

SPECIFICATIONS

Hardware Feature	Technical Specifications
Operating system	Windows CE™
Number of input channels	4 analog channels and 1 aux channel
Connector of input channels	BNC, 4 pin Lemo for triaxial sensor, Aux: 6 pin Lemo
Channel coupling	AC, DC, IEPE
Aux channel	TTL or non-TTL in (external trigger or tach)
DSP processor	TI TMS320C6713B
External memory	Compact flash card
Battery	Li-Po 7.4V 5800 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 / Ruggedness	IP 65
Housing material	Dual material: hard ABS plastic and soft TPR
Weight	4.5 lb (2.0 kg)
Size	11.2inch*7.1inch*3.0inch (284mm*180mm*76mm)
Input signal range	±5Volt, ±20 Volt
Dynamic range	>128 dB (measured from spectrum)
A/D converter	24 bit sigma-delta A/D converter
Frequency range	0 Hz~40 kHz
Input impedance	1M Ohm

Feature for Raw Data Recorder

Recorded data	Raw time data and TTL tach 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 channels
Data analysis	Raw data files can be replayed by Novian software with FFT, octave or order tracking analysis.

Feature for Bump Test module

FFT real time rate	40 kHz, dual channel @12800 lines
FFT resolution	100-12,800 lines
Time windows	Force/Exponential
Analysis functions	power spectrum, cross power spectrum,FRF, time waveform and coherence
Engineering units	Automatic units transform with pre-defined table
Zoom FFT	No
Average	Linear, exponential, peak hold
Trigger	Channel 1 triggering, pre/ post triggering
Cursor	Single, harmonic, harmonic+ single, peak, band cursor mark cursor

Feature for ODS Test module

FFT real time rate	40 kHz, dual channel @12800 lines
FFT resolution	100-12,800 lines
Time windows	Hanning window
Analysis functions	power spectrum, cross power spectrum,FRF, time waveform and coherence
Engineering units	Automatic units transform with pre-defined table
Zoom FFT	No
Average	Linear, exponential, peak hold
Trigger	No
Cursor	Single, harmonic, harmonic+ single, peak, band cursor mark cursor

Feature for Rotor Balancing	
Rotor type for balancing	Single plane, dual plane, 3 plane, 4 plane, overhung dual plane, 3 weights balancing
Balancing speed	60 rpm to 300,000 rpm
Order resolution	Low, normal, high, 0.03, 0.015, 0.008, and 0.004
Average number	10, 20, 50 and 100
Balancing grade	Built-in ISO 1940 standard or user defined
Tools	1X coast down order trace, decoupled balancing (static and couple), unequal radii, component calculation, drill depth, vibration history, balancing history and recalculation of balancing coefficients.

Feature for Order Tracking module

Measurement types	Measurement typesOrder 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; Bode plot by layout setting.
Geometry setting	Selectable angular location of sensors

Feature for Data Collector

Types of measurement	Overall acceleration, overall velocity, overall displacement, overall bearing condition (true peak detection of HP filtered waveform), time waveform, power spectrum (up to six sets), demodulated spectrum, Amplitude&Phase, Cepstrum, Crest factor, temperature, process parameters.
Vibration sensors	support simultaneous 3 axis measurement or single axial
Filters for overall value	2Hz-1kHz, 5Hz-1kHz, 10Hz-1kHz, 2Hz HP, 5Hz HP, 10Hz HP
Overall display	Bar chart or trend chart (shown 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



VP5
4 channel data collector/
machinery condition analyzer

BENSTONE
Condition monitoring



BENSTONE INSTRUMENTS, INC.

