Microcontroller Based Character Moving System

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Abstract:- The Microcontroller Based Characters Moving System is designed and constructed. The PIC16F84A microcontroller is programmed to display characters one by one on the liquid crystal display (J402A). When the system is powered, 16 characters are displayed on the first line of LCD. Then next 16 characters are displayed on the second line of LCD. After that next 19 characters are displayed on third line of LCD. Finally, different 19 characters are displayed on fourth line of LCD. The characters are displayed one after another. All characters from first line to fourth line are displayed for a while. The displayed procedure is repeated.

Keywords:- PIC16F84A Microcontroller, Liquid Crystal Display, Pic Basic Pro Language.

I. INTRODUCTION

Character display on liquid crystal display is found in many electronic devices. The microcontroller is simply a computer on a single chip. It is one of the most important developments in electronics after the invention of microprocessor. It is essential for the operation of devices such as mobile phones, DVD players, video cameras, and most stand-alone electronic systems. The small LCD screen is a good device to display the results in the programmed MCU (microcontroller unit).

This is a low cost microcontroller based system. Microcontroller based Moving Character Display on LCD has applications in various areas including schools, colleges, public areas, railway stations, hospitals. Liquid crystal display (LCD) display shows moving Characters. Microcontroller sends and controls the messages to be displayed on LCD. LCD technology is an immensely powerful tool for system feedback [5]. Since the entire device used need 5v to operate it also save the power. Therefore this system will be a great assert to small companies, shops, hotels, school, etc, in advertisement area.

This paper is organized into five sections including this section. Section 2 describes the theory background of Microcontroller and Electronic Devices in this system. This section also includes Voltage Regulator, Transformer, PIC16F84A, and Liquid Crystal Display (LCD). Section 3 displays design and construction of this system with three parts. Result and Discussion with the aid of diagram also describes in section 4. Finally, section 5 concludes the system.

II. BACKGROUND THEORY

Microcontroller is a computer-in-chip device that is used in controlling the circuit. Being a computer-in-chip means it has all the features of a simple which enables it to function alone independently. It has features like central processing unit (CPU), memories in the case of random access memory (RAM), read only memory (ROM), registers, input and Output units and other peripherals as shown in figure 1[1, 2, 4].

PIC microcontrollers can be used as the 'brain' to control a large variety of products. In order to control devices, it is necessary to interface (or 'connect') them to the PIC microcontroller.
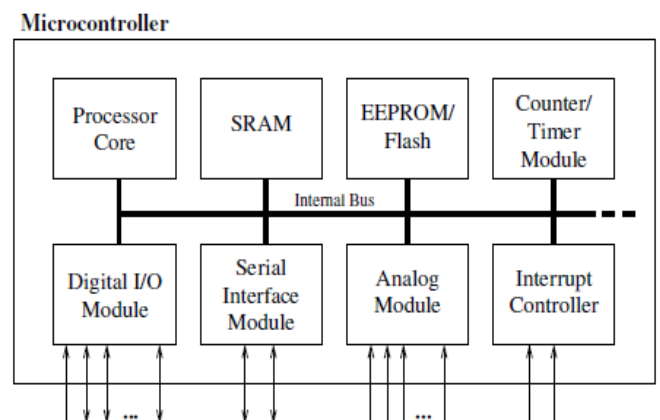

Fig 1:- Basic layout of a microcontroller.

A. LM7805 Voltage Regulator

The description of LM7805 three-terminal positive regulator is available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. [3, 6] This component keeps the output voltage from the capacitor to a constant value as long as its minimum operating voltage as required by its datasheet. In the case of this system, I made use of LM7805, which by its datasheet requires a minimum input voltage of 7VDC to be able to give out 5V regulated voltage output.

B. Transformer

Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC. Transformers have many applications in power transmission and electronics: They may be used to minimise energy losses due to voltage drop in transmitting electricity over long distances. They match loads with internal resistance so that there is maximum

power transfer. They couple signals between electronic stages. [3, 6]

