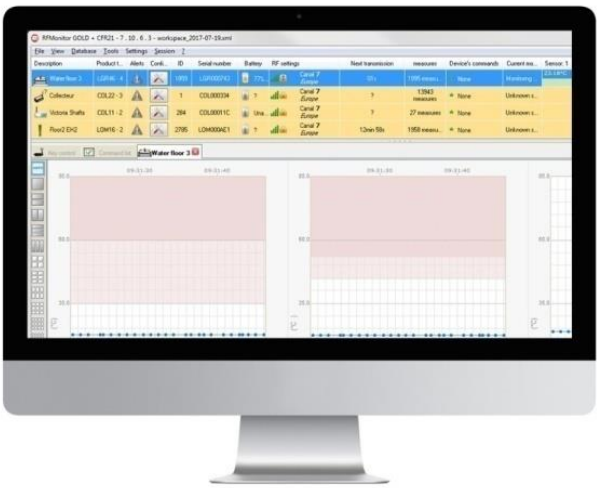
TRE Installation and user guide

Reference : TRE 35-TRE37-TRE38



1 TRACKERS DESCRIPTION

TRE trackers main functions:

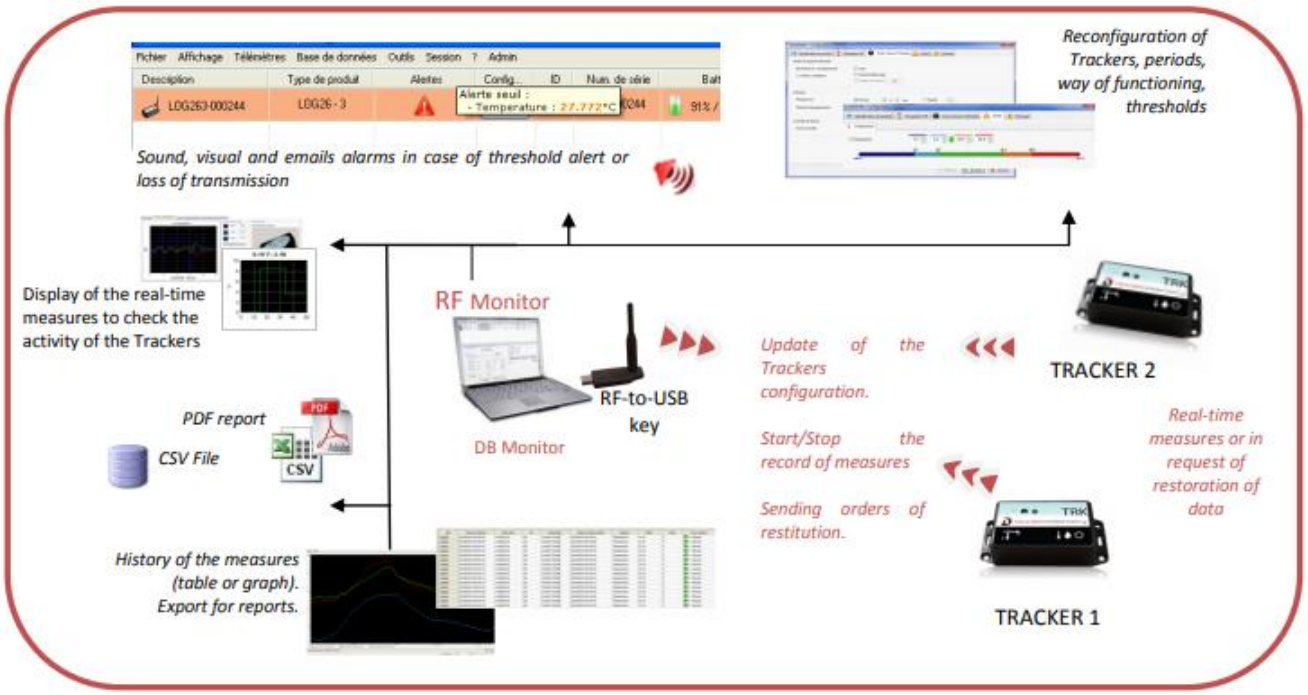
- Shocks and tilt measurements on 3 axis, free fall and temperature (TRE35-TRE37-TRE38), humidity (TRE35-TRE37), opening of parcels and opening of trackers (TRE38)
- Measurements times-tamped and stored in a flash memory

TRE trackers characteristics:

Integrated sensors:

- TRE35 : 3 axis accelerometer and temperature sensor
- TRE37 : 3 axis accelerometer and temperature sensor + humidity sensor
- TRE38: 3 axis accelerometer and temperature sensor + humidity sensor + 2 brightness sensors

2 RF MONITOR INSTALLATION OVERVIEW



2.1 General description

At your measurement site, you need to have a dedicated PC with RF Monitor installed to :

- Configure the operating modes, the measurement periods, the thresholds and the alarms
- Display the measures, generate CSV or PDF files

- Collect your trackers measurements (using a RF-to-USB key)
- Fill the database

It is possible to access the database using the software **DB Monitor** provided.

