

WindPlot - User Manual

WindPlot is a data processing and visualization software developed entirely in **MATLAB** for plotting wind pressure distribution over a roof and the associated wind speed and direction. The user can select a plot of his choice from various menus on the screen. All the menus and the commands are explained below in detail.

1. Input Format :

The purpose of WindPlot is to facilitate processing and visualization of the voluminous amount of data segmented by pressure sensors and accumulators . The sensors and accumulators are situated on the roof of a building and data is collected by a program called “House” .

The “House” collects data at 100 Hz and stores them in a binary file named as “dat_0_DDD_HHMMSS.hos” .

- *DDD* : Day of year (001,110,365)
- *HH* : Hour of day (01,12,23)
- *MM* : Minutes (00,23,59)
- *SS* : Seconds(00,23,59)

This is to represent the time of data collection. A single file contains data for a period of 15 minutes.

The module “*bin2txt.exe*” which comes along with WindPlot converts the above-mentioned binary file to free text format and saves the file in the following name format. *MMM-DD-YYYY_HH-MM_XM.txt* →

- *MMM* : Month in 3 letters(JAN,FEB,MAR ...)
- *DD* : Day of the month in 2 digits (01,12 ..)
- *YYYY* : Year in 4 digits (1999,2000,2001)
- *HH* : Hour of day in 2 digits (01, 02..12)
- *MM* : Minute of the hour (01,02,23,56 ..)
- *XM* : AM , PM.

The above data is of 3 second averaging. Although the bin2txt module has been implemented to produce n-second averaging text data, the default is kept as 3 seconds.

The input to WindPlot is in the form of a free text file containing the pressure and wind velocity information in different columns. The data is organized in a specific format as follows :

3	-6.38348	8.990188	..	..	0.091426	0.3411448	0.447923
6	-6.40661	9.018985	..	..	0.091411	0.215626	4.423247
9	-6.40803	9.021358	..	..	0.082739	0.203371	2.234377
12	-6.40798	9.021934	..	..	1.710658	1.643908	2.979169
15	-6.40442	9.022214	..	..	4.907807	4.865483	4.467277
18	-6.40391	9.023797	..	..	3.970522	3.998623	10.42709
21	-6.40248	9.022764	..	..	4.940111	4.910833	11.17188
24	-6.40176	9.022330	..	..	4.795172	4.768109	12.65728

The first column is the time in seconds. The remaining columns are the pressures corresponding to different channels at that instant of time. The columns are numbered as 1,2,3... The channels are numbered from 0,1,2.... So the data from the 3rd channel is in the 5th column & the data from the 20th channel is in the 22nd column and so on. As the data is for 15 minutes, for 3-second averaging, the time will vary from 3-900 in steps of 3 & for 1-second averaging it will vary from 1-900 in steps of 1sec.

2. House Information :

The house information is to contain the dimensions of the house, geographical north relative to the house, sensor positions over the roof, specified with the ridge & edge as the axes , the internal pressure channel , the directional channel, & the wind velocity channel. A sample file explaining the details is as follows. The order of information should always be the same. Although the information can be stored in any file, the default name is “house.inf”.

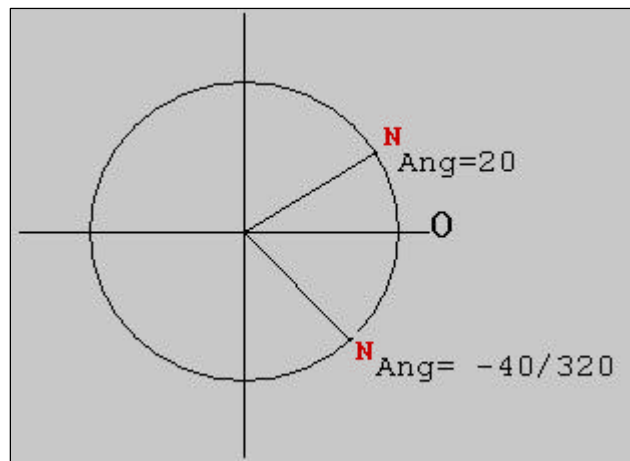
```

410          House width along the edge in inches.
135          House Length along the eves...
-20          Position of North in degrees w.r.t the standard 0 position
11          Internal Pressure Channel
29          Wind Direction Channel
31          Wind Velocity Channel.
1 199      131      Sensor-Number From-Ridge Along -Edge.
2 176.25 131      Repeat as above.
5 199 2 0.5      ..
6 199      0      ..
7 176.25 0
8 108.25 20.5
9 108.25 0
12 46      20.5
13 46      0
15 23      20.5
16 23      0
17 -19.5   20.5
18 -19.5   0
19 -41.5   20.5
20 -41.5   0
22 -110   20.5
23 -110   0
24 -179   0
25 -202   0
26 -202   20.5
28 -202   131
--- End -- // Not to be included in the file
...

