



Readme – 4ch Dynamic Pressure Analyzer

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 dynamic pressure (piezoelectric) transducers. 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 pressure sensor. There are many instruments that provide this current, and the “precision suggestion (section 4) will handle this automatically. The pressure transducer should have a specification of “mV/PSI”.

NOTE: The “low-cost” and “precision” options (listed below) include the proper signal conditioning for ICP or IEPE type pressure sensors. You just have to select the appropriate sensor depending on the expected pressure levels.

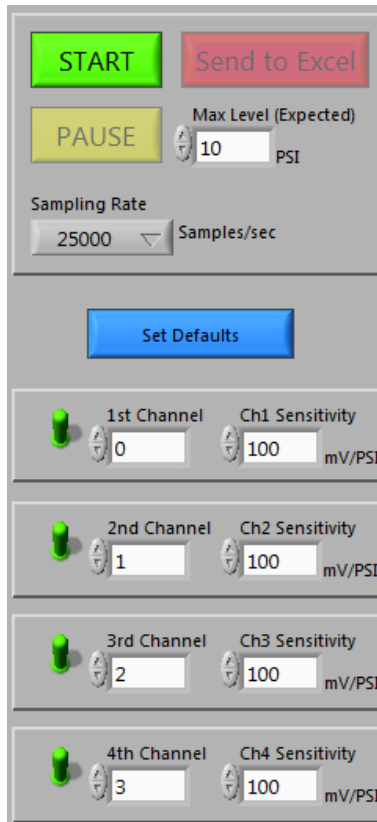
NOTE: This software will also work with traditional strain-gage based pressure transducers and the appropriate signal conditioning. Piezoelectric pressure transducers do not measure the DC pressure level, just the dynamic pulses above a certain low frequency cut-off.

3. SENSOR MOUNTING / CONSIDERATIONS

Pressure sensors can be mounted either in the open air or into the port of a pipe or other vessel. Piezoelectric pressure transducers are typically “face mount” or “shoulder mount” devices, depending on whether or not you want the sensor to protrude into your pipe or vessel. Sensor manufacturers offer a wide variety of adapters for different sizes, shapes, and threading, and they offer tools to create your own port. E-mail support@justmeasure.net and we can help you with that!

4. OPERATION OF SOFTWARE

You can double click the “4ch Dynamic Pressure Analyzer” link on your desktop or from Start Menu -> Programs -> JustMeasure. Once the software is launched, the next step is to provide a few parameters for the software to operate properly in this section:



“Start”

This will start sampling the pressure sensor, plotting the time trace and corresponding FFT simultaneously (up to 24,499Hz at 1Hz increments) every second.

NOTE: If the frequency content or average level of the signal has recently changed while operating, please give the FFT a few seconds to settle to ensure accurate results. The FFT uses exponential averaging, which takes into account the previous few seconds of data along with the most recent second of data. This is done to keep the signal from “jumping around”.

“Pause”

This will stop the sampling and hold the most recent second of data for your viewing pleasure on the screen. From here, you can hit “Start” again to re-start the acquisition and pause later, or you can hit “Export to Excel”. After the data is exported, you can re-start another measurement or exit.

“Max Level (Expected)”

Input the maximum dynamic levels you will need to measure in PSI. If you don’t know what kind of dynamic pressures to expect, try a test run using the maximum range of the pressure sensor you’ve chosen.

“Export to Excel”

This will automatically open Microsoft Excel (required on your PC) and populate the data results with the date / time, levels (in PSI) at every sample, and levels (in PSI RMS) at every frequency.

“Sampling Rate”

You have options of 100, 1000, 10000, 25000, and 50000 samples/sec. In every case you'll get the amplitudes of the measurement at 1Hz increments and updates of the graph every second. The higher sampling rates will only affect the maximum frequencies you can see. Each selection corresponds to a frequency reading a little less than half the value in Hz. For example, the 100 Samples / sec option will produce frequency information to 49Hz.

