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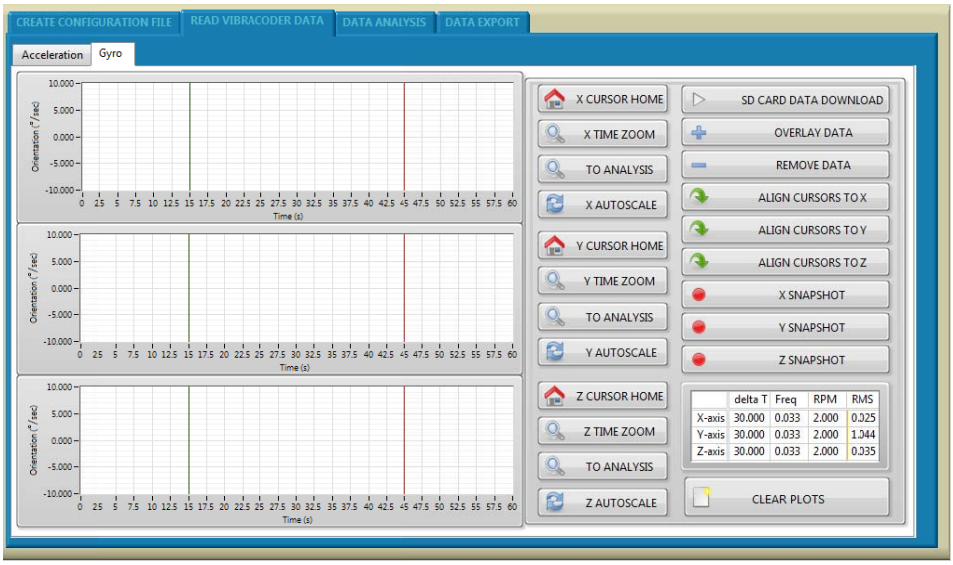
OG4401AX
Rev A, ECN 13442

OPERATING GUIDE – OG4401AX

4401AX VIBRATION RECORDER



Contents

Note: As part of our commitment to continuous product improvement, Dytran shall make modifications to this document without notice or restriction.

Dytran Instruments Model 4401AX is a vibration recorder with built-in 3-axis MEMS accelerometer and 3-axis Gyroscope capable of measuring and recording acceleration and orientation in three orthogonal directions and pitch, yaw, and roll. This data is written to a standard micro SD card.

I. Device Features

-System components:

4401AX Vibration Recorder
Approved SD card - Sandisk Extreme Plus 32GB - SDSQXVF-032G-GN6MA
9009 Software Toolkit (Can be downloaded from Dytran Vibration Recorder Product Page)

-4401AX is powered through a rechargeable li-po battery or external power from 8–32 V DC.

-Built-in firmware handles acceleration in three axes acceleration and gyroscope data storage on the SD card.

II. Software Toolkit Features

- Immediate data retrieval from the SD card to the PC
- Easy cursor operation for data selection, zoom, and cursor alignment
- Snap Shot with the press of a button
- Data overlay
- Anti-Alias Filtering
- Oversampling
- FFT analysis
- Data export
- Real Time Stamp

III. Acronyms used in this manual

GUI- Graphical User Interface
FFT- Fast Fourier Transform
JPG-Joint Photographic File format
ASCII-American Standard Code for Information Interchange
TDMS-Technical Data Management Solution (Binary and ASCII file saving option for smaller file sizes with stored header information)

IV. Minimum System Requirements

Desktop or a Laptop x86 based personal computer
Operating System: Windows Vista/Seven/Win8 32/64-bit
CPU: Intel i3 or better
RAM: 1 GB
Hard Disk space: 1 GB
Display Resolution 1280×780.

V. Installation

Insert the included Sandisk Extreme Plus 32GB into MicroSD Card Reader. Double click on the drive letter, navigate to *Autorun.exe*. Additionally, if this drive has already been formatted, the software can be downloaded from the Vibration Recorder Product Page on the Dytran Website.

Figure 1: Autorun Menu

There are two additional installations that are required prior to installing the 9009 software. Install Data Plug-ins by clicking the button on the *Autorun* menu. This will install plug-ins for data export.

