

**ECOTONE TELEMTRY
GPS-UHF SRD TYPE LOGGERS MANUAL
(URIA, STERNA, PICA LOGGERS)**

***PLEASE READ THE MANUAL
BEFORE SWITCHING YOUR LOGGER "ON"!***

Before the delivery all loggers are switching OFF by the software command - to switch them again - working Base station is necessary. This feature prevents from incidental turning ON the loggers during the transport.

DO NOT REMOVE THE BLACK LABELS THAT COVER SOLAR CHARGERS, WHEN LOGGERS ARE NOT DURING WORK!!

Loggers with solar chargers SHOULD NOT BE EXPOSED TO THE LIGHT WHEN THEY ARE SWITCHED OFF – it will damage battery in a few minutes.

BEFORE YOU SET LOGGER ON ANIMAL - TEST WHOLE EQUIPMENT CAREFULLY!

**After receipt of loggers do not wait with testing!
Take some time to refer to the procedures described below.
It will help you to familiarize with loggers BEFORE deploying on the animal!**

Software:

download software from:

http://telemetry.ecotone.pl/public/Program_TRACKER_Analyser/

- unzip Tracker software but DO NOT run it yet.

Drivers You can download from:

http://telemetry.ecotone.pl/public/UPGRADES/BASE_STATION/DRIVERS/

- unzip drivers and put in the separate folder for your Windows version.
Attach the antenna to the base station; **remember that BASE STATION CONNECTED TO THE POWER, WITHOUT ANTENNA CAN BE DESTROYED!**
- connect base station to the PC and wait till drivers will be installed

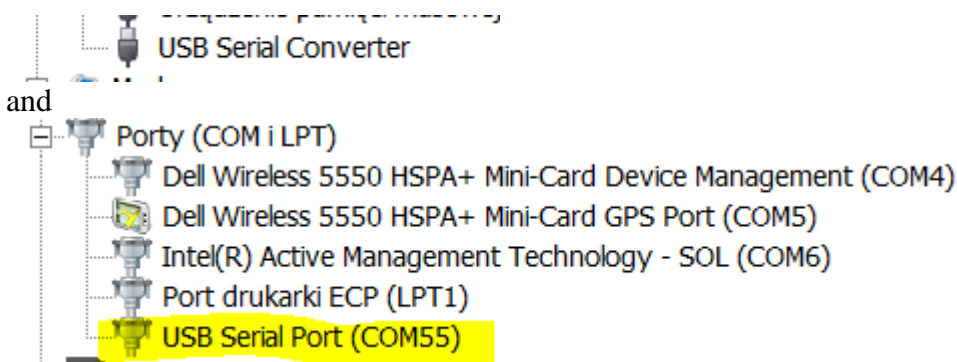
Windows 7, 8 – drivers usually are installed automatically; in other case follow description for Windows XP-2000.

Windows XP – 2000 - it may be necessary to “show” manually to the hardware installer the folder with drivers. If the hardware will be not recognised, go to Windows hardware manager and choose “update drivers” and specify the location for/of the driver’s folder. Disconnect and connect base station again to install Com port – it will go automatically.

Now you can check in Hardware Manager (COM/LPT ports) which COM port is associated with the USB. This number will be used each time when running the Tracker software.

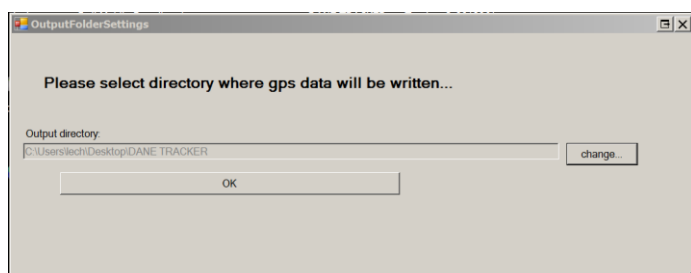
Windows 8 for tablets – software may not work.

When drivers are installed properly, in Hardware Manager you will find:

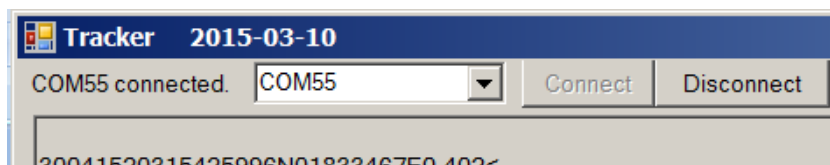


Tracker software - first use:

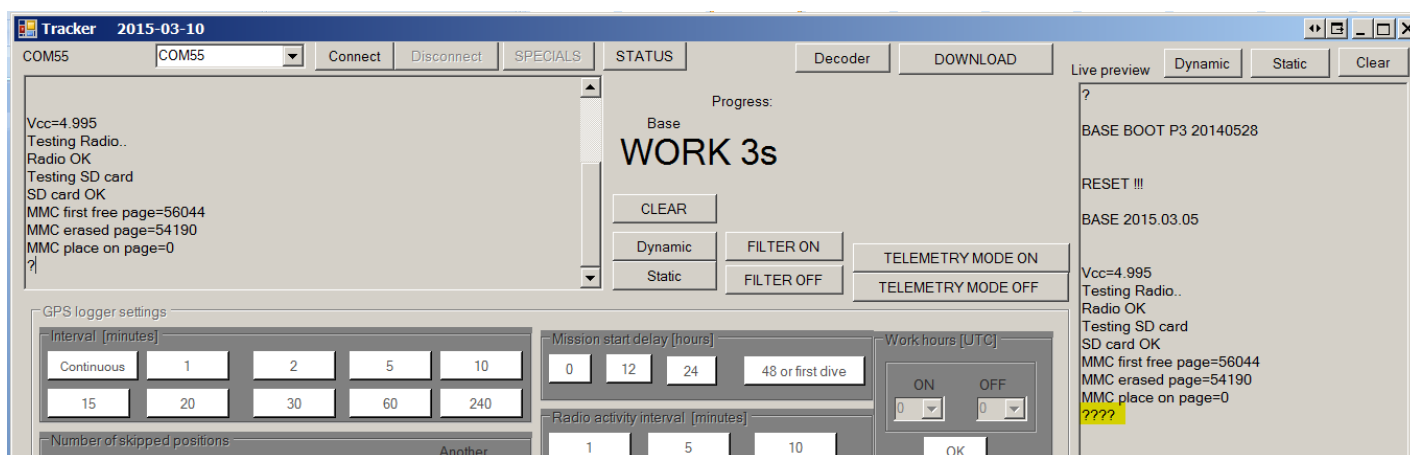
- Attach the antenna to the base station;
- Plug the base station USB cable to the PC;
- Run Tracker;
- During the first use, you will be asked for creating or selecting folder for GPS data;



- Select serial port - usually it is the last one on the list and the same which is listed in Hardware Manager



When everything is working well, some messages from base station and string of "?????" will be displayed in Tracker's window.



