DBS2T

SEISMOGRAPH

User Manual

General Index

1 Installation

1.1 Software

Refer to the folder / directory of the installation file , whose name is:

Install disk **DBS2T Vx.x**

You will find the installation file and a directory “FTDI Drivers” for driver installation.

Connect your seismic device to USB port of PC and execute installation of driver.

Then you can install the application.

An icon will appear on desktop.

1.2 Latency time

You have to verify that Latency time = 1ms.

This is why when acquiring in continuous mode, a Latency time greater generates timeot errors when acquiring from 24 channels.

First connect Dolang device to USB port.

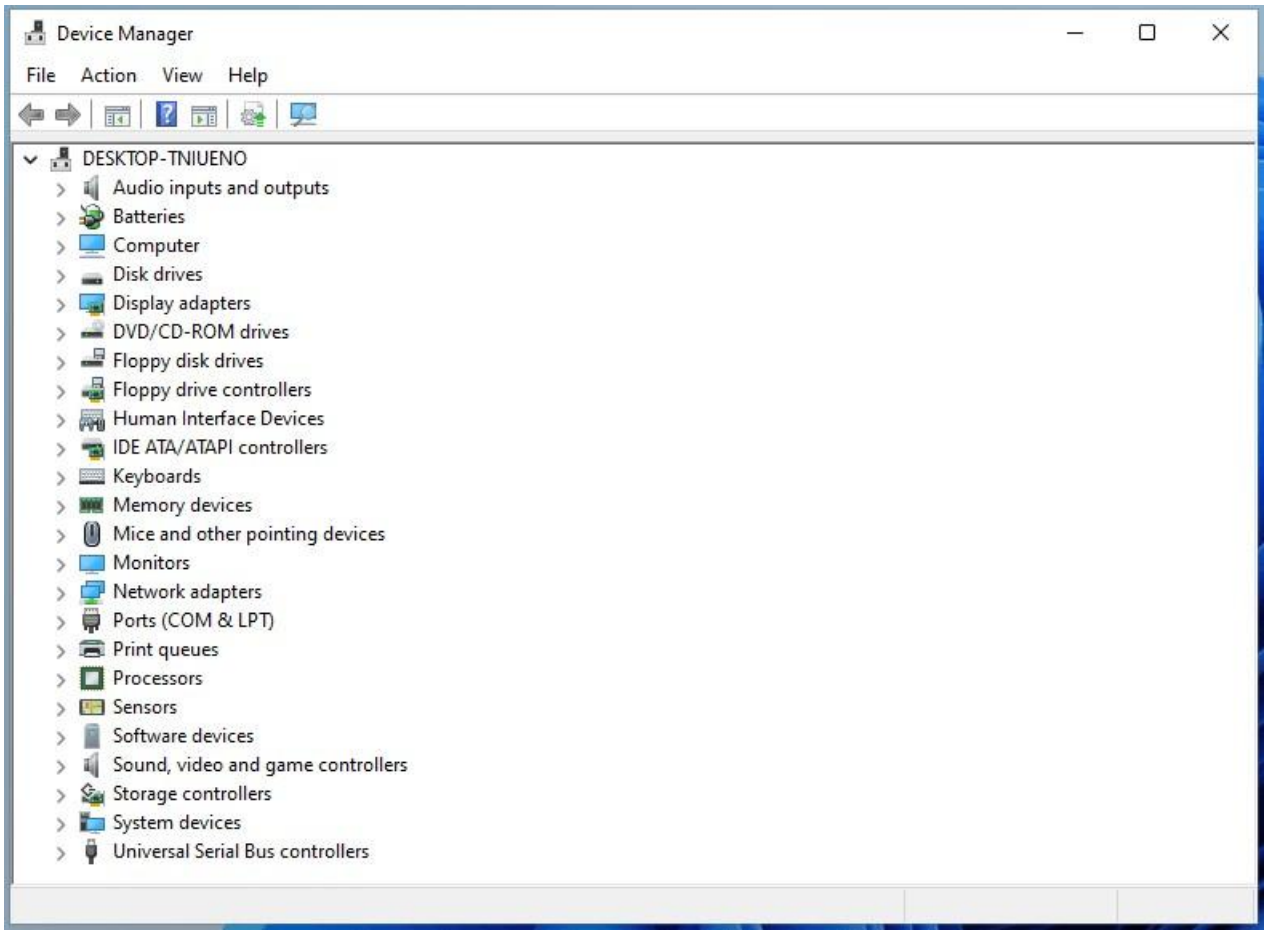
Remember the **number** of COM Port.

Launch DBS2T; go to "Initialization" from top menu of application, then select: **Latency time**.

Click on "Control Panel", than on System and Device Manager.

Then localize COM number relative to Dolang.

In case you have others USB devices connected, find Dolang COM unplugging other devices.



Localize COM properties and advanced parameters and find Latency time.

You have to change its value, that is generally 16ms as default, to a lower value, **1ms**.

