



Dynamic Transducers and Systems
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OG5340
REV A, 07/13/12, ECN 8482
Rev B, 10/18/12, ECN 8972

Operating Guide

5340 USB Vibration Measurement System



Featuring the

7543 USB Accelerometer

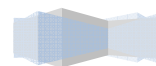
and

VibraScout™ Software Application

VibraScout™ Post Processor Software

Contents

1	Device Features	3
2	VibraScout™ Software Features	3
3	Acronyms used in this manual	4
4	Recommended Minimum System Requirements (for operation at maximum 1600 Hz BW)	4
5	Basic System Requirements	4
6	Installation	4
7	Starting the VibraScout™ application	6
8	GUI layout & Description of Software Features	7
9	Custom Applications	14
10	VibraScout™ Post Processor Software Features	14
11	Minimum System Requirements	15
12	Installation	15
13	Starting the VibraScout™PP application	17
14	Software Operation	17
15	Software License, Restrictions, and Disclaimer	21



The Dytran 7543A USB Digital Tri-axial Accelerometer combines a 3-Axis MEMS accelerometer with a microcontroller to create an intelligent sensor.

1 Device Features

-System components:

- USB 7543 Accelerometer
- 6330A 4-pin to USB cable
- VibraScout™ Software and VibraScout™PP on CD

-The 7543A is powered by a PC's USB bus.

-Temperature sensor.

-Real-time acquisition and USB transfer of acceleration (including Static Inclination) and temperature data.

-Built-in firmware handles USB communication and provides a number of unique features including:

- Storage of device serial number

- Storage of accelerometer and temperature calibration data

- Additional storage available for customer information - e.g. last calibration date, etc.

2 VibraScout™ Software Features

-Real-time scrolling plots of acceleration data with display of min, max, mean

-Plot features: zoom & pan, display of individual sample values, save to image file, printing

-Real-time display of X and Y axis inclination angles and temperature

-Real-time logging of data to delimited file for importing into spreadsheet

-Both auto and smart triggering modes

-

-Fast Fourier Transform Plots of all orthogonal channels.

- API available as .NET dll

3 Acronyms used in this manual

GUI- Graphical User Interface

USB- Universal Serial Bus

FFT- Fast Fourier Transform

PSD-Power Spectral Density

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)

UFF58- Universal File Format 58 (purely binary file format for data recording)

4 Recommended Minimum System Requirements (for operation at maximum 1600 Hz BW)

CPU: i7 870 2.93GHz or faster

RAM: 8GB

OS: Windows 7 64 bit

5 Basic System Requirements

Free Hard Disk Space: 2 MB (not including .NET Framework 4)

OS: Windows XP or Windows 7

One available USB 2.0 port

6 Installation

Insert CD into an empty CD/DVD drive. From My computer double click on CD/DVD drive. Navigate to VibraScout Acquisition Folder. Double click VibraScoutSetup.exe to run the setup file. Follow the on-screen instructions shown below to install the VibraScout application.



If necessary the .NET 4 Framework will be installed (internet connection is required).

