LECTURER ROOM DIRECTOR/MESSAGE BOARD

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DECLARATION

"I hereby declare that this thesis is the result of my own effort except as clearly stated its references"

Signature :.....

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I dedicate to my father and my mother, family members
and last but not least, to all my lecturers and friends

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ABSTRACT

The aim for this project is to build a message board using dot matrix display. The message board consists of four major subsections. These sections include a computer program, a communications system, a microcontroller, and the LED display. The computer program takes text entered by the user, converts the text to the proper data format, and loads the message onto the board.

The communications system handles data flowing from the computer to the message board. The message board is connected to the computer using RS232 cable. Data coming in from the computer is handled by the microcontroller, which stored the data in memory. The microcontroller is also responsible for reading instructions and messages from memory then displaying the messages according to the instructions. The LED display is operated by a set of constant current display drivers. These display drivers light the LED's based on data received from the microcontroller.

ABSTRAK

Tujuan penghasilan projek ini adalah untuk membina paparan mesej dengan menggunakan paparan dot matrix.Paparan mesej ini mengandungi empat bahagian utama. Bahagian tersebut ialah pengaturcaraan computer, sistem hubungan, pengatur mikro dan paparan LED.Aturcara komputer digunakan untuk memasukkan data oleh pengguna kemudian data akan diubah ke dalam format yang sepatutnya

Sistem hubungan berfungdi mengendalikan data yang dimasukkan daripada komputer kepada paparan mesej. Paparan mesej ini dihubungkan dengan menggunakan kabel RS232 . Data dari komputer akan dikendalikan oleh pengatur mikro yang mana data telah disimpan di dalam memorinya.Pengatur mikro ini juga bertanggungjawab untuk membaca arahan dan mesej daripada memori yang kemudiannya akan dipaparkan mengikut arahan tersebut.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABREVIATIONS

CISC	Complex Instruction Set Computer
CPU	Central Processing Unit
EEPROM	Electrically Erasable Programmable Read-Only Memory
Email	Electronic Mail
GSM	Groupe Special Mobile
I/O	Input/Output
IC	Integrated Circuit
LCD	Liquid Crystal Display
PC	Personal Computer
PIC	Peripheral Interface Controller
RAM	Random Access Memory
ROM	Read-Only Memory
SMS	Short Message System
VLSI	Very Large Scale Integrate

LIST OF APPENDICES

CHAPTER I

INTRODUCTION

1.1 Introduction of the Project

This will enable faculty as well as student organizations to communicate messages quickly to others in the department. Important messages regarding class cancellations, exam dates, meeting times, and other pertinent information will be displayed at this message board.

The message board consists of four major subsections. These sections include a computer program, a communications system, a microcontroller, and the LED display. The computer program takes text entered by the user, converts the text to the proper data format, and loads the message onto the board. The communications system handles data flowing from the computer to the message board. The message board is connected to the computer using RS232 cable. Data coming in from the receiver is handled by the microcontroller, which stored the data in memory. The microcontroller is also responsible for reading instructions and messages from memory then displaying the messages according to the instructions. The LED display is operated by a set of constant current display drivers. These display drivers light the LED's based on data received from the microcontroller.

1.2 Objectives

i) The objective of this project is to develop a message board to convey information to a large multitude of people such as student who you personally cannot contact.

ii) This poses problems in that many of these people are not going to receive the information you are sending them. That is why people use message boards.

iii) The lecturer can inform the student any message such as class cancellations using the message board.

1.3 Scopes of Project

1 Search about message board sign using dot matrix display :
   i) Search the information about the method that will be used in this project such as dot matrix display and the software to control the hardware.
   ii) Study about PIC programming.
2 Design the circuit diagram.
   i) Design and simulate circuit using PROTEUS software.
   ii) Construct and test circuit on the breadboard (hardware).
   iii) Etching the circuit
3 Write the program using PIC.
4 Test run and troubleshoot
   i) Insert the PIC into the hardware.

1.4 Problem Statement

i) To combine three different circuits into one circuit so it can be running without any problem.

ii) To develop the circuit layout using this software.

iii) To configure the message board.

