Mercury & Gná

A quick start guide for Star-Oddi telemetry system

STAR:ODDI

Logging Life Science

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This quick-start guide decribes main steps for getting started with setting up the telemetry system.

A more detailed user manual is included with the software under the **Help** menu.

For technical support you can reach us through email or phone.

E-mail **support@star-oddi.com**
Phone: **+354 533 6060.**

Changes to this document may occur without notice.

1 Downloading and Installing Mercury and Gna

To download Mercury and Gna visit: **https://www.star-oddi.com/support/software**.

The download contains two programs:
Mercury: This software is used to program the loggers, start the measurement sequence and connect to loggers after study to retrieve the stored data.
Gna: This software retreives and displays real time data transmitted from the loggers.

To install the program, follow the automatic InstallShield Wizard.

During installation a product key needs to be entered, which is delivered upon the one-time purchase of the software licence. The product key can be found on the inside of the front cover of the software package which was delivered with the loggers.

Please keep the product key in a safe location as you may need it for future use. The product key works for multiple computers on the same network.

All updates are free. It is recommended to always do the software updates when prompted to do so.

2 Connecting accessories

2.1 Components of the telemetry system

The Star-Oddi telemetry system is composed of a number of components that can be seperated into three groups:

The monitoring PC / Gna / PAN: This is the computer that is used to monitor the real time data, it needs to have the Gna software installed (page 3) and the PAN needs to be connected to this computer.

Antenna and RF box: The antenna and RF box (page 6) are used in combination. They receive the data from the loggers and transmit it to the PAN.

Data loggers, communication box and Mercury: The Mercury software and communication box are used to set up the loggers and read out the data saved in the logger's memory. Ideally, the same computer is used to program the loggers and display the telemetry data.

The Star-Oddi Telemetry System

The PC
The **PAN** is connected to the computer. It receives signal from the **RF-Box** that's attached to each cage. The PAN can handle up to 64 **RF-boxes.**

Each Cage
Each cage has an **Antenna** and an **RF-box**. Each **RF-Box** can handle 10 subjects. The **RF-Box** sends information to the **PAN**.

Crosstalk
To increase reliability of transmission and to reduce interference:
#1 Place the **Antenna** onto a 5cm thick **Styrofoam**
#2 Keep **Antennas** seperated by approximate 20cm

Group 1   Group 2
20cm
Antenna   Antenna
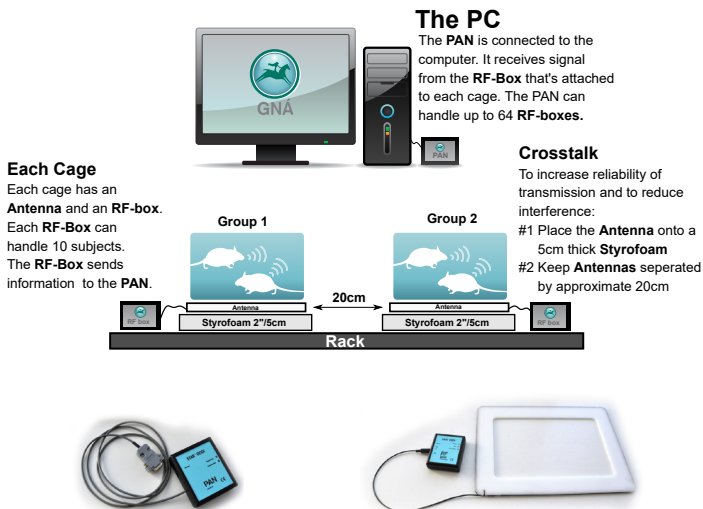Styrofoam 2"/5cm   Styrofoam 2"/5cm
Rack

Figure 2.1 An Overview image of the Star-Oddi telemetry system

2.2 PAN

The Personal Area Network (PAN) is a tranceiver module which is connected to the receiving computer and the Gna software. The PAN is connected to the computer using a serial cable and a USB converter. The PAN receives data from the RF box which is attached to each cage

At all times the PAN needs to be connected to power via the accompanied AC adapter. The PAN receives signed data packages from the RF-box through a MiWi protocol at 2.4Ghz.

