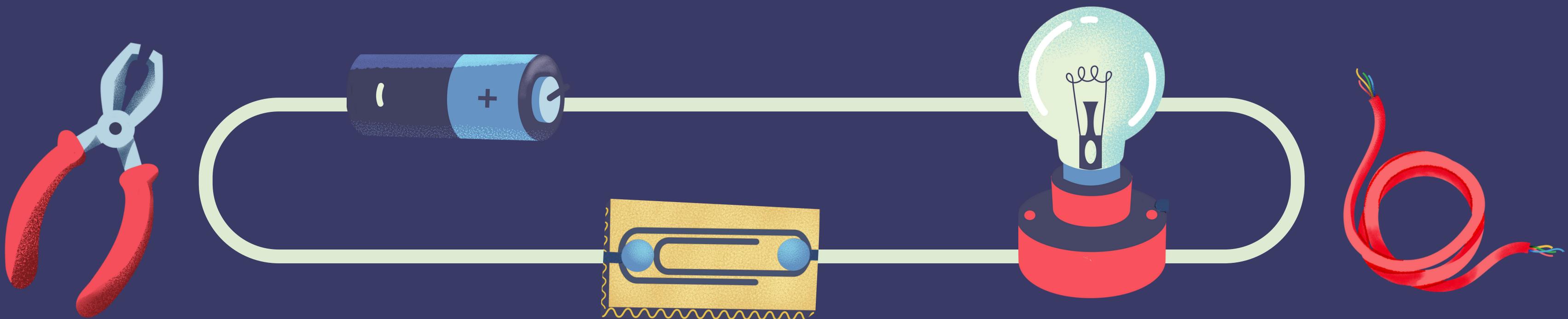


DIGITAL LOGIC MINI PROJECT

PRIVATE ELEVATOR SYSTEM DESIGN

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TEAM LEADER

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MOST ASSIST

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ALIF

BACKGROUND

We make a private lift system which contains a password to go up and down. The user needs to enter a 4-bit number to represent a password. The full circuit is drawn using deeds and includes combinational circuit and sequential circuits.

Combinational Circuit Components Includes:

- 3-bit comparator
- 4-bit comparator
- 4-bit decoder
- Demultiplexer
- Multiplexer
- Basic gates
- Switches
- LEDs
- 7-segment display

Sequential Circuit Components Includes:

- 3-bit up/down counter
- Clock disabler

Enhanced Features:

- 4-digit password
- Sound Notification
- Welcoming Note
- Door Open/Closes

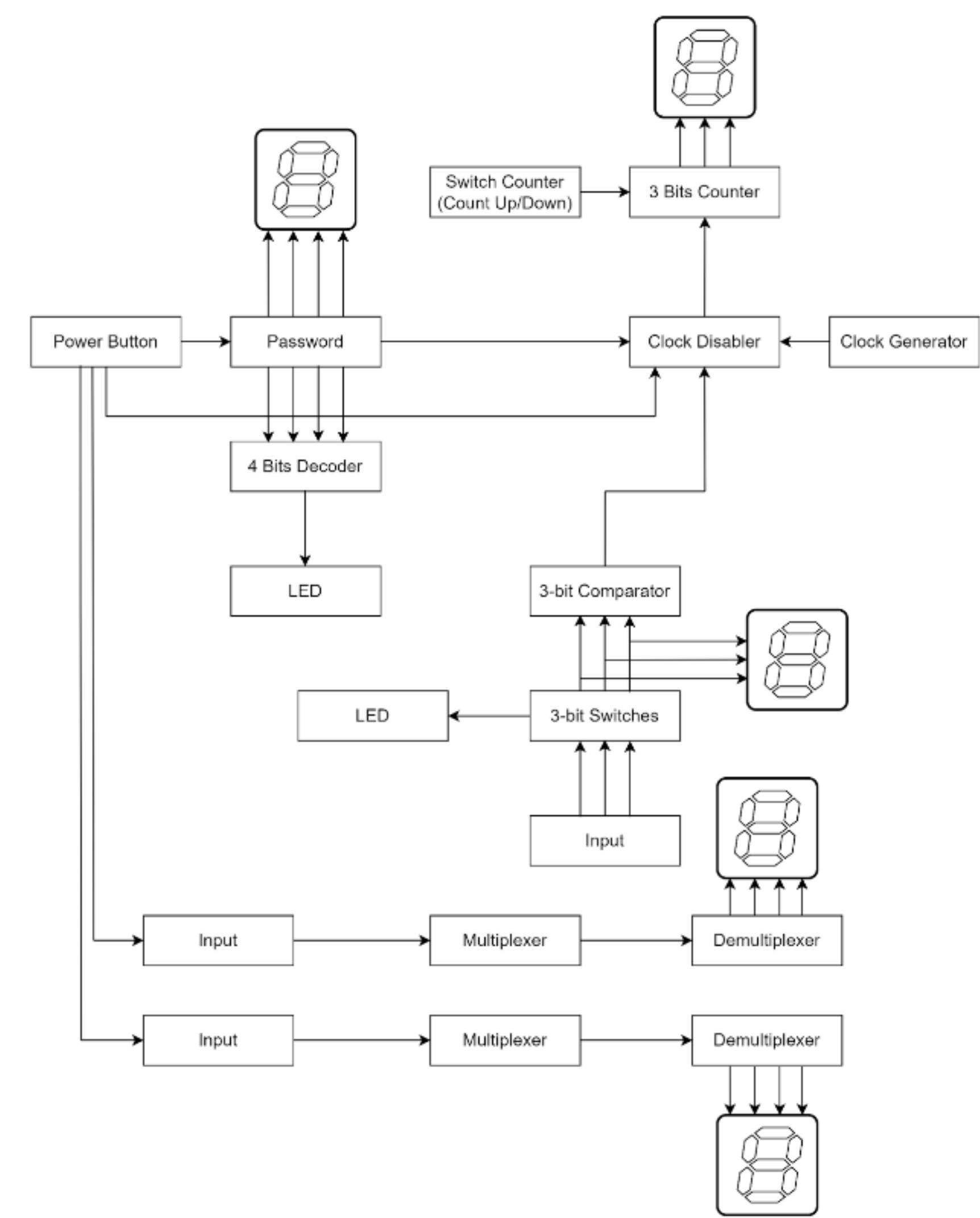
Problem and Solution

Unauthorized use can often be a problem especially in the construction and real estate industries, offering private or custom elevator solutions for high-end residences, corporate offices, and luxury buildings.

