

Experiment 1: The LabScribe Tutorial

LabScribe allows data to be accumulated, displayed and analyzed on a computer screen in a format similar to a laboratory strip chart recorder.

Equipment Setup

- 1 Place the iWorx unit on the bench, close to the computer.
- 2 Use the USB (or serial) cable to connect the computer to the USB (or serial) port on the rear panel of the iWorx unit (Figure 1-1 on page 1).
- 3 Plug the power plug into the rear of the iWorx unit and the transformer into the electrical outlet. Use the power switch to turn on the unit and confirm that the red power light is lit.

Start the Software

- 1 Click the Windows **Start** menu, move the cursor to **Programs** and then to the **iWorx** folder and select **LabScribe**; or click on the LabScribe icon on the Desktop
- 2 When the program opens, select **Load Group** from the **Settings** menu.
- 3 When the dialog box appears, select **IPLMV3.iws**. Click **Load**.
- 4 Click on the **Settings** menu again and select the **Tutorial** settings file.
- 5 After a short time, LabScribe will appear on the computer screen as configured by the **Tutorial** settings (Figure 1-2 on page 2). The LabScribe software has seven windows:

- **Main**: Record incoming signals and perform data analysis.
- **Analysis**: Perform data analysis.
- **ScopeView**: Overlay blocks of Chart data for comparison.
- **Journal**: Type notes and insert recordings to create lab reports.
- **Marks**: Review annotations entered during data acquisition.
- **Preview**: Examine incoming signals without recording them.
- **Stimulation**: Change stimulus parameters from **Main** window.

The **Main** window is displayed when LabScribe is first opened (Figure 1-2 on page 2). Notice that each channel has its own (white) recording area, with a title area at the upper left corner, **AutoScale** and **FullScale** select buttons, and the **Value** of the voltage at the upper right. Above the **Channel 1** is a **Time** value, the sampling **Speed**, the **Display Time**, the **Mark** button, the comment entry line, and the **Start** button.

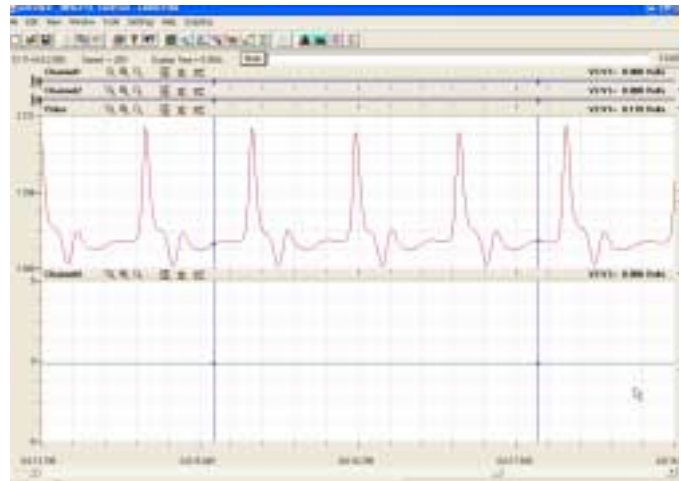


Figure 1-2: The LabScribe Main window

Connection

The output from a PT-104 pulse plethysmograph will be used as a signal source. Proceed as follows:

- 1 Locate the DIN connector on the end of the plethysmograph cable and plug it into Channel 3 (Figure 1-3 on page 2).
- 2 Place the plethysmograph on the volar surface (where the fingerprints are located) of the distal segment of the middle finger, and wrap the Velcro strap around the end of the finger to attach the unit firmly in place.

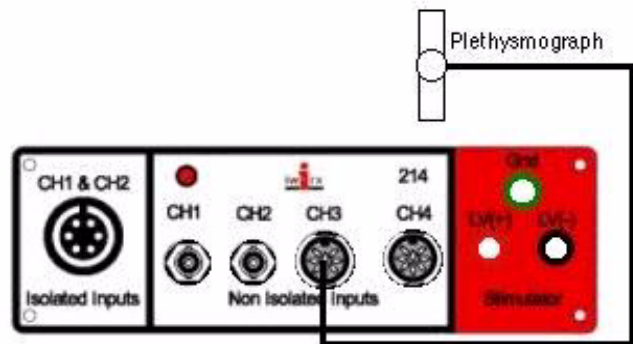


Figure 1-3: The connection between the plethysmograph and the iWorx/214.

