



DBS280B V3
SEISMOGRAPH

User Manual

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1 Software Installation

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

Install disk **DBS280 V3.x**

In it there is a file with the name :

FTDI Drivers

Open it and follow the prompts to install the USB drivers needed to operate the equipment.

After installation of the driver, run the installation file:

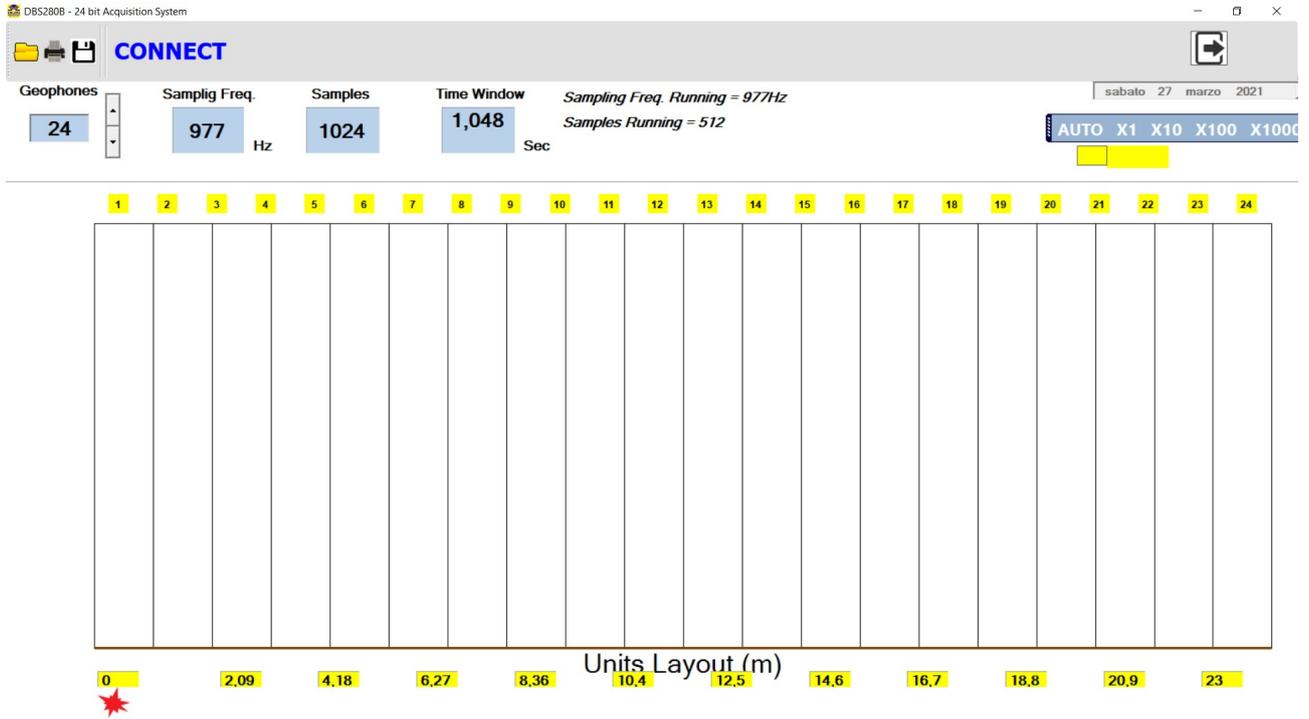
setupDBS280V3.X.exe

Will be created in C drive (default): DBS280B V3 folder , with inside the application file , with the name: DBS280B V3.exe .

An icon will appear on desktop.

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.

Connecting another device to the same USB port, OS will assign a new number.

On top of chart units are numbered, at bottom, geometry position in meters is shown.

3 Acquisition in Running

Once the device is connected to the PC, and you have verified that the led has flashed, you can verify if geophone and system work. Set geophone 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.

To change them go to Initialisation and to Running.