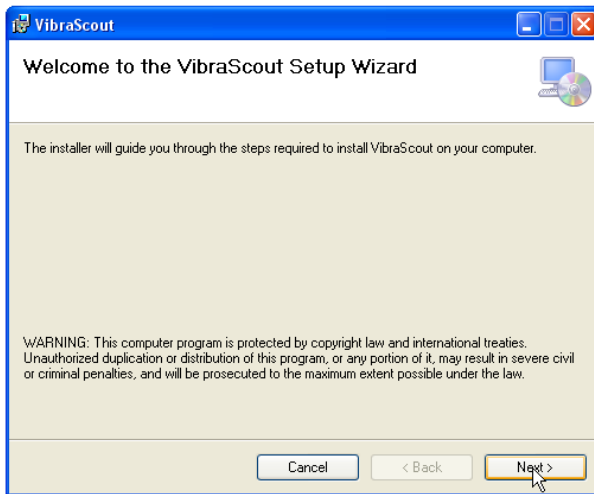


Figure 1: Step 1

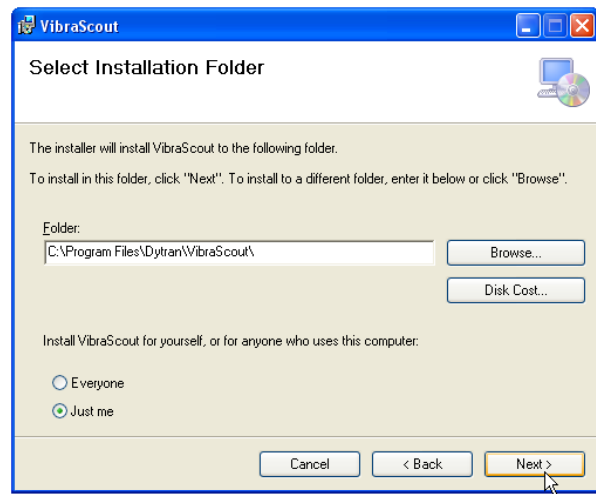


Figure 2: Step 2

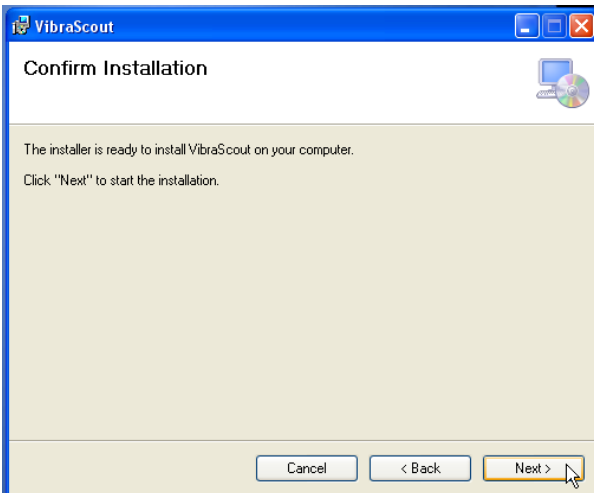


Figure 3: Step 3

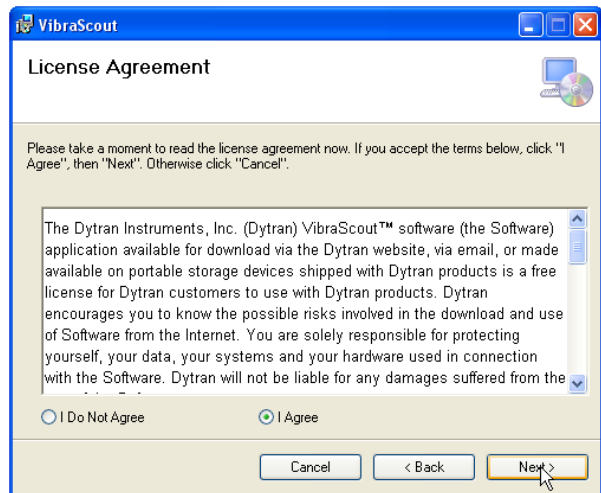


Figure 4: Step 4

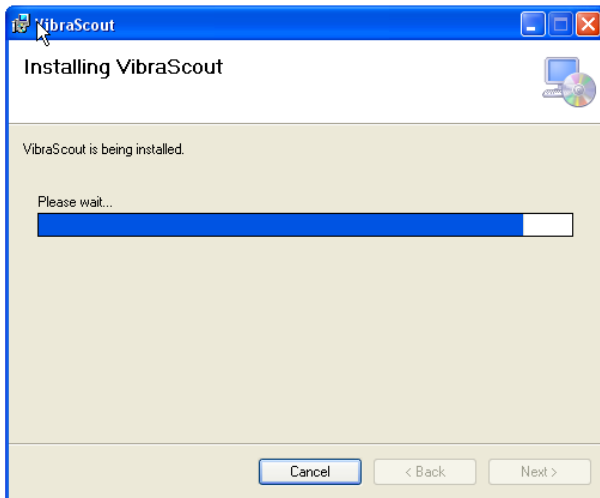


Figure 5: Step 5

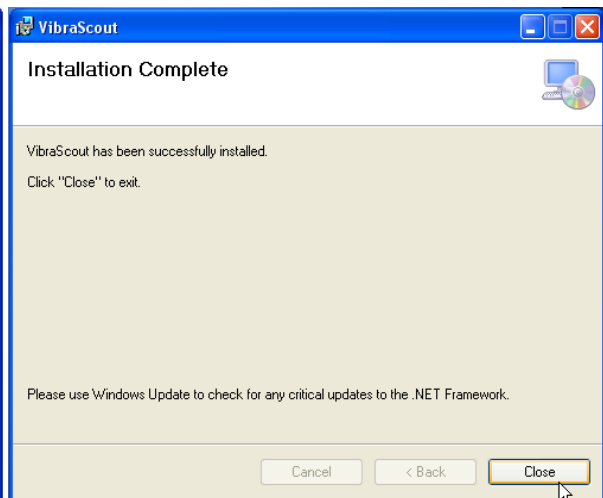


Figure 6: Step 6

7 Starting the VibraScout™ application

The 7543A Accelerometer must be connected to a USB port prior to starting the VibraScout™ application or the application will not function. After connecting the 7543A to a USB port, the device enumerates as an external storage device with 5 KB of available file storage. The drive space can store up to three VibraScout™ parameter files or other customer files. The on-screen enumeration window is the first indication that the USB communication between the 7543A and the host PC is functioning properly. The enumeration window may be closed prior to running the VibraScout™ application.

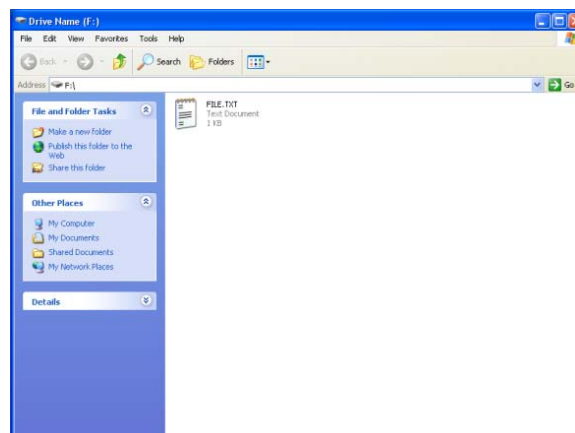


Figure 7: Enumeration window.

Run VibraScout™ (All Programs -> Dytran -> VibraScout™). After detecting the 7543A, the software will perform a self-test to verify that the device is functioning properly and then display the VibraScout™ application.

8 GUI layout & Description of Software Features

1. Configuration Screen

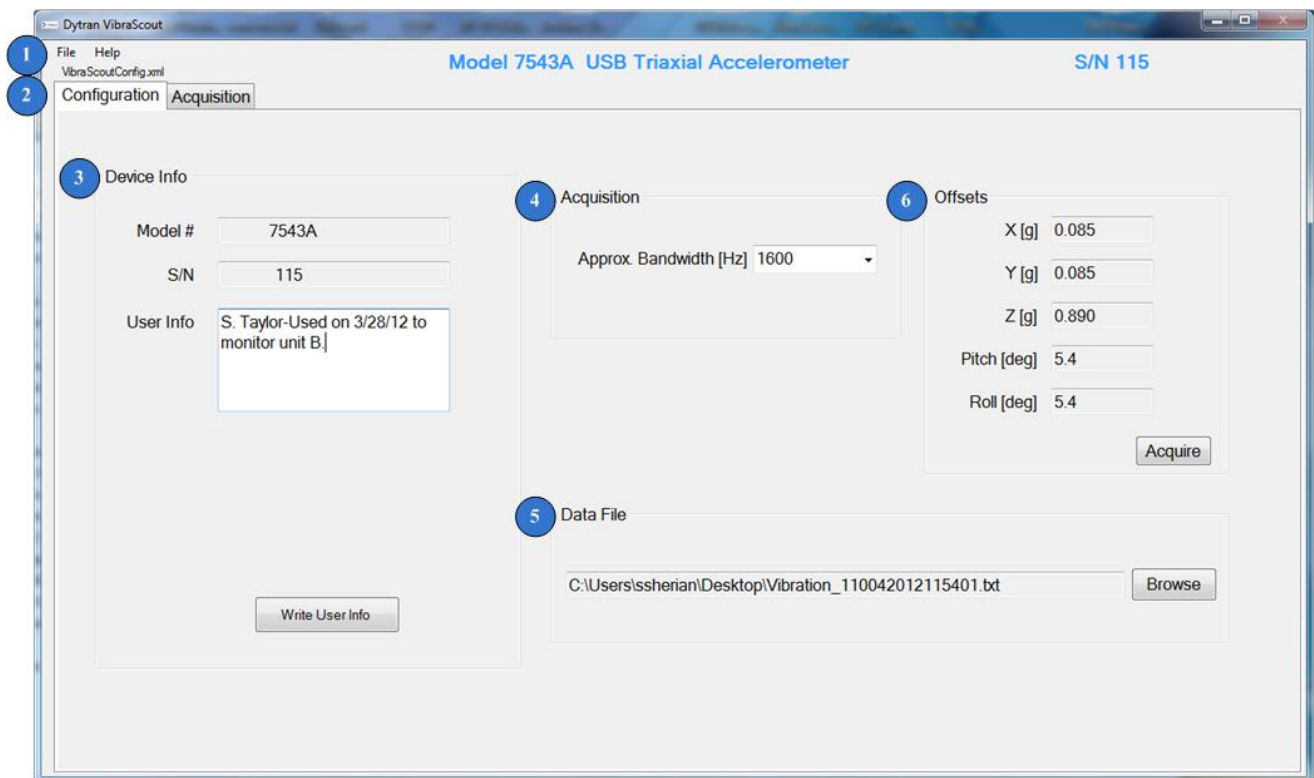


Figure 8: Configuration Window

2. File Menu

All GUI fields (bandwidth selection, FFT plot selections, etc) are stored in a configuration file. Fields are read from the default file VibraScoutConfig.xml when VibraScout™ is launched. The file is updated by selecting [Save GUI Settings](#) from the File menu. Fields may also be saved to other filenames using [Save GUI Settings As](#) and then read back using [Load GUI Settings](#). This feature is useful for saving/loading location-specific parameters. The name of the current file is displayed below the menu bar.

