

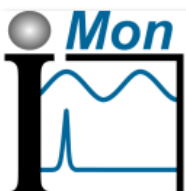
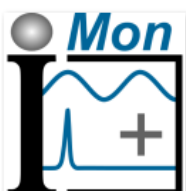

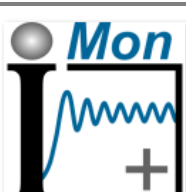


iMonitor – Real-Time Data collection software that combines Time and Frequency domain analysis for vibration, process monitoring, and modal testing...


<i>Product Description</i>	<i>Icon</i>
<i>iMonitor MODAL</i> Supports 8 vibration and 8 voltage channels along with impact hammer collection for modal testing.	
<i>iMonitor LAB</i> Supports 4 vibration and 12 voltage channels along with impact hammer collection for modal testing.	
<i>iMonitor VIBS</i> Supports 8 vibration and 8 voltage channels.	
<i>iMonitor VIBS PLUS</i> Supports 16 vibration channels.	
<i>iMonitor DAQ</i> Supports 8 voltage channels.	
<i>iMonitor DAQ PLUS</i> Supports 16 voltage channels.	



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- NOTE: Toggle  on/off at any time to display useful tips and descriptions for each control and setting. Simply mouse to the control or hover over it and a helpful description will be displayed.

1 NI HARDWARE SETUP

iMonitor uses NI hardware modules inserted at specific module locations (slots) in the NI cDAQ 9174 chassis. The NI 9174 cDAQ chassis holds a maximum of 4 modules. NI 9234 modules are used for vibration measurements and the NI 9215 modules are used for collecting voltage measurements. Each module type supports 4 channels.

The NI 9234 modules¹ are sophisticated modules designed for collecting vibration signals. They must be positioned starting in slot 1 of the cDAQ chassis to avoid data collection errors. The 9215 modules² will usually start in slot 3 or the first available slot after slot 3 based upon the number of installed 9234 modules.

The iMonitor Product type also influences the slot positions, module types, and the number of different modules supported. For example, iMonitor DAQ PLUS allows four 9215 modules starting in slot 1 to support a total of 16 voltage measurements.

Here are typical product-based configurations:

Product	cDAQ 9174 Chassis				Max Channles		Modal Support (Y/N)
	Slot 1	Slot 2	Slot 3	Slot 4	VIBS	VOLTS	
iMonitor - Modal	9234	9234	9215	9215	8	8	Yes
iMonitor - LAB	9234	9215	9215	9215	4	12	Yes
iMonitor - VIBS	9234	9234	9215	9215	8	8	No
iMonitor - VIBS PLUS	9234	9234	9234	9234	16	0	No
iMonitor - DAQ			9215	9215	0	8	No
iMonitor - DAQ PLUS	9215	9215	9215	9215	0	16	No

Note: Modal products reference the impact hammer on channel 1

¹ **4-Channel, 51.2 kS/s/channel, ± 5 V, C Series Sound and Vibration Input Module** - The NI-9234 can measure signals from integrated electronic piezoelectric (IEPE) and non-IEPE sensors such as accelerometers, tachometers, and proximity probes. The NI-9234 is also compatible with smart TEDS sensors. The NI-9234 delivers a wide dynamic range and incorporates software-selectable AC/DC coupling and IEPE signal conditioning. The input channels simultaneously measure signals. Each channel also has built-in anti-aliasing filters that automatically adjust to your sample rate. When used with NI software, this module provides processing functionality for condition monitoring such as frequency analysis and order tracking.

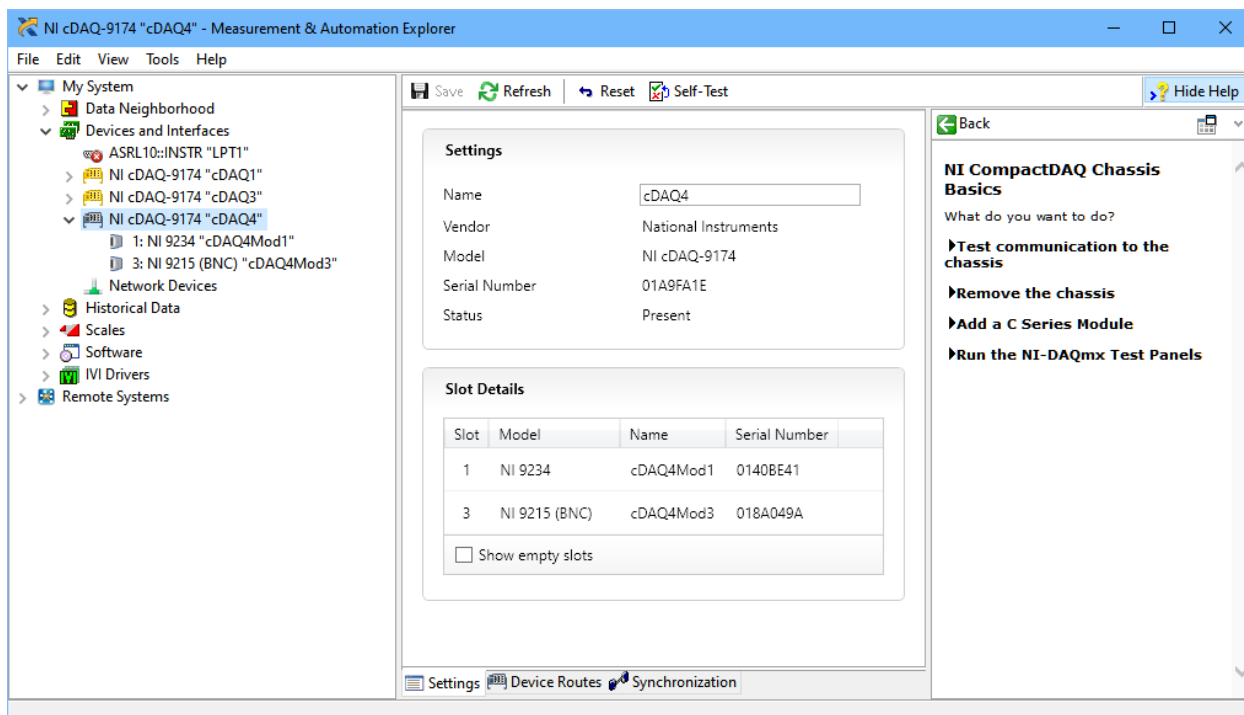
² **4-Channel, 100 kS/s/ch, ± 10 V, 16-Bit, Simultaneous Input, C Series Voltage Input Module** - The NI-9215 performs differential analog input. The module contains NIST-traceable calibration, a channel-to-earth ground double isolation barrier for safety and noise immunity, and high common-mode voltage range. It is also offered in two connectivity variants: 10-position screw terminal or BNC.

NI MAX (Measurement and Automation Explorer) driver software will automatically detect the USB data-collection hardware when it is connected to the PC.

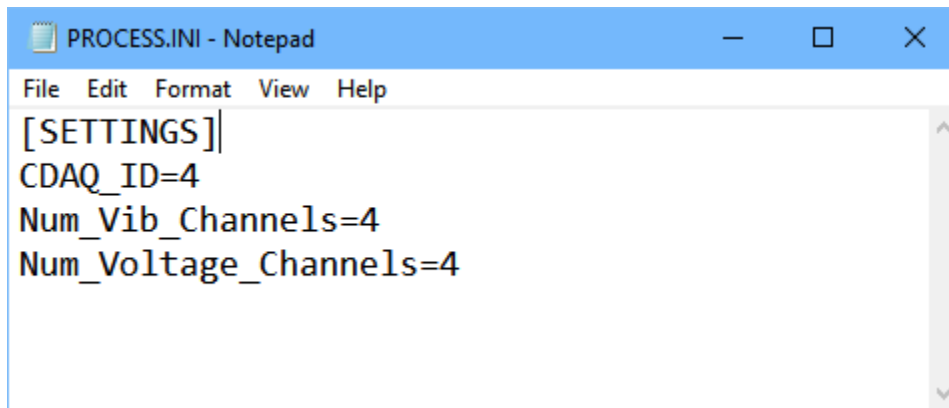


Run NI MAX to validate the cDAQ assignment (notice cDAQ4 referenced above). Once installed, NI MAX will use the same cDAQ number each time the hardware is connected or reconnected to the PC.

