



Time History Processing

Overview

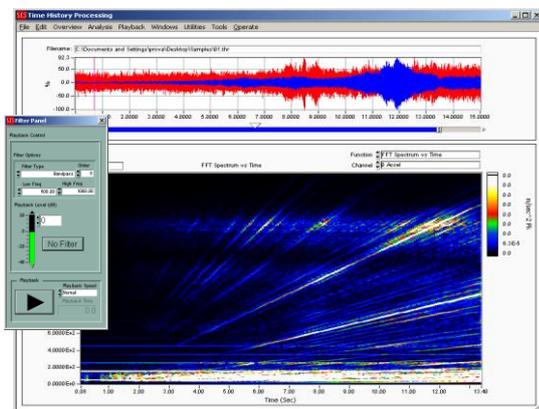
AS-Smart – Time History Processing is a comprehensive application for dynamic data recording, real time acquisition and postprocessing. Born as a tool of the AS-Smart Quality Control package, it's now an independent application, for general purpose acoustic and vibration investigations, NVH studies, structural and rotating machinery analysis.

A specific utility has been developed for multichannel recording, calibration, input monitor, real time FFT processing, etc.

Once the time histories have been recorded, the user can postprocess them extracting time, frequency, or RPM related information's.

A "two layer" user interface architecture makes the software very easy to use.

Multiple time history processing, multiple data recall and display, playback and filtering, RPM extraction utilities, data import/export are available and extremely useful tools.



- Example of Spectrogram with Playback-Filter Panel -

Hardware Specifications

Computer

Standard configuration:

- Desktop Computer (various models)

Optional:

- Industrial Computer (various models)
- Notebook Computer.

Specification (minimum):

- 4 Gbyte RAM
- Graphic board 1024 X 768 resolution
- 100 GByte Hard Disk
- 1 PCI Slot available (PCI-447x)
- 1 USB-2 port (USB-923x)
- Operating System:
 - Win7
 - Win XP (last available version: 5.3)

Acquisition Board (for data recording)

National Instrument USB-9233 Module (USB-2 port):

- 4 Analog Input Channels
- AC (+ICP) coupling
- Voltage range: 5 V
- 20 KHz bandwidth/channel (50 KHz/channel sampling)
- 24 Bit A/D Converter (Dynamic range: 85 dB typ.)

National Instruments NI447x, Dynamic Signal Analyzers:

- 4 (PCI-4474) or 8 (PCI-4472) Input channels.
- Input Range: 10 V
- 20 KHz bandwidth with A-A filters and ICP support.
- 24 bit A/D Converter (Dynamic range: 85 dB typ.).

Other supported platforms:

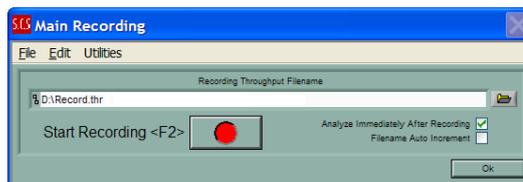
- 01dB Symphonie (2 channels DSP based).
- Audio devices (i.e. Digigram - contact SCS for details)

Software Specification

Recording

Multiple channel recording (up to 8 channels).

- Channel table: name, coupling, range, sensitivity, unit.
- Recording Parameters: sampling rate, max recording time, Hardware settings.
- Start condition: manual, RPM trigger (runup, rundown), input level trigger.
- Add RPM channel (analog input).
- Oscilloscope mode
- RPM monitor
- Automatic RPM Processing
- Filename autoincrement option



- Main Recording Panel -

Calibration

A calibration utilities is available for calibrating sensors: the calibration level is calculated based on a known signal (typically generated thanks to a vibration or acoustic calibrator); if correct, the new EU/Volts calibration level is automatically and permanently stored in the recording configuration file.

Main Available Functions:

- Time History Range
- FFT Spectrum Average
- FFT Spectrum vs time
- Cepstrum Average
- RPM Vs. Time
- Order Spectrum Average
- Order Spectrum vs RPM
- Order Levels and Overall vs Time/RPM
- Level vs Time
- 1/1 and 1/3 Octave Spectrum with digital filters
- 1/1 and 1/3 Octave Band vs time
- Auto-correlation
- Cross-correlation
- Frequency Response Function
- Coherence
- Impulse Response
- Envelope

Main processing specifications:

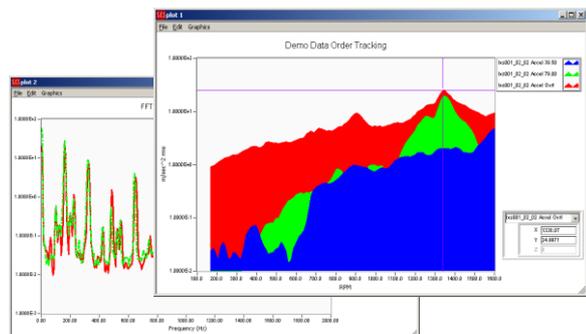
- Time History Processing Preprocessing:
 - Rescale ordinate
 - Filtering
 - Decimation
 - Single or double integration or decimation.
- Frequency Range:
 - FFT: max 20 KHz/Channel (HW dependent)
 - 1/3 Octave: 51.2 KHz
- FFT Blocksize: 128 - 65536 in $\sqrt{2}$ steps
- Software configurable trigger.
- Spectral windows user selectable
- Normalization (rms, pk, PSD, etc.)
- Order resolution: 0.1 – 1.0 (order analysis only)
- Weighting: linear or A-Weighting
- Averaging: linear, peak hold, exponential.
- Overlapping: 0-99%
- Order Table, including optional Overall vs. RPM.



Time History Processing

Graphic features

- Multiple windows for multi-plot data display.
- All functions have specific settings, user configurable: different configuration setup files can be stored and recall.
- Different graphic configuration setups (X, Y, Z axis type and scale, trace type – line style, line width and colors, plot area colors, etc.) can be stored and recall.



- Example of multiple plot windows -

- Bar graph or traceline plots
- Colormap editing for 3D plots
- 2D and 3D cursors with autocentering
- Legend On/Off
- X-Y Grid On/Off and colors
- Automatic axis Autoscaling
- Active Channel selection for 3D displays
- Use Group feature for quick recall group of data (*Use Group, Save Group, Recall Group, Overlay Group*).
- Save analysis in result files
- Multiple data selection form, with sorting and filtering features, for easy data recall and overlay.
- Save a time history range as new recording.

File Name	Extension	Size	Date	Channel Name
...
...
...
...
...
...
...
...
...

- Data selection form -

- Arrange Windows
 - Time + Analysis (Default in time history proc. mode)
 - Time only
 - Analysis only (Default in Review mode)
- Recalibrate Time History: the time history recordings can be recalibrated, if a calibration tone is stored inside the recording: this is useful, for example, if time history data are exchanged between different applications through a .wav format.
- Edit Time History Header: channel information's and user header can be viewed and edited.

Playback and filtering

Any selected time subsets can be played back to the Sound Card: a realtime filter on playback (LP, HP, BP or BS) allows the user to make an accurate listening, in order to identify and isolate specific noise components. Volume adjustment, variable playback speed and other useful feature are also available.



Multiple Time History Processing

One specific analysis of a single time history, can be automatically applied, with the same settings, to many other time histories: the results are automatically stored in appropriated result files. The user can then easily access multiple results for data comparison.

Prepare RPM

A dedicated utilities is available for extracting and processing the RPM information's from the recorded tachometer signal. The software automatically extract RPM information from the

RT Analyzer

RT Analyzer is the real time FFT multichannel acquisition and processing utility of AS-Smart.

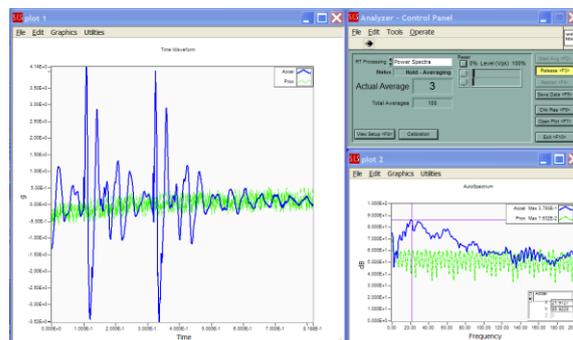
A very simple and easy to use control panel allows the user to completely control the real time processing in an interactively way, for example holding data, starting averaging, selecting analysis and channels to display, etc.

Two main processing type are available: *Power Spectrum* and *FRF* (Transfer Function).

In *FRF* processing - together with *Power Spectrum* - *FRF* and *Coherence* are also available for application like dynamic system characterization (i.e. hammer testing)

The user can create, store and recall any type of acquisition, processing and data display setup, to be recalled at any time for the user convenience.

The actual data or the averaged results can be displayed in real time. At the end of the averaging process the user can check the results of all the channels, just opening new plots.



- RT Analyzer control panel and example of RT displays -

The processed results – at the end of the averaging - can be stored in a result file (or directly exported to Excel), and then recalled as any other data of the SCS9002W environment.



- RT Analyzer: review data at end of averaging -

Import/Export

Available formats:

- Import File Wave (Time History – 2 channels only)
- Export File Wave (Time History – 2 channels only)
- Export ASCII
- Export Excel
- Export UFF (Universal File Format)