



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

**Design and Construction of a small amplitude signal digital
data acquisition system**

GREGORY MHLANGA

**A thesis submitted in partial fulfillment of the requirements for the award of a Master of
Science Degree in Geophysics in the Department of Applied Physics.**

YEAR - 2006

Abstract

A data acquisition system was designed and constructed to detect very small amplitude signals caused by man induced and natural earth movements. A ripple free power supply was designed and constructed to bias the amplifier, which amplifies voltages in the order of microvolts to volts. The power output voltages of +12.13V, -12.21V and +8.9V were achieved. A special amplifier chip, the MAX420, was incorporated in the design of the amplifier. The output of the amplifier, which is analogue, is interfaced through an analogue to digital converter, the DI - 151RS, to a computer for data storage and processing through an RS 232 communication cable. The data acquisition system was calibrated and found that 1 mV of the signal produced is equivalent to 1.14 nanometres displacement of the earth. The acquisition system was taken to the NRZ Parkade Building in the city centre of Bulawayo and later to the NUST Administration and Faculty of Commerce buildings for testing and noise measurements. An earthquake of surface magnitude 7.5, occurred in Mozambique on the 23rd of February 2006 while the data acquisition system was on test at the NRZ Building. The system detected the earthquake event demonstrating that besides being able to detect noise, it can detect earthquakes as well when they occur. Waveforms for the different measurements were generated and analyzed using the SEISAN software. The voltage signals obtained were converted into actual ground displacement using the calibration data.