THRESHOLD

SOF-806

USER'S MANUAL

DOC-017
Rev. 1.4

Copyright ©2015
All Rights Reserved

Med Associates Inc.
P.O. Box 319
St. Albans, Vermont 05478

Phone: 802.527.2343
Fax: 802.527.5095
www.med-associates.com

notes

Table of Contents

CHAPTER 1 SYSTEM SETUP

Software

If a complete system was purchased from Med Associates, Inc. the Threshold software has been installed and is ready for use. If Threshold is being installed on a new PC or is being reinstalled, place the CD in the computer's CD drive and click **Install Threshold** at the welcome splash screen. If the CD does not auto-start, navigate to the CD drive in Windows Explorer and double click the "autorun.exe" file to begin the installation.

DIG-744 Configuration

Once the software and driver installation is complete shut down the PC and install the DIG-744 card according to the directions for installing PCI cards included with the computer. Turn the computer back on and run the Measurement & Automation program found on the desktop. Under Devices and Interfaces the PCI-6023E (DIG-744) card will be listed. Click on the PCI-6023E card and click the Properties button. Click on the AI tab and set the mode to Referenced Single Ended, as shown in Figure 1-1. Click OK or Apply and OK to save the configuration changes.

Figure 1-1 - Configuring the PCI-6023E (DIG-744) Card
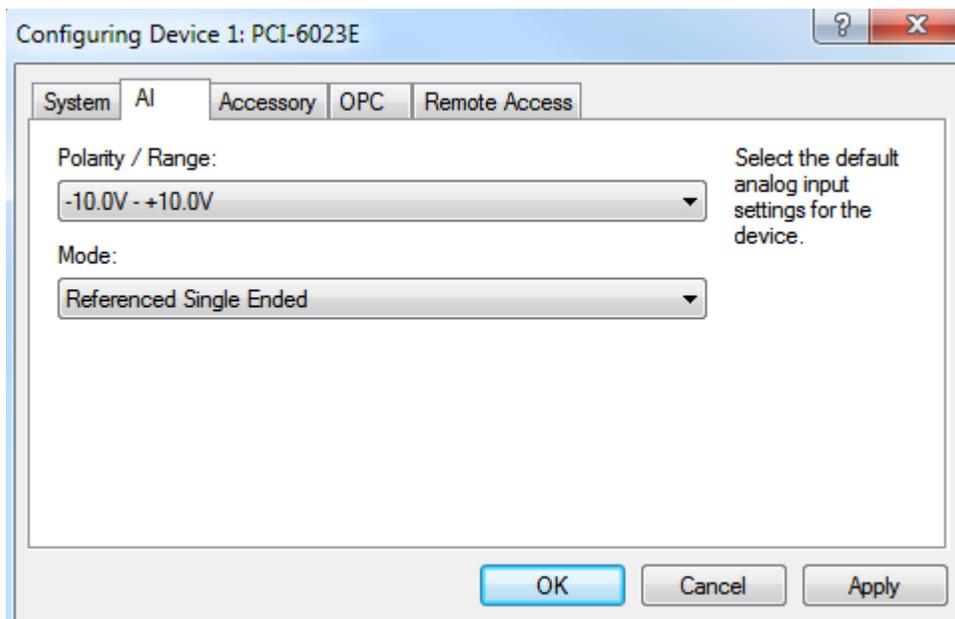
System Preferences

