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VSG301 VIBRATION SIMULATOR

Doc :   **User Manual**

A B S T R A C T

This document describes LANIR-TEC LTD , VSG301 ,   Electrical Motors Vibration ,
Dual Signal, Simulator for quick and effective Monitoring system tests.
Used in Lab, Field and Classes by technical experts

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Q.M.	A.Gordon			Rev.: I

VSG301   HEREINAFTER REFERRED TO AS   **VIBSIM**
UNIT UNDER TEST   ---------   UUT
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Table of content

1. <u>Welcome to the VibSim product User Manual</u>

VibSim is hardware and software package of variable signals simulator for Vibration Monitoring and Machine Protection Systems tests

1.1. About this Manual

In this manual we will explain how to deal with his product

1.2. Introduction

VibSim product contains hardware box and software application installed into any modern PC. Box and PC are connected by USB cable. Hardware box receive setting commands from the PC application and sends requested signal to Outputs A,B and A+B.
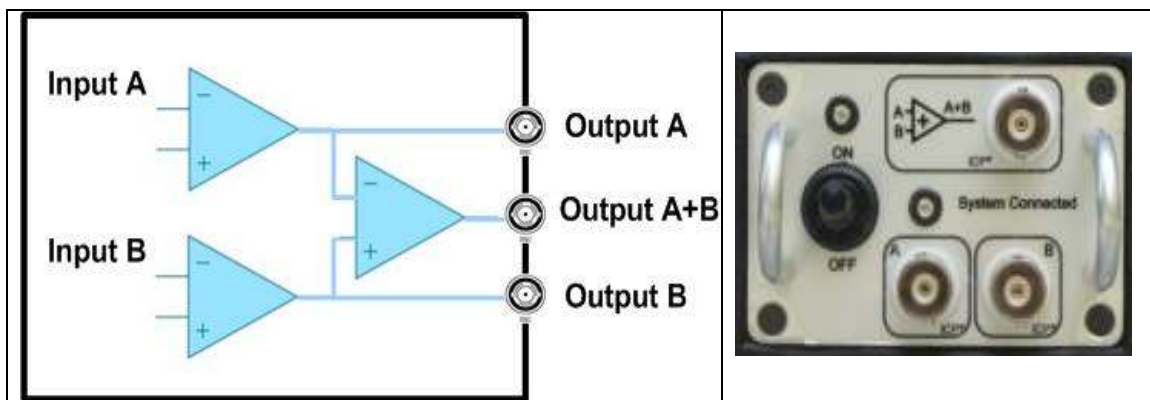
Fig 1

1.3. Minimal System Requirements

- Intel Dual Core CPU
- XP Pro SP3 with last updates , Win7 ,Win8,Win10
- 2GB RAM
- PSU should be low noise model.

1.4. Components of Required Software System:
- DirectX 9c
- Microsoft .NET Framework 4.0
- Adobe Acrobat Reader

2. VibSim Functionality details

Front Panel	Side View	Back Panel

Fig 2

2.1. Front Panel Description

Power Switch ON -   set the system in working status. **ON/OFF LED** will light

Important Notes :

ATTENTION!
When the Switch is in <u>ON</u> position – VibSim will be active but internal battery will <u>NOT</u> be charged.
ON/OFF LED is ON.
In case of low battery power – ON/OFF LED will be blinking.

When the switch is in OFF position – VibSim will be closed , output signal will not be transmitted and the battery will be charging (if Power USB cable is connected).
Battery Charging LED will light

If the Switch is in OFF position and then changed to ON there will be two options :
<u>OPTION 1</u> – output signal level will be "0". It was made for safety reasons to prevent not expected RED ALARM level signals transmission.

<u>OPTION 2</u> – output signal level will be the same as before the switch was closed.

Options 1 or 2 will be set in the Application Setting menu.

A BNC — A signal Output	
B BNC — B signal Output	
A+B BNC - A+B mixed signal Output	

Fig 3

System Connected LED - indicates external ICP® powering connection to at least to one of 3 BNC Connectors . It is acting as Logical OR Gate (Please, refer to the next Fig.)	
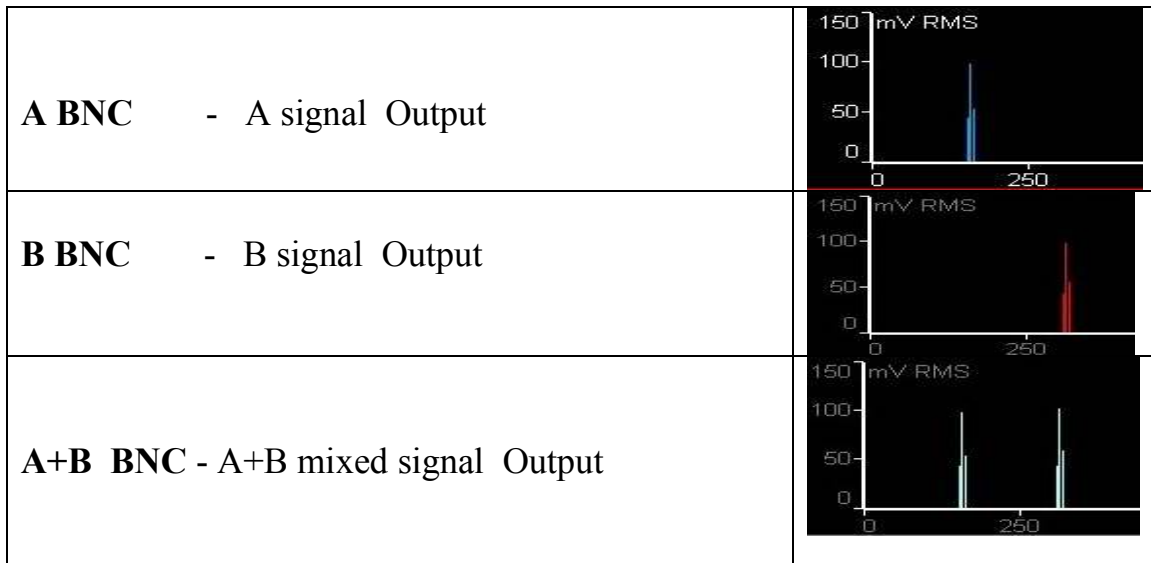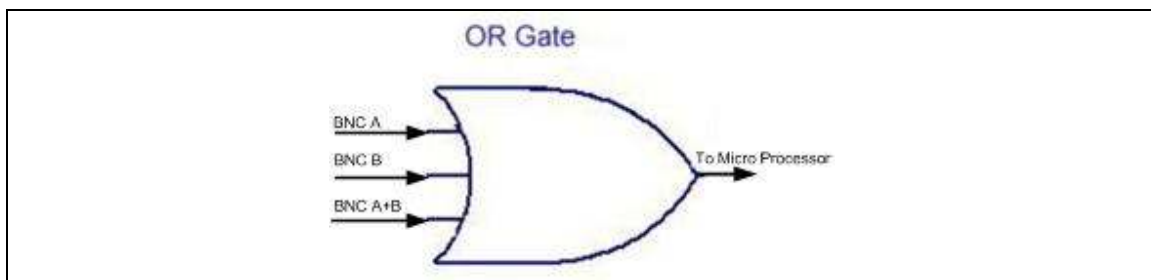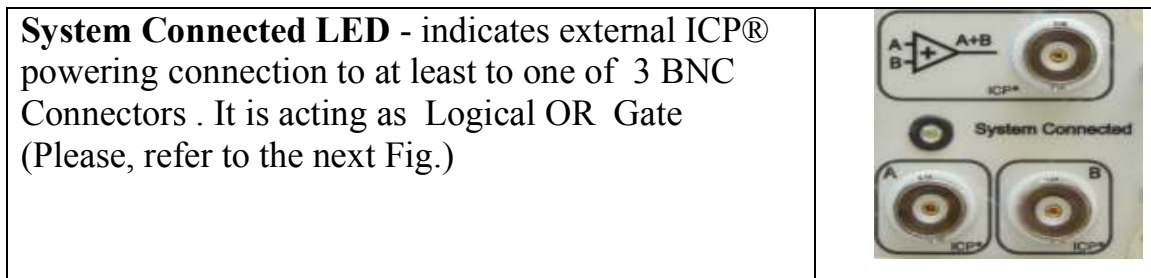
Fig 4