NI MAX can be used for advanced troubleshooting and will clearly show if a hardware issue exists. The cDAQ4 configuration is shown below with modules located in Slots 1 and 3 (slots 2 and 4 are empty):



It is not necessary to occupy all the slots with hardware. However, the PROCESS.INI file, which is in the INIFILES folder where the application is installed, must be properly configured to match the cDAQ ID and the installed hardware channel counts.



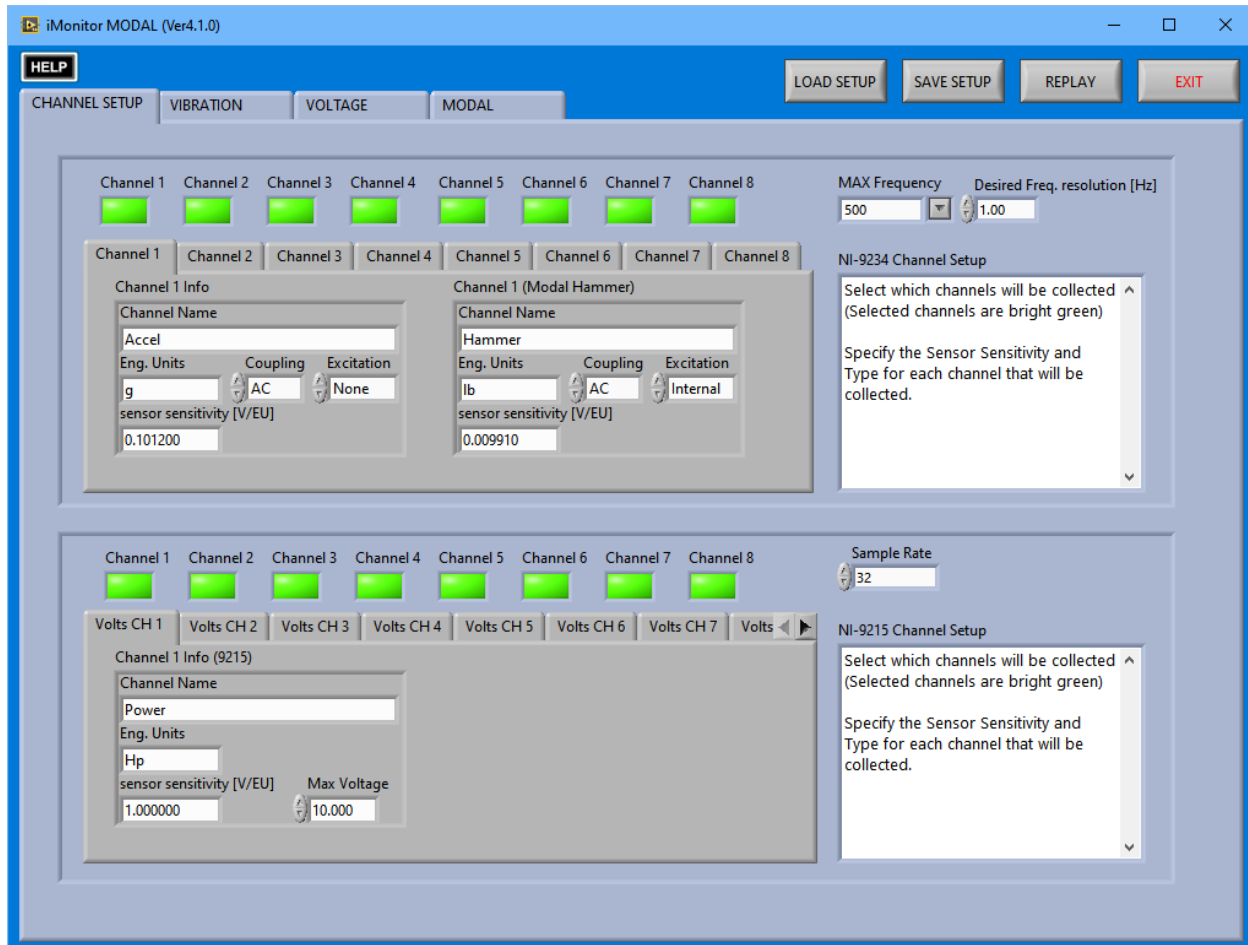
As shown above, the PROCESS.INI file has been edited to match the NI MAX cDAQ configuration previously shown. The CDAQ_ID value has been set to 4 and both the vibration and voltage channel counts are also 4 since 1 module of each type is currently installed and each module supports four channels.

Data collection errors will occur if more channels are requested than what the hardware supports or if the cDAQ ID doesn't match. The ID number is used to uniquely identify the cDAQ chassis and its corresponding modules. If collection errors occur, NI MAX is an extremely valuable tool to help resolve the issue.

Also, if NI MAX reports a hardware error, or if a Self-Test fails, the iMonitor software will not be able to collect data properly. The hardware must function correctly in NI MAX. Although extremely rare, NI modules can fail if dropped or if they are exposed to extreme signal loads.

2 CHANNEL SETUP

The CHANNEL SETUP and necessary data-collection tabs will be displayed based upon the product type and the channels selected.

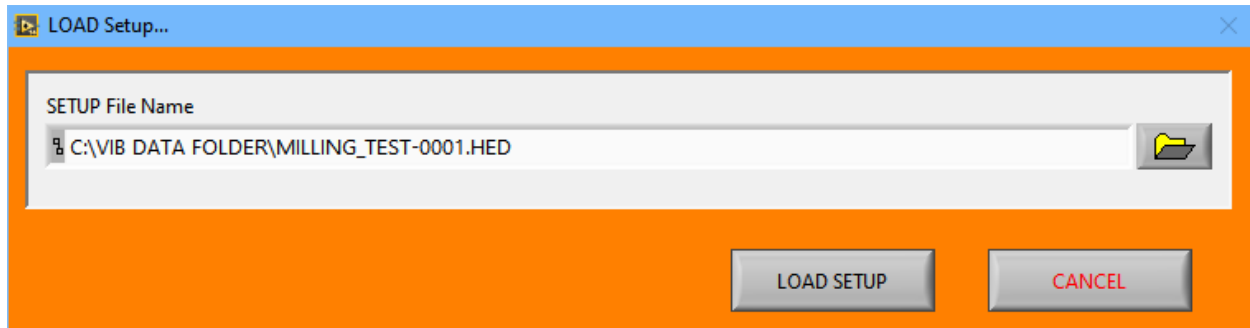


For example, the VIBRATION tab will only be displayed if at least one vibration channel is selected (the same is true for the VOLTAGE tab). Likewise, the MODAL tab will be displayed if Channel 1 (the channel dedicated for the hammer) and at least one other vibration sensor is enabled, and the product supports modal testing.

The channel selectors and their corresponding Channel tabs are used to edit the sensor calibration constants and to configure the channel details.

