Experiment 6: LED 16x16 Dot Matrix Display

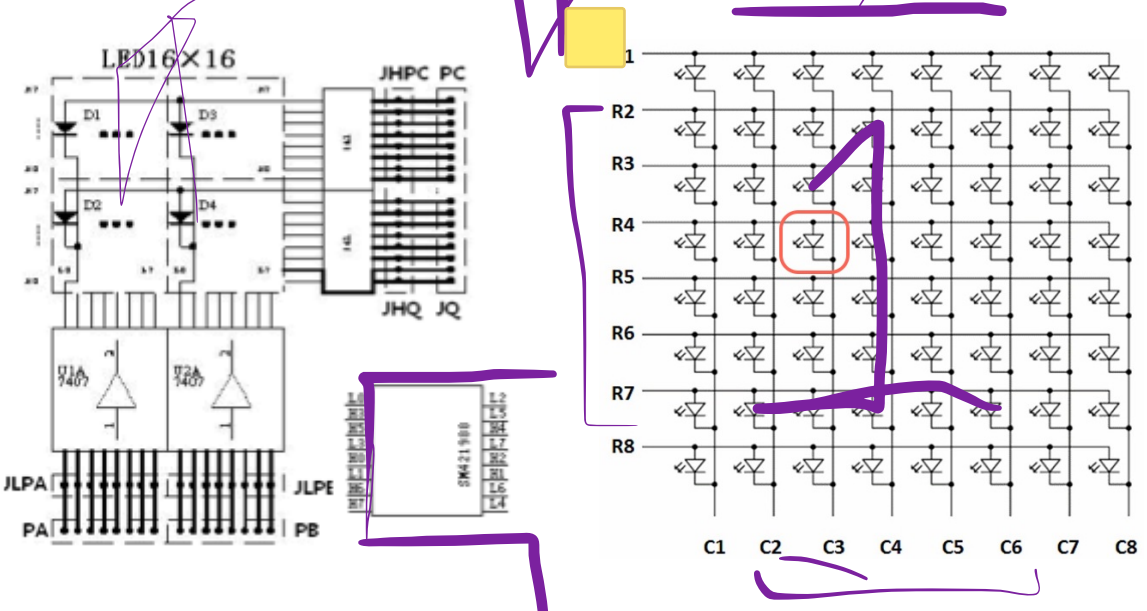
Objectives

- To know the basic principles and function of LED 16X16 dot matrix display.
- To master the interface circuit design between microprocessor and LED matrix block and its programming.

Introduction

16x16 matrix LED is a common-cathode display consisting of four 8x8 LED dot matrix. This display can be used to display information as it allows both static and animated text and images.

As shown in the figure below of a dot matrix display, multiple LEDs are wired together in **rows** and **columns**. This is done to minimize the number of pins required to drive them. For example, there are 256 LEDs in a 16x16 dot matrix and they require 32 pins to interface them (four 8-bit ports).



For a given row, all anodes of its LEDs are wired together. Cathodes are also wired in columns. Hence, each LED is addressed by its row and column number. In the figure above, if R4 is pulled high and C3 is pulled low, the LED in fourth row and third column will be turned on.

Characters can be displayed by fast scanning of either rows or columns as follows:

- First, column C1 is selected by pulling it low, and other columns are deselected by pulling them to high.
- Then the LEDs in the all rows of this column can be either turned ON or OFF.
- The process is repeated for all columns consequently and quickly so as human eye can perceive the display image as still.

Experimental connection

In this experiment, the control of the LED matrix ports (columns and rows) is done via **8255** where connections are shown in the following table:

Lattice module (B1 area)	8255 experiment module (D1 area)	I/O port extension module (B9)	System signal area (D2 区)
JLPA（0~7）	JX9（PA0~PA7）		
JLPB（0~7）	JX15（PB0~PB7）		
JHPC（0~7）	JX16（PC0~PC7）		
JHQ（0~7）		JQ（Q7~Q0）	
		CS2	8000H
		WR	IOWR
		JX7	JX17

Experiment Task

1. (Week#1) Static shape:
   Write a program that displays a single digit on 8x8 LED matrix statically. Choose one of the following digit fonts:

   You are required to declare two arrays (for columns and rows) that contain the LED patterns required for the column scanning method.
2. (Week#1) Basic animation:
   Write a program that performs basic animation on 8x16 LED matrix. You are required to turn on a single column and makes it rotate over the display starting from C1 until C16 and goes back.
3. (Week#2) Mini-Project: To be defined later.