Introduction to iWorx and LabScribe

LabScribe is a data recording and analysis software that permits you to collect data and analyze it quickly and efficiently. Using this software, we are going to explore many aspects of physiology over the term. In this introduction lab, you will first carry out an exercise measuring your finger pulse to learn basic functions of this software. You will then carry out a short experiment measuring reaction times to light stimuli. The results of this short experiment will be the basis for your partial lab report.

Equipment Setup

Confirm that the red power light on the data acquisition unit is illuminated. If not, press the switch at the rear of the unit. If the hardware is not connected properly, a pop-up window will alert you to that fact. Should this occur, check all connections, and then click **Tools** and select **Find Hardware**.
Each exercise should be performed and saved separately. After one exercise, please save it with proper label, close it and open a proper new setting for the next exercise.

Please note that the following images are for LabScribe 2, some of you will be using LabScribe 3. The icons are vary slightly but are found in the same position

Exercise 1: Finger Pulse Measurement

Click the LabScribe icon and answer “OK” in the box that appears.
Click the **Settings** menu and select the **Introduction Lab** settings file.
Notice that each Channel has its own recording area, with a title area at the upper left corner (e.g. Channel 1 and 2) followed in sequence by icons representing **Zoom In, AutoScale, Zoom Out, Add Function**, and the **Value** of the voltage at the upper right. Above Channel 1 is the sampling Speed, the Display Time, the **Mark** button, the comment entry line and the **Record** button.

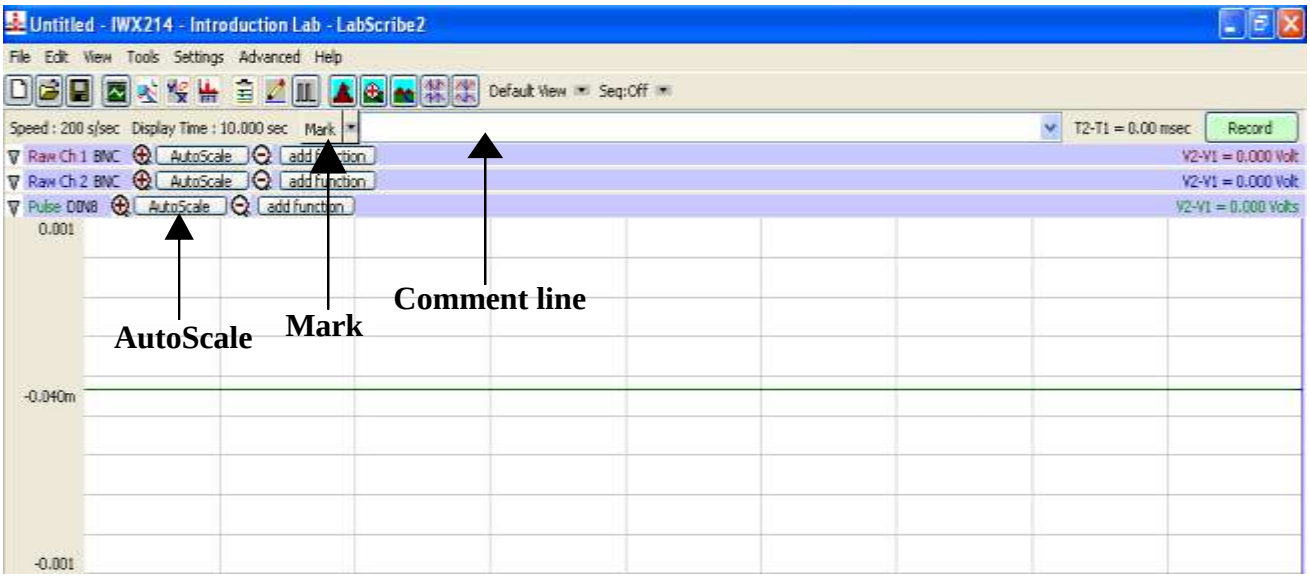


Figure 1-1 AutoScale and Mark buttons and Comment line within the Main window.

We will use pulse plethysmography to collect data about your finger blood flow. The plethysmograph detects very small changes in volume as the blood flow into your finger increases and decreases with each cardiac contraction.

Plug the DIN connector on the end of plethysmograph into the Channel 3 outlet on the data acquisition unit and place the plethysmograph on the volar surface (where the fingerprints are located) of the distal (outermost) segment of the middle finger, and wrap the Velcro strap around the finger to attach the unit firmly in place.

