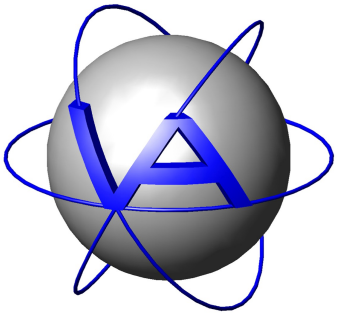
VERTEX PLUS Survey Collar

Globalstar

User's Manual



Version: 1.6

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	Name	Date	Signature
Prepared by			
Edited by	Erik Lewerenz	25/09/15	
Checked by	Robert Schulte	26/08/30	
Approved by			
Authorised by			

DOCUMENT CHANGE RECORD

Issue	Date	Item(s) Affected	Description
1		-	Initial Issue
2	27/05/15	- photos	Updated Survey photos (new housing)
3	22/02/16	Specifications	Updated specifications on page 7
4	29/03/16	Declaration of Conformity	Added DoC
5	26/08/16	Declaration of Conformity	Changed FCC and IC Label
6	30/08/16	Declaration of Conformity	Updated Label

Table of Contents

1 Product overview

The VERTEX Plus Survey collar has been designed for long-term survival studies. The collar offers the possibility to measure and store

- Up to two GPS positions per day in WGS84 coordinates
- Transmitting the location via Globalstar Satellite Network
- Ambient temperature (stored with every GPS position)

All data is stored on board of the collar and transmitted via Globalstar Simplex service. The user can choose the following settings which are preconfigured during production:

- GPS schedule
- Mortality period

Based on the activity of the animal, the collar can transmit a mortality event message to immediately inform you that the collar has not been moved for a user-defined time. This immediate message is sent to the researcher, first as email but optionally as immediate text message to the mobile phone.

2 Fast guide to deploy the collar

To get your VERTEX PLUS Survey collar working properly, you need to follow some basic steps:

In the lab/office/field station (the magnet needs to be attached to the electronic housing):

1. Make yourself familiar with the collar and its parts

When deploying the collar

2. Adjust the belt to the correct circumference for the animal
3. Make sure that the **magnet is removed** from the electronic housing, otherwise the collar stays deactivated and will not perform any GPS fixes or transmit data.

The steps of this list will be explained more detailed in the next chapter.

3 The VERTEX Plus Vertex Survey collar system

The VERTEX Plus Survey collar has been designed for long-term survival studies. It is equipped with a mortality sensor and temperature sensor. The size of the collar can be set up to your personal needs. Handling and software for all collars is identical. This enables you to manage all collars with the same software and database, the handling of several collars becomes easy.

3.1 The collar

The VERTEX PLUS Survey collar consists of the following components (Figure 1):

Figure 1: VERTEX PLUS Survey collar with magnet attached

- the electronic housing containing the GPS antenna, the mortality sensor, the temperature sensor, all electronics and the Globalstar antenna
- the magnet, which is attached to the electronic housing when the collar is turned off
- the battery which is integrated into the electronic housing

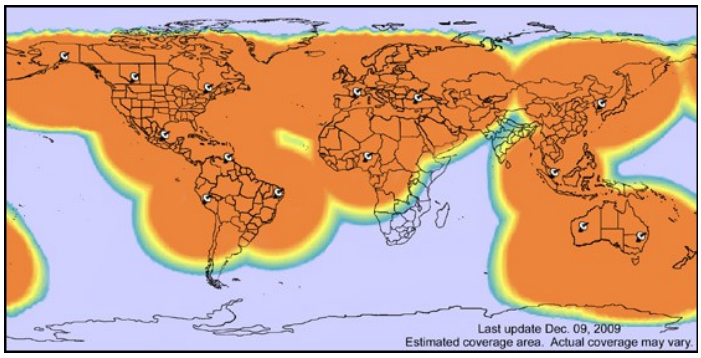
The collar is designed to function at extreme temperatures (-40°C to +55°C).