Current plot data can be exported to a selected tab-delimited file for convenient importing in a spreadsheet or other application such as the VibraScout Post Processor. This feature provides an alternative to the data log file by allowing the user to export data after acquisition.

3. **Device Info**

Model # and Serial # are stored in the device EEPROM and read when the VibraScout™ application is launched. Device memory is also available to store user information. Enter up to 180 characters in the [User Info](#) field and click on [Save User Info](#) to store the information in non-volatile memory. When VibraScout™ is launched, the information will be read from the device and appear in the [User Info](#) field.

4. **Approximate Bandwidth**

Select the desired bandwidth based on the application requirements. The noise level increases with bandwidth, so selecting a lower bandwidth will provide improved signal/noise at the expense of frequency response. The 7543A sample rate is equal to approximately twice the selected bandwidth. In cases where data overflows occur due to inadequate system resources (CPU speed, RAM), selecting a lower bandwidth will usually eliminate the overflows. See the section on the [Data Integrity](#) indicator for more information.

5. **Data File Settings**

The [Data File path](#) is selected with the Browse button. Data are saved as tab-delimited text for easy importing into a spreadsheet or other application when the [Log To File](#) box is checked in the Acquisition screen. Software automatically appends date and time code to the end of the file name for easier identification of test sequence. Data file is closed and this field is cleared every time acquisition is stopped. Selecting the [Log To File](#) box will prompt user for creating a new data file.

6. **Offsets**

The 7543A is calibrated at the Dytran factory along each orthogonal axis using precision fixtures and earth's gravity. When the 7543A is placed at any random position, the Offsets [Acquire](#) button allows the values for the three acceleration axes pitch and roll to be captured and set to zero. Therefore, relative measurements may now be made from that position.

The *Relative* mode must be selected on the Acquisition screen so offsets will be subtracted from the respective data during acquisition.

To reset the 7543A to factory defaults, simply select the *Abs* radio button in the Acquisition screen.

7. Acquisition Screen

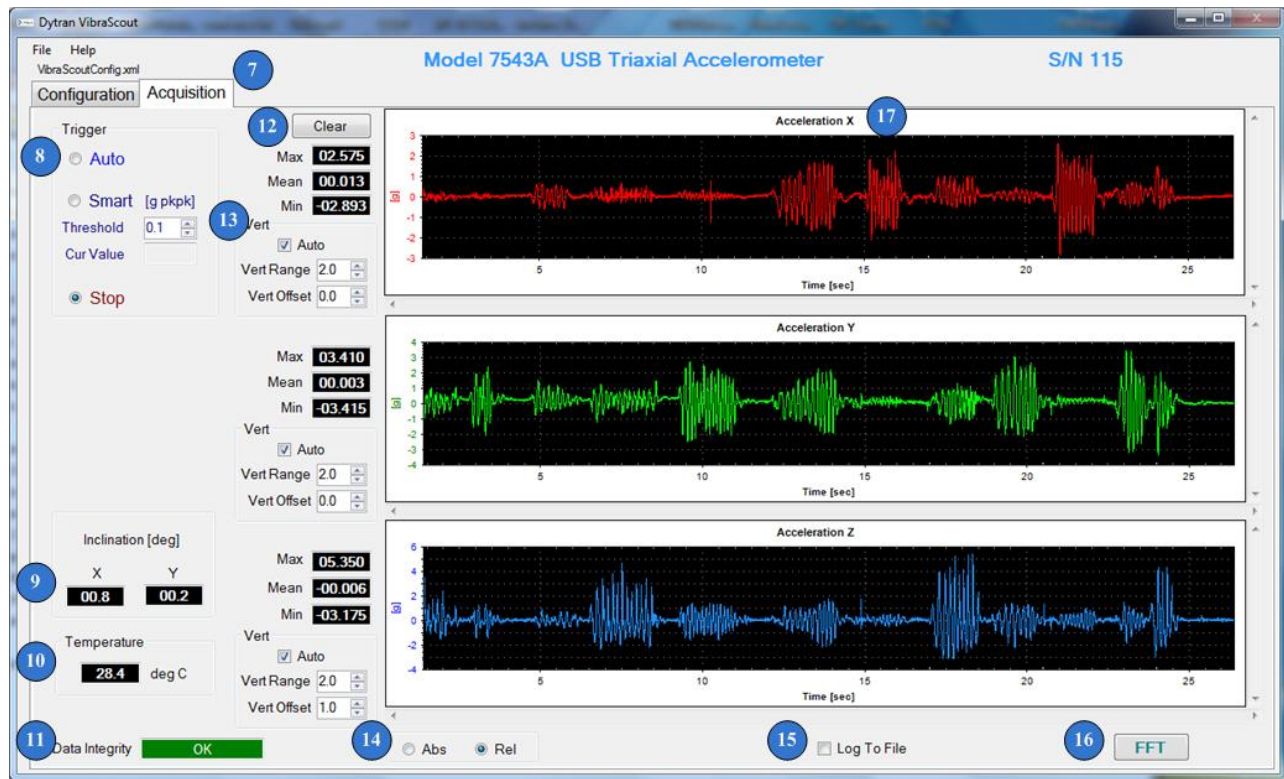


Figure 9: Acquisition Window

8. Trigger Modes

Acquisition is started by enabling one of the two trigger modes. **Auto** Trigger mode is amplitude independent so that triggering begins immediately and runs continuously when enabled. i.e. similar to an oscilloscope auto triggered scroll mode.

Smart Trigger mode starts data acquisition when the first change in value on any of the three acceleration axes exceeds the specified threshold in Units of Gpk-pk. Acquisition is to be stopped by user. Data are monitored continuously and the maximum change in value (maximum of the three axes) is displayed in the **Cur Value** field.

9. Inclination[deg] Display

Static inclination values in both X and Y axis, are updated continuously when the **Auto** or **Smart Trigger** is enabled. These fields are only valid in static angle measurement mode.

10. Temperature Display

The temperature is measured and updated continuously when the Auto or Smart Trigger is enabled.

11. Data Integrity Indicator

The *Data Integrity* box indicates one of three conditions: **OK**, **Overflow**, or **Checksum Failure**. An overflow condition occurs when system resources are inadequate to sustain data processing at the selected bandwidth. This might be due to CPU speed, insufficient free memory or cpu/memory - intensive processes running concurrently with the VibraScout™ application. An overflow indicates a loss of some data samples. The condition can usually be eliminated by selecting a lower bandwidth. A Checksum Failure indicates a fault in USB communication. If this occurs, check the cable connection between the 7543A and the PC.

12. Clear Button

The Clear button clears the plots and the min, max, mean values. Plots are automatically cleared at the start of every acquisition.