Before you switch ON the logger:

- to work properly GPS loggers have to read the GPS signal, which may be not available indoors. Logger after switching ON will start immediately to search for satellite signal – make sure that you have good place to start testing loggers;
- when GPS cannot orientate location - it uses a lot of energy. In bad conditions battery will be discharged up to 50x faster than in places with a good signal reception. **Logger left working in the office**, next day will be most probably **completely discharged!**
- GPS loggers use pre-amplified GPS radio signal and are very sensitive to electromagnetic noise which can disturb proper system work. Avoid places close to Wi-Fi or GSM repeaters, microwave ovens, any DC-AC converters;
- GPS antenna can receive false satellite signals, reflected from buildings, cliffs, etc. and then GPS error can be unpredictable. Such problem is less possible, when logger is on animal which is moving all the time (changing the antenna position);
- window glass, as well as car windows, can stop >70% of solar energy. Do not expect that your loggers with solar charger will work well in such places.
- **Lithium-polymer batteries are very sensitive to overheating**. Temperature ~50°C is dangerous and ~70°C will destroy the battery. Avoid testing our loggers in very hot places. On animals, even on Sahara desert, temperatures are never so high!!.
- Loggers with solar chargers **SHOULD NOT BE EXPOSED TO THE LIGHT WHEN THEY ARE TURNED OFF** – it will damage battery in a few minutes.

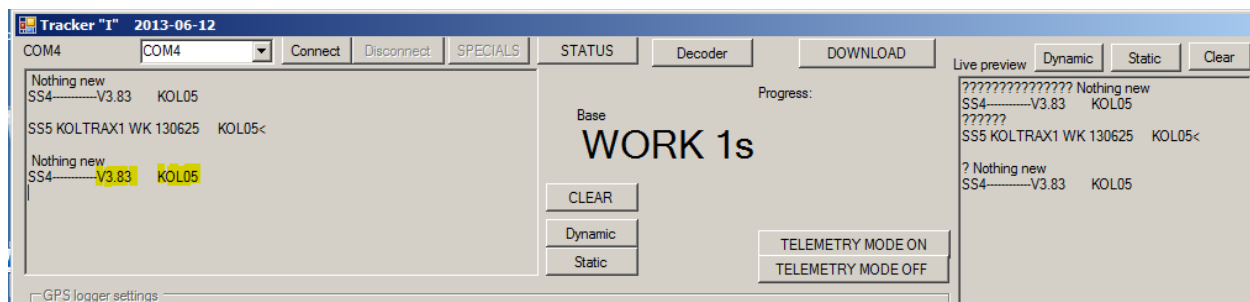
Switching ON and testing:

To turn ON the GPS logger, make sure that base station is working and logger is in the range. Tracker application is not necessary for functioning base station, however we do suggest to connect it to the PC and work at the beginning with live preview in Tracker windows. The best option is to take laptop with base station and loggers outdoors.

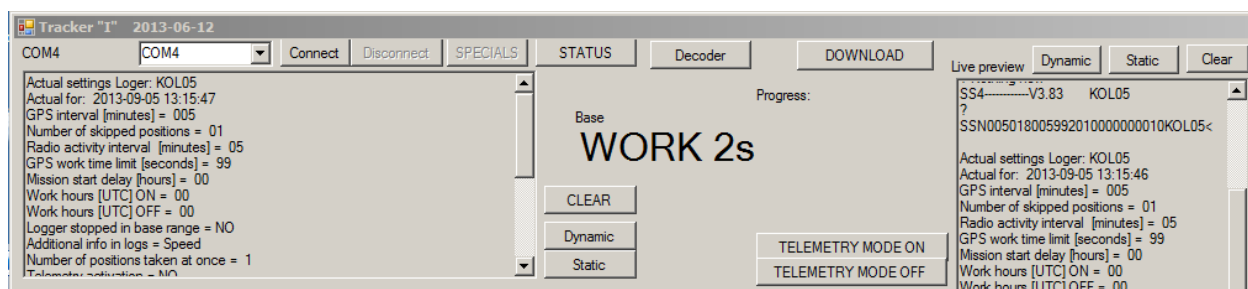
- Brush logger with the magnet. Sequence of one long and three short red and yellow LED blinks will show that logger has been switched on, so place it immediately outdoors.

- Logger will start work with last used settings.
- After a few seconds some messages from the logger will be displayed in Tracker's window:

First message will show the battery voltage and logger's Id.



After that, full information about used settings will be transmitted.



- Check the battery voltage:
 - o If it is < 4V, skip to charging procedure.
 - o If the battery is well charged (maximum is ~4,15V), continue with testing.
- LED light (green in most models) inside logger is blinking as long as each of four initial GPS positions is successfully calculated. Each successful position is confirmed by 2 fast green blinks. After the fourth well recorded GPS position a series of fast green Led blinks will indicate that logger started regular work. From this step, the LED will never blink again.
- After collecting initial positions, GPS data will be send to the Tracker.
- When logger will finish above "starting procedure" with series of red LED blinks, it indicates/means that the GPS met problems with the satellite signal reception and the procedure will start again automatically. In such case, it is suggested to change the testing place.
- When logger passed this first test, it can be switched off or left outdoors to collect GPS positions. It is also possible to send new settings to the logger to adapt working mode to project requirements (described below).

Possible problems during switching ON the loggers:

- After brushing with the magnet, only a series of red-yellow blinks can be seen – it happens when logger is switched off by the Tracker's command and now it is not in the range of working base station.
- Logger blinks only once in red – most probably battery is discharged < 3,7V.
- Absence of blinks – battery is discharged below the safe level or electronic system is broken.

Switching off:

Switching off by the magnet: Switching off is more difficult to avoid accidental switching off of the logger and requires a clear view of the LEDs. Different cases can obscure the small LEDs and it might sometimes be advisable to stand in the shade or use dark room to switch off the loggers.

