CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)
Evangeline J. Fleischaker

Project Number
22179

Project Title
Acoustic Thermometry

Abstract

Objectives/Goals
To build a circuit that will allow me to generate a sound signal at point A and time how long it takes to reach point B.

Methods/Materials
List of Materials- Equipment included an, Oscilloscope (HP 54501), a frequency counter, a power supply (+/- 12V) and breadboard, calipers, a large oven, a calibrated thermometer.
Major Electrical Components included are LM555 (oscillator), 4013 (flip-flop), 4098 (one-shot) Ultrasonic transceiver pair (Panasonic)

Method:
1) To build the circuitry to drive the piezo electric crystals. Build an amplifier to detect the pulse signal.
2) To characterize this devise and to assure myself that is functioning properly.
3) To calibrate it preform by looking at its response at different temperatures.

Results
The time required by the pulse to travel from the transmitter to the receiver decreased with temperature. That time decreased by approximately 10% over the temperature range between 20 and 80 deg C. Because the speed of sound at room temperature is approximately 335 m/s (750 miles/hour) the time to travel between the two sensors is very short and hence the further the two sensors can be placed apart the more accurately the measurement can be made.

Conclusions/Discussion
I was able to show that a simple device consisting of a matched pair of piezo electric ceramic crystals, a pulse generator, a transistor amplifier, and an oscilloscope to measure the time between the pulse and the response from the ceramic receiver could be used as an acoustic thermometer.

Summary Statement
I was able to show that a simple device consisting of a matched pair of piezo electric ceramic crystals, a pulse generator, a transistor amplifier, and an oscilloscope could be used as an acoustic thermometer.

Help Received
Used electronics equipment, calibrated thermometer, and large oven at Vista Biologicals Corporation