Recording with LabScribe

The Signal

- 1 Click **Start** (Figure 1-2 on page 2) and record the finger pulse for at least 30 seconds. Check Channel 3 (**Pulse**). If the pulse goes down, **Stop** the recording. Use the **Invert** function in the **right-click** menu for Channel 3 to orient the image in the correct direction, and **Start** recording again.

Note: If the iWorx unit and computer are not communicating there will be a sine wave in the first two recording windows. If this happens, click **Stop** to halt recording and restore communication between the computer and the iWorx by either selecting **Find Hardware** in the **Tools** menu, or selecting **iWorx** in the **Preferences** dialog under the **Edit** menu.

- 2 Click **AutoScale** in the **Pulse** channel (CH 3) title area and see the rhythmic signal almost fill the channel recording area.
- 3 Click **Stop** to halt recording; your record may look like Figure 1-2 on page 2.
- 4 Click and drag the red arrows at the right margin of the window, up and down to make the **Pulse** (Channel 3) recording window as large or as small as desired.

The Screen Time

The default value for the time for a signal to cross the screen is 10 seconds. This value is displayed as **Display Time** in the area above the Channel 1 title area (Figure 1-2 on page 2). The **Display Time** can be changed by clicking the display controls in the LabScribe toolbar (Figure 1-4 on page 3).

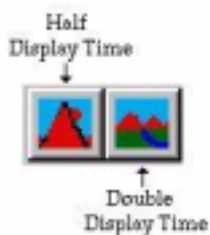


Figure 1-4: The display icons.

To demonstrate the display controls:

- 1 Click the left icon (big mountain) and notice that the trace spreads out; the **Display Time** is five seconds.
- 2 Click the right icon (small mountains) twice and see that the rhythmic peaks get closer; the **Display Time** is 20 seconds.
- 3 Click the left icon once to return to a 10-second display time.

The Sampling Rate

The default value for the number of samples taken per second is 200. This value is displayed as **Speed** above the Channel 1 recording window (Figure 1-2 on page 2). While this value is acceptable for most experiments, it can be changed by selecting **Preferences** in the **Edit** menu and adjusting the sampling rate. Such a change does not alter the screen display time.

Making Marks on a Record

Many experiments are divided into a series of exercises. It is convenient to annotate each exercise, so that during subsequent review of your data file it is possible to determine what was done at any particular stage.

Entering Marks while recording:

Marks can be entered “on-the-fly” while data are being recorded. Use the keyboard to type comments on the line 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 and that line will be associated with the comment typed on the line. Try this:

- 1 Click **Start**.
- 2 Type “Mark#1” using the keyboard and notice that the words appear on the line to the right of **Mark** button (Figure 1-2 on page 2).
- 3 Press the **Enter** key on the keyboard and notice that:
 - the words disappear
 - a vertical line appears in the LabScribe window.
- 4 Type “Mark#2” and repeat step #3.
- 5 Repeat to enter a total of five different comments, pressing the **Enter** key after each.
- 6 Click **Stop**.

Entering marks when not recording:

When data have been recorded, two blue vertical lines or cursors overlay the screen. As you will discover later, these lines can be used to make measurements. However, if you use the keyboard to type a comment on the line next to the Marks button and press the Enter key, the comment will be entered in the lower margin at the left cursor. The last mark may be seen in the lower margin of the recording window.

Saving a LabScribe File

It is wise to save work in any computer application and LabScribe is no exception:

- 1 Click on the **File** menu and select **Save As**.
- 2 When the **Save As** panel appears, type the name of the file. Choose a destination on the computer in which to save the file (e.g. the iWorx or your class folder). Click the **Save** button to save the file (as an *.iwd file).

Data Analysis of Your LabScribe File

Data analysis can be done in either the **Main** or the **Analysis** window. Access to these windows can be gained either by using the **Window** menu or by clicking on the appropriate icon on the LabScribe toolbar (Figure 1-5 on page 4).

