



Visual analysis of inversion tower temperature data

Gwen Tindula, Staff Research Associate, and Mark Battany, Farm Advisor


The temperature inversion measurement towers developed by UCCE utilize two inexpensive Pendant® data loggers from Onset Computer to measure the air temperature at 5 ft. and 35 ft. heights. The analysis of the temperature data produced by these two data loggers is made much easier if both data sets are combined together into one chart in the HOBOWare® program. This program enables a user to easily focus on those temperature events of interest and clearly see the inversion characteristics throughout each event. Doing a similar analysis in a spreadsheet program is very cumbersome and inefficient. The procedure to combine these files as described below may seem complicated the first time, but once the procedure is learned it can be carried out very quickly and will make the evaluation of the inversion tower data very straightforward.

For detailed instructions on how to assemble and install a temperature inversion tower, please consult the UCCE San Luis Obispo County pamphlet titled “Inversion Tower Instructions” available at the following website:

http://cesanluisobispo.ucanr.edu/Viticulture/Frost_Protection/

Step 1. Download the data from each Pendant® data logger and open in HOBOWare®

After disassembling the tower at the end of the field data collection period, remove the two data loggers from their respective radiation shields. Download the temperature data from the data loggers by performing a standard logger readout in HOBOWare® using the appropriate communication cable connected to the computer:

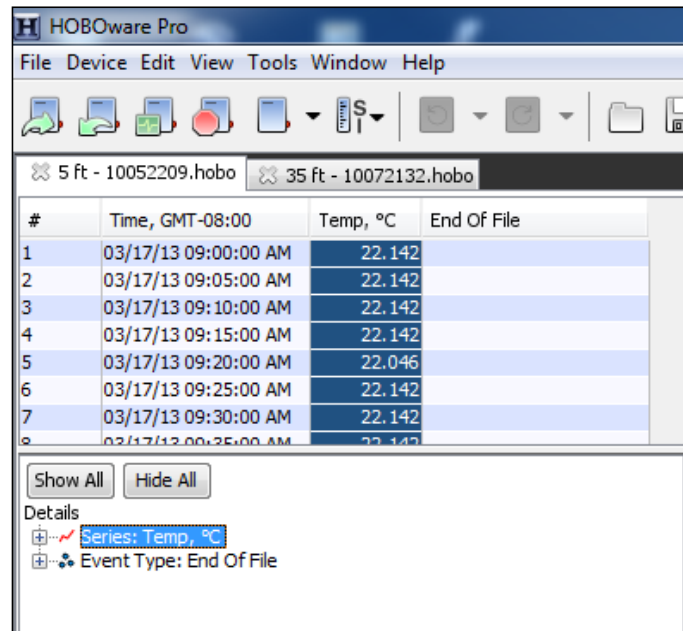
- a. Open HOBOWare® and click on the readout icon  on the toolbar once the program recognizes the logger (as evident by the appearance of the serial number of the device in the lower left-hand corner of the screen);
- b. Select the Pendant® logger in the “Select Device” window and click “OK”. Stop the logger if you are done taking readings with the logger (this will save the battery life of the device);
- c. The program will perform a readout of the data and the “Save” window will appear;
- d. Select the location where you would like to save the file and rename the file if necessary; it is helpful if the file name indicates the height of that data logger on the tower;
- e. When prompted by the program, plot the data with the default settings;

- f. Perform the same procedure to download the data from the second data logger. Both temperature charts should now be open in the HOBOWare® program.

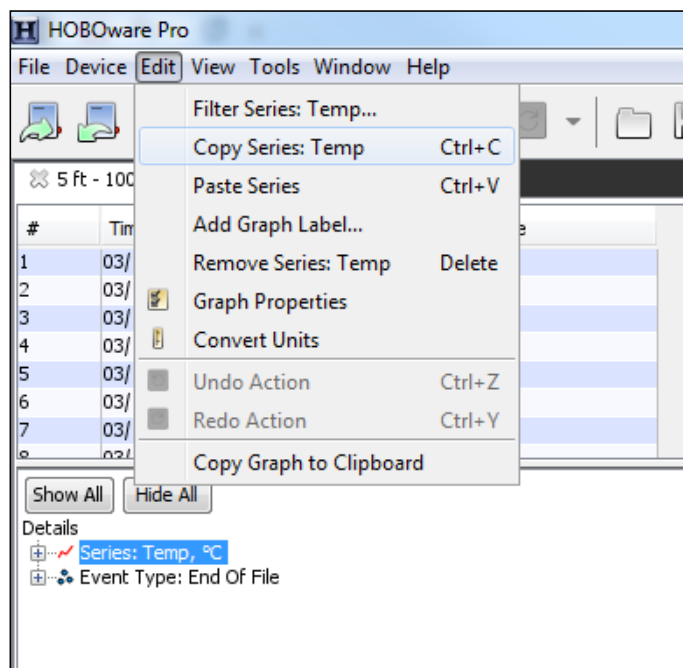
Step 2. Combine the two separate data files into one