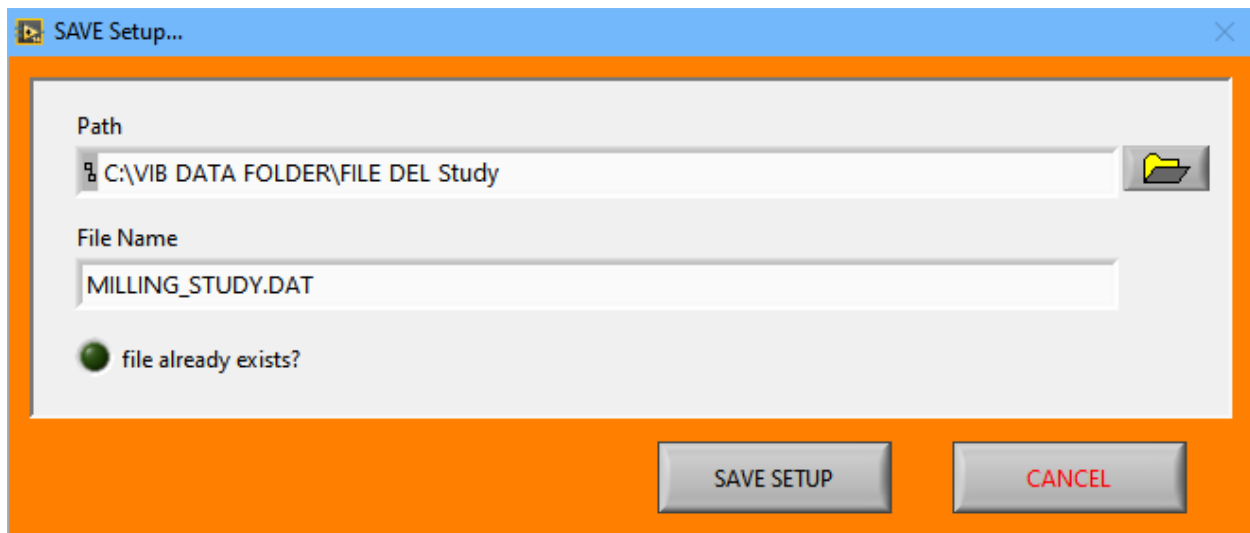
It is important to understand that the vibration and the voltage channels can be sampled at different data collection rates. Both collections, if configured, will begin at the same time, and will remain synchronized throughout collection.

The channel configurations are automatically stored whenever a collection is completed or whenever the program is exited. Upon restart, the last configuration will automatically be loaded (CHANNEL SETUP.DAT). However, the [LOAD SETUP] button can be used to reload any previously stored configuration.



Channel configuration files are automatically stored for each test using the test name followed by a HED extension. These test-header files can be reloaded and quickly reviewed using the [LOAD SETUP] button.

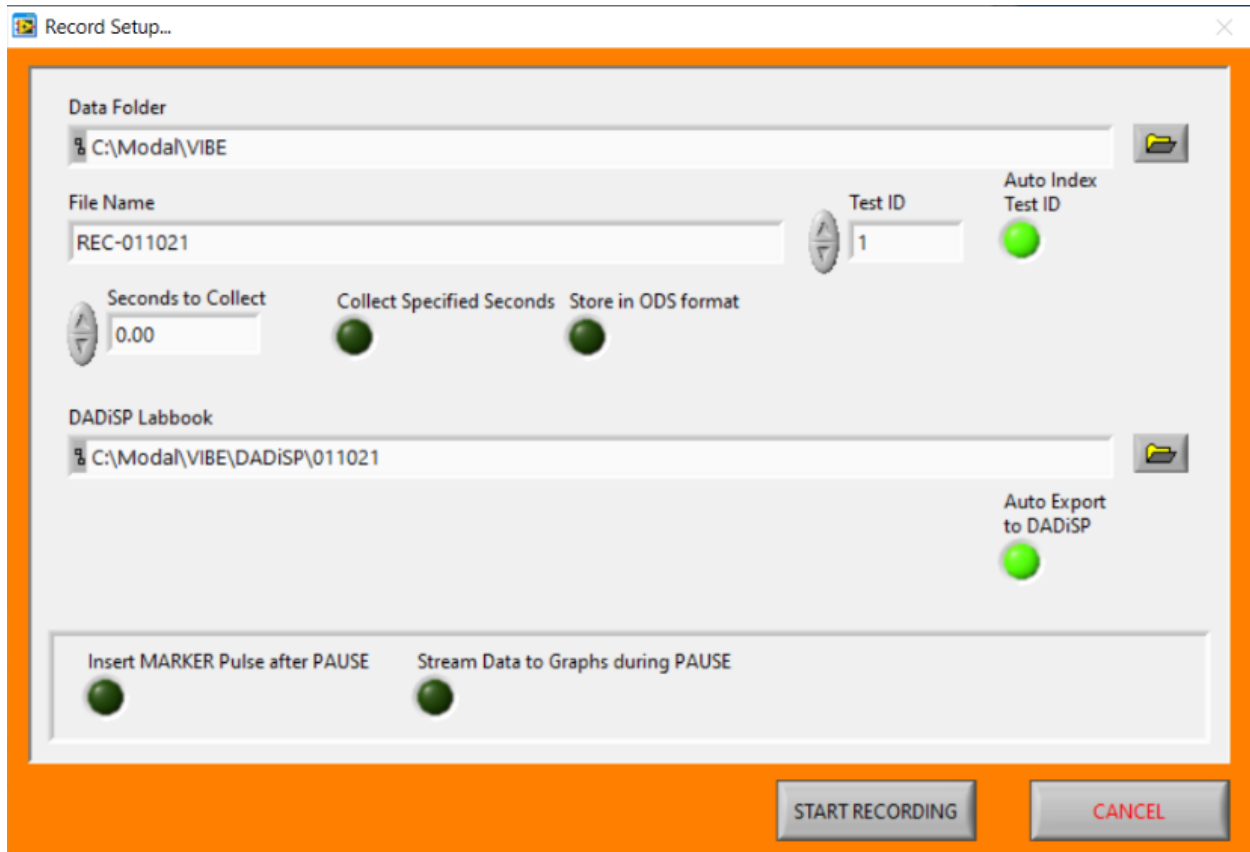
The [SAVE SETUP] will store the current channel configurations to disk using any specified name and will also warn if the setup file already exists to protect against overwriting a critical setup file. Selected channels, channel names, and all sensitivity settings and collection rates are stored.



3 DATA COLLECTION (Free RUN or RECORD)

The [Free RUN] and [RECORD] buttons are used to start the data collection process and will continue until the [STOP] button is pressed.

- [Free RUN] – Data is NOT stored to disk
- [RECORD] – Data is stored to disk using specified record settings

