



## **impaq 4 channel dynamic signal analyzer**

New Standard for Advanced Sound & Vibration Measurement in the Field



**Benstone Instruments, Inc.**  
Advancing Signal Science

# impaq 4 channel dynamic signal analyzer



## Born for in-Field Testing

Impaq is designed for those who need to perform advanced multi-channel sound and vibration measurements in the field. Unlike most PC-based analyzers that require a power cord and a gate leg table to setup a test, impaq integrates all the necessary subsystems into a compact, 1.15kg (2.54 lbs) metal housing. Each impaq is equipped with a long lasting Lithium-ion battery, which enables you to work continuously for at least 8 hours in the field. Simply put, impaq streamlines your in-field testing.

## Powered by the MS Windows CE™ ...

Powered by the MS Windows CE™ operating system, impaq offers a very intuitive operation and user friendly navigation of menus. This powerful operating system supports Compact Flash memory storage and USB interface. The impaq utilizes both of these features to provide unlimited storage and simple connectivity to your computer. With a high resolution color TFT display, now you can easily view your data of different channels on the impaq.

## High Speed DSP Programming

Equipped with the fastest commercially available DSP chip in the world (TI 67x series), the impaq can perform most advanced analysis in real-time. One example is a real-time FFT analysis performed at 40 kHz with 12,800 lines of resolution.

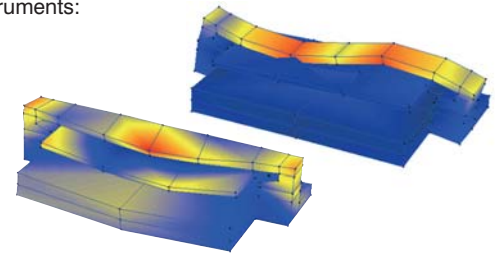


## MODULARIZED APPLICATION SOFTWARE

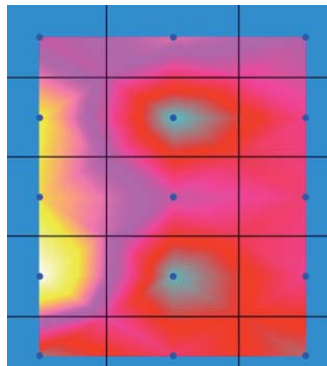
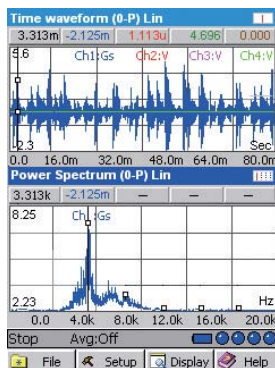
Because every person may have different needs for his own tests, we have made the application software completely modularized. It is very easy to install different application software to an impaq or download an updated version from our website. The following application programs are available from Benstone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

### FFT Spectrum Analysis:

Impaq'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.



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



Sample data transfer from Impaq's power FFT program to 3<sup>rd</sup> party software to create animated modal shapes and sound intensity maps.

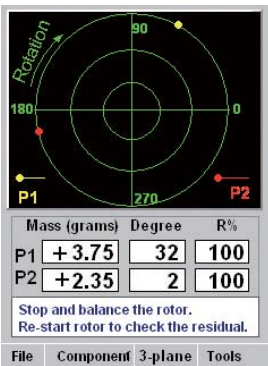




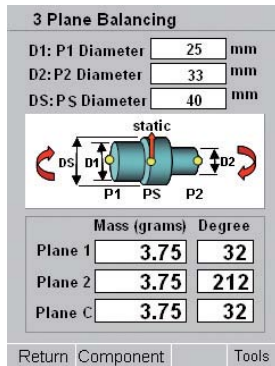
## Rotor Balancing:

The impaq can balance any rotor in the field without moving the rotor onto a balancing machine. The balancing program of impaq is simple, yet versatile. You may find the following utilities in the rotor balancing program:

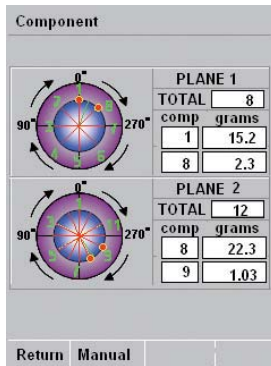
- Component calculation
- Drill depth calculation
- Allowable residual unbalance from ISO 1940 standard
- Unequal radii calculation
- 3 plane balancing (couple + static)
- Review of your vibration history
- Review of your balancing history
- Printout of a report to a thermal printer
- Balancing an overhung rotor
- 1 plane balancing
- 2 plane balancing



Rotor Balancing



3 Plane



Component Calculation

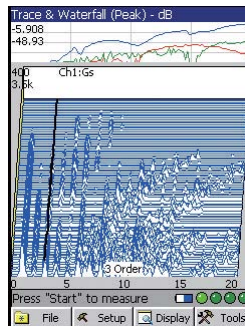


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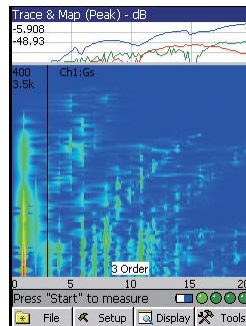


## Computed Order Tracking

The computed order tracking program is used to analyze the sound or vibration signals of a varying speed machine. It calculates the amplitude and phase accurately of specified orders during a start-up or coast-down process. Thanks to the power of the high-speed DSP chip, impaq's order tracking algorithm performs digital re-sampling of the measured data ensuring accuracy of data. 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.



Waterfall Plot



Intensity Plot

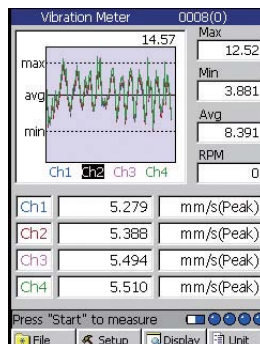


Polar Plot

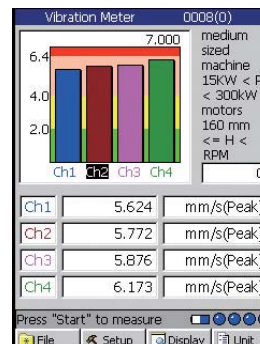
3/4

## Vibration Meter

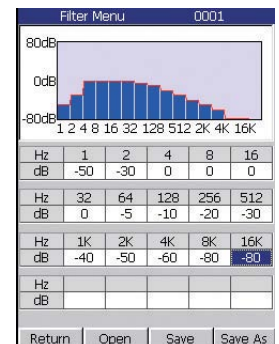
The overall vibration level is a basic parameter for determining a machine's operational condition. By simulating the operation of an analog meter, impaq's vibration meter program performs time domain integration, filtering and root mean square (RMS) calculations for accurate measurements of vibration 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.



Trending



Bar Chart



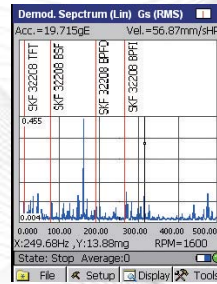
User Defined Filter



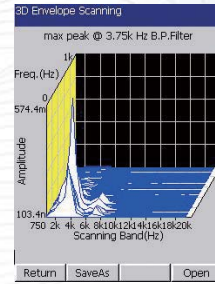


## Bearing Analysis

When the element of a bearing develops a defect, it will create repeated 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 its early stage of damage. Impaq's bearing analysis program uses a **patented** "wavelet based Hilbert Transform algorithm", which shows very 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 filter for best measurement quality results.



