Tutorial: Humidity Sensor

Using the Pasco Humidity/Temp/Dew Pt Sensor for Science in the Classroom

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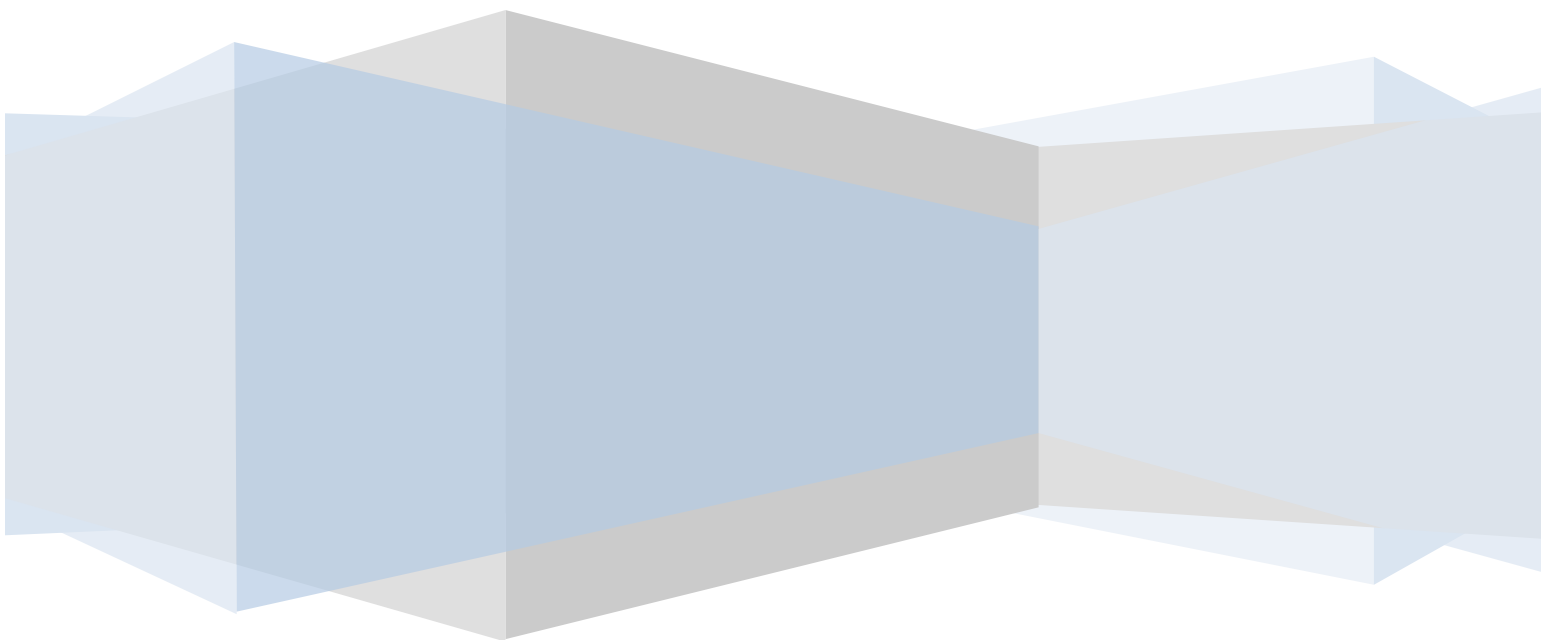
The Pasco Humidity Sensor is capable of reading several sets of data at once. Absolute and relative humidity as well as dew point and temperature may be tracked. In order to get an idea of what the terms dew point, absolute humidity, and relative humidity mean one should first understand, what exactly is humidity and why do we measure it. Let's begin with the term absolute humidity from which the other terms may be related.