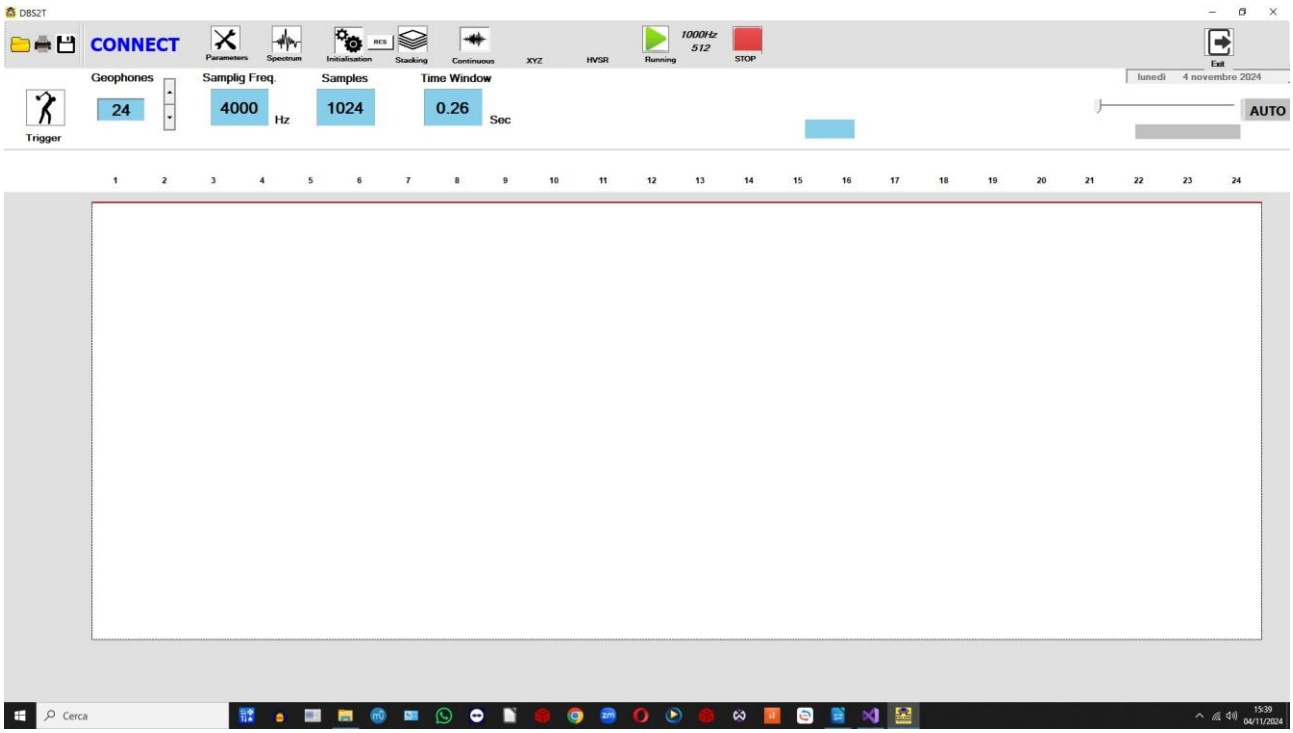
If you leave the value 16ms, when you acquire in continous mode, you will get an error.

With 16ms, PC/Notebook has not enough speed to execute the acquisition.

After Latency time has been changed, reboot your PC/Notebook, to make affective this change.

2 Application Start

Clicking on desktop icon, application will start:



Click on CONNECT and select the appropriate COM port.

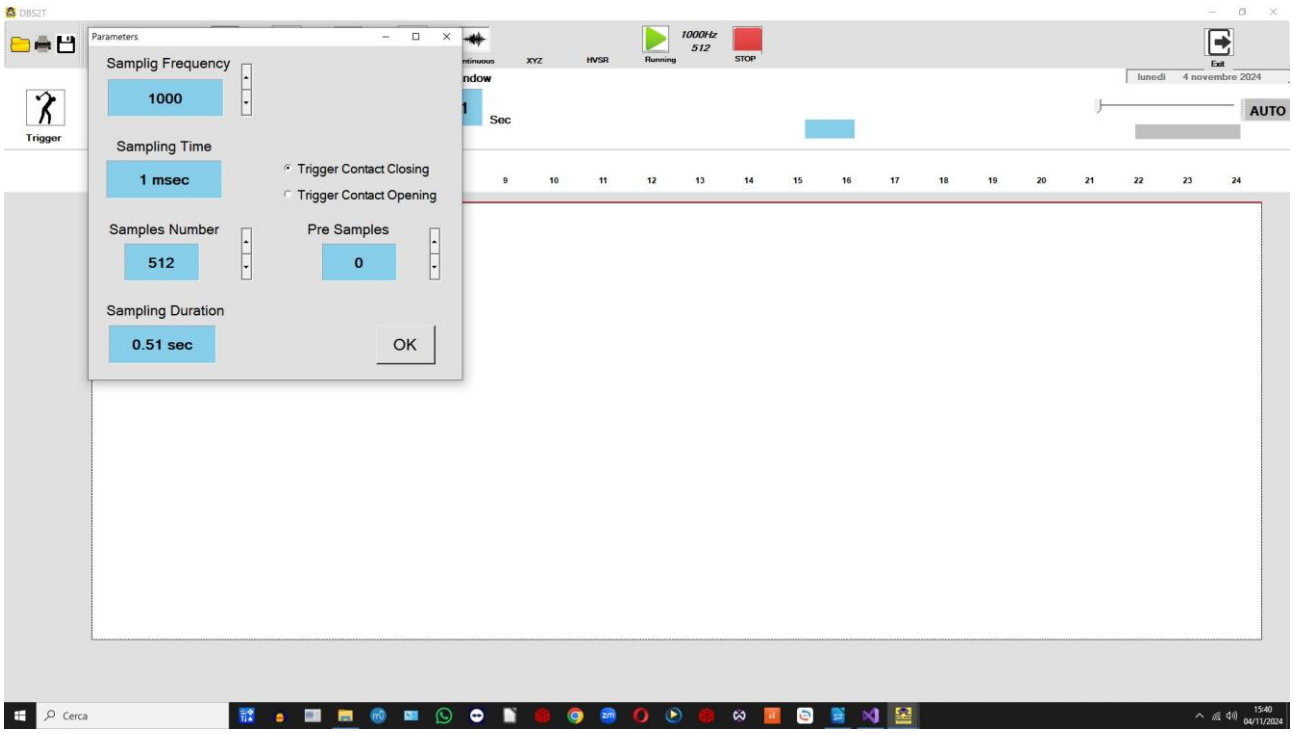
USB port is seen by application as a COM port, with its number.

On top of chart, units are numbered. If you have a device limited to 12 channels, set the correct Geophones Number in the box.

2 Setting Parameters for Acquisition with Trigger

Once you have entered the correct number of the communication port, enter the number of units (for ex. 24) in the box: Geophones.

Then click on Parameters



Parameters for triggering are shown.
In this example has been set a sampling frequency of 1000Hz (Sampling Time 1 msec), for a number of samples per channel equal to 512 .
As is shown, the acquisition lasts for 0.51 sec, as follows from relation:

512 samples / 1000Hz = 0.51 sec

Sampling duration = N samples / Sampling frequency

or

Samplig duration = N samples x Sampling Time

Remember to set trigger contact type, if will work when “closing” the circuit (when you hit the plate with hammer) or “opening” the circuit.
In this last case, hammer and plate will not be used, but user will have to set its own trigger system, using always the same cable.