13. Plot Vertical Axis Scaling

Range and Offset values for each axis can be specified or Auto-scaling can be selected to adjust the scale when an acceleration value exceeds the current range.

14. Absolute and Relative Mode

In *Absolute mode (Abs)*, acceleration data are shown relative to the earth's gravitational field using the factory calibration. In *Relative mode (Rel)*, the acceleration offsets are subtracted from the data using user selected *Offset* values acquired in the Configuration screen. See #6 Offsets in the Configuration section.

15. Log to File

Data File logging is enabled/disabled by the checkbox. The name of the data file and related parameters are first specified in the Configuration screen. If no data file is specified in the Configuration screen and this check button is selected, a data file prompt menu will pop up requesting a new data file to be created.

16. FFT

The frequency spectrums of the three acceleration axes are calculated and displayed by clicking the FFT button. The FFT is performed on all plot data. FFT plots can be displayed in Linear or Log format and the displayed frequency range is selectable. The maximum selectable frequency is equal to 1/2 the sample rate.

FFT data can be exported to a delimited file by clicking the Export button on the FFT form.

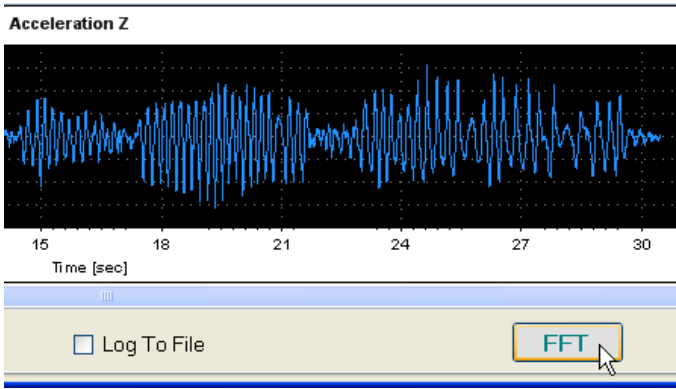


Figure 10: FFT

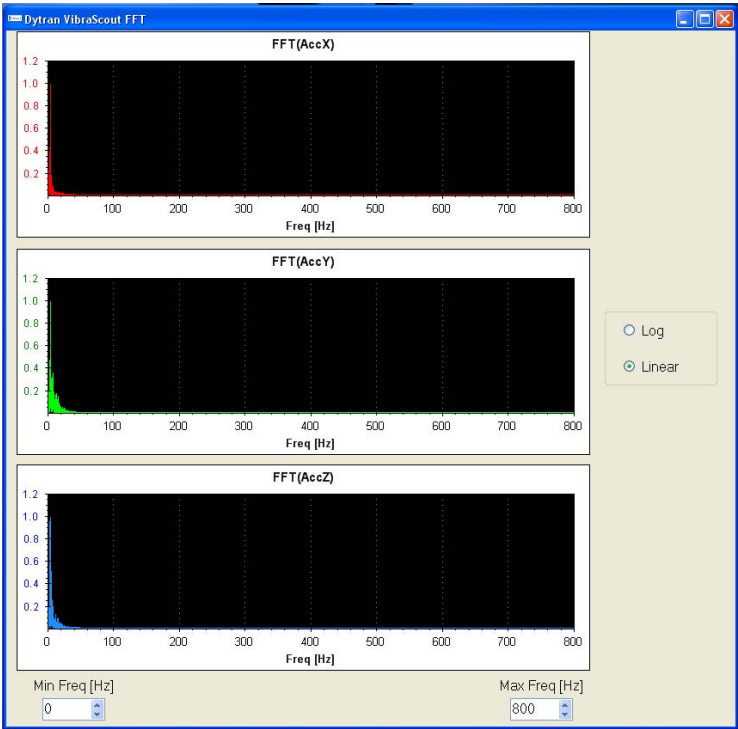


Figure 11: FFT Linear format

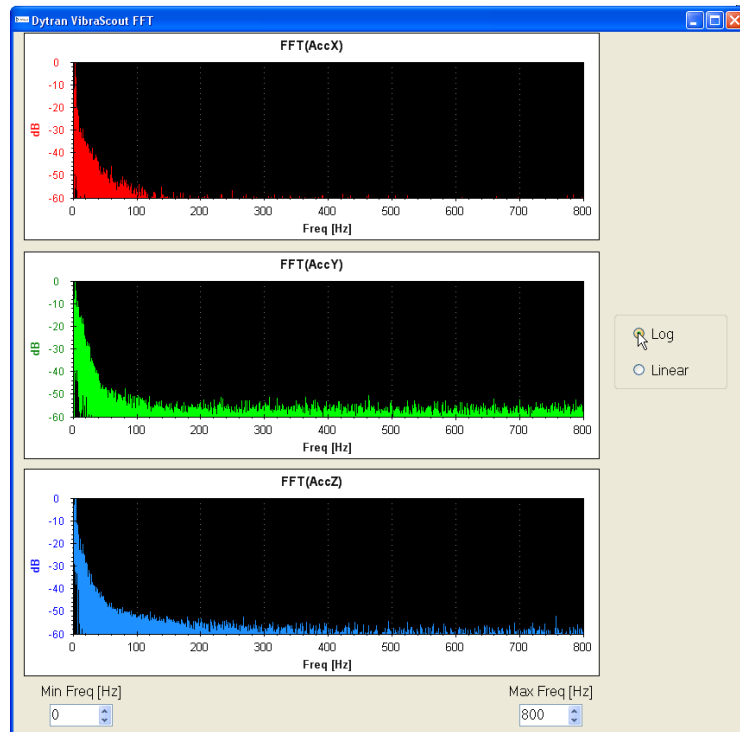


Figure 12: FFT Log format

17. Plot Features

Press the Stop button to halt chart scrolling. Left-clicking, dragging, and releasing the cursor will zoom the plots in a desired location. Vertical and horizontal scroll bars are displayed when data exceed the vertical and horizontal ranges respectively.

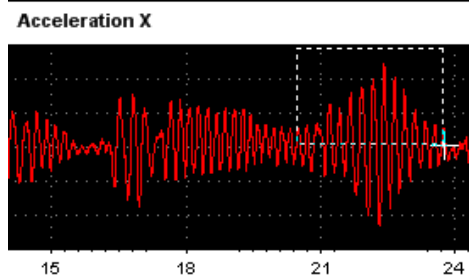


Figure 13: Select area on plot

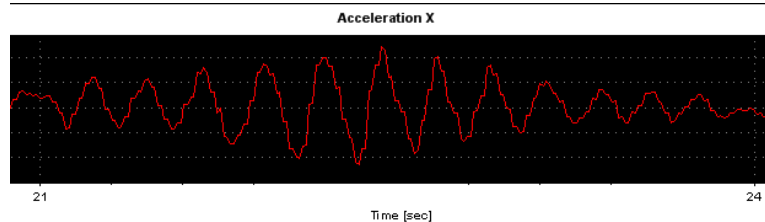


Figure 14: Zoomed plot

Right-clicking on plots (both time-domain and FFT) will display a context menu with available features - zooming, saving, printing, etc. as shown on the menu below.