Therefore, we have implemented a password using 4-bit decoders to allow users to input a four-digit password. Firstly, the user has to turn on the power switch in order to enter the input the password (The password has already been set). If the password is incorrect then the user may not choose which floor for the elevator to go. If the password is correct then LEDs will light up and the user can proceed to go where they want (The maximum is seventh floor). After the user chooses the option floor, then the option will display using a seven-segment display. The 3-bit counter will count up if the desired floor is higher than the current floor and vice-versa. The 3-bit counter will stop counting if it reaches the chosen floor and LEDs will light up indicating the door of the elevator is open as well as the sound notification.



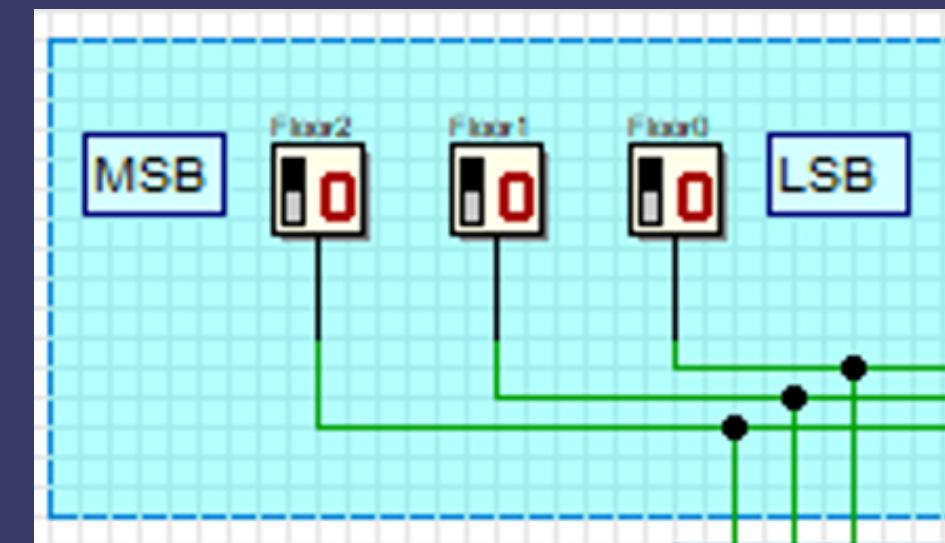
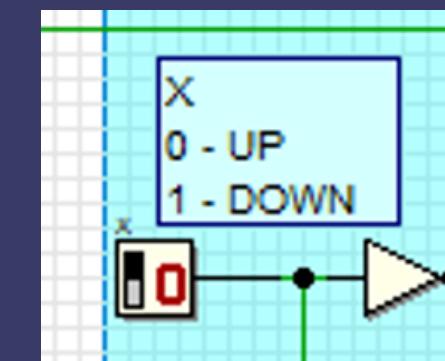
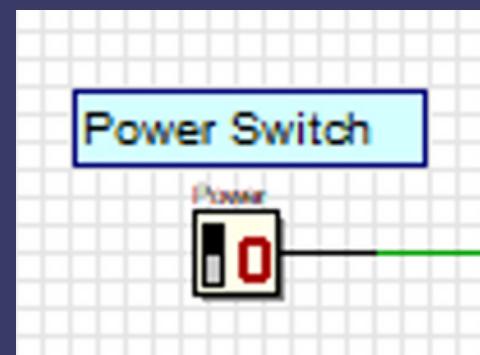
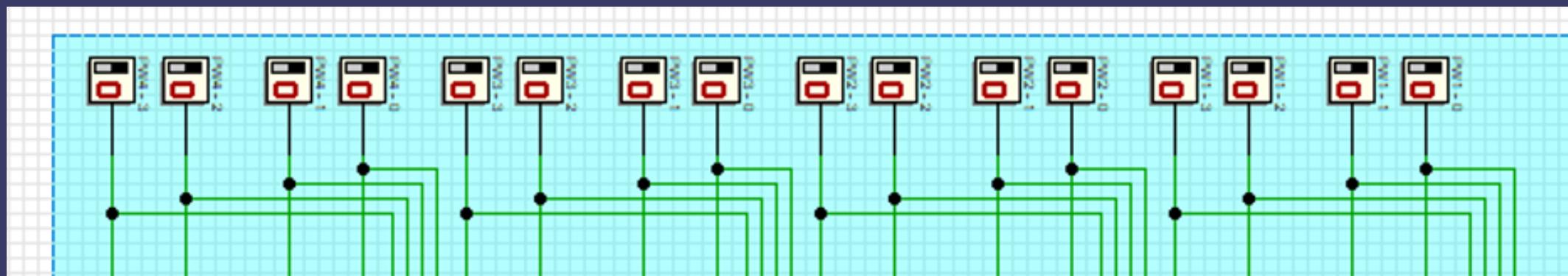
BLOCK DIAGRAM



