Controlling Access to a Secure Site

**Lab Assignment # 2**

**Pre-requisite:** Embedded Programming Principles Week 4 and 5 lectures, Lab 1, and the Hands-on Labs 2- a, b, c, d, and e.

**Objective:** In this assignment, you will develop an embedded system for controlling access to a sensitive site by using the STM32L432 Nucleo-32 board. To do so, you create a project in STM32CubeIDE and name your

development design document as “<LabAssignment2\_your group#>”.docx and the STM32CubeIDE project as “LabAssignment2\_< your group# >”. You develop embedded software that allows the authorized staff to access the site. Your code needs to fulfill the following criteria:

* Ten 4-digit authorization codes have been issued for access to the site, as shown in Table 1.
* The software is going to prompt for the passcode before unlocking the facility’s door.
* Your software displays an appropriate message on the screen for the staff accessing the site through serial port communication via the PuTTy software as an interface,
* Your software prompts the staff to enter a four-digit number and checks if the four-digit value entered is one of 10 passcodes stored in an array,
* Your software verifies if the passcode is one out of the 10 passcodes authorized to access the site,
  + If so, your code
    - Triggers a multi-tone auditory signal exciting a buzzer/speaker connected via the PA8 port,
    - Sends the “Access granted” text message to the PC through the serial port,
    - Unlocks the access door by turning on the RGB LED in green colour via PB4 port.
  + If not, your code
    - Triggers another multi-tone (warning) auditory signal,
    - Sends the “Access denied” text message sending to the PC through the serial port,
    - Keeps the door locked by turning the RGB-LED in red colour via the PB5 port.

**Note 1:** Ensure to follow ESD Programming Standards to factor your code appropriately.

**Note 2:** The RGB-LED always shows the red colour representing the door is locked unless someone is granted access to the site.

**Note 3:** the multi-tone auditory signals are generated by applying the PWM signals at different frequencies.

**Submission:** Compress your STEM32CubeIDE project directory and your development design .docx file (i.e., by utilizing 7-Zip freeware) as the “<LabAssignment2\_your group# >”.zip file and then, submit your Assignment as a single .zip file in eConestoga/Course Tools/Assignments.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| index | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Passcodes | 1210 | 1282 | 2283 | 5432 | 2345 | 9999 | 7777 | 6789 | 9876 | 2468 |

**Table 1:** The authorized passcode list

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Objective: In this assignment, you will develop an embedded system for controlling access to a sensitive site by using the STM32L432 Nucleo-32 board.

Step 1:

Identify and break down elements needed for the solution into three areas:

2. Processing

Once the user enters the access code, it verifies the entered code is valid or not and gives the control to the output section.

3. Output

If the code is valid the controller indicates with a green led and a 3 tone buzzer else, it indicates with Red led and 3 tone buzzer different sound

and message on the console/putty either acces granted or denied

1. Input Needed

The user should be able to give an access code as an input.

Step 2

Identify what you don’t know or know how to do.

* We need to know the timer concept and their PWM channel characteristics for the purpose of switching the alarm buzzer.
* We need to know the configuration of putty and their Baud rate, Com port I learn to transfer the data bits from controller to console screen using putty
* And we need to know about the GPIO register in Hal to enable the led for indication
* We need to know the C programming concepts like arrays, functions

Step 3:

Find out/figure out what you don’t know or know how to do.

I analyzed PWM timer channel configuration like how to change the period and pulse and how the output varies if we change the pulse and period values therefore the frequency changes with respective to the change in counter period. And next to it how to pass the arguments from one function to other function and print the required data on the putty screen and how to match the delay of led and buzzer is also a test case which we learned and therefore passed all the test cases in the assignment 2 and successfully completed the project with all the above pre