MAE 476/576

MECHATRONICS

IMPLEMENTING A BURGLAR ALARM SYSTEM

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ABSTRACT:

This project involved implementing and understanding the BASIC STAMP II. By interfacing the BASIC STAMP II with other components such as an LCD display, seven segment display, push buttons and a piezo beeper, a concept burglar alarm was designed. An added feature is the flexibility of the user changing the password, when the alarm is not active. Creating this burglar alarm included the incorporation of hardware and software. The chip that was implemented into the board was the MAX7219. To interact with the board and activate the burglar alarm, source code was written to control the functions of the alarm.

INTRODUCTION:

This lab introduces the components of the Stamp Works kit. This kit includes the BASIC STAMP II, which is interfaced with the components. The language that is used to communicate between the components and the chip is called PBASIC. The code for this project can be adapted from the experiments in the Stamp Works manual. The experiments in the manual also give a better understanding of how to implement the components with each other and with the source code.

TASKS:

The tasks for this lab include:

a. **Turning on and off an LED in response to pushbutton inputs**
   - First we implemented switches D1, D2 and D3 with LED 0. Initially the state of LED 0 is off, when pushing button D1 the LED stated flashing once every second; when pushing button D2 the LED turned off, and when pushing button D3 the LED was turned permanently on.

b. **Interfacing a Seven Segment Display**
   - The seven-segment display requires the use of many I/O pins. The MAX7219 was implemented to reduce the number of I/O lines used in the BASIC STAMP II. The seven-segment display displayed the button pressed.

c. **Interfacing the LCD Screen**
   - Program codes were used to display the button pushed.

d. **Interfacing a Piezo Beeper**
   - Piezo beeper was used to create different sounds with different frequencies.

e. **Implement a burglar alarm system**
   - The final step on this lab was to incorporate task a-d into one and create a burglar alarm.

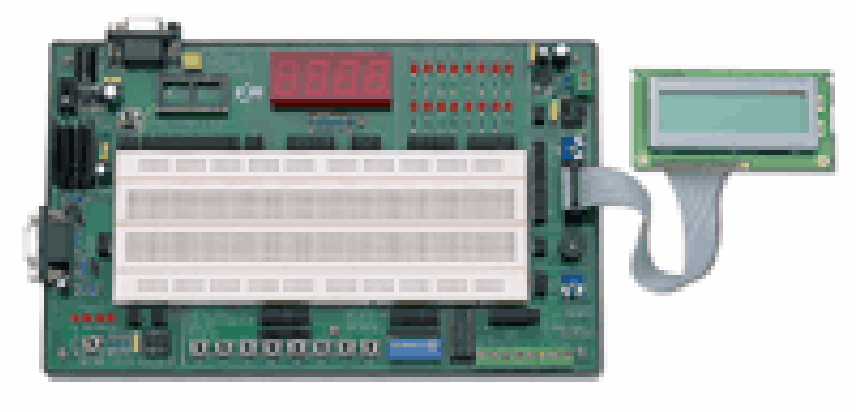
HARDWARE USED:

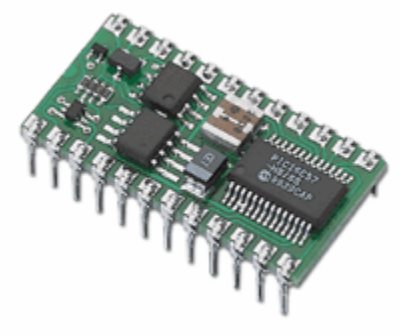
The hardware that was used came from the Stamp Works kit (Figure 1)

Figure 1

Hardware used included:

- NX-1000 BASIC Stamp Experiment Board
- BASIC Stamp 2 module (BS2-IC)
- 2 row x 16 character Hitachi-compatible parallel LCD with custom manufactured cable
- seven segment display
- Piezo beeper
- Digital multimeter with two probes
- Wire cutter / wire stripper / pliers
- Maxim 7219 8-digit LED display driver
- 2 Resistors 10K
- Serial cable
- Computer.