Click **Record** and collect data for 60 seconds. Each pulse represents the blood flow to the finger from one cardiac contraction. If the peak of the pulse deflects downwards, use the **Invert** function in the right-click menu for Channel 3 to orient the peaks in the correct direction. Click **AutoScale** in the Pulse Channel title area and see the rhythmic signal almost fill the Channel recording area. Click **Stop** to halt the recording.

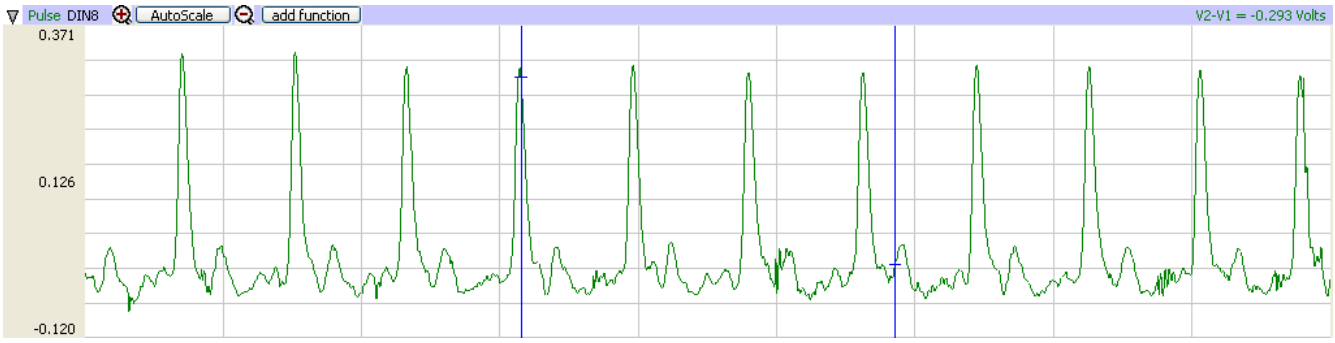
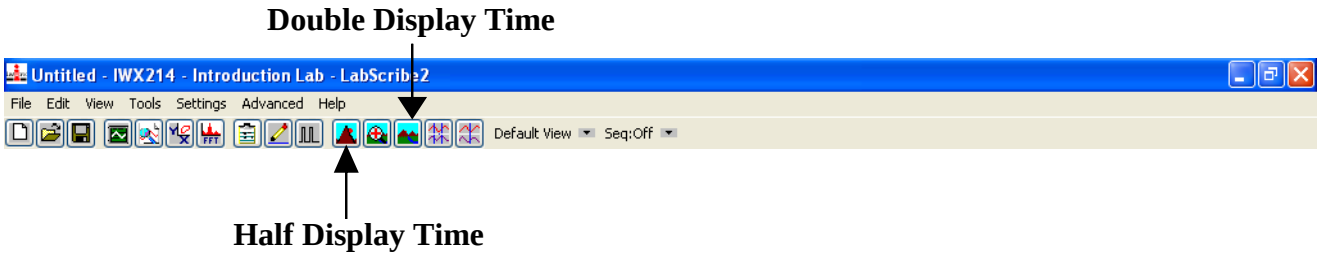


Figure 1-2. Finger pulse as measured by the plethysmograph which detects very small changes in volume as the blood flows into the finger.

Display Control



The default rate for a signal to cross the screen is 10 seconds and is represented as **Display Time** in the area above the Channel 1 title. The Display Time can be changed by clicking the **Half Display Time** (big mountain) or the **Double Display Time** (small mountains) icons. Each time you click these icons, the display time sequentially is reduced or expanded by 2-fold respectively. In order to return to the default value, click Display Time after clicking **Stop**. Try these functions on your pulse measurements and observe the changes.

Data can be navigated by using the scroll bar at the bottom of the Main window. Click the right or left scroll arrow to move to your desired portion of the data on the screen.

Pressing and holding the left mouse key when pointing at the interface between two channels will allow you to adjust the size of the channel window.

Making Marks on a Record

Many experiments are divided into a series of exercises. It is useful to mark each exercise with a proper label, so that during subsequent review of the data it is possible to determine what the particular stages of the recording represent.

