impaq Elite™

Benstone INSTRUMENTS

Impaq Elite 4 Channel Signal Analyzer

New Standard for Advanced Sound & Vibration Test in the Field

Benstone Instruments, Inc.

●Pioneering ●Partnership ●Performance

Born for In-Field Testing

Impaq Elite is a portable 4 channel real-time analyzer that is built for advanced noise and vibration test in the field. Unique features like rugged housing made by dual injection molding and protective sealing provide for IP 65 rating for measurement in harsh environments. Impaq Elite is equipped with a large 6.4 inch color VGA (640-x 480 high resolution) touch screen. The combination of Microsoft's powerful WinCE operating system and touch screen operation make it very easy and intuitive to use. Impaq Elite uses a 800 MHz CPU and the fastest commercially available DSP chip TI 6713, performing signal analysis at extremely high real-time rate.

## MODULARIZED APPLICATION SOFTWARE

Because every person may have different needs for his own tests, we have made the application software completely modularized. It is very easy to install different application software to an impaq Elite or download an updated version from our website. The following application programs are available from Benstone Instruments:

FFT Spectrum Analysis:

Impaq Elite's powerful FFT program allows you to conduct cross-channel analysis such as FRF, coherence, and cross power spectrum that are required for modal test, ODS testing or sound intensity measurements. This program also supports complex spectrum measurements, which offer both the phase and amplitude information needed for advanced analysis.
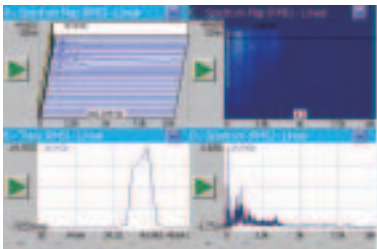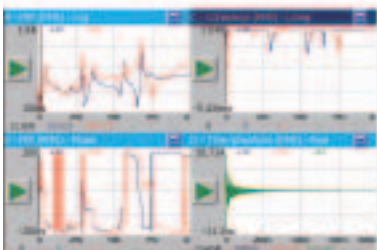
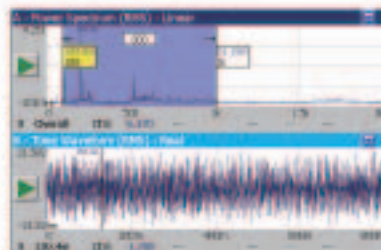Display data in waterfall plot, intensity plot, trace plot and spectrum plot.
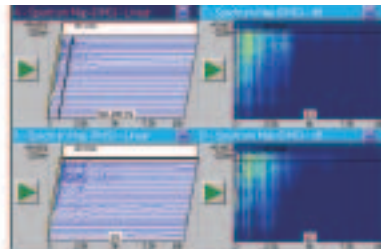
Measure spectral map and display data in 3D waterfall plots and intensity plots
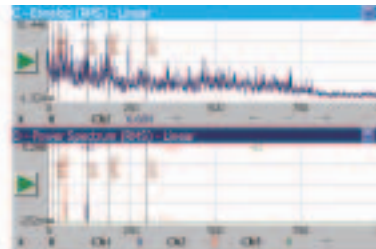
Display Envelope spectrum with bearing fault frequencies

Display the amplitude and phase of FRF, Coherence and time waveform

Display power spectrum with dual cursor and time waveform

- Modal testing
- Sound intensity measurement
- Operational deflection shape measurement
- System identification

Impaq Elite's FFT program also supports bearing vibration analysis as a standard feature. When the element of a bearing develops a defect, it will create periodic spike signals and excite the natural frequencies of the structures. By taking advantage of demodulation technology, one may see the fault frequencies of a bearing on a demodulated spectrum at it's early stage of damage. Impaq Elite's bearing analysis program uses a wavelet based Hilbert Transform algorithm, which shows clear spectral pattern and low levels of side band in the demodulated spectrum. With a built-in database of bearings, one can easily identify the bearing frequencies on a demodulated spectrum. In this program, one may conduct a scanning process and show the results on a 3D plot, and then select the appropriate envelope filter for best measurement quality results.
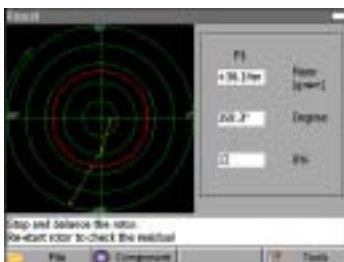
Rotor Balancing:

