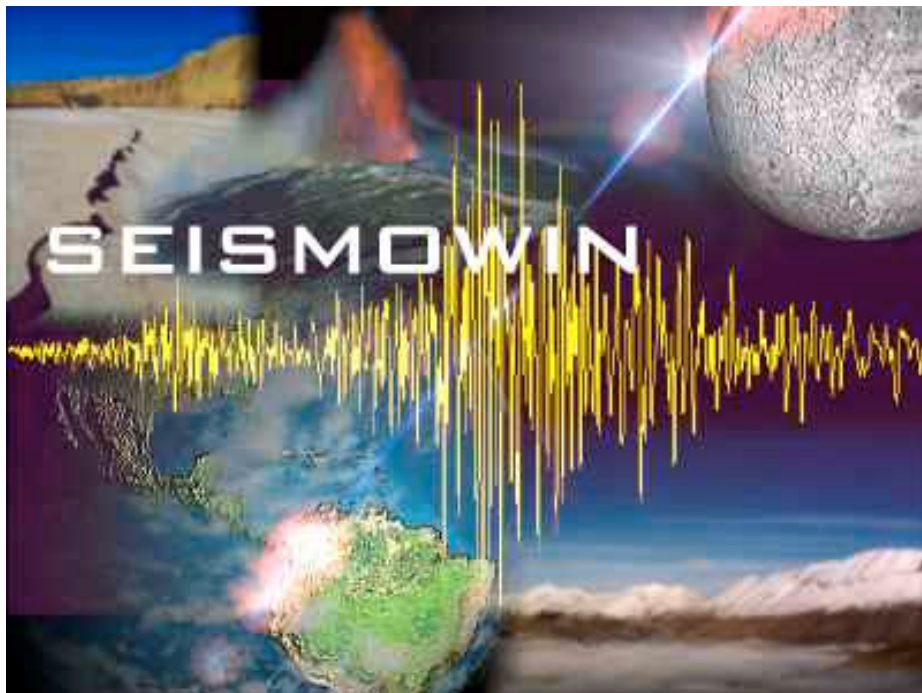


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revision  
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# SEISMOWIN 2.4x

## User and Reference Guide



Notice: Some functions and controls of the software may be recently modified,  
nevertheless the basic functions described in the manual still valid

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### Important notice!

This software is for hobbistic and amateur purpose, this mean basically for entertainment purpose and education. It must be used in a computerized system and or other appropriate electronics boards of that assembly and setup should be accomplished by trained personnel and under the EEC laws in matter of electric safety and Electromagnetic Compatibility. All certifications of that equipments, design, are under the direct responsibility of the final user. The software is provided AS IS without any warranty implicitly or explicitly.

The designer of the SEISMOWIN software will be no responsible of loss of any kind, damages, injuries, loss of data, casualties or other kind of damage if this software will be used in a context of life protection of any kind. This software is only proposed for training and entertainment purposes.

### Overview

The SEISMOWIN software is a program that should be used with one an electronic board able to convert signal from analogue to digital. It allows the acquisition of up to 4 channel with automatic storage of seismic events and storage of continues files (datalogging) for retrieve of past data.

The supported a/d boards are driven by SEISMOWIN in order collect data. Features available from SEISMOWIN are different for each supported boards.

Best performance, due to the explicit design of SEISMOWIN for it, are obtained from using SADC10, SADC20 and SADC30 boards supplied by SARA snc [www.sara.pg.it](http://www.sara.pg.it).

These boards can use an embedded real time clock to synchronize the incoming seismic data with a very precise reference time. The a/d card embeddes an DCF77 decoder to decode the time transmission transmitted by the DCF transmitter in a pulse per second modulation or by a GPS reference using a GPS board generating a PPS encoded as the DCF PPS signal. SEISMOWIN can also be adjusted in order to have a precise timing by the PC real time clock if it is synchronized by a GPS system of a NTP server.

SEISMOWIN can be used together with others tools like SEISMONET and SEISMODOCTOR that are able to give extra features to your seismic station.

### System requirements

SEISMOWIN require the usage of a Pentium Class processor. It is not needed a big memory of ram and the hard disk capacity is subdue to the will of the owner in order to record more or less seismic data.

Item	Minimum requirements	Minumum Recomend
Processor	Pentium 166	Pentium Celeron or Pentium 2 or higher
Ram	32 mbytes	128 Mbytes
Hard disk	200 Mbyte	2 Gigabyte
Operating system	Windows95	Win2K
CD rom	-	yes
Audio board	-	yes
Parallel port	-	yes
RS232 port	requested	requested
Video board	640x480 (VGA)	SVGA 1024x768
Monitor	monochrome	color

### Installation

Istallation of SEISMOWIN can be executed by the proper SETUP.EXE file present in the distribution disk. SEISMOWIN should be installed in the C hard drive and in the "C:\6SMOWIN" standard folder.

Update of the 6SMOWIN.EXE executable file can be accomplished simply by replacing the EXE file unless otherwise specifiied.

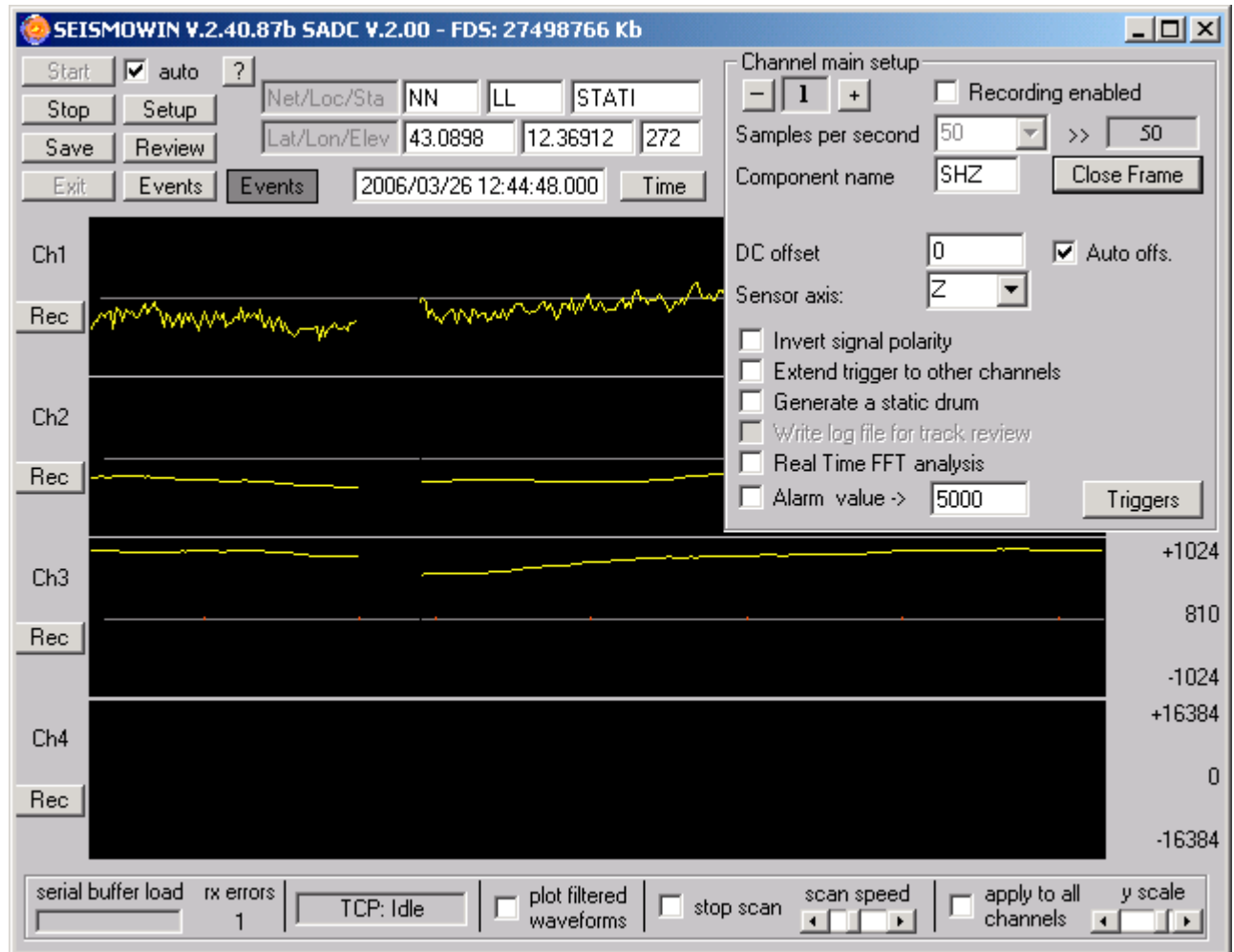
**Glossary**

6SMOWIN	See SEISMOWIN
A/D	Analogue to Digital (conversion)
ALIAS	Effect that corrupt the signal integrity if the A/D sampling is not correctly performed. See the related paragraph of this manual.
Baud	Speed of data transmission expressed in bit per second
Buffer	Transferring memory for serial data. It is used as queue for the data flow. When the processor is busy for other duty this buffer is filled until the processing is passed to Seismowin again to collect the data waiting in the buffer queue.
Clock	It can express two meanings. 1) the real time clock processing accomplished by a processor that keep the count of hour, minutes, seconds and fraction of seconds as well as years, months and days. 2) the oscillator that give the “tick” or the base time to a microprocessor and establish the speed at the microprocessor can crunch data.
Data rate	Speed of transferring data from the card to Seismowin. The data rate is affected not only by the baud rate but also by the transfer protocol used that decrease the effective data rate of about a factor of two.
DCF77	Time broadcasting standard for accurate timekeeping
Datalog	Data collection performed continuously allowing the data to be retrieved when necessary.
Event	Seismic event, earthquake.
Extension	In the Windows world means the 3 characters following a file name. It identifies the kind of file and help the operating system to handle that file properly. For instance, 6SMOWIN.EXE the extension is “.EXE” meaning EXEcutable program.
Firmware	Software stored inside a microcontroller chip
Gain	Usually related to amplifiers (but also on A/D converters) express the magnification factor of an input signal compared to the amplitude to the output signal processed by the device.
GPS	Global Positioning System, used in seismology especially for accurate timekeeping and picking of observation sites geographical coordinates.
GMT	Greenwich Mean Time (similar to UTC)
Handshake	Term used to express the electrical signal used to synchronize two equipments when they need to transfer data between themselves.
Inverse filter	A filter usually reduce a number of frequency leaving unaltered others. The Inverse filter or amplify a band of frequency and leave unaltered others. In seismology it is usually used as Period Extender.
Log	See Datalog
NTP	Network Time Protocol, used to synchronize the PC’s real time clock through Internet
Packet	Group of bytes that are related to a specific items of data to be transmitted as a single “package” and that will be decoded after received.
Period	Natural period of oscillation frequency of a sensor
Period extender	Electronic device or software routine capable to enhance or amplify the low frequency signal over the normal response curve of a sensor.

