## Mixed Signal Ground Technique Experiment

# Goal

* Goal of this experiment is to teach users about signal degradation issues that occur as a result of improper ground techniques in mixed signal applications. The user will be able to see the effect that isolated return paths, proximity, and correct power decoupling have on analog output signal.

# Detailed requirements:

* Powered by USB 2.0
* Include 1-8 MHz clock
* Have two ground planes that can be connected by a jumper
* Have power supply capacitors that can be bypassed by jumper
* Have multiple sockets for demonstrating proximity effects
* Include Test points near input and output
* User must be able to perform experiment using USB powered board and oscilloscope
* Experiment intended for 2 layer PCB.

# Equipment:

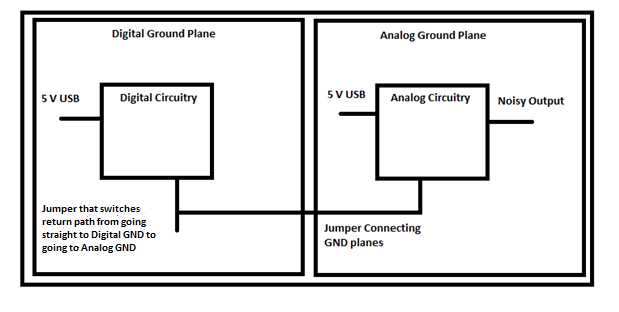
* Power source with USB 2.0 cable
* Oscilloscope
* Function Generator

# Description

This experiment will demonstrate signal degradation issues that occur due to improper grounding in mixed signal applications. To highlight common issues the experiment will purposely have analog and digital circuitry sharing the same return path, show the effect of isolating analog and digital ground planes, show the effect of placing digital circuitry in close proximity to the analog circuity, and show the importance of power supply de-coupling. To accomplish this jumpers and sockets will be used in order to switch to different paths and quickly move IC’s.

The experiment will use a low noise operational amplifier for the analog circuity and a high speed clock connected to parallel inverters for the digital circuit portion. Header pins will be connected to the input of the operational amplifier to allow the user to select different input signals. There will be two jumpers that connect the analog and digital ground planes. These jumpers will control the flow of current through the return paths. When the digital current flows through the analog circuit’s return path the analog signal will degrade which can be observed by the user with an oscilloscope.

# Block Diagram



Analog Circuitry will consist of operational amplifier.  
Digital Circuity will be a high speed clock connected to parallel inverters.