```

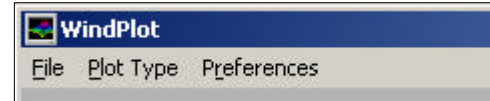
The geographical North is represented as the deviation in degrees from 0 position. The width of the house is assumed to be in the “0” position.

The text data files are stored in a directory named “**data**” which is the subdirectory of the directory where the house.inf is stored. The event information is also stored in a similar way in “**events**” directory.



Menu bar :

- *File*
- *Plot Type*
- *Preferences*



File Menu :

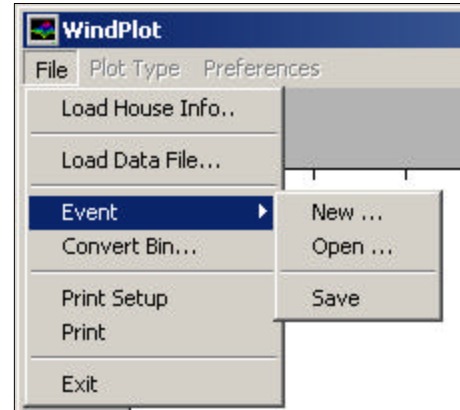
The file menu is the first menu that is to be used in WindPlot. It has many options. Each one is explained in detail below.

Load House Info:

This should be the first command that should be executed. It loads the dimensional & geographical details of the house and the location of sensors over the house.

Load Data File :

This command pops up a file selection box from which the user can select any data file to be viewed.



Event Menu : - New

This command brings upon the screen a new frame with which the user can enter information about an event, which took place on the given date, time & duration. A user-customized name can also be given to the event. All files corresponding to the event are loaded from the *data* directory.

Event Menu : - Open

This command is used to load a previously saved event from the *events* directory.

Event Menu : - Save

This command saves the loaded event in a file for future reading. This file is stored in the *events* directory.

Convert Bin :

This command converts the selected Binary File to free text format that can be read using WindPlot. Actually the module *bin2txt.exe* is executed.

Print Setup :

This command brings up a popup menu with which we can set print layout.

Print :

This command brings up a popup menu that is used to print the figure.

Exit :

This command closes the application & clears the memory. This is the safest way to quit the application.

