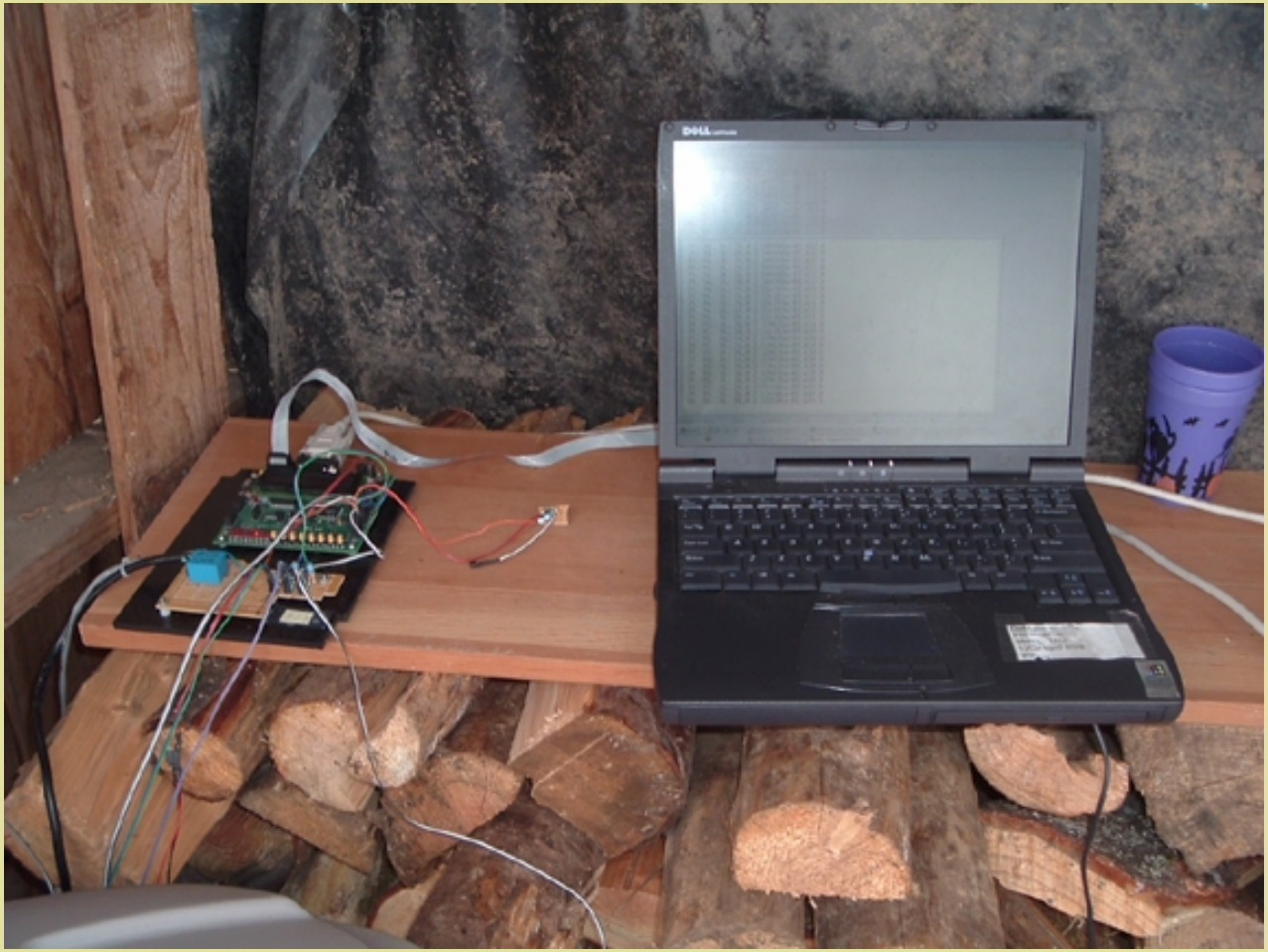
Solar Collector

Control System / Electronics



Tank

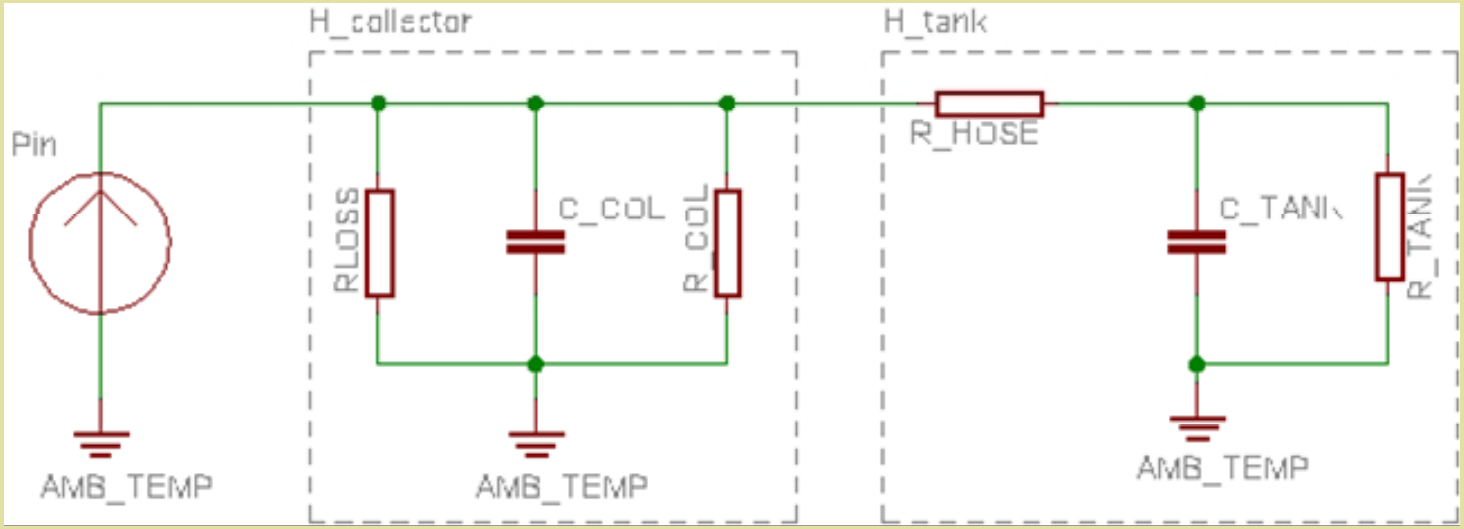
Thermal-Circuit Equivalents