CHAPTER II

LITERATURE REVIEW

2.1 OVERVIEW

This chapter is mainly discussing about the brief description of method or device that used to actualise this project. This chapter also will discuss how to actualise this project according to theoretical.

2.1.1 Message Board

The idea is to let a text scroll over the LED dot-matrix displays. A dot-matrix display is a display which contains 5x7 dots (LEDs) in one case, the LEDs are connected like a matrix, there are two types CC and CA, the LEDs are simply put the other way around, here the drawings (inside and front).

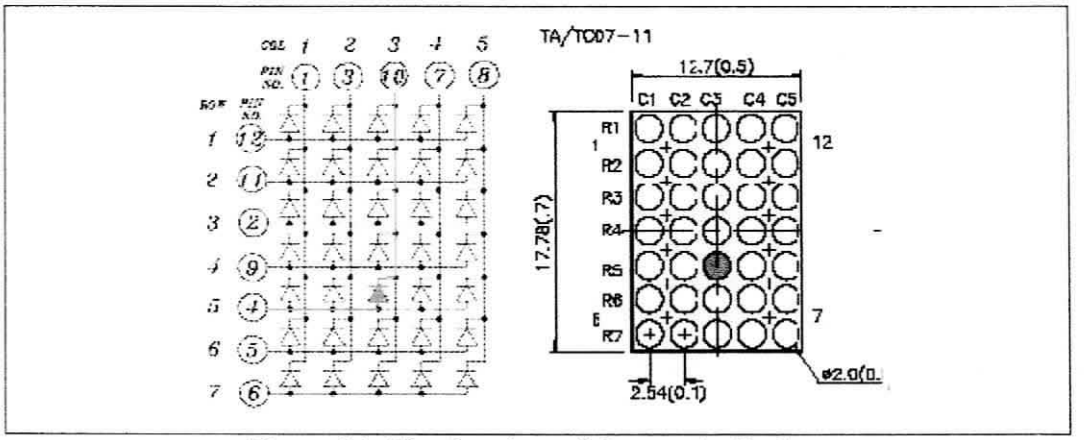
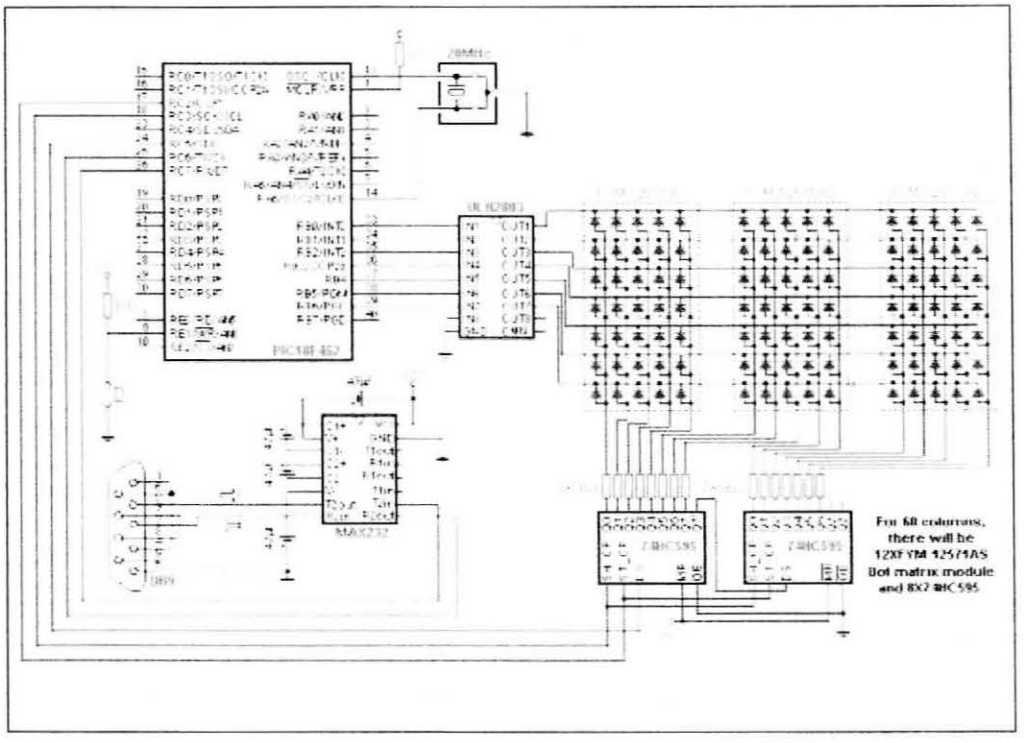