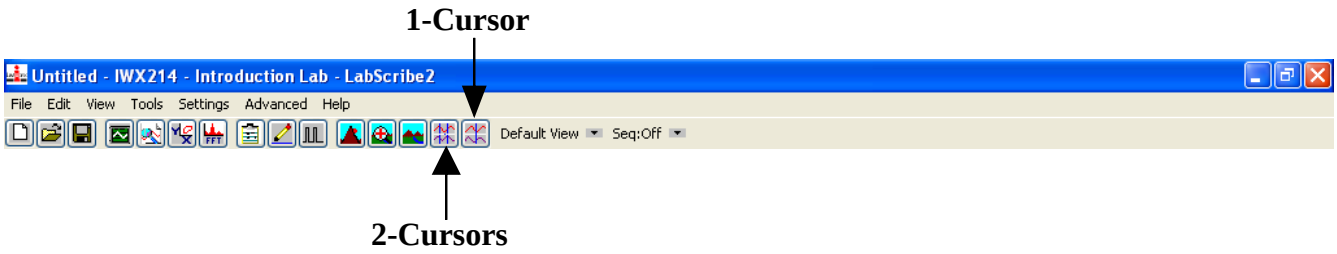
Entering Marks while recording

Use the keyboard to type comments in the area next to the **Mark** button. Press the **Mark** button, or the Enter key on the keyboard and a line will be placed on the recording with the comment inserted.

Place the plethysmograph on your middle finger and click **Record**. Type “Mark #1” using the keyboard and press Enter key. Notice that a vertical line appears in the window with the typed words in the lower margin. Note that if you stop a recording and then re-start, the labeled mark will disappear until you press **Stop** again. Repeat to enter a total of five comments, pressing the **Mark** button or Enter key after each. Click **Stop** and remove the plethysmograph. You can move the typed label anywhere along the black bar where the recording appears by clicking and dragging the label. If you want to restore any labels to their original positions, go to **View** and select **Marks**. From the options presented in the submenu that appears select **Reset Location of Displayed Marks**.

Entering Marks when not recording

Notice the **1-Cursor** and **2-Cursors** icons to the right of the Half and Double Display Time icons.



Using 2-Cursors mode:

When data has been recorded, two blue vertical lines or cursors overlay the screen. This is the **2-Cursor** mode, normally used for analyzing data. These cursors can be used to make annotations and may be moved to any point on the recording by clicking and dragging the blue asterisk. If you use the keyboard to type a comment on the line next to the Mark button and press the Enter key, the comment will be shown in the lower margin at the LEFT cursor.

Place the plethysmograph on your middle finger and click **Record**. Record finger pulse for 30 seconds and click **Stop**. Drag the left blue cursor to the peak of any pulse. Type “Peak 1” on the line next to the **Mark** button and press Enter. Notice that a vertical line with the comment will be shown at the left cursor. Drag the left blue cursor to next peak of pulse. Type “Peak 2” on the line next to the **Mark** button and press Enter. Repeat to enter a total of five different comments.

Note: You cannot write labels against the right blue cursor however it is used for data analysis. Observe that as you change the distance between the right and left cursor, the difference in volts displayed as **V2-V1** on the right hand side changes.

Using 1-Cursor mode:

The **1-Cursor** mode is used for determining absolute value on a recording. You can also create marks in this mode.

Click **1-Cursor** icon. A single cursor will appear. Follow the same method as entering marks with 2-Cursors. Repeat to enter a total of five different comments on the same recording. The trace should contain ten labels in total.

