SOFTWARE SECTION

Warning! Some software features may be
different compared to this manual
but the basics remain the same.
If you are in trouble in the understanding of operation
of the software feel free to ask for help to our engineers.

(5 / 2012)

SARA electronic instruments s.r.l.
Via Mercuri 4 – 06129
PERUGIA – ITALY
Phone +39 075 5051014
Fax + 39 075 5006315
email: info@sara.pg.it
URL: www.sara.pg.it

this page has been intentionally left blank

Introduction
DoReMi is a software application program used only with the DoReMi data acquisition systems produced by SARA electronic instruments srl.
Is dedicated to the management of digitizers DoReMi in all the ways in which they are used for seismic surveys. The DoReMi system can be used to investigate MASW, SASW, REMI, refraction, reflection, downhole, crosshole, and so on.

This section provides no guidance on how to proceed with the execution of seismic surveys, but rather is a reference guide to the system control and data acquisition.

DoReMi software has been developed Windows PC and is therefore compatible with all operating systems Microsoft Windows 32 and 64 bit: Win98, WinMe, NT, 2000, XP, Vista and Windows 7.

Warning! Compatibility with Windows Vista is not guaranteed, there 'is no development or testing for this operating system. Windows7 will be fully supported, at the moment we did not encounter any problems using the DoReMi software.

System Requirements
DoReMi software to work with PC requires a Microsoft Windows operating system. The requirements for RAM and processor are not demanding but it is important to take into account the needs of the operating system itself.

Interface
The interface with the system is via a classic RS232 serial port. To date, the majority of personal computers have none, the DoReMi system is then provided with a USB-RS232 adapter which has been successfully tested by us.
This is a "cable" adapter and therefore its use is completely transparent to the user except for the fact that it must be installed and configured the driver before using the seismograph DoReMi.
On request you can have an interface with Ethernet connectivity. This solution enables the simultaneous connection of multiple lines DoReMi also spread over considerable distances.

Installation
If your PC has a serial port is recommended to use this instead of the USB adapter. If your PC has no serial port is needed BEFORE installing the USB adapter and then the software DoReMi.
To install the adapter must follow the instructions in its package and/or on the CD containing the driver. In general it should be noted that the USB-RS232 adapters are used to configure the serial port with a port arbitrary identifier COMx for example COM5 and COM7 or any other number between 1 and 64.
It's important to know that often any USB port (especially the best PC) is headed to its own USB controller and thus engaging the adapter on a port different from the previous operating system to require you to reinstall the drivers to the new position. This is neither bad nor good, it is important to bear this in mind, however, given that every time you use the adapter to a different USB port, it will be seen by the operating system as a different COM port and it should be taken into account for the correct software operation of the seismograph.
Is recommended that the seismograph is used always with the same USB port, this will avoid confusion.
After installing the driver for the USB-R232 proceed with installing the software DoReMi. Inside the CD you will find a setup.exe file (or just SETUP).
A double-clicking the file will start the installation process. Unless other instructions given by the manufacturer or your dealer can follow the proposals for the installation.

Launching the program
From the start menu (START) found the sub-menu DoReMi, and then his DoReMi sub-menu, clicking on its icon the program starts.

Description of operation

The operation of the seismograph DoReMi is described in part in the description of the instrumental sections. However a mention here is necessary for those who had missed the reading of the manual from the beginning.

DoReMi is a seismograph constructed to be light, practical and flexible in its use. Compared to the other seismographs DoReMi is almost invisible because all (or almost) to its electronic resides along the cable. The entire management of the seismograph is via the control software that is described in this chapter. But there are some things to know before proceeding with the description of the control software.

As mentioned the seismograph is distributed with the channels along the cable stringing. This has many advantages including a very important one regarding the possibility of replacing the various elements and their use in various configurations.

Each channel must be "addressed": the software must be able to communicate with each channel independently from the others.

In seismograph DoReMi, unlike the seismographs integrated into a single box where the channel selection is wired, each element (or channel) corresponds to an address that can range from 1 to N, the sequence is usually progressive, but the system will work even if installed using an arbitrary sequence.

Obviously you must be aware of the precise location of each item to make sense of the acquisition. Although this possibility seems to be trivial or even a source of concern, but, just as an example, if a channel fails, you can disconnect it from the chain and replace it with another one giving to the new channel the address of the broken one.

Normally when you receive a new instrument all the channels are assigned in consecutive order with the serial number of the lowest set to channel 1.

From now on we will refer to the address so as to **channel.**

As a user you can then work with your system-wide channels, giving them some common parameters and other independent parameters. A common benchmark is the sampling interval and its duration, an independent parameter is the gain (sensitivity). Each channel can then be suitably programmed to have a reasonable gain, for example according to the distance which is from the shot.

The independence of the number of channels allows you to easily place the channels in many different configurations. Although in most cases you will use the channels in their progressive serial number and perhaps with some configuration of gain (for example, if the shot is at the top or bottom or the middle of the stringing), the ability to change the order of stringing or strings in its distribution and the ability to divide a N-channel system in K systems each consisting of N/K channels, make DoReMi an extremely flexible and practical system. Each channel also brings with him his memory, and then it retains the capacity for storage and sampling.

After setting the number of channels on the software (after stating the computer to how many channels available), you must select the COM port you connected the head unit. So you can now control the communication and health status of the channels by clicking on the *Communication Test* from *Commands menu,*, a window will highlight if there are any problems or if everything is ok.

Select the sampling frequency and duration. A progress bar will tell you if the memory is sufficient for the type of acquisition choice.

Having established that all channels are able to communicate and that you have enough memory for each channel with the PC you can configure the various gains (if necessary).

By clicking the *Start* command the software automatically performs in succession the functions *Set gain and arm trigger*, *request data* and *seismograms* (see relative sections for details).
When you run this command, you can select some option in the Setup menu (see the section on for details).

After this, if you clicked the *Display seismogram after recording* option on the Recording Setup window from the Setup menu, the chart of your acquisition will be immediately shown.

Each channel has 30,000 sample memory 16-bit so you get to sample up to 1.5 seconds at 20000Hz to 10000Hz or 3 seconds, 7.5 seconds at 4000Hz or even 60 seconds for a REMI to 500Hz.

Optimizing the sampling frequency and duration of the registration will allow you to work more smoothly and quickly. And 'in fact no logical sample for longer time intervals than is really necessary for the investigation to be carried out.

The main window

The figure shows the main window of the program command. Allows you to set both the software and hardware parameters, contains the command buttons to the testing, acquisition and display.
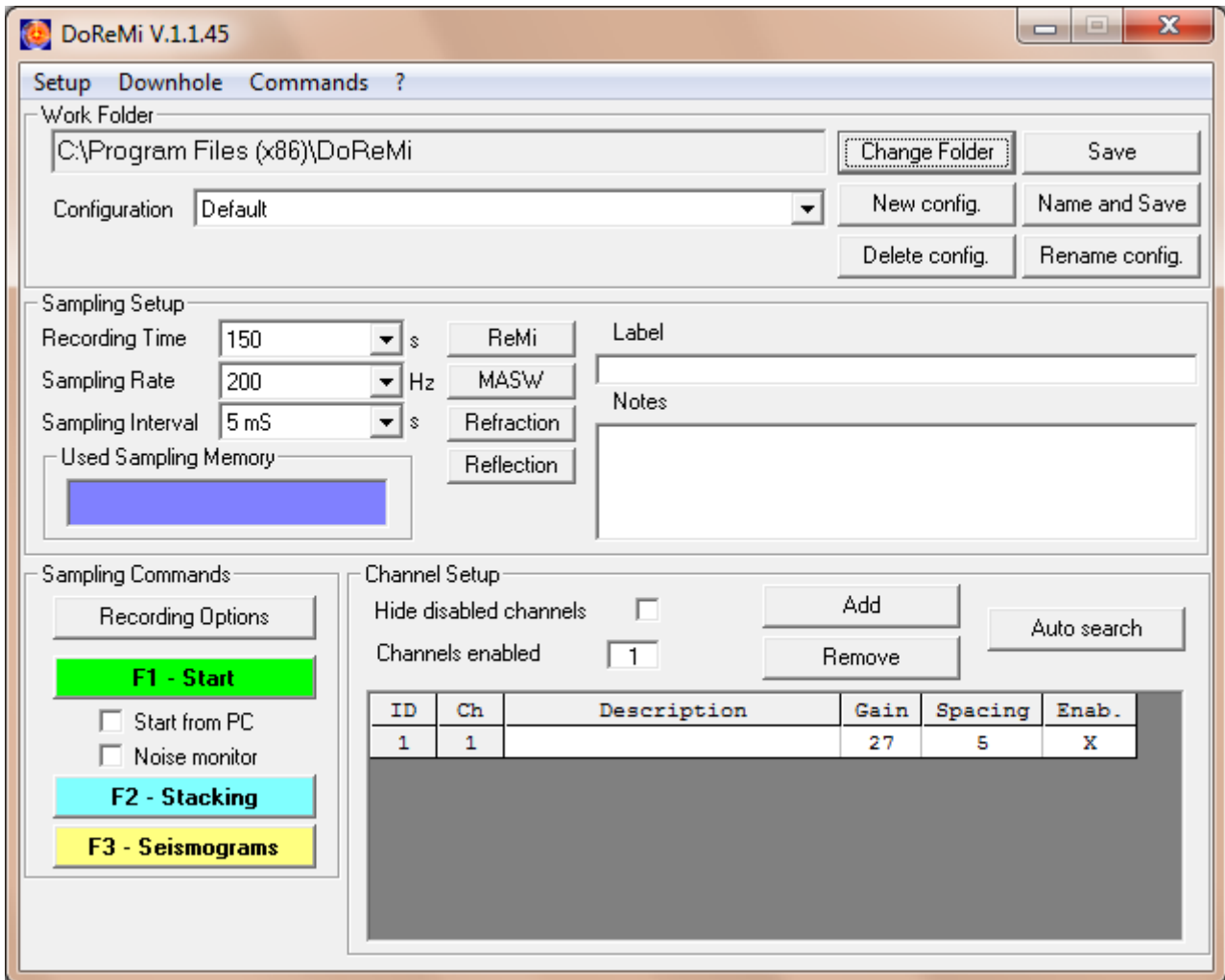
Described here below the controls on this window.

Work folder
Indicates the working folder. The data collected will be stored here.

For example, the figure above shows that the work folder is
        C:\Program Files(x86)\DoReMi

This feature allows the program to separate and tidy work or acquisitions carried out in different yards, day in and/or different conditions.

When the program starts, the last working folder is used is set as the current working directory.

Please note: also the parameters of serial port configuration is set as the last use.

Change folder
Opens the *work folder* window that allows you to change the working folder. See the corresponding section for details.

Selecting Configuration
Allows you to select the current configuration of the stringing. E 'can create as many configurations as you want.
Each configuration set their values and their settings, such as length and frequency of sampling, automatic gain, removal of DC component, number of channels, single channel parameters (description, Guad, interviews., Abil).
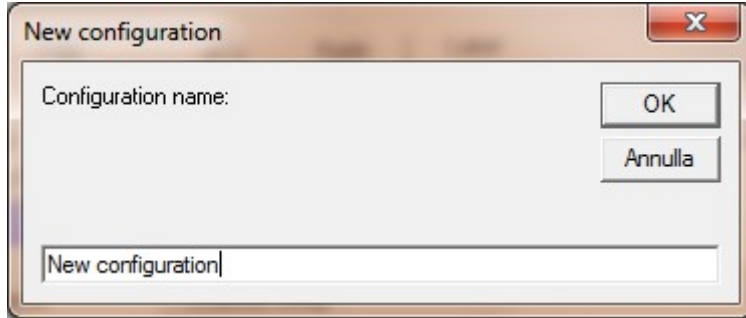
Example.
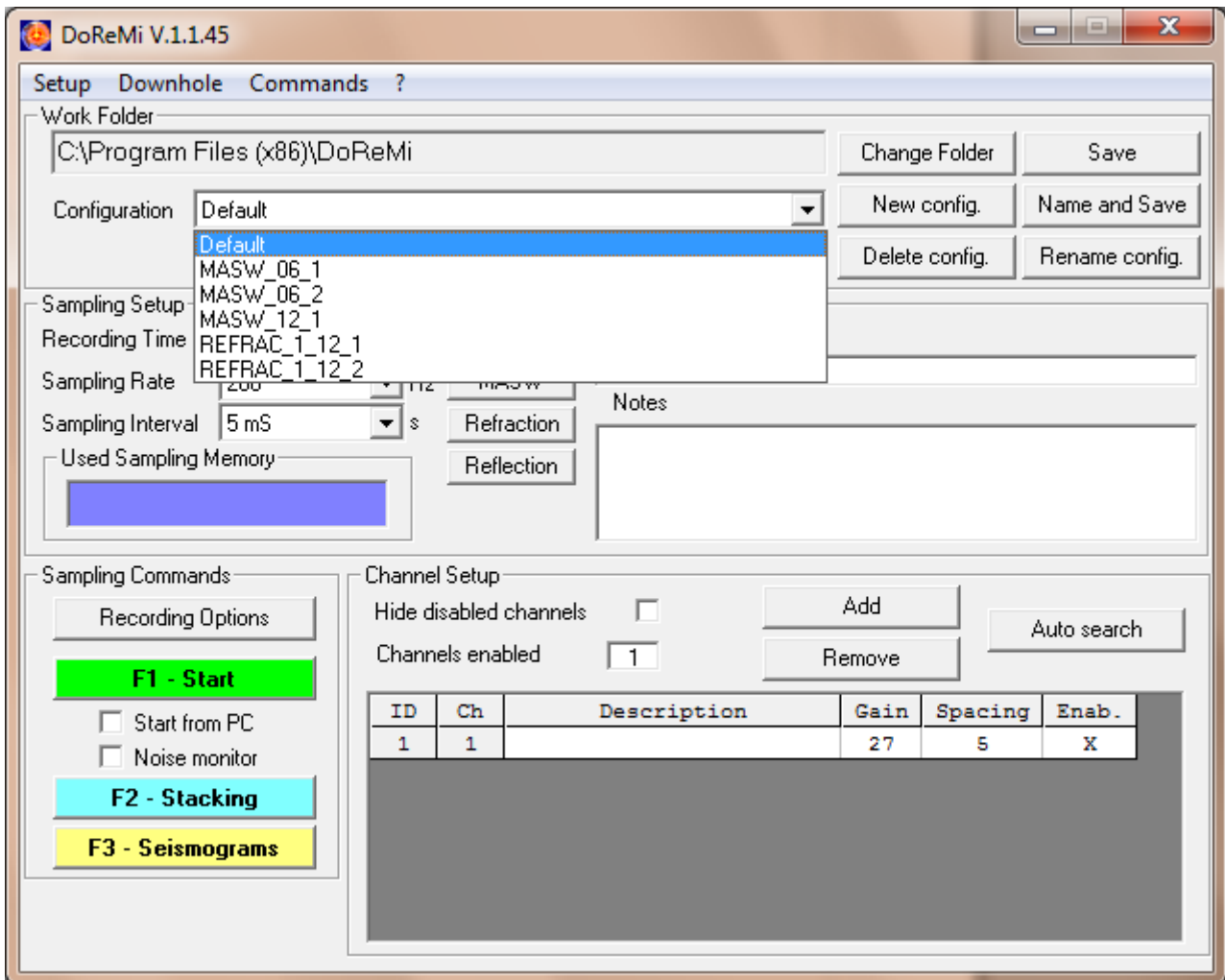
This feature of the program can be used to quickly change the parameters of stringing to make a stop at a different point of stringing it.