4 Acquisition with Trigger

For operation with trigger, sampling frequency must be set equal to:

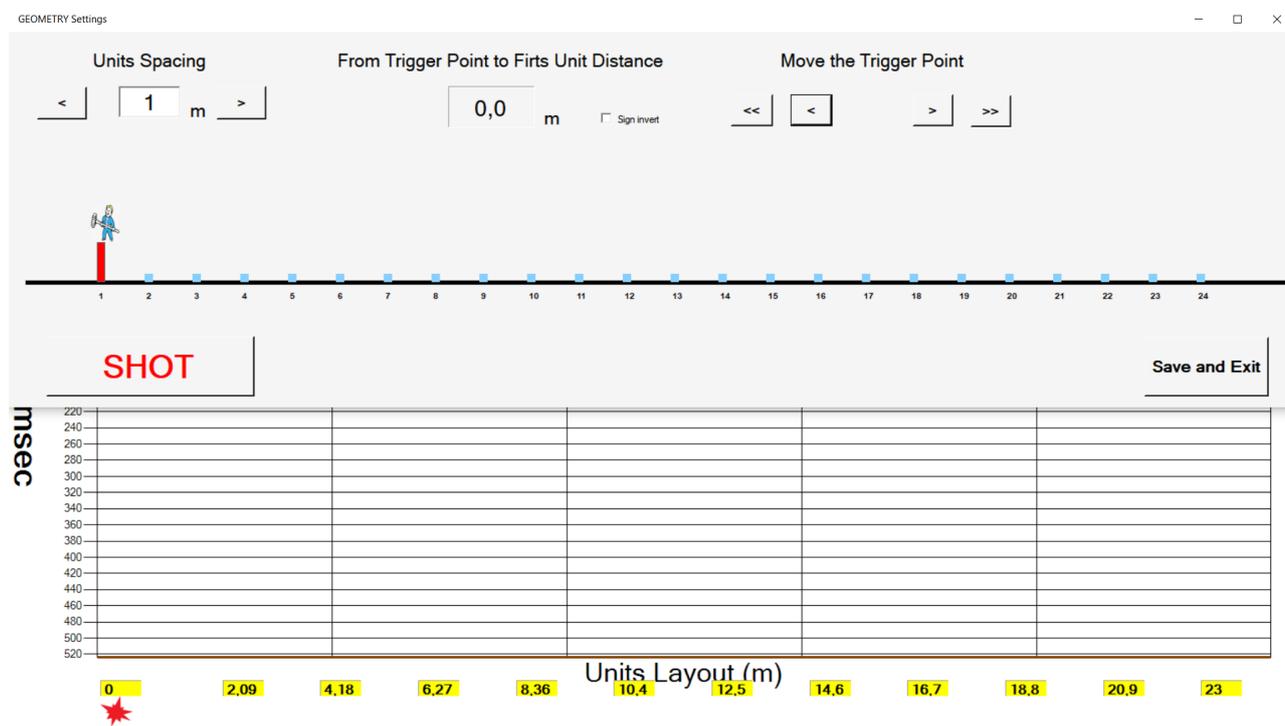
244Hz, 488Hz, 977Hz, 1953Hz, 3906Hz, 7812Hz

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 can be suitable the value of 512 samples and sampling frequency of 1953Hz.

Click on 

Window of geometry will show:



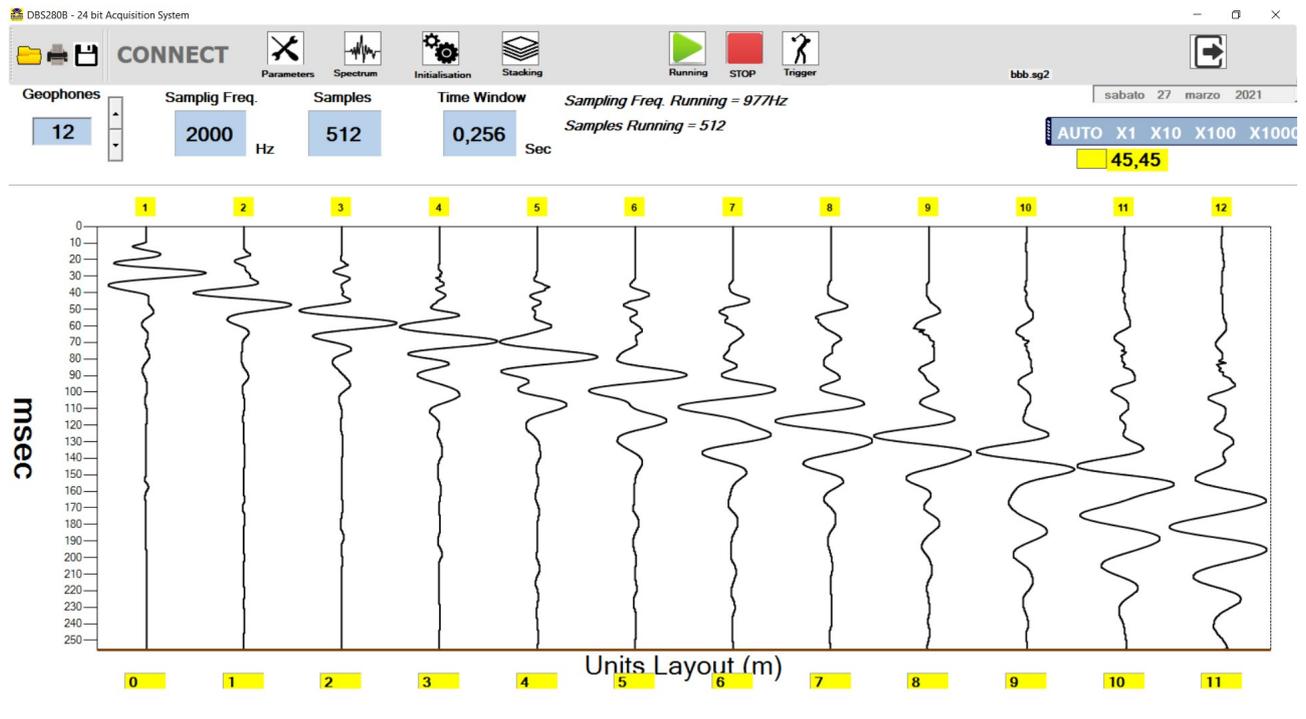
Set the distance between geophones (which in the example is 1 meters) and the position of the trigger with respect to the first unit.

By clicking SHOT, the geometry disappears and a message "EXIT From Trigger" will begin to flash.

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

When the trigger acquisition is finished, the application will ask whether 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 track and clicking, in the CH box will be displayed its number.

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

5 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 times.

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.

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

The graph will become blue.

At every triggering, tracks will be added together.

