Readme – Drop Test

1. INSTALL THE SOFTWARE FIRST

The software installs the necessary drivers for Microsoft Windows to recognize your National Instruments (NI) data acquisition device.

2. ACCELEROMETER TYPES SUPPORTED

This software will work with IEPE 3-axis accelerometers. IEPE accelerometers are also called ICP™, ISOTRON, CCLD, or Deltatron. These are names that vary by manufacturer, but they all mean the same thing: electronics are built into the accelerometer and a DC excitation current from 2mA to 20mA is sent automatically along the cable from the instrument. This current powers the electronics inside the accelerometer. There are many instruments that provide this current, and the "precision suggestion (section 4) will handle this automatically. The accelerometer should have a specification of "mV/g". Appropriate accelerometers for drop tests will have sensitivities that vary from 1mV/g to 10mV/g, though this is just typical and certainly accelerometers much more and much less sensitive will also be compatible with this software application.

3. HOW DATA IS CAPTURED

Once you click "Ready to Drop", the software constantly acquires a data point every 0.5msec from each of the 3 channels simultaneously and waits for a signal to exceed 3 g's on any axis. Once this happens, a ½ second curve is displayed on the graph with the trip point in the middle. If you need to take data faster than every 0.5msec, we can definitely accommodate that with our flat-rate "tweak" to our software. For more information, visit http://www.justmeasure.net/custom

4. SUGGESTIONS FOR NATIONAL INSTRUMENTS HARDWARE

Precision Suggestion: The National Instruments PCI-4462:

- Plugs inside a desktop PC into the "PCI slot" (in almost all desktop computers)
- Built in IEPE power to produce the DC excitation current so that you can hook it directly up to the accelerometer
- Features BNC jacks on the front for simple connection to accelerometers
- 118dB of dynamic range from 24-bit A/D converters for very fine resolution even with large signals like those produced on a drop test
- 6 gains built into device to zoom in on small pulses
- See the user's manual of this device at sine.ni.com/manuals for more information on measurement accuracy.

Low Cost Suggestion: The National Instruments USB-9215A (USB):

- Plugs into any USB port of a laptop or desktop and does not require batteries or a separate power cord
- Features BNC jacks on the front for simple connection to accelerometers
- 16-bit A/D converter with no gain options
- See the user's manual of this device at sine.ni.com/manuals for more information on measurement accuracy
- Requires an extra device to supply the DC current to the accelerometer: suggested model 482A22 from PCB Piezotronics – http://www.pcb.com) and a few extra cables (all included in this low-cost suggestion when purchased from our website)

5. ALL HARDWARE OPTIONS

The software only works with National Instruments devices, but there are many options in addition to the above suggestions. You might already have the National Instruments equipment you need. This software automatically detects and configures 14 Data Acquisition devices. All of the options are listed in Table 1 below. All of these devices have A/D converters on each channel that acquire each axis simultaneously. Many National Instruments devices (not listed in this document) have a single A/D converter and scan through the channels, which would inappropriate for this application without some data processing. JustMeasure, LLC can customize this application to meet your needs: http://www.justmeasure.net

Table 1: All National Instruments Data Acquisition Devices Supported

Device	# of Inputs	Accuracy (g force)[a]	Excitation Current?	Example NI Cable	Example NI Connector Box
PCI-6110	4	0.071	N	SH68-68-EP	SCB-68
PCI-6115	4	0.078	N	SH68-68-EP	SCB-68
PCI-6120	4	0.068	N	SH68-68-EP	SCB-68
PCI-6122	4	0.15	N	SH68-68-EP	SCB-68
PCI-6123	8	0.15	N	SH68-68-EP	SCB-68
PCI-6132	4	0.15	N	SH68-68-EP	SCB-68
PCI-6133	8	0.15	N	SH68-68-EP	SCB-68
PCI-6143	8	0.72	N	SHC68-68-EP	SCB-68
PCI-4462	4	0.20	Y	N/A	Built onto device
PCI-4472	8	23	Y	N/A	Built onto device
PCI-4474	4	23	Y	N/A	Built onto device
USB-9215A	4	28	N	N/A	Screw terminals
USB-9215A (BNC)	4	28	N	N/A	Built onto device
USB-9233	4	35	Y	N/A	Built onto device

[a]The accuracy calculated is theoretical worst-case scenario based on a 5mV/g accelerometer and the National Instruments device at its maximum gain setting and its smallest voltage range. This calculation is for the National Instruments device only and does not factor in the error from other sources including the accelerometer or cabling or external EMI/RF sources.

6. PROVIDING EXCITATION CURRENT TO THE ACCELEROMETER

The column in Table 1 labeled "Excitation Current?" indicates whether or not the NI Device supplies the required current somewhere between 2mA and 20mA to the accelerometer automatically. If not, you have to supply a separate device that provides the excitation current. The Model 482A22 from PCB Piezotronics (included in the low-cost suggestion) is the recommended device. It passes the signal through to the National Instruments device via BNC connector outputs. It also has BNC inputs also allowing for easy cabling to the accelerometer. For a picture and specifications of this device, please visit http://www.pcb.com and type the "482A22" into the search field.

7. PROPER CABLES / WIRING FOR THE NI DEVICES:

The devices with built-in excitation are special purpose devices primarily for accelerometers and microphones. Consequently, they have built-in BMC or SMB connectors that can match the cable supplied by your accelerometer manufacturer.

The PCI devices (for desktop PC's in Table 1) without built-in current excitation have 68 pins for connecting signals, but you obviously don't need 68 connections just for the accelerometer. You'll order a cable from National Instruments that matches that device and a connector box with the screw terminals inside (see suggestions for these items in Table 1). The USB-9215A is the exception because it screw terminals built into the side of the device. In any cases, the screw terminals will be assigned numbers. The purpose of each pin isn't labeled on the connector box itself. Here's where to connect the output of the signal conditioner:

Table 2: Wire connections for PCI Devices with cable and connector box

Software Channel	Signal	Ground
0	68	34
1	33	66
2	65	31
3	30	63
4*	28	61
5*	60	26
6*	25	58
7*	57	23

*only available on 8 channel devices

Table 3: Wire connections for the USB-9215 Device

Software Channel	Signal	Ground
0	0	1
1	2	3
2	4	5
3	6	7

The excitation device that we recommend (See section 6 above) has 3 BNC jacks for outputs corresponding to the x, y, and z axes. Consequently, you'll need 3 cables with a BNC jack on one side and 2 bare wires on the other side: one for "signal" and one for "ground". If you purchased a complete low-cost or precision bundle from JustMeasure, LLC these cables are provided standard by us. If you would rather build it yourself, you can connect the center pin of the BNC connector somehow to the "Signal" terminal and the outer sheath (or ground) to the "ground" terminal listed in Table 2 above.

Still confusing? E-mail us at support@justmeasure.net and we'll try to explain it better for your particular device. Just let us know which one you're using!

8. PC REQUIREMENTS:

Software:

- Windows 2000/XP or later
- Microsoft Excel 2000 or later
- Adobe Acrobat Reader Ver. 6.0 or later

Hardware:

- 256MB RAM
- Pentium III / Celeron 600MHz or equivalent/faster

This document serves as a repository for all the technical information we've published about this application. If we've left something out or you need more information, all e-mail is answered within 24 hours:

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