3 INSTALLATION OF RF MONITOR

PLEASE NOTE THAT YOU MUST HAVE ADMINISTRATOR RIGHTS ON THE COMPUTER TO INSTALL RF MONITOR

➢ 1ST  SOLUTION :

Connect the metallic USB storage key

Via Windows explorator, display the content of the USB key and double-click on **NewsteoKit_vX.X.X_00000000_setup.exe**.

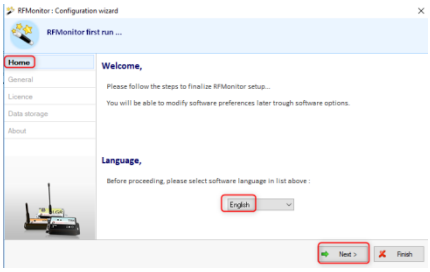
➢ 2ND SOLUTION : DOWNLOAD RF MONITOR FOLLOWING THE LINK

https://www.newsteo.com/en/help-center/softwares/

- On the first window select the language, then for a quick installation keep the default settings by validating the successive windows from the setup program. At the end of the installation, select the option « ***Reboot now*** » and click on « ***Finish*** ».

- Once the computer restarts, launch RFMonitor software by double-clicking on the shortcut created on the desktop or from the start Menu 

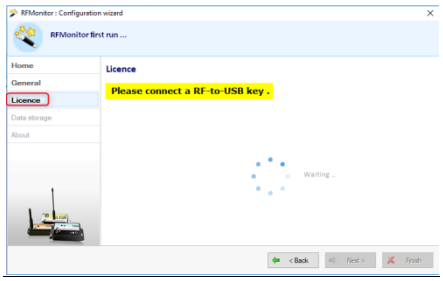
- On the « ***Home*** » window of the configuration wizard, select the desired language and click on « ***Next*** »



- On the « ***General*** » window of the configuration wizard click on « ***Next*** ».

Remark: Once the installation has been completed, the configuration may still be changed (right-click on the line of the tracker then click on « ***Configuration*** » on the RF Monitor program option

- When requested by the setup wizard, remove the label « install the software before inserting » and insert the **RF-To-USB key** preferably using the **USB extension**



- In the wizard window « ***Licence*** » click on **« *Next* ».**
- In the window « ***Data storage*** » click on **« *Next* ».**
- At the end of the configuration wizard, click on **« *Finish* »** to launch RF Monitor.
- The information concerning your RF-To-USB key is now displayed in the tab « ***Key control*** » on RF Monitor.

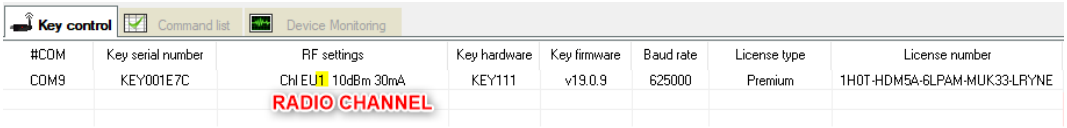
4 STARTING THE TRACKER WITH RF  MONITOR

4.1 RFM Launch – Starting the tracker

The tracker is delivered in Hibernating mode (sleeping mode).

1- Launch RF Monitor

2- Connect your RF-to-USB key, it will be appearing in channel 1

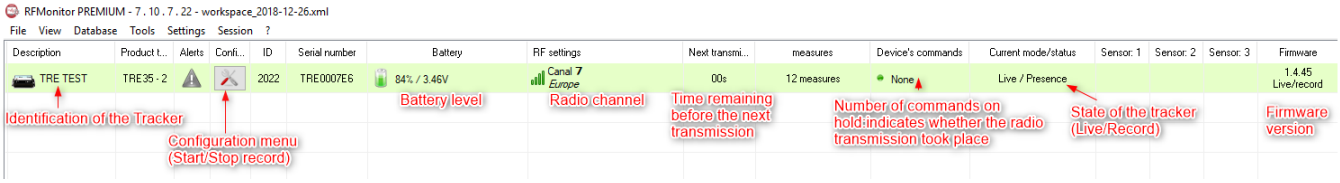


3- Activate your tracker by swiping the magnet on the magnet **area:**

Observe the following procedure:

- Swipe the magnet slowly on the magnet area: the LED lights up **RED**
- While the light is still RED, swipe the magnet a second time slowly on the magnet area: the LED lights up **ORANGE**
- While the LED is still ORANGE, swipe the magnet a third time slowly: the LED lights up **GREEN**
- Then the LED flashes **GREEN three times**
  (Watch the support video: https://www.newsteo.com/en/help-center/tutoriels-videos/newsteo-tracker-tre-trp/)
- The tracker is activated and starts recording
- If the LED doesn't flash green 3 times, it means that it's not activated please start the procedure from the beginning.