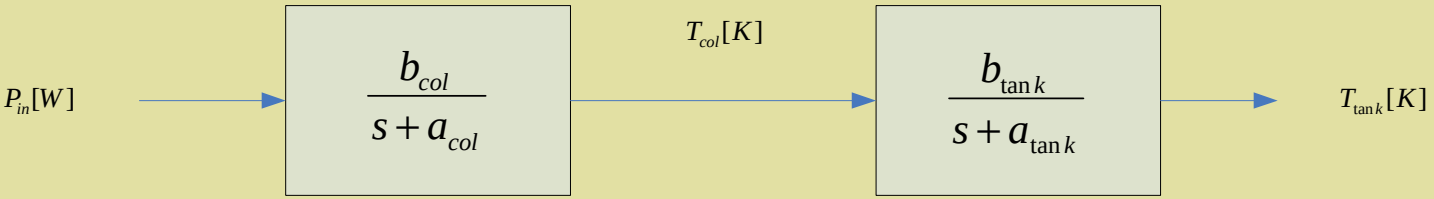
Heat [K] = Voltage [V]
Power [W] = Current [I] = Coulombs/Sec [Q/s]

Electrical:
C = [Q/V]
R = [V/I] = [V*s/Q]
L = [V*s/A] = [V*s^2/Q]

Thermal:
C = [J/K]
R = [K/W] = [K*s/J]
L = [K*s/W] = [K*s^2/J]

Feed Forward System



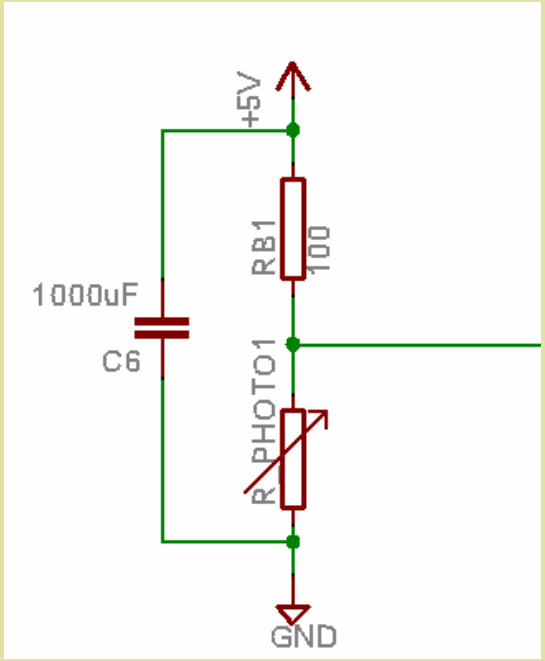


H_{col} $H_{\tan k}$

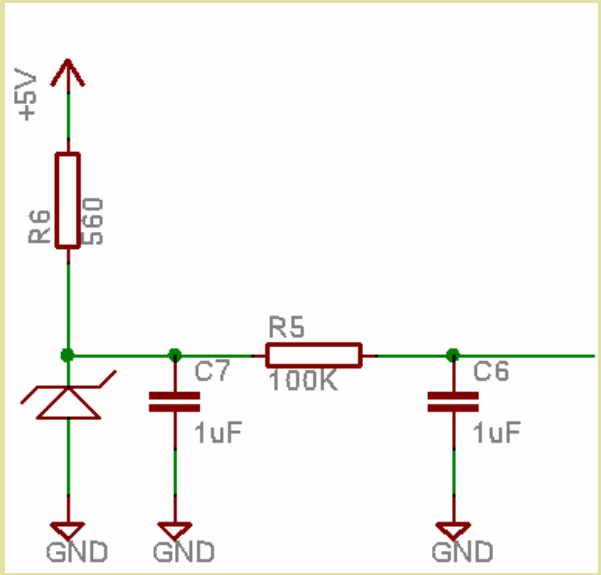
$$a_{col} = \frac{R_{loss} + R_{col}}{C_{col} R_{loss} R_{col}} \qquad a_{\tan k} = \frac{R_{hose} + R_{\tan k}}{C_{\tan k} R_{hose} R_{tamk}}$$

$$b_{col} = \frac{1}{C_{col}} \qquad b_{\tan k} = \frac{1}{C_{\tan k} R_{hose}}$$