New config.
Allows you to create a new configuration.
The current parameters are saved on the current configuration and asks for the name of the new configuration.
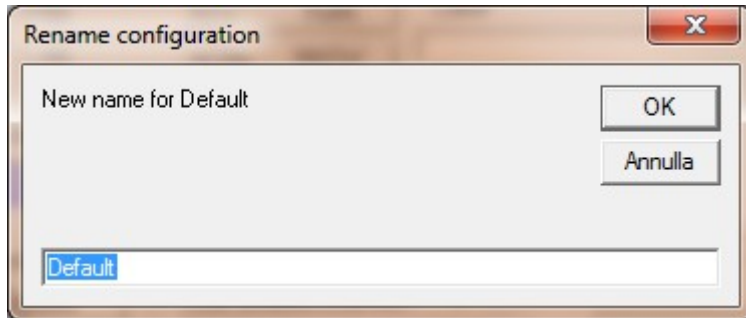

Delete config.
Allows you to delete the current configuration, after asking for confirmation.

Rename config.
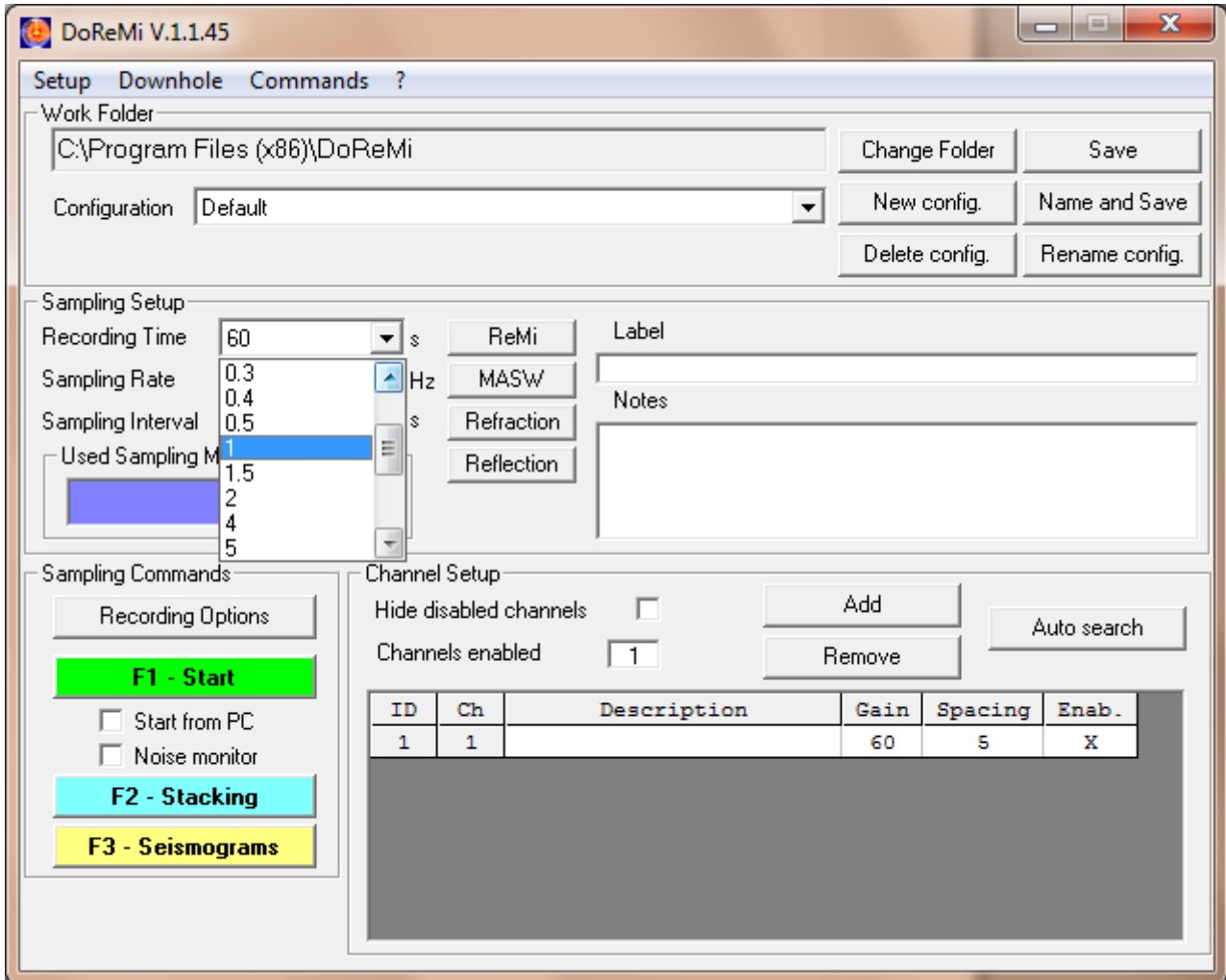Allows you to change the name of the current configuration.

Save
Save the current settings selected.

Selecting Recording Time
Allows you to select the time in seconds that the device will record data after an initial acquisition.
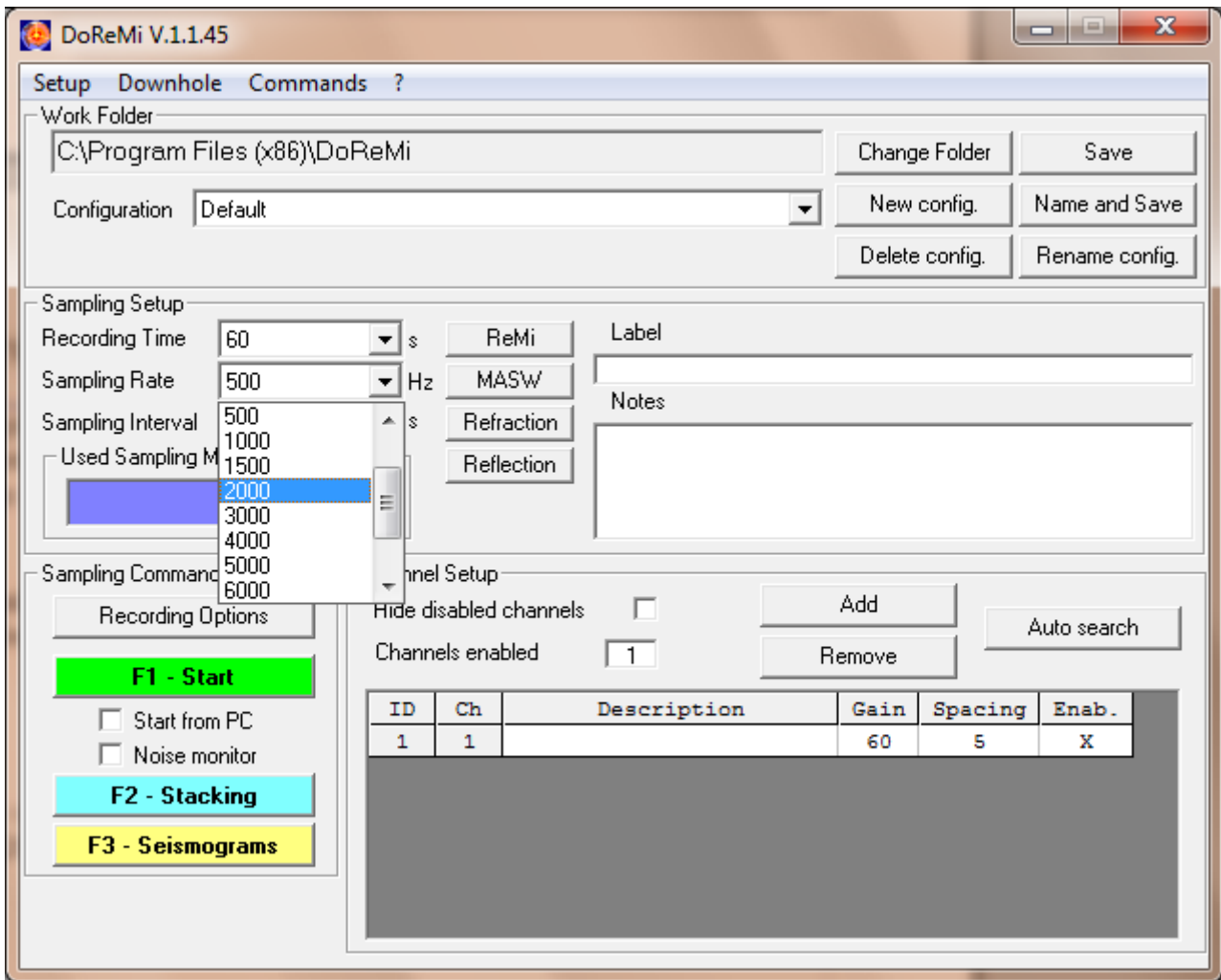
Example.

select from the following record lengths: 0.1, 0.15, 0.2, 0.25, 0.3, 0.4, 0.5, 1, 1.5, 2, 4, 5, 10, 20, 30, 60, 90, 120, 150.

Selecting Sampling rate and Sampling Interval
This selection can be made independently using either the control which is a reciprocal of the other. E 'permission then set the number of samples per second (Hz) or the sampling period of acquisition (seconds).

Example of setting the number of samples per second controlling the selection offers a range of options in SPS (Samples Per Second) or Hz (Hertz).

The sample rates selectable are: 200, 300, 400, 500, 1000, 1500, 2000, 3000, 4000, 5000, 6000, 8000, 10000, 20000.

Example of setting the sampling period.
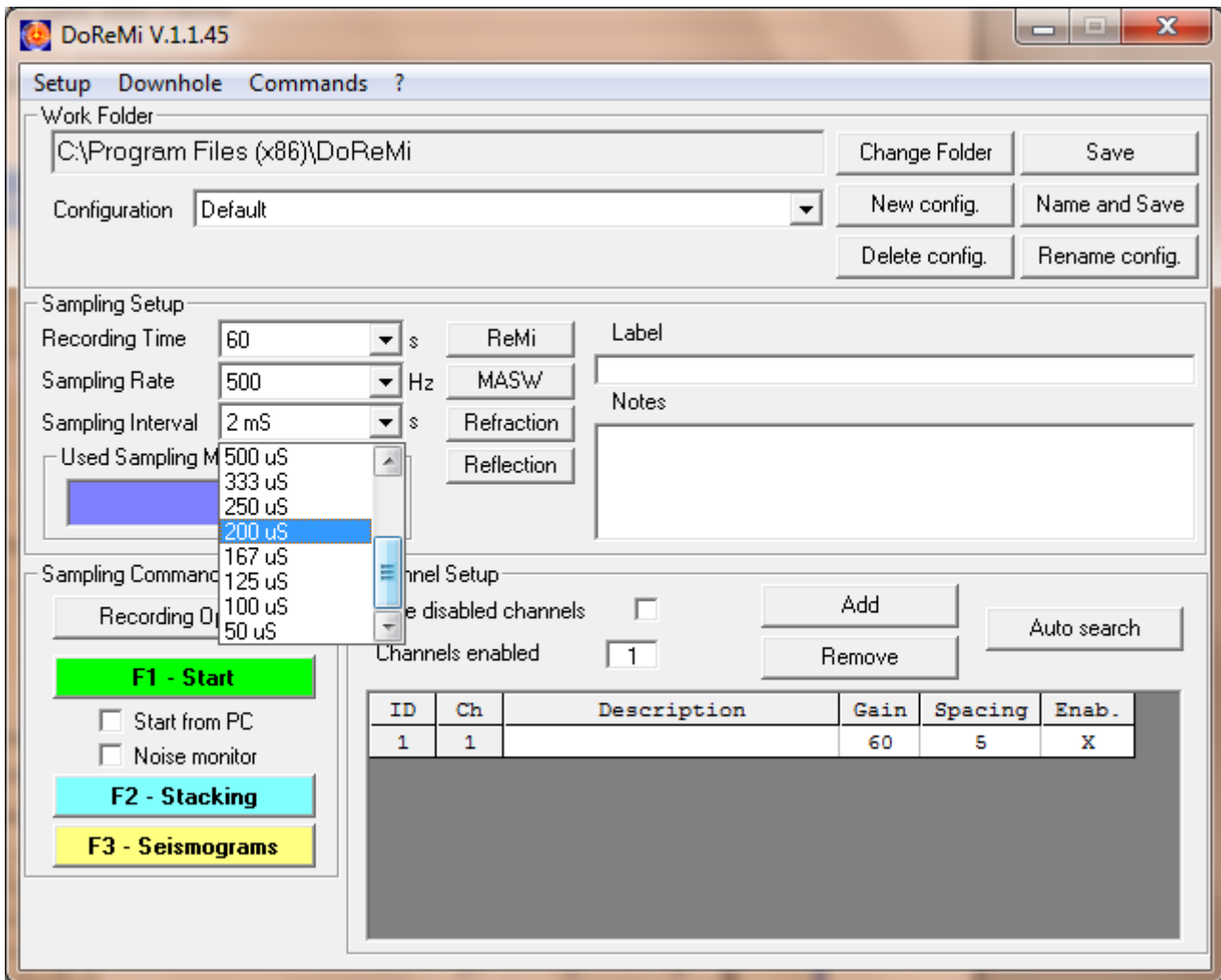
The sampling periods are selectable in milliseconds (ms), or decreasing, in microseconds (uS) and are as follows: 5ms, 3.33mS, 2.5ms, 1ms, 667uS, 500US, 333uS, 250uS, 200us, 167uS, 125uS, 100us, 50uS.

Clarification: In the SI (International System) to represent the unit of measurement of time in seconds you should use the symbol "s " (lowercase). In this case, to ease of reading and being obvious size shown, we used the symbol "S" (uppercase). (For reference, this is the SI unit of measurement of conductivity measured in Siemens.) Likewise, to typographical reasons we have represented the symbol "micro " with a "u" lowercase.