From the menu bar select **File > Preferences** to open the Preferences screen (Figure 1-2). Table 1-1 explains the available options. Click OK when all preferences are set.
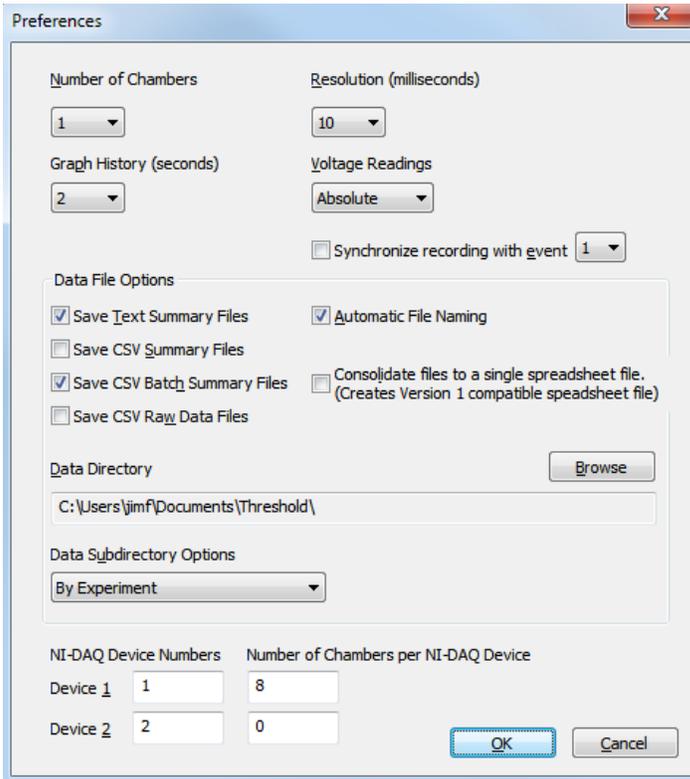
Figure 1-2 - Preferences


Table 1-1 - Preference Options

Item	Description
Number of Chambers	Sets number of chambers being used
Resolution	Sets data acquisition in milliseconds
Graph History	Sets number of seconds of data to display on the graph
Voltage Readings	Absolute – Voltage recorded as 0 – 10V Relative – Voltage recorded as -10 – 10V. See Threshold Data
Synchronize Recording With Event	Only record data when selected event is activated
Save Text Summary Files	Saves a text summary file of the experiment
Save CSV Summary Files	Saves a comma separated value (csv) version of the text summary. May be imported to a spreadsheet
Save CSV Batch Summary Files	Saves a single csv data file that contains the results of multiple experiments
Save CSV Raw Data Files	Converts the raw data file to a spreadsheet file. These files may be very large so use caution when using this option

Automatic File Naming	Automatically names data files based on experiment, group and subject
Consolidate files to a single spreadsheet file	Creates a Threshold v1 .out spreadsheet file. Only used for backwards compatibility with v1 analysis software
Data Directory (Browse)	Selects location to store data files
Data Subdirectory Options	Creates a sub-directory in the data directory for each experiment based on selected item
NI-DAQ Device Number	Sets the number of the DIG-744 card to use. The device number is listed in the Measurement and Automation program
Number of Chambers per NI-DAQ Device	Sets number of chambers connected to each DIG-744 card

Chamber Calibration

Click **File > Calibrate** to open the calibration screen. Each chamber has a graph showing the upper threshold (blue), lower threshold (green), and current input value (red). Line colors are adjustable through the **Colors** menu. The upper and lower thresholds are adjustable so optimal upper and lower thresholds can be derived before experiments are run.

Figure 1-3 - Calibration Screens
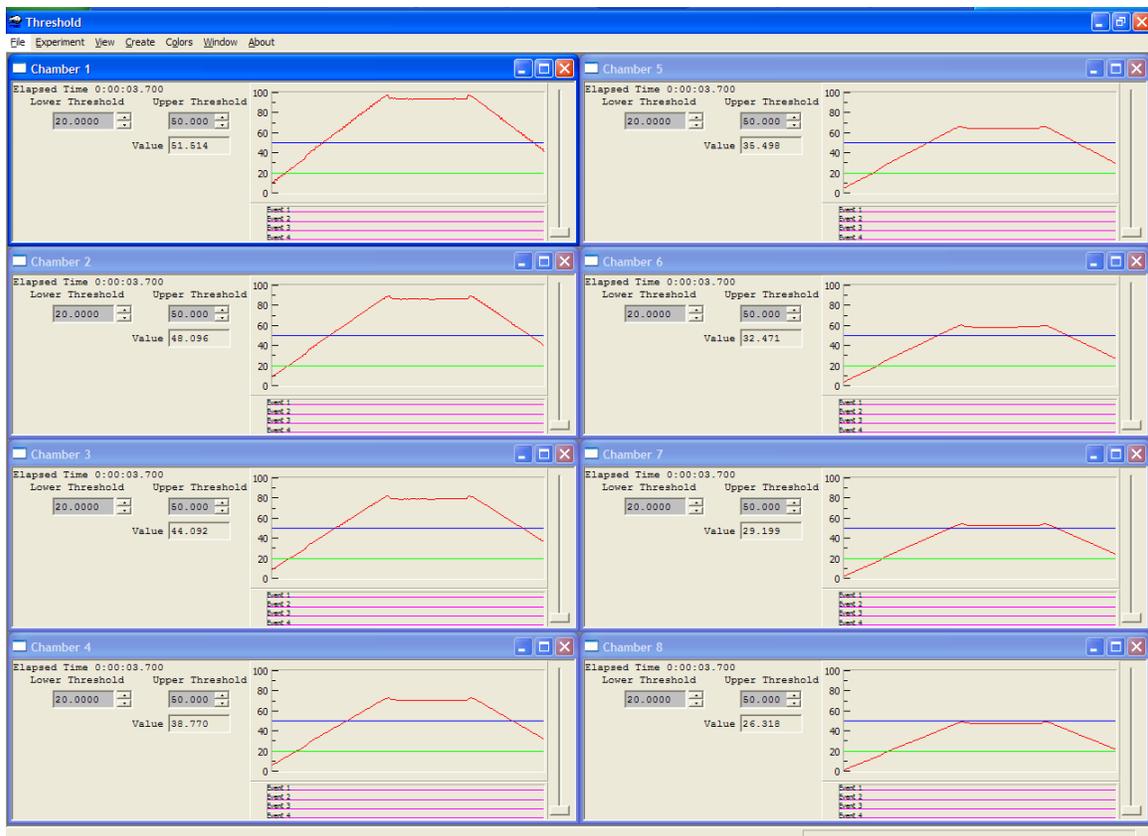
Use the up and down arrows on the upper & lower threshold boxes to set the respective threshold values. Click **File > Stop Calibration** when all settings are complete.