To install the runtime software, click on *9009* to start the installation of the 9009 4401AX VibraCorder software. Make sure that no other applications are open and proceed.

1. When the installer initialization is completed, click on "*Next*". In the following window, the user can define the directories in which the *4401AX VibraCorder* software and the National Instrument libraries will be saved. Click on *"Browse"* to select a different folder if desired, and click on *"Next"* to proceed.

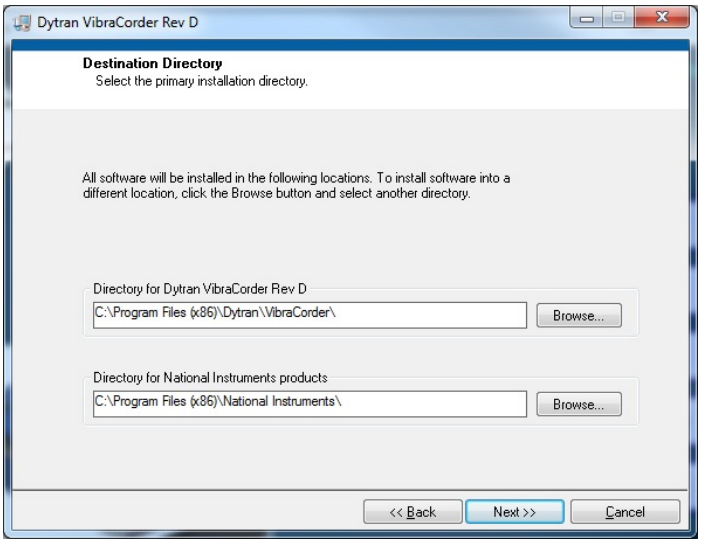


Figure 2: Install Destination Directory

2. In the next window, select *"I accept the license agreement..."* to accept *Dytran 4401AX VibraCorder* license conditions and then click on *"Next"*.
3. Select *"I accept the license agreement..."* to accept *National Instrument* license conditions and then click on *"Next"*.
4. At this point, select *"I accept 2 license agreement(s)..."* to accept *Microsoft Silverlight 5 EULA* and *Microsoft Silverlight Privacy Statement* conditions. Click on *"Next"* to proceed.
5. The *"Start Installation"* window will appear. It indicates whether a component will be upgraded or installed for the first time. Click on *"Next"* to start the installation. This process may take a few minutes. Please wait until the installation is complete.
6. When the installation is complete, click on *"Next"* to proceed.
7. If asked, reboot your PC by clicking on *"Restart"* in the following window.

Figure 3: Restart after Installation Completed.

VI. Operation

WARNING: Do not connector or disconnect the 25 pin external micro d-sub connector while the 4401 is powered. This may result in damage to the unit and/or loss of data.

1. After the computer is restarted, the user will find the "9009 *VibraCorder"* icon in the Windows menu, as shown in Figure below. A Shortcut will also be created on the Desktop for ease of access.

Figure 4: VibraCorder Icon.

