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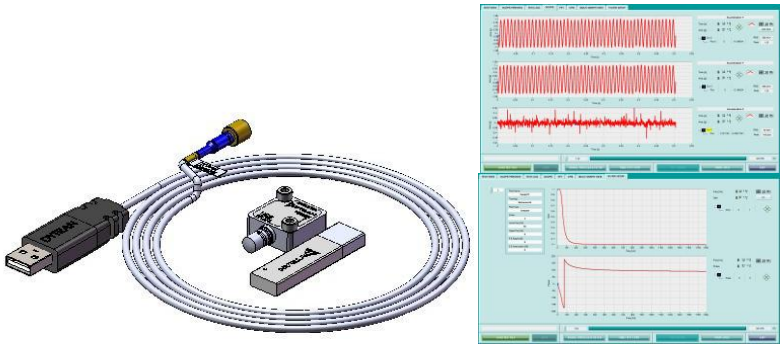
OG5340B
REV A, 07/13/14, ECN 10816

Operating Guide

5340B USB Vibration Measurement System



Featuring the

7543B USB Accelerometer

and

VibraScout ™ Software Application

VibraScout ™ Post Processor Software

Contents

The Dytran 7543B USB Digital Tri-axial Accelerometer combines a 3-Axis MEMS accelerometer with a microcontroller to create an intelligent sensor. This manual applies to both 7543B1 sensor with a range of +/-16G and 7543B2 sensor with a full scale range of +/- 200G. Corresponding systems for each model respectively are 5340B1 and 5340B2.

I. Device Features

-System components:

USB 7543 Accelerometer
6330A 4-pin to USB cable
VibraScout™-RT and VibraScout™-PP software on USB drive

-The 7543B is powered by a PC's USB bus.

-Temperature sensor.

-Real-time acquisition and USB transfer of acceleration (including Static Inclination) and temperature data.

-Built-in firmware handles USB communication and provides a number of unique features including:

Storage of device serial number

Storage of accelerometer and temperature calibration data

Additional storage available for customer information - e.g. last calibration date, etc.

II. VibraScout™ Software Features

-Real-time scrolling plots of acceleration data with display of min, max, mean

-Plot features: zoom & pan, display of individual sample values, save to image file, printing

-Real-time display of X and Y axis inclination angles and temperature

-Real-time logging of data to delimited file for importing into spreadsheet

-Both auto and smart triggering modes

-Fast Fourier Transform Plots of all orthogonal channels.

- API available as .NET dll

III. Acronyms used in this manual

GUI- Graphical User Interface
USB- Universal Serial Bus
FFT- Fast Fourier Transform
PSD-Power Spectral Density
JPG-Joint Photographic File format
ASCII-American Standard Code for Information Interchange
TDMS-Technical Data Management Solution (Binary and ASCII file saving option for smaller file sizes with stored header information)
UFF58- Universal File Format 58 (purely binary file format for data recording)

IV. Minimum System Requirements

Desktop or a Laptop x86 based personal computer
Operating System: Windows XP/Vista/Seven/Win8 32-bit
RAM: 1 GB
Hard Disk space: 40 GB
USB 2.0
Display Resolution 1280×780.

V. Installation

Insert the USB drive into a USB port on the computer.
Insert the USB drive into an empty USB port on the computer. (If Autorun is enabled, computer will automatically run the CD Menu as show in Figure-1 which will provide one click access to installation files). If autorun is disabled, from <My Computer>, navigate to USB drive contents and double click on the Autorun.exe.

If this is the first time installing this software ,click on dotNetFx40_Full_x86_64.exe and install it in order to properly install the VibraScout software. .NET Framework 4.0 will enable proper installation of the device driver of the USB sensor and proper communication to the on board memory. A system reboot might be required to continue with the rest of the installation.

Click .NET Framework 4.0 to run the setup file. Follow the on-screen instructions selecting all the defaults to complete the installation of the .NET Framework.

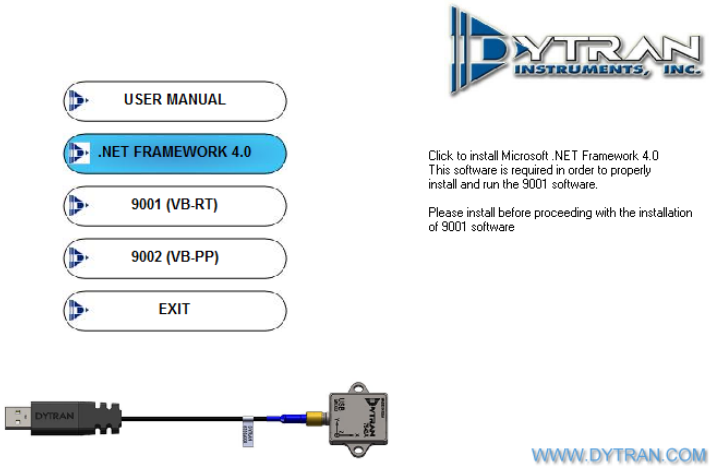


Figure-1: Main Menu

After .NET installation is completed, click on 9001(VB-RT) to start the installation of the 9001 VibraScout™ acquisition software. Make sure that no other applications are open and proceed with the following steps.

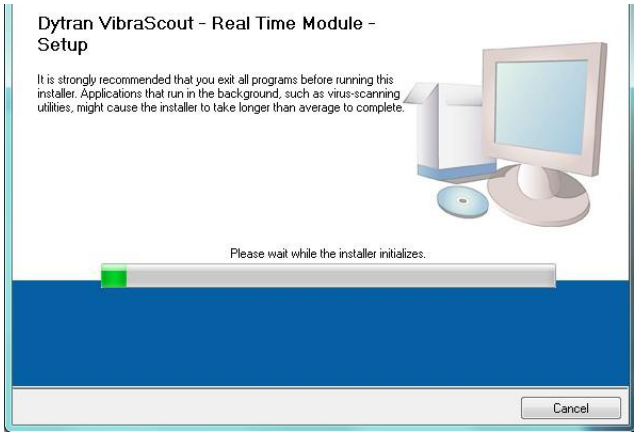


Figure-2: Installation Welcome Screen

1. When the installer initialization is completed, click on "*Next*". In the following window, the user should define the directories in which the *Dytran VibraScout™ – Real Time Module* and the

National Instrument products will be saved in. Click on *"Browse"* to select a different folder, and then click on *"Next"* to proceed.

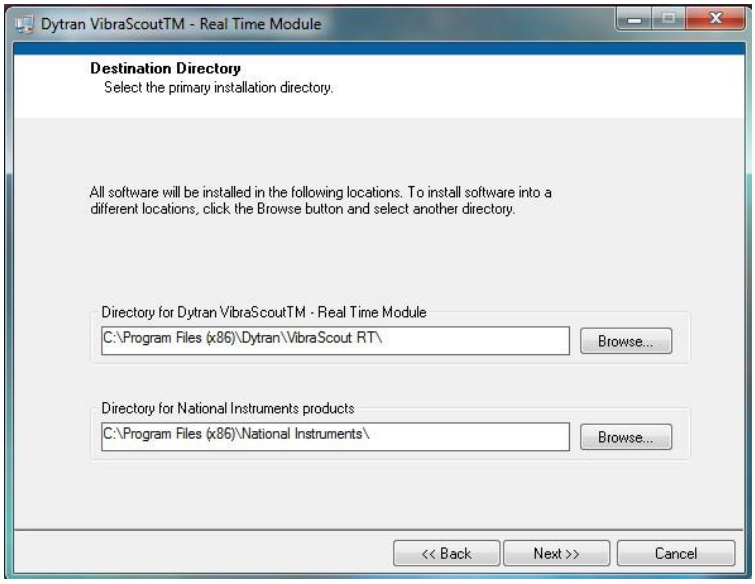


Figure-3: Install File Destination Directory

2. In the next window, select *"I accept the license agreement..."* to accept *Dytran VibraScout™* license conditions and then click on *"Next"*.
3. Select *"I accept the license agreement..."* to accept *National Instrument* license conditions and then click on *"Next"*.
4. At this point, select *"I accept 2 license agreement(s)..."* to accept *Microsoft Silverlight 5 EULA* and *Microsoft Silverlight Privacy Statement* conditions. Click on *"Next"* to proceed.
5. The *"Start Installation"* window will appear. It indicates whether a component will be upgraded or installed for the first time. Click on *"Next"* to start the installation. This phase may take a few minutes. Wait until the installation is complete.
6. When the installation is complete, click on *"Next"* to proceed.
7. If asked, reboot your PC, clicking on *"Restart"* in the following window.

Figure-4: Restart after Installation Completed

8. After the computer restart, the user will find the "*VibraScout RT*" icon in the Windows menu, as shown in the picture below.

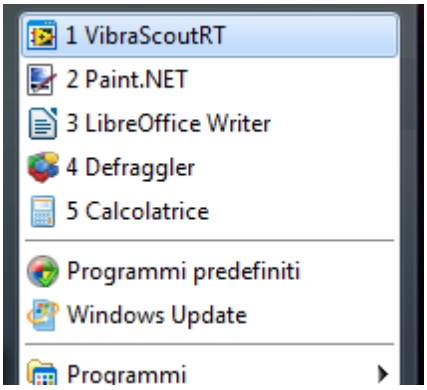


Figure-5: VibraScoutRT Icon

9. Make sure the accelerometer is connected to the USB port and click on the icon to launch the software.
10. The following window will appear. The message displayed in the dialog box should be *"Waiting Init Procedure"*.