To execute a trigger acquisition, click ok and go to: 

See paragraph number 4.

3 Acquisition in Running

Once the device is connected to the PC, and you have verified that the led on Dolang box is flashing, you can test if geophone and system works. Set gephone number and press the button: 

The system will acquire continuously, showing the result on chart.

Sampling frequency and samples number for “running” operation are written on middle top of screen, on the right of 

To change Sampling Frequency and Samples Number go to Initialisation and to Running.

4 Acquisition with Trigger

For operation with trigger, sampling frequency can have one of these values:

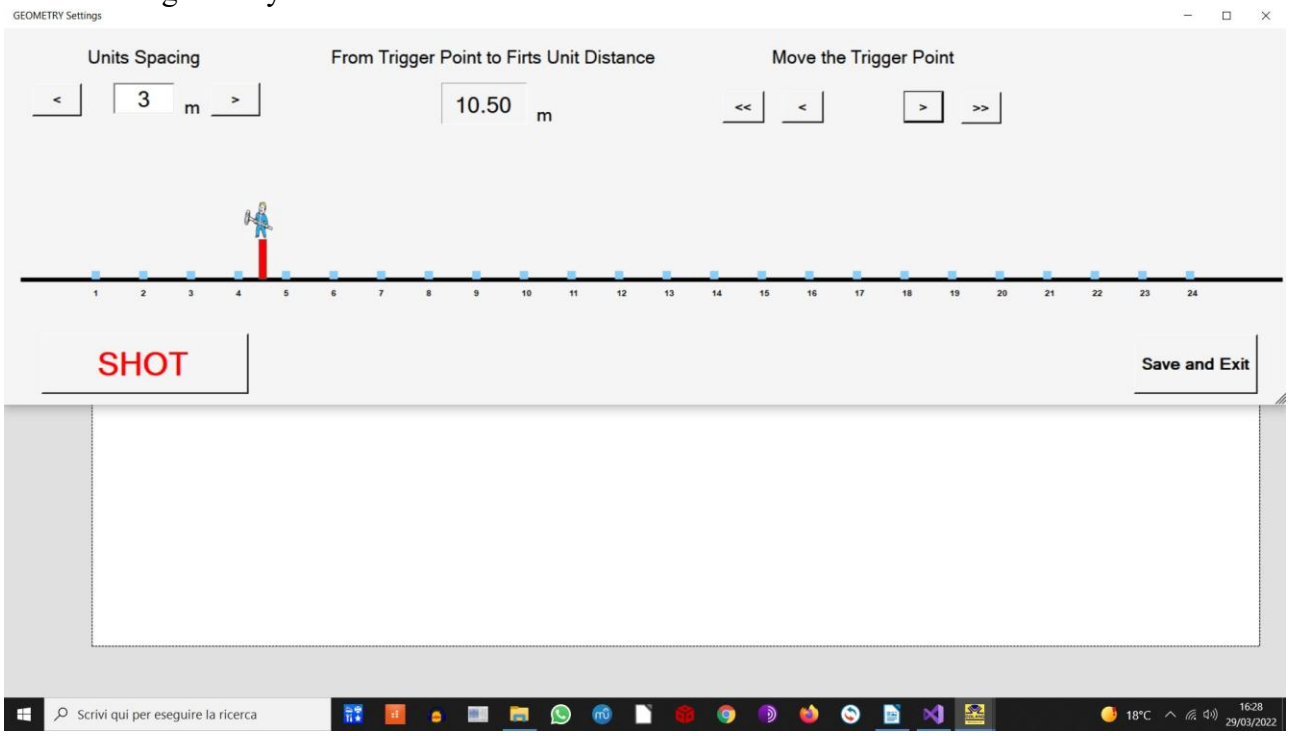
500Hz, 1000Hz, 2000Hz, 4000Hz

In the "Parameters" window, define whether the trigger signal will work in opening (eg. Explosion) or closing (eg. Hammer) of the contact.

For example, for a seismic refraction could be suitable the value of 512 samples and sampling frequency of 1000Hz.

