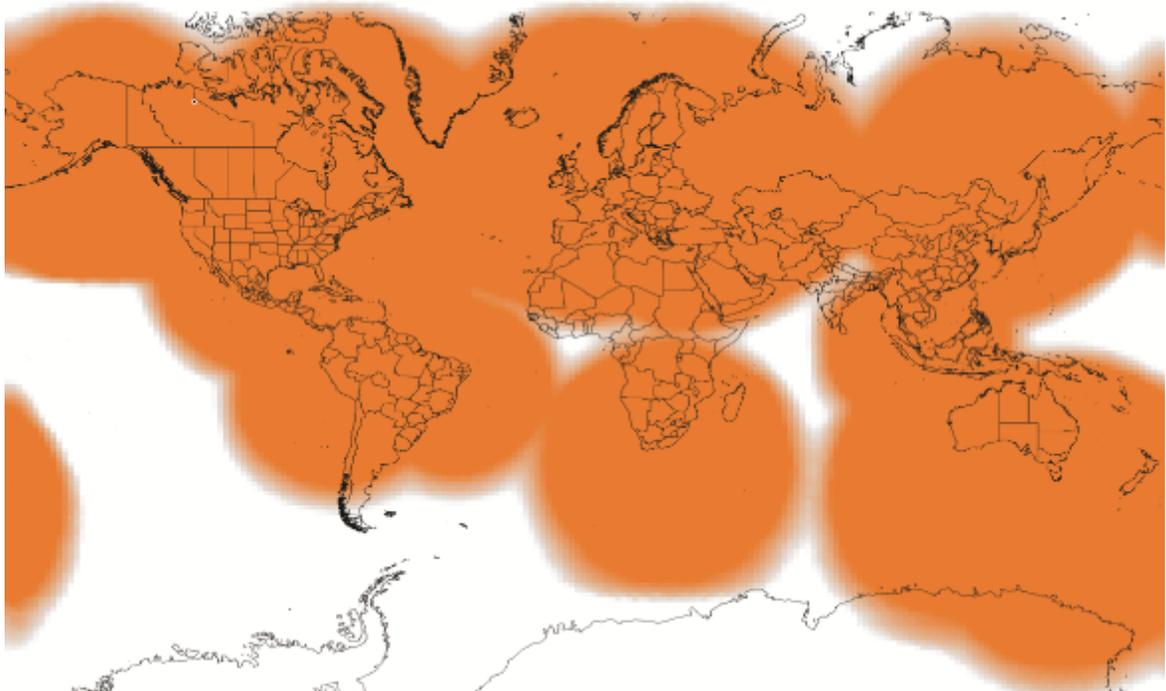


Figure 5: Globalstar Coverage Map 2016

Each GPS position data is sent by the collar (1-2 Fixes per message). Data is sent out 3 times to increase transmission probability but data reception is not confirmed by the satellites. The satellite sends the data to a base station on ground which forwards it via web to our system. It is possible that transmissions are blocked (e.g. thick canopy, bad angle towards sky etc.) and do not reach the satellites and thereby you. Data which are sent to our server can be downloaded by HTTP service of your GPS Plus X software. Another way to receive the data is by email. You always can get the full data set by downloading it after retrieving the collar via the USB to VERTEX Plus Interface cable.

**NOTE:** In the User Configuration of GPS Plus X software 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 third fix, all data will be stored in the collar). A skip count potentially reduces 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).

### 3.3.3 GSM Communication

GSM uses the SMS service of mobile phone providers. The GSM communication is a 2-way communication, which means 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 under [wildlife@vectronic-aerospace.com](mailto:wildlife@vectronic-aerospace.com).

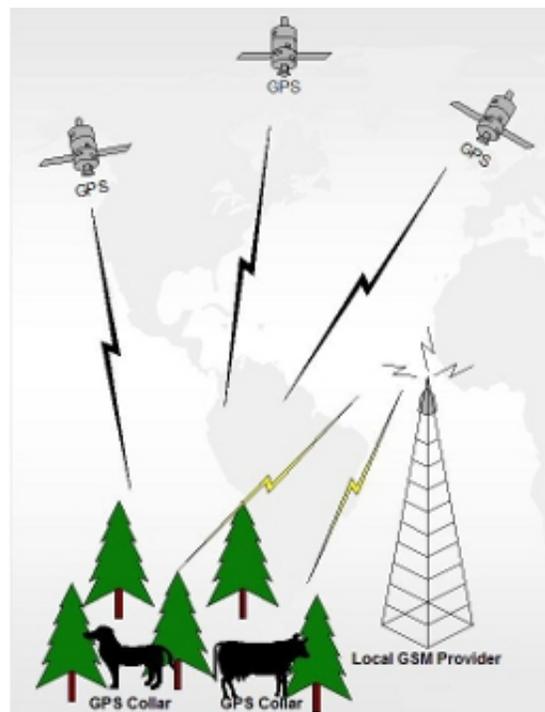


Figure 6: GSM Communication

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). 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 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. A message

transmitted via GSM contains 7 GPS positions per default. It is recommended having your own GSM Ground station when using your GSM collars with your own SIM cards.



Figure 7: 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.

### 3.4 Internal Sensors

Internal Sensors can be added to the collars additionally to record data or information which might be interesting for your research or study.

Please refer to the following subtopics to get more information regarding single external sensors:

[Mortality & Hibernation Sensor](#)

[Temperature Sensor](#)

[Activity Sensor \(Acceleration\)](#)

[Proximity and Separation Sensor](#)

### 3.4.1 Mortality & Hibernation Sensor

If no movement is detected for a user-defined mortality period (default setting: 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 to the [VHF Beacon pattern](#) of the Mortality Mode.
- Iridium/GSM communication: Performs a communication attempt to send out a mortality event message via SMS or e-mail instantly.
- Globalstar communication: Conducts unscheduled GPS fixes each 30 minutes for six hours before it returns to the programmed schedule.

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

**NOTE:** The mortality period should be adapted to the behavior of the collared animal to avoid false alerts (e.g. lions with a very long passive phase should get a longer mortality period than for example roe deer with a distinct but short activity pattern).

For instant mortality detection please check the [external MIT sensor](#).

Additionally, the mortality sensor can function as hibernation sensor. For this feature, we define an activity threshold for your animal. If the animal's activity is below this threshold for a given time, the collar changes into hibernation mode. That means only one GPS fix per day is attempted or transmitted. The collar returns to normal mode if the activity level exceeds the hibernation threshold again. The hibernation mode will save battery and is expedient for two reasons:

1. the animal does not change its position
2. there is little chance of GPS and GSM / satellite contact from a cave or den.

**NOTE:** Please consult VECTRONIC Aerospace regarding the hibernation settings. Wrong settings may result in losing contact with the collar.

### 3.4.2 Temperature Sensor

The temperature sensor is located in the electronic housing. Though the measured temperature is related to the ambient temperature, several factors effect these measurements. These are the animal's body temperature, the heating up of the housing because of sun, cooling effects of wind, etc. Due to the thermionic

characteristics of the housing material, variations in ambient temperature will not have an immediate effect on the temperature sensor, but will be measured with delay.

For very precise body temperature data please check the [external MIT sensor](#) application.

### 3.4.3 Activity Sensor (Acceleration)

The VERTEX Plus Collars can be equipped with a **Basic Activity Sensor** or an **Advanced Activity Sensor**. The data are stored in the non-volatile on-board memory.

**Basic Activity Sensor** records **average data** every 300 seconds (mode [1]) on 3-axis (X, Y, Z). So, you can analyze relative activity based on right- left, up- down, and forward-backward movement.

**Advanced Activity Sensor** measures activity on three axes based on the **true acceleration** experienced by the collar (Figure below). There are 3 axes (X, Y, Z) which constitute a three-dimensional space in which acceleration is measured. Data can be stored as true acceleration raw data generating a massive amount of information. The sensor records data with 2, 4, 8, 16 or 32 Hz (measurements per second). The default mode is 8 Hz. The memory capacity depends on sampling rate (e.g. up to 5 years with 8 Hz). The raw data is detailed enough to not only observe general pattern but to distinguish distinct behaviors and get a clear picture on what the animal is doing with proper analysis.

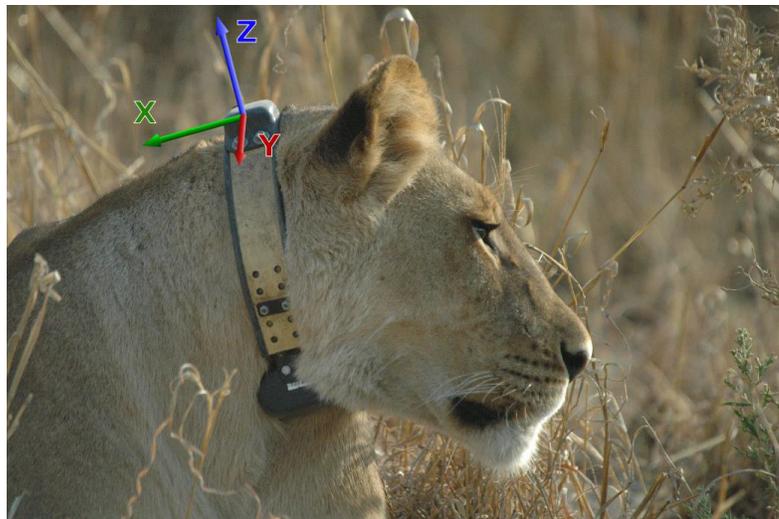


Figure 8: Directions of the three activity axes

**NOTE:** Activity raw data can only be downloaded via USB to VERTEX Plus Interface

cable because of the massive amount of data (Not via satellite, GSM or UHF communication!)

### 3.4.4 Proximity and Separation Sensor

The proximity sensor is part of a system that enables you to monitor interactions between different animals such as predator and prey or encounters between individuals of different social groups. The proximity sensor in the VERTEX Plus Collar with UHF communication is able to receive ID codes within a range between 5 and 500 meters, depending on ID Tag, collar settings and environmental issues.

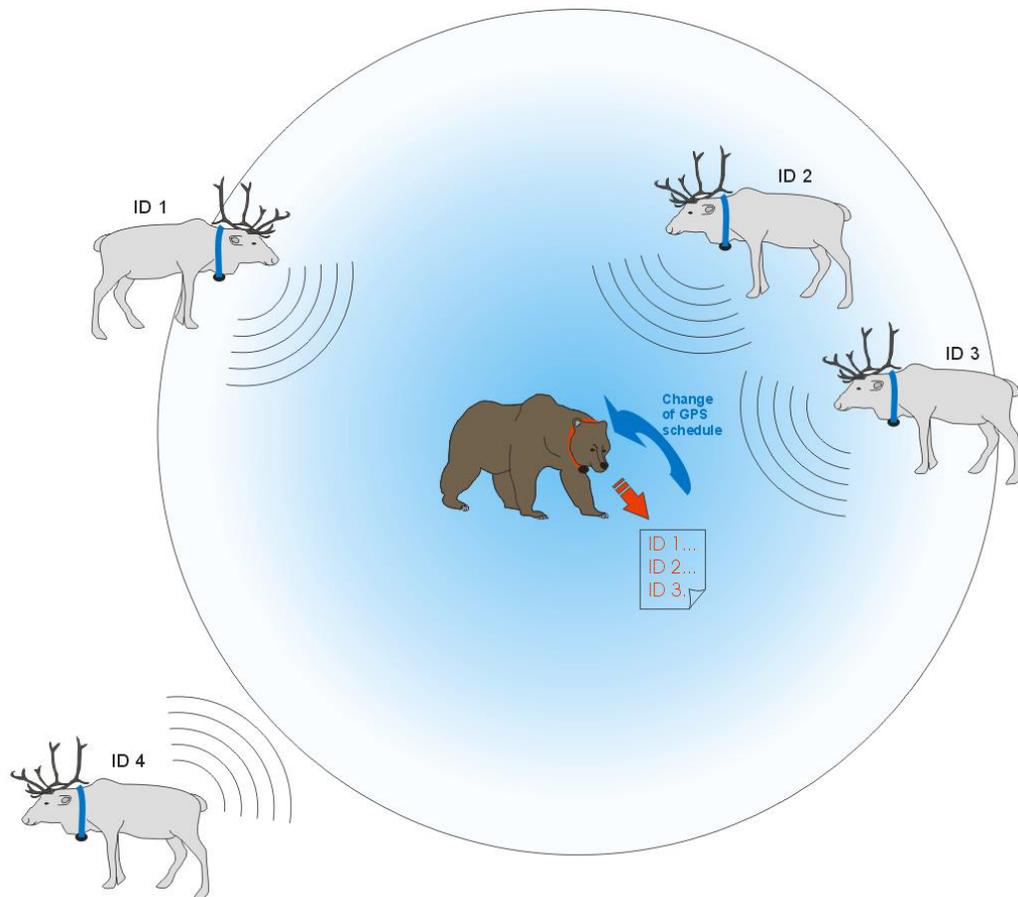
If an ID code is received, it will be stored in the memory with the signal strength and the time stamp. If GSM or Iridium transmission is enabled, a list of ID codes encountered between two transmissions is sent with each GSM or Iridium message. Signal strength and time stamp are not transmitted via GSM or Iridium. These are only available via cable or UHF link. The file extension is .PRX.

**NOTE:** Signal strength does not provide reliable information about the distance between two collared animals.

If an ID code has been received by the proximity sensor, an alternative GPS schedule can be activated. This way the frequency of GPS fixes can be intensified. The proximity GPS schedule can stay active for a configurable period of time after the last ID code has been received. Then the GPS receiver will return to the standard schedule. The proximity sensor will be switched off during GPS fixes, so small data gaps might occur.

You can decide if ID's will be ignored or if they create an immediate reaction by defining Blacklist and Whitelist. Optionally, you can define max. 25 ID for Blacklist. In that case all other IDs will cause Proximity event except the ones on the Blacklist. Additionally, and optionally, you can define max. 25 ID for Whitelist. In that case only those collars will cause a Proximity event.

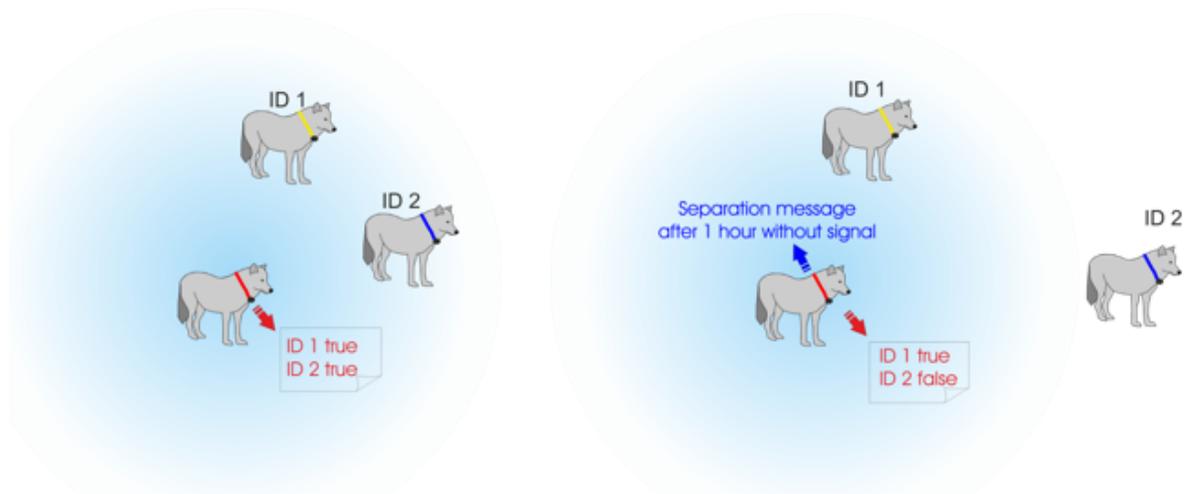
If you do not enter any IDs to the lists the sensor will behave normally and react to all incoming signals. For definitions please refer to [User Configurations](#)- External sensors Proximity Receiver.