3.2 Data interface

The Survey collar is designed for long-term survival studies and therefore includes all the necessary components.

- **Satellite communication:** The Survey Collar is equipped with the Globalstar satellite modem to transmit data from the collar.

  The Globalstar SIMPLEX service is a one-way only communication option and it uses a satellite network of 48 satellites with 24 hour coverage. The GPS data are repeatedly sent to the satellites, but no confirmation is sent by them. The Globalstar antenna is integrated into the electronic housing. There are areas which are not covered by Globalstar yet (see map of coverage below), so please check if your study area has Globalstar coverage.



3.3 Data format

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

- **GPS position information:** No, Collar ID, UTC date and time, LMT date and time, origin, SCTS date and time, ECEF X,Y and Z, latitude/longitude/height, DOP, 3D Error, number of the used satellites, Satallite ID (Sat No), Carrier to Noise (C/No [dBHz]), battery voltage, mortality status, temperature and last activity. Data is saved as .GDF file and can be accessed with GPS PLUS X. For more explanation of the transmitted data, please refer to the GPS PLUS X manual.

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

- **Mortality information:** Date and time of a mortality event based on the activity of the animal. The GPS Plus X software stores the received mortality message in the data base. In the Survey collar, the mortality events are not stored.

3.3.1 List of files and extensions used

Table 1: Download files

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

Table 2: Export files

.GDF	GPS Data File	Binary coded GPS fix data from the collar including main battery voltage, VHF beacon battery voltage, and temperature. The file name consists of the collar number and the time stamp of the file creation coded as "yyyymmddhhmmss".
.TXT	ASCII	Visually readable equidistant table, compatible to conventional text editors and spreadsheets
.CSV	Spreadsheet	Computer readable table, compatible to conventional text editors and spreadsheets
.DBF	DBase Table	Database format, compatible to conventional spreadsheets and most text editors
.GPX	GPS Exchange Format	File for data exchange with GPS devices
.KML	KML	Google Earth file to display tracks, points of interest, etc.
.KMZ	KMZ	Zipped Google Earth file
.BTX	BioTelemetry eXchange	VECTRONIC-defined XML-format
.GDX	GPS Data eXchange	Is an XML format defined by VECTRONIC Aerospace, which will make it easier to exchange acquired data over system boundaries. It is an internal format of GPS PLUS X and can also be used as import format.

Table 3: Upload files

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

Table 4: Hardware information files

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

3.4 Software

The VERTEX PLUS Survey collar comes with a software package including the GPS Plus X software. The software is used to configure and manage the Survey collar as well as all the GPS Plus/Pro Light collars. GPS Plus X allows you to generate schedules for GPS fixes for the Survey collar. It manages all data on GPS positions, mortality and temperature.

4 Handling of the collar

The collar is turned on or off with the magnet on the electronic housing (Figure 2). If the magnet is attached correctly, the collar is deactivated, thus no GPS fixes, transmissions, temperature and mortality measurements are performed.

The collar can be configured using the wireless USB Remote Stick. The range of the USB Remote Stick is between 0.5 and 2 metres.

No parts of the VERTEX Plus Survey collar can be changed by the user. After the battery lifetime is over, you have the possibility to send the collar back to VECTRONIC Aerospace to retrieve the data.