Purging	Automatic routine to delete old files considered no more useful for any processing purpose.
Range	Related to A/D converter and/or signal processing the range is the maximum amplitude that the converter and/or the software can handle.
Resolution	Related to A/D converter and/or an electronic device capable to detect and process signals, it is the value that express the smallest signal detectable by the device.
RS232	Electrical standard for serial communication data. It is the same of EIA-RS232. The device widely used in personal computers is often named COM1 or COM2 on your PC. The standard interface connector is a DB9 or DB25 male on the pc, female on the communication device.
RX	Acronymous stands for Receiver, Receiving process or functions.
Sensor	Element capable to transform a physical effect in to electric signals. In this context a sensor is typically a seismometer.
SPS	Samples per second
SYNC	Abbreviation of “Synchronism” or “Synchronized” or “Synchronization” depending on the context
SEISMOWIN	The software explained in this manual. In past it was called 6SMOWIN because the number 6 is pronounced literally SEI in italian and SEISMOWIN was a too long name to be recorded in DOS Win 3.X machines. So if you read somewhere 6SMOWIN its means SEISMOWIN.
TX	Acronymous stands for Transmitter, Transmitting process or functions.
Transducer	See “Sensor”
UTC	Universal Time Convention (similar to GMT)
FFT	Fast Fourier Transform, function to draw in a graphic the frequency amplitude of a signal. It is useful to identify the dominant signal and to make noise surveys.

## Control panel

The control panel appears like the picture below. This picture is a screenshot captured running a 24 bit a/d board with firmware version 2.0. Note that the **START** and **EXIT** buttons are in light gray because they are disabled during the data acquisition process.



Many of the controls are in this main window or this so called “control panel”; follows all the descriptions. Note that the **Channel main setup** it is a popup frame that can be opened and closed in order to access more controls related to each channel.

Controls and buttons of the control panel window

### START

This button **STARTS** the acquisition process. Note that when you click on **START** the check-box **Auto** activates by itself; if you will click on **SAVE** button the **Auto** function (Autostart) will remain activated at the next launch of the software and the acquisition process will start automatically.

### STOP

Stop the acquisition process. This button is disabled if the software is recording an event. While the system is in recording mode the **signal numbers** are enlightened in red color.

### SAVE

Click to save the system configuration.

**EXIT**

Button that terminate the execution of the program. The user cannot exit the program if the acquisition process is running neither using the key command ALT+F4 or the X window control button. Before to terminate the program you must stop it using the STOP button.

**Auto**

This check box enable Seismowin to automatically start the acquisition process as soon the program is launched by Windows. This allow an auto start process to be activated using the Automatic Execution feature of the Windows operating system.

**SETUP**

Button for opening the Seismowin SETUP window. The SETUP contains many basic function related to the data input/output of the system.

**REVIEW**

Button for review of the datalog files and event file extraction.

**EVENTS**

This button open the window where a system log is recorded and automatic recording of seismic events are listed

**? Button**

This button recall a credits windows.

**REC (REC/stop)**

For each channel a **REC** button is available. This button activates the recording of the related channel manually. After pressing the button the button's caption "**REC**" change to "**STOP**"; the button now has the STOP function allowing you to deactivate the recording. If you don't press on **rec/STOP** the channel will stop the recording according to the parameters selected for automatic channel event recording.

**IMPORTANT!** If you give a manual stop the check box **Recording enabled** (in the Channel main setup frame) is automatically disabled. You'll have to re-enabled it if you need the software to record events automatically again.

**Signal numbers and waveform of Ch1 to Ch4**

Each channel is monitored even by a numbers indicator and a graphic chart. The signal numbers can give you an idea of the magnitude of the signal the a/d board is detecting. Of course a better understandable view can be obtained watching the graphical waveform for each channel. When a recording is activated the background color of the numbers become red.

The waveform it is displayed in scope mode, being the data tracked in a continue loop. According to the Y scale factor you selected, you can see the start amplitude threshold in green dots and the stop amplitude threshold in red dots marking the chart each second The waveform chart can be enlarged giving a "double click" on it.

**TIME**

This button open the TIME SET window where the timing related options can be adjusted. The indicator at its left shows the time clock processed by Seismowin in real time.

**NET/LOC/STA**

These three fields contains the Network, Location and Station name or code used to identify the data waveform over the automatically recorded file or TCP data transmission.

**LAT/LON/ELEV**

Insert here the geographical coordinates of your station as Latitude, Longitude and Elevation. The coordinates should be written in centesimal notation with N/S and E/W identification (+/- if required), and the Elevation in meters over the sea level.

**EVENTS indicator**

This indicator flash in RED if one or more files has been automatically recorded.

**EVENTS button**

This button recall a list of events and system log recorded by SEISMOWIN.

### Channel Main Setup frame

This frame collect the majority of the control related to each channel. Some controls are always accessible by the user, others can be accessed clicking on the **OPEN FRAME / close frame** button. (The **OPEN FRAME** shown in the picture display the text: **CLOSE FRAME** because the frame for instance is already open)

#### Channel number selector

The number at the top-left corner of the Channel Main Setup frame show the selected channel of the parameter are related to. You can select the channel in two ways: a) clickin on the buttons + and -; b) clicking (single click) over a chart of the channel you want to select. The parameter in the Channel Main Setup frame will show the current setting of the selected channel.

#### Recording enabled

This check box allow you to Enable/Disable the automatic recording of the channel.

#### SPS

Samples per second. Number of samples per second established as acquiring data rate for that channel. The number at right of this setting shown the real data rate recorded by **Seismowin** during the last second. If there are differences between the selected SPS rate and the real SPS rate means that there is a problem on the communication link or in the A/D card. This parameter is not reliable in the third party A/D boards that doesn't issue the time together with the data but only the samples, so don't care too much of the number variation you may see with DATAQ, INFILTEC and LX1500 A/D boards.

***Tip!** To do not record anomalous signals, different from the reality, you must keep present a basic law of signal processing. To sample in digital form a signal without altering the waveform you have to sample it at least twice SPS frequency than the frequency you are interested to analyze. For example if your sensor or electronic amplifier filtering board has a bandwidth of 5 Hz you MUST sample at least 10 Hz (or SPS). Practically it will be useful to sample 5 times the interesting frequency in the example at 25 Hz. At the same time sampling more than 25 SPS if you have a bandwidth of your electronic of 5 Hz is useless and you are only capturing more data than are necessary. Obviously you must also apply an electronic filter that not allow to any frequency higher than one half of your sps rate to reach the converter. If this happens strange ALIAS phenomena will affect your recording. One way to check if you are in aliasing problem is to extend the SPS and watch if the waveform change. If it change you were observing an alias and not the real signal. You will have to apply an appropriate anti-alias filter and select the proper SPS rate.*

SPS data rate is locked using it with some kinds of a/d board (i.e. LX1500 and INFILTEC)

Not all SPS rate are allowed for all A/D boards. Seismowin knows wich rates are allowed and wich not and will warn you with explanation windows.

#### Component name

Up to 4 characters can be used to identify an event files with its component code or name. Usually the name or code is established with the supervision of your network. It is also related to the sensor type. A common convention is the following: The Federation of Digital Seismographic Network recomends the following naming for Seismometer (SEED Manual v 2.4 August 2004 page 122):

First char	Band code of sensor (frequency sensitivity as long period, short period etc..)
Second	Instrument code (high gain, low gain)
Third	Orientation code (vertical, north, south)

Band code: E=Extremely-Short-Period, S=Short-Period, M=Mid-Period, L=Long-Period, V=Very-Long-Period, U=Ultra-Long-Period, R=Extremely-Long-Period, H=High-Broad-Band, B=Broad-Band X=Experimental

Instrument code: H=High gain, L=Low Gain, G=Gravimeter, M=Mass Position Seismometer, N=Accelerometer

Orientation code: Z, N, E = Traditional vertical, North-South, East-West

**DC OFFSET**

Offset of counts incoming from a/d board. You can use a positive or negative value to adjust small counts differences from a/d board and maintain the signal to a graphic zero point.

**AUTO OFFS.**

Enable/Disable an high-pass filter used to remove the small dc offset you could have from your electronics, it could be used instead of the manual OFFSET adjust.

**SENSOR AXIS**

Identification of the sensitivity axis of the sensor. You can choose between Z (vertical), N (north-south), E (east – west) and < ? > for undetermined or not applicable.

**INVERT**

Enable/Disable the inversion of the polarity of the channel. You may have made a wrong wiring on your sensor (it is the human imperfection) this control is an easy remedy to put the signal in the right polarity.

*Tip! The standard, international signal polarity prescribe to use:  
Vertical axis, positive wave = ground moving from down to up  
East-West axis, positive wave = ground moving from West to East  
North-South axis, positive wave = ground moving from South to North*

**EXTEND TRIGGER TO OTHER CHANNELS**

Enable/Disable of the function that extend the record triggering to all others recording enabled channels. It is may be useful to trigger the recording of all channels if only one sensor detected a strong signal.

**GENERATE A STATIC DRUM**

Enable/Disable the virtual drum option. This option allows you to have a daily chart of the seismic activity for your reference during the last hours. Other settings for drum option are present on SETUP window. In the Seismowin folder in the DRUM subfolder the drum option will store a graphic file with a selectable format from BMP, GIF, JPG according to the Setup options.

**Write LOG file for track review**

Enable/Disable the recording of continuous binary data recording on the selected channel. After recorded these file can be reviewed and small events or not triggered events can be extracted.

**REAL TIME FFT ANALYSIS**

This checkbox enable the FFT Real time analysis window. See the FFT section for details.

**ALARM and its threshold value**

Enable/Disable the acoustic beep in the occasions of quake events. A WAV file can be played instead of the beep, see the SETUP window details.

