Experiment-7: Keypad 4x4 Matrix

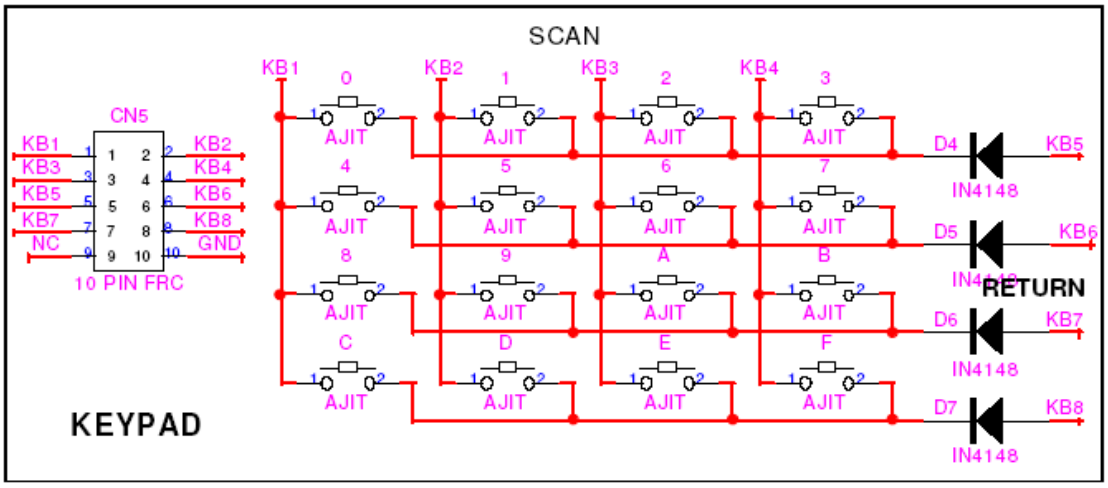
- Interfacing details - Po Pin configuration in the kit for the keypad
- Scan code look up table for keypad
- Scanning mechanism
- Hands On
    - interfacing keypad with 7S display

- Keypad (4 Rows X 4 Columns):
- The switches SW4 to SW19 are organized as 4 rows X 4 columns matrix.
- One end of all the switches are connected to port lines P0.4 - P0.7, which is configured as columns.
- The other end of the matrix is connected to the port lines P0.0 – P0.3 which is configured as rows.
- The interface diagram for keypad is shown below.

Operation:

- Initially take one column line to logic HIGH, then check for each row.
- If first row is at logic '0' and other rows are at logic '1' then save the read data and compare with the look-up table.
- Similarly repeat the procedure for all the columns.

Keypad Interface:



KEY MATRIX

Key pad Scan Code Table
(Scan column by keeping row low or vice-versa)

Digit	Scan code	P0.7	P0.6	P0.5	P0.4	P0.3	P0.2	P0.1	P0.0
0	0xEE	On	On	On	Off	On	On	On	Off
1	0xDE	On	On	Off	On	On	On	on	Off
2	0xBE	On	Off	On	On	On	on	On	Off
3	0x7E	Off	on	on	on	On	On	On	Off
4	0xED	On	On	On	off	On	On	Off	On
5	0xDD	On	On	Off	On	On	On	Off	On
6	0xBD	On	off	On	On	On	On	Off	On
7	0x7D	Off	On	On	On	On	On	Off	On
8	0xEB	On	On	On	Off	On	Off	On	On
9	0xDB	On	On	Off	On	On	Off	On	On
A	0xBB	On	Off	On	On	On	Off	On	On
B	0x7B	Off	on	On	on	On	Off	On	On
C	0xE7	on	on	on	Off	Off	On	on	on
D	0xD7	On	on	Off	on	Off	On	on	on
E	0xB7	on	Off	on	On	off	on	on	on
F	0x77	Off	on	On	on	off	On	on	on

```
//Pseudo code
//Sample Code skeleton for scanning the key press from keypad and displaying it on 7
//Segment displays
//Keypad scan code lookup table
unsigned char scan_code[16]={
                                0xEE,0xDE,0xBE,0x7E,
                                0xED,0xDD,0xBD,0x7D,
                                0xEB,0xDB,0xBB,0x7B,
                                0xE7,0xD7,0xB7,0x77
                                    };
//7 Segment code look up table from previous exercise
unsigned char LED_CODE[16]= {
                                0x3f,0x66,0x7f,0x39,
                                0x06,0x6d,0x6f,0x5e,
                                0x5b,0x7d,0x77,0x79,
                                0x4f,0x07,0x7c,0x71
                                };
//main routine
//row by row scanning technique in software
//init all the rows to low and cols to high
//select a 7S display digit to display the key press detected


while(1)
{
        //loop through all the rows
                //assume one row as low
                //scan through the cols to detect the key press
                //send the 7S code for the key press detected
}
```