

# ELECTRICAL MACHINES

## GARAGE SYSTEM

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**Table of Contents**

**1. Introduction ..... 2**

**2. System Operation ..... 3**

**3. System Design ..... 4**

**4. Code Structure ..... 6**

**5. Advanced plan ..... 10**

**6. Conclusion ..... 10**

# 1. INTRODUCTION

In this Document we will show and discuss the operation and Implementation of a smart Garage System. In which, all the entrance and outing doors are controlled automatically, limited number of cars Included in each partition ,and, a clear visualization of the entire system operation is provided.

## 2. SYSTEM OPERATION

This Garage system mainly consists of 3 main parts :

1)- The **PIC Microcontroller 16f877A** , which is the main component of the system which operates all the process.

- Pic is interfaced with :
  - **DC Motor**
  - **Seven Segment**
  - **limit switches.2 IR Sensors**
  - **2 Limit switches**

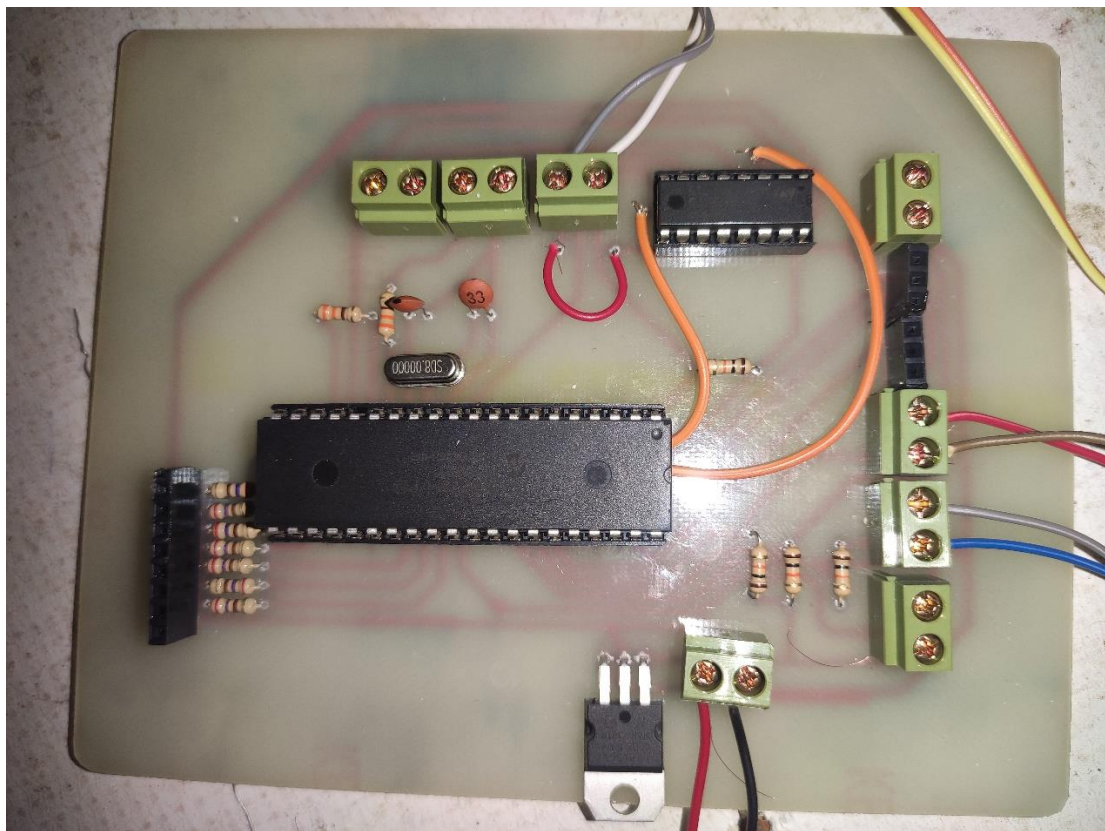
2)- Entrance door which opens and closes automatically when a car is at the entrance or leaving points. This is controlled by 2 IR Sensors, one at the entrance, and the other is inside the garage right before the leaving point.

