DT228-2 Micros Lab. Interfacing to a matrix keypad

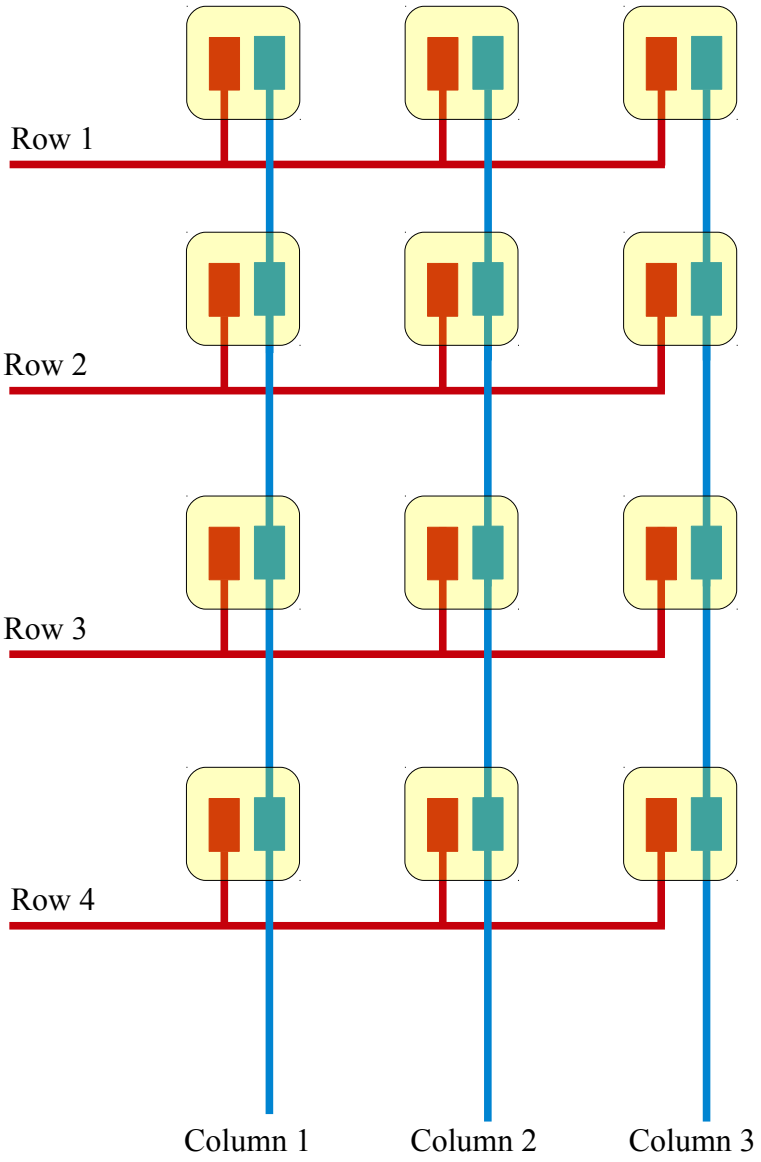
Key topics: Input ports, multiplexing, data encoding

Introduction

In this lab you will wire a matrix keypad to the LPC1114 microcontroller. You will then write code to convert keypad scan codes to ASCII characters which will then be displayed on the LED display. This exercise builds on the previous two exercises.