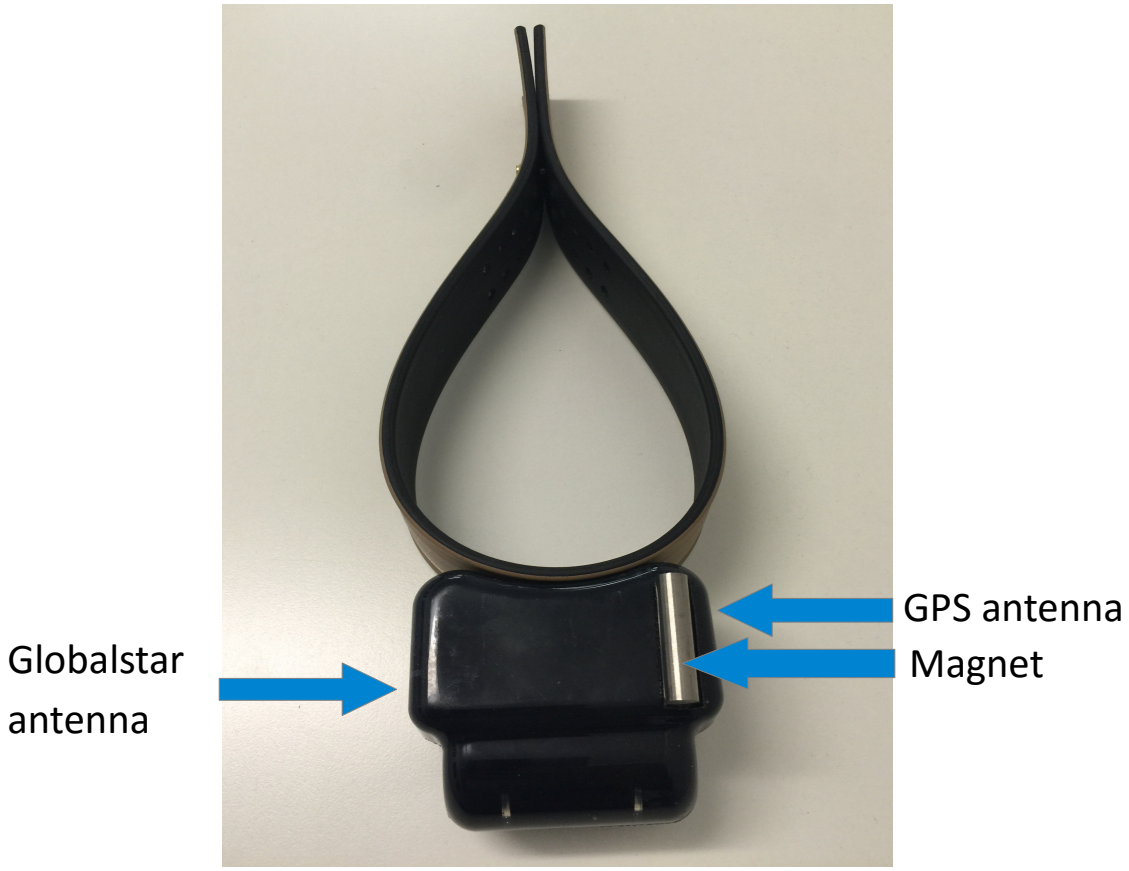


Figure 2: Magnet to switch off main processor

5 Configuration of the collar

Prior to deploying the collar to an animal, it has to be configured. This is done according to your requirements by VECTRONIC Aerospace before delivery.

5.1 Installation of the GPS Plus Collar Manager Software GPS PLUS X

Installation is simple and straightforward. There are three ways to start the installation:

- If you use the AutoRun CD which has been delivered with the collars, follow the instructions for “Set-up your system”.
- You can start the installation manually from the VECTRONIC CD by starting the GPS Plus X setup file, then
  - follow the instructions in the automatically started GPS Plus X set-up program
  - or manually start the file Ressources\VECTRONIC Software\GPS Plus X Vxx.x.x setup.
- You can download the latest release version of the software on the VECTRONIC homepage (Wildlife Monitoring → Downloads) and start the set-up manually.

