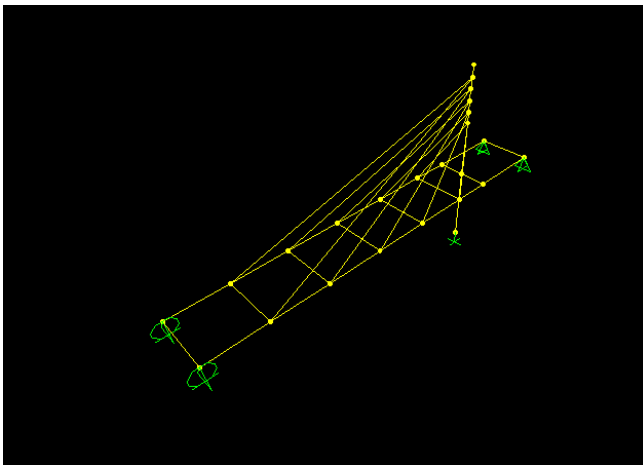
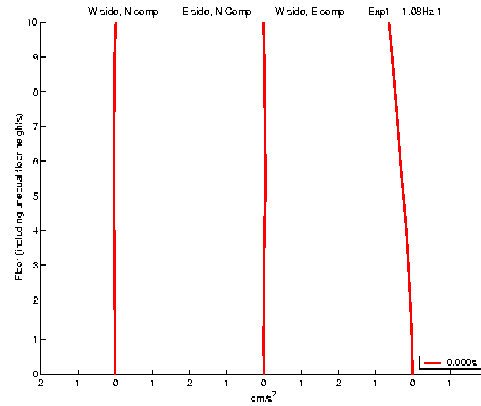


# Structural Identification Project



# Crossbow AD2012 Datalogger

(<http://xbow.com>)

**Provides power for the sensors & performs the analog to digital conversion.**



**12-bit A/D Converter**  
**8 Analog Inputs**

**Capable of Storing 540,000 Samples**  
**Configurable Sampling Rate (1 – 500 Hz)**

# Crossbow CXL01L1 and CXL02L1 Accelerometers

(<http://xbow.com>)



**Measurement Direction**

## CXL01L1 Capacitive Accelerometers

**$\pm 1.25$  g Measurement Range**

**DC – 100 Hz Measurement Range**

**0.000610 g Resolution on Channels 1-4**

**0.001221 g Resolution on Channels 5-8**

## CXL02L1 Capacitive Accelerometers

**$\pm 2.50$  g Measurement Range**

**DC – 100 Hz Measurement Range**

**0.001221 g Resolution on Channels 1-4**

**0.002441 g Resolution on Channels 5-8**

# Field-Testing

Using the Datalogger and accelerometers, you will need to go and record acceleration time histories at various locations on your structure.

You will need to choose these locations carefully (allowing you to capture the 1<sup>st</sup> couple of modes).

Once you have recorded your data, you will need to bring the datalogger back to the IT lab (SERF 154) and download the data.

We will then save the acceleration time histories onto a CD allowing you to perform the structural identification on your own.

# Checking In and Out the Equipment

As there is only one set of testing equipment, we will set up a series of time slots. Each group will sign up for one of these and will be expected to do their testing during this time. If more time is needed, you may either trade times with another group or try to find and unused time slot.

Each group will be responsible for checking in the equipment before it is due back. This will allow us to service the equipment and ensure that everything is working for the next group.

**Any data left on the datalogger will be erased once it is returned.**

**In order to allow sufficient time for analysis, all testing must be completed by February 28. The equipment cannot be checked out after this date!!!**

# One possibility: make the equipment available in 3 hour blocks

	Monday	Tuesday	Wednesday	Thursday	Friday
9:00 am-12:00 pm					
12:00 pm -3:00 pm					
3:00 pm -6:00 pm					

## SERF Building Rm. 154



## Crossbow AD2012 Datalogger



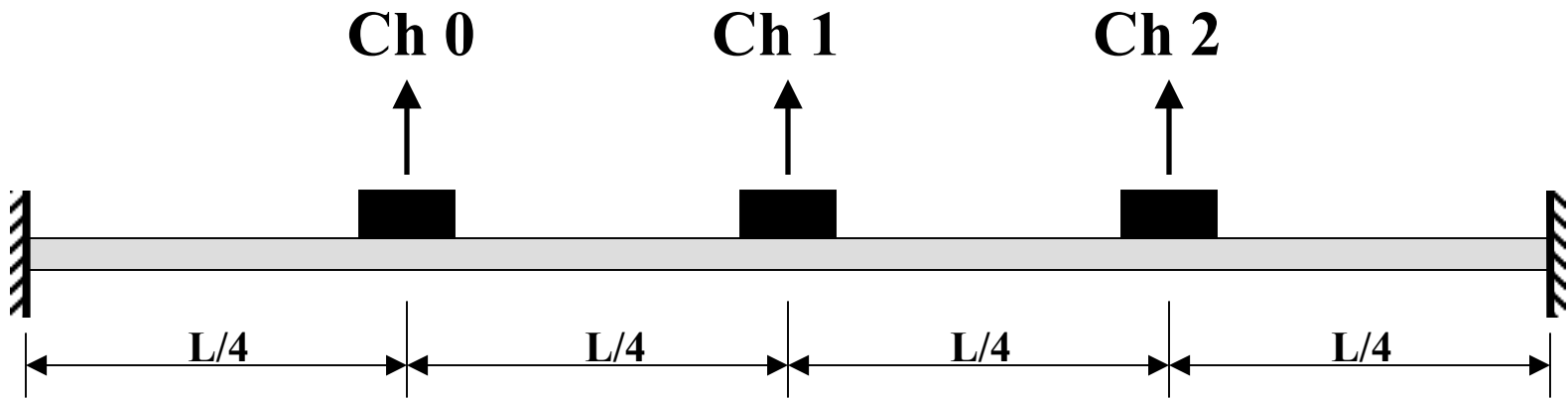
## Canon A40 PowerShot Digital Camera



## Crossbow CXL01L1 Accelerometer

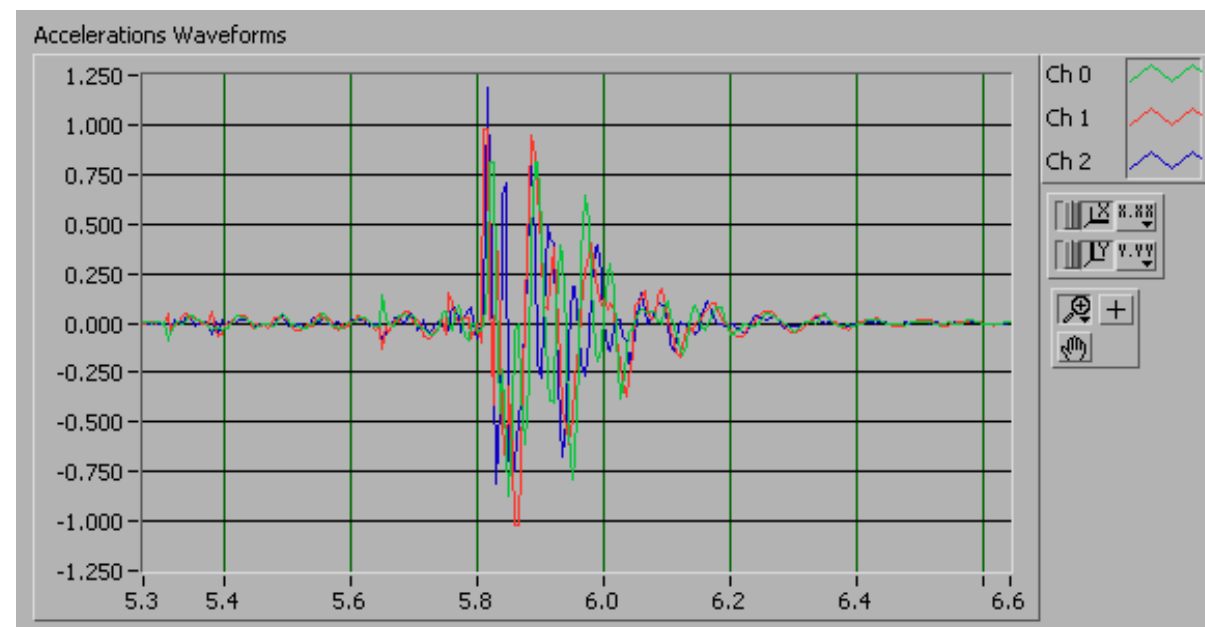
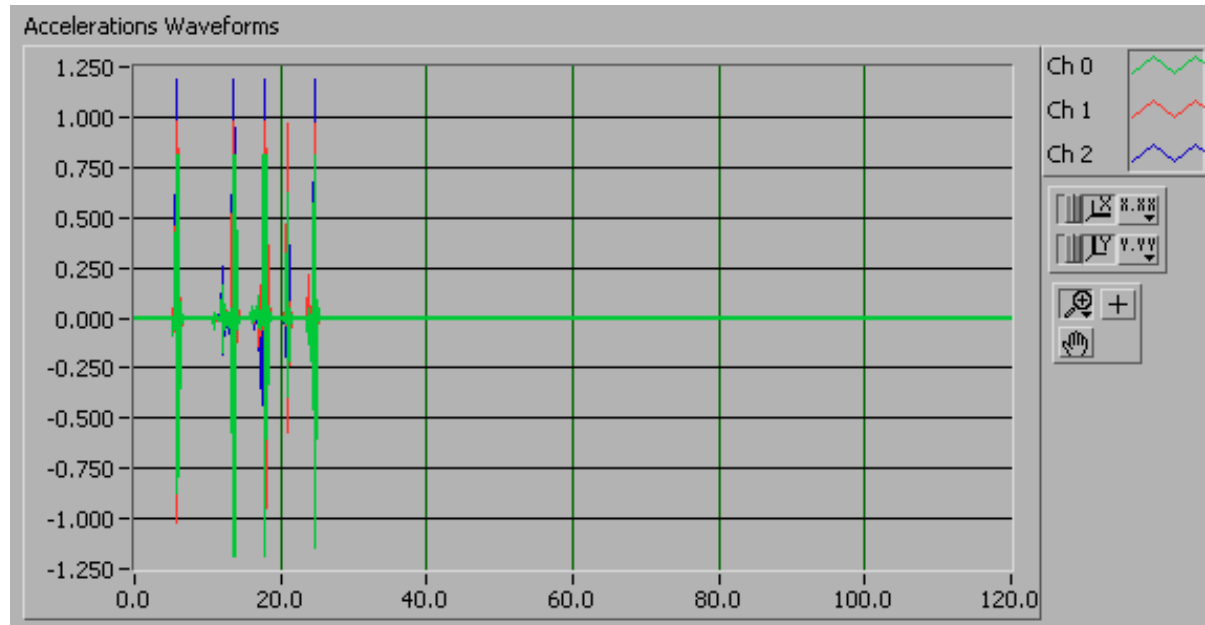


# Example





# Time Domain Data



# Structural Identification Tools

The Fast Fourier Transform (FFT) and the Power Spectrum are powerful tools for analyzing and measuring signals.

FFTs and the Power Spectrum are useful for measuring the frequency content of stationary or transient signals. FFTs produce the average frequency content of a signal over the entire time that the signal was acquired.

Note: the frequency resolution  $\Delta f = \frac{1}{N \cdot \Delta t}$

where, N is in the number of samples and  $\Delta t$  is the time increment.

**Additional Resource:** [http://zone.ni.com/devzone/conceptd.nsf/webmain/C045A890751303A6862568650061EA98/\\$File/AN041.pdf](http://zone.ni.com/devzone/conceptd.nsf/webmain/C045A890751303A6862568650061EA98/$File/AN041.pdf)

# Power Spectrum

The power spectrum shows power as the mean squared amplitude at each frequency line but includes no phase information.

Because the power spectrum loses phase information, you may want to use the FFT to view both the frequency and the phase information of a signal.

The units of a power spectrum are often referred to as quantity squared rms, where quantity is the unit of the time-domain signal.

## Fourier Transform

The FFT returns a two-sided spectrum in complex form (real and imaginary parts), which you must scale and convert to polar form to obtain magnitude and phase. The frequency axis is identical to that of the two-sided power spectrum. The amplitude of the FFT is related to the number of points in the time-domain signal.

The phase information the FFT yields is the phase relative to the start of the time-domain signal. For this reason, you must trigger from the same point in the signal to obtain consistent phase readings. In many cases, your concern is the relative phases between components, or the phase difference between two signals acquired simultaneously.

## Cross Power Spectrum

The cross power spectrum is a useful tool for determining the phase difference between two signals.

The two-sided cross power spectrum of two time-domain signals A and B is computed as:

$$\text{Cross Power Spectrum } S_{AB}(f) = \frac{\text{FFT}(B) \times \text{FFT}^*(A)}{N^2}$$

**These operations can be done in:**

**Matlab**

**LabVIEW**

**Excel**

**Fortran**

# Matlab

Type “help fft”

The screenshot shows the MATLAB environment with the following components:

- Launch Pad:** A tree view of toolboxes including MATLAB, Communications Toolbox, Control System Toolbox, Data Acquisition Toolbox, Database Toolbox, Datafeed Toolbox, Filter Design Toolbox, Financial Derivatives Toolbox, Financial Time Series Toolbox, Financial Toolbox, Fuzzy Logic Toolbox, GARCH Toolbox, Image Processing Toolbox, Instrument Control Toolbox, and LMI Control Toolbox.
- Command History:** Shows the command `help fft` entered at 11:58 AM on 2/10/03.
- Command Window:** Displays the help text for the `fft` function.
 

To get started, select “MATLAB Help” from the Help menu.

FFT Discrete Fourier transform.

FFT(X) is the discrete Fourier transform (DFT) of vector X. For matrices, the FFT operation is applied to each column. For N-D arrays, the FFT operation operates on the first non-singleton dimension.

FFT(X,N) is the N-point FFT, padded with zeros if X has less than N points and truncated if it has more.

FFT(X,[],DIM) or FFT(X,N,DIM) applies the FFT operation across the dimension DIM.

For length N input vector x, the DFT is a length N vector X, with elements

$$X(k) = \sum_{n=1}^N x(n) \exp(-j*2*\pi*(k-1)*(n-1)/N), \quad 1 \leq k \leq N.$$

The inverse DFT (computed by IFFT) is given by

$$x(n) = (1/N) \sum_{k=1}^N X(k) \exp(j*2*\pi*(k-1)*(n-1)/N), \quad 1 \leq n \leq N.$$

The relationship between the DFT and the Fourier coefficients a and b in  $N/2$

$$x(n) = a_0 + \sum_{k=1}^{N/2} a(k) \cos(2*\pi*k*t(n)/(N*dt)) + b(k) \sin(2*\pi*k*t(n)/(N*dt))$$

is

$$a_0 = X(1)/N, \quad a(k) = 2*\text{real}(X(k+1))/N, \quad b(k) = -2*\text{imag}(X(k+1))/N,$$

where x is a length N discrete signal sampled at times t with spacing dt.

See also IFFT, FFT2, IFFT2, FFTSHIFT.

Overloaded methods  
help qfft/fft.m



# LabVIEW

Context Help

restart averaging (F)      averaging done  
time signal                  magnitude  
window                      phase  
view                          averages completed  
error in                      error out  
averaging parameters

**FFT Spectrum (Mag-Phase).vi**

Computes the averaged FFT spectrum of the input signal. FFT results are returned as magnitude and phase. Each time waveform corresponds to a single FFT block and has to be passed individually to this VI. Averaging parameters specifies how the averaging is performed. This includes the averaging mode (No averaging, vector averaging, RMS averaging, or peak hold), the weighting mode (linear or exponential), and the number of averages. Averages completed returns the number of averages completed so far. The view cluster allows you to display magnitude results in decibels, and the phase results unwrapped or not, in radians or degrees.

[Click here for more help.](#)

Context Help

restart averaging (F)      averaging done  
time signal                  power spectrum  
window                      averages completed  
dB On (F)                    error out  
error in  
averaging parameters

**FFT Power Spectrum.vi**

Computes the averaged auto power spectrum of the input signal. Each time waveform corresponds to a single FFT block and has to be passed individually to this VI. Averaging parameters specifies how the averaging is performed. This includes the averaging mode (No averaging, vector averaging, RMS averaging, or peak hold), the weighting mode (linear or exponential), and the number of averages. Averages completed returns the number of averages completed so far.

[Click here for more help.](#)

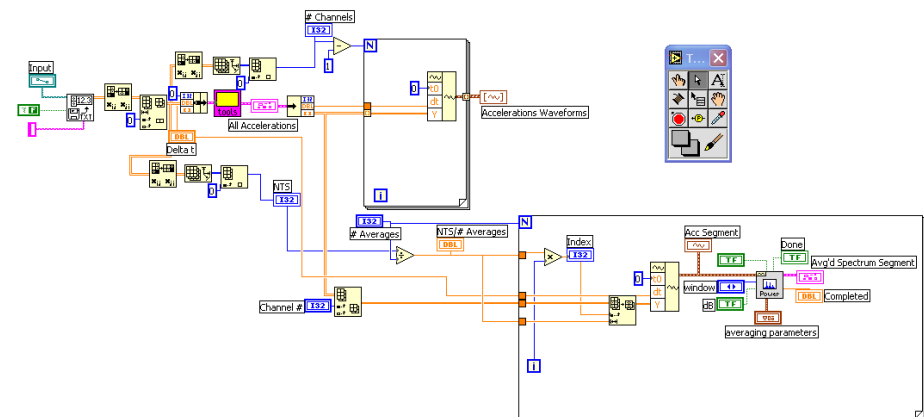
Context Help

restart averaging (F)      averaging done  
time signal X                magnitude  
time signal Y                phase  
window                      averages completed  
view                          error out  
error in  
averaging parameters

**Cross Spectrum (Mag-Phase).vi**

Computes the averaged cross power spectrum of the input signals. Typically, X signal is the stimulus, and Y signal is the response of the system. Results are returned as magnitude and phase. Each time waveform corresponds to a single FFT block and has to be passed individually to this VI. Averaging parameters specifies how the averaging is performed. This includes the averaging mode (No averaging, vector averaging, or RMS averaging), the weighting mode (linear or exponential) and the number of averages. Averages completed returns the number of averages completed so far. The view cluster allows you to display magnitude results in decibels, and the phase results unwrapped or not, in radians or degrees.

[Click here for more help.](#)





# Excel

This operation requires the Analysis ToolPak

The screenshot shows the Microsoft Excel Help window. On the left, there is a search interface with the following steps:

- Type keywords: A text box contains "Fourier". Below it are "Clear" and "Search" buttons.
- Or choose keywords: A list box contains the following items: accelerator, add, add-in, adjunct\_program, alteration, analysis, area. The "analysis" item is selected.
- Choose a topic (1 found): A list box contains "Fourier Analysis tool", which is selected.

The main content area displays the "Fourier Analysis tool" help page. It includes the following text:

**Fourier Analysis tool**

This tool is a part of the Analysis ToolPak. For information about how to install and use the Analysis ToolPak, click [?>](#).

This analysis tool solves problems in linear systems and analyzes periodic data by using the Fast Fourier Transform (FFT) method to transform data. This tool also supports inverse transformations, in which the inverse of transformed data returns the original data. For more information about options in the **Fourier Analysis** dialog box, click [?>](#).

Below the text is a table with two columns: "Input range" and "Output table".

	Input range	Output table
Time	Frequency	
Domain	Domain	
Data	Output	
1:	3:	
1:	1.707106789-1.707106789i	
1:	-1	
0:	0.292893231+0.292893231i	
0:		1:

Below the table, there is a section titled "Additional resources".



# Fortran (or similar)

```
1      program main
2      C MAIN PROGRAM CALLS SUBROUTINE FFT WHICH IS FROM
3      C JOHN F. HALL (1982). "AN FFT ALGORITHM FOR STRUCTURAL DYNAMICS",
4      C EARTHQUAKE ENGINEERING AND STRUCTURAL DYNAMICS, VOL.10, PP.797-81
5          DIMENSION a(33000)
6          INTEGER power,n,nn
7          open(10,file='acc.txt',
8      &      status='old')
9          open(20,file='fft.txt',
10     &      status='unknown')
11         n=0
12         a=0.0
13         DO WHILE (.NOT. EOF(10))
14             n = n + 1
15             read(10,*) time,a(n)
16             if (n.eq.1) time1 = time
17             if (n.eq.2) time2 = time
18         END DO
19         dt = time2 - time1
20         if (MOD(n, 2)/=0) then
21             n = n+1
22         endif
23         nn = 2
24         power = 1
25         DO WHILE (nn < n)
26             nn = 2*nn
27             power = power + 1
28         END DO
29         L=2; M = power-1;
30         CALL FFT(a,M,L,0,0,1.0 )
31         df = 1/(nn*dt)
32         f=0.0; amplitude=abs(a(1)); phase_angle = ATAN2D(0.,a(1))
33         write(20,100) f, amplitude, phase_angle
34
35     .
36     .
37     .
```

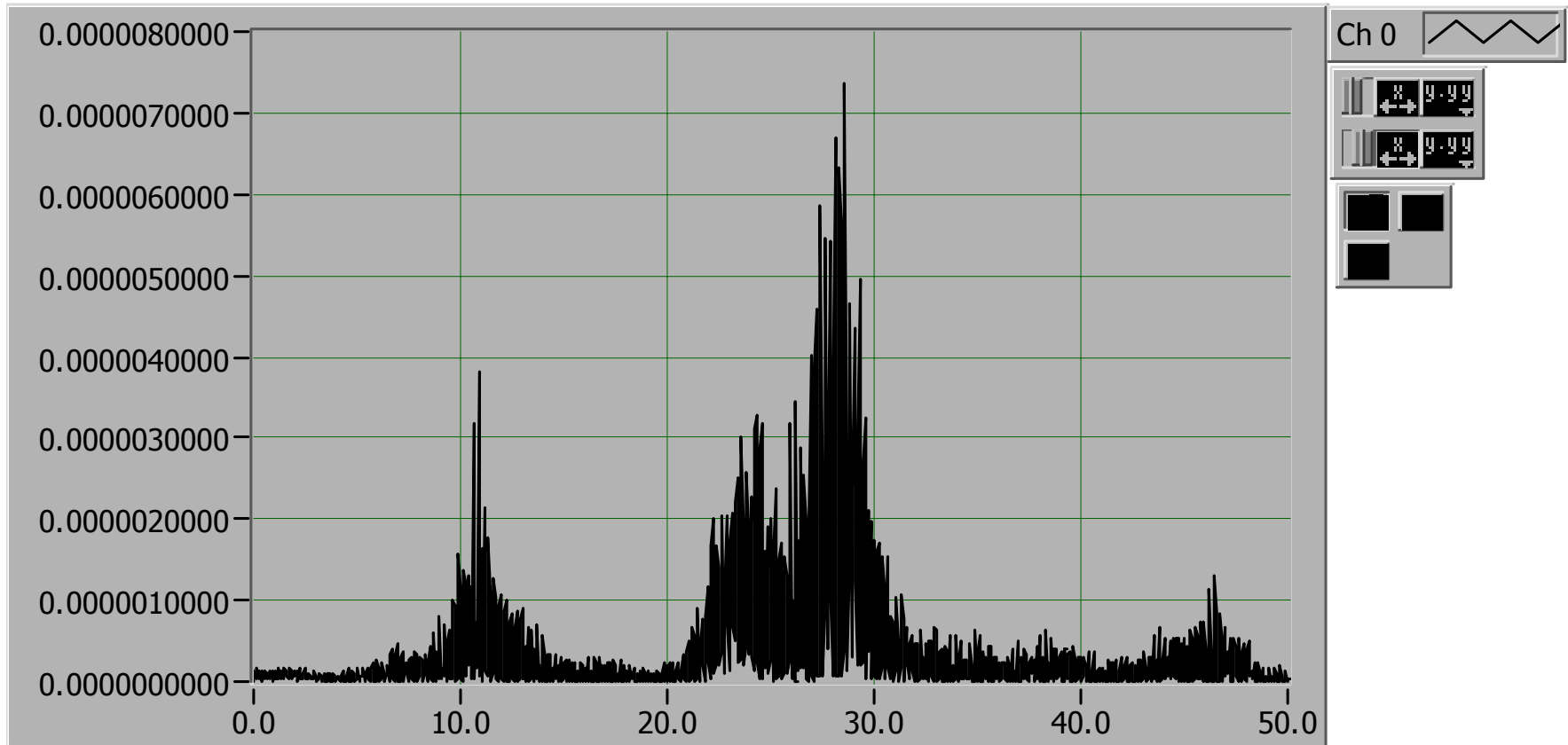
For more information see:

John F. Hall (1982). "AN FFT ALGORITHM FOR STRUCTURAL DYNAMICS", EARTHQUAKE ENGINEERING AND STRUCTURAL DYNAMICS, VOL.10, PP.797-811.