Used Sampling Memory
DoReMi Each channel has 60K of memory for fast, temporary storage of data. This memory space can operate in a wide range of survey methodologies. Memory usage is dependent on the length of the sample and the speed of acquisition. The bar indicates the used memory space in the memory of the recording devices that would be done with the current values of length and frequency in comparison with the maximum memory available in the devices themselves (60KByte = 30,000 samples). A red X indicates that the memory is not sufficient to store data with the parameters set, then the acquisition is inhibited.

The figure gives an example of indication of memory error.
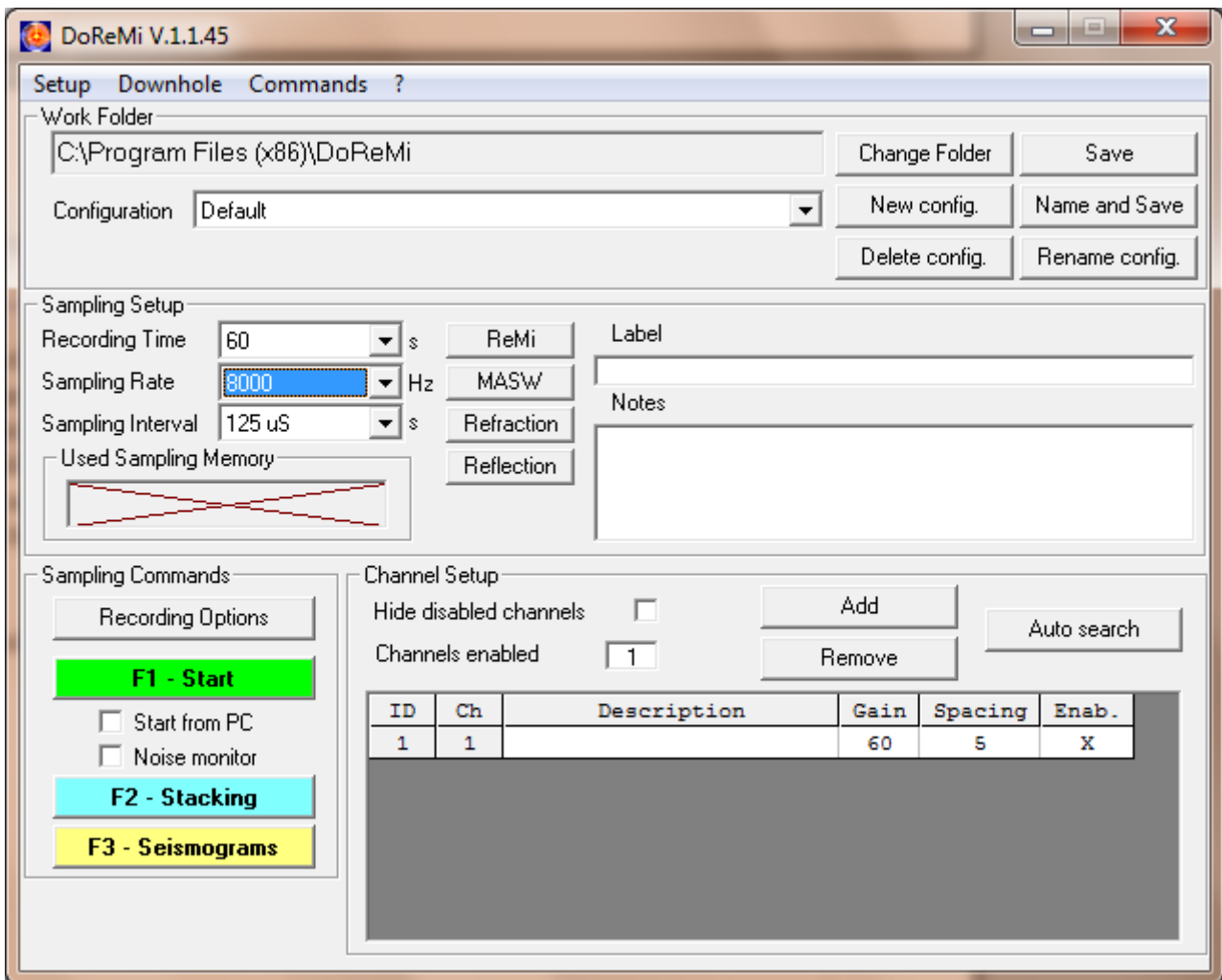
The Text Box Notes
It contains information that will be included in the data acquisition saved.

The name of working folder may indicate at first glance some information. In addition, the channel data is saved automatically. However the notes written in the text box to allow you to include more detailed information like current in connection with the acquisition.
The information written in the notes, can only be viewed with the command from the *View* menu and *Text Data,* in the window *Seismograms*. (See the corresponding section for details).

Some basic information that could be included are: the contractor's work, the location of the acquisition, etc..

Please note: The information to be included in the data acquisition are those in the text before giving the command *Start*. So before you write the note and after you give the command *Start.*

Channel Setup list
Contains the list of connected devices and is certainly the most widely used operating list. The maximum number of devices connected is 255, which, to work job, find otherwise on the ground, that provision shall be recorded per channel.

For each device, therefore, identified a number of identification (**ID**), a serial number in the numbering (**Ch**), a possible description, the gain selected (**Gain**), the amount of space from the device preceding it (**Spacing**) and Enable (**Enab.**) or disable it.

You can move between the box with the arrow keys.
The Enter key or double-click on a given box allows you to change it. In the case of the values in column **Enab**, alternate values **X** (channel enabled) and - (channel disabled). The change is not possible for the ID number column that is set automatically and consecutive.

Example of change given the range of the channel 1.
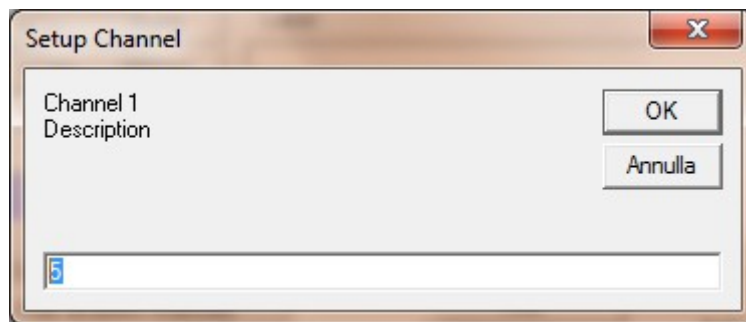
The boxes in the column **Spacing** should contain numbers. Use the dot key for decimal values(e.g.: 6.5).

The devices turned off, even if present in the list, do not receive commands and do not send data.

Add
Allows you to add a new device to the list. This is done by pressing the **INS** key or **I**.

Remove
Allows you to delete from the list the last device. It can be done by pressing the **Delete** key or **backspace** or **D**).

Auto Search
Starts searching for devices. The research must be stopped manually. At the end the *channel setup* will be updated.
Changing Gain column values is through the window channel gain to select one of the default gains for the device.

Example of the window of the channel gain.
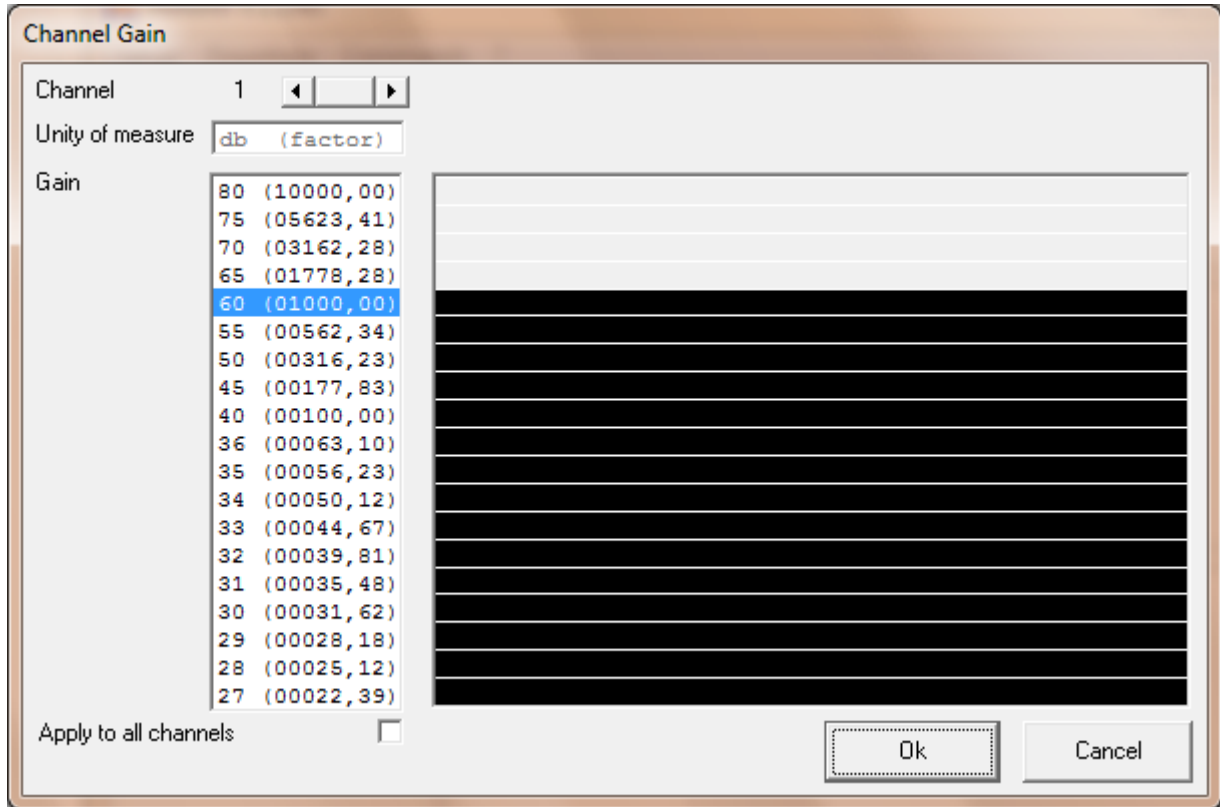
Apply to all channels
After confirmation, the gain value selected will be assigned to all channels of the list.

Ok
Confirm the selected value. This can be done even with the Enter key or double click on the value.

Cancel
Cancel the selection of the value. This can be done even with the Esc key.

The Seismograms Button
Graphically displays capture stored.
The acquisition to be displayed is selected via the *File Management* window (see the corresponding section for details).

The Start Button
Automatically performs the functions S*et gain and arm trigger*, *Request data* and S*eismograms* (see relative sections for details).
When you run this command, you can select some option in the *Recording Options* menu (see the section on for details).

The Stacking Button
Automatically performs the functions S*et gain and arm trigger*, R*equest Data* and S*eismograms* (see relative sections for details).
This can be repeated several times. The result is still a single waveform contains the sum of the values of the channels in each acquisition.
When you run this command, you can select some option in the *Recording Options* menu (see the section on for details).

Setup menu
Has the sub-menu to set the system.

Setup File
Opens the window *Setup file* that allows you to set options on the file name extensions (see the section on for details).

Instrument
Opens the window Instrument *setup* to set the hardware options (see the section on for details).

Graphic
Opens the window *Graphic setup* allows you to set options for graphical display of the waveform (see the section on for details).

Recording
Opens the window *Recording setup* that allows you to set the Auto Start options and digital filters (see the section on for details).

Language
Opens the *Language setup* window, allows you to choose the language (italian or english).

About menu
Opens the *About* window that contains the information of the program.
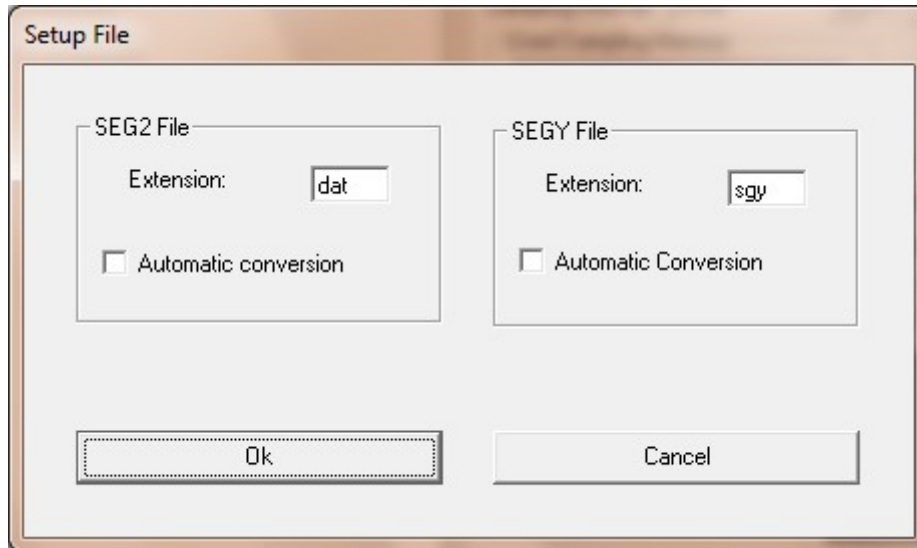

About Update
Allows you to update the software with the latest version.

Setup File Window
In this window you can set the extensions for files and SEG2 segy DOREMI that the program can generate.
You can also enable automatic conversion of the new files created as a result of an acquisition.
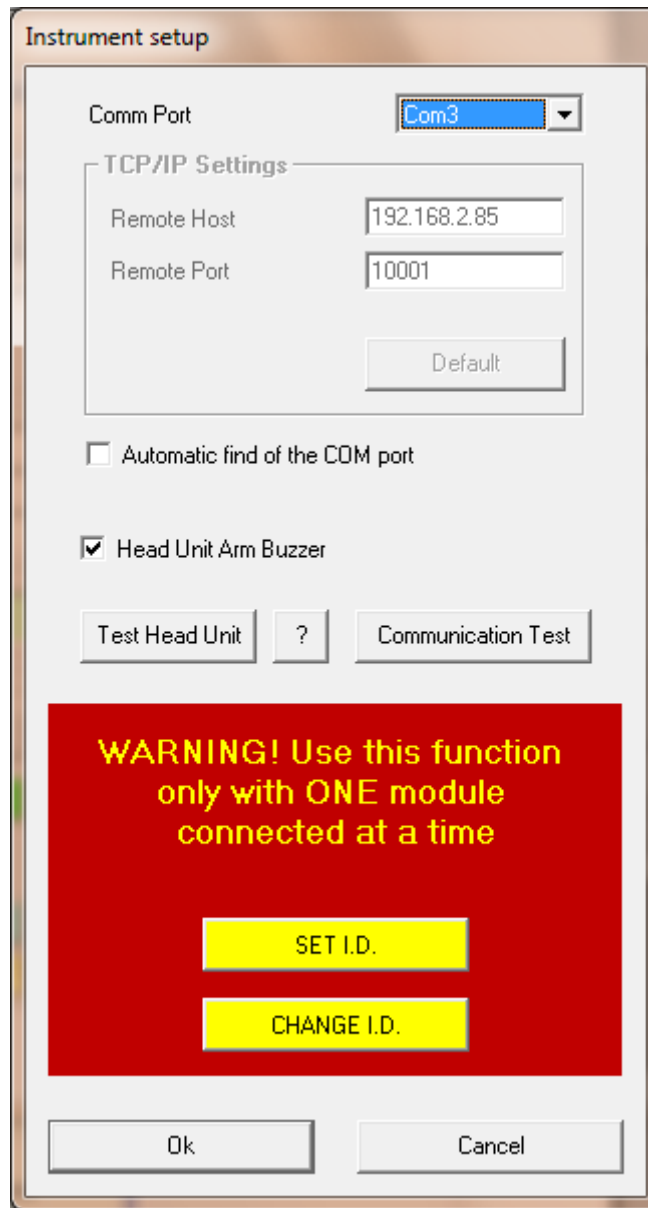

Automatic conversion options enable the automatic conversion of a new file created as a result of an acquisition in one of two formats, or both.
The *OK* button confirms the displayed settings.
The *Cancel* button cancels the settings without restoring the last.