**TRIGGERS**

This button opens the windows that adjust the automatic triggering of the event recording.

**Additional control and monitor frame**

At the bottom of the Control Panel window there is a frame containing some additional controls and information labels.

**Serial Buffer Load**

The receiving data from a/d card is performed by serial port. The gauge Serial Buffer Load shows how many data are stored in the serial port buffer. The data incoming the buffer even if effectively collected by SEISMOWIN seconds and sometimes minutes after the effective sampling time are always referred to the time when they were sampled. The gauge indicator must not increase, it can increase sometime when the personal computer is performing something else but after that task is finished the buffer level must decrease until become zero. If the buffer load increase and increase until the color become red it means that the total SPS received exceed the performance of the PC to collect data. If the buffer load overflow data will be lost and a warning window will be shown.

#### RX Errors

Counts the bad packet received from the serial port. This number is automatically cleared every 10 minutes. If it reach 5 counts a warning window is opened. This counter test the reliability of the RS232 connection.

#### TCP label

This label contains the TCP connection status. It may be IDLE or active from a specific IP showed in this label. See the SETUP window description for the TCP function explanations.

#### Plot Filtered Waveforms

This check box set SEISMOWIN to show in the waveform plot the results of the digital filters you may have set in the Trigger window. See the Trigger window for details on digital filters

#### Stop Scan

Enable/Disable the waveform scan plot allowing slow machine to have faster SPS rates.

#### SCAN SPEED

Adjust the horizontal scanning speed of the charts. This parameter is not related to any measurement unit, you can adjust as you prefer. It can enhance the readability of some frequency on the chart.

#### Y Scale

Y or zoom factor for tracks graphic view. You can select if change the scale simultaneously on all channel or only one by one checking or unchecking the **Apply to all channel** checkbox.

## Time Settings

Using the **TIME** button from the main panel you can activate this window.

From here you can adjust date and time, the time correction for the appropriate time zone. (GMT / UTC).

*Notice for the users of SADCxx a/d board: The A/D card embeds its own real time clock that provides the counting of years, months, days, hours, minutes and seconds. If you have a DCF77 time receiver or a GPS time receiver the internal real time clock is synchronized by it. The internal clock counter is needed because the DCF77 receiver cannot be used as a clock but only as a clock synchronizer. The DCF77 (and the GPS too) signal is not always present, sometime it is interrupted by atmospheric storms and other electromagnetic noises. The AD90S2313 controller check the DCF77 data stream and detect errors to avoid mistakes in the synchronization. This means that often the synchronizing tag is well received only few times per day depending by environmental conditions. For this reason the time must be always adjusted with the proper time after the card is powered up. The a/d card detect from the DCF77 signal the UTC time compensation and the daylight DCF77 changeover. In case of use of a GPS as synchronization source, it always transmit UTC time. The reception of the GPS signal is much more constant and it is recommended for better results.*

The fields for the DATE and TIME setup are preloaded by the software with the current time in the moment the window is opened. They can be changed before use the **SET TIME** button.

### SYNC source

This control select if a DCF77 source or a GPS source is used for accurate timing.

Considering DCF77 is always transmitting +1 UTC time or +2 during summer time, GPS will always transmit UTC and a different GMT correction is needed. This correction between DCF77 and GPS is made automatically by the software. *The GMT field must be always zero if you use Seismowin for seismological purpose.*

### PC Time

Is updated with the PC time.

### A/D Time

Is updated simultaneously with the sampling rate from the a/d card and contains the time received by the a/d card.

### DCF77 Sync

The box light in green for 6 seconds after a DCF77 or a GPS synchronization, the following text will show the date and time of the synchronization. Each time a correct synchronization is received the clock inside the A/D card it is updated and the file TIMEFILE.TXT is updated for future examination.

**Status**

Indicator showing if the system is considered *Locked* or *Not Locked* by the time receiver (DCF or GPS).

For DCF77 receiver Locked mean that the a/d board received a sync packet within the past 60 minutes

For GPS receiver Locked mean that the a/d board received a sync within the past 5 minutes.

In all the other cases the Status indicator become: Unlocked. Variation of the Time Status are reported in the file EVTFIELD.DAT.

**PC time not sync. from A/D time**

This selection allow to the PC clock to be not synchronized by the A/D TIME. Anyway all datas received by the A/D board are strictly associated to the time issued from the A/D board itself. So the waveform recorded will be always referred to the correct Real Time Clock.

**Enable PC to sync. A/D time**

This option allow SEISMOWIN to refresh the A/D time on the interval time specified at PC sync A/D every. This is useful when you want use a different kind of synchronization system like NTP or GPS that sync directly your PC. In this case PC time not sync. From a/d time must be selected to preevent sync conflicts.

**PC sync A/D every**

This option setup the frequency of the a/d clock refresh. For most of application a daily refresh is enough. Set the most appropriate timing according to your needs.

**CANCEL**

Close the TIME SET window and discard the modifications.

**SET TIME**

Adjust the time according to the values selected on the field at the left side of the window.

**OK**

Close the window accepting the setting and option in the window. The modification must be stored on disk using the SAVE button on the main window.

**Daily SYNC reception**

This chart allow to see in what hours the DCF signal is more strong. A green vertical bar is written on the chart each time a correct time frame is received. The chart can be cleared clicking on the chart. The box in the bottom left side of the window indicate if a solar time or legal time is received by the DCF77 converter.

**DCF77 Time**

This label shows if the DCF77 is broadcasting solar time or daylight (summer) time.

*Tip! To improve the DCF77 receiver setup you can apply the DCF77 pulsing signal to one of the channel of your a/d board. In this way you can able to see on the seismic channel where you applied the DCF77 signal the pulsing signal as an oscilloscope. This is very useful to determine the best orientation of the antenna. Even if during the setup the signal is disturbed, when you oriented the antenna at the best reception angle during the next 24 hours you will surely have enough synchronizations. This is usually not needed with a GPS receiver. Keep in mind that you may have to condition the DCF77 signal in order to be accepted by the A/D board without damage to the board itself!*

## Triggering and channel calibration

This window allow to adjust the parameters of automatic triggering and recording of earthquakes; some other controls are also presents. Everything is detailed described in the following paragraphs.

*Tip! Is warmly recomendado to read and study this section to obtain the best results of the automatic earthquake recording functions. Don't give up after few paragraph but conclude the reading and verify your understanding making test with your system.*

**Trigger and Channels calibration**

Channel:

DC:

P-P:

Inverse filter: The inverse filter improve the low frequency response of your sensor.  
**Don't use this filter with sensors already compensated using circuit.**  
 Select the natural frequency of your sensor

disable filter  
 4.5Hz  
 1Hz  
 0.2Hz  
 This sensor now can detect frequency down to  Hz

Trigger mode:  Amplitude  STA / LTA  Scheduled

Events output format:

**START**

START amplitude:

Pre Event Buffer:

Samples to trig.:

STA (seconds):    Freeze LTA

LTA (seconds):

START > ratio:

IIR Filters: Freq. Hz Poles trigger signal

IIR Filters	Freq. Hz	Poles	trigger	signal
Low Pass	<input type="text" value="4.5"/>	<input type="text" value="1"/>	<input type="checkbox"/>	<input type="checkbox"/>
High Pass	<input type="text" value="4.5"/>	<input type="text" value="1"/>	<input type="checkbox"/>	<input type="checkbox"/>

Trigger only if also the following channel are triggering  
 2  3  4  
 in a window of  Seconds

**STOP**

STOP amplitude:

STOP < ratio:

Post event time:  seconds

Max event length:  seconds

**Calibration**

Sensor type:

Measurement Unit:

Sensitivity:

Data out:

Amplif. Gain:

Resolut.:

A/D Bits:

Full range:

A/D range:

A/D sens.:

Mag. corr.:

Standard earthquake trigger set for:

### Channel frame

The channel control allow to select directly from this window on which channel operates, from 1 to 4. You can select the channel clicking on the + and – buttons or select a channel clicking on the graphic waveform in the main panel, if it is visible.

### DC

Shows the mean signal value made with a long time averaging of the signal.

### Level p-p

Represent the last largest waveform recorded. The computation is made of the difference between the maximum last positive peak and the last maximum negative peak. A peak is considered finished when the signal cross the zero level.

### Inverse Filter Frame

If enabled, the Inverse Filter, perform a digital signal process allowing frequency below the resonance period of a sensor to be magnified. Usually filters perform an attenuation of the amplitude over or below a certain frequency threshold. The inverse filter increase the signal amplitude within a specific frequency band. This process is also called *equalization*.

The notice in red recommend you to don't use this feature with sensors that already have a period extender like the 4.5Hz processed by the SEQUA10 boards, or sensor like Lennartz3D that already are frequency equalized to give a better low frequency response. In fact if you equalize a sensor already compensated in low frequency only extra noise will results.

The inverse filter can be adjusted to fit the "common" frequency response of popular sensors of natural frequency of 4.5Hz, 1Hz and 0.2Hz. Of course this filter have no sense if applied to broad band sensors.

### Trigger Mode Frame

#### ***Trigger mode***

There are 3 triggering modes. The first trigger using the amplitude threshold. The second is the classic STA/LTA triggering method. The third is Scheduled. A short overview of all three methods follows.

#### *Amplitude*

With this method two thresholds have to be adjusted, Start and Stop. The program verify if the signal is over a certain magnitude over the threshold value and it remains there for a certain number of samples (Samples to trig.). If this happens a recording is triggered. The generated file will have a pre-event time according to the pre-event time setting. When a recording is started to stop the signal is analyzed to see for how long it remains below the Stop threshold, when it is stable for all the post-event time the event recording is terminated. This allow to the entire earthquake coda to be recorded.

#### *STA/LTA (overview)*

This the classic algorithm used in seismology for the event triggering in noisy environment. Usually an earthquake produce a noticeable and quick variation on the amplitude of the signal. If the seismometer is deployed near city or roads the noise can increase during day and decrease at night. If the amplitude algorithm is used the thresholds fixed for night may be too low during day triggering too many recording and the thresholds suitable for the day are too high for night missing to record small events. Unfortunately at moment there are no 100% reliable solutions for this problem but this algorithm can face the majority of the site noise problems.