2. Insert the SD card into your PC and launch the software.

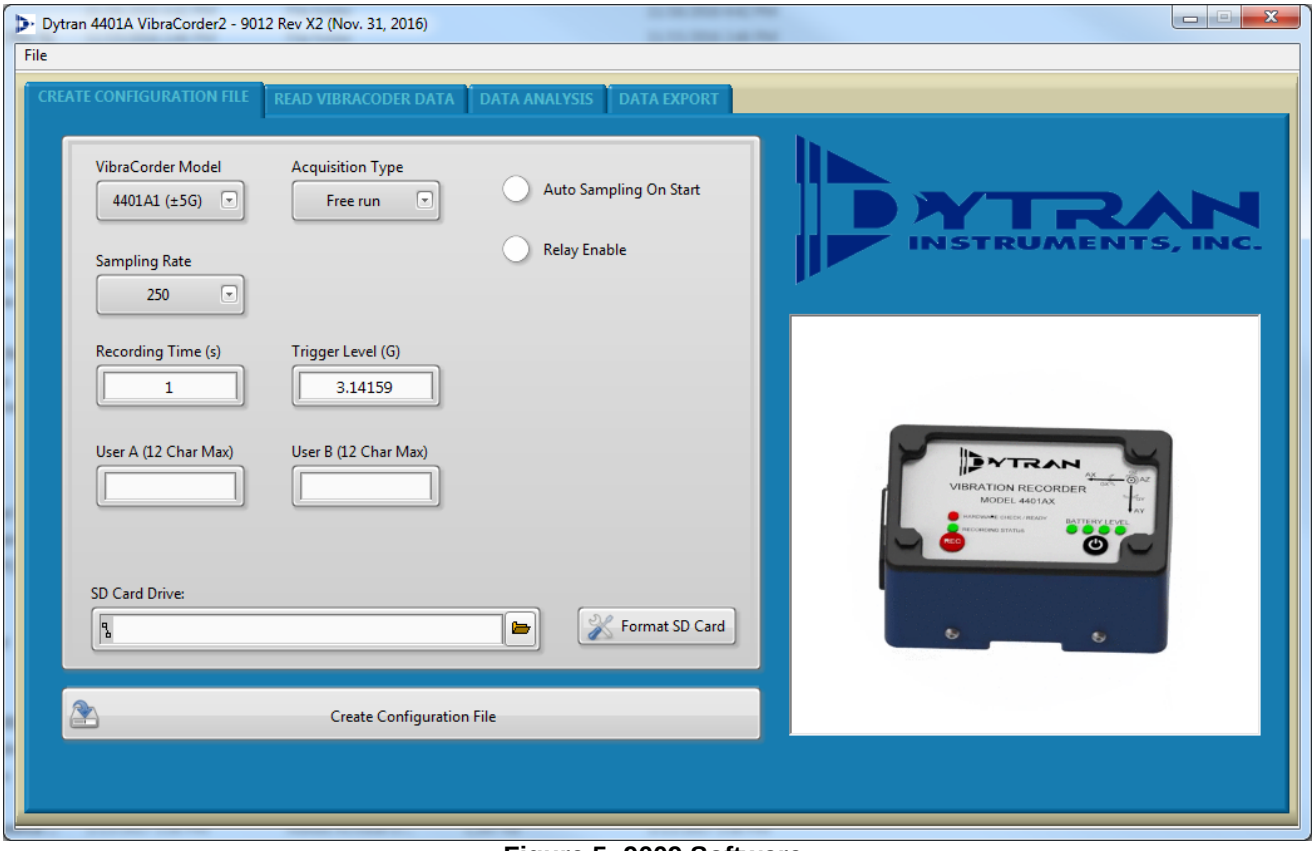


Figure 5: 9009 Software

3. Create configuration file – this tab allows the creation of the configuration file for the data acquisition.

3.1 It is recommended to format your SD card before every use. Use SD card drive navigation window to select the card and press “Format SD card” button.

3.2 Free run is determined by switch on hardware on. Default value of 40 pre-triggered samples is provided.

3.3 Three different sampling rates are available. The measurements bandwidth is effectively half of the selected sampling rate. These rates are 250, 1200, and 4280 Hz.

3.3 “Keep running after triggering” check box will allow for continuous recording once the triggered value is reached (Triggered acquisition has to be selected for this feature).

3.6 After the popup “Config.txt created” appear, press “Ok” button and safely eject the SD from the slot Insert the Micro SD card into the 4401AX Micro SD card slot and press the “Power” button. ***Ensure Vibracorder is powered off before inserting or removing Micro SD Card. If SD Card is removed during any operation, a format of the card in a PC may be required as the card file system can become corrupted.***

4. The firmware of the VibraCorder will verify the Micro SD card operation. The green “Ready Indicator” LED will remain illuminated if the system passes built in self tests and SD card is present. **Dytran Instruments, Inc. specifies using only the included Sandisk Extreme Plus 32GB - SDSQXVF-032G-GN6MA. Other cards may operate, but have not been tested and are not guaranteed to work with the system.**

4.1 After the accelerometer is verified operational, the firmware will check for the presence of the configuration file. Three beeps prior to startup sound will indicate the configuration file is not found.

