Measuring Electrical Conductivity Using A Low-Power Datalogging System

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Electrical conductivity is a valuable measurement for assessing plant nutrient status and soil salinity. Common methods for measuring include time domain reflectometer probes, electromagnetic induction sensors and resistive electrode arrays. Measurement volume is influenced by the geometry of the conductors or coils and the electrode array has considerably more flexibility in adjusting this aspect of the measurement. Here we describe a simple system for measuring electrical conductivity using a 4-electrode array powered by a low-voltage transistor current driver capable of measuring EC over a range of several orders of magnitude. A Campbell Scientific CR1000 datalogger was connected to a custom made current driver circuit that induced a field across the outer electrodes. The current driver circuit served to isolate the electrodes from the datalogger as well as providing a constant current source. The constant current source adjusts the circuit resistance to maintain steady current as soil conductance changes. Calibration of an array can be carried out in the laboratory for fixed electrode spacing. The constant current driver circuit component costs are less than twenty dollars making this an appealing solution to nutrient management or salinity research and monitoring needs in the laboratory or field.

Reference

Heinse, R., K.S. Lewis, S.B. Jones, G. Kluitenberg, R.S. Austin, P. Shouse and G.E. Bingham. 2006. Integration of heat capacity and electrical conductivity sensors for root module water and nutrient assessment. SAE Technical Paper no. 2006-01-06ICES-189.