System Implementation

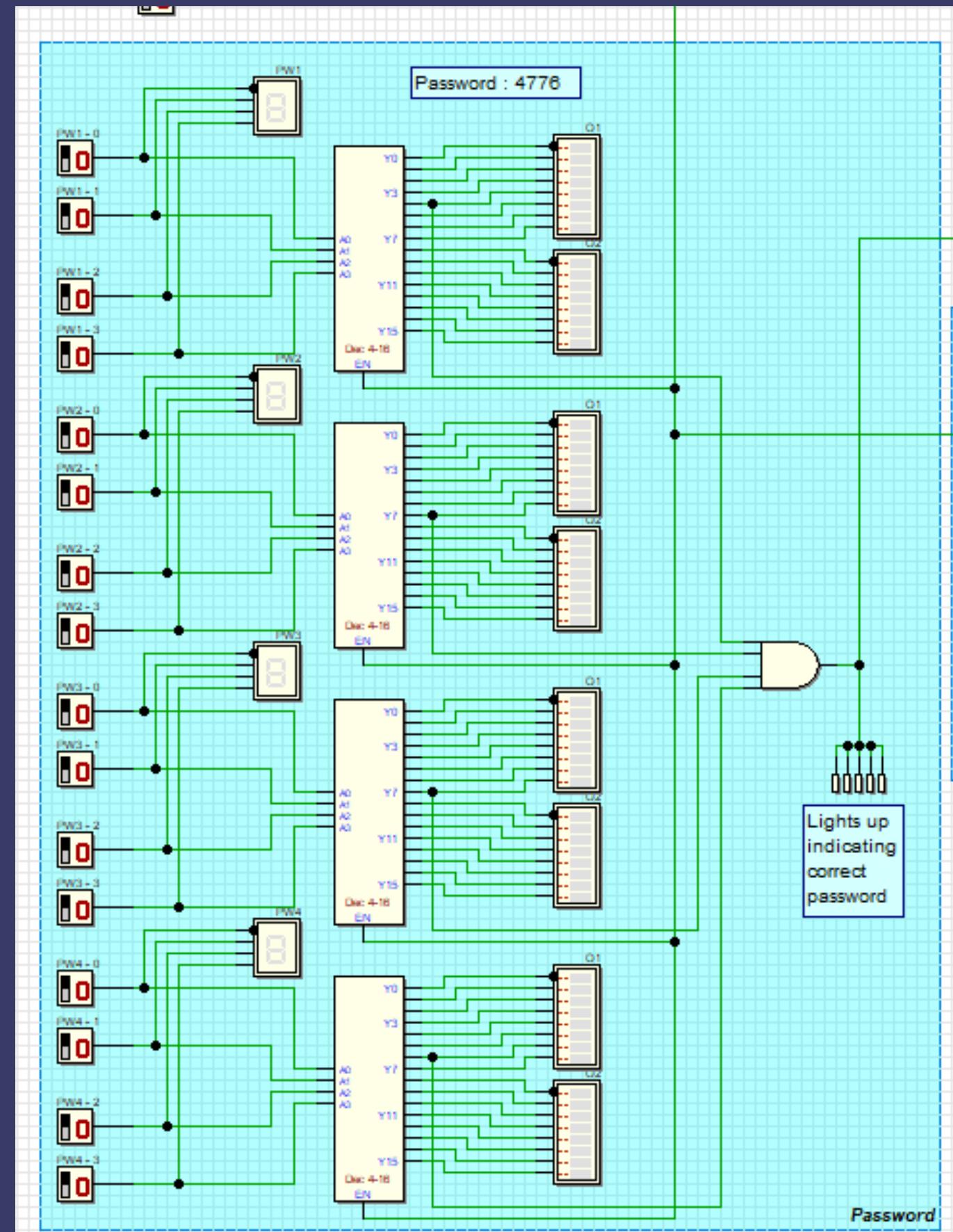
1. Input Switch

- A power button input switch to select either turn on or off all the switches.
- 3 input switches for the user to input the number of floors that user wants to go. Each of the switches represents a single respectively, which are Input 1, Input 2 and Input 3.
- For example, Input 1 represents LSB, and Input 3 represents MSB. Hence, the user can enter input values in range from 0 to 7.



2. Decoder

- We create a four-digit password and utilize four 4-bit decoders to decode the binary passwords. Each decoder represents a digit from the password.
- A power button input switch allows to turn on or off the elevator. The 4-bit decoder enable pins are attached to the power button. This implies the decoder will only start working when the power button is pressed.
- Each decoder's output is coupled to two LED arrays (Q1 and Q2). When the user selects an input value between 0 and F for each decoder, it will light up. The output of the decoders is coupled to an AND gate, which is then connected to the LED. When the LED lights up, it indicates that the user has entered the right password.