HARDWARE CHECK/READY LED STATUS INDICATIONS	
Ready Indicator GREEN	Unlit : System Powered Off
	Lit : Passed Self-Test, Ready to Record
Recording Indicator RED	Unlit: System not Recording
	Lit : Recording In Progress
4 GREEN Battery Charge Indicators	Four Lit – 100%, 3 Lit – 75%, 2 Lit – 50%, 1 Lit 25% Battery Remaining

5. Press “Record” button to start recording.

5.1 The “Recording Indicator” LED is illuminated during recording.

5.2 Press “RECORD” button to stop recording. The “Recording Indicator” will become unlit.

6. Insert the SD card into PC and click on “READ VIBRACORDER DATA” tab.

6.1 Press “SD CARD DATA DOWNLOAD” button and navigate to the data file using explorer window. Double click on the file and the software will request whether to display in standard or metric units.

6.2 Each axis has its set of data manipulation buttons: “CURSOR HOME”, “TIME ZOOM”, “TO ANALYSIS”, and “AUTOSCALE”. User can utilize those buttons for data examination and event selection.

6.3 Additional data files can be overlaid using “OVERLAY DATA” button. Once pressed, it will prompt the user to select additional data files. If one data file is greater than another, the missing data will be padded with 0s. “REMOVE DATA” button will remove the latest added data.

6.4 If one particular event is selected using cursors on any axis, the other two axis data for the same time interval can be selected by the user using “ALIGN CURSOR TO X POSITION”, “ALIGN CURSOR TO Y POSITION”, or “ALIGN CURSOR TO Z POSITION”.

6.5 Data snapshot can be taken in JPEG format for any axis using “SNAPSHOT” buttons.

6.6 Data table shows the immediate cursor information for each axis: delta T, Frequency (Calculated based on cursor positions when they are located on one period), RPM (Calculated based on cursor positions when they are located on one period), and RMS value of the signal between cursors. See *Figure 6* for example:

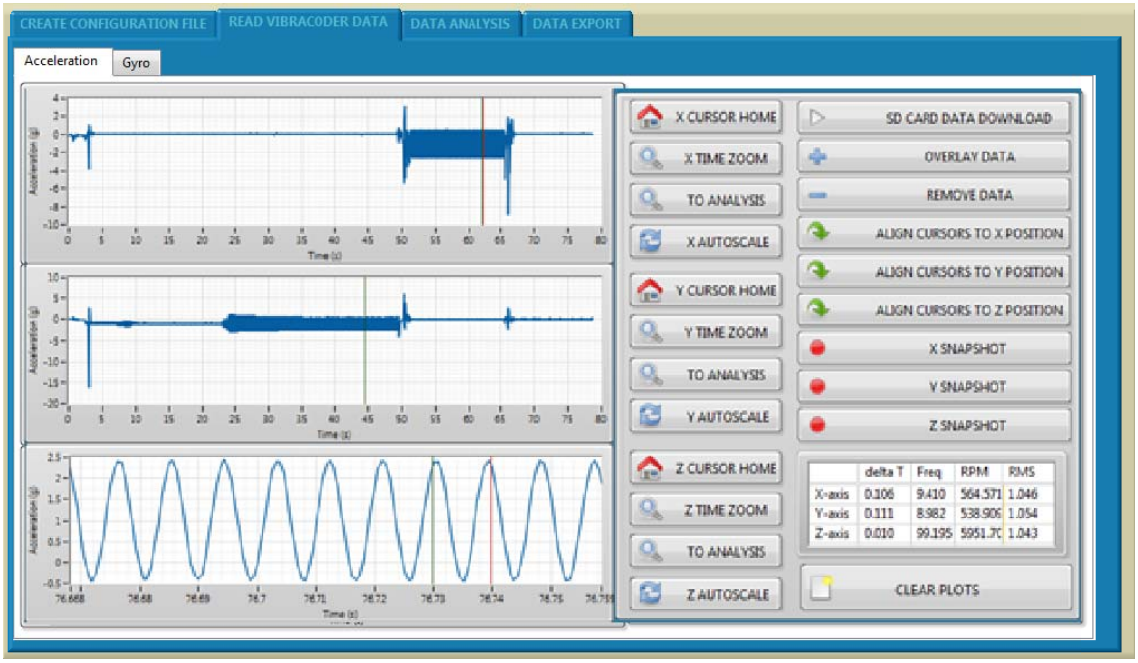


Figure 6: Axis Z data of 100Hz sinusoidal vibration at 1 g RMS.