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):

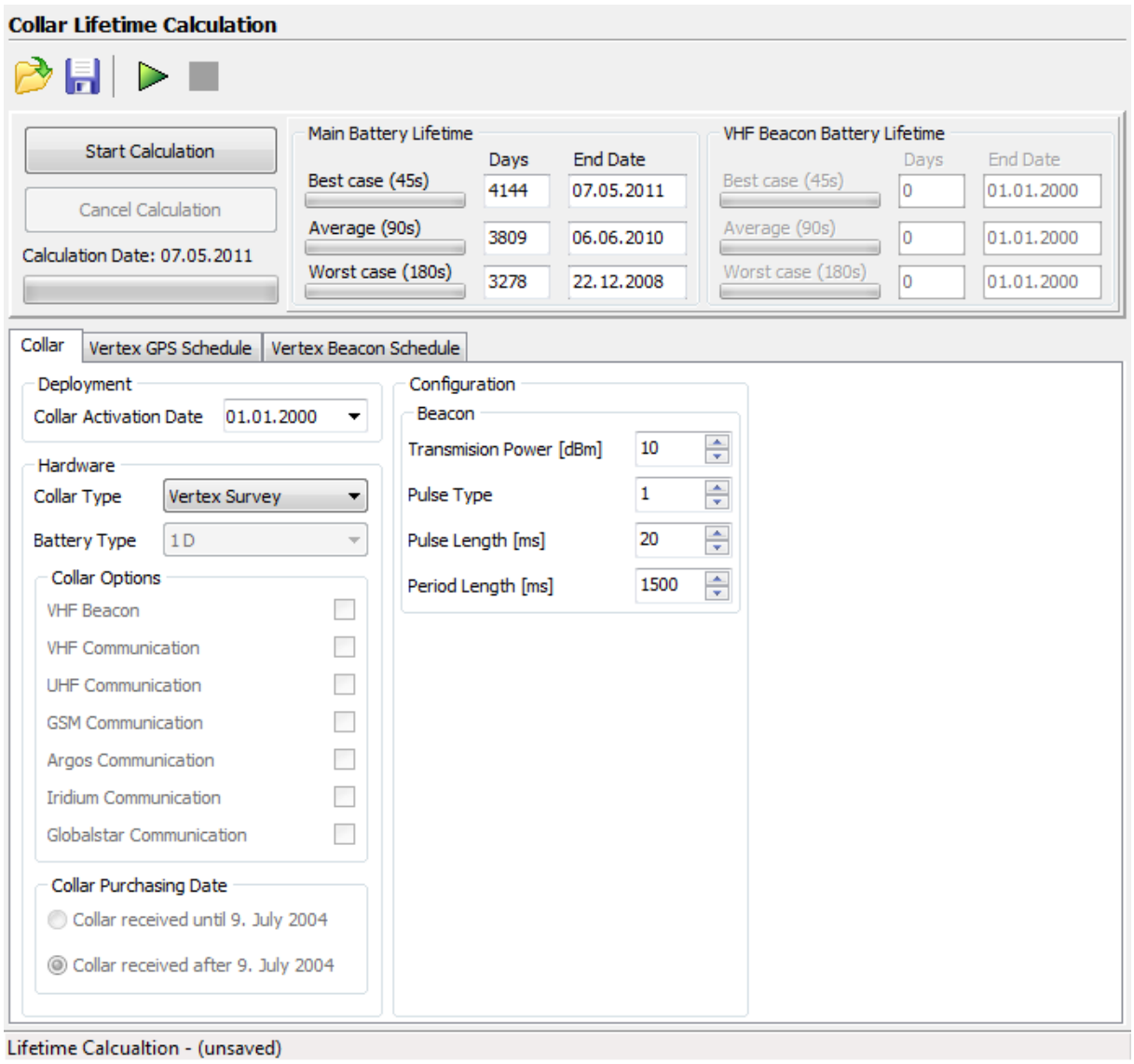
- User Interface: GPS Plus X User Interface to services and collar control
- Data Storage Service: Service that manages collected and stored collar data
- Data Collector Service: Service that receives collar data via email
- Colour Selector: Tool to select a colour for the belt of your collar
- TeamViewerQS VAS: Tool for remote support by VECTRONIC Aerospace GmbH
- GPS Plus X Manual: Manual for the GPS Plus X system

By default, GPS Plus X will be configured to run on a single computer without any network or data collectors. The next chapter will give you an overview of the configurations that might be necessary and in which chapters you will find information on these.

