GPS Tracking Solutions

Environmental Studies

Distributor of GPS collars of Vectronic Aerospace

Photo: Harri Norberg

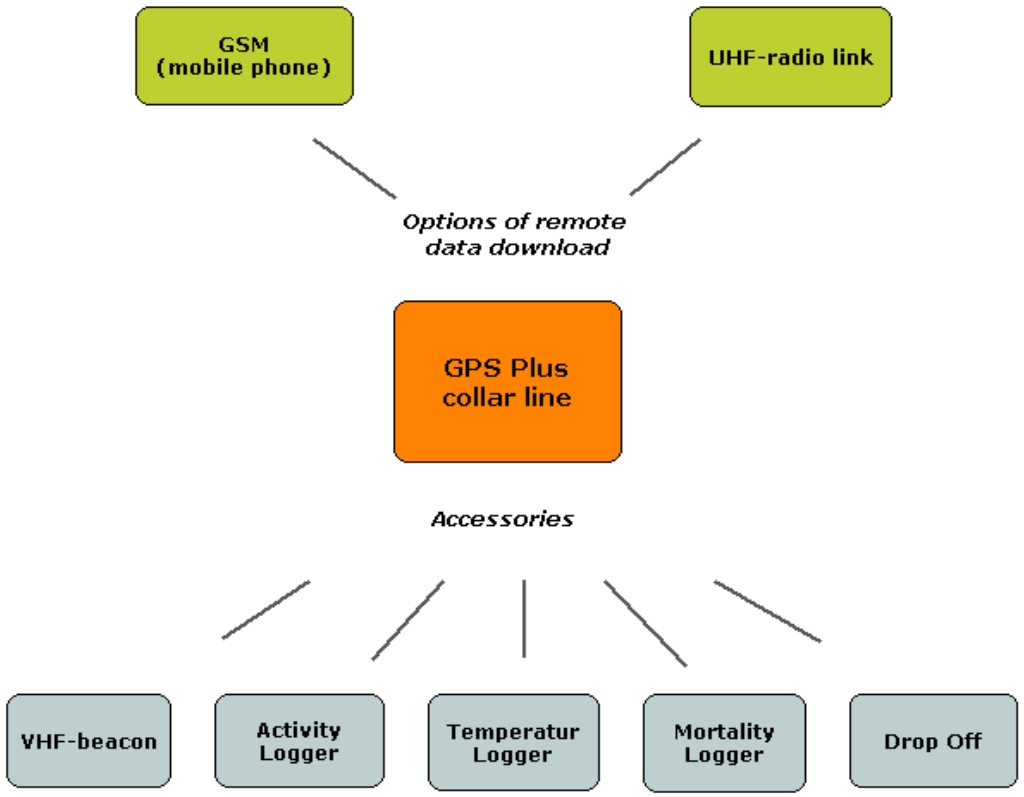
The collars are state of the art GPS equipment for the automatic positioning of mammals in all terrains and climates. Based on latest GPS technology, with weight up from 280 g, they are excellent tools in tracking wildlife.

The **GPS Plus collar system** is like a box of bricks. You can compile your own GPS system depending on your requirements and budget. The basic is the GPS Plus collar (fig. 1). With two complete different options of **remote data download** while the collar is still on the animal: Via UHF radio link on demand, or continously via the GSM mobile/ cell phone system (GSM= Gloabal System for Mobile Communication) directly into the office. About that there are several **accessories** available: VHF beacon, mortality-, activity- and temperatur-logger and two kinds of drop off mechanism.

Fig. 1: GPS Plus 4 collar, weight: 800 g, mean number of positions: 18000 (worst case estimation).

There is a wide range of GPS collars available with weight up from 280 g, suitable for different neck sizes and weights of the animals.
The battery box is easy exchangeable.

GPS-Plus Collar Components



Collar Communication:

Depending on the remote download type, two terminals for the collar communication are available: Handheld Terminal and GSM Groundstation. The Link Manager is the basic device for the direct communication collar → PC. The GPS Plus Software enables the user to easy programming GPS schedules etc..

Handheld Terminal	GSM Groundstation	Link Manager	GPS Plus Software

Operational Collar Lifetime (without GSM or ARGOS transmitter)

The lifetime is calculated with a mean temperature of 0°C. Worst case calculation means that the GPS receiver needs the max. time for a fix (3 minutes), average calculation means the receiver in average needs 90 seconds for a fix (table 1).