Menu Options

File Menu

Item	Description
Preferences	See System Preferences.
Calibrate	Calibrate the inputs for each chamber
Exit	Exit Threshold

Experiment Menu

Item	Description
Start Experiment	Displays the experiment form and allows the experiment to be started
Start Chambers	Start the currently configured chambers
Stop Chambers	Stop currently running chambers and saves the data
Abort Chambers	Abort currently running chambers without saving data
Pause Chambers	Pause currently running chambers
Resume Chambers	Resume paused chambers

View Menu

Item	Description
View Text Summary File	Display summary text data files
View CSV Summary File	Display CSV summary data files
View CSV Batch Summary File	Display CSV batch summary files
View Raw Data File	Display raw data files
View CSV Raw Data File	Display CSV raw data files

Create Menu

Item	Description
Create Text Summary File	Creates a text summary file from a raw data file

Create CSV Summary File	Creates a CSV summary file from a raw data file
Create CSV Batch Summary File	Creates a CSV batch summary file from a set of raw data files
Create CSV Raw Data File	Creates a CSV raw data file from a raw data file
Create Threshold Version 2 Export File	Converts raw data files to the old Threshold Version 2 exported data files format

NOTE: CSV (Comma-Separated Value) file format is a common spreadsheet format that can be viewed using any spreadsheet application.

Color Menu

Allows user to adjust colors of data and event lines.

Window Menu

Options for arranging experiment windows

About Menu

Displays copyright and version information about the Threshold software.

CHAPTER 2 COLLECTING DATA

Experiment Setup

To begin collecting Threshold data select **Experiment > Start Experiment** to open the Experiment Settings screen.

Figure 2-1 - Experiment Settings

If a new experiment is to be created, or an existing one is to be modified, click **Add Experiment** or **Modify Experiment**, set the experiment parameters in the Modify Experiment screen (Figure 2-2 & Table 2-1), and click OK to be returned to the Experiment Settings screen.

Highlight chamber 1 and select the experiment from the **Experiment ID** drop down box, the experiment settings will load into the right hand portion of the screen. The experiment ID and Group ID can be copied to all chambers being run by clicking **Copy data to all chambers**. Click each chamber number being used and enter the Subject ID, Subject Info and Comment (if desired). Click **Start Experiment**, select the chambers to start in the next screen and click **Start** to begin data collection.

While collecting data the **Experiment** menu allows the user to start, stop, pause, resume and abort chambers as needed. See Experiment Menu.