**Figure 9: Proximity sensor. UHF ID-tags (blue collars) send an ID code which is received by the proximity sensor on a VERTEX Plus Collar (red) if the UHF tag is within the radius of the sensor (app. 100 m). The IDs of the tags in range (ID1, ID2, ID3) are stored in the collars memory. ID4 is out of range. As soon as an ID is received, the GPS schedule is changed to the proximity GPS schedule.**

## Separation sensor

The separation sensor works with the same hardware and the same method as the proximity sensor, but the application and the recorded/sent data differ. The separation sensor listens for up to ten pre-defined UHF ID tags. With each listening attempt, the collar stores whether the ID signal has been received (true) or not (false, Figure below). A complete list of all listen attempts with time stamp, signal strength, and ID tag status can be downloaded via cable or UHF handheld terminal. Recorded data will not be transmitted via GSM or Iridium.



**Figure 10: Separation sensor.** UHF tags (yellow and blue collar) send an ID code which is received by the proximity sensor on a VERTEX Plus Collar (red) if the UHF tag is within the radius of the sensor (app. 100 m). With each listening attempt, all received ID numbers are stored in the separation data as “true” (see left picture). If an ID tag is not received by the sensor, its ID will be stored as “false” (see right picture, ID 2). If one ID tag has not been received for one hour, the collar will send a separation message via GSM or Iridium (optional).

If the signal has not been received for one hour, the collar can send a separation message via GSM or Iridium (optional). If the separation sensor is only active during some hours of the day, and an ID tag’s signal is not received when the sensor is switched on, the collar will wait for one hour without receiving the signal before it sends the separation message. If the separation sensors active time is shorter than one hour, and the ID tag’s signal has not been received during this time, it will send a separation message at the end of the active time.

### 3.5 UHF Radio Communication

The UHF Radio Link can establish contact with your collar every time you are in UHF range of the collared animal.

If you have UHF Communication in your collar you can download data (except acceleration raw data) and upload schedules also remotely via the UHF Handheld Terminal.



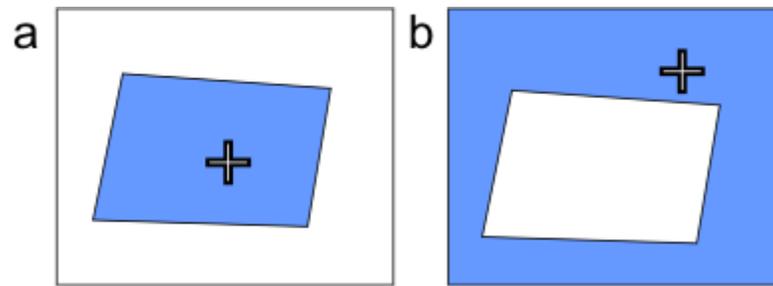
Figure 11: Handheld Terminal

For more information please refer to the Handheld Terminal Manual which is available on our homepage ([vectronic-aerospace.com](http://vectronic-aerospace.com)).

UHF radio communication is required to use external sensors (proximity application).

### 3.6 Virtual Fence

The Virtual Fence option is designed to use a different schedule in areas of interest, for example a national park, a township or a special vegetation area, or to inform the researcher if an animal enters or leaves a certain area. The Virtual Fence is created with one or more polygons, and an “Inside Point” for each polygon. This Inside Point defines whether the Virtual Fence area is located inside the polygon, or if the Virtual Fence area surrounds the polygon. Through a combination of polygons and Inside Points, a complex Virtual Fence can be created and stored as Virtual Fence Collection (VFC).



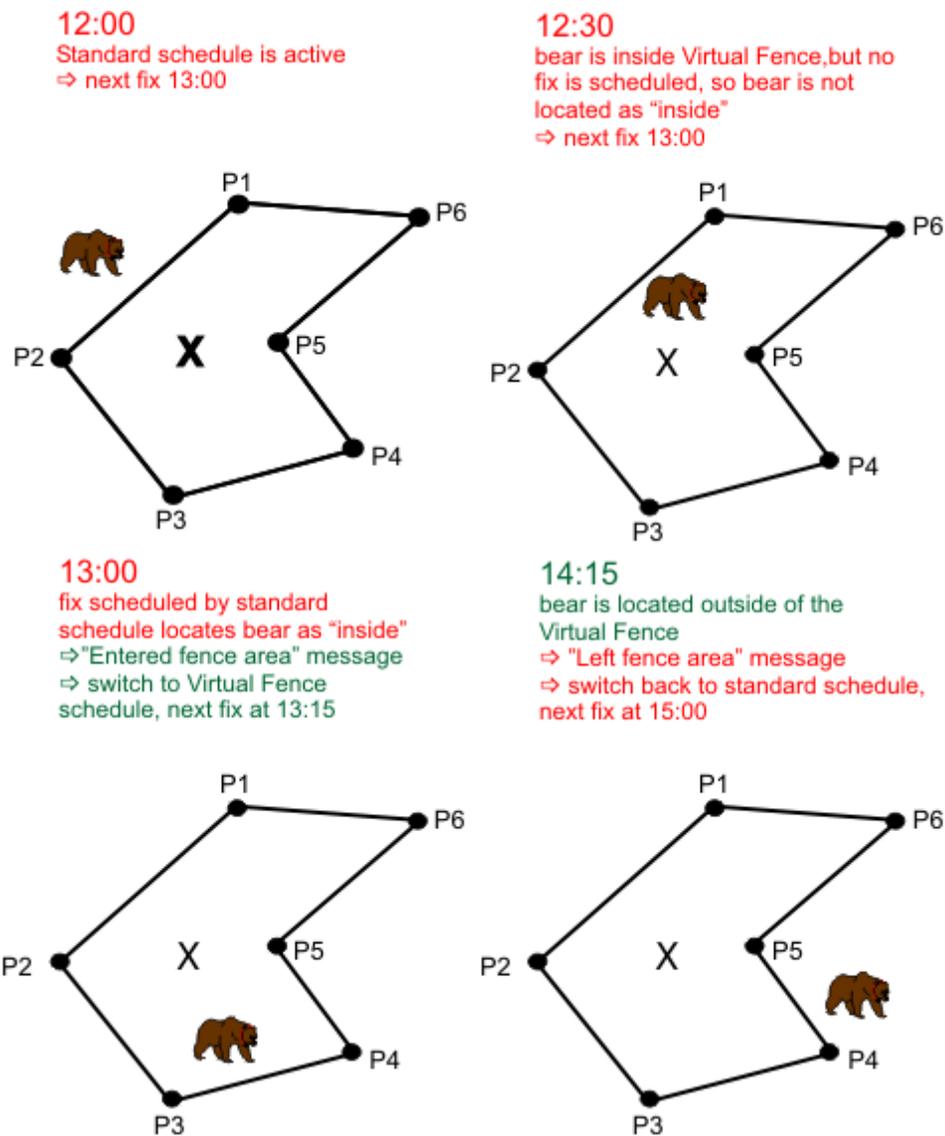
**Figure 12: Two examples for Virtual Fence polygons with Inside Point (a) inside and (b) outside of the polygon. The blue area indicates where the Virtual Fence settings are applied.**

The Virtual fence option allows two actions:

- If the animal is located inside the Virtual Fence area, the GPS schedule changes to the Virtual Fence GPS schedule until the animal has been located outside the Virtual Fence area.
- If the animal is located inside the Virtual Fence area, a message stating “Entered fence area” will be sent via GSM or Iridium. If the animal is located outside the fence area again, a message stating “Left fence area” will be sent.

**NOTE:** The switch to the Virtual Fence schedule takes place after the collar has been located by a GPS fix inside the Virtual Fence area. It is therefore possible that an animal enters and leaves a Virtual Fence area without being located “inside”.

An animal is located inside the Virtual Fence area only after a scheduled fix has positioned it there. This has to be considered when designing the standard schedule. The Figure below shows what happens when the animal enters the Virtual Fence area. The Virtual Fence event (“Entered fence area” message and/or switch to Virtual Fence schedule) does not take place immediately after the animal crosses the fence, but only after a fix is obtained inside the Virtual Fence area according to the standard schedule. If the standard schedule obtains fixes in long intervals, and the Virtual Fence area is rather small or the animal does spend only a short period of time inside the Fence area, the collar might not detect this. Due to this, the standard GPS schedule either needs intervals short enough to ensure that a Virtual Fence event is triggered or you have to accept that not each presence inside the Virtual Fence area will be detected.



**Figure 13: GPS schedules in relation to Virtual Fence area. 12:00: The bear is outside of the Virtual Fence and the standard GPS schedule is active, taking one position per hour.**

**12:30: The bear is inside the Virtual Fence, but the collar does not detect this until it obtains the first fix according to the standard schedule. 13:00: The collar has obtained a position according to the standard schedule and locates the bear inside the Virtual Fence - the collar switches to the Virtual Fence schedule and takes a position every 15 minutes. 14:15: The bear is positioned outside of the Virtual Fence - The collar switches back to the standard schedule and takes a position every hour.**

There are 5 Virtual Fence modes which you can configure in the GPS Plus X software:

[0] Off

[1] On- No Message

[2] On- Message on Enter

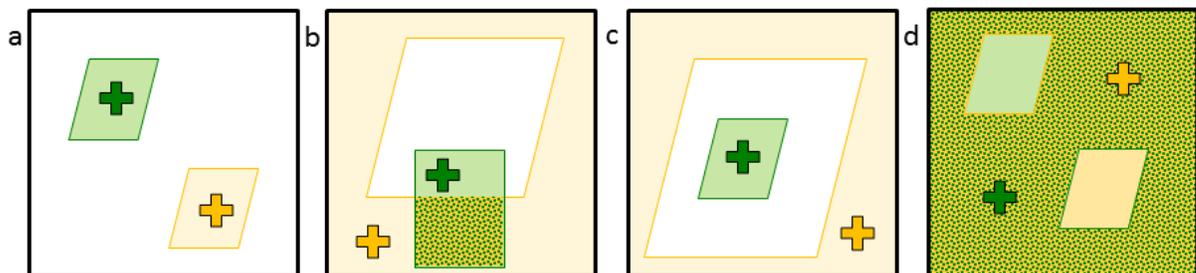
[3] On- Message on Leave

[4] On- Message on Enter and Leave

Corners of the polygons are defined by their longitude and latitude. You can set the corners as “posts” in GPS Plus X, but you can also import a polygon from Google Earth as .KML file. The lines between two corners are not straight lines, but segments of great or Riemannian circles which follow the curvature of Earth. This way they cover the shortest distance between two corners. For small polygons, the difference between the fence line on a flat map and the actual fence line will be marginal, but if you cover greater distances you should keep this in mind to avoid accidental exclusion of places close to the fence line. The polygon’s borderline itself is always defined as inside the Virtual Fence.

To each fence, an Inside Point is defined. Through a combination of polygons and Inside Points, you can create a complex Virtual Fence Collection to cover your study area. Each combination of fence and the associated inside point is checked separately. The animal is considered “inside” once the current position is located in at least one of these fences, otherwise it is considered to be 'outside'. Below you can see examples for Virtual Fences created with two polygons.

**Note:** In some cases, the Inside Point might be set automatically not inside the polygon, but outside. Please make sure that the Inside Point is on the correct position before sending the Virtual Fence to the collar.



**Figure 14: combined polygons** Colored areas are part of the Virtual Fence, white areas are outside the Virtual Fence. For details see text below.

a) The Inside Point of each Virtual Fence area is inside the polygon. This way, the

Virtual Fence areas are identical with the polygons, the animal is inside the fence whenever it is inside one of the polygons.

b) The yellow Inside Point is outside of both polygons, while the green Inside Point is in the green polygon, which is partly inside the yellow polygon. The Virtual Fence area covers all terrain outside the yellow polygon plus the terrain inside the green polygon; this also includes the areas in which the green and yellow polygons overlap.

c) The yellow Inside Point is outside the yellow polygon, while the green Inside Point is inside the green polygon, which is inside the yellow polygon. This way there is a gap between the yellow and the green Virtual Fence areas in which the standard schedule is applied.

d) Fault: The Inside Point of each Virtual Fence area is outside of its polygon, hence the green polygon is inside the yellow Virtual Fence area, and the yellow polygon is inside the green Virtual Fence area. This way, the polygons annul each other because the animal will always be inside the Virtual Fence area.

**NOTE:** If you combine polygons to a Virtual Fence Collection make sure that the Inside Point of one polygon is in the correct position to all other polygons.

The next figure shows an example how to reduce the binary size of a Virtual Fence by combining two polygons. In 'A', a star shaped polygon is created by defining 12 posts and one Inside Point (total 13 points). To reduce the numbers of corners, the polygon can be split in two polygons ('B') with three corners each, resulting in 6 posts and 2 Inside Points (total 8 points). Whenever the animal is in one of the two polygons, the Virtual Fence GPS schedule will be active.

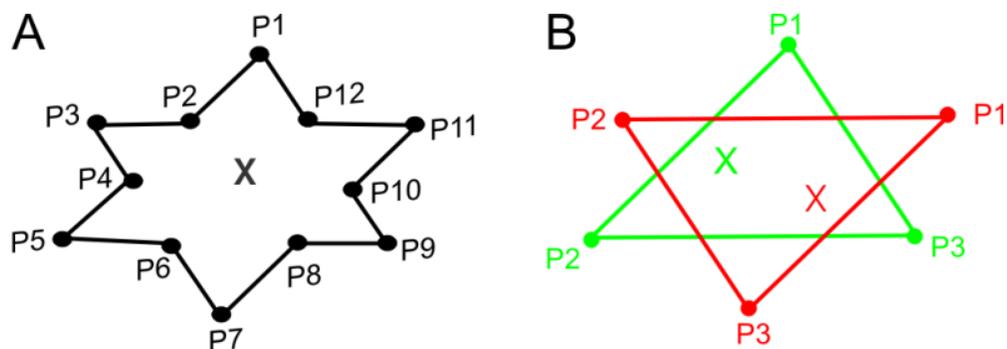


Figure 15: Example on how to reduce the binary size of a Virtual Fence: A: Star-shaped polygon with 12 corners ("posts") and one Inside Point, resulting in 13 points in total. B:

The same fence area created by combining two triangles with three corners each and 2 Inside Points, resulting in 8 points in total.

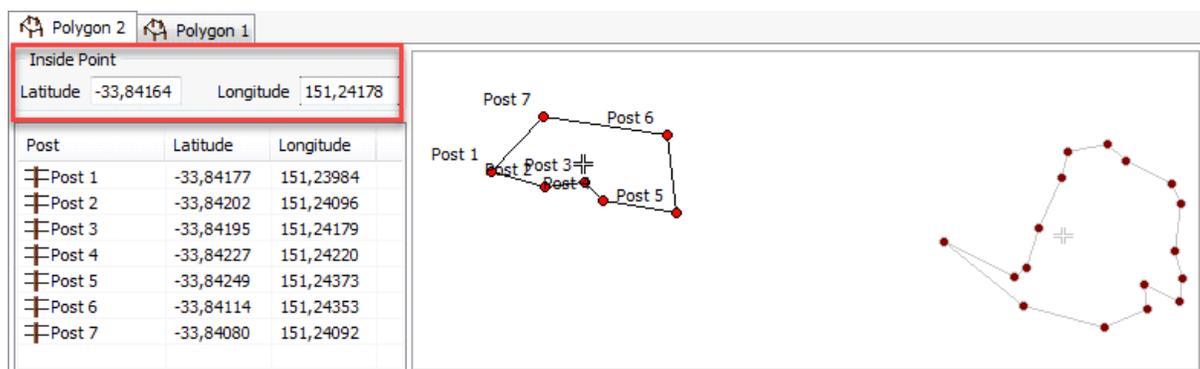
### 3.6.1 Virtual Fence in GPS Plus X

You can create Virtual Fence Polygons in GPS Plus X based on coordinates or with Google Earth and import the polygons to GPS Plus X.

A Virtual Fence consists of several posts and an Inside Point. The Inside point defines the area of interest; if the point is inside the fence the area of interest is surrounded by the fence, if the point is outside everything but the fence is area of interest.

The Inside point can be configured with Latitude and Longitude coordinates as you can see in the figure below.

All fences that are opened at one time can be saved as one Virtual Fence Collection (.VFC) and can be uploaded to the collar via Link Manager, Handheld Terminal, GSM, and IRIDIUM.