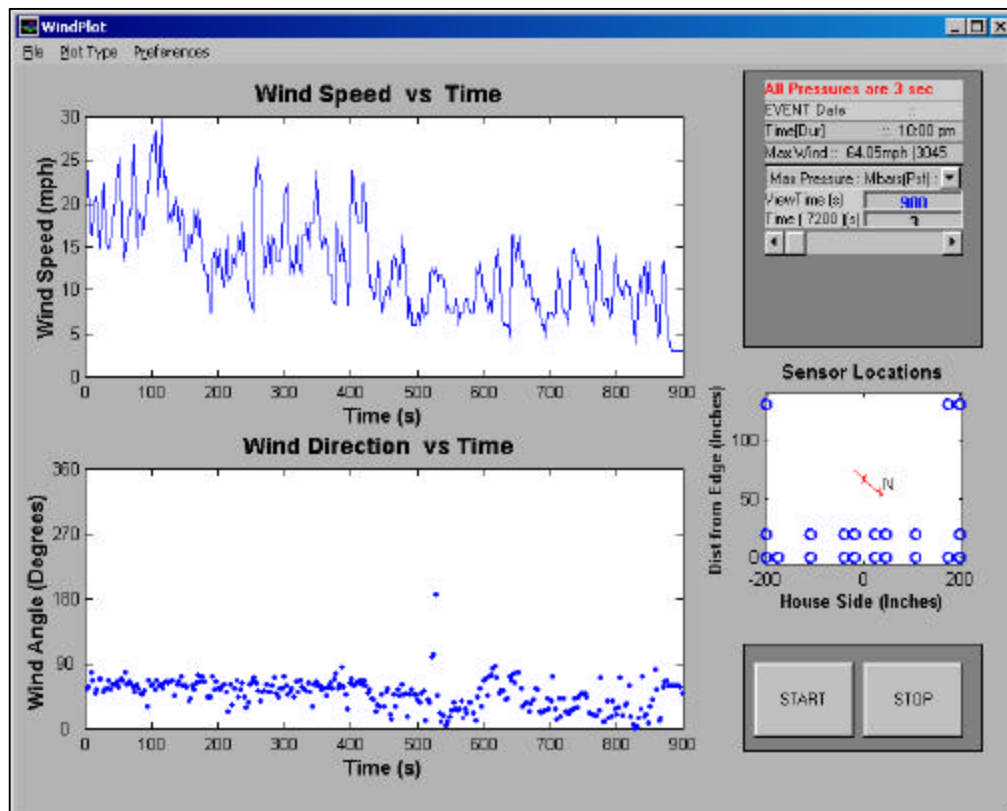
Plot Type :

This menu is used to select the type of plot to be viewed. This option can be used only after a data file is loaded.

Wind Speed :

This command plots the wind velocity & wind speed as shown in fig 1. (Note : The right frame which displays buttons, labels and scroll bars is displayed in Page x)

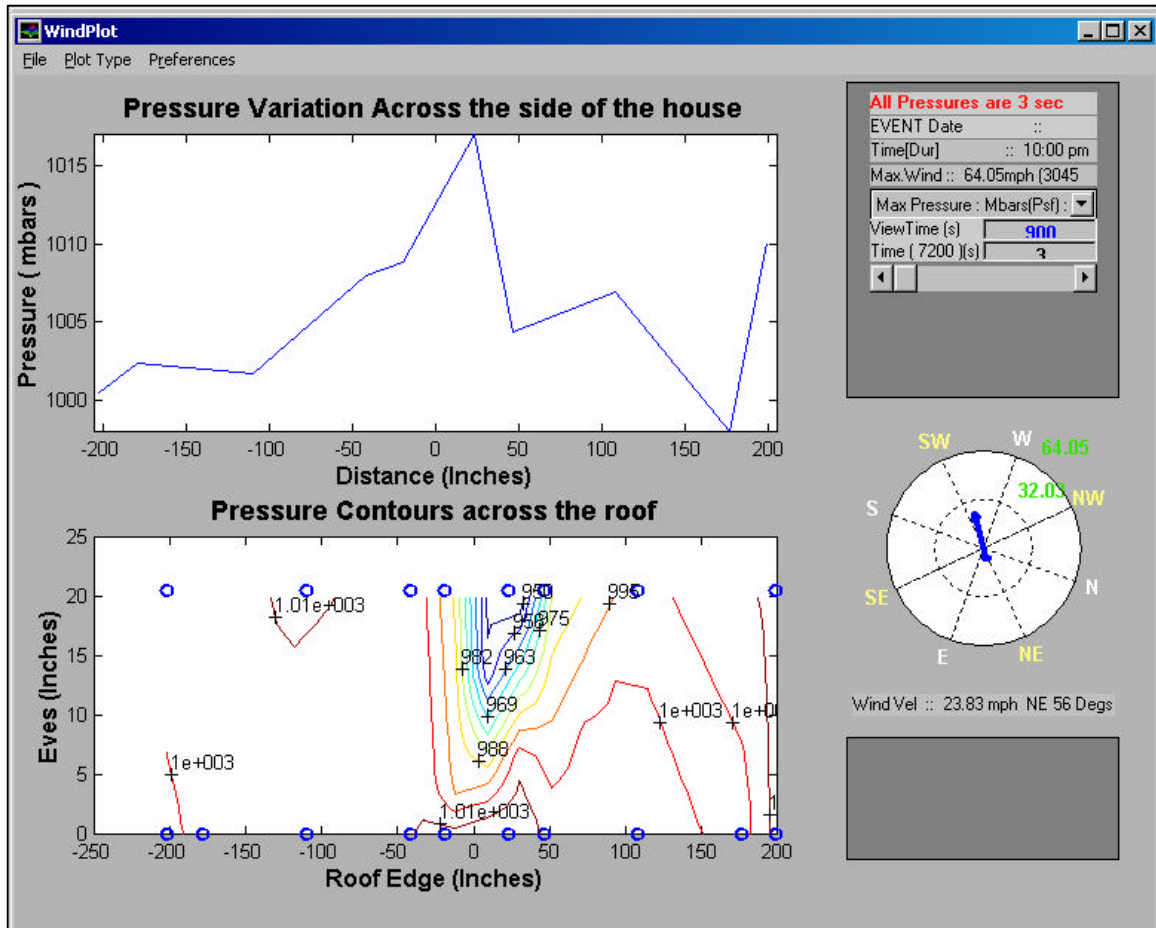
Fig 1 . Sample Wind Speed Plot.