CIRCUIT DIAGRAMS:

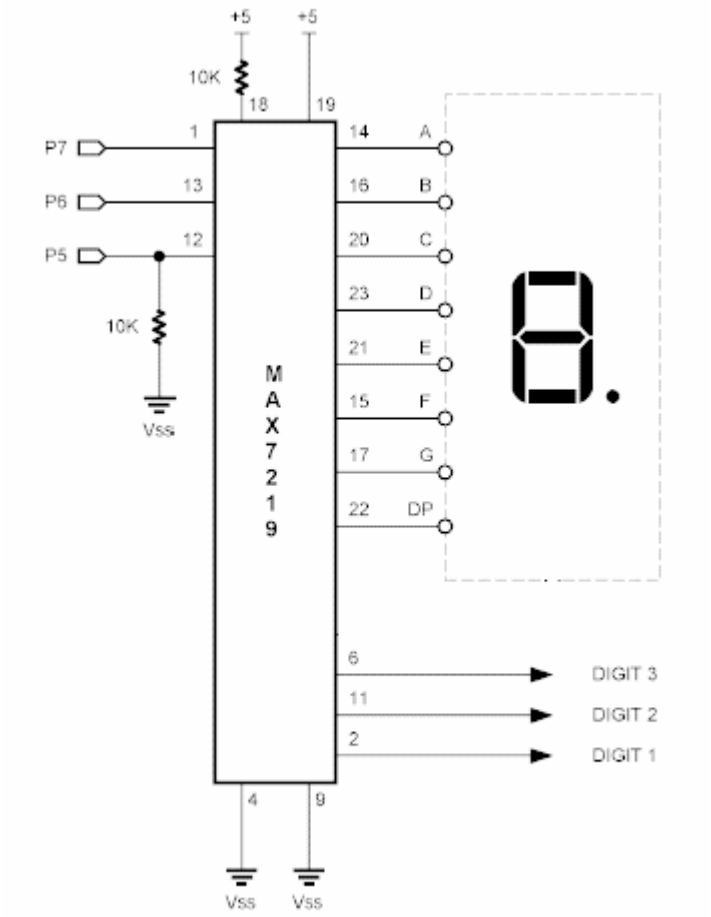


Figure 2

Figure 2 depicts the MAX7219 chip that connects to the breadboard and allows numbers and letters to be displayed on the seven-segment display.

