

Skill Demo 4: Microcontroller Switch Lab

NAME _____

GTID _____

Goals:

Understand how to use digital input/output lines on a microcontroller

Tools/supplies:

Teensy

various resistors, LED

laptop

breadboard

USB cable

Background:

CS 3651 videos that should have been watched by this time:

CS3651 - Intro to Multimeters

CS3651 - Using Multimeter in a Circuit

CS 3651 Introduction to Circuit Schematics

CS 3651 Introduction to Resistors

CS 3651 Introduction to Capacitors

IntroToLED.mov

pullupdown1.mov

How and WHY to Solder Correctly (if did not attend class)

Introduction to Breadboard (Protoboards) (if don't remember from ECE2031)

CS 3651 Pull-up resistors

CS 3651 - APIA - Pull down resistors

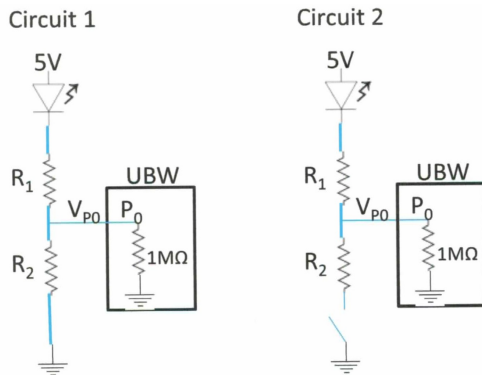
CS 3651 - APIA - Sensing: Photoresistor

Relevant section of book (Practical Electronics for Inventors 2000 edition): pages 1-14

Motivation: You are in a start-up that is building a small camera that attaches to the user's shirt collar and records an image once every 10 seconds (e.g. something like Memoto). Your CEO has concentrated on making the device cheap and small, so they've chosen a microcontroller with very few input/output pins, and the device has no interface (i.e. it is always on and has no buttons). Suddenly small video snippets become hot (e.g., Vine on Twitter), and the CEO wants to add them to his device. He asks you to add a button to the device to start recording video and a flashing LED to show when it is recording. The CEO, thinking he is the new Steve Jobs, has selected a button because it has a "good feel" and keeps with his minimalist design.

The button toggles, latching open when it is depressed (and the video should be recording), and latches closed when it returns to its non-depressed state (and the device goes back to its normal state). To make your job harder, the CEO wants to give users the ability to turn the take-a-picture-once-every-10-seconds function on and off. He has the (not-so-brilliant) idea that if the user is in video mode, and toggles the button when the LED is off, the system turns off. If the user toggles the button when the LED has flashed on, the device takes an image once every 10 seconds as expected. Your mission, should you choose to accept it (and you will if you want credit), is to make the circuit to fulfill the CEO's wishes. Unfortunately, there is only one digital I/O line left on the microcontroller.....

1) Build a circuit with an external LED, two resistors, a switch, and an input pin on your microcontroller, as depicted below.



Write a program for your microcontroller to accomplish the following:
 When the switch is open, the LED switches states (on/off) every 3 seconds.
 When the switch is closed, the LED maintains the current state (on or off).
 Demonstrate this application to an instructor

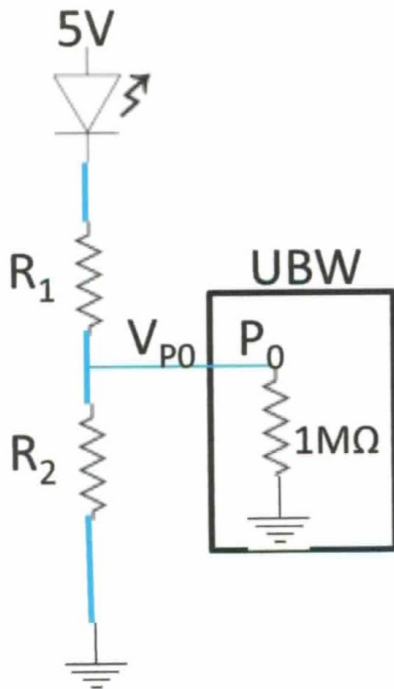
Initials _____ Date _____ Time _____

2) Using the diagrams provided, Determine V_{po} , R_1 , and R_2 , and complete the chart below.