Instrument setup window
In this window you can set some options of the system hardware.

Selecting *Comm Port* allows you to set the serial port that your PC uses to communicate with devices DoReMi.
If the communication is via RS232, RS232 or a USB stick USB_BLUETOOTH you must set the appropriate COM port. The selected ports are COM1 through COM16. If you use a USB-RS232 adapter, this allows you to select ports with identifiers greater than 16. Remember to select a number between 1 and 16 which identifies the port number.
The port settings are set automatically by the program. Communication takes place at 115200 baud, 8 data bits, stop bits, no parity, no hardware control.
If the interface used is the Ethernet port, communication port selection should select TCP / IP. In this case you need to set the values IP Address and Remote Port.
The Reset button sets the correct values because the PC to communicate with a device DoReMi with the factory.

The option *Head Unit Arm Buzzer* determines if it is on the buzzer system drive master DOREMI. The buzzer is used to warn that the system is that the battery is running low, he is waiting for the shot or other functions yet.

The *Communication Test* button check the communication PC with all the devices listed and enabled in the *Channel Setup* list

Setup ID button
Allows you to assign an identification number of the connected device.
The identification number to be entered must be a number between 1 and 255.

It should be noted that, in a connection, each device in the series must have a different identification number. On the contrary, there are communication errors.

To assign an identification number, proceed as follows:
1.Disconnect the head module from all devices.
2.Unplug the device to be set by all devices.
3.Connect the device to be set at the head module (must be the only two modules connected to the PC).
4.Run the Setup command set ID and the identification number that will be displayed in the window (see figure).

Note! DoReMi older devices must be reset by unplugging for a few seconds from the head before you can use.

Example.
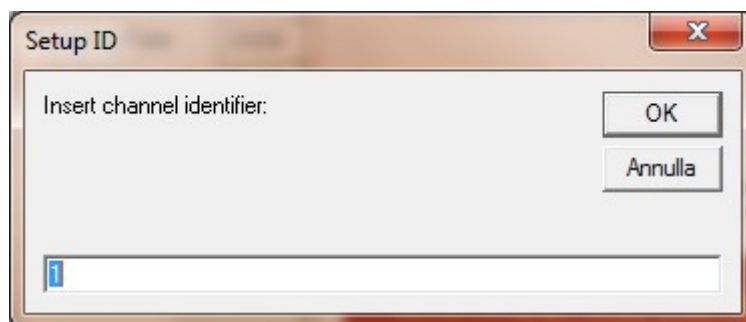
The ID number can be changed whenever necessary.
However, the last number of identifier assigned is stored, and then the device can continue to be used with that number. This avoids having to assign a number to the devices every time you use.

It is not necessary for the proper functioning of devices connected together in numerical order. However, it is usually better to do then to get a graphical representation of forms consistent with the configuration of spread, the waveforms are in fact still represented in ascending numerical order.

Graphic setup window
In this window you can set the display options of the standard waveforms.
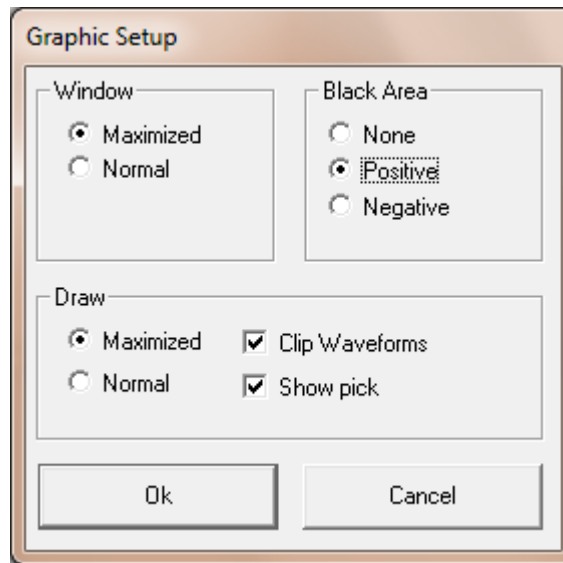
Maximized opens the seismograms window maximized to full screen, while *Normal* opens the seismograms to standard size.

The *Black Area* box indicates if an area of the waveform must be filled.
The *None* option does not fill any area.
The *Positive* option fills the positive area.
The *Negative* option fills the negative area.

Maximized Draw option indicates that the waveform must be represented with the greatest possible scale.
Normal Draw option indicates that the waveform of each channel must be represented with the same scale.
Clip Waveforms option indicates whether, when you run an enlargement in the view, the excess of the waveform display area of the channel must be cut off thus avoiding overlap with other channels tracking.
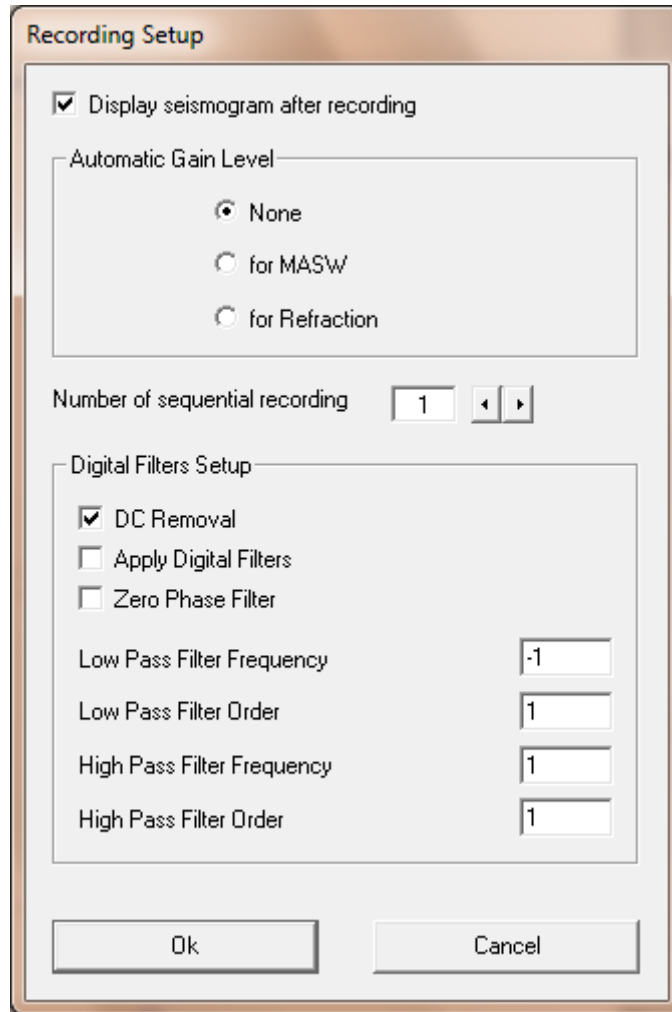*Show pick* option indicates whether the display of the waveform will also suggest the first arrivals.

OK button confirms the displayed settings.
The *Cancel* button cancels the settings without restoring the last.

Recording Option
This window allows you to set some options for the Auto Start and digital filters.

Display seismogram after recording option indicates that after running the command Start will also want to see the waveform acquired.

Automatic Gain Level box sets the selection function of the gain.
None option disables the function.
for MASW option tells the program that, for each channel, will have to calculate the optimum gain is typical for an acquisition MASW.
for Refraction option tells the program that, for each channel, will have to calculate the optimum gain is typical for an acquisition Refraction.

This is the sequence of operations performed:
1. Setting the minimum gain on all channels.
2. Waiting to start a recording.
3. Data acquisition.
4. Based on the minimum and maximum values recorded by each channel, the gain is calculated to exploit the full range of sample values (-32768 to +32767) without causing an outside staircase.
5. Setting the optimum gain for each channel.
6. Waiting to start a recording.
7. Data acquisition.
8. Data storage.

In practice it is necessary to obtain valid acquisition undertake two subsequent acquisitions. In the first (test) is calculated from the optimum gain setting for each device, are recorded in the second valid data.

NOTE: The *Automatic Gain Level* option works only when you are scanning with the Auto Start.

Number of records indicates the number of subsequent acquisitions should be conducted with the Start command.

Downhole menu
Runs a wizard to create downhole surveys.

Downhole New menu
Sets a new procedure for downhole survey

Downhole Open menu
Changes the procedure of a previously set downhole survey

Downhole New window
Allows you to set the parameters for the downhole surveys, enter the acquisitions which are part of the investigation and generate output files.
This wizard can be used either from scratch, when there were no acquisitions, that subsequent, ie when acquisitions have been recorded.
In the latter case, the files of the various acquisitions must be added manually to the file list of the survey (see the "Add") and, again manually, must be modified the parameters *type* and *depth* of each file (see button "Modify").
However, if you start a process from scratch, first of all, you must set some parameters: the *Type* option and the option *depth*. The *process* option only determines how will be represented the waveforms of the final horizontal bars, and can be changed at any time.
The *Process* button generates output files of the investigation.

Example of window downhole Open.
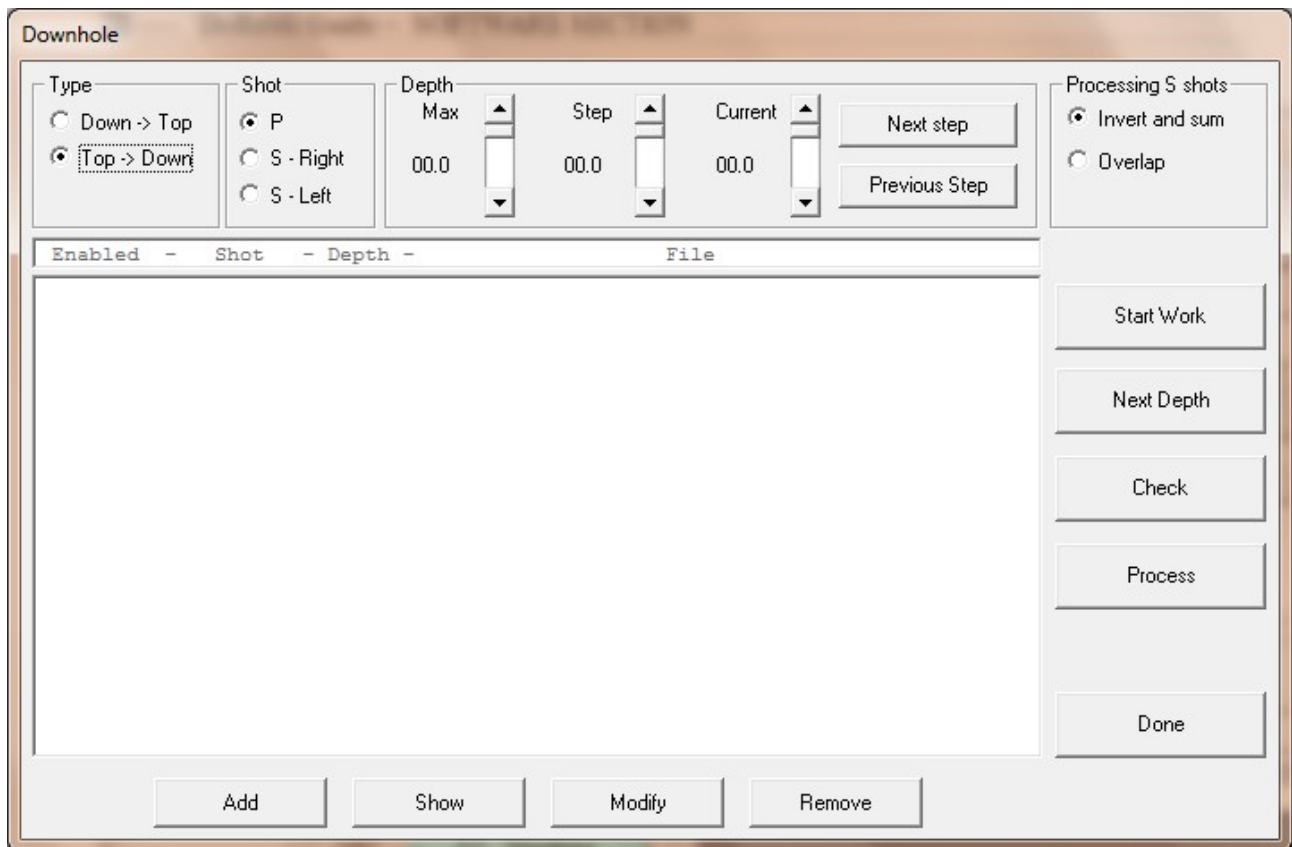
Type option
Allows you to set the sequence that will be executed acquisitions.
The "Down-> Top" indicates that acquisitions starting from the maximum depth then continue while the instrument is pulled up to the surface.
The "Top-> Down" indicates that acquisitions start from the surface while the tool is lowered into the hole.
When you run the wizard, this option affects the calculation of the current depth. In fact, after carrying out an investigation at a given depth, your choice determines whether the depth next to be investigated should be increased or decreased.

Shot option
Indicates what type of measure is being executed. The program assumes that the acquisition will be carried out will contain data of the measure indicated by this option. This option is stored in the individual waveforms will be used to generate the resulting files.
"P" indicates the shot for vertical waves, and "Right" and "Left" are the lines for the horizontal waves.
"Right" and "Left" are not absolute references, simply indicate an inverse measure to another.
This option is changed automatically while you follow the wizard.
However, as needed, can also be selected manually.