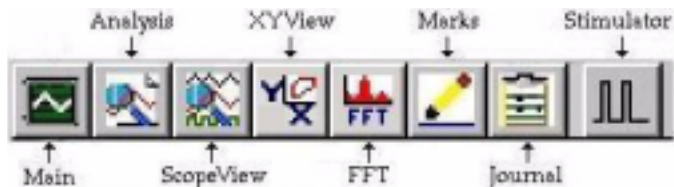


Figure 1-5: The Window icons in the LabScribe toolbar.

Data Analysis in the Main Window

Navigating the Main Window

There are two ways to navigate around a data file in the Main window: the scroll bar, or the Marks icon (pencil) on the LabScribe toolbar.

Scrolling

- 1 Move the cursor to the scroll bar in the lower margin of the **Main** window.
- 2 Click the arrows or move the slide to scroll the screen to the left or right. The typed marks appear in the lower margin of the window.

Marks

- 1 Pull down the **Window** menu and select **Marks**, or click the **Marks** icon in the toolbar (Figure 1-5 on page 4). Using either method will produce a panel with your typed comments, which may be edited at this stage.
- 2 Click on the **Time** for a given mark and then press the **Go To** button.
- 3 The panel will disappear and the relevant portion of data will be displayed in the center of the **Main** window.
- 4 The comments associated with a mark can be moved vertically and placed anywhere on the recording by clicking on the comment and dragging the mouse. Comments in a given view can be reset to the lower margin by selecting **Reset Marks** under the **View** menu.

Making Measurements on the Main window

Measurements are taken using the cursors. These are vertical blue lines that address all channels and can be called using one of the cursor icons (Figure 1-6 on page 4) in the LabScribe toolbar.

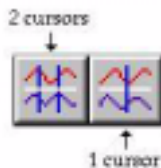


Figure 1-6: The cursor icons.

Using two cursors:

- 1 Click the **2-Cursor** icon (two vertical bars). Two blue vertical lines appear over the recording window (Figure 1-7 on page 5).
- 2 Click and drag the lines left and right to display the difference in:
 - time between the positions of the two cursor lines. This difference is labeled as **T2-T1** and is shown in the top left margin, above the title for Channel 1.
 - voltage between the intersects of the two cursor lines on the trace. This difference is labeled as **V2-V1** and is shown in the box on the upper right margin of each channel.

Using a single cursor:

- 1 Click the **1-Cursor** icon (single vertical bar). A blue vertical line appears over the recording window.
- 2 Click and drag the line to the left or right to make measurements of:
 - the absolute **Time** from the beginning of the trace, which is shown in the top left margin, above the title for Channel 1.
 - the absolute **Value** of the voltage, which is displayed in the box on the upper right margin of each channel.

The Journal

The **Journal** is a window that can be used as a notebook. Notes can be typed into the **Journal**, data and traces can be copied and pasted into it, and the contents of the **Journal** can be printed.

- Open the **Journal** either by selecting it from the **Window** menu or by clicking the **Journal** icon (clipboard) on the LabScribe toolbar (Figure 1-5 on page 4).
- To transfer a recording to the Journal, use the **Copy** command in **Edit** menu to select the screen displayed in the **Main** window. Open the Journal window and use the **Paste** command in **Edit** menu to transfer the trace to the **Journal**.
- Return to any of the other windows by selecting that window from the **Window** menu or by clicking that window's icon in the LabScribe toolbar.

Data Analysis in the Analysis Window

Additional data analysis features are available through the **Analysis** window (Figure 1-8 on page 5). Before the **Analysis** window can be opened, a section of data in the **Main** window must be selected (Figure 1-7 on page 5). To select the data to be displayed in the **Analysis** window:

- 1 Click the **2-Cursor** icon (Figure 1-6 on page 4). Two blue vertical lines appear over the recording window.
- 2 Drag the cursors left and right so that the section of the recording to be used in the **Analysis** window occurs between the two cursors. Place the cursors so that 2 complete pulse cycles are selected.
- 3 Open the Analysis window by either selecting Analysis from the Window menu, or clicking the Analysis icon on the **LabScribe** toolbar (Figure 1-5 on page 4).