With both charts are open in HOBOWare®, select the tab of the chart that corresponds to the 5 ft. data logger.

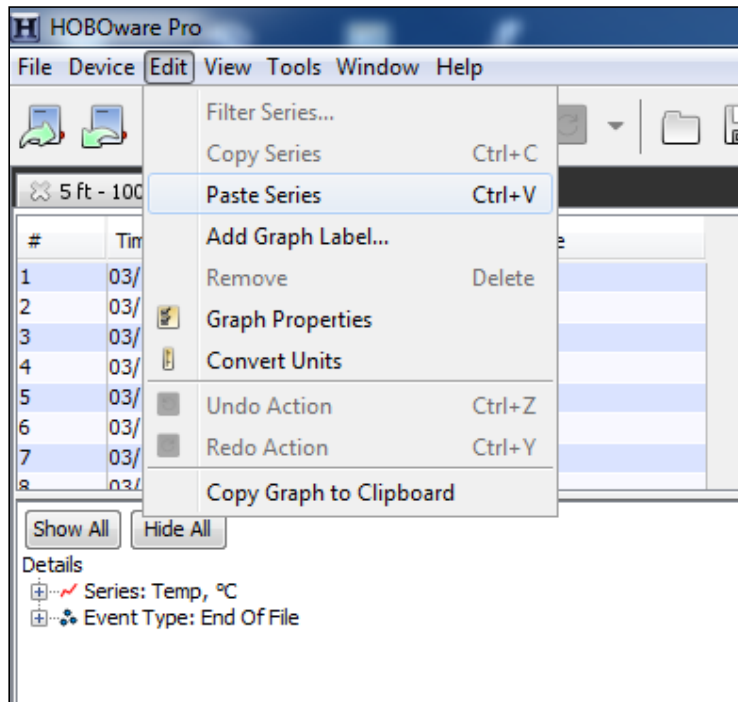
- a. Under “Details”, use the cursor to select “Series: Temp, °C”; it will now appear highlighted:



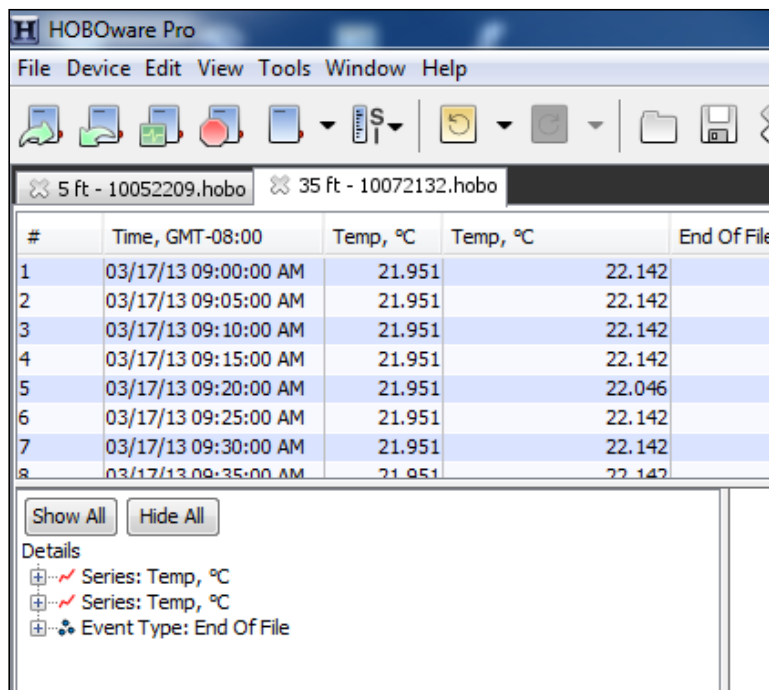
- b. Under the “Edit” file menu, select “Copy Series: Temp”:




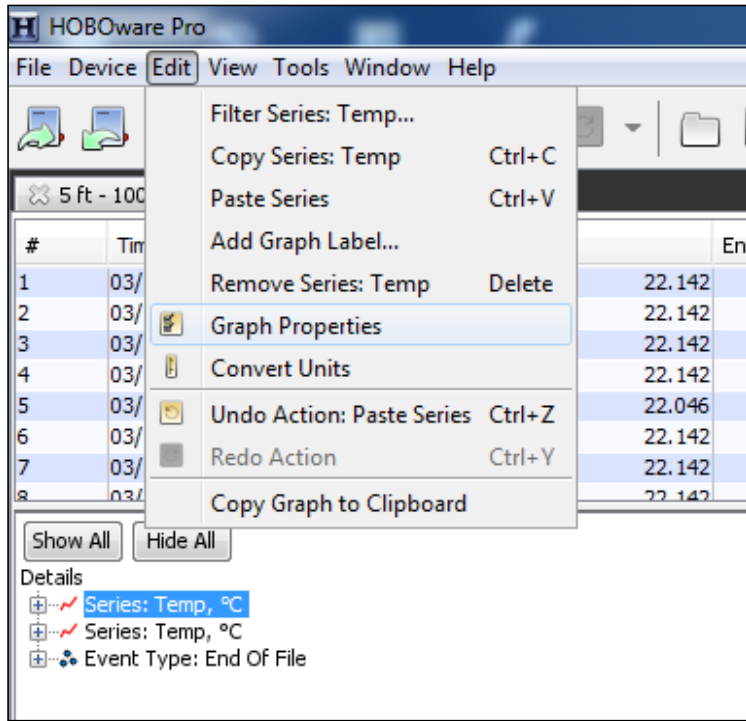
- c. Now, select the tab for the 35 ft. temperature sensor. From the “Edit” file menu, select “Paste Series”:



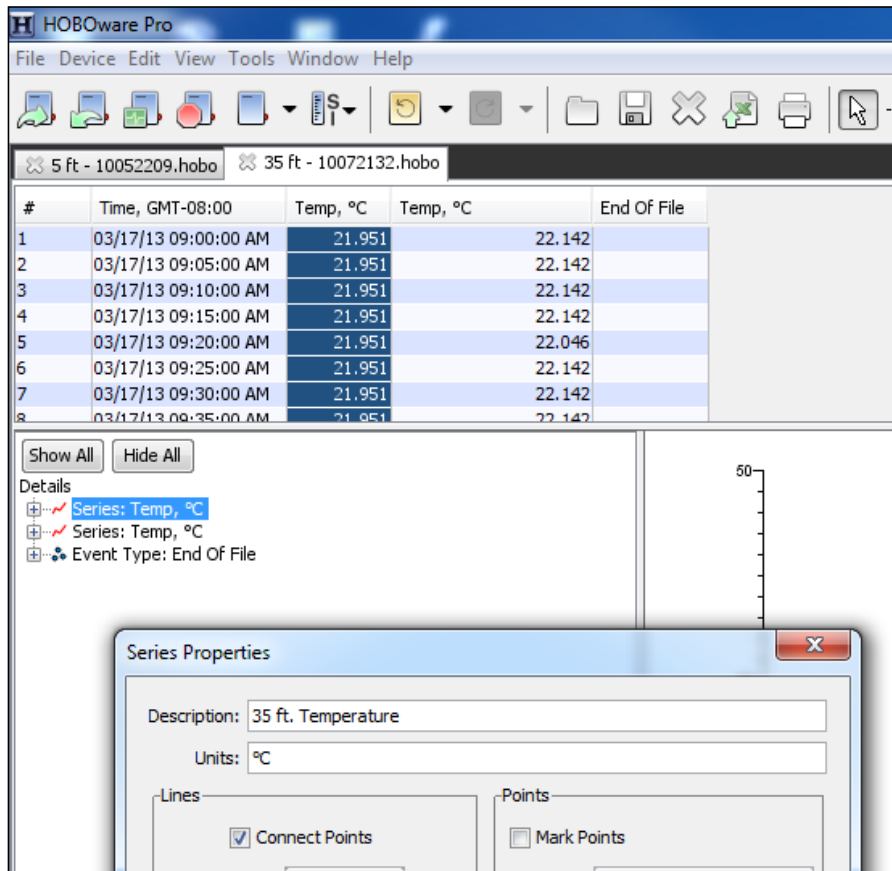
- d. The 5 ft. temperature data has now been pasted into the file which previously had only the 35 ft. temperature data (notice the two columns marked “Temp, °C”):