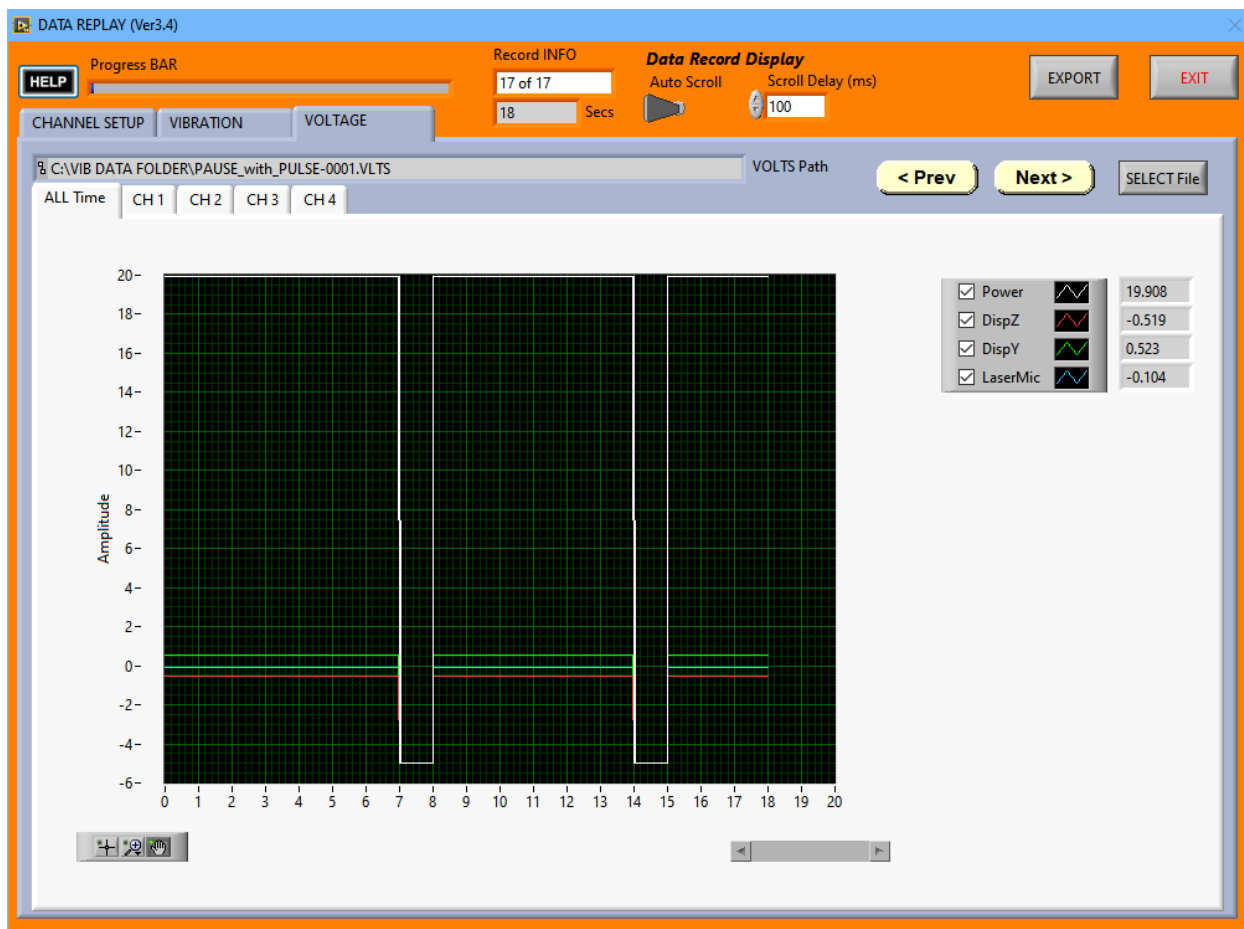


Collected data is stored into the Data Folder using the specified File Name. When enabled, Auto Index Test ID will increment and add an index after each test name to simplify file naming. The same File Name is used but the next index is automatically appended to help track collection order.

iMonitor is also compatible with DADiSP (a powerful data analysis package) and will automatically import the collected data directly into a specified Labbook. The collection rates and file names are used to create DADiSP compatible datasets and signals. This is a tremendous timesaving feature and allows immediate data review and complex signal processing.

Data can also be collected for a specified number of seconds when desired. This feature is useful when repetitive collections are desired, and the test duration is known beforehand.

During collection, it is possible to [PAUSE] and [RESUME] the collection process. This is a unique feature that is useful when transient events are being studied. A “MARKER” pulse can be inserted into the collected data stream to help identify exactly when the collection was paused and restarted.



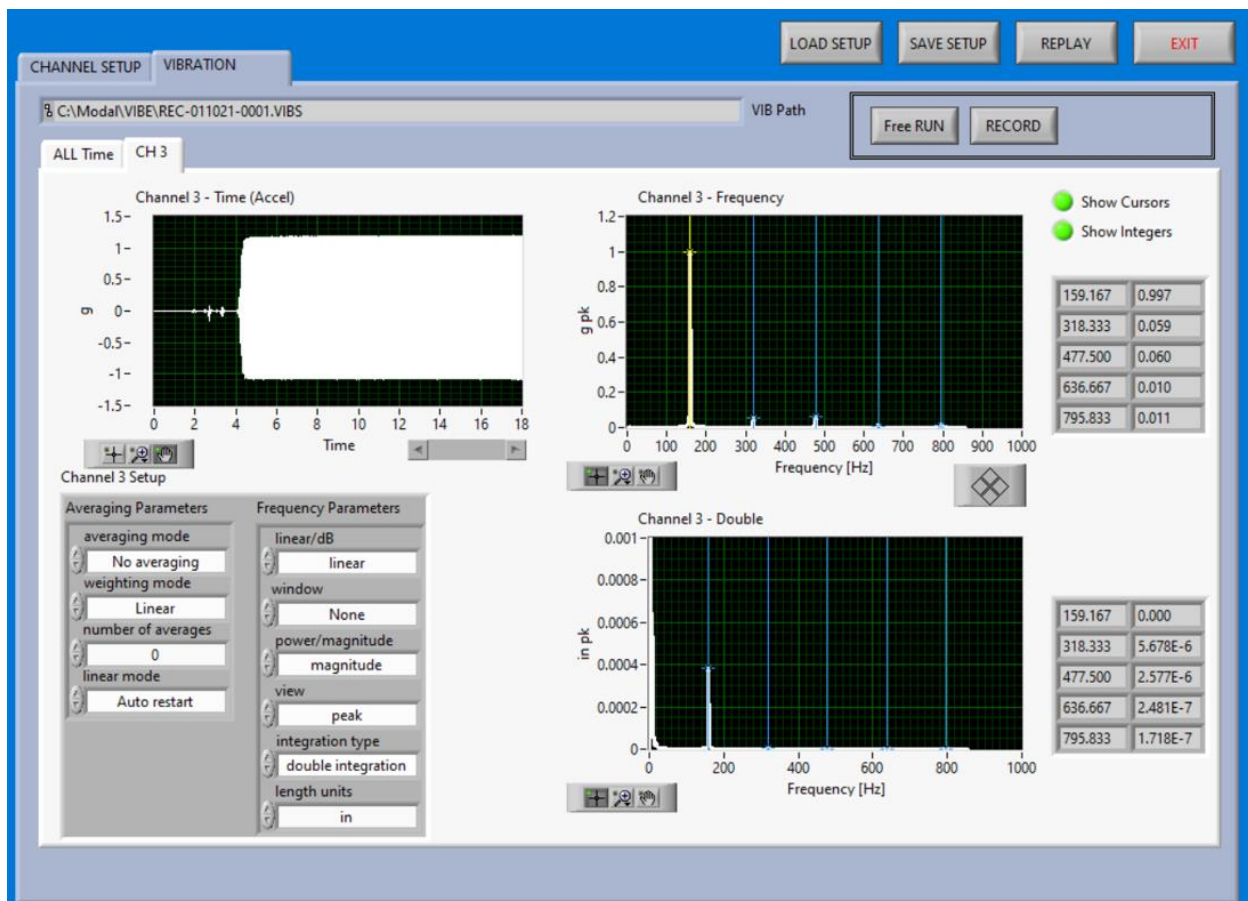
Marker pulses are shown in the above replay screen helping to quickly identify when the collection was paused. This is extremely helpful during post analysis since marker pulses can be quickly spotted and even used to extract data sections. For example, settings like cutter speed could be changed during the different sections but still all be contained within the same data file (multiple tests in one file with separations).

In most cases, when collection is PAUSED, data will not continue to flow into the graphs. However, the “Stream data to graphs during PAUSE” option will keep the data flowing into the graphs even though it will not be stored to disk during the PAUSE.

4 VIBRATION Tab

The VIBRATION tab displays measurements for the vibration channels that are enabled in CHANNEL SETUP. If no vibration channels are enabled, the VIBRATION tab will not be displayed and vibration data will not be collected.

The VIBRATION tab contains the individual channel tabs labeled CH1, CH2, etc. and a combined [ALL Time] tab for useful channel comparisons. The individual channel tabs are identical and display time, frequency, and processed data as it is being collected.