Depth option
Indicates and allows you to set the parameters of the depth of the investigation.
Max indicates the maximum depth of investigation in meters. In the wizard, if the survey is done with sequence "Down-> Top, this value will be the depth of the first acquisition. If the investigation is done with sequence "Top-> Down", when the value of the current depth has reached or exceeded this value, it will be a sign that the investigation was completed.
Step indicates the space in meters between the depths to which we investigated. When you run the wizard, the current depth value is increased or decreased by this value, depending on the value set in type option.
Current shows the depth to which you are currently investigating. The program assumes that the acquisition will be executed will contain the depth specified by this value. Eventually, the value stored in the individual waveforms will be used to generate the resulting files.
This value is automatically updated from the procedure, but it can also be changed manually both using the appropriate scroll bar, than with *next step* and *previous step* buttons to increase or decrease the current value of the amount indicated by the value set in *Step*.

Processing S shots option
Allows you to choose the way in which the files representing the horizontal waves are generated. This option does not affect the data themselves, but only on how they are represented.
Invert and sum generates a file in which a waveform is reversed in polarity and then summed with the other.
The *Overlap* option creates a file in which the two waveforms are superimposed, then you will see the opposite polarity.

Start Work button
Performs an acquisition with the parameters currently set. It is the button you should use when you start to run the lines for downhole surveys or when you want to run other shots in the sequence of the same type and at the same depth.
A message box will show, according to the options previously set, what kind of measure the program expects. Also shows the depth to which the instrument should be.
Pressing OK on this message box the program will run a normal acquisition as described in other chapters of this manual.

Next Depth button
Continue the wizard to the downhole surveys. Sets the type of shots and depth according to the values entered in the options.
A message box will show, according to the options previously set, what kind of measure the program expects. Also shows the depth to which the instrument should be.
Pressing OK on this message box the program will run a normal acquisition as described elsewhere in this manual.

Check button
Verify that the files in the list of the survey are homogeneous. In other words, the program expects for each depth, there are three files, one for each type of shot.

Process button
Generates output files for the survey.
Use the acquisition listed in the survey list and enabled ("Yes" in column headed "Enabled").
On acquisitions that relate to the same type of shot and at the same depth, stacking procedure is performed (the values of the waveforms are summed).
All acquisitions of horizontal shots are displayed and prompts you to choose a single horizontal channel. The program offers the one that has a higher amplitude.
Finally, two files are generated. One represents the waveforms of the vertical channel. One the waveforms of the horizontal canal which you choose each time. The latter, as mentioned above, superimposed or summed.

Add button
Allows you to choose a file previously registered in the file list of the survey. Treats it as part of the investigation.
In some cases, you must manually edit the values for the type of shot and the depth.

Show button
Pictorial representation of the selected file in the file list of the survey.

Modify button
Allows to modify the parameters of the selected file in the file list of the survey. These parameters are: Enabled, type of shot, Depth.

Remove button
Delete the selected file from the list of surveys.
Warning: The file is also deleted from computer memory. An alternative is to set the Enabled parameter file with "No ", that does not include the file in the process but leaves it in the computer memory.

Done button
Exit the Downhole window

Commands menu
Allows the sending of the secondary controls, some of which were already covered elsewhere in the main window

Commands Start
See page 18

Commands Stacking
See page 18

Commands Seismograms
See page 18

Communication Test
Check the PC communication with all devices listed and enabled in the *Channel setup*.

Example result of a test of communication.
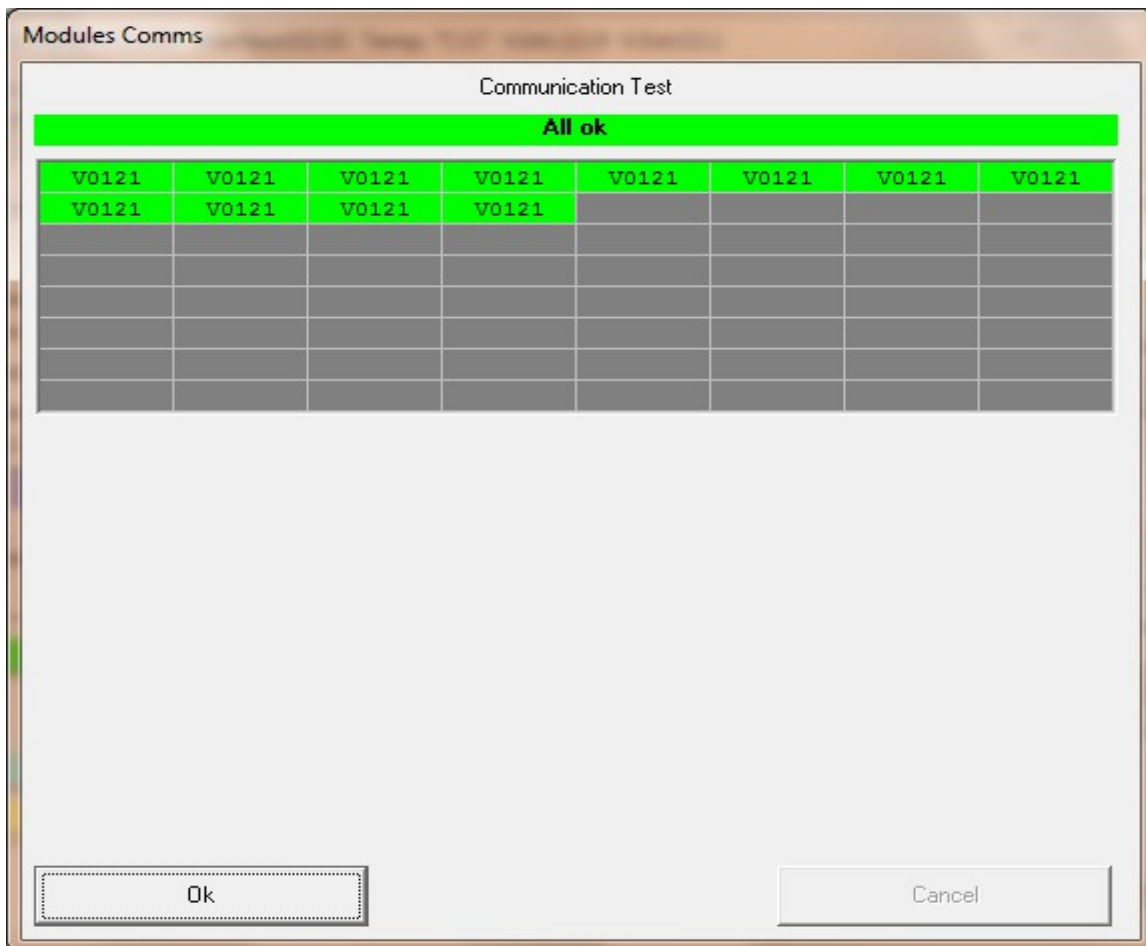
This command is used to do a quick check of the connections and the operation of devices. On a list displays the ID number of the channel and device status.

If this works it is shown the version of the program in the device and the test results of memory **(Mem Ok)**.
If you have problems connecting or running it displays the number of device ID and error message.

A problem on a device can result from several factors.
In the first analysis could proceed as follows:
1. Connect with the head module only the faulty device by inserting the connector firmly.
2. Disable all other devices from the list of devices.
3. Repeat the test.
If the problem persists you may groped to reset the ID number (See paragraph). If the communication does not happen you may need technical assistance.

Please note: If all the connected devices do not work, the problem may be caused by incorrect diet, or problems of the head module.

Commands Set gain and arm trigger
Set the gains on selected devices are listed and enabled in the *channel setup* menu and predisposes them to register.
After this command devices are awaiting the start recording.

This is the first command you to make an acquisition, after all the devices were placed and set.

Commands Request data
Requires data recorded by the devices listed and enabled in the channel setup menu.
This is the second command to give (after *Set gain and arm trigger*) to make an acquisition. It displays two bars that show the gradual progress of data reception. The time required to complete the command depends on the number of connected devices and the amount of memory used to record data.

In the list, you receive the file created and the result of the download.
The word "Ok" indicates successful download, the inscription mentions that lacks a number of samples considered negligible (less than one per thousand of total), the word "Err" indicates download wrong.

Commands Noise Monitor
Function that displays the background noise of the site where the survey is being done.
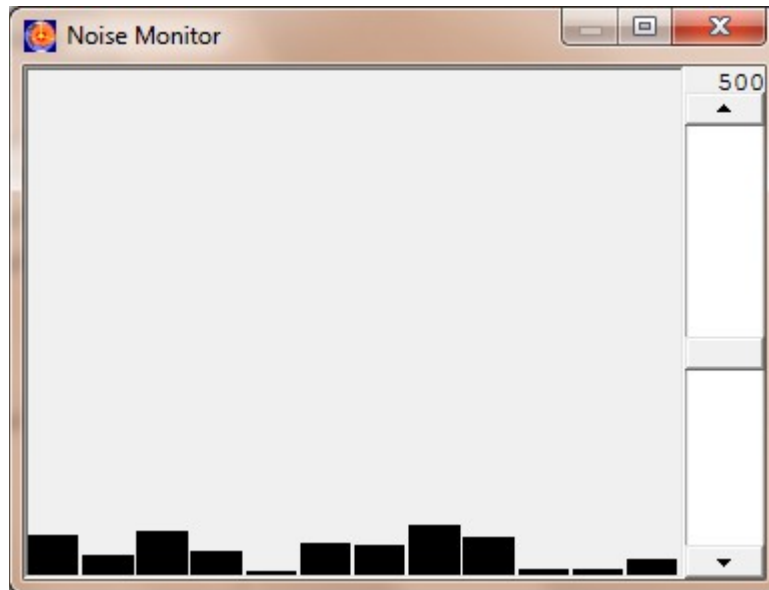
In cases of investigations at sites with a high background noise is best to wait for the opportune moment, that is when the noise is lower, to make the shot, in order to get a more reliable and only minimally affected by noise results.

Digital filters

With version 1.1 of the program we have introduced the ability to set the digital filters that are activated automatically when receiving the signal. This feature allows you to work directly with the frequency range of interest. For example, using geophones from 4.5Hz (essential for MASW tests or REMI) may become more difficult to perform work on refraction because the response characteristic of these sensors is greatly larger than sensors with 8 or 10Hz usually used for polls in refraction and / or reflection.

The program then makes available programmable low-pass filters and high pass either traditional or zero phase.

We enter into a detailed technical description of digital filters on but we will give some basic guidelines with examples to allow easy use of the same if deemed necessary.

Setting up filters

To adjust the digital filter is a setting in the *Recording Setup* panel

These settings apply to all records and then, if the digital filters are activated, signals are stored in the filtered mode and not so rough. It must be said that our company has always been a supporter of the philosophy that the raw data should never be modified and that all processes should be carried out in post-processing. However, we realize that it can be very inconvenient for the user to perform these calculations in post-processing when it is expected already in the process of acquiring a certain type of data, for example those who only find it useful to apply a refraction high-pass filter to 8Hz to simulate the use of geophones 8Hz. Therefore, it seemed more useful, in this case, ensure that all digital processing during the acquisition remain that way. DoReMi is written in the file what kind of filter was applied to the signal but the original data is not stored.

Those who wish to maintain complete control over the data must acquire data without any filter in place and provide then with the analysis software. We believe that this will avoid confusion about how the files are stored and / or processed.

In the Settings window is the frame recording setup digital filter which allows you to enable and disable the following steps.

DC Removal

A signal may have acquired a residual signal (positive or negative) often referred to as offset. If this signal is visible in this diagram as the "zero line" of the ideal signal is shifted slightly on the positive side or negative side of the diagram. This "defect" is so typical of all digitization equipment and is usually very low, but as a further refinement of the program can provide for the removal of this offset number.

Although placed in this box, and its implementation can be through the use of digital filters, the *DC Removal function* is not considered as a digital filter in the offset correction process does not happen with a filter algorithm (es. IIR or FIR) but simply by calculating the arithmetic mean of points in the league and removing seismogram from each sample. So the wave form and all its frequency components remain unchanged in both amplitude and phase.

This option allows you to act on the data immediately after acquisition, and is calculated automatically canceled if the small offset in this circuit. This option affects all connected devices.

This development brings the average value recorded by the device to 0, eliminating the offset that the device could have.

If this option is selected, the acquisition values recorded by the devices are processed. Specifically, for each device calculates the average value of recorded data. This average value is considered as an offset the device has. Hence, the data will be stored by subtracting the average value acquired or offset.

For example, if the average value of channel 3 is 35, a recorded sample is stored as -225 -260 writing. (-225-35 =- 260). While the average value of the channel 8 is -10, a recorded sample is stored as 17 writing 27 (17 - (-10) = 27).

It should be noted that Run processing software. This means that if a system had so high an offset to be achieved during the acquisition, the full scale of values, the problem must be solved by means of the device at the hardware level.

Obviously under normal conditions the offset is minimal, but this small automatic procedure is an elaboration trivial and practically operated at no cost from the system and, therefore, was made available. It is not automatic because the presence of a significant offset (ie more than 1% of full scale, which is a symptom of a malfunction of the system) must be verified by the operator.

Digital filters Apply
This option tells the program whether it should apply digital filters or not. If you want to apply only one filter type (for example, only the high pass filter) the corresponding value the *filter order* must be set to zero. In case you use the digital filters keep in mind that the removal of the DC component (*DC Removal*) is always applied automatically.

Low Pass Filter Frequency
Specifies the cutoff frequency of low pass filter. Beyond this frequency the signal will be attenuated in proportion to the number of filter order.

Low Pass Filter Order
Specifies the filter order. A first-order filter attenuates less than a fourth-order filter

High Pass Filter Frequency
Specifies the cutoff frequency high pass filter. Below this frequency the signal will be attenuated in proportion to the number of filter order.

High Pass Filter Order
Specifies the filter order. A first-order filter attenuates less than a fourth-order filter.