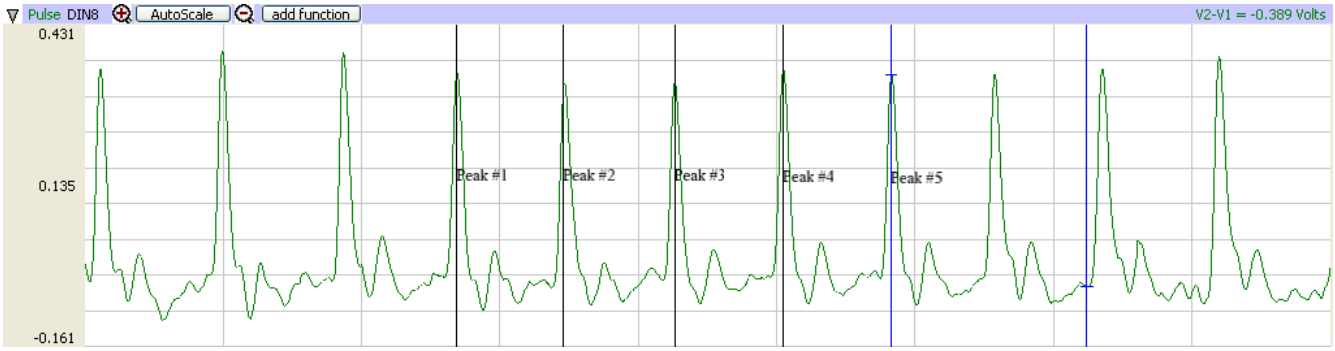
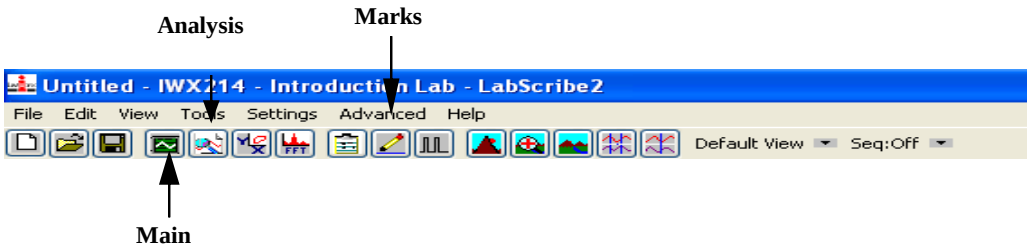


Figure 1-3. The finger pulse is recorded and labeled in Main window with 2 Cursors. 1 Cursor can also be used to make annotations in Main window.

Data Analysis

Data analysis can be performed in the either the **Main** or the **Analysis** windows. However, for more detailed analyses, the Analysis window is preferred. Ensure that you click the **2-Cursors** icon before you open the Analysis window. You will record your finger pulse with the plethysmograph and calculate heart rate from the reading while you get familiar with this software. The LabScribe software has several options listed under the **View** tab. You will use the following functions:

Main: Record incoming signals and perform data analysis
Analysis: Perform data analysis
Marks: Review annotations entered during data acquisition



Determining values using the Main Window

Using 2-Cursors mode:

Display a previous finger pulse recording on the screen. Click the 2-Cursors icon (two vertical bars). Drag the cursor lines to the left and right to see the difference in:

- Time between the positions of two cursor lines. This difference is labeled as **T2-T1** and is shown to the right of the comment entry line.
- Voltage between the positions of two cursor lines. This difference is labeled as **V2-V1** on the right hand side.

Using 1-Cursor mode:

Display a previous finger pulse recording on the screen. Click the **1-Cursor** icon (single vertical bar). Drag the line to the left or right to make measurement of:

- Absolute Time from the beginning of the trace, which is shown to the right of the comment entry line.
- Absolute Value of the voltage on the right hand side.

Data Analysis in the Analysis Window

Display a previous finger pulse recording on the screen. Click the 2-Cursors icon. Drag the cursors left and right so that the section of the recording to be used in the Analysis window is between the two cursors. Place the cursors so that 2 complete pulse cycles are selected. Click the Analysis icon. You will see a similar display however it will include an **Add Function** tab above the trace. Move the cursors so each is located on a peak of an adjacent finger pulse. Analyses are performed for all channels. Click **Add Function**, select **General** and select **T2-T1** from the list. This will generate a column above the trace indicating the difference in time between the two points. Return to the Main window.