# Example: Power Spectrum

Power Spectrum



# Averaging

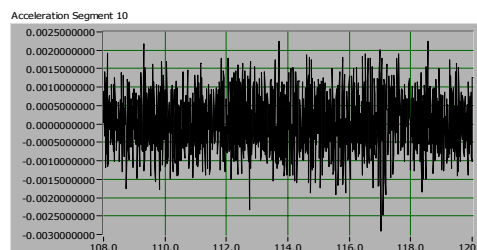
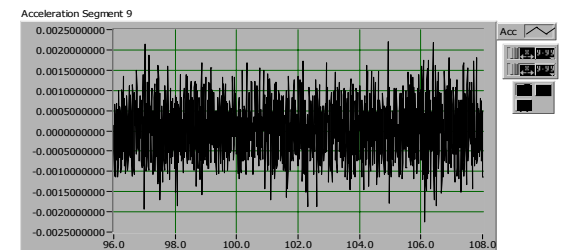
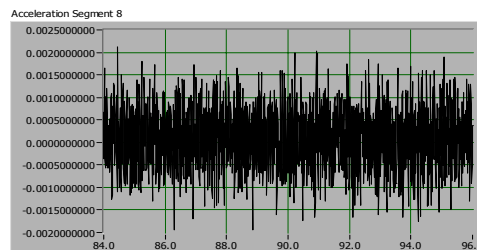
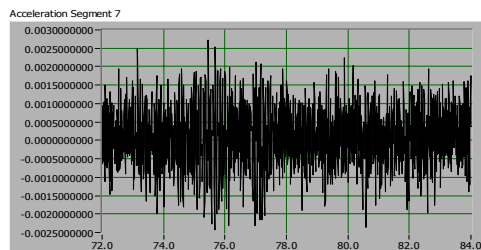
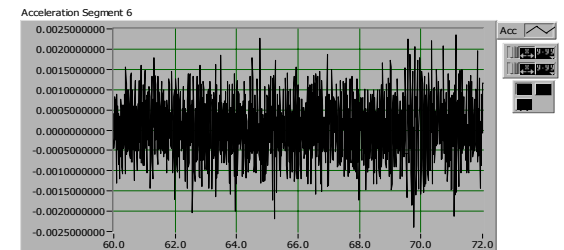
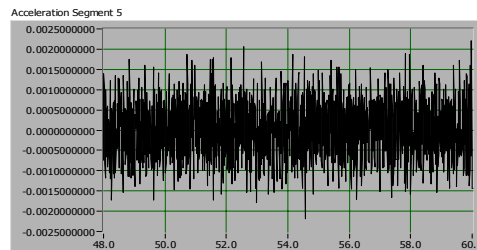
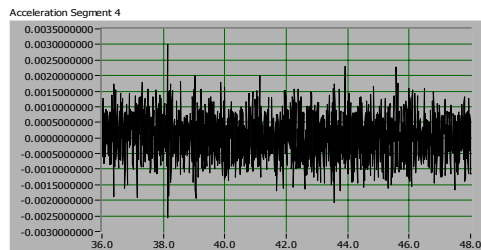
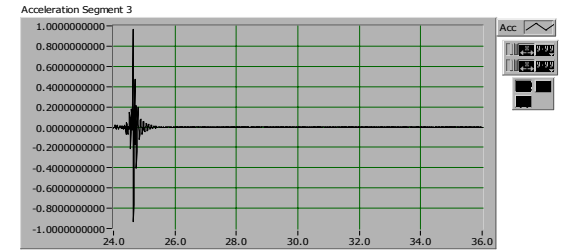
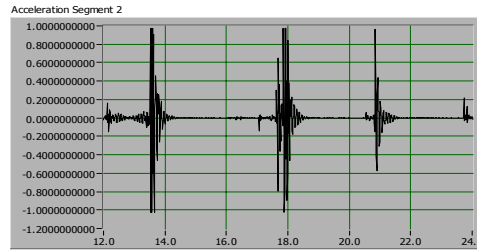
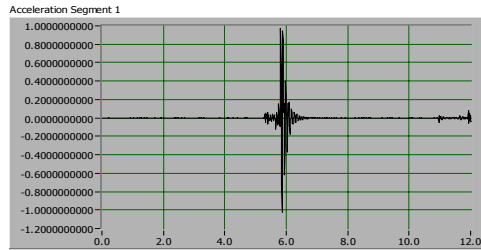
**To smooth the spectrum, we need to average the data.**

**This can be done by:**

- 1. Splitting the time history into a number of equally sized segments.**
- 2. Performing an FFT (or Cross Spectrum) on each of the segments.**
- 3. Averaging each of these segments (Magnitude & Phase).**  
Start by converting to complex form (Real and Imaginary). Then sum the two real components at each increment of frequency and then divide by the number of averages. Do the same for the imaginary. When you are done, convert back to magnitude and phase.

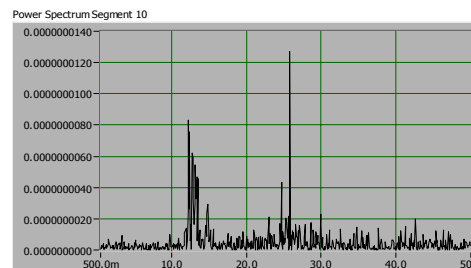
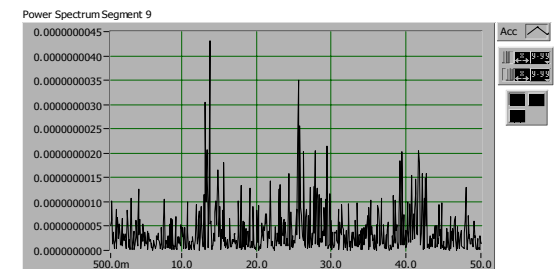
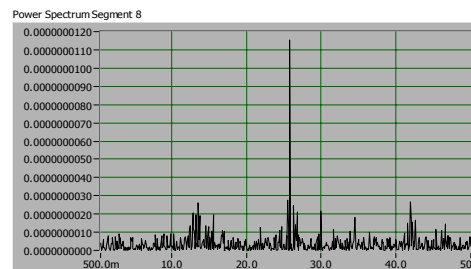
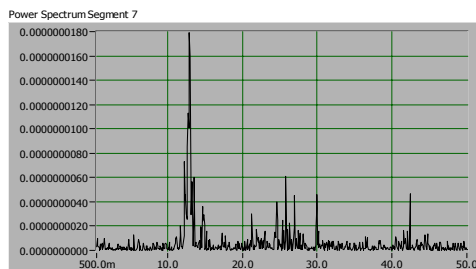
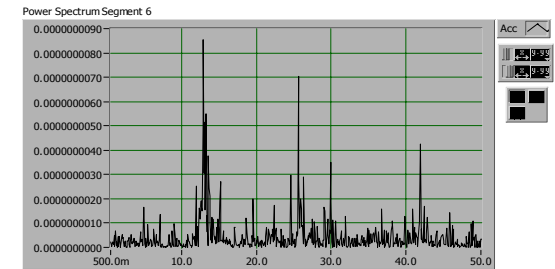
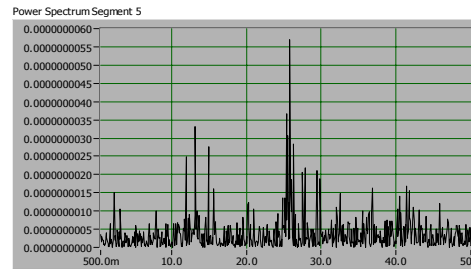
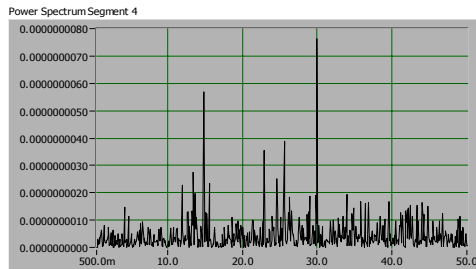
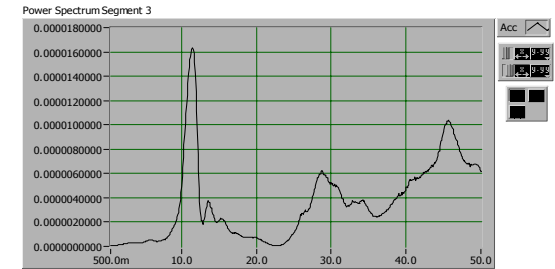
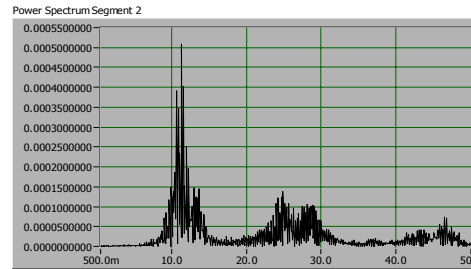
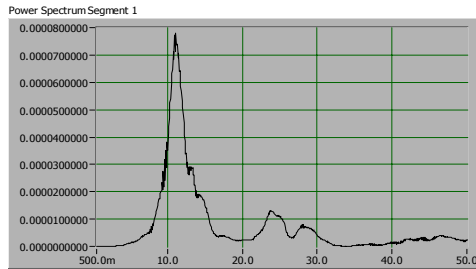
# For our beam example:

1. Split the time history into 10 segments each 12 seconds long.



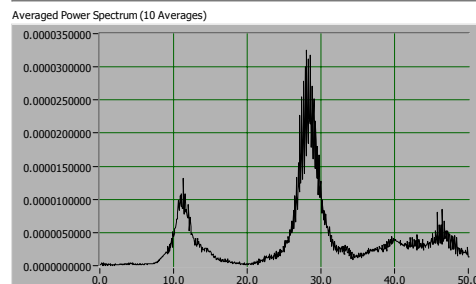
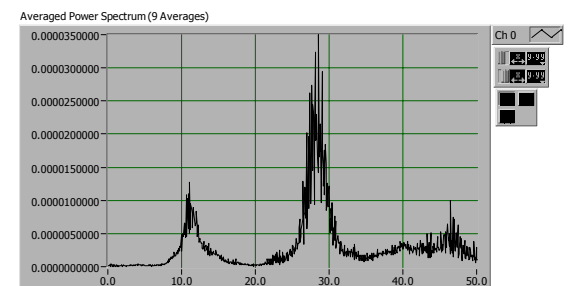
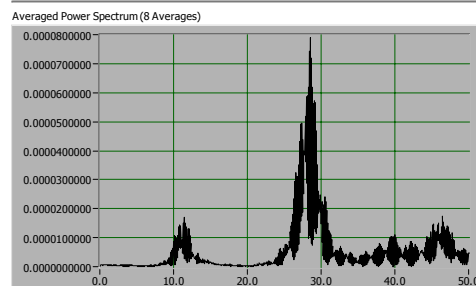
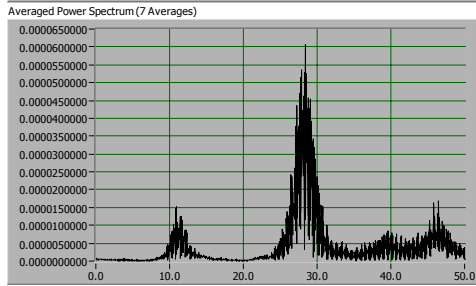
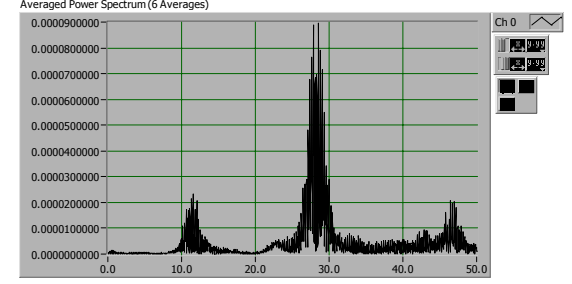
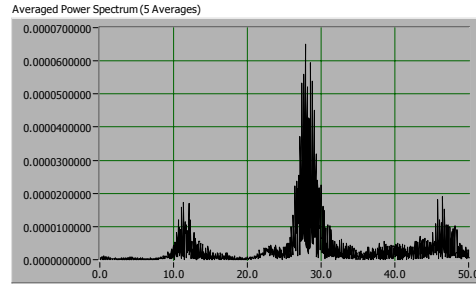
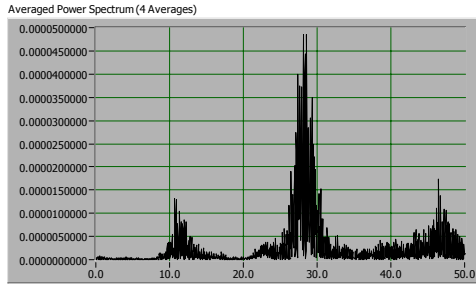
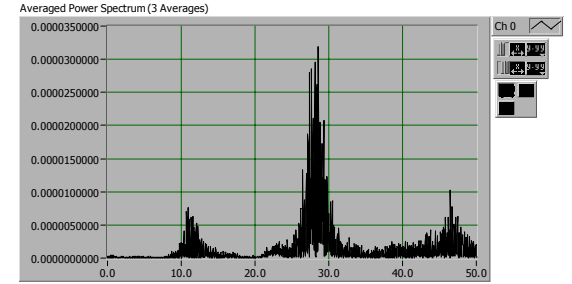
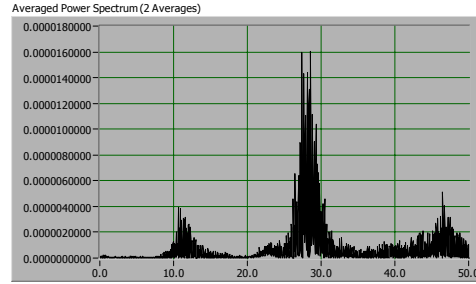
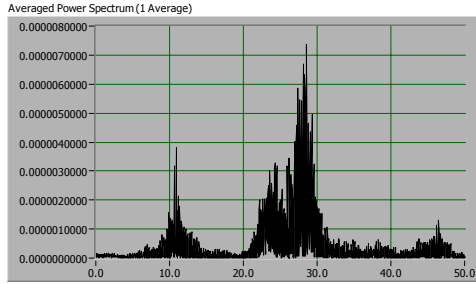
# For our beam example:

## 2. Perform the Power Spectrum on each of the segments.



# For our beam example:

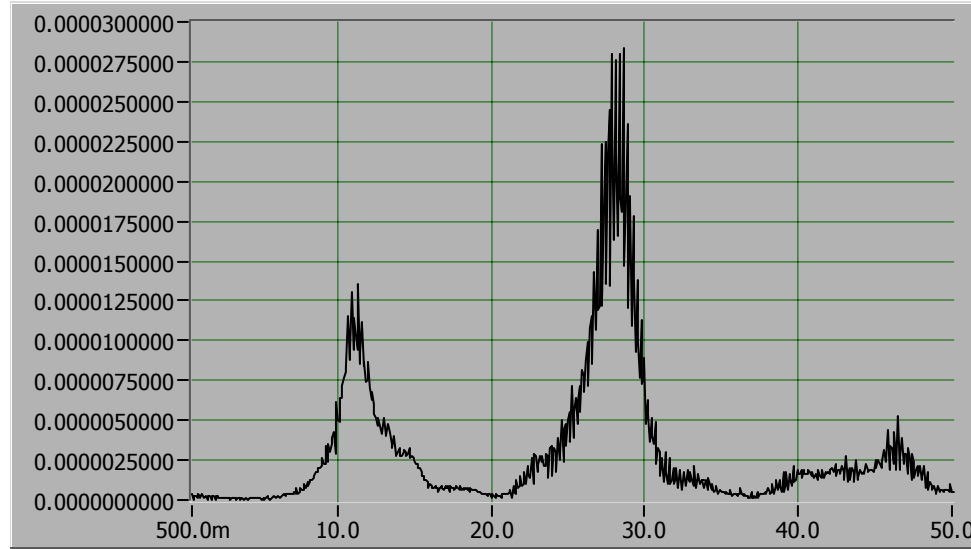
## 3. Average each of the segments



Do the Same for the  
Phase Angle

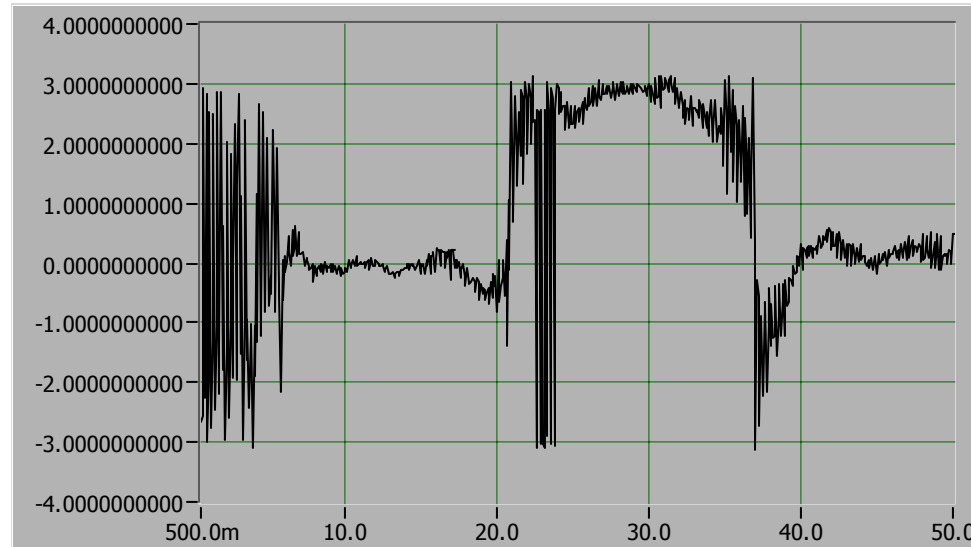
# Cross Spectrum Channels 0 & 2

Magnitude



Magnitude

Phase Angle

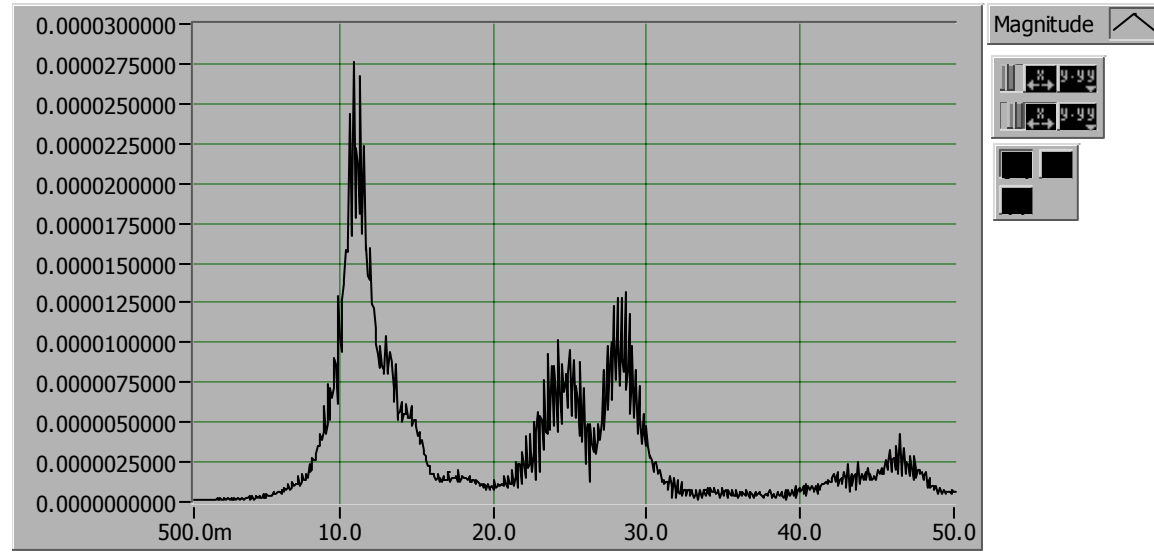


Phase Angle

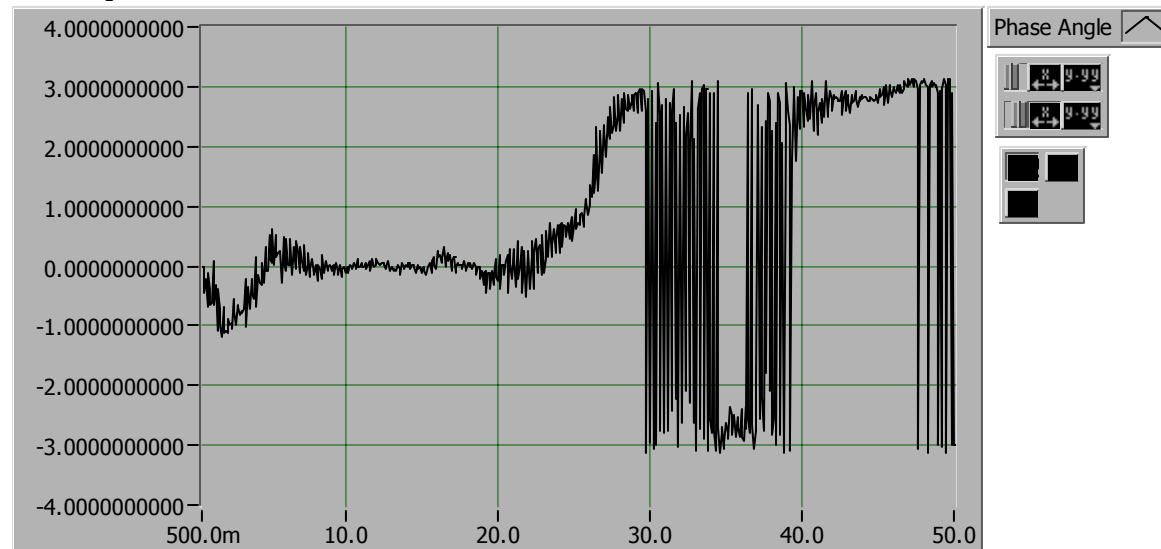


# Cross Spectrum Channels 0 & 1

Magnitude



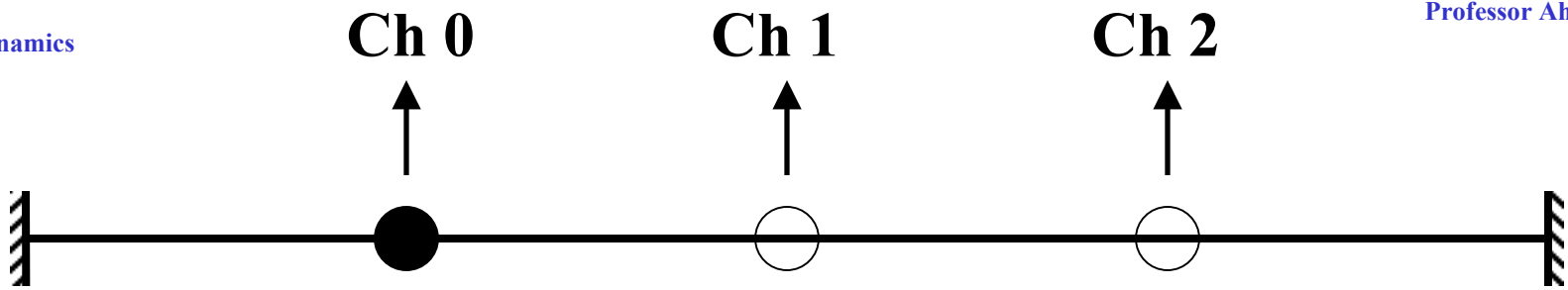
Phase Angle



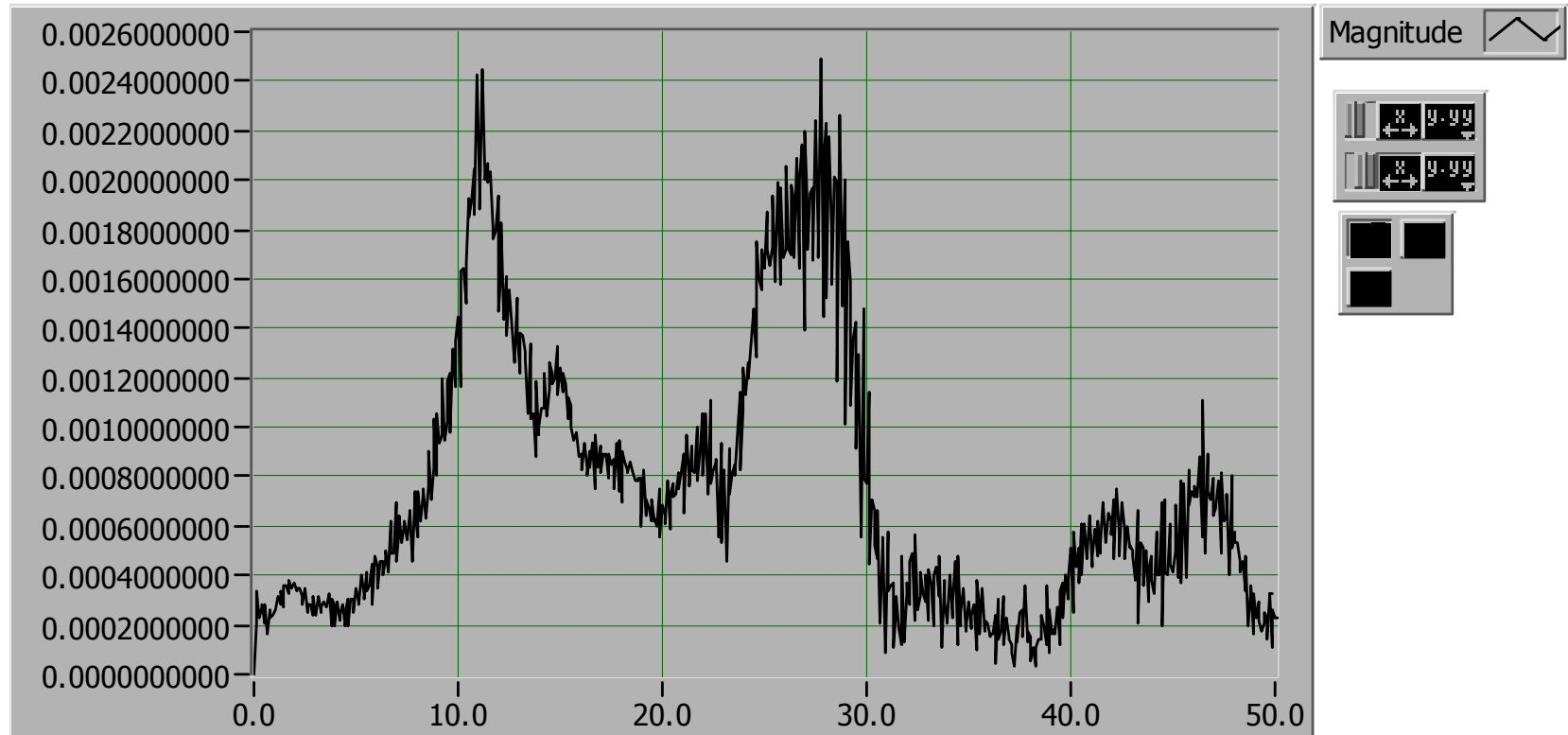
# Construct the Mode Shapes

- 1. From the Magnitude, determine the relative amplitude.**
- 2. From the Phase Angle, determine the sign.**

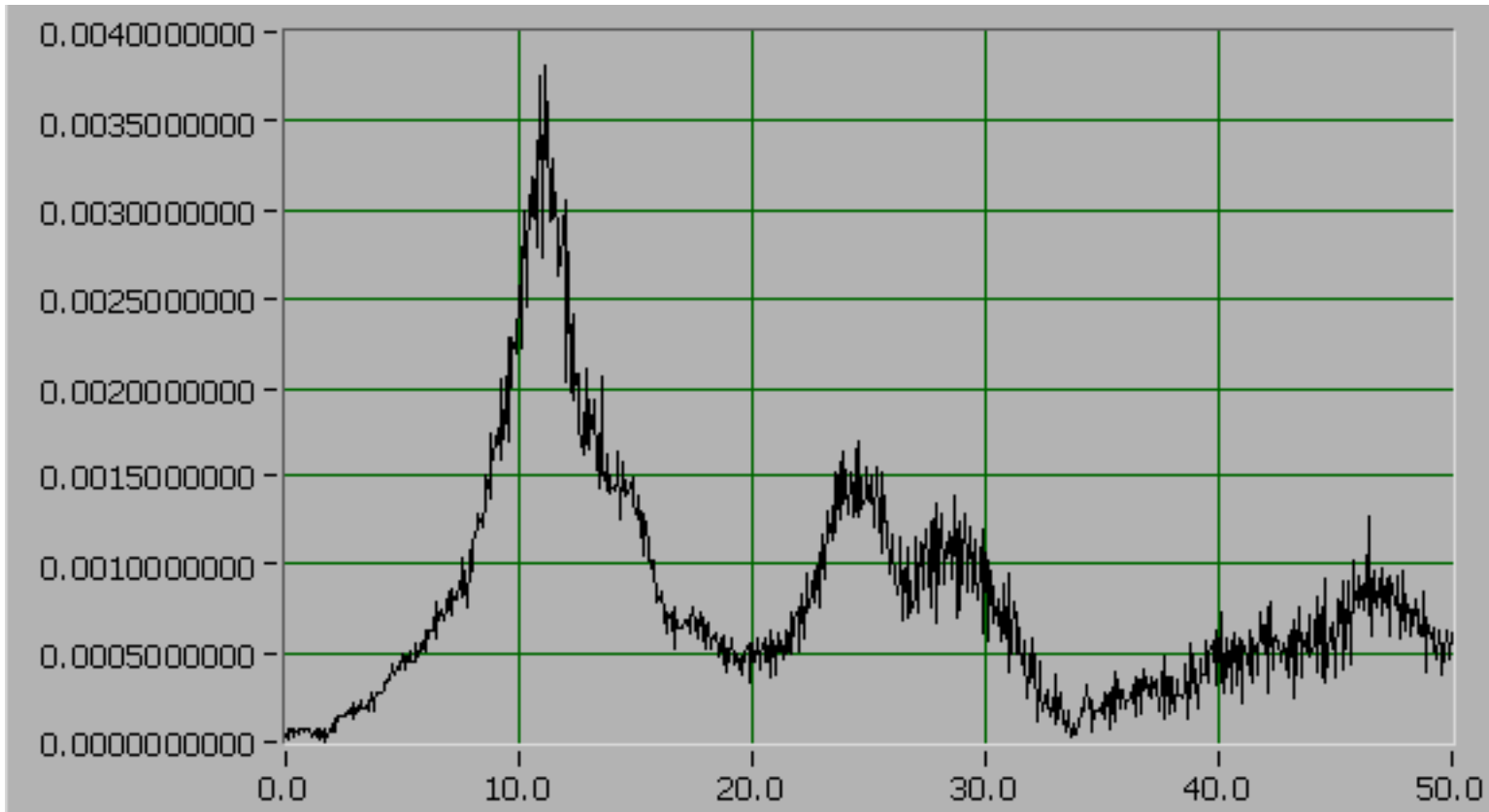
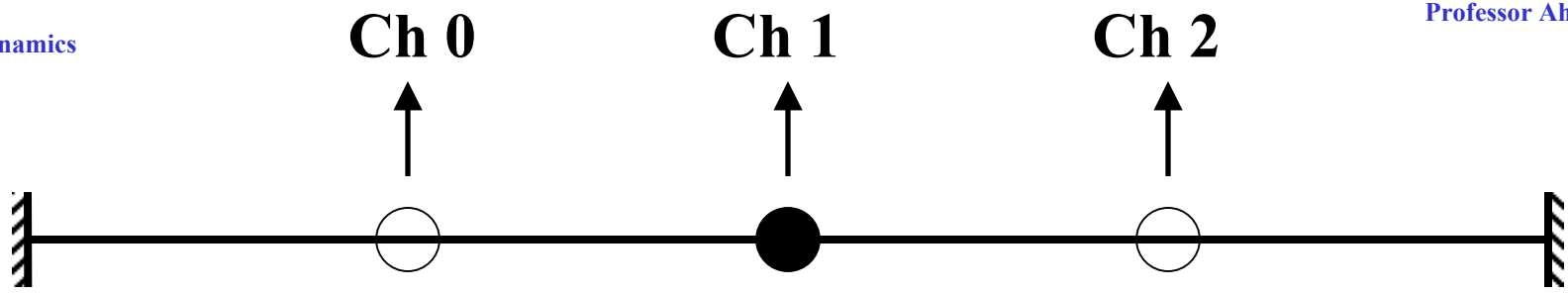
**For our example, let's start with the 1<sup>st</sup> mode**



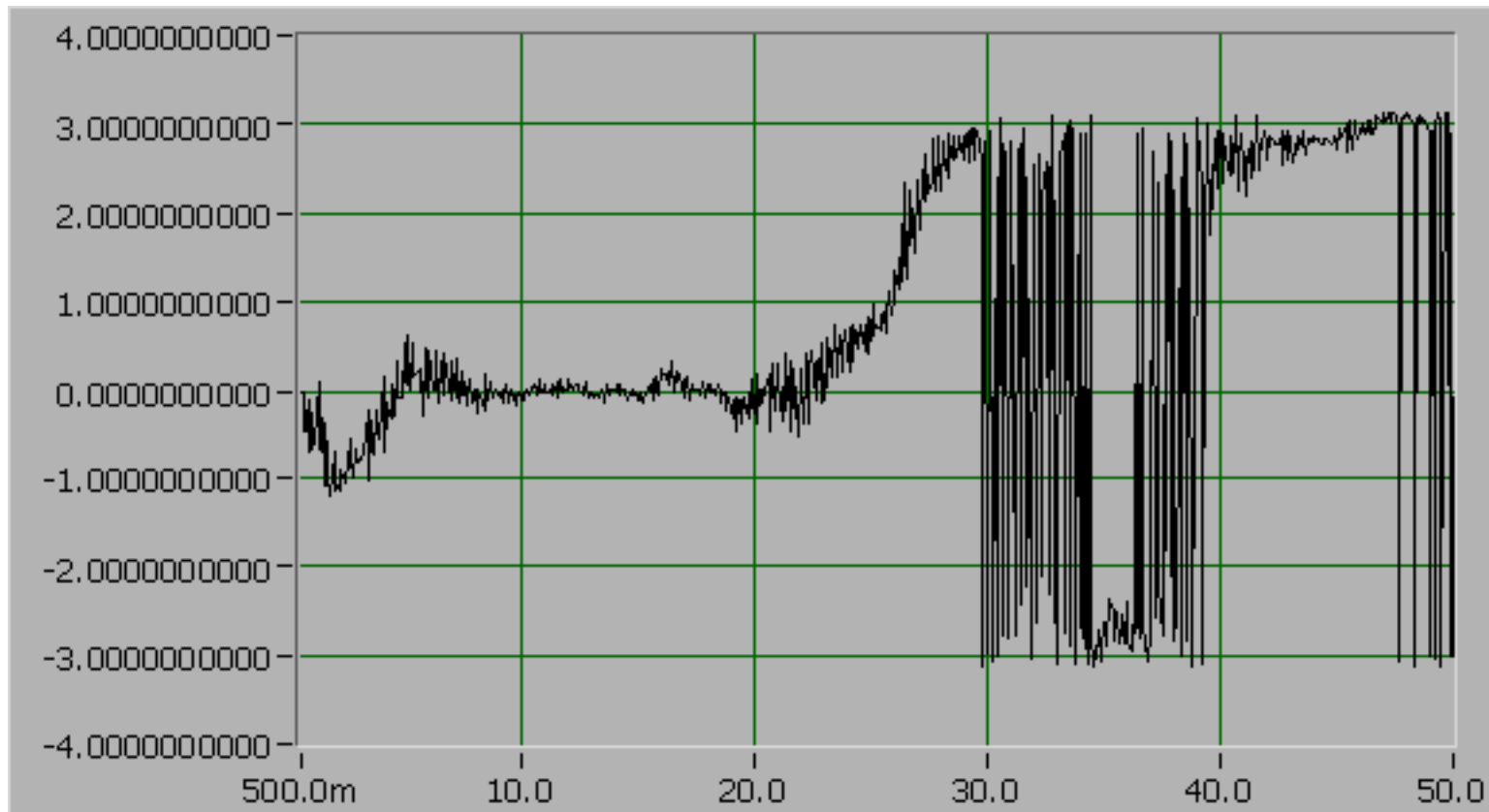
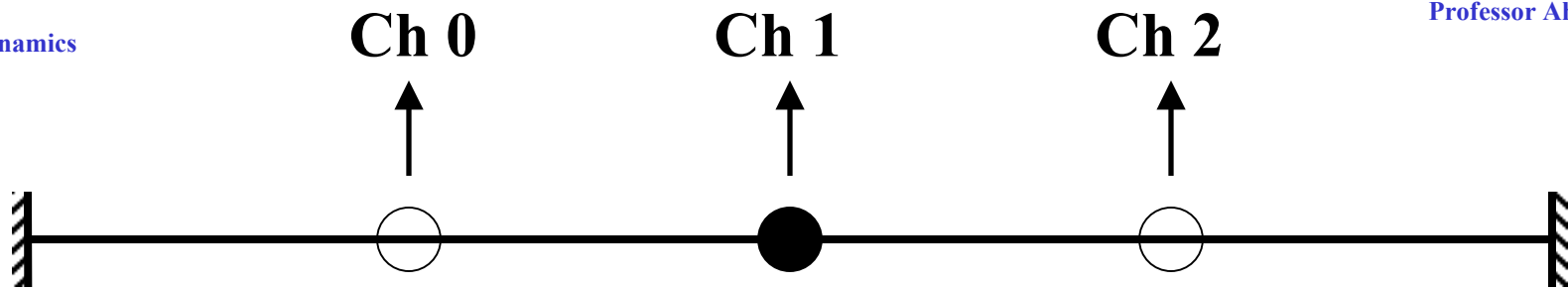
Magnitude



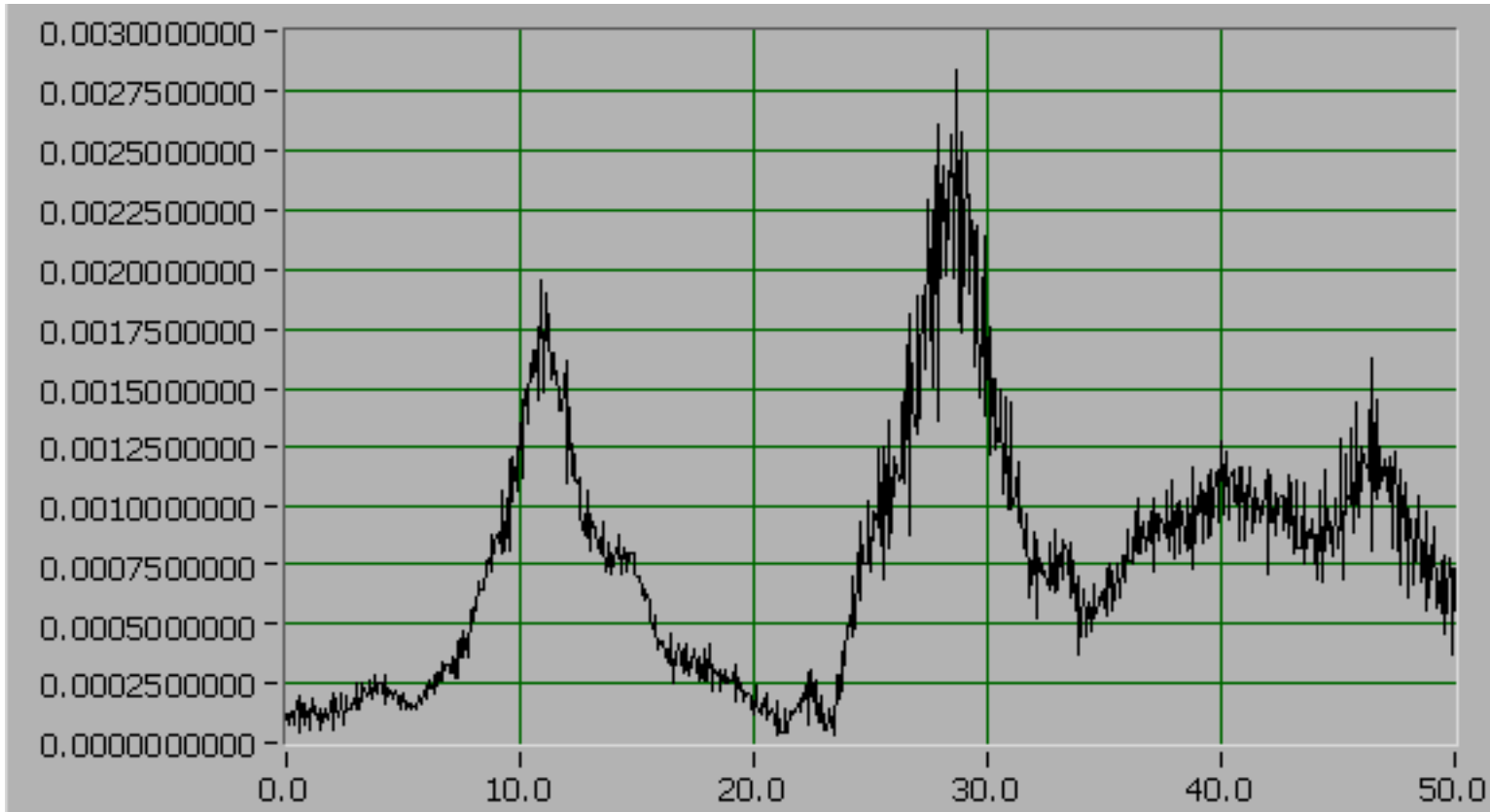
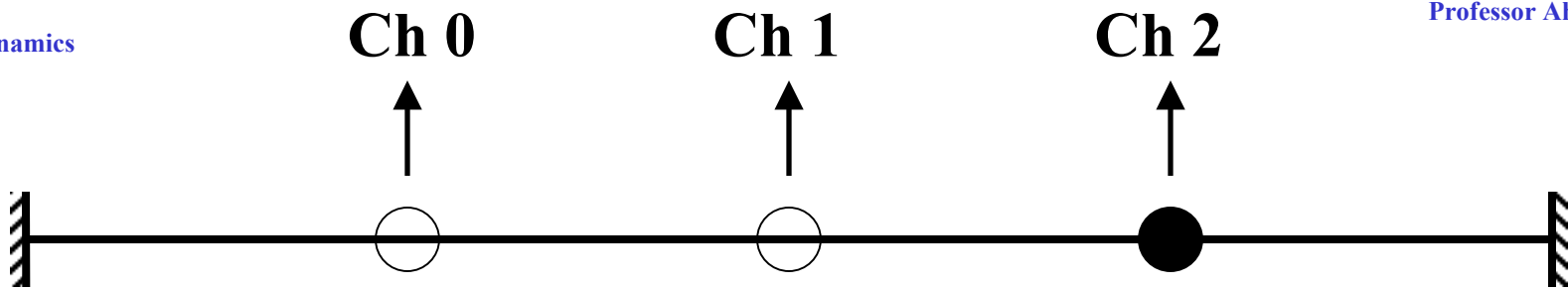
**At 11 Hz, the amplitude at Ch 0 is 0.00245. We will let this location be our reference location.**