2.2. Back Panel description

USB Mini connector is used for Data and Power connection between PC and VibSim. **Charging LED** will light till VibSim Internal Li-On Battery will be full loaded. Charging LED is OFF	

2.3. USB Connection indicator

USB Data channel Indicator is located on the SW VibSim Window, right side Menu bar line.

USB Cable Connected	USB Cable disconnected
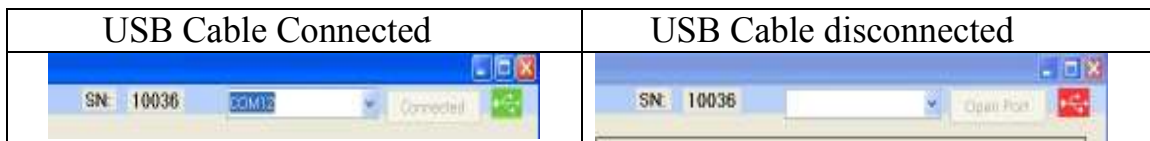
Fig 5

3. <u>Getting Started</u>

3.1. Installation of USB FTDI Driver
Please see **Appendix D** for instructions.

3.2. Software installation

Please see **Appendix E** for instructions.

3.3. Assembling the System

PC and VibSim should be connected together by USB cable.
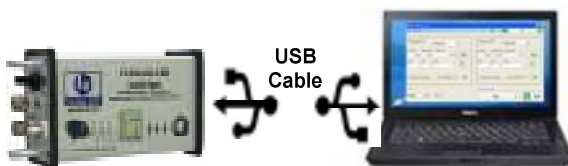
Fig 6

3.4. Start of the System Operation

Open ON/OFF Switch on the VibSim front panel
Run the last version of the VibSim application
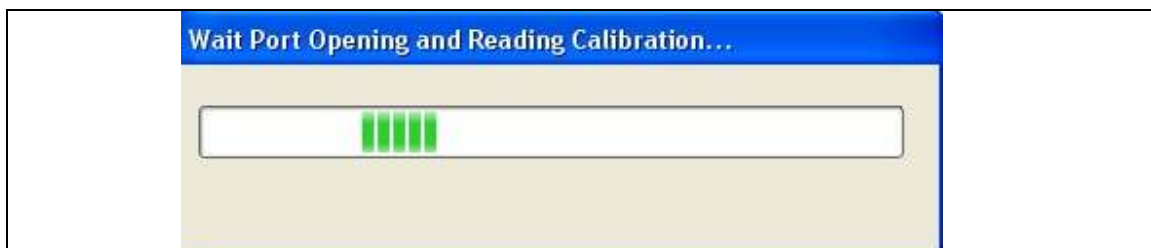
Fig 7

Now the VibSim box connected to PC will be installed.

Read Calibration data
Channel A: a= -0.077, b= 904.358, F(Hz) = 25.00
Channel B: a= -0.073, b= 867.552, F(Hz) = 8000.00

OK
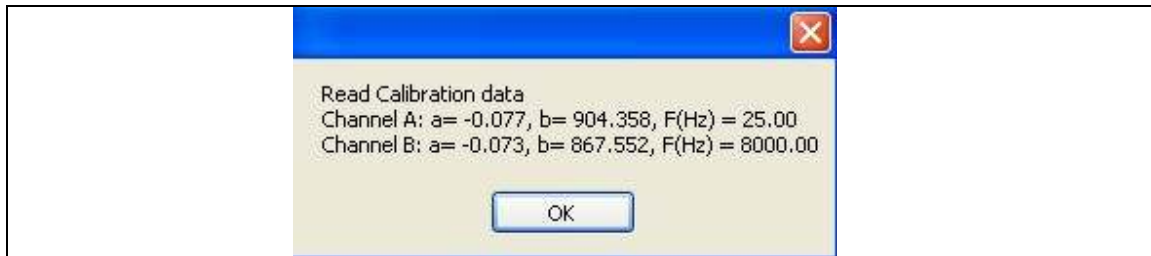
Fig 8

Then the last saved calibration values will be displayed
Note: F(Hz) indicates the active calibrated frequency for channels A
and B .
Press OK.
VibSim window will be opened

4. <u>Parts of the VibSim Window</u>

VibSim window is the software application which helps to check the various Vibration Monitoring Systems, Analyzers and Cabling in a short time and with precise results.