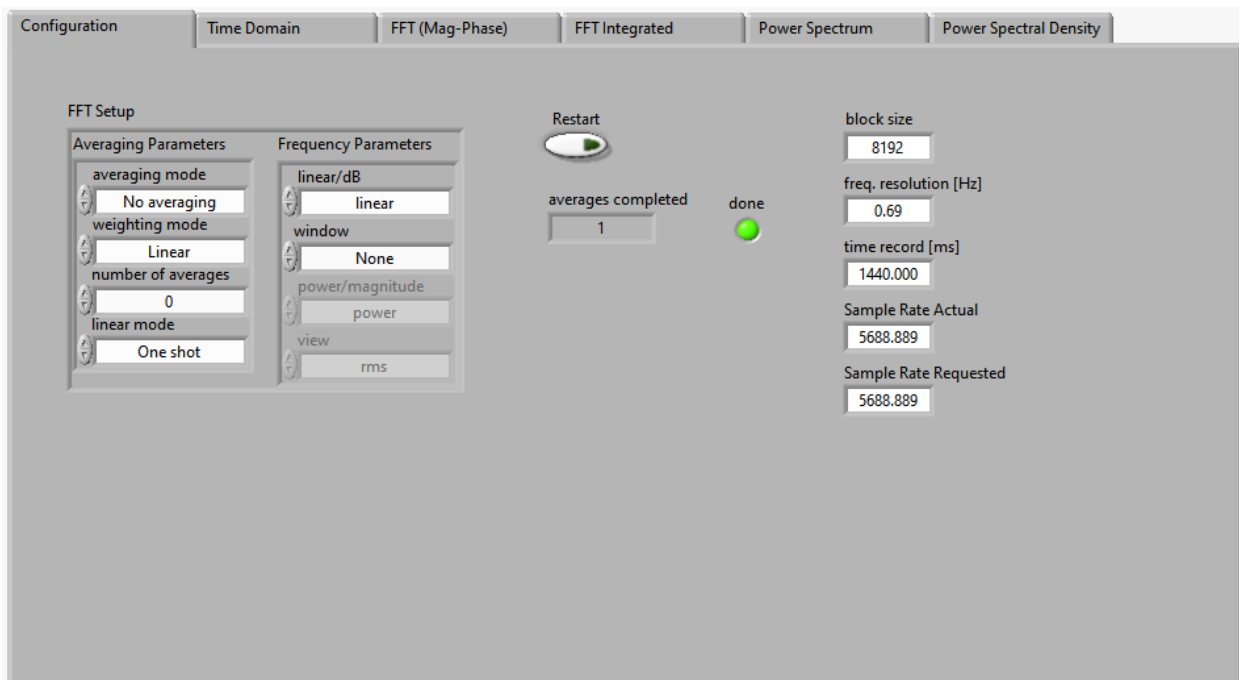


In the display above, CH 3 shows the time signature response along with the frequency content and the double integration of the response to displacement. These calculations are performed in real-time during collection. When cursors are enabled, they will display frequency and magnitudes. The integer cursors are useful to monitor harmonics.



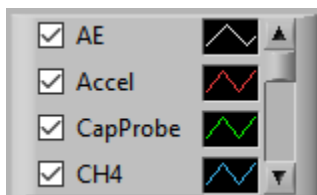
- NOTE: Each data graph typically has a pallet tool (shown above) that can be used to select/move cursors, zoom in and out on areas of interest (the magnifying glass), and to pan across the data (the hand). These are each activated by clicking the desired function and then interacting with the graph.

The [ALL Time] tab shows the active data-collection configuration details and is also useful for conducting channel comparisons in both the time and frequency domains as the data is being collected.



The FFT Setup parameters influence the FFT and Power spectrum calculations. The [HELP] button located in the top left corner can always be toggled to display useful descriptions for these different parameters and measurements.

The check boxes next to the signal names can be used to hide/show that specific channel. If the check mark is removed, the signal will not be displayed. This is helpful to declutter a graph when trying to study relationships between specific channels.



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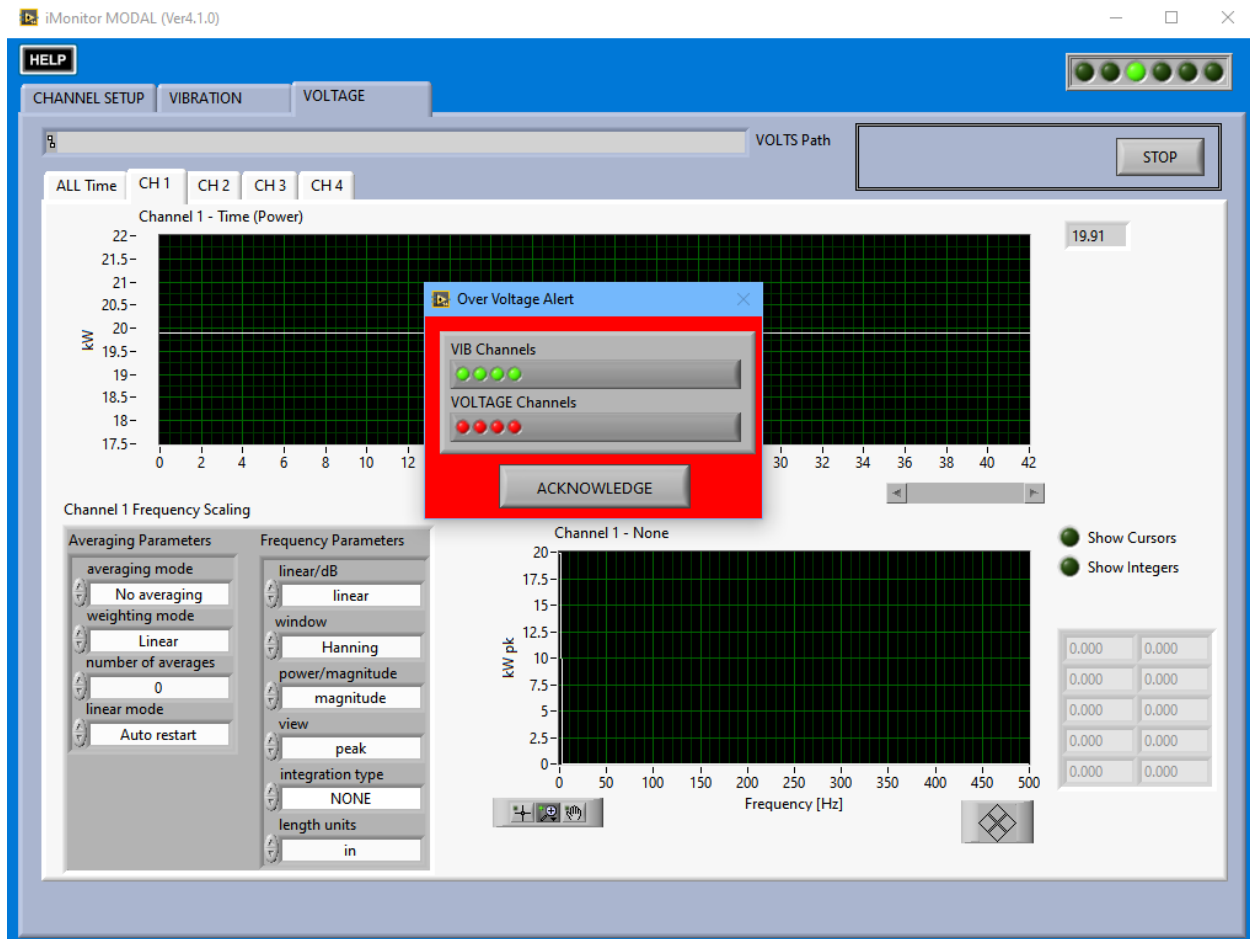
by Controlink Systems LLC

5 VOLTAGE Tab

The VOLTAGE tab displays measurements for the voltage channels that are enabled in CHANNEL SETUP. If no voltage channels are enabled, the VOLTAGE tab will not be displayed, and the voltage/sensor data will not be collected.