2.2.1 Starting the PAN in Gna

Once you start Gna a COM Port menu will appear, you can then either utilize the PAN Scan wizard or select the right COM port from the menu (see figure 2.2).

The PAN has two Lights (Green/Red):
Blinking green light: PAN checks if it is able to connect to the PC.
Green light on: PAN connected to PC/Gna software and ready to be used.
Blinking red light: PAN looks for available COM port.

Once the PAN is initialized the bottom left corner will have a green marker showing the COM number and the PAN ID as seen in Figure 2.3 To access the COM Port menu you can always double click on the Green/Red PAN box.
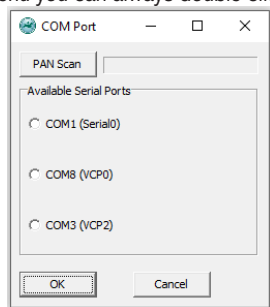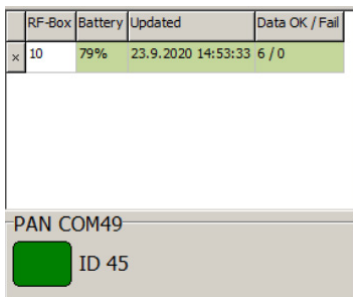
Figure 2.2 PAN Scan wizard

Figure 2.3 RF-box menu

2.3   Antenna and RF Box

The antenna receives real time data from the implant/s in the animal/s through a one way 500kHz wireless transmission and transmits data to the RF box via the mini jack connector that plugs into ANT on the RF box. The RF box then forwards the data to the PAN using a MiWi protocol (2.4Ghz). Each cage will need a set of an antenna and a RF box. The RF box has a rechargable battery but can also be kept plugged into power via the accompanied AC adapter.

To initalize the RF box you can turn ON the RF-box with the mechanical switch. An ID, battery life, the date of last transmission (**Updated**) and a column showing if the data package went through or transmission failed (**Data OK/Fail**), should appear in the lower left corner of Gna software (see Figure 2.3 on page 5).

The antenna is either attached to the bottom of the cage or to the rack system in use. Velcro© can be used to attach the RF box and antenna. Exampless of placement can be seen in Figures 2.4a and 2.4b below:
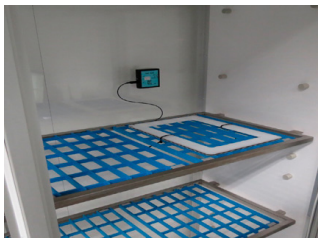

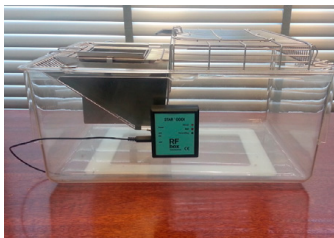Figure 2.4a Antenna and RF box in a rack system.

Figure 2.4b Standard rat rodent cage on top of the antenna. RF box attached with Velcro.
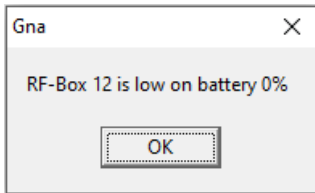

Figure 2.5 Battery level warning message

The RF Box has three lights (Yellow/Red/Green):
All lights off: Normal condition when nothing is being received and the RF-box is operating on battery power.

Yellow light on: The RF Box is fully charged
Yellow light blinking: The RF Box is charging

Red light blinks eight times: The RF Box is searching for a communication channel
Red light blinks once: Battery is running low. GNA gives a warning message (Figure 2.5).
Red light blinks three times: Transmission failed.

Green light on: The RF Box is connected to the PC/PAN. The light will stay on for 5 seconds after the box has been switched on.
Green light blinks once: RF Box receives a signal from the logger and forwards it to the PAN.