Figure 2.1: The drawings of dot matrix displays

If we put 1.8 Volt for an example at the lines 4 and 10, the LED will lit, the trick of multiplexing is to scan the columns (5) and set the data on the rows (7) or visa-versa, and the multiplex-frequency must be greater than approximate. 40Hz else you will see the flickering of the LEDs to much. It takes about 5 msec per column, that's about 25 msec for one frame.

The scanning goes as follows, first set the rows data on the 7 rows e.g. 1010010, then activate (0 or 1 -> depends on which type CA = common cathode, or CC = common anode) the first column, now these LEDs (dots) will lit, wait 5 msec, then switch the column off, now load the next rows data, and set the second column on, wait 5 msecs again, and switch it off again, if this sequence repeat very fast, the data (character data) appear on the display (refresh frequency 40 - 70Hz).

The rows data comes from the EEPROM or flash memory of the PIC, we can also take an external EEPROM/flash IC, PIC 18f452 has 256 bytes EEPROM and 32k flash memory and what to do is put the character data (ASCII) into the flash memory.



The 74HC595 is an 8-bit shift-register IC, with this IC you can shift 8 bits to the outputs with only 3 wires, that are Data (Ds), and 2 shift inputs (SHcp, STcp), connect like the diagram.

2.1.2 Type of Display

The trick to scroll a character across the display is to build one character on the display by scanning the columns very fast, and let say each 20 times (20 frames) scroll it one position to the left, this will give the effect of a walking text across the dot-matrix display. So first build one frame, repeat this 20 times, and after that, read the data one address later, if we do this 5 times (5 columns) the character scroll from right to left from the display. The refresh goes so fast that brain can't keep up, and what we see is the R scrolling over the display. I will take five 74HC595's shift

registers IC's, that are 5 x 8 bit = 40 bits / 5 columns = 8 dot-matrix displays, making it a nice tiny message sign.
This is simple stroller formula:

$$adrs = counter + pointer \qquad [1]$$

'adrs' is the register which will read the address to fetch data from, 'counter' is a bit-counter which counts up from 0 to 4 (5 columns), and 'pointer' is the register which increases every so many frames. The program starts from zero, so 'counter' and 'pointer' are both zero in the first round, so the first Rows data for the 1st column will be fetched from the 1st address (0). When small routine increase with one after 'counter' resets to zero, at that moment one frames is build (1 image = 1 character) and count that. The next round 'counter' will go to 1, and so 'adrs' will be also 1 because 'pointer' only increases each lets say 25 times (25 frames), so after 25 times 'pointer' increases with one, and then the first round will be: adrs = 0 + 1 = 1, the second round that will be 2, so you see the reading from the address is shifted one position to the left, because you INC. You can also scroll backwards, simply DEC the routine where 'pointer' is counted each 25 frames. Make the whole sequence run at a speed of about 25 msec that will make the display refresh at 40 Hz.

2.1.3 The full intensity of the displays

The scanning of the LEDs (dots) of the dot-matrix display takes 25 msec (40Hz refresh), so each LED is On for 5 msec (or Off when the data is '0'), because each column is On for 5 msec. One dot needs 10 mA of constant current, but when it

goes on and off with a high speed, the intensity will decrease, so it need to put more current through the LEDs to have the same effect (same at 0Hz) increasing the current can be done with transistors or a driver IC (like ULN2803, etc.) The dots have a duty-cycle of 20%, each LED is on for 20% of the total refresh time (Tref = 25 msec), so 5 msec On and 20 msec Off .