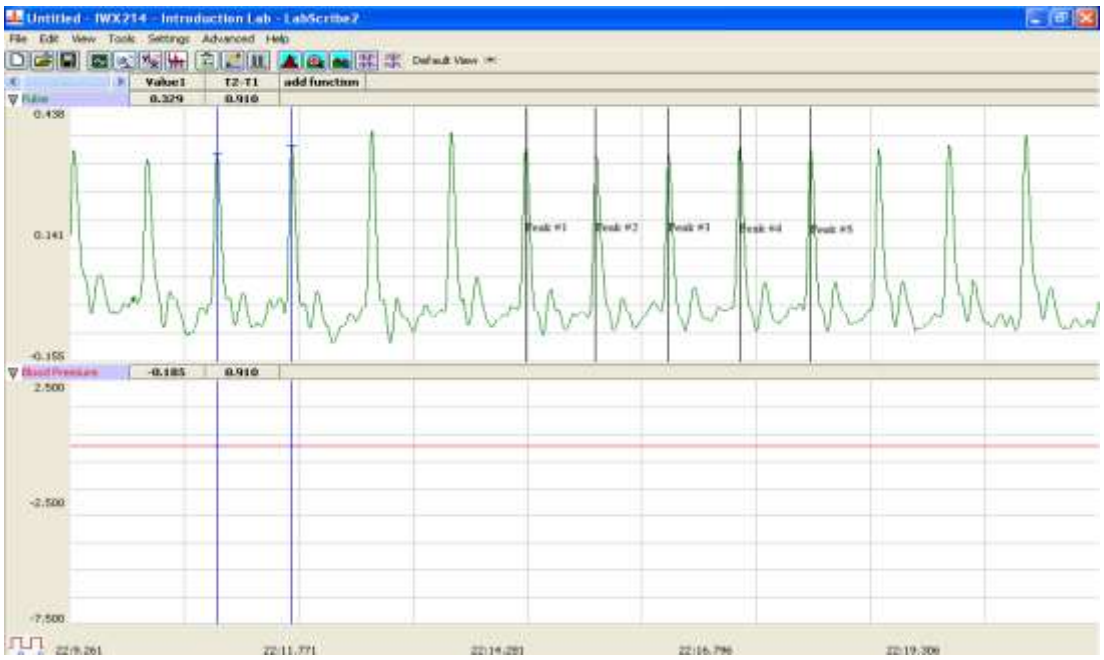


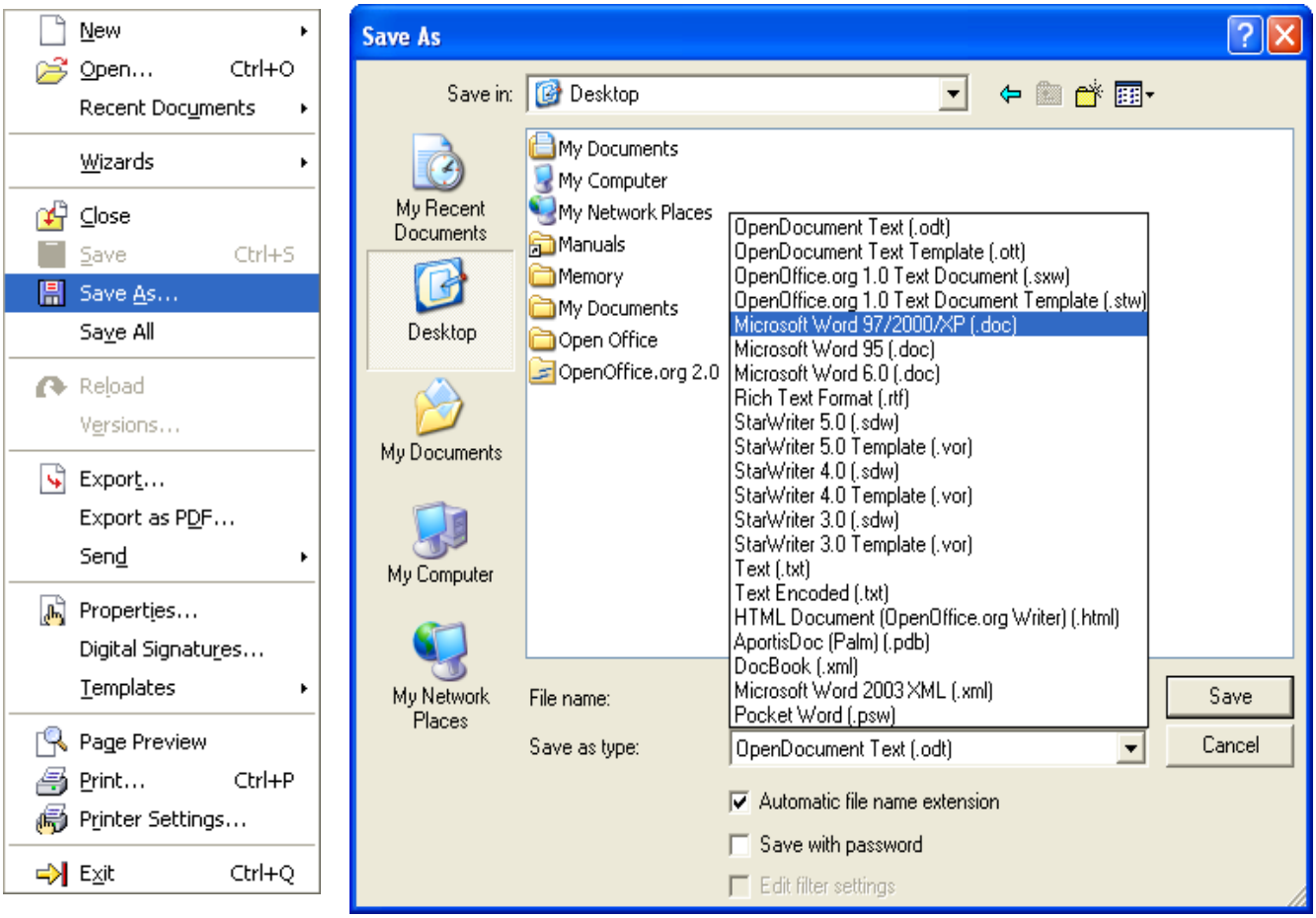
Figure 1-4. The Analysis window can be used to perform data analysis.