C. Microcontroller (PIC16F84A)

A microcontroller is an inexpensive single-chip computer. Single-chip computer means that the entire computer system lies within the confines of the integrated circuit chip. The microcontroller has features similar to those of standard personal computer. Primarily, the microcontroller is capable of storing and running a program. The PIC16F84 belongs to a class of 8-bit microcontrollers of RISC architecture. The PIC chips have two separate 'data' busses, one for instructions and one for everything else. Instructions are essentially in ROM and dedicate the microcontroller to doing one task, RAM is where variables are stored, there is very little RAM, a few dozen bytes, and this is reserved for variables operated on by the program. There is also very little 'data' storage, again a few dozen bytes, and this is in EEPROM which is slow and clumsy to change. EEPROM is used to hold values to be remembered when the power is turned off. [1, 2, 4].
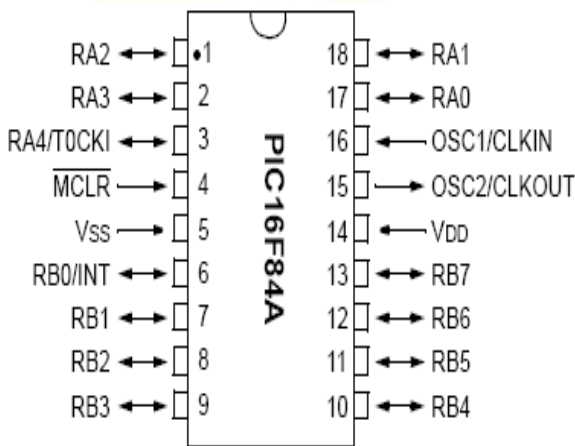

Fig 2:- Photograph and pin diagram of PIC16F84A

D. Liquid Crystal Display (LCD)

Alphanumeric dot matrix liquid crystal displays are used for displaying visual information, symbols, alphanumeric and icons in an impressive fashion. These modules have built-in controllers, drivers, character generator RAM/ROM, and associated circuitry for easy implementation of the logic for refreshing, multiplexing and updating the display. [5]

The J402A is a 20 characters x 4 lines liquid crystal display. Its features are interface with 8-bit or 4-bit MPU is available, 192 kind of alphabets, numeric, symbols and special characters can be displayed by built-in character generator (ROM), other preferred characters can be displayed by character generator (RAM), various functions of instructions are available by programming, compact and light weight design which can be easily assembled in devices, single power supply DC +5V drive and low power consumption. [5]
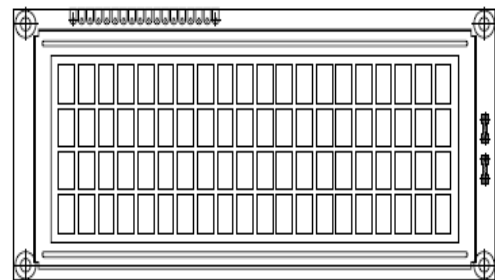

Fig 3:- Photograph and pin layout of the LCD J402A

III. DESIGN AND CONSTRUCTION

There are three main parts in the work of Microcontroller Based Characters Moving System. They are
(i) Regulated Power Supply Circuit
(ii) Microcontroller Control Circuit
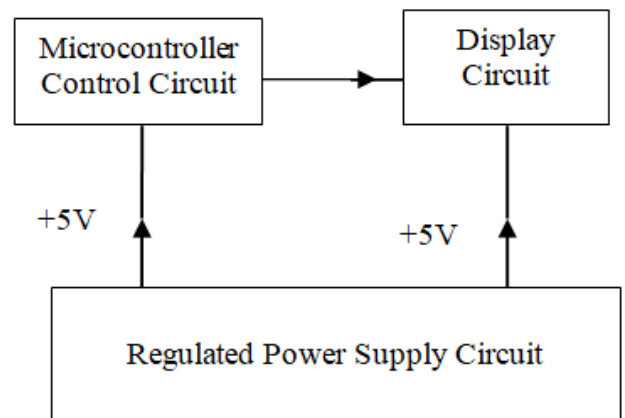(iii) Display Circuit

Fig 4:- Block diagram of Microcontroller Based Characters Moving System

A. Regulated Power Supply Circuit

The PIC16F84A works at DC +5V. To convert from line voltage AC 220V / 50 Hz into DC +5V, a regulated power supply is constructed. The input AC is stepped down to AC 18 V / 50 Hz by step-down transformer. The bridge rectifier rectifies this AC voltage into pulsating DC voltage and smoothed by capacitor filter. The voltage regulator (LM7805) produces the regulated DC +5V. For a proper function of any microcontroller, it is necessary to provide a stable source of supply, a sure reset when you turn it on and an oscillator. According to technical specifications by the manufacturer of PIC microcontroller, supply voltage should move between 2.0V to 6.0V in all versions. The simplest solution to the source of supply is using the voltage stabilizer LM7805 which gives stable +5V on its output. A fixed voltage power supply producing constant +5V consists of a bridge rectifier, filter capacitors and 3 terminal regulators IC LM7805. [3, 6]