Examples
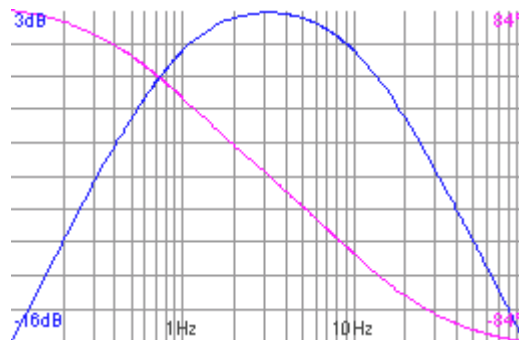
Diagram amplitude (blue) and phase (purple) a couple of filters: low pass at 10Hz 1st order high pass filter with 1 Hz to 1 order.
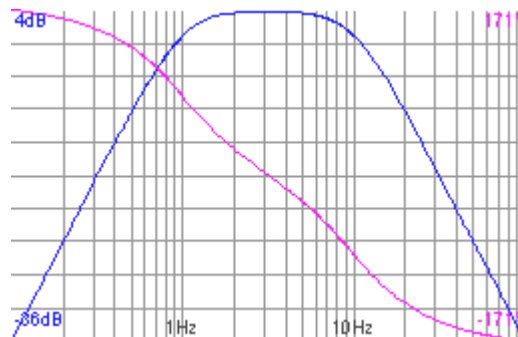
Diagram amplitude (blue) and phase (purple) a couple of filters: low pass 2nd order 10Hz high pass filter with 1 Hz 2nd order.
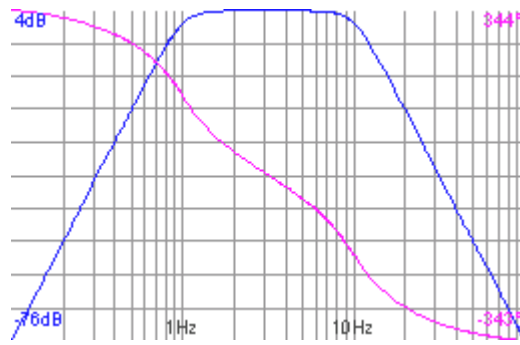
Diagram amplitude (blue) and phase (purple) a couple of filters: low pass 4th order 10Hz high pass filter with 1 Hz 4th order.

Note that although the forms are similar in fact those of higher order are less rounded corners and the attenuation is greater than-36dB in the 2nd-order and 76dB in the 4th.
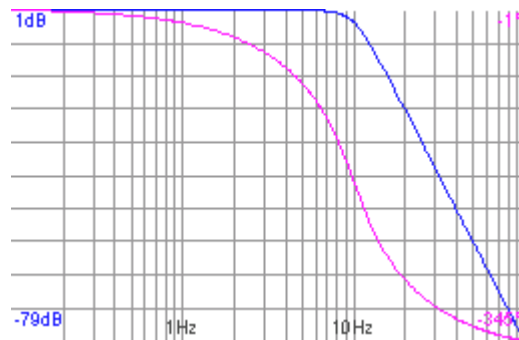

Diagram of a low pass filter 10Hz 4th order. All frequencies below 10Hz pass unchanged, the upper ones suffer attenuation.
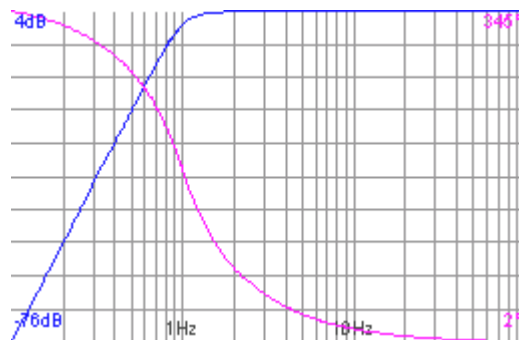

Diagram of a 1 Hz high pass filter of 4th order. All frequencies above 1Hz pass undisturbed, the lower ones suffer attenuation.

Using filters to simulate the presence of sensors of different frequencies.
And 'you may want to use a sensor for refractive index and a sensor for MASW and REMI. Using sensors at 4.5Hz (MASW and REMI) refraction can sometimes be difficult to read because of the low frequencies that tend to confuse the reading of the first arrival.
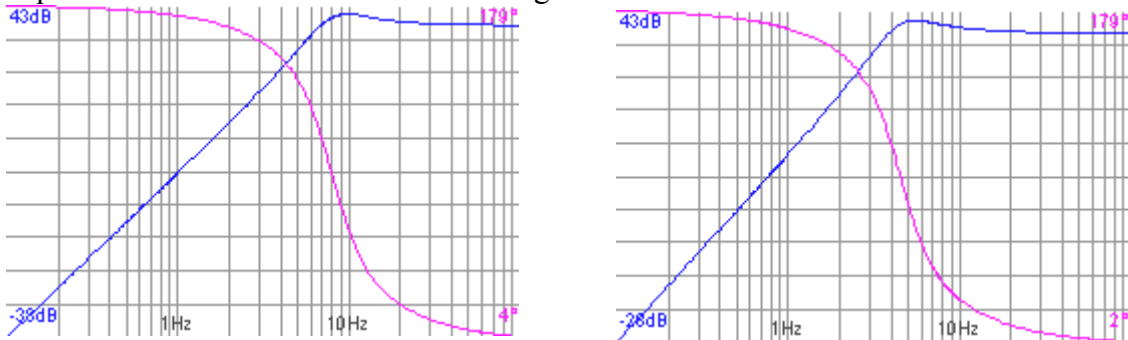

In this case you can use digital filters to correct the global response of the system. For example the figure below shows the frequency response of 8 Hz with a sensor next to the response of a sensor 4.5Hz

If you want to get the response of a sensor with one from 4.5Hz to 8Hz can filter the signal acquired by a filter with a 4.5Hz geophone to 8Hz. The result would be illustrated by two figures: on the left of the response of a geophone 8Hz (h = 0.4), on the right's answer to a 4.5Hz geophone with a filter 1-pole 8Hz. The steps are different but the amplitudes are almost overlapping.
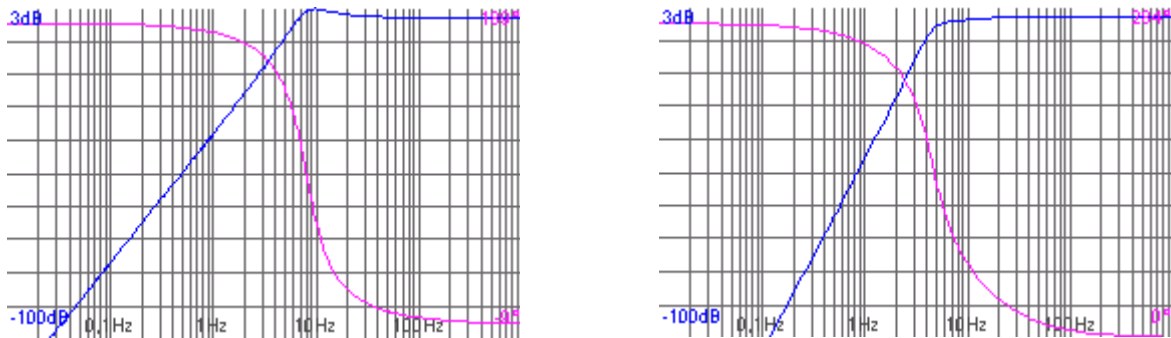
Zero Phase Filter

The filters used in this application are IIR filters of Butterworth type. They are so easy description for those who were to perform other processing on the signal. Usually these filters are known to be in phase zero, or always introduce a phase shift as do the filters applied to conventional electronic amplification circuits. However, activating this option you can get a filter that introduces a time lag between the various wave crests. An example is shown in the figure below.
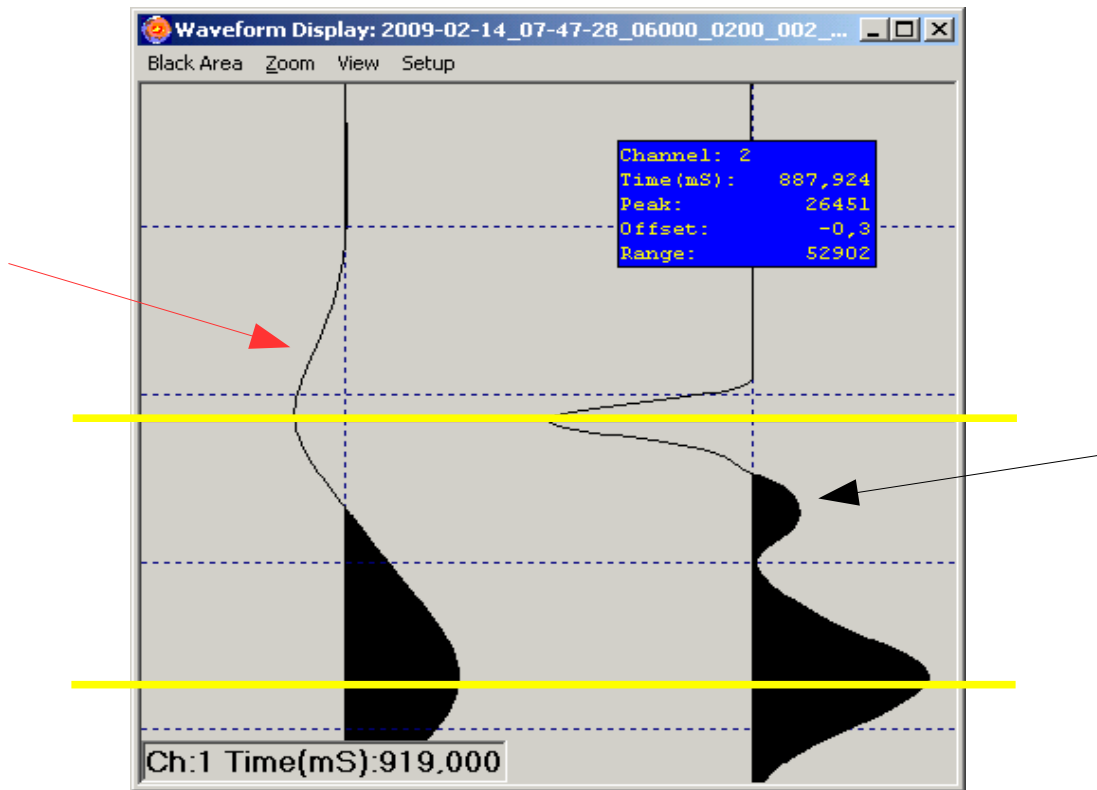
The trace on the right represents a portion of the acquired signal at 6000 Hz with a 4.5Hz geophone from the track on the left is the same signal filtered with a zero phase filter at 10Hz. As you can see the ridge indicated by the black arrow is absent in the left panel because he belonged to a higher frequency to 10Hz, thanks to the low-pass filter. However, the crests of the other waves indicated by the yellow lines (belonging to frequency components below 10Hz) are not out of line as normally would happen. This is a good result but you pay with a side effect and should be considered: the red arrow indicates the "predictive effect" of the zero phase filter. Obviously, the signal can not be "expected" (or above) but is generated by the zero-phase filter processing the signal both forward (from first to last sample) that back (from last to first) has this effect.

So when to use the zero-phase filter?
If the processing software will use as a main signal phase comparison of the various geophones then the zero phase filter (eg MASW and REMI) will be more useful as it maintains such information and introduce changes there, but if you wants to observe accurately the time of first arrival (eg the refraction) then the effect would make it less easy to predict the "picking", while the phase shift introduced by a zero-phase filter would not particularly bother.

Work Folder Window
This window pops up with the Change Folder button in the main window and allows you to select the folder where you saved the data are acquired.

Example.
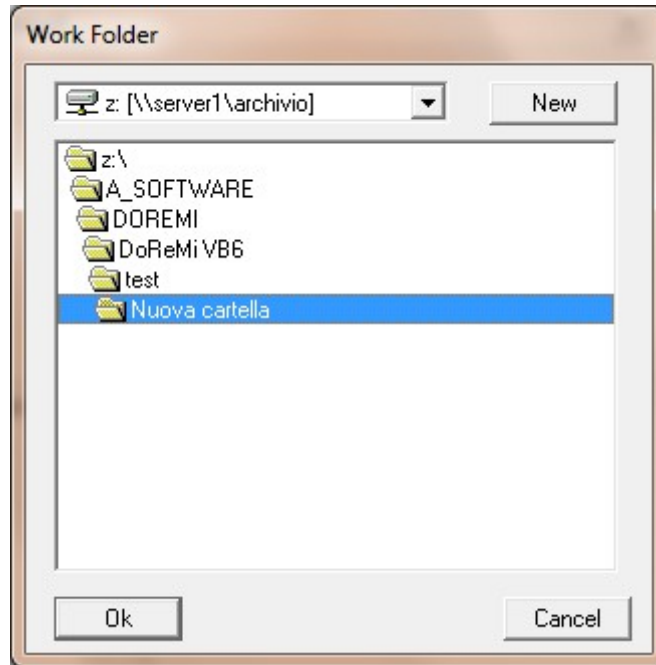
The list displays folders and subfolders, from the main current one. Double click on an entry, select it as the current folder and displays any existing subfolders.
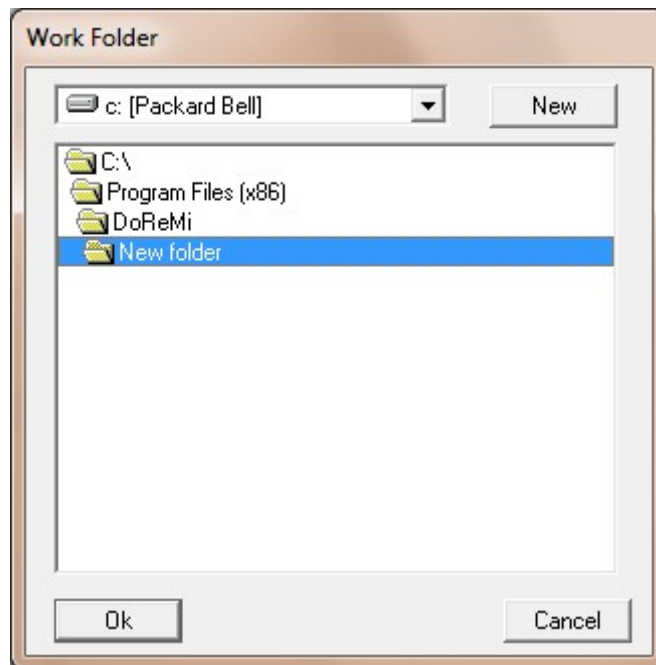
New Button
Allows you to create a new sub-folder in the selected list.
Example.