Troubleshooting for the antenna, RF Box and the PAN:

- The system is noise sensitive to ethernet cables and some power cables/switching power supplies that operate in the 500kHz range. If the (Data OK/Fail) column shows a constant stream of packages then try disconnecting the antenna from the RF box and adjust the placement of the antenna before reconnecting.

- A 2 inch/5cm styrofoam or non metallic object placed between the rack and the antenna as seen in *Figure 2.1* is usually sufficient to couple out any noise affecting the system.

- Having two antennas too close together can also reduce the chances of a successful transmission and we reccomend a 20cm distance between two antennas as seen in *Figure 2.1*.

- If none of the above solve the issue please don´t hesitate to contact our support service.

3   Setting up the loggers in Mercury

This part walks you through how to set up the loggers in the Mercury application software to be able to transmit data to the receving part of the system, the antenna and RF-box, and the PAN. The set-up of the receiving part has already been explained in Chapter 2 of this quick start guide.

It is reccomended to start the loggers using the same computer used to view the real time data in Gna. If that is not possible please refer to section 4.1 in this guide for information on how to move the group files from the computer used to set up the loggers to the computer used to view the real time data in Gna.

It is **important** to update your Mercury software frequently. The latest version can be downloaded from Star-Oddi's homepage: http://www.star-oddi.com/support/software

3.1   Creating a group

Before programming the DST telemetry loggers you have to create a group in the Mercury software. There are two main functions of the group:
To keep the information about the setup of the loggers in one place, to facilitate the transfer of the group to the Gna software
To create a recording and transmisson delay between loggers that are supposed to be received by the same Antenna and RF-box. This avoids crosstalk between devices.

An example of a recording and transmission delay can be seen in Table 3.1. It follows a rule that if the sampling interval time is larger then the number of loggers in a group, then each logger in the group gets 1 minute recording and transmission delay. If the sampling interval is less than the number of loggers in a group, the delay will not be in whole minutes. For example, setting up a 10 logger group with a sampling interval of 3 minutes, transmission delay will start with 0,1,2min then 0:30,1:30,2:30, 0:10,1:10,2:10 and 0:40.

One Group [n=10] (10min interval)		Two Groups [n=5] (10min interval)	
#	Transmission	#	Transmission
Logger 1	12:00:00 AM	Logger 1 - G1	12:00:00 AM
Logger 2	12:01:00 PM	Logger 2- G1	12:01:00 PM
Logger 3	12:02:00 PM	Logger 3 - G1	12:02:00 PM
Logger 4	12:03:00 PM	Logger 4 - G1	12:03:00 PM
Logger 5	12:04:00 PM	Logger 5 - G1	12:04:00 PM
Logger 6	12:05:00 PM	Logger 6- G2	12:00:00 AM
Logger 7	12:06:00 PM	Logger 7 - G2	12:01:00 PM
Logger 8	12:07:00 PM	Logger 8 - G2	12:02:00 PM
Logger 9	12:08:00 PM	Logger 9 - G2	12:03:00 PM
Logger 10	12:09:00 PM	Logger 10 - G2	12:04:00 PM

Table 3.1 An example of transmission delay between loggers

Select **New Group** to create a new group (see Figure 3.1). It is also possible to create a new group by clicking the **New Group** icon in the group view pane.
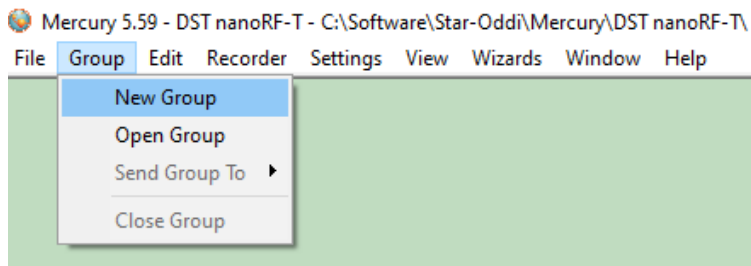
Figure 3.1 Group Menu in Mercury

