

# PROJECT 1: A simple COUNTER

## CPEG222 - Project 1 A Simple Counter

For this project, you will implement a counter, with an external 4-digit LED output display, that is capable of incrementing and decrementing based on user input (demo board switches). When a user presses the increment button, the counter, displayed on the 4-digit display, increments by 1, at a rate of ~60/second. A decrement button allows the user to decrement the counter at the same speed. A user should also be able to reset/clear the display.

As a “hint” of the design, you should, in theory, be able to scale your project to a 20-digit LED output with very little change in the basic design.

### 1. Display: 30 points

- Display Brightness - a sliding scale is given for the brightness of the display. A display that is bright enough to be seen easily will earn full points; an unacceptable display will earn few points.
- No flickering of display

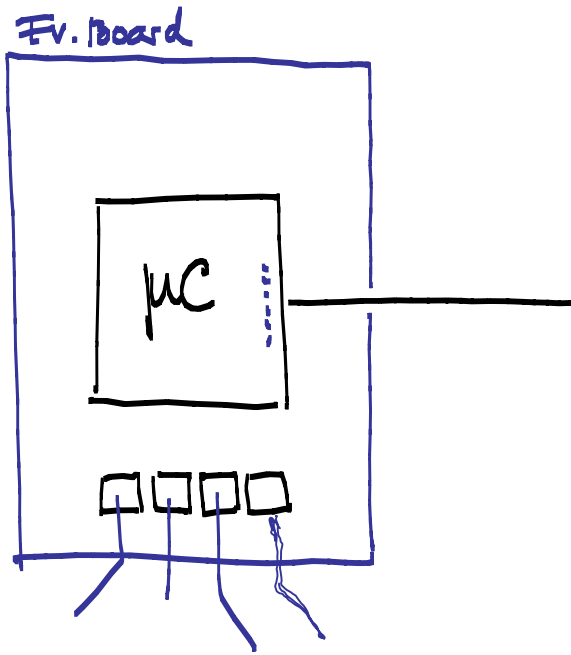
### 2. Operation: 40 points

- Displays 0000 by default.
- Increment Button - increments the counter by ~60/second.
- Decrement Button - decrements the counter by ~60/second.
- Clear Button - Resets the counter and display to 0000.
- The display should halt when the upper and lower limits are reached:
  - Upper limit = 9999
  - Lower limit = 0000

## once again, our design methodology...

Phase	Description	Outcome
∅	Intro to the problem	UNDERSTANDING.
1	Hardware discussion Which components How to connect them Anticipate for debugging	HWa Proven HW.
2	Software discussion Flow diagram/architecture variable definition CODING	HWb
3	Implementation / Lab demo	Working solution
4	Documentation	Design Notebook.

let's build a rudimentary block diagram...



Do we have more than one way of implementing the project?

How about reducing the number of external components

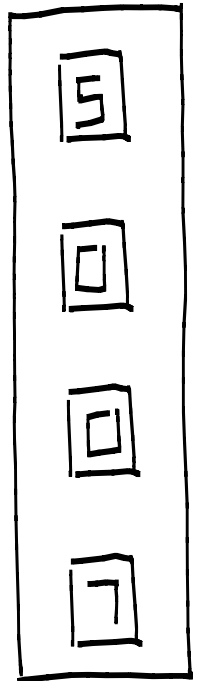
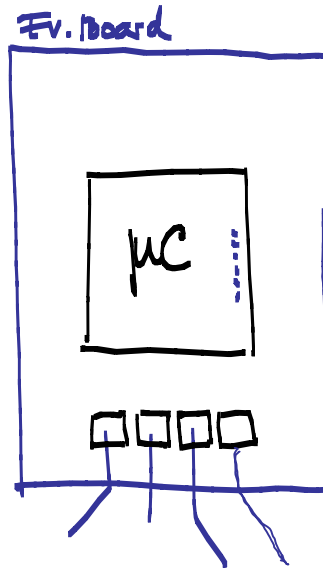
How about reducing the necessary  $\mu C$  resources