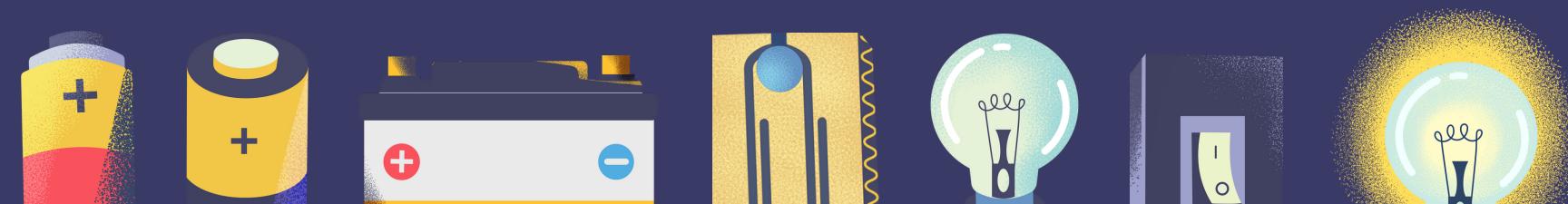
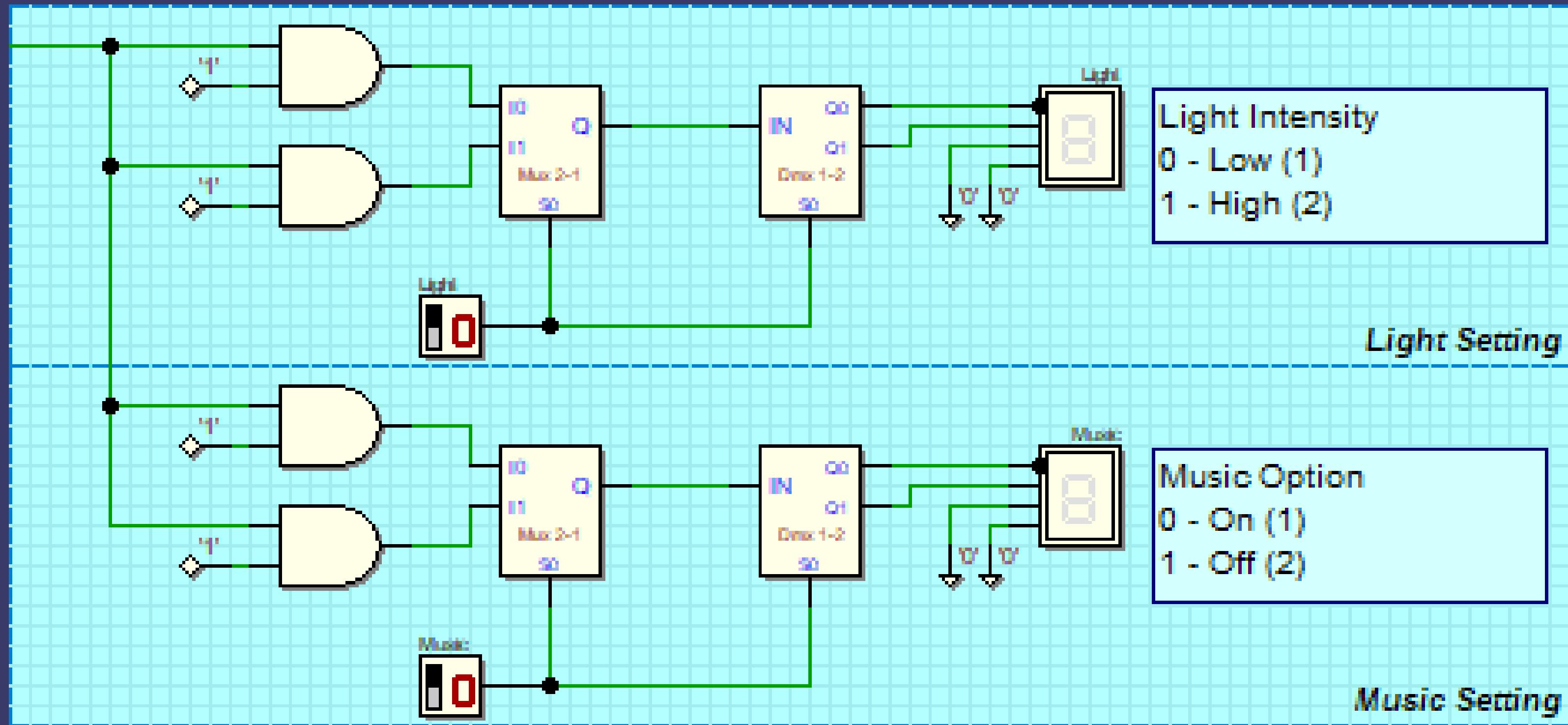
3. Multiplexer

- Two multiplexers that allow the user to select the ambiance in the lift. There is only one user input for each multiplexer.
- First multiplexer is Light. When Light = 0 the light intensity in the lift will be low while when Light = 1 the light intensity in the lift will be high.
- Second multiplexer is music. When Music = 0 the music in the lift will be turned on, while Music = 1 the music in the lift will be turned off.
- This feature can only be used when the power is turned on.

4. Demultiplexer

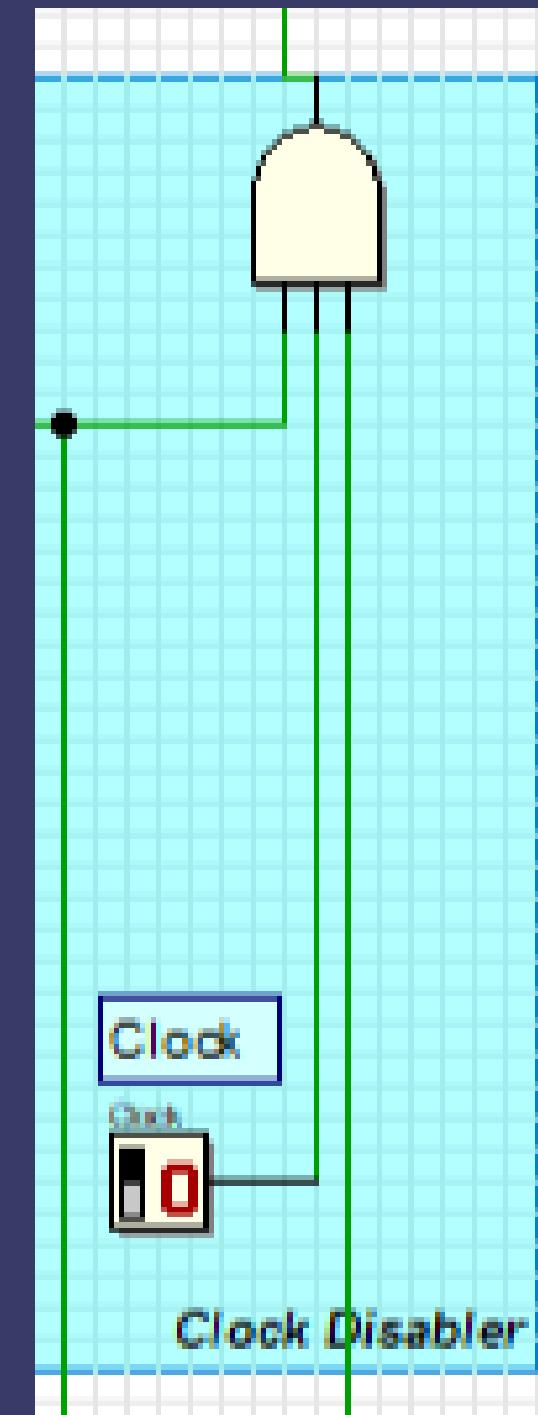
- Two demultiplexers connected to the outputs of the first and second multiplexers.
- The multiplexer's output determines the properties-type and properties-size set by the user. Therefore, each demultiplexer is connected to it.
- The output of both multiplexers is connected to a 7-segment display. After picking the attributes (type and size), the LED will light up according to the number of options (1 or 2).
- The 7-segment display displays the number of user selections (1 or 2) for the ambiance in the elevator.