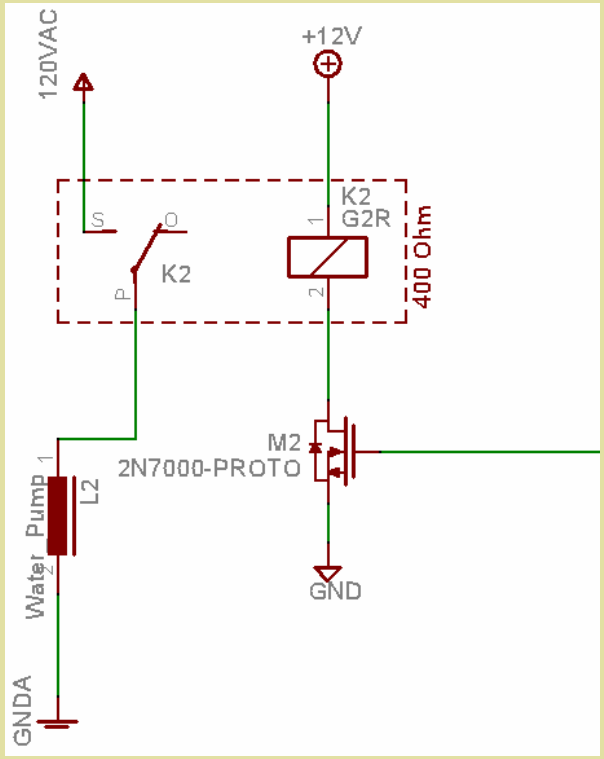
Sensors



Light Sensor

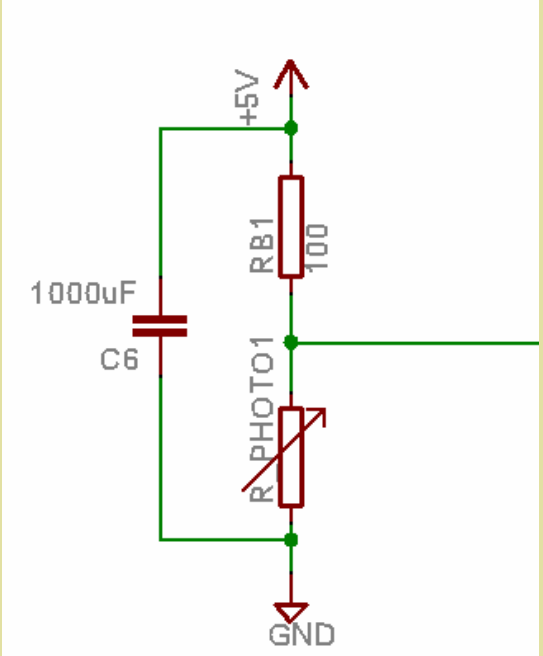


Temperature Sensor

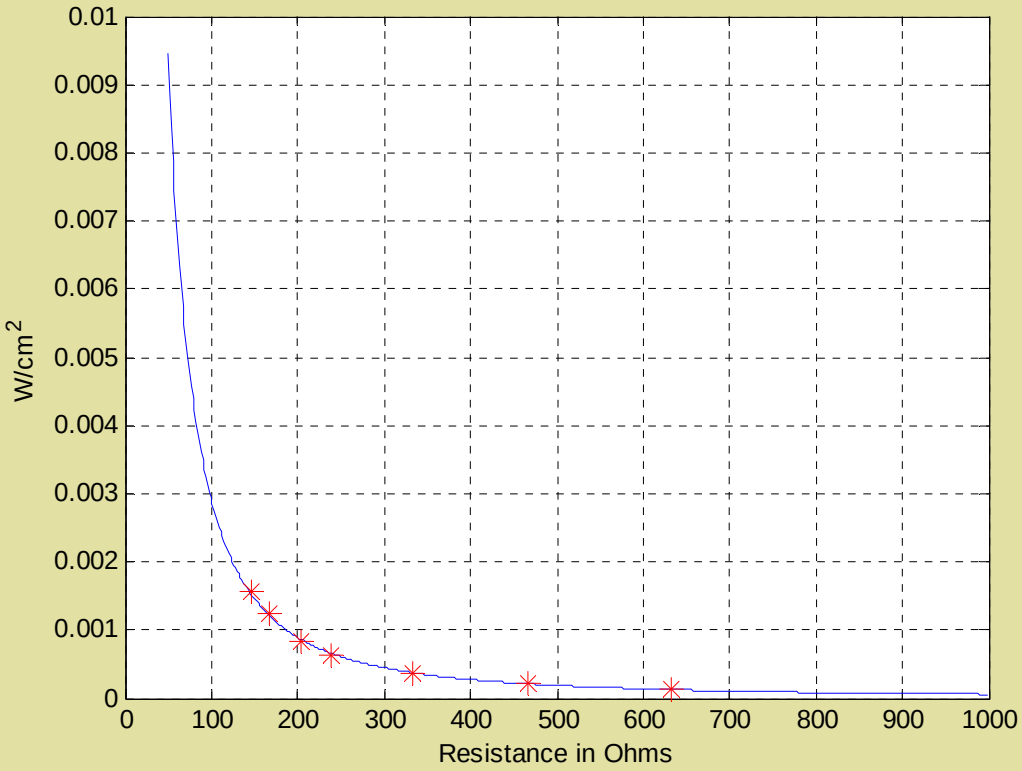