STA/LTA algorithm monitor not the simple amplitude of the signal but the ratio of amplitudes of two time-windows, the Short Time Average Window (that react quickly) and the Long Time Average Window (reacting slowly to the amplitude variation). So STA means **Short Time Average** and LTA means **Long Time Average**. Analyzing the ratio between these two values an event can be "declared" or triggered when the ratio increases over a preset value. In normal conditions both the averaged level are the same so the ratio will oscillate around the unity, 1, one. If the STA increase, the ratio also increase to values greater than 1 rising up of several units depend on the nature and level of the signal variation.

If the background noise increase, (usually slowly) the ratio will remain always near to 1 because while the STA will react more quickly than LTA also LTA react and increase its averaged value causing no triggering of false events when the background noise increases.

Appropriate setting the time windows allow to have excellent performance from the STA/LTA algorithm. When the event has been triggered, to stop the recording the STA/LTA ratio must remain below a "stop ratio threshold" for all the programmed post-event time to assure the recording of the earthquake coda.

#### *Scheduler*

Clicking on the Scheduler button you can activate up to 20 scheduled triggering event to record the signal of blasts or shot for seismic refraction or reflection study. See the scheduler paragraph reported below for details.

#### *Scheduler*

This button call the trigger scheduler (related to the Scheduled trigger mode) and it is described in the next section.

### *Events output format*

There are 3 kinds of output formats available:

PSN TEXT	Standard ASCII format supported by WinQuake
PSN TEXT CM6	Standard ASCII header as PSN TEXT but data represented in CM6
GSE2 CM6	Direct compatible GSE2.0 data format with compressed data in CM6

Note: What is CM6?

CM6 is a compression scheme using ASCII data to represent binary data. This may appear as a non sense but the compression algorithm is basically a method to remove all the redundant data usually present in the background noise especially when 24 bit samples are used. For the 70-80% of the times an earthquake is recorded using a very low dynamic range and the CM6 format compress the file weight of about 2-4 times truncating all the leading zeroes (unused) present in the samples.

ASCII coding allow to transmit the files in almost all kind of medias/modem/standard etc...

The PSN TEXT is a standard ASCII with plain-text readable data format. You can open it with WinQuake and it still readable also with Notepad.

The PSN TEXT CM6 preserve the same header of the PSN TEXT itself but the data are expressed in CM6 format (you would see a series of ++++++UvfCkvg348F8KUFO-JFG0-L....)

The GSE2 CM6 have a standard GSE2.0 header and the CM6 compression format it is directly compatible with all viewer supporting it (not WinQuake).

What you choose in the Events Output Format will influence either the automatic recording and the Extract function from the Review Window (often called data dump).

### **START frame**

This frame contains all the parameter that allow Seismowin to detect and trigger the recording of an event. There are many ways in order to detect a signal that can be considered seismically interesting. The START frame contains a numbers of parameter that help the software to have the correct behaviour in triggering. The basic goal is to avoid false triggering as much as possible, at the same time is absolutely needed to don't miss any earthquake. This issue cannot be always accomplished so a continuous recording option (datalog) is offered by Seismowin. Anyway the START and STOP facilities offered by Seismowin are very powerful and when well settled they can offer a reliability up to 95% of correct recording.

In order to help the user to setup the parameters at the best now are reported brief description of each parameter and after there are a couple of paragraph and pictures that will help the understanding of how they can be used in various forms and combinations according to the station needs, background noise, sensors sensitivity etc. It is recommended to go ahead and read all the description of the parameter even if not well understood until all the section is completed. Then everything will result more clear and a second readings will surely wipe out other doubts. (If not, you can always submit your questions on the [www.infoeq.it](http://www.infoeq.it) forum!)

First of all keep present the triggering and de-triggering (STOP of a recording) are conditioned basically on the kind of triggering. The basic trigger mode are selected using the **Trigger mode** options. (The explanation of Scheduled mode is described later.)

#### *START amplitude*

When the signal go over this threshold and remains over it for at least a number of samples specified in *Samples to trig* a recording is initiated.

#### *Pre-Event buffer (in seconds)*

Seconds of buffer used to save the data before the event declaring. This is needed to pick also the P waves often pass under the start threshold.

#### *Samples over start*

Number of samples (not counts) over the start threshold to declare triggered an event. This value work as sort of very simple low-pass filter because avoid that only a single samples are able to trigger an event.

#### *STA*

Short Time Average. Specify the time window where a signal averaging are made. The value showed at the right box is the absolute amplitude value computed for the current STA time frame. This parameter must be always lower than LTA.

*LTA*

Long Time Average. Specify the time window where a signal averaging are made. The value showed at the right box is the absolute amplitude value computed for the current LTA time frame. This parameter must be always greather than LTA.

*Freeze LTA*

This parameter specify that when a triggering is executed the LTA value must be frozen at its last value. This will allow to better record the earthquake coda.

*Start ratio*

Threshold ratio to start the recording. When the result of the STA/LTA division (ratio) will become higher than what is specified in this field a recording is started. The value showed at the right is the current computed ratio bewteen STA/LTA.

*IIR FILTERS*

Digital filters can be used to process the signal both for triggering and for recording.

Usually seismologists doesn't altere the signal with digital filters but tend to preserve the signal integrity and apply filters after the waveform is recorded. Amateurs may wants to remove annoyant noisy signal so this function allow also to filter the samples as they are sampled.

*Low Pass*

This option activate a low pass filter, this filter will reduce the amplitude of high frequencies and will make pass unchanged frequency lower than the specified value.

*High Pass*

This option activate a high pass filter, this filter will reduce the amplitude of low frequencies and will make pass unchanged frequency higher than the specified value.

*Frequency (Hz)*

Specify the frequency of the High or Low pass filter.

*Poles*

Specify the number of poles the filter will use to process the signal.

*Trigger*

If this option is enabled the triggering algorithm will use the filtered signal to check the triggering.

*Signal*

If this option is enabled SEISMOWIN will use a filtered signal for all its processes.

*Trigger only if..*

Specify what channel must be associated in triggering to start a recording. This allow to makeup a sort of conditonal triggering where at least 2 or more channel must have a strong signal simultaneously inside a time window specified in the window parameter. When the channel 1 is selected the option are related to channel 2, 3 and 4. When channel 2 is selected the option are of 1, 3 and 4, etcetera.

If you want (for example) to trigger only if 3 channels are requesting a recording you can click all options of 1 and 2 and 3 and apply a time window of 3-5 seconds and triggers that happens within 3-5 seconds will begin a recording.

**STOP frame**

Complementary to the START frame the STOP frame contains all the parameter needed to stop a recording without truncating the earthquake coda and/or record whatever is interesting for your surveys.

*STOP amplitude*

Amplitude threshold for stop event recording.

This specify the level of the signal to be consider no more interesting for recording.

*Post event time (in minute)*

Post event record duration. This parameter setup the length of the recording after the triggering allowing to record all the coda. It establish for how long the signal must remains under the stop threshold (if the amplitude algorithm is used) or under the Stop ratio threshold if the STA/LTA algorithm is used to declare a "stop recording".

*Stop ratio*

Threshold of stop ratio for STA/LTA algorithm.

**Max event length**

Max length of an event. Reached this time in any condition the event recording will be terminated regardless if all other stop condition are satisfied or not.

**Calibration Frame**

The parameters contained in the calibration frame have no effect on the signal. They only will be used to describe to the analysis software what kind of signal the system has recorded. No data for a system response description are provided.

**Sensor type**

You can select four different types of sensor from Velocity, Displacement, Acceleration or Unknown.

**Measurement Unit**

This allow to select the measurement unit. You can chose from meters to nanometers.

*Tip! With WinQuake you must use centimeters (cm)*

*Sensitivity*

You should put here the signal value in Volts that your sensor generates. The measurement unit of this number depends on the sensor type. The measurement unit is showed in the box at right of this control. For example if you have a velocity sensor you should be able to obtain how much Volts it generates at one meter per second velocity.

*Amplif. Gain*

Put here the gain factor of your amplifier. You can compute it looking carefully to the schematic you have or ask to who supplied your amplifier. For some systems it could be also be a unity gain.

*A/D Bits*

Put here the number of bit of resolution of your A/D. Usually 14, 16, 18, 24 bits are common size.

*A/D range*

Put here the full range of your A/D. Put the peak-to-peak value. For example if your A/D is able to pick signal from -10V to +10V your full range is 20V; if it can read from -1 to +1 the value is 2.

*Data Output*

This is an output field. Data output mean what signal is generated for a unity of measurement of your sensor. It is the reciprocal of the Sensor Sensitivity multiplied for the amplifier gain factor.

*Resolution*

This is the final resolution of your system. It represent what is the smallest measurement unit your system is able to resolve. Smaller is this value more precise is your system. Go low in resolution can be accomplished increasing the gain of the amplifier but this make narrow the full range of your system.

*Full range*

This is the maximum amount of measure your system is able to record in the selected measurement unit.

*A/D sensitivity*

This represent the A/D sensitivity in count per Volts. It is used in the internal computation of resolution.

Standard earthquake trigger set

Considering that for beginners such a number of controls can get you confused three kind of preset values are provided. Simply click the Local or Regional or Tele button to select parameters that can be appropriate to record earthquake very near to you (Local), or within 100-200km from you (Regional) or very far from you even at thousands of kilometers from your station (Teleseismic earthquakes).

Remember to click on APPLY button each time you click on Local, Regional or Tele button, then change the channel and repeat the procedure.

Cancel

This button close the window discarding the modifies. (The modifications are mantained if you applied them before click cancel!)

APPLY

This button apply the modifies to the system.