You should now be familiar with how to record your finger pulse and calculating the heart rate. Also, you should be quite familiar with features in this software such as display controls, creating marks and data analysis. If you are not, spend more time to explore these features to get yourself ready for the subsequent labs.

Exporting and Saving Files

Exporting Texts and Copying into Open Office

Select Open Office Writer. Copy and Paste the display by using the right-click menu into Open Office Writer. Label your files: last name of partner 1, last name of partner 2, Lab Day, File #. Save your data as the appropriate Microsoft file you will need.



Export Pictures and Copying into Open Office

Copy the graph, from either the Main or Analysis window, into Open Office Writer (Verify that all the information you require has been copied). When you save text or pictures in Open Office Writer, you must save it as the appropriate Microsoft Word file in order to access the files on other computers. Label your files: last name of partner 1, last name of partner 2, Lab Day, File #

Exercise 2: Reaction Times to Colour Visual Cues

IWX/214 Setup

Click the LabScribe icon and answer “OK” in the box that appears.
Pull down the Settings menu again. Select the Color-VisualReflexes-LS2 settings file. Remove the plethysmograph and plug the event marker into the Channel 3 input. Ensure that the female BNC to Dual Banana adapter into the positive (red) and negative (black) banana jacks of the IWX/214. Attach the bicolor light source to the adapter on the stimulator outputs if this has not already been done.

Procedure A

1. Instruct the subject to sit in a chair and hold the bicolor light source in one hand. Hold the event marker in the other hand in a manner that enables the subject to press the button on the event marker as quickly as possible. Watch the bicolor light source and quickly press and release the button on the event marker when the green colored signal generated by the BCL-100 first appears.

2. Open the **Sequence** menu (Figure 1). Select **GreenLED**. When **GreenLED** is selected, the name on the Sequence menu is replaced with the words, **GreenLED**. This sequence will run automatically when the **Record** button is clicked.