GPS Position information

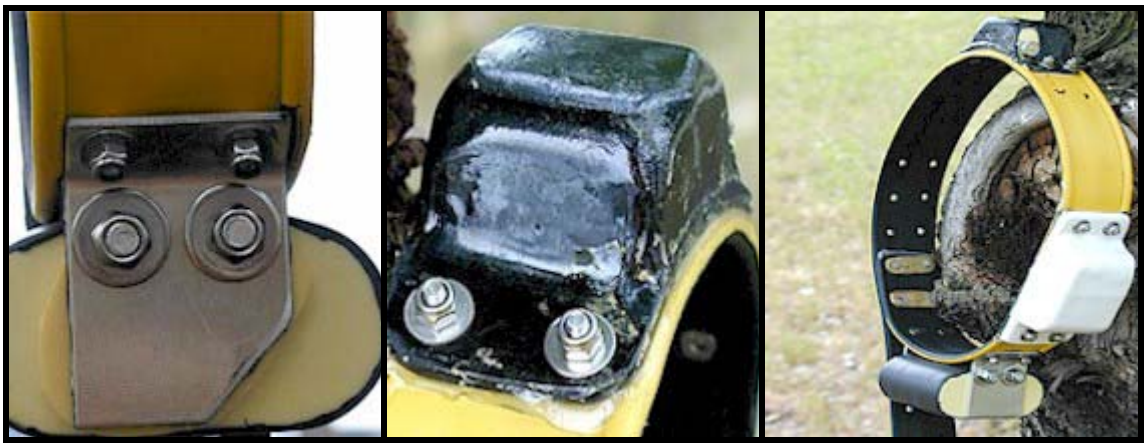
Date and time, ECEF X,Y,Z coordinates, latitude/longitude/height, DOP 2D/3D/3D+ navigation, number of satellites, satellites PRN code and carrier to noise ratio, main and VHF beacon battery voltage, temperature.

Tabl. 1: Collar weight/length/operational lifetime

Collar type	Weight typical [g]	Collar circum-ference {cm]	Nomber of positions Worst case scenario at 0°C	Nomber of positions Average scenario at 0°C
GPS Plus 1C	300	30	1500	2000
GPS Plus 1	450	50	4000	5700
GPS Plus 2	540	70	8300	11800
GPS Plus 3	800	70	13000	18500
GPS Plus 4	950	70	18000	25000
GPS Plus 5	1100	80	225000	32000

GPS-GSM Technology: data transmission from the collar direct to the PC
This technology has been worldwide first introduced by Vectronic Aerospace in March 2002: GPS data can be sent directly from the animal's collar via the mobile radio network GSM much as an SMS (Short Message Service) is sent by a mobile/ cell/ hand phone. The location coordinates of the animal are momentarily sent by a GSM-modem integrated into the collar (fig. 2). The data arrive directly at the user's office. The prerequisite for the data transmission is that the area of investigation is partially covered by GSM (if you can use mobile phone at the investigation area the GSM coverage is ok).

Fig. 2: Details of a GPS-GSM collar, suitable for tracking large predators, f.ex. bears. The housings are built of special protection material. The GSM modem is in the white box on the right picture



This system can provide GPS data nearly in real time if each GPS fix data is transmitted, but the most secure and cost effective solution, to get maximum of data via GSM network is: Transmission of seven positions per SMS with repetition in case of no GSM coverage (the SMS will be transmitted to the

customer after each seventh GPS fix when GSM coverage is available). When the collar is in an area without GSM coverage, the GPS fix data will be retransmitted next time when GSM coverage again is available.
The GSM collar are manufactured up from 720 g total collar weight.

GSM groundstation

The GSM groundstation (fig. 3) receives GPS position information from the GPS GSM Plus collar via the GSM service. Additional new GPS and beacon schedules can be transmitted via GSM to the collar. This gives you the flexibility and security you need for your data.

Fig. 3: The GSM groundstation is best positioned near the computer. The position data arrive from the collar via SMS.

UHF-radio link/ Handheld Terminal

With the Handheld Terminal (fig. 4) it is possible to download the data anytime by command from the collar, if the animal is in range of the UHF link.