32905 Northland Court- St. Paul, MN 55045

Tel : 651-257-6500 Email : info@benstone.com

Website : www.benstone.com/cm

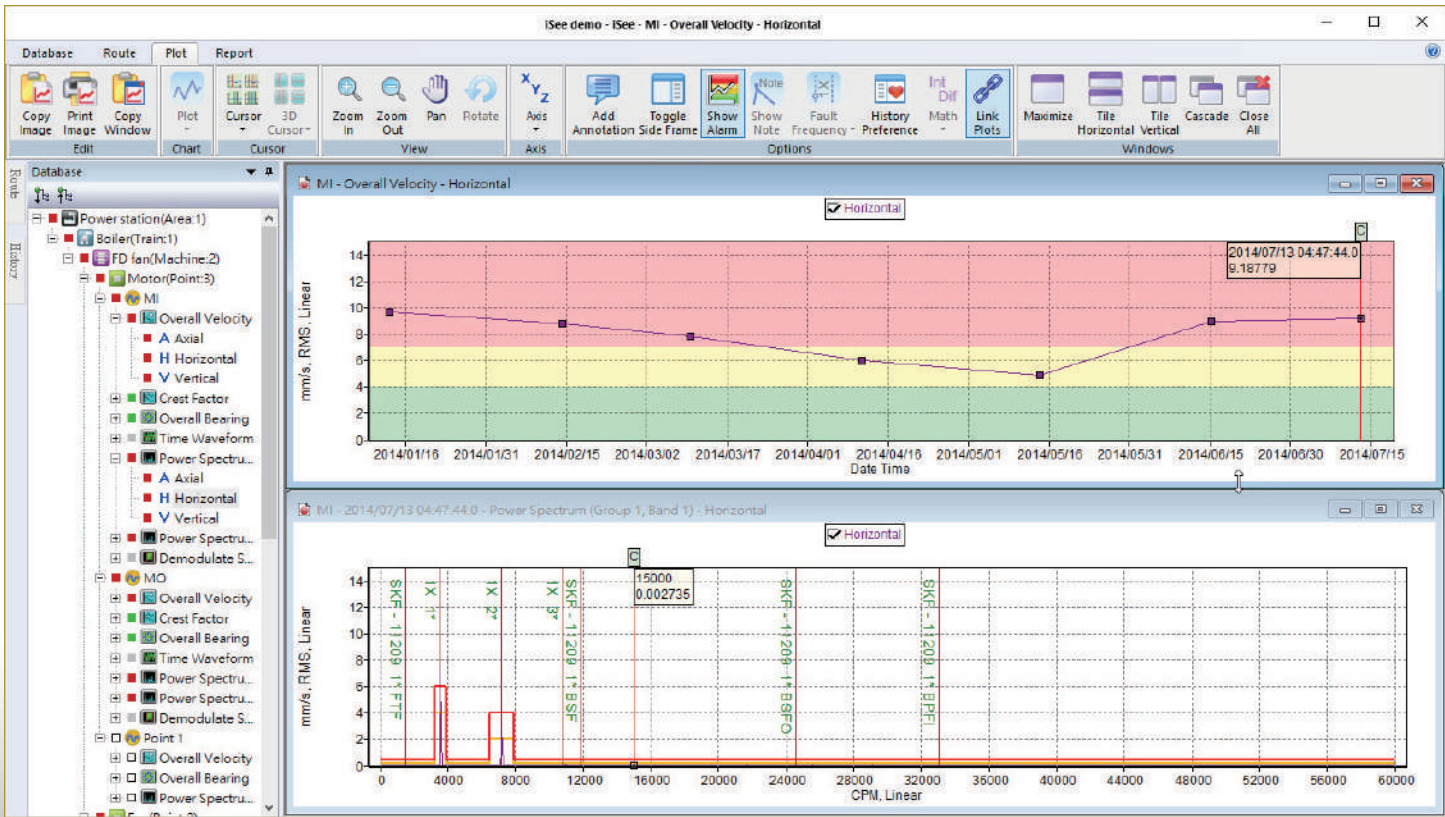
www.benstone.com/cm

BENSTONE
Condition monitoring

Introduction to VP5

The VP5 is a portable 4 channel data collector/ Analyzer built for advanced machinery condition monitoring and vibration root cause analysis. Manufactured with a dual injection molding process to provide a ruggedized housing with IP65 rating for measurement in harsh environments.

The VP5 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 provides a user friendly and intuitive interface. The VP5 acquires measurement signal with precision 24-bit sigma delta AD converters to provide a high dynamic range, up to 40 kHz maximum bandwidth. The VP5 is powered by the high-speed DSP chip TI TMS320C6713B for performing signal analysis at extremely fast real-time rates.