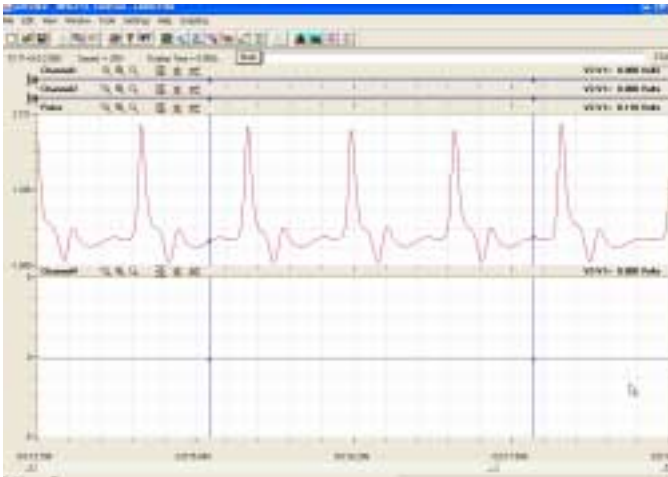


Figure 1-7: Cursors placed around the section of pulse recording selected for use in the Analysis window.

Channel Display in the Analysis Window

In this window, the recordings from all available channels are displayed under one another.

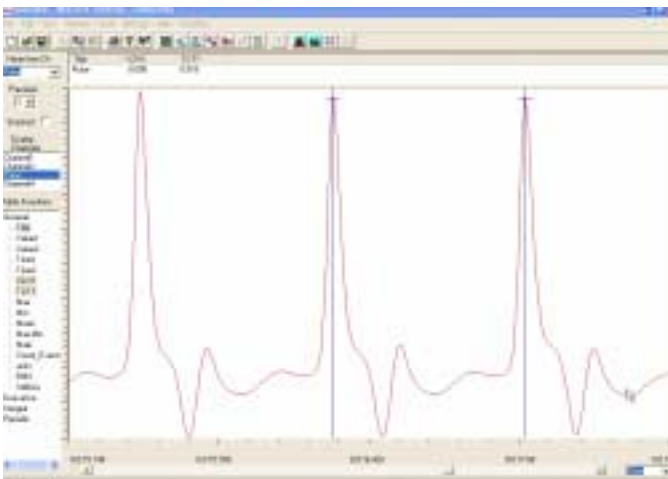


Figure 1-8: A finger pulse recording in the Analysis window.

- 1 To display only one channel, click on the channel name in the **Display Channels** control box on the left margin of the **Analysis** window. Click on **Pulse** to display only the finger pulse record.
- 2 To select additional channels, hold down the **Ctrl** key as another channel is selected from the list in the **Display Channels** control box. Use the **Shift** key to select a block of channels.
- 3 If two or more channels are displayed in the **Analysis** window, the traces can be stacked or superimposed over each other by putting a check in the **Stacked** box on the left margin of the **Analysis** window.

Screen display in the Analysis Window

The **Display Time** in the **Analysis** window can be changed in the same manner it is in the **Main** window. Clicking on the **Display Time** icons (mountains) will double or half the display time for each click (Figure 1-4 on page 3). The trace can also be scrolled horizontally by using the arrows or slider on the lower margin of the window.

Data Values in the Analysis Window

Data functions and values for a single channel are displayed across the upper margin of the **Analysis** window. To see values from another channel, select that channel from the pull-down menu labeled **Value from Ch** in the upper left corner of the window. The accuracy of the values (number of decimal places) can be set by using the **Precision** pull-down menu (Figure 1-8 on page 5).

The functions displayed across the top of the **Analysis** window are selected from the list labeled **Table Functions**. The titles of the functions and the matching data can be copied into the **Journal** by **right-clicking** the mouse in the data display area of the **Analysis** window and selecting either the **Add Titles to Journal** or **Add Data to Journal** item from this **right-click** menu.