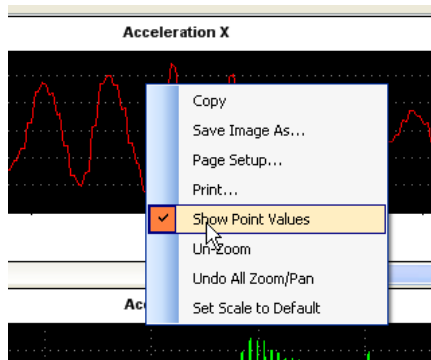


Figure 15: Point Value Display Select

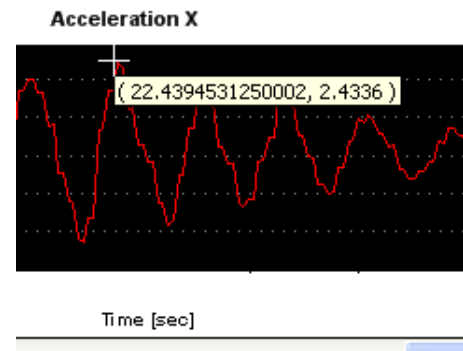


Figure 16: Point Value Displayed

9 Custom Applications

An API is available for customers who would like to build custom applications for the 7543A. The API provides support for any .NET-compatible client application - e.g. LabView, C#, etc. Please contact Dytran at sales@dytran.com or **818-700-7818**.

Custom application development is also available.

Please contact Dytran at dchange@dytran.com or **818-700-7818** for more information.

10 VibraScout™ Post Processor Software Features

VibraScout™ Post Processor software is designed to provide a user with the tools to apply non-linear interpolation to resample raw data that are recorded with VibraScout™ software at higher frequencies to improve signal resolution. Data is valid only up to 1.5KHz after applying the post processing. This mathematical interpolation is performed using the Whittaker-Shannon interpolation technique to reproduce the recorded real signals with the proper amplitude.

Software features include:

- Plot recorded data from the VibraScout™ software
- Zoom and select a specific timeframe of recorded data for post processing

- Reproduce interpolated oversampled data to provide better resolution of vibration signals
- Multiple file types to export to including: ASCII, time history.JPG files, TDMS binary files of time history data readable in Microsoft Excel, PSD and FFT plots in Joint Photographic file format.
- Display of recorded average temperature

11 Minimum System Requirements

Personal Computer running Windows XP/Vista/7 x86 or Windows XP/Vista/7 x64 with at least 2GB RAM or higher. 163MB of free hard disk space is required.

12 Installation

Please contact Dytran Instruments, Inc. at (818) 700-7818 for latest software revision. Check software revision while installing on welcome screen as in **Figure 18**.

To Install from CD:

Insert CD into an empty CD/DVD ROM drive. Navigate to **My Computer>CD/DVD ROM Drive>VibraScout PP** folder and double click on **setup.exe**. This will start the installer. Follow the step by step prompts to completely install the Post Processor software.

Leave all file paths in their default directories.

Note: Please make sure all windows applications are saved and closed before starting installation as system will ask to restart for the first time of installation.

After installation is completed, Installer will create a shortcut on the Desktop and in the Start Menu programs under Dytran>VibraScoutPP folder.