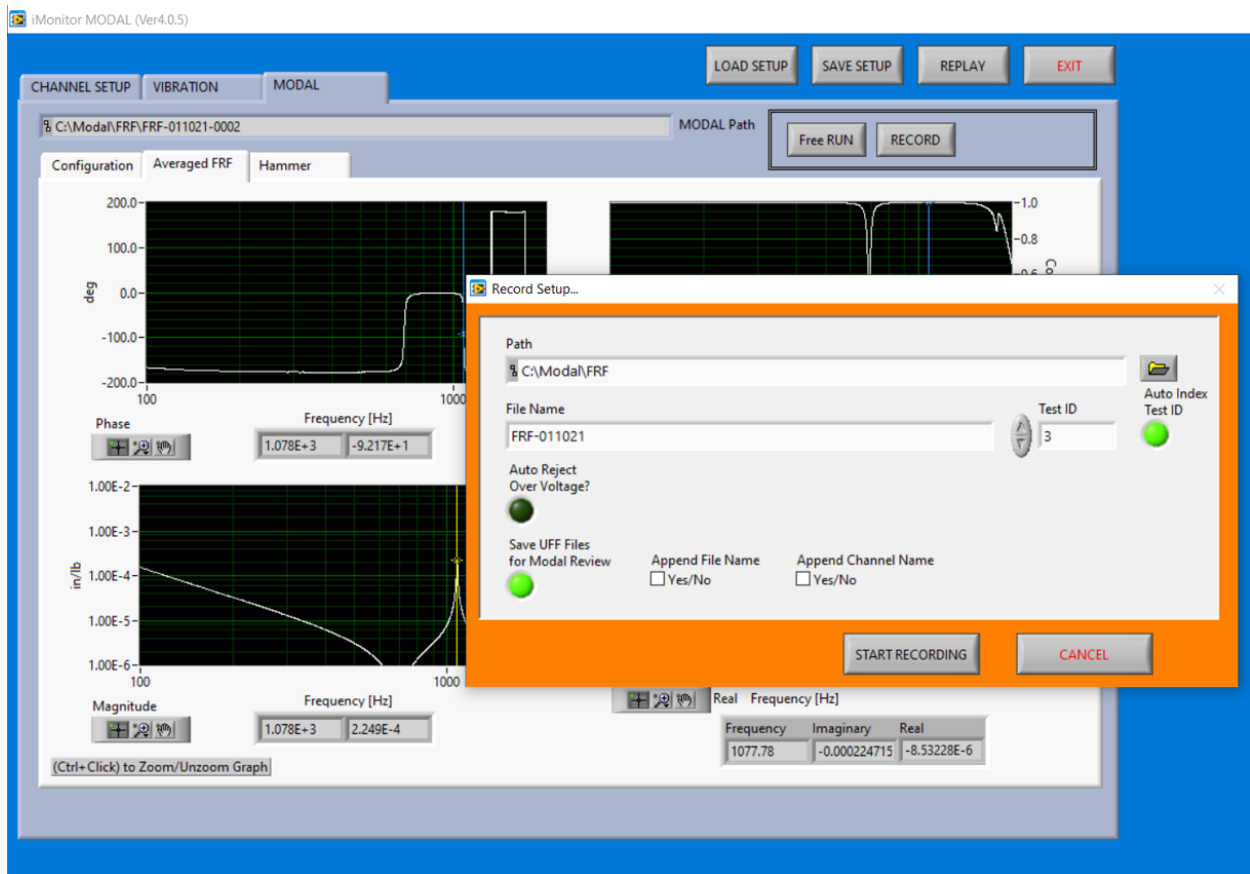
The VOLTAGE tab contains the individual channel tabs labeled CH1, CH2, etc. and a combined [ALL Time] tab for useful channel comparisons. The individual channel tabs are identical and display time and frequency domain data using the Frequency Scaling settings on that channel page.

Voltage levels are continuously monitored during collection and an “Over Voltage Alert” will be displayed if a channel voltage becomes excessive (marked in red). This is to inform the user so appropriate signal levels can be specified.



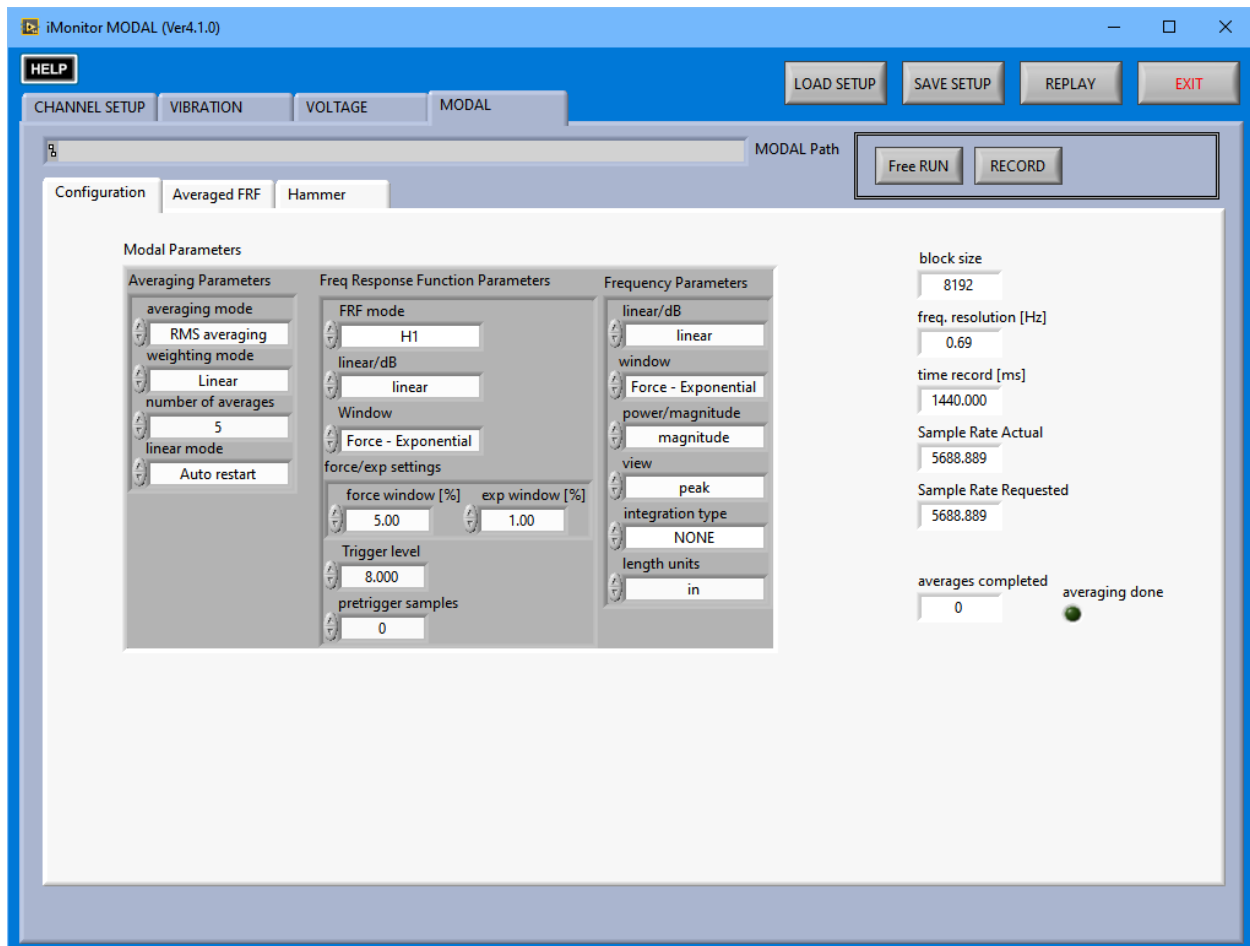
6 MODAL Tab

The MODAL tab is used to conduct modal analysis tests using an impact hammer (configured on channel 1) and response sensors positioned on the test structure. The collection can be done in Free RUN or RECORD mode.