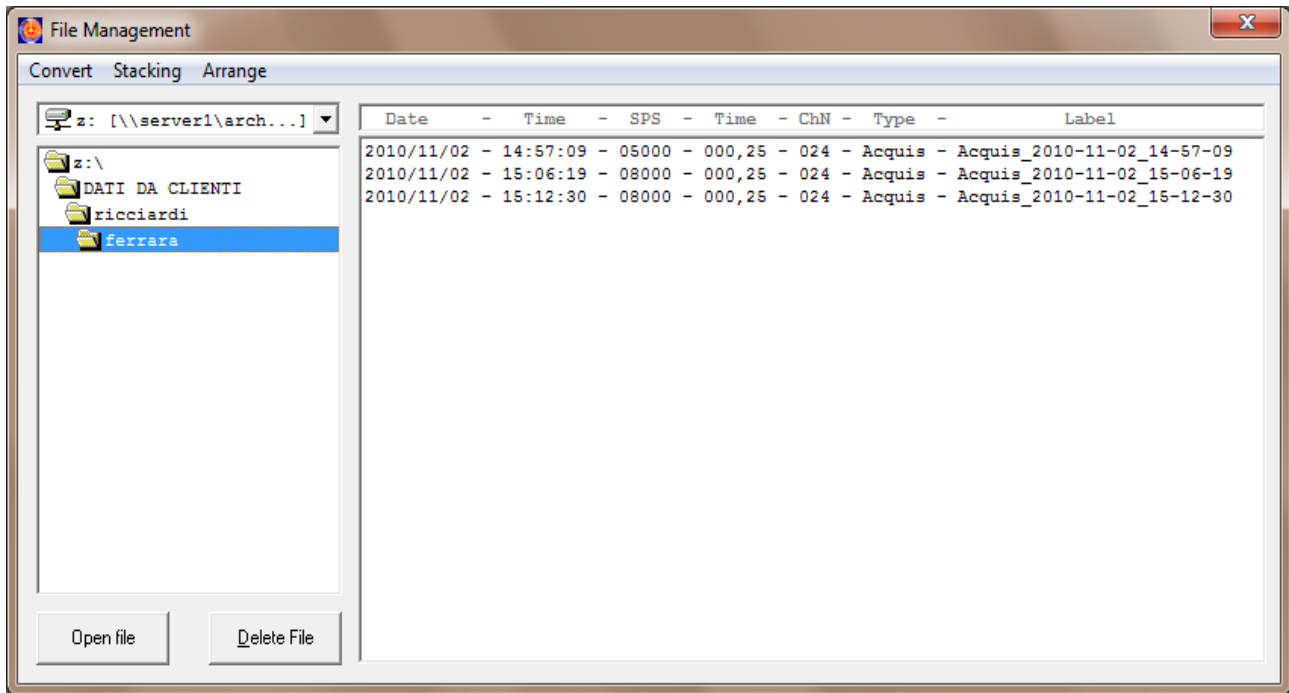The new folder is created.

Ok button
Close the window *Workfolder* confirming the selection of the entry in the list as the current working folder.

Cancel button
Cancel the selection and remains unchanged in the working folder.

File management window
Allows you to select, delete, convert or combine the waveforms.

The list shows the waveforms stored on the PC folder currently in use by the program. The lists to the left allow you to navigate through folders.
Displays Date **(Date)** and Time **(Time)**, samples per second **(SPS)**, time in seconds **(Time)**, number of acquisition channels **(ChN)** and the source of the data **(Type)**.
The entry **Type** indicates the type of file, that is the source of the displayed data.

Acquis	in the waveform is the result of an acquisition.
Update	the waveform is the result of the upgrade from old file formats.
DT_XXX	the waveform is the result of top-down processing downhole. The number XXX is a sequential number that indicates the channel.
TD_XXX	the waveform is the result of top-down processing downhole. The number XXX is a sequential number that indicates the channel.
Reass	the waveform is the result of a reallocation of the position of the channels.
StckAv	the waveform is the average result of some waveforms grouped.
StckSm	the waveform is the sum of some waveforms grouped.
Workaw	the waveform is the result of some waveforms together sequentially in the number of channels.
Interl	the waveform is the result of the interlacing of two waveforms.
Concat	the waveform is the result of combined waveform sequentially in time

Open File button
Opens the seismograms to view the selected file.
The same function can be done by double clicking on the file name.

Delete File button
Delete the selected waveform on the list.

Convert menu
Allows you to convert the data format of the selected waveform.
The possible conversion of the format are the formats segy DoReMi, SEG2 and CSV.
This will create files with the same name but different extension. In the event of formats and segy SEG2 the extension is selected from the *Setup menu* of the main window. In the case of the CSV extension is CSV.
To import a CSV file in a spreadsheet, it should be noted that the field separator is made with a semicolon (;).

Stacking menu
Allows you to group several waveform, which must first be selected from the list. The waveforms selected must have the same number of channels enabled, the SPS and the same length.
The result will be a new waveform that contains the sum (*Sum menu*) or media (*Average menu*) waveform selected.
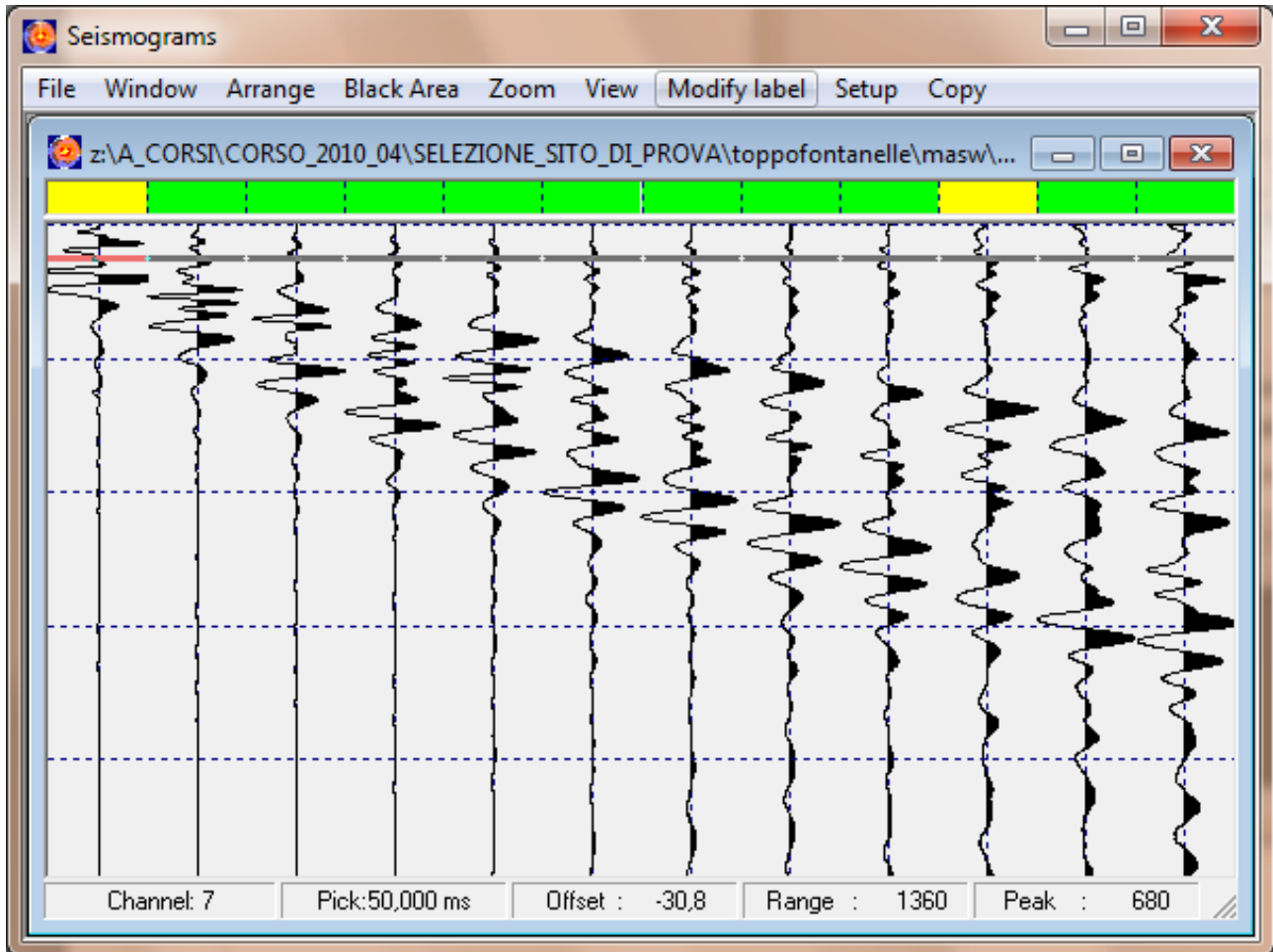
Arrange menu
It allows you to perform some specific processing waveform selected.
These findings are: *concat, downhole Top/Down, downhole Down/Top, a downhole invert and sum, downhole overlapped, for workaway, interlace*.

Seismograms window
Show the graph of the selected waveform.

Example.

Moving the mouse over the graph, the bottom bar displays the channel number bet, the time from when you placed your starting point, the offset applied, the scale is applied, and the peak of the channel.

The gray or red horizontal line on each channel indicates the starting point for the channel.

The left and right arrow keys, move the red cursor between channels thus identifying the current channel, the cursor keys Up, Down, Pg Up and Pg Down change the position of the start point of the current channel.

Pressing the left mouse button displays a yellow horizontal line that indicates the starting point of the vertical zoom. Pressing the left button for a second time at a low point, the area is enlarged vertically. The Zoom function is reset by pressing the left mouse button.

Example of a zoom.
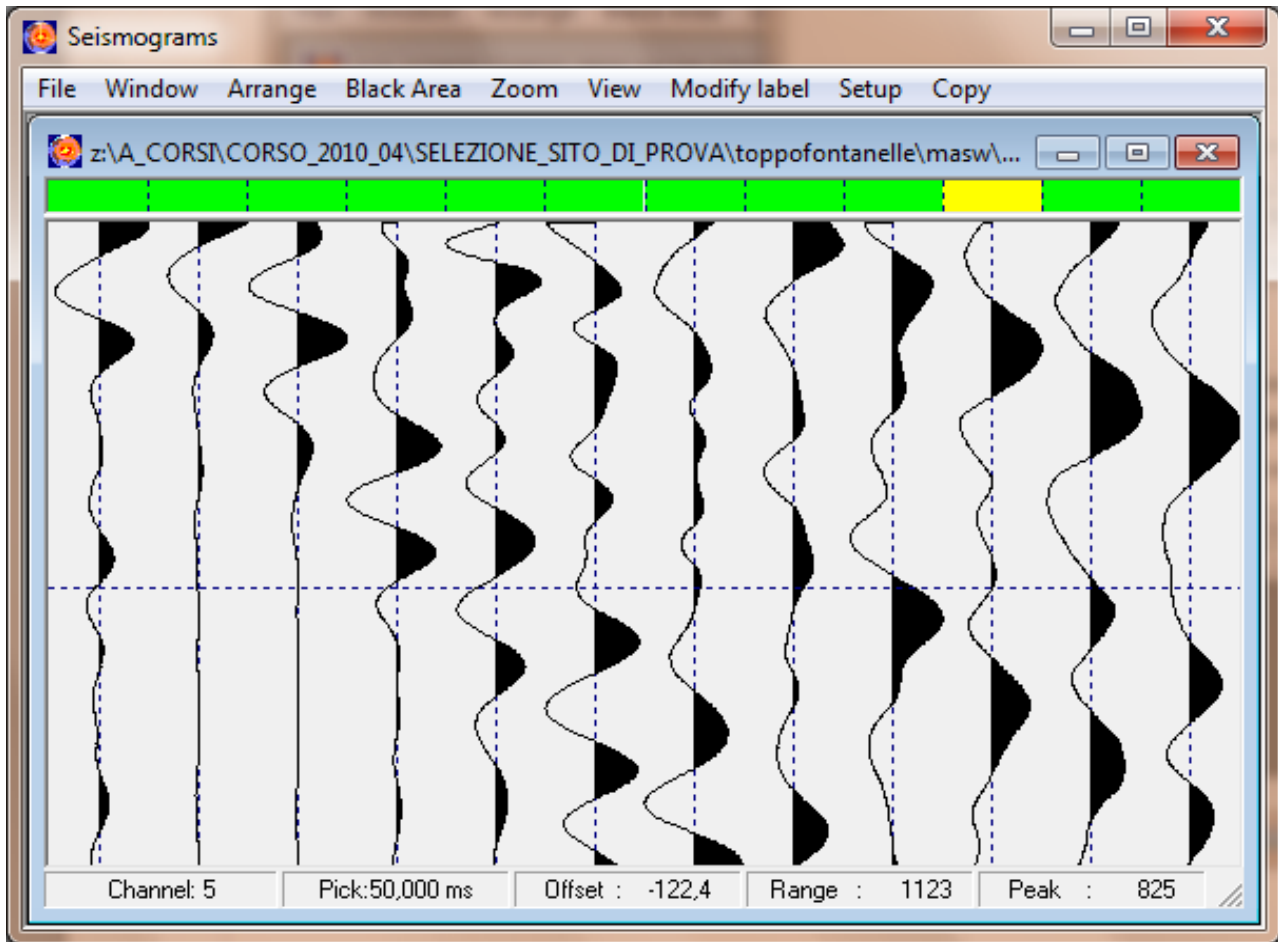
Pressing the right mouse button on a point on the graph you can place the starting point of the channel (**Pick select**), invert the waveform (**invert**), or display only a certain number of channels at a time (**Group**), zoom from the beginning of the graph to the mouse position (**Zoom from start to here**), the channel manually set the offset (**offset** and **set new**) or automatically (**offset** and **reset**).

Example of invert on Channel 3.
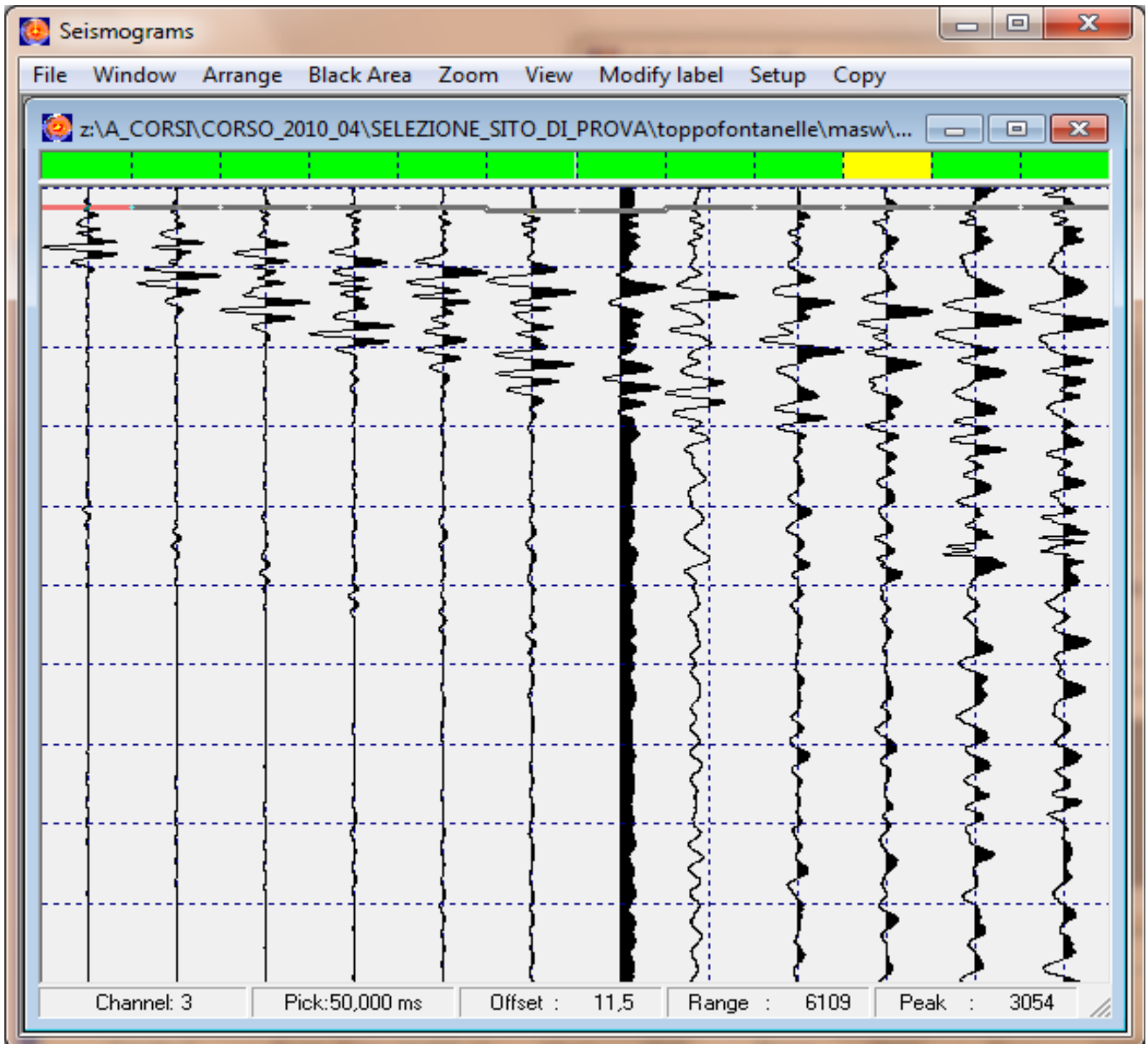
Display example of three channels at once.

