**Lab 2 Report**

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3360:0001 - Embedded Systems

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**Abstract**

The lab builds a hexadecimal up/down counter. It uses an ATmega328P microcontroller, an 8-bit shift register, a 7-segment LED display, and a pushbutton switch. The 7-segment display shows "0" at power on, and the counter increments by default. The pushbutton controls mode selection, increment/decrement, and reset.

**Materials List**

|  |  |  |
| --- | --- | --- |
| Hardware | Quantity | Description |
| Atmega 328P µC | 1 | Programmable µC |
| 74HC595 Shift Register | 1 | Storage of hex codes for 7-Segment display |
| 5161AS 7-Segment Display | 1 | Display current counter |
| Enable Low Push Button | 1 | Enables user interaction with 7-Segment display |
| 560Ω Resistor | 8 | Resist current into 7-Segment display LEDs |
| 10KΩ Resistor | 1 | Pull up resistor for push button |
| 100KΩ Resistor | 1 | Pull up resistor for push button |
| 0.1µF Capacitor | 2 | Decoupling capacitors for button and µC |

**Components**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 74HC595 | 5161AS | Push Button | Atmega 328P |
| #TODO | #TODO | #TODO | #TODO |

**Schematic**

A computer screen shot of a circuit board

AI-generated content may be incorrect.

Electrical circuit schematic created using KiCAD

**Functionality**

As stated in the abstract, the 7-Segment display is controlled by user via interacting with a push button. There are three modes, and their descriptions are as follows:

i) Increment Mode

- Press button < 1 second: Increment count by 1

- When display shows "F": Next increment rolls over to "0"

ii) Decrement Mode

- Press button < 1 second: Decrement count by 1

- When display shows "0": Next decrement rolls over to "F"

- DP LED on to indicate decrement mode

iii) Reset

- Press and hold button ≥ 2 seconds: Reset to "0" and enter increment mode

#TODO – ADD IMAGES OF EACH MODE

**Assembly Program**

Source Code:

<https://github.com/mattnkrueger/embedded_systems_marks_krueger/tree/main/labs/lab2>

#TODO – flow diagram of code (use draw.io or sum)