The collected data can be stored into UFF format which is compatible with commercial modal analysis packages to analyze and animate mode shapes. If selected, the data will be stored in UFF58 ASCII format that can be interpreted and directly imported by a UFF58 file reader.

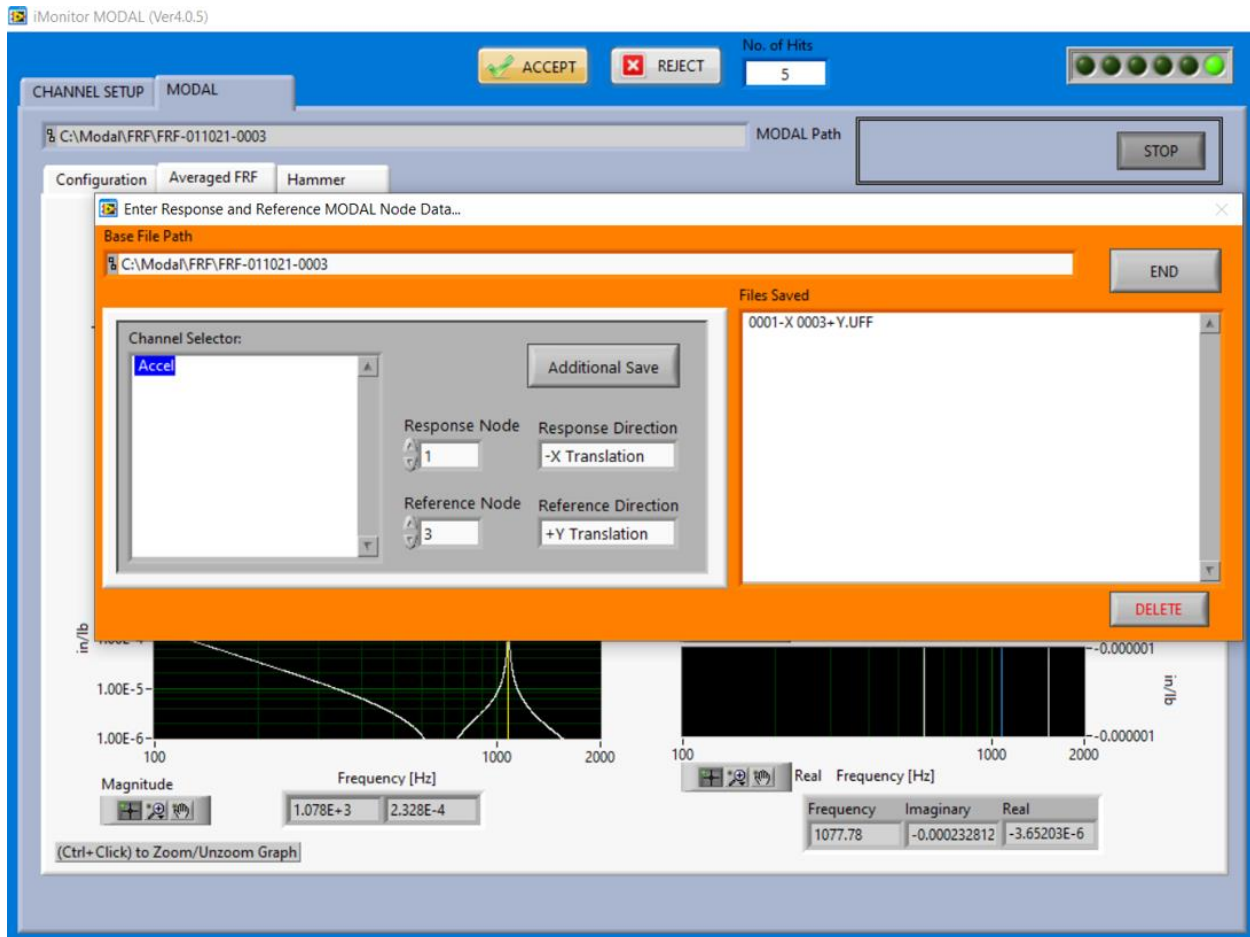
The Modal collection parameters can be entered on the Configuration tab. The number of averages to complete, averaging mode, and window types for both the impact and response channel(s) can be configured.



The hammer impact is displayed on the [Hammer] tab showing the impact in both the time and frequency domain with windowing applied. As impacts are made, the user is given the opportunity to [ACCEPT] or [REJECT] each impact/measurement.



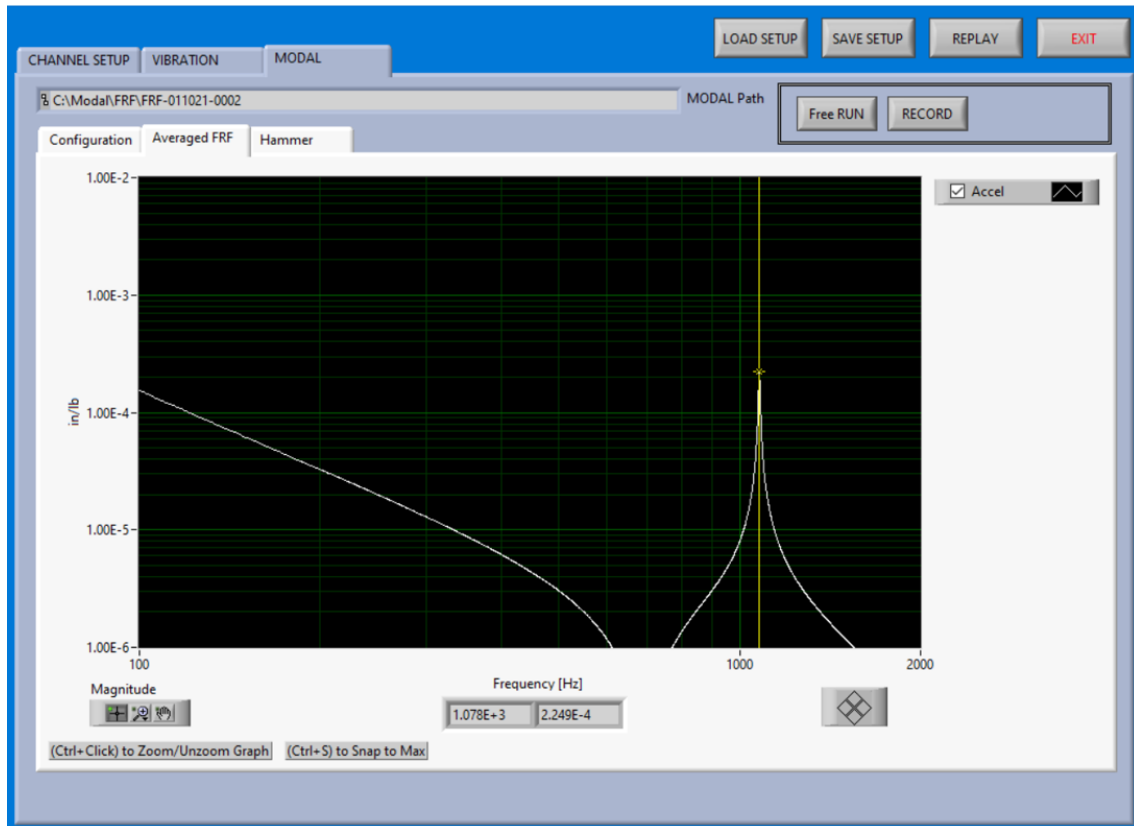
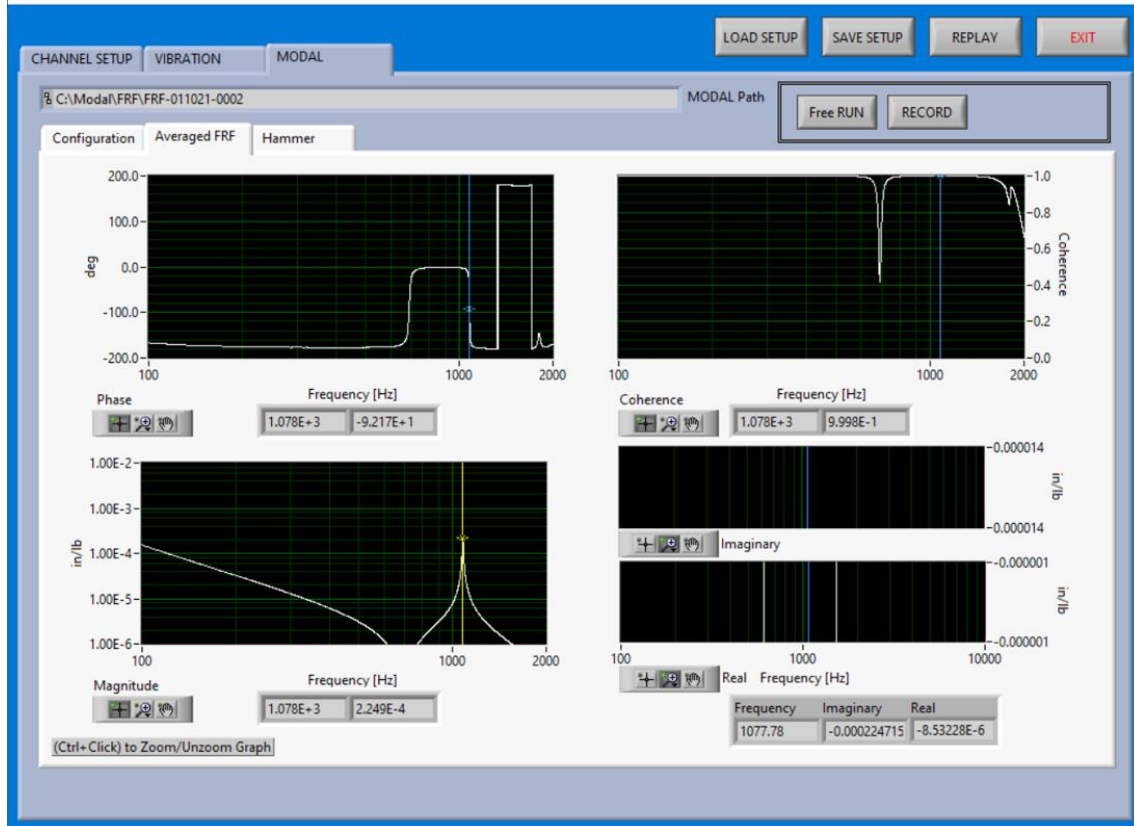
This can also be automated by enabling the “Auto Reject Over Voltage” option. Individual impacts are counted, and once averaging is complete, the user is prompted to store the measurement.