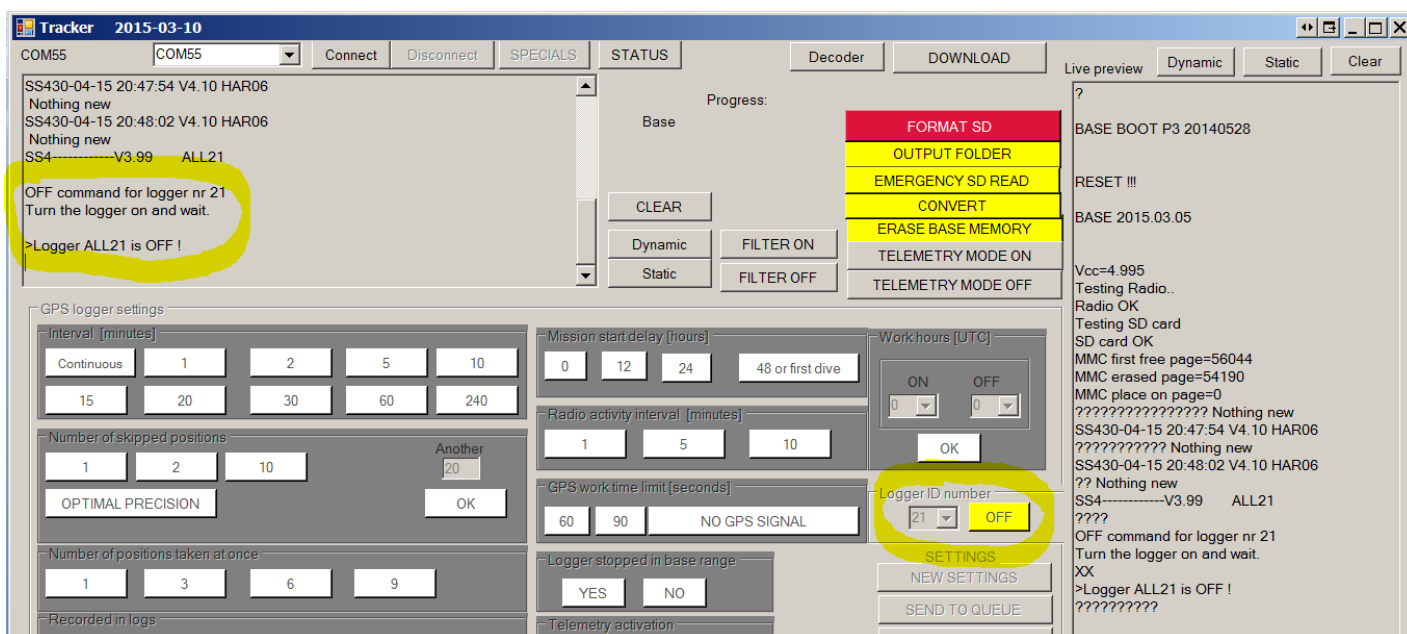
Brush the logger with the magnet. A yellow LED will blink three times and then will appear a longer flash. Immediately brush the logger with the magnet again. Repeat this sequence three times and if you got the right timing - yellow or red LEDs will blink fast for a few seconds, which means that logger is switched off (download the movie manual from: <http://telemetry.ecotone.pl/public/VIDEO/>)

Logger switched off by the magnet can be switched ON again anytime and the presence of working base station will be not necessary. The settings used before switching OFF haven't been erased and will be used when logger will be switched ON again.

Switching off by the software

Switching loggers off with the software is more reliable than by magnet and provides secured method for transportation and storage. **Switching OFF by the command is possible only for loggers in a hand. To switch it ON again you WILL HAVE TO do it when logger appears in the Base station range!**

To switch loggers off by the software from Tracker, press "SPECIALS" in Tracker's window. A series of options will appear on the screen (highlighted in yellow). Write the logger's ID number in the box and click the OFF button, highlighted in yellow. The status message "SWITCHING OFF!!!" and message in the window will be displayed. Now you have to reset logger by the magnet and in a few seconds you receive confirmation on the screen that the logger has been switched OFF. To confirm switching OFF, a red or yellow LED will flash for a few seconds.



There is no risk to switch OFF logger which is on an animal – this feature can work only for a few seconds after brushing logger with the magnet.

**Switching ON by the Tracker command is not possible!
To switch logger ON use the magnet!
Logger attached to an animal and not switched ON by the magnet is lost!!**

Programming logger settings:

To send settings to the logger, put logger's name and choose its number from the list in "Logger ID number" box, fill all boxes in Tracker window and click the "SEND TO QUEUE" button to send the string with new settings into the base station memory. It is possible to use different settings for each logger. New settings will be send to the logger and marked as DONE in queue, when logger will communicate with the base station.

Disconnecting the base station from PC will not erase the settings queue. The base station can be connected to the battery grip and left in the field for automatic programming of all loggers.

When you have loggers in a hand, it is possible to brush them with the magnet to speed up the radio communication.

It is possible to check command status by clicking SHOW QUEUE or to erase all settings with CLEAR QUEUE button.

To change the settings on animals:

When changing logger settings on animal - they will be uploaded automatically when animal will come to the base station range. Before accepting new settings, all data from logger's memory will be downloaded.

- use the PC and the Tracker to send all settings to the base station,
- disconnect base station from the PC,
- connect base station with the battery grip and leave it in a place where presence of tagged animals is expected.

Of course you can change settings of any logger while base station is working with the PC but usually it is not convenient in the field.

During the next visit in the field, connect base station with the PC and press CHECK QUEUE to see if all settings have been uploaded by loggers.

It is also possible to send new settings to the logger during battery charging. Logger communicates with base station every few minutes and can receive "new settings" command.

Tracker's controls

The screenshot shows the Tracker software interface with several callout boxes providing instructions:

- COM port selection, connect/disconnect to COM port:** Points to the 'COM7 connected' status and the 'COM7' dropdown menu.
- Show/hide additional functions:** Points to the 'SPECIALS', 'STATUS', and 'Decoder' tabs.
- Show detected loggers:** Points to the 'DOWNLOAD' button.
- Write to PC all GPS data from base station memory. (It will not erase BS memory) Progress bar will be displayed.** Points to the 'Live preview', 'Dynamic', 'Static', and 'Clear' buttons.
- The most important data and commands preview window and it's control buttons.** Points to the 'Base W' section.
- Base station mode. Use ON only when loggers have telemetry activated.** Points to the 'TELEMETRY MODE ON' and 'TELEMETRY MODE OFF' buttons.
- All data and commands preview window and its control buttons.** Points to the 'SETTINGS', 'NEW SETTINGS', 'SEND TO QUEUE', 'SHOW QUEUE', and 'CLEAR QUEUE' buttons.

The interface includes sections for 'GPS logger settings' (Interval, Mission start delay, Work hours, Radio activity interval, GPS work time limit, Logger ID number), 'Number of positions taken at once' (AUTO SLOW), 'Recorded in logs' (Altitude, Speed), and 'Diving sensor settings - optional' (Diving sensor sensitivity, GPS searching after immersion).

