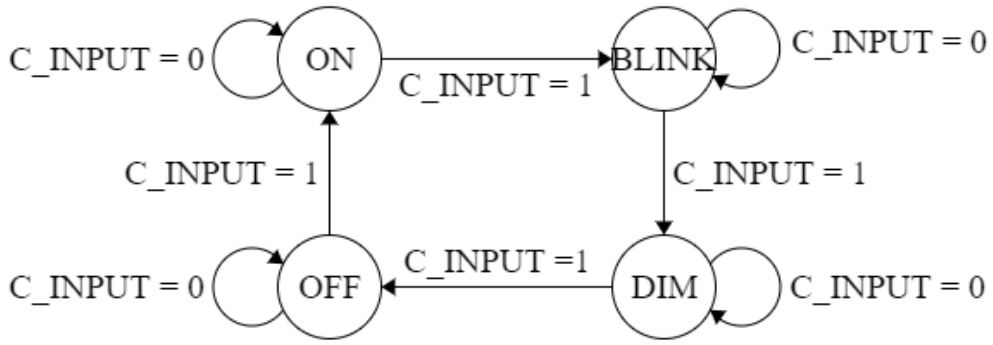
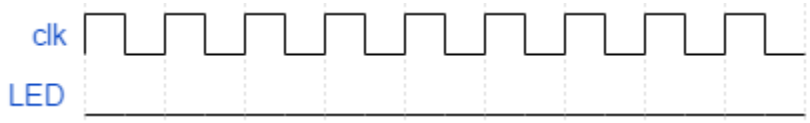
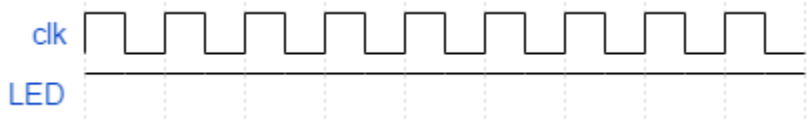
Bike Light Specification Document:
Prepared by Thuc Tran
Inputs:
The input is a single push button. When the button is pressed, it will alternate between different modes.
Outputs:
The output is a single LED that will blink in varying patterns, depending on the operational mode.
Operational Modes:
There are four modes of operation for the bike light: OFF, ON, BLINKING, DIM. When the button is depressed, the bike light will switch from its current mode to the next mode in a circular fashion as described below:



The actual behavior of each mode is described below.
OFF:

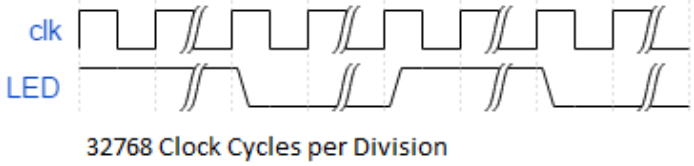


In the OFF mode, the LED will be unpowered, and therefore off.
ON:



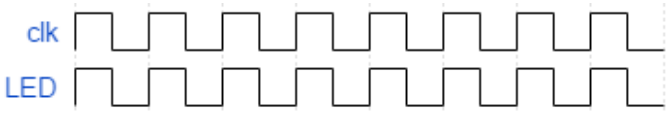
In the ON mode, the LED is on, and consistently on.

BLINKING:



In the BLINKING mode, the LED will alternate on and off at a pre-described frequency of roughly 1 Hz.

DIM:



In the DIM mode, the LED will operate at a duty cycle of approximately 50%.

Measurements:

General Measurements:

Button Signal Noise Decay: 1 ms from button press to stable

Clock time: 32768 Hz

Mode Measurements:

OFF:

Duty cycle: 0%

Frequency: Doesn't Matter / Zero

ON:

Duty Cycle: 100%

Frequency: Doesn't Matter/ Zero / Infinite (LED is always powered)

BLINKING:

Duty Cycle: 50%

Frequency: 1 Hz

DIM:

Duty Cycle: 50%

Frequency: 32678 Hz

References:

For Up Counter -> http://www.ece.mcmaster.ca/~shirani/2di4/chapter7.pdf ; Slide 34

For Input Conditioner -> https://eewiki.net/pages/viewpage.action?pageId=4980758

XOR Gate -> Using a 4 NAND configuration ala https://en.wikipedia.org/wiki/XOR_gate