Mux and Demux Circuit



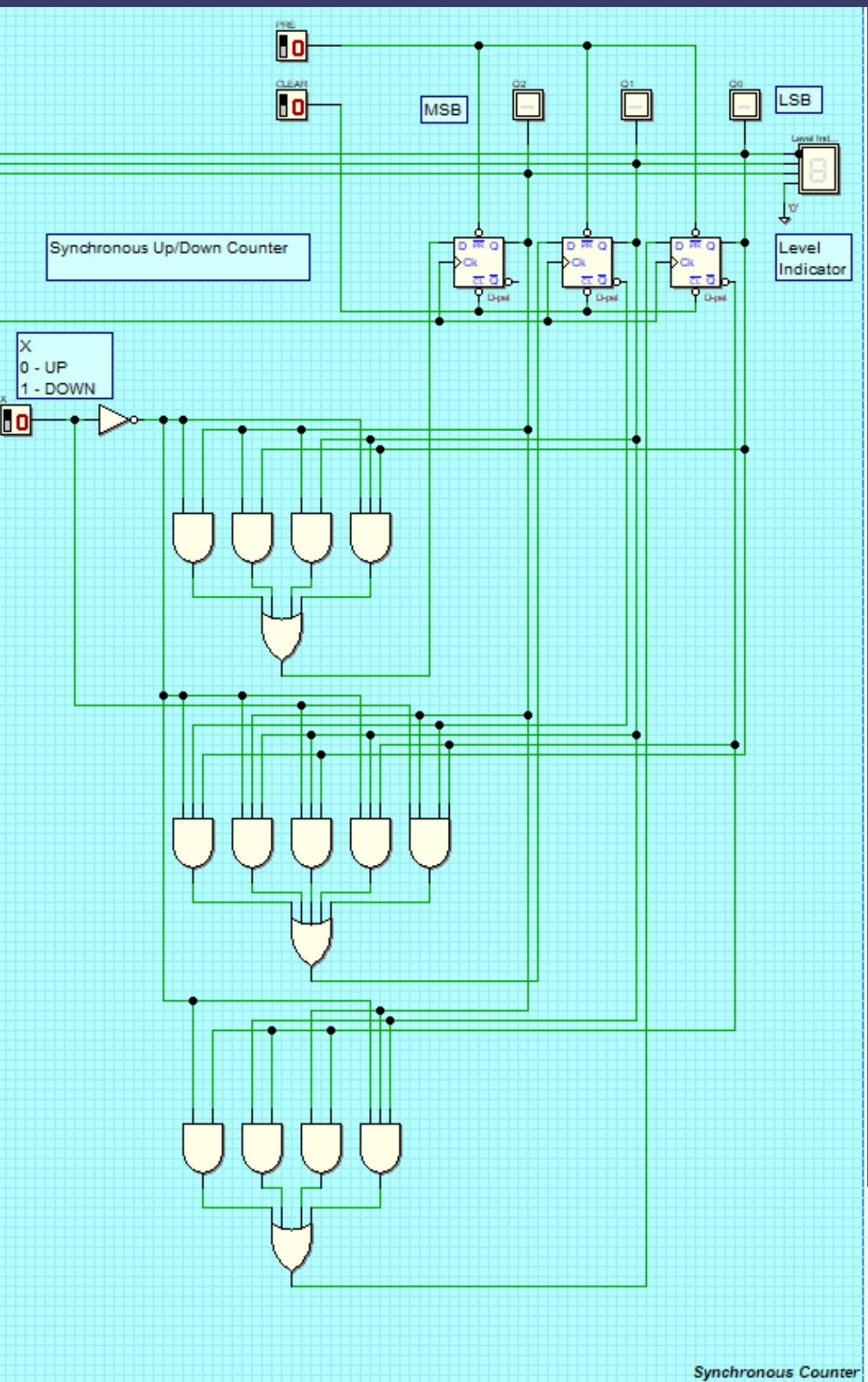
5. Clock Disabler

- The clock disabler is set up using a 3-input AND gate.
- The AND gate has four inputs: clock source, power, and comparator.
- The clock disabler only works when all four inputs are high.
- The output of the 3-input AND gate is connected to the clock of the counter's flip-flop.
- The counter would start and stop when the desired number of floor was reached.



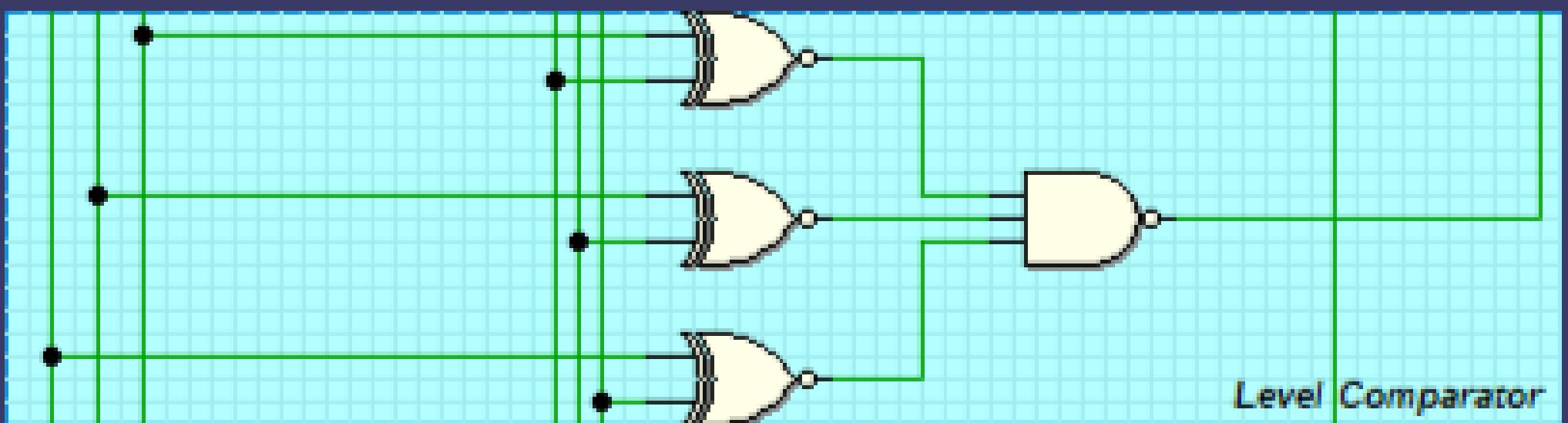
6. 3-bit, Synchronous Count Up/Down Counter

- We used a 3-bit, D positive edge count up/down counter.
- The clock enabler controls whether the counter starts or stops counting.
- When the Preset and Clear inputs are on high, the flip-flops will start working.
- The output Q of each flip-flops (Q0, Q1 and Q2) will be displayed on all three output (one-bit) displays as well as a 7-segment display.
- The flip-flops will no longer function when the desired floor is reached.