The following window appears (Figure 3.2) where you can Name your group and describe it:
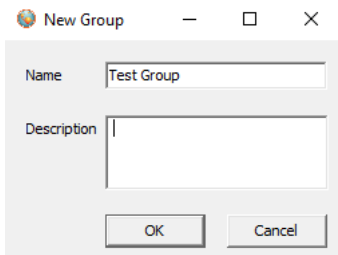

Figure 3.2 Create a New Group

Once the group has been created it will appear on the **Group View** menu on the left side of Mercury (Figure 3.3).
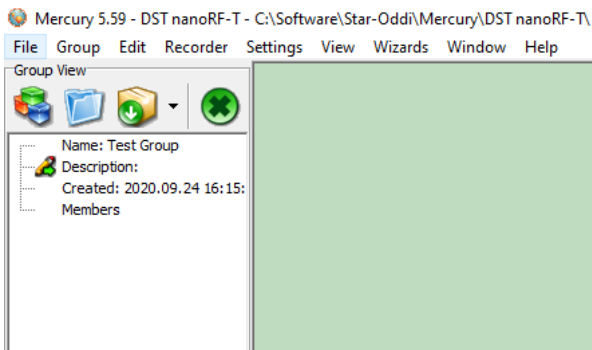

Figure 3.3 Group View in Mercury showing that a group has been created

You can now connect to the recorder and set it up for recording and transmission.

3.2 Communication Box

The Communication Box is a USB compatible communication interface, designed to communicate with DST recorders wirelessly via RF (radio frequency). If your computer does not detect the USB driver automatically please install the USB driver from www.star-oddi.com/support/software.

The Communication Box has three lights (Red/Green/Yellow):

1. **Red (Power)** – shows that power is fed to the communication box from the USB port.
2. **Green (DST COM)** – shows that the logger is connected and correctly placed in the communication box (Figure 3.4). The green light will not turn on unless red and yellow lights are on.
3. **Yellow (PC COM)** – shows that Mercury has established connection with the box and that the correct COM port has been selected.
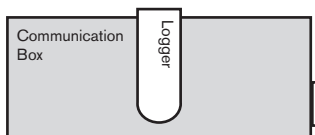
Figure 3.4 How to insert the logger into the Communication Box

3.3 Connection Wizard

If you are starting the software for the first time, you will be asked if you want the Connection Wizard to open automatically each time you start Mercury. If you have selected not to open the wizard every time you open Mercury, you can change it in under **Settings-Options-Startup.**

Connect the USB cable and the selected port will appear in the wizard pop-up window. Insert the DST into the box, the selected com port will turn green (Figure 3.5)
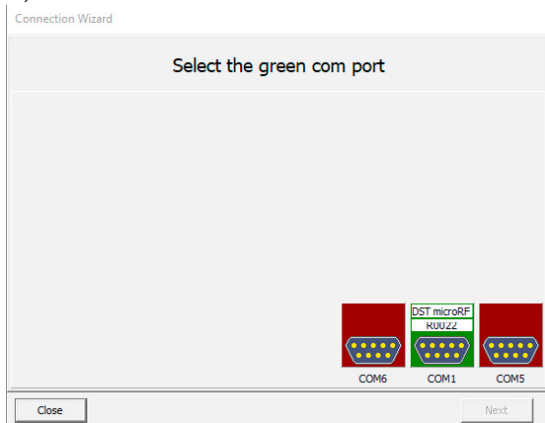
Figure 3.5 Connection Wizard

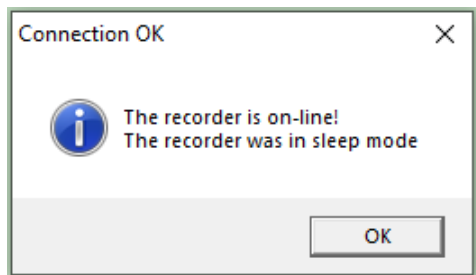In the Connection Wizard, click once on the green-lit port and select *Next* or double-click on the port.