4.1. Title bar

The blue title bar line of the top of the VibSim window includes Vibration Simulator **Version details**, **Minimize**, **Maximize** and **Close** buttons

4.2. Menu Bar

Menu Bar that you see on the left side shows **File**, **Tools, ISO10816-3** and **Help**.
On the right side of the Menu Bar you see the indicated VibSim box **Serial Number**, **Com Port number**, **Connected /Open port** indication and **Send command indicator**
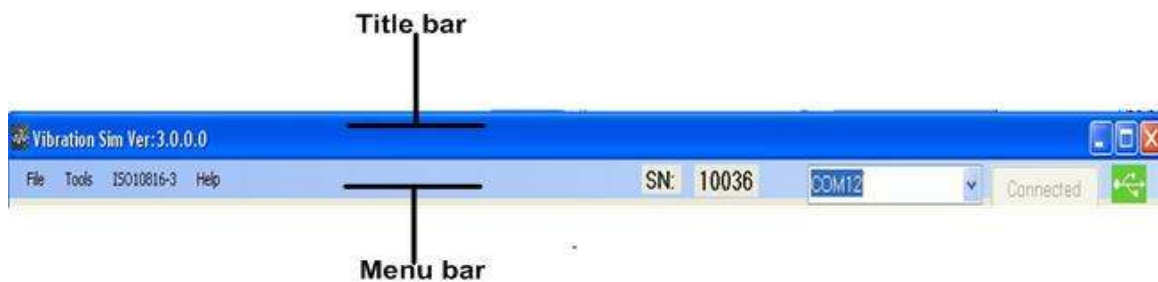
Fig 9

4.2.1. <u>File</u> Menu Commands

- **"Save Screenshots"** helps to store whole scenario image
- **"Exit"**
  ### 4.2.2. <u>Tools</u> Menu Commands
- "**Admin Mode**" is the administrator rights for super user functionality
- "**Calibrations**" open the calibration points for various signal values
- "**Sensor Type**" shows various sensors sensitivities of 1, 10, 100, 1000 mV/g
- "**Reset Whole Internal Memory**" is the option to reset the internal memory of the VibSim RAM.

- "**VibSim Front Panel Image**" shows the front panel view.

4.2.3. <u>ISO 10816-3</u> Menu Command

- **"ISO 10816-3"** shows the online table that helps to provide quick velocity test at any requested value. Please see **Appendix B** for more details

4.2.4. <u>Help</u> Menu Commands

- "**Manual**"　　Open the folder of documents those are included to the software package.
- "**VibSim Info**" Open Particular VibSim version information
- "**About** "　　- Various details

4.3. VibSim Window general functionality

Fig 10

- **1**　**Channel A** - Signal A Setting panel
- **2**　**Channel B** - Signal B Setting panel
- **3**　VibSim Box   **S/N**
- **4**　USB **COM** PORT number
- **5**　Indicator of USB **COM** connection.
- **6**　VibSim **Version** number
- **7**　**Loop** – continuous signal change
- **8**　**Auto Increment** Start /Stop

4.4. A and B Channels features

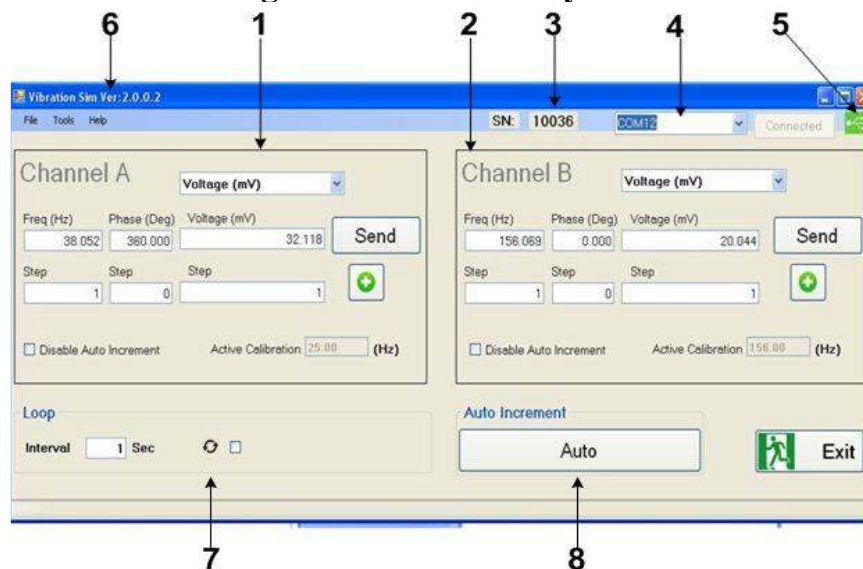We will explain Channel A functionality in details. (Channel B functionality is the same)
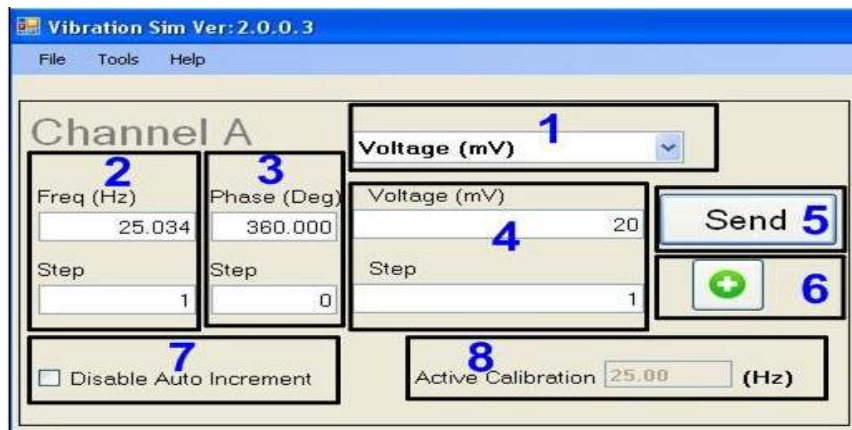
Fig 11

- **1 Signal Names and Units selection** Combo Box
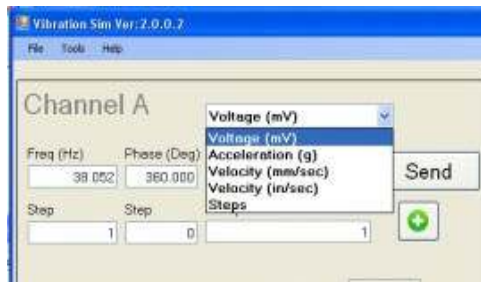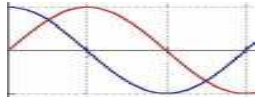
Fig 12