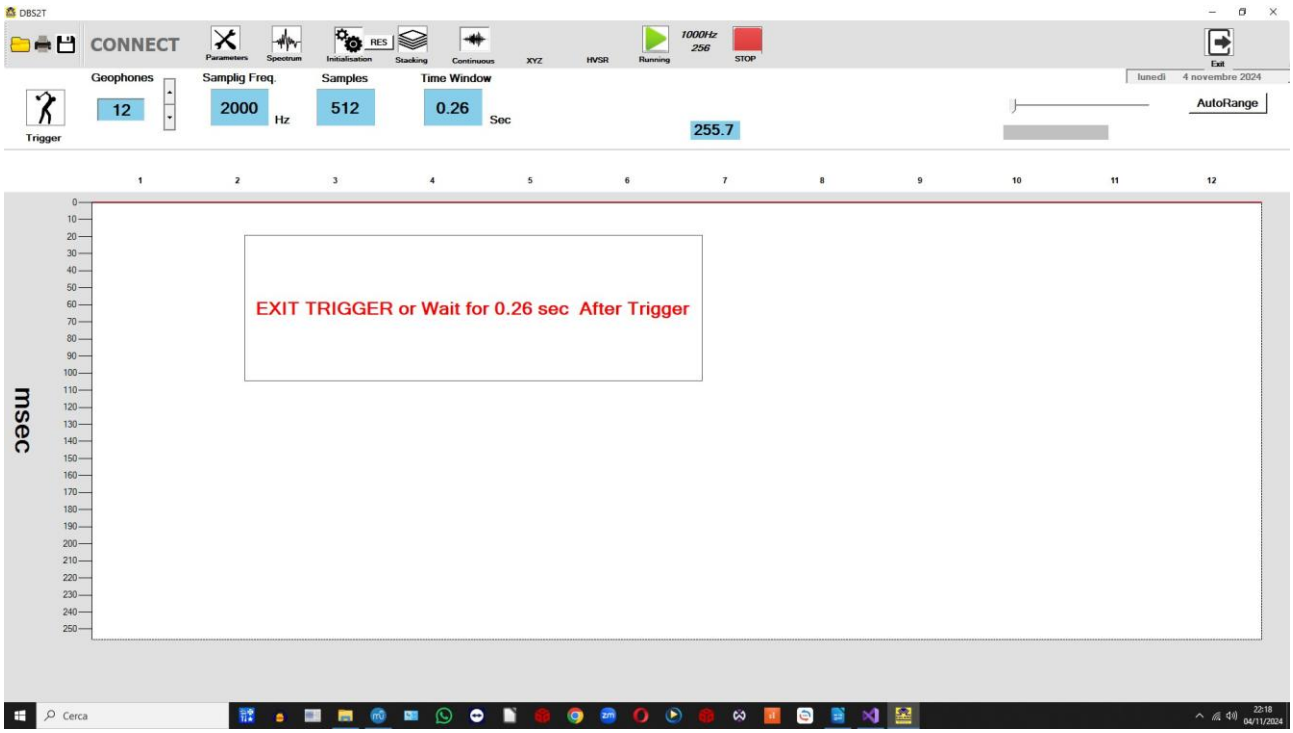
Click on 

Window of geometry will be shown:



Set the distance between geophones (which in the example is 3 meters) and the position of the trigger point, respect to the first unit. In the example, trigger point is amid geophone 4 and 5.

By clicking SHOT, the geometry disappears and a message will begin to flash:

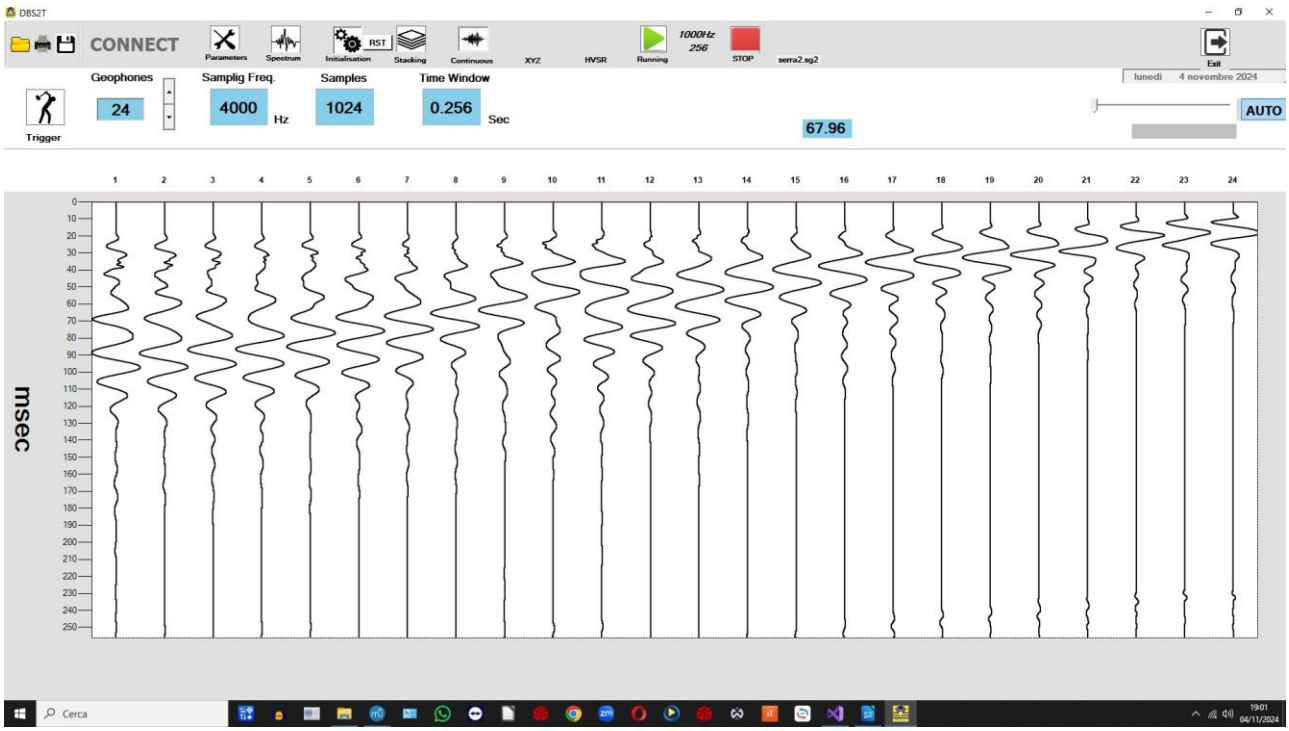


In message is indicated the time required to acquire the set number of samples.
In fact, this time is: 512/2000 = 0.26 seconds

The application is waiting for a trigger event, but if for some reason you want to abort this condition, you just have to click on message to exit.

When the trigger acquisition is finished, the application will ask if to save the acquired data.
If you decide to save, 3 versions of the file will be saved, with extension sg2, sgy and txt.