Components that make up a simple power supply unit are;
- Step-down Transformer
- Rectifying Diode
- Filter Capacitor
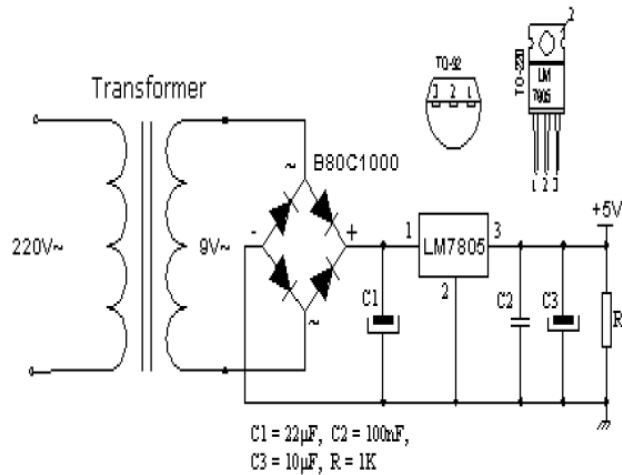- Voltage Regulator
- Indicator Light

Fig 5:- Supplying PIC16F84 Microcontroller

B. Microcontroller Control Circuit

This unit controls the operation of the work. The required program is embedded into the PIC16F84A microcontroller. The pin 14 (V_{DD}) of PIC16F84A is connected to DC +5V and pin 5 (V_{SS}) is tied to ground. The pin 4 ($\overline{MCLR}$) is tied to DC + 5V through $10\,k\,\Omega$ resistor. When RESET switch is pressed, the pin 4 is in ground state and the microcontroller is reset condition. The 4 MHz crystal oscillator is fixed at pin 15 (OSC2) and pin 16 (OSC1). The pin 6 (RB0), pin 7 (RB1), pin 8 (RB2), pin 9 (RB3), pin 10 (RB4) and pin 11 (RB5) of PIC16F84A microcontroller are connected to the pin 11 (DB4), pin 12 (DB5), pin 13 (DB6), pin 14 (DB7), pin 6 (E) and pin 4 (RS) of liquid crystal display (J402A) respectively. [1, 2, 4]

C. Complete Circuit Diagram

The characters are displayed on the 20 characters x 4 lines liquid crystal display (J402A). The pin 2 (V_{DD}) is powered by DC +5V. The pin 3 (V_{EE}) is also connected to middle pin of $10\,k\,\Omega$ variable resistor. The pin1 (V_{SS}) and pin 5 (R/W) are tied to ground. The pin 11 (DB4), pin 12 (DB5), pin 13 (DB6), pin 14 (DB7), pin 6 (E) and pin 4 (RS) of LCD are connected to pin 6 (RB0), pin 7 (RB1), pin 8 (RB2), pin 9 (RB3), pin 10 (RB4) and pin 11 (RB5) of PIC16F84A microcontroller respectively. The completed circuit diagram of Microcontroller Based Characters Moving System is shown in Figure 6.
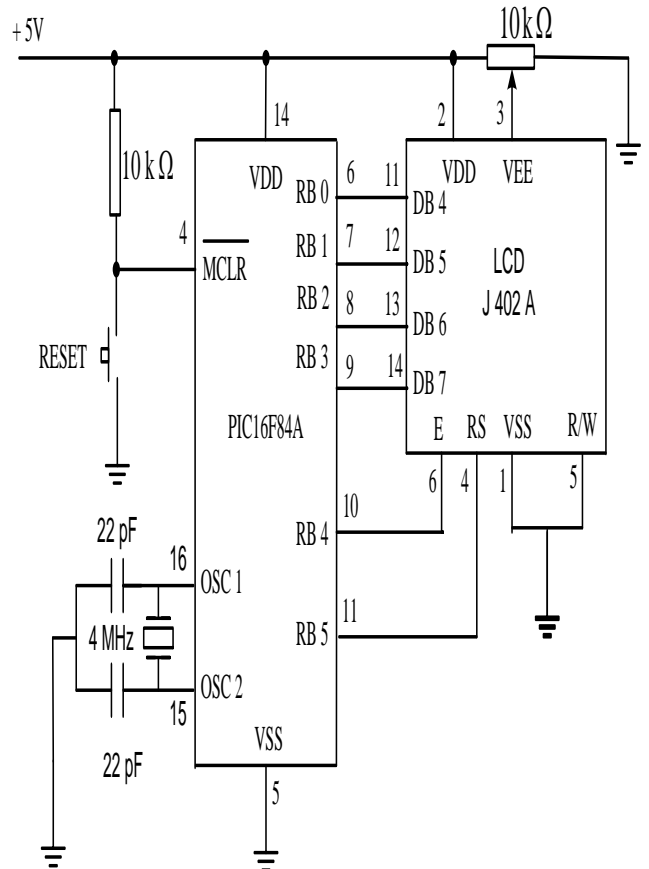

