Keypad & Time-Varying Patterns

EELE465 – Microcontroller Applications

02-29-24

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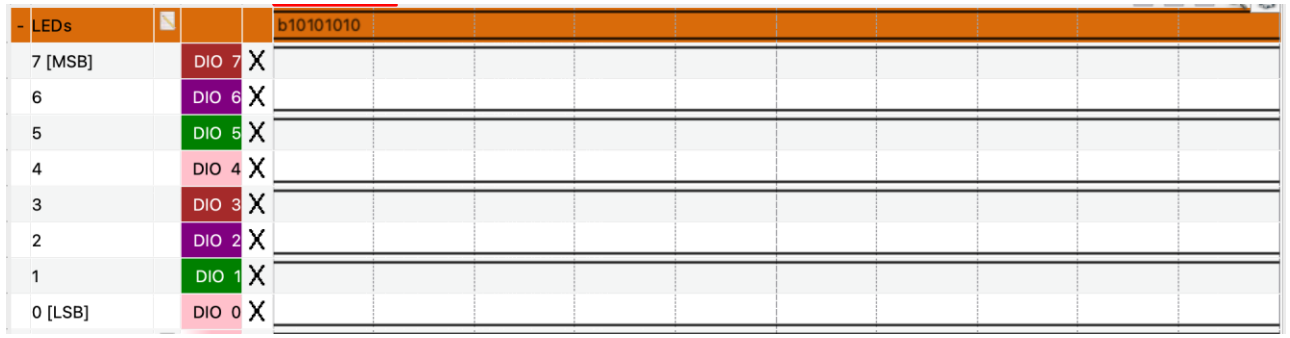
Intro

- Keypad implementation enabled password and selection of LED pattern.
- Password has timeout requiring it to be entered quickly.
- Timeout is setup to not give feedback on if the correct key was pressed.
- Multiple LED patterns implemented, from static patterns to fully time varying with differing duty cycles and frequencies.

Patterns

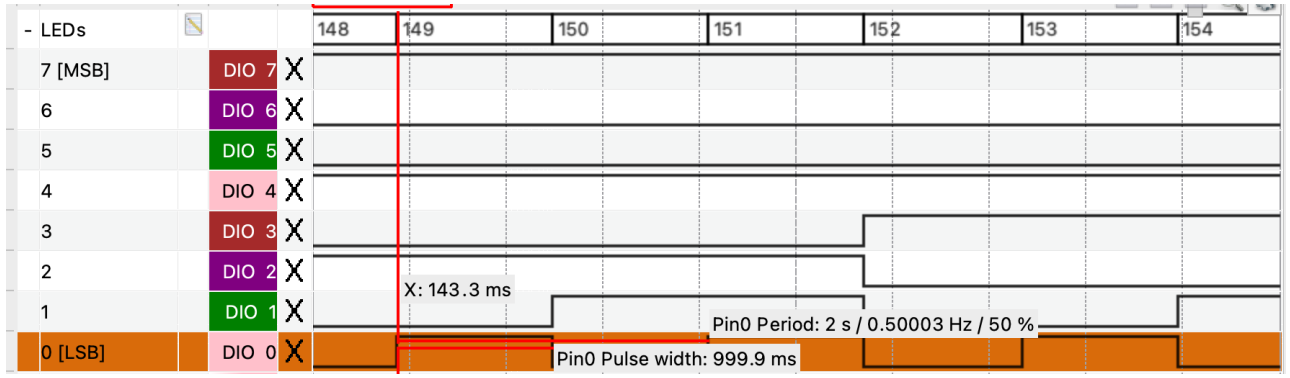
Pattern A:

- Steady 101010 Pattern



Pattern B:

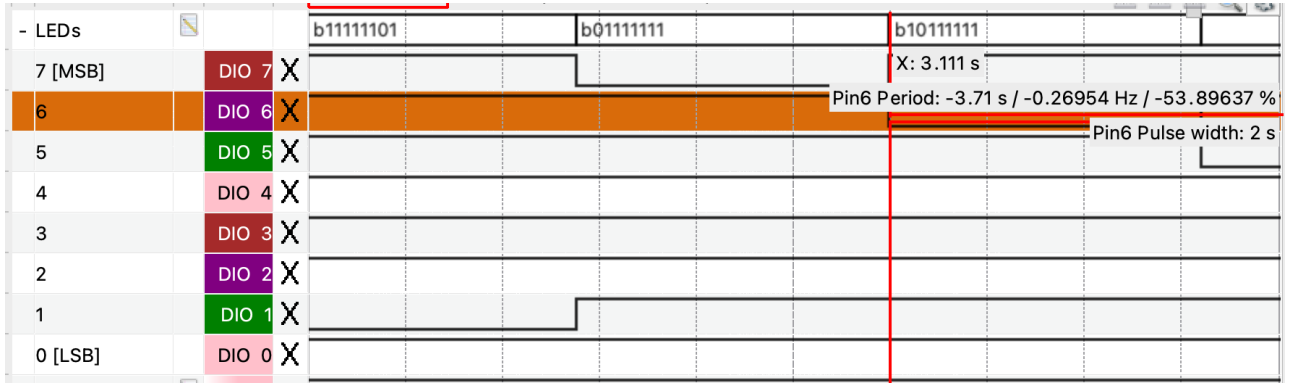
- Counting to 255
- Increments once a second



Patterns

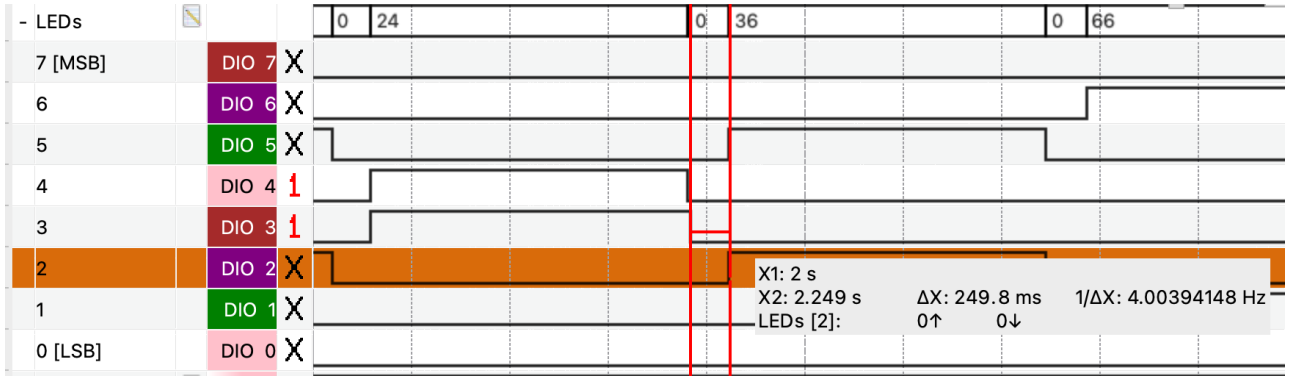
Pattern C:

- Rotating one LED off for 2 seconds



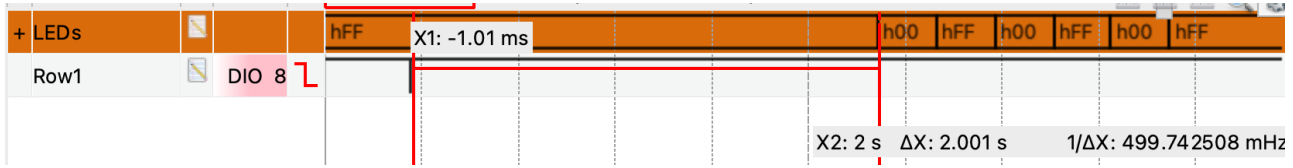
Pattern D:

- Follows set pattern, with LEDs on for 2 seconds, and off for 0.25 seconds before going to next output.