On top left corner 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

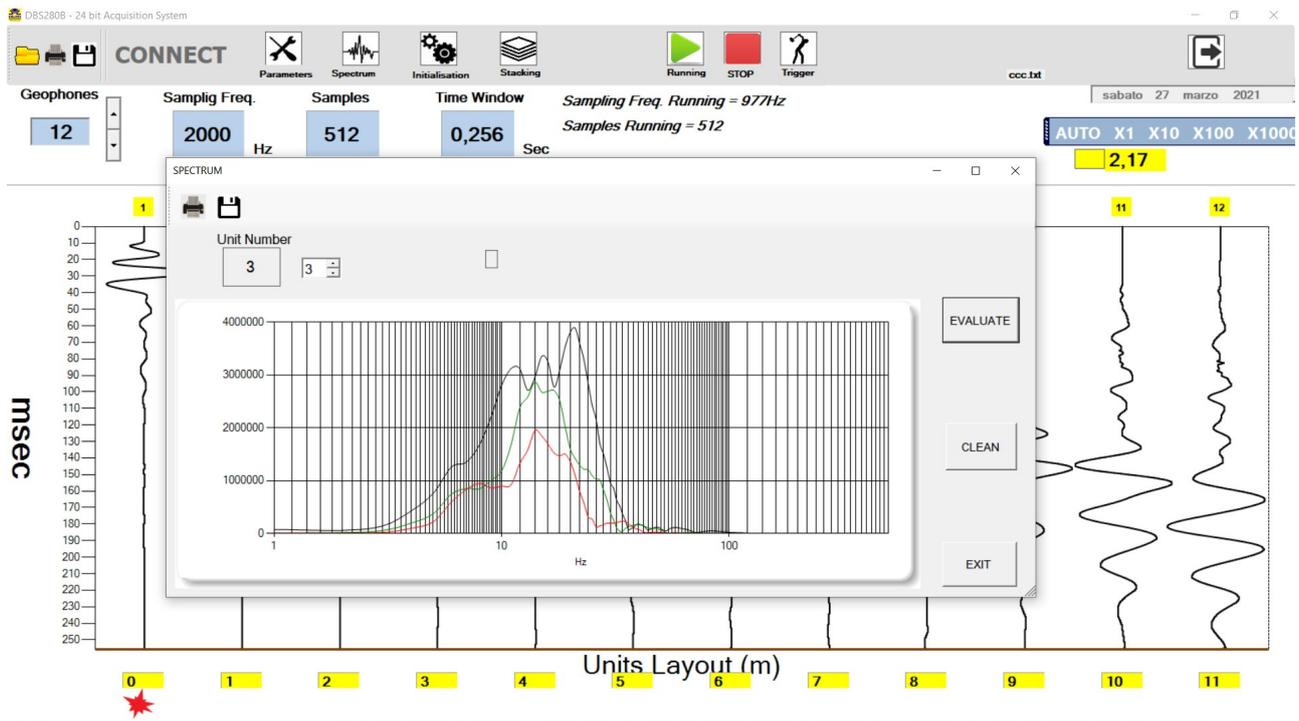
6 Retriving files

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 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 2000Hz the acquisition frequency, the maximum frequency of 1000Hz is displayed in the graph, in accordance with the sampling theorem.