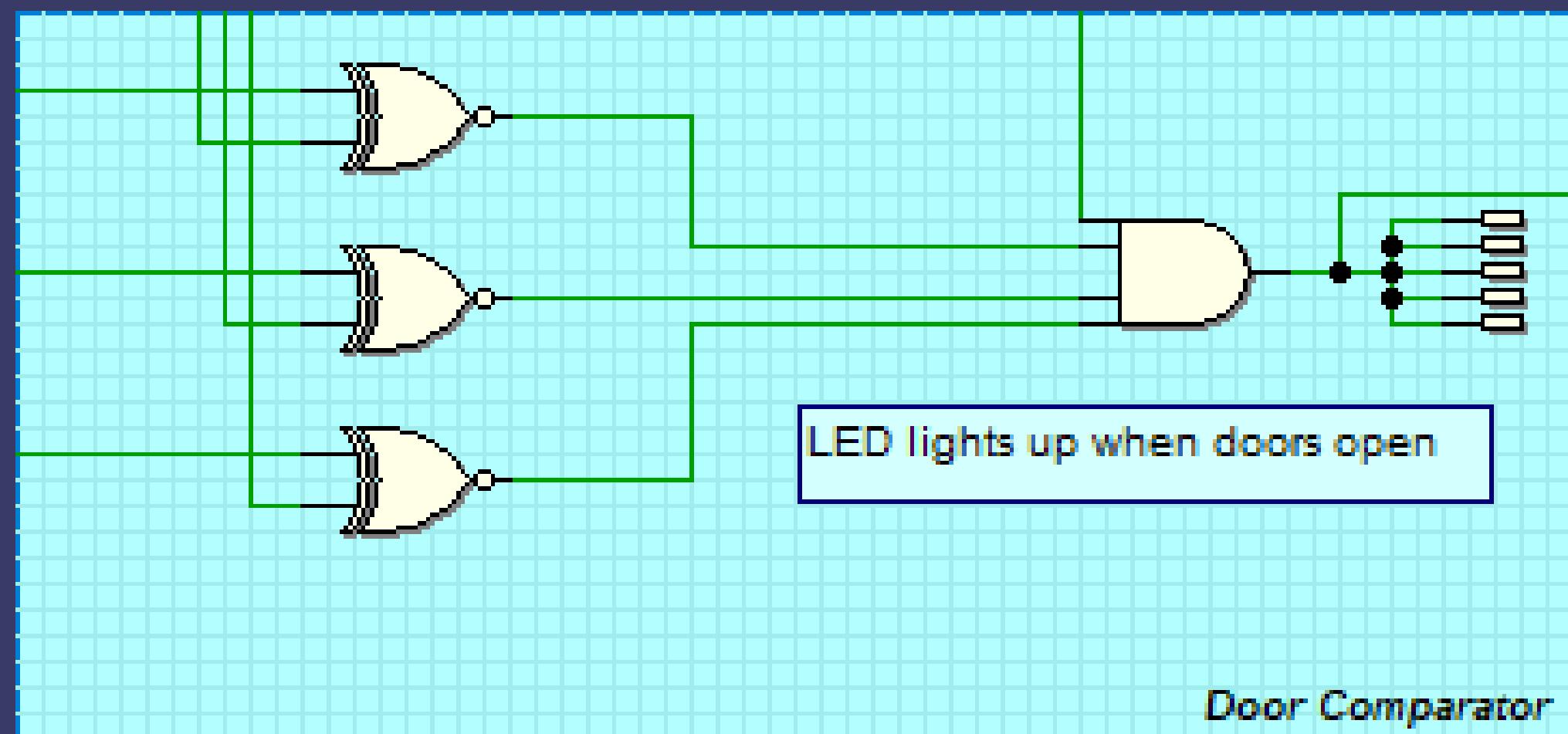
7. 3-bit Comparator

- Using three 2-input XNOR gates which are used to compare values from 2 sources, which are the input switches which are used to input the number of floors by the user and the 4-bit count up counter.