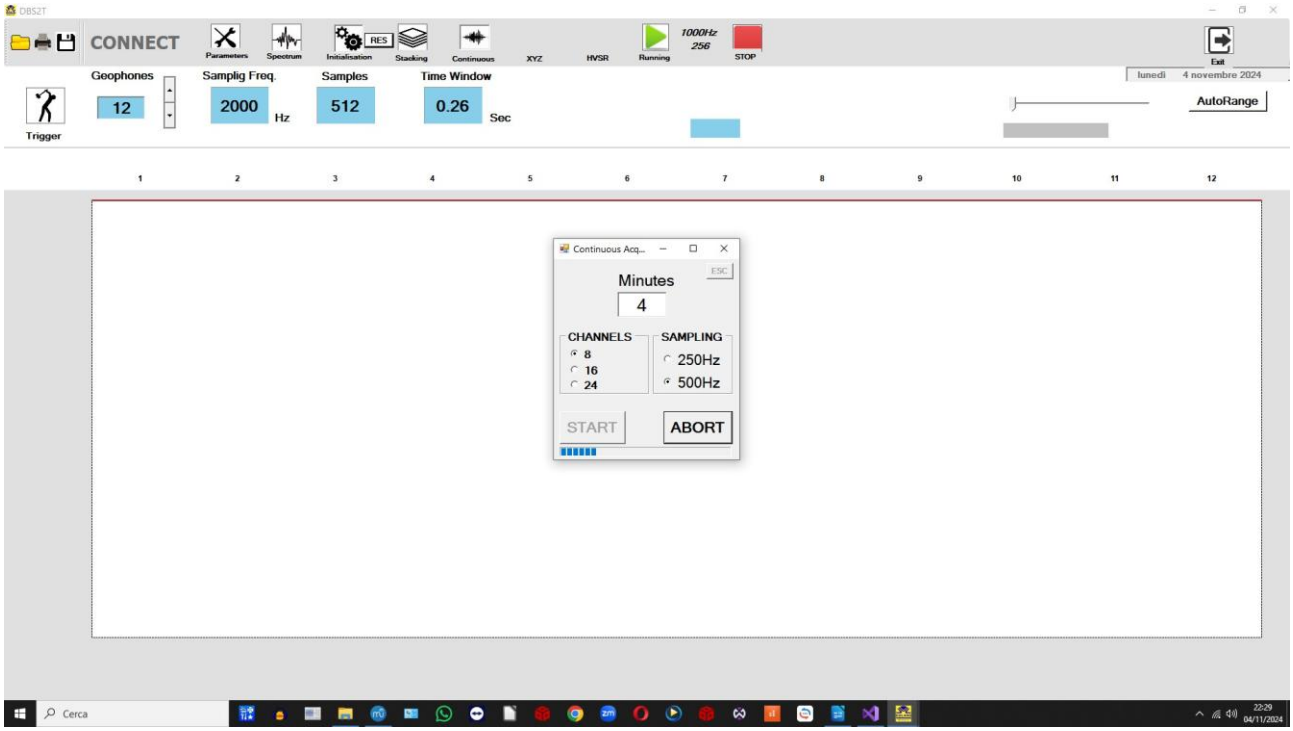
Below is an example of acquisition :



Moving the mouse over a point in a track, in a top right blue window will be visible the relative time from trigger instant.

5 Continuous Acquisition

Continuous Acquisition allows you to acquire for a time up to 60 minutes at sampling frequency of 250Hz or 500Hz, depending on the number of channels enabled.



In this case, 8 channles has been set, at a sampling frequency of 500Hz.

Setting 24 channels, sampling frequency will be 250Hz.

At the end of acquisition, file can be saved as sg2, sgy and txt format.

6 Stacking

In the goal of reducing the Gaussian noise, it is theoretically sufficient to mediate.

The STACKING do this, as it lets you add together the traces acquired (through trigger) at successive triggering sessions.

The resulting signal should be more clean, as long as the trigger is always carried out in the same exact condition and nothing has changed in the geometry.
This theoretical improvement of signal is due to gaussian noise present, that when added, tries to lower its average value with increasing number of acquisitons.
Statistic says that variance will be reduced by the square number of acquisitoons.
Signal to Noise ratio will be improved.

To acquire with the method "Stacking", go to the menu and select stacking.

On top a label will appear with the word “Sacking Enabled”.

At every triggering, tracks will be added together.

On top, a progressive number appears showing the number of acquisition.

After each triggering will be shown "Keep on staking?" Answer **no**, it ends the process of stacking and the file acquisition can be saved

6 Retriving files

On the upper left corner the menu, icon LOAD allows to retrieve an old acquisition.
Choose the appropriate .txt or .sg2 file and it will be loaded and the parameters on top menu are set to the new values (Samples, GEOPHONE Number, Sampling Frequency, Sampling Duration).
Geometry will be updated too.

7 GAIN

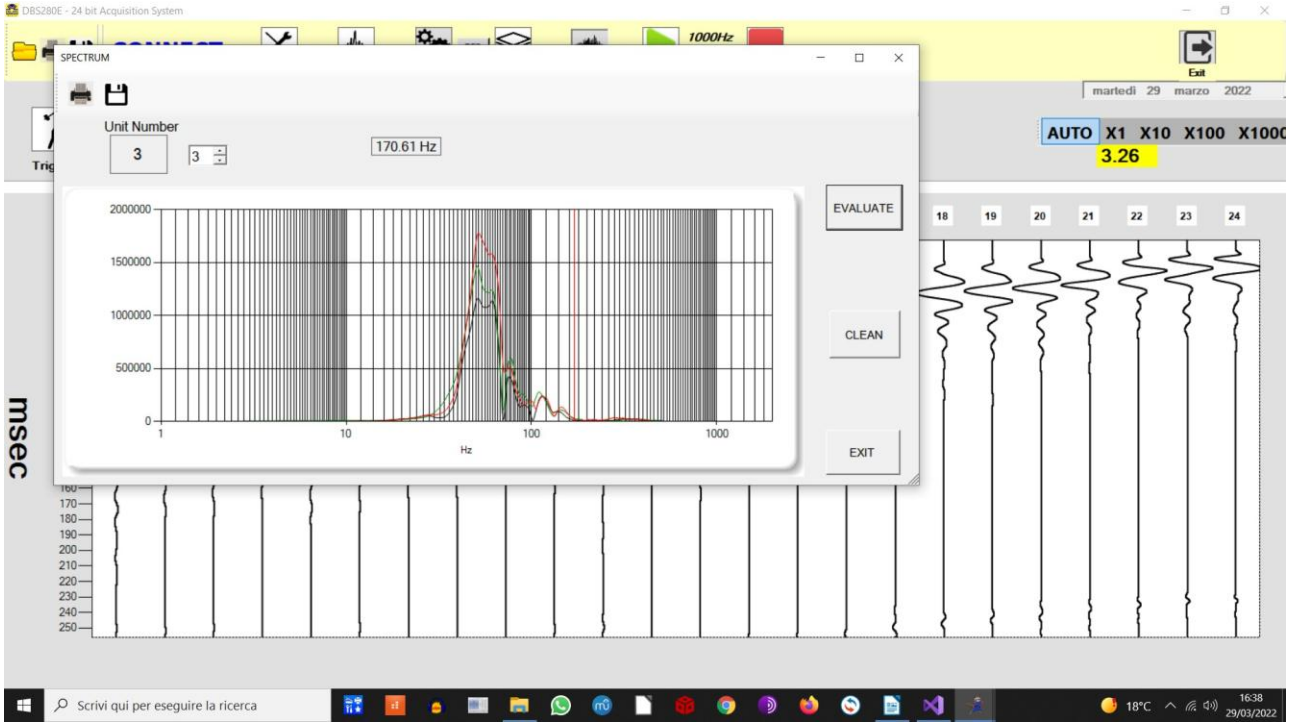
On top right of window there is a bar for continously changing gain of acquired data.