**Figure 16: Combination of two fences. The positions in the left tab define the left fence (bright red posts).**



Creates a polygon with four Posts and an Inside Point. The Posts are the corners of the Virtual Fence. The Inside Point is a reference of what side of the Fence is “inside”. If you apply an alternative GPS schedule, this defines if the Virtual Fence schedule is applied while the collar is inside the enclosed area or outside.



Edits the name of the fence.



Deletes the opened fence.



Appends a post to the end of the fence (e.g. Post 8 in Figure above).



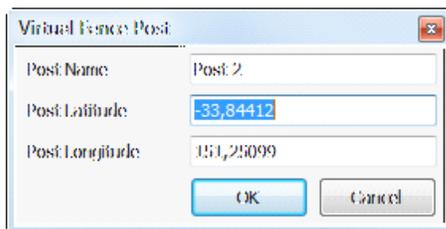
Inserts a post before the selected post.



Edits the selected fence post. A new window will open (Figure below), in which you can edit the post's coordinates and name. The post you are currently editing is highlighted in green in the fence schematic.



Removes the selected post from the fence.



**Figure 17: Post editing window**

### 3.6.1.1 Virtual Fence in Google Earth

- Create a polygon using  in Google Earth.
- Click the left mouse button to set a post. Click several times to build a fence.

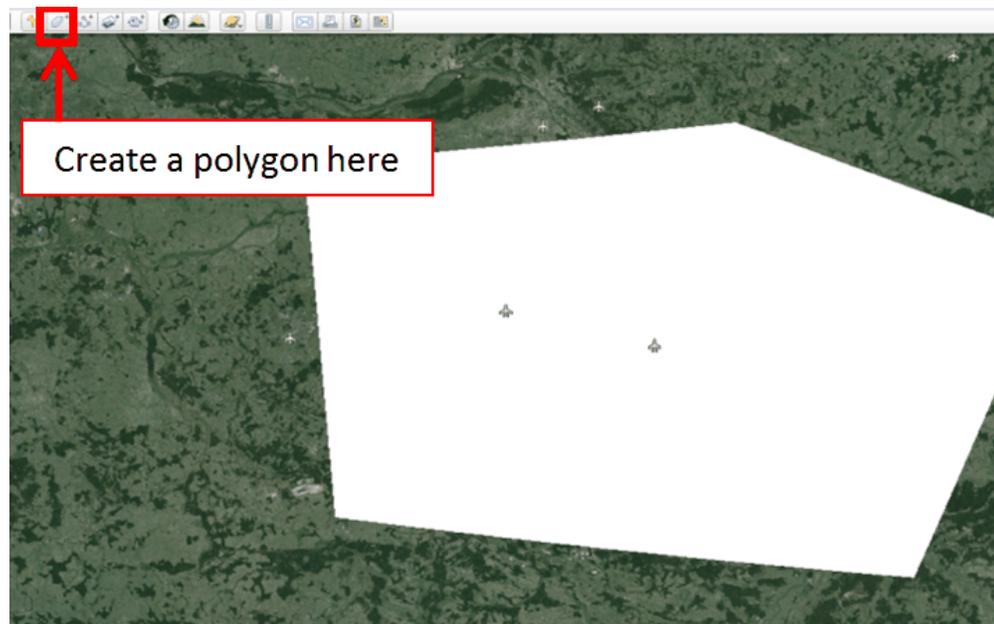
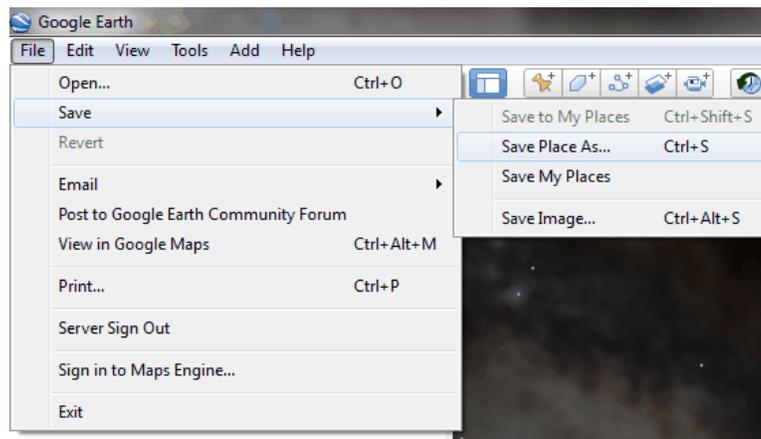


Figure 18: Google Earth - Creating a Virtual Fence

- Convert it into a KML file: File - Save - Saving As



- Import it in GPS Plus X under: collar - configuration - Virtual Fence Polygons

- In GPS Plus X:



Imports a .KML file from Google Earth into the Virtual Fence Editor. The corners of the polygon will be imported as posts.

- Exports a fence (active fence only, not the complete Virtual Fence Collection) as .KML file to view in Google Earth.

Please note: Sending Virtual Fences via cable and remotely makes a difference. Via cable and Handheld Terminal, you can send up to 4000 bytes, approximately 600 posts. Via Iridium message the collection is limited to 15 posts. You will get an error message if you exceed the maximum data size.

### 3.7 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. For the release an 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.

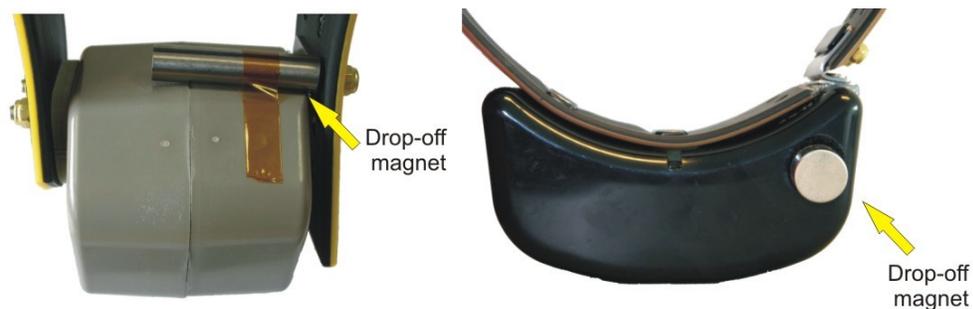


Figure 19: Drop Off magnet for standby mode



Figure 20: Drop Off release sites, magnet removed

## 3.8 External Sensors

It is only possible to have communication between your VERTEX Plus Collar and several external sensors if your collar has UHF Radio Communication. Data from these transmitting sensors are stored into the VERTEX Plus Collars internal memory. All external sensors share the same UHF receiver in the collar, and several sensors can be used simultaneously.

Please refer to the following subtopics to get more information regarding external sensors:

[UHF ID Tags](#)

[Expandable Collars](#)

[Vaginal Implant Transmitter \(VIT\)](#)

[Mortality Implant Transmitter \(MIT\)](#)

### 3.8.1 UHF ID Tags

The UHF-ID Tags provide data on animal interactions such as Proximity and Separation. ID tags can be deployed to a belt, an expandable fawn collar or they can be integrated into a VERTEX Plus Collar. There is also the possibility for a stationary UHF-ID Tag. ID Tags can be equipped with a mortality sensor and a VHF beacon transmitter.

Depending on the application, different data is transmitted between the ID tag and the VERTEX Plus Collar. The signal of external UHF ID tag is received and recorded using the UHF data communication in a VERTEX Plus Collar. Please refer also to chapter Internal Sensors [Proximity and Separation Sensor](#) and [Expandable Fawn](#)

## Collars.

IDs signal output can be adjusted to the needs of your study.  
For more information please contact our customer service.

### 3.8.2 Expandable Fawn Collars

Expandable Fawn Collars can be equipped with UHF ID Tags. The Expandable Fawn Collar is very light and made of elastic material which is folded in several layers. The layers are sewed together with cotton yarns which allow the layers to unfold with the effects from wear, time and weather. The combination of elastic and folded material ensures a good fit for the growing neck of a calf.

The Expandable Collars can be customized; accordingly, their design highly depends on the species. For further information please contact our customer service.

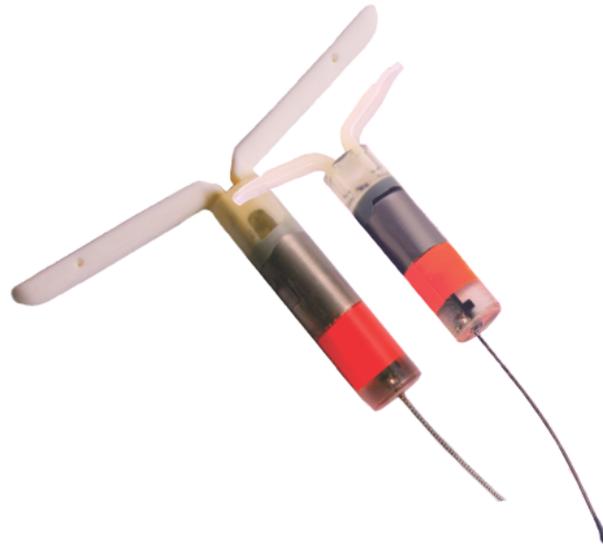


Figure 21: Left: expandable Survey collar for a moose. Right: expandable ID-Tag as a fawn collar

### 3.8.3 Vaginal Implant Transmitter (VIT)

The Vaginal Implant Transmitter (VIT) is used to observe the pregnancy and the birth event of a collared animal. The VIT informs the researcher about the date and location of the calving site and provides physiological data during the whole pregnancy. VIT measures and optionally stores the temperature and motion and defines its status. The VIT transmits this data with its unique ID to the collar which will initiate the alert

notifications in case of birth event or separation. We offer 2 different sizes suitable for medium (e.g. deer) and large (e.g. moose) species.



**Figure22: Moose sized VIT (left) and deer sized VIT (right)**

**Birth detection:** When the VIT is pushed out of the mother's body, two things are expected to happen: The temperature around the VIT will most likely drop and the motions will stop. When this happens, the VERTEX Plus Collar will recognize a birth event which will conduct an unscheduled GPS fix and send an alert notification to the researcher.

**Separation:** The VIT continuously transmits an ID signal via UHF frequency to the VERTEX Plus Collar. When the mother moves away from the calving site, the ID signal is not received any longer. The VERTEX Plus Collar will send a separation message after one hour has passed without detecting the ID signal (default settings).

**Localization:** To locate the calving site, the VIT is equipped with a VHF beacon transmitter. The VHF can be programmed as flexibly as the one in the GPS collar.

#### **3.8.4 Mortality Implant Transmitter (MIT)**

The MIT is designed to inform you immediately if your study animal has died. The Mortality Implant Transmitter is a stainless steel tube which can be placed either into the rumen or into the abdominal cavity of the animal. For the latter a surgery is needed and it is only recommended for non-ruminants or ruminants with a small esophagus/

rumen.

The MIT contains a highly sensitive acceleration sensor and a temperature sensor. Unlike the mortality sensor inside VERTEX Plus Collar, the MIT is able to detect the heartbeat of the animal. The MIT frequently sends status messages of the animal to the GPS collar using UHF communication. With each position message, the most recent body temperature and the status (alive/dead) can be sent remotely as well. Optionally the GPS collar can send a separate mortality message.

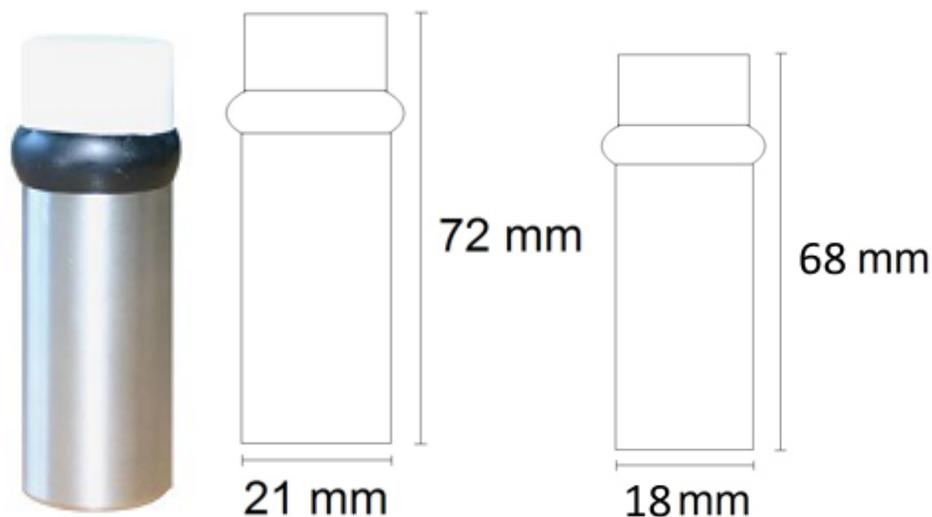


Figure 23: Mortality Implant Transmitter (MIT)

**Heartbeat and motion:** A highly sensitive acceleration sensor detects the slightest movements like heartbeat or breathing. If no motion has been detected for a user definable period of time, the animal is presumed dead and a mortality alert with the current GPS position data is sent. The VERTEX Plus Collar's VHF beacon will also switch to mortality mode.

**Temperature:** Body temperature is measured with an accuracy of 0.1°C. Following pre-defined intervals, the temperature is sent to the VERTEX Plus Collar and stored in the collar memory.

## 4 Data formats

**GPS position information:** Date and time, latitude/longitude/height, DOP, 2D/3D navigation, number of used satellites, satellite PRN code and carrier to noise ratio, main and VHF beacon battery voltage, temperature. Data can be accessed with GPS

Plus X.

**Temperature:** Date and time, logging same as GPS fixes or activity sampling interval. Temperature is stored with the GPS and the activity data in the .GDF and .binv2 files.

**Activity:** Date and time, different activity modes measuring acceleration on 3 axes (X,Y,Z). Activity is stored as .binv2 file and can be accessed with the Acceleration Data Viewer software.

**GSM information:** Time and date of GSM communication, RSSI (received signal strength indicator), and bit error rate. This information is stored in every SMS.

**Mortality information:** Date and time of a mortality event based on the activity of the animal.

### 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 “yyymmddhhmmss”.
.binv2 Activity Data File	Activity raw data from collar including activity (acceleration) and temperature.
.SMS GSM Message File	Contains one GSM or part of a Globalstar/ Iridium message with GPS data. The file name consists of the collar number and the time stamp of the SMS coded as “yymmddhhmmss”.
.PRX Proximity Sensor Data	Contains data from proximity sensor including signal strength and time stamp.

#### Export files

.TXT ASCII	Visually readable equidistant table, compatible to conventional text editors and spreadsheets
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.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 a 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.
.VFC	Virtual Fence	Virtual Fence Collection
.binv2	Acceleration	Is a format which can be read of the VECTRONIC software Acceleration Data Viewer.
.ADF		2-axis Activity Data File
.ADF3		3-axis Activity Data File

#### Upload files

.vbsf	Beacon Schedule File	VHF beacon schedule of VERTEX Plus Collar
.vgsf	GPS Schedule File	GPS schedule of VERTEX Plus Collar
.vcsf	Communication Schedule File	Communication Schedule of VERTEX Plus Collar
.vesf	External Sensor Schedule File	External Sensor Receiver Schedule file

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.vfc	Virtual Fence Collection	Coordinates for Virtual Fences
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#### Hardware information files

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.bin	Collar Firmware File	contains firmware for VERTEX Plus 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

---

## 5 System Set-up

The following sub chapters explain what you need to do before you can check and test your collar.

[Software Installation](#)

[Collar Registration](#)

[USB to VERTEX Plus Interface Cable](#)

[Test the collar](#)

### 5.1 User-Software Installation

All VECTRONIC collars are managed with our free software GPS Plus X which you can find on the collar user-CD. It also can be downloaded from our homepage ([www.vectronic-aerospace.com](http://www.vectronic-aerospace.com)). The auto-installer includes an Installation Wizard which will guide you through the installation and setup.

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
- TeamViewerQS VAS: Tool for remote desktop support
- GPS Plus X Manual: integrated Manual

If you want more information to the software program please refer to GPS Plus X Manual. (If you opened GPS Plus X just click "Help" or  to get linked.)

## 5.2 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 came with the collars.

For registering the collar, please go to the Configuration frame in GPS Plus X and select *Configuration* → *Collars*.