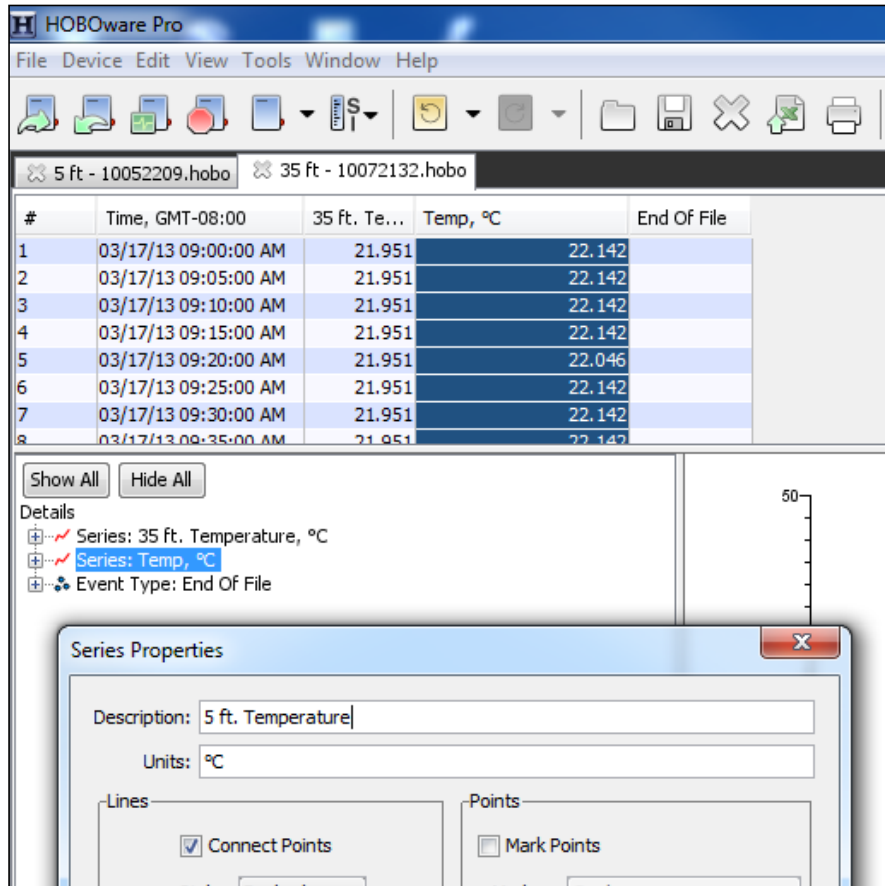
- e. The first (top) series in the “Details” list corresponds to the temperature data from the 35 ft. data logger. The second (bottom) series corresponds to the temperature data from the 5 ft. data logger which was just pasted in. To rename each series to better distinguish between the two, use the mouse cursor to select the first series (35 ft. height temperature) in the “Details” pane. Then from the “Edit” file menu, select “Graph Properties”, or alternatively click on the “Properties” icon  on the toolbar:



- f. In the “Series Properties” window that appears, rename the series by changing the text in the “Description” box at the top. Once completed, click “Done” to save the change:








- g. Complete the same steps to change the name of the series corresponding to the 5 ft. temperature:



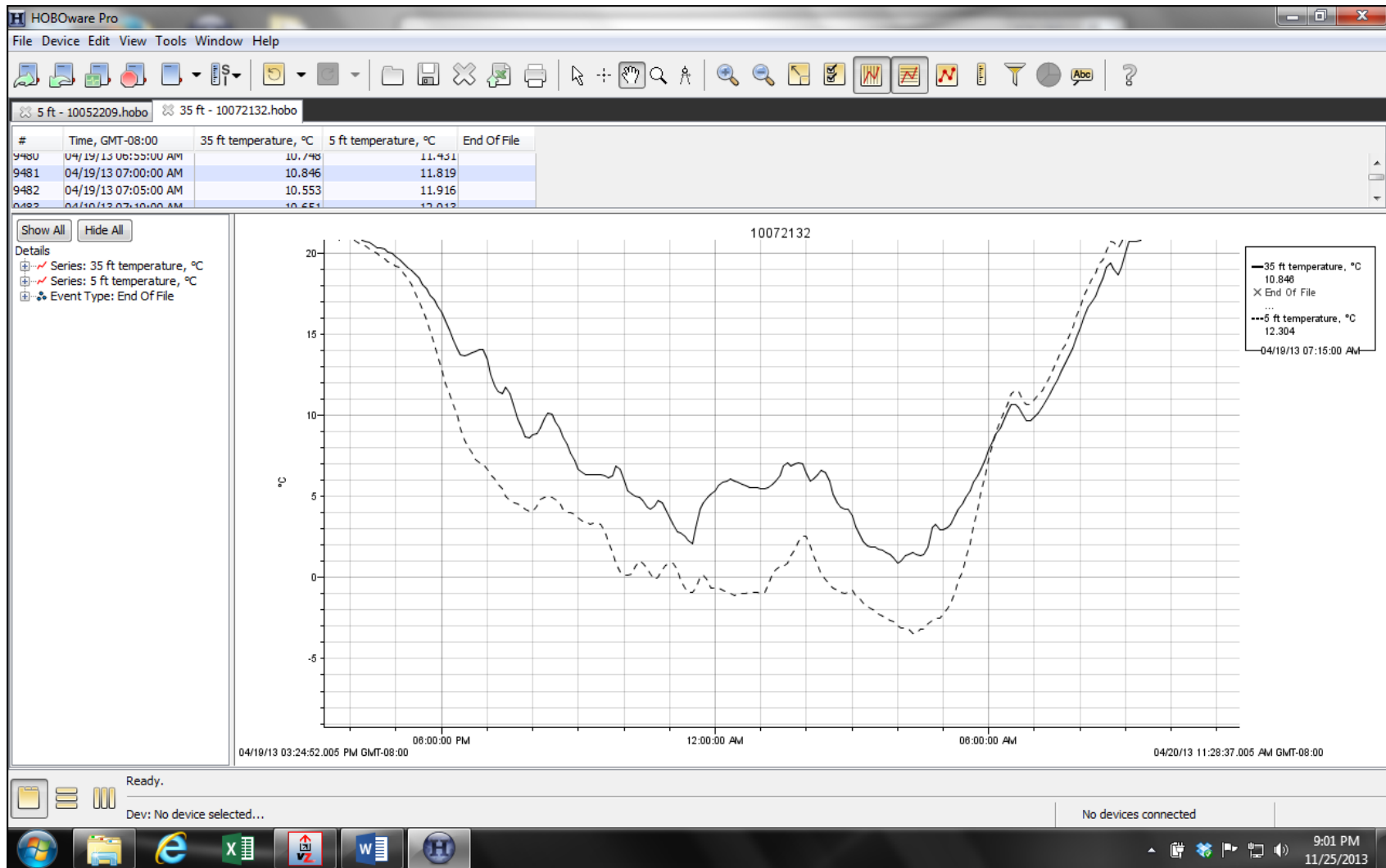
- h. Save the new combined data set by clicking on the “File” menu and selecting “Save Project”.

Step 3. Zooming in to view the data in detail

Once the new file has been saved, use the zoom options to see the data at a finer scale; in general we are interested in the conditions on the coldest nights, and these are easy to pick out visually with the charted data.

- a. Selecting the “Zoom In” icon  or the “Zoom Out” icon  on the toolbar will allow the plot to remain centered as you zoom.
- b. To zoom in on either the horizontal or vertical axis, use the “Zoom” tool  on the toolbar. For instance, if you would like to see the data for a particular night, select the Zoom tool from the toolbar and move the cursor to slightly below the x-axis, approximately below the desired date, and left-click your mouse to zoom in to that date. To adjust the y-axis, place the cursor slightly to the left of the axis and left-click on the mouse.
- c. Use the “Hand” tool  from the toolbar to shift the position of the chart in the viewing window as needed.
- d. If you want to return the plot to its original state showing all data points, select the “View at Full Scale”  icon from the toolbar.

An example temperature data chart appears on the following page which has been zoomed in to show one cold night. The solid line is the 35 ft. temperature, above the dashed line of the 5 ft. temperature.



Step 4. Converting units

In this example the temperature data are shown in Celsius units; these can be easily converted to Fahrenheit units. Under the “Edit” menu, select “Convert Units”. You can then change temperature units for both data sets from °C to °F if you prefer.

The mention of commercial products, their source, or their use in connection reported herein is not to be construed as either an actual or implied endorsement of said products.