# Converging to the final solution

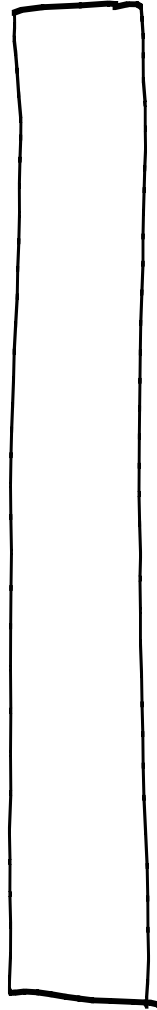
$\mu$ C resources

**BLOCK DIAGRAM**

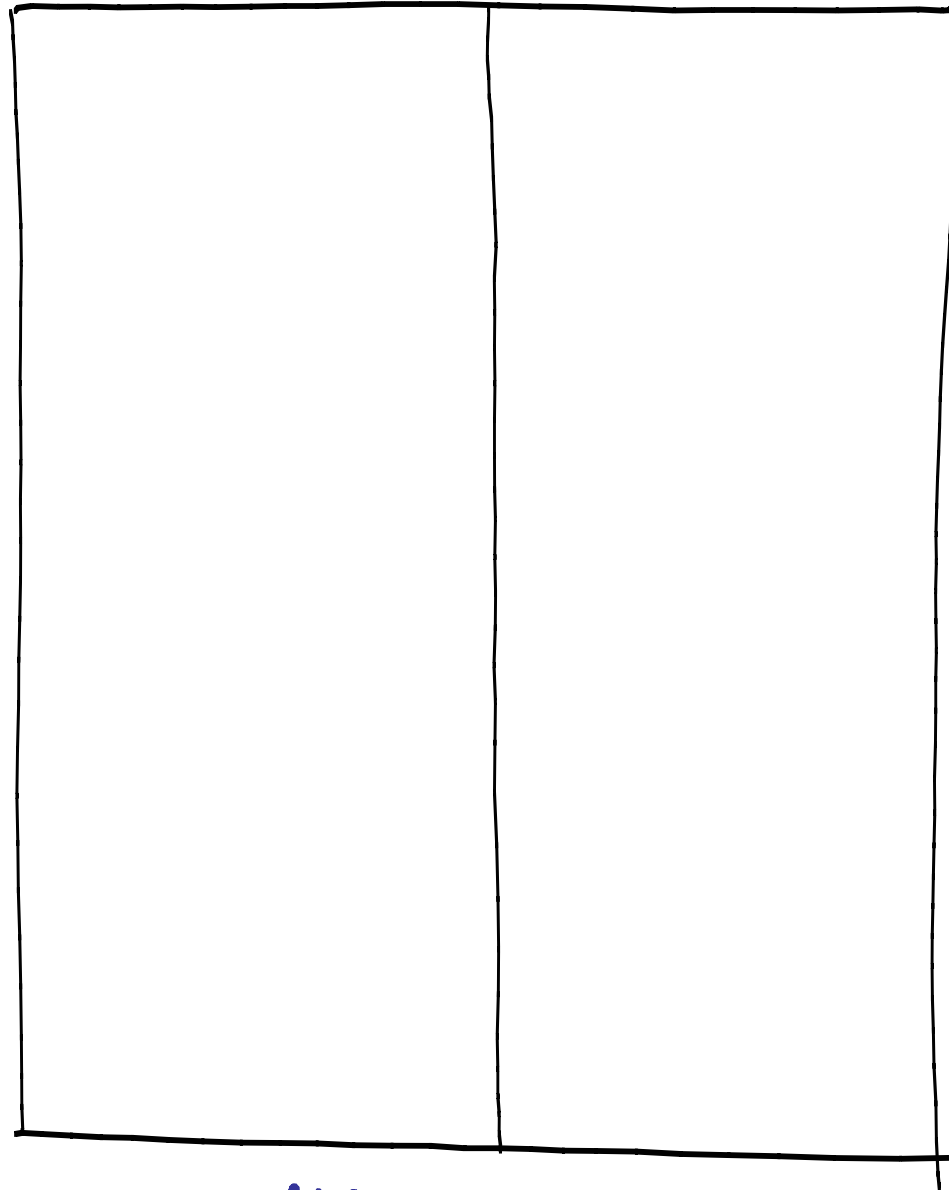
External resources



Where are we going to place those components?



PORT  
REPLICATOR



BREAD BOARD

How do we build the schematic diagram?

# SCHEMATIC DIAGRAM EXAMPLE