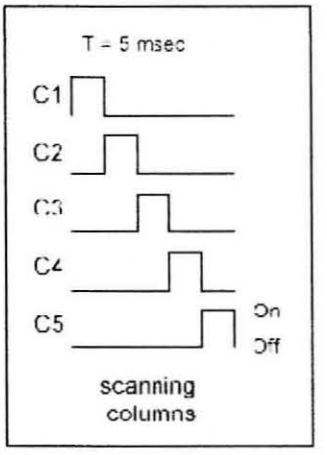


Figure 2.3 : The duty cycle of each LED

But the On / Off time of each dot is 5 msec -> On for 5 msec, so that's only 5/1000th of a second. Here is the formula to know how much current is needed to have the same light-intensity:

$$\text{I-led} = \text{T-tot} / \text{On-time} * \text{Normal Current} \qquad [2]$$

Where T-tot = the time from one rising edge to another.
On-time = the time that the LED is actually on.
Normal Current = the current the LED can handle at DC

2.2 Common configuration

i. Stand alone keypad solution
ii. On-to-one Serial Short Distance RS232 solution
iii. One-to-many serial RS422 solution
iv. LAN/Ethernet solution
v. Wireless – LAN solution
vi. Wireless Wide – Area – network solution

2.2.1 RS232

Communication between the software and the message board will be done via the RS232 serial port on the computer. The RS232 port has 9 pins. Three pins are used for communicating with the PC, one for receiving, transmitting, and ground. The remaining six pins are address pins for addressing more than one receiver, which will be fixed in our case since there is only one receiver. The computer program will send the data serially to the transmit pin, and will monitor the receive pin for a conformation message. Messages being received will be preceded with a specified preamble of 8 bits to ensure that noise is not interpreted as a message.

2.3 Device Overview

There are many types of devices and components can be use for constructing this message board system. In this system, the main devices and components is consists of display device and main controller.

2.3.1 ULN2803

The ULN2803 each contains eight Darlington transistors with common emitters and integral suppression diodes for inductive loads. Each Darlington features a peak load current rating of 600mA (500mA continuous) and can withstand at least 50V in the off state. Outputs maybe paralleled for higher current capability.

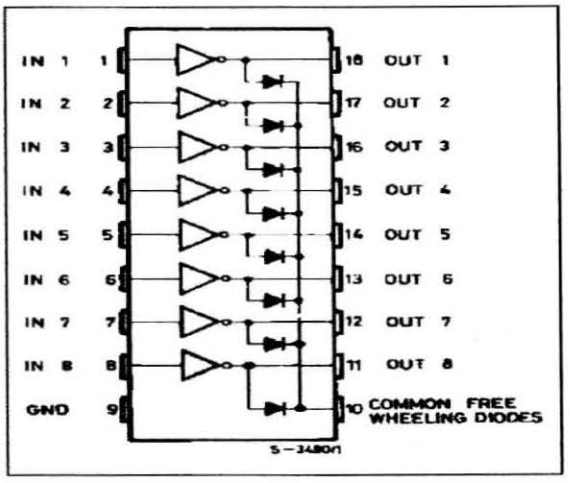


Figure 2.4 : ULN2803 internal circuit

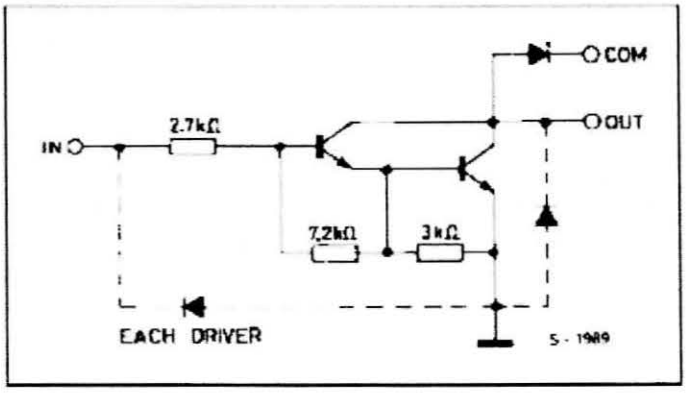


Figure 2.5 : Schematic diagram and Order Codes

2.3.2 PIC18F452

These devices come in 28-pin and 40/44-pin packages. The 28-pin devices do not have a Parallel Slave Port (PSP) implemented and the number of Analog-to-Digital (A/D) converter input channels is reduced to 5.