

# ECE 461: Test #1

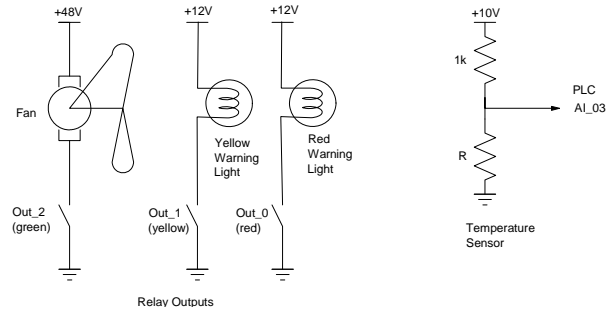
Counters & Analog Inputs. Due Monday, September 18th

You may work in groups of 1 - 3 on this exam (the same group you worked with for homework #3)

Repeat homework #3 only using Structured Text program. Grading:

- 95% (A): Demonstration of code. Printout of code along with an explanation for how it works, Verification the counter turns on at 10 and 15 switches. Data verifying that the on/off times are correct (o-scope plots work well here). Verification of the voltages where it switches between duty cycles in automatic mode.
- 85% (B): Demonstration of code but no verification of counters, timers, or analog voltages.
- 75% (C): Able to demonstrate mode 0 and 2 in structured text along with a counter for the yellow and red lights.

Write a Structured Text program for the following system. A Micro810 PLC is connected to a temperature sensor and a fan as follows:



The temperature - resistance of the temperature sensor is

$$R = 1000 \cdot \exp\left(\frac{3903}{T} - \frac{3903}{298}\right) \Omega$$

where T is the temperature in degrees Kelvin (celcius + 273). The PLC is to be able to turn on and off the fan based upon which button you press:

Button & Mode		On Time (4 second period)	Analog Input #3 (Temperature)
0	Fan On	100%	n/a
1	Automatic Mode	100%	> 50C
		75%	40C < T < 50C
		50%	30C < T < 40C
		25%	20V < T < 30C
		0%	T < 20C
2	Fan Off	0%	n/a

To monitor the life expectancy of the motor, turn on the yellow or red LEDs based upon the number of on/off cycles for the fan:

- Out1 (Yellow)      Between 10 and 15 on/off cycles      (warning - approaching time to replace the fan)
- Out0 (Red)        More than 15 on/off cycles                      (time to replace the fan)