Figure 3.6 Connecting to the recorder

Connection to the logger is established (Figure 3.6). Press **OK.** The Recorder is now on-line, as indicated at the bottom of the Mercury window.

Troubleshooting for the Communication box and logger:

- If the red light is off, we suggest you to manually install the USB drivers found on our homepage: http://www.star-oddi.com/support/software.

- If the yellow light is off, try using the **Connection Wizard** under Wizards in the menu bar. You can also select the com port manually using **Settings - Communication - Serial Ports**

- If the yellow and red light are on but no green light, the logger might have been placed in a reverse manner into the box, the transparant part should face the user. If there are still issues contact Star-Oddi for support.

3.4   Setting new measurement sequence (NMS)

To program the loggers the user has to define and set a new measurement sequence. Then that measurement sequence has to be downloaded to the logger by initiating the **Start New Measurement Sequence** command.

If you are not using the wizard, select the **Edit** menu and **New Measurement Sequence Definition** and **Single Interval.** The following window appears (Figure 3.7):

Figure 3.7 Start New Measurement Sequence window

Set the **start time** and **start date** of recording, the logger will start recording at the defined sampling interval at that time and date even if it is initiated in advance.

Set the **measurement interval time** for example to 10 Minutes as shown in Figure 3.7.

Set Mode: Single Mode (If starting one logger in a group)
Multi Mode (If starting multiple loggers in a group, see table 3.1 for time shift between loggers)

Use Template, Use Default, Previous: This feature is connected to Save this NMS definition as a template (file) in the bottom of the Set New Measurement Sequence menu. Please refer to the user manual for further information.

Primary / secondary - definition:
When selecting **Normal T + RF** (recommended) the logger records temperature, stores the data in its memory and transmits the data to Gná at the same intervals. When selecting **Temperature as primary** the user has the option of saving battery life by only storing the data in memory (secondary counter = 0) or transmitting data less frequently for example every 3rd measurement (secondary counter = 3).

Battery & memory calculator (days):
This gives you calculation of the estimated battery life and memory used during a study of selected days.

Blink with each transmission (only microRF-T):
For microRF-T loggers you can tick this box and the logger will blink a red light with each transmission. This will consume more battery but can be useful when familiarizing oneself with the system.

After the settings have been selected, press the OK button.

If you are using the wizard, the software will automatically start the new measurement sequence (start recording) and disconnect the logger. If not, choose the **Recorder** menu and **Start New Measurement Sequence** command.

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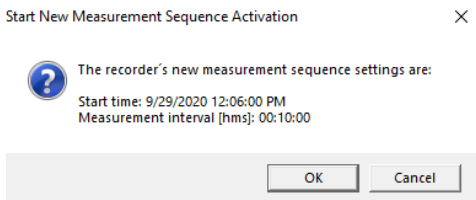A window appears on the screen, to verify the settings to be downloaded into the recorder (Figure 3.8):

Figure 3.8 Start New Measurement Sequence Activation window

Click **OK** and the sequence will be added to the group and the recorder will be in Measurement Mode. Now the logger is in Measurement mode, remove it from the communication box.

Important: placing the logger back in the communication box will put it in sleep mode.

Once the logger has been started it will appear on the **Group** menu in Mercury (Figure 3.9). If a group was not created before as shown in section 3.1, you will be asked to create a group.
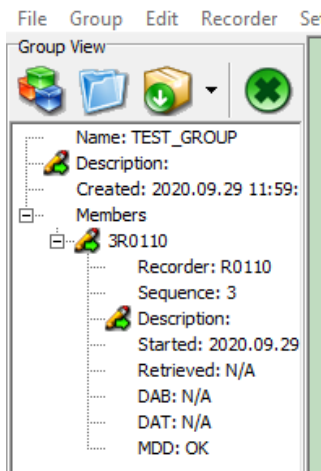

Figure 3.9 Group view pane

4 Transmitting data from Mercury to Gna

4.1 Sending a Group from Mercury to Gna

In order to monitor the online measurements after the loggers have been set up for measuring, the user has to start up the Gná software and send the group from Mercury to Gna. This happens automatically if using the wizard to set up the loggers.