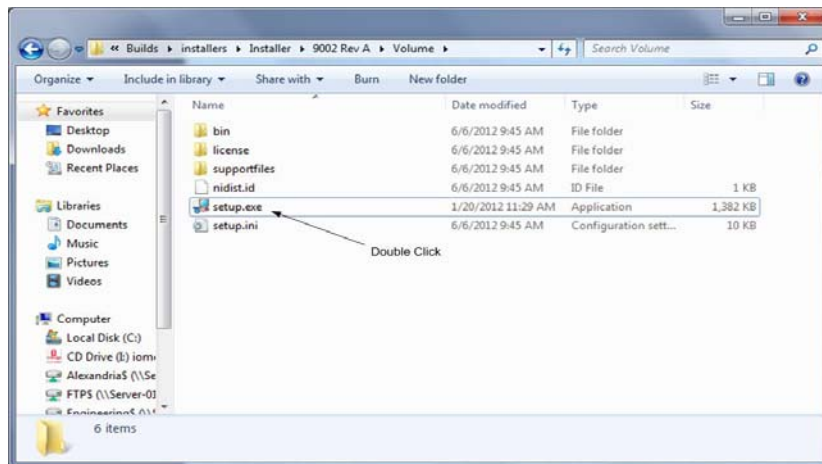


Figure 17: Installation File

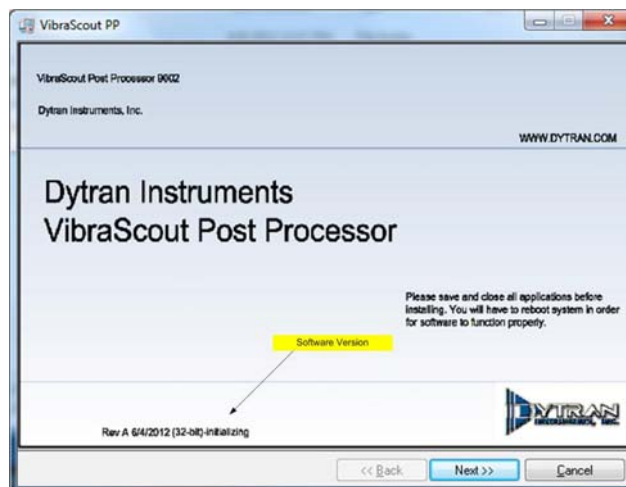


Figure 18: Welcome Screen and Software Version

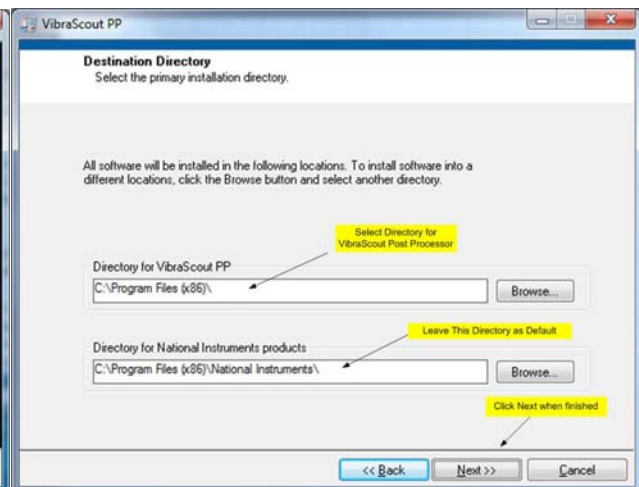


Figure 19: Installation Directories

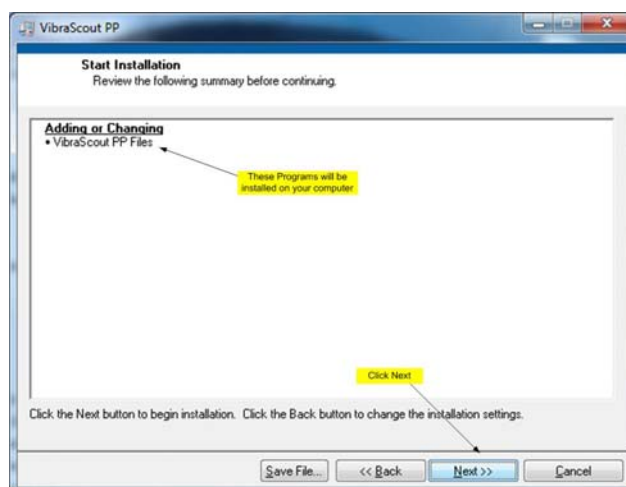


Figure 20: Products to be installed

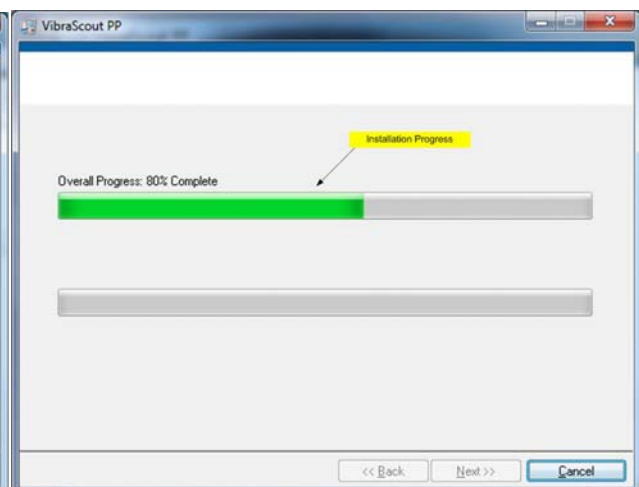


Figure 21: Installation Progress

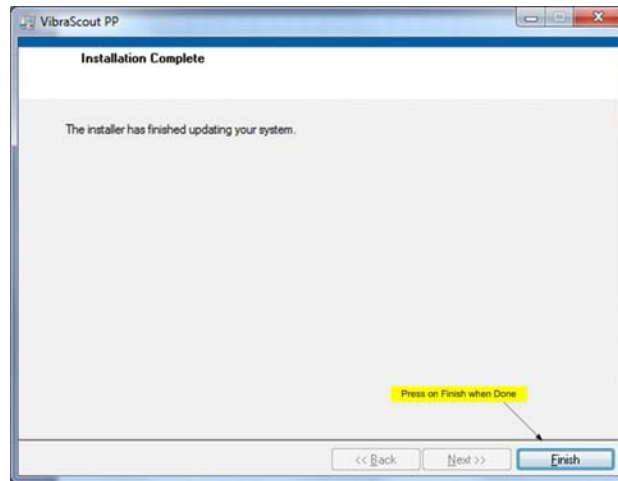


Figure 22: Installation Completed

13 Starting the VibraScout™ PP application

After System reboot, from the Desktop, double click the VibraScout™ PP icon.



14 Software Operation

I. Software Revision

Press F1 key on the keyboard or navigate to Help>About to display the current version and date of the Software. See Figure 23 for location on window. Press anywhere on the window to hide it.

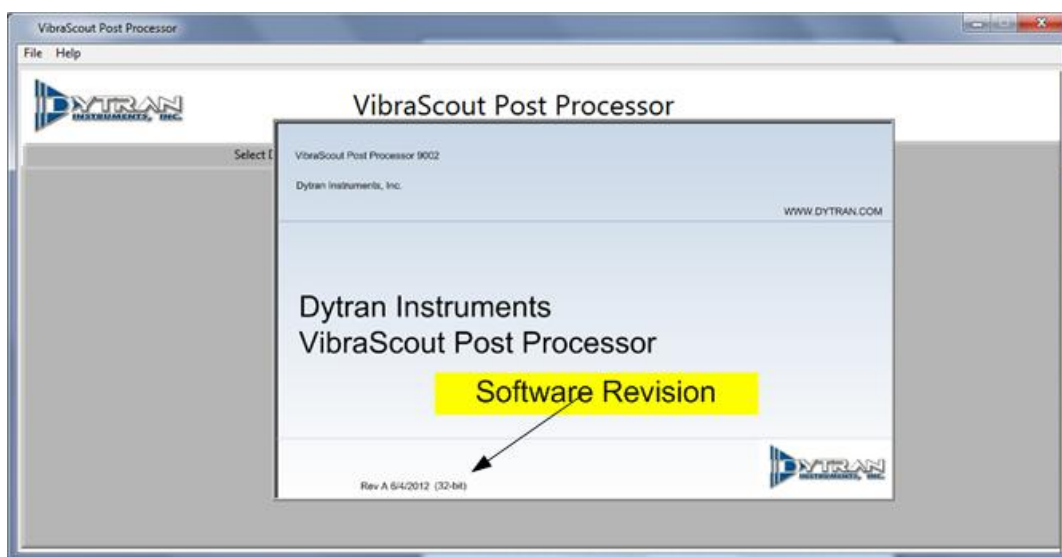


Figure 23: Software Revision

II. Select Data Tab

1. Select File- to select the data file recorded using the VibraScout™ software. A prompt window will pop up asking for data file to be selected. Navigate to folder where file exists and double click on data file.

Note: all exported files will be saved to the same directory as the original data file directory.

2. Model Number- Once file is opened, Model number of the transducer will be displayed in this field.
3. Serial Number- Serial number of the transducer will be displayed in this field.
4. Temp[deg@]- Average temperature recorded during test will be displayed in this field.
5. Continue- Click on Continue to proceed.
6. Channel- Select the channel in Axis with the vibration in the specified data file. This will allow user to zoom in on specific window of the vibration time history.
7. Zoom- allows user to zoom and select a specific window of the recorded data as opposed to processing the full time history. This feature works with the cursors in #9. You have to set the cursors at the desired window and then press Zoom.
8. Reset- If the zoomed window is NOT the desired window in #9, then press reset to display all data read from the data file again. This will allow user to display zoomed plots multiple times until desired window is selected.
9. Plot- Set the cursors to the desired window to be processed. This in combination with the zoom button will define the window to be post processed. Setting the cursors alone will NOT define the window. Zoom has to be pressed to select the desired window.
10. Continue- Once desired window is selected Pressing continue will allow to proceed to the next steps.

Note: If Continue is pressed without Zoom, all data recorded in data file will be processed. This will take longer to process depending on original file size and desired output files.

