Using the PINPoint

The Portable iSENSE Network Point (PINPoint) is a compact data-logging device designed for use with the iSENSE web system (www.isenseproject.org). The board features light, temperature, and sound sensors, a three-axis accelerometer, and connectors for a GPS receiver and an external sensor. The device has 2MB of flash memory—sufficient to store more than 12,000 data readings. The unit's rechargeable lithium-ion battery has a life of about 12 hours per charge if the PINPoint is connected to the GPS receiver, and about 50 hours per charge if the device is operating without the GPS.

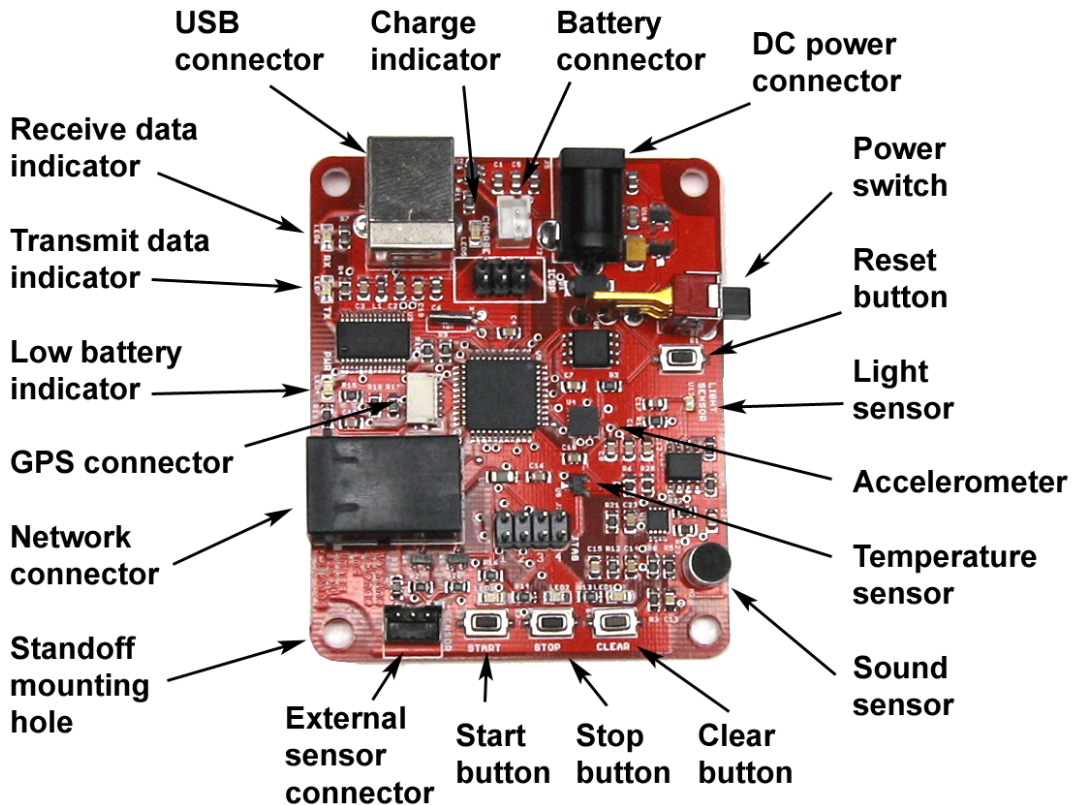Figure 1 shows the PINPoint board, with key components labeled.

Figure 1. PINPoint data logger.

Operating the PINPoint

To turn on the PINPoint, slide the Power switch to the On position (closer to the board). The PINPoint's Low Battery indicator (the green LED near the GPS connector) will flash on and off several times and then go off. If the Low Battery LED continues to flash on and off, the battery needs to be charged.

If you intend to record GPS data, you must wait for the GPS unit to fix its position. Generally, the GPS receiver functions only outdoors, although it sometimes works inside buildings, particularly near windows. Even outdoors, the GPS can take a minute or two to get a satellite lock. A red LED signals when a satellite lock has been achieved, as shown in Figure 2.
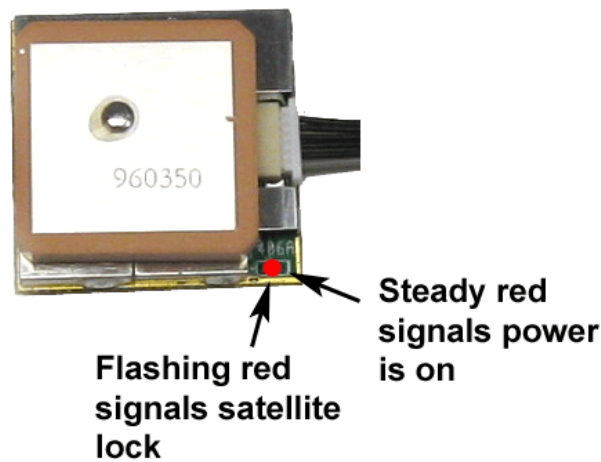
Figure 2. Indictor LED on GPS.

To start recording data, press the Start button once. The Start button's green LED will flash on and off to indicate that data are being recorded.

To stop recording data, press the Stop button once. The Stop button's amber LED will light to indicate that recording has stopped, and that there are data saved in memory. Pressing the Start button again will append more data to your previous data set.

To erase all data from the PINPoint's memory, stop any active data recording and then press and hold the Clear button for three seconds. The Clear button's red LED will light while the button is pressed, flash on and off several times, then go off, indicating that all data have been cleared from the PINPoint's memory.