HINT: You can change the sampling rate after the “pause” button is hit and re-start the application to see a different frequency range

“Set Defaults”

This writes a small text file to your hard disk to permanently store your selections for the next time you run the software. For your convenience, you will not see any confirmation or response from pressing this button unless there are any problems or errors to report.

“1st, 2nd, 3rd, 4th Channel”

These represent the hardware channel of your data acquisition device. For example: You may have 20 pressure sensors attached to your National Instruments Data Acquisition device, and you only want to read 4 at a time in multiple passes. The software allows you to select the hardware channel so you don't have to physically disconnect and reconnect the sensors.

“Ch1, 2, 3, 4 Sensitivity”

You can input the sensitivity of the sensor (in mV/PSI), which will be provided on the calibration sheet from the manufacturer.

NOTE: The software will accept “sensitivity” values from 0.001mV/PSI (min) to 11,000 mV/PSI (max)

5. SUGGESTIONS FOR NATIONAL INSTRUMENTS HARDWARE

Precision Suggestion: The National Instruments USB-9233:

- Plugs into the USB port of a laptop or desktop PC – and no external power is required!
- Built in IEPE power to produce the DC excitation current so that you can hook it directly up to the pressure transducer
- Features BNC jacks on the front for simple connection to the sensor
- 108dB of dynamic range from 24-bit A/D converters to see background vibration levels even with large device vibration. This means you could record 50dB and 158dB, for example, on the same graph in the software.

- 6 gains built into device to zoom in on small vibration levels (preset before the “start” button is hit automatically based on the sensitivity and max. expected inputs)
- 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-6210:

- Plugs into any USB port of a laptop or desktop and does not require batteries or a separate power cord
- Features small screw terminals on the sides
- 90dB of dynamic range from a single 16-bit A/D converter.
- 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 excitation current to the piezoelectric pressure transducer: suggested model 480C02 from PCB Piezotronics – <http://www.pcb.com>) and a few extra cables (all included in this low-cost suggestion when purchased from our website)
- See Section 7 below for the proper wiring configuration for the sensor, excitation device, and National instruments device

NOTE: If you purchase the low-cost or precision bundle from our website, all cables and the device that provides excitation current (if necessary) will be supplied to you by JustMeasure.