- When the outside sensor reads high so *"It's a car at the entrance !"* , The door opens then close automatically .
- When the inside sensor reads high so *"It's a car leaving the garage !"* , The door again opens then close automatically.
- The door in the prototype is controlled by a **DC Motor** interfaced with **L293 IC** to control it's motion in the two directions , externally interfaced with the Pic.

- The speed of the DC motor is controlled by a PWM Pin from the PIC.
- Starting and ending point for the Opening and closing operation is controlled by two

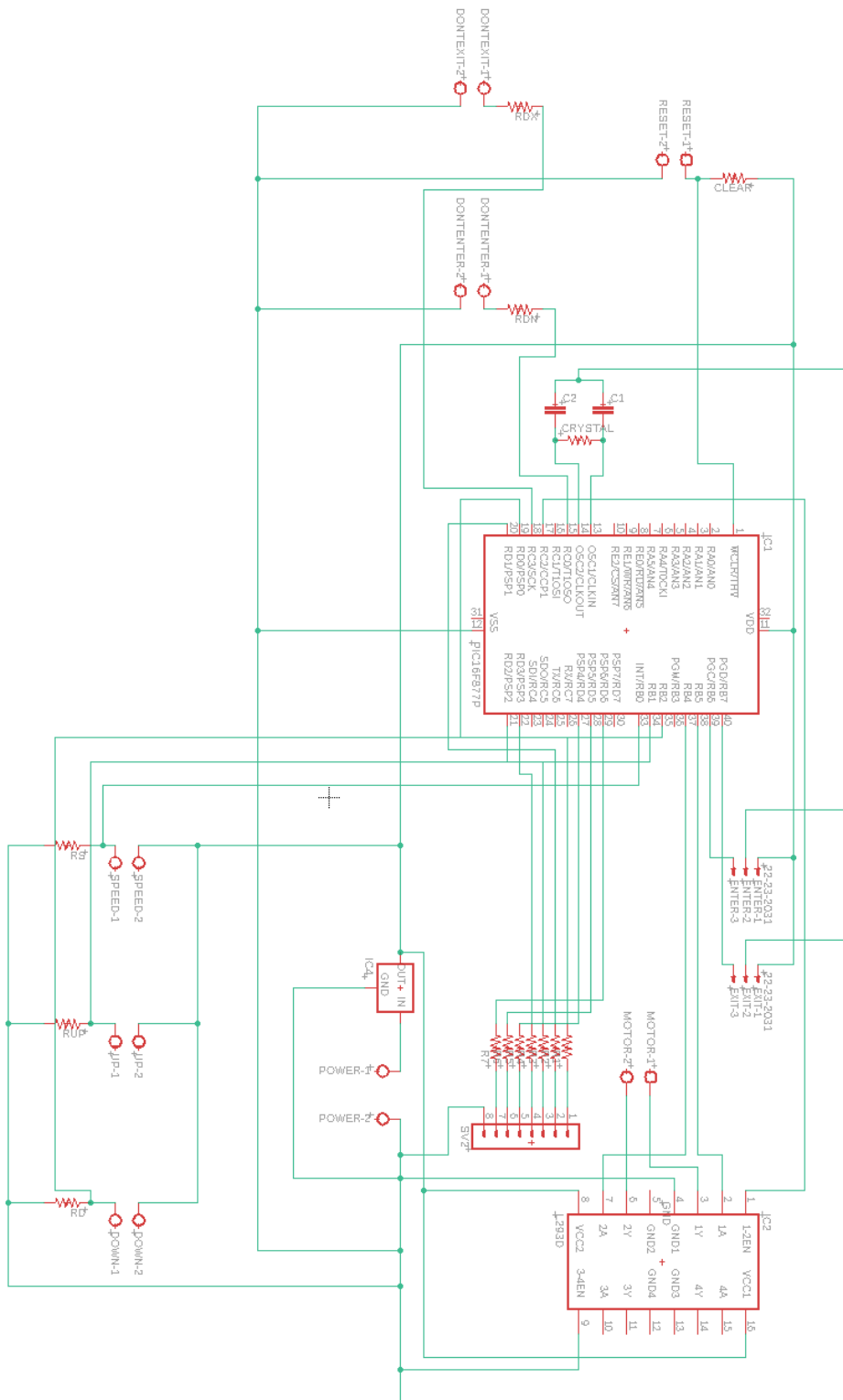
3)- The third main part of the system is the Seven Segment which involve the counting technique from 0 to 9 and reverse.