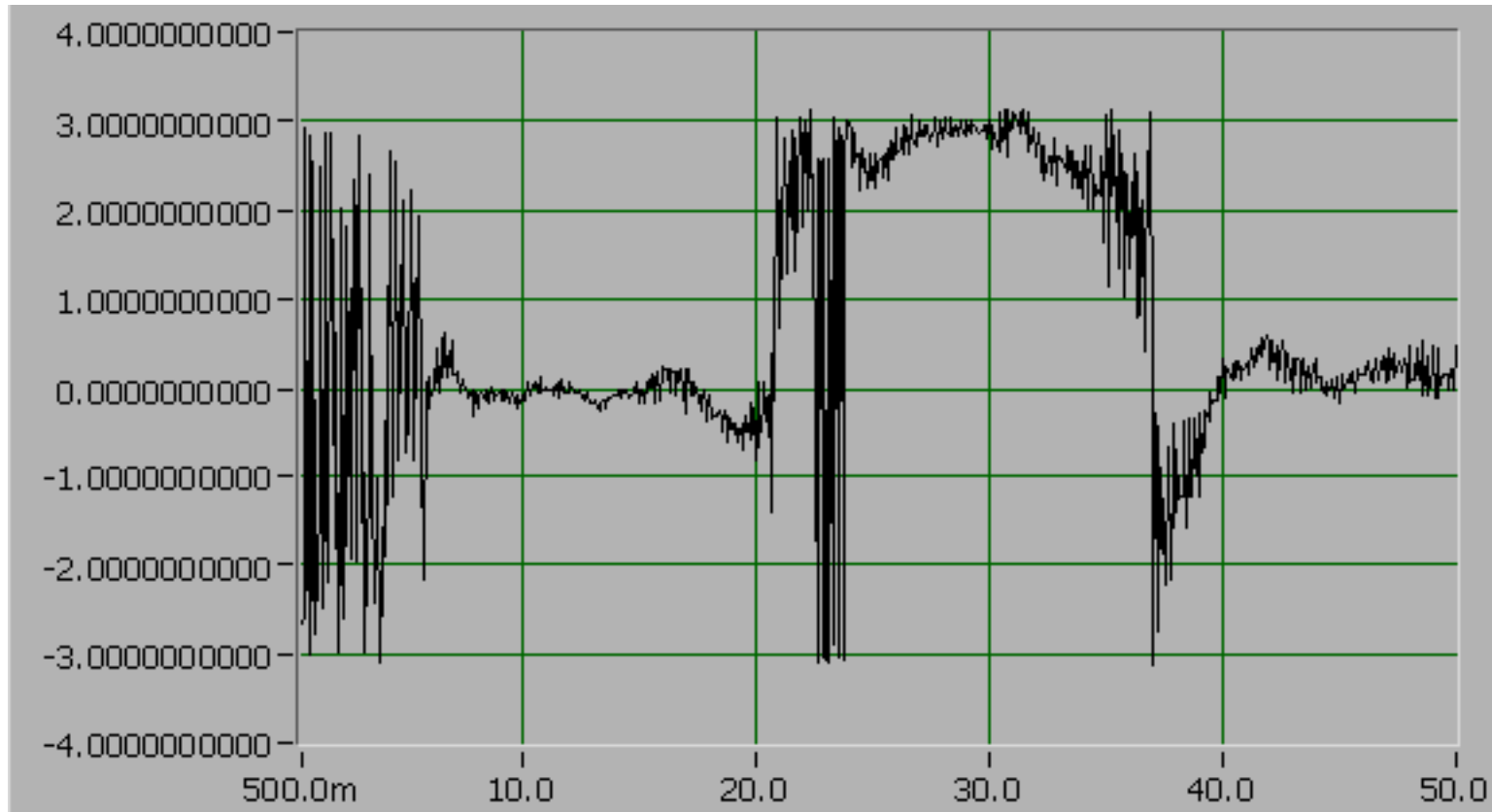
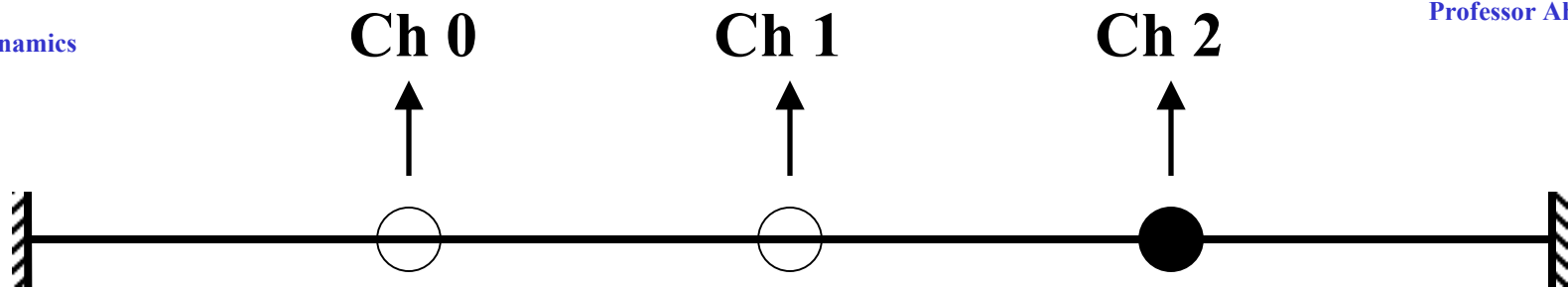
**At 11 Hz, the amplitude at Ch 1 is 0.00382.**



**At 11 Hz, the Phase Angle is 0; therefore, locations 0 & 1 are in phase (we will define this as positive).**

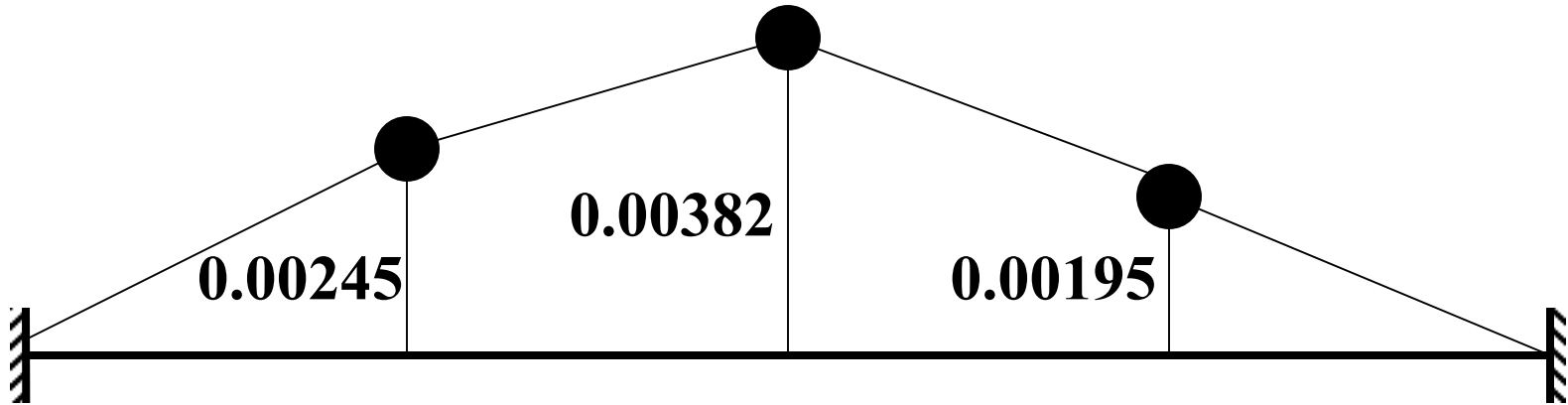


**At 11 Hz, the amplitude at Ch 2 is 0.00195.**



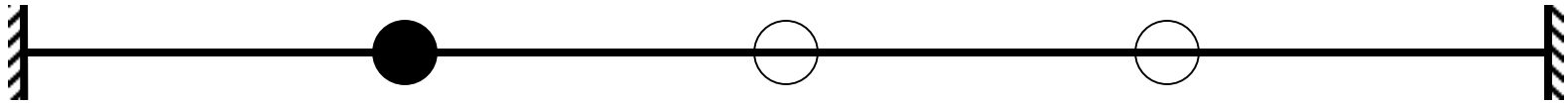
**At 11 Hz, the Phase Angle is 0; therefore, locations 0 & 2 are in phase (positive sign).**

# First Mode Shape

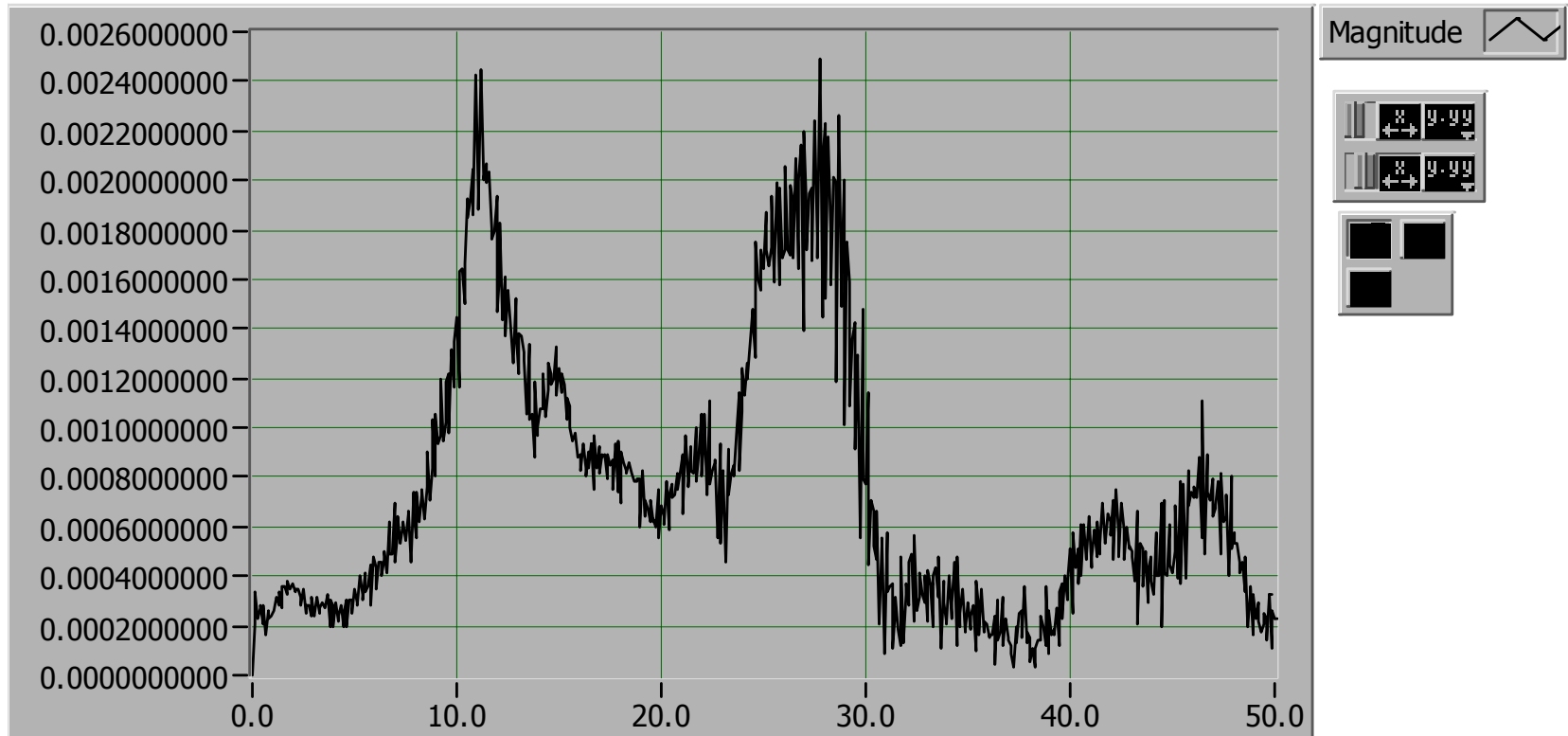




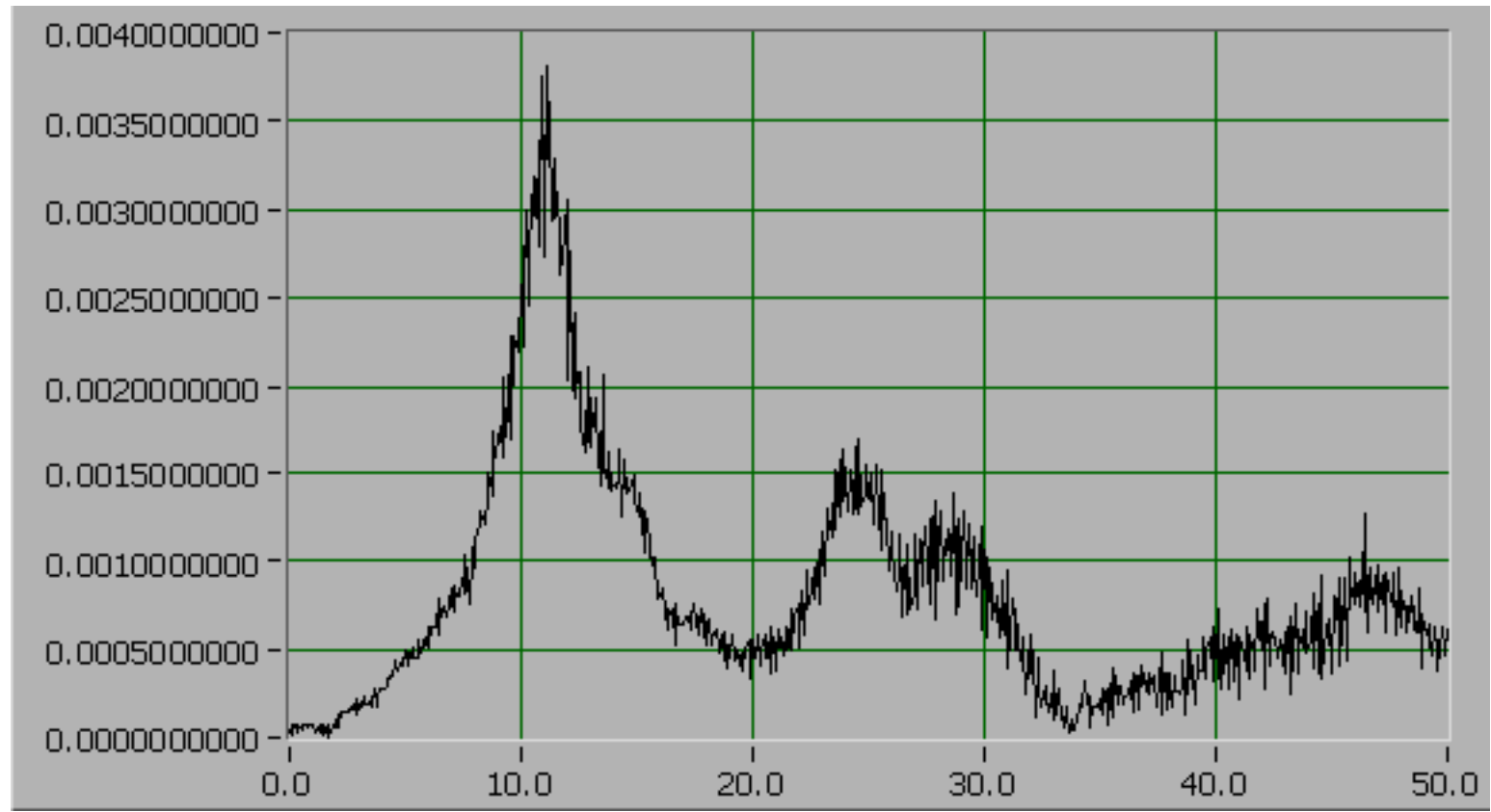
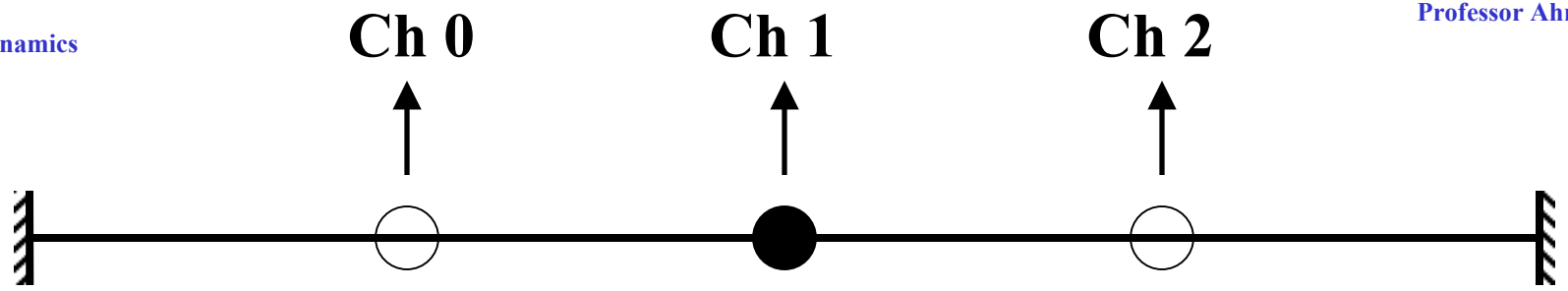
# Repeat for the 2<sup>nd</sup> Mode



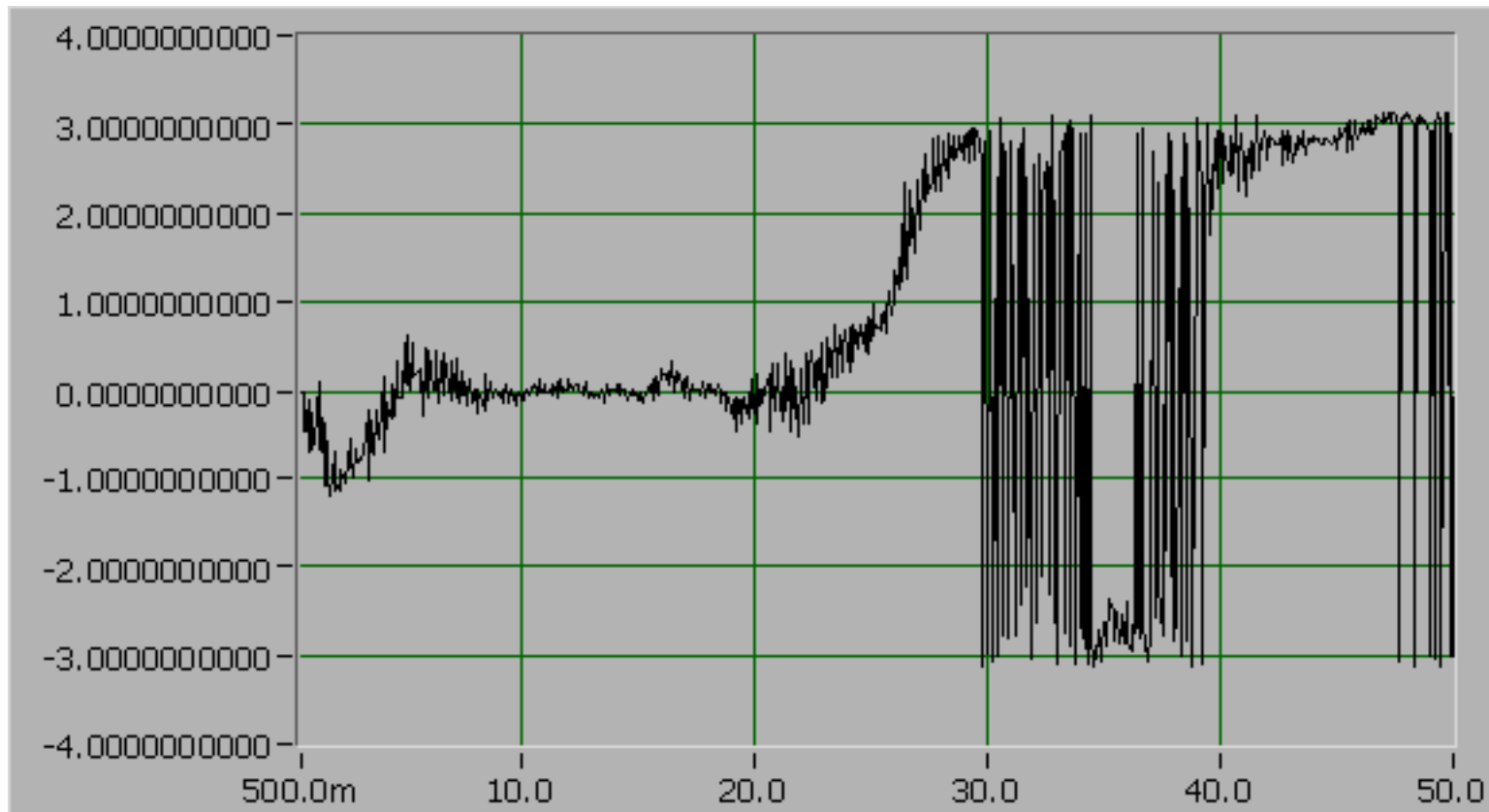
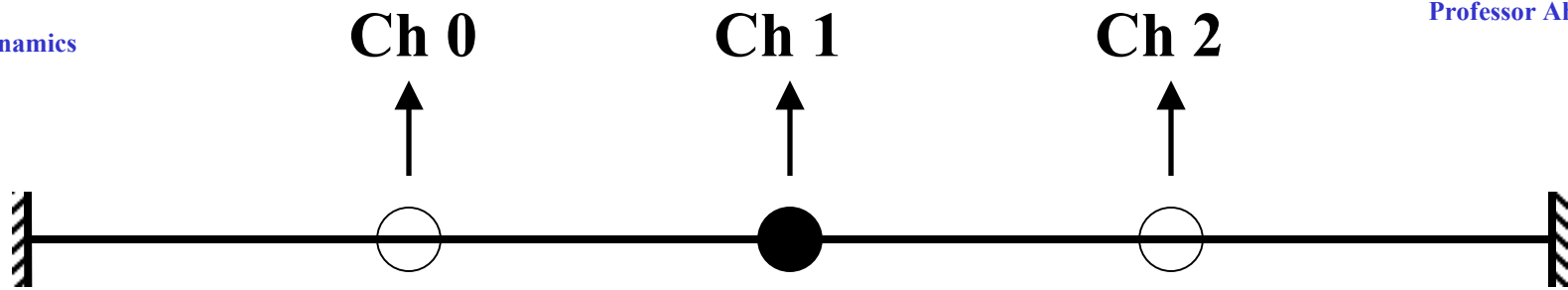
Magnitude