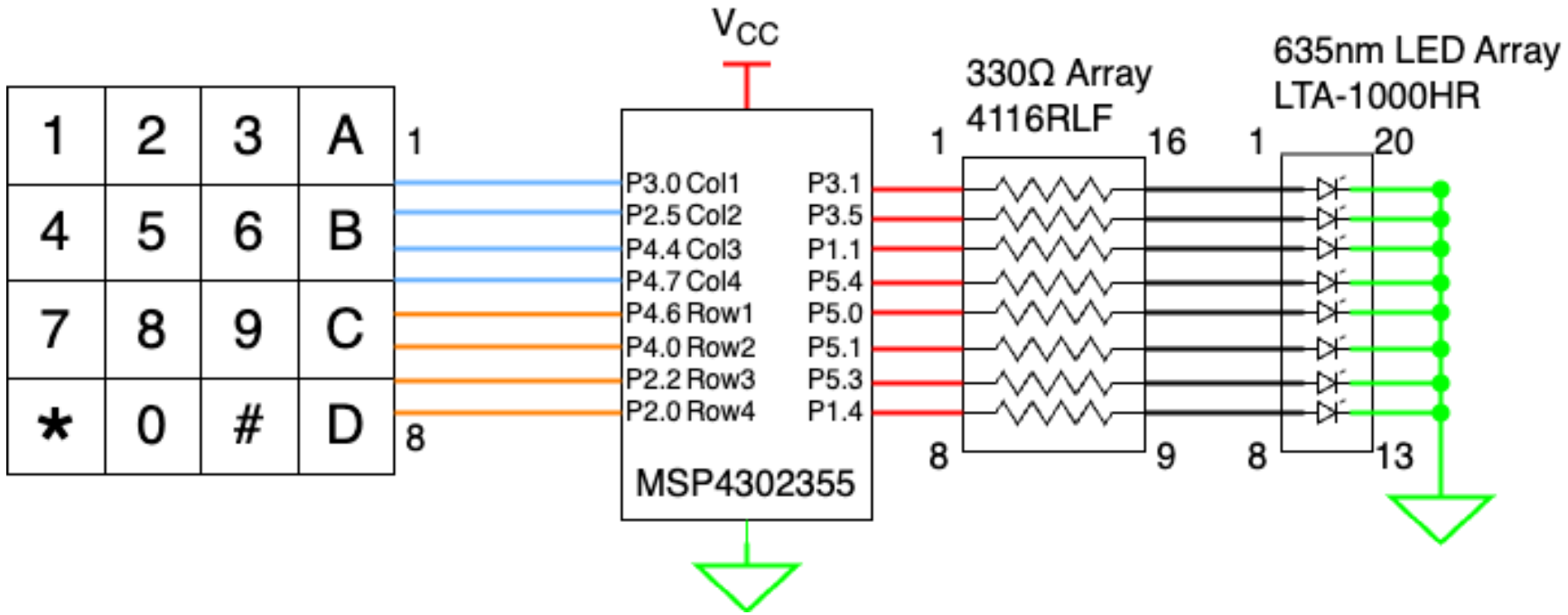


Password Timeout:

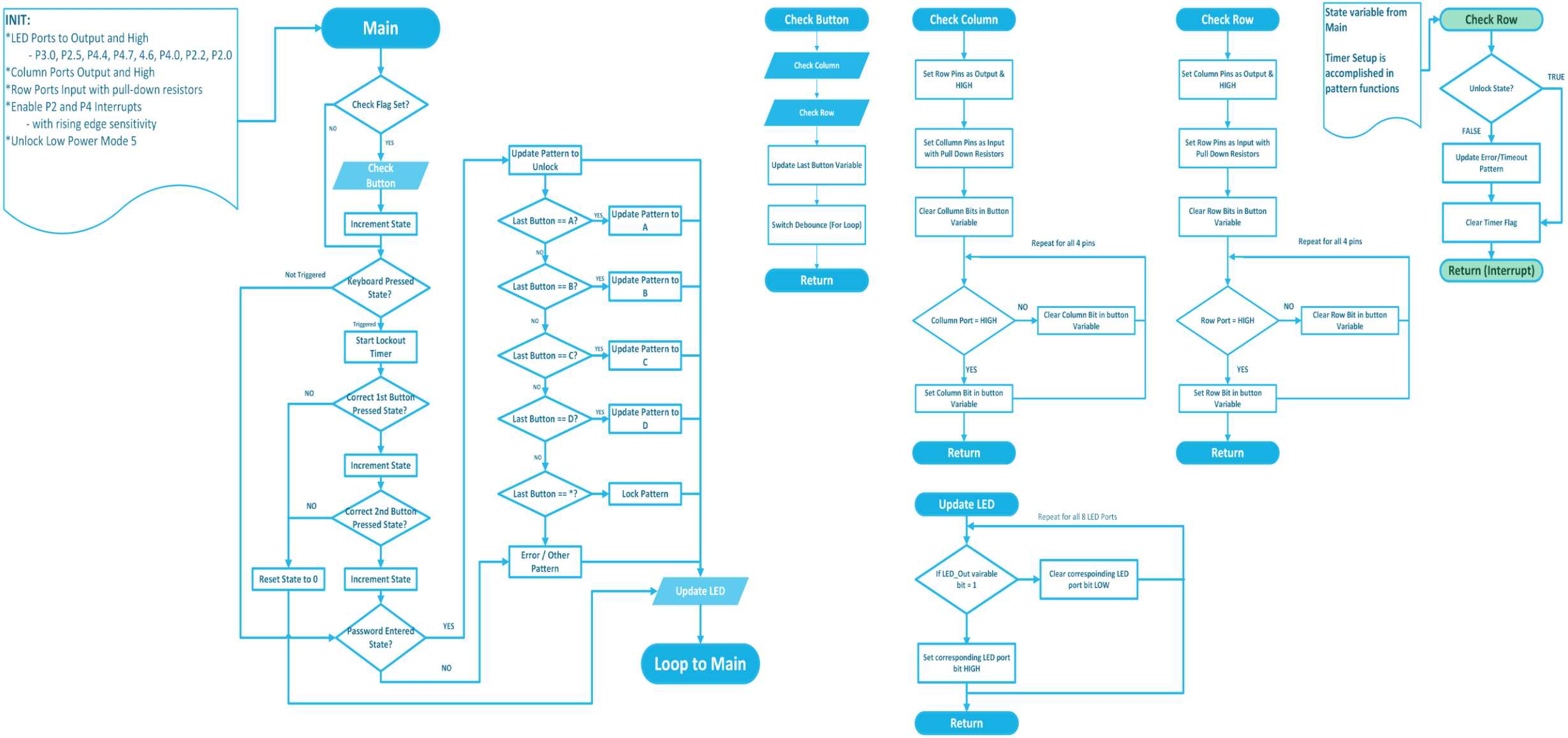
- Triggers 2 seconds after first key press
- Starts error pattern where lights flash 3 times at 2 Hz