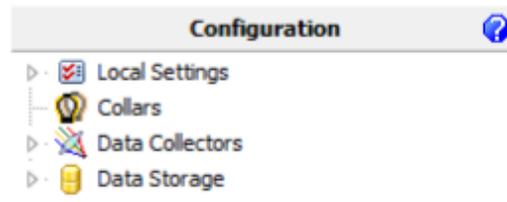
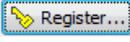


Figure 24: Collar List

In the appearing window “Collar List”, press  to add a new collar to the list. After clicking the button, the Collar Properties Editor appears. To register a collar, click . 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).

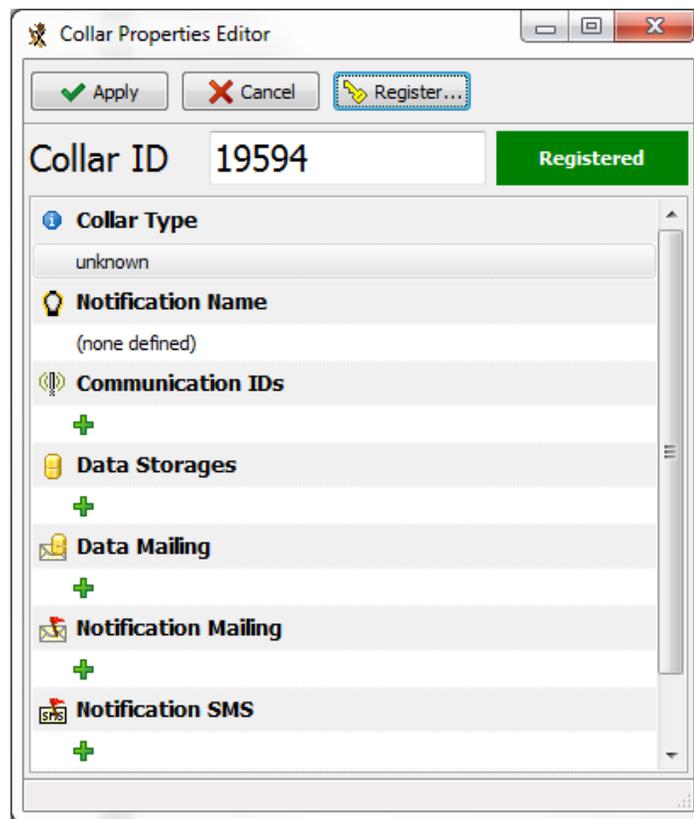


Figure 25: registering the collar

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.

### 5.3 USB to VERTEX Plus Interface Cable

After you have registered the collar, you will be able to communicate with the collar using the USB to VERTEX Plus Interface Cable.



**Figure 26: USB to VERTEX Plus Interface Cable**

**NOTE:** Please do not use any other cables than the USB to VERTEX Interface Cable to connect your VERTEX Plus Collar to your computer. You may destroy the communication connector of the collar which makes it impossible to load or upload data and schedules directly.

When you have installed and started the software GPS Plus X, registered your collar and connected your collar to the computer it appears in the software in frame 'Devices'. This action is optional. But it is recommended to get familiar with your collar settings and to check them before testing and deploying. Please refer also to chapter [Collar Main Tree](#).

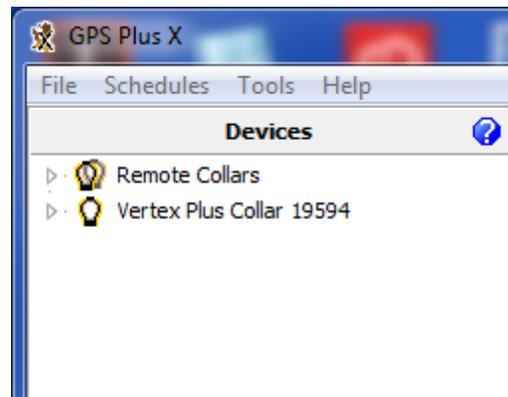


Figure 27: Devices

## 5.4 Test the Collar

It is recommended to test the collar in advance to confirm if 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 before)
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 to complete the testing

**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.

## 6 Collar Main Tree

**Devices** →  **VERTEX Plus Collar**

The Devices frame is the main tool to manage your VERTEX Plus Collar in any respect.

In the following chapter you get more information about all available options for your VERTEX Plus Collar, such as data download, data upload and configuration.

The first node ([Information](#)) contains reports 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.

The third node ([Schedules](#)) is where you can define and upload schedules.

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

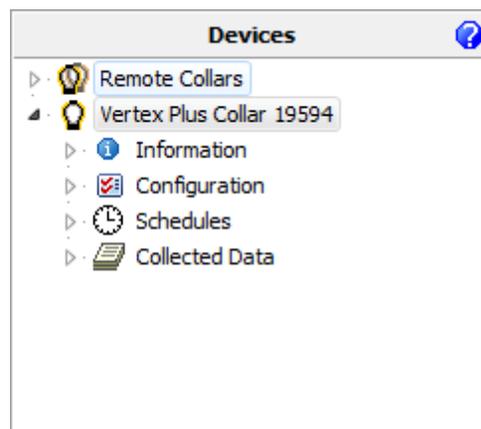


Figure28: Collar Main Tree

### 6.1 Information

**Devices** →  **VERTEX Plus Collar** →  **Information**

The Information Node contains all actual hardware and programming settings of the collar and its functionality.

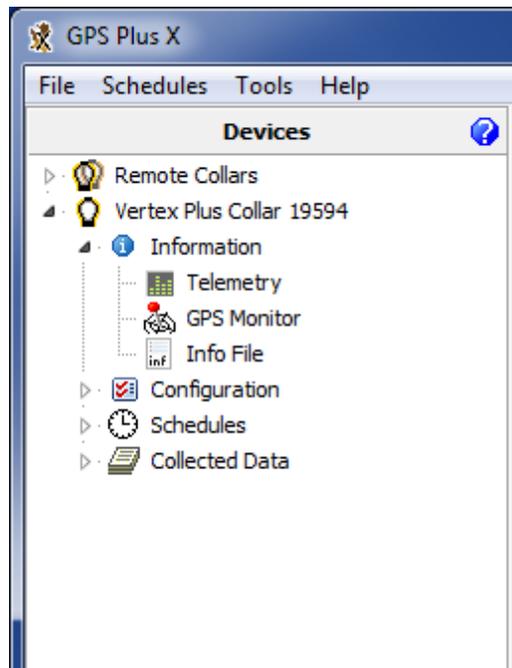


Figure 29: Main Tree- Information Node

Please refer to following subtopics of the Information Node:

[Telemetry](#)

[GPS Monitor](#)

[Info File](#)

### 6.1.1 Telemetry

***Devices*** → ***VERTEX Plus Collar*** → ***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. This topic informs you about definitions used in the Telemetry window.

**Vertex Plus Collar Telemetry**

 **19594**  Reload

Collar Time: 17:38:51  
 Collar Date: 14.09.2015  
 UTC Corr.: 02:00:00  
inactive

Name	Unit	Value
<b>SYSTEM</b>		
Device State		[0] Standby
<b>Collar</b>		
Production Number		19594
Production Date		15.06.2015
PCB Type		Vertex Plus Iridium Collar V 2.1
Serial Number		19594
<b>Time</b>		
Collar Time (UTC)		14.09.2015 17:38:30
UTC Correction		02:00
<b>Firmware</b>		
Bootloader Version		1.1.9
Bootloader Description		Release
Bootloader Date		15.06.2015
Firmware Version		2.2.31
Firmware Description		Release
Firmware Date		08.09.2015
<b>Internal Sensors</b>		
Main Voltage	V	3,70
Backup Voltage	V	3,78
Temperature	°C	23
SD Card Size (Sectors)		7716864
<b>SENSORS</b>		
<b>GPS</b>		
GPS Mode		[1] 34 Byte Solved Format
GPS Max Fix Time	s	180
Number of GPS Fixes		334
GPS Skip Count		0
<b>Mortality</b>		
Mortality Mode		[1] On
Period	h	4
<b>Hibernation</b>		
Hibernation Mode		[0] Off
Hibernation Wake-Up Level		39
Hibernation Period	s	1
<b>Acceleration</b>		
Acc. Mode		[2] Large
Acc. Sample Count (aprox.)		1083648
Acc. Sensor Range		[4] ±4 g
Acc. Recording Sample R...		3
<b>Temperature</b>		
Temp. Mode		[1] On

Figure 30: VERTEX Plus Collar Telemetry

## Telemetry window definitions

### **System Tab:**

Collar	production number, production date, Printed Circuit Board (PCB) type and collar ID
Time	collar time in UTC and the UTC correction, configured to the collar
Firmware	information about the collar firmware: Bootloader and Firmware information- Internal or service related information only
Internal Sensors	main voltage and the ambient temperature of the included mortality sensor. The voltage is an important value to estimate the battery power status of the collar
Data Memory (mb)	memory capacity of the non-volatile on-board storage in megabyte

### **Sensors Tab:**

GPS	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 data download only.
Mortality	shows mortality period (period without acceleration to trigger mortality alert)
Hibernation	wake-up level defines the activity threshold when Hibernation Mode is over (predefined values depending on the species)
Acceleration	3 modes to define the acceleration sensor: off(0), basic(1), advanced(2).  Sample Count shows how many data are actually saved on board. Sensor Range defines the accuracy of the acceleration data  recording Sample Rate Select defines how many measurements the sensor takes per second
Temperature	defines if temperature sensor is on / off

**Communication Tab:**

Radio	information about the Transmit Frequency, Receive Frequency and Transmit Power of the collar
Globalstar	amount of Globalstar communication attempts per position and the ESN number
Iridium	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 Tab:**

Beacon Frequency	frequency of the VHF beacon: the default frequency which was set by VECTRONIC Aerospace and the User defined frequency  values of the beacon min. frequency and the Beacon max. frequency are shown
Beacon Power	VHF Beacon output Power
Patterns	information about the Standard Pattern as well as the Mortality Pattern of the VHF beacon  also includes the Default Pattern which was set by VECTRONIC Aerospace and the User Pattern if it is configured

**Sensor Communication Tab:**

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

**External Sensors Tab:**

Listen Interval	how often does the collar listen for a signal (transmitted from an external sensor)
-----------------	---

### MIT/VIT/SEP Status Transmitter

transmit status: Temperature, latest receive (current state)

### Proximity Receiver

Listen Duration: time span the collar listens for a signal

Start / End times: At which times of the day the sensor listens for a signal

Shows the sensitivity of the proximity receiver in dbm

ID Blacklist: Fill in Collar ID's (for explanation always refer to [User Configuration](#) Sensor Communication- External Sensor-Proximity Receiver)

ID Whitelist: Fill in Collar ID's (for explanation always refer to [User Configuration](#) Sensor Communication- External Sensor Proximity Receiver)

Active Duration: time period how long the schedule is active once the collars (ID Tags) are separated again.

Skip Count: How many proximity GPS fixes actually will be sent

Sample Count: How many Proximity data are stored

### MIT / VIT / SEP Receiver

Listen Duration: defines how long the collar listens for a signal

Start/ End time: At which times of the day time the sensor listens for a signal

No Contact Delay: defines the delay when the contact has been lost.

ID: shows the ID/ the ID's

Sample Count: How many data are stored

### Virtual Fence Tab:

VF Mode shows the actual VF mode of your collar

VF Retransmit Interval defines when the message is sent again, just to secure it will be received

For more detailed explanations, notifications, and recommendations please refer to [User Configurations](#)

### 6.1.2 GPS Monitor

**Devices** →  **VERTEX Plus Collar** →  **Information** →  **GPS Monitor**

The GPS monitor function allows you 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.**

The process is done if the dataflow stops. (GPS position is set and time does not change anymore.) This Process takes a few minutes.

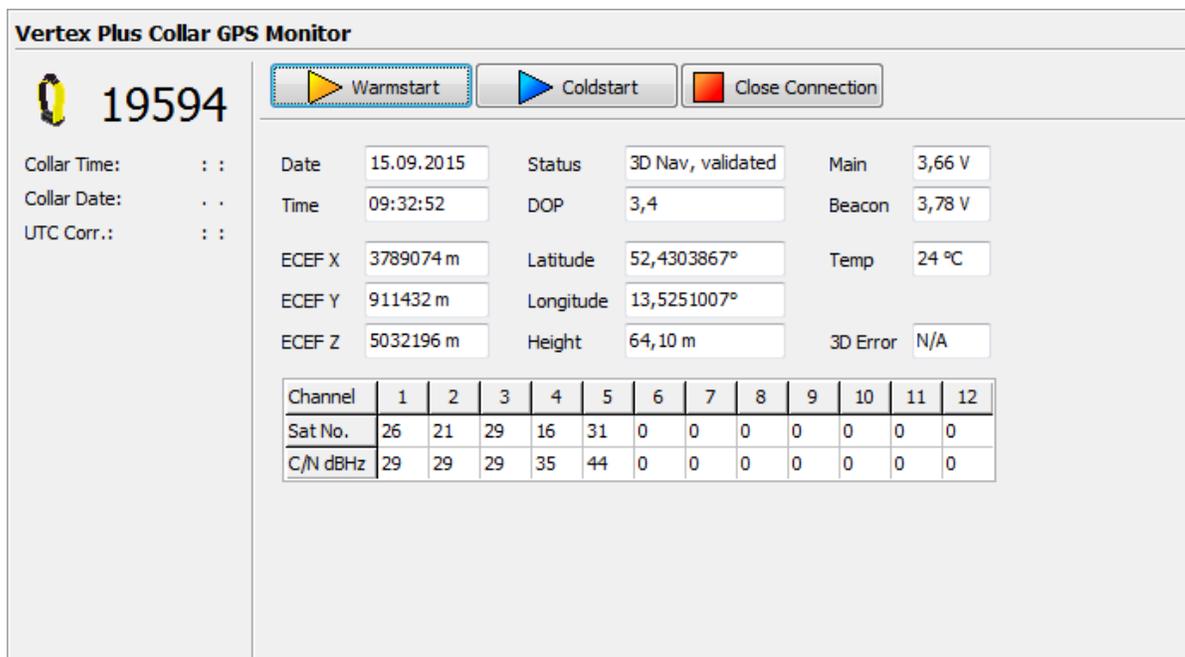


Figure 31: GPS Monitor after fix has been obtained

### 6.1.3 Info File

**Devices** → **VERTEX Plus Collar** → **Information** → **Info File**

The collar info file includes all information on the collar configuration. It can be saved as .TXT (file extension) file or printed directly. It contains technical information of the collar as well as all schedules and the Virtual Fence collection. You can see which schedule is used at the moment. If you did not program a schedule yet the default schedule is active. Every schedule is shown in a version which can be easily read and in the .XML format which is machine readable. Below you can see an extract of an Info File of the VERTEX Plus Collar.

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

**Vertex Plus Collar Information File**

 **19594**  Reload  Save...  Print...

Collar Time: 09:49:49  
 Collar Date: 15.09.2015  
 UTC Corr.: 02:00:00

Information file of Vertex Plus Collar collar no. 19594  
 Date of readout: 15.09.2015 11:40:17  
 GPS Plus X Version: 10.1.0.15208

---

**SYSTEM:**

Device State: [0] Standby  
 Collar:  
 Production Number: 19594  
 Production Date: 15.06.2015  
 PCB Type: Vertex Plus Iridium Collar V 2.1  
 Serial Number: 19594

Time:  
 Collar Time (UTC): 15.09.2015 09:40:16  
 UTC Correction: 02:00

Firmware:  
 Bootloader Version: 1.1.9  
 Bootloader Description: Release  
 Bootloader Date: 15.06.2015  
 Firmware Version: 2.2.31  
 Firmware Description: Release  
 Firmware Date: 08.09.2015

Internal Sensors:  
 Main Voltage: 3.70 V  
 Backup Voltage: 3.78 V  
 Temperature: 24 °C  
 SD Card Size (Sectors): 7716864

**SENSORS:**

GPS:  
 GPS Mode: [1] 34 Byte Solved Format  
 GPS Max Fix Time: 180 s  
 Number of GPS Fixes: 334  
 GPS Skip Count: 0

Mortality:  
 Mortality Mode: [1] On  
 Period: 4 h

Hibernation:  
 Hibernation Mode: [0] Off  
 Hibernation Wake-Up Level: 39  
 Hibernation Period: 1 s

Acceleration:  
 Acc. Mode: [2] Large  
 Acc. Sample Count (aprox.): 1083648  
 Acc. Sensor Range: [4] ±4 g  
 Acc. Recording Sample Rate: 3

Temperature:  
 Temp. Mode: [1] On

Figure 32: Info File

For definitions of terms used in the Info File please refer to [Telemetry](#).

