Basic Stamp Seismometer

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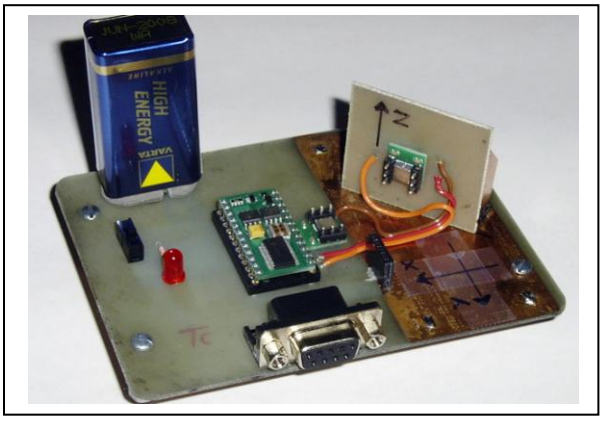
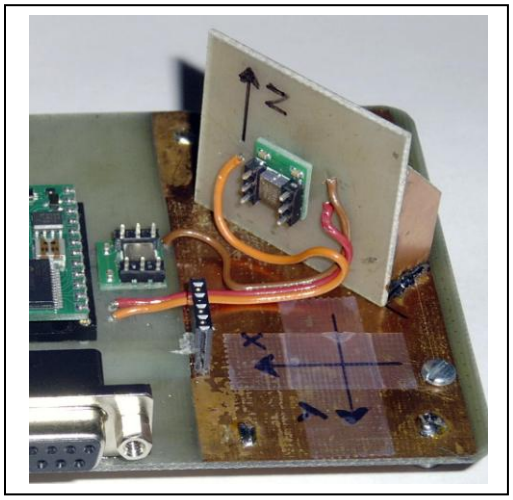
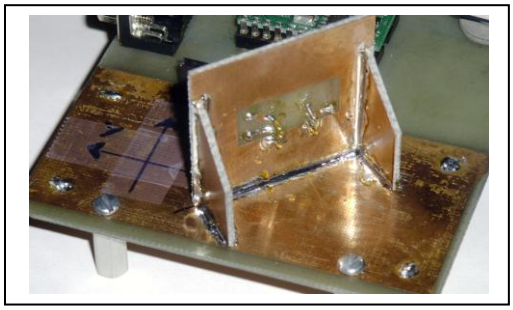
A simple, yet capable, seismometer that teachers can use to instruct the fundamental principles of seismology can be constructed using a Basic Stamp and two Memsic 2125 accelerometers.



Each accelerometer has two axes. One accelerometer for the X and Y-axes and one accelerometer for the Z-axis were used in the prototype. The Memsic accelerometers are capable of measuring up to +/- 2 gs with a resolution of about .001 g. Taking into consideration the 32-bit limitation of the Basic Stamp and the 2uS resolution for measuring pulse width, the combo can resolve to around .002 g.

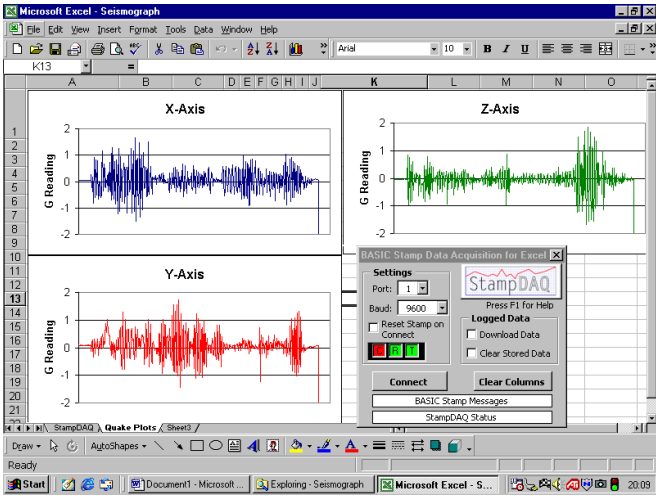


The seismometer was constructed on a homemade circuit board. The X-Y accelerometer is mounted flush on the main board. A ground plane of copper allows a sub board for the Z-axis accelerometer to be soldered perpendicular to the main board. Scraps of circuit board material were soldered in place to maintain structural rigidity. Since there was one unused axis, the Z accelerometer is mounted in such a way so that the unused axis is oriented 45o to the X-Y axis for later investigations (for example, verifying vector sums).



The Basic Stamp is programmed to sample the pulse width for each accelerometer axis channel. A pulse width of 2,500 uS represents zero g. Because of the Basic Stamp integer math limitations, the pulse width is sent via the serial port to a PC with StampDAQ software running. The StampDAQ places the received data into EXCEL where the full math and display power of the PC can be used to manipulate the data and create the seismograph displays. The power of the EXCEL spreadsheet provides unlimited opportunities for students to explore the data collected by their seismometer. The program is configured to provide continuous measurements, 500 samples are displayed, the graphs are clears, and the program loops back. The students may elect to program the

Stamp to wait for and "event" and not begin collecting data until a set g threshold is reached to trigger collection, and another g threshold to stop collection.



Alternatively, the seismometer could be connected to the PC via a data link transmitter/receiver pair. The data could then be sent over radio waves instead of the serial cable.

The seismometer can be used to do other acceleration collection tasks besides "shaking dirt." The Stamp could be programmed to store accelerations in ROM and then dump the data to StampDAQ. The 9 volt battery power source makes the seismometer a portable accelerometer that students can take on rides to study amusement park physics. Or the seismometer can tag along for vehicular motion studies.

This simple, and inexpensive seismometer proves many opportunities for students to study the science of accelerations. The hardware architecture matched with software flexibility allows this instrument to be used in many, many different activities. If you would like more details or copies of the software, contact the ARRL Education Services office, etp@arrl.org

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BStamp Seismograph