Project 3: Security keypad lock

Use a keypad to enter a pass code to lock and unlock the system. The pass code is stored in non-volatile EEPROM memory.

Components needed:

- Arduino
- 4-row × 3-column keypad
- 4-digit 7-segment LED display (common cathode)
- Non-volatile EEPROM memory (internal to the ATMega328P chip)

System detail:

1. After power on or system reset, the system is locked and the word “LOCk” is shown.

2. On each numeric key press the number is shown on the right-most digit of the LED display and the previous characters are shifted to the left. After four key presses all four digits will be shown. If more digits are pressed then the digits are shifted off to the left.

3. The initial pass code is 1234.

4. To unlock the system, you need to press the four matching digits followed by the # key. If the digits match the pass code then the system is unlocked and the word “OPEn” is shown. If the digits do not match then the word “LOCk” is shown.

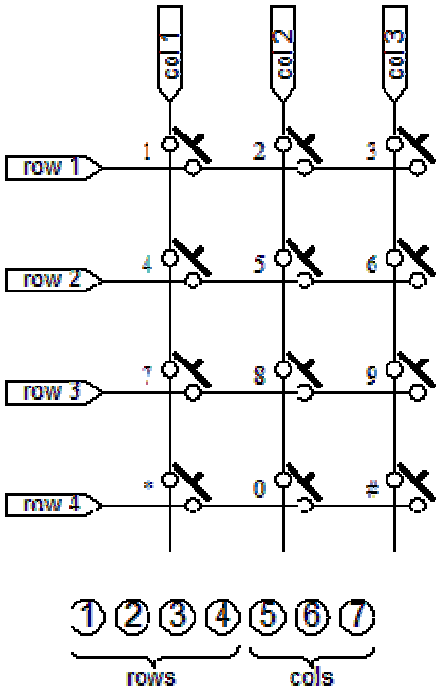
5. To enter a new pass code, enter four digits followed by the * key. This new 4-digit pass code is saved in non-volatile memory inside the ATMega328P chip so that after powering off and on the system, the code saved in non-volatile memory is used. Need to use the EEPROM.h library for this.[1]

Note: You need to write your own code to control both the keypad and the LED display. You cannot use any third-party libraries for controlling these two devices.

Connection Limits: The connections needed for this project has reached the maximum limits of the number of pins/connections that the Arduino Uno has. You’ll need to use pins 2 to 13, and pins A0 to A5. Pins 0 and 1 are used by the USB and not recommended to use unless you know what you are doing.

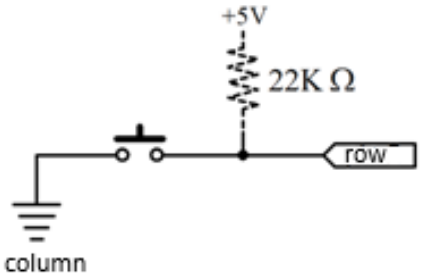
[1] Grading: The first five people to finish everything get 5 points. Then next five people get 4 points. The next five people to finish everything get 3 points. Total points possible are 5.

4-row × 3-column keypad connections:



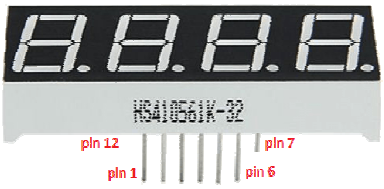
Columns – output
pinMode(column, OUTPUT);

Rows – input
pinMode(row, INPUT_PULLUP);



See sample keypad code on how to work with the keypad.

4-digit 7-segment LED display connections:



LED pins	Description
6 (Common Cathode)	Digit 0 (rightmost digit)
8 (Common Cathode)	Digit 1
9 (Common Cathode)	Digit 2
12 (Common Cathode)	Digit 3
11	Segment A
10	Segment F
7	Segment B
5	Segment G
4	Segment C
1	Segment E
3	Segment DP/Colon
2	Segment D

The colon is turned on when digit 2 is turned on, i.e. pin 9 connected to GND

The decimal point for digit 2 is turned on when digit 3 is turned on, i.e. pin 12 connected to GND

The decimal point for digit 3 cannot be turned on.