Fig. 4: Handheld Terminal

Technical specification:

Dimensions: 204 x 110 x 41 mm, without antenna connector
Weight: 550 g.
Memory capacity: 64 Mbyte standard (data storage of 16 collars), 128 Mbyte extended (32 collars). 315520 temperature and activity datasets per collar, 65536 GPS datasets per collar in non differential mode.
Operating time with charged battery: Depend on operation mode (24 hours GPS mode, 75 hours receive mode)
UHF frequency: 420 – 460 MHz (factory settings)
Output power: 0 – 500 mW (factory settings)

A built-in 12 channel GPS receiver gives you important information about your position in the field. Before downloading GPS data from the collar, the animal has to be located via the VHF or UHF beacon. Under normal conditions, the communication range is several kilometer with a small handheld yagi antenna.

Link Manager

The Link Manager (fig. 5) provides the interface between your PC or Laptop and the GPS-Plus collar or a hand held terminal. It is used to exchange data and to upgrade new firmware in your GPS-Plus collar or Handheld Terminal. With its own power, provided by an internal Lithium-Ion accumulator, it is used to access the collar by an external PC and to supply the collar with external power in case of an empty battery pack of the collar.
The Link Manager is quite simple to operate. Just connect it to a GPS Plus collar or a Handheld Terminal and to the PC. Then run the PC software.

Fig. 5: Link Manager

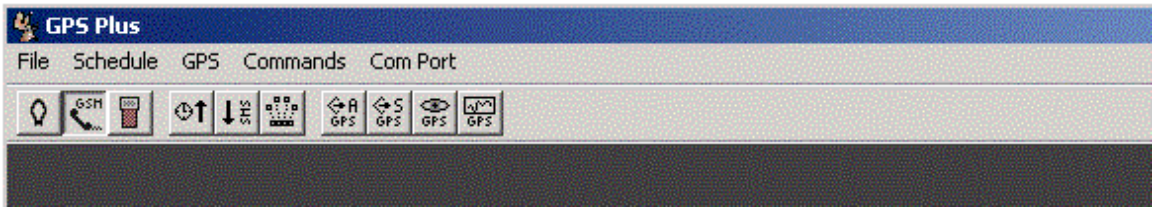
Technical specification:

Dimension: 105 x 76 x 44 mm
Weight: 350 g.

GPS Plus software

The GPS-Plus software is used to configure and to read out the GPS Plus collar, handle a GSM modem for reception of collar data and to configure and to read out a Handheld Terminal. GPS measurement times can be configured as well as position, activity and mortality data can be read out, stored, exported, graphically shown and erased. The next figure shows the main menue of the programm. Depending on your mode of interest (GPS Plus collar, GSM Groundstation or Handheld Terminal) push one of the first three buttons left side).

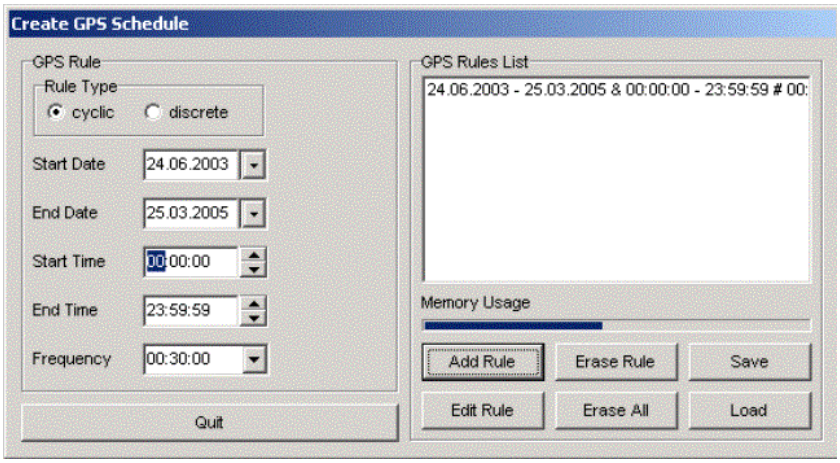
Fig. 6: Main menue of the GPS Plus software



With the GPS Plus software it is very easy to programm the GPS fixing schedule of the collar. In the window "Create GPS Schedule" the settings have to be filled in. Figure 7 demonstrates a schedule for the period 24.06.2003 until 25.03.2005 with fixings all 30 minutes. This file can be

uploaded to the collar by one buttom push, if the collar is linked to the Link Manager, or in the field via the Handheld Terminal.

Fig. 7: GPS Plus software window for creating GPS schedule



If you have more questions...

Please contact us or look at our website, here you will find tracking projects from all over the world.
We will be happy to discuss your GPS tracking system requirements in detail, and assist you through all the stages of your project planning to ensure that your system design is optimized to capture the information you wish.

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