Figure 2-2 - Modify Experiment

Table 2-1 - Experiment Settings

Item	Description
Experiment Time	Length of trial in minutes
Number of Blocks	Number of blocks the trial is broken into
Block Time	Block duration in seconds
Upper Threshold	Value of upper threshold from 0 – 100
Lower Threshold	Value of lower threshold from 0 – 100
Start Trigger	Value from 0 – 100 that must be exceeded before Threshold will start recording data. Set to 0 to disable this feature
Pre & Post Ignore 1 & 2	The event number that is used for Pre Ignore 1 and Post Ignore 1.
Pre Ignore 1 & 2 Time	Number of milliseconds of data ignored prior to the Pre Ignore 1 & 2 events. Only affects the summary data. Must be an even multiple of the resolution.
Post Ignore 1 & 2 Time	Number of milliseconds of data ignored after the Post Ignore 1 & 2 events. Only affects the summary data. Must be an even multiple of the resolution.
Event Labels 1-4	Descriptive labels for events implemented in the experiment

Threshold Data

Threshold voltage data (values) are acquired from a DIG-744 card (also known as a NI PCI-6023E), which is attached to a load-cell placed underneath the animal. The load-cell measures pressure, and outputs the pressure value in volts.

The DIG-744 reads voltage values between –10 volts and 10 volts, with a precision of 4.88 millivolts. When Threshold is in absolute voltage mode, all negative voltages are converted to positive values, therefore –5 volts becomes 5 volts. In relative voltage mode, Threshold keeps the voltage values between –10 and 10 volts. After the voltage value has been received, Threshold multiplies the value by ten. Therefore in absolute mode Threshold has a value scale from 0 to 100, and in relative mode Threshold has a value scale from –100 to 100.

Threshold events are acquired via software calls, either through MED-PC or third party software. The functions that are used to turn Threshold events on or off look like the following:

```
void EventOn(int box, int event);
void EventOff(int box, int event);
```

The box is a number between one and thirty-two, and the event is a number between one and four. On the Threshold CD there is a directory called "MED-PC Files", and in that directory are two files, thresh.hed and thresh.mpc. To turn Threshold events on and off from MED-PC, include the file thresh.hed in the MED-PC user.pas file.

```
{Place $I Filename.HED files here.}
{$I THRESH.HED}
```

Then from inside the MED-PC program issue the EventOn command as follows:

```
S.S.1,
S1, \ Wait for Start command and then tell
    \ Threshold to start recording data
#START: ~EventOn(Box, 1);~ ---> S2
```
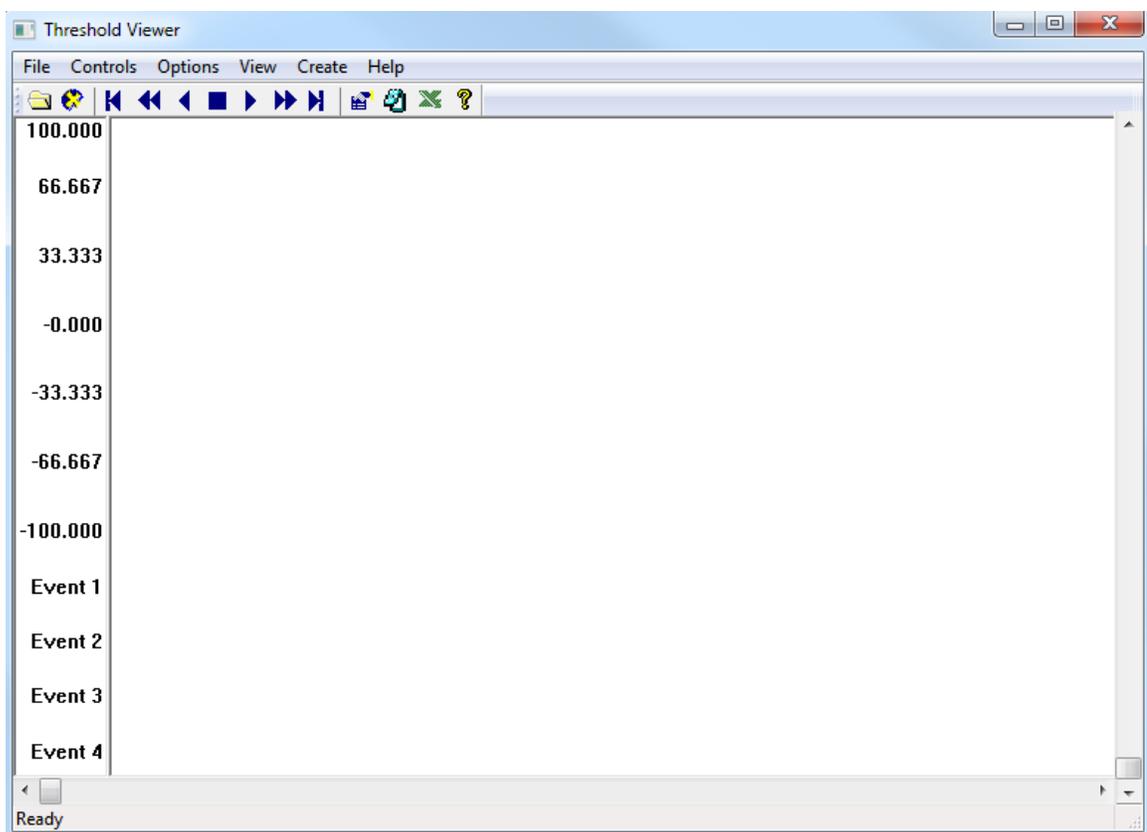
and the same syntax applies to the EventOff command.

```
S2, \ Run for 5 minutes and then tell
    \ Threshold to stop recording data
5': ~EventOff(Box, 1);~ ---> STOPKILL
```