## 6.2 Configuration

**Devices** →  **VERTEX Plus Collar** →  **Configuration**

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

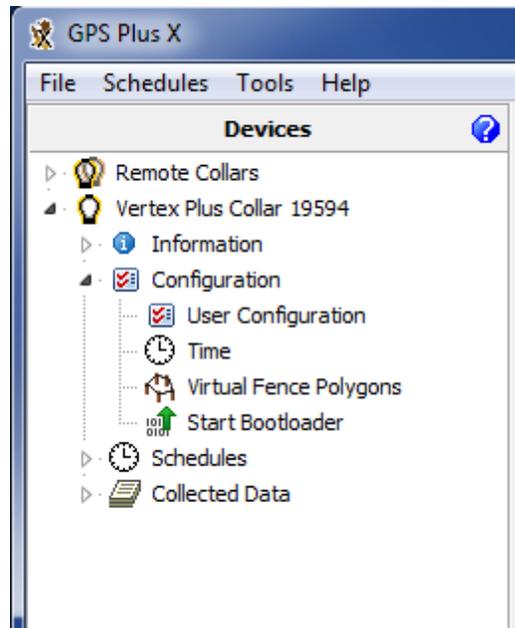


Figure 33: Main Tree- Configuration Node

Please refer to following subtopics of the Configuration Node:

[User Configuration](#)

[Time](#)

[Virtual Fence Polygons](#)

[Start Bootloader](#)

### 6.2.1 User Configuration

**Devices** → **VERTEX Plus Collar** → **Configuration** → **User Configuration**

In this frame you can change the user-definable configurations of your collar. The actual configurations can be seen in the collar's [Telemetry](#) and in the [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 are about to change (see below). In this window, the range of possible values to choose will appear (Min value and Max value). Depending on the kind of data which is edited, the window shows different values.

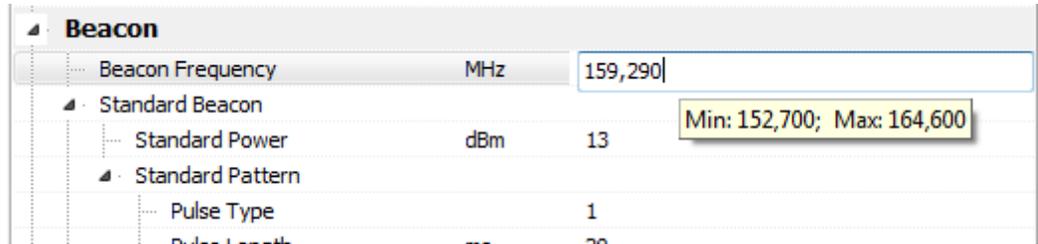


Figure 34: User Configs- Min and Max value

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 time in LMT programmed schedules internally.

**Recommendation:** Stick to either way (UTC correction **or** UTC schedules) for all collars and document it carefully. It is easy to get confused, especially if you ask us to do some changes.

## Sensors

**GPS Skip Count**      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.

**Mortality Period**      Here you can set a time span using the up- and down arrows. If no activity is recorded ([activity sensor](#)) during the set time span the animal is assumed to be dead and a mortality event is triggered. The default value is 24h which has 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.

**Hibernation Period** You can define the time after which the collar switches back to normal mode if the activity is higher than the wake-up threshold.

**Acceleration** Here you can define the accuracy of your acceleration data. The more accurate your data, the more storage you need.

You also can select a Recording Sample Rate. You can choose between 2, 4, 8, 16, 32 records per second.

## Communication

**Globalstar** You can change the positions per message.

**Recommendation:** 1 Fix per message

**Iridium** The Iridium Mode (1-18) defines the number of fixes per Iridium message. Please refer to [Iridium Communication](#) for information about message set-up and size.

**Recommendation:** 4 Fixes 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 by simply typing it into the field. You can only select frequency values between the minimum and maximum value which are hardware defined (shown in the small pop up window).

**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 unless we have specifically adjusted this for you. It offers the optimum balance between signal strength and energy consumption. Do not hesitate to ask us if you have questions.

**Mortality Beacon** The Mortality beacon is switched on during the defined beacon schedule. The Default setting is: [0] always on.

**Beacon Patterns** In both Beacon Modes, (Standard and Mortality) you can configure the patterns. You can set the pulse length in milliseconds (ms) and the Loop Length in ms. For more information please refer to [VHF Beacon](#).

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

**NOTE:** The Emergency Pattern is not user definable.

## Sensor Communication

**Proximity Tag** **Recommendation:** Stick to the default value of 10dBm. It offers the optimum balance between signal strength and

energy consumption.

## External Sensors

**Listen Interval** You can choose the time interval when the collar listens for a signal.

**Status Transmission** The status includes temperature and latest receive (current state) of data sent from an external sensor.

**Proximity Receiver** Listen Duration: The collar listens for e.g. 1500ms (1.5s) every 10 min (listen interval).

Start/Endtime: Shows at which times of the day the sensor listens for a signal.

Shows the sensitivity of the proximity receiver in dbm.

ID Blacklist: Shows which ID Tags will be ignored if a signal is received.

ID Whitelist: Shows which ID Tag contact will create a reaction immediately.

(change of GPS schedule)

Active Duration: Shows the activity time of the schedule once the collars (IDTags) are separated again.

Skip Count: How many proximity GPS fixes actually will be sent (Skip Count 3: Every third fix will be sent).

Sample Count: Shows how many Proximity data are stored.

**NOTE:** ID Tags which are not on Blacklist/ Whitelist: contact is recorded but no reaction is created. If no ID Tags are listed, every contact will create a reaction.

## MIT / VIT / SEP Receiver

Start/ End time: Shows at which times of the day the sensor listens for a signal.

No Contact Delay: Defines the delay when the contact has been lost. (e.g. (VIT) set a delay to **finally** know when mother

leaves birthplace)

ID: fill in the ID's of your external sensors.

Listen Duration: Low value- Expend less battery power but lower chance to receive a signal.

High value- Requires more battery power and high chance of receiving signal.

**Recommendation:** Stick to the default settings.

## Virtual Fence

Mode Shows 1 out of 5 modes: [0] Off, [1] On -No Message, [2] On - Message On Enter, [3] On -Message On Leave, [4] On - Message On Enter And Leave the Virtual Fence.

Retransmit Interval Defines when a second message is sent, just to secure it will be received.

**Recommendation:** If you urgently need the information that your animal enters an area do not wait too long to secure your message will be received. Do not hesitate to ask us for further information.

If you have a problem understanding the vocabulary of this topic you will find some definitions at [Telemetry](#) (**Telemetry window definitions**)

For more information please read the [VERTEX Plus Collar Chapter](#) carefully or just contact our customer service.

### 6.2.2 Time

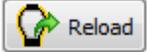
**Devices** →  **VERTEX Plus Collar** →  **Configuration** →  **Time**

The Time frame displays:

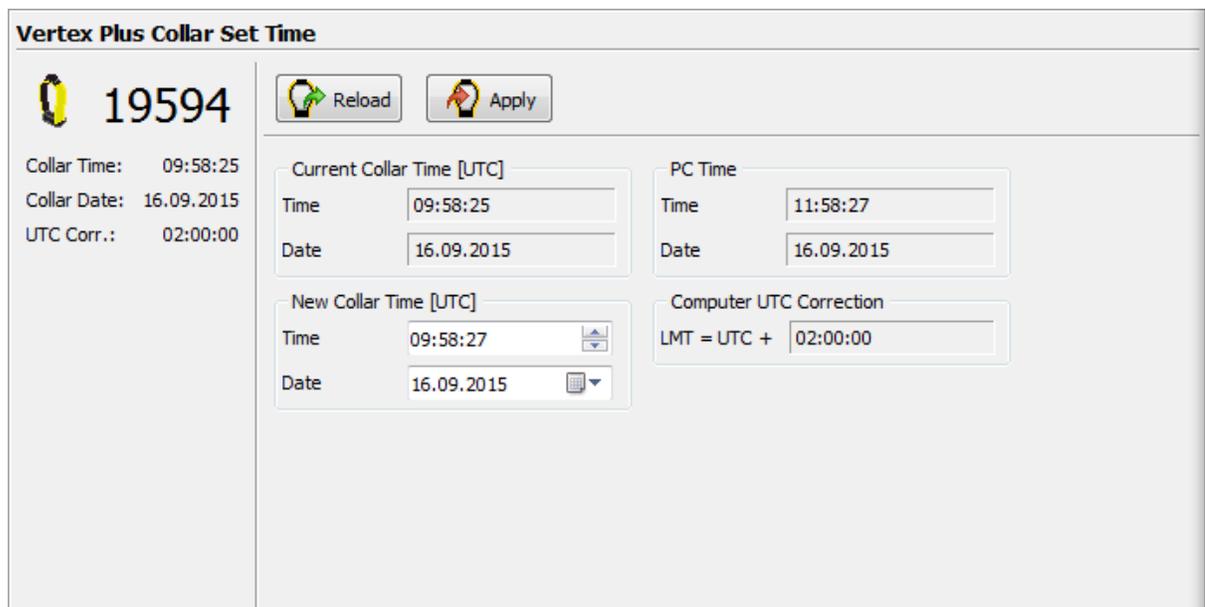
- Current Collar Time (UTC: Time, Date)
- PC Time (Time, Date)
- New Collar Time (UTC) which is definable for you: If the Current Collar Time is

incorrect please correct it by setting the New Collar Time (Time, Date)

- Computer UTC Correction

After you have provided your time changes press  to send the new time setting to your collar. With  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.



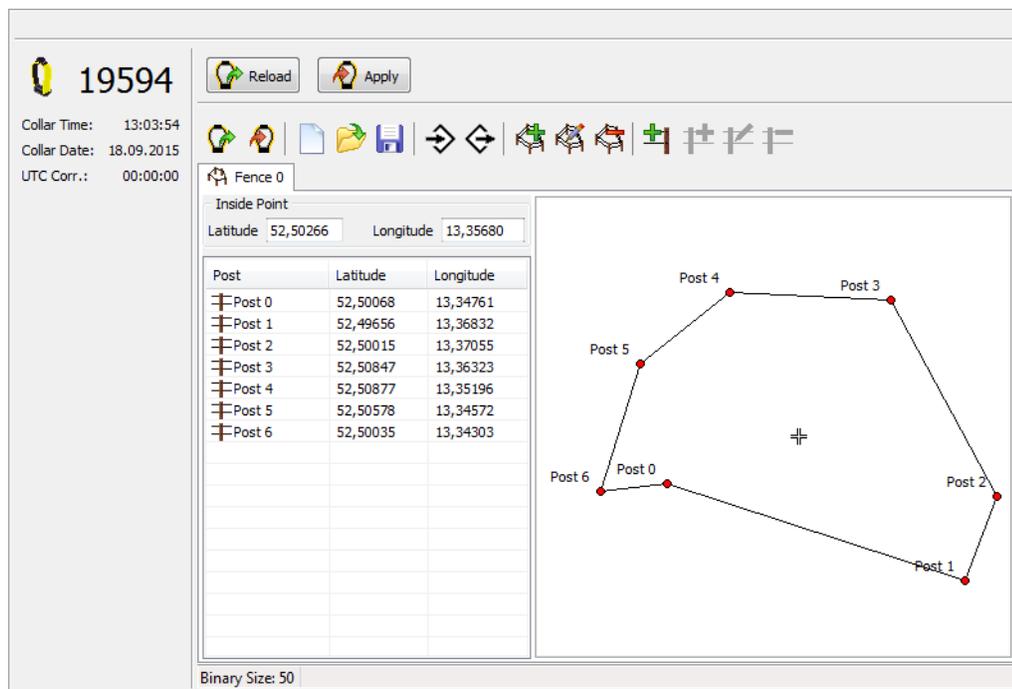
The screenshot shows the 'Vertex Plus Collar Set Time' configuration window. On the left, a collar icon is next to the ID '19594'. Below this, the current collar time is listed as 09:58:25 on 16.09.2015 with a UTC correction of 02:00:00. At the top right are 'Reload' and 'Apply' buttons. The main area is divided into four sections: 'Current Collar Time [UTC]' with input fields for Time (09:58:25) and Date (16.09.2015); 'PC Time' with input fields for Time (11:58:27) and Date (16.09.2015); 'New Collar Time [UTC]' with input fields for Time (09:58:27) and Date (16.09.2015); and 'Computer UTC Correction' with a text field containing 'LMT = UTC + 02:00:00'.

Figure 35: Set Time

### 6.2.3 Virtual Fence Polygons

**Devices** →  **VERTEX Plus Collar** →  **Configuration** →  **Virtual Fence Polygons**

The virtual fence allows you to use a different GPS schedule in a certain area ([Virtual Fence](#)). To do this, you need to define a virtual fence around this area and assign a [Virtual Fence schedule](#) to it. You can create a new fence by defining up to 62 posts (max. binary size 385 byte, see below for details).



**Figure 36: Virtual Fence Window**

There are two ways to create a polygon. You can use the Virtual Fence editor in the GPS Plus software and define fence posts by their coordinates. Alternatively, you can create a polygon in Google Earth and import the .KML file into GPS Plus X. A Virtual Fence Collection can contain several single fenced areas (“polygons”). Each fence will be created and edited on its own tab, but all opened fences are shown in all tabs. The fence that belongs to the opened tab is marked with bright red posts. All fences that are opened at one time can be saved as Virtual Fence Collections (.VFC) and can be uploaded to the collar via cable, UHF Handheld Terminal, GSM, and Iridium. For detailed information on shapes, combinations of several polygons of a Virtual Fence refer to 7.2.6 Functionality of sensors: Virtual Fence.



**Add a Fence:** You can add a fence to the fence collection by clicking on the icon or calling *Add Fence...* in the *Fences* menu.



**Edit Fence name:** The currently selected fence can be renamed with this option. Click on the icon or use *Edit Fence...* in the *Fences* menu.



**Remove Fence:** The currently selected fence will be removed from the Fence

Collection. You will be asked for a confirmation before this command is executed. Click on the icon or use *Remove Fence...* in the *Fences* menu.



**Append Post:** Appending a post will add a post to the end of the list of the current fence. A dialogue will open where you have to enter a name for the post (by default "Post x") and the coordinates. Click on the icon or use *Remove Fence...* in the *Posts* menu.



**Insert Post:** Inserting a post will only work if another post from the list is selected. A new post will be inserted before the currently selected post just like appending a post if you click in the icon or select *Insert Post...* in the *Posts* menu.



**Edit Post:** You can edit each fence post by double clicking on it, by clicking on the icon, or by clicking on *Edit Post...* in the *Posts* menu.



**Remove Post:** The currently selected post will be removed without further confirmation if you click on the icon or by selecting *Remove Post...* in the *Posts* menu.

To rearrange posts, you can drag & drop them in the list of the current fence.

## Importing and Exporting Virtual Fences from Google Earth

You can create a polygon in Google Earth, save it as .KML file, and import it into GPS Plus. Please make sure that you use the command *Add Polygon* in Google Earth.