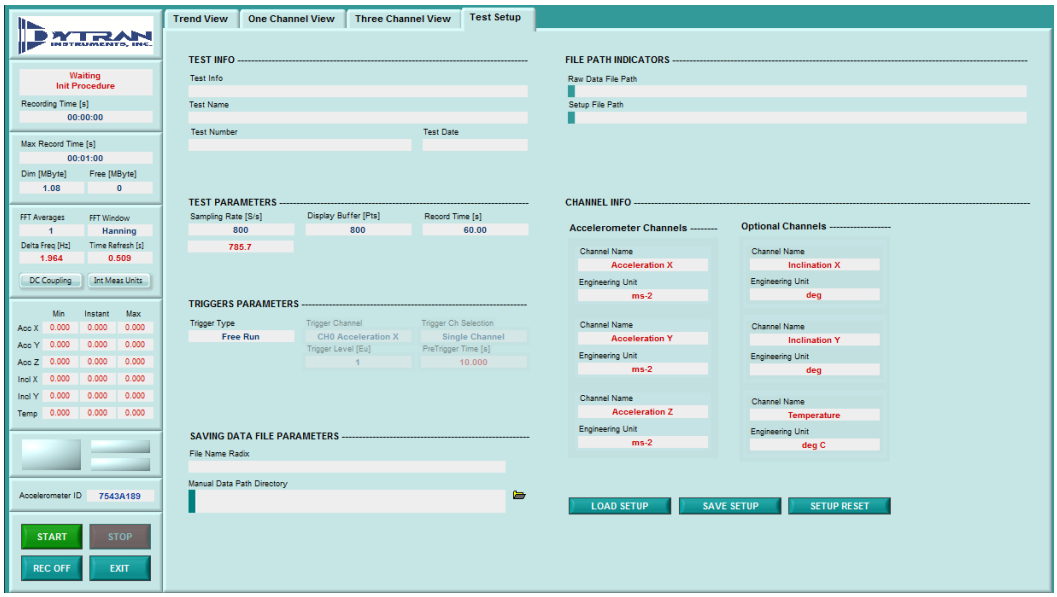


Figure-6: VibraScout Startup Window

11. At this point, the user is asked to select Dytran VibraScout™ License File, as show in the picture below.

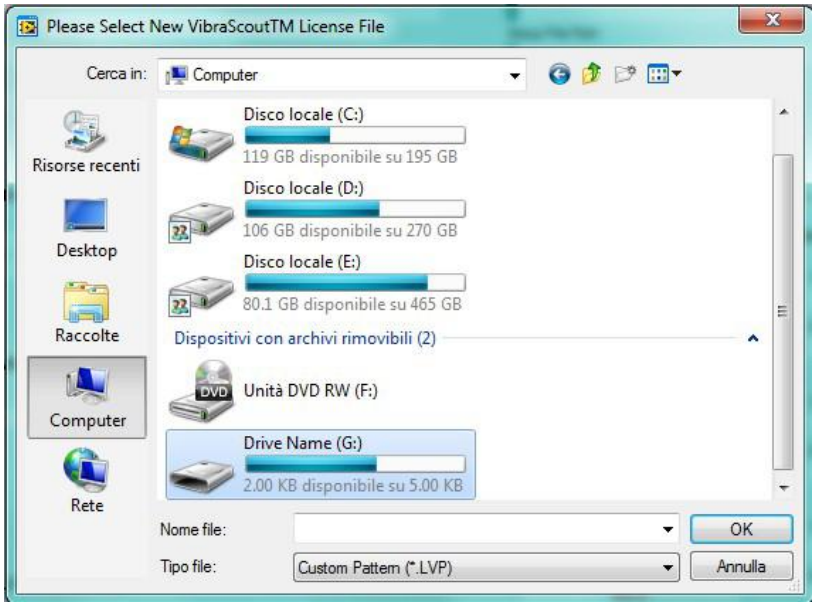


Figure-7: License File Selection Window

12. The USB accelerometer also works as a memory drive. The D*ytran VibraScout™ License File* is located in it. The user can recognize the accelerometer among the other drives located in the "My *Computer"* directory from its dimension which is 5 KB.
13. Double-click on the accelerometer drive to see its content. Select the License File (*.LVP file).

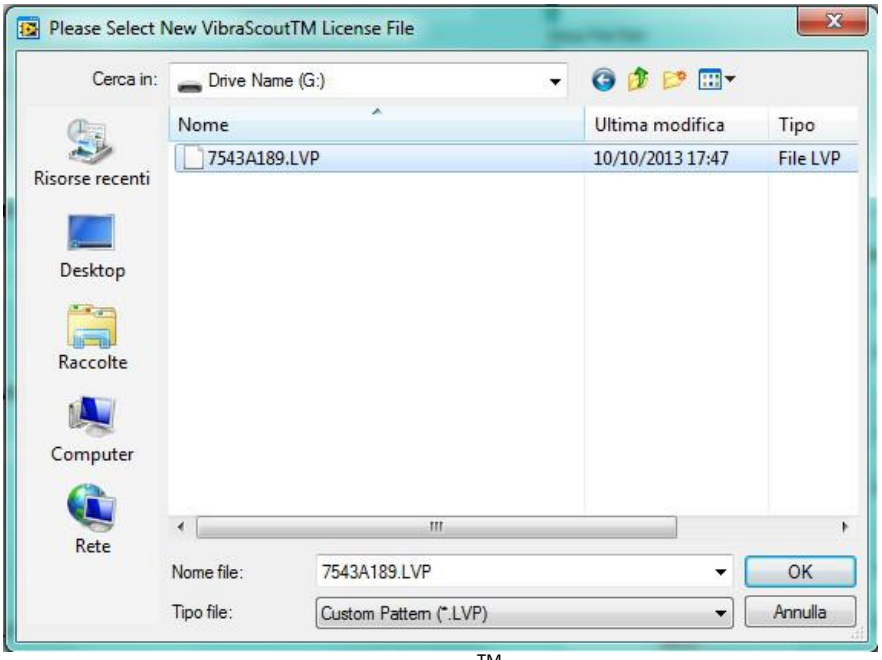


Figure-8: VibraScout™ License File

14. The software will now verify the license. During this phase the message "Waiting Self-Test will appear in the dialog box.

Figure-9: Self Test Indicator

15. When the message disasppears, the Dytran VibraScout™ Real-Time Module is ready to use.

The *VibraScout™ – Post-processing Module*, instead, is a license-free software. To install it, click on "*9002 (VB-PP)*" button. Follow the instructions in each window, taking the *Real Time Module* installation as reference.

VI. Acquisition and Recording

When the software is started, the displayed window is shown in the picture below.

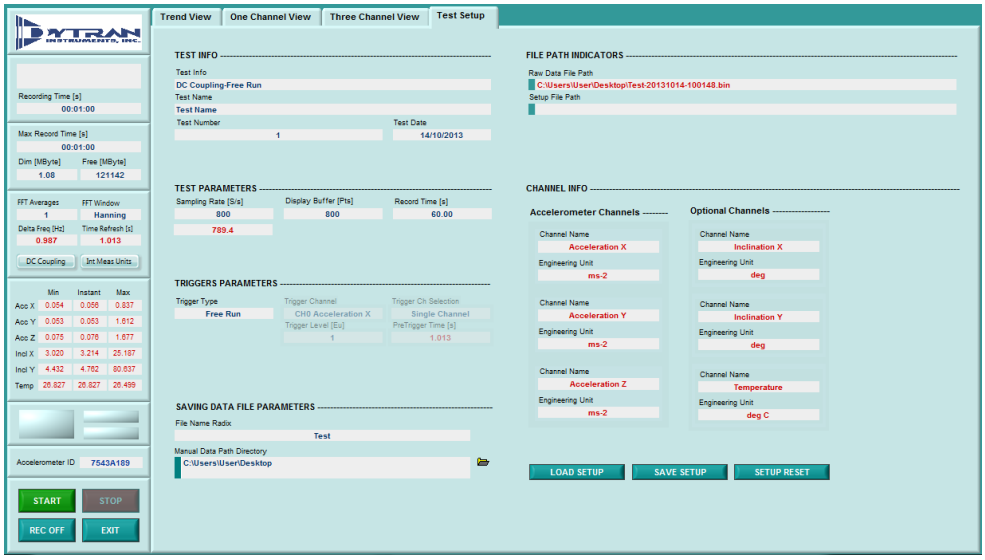


Figure-10: Test Setup Window

On the right side, there is a tabbed menu that will be described in details in paragraph 3.2.
On the left side, common controls and indicators are shown. These fields are described hereinafter.

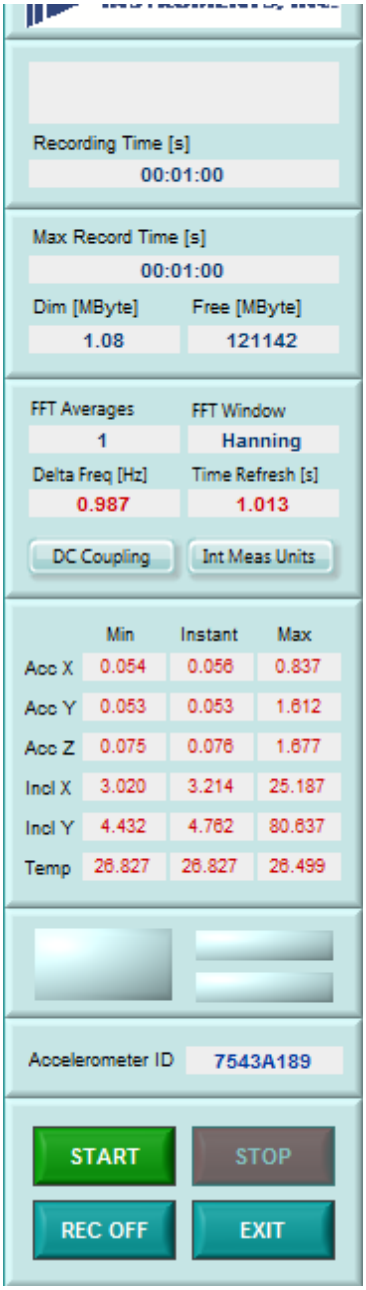


Figure-11: Recording Parameters

- RECORDING TIME [seconds] indicates the actual timing of the recording.
- MAX RECORD TIME [seconds]: this indicator shows the maximum available time for recording. This value can be imposed by users in the "Test Setup" panel.
- DIM [MB] indicates the file dimension of the current registration.
- FREE [MB] is the available free space on the computer hard-disk.