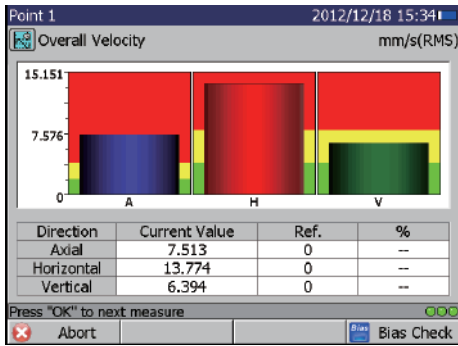


iSee software coupled with the vPod Pro, MP5 or VP5 data collectors is a powerful solution to your management of machinery health condition.

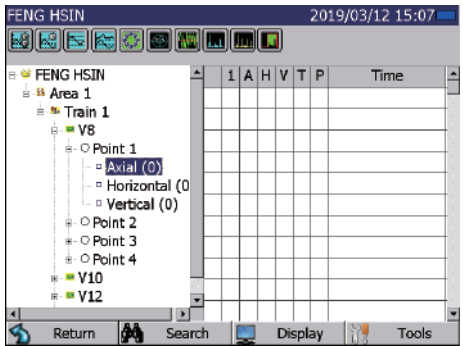


Route Based Data Collector

Combined with the powerful computer software iSee, the VP5 is your best choice for route-based data collection in the field. The VP5 supports simultaneous tri-axial measurement (x,y,z axes), saving many work hours in the field. The VP5 measures bearing fault signal via true peak detection on a high-pass filtered time waveform. This field-proven technology provides sensitive and accurate readings from the early stage of bearing damage and allows the user to track the bearing damage development from the trending analysis feature of iSee PC software. Envelope spectrum measurement is a standard feature for confirming bearing failure. Temperature and other process parameter measurements are also supported in the data collector program.



Triaxial measurement gives global view of machine conditions and saves work hours

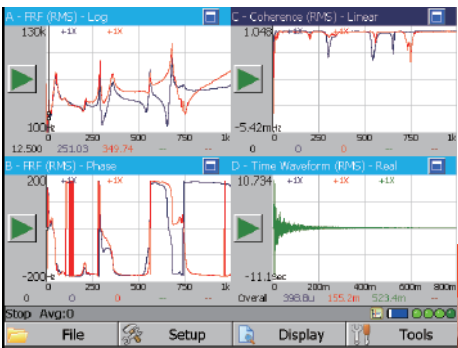


Browse the database of a route from the main display



Bump Test module

VP5's powerful Bump Test module allows you to conduct a bump test on a structure and measure its frequency response frequency (FRF), coherence, and cross power spectrum functions. This useful software module helps with the investigation of the resonance of a machine, conduct structural reinforcement and reduce the vibration level of a machine running at its resonance zone. The test data can be imported to a 3rd party software, such as ME'Scope, for further modal analysis to derive its modal shapes, natural frequencies and damping values.



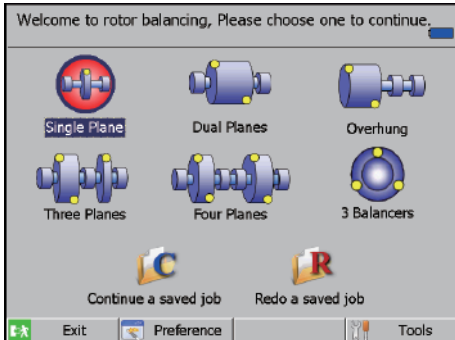
Display the amplitude and phase of FRF's, Coherence and time waveform



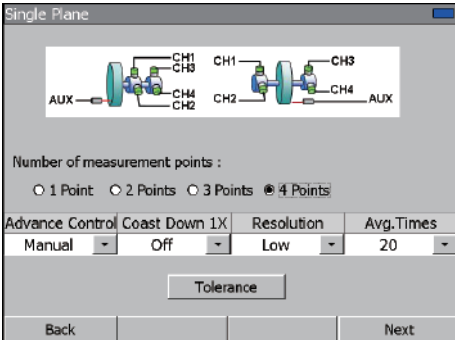
Rotor Balancing

The VP5 with the (optional) balancing software package can balance your rotating machines in the field with industry leading balancing techniques like; single plane, dual plane, overhung dual plane, 3 plane, 4 plane and 3 weights balancing. This advanced balancing software makes it very simple to balance machines in-field with a very high level of accuracy. Now with multiple-point balancing, vibration in BOTH the horizontal and vertical directions are minimized at the same time. By enabling coast-down measurements for 1X vibration, the heavy spot is identified correctly with only one measurement, saving time, money and increasing safety. The coast down technique prevents the user from excessive danger by putting the trial weights in the wrong place and shortens the time required to balance. Other features / functions are:

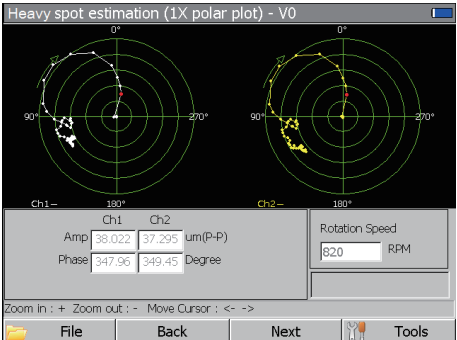
- Multi-point balancing
- Component calculation
- Drill depth calculation
- Allowable residual unbalance calculated from the ISO 1940 standard
- Unequal radii calculation
- Decoupled balancing (couple + static)
- Review historical vibration data on a polar plot.
- Review historical balancing data on a polar plot
- Heavy spot estimation with one shot measurement.
- Redo a previous balancing job with saved balancing factors.
- Continue an unfinished balancing job from a saved file



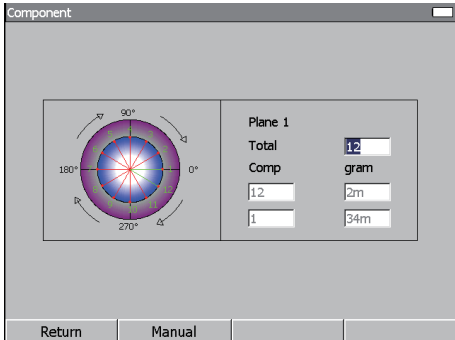
Select the desired balancing function from the main display



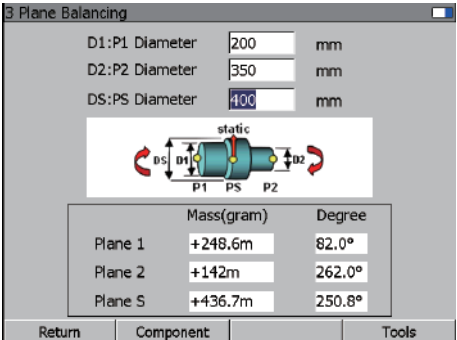
Select up to 4 measurement points for single plane balancing



Find out the heavy spot location from a single coast-down measurement of 1X vibration



Component calculation for discrete weight locations

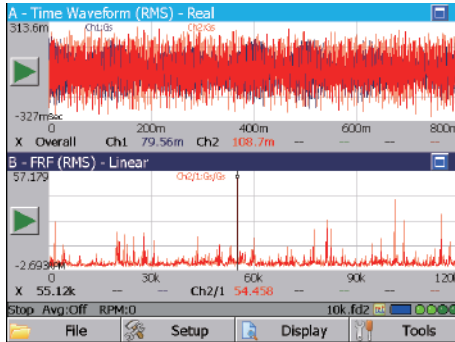


Conversion of dual plane balancing into static and couple balancing



ODS (Operational Deflection Shape) Test module

VP5's ODS module allows you to conduct a measurement on a running machine and measure its FRF, coherence, and cross power spectrum functions. With the reference vibration sensor connected to channel 1 and a triaxial vibration sensor connected to channel 2, 3 and 4, the VP5 saves your time for the measuring tasks in the field via real-time four channel measurements. By importing the test data to a 3rd party software, like ME'Scope, you may derive the Operational Deflection Shapes of your machines easily. The ODS test helps to find out how the structure deflects at certain running speeds, providing useful information for structural reinforcement.



