CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
Luc F. Bouchard

Project Number
J0904

Project Title
0 or 1: Who Knows?

Abstract

Objectives/Goals
Find out what an electronic adder is and how it works. I find the way computers add binary digits with an adder very interesting and I wanted to build one for myself.

Methods/Materials
First I designed my circuit using the PAD2PAD program on the Internet. Then, I printed out the circuit and ironed it on to a piece of copper. Then, I put it into a bath of ferric chloride and it ate away the copper not protected by the ink. Next, I wiped away the extra ink with acetone leaving the copper traces. I drilled the needed holes with a high-speed drill press. Finally, I soldered the components on the PCB.

Ferric chloride acid; Clothes Iron; Pencil; Double sided PCB copper; 2 74LSOO IC chips; Plastic Tupperware; Water; Stationary drill; .8mm drill bit; 2 100 ohm resistors; 2 470 ohm resistors; 2 LEDs 3mm; Laser Jet Printer; Computer; Saw; 4.5 volt battery pack; switches; toothbrush; Acetone; Powdered Bleach; Sponge; Sand Paper; Bread Board; Jumper Wires; Soldering Stand; Flash Light; Magnifying Glass; Multimeter.

Results
In the end, the PCB that I made didn#t work. When I tested the board with a multimeter I discovered the IC chip was read incorrectly. Since the PCB is a very important part of the experiment, I decided to recreate it on a breadboard. I got the breadboard version to work by making sure the chips faced the correct way. I used the circuit to add binary digits. I had to take more time to learn about the way the IC chip worked.
I learned that electronic devices are much more complex than I previously thought. I have gotten a better understanding from this experiment about how hard it is to design a circuit and get it to work. I learned to take more time to study the schematics and to make sure to make the circuit works on the breadboard before I solder it together. I don#t think I spent enough time making sure the circuit worked.

Conclusions/Discussion
In preparation for the County fair, I rebuilt the circuit again and this time got it to work correctly. I will be bringing all versions of my circuit at the State fair.

Summary Statement
I built a "half adder", which is the primary circuit that allows computers to do math

Help Received
Dad helped test and debug the circuit, friend's dad let me use his workshop and thought me how to use a drill press