

Security System Project

This project provides the logic and interface for a simple security system. The system monitors a series of simulated doors, setting off an alarm if the a door is opened when the system is armed.

Interface:

- 4 doors simulated by the 4 left-most DIP switches (SW1 “Door 1” to SW4 “Door 4”). A switch in the on/up/closed position is considered an open door.
- 4 pushbuttons prompting password entry (SW2), password confirmation (SW3), password cancellation (SW4), and manual alarm (SW5). Pressing a pushbutton always causes the specified action to occur immediately, without waiting for the pushbutton to be released. De-bounced and non-repetitive. Multiple simultaneous pushbutton presses should result in only one recorded press, the first one.
- Keypad allows for password entry. De-bounced and non-repetitive. Multiple simultaneous pushbutton presses should result in only one recorded press, the first one.
- 8 LEDs light up from left to right, one at a time, for 100ms at each change during the armed state. During all other times, the LEDs should be off.
- 7 segment digits show the password entered by the keypad. The digits should be displayed only during password entry. Once a password is confirmed or cancelled, the digits should turn off.
- LCD displays prompts for guiding the user, using either one or two lines as necessary. The displayed message remains on until specifically changed in a later step.

Logic:

- Initialization: System state begins by requesting a 4 digit hexadecimal password to be entered via the keypad. The LCD should display "Enter password". LEDs and digits should be off and switches should be in the off/up/open position. Password entry should then occur, using the input password as the new system password.
- Password entry: LCD displays “Enter password”. Using the keypad, the first key entry should appear on the left-most digit, 2nd on the left-middle digit, 3rd on the right-middle digit, and 4th on the right-most digit. After the system password is entered, press SW3 to confirm the password or press SW4 to cancel the current input and prompt again for password entry. After confirming the password, the LCD should display "Password accepted" for 2 seconds.
- Next, the system shall default to the armed state with the LEDs cycling in the above pattern. The LCD should display "Armed". Now two events may occur:
 - A door is opened, setting off the alarm, or

- Prompt to disarm the system.
- Alarm triggered: the LCD should display "Alarm" and the location of the entry (e.g. if DIP switch SW1 pushed to the on/down/closed position, LCD should also display "Door 1"). The door should be closed (turn off the switch) before proceeding.
- To disarm (or arm) the system:
 - All alarm sources, if any, should be reset first. Closing doors should not change the LCD display.
 - Then pressing pushbutton SW2 will enter the step labeled "Password entry".
 - After the four digit password is entered on the keypad, pushbutton SW3 can be pressed to confirm the password or pushbutton SW4 can be pressed to cancel password entry.
 - If the password is confirmed but incorrect or SW4 is pressed, the system reverts back to the previous state (armed, alarm, disarmed), displaying the appropriate message on the LCD.
 - If the password was correct, the LCD should display "Disarmed" if previously in the Armed or Alarm state; if the previous state is Disarmed, the LCD should display "Armed".
- The alarm may be manually turned on by pressing SW5 during either the Armed or Disarmed state. The LCD should display "Manual Alarm", following the step labeled "Alarm triggered".
- All LEDs and 7 segment digits should be time multiplexed using the timer subsystem.