Bearing Frequencies



3D Scanning

Maker	Model Number
SIF	11507ETN9
32208	11504ETN9
Add to	11505
	11505ETN9
1600	11506ETN9
Quick List	11507
SIF	32208 (11507Hz)

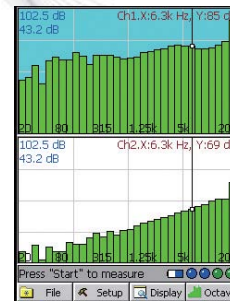
  

Bearing Information	Hz	RPM
SIF 32208	11504	670
32208	11504	670
1600	11506	4642
32208	11507	13414

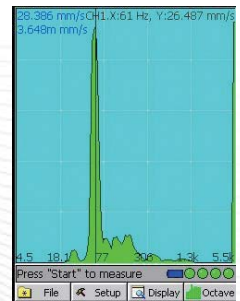
Bearing Database

## Octave Analysis

The octave program utilizes real-time digital filtering technology to generate octave, 1/3 octave or 1/12 octave spectrums. Conforming to the IEC 61260 & IEC 61672 standards, the octave program is best suited for acoustic or vibration measurement in the field. For vibration measurement, the octave program can perform time domain integration and then transform the acceleration spectrum into a velocity or a displacement spectrum.



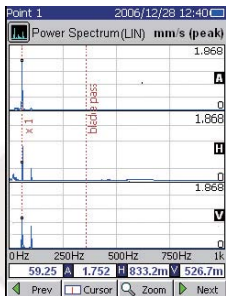
2 Channel 1/3 Octave



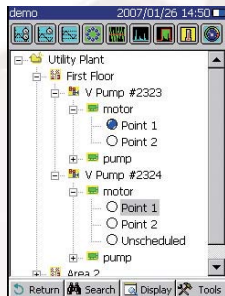
1/12th Octave plot

## Route-Based Data Collector

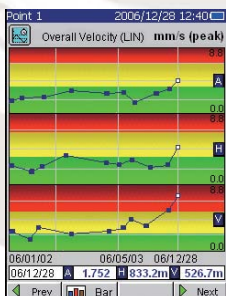
The data collector program can collect a large quantity of vibration data according to a predefined route. This software supports tri-axial vibration measurement simultaneously (real-time), saving many work hours in the field. Demodulation spectrum analysis is a standard feature for identifying bearing faults at earlier stages of bearing failure. Temperature and other process parameter measurements are also supported in the data collector program.



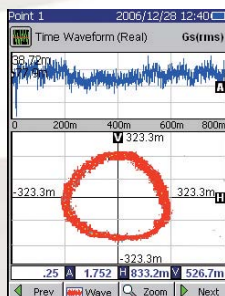
Power Spectrum



Typical Route Setup



Overall Velocity Trending



Time Waveform and Orbit plot



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## Specification

### Hardware Feature

Operating system  
 Number of input channels  
 Connector of input channels  
 Channel coupling  
 Aux channel  
 DSP processor  
 External memory  
 Battery  
 PC communication interface  
 LCD display  
 Operating temperature  
 Safety certifications  
 Sealing  
 Housing material  
 Weight  
 Size  
 Max input signal range  
 Dynamic range  
 Frequency range

### Technical Specifications

Windows CE™  
 4 analog channels and 1 aux channel  
 Analog: 7 pin Lemo, Aux: 6 pin Lemo  
 AC, DC, IEPE, 200V microphone, 0V microphone  
 TTL in (external trigger, TTL out, RS-232C)  
 TI TMS320C67x  
 Compact flash card  
 L-ION 8.4V 5400 mAh, rechargeable  
 USB 1.1, mini B type USB connector  
 240 x 320 bright active matrix TFT, 65,536 colors  
 -10 deg C to + 60 deg C  
 CE  
 IP 65  
 Aluminum alloy  
 2.4 lb (1120 grams)  
 4.5 in x 8.9 in x 2.56 in. (115 mm x 227 mm x 65 mm)  
 ±20 Volt  
 >90 dB  
 0 Hz to 40kHz