- When the outside sensor reads high , then the inside one reads high, This means “ *The car entered the garage!*” , The counter is incremented by 1.
- When the inside sensor reads high , then the outside one reads high, This means “ *The car leaved the garage!*” , The counter is decremented by 1.
- When the counter reaches 9 , this means the garage area has reached its limit and no any other car can enter.

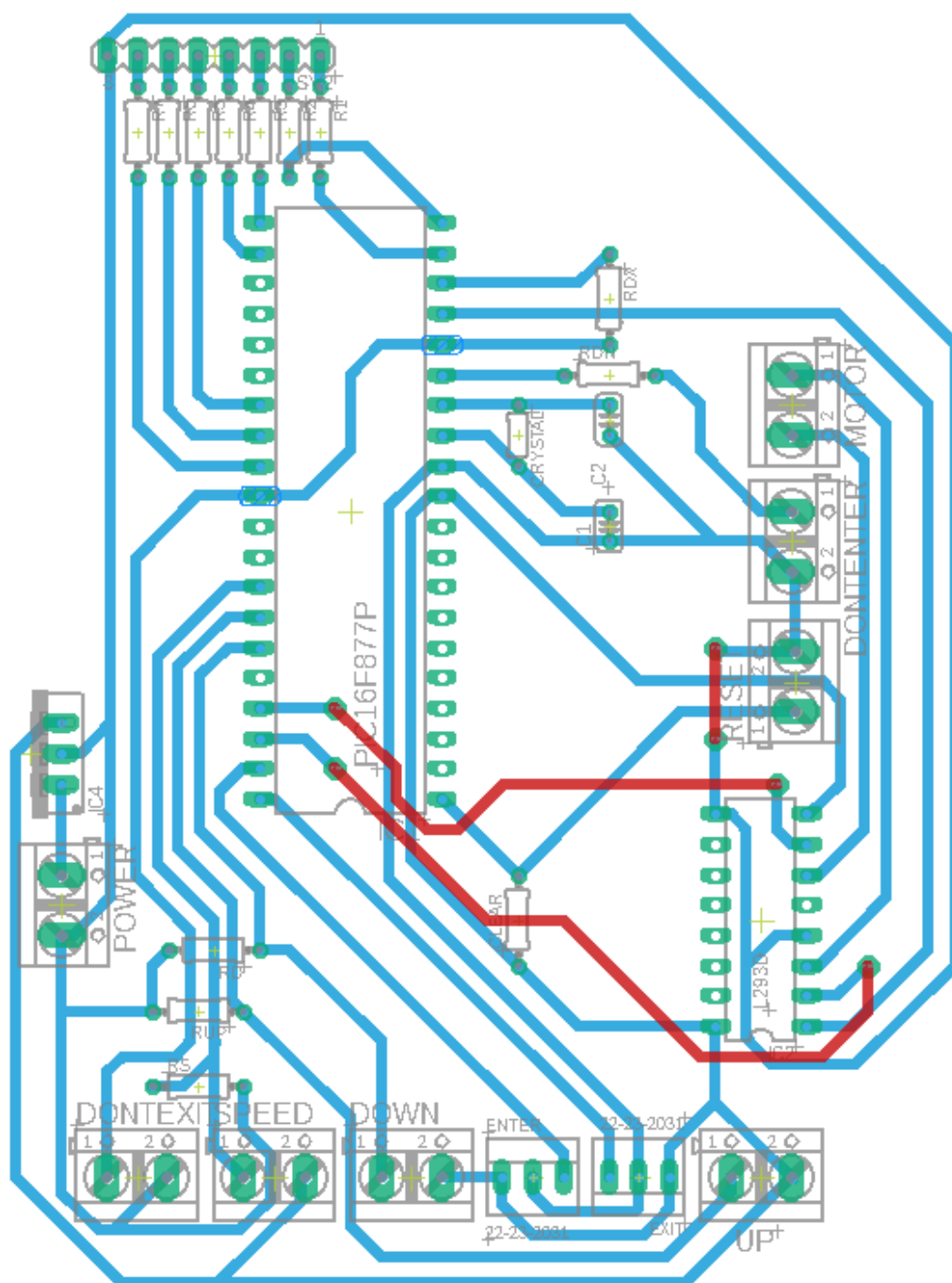


### 3. SYSTEM DESIGN

- **Circuit Diagram**



- **PCB Design**



## 4. CODE STRUCTURE

```
1. #define down portb.f2
2. #define up portb.f1
3. #define open portb.f4
4. #define close portb.f5
5. #define enter portb.f6
6. #define exit portb.f7
7. #define dontEnter portc.f0
8. #define dontExit portc.f3
9. float duty=30;
10. char flag=0;
11. char start=0;
12. char count=0;
13. char segment[]={0X3F,0X06,0X5B,0X4F,0X66,0X6D,0X7D,0X07,0X7F,0X6F};
14.
15. void interrupt()
16. {
17. INTCON.INTF=0;
18. start=1;
19. if(duty==100)
20. flag=1;
21. if(duty==40)
22. flag=0;
23. if(flag==0)
24. duty=duty+10;
```

```

25.else
26.duty=duty-10;
27.pwm1_set_duty(duty*255/100);
28.return ;
29.}
30.
31.void main() {
32.trisc=0;portc=0;
33.trisd=0; porta = 0;
34.trisb=0b11000111; portb = 0;
35.portd=segment[0];
36.
37.intcon.inte=1;
38.intcon.gie=1;
39.option_reg.intedg=1;
40.
41.pwm1_init(2000);
42.pwm1_start();
43.
44.while(start==0);
45.loop:                //main loop
46.while(enter==1 && exit==1);
47.//-----
48.if (enter==0&& exit==1 &&count<9) // when enter car
