

BASIC USERS GUIDE FOR THE SCIENCE WORKSHOP

This is a very basic outline of how to use the Science Workshop Program on the Macintoshes in the Physics Lab. This will cover the basics of getting started and activating the sensors. It will also include some basic graphing and data analysis techniques available to the user. This is just a get started guide, so if you really want to understand the program you ought to refer to the manual and tutorial that came with this program. Basically, only use this if you have no interest in actually learning how to use the program, but just need to look like you do.

Getting Started

The first thing on the leftmost side is the two numbers 1440 and 360. This is the number of data points per revolution of the sensor. The 1440 setting means that there is one data point per quarter degree, giving a much smoother and more continuous data, but unfortunately you can't go too fast or you will overload the computer. The 360 setting gives only one data point per degree. Less data, but you can take rotate the sensor faster. The basic rule here is that if you are only using one sensor, use 1440. If you are using two sensors simultaneously then use the 360 setting.

Next you will see on the right a little menu bar that you can select and scroll up and down. It should say RACK before you do anything. Now is the hard part. Look at your sensor and try to see which gear the little plastic band is around. There is a large gear, a medium gear, and a small gear. Whichever gear the plastic band is around, select the choice on the menu labeled "(YOUR GEAR SIZE HERE) PULLEY GROOVE". (Note that in the parentheses it doesn't actually say "your gear size here", it says large, medium, and small.)

Once you have done that then select done or hit return. You should return to the original window. It is now time to begin the adventure that is Science.

NOTE: If you are doing the driven harmonic motion experiment, then repeat the above procedure for your second sensor. Otherwise, proceed to the next section.

Actually Doing Something Useful

Now it is time to actually take some data. Exactly what data you are taking depends on the experiment. Here is where you need to use your brain and stop depending on this walk through. Once you have your data tables and graphs set up properly, then all you need to do is hit "RECORD" and the sensors become active. When you are done you can hit "STOP" or "PAUSE" to deactivate the sensors and stop recording data. "PAUSE" will keep you in the same data set if you want to record more data, while "STOP" closes the data set to new data. If you do not want to actually record data, but just want to quick look, you may select "MONITOR". This is the exact same as "RECORD" except when you hit "STOP" there is nothing saved to memory.

Before we move on to analysis, here are some basic guidelines for the Photogate and the Rotational Motion Sensor data recording methods.

Photogate - If you are using the photogate, it is to measure the velocity of a moving glider. Therefore you are interested in discrete data points, not a continuous spectrum. You should use then a table to display your data. You have two ways of doing this. You can click on the table icon and drag it over to the image of the sensor, or you can go to the "Display" menu and select "Open New Table". If you drag the table icon over you will be presented with a new window, which asks what quantity you want to measure. With the "PHOTOGATE & SOLID OBJECT" mode, there are only two quantities you can choose from: "TIME", and "VELOCITY". You should select the "VELOCITY" quantity.

If you used the "New Table" option the computer will select for you a quantity to measure. You can change this by clicking on the image of the sensor on the top of the table and scrolling down the menu it gives. If you are doing the collisions experiment you will want to display the velocities from both photogates on the same table, so you will need to push the "Add Column" Icon. This is just a little picture of a new column being added. If you are confused as to which button this is you can refer to the quick reference guide or go to help and turn on the "BUBBLE HELP". This way the computer will tell you which buttons are which. When you add a column it will ask which quantity you want to measure. This is the same as before but you need to make sure that you select the right digital port. For example the first photogate might be in port 1 and the second photogate could be in port 2 or 3 or 4. You need to tell the computer which one you want to measure. Remember you are smarter than the computer, regardless of what that little voice in the back of your head is telling you.

Rotational - The rotational motion sensor is a bit more complicated. With this sensor you are recording data over an extended period of time, so you will have a continuous data set. This calls for a graph or plot of the data over time. Click on the Graph Icon and drag it over to the Rotational Motion Sensor Icon or select "New Graph" from the "Display" Menu. If you drag the Graph icon over you will be presented with a new window, which asks what quantity you want to measure. The rotational motion sensor has many quantities it can measure, but you will always select angular position, velocity, or acceleration. Once you have selected this, the graph window will appear. If you selected "New Graph" the computer will assume which quantity to measure. You can change this by clicking on the image of the sensor on the left side of the window, and then selecting which port and which quantity to measure. If you need to display two variables at once from the same sensor or if you want to display quantities from two different sensors, you need to click on the Add-A-Plot icon, which looks like a little x-y graph with an arrow pointing down. You can then select a new quantity to display. If you are doing the Driven Harmonic Motion lab, you will not be directly measuring quantities from the sensor, but rather using the computer to "smooth" these values out. The computer uses smoothing functions to accomplish this. When you open the graph, instead of selecting the quantity next to the appropriate port number, look under the "CALCULATIONS" Heading. You should see a list of the quantities called for in the Lab Manual. (Note: This will only be true if you load the experiment ahead of time like it says in the Lab Manual)

Now What Do I Do?

Now that you've recorded some data, you may be asking what can I do with this data. The data analysis tools available to the Science Workshop program are adequate for the experiments in the Lab Manuals. To activate the data analysis package, click on the Sigma icon. This icon should appear on both the Graph and Table window. If you are in the Table window, the analysis program will give you the Min, Max, Mean, and Standard Deviation of the data set. If you are in the Graph window, the window will split in half and there will be an Analysis frame opened on the right half. The sigma button will appear on this side as well. Click here and a menu will appear with lots of different