Fig 6:- Complete circuit diagram of Microcontroller Based Characters Moving System

IV. RESULTS AND DISCUSSION

The work of Microcontroller Based Characters Moving System is designed and carried out. The program for characters moving on liquid crystal display is written, compiled and downloaded into PIC16F84A microcontroller. The pin 6 (RB0), pin 7 (RB1), pin 8 (RB2), pin 9 (RB3), pin 10 (RB4) and pin 11 (RB5) are defined as output pins. A RESET switch is fixed at pin 4 ($\overline{MCLR}$) of PIC16F84A microcontroller. The photograph of microcontroller based character moving system is shown in Figure 7.

Fig 7:- The photograph of microcontroller based character moving system

When the constructed system is powered, "DAW AYE MAR KHIN" is displayed on the first line of liquid crystal display (J402A). The characters are displayed one by one from left to right direction. By using the following program:
- main: serout 1,N2400,(" DAW AYE MAR KHIN")
- serout 1,N2400,(10,13)
- pause 1000

Then, "LECTURER, DEPT. OF" is also displayed on second line of LCD. The characters are also displayed one by one from left to right direction. The program is
- serout 1,N2400,(" LECTURER, DEPT. OF")
- serout 1,N2400,(10,13)
- pause 1000

After that, "ENGINEERING PHYSICS" is displayed on third line of LCD. The characters are displayed one by one from left to right direction. The program is
- serout 1,N2400,(" ENGINEERING PHYSICS")
- serout 1,N2400,(10,13)
- pause 1000

Finally, "YATANARPON CYBERCITY" is displayed on fourth line of LCD. The characters are displayed one by one from left to right direction. The program is
- serout 1,N2400,(" YATANARPON CYBERCITY")
- serout 1,N2400,(10,13)
- pause 1000

All characters from first line to fourth line are displayed 3 seconds. Then, the system repeats its operation as long as it is powered. The result of the system is displayed with all characters on LCD as shown in figure 8 and 9.

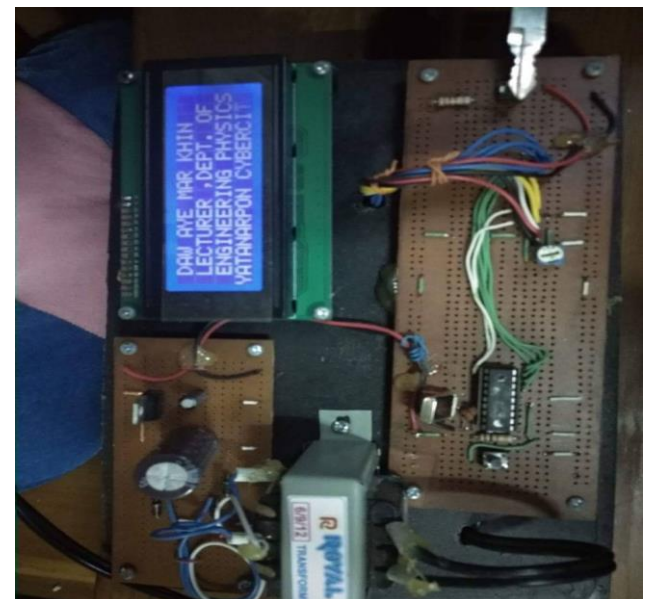Fig 8:- The result of microcontroller based character moving system

Fig 9:- The complete result of microcontroller based character moving system

V. CONCLUSION

A Moving Message Display system has been designed, analyzed and implemented. The completed system was able to display the message of text containing 70 characters. There are many display devices. Among them a liquid crystal display is used at this work. It is used in many areas. Not only characters but also numbers can be displayed. In this work, display characters are designed to move. The other display patterns are also suggested to be carried out as further works. The system would be found useful in applications which require information to be displayed in a legible and intelligible form such as in Restaurants, Banks, Museums, etc.

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