



**CALIFORNIA STATE SCIENCE FAIR  
2003 PROJECT SUMMARY**

<b>Name(s)</b> Conrad L. Salinas, Jr.	<b>Project Number</b> <b>S0714</b>
<b>Project Title</b> <b>Underclocking: For Fun and Profit</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Computers are getting faster, more powerful and more capable everyday. Most of today's home and business desktop computers would have been considered a 'Supercomputer' just a few years ago. Since more power is required to run these faster CPU's is it practical and economical and even ecologically beneficial in today's world? Is there a way to effectively get work done, save money, and save precious natural resources? One idea is Under-clocking. Under-clocking is the technique to slow down a computer's CPU speed from its default factory setting. I propose to build a device to under-clock computers.</p> <p><b>Methods/Materials</b> AMD Athlon XP Tbred "A" core 1800+ @1.533 GHz WINDOWS XP SP 1 VISUAL BASIC C++ Variety of electronic components Multi-meter and thermocouple Soldering iron and wire-wrap wire</p> <p><b>Results</b> The results of my data shows that clock speed greatly affects CPU power consumption and heat generation, but the overall power going into the computer did not change dramatically. According to my research CPU life would be increased with under-clocking because of reduce CPU temperatures. In addition my research shows that office applications operate well at lower clock speeds. This is because CPU speed tested in my project exceeded the minimum and recommended operating speeds listed by manufactures for those applications. The overall performance of the CPU decreases as the clock speed decreases and the CPU performance increases as clock speed increases; CPU performance is the measurement of its raw processing potential.</p> <p><b>Conclusions/Discussion</b> Surprisingly, in business environments, under-clocked computers would emit significantly less waste heat, which reduces air-conditioning which reduces air-conditioning loads accordingly. For example, if (a) business had 400 computers all running at regular speed, air-conditioning required to overcome CPU heating would cost over \$60,000 over the 3 year life of the computers. On the other hand, if the computers are under-clocked to the lowest level that energy drops to just over \$7,000. The difference between the regular and under-clocked computers is \$53,000. Huge difference!</p>	
<b>Summary Statement</b> Under-clocking computers to save power!	
<b>Help Received</b> Dad and mom helped with money; Advisor helped type out report.	