6.7 “CLEAR PLOTS” button will clear all the data from the plots.

7. By pressing “TO ANALYSIS” button from any axis, the currently selected data between the cursors will be exported to the “DATA ANALYSIS” tab with corresponding data from other two axes.

7.1 The software will prompt the user to either append data set or create a new one. This feature allows comparison of two or more separate data sets. When selected Append, the traces shall be

overlaid. When selected new, all the previously displayed data shall be erased and substituted with newly imported data set.

7.2 "RELOAD SELECTED DATA" button shall reload the original set of data into the analysis window.

7.3 "LOW PASS FILTER" and "HIGH PASS FILTER" buttons shall apply specified filter to the data, user shall be prompted for corner frequency and filter order. Butterworth topology is used.

7.4 "SINGLE INTEGRATION" and "DOUBLE INTEGRATION" buttons will apply either single or double numerical integration. The software shall automatically apply a high pass filter before performing integration (to avoid any data run off). User shall be prompted for corner frequency of the filter.

7.5 "OVERSAMPLING" button shall perform non-linear interpolation on the data set, calculating additional data point in between the existing one. The user will be prompted for the oversampling frequency:

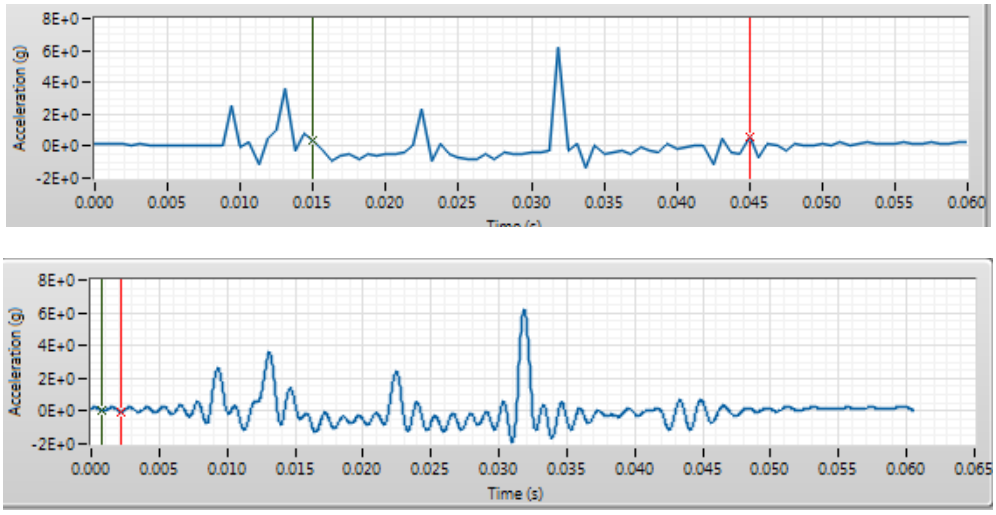