Mode	Measure	Channel	Engineer Unit	X
On/Off	Input Range	Coupling	Window	
☒ Ch1	5V	IEPE	Hanning	
☒ Ch2	5V	IEPE	Hanning	
☒ Ch3	5V	IEPE	Hanning	
☒ Ch4	5V	IEPE	Hanning	
Force Factor		Exponential Factor		
0.1		0.1		
Channel ID :		☒ Modal/ODS	☐ Machine	
	Channel ID	Auto Adv.	Adv. No.	
Ch1	201	-X	On	0
Ch2	1	+X	Off	1
Ch3	1	+Y	Off	1
Ch4	1	+Z	Off	1
Return		Assign Single	Assign All	

Measure cross channel functions, such as FRF and cross power spectrum, which are required by ODS testing

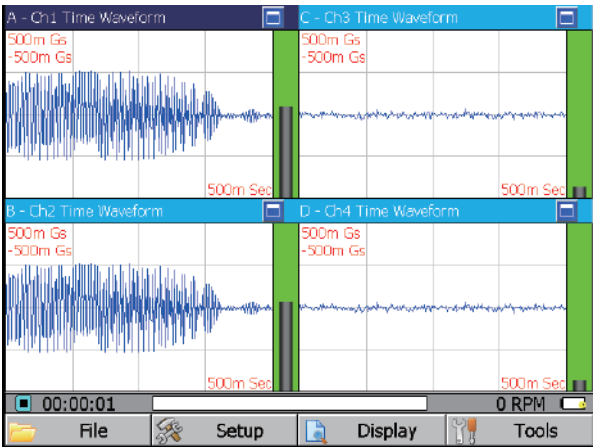
Define point ID with point numbers and axial directions for generating deflection shapes