6. ALL NATIONAL INSTRUMENTS DEVICES SUPPORTED

Table 1: All National Instruments Data Acquisition Devices Supported

Device	# of Ch's	Resolution / Gains	Current Excitation?	Example NI Cable	Example NI Connector Box	Wire Connections
PCI (goes inside Desktop PC)						
PCI-4462	4	24-bit / 6	Y	N/A	Built into Device	Group D
PCI-4472	8	24-bit / 1	Y	N/A	Built into Device	Group D
PCI-4474	4	24-bit / 1	Y	N/A	Built into Device	Group D
PCI-6110	4	12-bit / 8	N	SH68-68-EP	SCB-68	Group M
PCI-6111	2	12-bit / 8	N	SH68-68-EP	SCB-68	Group M
PCI-6115	4	12-bit / 8	N	SH68-68-EP	SCB-68	Group M
PCI-6120	4	16-bit / 8	N	SH68-68-EP	SCB-68	Group M
PCI-6122	4	16-bit / 4	N	SH68-68-EP	SCB-68	Group M
PCI-6123	8	16-bit / 4	N	SH68-68-EP	SCB-68	Group M
PCI-6133	8	14-bit / 4	N	SH68-68-EP	SCB-68	Group M
PCI-6143	8	16-bit / 1	N	SH68-68-EP	SCB-68	Group M
PCI-6010 (37-pin)	8	16-bit / 3	N	SH37F-37M-1	CB-37F-LP	Group C
PCI-6220	8	16-bit / 4	N	RC68-68	CB-68LP	Group M
PCI-6221 (68-pin)	8	16-bit / 4	N	RC68-68	CB-68LP	Group M
PCI-6221 (37-pin)	8	16-bit / 4	N	SH37F-37M-1	CB-37F-LP	Group C
PCI-6250	8	16-bit / 7	N	SHC68-68-EPM	SCB-68	Group M
PCI-6251	8	16-bit / 7	N	SHC68-68-EPM	SCB-68	Group M
PCI-6280	8	18-bit / 7	N	SHC68-68-EPM	SCB-68	Group M
PCI-6281	8	18-bit / 7	N	SHC68-68-EPM	SCB-68	Group M
PCI-6224	16	16-bit / 4	N	RC68-68, qty 2	CB-68LPR, qty 2	Group M2
PCI-6229	16	16-bit / 4	N	RC68-68, qty 2	CB-68LPR, qty 2	Group M2
PCI-6254	16	16-bit / 7	N	SHC68-68-EPM & SHC68-68	SCB-68, qty 2	Group M2
PCI-6259	16	16-bit / 7	N	SHC68-68-EPM & SHC68-68	SCB-68, qty 2	Group M2
PCI-6284	16	18-bit / 7	N	SHC68-68-EPM & SHC68-68	SCB-68, qty 2	Group M2
PCI-6289	16	18-bit / 7	N	SHC68-68-EPM & SHC68-68	SCB-68, qty 2	Group M2
PCI-6225	40	16-bit / 4	N	RC68-68, qty 2	CB-68LP, qty 2	Group H
PCI-6255	40	16-bit / 7	N	RC68-68, qty 2	CB-68LP, qty 2	Group H
PCI-6013	8	16-bit / 4	N	R6868	CB-68LPR	Group M
PCI-6014	8	16-bit / 4	N	R6868	CB-68LPR	Group M
PCI-6023E	8	12-bit / 4	N	R6868	CB-68LPR	Group M
PCI-6024E	8	12-bit / 4	N	R6868	CB-68LPR	Group M
PCI-6036E	8	16-bit / 4	N	R6868	CB-68LPR	Group M
PCI-6030E	8	16-bit / 14	N	SH68-68-EP	SCB-68	Group M
PCI-6032E	8	16-bit / 14	N	SH68-68-EP	SCB-68	Group M
PCI-MIO-	8	16-bit / 8	N	SH68-68-EP	SCB-68	Group M

16XE-50						
PCI-6040E	8	12-bit / 15	N	R6868	CB-68LP	Group M
PCI-6052E	8	16-bit / 15	N	SH68-68-EP	CB-68LPR	Group M
PCI-6070E	8	12-bit / 15	N	SH68-68-EP	SCB-68	Group M
PCI-6031E	32	16-bit / 14	N	SH1006868	SCB-68, qty 2	Group H
PCI-6033E	32	16-bit / 14	N	SH1006868	SCB-68, qty 2	Group H
PCI-6071E	32	12-bit / 15	N	SH1006868	CB-68LP	Group H
PCMCIA Devices (for Laptop PC):						
DAQCard-6024E	8	12-bit / 4	N	RC68-68	CB-68LPR	Group M
DAQCard-6036E	8	16-bit / 4	N	RC68-68	CB-68LPR	Group M
DAQCard-6062E	8	12-bit / 4	N	RC68-68	CB-68LPR	Group M
USB-Powered Devices:						
USB-6210	8	16-bit / 4	N	None Required	Built into Device	Group U
USB-6211	8	16-bit / 4	N	None Required	Built into Device	Group U
USB-6221	8	16-bit / 4	N	None Required	Built into Device	Group UM
USB-6229	16	16-bit / 4	N	None Required	Built into Device	Group UM
USB-6251	8	16-bit / 7	N	None Required	Built into Device	Group UM
USB-6259	16	16-bit / 7	N	None Required	Built into Device	Group UM
USB-9215A	4	16-bit / 1	N	None Required	Built into Device	Group UQ
USB-9215A (USB)	4	16-bit / 1	N	None Required	Built into Device	Group D
USB-9233	4	24-bit / 1	Y	None Required	Built into Device	Group D

NOTE: For more information on the specific devices, visit <http://sine.ni.com/manuals> and type in the exact model from the first column of Table 1 (above) into the search field on that website.