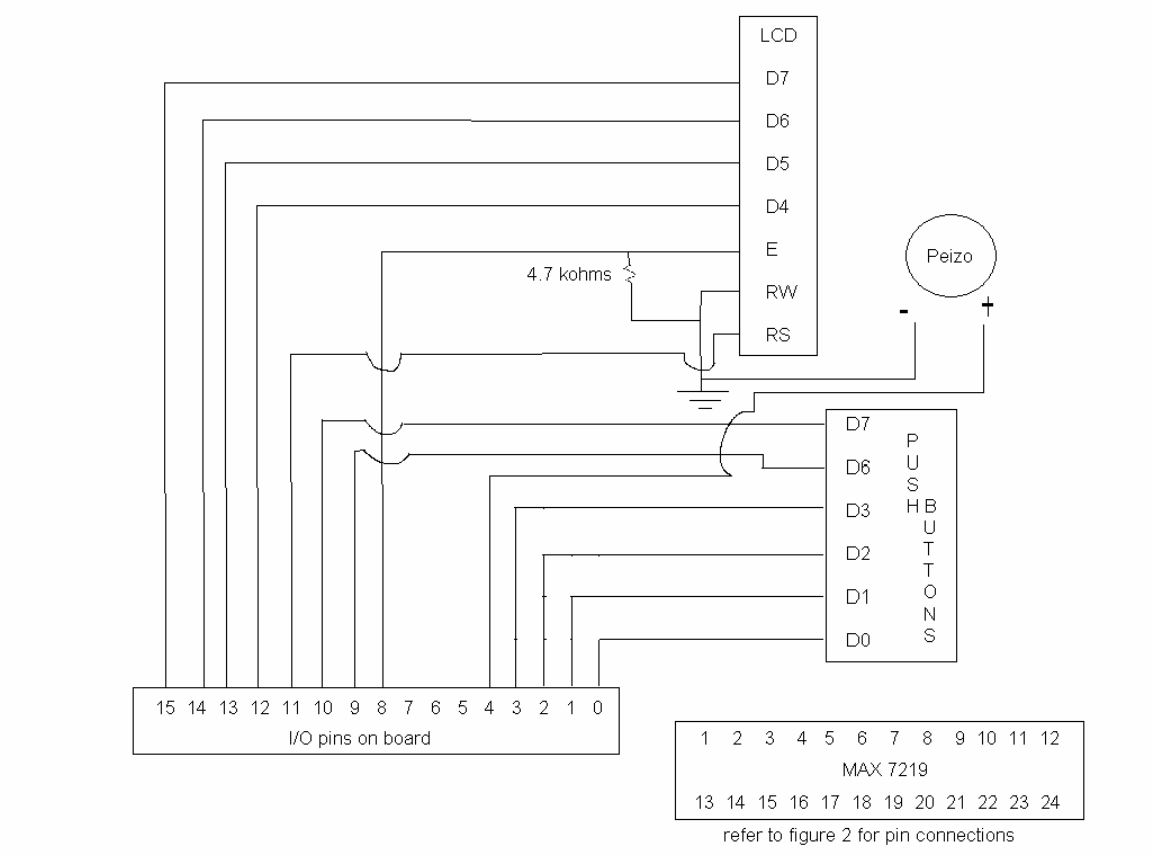


Figure 3

Figure 3 depicts the wiring used to construct the burglar alarm.

PROCEDURE:

Design and Implementation of the Project

The prerequisites for completing this lab were finished by conducting the desired tasks as listed above. In this we learned the basic programming techniques, the different ways of wiring the circuits, optimizing the use of I/O pins and getting to know the wonders of the basic stamp and a feel as to how electronics works in real life!

We started off by performing the following steps.

- The LCD was connected to the basic stamp as per experiment 11 .The higher bytes of STAMP I/O ports are used (Ports 8-15) instead of lower bytes (Ports 0-7) as taken in the experiment, since these we are using for interfacing MAX7219.
- MAX 7219 was connected as per the circuit diagram given in experiment 29 (please note we are not using digit 4(LED Display 4))
- Piezo beeper was interfaced by connecting its positive to I/O Pin 4 of STAMP and negative being grounded.
- Coding was done in Basic Stamp Editor
- The program was downloaded to Basic Stamp Chip.
- Successfully tested after going through minor modifications/debugging.

Special features:

Password of the alarm can be changed at any time by proper authentication. This allows for an added security feature and gives the alarm a more practical.

Future work:

- The I/O ports on Stamp can be kept to the minimum so that other ports can be used for another functionalities.
- In the present system we are not displaying the clock, whenever you try to disarm the alarm, this can be implemented in the future.
- Multi line LCD Display can be implemented, so that it can be made more user friendly.
- While deactivating the alarm either the alarm should trigger after the specified time or in some given number of chances.

Problems Faced:

- Interfacing both LED display and LCD Display to obtain maximum functionality since LED Display consumes 11 I/O Ports and LCD 7 Ports. The problem was resolved using MAX 7219.
- The lack of ports also meant giving more functionality with use of minimum number of buttons.
- Other issues were mainly pertaining to program debugging

Conclusion

We successfully implemented working of a burglar alarm and learnt various aspects associated with the working of a basic stamp including programming, interfacing and design of the system. Further we were reasonably successful at making the alarm practical, secure and as user friendly as possible.

Software:

Flow Chart: