MINISTERUL EDUCAȚIEI

UNIVERSITATEA TEHNICĂ
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FACULTATEA DE AUTOMATICĂ ŞI CALCULATOARE
DEPARTAMENTUL CALCULATOARE

Digital Locker Cabinet

DSD PROJECT

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1.Specifications

Encryption code application for security of cabinets
Description: Implement an application that allows the user to add a 3-digit cipher to secure a closet (similar to the lockers used in sports locker rooms, malls, etc.)

Functional requirements:
1. A FREE_CONTRACTED LED will have the function of signaling that the cabinet is free (LED off) or busy (LED on)
2. The user will press an ADD_DIGIT button to signal the start of entering the code. An INTRODU_CARACTERE LED will light to mark the status
3. The user will add 3 characters in a row using the UP and DOWN buttons
4. The characters are in the range 0-1 -..- 8-9-A-B -..- F
5. The current character is displayed on the SSD
6. To move to the next character, the user will press the ADD_DIGIT button
7. The previous character entered remains displayed
8. The next character is visible on the display in the next position
9. After entering the third character, when you press the ADD_DIGIT button, the SSD display will turn off and the encryption will be locked by turning on the FREE_OCUPIED LED.
10. The ENTER_ CHARACTER LED will turn off
11. Existence of a RESET button / switch during the entry of the cipher to return to the initial state (the LIBER_OCUPAT LED will go out, the SSD display is empty, the ENTER_CARACTERE LED will go out)
12. The user will press the ADD_CYPTER / switch button to start entering the code to unlock the cipher
13. Steps 2-8 will be repeated
14. When entering the last character, when pressing the ADD_DIGIT button, the check will be made, if the entered code corresponds to the previous code.
15. In case of a tie, the FREE_EN-occupied LED will light up, the ENTER_Character LED will go out, the SSD display will go blank
16. In case of unevenness, the FREE_EN-occupied LED will remain lit, the ENTER_CARCATERE LED will go out, the SSD display will be empty.

Example use case:
The user chooses a closet with the Free_occupied LED off. Press the ADD_DIGIT button to enter the characters. The "0" character is visible on the SSD. Enter the first "2" character by pressing the DOWN button twice. On the SSD, the display changes with the push of a button, namely: 0-> 1-> 2. The user presses ADD_DIGIT again to enter the second character "1". The user presses ADD_DIGIT again to enter the second character "3". The user presses ADD DIGITAL again, the code is saved, the ssd content is empty, the FREE_EN-occupied LED is on, the ENTER_Character LED will go out.

2.Design

2.1 Black box

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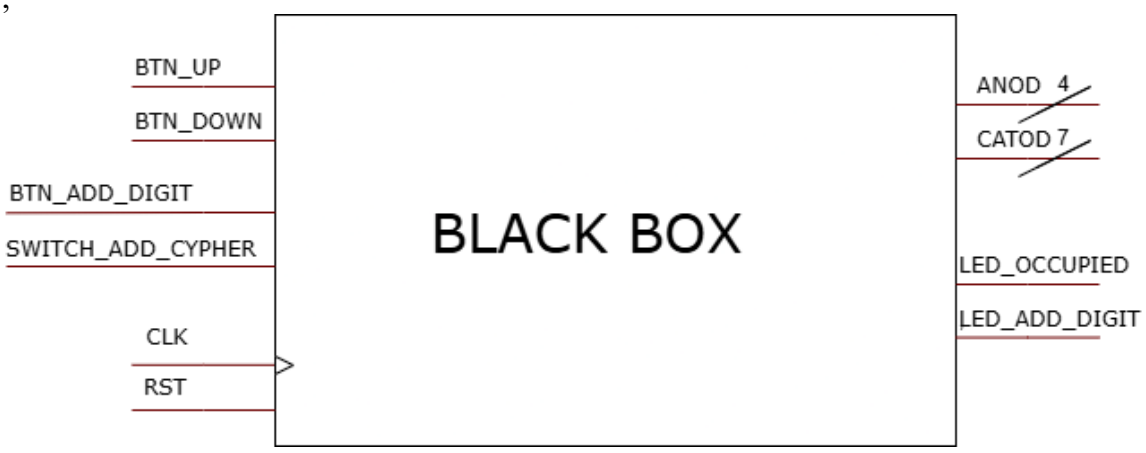
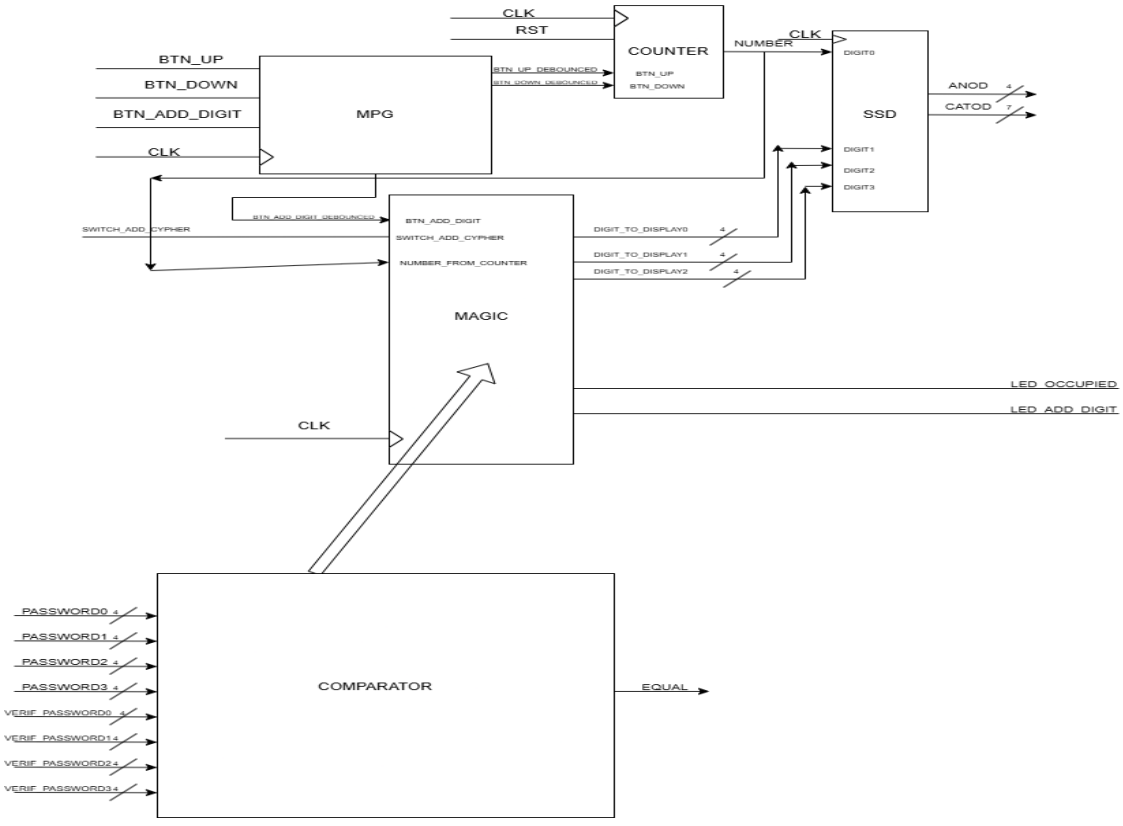


2.2 Detail diagram



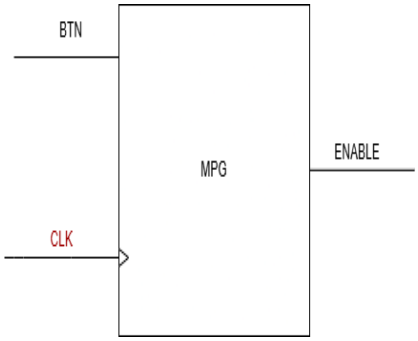
3.Structure and functionality

3.1 Functionality

Used components:

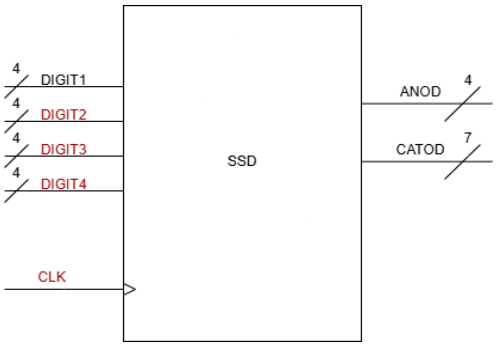
- MPG
- SSD
- COUNTER
- COMPARATOR
- ENCODER

MPG:



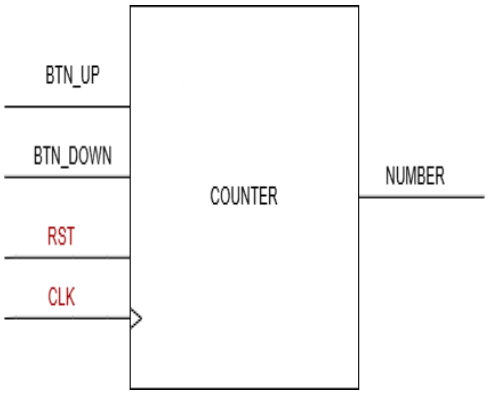
The „MPG" component fixes the way **BTN_ADD_DIGIT, BTN_UP** and **BTN_DOWN** work**.** When pressed, it makes sure each press counts as one input.

SSD:



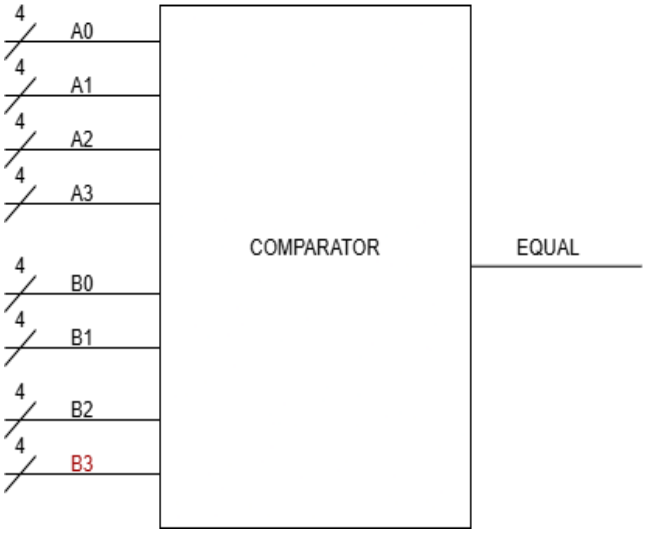
The **SSD** circuit turns 4-bit codes into signals that light up the correct segments of a 7-segment display.

COUNTER:



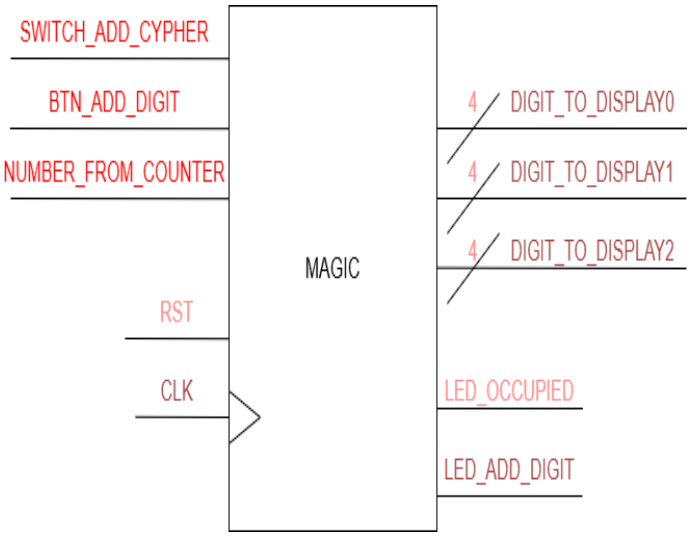
The **COUNTER** component can increase the number by pressing **BTN_UP** or decrease by pressing **BTN_DOWN**. The number ranges from (0 to F).

COMPARATOR:



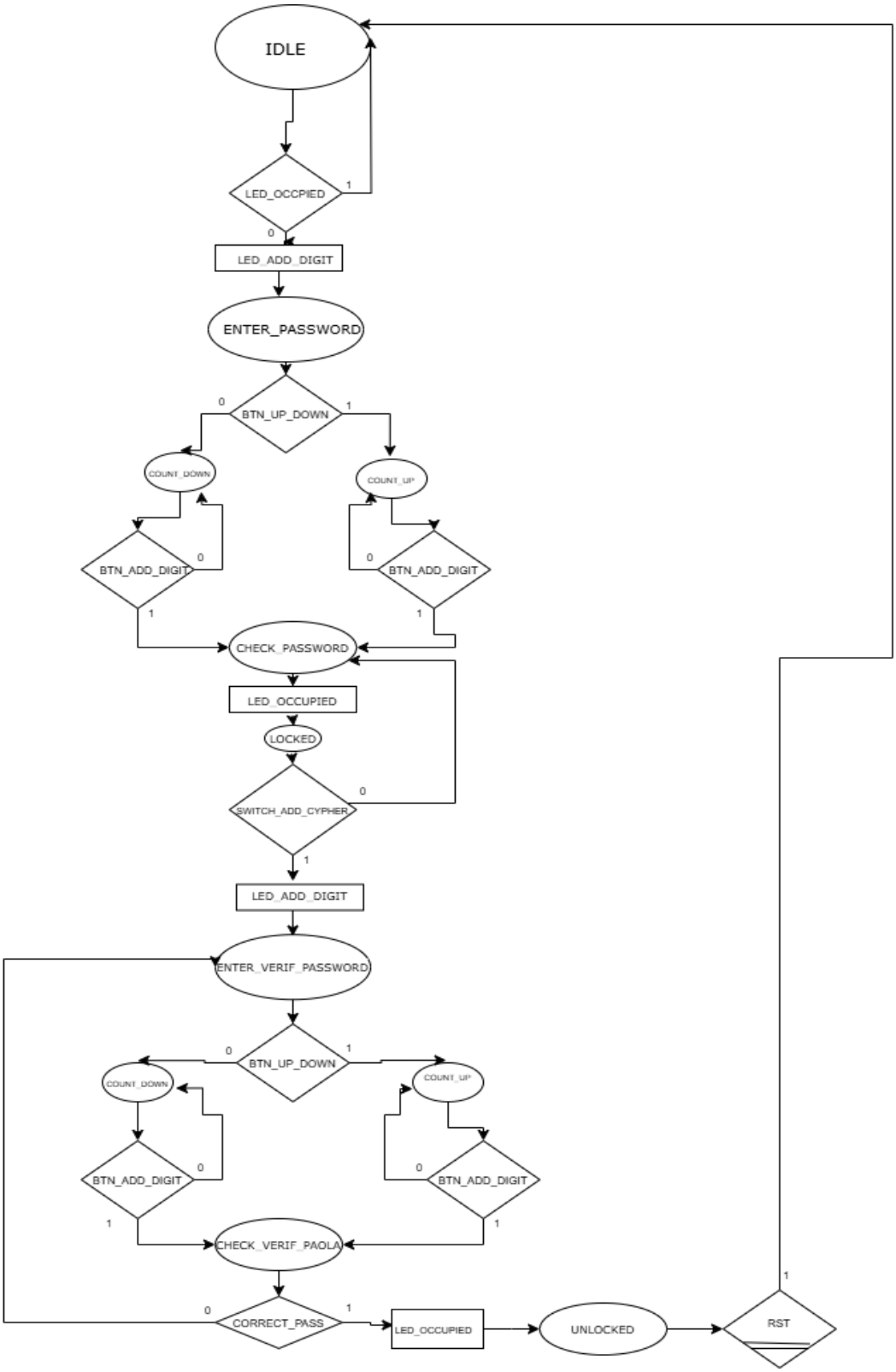
The **COMPARATOR** component checks if the 2 numbers are equal.

ENCODER/MAGIC:



The **MAGIC** component stores the password and the verification code. Depending on them it changes the state of the **LOCKER** from **LED_OCCUPIED ON/OFF**. It always

Flowchart:


IDLE
LED_OCCPIED
1
0
LED_ADD_DIGIT
ENTER_PASSWORD
BTN_UP_DOWN
0
1
COUNT_DOWN
COUNT_UP
BTN_ADD_DIGIT
0
1
BTN_ADD_DIGIT
0
1
CHECK_PASSWORD
LED_OCCUPIED
LOCKED
SWITCH_ADD_CYPHER
0
1
LED_ADD_DIGIT
ENTER_VERIF_PASSWORD
BTN_UP_DOWN
0
1
COUNT_DOWN
COUNT_UP
BTN_ADD_DIGIT
0
1
BTN_ADD_DIGIT
0
1
CHECK_VERIF_PAOLA
CORRECT_PASS
0
1
LED_OCCUPIED
UNLOCKED
RST
1

4.Utility and results

Utility: Secure, reusable locker system with low power consumption.

Results: Successful encryption/decryption of 3-digit codes. Clear visual feedback via LEDs and SSD.

5.Further development

- Add biometric authentication (fingerprint).
- Implement Wi-Fi connectivity for remote monitoring.
- Expand character set (e.g., symbols) for stronger security.

6.Technical justifications for the design

- Simple Interface: Buttons + LEDs ensure user-friendliness.
- Modular Components: Easy maintenance/upgrades (e.g., swap SSD for LCD).
- Efficiency: Minimalist design reduces cost and complexity.