Figure 7: Same data set before and after oversampling with 32,000Hz frequency

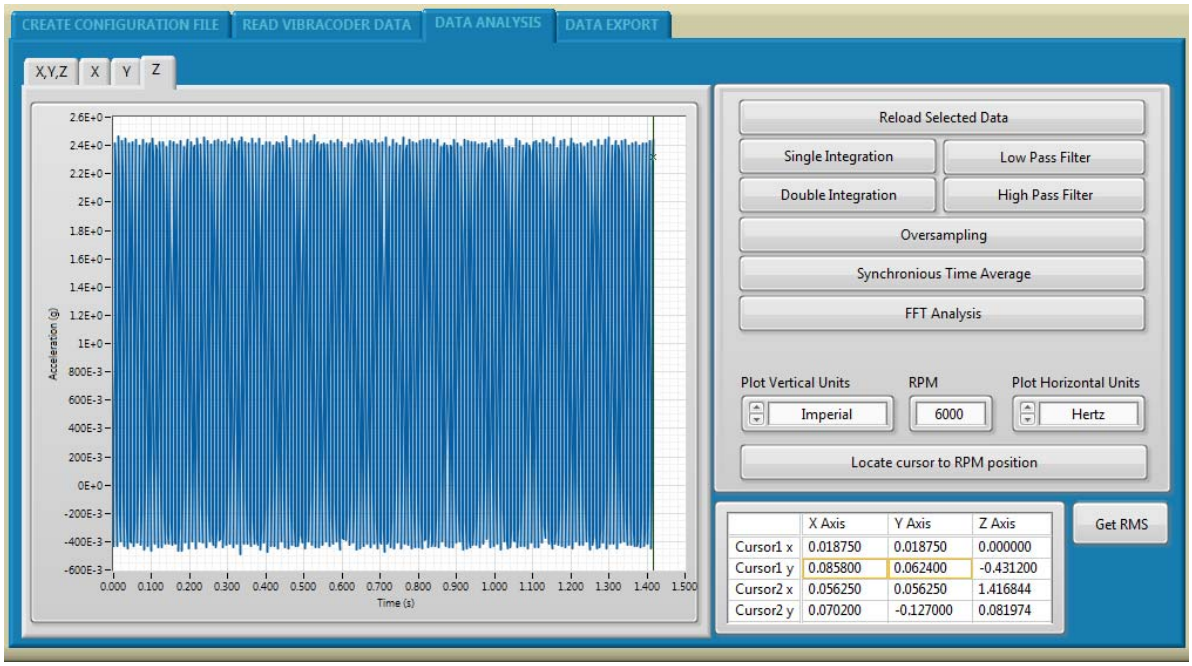


Figure 8a - TSA analysis results

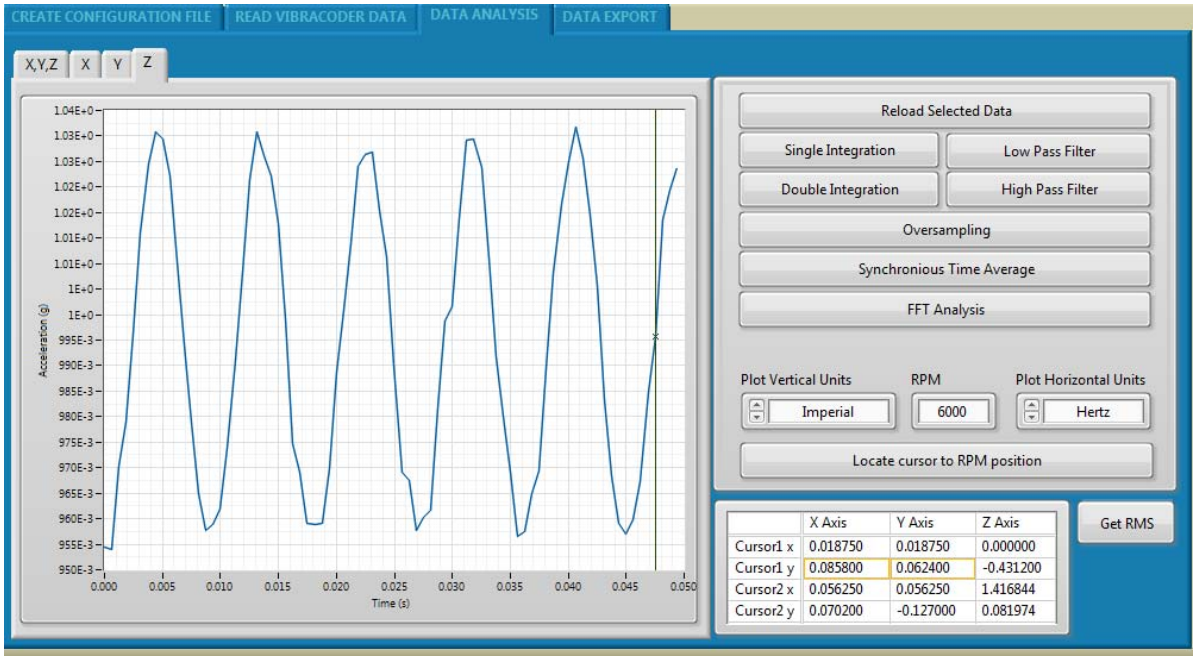


Figure 8b: TSA analysis results for 5 periods

7.6 "FFT ANALYSIS" button will perform Fast Fourier transform.

7.7 "PLOT VERTICAL UNIT" selector allows selection of acceleration units between English and Metric.

7.8 “RPM” control requires user input for TSA calculations and cursor location.

7.9 “PLOT HORIZONTAL UNITS” allows the change between Hertz, Orders, and RPM for FFT graph.

7.10 “GET RMS” button shall show the RMS signal value for each axis.

8. “DATA EXPORT” tab allows the export of the data to conventional file formats: *.csv*, *.mat*, *.tdms*, *.uff*, and *.sqlite*

8.1 User shall define the location of the file on the PC using the explorer.

8.2 If “EXPORT ALL RAW DATA” is checked, the software will export all the raw data from the measurements file. If the “EXPORT ALL RAW DATA” is not checked, the software will export only the content of the analysis screen.

Note: If running from external power through the 25 pin micro D-sub external connector, the Vibracorder should be powered on and off via an external power supply. Please ensure that external power is off when performing any connection or disconnection to D-sub connector. Turning the Vibracorder on with tactile buttons (battery powered operation) will not allow remote power cycling of the Vibracorder.