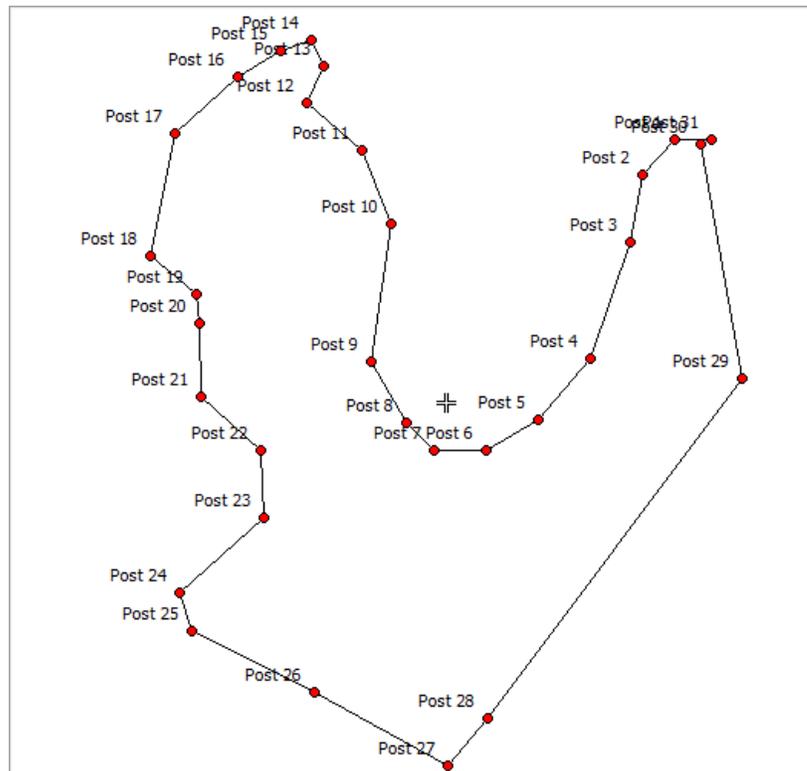
**Import KML polygon as Fence:** Imports a polygon created in Google Earth from a .KML file into GPS Plus. You can do this by clicking on the item or *Import Fence...* from the *Files* menu. The name of the file will be the name of the fence. If you have multiple polygons in the .KML file, only the first will be imported.



**Export Fence as KML polygon:** Exports a polygon as .KML file to view it in Google Earth. Click on the icon or select *Export Fence...* from the *Files* menu. Polygons are saved as Virtual Fence Collection (.VFC), which can contain more than one polygon.

The area of the polygon is not necessarily identical with the Virtual Fence area. **With the Inside Point (⊕ - see below) you can define whether the Virtual Fence area is inside or outside the polygon.**

**Note:** In some cases, the Inside Point might be set automatically not inside the polygon, but outside (Figure below). Please make sure that the Inside Point is on the correct position before sending the Virtual Fence to the collar.



**Figure 37: Virtual Fence with Inside Point automatically set outside of the polygon**

Though you can combine several polygons, you can upload only one Virtual Fence schedule which will be applied to all Virtual Fences on the collar. The collar can only distinguish between “inside” and “outside”, so it is “inside polygon 1 **and** inside polygon 2”, but “inside polygon 1 **but not** inside polygon 2” is not possible. If the collar is inside at least one of these polygons it uses the Virtual Fence schedule, otherwise it uses the standard GPS schedule.

If you transfer the VFC via Iridium or GSM, Virtual Fence collection and GPS schedule must be transferred in one message, so both files have to be smaller. For Iridium or GSM 7-bit coding, the maximum size of the two files is 129 bytes, for GSM 6-bit

coding, the maximum size of the two files is 109 bytes.

Select a Virtual Fence Collection and one GPS schedule which will be applied to all virtual fences in the collection. Press Send to upload it to your collar.

It is possible to program the collar to send a message via GSM or Iridium whenever the animal enters and/or leaves the Virtual Fence (for details see [Virtual Fence](#)).

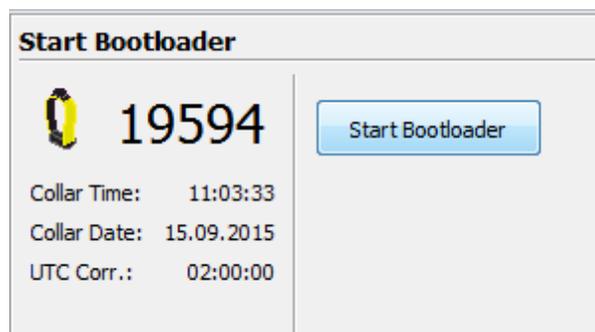
To upload a Virtual Fence to your collar press  to browse your computer for a .VFC file.

#### 6.2.4 Start Bootloader

**Devices** →  **VERTEX Plus Collar** →  **Configuration** →  **Start Bootloader**

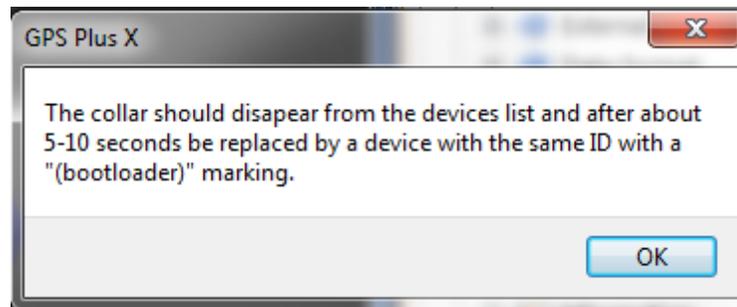
It might be necessary to update the firmware of your collar. Therefore, use the Start Bootloader frame. You should not do this unless you experience problems with the current collar firmware or need a feature only available in a newer version than the present one. In this case, get the appropriate file from VECTRONIC Aerospace and start the Bootloader.

**To upload new firmware the collar has to be deactivated - so please attach the magnet to the electronic housing.**

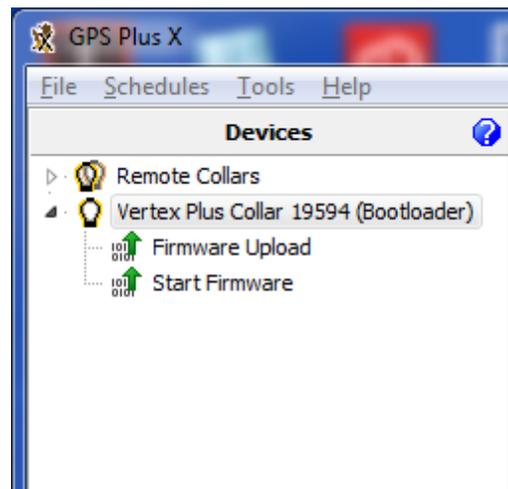


**Figure 38: Start Bootloader**

A notification window will appear to inform you that your collar switches the mode to be able to change firmware settings (e.g. firmware updates).



**Figure 39: Switch to Bootloader Mode**



**Figure 40: Bootloader Mode**

First, you need to upload the new firmware. Click on "Firmware Upload" and browse (  ) your computer for the firmware file you got from VECTRONIC and click the 'Start' button.

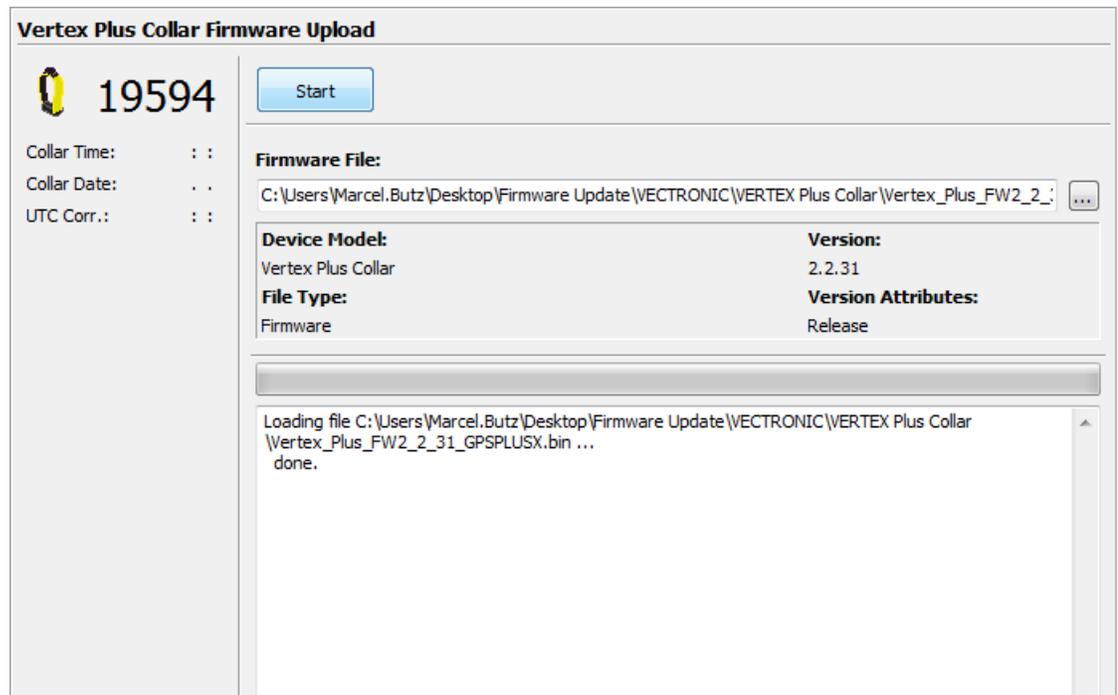


Figure 41: Upload Firmware

When the upload process is finished, click on "Start Firmware" and the collar will switch back to 'Normal mode'.

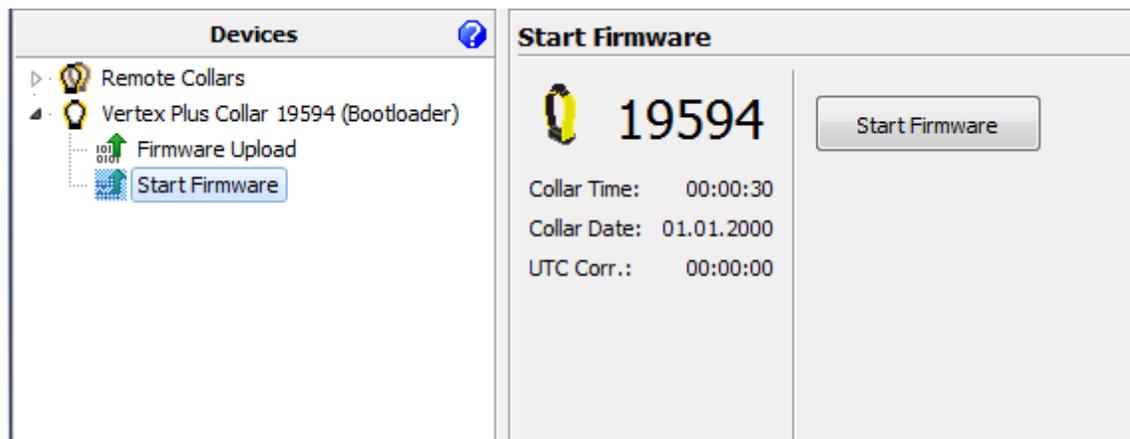


Figure42: Start Firmware

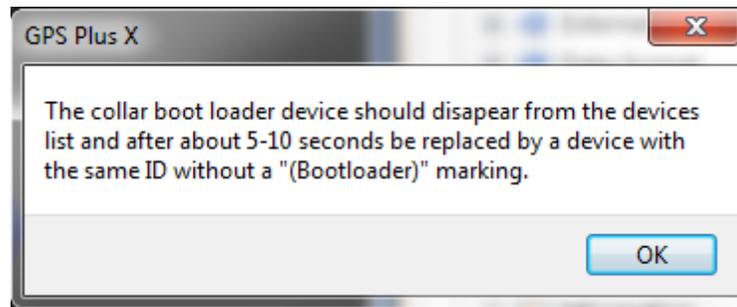


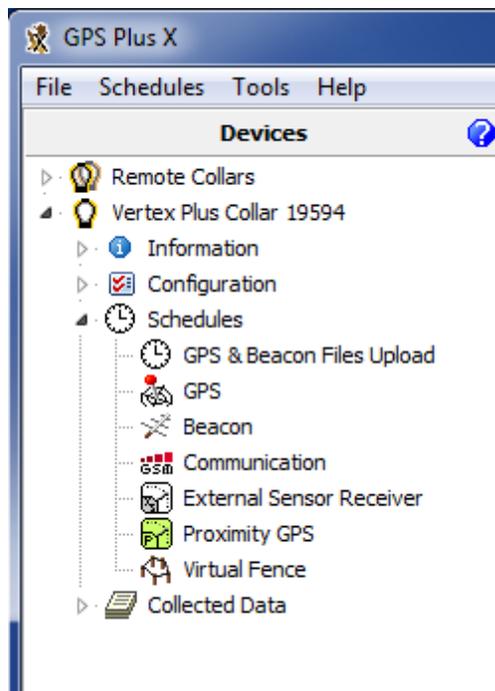
Figure 43: Switch back to Normal Mode

## 6.3 Schedules

*Devices* →  *VERTEX Plus Collar* →  *Schedules*

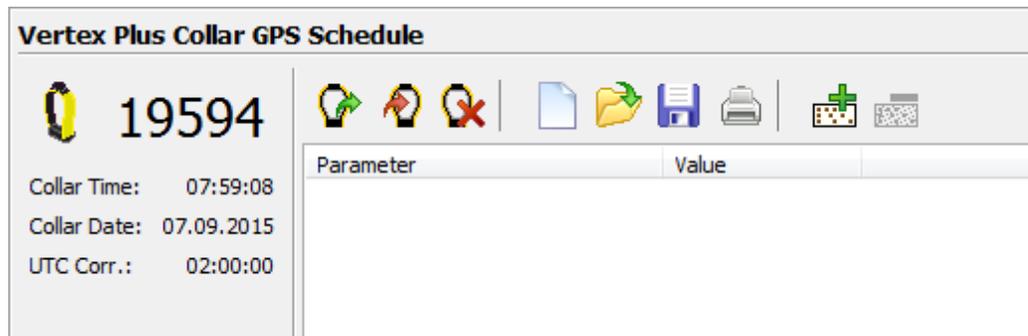
Schedules define when the respective sensor is on. That means you can precisely decide when certain sensors of your collar send, receive or record information. To create new or change already existing schedules click on the Collar Main Tree and open the Schedules node. There you can see all available options which you can create schedules for. It always requires battery power to send, receive, or record data so you should spend some serious thoughts on schedules before collar deployment.

**VERTEX Plus Globalstar: You cannot upload schedules via satellite due to the one-way communication system.**



**Figure 44: Main Tree- Schedules Node**

To create a new schedule, you will need basic knowledge regarding major buttons and schedule rules, which are described in the following:

**Figure 45: Schedule Creation Window**

Load schedule from collar



Upload created schedule to the collar



Erases the collar schedule



Clears the tool window to start schedule



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

All schedules consist of one or more **rules** specifying the date and time when the appropriate sensor of the collar will be active. Each schedule consists of a varying set of rules:

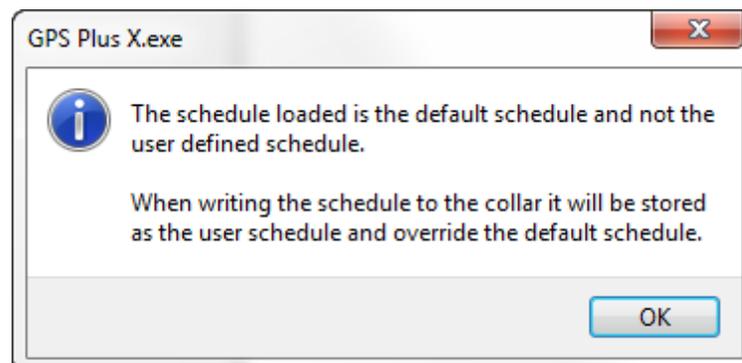
<b>Start Date</b>	the date when the rule should start
<b>End Date</b>	the date when the rule should end
<b>Period Length</b>	the length of the period in which the Sequence for recording is repeated
<b>Sequence</b>	The sequence is a time span within the period length in which you like to record data. Here you can define:  <b>Offset</b> - it defines the time span between the start of the period and the first recording of data  <b>Duration</b> - period in which the data will be recorded with the Rate repetition  <b>Rate</b> - data recording repetition rate

**NOTE:** You can only record data 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.

Parameter	Value
<b>GPS</b>	
Start date	01.01.2000
End date	20.02.2030
Period Length	1d 00:00
Sequences	
Sequence	
Offset	0d 12:00
Duration	1d 00:00
Fix Rate	0d 12:00:00
...	
<b>GPS</b>	
Start date	01.01.2000
End date	20.02.2030
Period Length	7d 12:00
Sequences	
Sequence	
Offset	1d 00:00
Duration	0d 05:00
Fix Rate	0d 00:05:00
Sequence	
Offset	1d 01:00
Duration	1d 00:00
Fix Rate	0d 02:00:00
...	