CHAPTER 3 USING THRESHOLD VIEWER

When the Threshold Viewer software is opened, the screen depicted in Figure 3-1 will appear.

Figure 3-1– Threshold Viewer main screen

Menu Options

File Menu:

- **Open Data File** – Opens a Threshold raw data file.

- **Close Data File** – Closes a data file.

- **Print** – Prints the current screen.

- **Import | Tail Suspension data files** – Imports Tail Suspension data files to Threshold format raw data files.

- **Exit** – Exits the program.

Controls Menu:

- **Play** – Scrolls forward through the data file.

- **Pause** – Stops scrolling the data file.

- **Rewind** – Scrolls backwards through the data file.

- **Fast Forward** – Scrolls forward through the data file ten times faster than play.

- **Fast Reverse** – Scrolls backwards through the data file ten times faster than rewind.

- **Beginning** – Goes to the beginning of the data file.

- **End** – Goes to the end of the data file.

- **Refresh** – Refreshes the screen.

Options Menu:

- **Colors** – Modifies the color of the thresholds, events, tracking and data lines.

- **Current File** – Selects the current file. Only the current files events are displayed, and the program cannot scroll past the end of the current file.

View Menu:

- **File Information** – Displays information about the open files and allows recalculation of threshold parameters.

- **Zoom** – Changes the scale of the data graph. If the tracking bars would be moved off the screen due to modifying the scale, the tracking bars are moved to a location that is visible on the screen.

- **Tracking** – Turns the tracking line (Trace 2) on and off.

- **Lock Trace 1** – Locks the Trace 1 line to the current position.

- **Lock Trace 2** – Locks the Trace 2 line to the current position.

- **View Text Summary File** – Displays summary files.

- **View CSV Summary File** – Displays CSV summary files.

- **View CSV Batch Summary File** – Displays CSV batch summary files.

- **View CSV Raw Data File** – Displays CSV raw data files.

Create Menu.

- **Create Text Summary File** – Creates a text summary file from a raw data file.

- **Create CSV Summary File** – Creates a CSV summary file from a raw data file.

- **Create CSV Batch Summary File** – Creates a CSV batch summary file from a set of raw data files.

- **Create CSV Raw Data File** – Creates a CSV raw data file from a raw data file.

- **Create Threshold Version 2 Export File** – Creates an export file in the .out file format compatible with Threshold Version 2.

The **Help** menu displays version number and copyright information.

File Information

The file information screen displays pertinent information about the experiment, and allows several experiment parameters to be modified and recalculated. When the Recalculate button is clicked a Threshold summary file will be appended to with the recalculated data.   For example, if the original experiment was run with an upper threshold of 40, the upper threshold can be changed to 30 and the experiment will be reanalyzed with the new analysis data saved in the summary file.

Figure 3-2– File Information screen

APPENDIX A DATA FILE FORMATS

Summary Files

Summary data files contain the following information:

- **Printed on** – The date and time the summary file was printed.

- **Threshold Summary, Version** – Displays which version of Threshold created the summary file.

- **Experiment ID** – The experiment ID.