When in partial view of the channel, moving the mouse near the left or right edge of the window shaking the channels shown.
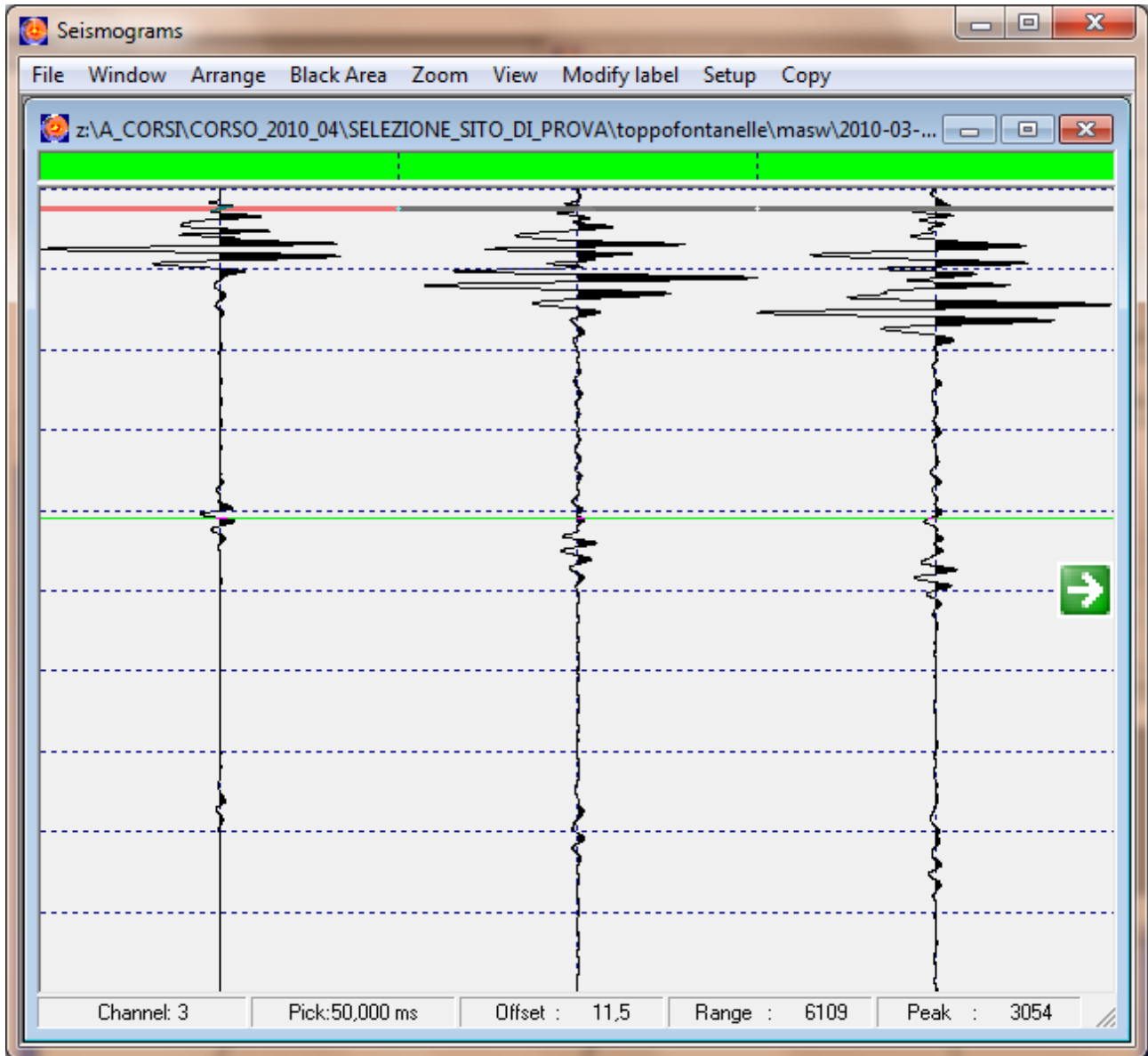
When in partial view of the channel, moving the mouse near the left or right edge of the window you see a green arrow that allows you to view other channels.

The menu of the window allows you to perform general functions for the chart.
Zoom and *Draw zoom* maximizes the waveform of each channel independently, optimizing space at his disposal.
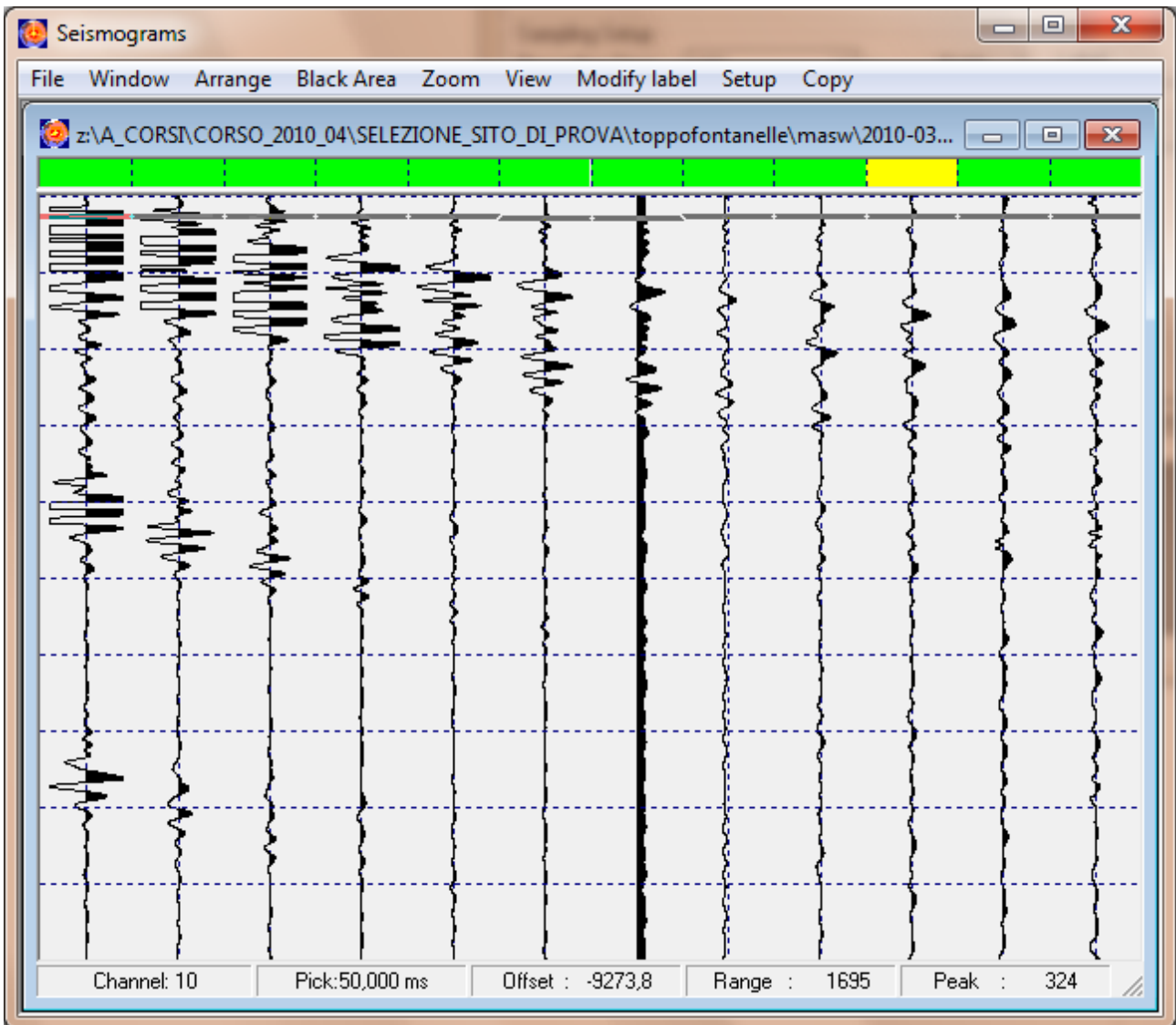
Example of *Draw zoom*.
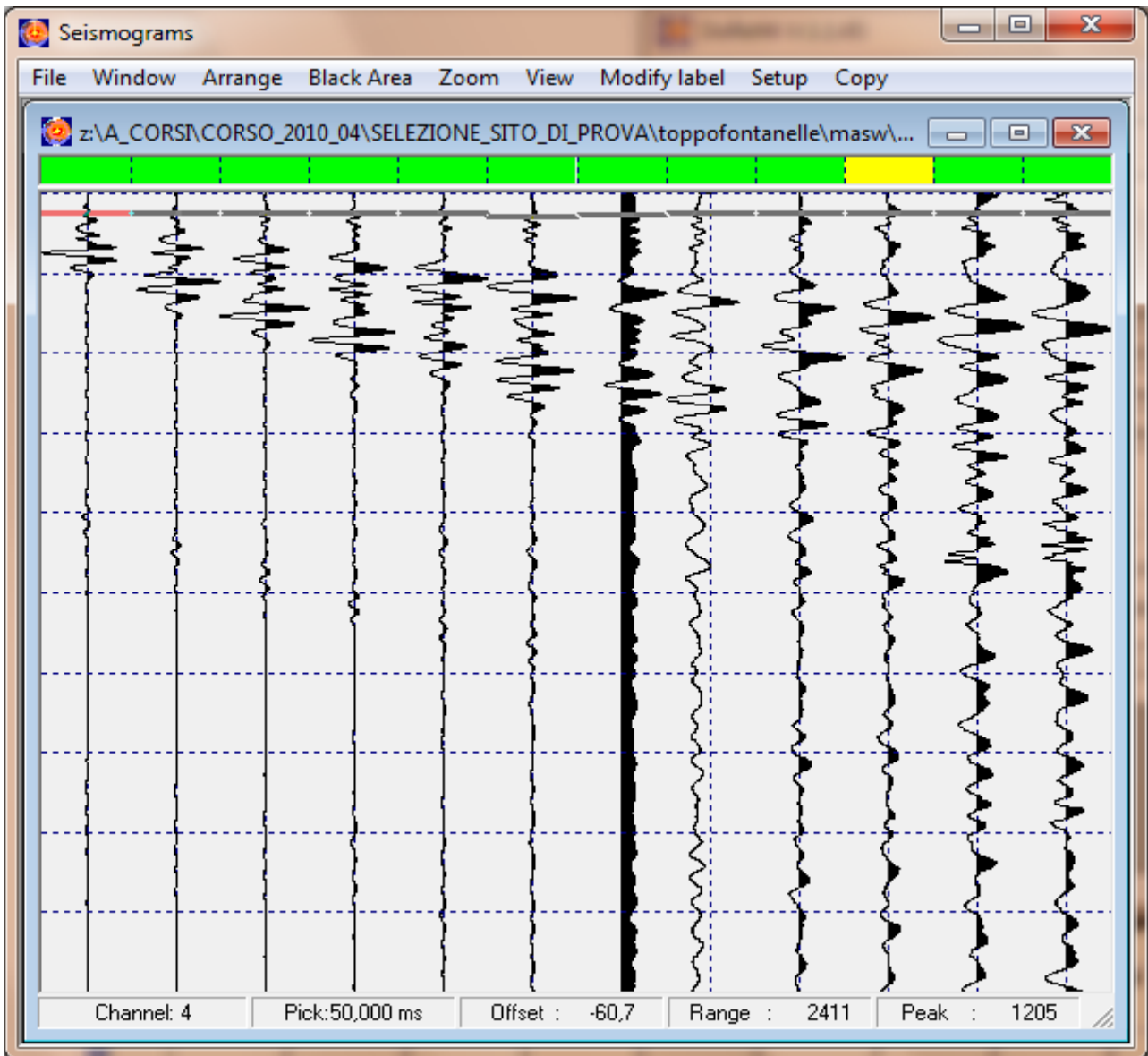
Zoom and *draw normal* shows you each channel with the same scale.

Cut zoom + and *Cut zoom -* increase or decrease the horizontal zoom of the waveform of each channel cutting (if *clip mode* is selected from the *zoom* menu) or not the peaks that exceed the space graph.

Example of a magnified view with the clip mode on.

Zoom and *All channels* view all channels simultaneously.

View menu and Text data
Opens the window that displays some of the data waveform.
For each channel shows the identification number, description, the gain, the interval from the previous channel and the starting point. In the text box below shows the notes.

Example.

Setup menu and Channels
Channel Setup window opens that lets you change the order in which channels are displayed, re-directing the sequence number of the channel in the waveform. You can also delete a channel from the waveform reassigning it with the number 0.

Setup menu and Show Pick or Hide Pick
Sets whether to display horizontal lines indicating the starting point of the channel.

Copy on Clipboard
Copy the design of the waveform as it appears on an area of memory. Opening another program (for example, displaying images such as Paint, present on all Windows systems), and then you can paste it, for example, print, edit, etc...