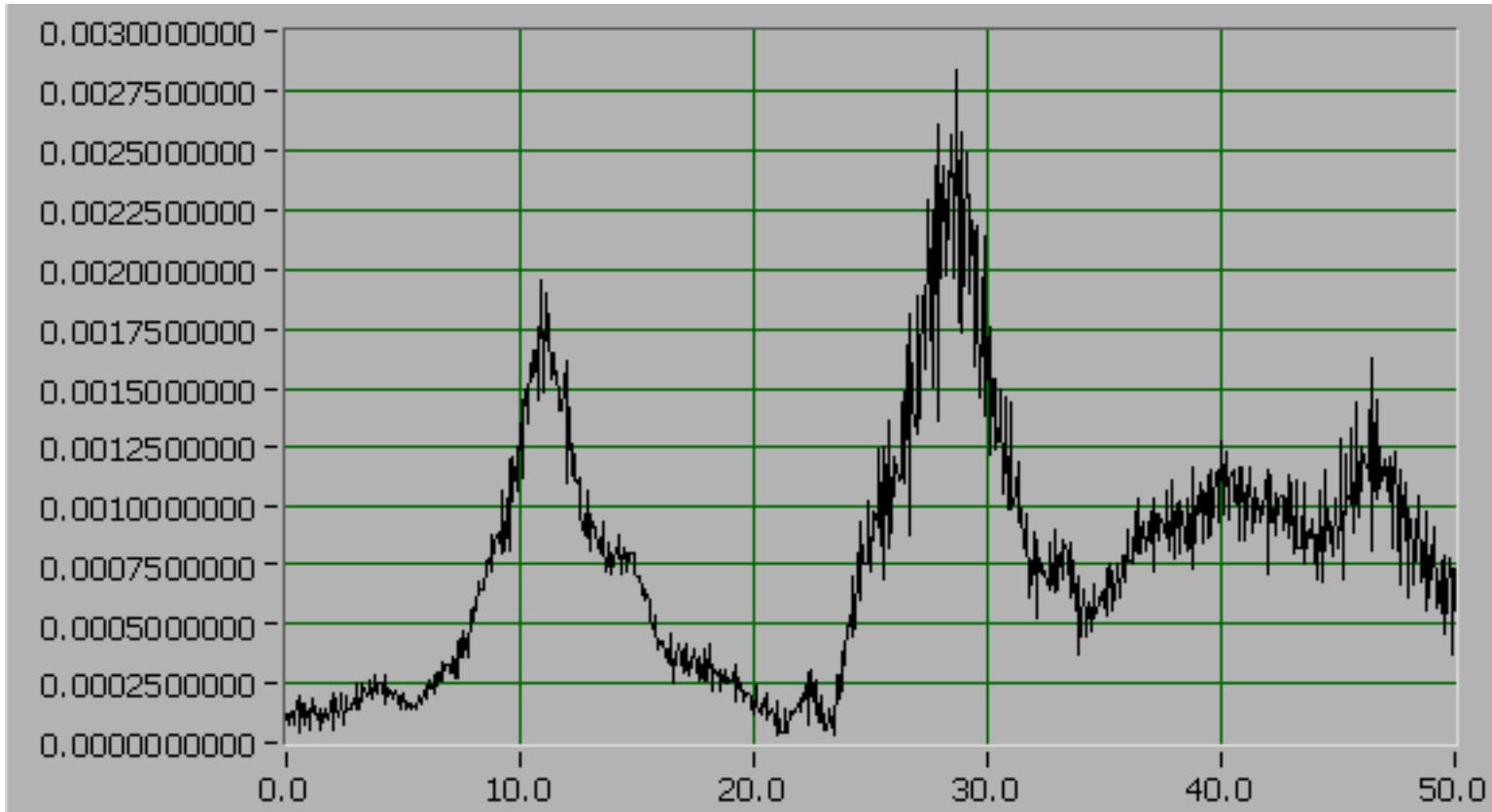
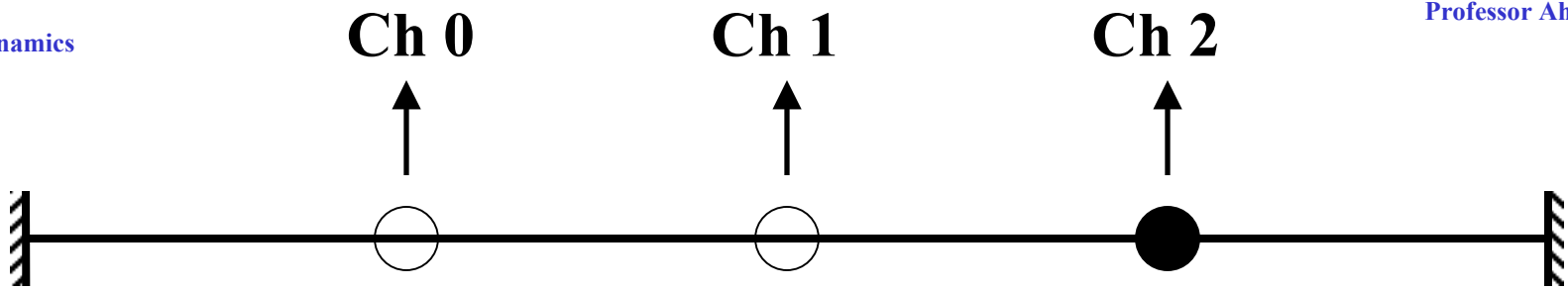
**At 28 Hz, the amplitude at Ch 0 is 0.0022. We will let this location be our reference location.**



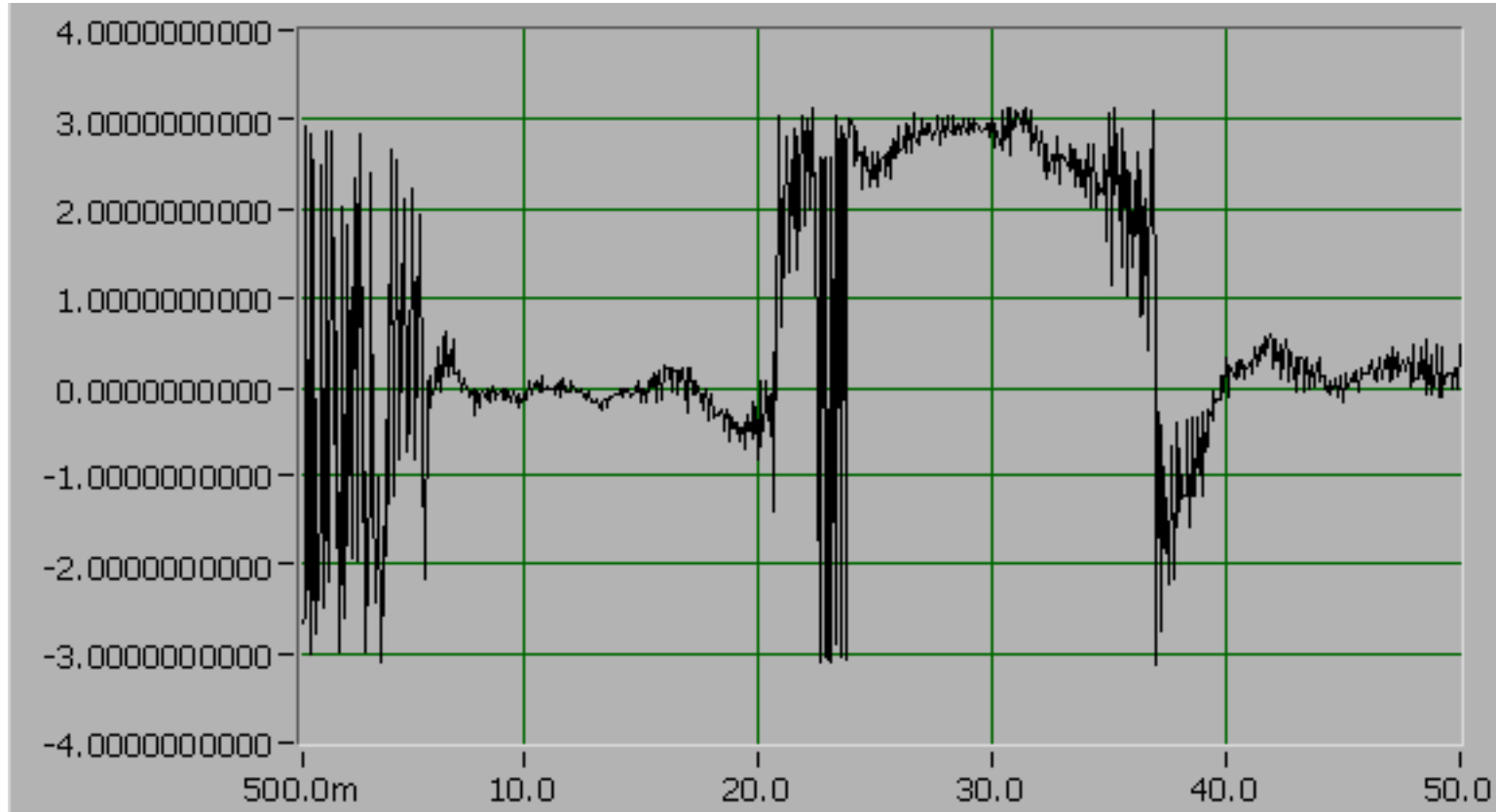
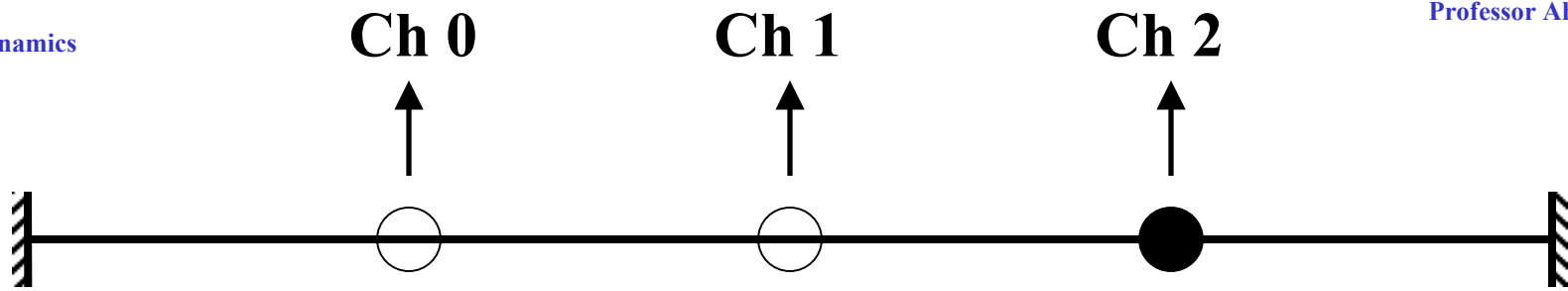
**At 28 Hz, the amplitude at Ch 1 is 0.0013.**



**At 28 Hz, the Phase Angle is  $\pi$ ; therefore, locations 0 & 1 are out of phase (we will define this as negative).**

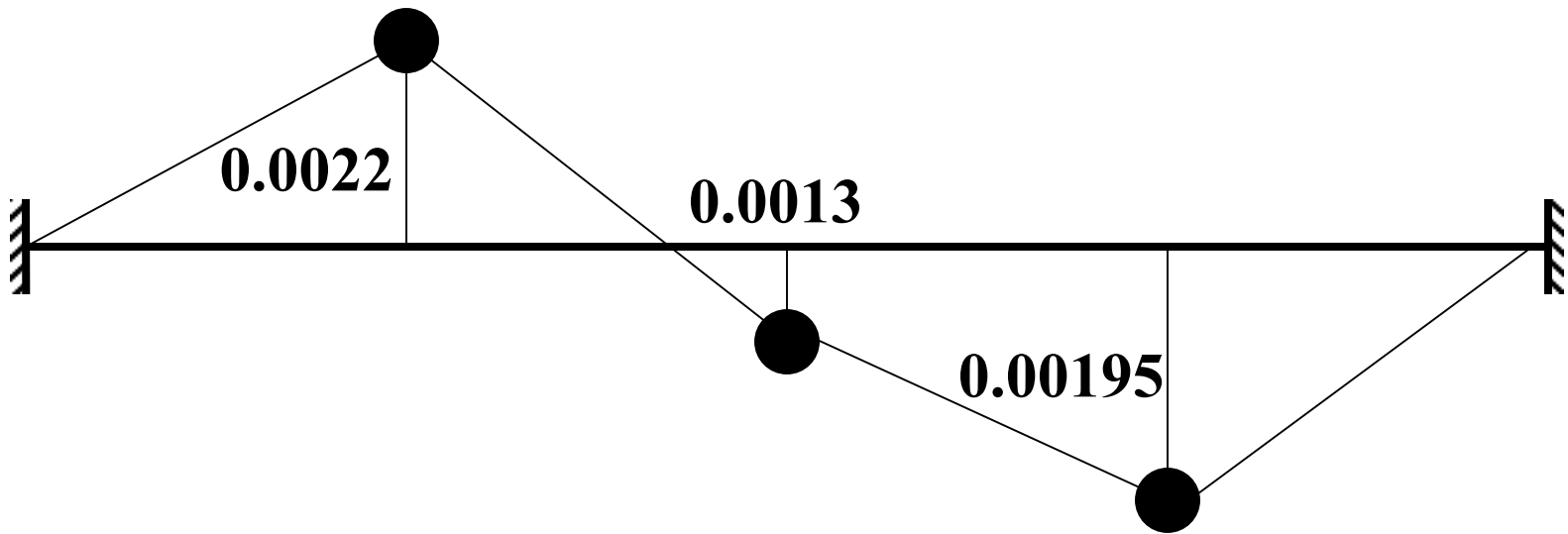


**At 28 Hz, the amplitude at Ch 2 is 0.0026.**



**At 28 Hz, the Phase Angle is  $\pi$ ; therefore, locations 0 & 2 are out of phase (negative sign).**

# Second Mode Shape



# Hints

1. In order to determine the mode shape, you will need to establish a reference location on your structure.

Depending on the geometry of the structure, you may not be able to keep the same reference point. In this case, you will need to use a moving reference. For example on the bridge below, you would probably need to take a data sets with a repeated sensor location. One possibility is to record at 1&2, then 2&3, and finally 3&4.



## Hints (continued)

The Crossbow CXL01L1 and CXL02L1 are capacitive accelerometers. Therefore, they will record a DC signal when used for measuring vertical acceleration. In a vertical configuration, the CXL01L1 has only a 0.25 g measurement range.



Measurement Direction

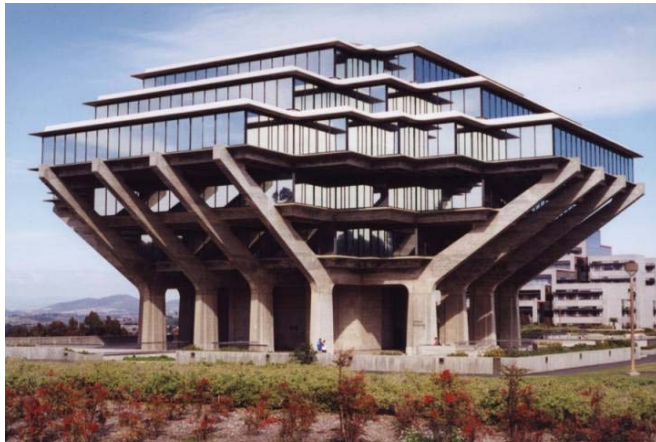


When measuring vertical acceleration on a horizontal surface, you may need to use one of the anchor plates.

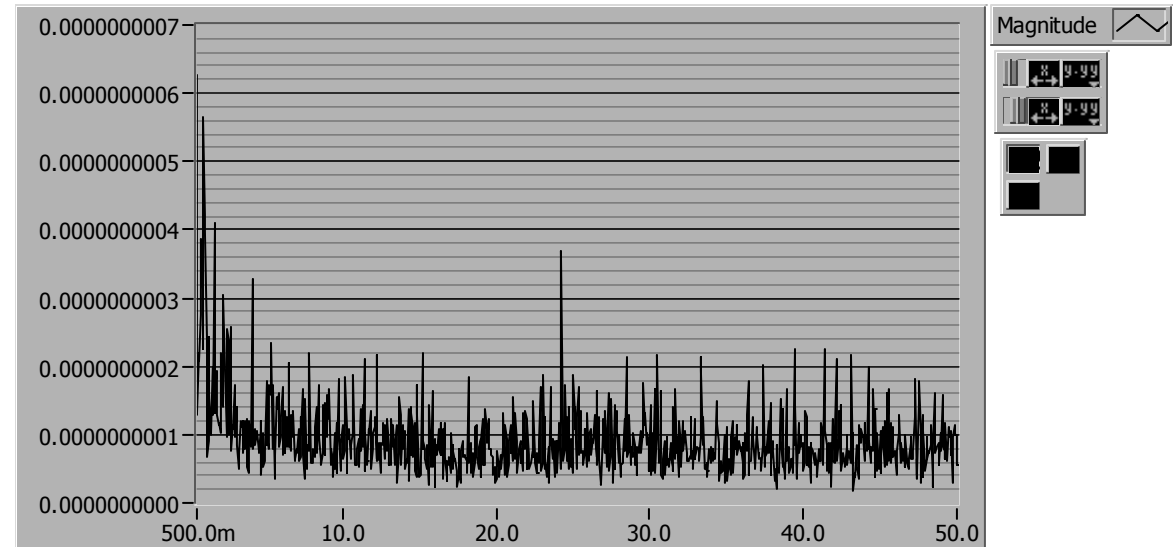


## Hints (continued)

Before you get very far into your testing, you may want to check to ensure that you are measuring a meaningful signal. This can be done by making a simple preliminary test at one or two locations and checking the Power Spectra of the data.



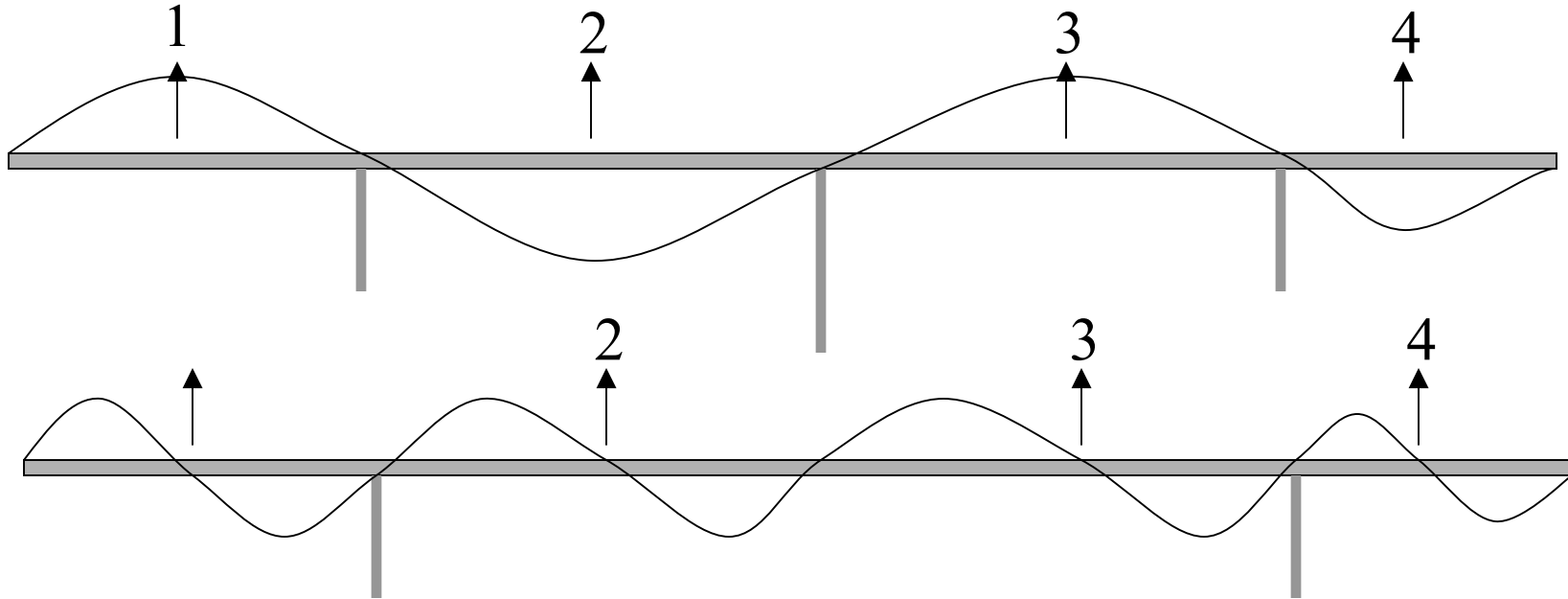
Avg'd Power Spectrum



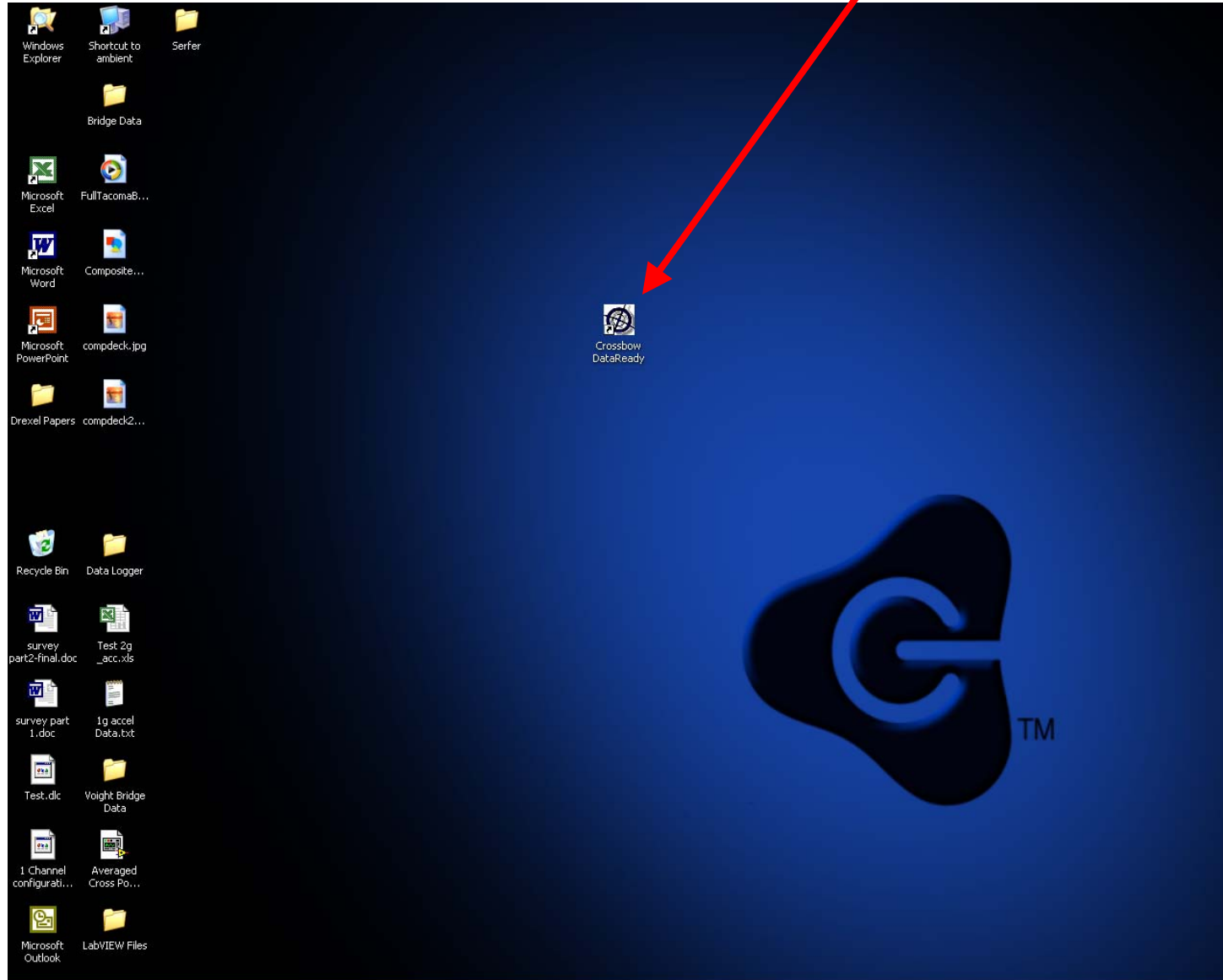
## Hints (continued)

When choosing the location for your sensors, make sure you choose locations that will allow you to capture the first few modes.