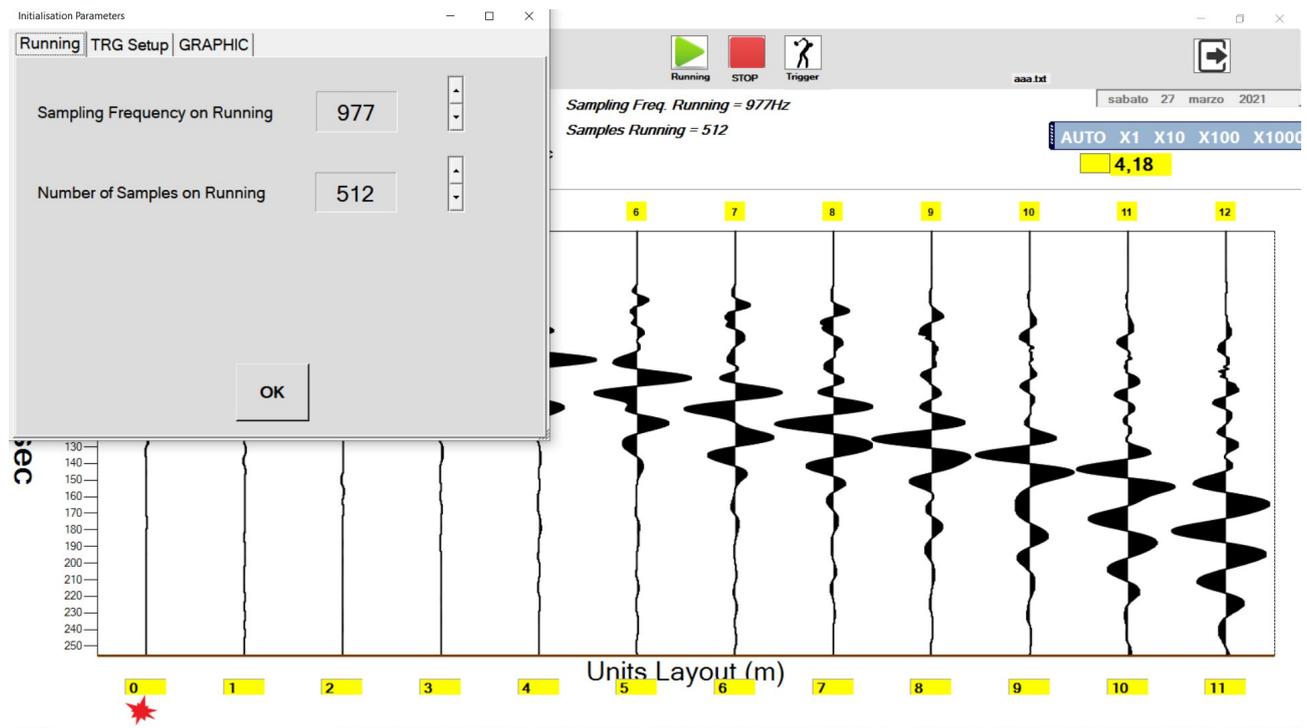
8 Initialisation

Clicking on 

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

8.1 Running

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

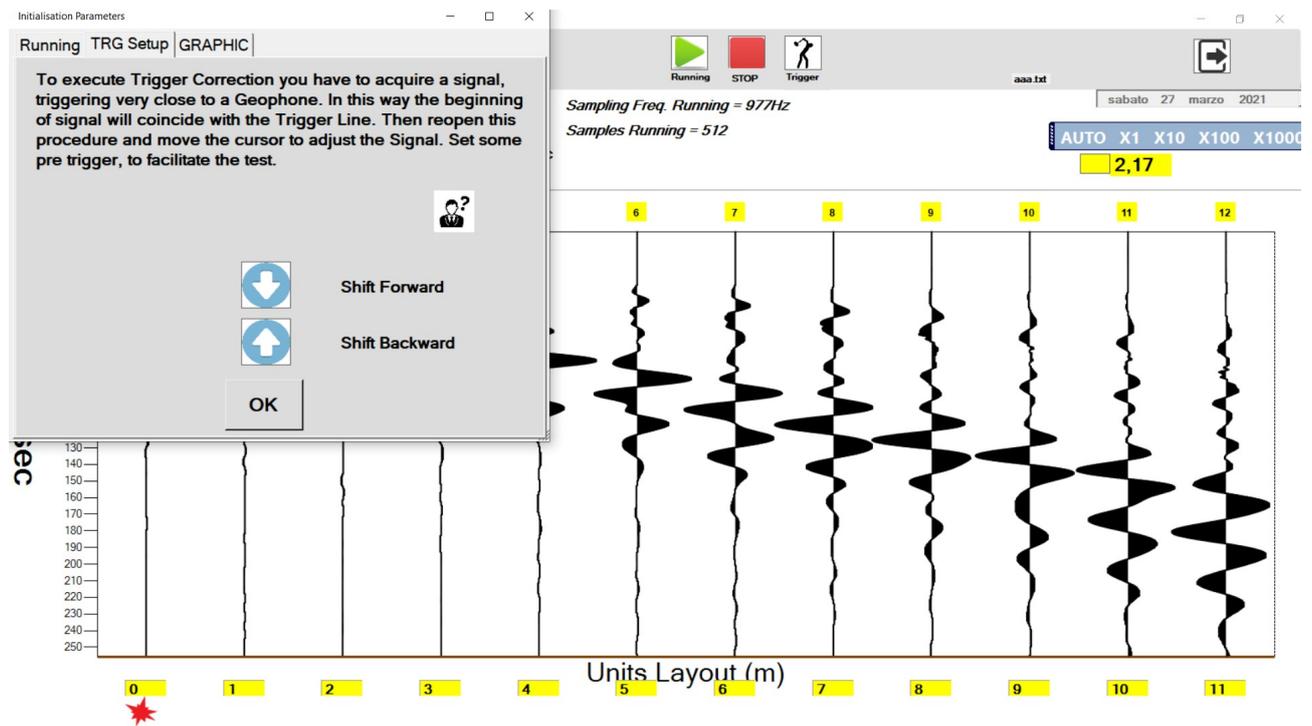


8.2 TRG Setup

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.