- FFT AVERAGES: this control allows the user to define the number of exponential averages for spectrum calculation during real-time displaying.
- FFT WINDOW: with this control, the user can choose among different time windowing functions in order to reduce the effects of spectral- leakage.
- The available window types are:
  - *None*
  - *Hanning*
  - *Hamming*
  - *Blackman-Harris*
  - *Exact Blackman*
  - *Blackman*
  - *Flat-Top*
  - *4 Terms B-Harris*
  - *7 Terms B-Harris*
  - *Low Sidelobe*

- DELTA FREQ [Hz] indicates the spectrum analysis frequency resolution. It is obtained dividing the actual sampling frequency by the number of samples (defined by the user in Display *Buffer – Test Setup* window).
- TIME REFRESH [s]: indicates the length of time of a single buffer displayed on graphs.
- AC/DC Coupling- This control sets the type of electrical input for all the accelerometer channels. International/Imperial Measurement Units- This control sets the measurement units. The user may choose between *International* (m/s2, deg, deg C) or *Imperial* (g, deg, deg C). These measure units will be the same visualized in the Post-Processing module.
- Minimum/Instant/Maximum Values-These indicators shows the maximum, the instantaneous and the minimum values of each quantity measured with an accelerometer channel (X, Y, Z – acceleration, X, Y – inclination and temperature).
- Accelerometer ID- This indicator reports the accelerometer serial number. Only if the device is correctly identified by the software, the signal acquisition can take place, if the accelerometer is not recognized, an error message will be displayed in the box above.
- Acquisition/Recording Controls
  - START- starts the signal acquisition or the signal recording. The application status is indicated in the white window at the top(acquisition in progress…/Recording in progress…).
  - STOP-ends the signal acquisition or the signal recording
  - REC ON/REC OFF-indicates if the recording is active or not. The user is allowed to choose to record a signal before the acquisition starts. For further details, see Test Setup
  - EXIT- closes the software

VII. Software Panels

Different windows can be accessed using the tabbed menu at the top:

- Test Setup
- Trend View
- One Channel View
- Three Channel View

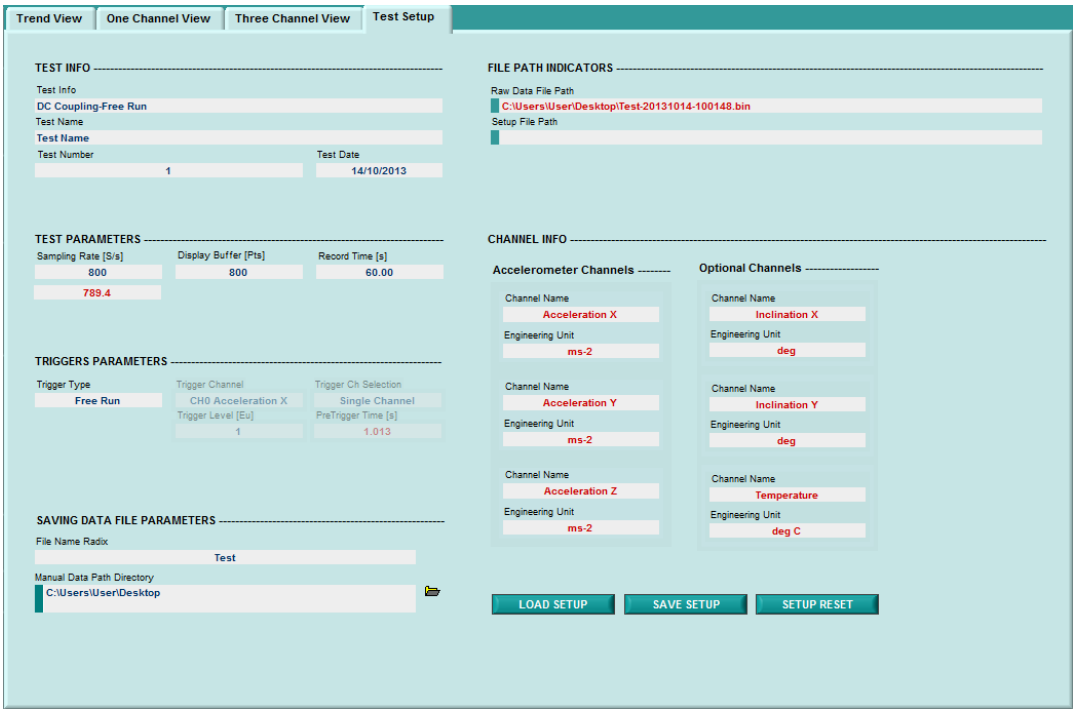


Figure-12: Tabs and Functionalities

1. Test Setup
   This window allows the user to define test and accelerometer conditions. Every section deals with different controls and indicators as described below.

Figure-13: Test Setup Controls

- LOAD SETUP- allows to load a previously saved setup
- SAVE SETUP- saves a setup(*.set) file. A setup file contains all the information shown in the "Test Setup" panel.
- SETUP RESET-reactiveate the default setup file.

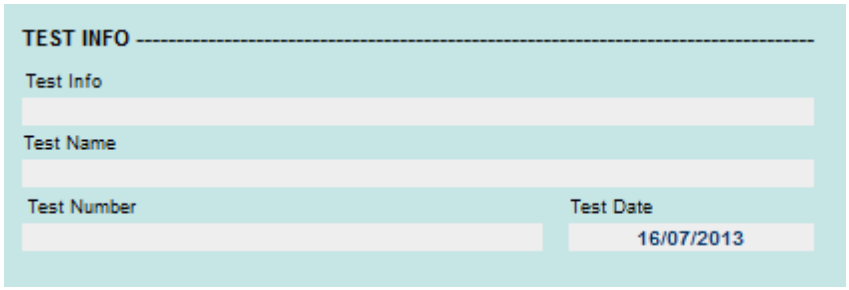


Figure-14: Test Setup>Test Info

- INFO- alphanumeric field that allows the user to insert additional information regarding the current test.
- NAME- alphanumeric field in which the user can indicate the test name
- NUMBER- field that allows to define a sequential number related to the current test
- DATE- field in which the test date is reported. This box is automatically filled by the software itself, using the same date as the operating system.

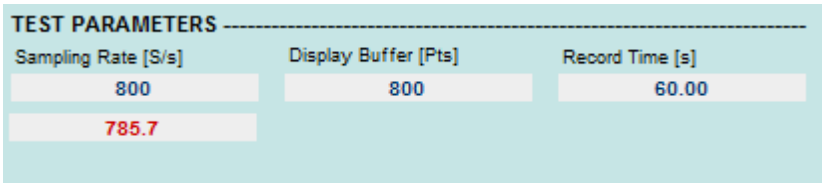


Figure-15: Test Setup>Test Parameters

- SAMPLING RATE[Samples/second]- allows the user to define the sampling frequency. The chosen rate can be written in the box above (in blue) by the user. The real sample frequency, which depends on hardware characteristics, may be different. The red number in the box below indicates the actual sampling rate.
- DISPLAY BUFFER [Points] identifies the acquisition buffer dimension. To see a whole waveform, N points should be displayed; the spectrum visualization, instead, requires N/2 points. The buffer dimension determinates the refresh velocity, too. In fact, the acquisition period is given by the buffer number of points divided by the sampling frequency.
- RECORD TIME [seconds] defines the maximum length of a recording. The inserted value is then shown in the left panel as an indicator. The recording can be stopped manually ahead of time by the user, using the *STOP* button.

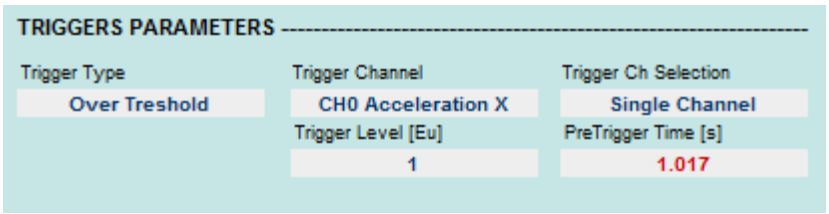


Figure-16: Test Setup>Triggers Parameters

- TRIGGER TYPE- this control allows users to select how to start the acquisition. By clicking on it, the user can choose among

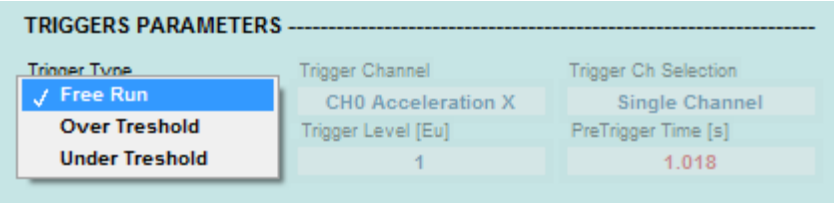


Figure-17: Trigger Types

- Free Run- The acquisition starts regardless of signal level
- Over/Under Threshold- the acquisition starts when the signal level is above(or below) a user defined threshold.
- TRIGGER CHANNEL- defines on which channel the threshold must exceed in order to activate the acquisition.
- TRIGGER CHANNEL SELECTION- defines whether the trigger is imposed on just one channel(Single Channel, indicated in Trigger Channel) or on three accelerometer channels(X-Y-Z)with an "or" condition.
- TRIGGER LEVEL [Engineering Units]- expresses the level at which the trigger activates. This value is expressed in EU, meaning that the user should indicate the physical unit.
- PRE-TRIGGER TIME [seconds]- indicates the duration of the signal recording before trigger activation.

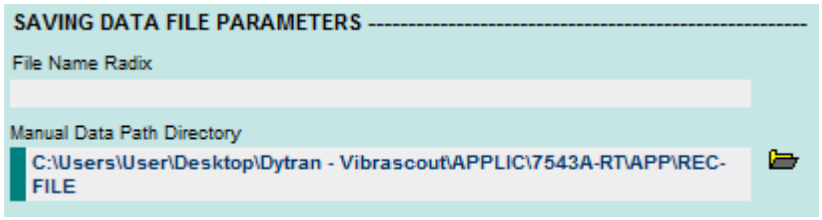


Figure-18: Test Setup> Saving Data File Parameters

- FILE NAME RADIX: alphanumeric field in which the user can write the radix of the *.bin file name that will be saved on the computer during signal recording. For instance, writing "Test1" in the box, the resulting file will be named: test1-20130716-175533. Thus, the file name contains: the user defined radix, the acquisition date and time (yyyymmdd – hhmmss).
- MANUAL PATH DIRECTORY: by clicking on the folder adjacent to this field, the user can define the folder in which the recorded signal will be saved. To correctly define this folder, after its selection, click on *Current Folder*, as shown in the picture below. If the folder is not correctly identified, *<Not a Path>* will be displayed in the *File Path Indicator* box (see next paragraph) and the signal will not be recorded.