Absolute humidity is the measure of the moisture or water vapor in a volume of air. It is usually represented by units of mass per unit volume, for instance in SI units **[kg/m^2]**. Absolute humidity is a specific term and it helps us understand relative humidity, which as we'll find out is a more intuitive term. **Relative humidity** is useful because it is related to how humans experience moisture in the air. Relative humidity is actually a comparison of two absolute humidity values. It may be defined as the amount of water vapor in the air at a specific temperature, compared to the maximum amount of water vapor that could be in the air at the same temperature. An example of this would be the humidity referred to during weather forecasts.

Objectives:

In this experiment we will

- Measure and catalog the humidity, temperature, and dew point in a room.
- Compare humidity and temperature in multiple locations.
- Analyze the significance of any changes in humidity.

You will need:

- o A "can do" attitude, this is required for all science.

- o Pasco Humidity/Temperature/Dew Point Sensor

- o Pasco PASSPORT Airlink$_2$

- o iPod Touch with SPARKvue app installed

- o Software to unzip a file, for example 7zip.

In this guide some knowledge of the basic navigation on the iPod Touch and is required. It is highly encouraged that you get to know your way around the iPod. We have a guide specifically for those of us who are new to the iPod Touch.
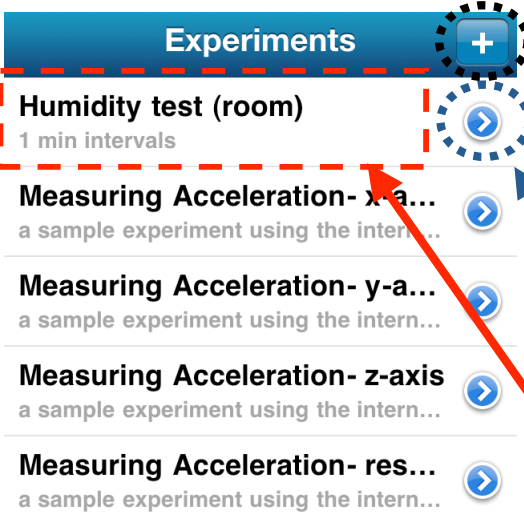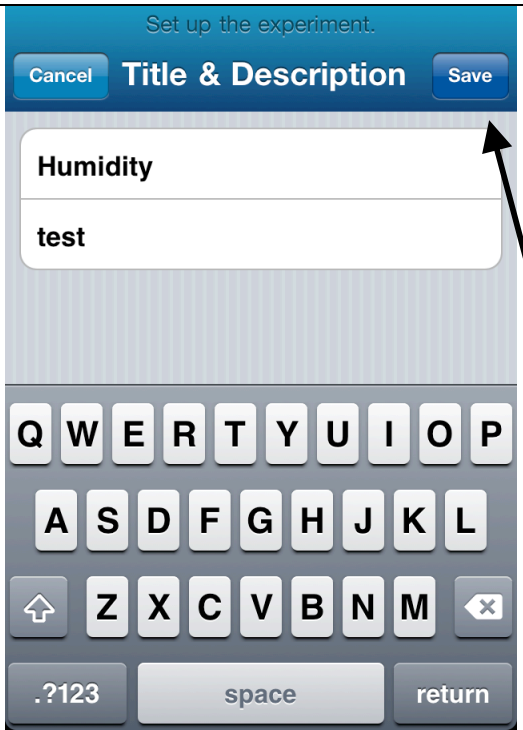I hope you will find that the iPod Touch is a very fun and useful tool.
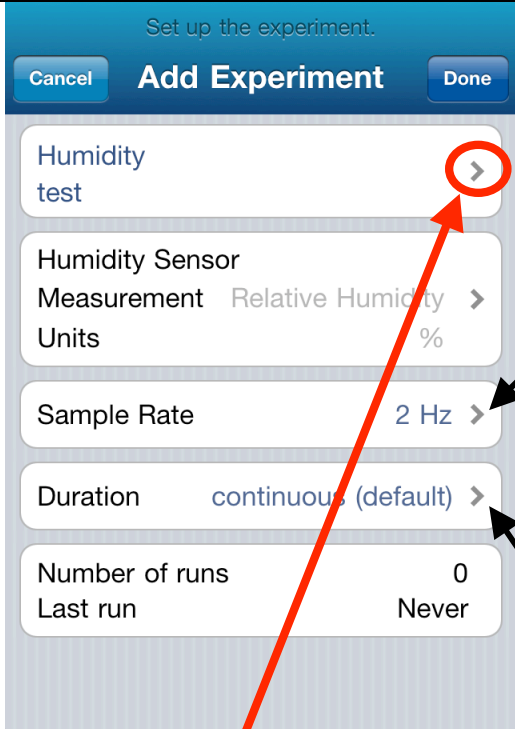
You will also need to connect the Pasco hardware via Bluetooth. There is a small chance that this can be tricky the first time, however, we hope that you find wireless connection is very convenient once established. This is also included in the getting started with iPod Touch guide.