- **2 Frequency (Hz) and Frequency steps** – Frequency may be changed manually or automatically according to the Step value.
- **3 Phase(degree)** and its **steps** may be changed
- **4 Signal Amplitude** (in selected units) and its **Step** selected.
- **5 Send** Output signal sending command button without signal increment
- **6 Send with Increment** Output signal sending command button with signal increment as indicated in relevant Step text Box
- **7 Disable Auto increment** check box (V) will disable the option.
- **8 Active Calibration** display indicates the active selected frequency calibration point (in our case it was 25.00Hz)

4.5. Loop feature description

Fig 13

Loop feature allows to send a signal on (A&B) or (A) or (B) channels in automatically mode.
We will use simple example to explain this feature
Please see **Appendix F**

Let's define the scenario
The change of signal on the channel **A**:
- Velocity (mm/s) will be changed by 0.1mm/s each time
- Frequency and Phase of A signal will be constant
- Interval = 2sec
- Number of steps =10

The change of signal on the channel **B**:
It will be left without any changes

The **Interval** and **Num of Steps** will be set by a user.
To Start the Auto Increment press on "**Auto Increment button**" -> "**Auto**"
USB indicator on the right up corner of Menu bar will start blinking.
The loop will be repeated endless times till a user interrupt the process.
To Start the Auto Increment press on "**Auto Increment**" -> "**Auto**".
It will be changed to "**Stop**" ("Auto" to "Stop").
USB indicator on the right up corner of Menu bar starts blinking.

To Stop the Loop run press the "**Auto Increment**" button. It will be changed from "Stop" to "Auto"

USB indicator on the right up corner of Menu bar stops blinking (green status).

4.6. Few demo clips

You can find demo clips in **Appendix A**.
It includes YouTube movies of:
- VibSim SW Overview
- Signal B Phase shift
- A3900 Monitoring Unit test
- A4900 Single Channel Analyzer test
- TPI 9800 Single Channel Analyzer test
- A4100 Multi Channel Analyzer test
- HF-535 Monitoring Unit test

5. <u>Calibration</u>

5.1. Calibration Ranges

Signal A and B must be calibrated to get the maximum accuracy at the requested frequency points.
Each VibSim application is being supplied with the most relevant calibration frequencies points:
25Hz   -   Relevant only for **25Hz**
156Hz   -   range of **60Hz**   till 1**000Hz**
 8000Hz -   range of **1000Hz** till **20000Hz**
Note: 156Hz Signal is most useful for regular Monitoring system tests

Please contact LANIR-TEC or your area local distributor to get any other frequency calibration points.

5.1. The procedure of the Calibrated frequency selection.

Let's start with already existing <u>Active Calibration</u> on Channel B ;156Hz .
We want to change the calibration to 8000Hz
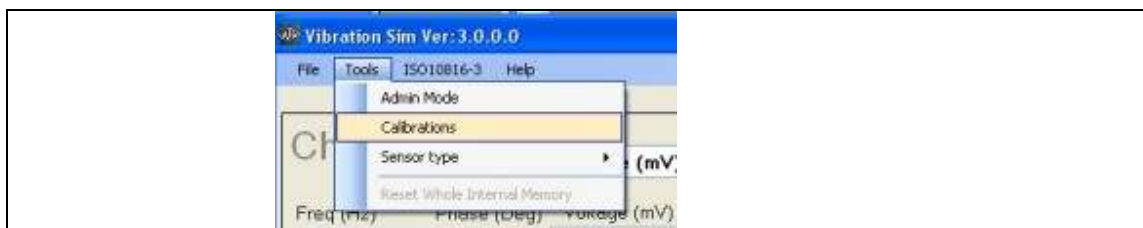

Press on   **Tools** -> **Calibrations**

Fig 14

On Calibration Manager select Ch B; and select F(Hz) 8000

Table of 21 measured points of 8000 Hz will appear:
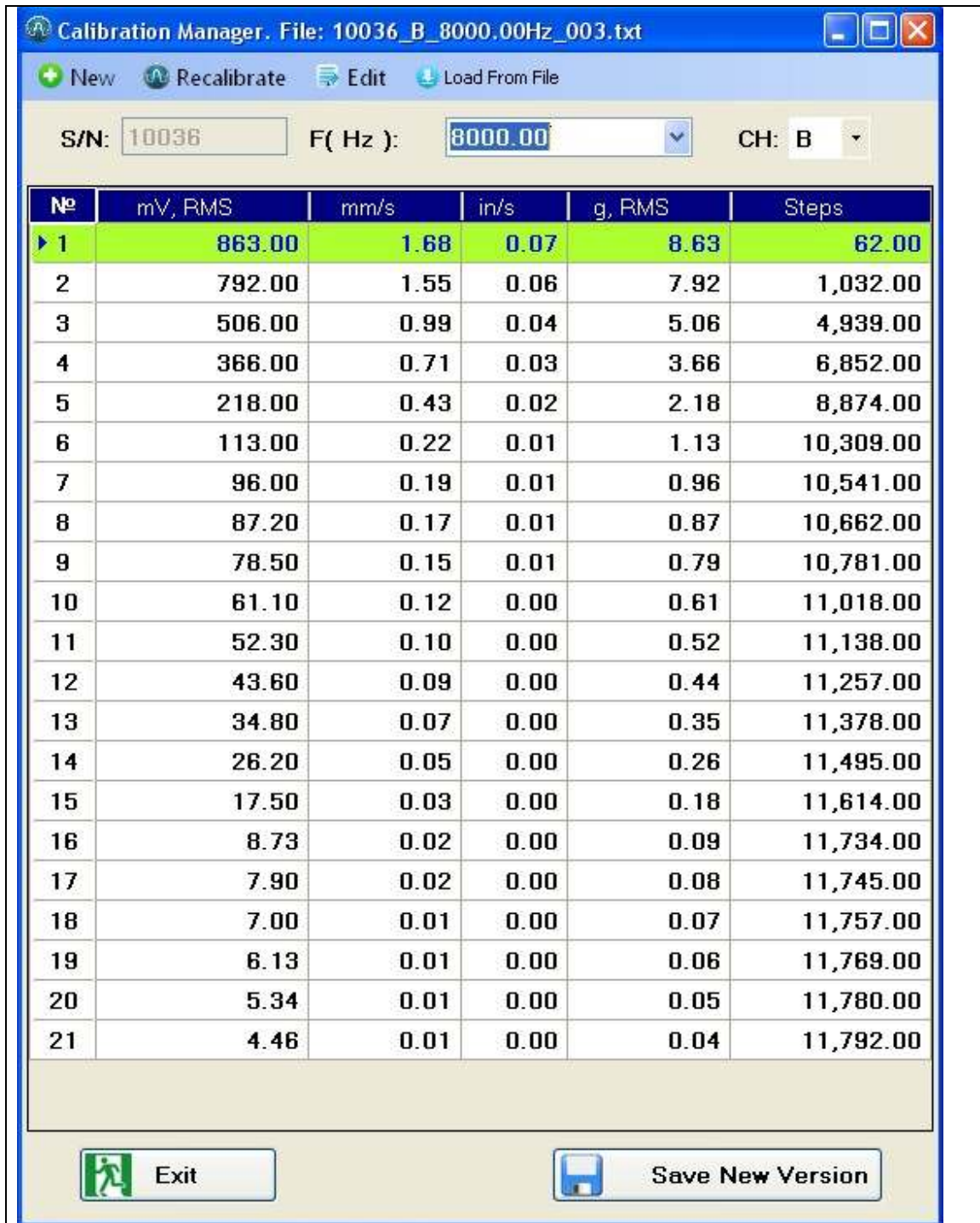
Fig 15