Sample Data Measurement

Determine the subject's heart rate from the finger pulse data displayed in the **Analysis** window. Also, copy the trace displayed in the **Analysis** window to the **Journal**:

- 1 Move the cursors so each cursor is located on a peak of an adjacent finger pulse.
- 2 Select **Title** and **T2-T1** from the **Table Functions** list. Select **Pulse** from the **Value from Ch** menu.
- 3 **Right-click** in the **Analysis** window and select **Add Titles to Journal** and **Add Data to Journal** to transfer the title of the channel (**Pulse**) and the value measured (**T2-T1**) to the **Journal**.

- 4 Select **Copy** in the **Edit** menu. Open the **Journal** from the **Window** menu or the **Journal** icon on the toolbar (Figure 1-5 on page 4). Select **Paste** in the **Edit** menu. The trace in the **Analysis** window will appear in the **Journal**.
- 5 Calculate the subject's heart rate by dividing 60 (as in 60 sec/min) by **T2-T1** (secs/heart beat). **T2-T1**, the time between pulse waves, is the period of each heart beat.
- 6 Return to the **Main** window via the **Window** menu or **Main** window icon on the toolbar (Figure 1-5 on page 4).

Channel Features

Additional features for each channel are available from the **right-click** menu in the **Main** window. Some of the items can be programmed before data is recorded; others are only active after data is recorded. Some of the functions available include; rates, integrals, filters, units conversions, scaling, and mathematical manipulations.

To demonstrate the usefulness of one of these functions, integrate the finger pulse signal to display the blood flow through the finger:

- 1 Place the cursor over Channel 4, **right-click** the mouse. Select **Integral**, and then **Regular**, from the **right-click** menu. By default, **Pulse** (Channel 3) is selected by the **Set Raw Ch** function in the **right-click** menu. If necessary, click **AutoScale** for Channel 4 to display the **Integral** of the pulse.
- 2 Click the **2-Cursor** icon (Figure 1-6 on page 4). Two blue vertical lines appear over the **Main** window.
- 3 Drag the cursors to the left and to the right to select a couple of pulse cycles between the two blue lines.
- 4 Open the **Analysis** window by either selecting **Analysis** from the **Window** menu, or clicking the **Analysis** icon on the **LabScribe** toolbar (Figure 1-5 on page 4).

- 5 Make the following measurements from recordings displayed in the **Analysis** window (Figure 1-9 on page 6) using the **Title**, **V2-V1**, and **T2-T1** functions listed in the **Tables Functions** menu:

- The amplitude of the **Integral** on the Channel 4. Select **Channel 4** from the **Value from Ch** menu, and **Title** and **V2-V1** from the **Tables Functions** menu. Place the cursors on the trough and the peak of an integral wave.
- The period of the **Integral**. Select **Title** and **T2-T1** from the **Tables Functions** menu. Place the cursors on the peaks of two adjacent integral waves. The value for **T2-T1** is the pulse period, which can be used to find the heart rate.

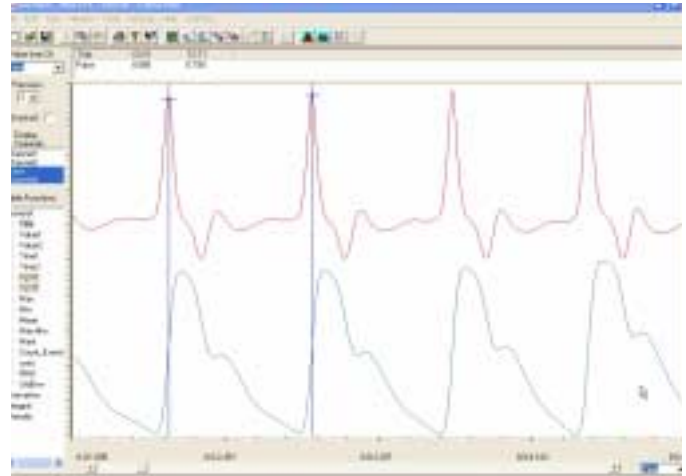


Figure 1-9: Finger pulse (upper trace) and its integral (lower trace) in the **Analysis** window.

In the Future

You will use functions available in the **Analysis** window to determine values for arterial blood pressure, pulse amplitude, relative blood flow, heart rate, lung volumes, nerve conduction velocity, and more.