5.2 Calculate Collar Lifetime

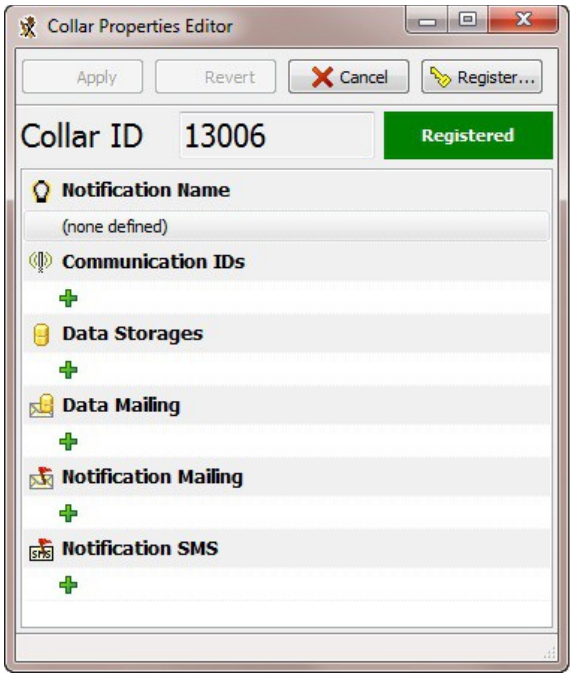
This command estimates the lifetime of your VERTEX PLUS Survey collar and can be found in the Tools menu of GPS Plus X. You need to select the Collar Type “Vertex Survey” and choose an Activation Date of the collar (e.g. 01.01.2000). Now you need to set the Vertex GPS schedule. Please make sure that the starting points of the schedules are the same as the Activation Date you selected.

After you have you have selected all the options for the Survey collar, press Start Calculation or ▶ to start the calculation. When pressing Cancel Calculation or ■ while the calculation process is running, you will cancel the actual calculation.



5.3 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 on the CD which is sent with the collars.



For registering the collar, please go to the Configuration tree in GPS Plus X and select *Configuration → Collars*. In the appearing window "Collar List", press to add a new collar to the list. After clicking on the button, the Collar Properties Editor appears. To register a collar, click Register... . An open file dialog will open and you can select the collar registration key for the collar. This key is provided on the CD (in the folder Ressources\Collar and Drop Off Keys).

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

5.4 Schedules

5.4.1 GPS schedule

In the GPS schedule frame (Figure 3) you can edit the rules for the collar in the left part of the frame. A graphic of the defined rules is displayed in the right part of the frame. The schedule which appears when opening the GPS schedule frame is the default schedule for the selected collar. You will be able to overwrite the default schedule with your own schedule. To do that, you can set the following parameters:

Start Date	the date when the rule should start
End Date	the date when the rule should end
Period Length	the length of the period in which the Sequence for GPS recording is repeated.

Sequence

The sequence is a time span within the period length between you like to take GPS positions. Here you can define: Offset – it defines the time span between the start of the period and the recording of the first GPS position; Duration – period in which the GPS positions will be recorded with the Fix Rate repetition; Fix Rate – GPS position recording repetition rate. Please note that you can only take GPS fixes within the time span of the period. This way, the sum of offset and duration must be smaller than the value of the defined period length. If you like to take only 1 GPS fix per sequence, the fix rate can equal the duration value. If you have already two position recordings in one sequence, you can delete the other sequence in the rule editor.