- **Group ID** – The group ID.

- **Subject ID** – The subject ID.

- **Subject Info** – The subject info.

- **Comment** – The comment.

- **Session #** - The session number.

- **Experiment Length** – The length of the experiment in minutes.

- **Block Time** – The length of each block in seconds.

- **Number of Blocks** – The number of blocks in the experiment.

- **Experiment Date and Time** – The date and time the experiment was started.

- **Actual Run Time** – The actual amount of time the experiment ran for, in hour:minute:second:millisecond format.

- **Resolution** – The rate at which data was collected, in milliseconds.

- **Voltage Readings** – Whether the voltage was recorded in absolute mode (took the absolute value of the incoming voltage, from zero to ten volts), or relative mode (did not modify the voltage value, from negative ten to ten volts).

- **Upper Threshold** – The upper threshold value.

- **Lower Threshold** – The lower threshold value.

- **Ignore Event 1** – The event number that is used for Pre Ignore 1 and Post Ignore 1.

- **Pre Ignore 1** - Contains the number of milliseconds to ignore data that occurred prior to Ignore Event 1. This setting only affects the following summary fields, it does not affect the raw data – Time Below Lower Threshold, Time Above Lower Threshold, Time Above Upper Threshold, Lower Threshold Crossings, Upper Threshold Crossings, Sum Above Lower Threshold, Sum Above Upper Threshold.

- **Post Ignore 1** – Contains the number of milliseconds to ignore data that occurred after Ignore Event 1.

- **Ignore Event 2** – The event number that is used for Pre Ignore 2 and Post Ignore 2.

- **Pre Ignore 2** – Contains the number of milliseconds to ignore data that occurred prior to Ignore Event 2.

- **Post Ignore 2** – Contains the number of milliseconds to ignore data that occurred after Ignore Event 2.

- **Event 1-4 Labels** – The name of the respective event.

- **Summary Blocks** – The analysis of the raw data broken into blocks.

- **Time Below Lower Threshold** - The amount of time that the data was below the lower threshold.

- **Time Above Lower Threshold** - The amount of time that the data was less than the upper threshold and greater than or equal to the lower threshold.

- **Time Above Upper Threshold** - The amount of time that the data was greater than or equal to the upper threshold.

- **Lower Threshold Crossings** - The number of times where the data was below the lower threshold, than became greater than or equal to the lower threshold.

- **Upper Threshold Crossings** - The number of times where the data was below the upper threshold, than became greater than or equal to the upper threshold.

- **Sum Above Lower Threshold** - The sum of the data when the data was less than the upper threshold and greater than or equal to the lower threshold.

- **Sum Above Upper Threshold** - The sum of the data when the data was greater than or equal to the upper threshold.

Following is an example of a typical summary file.

```
Printed on : 05/20/2010 11:28:05

                    Threshold Summary, Version 3.0

Experiment ID: First Test
Group ID     : 10ml of saline used
Subject ID   : andy (mouse #1)
Subject Info : Weight - 25 grams
Comment      : andy - first test
Session #    : 1


Experiment Length         : 5 minutes
Block Time                : 60 seconds
Number of Blocks          : 5
Experiment Date and Time : 05/20/2010 11:23:04


Actual Run Time           : 0:05:00.000
Resolution                : 10 milliseconds
Relative Voltage Readings
Upper Threshold           : 50.0
Lower Threshold           : 20.0
Ignore Event 1            : 1
Pre Ignore 1              : 50 milliseconds
Post Ignore 1             : 0 milliseconds
Ignore Event 2            : 4
Pre Ignore 2              : 0 milliseconds
Post Ignore 2             : 20 milliseconds
Event 1 Label             : Light
Event 2 Label             : Shock
Event 3 Label             : Lever 1
Event 4 Label             : Lever 2

-----------------Summary Blocks------------------

Block Number 1
Time Below Lower Threshold : 0:00:34.260
Time Above Lower Threshold : 0:00:07.020
Time Above Upper Threshold : 0:00:18.720
Lower Threshold Crossings  : 18
Upper Threshold Crossings  : 12
Sum Above Lower Threshold  : 24351.5
Sum Above Upper Threshold  : 157338.9

Block Number 2
Time Below Lower Threshold : 0:00:34.280
Time Above Lower Threshold : 0:00:07.000
Time Above Upper Threshold : 0:00:18.720
Lower Threshold Crossings  : 14
```

```
Upper Threshold Crossings  : 12
Sum Above Lower Threshold  : 24306.4
Sum Above Upper Threshold  : 157311.7


Block Number 3
Time Below Lower Threshold : 0:00:34.980
Time Above Lower Threshold : 0:00:06.640
Time Above Upper Threshold : 0:00:18.380
Lower Threshold Crossings  : 16
Upper Threshold Crossings  : 12
Sum Above Lower Threshold  : 23137.0
Sum Above Upper Threshold  : 155006.3


Block Number 4
Time Below Lower Threshold : 0:00:34.960
Time Above Lower Threshold : 0:00:06.960
Time Above Upper Threshold : 0:00:18.080
Lower Threshold Crossings  : 19
Upper Threshold Crossings  : 12
Sum Above Lower Threshold  : 24204.5
Sum Above Upper Threshold  : 150987.0


Block Number 5
Time Below Lower Threshold : 0:00:35.240
Time Above Lower Threshold : 0:00:06.620
Time Above Upper Threshold : 0:00:18.140
Lower Threshold Crossings  : 15
Upper Threshold Crossings  : 11
Sum Above Lower Threshold  : 23087.2
Sum Above Upper Threshold  : 152691.7
```