Power Relay

Light Sensor

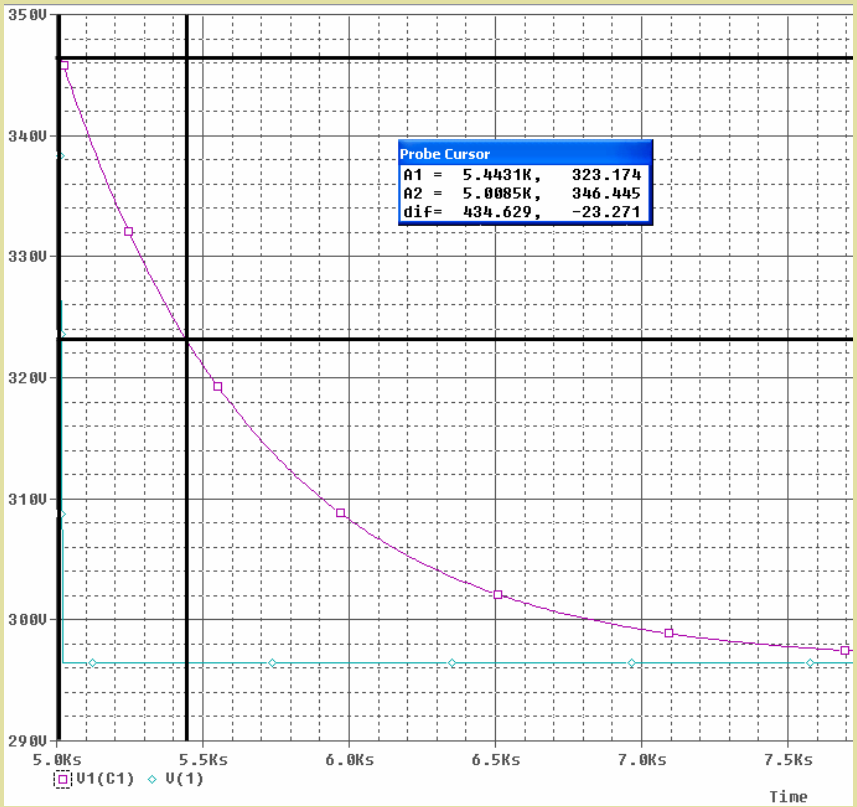


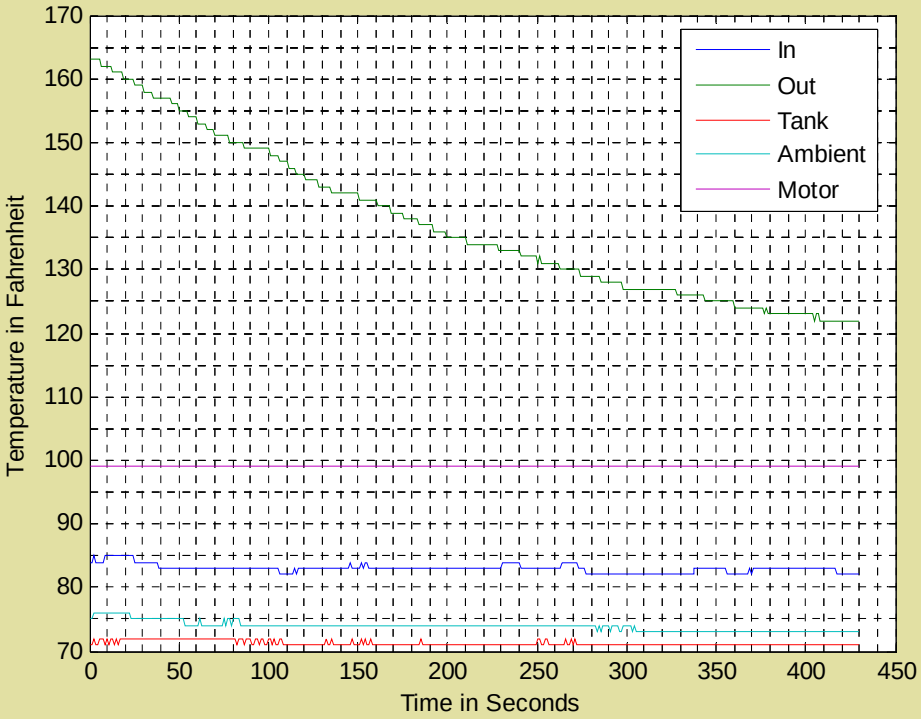
Light Sensor



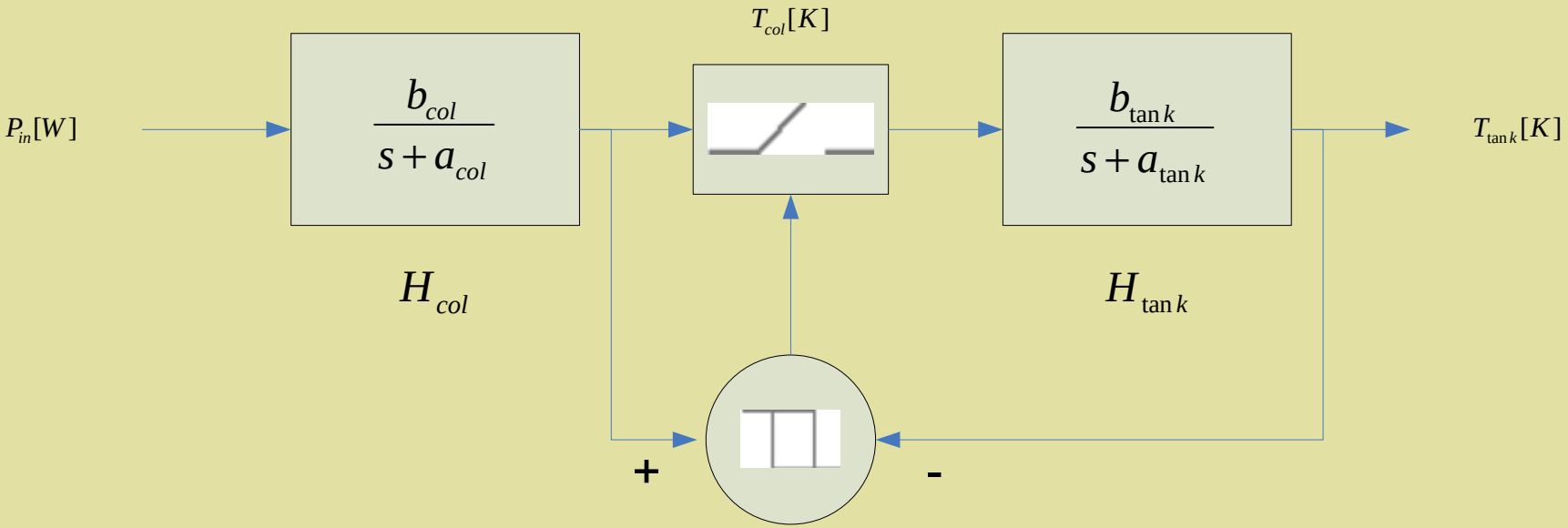
Finding Component Values: Rcol

$$V_c = V_{t=0} * e^{\frac{-t}{RC}} \quad <=> \quad R = \frac{-t}{C * \ln(\frac{V_c}{V_{t=0}})}$$





Feed Back System



Model Comparison