**Figure 46: Schedule Rules**

If you want to create a new schedule for the first time (only the default schedule exists in the collar), a notification window appears when selecting the schedule frame.



**Figure 47: Notification- Default schedule**

Please refer to following subtopics of the Schedules Node for deeper information

regarding single schedule creation possibilities:

[GPS & Beacon Files Upload](#)

[GPS](#)

[Beacon](#)

[Communication](#)

[External Sensor Receiver](#)

[Proximity GPS](#)

[Virtual Fence](#)

### 6.3.1 GPS & Beacon Files Upload

***Devices*** →  ***VERTEX Plus Collar*** →  ***Schedules*** →  ***GPS & Beacon Files Upload***

This option is only useful if you already created GPS or beacon schedule files beforehand and want to upload them to your collar (otherwise you can skip to the next subtopic [GPS Schedule](#)). To upload a GPS and/or Beacon file tick the appropriate check box. Browse () your computer for a schedule file (.vgsf / .vbsf) and upload () the configuration to the collar. You have no option to cross-check the schedules again so **you should be well experienced to use this feature.**

This feature speeds up the process of loading schedules to collars.

### 6.3.2 GPS Schedule

***Devices*** →  ***VERTEX Plus Collar*** →  ***Schedules*** →  ***GPS***

For general schedule creation rules and hints check the main topic of this chapter ([Schedules](#))

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). It highly depends on your studies and the species how

many GPS fixes the collar should take per day.

GPS Scheduling differs between the 3 variants of the VERTEX Plus Collar you can have (Globalstar / Iridium / GSM).

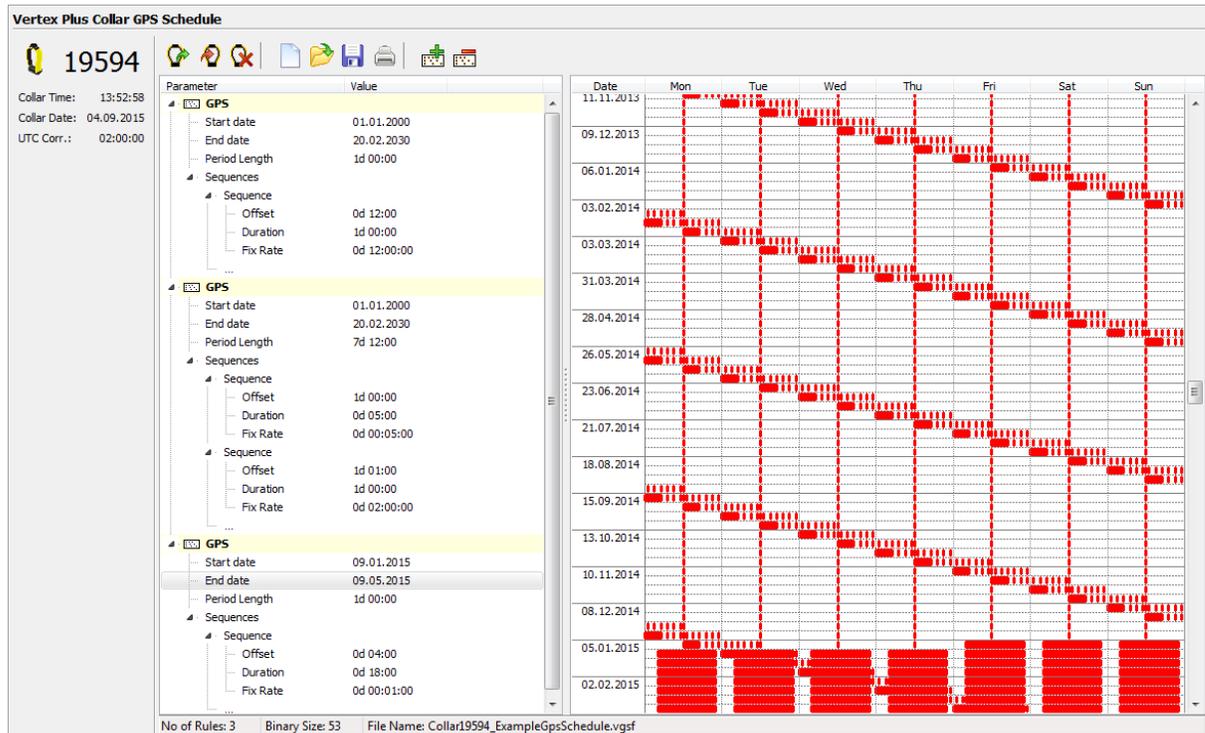


Figure 48: Example GPS Schedule

### VERTEX Plus Globalstar:

Due to the Globalstar system setting there is minimal pause of 30 minutes between different Globalstar transmissions. GPS positions can be recorded more often but data are in the collar only and not transmitted remotely.

**NOTE:** 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.

For more information please refer to [Globalstar Communication](#).

### VERTEX Plus Iridium:

The Iridium variant has no limitation for Iridium Transmissions. This means you can get

as many fixes as you like and also vary them along the study period.

You can start with a low number of fixes to get an overview of how many fixes you really need and how your animal behaves, it is possible to change schedules remotely. But you should pay attention to the file size of your schedule (Figure: schedule file size), it has to be smaller than the maximum file size of one Iridium message (109 bits) if you want to upload the schedule via satellite connection. If the schedule file size is too big for an Iridium upload there will be an error message when you try to send the file to the collar.

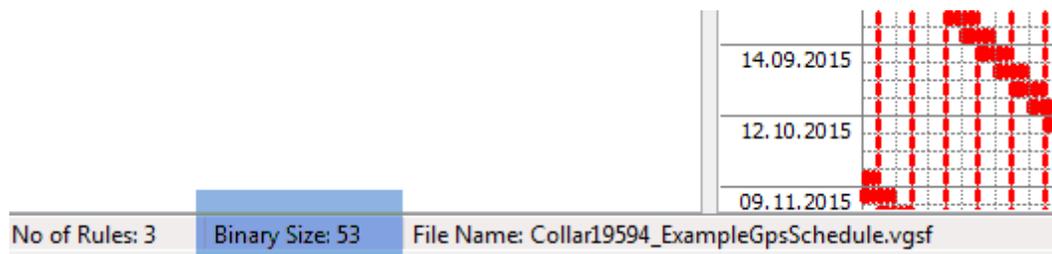


Figure 49: schedule file size

**Recommendation:** To make sure you receive GPS fixes of your collar, please program irregular sequences so that communication attempt does not take place at the same time every day. (In case of the animal is not reachable for the satellite at a specific daytime when the satellite tries to reach it, e.g. if a bear hides in a cave around 6pm and the satellite tries to reach the collar only at 6pm every day.) **The worst case is to get no results at all but you can prevent this with correct scheduling.**

**NOTE:** 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.

For more information please refer to [Iridium Communication](#).

### **VERTEX Plus GSM:**

You can start with a low number of fixes to get an overview of how many fixes you really need and how your animal behaves, it is possible to change schedules remotely. But you should pay attention to the file size of your schedule (Figure: schedule file size), it has to be smaller than the maximum file size of one Iridium message (109 bits)

if you want to upload the schedule via satellite connection. If the schedule file size is too big for an Iridium upload there will be an error message when you try to send the file to the collar.

**NOTE:** 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.

For more information please refer to [GSM Communication](#).

**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.

If you need further help please contact our customer service.

### 6.3.3 Beacon Schedule

**Devices** →  **VERTEX Plus Collar** →  **Schedules** →  **Beacon**

For general schedule creation rules and hints check the main topic of this chapter ([Schedules](#))

The configuration of the VHF Beacon schedule is similar to the configuration of the [GPS schedule](#) 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 o'clock 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.

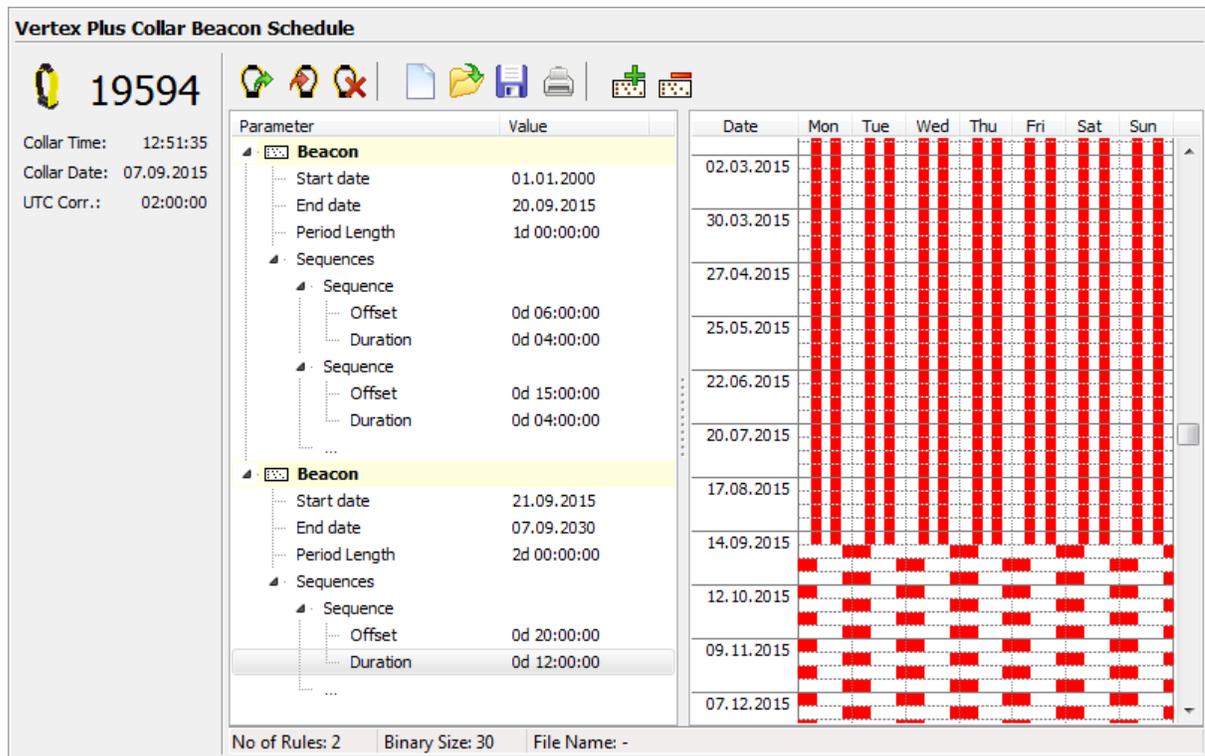


Figure 50: Example Beacon Schedule

To save battery life, it is important 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, press  to send it to the collar.

### 6.3.4 Communication Schedule

**Devices** →  **VERTEX Plus Collar** →  **Schedules** →  **Communication**

The Communication Schedule is only available for GSM or Iridium collars.

For general schedule creation rules check the main topic of this chapter ([Schedules](#))

With this feature you can control when the collar tries to contact the satellite to transfer fixes. It is only necessary to create this schedule if you do not agree with the default settings which collects 4 fixes and send them instantly in one message.

Recommendation: Do not use the communication schedule unless you know the satellite reception is very good.

### 6.3.5 External Sensor Receiver Schedule

**Devices** →  **VERTEX Plus Collar** →  **Schedules** →  **External Sensor Receiver**

For general schedule creation rules check the main topic of this chapter ([Schedules](#))

The External Sensor Receiver schedule defines when the collar listens for signals sent by external sensors. The schedule rules are similar to the Beacon schedule: You can only set the Start Date and End Date, Period Length, Offset and Duration. The External Sensor Receiver is active in the time span between Offset and Duration.

### 6.3.6 Proximity GPS Schedule

**Devices** →  **VERTEX Plus Collar** →  **Schedules** →  **Proximity GPS**

For general schedule creation rules check the main topic of this chapter ([Schedules](#))

You can define a GPS schedule as proximity schedule. It is created and uploaded the same way as the standard [GPS schedule](#), but you need to select the proximity GPS schedule node. For information regarding the proximity application please refer to [Proximity Sensor](#).

### 6.3.7 Virtual Fence Schedule

**Devices** →  **VERTEX Plus Collar** →  **Schedules** →  **Virtual Fence**

For general schedule creation rules check the main topic of this chapter ([Schedules](#))

You can define a GPS schedule as Virtual Fence schedule. It is created and uploaded the same way as the standard [GPS schedule](#), but you need to select the Virtual Fence schedule node. For information regarding the Virtual Fence application please refer to [Virtual Fence](#) and [Virtual Fence Polygons](#).

## 6.4 Collected Data

**Devices** →  **VERTEX Plus Collar** →  **Collected Data**

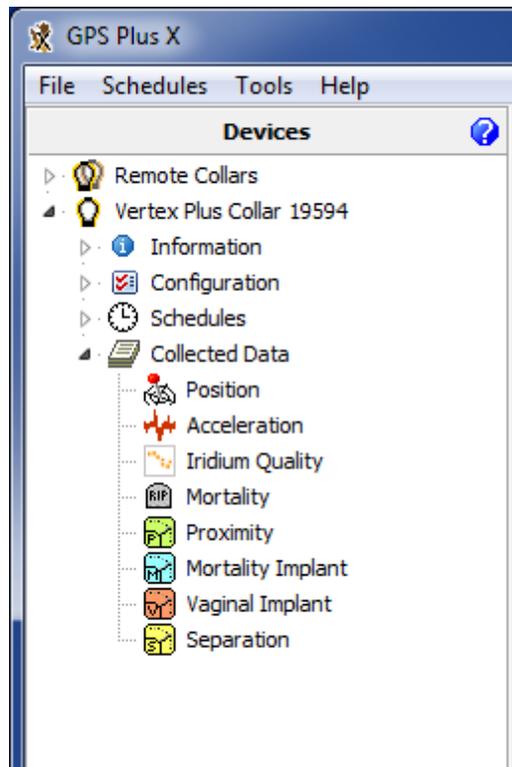


Figure 51: Main Tree- Collected Data Node

This frame shows the data retrieval options of the collar.

The main function of this node is to download the collar data. The output window and functions differ but the main functions are pretty much identical. Following buttons will appear on the symbol bar in this chapter:

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

 Saves data to storage module.

 Exports acceleration data (.csv).

     These commands erase data stored on the collar. From left to right: GPS position, acceleration, mortality, proximity. Please make sure that you have stored the data before you use this command. **Data cannot be restored once**

**deleted!**

In all subtopics (accept acceleration) there is a filter to restrict the output file to a certain period and/or also to certain data value attributes.

For further instructions how to save, erase, export and display data please refer to the GPS Plus X manual and search for 'Downloading Data' and 'Filter'.

## 7 Remote Collar (Communication)

This chapter deals with the remote communication to the collar after deployment or for testing the collar using Iridium or GSM communication.

For remote communication go to **Devices** →  **Remote Collars** →  **Vertex Collars**

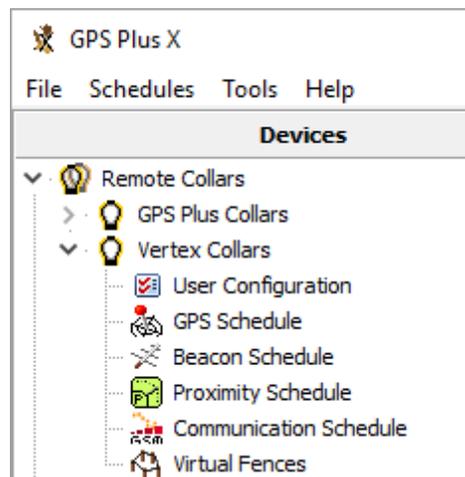


Figure 52: Remote Vertex Collars

Refer to the subtopics to learn how to communicate with the collar remotely.

“GPS Schedule” is used to define and send GPS schedules to one or more collars.

The third node includes the same options for VHF Beacon schedules.

“Communication Schedule” enables you to upload communication schedules defining communication windows for the collar. To edit schedules please refer to chapter [Schedules](#).

“Virtual Fence” allows you to browse for Virtual Fence collections you created before and send them to your collar as explained in [Virtual Fence Polygons](#).

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”.

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

**NOTE:** Make sure you have chosen the correct collars only.

**NOTE:** Please keep track on your changes (collar journal) for you and your planning but also for us if you need support at some point.