While the configuration shown below may work well for the 1<sup>st</sup> Mode, it may not work for higher modes.



# Running the Crossbow DataReady Software



# Crossbow DataReady Startup Window

The screenshot displays the 'Crossbow Data Acquisition' software interface. The main window is titled 'Crossbow Data Acquisition' and contains a menu bar (File, Edit, Communications, Data, Graph, Window, Help) and a toolbar. The left pane shows system information for a ReadyDAQ AD2012 device, including its name, serial number, configuration file name, and memory status. The right pane is a 'Configuration - 1 Channel configurati...' dialog box with the following sections:

- Status - ReadyDAQ AD2012**: Number of channels selected: 0; Max # of configured sequences: 1; % Memory used for 1 sequence: 0.0%. Buttons: Notes >>, Help, Advanced.
- Sequence Parameters**:  Lock; Sample Frequency: 512 per second (Hz); Total Run Time: 0 days, 00 hr, 00 min, 00 sec;  Lock; Total # Samples: 0.
- Channel Selections**: A table with columns 'Select', 'Labels', 'Details', and 'Pin #'.

Select	Labels	Details	Pin #
<input type="checkbox"/>	Analog 1	Channel 1	24
<input type="checkbox"/>	Analog 2	Channel 2	12
<input type="checkbox"/>	Analog 3	Channel 3	25
<input type="checkbox"/>	Analog 4	Channel 4	13
<input type="checkbox"/>	Analog 5	Channel 5	6

The status bar at the bottom left shows 'Ready'.

# Datalogger Status

**Crossbow Data Acquisition**

File Edit Communications Data Graph Window Help

Model: ReadyDAQ AD2012  
 Name: Crossbow  
 Serial #: 02003-00903-J20

Configuration file name: Channel configuration.dic  
 Configured on 2/5/2003 at 2:21:22 PM

Memory available: 100.0%  
 Total sequences logged: 0

== Sequence Parameters ==  
 Sample Frequency: 200 Hz  
 Run Time: 0 days, 0 hrs, 7 min, 30 sec  
 Total number of samples: 90000

== Channel Selections ==  
 Channels recorded: 2 out of 16  
 Pin 24 Analog 1: Channel 1 (G)  
 Pin 12 Analog 2: Channel 2 (G)

== Trigger Setup ==  
 No triggers enabled

== Advanced Configuration Options ==  
 Power interruption recovery mode: on  
 Indicate rate: 5 seconds.

== Channel Calibration Values ==  
 Analog 1: Slope 1.004957885409,  
 Intercept -0.00841718002  
 Analog 2: Slope 1.002528719844,  
 Intercept -0.006511943618

Date bad date  
 ; Begin logging date  
 Time 00:00:00  
 ; Begin logging time  
 Timed Start 0 switch  
 ; Set to '1' to start logging at specified time

**Configuration - 1 Channel configurati...**

Status: ReadyDAQ AD2012

Number of channels selected: 0  
 Max # of configured sequences: 1  
 % Memory used for 1 sequence: 0.0%

Sequence Parameters

Lock Sample Frequency: 512 per second (Hz)

days hr min sec  
 Total Run Time: 0 00 : 00 : 00  
 Lock  
 Total # Samples: 0

Channel Selections

Select	Labels	Details	Pin #
<input type="checkbox"/> Analog 1	Channel 1	...	24
<input type="checkbox"/> Analog 2	Channel 2	...	12
<input type="checkbox"/> Analog 3	Channel 3	...	25
<input type="checkbox"/> Analog 4	Channel 4	...	13
<input type="checkbox"/> Analog 5	Channel 5	...	6

Ready

# Current Datalogger Configuration

The screenshot displays the 'Crossbow Data Acquisition' software interface. The main window shows the configuration for a ReadyDAQ AD2012. A red arrow points to the 'Number of channels selected' field in the 'Configuration - 1 Channel configuration...' dialog box, which is currently set to 0.

**Configuration - 1 Channel configuration...**

- Status: ReadyDAQ AD2012
- Number of channels selected: 0
- Max # of configured sequences: 1
- % Memory used for 1 sequence: 0.0%

**Sequence Parameters**

- Lock
- Sample Frequency: 512 per second (Hz)
- Total Run Time: 0 days, 00 hr, 00 min, 00 sec
- Lock
- Total # Samples: 0

**Channel Selections**

Select	Labels	Details	Pin #
<input type="checkbox"/>	Analog 1	Channel 1	24
<input type="checkbox"/>	Analog 2	Channel 2	12
<input type="checkbox"/>	Analog 3	Channel 3	25
<input type="checkbox"/>	Analog 4	Channel 4	13
<input type="checkbox"/>	Analog 5	Channel 5	6

**Main Window Information:**

- Model: ReadyDAQ AD2012
- Name: Crossbow
- Serial #: 02003-00903-J20
- Configuration file name: 1 Channel configuration.dlc
- Configured on 2/5/2003 at 2:21:22 PM
- Memory available: 100.0%
- Total sequences logged: 0
- Sequence Parameters:
  - Sample Frequency: 200 Hz
  - Run Time: 0 days, 0 hrs, 7 min, 30 sec
  - Total number of samples: 90000
- Channel Selections:
  - Channels recorded: 2 out of 16
  - Pin 24 Analog 1: Channel 1 (G)
  - Pin 12 Analog 2: Channel 2 (G)
- Trigger Setup: No triggers enabled
- Advanced Configuration Options: Power interruption recovery mode: on, Indicate rate: 5 seconds
- Channel Calibration Values:
  - Analog 1: Slope 1.004957885409, Intercept -0.00841718002
  - Analog 2: Slope 1.002528719844, Intercept -0.006511943618
- Date: bad date; Begin logging date: 00:00:00
- Time: 00:00:00; Begin logging time: 00:00:00
- Timed Start: 0 switch; Set to '1' to start logging at specified time

Ready

# Configuring the Datalogger

**Select Active Channels**

**Configure each of the channels**

**Set Sampling Frequency**

**Set Total Run Time**

# Step 1 – Activate Channel 1

The screenshot displays the 'Crossbow Data Acquisition' software window. The main window is titled 'Crossbow Data Acquisition' and has a menu bar with 'File', 'Edit', 'Communications', 'Data', 'Graph', 'Window', and 'Help'. Below the menu bar is a toolbar with various icons. The main area is divided into two panes. The left pane shows system information and configuration details for a ReadyDAQ AD2012 device. The right pane is a 'Configuration - 1 Channel configurati...' dialog box.

**System Information (Left Pane):**

- Model: ReadyDAQ AD2012
- Name: Crossbow
- Serial #: 02003-00903J20
- Configuration file name: 1 Channel configuration.dic
- Configured on 2/5/2003 at 2:21:22 PM
- Memory available: 100.0%
- Total sequences logged: 0
- Sequence Parameters:
  - Sample Frequency: 200 Hz
  - Run Time: 0 days, 0 hrs, 7 min, 30 sec
  - Total number of samples: 90000
- Channel Selections:
  - Channels recorded: 2 out of 16
  - Pin 24 Analog 1: Channel 1 (G)
  - Pin 12 Analog 2: Channel 2 (G)
- Trigger Setup: No triggers enabled
- Advanced Configuration Options: Power interruption recovery mode: on, Indicate rate: 5 seconds.
- Channel Calibration Values:
  - Analog 1: Slope 1.004957885409, Intercept -0.00841718002
  - Analog 2: Slope 1.002528719844, Intercept -0.006511943618
- Date: bad date; Time: 00:00:00
- Timed Start: 0 switch

**Configuration - 1 Channel configurati... (Right Pane):**

- Status: ReadyDAQ AD2012
- Number of channels selected: 1
- Max # of configured sequences: 1
- % Memory used for 1 sequence: 100.0%
- Sequence Parameters:
  - Sample Frequency: 512 per second (Hz)
  - Total Run Time: 0 days, 00 hr, 17 min, 36 sec
  - Total # Samples: 540672
- Channel Selections:
 

Select	Labels	Details	Pin #
<input checked="" type="checkbox"/>	Channel 1	...	24
<input type="checkbox"/>	Channel 2	...	12
<input type="checkbox"/>	Channel 3	...	25
<input type="checkbox"/>	Channel 4	...	13
<input type="checkbox"/>	Channel 5	...	6

The status bar at the bottom of the window shows 'Ready'.



# Step 2 – Enter Channel 1 Details

The screenshot displays the 'Crossbow Data Acquisition' software interface. The main window shows the configuration for a ReadyDAQ AD2012 device. A 'Configuration - 1 Channel configurati...' dialog box is open, and a 'Channel Details' dialog box is overlaid on top of it.

**Channel Details Dialog Box:**

- Channel:** Analog 1: Channel 1
- Label:** Channel 1
- Scaling:** Sensor: Accelerometer - Crossbow CXL01LF +/- 1 (G); Units/Range: G (-1.254209 to 1.258186) 12-bit
- Triggering:** Mode: Single Sequence (selected); Repetitive (deselected);  Disable all triggering; This channel is a trigger (deselected); Edge: Low to High (selected); High to Low (deselected); Threshold units are: G; Threshold: -1.254209

**Main Configuration Dialog Box (Configuration - 1 Channel configurati...):**

- Status: ReadyDAQ AD2012
- Number of channels selected: 1
- Max # of configured sequences: 1
- % Memory used for 1 sequence: 100.0%
- Sequence Parameters: Sample Frequency: 512 per second (Hz); Total Run Time: 0 days, 00 hr, 17 min, 36 sec; Total # Samples: 540672
- Channel Selections:
 

Select	Labels	Details	Pin #
<input checked="" type="checkbox"/>	Analog 1	Channel 1	2
<input type="checkbox"/>	Analog 2	Channel 2	1
<input type="checkbox"/>	Analog 3	Channel 3	2
<input type="checkbox"/>	Analog 4	Channel 4	1
<input type="checkbox"/>	Analog 5	Channel 5	6

**Main Window (Crossbow Data Acquisition):**

- Model: ReadyDAQ AD2012
- Name: Crossbow
- Serial #: 02003-00903J20
- Configuration file name: 1 Channel configuration.dlc
- Configured on 2/5/2003 at 2:21:22 PM
- Memory available: 100.0%
- Total sequences logged: 0
- Sequence Parameters: Sample Frequency: 200 Hz; Run Time: 0 days, 0 hrs, 7 min, 30 sec; Total number of samples: 90000
- Channel Selections: Channels recorded: 2 out of 16; Pin 24 Analog 1: Channel 1 (G); Pin 12 Analog 2: Channel 2 (G)
- Trigger Setup: No triggers enabled
- Advanced Configuration Options: Power interruption recovery mode: on; Indicate rate: 5 seconds
- Channel Calibration Values: Analog 1: Slope 1.004957885409, Intercept -0.00841718002; Analog 2: Slope 1.002528719844, Intercept -0.006511943618
- Date: bad date; Time: 00:00:00

# Step 3 - Select the Appropriate Sensor Type & Serial Number from the Drop Down Window

The screenshot displays the 'Crossbow Data Acquisition' software interface. The main window shows configuration details for a ReadyDAQ AD2012 device, including channel selections and sequence parameters. A 'Configuration - 1 Channel configurati...' window is open, showing a table of channel selections and a 'Channel Details' dialog box for 'Analog 1: Channel 1'.

**Configuration - 1 Channel configurati...**

Status: ReadyDAQ AD2012

Number of channels selected: 1

Max # of configured sequences: 1

% Memory used for 1 sequence: 100.0%

Sequence Parameters

Lock Sample Frequency: 512 per second (Hz)

Lock Total Run Time: 0 days 00 hr 17 min 36 sec

Total # Samples: 540672

Channel Selections

Select	Labels	Details	Pin #
<input checked="" type="checkbox"/>	Analog 1	Channel 1	2
<input type="checkbox"/>	Analog 2	Channel 2	1
<input type="checkbox"/>	Analog 3	Channel 3	2
<input type="checkbox"/>	Analog 4	Channel 4	1
<input type="checkbox"/>	Analog 5	Channel 5	6

**Channel Details**

Channel: Analog 1: Channel 1

Label: Channel 1

Note: Channels with an asterisk (\*) in front of their names are trigger channels.

Scaling

Sensor: \* Accelerometer - Crossbow CXL01LF +/- 1 SN 0126500 (G)

Units/Range: \* Accelerometer - Crossbow CXL01LF +/- 1 SN 0126500 (G)

Triggering

Mode:  Accelerometer - Crossbow CXL01LF +/- 1 (G)

Accelerometer - Crossbow CXL02LF +/- 2 (G)

Accelerometer - Crossbow CXL04M +/- 4 (G)

Disab Accelerometer - Crossbow CXL100LF +/- 100 (G)

Accelerometer - Crossbow CXL10LF +/- 10 (G)

Accelerometer - Crossbow CXL25M +/- 25 (G)

Edge:  Lgw to High  High to Low

Threshold: 1.234007

Buttons: OK, Cancel, View

If you select a serial number from the drop down window, you do not need to worry about the “scaling” tab.

The screenshot displays the Crossbow Data Acquisition software interface. The main window shows the configuration for a ReadyDAQ AD2012 device. The Configuration window is titled "Configuration - 1 Channel configurati...". It includes a status section, sequence parameters (Sample Frequency: 512 per second (Hz), Total Run Time: 0 days, 00 hr, 17 min, 36 sec), and a table of channel selections. The Channel Details dialog box is open, showing the "Scaling" tab. A red arrow points from the "Serial Number" dropdown in the Configuration window to the "Sensor" dropdown in the Channel Details dialog, which is set to "Accelerometer - Crossbow CXL01LF +/- 1 (G)".

**Configuration - 1 Channel configurati...**

Status - ReadyDAQ AD2012

Number of channels selected: 1

Max # of configured sequences: 1

% Memory used for 1 sequence: 100.0%

Sequence Parameters

Lock Sample Frequency: 512 per second (Hz)

Total Run Time: 0 days, 00 hr, 17 min, 36 sec

Lock Total # Samples: 540672

Channel Selections

Select	Labels	Details	Pin #
<input checked="" type="checkbox"/>	Analog 1	Channel 1	2
<input type="checkbox"/>	Analog 2	Channel 2	1
<input type="checkbox"/>	Analog 3	Channel 3	2
<input type="checkbox"/>	Analog 4	Channel 4	1
<input type="checkbox"/>	Analog 5	Channel 5	6

**Channel Details**

Channel: Analog 1: Channel 1

Label: Channel 1

Scaling

Sensor: Accelerometer - Crossbow CXL01LF +/- 1 (G)

Units/Range: G [-1.254209 to 1.258186] 12-bit

Triggering

Mode:  Single Sequence  Repetitive

Disable all triggering

This channel is a trigger

Edge:  Low to High  High to Low

Threshold units are: G

Threshold: -1.254209

# Step 4 – Select Additional Channels

## (Repeat Steps 1-3 For Each Additional Channel)

The screenshot displays the Crossbow Data Acquisition software interface. The main window shows the configuration for a ReadyDAQ AD2012 device. A dialog box titled "Configuration - 1 Channel configurati..." is open, showing the following settings:

- Status: ReadyDAQ AD2012
- Number of channels selected: 4
- Max # of configured sequences: 1
- % Memory used for 1 sequence: 100.0%
- Sequence Parameters:
  - Sample Frequency: 512 per second (Hz)
  - Total Run Time: 0 days, 00 hr, 04 min, 24 sec
  - Total # Samples: 135168
- Channel Selections:
 

Select	Labels	Details	Pin #
<input checked="" type="checkbox"/>	Analog 1	Channel 1	24
<input checked="" type="checkbox"/>	Analog 2	Channel 2	12
<input checked="" type="checkbox"/>	Analog 3	Channel 3	25
<input checked="" type="checkbox"/>	Analog 4	Channel 4	13
<input type="checkbox"/>	Analog 5	Channel 5	6

The main window also displays the following information:

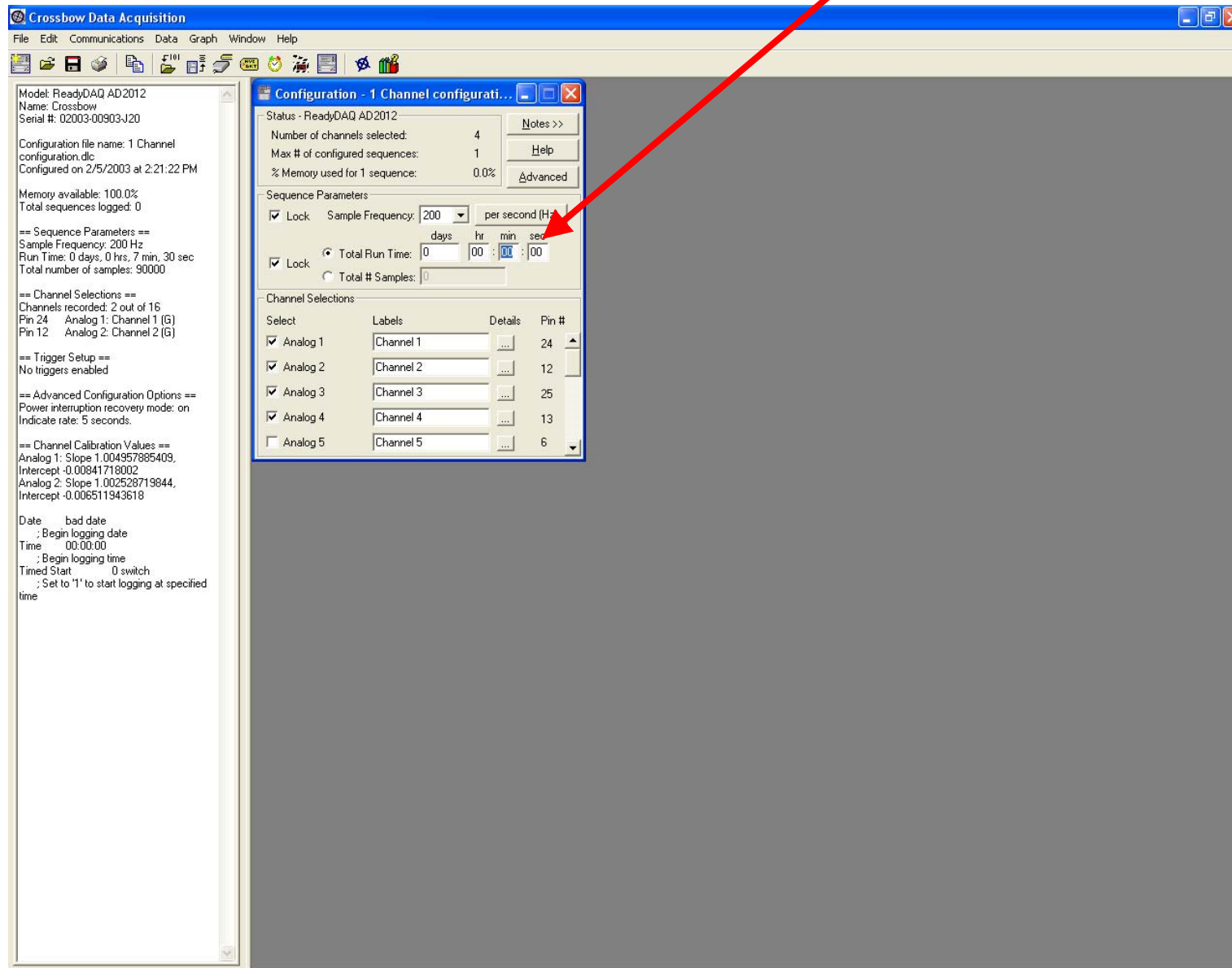
- Model: ReadyDAQ AD2012
- Name: Crossbow
- Serial #: 02003-00903-J20
- Configuration file name: 1 Channel configuration.dic
- Configured on 2/5/2003 at 2:21:22 PM
- Memory available: 100.0%
- Total sequences logged: 0
- Sequence Parameters:
  - Sample Frequency: 200 Hz
  - Run Time: 0 days, 0 hrs, 7 min, 30 sec
  - Total number of samples: 90000
- Channel Selections:
  - Channels recorded: 2 out of 16
  - Pin 24 Analog 1: Channel 1 (G)
  - Pin 12 Analog 2: Channel 2 (G)
- Trigger Setup: No triggers enabled
- Advanced Configuration Options: Power interruption recovery mode: on, Indicate rate: 5 seconds
- Channel Calibration Values:
  - Analog 1: Slope 1.004957885409, Intercept -0.00841718002
  - Analog 2: Slope 1.002528719844, Intercept -0.006511943618
- Date: bad date
- Time: 00:00:00
- Timed Start: 0 switch

# Step 5 – Set Desired “Sample Frequency” In the Drop Down Window

The screenshot shows the 'Crossbow Data Acquisition' software interface. The main window displays system information and configuration options. A secondary window titled 'Configuration - 1 Channel configurati...' is open, showing the 'Sequence Parameters' section. In this section, the 'Sample Frequency' is set to 512 per second (Hz). A dropdown menu is open, showing a list of available sample frequencies: 200, 240, 256, 300, and 320. A red arrow points to this dropdown menu. Below the 'Sequence Parameters' section, there is a 'Channel Selections' table with columns for 'Select', 'Labels', 'Details', and 'Pin #'. The table lists five analog channels, each with a 'Channel' label and a 'Pin #' value.