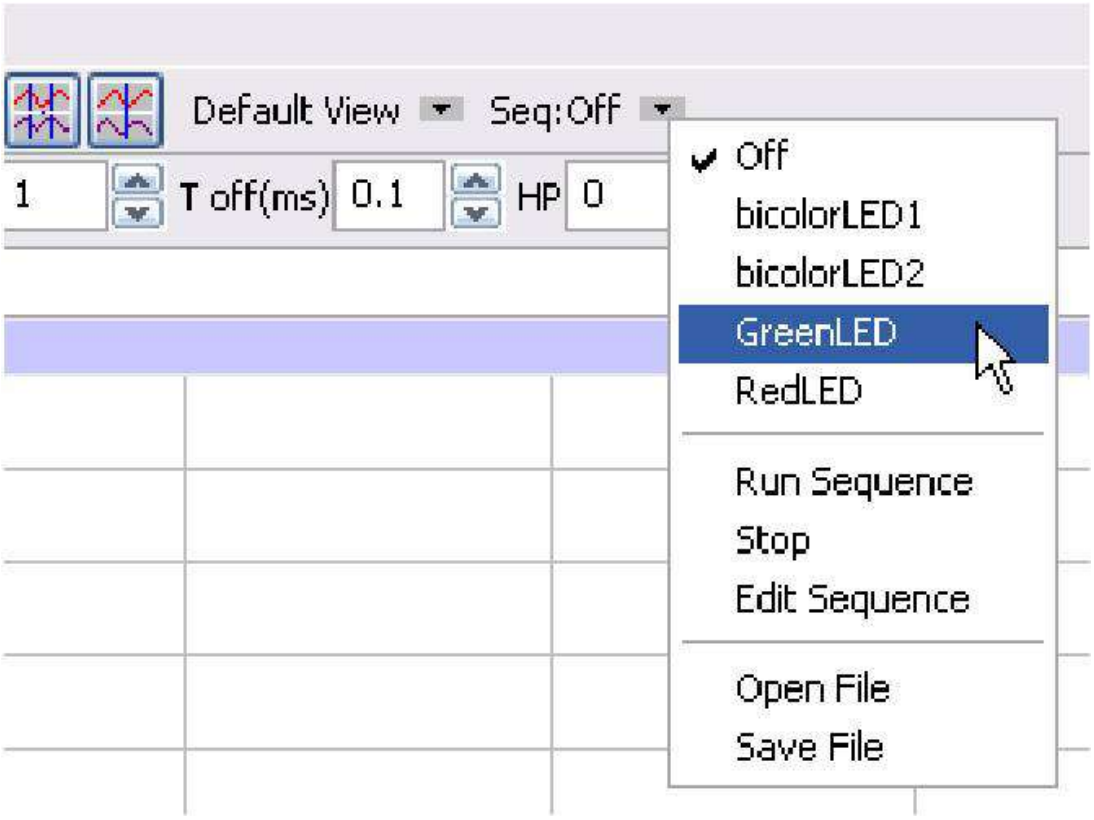


Figure 2-1. The Sequence menu containing the preprogramming light sequences used in this exercise.

3. Type <Subject’s Name> Green Cues in the comment box that is to the right of the **Mark** button.

4. Instruct the subject that a visual cue from the bicolor light source could appear at any time, and that he or she should respond to the visual cue as quickly as possible. Click the **Record** button and press

the Enter key to mark the recording.

5. Twenty green colored visual cues will be presented to the subject. The cues will be between two and five seconds apart.

6. After the twentieth cue, click **Stop** to halt recording.

7. Select Save As in the File menu, type a name for the file. Choose a destination on the computer in which to save the file. Click the Save button to save the data file.