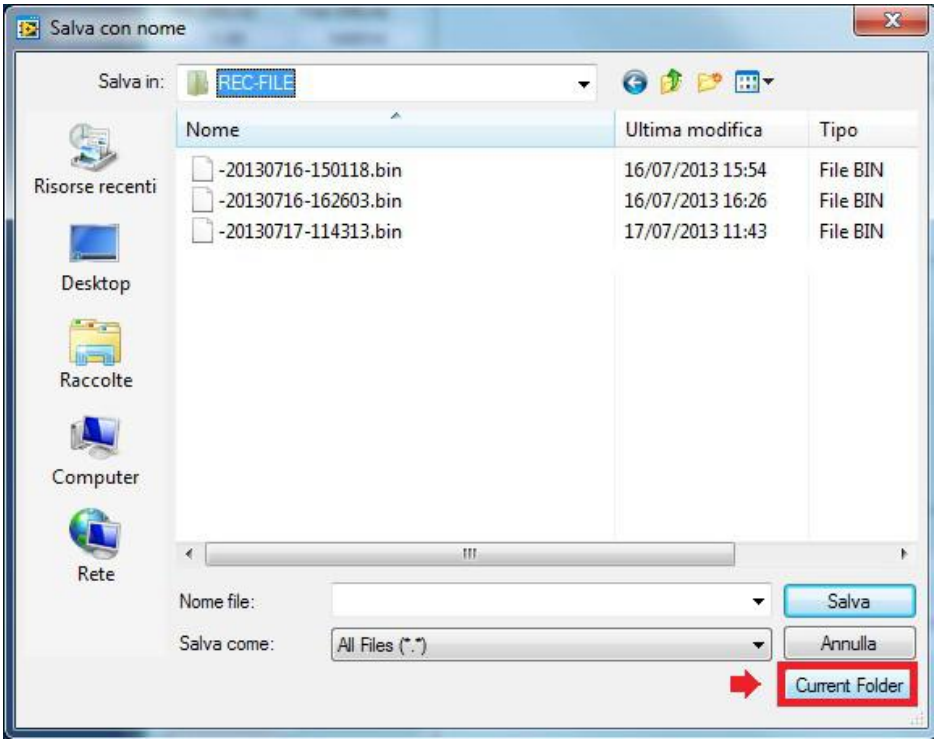


Figure-19: Test Data Directory Selection(Folder)

Figure-20: Test Setup>File Path Indicators

- RAW DATA FILE PATH- this indicator shows the file path for saving the *.bin file. It is chosen by the user, as explained in the previous paragraph.
- SETUP FILE PATH- this field indicates the folder where the setup files will be saved in or can be loaded from.

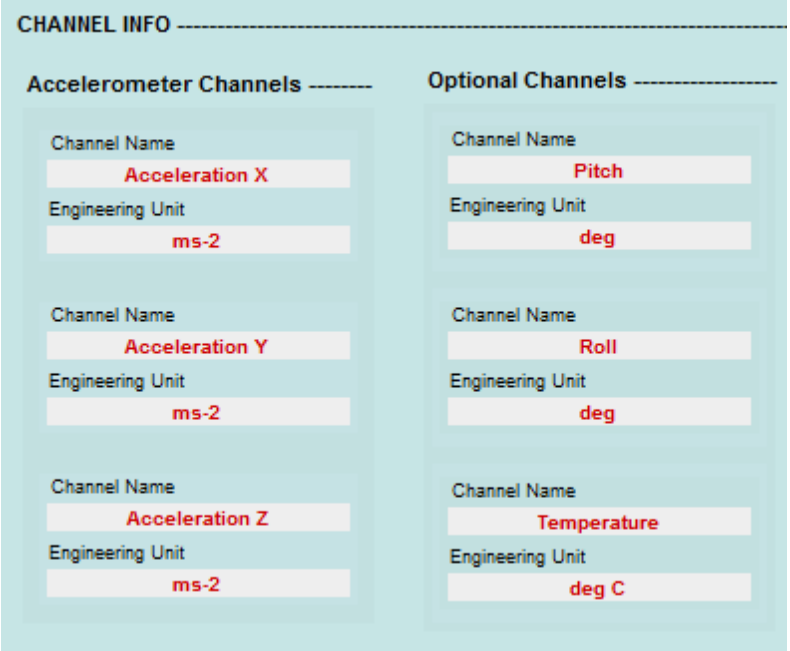


Figure-21: Test Setup>Channel Info

- ACCELEROMETER CHANNELS- these indicators define the three accelerometer physical channel names and measurements units. The measurement units reported in here depend on the user choice between international and imperial.
- OPTIONAL CHANNELS- these fields add further information on additional physical channels that can be measured with accelerometer.

2. TREND VIEW

This window allows the user to see the whole trend of the measurements as function of time [s]. Every graph corresponds to one of the accelerometer channels (main and optional).

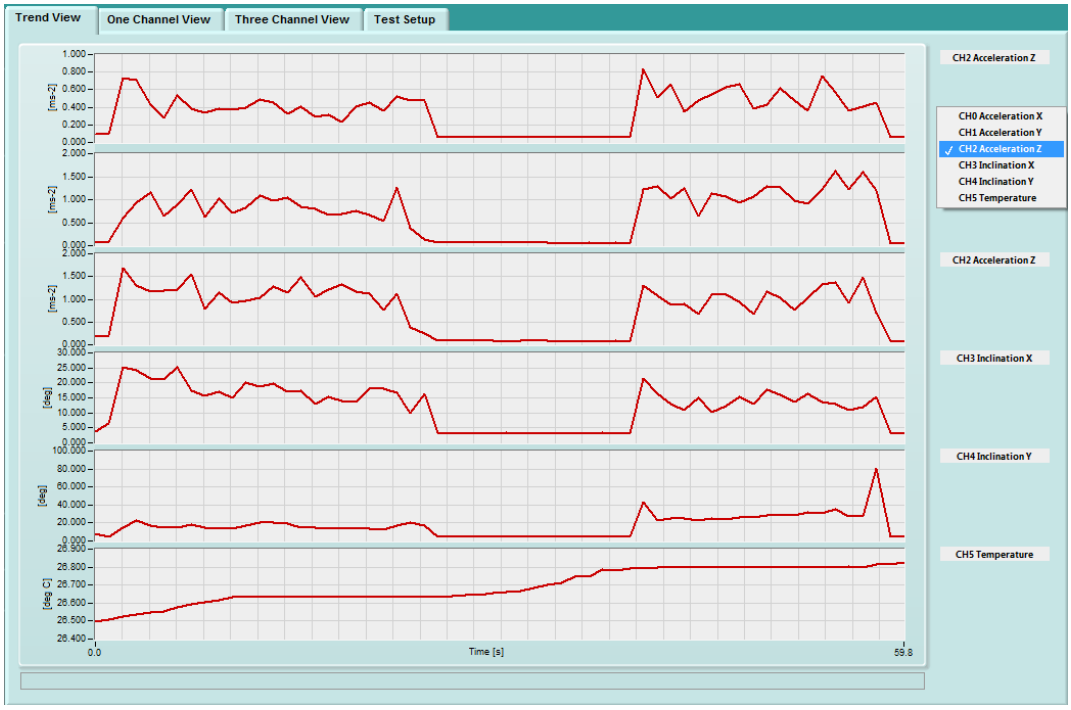


Figure-22: TREND VIEW TAB

These graphs, which are *Chart* graphs, simulate an analog paper recorder. Thus, they allow the user to see the last 32768 points for each acquisition channel. Both the x and the y axes are auto-scaled to fit in all the acquired data. The user may choose to change the order of graphs by clicking on the white labels on the right.

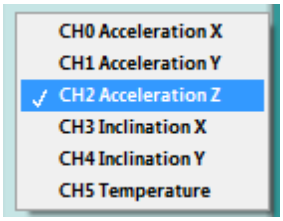


Figure-23: Channel Selection

3. ONE CHANNEL VIEW

In this window the user can display the trend of one channel. The number of points on the x-axis depends on the number written in the Display Buffer field (Test Setup Window).

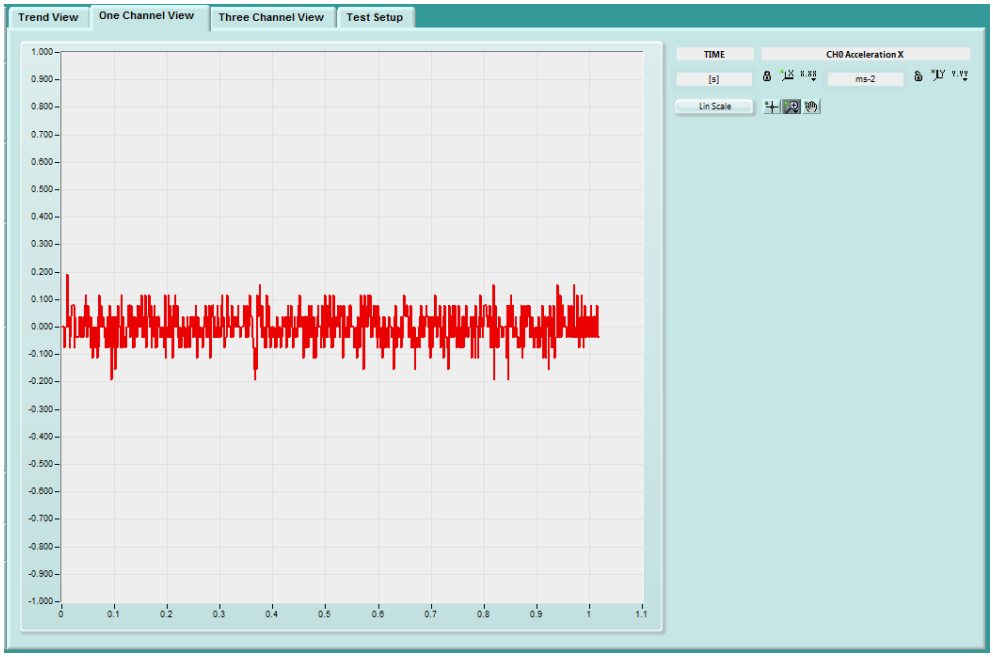


Figure-24: One Channel View

Using the commands on the right side the user can change the displayed channel and the graph format. To change the minimum and the maximum value of the axes, it is possible to click on them and re-write the desired value.

- TIME: by clicking on this label, the user can choose to display either time [s] or frequency [Hz] on the x-axis of the graph. The measurement unit of the chosen quantity is indicated below
- CHANNEL DEFINITION: this scroll-down menu allows to choose the accelerometer channel to display on graph. In the picture above, it is set to "CH0 Acceleration X". The physical unit is shown below: in this case, the acceleration is measured in m/s2 [ms-2].
- AXES FORMAT DEFINITION: the buttons below may be used to define X-axis properties. The same commands for the y-axis are present on the right (see picture above).