Surface Pressure :

This command plots the pressure distribution over the line of sensors nearest to the edge and the contour plot of the pressure distribution over the roof. The wind is also shown in the screen.

Fig 2. Sample Surface pressure Plot



Individual – Internal Pressure :

This command plots the internal pressure of the house & the wind velocity.

Individual – Absolute External Pressure :

This command plots the absolute pressure given by any given channel . The channel can be selected from a popup menu in the right frame. The selected sensor is lighted in red in the sensor map.

Individual – Relative External Pressure :

This command plots the difference of pressure between any sensor & the internal sensor. The channel can be selected from a popup menu in the right frame. The selected sensor is lighted in red in the sensor map.

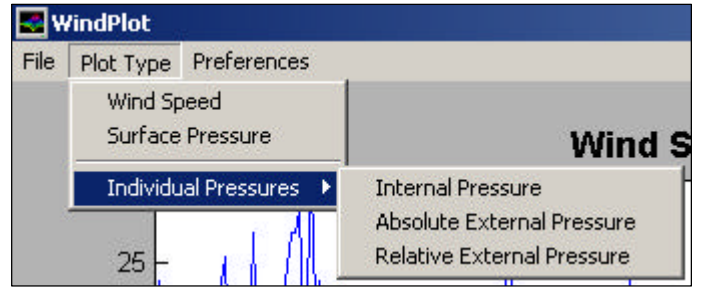
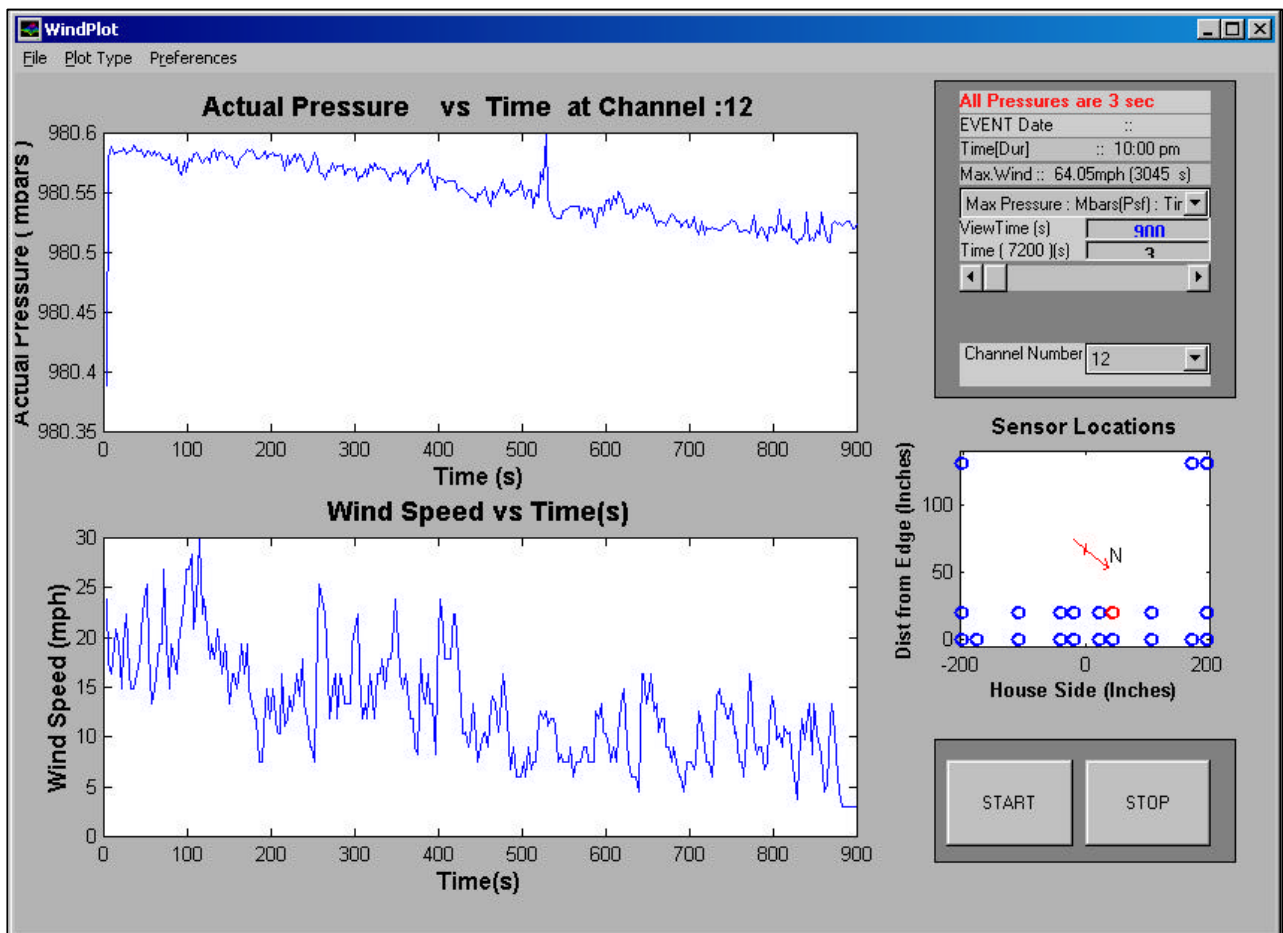
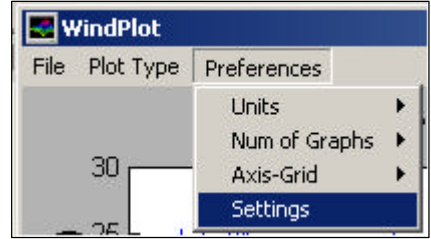


Fig 3. Sample Absolute Pressure Plot



Preferences :

This menu is used for changing the settings of plots.



Units :

The Units can be changed from Millibars to Psf & vice versa.

Num of Graphs :

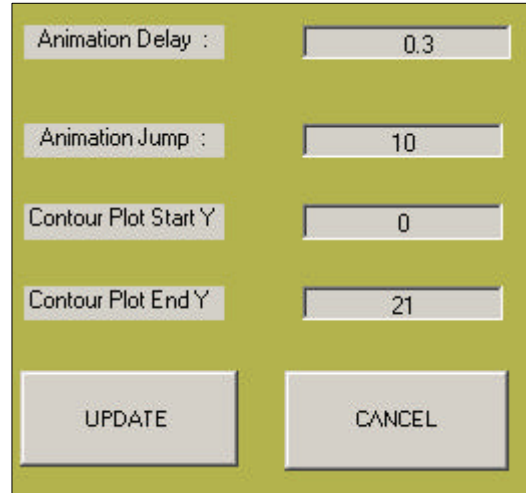
The number of plots on the screen is by default 2. This can be changed to 1 for better clarity. Refer Fig 5.

Axis Grid:

This command toggles the **grid** on the axis on/off. In many cases grid is very useful for viewing. Ref Fig 4.