VII. Mechanical configuration and mounting

1. Refer to 127-4401A2 outline drawing for physical dimensions of the device.

2. Model 4401AX must be mounted using the supplied removable mounting plate and screws.

Select a desired hole pattern as outlined on 127-4401A2 drawing (2.00” x 2.00”, 2.00”x 1.00” or 1.00”x1.00”), drill and tap four 10-32 holes x 0.35” minimum depth. Mount the plate to the test surface using the supplied four 10-32 low profile head screws as shown in Figure 9. Torque screws to 28 lb-in.

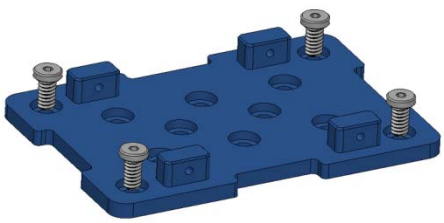


Figure 9

Mount model 4401AX onto mounting plate as shown in Figure 10. Secure the unit to the mounting plate from both sides using the four 4-40 button cap screws supplied. Torque screws to 8 lb-in.

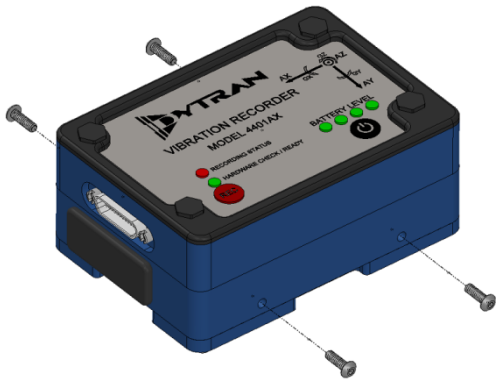


Figure 10

VIII. Data recording considerations

The Vibracorder is powered by a non-replaceable lithium ion battery. The minimum continuous recording time is defined as 24 hours. During freerun, the recording will be automatically broken down to 4gb files. That means if the recorder is left in free run, it will record the into VR-00001.BIN, then it will close VR-00001.BIN, open new file VR-00002.BIN and continue the recording. It will perform that operation until battery runs out.

IX. Software License, Restrictions, and Disclaimer

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