7. CABLES / WIRING FOR NATIONAL INSTRUMENTS DEVICES

STEP 1: DETERMINE HOW EXCITATION IS PROVIDED

The column in Table 1 labeled “Excitation Current?” indicates whether or not the NI Device supplies the required current between 2mA and 20mA to the pressure transducer automatically.

If “Y”: The excitation is provided automatically and only a single cable is required (typically provided by the accelerometer manufacturer) from the sensor direct to the National instruments device. The BNC or SMB connectors on the front of the National Instruments device are clearly marked with channel numbers and correspond to the channels in your JustMeasure software application.

If “N”: You have to supply a separate device that provides the excitation current. The Model 480C02 from PCB Piezotronics is the recommended device for each channel. This device is included in the low-cost bundle from the JustMeasure website. It has 2 BNC jacks: One for the sensor input and one for the output to the National Instruments device. The manufacturer of the pressure transducer can provide the proper cable from the sensor to the “Sensor” input BNC jack. The “Output” BNC jack on this device will need a cable from the BNC jack to 2 bare wires: one for “signal”, and one for “ground”. The one exception is if you’ve purchased the USB-9215A, in which case you just need a cable with BNC plugs on both sides to connect the excitation device (model 480C02 1 ea per channel) to the National Instruments device.

NOTE: If you purchase the low-cost or precision bundle from our website, all cables and the device that provides excitation current (if necessary) will be supplied to you.

STEP 2: DETERMINE THE PROPER NI CABLE AND SCREW TERMINAL BOX

You will need a cable from National Instruments that matches that device and a screw terminal box with the screw terminals inside (see suggestions for each device in Table 1 above). The screw terminals in the connector box will be assigned numbers. These numbers DO NOT correspond to the “channel” input in the software!

STEP 3: DETERMINE WHICH SCREW TERMINALS TO USE

Use table 1 (above) to find the correct group for you your National Instruments device. Then, use Table 2 below to determine the appropriate screw terminals for the “signal” and “ground” wires coming out of the current excitation device.

NOTE: If your device is in Group D, the connections are self-explanatory and they won’t be in the table below. The inputs are BNC or SMB connectors and are clearly labeled with the appropriate channel numbers. These numbers are the ones you’ll use in the “1st, 2nd, 3rd, and 4th Channel” inputs in your software.

Table 2: Wire Connections for NI Devices

Group M		
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

Group C		
Software Channel	Signal	Ground
0	1	20
1	21	2
2	22	4
3	5	23
4	6	25
5	26	7
6	27	9
7	28	10

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

Group U		
Software Channel	Signal	Ground
0	15	16
1	17	18
2	19	20
3	21	22
4	24	25
5	26	27
6	29	30
7	31	32

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

Connector 1		
8	68	34
9	33	67
10	32	66
11	65	31
12	30	64
13	29	63
14	62	28
15	27	61
16	26	60
17	59	25
18	24	58
19	23	57
20	55	21
21	20	54
22	19	53
23	52	18
24	17	51
25	16	50
26	49	15
27	14	48
28	13	47
29	46	12
30	11	45
31	10	44
32	42	8
33	7	41
34	6	40

Group M2		
Software Channel	Signal	Ground
Connector 0		
0	68	34
1	33	66
2	65	31
3	30	63
4	28	61
5	60	26
6	25	58
7	57	23
Connector 1		
8	68	34
9	33	66
10	65	31
11	30	63
12	28	61
13	60	26
14	25	58

Group UM		
Software Channel	Signal	Ground
0	1	2
1	4	5
2	7	8
3	10	11
4	17	18
5	20	21
6	23	24
7	26	27
8	33	34
9	36	37
10	39	40
11	42	43
12	49	50

13	52	53
14	55	56
15	58	59

15	57	23
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35	39	5
36	4	38
37	3	37
38	36	2
39	1	35

8. PC REQUIREMENTS:

Software:

- Windows 2000/XP/Vista
- Microsoft Excel 2000 or later
- Adobe Acrobat Reader v6 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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