Settings:

This command brings up a new frame on which the user can set the animation delay, animation time jump, contour plot extents etc. The user may cancel the input at any point. All data should be numerical & within the given range.



Animation Delay:

This is the time in seconds for which a particular plot is displayed before the next plot is shown during an animation delay. Lower delay implies faster animation. It's value ranges $0 < \text{delay} < 1$.

Animation Jump:

This is the time increment in seconds that is used for plotting the next plot. Lower the value, smoother the animation.

Contour Plot Start Y:

This is the Y-axis start position on the roof for the surface plot option.

Contour Plot End Y:

This is the Y-axis end position on the roof for the surface plot option. These settings help to plot within a given range.

Update :

The button replaces the old settings with new settings. If in case of any error, error message is printed out in the matlab command window.

Cancel :

The button cancels the change settings operation.

3. Right Frame :

The right frame acts like a tool bar to drive the whole software. It shows the name date, time & duration of the event or single data file, the current view span & view time , Maximum wind & time of occurrence , Maximum pressures at all the sensors with time of occurrence , a slider to view particular time plot , the wind compass, sensor map , the Start & Stop Animation Buttons.....

View Time :

The view time is the duration for which a single plot is plotted. The default is 900s. It can be changed as wanted. The view time cannot be more than the maximum time, which is shown in the next label.

Slider :

This is a very useful tool to move the graph to a position of wanted time. The new time is changed and shown in the text box above.

Channel Number :

This popup menu is used for selecting the channel for which the pressures are to be plotted.

Sensor Locations :

This is a map of the sensors on the roof of the house. This map also shows the geographical north with respect to the house.

Buttons:

The frame also has two buttons namely the *Start* & *Stop* buttons for animation. The speed of the animation can be changed in the settings menu option. Once the *Start* button is pressed, the animation starts & it runs till the maximum time is reached or the *Stop* button is pressed.

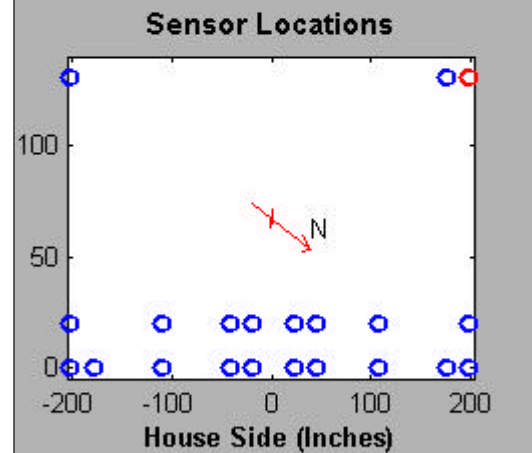
Wind Compass:

This plot replaces the sensor map in surface pressure plot. This shows the wind direction at any given time. The compass rotates itself to align towards the geographical north. The wind velocity in magnitude & direction is given in the label below.

All Pressures are 3 sec averages

EVENT Date	:: sep-30-2000
Time[Dur]	:: 10:00 pm [02:00]
Max.Wind	:: 64.05mph (3045 s)
Max Pressure : Mbars(Psf) : Time(s)	
ViewTime (s)	900
Time (7200)(s)	924