Procedure:

We will be setting up a humidity test for a long duration. If the iPod is going to be on for a long duration, be sure that you have a power chord handy as the battery may not last through an entire 24 hour experiment. Also be sure that the Pasco AIRport is fully charged before beginning any long experiments.

(For more information on the procedures please visit www.sip-hawaii.org and search for PASCO.)

Home Screen in SPARKvue

From here we can go straight to experiments or set up new experiments.

Experiments +

Humidity test (room)
1 min intervals

Measuring Acceleration- y-a...
a sample experiment using the intern...

Measuring Acceleration- y-a...
a sample experiment using the intern...

Measuring Acceleration- z-axis
a sample experiment using the intern...

Measuring Acceleration- res...
a sample experiment using the intern...

Open SPARKvue on the iPod Touch. (Tap on the icon, you may have to navigate to another screen to find the icon.)

Create or choose an experiment:
By touching the + sign we may add a new experiment.

Arrows on the right side of the screen take you to an overview menu of the experiment where you may review or edit settings.

Select the experiment you want to carry out by choosing the box containing the name of the experiment.

Set up the experiment.

Cancel **Title & Description** Save

Humidity

test

Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
.?123   space   return

Use descriptive names for your experiments since you may not be the only one setting up an experiment on the iPod.
A Suggested Format:
Example:

Name: "Sensor-your initials"
Name: Humitiy-ja

Description: "Location or Reason for experitment"
Description: Room 201 near computer

Be sure to hit Save when you are done.

Setting up the experiment parameters is a crucial part of data collection.

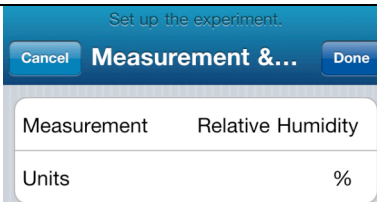**(Try different settings here so that you understand what the settings do)**

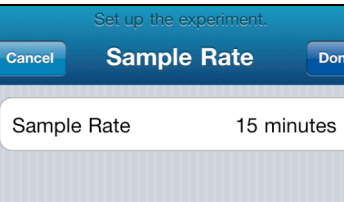Here the initial sample rate is 2Hz (Hertz) which means that data will be sampled twice every second.
In the case of a long term experiment this is way more "resolution" than we will need, so let's change the sample rate to 5 or 15 minutes.
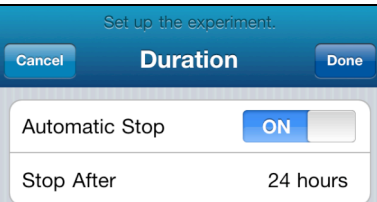**Note: Hz = Samples/second.**
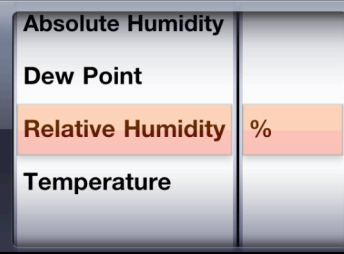(Check yourself: How many Hz is 5min/sample?)

We may also set the duration to a long period of time, for instance 24 hours. This way we can keep track of the humidity throughout an entire day.

Touching the arrows takes you to a new screen where you can set parameters, or type in information.