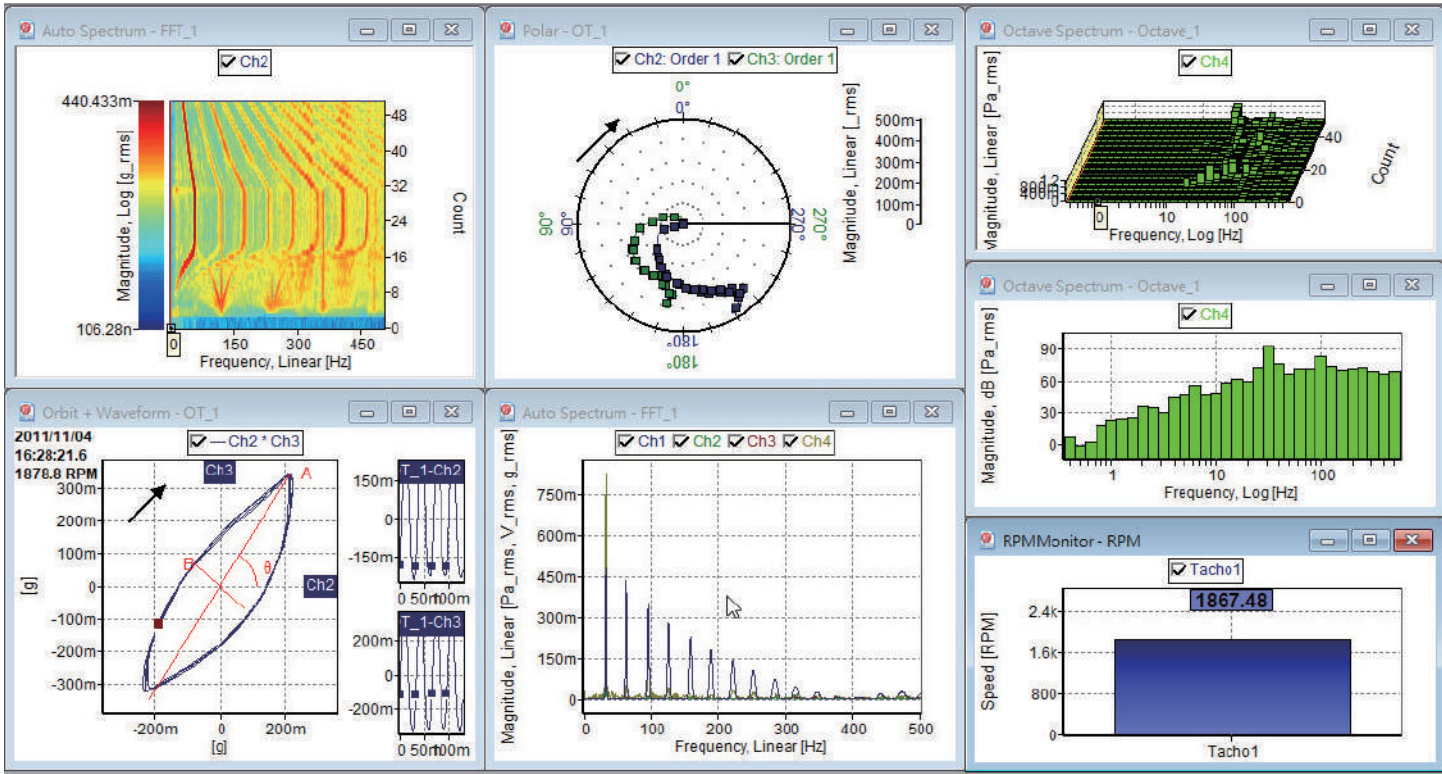


Raw Data Recorder module

The recorder program directly records 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 5 kHz bandwidth. Post processing of Raw Data Recorder files such as FFT, Order Tracking or Octave Analysis from the playback mode can be done with Novian Computer based software.



Record raw data with real-time waveform or spectrum view.

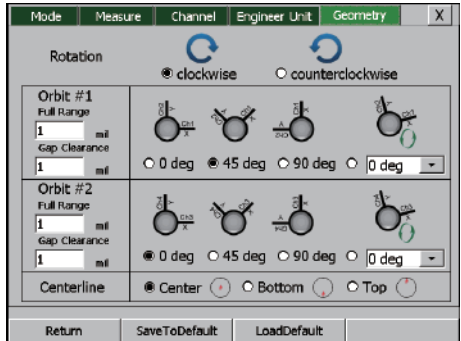


Computer based Novian software can be used to investigate the measured data from the VP5. Conduct FFT, Order Tracking or Octave spectrum analysis with the playback mode of PC software. Create Microsoft Word Test reports, export to a variety of formats, ie. XML, UFF, etc...

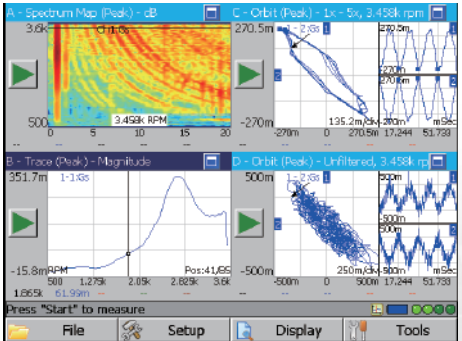


Order Tracking module

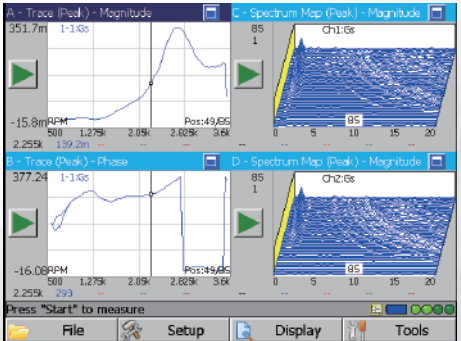
The computed order tracking program is designed to analyze the sound or vibration signals of a varying speed machines. Calculation of the order spectrum, order traces, filtered or unfiltered orbits, gap reading and centerline of a shaft accurately during a start-up or coast-down process. The VP5's order 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. Cut a slice or a trace of data from the waterfall plot and then examine the individual traces. As shown in the figure below, the user can enter geometric position(s) of the vibration sensors to create a plot to display orbit and shaft centerline motion, which relates to the realistic behavior of a turbine machine.



Setup the sensor locations and rotating direction for orbit, polar and centerline measurements



Display order spectral map, orbit and waveform, order spectrum and order trace



Display filtered orbit, unfiltered orbit, waterfall plot and polar plot for 1X vibration

