Digital Lock - ZedBoard

Instruction Manual

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I. Project Setup

a. Overview

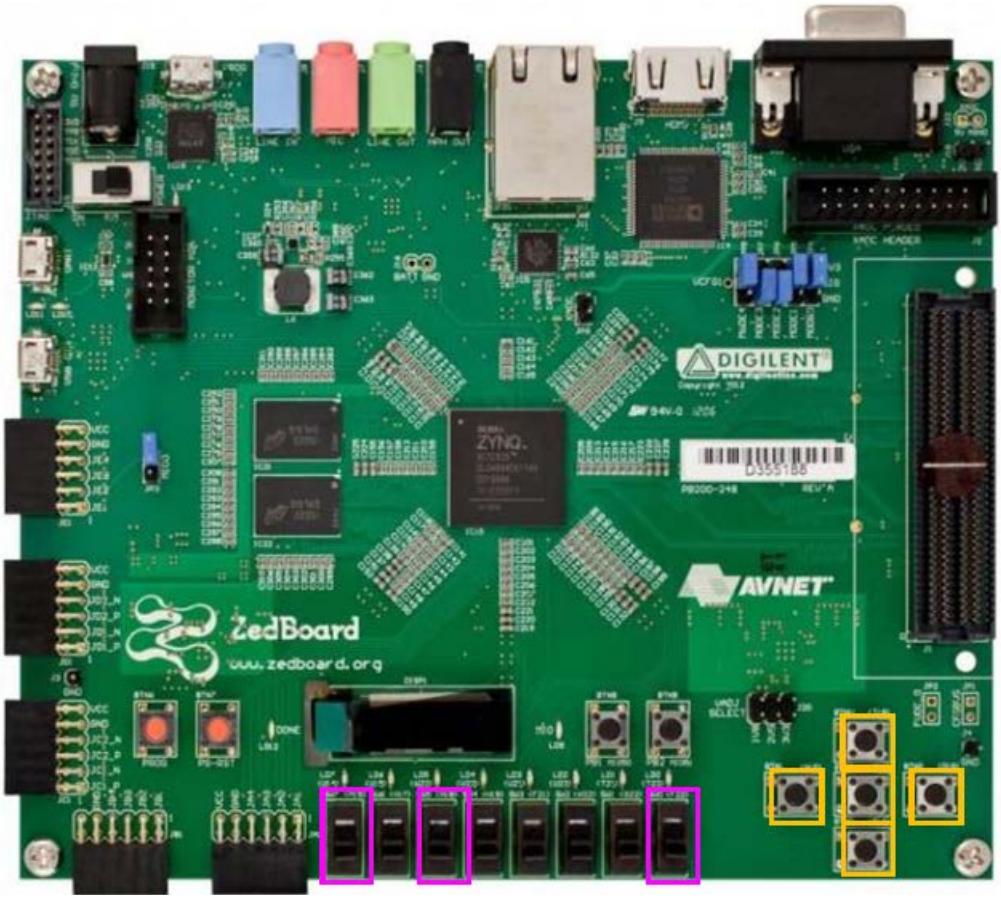
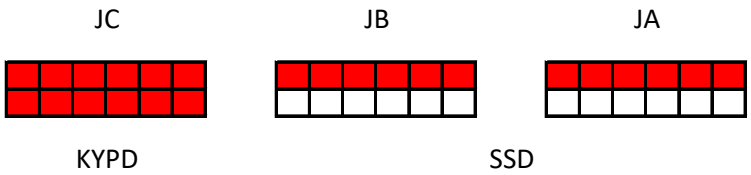


Figure 1: *ZedBoard layout with highlighted peripherals*

The bounding boxes in Figure 1 shows the buttons to be pressed and switches to be toggled during the lock's usage. The purple boxes indicate the switches to be toggled during the administrator mode's first stage, while the directional buttons (North, South, East, West) are used in the second stage. On the other hand, the center button serves as the 'Enter' button for both administrator and guest modes.

b. PMOD Pinout Configuration



The highlighted parts of the PMOD ports indicate the pinouts to be used. The keypad is plugged into the JC PMOD, while the SSD uses both the JA and JB PMODs.

II. Using the Lock System

a. Guest Mode

By default, the lock system will boot in this mode. The seven-segment display must have a 0 in the left and blank in the right. The user is free to input any non-consecutive digits until the center push button is pressed. Upon the button press, the last four key inputs will be taken as the guess. The user is allowed five tries to guess the lock combination, otherwise, the lock will be in a disabled state.

The following table shows the LED and SSD status during each guess:

Guess	LED Status	SSD Status
1	11000000	0X (ready for input)
2	11110000	
3	11111100	
4	11111111	
5	01010101 (alternating)	FF (alternating)

If the lock combination is guessed, the LED status will be an alternating '00110011' and the SSD status with alternating 'U' and 'L' characters, indicating an unlocked state. It will continue running for a short period of time. Afterwards, the lock will go to an unlocked state and the number of guesses cleared.

b. Administrator Mode

With the current configuration, the safest way to enter this mode is to forcefully disable the lock initially before going through the two-factor authentication phase. That said, the admin can still enter this mode in any other circumstance.

First stage: Set the switch to a predetermined value (161).
Second stage: A four-digit admin password must be entered.

If the login is successful, the LEDs will run a ring counter pattern, and the SSDs will output an alternating 'A' and 'd' characters. Otherwise, the switches must be reset to all down, and perform the authentication again.

Inside the admin mode, four options can be accessed by using the push buttons on the bottom-right part of the board.

Button	Option
N	Enter a new lock combination
W	Enter a new admin password
S	Set the lock combination to default
E	Set the admin password to default

- N button
  Upon button press, the LED will output a '11000000' pattern and the SSD a '0X' pattern, indicating the lock is ready for input. The user is free to input any key until the center button is pressed. The last four key inputs will be recorded as the new lock combination
- W button
  Upon button press, the LED will output a '00110000' pattern and the SSD a '0X' pattern. Same as the N button option, the last four key inputs will be recorded as the new lock combination

  (*Note for N and W buttons: the new combination MUST NOT start with a 0*)
- S button
  When the button is pressed, the LED will output a '00000011' pattern once. The lock combination will be set to the default value of ABCD.
- E button
  - When the button is pressed, the LED will output a '00001100' pattern once. The admin password will be set to the default value of 1234.

To exit the mode, all the switches must be set down; afterwards, press the center button. Upon exiting admin mode, the number of guesses is automatically cleared.