Thevenin Equivalents

Concept
The purpose of this lab is to introduce Thevenin equivalent circuits and gain more experience with the equipment. The Thevenin equivalent source potential $V_{TH}$ and the Thevenin equivalent source resistance $R_{TH}$ are a way of characterizing a complicated circuit in terms of a simple circuit with one battery and one source resistor, as shown at right. When connected across a varying load $R_L$, the current $I$ through the load and the potential $V_{AB}$ across the load obey the equation

$$I = \frac{V_{TH}}{R_{TH}} - \frac{1}{R_{TH}} V_{AB}.$$ 

Experimental Instructions

1. **Thevenin equivalent potential and resistance**
   a. Build the circuit shown in the diagram below (with $R = 100 \ \Omega$ and $V_S = 3.3 \ V$).
   b. Determine the Thevenin equivalent source potential $V_{TH}$ by measuring the output potential $V_{AB}$ with a high input resistance DMM.

2. **Thevenin equivalent resistance**
   c. Determine the Thevenin equivalent source resistance $R_{TH}$ by short-circuiting the output and measuring the current $I_{sc}$ through this short-circuit.
   d. Determine the Thevenin equivalent potential and resistance by connecting a variable load resistor (potentiometer) and measuring the output potential $V_{AB}$ and the load current $I_L$ over a range of load resistances. (If you are confident that you know the resistance, then you can deduce the current from the voltage) From a plot of $I$ vs. $V_{AB}$, determine $V_{TH}$ and $R_{TH}$.
   e. Compare your two measurements of $V_{TH}$ and $R_{TH}$ with a Kirchoff loop calculation based on values of the resistors used in your circuit (*i.e.* HW 2).