4- On RF Monitor, the tracker will automatically appear in the list of devices:

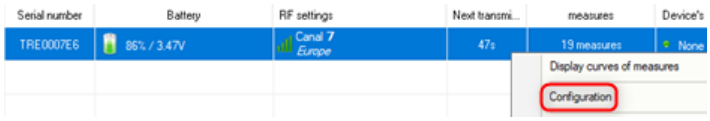


➔ Right-click on the line of the device, click on « ***Stop recording*** » then « ***Download data*** »

5 CONFIGURATION OF THE TRACKER WITH RF MONITOR

5.1 Configuration menu

- Click on the tool icon of the logger's  line **Or** right-click on the logger's line
- Then click on "***Configuration***".

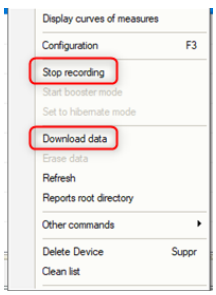


5.2 Execution of the commands

For a command to be taken into account:

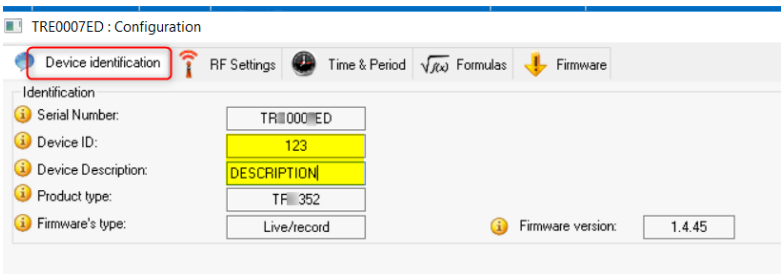
- Swipe the magnet on the tracker to execute the command
- **Or** Wait for the next radio transmission (<1 minute)
  The tracker sends a presence radio signal every minute

- The message « 1 command waiting » disappears as soon as the command has been taken into account.



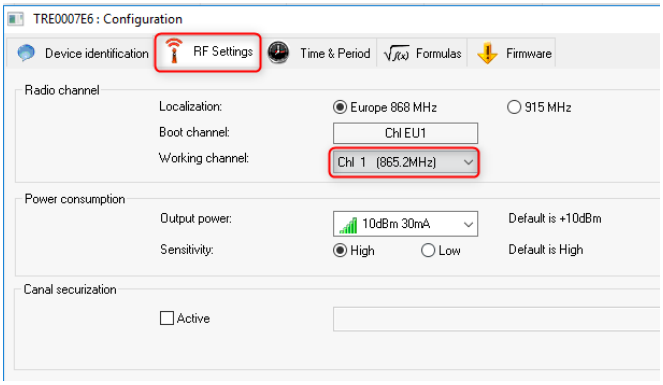
5.3 Product identification

- Select the tab « ***Device identification***»
- Select a personalised identifier (ID, number between 0 and 65535)
- Enter a description
- Click on "Send" to validate the modifications



5.4 Changing the radio channel

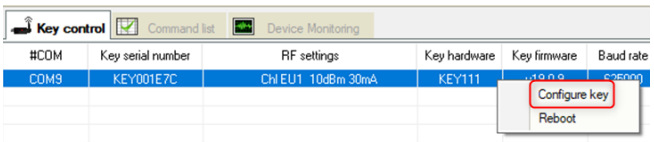
- Select the tab « ***RF Settings***»



- **By default** the trackers and the RF-To-USB key are set on **channel 1**
  Channel 1 properties: When the key is set on Channel 1, you can detect the trackers which are on any other channel. The channel 1 is a detection channel.

- You can change the radio channel following these steps:

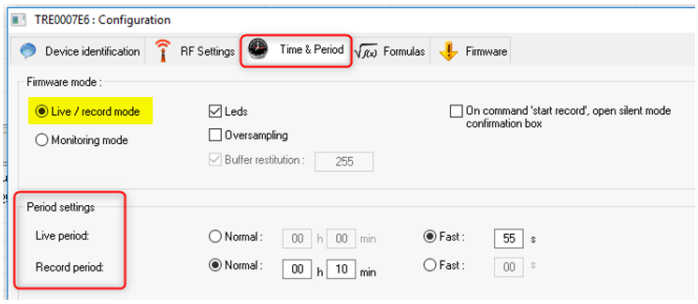
1. First you need to change the channel of the tracker
2. Wait for the next transmission or swipe the magnet on the tracker to execute the command
3. Change the channel of the RF-To-USB key by right-clicking on the line of the key



4. Change the radio channel in « ***RF Settings*** »

5.6 Live/Record mode

Select the tab « ***Time and Period*** »



« *Live period* »: measurements recorded outside the recording period

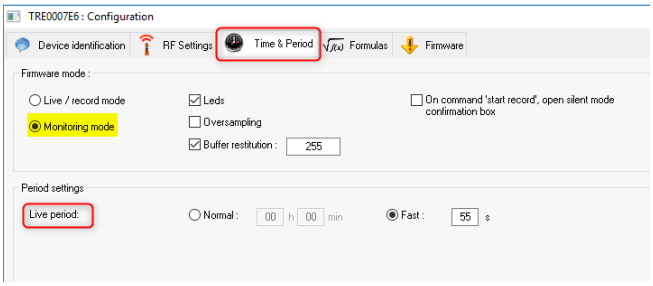
The TRE takes a measure at the live period which has been configured (10s by default) and sends it to the PC. RF Monitor displays the measure without recording it. The user can also check the tracker functioning, set the thresholds and the measurement period for the coming measurement campaign.