NOTE:
- Each Calibration frequency point will be indicated in all formats : **mV(RMS)** ; **mm/s ; in/s ; g (RMS) and A/D Steps**
- In case if you don't see any data in the table press the button "**Load From File**" and select relevant File.

Fig 16

To continue the process press the "**Recalibrate** " button.
Check on the VibSim Window that Channel B Frequency and Active Calibration were changed.
Check the values.

Define a wanted signal value and start your test procedure

Appendix A   YouTube clips

VSG301 (VibSim) Demonstration links placed on YouTube

https://www.youtube.com/watch?v=v6CZTfPRgvo
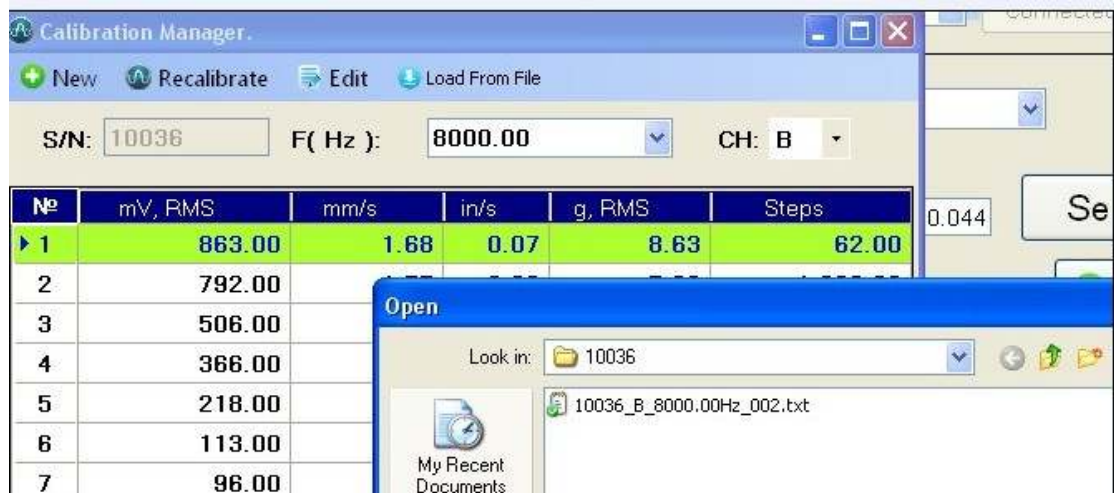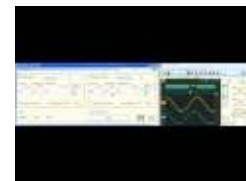VSG301 Vibration Simulator - Overview of SW Application

https://www.youtube.com/edit?o=U&video_id=kzoy1V4tsoA
VSG301 Vibration Simulator- Signal B Phase shift against
Signal A

https://www.youtube.com/watch?v=h27_bRFIjx4
VSG301 Vibration Simulator- **A3900 Monitoring module**
under test

https://www.youtube.com/watch?v=Xw1FHhEbo_U
VSG301 Vibration Simulator- **A4900** quick test (mm/s and
"g" RMS)

https://www.youtube.com/watch?v=6xHdiia-dRA
VSG301 Vibration Simulator- ISO 10816 signals injected
into **TPI9080**

https://www.youtube.com/watch?v=3TF1yMF7js4
VSG301 Vibration Simulator- **A4100** under test

https://www.youtube.com/watch?v=9euCRrS2DmE
VSG301 Vibration Simulator-**HF535** Very Low Frequency
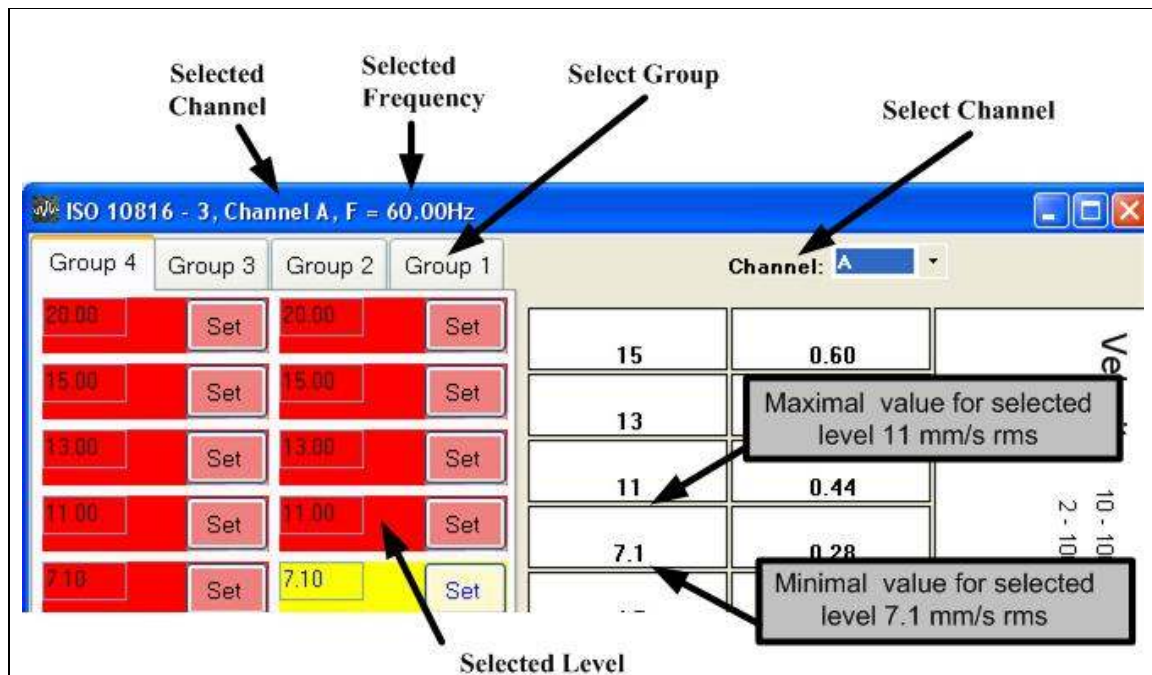test