If you click to Autorange, gain is applied automatically in the way that signal is contained in its track, and it does not overlap on next tracks. Clicking on the bar, Autorange stops to have effect.

8 Spectrum

In the menu you can select "Spectrum", to carry out the spectral analysis of a track.
In following example has been selected track 1,2 3.

Moving the mouse over the graph, we can determine the value of the frequency accurately.



Being 4000Hz the acquisition frequency, the maximum frequency of 1500Hz is displayed in the graph, in accordance with the sampling theorem, that does not allow meaningful frequencies above half sampling frequency value.

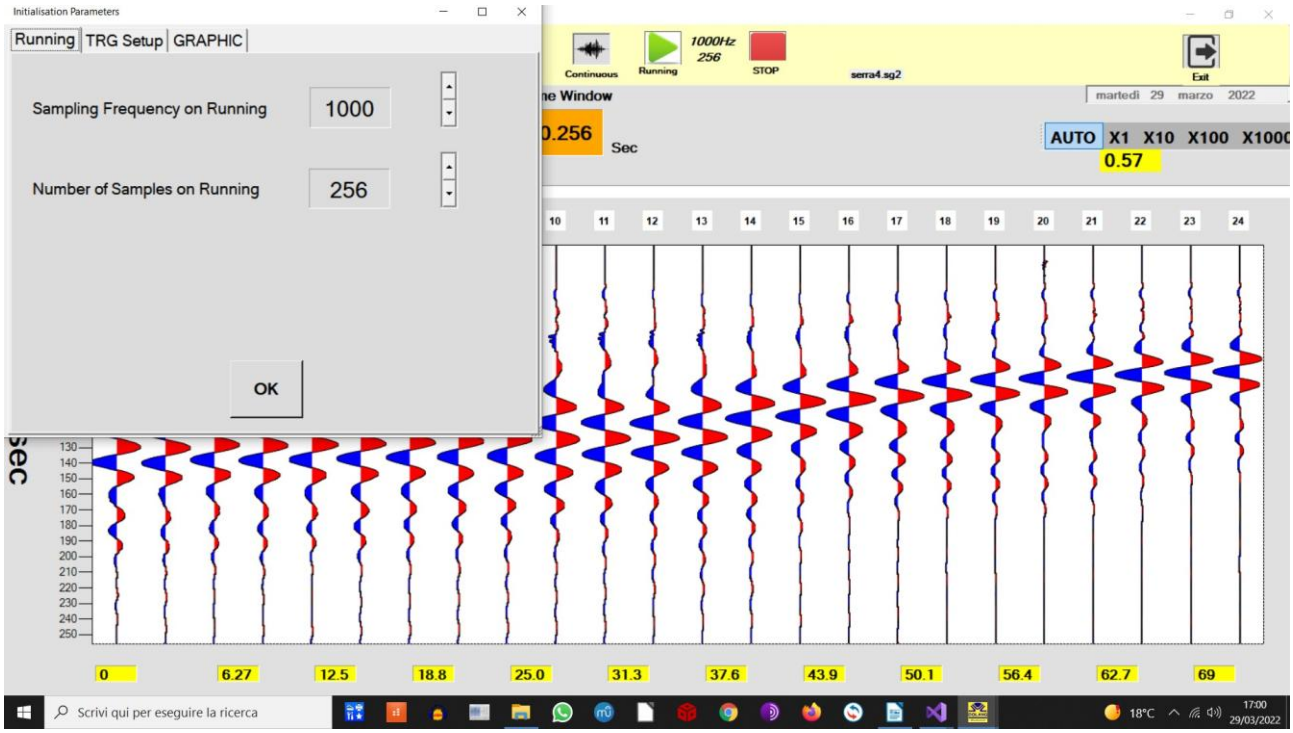
9 Initialisation

Clicking on 

Initialisation will be displayed. Tree tabs are possible: Running, TRG Setup, GRAPHIC.

9.1 Running

You can vary acquisition parameters when in “running” mode:

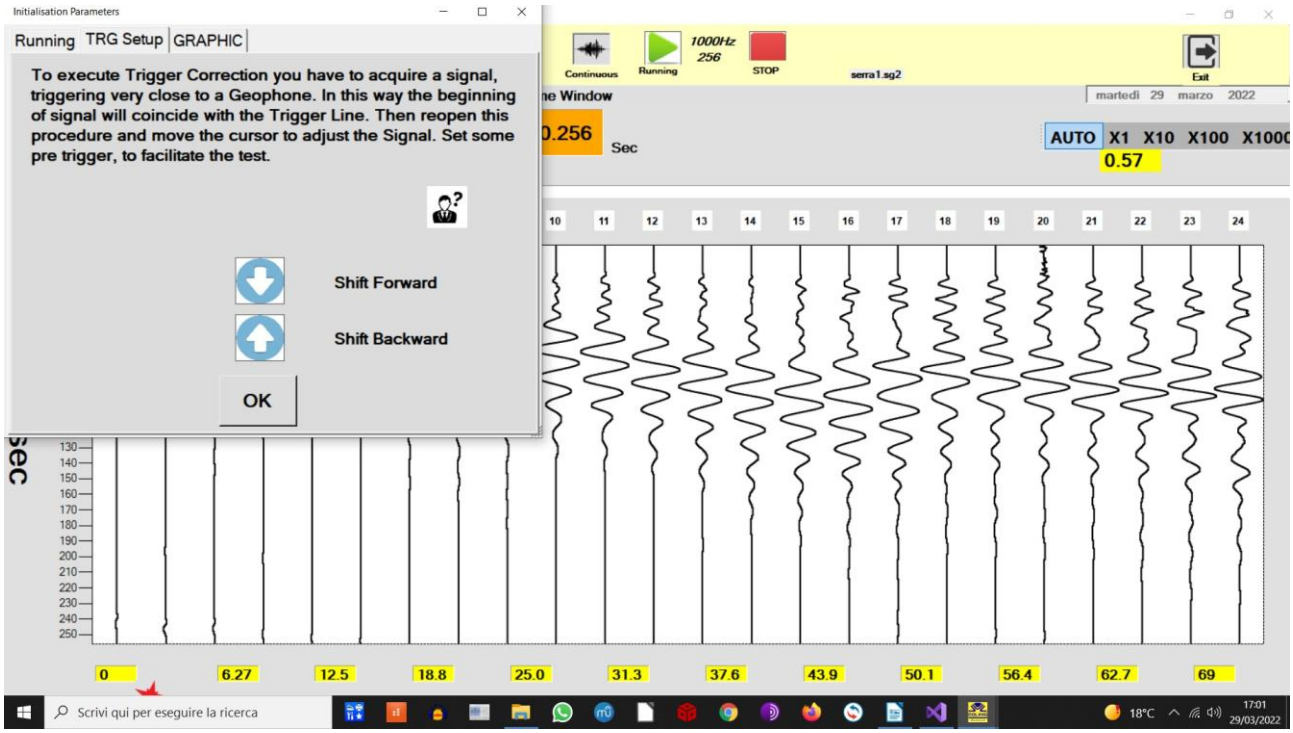


9.2 TRG Setup

This procedure can shift the beginning of signal acquired, in relation to its triggering point.

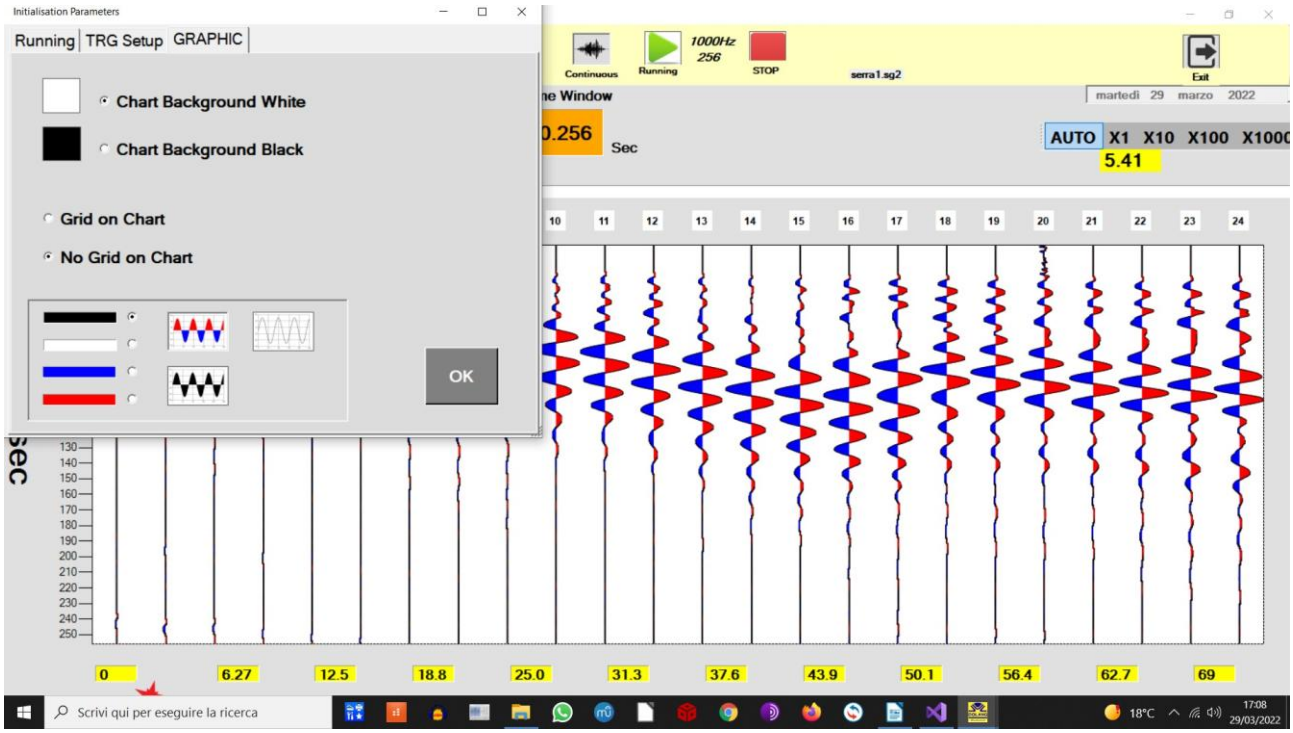
This procedure should not be necessary.

This procedure, if used not properly, can affect measurement.