49.{
50.dontExit=1;

```



```
51.dontEnter=0;
52. open=1;
53. while(up==0 && enter==0);
54. open=0;
55. while(enter==0 && exit==1);
56. while(enter==0 && exit==0 );
57. if(exit==0 && enter==1)
58. {
59.   count++ ;
60.   portd=segment[count];
61. }
62. while(enter==1 && exit==0);
63. while(down==0 && enter==1 && exit==1)
64. {
65.   close=1;
66.   dontExit=0;
67.   dontEnter=0;
68. }
69. close=0;
70.}
71.//-----
72.else if(enter==1 && exit==0)  // when exit car
73.{
74.dontExit=0;
75.dontEnter=1;
76.while(up==0 && exit==0)
```

```
77.{
78.open=1;
79.}
80.open=0;
81.while(exit==0 && enter == 1);
82.while(enter==0 && exit==0 );
83.if(exit==1 && enter==0)
84.{
85.count--;
86.portd=segment[count];
87.}
88.while(enter==0 && exit==1);
89.while(down==0 && enter==1 && exit==1)
90.{
91.close=1;
92.dontExit=0;
93.dontEnter=0;
94.}
95.close=0;
96.}
97.//-----
98.if(count==9)           // garage is full
99.dontEnter=1;
100.    goto loop;
101.    }
```

## **5. FUTURE OR ADVANCED PLAN**

The system can be enhanced with two doors, One as an entry and the other as an exit door.

The System can be controlled with a GUI made with Java watched by an observer in the control room.

## **6. CONCLUSION**

In This project we exert our utmost efforts to make this system operate properly. Though the lack of time and material we faced, we tried to do our best to make something good that reflects our understanding of automatic control systems, Electrical machines and Microcontroller.