Appendix B   ISO 10816-3 Table

Below you can see **ISO 10816-3** the values of the Table of Velocity threshold .
Values are only for **Velocity** and are measured in **mm/s** or **in/s** (**RMS**)

Velocity threshold values   ISO 10816-3

									11	0.44	
									7,1	0.28	
									4,5	0.18	
									3,5	0.11	
									2,8	0.07	Velocity
									2,3	0.04	10~1000 Hz r>600rpm
									1,4	0.03	2~1000 Hz r>120rpm
									0,71	0.02	
									mm/s rms	inch/s rms	
rigid	flexible	rigid	flexible	rigid	flexible	rigid	flexible				Foundation
pumps > 15 kW radial, axial, mixed flow				medium sized machines 15 kW < M 300 kW		large machines 300 kW < M < 50 MW					Machine Type
integrated driver		external driver		motors 160 mm H < 315 mm		motors 315 mm H				
Group 4		Group 3		Group 2		Group 1					Group

A newly commissioned
B unrestricted long-term operation
C restricted long-term operation
D vibration causes damage

If we need to find any appropriate levels of the whole signal range (from **Idle** showed in blue color to **Alarm** showed in red color) the live **ISO 10816-**3 table will help to find them very fast.

- On the VibSim , please check that right active calibration frequencies on Channels A and B are presented or change them if it is needed
- Select **ISO 10816-3 o**n the window menu bar panel
- On the **ISO 10816-3** Table select a requested channel (A or B)
- Frequency is already set before

- Now you need to select the **Group** (1-4). In our case **Group** 4 was selected
- Send the required level of various test signals those should be evaluated.

For example, let's select green area levels of signals (values are from 2.8 mm/s to 3.5mm/s).
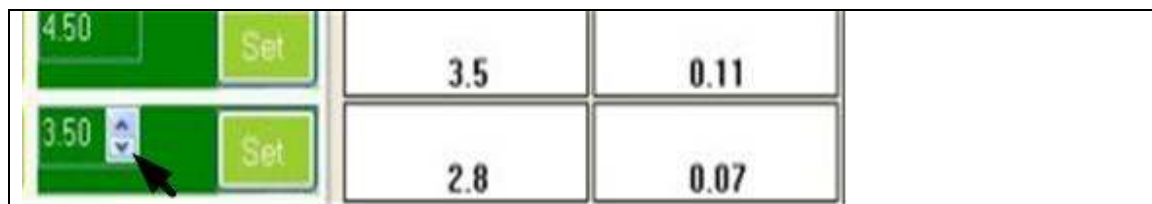
- Select the requested level of signals
- Point the mouse cursor and increase /decrease the signal
  The signal level can be changed from 2.8 mm/s to 3.5mm/s
- When you find the requested signal level, press the **Set** button situated on the right side of the green cell. Signal is being sent to Output A.
- Continue to get more levels tests

.

Appendix C   Example of VibSim connection

Example of UUT connection to the VibSim

3 channels VibSim is connected to multi channel monitoring system.
Collected Online data are being transferred to the remote control room
computer by 4-20mA channels.
Normal, Warning or Alarm signals can be obtained for a quick test.
It can be achieved by changing VibSim signal values.
Alarms lamp, Horn, Semaphore indicator connected to the Monitoring
System could be tested as well.