Channel Number: 1



START STOP

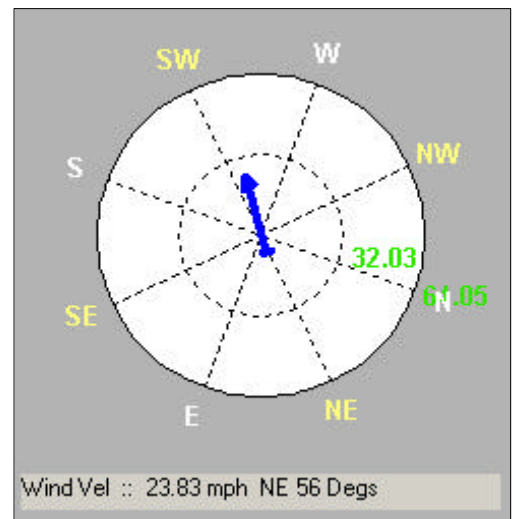


Fig 4. Sample Internal Pressure Plot wit Axis ON

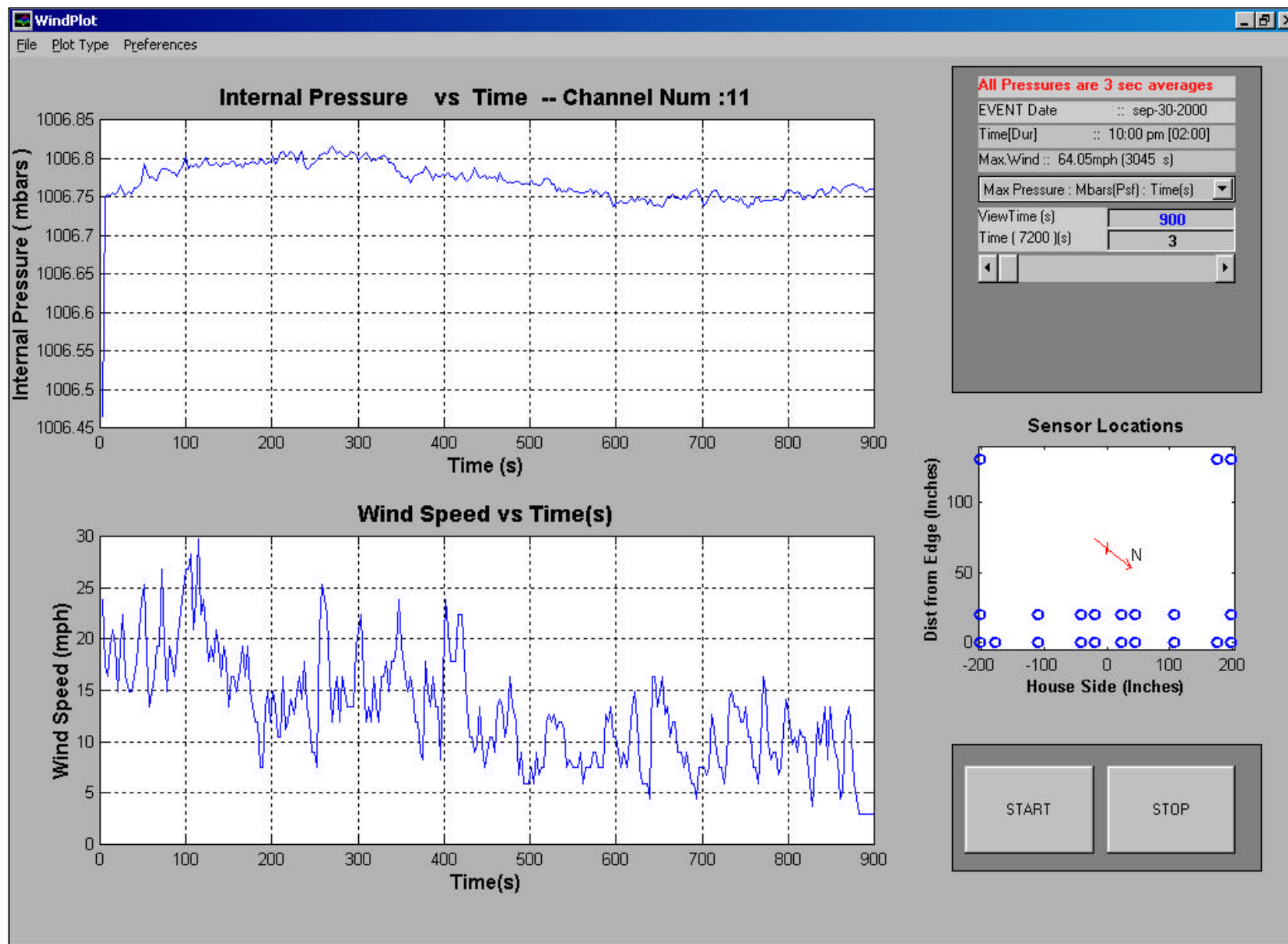


Fig 5. Sample Wind Speed Plot as a single plot