### Feature for FFT Analysis

FFT real time rate  
 FFT resolution  
 Windows  
 Analysis function  
 Engineering units  
 Zoom FFT  
 Average  
 Input signal range  
 Trigger  
 Cursor

40 kHz, single channel @12,800 lines  
 100-12,800 lines  
 Hanning, flattop, rectangular, force, exponential  
 Spectrum, power spectrum, cross power spectrum,  
 FRF, time waveform, orbit and coherence  
 Automatic units transform with pre-defined table  
 Yes  
 Linear, exponential, time, peak hold  
 ±10mV, ±20mV, ±50mV, ±100mV, ±200mV, ±500mV,  
 ±1V, ±2V, ±5V, ±10V, ±20 V, auto range, range up only  
 External, input channel triggering, pre/ post triggering  
 Single, harmonic, harmonic+ single, peak, mark cursor

### Feature for Rotor Balancing

Rotor type for balancing  
 Balancing speed  
 Order resolution  
 Average number  
 Balancing grade  
 Tools

Single plane, dual plane, overhung rotor  
 60 rpm to 300,000 rpm  
 Low, normal, high, 0.03, 0.015, 0.008, and 0.004 orders  
 10, 20, 50, 100 times  
 Built-in ISO 1940 standard or user defined  
 3 plane balancing (static and couple), unequal radii,  
 Component calculation, drill depth, vibration history,  
 balancing history.

### Feature for Computed Order Tracking

Measurement types  
 Rotation speed  
 Order resolution  
 Max. number of traces  
 Max. order  
 Waterfall display  
 Waterfall cursor  
 Y-Axis of order traces

Order trace, Order spectrum and waterfall display  
 6 rpm to 480,000 rpm  
 0.5, 0.25, 0.125 and 0.0624  
 User selectable 16 orders plus overall traces.  
 800 order  
 Adjustable waterfall plot and intensity plot  
 RPM cursor and Order cursor  
 Linear, log, dB, real, image, phase and polar plot.



## Specification

### 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 HP, 5Hz HP, 10Hz HP, MeF (ISO 10816) and user defined.
Display	Trend chart (vibration vs. time or rpm) or bar chart.
Severity	ISO 10816-3 or user defined

### Feature for Bearing Analysis

Max. frequency band	10kHz
Max. resolution	12,800 lines
Demodulation filters	500Hz-2kHz, 1kHz-2.5kHz, 2kHz-5kHz, 5kHz-10kHz, custom
Bearing database	Built-in commonly used bearings' fault frequencies
3D scanning	Scan the demodulation filter from 1kHz to 10kHz and show the results in a 3D plot
Overall bearing vibration	Envelope acceleration and high pass velocity

### Feature for Octave Analysis

Octave spectrum	Full octave, 1/3 octave and 1/12 octave
Max. band with 4 channel on	Full octave: 32kHz, 1/3 octave: 10kHz, 1/12 octave: 5kHz
Max. band with 1 channel on	Full octave: 32kHz, 1/3 octave: 40kHz, 1/12 octave: 20kHz
Integration time (sec)	1/128, 1/64, 1/32, 1/16, 1/8, 1/4, 1/2, 1, 2, 4
Detection	Fast, slow, impulse, linear
Trigger sources	Off, external, input channels, manual
Weighting	A, C or flat

### Feature for Data Collector

Types of measurement	Overall acceleration, overall velocity, overall displacement, overall bearing vibration (envelope acceleration and high pass velocity), time waveform, power spectrum, demodulated spectrum, temperature, process parameters.
Vibration sensors	support simultaneous 3 axis measurement or uni-axial
Overall display	Bar chart or trend chart (show with latest 9 historical data)
Spectrum display	Show band alarm or fault frequencies.
Time waveform display	Show waveform and/ or orbit
Search	Search train, machine or point
Tools	Add note, skip point, hide archive points, show all points, show archive points only, insert or delete unscheduled points







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