« *Record period* »: measurement period recorded during the recording

- NORMAL: measurement period from 1 minute up to 4 hours
- FAST: measurement period from 1 second up to 59 seconds

5.7 Monitoring mode: monitoring in real time

- Select the tab « ***Time & Period*** ».
- This concerns real-time monitoring applications



Operation principle :

- The tracker takes a measure according to the period defined by the user and sends it to the PC with a request for ackowledgement
  - ➢ **Which mode should you choose ?** Generally, the « **Live/record mode** » set-up by default on the tracker is perfectly suitable.

Remark : the higher the frequency is, the faster the memory will be full

For information :

- **For a period of 1 mn**, the memory will be filled in 2 months with 20500 recorded shocks and temperatures
- **For a period of 15 mn**, the memory will be filled in 2 years with 29000 recorded shocks and temperatures

5.8 Oversampling

- The oversampling option allows to have a higher measurement frequency when the threshold are reached.
- Attention: this option increases the battery consumption
- When the threshold is exceeded :
  - ➢ The measurement period changes to 1 measure / minute in **NORMAL** period
  - ➢ The measurement period changes to 1 measure / second in **FAST** period

5.9 Recording campaign

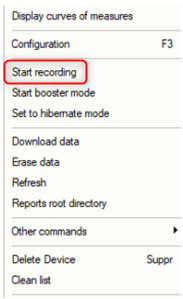
5.9.1 Start recording

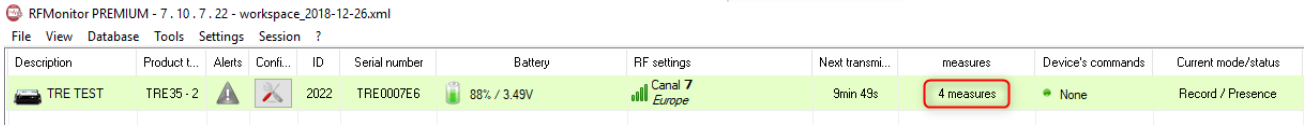
- Once the mode ***Live/record*** has been selected
- Click on « ***Start recording*** »

- Wait for the next radio transmission or swipe the magnet on the trackers magnet area to execute the command.

5.9.2 Recording

- The tracker records and stores the measures in its memory
- Every minute the tracker sends a presence radio signal to indicate its status, the thresholds which have been exceeded and the number of measures in memory.
- The number of measures in memory are displayed in the column "measures" on the line of the device



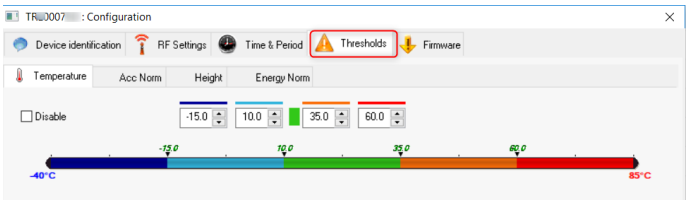


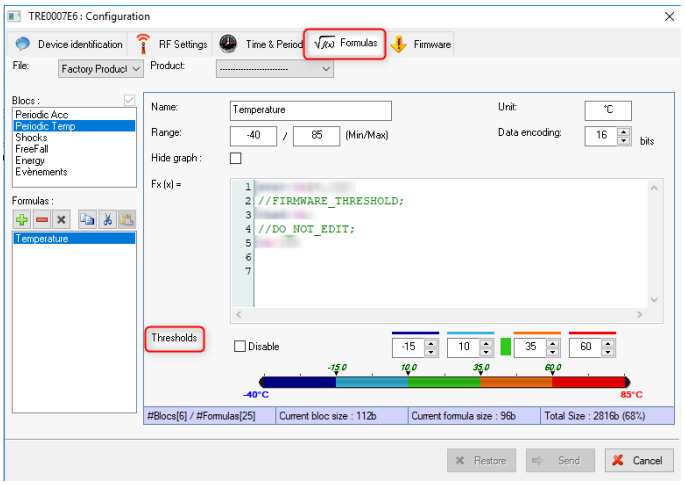
5.9.3 End of recording

- Click on « ***Stop recording*** » then « ***Download data*** »