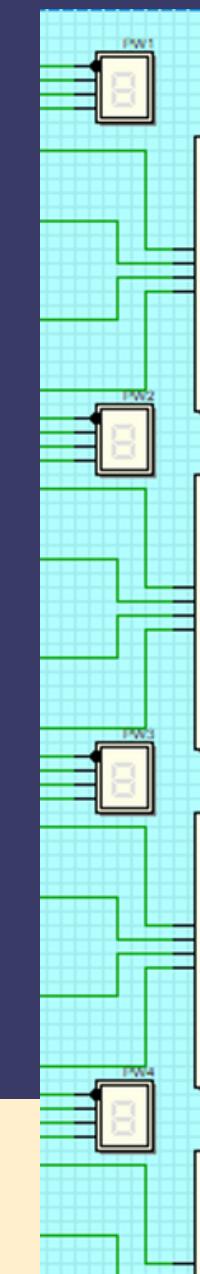
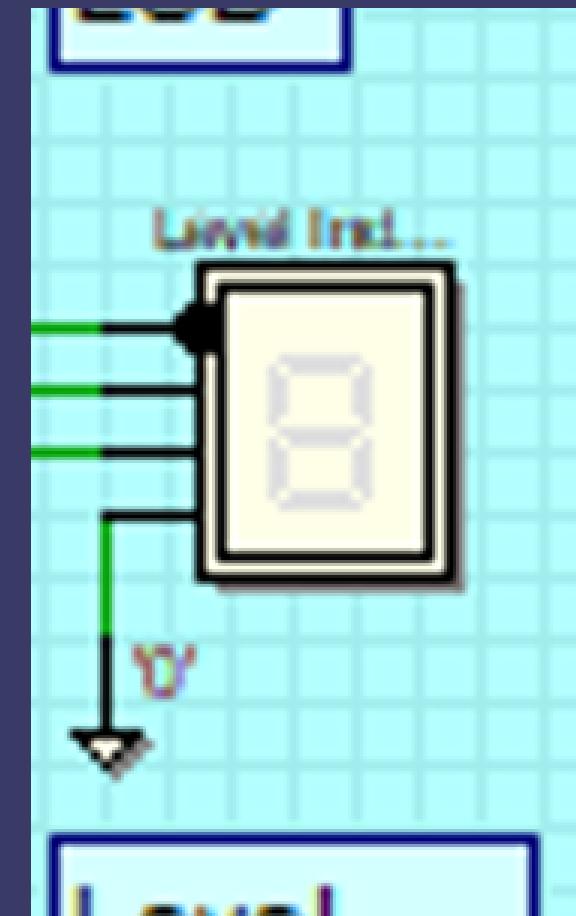
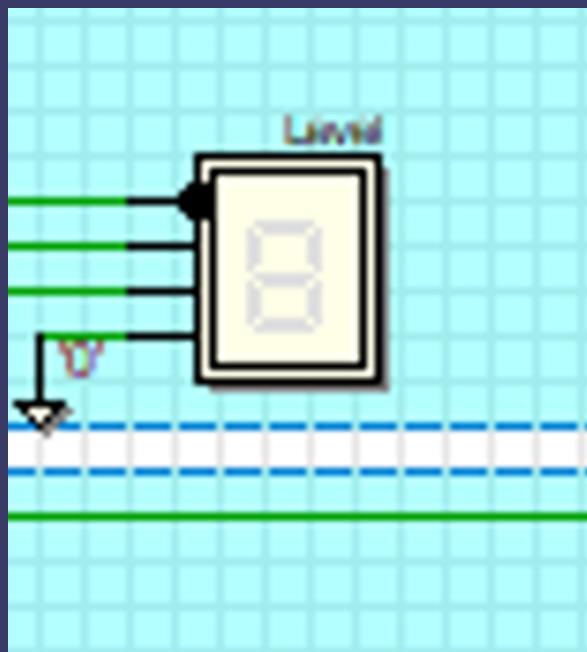
8. 4-Bit Comparator

- Works almost the same as the 3-bit comparator. However, it has an extra for a 4-bit AND gate instead of NAND which is connected to the power button.
- When the power and the input floor has not been reached, the door will be closed and vice-versa.



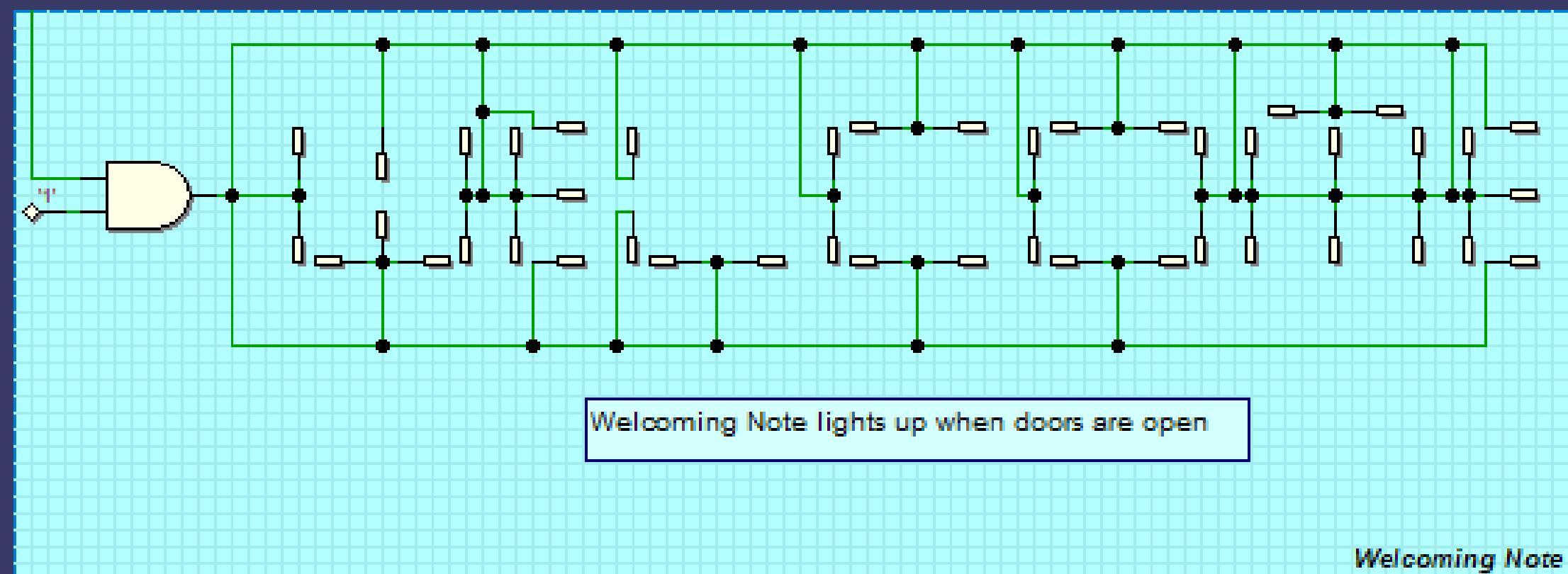
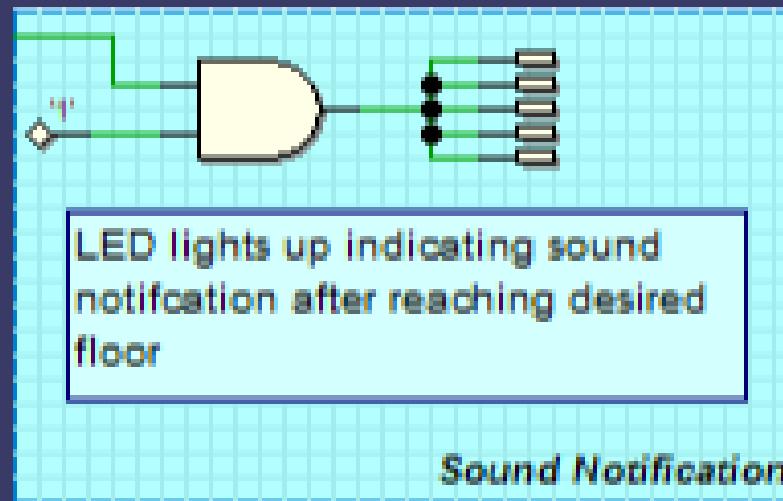
9. 7-Segment Display