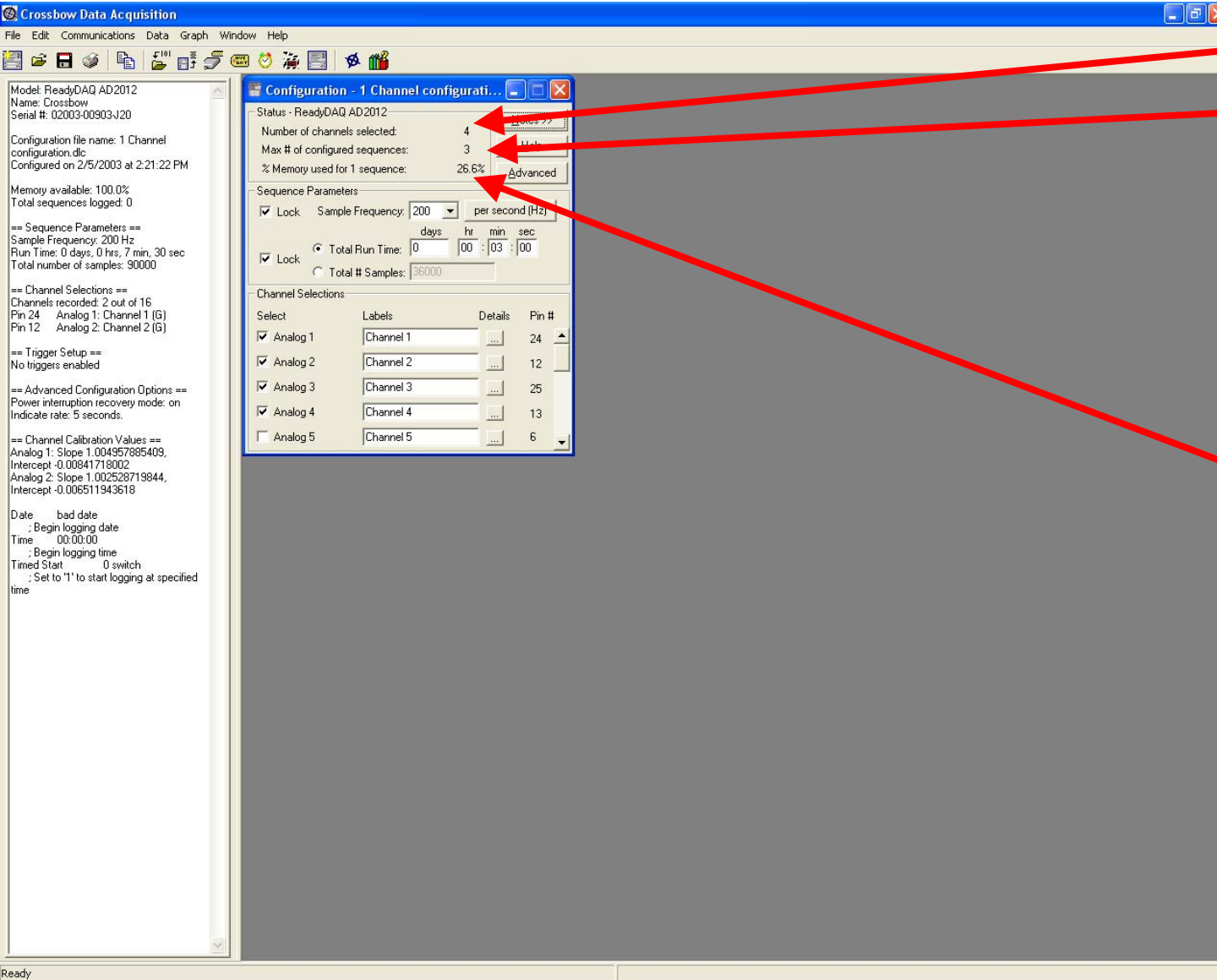
Select	Labels	Details	Pin #
<input checked="" type="checkbox"/>	Analog 1	Channel	24
<input checked="" type="checkbox"/>	Analog 2	Channel 2	12
<input checked="" type="checkbox"/>	Analog 3	Channel 3	25
<input checked="" type="checkbox"/>	Analog 4	Channel 4	13
<input type="checkbox"/>	Analog 5	Channel 5	6

# Step 6 – Enter “Total Run Time”



**The “Total Run Time” is limited by the maximum number of samples that the data logger can store.**

# Configuration Details



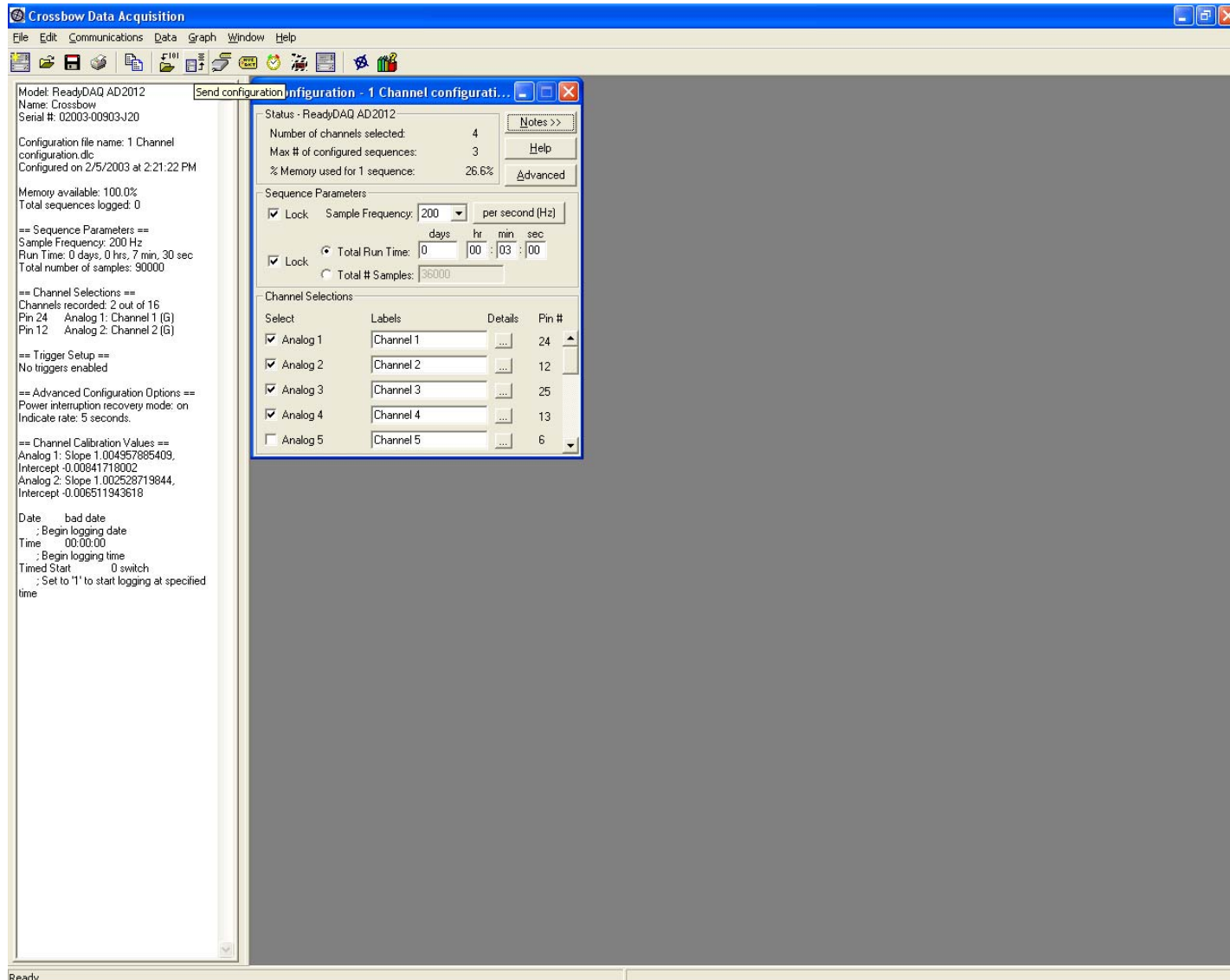
# Active Channels

Max # of configured sequences that can be run before the memory on the datalogger is filled.

% of datalogger memory used by each sequence.

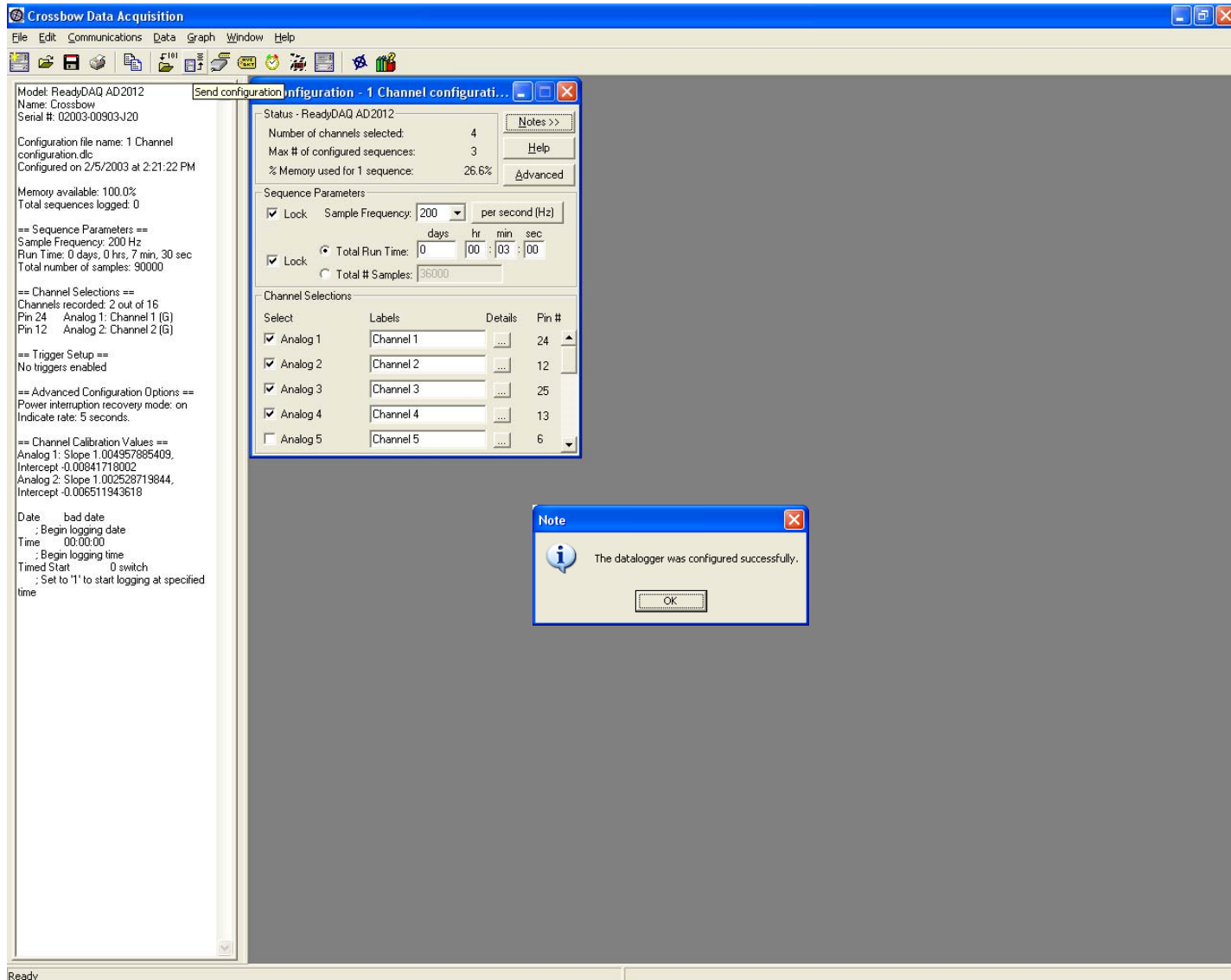
# Click “Send Configuration” to Datalogger and Then Click “OK”.

*Note: this will erase any data stored on the logger.*

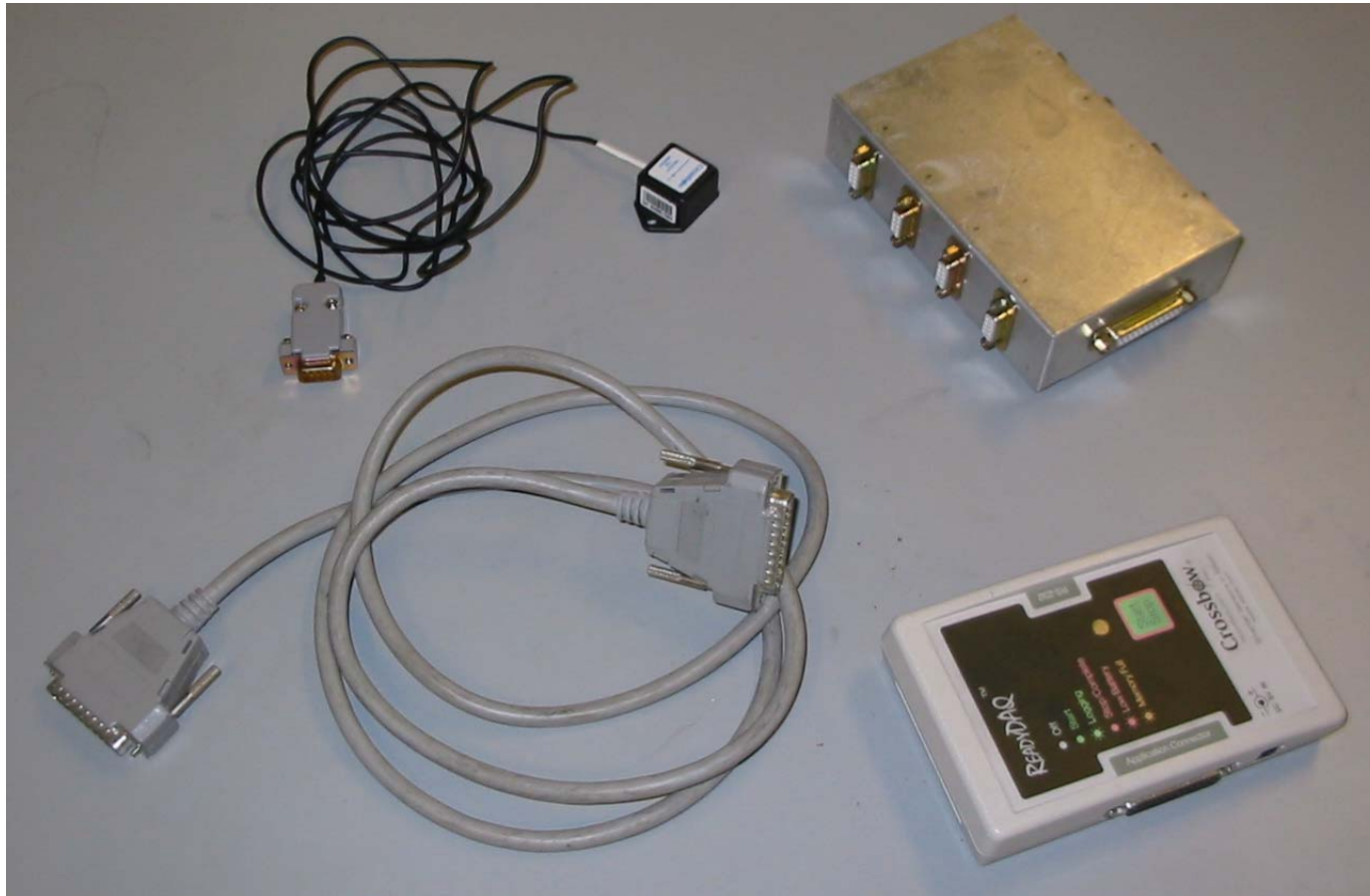




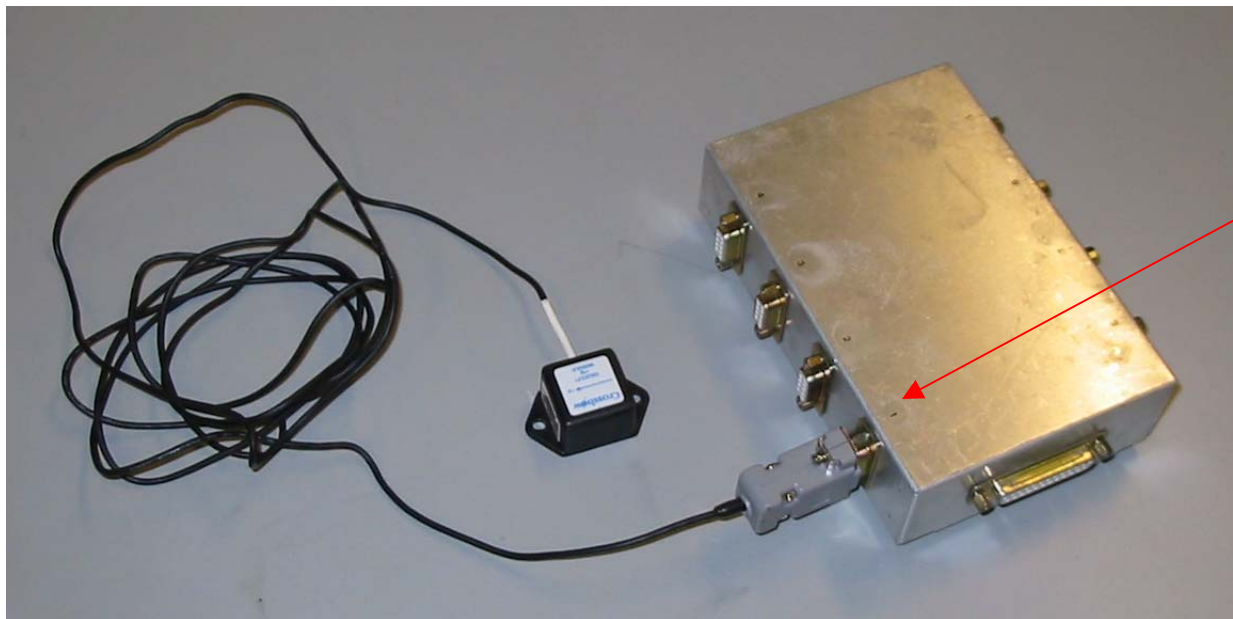
# When the upload is complete it will display “The datalogger was configured successfully”