Tracker's controls –SPECIALS button

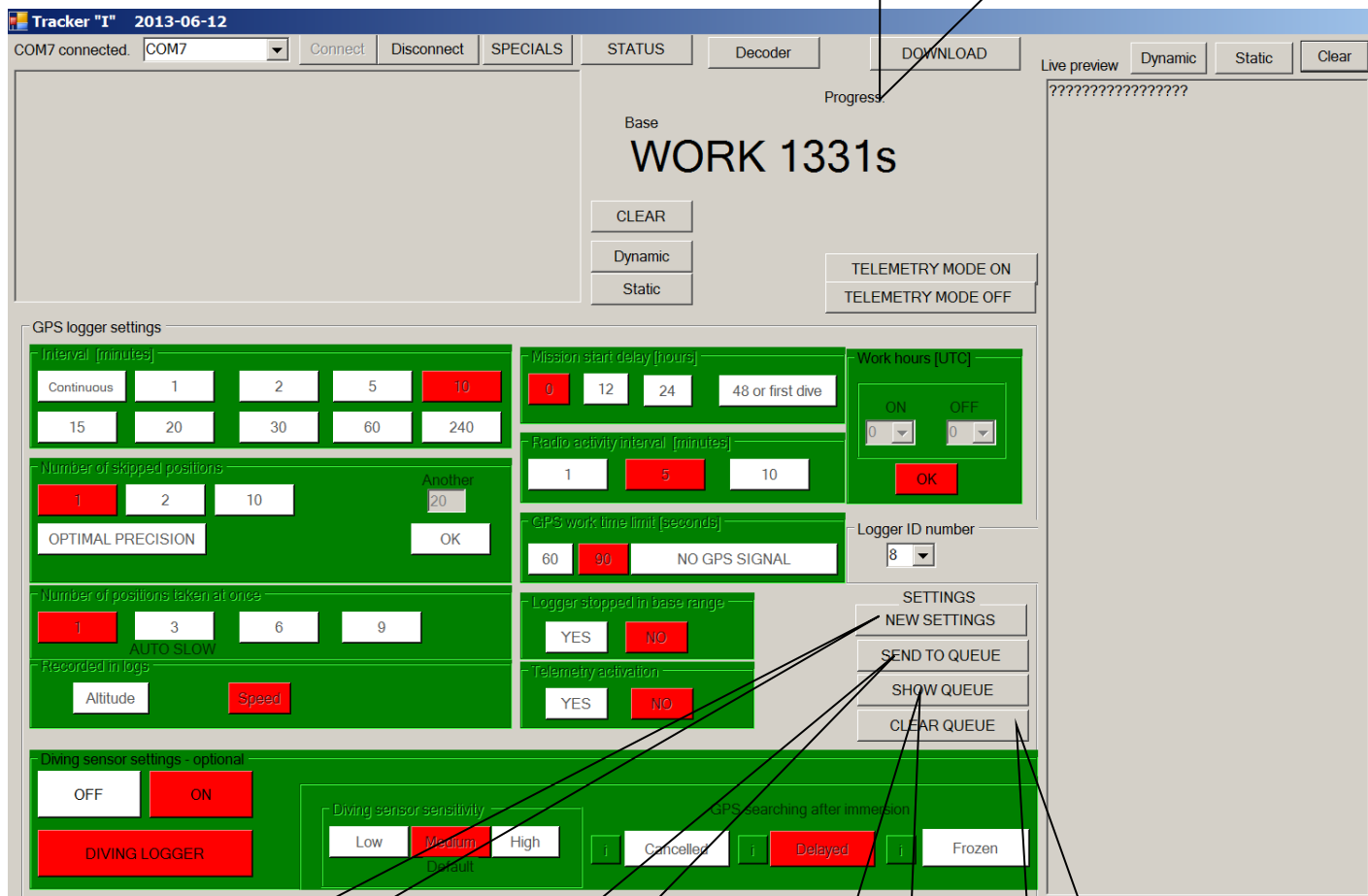
The screenshot shows the Tracker software interface with the 'SPECIALS' menu open. The menu items are: FORMAT SD, OUTPUT FOLDER, EMERGENCY SD RE, CONVERT, ERASE BASE MEMORY, TELEMETRY MODE ON, and TELEMETRY MODE OFF. The 'ALL DONE' status is visible at the top of the menu. Below the menu is the 'GPS logger settings' section, which includes various configuration options like interval, mission start delay, work hours, and logger ID number.

Callouts and their corresponding functions:

- Erase the base stations' SD card.** (Points to ERASE BASE MEMORY)
- Format the SD card.** (Points to FORMAT SD)
- Change the output folder for downloaded data** (Points to OUTPUT FOLDER)
- Read the whole SC card – it may help when data cannot be read in typical way or after accidental erasing or formatting the SD.** (Points to EMERGENCY SD RE)
- Convert again the RAW data txt file.** (Points to CONVERT)
- Switch OFF the logger by the UHF command (by software)** (Points to OFF in the Logger ID number dropdown)

Tracker's controls – logger programming

Base station status messages, progress bar & timer.
Timer is cleared after each communication with any logger



click to start new configuration

send new settings to the queue in base station memory

show commands queue stored in base station.

clear the queue from base station memory.

Click “New Settings” button to change any of the logger’s parameters. Highlight one setting in each section by clicking on the box or filling in a parameter and press OK to accept. The item will change to red.

Interval [minutes]: the time between GPS fixes (*time between the end of the previous GPS session and beginning of the next one. Time needed for GPS position calculating is excluded*). When “Continuous” is chosen, logger will record GPS positions every one second. In that case choose “Number of skipped positions”=1 and “Number of positions taken at once”=1.

Number of skipped positions: the more fixes the GPS takes before recording a position the more accurate the position will be; but this comes at the cost of increasing power usage. We recommend to start with one “skipped” and use higher value if you find you really need greater accuracy and when battery life is not a limit.

We suggest using “OPTIMAL PRECISION” instead of skipping positions when battery life is not a problem or when accuracy is a priority in your project. This setting is especially recommended to

use with solar powered loggers. **WARNING: power consumption will be ~2x higher comparing with skip=1.**

Number of positions taken at once: change only this parameter if your application requires recording more than one position during each GPS session at every interval. Additional GPS positions will be recorded **every one second**.

WARNING: Recording multiple positions will increase power consumption (about 10% more for each additional position recorded).

example: value=1

GPS-----interval-----GPS-----interval-----...

example: value=3

GPS-GPS-GPS-----interval-----GPS-GPS-GPS-----interval-----...

Recorded in logs: Choose to record either speed only (SPEED button) or altitude and speed (ALTITUDE button) with your positions. We suggest to choose speed; precise altitude calculation requires long time with the GPS switched on, what is not possible when the battery life is a priority. Loggers with software from May 2014 can record speed or simultaneously speed and altitude. To record both parameters, choose altitude from the Trackers' menu. In RAW data, additional [line](#) will be transmitted:

```
10051407065428888N01831593E0.801
INFO t=10 Sat=9 U=3.88 GLA01
H=0070 10-05-14 07:06:16 GLA01
```

Mission start delay [hours]: usually used to give necessary time for the animal to adopt after attaching the logger. When diving sensor is present in your logger, it is possible to set **“48 or first dive”** to activate logger after diving. If no diving sensor is present, or diving sensor is not activated or no diving detected, logger will start to work anyway after 2 days.

Notice: Logger with activated delay does not use energy nearly at all. The delay command will be not repeated after switching the logger OFF and again ON.

Radio activity interval [minutes]: interval between radio sessions. Radio sessions consume only a bit of power but if you can afford, to wait 10 minutes between sessions, you can set this to 10 to save some energy. When fast response from logger is necessary – use 1minute interval. The most common is using 5 minutes interval.