III. Set Sampling Parameters Tab

11. Type in Operator name and Test Description to be exported on Selected Output Plots.
12. Select Output Format- Select the desired output file formats by checking the box next to them. The software outputs the following formats
 - a. ASCII- is a comma separated text file saved in .csv and can be imported to Excel. This file can get very large based on the window selected.
 - b. TDMS Binary- is a combination of binary and text file format. This file format is more convenient as it can be opened in Excel by double clicking the file. It will separate the header information and the re-sampled raw data in 2 different sheets in excel.
 - c. JPEG- will export time history plots of all channels in *.jpg file format.
 - d. UFF58- is the universal file format in binary. This file format allows for further data manipulation in other post processing software such as Matlab, C++, LabVIEW, etc.
 - e. Power Spectral Density- will export the Power spectral density plots of all channels in *.jpg format. (see note 13 and 14 for further parameters)
 - f. Fast Fourier Transform- will export the FFT Plots of all channels in *.jpg format.

13. Re-sampling frequency- There are 7 different settings for re-sampling recorded data: 10KHz, 20KHz, 30KHz, 40KHz, 50KHz, 70KHz, and 100KHz. It is recommended to use the lowest available sampling rate for longer duration of recordings to prevent system from running out of memory during processing.
Window- is the PSD window and **Hanning** window is the most commonly used to perform the PSD calculations.
 - Units- there are 2 settings for this field. Most commonly used for PSD is EU^2/Hz .
 14. Min. Frequency (Hz) – enables zooming PSD and FFT plots to start from frequency set in this field.
Max. Frequency (Hz)- enables zooming PSD and FFT plots to end at frequency set in this field.
Graph Type – exports FFT and PSD plots in either Linear or Logarithmic.
 15. Save- After setting all the re-sampling parameters, press the save button and software will export all selected file formats to the same directory as the original recorded data file. A series of plots will pop up and disappear displaying the JPG, PSD, and FFT plots as selected.
 16. Exported Files Directory- All exported files will be saved to the directory listed in this field. This is the directory for the original data file selected in #1.
- Process Completed- this indicator will illuminate bright green once the saving process is complete. It will reset to matte green when a new file is selected.
17. Exit- once export is completed in step 15, there are 2 ways to exit the program. Pressing the Exit button or from the File menu Exit.

See Figure 24-26 for controls and displays.

Note: both continue and save buttons will be disabled if no data file is selected.

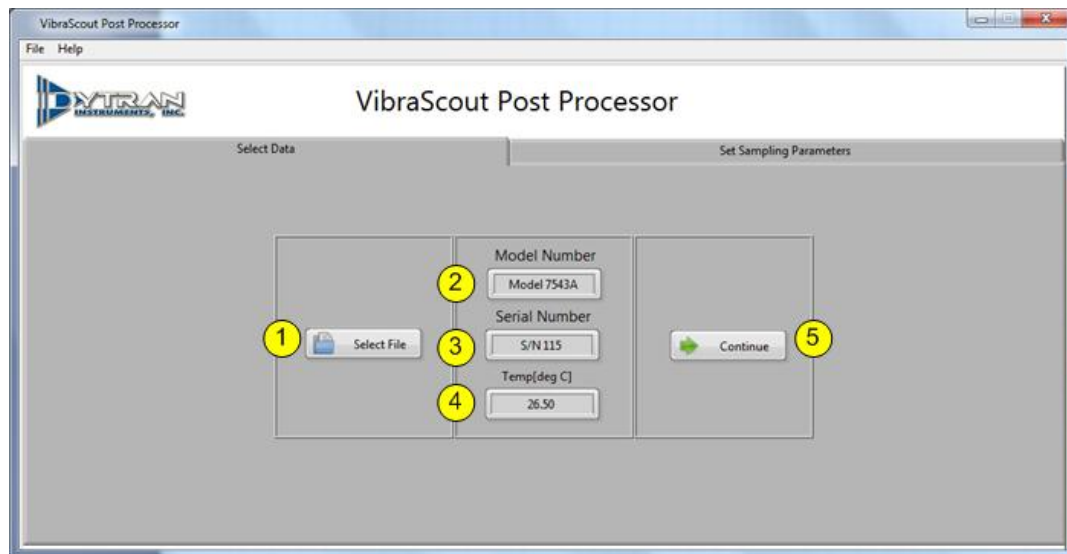


Figure 24: Data Setup Window

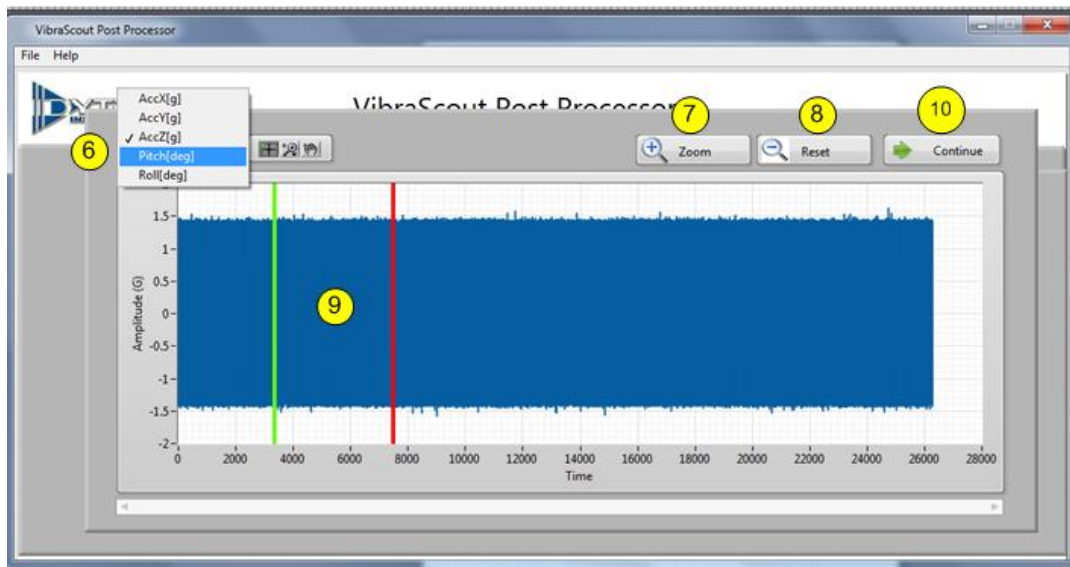


Figure 25: Select specific window for Re-sampling

VibraScout Post Processor 9002 Rev B

File Help

VibraScout Post Processor

Select Data | Set Sampling Parameters and Process

11 Operator Name: S. Taylor

12 Select Output Format:

- ☒ ASCII
- ☒ TDMS Binary
- ☒ JPEG
- ☒ Universal File Format
- ☒ Power Spectral Density
- ☒ Fast Fourier Transform

13 Re-sampling Frequency: 30000

Window: Hanning

Units PSD only: EU^2 / Hz

14 Min Frequency (Hz): 800

Max Frequency (Hz): 1200

Graph Type: Linear

15 Save

17 Exit

16 Exported File Directory: L:\labview\Sarkis\10_1_12

Processing Complete

Figure 26: Re-sampling and output file parameters

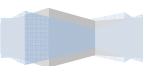
15 Software License, Restrictions, and Disclaimer