When you have finished using the device, press the Stop button to stop any active data recording, and slide the PINPoint's power switch to the Off position (away from the board). Any data in memory will be stored, even with the power turned off.

Figure 3 illustrates the operation of the PINPoint's LEDs.
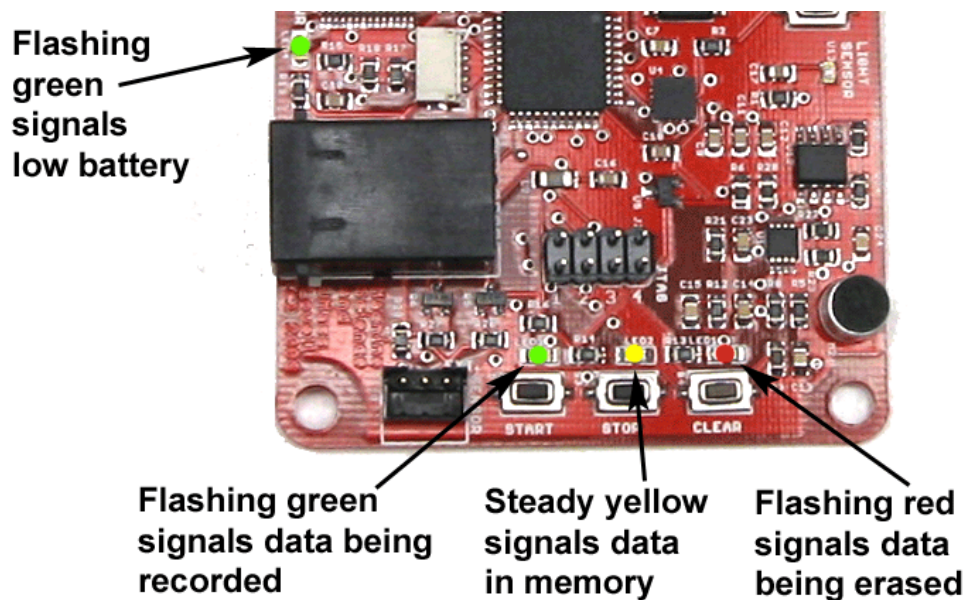
Figure 3. PINPoint's LED indicators.

Using the iSENSE System

The iSENSE web system (www.isenseproject.org) provides a simple framework for organizing collaborative experimentation using classroom probes and other sensor hardware:

- An *experiment* is a placeholder for iSENSE data. Each experiment has a title, an experimental procedure, and one or more data fields. Each data field is associated with a particular sensor, a unit of measurement, and a description that indicates what the sensor will be used to measure. When creating an experiment, a user may also provide keywords (or "tags") indicating the experiment's topic or theme. The tags make it easier for other iSENSE users to identify experiments of interest.

- A *session* is a series of data points contributed to iSENSE. Each session has a title, a collection procedure, and a street address. When contributing data, users are required to match the session's data values to the experiment's data fields. All iSENSE data must be contributed in the context of an experiment.

Creating an Experiment

At the iSENSE home page, click on the Create an Experiment link. In Step 1, title your experiment, describe the experimental procedure in as much detail as possible, and assign any relevant tags. Next, in Step 2, click the Setup Data Fields button and follow the on-screen prompts. If your experiment will make use of the PINPoint data logger, you simply need to select which of the device's on-board sensors will be used. If your experiment will not use the PINPoint (or if it will use an external sensor on the PINPoint), you will need to describe each of the values to be measured, identify a type of data for each field, and select the relevant units of measurement. Finally, in Step 3, when you have finished setting up the data fields, review your experiment details and click the Create Experiment button.

Contributing Data

Use the Browse window to identify an experiment of interest. Then, click the Contribute button to contribute a data session to the experiment. Assign a name to your session and describe how the data were collected. If the data do not include GPS readings, fill in a street address indicating where the data were collected. Data may be contributed either by uploading a CSV file or by manually entering values. If you are uploading a CSV file, you will be prompted to align the column headings of your file with the experiment's data fields.

Viewing Data

To view the data associated with a particular experiment, click the checkbox next to the data sessions that you would like to include and then click the Visualize button. Several visualization (viz) tools are available. These are described below and shown in Figure 4.

- *Map*. The Map viz tool displays data on a Google Map, with individual readings represented by a map pointer. Pan and zoom, as you would in any Google Map, to view data pointers in different locations. Clicking on a pointer displays the associated data values in a pop-up box.
- *Annotated Time Line*. The Annotated Time Line shows how data values change over time, with a line connecting each value. If multiple sessions are displayed, each session is represented with a different color line. Mouse over the line to view the data values associated with a particular

moment in time. Use the scroll bar along the bottom to adjust the start and end times in the time line viewer.

- *Scatter Chart*. The Scatter Chart plots data points on an X and Y plane according to any two attributes. This tool can be useful for detecting correlations among data values, interpolating or extrapolating trends, and identifying outliers.
- *Bar Chart*. The Bar Chart viz tool displays rectangular bars with lengths proportional to the values that they represent.
- *Motion Chart*. The Motion Chart is a scatter plot that uses multiple visual cues to indicate the relationships among data points. In addition to their X and Y positions, the size and color of the points on the Motion Chart can be linked to values. Moreover, a Motion Chart can be "animated," showing changes in data values over time. The Motion Chart is particularly well suited to visualizing large, complex data sets, collected from multiple sources over long periods of time.

Figure 4. Clockwise from upper left: map, motion chart, bar chart, and timeline.