Advice: when tagged animal is used to stay within the base station range for a very short time only, we recommend to set it to 1 minute. It will increase the chance for data download during each visit of an animal.

GPS work time limit [seconds]: (timeout) - time to take decision to stop calculating position when GPS signal is not available.

WARNING: The GPS consume more power than anything else while trying to calculate position while no good satellite reception! When your subjects are deep below ground in burrows, sheltering in rocky caves or roosting in tree hollows, battery consumption could be very high. In good conditions, GPS can calculate position after a few seconds, while satellite signal is weak - power consumption will be much higher.

- In most cases we recommend to set it to 90s or “NO GPS SIGNAL”.
- For burrowing animals choose “NO GPS SIGNAL”.

Logger stopped in the base range: one of the most important features to save battery power. Use ON by default because you seldom need to waste the battery power when you know that your subject is nearby. **Advice: Leave the base station working all the time near the nest, in cave, close to**

the entrance of the burrow, where your animal is used to spend a lot of time. Especially important

in such places GPS signal is weak.

Telemetry activation: allows to switch on the optional telemetry signal, similar in use to VHF radio telemetry. Telemetry uses battery power, so we strongly advise that any time you use this feature you also should set a duty cycle in the “Work Hours (UTC)” field. The telemetry function is active throughout the duty cycle and stays on for two hours afterwards before switching off automatically to conserve the power. When work hours are not set, telemetry will work all the time. Loggers with the solar charger, especially loggers with big solar charger e.g. Harrier, can use it all the time with only small effect on the battery state.

Work hours: Use that setting whenever possible to save the energy.

Example: when tracking nocturnal animal, there is no sense to waste the energy for calculating positions, while it is not active and in known location. When it is in burrow during the day, where is no GPS signal, it will be the only chance to not discharge the battery for not successful GPS work.

Please remember that GPS uses UTC hours and “work hours” have to be set in UTC as well.

Diving sensor settings: When diving sensor is present, chose ON, then set additional parameters:

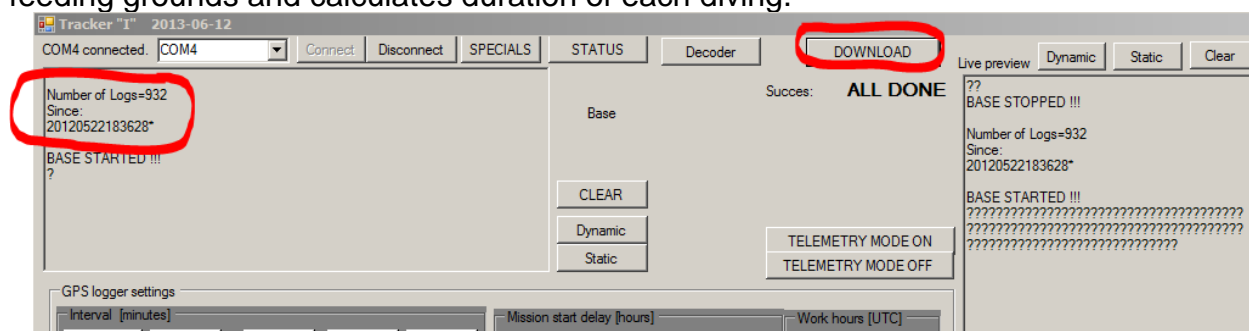
Sensitivity:

- **medium:** it is calibrated for sea water and can be used in most cases;
- **high:** for fresh or brackish water;
- **low:** for extreme conditions, when an animal can stay wet for a long time or use salt pans,... That setting has to be tested in your study area before tagging the animal.

Action after immersion:

- **Cancelled:** Diving switches off the GPS for one GPS interval
- **Frozen:** Each diving pauses the GPS action. Every time when logger is on the surface, GPS continues work until total working time reaches value of the GPS work time limit”.
- **No reaction:** Diving sensor will not affect the GPS work but all diversions can be recorded when “DIVING LOGGER” is activated.

Diving logger- records date and time of any “dive down” and “dive up” event, which allows to define feeding grounds and calculates duration of each diving.



Downloading data from the base station:

Base station can store in memory nearly not limited number of the GPS positions.

To download data to the PC connect the base station, run Tracker and click the DOWNLOAD button.

Data will be recorded in automatically created folder as a .txt file. New folder is created each time when the base station is cleared and is used till you clear the base station memory again. The raw data file uses the name of parental folder i.e. 20150425121444.txt

Keep the raw data files unchanged and work only on copies. Be sure while downloading that raw data file is not edited by another applications.

It is not necessary to erase the base station memory each time after data downloading. When downloads will be repeated again and again, the raw data file will be updated with new records.

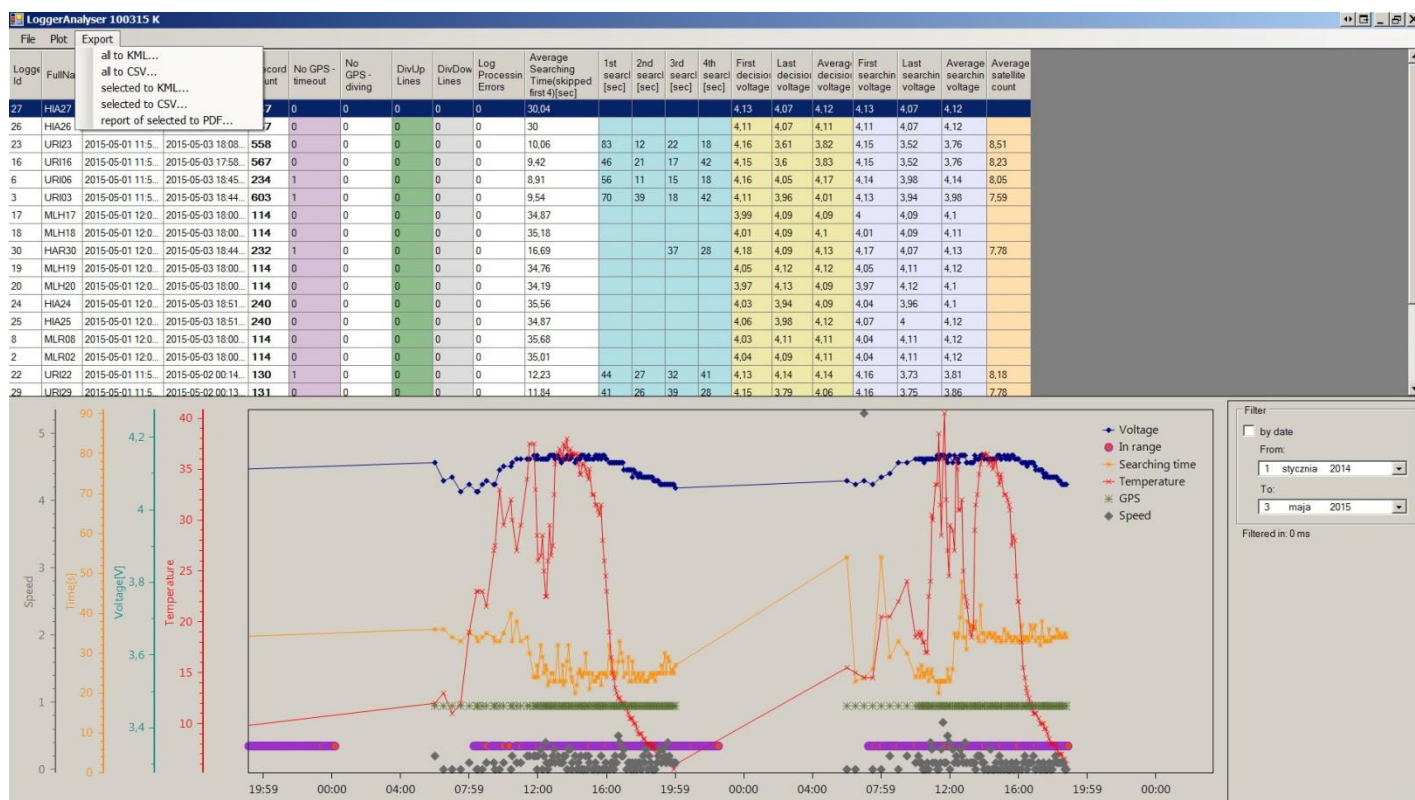
When there is a lot of data in the base station memory, downloading process can take a lot of time. To speed up downloading or when you starting a new project, erase the base station memory by clicking SPECIALS-> ERASE BASE MEMORY. While the memory is erased, the new folder to store data will be created automatically.