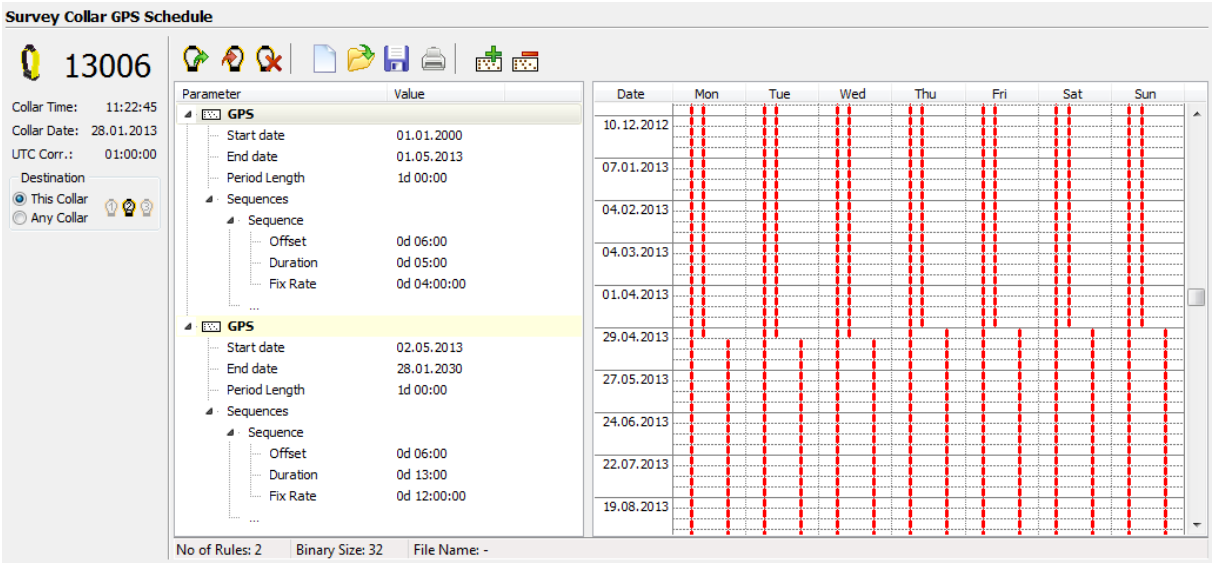


Figure 3: Survey Collar GPS Schedule frame

As the Survey collar **can only take up to two positions per day**, GPS PLUS X will check if there are not more than two fixes per day configured. If the rules are set up in a way that more than two positions are recorded every day, you will receive an error message. You can define max. 292 GPS schedule rules.

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.

Note: The collar will take on GPS fix per week when all schedules rules are in the future or already outdated.

Note: With each successful GPS fix, the collar time is automatically adjusted to the correct UTC time, corrected by your UTC correction (if enabled). It is thus not possible to synchronise the collar with another time, than the GPS satellite system's time. Also, UTC correction cannot be enabled by sending the local mean time to the collar.

6 Getting the collar into action

6.1 Testing the collar

Before the collar has been shipped to you, it has been configured according to your requirements and tested thoroughly at VECTRONIC Aerospace. **Nevertheless, we strongly recommend to test the collar before it is deployed to the animal.** This is especially important after you have stored the collar for several months, even if it has been tested before. **Also make sure that data is received correctly and is accessible to you.**

6.2 Attaching the collar

Please be careful when attaching the Survey collar to the animal. The electronic housing includes the Globalstar antenna as well as the GPS antenna. Both antennas must have direct contact to the satellites for recording and transferring data. Therefore, the collar needs to be attached correctly.

The adjustable side of the collar must be on the right side of the animal. You should shorten the belt if necessary to avoid irritation and abrasions.

To achieve the best possible GPS and Globalstar signal, the collar must be attached to the animal's neck so that the electronic housing faces downwards and the adjustable side of the belt is on the right side of the animal. The magnet which is attached to the electronic housing must face to the animal directly.