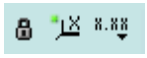


Figure-25: Axes Formatting

- AUTOSCALE [On/Off]: when the padlock is closed, the axis auto-scale function is active. The green light on the adjacent indicator is turned on. The auto-scale function can be disabled by clicking on the padlock. When the auto scale is turned off, the user may apply auto scale just once, clicking on the second button in the picture above.
- AXIS PROPERTIES: Clicking on the [X.XX] button, the user may define different x-axis properties. The same can be done for y-axis.

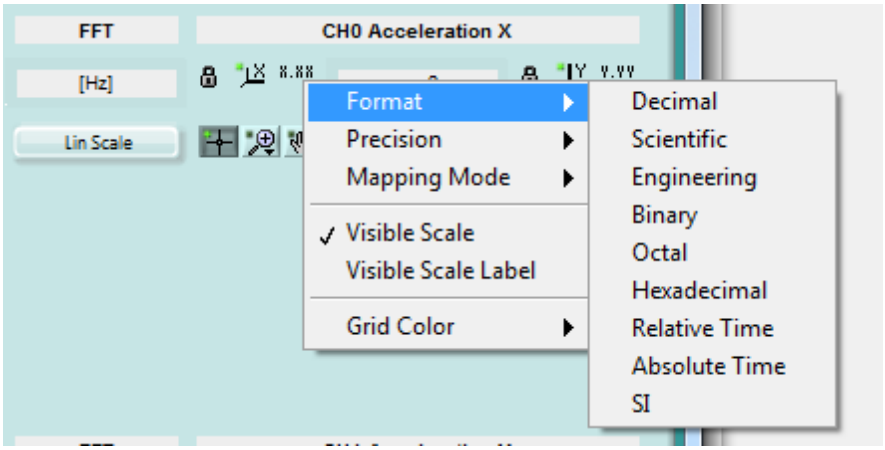


Figure-26: Axis Format Options

The user can choose the number format (as shown in the picture above), the number of significant figures, the type of scale (Linear/Logarithmic), to see the scale, the scale label, and the axis grid color.

- LINEAR/ DECIBEL SCALE: this button allows users to choose between a linear and a dB scale for the y-axis. When the latter is selected the button turns to yellow.
- CURSOR: a cursor may be dragged with the PC mouse on the graph.
- GRAPH AREA: the displayed area may be zoomed (using the magnifying lens button) or translated (clicking on the hand button).

4. THREE CHANNEL VIEW

In this window, three different hcannels can be simultaneiously displayed. These graphs are equivalent to the graphs pictured in the “One Channel View” window. The same operation described in paragraph 3 above can be performed on these graphs too.

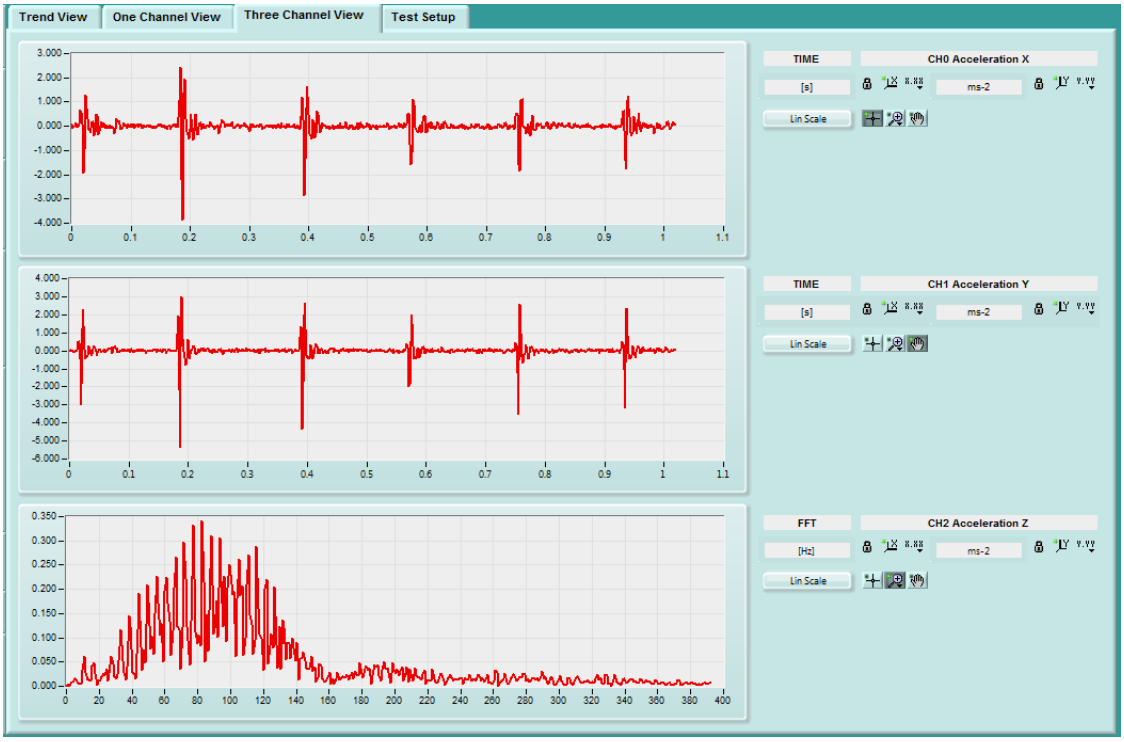


Figure-27: Three Channel View

VIII. VibraScout™ Post Processor

The *Dytran VibraScout™ Post-Processing Module* allows the user to analyze the previously recorded signal with different numerical analysis techniques. When the software is started, the first displayed window is shown below.

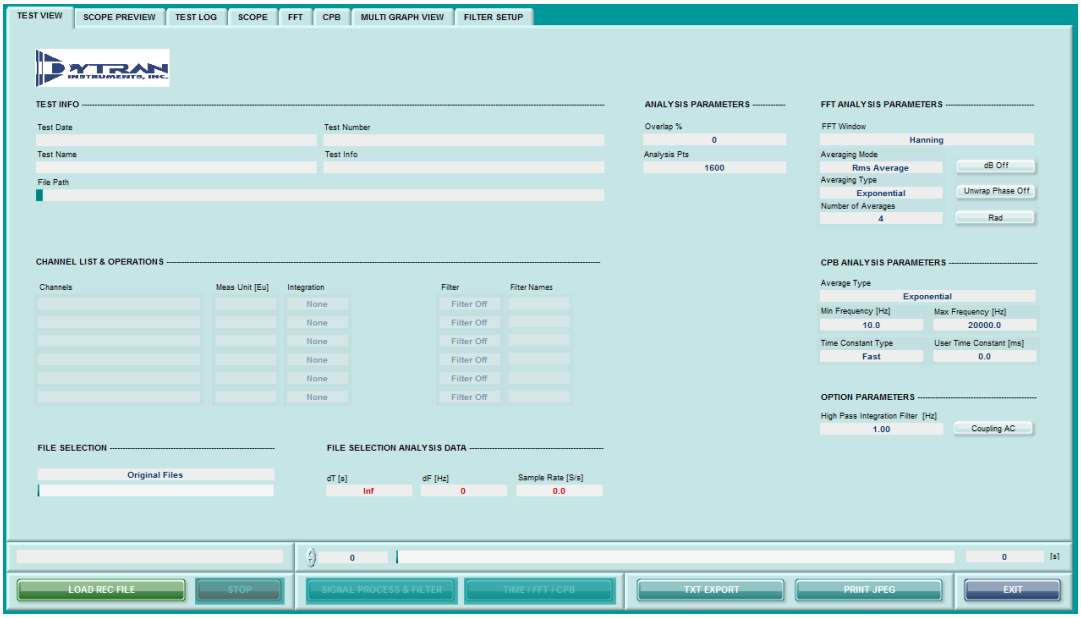


Figure-28: VibraScout™ Post Processor

A list of all the windows that can be accessed using the tabbed menu is reported below. All the possible operations that can be performed in each panel are described in details in the following paragraphs.

- Test view;
- Scope Preview;
- Test Log;
- Scope;
- FFT;
- CPB;
- Multi-graph View;
- Filter Setup.

In this software, as it was for real time acquisition, there are some common controls and indicators. Their functions are described in the next paragraph.

1. Common Controls and Indicators

Figure-29: Controls

- LOAD REC FILE- allows the user to load a *.bin file. To load a recorded signal, the user should press the LOAD REC FILE button at the bottom of the window. After selecting the *.bin file, clicking OK, the recording will be automatically opened and recognized by the software.

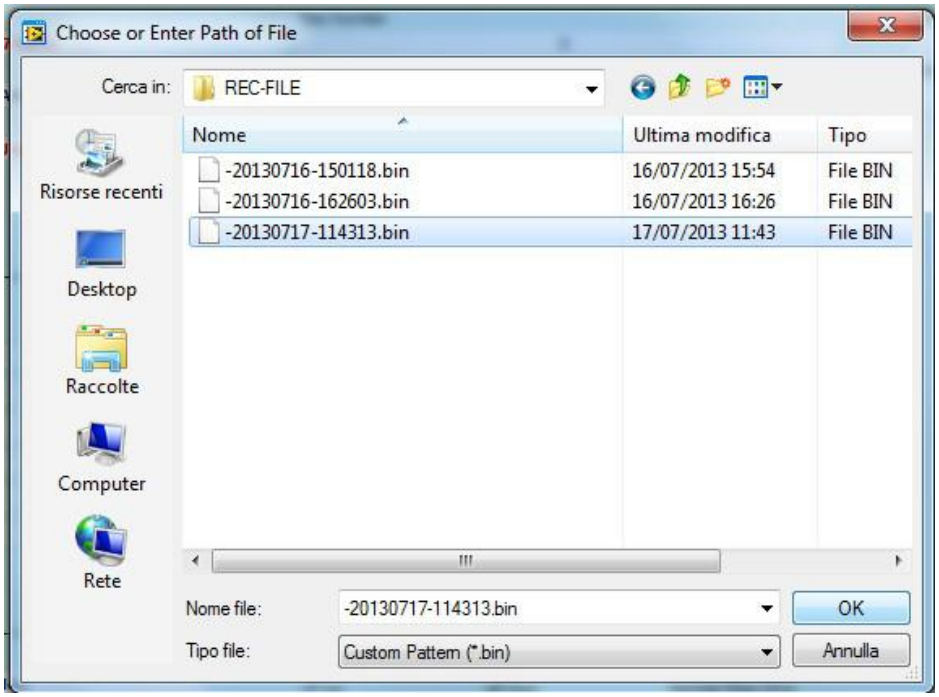


Figure-30: Recorded File Selection

If the recorded file is correctly recognized, all the *Test Info* and *Channel List & Operations* fields will be filled with the information acquired during the recording.

- STOP- allows users to manually interrupt the running processes. When the software is working, the push button becomes active (red).

Figure-31: Signal Processing Controls

- SIGNAL PROCESS AND FILTER: applies the filters and integration functions the user imposed on every channel. The analysis is performed until the end of the acquired file, if the user does not click the STOP button earlier. The software automatically creates a folder (with the test same name) in which all the analyzed signals are saved. Also, the software saves a file for each channel separately. It turns orange when the user modifies integration (including the *high-pass filter cutoff frequency*) and filtering conditions, advising that the operation has to be performed again.
- TIME/FFT/CPB: draws the corresponding graphs in each software window for raw or processed signals. This operation may be manually stopped by pressing the STOP button. It turns orange when at least one of the parameters which affect *Time/FFT/CPB* analysis is changed, indicating that the analysis should be performed again to display the new results.

Figure-32: Export/Print Controls

- TXT EXPORT allows to save and export a chart file in ASCII format. This control saves the graph on the currently displayed panel automatically. TXT Export is available for *Scope Preview, Scope, Test Log, FFT* and *CPB* windows.
- PRINT generates a picture for each window (*.jpg) and creates a HTML file including all window view.

Figure-33: Exit Control

- EXIT-closes the software

Figure-34: Scroll Bar and Test Time indicator

- HORIZONTAL SCROLL-BAR this bar can be used to easily display all the acquired/processed signal in some graphs (*Scope, FFT, CPB, Multi-graph View* panels). It may be moved either by dragging it with the computer mouse or using the numerical control on the left. This control identifies the number of the time frame currently displayed on the graphs. The indicator on the right shows the instant of time, expressed in [sec], to which the visualized analysis is referred.

2. Software Panels

TEST VIEW

From this panel, it is possible to load the recorded *.bin file and see all the accelerometer channels. Also, the user can choose to integrate a specific signal or filter it, defining all the filtering conditions.

- Test Info- When the file is uploaded these indicators will report all the information the user set during the signal acquisition. The last box indicates where the raw file data was stored after its recording.
- Channel List & Operations- On the left side, all the accelerometer channels are displayed. For each channel, the name and the measurement unit [Eu] are indicated, as it can be seen in the picture below.

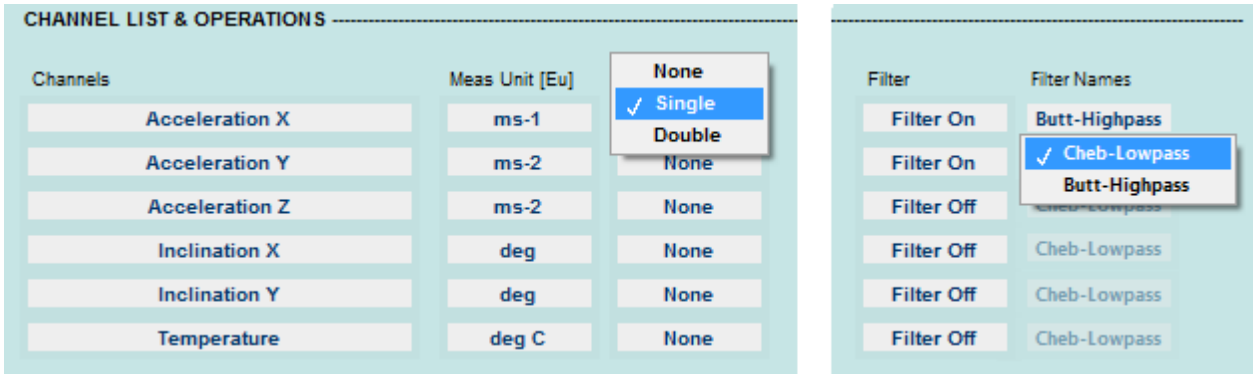


Figure-35: Channel List and Operations

The third column allows the user to perform an integral filtering on the selected channel. Integration can be either performed or not, and the user can select between a single and a double integration method. When integration is selected, the unit of measurement automatically changes to the integrated quantity unit.
To apply a filter on a specific channel, the user must first define the filter parameters using the *Filter Setup* panel (see paragraph 4.2.8). After the filters definition, the same filter names defined by the user in the *Filter Setup* window will be available here, allowing the user to recall the filter with that name. The filter can be selected only if the adjacent control is set on *Filter On*.

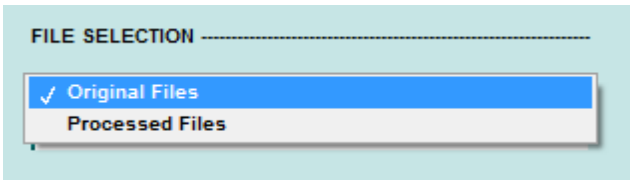


Figure-36: File Selection Field

- File Selection- By clicking on the above box, the user can choose either to process a raw file or an integrated/filtered file, as shown in the picture above. The progress bar below the control indicates the status of the data analysis.

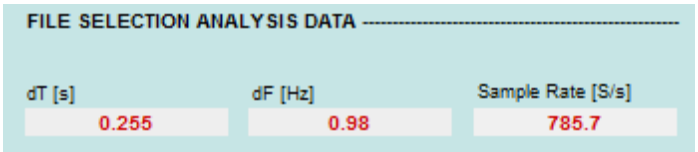


Figure-37: File Selection Analysis Data

- dT [s]- indicates the time resolution, also called Time Section, which depends on the sampling frequency, the buffer dimension and the overlapping percentage. These last two values can be defined by the user in the Analysis Parameters section.
- dF [Hz]- reports the frequency resolution calculated from the sampling frequency and the buffer number of samples.

- SAMPLE RATE [Samples/second]- in this field, the real sample frequency used during the signal recording is indicated.

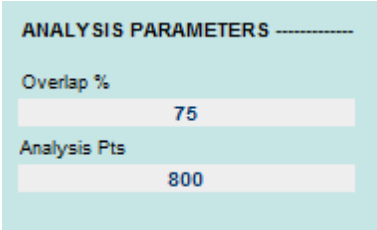


Figure-38: Analysis Parameters

- OVERLAP [%]- this control allows users to analyze overlapped time frames. The overlapping points-ratio is expressed in percentage. This function is generally used for non-stationary signal analysis or to correctly evaluate signal power in case of windowing.
- ANALYSIS POINTS [Points]- this control represents the buffer dimension (in Number of Samples) that will be used to perform the analysis. Considering the time domain, the resolution (that is the duration of a single time frame) is obtained dividing the chosen number of samples by the used sampling frequency.

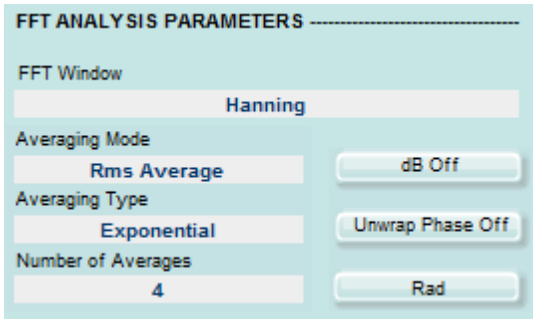


Figure-39: FFT Analysis Parameters

- FFT WINDOW- different time windowing functions may be used in order to reduce the effects of spectral-leakage. The available window types are:

  - None
  - Hanning
  - Hamming
  - Blackman-Harris
  - Exact Blackman
  - Blackman
  - Flat-Top
  - 4 Terms B-Harris
  - 7 Terms B-Harris
  - Low Sidelobe.

- AVERAGING MODE- control to assign the kind of time spectral average to apply

- No Average
- RMS Average
- Peak Hold Average- This mode displays the maximum level reached by each frequency in relation to the calculated spectra.

➢ AVERAGING TYPE- this control allows the user to select the time mode averaging process in the time domain.
- Linear- the linear average is performed on the levels of each frequency, which depends on the calculated evolving spectra.
- Exponential- during the energy calculation, an integral filter is applied to each band. Every filter has a different time constant. This value defines the ration between the weight of current data and tehe weight of past data. This averaging type is particularly indicated for non-stationary signals.

➢ NUMBER OF AVERAGES- this control may be used to impose the number of averages, when the averaging is active.
➢ dB ON/OFF- allows the user to choose between linear or decibel scale.
➢ UNWRAP PHASE ON/OFF- control for phase visualization. When the function is active, the angles are displayed continuously. Otherwise, the angles are displayed as if they were always between -180 and +180 deg.
➢ RAD/DEG- control to choose between degrees and radians for phase visualization.

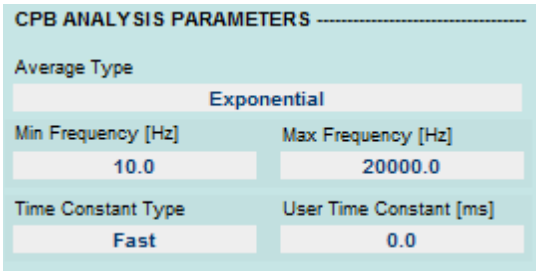


Figure-40: CBP Analysis Parameters

➢ AERAGE TYPE- control that allows selecting the type of average to apply in the time domain.
- Linear- the linear average of every single frequency level in relation to evolving spectra is calculated
- Exponential- the levels of more recent frequency spectra are more important than the past ones. The ratio among them is obtained using an exponential function.
- Peak- the maximum level of each band is maintained until the last calculated instant. Only if there is higher number, the memorized value will be substituted.

➢ FREQUENCY MIN/MAX- this control allows the user to choose the minimum and maximum frequency band for which octave (or one-third of octave) energy levels will be calculated.
➢ TIME CONSTANT TYPE- the time constant may be chosen among these values:
- Slow: 1 sec
- Fast: 125 msec
- Impulse: 35 msec

- User: The user can define the duration of the time constant in the box User Time Constant in [msec].

