

ABSTRACT

Conventional multi-electrode geoelectrical systems require numerous cables, complicating field setup. This work develops a Schlumberger-configured multi-channel resistivity meter using the Modbus RS485 protocol, which reduces the wiring to eight lines between the control unit and electrode modules. The system comprises an Arduino-based Control Unit, an Electrode Control (EC), an Electrode Relay Module (ERM) for electrode selection, and a GUI for configuration and monitoring. The prototype was validated through relay-control tests, inter-module communication checks, and field data acquisition. Results indicate stable RS485 communication under a master–slave scheme, correct relay-based electrode selection for A–B (current) and M–N (voltage), and field measurements yielding apparent resistivity values of 565.49–7068.58 $\Omega \cdot \text{m}$, revealing 3–4 subsurface layers from conductive shallow materials to more resistive bedrock. These findings confirm that integrating RS485–relay–GUI is feasible for multi-electrode geoelectrical surveys while simplifying cabling and centralizing operations.

Keywords: *Geoelectrical, Resistivity meter, Modbus RS485, Arduino, Schlumberger, Multi-electrode.*