Before you release the animal, please make sure that the **magnet is removed from the electronic housing so that the collar is activated**. The collar is attached to the animal with the electronic housing facing downwards.

7 Collar specifications

7.1 Globalstar Communication

The Globalstar system provides remote data download. Each position data (maximum 2 positions per day) is sent by the collar. If a satellite is in range, data is directly transmitted to the researcher. If no satellite is in range, data is not transmitted and can only be received from the collar's non-volatile on-board-memory after the retrieval of the collar.

7.2 Functionality of sensors

7.2.1 GPS Receiver

All positionings are performed with the GPS receiver. Locations are stored with UTC date and time, LMT date and time, three coordinates (Latitude, Longitude and Height), Dilution of Precision (DOP) and Navigation status as quality information and number of satellites used for positioning.

GPS data can be exported to ASCII, Spreadsheet, DBase, GPS Exchange, Google Earth and BioTelemetry eXchange format (see Table 2 for details). You can easily import the data into Google Earth to check the area your animal is using.

7.2.2 Mortality Sensor

The mortality sensor measures true acceleration of the animal. If no acceleration is detected for a user-defined period (e.g. 24 hours), a mortality event is triggered. The mortality period is user-definable and can set up to 140 hours. When a mortality event is detected an immediate mortality message is sent. First, this message is sent as email but optionally also as immediate text message to your mobile phone. In case of mortality, the collar records a GPS position every 30 minutes for six hours. This way, you will be able to get the information that your animal has died, even if the mortality message should have been lost.

8 Specification

8.1 Storage capacity

The collar is able to store 25800 GPS positions in solved mode.

8.2 Environmental specification for the collar

Operational temperature range: -40°C – +55°C
Operating humidity range: <= 100% RH

Storage temperature range: -45°C – +55°C
Storage humidity range: <= 100% RH

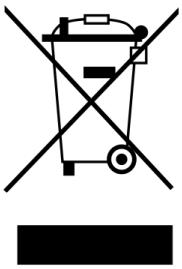
8.3 Battery

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.

8.4 Declaration of Conformity

The VERTEX PLUS Survey collar is only designed for long term survival studies on wild animals. A label on the collar will be unreadable after a very short time, therefore all labels will be sown in the manual

VERTEX PLUS Survey

Model: 13604
FCC ID: X5ZVERTEXPLUS
IC: 8020A-13604SURVEY

Canada 310
Contains: FCC ID: L2V-STX3 IC: 3989A-STX3
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.

VECTRONIC Aerospace GmbH

Kommunikation • Navigation • Raumfahrttechnik

Declaration of Conformity

We,
VECTRONIC Aerospace GmbH
Carl-Scheele-Str. 12
12489 Berlin, Germany
Tel.: +49 30 6789 4990, Fax: +49 30 67895230
Email: mail@vectronic-aerospace.com
declare under our sole responsibility that the Product

VERTEX PLUS Survey Collar

to which this declaration relates, is in conformity with the following standards and/or other normative documents.

Applied standards / directives were:	Title or description of the standard:
EN 300 440-1,-2 V1.6.1/ V1.4.1	**Short Range Devices 1- 40 GHz**
EN 301 441 V1.1.1	**Satellite Earth Stations and Systems (SES)**
EN 301 489-1,-3 V1.9.2 / V 1.6.1	**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/ A2:2013	**Safety of information technology equipment**
EN 62311:2008	**RF Exposure**

We hereby declare that [all essential radio test suites have been carried out and that] the above named product is in conformity to all the essential requirements of Directive 1999/5/EC.