Schematic


1 2 3 A
4 5 6 B
7 8 9 C
* 0 # D
1
8
VCC
P3.0 Col1
P2.5 Col2
P4.4 Col3
P4.7 Col4
P4.6 Row1
P4.0 Row2
P2.2 Row3
P2.0 Row4
P3.1
P3.5
P1.1
P5.4
P5.0
P5.1
P5.3
P1.4
MSP4302355
330Ω Array
4116RLF
1
16
8
9
635nm LED Array
LTA-1000HR
1
20
8
13

Flowchart


INIT:
*LED Ports to Output and High
- P3.0, P2.5, P4.4, P4.7, 4.6, P4.0, P2.2, P2.0
*Column Ports Output and High
*Row Ports Input with pull-down resistors
*Enable P2 and P4 Interrupts
- with rising edge sensitivity
*Unlock Low Power Mode 5
Main
Check Flag Set?
NO
YES
Check Button
Increment State
Keyboard Pressed State?
Not Triggered
Triggered
Start Lockout Timer
Correct 1st Button Pressed State?
NO
Increment State
Correct 2nd Button Pressed State?
NO
Reset State to 0
Increment State
Password Entered State?
YES
NO
Update Pattern to Unlock
Last Button == A?
YES
Update Pattern to A
NO
Last Button == B?
YES
Update Pattern to B
NO
Last Button == C?
YES
Update Pattern to C
NO
Last Button == D?
YES
Update Pattern to D
NO
Last Button == *?
Lock Pattern
Error / Other Pattern
Update LED
Loop to Main
Check Button
Check Column
Check Row
Update Last Button Variable
Switch Debounce (For Loop)
Return
Check Column
Set Row Pins as Output & HIGH
Set Collumn Pins as Input with Pull Down Resistors
Clear Collumn Bits in Button Variable
Repeat for all 4 pins
Collumn Port = HIGH
NO
Clear Column Bit in button Variable
YES
Set Column Bit in button Variable
Return
Check Row
Set Column Pins as Output & HIGH
Set Row Pins as Input with Pull Down Resistors
Clear Row Bits in Button Variable
Repeat for all 4 pins
Row Port = HIGH
NO
Clear Row Bit in button Variable
YES
Set Row Bit in button Variable
Return
State variable from Main
Timer Setup is accomplished in pattern functions
Check Row
Unlock State?
TRUE
FALSE
Update Error/Timeout Pattern
Clear Timer Flag
Return (Interrupt)
Update LED
Repeat for all 8 LED Ports
If LED_Out vairable bit = 1
Clear correspoinding LED port bit LOW
Set corresponding LED port bit HIGH
Return