After downloading data from the base station, separate GPS Analyzer application will be launched.

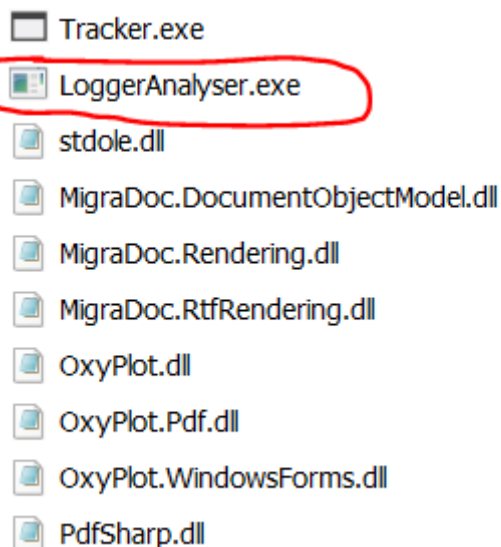
GPS Analyzer

Main features:

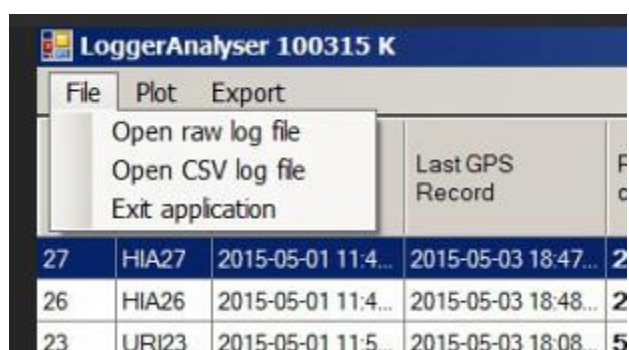
- Allows to preview downloaded data on graphs.
- Separates data from loggers which use different names but the same Id number
- Extracts data into .csv or .klm format
- Allows to open raw data, downloaded from the base station as well previously exported .csv files
- Creates reports about loggers work, which might be usefull if some problems should be consulted with the service.
- GPS analyser can be simultaneously opened in many windows, it helps to compare different data files
- Saves .csv and .klm in directory where raw data files are recorded



GPS analyser can be launched irrespective of the Tracker application, create a shortcut to the exe file located in the Tracker folder. Do not move the application file to another location.

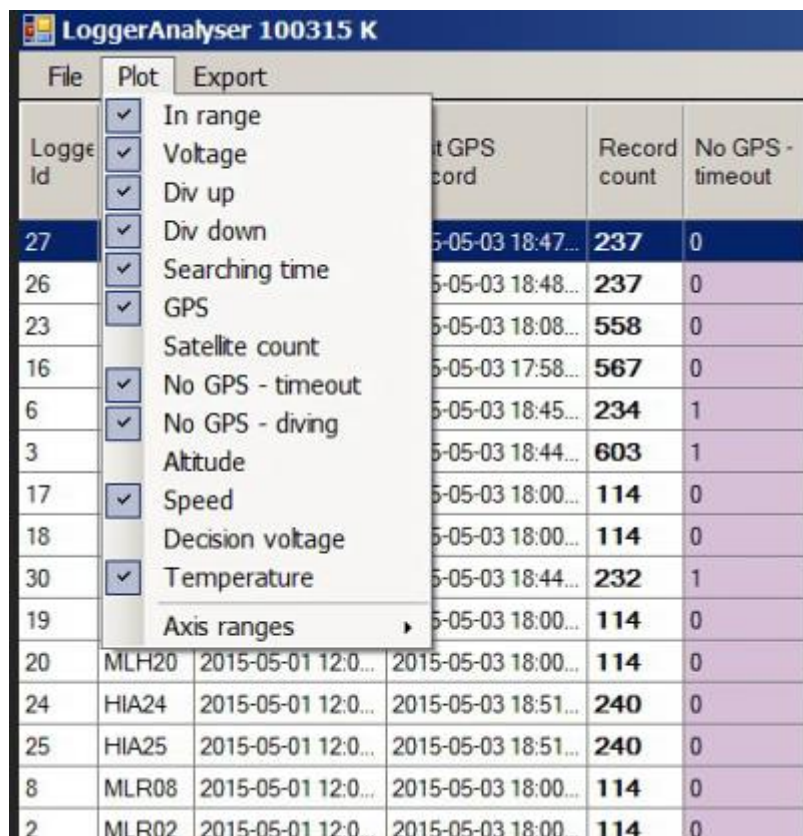


Available options:

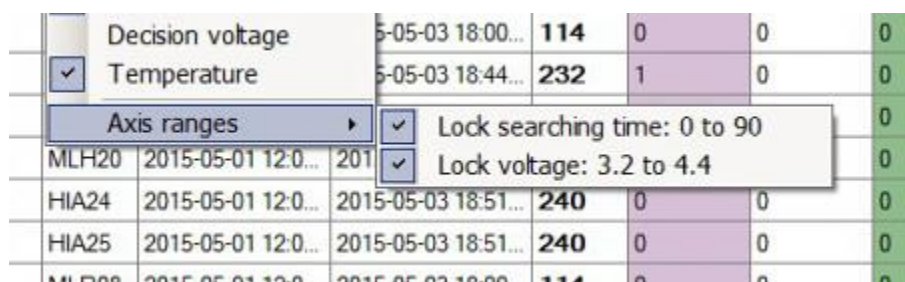


From the File menu it is possible to open raw data file downloaded from the base station or data exported by Analysed to .csv format.

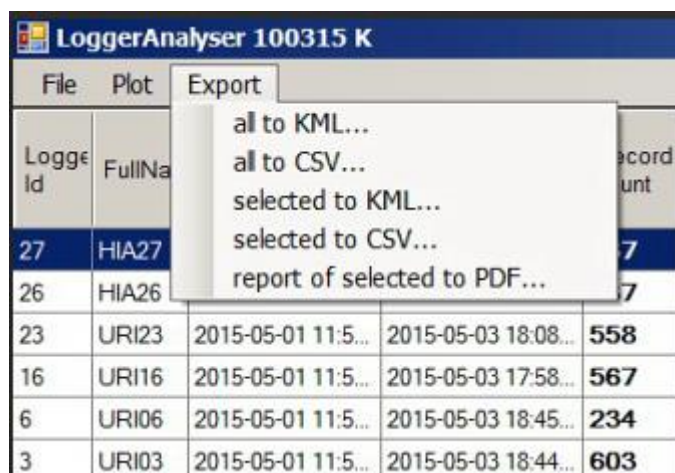
Work on .csv files allows to open them in the Excel, remove unwanted GPS points, apply any custom filters and save again in the same .csv format. Created again .klm files will reflect changes in data base.



Decide which parameters to show on graphs.



If your data exceeds the fixed ranges -> unlock.



Export raw data to csv or .klm files or create a pdf report.

Data formats:

The .csv file, contains semicolon data separated:

Logger ID	logger's name and Id	
Year	date & time stamp	
Month	date & time stamp	
Day	date & time stamp	
Hour	date & time stamp	
Minute	date & time stamp	
Second	date & time stamp	
Latitude	DDD.DDDD	54.433083
Longitude	DDD.DDDD	18.557750
Speed	knots [kn]	
Searching time	TTF (time to fix)	
Voltage	battery voltage recorded after recording the GPS position	
Temperature	Celsius degree	
Altitude	metres [m] ellipsoidal altitude	
Div. up	diving started	
Div. down	diving finished	
No GPS - timeout	not able to record the GPS position	
No GPS - diving	not able to record the GPS position due to diving (only with parameter "CANCELED")	
In range	recorded presence in the base station range	
Diving duration	diving duration in seconds [s]	
Raw latitude	DDMMMM	5425985N
Raw longitude	DDMM MMM	01833465E
Decision voltage	battery voltage recorded before recording the GPS position	

Latitude and Longitude (WGS84 Datum)

Raw format:

5425974N;01833502E

DDD MM.MMM (degrees minutes decimals)

N 54° 25.974 E 018° 33.502

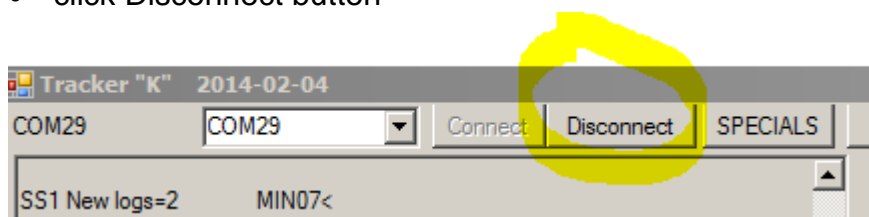
Format SD memory:

Sometimes it is necessary to FORMAT SD memory, especially when Tracker detects errors while testing the base station just after connecting to the PC.

Due to security reasons, formatting is possible only for a few seconds after the base station starts to work. It is possible to start formatting just after the "Testing Radio" is displayed.

Follow the manual:

- connect the base station to the PC,
- run Tracker and select port,
- click SPECIALS to see FORMAT SD CARD button,
- click Disconnect button



- remove the base station cable from the USB
- put again the base station to the USB port
- click Connect button (immediately)
- click FORMAT SD CARD
- move cursor to OK and wait
- click OK immediately when you will see "Testing Radio" message

After successful formatting you will see the message:
SD card FORMATED !!!

```
SD CARD ERASED
MMC first free page=0
MMC erased page=0
MMC place on page=0
```

Battery charging

All Ecotone GPS loggers use rechargeable batteries, versions with solar are charged by the solar energy, batteries in loggers without solar chargers could be recharged by the charger delivered with the telemetry set. It is an AC/DC adapter with wires to connect 5 loggers to gold pins of the logger. Polarity is marked by the blue and red dots.

When the coloured markings are not visible, you can always check the polarity. LEDs are on the same side as the negative pole – use the magnet to check it.

To charge the battery, connect logger to the working charger and **use the magnet to switch on logger immediately**. After some yellow-red blinks, the red Led will start to blink indicating that charging is in progress. When the battery is fully charged - it will be indicated by green light inside the logger housing (charging is finished). Logger disconnected from the charger will start to blink to remind that it has to be switched OFF.

Depending on the discharging level and the battery capacity, charging can take from 1 to 15 hours.

While charging, loggers send the battery voltage and charging status by the radio and it can be observed in the Tracker's window. As well during charging batteries, it is possible to send new settings to the logger or upgrade the firmware.

WARNING: Do not leave loggers connected to the charger with no magnet reset. It will damage batteries in short time. Check it twice!!

Loggers with solar chargers SHOULD NOT BE EXPOSED TO THE LIGHT WHEN ARE SWITCHED OFF – it will damage their batteries in short time.

Sometimes, when the battery is discharged below the safe level, charging may not start immediately. You can try to "force it" – connect the logger and use the magnet after ~1 hour. If battery is not damaged, logger will start charging/to charge. **DO NOT LEAVE such logger unattended, before the regular charging is started.**

Radio link

The loggers do not check continuously are they in the range of a base station, but only monitor communications at user-defined intervals. Communication consumes only a bit of energy and for normal field use we advise a 5 minutes interval. When fast response from the logger is necessary, use 1minute interval. When the base station signal is detected, logger uses the radio for 1 minute every 5 seconds to increase the chance for successful communication.

To save the battery power you have the option of having the logger turn itself off automatically, whenever it is within the range of the base station. The presence in the base station range is recorded together with the time stamp with every radio communication interval (radio activity interval).

The data download and the telemetry range will be sensitive to the orientation of the transmitting and the receiving antennas.

Digital telemetry

Digital telemetry is built in all Ecotone UHF loggers. The main advantage in comparison with the conventional analogue VHF telemetry is that it can locate loggers with the base station, equipped with a directional antenna with no need for a separate dedicated telemetry receiver and Yagi antenna.