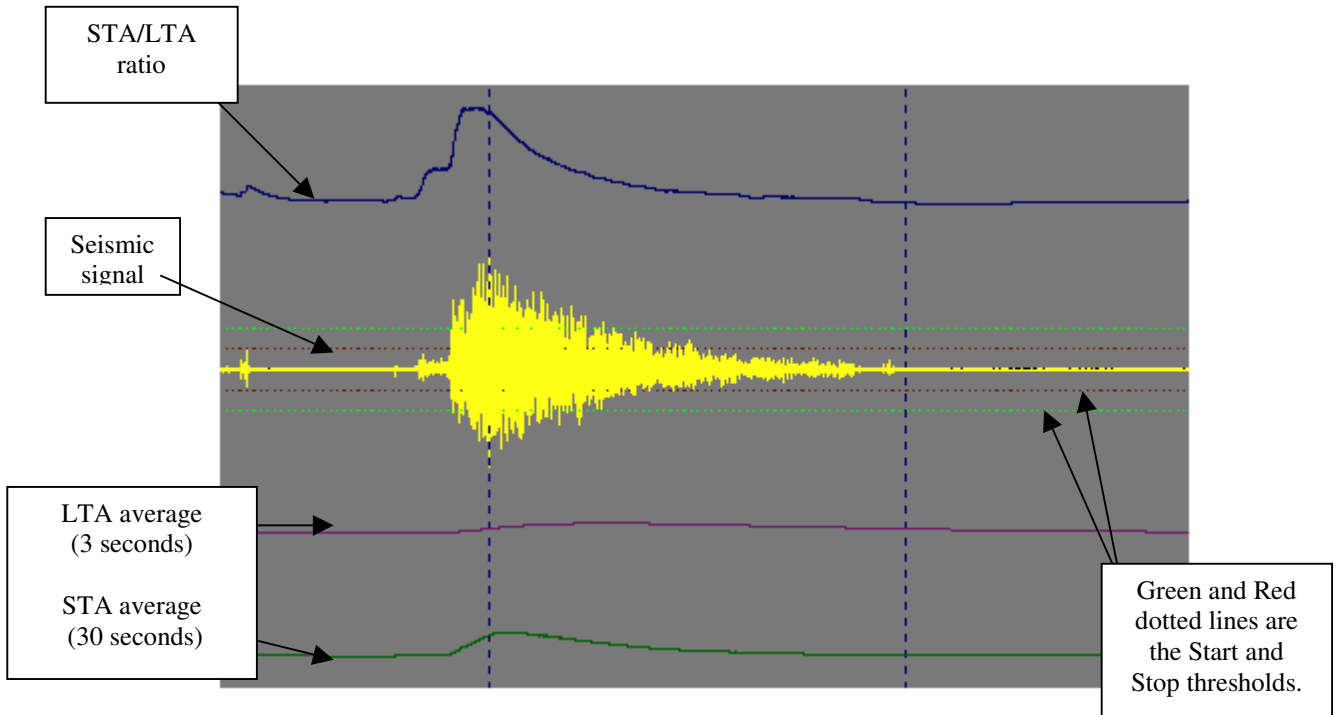
OK

Apply modifies (only for the current channel) and close the window.

USE of START/STOP recording parameters and their meanings.

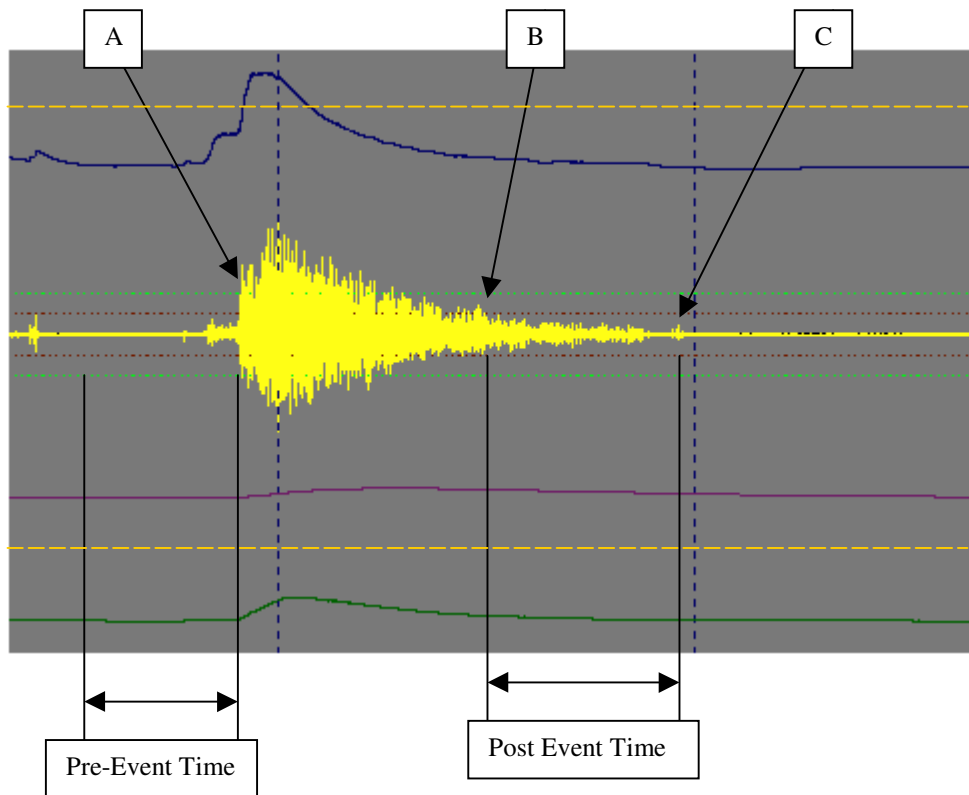
In this paragraph a summary of all controls will be listed using an example chart. Please look the chart carefully and try to familiarize with the parameters and their description. Measurements unit are not necessary in this moment, notice only that the base line of the STA/LTA ratio represent the unity value (one, 1).

The same chart will be interpreted in the various triggers mode, so the first is only descriptive.



### Triggering with amplitude method

Looking at this chart you can see how the noise at the right side of the chart was not able to trigger a recording. It would if it would reach the green dotted line representing the start threshold. Neither the P waves of the recorded earthquake would be able to trigger it, (for this reason exist a pre-event buffer). Only at point A the recording begins. At point B the signal amplitude become constant under the level of the Stop (red) threshold but only at point C where the STOP post event time elapsed the recording is finished.

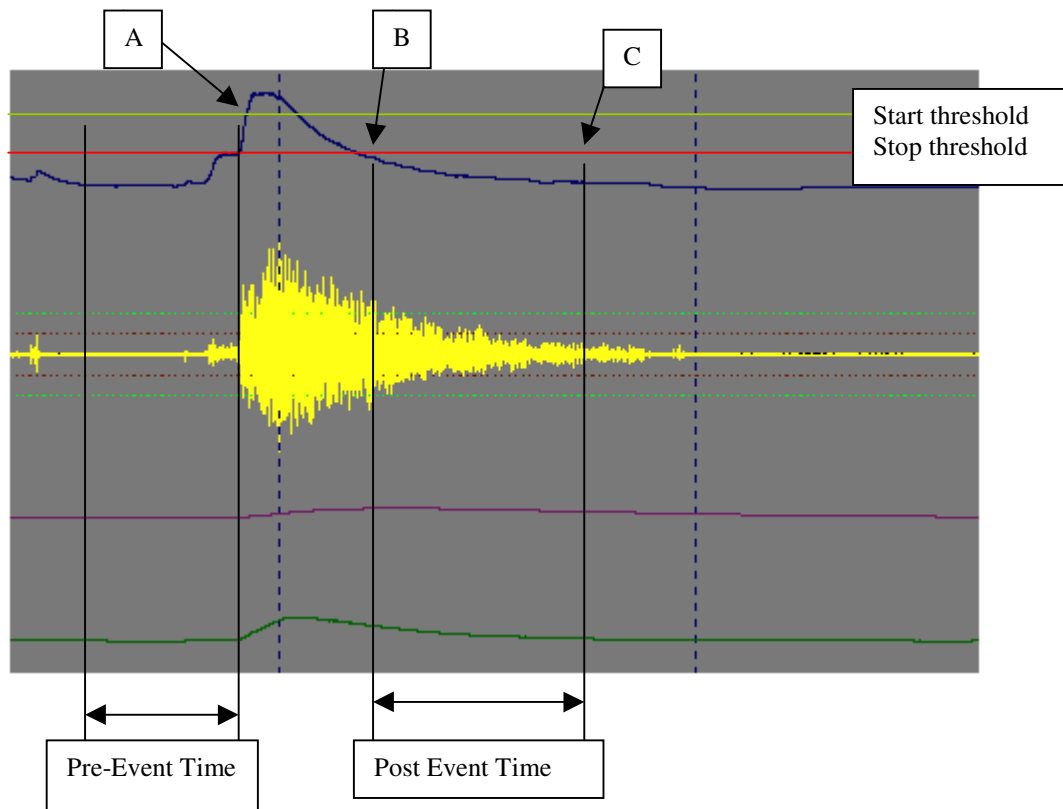


You may prefer to record exactly 1 minutes before the event and 1 minutes after the event; use the Amplitude method and adjust the START threshold as you prefer according to the background noise of the site (like the green threshold of the picture); then adjust the STOP threshold to the maximum allowed or let's say at 10000 count or more (like the orange dashed line). Set the pre-event time at 1 minutes and the post event time at 1 minutes. The majority of the events will be surely already under the STOP threshold as soon an event is declared; 1 minutes of buffer will be recorded in the file, then the STOP sequence will be initiated due the signal is already under the STOP threshold and just after 1 minutes from the START time the event will be stopped having an event length of 2 minutes.

### Triggering with STA/LTA

With the STA/LTA algorithm the triggering is performed keeping in count not the absolute value of the signal but its averaging in a short time period window and a long time period window. This averaging react in different times to the variation of the recorded signal. You can see in the picture a purple line showing the long time average and a green line showing the short time average. As you can see the STA react faster.

The blue line is the ratio computed (graphically emphasized) between LTA and STA.



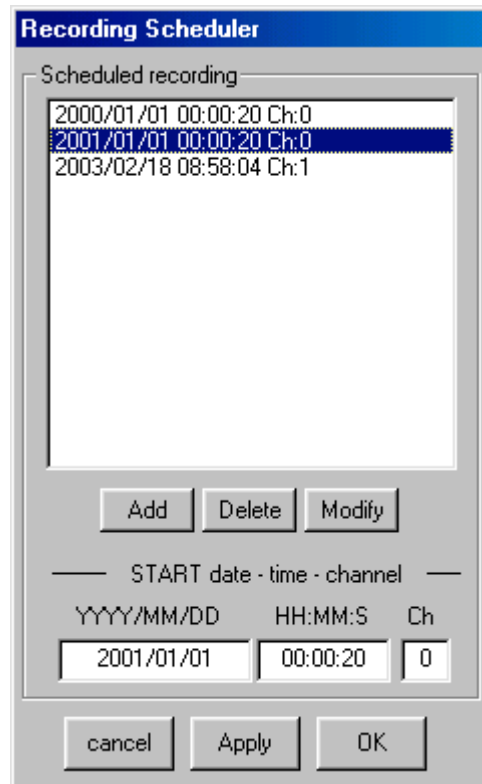
Also in this case you can easily see how the recording start at point A and also all the preevent time is recorded. Then the recording runs and cross the point B where the post-event time begins until the recording is stopped at point C. The advantage of this method is that the system adapt itself to the noise background level.