The impaq Elite can balance any rotor in the field without moving the rotor onto a balancing machine. The balancing program of impaq supports balancing jobs of single plane, dual plane, overhung dual plane and 3 weights balancing. You may find the following utilities in the rotor balancing program:


Select a balancing job from the main display

Show balancing data with polar plot

- component calculation
- drill depth calculation
- allowable residual unbalance from ISO 1940 standard
- unequal radii calculation
- 3 plane balancing (couple + static)
- review of your vibration historic data on a polar plot
- review of your balancing historic data on a polar plot
- printout of a report to a thermal printer
- 2 plane balancing for an overhung rotor
- 1 plane balancing
- 2 plane balancing
- Balancing an rotor who has 3 balancing weights
- Redo a balancing job with saved balancing factors
- Continue an unfinished balancing job from a saved file

Show dual plane balancing data as a couple and a static one
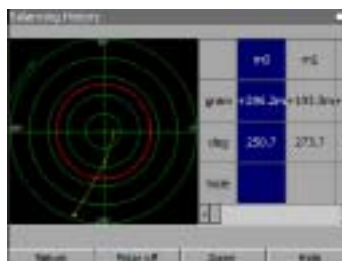
Review of historical balancing data and vibration data

Conversion of balancing mass into depth of drilling

Computed Order Tracking

The computed order tracking program is used to analyze the sound or vibration signals of a varying speed machine. Typical applications for this software module are like NVH testing of vehicles or vibration analysis of turbine machines. It calculates the order spectrum, order trace, filtered or unfiltered orbits, gap reading and centerline of a rotor accurately during a start-up or coast-down process. The impaq Elite's order tracking algorithm performs digital re-sampling of the measured signal for ensuring data accuracy. The order spectrum data can be displayed on a waterfall plot or intensity map. One may cut a slice or a trace of data from the waterfall plot and then examine the individual traces. The user can defined the geometric position of the vibration sensors for displaying the orbit, centerline or order trace in polar plot to show the realistic behavior of a turbine machines.

Setup the sensor locations and rotating direction for orbit, polar and centerline measurements
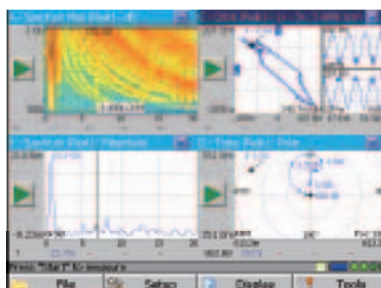
Display order spectral map, orbit and waveform, order spectrum and polar plot
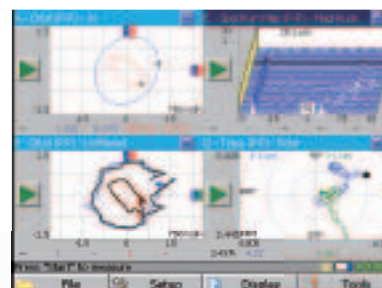
Display filtered orbit, unfiltered orbit, waterfall plot and polar plot for 1X vibration

Raw Data Recorder

Directly record raw time data to the built-in compact flash card. For example, a 1 gigabyte file will contain approximately three hours of continuous data with four channels recording at 2 kHz bandwidth.

The impaq Elite Windows CE operating system supports current and future compact flash card technology. This means that as compact flash cards increase in size, you will be able to install and use the higher data density compact flash cards for your raw data recording needs. The recorded data can be viewed directly on the impaq Elite or replayed and analyzed with Novian analysis software on your computer.
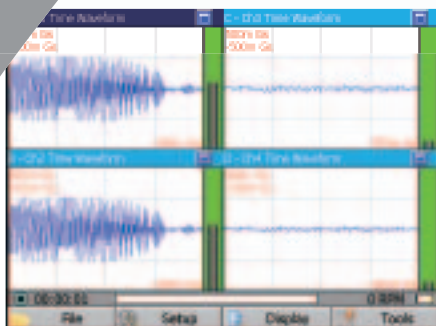
Record raw data with real time waveform view.