# Connecting the Accelerometers to the Datalogger

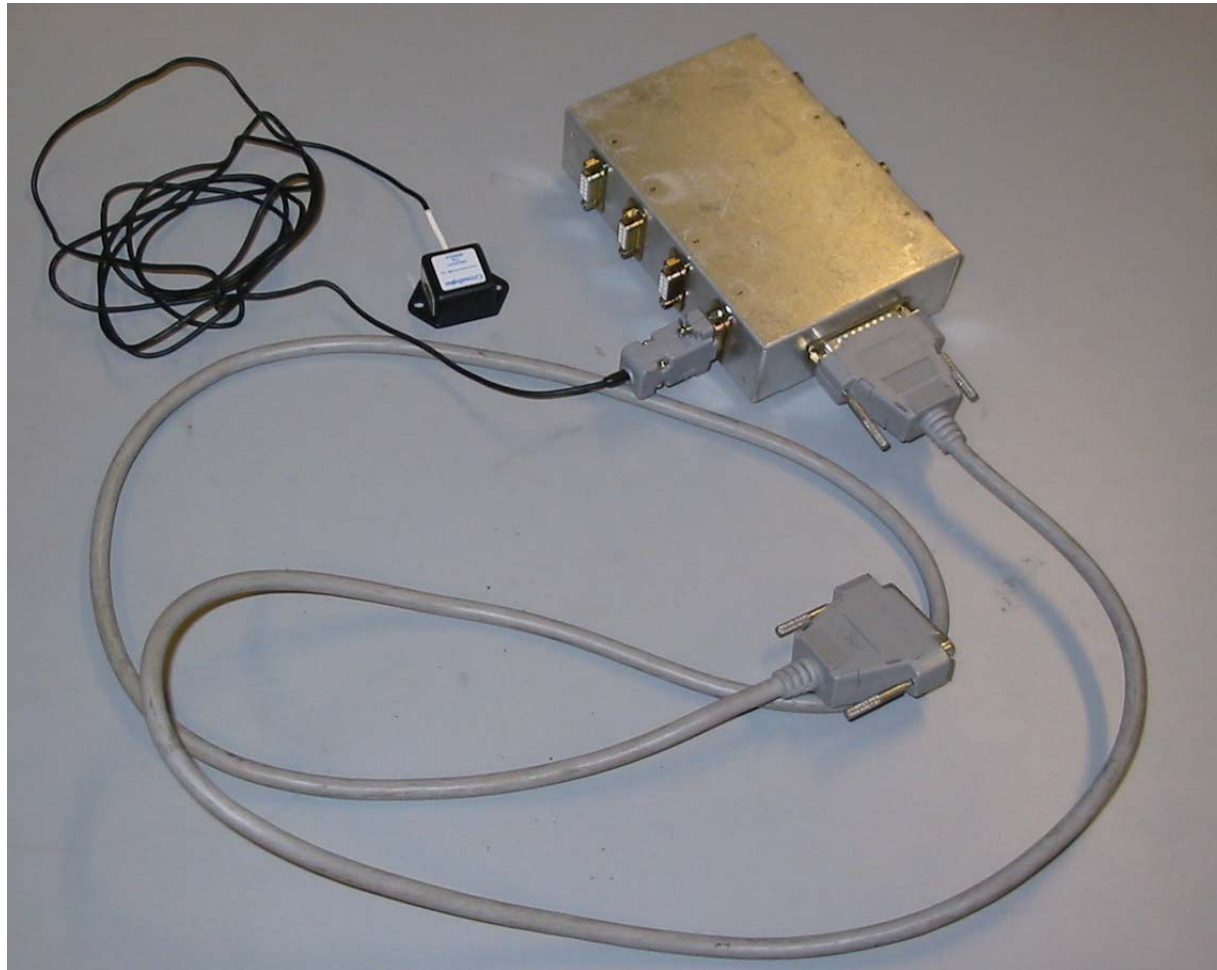


# Plug the accelerometer into the desired port on the junction box.



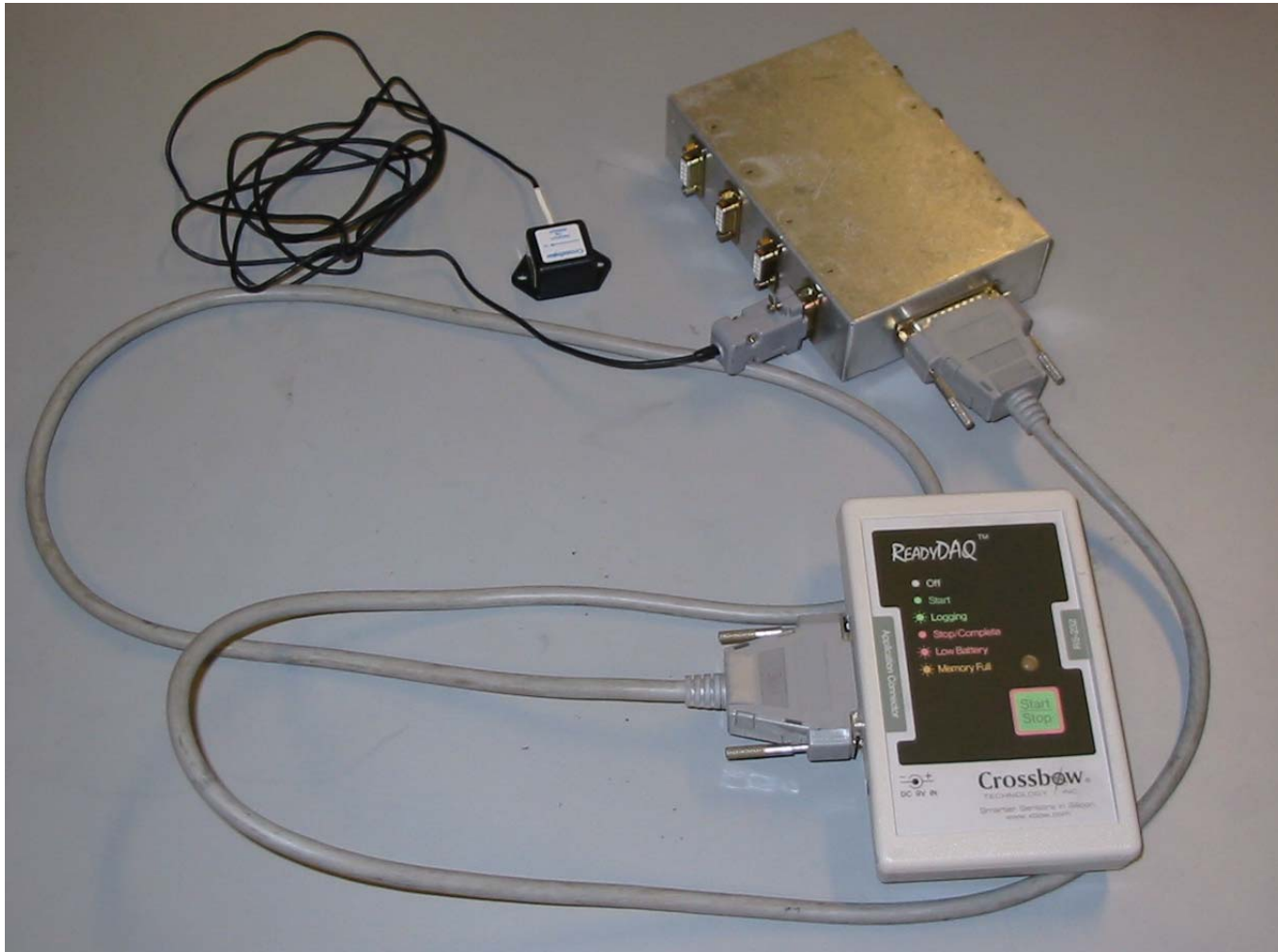
Ports on the junction box are numbered

**Plug the 25 pin cable into the junction box.**



# Plug the 25 pin cable into the datalogger.

*Note:* Once the datalogger is connected to the junction box, the datalogger will start supplying power for the sensors. Please conserve the battery by not connecting to the datalogger until you are ready to start taking measurements.



**To start collecting data,  
press the green “Start/Stop” button.**

Once, the “Start/Stop” button is pushed once, the indicator light will turn green. When the measurement is complete this light will turn off.



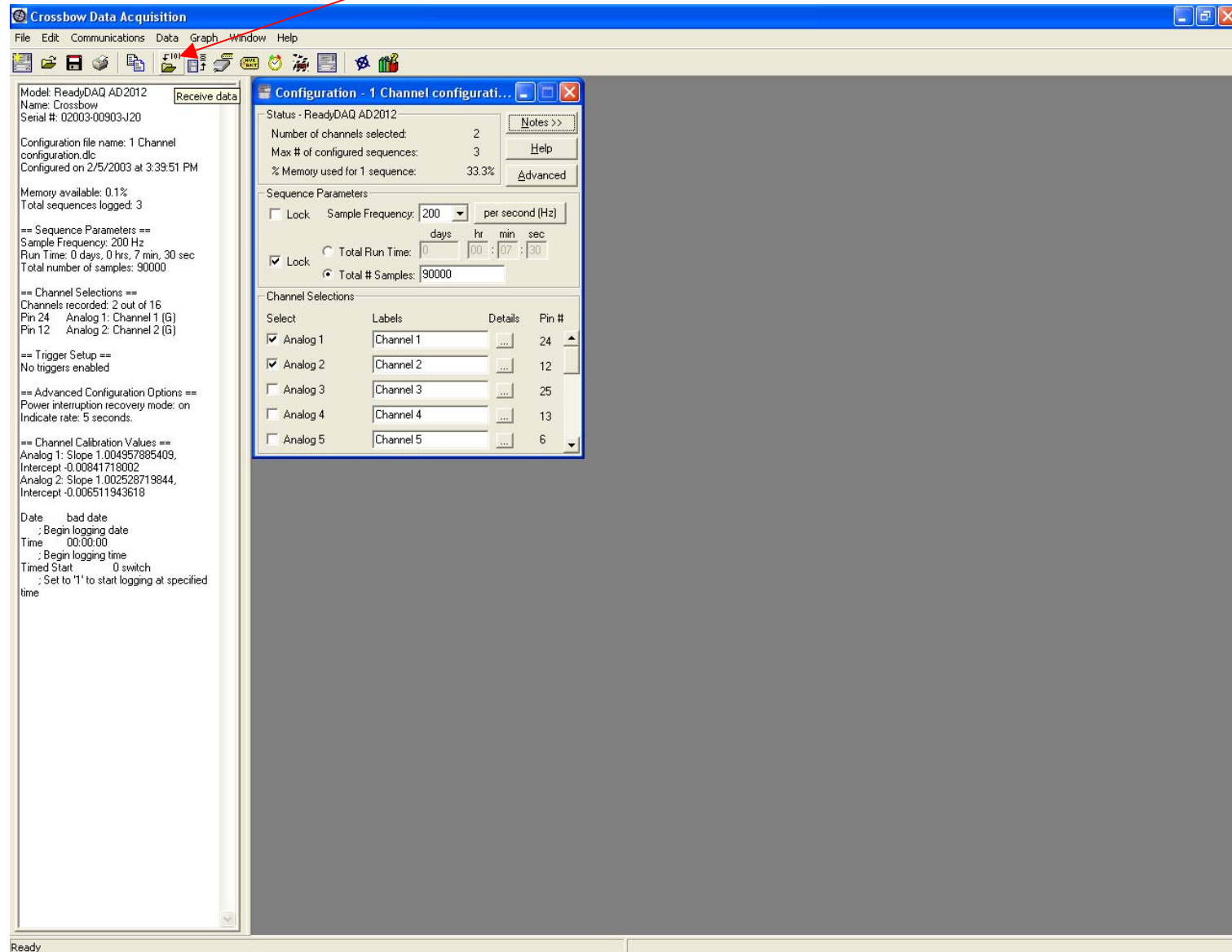
Indicator Light

Start/Stop Button

# Uploading Recorded Data

1. Connect the datalogger to a PC using the RS-232 cable
2. Run the Crossbow DataReady Software

# Click on the "Receive Data" Button





# Recorded Data

Crossbow Data Acquisition - [Data File: 1 Channel configuration.dld Unit: Crossbow s/n: 02003-00903-J20]

File Edit Communications Data Graph Window Help

Model: ReadyDAQ AD2012  
Name: Crossbow  
Serial #: 02003-00903-J20

Configuration file name: 1 Channel configuration.dld  
Configured on 2/5/2003 at 3:39:51 PM

Memory available: 0.1%  
Total sequences logged: 3

== Sequence Parameters ==  
Sample Frequency: 200 Hz  
Run Time: 0 days, 0 hrs, 7 min, 30 sec  
Total number of samples: 90000

== Channel Selections ==  
Channels recorded: 2 out of 16  
Pin 24 Analog 1: Channel 1 (G)  
Pin 12 Analog 2: Channel 2 (G)

== Trigger Setup ==  
No triggers enabled

== Advanced Configuration Options ==  
Power interruption recovery mode: on  
Indicate rate: 5 seconds.

== Channel Calibration Values ==  
Analog 1: Slope 1.004957885409,  
Intercept -0.00841718002  
Analog 2: Slope 1.002528719844,  
Intercept -0.006511943618

Date : bad date  
: Begin logging date  
Time : 00:00:00  
: Begin logging time  
Timed Start : 0 switch  
: Set to '1' to start logging at specified time

Record	Interval Seconds	Channel 1 G	Channel 2 G	Date	Time
1	0.000	0.9832	0.9907	2/7/2003	14:52:44.000
2	0.005	0.9790	0.9907	2/7/2003	14:52:44.005
3	0.010	0.9796	0.9907	2/7/2003	14:52:44.010
4	0.015	0.9796	0.9907	2/7/2003	14:52:44.015
5	0.020	0.9790	0.9901	2/7/2003	14:52:44.020
6	0.025	0.9796	0.9907	2/7/2003	14:52:44.025
7	0.030	0.9796	0.9901	2/7/2003	14:52:44.030
8	0.035	0.9796	0.9901	2/7/2003	14:52:44.035
9	0.040	0.9790	0.9901	2/7/2003	14:52:44.040
10	0.045	0.9784	0.9901	2/7/2003	14:52:44.045
11	0.050	0.9796	0.9901	2/7/2003	14:52:44.050
12	0.055	0.9802	0.9907	2/7/2003	14:52:44.055
13	0.060	0.9802	0.9907	2/7/2003	14:52:44.060
14	0.065	0.9796	0.9907	2/7/2003	14:52:44.065
15	0.070	0.9790	0.9907	2/7/2003	14:52:44.070
16	0.075	0.9790	0.9907	2/7/2003	14:52:44.075
17	0.080	0.9796	0.9901	2/7/2003	14:52:44.080
18	0.085	0.9796	0.9901	2/7/2003	14:52:44.085
19	0.090	0.9802	0.9901	2/7/2003	14:52:44.090
20	0.095	0.9796	0.9901	2/7/2003	14:52:44.095
21	0.100	0.9796	0.9901	2/7/2003	14:52:44.100
22	0.105	0.9784	0.9895	2/7/2003	14:52:44.105
23	0.110	0.9790	0.9901	2/7/2003	14:52:44.110
24	0.115	0.9796	0.9901	2/7/2003	14:52:44.115
25	0.120	0.9790	0.9901	2/7/2003	14:52:44.120
26	0.125	0.9790	0.9901	2/7/2003	14:52:44.125
27	0.130	0.9802	0.9901	2/7/2003	14:52:44.130
28	0.135	0.9790	0.9901	2/7/2003	14:52:44.135
29	0.140	0.9796	0.9895	2/7/2003	14:52:44.140
30	0.145	0.9784	0.9889	2/7/2003	14:52:44.145
31	0.150	0.9784	0.9901	2/7/2003	14:52:44.150
32	0.155	0.9796	0.9895	2/7/2003	14:52:44.155
33	0.160	0.9796	0.9901	2/7/2003	14:52:44.160
34	0.165	0.9790	0.9895	2/7/2003	14:52:44.165
35	0.170	0.9790	0.9907	2/7/2003	14:52:44.170
36	0.175	0.9796	0.9895	2/7/2003	14:52:44.175
37	0.180	0.9796	0.9901	2/7/2003	14:52:44.180
38	0.185	0.9796	0.9895	2/7/2003	14:52:44.185
39	0.190	0.9790	0.9901	2/7/2003	14:52:44.190
40	0.195	0.9790	0.9895	2/7/2003	14:52:44.195
41	0.200	0.9802	0.9901	2/7/2003	14:52:44.200
42	0.205	0.9802	0.9901	2/7/2003	14:52:44.205
43	0.210	0.9802	0.9901	2/7/2003	14:52:44.210
44	0.215	0.9796	0.9901	2/7/2003	14:52:44.215
45	0.220	0.9796	0.9907	2/7/2003	14:52:44.220
46	0.225	0.9796	0.9913	2/7/2003	14:52:44.225
47	0.230	0.9802	0.9907	2/7/2003	14:52:44.230
48	0.235	0.9790	0.9907	2/7/2003	14:52:44.235
49	0.240	0.9796	0.9907	2/7/2003	14:52:44.240
50	0.245	0.9790	0.9907	2/7/2003	14:52:44.245
51	0.250	0.9790	0.9913	2/7/2003	14:52:44.250

Seq 1 of 3

Ready

# To plot the data, press the “Graph (Quick)” button

The screenshot displays the Crossbow Data Acquisition software interface. The main window shows a data table with columns for Record, Interval, Channel 1 (G), Channel 2 (G), and Date. A red arrow points to the 'Graph (Quick)' button in the toolbar. An inset window shows a graph of the data, with Channel 1 (red) and Channel 2 (green) plotted against Time (Seconds). Channel 1 remains constant at 1.0, while Channel 2 drops from 1.0 to approximately -0.15 at 22.5 seconds.

Record	Interval	Channel 1	Channel 2	Date
1	0.000	0.9832	0.9907	2/7/2003 14:52:44.000
2	0.005	0.9790	0.9907	2/7/2003 14:52:44.005
3	0.010	0.9796	0.9907	2/7/2003 14:52:44.010
4	0.015	0.9796	0.9907	2/7/2003 14:52:44.015
5	0.020	0.9790	0.9901	2/7/2003 14:52:44.020
6	0.025	0.9796	0.9907	2/7/2003 14:52:44.025
7	0.030	0.9796	0.9901	2/7/2003 14:52:44.030
8	0.035	0.9796	0.9901	2/7/2003 14:52:44.035
9	0.040	0.9790	0.9901	2/7/2003 14:52:44.040
10	0.045	0.9784	0.9901	2/7/2003 14:52:44.045
11	0.050	0.9796	0.9901	2/7/2003 14:52:44.050
12	0.055	0.9802	0.9907	2/7/2003 14:52:44.055
13	0.060	0.9802	0.9907	2/7/2003 14:52:44.060
14	0.065	0.9796	0.9907	2/7/2003 14:52:44.065
15	0.070	0.9790	0.9907	2/7/2003 14:52:44.070
16	0.075	0.9790	0.9907	2/7/2003 14:52:44.075
17	0.080	0.9796	0.9901	2/7/2003 14:52:44.080
18	0.085	0.9796	0.9901	2/7/2003 14:52:44.085
19	0.090	0.9802	0.9901	2/7/2003 14:52:44.090
20	0.095	0.9796	0.9901	2/7/2003 14:52:44.095
21	0.100	0.9796	0.9901	2/7/2003 14:52:44.100
22	0.105	0.9784	0.9895	2/7/2003 14:52:44.105
23	0.110	0.9790	0.9901	2/7/2003 14:52:44.110
24	0.115	0.9796	0.9901	2/7/2003 14:52:44.115
25	0.120	0.9790	0.9901	2/7/2003 14:52:44.120
26	0.125	0.9790	0.9901	2/7/2003 14:52:44.125
27	0.130	0.9802	0.9901	2/7/2003 14:52:44.130
28	0.135	0.9790	0.9901	2/7/2003 14:52:44.135
29	0.140	0.9796	0.9895	2/7/2003 14:52:44.140
30	0.145	0.9784	0.9889	2/7/2003 14:52:44.145
31	0.150	0.9784	0.9901	2/7/2003 14:52:44.150
32	0.155	0.9796	0.9895	2/7/2003 14:52:44.155
33	0.160	0.9796	0.9901	2/7/2003 14:52:44.160
34	0.165	0.9790	0.9895	2/7/2003 14:52:44.165
35	0.170	0.9790	0.9907	2/7/2003 14:52:44.170
36	0.175	0.9796	0.9895	2/7/2003 14:52:44.175
37	0.180	0.9796	0.9901	2/7/2003 14:52:44.180
38	0.185	0.9796	0.9895	2/7/2003 14:52:44.185
39	0.190	0.9790	0.9901	2/7/2003 14:52:44.190
40	0.195	0.9790	0.9895	2/7/2003 14:52:44.195
41	0.200	0.9802	0.9901	2/7/2003 14:52:44.200
42	0.205	0.9802	0.9901	2/7/2003 14:52:44.205
43	0.210	0.9802	0.9901	2/7/2003 14:52:44.210
44	0.215	0.9796	0.9901	2/7/2003 14:52:44.215
45	0.220	0.9796	0.9907	2/7/2003 14:52:44.220
46	0.225	0.9796	0.9913	2/7/2003 14:52:44.225
47	0.230	0.9802	0.9907	2/7/2003 14:52:44.230
48	0.235	0.9790	0.9907	2/7/2003 14:52:44.235
49	0.240	0.9796	0.9907	2/7/2003 14:52:44.240
50	0.245	0.9790	0.9907	2/7/2003 14:52:44.245
51	0.250	0.9790	0.9913	2/7/2003 14:52:44.250

# To save your data, press the “Save” button.

The screenshot shows the Crossbow Data Acquisition software interface. The main window displays a data table with columns for Record, Interval, Channel 1, Channel 2, Date, and Time. The data table contains 51 rows of recorded data. On the left side, there is a configuration panel with various settings such as 'Name: Crossbow', 'Serial #: 02003-00903-J20', and 'Configuration file name: 1 Channel configuration.dic'. Two dialog boxes are overlaid on the main window. The 'Save As' dialog box is open, showing the file name '1 Channel configuration' and the save type 'Data (\*.did)'. The 'Export Text File' dialog box is also open, showing options for scaling (Device, Raw, Calibrated, Scaled) and separator (Comma, Space, Tab). The 'Export Text File' dialog box also has options for selection (Entire Spreadsheet, Selected Block).

Record	Interval	Channel 1	Channel 2	Date	Time
1	0.000	0.9832	0.9907	2/7/2003	14:52:44.000
2	0.005	0.9790	0.9907	2/7/2003	14:52:44.005
3	0.010	0.9796	0.9907	2/7/2003	14:52:44.010
4	0.015	0.9796	0.9907	2/7/2003	14:52:44.015
5	0.020	0.9790	0.9901	2/7/2003	14:52:44.020
6	0.025	0.9796	0.9907	2/7/2003	14:52:44.025
7	0.030	0.9796	0.9901	2/7/2003	14:52:44.030
8	0.035	0.9796	0.9901	2/7/2003	14:52:44.035
9	0.040	0.9790	0.9901	2/7/2003	14:52:44.040
10	0.045	0.9784	0.9901	2/7/2003	14:52:44.045
11	0.050	0.9796	0.9901	2/7/2003	14:52:44.050
12	0.055	0.9802	0.9907	2/7/2003	14:52:44.055
13	0.060	0.9802	0.9907	2/7/2003	14:52:44.060
14	0.065	0.9796	0.9907	2/7/2003	14:52:44.065
15	0.070	0.9790	0.9907	2/7/2003	14:52:44.070
16	0.075	0.9790	0.9907	2/7/2003	14:52:44.075
17	0.080	0.9796	0.9901	2/7/2003	14:52:44.080
18	0.085	0.9796	0.9901	2/7/2003	14:52:44.085
19	0.090	0.9802	0.9901	2/7/2003	14:52:44.090
20	0.095	0.9796	0.9901	2/7/2003	14:52:44.095
21	0.100	0.9796	0.9901	2/7/2003	14:52:44.100
22	0.105	0.9784	0.9895	2/7/2003	14:52:44.105
23	0.110	0.9790	0.9901	2/7/2003	14:52:44.110
24	0.115	0.9796	0.9901	2/7/2003	14:52:44.115
25	0.120	0.9790	0.9901	2/7/2003	14:52:44.120
26	0.125	0.9790	0.9901	2/7/2003	14:52:44.125
27	0.130	0.9802	0.9901	2/7/2003	14:52:44.130
28	0.135	0.9790	0.9901	2/7/2003	14:52:44.135
29	0.140	0.9796	0.9895	2/7/2003	14:52:44.140
30	0.145	0.9784	0.9889	2/7/2003	14:52:44.145
31	0.150	0.9784	0.9901	2/7/2003	14:52:44.150
32	0.155	0.9796	0.9895	2/7/2003	14:52:44.155
33	0.160	0.9796	0.9901	2/7/2003	14:52:44.160
34	0.165	0.9790	0.9895	2/7/2003	14:52:44.165
35	0.170	0.9790	0.9907	2/7/2003	14:52:44.170
36	0.175	0.9796	0.9895	2/7/2003	14:52:44.175
37	0.180	0.9796	0.9901	2/7/2003	14:52:44.180
38	0.185	0.9796	0.9895	2/7/2003	14:52:44.185
39	0.190	0.9790	0.9901	2/7/2003	14:52:44.190
40	0.195	0.9790	0.9895	2/7/2003	14:52:44.195
41	0.200	0.9802	0.9901	2/7/2003	14:52:44.200
42	0.205	0.9802	0.9901	2/7/2003	14:52:44.205
43	0.210	0.9802	0.9901	2/7/2003	14:52:44.210
44	0.215	0.9796	0.9901	2/7/2003	14:52:44.215
45	0.220	0.9796	0.9907	2/7/2003	14:52:44.220
46	0.225	0.9796	0.9913	2/7/2003	14:52:44.225
47	0.230	0.9802	0.9907	2/7/2003	14:52:44.230
48	0.235	0.9790	0.9907	2/7/2003	14:52:44.235
49	0.240	0.9796	0.9907	2/7/2003	14:52:44.240
50	0.245	0.9790	0.9907	2/7/2003	14:52:44.245
51	0.250	0.9790	0.9913	2/7/2003	14:52:44.250

Location  
(Choose save as  
.txt type)

Export File  
Option