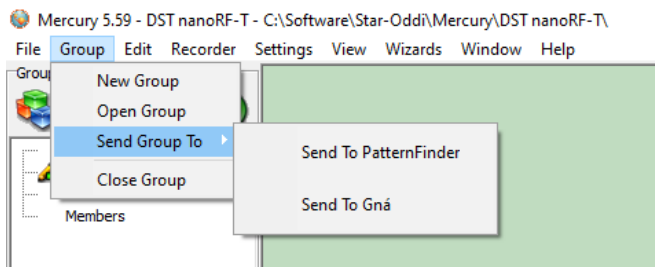Select **Group** Menu and **Send Group To Gna** in Mercury to transfer a group to Gna (Figure 4.1).

Figure 4.1 Send Group Menu

It is also possible to transfer a group by clicking the Send Group to icon in the group view pane.

If you are **not** using the same computer to set up the loggers and run Gna you will have to do the following steps.

#1 Install Gna on the same computer you used to start the loggers

#2 Send Group from Mercury to Gna as explained above

#3 Copy Group file for the study found in the **Gna/Groups** subfolder and place it in the monitoring computer's **Gna/Groups** subfolder.

#4 Copy *.logger files for the loggers used in the study found in **Gna/Loggers** subfolder and place it in **Gna/Loggers** subfolder in the monitoring computer. The *.logger files are the ones being updated when telemetered data is received by Gna.

#5 On the monitoring computer select **File - Open - Select** the group and double click or right click (display graph) on the correct group.

If Gna software does not open automatically, open the Gna software.

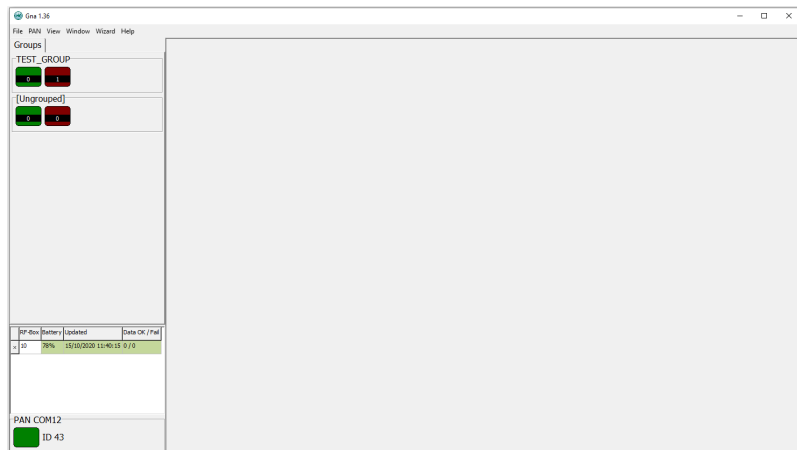The group TEST_GROUP sent successfully to Gna (see figure 4.2).

Figure 4.2 Gna interface after receiving or opening up a group file

In the green box of the group on the left side of the interface the user can see how many loggers are online. Online means that Gna is receiveing data from that logger based on the defined sampling and transmission interval. The number in the red box represents how many loggers have not consistently transmitted data to Gná (see figure 4.3).

