Digital Lock - Zybo

Instruction Manual

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I. Project Setup

a. Overview

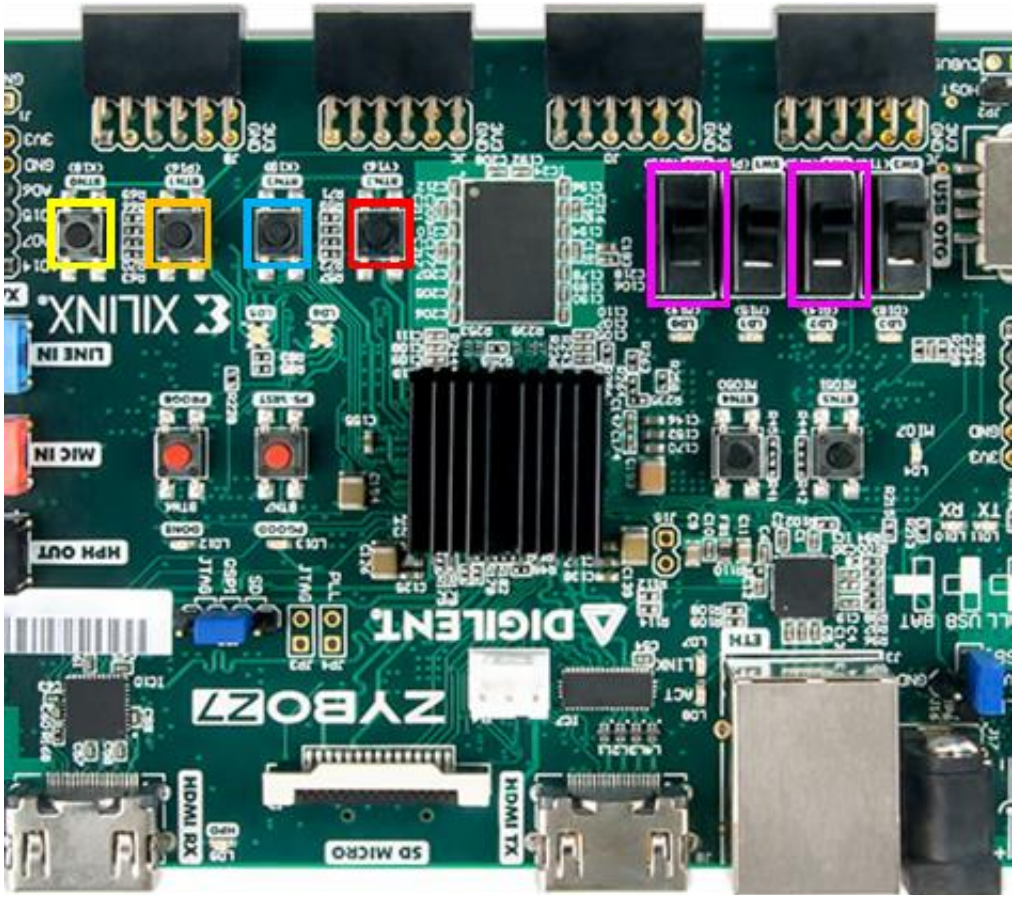

Figure 1: *Zybo Z7-20 layout with highlighted peripherals*

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 buttons with yellow, orange, and blue bounding boxes are to be utilized in the second stage. On the other hand, the button inside the red box serves as the 'Enter' button every time a combination is applied to the lock, regardless of mode.

b. PMOD Pinout Configuration

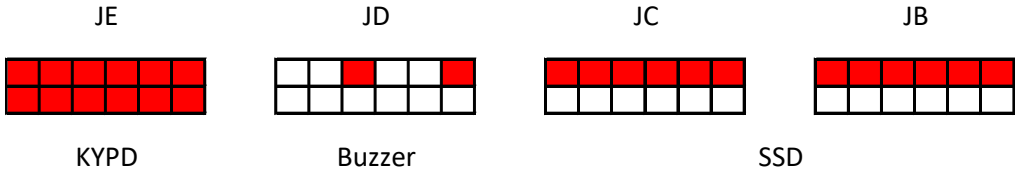

Figure 2*: PMOD pinouts to be used highlighted in red*

II. Using the Lock System

a. Guest Mode

By default, the lock system will boot in this mode. The seven-segment display will output '- -'. The user is free to input any numeric digits until the 'Enter' button is pressed. Upon button press, the last six 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, RGB LED, and SSD status during each guess:

Guess	LED Status	SSD Status	RGB LED Status
1	1000	- - (ready for input)	Blue during input press, red if incorrect green when correct
2	1100		
3	1110		
4	1111		
5	0101 (alternating)	FF (alternating)	Two red, flashing

If the lock combination is guessed, the LED status will be an alternating '1100' and the SSD status with 'G' and '0' characters flashing, indicating an unlocked state. It will continue running for a short period of time. Afterwards, the lock will go to locked 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 (5).
Second stage: A six-digit admin password must be entered.

Only the letter keys can be used for input, and 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.

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

Button	Option
Yellow	Resets both admin and lock combinations
Orange	Enter a new admin password
Blue	Enter a new lock combination

- Yellow button

  Upon button press, the LED will output a '1000' pattern once. The lock combination will reset to 123456, while the admin password, ABCDEF.

- Orange button

  Upon button press, the LED will output a '0100' pattern, the RGB LED turns white, and the SSD a '--' pattern. The user is free to press any 6-letter combination. Once finished, press the Enter button to save the new password.

- Blue button

  Upon button press, the LED will output a '0010' pattern, the RGB LED also turns white, and the SSD a '--' pattern as well. In this case however, the user is free to press any 6-number combination. Once finished, press the Enter button to save the new lock combination.

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