Various display modes and tools.
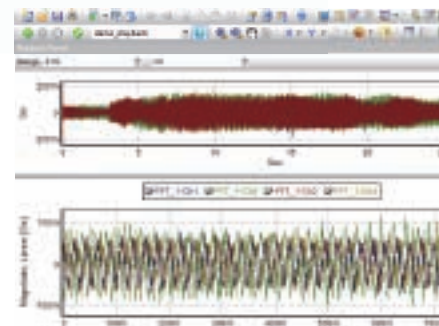
Replay and analyze raw data file with Novian on a PC

Octave Spectrum Analysis

The octave analysis program utilizes real-time digital filtering technology to generate octave, 1/3 octave or 1/12 octave spectrum. Conforming to the IEC 61260 & IEC 61672 standards, the octave program is best suited for acoustic or vibration measurements in the field.

For vibration applications, the octave program can perform measurements with user defined weightings. One example is that impaq Elite can perform triaxial measurements with the special weighting of ISO 6954 standard.
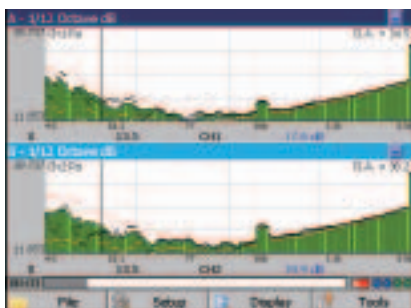
1/12 octave measurement with maximum, minimum and live bars
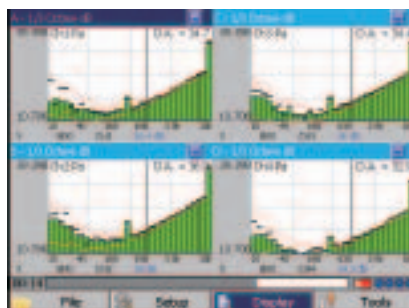
Display 1/3 octave in four window format

1/12 octave measurement in dual window format

Vibration Meter

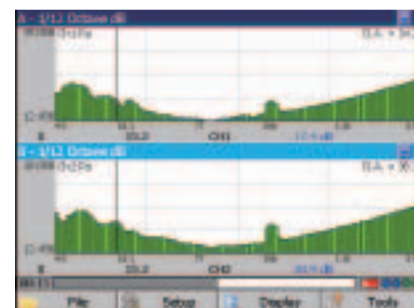The overall vibration level is a basic parameter for determining a machine's operational condition. By simulating the operation of an analog meter, impaq Elite's vibration meter program performs time domain integration, filtering and root mean square (RMS) calculations for accurate measurements of vibration levels. One to Four channels can be measured at the same time, displaying the results to a trend chart, bar chart, or you may record the data continuously to a file. Easily check vibration severity with the built-in ISO 10816-3 standard. The user may select different filter settings, or create a user defined filter for special measurements. This program also supports HAV (hand-arm vibration) measurement.

Measure and display overall level of acceleration, velocity and displcement in trend plot
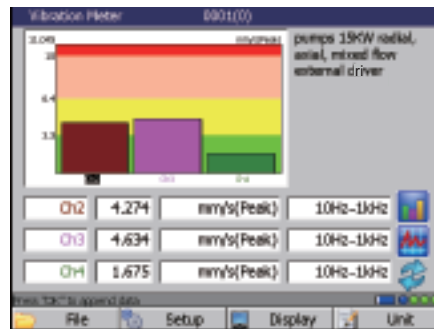
Display bar plot with severity color in background (ISO 10816-3 or user defined)
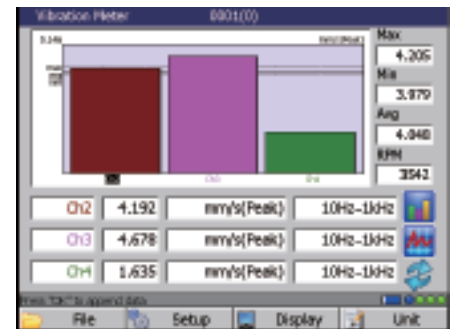
Display vibration velocity in bar plot for multi channel measurement

Specifications:

Hardware Feature	Technical Specifications
Operating system	Windows CE™
Number of input channels	4 analog channels and 1 aux channel
Connector of input channels	Analog: BNC and 7 pin Lemo, Aux: 6 pin Lemo
Channel coupling	AC, DC, IEPE, 0V microphone
Aux channel	TTL in (external trigger, TTL out, RS-232C)
DSP processor	TI TMS320C67x
External memory	Compact flash card
Battery	Li-ION 8.4V 5700 mAhr, rechargeable
PC communication interface	USB 1.1, mini B type USB connector
LCD display	640X480 6.4 inch TFT color touch screen
Operating temperature	-10 deg C to + 45 deg C
Safety certifications	CE
Sealing	IP 65
Housing material	Dual material: hard ABS plastic and soft TPR
Weight	4.5 lb (2.05 kg)
Size	11.2inch*7.1inch*3.0inch (284mm*180mm*76mm)
Max input signal range	±20 Volt
Dynamic range	>90 dB (16 bit A/D converter)
Frequency range	0 Hz to 40KHZ

Feature for FFT Analysis	
FFT real time rate	40 kHZ, single channel @12800 lines
FFT resolution	100-12,800 lines
Spectral map	3D waterfall or intensity plots for continuous spectrum measurements
Time windows	Hanning, flattop, rectangular, force, exponential
Analysis functions	Spectrum, power spectrum, cross power spectrum, FRF, time waveform, envelope spectrum, orbit and coherence
Engineering units	Automatic units transform with pre-defined table
Zoom FFT	Yes
Average	Linear, exponential, time, peak hold
Input Signal Range	± 10mV,± 20mV,± 50mV,± 100mV,±200mV,±500mV, ± 1V,± 2V,± 5V,± 10V,± 20V,autorange,range up only
Trigger	External, input channel triggering, pre/ post triggering
Cursor	Single, harmonic, harmonic+ single, peak, band cursor mark cursor
Envelope filters	500~2kHz, 1k~2.5kHz, 2k~5kHz, 5k~10kHz or user defined.
Bearing database	downloadable bearing fault frequencies of 350 bearings or optional database of up to 400,000 bearings

Feature for Rotor Balancing	
Rotor type for balancing	Single plane, dual plane, overhung rotor
Balancing speed	60 rpm to 300,000 rpm
Order resolution	Low, normal, high, 0.03, 0.015, 0.008, and 0.004 order
Average number	10, 20, 50 and 100
Balancing grade	Built-in ISO 1940 standard or user defined
Tools	3 plane balancing (static and couple), unequal radii, component calculation, drill depth, vibration history, balancing history

Feature for Vibration Meter	
Types of vibration	Acceleration, velocity and displacement
Types of detection	RMS, peak, peak to peak, true peak and quest factor
Filters	2Hz-1kHz, 5Hz-1kHz, 10Hz-1kHz, 2Hz high pass, 5Hz high pass, 10Hz high pass and user defined.
Display	trend chart (vibration vs. time or rpm) or bar chart.
Severity	ISO 10816-3 or user defined

Feature for Computed Order Tracking	
Measurement types	Order trace, order spectrum, spectrum map, RPM profile, orbit, gap and shaft centerline.
Measurement control	Manual, time step, rpm step or both time and rpm step.
Rotation speed	6 rpm to 480,000 rpm
Order resolution	0.5, 0.25, 0.125 and 0.0624
Max. number of traces	User selectable 16 orders plus overall traces.
Max. order	800 order
Waterfall display	Adjustable waterfall plot and intensity plot
Waterfall cursor	RPM cursor and Order cursor
Y-Axis of order traces	Linear, log, dB, real, image, phase, number and polar plot.
Geometry setting	Selectable angular location of sensors

Feature for Octave Analysis	
Octave spectrum	Full octave, 1/3 octave and 1/12 octave
Maximum band with 4 channel on	Full octave: 32k Hz, 1/3 octave: 10kHz, 1/12 octave: 5kHz
Maximum band with 1 channel on	Full octave: 32kHz, 1/3 octave: 40kHz, 1/12 octave: 20kHz
Integration time (second)	1/128, 1/64, 1/32, 1/16, 1/8, 1/4, 1/2, 1, 2, 4
Detection method	Fast, slow, impulse, linear
Trigger sources	Off, external, input channels, manual
Weighting	A, C, flat or user defined

Feature for Raw Data Recorder	
Recorded data	Raw time data and TTL tacho signal
Monitor display	Waveform, continuous waveform or spectrum (resolution 100, 200 or 400 lines)
Storage media	Compact flash card
Data review	Playback block by block, fast forward or rewind
Maximum file size	1 Gigabyte each
Maximum sampling rate	51.2 kHz for 1 channel, 25.6kHz for 2 channels and 12.8 kHz for 4 channel
Data analysis	Raw data files can be replayed by Novian software with FFT, octave or order tracking analysis.