5.10 Thresholds

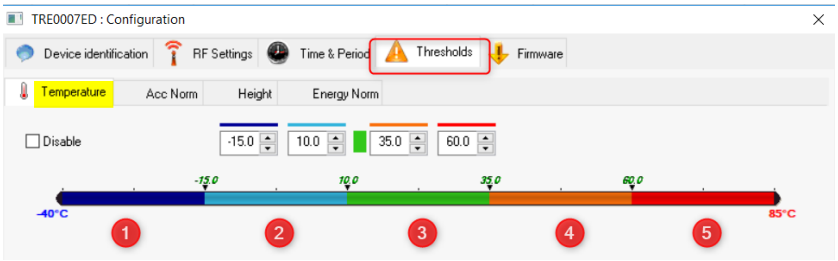
- Right-click on the line of the device then on «**Configuration**»
- Select the tab «***Thresholds*** » *or* « ***Formulas*** »





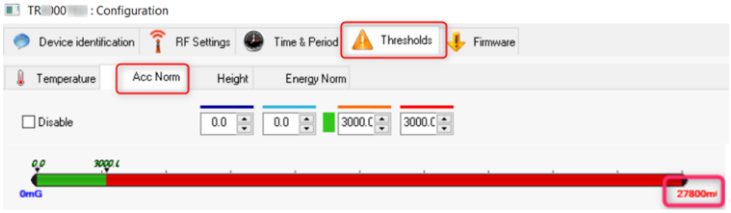
5.11 Configure the temperature thresholds

- Set the thresholds which correspond to the desired level of alerts for the tracker:



1. Dark blue range: triggers very low alerts
2. Light blue range: triggers low alerts
3. Green range: no alerts (normal range)
4. Orange range: triggers high alerts
5. Red range: triggers very high alerts

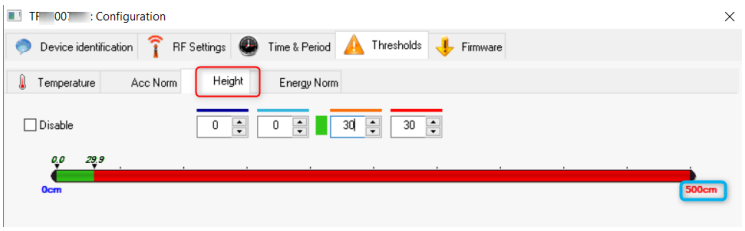
5.12 Configure the shocks thresholds



- For the shocks you can't have shocks lower than zero
- The unit above is in mG
- In our example:

For any shock higher than 3G (3000mG), the TRP55 records the event (refer to section 9.3)
For the shocks lower than 3G the TRP55 takes the measures regularly (refer to section 9.2)

5.13 Configure the height thresholds



- For the falls, you can't have a height lower than zero
- The unit above is in cm

In our example above:
For the falls higher than 30cm the TRP55 records the event (refer to section 9.4)

5.14 Configure the Energy Norm thresholds

- The energy calculation takes into account the duration of the shock in ms, you can't have a fall lower than zero
- The unity above is in ms
  Example below:

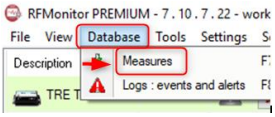
For a shock with a duration higher than 400ms, the TRE records the shock and calculates the shock energy taking into account the shock duration and the measure of the shock.

5.15 Data recovery

5.15.1 Access the database

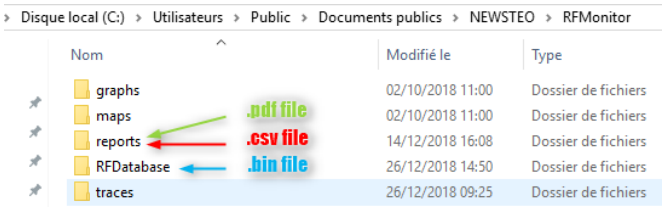
- Click on « Measures »

5.15.2 Data file location

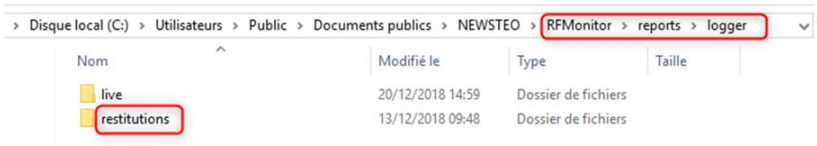


During the recording, the tracker generates 2 or 3 file types depending on the mode which has been selected:

.csv file -> Excel format
.pdf file -> Campaign report (recording mode only)
.bin file -> Database



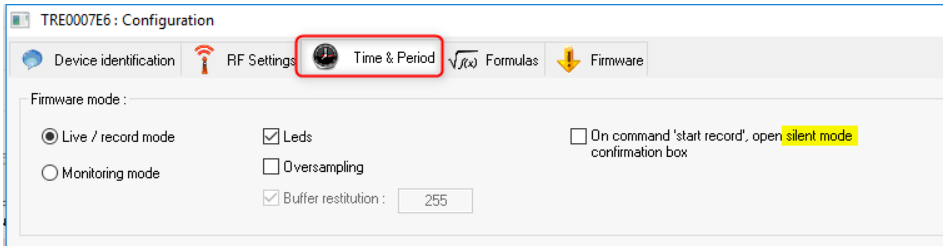
In ***Record mode***: the tracker downloads its data in the folder « **RESTITUTION** » and generates a **PDF or CSV file**



