



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Frederick J. Meyer	Project Number J0723
Project Title Designing Active Audio Noise Canceling Circuits	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this science project was to understand how active audio noise canceling is achieved and to use this knowledge to design noise canceling circuits, then test and compare these circuits and measure their effectiveness over the audio frequency range.</p> <p>Methods/Materials First I researched audio noise canceling theory. Then I designed, prototyped and tested a noise canceling circuit that had only a 180 degree phase adjust. Later I researched variable phase adjustment methods and output delays. I built additional circuits that allowed a notch phase adjustment and finally a uniform phase adjust across the frequency range from 20Hz-10kHz. My most complex design worked over the full 20-20kHz range. For each design, I tested the efficiency of the circuit with test instruments and my ears. :: Circuit Boards, Bread Boards, Multi Meter, Function Generator, Headphones, Microphones, Computer, Solder, Soldering Iron, misc. electronic components, Computer Software, Display board, Spray Glue, Photos taken with my Mom's digital camera.</p> <p>Results All of my noise canceling devices worked very well at suppressing all kinds of repetitive noises (like a motor), but the circuits with phase adjustments worked much better than those without. Being able to adjust the phase made a big difference and gave my circuits the ability to better suppress noise by lining up the canceling and source waves.</p> <p>Conclusions/Discussion In this project I learned how audio noise canceling devices work and I built many complex circuits. Even the noise canceling circuit that didn't have a phase adjust did surprisingly well and canceled many common machine noises. I can think of many applications for this powerful technology.</p>	
Summary Statement The goal of this project was to understand how electronic noise canceling devices work and to design and build my own operating circuits with various features.	
Help Received Dave Rank (retired UCSC astronomer) gave me ideas about how to improve my circuit. Eric Swartz gave me tips on how to make my own PCBs and answered questions when I got stumped. My Dad helped me locate and order my circuit components. My Mom helped me glue down my display board presentation.	