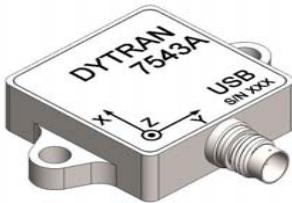
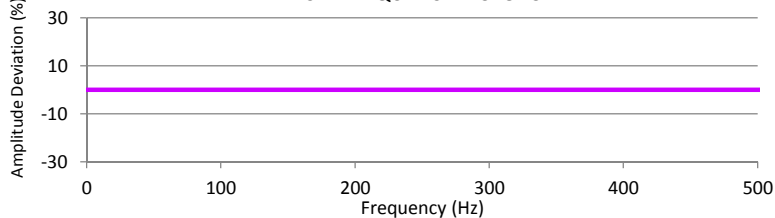
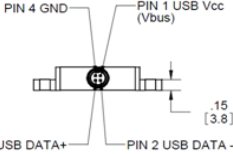
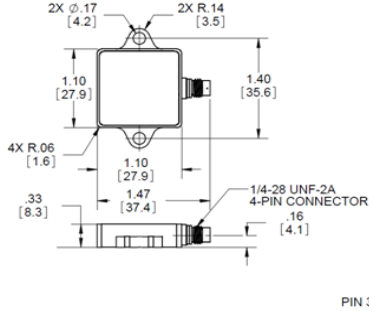
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Model Number 7543A	PERFORMANCE SPECIFICATION				DOC NO PS7543A																																																																																																									
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	<ul style="list-style-type: none">• USB/MEMS TECHNOLOGY• EMBEDDED MICROCONTROLLER• HERMETICALLY SEALED• DC RESPONSE• POST PROCESSOR INCLUDED TO EXTEND FREQUENCY RESPONSE																																																																																																													
	Device Features: Dytran model 7543A is a unique and innovative solution for fast and cost effective data acquisition. The only addition that is required is a personal computer and it is ready to take data. Model 7543A is USB powered, so no additional external power supply is required. The software package supplied with each sensor allows for real time, three directional acceleration acquisition along with temperature data and pitch/roll data. The standard USB protocol handles all the sensor communications with the PC and provides the following information: storage of the acceleration and temperature information, storage of pitch/roll data, real-time scrolling plots of acceleration data with display of min, max, mean, real-time logging of data to delimited file for importing into spreadsheet, both auto and smart triggering modes, digital filters to improve signal/noise ratio, real-time data compression to FFT, and many more.																																																																																																													
	<table><tr><th></th><th>ENGLISH</th><th></th><th>SI</th><th></th></tr><tr><td>PHYSICAL</td><td></td><td></td><td></td><td></td></tr><tr><td>Weight, Max</td><td>0.6</td><td>oz</td><td>17</td><td>grams</td></tr><tr><td>Connector [2]</td><td>1/4-28UNF</td><td></td><td>1/4-28UNF</td><td></td></tr><tr><td>Material</td><td>Ti-6Al-4V</td><td></td><td>Ti-6Al-4V</td><td></td></tr><tr><td>PERFORMANCE</td><td></td><td></td><td></td><td></td></tr><tr><td>Input Range</td><td>±16</td><td>g</td><td>±157</td><td>m/s²</td></tr><tr><td>Frequency Response, +/- 10%</td><td>0 - 500</td><td></td><td>0 - 500</td><td></td></tr><tr><td>Frequency Response (3dB), Nominal [3]</td><td>0 - 1100</td><td>Hz</td><td>0 - 1100</td><td>Hz</td></tr><tr><td>Freq. Toll. Over Temp (0.5 Deg C/min)</td><td>0.50</td><td>%</td><td>0.50</td><td>%</td></tr><tr><td>Output Noise, Differential ,Typical</td><td>x,y = 290; z = 430</td><td>μ g rms/√ Hz</td><td>x,y = 2845; z = 4218</td><td>μ m/s² /√ Hz</td></tr><tr><td>Non-Linearity, Typical</td><td>0.5</td><td>% F.S</td><td>0.5</td><td>% F.S</td></tr><tr><td>Cross Axis Sensitivity, Typical</td><td>1</td><td>%</td><td>1</td><td>%</td></tr><tr><td>ENVIRONMENTAL</td><td></td><td></td><td></td><td></td></tr><tr><td>Maximum Mechanical Shock</td><td>±10000</td><td>gpk</td><td>±98100</td><td>m/s² peak</td></tr><tr><td>Operating Temperature Range</td><td>-40 to +185</td><td>°F</td><td>-40 to +85</td><td>°C</td></tr><tr><td>Scale Factor Temperature Shift [1]</td><td>-56 to +56</td><td>ppm/°F</td><td>-100 to +100</td><td>ppm/°C</td></tr><tr><td>Seal</td><td>Hermetic</td><td></td><td>Hermetic</td><td></td></tr><tr><td>ELECTRICAL</td><td></td><td></td><td></td><td></td></tr><tr><td>Operating Voltage</td><td>3.8 to 6.0</td><td>VDC</td><td>3.8 to 6.0</td><td>VDC</td></tr><tr><td>Power Supply Rejection Ratio, Typical</td><td>44</td><td>dB</td><td>44</td><td>dB</td></tr></table>						ENGLISH		SI		PHYSICAL					Weight, Max	0.6	oz	17	grams	Connector [2]	1/4-28UNF		1/4-28UNF		Material	Ti-6Al-4V		Ti-6Al-4V		PERFORMANCE					Input Range	±16	g	±157	m/s ²	Frequency Response, +/- 10%	0 - 500		0 - 500		Frequency Response (3dB), Nominal [3]	0 - 1100	Hz	0 - 1100	Hz	Freq. Toll. Over Temp (0.5 Deg C/min)	0.50	%	0.50	%	Output Noise, Differential ,Typical	x,y = 290; z = 430	μ g rms/√ Hz	x,y = 2845; z = 4218	μ m/s ² /√ Hz	Non-Linearity, Typical	0.5	% F.S	0.5	% F.S	Cross Axis Sensitivity, Typical	1	%	1	%	ENVIRONMENTAL					Maximum Mechanical Shock	±10000	gpk	±98100	m/s ² peak	Operating Temperature Range	-40 to +185	°F	-40 to +85	°C	Scale Factor Temperature Shift [1]	-56 to +56	ppm/°F	-100 to +100	ppm/°C	Seal	Hermetic		Hermetic		ELECTRICAL					Operating Voltage	3.8 to 6.0	VDC	3.8 to 6.0	VDC	Power Supply Rejection Ratio, Typical	44	dB	44	dB
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Notes: [1] Over the rated Temperature Ramp Rate . [2] Mates with Dytran cable assembly 6330AXX ("XX = Length in FT) [3] Accelerometer bandwidth is 1.1KHz. Data can be reconstructed using the VibraScout Post Processor Software using the Whittaker-Shannon Interpolation method. [4] In the interest of constant product improvement, we reserve the right to change specifications without notice. [5] Measured at 100Hz 1Grms per ISA RP 37.2																																																																																																														
<div><div>TYPICAL FREQUENCY RESPONSE</div><div></div></div> <p>Units on the line drawing are in inches. Refer to 127-7543A for more information.</p>																																																																																																														



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