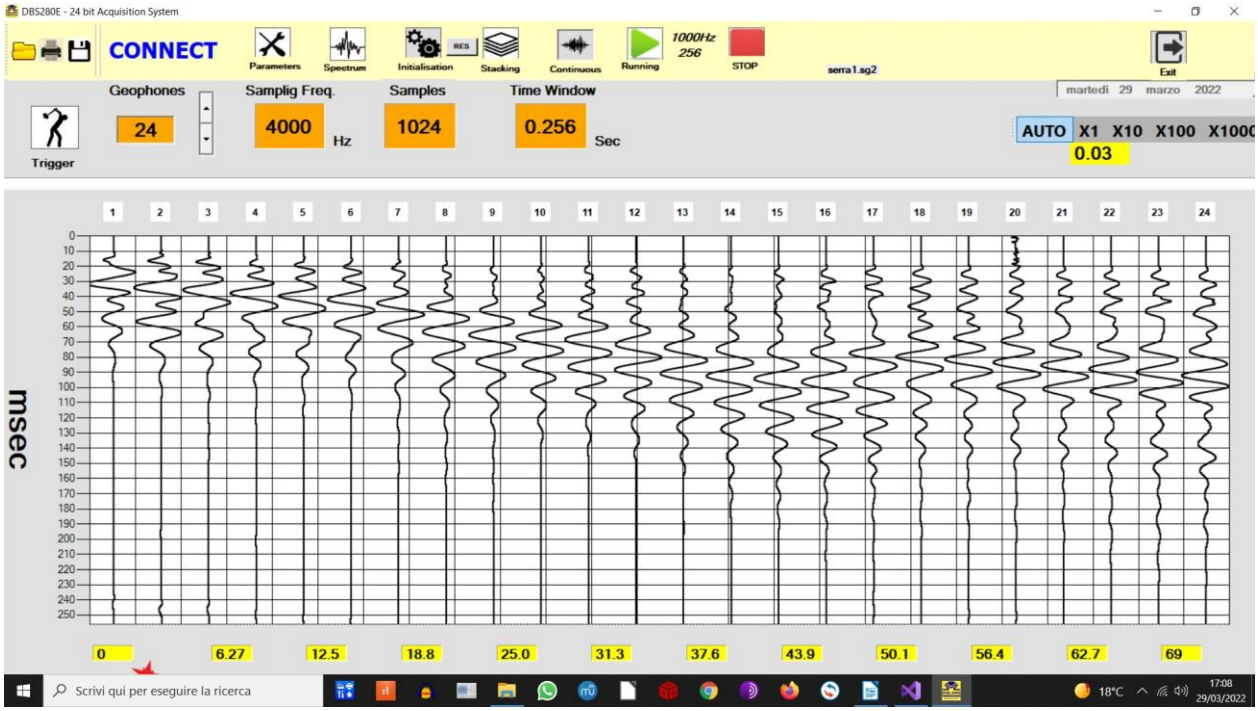


9.3 GRAPHIC

The way signals are displayed on chart can be changed with this option.



A Grid on chart has been set:



10 Other Considerations

10.1 Sampling Rate

To perform a correct acquisition, should be thoroughly learned what it means "signal", what is its spectrum, filtering, reconstruction of signal from its samples, sample rate etc ...., otherwise you may set the parameters without understanding why and do not correctly interpret what happens.

The basic parameters of the process of acquisition is the sampling frequency (Fs,
from sampling frequency) and resolution (see below).

The reciprocal value of Fs is the sampling interval (Ts, by sampling time).

In the application, in the Parameters window, it acts directly on Fs (Hz) and as a result, of Ts (milliseconds).

To find out how long is the acquisition process, the formula is as follows:

Acquisition Time = Number of samples / Fs

or

Acquisition Time = Number of samples x Ts

For example, if I want a long acquisition time at a high Fs, I expect a large number of samples.

It is not simple to deal with a large number of samples; for cases where it is required a long period of acquisition, a low Fs is used.

A basic rule of sampling is that **Fs must be at least twice the highest frequency contained in the signal** to be acquired (Nyquist theorem).

If the rule is broken, the acquired signal contains errors (aliasing).

By the nature of the signals to be acquired, which are coming from a geophone, the spectrum barely reaches a few hundred Hz, starting from a minimum of a few Hz, depending on the geophone used, thus not requiring a high Fs.

So in the case of a geophone, it is expected it will provide signals until 300Hz.
A sampling frequency must be at least twice this value, i.e. 600Hz.
A hardware filter on Dolang system provides to eliminate / mitigate frequencies not useful, coming from geophone.

In practical usage a FS=1000Hz it is generally enough; in this way you will get signals with a number of samples not too large. Post-Processing not huge files is easier.

10.2 Resolution

The resolution is determined by the number of bits produced by the AD converter.
Higher is this bit number, higher will be resolution.
The higher the resolution, the more the sampling system can "see" small signals.
DBS280B uses a 24-bit converter, so if it is assumed that the geophone can give a maximum signal between 1V and -1V, matching the range of AD converter, the theoretical minimum measurable signal is:
2volt / 2 ^ 24 = 119 NV = 0.119 millivolts microvolts = 0.000119 = 0.000000119 volts
Although this measure is theoretical and is incredibly low, it gives us a strong factor to measure the goodness of an acquisition.

An acquisition at 16-bit, at least theoretically, is 256 times worse than at 24-bit.

In DBS280B each channel has its own AD converter and aplifier. This expansive feature gives us the better affordable signal.

10.3 Signal / Noise Ratio

This parameter is very important , as it can measure and tell us what is actually possible to discriminate a signal acquired in the presence of noise.
The problem to recover a signal from the noise is universal and always present in every situation .
If you remove the geophone and short-circuit the inputs of the unit , the signal only noise source is internal to the equipment, or from electromagnetic interference , or due to the digital conversion process, which gives rise to the quantization noise. The quantization noise decreases with the increase of the bits number of AD converter.

AD converter is a Successive Approximation and downsampling type. Sampling frequency is performed at low resolution at 128KHz, then reduced with digital filtering, to get a 24 bits data at 4KHz. For its high sampling frequency, aliasing is not a problem when acquiring.

If the noise produced by equipment was zero, we had to deal only with quantization noise.
Considering an AD that converts perfecly and with 24 bits of resolution, Signal/Noise ratio will be approximately 144dB , which is a theoretical unreachable ideal value.

12 Technical Data of DBS2T > WATER PROOF <

Structure	Device connected by USB/RS485 to PC
Max geophones	24 or 12
Input	Differential Input, Input resistance 47kohm
Resolution	24 bit
Filtering	Automatic filtering at each Fs for a bandwith related to Fs, but not exceeding 250Hz.
Sampling Frequency (Fs)	500Hz, 1000Hz, 2000Hz, 4000Hz
Number of samples	8192 samples max
Continuous Acquisition Sampling Frequency	500Hz - 250Hz
Max Sampling duration in continuous mode	1 hour
S/N ratio	> 105dB at Fs=1000Hz, N=1024
Trigger	You can connect a trigger wire of desired length, to work in contact opening or closing.
Power	Power comes from the USB port of PC No battery needed.
Nyquist frequency	512KHz at every Fs
Connection	Unit serially connected to PC by USB/RS485 standard, at 1MHz baudrate
Software	Application for Windows XP, 7, 8, 10 allows easy setting of all acquisition parameters and produces a .sgy and sg2 file for further analysis