

## ***ABSTRACT***

Geoelectrical measurement is one of the geophysical methods used to determine the subsurface characteristics of the earth based on its electrical properties. In traditional implementations, multi-electrode geoelectrical systems require a large number of cables, which leads to installation complexity and high operational costs. This research proposes an optimized multi-electrode geoelectrical data acquisition system using an 8-wire RS485 configuration and the Wenner method. The designed system integrates RS485 communication protocol to reduce the number of required cables, a relay controller as the electrode selector, and a graphical user interface (GUI) to facilitate operation and monitoring.

RS485 protocol is selected for its capability to support long-distance communication up to 1.2 km with high noise tolerance. The use of mechanical relays as electrode selectors allows flexible switching during the measurement process. The system is designed to support up to 32 Electrode Control modules, with each module managing four electrodes. The Wenner configuration is chosen for its superior accuracy in potential difference measurement compared to other geoelectrical methods. The expected result of this research is the development of a more efficient, user-friendly, and cost-effective geoelectrical data acquisition system that can be applied in various fields such as groundwater exploration, soil layer mapping, and subsurface structure identification.

Keywords: geoelectrical, multi-electrode, Modbus RS485, Wenner method, relay, GUI, Electrode Control