Digital telemetry does not have the range of VHF telemetry, but allows the user to locate the logger from about 50 percent to 100 percent further away than the data download range. The "ping" is transmitted by the logger every eight seconds. It can be detected as a LED blink in the base station. When the base station is connected to the PC, the ID of the logger is displayed in Tracker application. To use the digital telemetry, it has to be activated in logger and the base station has to be switched in the telemetry mode.

The digital telemetry still takes some power and when energy is a limitation, do not use that feature. The base station working in telemetry mode can still receive data from all loggers.

Directional antenna & base station

We recommend to use the base station with directional antenna to get maximum sensitivity and downloading distance. The UHF communication takes much less energy when UHF signal is strong. It can save some logger's energy.



The unidirectional antenna can be used for loggers programming before attaching them to animals or when the base station is working in very short distance from the nest.

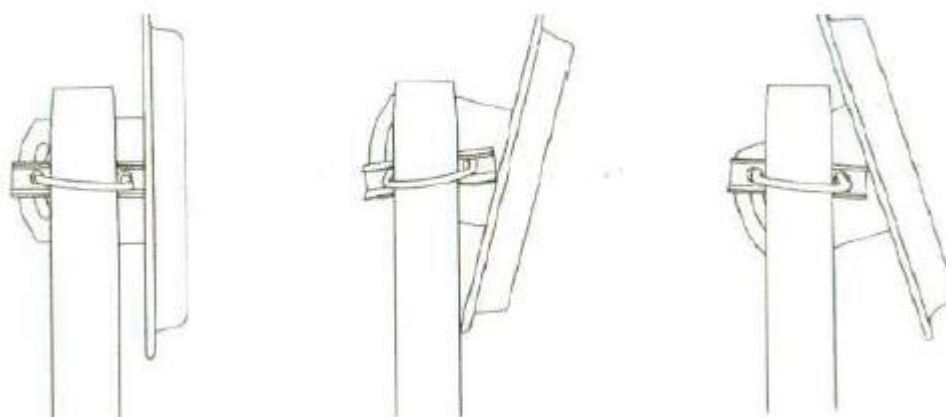
The base station is waterproof but protect the USB and antenna connectors against water. The antenna connectors can be covered by grease, for example Vaseline lipstick.

The base station can be powered by the laptop USB, battery grip or by the DC 12V-> USB converter.

Batteries in battery grip (3x LR 20) last for 10-15 days of continuous work. Battery life depends on temperature, the size of data files, download distance etc.

The base station average power consumption is ~1Ah/day. The battery grip with 3 alkaline D cells lasts for ~10 days. Battery life depends on the temperatures and number of loggers downloading data.

Example of antenna positioning at different angles





Raw data formats

After downloading data from the base station, a file containing raw data is created. The file uses the same name “20140419104957.txt” as the parent folder “since 20140419104957”.

All data lines are between “-“ which opens the file and “+” which closes the file.

```
-
SS1 New logs=2      MIL10
19041408575428868N01831609E0.410
INFO t=68 U=4.04 T=31.0  MIL10
SS1 New logs=2      MIL09
19041408575428875N01831598E1.309
INFO t=79 U=3.92 T=30.5  MIL09
.
.
.
INFO t=11 U=3.90 T=31.0  MIL09
SS419-04-14 08:57:16 V3.90 MIL09
SS1 New logs=2      MIL10
19041408575428871N01831608E0.210
INFO t=10 U=4.03 T=31.0  MIL10
+
```

The GPS data come each time with additional line called INFO:

```
SS1 New logs=2      BDU28
20041404445428878N01831593E1.328
INFO t=7 Sat=6 U=3.98  BDU28
where:
```

t= TTF (time spent to calculate GPS position)

Sat= number of satellites used by GPS

U= battery voltage at the end of GPS work

```
SS1 New logs=2      MIL10
19041408575428868N01831609E0.410
INFO t=68 U=4.04 T=31.0  MIL10
```

Some models can send also the temperature:

T= temperature [°C]

The line

```
SS1 New logs=2      MIL10
```

opens downloading stream. Value=2 or 3 is typical for data collected close to the base station when records are transmitted immediately.

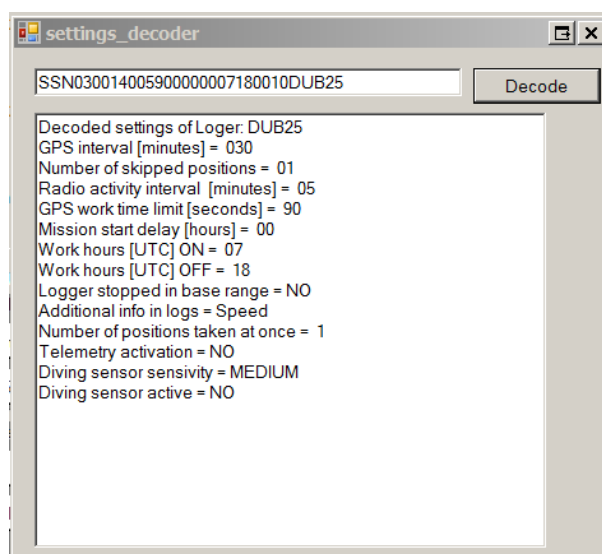
When logger sends data from memory, the “New logs=” shows number of lines that will be transmitted:

```
SS1 New logs=17      DUB25
13041417285425985N01833469E0.225
INFO t=25 Sat=8 U=3.50  DUB25
SSN030014005900000007180010DUB25
13041419325425985N01833459E0.925
INFO t=8 Sat=7 U=3.47   DUB25
14041416265425985N01833474E0.225
INFO t=29 Sat=8 U=3.38  DUB25
15041409235425982N01833464E0.125
INFO t=69 Sat=11 U=3.47  DUB25
15041411295425983N01833466E0.125
INFO t=27 Sat=8 U=3.62  DUB25
15041413345425984N01833480E0.225
INFO t=22 Sat=7 U=3.63  DUB25
15041415395425996N01833460E0.725
INFO t=23 Sat=8 U=3.56  DUB25
15041417445425984N01833466E0.125
INFO t=21 Sat=8 U=3.49  DUB25
```

Usually the third line in the data stream is different:

```
SSN030014005900000007180010DUB25
```

The SSN line contains the logger settings; to translate, copy it and paste into Trackers’ “Decoder” window:



When the logger is within the base station range and it has no data to download, it sends SS4 line:

```
SS420-04-14 04:13:36 V4.02 BDU29
```

The date and time in this line indicates when bird was in the nest, in the colony etc.

Diving logs:

```
DIV DOWN 21-04-14 00:27:08 ALL08 (dive start)
```

```
DIV UP 21-04-14 00:27:18 ALL08 (dive end)
```

Battery charging messages:

```
SS5 START CHARGING URI18
```

```
SS5 CHARGING BDU29
```

```
SS4-----V3.93 BDU29
```

```
SS5 FULL CHARGED URI02
```

```
SS4-----V4.15 URI02
```