### Scheduler triggering

The scheduler windows allow to select up to 20 timed events to record the seismic signal.

This allow to accomplish refraction or reflection seismic study or simply to check the background noise level at various time of the day. Up to 20 events are allowed.

This window allow to set, modify or delete the scheduling list.



Use Add to add an event, Delete to delete an event, Modify to modify and event.

Clicking on a TIME in the Scheduled recording list the row selected become colored and the time appear in the editing fields YYYY/MM/DD HH:MM:SS Ch.

You can also select what channel must record the event, alternatively the trigger will be extended on all channel with Xtrig option enabled.

Give Apply to make operative the changes, remember to click on SAVE button of the main control panel to save the parameters, else at the next launch of seismowin the scheduled events will be lost.

## Setup

This window allow to setup several functions and controls for hardware and software automation.

### A/D Interface

This section allow to setup the hardware connected to Seismowin. You must select the a/d board you are using and in which serial port is connected.

#### Interface type

Select the board to be used for a/d conversion processing.

Version 2.27 of SEISMOWIN supports 4 kinds of boards:

- |                         |  |
|-------------------------|--|
| - SADC10 (16 bit board) | SARA snc 16 bit 4 channel board with timing  |
| - SADC18 (18 bit board) | SARA snc 16 bit 4 channel board with timing  |
| - INFILTEC 16b          | 9600 baud Infilter 16 bit 1 channel board  |
| - N.E. LX1500           | 9600 baud Nuova Elettronica 16 bit 1 channel board                                   |
| - DATAQ 194             | 4800 baud DataQ 12 bit 4 channel board   |
| - SADC20 (24 bit board) | SARA snc 24 bit 3 channel board with timing  |
| - SADC30 (16 bit board) | SARA snc 16 bit 16 channel board with timing (only 4 available using SEISMOWIN 2.4x) |

#### Serial Port

Select the communication serial porto from 1 to 16

#### Baud Rate

This parameter select the baud rate of your a/d board.

Usually SADC10, SADC18 and SADC30 works at a standard speed of 38400 baud. The SADC20 has the capability to work from 4800 to 115200, at factory it is preset to 38400 so this speed is ok for the majority of the cases.

### **A/D Settings**

This section contains some additional control that are basically related to old versions of the SADCxx board series and a feature that allow to connect a board without use a preliminary handshake intended to be used for simplex connection (single communication direction links).

#### *Blind Start*

This control avoid the checking of the Seismowin on the firmware and a/d board speed. This function allow to have a *one direction communication line* like in a radio link or a half duplex modem link. Seismowin simply starts with the selected board speed 14400 as default or 38400 if selected function.

#### *Datekeeping*

This control is enabled only if BlindStart is selected. Tell seismowin if the connected board is capable to count days, months and years with its own calendar.

#### *Clock error*

This selection allow to specify how many second per day the a/d board cristal have as absolute frequency error. This allow to clear the Crystal Absolute Frequency tolerance. This feature is available basically only for old boards. If your a/d board have a low drift crystal oscillator select always the hex value FF FF FF FF as calibration code. Pressing the key ENTER on your keyboard when you are on this field allow you to recompute the s/day hex code to be written in the a/d board pressing the *write* button. You can check the value of the board pressing the *read* button.

#### *S/N*

This box contains the serial number read from the a/d board (if it is equipped with).

Note: These last functions are no longer used in the recent releases of the boards. Getting a series of FF is perfectly normal for boards produced after year 2004.

### **Hardware and Reliability**

This frame contains some control that can increase the system stability especially if it is used in remote sites. For better understanding we can say that a watch-dog system is a simple long period timer that can reset the PC if it is not cleared by a signal; this allow the PC to be automatically rebooted if the main program or the operating system crashes. Other function regards some service option used by Seismowin and not intended to be functional for the end user.

#### *Output control port*

This control selecty what parallel port use to drive bits for hardware control.

#### *Watch dog timer pulse on BIT0 LPTx*

Select if a pulse to refresh an eventually external watch-dog circuit must be used or not. A Watch-dog circuit is a special timer (long period timer) that is able to RESET your pc if it is not refreshed periodically. This allow to a system to reboot automatically if it hangs. An appropriate watchdog device should reset the PC acting on the power supply unit or on the RESET switch push-button contacts. The period of the pulsing signal is set by the SECONDS parameter.

#### *Watch-dog Bit 0 Status*

This indicator monitor the action of the bit in the parallel port circuit.

#### **L1**

The indicator L1 is related to the ON/OFF input in the a/d board. This signal is usually used to decode the DCF77. If a receiver (also a GPS receiver) is present and used by the a/d card this indicator will blink. The blinking of this indicator is not in real time with the DCF77 pulse per second sequence.

#### **L2**

This indicator is connected to the ON/OFF input number 2 of the a/d card. (Not available for SADC20 and SADC30 Board where this indicator will be always off).

### *Lock settings*

This parameter allow to lock the settings of whole program. A password is required to lock and unlock the settings. The password setting is not visible so you must remember it. Anyway the password is visible inside the 6smowin.ini file at the line "PSW=...."

### *Use Seismodoctor*

This function tell to seismowin to generate a file that link Seismowin and Seismodoctor in order to preevent system hangs. When this option is used the Seismodoctor software is looked in the c:\6smodct folder with the name 6smodct.exe. If it is present it will be automatically executed after Seismowin startup.

### *Service mode*

This function allow Seismowin to enter in service mode. The service mode allow to show up the trimming window and some other data flow functions. These functions are not so user friendly it is recomended to use the service mode only with the direct assistance of an expert.

### No Startup Logo

This option inhibit the function to have the Seismowin Logo to be showed at startup.

## **Miscellaneous**

Some function can be enabled to be executed when a Seismic Event is recorded.

### *Hardware alarm on bit1 LPTx*

This control set if the BIT 1 of the selected LPT parallel port should be used as a signal to give an electric alarm. The bit change the state and it can drive a relay contact when a quake is recorded.

### *Alarm react on L2 state low*

This control set if the BIT 1 of the selected LPT parallel port should react on the changing state of L2 to ground. This function can be useful to read the signal of a seismoscope or as an intrusion alarm system on the place where sensors are. The signal to be detected must remains closed for at least 2 seconds.

### *Alarm on events Event list*

This control set the hardware alarm bit (BIT 1 of selected LPT) must be excited in occasions of events added on Event List.

### *On Alarm use ALARM.WAV*

This check box allow you to ask Seismowin to recall the file ALARM.WAV from the SEISMOWIN folder to be reproduce as a WAV file. The WAV file can contains any sound or speech not more long of few seconds. The file will be played when the recording is active and over the threshold instead of a normal beep from PC speaker.

### *Print Quake Report*

This option tell Seismowin to print a single line of information on a printer. If you have a old impact printer you can have a old-fashion earthquake report on paper. ☺

### *Generates SMS command file*

This control allow the update of the file SENDSMS.TXT on the application folder. It can be used to send an updated SMS message.

### *Generates EMAIL command file*

This control allow the update of the file SENDMAIL.TXT on the application folder. It can be used to check and update email messages.

### No version and date/time warning

This option disable the check of the date and time format. For your reference the date and time format must be in this form: YYYY/MM/DD and HH:MM:SS.

### Event folder

Identify the folder where events should be recorded. For standard operation selects: C:\6SMOWINEVENTS

### *Event Browser*

Identify the standard event browser path to be called automatically from EVENT LIST

### Continous Data Recording (Datalog)

Seismowin is capable to record event-files meaning signals considered interesting as earthquakes or strong seismic signals. Of course the triggering functions are not “intelligent” and some very small signal or waveforms picked together with other seismic noise could pass unrecongnized. For this reason many people wants Seismowin to record both with event triggering AND continuously. The data recorded continuously can after be recalled and analyzed using the Review function.

The continous data Recording can be enabled using the option *Write Log File* available on the main control panel (see page 9). When this option is enabled files with continous data are written inside the `..\DATALOG` folder. These files are splitted in size to be more useable on disk sharing, beckup, etc.. The size is established a) by the sampling rate and the A/D converter resolution (and its word length 16 or 32 bits) and b) from the time length of these files. The time length is established by the option *Flush Buffers Every* available in this section. The controls of the datalog files are the following:

*Write Log File* (enable or disable on the main panel)

#### *Flush Buffers Every*

Set the datalog buffer length. For example if it is set to 2 hours each file will be long 2 hours. After this time a new file is created and the previous is closed.

#### *Purge files older than*

SEISMOWIN can retain all datalog files. This mean that the disk will fill continuously until it become filled or someone or something not erase unused data. For this reason this automatic purge function is prepared, it will delete all datalog files older than N days according to the setting.

#### *Never Purge*

If at a certain moment you need to disable the purging function simply check this option.

File purging is executed at midnight at the beginning of the new day.

### How Datalog Files are recorded

The datalog files are recorded continuously if the Datalog option is activated on one or more channell. Here you can find a brief description on how they are recorded and the naming convention of the datalog files.

The datalog files are recorded in the `..\datalog\` folder od Seismowin, typically inside: `C:\6SMOWIN\DATALOG`

Each time the system is started, stopped, restarted by a cold start the old file is closed and a new file is opened for recording. The same happens when the flush period expires, the old one is closed (flushed) and a new one is opened for recording.

The name convention is the following:

YYYYMMDD\_HHNNSS\_RRRRT.LGX

Where

YYYY = year    MM = month    DD = day    HH = hour    NN = minute    SS = second

RRRR = sampling rate (from 0001 to 9999)    T = time locked or not locked (L = locked N = not locked)

LG is a suffix always present

X is the channell number

The datalog files are stored in RAW 16 or 32 bit binary format depending of the a/d board used, for all 16 bit models a 16 bit word is used for 18 or more bit a/d board a 32 bit format is used.  
Low/high order or Low/Middle/High order.

