

PreLab 5b: Design Project Simulation

• GOAL

This is a team project involving two or three students. The main requirement is that the project involves pulse width modulation (PWM). Due to time constraints, your team project topic is limited to one of the following:

- (1) Two-axis servo motor driver
- (2) Red-Green-Blue (RGB) LED driver with dimming control
- (3) Power LED driver with dimming control

• PRELAB TASKS

Each student must turn in the following for their individual circuit:

(1) Circuit schematic

- **Triangle wave generator:** If this is your circuit, be mindful of the pin diagram for your op amp or 555 timer. For example, flipping the op amp (i.e. –input terminal is on top) also flips the Vcc and Gnd pins!
- **PWM:** If this is your circuit, the triangle wave must come from a signal source (Component>>Signal_Voltage_Sources>>Triangular_Voltage) rather than your teammate's circuit. This mimics your actual circuit testing, where you will use the function generator.

NOTE: If you are using the LM311 comparator, pins 1 and 4 should both be grounded.

NOTE: If you are doing the servo controller project, the servo motors should NOT be in your simulation. Just leave the PWM output by itself (i.e. not connected to a load).

- **LED switch:** If this is your circuit AND you are not responsible for PWM, then use a signal source (Component>>Signal_Voltage_Sources>>Clock_Voltage) to provide the PWM input.

NOTE: If you need a power LED, just use the generic “LED_BLUE” in Multisim. It can handle any current, which is not realistic but sufficient for this course.

NOTE: If you need a RGB LED, just use three separate red, green, and blue LEDs with their cathodes connected.

(2) Simulation waveforms

- **Triangle wave generator:** A few cycles of the output. Measure the peak-to-peak voltage, frequency, and offset.
- **PWM:** A few cycles of the PWM output when potentiometer is at 10%, 50%, and 90%. For each potentiometer setting, measure the duty cycle and/or pulse width (whichever is more appropriate).
- **LED switch:** A few cycles of the LED current for 10%, 50%, and 90% duty cycle. Measure peak current.

(3) Calculations for choosing component values

(End of PreLab 5b)