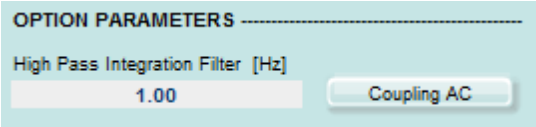


Figure-41: Option Parameters

- HIGH PASS INTEGRATION FILTER- this control allows choosing the lower cut-off frequency for all the integrated signals. It is used to prevent amplification of the lowest frequencies of the signal.
- COUPLING AC/DC- button to define the electrical coupling of channels.

SCOPE PREVIEW

This panel permits to display the trend of a signal (in time) during the entire period of the acquisition. The channel to be visualized can be chosen by clicking on the white box below the graph.

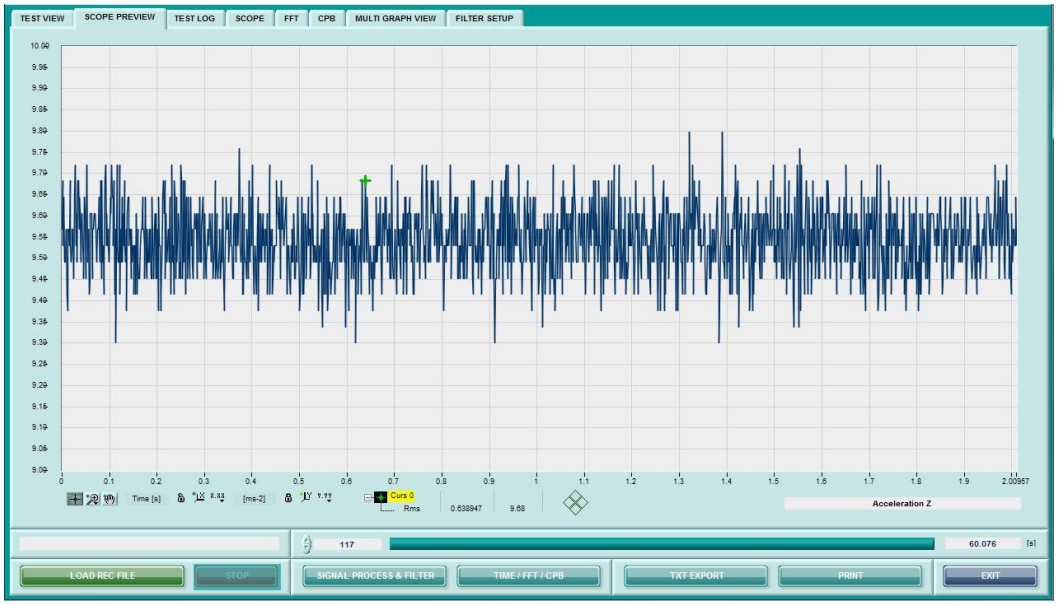


Figure-42: Scope Preview Tab

The graph may be zoomed, translated, the x and y scales may be modified using the same command buttons described for real time acquisition software above.
There is the possibility to use a cursor, identified bya green cross in the picture above, which gives the x (left) and y (right) coordinates of the marked point as can be seen below.

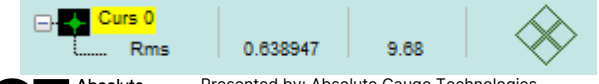


Figure-43: Cursor Setup Window

The cursor can be moved when the command is active by dragging it with the mouse or using the four arrows on the right. The activation/deactivation is made by clicking on the specific button (next to the Zoom button).

TEST LOG

In this panel, the user can choose to display some calculated quantities as the RMS level, the maximum and the minimum levels, the peak-to-peak level and the equivalent level trend. All these parameters are intended in the time domain and can be either visualized using a linear or a dB scale. An example is reported below.

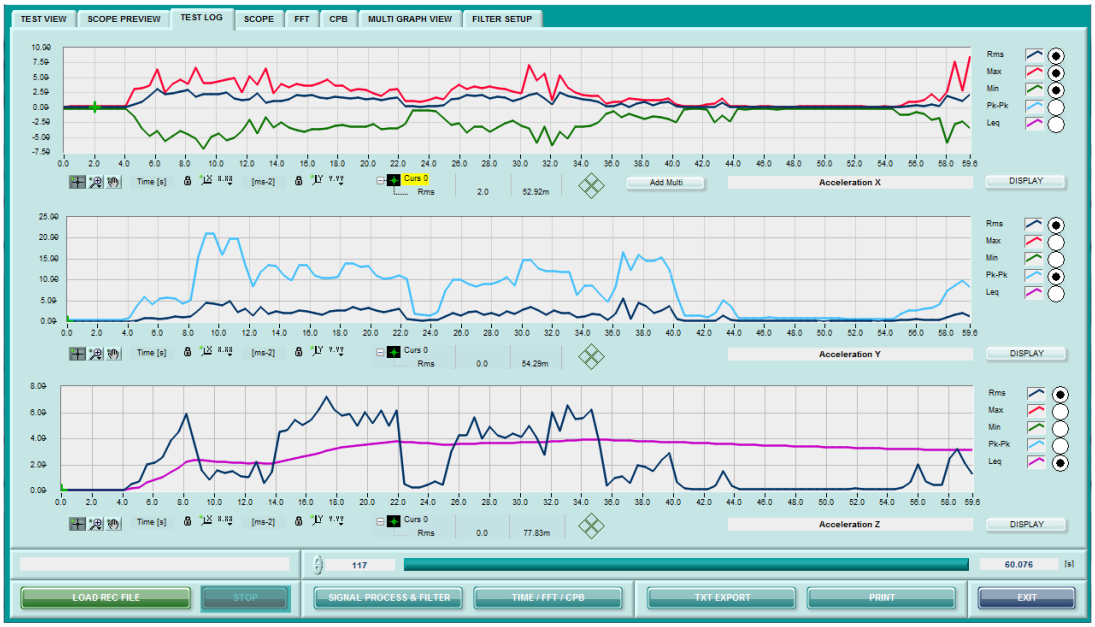


Figure-44: Test Log View

Below each graph and on the left side of it, the axes legend and the formatting controls are described below.
The channels to be visualized in the three graphs can be chosen by clicking on the name of the channel in the white box. The calculated parameters, instead, can be selected using the radio button on the right of the window.

The push button ADD MULTI allows displaying the correspondent graph in the panel Multi Graph View. This operation can be made on different graphs, thus the user has the possibility to compare graphs obtained from different channels or different files.

After the positioning of the cursor on a graph, by clicking on the push button DISPLAY, the user will have the possibility to see the signal analysis of the selected (with the cursor) time buffer. Redirection to the SCOPE panel occurs automatically.

SOCPE

This panel displays the signal trend during the acquisition time, in the time domain. What can be seen is the buffer which corresponds to selected instant of time, that comprises all the samples acquired for that time instance.

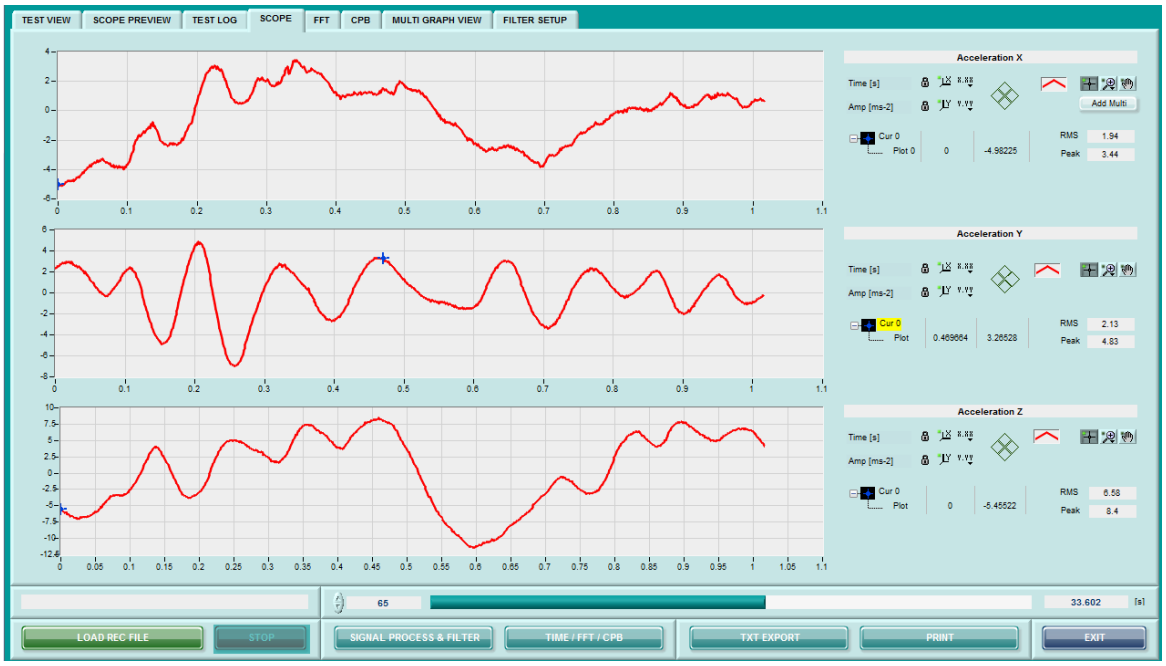


Figure-45: Scope View

All the channels can be displayed by choosing the channel name in the white box. The first graph, as the one in the Test Log Window, can be copied to the Multi-graph panel with the aim to compare it with other different graphs.

Two indicators for each graph shows the RMS and the Peak value for each time frame.

The horizontal scroll bar can be used, in this case, to visualize different time instant.

FFT

In this panel, frequency analysis results are displayed. Every graph represents a spectrum analyzer that is able to calculate FFT Modulus and Phase, FFT Real and Imaginary Part, Power Spectrum and PSD.

As said before, it is possible to select from the scroll-down menu on the left, one of the following FFT analysis to display on graphs:

Figure-46: FFT Analysis View

- FFT M & PH- allows display the spectrum modulus and phase, correspondent to the selected channel. The modulus scale is represented on the left side of the graph, the phase scale on the right.
- FFT Re & Im displays the Real (scale on the right side) and the Imaginary (left) part of the spectrum.
  Note: for this type of analysis, it is necessary to deactivate the control on spectral average (FFT Analysis Parameters – Averaging Mode: No Average).
- POWER SPEC- calculates the power spectrum of the chosen channel signal and visualize it on the graph
- PSD- computes the power spectral density of the selected channel signal.