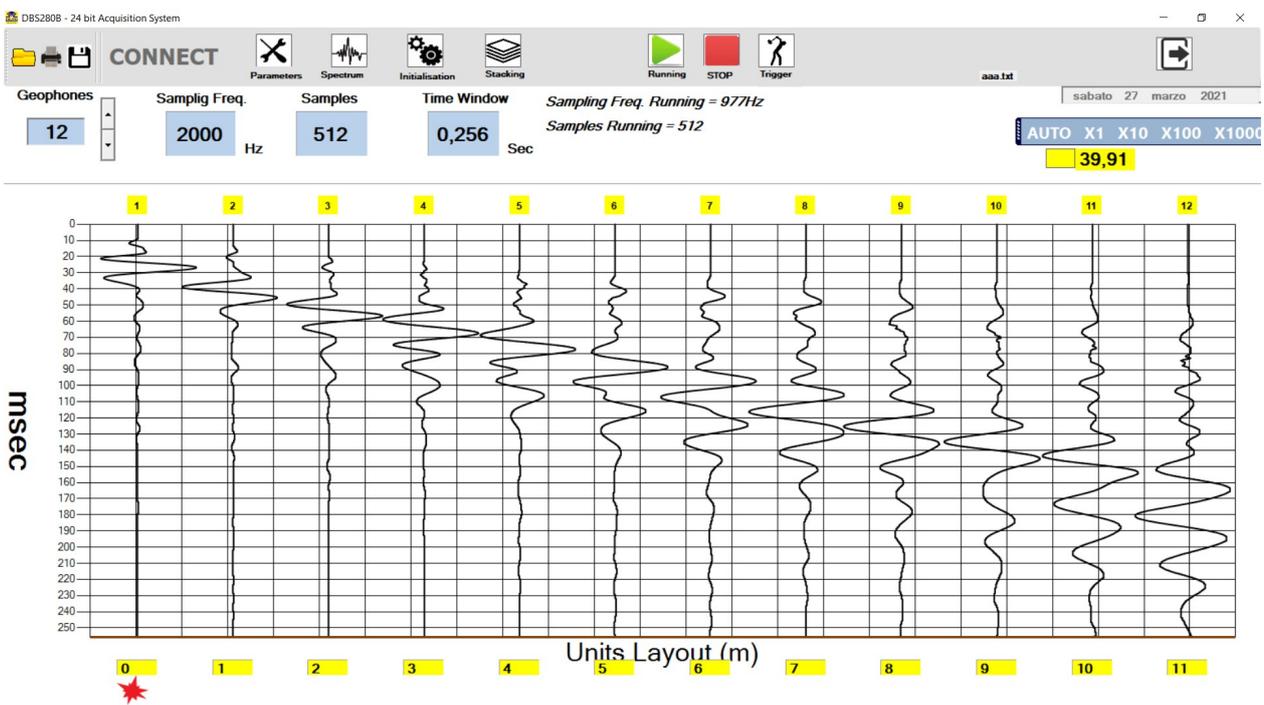


8.3 GRAPHIC

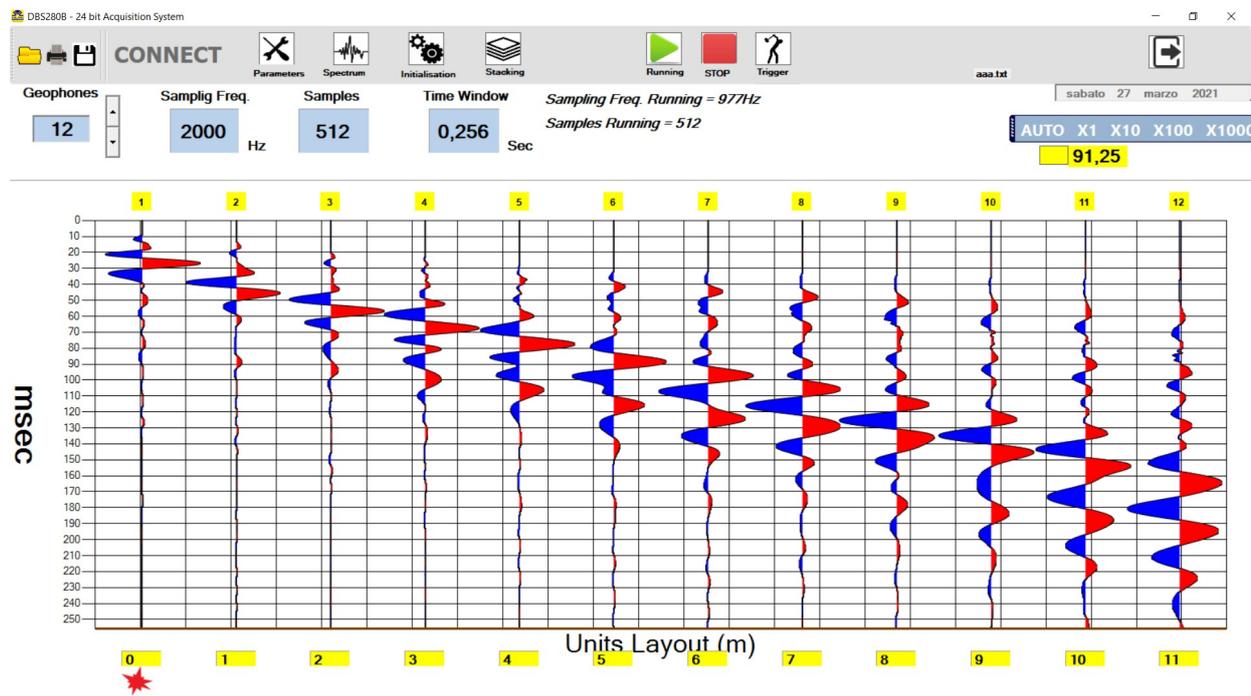
The way signals are displayed