5.16 Silent mode

➢ *Activate the silent mode*

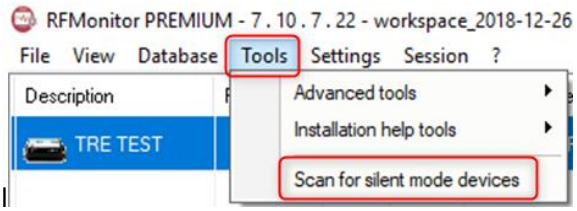
If the products travel by air, it is essential to activate the silent mode so they do not emit any radio signal

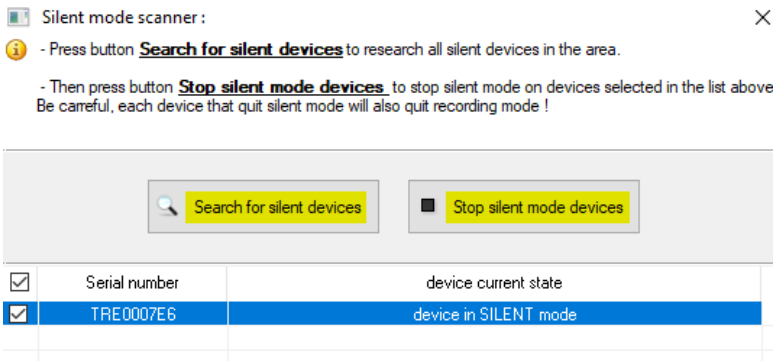


➢ *Look for a device which has been set to silent mode*

Select the tab « ***Tools*** »

- Click on **« *Scan for silent mode devices* »**





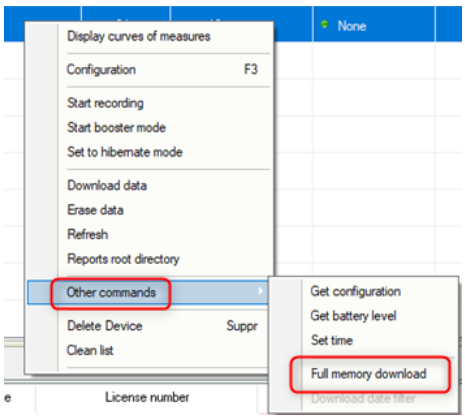
- Select the trackers you wish to retrieve from the silent mode
- Click on « ***Stop silent mode devices*** » The trackers is set to « *Live* » mode
- Click on **« *Close* »**

5.17 Alerts and Alarms

The alerts are related to: measures which are under or above the thresholds, incorrect date or time, transmission loss and battery levels.
There are different types of alarms. The alarms are at least visual (tracker line in red, warning triangle…)
The alarms can also be of sound types (can be configured for each type of alert), e-mail or alerts relay (with optional external equipment)

5.18 Saving data in the tracker

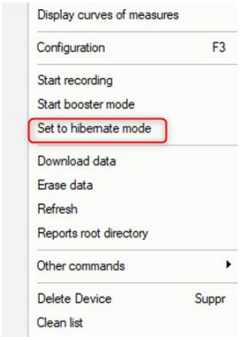
- At any time, you can download the last 32000 recorded measurements of each device.
- All measurements are registered in the buffer and are only cleared when the tracker rewrites on these measurements.
- By clicking on « ***Full memory download*** » you can retrieve the **last 32000 measures**



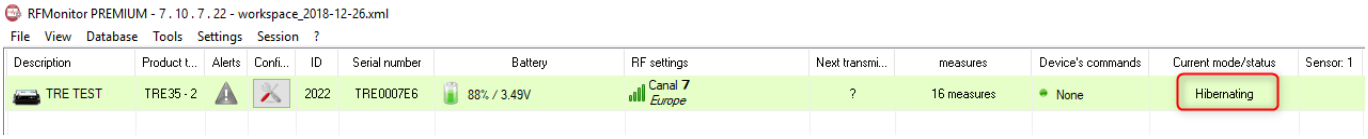
5.20 Deactivate the tracker

The tracker must be hibernated (sleeping mode) at the end of the campaign

or test measurements to preserve its batteries during storage.



- Right-click on the line of the tracker then « set to hibernate mode »
- Check that the status has been changed to « **Hibernating** »



- To reactivate the tracker, simply swipe the magnet on the magnet area. The RF-To USB key must be plugged in.

6 BATTERY REPLACEMENT

The user can change the batteries himself.

Open the device and change the battery in a dry environment. The device must be clean and free of dust. Clean it if necessary before opening it.