Appendix D   FTDI USB Driver

1. Download FTDI drivers file (CDM 2.08.28 WHQL Certified.zip)
2. Uncompress the file into any selected directory (e.g. C:\\).
3. Connect the VibSim box to your PC by USB cable.
4. If drivers are not installed already in your computer, then the Add hardware Wizard window will open and you follow next steps.
5. Select Install from a list or specific location and click the Next button (do not accept any automatic downloads).
6. Check Include this location in the search.
7. Click the browse button and select the driver folder, where you uncompressed the file (e.g. C:\CDM 2.08.28 WHQL Certified.zip).
8. Click the Next button and wait for installation completing.
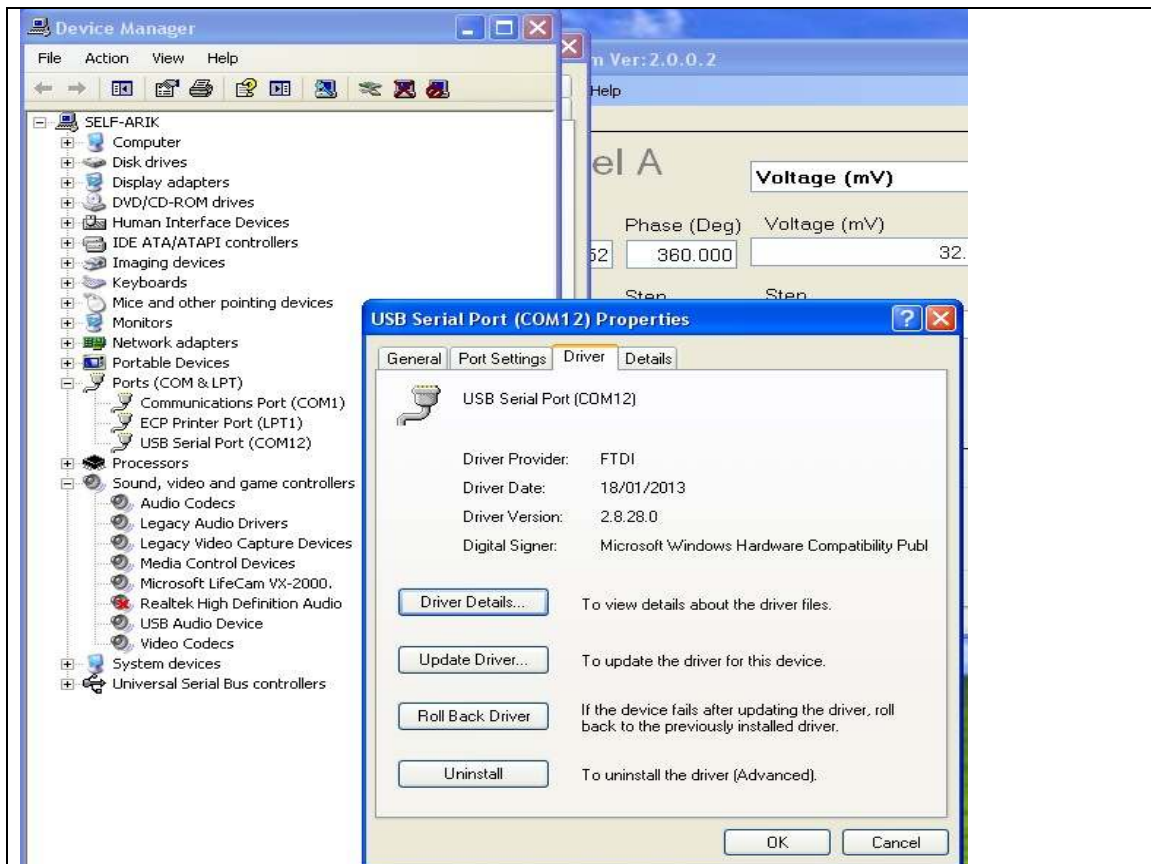
Open the Control Panel -> Device Manager
Check Ports (COM & LPT) for USB Serial Port installed without any yellow warning icons.

Appendix E   Software installation

Software installation instructions

1. Download Last VibSim folder to your PC
2. Uncompress the file into any selected directory (e.g. C:\\Program Files\Lanir-Tec\VibSim).
3. Launch the EXE file

<u>Appendix F</u>   Loop feature example

As explained before **Auto Increment** option will change signals automatically relatively to **Step** settings' values for Signals A and B. If **Disable Auto Increment** option is selected Auto Increment will not act on selected Channel (A or B) .
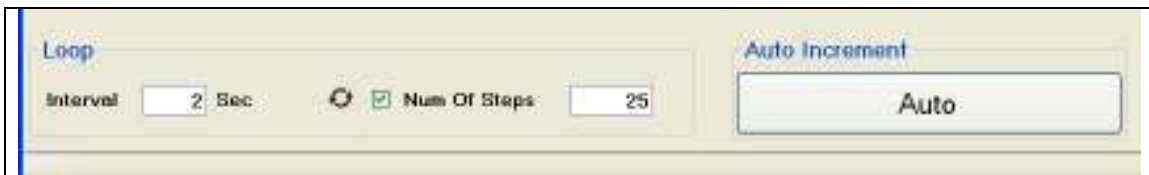
<u>Now we will show Loop feature example.</u>

<u>Parameters that we'd like to set:</u>
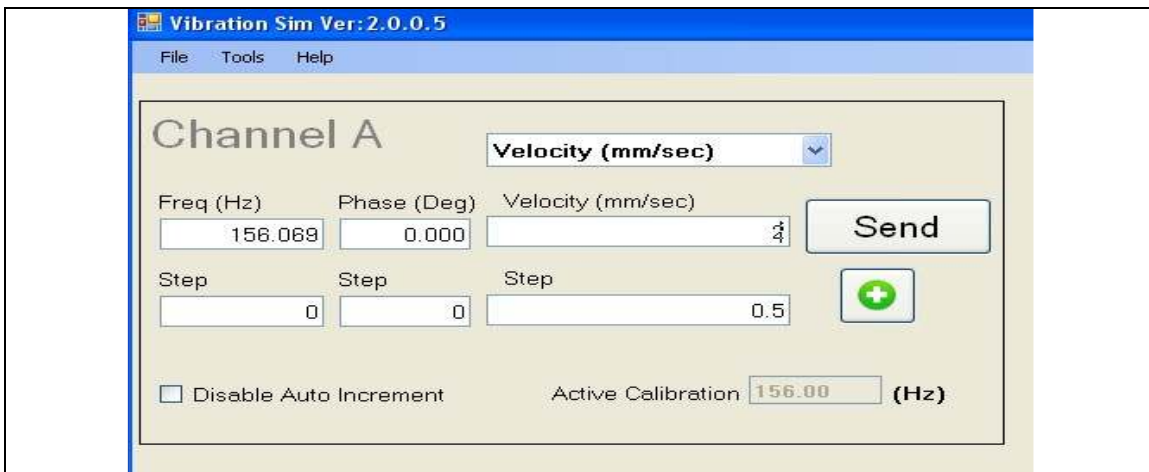
<u>Loop</u> setting:
- **Interval** = 2 Sec
- **Num of Steps** = 25

It means that Signal(s) will be changed each 2sec and then after 25 times of increments will return to the starting value.
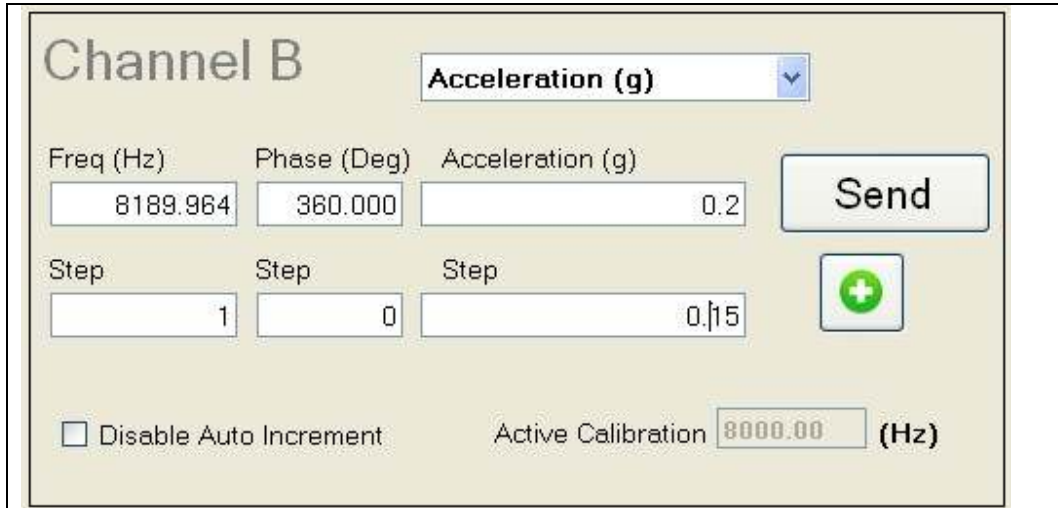