We are able to tailor the experiment to our needs by setting up the parameters of measurement type, sample rate, and duration, as well as other options.
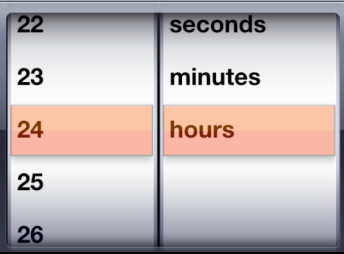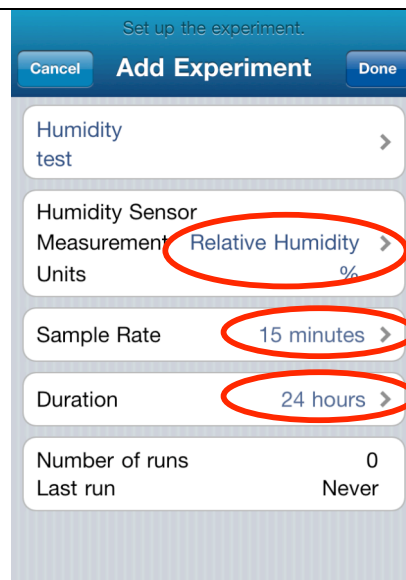

Here we see the completed experiment settings.

|	
Double Check your settings. Now we are ready to begin data collection. Be sure to hit the **done** button to save your settings. Back in the home screen, select your experiment and you will be taken to a new screen where we can begin data collection.	Set up the experiment. Cancel **Add Experiment** Done Humidity test ❯ Humidity Sensor Measurement Relative Humidity ❯ Units % Sample Rate 15 minutes ❯ Duration 24 hours ❯ Number of runs 0 Last run Never
A Quick Review: We have already: • Started SPARKvue • Connected wirelessly to the sensor • Set up an experiment **Next is the difficult part…Letting the computer do all the work.**	

Hit the green button to start the experiment. The same button stops the experiment.
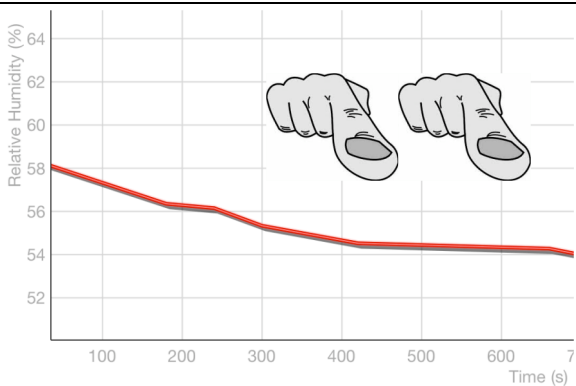

Several experiments may be stored and view simultaniously. They are distiguished by a color and a number.

The data w ill be graphed right on the iPod.
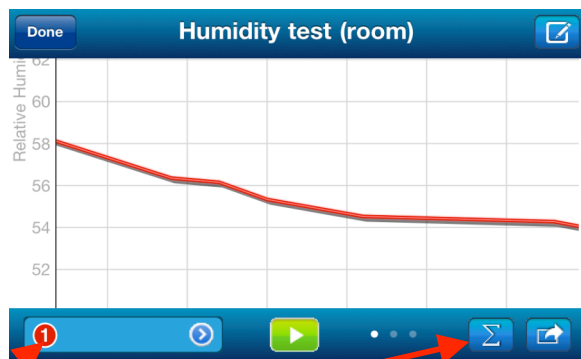
Hitting the Sigma button will show some standard statistical data.

Double tapping the screen will toggle the menu leaving the whole screen to view graphs.

By using finger gestures you may zoom in or move around on the graph. (Try it out)
Just double tap with two fingers to rescale the graph if you get lost.