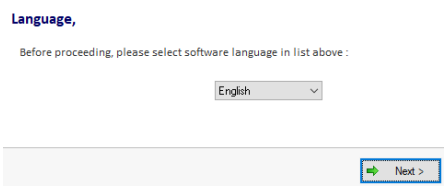
Use a PH2 cruciform screwdriver. Unscrew the 4 screws on the cover of device

You can then either use a Lithium Thionyl battery, size A with a special connector (recommended for a longer battery life), or an alkaline battery, size AA / LR6 (the autonomy and the operating temperature will be reduced).
After changing the battery, tighten the 4 screws of the cover.
-Please note that Newsteo also provides battery, do not hesitate to contact us-

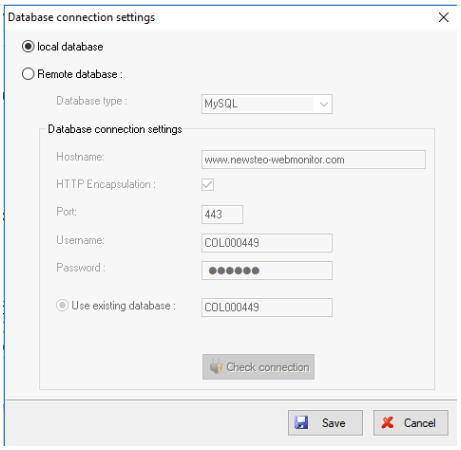
7 INSTALLATION OF DB MONITOR TO ACCESS THE DATA

- Once RF Monitor has been installed, launch DB Monitor by double clicking on the shortcut created on the desktop or from the « Start menu »

- On the first window of the configuration wizard, select the language then click on « ***next*** » .



- In the database window of the configuration wizard, select « ***Local database*** »
- Enter the path of the local database, test the connection then « ***Save*** »



- On the finalisation window of the configuration wizard, click on « ***validate*** » then click on « ***Finish*** ».

8 TRACKER MEASUREMENTS

8.1 Measurements at regular intervals

Depending on the frequency set by the user, the tracker measures, timestamps and stores:

- Temperature
- The tilt of the device on each of the 3 axis
- Humidity (TRE37, TRE38)
- Brightness (TRE38)

Pdf extract report

Packet	Date	Time	Ax	Ay	Az	AngleX	AngleY	AngleZ
000004	2018/12/26	16:55:17	0.011 G	-0.008 G	1.010 G	0.645 °	-0.448 °	90.000 °
000006	2018/12/26	16:55:20	-0.000 G	0.000 G	1.002 G	-0.027 °	0.000 °	90.000 °
000008	2018/12/26	16:55:30	-0.000 G	0.008 G	1.014 G	-0.027 °	0.448 °	90.000 °
000010	2018/12/26	16:55:40	0.007 G	-0.004 G	1.010 G	0.421 °	-0.224 °	90.000 °

Packet	Date	Time	event	status	VCC	Alcaline	Lithium	Board Temp
000001	2018/12/26	16:55:13	erase_data	0.000	2.970 V	0.290 V	3.500 V	24.350 °C
000002	2018/12/26	16:55:14	start_camp	0.000	2.970 V	0.290 V	3.500 V	24.350 °C
000025	2018/12/26	16:56:44	stop_camp	1.000	2.970 V	0.300 V	3.500 V	24.350 °C

Packet	Date	Time	Temperature
000003	2018/12/26	16:55:17	24.350 °C
000005	2018/12/26	16:55:20	24.350 °C
000007	2018/12/26	16:55:30	24.350 °C
000009	2018/12/26	16:55:40	24.350 °C

8.2 Measurements in case of shocks

In case of shocks when the acceleration data - Acc Norm - exceeds the threshold set by the user, the tracker measures, timestamps and stores the following values:

- Maximum acceleration on the 3 axis: Max Ax, Max Ay, Max Az
- Calculation of the vector acceleration norm: Acc Norm
- Calculation of energy on the 3 axis: Energy X, Energy Y, Energy Z
- Calculation of the energy vector norm: Energy Norm
- Shock duration

The measurements are made by a 3-axis accelerometer, the unit of measurement is in g (unit for gravitation).

The accelerometer takes measures at a frequency of 3200Hz which ensures that no shock can be missed.

Pdf extract report

Bloc : Shocks

Packet	Date	Time	Max Ax	Max Ay	Max Az	Duration	Acc Norm
000006	2018/12/28	11:09:23	0.840 G	0.801 G	1.578 G	25.000 ms	1.959 G
000008	2018/12/28	11:09:32	9.148 G	3.125 G	3.688 G	4262.00 ms	10.347 G
000010	2018/12/28	11:09:33	13.813 G	15.977 G	15.813 G	777.000 ms	26.383 G

8.3 Measurements in case of free fall

In case of a **free fall** when the value exceeds the threshold set by the user, the tracker measures, timestamps and stores the following values:

- Free fall height
- Maximum acceleration on the 3 axis: Max Ax, Max Ay, Max Az
- Calculation of the norm of the vector acceleration: Acc Norm

- Calculation of the energy on the 3 axis : Energy X, Energy Y, Energy Z
- Calculation of the energy vector norm : Energy Norm

Pdf extract report

Bloc : FreeFall

Packet	Date	Time	Height	Energy
000013	2018/12/28	11:09:42	36.556 cm	3.586 J/kg

8.4 Measurements when a parcel or a tracker is opened

Thanks to its external brightness sensor

- When a parcel is opened, the trackers record the information
- When the tracker TRE38 is opened, the tracker records the information

8.5 Energy measurements

The energy measurement is calculated from a function that takes into account the acceleration value and the duration of these accelerations.