When the user selects a different FFT analysis from the one already displayed all the measurement units are turned immediately into the right ones. The same happens when the channel is changed. In this panel too, the user can find all the tools for graph aspect modifications, a cursor and two indicators to identify that time frame's RMS and Peak values. The horizontal scroll bar can be used to seek for the desired time instant.

The push button ADD MULTI is present in the first graph. Selecting with a tick Plot 0 and/or Plot 1, the user can change which graph(s) should be copied in the Multi-Graph view panel.

CPB

In this panel, frequency analysis using a scale of octave band or one-third octave band is performed, according to IEC 1260 standards.

Figure-47: CPB VIEW

Using the controls on the right side, the user can define the channel and the octave scale: one octave (second and third graphs in the picture above) or one-third of octave (first graph).

Using the four arrows the cursor moves from one column maximum value to next one. The cursor can be dragged with the mouse too.

The ADD MULTI push button is present also in this panel, with the same functions described before.

Two indicators for each graphs show the RMS and the Peak values.

The horizontal bar at the bottom is useful to skim among all the recorded time instant in order to identify the most interesting instants.

It may be possible that the user will not be able to visualize the CPB analysis results corresponding to the first time instants. This fact depends on how the CPB analysis is performed: when starting the filtering operation, a certain time is required before each filter reaches its steady-state. This time, called *settling time,* is defined as 5 divided by the bandwidth of the corresponding filter.

For octave filters, the lowest frequency band filter has the smallest bandwidth; thus, this is the parameter that defines the overall settling time. Only when this time has passed, the complete octave analysis results can be considered valid (and, consequently, they can be visualized on graphs)

MULTI GRAPH VIEW

The Multi-graph window can be used to display different quantities on the same graph. Since the graphs are overlapped, the comparison among them is easier.

An example is reported in the Figure-48.

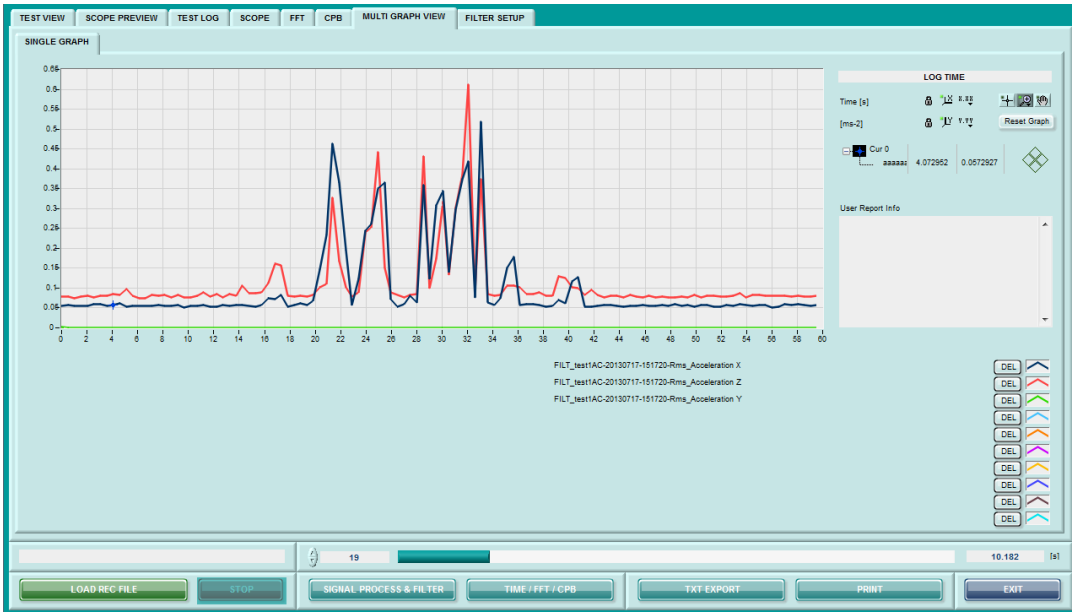


Figure-48: Multi-Graph View with Overlapped Signals

On the left of the graph, it is possible to see which kind of graphs is compared (for example, Log time). In case of comparison of two different quantities, only the last added will be displayed in the white box.

A legend of the added quantities is automatically created below the graph. The name of each parameter includes the saved (*.bin) file name and the channel name (for instance, Acceleration X).

In addition to usual controls for graph formatting, there is a push button (RESET GRAPH) which allows clearing the graphs in this window. In this way, all the quantities that were previously displayed will be deleted.

To delete one (or more) graph independently, the user should use the push button DEL, choosing the graph line to eliminate, on the bottom right of the screen.

The white box USER REPORT INFO may be used to write additional information on the displayed data. This field will be included in the printed form of the document.

FILTER SETUP

In the Filter Setup window, it is possible to define all the parameters that are needed to design the desired filter.

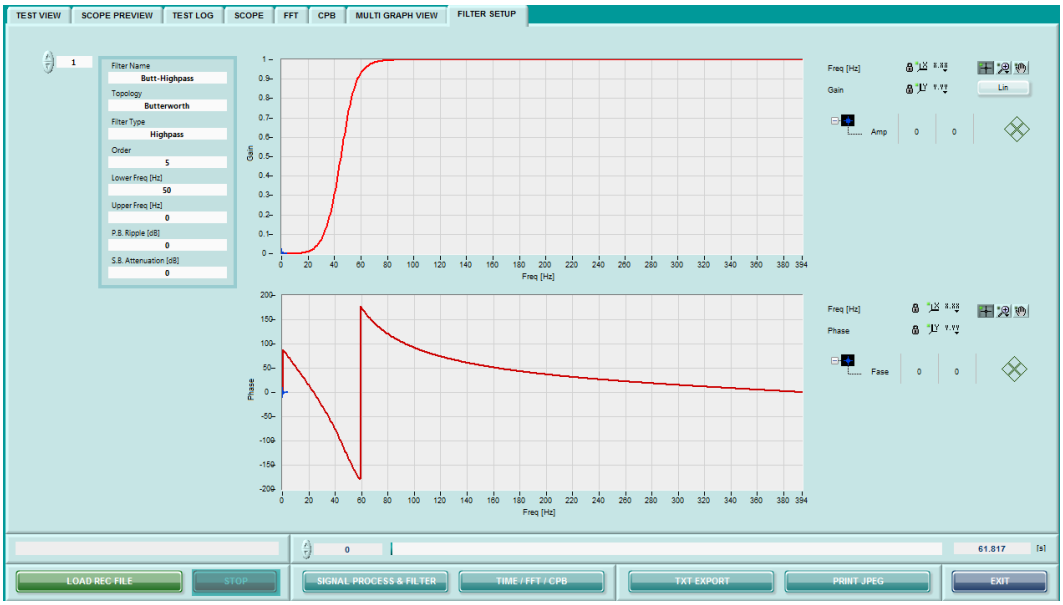


Figure-49: Filter Setup Window

The user can choose to apply a different filter on each channel acting on the controls described hereinafter.

The two graphs allow user to graphically display the filter characteristics in terms of *Gain* and *Phase*, in the frequency domain. The *Gain* can either be visualized using a linear or a dB scale, clicking on the *LIN/dB* button. Different graphic visualizations may be obtained by using the usual formatting tools.

The number of filters that can be defined is potentially infinite. In fact, a different number is associated to a specific array position in which every different filter characteristics chosen by the user are defined.

After its parameter definition, in order to apply a filter to a specific channel, the user should indicate the *Filter Name* in the correspondent column in the *Test View* window.

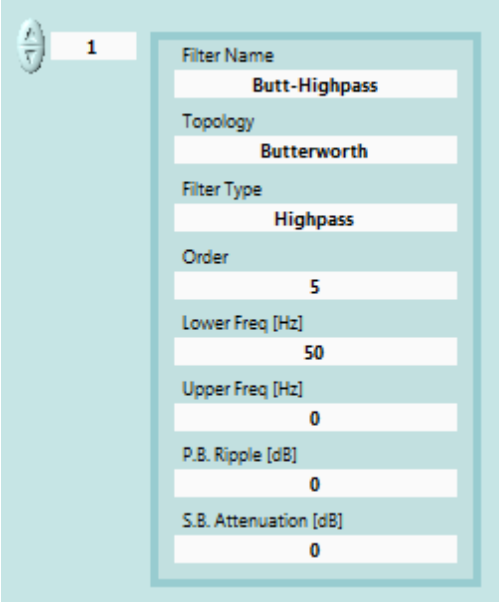


Figure-50: Filter Parameters

- FILTER NAME- with this control, for every filter, the user can set the filter name. This name will be then visualized in the *Test View* window. In this way, the user can apply a filter on one or more channels, just recalling its name in the *Filter Names* column. A new filter can be created using the arrows and clicking on one of the fields shown in the picture, in the first grayed out window (filter indexes must be consecutive). The filter definition must start at index 0.

- TOPOLOGY defines the algorithm used to perform signal convolution. The user can choose among the following options:

  - Butterworth
  - Chebyshev
  - Inverse Chebyshev
  - Elliptic
  - Bessel

- FILTER TYPE: control that allows to chose the passing band among

  - Lowpass
  - Highpass
  - Bandpass
  - Bandstop

- ORDER defines the order of the filter, which is the number of poles and zeroes. Thus, the filter slope depends on this parameter. For a low-pass filter, each increase in order, corresponds to an attenuation with a slope of 20 dB/decade or 6 dB/octave.

- LOWER FREQUENCY [Hz]: with this control the user can define the inferior cut-off frequency for Bandpass and Bandstop filters. In case of Low-pass or High-pass filter, this value defines the cut-off frequency.
- UPPER FREQUENCY [Hz] defines the upper cut-off for Bandpass and Bandstop filters. For Low-pass or High-pass, this value is ignored.
- P.B RIPPLE [dB] allows to indicate the maximum oscillation in dB in the passing band (for a Bandpass-like filter).
- S.B ATTENUATION [dB] control that defines the maximum attenuation for a Bandstop filter.

IX. Custom Applications

An API is available for customers who would like to build custom applications for the 7543B. The API provides support for any .NET-compatible client application - e.g. LabView, C#, etc. Please contact Dytran at **sales@dytran.com** or ***818-700-7818.***

Custom application development is also available.
Please contact Dytran at **dchange@dytran.com** or ***818-700-7818*** for more information.

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