- Display the number based on the BCD value by converting the BCD code received into decimal numbers and letters.
 - Display the decimal numbers 0 to 9 and letters from A to F by turning up the proper light of the 7-segment display.

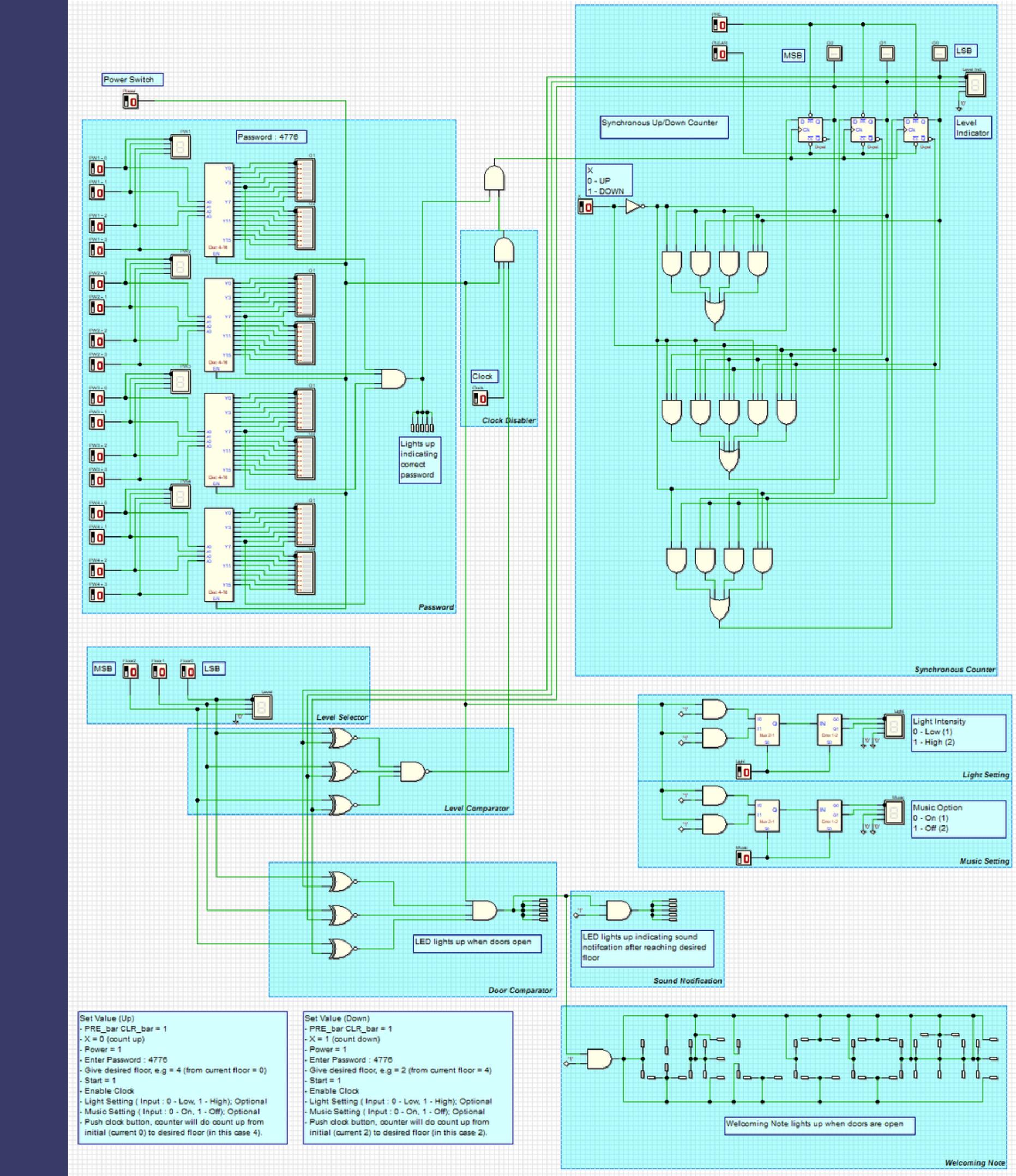


10. LED Features

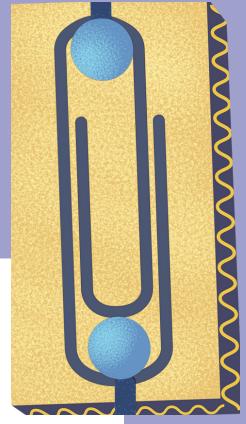
- The Sound Notification and Welcoming Note feature both take the input from the 4-bit comparator.
- If the output of the comparator is high then this feature will be functional.



Full DEEDS Circuit



Conclusion



- This project has a simple, user-friendly design.
- The password for security was a great addition to our circuit and was connected so that none of the other components worked when it is wrong. The optional music and light intensity choices are very convenient when it comes to a variety of different people's tastes.
- One of the issues that we encountered is that the password is not too complicated to be figured out by the unauthorized user and it is also because of the limitation numbers or characters to set is password lock.
- In future projects, we are hoping to implement even more complex circuits with more exciting options, and we are looking forward to using our knowledge in related courses and applying it to real life situations.





THANK YOU!!