If UFF format is enabled, files can be stored with the necessary nodal information for direct import into a modal analysis package.

The frequency response signals can be reviewed on the [Averaged FRF] page which updates immediately following each impact. Magnitude, Phase, Coherence, and Real/Imaginary data is calculated for review. Each graph can be enlarged by pressing [Ctrl] and then clicking the desired plot (Ctrl+Click).

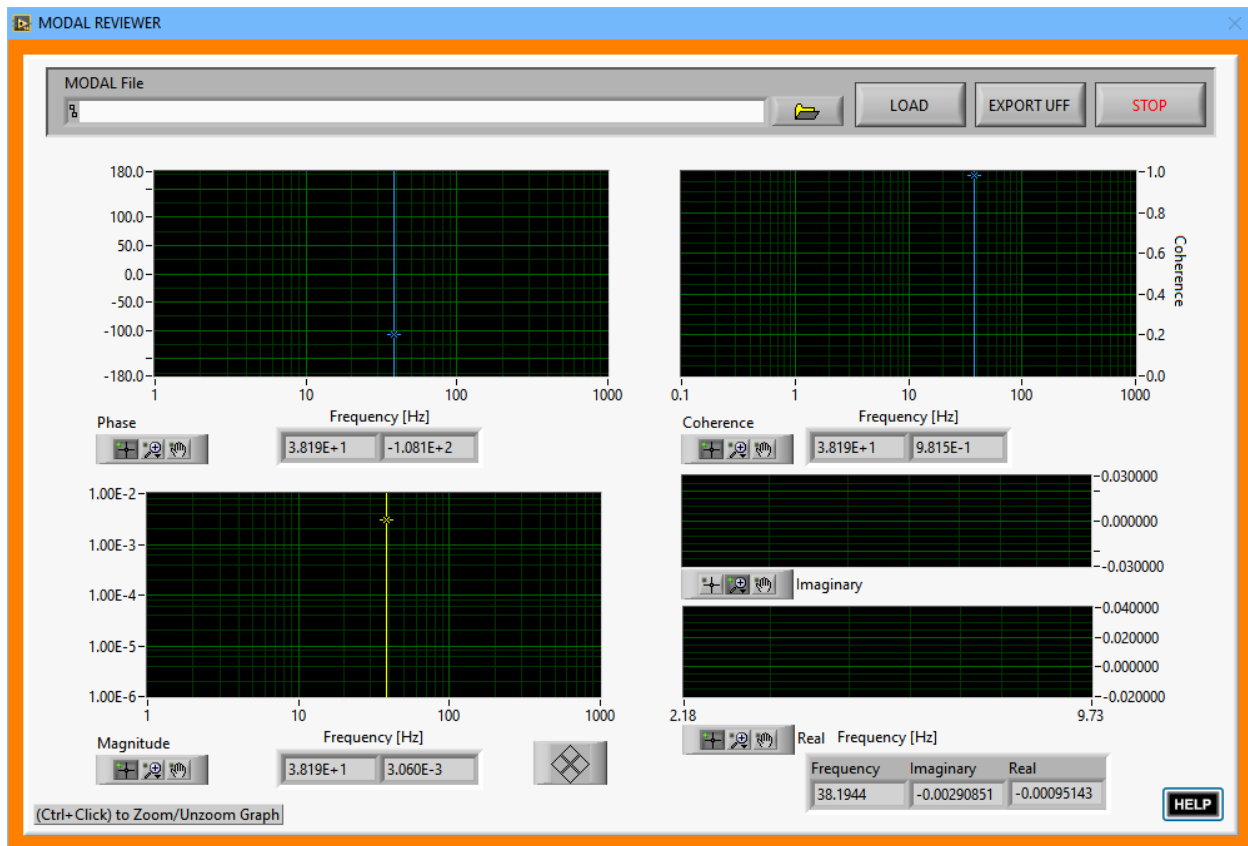
Cursor values are displayed, and a very handy “SNAP” feature is available on the zoomed graphs. Once zoomed, press [Ctrl+S] and the cursor will progress toward the maximum position in its vicinity. This helps to quickly find frequencies of interest.



7 REPLAY Modules

Pressing [REPLAY] will cause an associated REPLAY Module to display based upon which measurement tab is active when [REPLAY] is selected. The MODAL VIEWER will load if the MODAL window is active, or the DATA REPLAY module will load if either the VIBRATION or VOLTAGE tab is the active screen.

The MODAL REVIEWER can be used to [LOAD] individual tests and to [EXPORT UFF] files following review.



The DATA REPLAY module will load selected files from either the VIBRATION or VOLTAGE tabs and allow the user to step through each data record. If "Auto Scroll" is turned ON, the file will continue to load until the entire file has been replayed.

The DATA REPLAY module supports the same analysis capabilities as are available during collection. Data can also be exported for analysis with other software tools.