Sweeping your finger across the screen will bring up alternate veiws of the sensor readings.
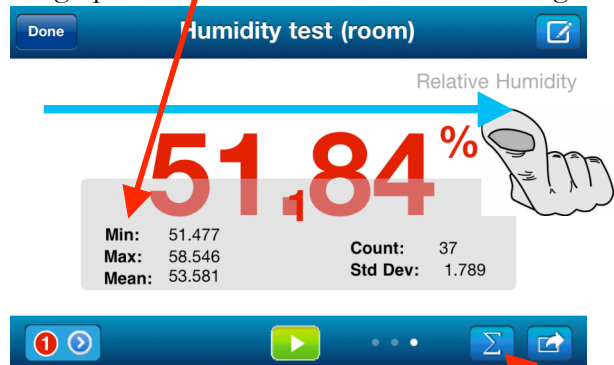
Touching this arrow button will allow you to email your results to yourself or anyone.

When your data collection is done be sure to turn off all the hardware and store appropriately. Next we will discuss data retreival.

ONE MORE TRICK:
 The data is emailed in a zipped file format (filename.csv.gz), so in order to import the data into a spread sheet, we need to use a program like WinZip or 7zip to access the compressed data. If you do not have access to install software, please contact us via the SIP website and we will be able to unzip the file for you. Once unzipped the .csv (comma separated value) file will import directly into a spreadsheet.

Step by step procedures

1. Set up the iPod Touch and Pasco hardware to collect data
    a. Connect the humidity sensor to the Airlink.
    b. Turn on the Airlink and verify that the iPod Touch is connected via Bluetooth.
    c. Run SPARKvue on the iPod and create a new experiment called "Humidity" or any other relevant name.
    d. Click on the arrow to the right of the newly created experiment.
    e. Fill in the description with the setting for the experiment, for example "room #"
    f. Choose the type of measurement you'd like to make: absolute or relative humidity, dew point, temperature.
    g. Set the sample rate to a relevant time, for example every 5 minutes.
    h. If this is a timed experiment you may set the duration.
    i. Choose "done" to save your settings.
2. Measure the Humidity in the room.
    a. Go to the experiments screen and select your experiment.
    b. Press the green arrow button to begin collecting data.
    c. Once you've finished collecting data, hit the email Icon to send the data file to an email account.
3. Turn off the equipment if you are finished taking data.
4. Retrieving and graphing data on a computer.
    a. Retrieve the file "Run##.csv.gs from your email.
    b. If you are using a PC, you will need to unzip the file and run the Run##.csv file.
    c. Import the data using a spreadsheet such as Microsoft Excel. The data should have two columns "time" and "humidity/temperature" depending on the type of data.

Accessing your data
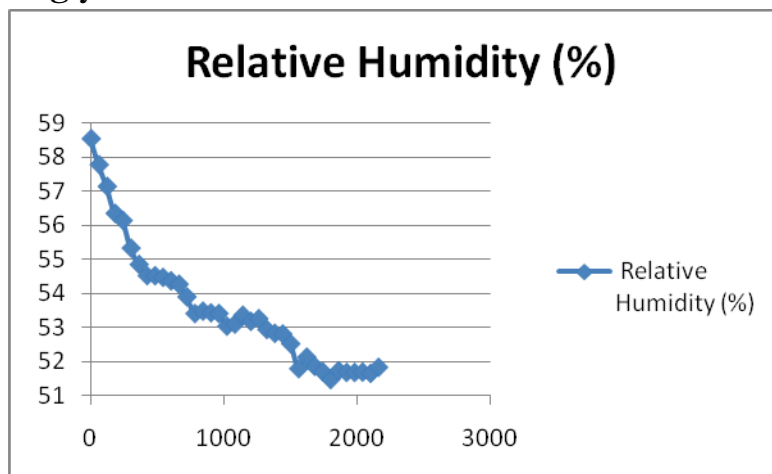
The data from the experiment may be plotted in Microsoft Excel by using a scatter plot. The above plot shows Humidity over time in seconds. To import your humidity data into Excel, you will need to unzip the Run##.csv.gz File. Inside the zipped file you will find the Run##.csv which is a "comma separated value" file. This .csv file can then be imported directly into Excel.