<u>Signal A</u> values:
- Frequency =156Hz ; Step =0
- Phase Step=0   - (stay constant)
- Value = Velocity (mm/s) ; Step =0.5. (mm/s)
Signal Value Start point = 2mm/s

Signal B values:

- Frequency =8000Hz ; Step =10(Hz)
- Phase Step=0   - (stay constant)
- Value = Acceleration (g) =0.2 ; Step =0 - (stay constant)
- Acceleration step=0.15
  (It means that only Frequency will be changed 25 times by
  10 Hz and then will start form the first one)

Start with the VibSim setting process:

Channel A :
- Please check the Channel A active calibration value . If the
  value is not equal to 156Hz then calibrate Channel using
  regular Calibration process.

Check that **VibSim Window Active Calibration** text box shows 156Hz

Active Calibration 156.00 (Hz)

- Change Signal Units definition to **Velocity** (mm/s)
- Set the **Velocity** value to 2mm/s
- Set the **Step** to 0.5mm/s

Press the **SEND** button to transmit VibSim Signal A

Channel A

Velocity (mm/sec)

Freq (Hz)	Phase (Deg)	Velocity (mm/sec)	
156.069	360.000	11.500	Send
Step	Step	Step	
0	0	0.5	

Channel B :
Calibrate Channel B to 8000Hz by using regular Calibration process.

Calibration Manager. File: 10036_B_8000.00Hz_002.txt

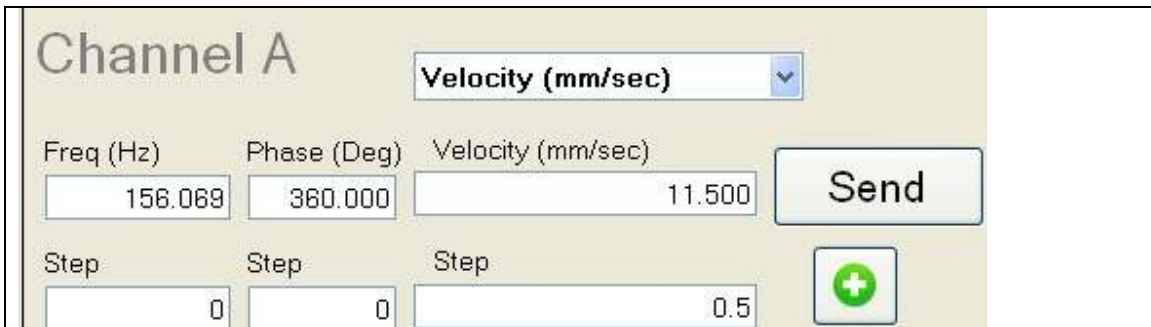New   Recalibrate   Edit   Load From File

S/N: 10036   F(Hz): 8000.00   CH: B
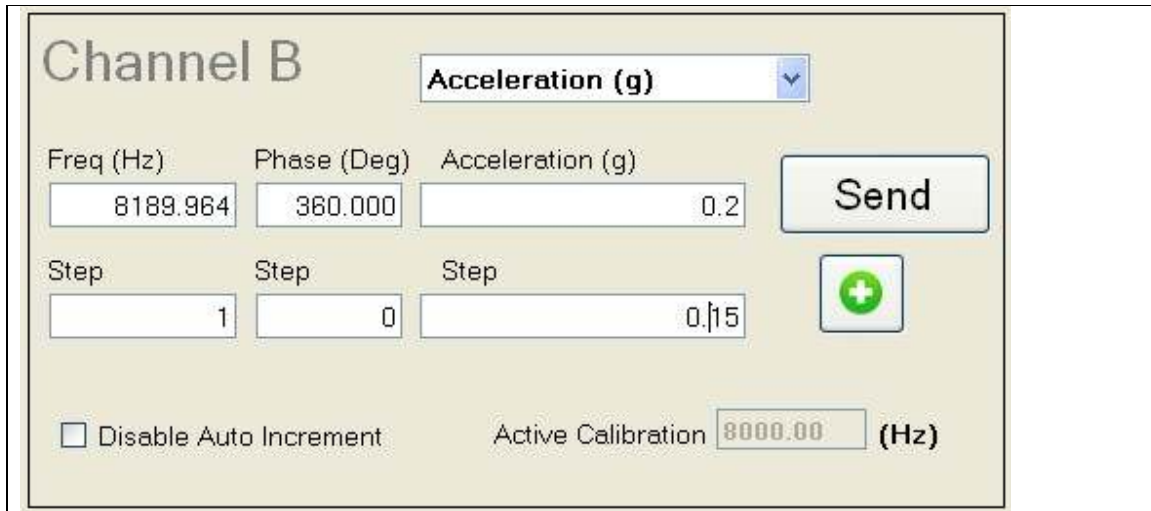
№	mV, RMS	mm/s	in/s	g, RMS	Steps
▶ 1	863.00	1.68	0.07	8.63	62.00
2	792.00	1.55	0.06	7.92	1,032.00
3	506.00	0.99	0.04	5.06	4,939.00
4	366.00	0.71	0.03	3.66	6,852.00
5	218.00	0.43	0.02	2.18	8,874.00

Check that **Active Calibration** on the VibSim Window will show 8000Hz

Active Calibration 8000.00 (Hz)

- Change Signal Units definition to **Acceleration** (g)
- Set the **Acceleration** value to 0.2g
- Set the **Acceleration Step** to 0.15g

Press on **SEND** button to set VibSim Signal B Output

To start press the Auto Increment button. (**Auto** will be changed to **Stop**)

The blinking VibSim USB command sending indicator shows that signal was transferred.