## Virtual drums

Virtual drums emulate the old fashion pen drum used for years in seismic observatories. Metal cilinder holding a paper (often thermal paper) moved by a precise clock system was used to record the signal of the seismometer using a electriv driven pen or a hot stylus. Seismowin can generate digital images emulatins the same tecnique. Even if they are no longer used toanalyze earthquake a virtual drum is very useful to have a overview of data of a whole day or several hours. If a strong or interesting signal is present you can go to retrieve the data at that specific time using the Review function or look for the automatic recorded files. The option to generate virtual drum is available in the main panel at the control named *Generate a static drum*.

### Image format

Allow you to select the image format of the drums images between JPG, BMP or GIF format. (GIF recomended).

### Size X / Y

This represent the size of the virtual drum. It can be expressed in Twips (the Windows measuerment unit) or in Pixels. The related value will change automatically and accordingly at the pressing the Enter Key. This setting will reflect the size of the drum window that is automatically opened when the static drum generation is enabled.

### Rows

This control specify how many hours the drum will hold in the screen.

### Hours per row

Select how many hours you want to see in a single drum row.

### Counts/Pixels

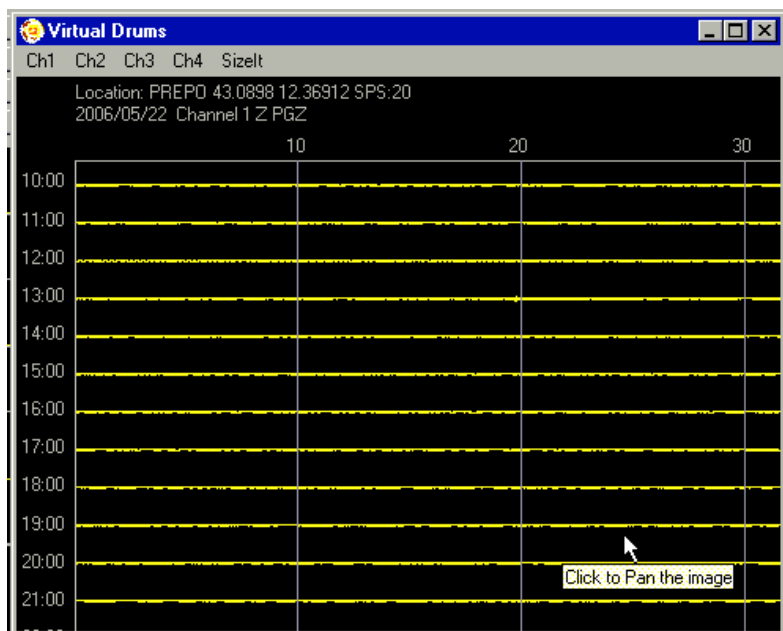
This set the graphic magnification/reduction of the waveform on the drum screen. The parameter is expressed in Counts over Pixels meaning how many counts a pixel is valuated to. To have a bigger waveform reduce this value. To have a smaller signal on the screen increase this value. The values are four, one for each channel.

### Helicorder Mode

This option emulate the bending movement of the pens on mechanical drums, it is here just for fun. The electric driven pen or stylus was often mounted on a single hinge making the pen to have a circular motion, and draw, on the paper. In more modern seismographs this was replaced by a carrier moving the pen straight forward and backward on the paper and giving a better result and reading of the seismographs.

## Drum window

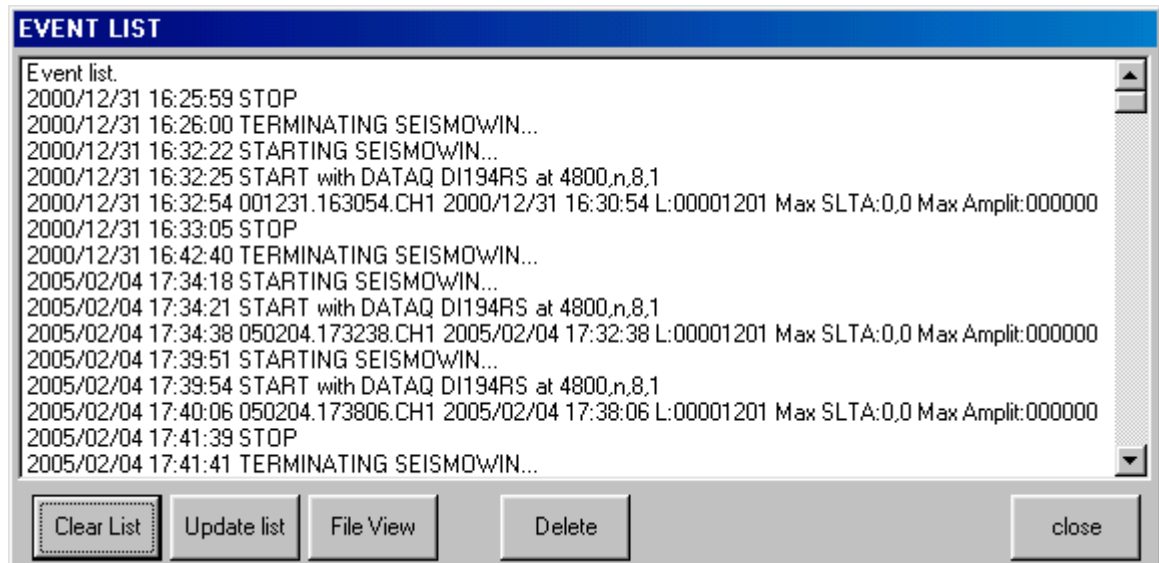
When a drum is enabled a drum window is opened. A menu is present to select the four channel. You can determine the size of the window also using the *SizeIt* control that automatically adjust the Size X/Y values according to the window size you have on the screen. If the window size is smaller than the graphic picture you can drag the picture clicking the left button on the mouse and drag it to pan the picture and see the hidden parts of the chart.



**Event list**

From the main panel window clicking on button EVENT the Event list Window is activated.

This window allow to see the description of the warning messages and the events description recorded by the triggering methods.

**Clear List**

Clean the eventlist file. Files recorded are not removed. It is cleared only the list.

**Update List**

Refresh the text list of the event list.

**Close**

Close the Event List window

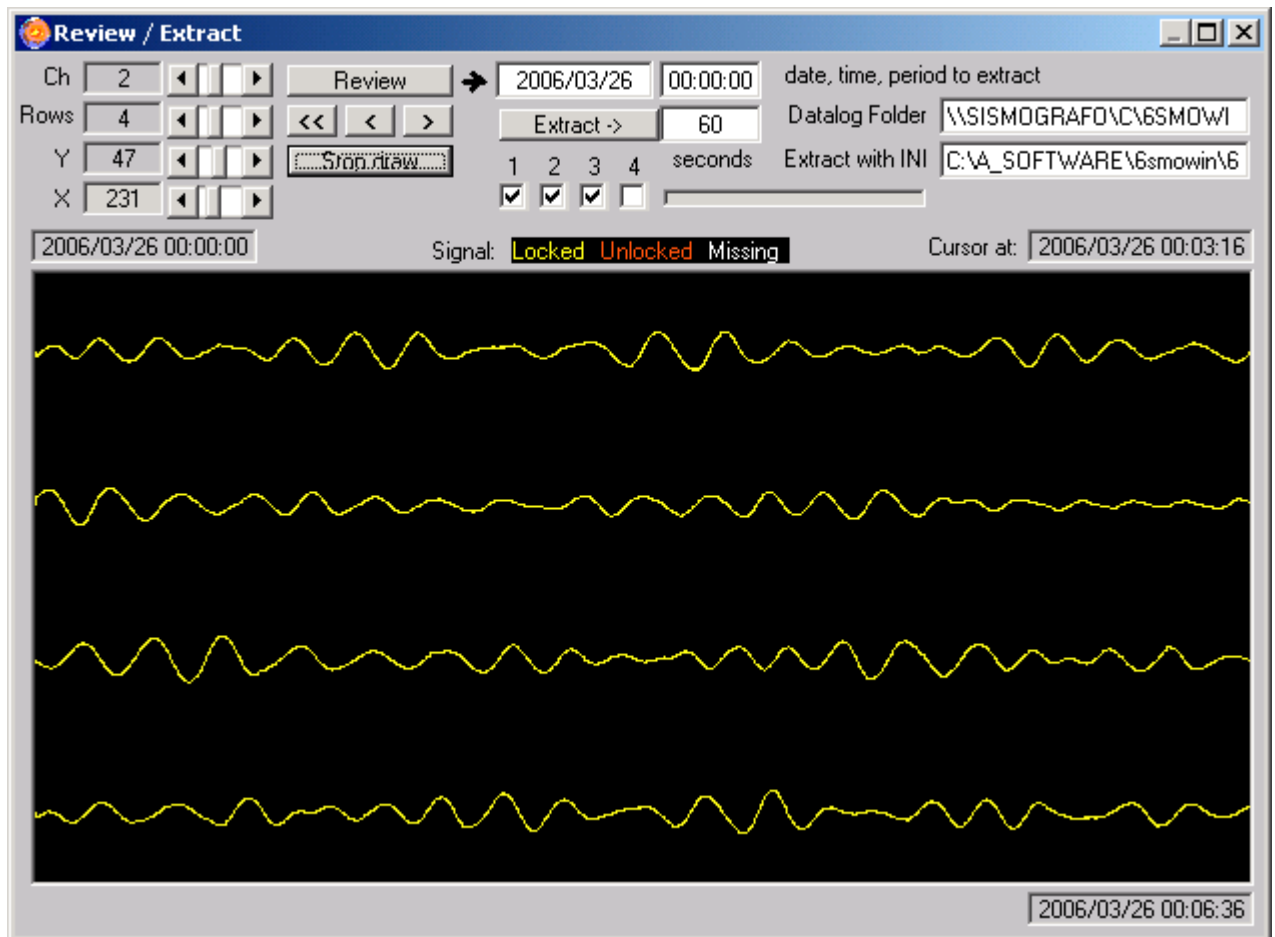
**File view or double click on event file.**

Selecting an event file and clicking on File View you can open automatically your favourite event browser. (The event browser is selected in the **SETUP** window)

## Review and Extract

Using this window you can review datalogged files in the past days.

It is possible to point at one specific time and extract a piece of recorded file from there.