on chart can be changed with this option.



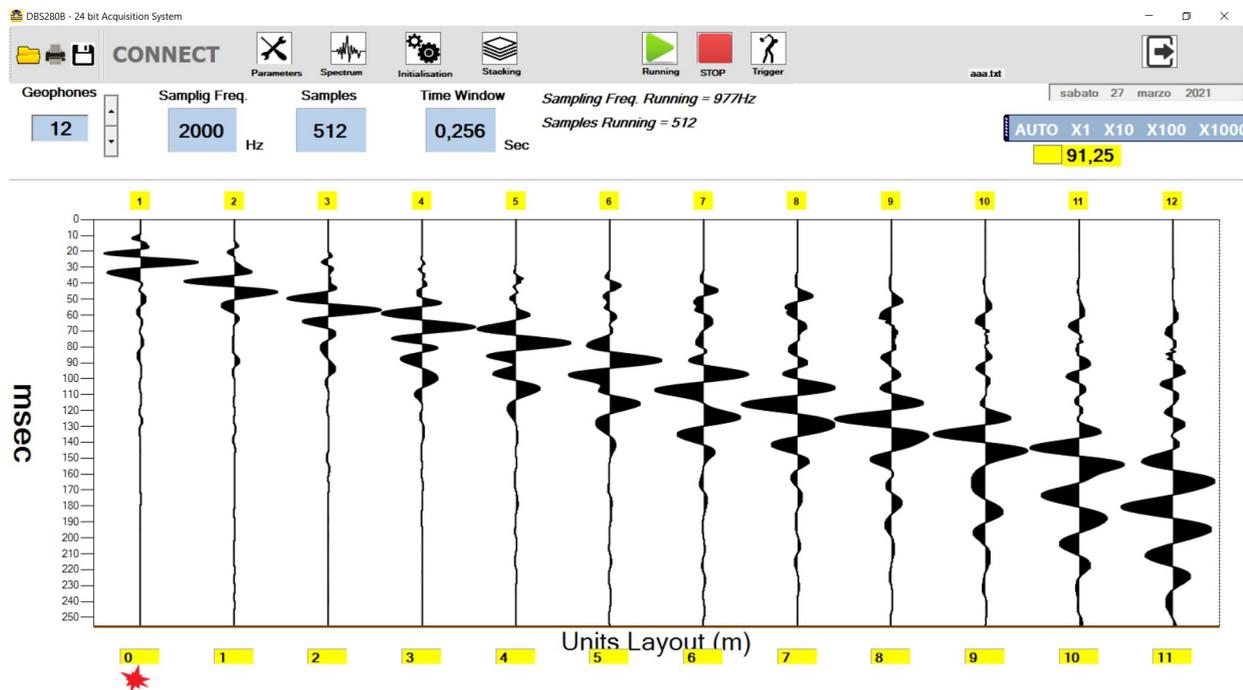
A Grid on chart has been set:



Now solid color has been set:



Solid color only black and no Grid:



9 Other Considerations

9.1 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 (F_s , from sampling frequency) and resolution (see below).

The reciprocal value of F_s is the sampling interval (T_s , by sampling time).

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

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

Acquisition Time = Number of samples / F_s

or

Acquisition Time = Number of samples x T_s

For example, if I want a long acquisition time at a high F_s , 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 F_s is used.

A basic rule of sampling is that F_s 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 F_s .

So in the case of a geophone, it is expected it will provide signals until 300/400Hz, the sampling frequency must be at least twice, or 800Hz.

A hardware filter on this unit provides to eliminate / mitigate frequencies not useful coming from geophone.

9.2 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:

$2\text{volt} / 2^{24} = 119 \text{ NV} = 0.119 \text{ millivolts microvolts} = 0.000119 = 0.000000119 \text{ volts}$

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 amplifier. This expansive feature gives us the better affordable signal.

9.3 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 of conversion.

This quantization noise is reduced by the averages that are performed to get F_s from 7812Hz. For example at 977Hz there is a quantization noise 8 times lower than at 7812Hz.

This process of noise reduction is called "Noise Shaping".

This averaging also reduces random Gaussian noise.

DBS280B provides a value for this ratio, better than 124dB for $F_s = 977\text{Hz}$, which is a very good result.

If the noise produced by equipment was zero, we had to deal only with quantization noise.

Considering an AD that converts perfectly and with 24 bits of resolution, Signal/Noise ratio will be approximately 144dB, which is a theoretical ideal value.

Signal/Noise ratio is a critical value but it is very often not correctly shown on many acquisition systems. Even other parameters are more or less invented, having no real relation with hardware.

10 Technical Data of DBS280B

> WATER PROOF <

Structure	Device connected by USB/RS485 to PC
Max geophones	24 or 12
Resolution	24 bit
AD Converter	Sigma Delta
Sampling Frequency (Fs)	244Hz, 488Hz, 977Hz, 1953Hz, 3906Hz, 7812Hz
Number of samples	10922 samples max
Max Sampling duration	With Fs = 240Hz is 44.76 sec
Trigger	You can connect a wire trigger of desired length, to work in contact opening or closing.
Power	The power comes from the USB port of PC
Bandwidth	Up to 500Hz, 2 poles low pass filter, DC component rejection
Input impedance	47000 ohm
Nyquist frequency	3906Hz at every Fs
Signal/RSM noise ratio	122dB at Fs=977Hz, input shorted
Connection	Units serially connected to PC by RS485 standard, at 3MHz 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