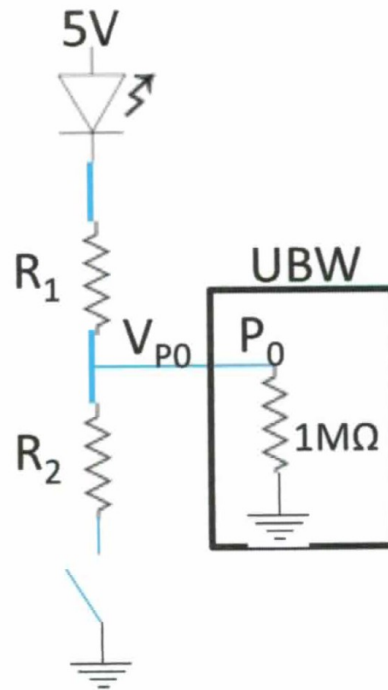
Circuit	Switch Position	Pin IN/OUT	Pin High/Low	LED ON/OFF	R_1 (Ohms)	R_2 (Ohms)	V_{po} (V)
1	Closed	IN	N/A	ON			
2	Open	IN	N/A	OFF			
3	Closed	OUT	HIGH	OFF			
4	Closed	OUT	LOW	ON			
5	Open	OUT	HIGH	OFF			
6	Open	OUT	LOW	ON			

Initials _____ Date _____ Time _____

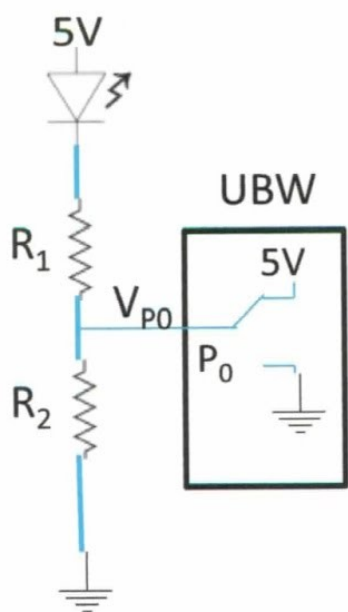
Circuit 1



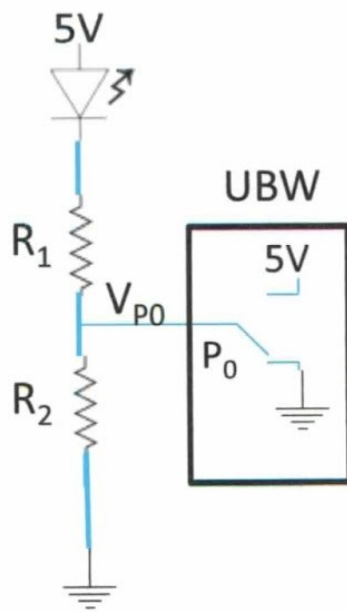
Circuit 2



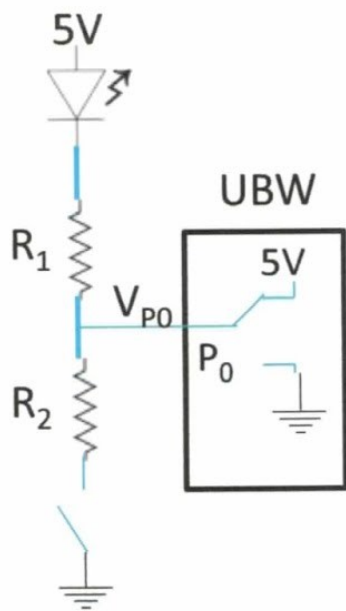
Circuit 3



Circuit 4



Circuit 5



Circuit 6