<b>Ch</b>	Select what channel to replay
<b>Rows</b>	Select how many rows see in the screen
<b>Y</b>	Adjust the Y scaling factor
<b>X</b>	Adjust the X scaling factor
<b>Review</b>	Start the replay of the LOG file selected by the channel option beginning from the date and time selected in the fields at right (Date/Time)
<b>&lt;&lt;</b>	Fast Rewind to 00:00:00 time of the selected day
<b>&lt;</b>	Go back one page
<b>&gt;</b>	Go ahead of one page
<b>Stop draw</b>	Stop the current review
<b>Close</b>	Close the Review/Extract window
<b>Extract</b>	Extract the selected minutes beginning from the selected time.

<b>Datalog Folder position</b>	Select the path where find the datalog files
<b>1, 2, 3, 4</b>	Select the track to be extracted
<b>Show drum</b>	Show the current drum active. If present. To close the drum window, close the Review window.
<b>Chart picture</b>	Double clicking on the chart you can start the review of the following data starting from where you clicked. The mouse movement point at the time on the chart. You can see the time in the indicator above the chart.

How to browse the datalog and extract an event

To extract an event you may already know the date and time to look for. You can enter the date and the time right before the expected time and click on review.

Be sure to enable the proper channel you want to see. If data are present they will be drawn in yellow color. The chart maybe in red indicating the data are present but they are far from the last useful time synchronization and they could be not reliable in time location.

If there are no data at all the line will be drawn a straight white line.

When you have isolated the portion of waveform to extract you can click right before it and the date and time will assume the desired start time. Select a duration in minutes typing the number of minutes to extract and select the number of channels you want to extract from 1 to 4. When the window opens the software automatically select the numbers of channels currently selected for datalogging.

If one or more data are missing a message will be displayed explaining what is missing.

The extracted data will be written in the usual Seismowin event folder.

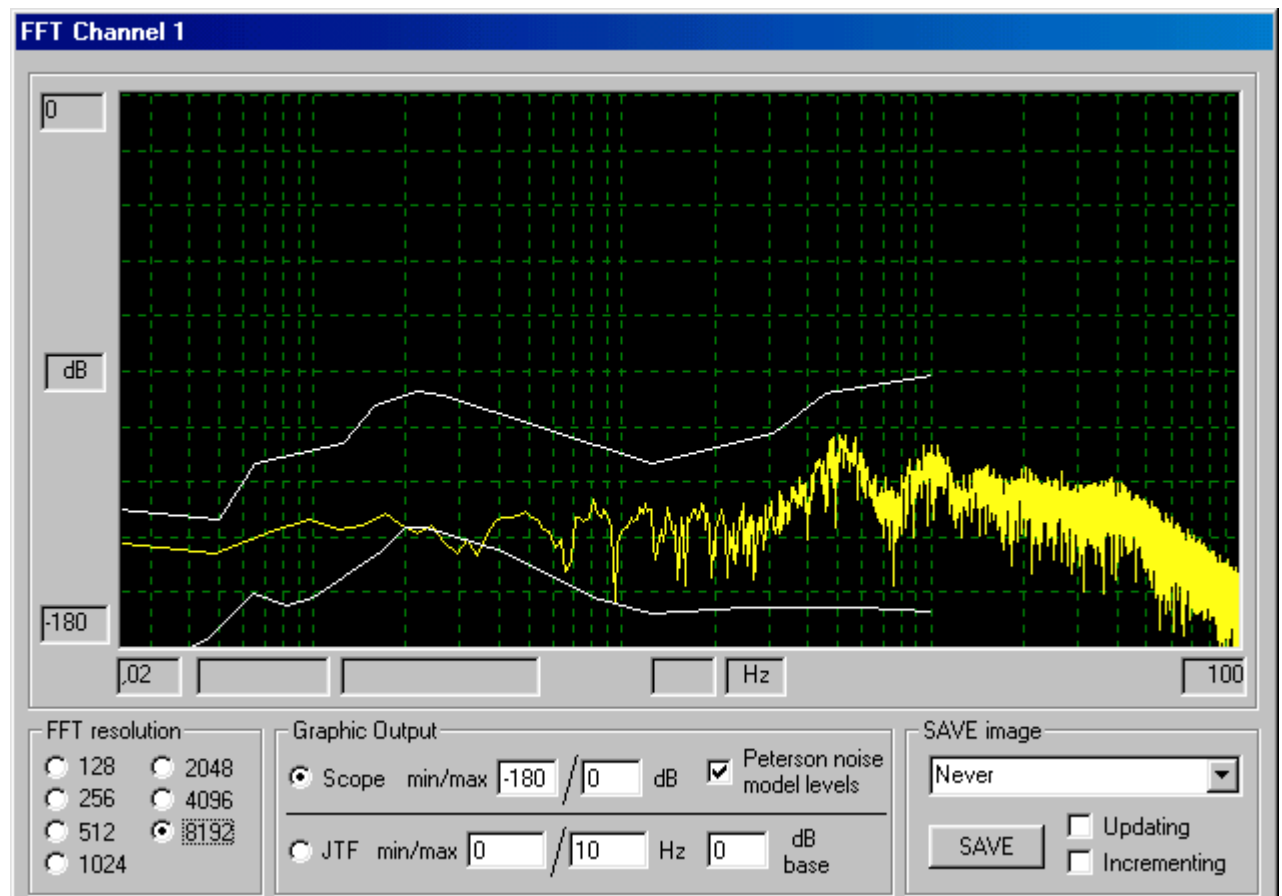
### Spectrum analyzer

This window is enabled from the main control panel in the channel setup frame. It can be opened and managed independently for each channel. It allow to see the spectrum of the recorded waveform either in scope or time-frequency mode (JTF). The scope mode is very useful to watch the noise performance of your system and compare it with the Peterson noise curve model.

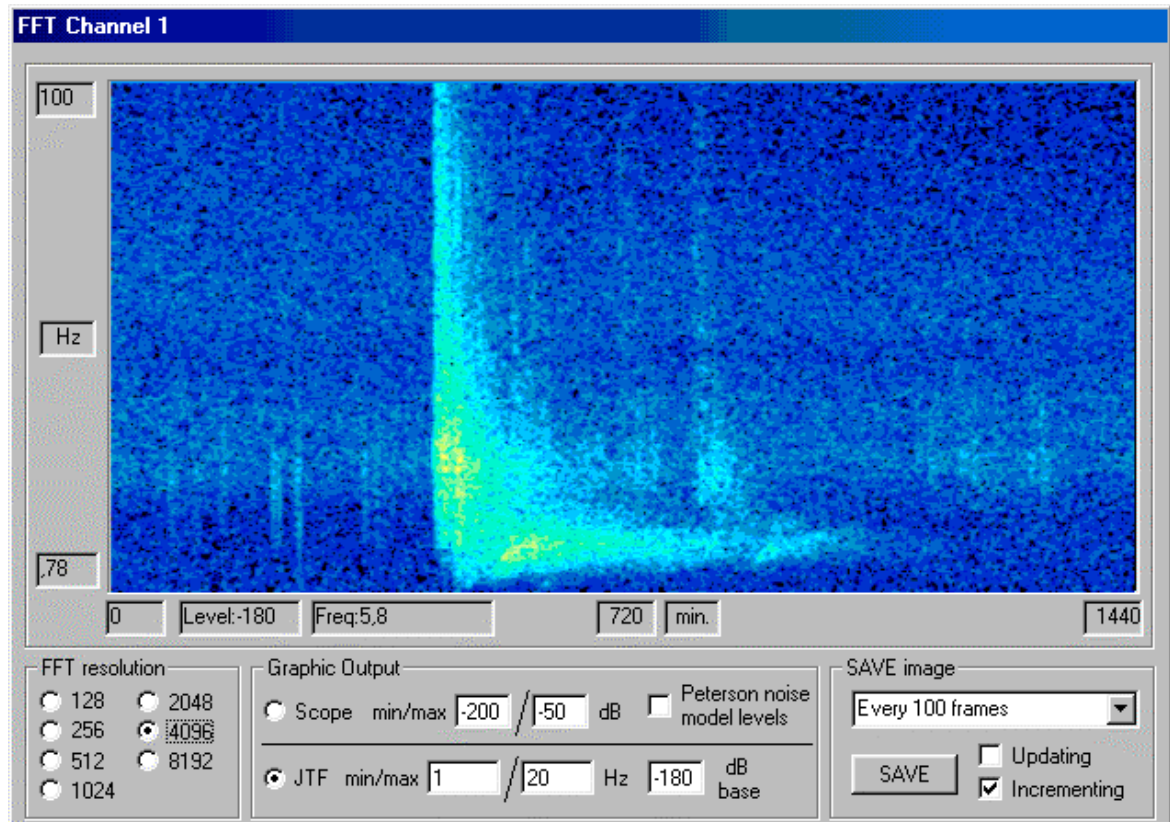
The Peterson noise model describe the maximum and the minimum noise recorded in about 75 professional seismic stations around the world. The site selection for seismology should be choosen using this comparison. If the spectrum curve falls in the model limits it is acceptable for seismic recording.

JTF diagram join the frequency domain analisys in time. The frequency response is recorded during a long period of time (24 hours in seismowin chart) and allow to see the varation of the noise during the day. Colors identify the signal level. Also earthquake can be recorded in this graphic mode the following picture shows a teleseismic event recorded with such JTF diagram.

Frequency domain spectrum



## Time/Frequency domain spectrum



## FFT resolution

These options from 128 or 8192 select the numbers of samples used to draw the FFT. Of course you cannot see low frequency signal using low numbers of samples because the FFT algorithm needs more samples in order to detect low frequency and long period waves.

## Scope / JTF selection

Select the Scope or JTF diagram

## Scope Min/Max

These are the minimum and maximum dB level showed in the Y axis of the scope diagram.

## JTF Min/Max

These are the minimum and maximum frequency values showed in the Y axis of the JTF diagram.

## Peterson noise mode levels

This option enable the draw of the Peterson's curves on the diagram allowing the direct comparisons with the measured signal.

## SAVE mode

This control allow to select if and how often the picture will be saved. It allow to select every how many frames it is saved. One frame means one spectrum diagram refresh.

## Updating

This selection save the spectrum picture always in the same file named SPEC\_x.GIF or JPG or BMP (according to the drum saving mode) where x is the channel number.

## Incrementing

It allow to save images with a name including date and time saving a different picture for each save operation.

## Image window cursors

The image window allow the cursor to pinpoint the frequency and level. See the indicators in the left bottom corner vary moving the cursor around the diagram.

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