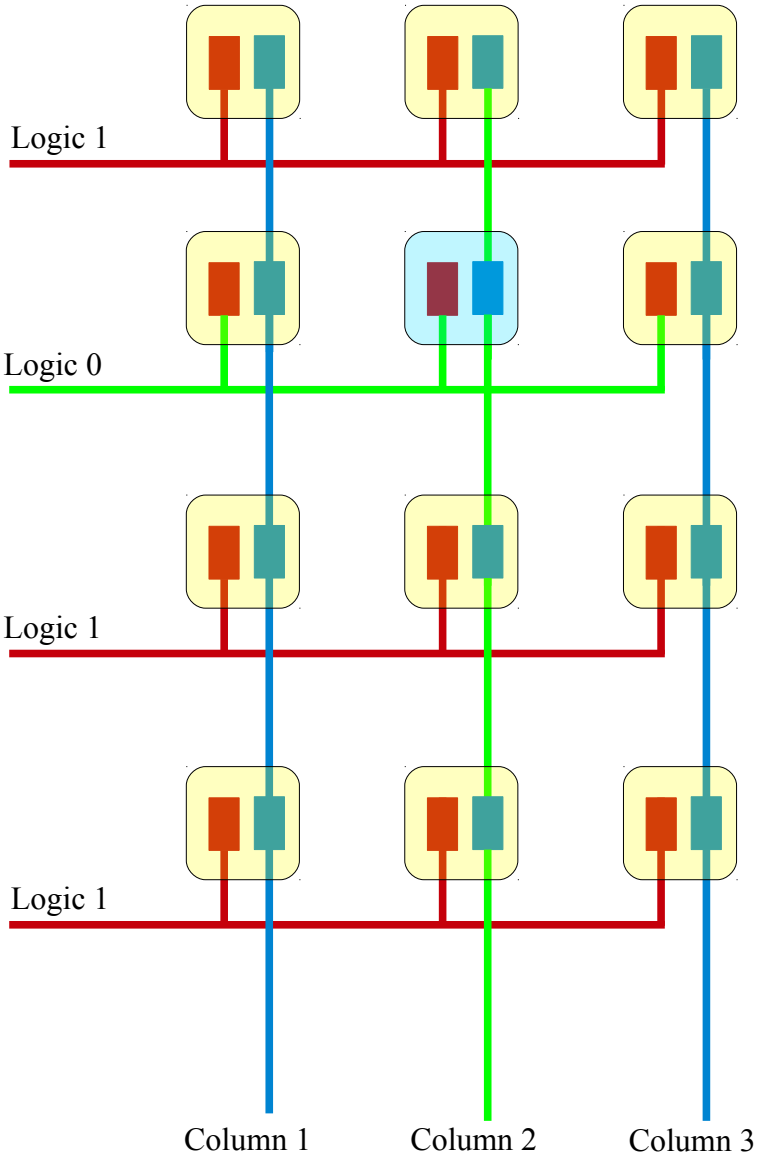
Theory of operation

Matrix keypads are arranged in rows and columns as shown below.



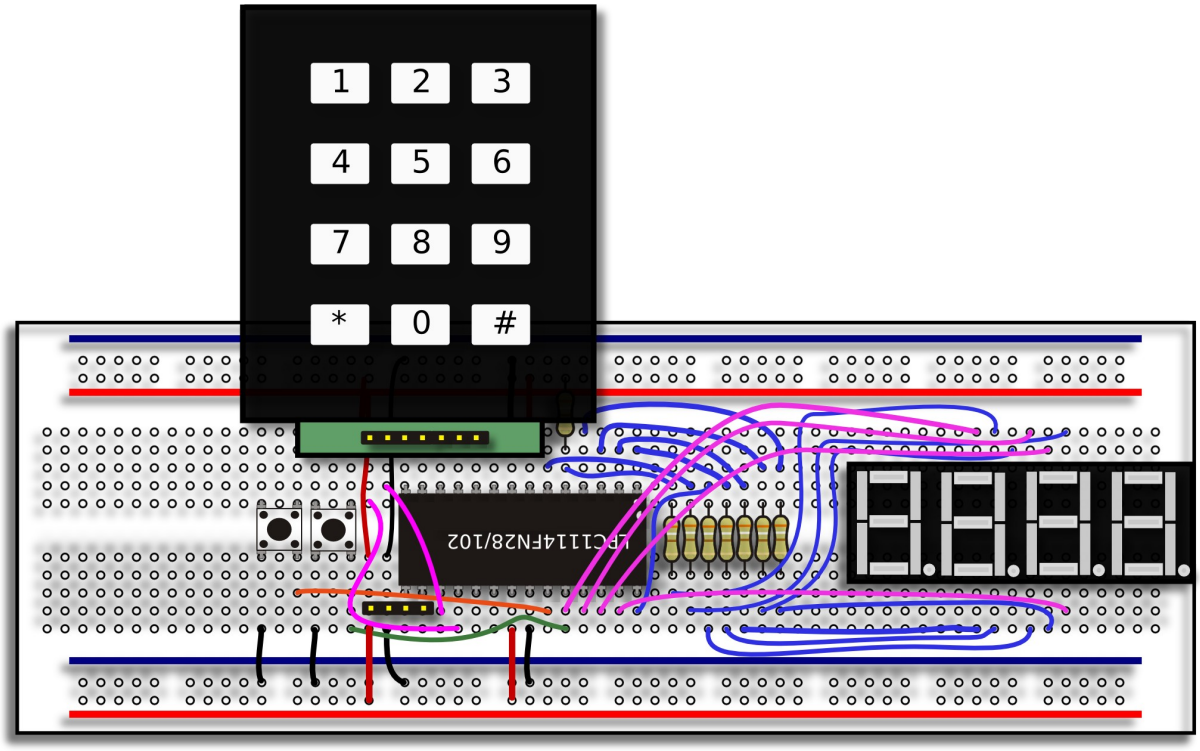
If a button (yellow) is pressed, it connect the two pads underneath it. Microcontrollers "scan" keypads by driving all rows except one to a particular logic level. They then check the column wires to see which, if any, are set to the same level as the "odd" row. If they find that a column wire

is at this level then they conclude that the button which overlaps pads from the row/column with the "odd" logic level has been pressed. For example, in the figure below, the microcontroller would note the zero on the column 2 wire when Row 2 is at logic 0 (the "odd" logic level) and correctly conclude that the blue button had been pressed.



Out LPC1114 has 4 outputs that drive the keypad rows and three inputs that monitor the keypad columns.

Construction



The keypad is easily added to the existing circuit. Make sure the circuit is not plugged in to the computer before you start assembly. Plug the keypad in as shown above being careful that it protrudes by two columns past the left side of the microcontroller. These two columns are wired around to the lower side of the microcontroller as shown. There should be no other components or wires on these columns – ask if unsure.

Download and extract the support files for this exercise. Compile and download the program on to the microcontroller. You should note that the display correctly shows the ASCII codes for the first two columns.

Your tasks

(1) Complete the code so that it correctly displays button data for all three columns

(2) Modify the code so that the number '1' is displayed if the user presses button 1, '2' if button 2 is pressed and so on. The '*' and '#' symbols should be encoded on the display in some unique way also.