The conformity assessment procedure referred to in Article 10 and detailed in Annex [III]or [IV] of Directive 1999/5/EC has been followed with the involvement of the following Notified Body(ies):

TUV SUD BABT, Octagon House, Concorde Way,Fareham, Hampshire PO15 5RL, UK

Identification mark: 0168 (Notified Body number)

The equipment will also carry the Class 2 equipment identifier

The technical documentation relevant to the above equipment will be held at:
VECTRONIC Aerospace GmbH
Robert Schulte
Carl-Scheele-Str. 12, 12489 Berlin, Germany
Tel.: +49 30 6789 4990, Fax: +49 30 67895230, Email: mail@vectronic-aerospace.com

The product carries the CE mark CE 0168 !

Berlin, 2015-10-28

. . . . . .
Robert Schulte

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

Notified Body Statement of Opinion

No. THER1 15 10 93888 001

Certificate Holder: **Vectronic Aerospace GmbH**
Carl-Scheele-Str. 12,
12489 Berlin
GERMANY

Product: **Satellite Radio**
GPS GLOBALSTAR Satellite collar

Model(s): **VERTEX PLUS Survey Collar**

Technical data: TCF No. TCF VERTEX Plus Survey Collar V1.0

In accordance with Annex IV of European Union Council Directive 1999/5/EC on radio equipment and telecommunications terminal equipment, our opinion is that the equipment identified above and described in the Annex to this statement of opinion complies with the requirements of the above Directive as stated in article 3.1 (a) in respect of Health & Safety, article 3.1 (b) in respect of EMC and article 3.2 in respect of Radio Spectrum Use.

BABT File number: NC20465 i01

Date, 2016-02-25 (Allen Ferry)

TÜV SÜD BABT is appointed as a Notified Body, with the identification number 0168, in accordance with the Council Directive 1999/5/EC for radio equipment and telecommunications terminal equipment. The CE marking and the TÜV SÜD BABT 0168 identification number may be used on the equipment described above, subject to the equipment meeting the compliance requirements of all applicable EU directives. This Statement of Opinion has been issued in accordance with the Certification Regulations of TÜV SÜD BABT. For further details related to this Statement of Opinion please contact babt@tuv-sud.co.uk

TÜV SÜD BABT • TÜV SÜD Group
Octagon House • Concorde Way • Fareham • Hampshire • PO15 5RL • United Kingdom

Annex to

R&TTE Directive Annex IV Notified Body Opinion

Description of Equipment

Intended Use:	VERTEX PLUS Survey GPS GLOBALSTAR Collar for wild animals
Class of Equipment:	Class 2
Frequency Band(s):	1610 to 1620 MHz 1575.42 MHz (GPS)
Type of modulation:	DSSS
Channel Spacing(s):	2.5 MHz
Designation of Emissions:	2M50G1D
Standards	EN 60950-1:2006 +A2:2013 EN 62311: 2008 EN 301 489-1 V1.9.2 (2011-09) EN 301 489-3 V1.6.1 (2013-08) EN 301 489-20 V1.2.1 (2002-11) EN 301 441 V1.1.1 (2000-05) EN 300 440-1 V1.6.1 (2010-08) EN 300 440-2 V1.4.1 (2010-08)

Relevant Technical Documentation

Supplier's Declaration(s) of Conformity:		R&TTE dated	2015-10-28
User Guide:		VERTEX PLUS Survey Collar Version 1.2, dated	2016-02-16
Test report numbers:	Radio:	75931976 Report 04,	2015-10-16
	GPS:	75931976 Report 05,	2015-10-13
	EMC:	75931976 Report 03,	2015-10-15
	RF Exposure:	75931976 Report 02,	2015-10-16
	Safety:	071-75931976-000	2016-02-15
Approved Software:	Version V 2.5.4		
Approved Hardware:	Version V 5.1		
	Circuit Diagrams:	Main PCB V51, dated	2015-04-20
		Patch PCB V5, dated	2014-04-29
		STX-3 PCB V5_1, dated	2015-09-24
	Parts List:	BOM, dated	2015-10-16

Signed: ..... Date: 25th FEBRUARY 2016...

on behalf of TÜV SÜD BABT