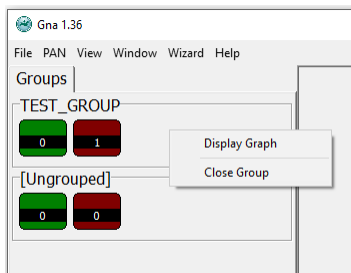To open the group graph, right click on the group and select Display Graph.
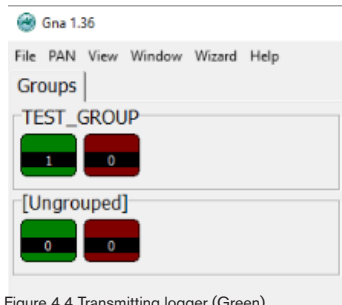

Figure 4.3 Display Graph

Figure 4.4 Transmitting logger (Green)

A graph will appear displaying the RF transmissions from the loggers that are online seen in Figure 4.5. If a number of loggers are started in a group each logger will be presented in the graph and the number in Figure 4.4 goes from 1 to N (the number of loggers in the group).

Each logger will transmit the last three measurements recorded with each transmission; this is done to increase the transmission relability.

To open an individual recorder graph double click on the recorder you want to view in the table on the right side of the graph window. Each graph can be saved and opened in programs such as Excel for further analysis.
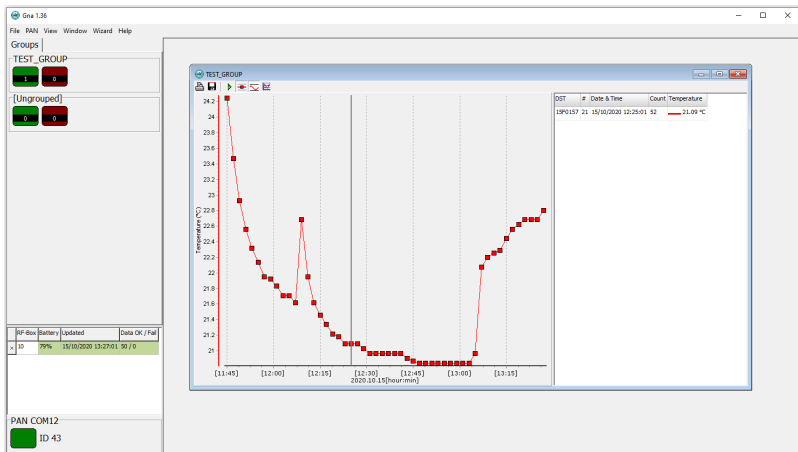

Figure 4.5 Transmission of temperature data from loggers.

Troubleshooting for Transmission:

- The best reception power is in the center of the antenna, and lowest reception power is outside the edges of the antenna.

- When the logger is not implanted in the animal, the transmission can be quite directional and turning the logger in different direction can improve or decrease transmission power.

- If you have followed this guide and troubleshooting section on page 7 in this guide without solving your issue, then please contact our support team.

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5 **Downloading data in Mercury**

Once the study has been concluded and the loggers been retrieved from the animals, the user can download all data from the loggers in Mercury. When connecting to a logger after a measurement period, the following window appears (Figure 5.1) followed by a request to retreive the data (Figure 5.2):
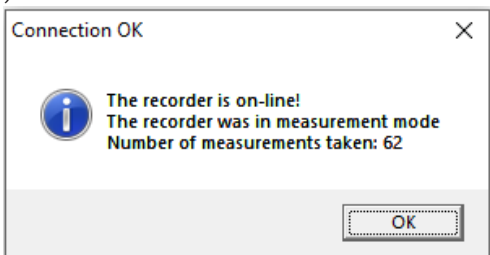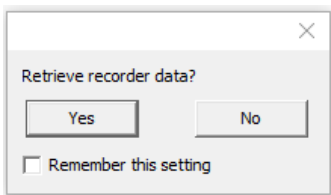

Figure 5.1 Connection OK

Figure 5.2 Retrieve recorder data

Click *Yes* if you wish to retrieve the data, click **No** if you would like to retrieve it later. If you are not using the wizard choose the **Recorder** menu**, Connect** and the **Retrieve Data command.**

After you have retrieved the data you can start a new measurement sequence or disconnect the recorder which places it in sleep mode.