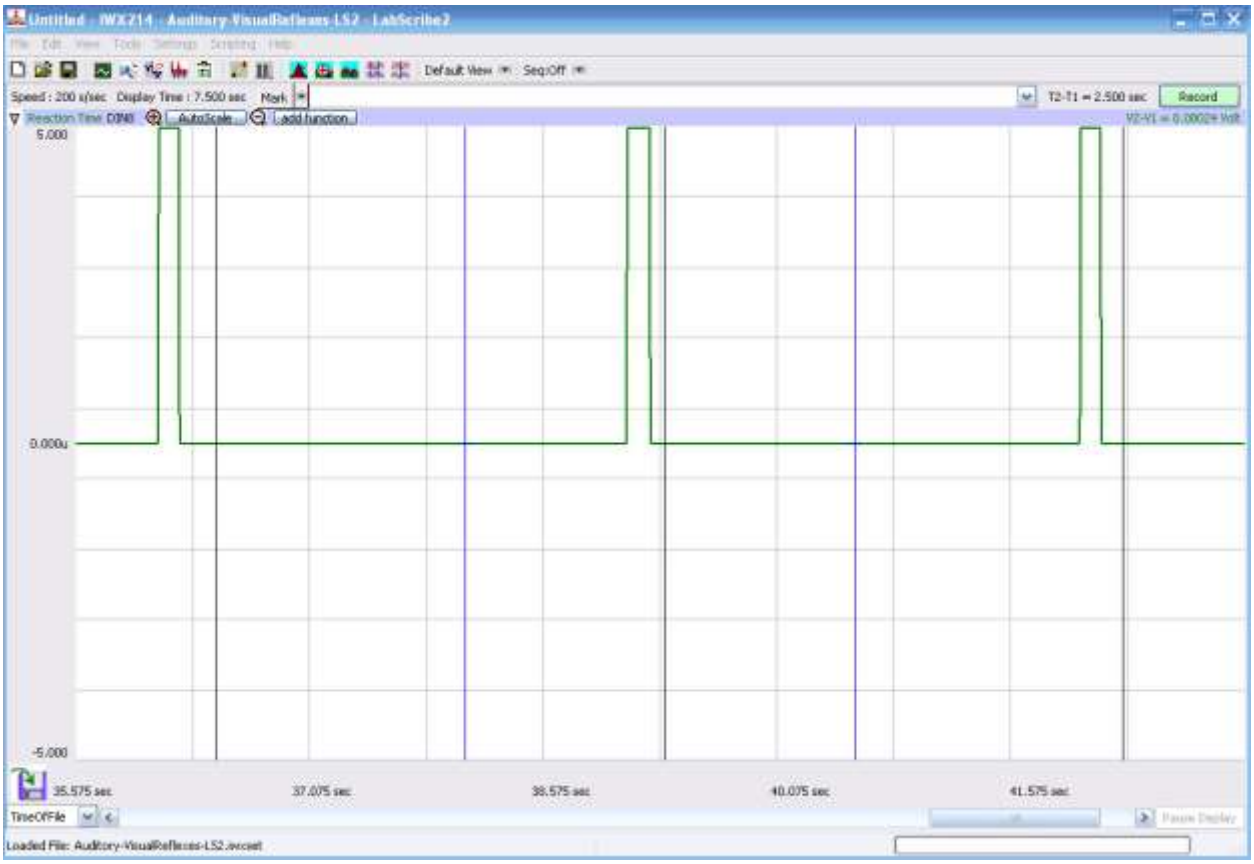


Figure 2-2. The signals for the visual cue and the subject's response to the cue shown on the Main window.

Procedure B

In this exercise, the same subject will be responding to twenty red colored light cues.

1. Open the **Sequence** menu (Figure 1). Select **RedLED**. When RedLED is selected, the name on the Sequence menu is replaced with the words, RedLED. This sequence will run automatically when the **Record** button is clicked.

2. Type <Subject's Name> Red Cues-Set in the comment box that is to the right of the **Mark** button.

3. Instruct the subject that a visual cue from the bicolor light source could appear at any time, and that he or she should respond to the visual cue as quickly as possible. Click the **Record** button and press the Enter key on the keyboard to mark the recording.

5. Deliver twenty red colored visual cues to the subject. The cues will be between two and five seconds apart.

6. After the twentieth cue, click **Stop** to halt recording.

7. Select Save As in the File menu, type a name for the file. Choose a destination on the computer in which to save the file. Click the Save button to save the data file.

Procedure C

In this exercise, the same subject will be responding only to red colored light cues in when presented random combinations of twenty red or green colored cues.

1. Open the **Sequence** menu (Figure 1). Select **bicolorLED1**. When bicolorLED1 is selected, the name on the Sequence menu is replaced with the words, bicolorLED1. This sequence will run automatically when the Record button is clicked.

2. Type <Subject's Name> Red Cues Only-Set in the comment box that is to the right of the **Mark** button.

3. Instruct the subject that a visual cue from the bicolor light source could appear at any time, and that he or she should respond as quickly as possible to only the red colored cues. Click on the **Record** button and press the Enter key on the keyboard to mark the recording.

4. Deliver twenty visual cues to the subject. The cues will be between two and five seconds apart.

5. After the twentieth cue, click **Stop** to halt recording.

6. Select Save in the File menu.

Partial Lab Report:

You should write a Results section that describes how the response times to visual stimuli are affected by the colour of the visual stimulus, and by the need to discern between two different colours. This Results section should include two main elements:

1. A figure that shows your data. Create a bar graph that shows the average response time in each of the three conditions. Show the variability in the response time in each condition by plotting error bars on each bar that represent the standard deviation of the response times. Properly label your figure and include a figure legend, as described in the lab report guidelines.

2. A written section that describes the results that are presented in the figure, as described in the lab report guidelines. Answer the following questions when writing this section:
   a. How does the subject's mean reaction time for the green visual cues compare to the mean reaction time for the red visual cues?
   b. How was the subject's reaction time affected when asked to react to only one specific colour cue in sets that contain cues of multiple colours?
   c. What was the relative magnitude of the variability in response times?