CSV (Comma Separated Value) summary data files

The CSV summary data files created by Threshold contain the summary data in an easy to read format that is understood by most spreadsheet programs. Following is part of a sample CSV file.


```
Printed on : 10/05/2010 09:56:29


Threshold Summary Recalculated by Threshold Viewer

Experiment ID          5 minute test
Group ID
Subject ID
Subject Info
Comment
Experiment Length    300 seconds
Block Time           60 seconds
Number of Blocks     5
Experiment  Date  and
Time                 9/27/2010 10:15


Actual Run Time      5:00.0
Resolution           1 milliseconds
Absolute Voltage Readings
Upper Threshold      60
Lower Threshold      30
Event 1 Label
Event 2 Label
Event 3 Label
Event 4 Label


------------------Summary Blocks----------- ---------
---                              -      -
All times are in seconds.
```

Block Number	Time Below Lower Threshold	Time Above Lower Threshold	Time Above Upper Threshold	Lower Threshold Crossings	Upper Threshold Crossings	Sum Above Lower Threshold	Sum Above Upper Threshold
1	46.323	4.454	9.223	8	7	199698	812765.8
2	14.040	14.281	31.680	24	24	639280.2	2793319
3	13.924	14.395	31.681	24	24	645375.8	2793047
4	13.923	14.390	31.687	27	24	645022.4	2793226
5	13.920	14.400	31.680	24	24	645472.7	2792550

CSV (Comma Separated Value) batch summary files

The CSV batch summary files created by Threshold contain the summary data from multiple experiments in an easy to read format that is understood by most spreadsheet programs. Following is part of a sample CSV file.

Figure A1.1 – Sample CSV File

CSV (Comma Separated Value) raw data files

The CSV raw data files created by Threshold contain the raw data in an easy to read format that is understood by most spreadsheet programs. Following is part of a sample CSV file.

The first value is the raw value. The raw value is between –100.000 and 100.000. The raw value is the voltage read from the DIG-744 (NI-DAQ card) multiplied by 10.

The second, third, fourth, and fifth values are events one through four, respectively.

So the following line would be interpreted as value: 2.344, event 1: off, event 2: off, event 3: off, event 4: off.

2.344, 0, 0, 0, 0
2.344, 0, 0, 0, 0
2.344, 0, 0, 0, 0
2.344, 0, 0, 0, 0
2.344, 0, 0, 0, 0
2.393, 0, 0, 0, 0
2.344, 1, 1, 1, 1
37.988, 1, 1, 1, 1
38.574, 1, 1, 1, 1
38.916, 1, 1, 1, 1
39.063, 1, 1, 1, 1
39.111, 1, 1, 1, 1
39.160, 1, 1, 1, 1
39.258, 1, 1, 1, 1

The above line would be interpreted as value: 39.258, event 1: on, event 2: on, event 3: on, event 4: on.

APPENDIX B CONTACT INFORMATION

Please contact MED Associates, Inc. for information regarding any of our products.

Visit our website at www.med-associates.com for contact information.

For technical questions, email support@med-associates.com.