## 7.1 Remote User Configuration

*Devices* →  *Remote Collars* →  *VERTEX Collars* →  *User Configuration*

Number of parameter bytes (25 max.): 0

Name	Unit	Value
<b>System</b>		
Time		
UTC Correction		00:00
<b>Sensors</b>		
GPS		
Skip Count		0
Mortality		
Mortality Mode		[0] Off
Mortality Period	h	24
Hibernation		
Hibernation Mode		[0] Off
Hibernation Period		0d 01:00:00
Activity		
Activity Mode		[0] Off
Acceleration		
Acc. Recording Sample Rate		[1] 2 Hz
Acc. Sensor Range		[4] ±4 g
<b>Communication</b>		
Beacon		
Beacon Frequency	MHz	151,000
Standard Beacon		
Beacon Power	dBm	10
Pattern		
Pulse Type		1
Pulse Length	ms	20
Loop Length	ms	1500
Mortality Beacon		
Mortality Mode		[0] Always on
Mortality Power	dBm	10
Pattern		
Pulse Type		1
Pulse Length	ms	10
Loop Length	ms	750
Sensor Communication		
External Sensors		
Virtual Fence		

Figure 53: Remote User Configuration

All options are explained in Chapter [User Configuration](#) and [Telemetry](#).

**NOTE:** 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.**

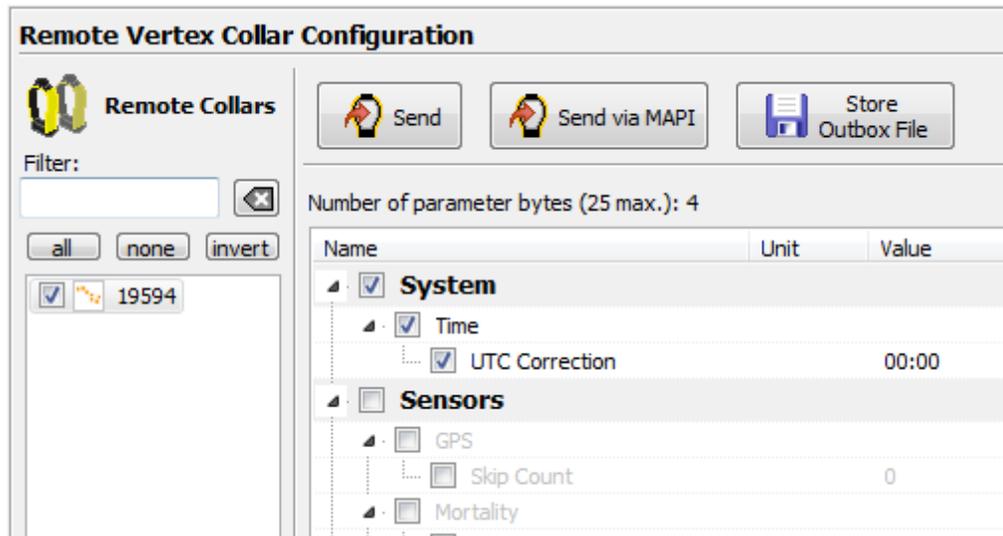


Figure 54: Remote VERTEX Collar Configuration

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 à 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 if you need support at some point.

## 7.2 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. You might have to stick to some more basic rules, respectively plan for a certain period and resend updates from time to time.

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”.

## 7.3 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 send 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, respectively 5-9 VHF Beacon rules. You might have to stick to some more basic rules, respectively plan for a certain period and resend updates from time to time.

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

## 7.4 Remote Proximity Schedule

**Devices** →  **Remote Collars** →  **VERTEX Collars** →  **Proximity Schedule**

The Proximity Schedule editor is identical to the one described in [Proximity 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 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.

## 7.5 Remote Communication Schedule

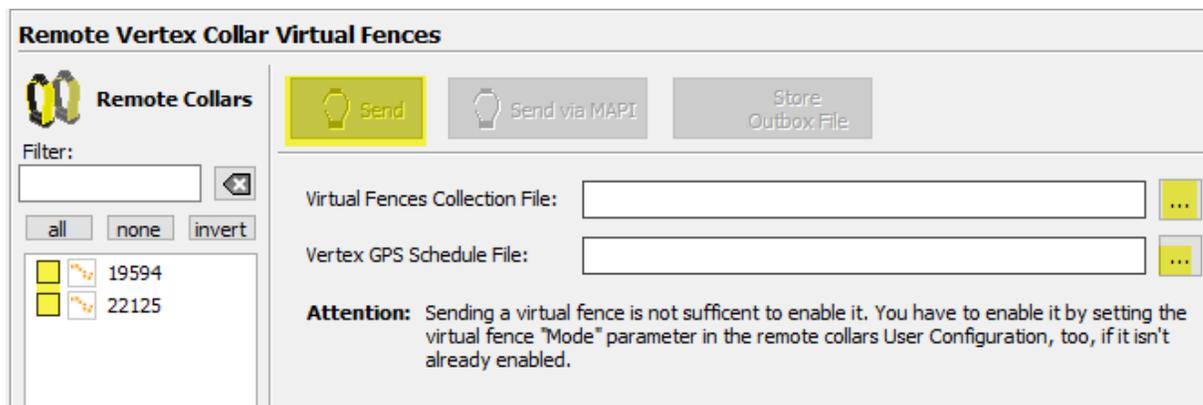
**Devices** →  **Remote Collars** →  **VERTEX Collars** →  **Communication Schedule**

The Communication Schedule editor is identical to the one described in [Communication 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.

## 7.6 Remote Virtual Fences

**Devices** →  **Remote Collars** →  **VERTEX Collars** →  **Virtual Fences**



**Figure 55: Remote Vertex Collar Virtual Fences**

Browse for a Virtual Fence Collection and GPS Schedule, choose your collar from the list and press send to remotely send the files to your collar.

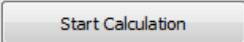
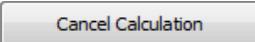
To learn how to create a Virtual Fence Collection, refer to the GPS Plus X manual. Any schedule sent to the collar will erase the existing one on the collar, meaning you will have to include all rules of the first one.

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 only contain 108 bytes.

## 8 Calculate Collar Lifetime

This command estimates the lifetime of your VERTEX Plus Collar and can be found in the Tools menu of GPS Plus X. Please select Calculate Vertex Collar Lifetime and type in all your configurations.

**Figure56: Collar Lifetime Calculation**

Now you can enter or load your schedules or create schedules in the according tags. The  icon enables you to load schedules into the calculation tool, potentially retrieved from the collar. After you have selected all the options for the Collar, press  or  to start the calculation. When pressing  or  while the calculation process is running, you will cancel the actual calculation. It might be useful to save the settings using the  icon as this schedule could later be used for collar configuration.

## Output:

Main Battery Lifetime			Beacon Battery Lifetime		
	Days	End Date		Days	End Date
Best case (45s)	1195	26.12.2018	Best case (45s)	1911	11.12.2020
Average (90s)	728	15.09.2017	Average (90s)	1443	31.08.2019
Worst case (180s)	408	30.10.2016	Worst case (180s)	1124	16.10.2018

**Figure57: Output Lifetime Calculation**

The calculation results are shown in the above shown window. It contains the collar lifetime for the main battery whereby all functions you typed in before are working.

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 45s 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 mountainous area where the collar has difficulties maintaining contact with 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.

## 9 Battery options

The VERTEX Plus Collar enables the usage of different battery sizes to fit a wide range of species and study scenarios. 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
1D IG	205 g	300 g
2D IG	329 g	430 g
3D IG	492 g	580 g
4D IG	616 g	708 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

## 10 Changing of battery pack

All VERTEX Plus 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 plugging and unplugging 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](#)

### 10.1 Oval Collar



Figure 58: 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 59: 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, center).

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 you changed the battery pack of your collar, a GPS coldstart is necessary. For this please refer to [GPS Monitor](#).

## 10.2 Round Collar, standard battery pack



Figure 60: 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.



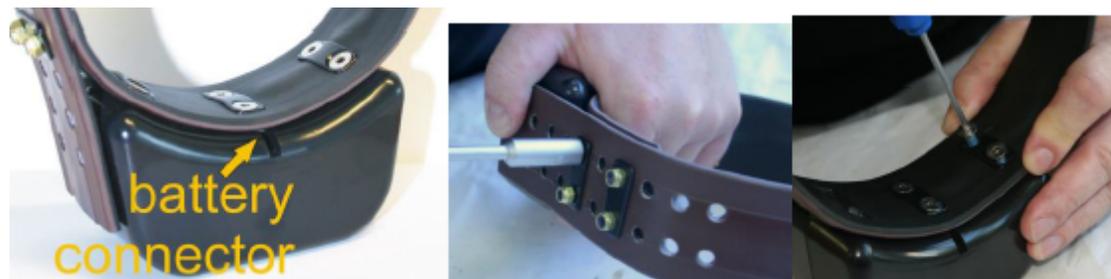
**Figure 61: Removing the battery connector from round collar, standard battery pack**

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, center). 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 sealing 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 you changed the battery pack of your collar, a GPS coldstart is necessary. For this please refer to [GPS Monitor](#).

### 10.3 Round Collar, curved battery pack



**Figure 62: 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, center), 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 63: 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 64: 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 65: 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).



**Figure 66: Attachment for curved battery pack on round collar. Left: metal base plate; center: 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 you changed the battery pack of your collar, a GPS coldstart is necessary. For this please refer to [GPS Monitor](#).

## 11 Collar Deployment

The VERTEX Plus Collars are easily deployable and adjustable to a variety of specimen. There is 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. Please cut the overhanging belt part and smooth the cut edge.

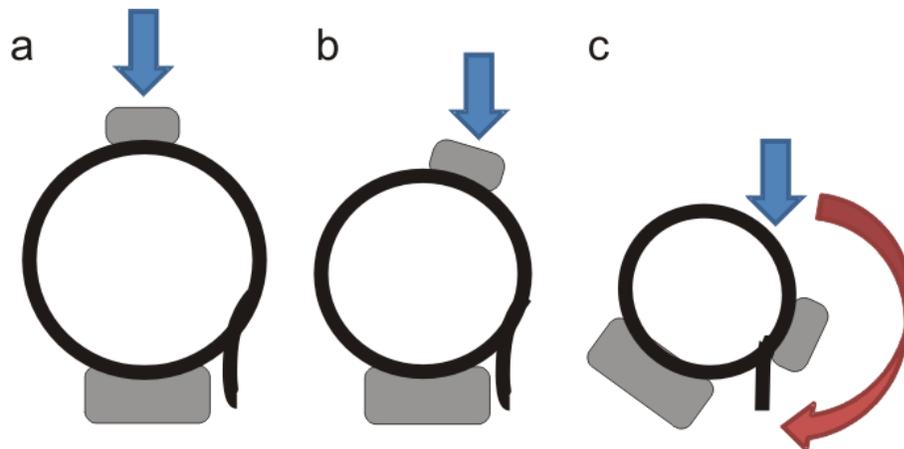
- 1. Make sure the communication connector end cap with the thin O-ring are in place to protect it from dirt and humidity.**



Figure 67: left: with communication connector end cap. right: without communication connector end cap.

- 2. Adjust the belt to the correct circumference and cut the overhanging belt.**

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. The battery pack acts as counterweight to keep the electronic case in that position; 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.



**Figure68: Collar circumferences (a) Predefined circumference: Electronic case is exactly on top of animal's neck, best possible GPS reception. (b) Up to  $\pm 10\%$  variation from predefined circumference: Electronic case is slightly on side of animal's neck (c) bad or no GPS reception**

**NOTE:** Please do not shorten the belt beyond the perforated belt part as you would possibly cut and thereby damage the VHF antenna or electrical cables. If you need further help do not hesitate to contact our customer service.

- 3. 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.**

## 12 Specification

### 12.1 Environmental specification for the collar

Operational temperature range:  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$

Operating humidity range:  $\leq 100\%$  RH (relative humidity)

Storage temperature range:  $-45^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$

Storage humidity range:  $\leq 100\%$  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 tentatively charged.

### 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.

## 12.2 Declarations of Conformity

<b>GPS Plus Collar      Globalstar</b>
Contains FCC ID: L2V-STX2-1 Contains IC: 3989A-STX2-1
<b>Canada 310</b> 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

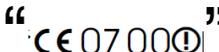
Address of the manufacturer or his authorized representative:

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](mailto: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 “”

Berlin, 2010-08-23



.....  
 Robert Schulte

## 12.3 Certificates

<p><b>m. dudde hochfrequenz-technik</b>          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</p>	
 Deutscher Akkreditierungs Rat DAT-P-225/96	
<h3>Certificate of Conformity</h3> <p>N° 10006100</p>	
<p>Product definition : GPS transmitter          Trademark : VECTRONIC          Product name (Type) : <b>GPS Plus Globalstar Halsband</b>          Hardware version : GPS Plus Globalstar Halsband          Serial number : 7247, 7278          Software release number : ---</p> <p>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</p>	
<p>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:</p>	
<p>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</p>	
<p>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</p>	
<p>This Certificate of Conformity has been granted to:</p>	
<p>VECTRONIC Aerospace GmbH          Carl-Scheele-Str. 12          12489 Berlin</p>	
<p>Bergisch Gladbach, 2010-05-18</p>	
	
<p>Manfried Dudde</p>	



# 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**

Recognised by  Bundesnetzagentur

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 9<sup>th</sup> 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 Bentje  
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

Annex of the Expertise No. 10-111760  
Date 26 July 2010

Page 1 of 2

## 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	m. dudde	10006149
EN 301 489-3 V1.4.1: 2002-08		10006116
EN 301 489-20 V1.2.1: 2002-11		
EN 300 440-2 V1.3.1: 2009	m. dudde	10006148
EN 300 440-1 V1.5.1: 2009-03		
EN 301 441 V1.1.1 : 2000-05	m. dudde	10006238

### Further Documents

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



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Annex of the Expertise No. 10-111760  
Date 26 July 2010

Page 2 of 2

### 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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DIRECTION TECHNIQUE DU CONTROLE DU SPECTRE  
Département R&TTE

Affaire suivie par : M LOUIS Laurent  
Mel : [rte@anfr.fr](mailto:rte@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/rte/files/class\\_en.pdf](http://ec.europa.eu/enterprise/sectors/rte/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 : [rte@anfr.fr](mailto:rte@anfr.fr)

AUG.31.2010 10:12 +37052161564

LR RYSIU REGULIAVIMO TARNYBA

#4865 P.001 /001



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

Attn.: Ms. Anja Hitting-Rademacher  
 M.dudde hochfrequenz-technik

31.08.2010 Our ref: (11.16) 1B-3470  
 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  
 Code 121442211

VAT code LT 214422113

Register: The register of legal entities

27a Algirdo str.  
 LT-03219 Vilnius  
 Lithuania

Tel: +370 5 210 56 23/33,  
 Fax: +370 5 216 15 64

E-mail: rrt@rrt.lt  
 Web site: www.rrt.lt



INSTITUT LUXEMBOURGEOIS DE RÉGULATION

m.dudde hochfrequenz-technik

c/o Mrs Anja HITTIG -  
Rottahaus

RADEMACHER  
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,

Referring 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. Further 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,

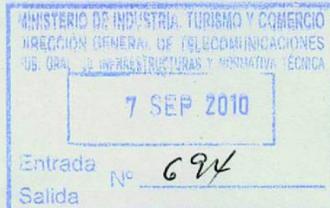
Roland Thurmes  
Premier Conseiller de direction

### Results of our technical analysis:

Date of notification	Observations
Our reference	
10/08/2010	<p><b>Notification body:</b> 0700 - Phoenix Testlab GmbH, Germany</p> <p><b>Manufacturer:</b> VECTRONIC Aerospace GmbH</p> <p><b>Type / Number of model:</b> VECTRONIC: GPS Plus Globalstar Halsband</p> <p><b>Operating frequency:</b> 1610-1626.2 MHz</p> <p>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&amp;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:</p> <p><b>Maximum radiated power:</b> -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)</p>
100810/16025	



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

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: .....**Transeptor 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](mailto:feo@nhh.hu)

Ügyintéző: Buczás 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.

Üdvözlettel:

főigazgató nevében és megbízásából



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 brájék.doc