8.6 Earth gravity

The 1g of Earth gravity is measured and displayed on RF Monitor when the TRE is in « LIVE » mode. In the event of a shock, the firmware deduces the 1g of Earth gravity from the acceleration measurements generated by the shock.

8.7 Determination of shock thresholds

If the acceleration threshold is set too low (for example 1.5 g) the memory of the tracker will be quickly full.

To avoid such a situation, pre-tests must be carried out with the TRE, configured in « LIVE » mode and fixed on its final support, to determine the relevant threshold that should be used during registration campaigns.

8.9 Interpretation of shock and energy measurements

Shocks are accelerations of very high amplitude. For example, an accelerometer that falls from a height of 20 cm on a sheet of steel 5 cm thick will be subjected to an acceleration of 8000 g at impact, and on a notebook of 50 pages thick, it will be subjected to an acceleration of 90 g

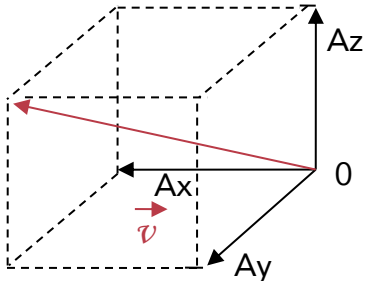
The values of the acceleration measures depend on several physical parameters:

- Rigidity of the structure
- Flexibility of the TRE support
- Distance between the shock and the positioning of the TRE

The TRE measures the value, the duration and the energy of the shock, these 3 magnitudes, associated with a test campaign will allow users to interpret a part of the events which are at the origin of the shocks.

8.10 Acceleration measurements : Acc Norm

Acc Norm represents the norm of vector $\vec{v}$ (Ax,Ay,Az) :

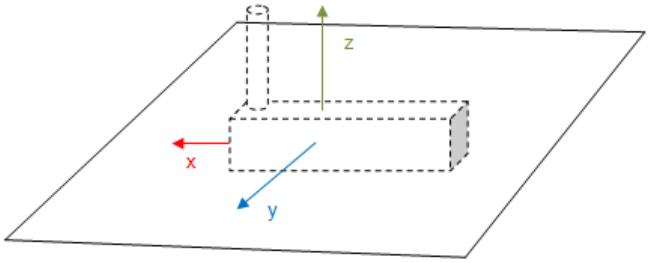


$$\boldsymbol{Acc\ Norm} = \sqrt{(\boldsymbol{Ax2} + \boldsymbol{Ay2} + \boldsymbol{Az2})}$$

8.11 Tilt measurements: angle X, angle Y, angle Z

Angle X, angle Y, angle Z = angle of axis x, y and z on a horizontal plane

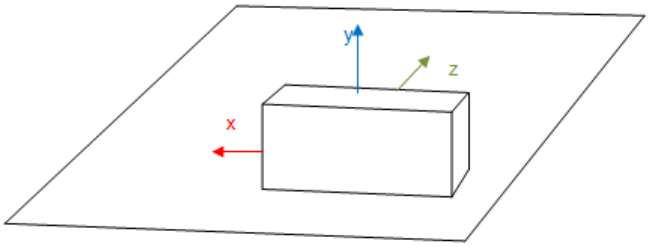
Case n° 1 : The TRE is placed on a horizontal plane



θAy = 0° or 180° θAx = 0° or 180° θAz = 90°

The axis Z of the TRE is perpendicular to the horizontal plane

Case n° 2 : Titling of the TRE toward the horizontal plane



θAx = 0° or 180° θAy = 90° θAz = 0°

The axis of the TRE is perpendicular to the horizontal plane

ANNEX : TECHNICAL DATA

MAIN FEATURES	
Operating temperature range	-40°C to 60°C with Thionyle lithium batteries , size A with a specific connector -10°C to +60°C with alkaline batteries, size AA / LR6 Recommended temperature range to maximize the device autonomy : +5°C to +35°C.
Batteries autonomy	@25°C 2 years, with the battery supplied (Thionyle Lithium battery, size A) User-replaceable battery
Flash memory	16 Mbits Flash equivalent to 129000 measurement blocks (a shock takes 2 blocs) For example, it allows a 2 years campaign : - With a periodic measurement (temperature and tilt) every 15 minutes (70080 recordings) - And 29000 shocks
Radio communication	Operating on the ISM band This device is designed to be used on the European market (using the 868MHz band).
Radio frequence range	100 meters in free field
IP Level	IP54